

# VariFlex<sup>2</sup>

## RVCF Series

### Advanced User Manual

|      |                  |                        |
|------|------------------|------------------------|
| 230V | Class 1ph or 3ph | 0.4~30.0kW<br>0.5~40HP |
| 480V | Class 3ph        | 0.75~55kW<br>1.0~75HP  |



**Switch**



## **General Information**

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The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional parameters of the equipment or from mismatching the variable speed drive with the motor.

The contents of this guide are believed to be correct at the time of printing. In the interests of commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the content of the guide without notice.

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## **Drive Software Version**

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This product is supplied with the latest version of user-interface and machine control software.

This product is to be used in a new or existing system with other drives, there may be differences between their software and the software in this product. These differences may the product to function differently. This may also apply to drives returned from the Carlo Gavazzi Service Centre.

If there is any doubt, please contact your local Carlo Gavazzi representative or Distributor.

## **Environmental Statement**

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The electronic variable speed drives have the potential to save energy and (through increased machine/process efficiency) reduce raw material consumption and scrap throughout their long working lifetime. In typical applications, these positive environmental effects far outweigh the negative impacts of product manufacture and end-of-life disposal.

Nevertheless, when the products eventually reach the end of their useful life, they can very easily be dismantled into their major component parts for efficient recycling. Many parts snap together and can be separated without the use of tools, while other parts are secured with conventional screws.

Virtually all parts of the product are suitable for recycling.

Product packaging is of good quality and can be re-used. All the products come in strong cardboard cartons which themselves have a high recycled fibre content. If not re-used, these containers can be recycled. Polythene, used on the protective film and bags from wrapping product, can be recycled in the same way. Carlo Gavazzi packaging strategy favours easily recyclable materials of low environmental impact, and regular reviews identify opportunities for improvement.

When preparing to recycle or dispose of any product or packaging, please observe local legislation and best practice.



# Advanced User Guide

This guide is to assist in installing and running the inverter to verify that the drive and motor are working properly. Starting, stopping and speed control will be from the keypad. If your application requires external control or special system programming, consult the RVCF Instruction Manual supplied with your inverter.

## Step 0: Products Inspection

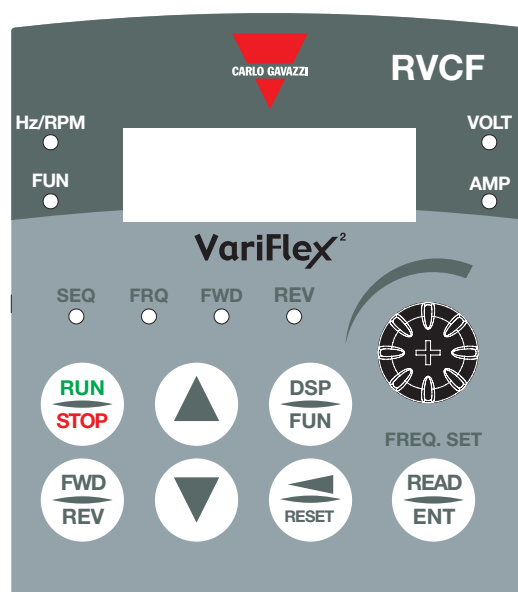
Carlo Gavazzi's inverters are all passed the function test before delivery. Please check the followings when you received and unpacked the inverter:

- The model and capacity of the inverter are the same as those specified in your purchase order.
- Check where there are any damages caused by transportation. Please do not apply the power, and do contact Carlo Gavazzi's sales representatives if any of the above problems happened.

## Step 1: Before Starting the Inverter

Please review Introduction and Safety Precautions of the RVCF Instruction Manual. Verify drive was installed in accordance with the procedures as described in this manual. If you feel this was abnormal, do not start the drive until qualified personnel have corrected the situation. (Failure to do so could result in serious injury.)

- **Check inverter and motor nameplates to determine that they have the same HP and voltage ratings. (Ensure that full load motor amps do not exceed that of the inverter.)**
- **Remove the terminal cover to expose the motor and power terminals.**
  - Verify that AC power is wired to L1, L2, and L3.**
  - Verify that Motor leads are connected to T1, T2, and T3.**  
(The two leads may need to be reversed if motor rotation is not correct).





1. **SEQLED:** 1-00 = 0001, LED Lit.
2. **FRQ LED:** 1-06 = 0001/0002/0003/0004/0005, LED Lit
3. **FWD LED:** Forward Direction, LED action(Flash in stop, Keep Lit in operation).
4. **REV LED:** Reverse Direction, LED action(Flash in stop, Keep Lit in operation).
5. **Four action of FUN, Hz/RPM, VOLT, AMP LED** and display of four 7-segment display, refer to operation description of the keypad.
6. **LCD keypad without FUN, Hz/RPM, VOLT, AMP LED.**

## Step 2: Apply Power to the Drive

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- Apply AC power to the Drive and observe Operator. Four 7-segment Display should read Power Voltage for 3~5 seconds and then read Frequency/Speed, 05.00. Four 7-segment Display and FWD LED should be flashed all the time.

## Step 3: Check Motor Rotation Without Load

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- Press RUN key (FWD LED should light); Four 7-segment Display should run from 00.00 to 05.00.
- Check motor rotation. If it is not correct:  
     Press STOP key. Remove AC power. Wait for LED "charge" lamp to extinguish.  
     Reverse motor leads T1 and T2. Restart the drive and check new rotation.
- Press STOP key to stop the drive.

## Step 4 Check Full Speed at 50Hz/60Hz

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- Frequency/Speed can be changed by pressing the up or down Arrow keys. To move right or left for next digit, press SHIFT/RESET key. Press the READ/ENTER key to set the speed.
- Set frequency up to 50Hz/60Hz in accordance with the last rule (0-05 parameter).
- Press RUN key. Check drive acceleration to full speed.
- Press STOP key to stop drive and check deceleration.

## Step 5 Other Operations

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Please refer to the following pages:

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# Chapter 0: Introduction

## i.1 Preface

To extend the performance of the product and ensure your safety, please read this manual thoroughly before using the inverter. Should there be any problem in using the product and can not be solved with the information provided in the manual, contact your nearest Carlo Gavazzi's distributor or our sales representatives who will be willing to help you. Please keep using Carlo Gavazzi's products in the future.

## i.2 Precautions

The inverter is an electrical electronic product. For your safety, there are symbols such as "Danger", "Caution" in this manual to remind you to pay attention to safety instructions on handling, installing, operating, and checking the inverter. Be sure to follow the instructions for highest safety.



### Danger

Indicates a potential hazard could cause death or serious personal injury if misused.



### Caution

Indicates that the inverter or the mechanical system might be damaged if misused.



### Danger

- Do not touch any circuit boards or components if the charging indicator is still lit after turned the power off.
- Do not wire when the inverter is electrified. Do not check parts and signals on circuit boards during the inverter operation.
- Do not disassemble the inverter and modify internal wires, circuits and parts.
- Ground the ground terminal of the inverter properly. As for 230V class ground to 100Ω or below, 480V class ground to 10Ω or below.



### Caution

- Do not perform a voltage test on parts inside the inverter. High voltage will easily destroy these semiconductor parts.
- Do not connect T1 (U), T2 (V), and T3 (W) terminals of the inverter to AC power supply.
- CMOS ICs on the inverter's main board are susceptible to static electricity. Do not touch the main circuit board.

## i.3 Products Inspection

Carlo Gavazzi's inverters are all passed the function test before delivery. Please check the followings when you received and unpacked the inverter:

- The model and capacity of the inverter are the same as those specified in your purchase order.
- Check where there are any damages caused by transportation. Please do not apply the power, and do contact Carlo Gavazzi's sales representatives if any of the above problems happened.

# Chapter 1: Safety Precautions



## 1.1 Before Power ON



### Caution

The line voltage applied must comply with the inverter's specified input voltage.



### Danger

Make sure the main circuit connections are correct. L1(L), L2 and L3(N) are power-input terminals and must not be mistaken for T1, T2 and T3. Otherwise, the inverter might be damaged.



### Caution

- To avoid the front cover from disengaging, do not pull the cover during handling for the heat sink should be fallen off. Accident falling down will damage the inverter or injure to person, which should be avoided.
- To avoid the risk of fire, do not install the inverter on a flammable object. Install it on nonflammable object such as metal.
- If several inverters are placed in the same control panel, add extra heat sink to keep the temperature below 40°C to avoid overheat or fire.
- When removing or installing the operator, turn OFF the power first, and manipulate the operator following the instruction of the diagram to avoid operator error or no display caused by bad contact.

### Warning

This is a product of the restricted sales distribution class according to IEC 61800-3. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.



### Caution

To ensure the safety of peripheral devices, it is strongly command to install a fast acting fuse in the input side especially for higher output system. Regarding the specification of fast acting fuse, .

## 1.2 During Power ON



### Danger

- Do not plug or unplug the connectors on the inverter when electrified to avoid the control panel damage resulting from erratic transition voltage surge due to contact bounce.
- When momentary power loss is longer than 2 seconds (the larger of horse power, the longer of time), the inverter does not have enough storage power to control the circuit; Therefore, when power is regenerated, the operation of the inverter is based on the setup of 1-00 / 2-05 and the condition of external switch, this is considered to be [restart] in the following paragraphs.





**!** **Danger**

- When the momentary power loss is short, the inverter still has enough storage power to control the circuit. Therefore, when power is regenerated, the inverter will automatically restart depending on the setup of 2-00/2-01.
- When restart the inverter, the operation of the inverter is based on the setup of 1-00 and 2-05 and the condition of external switch (FWD/REV button). Attention: the start operation is irrelevant with 2-00/2-01/2-02/2-03.
  1. When 1-00=0000, the inverter will not automatically run after restart.
  2. When 1-00=0001 and the external switch (FWD/REV button) is OFF, the inverter will not run after restart.
  3. When 1-00=0001, the external switch (FWD/REV button) is ON, and 2-05=0000, the inverter will run automatically after restart. Attention: In the sake of safety, please turn off the external switch (FWD/REV button) after power loss to avoid underling damage to the machine and the human body after sudden regeneration of power.
- To ensure the safety of people and machine, please refer to the description and suggestion of 2-05

### 1.3 Before Operation

**!** **Danger**

Make sure the model and capacity are the same as those set by 15-0.

**⚠** **Caution**

The inverter will flash the power voltage set by 0-07 for 5 seconds when applying power.

### 1.4 During Operation

**!** **Danger**

Do not engage or disengage the motor during operation. Otherwise, the over-current will cause the inverter to disconnect or the main circuit to burn.

**!** **Danger**

- To avoid electric shock, do not take the front cover off during electrifying.
- The motor will restart automatically after stop when auto-restart function is on. In this case, do not get close to the machine.
- Note: The stop switch is different from the usage of the emergency stop switch. It must be set first to be effective.

 **Caution**

- Do not touch heat-generating components such as heat sink and braking resistor.
- The inverter can drive the motor running from low speed to high speed. Verify the allowable capacities range of the motor and the mechanism.
- Note the settings related to the braking reactor.
- Do not check signals on circuit boards while the inverter is running.

 **Caution**

It is after 5 minutes that disassembling or checking the components could be performed as power supply OFF and the indicator turned off.

## 1.5 During Maintenance

---

 **Caution**

The inverter should be used in a non-condensed environment with temperature from -10°C to +40°C and relative humidity of 95% non-condense.

 **Caution**

When the inverter top cover has removed, it can be used in a non-condensed environment with temperature from -10°C to +50°C and relative humidity of 95%, but the environment should be free from water and metal dust.



# Chapter 2: Model description

## 2.1 Label description

**⚠ CAUTION**

Do not inspect components unless the lamp is off.  
See manual for proper installation and operation.

---

Model : RVCFB3400220  
Motor Rating : 3HP/2.2kW

---

INPUT : AC 3 phases 50/60Hz  
VOLTAGE : 380~480V (+10%, -15%)  
Amps : 7.3A

---

OUTPUT : AC 3 phases 0~650Hz  
VOLTAGE : 0~480V  
Amps : 5.2A


---

HW ver. :  
SW ver. :


---

IP20 / UL Open-Type with shielding cover removed  
(rated - 10°C to 50°C Ambient).  
NEMA 1/ UL Type 1 with shielding cover and optional  
conduit box kit installed (rated -10°C to 40°C Ambient).


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LISTED  
Exxxxx



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**Carlo Gavazzi**  
Via Milano 13, IT-20020 Lainate (MI)

Made in:

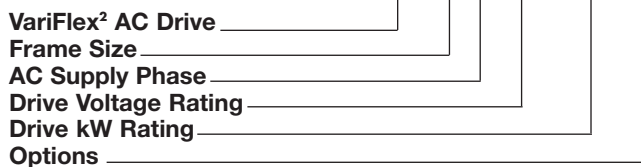
← Inverter model

← Input power

← Output power

## 2.2 Ordering Key

**RVCF B 3 40 0220 F**





## 2.3 Type Selection

| Voltage rating                      | Output voltage                 | Motor rating |              | Model        | Dimension |
|-------------------------------------|--------------------------------|--------------|--------------|--------------|-----------|
|                                     |                                | kW           | HP           |              |           |
| 200-240VAC<br>(+10%-15%)<br>1-phase | 0÷240V<br>3-phase<br>0.1÷650Hz | 0.4          | 0.5          | RVCFA1200040 | A         |
|                                     |                                | 0.75         | 1.0          | RVCFA1200075 | A         |
|                                     |                                | 1.5          | 2.0          | RVCFB1200150 | B         |
|                                     |                                | 2.2          | 3.0          | RVCFB1200220 | B         |
| 0.40                                |                                | 0.50         | RVCFA3200040 | A            |           |
| 0.75                                |                                | 1.0          | RVCFA3200075 | A            |           |
| 1.5                                 |                                | 2.0          | RVCFA3200150 | A            |           |
| 2.2                                 |                                | 3.0          | RVCFB3200220 | B            |           |
| 3.7                                 |                                | 5.0          | RVCFB3200370 | B            |           |
| 5.5                                 |                                | 7.5          | RVCFC3200550 | C            |           |
| 7.5                                 |                                | 10.0         | RVCFC3200750 | C            |           |
| 11.0                                |                                | 15.0         | RVCFD3201100 | D            |           |
| 15.0                                |                                | 20.0         | RVCFD3201500 | D            |           |
| 18.5                                |                                | 25.0         | RVCFD3201850 | D            |           |
| 22.0                                |                                | 30.0         | RVCFE3202200 | E            |           |
| 30.0                                |                                | 40.0         | RVCFE3203000 | E            |           |
| 380-480VAC<br>(+10%-15%)<br>1-phase | 0.75                           | 1.0          | RVCFA3400075 | A            |           |
|                                     | 1.5                            | 2.0          | RVCFA3400150 | A            |           |
|                                     | 2.2                            | 3.0          | RVCFB3400220 | B            |           |
|                                     | 3.7                            | 5.0          | RVCFB3400370 | B            |           |
|                                     | 5.5                            | 7.5          | RVCFC3400550 | C            |           |
|                                     | 7.5                            | 10.0         | RVCFC3400750 | C            |           |
|                                     | 11.0                           | 15.0         | RVCFC3401100 | C            |           |
|                                     | 15.0                           | 20.0         | RVCFD3401500 | D            |           |
|                                     | 18.5                           | 25.0         | RVCFD3401850 | D            |           |
|                                     | 22.0                           | 30.0         | RVCFD3202200 | D            |           |
|                                     | 30.0                           | 40.0         | RVCFE3403000 | E            |           |
|                                     | 37.0                           | 50.0         | RVCFE3403700 | E            |           |
|                                     | 45.0                           | 60.0         | RVCFF3404500 | F            |           |
|                                     | 55.0                           | 75.0         | RVCFF3405500 | F            |           |

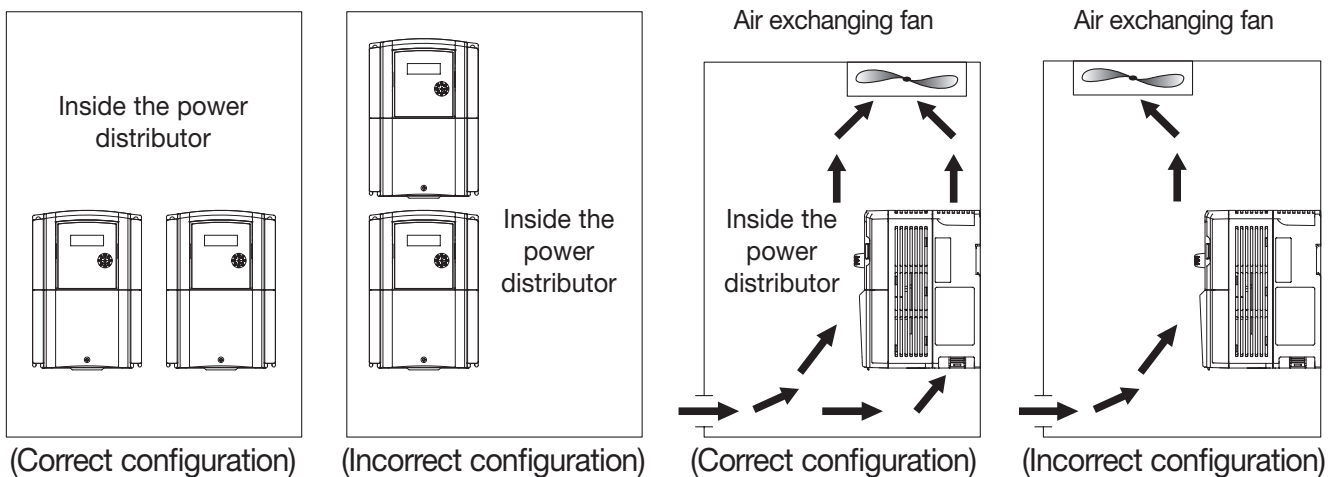
# Chapter 3: Ambient Environment and Installation



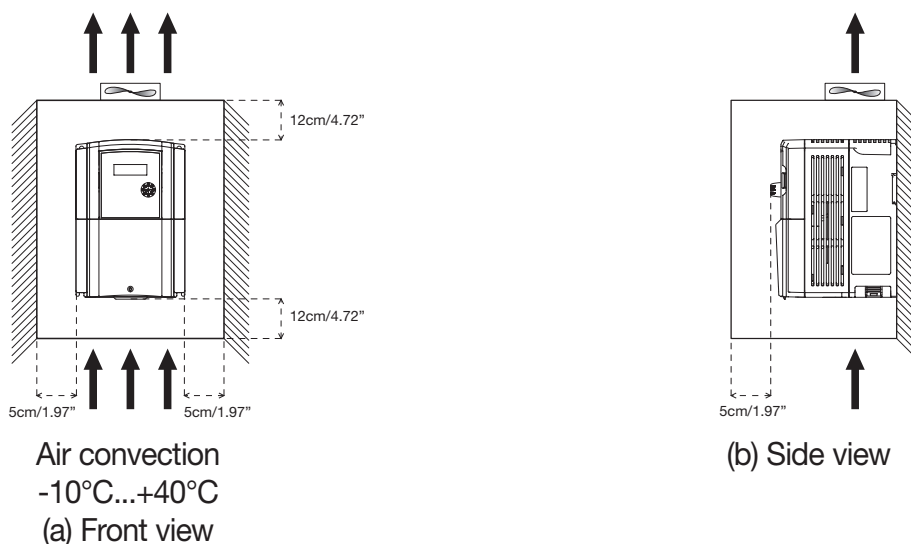
## 3.1 Environment

The environment will directly affect the proper operation and the life span of the inverter, so install the inverter in an environment complying with the following conditions:

- Ambient temperature:  $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$ ; without cover:  $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Avoid exposure to rain or moisture.
- Avoid direct sunlight.
- Avoid oil mist and salinity.
- Avoid erosive liquid and gas.
- Avoid dust, bats, and small metal pieces.
- Keep away from radioactive and flammable materials.
- Avoid electromagnetic interference (soldering machine, power machine).
- Avoid vibration (punching machine). Add a vibration-proof pad if the situation cannot be avoided.
- If several inverters are placed in the same control panel, add extra heat sinks to keep the temperature below  $40^{\circ}\text{C}$ .

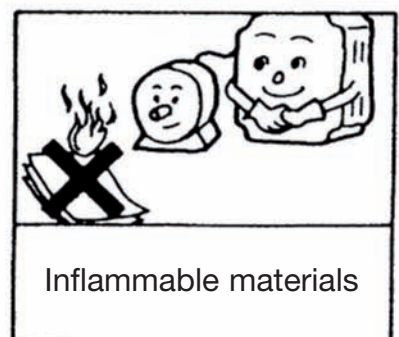
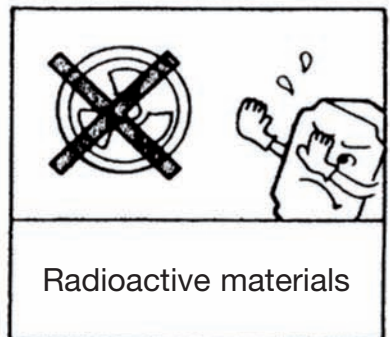
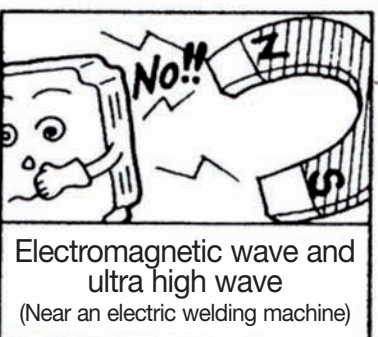
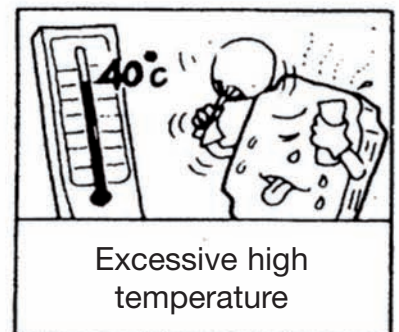
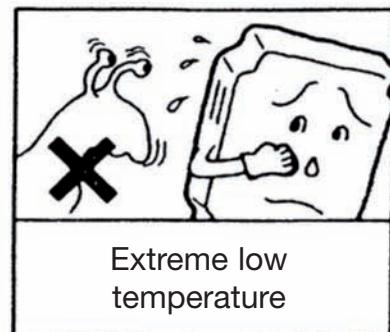
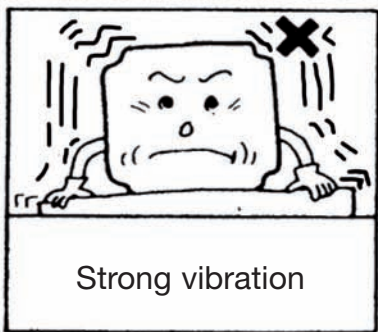
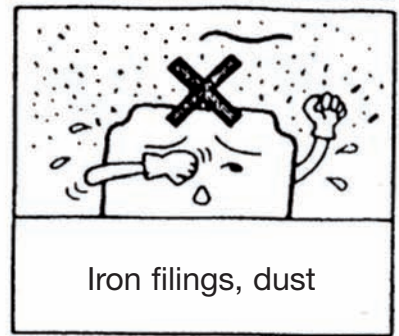
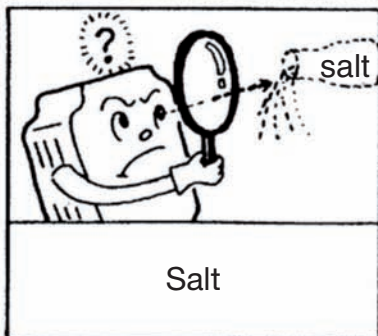
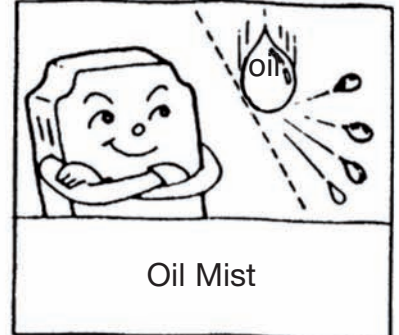
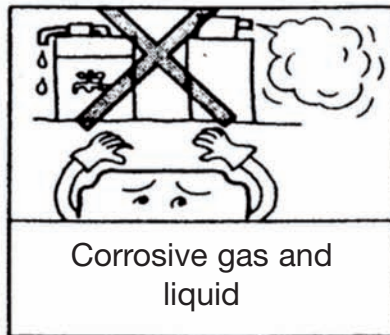
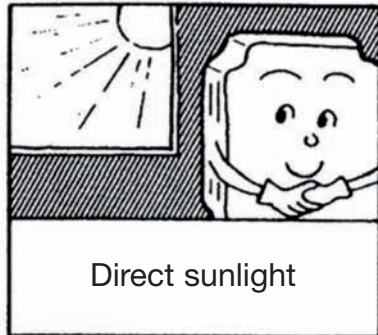


- Place the front side of the inverter onward and top upward to in favor of heat sink.
- Install the inverter according to the following figures: (take the dustproof cover off in favor of heat sinking if it is installed in a box or the environment allows to do so).



### 3.2 Environmental precautions

Do not use the inverter in an environment with the following conditions:







### 3.3 Wiring Role

#### 3.3.1 Notice for wiring

**A. Screwdriver torque:** Wiring with a screwdriver or other tools and follow the torque listed below:

| Securing torque          |              |                                 |                               |
|--------------------------|--------------|---------------------------------|-------------------------------|
| Horsepower               | Power source | Nominal torque for TM1 terminal |                               |
| 0.5/1/2 (3 $\phi$ )      | 200-240V     | 0.59/0.08<br>(LBS-FT/KG-M)      | 7.10/8.20<br>(LBS-IN/KG-CM)   |
| 1/2                      | 380-480V     |                                 |                               |
| 2 (1 $\phi$ )/3/5/4.5/10 | 200-240V     | 1.5/0.21<br>(LBS-FT/KG-M)       | 18.00/20.28<br>(LBS-IN/KG-CM) |
| 3/5/7.5/10/15            | 380-480V     |                                 |                               |
| 15/20/25                 | 200-240V     | 1.84/0.3<br>(LBS-FT/KG-M)       | 22.1/30<br>(LBS-IN/KG-CM)     |
| 20/25/30                 | 380-480V     |                                 |                               |
| 30/40                    | 200-240V     | 4.42/0.66 (LBS-<br>FT/KG-M)     | 53.1/66<br>(LBS-IN/KG-CM)     |
| 40/50/60/75              | 380-480V     |                                 |                               |

#### B. Power wires:

Power wires are connecting to L1, L2, L3, T1, T2, T3, P, BR and P1. Choose wires in accordance with the following criteria:

- (1) Use copper wires only. Deciding diameters of wires should be based on rating working at 105°C.
- (2) For rating voltage of wires, the minimum voltage of 240VAC type is 300V, and 480VAC type is 600V.
- (3) For safety reason, the power wires should be fixed by type terminal

#### C. Control wires:

Control wires are wires connecting to TM2 control terminal. Choose the wire in accordance with the following criteria:

- (1) Use copper wires only. Deciding diameters of wires should be based on rating working at 105°C.
- (2) To avoid noise interference, do not route the control wires in the same conduit with power wires and motor wires.

**D. Nominal electrical specifications of the terminals Block:** the following list is nominal values of TM1:

| Horsepower                  | Power source | Volt | Amps |
|-----------------------------|--------------|------|------|
| 0.5/1/2 (3 $\phi$ )         | 200-240V     | 600V | 15A  |
| 1/2                         | 380-480V     |      |      |
| 5/7.5/10                    | 200-240V     |      | 40A  |
| 2 (1 $\phi$ )/3/5/4.5/10/15 | 380-480V     |      |      |
| 15/20/25                    | 200-240V     |      | 80A  |
| 20/25/30                    | 380-480V     |      | 60A  |
| 30                          | 200-240V     |      | 100A |
| 40/50                       | 380-480V     |      |      |
| 40                          | 200-240V     |      | 150A |
| 60/75                       | 380-480V     |      |      |

Note: Nominal values of input and output signals (TM2) – follow the specifications of class 2 wiring.



### 3.3.2 Fuse Type

Drive input fuses are provided to disconnect the drive from power in the event that a component fails in the drive's power circuitry. The drive's electronic protection circuitry is designed to clear drive output short circuits and ground faults without blowing the drive input fuses. Below table shows the RVCF input fuse ratings. To protect the inverter most effectively, use fuses with current-limit function (RK5, CC/T TYPE FUSE FOR RVCF).

| Model        | Motor rating |      | Max Fuse Rating (A) |              |
|--------------|--------------|------|---------------------|--------------|
|              | kW           | HP   | RK5 fuse            | CC or T fuse |
| RVCFA1200040 | 0.4          | 0.5  | 10                  | 20           |
| RVCFA1200075 | 0.75         | 1.0  | 15                  | 30           |
| RVCFB1200150 | 1.5          | 2.0  | 20                  | 40           |
| RVCFB1200220 | 2.2          | 3.0  | 25                  | 50           |
| RVCFA3200040 | 0.40         | 0.50 | 8                   | 10           |
| RVCFA3200075 | 0.75         | 1.0  | 12                  | 15           |
| RVCFA3200150 | 1.5          | 2.0  | 15                  | 20           |
| RVCFB3200220 | 2.2          | 3.0  | 20                  | 30           |
| RVCFB3200370 | 3.7          | 5.0  | 30                  | 50           |
| RVCFC3200550 | 5.5          | 7.5  | 50                  | 60           |
| RVCFC3200750 | 7.5          | 10.0 | 60                  | 70           |
| RVCFD3201100 | 11.0         | 15.0 | 80                  | 100          |
| RVCFD3201500 | 15.0         | 20.0 | 100                 | 125          |
| RVCFD3201850 | 18.5         | 25.0 | 125                 | 150          |
| RVCFE3202200 | 22.0         | 30.0 | 160                 | 200          |
| RVCFE3203000 | 30.0         | 40.0 | 200                 | 250          |
| RVCFA3400075 | 0.75         | 1.0  | 60                  | 10           |
| RVCFA3400150 | 1.5          | 2.0  | 10                  | 15           |
| RVCFB3400220 | 2.2          | 3.0  | 10                  | 20           |
| RVCFB3400370 | 3.7          | 5.0  | 20                  | 30           |
| RVCFC3400550 | 5.5          | 7.5  | 25                  | 35           |
| RVCFC3400750 | 7.5          | 10.0 | 30                  | 50           |
| RVCFC3401100 | 11.0         | 15.0 | 50                  | 60           |
| RVCFD3401500 | 15.0         | 20.0 | 60                  | 70           |
| RVCFD3401850 | 18.5         | 25.0 | 70                  | 80           |
| RVCFD3202200 | 22.0         | 30.0 | 80                  | 100          |
| RVCFE3403000 | 30.0         | 40.0 | 100                 | 125          |
| RVCFE3403700 | 37.0         | 50.0 | 125                 | 150          |
| RVCFF3404500 | 45.0         | 60.0 | 150                 | 200          |
| RVCFF3405500 | 55.0         | 75.0 | 200                 | 250          |

#### Notice

- To avoid shock hazards, do not touch any electrical component when the power is applied or just after five minutes the power plug is unplugged. The other action should be performed after the charge indicator went off.
- Do not perform wiring on the inverter while it is still electrified. Disregard of this notice could cause serious injury or death to persons.

This product is designed to use in Pollution Degree 2 environment or equivalent environments.

\* Fuse ratings are based upon 300V fuses for 230V inverter, and 500V for 480V inverters.



### 3.3.3 Applicable specification of magnetic contactor and wires

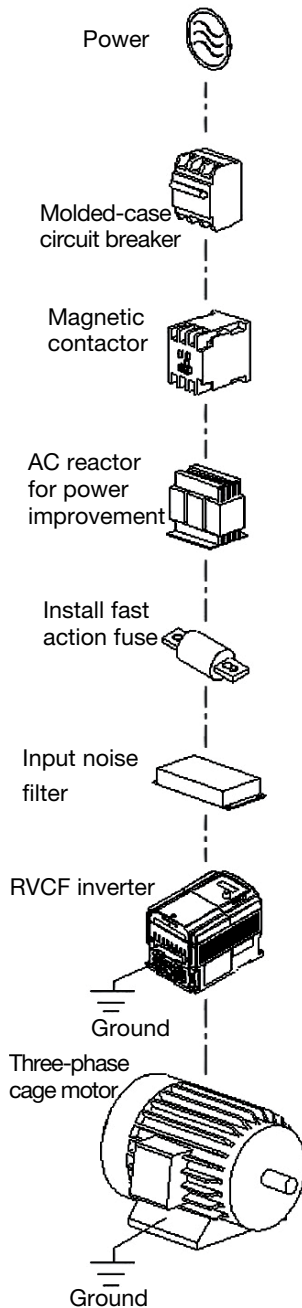
Molded-case circuit breaker/magnetic contactor

- Carlo gavazzi bears no responsibility to service for failures caused by the following conditions:
  - (1) A molded-case circuit breaker is not installed, or an improper or overrated breaker is used, between the power source and the inverter.
  - (2) A magnetic contactor, a phase capacitor, or a burst absorber is connected between the inverter and the motor.

| RVCF Model   | Molded-case circuit breaker (max Amp) | Main circuit terminals (TM1)  | Signal terminals (TM2)                                       |
|--------------|---------------------------------------|-------------------------------|--------------------------------------------------------------|
| RVCFA1200040 | 10A                                   | Wire gauge 2.0mm <sup>2</sup> | Wire gauge 0.75mm <sup>2</sup> (#18 AWG)                     |
| RVCFA3200040 |                                       |                               |                                                              |
| RVCFA1200040 | 20A                                   | Wire gauge 3.5mm <sup>2</sup> |                                                              |
| RVCFA3200040 |                                       |                               |                                                              |
| RVCFA1200040 | 30A                                   | Wire gauge 5.5mm <sup>2</sup> |                                                              |
| RVCFA3200040 |                                       |                               |                                                              |
| RVCFA1200040 |                                       |                               |                                                              |
| RVCFA3200040 |                                       |                               |                                                              |
| RVCFB3200370 | 50A                                   | Wire gauge 14mm <sup>2</sup>  |                                                              |
| RVCFC3200550 |                                       |                               |                                                              |
| RVCFC3200750 | 60A                                   | Wire gauge 22mm <sup>2</sup>  |                                                              |
| RVCFD3201100 | 100A                                  | Wire gauge 38mm <sup>2</sup>  |                                                              |
| RVCFD3201500 |                                       | Wire gauge 60mm <sup>2</sup>  |                                                              |
| RVCFD3201850 | 150A                                  |                               |                                                              |
| RVCFE3202200 | 175A                                  |                               |                                                              |
| RVCFE3203000 |                                       |                               |                                                              |
| RVCFA3400075 | 15A                                   | Wire gauge 2.0mm <sup>2</sup> | Wire gauge 0.75mm <sup>2</sup> (#18 AWG), "terminal screw M3 |
| RVCFA3400150 |                                       |                               |                                                              |
| RVCFB3400220 |                                       |                               |                                                              |
| RVCFB3400370 |                                       |                               |                                                              |
| RVCFC3400550 | 20A                                   | Wire gauge 3.5mm <sup>2</sup> |                                                              |
| RVCFC3400750 | 30A                                   |                               |                                                              |
| RVCFC3401100 | 50A                                   | Wire gauge 5.5mm <sup>2</sup> |                                                              |
| RVCFD3401500 |                                       | Wire gauge 8mm <sup>2</sup>   |                                                              |
| RVCFD3401850 | 75A                                   | Wire gauge 14mm <sup>2</sup>  |                                                              |
| RVCFD3402200 | 100A                                  | Wire gauge 22mm <sup>2</sup>  |                                                              |
| RVCFE3403000 |                                       |                               |                                                              |
| RVCFE3403700 | 125A                                  |                               |                                                              |
| RVCFF3404500 | 175A                                  | Wire gauge 38mm <sup>2</sup>  |                                                              |
| RVCFF3405500 |                                       | Wire gauge 60mm <sup>2</sup>  |                                                              |

- Use three-phase cage induction motor with capacity suitable for the inverter.
- One inverter is driving several motors, the total current of all motors running simultaneously must be less than the rated current of the inverter, and each motor has to be equipped with a proper thermal relay.
- Do not add capacitive component, such as a phase capacitor, LC or RC, between the inverter and the motor.

### 3.3.4 Precautions for peripheral applications



#### Power supply:

- Make sure the voltage applied is correct to avoid damaging the inverter.
- A molded-case circuit breaker must be installed between the AC source and the inverter.

#### Molded-case circuit breaker:

- Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter to control the power ON/OFF and protect the inverter.
- Do not use the inverter as the switch for run/stop switch.

#### Leakage breaker:

- Install a leakage breaker to prevent error operation caused by electric leakage and to protect operators.
- Setting current should be 200mA or above and the operating time at 0.1 second or longer to prevent malfunction.

#### Magnetic contactor:

- Normal operations do not need a magnetic contactor. But a contactor has to be installed in primary side when performing functions such as external control and auto restart after power failure, or when using brake controller.
- Do not use the magnetic contactor as the run/stop switch of the inverter.

#### AC reactor for power improvement:

- When inverters below 230V/480V 15kW are supplied with high capacity (above 600kVA) power source or an AC reactor can be connected to improve the power performance.

#### Install fast action fuse:

- To ensure the safety of peripheral devices, please install the fast action fuse. Regarding the specification, please refer to pag 15.

#### Input noise filter:

- A filter must be installed when there are inductive load around the inverter.

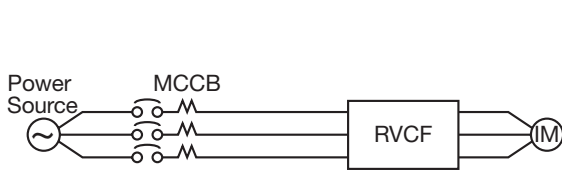
#### Inverter:

- Input power terminals L1, L2, and L3 can be used in any sequence regardless of phases.
- Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor. If the motor is reversed while the inverter is forward, just swap any two terminals of T1, T2, and T3.
- To avoid damaging the inverter, do not connect the input terminals T1, T2, and T3 to AC power.
- Connect the ground terminal properly. Class 240V:  $R_g < 100\Omega$ ; Class 480V:  $R_g < 10\Omega$ .

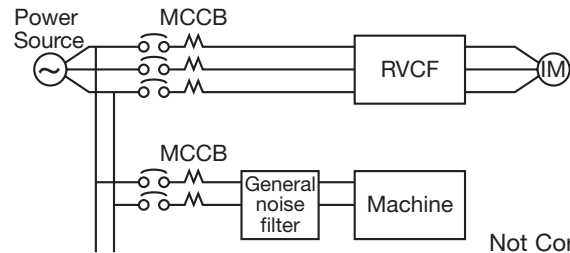


Make external connections according to the following instruction. Check connections after wiring to make sure all connections are correct. (Do not use the control circuit buzzer to check connections).

- The inverter uses dedicated power line
- A general noise filter may not provide rightful results

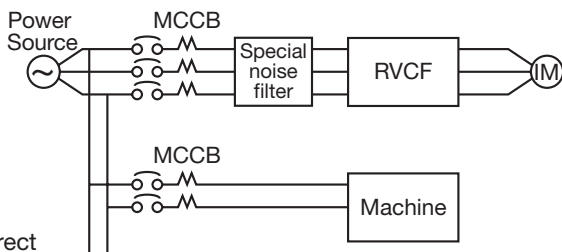


Correct

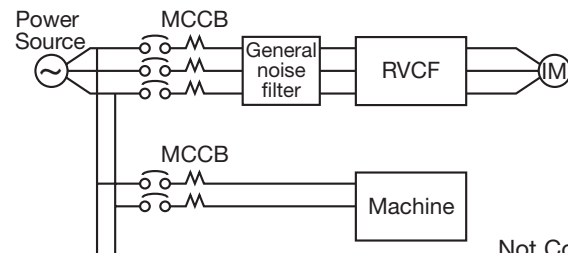


Not Correct

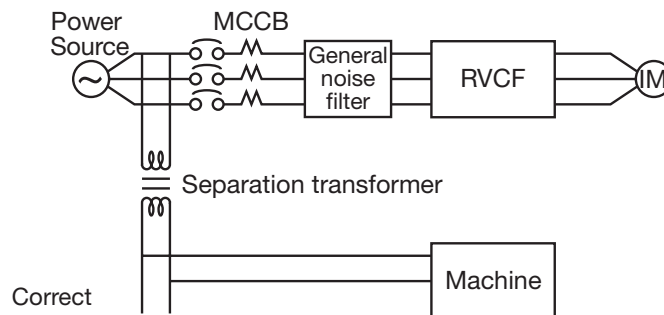
- Add a noise filter or separation transformer whenter shares the power line with other machines.



Correct



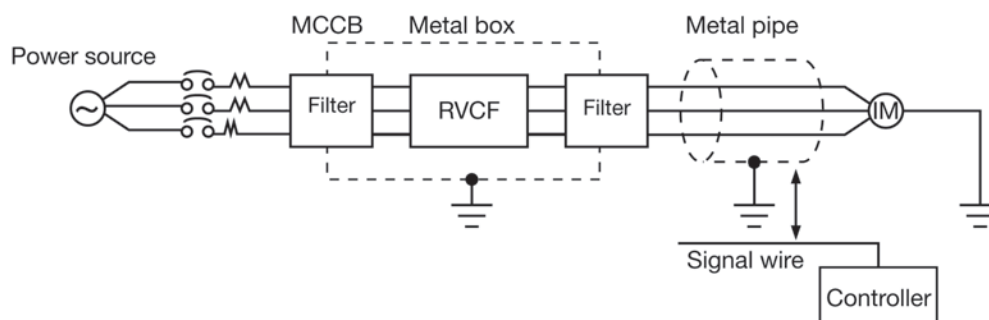
Not Correct



Correct

(A) Main circuit's wiring must separate from other high voltage or high current power line to avoid noise interference. Refer to the figures below:

- A noise filter in the output of the main circuit can suppress conductive noise. To prevent radiative noise, the wires should be put in a metal pipe and distance from signal lines of other control machines for more than 30cm.



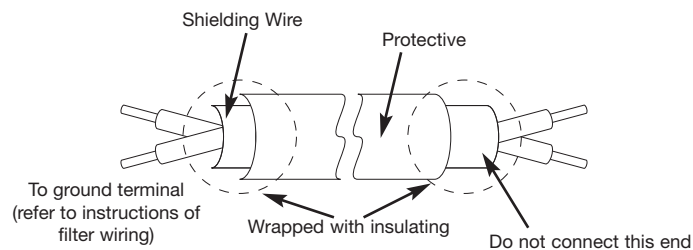
- When the connection between the inverter and the motor is too long, consider the voltage drop of the circuit. Phase-to-phase voltage drop  $(V) = \sqrt{3} \times \text{resistance of wire } (\Omega/\text{km}) \times \text{length of line (m)} \times \text{current} \times 10^{-3}$ .
- The number of carriers must be adjusted based on the length of the line.

| The length of the line between the inverter and the motor | Below 25m   | Below 50m   | Below 100m | Over 100m  |
|-----------------------------------------------------------|-------------|-------------|------------|------------|
| Number of carriers allowed                                | Below 16kHz | Below 12kHz | Below 8kHz | Below 5kHz |
| Settings of 3-22 parameter                                | 16          | 12          | 8          | 5          |

(B) The wiring of the control circuit must be separated and routed away from the main circuit control line or other high voltage or current power lines to avoid noise interference.

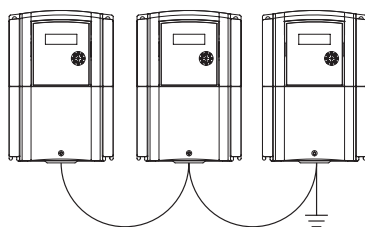
- To avoid error actions caused by noise interference, shield the control circuit wiring with a twisted wire, and connect the shielded wire to a ground terminal. Refer to the figure below.

The wiring distance should not exceed 50m.

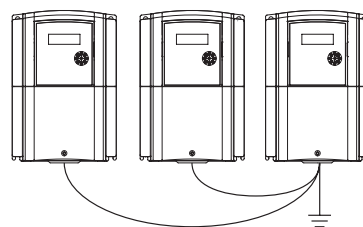


(C) Ground the ground terminal of the inverter properly. For 230V class ground 100Ω or less; for 480V class ground 10Ω or less.

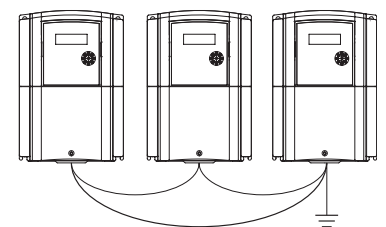
- Ground wiring is based on the electrical equipment technical basis (AWG). The shorter, the better.
- Do not share the ground of the inverter to other high current loads (welding machine, high power motor). Connect the terminals to ground respectively.
- Do not make a loop when several inverters share a common ground point.



(a) Good



(b) Good



(c) Bad

(D) To ensure maximum safety, use proper wire gauges (AWG) for the main power circuit and control circuit according to relative regulations.

(E) After wiring, check that the wiring is correct, wires are intact, and terminal screws are secured.





