CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

VariFlex^2

RVEF series

Advanced User Manual

110V Class 1ph	0,20~0,75kW 0,2~1HP
220V Class 1ph or 3ph	0,2~2.2kW 0,2~3HP
440V Class 3ph	0,75~2,2kW 1~3HP

Switch

General Information

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.

Drive Software Version

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

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 RVEF 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:

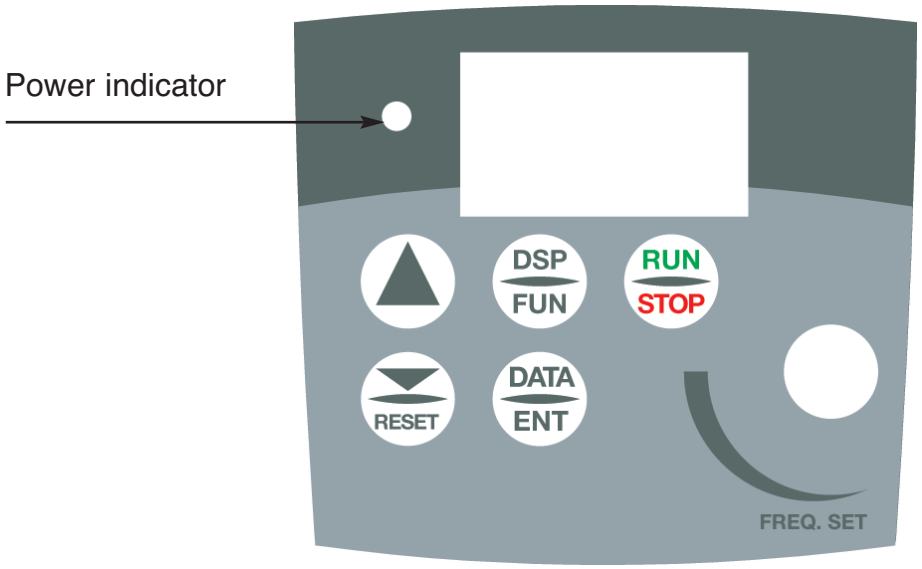
- The model and capacity of the inverter are the same as those specified in your purchase order.
- Check where there are any damages caused by transportation. Please do not apply the power, and do contact Carlo Gavazzi's sales representatives if any of the above problems happened.

Step 1 Before starting the inverter

Please review Introduction and Safety Precautions of the RVEF 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.**

a. Verify that AC power is wired to L1, L2, and L3.
b. 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).
C. If brake module is necessary, please connect terminal voltage of the braking unit to + and - of the inverter.



Step 2 Apply power to the drive.

- Apply AC power to the drive and observe operator. Three 7-segment display should show power voltage for 3~5 seconds and then show Frequency Command, factory sets 5.00. Frequency Command of 7-segment display should be flashed all the time.

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Step 3 Check motor rotation without load.

- Press RUN Key. 7-segment Display will indicates 00.0 to 05.0. Such value is the frequency output value.
- Check motor rotation. If the direction of the motor is incorrect:
  Press STOP Key, turn off the AC power supply. After Power indicator LED is off, change over the T1 and T2. Supply the power again, then check the motor direction.
- Press STOP key to stop the drive.

Step 4 Check full speed at 50Hz/60Hz

- Change the frequency with ▲ ▼ arrow mark, please press DATA/ENTER after setting frequency.
- Set frequency to 50Hz/60Hz according to the above regulations.
- Press RUN Key, check drive acceleration to full speed.
- Press STOP Key, to stop drive and check deceleration.

Step 5 Other settings

Please refer to the following page:

Step 6 Sensorless mode setting

When the RVEF inverter is set to run in Sensorless Mode (C14=000), the motor parameters needs to be set. The required information should be readily available on the nameplate of the motor (0.75 kW=1HP).
The parameters to set for sensorless operation are:

Additional Sensorless Mode Settings to adjust for optimum operations are:

Table of Contents

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.

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Chapter 1: Safety Precautions

1.1 Before Power ON

Caution
The line voltage applied must comply with the inverter's specified input voltage. (See the nameplate).

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

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 installing the remote keypad, 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, see the fuse table in this manual.

1.2 During Power ON

Danger

- The inverter still has control power immediately after power loss. When the power is re-supplied, the inverter operation is controlled by F41.
- The inverter operation is controlled by F04 and C09 and the status of (FWD/REV RUN switch) when power is re-supplied. (F39/F40) Power loss ride through / Auto reset after fault).
  1. When F04=000, the inverter will not auto restart when power is re-supplied.
  2. When F04=001 and operation switches (FWD/REV RUN) is OFF, the inverter will not auto restart when power is re-supplied.
  3. When F04=001 and operation switch ON and C09=000, the inverter will auto restart when power is re-supplied. Please turn OFF the run (start) switch to avoid damage to machine and injury to personnel before the power is re-supplied.
- When C09=000 (direct start on power up), please refer to the description and warning for C09 (Page 4-27) to verify the safety of operator and machine.

1.3 Before Operation

Caution

Make sure the model and inverter capacity match the F00 parameter setting.

1.4 Leakage Current

Warning

RVEF series built-in filter type leakage current can exceed the IEC standard limit of 3.5mA. Please ground the inverter.

Operation with ungrounded supplies:

1. Filtered inverters CANNOT be used on ungrounded supplies.
2. Unfiltered inverters can be used on ungrounded supplies. If any output phase is shorted to ground, the inverter may trip with OC (over current trip).

Operation with Residual Current Device (RCD):

1. A filtered inverter with the trip limit of the RCD is 300mA
2. The neutral of the supply is grounded, as is the inverter.
3. Only one inverter is supplied from each RCD.

1.5 During Operation

Danger

Do not connect or disconnect the motor while inverter is operating the motor. The inverter and the disconnect device can sustain damage from high levels of switch-off current transients.

Danger

- To avoid electric shock, do not take the front cover off while power is on.
- The motor will restart automatically after stop when auto-restart function is enabled. In this case, care must be taken while working around the drive and associated equipment.
- Note: the operation of the stop switch is different than that of the emergency stop switch. The stop switch has to be activated to be effective. Emergency stop has to be de-activated to become effective.

Caution

- Do not touch heat-generating components such as heat sinks and brake resistors.
- The inverter can drive the motor from low speed to high speed. Verify the allowable speed ranges of the motor and the associated machinery.
- Note the settings related to the braking unit.
- Do not check signals on circuit PCB while the inverter is running.

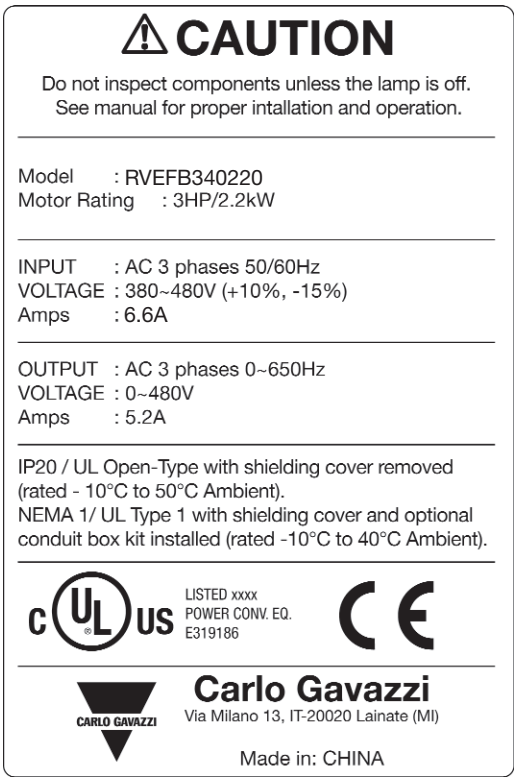
1.6 Useable Environment

Caution

When the inverter top dust cover has been removed the drive can be installed in a non-condensing environment with temperature ranging between –10°C to +50°C and relative humidities of 95% or less, but the environment should be free from water and metal dust.

Chapter 2
Model description

2.1 Label description



Inverter model

Input power

Output power

2.2 Ordering Key

RVEF A 1 20 075 F

- **VariFlex² AC Drive**
- **Frame Size**
- **AC Supply Phase**
- **Drive voltage Rating**
- **Driwe kW Rating**
- **Options**

2.3 Type Selection

Voltage rating	Output voltage	Motor size		Model	Dimension
		kW	HP		
100-120VAC (+10% -15%) 1-Phase	0÷240V 3-Phase 0.1÷200Hz	0.20	0.25	RVEFA110020	A
		0.40	0.50	RVEFA110040	A
		0.75	1.0	RVEFA110075	A
200-240VAC (+10% -15%) 1-Phase		0.20	0.25	RVEFA120020(F)	A
		0.40	0.50	RVEFA120040(F)	A
		0.75	1.0	RVEFA120075(F)	A
		1.5	2.0	RVEFB120150(F)	B
		2.2	3.0	RVEFB120220(F)	B
200-240VAC (+10% -15%) 3-Phase		0.20	0.25	RVEFA320020	A
		0.40	0.50	RVEFA320040	A
		0.75	1.0	RVEFA320075	A
		1.5	2.0	RVEFB320150	B
		2.2	3.0	RVEFB320220	B
380-480VAC (+10% -15%) 3-Phase	0÷480V 3-Phase 0.1÷200Hz	0.75	1.0	RVEFB340075	B
		1.5	2.0	RVEFB340150	B
		2.2	3.0	RVEFB340220	B

Chapter 3 Ambient environment and installation

3.1 Environment

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

- Ambient temperature: -10°C ~ +50°C (14 ~ 122°F).
- 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 radio active and flammble materials.
- Avoid electromagnetic interference (soldering machines, power machine).
- Avoid vibration (stamping, punchpress). Add a vibration-proof pad if the situation can not be avoided.
- If several inverters are placed in the same control panel, provide heat remoual means to maintain the temperature below 50°C.

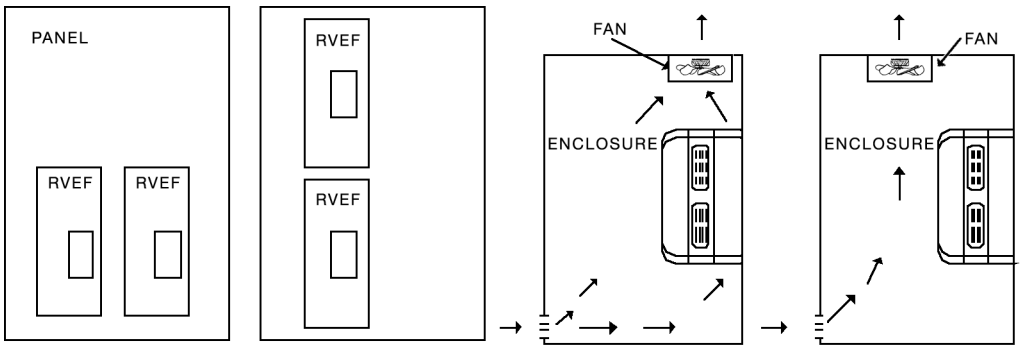


Figure 3-1 Panel and enclosure arrangement for drives

- Place the front side of the inverter outward and the top upward to improve heat dissipation.

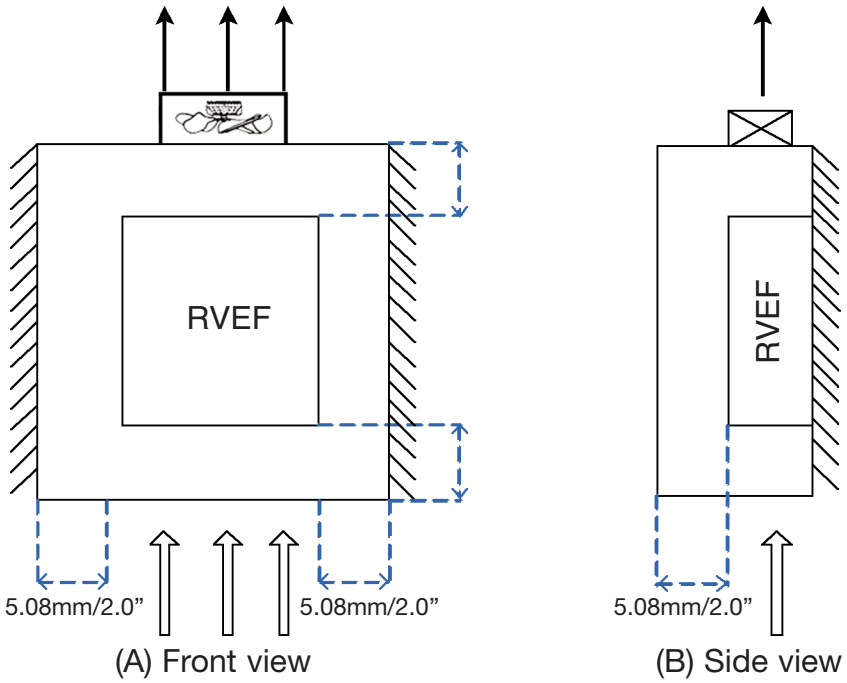
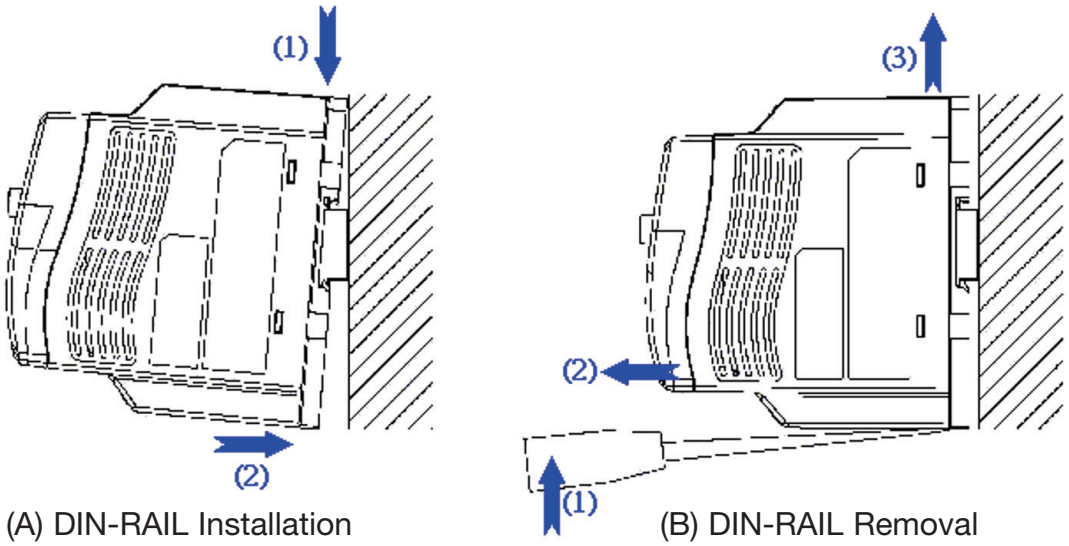


Figure 3-2 Mounting and clearance requirements

- All RVEF drives in IP-20 Enclosures can be DIN-RAIL mounted as shown below.



(A) DIN-RAIL Installation (B) DIN-RAIL Removal

Figure 3-3 Din-rail mounting of the RVEF drive

- All RVEF Drives in IP-20 enclosures can be mounted side-by-side as shown below. (ambient temperature below 50°C).

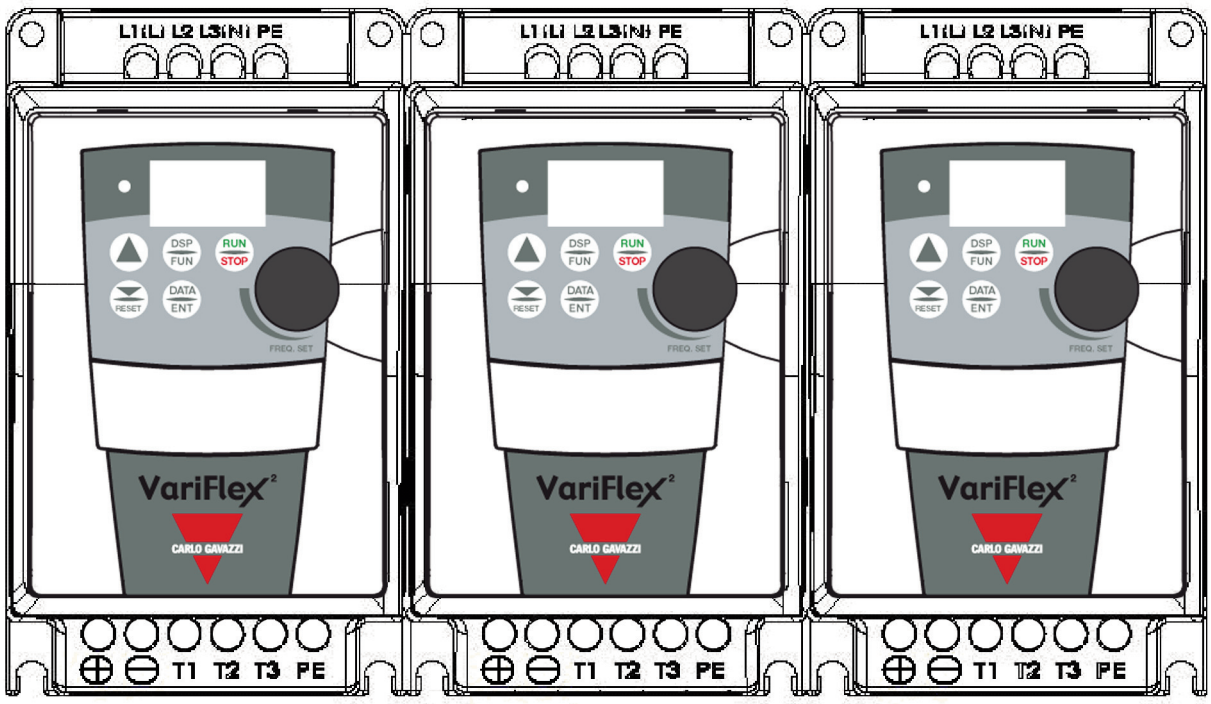
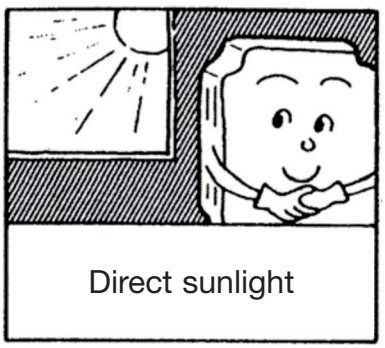
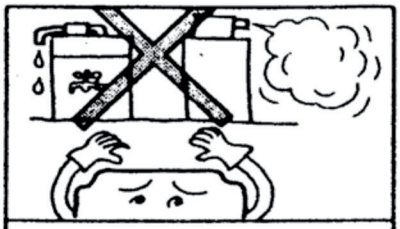


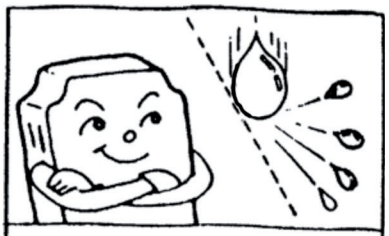
Figure 3-4 Side-by-side mounting of the RVEF drive

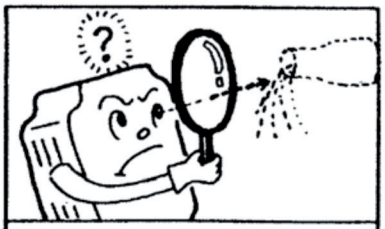
3.2 Mounting and installation

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

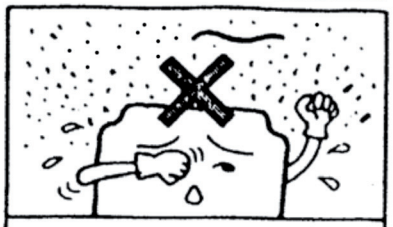

Direct sunlight

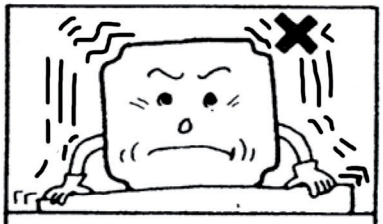

Corrosive gas and liquid

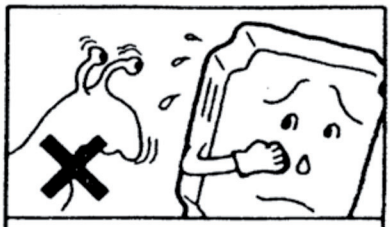

Oil Mist

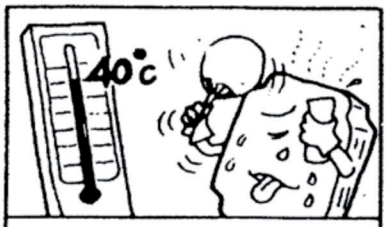

Salt


Wind, rain, and water drops may get into

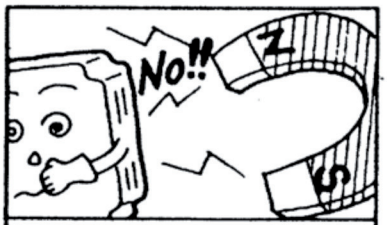

Iron filings, dust


Strong vibration

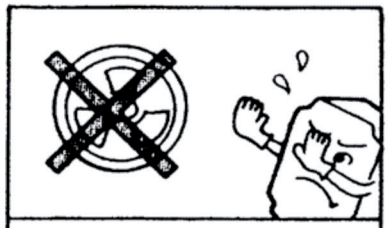

Extreme low temperature

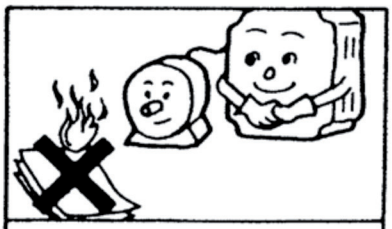


Excessive high temperature



Electromagnetic wave and ultra high wave
(Near an electric welding machine)


Radioactive materials


Inflammable materials

3.3 Wiring Rules

3.3.1 Notice for wiring

A. Screwdriver torque:

Connect cables with a screwdriver or other suitable tools per the tightening torques listed below.

Securing torque			
Horsepower	**Power source**	**Tightening torque for TM1 terminal**	
0.25/0.5/1	100-120V	0.74/0.1 (LBS-FT/KG-M)	8.66/10 (LBS-FT/KG-M)
0.25/0.5/1	200-240V		
2/3	200-240V	1.286/0.18 (LBS-FT/KG-M)	15.97/18 (LBS-FT/KG-M)
1/2/3	380-480V		

B. Power wires:

Power wires are connecting to L1, L2, L3, T1, T2, T3 and PE. 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	Volts	Amps
0.25/0.5	100-120V	600V	15A
0.25/0.5/1	200-240V		
2/3	200-240V		40A
1/2/3	380-480V		

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

3.3.2 Fuse Types

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 RVEF input fuse ratings. To protect the inverter most effectively, use fuses with current-limit function (RK5, CC/T type fuse for RVEF).

Model	Motor Rating		Max Fuse Rating (A)	
	kW	HP	RK5 fuse	CC or T fuse
RVEFA110020	0.20	0.25	10	20
RVEFA110040	0.40	0.50	15	30
RVEFA110075	0.75	1.0	20	40
RVEFA120020	0.20	0.25	8	15
RVEFA120040	0.40	0.50	10	20
RVEFA120075	0.75	1.0	15	30
RVEFB120150	1.5	2.0	20	40
RVEFB120220	2.2	3.0	25	50
RVEFA320020	0.20	0.25	5	8
RVEFA320040	0.40	0.50	8	10
RVEFA320075	0.75	1.0	12	15
RVEFB320150	1.5	2.0	15	20
RVEFB320220	2.2	3.0	20	30
RVEFB340075	0.75	1.0	6	10
RVEFB340150	1.5	2.0	10	15
RVEFB340220	2.2	3.0	10	20

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 injure 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

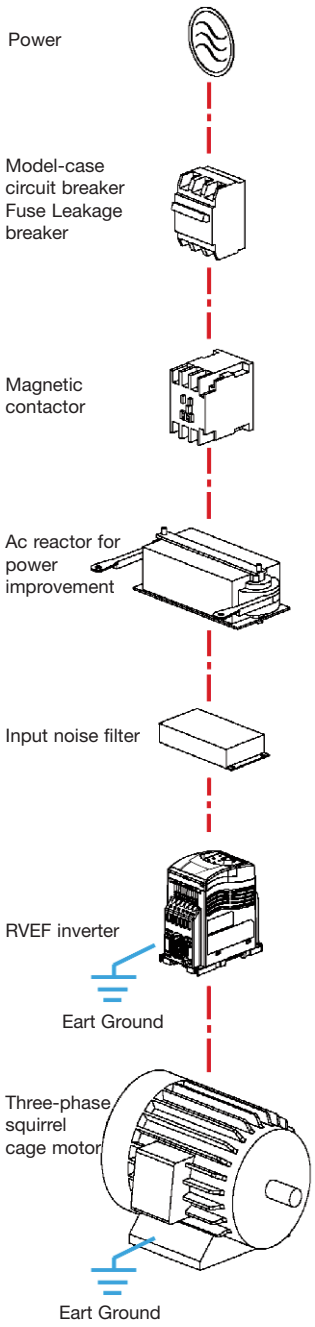
Molded-case circuit breaker/magnetic contactor

- 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.

RVEF Model	Molded-case circuit breaker (max Amp)	Main circuit terminals (TM1)	Signial terminals (TM2)
RVEFA110020	10A (at 300V)	Wire gauge 2mm^2 (14 AWG) terminal screw M4	Wire gauge 0.75mm^2 (18 AWG), terminal screw M3
RVEFA110040			
RVEFA120020(F)			
RVEFA120040(F)			
RVEFA320020			
RVEFA320040			
RVEFA110075	20A (at 300V)		
RVEFA120075(F)			
RVEFA320075			
RVEFB120150(F)	30A (at 300V)		
RVEFB320150			
RVEFB120220(F)		Wire gauge 3.5mm^2 (12 AWG), terminal screw M4	
RVEFB320220			
RVEFB340075(F)	15A (at 600V)	Wire gauge 2.0mm^2 (14 AWG), terminal screw M4	
RVEFB340150(F)			
RVEFB340220(F)			

- Use a single fuse for 1-phase L/N model. For 3-phase models, each L1(L)/L2/L3(N) phase must be fused.
- Please use three phase squirrel cage induction motor with appropriate capacity for inverter.
- If the inverter is used to drive more than one motor, the total capacity must be smaller than the capacity of the AC drive. Additional thermal overload relays must installed in front of each motor.
- Do not install phase advancing capacitors, LC, or RC components between inverter and motor.

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 primiary 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 are supplied with high capacity (above 600kVA) power source, 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 17.

Input noise filter:

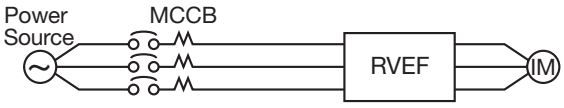
- A filter must be installed when there are inductive load around the inverter.

