

VariFlex²

RVEF series

Quick Start Guide

110V	Class 1ph	0.2~0.75kW 0.2~1HP
220V	Class 1ph or 3ph	0.2~2.2kW 0.2~3HP
440V	Class 3ph	0.75~2.2kW 1~3HP



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.

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Drive software version

This product is supplied with the latest version of user-interface and machine control software. If this product is to be used in a new or existing system with other drives, there may be some differences between their software and the software in this product. These differences may cause 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.

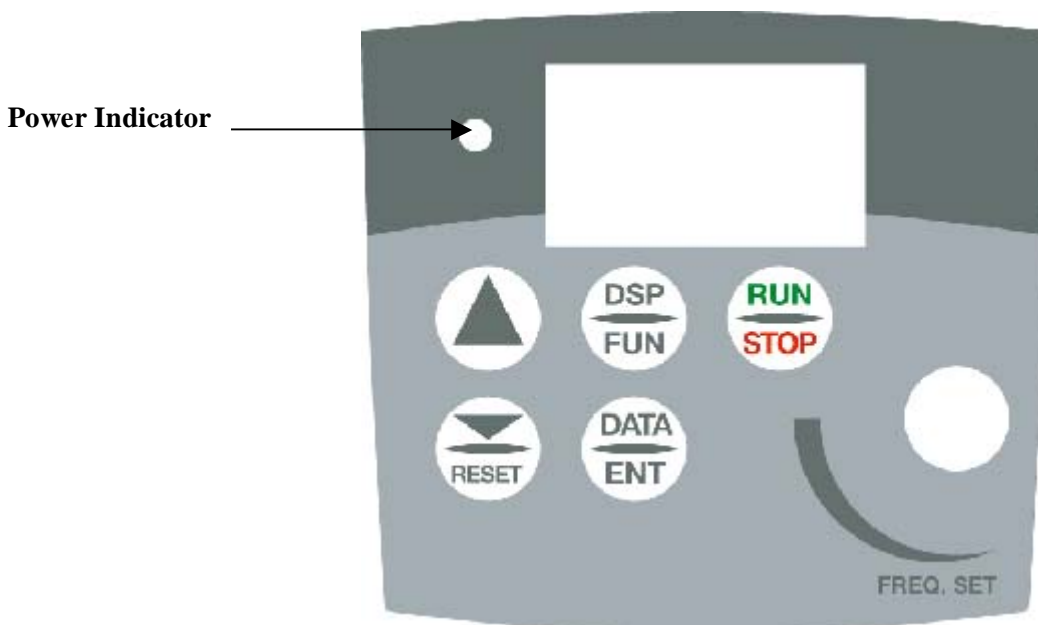
Quick Start Guide

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 VariFlex² Instruction Manual (Advanced User Manual) supplied with your inverter.

Step 1 Before starting the inverter

Please refer to chapter one (Notice for wiring) of the VariFlex² Instruction 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(L), L2, and L3(N) .
 - b. Verify that Motor leads are connected to T1, T2, and T3 .
 - c. IF brake module is necessary, please connect terminal voltage of the braking unit to + and - of the inverter.



Step2 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.)

Step3 Check motor rotation without load.

- Press RUN Key. 7-segment Display will indicates 00.0to 05.0. Such value is the frequency output value.
- Check the operation direction of the motor.
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 theT1 and T2.
Supply the power again, then check the motor direction.
- Press STOP key.

Step4 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, inspect the motor operation as motor accelerates to full load.
- Press STOP Key, inspect the motor operation as motor deceleration.

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Introduction

i.1 Model description

Inverter model

Input power

Output power

⚠ CAUTION


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

Model : RVCFB3400220
Motor Rating : 3HP/2.2kW


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


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

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



LISTED xxxxx
POWER CONV. EQ.
E319186





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Via Milano 13, IT-20020 Lainate (MI)

Carlo Gavazzi
Made in: CHINA

Ordering Key

RVEF A 1 10 075

VariFlex² AC Drive

Frame Size

AC Supply Phase

Drive Voltage Rating

Drive kW Rating

Type Selection

Series	Frame Size	AC Supply Phase	Drive Voltage Rating	Drive kW Rating	Noise filter	Enclosure
RVEF	A: Size1	1: 1-Phase	10: 110VAC	020: 0.20kW, 0.25 HP	Nil : none	Nil: IP20
	B: Size2	3: 3-Phase	20: 230VAC	040: 0.40kW, 0.50 HP	F: built-in	N4:IP65 without water and dust proof switch
			40: 400VAC	075: 0.75kW, 1.0 HP		
				150: 1.5kW, 2.0 HP		N4S:IP65 with water and dust proof switch
				220: 2.2kW, 3.0 HP		

i.2 Electrical Safety - general warning

The voltages used in the drive can cause severe electrical shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with or adjacent to the drive. Specific warnings are given at the relevant places in this guide.

i.3 System design and safety of personnel

The drive is intended as a component for professional incorporation into complete equipment or system. If installed incorrectly, the drive may present a safety hazard.

The drive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control equipment which can cause injury.

System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this guide carefully.

The STOP and START controls or electrical inputs of the drive must not be relied upon to ensure safety of personnel. They do not isolate dangerous voltages from the output of the drive or from any external option unit. The supply must be disconnected by an approved electrical isolation device before gaining access to the electrical connections.

The drive is not intended to be used for safety-related functions.

Careful consideration must be given to the function of the drive which might result in a hazard, either through its intended behaviour or through incorrect operation due to a fault. In any application where a malfunction of the drive or its control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk - for example, an over-speed protection device in case of failure of the speed control, or a fail-safe mechanical brake in case of loss of motor braking.

i.4 Environmental Limits

Instructions within the supplied data and information within the *VariFlex² Advanced User Manual* regarding transport, storage, installation and the use of the drive must be complied with, including the specified environmental limits. Drives must not be subjected to excessive physical force.

i.5 Access

Access must be restricted to authorised personnel only. Safety regulations which apply at the place of use must be complied with.

The IP (Ingress Protection) rating of the drive is installation dependant. For further information, refer to the *VariFlex² Advanced User Manual*.

i.6 Compliance and regulations

The installer is responsible for complying with all relevant regulations, such as national wiring regulations, accident prevention regulations and electromagnetic compatibility (EMC) regulations. Particular attention must be given to the cross-sectional areas of conductors, the selection of fuses and other protection, and protective earth (ground) connections.

The *VariFlex² Advanced User Manual* contains instructions for achieving compliance with specific EMC standards.

Within the European Union, all machinery in which this product is used must comply with the following directives:

98/37/EC: Safety of machinery

89/336/EEC: Electromagnetic compatibility

i.7 Motor

Ensure the motor is installed in accordance with the manufacturer's recommendations.

Ensure the motor shaft is not exposed. Standard squirrel cage induction motors are designed for single speed operation. If it is intended to use the capability of a drive to run a motor at speeds above its designed maximum, it is strongly recommended that the manufacturer is consulted first.

Low speeds may cause the motor to overheat because the cooling fan becomes less effective. The motor should be fitted with a protection thermistor. If necessary, an electric force vent fan should be used. The values of the motor parameters set in the drive affect the protection of the motor. The default values in the drive should not be relied upon. It is essential that the correct value is entered into parameter concerning the motor rated current. This affects the thermal protection of the motor.

i.8 Adjusting parameters

Some parameters have a profound effect on the operation of the drive. They must not be altered without careful consideration of the impact on the controlled system. Measures must be taken to prevent unwanted changes due to error or tampering.

i.9 Electrical installation

i.9.1 Electric shock risk

The voltages present in the following locations can cause severe electric shock and may be lethal:

- AC supply cables and connections
- DC bus, dynamic brake cables and connections
- Output cables and connections
- Many internal parts of the drive, and external option units

Unless otherwise indicated, control terminals are single insulated and must not be touched.

i.9.2 Isolation device

The AC supply must be disconnected from the drive using an approved isolation device before any cover is removed from the drive or before any servicing work is performed.

i.9.3 STOP function

The STOP function does not remove dangerous voltages from the drive, the motor or any external option units.

i.9.4 Stored charge

The drive contains capacitors that remain charged to a potentially lethal voltage after the AC supply has been disconnected. If the drive has been energised, the AC supply must be isolated at least ten minutes before work may continue.

