CARLO GAVAZZI
Automation Components

RVLF

Motor Controllers AC Variable Frequency Drives
Type VariFlex³ RVLF

Switches

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RVLF Series

100V	0.4-0.75kW (0.5-1HP)
200V	0.4-2.2kW (0.5-3HP)
400V	0.75-2.2kW (1-3HP)

Index

0 Preface

To extend the performance of the product and ensure personnel safety, please read this manual thoroughly before using the inverter. Should there be any problem in using the product that cannot be solved with the information provided in the manual, contact our technical or sales representative who will be willing to help you.

Precautions

The inverter is an electrical product. For your safety, there are symbols such as "Danger", "Caution" in this manual as a reminder 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 that could cause death or serious personal injury if misused.

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

Danger

- Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. It is not permissible to open the equipment until 5 minutes after the power has been removed.
- Do not make any connections when the inverter is powered on. Do not check parts and signals on circuit boards during the inverter operation.
- Do not disassemble the inverter or modify any internal wires, circuits, or parts.
- Ensure that the inverter ground terminal is connected correctly.

Caution

- Do not perform a voltage test on parts inside the inverter. High voltage can destroy the semiconductor components.
- Do not connect T1, T2, and T3 terminals of the inverter to any AC input power supply.
- CMOS ICs on the inverter's main board are susceptible to static electricity. Do not touch the main circuit board.

1. Safety Precautions

1.1. Before Power Up

Danger   Make sure the main circuit connections are correct. Single phase L1 (L), L3 (N), and Three phase L1(L), L2, L3 (N); 400V: L1, L2, L3 are power-input terminals and must not be mistaken for T1, T2 and T3. Otherwise, inverter damage can result.

Caution
- The line voltage applied must comply with the inverter's specified input voltage. (See the nameplate).
- To avoid the front cover from disengaging, or other damge do not carry the inverter by its covers. Support the drive by the heat sink when transporting.
  Improper handling can damage the inverter or injure personnel and should be avoided.
- To avoid the risk of fire, do not install the inverter on a flammable object. Install on nonflammable objects such as metal.
- If several inverters are placed in the same control panel, provide heat removal means to maintain the temperature below 50°C to avoid overheat or fire.
- When disconnecting the remote keypad, turn the power off first to avoid any damage to the keypad or the inverter.

Warning
- This product is sold subject to EN 61800-3 and EN 61800-5-1.
  In a domestic environment this product may cause radio interference in which case the user may be required to apply corrective measures.
- Motor over temperature protection is not provided.

Caution
- Work on the device/system by unqualified personnel or failure to comply with warnings can result in severe personal injury or serious damage to material.
  Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed.

1.2. During Power Up

Danger   When the momentary power loss is longer than 2 seconds, the inverter will not have sufficient stored power for its control circuit. Therefore, when the power is re-applied, the run operation of the inverter will be based on the setup of following parameters:
- Run parameters. 00-02 or 00-03.
- Direct run on power up. Parameter. 07-04 and the status of external run switch,

Note: The start operation will be regardless of the settings for parameters 07-00/07-01/07-02.

Danger. Direct run on power up.

If direct run on power up is enabled and inverter is set to external run with the run FWD/REV switch closed then the inverter will restart

Danger

Prior to use, ensure that all risks and safety implications are considered.
- When the momentary power loss ride through is selected and the power loss is short, the inverter will have sufficient stored power for its control circuits to function, therefore,when the power is resumed the inverter will automatically restart depending on the setup of parameters 07-00 & 07-01.

1.3. Before Operation

Caution   Make sure the model and inverter capacity are the same as that set in parameter 13-00.

Note: On power up the supply voltage set in parameter 01-01 will flash on display for 2 seconds.

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1.4. During Operation

Danger   Do not connect or disconnect the motor during operation. Otherwise, It may cause the inverter to trip or damage the unit.

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.
- 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 radiating 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.
- Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. It is not permissible to open the equipment until 5 minutes after the power has been removed.

Caution
- The Inverter should be used in environments with temperature range from (14 to +104°F) or (-10 to +40°C) and relative humidity of 95%.

Danger
- Make sure that the power is switched off before disassembling or checking any components.

1.5. Inverter Disposal

Caution
  Please dispose of this unit with care as an industrial waste and according to your required local regulations.
- The capacitors of inverter main circuit and printed circuit board are considered as hazardous waste and must not be burnt.
- The plastic enclosure and parts of the inverter such as the cover board will release harmful gases if burnt.

WEEE designation

Do not dispose of the product together with the household waste but according to the disposal regulations for electronic waste locally applicable at the product installation site.

2. Part Number Definition

2.1. Model Part Number

Ordering Key   **RVLF A 1 20 075 F A**

VariFlex³ AC Drive
Frame Size A/B
AC Supply Phase 1/3
Drive Voltage Rating
Drive kW Rating
Filter
Advance
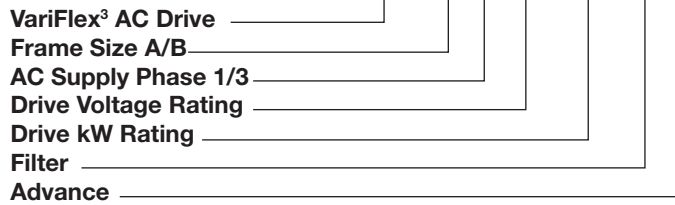
Frame Size	AC Supply Phase	Drive Voltage Rating	Drive kW Rating
A: Size 1 B: Size 2	1: 1-Phase 3: 3-Phase	10: 100-120VAC 20: 200-240VAC 40: 380-480VAC	040: 0.40kW, 0.50HP
			075: 0.75kW, 1.0HP
			150: 1.5kW, 2.0HP
			220: 2.2kW, 3.0HP
			370: 3.7KW, 5.0HP
			550: 5.5KW, 8.0HP
			750: 7.5KW, 10HP
			1100: 11KW, 15HP

Filter	Advance
Nil: No inbuilt Filter F: Inbuilt filter	**A**: Advance. Sensorless vector control

2.2. Standard Product Specification

Model	Supply Voltage (Vac)	Frequency (Hz)	(HP)	(KW)	Filter	SLV
RVLFA110040A	1Ph, 100-120V +10%/-15%	50/60Hz	0.5	0.4		•
RVLFA110075A			1	0.75		•
RVLFA120040FA	1Ph, 200-240V +10%/-15%		0.5	0.4	•	•
RVLFA120075FA			1	0.75	•	•
RVLFB120150FA			2	1.5	•	•
RVLFB120220FA			3	2.2	•	•
RVLFA320040A	3Ph, 200-240V +10%/-15%		0.5	0.4		•
RVLFA320075A			1	0.75		•
RVLFB320150A			2	1.5		•
RVLFB320220A			3	2.2		•
RVLFB340075FA	3Ph, 380-480V +10%/-15%		1	0.75	•	•
RVLFB340150FA			2	1.5	•	•
RVLFB340220FA			3	2.2	•	•
RVLFC340370FA			5	3.7	•	•
RVLFC340550FA			8	5.5	•	•
RVLFD340750FA			10	7.5	•	•
RVLFD3401100FA			15	11	•	•

Short circuit capacity is below 5000A/120V or 5000A/240V or 5000A/480V, for 100~120V models is 120V; 200-240V models is 240V, 380-480V for 480V.

3. Environment & Installation

3.1. Environment

Installation environment has a direct affect on the correct operation and the life expectancy of the inverter, Install the inverter in an environment complying with the following conditions:

Protection	
Protection class	IP20, NEMA/UL Open Type
Suitable environment	
Operating temperature	-10~+40°C (-10~+50°C with fan) If several inverters are installed in the same control panel, ensure adequate spacing and provide the necessary cooling and ventilation for successful operation.
Storage temperature	-20~+60°C
Relative humidity	Max 95% (without condensation) Notice prevention of inverter freezing up.
Shock and Vibration	0.075mm Amplitude for 10Hz to 57Hz 1G for 57Hz to 150Hz

Installation site

Install in an environment that will not have an adverse effect on the operation of the unit and ensure that there is no exposure to areas such as that listed below:

- Direct sunlight, rain or moisture
- Oil mist and salt
- Dust, lint fibbers, small metal filings and corrosive liquid and gas
- Electromagnetic interference from sources such as welding equipment
- Radioactive and flammable materials
- Excessive vibration from machines such as stamping, punching machines
- Add a vibration-proof pads if necessary

Product Overview

Frame C   Frame D
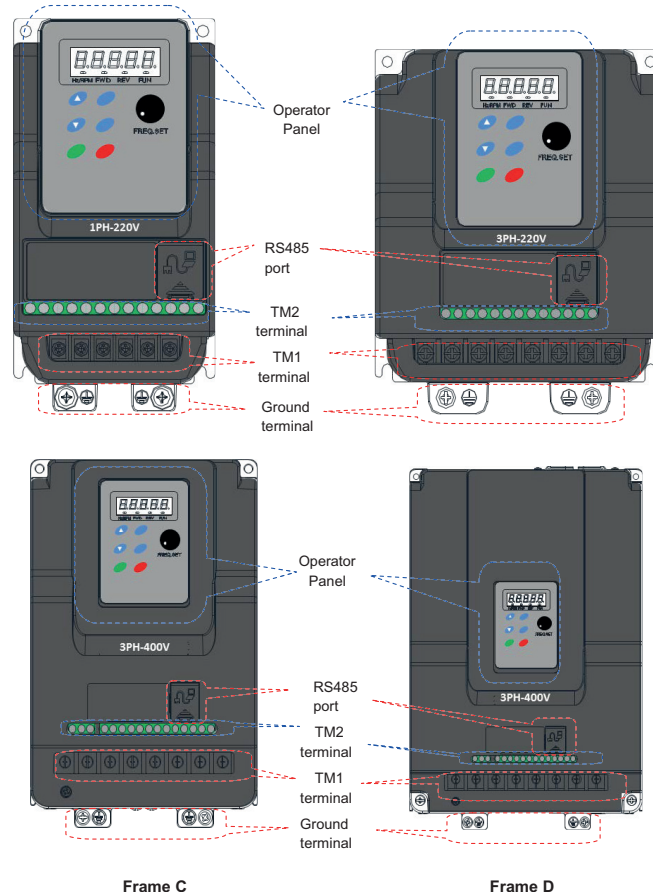
3.2. Installation

3.2.1. Installation methods

Frame1. Mounting on a flat surface.
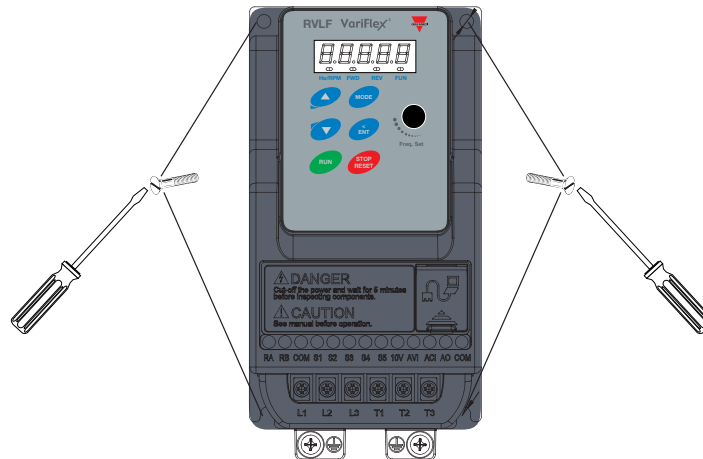
DIN rail type installation:
DIN rail kit includes a plastic and a metal adaptor plates.

Assembly Steps:
1) Attach the metal adaptor plate to the inverter base with the screws provided.
2) Attach the plastic din rail adaptor to the metal adaptor plate.
3) Push the plastic adaptor forward to lock into position.

Disassembly Steps:
1) Unlock by pushing the snap hooks
2) Retract and remove the plastic DIN rail adaptor.
3) Unscrew the metal plate & remove
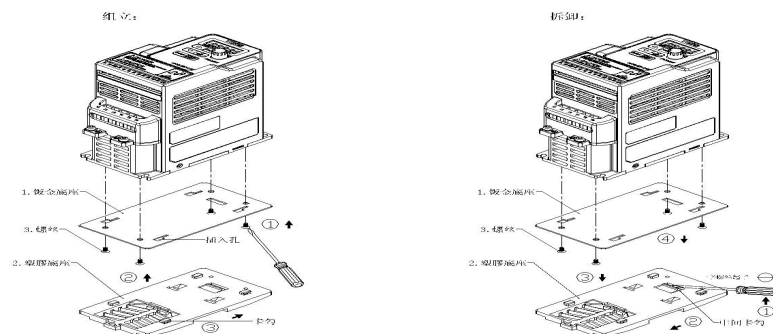
Note:
RVLF-DIN-01 (Size 1 din rail kit part number), including the following parts
1. Metal plate adaptor
2. Plastic adaptor
3. Chamfer head screw: M3×6

Frame 2. Mounting on a flat surface.
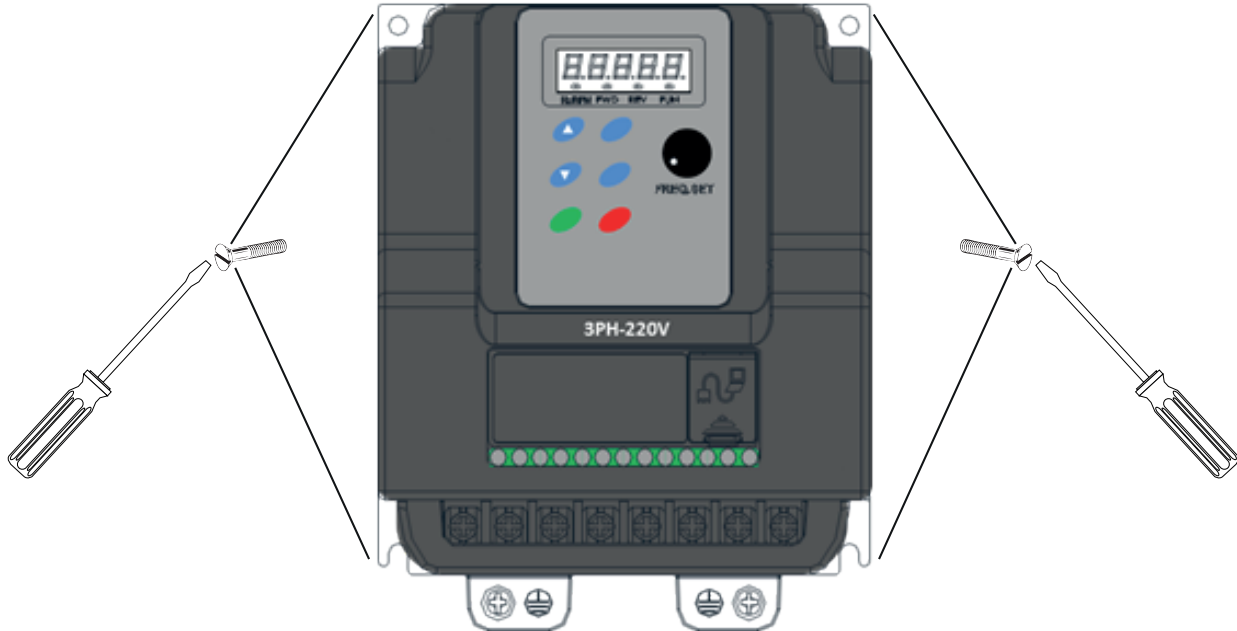
DIN rail type installation:
DIN rail kit includes a plastic adaptor plate as an attachment for the inverter base.
Refer to diagram below:
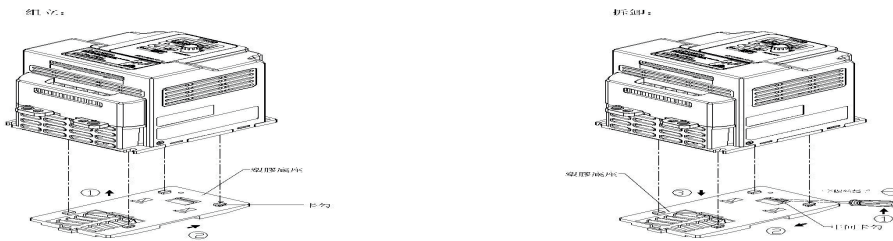
DIN rail mounting & dismounting as shown in the diagram below: Use a 35mm DIN rail.
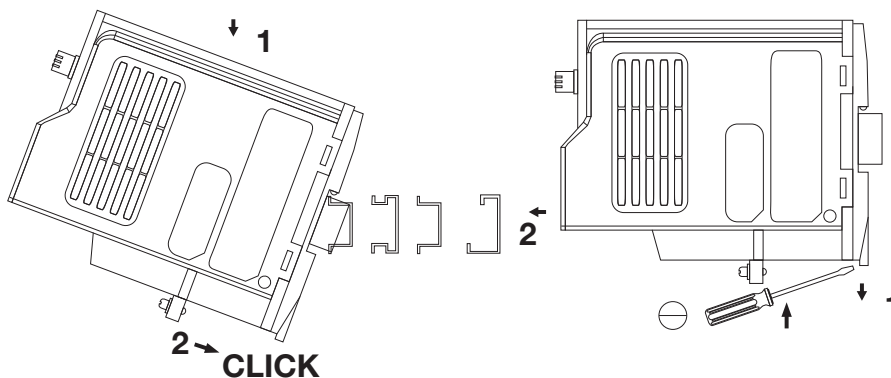
Plastic adaptor plate.
RVLF-DIN02 (Size 2 DIN rail kit part number)

Frame 3. Mounting on a flat surface.
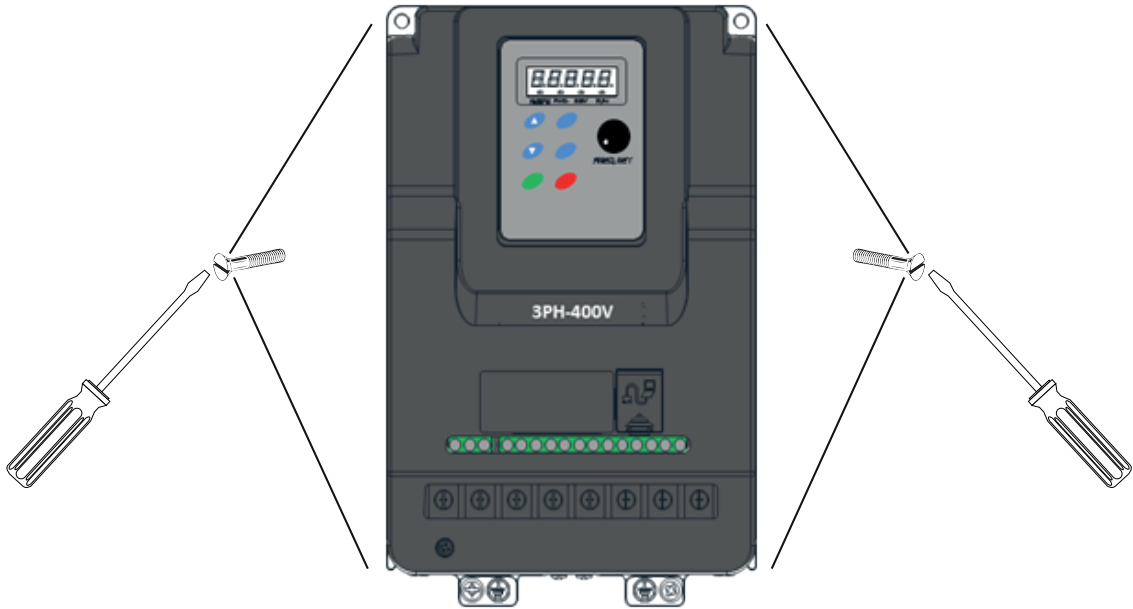
Frame 3. Mounting on a flat surface.
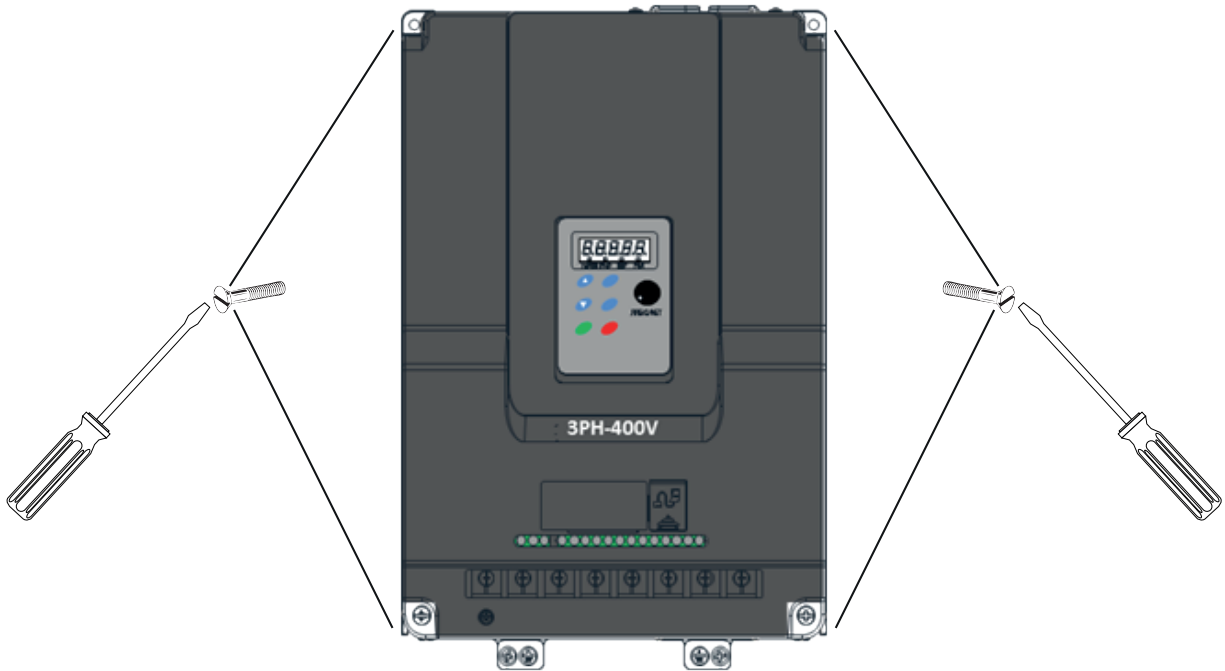
3.2.2. Installation Space

Provide sufficient air circulation space for cooling as shown in examples below.
Install the Inverter on surfaces that provide good heat dissipation.

Single unit Installation
Install the inverter verticality to obtain effective cooling

Frames 1 & 2.

Front view

Side view
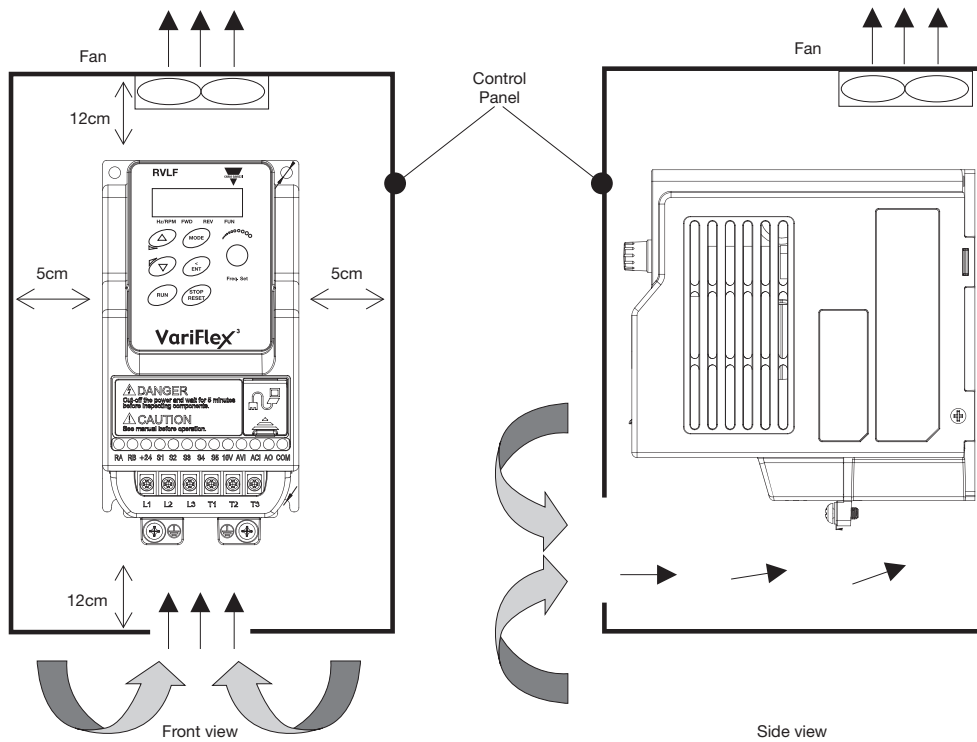
Side by side Installation
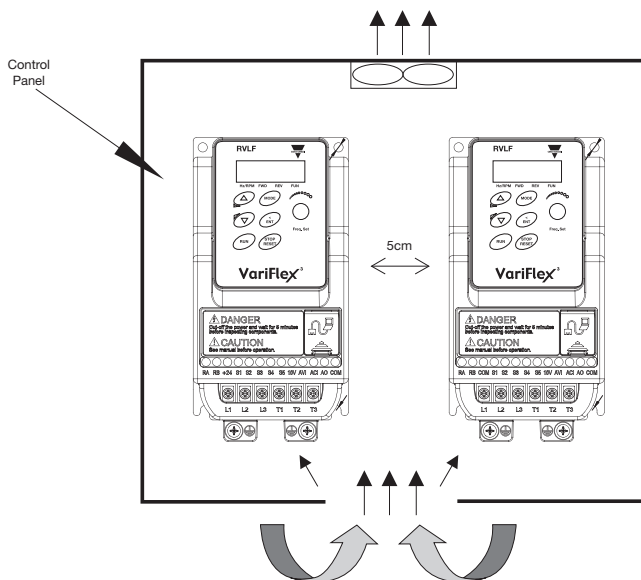
Provide the necessary physical space and cooling based on the ambient temperature and the heat loss in the panel.

3.2.3. Derating Curve

Curves below show the applicable output current de-rate due to setting of carrier frequency and the ambient operating temperatures of 40 and 50°C.