### 3.4.1 Products Individual Specifications

| Model        | Motor rating |      |       | Voltage rating                       | Output voltage                 | Current (A) |        | Allowable momentary power loss time (s) |
|--------------|--------------|------|-------|--------------------------------------|--------------------------------|-------------|--------|-----------------------------------------|
|              | kW           | HP   | kVA   |                                      |                                | Input       | Output |                                         |
| RVCFA1200040 | 0.4          | 0.5  | 1.2   | 200-240VAC<br>(+10% -15%)<br>1-phase | 0÷240V<br>3-phase<br>0.1÷650Hz | 8.5         | 3.1    | 1.0                                     |
| RVCFA1200075 | 0.75         | 1.0  | 1.7   |                                      |                                | 12          | 4.5    |                                         |
| RVCFB1200150 | 1.5          | 2.0  | 2.9   |                                      |                                | 16          | 7.5    | 2.0                                     |
| RVCFB1200220 | 2.2          | 3.0  | 4.0   |                                      |                                | 23.9        | 10.5   |                                         |
| RVCFA3200040 | 0.40         | 0.50 | 1.2   | 200-240VAC<br>(+10% -15%)<br>3-phase |                                | 4.5         | 3.1    | 1.0                                     |
| RVCFA3200075 | 0.75         | 1.0  | 1.7   |                                      |                                | 6.5         | 4.5    |                                         |
| RVCFA3200150 | 1.5          | 2.0  | 2.9   |                                      |                                | 11.0        | 7.5    | 2.0                                     |
| RVCFB3200220 | 2.2          | 3.0  | 4.0   |                                      |                                | 12.5        | 10.5   |                                         |
| RVCFB3200370 | 3.7          | 5.0  | 6.7   |                                      |                                | 20.5        | 17.5   |                                         |
| RVCFC3200550 | 5.5          | 7.5  | 9.9   |                                      |                                | 33.0        | 26.0   |                                         |
| RVCFC3200750 | 7.5          | 10.0 | 13.3  |                                      |                                | 42.0        | 35.0   |                                         |
| RVCFD3201100 | 11.0         | 15.0 | 20.6  |                                      |                                | 57.0        | 48.0   |                                         |
| RVCFD3201500 | 15.0         | 20.0 | 27.4  |                                      | 70.0                           | 64.0        |        |                                         |
| RVCFD3201850 | 18.5         | 25.0 | 34.0  |                                      | 85.0                           | 80.0        |        |                                         |
| RVCFE3202200 | 22.0         | 30.0 | 41.0  |                                      | 108.0                          | 96.0        |        |                                         |
| RVCFE3203000 | 30.0         | 40.0 | 54.0  |                                      | 138.0                          | 130.0       |        |                                         |
| RVCFA3400075 | 0.75         | 1.0  | 1.7   | 380-480VAC<br>(+10% -15%)<br>3-phase | 0÷480V<br>3-phase<br>0.1÷650Hz | 4.2         | 2.3    | 1.0                                     |
| RVCFA3400150 | 1.5          | 2.0  | 2.6   |                                      |                                | 5.6         | 3.8    |                                         |
| RVCFB3400220 | 2.2          | 3.0  | 4.0   |                                      |                                | 7.3         | 5.2    | 2.0                                     |
| RVCFB3400370 | 3.7          | 5.0  | 6.7   |                                      |                                | 11.6        | 8.8    |                                         |
| RVCFC3400550 | 5.5          | 7.5  | 9.9   |                                      |                                | 17.0        | 13.0   |                                         |
| RVCFC3400750 | 7.5          | 10.0 | 13.3  |                                      |                                | 23.0        | 17.5   |                                         |
| RVCFC3401100 | 11.0         | 15.0 | 19.1  |                                      |                                | 31.0        | 25.0   |                                         |
| RVCFD3401500 | 15.0         | 20.0 | 27.4  |                                      |                                | 38.0        | 32.0   |                                         |
| RVCFD3401850 | 18.5         | 25.0 | 34.0  |                                      |                                | 48.0        | 40.0   |                                         |
| RVCFD3202200 | 22.0         | 30.0 | 41.0  |                                      |                                | 56.0        | 48.0   |                                         |
| RVCFE3403000 | 30.0         | 40.0 | 54.0  |                                      |                                | 75.0        | 64.0   |                                         |
| RVCFE3403700 | 37.0         | 50.0 | 68.0  |                                      |                                | 92.0        | 80.0   |                                         |
| RVCFF3404500 | 45.0         | 60.0 | 82.0  |                                      |                                | 112.0       | 96.0   |                                         |
| RVCFF3405500 | 55.0         | 75.0 | 110.0 |                                      |                                | 142.0       | 128.0  |                                         |

### 3.4.2 General Specifications

| Item                               |                                                                                                                                                                                                                                                                                                                                            | RVCF TYPE                                                                                                                                                                                            |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Control Mode                       |                                                                                                                                                                                                                                                                                                                                            | V/F or Sensorless Control                                                                                                                                                                            |
| Frequency Control                  | Range                                                                                                                                                                                                                                                                                                                                      | 0.1~650.0Hz                                                                                                                                                                                          |
|                                    | Start control torque                                                                                                                                                                                                                                                                                                                       | 150%/1Hz (Current Vector)                                                                                                                                                                            |
|                                    | Speed control range                                                                                                                                                                                                                                                                                                                        | 1:50 (Current Vector)                                                                                                                                                                                |
|                                    | Speed Control Precision                                                                                                                                                                                                                                                                                                                    | ±0.5% (Current Vector)                                                                                                                                                                               |
|                                    | Setting resolution                                                                                                                                                                                                                                                                                                                         | Digital: 0.01Hz ( Note *1 ) : Analog: 0.06Hz/ 60Hz(10bits)                                                                                                                                           |
|                                    | Keypad setting                                                                                                                                                                                                                                                                                                                             | Set directly with ▲ ▼ keys or the VR on the keypad                                                                                                                                                   |
|                                    | Display Function                                                                                                                                                                                                                                                                                                                           | Four digital LED (or 2*16 LCD) and status indicator; display frequency/ speed/ line speed/ DC voltage/ Output voltage/ Current/ Rotation direction/ Inverter parameter/ Trouble Log/ Program Version |
|                                    | External signal setting                                                                                                                                                                                                                                                                                                                    | 1. External variable resistor/ 0-10V/ 0-20mA/ 10-0V/ 20-0mA<br>2. Performs up/down controls, speed control or automatic procedure control with multifunctional contacts on the terminal block (TM2)  |
|                                    | Frequency Limit Function                                                                                                                                                                                                                                                                                                                   | Respectively setting upper/lower frequency limits and three-stage prohibited frequencies                                                                                                             |
| General Control                    | Carrier frequency                                                                                                                                                                                                                                                                                                                          | 2~16kHz                                                                                                                                                                                              |
|                                    | V/F pattern                                                                                                                                                                                                                                                                                                                                | 18-fixed patterns, 1 programmable pattern                                                                                                                                                            |
|                                    | Acc/Dec control                                                                                                                                                                                                                                                                                                                            | Two-stage Acc/Dec time (0.1~3600 seconds) curves (refer to descriptions on 3-05)                                                                                                                     |
|                                    | Multifunctional analog output                                                                                                                                                                                                                                                                                                              | 6 functions (refer to description on 8-00/8-01)                                                                                                                                                      |
|                                    | Multifunctional input                                                                                                                                                                                                                                                                                                                      | 30 functions (refer to description on 5-00~5-06)                                                                                                                                                     |
|                                    | Multifunctional output                                                                                                                                                                                                                                                                                                                     | 16 functions (refer to description on 8-02~8-03)                                                                                                                                                     |
|                                    | Digital Input Signal                                                                                                                                                                                                                                                                                                                       | NPN (SINK) / PNP (SOURCE) toggle                                                                                                                                                                     |
| Other Function                     | Momentary Power Loss Restart, Speed Search, Overload Detection, 8 preset speeds (PLC use 16 preset speeds) . Acc/Dec Switch (2 Stages), S Curves, 3-wire Control, PID control, torque boost, Slip Compensation, Frequency Upper/ Lower Limit, Auto energy saving, Modbus slave and PC/PDA Link, Auto Restart, Built-in Simple PLCFunction. |                                                                                                                                                                                                      |
| Communication Control              | 1. Control by RS232 or RS485<br>2. One to one or One to more (RS485 ONLY) control.<br>3. BAUD RATE/STOP BIT/PARITY/bit can be set                                                                                                                                                                                                          |                                                                                                                                                                                                      |
| Braking Torque                     | About 20%, the model built-in braking transistor and connected braking resistor is 100%                                                                                                                                                                                                                                                    |                                                                                                                                                                                                      |
| Input Displacement Factor (cos ' ) | >0.97                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                      |
| Operation temperature              | -10~50°C (Note 2)                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                      |
| Storage temperature                | -20~60°C                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                      |
| Humidity                           | 0~95% Relative Humidity (Non-condense)                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                      |
| Max altitude                       | Below 1000m                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                      |
| Vibration Sustention               | 1G (9.8m/s <sup>2</sup> )                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                      |
| EMC                                | Comply with requirement EN 61800-3 (with optional Filter)                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                      |
| LVD                                | Comply with requirement EN 50178                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                      |
| Enclosure                          | IP00 or IP20 (NEMA 1 by external box attached)                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                      |
| Safety Level                       | UL 508C                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                      |



|                      | Item                          | RVCF TYPE                                                                                                                                                                                       |
|----------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protective Functions | Overload protection           | The relays to protect the motor (the curve can be set) and the inverter (150% / 1min)                                                                                                           |
|                      | FUSE protection               | The motor stops after FUSE melt                                                                                                                                                                 |
|                      | Over Voltage                  | 200V class: DC Voltage>410V - 400V class: DC Voltage>820V                                                                                                                                       |
|                      | Under Voltage                 | 200V class: DC Voltage<190V - 400V class: DC Voltage<380V                                                                                                                                       |
|                      | Momentary Power Loss Restart  | Stop for more than 15ms-power-loss can be restarted with spin start after momentary power loss in Max 2 sec.                                                                                    |
|                      | Stall Prevention              | Stall prevention for Acceleration/ Deceleration/ Operation.                                                                                                                                     |
|                      | Short-circuit output terminal | Electronic Circuit Protection                                                                                                                                                                   |
|                      | Grounding Fault               | Electronic Circuit Protection                                                                                                                                                                   |
|                      | Other Function                | Protection for overheating of heat sink, over torque detection, error contact control, reverse restriction, restrictions for direct start after power up and error recovery, parameter lock up. |

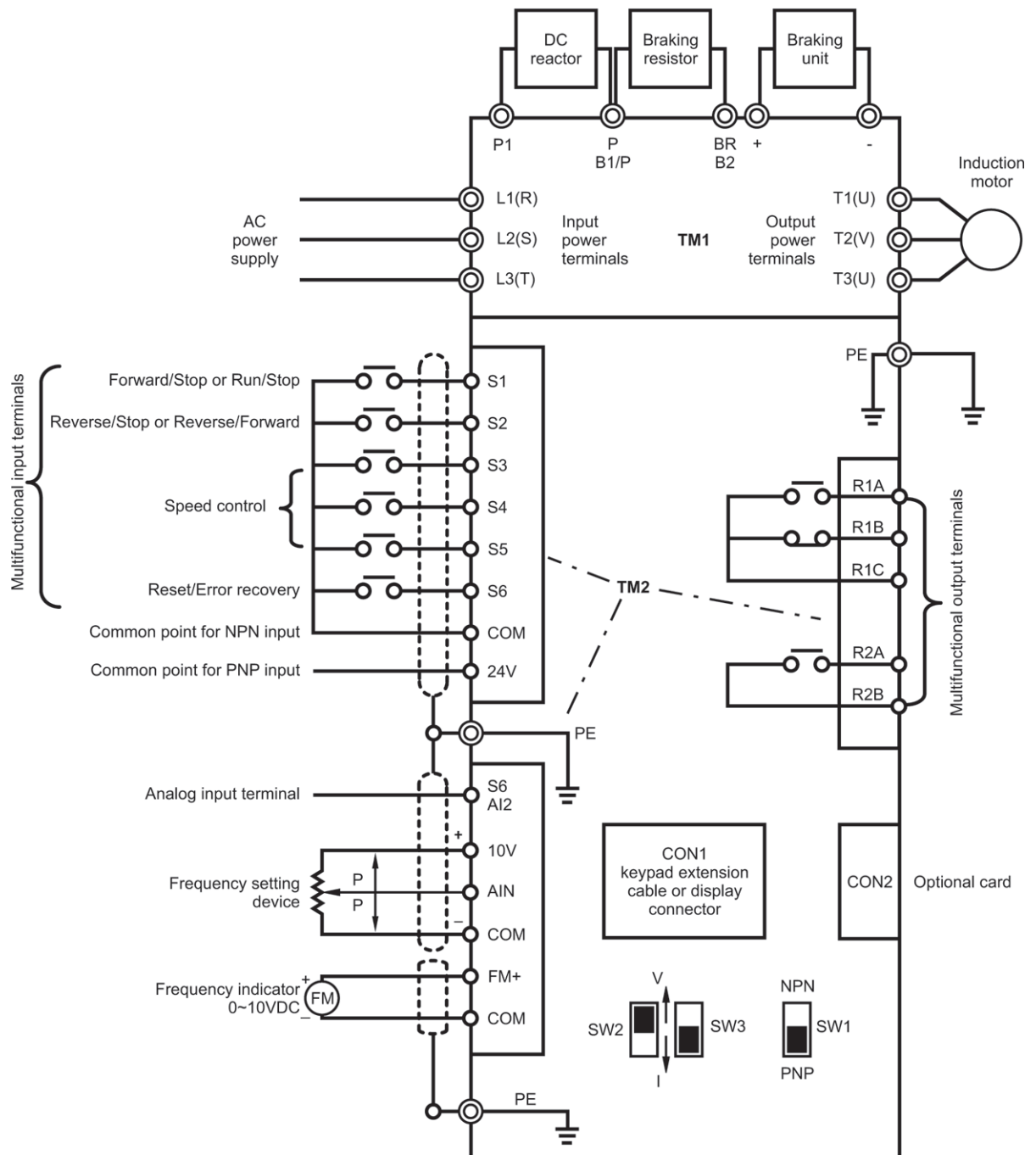
**Note 1:** The setting resolution of above 100Hz is 0.1Hz when controlled with operation keypad, and 0.01 Hz when controlled using computer PC or programmable controller (PLC)

**Note 2:** -10 ~ 50°C in distributor (without dustproof cover)  
-10 ~ 40°C outside distributor (with dustproof cover)

**Note 3:** 230V 15HP and above capacity are not CE complied

### 3.5 Wiring diagram RVCF series inverter Wiring diagram I:

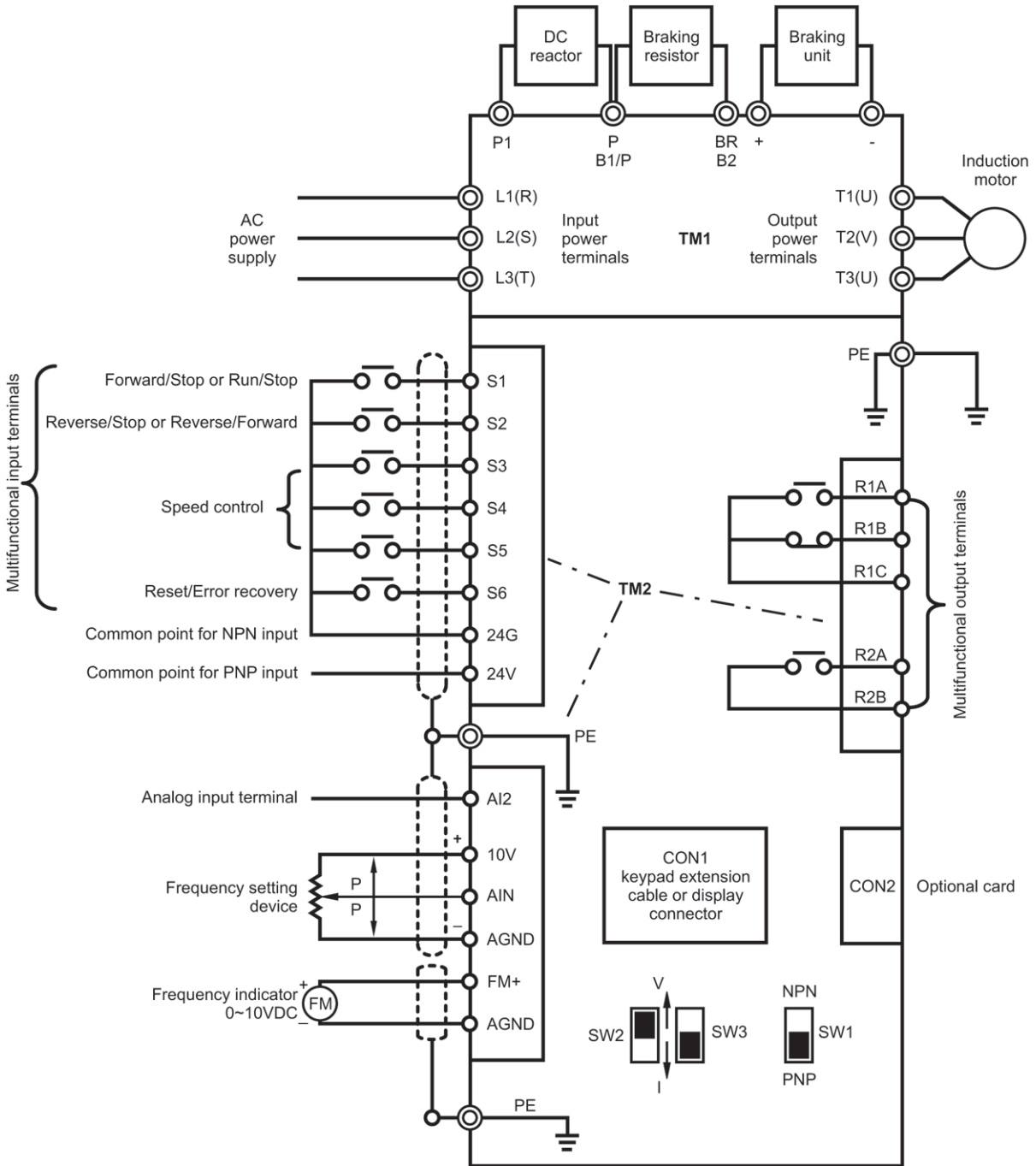
Valid for 0.4 - 1.5 kW at 240V and 0.75 - 1.5 kW at 480V





## Wiring diagram II:

Valid for 2.2 - 7.5 kW at 240V and 2.2 - 55 kW at 480V

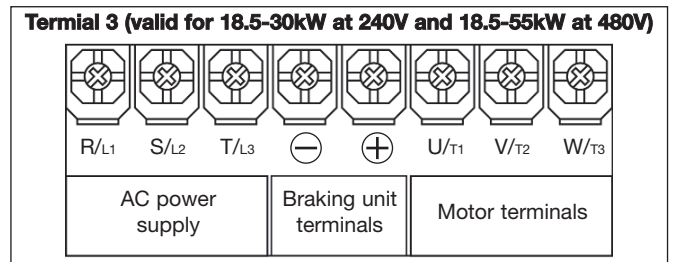
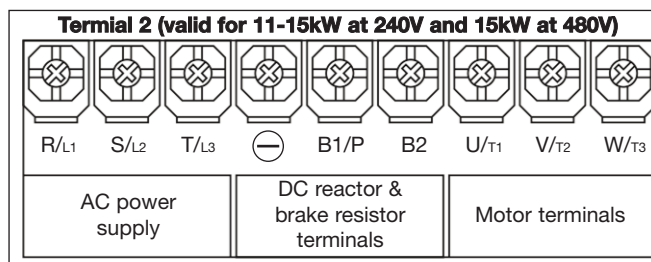
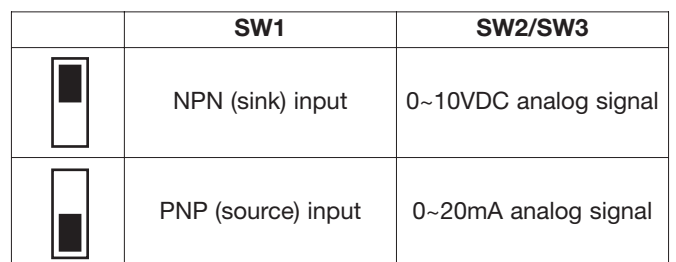
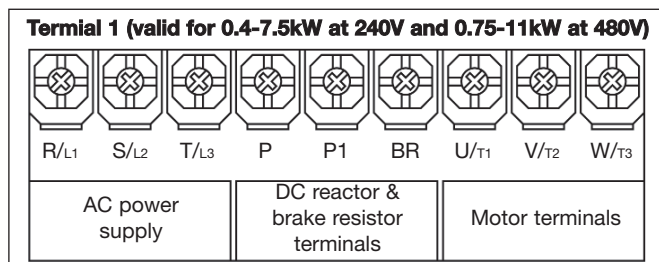




### 3.6 Description of inverter terminals

#### Descriptions of main circuit terminals

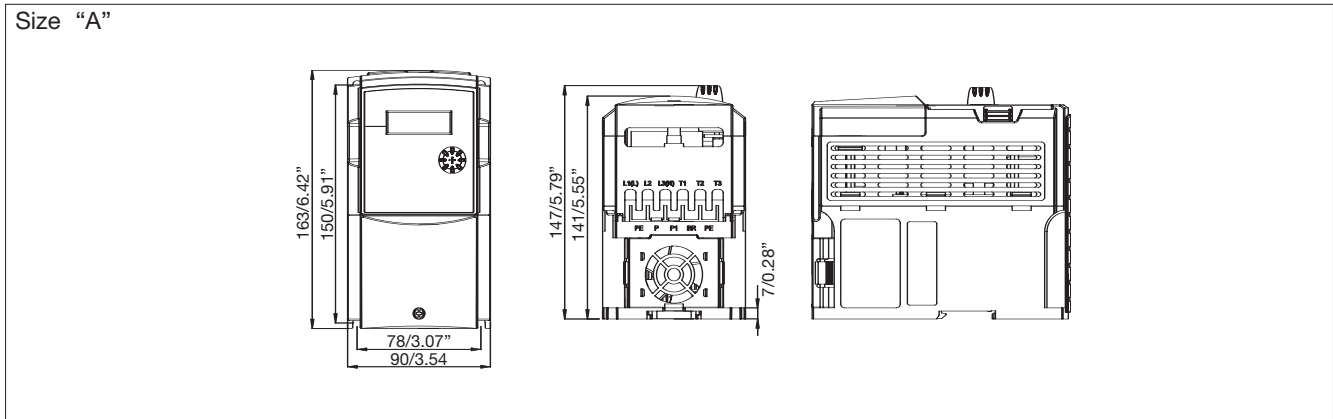
|                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Supply terminal</b><br/>1-phase<br/>3-phase</p> <p><b>Motor terminal</b></p> <p><b>Multifunctional input terminal</b><br/>Input terminal</p> <p>Common terminal<br/>24V<br/>COM</p> <p>24G</p> <p><b>Multifunctional output terminal</b><br/>R1A, R1B, R1C<br/>R2A, R2B</p> <p><b>Analog input terminal</b><br/>Input terminal</p> <p>AIN<br/>AI2</p> <p>S6</p> <p>Common terminal<br/>COM<br/>AGND</p> | <p>L1, L3(N)<br/>L1, L2, L3<br/>T1(U), T2(V), T3(W)</p> <p>S1~S6 (and AIN: High level &gt;8V, low level &lt;2V)</p> <p>PNP input<br/>NPN input (for 0.4~1.5kW at 220V and 0.75~1.5kW at 480V drive)<br/>NPN input (for 2.2~30kW at 220V and 2.2kW~55kW at 480V drive)</p> <p>Change over relay contact<br/>NO relay contact</p> <p>for all drives<br/>for 2.2~30kW at 220V and 2.2kW~55kW at 480V drive<br/>for 0.4~1.5kW at 220V and 0.75~1.5kW at 480V drive</p> <p>for 0.4~1.5kW at 220V and 0.75~1.5kW at 480V drive<br/>for 2.2~30kW at 220V and 2.2kW~55kW at 480V drive</p> | <p><b>Analog output terminal</b><br/>Output terminal</p> <p>FM+</p> <p>Common terminal<br/>COM</p> <p>AGND</p> <p><b>Braking resistor</b><br/>P, BR</p> <p>B1/P, B2</p> <p>Through braking unit</p> <p><b>DC reactor</b><br/>P, P1</p> <p>Not available</p> <p><b>Braking unit</b><br/>+, -</p> <p>Not available</p> | <p>for all drives</p> <p>for 0.4~1.5kW at 220V and 0.75~1.5kW at 480V drive<br/>for 2.2~30kW at 220V and 2.2kW~55kW at 480V drive</p> <p>for 0.4~7.5kW at 220V and 0.75~11kW at 480V drive<br/>for 11~15kW at 220V and 15kW at 480V drive<br/>for 18.5~30kW at 220V and 18.5~55kW at 480V drive</p> <p>for 0.4~7.5kW at 220V and 0.75~11kW at 480V drive<br/>for 11~30kW at 220V and 15~55kW at 480V drive</p> <p>for 18.5~30kW at 220V and 18.5~55kW at 480V drive<br/>for 0.4~15kW at 220V and 0.75~15kW at 480V drive</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



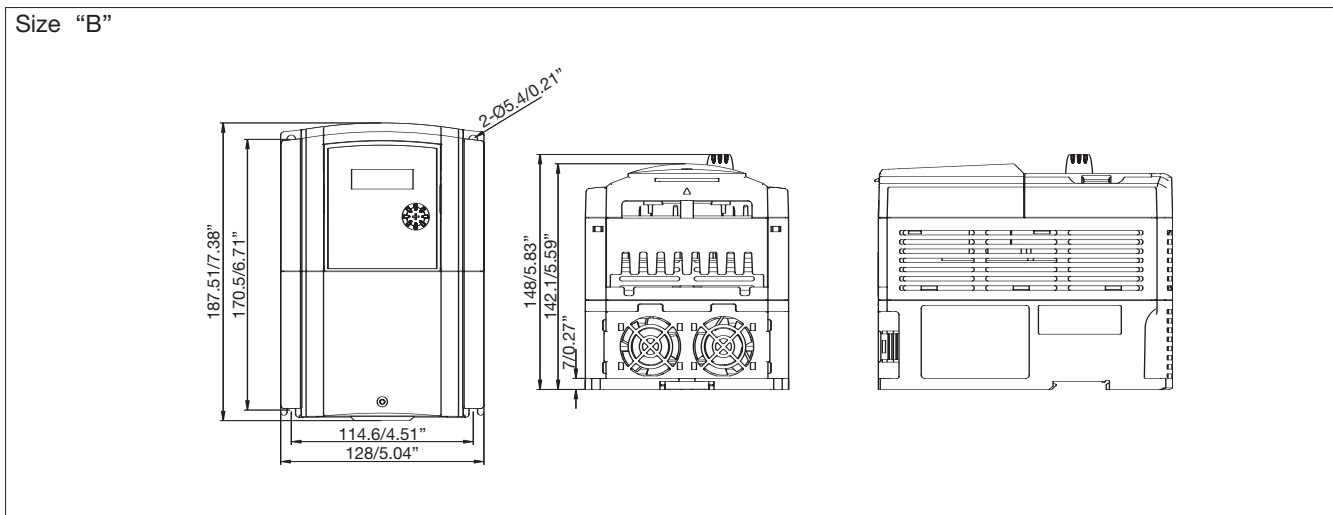


### 3.7 Outline Dimensions

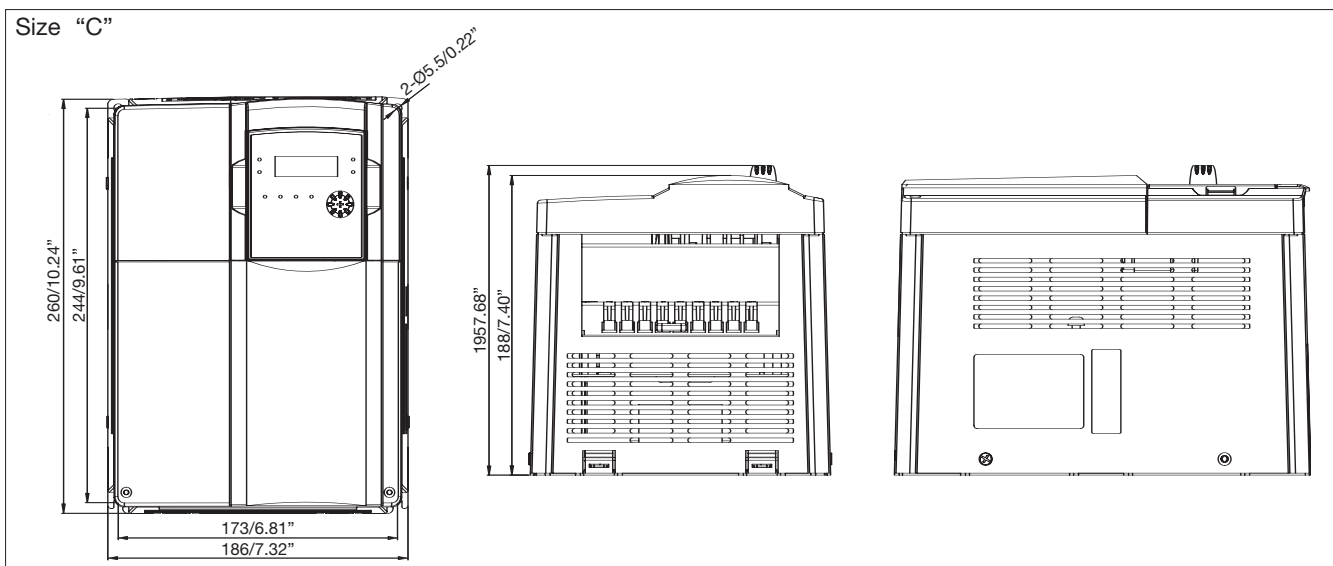
- (1) Size A:** Single phase RVCFA1200040, RVCFA1200075  
 Three phase RVCFA3200040, RVCFA3200075, RVCFA3200150, RVCFA3400075, RVCFA3400150



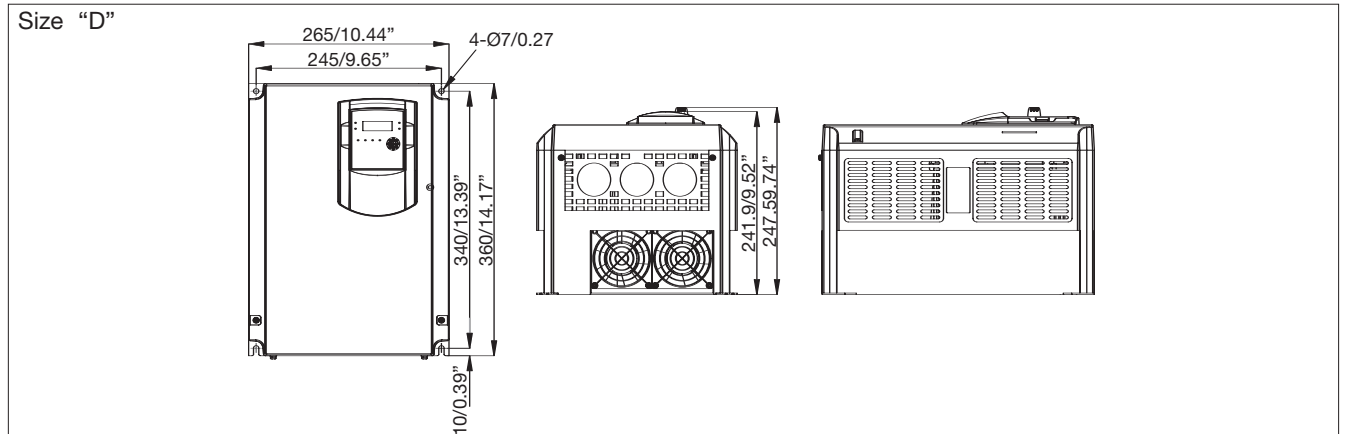
- (2) Size B:** Single phase RVCFB1200150, RVCFB1200220  
 Three phase RVCFB3200220, RVCFB3200370, RVCFB3400220, RVCFB3400370



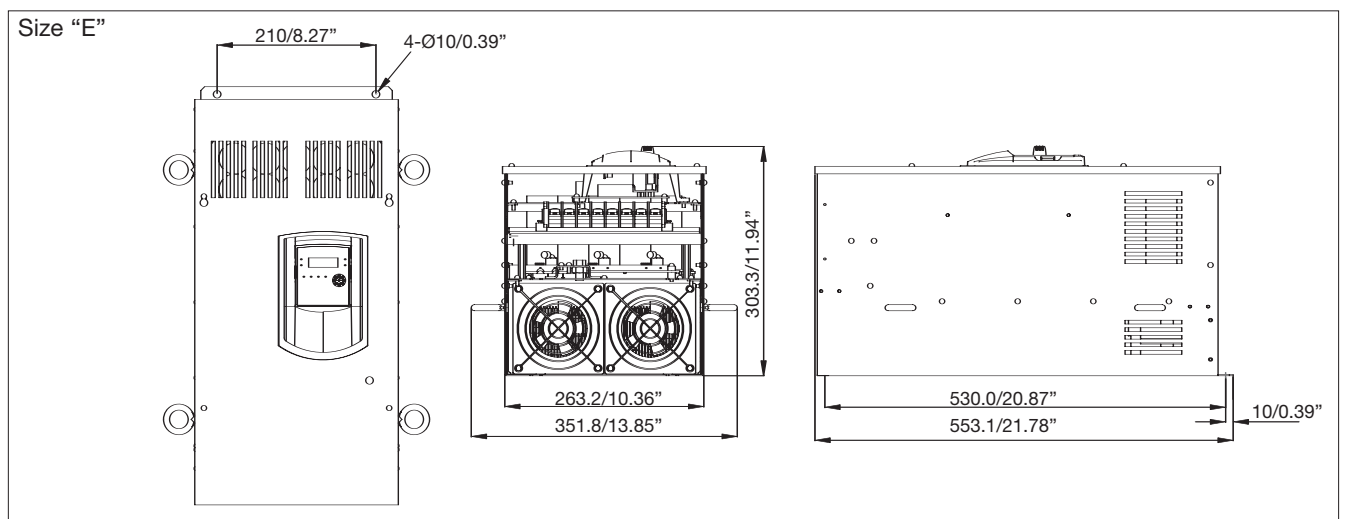
- (3) Size C:** Three phase RVCFC3200550, RVCFC3200750, RVCFC3400550, RVCFC3400750, RVCFB3401100



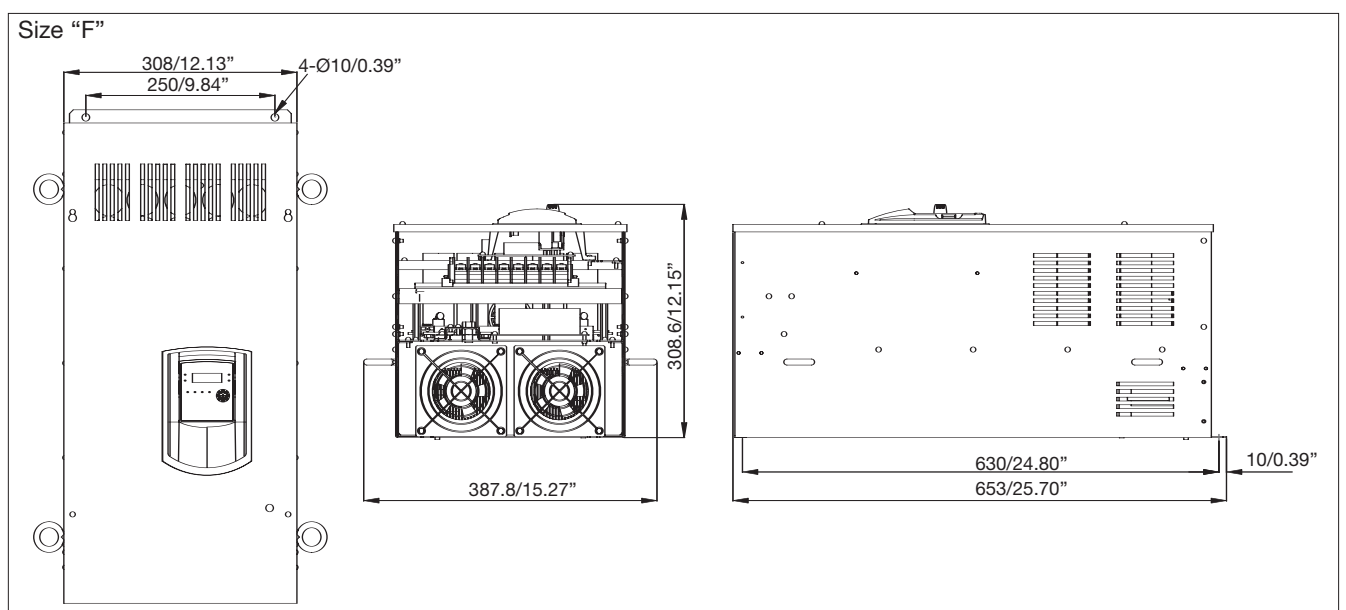
**(4) Size D:** Three phase RVCFD3201100, RVCFD3201500, RVCFD3201850 RVCFD3401500, RVCFD3401850, RVCFD3402200



**(5) Size E:** Three phase RVCFE3202200, RVCFE3203000, RVCFE3403000, RVCFE3403700



**(6) Size F:** Three phase RVCFF3404500, RVCFE3405500



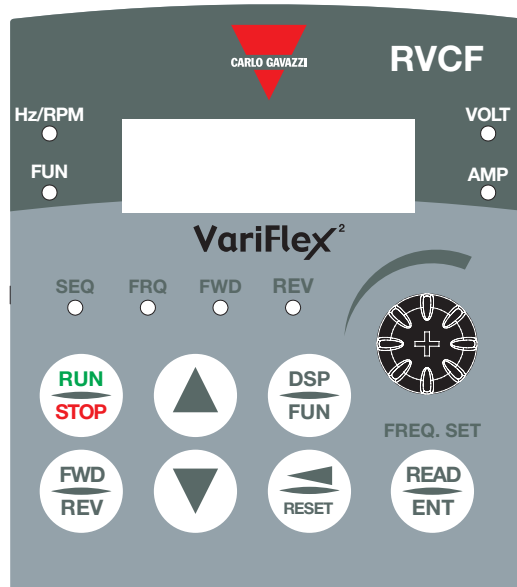


|               |                     |                     |                     |                     |                     |                      |
|---------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
| Net Weight kg | <b>RVCFA1200040</b> | <b>RVCFA1200075</b> | <b>RVCFB1200150</b> | <b>RVCFB1200220</b> | <b>RVCFA3200040</b> | <b>RVCFA3200075</b>  |
|               | 1.2(1.3)            | 1.2(1.3)            | 1.5(1.8)            | 1.9(2.3)            | 1.2                 | 1.2                  |
|               | <b>RVCFA3200150</b> | <b>RVCFB3200220</b> | <b>RVCFB3200370</b> | <b>RVCFC3200550</b> | <b>RVCFC3200750</b> | <b>RVCFD32001100</b> |
|               | 1.2                 | 1.75                | 5.6                 | 5.6                 | 5.6                 | 15                   |
|               | <b>RVCFD3201500</b> | <b>RVCFD3201850</b> | <b>RVCFE3202200</b> | <b>RVCFE3203000</b> | <b>RVCFA3400075</b> | <b>RVCFA3200150</b>  |
|               | 15                  | 15                  | 33                  | 34                  | 1.2(1.3)            | 1.2(1.3)             |
|               | <b>RVCFB3400220</b> | <b>RVCFB3400370</b> | <b>RVCFC3400550</b> | <b>RVCFC3400750</b> | <b>RVCFC3401100</b> | <b>RVCFD3401500</b>  |
|               | 1.8(2.2)            | 1.8(2.2)            | 5.6(6.6)            | 5.6(6.6)            | 15                  | 15                   |
|               | <b>RVCFD3401850</b> | <b>RVCFD3402200</b> | <b>RVCFE3403000</b> | <b>RVCFE3403700</b> | <b>RVCFF3404500</b> | <b>RVCFF3405500</b>  |
| 15            | 15                  | 33                  | 33                  | 50                  | 50                  |                      |

# Chapter 4: Software Index

## 4.1 Keypad Description

### 4.1.1 Keypad Display and Operation Instruction



1. SEQ LED: 1-00 = 0001, LED Lit.
2. FRQ LED: 1-06 = 0001/0002/0003/0004/0005, LED Lit
3. FWD LED: Forward Direction, LED action (Flash in stop, Keep Lit in operation).
4. REV LED: Reverse Direction, LED action (Flash in stop, Keep Lit in operation).
5. Four action of FUN, Hz/RPM, VOLT, AMP LED and display of four 7-segment display, refer to operation description of the keypad.
6. LCD keypad without FUN, Hz/RPM, VOLT, AMP LED and FREQ.SET knob.



#### Caution

To avoid impairing the keypad, do not operate it with screwdriver or sharp and hard tool.

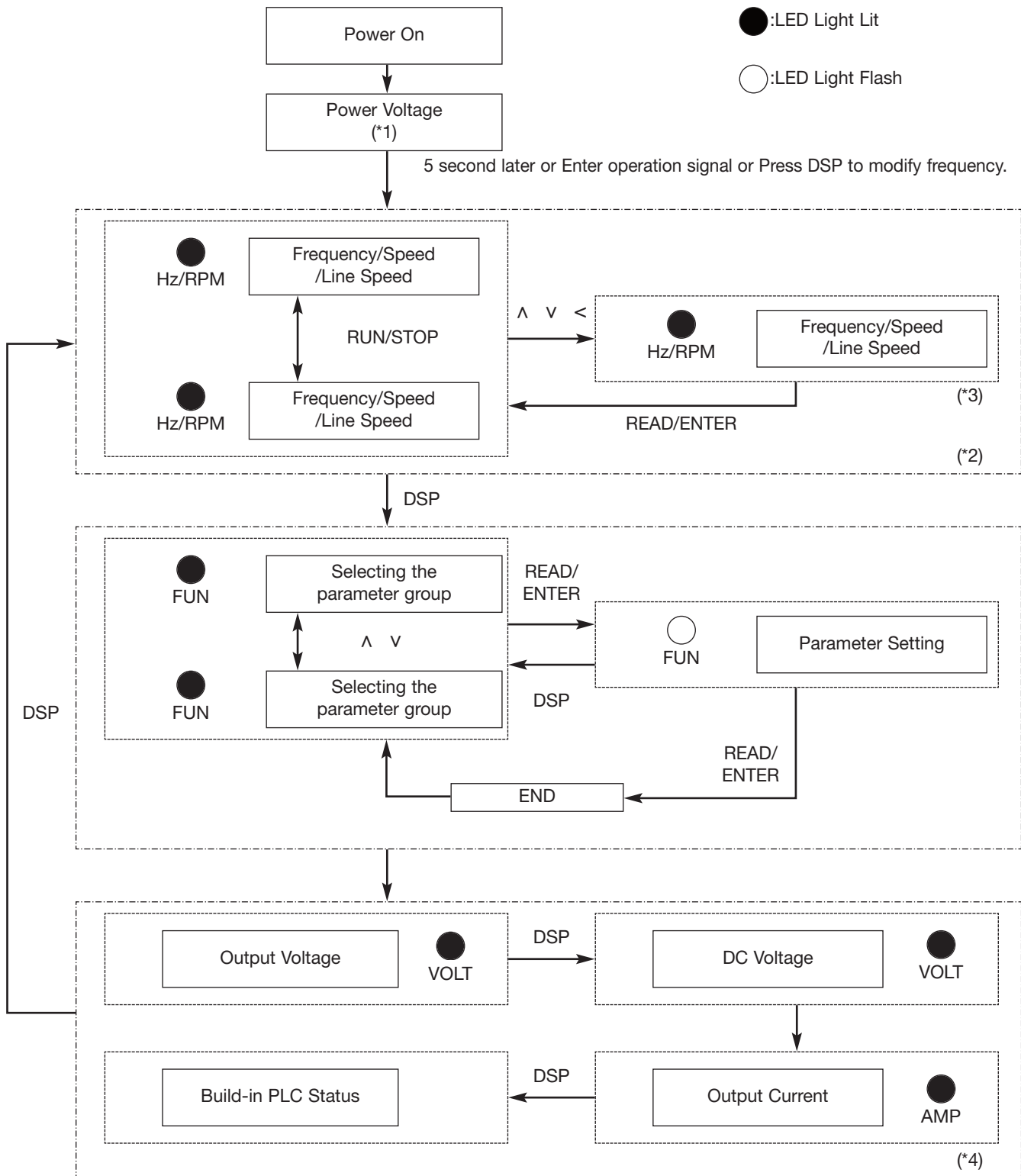
#### Remote/Local Mode

- Local mode - Operation Command by RUN/STOP key on keypad
  - Frequency Command by ▲ ▼ key on keypad
- Remote mode - Operating Command by 1-00
  - Frequency Command by 1-06

To Change the Remote/Local mode, you must push FWD/REV and ▲/RESET key at the same time. The Remote /Local mode of change can used in STOP mode, it can't used in Run mode.



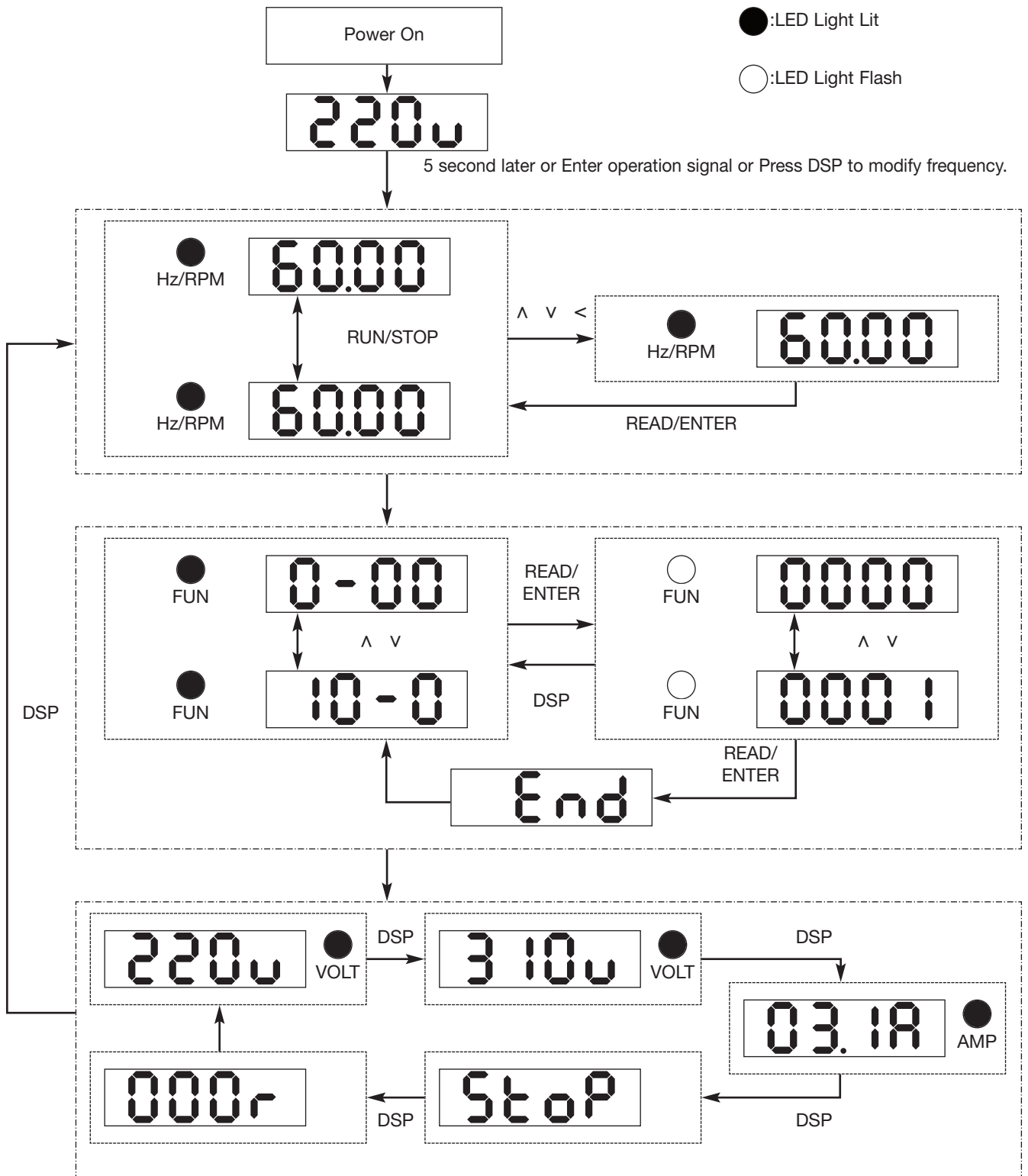
### 4.1.2 Operation Instruction of the keypad



\*1: The inverter will flash the current setting of 0-07 (power supply voltage) after power up.  
 \*2: 4-04, 4-05 determines the displaying of frequency, speed or line speed.  
 \*3: It is not necessary to press ENTER key when stopped for modification. Refer to example 1, 2.  
 \*4: Whether output current, output voltage, DC voltage, status of built-in PLC is displayed or not is determined by 4-00 ~ 4-03 respectively.