Normally, the capacitors are discharged by an internal resistor. Under certain, unusual fault conditions, it is possible that the capacitors may fail to discharge, or be prevented from being discharged by a voltage applied to the output terminals. If the drive has failed in a manner that causes the display to go blank immediately, it is possible the capacitors will not be discharged. In this case, consult Carlo Gavazzi or their authorised distributor.

i.9.5 Equipment supplied by plug and socket

Special attention must be given if the drive is installed in equipment which is connected to the AC supply by a plug and socket. The AC supply terminals of the drive are connected to the internal capacitors through rectifier diodes which are not intended to give safety isolation. If the plug terminals can be touched when the plug is disconnected from the socket, a means of automatically isolating the plug from the drive must be used (e.g. a latching relay).

i.9.6 Ground leakage current

The drive is supplied without or with an internal EMC filter capacitor fitted. If the input voltage to the drive is supplied through an ELCB or RCD, these may trip due to the ground leakage current. Please refer to *VariFlex² Advanced User Manual* for further information and how to connect correctly the EMC capacitor.

Chapter 1 Notice for wiring

1.1 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

110V class(1 ϕ)

MODEL	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
RVEF A110020	0.25	0.2	0.53	1.7	10	20
RVEF A110040	0.5	0.4	0.88	3.1	15	30
RVEF A110075	1	0.75	1.6	4.2	20	40

220V class(1 ϕ)

MODEL	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
RVEF A120020	0.25	0.2	0.53	1.7	8	15
RVEF A120040	0.5	0.4	0.88	3.1	10	20
RVEF A120075	1	0.75	1.6	4.2	15	30
RVEF B120150	2	1.5	2.9	7.5	20	40
RVEF B120220	3	2.2	4.0	10.5	25	50

220V class(3 ϕ)

MODEL	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
RVEF A320020	0.25	0.2	0.53	1.7	5	8
RVEF A320040	0.5	0.4	0.88	3.1	8	10
RVEF A320075	1	0.75	1.6	4.2	12	15
RVEF B320150	2	1.5	2.9	7.5	15	20
RVEF B320220	3	2.2	4.0	10.5	20	30

440V class(3 ϕ)

MODEL	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
RVEF B340075	1	0.75	1.7	2.3	6	10
RVEF B340150	2	1.5	2.9	3.8	10	15
RVEF B340220	3	2.2	4.0	5.2	10	20

*Fuse ratings are based upon 300V fuses for 120V inverters, and 300V fuses for 230V inverters, and 500V for 460V inverters

1.2 Precautions for peripheral applications:

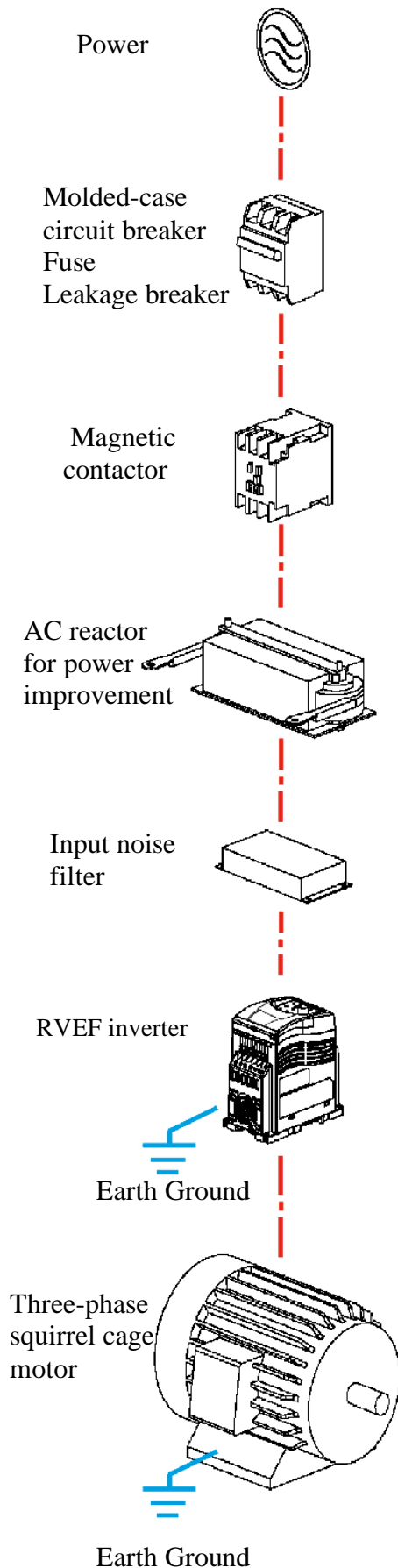


Figure 1-1 Typical installation schematic

Power supply:

- Make sure the correct voltage is applied to avoid damaging the inverter.
- A molded-case circuit breaker or fused disconnect 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 and protect the inverter.
- Do not use the circuit breaker as the run/stop switch for the inverter.

Fuse:

- A suitable fuse should be installed with inverter rated voltage and current when a MCCB is not being used.

Earth Leakage circuit breaker:

- Install a leakage breaker to prevent problems caused by current leakage and to protect personnel. Select current range up to 200mA, and action time up to 0.1 second to prevent high frequency failure.

Magnetic contactor:

- Normal operations do not need a magnetic contactor. When performing functions such as external control and auto restart after power failure, or when using a brake controller, install a magnetic contactor.
- Do not use the magnetic contactor as the run/stop switch for the inverter.

AC Line Reactor for power quality:

- When inverters are supplied with high capacity (above 600KVA) power source, a AC reactor can be connected to improve the PF.

Input noise filter:

- A filter must be installed when there are inductive loads affecting the inverter.

Inverter:

- 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 set to run 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 input power.
- Connect the ground terminal properly. (230 V series: $R_g < 100\Omega$; 460 V series: $R_g < 10\Omega$.)