RVLFA*2**FA (40°C)

Rated Current (In)

RVLFA1100**A (40°C), RVLFB*2****A (50°C)

Rated Current (In)

RVLFB340***FA (50°C)

Rated Current (In)

RVLFC340370FA (50°C)

Rated Current (In)

RVLFC340550FA (50°C)

Rated Current (In)

RVLFD340750FA (50°C)

Rated Current (In)

RVLFD3401100FA (50°C)

Rated Current (In)

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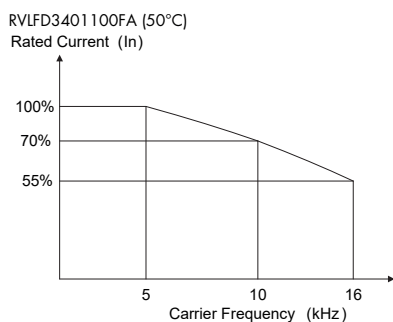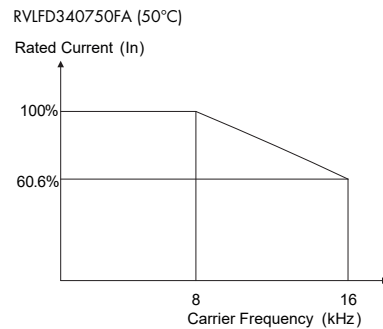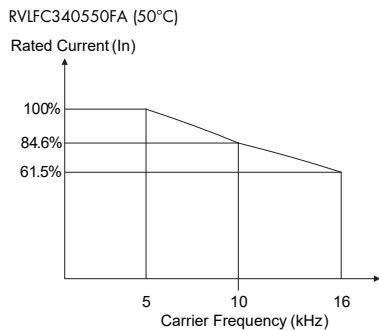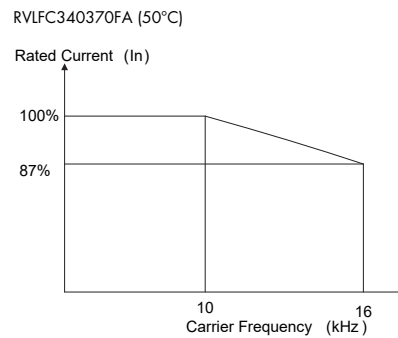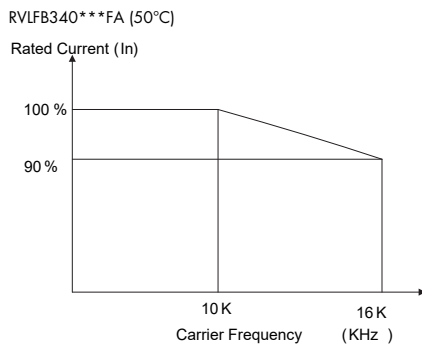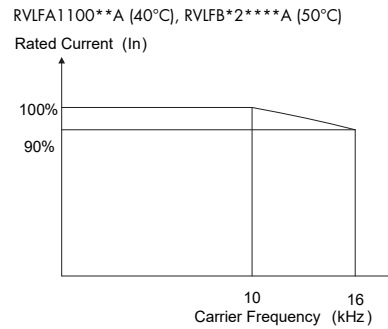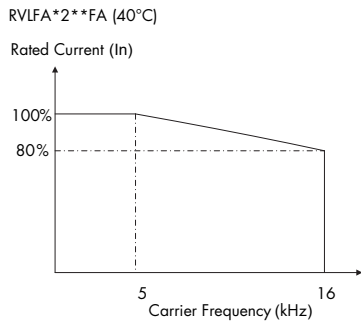
3.2.4 Capacitor reforming guide after long storage

For correct performance of this product after long storage before use it is important that Inverter Capacitors are reformed according to the guide below:

Storage time	Procedure to re-apply voltage
≤ 1year	Apply rated voltage(Note1) of inverter in the normal way
Between 1-2 years	Apply rated voltage of inverter to the product for one hour before using the inverter
≥ 2 years	Use a variable AC power supply to 1.Connecting 25% rated voltage of inverter for 30 minutes. 2.Connecting 50% rated voltage of inverter for 30 minutes. 3.Connecting 75% rated voltage of inverter for 30 minutes. 4.Connecting 100% rated voltage of inverter for 210 minutes. Once the procedures completed, inverter just can be used normally.

Note 1: Rated voltage: please refer the rated voltage according to model label of inverter.

3.2.5 Installation instruction with ferrite ring core

Ferrite cores should be installed with the following units to reduce the leakage current in the built-in filter. These will improve the functionality of the drives with 30mA RCDs.

Supply	Voltage (VAC)	Rating (kW)	Drive	Ferrite core
1-Ph	200	0.40	RVLFA120040FA	1
		0.75	RVLFA120075FA	1
		1.50	RVLFB120150FA	2
		2.20	RVLFB120220FA	2

Installation diagrams:

A. RVLFA120040FA / RVLFA120075FA

• Installation position: The wiring between supply and drive (main power input).
• Installation procedure: The power cord should be winded through the ferrite ring core in the same direction for 3 rounds; and then connected to the main power input L1(L) L3(N).

Single phase , 220V input
Connect to L1(L)&L3(N)

The power cord needs to wind through the ferrite core 3 rounds
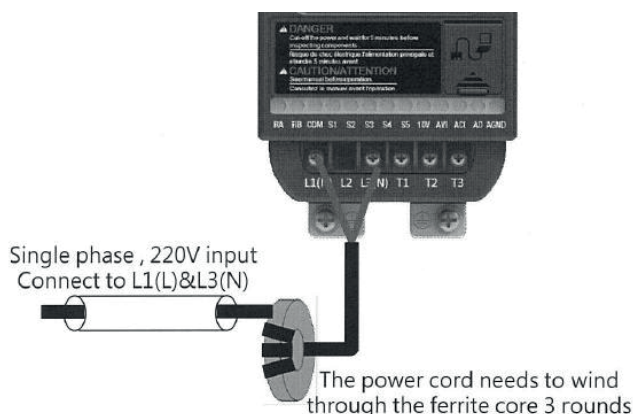
B. RVLFB120150FA / RVLFB120220FA

• Installation position: The wiring between supply and drive (main power input).
The wiring between earth and drive (ground terminal).
• Installation procedure: The power cord should be winded through the ferrite ring core in the same direction for 2 rounds; and then connected to the main power input L1(L) L3(N).
The earth conductor should be winded through the ferrite ring core in the same direction for 3 rounds; and then connected to the ground terminal.

Single phase , 220V input
Connect to L1(L)&L3(N)

The power cord needs to wind
through the ferrite core 2 times

Ground terminal ⏚

The power cord needs to wind
through the ferrite core 3 rounds

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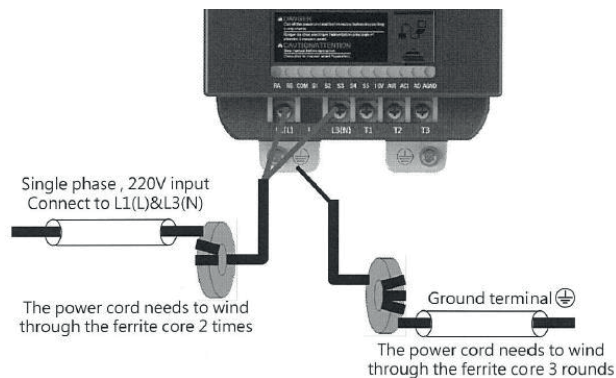
3.3. Wiring Guidelines

3.3.1. Main Considerations

1. Tightening Torque for Screw terminals : Refer to the tables 3-1, when using a screwdriver or any other suitable tools to make connections.
2. Power terminals:
   Single phase : L1 (L), L3 (N)
   Three-phase 200V models: L1 (L), L2, L3 (N)
   400V models: L1, L2, L3
3. For all cabling use copper wires and the cable size shall be according to the table below rated at 105 degrees Celsius.
4. Power & Control cable Minimum rated voltage
   240V AC system, 300V AC.
   480V AC system, 600V AC.
5. Control cables should be separated from the power cables. Do not place them in the same cable tray or cable trunking to prevent against electrical interference.

Frame size	TM1					TM1/TM2				
	Cable Size		Tightening torque			Cable Size		Tightening torque		
	AWG	mm²	kgf.cm	lbf.in	Nm	AWG	mm²	kgf.cm	lbf.in	Nm
Frame A	22~10	0.34~6	14	12.15	1.37	24~12	0.5~2.5	4.08	3.54	0.4
Frame B			12.24	10.62	1.2					
Frame C	18~8	0.82~8.4	18	15.58	1.76	24~12	0.5~2.5	5.1	4.43	0.5
Frame D	14~6	2~13.3	24.48	21.24	2.4					

Supply power cable must be connected to TM1 terminal block, terminals L1 (L) and L3 (N) for single phase 200V supply, L1 (L), L2, L3 (N) and L1, L2, L3 for three phase 400V supply. Motor cable must be connected to TM1 terminals. T1, T2, T3.

Warning: Connection of supply line cable to terminals T1, T2 & T3 will result in serious damage to the drive components.

Example power connections: inverter with dedicated power line.
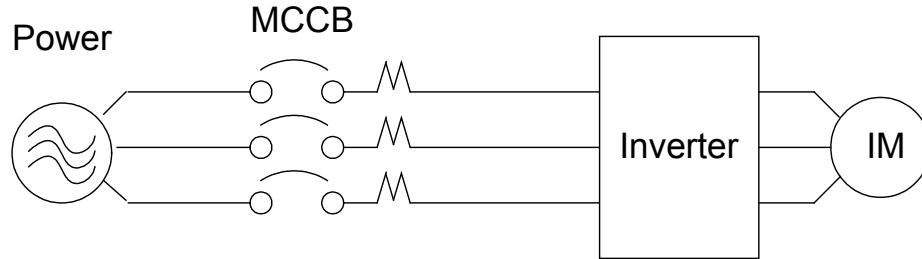
Install a supply RFI filter or Isolation transformer when the power source is shared with other high power electrical equipment as shown below.
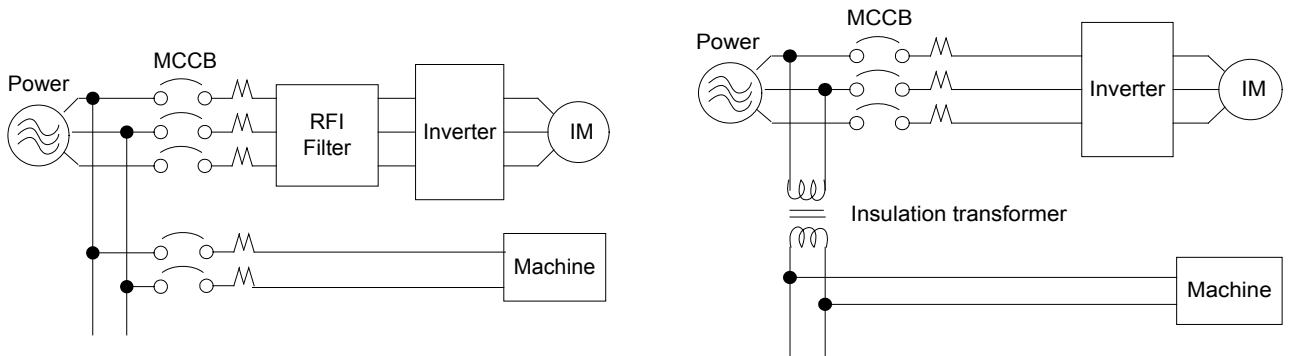
The maximum rms symmetrical amperes and voltage are listed as follows

Device Rating		Short circuit Rating	Maximum Voltage
Voltage	HP		
220V	0.2~3	5000A	240V
440V	1~3	5000A	480V

Electrical ratings of terminals

Horse power	Power Specification	Voltage (Volt)	Current(A)
0.25/0.5/1	220V	300	30
2/3	220V		30
1/2/3	440V	600	28

3.3.2. Control Cable selection and Wiring

Control cables should be connected to terminal block TM2.
Choose power & control cables according to the following criteria:
- Use copper wires with correct diameter and temperature rating of 60/75°C.
- Minimum cable voltage rating for 200V type inverters should be 300VAC.
- Route all cables away from other high voltage or high current power lines to reduce interference effects.

Use a twisted pair shielded cable and connect the shield (screen) wire to the ground terminal at the inverter end only. Cable length should not exceed 50 meters.

Shielding sheath   Protective covering

Connect the shield to inverter ground terminal

Do not connect this end
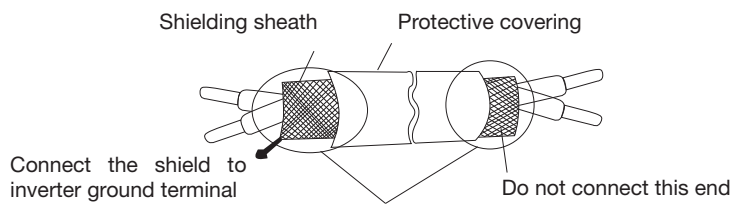
3.3.3. Wiring and EMC Guidelines.

For effective interference suppression, do not route power and control cables in the same conduit or trucking. To prevent radiated noise, motor cable should be put in a metal conduit. Alternatively an armored or shielded type motor cable should be used.

For effective suppression of noise emissions the cable armor or shield must be grounded at both ends to the motor and the inverter ground. These connections should be as short as possible. Motor cable and signal lines of other control equipment should be at the least 30 cm apart.

RVLF has a built in Class "A" EMC filter to first environment restricted. (Category C2).
For some installations such as residential, (Category C1) an optional external Class "B" type filter will be necessary. Please consult your local supplier.

Typical Wiring.
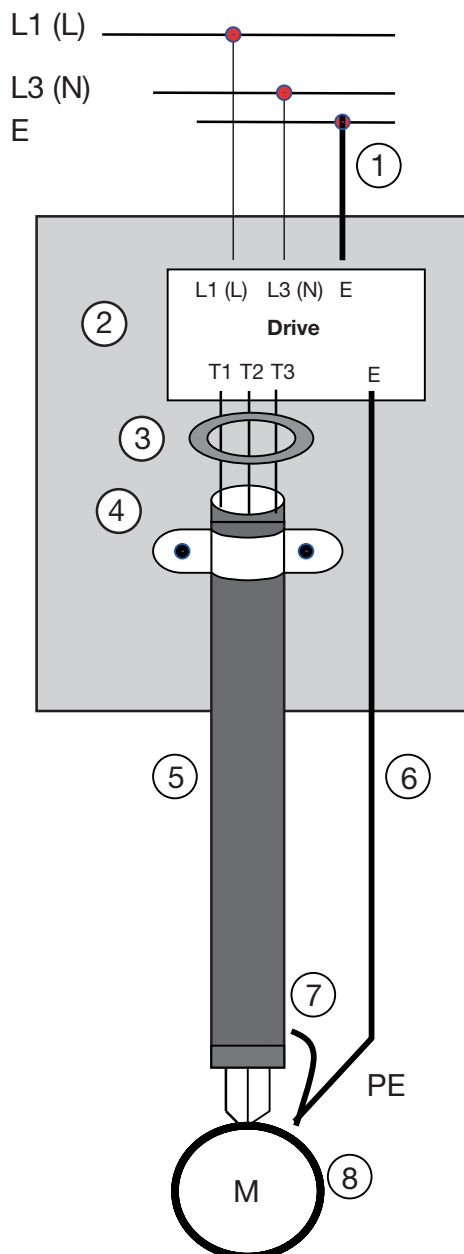
1. Protective earth conductor.
   Conductor size for enclosure & back plate must comply with the local electrical standards. Min 10mm².
2. Back plate. Galvanised steel (Unpainted).
3. Ferrite core / Output reactor ferrite cores can be used to reduce radiated noise due to long motor cables. If ferrite core is used loop motor wires, 3 times round the core. Install core as close to the inverter as possible.

   Output reactors provide additional benefit of reducing dv/dt for protection of motor windings.

4. Metal cable clamp. no more than 150mm from the inverter.

   Note: If no enclosure & back plate is used then connect the cable shield by a good 360° termination to the Inverter output terminal E.
5. Screened (Shielded four core cable).
6. Separate protective earth wire, routed outside motor cable separated be at least 100mm.

   Note: this is the preferred method specially for large output cables and long length. Multi core screened (3 core & protective earth) can be used for small power and short length.

7. Connect the cable shield by a good 360° termination and connect to the motor protective earth terminal. This link must be as short as possible.
8. Motor earth terminal (Protective Earth).

3.3.4. Failure Liability

- Carlo Gavazzi bears no responsibility for any failures or damages caused to the inverter if the recommendations in this instruction manual have not been followed specifically points listed below.

- If a correctly rated fuse or circuit breaker has not been installed between the power source and the inverter.

- If a magnetic contactor, a phase capacitor, burst absorber and LC or RC circuits have been connected between the inverter and the motor.

- If an incorrectly rated three-phase squirrel cage induction motor has been used

Note:
When one inverter is driving several motors, the total current of all motors running simultaneously must be less than the rated current of the inverter, and each motor has to be equipped with a correctly rated thermal overload relay.

3.3.5. Considerations for Peripheral Equipment

	Power	Ensure that the supply voltage is correct. A molded-case circuit breaker or fused disconnect must be installed between the AC source and the inverter.
	Circuit Breaker & RCD	Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter. Do not use the circuit breaker as the run/stop switch for the inverter. Residual Current Circuit Breaker (RCD). Current setting should be 200mA or above and the operating time at 0.1 second or longer to prevent malfunctions.
	Magnetic contactor	Normally a magnetic contactor is not needed. A contactor can be used to perform functions such as external control and auto restart after power failure. Do not use the magnetic contactor as the run/stop switch for the inverter.
	AC reactor for power quality improvement	When a 200V/400V inverter with rating below 15KW is connected to a high capacity power source (600KVA or above) then an AC reactor can be connected for power factor improvement and reducing harmonics.
	Input noise filter	RVLF inverter has a built-in filter to Class "A" first Environment. (CategoryC2). To satisfy the required EMC regulations for your specific application you may require an additional EMC filter.
	Inverter	Connect the single phase power to Terminals, L1 (L) & L3(N) and three phase power to Terminals: (200V: L1 (L), L2, L3 (N) or 400V: L1, L2, L3) Warning! Connecting the input terminals T1, T2, and T3 to AC input power will damage the inverter. Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor. To reverse the motor rotation direction just swap any two wires at terminals T1, T2, and T3. Ground the Inverter and motor correctly. Ground resistance for 200V power <100 Ohms.
	Motor	Three-phase induction motor. Voltage drop on motor due to long cable can be calculated. Volts drop should be $< 10\%$. Phase-to-phase voltage drop (V)= 3 ×resistance of wire (Ω/km) ×length of line (m) × current × 10-3

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3.3.6. Ground Connection

Inverter ground terminal must be connected to installation ground correctly and according to the required local wiring regulations.

- Ground cable size must be according to the required local wiring regulations.
  Ground connection should be as short as possible.
- Do not share the ground of the inverter with other high current loads (welding machine, high power motors). Ground each unit separately.
- Ensure that all ground terminals and connections are secure
- Do not make ground loops when several inverters share a common ground point.

Note:

Please leave at least 5cm while installing inverter side by side in order to provide enough cooling space.

3.3.7. Inverter Exterior

Operator panel

RS485 communication port

TM2

TM1

Ground terminal

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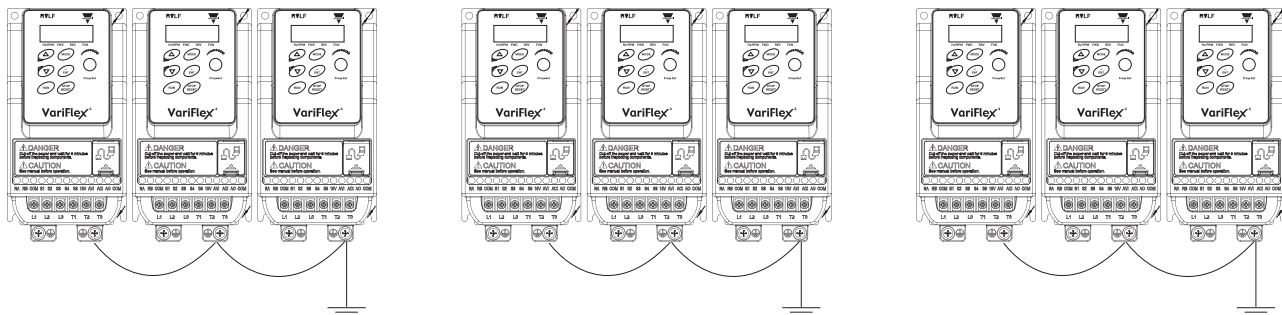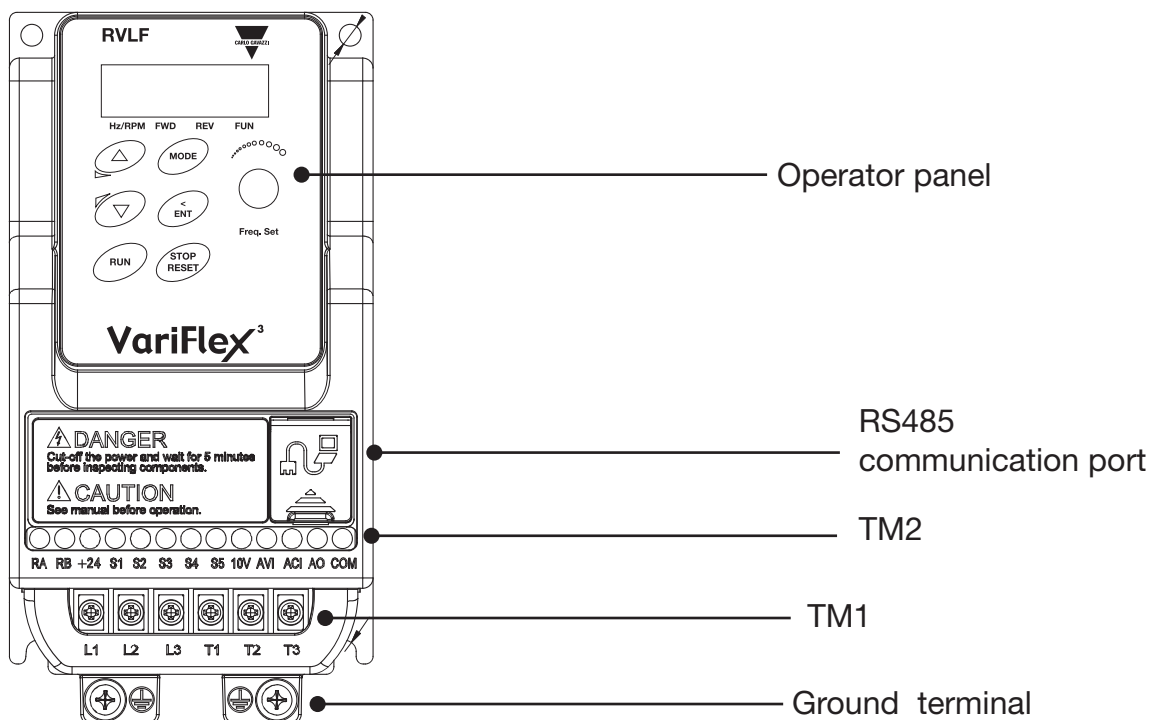
3.4. Specifications

3.4.1. Inverter exterior

100V Class: Single phase.

Model: RVLF	110040	110075
Horse power (HP)	0.5	1
Suitable motor capacity (KW)	0.4	0.75
Rated output current (A)	2.6	4.3
Rated capacity (KVA)	1.00	1.65
Input voltage range(V)	Single Phase: 110~120V, 50/60HZ	
Allowable voltage fluctuation	+10%-15%	
Output voltage range(V)	Three Phase: 0~240V	
Input current (A)	13	19
Allowable momentary power loss time (S)	1.0	1.0
Enclosure	IP20	

200V Class: Single phase.   F: Built-in Filter

Model: RVLF	120040	120075	120150	120220
Horse power (HP)	0.5	1	2	3
Suitable motor capacity (KW)	0.4	0.75	1.5	2.2
Rated output current (A)	2.6	4.3	7.5	10.5
Rated capacity (KVA)	1.00	1.65	2.90	4.00
Input voltage range(V)	Single Phase: 200~240V, 50/60HZ			
Allowable voltage fluctuation	+10%-15%			
Output voltage range(V)	Three Phase: 0~240V			
Input current (A)	7.2	11	15.5	21
Allowable momentary power loss time (S)	1.0	1.0	2.0	2.0
Enclosure	IP20			

200V Class: Three phase.

Model: RVLF	320040	320075	320150	320220
Horse power (HP)	0.5	1	2	3
Suitable motor capacity (KW)	0.4	0.75	1.5	2.2
Rated output current (A)	2.6	4.3	7.5	10.5
Rated capacity (KVA)	1.00	1.65	2.90	4.00
Input voltage range(V)	Single Phase: 200~240V, 50/60HZ			
Allowable voltage fluctuation	+10%-15%			
Output voltage range(V)	Three Phase: 0~240V			
Input current (A)	4.0	6.4	9.4	12.2
Allowable momentary power loss time (S)	1.0	1.0	2.0	2.0
Enclosure	IP20			

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400V Class: Three phase.   F: Built-in Filter

Model: RVLF	340075	340150	340220
Horse power (HP)	1	2	3
Suitable motor capacity (KW)	0.75	1.5	2.2
Rated output current (A)	2.3	3.8	5.2
Rated capacity (KVA)	1.7	2.9	4.0
Input voltage range(V)	Three phase: 380~480V, 50/60HZ		
Allowable voltage fluctuation	+10%		
Output voltage range(V)	Three phase 0~480V		
Input current (A)	4	5.6	7.3
Allowable momentary power loss time (S)	2	2.0	2.0
Enclosure	IP20		

Model: RVLF	340370	340550	340750	3401100
Horse power (HP)	5.0	7.5	10	15
Suitable motor capacity (KW)	3.7	5.5	7.5	11
Rated output current (A)	9.2	13	17.5	24
Rated capacity (KVA)	7.01	9.91	13.34	18.29
Input voltage range(V)	Three phase: 380~480V, 50/60HZ			
Allowable voltage fluctuation	+10%-15%			
Output voltage range(V)	Three phase 0~480V			
Input current (A)	10.1	14.3	19.3	26.4
Allowable momentary power loss time (S)	2.0	2.0	2.0	2.0
Enclosure	IP20			

3.4.2. General Specifications

Item		RVLF
Control Mode		V/F Control + SLV
Frequency	Range	0.01~599.00Hz
	Speed Accuracy (100% torque)	V/F: 3% SLV: 1%
	Setting	Keypad: Set directly with keys or the VR (Potentiometer) on the keypad
		External input terminals: AVI (0/2~10V), ACI (0/4~20mA) input Multifunction input up/down function (Group 3)
		Setting frequency by communication method.
	Frequency limit	Lower and upper frequency limits 3 -skip frequency settings.
Run	Operation set	Keypad run, stop button
		External terminals: Multi-operation-mode 2 / 3 wire selection Jog operation
		Run command by communication method.
Main Controls	V / F curve setting	6 fixed curve and one customized curve
	Carrier frequency	1~16KHz (default 5KHz)
	Acceleration and deceleration control	2 off Acc / dec time parameters. 4 off S curve parameters.
	Multifunction input	19 functions (refer to description on group3)
	Multifunction output	14 functions (refer to description on group3)
	Multifunction analog output	5 functions (refer to description on group4)
	Main features	Overload detection, 8 preset speeds, auto-run, Acc/Dec switch (2 Stages), Main/Alt run command select, main/alt frequency Command select, PID control, torque boost, V/F start frequency, fault reset.