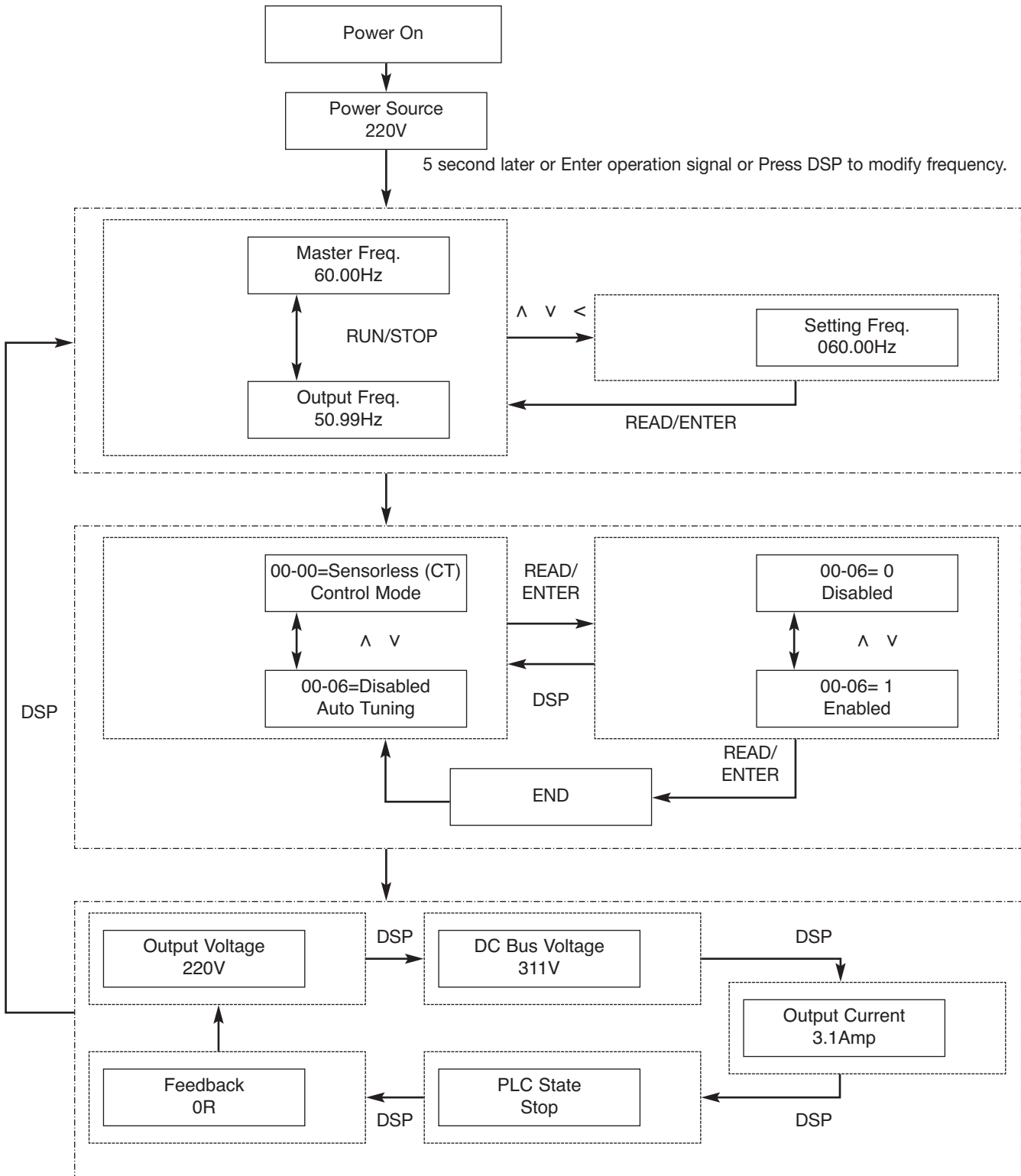
### 4.1.3 Operation Instruction of the LED keypad







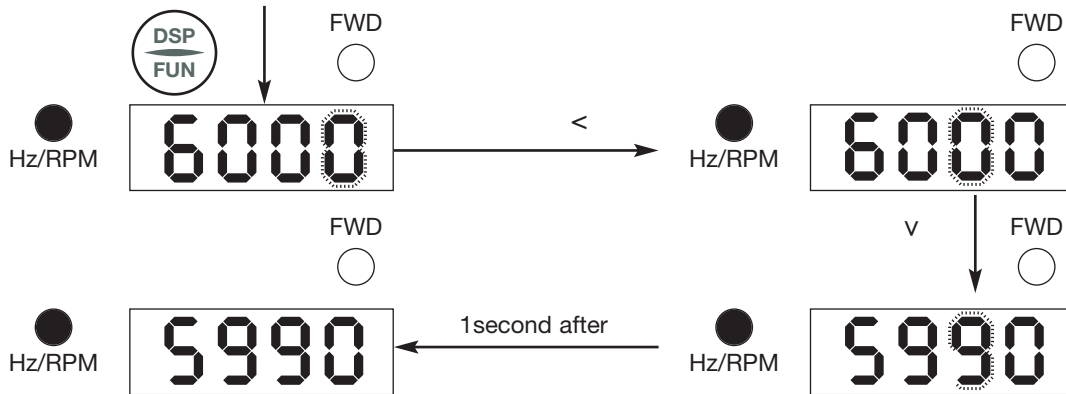
### 4.1.4 Operation Instruction of the LCD keypad



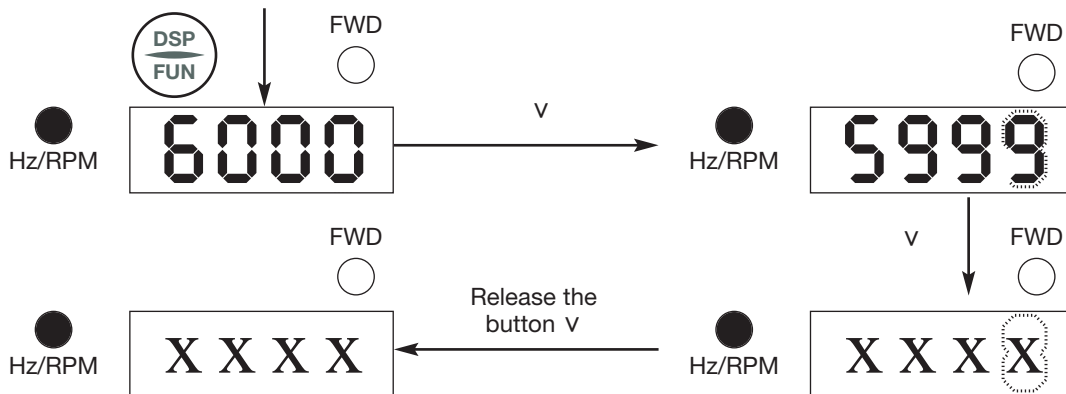


### 4.1.5 Keypad Operating Example

Example 1. Modify frequency in stopping

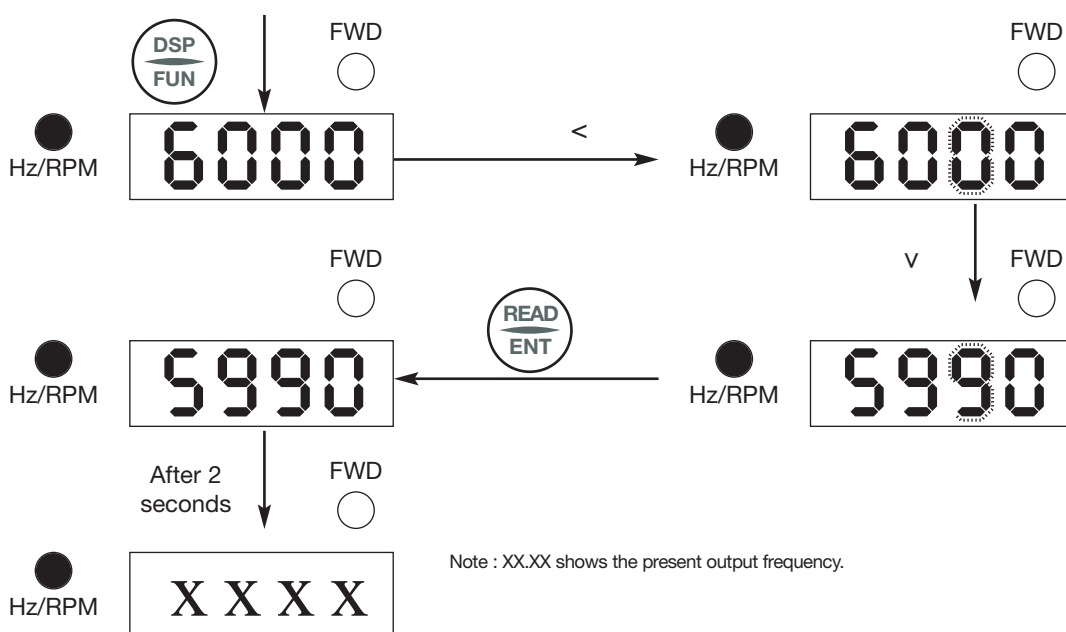


Example 2. Modify frequency in operating



Note : XX.XX shows the present output frequency. The value ranges from 59.58 to 0Hz, depending on the length of time the key v pressed.

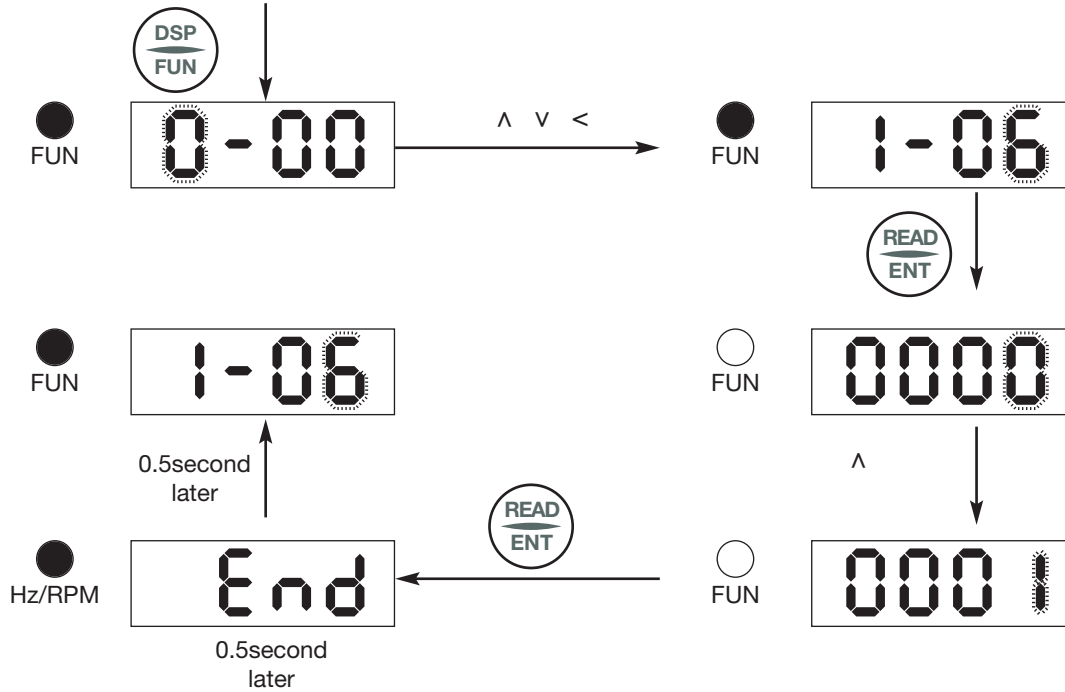
Example 3. Modify frequency in running



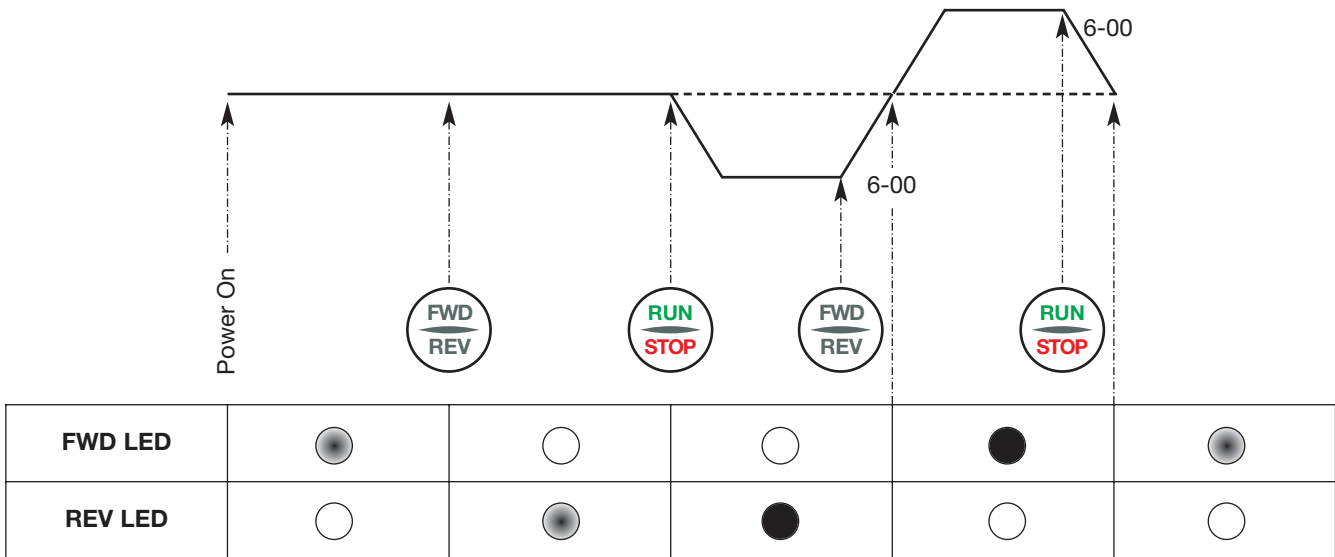
Note : XX.XX shows the present output frequency.



Example 4. Modify the Value of Paramter



Example 5. Operation Control



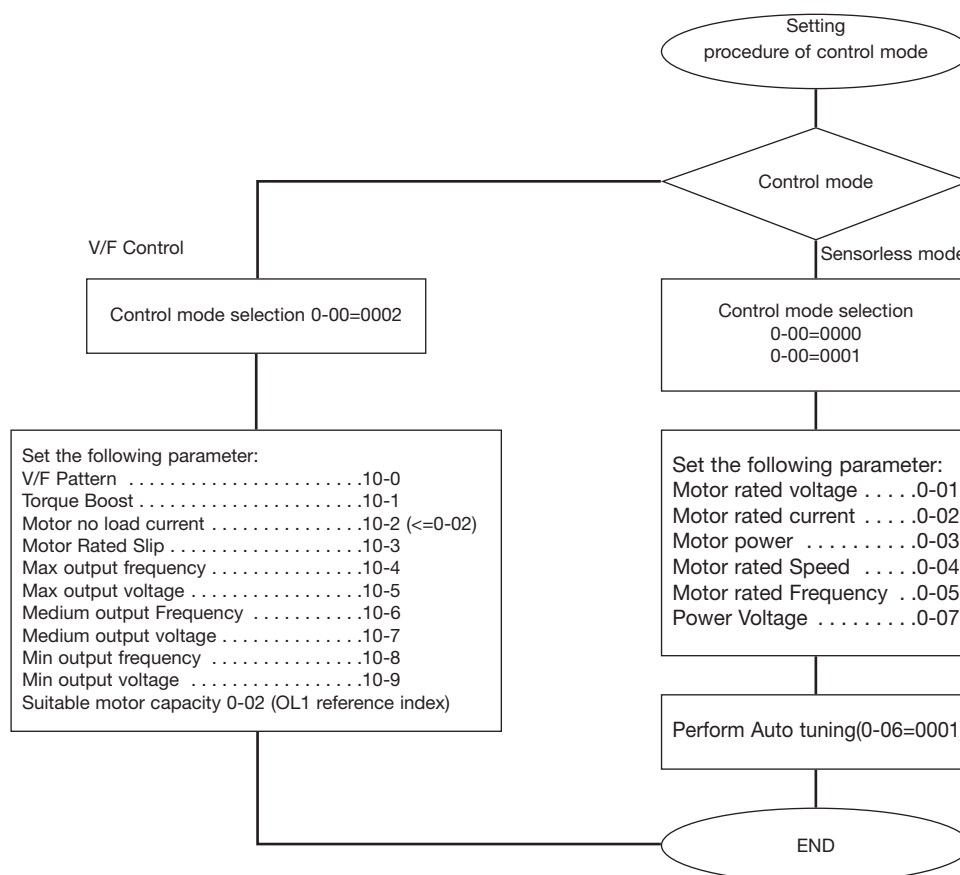
- : LED Lit
- : LED Flash
- : LED Go Out

## 4.2 Control Mode Selection

RVCF Series inverter has three control modes:

1. General Sensorless Control Mode
2. VT Sensorless Control Mode (Special for Blower, Pump).
3. V/F Control Mode.

The user can choose these modes with the digital keypad according to the application characteristics. The factory setting is general sensorless control mode. Before operation, please set the control mode and the relative parameters of the motor in accordance with the following flow chart. (The sensorless control mode only suits for the inverter with same capacity comparing to the motor, or a grade bigger or smaller one).



### Note:

1. Use V/F Control Mode:
  - (1) Use one inverter to drive several motors simultaneously
  - (2) Motor's nameplate is unknown or motor's specifications are too special, it will cause Auto-tuning fault.
  - (3) Specification of inverter and motor differ more than 1 class.
2. One inverter drives several motors (Only V/F mode available), set the motor parameter complying with the following rules:
  - (1) As for the current, sum the rated current of all motors.
  - (2) As for others, input correct VF Pattern parameter (10-4~10-9).
3. When the nameplate of the motor is unknown, the inverter will set the internal parameter according to the standard CARLO GAVAZZI motor.
4. When parameter 0-00 does set to 0002, the keypad will display 'Err2' in performing Auto tuning.
5. In SENSORLESS MODE control, the max. & min. value of 0-01~0-05 will be limited by grade upper or lower than CARLO GAVAZZI standard motor specification. In VF MODE control, there is no limitation.



### 4.3 RVCF Programmable Functions List

| Parameter Group No. | Description                                             |
|---------------------|---------------------------------------------------------|
| 0-                  | Drive Operation Mode                                    |
| 1-                  | Start/Stop and Frequency Control Modes                  |
| 2-                  | Manual/Automatic Restart Modes                          |
| 3-                  | Operating Parameters                                    |
| 4-                  | Digital Display Operation Mode                          |
| 5-                  | Multifunction Input Terminals (MFIT)                    |
| 6-                  | Jog, and Preset (MFIT) Speed Setting on Keypad          |
| 7-                  | Analog Input Signal Operation                           |
| 8-                  | Multifunction Output Relays and Output Signal Operation |
| 9-                  | Drive and Load Protection Modes                         |
| 10-                 | Volts/Hz Pattern Operation Mode                         |
| 11-                 | PID Operation Mode                                      |
| 12-                 | PID "Limits" and "Out of Range" Mode                    |
| 13-                 | Communication Mode                                      |
| 14-                 | Motor Auto-Tuning Parameters                            |
| 15-                 | Drive Status and Function Reset                         |

#### 0- Drive Operation Mode

| Function Code No. | LCD Display        | Description                 | Range/Code                                                                                                                              | Factory Setting | Remarks             |
|-------------------|--------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------|
| 0-00              | (Control Mode)     | Control Mode                | 0000: Sensorless (General Purpose)<br>0001: Sensorless (Variable Torque)<br>0002: Volts/Hz (Refer to Parameter Group 10- Volts/Hz Mode) | 0000            | *3                  |
| 0-01              | (Motor rated Volt) | Motor Rated Voltage (VAC)   | ----                                                                                                                                    |                 | *3*5                |
| 0-02              | (Motor rated Amps) | Motor Rated Current (Amp)   | ----                                                                                                                                    |                 | *3*5                |
| 0-03              | (Motor rated kW)   | Motor Rated Power (kW)      | ----                                                                                                                                    |                 | *3*5                |
| 0-04              | (Motor rated RPM)  | Motor Rated Speed (RPM/100) | ----                                                                                                                                    |                 | *3*5*7              |
| 0-05              | (Motor rated Hz)   | Motor Rated Frequency (Hz)  | ----                                                                                                                                    |                 | *3*5                |
| 0-06              | (Auto Tuning)      | Auto-tuning function        | 0000: Disable<br>0001: Enable                                                                                                           | 0000            |                     |
| 0-07              | (AC Input Volt)    | AC Line Input Voltage (VAC) | 170.0~264.0 (Class 240V)<br>323.0~528.0 (Class 480V)                                                                                    |                 | *3                  |
| 0-08              | (Select Language)  | Language Selection          | 0000: English<br>0001: German<br>0002: French<br>0003: Italian<br>0004: Spanish                                                         | 0000            | Only for LCD keypad |



| 1- Start/Stop and Frequency Control Modes |                    |                                                |                                                                                                                                                                                                                                                             |                 |         |
|-------------------------------------------|--------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                         | LCD Display        | Description                                    | Range/Code                                                                                                                                                                                                                                                  | Factory Setting | Remarks |
| 1-00                                      | (Run Source)       | Run Command Source Selection                   | 0000: Keypad<br>0001: External Run/Stop Control (See 1-01)<br>0002: Communication<br>0003: Built-In PLC                                                                                                                                                     | 0000            |         |
| 1-01                                      | (MFIT Run Mode)    | Operation Mode with External Terminals (MFIT)  | 0000: Forward/Stop-Reverse/Stop<br>0001: Run/Stop-Forward/Reverse<br>0002: 3-Wire Control Mode-Run/Stop                                                                                                                                                     | 0000            |         |
| 1-02                                      | (Reverse Oper)     | Prohibition of Reverse operation               | 0000: Enable Reverse Command<br>0001: Disable Reverse Command                                                                                                                                                                                               | 0000            |         |
| 1-03                                      | (Keypad Stop)      | Keypad Stop Button                             | 0000: Stop Button Enabled<br>0001: Stop Button Disabled                                                                                                                                                                                                     | 0000            |         |
| 1-04                                      | (Starting Method)  | Starting Method Selection                      | 0000: Start from zero<br>0001: Start from speed search                                                                                                                                                                                                      | 0000            |         |
| 1-05                                      | (Stopping Method)  | Stopping Method Selection                      | 0000: Controlled Deceleration-to-Stop with DC Injection Braking (Rapid Stop)<br>0001: Free run Stop                                                                                                                                                         | 0000            |         |
| 1-06                                      | (Frequency Source) | Frequency Command Source Selection             | 0000: Keypad<br>0001: Potentiometer on Keypad<br>0002: External Analog Signal Input or Remote Potentiometer<br>0003: Up/Down Frequency Control Using MFIT (S1-S6)<br>0004: Communication setting frequency<br>0005: Impulse (S5) setting frequency (ver2.3) | 0000            |         |
| 1-07                                      | (Keypad Up/Down)   | Keypad Operation with Up/Down Keys in Run Mode | 0000: 'Enter' must be pressed after frequency change with Up/Down Keys on keypad.<br>0001: Frequency will be changed directly when Up/Down Keys are Pressed                                                                                                 | 0000            |         |



| 2- Manual/Automatic Restart Modes |                    |                                          |                                                                                                                                                                                                                  |                 |         |
|-----------------------------------|--------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                 | LCD Display        | Description                              | Range/Code                                                                                                                                                                                                       | Factory Setting | Remarks |
| 2-00                              | (PwrL Selection)   | Momentary Power Loss and Restart         | 0000: Momentary power loss and restart disable<br>0001: Momentary power loss and restart enable<br>0002: Momentary power loss and restart enable while CPU is operating. (According to the capacity of DC power) | 0000            |         |
| 2-01                              | (PwrL Ridethru T)  | Momentary Power Loss Ride-Thru Time (s)  | 0.0 - 2.0                                                                                                                                                                                                        | 0.5             |         |
| 2-02                              | (Delay of Restart) | Auto Restart Delay Time (s)              | 0.0 - 800.0                                                                                                                                                                                                      | 0.0             |         |
| 2-03                              | (Num of Restart)   | Number of Auto Restart Attempts (times)  | 0 - 10                                                                                                                                                                                                           | 0               |         |
| 2-04                              | (Auto Restart)     | Auto Restart Method                      | 0000: Start from speed search<br>0001: Start from zero                                                                                                                                                           | 0000            |         |
| 2-05                              | (Direct Start Sel) | Direct Running After Power Up            | 0000: Enable Direct running after power up<br>0001: Disable Direct running after power up                                                                                                                        | 0001 *8         |         |
| 2-06                              | (Delay-on Timer)   | Delay-ON Timer (s)                       | 0.0 - 300.0                                                                                                                                                                                                      | 0.0             |         |
| 2-07                              | (Reset Mode Sel)   | Reset Mode Setting                       | 0000: Enable Reset Only when Run Command is Off<br>0001: Enable Reset when Run Command is On or Off                                                                                                              | 0000            |         |
| 2-08                              | (KEB Decel Time)   | Kinetic Energy Back-up Deceleration Time | 0.0: Disable<br>0.1~25.0: KEB Deceleration Time                                                                                                                                                                  | 0.0             |         |



| 3- Operating Parameters |                    |                                         |                                                                                                                                                             |                 |         |
|-------------------------|--------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.       | LCD Display        | Description                             | Range/Code                                                                                                                                                  | Factory Setting | Remarks |
| 3-00                    | (Freq Upper Limit) | Frequency Upper Limit (Hz)              | 0.01 - 650.00                                                                                                                                               | 50.00/60.00     | *4      |
| 3-01                    | (Freq Lower Limit) | Frequency Lower Limit (Hz)              | 0.00 - 650.00                                                                                                                                               | 0.00            |         |
| 3-02                    | (Accel Time 1)     | Acceleration Time #1 (s)                | 0.1 - 3600.0                                                                                                                                                | 10.0            | *1      |
| 3-03                    | (Decel Time 1)     | Deceleration Time #1 (s)                | 0.1 - 3600.0                                                                                                                                                | 10.0            | *1      |
| 3-04                    | (S-Curve 1)        | S-Curve Acc/Dec #1 (s)                  | 0.0 - 4.0                                                                                                                                                   | 0.2             |         |
|                         |                    |                                         |                                                                                                                                                             | 1.0 *9          |         |
| 3-05                    | (S-Curve 2)        | S-Curve Acc/Dec #2 (s)                  | 0.0 - 4.0                                                                                                                                                   | 0.2             |         |
|                         |                    |                                         |                                                                                                                                                             | 1.0 *9          |         |
| 3-06                    | (Accel Time 2)     | Acceleration Time # 2 (MFIT) (s)        | 0.1 - 3600.0                                                                                                                                                | 10.0            | *1      |
| 3-07                    | (Decel Time 2)     | Deceleration Time # 2 (MFIT) (s)        | 0.1 - 3600.0                                                                                                                                                | 10.0            | *1      |
| 3-08                    | (Jog Accel Time)   | Jog Acceleration Time (MFIT) (s)        | 0.1 - 25.5                                                                                                                                                  | 0.5             | *1      |
| 3-09                    | (Jog Decel Time)   | Jog Deceleration Time (MFIT) (s)        | 0.1 - 25.5                                                                                                                                                  | 0.5             | *1      |
| 3-10                    | (DCInj Start Freq) | DC Injection Brake Start Frequency (Hz) | 0.1 - 10.0                                                                                                                                                  | 1.5             |         |
| 3-11                    | (DCInj Level)      | DC Injection Brake Level (%)            | 0.0 - 20.0                                                                                                                                                  | 5.0             | *7      |
| 3-12                    | (DCInj Time)       | DC Injection Brake Time (s)             | 0.0 - 25.5                                                                                                                                                  | 0.5             |         |
| 3-13                    | (Skip Freq 1)      | Skip Frequency #1 (Hz)                  | 0.00 - 650.00                                                                                                                                               | 0.0             | *1      |
| 3-14                    | (Skip Freq 2)      | Skip Frequency #2 (Hz)                  | 0.00 - 650.00                                                                                                                                               | 0.0             | *1      |
| 3-15                    | (Skip Freq 3)      | Skip Frequency #3 (Hz)                  | 0.00 - 650.00                                                                                                                                               | 0.0             | *1      |
| 3-16                    | (Skip Bandwidth)   | Skip Frequency Bandwidth (±Hz)          | 0.00 - 30.00                                                                                                                                                | 0.0             | *1      |
| 3-17                    | (Parameter Lock)   | Parameter Lock                          | 0000: Enable all Functions<br>0001: 6-00 - 6-08 cannot be changed<br>0002: All Functions Except 6-00 - 6-08 cannot be changed<br>0003: Disable All Function | 0000            |         |
| 3-18                    | (ROM Pack Operate) | Copy Unit                               | 0000: Disable<br>0001: Inverter to Copy Unit<br>0002: Copy Unit to Inverter<br>0003: Verify                                                                 | 0000            |         |





| 3- Operating Parameters |                    |                                           |                                                                                                          |                 |         |
|-------------------------|--------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.       | LCD Display        | Description                               | Range/Code                                                                                               | Factory Setting | Remarks |
| 3-19                    | (Fan Control)      | Fan Control                               | 0000: Auto (Depend on temp.)<br>0001: Operate while in RUN mode<br>0002: Always Run<br>0003: Always Stop | 0000            |         |
| 3-20                    | (Energy Save Mode) | Energy Saving Mode *1                     | 0000: Disabled<br>0001: Controlled by MFIT at Set Frequency                                              | 0000            | *6      |
| 3-21                    | (Energy Save Gain) | Energy Saving Gain (%) *1                 | 0 - 100                                                                                                  | 80              | *6      |
| 3-22                    | (Carrier Freq)     | Carrier Frequency (kHz)                   | 2 - 16                                                                                                   | 10              |         |
| 3-23                    | (Center F of Trav) | Center Frequency (CF) of Traverse Run (%) | 5.00 - 100.00                                                                                            | 20.00           |         |
| 3-24                    | (Amplit. of Trav)  | Amplitude (A) of Traverse Run (%)         | 0.1 - 20.0                                                                                               | 10.0            |         |
| 3-25                    | (Drop of Trav)     | Drop (D) of Traverse Run (%)              | 0.0 - 50.0                                                                                               | 0.0             |         |
| 3-26                    | (Acc T of Trav)    | Acc Time (AT) of Traverse Run (s)         | 0.5 - 60.0                                                                                               | 10.0            |         |
| 3-27                    | (Dec T of Trav)    | Dec Time (DT) of Traverse Run (s)         | 0.5 - 60.0                                                                                               | 10.0            |         |
| 3-28                    | (Rise Deviated)    | Rise (X) Deviated Traverse (%)            | 0.0 - 20.0                                                                                               | 10.0            |         |
| 3-29                    | (Lower Deviated)   | Lower (Y) Deviated Traverse (%)           | 0.0 - 20.0                                                                                               | 10.0            |         |
| 3-30                    | (Start Freq)       | Start frequency (Hz)                      | 0.0 - 10.0                                                                                               | 0.0             |         |

Nota:

1. Energy Saving Mode is available only under Volts/Hz Mode (0-00 = 0002).



| 4- Digital Display Operation Mode |                    |                                        |                                                                                                                                                                                                                                                                                                  |                 |         |
|-----------------------------------|--------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                 | LCD Display        | Description                            | Range/Code                                                                                                                                                                                                                                                                                       | Factory Setting | Remarks |
| 4-00                              | (Motor Curr Disp)  | Motor Current Display Selection        | 0000: Disable Motor Current Display<br>0001: Enable Motor Current Display                                                                                                                                                                                                                        | 0000            | *1      |
| 4-01                              | (Motor Volt Disp)  | Motor Voltage Display Selection        | 0000: Disable Motor Voltage Display<br>0001: Enable Motor Voltage Display                                                                                                                                                                                                                        | 0000            | *1      |
| 4-02                              | (Bus Volt Disp)    | DC Bus Voltage Display Selection       | 0000: Disable Bus Voltage Display<br>0001: Enable Bus Voltage Display                                                                                                                                                                                                                            | 0000            | *1      |
| 4-03                              | (PLC Status Disp)  | PLC Status Display Selection           | 0000: Disable PLC Status Display<br>0001: Enable PLC Status Display                                                                                                                                                                                                                              | 0000            | *1      |
| 4-04                              | (Display Scaling)  | Custom Units (Line Speed) Value        | 0 - 9999                                                                                                                                                                                                                                                                                         | 1800            | *1      |
| 4-05                              | (Display Units)    | Custom Units (Line Speed) Display Mode | 0000: Drive Output Frequency is Displayed<br>0001: Line Speed is Displayed in Integer (xxxx)<br>0002: Line Speed is Displayed with One Decimal Place (xxx.x)<br>0003: Line Speed is Displayed with Two Decimal Places (xx.xx)<br>0004: Line Speed is Displayed with Three Decimal Places (x.xxx) | 0000            | *1      |
| 4-06                              | (PID Fdbk Display) | PID Feedback Display Selection         | 0000: Disable PID Feedback Display<br>0001: Enable PID Feedback Display                                                                                                                                                                                                                          | 0000            | *1      |



| 5- Multifunction Input Terminals (MFIT) |                  |                                                                            |                                                                                                                                                                                                 |                 |         |
|-----------------------------------------|------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                       | LCD Display      | Description                                                                | Range/Code                                                                                                                                                                                      | Factory Setting | Remarks |
| 5-00                                    | (MFIT S1 Sel)    | Multifunction Input Term. S1                                               | 0000: Forward/Stop Command <sup>Note 1</sup><br>0001: Reverse/Stop Command <sup>Note 2</sup><br>0002: Preset Speed # 1 (6-02)<br>0003: Preset Speed # 2 (6-03)<br>0004: Preset Speed # 3 (6-05) | 0000            |         |
| 5-01                                    | (MFIT S2 Sel)    | Multifunction Input Term. S2                                               | 0005: Jog (6-01)<br>0006: Acc/Dec # 2<br>0007: Emergency Stop A Contact<br>0008: Base Block<br>0009: Speed Search                                                                               | 0001            |         |
| 5-02                                    | (MFIT S3 Sel)    | Multifunction Input Term. S3                                               | 0010: Energy Saving<br>0011: Control Signal Selection<br>0012: Communication Selection<br>0013: Acc/Dec Disabled<br>0014: Up Command                                                            | 0002            |         |
| 5-03                                    | (MFIT S4 Sel)    | Multifunction Input Term. S4                                               | 0015: Down Command<br>0016: Master/Auxiliary Speed<br>0017: PID Function Disabled<br>0018: Reset                                                                                                | 0003            |         |
| 5-04                                    | (MFIT S5 Sel)    | Multifunction Input Term. S5                                               | 0019: Encoder input terminal (terminal S5)<br>0020: PID feedback signal A12 (terminal AI2)<br>0021: AI2 Bias signal 1 input (terminal AI2)<br>0022: AI2 Bias signal 2 input (terminal AI2)      | 0004            |         |
| 5-05                                    | (MFIT S6 Sel)    | Multifunction Input Term. S6                                               | 0023: Analog input (terminal AIN)<br>0024: PLC Application<br>0025: Traverse Run<br>0026: Traverse run upper deviation                                                                          | 0018            |         |
| 5-06                                    | (MFIT AIN Sel)   | Multifunction Input Term. AIN                                              | 0027: Traverse run lower deviation<br>0028: Power Source Detect for KEB Function<br>0029: Emergency Stop B Contact *7                                                                           | 0023            |         |
| 5-07                                    | (MFIT Scan Time) | Multifunction terminal S1~S6 and AIN signal confirm the scan times (ms x4) | 1 – 100                                                                                                                                                                                         | 5               |         |

| 5- Multifunction Input Terminals (MFIT) |                    |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |         |
|-----------------------------------------|--------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                       | LCD Display        | Description                             | Range/Code                                                                                                                                                                                                                                                                                                                                                                                                                                         | Factory Setting | Remarks |
| 5-08                                    | (Stop Sel by MFIT) | Stop Mode Using MFIT                    | 0000: When the MFITs are Programmed for Up/Down Frequency Control, the Set Frequency will remain when the Drive stops. And when the Drive stops, Up/Down Function Disabled.<br>0001: Up/Down is used. The preset frequency is reset to 0Hz as the inverter stops.<br>0002: When the MFITs are Programmed for Up/Down Frequency Control, the Set Frequency will remain when the Drive stops. And when the Drive stops, Up/Down Function Enabled. *7 | 0000            |         |
| 5-09                                    | (Step Up/Down Fun) | Step of Up/Down Function (Hz)           | 0.00-5.00                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00            |         |
| 5-10                                    | (Pulse Inp. Mult.) | Impulse input frequency time ratio      | 0.001-9.999                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1.000           | *7      |
| 5-11                                    | (Ref.Source2)      | Select auxiliary frequency source (AIN) | 0000: Frequency refer to 6-00.<br>0001: Frequency refer to the VR analog signal on the Keypad.<br>0002: Frequency refer to the VR analog signal on TM2.<br>0003: Frequency refer to the frequency value which is calculated by Up/Down on TM2.<br>0004: Frequency refer to the input communication frequency                                                                                                                                       | 0               | *7      |
| 5-12                                    | (AI2 Function)     | AI2 Function Set <sup>Note3</sup>       | 0020: PID Feedback Signal AI2 (Terminal AI2)<br>0021: AI2 Bias Signal 1 Input (Terminal AI2)<br>0022: AI2 Bias Signal 2 Input (Terminal AI2)                                                                                                                                                                                                                                                                                                       | 0020            | *11     |

Notes: 1. To switch to Run/Stop with Function 1-01 = 0001.  
2. To switch to Forward/Reverse with Function 1-01 = 0001.  
3. For 2.2~7.5KW at 230V and 2.2~11kW at 480V only.

| 6- Jog, and Preset (MFIT) Frequency Setting on Keypad |                   |                       |             |                 |         |
|-------------------------------------------------------|-------------------|-----------------------|-------------|-----------------|---------|
| Function Code No.                                     | LCD Display       | Description           | Range/Code  | Factory Setting | Remarks |
| 6-00                                                  | (Keypad Freq)     | Keypad Frequency (Hz) | 0.00-650.00 | 5.00            | *1      |
| 6-01                                                  | (Jog Freq)        | Jog Frequency (Hz)    | 0.00-650.00 | 2.00            | *1      |
| 6-02                                                  | (Preset Speed #1) | Preset Speed n°1 (Hz) | 0.00-650.00 | 5.00            | *1      |
| 6-03                                                  | (Preset Speed #2) | Preset Speed n°2 (Hz) | 0.00-650.00 | 10.00           | *1      |
| 6-04                                                  | (Preset Speed #3) | Preset Speed n°3 (Hz) | 0.00-650.00 | 20.00           | *1      |
| 6-05                                                  | (Preset Speed #4) | Preset Speed n°4 (Hz) | 0.00-650.00 | 30.00           | *1      |
| 6-06                                                  | (Preset Speed #5) | Preset Speed n°5 (Hz) | 0.00-650.00 | 40.00           | *1      |
| 6-07                                                  | (Preset Speed #6) | Preset Speed n°6 (Hz) | 0.00-650.00 | 50.00           | *1      |
| 6-08                                                  | (Preset Speed #7) | Preset Speed n°7 (Hz) | 0.00-650.00 | 60.00           | *1      |



| 7- Analog Input Signal Operation Mode |                 |                                                         |                                  |                 |         |
|---------------------------------------|-----------------|---------------------------------------------------------|----------------------------------|-----------------|---------|
| Function Code No.                     | LCD Display     | Description                                             | Range/Code                       | Factory Setting | Remarks |
| 7-00                                  | (AIN Gain)      | AIN Gain (%)                                            | 0 - 1000 *10                     | 100             | *1      |
| 7-01                                  | (AIN Offset)    | AIN Bias (%)                                            | 0 - 100                          | 0               | *1      |
| 7-02                                  | (AIN Bias)      | AIN Bias Selection                                      | 0000: Positive<br>0001: Negative | 0000            | *1      |
| 7-03                                  | (AIN Slope)     | AIN Slope                                               | 0000: Positive<br>0001: Negative | 0000            | *1      |
| 7-04                                  | (AIN Scan Time) | AIN Signal Verification Scan Time (AIN, AI2) (mSec x 2) | 1-100                            | 50              | *1      |
| 7-05                                  | (AI2 Gain)      | AI2 Gain (%)                                            | 0-200                            | 100             | *1      |

Notes: 7-00~7-04 is available when 5-06=0023 (AIN term.=Analog input)

| 8- Multifunction Output Relays and Output Signal Operation Mode |                    |                                                         |                                                                                                                                                                                                                                                                                                                                                                                           |                 |         |
|-----------------------------------------------------------------|--------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                                               | LCD Display        | Description                                             | Range/Code                                                                                                                                                                                                                                                                                                                                                                                | Factory Setting | Remarks |
| 8-00                                                            | (AO Mode Sel)      | Analog Output Voltage Mode<br>(0 - 10 VDC, Term. FM+)   | 0000: Output Frequency<br>0001: Frequency Setting<br>0002: Output Voltage<br>0003: DC Voltage<br>0004: Output Current<br>0005: PID Feedback *7                                                                                                                                                                                                                                            | 0000            | *1      |
| 8-01                                                            | (AO Gain)          | Analog Output Gain (%)                                  | 0 - 200                                                                                                                                                                                                                                                                                                                                                                                   | 100             | *1      |
| 8-02                                                            | (Relay R1 Sel)     | Output Relay R1 Operation Mode                          | 0000: Run<br>0001: Frequency Reached<br>(Frequency Command)<br>(Set Frequency $\pm$ 8-05)<br>0002: Set Frequency<br>(8-04 $\pm$ 8-05)<br>0003: Frequency Threshold<br>Level (>8-04)-Frequency<br>Reached<br>0004: Frequency Threshold<br>Level (<8-04)-Frequency<br>Reached<br>0005: Over torque Threshold Level<br>0006: Fault<br>0007: Auto Restart<br>0008: Momentary AC Power<br>Loss | 0006            | *1      |
| 8-03                                                            | (Relay R2 Sel)     | Output Relay R2 Operation Mode                          | 0009: Emergency Stop Mode<br>0010: Coast-to-Stop Mode<br>0011: Motor Overload<br>Protection<br>0012: Drive Overload<br>Protection<br>0013: PID Feedback Signal Loss<br>0014: PLC Operation<br>0015: Power On *7                                                                                                                                                                           | 0000            | *1      |
| 8-04                                                            | (Freq Agree)       | Frequency Reached output (Hz)<br>(Refer to 8-02 = 0001) | 0.00-650.00                                                                                                                                                                                                                                                                                                                                                                               | 0.00            | *1      |
| 8-05                                                            | (Freq Agree width) | Frequency Reached Bandwidth ( $\pm$ Hz)                 | 0.00-30.00                                                                                                                                                                                                                                                                                                                                                                                | 2.00            | *1      |

| 9- Drive and Load Protection Modes |                     |                                                         |                                                                                                                                                                         |                 |         |
|------------------------------------|---------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                  | LCD Display         | Description                                             | Range/Code                                                                                                                                                              | Factory Setting | Remarks |
| 9-00                               | (Trip ACC Sel)      | Trip Prevention Selection During Acceleration           | 0000: Enable Trip Prevention During Acceleration<br>0001: Disable Trip Prevention During Acceleration                                                                   | 0000            |         |
| 9-01                               | (Trip ACC Level)    | Trip Prevention Level During Acceleration (%)           | 50-300                                                                                                                                                                  | 200<br>150 *9   |         |
| 9-02                               | (Trip DEC Sel)      | Trip Prevention Selection During Deceleration           | 0000: Enable Trip Prevention During Deceleration<br>0001: Disable Trip Prevention During Deceleration                                                                   | 0000            |         |
| 9-03                               | (Trip DEC Level)    | Trip Prevention Level During Deceleration (%)           | 50-300                                                                                                                                                                  | 200<br>150 *9   |         |
| 9-04                               | (Trip RUN Sel)      | Trip Prevention Selection in Run Mode                   | 0000: Enable Trip Prevention in Run Mode<br>0001: Disable Trip Prevention in Run Mode                                                                                   | 0000            |         |
| 9-05                               | (Trip Run Level)    | Trip Prevention Level In Run Mode (%)                   | 50-300                                                                                                                                                                  | 200<br>150 *9   |         |
| 9-06                               | (Dec Sel Trip RUN)  | Trip Prevention Deceleration Time Selection in Run Mode | 0000: Trip Prevention Deceleration Time Set by 3-03<br>0001: Trip Prevention Deceleration Time Set by 9-07                                                              | 0000            |         |
| 9-07                               | (Dec Time Trip RUN) | Deceleration Time In Trip Prevention Mode (Seconds)     | 0.1 – 3600.0                                                                                                                                                            | 3.0             |         |
| 9-08                               | (Motor OL1 Sel)     | Electronic Motor Overload Protection Operation Mode     | 0000: Enable Electronic Motor Overload Protection<br>0001: Disable Electronic Motor Overload Protection                                                                 | 0000            |         |
| 9-09                               | (Motor type)        | Motor type Selection                                    | 0000: Electronic Motor Overload Protection Set for Non-Inverter Duty Motor<br>0001: Electronic Motor Overload Protection Set for Inverter Duty Motor                    | 0000            |         |
| 9-10                               | (Motor OL1 Curve)   | Motor Overload Protection Curve Selection               | 0000: Constant Torque (OL=103%) (150% for 1 Minute)<br>0001: Variable Torque (OL=113%)                                                                                  | 0000            |         |
| 9-11                               | (Motor OL1 Operat)  | Operation After Overload Protection is Activated        | 0000: Coast-to-Stop After Overload Protection is Activated<br>0001: Drive Will Not Trip when Overload Protection is Activated (OL1)                                     | 0000            |         |
| 9-12                               | (Torq Det Sel)      | Over torque Detection Selection                         | 0000: Disable Over torque Operation<br>0001: Enable Over torque Operation Only if at Set Frequency<br>0002: Enable Over torque Operation while the Drive is in Run Mode | 0000            |         |



| 9- Drive and Load Protection Modes |                   |                                                    |                                                                                                                           |                 |         |
|------------------------------------|-------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                  | LCD Display       | Description                                        | Range/Code                                                                                                                | Factory Setting | Remarks |
| 9-13                               | (Torq Det Operat) | Operation After Over torque Detection is Activated | 0000: Drive will Continue to Operate After Over torque is Activated<br>0001: Coast-to-Stop After Over torque is Activated | 0000            |         |
| 9-14                               | (Torq Det Level)  | Over torque Threshold Level (%)                    | 30-200                                                                                                                    | 160             |         |
| 9-15                               | (Torq Det Delay)  | Over torque Activation Delay Time (s)              | 0.0 - 25.0                                                                                                                | 0.1             |         |

| 10- Volts/Hz Operation Mode |                    |                                                |             |                 |         |
|-----------------------------|--------------------|------------------------------------------------|-------------|-----------------|---------|
| Function Code No.           | LCD Display        | Description                                    | Range/Code  | Factory Setting | Remarks |
| 10-0                        | (V/F Selection)    | Volts/Hz Patterns                              | 0-18        | 0/9             | *4*6    |
| 10-1                        | (Torque Boost)     | Volts/Hz Curve Modification (Torque Boost) (%) | 0-30.0      | 0.0             | *1*6    |
| 10-2                        | (Motor noLoad Amp) | Motor No Load Current (Amps AC)                | -----       |                 | *5*6    |
| 10-3                        | (Motor rated slip) | Motor Slip Compensation (%)                    | 0.0-100.0   | 0.0             | *1*6    |
| 10-4                        | (Max frequency)    | Maximum Frequency (Hz)                         | 0.20-650.00 | 50.00/ 60.00    | *4*6    |
| 10-5                        | (Max Voltage)      | Maximum Frequency Voltage Ratio (%)            | 0.0-100.0   | 100.0           | *6      |
| 10-6                        | (Mid frequency)    | Mid Frequency (Hz)                             | 0.10-650.00 | 25.00/30.00*7   | *4*6    |
| 10-7                        | (Mid Voltage)      | Mid Frequency Voltage Ratio (%)                | 0.0-100.0   | 50.0 *7         | *6      |
| 10-8                        | (Min frequency)    | Minimum Frequency (Hz)                         | 0.10-650.00 | 0.50/ 0.60      | *6      |
| 10-9                        | (Min Voltage)      | Minimum Frequency Voltage Ratio (%)            | 0.0 - 100.0 | 1.0 *7          | *6      |

| 11- PID Operation Mode |                 |                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |         |
|------------------------|-----------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.      | LCD Display     | Description                | Range/Code                                                                                                                                                                                                                                                                                                                                                                                                         | Factory Setting | Remarks |
| 11-0                   | (PID Mode Sel)  | PID operation selection    | 0000: Disabled<br>0001: Bias D Control<br>0002: Feedback D Control<br>0003: Bias D Reversed Characteristics Control<br>0004: Feedback D Reversed Characteristics Control<br>0005: Frequency Command + Bias D Control<br>0006: Frequency Command + Feedback D Control<br>0007: Frequency Command + Bias D Reversed Characteristics Control<br>0008: Frequency Command + Feedback D Reversed Characteristics Control | 0000            |         |
| 11-1                   | (Feedback Gain) | Feedback Gain              | 0.00-10.00                                                                                                                                                                                                                                                                                                                                                                                                         | 1.00            | *1      |
| 11-2                   | (PID Gain)      | Proportional Gain          | 0.0-10.0                                                                                                                                                                                                                                                                                                                                                                                                           | 1.0             | *1      |
| 11-3                   | (PID I Time)    | Integration Time (Seconds) | 0.0-100.0                                                                                                                                                                                                                                                                                                                                                                                                          | 10.0            | *1      |





| 11- PID Operation Mode |                   |                            |                                  |                 |         |
|------------------------|-------------------|----------------------------|----------------------------------|-----------------|---------|
| Function Code No.      | LCD Display       | Description                | Range/Code                       | Factory Setting | Remarks |
| 11-4                   | (PID D Time)      | Differentiation Time (s)   | 0.0-10.0                         | 0.00            | *1      |
| 11-5                   | (PID Offset)      | PID Offset                 | 0000: Positive<br>0001: Negative | 0000            | *1      |
| 11-6                   | (PID Offset Adj)  | PID Offset Adjust (%)      | 0-109                            | 0               | *1      |
| 11-7                   | (Output Filter T) | Output Lag Filter Time (s) | 0.0-2.5                          | 0.0             | *1      |

| 12- PID "Limits" and "Out of Range" Mode |                    |                                                                                 |                                                                                                                                                                                                       |                 |         |
|------------------------------------------|--------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                        | LCD Display        | Description                                                                     | Range/Code                                                                                                                                                                                            | Factory Setting | Remarks |
| 12-0                                     | (Fb Los Det Sel)   | Feedback Loss Detection Mode                                                    | 0000: Disabled<br>0001: Enabled - Drive Continues to Operate After Feedback Loss<br>0002: Enabled - Drive "STOPS" After Feedback Loss                                                                 | 0000            |         |
| 12-1                                     | (Fb Los Det Level) | Feedback Loss Detection Level (%)                                               | 0-100                                                                                                                                                                                                 | 0               |         |
| 12-2                                     | (Fb Los Det Time)  | Feedback Loss Detection Delay Time (s)                                          | 0.0-25.5                                                                                                                                                                                              | 1.0             |         |
| 12-3                                     | (PID I Limit)      | Integration Limit Value (%)                                                     | 0-109                                                                                                                                                                                                 | 100             | *1      |
| 12-4                                     | (I Time value Sel) | Integration Value Resets to Zero when Feedback Signal Equals the Intended Value | 0000: Disabled<br>0001: 1 Second<br>0030: 30 Seconds                                                                                                                                                  | 0000            |         |
| 12-5                                     | (I Error Margin)   | Allowable Integration Error Margin (Units value)<br>(1 Unit = 1/8192)           | 0-100                                                                                                                                                                                                 | 0               |         |
| 12-6                                     | (AIN AI2 Source)   | AIN or AI2 Source signal type                                                   | 0000: AIN=0~10V o 0~20mA<br>AI2= 0~10V o 0~20mA<br>0001: AIN=0~10V o 0~20mA<br>AI2=2~10V o 4~20mA<br>0002: AIN=2~10V o 4~20mA<br>AI2=0~10V o 0~20mA<br>0003: AIN=2~10V o 4~20mA<br>AI2=2~10V o 4~20mA | 0000            | *7      |
| 12-7                                     | (Sleep Level)      | Sleep Function Operation Level                                                  | 0.00-650.00                                                                                                                                                                                           | 0.0             |         |
| 12-8                                     | (Sleep Delay Time) | Sleep Function Delay Time                                                       | 0.0-25.5                                                                                                                                                                                              | 0.0             |         |

| 13- Communication Mode |                    |                                       |                                                        |                 |         |
|------------------------|--------------------|---------------------------------------|--------------------------------------------------------|-----------------|---------|
| Function Code No.      | LCD Display        | Description                           | Range/Code                                             | Factory Setting | Remarks |
| 13-0                   | (Serial Comm ADR)  | Assigned Communication Station Number | 1-254                                                  | 00001           | *2*3    |
| 13-1                   | (Serial Baud Rate) | Baud Rate Setting (bps)               | 0000: 4800<br>0001: 9600<br>0002: 19200<br>0003: 38400 | 0003            | *2*3    |
| 13-2                   | (Comm Stop Bit)    | Stop Bit Selection                    | 0000: 1 Stop Bit<br>0001: 2 Stop Bits                  | 0000            | *2*3    |



| 13- Communication Mode |                    |                                            |                                                                                                                                                                                 |                 |         |
|------------------------|--------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.      | LCD Display        | Description                                | Range/Code                                                                                                                                                                      | Factory Setting | Remarks |
| 13-3                   | (Comm Parity Sel)  | Parity Selection                           | 0000: Without Parity<br>0001: With Even Parity<br>0002: With Odd Parity                                                                                                         | 00000           | *2*3    |
| 13-4                   | (Comm Data Format) | Data Format Selection                      | 0000: 8-Bits Data<br>0001: 7-Bits Data                                                                                                                                          | 0000            | *2*3    |
| 13-5                   | (Comm Err Ope Sel) | Communication time-out operation selection | 0000: Deceleration to stop.<br>(3-03: Deceleration time 1).<br>0001: Coast to stop.<br>0002: Deceleration to stop.<br>(3-07: Deceleration time 2).<br>0003: Continue operating. | 0000            | *11     |
| 13-6                   | (Comm Err Det Tim) | Communication time-out detection time      | 00.0 ~ 25.5 s                                                                                                                                                                   | 0000            | *11     |

| 14- Motor Auto-Tune Parameters |                   |                               |            |                 |         |
|--------------------------------|-------------------|-------------------------------|------------|-----------------|---------|
| Function Code No.              | LCD Display       | Description                   | Range/Code | Factory Setting | Remarks |
| 14-0                           | (Stator Resistor) | Stator Resistance (Ohms)      | -----      |                 | *5      |
| 14-1                           | (Rotor Resistor)  | Rotor Resistance (Ohms)       | -----      |                 | *5      |
| 14-2                           | (Equi Inductance) | Equivalent Inductance (mH)    | -----      |                 | *5      |
| 14-3                           | (Magnet Current)  | Magnetizing Current (Amps AC) | -----      |                 | *5      |
| 14-4                           | (Ferrite Loss)    | Ferrite Loss Conductance (gm) | -----      |                 | *5      |

| 15- Drive Status and Function Reset |                    |                                              |                                                                                                         |                 |         |
|-------------------------------------|--------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------|---------|
| Function Code No.                   | LCD Display        | Description                                  | Range/Code                                                                                              | Factory Setting | Remarks |
| 15-0                                | (Drive Model)      | Drive Horsepower Code                        | -----                                                                                                   |                 | *3      |
| 15-1                                | (Software Version) | Software Version                             | -----                                                                                                   |                 | *3      |
| 15-2                                | (Fault Log)        | Fault Jog (Last 3 Faults)                    | -----                                                                                                   |                 | *3      |
| 15-3                                | (Elapsed Hours)    | Accumulated Operation Time 1 (Hours)         | 0-9999                                                                                                  |                 | *3      |
| 15-4                                | (Elapsed Hr*10000) | Accumulated Operation Time 2 (Hours X 10000) | 0-27                                                                                                    |                 | *3      |
| 15-5                                | (Elapsed Time Sel) | Accumulated Operation Time Mode              | 0000: Time Under Power<br>0001: Run Mode Time Only                                                      | 0000            | *3      |
| 15-6                                | (Reset Parameter)  | Reset Drive to Factory Settings              | 1110: Reset for 50Hz Motor Operation<br>1111: Reset for 60Hz Motor Operation<br>1112: Reset PLC Program | 0000            | *4      |

Notes: \*1 can be modified during operation  
 \*2 cannot be modified during communication  
 \*3 do not change while making factory setting  
 \*4 as parameter related to factory setting  
 \*5 the parameter will be changed by replacing model (see descriptions of the POSTSCRIPT 1)  
 \*6 only available in V/F mode  
 \*7 only for version 2.3 and above.  
 \*8 only for version 2.4 and above.  
 \*9 for 15HP of 230V class and 20HP of 480V class above  
 \*10 only for version 2.6A and above.  
 \*11 only for version 2.9 and above.