1.3RFEF Wiring diagram

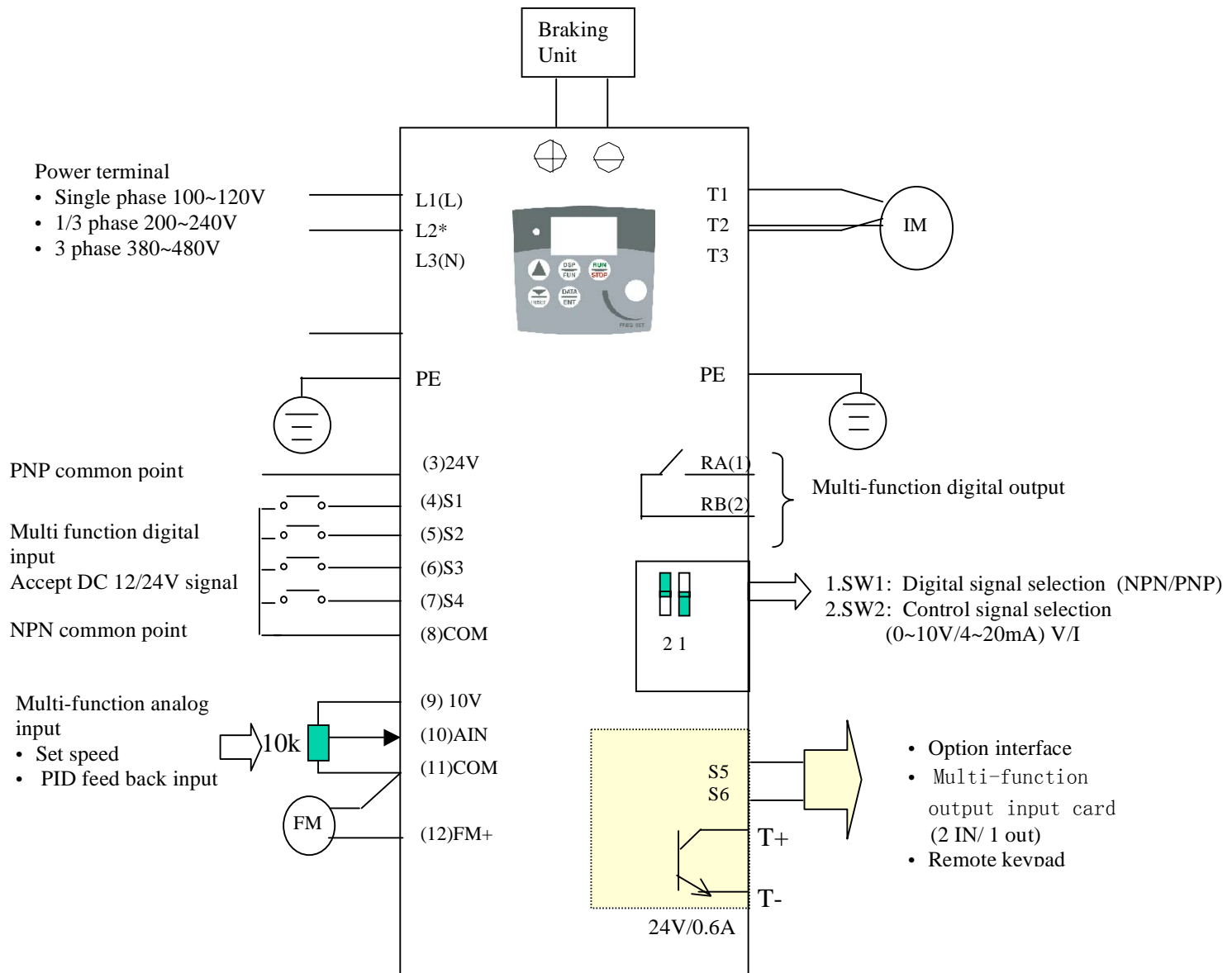


Figure 1-2 Wiring diagram

Note 1:- Connect inputs to

Terminal 3 (internal 24vdc) for PNP mode (Positive switching) .

Or to terminal 8 (Common) for NPN mode(Negative switching) .

Note2:- 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).)

1.4 Description of Inverter Terminal

Descriptions of power terminals

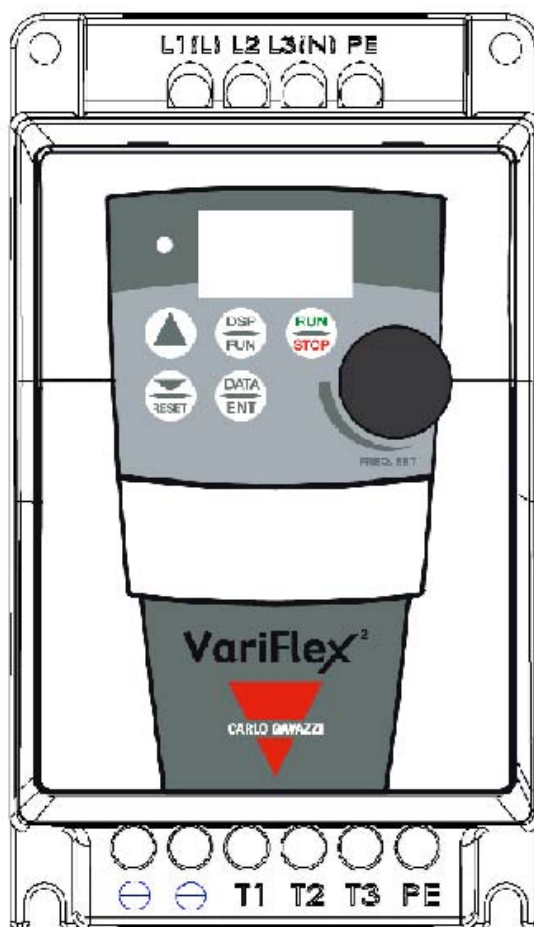


Figure 1-3 Power terminals locations

Symbol	Description
L1 (L)	Main power input Single-phase: L/N* Three-phase: L1/L2/L3
L2	
L3 (N)	
	DC power and braking unit connection terminals. (match with braking units and braking resistor to brake)
T1	Inverter output
T2	
T3	
PE	Grounding terminals (2 points)

* 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.

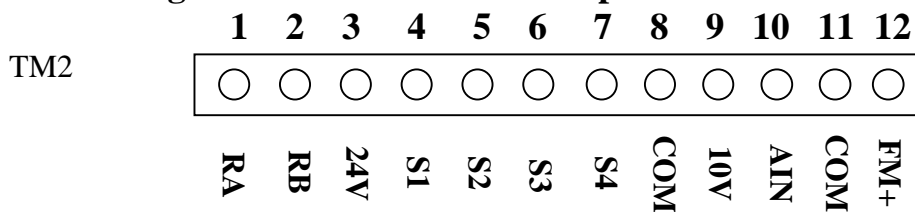
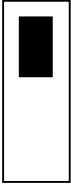



Control signal terminals block description

Figure 1-4 Signal terminal locations

Symbol	Description	
RA	Multi-functional output terminal Normally open contact	Rated contact capacity: (250VAC/10A)
RB		Contact description: (refer to parameter F21)
10V	Supply for external potentiometer for speed reference.	
AIN	Analog frequency signal input terminal (high level : 8V/low level: 2V), adaptable to PNP (refer to parameter F15 description)	
24V	PNP (SOURCE) input, S1~S4 (S5/S6) common terminal, (set SW1 to PNP and connect option card power.)	
COM	NPN (SINK) input, S1~S4 (S5/S6) common terminal, (set SW1 to NPN, and analog input, connect option card power, output signal common terminal.)	
FM+	Multi-function analog output + terminal (refer to parameter F26description), output signal: DC 0-10V.	

Symbol	Description
S1	Multi-function input terminals (refer to parameters F11~F14 description)
S2	
S3	
S4	

SW1	Type of external signal	Remarks
	NPN input (SINK)	
	PNP input (SOURCE)	Factory default

SW2	Type of external signal	Remarks
 V I	0~10V DC analog signal	(1) Effective when parameter F05=2 (analog input signal from TM2) (2) Factory setting is voltage input
 V I	4~20mA analog signal	

1.5 Dimension

(1) IP20 Frame1: Single phase: RVFA110020, RVFA110040, RVFA110075, RVFA120020(F),
RVFA120040(F), RVFA120075(F)

