RVDS Quick Start Manual

Content

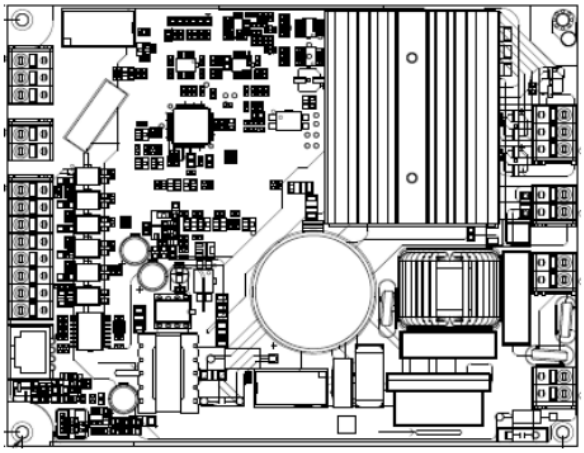
- General installation considerations
- Frequently used parameters
- Motor parameters
- Configuration with digital input
- Alarms
- Keypad user guide

General installation considerations

Installation – Mounting

Secure the inverter to the mounting base with 4 screws or bolts (M3) so that the RVDS Heatsink is on the top side. Tighten those screws or bolts perpendicular to the mounting base. (Maximum torque is 0.6N·m)

Do not mount the inverter upside down or horizontally. Doing so will reduce the heat dissipation efficiency of the inverter and cause the overheat protection function to operate, so the inverter will not run.

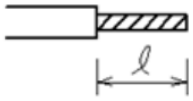


[RVDS120055F/RVDS120075F]

Installation - Wire size

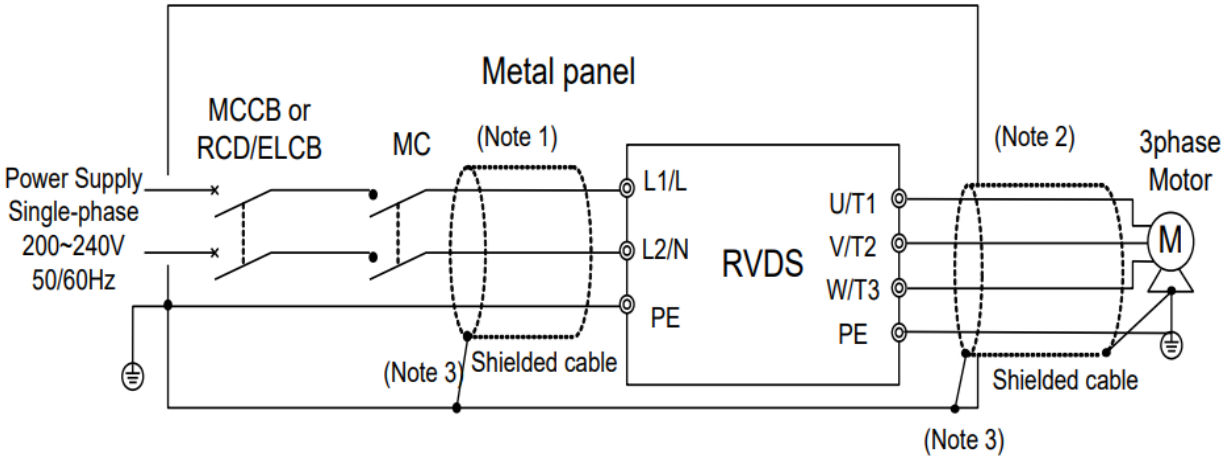
Power supply	Nominal applied motor (kW)	Inverter type	Recommended wire size (mm^2)		
			Main circuit: input: [L1/L, L2/N] output: [U/T1,V/T2,W/T3] Earth : [PE] Braking resistor : [PB, PA+]	Control circuit Alarm: [ALM_A, ALM_B, ALM_C] Relay: [RLY1, RLY2]	Digital input
Single-phase 200V	0.55	RVDS120055F	1.5(1.5) mm2		0.5mm
	0.75	RVDS120075F			

*Bare wire length: 8~9mm



Installation – EMC

Power supply voltage	Applicable motor rating (kW)	Inverter type	Rated Current(A) of MCCB (w/o ACR)
Single- phase 200V	0.55	RVDS120055F	10
	0.75	RVDS120075F	15



Note 1: Pass the EMC filter input wires (shielded cable and grounding wire in a bundle) through the ferrite bead core for reducing radio noise two times.