## 4.4 Parameter Function Description

### Parameter Group 0: Drive Operation Mode

#### 0-00 Control Mode

- 0000: Sensorless (General Mode)
- 0001: Sensorless (Variable Torque)
- 0002: Volts/Hz

To select the most suitable sensorless control mode or V/F mode according to the load characteristics.

- 1.) Sensorless (general mode) is inclined to control the general load or rapidly-changed torque load.
- 2.) Sensorless (VT mode) is suitable for Blower/ Pump and HVAC load. The magnetic current of motor will be variable with the torque, which will reduce the current to save the energy
- 3.) In V/F mode please set the parameter group10 comply with the load features.

#### 0-01 Motor Rated Voltage (Vac)

#### 0-02 Motor Rated Current (A)

#### 0-03 Motor Rated Power (kW)

#### 0-04 Motor Rated Speed (RPM/100)

#### 0-05 Motor Rated Frequency (Hz)

#### 0-06 Auto Tuning-Function

- 0000 Disabled 0001: Enabled

It is necessary to input the data on nameplate and auto tuning as long as changing the motor as sensorless mode is selected.

Auto tuning: firstly input the data to 0-01~0-05 according to the nameplate after power off, then set 0-06=0001 and perform auto tuning; the detected internal data will auto be written to parameter group 14 when display "End".

ex. If the motor rated speed is 1700 rpm, please set 0-04 to 17.0



#### Precaution

- 1.) The motor parameter auto tuning is the stationary auto tuning. During motor auto tuning, the motor does not rotate, and the keypad display "-AT-".
- 2.) During motor parameter auto tuning, the input signal in control circuit is invalid.
- 3.) Before motor parameter auto tuning, please confirm the stop state of the motor.
- 4.) The motor parameter auto tuning is only available for sensorless control mode (0-00=0000 or 0-00=0001).

#### 0-07 AC Line Input Voltage (Volts AC)

170.0~264.0 (Class 240V)

323.0~528.0 (Class 480V)

To make sure the voltage level of inverter, please input the actual on-site voltage value.

#### 0-08 Language Selection

- 0000: English
- 0001: German
- 0002: French
- 0003: Italian
- 0004: Spanish

The function is only available for the products with LCD operation keypad. The operation is not necessary for the one with LED.



## Parameter Group 1 - Start/Stop and Frequency Control Modes

### 1-00 Run command Source Selection

- 0000: Keypad**
- 0001: External Run/Stop control (see 1-01)**
- 0002: Communication control**
- 0003: Built-in PLC**

- 1.) 1-00=0000 the inverter is controlled by the keypad.
- 2.) 1-00=0001 the inverter is controlled by the external terminals, and the Stop key for emergency does work. (Refer to 1-03 description).  
Note: 1-00=0001, please refer to parameter group 2-00, 2-01, 2-02 and 2-03 for detail description to make secure of persons and machines.
- 3.) 1-00=0002 the inverter is communication controlled.
- 4.) 1-00=0003 the inverter is built-in PLC controlled, and 1-06 preset value is invalid.

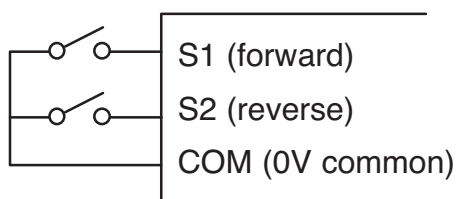
### 1-01 Operation modes for external terminals (MFIT)

- 0000 : Forward/stop-reverse/stop**
- 0001 : Run/stop-forward/reverse**
- 0002 : 3-wire control mode -run/stop**

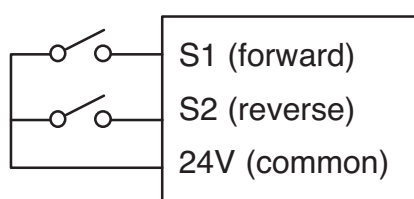
When operation command 1-00=0001 (external terminal), 1-01 is valid. That both forward and reverse commands are ON will be treated as STOP. Set the external input for the following functions (ex. use S1 and S2, set 5-00=0000 and 5-01=0001):

- 1.) 1-01 = 0000, Control mode is as below:

Input signal is NPN:



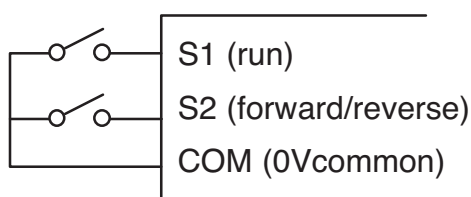
Input signal is PNP:



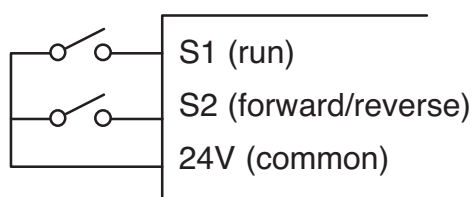
That both forward and reverse commands are ON will be treated as STOP

- 2.) 1-01 = 0001, Control mode is as below:

Input signal is NPN:

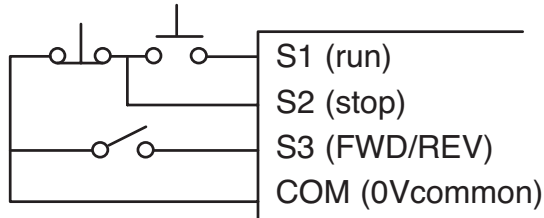


Input signal is PNP:

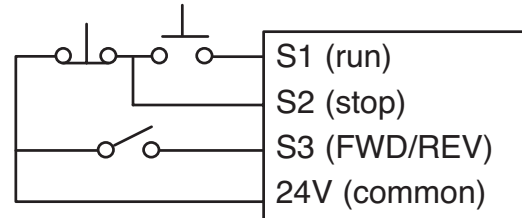


3.) 1-01 = 0002, Control mode is as below:

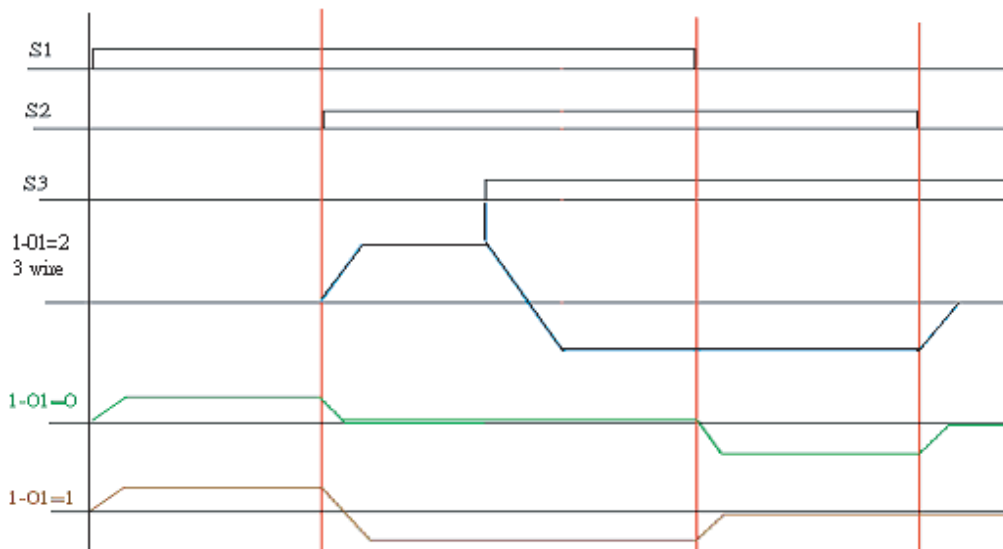
Input signal is NPN:



Input signal is PNP:



Note: As 3 wire control mode is selected, the terminal S1, S2 and S3 is not controlled by 5-00, 5-01 and 5-02.



Note: 1-02=0001, the reverse command is unavailable.

**1-02 Prohibition of Reverse Operation**  
**0000: Enable Reverse Command**  
**0001: Disable Reverse Command**

1-02=0001, the reverse command is invalid.

**1-03 Keypad Stop Button**  
**0000: Stop Button Enable**  
**0001: Stop Button Disable**

1-03 is valid only when 1-00=0000/0002 and the STOP command is enable when 1-03=0000. When 1-00=0000 the STOP command is always available.

**1-04 Starting Method Selection**  
**0000: Start from zero**  
**0001: Start from speed search**

- 1.) 1-04=0000: As starting, the inverter accelerates from 0 to target frequency in the set time.
- 2.) 1-04=0001: As starting, the inverter accelerates to target frequency from the detected speed of motor.



### 1-05 Stopping Method Selection

**0000:Controlled Deceleration with DC Injection Braking (Rapid Stop)**

**0001:Free run stop**

- 1.) 1-05=0000: the inverter will decelerate to 0Hz in preset deceleration time after receiving the stop command.
- 2.) 1-05=0001: the inverter will stop output as receiving the stop command. The motor will inertia free run to stop.

### 1-06 Frequency Command Source Selection

**0000:Keypad**

**0001:Potentiometer on Keypad**

**0002:External Analog Signal Input or Remote Potentiometer**

**0003:Up/Down Frequency Control Using MFIT (S1 - S6)**

**0004:Communication Setting Frequency**

**0005:Impulse frequency (S5) setting frequency (ver2.3)**

- 1.) 1-06=0000 the frequency is setted with keypad (refer to 1-07 for more detail)"
- 2.) 1-06=0001, as one of the parameter in group 5-00~5-06 is set 0016 and multifunction terminal is OFF, the frequency is set by the KNOB (VR for principal speed) on keypad. While the multifunction is ON, the frequency is set by analog signal (auxiliary speed) on terminal block (TM2).
- 3.) 1-06=0002, as one of the parameter in group 5-00~5-06 is set 0016 and the multifunction terminal is OFF, the frequency is set by analog signal (principal speed) on terminal block (TM2), while the multifunction is ON, the frequency is set by the KNOB (VR for auxiliary speed) on keypad.
- 4.) 1-06=0003, please refer to description of parameter group 5-00~5-06 (multifunction input terminals) for the function Up/Down terminal.
- 5.) The priority in reading frequency is PLC frequency control > traverse run > Jog > preset speed > ▲ ▼ on keypad or Up / Down or communication control.
- 6.) 1-06=0005, impulse frequency command input source should be setting as S5 terminal and need to coordinate with 5-10 frequency exchange times ratio. For example, the input value S5 is 4kHz, 5-10 is 1.500 times, and output frequency is  $40.00 \times 1.5 = 60.00\text{Hz}$ . 5-04(S5) should be setting as 0019.

### 1-07 Keypad Operation with Up/Down Keys in Run Mode

**0000:'Enter' must be pressed after frequency change with Up/Down Keys on keypad.**

**0001: Frequency will be changed directly when Up/Down Keys are Pressed**



## Parameter Group 2 - Manual/Automatic Restart Modes

### 2-00 Momentary Power Loss and Restart

**0000 : Momentary Power Loss and Restart is Disable**

**0001 : Momentary Power Loss and Restart is Enable**

**0002 : Momentary Power Loss and Restart Enable while CPU is Operating.**

**2-01 Momentary Power Loss Ride-Thru Time (s): 0.0~2.0**

As start of the other load of power supply results in lowering the voltage below the under voltage level, the inverter will stop output at once. If the power supply recovers in the 2-01 preset time, it will speed search start tracing from the trip frequency, or the inverter will trip with 'LV-C' displayed.

The allowable power loss time differs with the models. The range is from 1second to 2 second.

1.) 2-00=0000: as power lost, the inverter will not start.

2.) 2-00=0001: if the loss time is less than the value of 2-01, the inverter will Spin Start in 0.5 second as the power supplied and restart times are infinite.

3.) 2-00=0002: the power lost for long time, before the inverter lost the control power for the CPU, the inverter will restart according to the 1-00 and 2-04 setting and status of external switch as the power resupplied.

Note: 1-00=0001, 2-04=0000, 2-00=0001 or 0002 after power lost for a long time, please OFF the power and power switches in case of injury to person and machine by the resupplied power.

**2-02 Auto restart Delay Times (s) : 0 ~ 800.0**

**2-03 Number of Auto restart Attempts (times): 0~10**

1.)2-03=0:the inverter will not auto restart as trip for accident.

2.)2-03>0, 2-02= 0:

The inverter will conduct SPEED SEARCH in 0.5 second after trip for accident. The motor will inertia run to frequency at the trip stop, then according to setting accelerate or decelerate time to target frequency.

3.)2-03>0, 2-02>0 :

The output will be stopped for a period which is determined by the 2-02 after accident trip. Then, speed search to present target frequency.

4.)As the inverter is set in braking deceleration or DC braking, it will not perform restart after accident.

### 2-04 Auto Restart Method:

**0000: Start from speed search**

**0001: Start from zero**

1.)2-04=0000: the inverter will detect motor speed and accelerated the setting frequency as speed search enable.

2.)2-04=0001: the inverter will accelerated the motor speed from stop (zero speed) to setting frequency.

### 2-05 Direct running after power up:

**0000: Enable Direct Running After Power Up**

**0001: Disable Direct Running After Power Up**



**! Danger**

- 1.) 2-05=0000 and the inverter is set external terminal controlled (1-00=0001), if the run switch is ON as power is supplied, the inverter will auto start. It is recommend that to cut off the power switch and run switch in case of injury to persons or machine as power is supplied again.
- 2.) 2-05=0001 and the inverter is set external terminal controlled (1-00=0001), if the run switch is ON as power is supplied, the inverter will not auto start and flash STP1. It is necessary to OFF the run switch and then ON to normally start.

**2-06 Delay time for direct running (s): 0 ~ 300.00**

As power on and 2-05=0000, the inverter will perform auto restart in the setting time for delay.

**2-07 Reset mode setting**

**0000: Enable Reset Only when Run Command is Off**

**0001: Enable Reset when Run Command is On or Off**

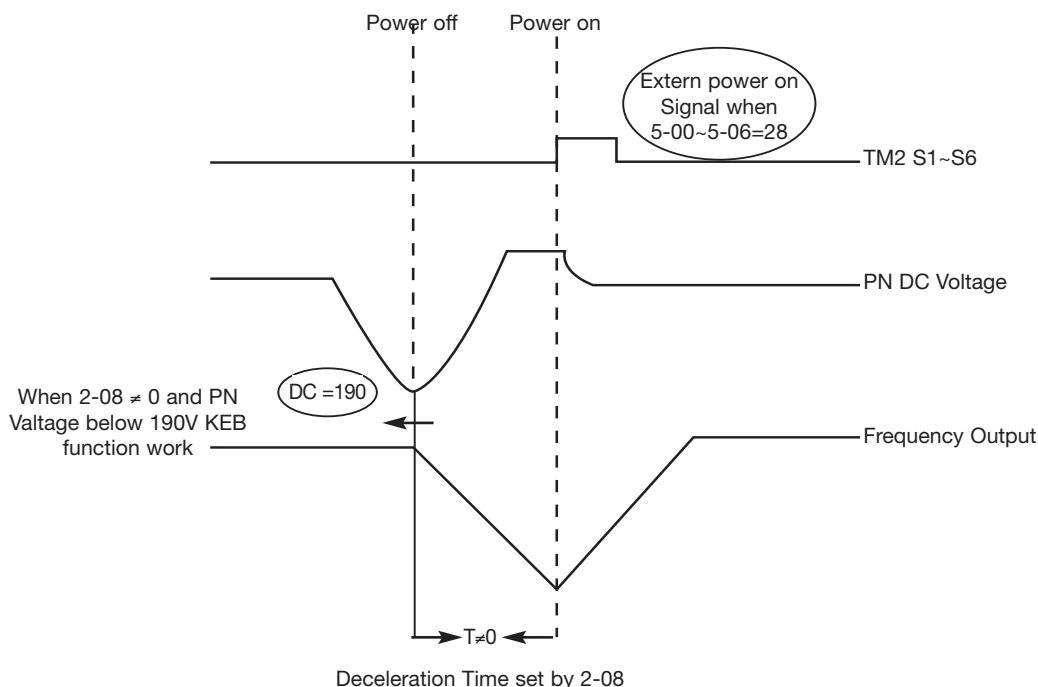
2-07=0000 as the inverter is detected the accident, please cut off the Run switch to perform reset, or restarting does not work.

**2-08 Kinetic Energy Back-up Deceleration Times (s): 0.00~25.00**

1.) 2-08 = 0.0 KEB function disable

2.) 2-08  $\neq$  0.0 KEB function enable

Ex: 230V system



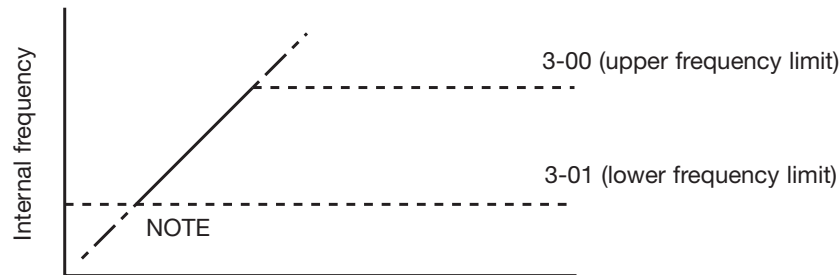
**NOTE:**

1. When 2-08 $\neq$ 0.0, the momentary power loss and Restart is disabled, the inverter will do KEB Function.
2. When power off, CPU detect the DC Voltage. KEB function enable when DC Voltage below than 190V (230V system) or 380V (480V system).
3. When KEB function enabled, the inverter decelerate to zero by 2-08, and the inverter stop.
4. If the power on signal enabled during the KEB function, the inverter accelerate to original frequency.



### Parameter Group 3 - Operating Parameters

**3-00 Frequency Upper limit (Hz): 0.01 ~ 650.00**  
**3-01 Frequency Lower limit (Hz): 0.01 ~ 650.00**



**NOTE:**

When 3-01 = 0 Hz and frequency command is 0 Hz, the inverter will stop at 0 speed.  
 When 3-01 > 0 Hz and frequency command ≤ 3-01, the inverter will output 3-01 preset value.

**3-02 Acceleration Time #1 (s): 0.1 ~ 3600.0**  
**3-03 Deceleration Time #1 (s): 0.1 ~ 3600.0**  
**3-04 S Curve of acceleration/deceleration #1 (s): 0.0 ~ 4.0**  
**3-05 S Curve of acceleration/deceleration #2 (s): 0.0 ~ 4.0**  
**3-06 Acceleration Time (MFIT) #2 (s): 0.1 ~ 3600.0**  
**3-07 Deceleration Time (MFIT) #2 (s): 0.1 ~ 3600.0 reference**  
**3-08 Jog Acceleration Time (MFIT) (s): 0.1 ~ 25.5**  
**3-09 Jog Deceleration Time (MFIT) (s): 0.1 ~ 25.5**

Formula for calculating acceleration and deceleration time: The denominator is base on the rated frequency of motor.

$$\text{Acceleration time} = 3-02 \text{ (or } 3-06) \times \frac{\text{Preset frequency}}{0-05} \quad \text{Deceleration time} = 3-03 \text{ (or } 3-07) \times \frac{\text{Preset frequency}}{0-05}$$

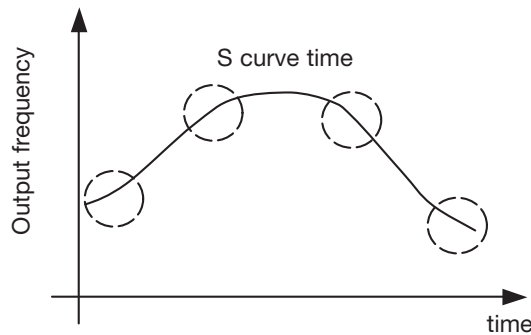
- 1.) When 5-00~5-06 is set 0006 (the second acceleration and deceleration time), the first acceleration/ deceleration/ S curve or the second acceleration/ deceleration/ S curve will be selected by off or on the external input terminal.
- 2.) When 5-00~5-06 is set 0005 (Jog), Jog run is controlled by external terminals. The acceleration and deceleration action will be at Jog acceleration and deceleration time.
- 3.) When 5-00~5-06 is set as 0005 (Jog) and 0006 (acceleration and deceleration time toggle), to change the acceleration and deceleration time by ON the external terminals, and the list setting:

| Function                                  | Acc/ Dec time #1 (3-02/3-03) | Acc/ Dec time #2 (3-06/3-07)         | JOG Acc/Dec time (3-08/3-09)         |
|-------------------------------------------|------------------------------|--------------------------------------|--------------------------------------|
|                                           | preset value                 | 1-06 determines the output frequency | 1-06 determines the output frequency |
| Jog input command (5-00~5-06=0005)        | OFF                          | OFF                                  | ON                                   |
| Acc/dec input command #2 (5-00~5-06=0006) | OFF                          | ON                                   | OFF                                  |

- 4.) When S curve time (3-04/3-05) is set as 0.0, the S curve is useless. Namely, acceleration and deceleration is at line.

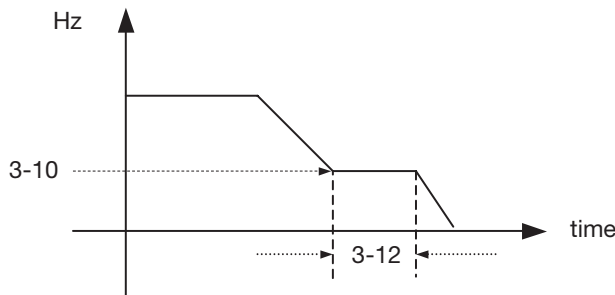


- 5.) When S curve time (3-04/3-05) is larger than 0.0, the acceleration and deceleration action is as following diagram.
- 6.) Regardless of the stall prevention period, actual acceleration and deceleration time = preset acceleration / deceleration time + S curve time. For example: acceleration time = 3-03+ 3-04.
- 7.) During acceleration and deceleration process, there might be residual error in acceleration and deceleration toggling. Please set the S curve time as 0.0 (3-04/3-05), if you need to toggle acceleration and deceleration time in acceleration / deceleration process.



**3-10 DC Injection Brake Start Frequency (Hz) : 0.1 ~ 10.0**  
**3-11 DC Injection Brake Level (%) : 0.0 ~ 10.0**  
**3-12 DC Injection Brake Time (s) : 0.0 ~ 25.5**

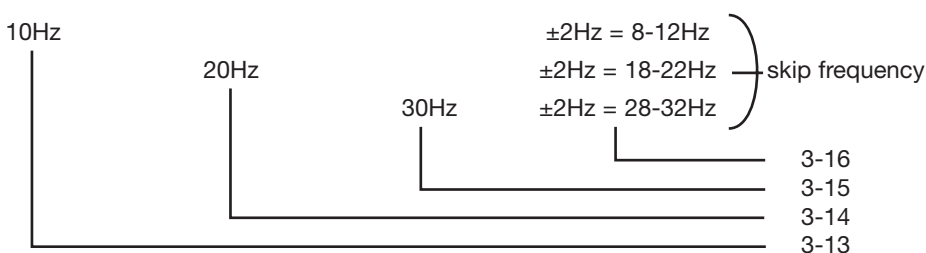
3-12 / 3-10 is the action time and start frequency of DC braking, as graph below:



The upper setting of 3-11 will be corrected 20.0 after manual V2.3.

**3-13 Skip Frequency #1 (Hz) : 0.00 ~ 650.00**  
**3-14 Skip Frequency #2 (Hz) : 0.00 ~ 650.00**  
**3-15 Skip Frequency #3 (Hz) : 0.00 ~ 650.00**  
**3-16 Skip Frequency Bandwidth (± Hz) : 0.00 ~ 30.00**

Example: as 3-13 is set as 10.0Hz / 3-14 as 20.0 Hz / 3-15 as 30.0 Hz / 3-16 as 2.0Hz



**3-17 Parameter lock**

- 0000: All Functions can be changed**
- 0001: Only 6-00 - 6-08 can't be changed**
- 0002: All Functions except 6-00 - 6-08 can't be changed**
- 0003: All Function can't be changed**

**3-18 Copy Unit**

- 0000: Disable**
- 0001: Inverter to Copy Unit**
- 0002: Copy Unit to Inverter**
- 0003: Verify**

- 1.) 3-18=0000: Disable.
  - 2.) 3-18=0001: Copy the inverter parameters to module.
  - 3.) 3-18=0002: Copy the module parameters to inverter.
  - 4.) 3-18=0003: Copy the parameters to inverter or module to mutually verify the parameters.
- Note: The copy function is available for the models with same capacity.

**3-19 Fan Control**

- 0000: Auto (Depend on temp.)**
- 0001: Operate while in RUN Mode**
- 0002: Always Run**
- 0003: Always Stop**

- 1.) 3-19=0000: The fan run as the inverter senses temperature rises. Thusly, extend the service period.
  - 2.) 3-19=0001: The fan runs while the inverter is running.
  - 3.) 3-19=0002: The fan is continuously running regardless of the action of the inverter.
  - 4.) 3-19=0003: The fan is always stopping regardless of the action of the inverter.
- Note: Due to the hardware limitation, the function is disable at 15HP above of 220V class and 20HP above of 440V class. The fan is running after the inverter power on.

**3-20 Energy Saving Mode**

- 0000: Disabled**
- 0001: Controlled by MFIT at Set Frequency**

**3-21 Energy saving gain (%): 0 ~ 100**

In terms of FAN, PUMP or other heavy inertia loads which need greater start torsion, while in operation they need not so high torsion. Consequently, to decline the output voltage to saving energy by setting 3-20 is necessary. Set 3-20=0001 to enable the function and set 5-00~5-06=0010 to control the energy saving with MFIT input. The output voltage will gradually decline to 'original voltage'x'3-21' preset value as the terminal' is ON. The output voltage will rise to original voltage as the terminal is OFF.

- Note:
1. The declining and rising speeds of voltage for energy saving is same as the ones for SPEED SEARCH.
  2. Energy saving mode is only available under V/F mode (0-00 = 0002).



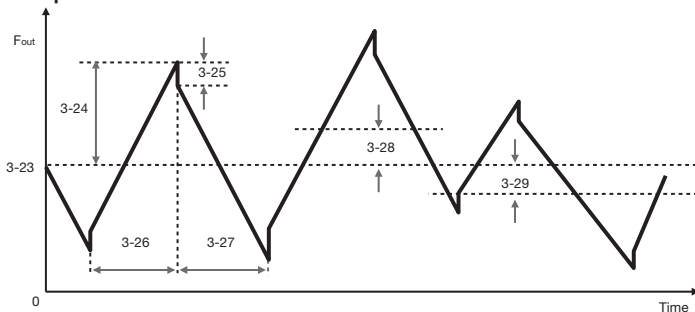
**3-22 Carrier Frequency (kHz): 2~16**

| 3-22 | Carrier frequency | 3-22 | Carrier frequency | 3-22 | Carrier frequency | 3-22 | Carrier frequency |
|------|-------------------|------|-------------------|------|-------------------|------|-------------------|
| 2    | 2kHz              | 6    | 6kHz              | 10   | 10kHz             | 14   | 14kHz             |
| 3    | 3kHz              | 7    | 7kHz              | 11   | 11kHz             | 15   | 15kHz             |
| 4    | 4kHz              | 8    | 8kHz              | 12   | 12kHz             | 16   | 16kHz             |
| 5    | 5kHz              | 9    | 9kHz              | 13   | 13kHz             |      |                   |

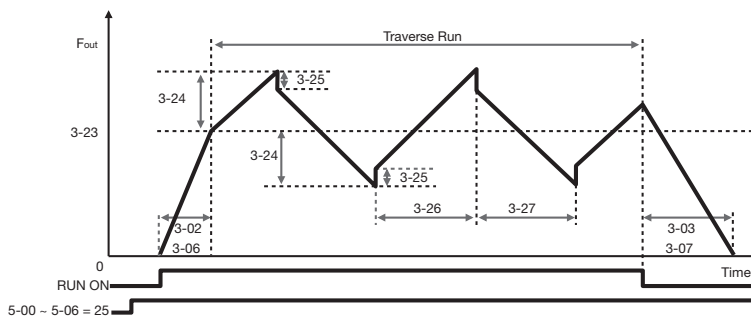
Note: The external electronic components maybe interfered, more serious, even the motor vibration due to cutting of the high carrier frequency waveform, although the inverter provides low noise environment in running. Thusly, it is necessary to regulate the carrier frequency.

- 3-23 Center Frequency (CF) of Traverse Run (%): 5.0~100**
- 3-24 Amplitude (A) of traverse Run (%): 0.1~20.0**
- 3-25 Drop (D) of traverse Run (%): 0.0~50.0**
- 3-26 Acceleration Time (AT) of traverse Run (s): 0.5~60.0**
- 3-27 Deceleration Time (DT) of traverse Run (s): 0.5~60.0**
- 3-28 Rise (X) deviated traverse (%): 0.0~20.0**
- 3-29 Lower (Y) deviated traverse (%): 0.0~20.0**

Traverse Run is defined as adding a triangle wave to the basic operation frequency of inverter output frequency at the preset acceleration and deceleration time. The action is as the graph below:

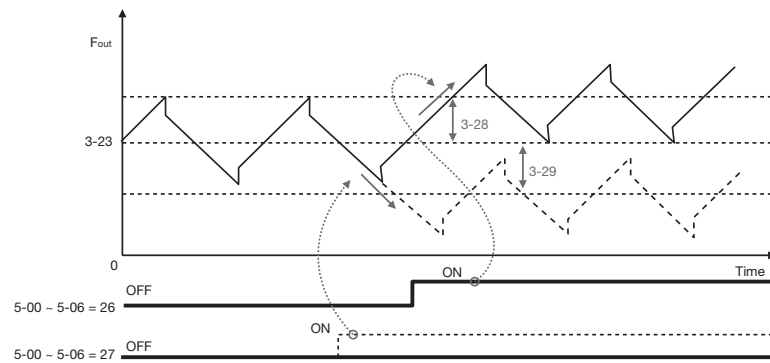


1.) The traverse run is available as the run command and the terminal (5-00~5-05=0025) for such operation both ON. Inverter operating, the traverse run is ready when the inverter output frequency reaches center frequency (3-23). During acceleration to center frequency, the acceleration time is at the originally preset value (3-02/3-06). When the traverse run is OFF or the inverter is OFF, the deceleration time is also at original preset value (3-03/3-07). However, in traverse running, the inverter is at traverse run acceleration time (3-26) and deceleration time (3-27). The action is as follow diagram:





- 2.) During traverse run, the center frequency could be controlled by the multifunction input terminals. However, the X up deviation and Y low D deviation can not be input at the same time. If they are input at the same time, the inverter will maintain the original center frequency. The motion is as the graph below:



- 3.) The stall prevention is idle in the acceleration and deceleration time of traverse run. Whereas, it is valid during first acceleration to center frequency process when the Function of traverse run is OFF or the inverter is in deceleration time after the STOP command is received. Thusly, it is must take into consideration to comply the actual system capacity with the proper inverter capacity when designing equipment.
- 4.) The frequency range of traverse run is restricted by the inverter upper and lower frequency limit. That is: if the (center frequency + Amplitude) is larger than Upper Limit, it will operate at upper frequency limit. And if (center frequency - Amplitude) is less than Lower Limit, vice versa.
- 5.) During traverse run, all the preset values can't be modified such as (center frequency, amplitude, amplitude drop, acceleration time, deceleration time, traverse run upper deviation and lower deviation). The modified acceleration and deceleration time is priority to the original one, but not traverse run acceleration and deceleration time. The motion is as graph below:
- 6.) Center frequency = 3-23\* max. frequency (3-00)  
 Amplitude = 3-24\* center frequency  
 Acceleration/Deceleration time = amplitude acceleration / deceleration time  
 Amplitude Drop = 3-25\*amplitude  
 Deviated traverse (X upper deviation) = 3-28\* traverse run center  
 Deviated traverse (Y lower deviation) = 3-29\* traverse run center  
 If change the max. frequency of 3-00, reset 3-23~3-29 value is necessary.

**3-30 Start Frequency (Hz) : Start Frequency (Hz): 0.0~10.0**



- 4-00 Motor Current Display Selection**  
**0000:Disable Motor Current Display**  
**0001:Enable Motor Current Display**
- 4-01 Motor Voltage Display Selection**  
**0000:Disable Motor Voltage Display**  
**0001:Enable Motor Voltage Display**
- 4-02 DC Bus Voltage Display Selection**  
**0000:Disable Bus Voltage Display**  
**0001:Enable Bus Voltage Display**
- 4-03 PLC Status Display Selection**  
**0000:Disable PLC Status Display**  
**0001:Enable PLC Status Display**

#### 4-04 Reference speed motor value (RPM)

The display speed value is calculated as follows:  $\frac{4-04}{0-05}$   
 Display speed value = frequency command x

Ex. if the rated frequency (0-05) is 60Hz, the frequency command is 30Hz and 4-04=1800, then the display value is 900.

- 4-05 Custom Units (Line Speed) Display Mode**  
**0000:Drive Output Frequency is Displayed**  
**0001:Motor Speed is Displayed in Integer (xxxx)**  
**0002:Motor Speed is Displayed with One Decimal Place (xxx.x)**  
**0003:Motor Speed is Displayed with Two Decimal Places (xx.xx)**  
**0004:Line Speed is Displayed with Three Decimal Places (x.xxx)**

The preset frequency is displayed as the inverter stops while the operation line speed is displayed as the inverter is running.

- 4-06 PID Feedback Display Selection**  
**0000:Disabled**  
**0001:Enable**

Set the following parameters to display the feedback PID value:

|           |                                                                        |
|-----------|------------------------------------------------------------------------|
| 5-05=0020 | Set S6 input (MFIT) as the PID feedback analog terminal (tefer to PID) |
| 11-0=0001 | PID is enabled                                                         |
| 4-06=0001 | Display S6 as PID analog feedback value 0~100                          |

Set the following parameters to display the feedback PID value:

| Signal type        | Keypad display value |
|--------------------|----------------------|
| 0~10V (12-6=0000)  | S6 x 100 / 10V       |
| 4~20mA (12-6=0001) | S6 x 100 / 20mV      |

Note 1: Please press DSP Key to switch between the output frequency and PID feedback value.

Note 2: The inverter displays XXXF as Running, while XXXR as Stop.





## Parameter Group 5-Multifunction Input Terminals

**5-00~5-06 Multifunction input terminals:**

- 0000:Forward/Stop Command \*1
- 0001:Reverse/Stop Command \*2
- 0002:Preset Speed # 1 (6-02)
- 0003:Preset Speed # 2 (6-03)
- 0004:Preset Speed # 3 (6-05) \*3
- 0005:Jog
- 0006:Acc/Dec time # 2
- 0007:Emergency Stop Contact A
- 0008:Base Block
- 0009:Speed Search Stop
- 0010:Energy Saving
- 0011:Control Signal Selection
- 0012:Communication Control Signal Selection
- 0013:Acc/Dec Disabled
- 0014:Up Command
- 0015:Down Command
- 0016:Principal/Auxiliary Speed
- 0017:PID Function Disabled
- 0018:Reset
- 0019:Encoder Input Terminal (Terminal S5)
- 0020:PID Feedback Signal A12 (Terminal AI2)
- 0021:AI2 Bias Signal 1 Input (Terminal AI2)
- 0022:AI2 Bias Signal 2 Input (Terminal AI2)
- 0023:Analog Input (Terminal AIN)
- 0024:PLC Application
- 0025:Traverse Run
- 0026:Traverse Run Upper Deviation
- 0027:Traverse Run Lower Deviation
- 0028:Power Source Detect for KEB Function
- 0029:Emergency Stop Contact B

The terminals S1-AIN on terminal block (TM2) are multifunction input terminals. The above 30 functions can be set in these terminals.

Function Description for 5-00~06:

**A.** 5-00~5-06=0000/0001 (Forward/Reverse/Stop).

As forward command is ON, the inverter runs while stops as OFF. The 5-00 factory set is forward.  
As reverse command is ON, the inverter runs while stops as OFF. The 5-01 factory set is reverse.

**B.** 5-00~5-06=0002-0004 (Preset speed #1~#3).

External multifunction input terminals are ON, the inverter is operation at the preset time, and the duration is determined by the time of the terminal ON. The corresponding frequency parameter is illustrated below:



- C.** 5-00~5-06=0005 (Jog) To select Jog operation as ON the external input terminals. Now, the inverter operates at the Jog acceleration and deceleration time. The corresponding frequency parameter is illustrated below:

The priority order of frequency: Jog Speed → Preset Speed → Keypad frequency or external frequency signal

| MFIT input with 5-00~5-06=0004 | MFIT input with 5-00~5-06=0003 | MFIT input with 5-00~5-06=0002 | MFIT input with 5-00~5-06=0005 | Output frequency preset value |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|
| OFF                            | OFF                            | OFF                            | OFF                            | 6-00                          |
| ON/OFF                         | ON/OFF                         | ON/OFF                         | ON                             | 6-01                          |
| OFF                            | OFF                            | ON                             | ON                             | 6-02                          |
| OFF                            | ON                             | OFF                            | OFF                            | 6-03                          |
| OFF                            | ON                             | ON                             | OFF                            | 6-04                          |
| ON                             | OFF                            | OFF                            | OFF                            | 6-05                          |
| ON                             | OFF                            | ON                             | OFF                            | 6-06                          |
| ON                             | ON                             | OFF                            | OFF                            | 6-07                          |
| ON                             | ON                             | ON                             | OFF                            | 6-08                          |

- D.** 5-00~5-06=0006 (acc / dec time #2)

On the external input terminal, to select the acceleration #1/deceleration #1/S curve #1 or acceleration #2/deceleration #2/S curve #2.

- E.** 5-00~5-06=0007/0029: External Emergency Stop Contact A or B.

The inverter will decelerate to stop by 3-07 setting and Flash E.S as the emergency stop signal received regardless of 1-05 setting. After such signal released, OFF the operation switch then ON or Press Operation Key, the inverter will restart from the start frequency. If the emergency signal was released before the inverter stop completely, the inverter still carries out emergency stop. The 8-02/8-03 determines the action of the error terminal. As 8-02/8-03=0000: the error terminal does not act when the external emergency signal input. While 8-02/8-03=0009, the error terminal does act when emergency signal input.

Please wiring the terminal before to set 5-00~5-06=0029.

- F.** 5-00~5-06=0008: Base Block

The inverter stop output as receiving STOP command, and the motor Free-Run stops.

- G.** 5-00~5-06=0009: Speed Search Stop

When starting, the inverter detects the present speed of the motor firstly, then, the inverter accelerates from the present speed to preset speed.

- H.** 5-00~5-06=0010: Energy-saving operation

In terms of FAN, PUMP or other heavy inertia loads which need greater start torque, while in operation they need not so high torsion. Thusly, to decline the output voltage is to saving energy. The output voltage gradually declines as the multifunction terminal is ON. It will gradually increase (to the original voltage) as the Multifunction terminal is OFF.

Note: The acceleration and deceleration speed of energy saving operation is the same as the speed of SPEED SEARCH.

- I.** 5-00~5-06=0011: Switch of the control signal

External switch terminal is OFF: 1-00/1-01 determines the operation signal and frequency signal.  
External switch terminal is ON: Keypad controls the operation signal and frequency signal but not controlled by 1-00/1-01.

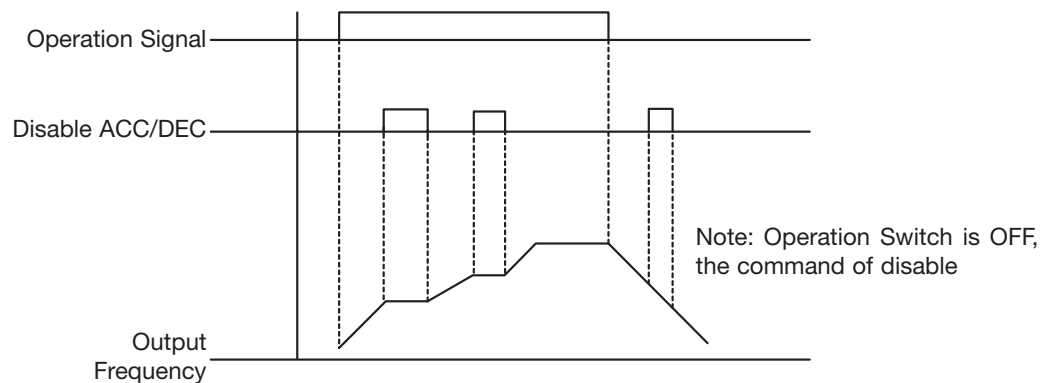
**J. 5-00~5-06=0012: Switch of the inverter controlling in communication**

External switch terminal is OFF: in communication, the master (PC or PLC) can control the inverter operation and frequency signal and allowably modify the parameters, and the operation signals from Keypad and TM2 are idle. Furthermore, the keypad can only display the voltage, current and frequency, the parameters are readable and not writable, and Emergency Stop is valid.

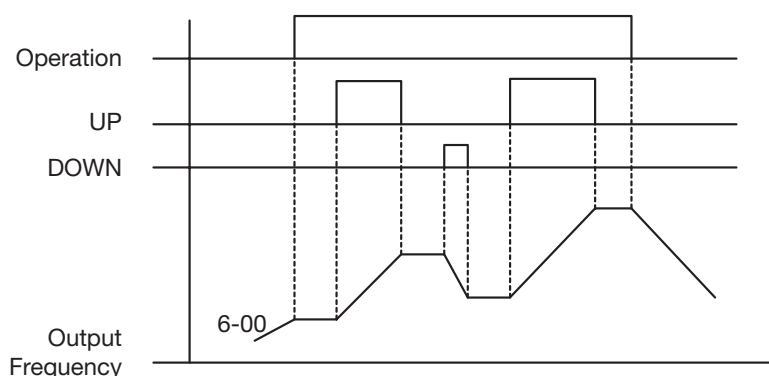
External switch terminal is ON: in communication, the inverter is controlled by the keypad regardless of the setting of 1-00/1-06 and master. Under such circumstance, the master still can read and write the inverter parameters.

**K. 5-00~5-06=0013: Disable acceleration and deceleration**

The acceleration and deceleration action is unavailable till the forbid acceleration and deceleration signals are released. The action is illustrated in the graph below:

**L. 5-00~5-06=0014,0015: UP / DOWN Function**

- (1) Please set 1-06=0003 if you want to use the UP/DOWN Function, and the other frequency signals are useless.
- (2) Set 5-08=0000 and 5-09=0.0, the inverter accelerates to the preset value of 6-00 when the operation terminal is ON. Then, it maintains the certain speed. As the inverter receives the UP/DOWN command, it will accelerate / decelerate till the command is released. The inverter runs at the certain speed. The inverter will ramp stop or Free-Run stop which is determined by the 1-05 as long as the inverter receives the STOP command. And the frequency of Stopping will be stored in 6-00. The UP/DOWN KEY is invalid as the inverter stops. It is necessary to use the Keypad to modify the preset parameter.
- (3) Set 5-08=0001, the inverter will operate from 0Hz when the operation terminal is ON. The action of UP/DOWN is as above description. The inverter will ramp stop or free-run stop which determined by 1-05 setting when as it receiving the Stop Command and back to 0Hz. The next operation will start at 0Hz.
- (4) That UP/Down Signal Simultaneously act are invalid
- (5) 5-09≠0.0, the inverter will accelerate to the setting of 6-00 and maintain at the speed. When the UP/Down terminal is ON, setting frequency is present value  $6-00 \pm 5-09$ , and the inverter will accelerate/ decelerate to frequency  $6-00 \pm 5-09$ . The upper frequency limit and lower frequency limit also restrict the operation. If the signal of UP/DOWN is maintained over 2 seconds, the inverter will begin to accelerate/decelerate. If 5-09=0.0, the operation is the same, till the UP/DOWN signal stops. Please refer to the time diagram of 5-09.



**M.** 5-00~5-06=0016 Principal/Auxiliary speed toggle

Multifunction terminal = OFF, the frequency is set by Master Speed, whereas, Multifunction terminal = ON, the frequency is set by Auxiliary Speed.

Ex. 1-06=0001, the master speed is the VR on the keypad and the auxiliary speed is analog signal on the TM2 terminal block.

**N.** 5-00~5-06=0017 (PID Function Disable)

The PID Function Disable is ON. PID is not controlled by 11-0, while OFF, it is controlled by 11-0.

**O.** 5-00~5-06=0018 (Reset Command)

The Reset command is same as Reset Key on the panel is ON. The command is OFF, and the inverter does not response. The factory set of 5-05 is Reset command.

**P.** 5-04=0019 (Encoder Input terminal)

The multifunction terminal S5 is set 0019 means it is the input terminal for PLC program Encoder.