Three phase: RVFA320020, RVFA320040, RVFA320075

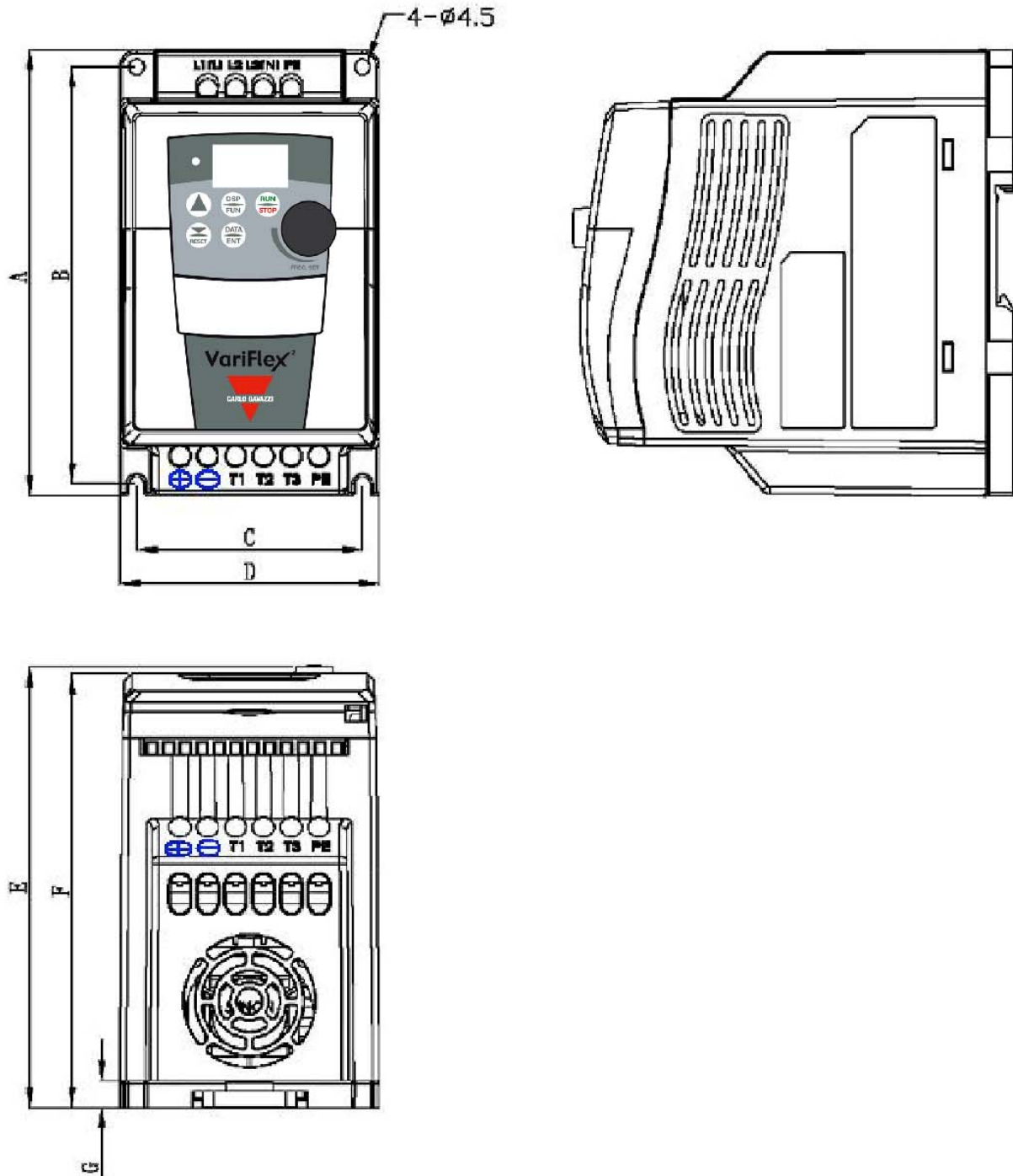


Figure 1-5 RVEF Drive frame1 Dimensions

- (2) IP20 Frame2: Single phase RVFB120150(F), RVFB120220(F)
 Three phase RVFB320150, RVFB320220
 Three phase RVFB340075(F), RVFB340150(F), RVFB120220(F)

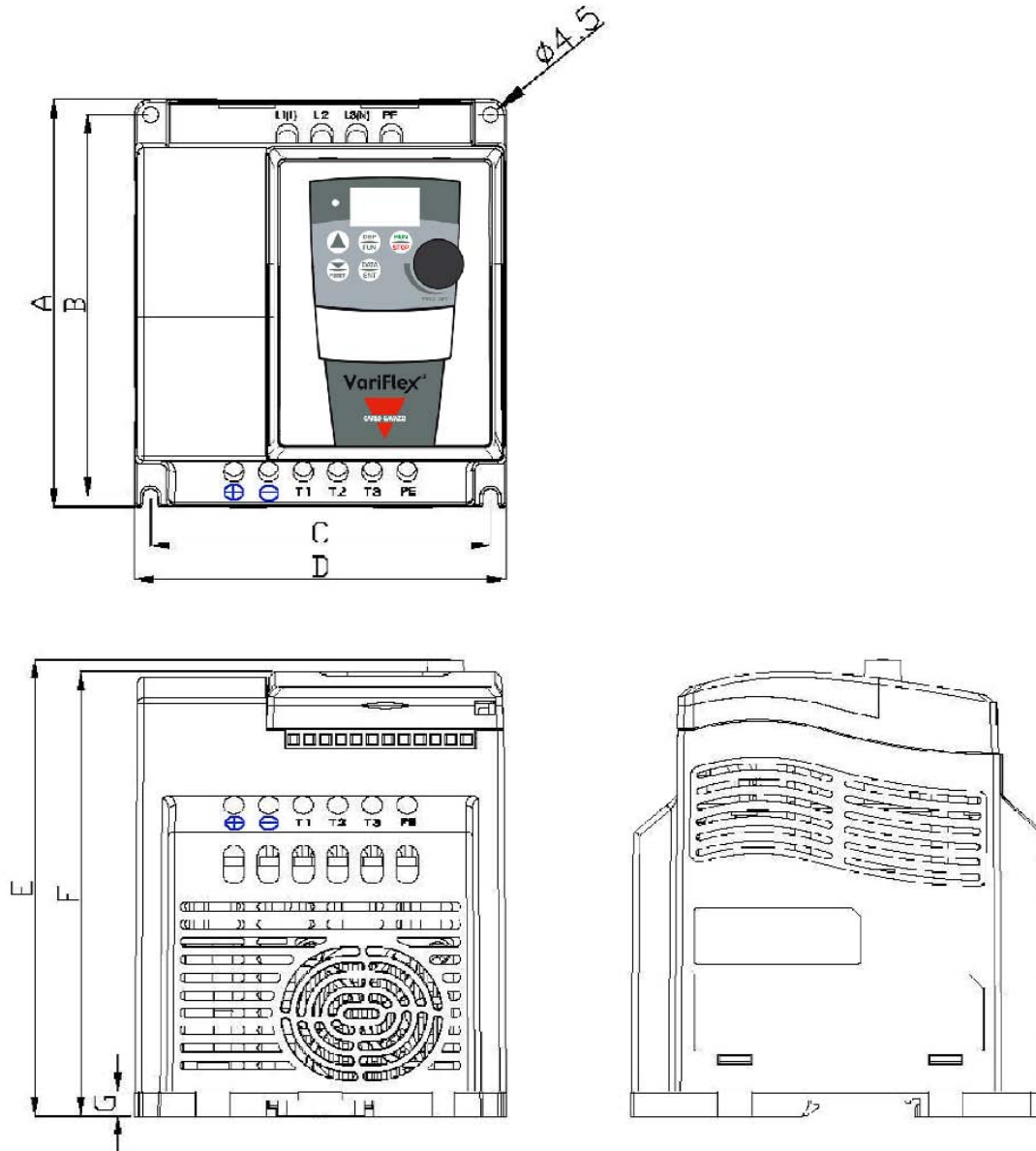


Figure 1-6 RVEF Drive frame2 Dimensions

Unit: inch/mm

MODEL	LENGTH			
	A	B	C	D
Frame 1	5.2/132	4.86/123.5	2.64/67	3.03/77
Frame 2	5.2/132	4.86/123.5	4.25/108	4.65/118
MODEL	LENGTH			
	E	F	G	
Frame 1	5.13/130.5	5.06/128.45	0.315/8	
Frame 2	5.83/148	5.67/144	0.315/8	