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Display	LED	Display: parameter/parameter value/frequency/line speed/ DC voltage/output voltage/ output current/PID feedback/ input and output terminal status/heat sink temperature/Program version/Fault Log.
	LED Status indicator	For run/stop/forward and reverse.
Protective Functions	Overload protection	Integrated motor and Inverter overload protection. (150% rated current for 60s, every 10minutes)
	Over voltage	100V/200V: Over 410V, 400V: Over 820V
	Under voltage	100V/200V: Under 190V, 400V: Under 380V
	Momentary power loss restart	Inverter auto-restart after a momentary power loss.
	Stall prevention	Stall prevention for acceleration / deceleration / and continuous run.
	Short-circuit output terminal	Electronic circuit protection
	Grounding fault	Electronic circuit protection
	Additional protective functions	Heak sink over temperature protection, auto carrier frequency reduction with temperature rise, fault output, reverse prohibit, number of auto restart attempts, parameter lock
International Certification		CE/UL
Communication		RS485 (Modbus) built in, with one to one or one to many control.
Environment	Operating temperature	-10~50°C
	Storage temperature	-20~60°C
	Humidity	Under 95%RH (no condensation)
	Shock and Vibration	0.075mm Amplitude for 10Hz to 57Hz 1G for 57Hz to 150Hz
	EMC compliance	EN61800-3, First Environment Present models can pass C1 level with grounding kit
	LVD compliance	EN 61800-5-1
	Electrical safety	UL508C
	Protection level	IP20

CARLO GAVAZZI

3.5. Standard wiring

3.5.1. Single phase (NPN input)
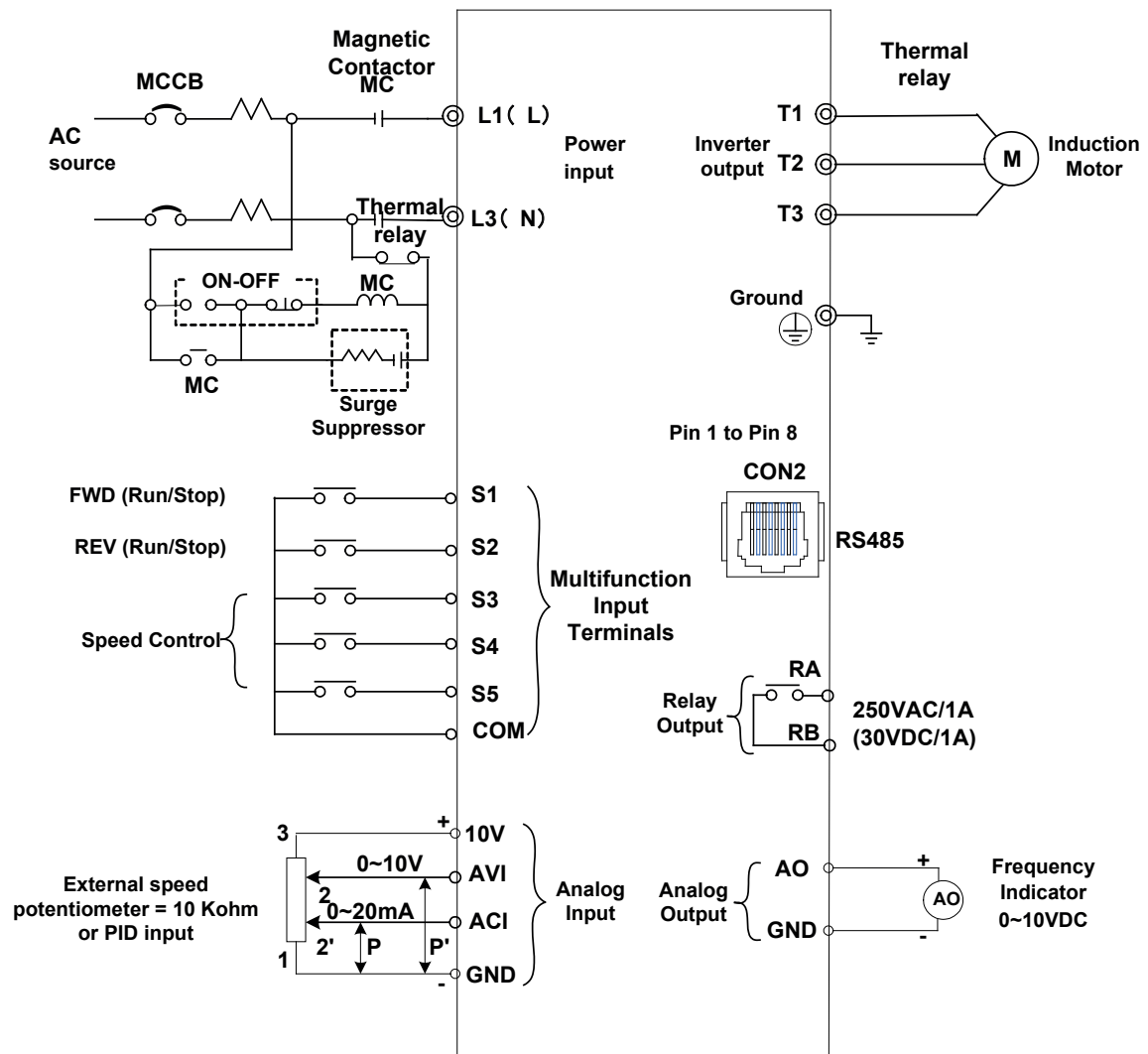
Model:
100V: RVLFA110040A, RVLFA110075A

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3.5.2. Single phase (PNP Input)
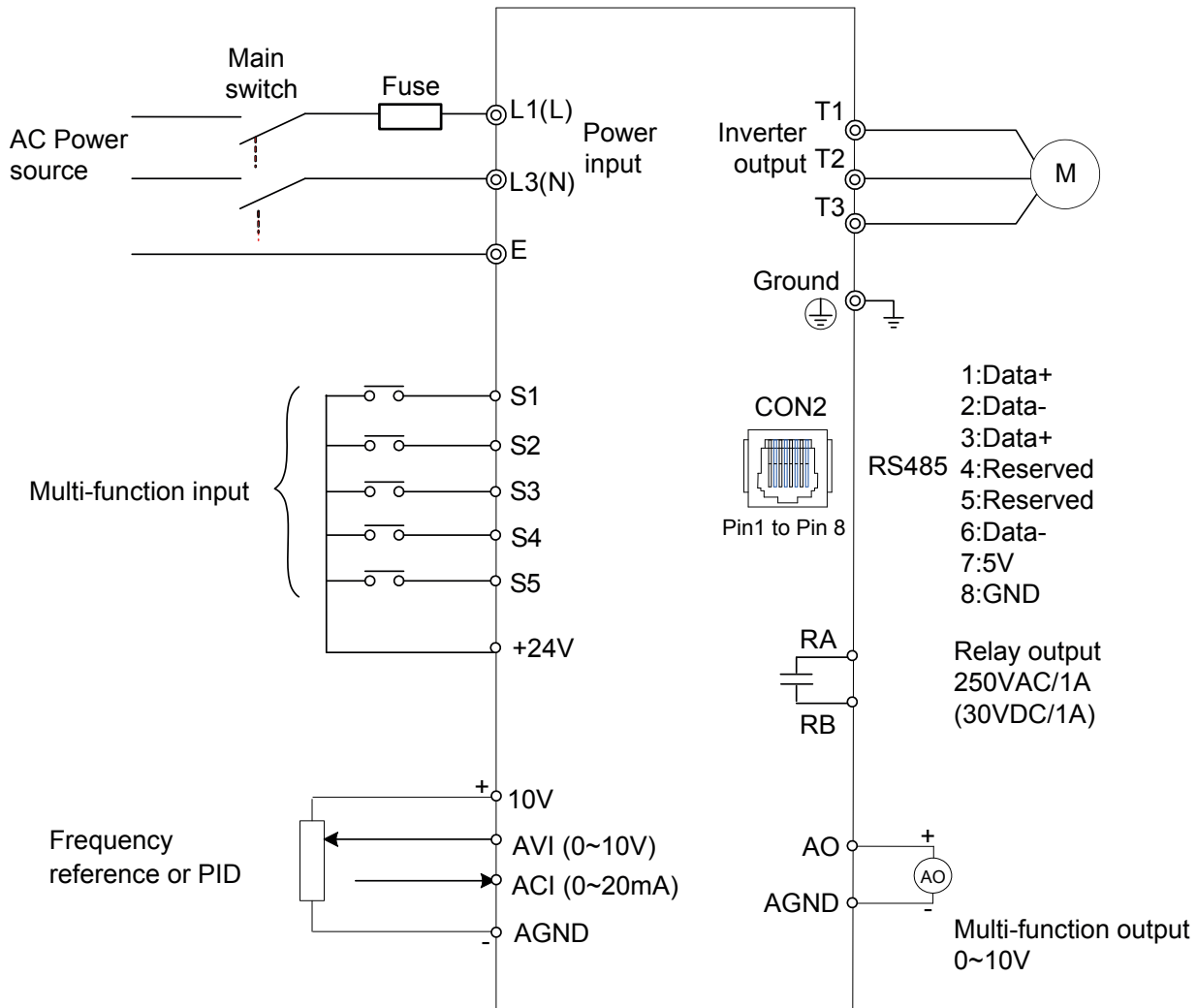
Model:
200V: RVLFA120040FA / RVLFA120075FA / RVLFB120150FA / RVLFB120220FA

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3.5.3.Three phase (NPN Input)
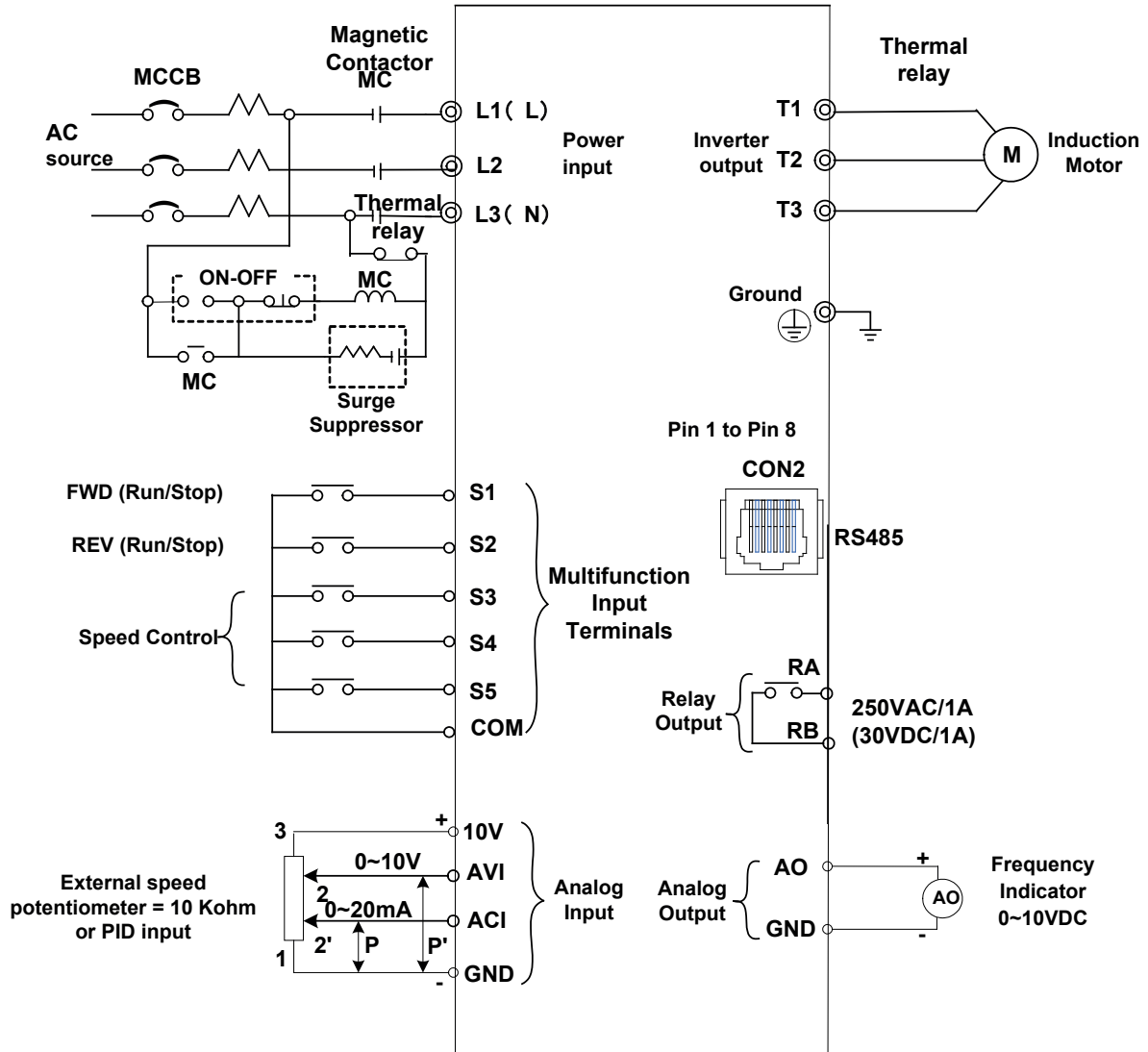
Model:
200V: RVLFA320040A, RVLFA320075A, RVLFB320150A, RVLFB320220A

3.5.4. Three phase (PNP Input)
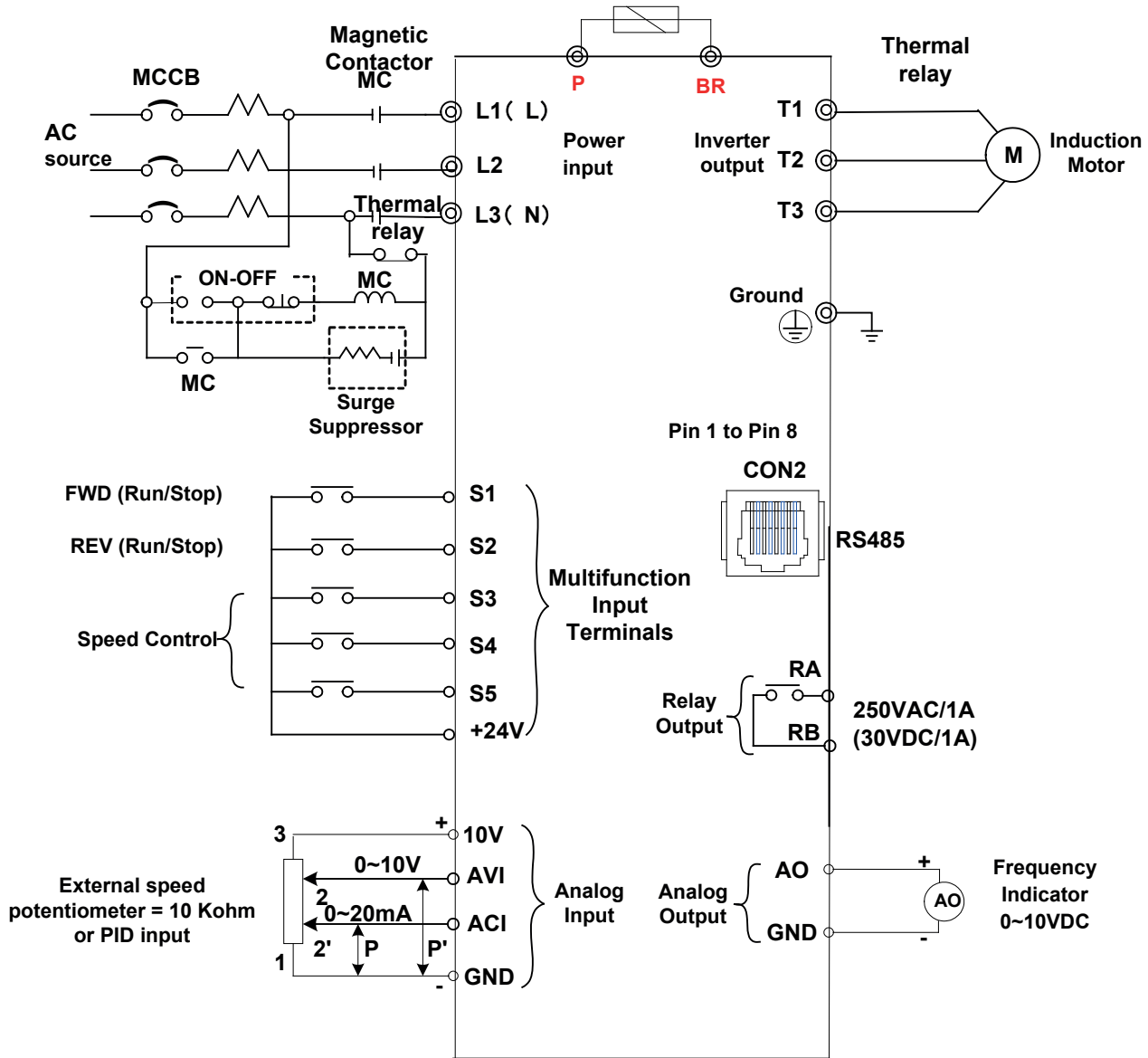
Model:

400V: RVLFB340075FA, RVLFB340150FA, RVLFB340220FA

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3.5.5. Three phase (PNP / NPN)
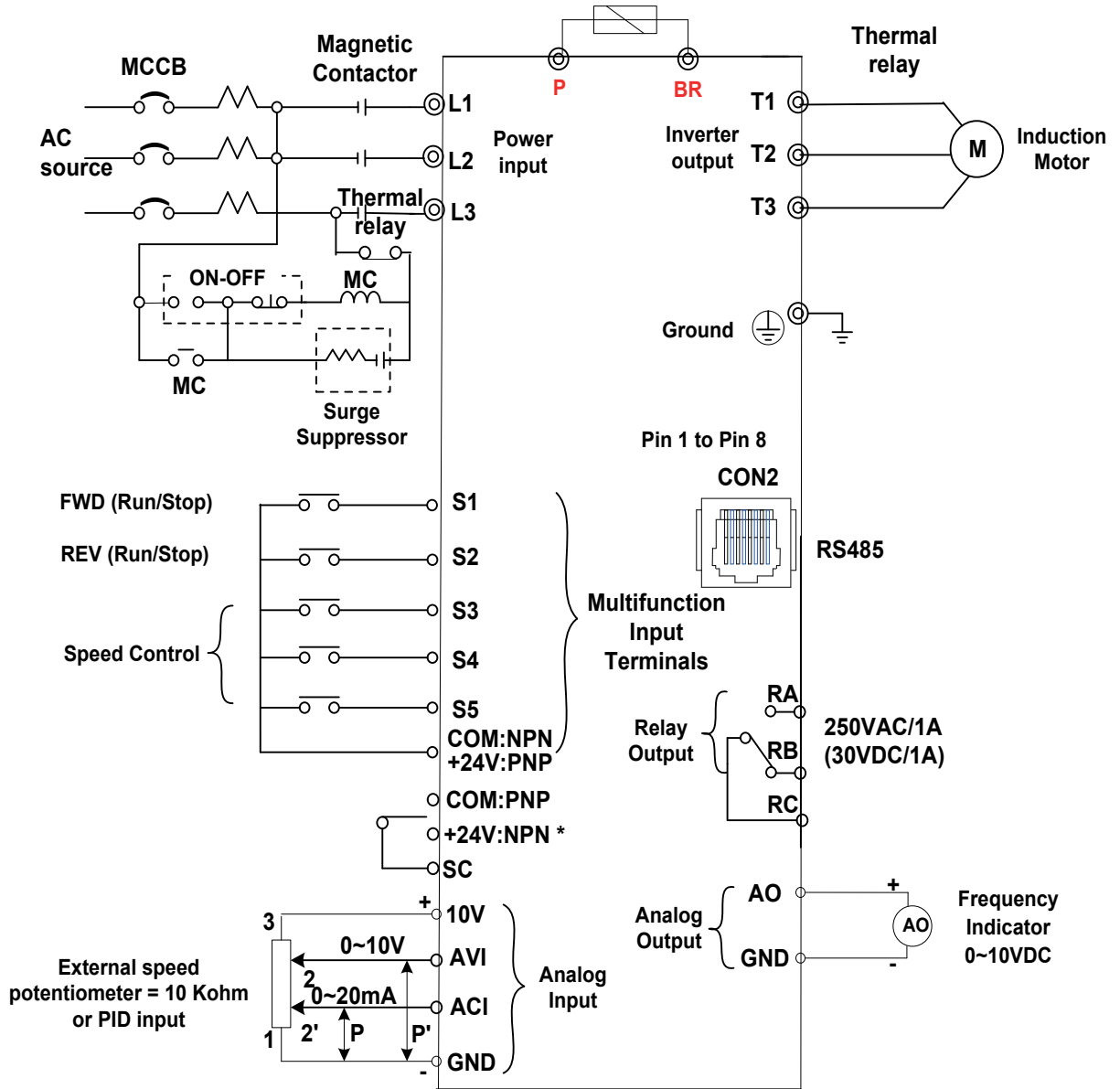
Model:
400V: RVLFC340370FA, RVLFC3405500FA, RVLFD340750FA, RVLFD3401100FA

3.6. Terminal Description

3.6.1. Terminal Description

Terminal symbols	TM1 Function Description
L1(L)	Main power input, Single Phase L1(L)/ L3(N)
L2	Three Phase (200V): L1(L)/ L2/ L3 (N)
L3(N)	Three Phase (400V): L1/ L2/ L3
P*	Externally connected braking resistor
BR*	
T1	
T2	Inverter output, connect to U, V, W terminals of motor
T3	
⏚	Ground terminal

*P,BR for 400V series

Single phase (200V series)

L1(L)　　　L2　　　L3 (N)　　　T1　　　T2　　　T3
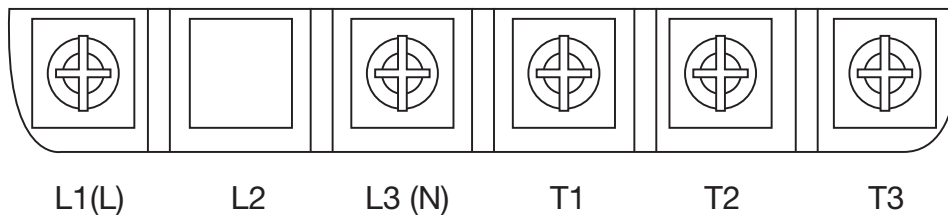
Note: the screw on L2 terminal is removed for the single phase input supply models.

Three phase (200V series)

L1(L)　　　L2　　　L3 (N)　　　T1　　　T2　　　T3
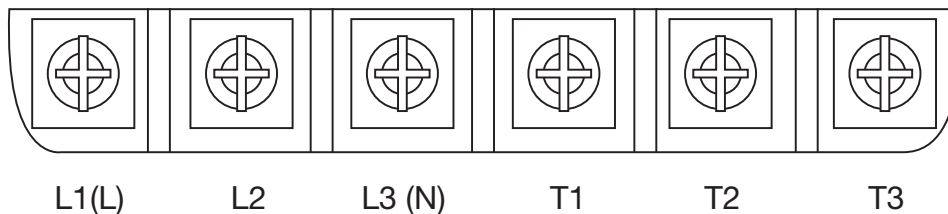
Three phase (400V series)

L1　　　L2　　　L3　　　P　　　BR　　　T1　　　T2　　　T3
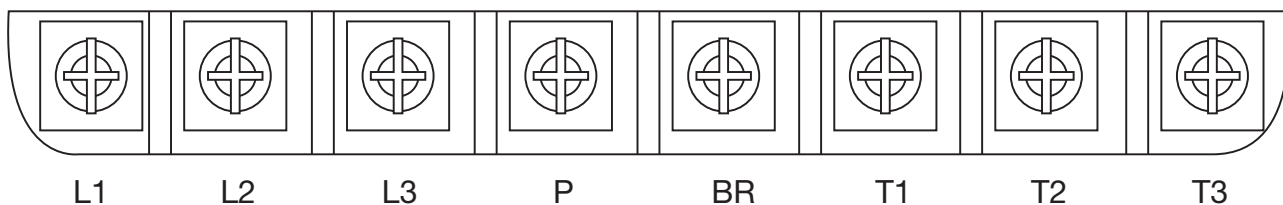
3.6.2. Control Circuit Terminal Description

Frame A & B

Terminal	TM1 Function Description	Signal Level
RA	Relay output terminal, Specification: 250VAC/1A (30VDC/1A)	250VAC/ 1A (30VDC/ 1A)
RB		
COM	S1~S5 (COMMON) NPN	+/-15%, Max output 30mA
+24V	S1~S5 (COMMON) PNP	+/-15%, Max output 30mA
S1		
S2		
S3	Multi-function input terminals (refer to group3)	24VDC, 4.5mA, optical coupling isolation (Max voltage 30VDC, Input impedance 6kΩ)
S4		
S5		
10V	Built in power for an external speed potentiometer	10V (Max current 20mA)
AVI	Analog voltage input, specification: 0~10VDC/ 2-10V	0-10V (Input impedance 200kΩ)
ACI	Analog current input, specification: 0/4~20mA	0-20mA (Input impedance 499kΩ)
AO	Multi function analog output terminal. Maximum output 10VDC/1mA	0-10V(Max current 2mA)
AGND	Analog ground terminal	

PNP:

RA   RB   +24V   S1   S2   S3   S4   S5   10V   AVI   ACI   AO   AGND

PNP:

RA   RB   COM   S1   S2   S3   S4   S5   10V   AVI   ACI   AO   AGND

Frame C & D

Terminal	TM1 Function Description	Signal Level
RA	Relay output terminal, Specification: 250VAC/1A (30VDC/1A) RA-NO; RB-NC; RC-Common	250VAC/ 1A (30VDC/ 1A)
RB		
RC		
+24V	S1~S5 (COMMON) PNP	+/-15%, Max output 30mA
SC	PNP input: COM&SC needs shorted	
S1		24VDC, 4.5mA, optical coupling isolation (Max voltage 30VDC, Input impedance 6kΩ)
S2		
S3	Multi-function input terminals (refer to group 3)	
S4		
S5		
10V	Built in power for an external speed	10V (Max current 20mA)
AVI/PTC	Analog voltage input, specification: 0~10VDC/ 2-10V	0-10V (Input impedance 200kΩ)
ACI	Analog current input, specification: 0/4~20mA	0-20mA (Input impedance 499kΩ)
AO	Multi-function analog output terminal. Maximum output 10VDC/1mA	0-10V(Max current 2mA)
AGND	Analog ground terminal	

TM1

RA RB RC

TM2

+24V SC COM S1 S2 S3 S4 S5 10V AVI ACI AO AGND
                                              PTC

3.7. Outline Dimensions

Size A
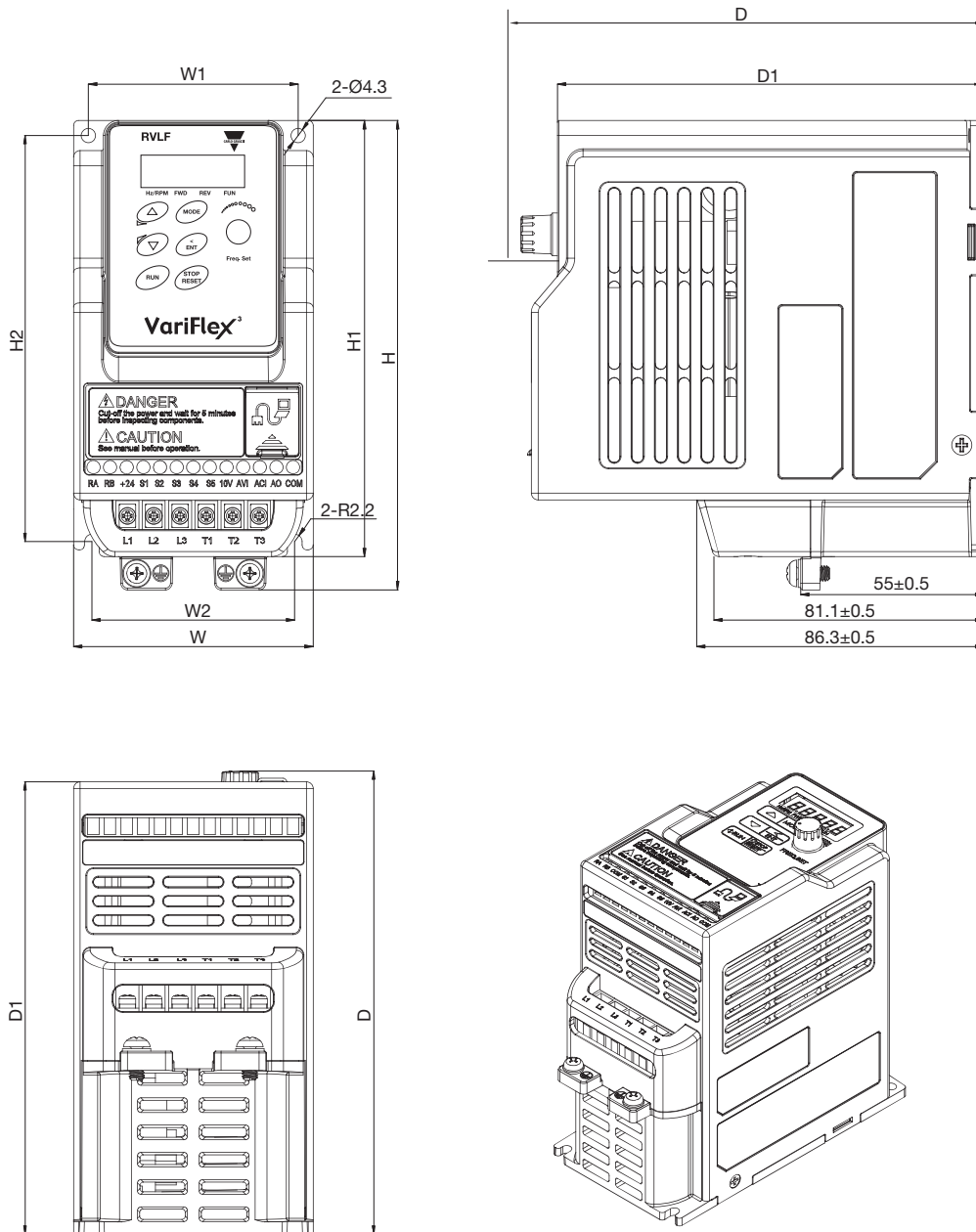
Model	W	W1	W2	H	H1	H2	D	D1	D2	E	E1	E2
RVLFA120040FA												
RVLFA120075FA												
RVLFA320040A	72	63	61	141	131	122	144.2	136	128.2	86.3	81.1	55
RVLFA320075A												
RVLFA110040A												
RVLFA110075A												