Inverter:

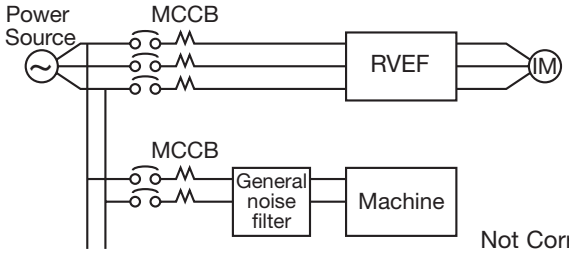
- Input power terminals L1, L2, and L3 can be used in any sequence regardless of phases.
- Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor. If the motor is reversed while the inverter is forward, just swap any two terminals of T1, T2, and T3.
- To avoid damaging the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

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

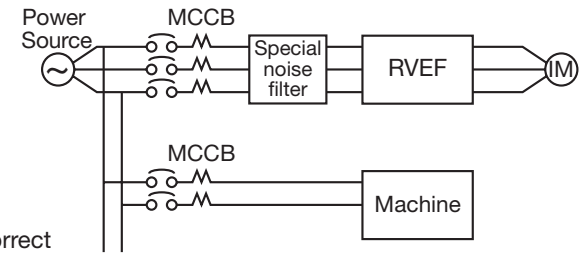


Correct

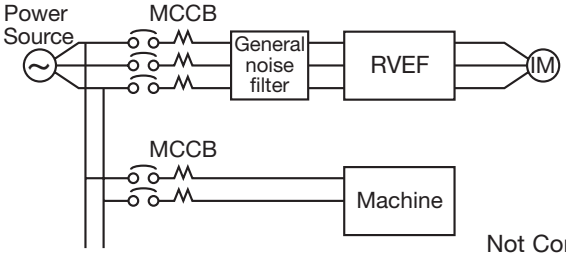


Not Correct

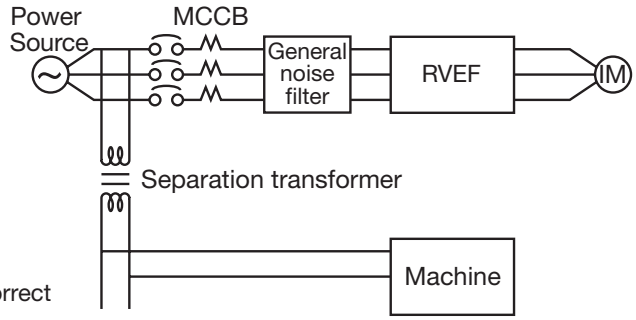
- Add a noise filter or separation transformer whenter shares the power line with other machines.



Correct



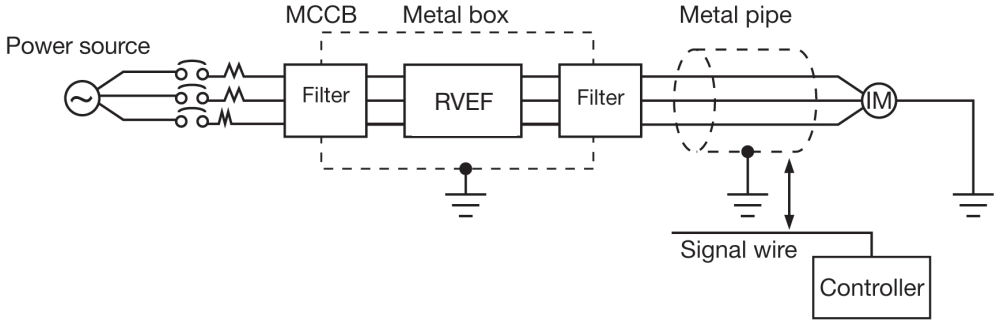
Not Correct



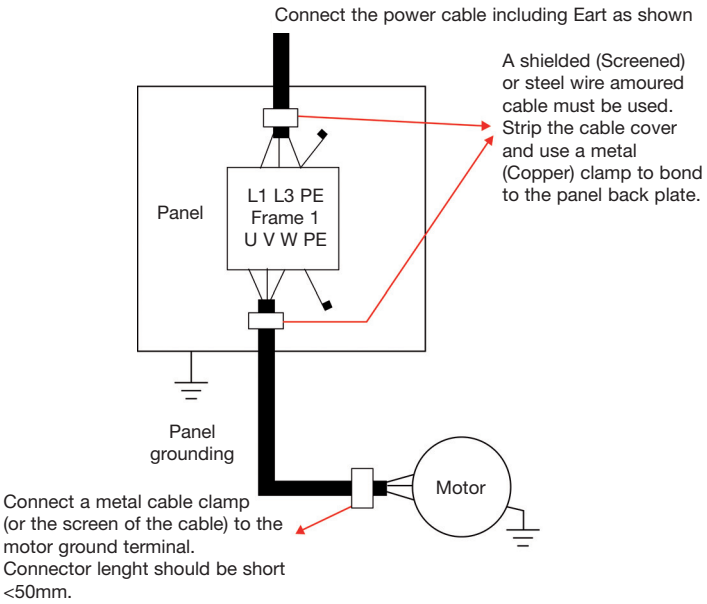
Correct

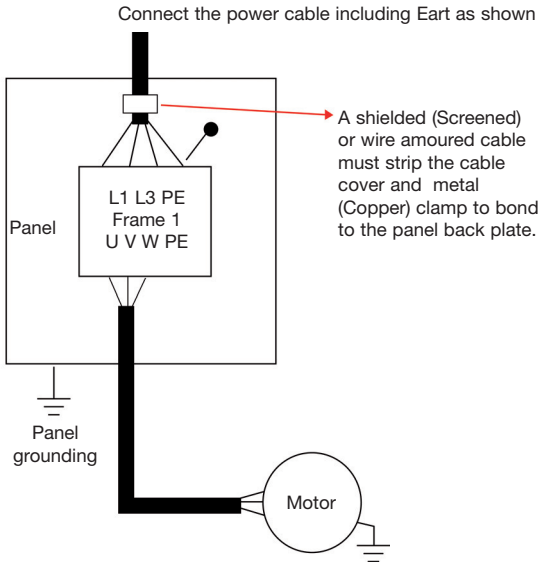
(A) Main circuit's wiring must separate from other high voltage or high current power line to avoid noise interference. Refer to the figures below:

- 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.



- The power supply and output PE terminals must be connected to ground to increase noise immunity of the built-in filter.



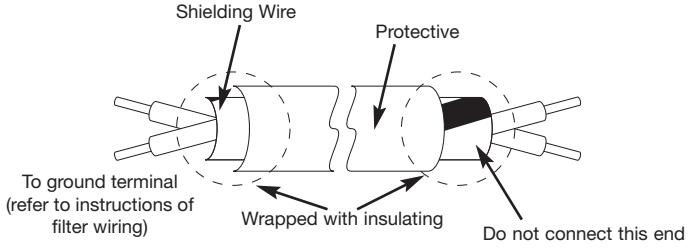


- When the connection between the inverter and the motor is too long, consider the voltage drop of the circuit. Phase-to-phase voltage drop (V)=$\sqrt{3}$*resistance of wire (Ω/km)*length of line (m)*current*10^{-3}.
- The number of carriers must be adjusted based on the length of the line.

The length of the line between the inverter and the motor	Below 25m	Below 50m	Below 100m	Over 100m
Carriers allowed	Below 16kHz	Below 12kHz	Below 8kHz	Below 5kHz
Settings of F40 parameter	16	12	8	5

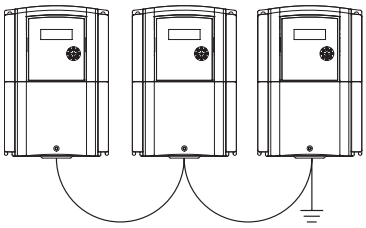
(B) The wiring of the control circuit must be separated and routed away from the main circuit control line or other high voltage or current power lines to avoid noise interference.

- 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.

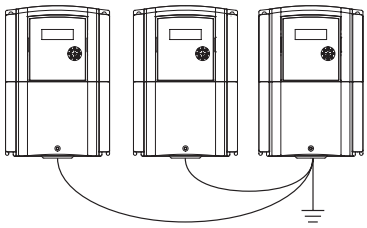


(C) Ground the ground terminal of the inverter properly. For 240V class ground 100Ω or less; for 480V class ground 10Ω or less.

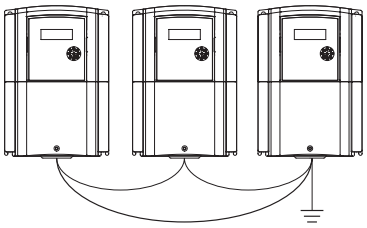
- Ground wiring is based on the electrical equipment technical basis (AWG). The shorter, the better.
- Do not share the ground of the inverter to other high current loads (welding machine, high power motor). Connect the terminals to ground respectively.
- Do not make a loop when several inverters share 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	
RVEFA110020	0.20	0.25	0.53	100-120VAC (+10%+15%) 1-phase	0÷240V 3-phase 0.1÷200Hz	7.1	1.7	1.0
RVEFA110040	0.40	0.50	0.88			12.2	3.1	
RVEFA110075	0.75	1.0	1.60			17.9	4.2	
RVEFA120020(F)	0.20	0.25	0.53	200-240VAC (+10%+15%) 1-Phase		4.3	1.7	
RVEFA120040(F)	0.40	0.50	0.88			5.4	3.1	
RVEFA120075(F)	0.75	1.0	1.60			10.4	4.2	
RVEFB120150(F)	1.5	2.0	2.90			15.5	7.5	2.0
RVEFB120220(F)	2.2	3.0	4.00			21	10.5	
RVEFA320020(F)	0.20	0.25	0.53	200-240VAC (+10%+15%) 3-Phase		3.0	1.7	1.0
RVEFA320040(F)	0.40	0.50	0.88			4.0	3.1	
RVEFA320075(F)	0.75	1.0	1.60			6.4	4.2	
RVEFB320150(F)	1.5	2.0	2.90			9.4	7.5	2.0
RVEFB320220(F)	2.2	3.0	4.00			12.2	10.5	
RVEFB340075(F)	0.75	1.0	1.70	380-480VAC (+10%+15%) 3-Phase	0÷480V 3-phase 0.1÷200Hz	3	2.3	1.0
RVEFB340150(F)	1.5	2.0	2.90			4.8	3.8	
RVEFB340220(F)	2.2	3.0	4.00			6.6	5.2	2.0

Note: Voltage input impedance of AIN is 204kΩ, current input impedance of AIN is 499Ω.

3.4.2 General Specifications

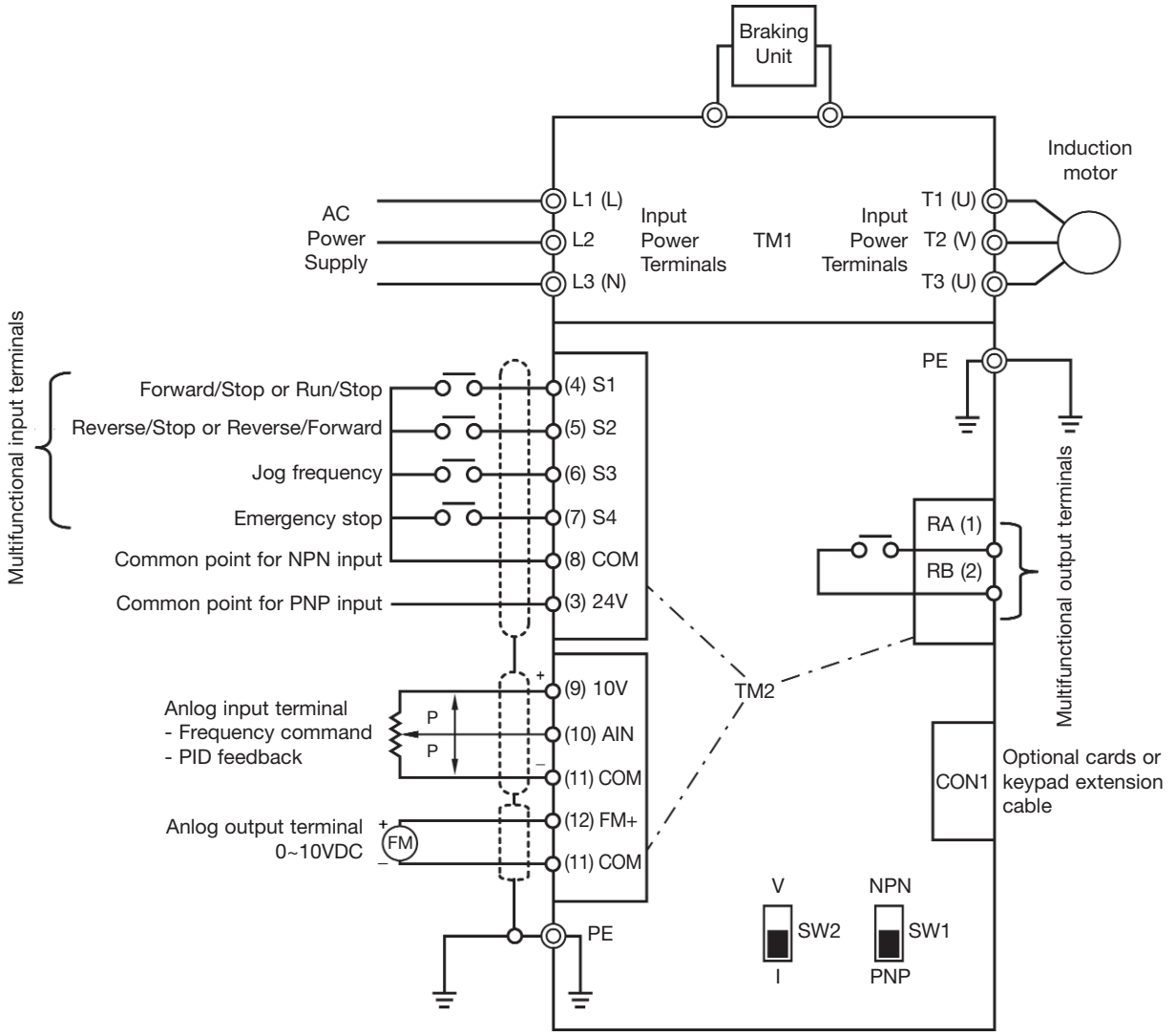
Item		RVEF TYPE
Control Mode		V/F or Sensorless control
Frequency Control	Range	0~200Hz
	Start control torque	100%/3Hz (Sensorless)
	Speed control range	1:20 (Sensorless)
	Speed Control Precision	±0.5% (Sensorless)
	Setting resolution	Digital: 0.1Hz (0~99.9Hz)/1Hz (100~200Hz); Analog: 0.06Hz/ 60Hz
	Keypad setting	Set directly with ▲▼ keys or the VR on the keypad
	Display Function	Three digital LED; display frequency/DC Voltage/Output Voltage/Output Current/inverter parameters/faultlog/program version/PID feedback control potentiometer.
	External signal setting	1. External variable resistor/0(2)-10V/ 0(4)-20mA 2. Performs up/down controls; speed control or automatic procedure control with multifunctional contacts on the terminal block (TM2).
	Frequency Limit Function	Upper/lower frequency limits, and two skip frequencies
General Control	Carrier frequency	4~16kHz (default 10kHz, above 10kHz with de-rating)
	V/F pattern	6 fixed patterns 50Hz/60Hz, 1 programmable
	Acc/Dec control	Two-stage acc/dec time (0.1~999s)
	Multifunctional analog output	6 functions (refer to F26 description)
	Multifunctional input	19 functions (refer to F11~F14 description)
	Multifunctional output	16 functions (refer to F21 description)
	Digital Input Signal	NPN/PNP alternative: 4 points standard, 2 points option (S1~S4 standard, S5~S6 option)
	Digital Output	Relay output (RA and RB multifunction output terminals). Optional T+ T- multifunction output terminals with option card (open collector transistor 24V, 600mA)
	Analog input	Set speed command and PID feedback signal (speed, PID 4~20mA/0~10V)
	Other function	Instantaneous power loss on restart, Speed search, overload detection, fault restart, DC injection braking, torque boost, slip compensation, frequence upper/lower limit, 8 preset speed 2/3 wire control, PID function, Acc/Dec switch (2 stages)
Communication Control		1. RS485 Option card: Modbus RTU/ASCII mode, 4800~38400 bps, max. 254 stations 2. PC/PDA software
Operation temperature		-10°C ~ +50°C (14°F ~ 122°F)
Storage temperature		-20°C ~ +60°C (-4°F ~ +140°F)
Humidity		0 – 95% RH (non condensing)
Vibration immunity		1G (9.8m/s^2)
EMI/EMS compatibility		Comply with requerement EN61800-3 (with optional filter)
LVD		Comply with requirement EN50178
Enclosure		IP20
Safety level		UL/508C

3.4.2 General Specifications

Item		RVEF TYPE
Protective Functions	Over load protection	Inverter rated current 150%/1min.
	Over voltage	240V Class: DC voltage >400V 480V Class: DC voltage >800V
	Under voltage	240V Class: DC voltage <190V 480V Class: DC voltage <380V
	Momentary power loss restart	Set to enable or disable
	Stall prevention	Stall prevention for acceleration/deceleration/operation
	Output terminal short circuit	Electronic circuit protection
	Other faults	Electronic circuit protection
	Other functions	Over current, over load, instantaneous power loss restart, output terminal short circuit, reverse restriction, directly start as power on and fault reset.

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

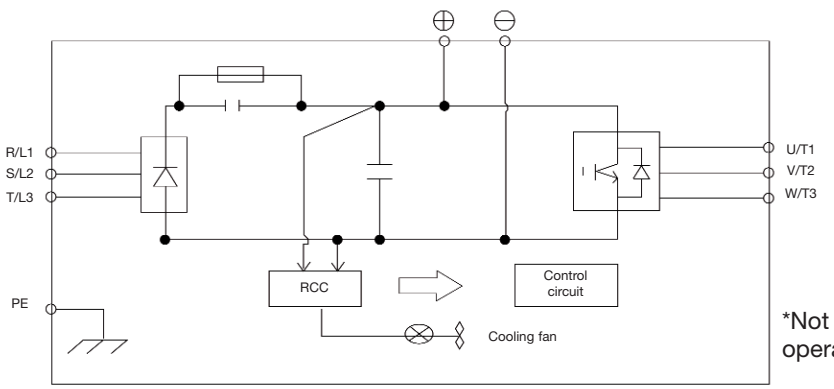
3.5 RVEF Wiring Diagram



Note 1: connect inputs to terminal 3 (internal 24VDC) for PNP mode (positive switching) or to terminal 8 (common) for NPN mode (negative switching).

Note 2: external 24 VDC may be used to supply the external contacts at each input; connect the 0V of the external supply to common (terminal 8).

Example: Main circuit wiring diagram



*Not used for single-phase operation

3.6 Description of Inverter Terminal

Description of power terminals

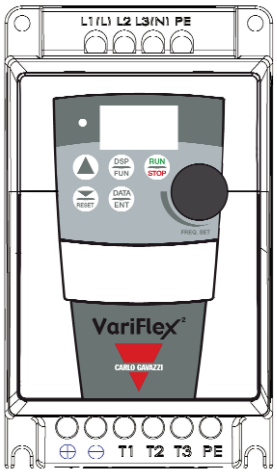


Figure 3-15 Power terminals locations

Supply terminal	
1-phase	L1, L3(N)
3-phase	L1, L2, L3
Motor terminal	T1, T2, T3
Multifunctional input terminal	
Input terminal	S1~S4 (and AIN: high level >8V, low level <2V).
Common terminal	
24V	PNP input.
COM	NPN input.
External terminal	Supply the input terminal with external 24VDC and connect the 0V of the external supply to COM terminal.

Multifunctional output terminal	
RA, RB	NO relay contact.
Analog input terminal	
Input terminal	AIN
Common terminal	COM
Analog output terminal	
Output terminal	FM+
Common terminal	COM
Additional terminals	T+, T- with an optinal card.
Braking unit	
Terminals	+, -

Termial TM1

L1(L)	L2	L3(N)	PE	+	-	T1	T2	T3	PE
AC power supply				Braking unit		Motor terminals			

Termial TM2

1	2	3	4	5	6	7	8	9	10	11	12
RA	RB	24V	S1	S2	S3	S4	COM	10V	AIN	COM	FM+

	SW1	SW2
	NPN input	0~10VDC analog signal
	PNP input	4~20mA analog signal

* Braking units are required for applications where a load with high inertia needs to be stopped rapidly.
Use a power-matched braking unit and resistor to dissipate the energy generated by the load while stopping. Otherwise inverter will trip on over voltage.
* Terminal at L2 will be non-functional for single-phase units.

3.7 Dimension

(1) Size A: Single phase: RVEFA110020, RVEFA110040RVEFA110075,
RVEFA120020(F), RVEFA120040(F), RVFA120075(F)
Three phase: RVEFA320020, RVEFA320040, RVEFA320075

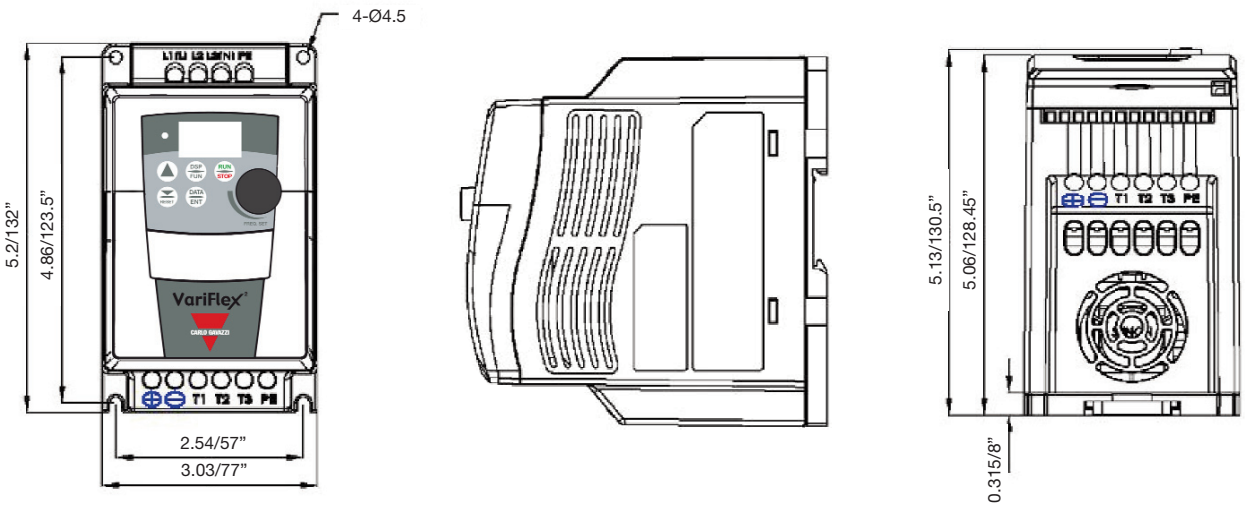


Figure 3-17 RVEF drive size A

(2) Size B: Single phase: RVEFB120150(F), RVEFB120220(F)
Three phase: RVFEB320150, RVFEB320220
Three phase: RVFEB340075(F), RVFEB340150(F), RVEFB120220(F)

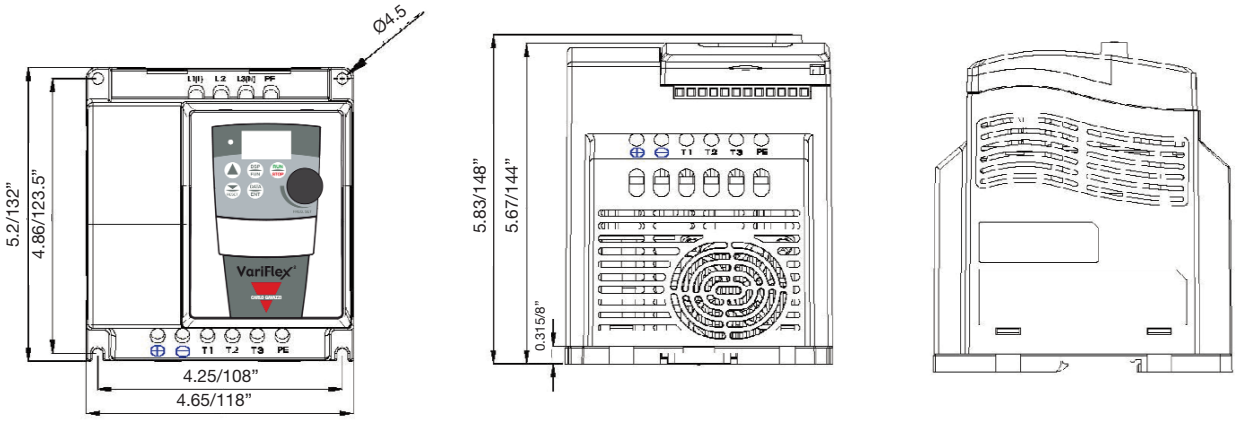


Figure 3-18 RVEF drive size B

Net Weight kg	**RVEFA110020**	**RVEFA110040**	**RVEFA110075**	**RVEFA120020(F)**	**RVEF120040(F)**	**RVEF120075(F)**
	0.62	0.68	0.72	0.65(0.71)	0.67(0.73)	0.67(0.73)
	RVEFB120150(F)	**RVEFB120220(F)**	**RVEFA320020**	**RVEFA320040**	**RVEFA320075**	**RVEFB320150**
	1.00(1.25)	1.05(1.3)	0.61	0.61	0.66	0.95
	RVEFB320220	**RVEFB340075(F)**	**RVEFB340150(F)**	**RVEFB340220(F)**	**-**	**-**
	1.00	1.5(1.68)	1.52(1.7)	1.55(1.74)	-	-