Note 2: Pass the EMC filter output wires (shielded cable and grounding wire in a bundle) through the ferrite bead core for reducing radio noise two times.

Note 3: Connect the shielding layer of the shielded cable to the motor and panel electrically and ground the motor and panel.

Frequently used parameters

Function Code	Name	Description
F00	Data Protection	0: Disable both data protection and digital reference protection 1: Enable data protection and disable digital reference protection 2: Disable data protection and enable digital reference protection 3: Enable both data protection and digital reference protection

F01	Frequency Command 1	0: UP/DOWN keys on keypad Keypad enters frequency reference data in to F29
F02	Operation Method	1: Terminal command FWD or REV 2: RUN/STOP keys on keypad (forward) 3: RUN/STOP keys on keypad (reverse)
F21	Motor Sound (Carrier frequency)	2 to 10
F24	Control Mode Selection 1	0: V/f control with slip compensation inactive; 1: Dynamic torque vector control; 2: V/f control with slip compensation active

Frequently used parameters – Frequency setting

Function Code	Name	Description
F03	Maximum Frequency 1	25.0 to 120.0
F13	Frequency Limiter (High)	0.0 to 120.0
F14	Frequency Limiter (Low)	0.0 to 120.0
F18	Starting Frequency1	0.1 to 60.0
F20	Stop Frequency	0.1 to 60.0
F29	Digital Reference Frequency	0.0 to 120.0

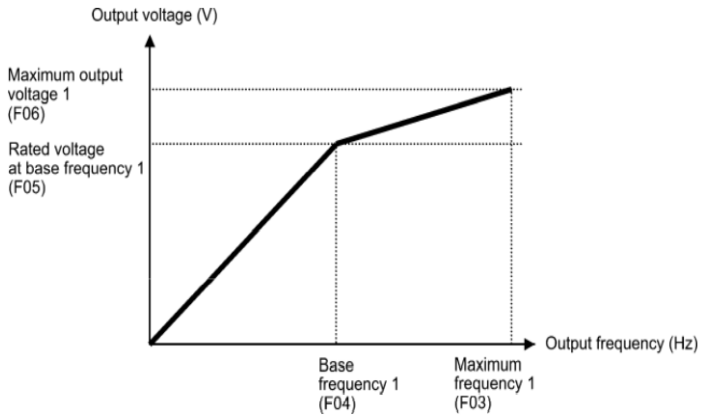
F13 and F14 specify the upper and lower limits of the output frequency, respectively.

- When you change the frequency limiter (High) (F13) in order to raise the reference frequency, be sure to change the maximum frequency (F03) accordingly.

- Maintain the following relationship among the data for frequency control: F13 > F14, F13 > F18, F13 > F20, and F03 > F14. Where, F18 is of the starting frequency and F20 is of the stop frequency. If you specify any wrong data for these function codes, the inverter
- may not run the motor at the desired speed or cannot start it normally.

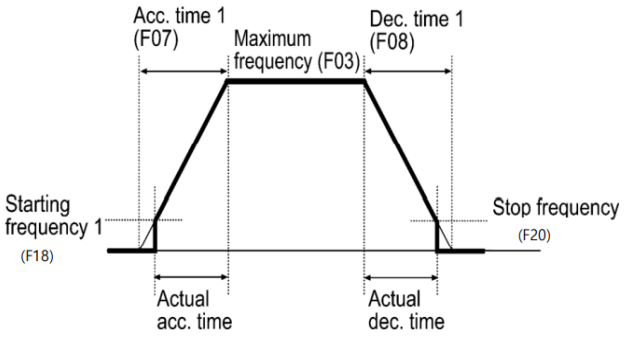
Frequently used parameters – Output voltage setting