F: Built-in EMC filter

Size B
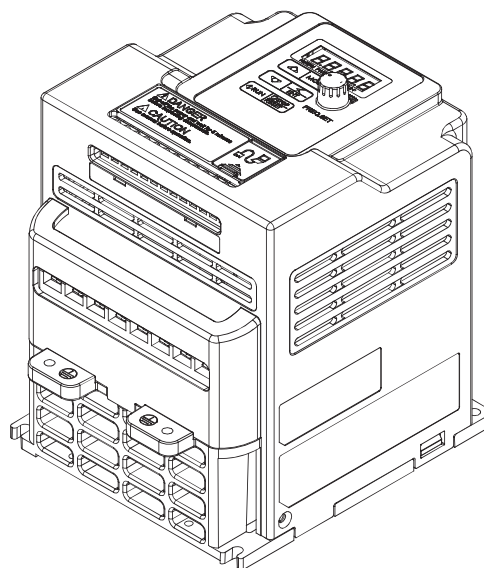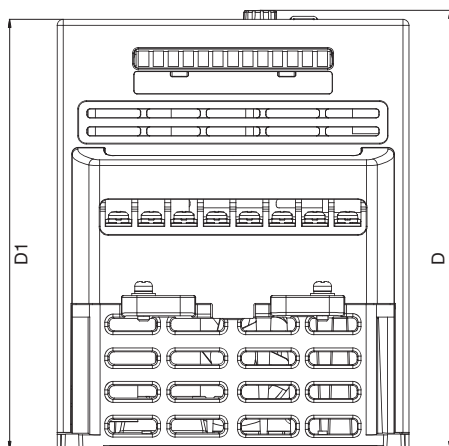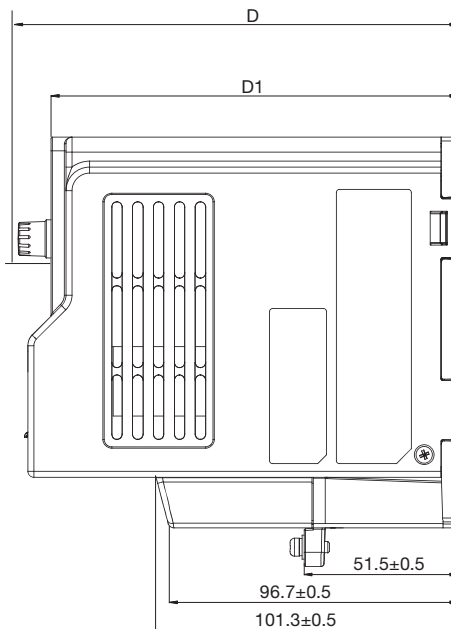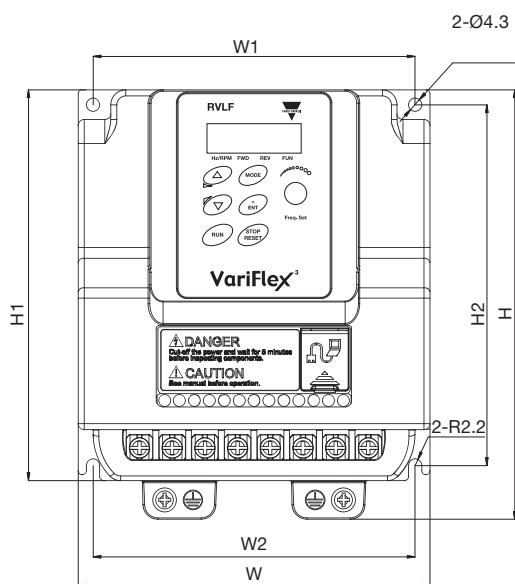
Model	W	W1	W2	H	H1	H2	D	D1	D2	E	E1	E2
RVLFB120150FA												
RVLFB120220FA												
RVLFB320040A												
RVLFB320075A	118	108	108	144	131	121	152.2	144.2	136.4	101.3	96.7	51.5
RVLFB340075FA												
RVLFB340150FA												
RVLFB340220FA												

F: Built-in EMC filter

Size C and D
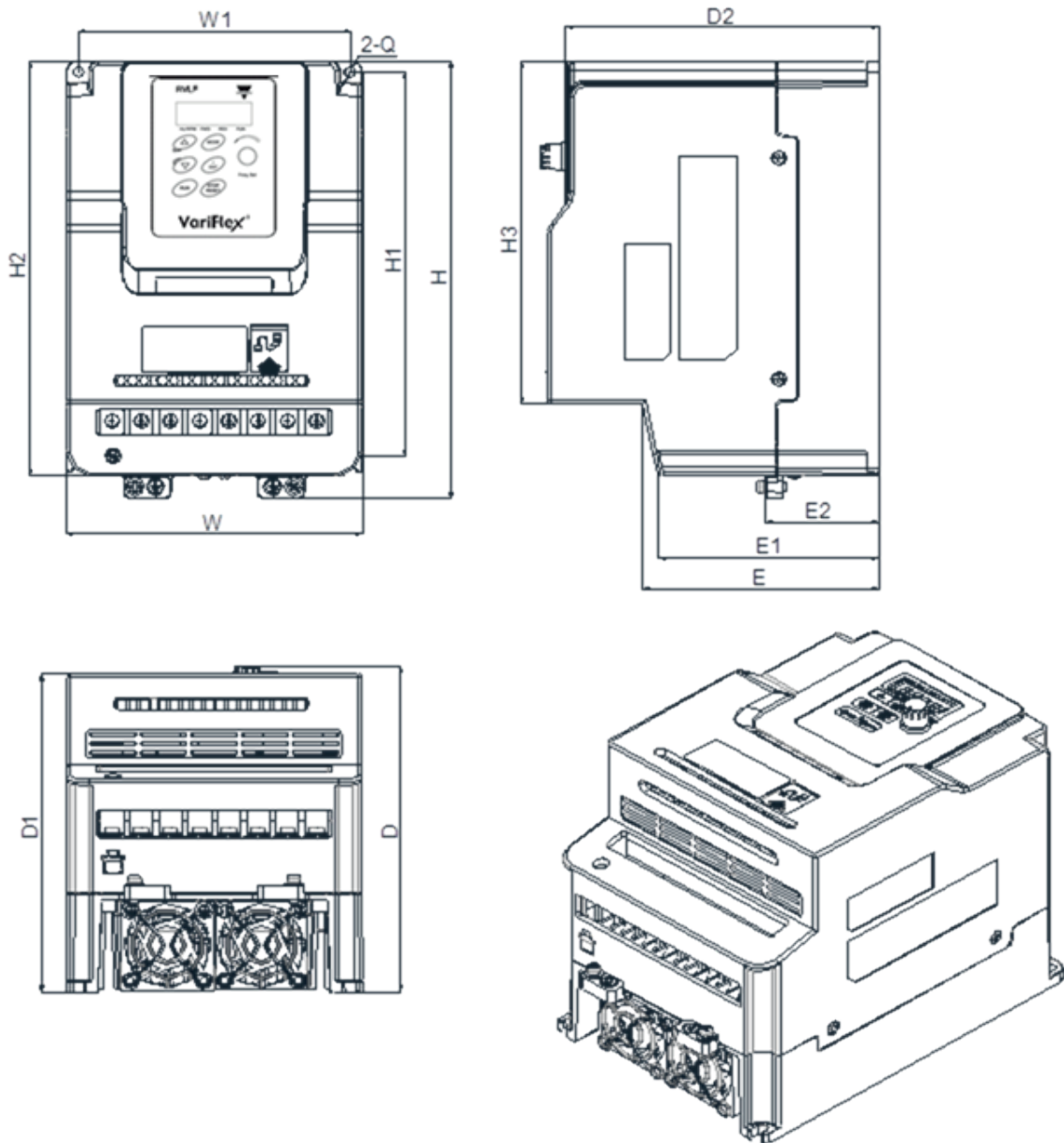
Model	W	W1	W2	H	H1	H2	D	D1	D2	E	E1	E2
RVLFC340370FA	129	118	197.5	177.6	188	154	148	143.7	136	102.6	96	48.2
RVLFC340550FA												
RVLFD340750FA	187	176	273	249.8	261	228.6	190	185.6	177.9	136	84.7	-
RVLFB3401100FA												

F: Built-in EMC filter

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3.8. Filter Disconnection

EMC filter may be disconnected:
Inverter drives with built-in EMC filter are not suitable for connection to certain type of supply systems, such as listed below; in these cases the RFI filter can be disabled.
In all such cases consult your local electrical standards requirements.

IT type supply systems (ungrounded) & certain supply systems for medical equipment.
For ungrounded supply systems if the filter is not disconnected the supply system becomes connected to earth through the Y capacitors on the filter circuit. This could result in danger and damage to the drive.

Disconnection steps:

1. Remove EMC filter protection cover by screwdriver.
2. Remove EMC line by pliers.

Note: Disconnecting the EMC filter link will disable the filter function, please consult your local EMC standards requirement.

Warning:
Inverter drives with built-in EMC filter are not suitable for connection to certain type of supply connections, such as listed below, in these cases the RFI filter can be disabled. In all such cases consult your local electrical standards requirements.

IT type supply systems (ungrounded), corner grounded type TN systems cetain supply system for medical equipment.

For european type supply systems. The following link is very useful, please see section 3.8 mains type.

4. Software Index

4.1. Keypad Description

4.1.1. Operator Panel Functions

Type	Item	Function
Digital display & LEDs	Main digital displays	Frequency display, parameter, voltage, current, temperature, fault messages.
	LED Status	Hz/RPM: ON when the frequency or line speed is displayed. OFF when the parameters are displayed. FWD: ON while the inverter is running forward. Flashes while stopped. REV: ON while the inverter is running reverse. Flashes while stopped. FUN: ON when the parameters are displayed. OFF when the frequency is displayed.
Variable Resistor	FREQ SET	Used to set the frequency
Keys On Keypad	RUN	RUN: Run at the set frequency.
	STOP/RESET (Dual function keys)	STOP: Decelerate or coast to stop. RESET: Use to reset alarms or resettable faults.
	▲	Increment parameter number and preset values.
	▼	Decrement parameter number and preset values.
	MODE	Switch between available displays
	</ENTER (Dual function keys, a short press for left shift function, a long press for ENTER function)	"<" Left Shift: Used while changing the parameters or parameter values ENTER: Used to display the preset value of parameters and for saving the changed parameter values.

3.8. Filter Disconnection

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Inverter drives with built-in EMC filter are not suitable for connection to certain type of supply systems, such as listed below; in these cases the RFI filter can be disabled.
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Type	Item	Function
Digital display & LEDs	Main digital displays	Frequency display, parameter, voltage, current, temperature, fault messages.
	LED Status	Hz/RPM: ON when the frequency or line speed is displayed. OFF when the parameters are displayed. FWD: ON while the inverter is running forward. Flashes while stopped. REV: ON while the inverter is running reverse. Flashes while stopped. FUN: ON when the parameters are displayed. OFF when the frequency is displayed.
Variable Resistor	FREQ SET	Used to set the frequency
Keys On Keypad	RUN	RUN: Run at the set frequency.
	STOP/RESET (Dual function keys)	STOP: Decelerate or coast to stop. RESET: Use to reset alarms or resettable faults.
	▲	Increment parameter number and preset values.
	▼	Decrement parameter number and preset values.
	MODE	Switch between available displays
	</ENTER (Dual function keys, a short press for left shift function, a long press for ENTER function)	"<" Left Shift: Used while changing the parameters or parameter values ENTER: Used to display the preset value of parameters and for saving the changed parameter values.

4.1.2. Digital Display Description

Alpha numerical display format

Digit	LED	Letter	LED	Letter	LED	Symbol	LED
0	*0*	A	*A*	n	*n*	-	*-*
1	*1*	b	*b*	o	*o*	°	*o*
2	*2*	C	*C*	P	*P*	_	*_*
3	*3*	d	*d*	q	*q*	.	*•*
4	*4*	E	*E*	r	*r*		
5	*5*	F	*F*	S	*S*		
6	*6*	G	*G*	t	*t*		
7	*7*	H	*H*	u	*u*		
8	*8*	J	*J*	V	*U*		
9	*9*	L	*L*	Y	*y*		

Digital display indication formats

Actual output frequency	Set frequency	
Digits are lit continually	Preset digits flashing	Selected digit flashing

 12/10/2018

LED display example

Display	Description
5.00	In stop mode shows the set frequency In run mode shows the actual output frequency
00-01	Selected parameter
0	Parameter value
220u	Output voltage
1.1A	Output current in amps
310u	DC Bus voltage
24°C	Temperature
000--	PID feedback value
Err1	Error display
00000	Analogue current / voltage ACID / AVI . Range (0~1000)

LED Status description

	LED Indicator light status			
Frequency / line speed Indicator	Hz/RPM	On		
Menu mode indicator	FUN	On while not displaying frequency or line speed		
FWD indicator	FWD	On while running forward	FWD	Flashing while stopped in forward mode
REV indicator light	REV	On while running reverse	REV	Flashing while stopped in reverse mode

4.1.3 Digital Display Set Up

On power up digital display screens will be as shown below.

User selectable display formats:

12-00	Display Mode
Range	0 0 0 0 0 High Low Each of the above 5 digits can be set to any of the selections below from 0 to 7 [0]: Disable display [1]: Output current [2]: Output voltage [3]: DC voltage [4]: Temperature [5]: PID feedback [6]: AVI [7]: ACI

The highest bit of 12-00 sets the power on the display, other bits set the selected display from range 0-7 as listed above.

Example1: Set parameter 12-00=[10000] to obtain display format shown below.

display : Power supply → Output Current → parameter

Set frequency
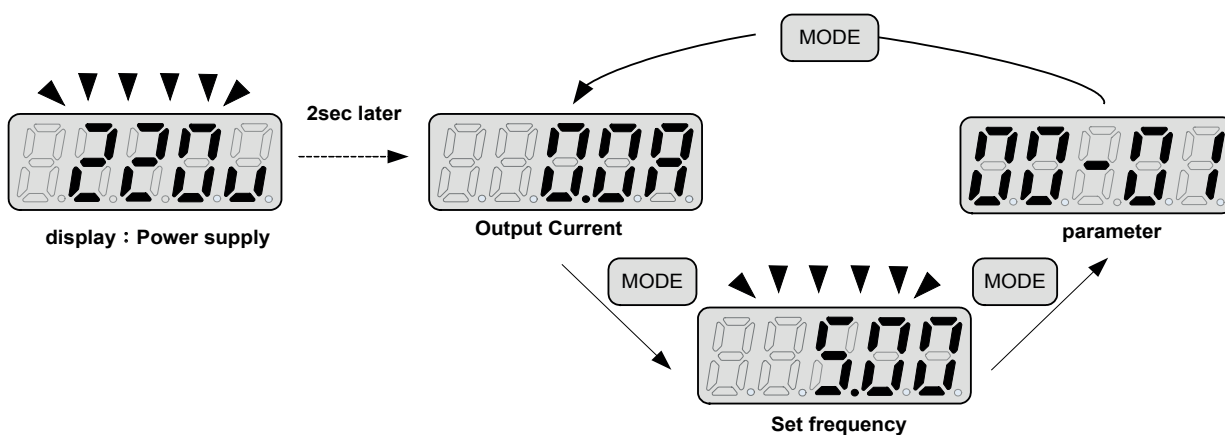
Example 2. Set parameter 2: 12-00=[12345] to obtain the display format shown below.
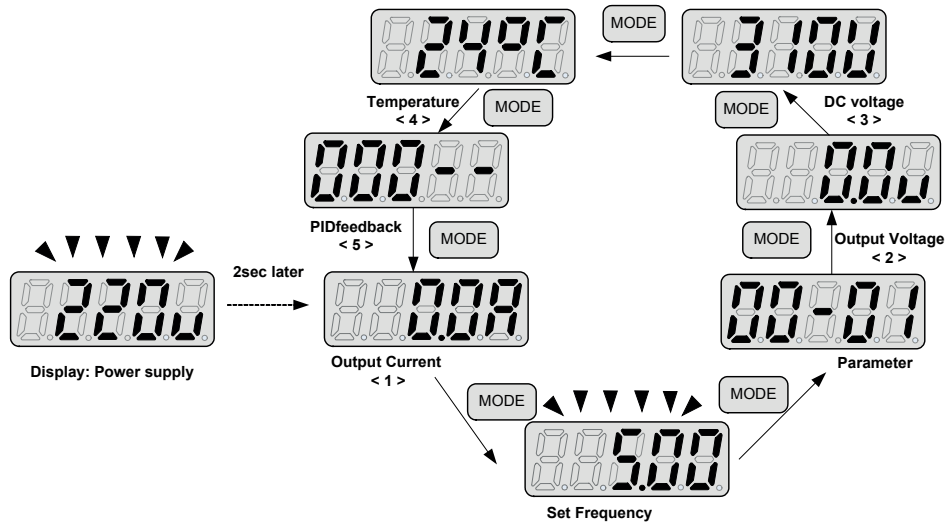
Increment / Decrement key functions:
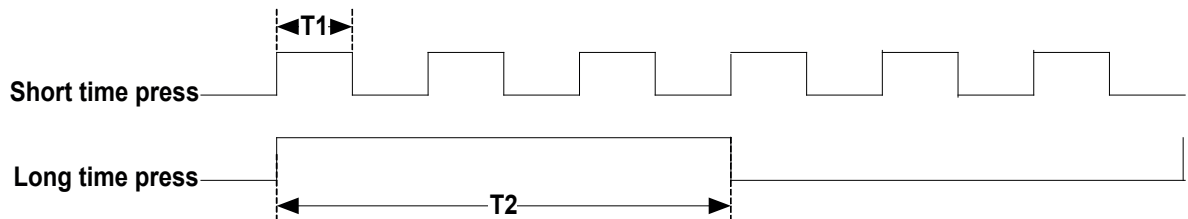
Quick pressing of these keys will increment or decrement the selected digit by one. Extended pressing will increment or decrement the selected digit continuously.

2."</ENT" Key functions :
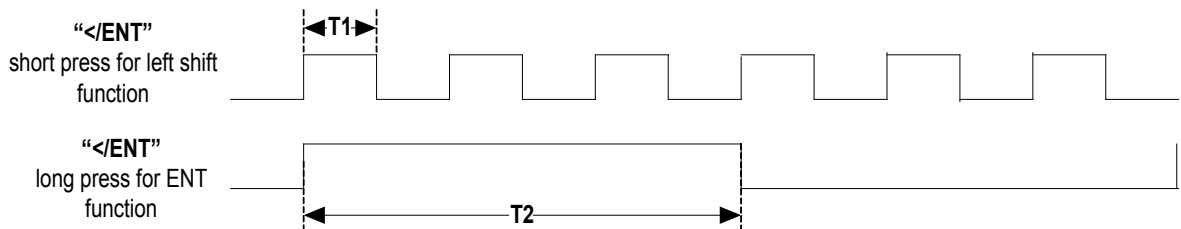
Quick pressing of this key will display the preset value of the parameter selected. Extended pressing of this key will save the altered value of the selected parameter.

4.1.4. Example of Keypad Operation

Example1: Modifying parameters
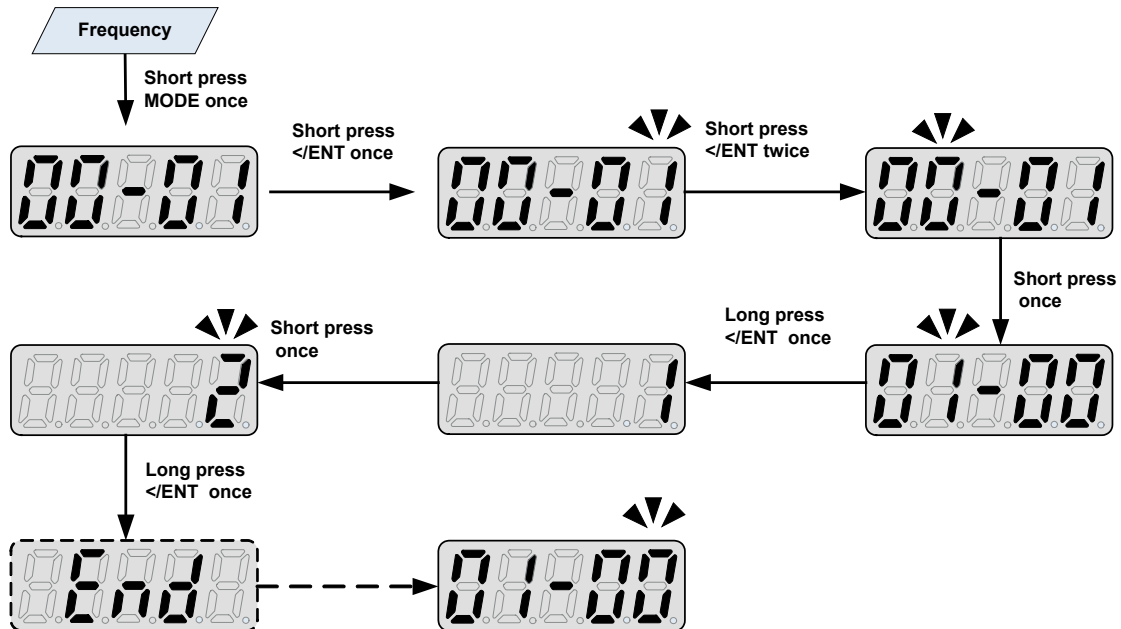
Example 2: Modifying the frequency from keypad in run and stop modes.

Modify frequency in stopping

Power Supply

2sec later

Set frequency display

Short time press
</ENT once

Modify bit<unit>

Short time press
</ENT once

Modify bit<ten>

Short time press
</ENT once

Modify bit<hundred>

Short time press
▲ once

Modify bit<hundred+1>

5sec later
or long time press
</ENT once

Modify frequency in operating

Power supply

2sec later

Set frequency display

Press RUN

Actual frequency

Short time press
</ENT once

Modify bit<unit>

Short time press
</ENT once

Modify bit<ten>

Short time press
</ENT once

Modify bit<hundred>

Short time press
▲ once

Modify bit<hundred+1>

Long time press
</ENT once

Actual frequency

Without pressing the button </ENT, After 5 seconds to return

Note: frequency command setting will be limited to the range set by parameters for lower & upper frequency.

4.1.5. Operation Control
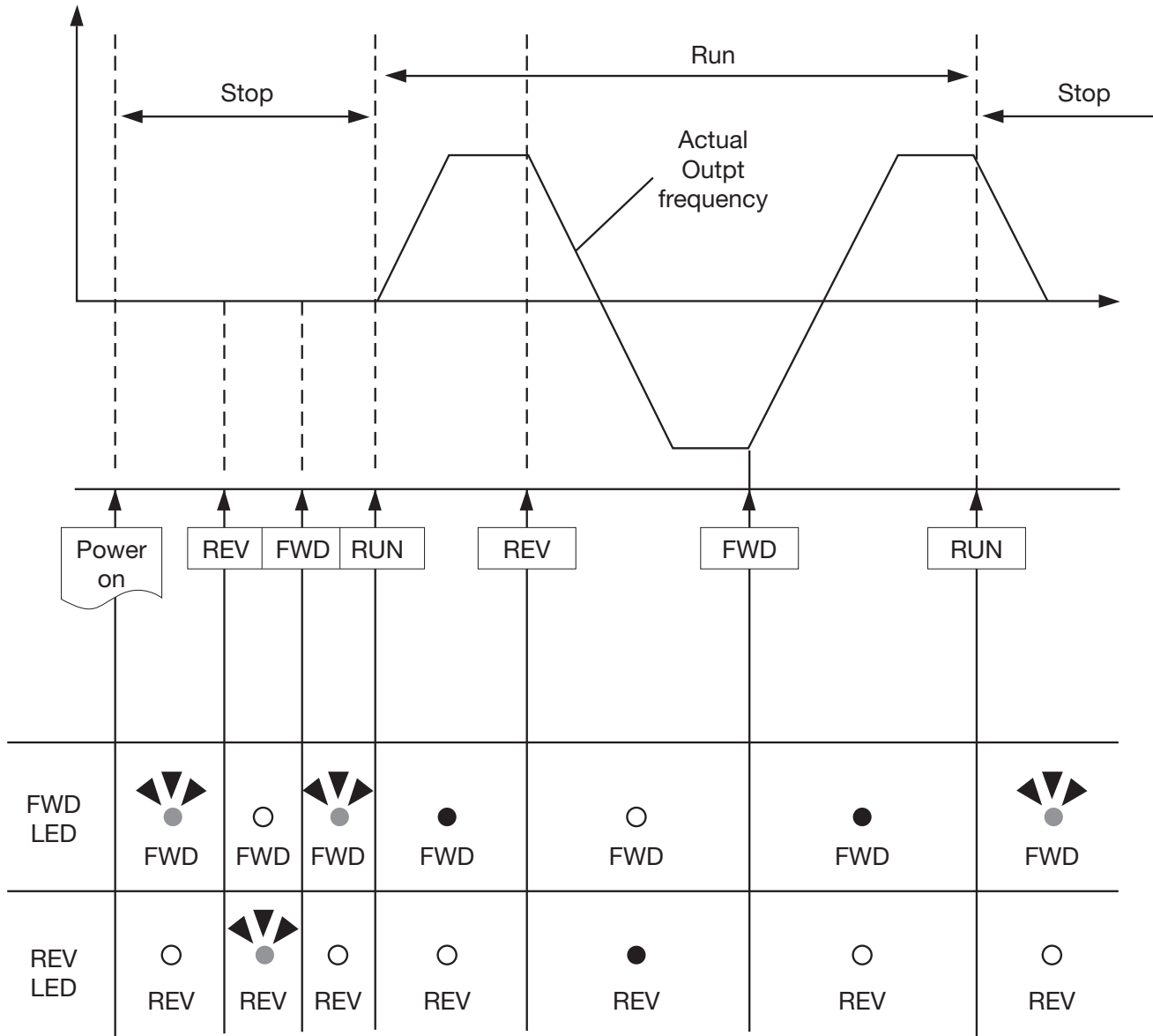
4.2. Programmable Parameter Groups

Parameter Group No.	Description
Group 00	Basic parameters
Group 01	V/F Pattern selections & setup
Group 02	Motor parameters
Group 03	Multi function digital Inputs / Outputs
Group 04	Analog signal Inputs / Analog output
Group 05	Preset frequency selections.
Group 06	Auto run (auto sequencer) function
Group 07	Start/stop command setup
Group 08	Drive and motor protection
Group 09	Communication function setup
Group 10	PID function setup
Group 11	Performance control functions
Group 12	Digital display & monitor functions
Group 13	Inspection & maintenance function