(3) IP65 Frame1(switch) (IP65 type) :

RVEFA110020N4S/RVEFA110040N4S/RVEFA110075N4S/ RVEFA120020N4S/RVEFA120040N4S/RVEFA120075N4S

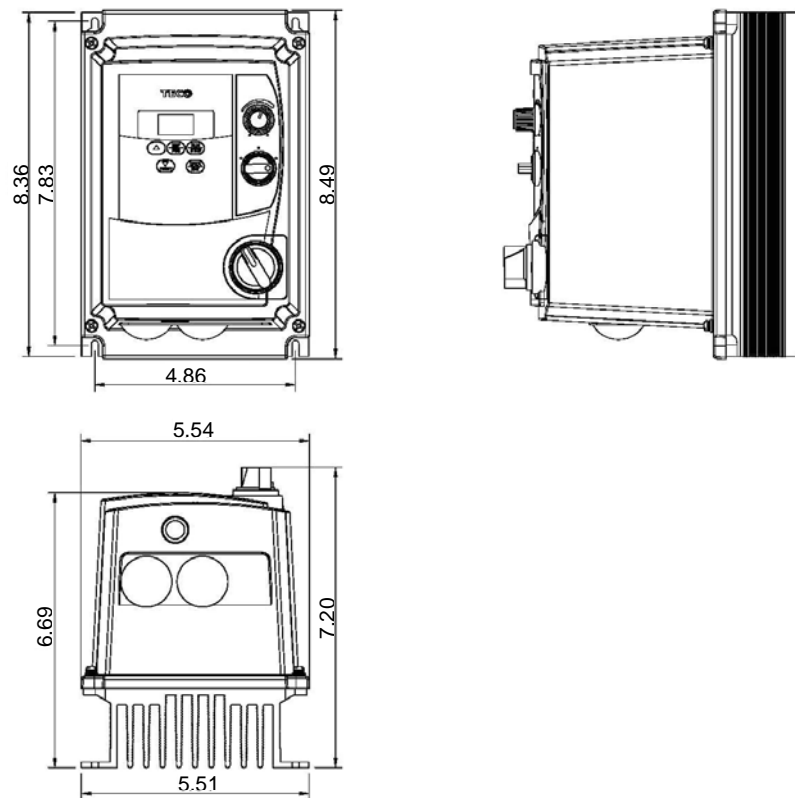


Figure 1-7 RVEF Drive IP65 (switch) Frame 1 dimensions

- **IP65 Frame1(no switch) (IP65 type) :**

RVEFA110020N4/RVEFA110040N4/RVEFA110075N4/ RVEFA120020N4/RVEFA120040N4/RVEFA120075N4

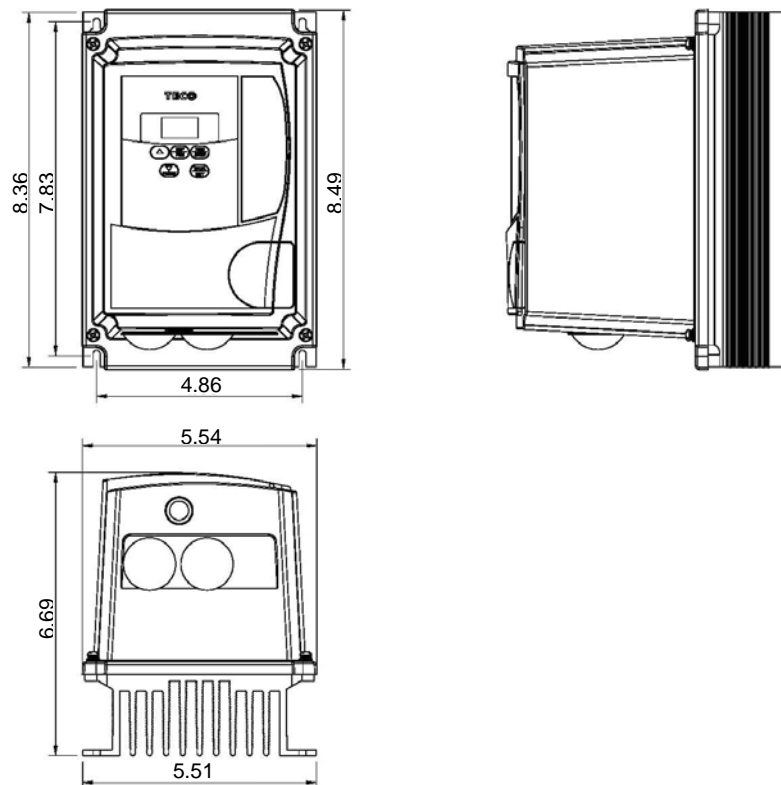


Figure 1-8 RVEF Drive IP65 (no switch) Frame 1 dimensions

● IP65 Frame 2 (switch):

RVEFB320150N4S/RVEFB320220N4S/RVEFB340075N4S/RVEFB340150N4S/RVEFB320220N4S

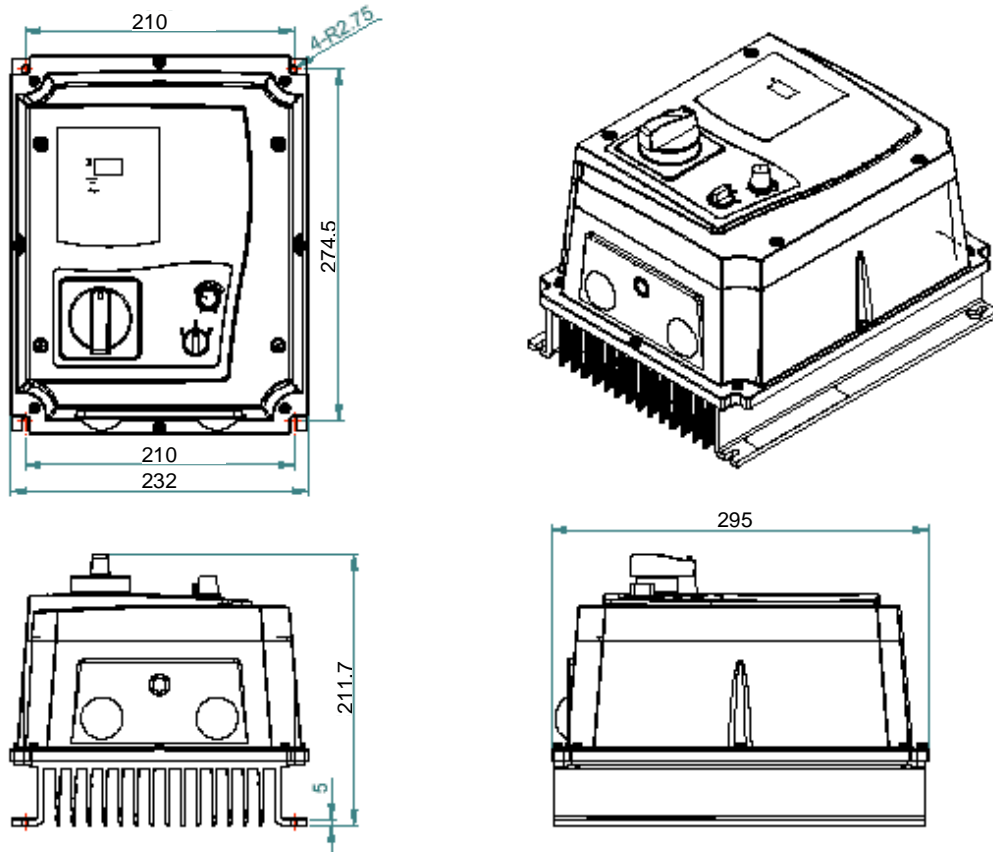


Figure 1-9 RVEF Drive IP65 (switch) Frame 2 dimensions

● IP65 Frame 2 (no switch):