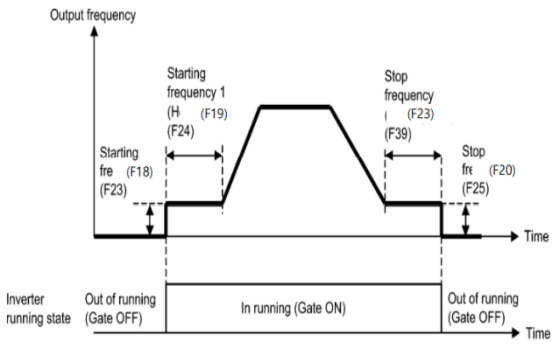
Function Code	Name	Description
F03	Maximum Frequency 1	25.0 to 120.0
F04	Base Frequency 1: nameplate of the motor	25.0 to 120.0
F05	Rated Voltage at Base Frequency 1: nameplate of the motor	0: Output a voltage in proportion to input voltage 80 to 240: Output an AVR-controlled voltage
F06	Maximum Output Voltage 1	80 to 240: Output an AVR-controlled voltage



Frequently used parameters – Starting, Stop, slope setting

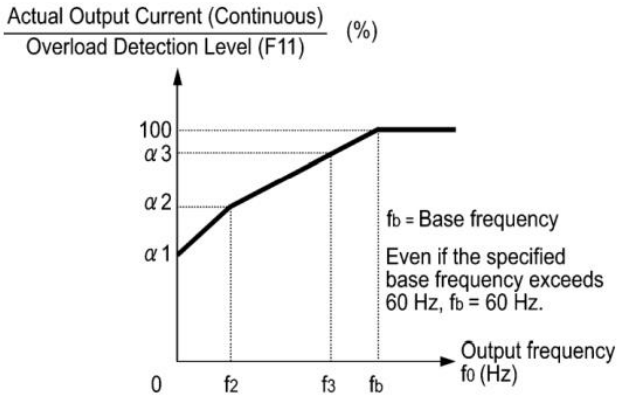
Function Code	Name	Description	Example	
F03	Maximum Frequency 1	25.0 to 120.0	100.0	Acc.slope = 100Hz/5.00sec = 20Hz/s Dec.slope = 100Hz/10.00sec = 10Hz/s
F07	Acceleration Time 1	0.01 to 655	5.00	
F08	Deceleration Time 1	0.01 to 655	10.00	
F18	Starting Frequency1	0.1 to 60.0	0.5	Inverter outputs from 0.5Hz. After outputting 0.5Hz for 1 second, acceleration starts.
F19	Starting Frequency1 (Holding time)	0.00 to 10.00	1.00	
F20	Stop Frequency	0.1 to 60.0	0.5	If it reaches 0.5Hz during deceleration, it outputs 0.5Hz for 2 seconds before stopping the inverter output.
F23	Stop Frequency (Holding time)	0.00 to 10.00	2.00	





Frequently used parameters – Motor thermal protection

Function Code	Name	Description
F09	Motor ETH Characteristic	1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor with separately powered cooling fan
F10	Motor ETH Level	0.00: Disable, 0.01 to 100.0 1 to 135% of the rated current (allowable continuous drive current) of the motor
F11	Motor ETH Thermal Time Constant	0.5 to 75.0



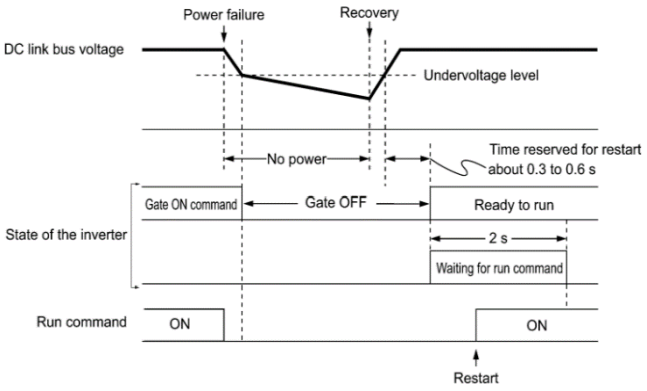
The figure shows operating characteristics of the electronic thermal overload protection when F09 = 1. The characteristic factors a1 through a3 as well as their corresponding switching frequencies f2 and f3 vary with the characteristics of the motor. Also, Actual Output Current (Continuous) means the detection level of output current that electronic thermal overload protection activates above.