Parameter notes for Parameter Groups	
*1	Parameter can be adjusted during running mode
*2	Cannot be modified in communication mode
*3	Does not change with factory reset
*4	Read only

Group 00 The basic parameters group					
No.	Description	Range	Factory setting	Unit	Note
00-00	Motor rotation	0: V/F model 1: SLV model	0	-	
00-01	Motor rotation	0: Forward 1: Reverse	0	-	*1
00-02	Main run source selection	0: Keypad 1: External Run/Stop control 2: Comm unication	1	-	
00-03	Alternative run source selection	0: Keypad 1: External Run/Stop control 2: Communication	0	-	
00-04	Operation modes for external terminals	0: Forward/Stop-Reverse/Stop 1: Run/Stop-Reverse/Forward 2: 3-Wire control mode-run/stop	0	-	
00-05	Main frequency source selection	0: Keypad 1: Potentiometer on keypad 2: External AVI analog signal Input 3: External ACI analog signal input 4: External Up/Down frequency control 5: Communication setting frequency 6: PID output frequency	2	-	
00-06	Alternative frequency source selection	0: Keypad 1: Potentiometer on keypad 2: External AVI analog signal input 3: External ACI analog signal input 4: External Up/Down frequency control 5: Communication setting frequency 6: PID output frequency.	0	-	
00-07	Main and alternative Frequency command modes	0: Main or alternative frequency 1: Main frequency + alternative frequency	0	-	
00-08	Communication frequency command	0.00~599.00		Hz	*4
00-09	Frequency command Save mod (communication mode)	0: Save the frequency before power down 1: Save the communication frequency	0	-	
00-10	Initial frequency selection (keypad mode)	0: By current frequency command 1: By 0 frequency command 2: By 00-11	0	-	
00-11	Initial Frequency Setpoint	0.00~599.00	50.00/60.00	Hz	
00-12	Frequency upper limit	0.01~599.00	50.00/60.00	Hz	
00-13	Frequency lower limit	0.00~599.99	0.00	Hz	*1
00-14	Acceleration time 1	0.1~3600.0	10.0	s	*1
00-15	Deceleration time 1	0.1~3600.0	10.0	s	*1
00-16	Acceleration time 2	0.1~3600.0	10.0	s	*1
00-17	Deceleration time 2	0.1~3600.0	10.0	s	*1
00-18	Jog frequency	1.00~25.00	2.00	Hz	*1
00-19	Jog acceleration time	0.1~25.5	0.5	s	*1
00-20	Jog deceleration time	0.1~25.5	0.5	s	

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Group 01 V/F Pattern selection & setup

No.	Description	Range	Factory setting	Unit	Note
01-00	Volts/Hz patterns	1~7	1/4	-	
01-01	V/F max voltage	200V: 198.0~256.0 400V: 323.0~528.0	Based on 13-08	Vac	
01-02	Max frequency	0.20~599.00	50.00/60.00	Hz	
01-03	Max frequency voltage ratio	0.0~100.0	100.0	%	
01-04	Mid frequency 2	0.10~599.00	25.00/30.00	Hz	
01-05	Mid frequency voltage ratio 2	0.0~100.0	50.0	%	
01-06	Mid frequency 1	0.10~599.00	10.00/12.00	Hz	
01-07	Mid frequency voltage ratio 1	0.0~100.0	20.0	%	
01-08	Min frequency	0.10~599.00	0.50/0.60	Hz	
01-09	Min frequency voltage ratio	0.0~100.0	1.0	%	
01-10	Volts/Hz curve modification (torque boost) V/F start frequency	0~10.0	0.0	%	*1
01-11	V/F start frequency	0.00~10.00	0.0	Hz	
01-12	No-load oscillation suppression gain	0.0~200.0	0.0	%	
01-13	Motor Hunting Prevention Coefficient	1~8192	800		
01-14	Motor Hunting Prevention Gain	0~100	7	%	
01-15	Motor Hunting Prevention Limit	0.0~100.0	5.0	%	
01-16	Auto-Torque Compensation Filter Coefficient	0.1~1000.0	0.1	ms	
01-17	Auto-Torque Compensation Gain	0~100	0	%	
01-18	Auto-Torque Compensation Frequency	1.30~5.00	2.00	Hz	

Group 02 Motor parameters

No.	Description	Range	Factory setting	Unit	Note
02-00	Motor no load current	----		A	*3
02-01	Motor rated current (OL1)	----		A	
02-02	Motor rated slip compensation	0.0~100.0	0.0	%	*1
02-03	Motor rated speed	----		Rpm	
02-04	Motor rated voltage	----		Vac	*4
02-05	Motor Rated Power	0~22.0	Motor nameplate	kW	
02-06	Motor Rated Frequency	0~599.0	Motor nameplate		
02-07	Motor Auto Tuning	0: Disable	0		
02-08	Stator Resistor Gain	0~600	by series		
02-09	Rotor Resistor Gain	0~600	by series		
02-10	Reserved	0~200			
02-11	Reserved	0~200			
02-12	Reserved				
02-13	SLV Slip Compensation Gain	0~200			
02-14	SLV Torque Compensation Gain	0~200			
02-15	Low Frequency Torque Gain	0~100			
02-16	SLV Without Load Slip Compensation Gain	0~200			
02-17	SLV With Load Slip Compensation Gain	0~200			
02-18	SLV With Load Torque Compensation Gain	0~200			
02-19	SLV Slip Compensation Select	0: Slip Compensation 1 2: Slip Compensation 2			

Group 03 Multifunction digital inputs / outputs					
No.	Description	Range	Factory setting	Unit	Note
03-00	Multifunction input term. S1	0: Forward/Stop command or Run/Stop	0	-	
03-01	Multifunction input term. S2	1: Reverse/Stop command or REV/WD	1	-	
03-02	Multifunction input term. S3	2: Preset speed 1 (5-02)	2	-	
03-03	Multifunction input term. S4	3: Preset speed 2 (5-03)	3	-	
03-04	Multifunction input term. S5	4: Preset speed 4 (5-05) 6: Jog forward command 7: Jog reverse command 8: Up command 9: Down command 10: Acc/Dec 2 11: Acc/Dec disabled 12: Main/Alternative run command select 13: Main/Alternative frequency command select 14: Rapid stop (decel to stop) 15: Base block 16: Disable PID function 17: Reset 18: Auto run mode enable	17	-	
03-05		Reserved			
03-06	Up/Down frequency band	0.00~5.00	0.00	Hz	
03-07	Up/Down frequency modes	0: When Up/Down is used, the preset frequency is held as the inverter stops, and the UP/Down function is disabled. 1: When Up/Down is used, the preset frequency is reset to 0 Hz as the inverter stops. 2: When Up/Down is used, the preset frequency is held as the inverter stops, and the UP/Down is available.	0	-	
03-08	S1~S5 scan confirmation	1~400. Number of scan cycles	20	1ms	
03-09	S1~S5 switch type select	xxxx0: S1 NO xxxx1: S1 NC xxx0x: S2 NO xxx1x: S2 NC xx0xx: S3 NO xx1xx: S3 NC x0xxx: S4 NO x1xxx: S4 NC 0xxxx: S5 NO 1xxxx: S5 NC	00000	-	
03-10		Reserved			
03-11	Output relay (RY1)	0: Run 1: Fault 2: Setting frequency reached 3: Frequency reached (3-13 ± 3-14) 4: Output frequency detection 1 (> 3-13) 5: Output frequency detection 2 (< 3-13) 6: Auto-Restart 7: Momentary AC power loss 8: Rapid stop 9: Base block 10: Motor overload protection(OL1) 11: Drive overload protection (OL2) 12: Reserved 13: Output current reached 14: Brake control	0	-	

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No.	Description	Range	Factory setting	Unit	Note
	Group 03 Multifunction digital inputs / outputs				
03-12	Reserved				
03-13	Output frequency detection level (Hz)	0.00~599.00	0.00	Hz	*1
03-14	Frequency detection band	0.00~30.00	2.00	Hz	*1
03-15	Output current detection level	0.1~999.9	0.1	A	
03-16	Output current detection period	0.1~10.0	0.1	s	
03-17	External brake engage level	0.00~20.00	0.00	Hz	
03-18	External brake engage level	0.00~20.00	0.00	Hz	
03-19	Relay output function type	0: A (normally open) 1: B (normally close)	0	-	
03-20	Braking Transistor On Level	100/200V : 220-230V	380	VDC	
		240-400V : 380/400V	690	VDC	
		400-800V: 415/460V	780	VDC	
03-21	Brake Transistor Off Level	100/200V : 220-230V	360	VDC	
		240-400V : 380/400V	670	VDC	
		400-800V: 415/460V	760	VDC	

"NO" indicates normally open, "NC" indicates normally closed.

No.	Description	Range		Factory setting	Unit	Note
	Group 04 Analog signal inputs/Analogue output functions					
04-00	AVI/ACI analog input signal type select	AVI 0:0~10V 1:0~10V 2:2~10V 3:2~10V	ACI 0~20mA 4~20mA 0~20mA 4~20mA	0	-	
04-01	AVI signal verification scan rate	1~400		100	1ms	
04-02	AVI Gain	0~1000		100	%	*1
04-03	AVI Bias	0~100		0	%	*1
04-04	AVI Bias selection	0: Positive 1: Negative		0	-	*1
04-05	AVI Slope	0: Positive 1: Negative		0	-	*1
04-06	ACI Signal verification scan rate	1~400		100	1ms	
04-07	ACI Gain	0~1000		100	%	*1
04-08	ACI Bias	0~100		0	%	*1
04-09	ACI Bias selection	0: Positive 1: Negative		0	-	*1
04-10	ACI Slope	0: Positive 1: Negative		0	-	*1
04-11	Analog output mode (AO)	0: Output frequency 1: Frequency command 2: Output voltage 3: DC bus voltage 4: Motor current		0	-	*1
04-12	Analog output AO Gain (%)	0~1000		100	%	*1
04-13	Analog output AO Bias (%)	0~1000		0	%	*1
04-14	AO Bias selection	0: Positive 1: Negative		0	-	*1
04-15	AO Slope	0: Positive 1: Negative		0	-	*1
04-16	Potentiometer on Keypad Gain	0~1000		100	%	*1
04-17	Potentiometer on Keypad Bias	0~1000		100	%	*1
04-18	Potentiometer on Keypad Bias Selection	0~1000		100	%	*1
04-19	Potentiometer on Keypad Slope	0~1000		100	%	*1

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No.	Description	Range	Factory setting	Unit	Note
05-00	Preset speed control mode selection	0: Common Accel/Decel Accel/Decel 1 or 2 apply to all speeds	0	-	
		1: Individual Accel/Decel Accel/ Decel 0-7 apply to the selected preset speeds (Acc0/Dec0~Acc7/Dec7)			
05-01	Preset speed 0 (Keypad Freq)		5.00	Hz	
05-02	Preset speed 1 (Hz)		5.00	Hz	*1
05-03	Preset speed 2 (Hz)		10.00	Hz	*1
05-04	Preset speed 3 (Hz)	0.00~599.00	20.00	Hz	*1
05-05	Preset speed 4 (Hz)		30.00	Hz	*1
05-06	Preset speed 5 (Hz)		40.00	Hz	*1
05-07	Preset speed 6 (Hz)		50.00	Hz	*1
05-08	Preset speed 7 (Hz)		50.00	Hz	*1
05-09 ~ 05-16		Reserved			
05-17	Preset speed 0-Acc time		10.0	s	*1
05-18	Preset speed 0-Dec time		10.0	s	*1
05-19	Preset speed 1-Acc time		10.0	s	*1
05-20	Preset speed 1-Dec time		10.0	s	*1
05-21	Preset speed 2-Acc time		10.0	s	*1
05-22	Preset speed 2-Dec time		10.0	s	*1
05-23	Preset speed 3-Acc time		10.0	s	*1
05-24	Preset speed 3-Dec time	0.1~3600.0	10.0	s	*1
05-25	Preset speed 4-Acctime		10.0	s	*1
05-26	Preset speed 4-Dec time		10.0	s	*1
05-27	Preset speed 5-Acc time		10.0	s	*1
05-28	Preset speed 5-Dec time		10.0	s	*1
05-29	Preset speed 6-Acc time		10.0	s	*1
05-30	Preset speed 6-Dec time		10.0	s	*1
05-31	Preset speed 7-Acc time		10.0	s	*1
05-32	Preset speed 7-Dec time		10.0	s	*1

Group 05 Preset frequency selections

Group 06 Auto run (Auto Sequencer) function					
No.	Description	Range	Factory setting	Unit	Note
06-00	Auto Run (sequencer) mode selection	0: Disabled. 1: Single cycle. (Continues to run from the unfinished step if restarted). 2: Periodic cycle. (Continues to run from the unfinished step if restarted). 3: Single cycle, then holds the speed of final step to run. (Continues to run from the unfinished step if restarted). 4: Single cycle. (Starts a new cycle if restarted). 5: Periodic cycle. (Starts a new cycle if restarted). 6: Single cycle, then hold the speed of final step to run (Starts a new cycle if restarted).	0	-	
06-01	Auto Run mode frequency command 1	0.00~599.00	0.00	Hz	*1
06-02	Auto Run mode frequency command 2		0.00	Hz	*1
06-03	Auto Run mode frequency command 3		0.00	Hz	*1
06-04	Auto Run mode frequency command 4		0.00	Hz	*1
06-05	Auto Run mode frequency command 5		0.00	Hz	*1
06-06	Auto Run mode frequency command 6		0.00	Hz	*1
06-07	Auto Run mode frequency command 7		0.00	Hz	*1
06-08 ~ 06-15		Reserved			
06-16	Auto Run mode running time setting 0	0.0~3600.0	0.0	s	
06-17	Auto Run mode running time setting 1		0.0	s	
06-18	Auto Run mode running time setting 2		0.0	s	
06-19	Auto Run mode running time setting 3		0.0	s	
06-20	Auto Run mode running time setting 4		0.0	s	
06-21	Auto Run mode running time setting 5		0.0	s	
06-22	Auto Run mode running time setting 6		0.0	s	
06-23	Auto Run mode running time setting 7		0.0	s	
06-24 ~ 06-31		Reserved			
06-32	Auto Run mode running direction 0	0: Stop 1: Forward 2: Reverse	0	-	
06-33	Auto Run mode running direction 1		0	-	

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No.	Description	Range	Factory setting	Unit	Note
	Group 06 Auto run (Auto Sequencer) function				
06-34	Auto Run mode running direction 2	0: Stop 1: Forward 2: Reverse	0	-	
06-35	Auto Run mode running direction 3		0	-	
06-36	Auto Run mode running direction 4		0	-	
06-37	Auto Run mode running direction 5		0	-	
06-38	Auto Run mode running direction 6		0	-	
06-39	Auto Run mode running direction 7		0	-	

No.	Description	Range	Factory setting	Unit	Note
	Group 07 Start/Stop command setup				
07-00	Momentary power loss and restart	0: Momentary power loss and restart disable 1: Momentary power loss and restart enable	0	-	
07-01	Auto restart delay time	0.0~800.0	0.0	s	
07-02	Number of auto restart attempts	0~10	0	-	
07-03	Reset mode setting	0: Enable reset only when run command is Off 1: Enable reset when run ommand is On or Off	0	-	
07-04	Direct running after power Up	0: Enable direct run on power up 1: Disable direct run on power up	1	-	
07-05	Delay-ON timer	1.0~300.0	1.0	s	
07-06	DC injection brake start frequency (Hz) in stop mode	0.10~10.00	1.5	Hz	
07-07	DC injection brake level (%) in stop mode	0~20	5	%	
07-08	DC injection brake time (seconds) In stop mode	0.0~25.5	0.5	s	
07-09	Stopping method	0: Deceleration to stop 1: Coast to stop	0		
07-10	DC Braking Level at Start	0~100	0	%	
07-11	DC Braking time at Start	0.0~25.5	0	%	

Group 08 Drive & motor protection functions					
No.	Description	Range	Factory setting	Unit	Note
08-00	Trip prevention selection	xxxx0: Enable trip prevention during acceleration xxxx1: Disable trip prevention during acceleration xxx0x: Enable trip prevention during deceleration xxx1x: Disable trip prevention during deceleration xx0xx: Enable trip prevention in Run mode xx1xx: Disable trip prevention in Run mode x0xxx: Enable over voltage prevention in Run mode x1xxx: Disable over voltage prevention in Run mode	00000	-	
08-01	Trip prevention level during acceleration (%)	50~200	200	Inverter rated current 100%	
08-02	Trip prevention level during deceleration (%)	50~200	200		
08-03	Trip prevention level in Run mode (%)	50~200	200		
08-04	Over voltage prevention level in Run mode	200V: 350~390 400V: 700-780	380/760	VDC	
08-05	Electronic motor overload protection operation mode	xxxx0: Disable Electronic Motor Overload Protection xxxx1: Enable Electronic Motor Overload Protection xxx0x: Motor Overload Cold Start xxx1x: Motor Overload Hot Start xx0xx: Standard Motor xx1xx: Inverter Duty Motor	00001	-	
08-06	Operation after overload protection is activated	0: Coast-to-Stop after overload protection is activated 1: Drive will not trip when overload protection is activated (OL1)	0	-	
08-07	Over heat protection (cooling fan control)	0: Auto (depends on temp.) 1: Operate while in RUN mode 2: Always run 3: Disabled	1	-	
08-08	AVR function (Auto voltage regulation)	0: AVR function enable 1: AVR function disable 2: AVR function disable for stop 3: AVR function disable for deceleration 4: AVR function disable for stop and deceleration. 5: When VDC> (360V/740V), AVR function disable for stop and deceleration.	4	-	
08-09	Input phase lost protection	0: Disabled 1: Enabled	0	-	
08-10	PTC Overheat Function	0: Disabled 1: Decelerate to stop 2: Coast to stop 3: Continue running, when warning level is reached. Coast to stop when protection level is reached			
08-11	PTC Signal Smoothing Time	0.01 ~ 10.00	0.2	Sec	

Group 08 Drive & motor protection functions

No.	Description	Range	Factory setting	Unit	Note
08-12	PTC Detection Time Delay	1 ~ 300	60	Sec	
08-13	PTC Protection Level	0.1 ~ 10.0	0.7	Sec	
08-14	PTC Detection Level	0.1 ~ 10.0	0.3	V	
08-15	PTC Warning Level	0.1 ~ 10.0	0.5	V	
08-16	Fan Control Temperature	10.0 ~ 50.0	50	°C	
08-17	Over Current Protection Level	0.0 ~ 60.0	0.0	A	
08-18	Over Current Protection Time	0.0 ~ 1500.0	1.0	Sec	
08-19	Motor Overload Protection Level	0: Motor Overload Protection Level 0 1: Motor Overload Protection Level 1 2: Motor Overload Protection Level 2	0		

Group 09 Communication function setup

No.	Description	Range	Factory setting	Unit	Note
09-00	Assigned communication station umber	1~32	1	-	*2*3
09-01	RTU code /ASCII ode select	0: RTU code 1: ASCII code	0	-	*2*3
09-02	Baud rate setting (bps)	0: 4800 1: 9600 2: 19200 3: 38400	2	bps	*2*3
09-03	Stop bit selection	0: 1 Stop bit 1: 2 Stop bits	0	-	*2*3
09-04	Parity selection	0: Without parity 1: With even parity 2: With odd parity	0	-	*2*3
09-05	Data format selection	0: 8-Bits data 1: 7-Bits data	0	-	*2*3
09-06	Communication time - out detection time	0.0~25.5	0.0	s	
09-07	Communication time-out operation selection	0: Deceleration to stop (00-15: deceleration time 1) 1: Coast to stop 2: Deceleration to stop (00-17: deceleration time 2) 3: Continue operating	0	-	
09-08	Error 6 verification time.	1~20	3		
09-09	Drive transmit delay time (ms)	5~65	5	ms	
09-10	BACmet Station	1~254	1		*2*3

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\multicolumn{6}{c	}{Group 10 PID function setup}
No.	Description	Range	Factory setting	Unit	Note
10-00	PID target value selection (when 00-05\00-06=6 ,this function is enabled)	0: Potentiometer on keypad 1: Analog signal input. (AVI) 2: Analog signal input. (ACI) 3: Frequency set by communication 4: 10-02 given 5: Preset frequency	1	-	*1
10-01	PID feedback value selection	0: Potentiometer on keypad 1: Analog signal input. (AVI) 2: Analog signal input. (ACI) 3: Frequency set by communication	2	-	*1
10-02	PID target (keypad input)	0.0~100.0	50.0	%	*1
10-03	PID mode selection	0: Disabled 1: Deviation D control FWD characteristic. 2: Feedback D control FWD characteristic. 3: Deviation D control reverse characteristic. 4: Feedback D control reverse characteristic.	0	-	
10-04	Feedback gain coefficient	0.00~10.00	1.00	%	*1
10-05	Proportional gain	0.0~0.0	1.0	%	*1
10-06	Integral time	0.0~100.0	10.0	s	*1
10-07	Derivative time	0.00~10.00	0.00	s	*1
10-08	PID offset	0: Positive 1: Negative	0	-	*1
10-09	PID offset adjust	0~109	0	%	*1
10-10	PID output lag filter time	0.0~2.5	0.0	s	*1
10-11	Feedback loss detection mode	0: Disabled 1: Drive keeps running after feedback loss 2: Drive stops after feedback loss			
10-12	Feedback loss detection level	0~100	0	%	
10-13	Feedback loss detection delay time	0.0~25.5	1.0	s	
10-14	Integration limit value	0~109	100	%	*1
10-15	Integral value resets to zero when feedback signal equals the target value	0: Disabled 1: 1 Second 30: 30 Seconds (0~30)	0	s	
10-16	Allowable integration error margin (units) (1unit = 1/8192)	0~100	0	-	
10-17	PID sleep frequency level	0.00~599.00	0.00	Hz	
10-18	PID sleep function delay time	0.0~25.5	0.0	s	
10-19	PID wake up frequency level	0.00~599.00	0.00	Hz	
10-20	PID wake up function delay time	0.0~25.5	0.0	s	
10-21	Max PID feedback setting	0~999	100	-	*1
10-22	Min PID feedback setting	0~999	0	-	*1

Group 11 Performance control functions

No.	Description	Range	Factory setting	Unit	Note
11-00	Reverse operation control	0: Reverse command is enabled 1: Reverse command is disabled	0	-	
11-01	Carrier frequency (kHz)	1~16	5	KHz	
11-02	Carrier mode selection	0: Mode 0, 3 phase PWM modulation 1: Mode 1, 2 phase PWM modulation 2: Mode 2, 2 phase random PWM modulation	0	-	
11-03	Carrier frequency reduction by temperature rise	0: Disabled 1: Enabled	0	-	
11-04	S-Curve acc 1	0.0~4.0	0.00	s	
11-05	S-Curve acc 2	0.0~4.0	0.00	s	
11-06	S-Curve dec 3	0.0~4.0	0.00	s	
11-07	S-Curve dec 4	0.0~4.0	0.00	s	
11-08	Skip frequency 1	0.00~599.00	0.00	Hz	*1
11-09	Skip frequency 2	0.00~599.00	0.00	Hz	*1
11-10	Skip frequency 3	0.00~599.00	0.00	Hz	*1
11-11	Skip frequency bandwidth (±)	0.00~30.00	0.00	Hz	*1
11-13	Regeneration Prevention Function	0: Disable 1: Enable 2: Enable (during constant speed only)	0		
11-14	Regeneration Prevention Voltage Level	300.0~400.0	380.0		
11-15	Regeneration Prevention Frequency Limit	0.00~15.00	3.00	V	
11-16	Regeneration Prevention Voltage Gain	0~200	100	Hz	
11-17	Regeneration Prevention Frequency Gain	0~200	100	%	
11-18	Speed loop proportion gain	0~65535	10000	%	
11-19	Speed loop integration gain	0~65535	800		
11-20	Speed loop differential gain	0~65535	0		
11-21	Stop Key Selection	0: Enable Stop Key when Run Command not from Keypad 1: Disable Stop Key when Run Command not from Keypad	0		

Group 12 Digital display & monitor functions

No.	Description	Range	Factory setting	Unit	Note
12-00	Extended display mode	00000~77777. Each digit can be set to 0 to 7 0: Default display (frequency & parameters) 1: Output current 2: Output voltage 3: DC voltage 4: Temperature of Heat Sink 5: PID feedback 6: Analog signal Input. (AVI) 7: Analog signal Input. (ACI)	00000	-	*1
12-01	PID feedback display format	0: Integer (xxx) 1: One decimal place (xx.x) 2: Two decimal places (x.xx)	0	-	*1
12-02	PID feedback display unit setting	0: xxx-- 1: xxxpb (pressure) 2: xxxfl (flow)	0	-	*1
12-03	Custom units (line speed) value	0~65535	1500/1800	RPM	*1
12-04	Custom units (line speed) display mode	0: Drive output frequency is displayed 1: Line speed. Integer. (xxxxx) 2: Line speed. One decimal place (xxxx.x) 3: Line speed. Two decimal places (xxx.xx) 4: Line speed. Three decimal places (xx.xxx)	0	-	*1

No.	Register No.	Description	Range	Factory setting	Unit	Modbus example value	Note
		Group 12 Digital display & monitor functions					
12-05	0C05H	Inputs and output logic status display (S1 to S5) & RY1		-----	-		*4
12-06		Output Power	---	0.0	Kw		
12-07		Motor Current Percentage	---	0	%		

No.	Description	Range	Factory setting	Unit	Note
	Group 13 Inspection & maintenance functions				
13-00	Drive horse power code	----	-	-	*3
13-01	Software version	----	-	-	*3*4
13-02	Fault log (last 3 faults)	----	-	-	*3*4
13-03	Accumulated operation time 1 1	0~23	-	Hour	*3
13-04	Accumulated operation time 1 2	0~65535	----	Day	*3
13-05	Accumulated operation time mode	0: Time under power 1: Run mode time only	0	-	*3
13-06	Parameter lock	0: Enable all functions 1: Preset speeds 05-01~05-08 cannot be changed 2: All functions cannot be changed except for preset speeds 05-01~05-08 3: Disable all function	0	-	
13-07	Parameter lock code	00000~65535	00000	-	
13-08	Reset drive to factory settings	1150: Initialization (50Hz,220V/380V) 1160: Initialization (60Hz,220V/380V) 1250: Initialization (50Hz,230V/400V) 1260: Initialization (60Hz,230V/460V) 1350: Initialization (50Hz,220V/415V) 1360: Initialization (60Hz,230V/400V)	00000	-	

Notes:
For built-in EMC filter models, the default setting of 13-08 is "1250"
For without built-in filter models, the default setting of 13-08 is "1360"

4.3. Parameter Function Description

00-00	Control Mode
Range	[0]: V/F mode [1]: SLV mode

Select the relevant control mode for the application, using parameter 00-00 Control mode. Default control mode is V/F.

V/F mode can be used for most applications specifically multi-motor or applications where auto tune is not successful or when a customized V/F pattern may be required.

Several V/f patterns are available selectable by parameter 01-00.

Select the appropriate V/f pattern based on the application load type and the motor base frequency of 50 or 60 Hz.

For selections of the V/f patterns. Refer to description of parameter 01-00

SLV (Sensor less vector) is used for obtaining best performance from a motor. Specially at low speeds or for applications with dynamic speed change.

00-01	Motor Direction Control
Range	[0]: Forward [1]: Reverse

00-01 Is valid in key pad mode only.

Note: When reverse function is disabled by parameter 11-00=1 setting 00-01 to 1 ." LOC" will be displayed.