3.8 Installation and Design Consideration

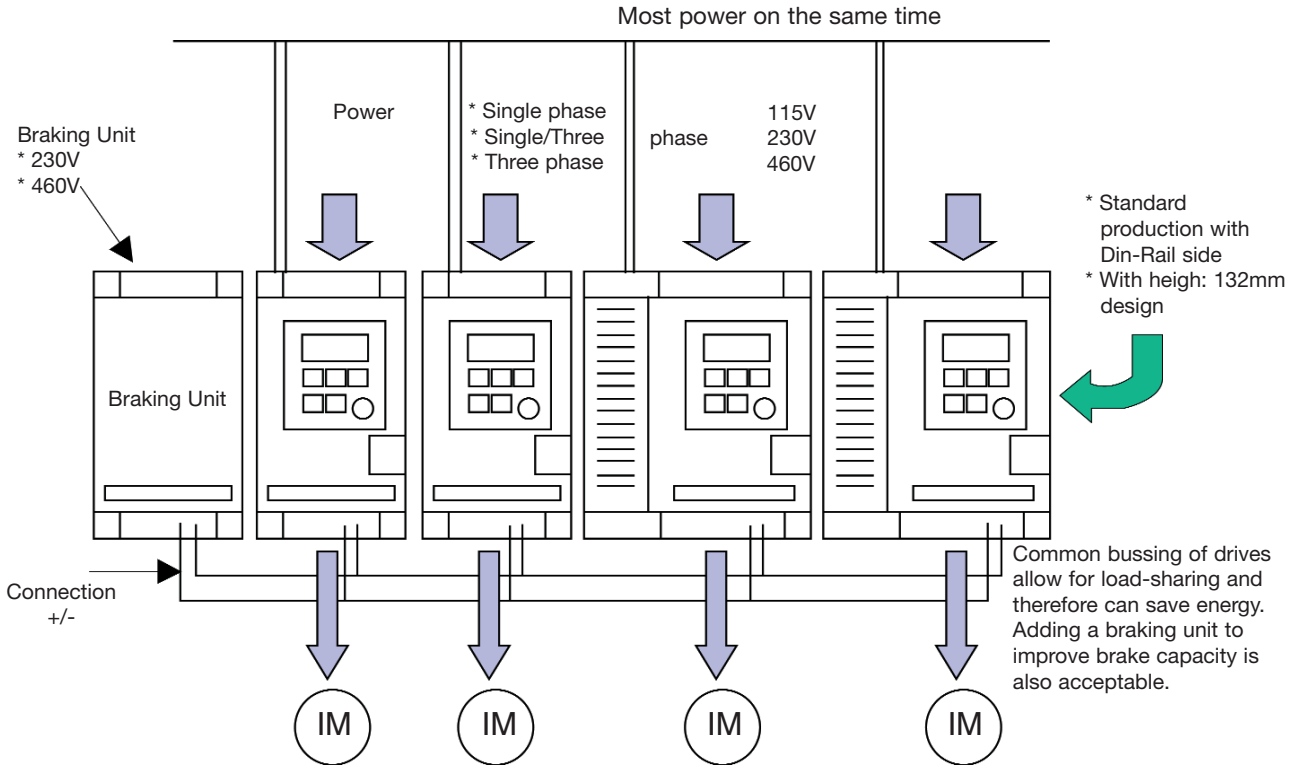
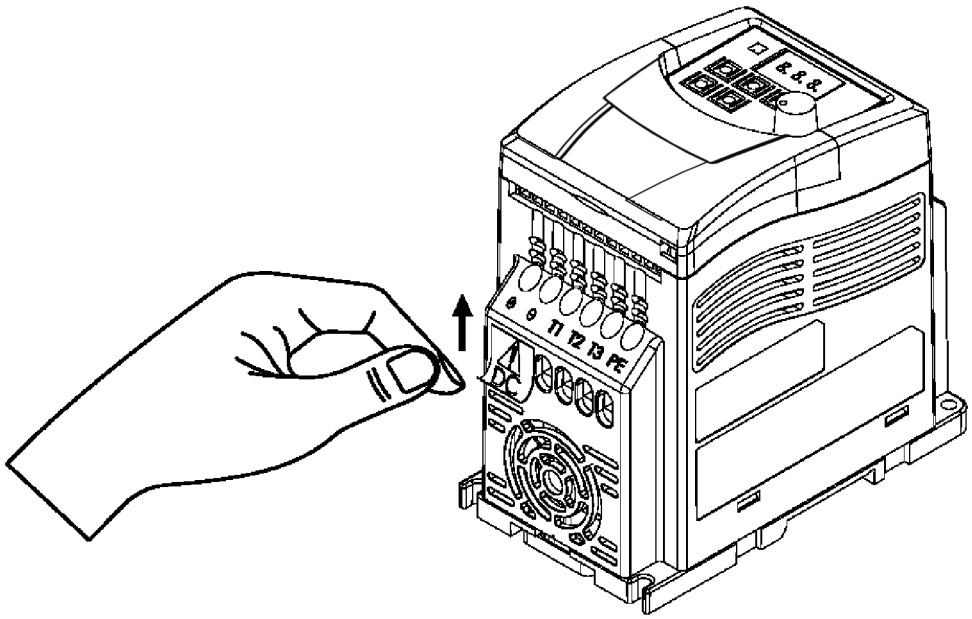


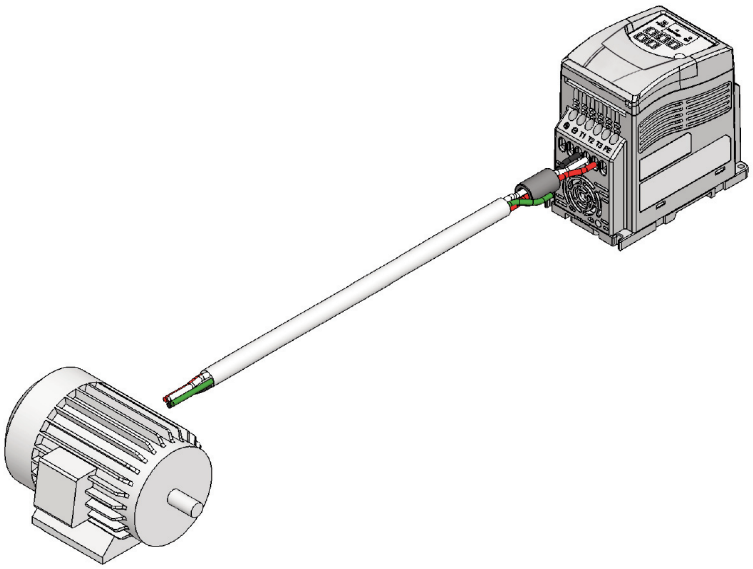
Figure 3-21 Common bus configurations

Note 1. Common bus connections from a common input power supply as shown above.
Note 2. When connecting a drive or drives' DC bus connections in parallel with larger. Hp rated drives, use a magnetic contactor with the "+" & "-" terminals, otherwise, inverter damage can result.

Note: if terminal block be used, please take off the TB label as shown below.



• Connection & EMC Mounting (for drivers with built-in filter):



NOTE:
For 0.20~0.75 kW filter models, additional items will be find inside the box including: [1] pc of EMC conformed waterproof (IP65) ferrite core.

⚠ Caution
If application require to meet EMC regulation, you MUST first let the ferrite core through the motor cables, then constrain the motor cable on the inverter as stated in the above diagram. Please also note the length of the motor cable CANNOT exceed 5m under EMC regulation.

Chapter 4 Programming instructions & Parameter list

4.1 Keypad description

4.1.1 Keypad display and operation instuction

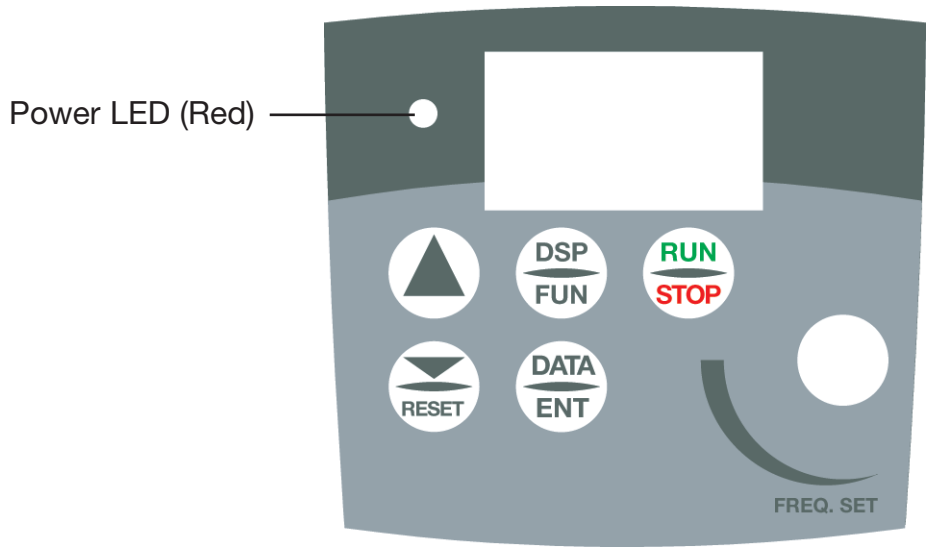


Figure 4-1 Keypad layout

Remote/Local change function

- **Local mode**
  - Run command via **RUN/STOP** key on the keypad
  - Frequency command
    When C41=000: only UP/DOWN key on the keypad can control and F05 setting has no effect.
    When C41=001: only VR on the keypad can control and F05 setting has no effect.

- **Remote mode**
  - Run command from run parameter **(F04)** control setting
  - Frequency command from Frequency parameter **(F05)** control setting

Remote/Local change mode on keypad is achieved by simultaneously pressing RESET and DATA/ENT. Each successive operation toggles between local and remote. Note: the inverter must be stopped.

4.1.2 Operation Instruction of the Keypad

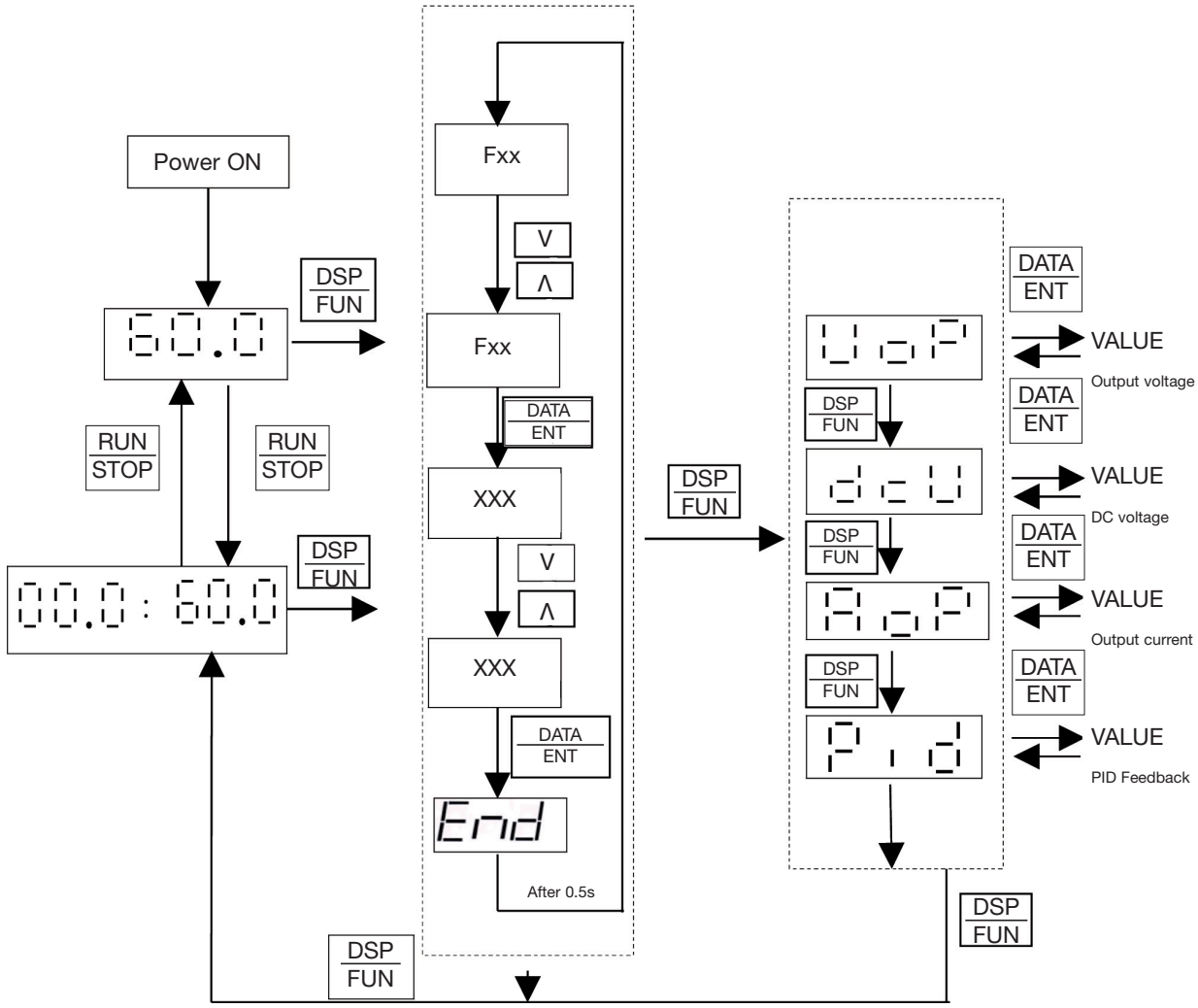


Figure 4-2 Keypad Operations Sequence

*1: Display flashes with set frequency in stop mode, but it is solid in run mode.
*2: The frequency can be set during both stop and run modes.
*3: Output voltage, DC voltage, Output current and PID feedback is dislayed when F10=001.

4.2 Parameter Function List

Basic parameter function list

F	Function Description Factory	Range/ Code	Factory Default	Remarks
F00	Inverter horse power capacity			
F01	Acceleration time #1 (s)	00.1~999	05.0	*1 *2
F02	Deceleration time #1 (s)	00.1~999	05.0	*1 *2
F03	Motor rotation direction	000: Forward 001: Reverse	000	*1
F04	Run command source	000: Keypad 001: External terminals (TM2) 002: Communication control	000	
F05	Frequency command source	000: Up/Down keypad 001: Potentiometer on keypad 002: AIN input signal (TM2) 003: Multifunction input terminals UP/DOWN function 004: Communication control	000	
F06	External control operation mode	000: Forward/Stop - Reverse/Stop 001: Run/Stop - Forward/Reverse 002: 3-wires control mode Run/Stop	000	
F07	Frequency upper limit (Hz)	01.0 ~200	50.0/60.0	*2
F08	Frequency lower limit (Hz)	00.0 ~200	00.0	*2
F09	Stopping method	000: Decelerate to stop 001: Coast to stop	000	*1
F10	Status display parameters	000: No display 001: Display	000	*1
F11	Multifunction input terminal S1	000: Forward/stop command 001: Reverse/stop command 002: Preset speed command #1 003: Preset speed command #2 004: Preset speed command #3 005: Jog frequency command 006: Emergency stop (E.S.) 007: Base Block (b.b.) 008: Use accel / decel time #2 009: Reset 010: Up command 011: Down command 012: Control signal switch 013: Communication control signal switch 014: Acceleration/deceleration inhibition 015: Master/Auxiliary speed source select 016: PID function disable 017: Analog frequency signal input (terminal AIN) 018: PID feedback signal (terminal AIN) 019: DC Brake signal *6	000	
F12	Multifunction input terminal S2		001	
F13	Multifunction input terminal S3		005	
F14	Multifunction input terminal S4		006	
F15	Multifunction input terminal AIN		017	
F16	AIN signal select	000: 0 ~10V (0~20mA) 001: 4~20mA (2~10V)	000	
F17	AIN Gain (%)	000~200	100	
F18	AIN Bias (%)	000~100	000	*1
F19	AIN Bias selection	000: Positive 001: Negative	000	
F20	AIN Slope Direction	000: Positive 001: Negative	000	*1

F	Function Description Factory	Range/ Code	Factory Default	Remarks
F21	Multifunction output RA/RB	000: Run 001: Frequency reached (set frequency ± F23) 002: Frequency is within the range set by (F22±F23) 003: Frequency detection (>F22) 004: Frequency detection (<F22) 005: Fault conditions 006: Auto reset and restart 007: Momentary power loss 008: Emergency Stop (E.S.) 009: Base Block (b.b.) 010: Motor overload protection 011: Inverter overload protection 012: Retain 013: Power on 014: Communication error 015: Output current detection (>F24)	000	
F22	Frequency detection set-point (Hz)	00.0~200	000	*1
F23	Frequency detection range (±Hz)	00.0~30.0	00.0	*1
F24	Output current set-point (%)	000~100	000	
F25	Output current detection time (s)	00.0~25.5	00.0	
F26	Multifunction analog output type selection	000: Output frequency 001: Set frequency 002: Output voltage 003: DC voltage 004: Output current 005: PID feedback signal	000	*1
F27	Multifunction analog output gain (%)	000~200	100	*1
F28	Preset frequency n°1 (Main frequency setting) (Hz)	00.0~200	05.0	*1
F29	Preset frequency n°2 (Hz)	00.0~200	05.0	*1
F30	Preset frequency n°3 (Hz)	00.0~200	10.0	*1
F31	Preset frequency n°4 (Hz)	00.0~200	20.0	*1
F32	Preset frequency n°5 (Hz)	00.0~200	30.0	*1
F33	Preset frequency n°6 (Hz)	00.0~200	40.0	*1
F34	Preset frequency n°7 (Hz)	00.0~200	50.0	*1
F35	Preset frequency n°8 (Hz)	00.0~200	60.0	*1
F36	Jog frequency instruction (Hz)	00.0~200	05.0	*1
F37	DC braking time (s)	00.0~25.5	00.5	
F38	DC braking start frequency (Hz)	01.0~10.0	01.5	
F39	DC braking level (%)	000~020	005	
F40	Carrier frequency (kHz)	004~016	010	4~15k
F41	Auto restart on momentary power loss	000: Enable 001: Disable	001 *6	
F42	Auto restart times	000~005	000	
F43	Motor rated current (A)	— — — — — — — — — — — — —	*4	
F44	Motor rated voltage (V)	— — — — — — — — — — — — —	*4	
F45	Motor rated frequency (Hz)	— — — — — — — — — — — — —	*4	
F46	Motor rated power (kW)	— — — — — — — — — — — — —	*4	
F47	Motor rated speed (RPM/100)	0~120 *8	*4	

F	Function Description Factory	Range/ Code	Factory Default	Remarks
F48	Torque Boost Gain (sensorless) (%)	001~450		
F49	Slip compensation gain (sensorless) (%)	001~450		
F50	Low frequency voltage compensation	000~40		
F51	Advanced parameter function display	000: Don't display 001: Display	000	*1
F52	Factory default	010: Reset to factory default (50Hz) 020: Reset to factory default (60Hz)	000	
F53	Software version	CPU Version		*3 *4
F54	Latest 3 fault records	— — — — — — — — — — — —		*3 *4

Advanced function parameter list **(Enable access to these parameters by setting F51=001)**

C	Function Description	Range/ Code	Factory Default	Remarks
C00	Reverse run	000: Reverse enable 001: Reverse disable	000	
C01	Acceleration stall prevention	000: Enable stall prevention during acceleration 001: Disable stall prevention during acceleration	000	
C02	Acceleration stall prevention level (%)	050~300	200	
C03	Deceleration stall prevention	000: Enable stall prevention during deceleration 001: Disable stall prevention during deceleration	000	
C04	Deceleration stall prevention level (%)	050~300	200	
C05	Run stall prevention	000: Enable stall prevention in run mode 001: Disable stall prevention in run mode	000	
C06	Run stall prevention level (%)	050~300	200	
C07	Stall prevention time during run	000: according to decel time set in F02 001: according to decel time set in C08	000	
C08	Stall prevention deceleration time (s)	00.1~999	03.0	
C09	Direct start on power up	000: Enable direct start on power up 001: Disable direct start on power up	001	
C10	Reset mode	000: Reset is enable when RUN switch is OFF 001: Reset is enable with RUN switch OFF or ON	000	
C11	Acceleration time #2 (s)	00.1~999	05.0	*1 *2
C12	Deceleration time #2 (s)	00.1~999	05.0	*1 *2
C13	Fan control	000: Auto-run by temperature 001: Run when inverter runs 002: Always run 003: Always stop	001	
C14	Control mode	000: Sensorless control 001: V/F Control	000	*4
C15	V/F Pattern setting	001~007	001/004	*8
C16	V/F base output voltage (V)	198~265V / 380~530V	220/440	
C17	V/F Max. output frequency (Hz)	00.2~200	50.0/60.0	
C18	V/F Output voltage ratio at max frequency (%)	00.0~100	100	
C19	V/F Mid frequency (Hz)	00.1~200	25.0/60.0	

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C	Function Description	Range/ Code	Factory Default	Remarks
C20	V/F Output voltage ratio at mid frequency (%)	00.0~100	50.0	
C21	V/F Min output frequency (Hz)	00.1~200	00.5/00.6	
C22	V/F Output voltage ratio at min frequency (%)	00.0~100	01.0	
C23	V/F Torque Boost Gain (%)	00.0~30.0	00.0	1
C24	V/F Slip Compensation Gain (%)	00.0 ~100	00.0	*1
C25	Motor no load current (A)	— — — — — — — — — — — — —		Varies with motor rating *4
C26	Electronic thermal relay protection for motor (OL1)	000: Enable motor protection 001: Disable motor protection	00.0	
C27	Skip frequency #1 (Hz)	00.0~200	00.0	
C28	Skip frequency #2 (Hz)	00.0~200	00.0	
C29	Slip frequency range (±Hz)	00.0~30.0	00.0	
C30	PID operation mode	000: PID Function unavailable 001: PID control, deviation is derivate controlled 002: PID control, Feedback is derivate controlled 003: Same as 001 BUT reverse characteristics control 004: Same as 002 BUT reverse characteristics control	000	
C31	PID Error gain	0.00 - 10.0	1.00	*1
C32	Proportional gain P (%)	0.00 - 10.0	01.0	*1
C33	Integral time I (s)	0.00 - 100	10.0	*1
C34	Differential time D (s)	0.00 - 10.0	0.00	*1
C35	PID offset	000: Positive direction 001: Negative direction	000	*1
C36	PID offset adjust (%)	000 - 109	000	*1
C37	PID update time (s)	00.0 - 02.5	00.0	*1
C38	PID sleep set-point (Hz)	00.0~200	00.0	
C39	PID sleep delay time (s)	00.0~25.5	00.0	
C40	Frequency Up/Down control using MFIT	000: Up/Down command is available. Set frequency is held when inverter stops. 001: Up/Down command is available. Set frequency resets to 0Hz when inverter stops. 002: Up/Down command isa available. Set frequency is held when inverter stops. Up/Down is available in stop.	000	
C41	Local/Remote frequency control select (run command by the Run/Stop key)	000: Up/Down key on keypad sets frequency 001: Potentiometer on the keypad set frequency	000	
C42	Terminal S5 function (option card)	000: Forward/stop command 001: Reverse/stop command 002: Preset speed command #1 003: Preset speed command #2 004: Preset speed command #3 005: Jog frequency command 006: Emergency stop (E.S.) 007: Base Block (b.b) 008: Use accel/decel time #2 009: Reset 010: Up command	007	

C	Function Description	Range/ Code	Factory Default	Remarks
C43	Terminal S6 function (option)	011: Down command 012: Control signal switch 013: Communication control signal switch 014: Acceleration/deceleration inhibition 015: Master/auxiliary speed source select 016: PID function disable 019: DC Brake signal *7	009	
C44	Multifuction input terminal S1~S6 signal scan time (ms x 8)	001~100	010	
C45	Confirming AIN signal scan time (ms x 8)	0~100	050	
C46	Multifunction output T+ T- (option)	000: Run 001: Frequency reached (Set frequency ± F23) 002: Frequency is within the range set by (F22±F23) 003: Frequency detection (>F22) 004: Frequency detection (<F22) 005: Fault conditions 006: Auto reset and restart 007: Momentary power loss 008: Emergency Stop (E.S.) 009: Base Block (b.b.) 010: Motor overload protection 011: Inverter overload protection 012: Retain 013: Power on 014: Communication error 015: Output current detection (>F24)	005	
C47	Remote keypad control selection	000: Disable (no signal loss detection) 001: Enable. On signal loss stop according to F09 002: Enable. Runs at the last set frequency. On signal loss Stop is according to F04 setting or stop key on keypad	000	Stop inverter then connect remote key pad for pro per operation *4
C48	Copy module	000: Copy module disabled 001: Copy to module from inverter (read) 002: Copy to inverter from module (write) 003: Read/write check (compare the parameters)	000	*3
C49	Inverter communication address	001~254	001	*3 *4
C50	Baud rate (bps)	000: 4800 001: 9600 002: 9200 003: 38400	003	*3 *4
C51	Stop Bit	000: 1 stop bit 001: 2 stop bit	000	*3 *4
C52	Parity Bit	000: No parity 001: Even parity 002: Odd parity	000	*3 *4
C53	Data bits	000: 8 bits data 001: 7 bits data (Only for Modbus ASCII Mode)	000	*3 *4
C54	Communication time-out detection time (s)	00.0~25.5	00.0	*3 *4
C55	Communication time-out operation selection	000: Deceleration stop. (F02: deceleration time #1) 001: Coast to stop. 002: Deceleration stop. (C12: deceleration time #2). 003: Continue operating.	000	*3 *5

Note: *1: Can be modified in Run mode.
***2: Frequency resolution is 1Hz for settings above 100 Hz.**
***3: Cannot be modified during communication.**
***4: Do not change while making factory setting.**
F52 factory setting is 020(60HZ) and motor parameter value is 17.0.
F52 factory setting is 010(50HZ) and motor parameter value is 14.0.
***5: Available in Software version 1.2 or later**
***6: Changed in Software version 1.5 or later**
***7: Changed in Software version 1.6 or later**
***8: Changed in Software version 1.7 or later**

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4.3 Parameter Function Description

Basic function parameter list

F00 Inverter horse power capacity

F00	Inverter model	
1P2	RVEF	RVEFA110020
1P5		RVEFA110040
101		RVEFA110075
2P2		RVEFA120020(F) RVEFA320020
2P5		RVEFA120040(F) RVEFA320040
201		RVEFA120075(F) RVEFA320075
202		RVEFB120150(F) RVEFB320150

F00	Inverter model	
203	RVEF	RVEFB120220 RVEFB320220
401		RVEFB340075(F)
402		RVEFB340150(F)
403		RVEFB340220(F)

F01 Acceleration time #1 (s): 00.1~999
F02 Deceleration time #1 (s): 00.1~999

Formula for acceleration/deceleration time; denominator is based on the setting of C14:

a) Motor rating frequency (sensorless vector control C14=000)

$$\text{Aceleration time} = F01x \frac{\text{Set frequency}}{\text{C17 (Rated frequency)}} \qquad \text{Deceleration time} = F02x \frac{\text{Set frequency}}{\text{C17 (Rated frequency)}}$$

b) Max output frequency (V/f mode C14=001)

$$\text{Aceleration time} = F01x \frac{\text{Set frequency}}{\text{C17 (Max output frequency)}} \qquad \text{Deceleration time} = F02x \frac{\text{Set frequency}}{\text{C17 (Max output frequency)}}$$

F03 Motor rotation direction
000: Forward
001: Reverse

Parameter F04=000 must be set to 000 for this function to be effective.

F04 Run signal source
000: Keypad
001: External terminals (TM2)
002: Communication control

1.) F04=000: inverter is controlled by keypad.
2.) F04=001: inverter is controlled by multifunction input terminal (S1~S4). See F06 parameter.
3.) F04=002: inverter is controlled by serial communication.