RVEFB320150N4/RVEFB320220N4/RVEFB340075N4/RVEFB340150N4/RVEFB320220N4

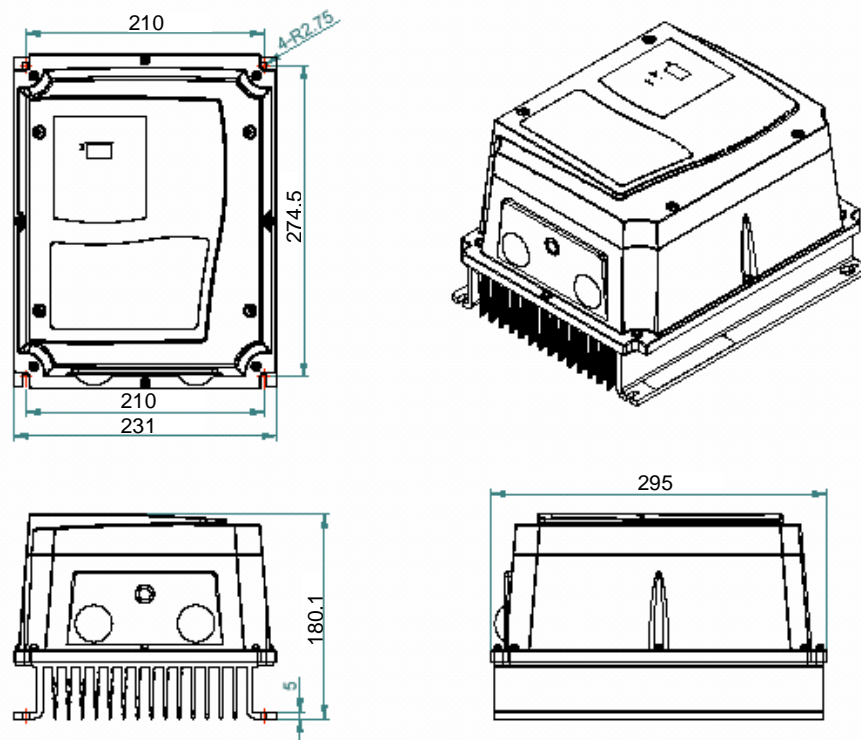


Figure 1-10 RVEF Drive IP65 (no switch) Frame 2 dimensions

Chapter 2 Programming instructions & Parameter list

2.1 Operation Instruction of the keypad

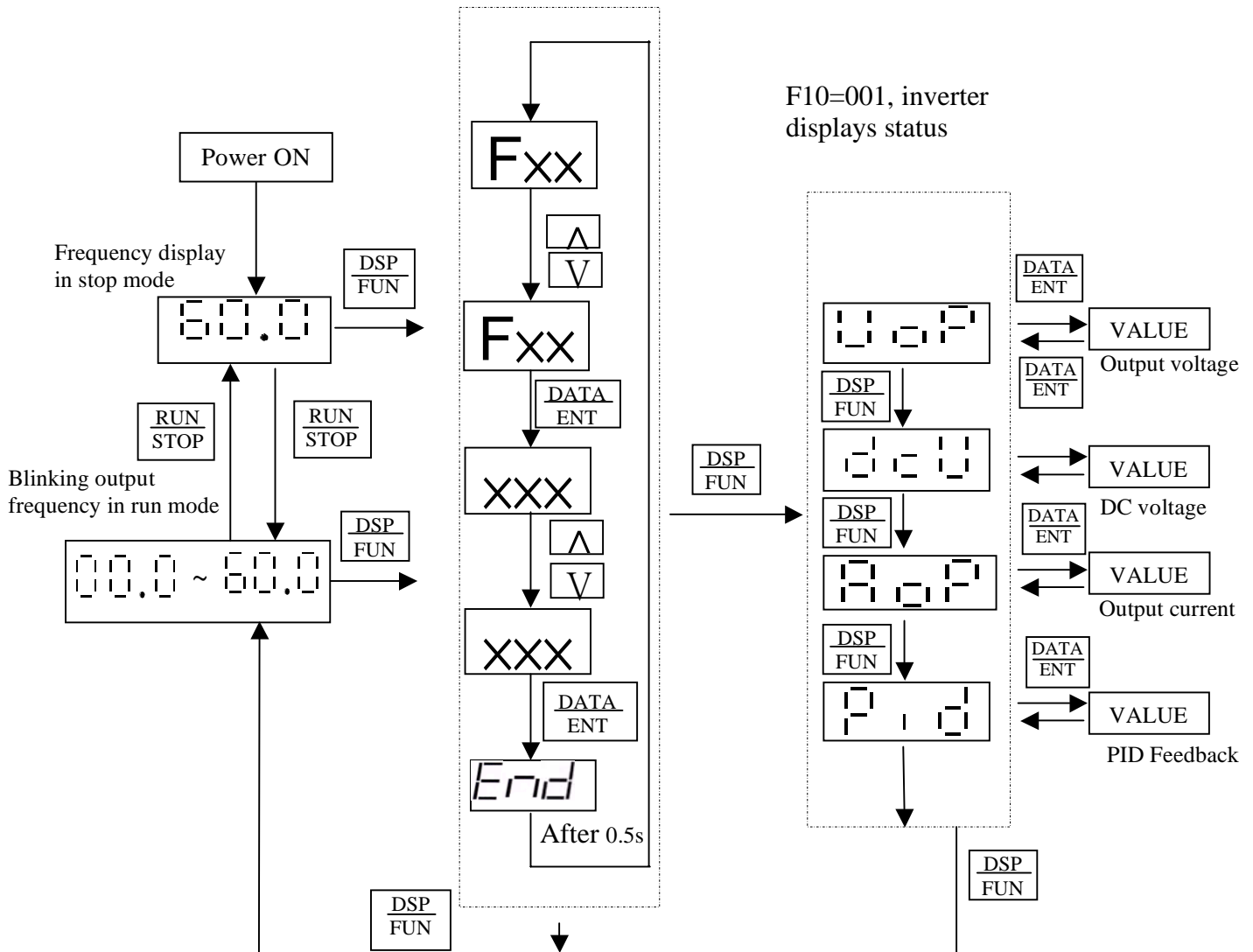


Figure 2-1 Keypad Operations Sequence

*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.

- 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.

2.2 Parameter function list**Basic parameter function list**

F	Function Description	Range/ Code	Factory Default	Remarks
00	Inverter horse power capacity			
01	Acceleration time 1	00.1~999s	05.0	*1 *2
02	Deceleration time 1	00.1~999s	05.0	*1 *2
03	Motor rotation direction	000: Forward 001: Reverse	000	*1
04	Run command source	000: keypad 001: External Terminal 002: Communication Control	000	
05	Frequency command source	000: UP/Down Key on control panel 001: Potentiometer on control panel 002: AIN input signal from (TM2) 003: Multi-function input terminal UP/DOWN function 004: RS-485 Communication frequency setting	000	
06	External control operation mode	000: Forward/ Stop-Reverse/Stop 001: Run/ Stop-Forward/Reverse 002:3-wire—Run/ Stop	000	
07	Frequency upper limit	01.0 ~200Hz	50.0/60.0	*2
08	Frequency lower limit	00.0 ~200Hz	00.0	*2
09	Stopping method	000: Decelerate to stop 001: Coast to stop	000	
10	Status display parameters	000: No display 001: Display	000	*1
11	Terminal S1 Function	000: Forward 001: Reverse	000	
12	Terminal S2 Function	002: Preset Speed Command 1 003: Preset Speed Command 2 004: Preset Speed Command 3	001	
13	Terminal S3 Function	005: Jog frequency Command 006: Emergency stop(E.S.) 007: Base Block (b.b.)	005	
14	Terminal S4 Function	008: Select 2 nd accel / decel time 009: Reset 010: Up command 011: Down command 012: Control signal switch 013: Communication control signal switch 014: Acceleration/deceleration prohibit 015: Master/Auxiliary speed source select 016: PID function disable	006	
15	Terminal AIN Function	017: Analog frequency signal input(terminal AIN) 018: PID feedback signal (terminal AIN) 019: DC Brake signal *6	017	
16	AIN signal select	000: 0~10V(0~20mA) 001: 4~20mA(2~10V)	000	
17	AIN Gain (%)	000~200	100	*1