00-02	Main Run Command Source selection
00-03	Alternative Run Command Source selection
Range	[0]: Keypad [1]: External Run/Stop control [2]: Communication

Parameter 00-02/00-03 sets the inverter operation command source. For switching between 00-02 and 00-03, use any of the external inputs S1 to S5 and set the relevant parameters (03-00~03-04) to [12]. refer to parameter group 3.

00-04	Operation modes for external terminals
Range	[0]: Forward/stop-reverse/stop [1]: Run/Stop-forward/reverse [2]: 3-wire control mode-run/stop

00-02(Main Run Source) = 1 or 00-03(Alternative Run source) = 1
(When 00-02/00-03=1, the command comes from External Run /Stop)
Parameters 03-00 to 03-04, which are used to set the required function for the digital inputs [S1 to S5](multi-function inputs).

Note1: Parameters 03-00 to 03-04 are only Required for External Run/stop (Two wire control mode).

Note 2: For External Run /Stop control set parameters in the following order:
1. 00-02 or 00-03
2. 00-04
3. 03-00 to 03-04 as required. Not required for three wire control mode.

When 00-04=0
1. 00-02 or 00-03
2. 00-04
3. 03-00 to 03-04 as required. Not required for three wire control mode.
When 00-04=0
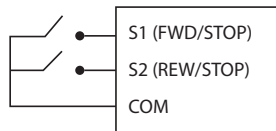
Two external switches are required, one for forward direction and the other for reverse.
Switch type: two position, maintained type. (This is two wire mode).

1. Forward (Run/Stop) Switch
Select one of the multifunction inputs [S1 to S5] and set the relevant parameter 03-00 to 03-04 = 0 (Forward run /Stop mode.)
2. Reverse (Run/Stop) Switch
Select one of the multifunction inputs [S1 to S5] and set the relevant parameter 03-00 to 03-04 = 1 (Reverse run /Stop mode.)

00-04 = 1
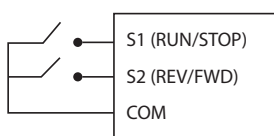
Two external switches are required.
Switch type: two position, maintained type. (This is two wire mode).

1. Run/Stop switch
Select one of the multifunction inputs [S1 to S5] and set the relevant parameter 03-00 to 03-04 = 0 (Run/Stop mode.)

2. Forward/Reverse Switch
Select one of the multifunction inputs [S1 to S5] and set the relevant parameter 03-00 to 03-04 = 1 (Forward/ Reverse direction selection.)
Switch in OFF position = Forward direction
Switch in ON position = Reverse direction

00-04= 2. Three Wire Control mode Run/Stop
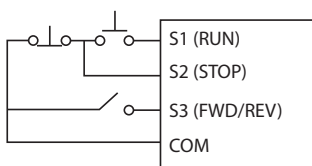
In this mode, two separated momentary push buttons are used for start and stop functions.
In this mode, parameter group 03 for S1 to S5 are not effective.
S1, S2 and S3 are allocated automatically.
 Note: For S1 to initiate the Run command. Push button connected to S2 must be connected by a normally closed type contact (NC).

00-05	Main Frequency Command Source Selection
00-06	Alternative Frequency Command Source Selection
Range	[0]: UP/DOWN of keypad [1]: Potentiometer on keypad [2]: External AVI analog signal input [3]: External ACI analog signal input [4]: External Up/Down frequency control [5]: Communication setting frequency [6]: PID output frequency

When 00-06 = [6], frequency command source is output of the PID.

00-07	Main Frequency Command Source Selection
Range	[0]: Main or alternative frequency. [1]: Main frequency + alternative frequency

When 00-07= [0], the frequency source is set by the main frequency parameter 00-05 (default) or by the alternative frequency parameter 00-06.
Use any of the external terminals S1 to S5 and set the relevant parameter 03-00 to 03-04= [13] to switch from main to alternative source.
When 00 - 07= [1] the frequency command will be the result of setting of main & alternative frequencies.

00-08	Communication Frequency Command
Range	[0.00~650.00] Hz

This parameter can be used to read the set frequency in communication mode.
This parameter is only effective in the communication mode.

00-09	Frequency Command save on power down (Communication mode)
Range	[0]: disable [1]: enable

00-09= [0] keypad frequency is saved.
00-09= [1] frequency set by communication is saved.

00-10	Initial Frequency Selection (Keypad Mode)
Range	[0]: by current freq command [1]: by zero freq command [2]: by 00-11
00-11	**Initial Frequency Setpoint**
Range	[0.00~650.00] Hz

When 00-10= [0], the initial frequency will be current frequency.
When 00-10= [1], the initial frequency will be 0.
When 00-10= [2], the initial frequency will be as set by parameter 00-11.

00-12	Frequency Upper limit
Range	[0.01~650.00]: Hz
00-13	**Frequency Lower limit**
Range	[0.00~649.99] Hz

When 00-13 and the command frequency are both set to 0.00, if RUN is pressed ” Stop” is displayed.
When frequency command is > than preset in 00-13 inverter output will ramp up from 0.00 to the command frequency.
When 00-13> 0, and the frequency command value ≤ 00-13, inverter output will ramp up from preset in lower limit to the command frequency.
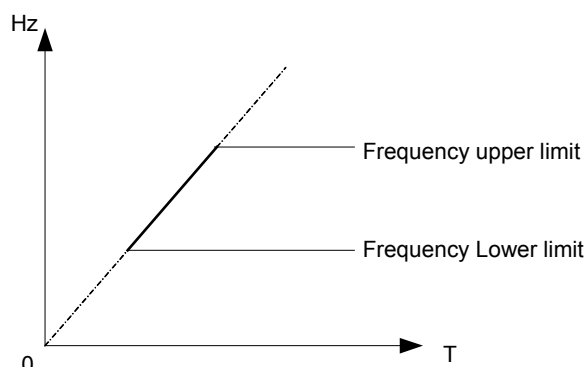
00-14	Acceleration time 1
Range	[0.1~3600.0] s
00-15	Deceleration time 1
Range	[0.1~3600.0] s
00-16	Acceleration time 2
Range	[0.1~3600.0] s
00-17	Deceleration time 2
Range	[0.1~3600.0] s

Preset acceleration and deceleration times by above parameters are the time taken for the output frequency to ramp up or ramp down between the upper and the lower frequency limits.

Actual acceleration and deceleration time is calculated as follows:

V/F Mode

$$\text{Actual acceleration time} = \frac{(00\text{-}14)\times(\text{set frequency-the minimum starting frequency})}{\text{Maximum output frequency}}$$

$$\text{Actual deceleration time} = \frac{(00\text{-}15)\times(\text{set frequency-the minimum starting frequency})}{\text{Maximum output frequency}}$$

SLV Mode

$$\text{Actual acceleration time} = \frac{(00\text{-}14)\times(\text{set frequency-the minimum starting frequency}}{\text{Motor rated frequency}}$$

$$\text{Actual deceleration time} = \frac{(00\text{-}15)\times(\text{set frequency-the minimum starting frequency}}{\text{Motor rated frequency}}$$
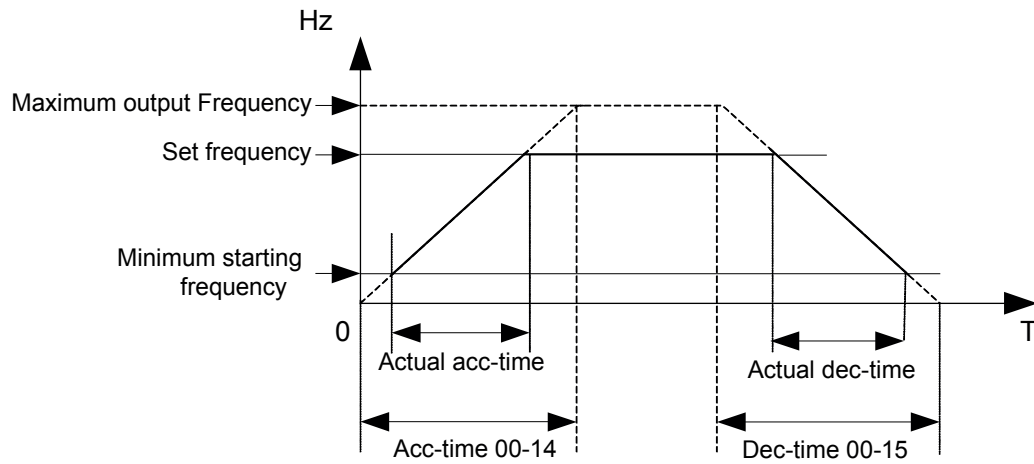
Maximum output frequency is for V/F curve, which can be checked from table when V/F curve is fixed. Maximum output frequency is 01-02 when V/F curve is customized.

00-18	Jog Frequency
Range	[1.00~25.00] s
00-19	Jog Acceleration Time
Range	[0.1~25.5] s
00-20	Jog Deceleration Time
Range	[0.1~25.5] s

The JOG function is operational by using the multi-function input terminals S1 to S5 and setting the relevant parameters 03-00~03-04 to [6] JOG FWD or [7] JOG REV. Refer to parameter group 3.

01-V/F command group	
01- 00	**Volts/Hz Patterns (V/F)**
Range	[1-7]

Set 01-00 to one of the following preset V/F selections [1~6] according to the required application. Parameters 01-02~01-09 are not applicable.
Six fixed V/F patterns are shown below. [1~3] For 50 Hz systems and [4~6] for 60 Hz.

TYPE	50Hz		60Hz	
Function	01-00	V/F pattern	01-00	V/F pattern
General use	= [1]		= [4]	
High start torque	= [2]		= [5]	
Decreasing torque	= [3]		= [6]	

(V) 100% is the maximum output voltage. B, C point preset % settings will be as table below

01-00	B (Xb)	C (Xc)
1/4	10%	8%
2/5	15%	10.5%
3/6	25%	7.7%

Setting 01-00 = [7] provides a flexible V/F curve which can be selected by experienced users by setting parameters (01-02~01-09).

01- 01	V/F Maximum voltage
Range	200: [198.0~256.0] V 400: [323.0~528.0] V
01-02	Maximum Frequency
Range	[0.20~599.00] Hz
01-03	Maximum Frequency Voltage Ratio
Range	[0.0~100.0] %
01-04	Medium Frequency 2
Range	[0.10~599.00] Hz
01-05	Medium Frequency Voltage Ratio 2
Range	[0.0~100.0] %
01-06	Medium Frequency 1
Range	[0.10~599.00] Hz
01-07	Medium Frequency Voltage Ratio 1
Range	[0.0~100.0] %
01-08	Minimum Frequency
Range	[0.10~599.00] Hz
01-09	Minimum Frequency Voltage Ratio
Range	[0.0~100.0] %

Max output frequency depends on parameter 01-00, for 01-00= [7] it can be set by parameter 01-02.
Maximum output frequency = 50.00 hz or 60.00 hz when preset V/F patterns are selected 01-00≠7.
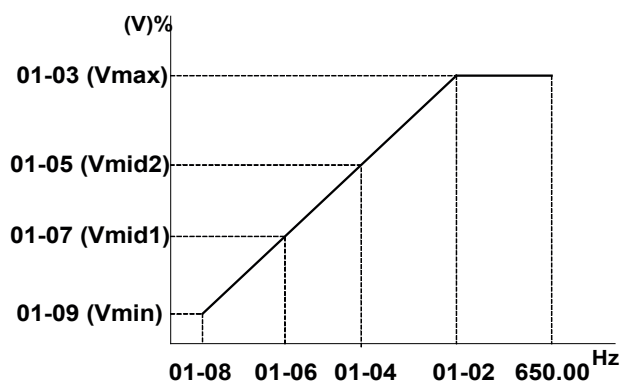
01-10	Volts/Hz Curve Modification (Torque Boost)
Range	[0~10.0] s

Inverter output V/F curve settings for points B, C can be adjusted by parameter 01-10 to improve the output torque.
Calculation of B, C point voltage: B point voltage = X_b × maximum output voltage, C point voltage = X_c × maximum output voltage (X_b, X_c see Page 4-26). When 01-10 = 0, the torque improvement is disabled.
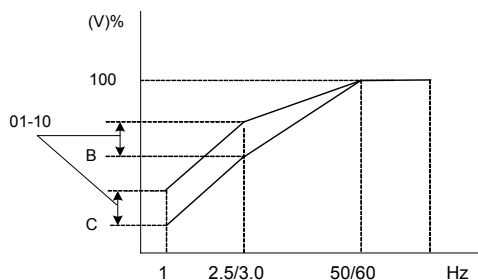
01-11	V/F start Frequency
Range	[0.00~10.00] Hz

V/F Start frequency is for occasion where start frequency higher than zero Hz is needed.

01-12	No-load oscillation suppression gain
Range	[0.00~200.0] %

If the control mode is set to V/F control and the motor is operating under light load conditions with a running frequency below 10Hz, there is the possibility that the motor shaft oscillates caused by the current instability. Appropriately adjusting parameter 01-12 can suppress this effect. Compensation is based on the percentage of the load current corresponding to the motor rated current. The adjustment can be increased or decreased in steps of 5% to 10%.

01-13	Motor Hunting Prevention Coefficient
Range	[1~8192]
01-14	Motor Hunting Prevention Gain
Range	[0~100]%
01-15	Motor Hunting Prevention Limit
Range	[0.0~100.0]%

- In V/F control mode under light load conditions, there is the possibility that the motor shaft oscillates caused by the current instability. Appropriately adjusting parameter 01-14 can suppress this effect by compensating the V/F voltage command. Compensation is based on manipulation of the load current then adding the result is added to the V/F output voltage as shown in the diagram. The load current is manipulated by a high pass filter (adjustable by parameter 01-13) then multiplied by a gain (Adjustable by parameter 01 14) and limited by parameter 01-15. Note parameter 01-14 can be increased or decreased in steps of 5% to 10%.

- In V/F control mode under light load conditions, there is the possibility that the motor shaft oscillates caused by the current instability. Appropriately adjusting parameter 01-14 can suppress this effect by compensating the V/F voltage command. Compensation is based on manipulation of the load current then adding the result is added to the V/F output voltage as shown in the diagram. The load current is manipulated by a high pass filter (adjustable by parameter 01-13) then multiplied by a gain (Adjustable by parameter 01-14) and limited by parameter 01-15. Note parameter 01-14 can be increased or decreased in steps of 5% to 10%.

- The high pass filter time constant is calculated by dividing 2048 with parameter 01-13. The default value of parameter 01-13 is 800, therefore the default time constant is 2048/800 = 2.56ms.

- Parameter 01-15 range: 100% corresponds to 150V (for 100, 200V series) and 300V (for 400V series)
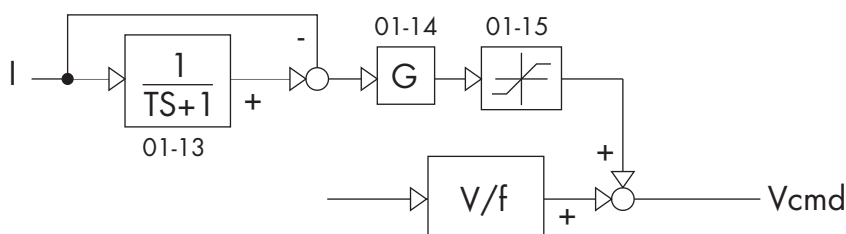
01- 16	Auto-Torque Compensation Filter Coefficient
Range	[0.1 ~ 1000.0]ms
01- 17	Auto-torque Compensation Gain
Range	[0~ 100]%
01- 18	Auto-torque Compensation Frequency
Range	[1.30 ~ 5.00]Hz

- In V/F control mode, auto torque compensation can only be achieved with parameters 01-16 to 01-18. The compensation is based on the calculation of V/F maximum output voltage and the load current. Parameter 01-17 can be increased or decreased in steps of 5% to 10%.
  Note: for these parameters to become effective, motor auto-tuning should be performed beforehand so that the drive knows the value of the motor stator resistor.

- In SLV mode, the user does not need to adjust these parameters because the auto-tuning (parameter 02-07) will get the value of motor parameter.

Auto compensation Frequency (Hz)
01-18
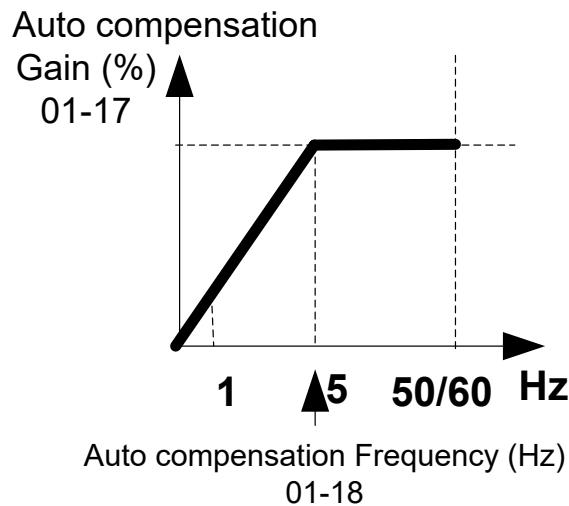
02-Motor parameter group

02-00	Motor no load current
Range	----
02-01	**Motor rated current**
Range	----
02-02	**Motor rated slip compensation**
Range	[0.0~100.0] (%)

When the load causes the actual motor speed to be reduced below the speed set by inverter output frequency (Slip) , parameter 02-02 slip compensation can be used to correct the speed.

$$\text{Slip compensation boost} = \frac{\text{Output Current} - (02\text{-}00)}{(02\text{-}01) - (02\text{-}00)} \times (02\text{-}02) \times \text{Rate motor slip}$$

Motor slip= Motor synchronous speed-motor rated speed

$$(02\text{-}02)\text{approximate Value} = \frac{\text{Motor synchronization speed} - \text{Rated speed}}{\text{Motor synchronization speed}}$$

Example: 4 poles, 60Hz induction motor synchronization speed$= \frac{120}{4} \times 60 = 1800 (RPM)$

Note: 02-00/02-01 differs with the inverter capacities (13-00), it should be regulated according to actual conditions.

02-03	Motor rated speed
Range	----

Slide compensation limit, inverter will calculate the motor slide according to 02-03. V/F slid compensation will not be higher than 02-03
Note: Please set the value according to motor's nameplate.

02-04	Motor rated voltage
Range	----

In order to prevent the output voltage of inverter is too high. The output voltage value will not be higher than 02-04. 02-04 can be changed during operation.
Note: Please set the value according to motor's nameplate.

02-05	Motor rated Power
Range	[0~22.0]kW
02-06	**Motor rated Frequency**
Range	[0~599.0]kW
02-07	**Motor Auto tunning**
Range	[0]Disable

When inverter executes auto tuning function, Fmax value sets by 02-06
When inverter does not execute auto tuning function, Fmax value sets by 01-02

02-08	Stator Resistor Gain
Range	-----
02-09	Stator Resistor Gain
Range	-----

Auto tune function in SLV mode. 00-00=[1]
- Set motor parameters 02-01 and 02-03~02-06, then set 02-07 to [1] to start the auto tune function.
- During the Auto tune function the display will show AT and show END briefly when auto tune is completed then the display will return to the frequency display.
- Following an auto tune the motor test data are stored in parameters 02-08 & 02-09 then the setting in 02-07 will automatically reset to 0.

Notes:
- Carry out Auto tune again whenever replacing the motor.
- Auto tune function is not possible for applications with multi-motor connected to one inverter.
- Auto tune can be used on motors of equivalent size to the inverter or one size smaller(or one size bigger). Just need to set the motor parameter and set 02-07 to be 1.
- Parameters 02-00 ~ 02-06 are available both for V/F & SLV mode (Except parameter 02-02 which is for V/F).

02-13	SLV Slip Compensation Gain
Range	[0~200]%
02-14	SLV Torque Compensation Gain
Range	[0~200]%

SLV Slip compensation
- When the load causes the actual motor speed to be reduced below the speed set by inverter output frequency (Slip), parameter 02-13 SLV Slip compensation can be used to correct the speed.

SLV Torque compensation:
- When torque is reduced due to load conditions, parameter 02-14 can be used to correct the torque. Torque producing current adjusted to compensate for the reduced torque.
- 02-13, 02-14 compensation is based on the load current. The unit of 02-13 is based on rated slip frequency; The unit of 02-14 is based on rated torque difference.
- The adjustment for 01-14 can be increased or decreased every time about 5% to 10

02-15	Low Frequency Torque Gain
Range	[0~100]%

Inverter of dead zone (IGBT on short) will lower the torque of output in the system, leading to lower motor efficiency. Setting 02-15 can not only reduce this situation but also increase torque of output in low frequency. Default setting is 50, means 50% voltage compensation. 100% of 02-15 according to output voltage that is less affected by dead zone.

02-16	SLV Without Load Slip Compensation Gain
Range	[0~200]%
02-17	SLV With Load Slip Compensation Gain
Range	[0~200]%

- 1. When output current <= 02-00 (Motor current without load)
  Slip compensation gain :
  = [SLV slip compensation gain(02-13)]* [Normal Duty slip compensation gain (02-16)]
- 2. When output current > 02-00 (Motor current with load)
  Slip compensation gain:
  = [SLV slip compensation gain(02-13)] * Slip compensation gain 1(as bellowed figure)
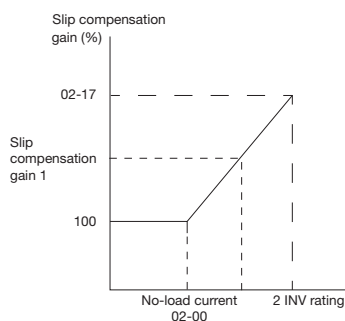
02-18	SLV With Load Torque Compensation Gain
Range	[0~200]%

Please refer the contents as parameter 02-13/02-14

02-19	SLV Slip Compensation Select
Range	0: Slip Compensation Select 1 1:Slip Compensation Select 2

- When output current lower or equal to 02-00(no load), the value of slip compensation will be equal to (02-13)*(02-16)(slip compensation select 1)
- When output current higher than 02-00(with load), the value of slip compensation will be equal to (02-13)*(02-17)(slip compensation select 2)

Note: If inverter worked at lower speed with load, please use slip compensation select 2

03-External digital inputs & realy output functions

03-00	**Multifunction Input Term. S1**
03-01	**Multifunction Input Term. S2**
03-02	**Multifunction Input Term. S3**
03-03	**Multifunction Input Term. S4**
03-04	**Multifunction Input Term. S5**
Range	[0]: Forward/Stop command------------------------------ (Parameters 00-02/00-03=1 & 00-04) [1]: Reverse/Stop command------------------------------(Parameters 00-02/00-03=1 & 00-04) [2]: Preset speed 1 (5- 02)---------------------------------- (Parameter group 5) [3]: Preset speed 2 (5- 03)---------------------------------- (Parameter group 5) [4]: Preset speed 4 (5- 05)---------------------------------- (Parameter group 5) [6]: JOG forward command------------------------------- (Parameters 00-18~00-20) [7]: JOG reverse command------------------------------- (Parameters 00-18~00-20) [8]: Up command-- (Parameters 00-05/00-06=4& 03-06/03-07) [9]: Down command--- (Parameters 00-05/00-06=4& 03-06/03-07) [10]: 2nd Acc/Dec times [11]: Disable Acc/Dec [12]: Main/Alternative run source select------------------- (Parameters 00-02/00-03) [13]: Main/Alternative frequency command select------- (Parameters 00-05/00-06) [14]: Rapid stop (controlled deceleration stop) [15]: Base block (coast to stop) [16]: Disable PID function ---------------------------------- (Parameter group 10) [17]: Reset [18]: Enable auto run mode------------------------------- (Parameter group 6)

Various example settings and descriptions for parameters 03-00 to 03-04 are noted in the following pages seconds from 1 to 13.

1) For setting parameters 03-00~03- 04 to [0,1] external Run/Stop control, refer to 00-04.

2-wire method. Mode 1.
Example: FWD/STOP and REV/STOP from two inputs (S1&S2)
Set 00-04= [0], S1: 03- 00= [0] (FWD/STOP) , S2: 03-01= [1] (REV/STOP);
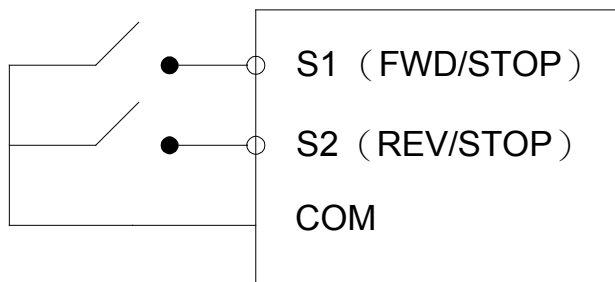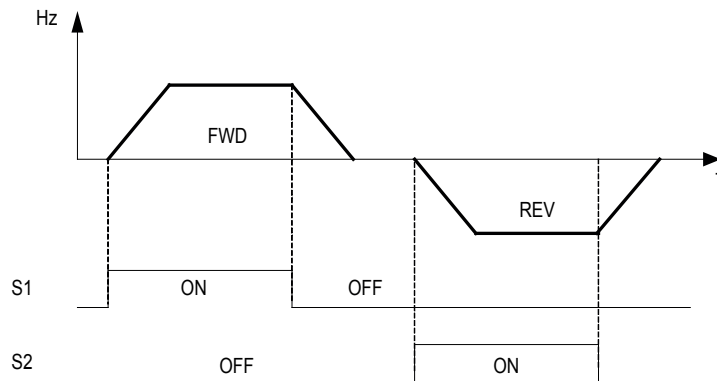
Note: If both forward and reverse commands are ON, it will be treated as a STOP

2-Wire method. Mode 2.
Example: RUN/STOP and REV/FWD from two inputs (S1&S2)
Set 00-04= [1]; S1: 03-00= [0] (RUN/STOP); S2: 03-01= [1] (REV/FWD);
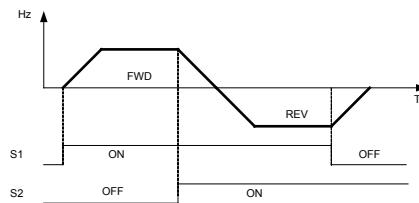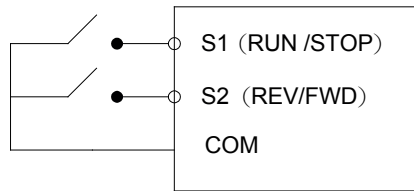
3-Wire method.
Example: Two separate push buttons for RUN & STOP and a two position switch for FWD/REV
Set 00-04=2. (3 wire control mode), then terminals S1, S2 and S3 are dedicated to this function and preset selections for parameters 03-00, 03-01 and 03-02 are not relevant.
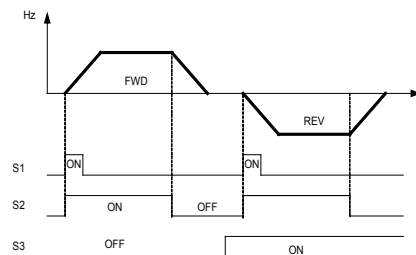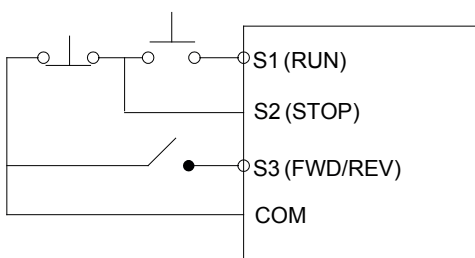
2) Parameters 03-00~03-04= [4, 3, 2] Preset speed selections.

Combination of any three terminals from S1~S5 can be used to select preset speed 0 to 7 according to the table below.
Preset speed 0-7 and the related acceleration/decelerating times should be set in parameter group 5. For example timing diagram refer to group 5 description.