F05 Frequency signal source
000: Up/Down key on keypad
001: Potentiometer on keypad
002: AIN input signal (TM2)
003: Multifunction input terminal UP/DOWN function
004: Communication control

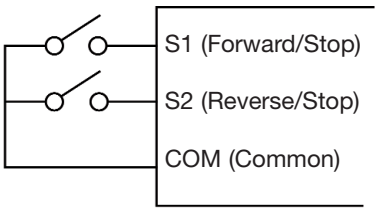
1.) F5=001: when any of parameter group F11~F15 is set to 015 and multifunction input terminal is OFF, the frequency is set by the potentiometer on the keypad.
If the multifunction input terminal is ON, the frequency is set by the analog signal (auxiliary speed) from TM2.
2.) F5=002: when any of parameter group F11~F15 is set to 015 and multifunction input terminal is OFF, the frequency is set by the analog signal (auxiliary speed) from TM2.
If the multifunction input terminal ON, the frequency is set by the potentiometer on keypad.
3.) F5=003: please refer to description of parameter group F11~F15. F11~F15=010/011 enables multifunction input terminals to control up/down commands.
4.) Priority of reading frequency command: Jog > preset frequency > (keypad ▲▼ or TM2 Up/Down or communication).

F06: External control operation mode
000: Forward/Stop - Reverse/Stop
001: Run/Stop - Forward/Reverse
002: 3-wires control mode Run/Stop

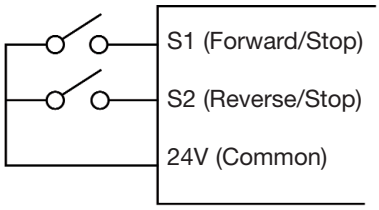
F06 is only available when F04=001 (external terminal). Active two MFIT terminals to control forward and reverse commands (ex. F11=000 and F12=001).

Parameter F06 = 000, control method is as follows:

(1). NPN input signal:



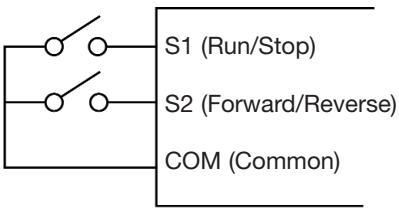
(2). PNP input signal:



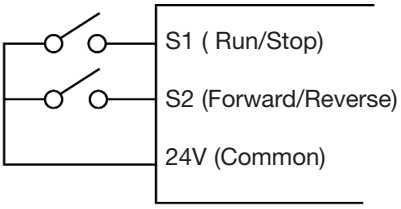
That both forward and reverse commands are ON will be treted as stop.

Parameter F06 = 001, control method is as follows

(1). NPN input signal:

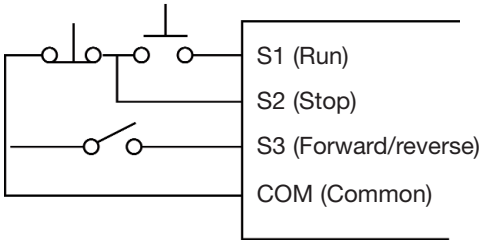


(2). PNP input signal:

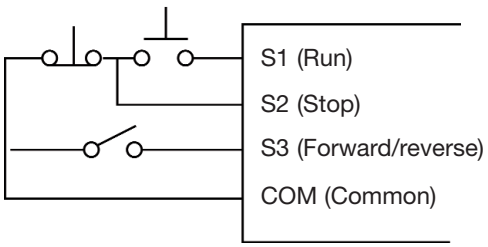


Parameter F06 = 002, control method is as follows

(1). NPN input signal:



(2). PNP input signal:



Note: In 3 wires control mode terminals S1-S3 are used, therefore parameters F11~ F13 are ineffective.

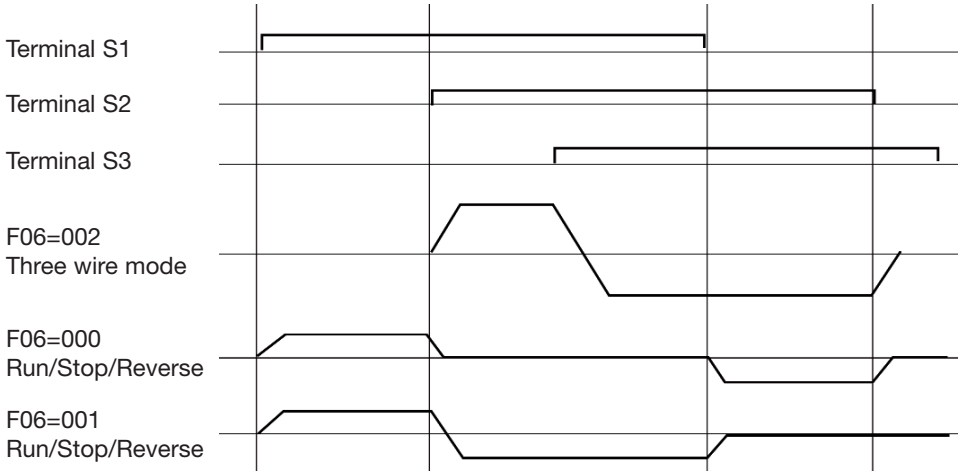


Figure 4-4 Control Method Sequences

Note: C00=001, reverse command is disabled.

F07 Frequency upper limit (Hz): 01.0~200
F08 Frequency lower limit (Hz): 00.0~200

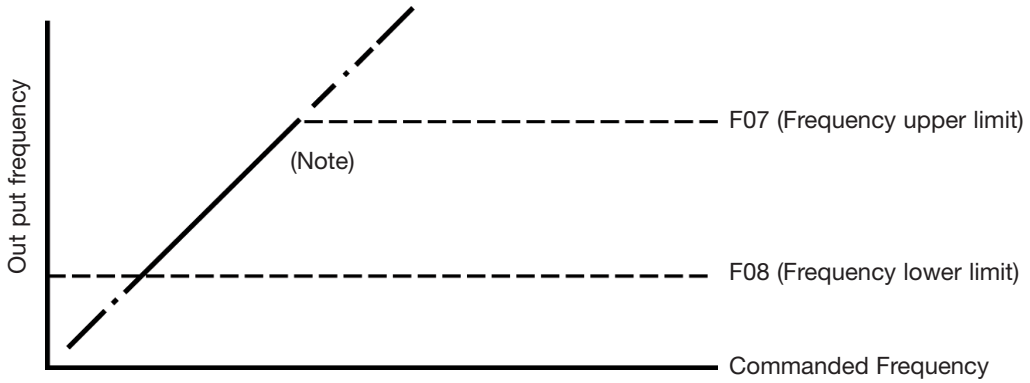


Figure 4-5 Frequency Limits

Note: If F07 = 0 Hz and frequency command = 0 Hz, the inverter will 0-speed stop.
If F08 > 0 Hz and frequency command <F08, inverter will run at <F08 set value.

F09 Stopping method
000: Decelerate to stop
001: Coast to stop

1.) F09=000: after receiving stop command, the motor will decelerate to stop according to setting of F02, deceleration time #1.
2.) F09=001: after receiving stop command, the motor will free-run (coast) to stop.

F10 Status monitoring display
000: Disable
001: Enable

F10=001: the inverter displays motor current, voltage, DC bus voltage, and PID feedback through “DSP” keypad key.

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F11~15	**Multifunction input terminals S1~S4 and AIN** **000: Forward/Stop command** **001: Reverse/Stop command** **002: Preset speed command #1** **003: Preset speed command #2** **004: Preset speed command #3** **005: Jog frequency command** **006: Emergency stop (E.S.)** **007: Base block (b.b.)** **008: Use accel/decel time #2** **009: Reset** **010: Up command** **011: Down command** **012: Control signal switch** **013: Communication control signal switch** **014: Acceleration/deceleration inhibition** **015: Master/ausiliary speed source select** **016: PID function disable** **017: Analog frequency signal input (terminal AIN)** **018: PID feedback signal (terminal AIN)** **019: DC brake signal**

S1~S4 and AIN on TM2 are multifunction input terminals which can be set to the above 19 funtions.
F11~F15 function description:

A. F11~F15=000/001 Forward/Reverse

Set F06 to choose the control operation mode.
Forward command ON sets the inverter running forward, while OFF command stop the motor (F11 factory default is forward command).
Reverse command ON sets the inverter running reverse, while OFF command stop the motor (F12 factory default is reverse command).
If forward–reverse command are ON at the same time the inverter is in Stop mode.

B. F11~F15=002~004 Preset speed command #1~#3

When run signal is applied and the selected external multifunction input terminal is ON, the inverter will run at one of 8 preset speeds which are controlled by the status of the multifunction input terminals. The corresponding speeds are programmed in F28 to F36 parameters as shown in the table below.

C. F11~F15=005 Jog frequency command

When run signal is applied and the selected external multifunction input terminal is ON and set to Jog speed, the inverter will run according to F36 frequency.

Priority of the frequencies: Jog > preset speed

MFIT input F11~F15=004	MFIT input F11~F15=003	MFIT input F11~F15=002	MFIT input F11~F15=005	Output frequency set value
ON / OFF	ON / OFF	ON / OFF	ON	F36
OFF	OFF	OFF	OFF	F28
OFF	OFF	ON	OFF	F29
OFF	ON	OFF	OFF	F30
OFF	ON	ON	OFF	F31
ON	OFF	OFF	OFF	F32
ON	OFF	ON	OFF	F33
ON	ON	OFF	OFF	F34
ON	ON	ON	OFF	F35

D. F11~F15=006 Emergency stop (E.S)

The inverter will decelerate to stop by C12 setting on receiving the external emergency stop signal regardless of F09 setting. The display will be blinking with “E.S”. The inverter will only start again when the Emergency stop signal is removed and the start signal is turned OFF and then on again (remote start mode) or the RUN key is pressed (keypad mode). Removing the Emergency stop signal before the inverter has fully stopped will not inhibit the Emergency Stop operation. Output relay can be set to Emergency stop fault by setting F21=008.

E. F11~F15=007 Base Block (b.b.)

The inverter will stop immediately on receiving the Base Block signal regardless of the setting of F09 and blink “b.b”. The inverter will auto restart at speed search when the Base Block signal is released.

F. F11~F15=008 Use acceleration/ deceleration time #2

When the external terminal is ON it selects the acceleration/ deceleration #2 time (see parameters C11,C12).

G. F11~F15=009 Reset command

When the reset command is ON, the inverter will be disabled. Reset table faults will be cleared.

H. F11~F15=010/011 UP/DOWN function (controlled by acceleration/deceleration times)

1.) Set F05=003, to enable the UP/DOWN function. Note: the UP/DOWN key on the keypad is unavailable for changing frequency directly.

2.) C40=000: when the RUN signal is ON, the inverter will accelerate to the F28 setting then continue to run at the set command speed. When UP/DOWN terminal is activated, the inverter begins to accelerate/decelerate until the signal is released then. It run at the reached speed. When the RUN signal is OFF, the inverter decelerates to stop (or coasts to stop) according to the setting of F09. The last output frequency when the RUN signal is OFF, will be stored in F28. UP/DOWN Key is unavailable in stop. The stored frequency can not be changed by Up/Down terminal, but can be changed by the content of F28 by keypad.

3.) C40=001: the inverter will run from 0Hz as the run signal is applied. UP/DOWN operation method is same as C40=000. But on next RUN signal is ON, inverter always starts up from 0Hz. Note: UP/DOWN commands are disabled if both terminals are ON at the same time.

I. F11~F15=012 Control signal switch

External control terminal OFF: operation signal/frequency signal is controlled by F04/F05.
External control terminal ON: operation signal/frequency signal is controlled by keypad display.

J. F11~F15=013 Communication control signal switch

External control terminal OFF: in communication, the inverter is controlled by master (PC or PLC) run/frequency signal and allows parameter modification. The keypad and TM2 run/frequency signal is not available for inverter at this time. The keypad is only available for display of voltage/current/frequency and read parameters but cannot modify them. It is also available for emergency stop.
External control terminal ON: PC/PLC can read and modify parameters. BUT all controls are from the keypad.
(Not affected by settings of F04 & F05).

K. F11~F15=014 Acceleration/deceleration inibition

When the external control terminal ON, the inverter will stop acceleration/deceleration until the signal is released. The motion is as follows:

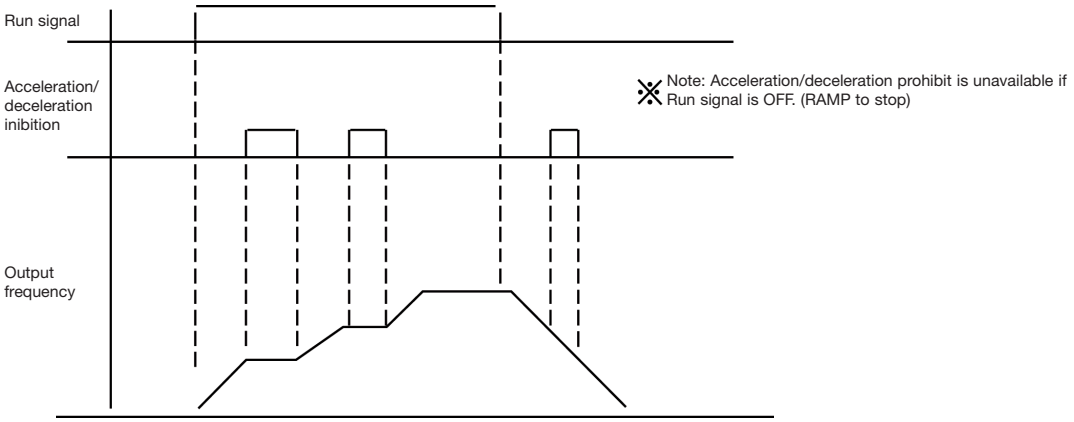


Figure 4-6 Acceleration/Deceleration inibition

L. F11~F15=015 Master/Auxiliary speed source select

1.) F05=001: when one of the parameters F11~ F15 is set to 015, and multifunction input terminal is OFF, the frequency is set by the potentiometer on the keypad (master speed), when the multifunction input terminal is ON, the frequency is set by the analog signal on TM2 (auxiliary speed AIN).

2.) F05=002: when one of the parameters F11~ F15 is set to 015, and multifunction input terminal is OFF, the frequency is set by the analog signal on TM2 (master auxiliary speed AIN); while multifunction input terminal is ON, the frequency is set by the potentiometer on the keypad (auxiliary speed).

M. F11~F15=016 PID function disable

When input terminal is ON, PID functions set by C30 are disabled.
When input terminal is OFF the PID functions are enabled.

N. F15=017 Analog frequency signal input (terminal AIN)

Frequency reference can be set by 0-10VDC or 4-20mA on terminal AIN as set by F16 and SW2.

O. F15=018 PID feedback signal input (terminal AIN)

PID feedback can be connected to AIN terminal 0-10VDC/0~20mA or 2~10VDC/ 4-20mA as set by F16 and SW2.

P. F11~F15=019 DC Brake signal

When TM2 DC Brake signal is OFF, and the brake time of F37 has not been over, then brake time is according to set value of F37; when TM2 DC Brake signal is ON, and the brake time of F37 has already been over, the brake is stopped according to DC Brake signal OFF of TM2.

Set SW2 to appropriate V/I signal selection:

1.) F16=000: 0~10V/0~20mA

2.) F16=001: 2~10V/4~20mA

F16 AIN signal select
000: 0~10V/0~20mA
001: 2~10V/4~20mA

F17 AIN Gain (%): 000~200
F18 AIN Bias selection (%): 000~100
F19 AIN Bias
000: Positive
001: Negative
F20 AIN signal slope direction.
000: Positive
001: Negative

The inverter reads A/D average value every C45 x 8ms. The user can set scan interval time according to noise levels in the operation environment. Extend C45 if noise is a problem, however the response speed will be slower.

	F17	F18	F19	F20
A	100%	050%	000	000
B	100%	000%	000	000

	F17	F18	F19	F20
C	100%	050%	000	001
D	100%	000%	000	001

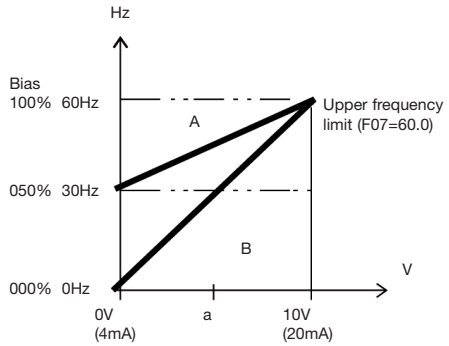


Fig 4-7a

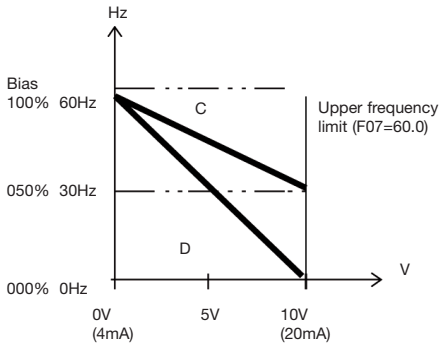


Fig 4-7b

	F17	F18	F19	F20
E	100%	020%	001	000

	F17	F18	F19	F20
F	100%	050%	001	001

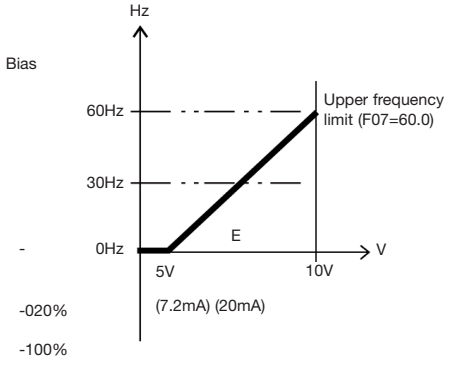


Fig 4-7c

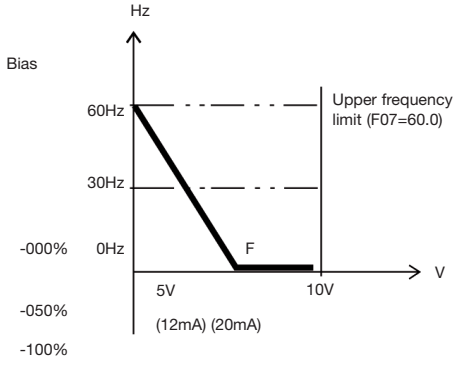
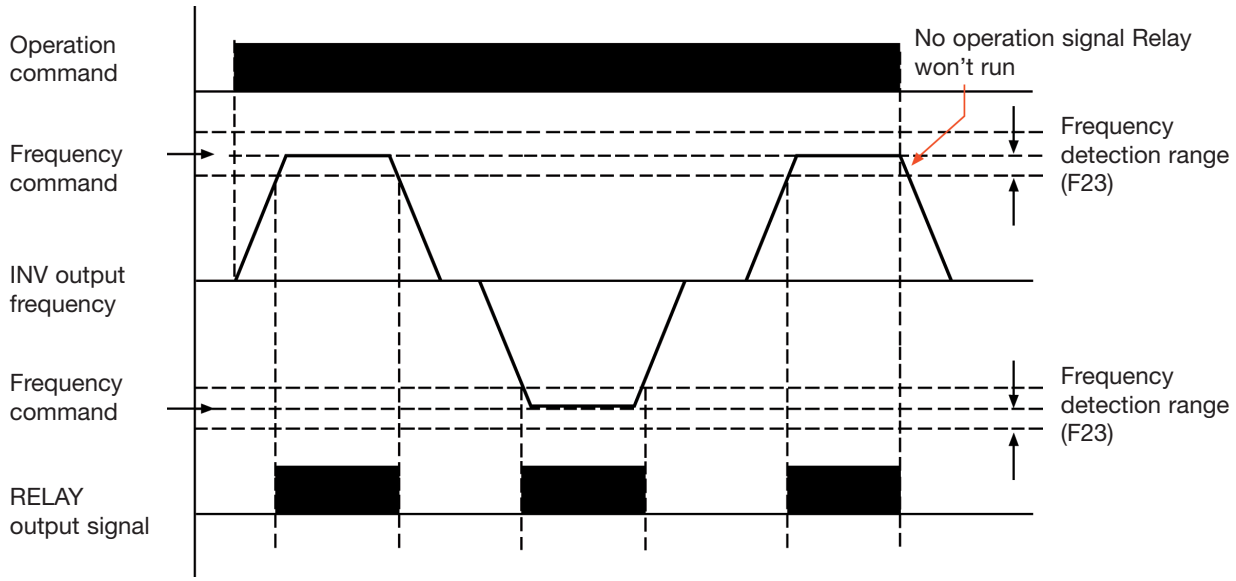


Fig 4-7d

F21 Multifunction output RA/RB
- **000: Run**
- **001: Frequency reached (set frequency ± F23)**
- **002: Frequency is within the range set by (F22 ± F23)**
- **003: Frequency detection (>F22)**
- **004: Frequency detection (<F22)**
- **005: Fault conditions**
- **006: Auto reset and restart**
- **007: Momentary power loss**
- **008: Emergency Stop (E.S.)**
- **009: Base Block (b.b.)**
- **010: Motor overload protection**
- **011: Inverter overload protection**
- **012: Retain**
- **013: Power on**
- **014: Communication error**
- **015: Output current detection (>F24)**

F22 Frequency detection set-point (Hz): 00.0 ~ 200
F23 Frequency detection range (±Hz): 00.0 ~ 30
F24 Output current set-point (%): 0~100
F25 Output current detection time (s): 0.0~25.5

F21/C46=001 Set Frequency ± F23 reached



Multifunction output point F21/C46 =1, frequency reach (setting frequency +-F 23)

F21/C46=002 Frequency detection set-point F22 ± F23 reached

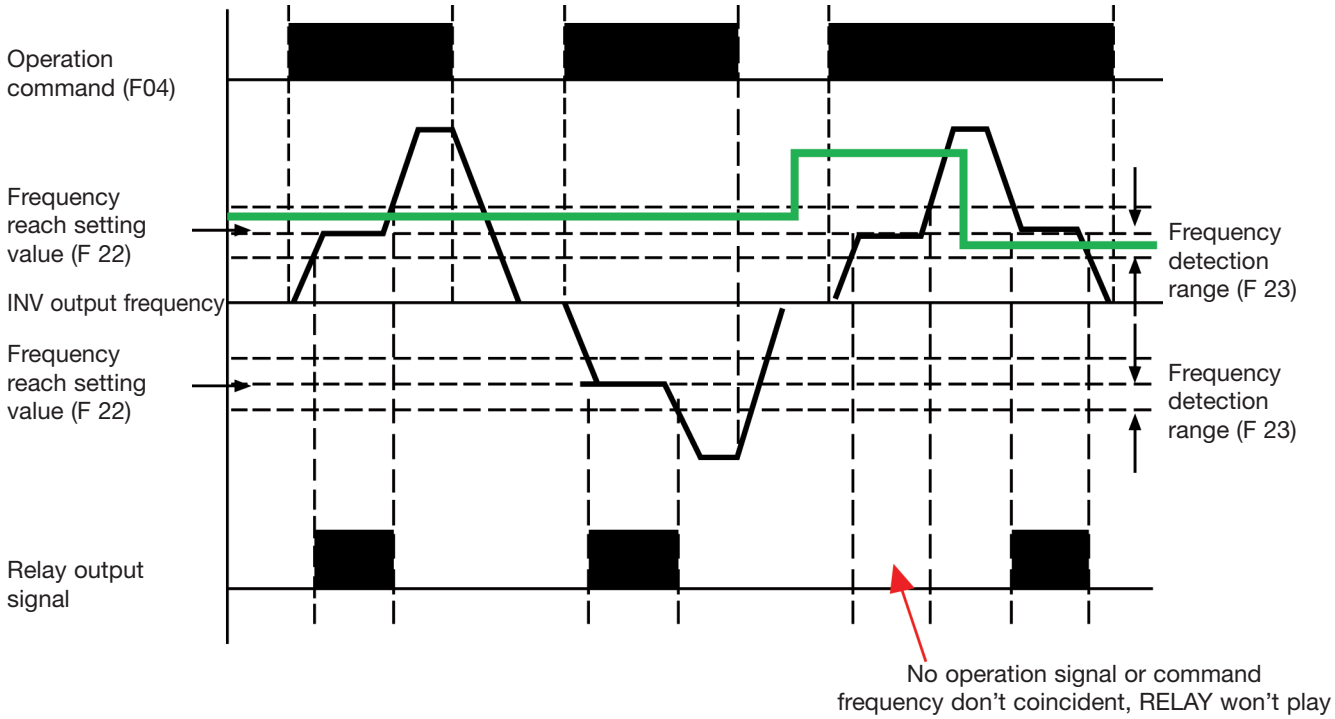


Figure 4-8b Frequency Reached (F21/C46=2)

F21/C46=003 Frequency detection > F22

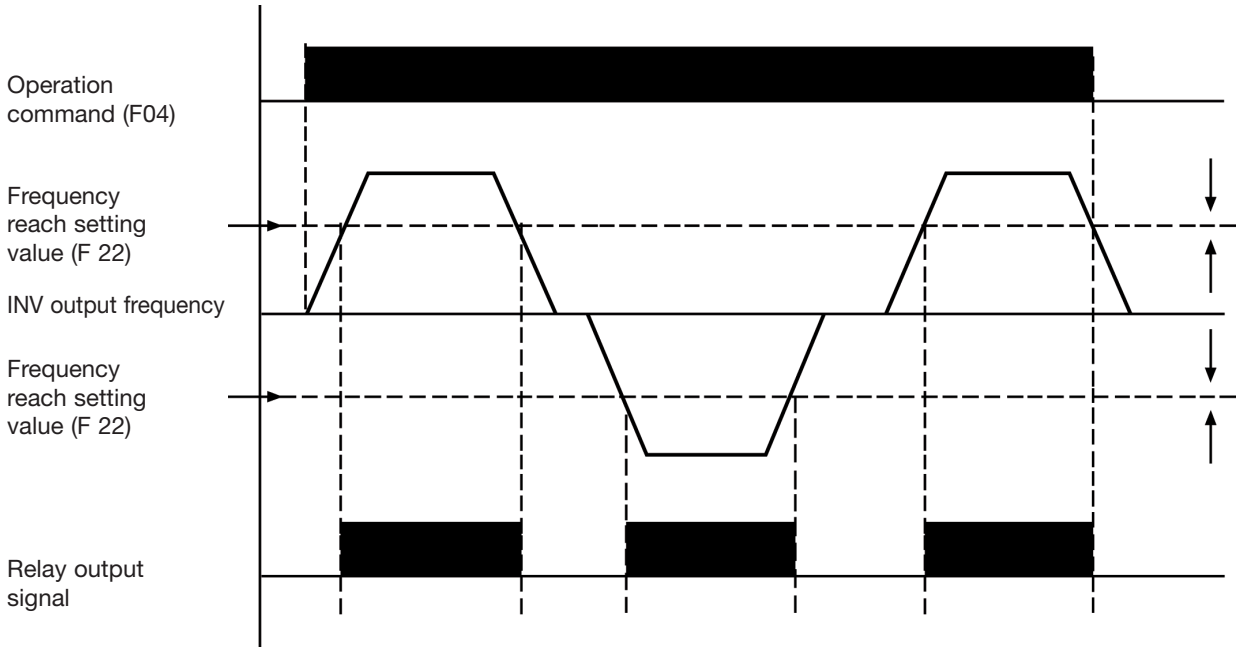


Figure 4-8c Frequency Detection (F21/C46=3)

F21/C46=004 Frequency detection < F22

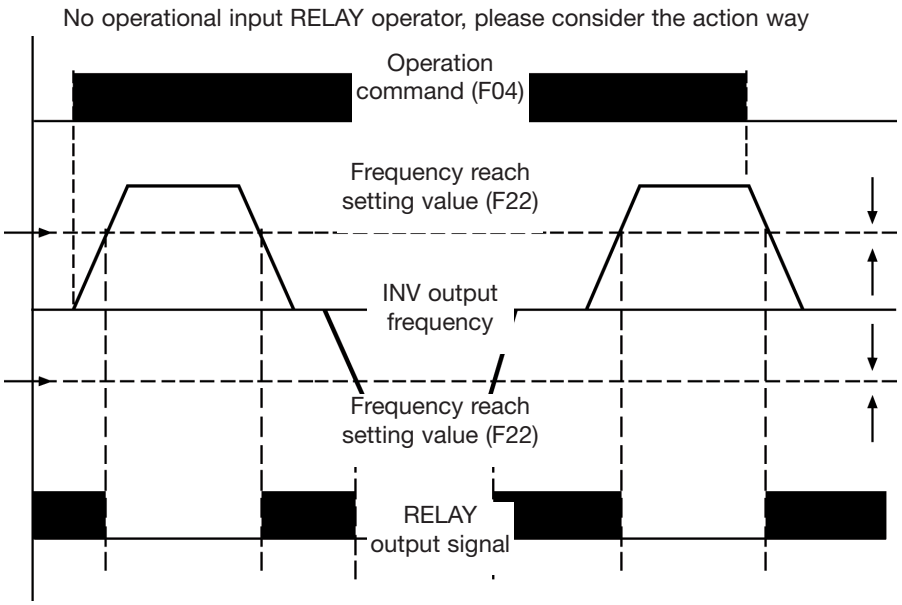


Figure 4-8d Frequency Detection (F21/C46=4)

F21/C46=005 Fault conditions

The relay will be enabled in the following fault conditions: EPR, CTR, OCS, OCD, OCA, OCC, OVC, OHC, OVP, OL1, OIL2, OLC, LVC, PID.