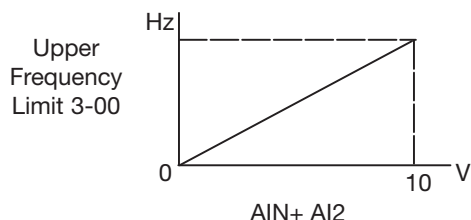
**Q.** 5-05 or 5-12=0020 (PID feedback input terminal)

The multifunction terminal AI2=0020 means the PID feedback input terminal and 0~10V (0~ 20mA) or 2~10V (4~20mA) is available by the setting of 11-0.

**R.** 5-05 or 5-12=0021/0022 (Bias signal 1/2 input)

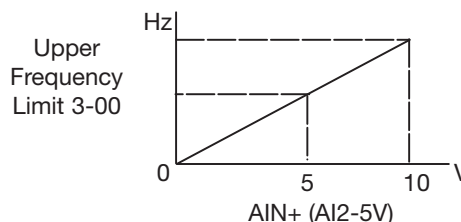
To regulate the Offset of the Keypad VR or AIN analog input, only the signal of 0~10V (0~ 20mA) or 2~10V (4~20mA) is available.

5-05 or 5-12=0021 Function



5-05 or 5-12=0022 Function

\* The value is 0 when  $AIN+(AI2-5V)<0$



**S.** 5-06=0023 (Analog input AIN)

The multifunction terminal AIN = 0023. The action is provided for setting the frequency.

**T.** 5-00~5-06=0024 (PLC Application)

The multifunction terminal S1-AIN=0024, which means the terminal is for PLC application. The terminal is provided for the PLC program input.

**U.** 5-00~5-06=0025 (Traverse Run).

The motion description refers to 3-23~3-29 for detail description.

**V.** 5-00~5-06=0028 (Power Source Detect for KEB Function) Please refer to the description of 2-08.



**5-07 Multifunction terminal S1~S6 and AIN signal confirm the scan times (ms X 4):  
1~100 times**

TM2 terminal used as scanning, if there are same signals continuously input for N times (Namely, Scan times), the inverter will treated the signal as normal. During performing the signal, if the scan times are less than N, the signal will be as noise.

Each scan period is 4ms.

The user can specify the scan times interval duration according to the noise environment. If the noise is serious, upper modify the value of 5-07, but the response speed will be slow down.

Note: If the S6 and AIN is for digital signal, the voltage level for digital signal above 8V is treated as ON, below 2V is OFF.

**5-08 Stop Mode Using MFIT:**

**0000: When Up/Down is used, the preset frequency is hold as the inverter stops, and the UP/Down is idle.**

**0001: When Up/Down is used, the preset frequency is reset to 0Hz as the inverter stops.**

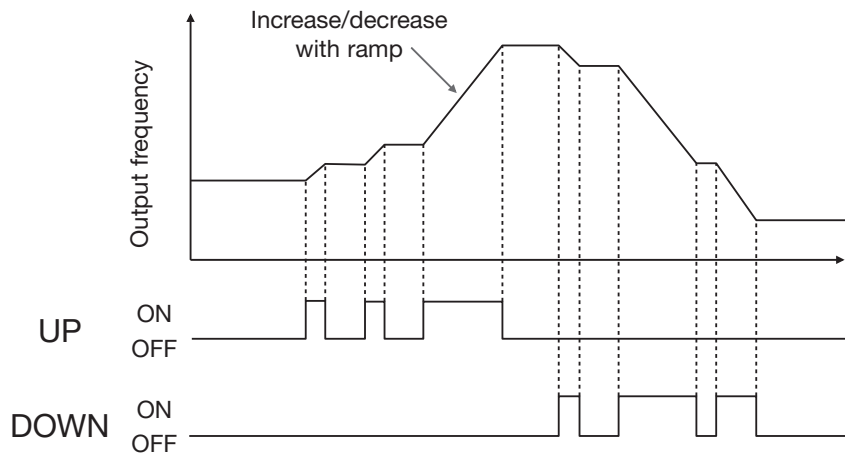
**0002: When Up/Down is used, the preset frequency is hold as the inverter stops, and the UP/Down is available.**

- (1) Set 5-08=0000, the inverter will accelerate to the speed of 6-00 as receiving the Run command and run at such certain speed. The inverter begins to accelerate (decelerate) as the UP (Down) terminal is energized. The inverter will hold the speed as the UP/DOWN command released. When the Run Signal releases, the inverter will ramp stop or stop output (determined by the 1-05). It will store the frequency when the operation signal disappeared. UP/DOWN keys are idle when the inverter is stop. The keypad is available for you modify the preset frequency (6-00).
- (2) If 5-08=0002, the UP/Down is available as the inverter stops.
- (3) Set 5-08=0001, as the Run terminal is energized, the inverter operates from 0Hz, the Function of UP/DOWN is same as the above description. When the Run Signal released, the inverter will ramp stop or stop output (determined by 1-05). And back to 0Hz. The following operation will always begin from 0Hz.

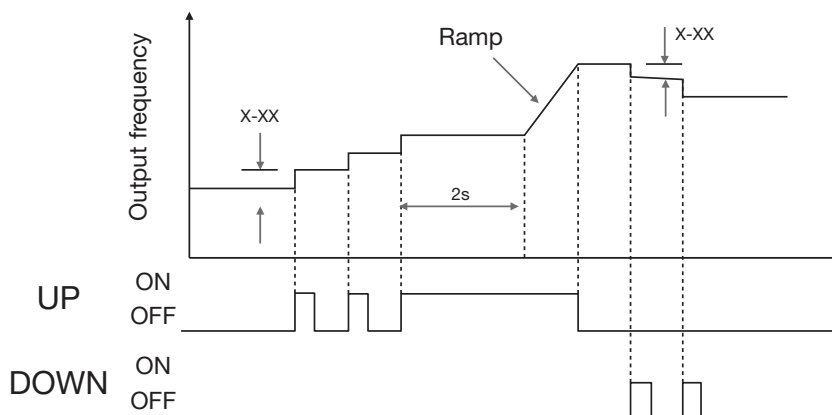
**5-09 Step of Up/Down Function (Hz): 0.00 ~ 5.00**

There are two modes covered below:

- (1) 5-09 = 0.00, the function is disable. The operation is just as the original one. As UP terminal is ON, the frequency increases while the DOWN terminal is ON, the frequency decreases. (Refer to the following graph).



(2) 5-09 = 0.01 to 5.00, UP/ DOWN terminal ON, that equivalent to increase/decrease the frequency of 5-09. If the pressing is over 2 seconds, revive the original UP/DOWN mode (Please refer to the following diagram)



**5-10 Impulse input frequency time ratio: 0.001~9.999**

When frequency source 1-06 be setting as 0005, the impulse signal frequency will be according to this parameter to decide to the real inside frequency of inverter. The inside calculate formula:

$$\text{Frequency} = S5 \text{ (impulse frequency)} * 5-10 \text{ (times ratio)}$$

Es. S5 impulse is 1kHz (1000), 5-10=1.50:

$$\text{Frequency} = 1000 * 1.5 = 1500 = 15.00\text{Hz}$$

The frequency accuracy of S5 is by base of 100, 1K (1000) present 10.00Hz.



**5-11 Select auxiliary frequency source (AI2)**

**0000: Frequency refer to 6-00.**

**0001: Frequency refer to the VR analog signal on the Keypad.**

**0002: Frequency refer to the VR analog signal on TM2.**

**0003: Frequency refer to the frequency value which is calculated by Up/Down on TM2.**

**0004: Frequency refer to the input communication frequency**

When frequency source command setting as impulse command, (1-06= 0005)

If master speed operating (5-00~5-06 setting to 0016 and the terminal is OFF), frequency running as impulse frequency. If auxiliary speed operating (5-00~5-06 setting to 0016 and the terminal is ON), frequency should be decided by 5-11 setting.

**5-12 AI2 function set (For 2.2~7.5kW @ 220V and 2.2~11kW @ 440V only).**

**0020: PID Feedback Signal AI2 (Terminal AI2)**

**0021: AI2 Bias Signal 1 Input (Terminal AI2)**

**0022: AI2 Bias Signal 2 Input (Terminal AI2)**





## Parameter Group 6- Jog and Preset (MFIT) Speed Setting on Keypad

**6-00 Keypad frequency (Hz): 0.00~650.00**  
**6-01 Jog frequency (Hz): 0.00~650.00**  
**6-02 Preset frequency #1 (Hz): 0.00~650.00**  
**6-03 Preset frequency #2 (Hz): 0.00~650.00**  
**6-04 Preset frequency #3 (Hz): 0.00~650.00**  
**6-05 Preset frequency #4 (Hz): 0.00~650.00**  
**6-06 Preset frequency #5 (Hz): 0.00~650.00**  
**6-07 Preset frequency #6 (Hz): 0.00~650.00**  
**6-08 Preset frequency #7 (Hz): 0.00~650.00**

The inverter can operate at 9 preset speeds. The operation time of the 9 stages is based on the ON time of the terminal MFIT (set 5-00~5-06=0002~0005), the operation is as follows:

| MFIT input with<br>5-00~5-06=0004 | MFIT input with<br>5-00~5-06=0003 | MFIT input with<br>5-00~5-06=0002 | MFIT input with<br>5-00~5-06=0005 | Output frequency<br>preset value |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|
| OFF                               | OFF                               | OFF                               | OFF                               | 6-00                             |
| ON/OFF                            | ON/OFF                            | ON/OFF                            | ON                                | 6-01                             |
| OFF                               | OFF                               | ON                                | OFF                               | 6-02                             |
| OFF                               | ON                                | OFF                               | OFF                               | 6-03                             |
| OFF                               | ON                                | ON                                | OFF                               | 6-04                             |
| ON                                | OFF                               | OFF                               | OFF                               | 6-05                             |
| ON                                | OFF                               | ON                                | OFF                               | 6-06                             |
| ON                                | ON                                | OFF                               | OFF                               | 6-07                             |
| ON                                | ON                                | ON                                | OFF                               | 6-08                             |

The Jog external multifunction terminal = ON, the inverter operates in Jog acceleration time/Jog decelerate time.

Priority in reading the frequency: Jog > Preset speed > Keypad frequency or external frequency signal.

## Parameter Group 7 - Analog input signal operation mode

**7-00 AIN Gain (%): 0 ~100**  
**7-01 AIN Bias (%): 0 ~100**  
**7-02 AIN Bias Selection: 0000:Positive 0001:Negative**  
**7-03 AIN Slope: 0000:Positive 0001:Negative**  
**7-04 AIN signal verification Scan Time (AIN, AI2) 1~100**  
**7-05 A12 Gain (%): 0 ~ 200**





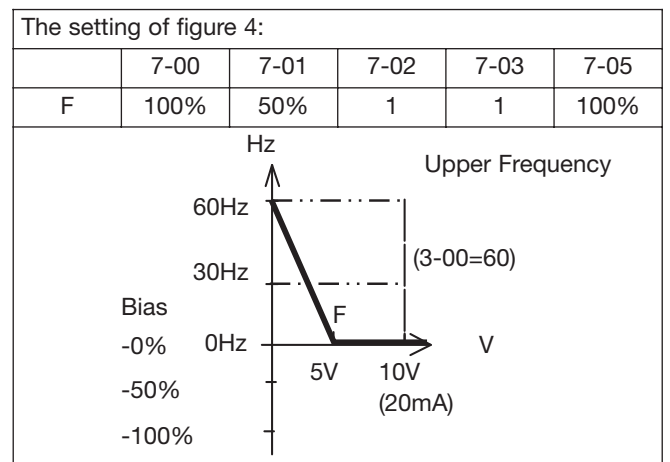
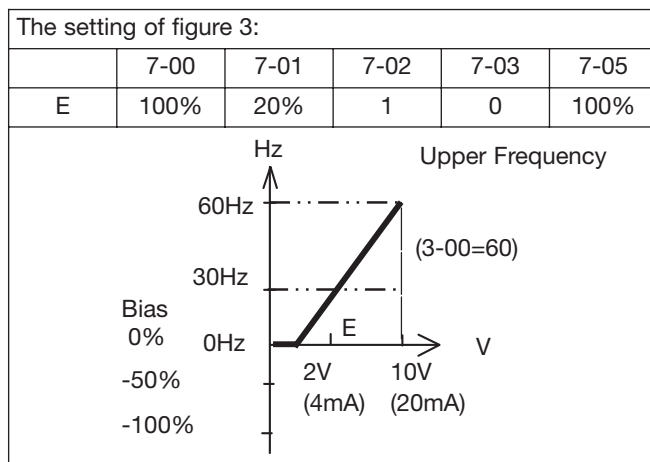
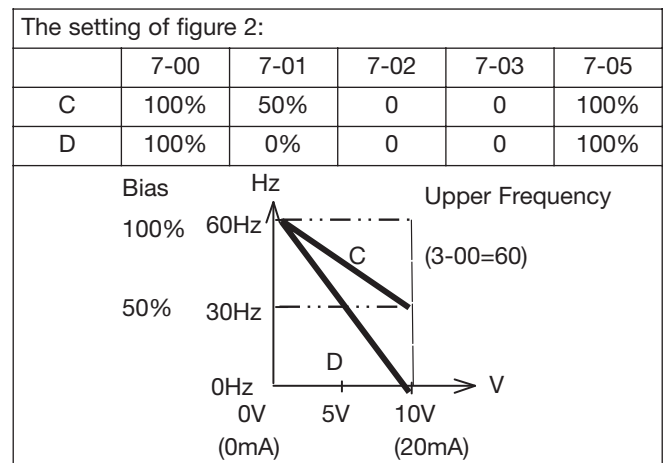
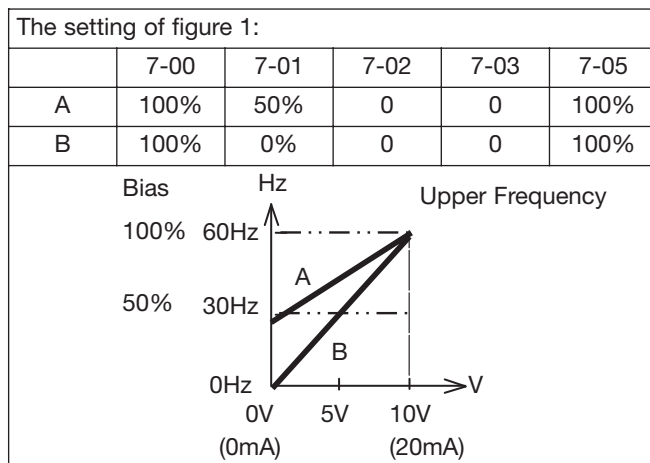
The function is valid when 1-06=0002.

- 1.) 7-02 = 0000: 0V(0mA) corresponding to Lower Frequency Limit, 10V (20mA) corresponding to Upper Frequency Limit
- 2.) 7-02 = 0001: 10V(20mA) corresponding to Lower Frequency Limit, 0V (0mA) corresponding to Upper Frequency Limit.
- 3.) 12-6 = 0000: 0~10V(0~20mA)

|          |                                 |
|----------|---------------------------------|
| if SW2=I | $F=I*(3-00)/20$ with $I \geq 0$ |
| if SW2=V | $F=V*(3-00)/10$ with $V \geq 0$ |

4.) 12-6 = 0001: 2~10V (2~10V o 4~20mA)

|          |                                     |
|----------|-------------------------------------|
| if SW2=I | $F=(I-4)*(3-00)/16$ with $I \geq 4$ |
|          | $F=0$ with $I < 4$                  |
| if SW2=V | $F=(V-2)*(3-00)/8$ with $V \geq 2$  |
|          | $F=0$ with $V < 2$                  |



The inverter reads the average value of A/D signals once per (7-04x4ms). Users can determine scan intervals according to noise in the environment. Increase 7-04 in noisy environment, but the respond time will increase accordingly.



## Parameter Group 8 - Multifunction output terminal and output signal operation mode

### 8-00 Analog Output Voltage Mode:

- 0000: Output frequency
- 0001: Frequency Setting
- 0002: Output voltage
- 0003: DC Bus Voltage
- 0004: Motor current
- 0005: FEEDBACK Signal of PID

### 8-01 Analog Output Gain (%) : 0 ~ 200

The multifunction analog output terminal of the terminal block (TM2), is 0~10Vdc analog output. The output type is determined by the 8-00. The function of 8-01 is: when there is tolerance for the external voltage meter and peripheral equipment, please regulate 8-01.

The FEEDBACK value of PID (That is the input voltage and current of AI2) outputs analog value from FM+ terminal. (Decide to parameter 4-06). The value is corresponding to the input signal 0~10V (0~20mA) or 2~10V (4~20mA).

Note: The max output voltage is 10V due to the circuit, even the output voltage should be higher than 10V.

### 8-02 Output Relay R1 operation Mode (R1C, R1A, R1B terminal on TM2)

### 8-03 Output Relay R2 operation Mode (R2C, R2A terminal on TM2)

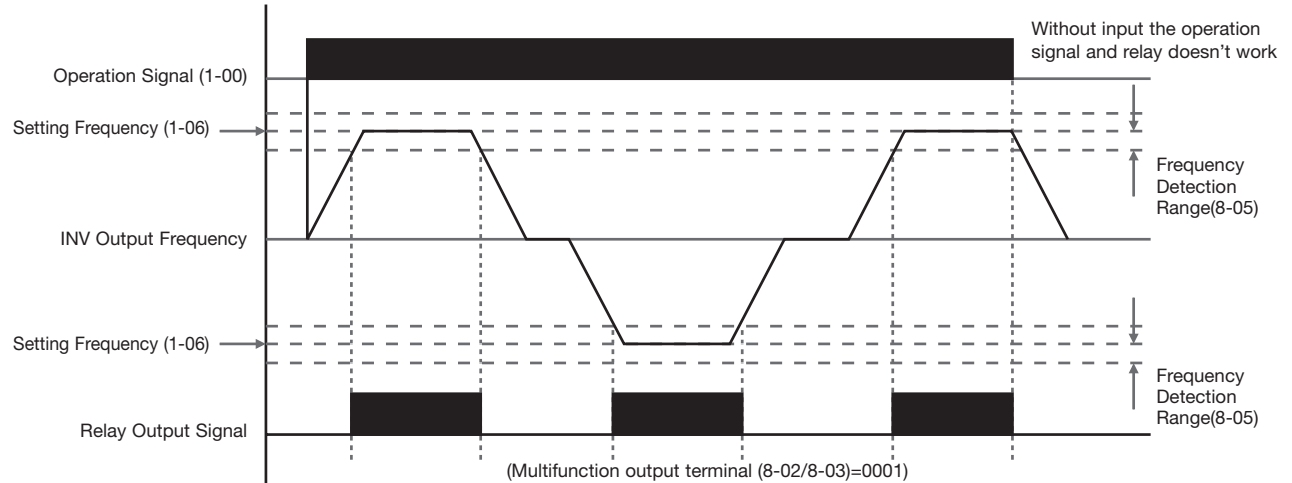
- 0000: Run
- 0001: Frequency Reached (Target Frequency) (Set Frequency  $\pm$ 8-05)
- 0002: Set Frequency (8-04  $\pm$  8-05)
- 0003: Frequency Threshold Level (>8-04) - Frequency Reached
- 0004: Frequency Threshold Level (<8-04) - Frequency Reached
- 0005: Over torque Threshold Level
- 0006: Fault
- 0007: Auto-restart
- 0008: Momentary AC Power Loss
- 0009: Emergency Stop Mode (When multifunction input set to 0007)
- 0010: Base Block (When multifunction input set to 0008)
- 0011: Motor Overload Protection
- 0012: Drive Overload Protection
- 0013: PID Feedback Signal Break
- 0014: PLC Operation
- 0015: Power On

### 8-04 Frequency Reached Output (refer to 8-02=0001) (Hz) = 0~650

### 8-05 Frequency Reached Bandwind ( $\pm$ Hz): 0~30



**8-02/8-03 = 0001:** The preset frequency is reached ( $\pm 8-05$ )

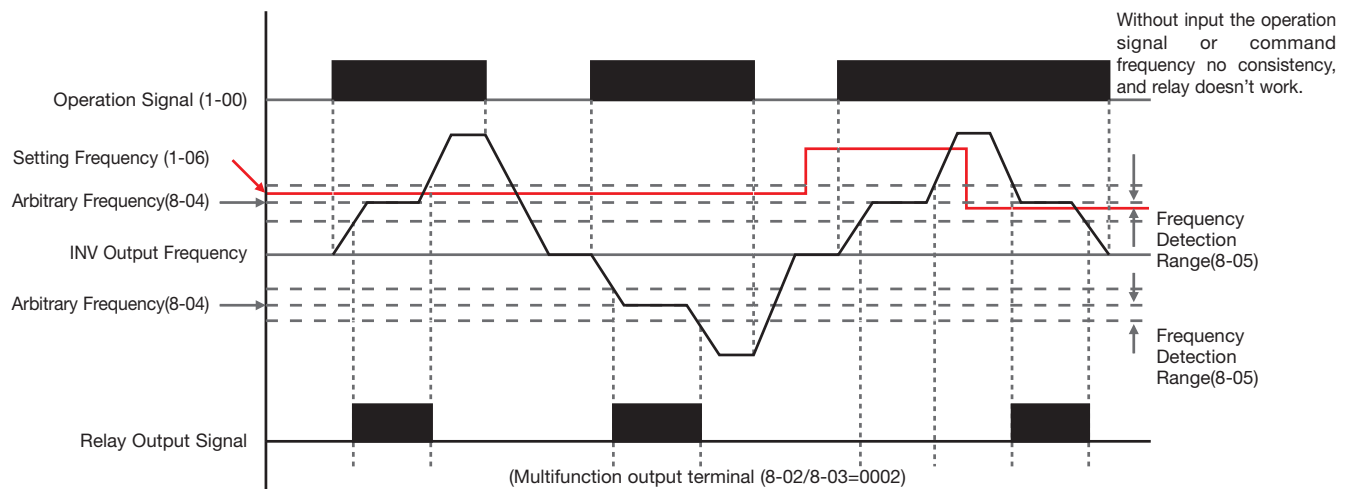


**8-02/8-03 = 0002:** Arbitrary frequency consistency  $F_{out} = 8-04 \pm 8-05$

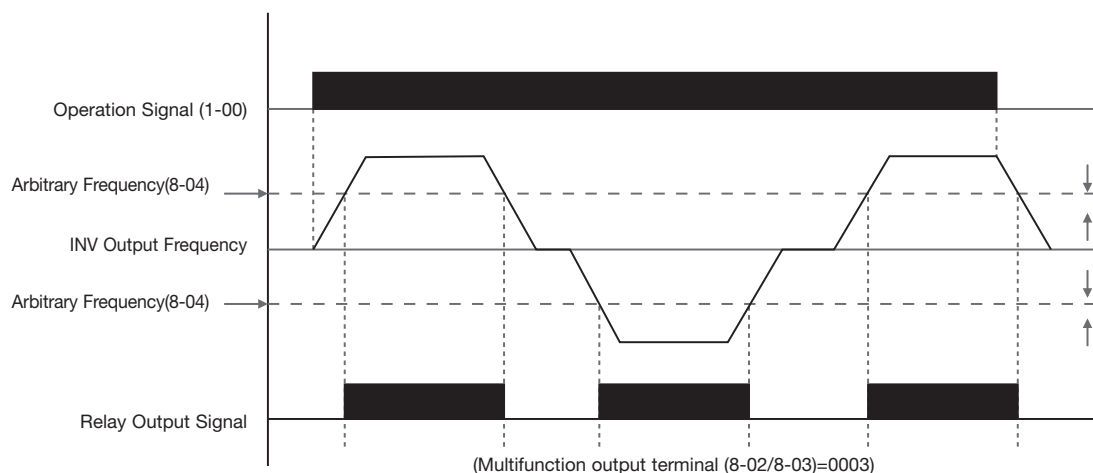
Operation Frequency Reached Arbitrary Frequency ( $8-04 \pm 8-05$ )

Operation conditions:

- A. | Input Frequency-Frequency Command (1-06) | < Frequency Threshold Level (8-05)
- B. | Input Frequency-Detecting Level (8-04) | < Frequency Threshold Level (8-05)

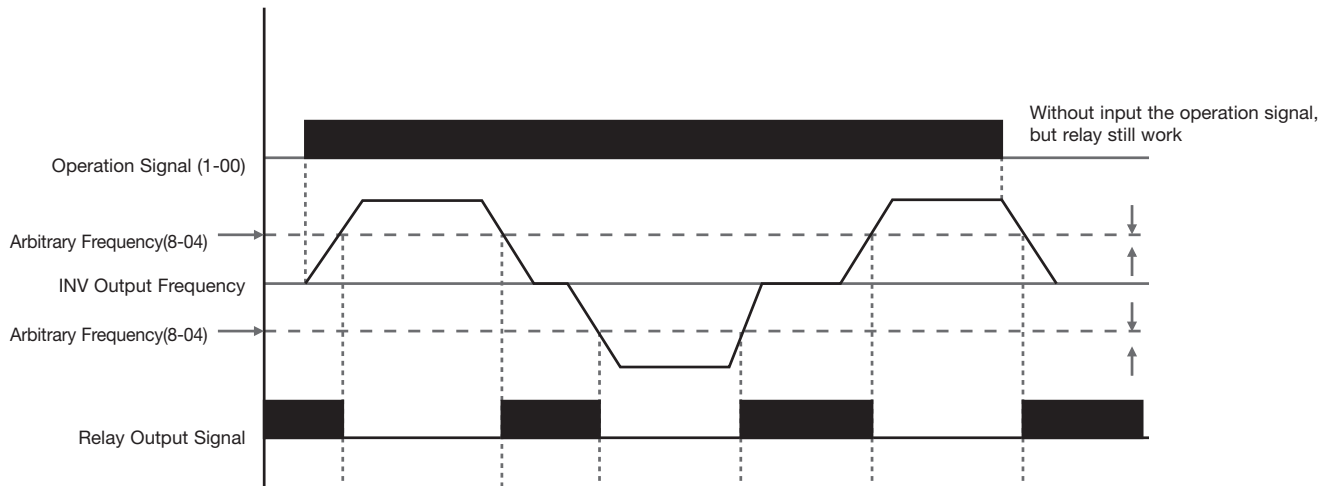


**8-02/8-03 = 0003:** Frequency detection  $F_{out} > 8-04$

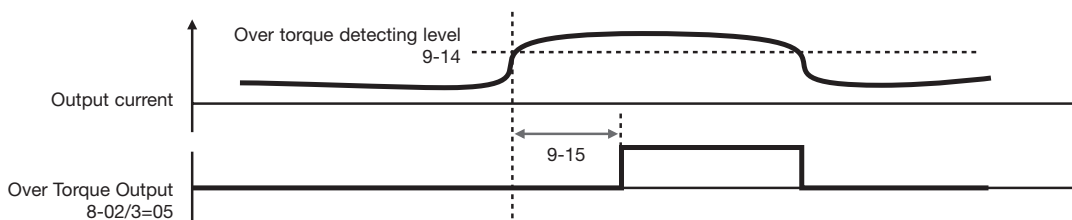




### 8-02/8-03 = 0004: Frequency detection $F_{out} < 8-04$



### 8-02/8-03= 0005: Over torque detection



## Parameter Group 9 – Drive and Load Protection Modes

- 9-00 Trip Prevention Selection During Acceleration:**  
 0000: Enable Trip Prevention During Acceleration  
 0001: Disable Trip Prevention During Acceleration
- 9-01 Trip Prevention Level During Acceleration (%): 50~300**
- 9-02 Trip Prevention Selection During Deceleration:**  
 0000: Enable Trip Prevention During Deceleration  
 0001: Disable Trip Prevention During Deceleration
- 9-03 Trip Prevention Level During Deceleration (%): 50~300**
- 9-04 Trip Prevention Selection in Run Mode:**  
 0000: Enable Trip Prevention in Run Mode  
 0001: Disable Trip Prevention in Run Mode
- 9-05 Trip Prevention Level in Run Mode (%): 50~300**
- 9-06 Trip Prevention Deceleration Time Selection in Run Mode:**  
 0000: Trip Prevention Deceleration Time Set by 3~03  
 0001: Trip Prevention Deceleration Time Set by 9~07
- 9-07 Deceleration Time in Trip Prevention Mode (s): 0.1~3600.0**



1. In acceleration, the inverter will delay the acceleration time if the time is too short resulting in the over current in order to prevent the inverter trips.
2. In deceleration, the inverter will delay the deceleration time if the time is too short resulting in the over voltage of DC VUS in order to prevent the inverter trips with 'OV' displayed.
3. Some mechanical characteristics (such as press) or unusual breakdown (seize due to insufficient lubrication, uneven operation, impurities of processed materials, etc.) will cause the inverter to trip, thus inconvenience users. When the operating torque of the inverter exceeds the setting of 9-05, the inverter will lower the output frequency following the deceleration time set by 9-06, and return to the normal operation frequency after the torque get steady.
4. When the inverter needs to stop immediately and the braking resistor is connected, set 9-02 to 1 to get bigger braking capacity.

**9-08 Electronic Motor Overload Protection Operation Mode:**

**0000: Enable Electronic Motor Overload Protection**

**0001: Disable Electronic Motor Overload Protection**

**9-09 Motor Type Selection:**

**0000: Electronic Motor Overload Protection Set for Non-Inverter Duty Motor**

**0001: Electronic Motor Overload Protection Set for Inverter Duty Motor**

**9-10 Motor Overload Protection Curve Selection:**

**0000: Constant Torque (OL=103%) (150%, 1 minute)**

**0001: Variable Torque (OL=113%) (123%, 1 minute)**

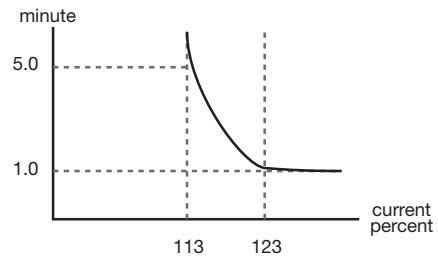
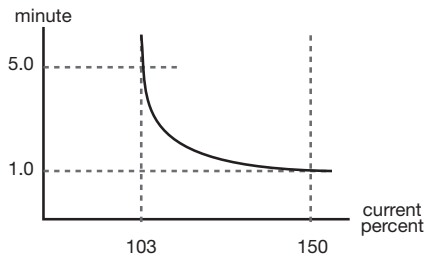
**9-11 Operation After Overload Protection is Activated**

**0000: Coast-to stop after overload protection is activated**

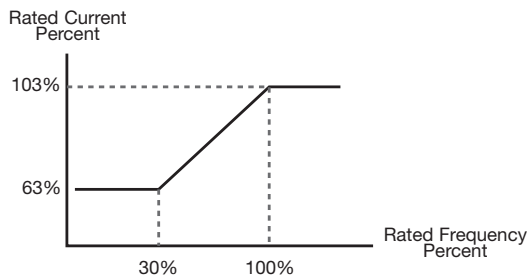
**0001: Drive Will not Trip when Overload Protection is Activated (OL1)**

Description of the thermal relay function:

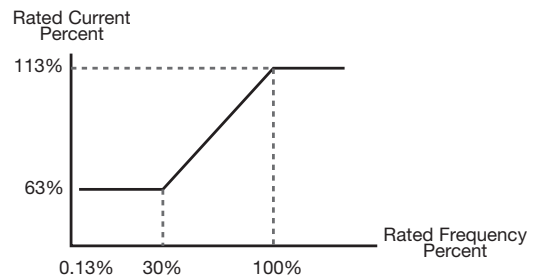
1. 9-10 = 0000: protect the general mechanical load, the load is less than 103% rated current, the motor continue to run. The load is larger than 150% rated current, the motor will run for 1 minute. (Refer to following curve1).  
= 0001: protect HVAC load (FAN, PUMP...so on): the load is less than 113% rated current, the motor continue to run. The load is larger than 123% rated current, the motor will run for 1 minute.
2. The heat sinking function will declining when the motor run at low speed. So the thermal relay action level will decline at the same time. (The curve 1 will change to curve 2).
3. 9-09 = 0000: set 0-05 as the rated frequency of the serve motor.
4. 9-11 = 0000: the inverter coast to stop as the thermal relay acts and flash OL1. Press the 'reset' or the external reset terminal to continue to run  
= 0001: the inverter continues to run as the thermal relay acts and flash OL1. Till the current decline to 103% or 113% (determined by 9-10), OL1 will disappear.



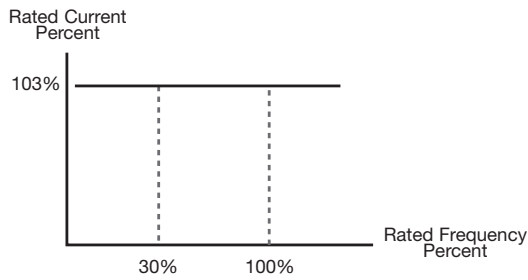
Electronic Motor Overload OL1 protection current and frequency



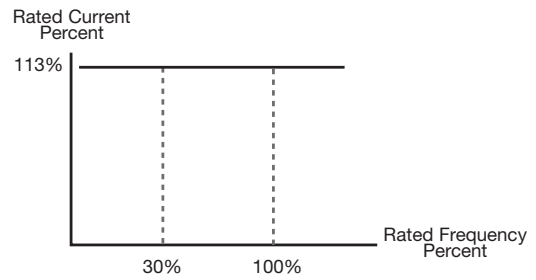
Non-Inverter Duty Motor OL1 Protection Curve  
OL=103% Start, 150%/1 Min.



Non-Inverter Duty Motor OL1 Protection Curve  
OL=113% Start, 123%/1 Min.



Inverter Duty Motor OL1 Protection Curve  
OL=103% Start, 150%/1 Min.



Inverter Duty Motor OL1 Protection Curve  
OL=113% Start, 123%/1 Min.



**9-12 Over Torque Detection Selection:**

**0000: Disable Over Torque Operation**

**0001: Enable Over Torque Operation Only if at Set Frequency**

**0002: Enable Over Torque Operation while the Drive is in Run Mode**

**9-13 Operation After Over Torque Detection is Activated:**

**0000: Drive will Continue to Operate After Over Torque is Activated**

**0001: Coast-to-Stop After Over Torque is Activated**

**9-14 Over Torque Threshold Level (%): 30~200**

**9-15 Over Torque Activation Delay Time (s): 0.0~25.0**

The over torque is defined as: the output torque is inside parameter 9-15, the voltage level (the inverter rated torque is 100%) is over 9-14 parameter.

9-13 = 0000: If there is over torque, the inverter can continue to run and flashes OL3 till the output torque is less than the 9-14 setting value.

= 0001: If there is over torque, the inverter coasts to stop and flashes OL3. It is necessary to press 'RESET' or external terminal to continue to run.

Parameter 8-02, 8-03 (Multifunction output terminal) =0005, the output terminal is output over torque signal.

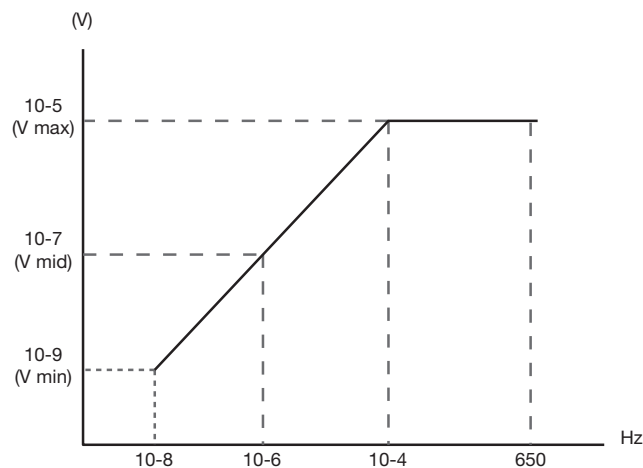
Note: Over torque output signal will be output as the parameter 9-12=0001 or 0002 when the level and time are over the range.



## Parameter Group 10 – Volts /Hz Pattern Operation Mode

**10-0 V/F PATTERN Selection = 0 ~ 18**  
**10-1 Torque boost gain (V/F pattern modulation %) = 0.0 ~ 30.0**  
**10-2 Motor no load current (Amps AC) : -----**  
**10-3 Motor rated slip compensation (%) = 0.0 ~ 100.0**  
**10-4 Max output frequency (Hz) = 0.20 ~ 650.0**  
**10-5 Max output frequency voltage ratio (%) = 0.0 ~ 100.0**  
**10-6 Medium frequency (Hz) = 0.10 ~ 650.0**  
**10-7 Medium output frequency voltage ratio (%) = 0.0 ~ 100.0**  
**10-8 Min output frequency (Hz) = 0.10 ~ 650.0**  
**10-9 Min output frequency voltage ratio (%) = 0.0 ~ 100.0**

10-0=18, set the V/F pattern freely complying with 10-4~10-9 (Refer to following diagram)



10-0 = 0 ~ 17 V / F Pattern (Refer to following list )





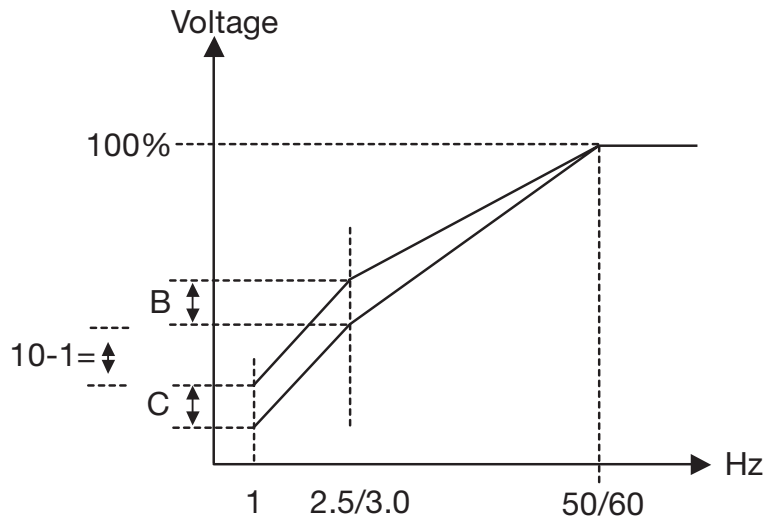
| Type | Function          | 10-0 | V/F Pattern | Type | Function          | 10-0 | V/F Pattern |
|------|-------------------|------|-------------|------|-------------------|------|-------------|
| 50Hz | General Use       | 0    |             | 60Hz | General Use       | 9    |             |
|      | High start torque | 1    |             |      | High start torque | 10   |             |
|      |                   | 2    |             |      |                   | 11   |             |
|      |                   | 3    |             |      |                   | 12   |             |
|      | Decreasing torque | 4    |             |      | Decreasing torque | 13   |             |
|      |                   | 5    |             |      |                   | 14   |             |
|      | Constant torque   | 6    |             |      | Constant torque   | 15   |             |
|      |                   | 7    |             |      |                   | 16   |             |
|      |                   | 8    |             |      |                   | 17   |             |

| 10-0   | B     | C           |
|--------|-------|-------------|
| 0 / 9  | 7.5%  | 4.5%        |
| 1 / 10 | 10.0% | 7.0%        |
| 2 / 11 | 11.0% | 8.5% / 8.0% |
| 3 / 12 | 12.0% | 9.5% / 9.0% |
| 4      | 17.5% | 4.0%        |
| 5      | 25.0% | 5.0%        |
| 13     | 20.5% | 7.0%        |
| 14     | 28.5% | 8.0%        |
| 6 / 15 | 45.0% | 1.0%        |
| 7 / 16 | 55.0% | 1.0%        |
| 8 / 17 | 65.0% | 1.0%        |



The inverter will output the value that B, C voltage (refer to 10-0) plus 10-1 V/F pattern setting.

And the start torque will be raised.



Note: 10-1=0.0, Torque boost function is invalid

When the induction motor is in running, there must be slip due to the load. It is necessary to boost to improve the precision of the speed.

$$\text{Slip frequency boost} = \frac{\text{Output Current}}{(\text{0-02})-(\text{10-2})} \times (\text{10-3})$$

$$\text{Motor synchronization speed (RPM)} = \frac{\text{Motor rated frequency (50-60Hz)}}{\text{Motor Poles}} \times 120$$

eg: 4 Poles, 60Hz Motor synchronization speed (RPM) =  $\frac{60}{4} \times 120 = 1800$

Note: 0-02=motor rated current

10-2=motor no load current

$$\text{10-3 rough value} = \frac{(\text{Motor synchronization speed}-\text{Rated speed})}{\text{Motor synchronization speed}}$$

Motor no load current (10-2) differs with the inverter capacities (15-0) (Refer to 0-02 note), it should be regulated according to the actual condition.



## Parameter group 11 - PID operation mode

### 11-0 PID Operation Selection

**0000:PID disable**

**0001:PID enable (Deviation is D-controlled)**

**0002:PID Feedback D-controlled**

**0003:PID D Reverse characteristic controlled**

**0004:PID Feedback D characteristic controlled**

**0005:PID, Frequency Command + D controlled**

**0006:PID, Frequency Command + Feedback D controlled**

**0007:PID, Frequency Command + D reverse Characteristic controlled.**

**0008:PID, Frequency Command + Feedback D reverse Characteristic controlled.**

11-0 =0001, D is the deviation of (target value – detected value) in the unit time (11-4).

=0002, D is the deviation of the detected values in unit time (11-4).

=0003, D is the deviation of (target value – detected value) in the unit time (11-4). If the deviation is positive, the output frequency decreases, vice versa.

=0004, D is the deviation of detected value in unit time (11-4). When the deviation is positive, the frequency decreases, vice versa.

=0005, D is equal to the deviation of (target value – detected value) in unit time (11-4) + Frequency command.

=0006, D is equal to the deviation of detected values in unit time + Frequency command.

=0007, D is equal to the deviation of (target value – detected value) in unit time + Frequency command. If the deviation is positive, the output frequency decreases, vice versa.

=0008, D is equal to the deviation of detected values in unit time + Frequency command. When the deviation is positive, the frequency decreases, vice versa.

### 11-1 Feedback Calibration Gain: 0.00 ~ 10.00

11-1 is the calibration gain. Deviation = (target value – detected value) x11-1

### 11-2 Proportion Gain: 0.00 ~ 10.00

11-2 Proportion gain for P control.

### 11-3 Integrate Time(s): 0.0 ~ 100.0

11-3 Integrate time for I control

### 11-4 Differential Time(s): 0.00 ~ 10.00

11-4 Differential time for D control

### 11-5 PID Offset :

**0000:Positive Direction**

**0001:Negative Direction**

### 11-6 PID Offset Adjust (%) : 0~109

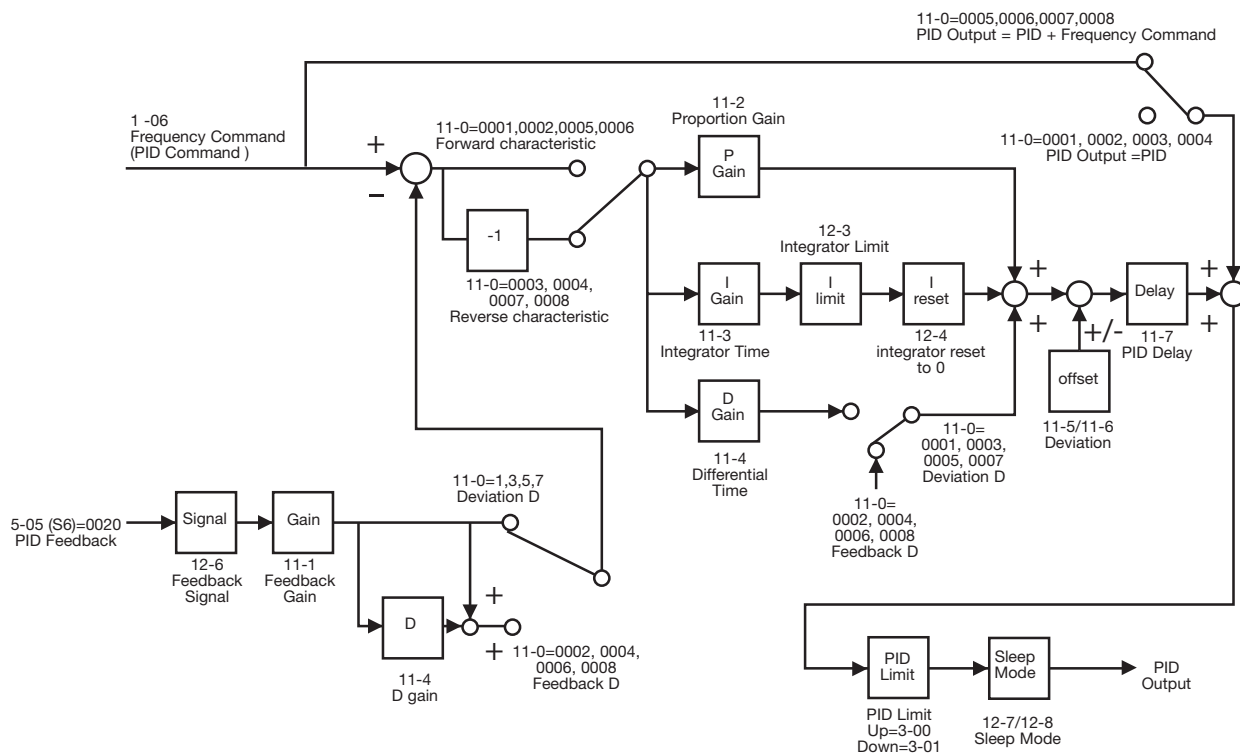
11-5/11-6: PID the calculated result pluses 11-6 (the sign of 11-6 is determined by 11-5).



### 11-7 Output Lag Filter Time (s): 0.0 ~ 2.5

11-7: update time for output frequency.

Note: PID Function is available for controlling the output flow, external fan flow and temperature. The controlling flow is as follow:



Performing PID control, set 5-05 or 5-12=0020, AI2 (S6) on TM2 as PID feedback signal.

The target value of above diagram is the 1-06 input frequency.

There are two ways to see the PID feedback signal, one is using the Keypad switch display (4-06 must be setting as 0001), the other is using analog output FM+ (8-00 must be setting as 005).

## Parameter Group 12 - PID "Limits" and "Out of Range" Mode

### 12-0 Feedback Loss Detection Mode:

0000:Disable

0001:Enable – Drive Continues to Operate After Feedback Loss

0002:Enable – Drive “STOPS” After Feedback Loss

12-0= 0000: Disable; 12-0=0001: detect to run and display PDER; 12-0= 0002: detect to stop and display PDER.

### 12-1: Feedback Loss Detection level (%): 0 ~ 100

12-1 is the level for signal loss. Deviation = Command value – Feedback value. While the deviation is larger than the loss level, the feedback signal is lost.


**12-2: Feedback Loss Detection Delay Time (s): 0.0 ~ 25.5**

12-2: the action lay time as the feedback signal lost.

**12-3: Integrate Limit Value (%): 0 ~ 109**

12-3: the Limiter to prevent PID saturating

**12-4 Integrator value Reset to 0 when Feedback Signal Equals the Intended Value**

**0000: Disable**

**0001: 1 second**

**0030: 30 seconds**

12-4=0000: As PID feedback value reaches the command value, the integrator will not be reset to 0.

12-4=0001~0030: As PID feedback value reaches the target value, reset to 0 in 1~30 seconds and inverter stops output. The inverter will output again as the feedback value differs from the target value.

**12-5: Allowable Integration Error Margin (Unit Value) (1 Unit = 1/8192): 0 ~ 100**

12-5=0~100% unit value: restart the tolerance after the integrator reset to 0.

**12-6: 12-6: AIN and AI2 Signal Type**

12-6=0000: AIN=0~10V or 0~20mA, AI2=0~10V or 0~20mA

12-6=0001: AIN=0~10V or 0~20mA, AI2=2~10V or 4~20mA

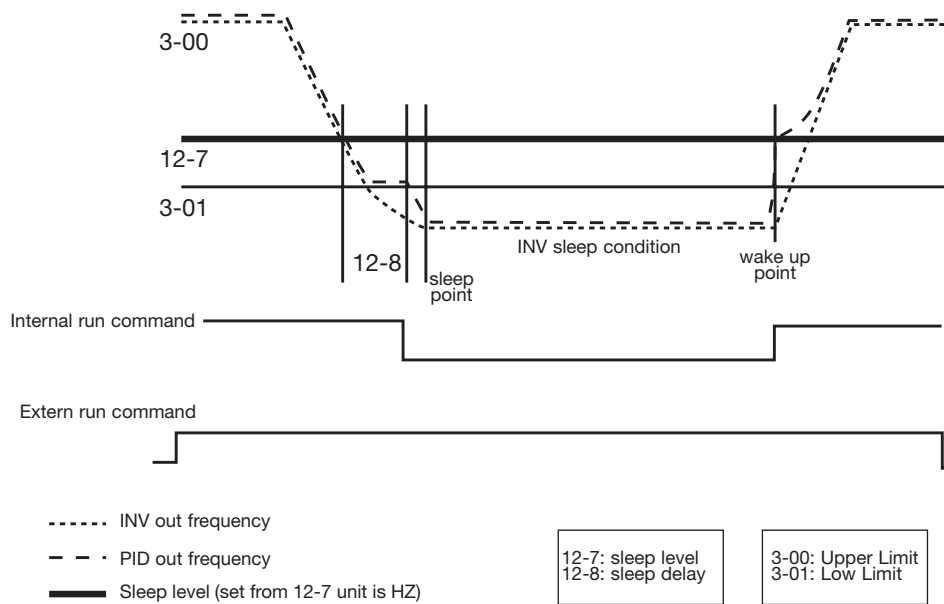
12-6=0002: AIN=2~10V or 4~20mA, AI2=0~10V or 0~20mA

12-6=0003: AIN=2~10V or 4~20mA, AI2=2~10V or 4~20mA

Signal V or I is decided by SW2 & SW3

**12-7 Sleep function operation level (Hz): 0.0~650.0**
**12-8 Sleep function delay time (s): 0.0~25.5**

To enable the PID function set 11-0=0001. To configure the PID feedback signal set 5-05 or 5-12 as 0020 (1-06 parameter define the frequency command). When the PID output goes below the 12-7 level for 12-8 time the drive passes in sleep mode (the drive decelerates to zero); when the PID output return above 12-7 level the PID function is reactivated. The time diagram is as follow:



## Parameter Group 13 - Communication mode

### 13-0 Assigned Communication Station Number: 1 ~ 254

13-0: to set the communication station codes which are suitable for driving more than one inverters situations.