F	Function Description	Range/ Code	Factory Default	Remarks
18	AIN Bias (%)	000~100	000	*1
19	AIN Bias	000: Positive 001: Negative	000	*1
20	AIN Slope Direction	000: Positive 001: Negative	000	*1
21	Multi-function output RY1	000: Run 001: Frequency reached (Set frequency \pm F23) 002: Frequency is within the range set by (F22 \pm F23) 003: Frequency Detection (>F22) 004: Frequency Detection (<F22) 005: Fault terminal 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	
22	Output frequency at the Set value (Hz)	00.0~200	00.0	*1
23	Frequency detection range (\pm Hz)	00.0~30.0	00.0	*1
24	Output current set value	000~100%	000	
25	Output current detection time	00.0~25.5(Sec)	00.0	
26	Multi-function output analog type selection (0~10Vdc)	000: Output frequency 001: Set frequency 002: Output voltage 003: DC voltage 004: Output current 005: PID feedback signal	000	*1
27	Multi-function analog output gain (%)	000~200%	100	*1
28	Preset frequency 1 (Main frequency setting)	00.0~200Hz	05.0	*1
29	Preset frequency 2	00.0~200Hz	05.0	*1
30	Preset frequency 3	00.0~200Hz	10.0	*1
31	Preset frequency 4	00.0~200Hz	20.0	*1
32	Preset frequency 5	00.0~200Hz	30.0	*1
33	Preset frequency 6	00.0~200Hz	40.0	*1
34	Preset frequency 7	00.0~200Hz	50.0	*1
35	Preset frequency 8	00.0~200Hz	60.0	*1
36	Jog frequency instruction	00.0~200Hz	05.0	*1

F	Function Description	Range/ Code	Factory Default	Remarks
37	DC braking time	00.0~25.5 Sec	00.5	
38	DC braking start frequency	01.0~10.0 Hz	01.5	
39	DC braking level	000~020%	005	
40	Carrier frequency	004~016	010	4~16K
41	Auto Restart for power-loss	000: Enable 001: Disable	001 *6	
42	Auto-restart times	000~005	000	
43	Motor rated current			*4
44	Motor rated voltage			*4
45	Motor rated frequency			*4
46	Motor rated power			*4
47	Motor rated speed	0~120 (*100 RPM) *8		*4
48	Torque Boost Gain (Vector)	001~450		
49	Slip Compensation Gain (Vector)	001~450		
50	Low frequency voltage compensation	000~40		
51	Advanced parameter function display	000: don't display 001: display	000	*1
52	Factory default	010: Reset to factory default (50Hz) 020: Reset to factory default (60Hz)	000	
53	Software version	CPU Version		*3 *4
54	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
00	Reverse run instruction	000: Reverse enable 001: Reverse disable	000	
01	Acceleration stall-prevention	000: Acceleration stall prevention enable 001: Acceleration stall prevention disable	000	
02	Acceleration stall-prevention level (%)	050 - 300	200	
03	Deceleration stall-prevention	000: Deceleration stall prevention enable 001: Deceleration stall prevention disable	000	
04	Deceleration stall-prevention level (%)	050 - 300	200	
05	Run stall-prevention	000: Run stall prevention available 001: Run stall prevention unavailable	000	
06	Run stall-prevention level (%)	050 - 300	200	
07	Stall prevention time during run	000: according to decel time set in F02 001: according to decel time set in C08	000	
08	Stall prevention deceleration time set	00.1 – 999 Sec	03.0	
09	Direct start on power up	000: Direct start available 001: Direct start disabled	001	

C	Function Description	Range/ Code	Factory default	Remarks
10	Reset mode	000: RUN instruction is OFF, Reset command is available. 001: Whether RUN instruction is OFF or ON, Reset command is available.	000	
11	Acceleration time 2	00.1~999 Sec	05.0	*1 *2
12	Deceleration time 2	00.1~999 Sec	05.0	*1 *2
13	Fan control	000: Auto-run at set temperature 001: Run when inverter runs 002: Always run 003: Always stop	001	This function only available for IP20 type, For IP65 type , fan will run while power is on.
14	Control mode	000:Vector control 001:V/F Control	000	*4
15	V/F Pattern setting	001 ~ 007	001/004	*8
16	V/F base output voltage set	198~265V / 380~530V	220/440	
17	Max output frequency (Hz)	00.2 – 200	50.0/60.0	
18	Output voltage ratio at max frequency (%)	00.0 – 100	100	
19	Mid frequency(Hz)	00.1 – 200	25.0/30.0	
20	Output voltage ratio at mid frequency (%)	00.0 – 100	50.0	
21	Min output frequency (Hz)	00.1 – 200	00.5/00.6	
22	Output voltage ratio at Min frequency (%)	00.0 – 100	01.0	
23	Torque Boost Gain (V/F)	00.0 ~ 30.0%	00.0	*1
24	Slip Compensation Gain (V/F)	00.0 ~100%	00.0	*1
25	Motor no load current			Varies with motor rating *4
26	Electronic thermal relay protection for motor (OL1)	000: Enable motor protection 001: Disable motor protection	000	
27	Skip frequency 1(Hz)	00.0~200	00.0	*1
28	Skip frequency 2(Hz)	00.0~200	00.0	*1
29	Skip frequency range (±Hz)	00.0~30.0	00.0	*1

C	Function Description	Range/ Code	Factory default	Remarks
30	PID operation mode	000: PID Function unavailable 001: PID control, Bias D control 002: PID Control, Feedback D control 003: PID Control, Bias D reverse characteristics control. 004: PID Control, Feedback D reverse characteristics control.	000	
31	PID Error gain	0.00 – 10.0	1.00	*1
32	P: Proportional gain	0.00 – 10.0	01.0	*1
33	I: Integral time (s)	00.0 – 100	10.0	*1
34	D: Differential time (s)	0.00 – 10.0	0.00	*1
35	PID OFFSET	000: Positive direction 001: Negative direction	000	*1
36	PID OFFSET adjust (%)	000 – 109	000	*1
37	PID Update time (s)	00.0 - 02.5	00.0	*1
38	PID Sleep mode threshold	00.0~200Hz	00.0	
39	PID Sleep delay time	00.0~25.5	00.0	
40	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.	000	
41	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	
42	Terminal S5 function (option)	000: Forward 001: Reverse 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: Select 2 nd accel/decel time. 009: Reset 010: Up Command 011: Down Command 012: Control signal switch 013: Communication control signal switch 014: Acceleration/ deceleration disable 015: Master/auxiliary speed source select 016: PID function disable 019: DC Brake signal *7	007	
43	Terminal S6 function (option)		009	
44	Multi-function input terminal S1~S6 signal scan time (mSec ×8)	001~100	010	