F21/C46=015 Output current reached > F24

F24: setting value (000~100%) by motor rated current (F43)

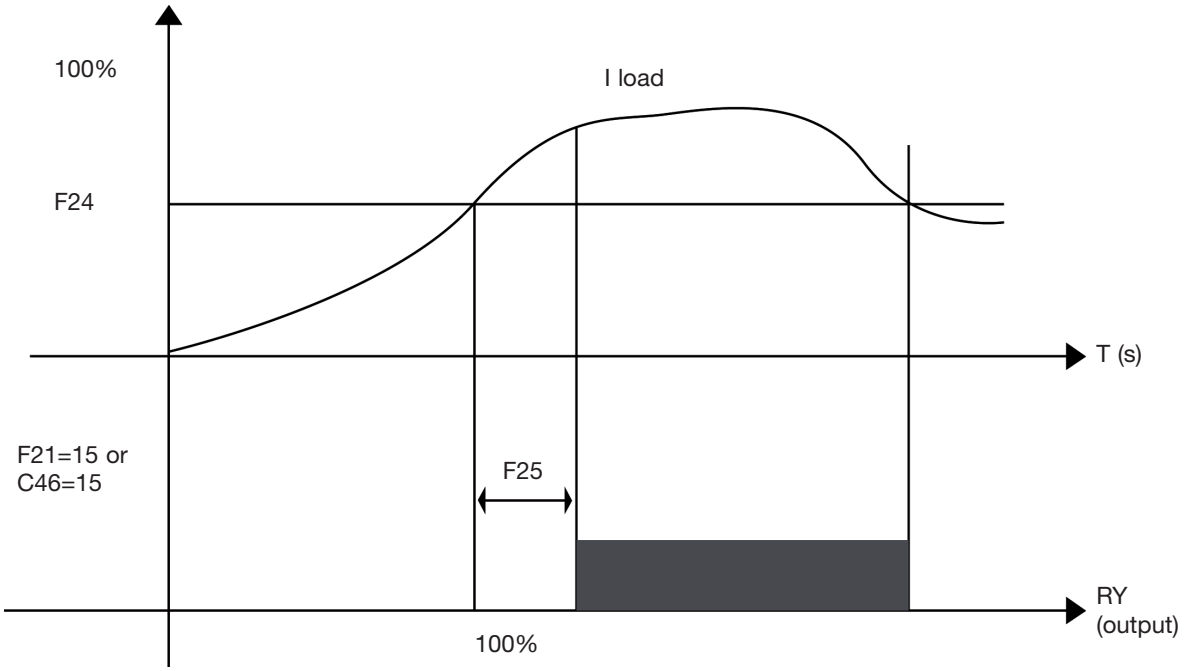


Figure 4-9 Output current detection

F26 Multifunction analog output type selection
- **000: Output frequency**
- **001: Set frequency**
- **002: Output frequency**
- **003: DC voltage**
- **004: Output current**
- **005: PID feedback signal**

F27 Multifunction analog output gain: 000 ~ 200%

F26 configures 0-10VDC output from the FM+ multifunction analog output terminal. Output can be set to any of the above variables.

F27 is used to scale the output signal supplied to the externally connected analog device.

F26=005, PID Feedback. The analog input to terminal AIN (0-10VDC or 4-20mA), will be outputted from terminal FM+ as 0-10VDC.
Note: due to hardware limits, the max output voltage from FM+ terminal will be limited to 10V.

F28 Preset frequency n°1 (Hz): 00.0~200
F29 Preset frequency n°2 (Hz): 00.0~200
F30 Preset frequency n°3 (Hz): 00.0~200
F31 Preset frequency n°4 (Hz): 00.0~200
F32 Preset frequency n°5 (Hz): 00.0~200
F33 Preset frequency n°6 (Hz): 00.0~200
F34 Preset frequency n°7 (Hz): 00.0~200
F35 Preset frequency n°8 (Hz): 00.0~200
F36 Jog frequency (Hz): 00.0~200

When run signal is applied and the selected external multi-function input terminal is ON, the inverter will run at one of 9 preset speeds which are controlled by the status of the terminals. The corresponding speeds are programmed in parameters F28 to F36 as shown in the table below. When run signal is applied and the selected external multifunction input terminal is ON and set to Jog speed, the inverter will run according to F36 setting.

Set frequency priority: Jog > Preset frequency > External analog frequency signal

MFIT input F11~F15=004	MFIT input F11~F15=003	MFIT input F11~F15=002	MFIT jog input F11~F15=005	Output frequency
OFF	OFF	OFF	OFF	F28
OFF	OFF	ON	OFF	F29
OFF	ON	OFF	OFF	F30
OFF	ON	ON	OFF	F31
ON	OFF	OFF	OFF	F32
ON	OFF	ON	OFF	F33
ON	ON	OFF	OFF	F34
ON	ON	ON	OFF	F35
ON/OFF	ON/OFF	ON/OFF	ON	F36

F37 DC braking time (s): 00.0~25.5
F38 DC braking start frequency (Hz): 01.0~10.0
F39 DC braking level (%): 00.0~20.0

F37 / F38: DC braking time and start frequency, per the following figure:

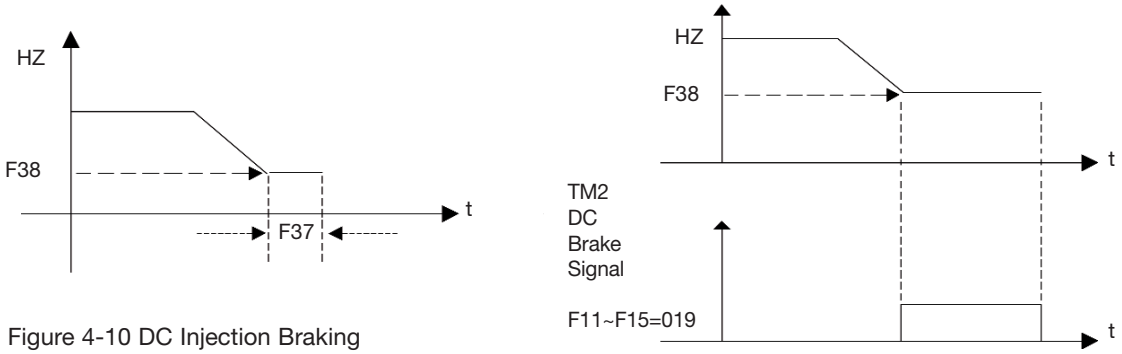


Figure 4-10 DC Injection Braking

- To reduce noise due to long cable decrease carrier frequency.
- To reduce motor audible noise increase carrier frequency. However the output current from the inverter will be de-rated according to the table below.
- When output current is over the full load current of inverter, the carrier frequency will be decreased automatically.

F40 Carrier frequency (kHz): 004-016

Set this parameter to a level from 4-16kHz as required. (Default is 10kHz).

F40	Carrier frequency	F40	Carrier frequency	F40	Carrier frequency	F40	Carrier frequency
004	4kHz	008	8kHz	012	12kHz	016	16kHz
005	5kHz	009	9kHz	013	13kHz		
006	6kHz	010	10kHz	014	14kHz		
007	7kHz	011	11kHz	015	15kHz		

In situations where there is excessive audible noise from the motor or it is required to reduce electrical noise from the inverter caused by use of long cable then the carrier frequency can be adjusted as follows:

Corresponding list of current and carrier frequency

Model / Carrier Frequency	RVEFA110020 RVEFA1200220 (F) RVEFA32020	RVEFA110040 RVEFA1200240 (F) RVEFA320040	RVEFA110075 RVEFA1200275 (F) RVEFA320075	RVEFB120150 (F) RVEFB320150	RVEFB120220 (F) RVEFB320220	RVEFB340075 (F)	RVEFB340150 (F)	RVEFB340220 (F)
4~10K	1.7	3.1	4.2	7.5	10.5	2.3	3.8	5.2
12K	1.7	3.1	4.2	7.5	10.5	2.2	2.2	3.7
14K	1.6	3.0	4.0	7.0	10.0	2.2	2.2	3.6
16K	1.5	2.8	3.8	6.8	8.7	2.1	2.1	3.5

F41 Auto restart on momentary power loss
000: Enable
001: Disable

F41=000: auto restart after a momentary power loss is enabled on resumption of power and applying the run signal, according to setting of parameter F04.
The inverter will carry out an auto speed search, once the motor rotation speed is found then it will accelerate to the running speed before the power loss.
F41=001: the inverter will not restart.

F42 Auto restart times: 000 ~ 005

1.) F42=000: the inverter will not auto-restart on fault trip (regardless of F41).
2.) F42>000: the inverter will carry out an auto search 0.5 sec after the fault trip, and while the inverter output is switched off and the motor is coasting to stop. Once the rotation speed is determined the inverter will accelerate or decelerate to speed before the fault.
3.) When OL1, OL2, OH, BB faults happens, auto-restart doesn't work.
Note: Auto restart doesn't work while DC injection braking or deceleration to stop performed.

F43 Motor rated current (A)
F44 Motor rated voltage (VAC)
F45 Motor rated frequency (Hz)
F46 Motor rated power (kW)
F47 Motor rated speed (RPM): F47 X 10= Motor rated speed

F48 Torque boost gain (sensorless) (%): 001~450

Performance: if the motor load is determined to be too large increase the output torque (this parameter is used in sensorless mode C14=000).

$$\Delta Te \fallingdotseq I \times Gain$$

(load current) (torque boost gain)

- Torque/Speed curve pattern:

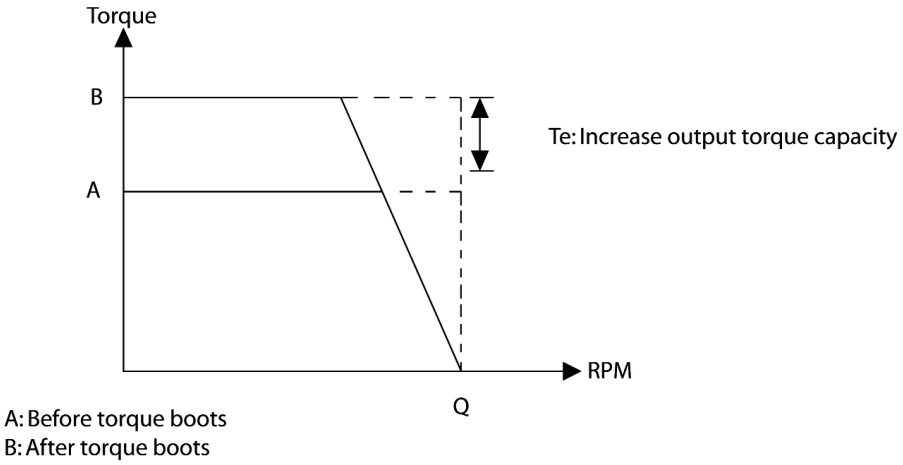


Figure 4-11 Output Torque Capacity

- Operating frequency range: 0~Motor rated frequency (F45).
- When the motor output torque is nt enough and increase F48 setting value.
- When the motor is erratic or vibrates decrease F48 setting value.
- The max. output torque limit to the inverter is current rated.
- If increase F48 setting value then the output current is too large. Please increase F49 setting value on the same time.

F49 Slip compensation gain (sensorless) (%): 000-450

Performance: If the motor load appears too large, increase slip compensation (this parameter is used in sensorless mode C14=000):

$$\Delta F_{slip} \fallingdotseq I \times Gain$$

(load current) (slip compensation gain)

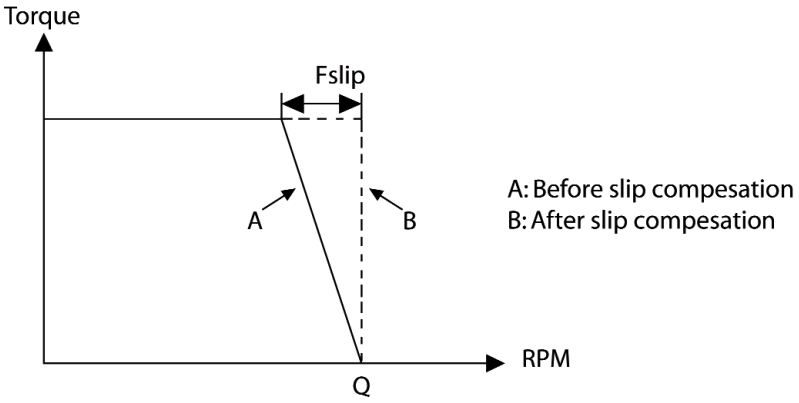


Figure 4-12 Slip Compensation

- Operating frequency range: 0~Motor rated frequency (F45).
- When the motor output rotation speed is too low increase F49 setting value.
- When the motor is erratic or vibrates, decrease F48 setting value.
- The max. output rotation speed limit to the motor max. setting frequency.
- If increase F49 setting value then the output current is too large. Please increase F48 setting value on the same time.

F50 Low frequency voltage compensation: 000-040

Performance: During low frequency
Increase F50 setting value to increas output voltage and low frequency torque.
• Output voltage/frequency curve pattern:

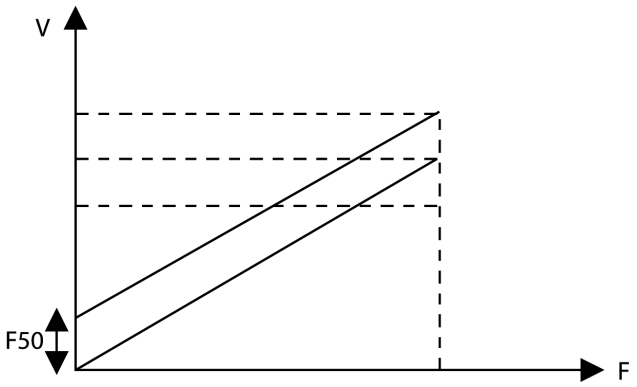


Figure 4-13 Low frequency Voltage Compensation

• Operating frequency range: 0~12Hz/60Hz
0~10Hz/50Hz

• During low frequency use:
When the motor output torque is insufficient, increase F50 setting value.
When the motor is vibrating excessively, decrease F50 setting value.

F51 Advanced parameter function display
000: Disable access to advanced parameters (group C)
001: Enable access to advanced parameters (group C)

F51=000: parameter group C can not be displayed or accessed.
F51=001: enable display and access to parameter group C.

F52 Factory default
010: Reset parameters to factory default (50Hz)
020: Reset parameters to factory default (60Hz)

F53 Software version

F54 Fault records (Latest 3 times)

Advanced Parameter List (Group C parameters)

C00 Reverse run
000: Reverse enable
001: Reverse disable

When F04=000 and C00=001, F03 (motor direction) is disabled, the inverter is set to forward operation.
When F04=001 or 002, and C00=001, reverse command is disabled.

C01 Acceleration stall prevention
000: Enable stall prevention during acceleration
001: Disable stall prevention during acceleration
C02 Acceleration stall prevention level (%): 050 ~ 200
C03 Deceleration stall prevention
000: Enable stall prevention during deceleration
001: Disable stall prevention during deceleration
C04 Deceleration stall prevention level (%): 050 ~ 200
C05 Run stall prevention
000: Enable stall prevention in run mode
001: Disable stall prevention in run mode
C06 Run stall prevention level (%): 050 ~ 200
C07 Stall prevention time during run mode
000: Set by parameter F02 (deceleration #1)
001: Set by parameter C08
C08 Stall prevention deceleration time (s): 00.1 ~ 999

1.) When the acceleration time is set too low, the inverter could trip on Over Current (OC). If the time can not be increased then trip prevention can be used. A trip prevention level has to be programmed. When the inverter detects this level it holds the acceleration until the current is below this set level and then continues with acceleration.

2.) When the deceleration time is set too low the inverter could trip on Over Voltage (OV). If the time can not be increased then trip prevention can be used. A trip prevention level has to be programmed. When the inverter detects this level it holds the deceleration until the voltage is below this set level and then continues with deceleration.

3.) The inverter could trip (stall) during run mode due to an impact load or sudden change of the load. Stall prevention in run mode will detect a programmed stall level (C06) for a period of time (C07). If the level exceeds C06, then the inverter reduces its frequency (speed) to provide the required additional torque to overcome the stall. Once this level is below the programmed stall level, then it ramps up to its normal running speed.

C09 Direct start on power up
000: Enable direct start on power up
001: Disable direct start on power up

Danger

- When C09=000 and external run mode (F04=001), the inverter will auto start when the power is supplied to the inverter and the run switch is ON.
- When C09=001 and external run mode (F04=001), the inverter will not auto start when power is supplied and the RUN switch is ON. Inverter display will blink "SP1" error message. It can only restart after the RUN switch was ned off and ON again.

This feature should only be considered when all safety implications of its use have been investigated. (Risk assessment for maintenance, use of warning labels etc.) We recommend that this mode stay disabled.

C10 Reset mode
000: Reset is enable when RUN switch is OFF
001: Reset is enable with RUN switch OFF or ON

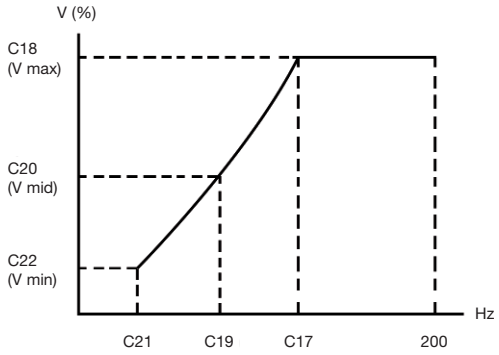
C10=000: fault can not be reset, therefore the inverter can not start when the RUN switch is in ON position (F4=001)

C11 Acceleration time #2 (s): 00.1 ~ 999
C12 Deceleration time #2 (s): 00.1 ~ 999 (for emergency Stop reference)
C13 Fan control
000: Auto-run by temperature
001: Run when inverter runs
002: Always run
003: Always stop

1.) C13=000: the fan will auto-run at or above a set certain temperature in order to extend the life span of the fan.
2.) C13=001: the fan runs as long as inverter is running.
3.) C13=002: the fan runs as long as power is supplied.
3.) C13=003: the fan does not run at any time.

C14 Control mode
000: Sensorless control
001: V/F control
C15 V/F pattern setting: 001 ~ 007
C16 V/F base output voltage (V): 198~265V/380~530V
C17 V/F Max. output frequency (Hz): 50.0 ~ 200
C18 V/F Output voltage ratio at max. frequency (%): 00.0 ~ 100
C19 V/F Mid frequency (Hz): 00.1 ~ 200
C20 V/F Output voltage ratio at mid. frequency (%): 00.0 ~ 100
C21 V/F Min. output frequency (Hz): 00.1 ~ 200
C22 V/F Output voltage ratio at min. frequency (%): 00.0 ~ 100

C15 = 007: select user-set V/F pattern by setting parameters C17~C22.
See the diagram below. Care should be taken when this feature is used as improper setting of these parameters will have an adverse effect on motor performance.



C15 = 001~ 006 fixed V/F patterns (see below).

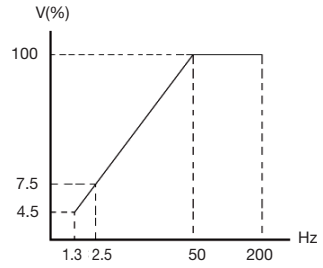
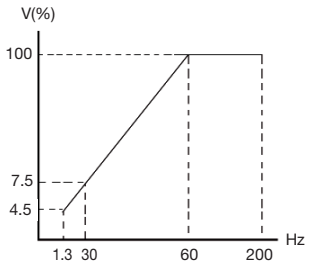
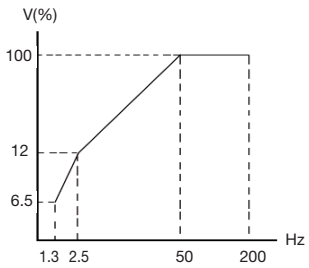
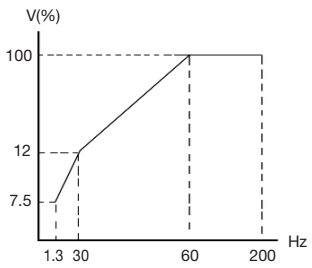
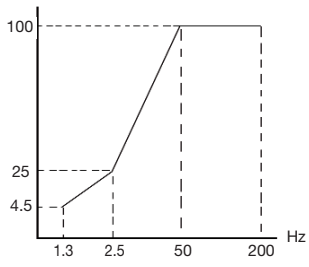
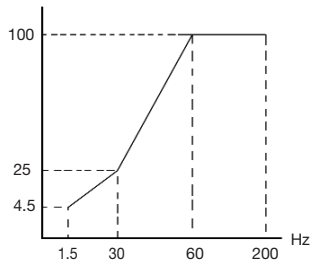
Spec	Purpose	C15	V/F Pattern	Spec	Purpose	C15	V/F Pattern
50 Hz System	General	001		60 Hz System	General	004	
	High staring torque	002			High staring torque	005	
	Variable torque	003			Variable torque	006	

Figure 4-14b Pre-configured V/F patterns

The value of C16 is the base output voltage for V/F control.
Ex. C17=60Hz and C18=100% for the 200~240 model.

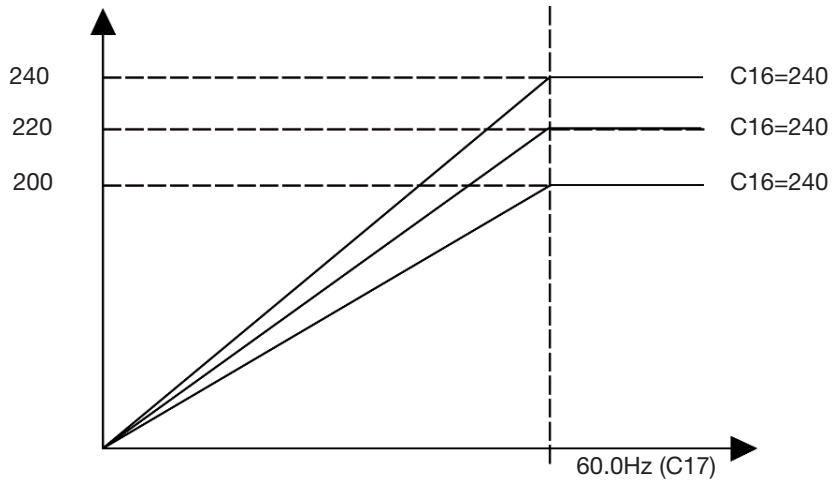


Figure 4-15V/Hz curves with varying voltages

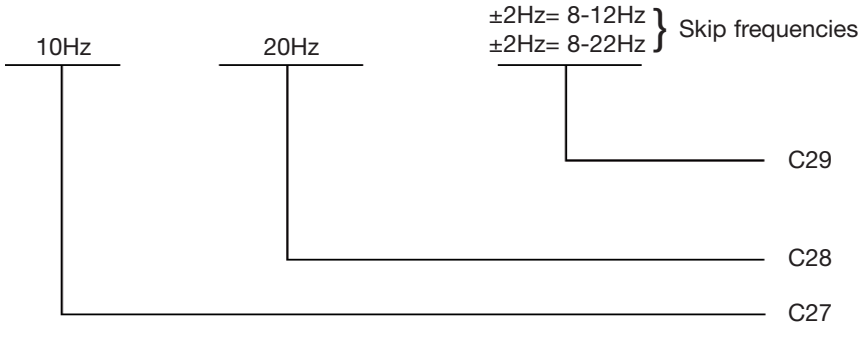
When the output voltage is set higher than the input voltage, the max output voltage is limited to the max input voltage.

C23 V/F Torque Boost Gain (%): 00.0 ~ 30.0
C24 V/F Slip Compensation Gain (%): 00.0 ~ 100
C25 Motor no load current (A): ----------

Motor no load current varies with inverter capacity F00. Please adjust according the actual conditions.

C26 Electronic thermal relay protection for motor (OL1)
000: Enable motor protection
001: Disable motor protection
C27 Skip frequency #1 (Hz): 00.0 ~ 200
C28 Skip frequency #2 (Hz): 00.0 ~ 200
C29 Skip frequency range (± Hz): 00.0 ~ 30.0

Example: C27=10.0Hz/C28=20.0Hz/C29=02.0Hz



C30 PID operation mode
000: PID function disabled
001: PID control, deviation is derivative controlled
002: PID control, feedback is derivative controlled
003: Same as 001 but reverse characteristics control
004: Same as 002 but reverse characteristics control

C30 =001: D is the deviation of PID error in the unit time (C34).
=002: D is the deviation of feedback value in the unit time (C34).
=003: D is the deviation of PID error in the unit time (C34). If the deviation is positive, the output frequency decreases, and vice versa.
=004: D is the deviation of feedback value in unit time (C34). When the deviation is positive, the frequency decreases, and vice versa.