Preset speed	Function setting and state of any three (A, B, C) of terminal S1~S5			Frequency	Acc-time	Dec-time
	terminal A=4	terminal B=3	terminal C=2			
speed 0	OFF	OFF	OFF	05-01	05-17	05-18
speed 1	OFF	OFF	ON	05-02	05-19	05-20
speed 2	OFF	ON	OFF	05-03	05-21	05-22
speed 3	OFF	ON	ON	05-04	05-23	05-24
speed 4	ON	OFF	OFF	05-05	05-25	05-26
speed 5	ON	OFF	ON	05-06	05-27	05-28
speed 6	ON	ON	OFF	05-07	05-29	05-30
speed 7	ON	ON	ON	05-08	05-31	05-32

3) 03-00~03-04= [6, 7] Forward/Reverse JOG
When an input terminal is set to function [6] and is turned on, inverter will work in jog forward mode. When an input terminal is set to function [7] and is turned on, inverter will work in jog reverse mode. Note: if jog forward and jog reverse function is enabled at the same time, inverter will enter stop mode.

4) 03-00~03-04= [8, 9] UP/DOWN
When an input terminal is set to function [8] and is turned on, frequency command is increased according to the UP/DOWN, increment/decrement step set in parameter 03-06. If the input is kept on continuously, the frequency command increases accordingly until the upper frequency limit is reached.

When an input terminal is set to function [9] and is turned on, frequency command decreases according to the UP/DOWN increment/decrement step set in parameter 03-06. If the input is kept on continuously, the frequency command decreases accordingly and in relation to settings for parameter 03-06 and 3-07 until zero speed is reached. Refer to group 3 parameter description.

5) 03-00~03-04= [10] 2nd Acc/Dec time
When an input terminal is set to function [10] and is turned on, the actual acceleration and deceleration time will be according to the time for 2nd Accel/Decel set in parameters 00-16 and 00-17. If the input is turned off, the acceleration and deceleration times will be according to the default accel/decal 1 set in parameters 00-14 & 00-15.

6) 03-00~03-04= [11] Disable Acc/Dec function
When an input terminal is set to function [11] and is turned on, acceleration and deceleration function will be disabled and the frequency at the time is maintained. (constant speed mode)
If the input is turned off, acceleration and deceleration function is enabled again.
For an example see the following diagram.
Accel/Decel & Enable/Disable timing diagram using terminal S1 and parameter 03-00= 11.
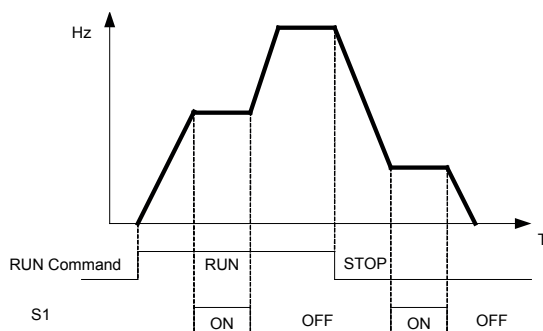
7) 03-00~03-04= [12] Main/Alternative run source select.
When an input terminal is set to function [12] and is turned on, the run command source is according to parameter 00-03 (alternative run source). If the Input is off it will be according to 00-02 (main run source).

8) 03-00~03-04= [13] Main/Alternative frequency source select
When an input terminal is set to function [13] and is turned on, the frequency source is according to parameter 00-06 (alternative frequency source). If the Input is off it will be according to 00-05 (main frequency source).

9) 03-00~03-04= [14] Rapid stop (controlled deceleration stop)
When DI is on, keypad shows "E.S", motor decelerates to stop according to the setting value of 00-17. When turning off DI (remove ES), RVLF stays in "stop" status. RVLF runs again after giving Run command.

10) 03-00~03-04= [15] Base Block (Coast to stop)
When DI is on, keypad shows "b.b", motor free runs to stop. When turning off DI (remove b.b), RVLF starts running from 5Hz below the set frequency to 5Hz above the set frequency, then setting in set frequency.

11) 03-00~03-04=[16] Disable PID function.
When an input terminal is set to function [16] and is turned on, PID functions is disabled, if it is turned off, PID function is enabled again.

12) 03-00~03-04= [17] Reset
When a failure that can be manually reset occurs, turn on a terminal with function [17], the failure will be reset. (same function as the reset button on keypad).

13) 03-00~03-04= [18] Auto Run Mode
When an input terminal is set to function [18], the programmable auto-sequencer function is enabled, refer to description of parameter group 6.

03-06	Up/Down frequency step
Range	[0.00~5.00] Hz

Example [S1] 03-00= [8] up frequency command, S2:03-01= [9] down frequency command, 03- 06= [Δ] Hz
Mode1: If UP or DOWN input terminals are turned on for less than 2 seconds, for every On operation frequency changes by Δ Hz.
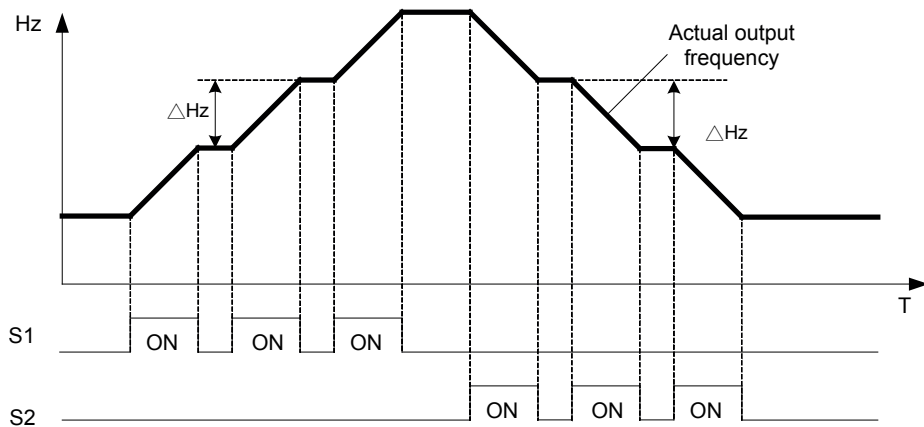
Mode 2: If UP or DOWN input terminals are turned on for more than 2 seconds, the original UP/ DOWN mode is restored output frequency ramps up or down as long as the input is kept ON. As shown in the diagram below.
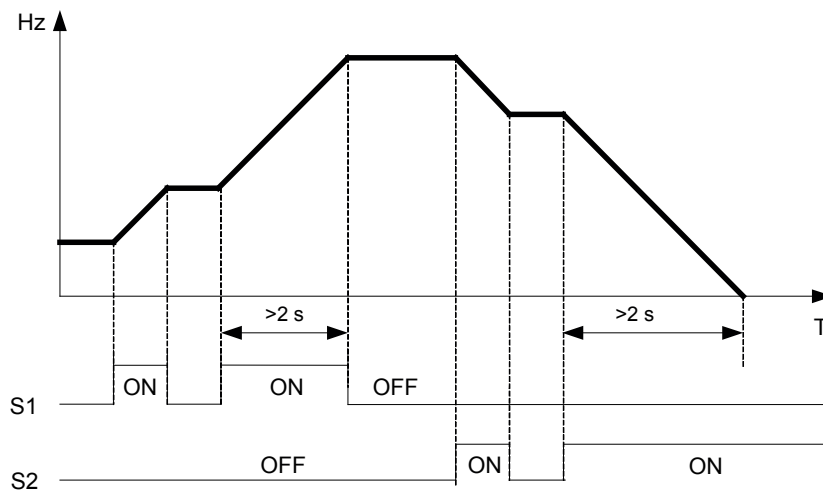
03-07	Up/Down keep frequency status after a stop command
Range	[0]: After a stop command in Up/Down mode, the preset frequency is held as the inverter stops, and the UP/Down function is disabled. [1]: After a stop command in Up/Down mode, the preset frequency is reset to 0 Hz as the inverter stops. [2]: After a stop command in Up/Down mode, the preset frequency is held as the inverter stops, and the UP/Down function remains enabled.

03-07= [0], [2] when run signal is removed (stop command), the output frequency is stored in parameter 05-01 (key pad frequency).
03-07= [0] in stop mode since frequency can not be increased or decreased from Up/Down terminals then keypad can be used to change the frequency by modifying parameter 05-01.

03-07= [1] in Up/down frequency mode inverter will ramp up from 0Hz on run command and ramp down to 0 Hz on stop command.

03-08	Multifunction terminals S1~S5 scan time
Range	[1~400] ms

Multifunction input terminal On/Off periods will be scanned for the number of cycles according to the set value in parameter 03-08. If the signal status for on or off period is less than the set period it will be treated as noise.

Scan period unit is 1ms.

Use this parameter if unstable input signal is expected, however setting long scan time periods results in slower response times.

03-09	S1~S5 Input type selection NO & NC
Range	[xxxx0]: S1 NO [xxxx1]: S1 NC [xxx0x]: S2 NO [xxx1x]: S2 NC [xx0xx]: S3 NO [xx1xx]: S3 NC [x0xxx]: S4 NO [x1xxx]: S4 NC [0xxxx]: S5 NO [1xxxx]: S5 NC

(NO) Normally open, (NC) normally closed. Select as required.

For selecting normally open (NO) or normally closed (NC) set the relevant digit in parameter 03-09 to 0 or 1 as required.

Set parameter 03-09 first before you use the parameters 00-02/00-03=1 to set the inverter run mode to external multifunction inputs.

03-11	Multifunction Output Relay RY1 functions. (Terminals RB, RA)
Range	[0]: Run [1]: Fault [2]: Setting frequency reached --- (refer to 03-14) [3]: Frequency reached (3-13±3-14) ----------------------------------- (refer to 03-13/03-14) [4]: Output frequency detection 1 (> 03-13) -------------------------- (refer to 03-13) [5]: Output frequency detection 2 (< 03-13) -------------------------- (refer to 03-13) [6]: Auto-Restart [7]: Momentary AC power loss--- (refer to 07-00) [8]: Rapid stop (decelerate to stop) [9]: Base Block [10]: Motor overload protection (OL1) [11]: Drive overload protection (OL2) [12]: Reserved [13]: Output current reached --- (refer to 03-15/03-16) [14]: Brake control-- (refer to 03-17/03-18)
03-13	**Frequency Detection Level**
Range	[0.00~650.00] Hz
03-14	**Frequency Detection Width**
Range	[0.00~300.00] Hz

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Output relay RY1. Function descriptions:
1) 03-11 =[0]. RY1 will be ON with run signal.
2) 03-11 =[1]. RY1 will be ON with inverter faults.
3) 03-11 =[2]. RY1 will be ON when output frequency reached setting frequency.

When Output Freq. = Setting Frequency – Frequency Detection Width (03-14), Relay Output will be ON.
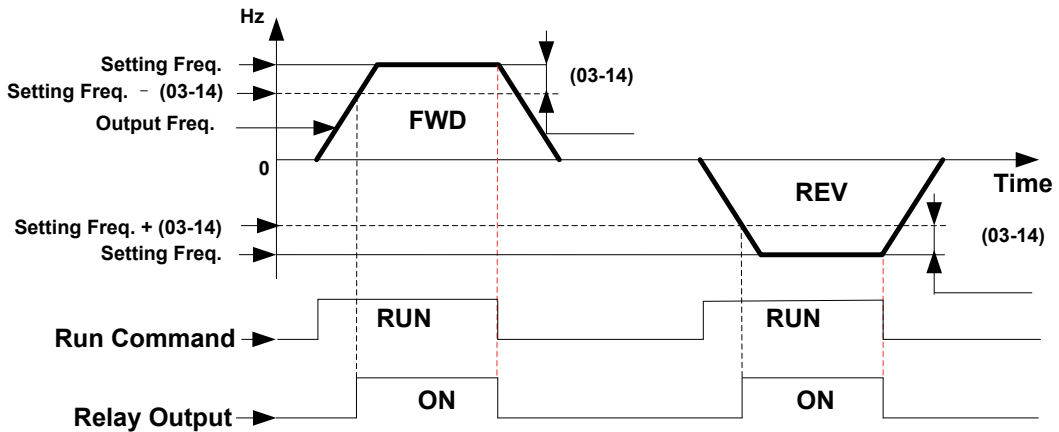
Example: Setting freq. = 30, and frequency detection width (03-14)=5,
Relay will be ON when output frequency reached 25Hz to 30Hz and run command is on (allowable tolerance ±0.01).

4) 03-11= [3] RY1 will be ON when setting freq. and output frequency reached (03-13 +/- 03-14).

When Frequency Detection Range Lower Limit**<Setting Freq.<**Frequency Detection Range Upper Limit
And, Frequency Detection Range Lower Limit**<Output Freq.<**Frequency Detection Range Upper Limit，
Relay output will be ON（**Allowable tolerance ±0.01**）
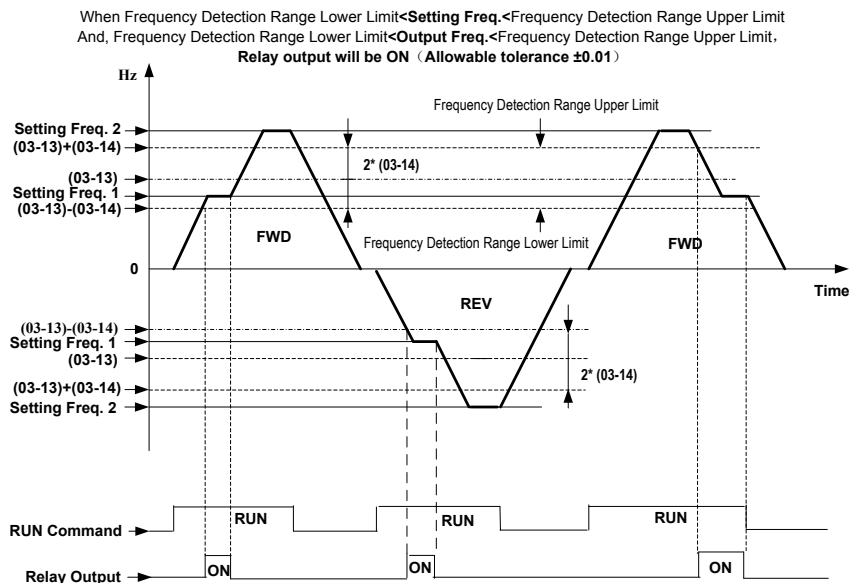
Example: Frequency detection level (03-13) =30, and frequency detection width (03-14) =5 cause frequency detection range upper limit = 35, and frequency detection range lower limit = 25. So RY1 will be on when setting freq. and output freq. are both under these limits; on the other hand, RY1 will be off when setting freq. and output freq. are not under these limits either.

5) 03-11= [4] RY1 will be on while output freq. > frequency detection level (03-13)

When Output Freq.> (03-13), Relay output will be ON.
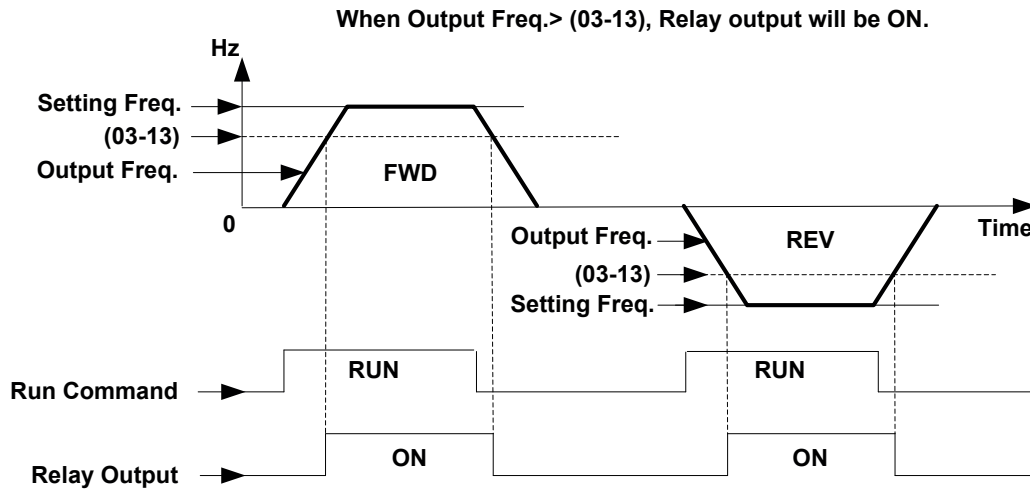
6) 03-11= [5] RY1 will be on while output freq. < frequency detection level (03-13).

When Output freq. < (03-13), Relay output will be ON.
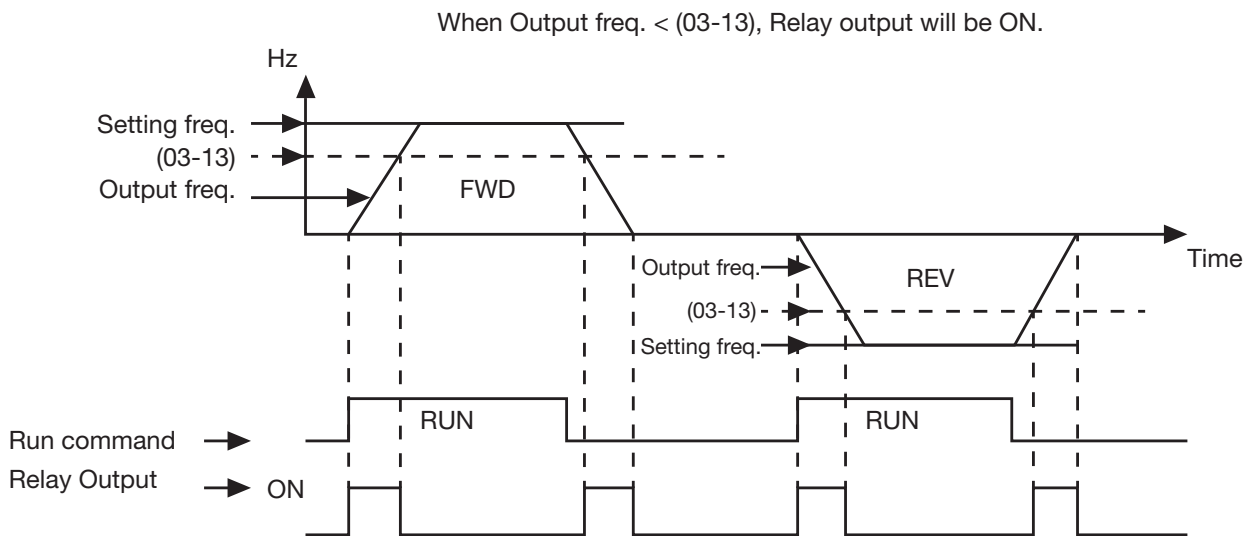
03-15	Output Current Detection Level
Range	[0.1~999.9] A
03-16	Output Current Detection Period
Range	[0.1~10.0] s

03-11= [13].RY1 will be on as soon as the output current value > output current detection level (03-15).
03-15: Setting range (0.1~15.0 Amps) as required according to the rated motor current.
03-16: Setting range (0.1~10.0) unit: seconds.
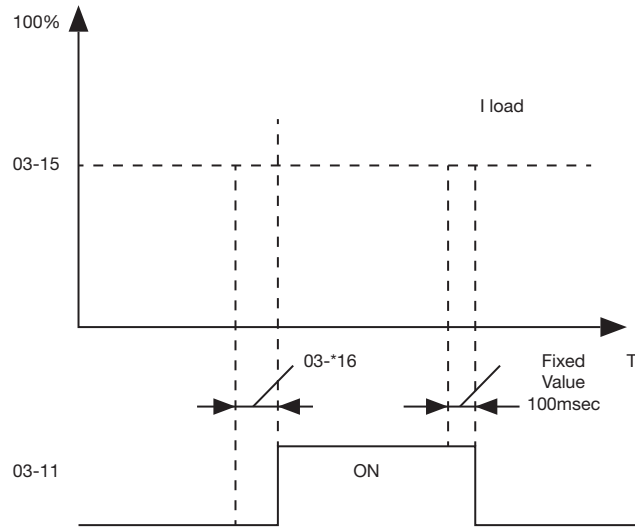
03-17	**Brake Release Level**
Range	[0.00~20.00] Hz
03-18	**Brake Engage Level**
Range	[0.00~20.00] Hz

If 03-11 = [14]

In accelerating mode. RY1 will be ON as soon as the actual output frequency reaches the external brake release level set in parameter 03-17.

In decelerating mode, RY1 will be OFF as soon as the actual output frequency reaches the external brake engage level set in parameter 03-18.

Timing diagram for 03-17 < 03-18 is shown below:
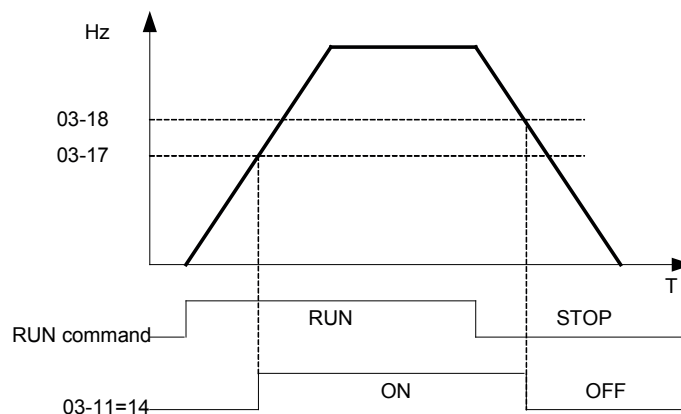
Timing diagram for 03-17 > 03-18 is shown below:
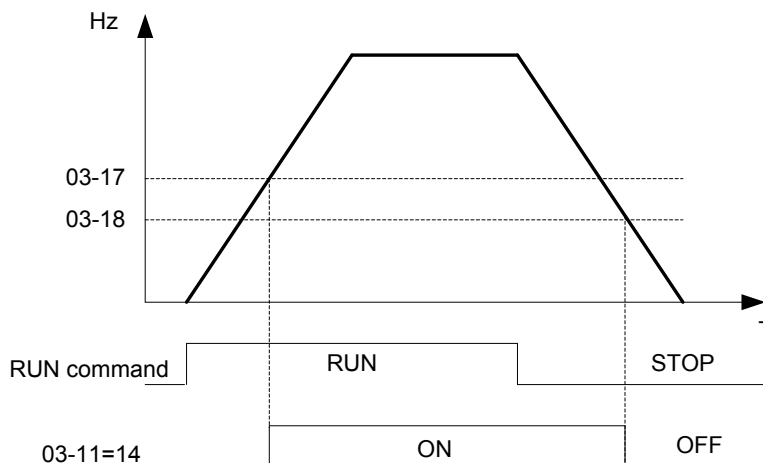
03-19	Relay Output Status type
Range	[0]: A (Normally open) [1]: A (Normally close)

03-20	Brake Transistor ON Level
Range	100V/200V:[240.0~400.0]VDC 400V:[500.0~800.0]VDC
03-21	Brake Transistor OFF Level
Range	100V/200V:[240.0~400.0]VDC 400V:[500.0~800.0]VDC

When DC bus voltage >03-20, Excess voltage will be applied to the external brake resistor.
When DC bus voltage <= 03-21, Braking transistor will be switched off.
Do not set 03-21 > 03-20, or display will show Err2, which means parameter setting error.

04- External analog signal input / output functions

04-00	Analog Voltage & Current input selections
Range	AVI ACI [0]: 0~10V 0~20mA [1]: 0~10V 4~20mA [2]: 2~10V 0~20mA [3]: 2~10V 4~20mA

Analog Input Scaling formulas:

AVI (0~10V), ACI (0~20mA)

AVI (0~10V): $F\,(Hz) = \dfrac{V(v)}{10(v)} \times (00\text{-}12)$

ACI (0~20V): $F\,(Hz) = \dfrac{I(mA)}{20(mA)} \times (00\text{-}12)$

AVI (2~10V), ACI (4~20mA)

AVI (2~10V): $F\,(Hz) = \dfrac{V - 2\,(v)}{10 - 2\,(v)} \times (00\text{-}12),\ V >= 2$

ACI (4~20V): $F\,(Hz) = \dfrac{I - 4\,(mA)}{20 - 4\,(mA)} \times (00\text{-}12),\ I >= 4$

04-01	AVI Signal verification Scan Time
Range	[1~400] ms
04-02	AVI Gain
Range	[0~1000]%
04-03	AVI Bias
Range	[0~100]%
04-04	AVI Bias Selection
Range	[0]: Positive [1]: Negative
04-05	AVI Slope
Range	[0]: Positive [1]: Negative
04-06	ACI signal verification Scan Time
Range	[1~400] ms
04-07	ACIGain
Range	[0~1000]%
04-08	ACI Bias
Range	[0~100]%
04-09	ACI Bias Selection
Range	[0]: Positive [1]: Negative
04-10	ACI Slope
Range	[0]: Positive [1]: Negative

Set 04-01 and 04-06 for analog signal verification.

Inverter reads the average values of A/D signal once per (04- 01/04- 06 x 1ms).

Set scan intervals according to the application and with consideration for signal instability or interference effects on the signal by external sources. Long scan times will result in slower response time.

AVI. Analog voltage input scaling examples by adjusting gain, bias & slope parameters (04-02~04-05).

(1) Positive Bias type (04-04= 0) and effects of modifying Bias amount by parameter 04-03 and slope type with parameter 04-05 are shown in Fig 1 & 2.

	04-02	04-03	04-04	04-05
A	100%	50%	0	0
B	100%	0%	0	0

	04-02	04-03	04-04	04-05
C	100%	50%	0	1
D	100%	0%	0	1
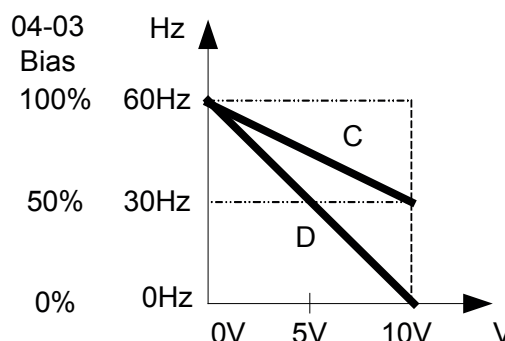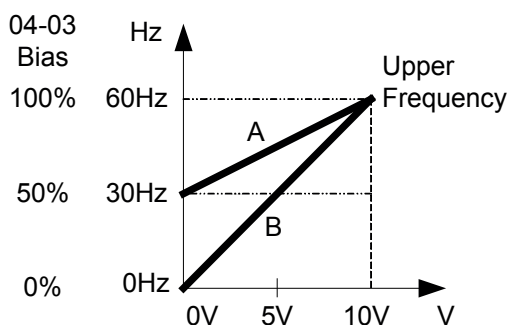
(2) Negative Bias type and effects of modifying Bias amount by parameter 04-03 and slope type with parameter 04-05 are shown in Fig 3 & 4.

Figure 3:

	04-02	04-03	04-04	04-05
E	100%	20%	1	0
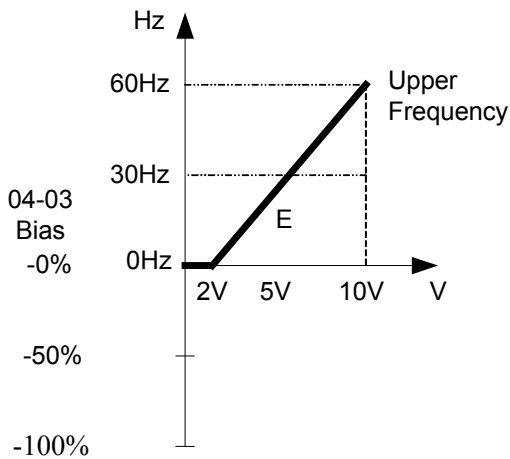
Figure 4:

	04-02	04-03	04-04	04-05
F	100%	50%	1	1
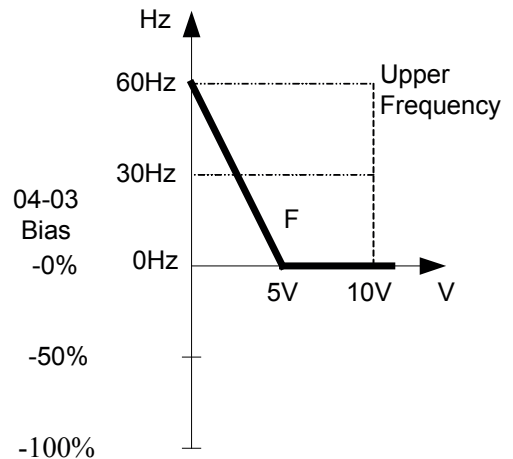
(3) Offset Bias set to 0% (04-03) and effect of modifying analog gain (04-02), Bias type (04-04) and slope type (04-05) are shown in shown Fig 5 & 6.