### 13-1 Baud Rate setting (bps):

0000:4800  
 0001:9600  
 0002:19200  
 0003:38400

### 13-2 Stop Bit Selection:

0000:1 stop bit  
 0001:2 stop bit

### 13-3 Parity Selection :

0000: no parity  
 0001:even parity  
 0002:odd parity

### 13-4: Data Format Selection:

0000:8 bit data  
 0001:7 bit data



#### RS-485 Communication:

- (1) One inverter is controlled by a PC or PLC or controller. (set 13-0 = 1~254)
- (2) More than one inverters are controlled by a PC or PLC or Controller (The maximum of inverter could be controlled is 32), when the inverter receives the communication station code = 000, the communication controlling is acceptable regardless the setting value of 13-0.

#### RS-232communication: (RS232 interface is required)

1vs1 controlling: to control one inverter by a PC or PLC or controller. (Set 13-0 = 1~254)

#### Note:

- a. The BAUD RATE (13-1) of PC (or PLC or Controller) and the one of the inverter should be set as the same .Communication format (13-2/13-3/13-4) should be set as the same.
- b. The inverter will confirm the parameter efficient as PC modifies the parameter of the inverter.
- c. Please refer to the RVCF Communication PROTOCOL

#### **13-5 Communication time-out operation selection**

**0000: Deceleration to stop (3-03: Deceleration time 1).**

**0001: Free run to stop.**

**0002: Deceleration to stop (3-07: Deceleration time 2).**

**0003: Continue operating.**

#### Reset method:

- a. Push the “Reset” button directly.
- b. Receive correct Modbus data from Master.

After communication time-out, the motor decelerates to stop (13-5 = 0000, 0001, 0002). And the motor does not run automatic after reset, the inverter must set the run command again to restart.

\*Cannot be modified during communication.

\*Detail list please see Appendix

#### **13-6 Communication time-out detection time (s): 0.00 ~ 25.5**

Communication time-out detection enable or not is according to 13-6, not relationship with Run/Frequency command.

\*Cannot be modified during communication.

\*Detail list please Appendix



## Parameter Group 14 - Auto Tuning

- 14-0 Stator Resistance (Ohms)**
- 14-1 Rotor Resistance (Ohms)**
- 14-2 Equivalent Inductance (mH)**
- 14-3 Magnetized Current (Amps AC)**
- 14-4 Ferrite Loss Conduction (gm)**

If 0-00=0000 or 0001 (sensorless mode) is selected, as power ON, set 0-06=0001, the motor will run as the inverter performs auto tuning. As the motor stop, it means that auto tuning finished. The inverter will write the internal parameter of the motor to 14-0~14-4, and auto reset the 0-06 as 0000.

Auto tuning must be carried out as long as the motor changed. If the internal parameters is known already, they can be input to 14-0~14-4 directly.

0-06=0001, to perform auto tuning, after finished, 0-06 auto reset to 0000, the Keypad displays END. The parameter group only affect in sensorless mode.

## Parameter Group 15 - Operation Status and Function Reset

### 15-0: Drive Horsepower Code

| 15-0 | Inverter Model |                              | 15-0 | Inverter Model |              |
|------|----------------|------------------------------|------|----------------|--------------|
| 2P5  | RVCF           | RVCFA1200040<br>RVCFA3200040 | 401  | RVCF           | RVCFA3400075 |
| 201  |                | RVCFA1200075<br>RVCFA3200075 | 402  |                | RVCFA3400150 |
| 202  |                | RVCFB1200150<br>RVCFA3200150 | 403  |                | RVCFB3400220 |
| 203  |                | RVCFB1200220<br>RVCFB3200220 | 405  |                | RVCFB3400370 |
| 205  |                | RVCFB3200370                 | 408  |                | RVCFC3400550 |
| 208  |                | RVCFC3200550                 | 410  |                | RVCFC3400750 |
| 210  |                | RVCFC3200750                 | 415  |                | RVCFC3401100 |
| 215  |                | RVCFD3201100                 | 420  |                | RVCFD3401500 |
| 220  |                | RVCFD3201500                 | 425  |                | RVCFD3401850 |
| 225  |                | RVCFD3201850                 | 430  |                | RVCFD3402200 |
| 230  |                | RVCFE3202200                 | 440  |                | RVCFE3403000 |
| 240  |                | RVCFE3203000                 | 450  |                | RVCFE3403700 |
|      |                |                              | 460  |                | RVCFF3404500 |
|      |                |                              | 475  |                | RVCFF3405500 |



**15-1 Software Version****15-2 Fault Jog (Latest 3 faults)**

1. When the inverter doesn't work normally, the former fault log stored in 2.xxxx will be transferred to 3.xxxx, then, the one in 1.xxxx to 2.xxxx. The present fault will be stored in the blank 1.xxxx. Thusly, the fault stored in 3.xxxx is the earliest one of the three, while the one 1.xxxx is the latest.
2. In 15-2, the fault 1.xxxx will be displayed at first, press, you can read 2.xxx 3.xxx 1.xxx, whereas, the order is 3.xxx 2.xxx 1.xxx 3.xxx.
3. In 15-2, the three fault log will be cleared as the reset key is pressed. The log content will be changed to 1.--, 2.--, 3.--.
4. E.g. if the fault log content is '1.OCC' which indicates the latest fault is OC-C, and so on.

**15-3 Accumulated Operation Time 1 (Hours): 0 ~ 9999****15-4 Accumulated Operation Time 2 (Hours X 10000): 0 ~ 27****15-5 Accumulated Operation Time Mode:****0000:Power on time****0001:Operation time**

When the operation time #1 is set to 9999, the next hour will be carried to operation time #2. Meanwhile, the recorded value will be cleared to 0000, and the record value of operation duration #2 will be 01.

Description of operation time selection:

| PRESET VALUE | DESCRIPTION                                              |
|--------------|----------------------------------------------------------|
| 0000         | Power on, count the accumulated time.                    |
| 0001         | Inverter operation, count the accumulated operation time |

**15-6 Reset the factory setting:****1110:Reset the 50Hz factory setting****1111:Reset the 60Hz factory setting****1112:Reset PLC program**

When 15-6 is set to 1111, the parameter will be reset to factory setting. The max output voltage will comply with the voltage and frequency (0-01~0-05) on the nameplate of the motor. The output frequency is 60Hz if the upper frequency limit is not set.

Note: Motor parameters (14-0~14-4) will be modified under V/F control mode when reset factory setting. On the contrary, motor parameters (14-0~14-4) will not be modified under sensorless control mode when reset factory setting.








### 8-00 Multifunction analog output control:

|                                                                            |                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>8-00=0000</p>                                                           | <p>8-00=0001</p>                                                                                                                                                                                                                                                                   |
| <p>8-00=0002</p> <p>Vector L: 0-01<br/>or<br/>V/F 0-07x10<sup>-5</sup></p> | <ol style="list-style-type: none"> <li>1. When 0-00=0000 or 0001 (sensorless)<br/>FM+ 0~10V corresponds to 0~ motor rated voltage (0-01)</li> <li>2. When 0-00=0002 (V/F) FM+ 0~10V corresponds to 0~AC line input voltage (0-07) x Max output frequency ratio % (10-5)</li> </ol> |
| <p>8-00=0003</p>                                                           | <p>200V class: FM+ 0~10V corresponds to 0~500VDC<br/>400V class: FM+ 0~10V corresponds to 0~1000VDC</p>                                                                                                                                                                            |
| <p>8-00=0004</p>                                                           | <p>Ex. The rated current of 201 is 4.5A, FM+ 0~10V corresponds to 0~4.5A</p>                                                                                                                                                                                                       |
| <p>8-00=0005</p>                                                           | <ol style="list-style-type: none"> <li>1. When 11-0≠0000, FM+ 0~10V corresponds to 0~100% feedback value.</li> <li>2. When 11-0=0000 FM+ 0~10V corresponds to 0~10V or 0~20mA on AI2.</li> </ol>                                                                                   |

## 4.5 Specification Description on Built-in PLC Function



RVCF has Built-in simple PLC function, user can download Ladder Diagram from PC (Windows base software) very friendly.

### 4.5.1 Basic Instruction





|                               |  |  |  | P |  |  | NO / NC       |
|-------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
| Input Instruction             |                                                                                   |                                                                                   |                                                                                   |   | I                                                                                   | i                                                                                   | I1~I7 / i1~i7 |
| Output Instruction            | Q                                                                                 | Q                                                                                 | Q                                                                                 | Q | Q                                                                                   | q                                                                                   | Q1~Q2 / q1~q2 |
| Auxiliary Instruction         | M                                                                                 | M                                                                                 | M                                                                                 | M | M                                                                                   | m                                                                                   | M1~MF / m1~mF |
| Special Register              |                                                                                   |                                                                                   |                                                                                   |   |                                                                                     |                                                                                     | V1~V7         |
| Counter Instruction           | C                                                                                 |                                                                                   |                                                                                   |   | C                                                                                   | c                                                                                   | C1~C4 / c1~c4 |
| Timer Instruction             | T                                                                                 |                                                                                   |                                                                                   |   | T                                                                                   | t                                                                                   | T1~T8 / t1~t8 |
| Analog Comparing Instruction  | G                                                                                 |                                                                                   |                                                                                   |   | G                                                                                   | g                                                                                   | G1~G4 / g1~g4 |
| Encoder Comparing Instruction | H                                                                                 |                                                                                   |                                                                                   |   | H                                                                                   | h                                                                                   | H1~H4 / h1~h4 |
| Operation Instruction         | F                                                                                 |                                                                                   |                                                                                   |   | F                                                                                   | f                                                                                   | F1~F8 / f1~f8 |

#### Description for Special Register

|                           |                    |
|---------------------------|--------------------|
| V1: Setting Frequency     | Range: 0.1~650.0Hz |
| V2: Operation Frequency   | Range: 0.1~650.0Hz |
| V3: AIN Input value       | Range: 0~1000      |
| V4: AI2 Input Value       | Range: 0~1000      |
| V5: Keypad VR Input Value | Range: 0~1000      |
| V6: Operation Current     | Range: 0.1~999.9A  |
| V7: Torque Value          | Range: 0.1~200.0%  |

|                          | Upper Differential | Lower Differential | Other Instruction Symbol                                                              |
|--------------------------|--------------------|--------------------|---------------------------------------------------------------------------------------|
| Differential Instruction | D                  | d                  |                                                                                       |
| SET Instruction          |                    |                    |  |
| RESET Instruction        |                    |                    |  |
| P Instruction            |                    |                    | P                                                                                     |

|                            |     |  |
|----------------------------|-----|--|
| Open circuit (On status)   | “ “ |  |
| Short circuit (Off status) | “_” |  |

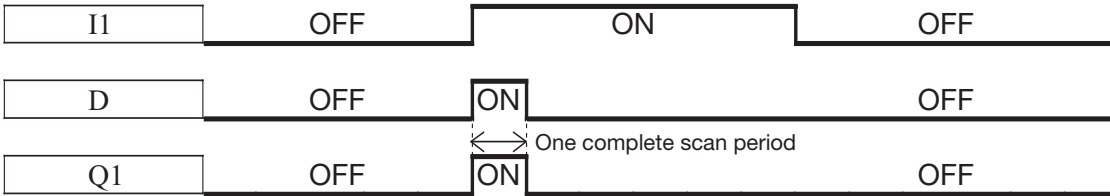
| Connection Symbol                                                                   | Description                                        |
|-------------------------------------------------------------------------------------|----------------------------------------------------|
|  | Connecting left and right Components               |
|  | Connecting left, right and upper Components        |
|  | Connecting left, right, upper and lower Components |
|  | Connecting left, right and lower Components        |



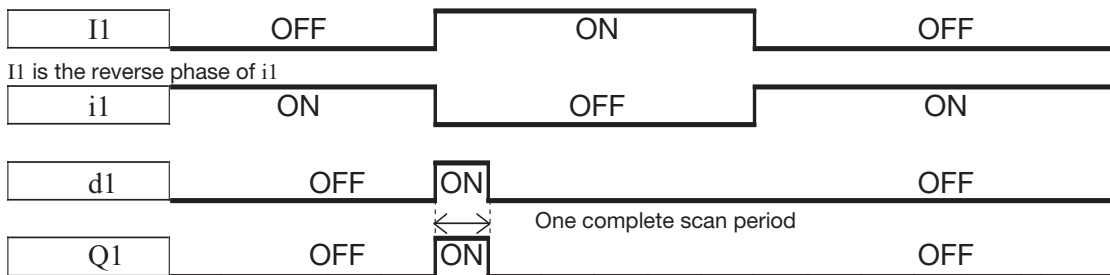
### 4.5.2 Function of Basic Instruction

Function D (d) Command

Sample 1: I1 -D —[ Q1



Sample 2: i1 -d —[Q1



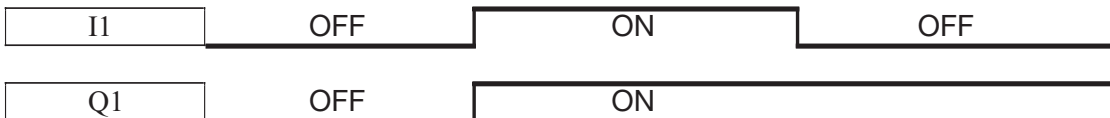
NORMAL ( - [ ) Output

I1 — [Q1



◎ SET (▲) Output

— ▲



RESET (▼) Output

I1 — ▼ Q1

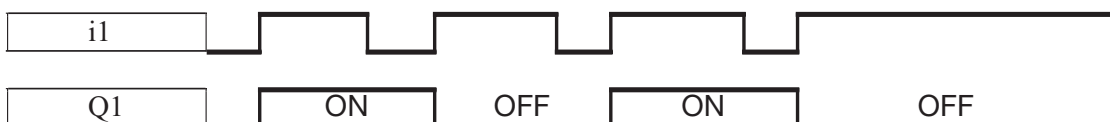


P Output

I1 — PQ1

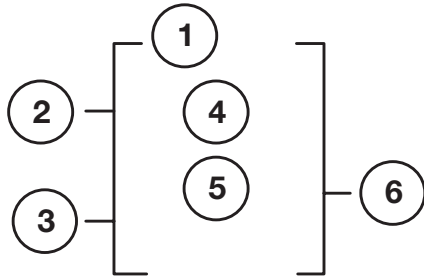


I1 is the reverse phase of i1



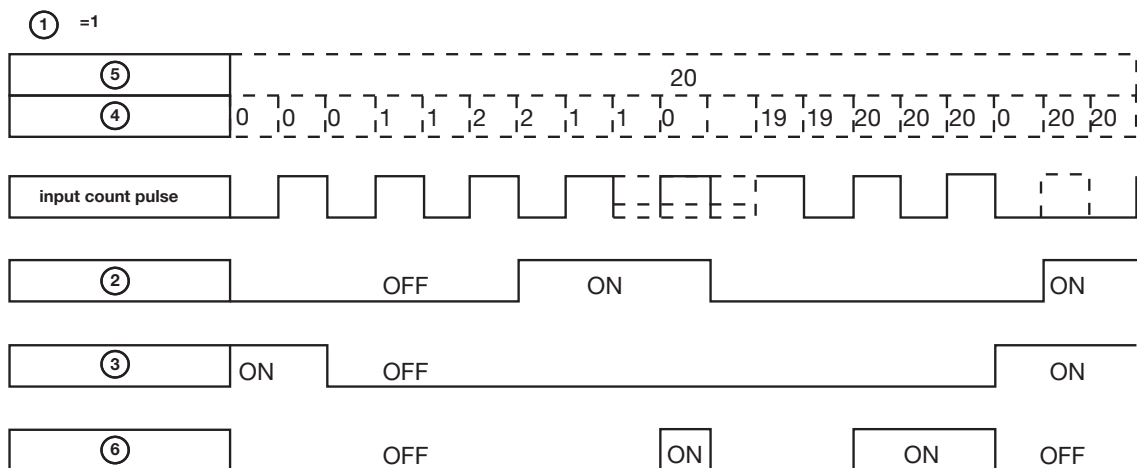


### 4.5.3 Function of Basic Instruction Counter



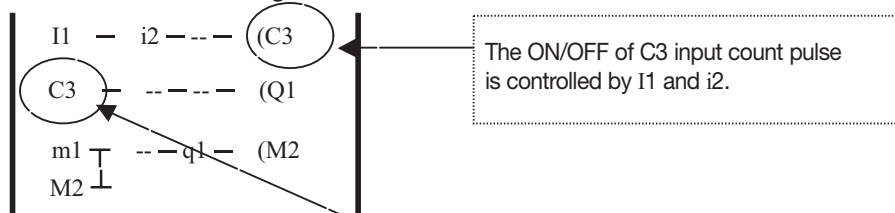
| Symbol | Description                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Counting Mode (1-4)                                                                                                                |
| 2      | Use (I1 ~ f8) to set counting up or counting down<br>OFF: counting up (0, 1, 2, 3, 4...)<br>ON: counting down ( ...3, 2, 1, 0)     |
| 3      | Use (I1~f8) to RESET the counting value<br>ON: the counter is initialized to zero and 6 OFF<br>OFF: the counter continues to count |
| 4      | Preset Counting Value                                                                                                              |
| 5      | Target (Setting) Value                                                                                                             |
| 6      | Code of the counter (C1~C4 total: 4 groups).                                                                                       |

#### (1) Counter

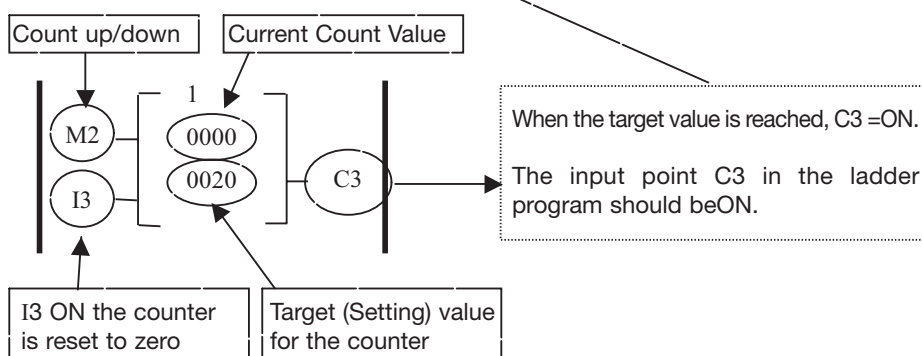


#### Sample:

##### Input under the Ladder Program Mode

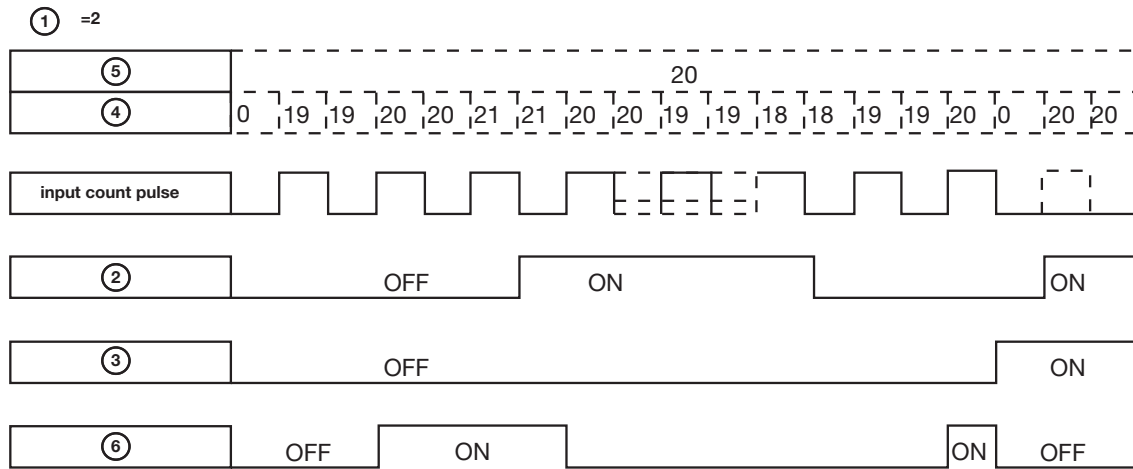


##### Input under the Function Program Mode





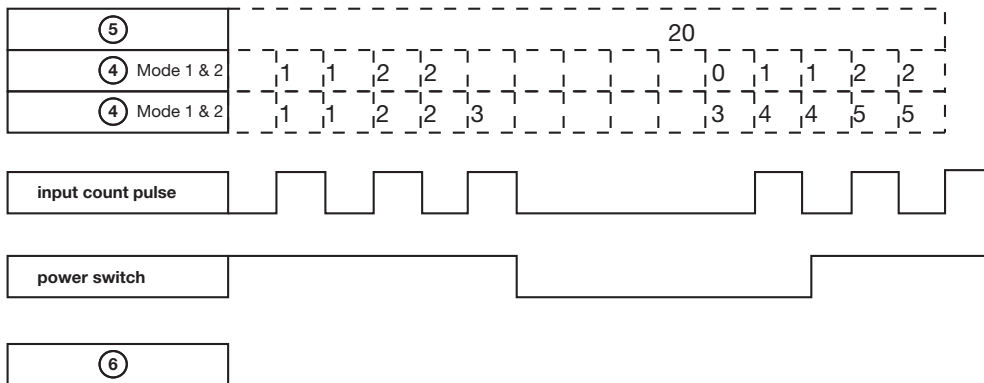
(2) Counter Mode 2



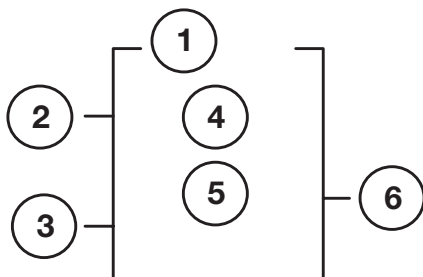
Note:

Under this Mode, the counting preset value appeared will be greater than 20, unlike the Mode 1 in which the value is locked at 20.

- (3) The counter Mode 3 is similar to the counter Mode 1 except that the former can memory the recorded value after the power is cut off and continued counting when the power is turned on at the next time.
- (4) The counter Mode 4 is similar to the counter Mode 2 except that the former can memory the recorded value after the power is cut off and continued counting when the power is turned on at the next time.

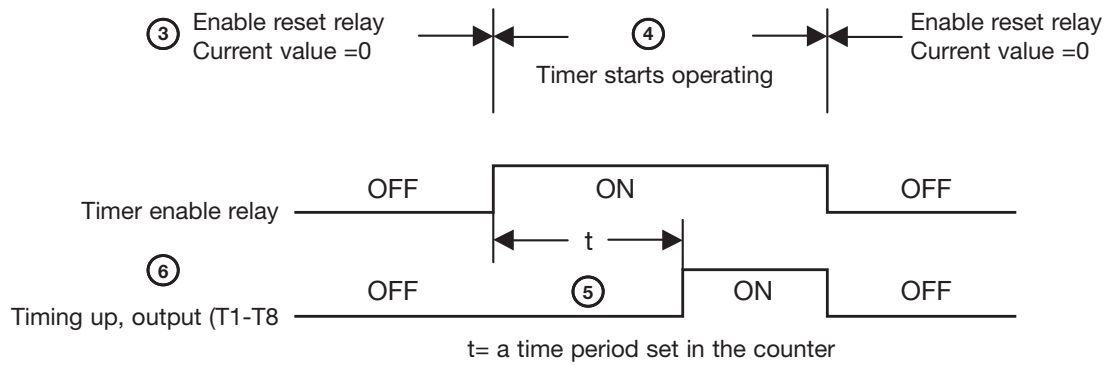


Timer



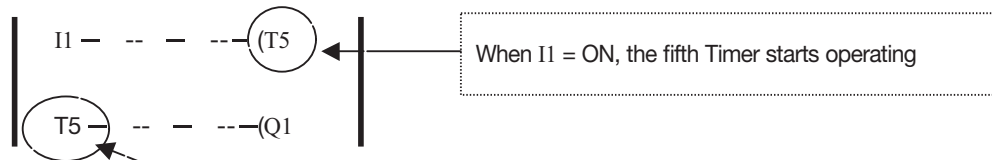
| Symbol | Description                                                                                                                      |
|--------|----------------------------------------------------------------------------------------------------------------------------------|
| 1      | Timing Mode (1-7)                                                                                                                |
| 2      | Timing unit<br>1: 0.0 – 999.9 sec<br>2: 0 – 9999 sec<br>3: 0 – 9999 min                                                          |
| 3      | Use (I1~f8) to RESET the timing value<br>ON: the counter is initialized to zero and 6 OFF<br>OFF: the counter continues to count |
| 4      | Preset Timing Value                                                                                                              |
| 5      | Target (setting) Timing Values                                                                                                   |
| 6      | The code of the Timer (T1~T8 total: 8 groups).                                                                                   |

### (1) Timer Mode 1 (ON-Delay A Mode)

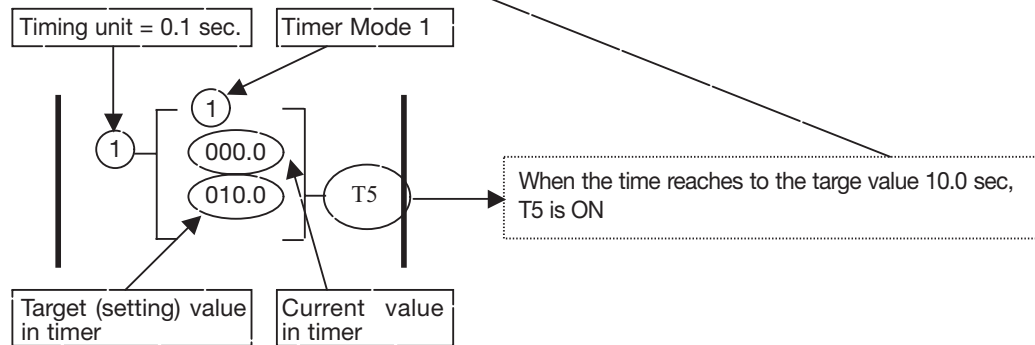


Sample:

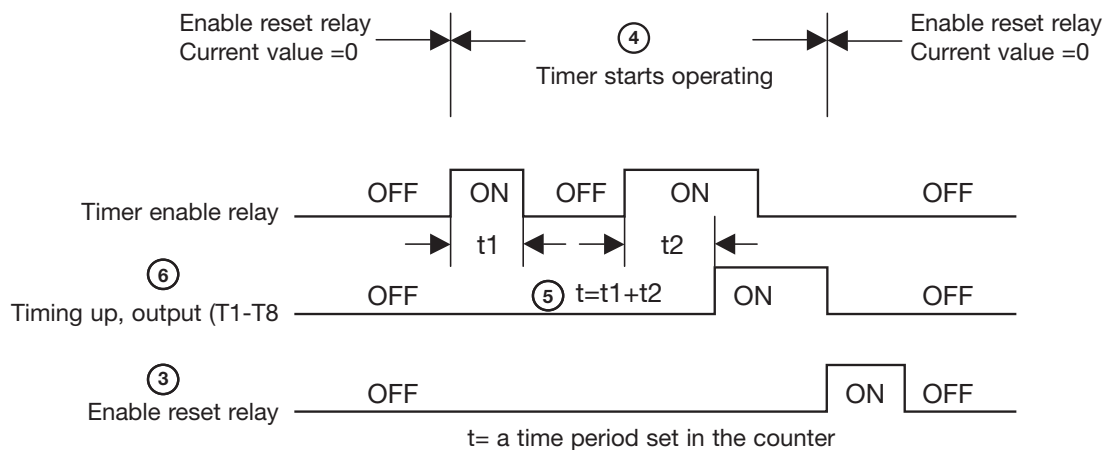
#### Input under the Ladder Program Mode



#### Input under the Function Program Mode

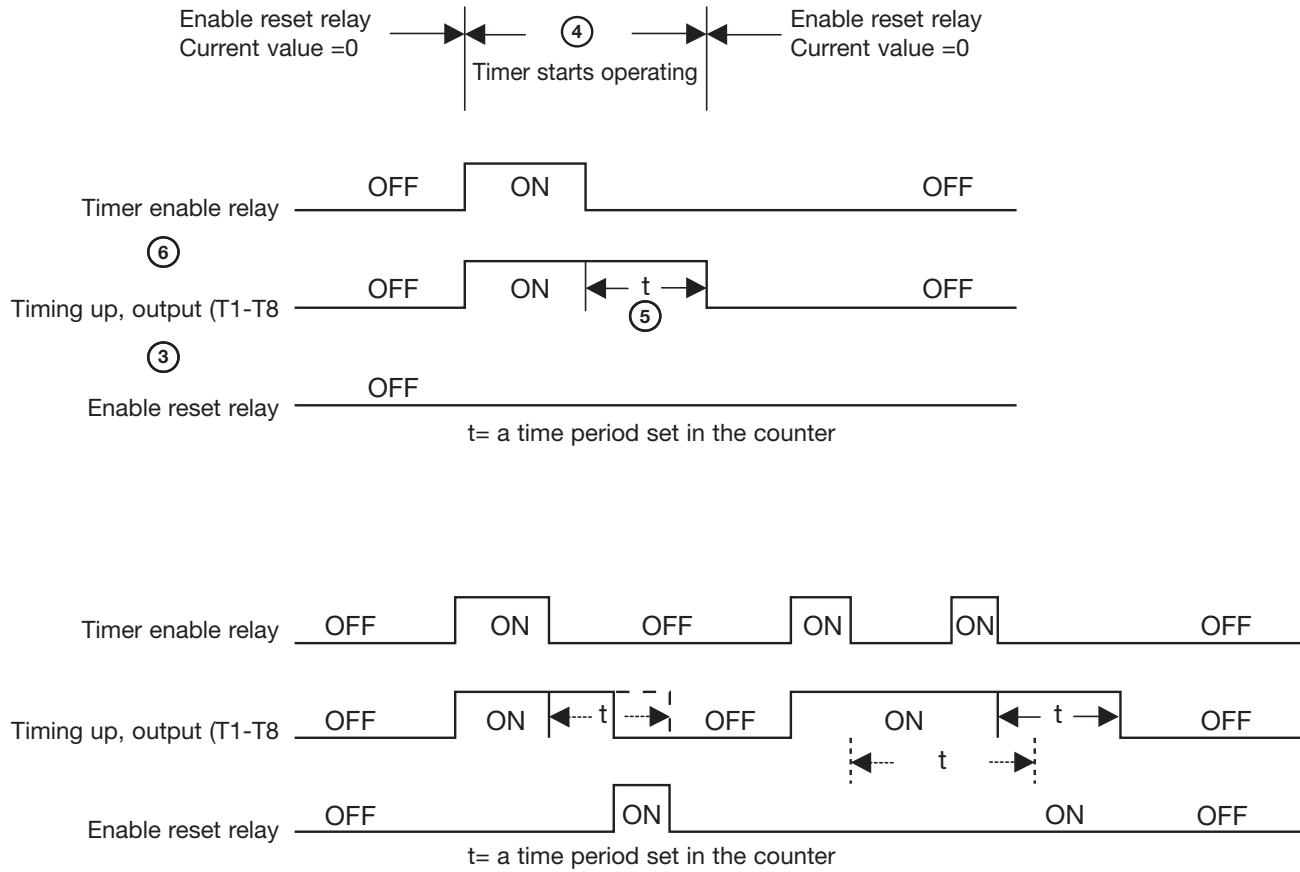


### (2) Timer Mode 2 (ON-Delay B Mode)

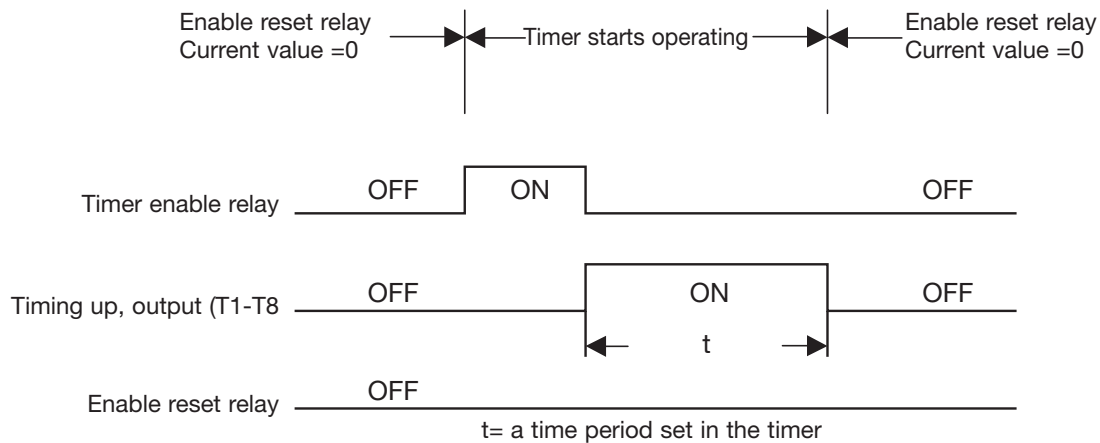




### (3) Timer Mode 3 (OFF-Delay A Mode)

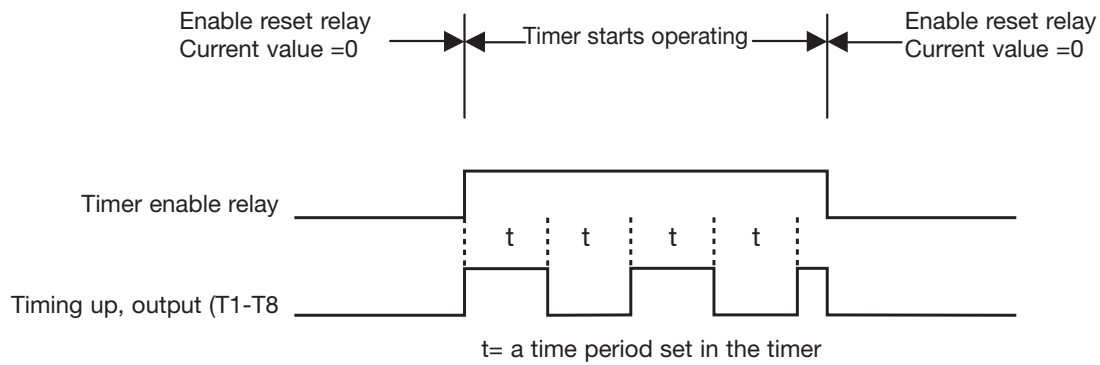


### 4) Timer Mode 4 (OFF-Delay B Mode)

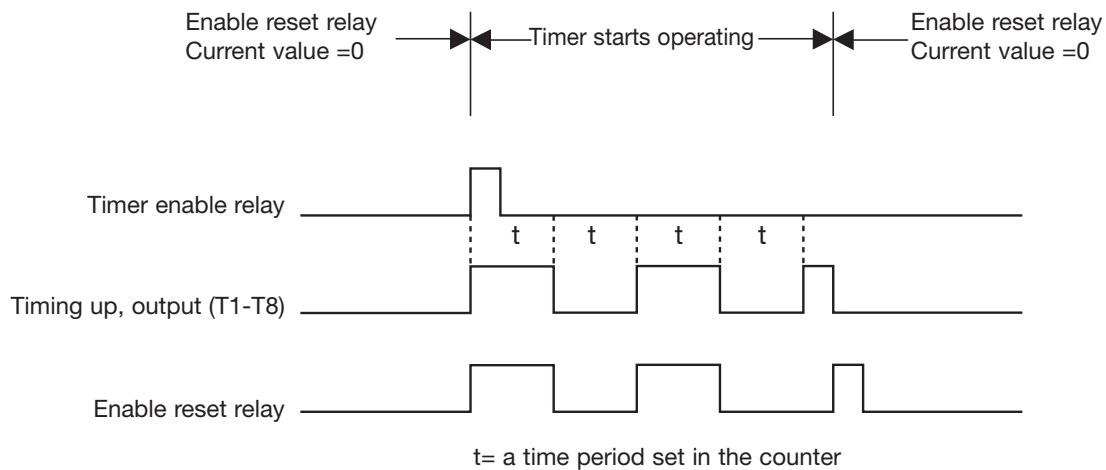




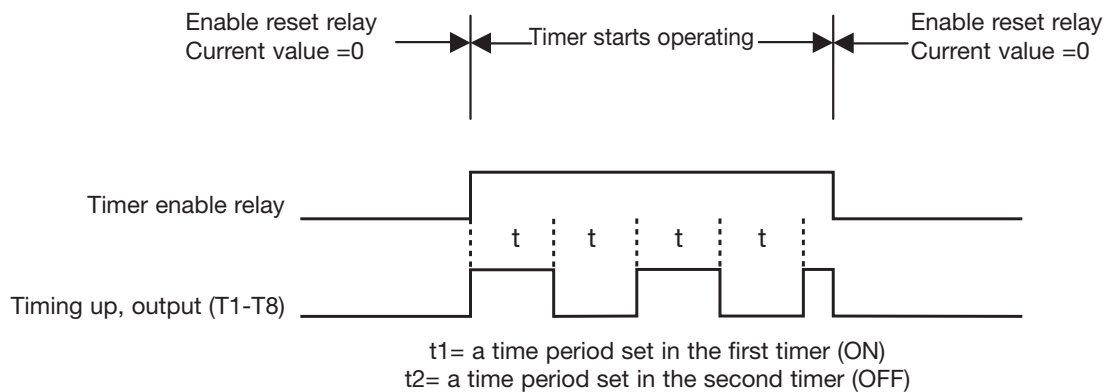
### (5) Timer Mode 5 (Flash A Mode)



### (6) Timer Mode 6 (Flash B Mode)

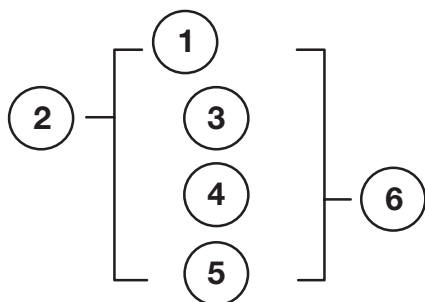


### (7) Timer Mode 7 (Flash C Mode)





## Analog comparator



| Symbol | Description                                      |
|--------|--------------------------------------------------|
| 1      | Analog comparison mode (1-3)                     |
| 2      | Selection of the input comparison value          |
| 3      | Analog input value                               |
| 4      | Setting reference comparison value (upper limit) |
| 5      | Setting reference comparison value (lower limit) |
| 6      | Output terminals of analog comparator (G1-G4)    |

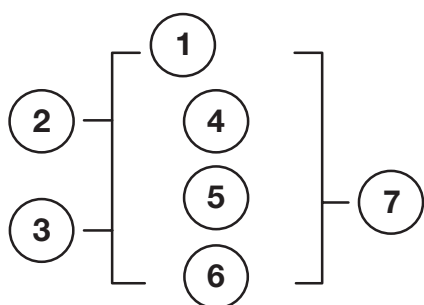
### Analog Comparison Mode (1-3)

- (1) Analog comparator mode 1 ( $3 \leq 5$ , 6 ON)
- (2) Analog comparator mode 2 ( $3 \geq 4$ , 6 ON)
- (3) Analog comparator mode 3 ( $5 \leq 3$ ,  $\leq 4$ , 6 ON)

### Selection of the input comparison value (V1-V7)

- (1) The input comparison value =V1: Setting Frequency
- (2) The input comparison value =V2: Operation Frequency
- (3) The input comparison value =V3: AIN Input Value
- (4) The input comparison value =V4: AI2 Input Value
- (5) The input comparison value =V5: Keypad VR input Value
- (6) The input comparison value =V6: Operation Current
- (7) The input comparison value =V7: Torque Value

## Encoder input Comparing Instruction



| Symbol | Description                                                                                                                   |
|--------|-------------------------------------------------------------------------------------------------------------------------------|
| 1      | Encoder control mode (1-2)                                                                                                    |
| 2      | Use (I1 ~ f8) to set counting up or counting down<br>OFF: counting up (0, 1, 2, 3, 4...)<br>ON: counting down (...3, 2, 1, 0) |
| 3      | Use (I1~f8) to Reset counting value.                                                                                          |
| 4      | A1, Encoder Input Value/Encoder dividing ratio ⑥                                                                              |
| 5      | A2, Setting comparing value                                                                                                   |
| 6      | C, Encoder dividing ratio                                                                                                     |
| 7      | Encoder comparing output terminal, H1~H4                                                                                      |

### (1) Control Mode 1

Encoder Comparing Function:  $A1/C \geq A2$  Comparing Output

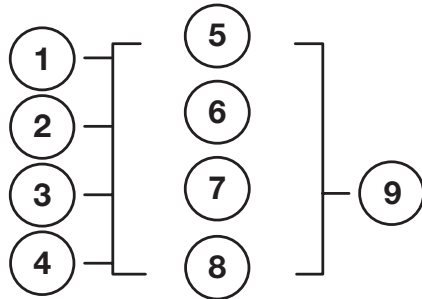
### (2) Control Mode 2

Encoder Comparing Function:  $A1/C \leq A2$  Comparing Output

Comparison Enable/ Disable of the Encoder input value is determined by the Ladder Program ON/OFF.