C31 PID error gain: 0.00 ~ 10.0

C31 is PID error gain, that is feedback value = feedback value x C31.

C32 Proportional gain P (%): 0.00 ~ 10.0

C32: Proportional gain for P control.

C33 Integral time I (s): 00.0 ~ 100

C33: Integral time for I control.

C34 Differential time D (s): 0.00 ~ 10.0

C34: Differential time for D control.

C35 PID offset
000: Positive direction
001: Negative direction
C36 PID offset adjust (%): 000 ~ 109

PID operation result can be adjusted by C36 (C35 effects the polarity of C36).

C37 PID update time (s): 00.0 ~ 02.5

C37: the refresh time of the PID output command.
Note: PID function is used in flow control, external fan wind volume control, and temperature control. See flow control diagram below.

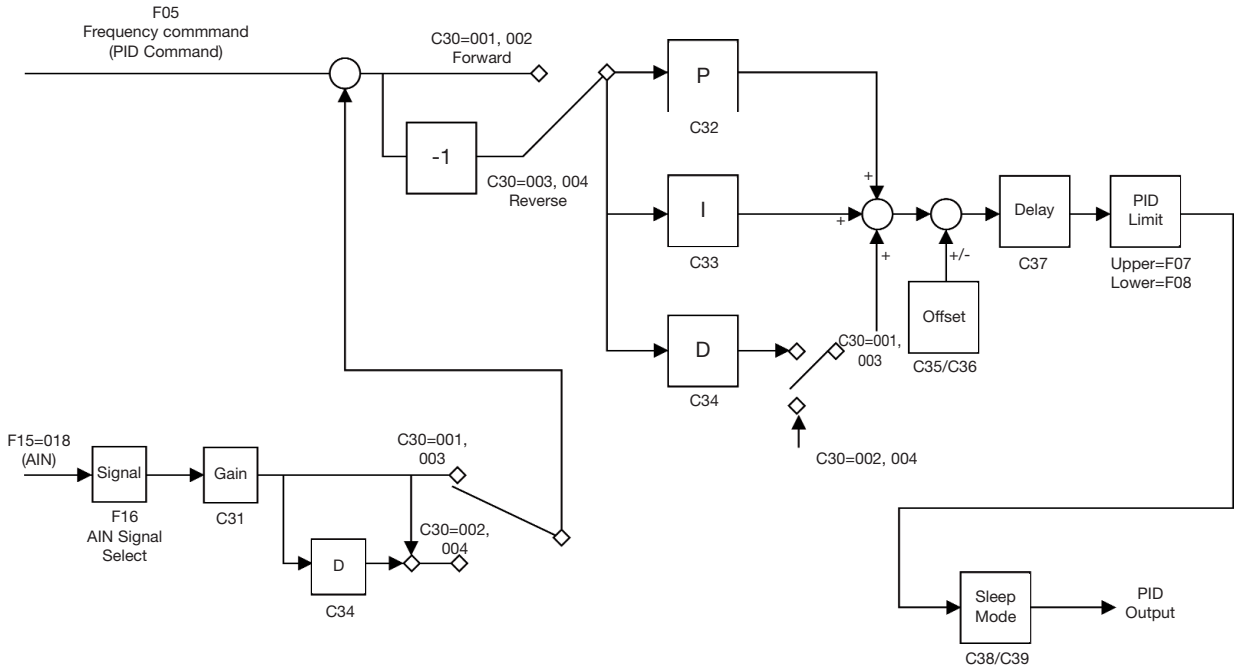


Figure 4-16 PID flow control diagram

1. In PID mode select, AIN on TM2 is the PID feedback signal (set F15=018).
2. The PID command (set-point) is selected by parameter F05 (selections 000 & 001). This value is stored in F28.

C38 PID Sleep set-point (Hz): 00.0~200
C39 PID Sleep delay time (s): 00.0~25.5

PID sleep mode requires setting all functions below:
C30=001~004 (PID enable)
F15=018 (AIN is PID feedback signal)
F28=PID preset frequency
C38 sleep start frequency (Hz)
C39 PID sleep delay time (s)
F05 frequency command source
When PID output frequency becomes lower than the PID sleep start frequency (C38) for a period of time (C39), then the inverter output will decelerate to zero speed (sleep mode). When the PID output frequency becomes higher than the sleep start frequency (C38), the inverter output accelerates to PID output frequency (wake mode). Refer to figure 4-17.

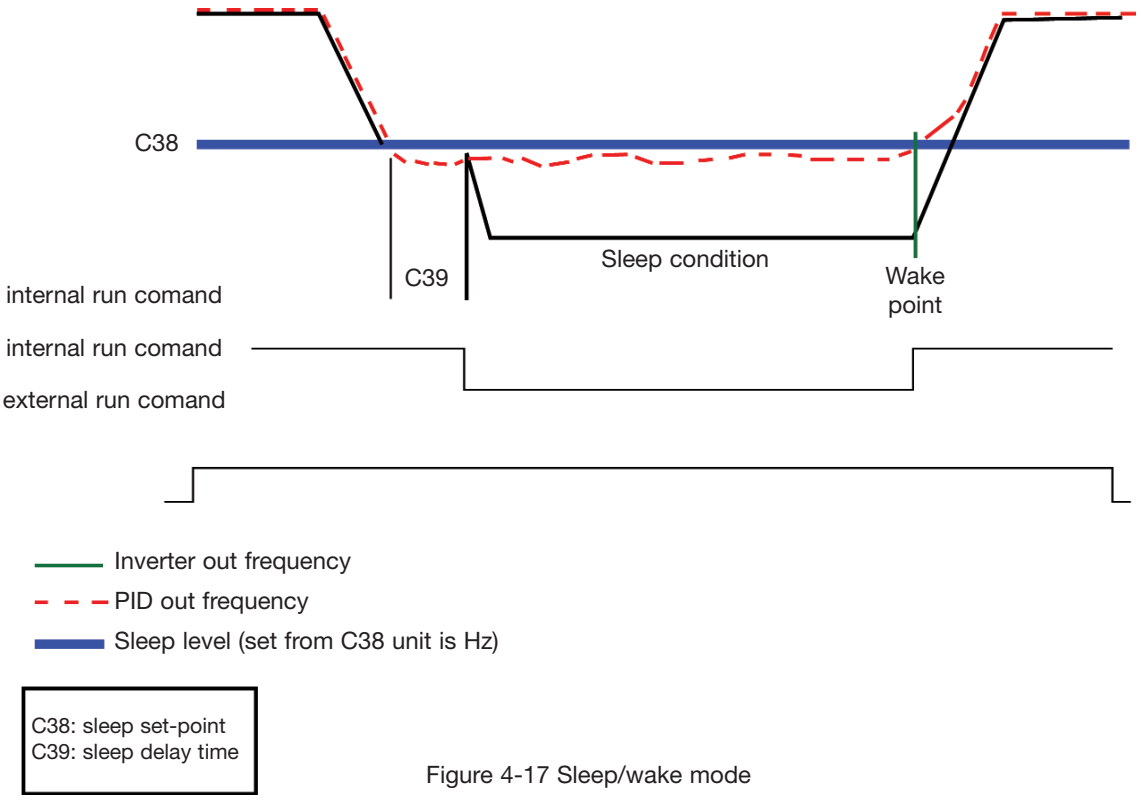


Figure 4-17 Sleep/wake mode

C40 Frequency Up/Down control using MFIT

000: Up/Down command is available. Set frequency is held when inverter stops

001: Up/Down command is available. Set frequency resets to 0Hz when inverter stops

002: Up/Down command is available. Set frequency is held when inverter stops. Up/Down is available in stop

1.) C40=000: when the RUN signal is ON, the inverter will accelerate to the F28 setting then continue to run at the set command speed. When Up/Down terminal is activated, the inverter begins to accelerate/decelerate until the signal is released then. It run at the reached speed.
When the RUN signal is OFF, the inverter decelerates to stop (or coasts to stop) according to the setting of F09. The last output frequency when the RUN signal is OFF, will be stored in F28.
Up/Down keys is unavailable in stop. The stored frequency can not be changed by Up/Down terminal, but can be changed by the content of F28 by keypad.

2.) C40=001: the inverter will run from 0Hz as the run signal is applied.
Up/Down operation method is same as C40=000. But on next RUN signal is ON, inverter always starts up from 0Hz.

3.) C40=002: same as when C40=001 but Up/Down is available while in stop mode.

C41 Local/remote frequency control select (run command by the run/stop key)
000: Up/Down key on the keypad sets the frequency
001: Potenziometer on the keypad sets the frequency

- Local mode
  - Run command
    The Run/Stop pad on the keypad controls inverter F04 setting has no effect on control.

  - Frequency command
    When C41=000: the UP/DOWN pad on the keypad controls the drive and the F05 setting has no effect.
    When C41=001: the potentiometer on the keypad controls frequency, and F05 setting has no effect.

- Remote mode
  - Run command is by the run parameter (F04) setting
  - Frequency command from the frequency parameter (F05) setting.

Control select mode is changed by simultaneously pressing V/RESET and DATA/ENT keys (drive must be in stop mode).

C42/43 Terminal S5~S6 (option card)
000: Forward/stop comand
001: Reverse/stop comand
002: Preset speed command #1
003: Preset speed command #2
004: Preset speed command #3
005: Jog frequency command
006: Emergency stop (E.S.)
007: Base Block (b.b.)
008: Use acceleration/deceleration time #2
009: Reset
010: Up command
011: Down command
012: Control signal switch
013: Communication control signal switch
014: Acceleration/deceleration inhibition
015: Master/auxiliary speed source select
016: PID function disable
019: DC brake signal

Refer to F11~F14 description.

C44: Multi-function input terminal S1~S6 signal scan time (ms x 8): 1 ~ 100
C45: Confirming AIN signal scan time (ms x 8): 1 ~ 100

If the scan signal is seen for N times (scan times), the inverter takes it as signal change. If it is seen for less than N times, it is seed as noise. One scan time: 8ms. Ex: if the C44 scan time is set to 80 ms as an example (i.e C44=010 so N=10) then digital input signals on for less than 80 msec will be ignored. User can set scan interval time according to noise in the operation environment.
Extend C44/C45 if noise is a problem, however this will reduce the scan response time.

C46 Multifunction output T+ T- (option card)

000: Run
001: Frequency reached (set frequency ± F23)
002: Frequency is within the range set by (F22 ± F23)
003: Frequency detection (>F22)
004: Frequency detection (<F22)
005: Fault conditions
006: Auto reset and restart
007: Momentary power loss
008: Emergency stop (E.S.)
009: Base Block (b.b.)
010: Motor overload protection
011: Inverter overload protection
012: Retain
013: Power on
014: Communication error
015: Output current detection (>F24)

Refer to F21 description.

C47 Remote keypad control selection

000: Disable (no signal loss detection)
001: Enable. On signal loss stop according to F09
002: Enable. Runs at the last set frequency. On signal loss stop is according to F04 settings or stop key on keypad.

1. Before remote keypad is installed, set C47 to 001 or 002 by main keypad, then power off and install the remote keypad.
2. When C47=001, C49~C53 set parameter disable the following parameters will be auto set: inverter communication address: no 1, data bytes: 8 bit, baud rated (bps): 38400, parity bytes: no parity, stop bytes: 1 bit.
3. Set C47 to 000 by main keypad after remote keypad removed.
4. C47 can't be changed by Remote keypad.

Note: 1. For safety reason, please install or remove remote keypad when power off.
2. If the remote keypad installed while power on and in stop mode, the inverter will be controlled by remote keypad.
3. If the remote keypad installed while power on and in run mode, the inverter will be controlled by main keypad, it will not be effective until the inverter has stopped.

C48 Copy module

000: Copy module disabled
001: Copy to module from inverter (read)
002: Copy to inverter from module (write)
003: Read/write check (compare the parameters)

Note: Module copy function is applicable only to inverters with the same voltage and kW rating.

C49 Inverter communication address: 001~ 254

C49 set communication address, for the specific inverter when multi-inverters are controlled by communication method.

C50 Baud rate (bps)
000: 4800
001: 9600
002: 19200
003: 38400
C51 Stop bit
000: 1 stop bit
001: 2 stop bit
C52 Parity bit
000: No parity
001: Even parity
002: Odd parity
C53 Data bits
000: 8 bits data
001: 7 bits data

RS-485 communication (requires RS485 port device):

-1 to 1 control: PC or PLC or controller controls one inverter (C49 is set to 001~254).

-1 to multiple drives control: PC or PLC or other controllers control several inverters (up to 254 inverters with C49 set as 001~254). When the communication address =000, the inverter is controlled by communication regardless of the C49 setting.

RS-232 communication (requires RS232 port):

-1 to 1 control: PC or PLC or controller controls one inverter (C49 is set to 001~254).

Note:

a. The baud rate (C50) and communication format (C51/C52/C53) of PC (or PLC or other controller) and inverter should be the same.

b. The inverter will validate the modified parameters after the parameters modified by PC.

c. Communication protocol: refer to RVEF communication protocol description.

d. Parameter C49~C53 can't be changed via communication module.

C54 Communication time-out detection time (s): 0.0~25.5
C55 Communication time-out operation selection
000: Deceleration to stop (F02 deceleration time #1)
001: Coast to stop
002: Deceleration to stop (C12 deceletation time #2)
003: Continue opetating

Communication time-out detection enable or not is according to C54 (C54=0.0 disable), not relationship with Run/Frequency command. *Cannot be modified during communication. *Detail list please see Appendix.

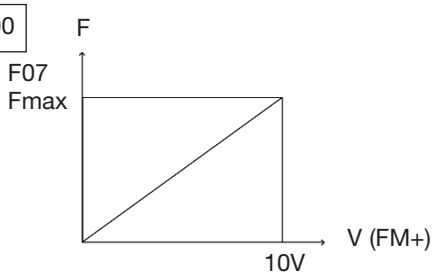
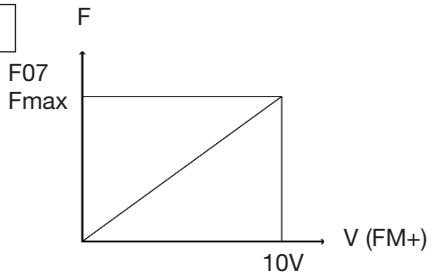
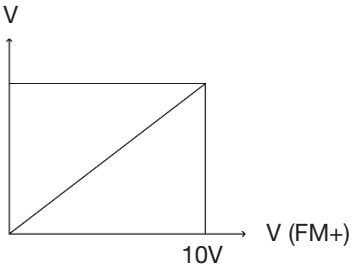
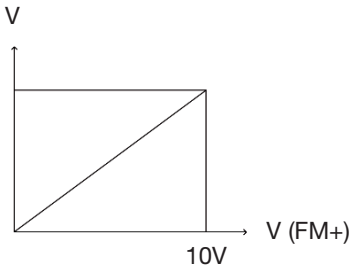
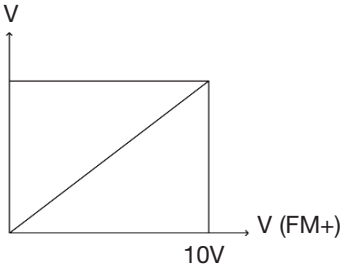
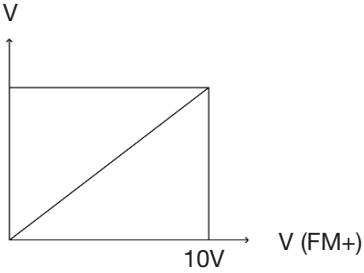
After communication time-out, the motor decelerates to stop (C55 = 000, 001, 002). And the motor does not run automatic after reset, the inverter must set the run command again to restart. *Cannot be modified during communication. *Detail list please see Appendix.

Reset method:

a. Push the "Reset" button directly.

b. Receive correct Modbus data from Master.

F26 Multifunction analog output control:

F26=000 	F26=001 
F26=002 Sensorless F44 or V/F C16 x C18 	1. When C14=000 (sensorless) FM+ 0~10V corresponds to 0~motor rated voltage (F44). 2. When C14=001 (V/F) FM+ 0~10V corresponds to 0~ V/F base output voltage set (C16) x Max output frequency voltage ratio % (C18).
F26=003 500V or 1000V 	240V class: FM+ 0~10V corresponds to 0~500Vdc 480V class: FM+ 0~10V corresponds to 0~1000Vdc
F26=004 Rated current 	Ex. The rated current of RVEFA320075 is 4.2A, FM+0~10V corresponds to 0~4.2A.
F26=005 100% feedback value 	1. When C30≠000, FM+ 0~10V corresponds to 0~100% feedback value. 2. When C30=000 FM+ 0~10V corresponds to 0~10V or 0 ~ 20mA on S6.

CARLO GAVAZZI

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
EPR	EEPROM problem.	EEPROM problem.	Replace EEPROM.
OV@	Over voltage during stop.	Voltage detection circuit malfunction.	Repair or replace unit.
LV@	Under voltage during stop.	1. Power voltage too low. 2. Restraining resistor or fuse burnt out. 3. Detection circuit malfunctions.	1. Check if the power voltage is correct or not. 2. Replace the restraining resistor or the fuse. 3. Repair or replace unit.
OH@	The inverter is overheated during stop.	1. Thermal detection circuit malfunction. 2. Ambient temperature too high or bad ventilation.	1. Repair or replace unit. 2. Improve ventilation conditions or relocate inverter.
CTR@	Current transducer detection error	Current transducer or circuit error.	Repair or replace unit

Note: "@" the Failure contact does not operate.

5.1.2. Errors which can be recovered both manually and automatically

Display	Error	Cause	Remedy
OCS	Over-current at start.	1. Motor winding and frame short circuit. 2. Motor and ground short circuit. 3. Power module is damaged.	1. Check the motor. 2. Check the wiring. 3. Replace the power module.
OCD	Over-current at deceleration.	The preset deceleration time is too short.	Set a longer deceleration time.
OCA	Over-current at acceleration.	1. Acceleration time is too short. 2. The capacity of the motor is higher than the capacity of the inverter. 3. Short circuit between motor winding and frame. 4. Short circuit between motor wiring and earth. 5. IGBT module is damaged.	1. Set a longer acceleration time. 2. Replace the inverter with the same or greater capacity as that of the motor. 3. Check the motor. 4. Check the wiring. 5. Replace the IGBT module.
OCC	Over-current during run.	1. Transient load change. 2. Transient power change.	Increase inverter capacity.
OVC	Over voltage during operation/deceleration.	1. Deceleration time setting is too short or excessive load inertia. 2. Power voltage varies widely.	1. Set a longer deceleration time. 2. Add a braking resistor or braking unit. 3. Add a reactor at the input line side. 4. Increase inverter capacity.
OHC	High heat sink temperature during operation.	1. Heavy load. 2. Ambient temperature too high or bad ventilation.	1. Check if there are any problems with the load. 2. Increase inverter capacity. 3. Improve ventilation conditions. 4. Inspect the setting value of parameter.
COT	Communication time-out detection	1. C54 communication time-out detection time is too short. 2. Inverter communication is broke 3. Inverter can not receive the correct Modbus data within detection time.	1. Increase C54 communication time detection time. 2. Keep the inverter communication. 3. Check the received. Modbus data is correct from Master.

5.1.3 Errors which can be recovered manually but not automatically (no autorestart)

Display	Error	Cause	Remedy
OC	Over-current during stop.	1. OC Detection circuit malfunction. 2. Bad connection for CT signal cable.	Send the inverter back for repair.
OL1	Motor overload.	1. Heavy load. 2. Improper settings of F43.	1. Increase motor capacity. 2. Set F43 correctly according to motor nameplate.
OL2	Invreter overload.	Excessively heavy load.	Increase inverter capacity.
LVC	Under voltage during operation.	1. Power voltage too low. 2. Power voltage varies widely.	1. Improve power quality. 2. Set a longer acceleration time. 3. Add a reactor at the power input side. 4. Contact technical support.

5.1.4 Special conditions

Display	Error	Cause	Remedy
SP0	Zero speed stop	Set frequency is <0.1Hz Increase set frequency.	
SP1	Fail to start directly	1. If the inverter is set to external control mode (F04=001), and direct start is disabled (C09=001), the inverter cannot be started and will flash STP1 when the Run switch is ON when applying power (see descriptions of C09). 2. Direct start is possible when C09=000.SP1.	
SP2	Keypad emergency stop	1. If the inverter is set to external control mode (F04=001), the inverter will stop according to the setting of F09 when the stop key is pressed. STP2 flashes after stop. Turn the Run switch to OFF and then ON again to restart the inverter. 2. If the inverter is in communication mode and Stop key is enabled, the inverter will stop in the way set by F9 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. SP2.	
E.S.	External emergency stop	The inverter will decelerate to stop and flashes E.S. when there is an external emergency stop signal via the multi-function input terminals (see descriptions of F11~F14).	
b.b	External base block	The inverter stops immediately and then flashes b.b. when external base block is input through the multi-functional input terminal (see descriptions of F11~F14).	
PID	PID feedback signal loss	PID feedback signal circuit error detection.	
---	REMOTE KEYPAD cable broken	1. When REMOTE KEYPAD does not connect with inverter, this signal will be displayed on the Remote keypad. 2. When REMOTE KEYPAD connects with inverter, this signal will be displayed on the main keypad. 3. When both REMOTE KEYPAD and main KEYPAD display this signal means communication errors.	

5.1.5 Operation errors

Display	Error	Cause	Remedy
Er	Zero speed stop	1. Attempt to Press ▲or ▼ keys when F05> 000 or in speed operation. 2. Attempt to modify parameters, wich can not be modified during Run (see parameter list).	1. ▼or ▲keys can be used to modify frequencies only when F05=000. 2. Modify parameters only in stop mode.
Er2	Parameter setting error.	1. F07 is within ranges of C27±C29 or C28±C29. 2. F07<F08 or F07=F08.	1. Modify F32~F33 2. 3-00>3-01
Er5	Modification of parameter is not allowed during communication.	1. Issue a control command during communication disabled. 2. Modify C49~C53 during communication. 3. Change C47 by remote keypad.	1. Issue the enabling command before while communicating. 2. Set up parameters before communicating. 3. Change C47 by inverter keypad.
Er6	Communication error.	1. Incorrect wiring. 2. Incorrect setting of communication parameters. 3. Check-sum error. 4. Incorrect communication verification.	1. Check the hardware and wiring. 2. Check C49~C53.
EP1	Incorrect parameter setting.	1. Attempt to modify F00. 2. Voltage and current detection circuits are malfunctioning.	Reset inverter or contact technical support.
Er7	Parameter set error, Copy Unit failure.	1. Set C48=1.2, can not connect with Copy Unit. 2. Copy Unit failure. 3. The voltage and drive rating on Copy Unit & the inverter are different.	1. Modify C48. 2. Change Copy Unit. 3. Copy from keypad to. inverter with only matched HP ratings.
EP2	Parameters do not match.	Copy the parameter to inverter to verify the parameter not matched.	1. Change Copy Unit. 2. The voltage and HP rating of Copy Unit is different than the inverter.

5.2 General functional troubleshooting

Status	Checking point	Corretive Action
Motor does not run	Is power applied to L1, L2, and L3 (N) terminals (is the charging indicator lit)?	• Is the power applied? • Turn the power OFF and then ON again. • Make sure the input line voltage is correct. • Make sure all terminal screws are secured firmly.
	Are there voltage outputs on T1, T2, and T3 terminals?	Turn the power OFF and then ON again.
	Is the motor mechanically overloaded?	• Reduce the load to improve performance.
	Are there any problems with the inverter?	• See error descriptions to check wiring and correct if necessary
	Has the forward or reverse run commands been issued?	
	Is there an analog input signal?	• Is analog frequency input signal wiring correct? • Is frequency input voltage correct?
	Is operation mode setting correct?	• Configure operations through the digital panel.
Motor rotates in the wrong direction	Are wiring for output terminals T1, T2 and T3 correct?	• Wiring must match U, V, and W terminals of the motor.
	Are wiring for forward and reverse signals correct?	• Check wiring and correct if necessary.
Motor rotates in the wrong direction the motor speed can not vary.	Are wiring for output terminals T1, T2, and T3 correct?	• Check wiring and correct if necessary.
	Is the setting of frequency command source correct?	• Check the operation mode setting on the keypad
	Is the load too large?	• Reduce the applied load
Motor running at too high or too low speeds.	Is the setting of operation mode correct?	• Confirm the motor's specifications
	Is the load too large?	• Confirm the gear ratio
	Are specifications of the motor (poles, voltage) correct?	• Confirm the highest output frequency
Motor speed is incorrect or erratic.	Is the gear ratio correct?	• Reduce the load
	Is the setting of the highest output frequency correct?	• Minimize the variation of the load • Increase capacities of the inverter and the motor
	Is the load too large?	• Add an AC reactor at the power input side if using single-phase power • Check wiring if using three-phase power