C	Function Description	Range/ Code	Factory default	Remarks
45	Confirming AIN signal scan time (mSec x 8)	001~100	050	
46	Multi-function output T+, T- (option)	000: Run 001: Frequency reached (Set frequency \pm F23) 002: Frequency is within the range set by (F22 \pm F23) 003: Frequency detection (>F22) 004: Frequency detection (<F22) 005: Fault terminal 006: Auto-restart 007: Momentary power loss 008: Emergency Stop(E.S.) 009: Base Block(b.b.) 010: Motor overload protection 011: Inverter overload protection 012: Reserve 013: Power ON 014: Communication error 015: Output current detection(>F24)	005	
47	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 keypad for proper operation *4
48	Copy module	000: Copy module disable 001: copy to module from inverter 002: copy to inverter from module 003: read/ write check	000	*3
49	Inverter communication address	001 ~ 254	001	*3 *4
50	Baud rate (bps)	000: 4800 001: 9600 002: 9200 003: 38400	003	*3 *4
51	Stop bit	000: 1 Stop bit 001: 2 Stop bit	000	*3 *4
52	Parity bit	000: No parity 001: Even parity 002: Odd parity	000	*3 *4
53	Data bits	000: 8 bits data 001: 7 bits data (Only for Modbus ASCII Mode)	000	*3 *4
54	Communication time-out detection time	00.0 ~ 25.5 Sec	00.0	*3*5

C	Function Description	Range/ Code	Factory default	Remarks
55	Communication time-out operation selection	000: Deceleration to stop. (F02: Deceleration time 1). 001: Coast to stop. 002: Deceleration to 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**

Chapter 3 Troubleshooting and maintenance

3.1 Trouble indication and corrective action

3.1.1 Fault/ Error display and Diagnostics

1. Un- reset able / un recoverable Errors

Display	Error	Cause	Corrective Action
EPR	EEPROM problem	EEPROM problem	Change 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.

2. Errors which can be recovered both manually and automatically

Display	Error	Cause	Corrective Action
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 the 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 C13
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-out detection time. 2. Keep the inverter communication. 3. Check the received Modbus data is correct from Master.

3. Errors which can only be recovered manually (no auto-restart)

Display	Error	Cause	Corrective Action
OC	Over-current during stop	<ol style="list-style-type: none"> 1. OC Detection circuit malfunction 2. Bad connection for CT signal cable 	Send the inverter back for repair
OL1	Motor overload	<ol style="list-style-type: none"> 1. Heavy load 2. Improper settings of F43 	<ol style="list-style-type: none"> 1. Increase motor capacity 2. Set F43 correctly according to motor nameplate.
OL2	Inverter overload	Excessively Heavy load	Increase inverter capacity
LVC	Under voltage during operation	<ol style="list-style-type: none"> 1. Power voltage too low 2. Power voltage varies widely 	<ol style="list-style-type: none"> 1. Improve power quality. 2. Set a longer acceleration time 3. Add a reactor at the power input side 4. Contact technical support

3.1.2 Set up Configuration, Interface Errors.

Display	Error	Description
SP0	Zero speed stop	Set frequency is <0.1Hz Increase set frequency
SP1	Fail to start directly	<ol style="list-style-type: none"> 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.
SP2	Keypad emergency stop	<ol style="list-style-type: none"> 1. If the inverter is set to external control mode (F04=001), the inverter will stop according to the setting of F9 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.
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	<ol style="list-style-type: none"> 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.

3.1.3 Keypad operation error description

Display	Error	Cause	Corrective Action
Er	Key operation error	<ol style="list-style-type: none"> 1. Attempt to Press ▲ or ▼ keys when F05> 0 or in speed operation. 2. Attempt to modify parameters, which can not be modified during Run (see parameter list). 	<ol style="list-style-type: none"> 1. ▲ or ▼ keys can be used to modify frequencies only when F05=0. 2. Modify parameters only in stop mode.
Er2	Parameter setting error	<ol style="list-style-type: none"> 1. F07 is within ranges of C27±C29 or C28±C29 2. F07<F08 or F07=F08 	<ol style="list-style-type: none"> 1. Modify F32~F33 2. 3-00>3-01
Er5	Modification of parameter is not allowed during communication	<ol style="list-style-type: none"> 1. Issue a control command during communication disabled 2. Modify C49~C53 during communication. 3. Change C47 by remote keypad. 	<ol style="list-style-type: none"> 1. Issue the enabling command before while communicating. 2. Set up parameters before communicating. 3. Change C47 by inverter keypad.
Er6	Communication error	<ol style="list-style-type: none"> 1. Incorrect wiring. 2. Incorrect settings of communication parameters. 3. Check-sum error. 4. Incorrect communication verification. 	<ol style="list-style-type: none"> 1. Check the hardware and wiring. 2. Check C49~C53
Er7	Incorrect parameter settings	<ol style="list-style-type: none"> 1. Attempt to modify F00 2. Voltage and current detection circuits are malfunctioning. 	Reset inverter or contact technical support
EP1	Parameter set error, Copy Unit failure	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 1. Change Copy Unit 2. The voltage and HP rating of Copy Unit is different than the inverter.




3.2 General functional troubleshooting

Status	Checking point	Corrective Action
Motor does not run	Is power applied to L1, L2, and L3(N) terminals (is the charging indicator lit)?	<ul style="list-style-type: none"> 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?	<ul style="list-style-type: none"> 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?	<ul style="list-style-type: none"> Is analog frequency input signal wiring correct? Is frequency input voltage correct?
	Is operation mode setting correct?	<ul style="list-style-type: none"> Configure operations through the digital panel
Motor rotates in the wrong direction	Are wiring for output terminals T1, T2, and T3 correct?	<ul style="list-style-type: none"> Wiring must match U, V, and W terminals of the motor.
	Are wiring for forward and reverse signals correct?	<ul style="list-style-type: none"> 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?	<ul style="list-style-type: none"> Check wiring and correct if necessary.
	Is the setting of frequency command source correct?	<ul style="list-style-type: none"> Check the operation mode setting on the keypad.
	Is the load too large?	<ul style="list-style-type: none"> Reduce the applied load.
Motor running at too high or too low speeds.	Is the setting of operation mode correct?	<ul style="list-style-type: none"> Confirm the motor's specifications.
	Is the load too large?	<ul style="list-style-type: none"> Confirm the gear ratio.
	Are specifications of the motor (poles, voltage...) correct?	<ul style="list-style-type: none"> Confirm the highest output frequency.
Motor speed is incorrect or erratic	Is the gear ratio correct?	<ul style="list-style-type: none"> Reduce the load.
	Is the setting of the highest output frequency correct?	<ul style="list-style-type: none"> Minimize the variation of the load. Increase capacities of the inverter and the motor.
	Is the load too large?	<ul style="list-style-type: none"> Add an AC reactor at the power input side if using single-phase power. Check wiring if using three-phase power.

4. Appendix

UL Listing and CE certification Information

4.1 Approvals Table

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

4.2 Common UL information (for VariFlex² Size 1 and 2)

4.2.1 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

4.2.2 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).

4.2.3 Motor overload protection

The drive provides motor overload protection. The overload protection level is 150% of full-load current. Refer to the *VariFlex² RVEF Advanced User Guide* for further information.

4.2.4 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.

4.3 Power dependant UL information

4.3.1 VariFlex² Size 1 and Size 2

Conformity

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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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

RVEF series of Motor Controllers Variable Frequency AC Drives

are in conformity with

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

The EMC Directive 89 / 336 / EEC,

referring to the below listed standards

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

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

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

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

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

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

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



CE marking

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

Manufacturer

Place / Date : Lainate , February 25th / 2008

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Controls Division
Belluno - **ITALY**

Carlo Gavazzi Controls SpA
Sensors Division
Castel Maggiore (BO) - **ITALY**

Uab Carlo Gavazzi Industri Kaunas
Kaunas - **LITHUANIA**

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