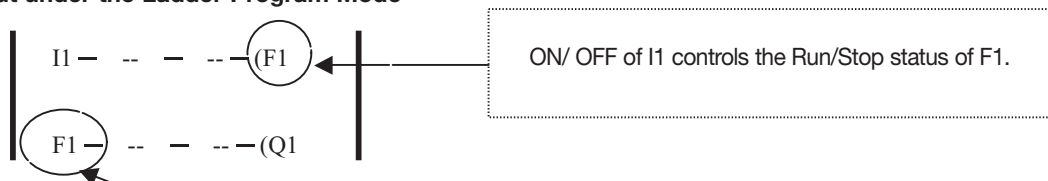
Running Instruction



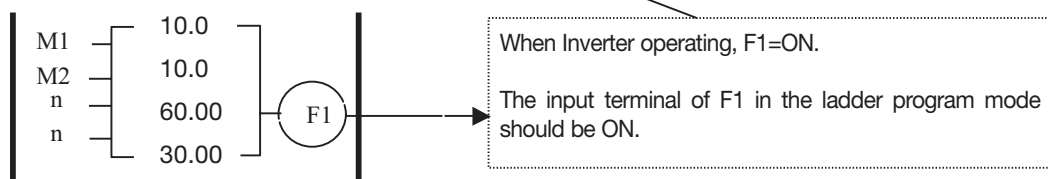
| Symbol | Description                                                                                                                 |
|--------|-----------------------------------------------------------------------------------------------------------------------------|
| 1      | Running mode could be set via I1~f8<br>OFF: (FWD)<br>ON: (REV)                                                              |
| 2      | Segment Speed could be set via I1~f8<br>OFF: Operating at the frequency set on ⑦<br>ON: Operating at the frequency set on ⑧ |
| 3      | Select constant or V3, V5 for Setting Frequency                                                                             |
| 4      | Select constant or V3, V5 for Preset Speed                                                                                  |
| 5      | Acceleration Time                                                                                                           |
| 6      | Deceleration Time                                                                                                           |
| 7      | Setting Frequency (Could be a constant or V3, V5)                                                                           |
| 8      | Segment Speed (Could be a constant or V3, V5)                                                                               |
| 9      | Instruction code of operation<br>(F1~F8, Total: 8 Groups)                                                                   |

Sample:

Input under the Ladder Program Mode



Input under the Function Program Mode



# Chapter 5:

## Troubleshooting and maintenance



### 5.1. Error display and remedy

| 5.1.1. Errors which can not be recovered manually |                                        |                                                                                                                                                                           |                                                                                                                                                                                                              |
|---------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                                           | Error                                  | Cause                                                                                                                                                                     | Remedy                                                                                                                                                                                                       |
| CPF                                               | Program problem                        | External noise interference                                                                                                                                               | Connect a parallel RC burst absorber across the magnetizing coil of the magnetic contactor that causes interference                                                                                          |
| EPR                                               | EEPROM problem                         | Faulty EEPROM                                                                                                                                                             | Replace EEPROM                                                                                                                                                                                               |
| -OV @-                                            | Voltage too high during stop           | Detection circuit malfunction                                                                                                                                             | Send the inverter back for repairing                                                                                                                                                                         |
| -LV @-                                            | Voltage too low during stop            | <ol style="list-style-type: none"> <li>1. Power voltage too low</li> <li>2. Restraining resistor or fuse burnt out.</li> <li>3. Detection circuit malfunctions</li> </ol> | <ol style="list-style-type: none"> <li>1. Check if the power voltage was correct or not</li> <li>2. Replace the restraining resistor or the fuse</li> <li>3. Send the inverter back for repairing</li> </ol> |
| -OH @-                                            | The inverter is overheated during stop | <ol style="list-style-type: none"> <li>1. Detection circuit malfunctions</li> <li>2. Ambient temperature too high or bad ventilation</li> </ol>                           | <ol style="list-style-type: none"> <li>1. Send the inverter back for repairing</li> <li>2. Improve ventilation conditions</li> </ol>                                                                         |
| CTER                                              | Current Sensor detecting error         | Current sensor error or circuit malfunctions                                                                                                                              | Send the inverter back for repairing                                                                                                                                                                         |

Note: @ the Failure contact does not function.

| 5.1.2. Errors which can be recovered manually and automatically |                                                |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                                                         | Error                                          | Cause                                                                                                                                                                                                                                                                                                                   | Remedy                                                                                                                                                                                                                                                                                                             |
| OC-S                                                            | Over current at start                          | <ol style="list-style-type: none"> <li>1. The motor wind and enclosure short circuit</li> <li>2. The motor contacts and earth short circuit</li> <li>3. The IGBT module ruined</li> </ol>                                                                                                                               | <ol style="list-style-type: none"> <li>1. Inspect the motor</li> <li>2. Inspect the wire</li> <li>3. Replace the transistor module</li> </ol>                                                                                                                                                                      |
| OC-D                                                            | Over-current at deceleration                   | The preset deceleration time is too short.                                                                                                                                                                                                                                                                              | Set a longer deceleration time                                                                                                                                                                                                                                                                                     |
| OC-A                                                            | Over-current at acceleration                   | <ol style="list-style-type: none"> <li>1. Acceleration time too short</li> <li>2. The capacity of the motor higher than the capacity of the inverter</li> <li>3. Short circuit between the motor coil and the shell</li> <li>4. Short circuit between motor wiring and earth</li> <li>5. IGBT module damaged</li> </ol> | <ol style="list-style-type: none"> <li>1. Set a longer acceleration time</li> <li>2. Replace a inverter with the same capacity as that of the motor</li> <li>3. Check the motor</li> <li>4. Check the wiring</li> <li>5. Replace the IGBT module</li> </ol>                                                        |
| OC-C                                                            | Over-current at fixed speed                    | <ol style="list-style-type: none"> <li>1. Transient load change</li> <li>2. Transient power change</li> </ol>                                                                                                                                                                                                           | <ol style="list-style-type: none"> <li>1. Increase the capacity of the inverter</li> <li>2. Rerun parameter auto tuning (0-06 = 0001)</li> <li>3. Reduce stator resistance (14-0) if the above remedies are helpless</li> </ol>                                                                                    |
| OV-C                                                            | Voltage too high during operation/deceleration | <ol style="list-style-type: none"> <li>1. Deceleration time setting too short or large load inertia</li> <li>2. Power voltage varies widely</li> </ol>                                                                                                                                                                  | <ol style="list-style-type: none"> <li>1. Set a longer deceleration time</li> <li>2. Add a brake resistor or brake module</li> <li>3. Add a reactor at the power input side</li> <li>4. Increase inverter capacity</li> </ol>                                                                                      |
| Err4                                                            | Illegal interrupt of CPU                       | Outside noise interference                                                                                                                                                                                                                                                                                              | Send back to repair if it happens many times                                                                                                                                                                                                                                                                       |
| OVSP                                                            | Over speed during operating                    | <ol style="list-style-type: none"> <li>1. Moter load too big or Inverter capacity too small</li> <li>2. Moter parameter error (sensorless mode)</li> <li>3. The gain is too big during sensorless mode operating</li> <li>4. The Current detect circuit fault</li> </ol>                                                | <ol style="list-style-type: none"> <li>1. Increase acceleration/deceleration time (3-02/3-03)</li> <li>2. Input correct motor Parameter</li> <li>3. Change stator Resistance gain and Rotator resistance gain (14-0/14-1), suggest that decrease 50~100, until 0</li> <li>4. Send back to Carlo Gavazzi</li> </ol> |

### 5.1.3 Errors which can be recovered manually but not automatically

| Display | Error                                           | Cause                                                                                                                                          | Remedy                                                                                                                                                                                                                                                                          |
|---------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OC      | Over-current during stop                        | <ol style="list-style-type: none"> <li>Detection circuit malfunctions</li> <li>Bad connection for CT signal cable</li> </ol>                   | <ol style="list-style-type: none"> <li>Check the noise between Power line and motor line</li> <li>Send the inverter back for repairing</li> </ol>                                                                                                                               |
| OL1     | Motor overload                                  | <ol style="list-style-type: none"> <li>Heavy load</li> <li>Inappropriate settings of 0-02, 9-08~9-11</li> </ol>                                | <ol style="list-style-type: none"> <li>Increase the motor capacity</li> <li>Set 0-02, 9-08~9-11 properly</li> </ol>                                                                                                                                                             |
| OL2     | Inverter overload                               | Heavy Load                                                                                                                                     | Increase the inverter capacity                                                                                                                                                                                                                                                  |
| OL3     | Over torque                                     | <ol style="list-style-type: none"> <li>Heavy Load</li> <li>Insufficient settings of 9-14, 9-15</li> </ol>                                      | <ol style="list-style-type: none"> <li>Increase the inverter capacity</li> <li>Set 9-14, 9-15 properly</li> </ol>                                                                                                                                                               |
| LV-C    | Voltage too low during operation                | <ol style="list-style-type: none"> <li>Power voltage too low</li> <li>Power voltage varies widely</li> <li>Main Circuit Relay error</li> </ol> | <ol style="list-style-type: none"> <li>Improve power quality or increase the value of 2-01</li> <li>Set a longer acceleration time</li> <li>Increase inverter capacitor</li> <li>Add a reactor at the power input side</li> <li>Send the inverter back for repairing</li> </ol> |
| OH-C    | Heat sink temperature too High during operation | <ol style="list-style-type: none"> <li>Heavy load</li> <li>Ambient temperature too high or bad ventilation</li> </ol>                          | <ol style="list-style-type: none"> <li>Check if there are any problems with the load</li> <li>Increase inverter capacity</li> <li>Improve ventilation conditions</li> </ol>                                                                                                     |

### 5.1.4 Special conditions

| Display | Error                   | Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STP0    | Zero speed stop         | Happened when preset frequency <0.1Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| STP1    | Fail to start directly  | <ol style="list-style-type: none"> <li>If the inverter is set as external terminal control mode (1-00=0001) and direct start is disabled (2-04=0001), the inverter cannot be started and will flash STP1 when operation switch turned to ON after applying power (refer to descriptions of 2-04).</li> <li>Direct start is possible when 2-04=0001.</li> </ol>                                                                                                                                                                                                                                                                                                                                              |
| STP2    | Keypad emergency stop   | <ol style="list-style-type: none"> <li>If the inverter is set as external control mode (1-00=0001) and Stop key is enabled (1-03=0000), the inverter will stop according to the setting of 1-05 when Stop key is pressed. STP2 flashes after stop. Turn the operation switch to OFF and then ON again to restart the inverter.</li> <li>If the inverter is in communication mode and Stop key is enabled (1-03=0000), the inverter will stop in the way set by 1-05 when Stop key is pressed during operation and then flashes STP2. The PC has to send a Stop command then a Run command to the inverter for it to be restarted.</li> <li>Stop key cannot perform emergency stop when 1-03=0001</li> </ol> |
| E.S.    | External emergency stop | <ol style="list-style-type: none"> <li>The inverter will ramp stop and then flash E.S., when input external emergency stop signal via the multifunctional input terminal (refer to descriptions of 5-00~5-06).</li> <li>Please wiring the terminal before to set 5-00~5-06=0029.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| b.b.    | External base block     | The inverter stops immediately and then flashes b.b., when external base block is input through the multifunctional input terminal (refer to descriptions of 5-00~5-06).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| ATER    | Auto-tuning faults      | <ol style="list-style-type: none"> <li>Motor data error resulting in for auto-tuning failure</li> <li>Stop the inverter emergently during Auto-tuning</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| PDER    | PID feedback loss       | PID feedback loss detect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



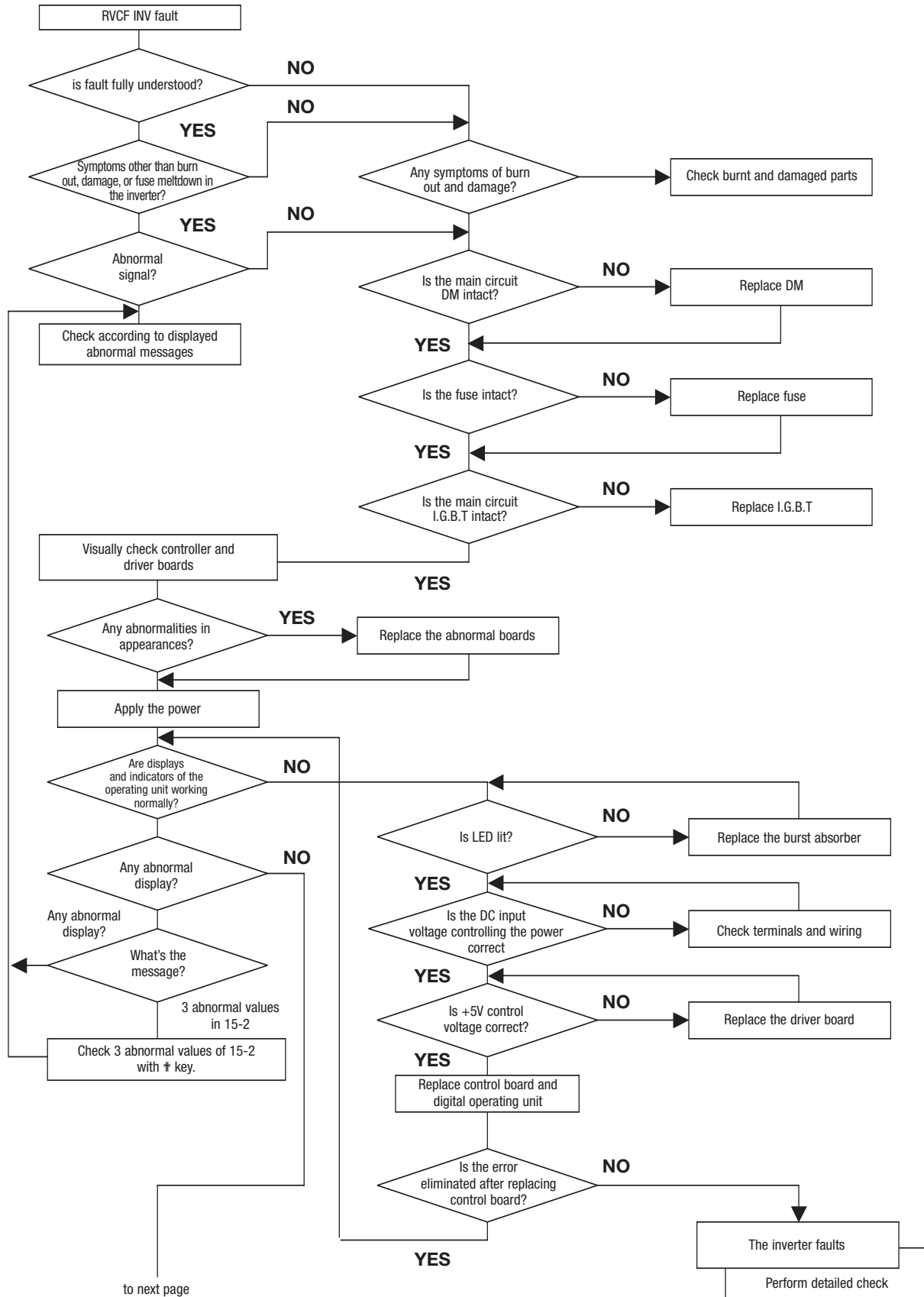
| 5.1.5 Operation errors |                                                             |                                                                                                                                                                                                                            |                                                                                                                                                                    |
|------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                | Error                                                       | Cause                                                                                                                                                                                                                      | Remedy                                                                                                                                                             |
| LOC                    | Parameter and frequency reverse already locked              | <ol style="list-style-type: none"> <li>Attempt to modify frequency /parameter while 3-17&gt;0000</li> <li>Attempt to reverse while 1-02=0001</li> </ol>                                                                    | <ol style="list-style-type: none"> <li>Set 3-17=0000</li> <li>Set 1-02=0000</li> </ol>                                                                             |
| Err1                   | Key operation error                                         | <ol style="list-style-type: none"> <li>Press ▲ or ▼ while 1-06&gt;0000 or running at preset speed.</li> <li>Attempt to modify the parameter can not be modified during operation (refer to the parameter list).</li> </ol> | <ol style="list-style-type: none"> <li>The ▲ or ▼ is available for modifying the parameter only when 1-06=0000</li> <li>Modify the parameter while STOP</li> </ol> |
| Err2                   | Parameter setting error                                     | <ol style="list-style-type: none"> <li>3-01 in the range of 3-13 ± 3-16 or 3-14 ± 3-16 or 3-15 ± 3-16</li> <li>3-00 ≤ 3-01</li> <li>The setting error as performing Auto tuning (e.g. 1-00 ≠ 0, 1-06 ≠ 000)</li> </ol>     | <ol style="list-style-type: none"> <li>Modify 3-13~3-15 or 3-16</li> <li>3-00 &gt; 3-01 Set 1-00=0000, 1-06=0000 during Auto tuning</li> </ol>                     |
| Err5                   | Modification of parameter is not available in communication | <ol style="list-style-type: none"> <li>Issue a control command during communication disabled</li> <li>Modify the function 13-1~13-4 during communication</li> </ol>                                                        | <ol style="list-style-type: none"> <li>Issue enable command before communication</li> <li>Set the very parameter of the function before communication</li> </ol>   |
| Err6                   | Communication failed                                        | <ol style="list-style-type: none"> <li>Wiring error</li> <li>Communication parameter setting error.</li> <li>Sum-check error</li> <li>Incorrect communication protocol</li> </ol>                                          | <ol style="list-style-type: none"> <li>Check hardware and wiring</li> <li>Check Function 13-1~13-4</li> </ol>                                                      |
| Err7                   | Parameter conflict                                          | <ol style="list-style-type: none"> <li>Attempt to modify the function 15-0</li> <li>Voltage and current detection circuit is abnormal</li> </ol>                                                                           | If Reset inverter is not available, please send the inverter back for repair                                                                                       |
| Err8                   | Factory setting error                                       | When PLC is Running, Perform factory setting                                                                                                                                                                               | Please perform factory setting before PLC stops.                                                                                                                   |
| Epr1                   | Parameter setting error copy unit failed                    | <ol style="list-style-type: none"> <li>Set 3-18=0001/0002 without connecting copy unit.</li> <li>Copy unit failed.</li> <li>The HP rating don't match between copy unit and inverter</li> </ol>                            | <ol style="list-style-type: none"> <li>Modify 3-18</li> <li>Replace copy unit</li> <li>The HP rating need to be the same</li> </ol>                                |
| Epr2                   | Parameter not match                                         | Compare the parameter and inverter, and their parameter are not the same.                                                                                                                                                  | <ol style="list-style-type: none"> <li>Rewrite again</li> <li>Replace copy unit</li> </ol>                                                                         |

## 5.2 General functional troubleshooting

| Status                                  | Checking point                                                                      | Remedy                                                                                                                                                                                                                |
|-----------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor can not run                       | Is power applied to L1(L), L2, and L3(N) terminals (is the charging indicator lit)? | <ul style="list-style-type: none"> <li>Is the power applied?</li> <li>Turn the power OFF and then ON again.</li> <li>Make sure the power voltage is correct.</li> <li>Make sure screws are secured firmly.</li> </ul> |
|                                         | Are there voltage across the output terminal T1, T2, and T3?                        | <ul style="list-style-type: none"> <li>Turn the power OFF and then ON again.</li> </ul>                                                                                                                               |
|                                         | Is overload causing the motor blocked?                                              | <ul style="list-style-type: none"> <li>Reduce the load to let the motor running.</li> </ul>                                                                                                                           |
|                                         | Are there any abnormalities in the inverter?                                        | <ul style="list-style-type: none"> <li>See error descriptions to check wiring and correct if necessary.</li> </ul>                                                                                                    |
|                                         | Is forward or reverse running command issued?                                       |                                                                                                                                                                                                                       |
|                                         | Has analog frequency signal been input?                                             | <ul style="list-style-type: none"> <li>Is analog frequency input signal wiring correct?</li> <li>Is voltage of frequency input correct?</li> </ul>                                                                    |
|                                         | Is operation mode setting correct?                                                  | <ul style="list-style-type: none"> <li>Operate operations through the digital panel.</li> </ul>                                                                                                                       |
| Motor runs inversely                    | Are wiring for output terminals T1, T2, and T3 correct?                             | <ul style="list-style-type: none"> <li>Wiring must match U, V, and W terminals of the motor.</li> </ul>                                                                                                               |
|                                         | Are wiring for forward and reverse signals correct?                                 | <ul style="list-style-type: none"> <li>Check wiring are correct if necessary.</li> </ul>                                                                                                                              |
| The motor speed can not be regulated.   | Are wiring for analog frequency inputs correct?                                     | <ul style="list-style-type: none"> <li>Check wiring are correct if necessary.</li> </ul>                                                                                                                              |
|                                         | Is the setting of operation mode correct?                                           | <ul style="list-style-type: none"> <li>Check the operation mode of the operator.</li> </ul>                                                                                                                           |
|                                         | Is the load too heavy?                                                              | <ul style="list-style-type: none"> <li>Reduce the load.</li> </ul>                                                                                                                                                    |
| Motor running speed too high or too low | Are specifications of the motor (poles, voltage...) correct?                        | <ul style="list-style-type: none"> <li>Confirm the motor's specifications.</li> </ul>                                                                                                                                 |
|                                         | Is the gear ratio correct?                                                          | <ul style="list-style-type: none"> <li>Confirm the gear ratio.</li> </ul>                                                                                                                                             |
|                                         | Is the setting of the highest output frequency correct?                             | <ul style="list-style-type: none"> <li>Confirm the highest output frequency.</li> </ul>                                                                                                                               |
| Motor speed varies unusually            | Is the load too heavy?                                                              | <ul style="list-style-type: none"> <li>Reduce the load.</li> </ul>                                                                                                                                                    |
|                                         | Does the load vary largely?                                                         | <ul style="list-style-type: none"> <li>Minimize the variation of the load.</li> <li>Increase capacities of the inverter and the motor.</li> </ul>                                                                     |
|                                         | Is the input power lack of phase?                                                   | <ul style="list-style-type: none"> <li>Add an AC reactor at the power input side if using single-phase power.</li> <li>Check wiring if using three-phase power.</li> </ul>                                            |

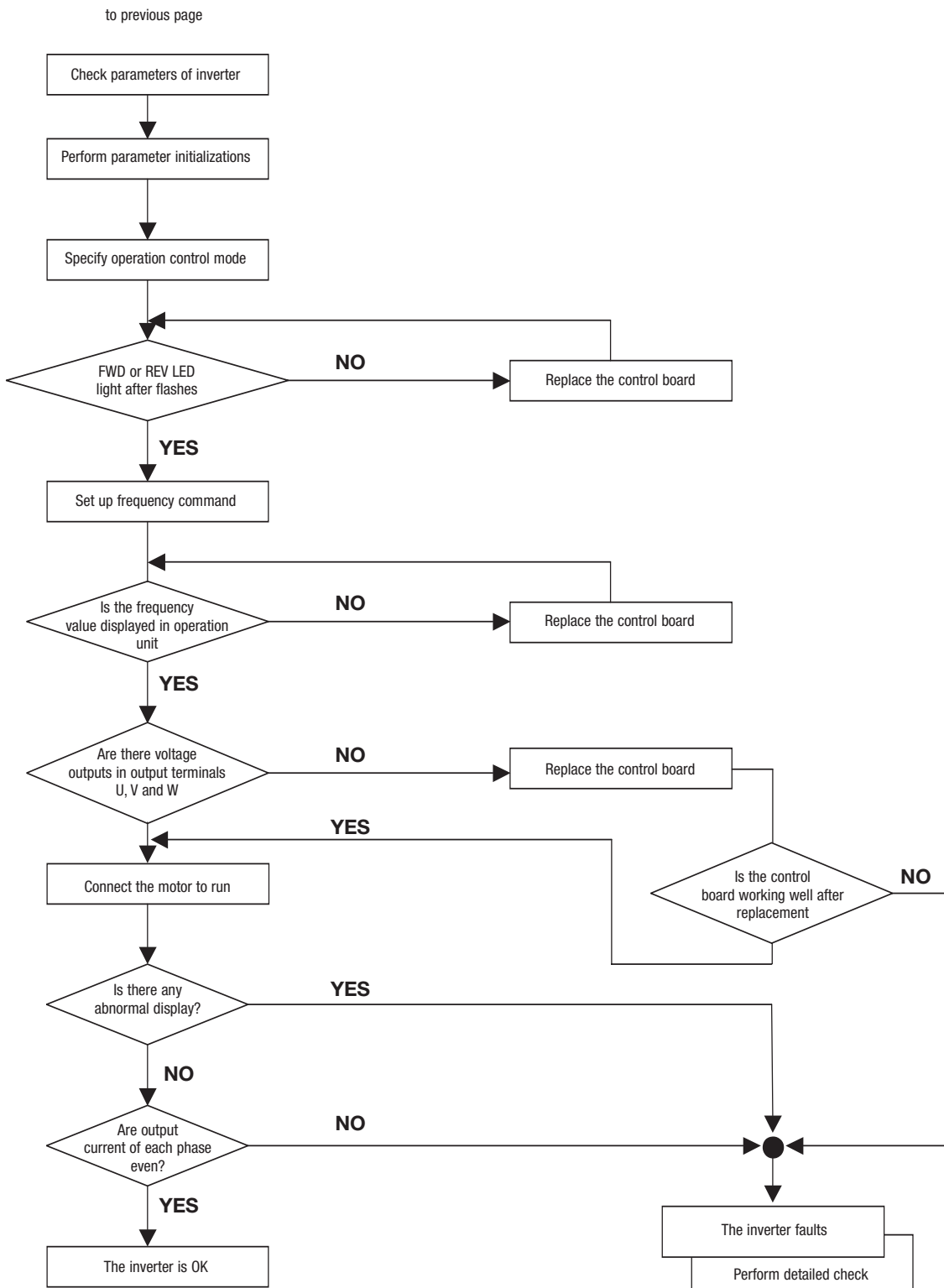


### 5.3 Quick troubleshooting of RVCF



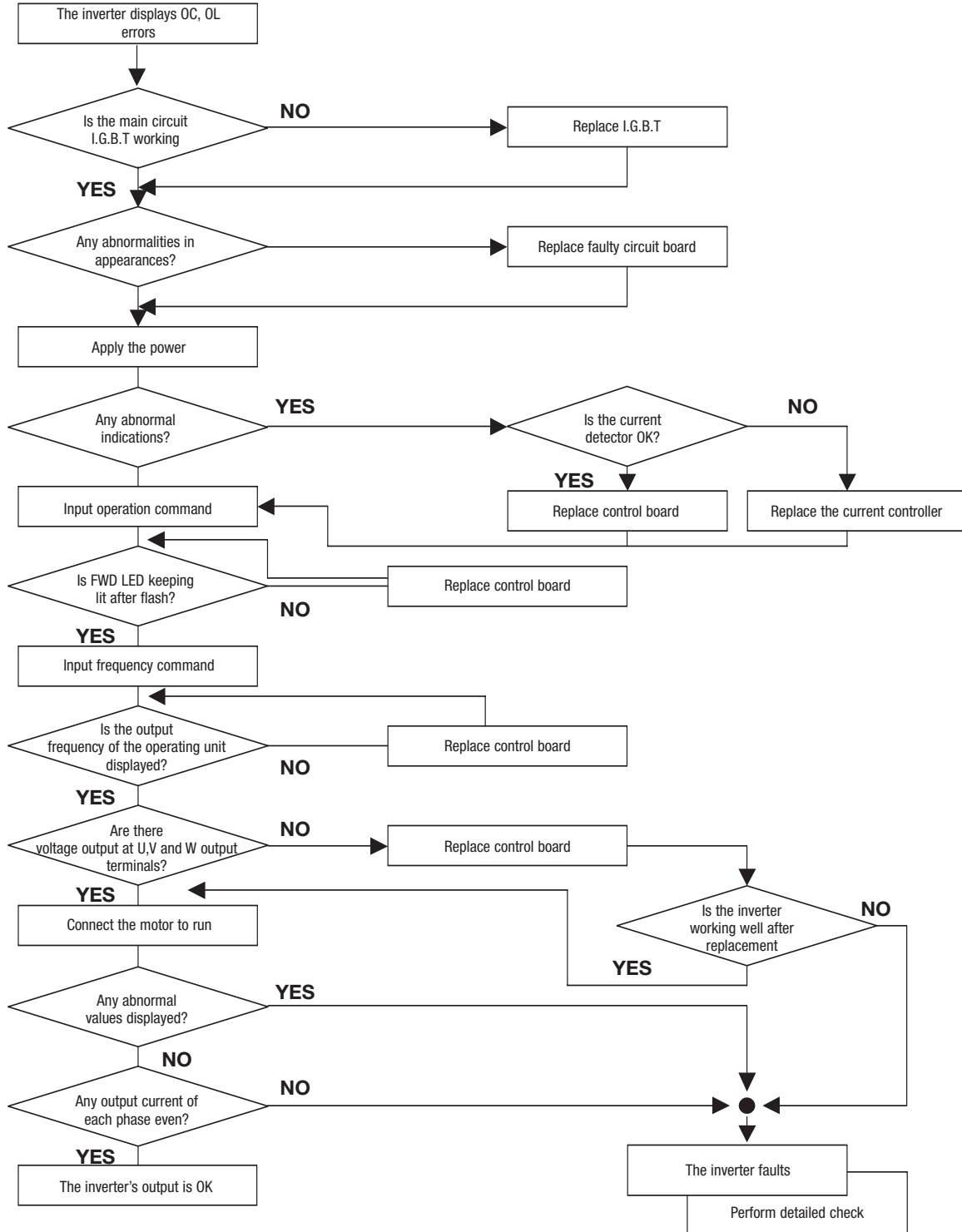
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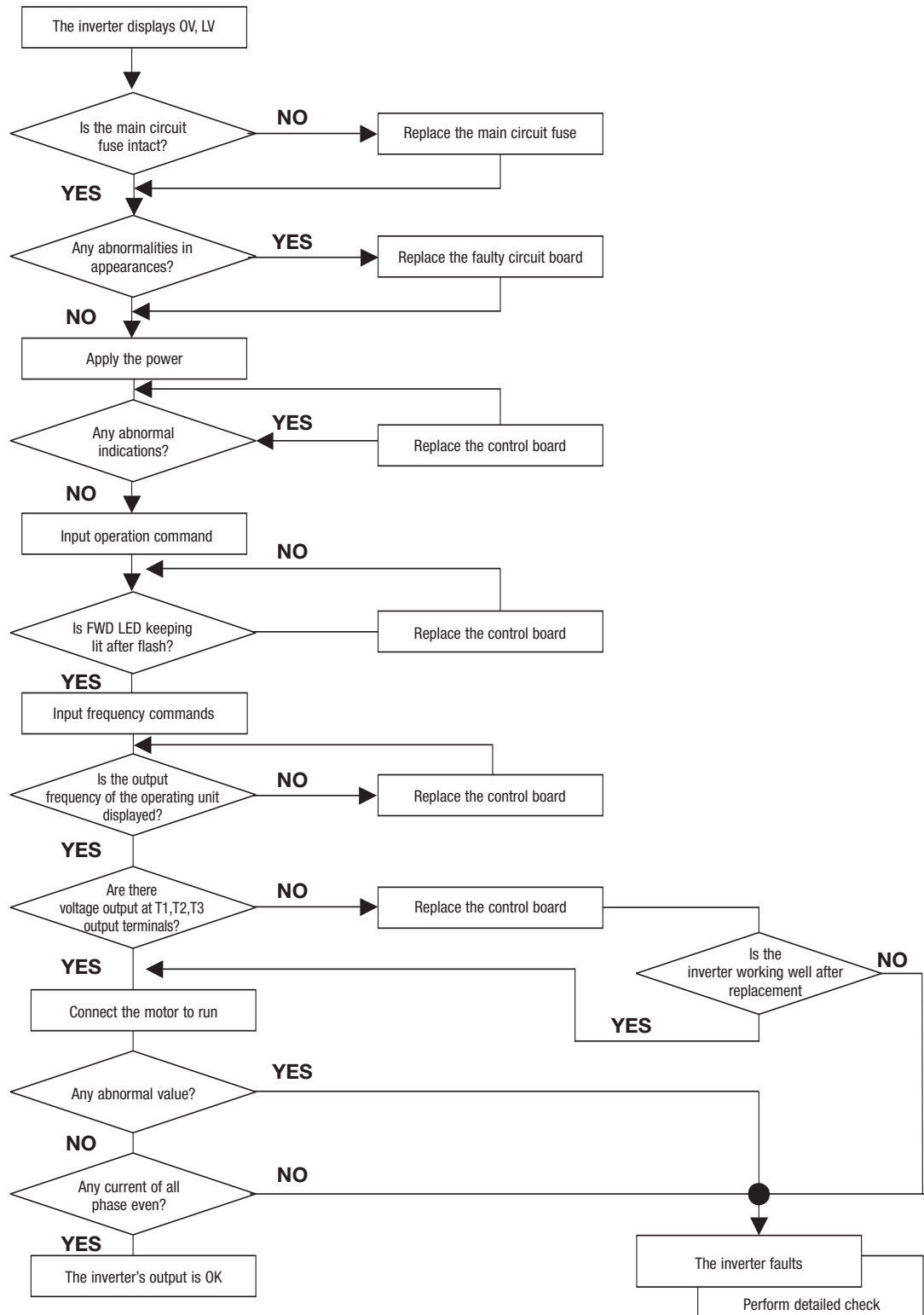


### Troubleshooting for OC, OL error displays



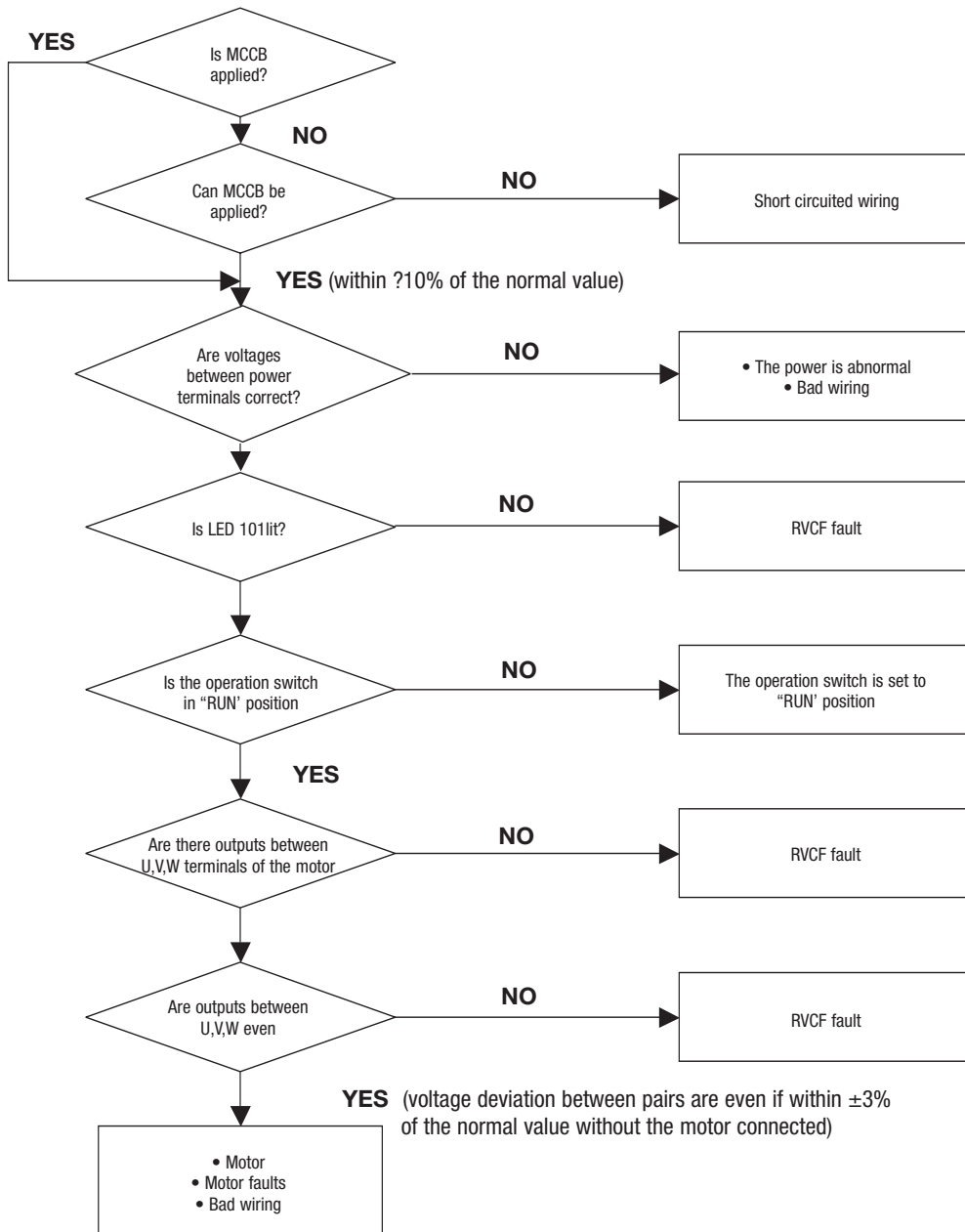


### Troubleshooting for OV, LV error



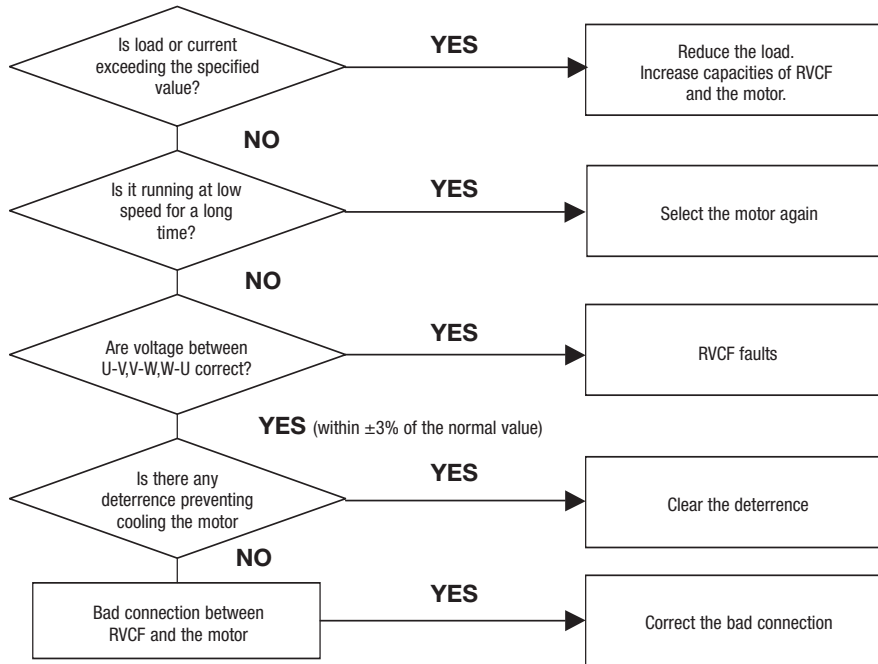


The motor can not run

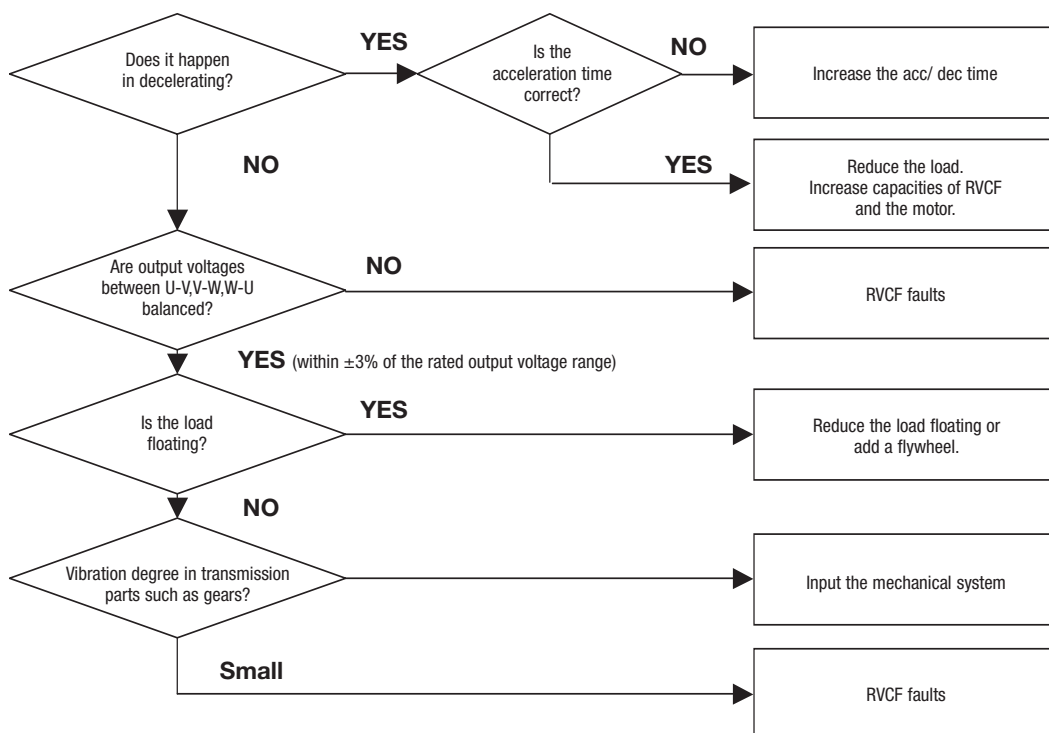




### The motor is overheated



### Motor runs unevenly





## 5.4 Routine inspection and period inspection

To ensure stable and safe operations, check and maintain the inverter regularly and periodically. The table below lists the items to be checked to ensure stable and safe operations. Check these items 5 minutes after the “Charge” indicator goes out to prevent service persons from being hurt by residual electric power.

| Items                                                           | Details                                                 | Checking period |       | Methods                                                                    | Criteria                                                 | Remedies                              |
|-----------------------------------------------------------------|---------------------------------------------------------|-----------------|-------|----------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------|
|                                                                 |                                                         | Daily           | 1Year |                                                                            |                                                          |                                       |
| Circumstances around the machine                                | Confirm the temperature and humidity around the machine | ✓               |       | Measure with thermometer and hygrometer according to installation notices. | Temperature:<br>-10 ~ +40°C<br>Humidity:<br>Below 95%RH  | Improve the circumstances             |
|                                                                 | Are there inflammables piled up around?                 | ✓               |       | Visual check                                                               | No foreign matters                                       |                                       |
| Installation and grounding of the inverter                      | Any unusual vibration from the machine                  | ✓               |       | Visual, hearing                                                            | No foreign matters                                       | Secure screws                         |
|                                                                 | Is the grounding resistance correct?                    |                 | ✓     | Measure the resistance with a multi-tester                                 | 200V series:<br>below 100Ω<br>400V series:<br>below 10Ω  | Improve the grounding                 |
| Input power voltage                                             | Is the voltage of the main circuit correct?             | ✓               |       | Measure the voltage with a multi-tester                                    | Voltage must conform with the specifications             | Improve input voltage                 |
| External terminals and internal mounting screws of the inverter | Are secure parts loose?                                 |                 | ✓     | Visual check<br>Check with a screwdriver                                   | No abnormalities                                         | Secure or send back for repair        |
|                                                                 | Is the terminal base damaged?                           |                 | ✓     |                                                                            |                                                          |                                       |
|                                                                 | Obvious rust stains                                     |                 | ✓     |                                                                            |                                                          |                                       |
| Internal wiring of the inverter                                 | Deformed or crooked                                     |                 | ✓     | Visual check                                                               | No abnormalities                                         | Replace or send back for repair       |
|                                                                 | Any damage of the wrapping of the conducting wire       |                 | ✓     |                                                                            |                                                          |                                       |
| Heat sink                                                       | Heap of dust or mingled trifles                         | ✓               |       | Visual check                                                               | No abnormalities                                         | Clean up heaped dust                  |
| Printed circuit board                                           | Heap of conductive metal or oil sludge                  |                 | ✓     | Visual check                                                               | No abnormalities                                         | Clean up or replace the circuit board |
|                                                                 | Discolored, overheated, or burned parts                 |                 | ✓     |                                                                            |                                                          |                                       |
| Cooling fan                                                     | Unusual vibration and noise                             |                 | ✓     | Visual or hearing check                                                    | No abnormalities                                         | Replace the cooling fan               |
|                                                                 | Heap of dust or mingled trifles                         | ✓               |       | Visual check                                                               |                                                          | Clean up                              |
| Power component                                                 | Heap of dust or mingled trifles                         |                 | ✓     | Measure with a multi-tester                                                | No short circuit or broken circuit in three-phase output | Replace power component or inverter   |
|                                                                 | Check resistance between each terminals                 |                 | ✓     |                                                                            |                                                          |                                       |
| Capacitor                                                       | Any unusual odor or leakage                             | ✓               |       | Visual check                                                               | No abnormalities                                         | Replace capacitor or inverter         |
|                                                                 | Any inflation or protrusion                             | ✓               |       |                                                                            |                                                          |                                       |

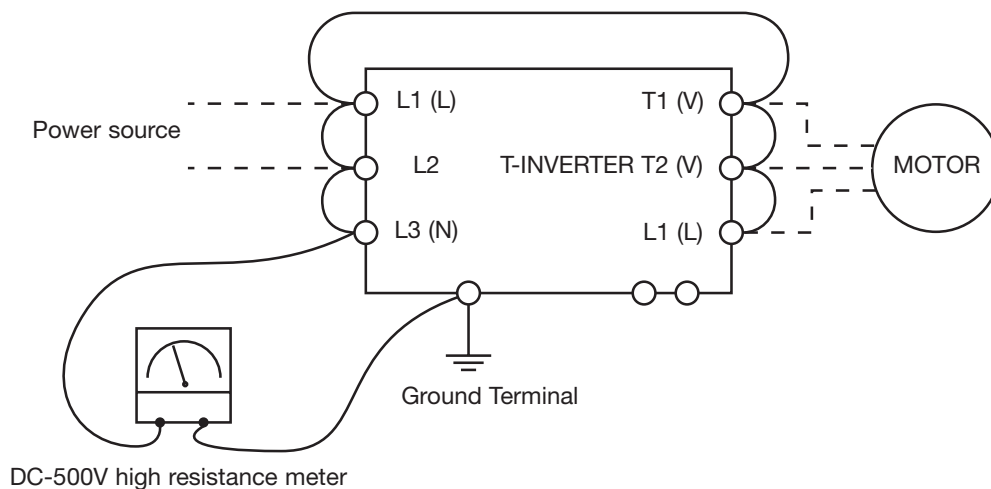
## 5.5 Maintenance and Inspection

Inverter doesn't need daily inspection and maintenance.

To ensure long-term reliability, follow the instructions below to perform regular inspection. Turn the power off and wait for the charge indicator (LED101) to go out before inspection to avoid potential shock hazard possibly caused by charges resides in high-capacity capacitors.

- (1) Clean up the accumulation of muck inside the inverter.
- (2) Check if there are any loose terminal screws and securing screws. Tighten all loose screws.
- (3) Insulation tests
  - (a) Disconnect all leads connecting T-VERTER with external circuit when performing insulation tests against external circuit.
  - (b) Internal insulation test should be performed against the main circuit of the TVERTER body only. Use a high resistance DC 500V meter with insulating resistance higher than  $5M\Omega$ .

 **Caution! Do not perform this test against the control circuit.**



# Chapter 6: Peripherals Components



## 6.1 Reactor specification at Input side

| Model                       | AC inductance at input side |                 |
|-----------------------------|-----------------------------|-----------------|
|                             | Current (A)                 | Inductance (mH) |
| RVCFA1200040 / RVCFA3200040 | 5.0                         | 2.1             |
| RVCFA1200075 / RVCFA3200075 | 5.0                         | 2.1             |
| RVCFB1200150 / RVCFA3200150 | 10.0                        | 1.1             |
| RVCFB1200220 / RVCFB3200220 | 15.0                        | 0.71            |
| RVCFB3200370                | 20.0                        | 0.53            |
| RVCFC3200550                | 30.0                        | 0.35            |
| RVCFC3200750                | 40.0                        | 0.265           |
| RVCFD3201100                | 60.0                        | 0.18            |
| RVCFD3201500                | 80.0                        | 0.13            |
| RVCFD3201850                | 90.0                        | 0.12            |
| RVCFE3202200                | 120.0                       | 0.09            |
| RVCFE3203000                | 160.0                       | 0.07            |

| Model        | AC inductance at input side |                 |
|--------------|-----------------------------|-----------------|
|              | Current (A)                 | Inductance (mH) |
| RVCFA3400075 | 2.5                         | 8.40            |
| RVCFA3400150 | 5.0                         | 4.20            |
| RVCFB3400220 | 7.5                         | 3.60            |
| RVCFB3400370 | 10.0                        | 2.20            |
| RVCFC3400550 | 15.0                        | 1.42            |
| RVCFC3400750 | 20.0                        | 1.06            |
| RVCFC3401100 | 30.0                        | 0.70            |
| RVCFD3401500 | 40.0                        | 0.53            |
| RVCFD3401850 | 50.0                        | 0.42            |
| RVCFD3402200 | 60.0                        | 0.36            |
| RVCFE3403000 | 80.0                        | 0.26            |
| RVCFE3403700 | 90.0                        | 0.24            |
| RVCFF3404500 | 120.0                       | 0.18            |
| RVCFF3405500 | 150.0                       | 0.15            |

## 6.2 Reactor specification at DC side

| Model                       | AC inductance at input side |                 |
|-----------------------------|-----------------------------|-----------------|
|                             | Current (A)                 | Inductance (mH) |
| RVCFA1200040 / RVCFA3200040 | 3.1                         | 5.65            |
| RVCFA1200075 / RVCFA3200075 | 4.5                         | 3.89            |
| RVCFB1200150 / RVCFB3200150 | 7.5                         | 2.33            |
| RVCFB1200220 / RVCFB3200220 | 10.5                        | 1.67            |
| RVCFB3200370                | 17.5                        | 1.00            |
| RVCFC3200550                | 26.0                        | 0.67            |
| RVCFC3200750                | 35.0                        | 0.50            |
| RVCFA3400075                | 2.3                         | 15.22           |
| RVCFA3400150                | 3.8                         | 9.21            |
| RVCFB3400220                | 5.2                         | 6.73            |
| RVCFB3400370                | 8.8                         | 3.98            |
| RVCFC3400550                | 13.0                        | 2.69            |
| RVCFC3400750                | 17.5                        | 2.00            |
| RVCFC3401100                | 25.0                        | 1.40            |



## 6.3 Braking unit and braking resistor

### RVCF series braking current calculation

| Inverter Model               | Braking Unit |                | Suitable Motor Capacity (HP) | Suitable Motor Capacity (kW) | Braking resistor Specification |      | Braking resistor ED(%) | Braking torque (%) | Braking Resistor Model |
|------------------------------|--------------|----------------|------------------------------|------------------------------|--------------------------------|------|------------------------|--------------------|------------------------|
|                              | Model        | Number used    |                              |                              | (W)                            | (Ω)  |                        |                    |                        |
| RVCFA1200040<br>RVCFA3200040 | -            | -              | 0.5                          | 0.4                          | 150                            | 200  | 10                     | 238                | -                      |
| RVCFA1200075<br>RVCFA3200075 | -            | -              | 1.0                          | 0.75                         | 150                            | 200  | 10                     | 119                | -                      |
| RVCFB1200150<br>RVCFB3200150 | -            | -              | 2.0                          | 1.5                          | 150                            | 100  | 10                     | 119                | CRBR-260W-100R         |
| RVCFB1200220<br>RVCFB3200220 | -            | -              | 3.0                          | 2.2                          | 260                            | 70   | 10                     | 115                | -                      |
| RVCFB3200370                 | -            | -              | 5.0                          | 3.7                          | 390                            | 40   | 10                     | 119                | CRBR-700W-40R          |
| RVCFC3200550                 | -            | -              | 7.5                          | 5.5                          | 520                            | 30   | 10                     | 108                | -                      |
| RVCFC3200750                 | -            | -              | 11                           | 7.5                          | 780                            | 20   | 10                     | 119                | -                      |
| RVCFD3201100                 | -            | -              | 15                           | 11                           | 2400                           | 13.6 | 10                     | 117                | -                      |
| RVCFD3201500                 | -            | -              | 20                           | 15                           | 3000                           | 10   | 10                     | 119                | -                      |
| RVCFD3201850                 | RVCFTBU230   | 1              | 25                           | 18.5                         | 4800                           | 8    | 10                     | 119                | -                      |
| RVCFE3202200                 | RVCFTBU230   | 1              | 30                           | 22                           | 4800                           | 6.8  | 10                     | 117                | -                      |
| RVCFE3203000                 | RVCFTBU230   | 2              | 40                           | 30                           | 3000                           | 10   | 10                     | 119                | -                      |
| RVCFA3400075                 | -            | -              | 1                            | 0.75                         | 150                            | 750  | 10                     | 126                | -                      |
| RVCFA3400150                 | -            | -              | 2                            | 1.5                          | 150                            | 400  | 10                     | 119                | -                      |
| RVCFB3400220                 | -            | -              | 3                            | 2.2                          | 260                            | 250  | 10                     | 126                | CRBR-260W-250R         |
| RVCFB3400370                 | -            | -              | 5                            | 3.7                          | 400                            | 150  | 10                     | 126                | CRBR-700W-150R         |
| RVCFC3400550                 | -            | -              | 7.5                          | 5.5                          | 600                            | 130  | 10                     | 102                | CRBR-1100W-130R        |
| RVCFC3400750                 | -            | -              | 10                           | 7.5                          | 800                            | 100  | 10                     | 99                 | CRBR-750W-100R         |
| RVCFC3401100                 | -            | -              | 15                           | 11                           | 1600                           | 50   | 10                     | 126                | CRBR-1500W-50R         |
| RVCFD3401500                 | -            | -              | 20                           | 15                           | 1500                           | 40   | 10                     | 119                | CRBR-1500W-40R         |
| RVCFD3401850                 | RVCFTBU430   | 1              | 25                           | 18.5                         | 4800                           | 32   | 10                     | 119                | CRBR-5000W-32R         |
| RVCFD3402200                 | RVCFTBU430   | 1              | 30                           | 22                           | 4800                           | 27.2 | 10                     | 117                | CRBR-5000W-27R2        |
| RVCFE3403000                 | RVCFTBU430   | 1              | 40                           | 30                           | 6000                           | 20   | 10                     | 119                | CRBR-6000W-20R         |
| RVCFE3403700                 | RVCFTBU430   | 2 <sup>¼</sup> | 50                           | 37                           | 9600                           | 16   | 10                     | 119                | CRBR-5000W-32R         |
| RVCFF3404500                 | RVCFTBU430   | 2 <sup>¼</sup> | 60                           | 45                           | 9600                           | 13.6 | 10                     | 117                | CRBR-5000W-27R2        |
| RVCFF3405500                 | RVCFTBU430   | 2 <sup>¼</sup> | 75                           | 55                           | 6000                           | 20   | 10                     | 126                | CRBR-6000W-20R         |

Note 1: Formula for brake resistor:  $W = (V_{pnb} * V_{pnb}) * ED\% / R$

1. **W** : braking resistor consumption power
2. **V<sub>pnb</sub>**: braking voltage (230V=380VDC, 480V=760VDC)
3. **ED%**: braking effective period
4. **R**: using braking resistor

Note 2: Above 25HP, please add Braking Unit: 200V RVCFTBU230  
400V RVCFTBU430

About the detail information, please contact with your supplier.