5.3 Troubleshooting Flowcharts RVEF Series

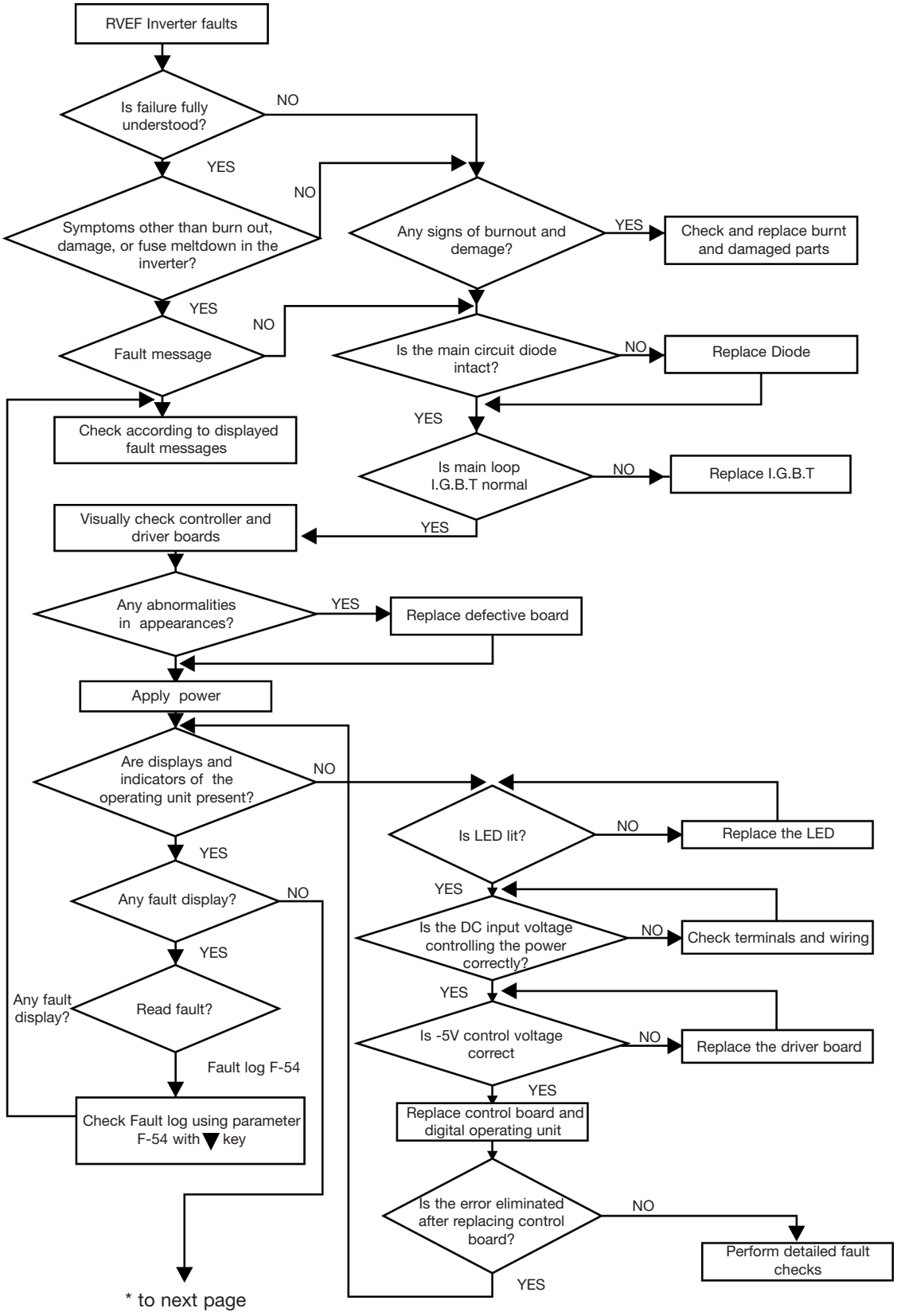


Figure 5-1 General troubleshooting flowchart

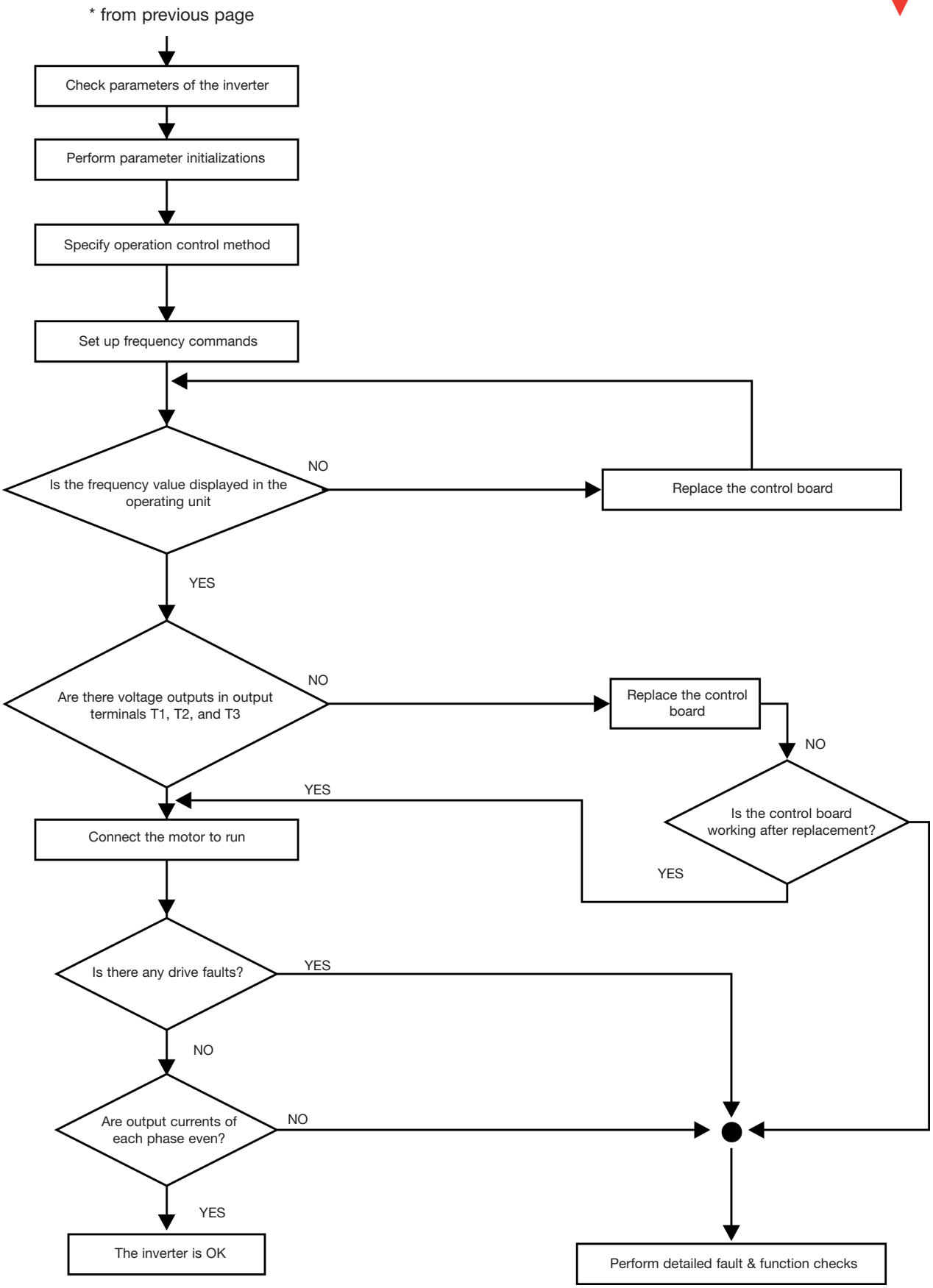


Figure 5-1 General troubleshooting flowchart, CONTD

Troubleshooting for OC, OL error displays

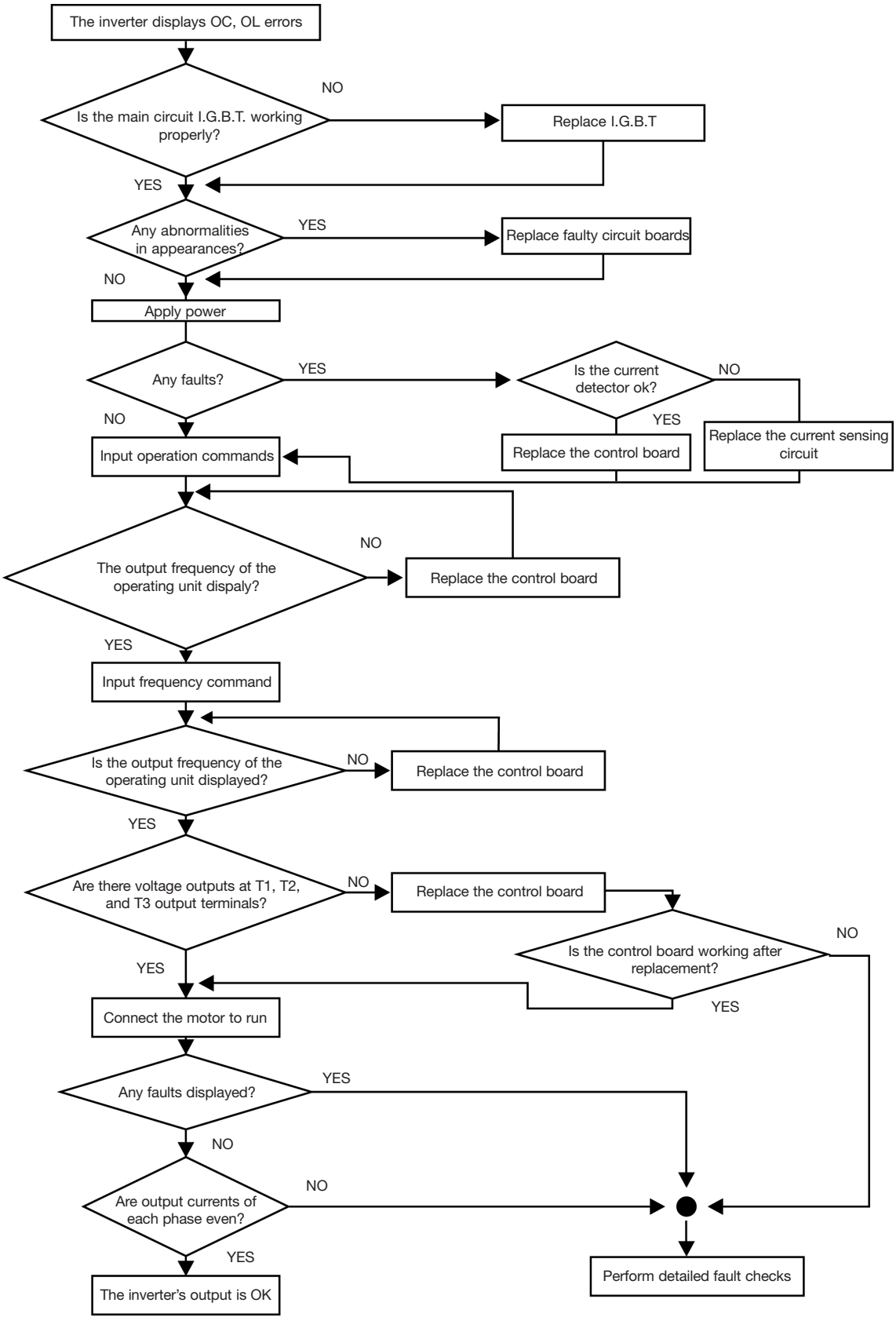


Figure 5-2 OC, OL fault troubleshooting

Troubleshooting for OV, LV error display

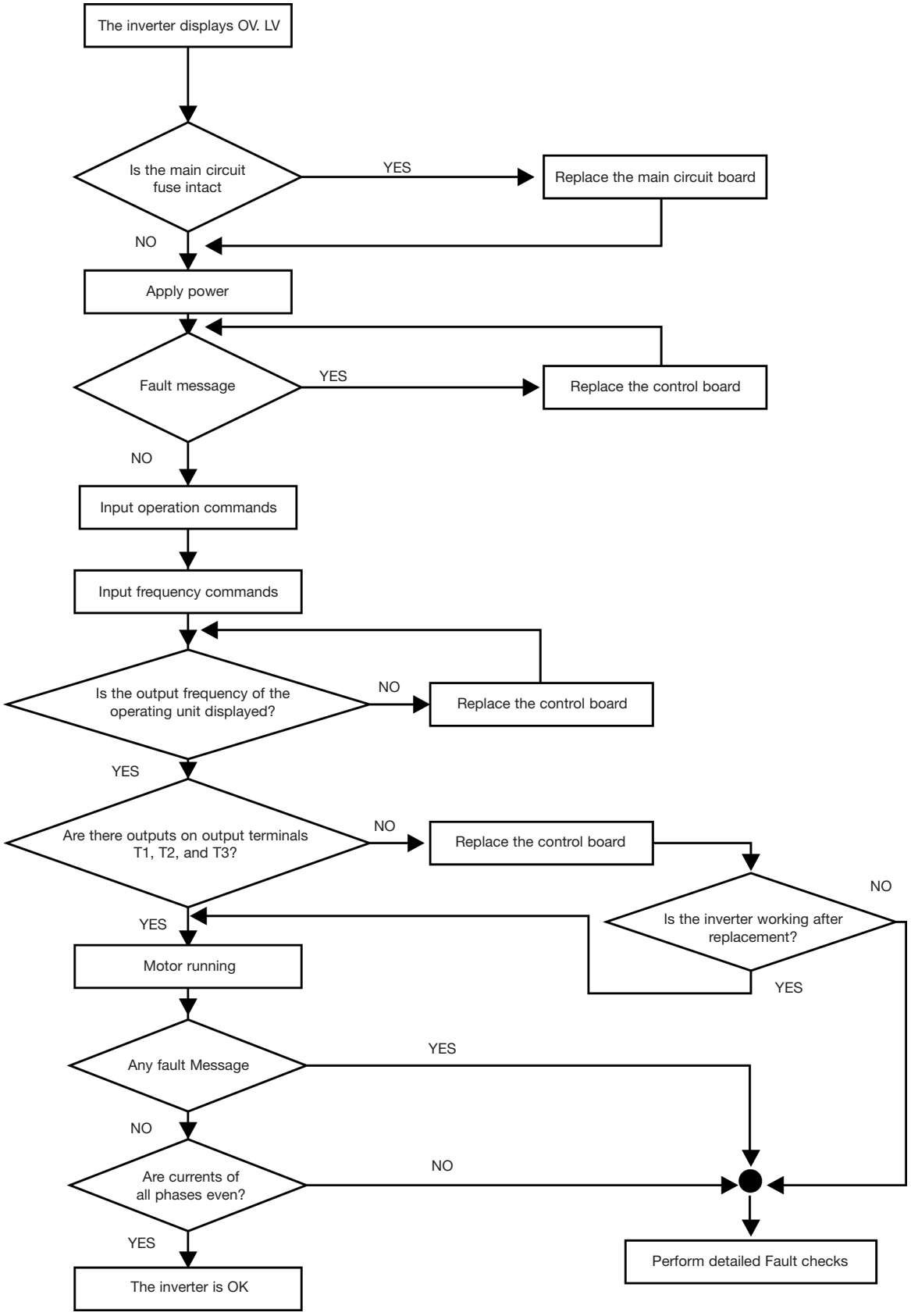


Figure 5-3 OV, fault troubleshooting

The motor doesn't run

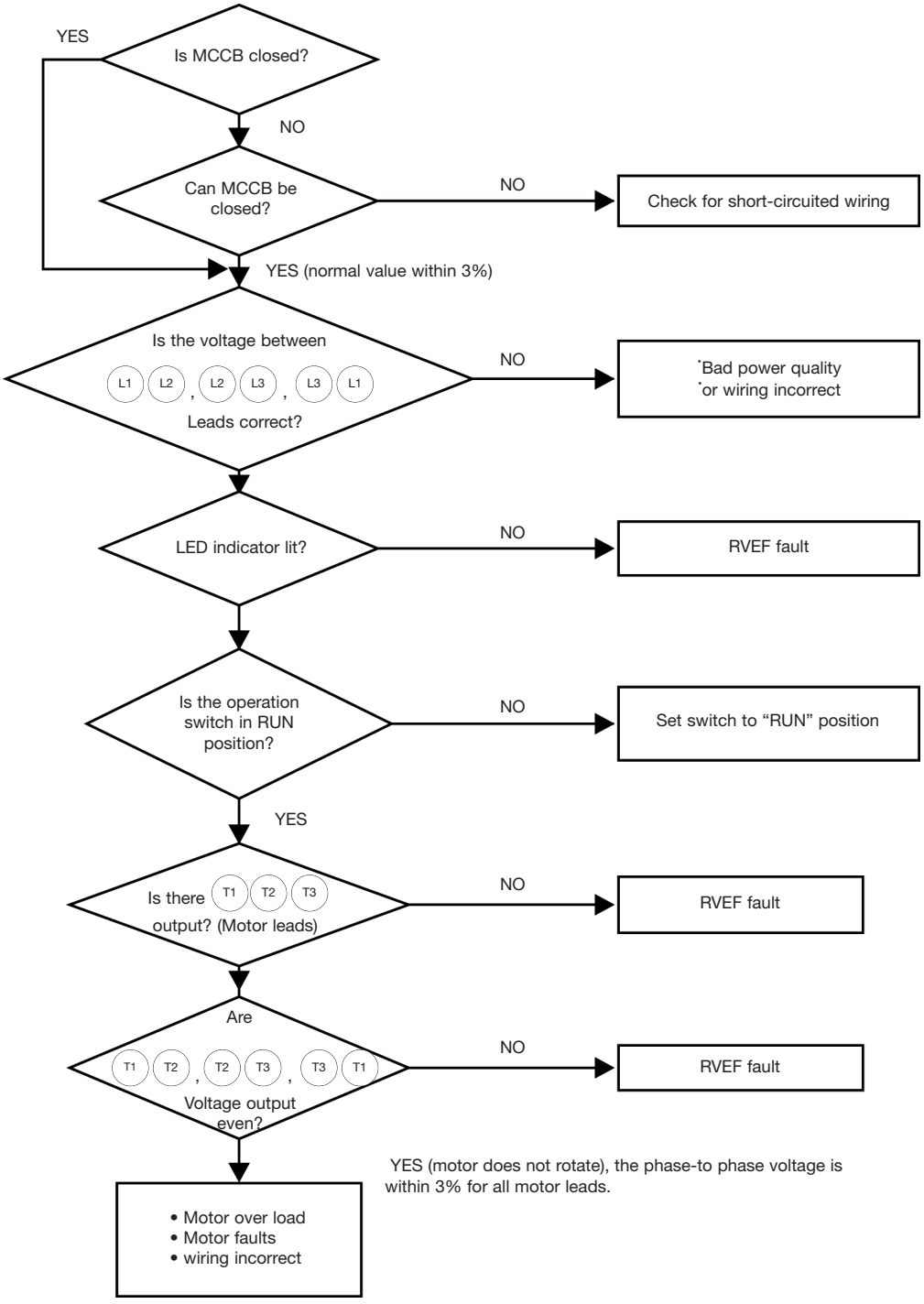


Figure 5-4 Drive Running troubleshooting diagnostics

Motor is overheated

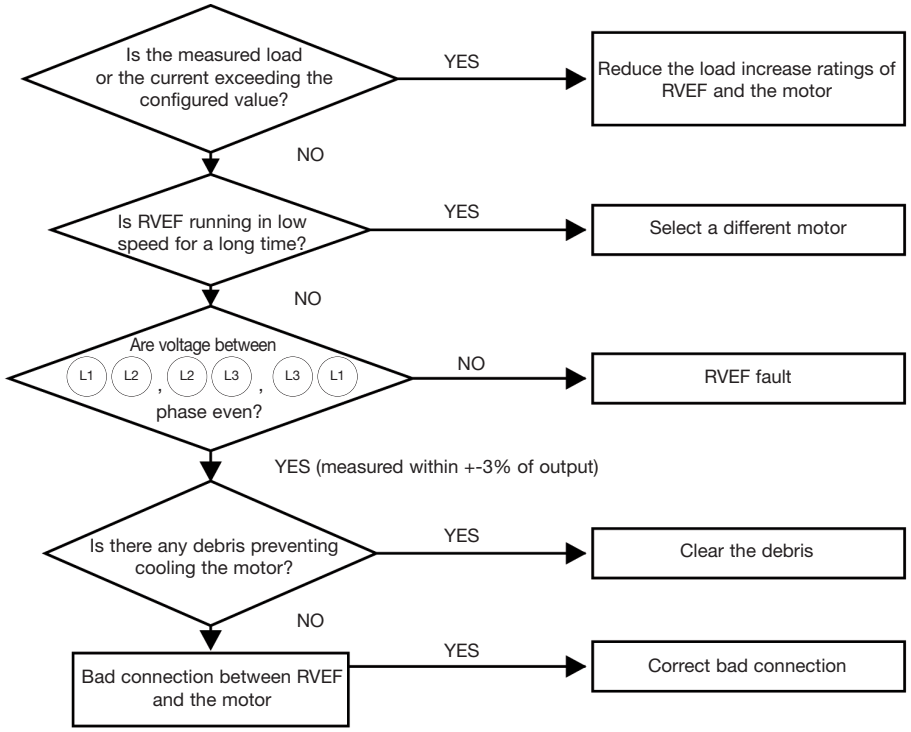


Figure 5-5 Motor Overload/Overheating Diagnostics

Motor runs unevenly

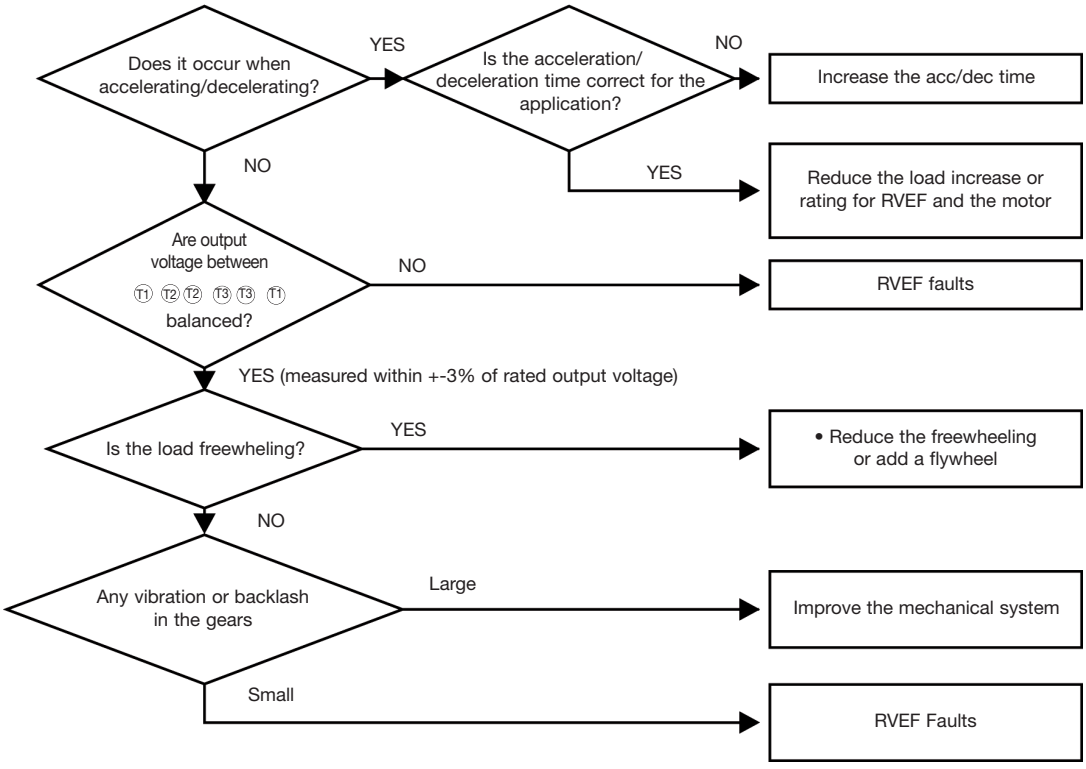


Figure5-6 Overload Speed Operation Diagnostics

5.4 Routine and periodic checks

To ensure stable and safe operations, check and maintain the inverter regularly and periodically. The table below lists the items to be check to ensure stable and safe operations. Check these items 5 minutes after the “Charge” indicator goes out to prevent injury to personnel.

Items	Details	Checking period		Methods	Criteria	Remeids
		Daily	1 year			
Ambient conditions around the machine	Confirm temperature and humidity at the machine	✓		Measure with thermometer and hygrometer according to installation notices	Temperature: -10-50°C (14~120°F) Humidity: Below 95% RH	Improve the ambient or relo cate the drive to a better area
	Are there inflammable materials in the vicinity?	✓		Visual check	Keep area clear	
Installation and grounding of the inverter	Any unusual vibration from the machine	✓		Visual, hearing check	No vibration	Secure screws
	Is the grounding resistance correct?		✓	Measure the resistance with the Ground Resistor	200V series: below 100Ω 400V series: below 10Ω	Improve the grounding
Input power voltage	Is the voltage of the main circuit correct?	✓		Measure the resistance 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 Check with screw driver	Secure terminals and no rust	Secure or send back for repair
	Is the terminal base damaged?		✓			
	Visual rust stains present?		✓			
Internal wiring of the inverter	Any unusual bends or breaks?		✓	Visual check	No abnormalities	Replace or send back for repair
	Any damage of the wire insulation?		✓			
Heat sink	Excessive dust or debris?	✓		Visual check	No abnormalities	Clean up debris or dust
Printed circuit board	Conductive metal shavings or oil sludge present?		✓	Visual check	No abnormalities	Clean 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
	Excessive dust or debris?	✓		Visual check		Clean fan
Power component	Excessive dust or debris?		✓	Visual check	No abnormalities	Clean component
	Check resistance between each terminals		✓	Measure with a multi-tester	No short circuit or broken circuit in three-phase output	Replace power component or inverter
Capacitor	Any unusual odor or leakage	✓		Visual check	No abnormalities	Replace capacitor or inverter
	Any deformity or protrusion	✓				

Chapter 6: Peripherals Components

6.1 Input side AC reactor

Model	Line input side AC inductance	
	Current (A)	Inductance (mH)
RVEFA120020(F) RVEFA120040(F) RVEFA320020 RVEFA320040	5.0	2.1
RVEFA120075(F) RVEFA320075	5.0	2.1
RVEFB120150(F) RVEFB320150	19.0	1.1
RVEFB120220(F) RVEFB320220	25.0	0.71
RVEFB340075(F)	2.5	8.4
RVEFB340150(F)	5.0	4.2
RVEFB340220(F)	7.5	3.6

6.2 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.