Nominal applied motor (kW)	Thermal time constant (Factory default)	Reference current for setting the thermal time constant (Imax)	Output frequency for motor characteristic factor		Characteristic factor		
			f2	f3	1	2	3
0.1 to 0.75	5 min	Allowable continuous current 150%	5 Hz	7 Hz	75%	85%	100%

Frequently used parameters – Restart (flying start)

Function Code	Name	Description
F12	Restart Mode after Momentary Pow er Failure (Mode selection)	0: Disable restart (Trip immediately) 1: Disable restart (Trip after a recovery from power failure) 2: Trip after decelerate-to-stop 4: Enable restart (Restart at the frequency at which the power failure occurred, for general loads) 5: Enable restart (Restart at the starting frequency)

This function is useful for loads with high inertia and low damping



The inverter recognizes a momentary power failure upon detecting the condition that DC link bus voltage goes below the under-voltage detection level, while the inverter is running. If the load of the motor is light and the duration of the momentary power failure is extremely short, the voltage drop may not be great enough for a momentary power failure to be recognized, and the motor may continue to run uninterrupted.

Upon recognizing a momentary power failure, the inverter enters the restart mode (after a recovery from momentary power failure) and prepares for restart. When power is restored, the inverter goes through an initial charging stage and enters the ready-to-run state.

Frequently used parameters – DC braking decelerating for motor stop

Function Code	Name	Description
F15	DC Braking1 (Start Frequency)	0.0 to 60.0
F16	DC Braking1 (Level)	0 to 100 *2
F17	DC Braking1 (Time)	0.00 (Disable), 0.01 to 30.00

•Braking starting frequency (F15): F15 specifies the frequency at which the DC braking starts its operation during motor decelerate-to-stop state.

∇ Generally, set the motor rated slip frequency or so to F15. Setting an extremely large value makes the control unstable; according to conditions, it activates an overvoltage protection.

•Braking level (F16):

F16 specifies the output current level to be applied when the DC braking is activated. The function code data should be set, assuming the rated output current of the inverter as 100%, in increments of 1%.

∇ Conversion formula & 0.75kW example:

[Conversion formula]

$$\text{Setting value (\%)} = \frac{I_{DB}\,(A)}{I_{INV}\,(A)} \times 100 \qquad \text{Setting value (\%)} = \frac{4.2\,(A)}{5.0\,(A)} \times 100 = 84$$

•Braking time (F17)

•F17 sspecifies the braking period that activates DC braking.

Frequently used parameters – Current limit

Function Code	Name	Description
F25	Current Limiter (Mode selection)	0: Disable (No current limiter works.) 1: Enable at constant speed (Disable during ACC/DEC) 2: Enable during ACC/constant speed operation
F26	Current Limiter (Level)	20 to 200 (The data is interpreted as the rated output current of the inverter for 100%.) *2)

Data for F25	Running states that enable the current limiter		
	During acceleration	During constant speed	During deceleration
0	disable	disable	disable
1	disable	enable	disable
2	enable	enable	disable

F26 specifies the operation level at which the output current limiter becomes activated, in ratio to the inverter rating.