Note 3: When set up braking unit and resistor, please make sure there is adequately ventilated environment and appropriate distance for setting

Note 4. **Device configuration**: install the (RVCFTBU430 + Braking resistor) x 2



## 6.4 Digital operator and extension cable

All models

### A. Remote Cable Kit

| Inverter Model            | Extension Cable Kit | Cable Length (Meter) |
|---------------------------|---------------------|----------------------|
| All models of RVCF series | RVFSW3001           | 1.0                  |
|                           | RVFSW3003           | 3.0                  |
|                           | RVFSW3005           | 5.0                  |

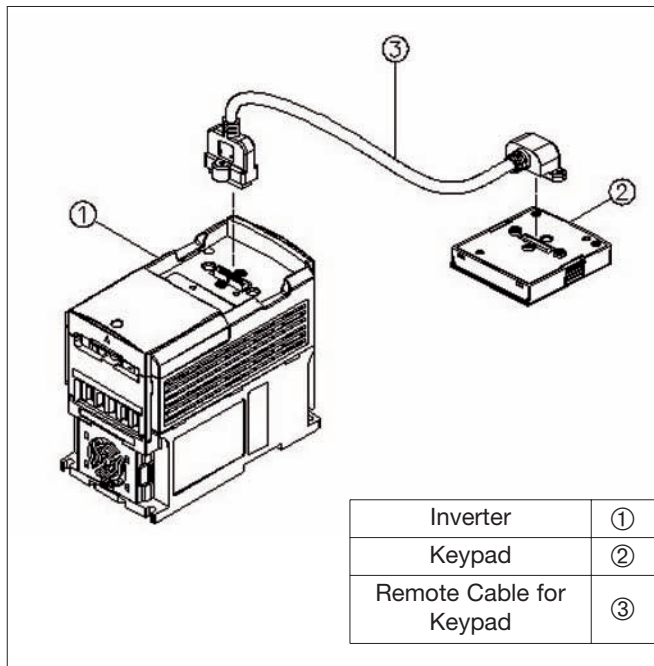
### C. Operation procedure:

Warning: Turn OFF the power supply. The following procedures should be performed after there is no display on the keypad.

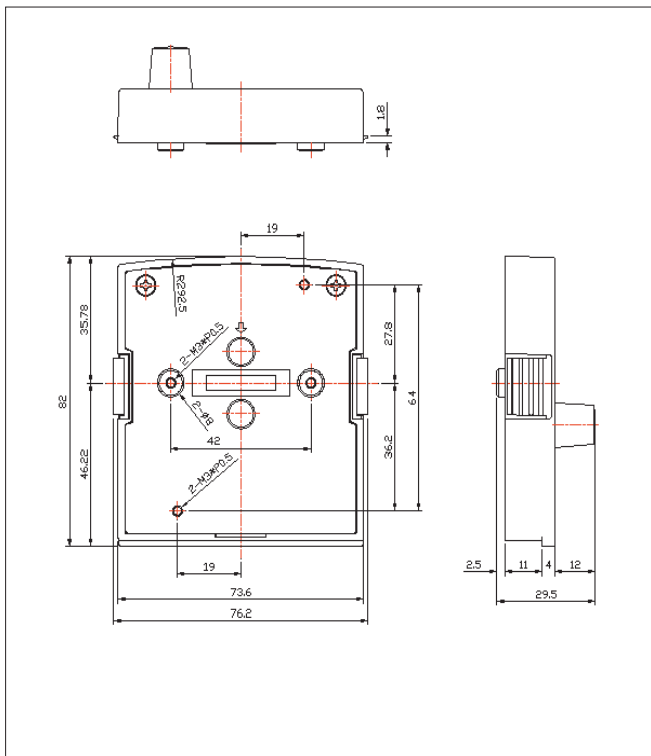
1. Remove the keypad from the Inverter.
2. Please refer to Diagram before mounting the keypad to your machine or Panel.
3. Connect the inverter and the keypad with the remote cable in accordance with the above Diagram.

Supply the power to operate ONLY after all elements are securely fixed.

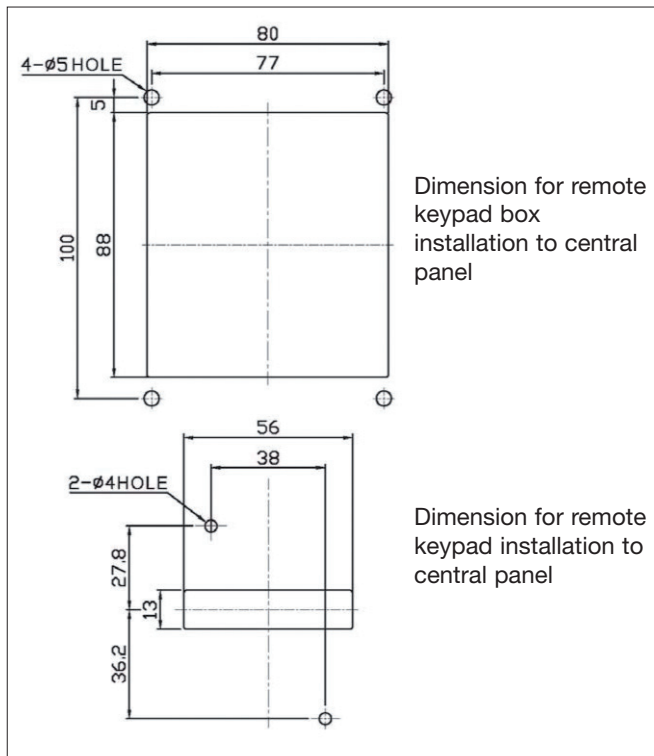
### B. Content



### RVCF Keypad Mounting Dimensions (mm)



### RVCF Keypad Installation Dimensions (mm)



## 6.5 EMC Filter

The inverter adopts rapid switching components to improve the efficiency of the motor and to reduce the motor noise. Using the EMC Filter allows the EMI (Electromagnetic Interference) and RFI (Radio Frequency interference) to be controlled within certain range.

### EMC Directives

The inverter with optional filter complies with the EMC directives 89/336/EEC, limiting the environmental EMI and RFI. Independent tests have demonstrated compliance to the following standards when the optional filters are used.

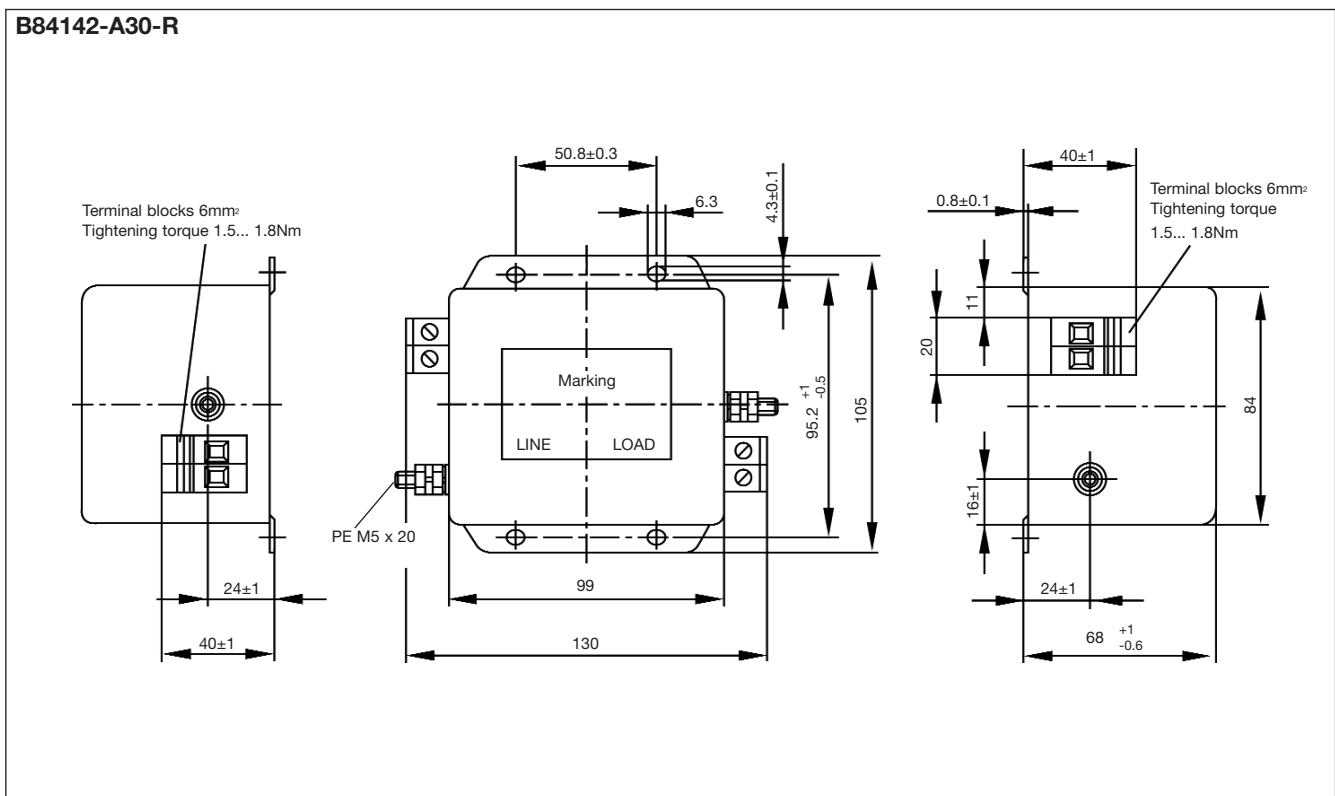
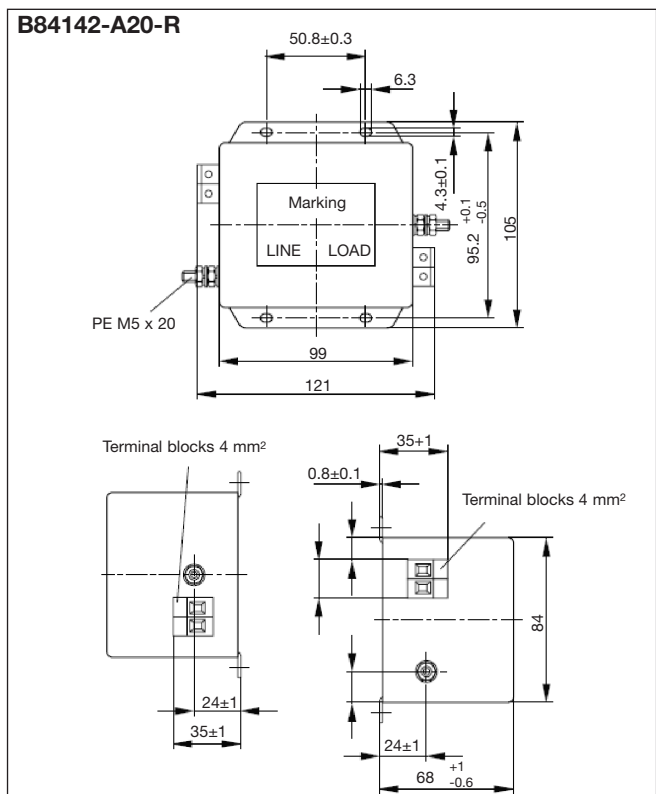
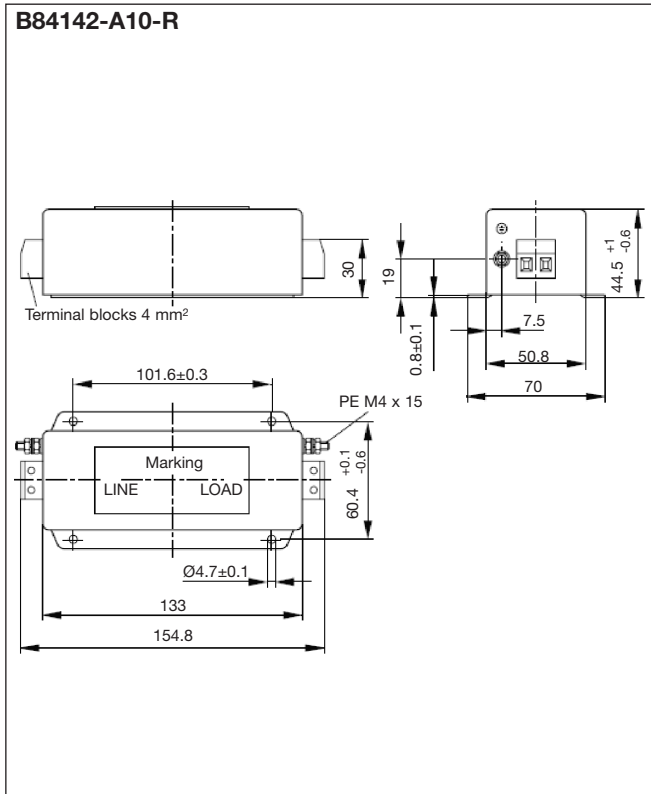
EMI radio standard, EMS immunity standard  
EN 55011, class A / EN 61800-3 category C2

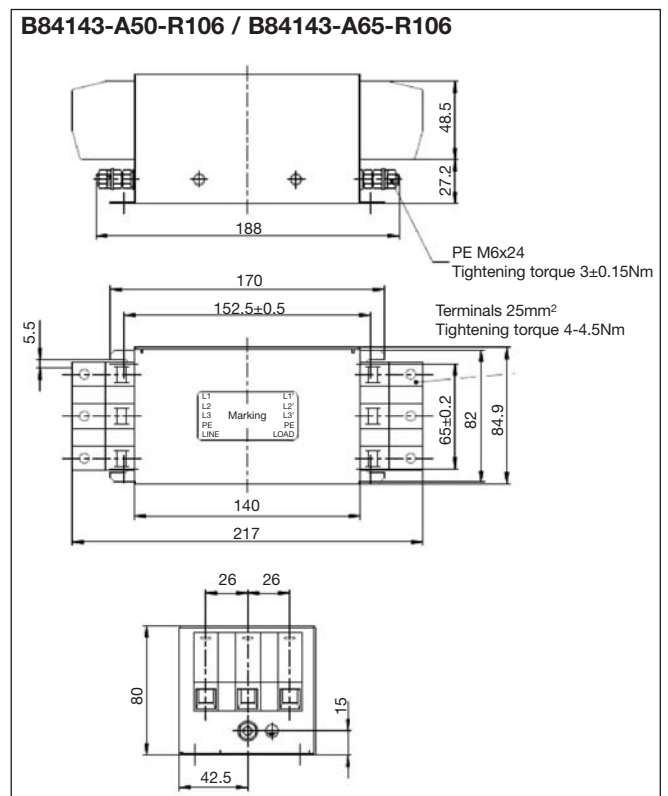
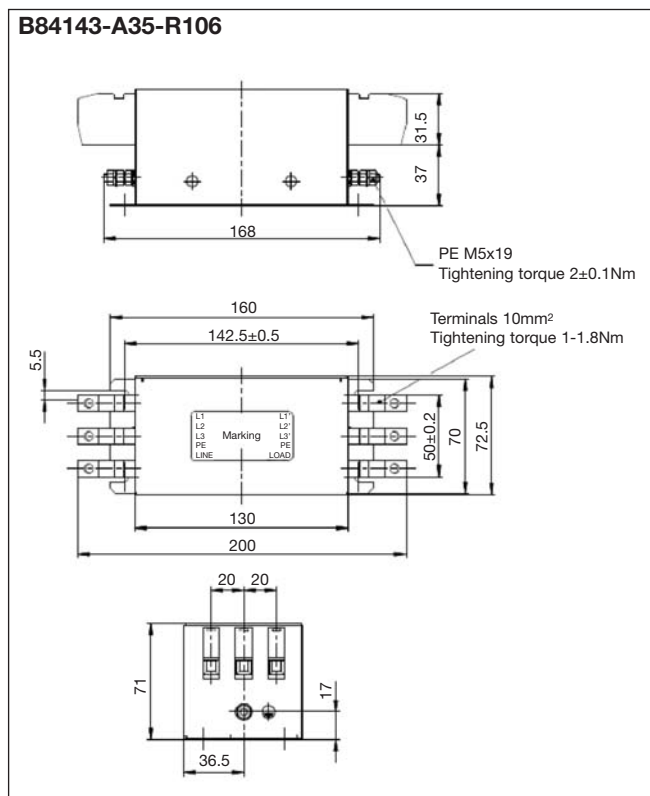
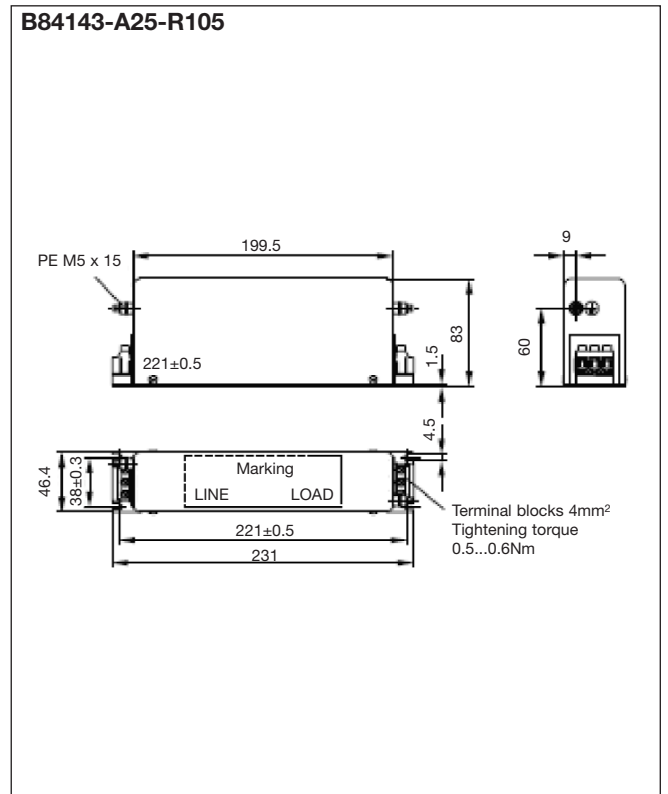
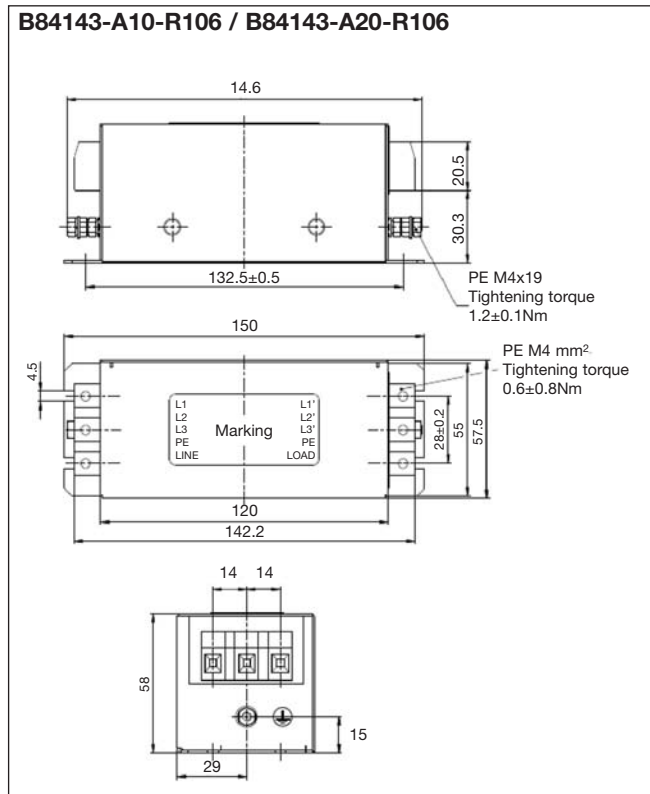
### Filter Selection

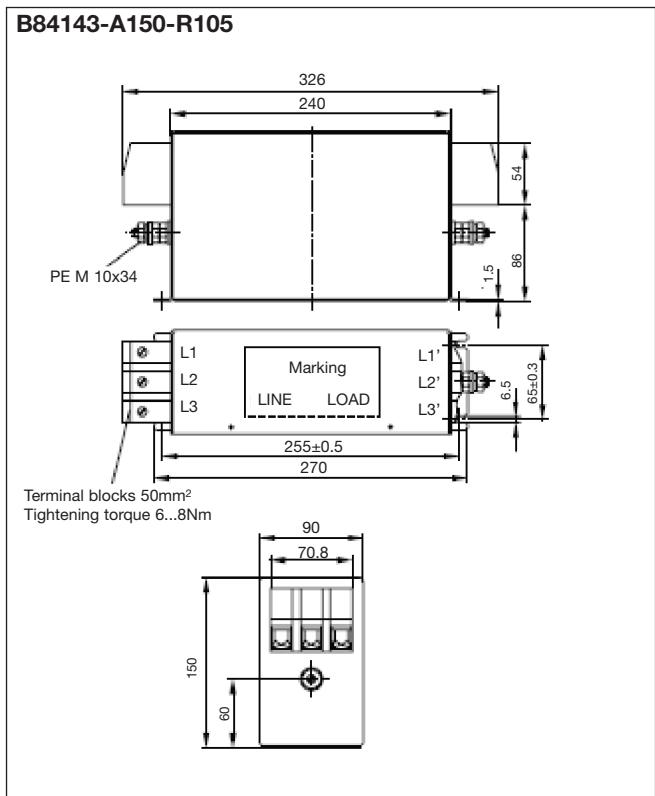
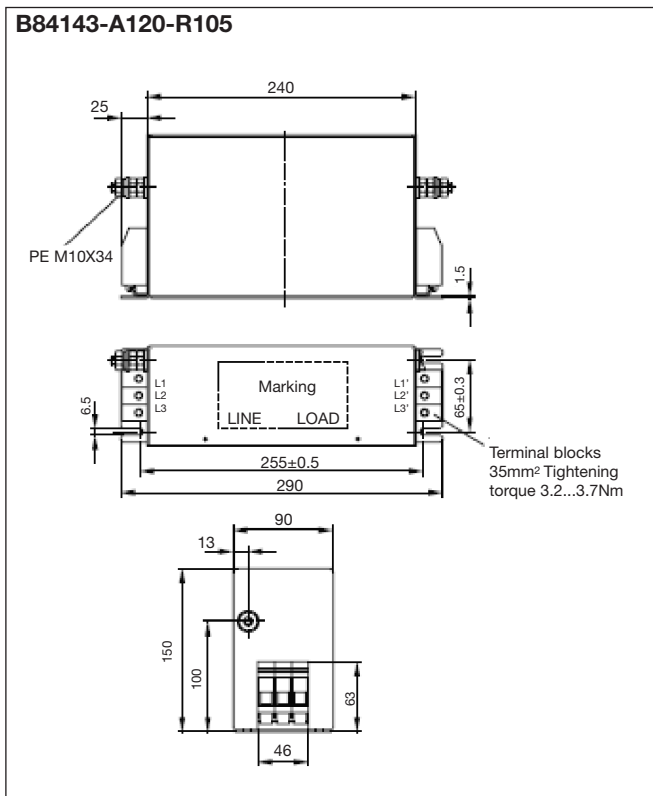
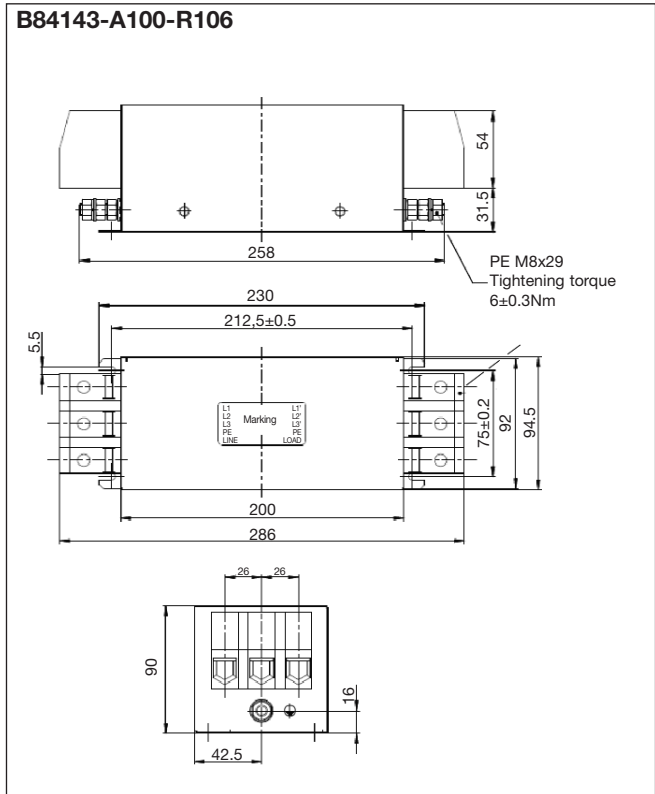
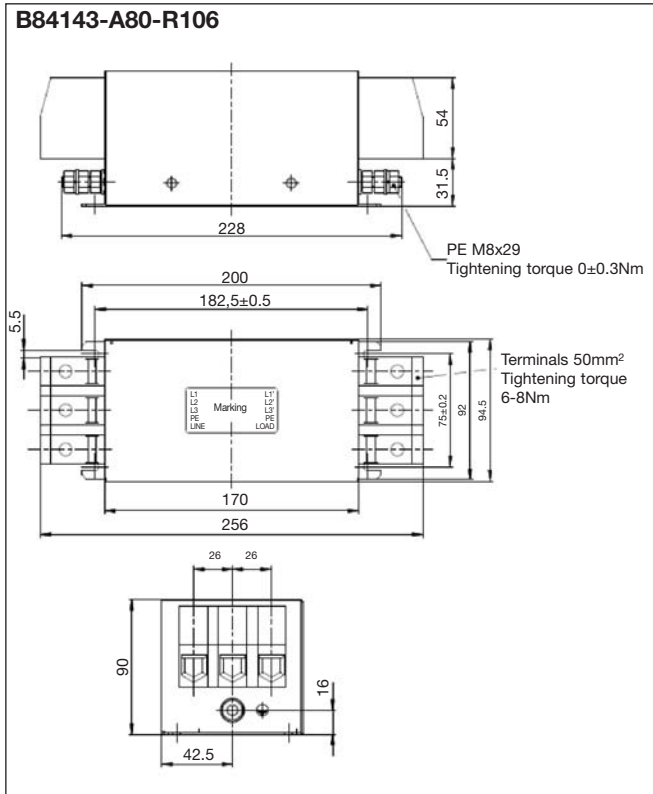
| Drive         |                  |                   | Filter           |                   |
|---------------|------------------|-------------------|------------------|-------------------|
| Model         | Rated power (kW) | Input Current (A) | Model            | Rated Current (A) |
| RVCFA1200040F | 0.4              | 8.5               | B84142-A10-R     | 10                |
| RVCFA1200075F | 0.4              | 8.5               | Built-in         |                   |
| RVCFB1200150F | 0.75             | 12.0              | B84142-A20-R     | 20                |
| RVCFB1200220F | 0.75             | 12.0              | Built-in         |                   |
| RVCFA1200040  | 1.5              | 16.0              | B84142-A20-R     | 20                |
| RVCFA1200075  | 1.5              | 16.0              | Built-in         |                   |
| RVCFB1200150  | 2.2              | 23.9              | B84142-A30-R     | 30                |
| RVCFB1200220  | 2.2              | 23.9              | Built-in         |                   |
| RVCFA3200040  | 0.4              | 4.5               | B84143-A10-R106  | 10                |
| RVCFA3200075  | 0.75             | 6.5               | B84143-A10-R106  | 10                |
| RVCFA3200150  | 1.5              | 11.0              | B84143-A20-R106  | 20                |
| RVCFB3200220  | 2.2              | 12.5              | B84143-A20-R106  | 20                |
| RVCFB3200370  | 3.7              | 20.5              | B84143-A25-R105  | 25                |
| RVCFC3200550  | 5.5              | 33.0              | B84143-A35-R106  | 35                |
| RVCFC3200750  | 7.5              | 42.0              | B84143-A50-R106  | 50                |
| RVCFD3201100  | 11               | 57.0              | B84143-A65-R106  | 65                |
| RVCFD3201500  | 15               | 70.0              | B84143-A80-R106  | 80                |
| RVCFD3201850  | 18.5             | 85.0              | B84143-A100-R106 | 100               |
| RVCFE3202200  | 22               | 108.0             | B84143-A120-R105 | 120               |
| RVCFE3203000  | 30               | 138.0             | B84143-A150-R105 | 150               |

| Drive         |                  |                   | Filter           |                   |
|---------------|------------------|-------------------|------------------|-------------------|
| Model         | Rated power (kW) | Input Current (A) | Model            | Rated Current (A) |
| RVCFA3400075F | 0.75             | 4.2               | B84143-A10-R106  | 10                |
| RVCFA3400150F | 0.75             | 4.2               | Built-in         |                   |
| RVCFB3400220F | 1.5              | 5.6               | B84143-A10-R106  | 10                |
| RVCFB3400370F | 1.5              | 5.6               | Built-in         |                   |
| RVCFC3400550F | 2.2              | 7.3               | B84143-A10-R106  | 10                |
| RVCFC3400750F | 2.2              | 7.3               | Built-in         |                   |
| RVCFC3401100F | 3.7              | 11.6              | B84142-A30-R     | 20                |
| RVCFA3400075  | 3.7              | 11.6              | Built-in         |                   |
| RVCFA3400150  | 5.5              | 17                | B84143-A20-R106  | 20                |
| RVCFB3400220  | 5.5              | 17                | Built-in         |                   |
| RVCFB3400370  | 7.5              | 23.0              | B84143-A25-R105  | 25                |
| RVCFC3400550  | 7.5              | 23.0              | Built-in         |                   |
| RVCFC3400750  | 11               | 31.0              | B84143-A35-R105  | 35                |
| RVCFC3401100  | 11               | 31.0              | Built-in         |                   |
| RVCFD3401500  | 15               | 38.0              | B84143-A50-R106  | 50                |
| RVCFD3401850  | 18.5             | 48.0              | B84143-A50-R106  | 50                |
| RVCFD3402200  | 22               | 56.0              | B84143-A65-R106  | 65                |
| RVCFE3403000  | 30               | 75.0              | B84143-A80-R106  | 80                |
| RVCFE3403700  | 37               | 92.0              | B84143-A100-R106 | 100               |
| RVCFF3404500  | 45               | 112.0             | B84143-A120-R105 | 120               |
| RVCFF3405500  | 55               | 142.0             | B84143-A15-R105  | 150               |

### 6.5.1 EMC Filter Dimensions (mm)

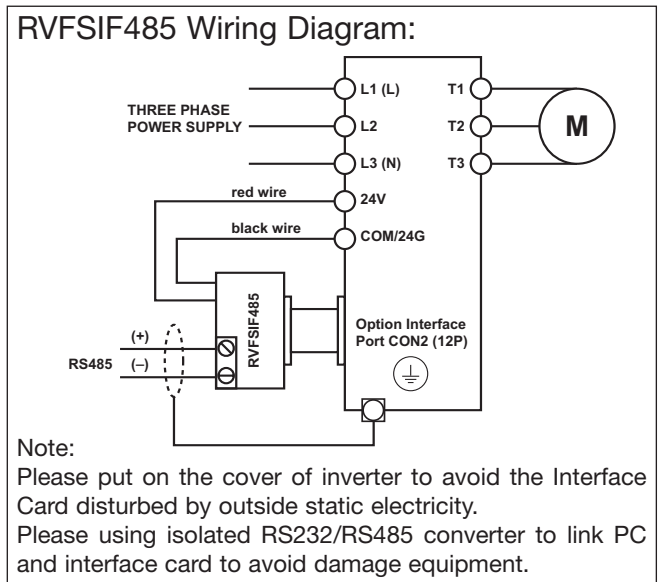
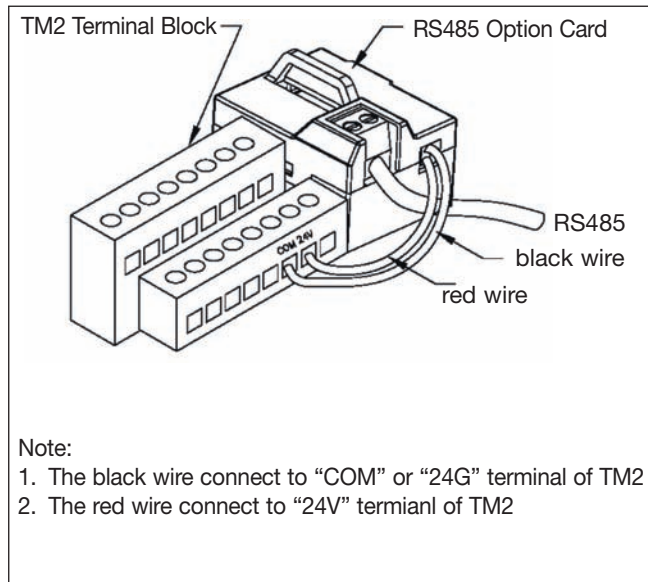




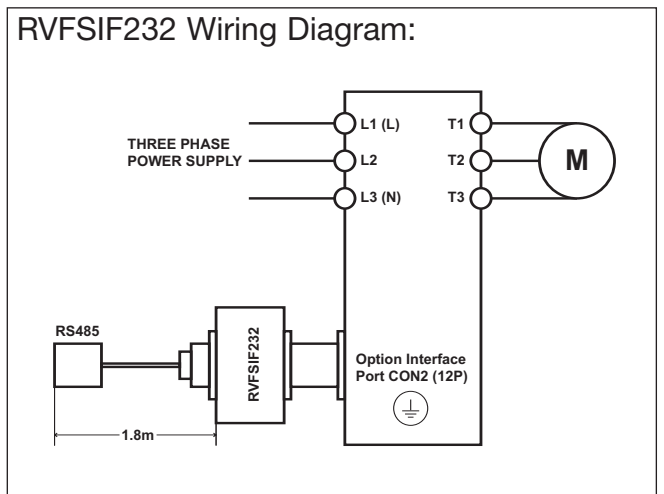
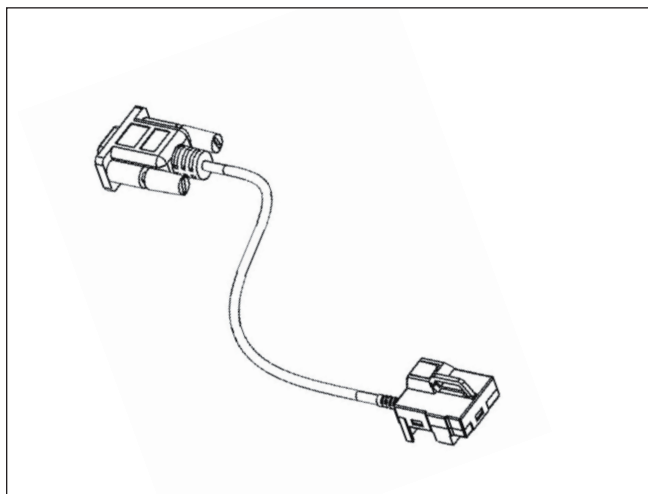


## 6.6 Interface Card

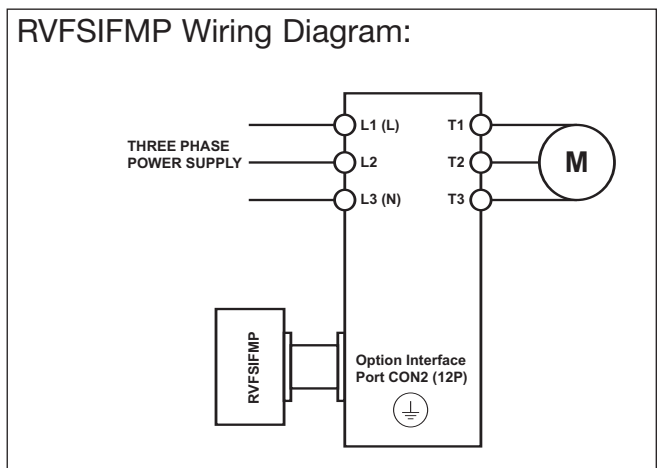
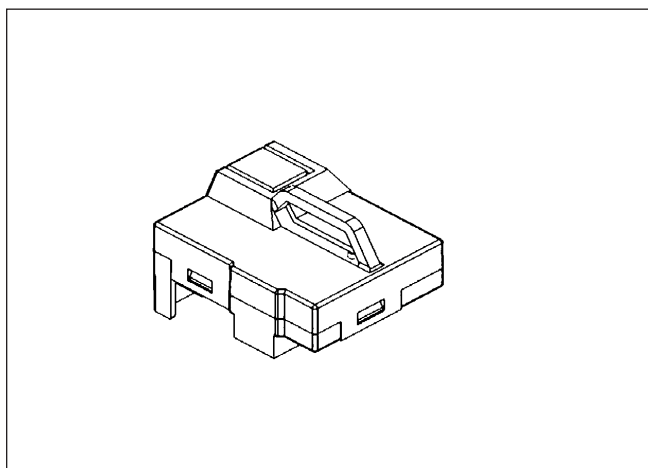
### 6.6.1 RS-485 Interface Card ( Model: RVFSIF485 )



### 6.6.2 RS-232 Interface Card (Model: RVFSIF232)



### 6.6.3 Program Copy Unit (Model: RVFSIFMP)



# Appendix 1:

## RVCF Motor Internal Parameter List



Factory Setting of the Motor Internal Parameters:

| Parameter Model                              | 14-0<br>(Stator Resistance) | 14-1<br>(Rotor Resistance) | 14-2<br>(Equivalent Inductance) | 14-3<br>(Magnetization Current) | 14-4<br>(Iron Loss Conductance) |     |
|----------------------------------------------|-----------------------------|----------------------------|---------------------------------|---------------------------------|---------------------------------|-----|
| RVCFA1200040<br>RVCFA3200040                 | 400                         | 350                        | 800                             | 7200                            | 205                             |     |
| RVCFA1200075<br>RVCFA3200075<br>RVCFA3400075 | 380                         | 300                        |                                 |                                 |                                 |     |
| RVCFB1200150<br>RVCFA3200150<br>RVCFA3400150 | 300                         | 280                        |                                 |                                 |                                 |     |
| RVCFB1200220<br>RVCFB3200220<br>RVCFB3400220 | 280                         | 240                        |                                 | 4100                            |                                 |     |
| RVCFB3200370<br>RVCFB3400370                 | 260                         | 200                        |                                 |                                 |                                 |     |
| RVCFC3200550<br>RVCFC3400550                 | 240                         | 160                        |                                 |                                 |                                 |     |
| RVCFC3200750<br>RVCFC3400750                 | 220                         | 150                        |                                 |                                 |                                 |     |
| RVCFD3201100<br>RVCFC3401100                 | 200                         | 140                        |                                 | 180                             |                                 | 130 |
| RVCFD3201500<br>RVCFD3401500                 |                             |                            |                                 |                                 |                                 |     |
| RVCFD3201850<br>RVCFD3401850                 |                             |                            |                                 |                                 |                                 |     |
| RVCFE3202200<br>RVCFD3402200                 |                             |                            |                                 |                                 |                                 |     |
| RVCFE3203000<br>RVCFE3403000                 |                             |                            |                                 |                                 |                                 |     |
| RVCFE3403700                                 |                             |                            |                                 |                                 |                                 |     |
| RVCFF3404500<br>RVCFF3405500                 |                             |                            |                                 |                                 |                                 |     |

Note:

1. The above motor internal parameters are idle under V/F Control Mode. These parameters are usable under sensorless control mode.
2. The motor parameters (14-0~14-4) are not be modified when factory setting under sensorless mode. The internal parameters after auto-tuning will be maintained.
3. The motor parameters (14-0~14-4) will be modified to factory setting completely after changing the Drive Horsepower code (15-0).

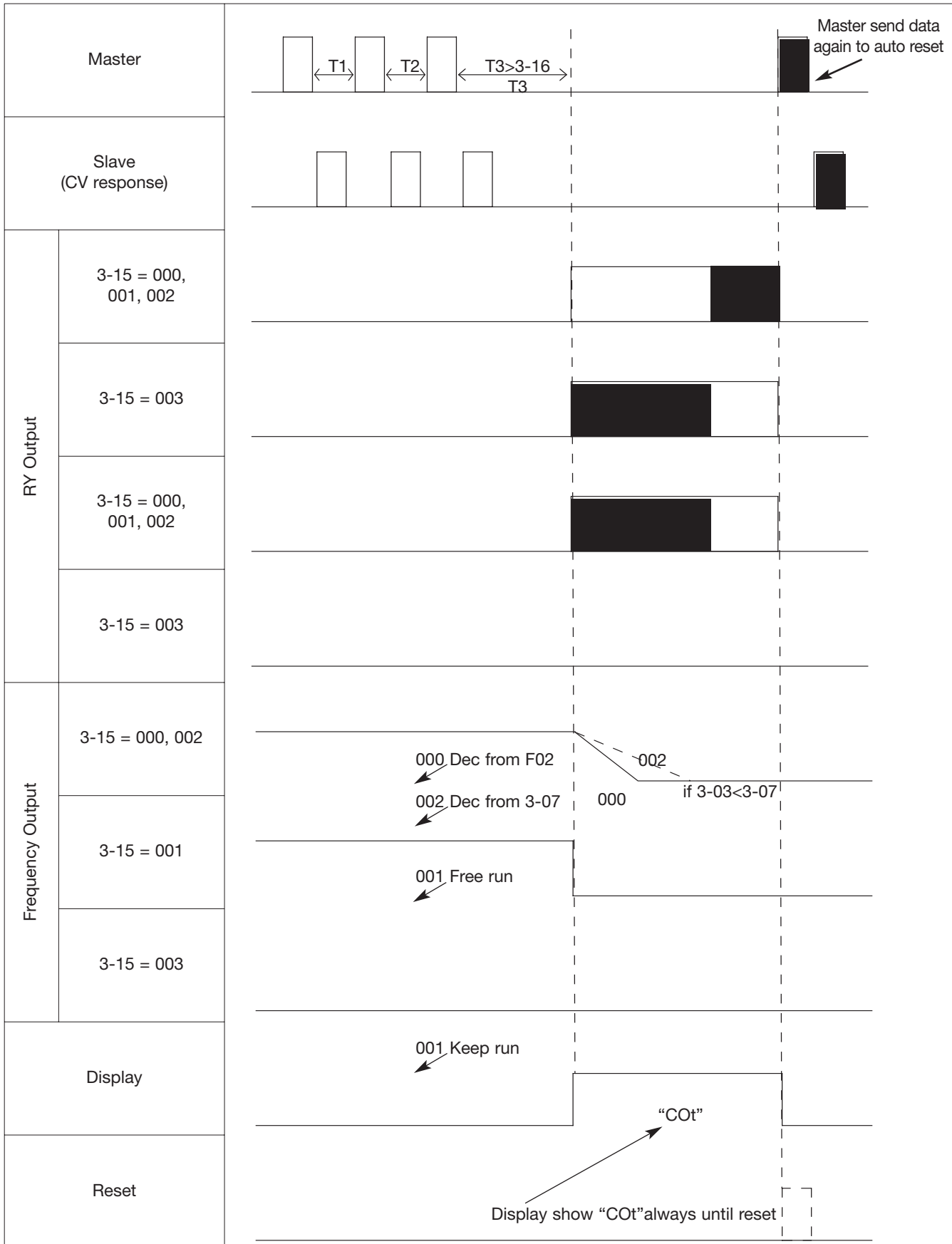


# Appendix 2: RVCF parameter setting list



| Customer       |                 |                |                 |                |                 |                | Inverter Model  |  |
|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|--|
| Using Site     |                 |                |                 |                |                 |                | Contact Phone   |  |
| Address        |                 |                |                 |                |                 |                |                 |  |
| Parameter Code | Setting Content | Parameter Code | Setting Content | Parameter Code | Setting Content | Parameter Code | Setting Content |  |
| 0-00           |                 | 3-14           |                 | 6-06           |                 | 10-07          |                 |  |
| 0-01           |                 | 3-15           |                 | 6-07           |                 | 10-08          |                 |  |
| 0-02           |                 | 3-16           |                 | 6-08           |                 | 10-09          |                 |  |
| 0-03           |                 | 3-17           |                 | 7-00           |                 | 11-00          |                 |  |
| 0-04           |                 | 3-18           |                 | 7-01           |                 | 11-01          |                 |  |
| 0-05           |                 | 3-19           |                 | 7-02           |                 | 11-02          |                 |  |
| 0-06           |                 | 3-20           |                 | 7-03           |                 | 11-03          |                 |  |
| 0-07           |                 | 3-21           |                 | 7-04           |                 | 11-04          |                 |  |
| 0-08           |                 | 3-22           |                 | 7-05           |                 | 11-05          |                 |  |
| 1-00           |                 | 3-23           |                 | 8-00           |                 | 11-06          |                 |  |
| 1-01           |                 | 3-24           |                 | 8-01           |                 | 11-07          |                 |  |
| 1-02           |                 | 3-25           |                 | 8-02           |                 | 12-00          |                 |  |
| 1-03           |                 | 3-26           |                 | 8-03           |                 | 12-01          |                 |  |
| 1-04           |                 | 3-27           |                 | 8-04           |                 | 12-02          |                 |  |
| 1-05           |                 | 3-28           |                 | 8-05           |                 | 12-03          |                 |  |
| 1-06           |                 | 3-29           |                 | 9-00           |                 | 12-04          |                 |  |
| 1-07           |                 | 4-00           |                 | 9-01           |                 | 12-05          |                 |  |
| 2-00           |                 | 4-01           |                 | 9-02           |                 | 12-06          |                 |  |
| 2-01           |                 | 4-02           |                 | 9-03           |                 | 13-00          |                 |  |
| 2-02           |                 | 4-03           |                 | 9-04           |                 | 13-01          |                 |  |
| 2-03           |                 | 4-04           |                 | 9-05           |                 | 13-02          |                 |  |
| 2-04           |                 | 4-05           |                 | 9-06           |                 | 13-03          |                 |  |
| 2-05           |                 | 5-00           |                 | 9-07           |                 | 13-04          |                 |  |
| 2-06           |                 | 5-01           |                 | 9-08           |                 | 13-05          |                 |  |
| 3-00           |                 | 5-02           |                 | 9-09           |                 | 13-06          |                 |  |
| 3-01           |                 | 5-03           |                 | 9-10           |                 | 14-00          |                 |  |
| 3-02           |                 | 5-04           |                 | 9-11           |                 | 14-01          |                 |  |
| 3-03           |                 | 5-05           |                 | 9-12           |                 | 14-02          |                 |  |
| 3-04           |                 | 5-06           |                 | 9-13           |                 | 14-03          |                 |  |
| 3-05           |                 | 5-07           |                 | 9-14           |                 | 14-04          |                 |  |
| 3-06           |                 | 5-08           |                 | 9-15           |                 | 15-00          |                 |  |
| 3-07           |                 | 5-09           |                 | 10-00          |                 | 15-01          |                 |  |
| 3-08           |                 | 6-00           |                 | 10-01          |                 | 15-02          |                 |  |
| 3-09           |                 | 6-01           |                 | 10-02          |                 | 15-03          |                 |  |
| 3-10           |                 | 6-02           |                 | 10-03          |                 | 15-04          |                 |  |
| 3-11           |                 | 6-03           |                 | 10-04          |                 | 15-05          |                 |  |
| 3-12           |                 | 6-04           |                 | 10-05          |                 | 15-06          |                 |  |
| 3-13           |                 | 6-05           |                 | 10-06          |                 |                |                 |  |

# Appendix 3: RVCF Communication Time-out Table



# Appendix 4: CE certificate



**CARLO GAVAZZI**  
Automation Components

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## CE Declaration of Conformity

We, Manufacturer, **CARLO GAVAZZI LOGISTICS S.p.A.**, located at Via Milano,13  
20020 Lainate ( ITALY ), declare under our own responsibility that the products here listed

### ***RVCF series of Motor Controllers Variable Frequency AC Drives***

are in conformity with

**The Low-Voltage Directive 73/23/EEC, as amended by 93/68/EEC,**

**The EMC Directive 89 / 336 / EEC,**

**referring to the below listed standards**

EN 61800-5-1: Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy

EN 61800-3: Adjustable speed electrical power drive systems. EMC requirements and specific test methods.

EN 61000-6-2: Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-4: Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments

EN 61000-3-2: Electromagnetic compatibility (EMC). Limits. Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)

EN 61000-3-3 Electromagnetic Compatibility (EMC). Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current less than or equal to 16 A per phase and not subject to conditional connection

**Compliance with these directives will require the application of a correct installation, maintenance and use conforming to intended purpose of the product, following the supplier's instructions and accepted rules of the art. The product must be installed and connected by skilled personnel who are authorised to be responsible for the safety of the equipment, at all times, even whilst carrying out their normal duties, and are therefore aware of, and can report, possible safety hazards.**



CE marking

**Design and manufacturing follows the provisions of the Low Voltage Directive of the European Communities as of February 19. 1973 as changed by 93 / 68 / EEC and the EMC Directive 89 / 336 / EEC as changed by 92 / 31 / EEC and 93 / 68 / EEC.**

Manufacturer




Place / Date : Lainate , November, 19th / 2008

Signature :

Name : Graziano Padovan

## Appendix 5: Approvals Table - UL Listing and CE certification Information



|                                                                                   |                    |              |                          |
|-----------------------------------------------------------------------------------|--------------------|--------------|--------------------------|
|  | CE approval        | Europe       | See attached certificate |
|  | UL / cULs approval | USA & Canada | File number<br>E319186   |
|  | RoHS               | -            | -                        |

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