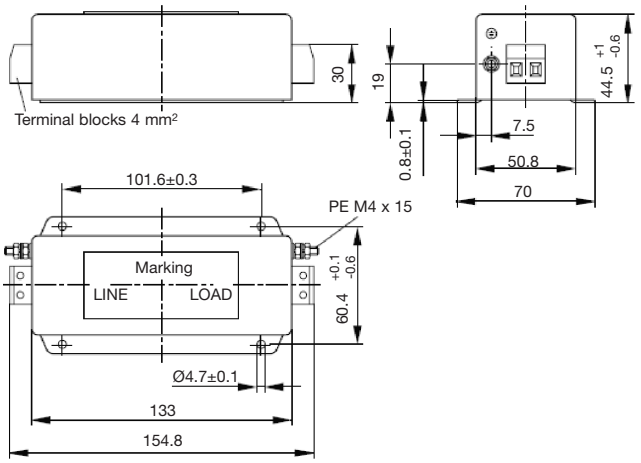
EMC Directives
The inverter with optional filter complies with the EMC directives 89/336/EEC, limiting the environmental EMI and RFI. Independent tests have demonstrated compliance to the following standards when the optional filters are used.
EMI radio standard, EMS immunity standard
EN 55011, class A / EN 61800-3 category C2

Filter selection:

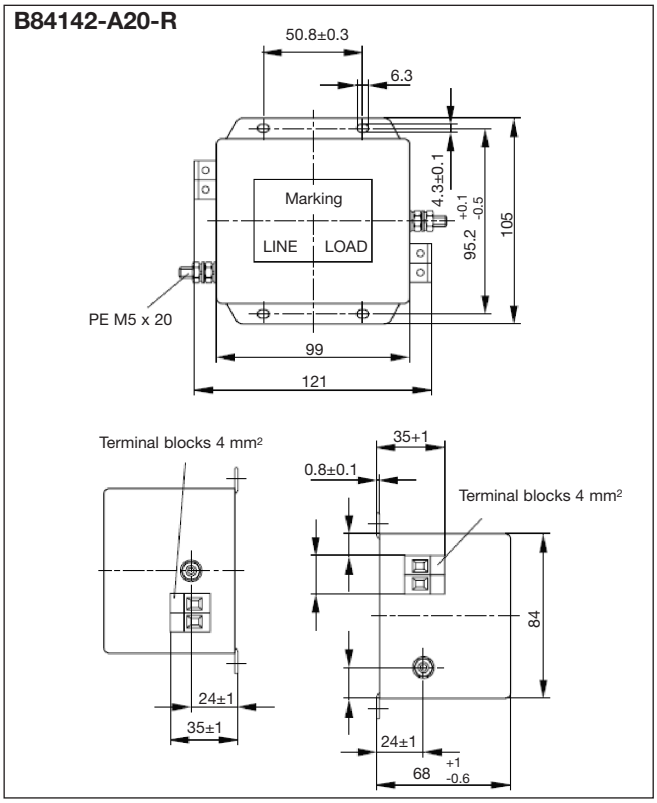
Drive			Filter	
Model	**Rated power (kW)**	**Input Current (A)**	**Model**	**Rated Current (A)**
RVEFA110020	0.2	7.1	B84142-A10-R	10
RVEFA110040	0.4	12.2	B84142-A20-R	20
RVEFA110075	0.75	17.9	B84142-A20-R	
RVEFA120020	0.2	4.3	B84142-A10-R	10
RVEFA120020F			Built-in	
RVEFA120040	0.4	5.4	B84142-A10-R	10
RVEFA120040F			Built-in	
RVEFA120075	0.75	10.4	B84142-A20-R	20
RVEFA120075F			Built-in	
RVEFB120150	1.5	15.5	B84142-A20-R	20
RVEFB120150F			Built-in	
RVEFB120220	2.2	21.0	B84142-A30-R	30
RVEFB120220F			Built-in	
RVEFA320020	0.2	3.0	B84143-A08-R105	8
RVEFA320040	0.4	4.0	B84143-A08-R105	8
RVEFA320075	0.75	6.4	B84143-A08-R105	8
RVEFB320150	1.5	9.4	B84143-A10-R106	10
RVEFB320220	2.2	12.2	B84143-A20-R106	20
RVEFB340075	0.75	3.0	B84143-A08-R105	8
RVEFB340075F			Built-in	
RVEFB340150	1.5	4.8	B84143-A08-R105	8
RVEFB340150F			Built-in	
RVEFB340220	2.2	6.6	B84143-A08-R105	8
RVEFB340220F			Built-in	

EMC Filter Dimensions (mm)

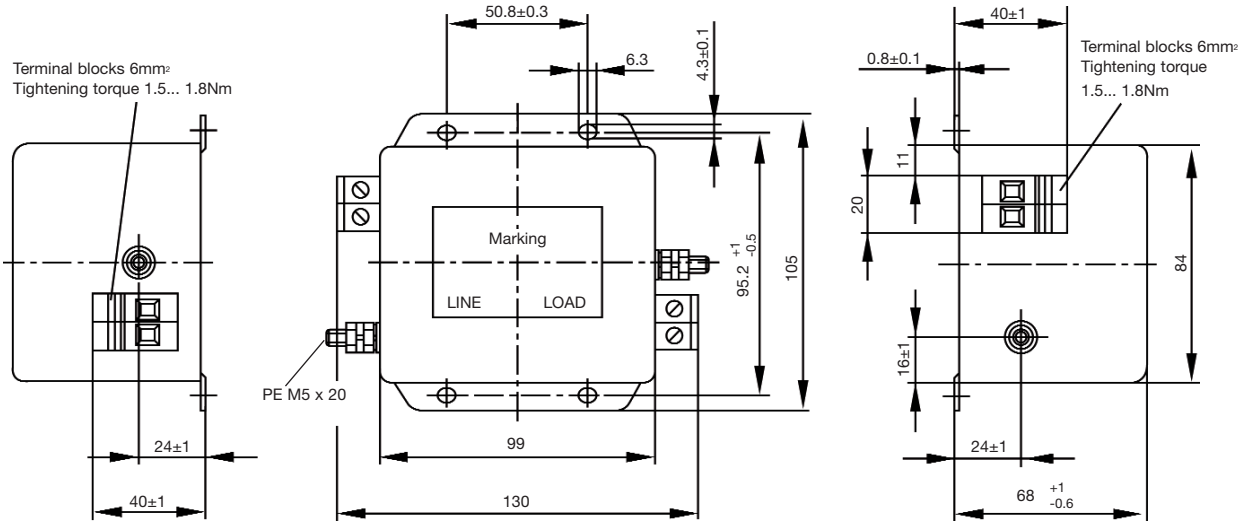
B84142-A10-R



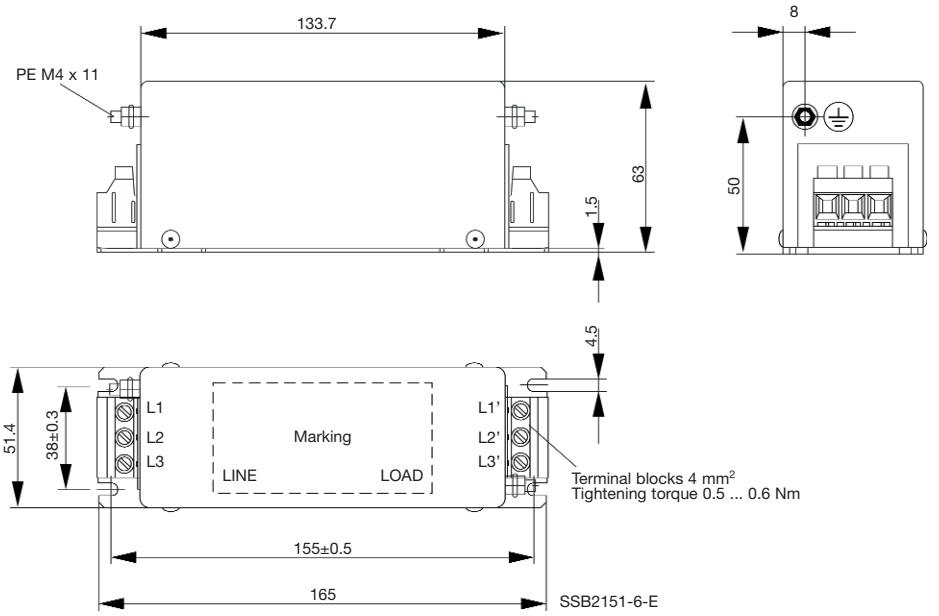
B84142-A20-R



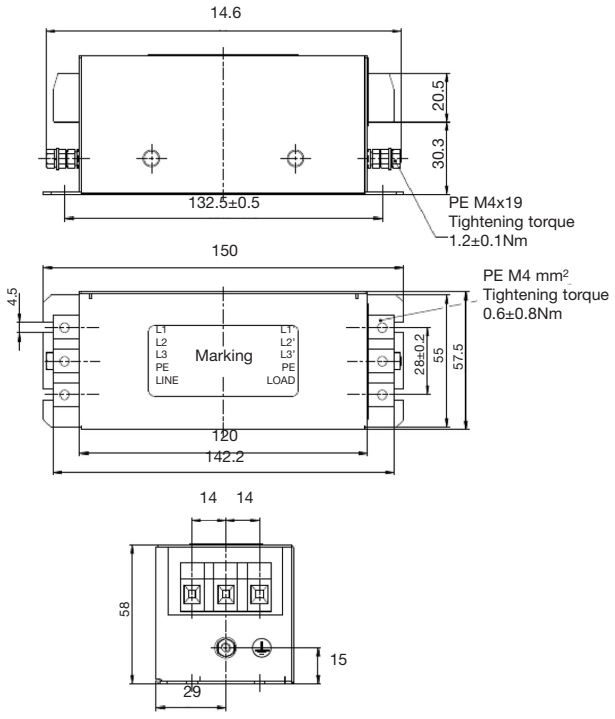
B84142-A30-R



B84143-A8-R105



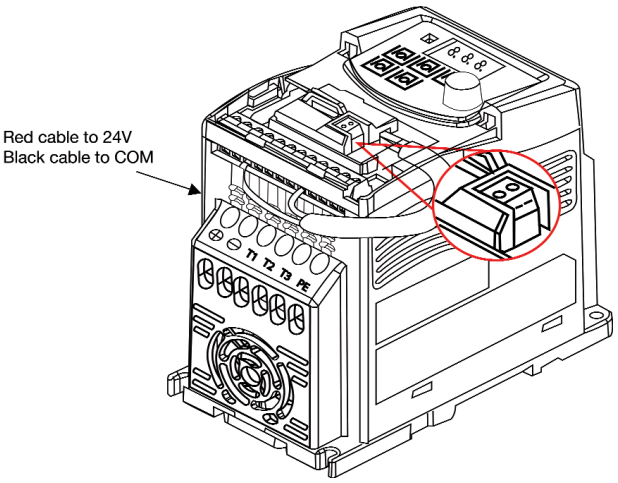
B84143-A10-R106 / B84143-A20-R106



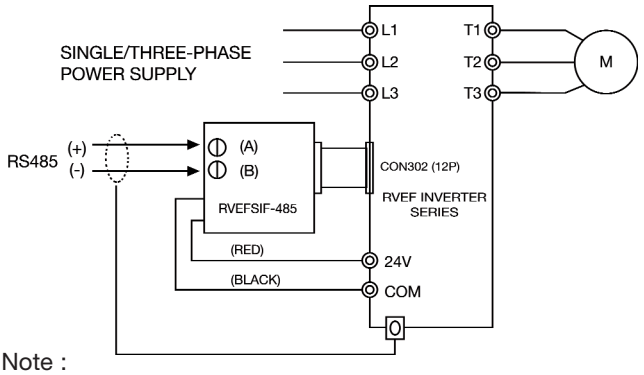
6.3 Option Card

6.3.1 RS-485 option card (model: RVFSIF-485)

RVFSIF-485 MODULE

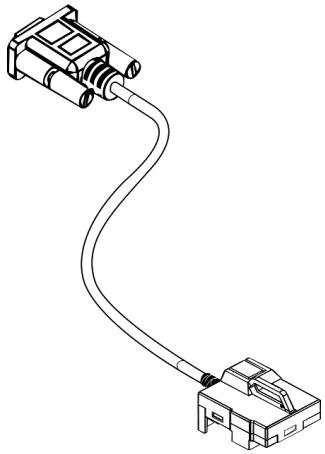


RVFSIF-485 wiring diagram:

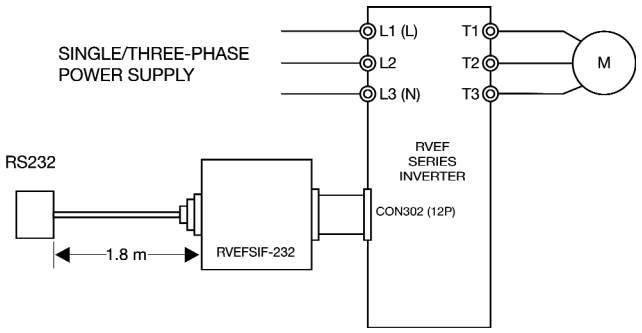


Note :
In order to avoid external static electricity interference with option cards function, please replace cover of the inverter after installing option cards. Please use isolated RS232 / RS485 converter connections with PC and option card to avoid equipment damage.

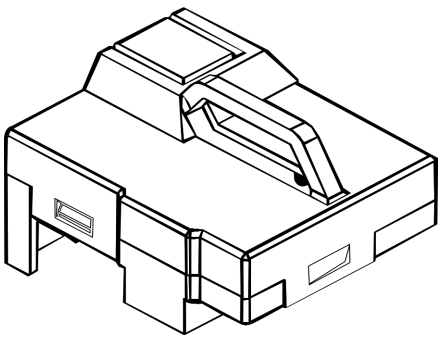
6.3.2 RS-232 option card (model: RVFSIF-232)



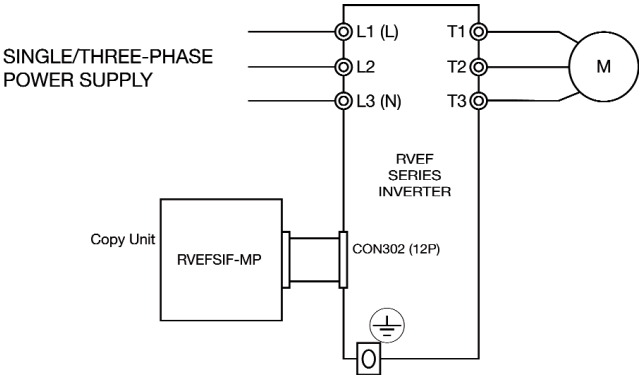
RVFSIF-232 wiring diagram



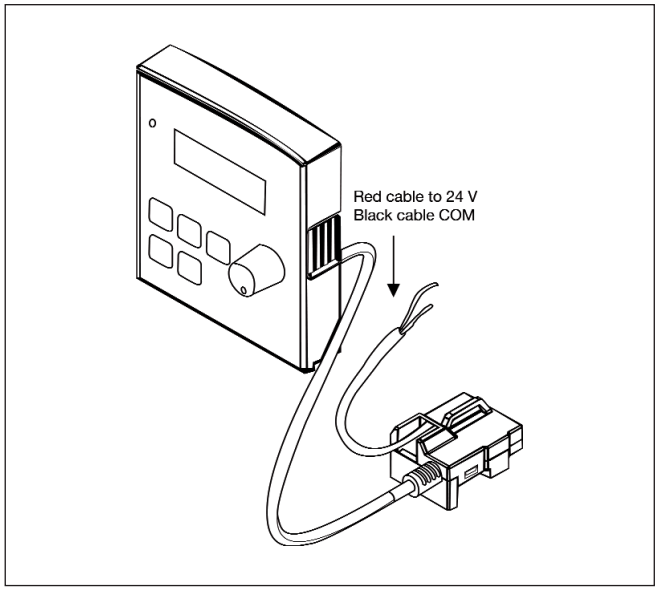
6.3.3 program copy option card (Copy Unit) (model: RVFSIF-MP)



RVFSIF-MP Wiring diagram



6.3.4 Remote keypad (model: RVFSDOP-LED-2M)



RVFSDOP-LED-2M wiring diagram

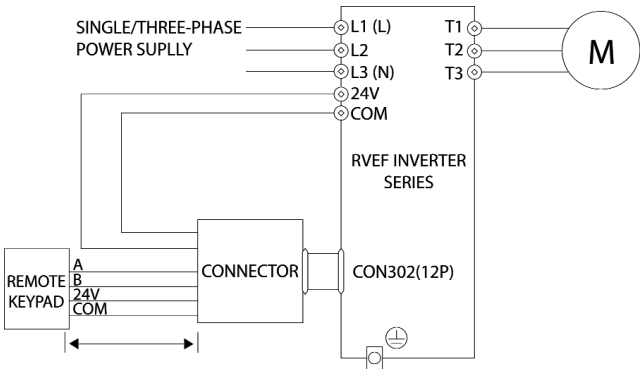
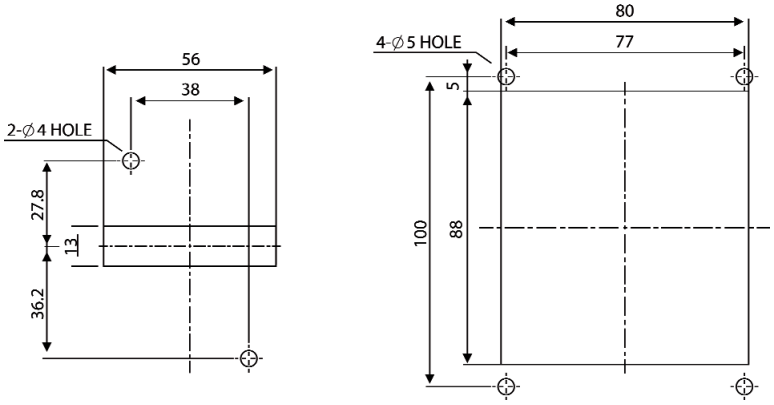


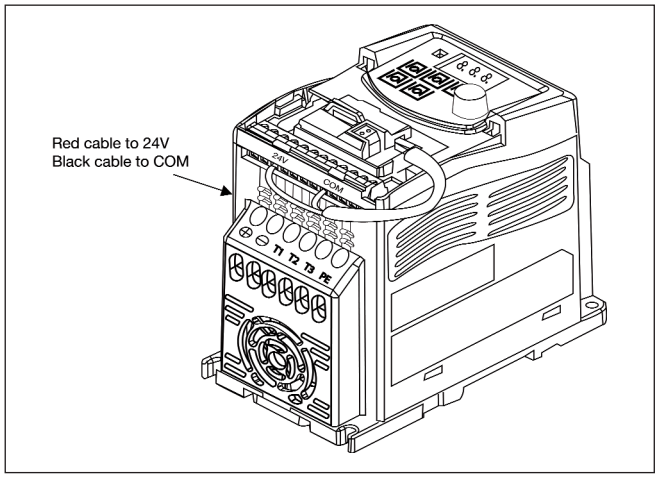
Figure 6-6b Remote keypad wiring diagram

* When the inverter is powered on or off the user can set up or remove the remote keypad.
(Must be in remote terminal configuration)

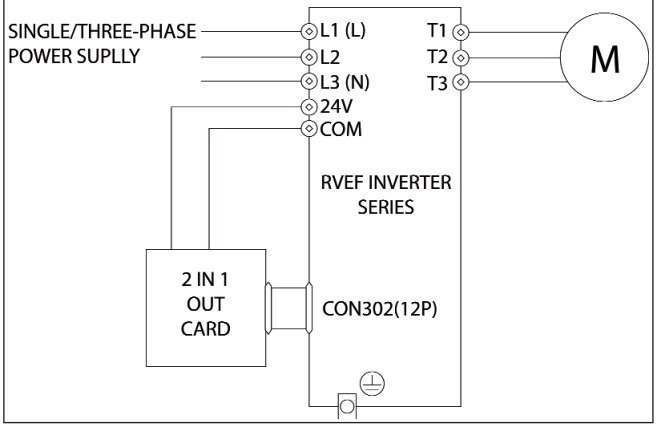
Remote keypad installation dimension



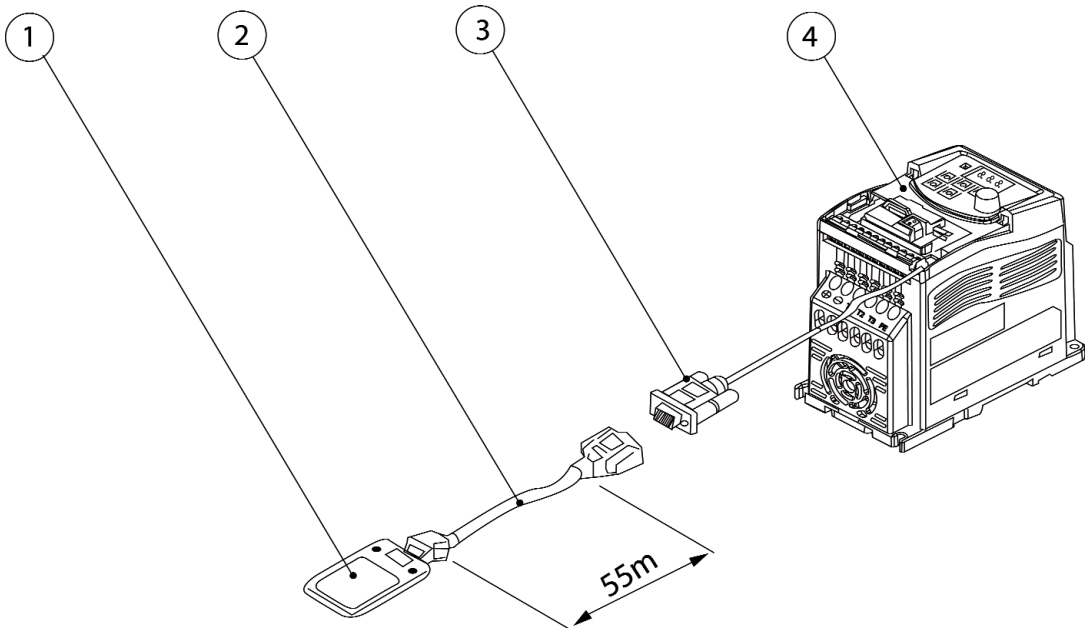
6.3.5 Input/Output expansion card (model: RVFSIF-IO)



RVFSIF-IO wiring diagram



6.3.6 PDA Link

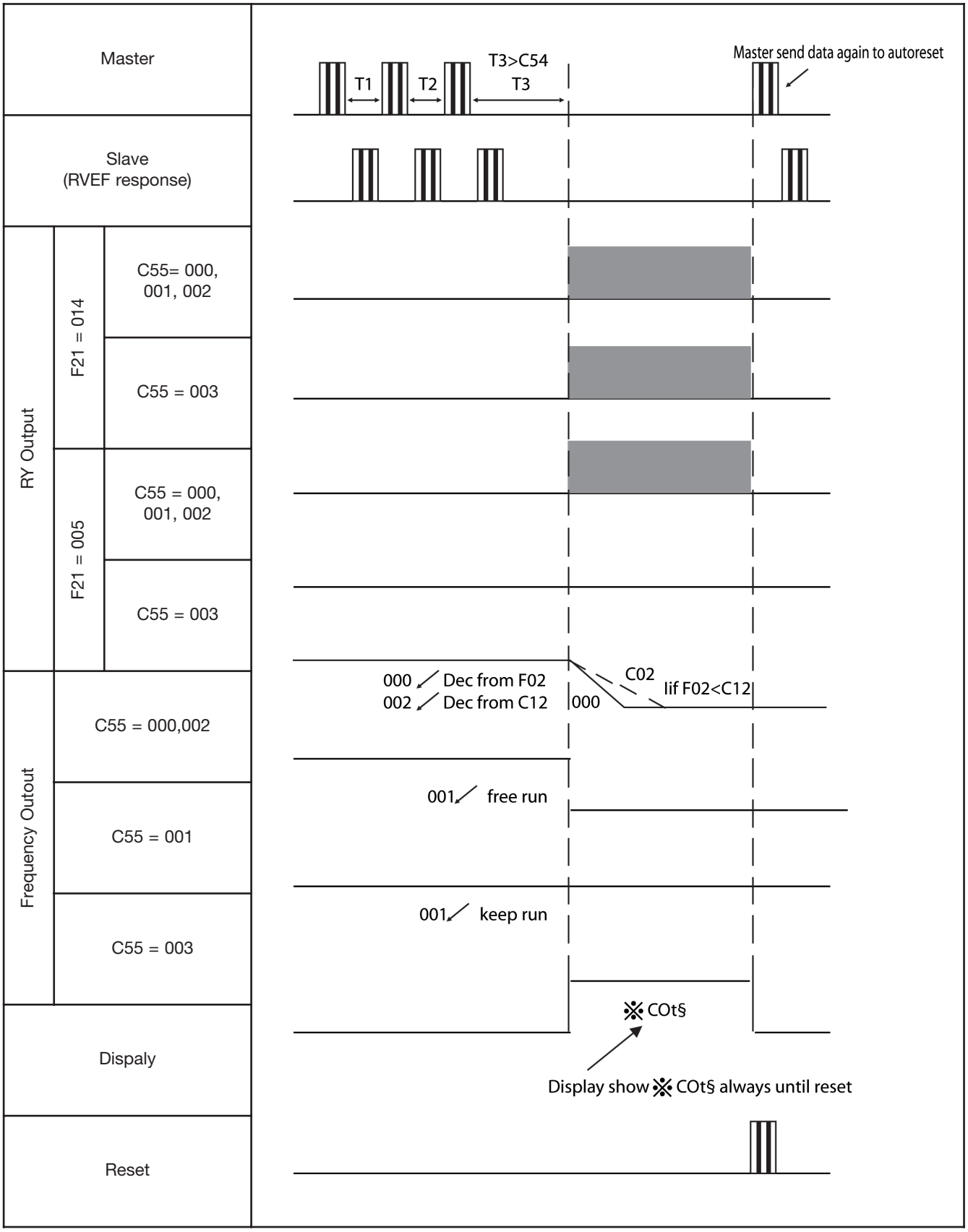


(1) HP iPAQ Pocket PC h2210. (PDA) / PC hx2190
(2) PDA wire (RVFSWPDA).
(3) RS-232 Interface Card (RVFSIF-232).
(4) Inverter

Appendix 1:
RVEF parameter setting list

Customer			**Inverter Model**		
Using Site			**Contact Phone**		
Address:					
Parameter code	**Setting**	**Parameter code**	**Setting**	**Parameter code**	**Setting**
F00		F38		C22	
F01		F39		C23	
F02		F40		C24	
F03		F41		C25	
F04		F42		C26	
F05		F43		C27	
F06		F44		C28	
F07		F45		C29	
F08		F46		C30	
F09		F47		C31	
F10		F48		C32	
F11		F49		C33	
F12		F50		C34	
F13		F51		C35	
F14		F52		C36	
F15		F53		C37	
F16		F54		C38	
F17		C01		C39	
F18		C02		C40	
F19		C03		C41	
F20		C04		C42	
F21		C05		C43	
F22		C06		C44	
F23		C07		C45	
F24		C08		C46	
F25		C09		C47	
F26		C10		C48	
F27		C11		C49	
F28		C12		C50	
F29		C13		C51	
F30		C14		C52	
F31		C15		C53	
F32		C16		C54	
F33		C17		C54	
F34		C18		C55	
F35		C19			
F36		C20			
F37		C21			

Appendix 2:
Communication time out sequence list



Appendix 3: CE certificate

CARLO GAVAZZI
Automation Components

CARLO GAVAZZI LOGISTICS SpA
Administrative and directive headquarter: Via Milano 13, I – 20020 Lainate (MI)
Tel.: ++39 02 93176.1, Fax ++39 02 93176.403
Internet: http:// www.carlogavazzi.com

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 **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 4
UL Listing and CE certification Information

III.1 Approvals Table

CE	CE approval	Europe	See attached certificate
c UL us LISTED	UL / cULs approval	USA & Canada	File number E319186
RoHS COMPLIANT	RoHS	-	-

III.2 Common UL information (for VariFlex Size 1 and 2)

Conformity

The drive conforms to UL listing requirements only when the following are observed:

- Class 1 60/75°C (140/167°F) copper wire only is used in the installation
- The ambient temperature does not exceed 40°C (104°F) when the drive is operating
- The terminal tightening torques specified in section 4.1 Power terminal connections are used

AC supply specification

The drive is suitable for use in a circuit capable of delivering not more than 100,000 RMS symmetrical Amperes at 264Vac RMS maximum (200V drives) or 528Vac RMS maximum (400V drives).

Motor overload protection

The drive provides motor overload protection. The overload protection level is 150% of full-load current. RVEF Advanced User Guide for further information.

Overspeed protection

The drive provides overspeed protection. However, it does not provide the level of protection afforded by an independent high integrity overspeed protection device.

Power dependant UL information

The drive conforms to UL listing requirements only when the following is observed:

- UL listed class CC fast acting fuses e.g. Bussman Limitron KTK series, Gould Amp-Trap ATM series or equivalent are used in the AC supply.

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Zejtun - **MALTA**

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Belluno - **ITALY**

Uab Carlo Gavazzi Industri Kaunas
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Sense Switch Control Fieldbus EcoEnergy equipment

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www.gavazziautomation.com - www.carlogavazzi.com

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