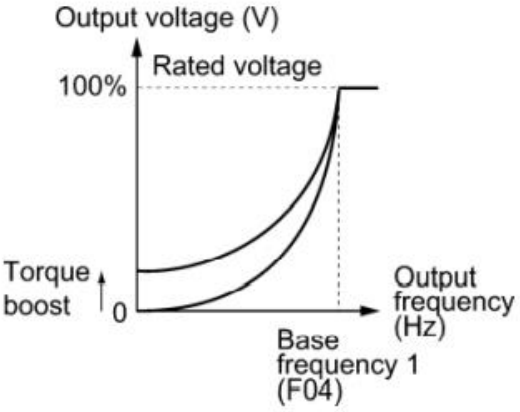
Note: Since the current limit operation with F25 and F26 is performed by software, it may cause a delay in control. If you need a quick response, specify a current limit operation by hardware (H07 = 1) at the same time.

Note: If an excessive load is applied when the current limiter operation level is set extremely low, the inverter will rapidly lower its output frequency. This may cause an overvoltage trip or dangerous turnover of the motor rotation due to undershooting

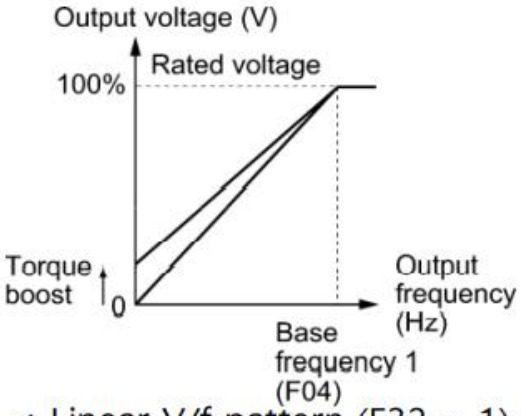
Frequently used parameters – Dynamic Braking setting

Function Code	Name	Description
F30	Torque Boost 1	0.0 ~ 20.0 (The percentage is relative to the F05 "Rated Voltage at Base Frequency 1")

Data for F32	V/f pattern	Torque boost (F30)	Applicable load
0	Variable torque V/f pattern	Torque boost specified by F30	Variable torque load (General purpose fans and pumps)
1	Linear V/f pattern		Constant torque load
2		Auto torque boost	Constant torque load (To be selected if a motor may be over-excited at no load.)



< Variable torque V/f pattern (F32 = 0) >



< Linear V/f pattern (F32 = 1) >

Motor parameters

Function Code	Name	Description
P01	Motor (Rated capacity): nameplate of the motor	0.01 to 30.00
P02	Motor (Rated current): nameplate of the motor	0.00 to 100.0
P03	Motor (Auto-tuning)	0: Disable 1: Tune when the motor stops (%R1, %X)

P04~P10: please refer to "2.2.8 Motor parameters" in manual

•Motor parameter(P05(%R1), P06(%X)) is needed when control mode(F24) is "1: Dynamic torque vector control" or "2: slip compensation control" and when auto torque boost is activated(F32=2)

•Please perform auto-tuning when motor parameter is needed for application and the following conditions are met

- The motor to be driven is a non-standard motor

- Cabling between the motor and the inverter is long

- A reactor is inserted between the motor and the inverter

• Auto-tuning sequence

1) power on the inverter with motor connected

2) set P03 to "1"

- Keypad: after setting P03, "Run" button should be pushed.

- Communication (RS485): when P03 is set by 3 via RS485, then inverter will start auto-tuning without run command

3) inverter will perform auto-tuning by itself

- DC and altered current will be induced to motor. (Normally, it should be over in 35 seconds.)

4) after auto-tuning, P03 will be reset to "0" automatically

• auto-tuning will be stop when a tuning failure, interruption, or abnormal tuning result is detected during tuning of motor parameters. (Alarm code: 37, Keypad indication: Er7)

Configuration via digital input

Digital Input – Function code

Function Code	Name	Description
E01	Terminal [DI1] Function 1	Selecting function 1 code data assigns the corresponding function to terminals [DI 1], [DI2] ... [DI5] as listed in the manual. [FWD] and {REV] function can not support logic-inverted assignment (i.e., 1098, 109 9)
E02	Terminal [DI2] Function 1	
E03	Terminal [DI3] Function 1	
E04	Terminal [DI4] Function 1	
E05	Terminal [DI5] Function 1	
E22	Terminal [DI1] Function 2	Selecting function 2 code data assigns the corresponding function to terminals [DI1], [DI2] ... [DI5] as listed in the manual.
E23	Terminal [DI2] Function 2	
E24	Terminal [DI3] Function 2	
E25	Terminal [DI4] Function 2	
E26	Terminal [DI5] Function 2	

Digital Input – value setting

Function code data		Terminal commands assigned	Symbol
Active ON	Active OFF		
0	1000	Select preset frequency (Preset 1 to 3)	SS1
1	1001		SS2
8	1008	Reset alarm	RST
40	1040	Emergency stop	EST
50	1050	Select preset acceleration/deceleration time (Preset 1 to 3)	SA1
51	1051		SA2
97	1097	Change motor operation direction	CHD
98	-	Run forward	FWD
99	-	Run reverse	REV
100	-	No choice	NOC

*These functions codes may also switch the logic system between normal and negative to define how the inverter logic interprets either ON or OFF status of each terminal. The default setting is normal logic system "Active ON."

Digital Input – Preset frequency selection

SS2	SS1	Selected frequency
OFF	OFF	Other than preset frequency
OFF	ON	E19 (Preset frequency 1, PF1)
ON	OFF	E20 (Preset frequency 2, PF2)
ON	ON	E21 (Preset frequency 3, PF3)

Function code	Description
F29	Digital Reference Frequency
E19	Preset Frequency 1 (PF1)
E20	Preset Frequency 2 (PF2)
E21	Preset Frequency 3 (PF3)

If the preset function is not used for digital input or if the preset function is not input to the preset terminal even if the preset function is used, acceleration/deceleration is performed only with a single frequency

Digital Input – Preset slope selection

SA2	SA1	Selected acc,./dec. time
OFF	OFF	Acc. time: F07 (Acc. time 1) Dec. time: F08 (Dec. time 1)
OFF	ON	Acc. time: E27 (Preset acc. time 1) Dec. time: E28 (Preset dec. time 1)
ON	OFF	Acc. time: E29 (Preset acc. time 2) Dec. time: E30 (Preset dec. time 2)
ON	ON	Acc. time: E31 (Preset acc. time 3) Dec. time: E32 (Preset dec. time 3)

Function code	Description
F07	Acceleration Time 1
F08	Deceleration Time 1
E27	Preset Acceleration Time 1 (for PF1)
E28	Preset Deceleration Time 1 (for PF1)
E29	Preset Acceleration Time 2 (for PF2)
E30	Preset Deceleration Time 2 (for PF2)
E31	Preset Acceleration Time 3 (for PF3)
E32	Preset Deceleration Time 3 (for PF3)

Digital Input – Multi step speed example (setting)

Specification			Implementation				
Digital input	**Function setting**	**Note**	**Function code**	**Description**	**Modbus Addr.(Hex)**	**Value**	**Action**
DI1	FWD/Stop	-	E01	DI1 function select 1	0x0101	98	-
DI2	Preset frequency	-	E02	DI2 function select 1	0x0102	0	Select preset frequency 1 (SS1)
			E23	DI2 function select 2	0x0117	50	Select acc./dec. time 1 (SA1)
DI3	Preset frequency	-	E03	DI3 function select 1	0x0103	1	Select preset frequency 2 (SS2)
			E24	DI3 function select 2	0x0118	51	Select acc./dec. time 2 (SA2)
DI4	REV/Stop	-	E04	DI4 function select 1	0x0104	99	-
DI5	Reset	-	E05	DI5 function select 1	0x0105	8	-

Digital Input – Multi step speed example (Operation map)

Digital input status				Output		
DI1	**DI2 (SS1 & SA1)**	**DI3 (SS2 & SA2)**	**DI4**	**Direction**	**Target frequency**	**Acc/Dec time (slope)**
OFF	Don't care	Don't care	OFF	Stop (0 Hz)	0 Hz	Dec. time is decided by DI2&DI3
ON	OFF	OFF	OFF	FWD	PF0	Acc time 0, dec time 0
ON	ON	OFF	OFF	FWD	PF1	Preset acc. time 1, preset dec. time 1
ON	OFF	ON	OFF	FWD	PF2	Preset acc. time 2, preset dec. time 2
ON	ON	ON	OFF	FWD	PF3	Preset acc. time 3, preset dec. time 3
OFF	OFF	OFF	ON	REV	PF0	Acc time 0, dec time 0
OFF	ON	OFF	ON	REV	PF1	Preset acc. time 1, preset dec. time 1
OFF	OFF	ON	ON	REV	PF2	Preset acc. time 2, preset dec. time 2
OFF	ON	ON	ON	REV	PF3	Preset acc. time 3, preset dec. time 3
ON	Don't care	Don't care	ON	Stop (0 Hz)	0 Hz	Dec. time is decided by DI2&DI3

Alarm code

Value	Keypad indication	Description	LED flashes
1	OC1	Instantaneous over-current (during acceleration	5
2	OC2	Instantaneous over-current (during deceleration)	
3	OC3	Instantaneous over-current (during steady state)	
6	OU1	Over-voltage (during acceleration)	3
7	OU2	Over-voltage (during deceleration)	
8	OU3	Over-voltage (during steady state)	
10	LU	Under-voltage	
17	OH1	Heatsink overheated	7
22	dbH	Braking resistor overheated	8
23	OL1	Motor overload	
25	OLU	Inverter overload	
31	Er1	Memory error	Fully ON
33	Er3	CPU error	
37	Er7	Tuning error	2
38	Er8	RS-485 communications error	1
46	OPL	Output phase loss	9
51	ErF	Data saving error during under-voltage	1
61	STO	STO activated	10
254	Err	Mock alarm	4

Keypad user guide

Keypad Component

The keypad allows you to run and stop the motor, display various data, configure function code data, and monitor I/O signal states, maintenance information and alarm information.

Keypad Function

Item	LED Monitor, Keys, and LED Indicators	Functions
LED Monitor	60.00	Four-digit, 7-segment LED monitor which displays the followings according to the operation modes. ■ In Running mode: Running status information (e.g., output frequency, current, and voltage) When a light alarm occurs, L-AL is displayed. ■ In Programming mode: Menus, function codes and their data ■ In Alarm mode: Alarm code, which identifies the alarm factor that has activated the protective function.
Operation Keys	PRG RESET	Program/Reset key which switches the operation modes of the inverter. ■ In Running mode: Pressing this key switches the inverter to Programming mode. ■ In Programming mode: Pressing this key switches the inverter to Running mode. ■ In Alarm mode: Pressing this key after removing the alarm factor resets the alarm and switches back to Running mode.
	FUNC DATA	Function/Data key which switches the operations you want to do in each mode as follows: ■ In Running mode: Pressing this key switches the information to be displayed concerning the status of the inverter (output frequency (Hz), output current (A), output voltage (V), etc.). When a light alarm is displayed, holding down this key resets the light alarm and switches back to Running mode. ■ In Programming mode: Pressing this key displays the function code or establishes the data entered with ∧ and ∨ keys. ■ In Alarm mode: Pressing this key displays the details of the problem indicated by the alarm code that has come up on the LED monitor.
	RUN	RUN key. Press this key to run the motor.
	STOP	STOP key. Press this key to stop the motor.
	∧ and ∨	UP and DOWN keys. Press these keys to select the setting items and change the function code data displayed on the LED monitor.
	»	Shift key. Press this key to shift the cursor to the right for entry of a numerical value.

Keypad Configuration Steps

To change parameter setting value using RV_Keypad, please refer to the following steps:

RV-Keypad when wiring it to the RVDS

Step 1
Press PRG/RESET to have access to the groups of registers and use the up and down button to select the group

Step 2
Press FUNC/DATA to access the register and use the UP/DOWN buttons to select the register to configure

Step 3
Press FUNC/DATA
Select the value using UP/DOWN buttons

Step 4
After changing the value, press FUNC/DATA key to save