Figure 5:

	04-02	04-03	04-04	04-05
A	50%	0%	0/1	0
B	200%	0%	0/1	0
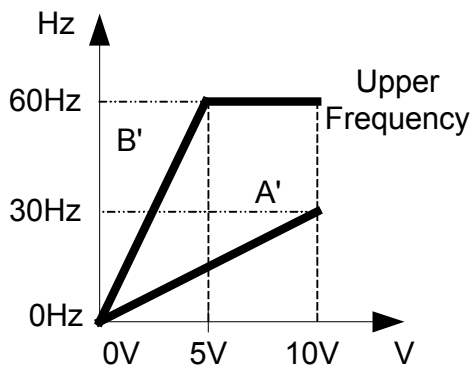
Figure 6:

	04-02	04-03	04-04	04-05
C'	50%	0%	0/1	1
D'	200%	0%	0/1	1
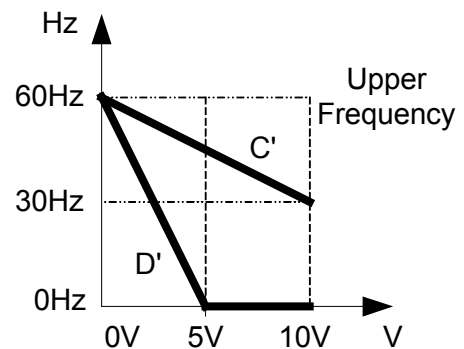
(4) Various other examples of analog input scaling and modification are shown in following figures 7, 8, 9 & 10.

Figure 7:

	04-02	04-03	04-04	04-05
A	50%	50%	0	0
B	200%	50%	0	0

Figure 8:

	04-02	04-03	04-04	04-05
C	50%	50%	0	1
D	200%	50%	0	1
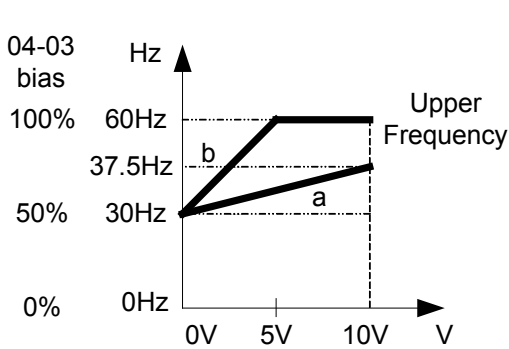
Figure 9:

	04-02	04-03	04-04	04-05
E	50%	20%	1	0
F	200%	20%	1	0
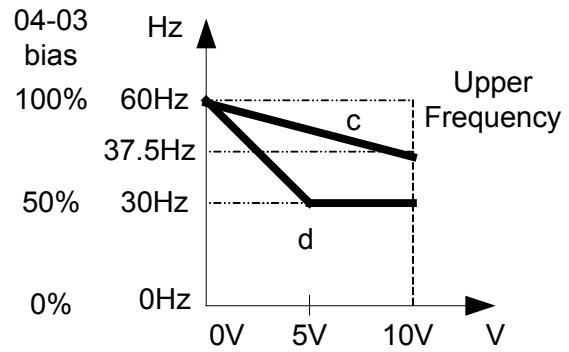
Figure 10:

	04-02	04-03	04-04	04-05
G	50%	50%	1	1
H	200%	0%	0	1
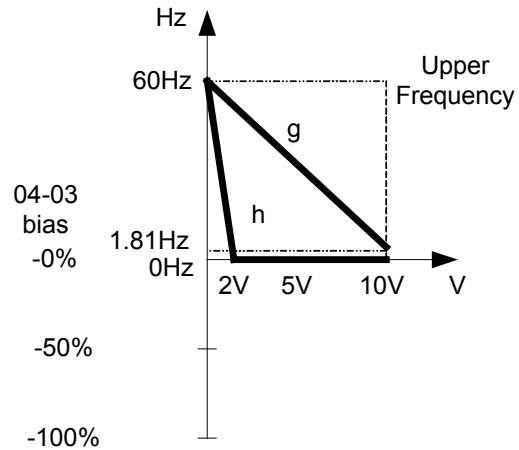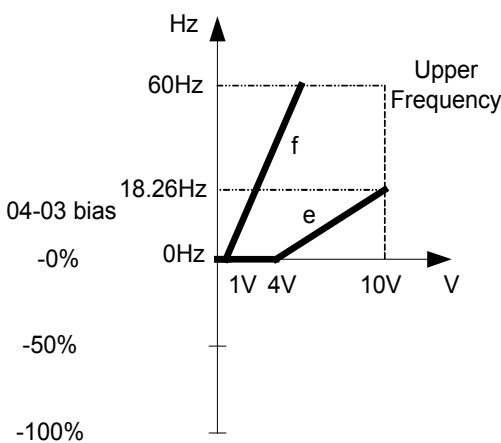
04-11	Analog Output (AO) function selection.
Range	[0]: Output frequency [1]: Frequency setting [2]: Output voltage [3]: DC Bus voltage [4]: Output current

Example: Set 04-11 required according to the following table.
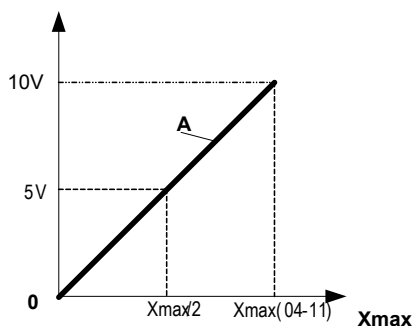
04-11	A	Xmax
[0]	Output frequency	Upper frequency limit
[1]	Frequency setting	Upper frequency limit
[2]	Output voltage	Motor rated voltage
[3]	DC Bus voltage	220V: 0~400V
[4]	Output current	2 times rated current of inverter

04-12	AO Gain
Range	[0~1000]%
04-13	AO Bias
Range	[0~100]%
04-14	AO Bias Selection
Range	[0]: Positive [1]: Negative
04-15	AO Slope
Range	[0]: Positive [1]: Negative

- Select the analog output type for the multifunction analog output on terminal (TM2) as required by parameter 04-11. Output format is 0-10V dc. The output voltage level can be scaled and modified by parameters 04-12 to 04-15 If necessary.
- The modification format will be same as the examples shown previously for analog voltage Input (AVI) parameters 4-02 to 4-05.

Note: the max output voltage is 10V due to the hardware of the circuit.

Use external devices that require a maximum of 10V dc signal.

04-16	Potentiometer on Keypad Gain
Range	[0~1000]%
04-17	Potentiometer on Keypad Bias
Range	[0~1000]%
04-18	Potentiometer on Keypad Bias Selection
Range	[0~1000]%
04-19	Potentiometer on Keypad Slope
Range	[0~1000]%

05- Preset Frequency Selections.

05-00	Preset Speed Control mode Selection
Range	[0]: Common Accel/Decel. [1]: Individual Accel/Decel for each preset speed 0-7.

05-01	Preset Speed 0 (Keypad Freq)
05-02	Preset Speed 1
05-03	Preset Speed 2
05-04	Preset Speed 3
05-05	Preset Speed 4
05-06	Preset Speed 5
05-07	Preset Speed 6
05-08	Preset Speed 7
Range	[0.00 ~ 599.00] Hz
05-17	Preset Speed 0 Acceleration time
05-18	Preset Speed 0 Deceleration time
05-19	Preset Speed 1 Acceleration time
05-20	Preset Speed 1 Deceleration time
05-21	Preset Speed 2 Acceleration time
05-22	Preset Speed 2 Deceleration time
05-23	Preset Speed 3 Acceleration time
05-24	Preset Speed 3 Deceleration time
05-25	Preset Speed 4 Acceleration time
05-26	Preset Speed 4 Deceleration time
05-27	Preset Speed 5 Acceleration time
05-28	Preset Speed 5 Deceleration time
05-29	Preset Speed 6 Acceleration time
05-30	Preset Speed 6 Deceleration time
05-31	Preset Speed 7 Acceleration time
05-32	Preset Speed 7 Deceleration time
Range	[0.1~3600.0] s

- When 05-00= [0] Accel /Decel 1 or 2 set by parameters 00-14/00-15 or 00-16/00-17 apply to all speeds
- When 05-00= [1] Individual Accel/Decel apply to each preset speed 0-7. Parameters 05-17 to 05-32.

Formula for calculating acceleration and deceleration time:

$$\text{Actual Acc time} = \frac{\text{Time of Accel1 or 2 x Preset Frequency}}{\text{Max Frequency}}$$

$$\text{Actual Dec time} = \frac{\text{Time of Accel1 or 2 x Preset Frequency}}{\text{Max Frequency}}$$

- Maximum output frequency = parameter 01-02 when programmable V/F is selected by 01-0=[7].
- Maximum output frequency = 50.00 hz or 60.00 hz when preset V/F patterns are selected. 01-00≠[7]

Example：01- 00≠【7】, 01- 02=【50】Hz, 05- 02=【10】Hz (preset speed1),
05-19=【5】s (Accel time), 05-20=【20】s (Decel time)

$$\text{Preset speed 1 Actual Accel time} = \frac{(05\text{-}19)\text{x}10(\text{Hz})}{01\text{-}02} = 1(s)$$

$$\text{Preset speed 1 Actual Decel time} = \frac{(05\text{-}20)\text{x}10(\text{Hz})}{01\text{-}02} = 4(s)$$

- Multi speed run/stop cycles with Individual accel/decel times. 05-00= [1]
- Two modes are shown below:-
- Mode 1= On/Off run command
- Mode 2= Continuous run command

Mode 1 example: 00-02= [1] (External Run/Stop control).
00-04= [1] (Operation Mode: Run/Stop-Forward/Reverse).
    S1: 03-00= [0] (RUN/STOP);
    S2: 03-01= [1] (Forward/Reverse);
    S3: 03-02= [2] (Preset speed 1);
    S4: 03-03= [3] (Preset speed 2);
    S5: 03-04= [4] (Preset speed 4);
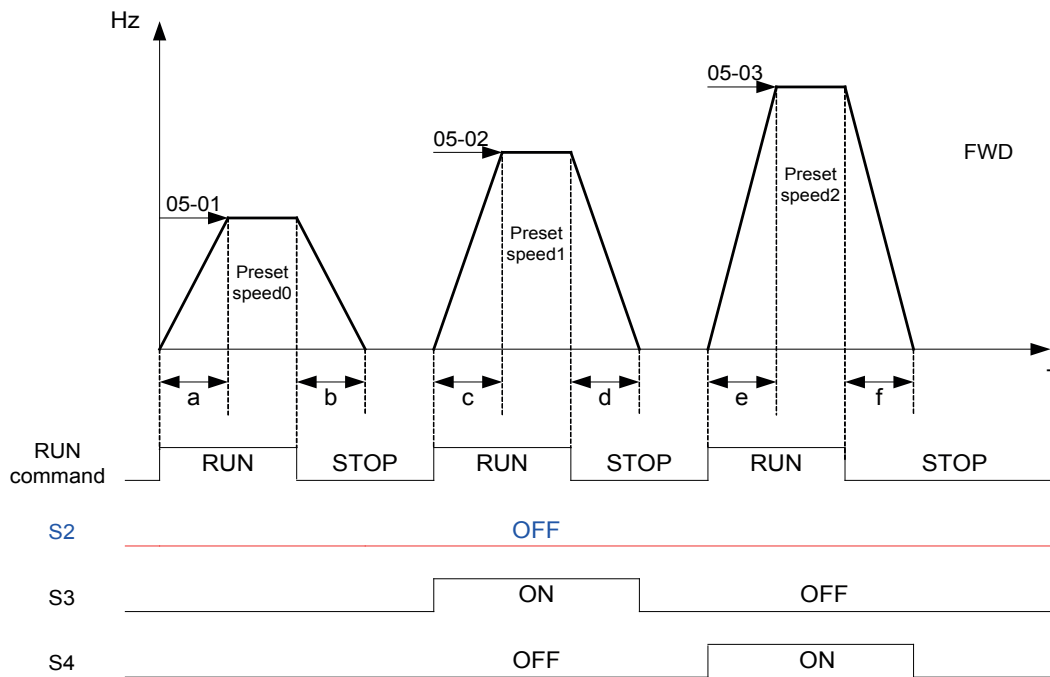
When the run command is On/Off, acceleration and deceleration times for each cycle can be calculated as below:- time unit is in seconds'.

$$a= \frac{(05\text{-}17) \times (05\text{-}01)}{01\text{-}02} \qquad b= \frac{(05\text{-}18) \times (05\text{-}01)}{01\text{-}02} \qquad c= \frac{(05\text{-}19) \times (05\text{-}02)}{01\text{-}02} \qquad d= \frac{(05\text{-}20) \times (05\text{-}02)}{01\text{-}02}$$

- Mode 2 example. Continuous run command.
- Set S1 for continuous run
- Set S2 For forward/reverse direction selection
- Set multi function terminals S3, S4 & S5 for setting three different preset speeds
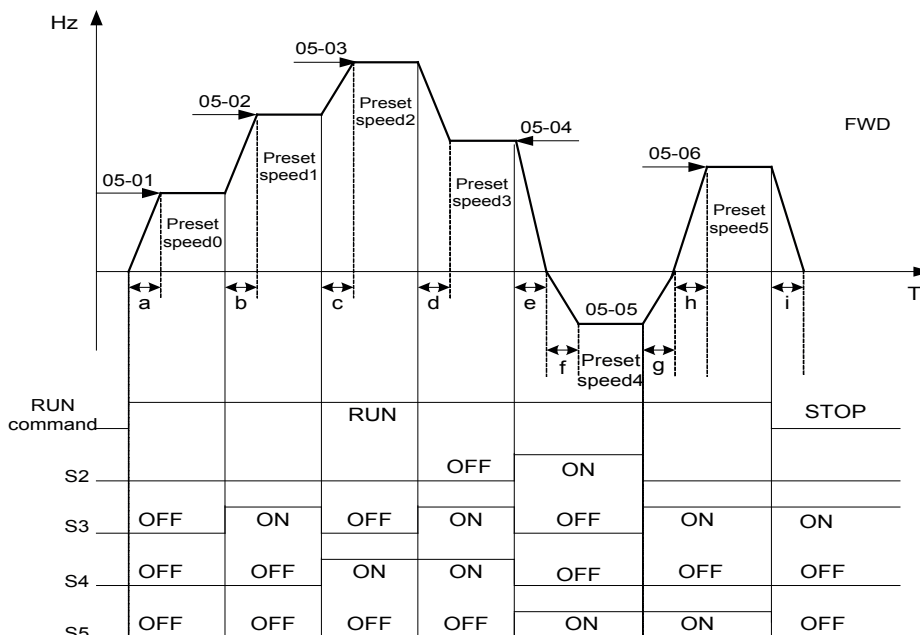
When the run command is continuous, acceleration and deceleration times for each segment can be calculated as below:

$$Ex : a = \frac{(05\text{-}17) \times (05\text{-}01)}{01\text{-}02} \quad , b = \frac{(05\text{-}19) \times [(05\text{-}02)\text{-}(05\text{-}01)]}{01\text{-}02}$$

$$c = \frac{(05\text{-}21) \times [(05\text{-}03)\text{-}(05\text{-}02)]}{01\text{-}02} \quad , d = \frac{(05\text{-}24) \times [(05\text{-}03)\text{-}(05\text{-}04)]}{01\text{-}02}$$

$$e = \frac{(05\text{-}26) \times (05\text{-}05)}{01\text{-}02} \quad , f = \frac{(05\text{-}28) \times (05\text{-}05)}{01\text{-}02} \quad , g = \frac{(05\text{-}27) \times (05\text{-}05)}{01\text{-}02}$$

$$h = \frac{(05\text{-}29) \times (05\text{-}05)}{01\text{-}02} \quad , i = \frac{(05\text{-}32) \times (05\text{-}05)}{01\text{-}02} \quad \ldots\ldots\text{Unit (s)}$$

06- Auto Run (Auto Sequencer) function

06-00	Auto Run (sequencer) mode selection
Range	[0]:Disabled [1]:Single cycle, continues to run from the unfinished step if restarted. [2]:Periodic cycle, continues to run from the unfinished step if restarted. [3]:Single cycle, then holds the speed of final step to run. Continues to run from the unfinished step if restarted. [4]:Single cycle, starts a new cycle if restarted. [5]:Periodic cycle, starts a new cycle if restarted. [6]:Single cycle, then hold the speed of final step to run, starts a new cycle if restarted.

Frequency of the step 0 is set by parameter 05-01 keypad frequency.	
06-01	**Auto Run Mode Frequency Command 1**
06-02	**Auto Run Mode Frequency Command 2**
06-03	**Auto Run Mode Frequency Command 3**
06-04	**Auto Run Mode Frequency Command 4**
06-05	**Auto Run Mode Frequency Command 5**
06-06	**Auto Run Mode Frequency Command 6**
06-07	**Auto Run Mode Frequency Command 7**
Range	**[0.00~599.00] Hz**

06-16	Auto Run Mode Running Time Setting 0
06-17	Auto Run Mode Running Time Setting 1
06-18	Auto Run Mode Running Time Setting 2
06-19	Auto Run Mode Running Time Setting 3
06-20	Auto Run Mode Running Time Setting 4
06-21	Auto Run Mode Running Time Setting 5
06-22	Auto Run Mode Running Time Setting 6
06-23	Auto Run Mode Running Time Setting 7
Range	**[0.00 ~ 3600.0] s**

06-32	Auto Run Mode Running Direction 0
06-33	Auto Run Mode Running Direction 1
06-34	Auto Run Mode Running Direction 2
06-35	Auto Run Mode Running Direction 3
06-36	Auto Run Mode Running Direction 4
06-37	Auto Run Mode Running Direction 5
06-38	Auto Run Mode Running Direction 6
06-39	Auto Run Mode Running Direction 7
Range	**[0]: STOP [1]: Forward [2]: Reverse**

- Auto run sequencer mode has to be enabled by using one of the multifunctional inputs S1 to S5 and setting the relevant parameter 03-00 to 03-04 to selection [18].
- Various auto run (sequencer) modes can be selected by parameter (06-00) as listed above.
- 7 Auto run (sequencer) modes can be selected by parameters (06-01~06-39)
- Auto run frequency commands1 to 7 are set with parameters (06-01~06-07),
- Sequence run times are set with parameters (06-17~06-23)
- FWD/REV direction for each sequence can be set with parameters (06-33~06-39).
- Auto sequence 0, frequency is set from keypad by parameter 05-01, sequence run time and direction are set by parameters 06-16 and 06-32.

Auto RUN (Auto Sequencer) examples are shown in the following pages:-
Example 1.   Single cycle (06-00=1,4)
The inverter will run for a single full cycle based on the specified number of sequences, then it will stop. In this example 4 sequences are set, three in forward direction and one in reverse.

Auto run mode. 06-00=[1] or [4],
Frequency 5-01= [15]Hz, 06-01=[30] Hz, 06-02= [50] Hz, 06-03= [20]Hz
Sequence run time 06-16= [20] s, 06-17 =[25] s, 06-18= [30]s, 06-19= [40] s,
Direction 06-32= [1] FWD, 06-33 = [1] FWD, 06-34= [1] (FWD), 06-35= [2] (REV)
Unused sequence parameters 06-04~ 06-07= [0] Hz , 06-20~06-23= [0] s , 06-36~06-39=[0]
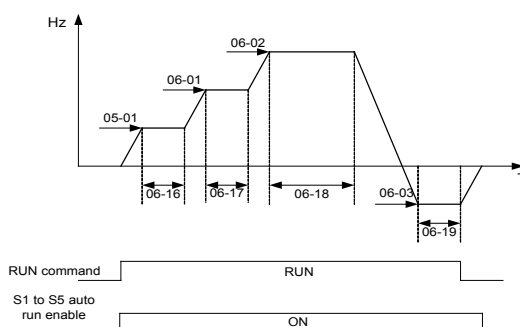
Example 2. Periodic cycle Run.

Mode: 06-00=[2] or [5]
The inverter will repeat the same cycle periodically.
All other parameters are set same as example 1. shown above.
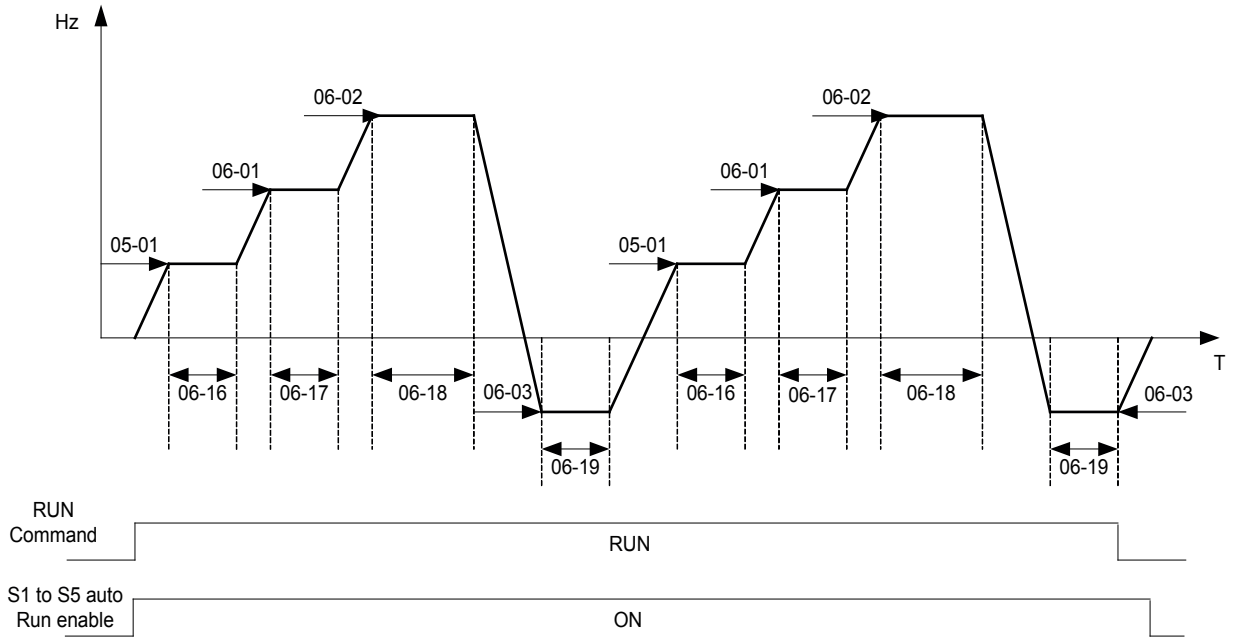
Example 3. Auto Run Mode for Single Cycle 06-00= [3 or 6]

The speed of final step will be held to run.
Auto run mode. 06-00 =[3] or [6]
Frequency 05-01 =[15]Hz, 06-01 =[30]Hz, 06-02=[50]Hz, 06-07=[20]Hz,
Sequence run time 06-16 = [20]s, 06-17= [25]s, 06-18= [30]s, 06-23= [40]s,
Direction 06-32 = [1]FWD 06-33= [1], 06-34 = [1], 06-39= [1],
Unused sequence parameters 06-03~06-06= [0]Hz, 06-19~06-22= [0]s, 06-35~06-38= [0]
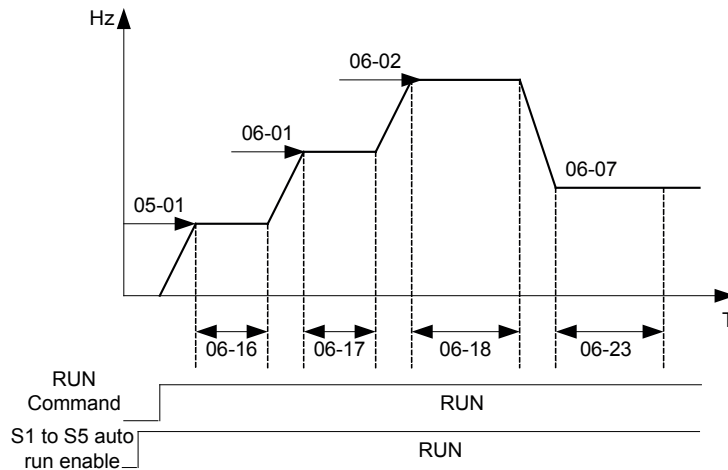
Example 4 & 5.

Auto Run Mode 06-00= [1~3]. After a restart continues to run from the unfinished step.
Auto Run Mode 06-00= [4~6]. After a restart, it will begin a new cycle.

06-00	1~3	4~6
Output Frequency		
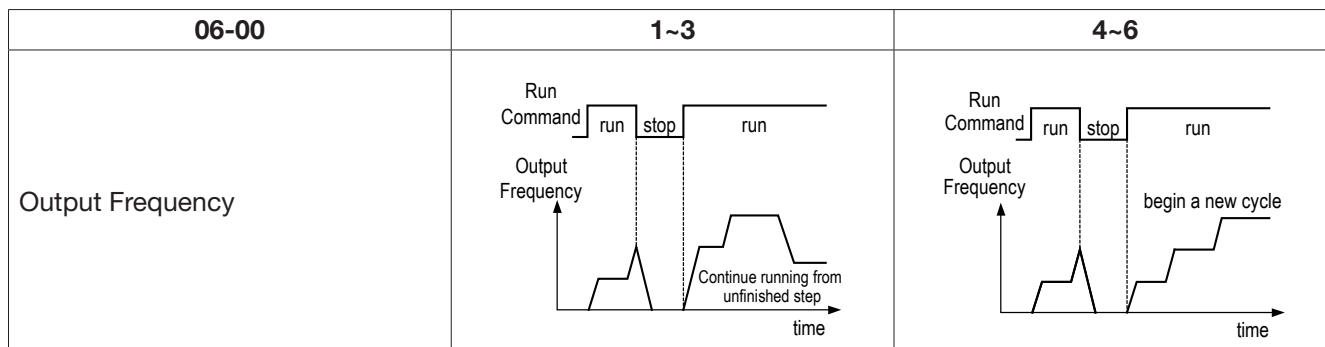
ACC/DEC time in auto run mode will be according to the setting of 00-14/00-15 or 00-16/00-17. For auto sequence 0. The run frequency will be according to keypad frequency set by parameter 05-01. Parameters 06-16 and 06-32 are used to set the sequence run time and run direction.

07- Start/Stop Command Setup

07-00	Momentary power loss and restart
Range	[0]: Momentary power loss and restart disable [1]: Momentary power loss and restart enable

If the input power supply due to sudden increase in supply demand by other equipment results in voltage drops below the under voltage level, the inverter will stop its output at once.

When 07-00 = [0]. On power loss, the inverter will not start.

When 07-00 = [1]. After a momentary power loss, inverter will restart with the same frequency before power loss, and there is no limitation on number of restarts.

On power loss, as long as the inverter CPU power is not completely lost, the momentary power loss restart will be effective, restart will be according to setting of parameters 00-02 & 07-04 and status of external run switch.

Caution:- After any power loss if the run mode is set to external by parameter 00-02=1 and if direct start on power up is also selected by parameter 07-04=0, please note that the inverter will run on resumption of power.

To ensure safety of operators and to avoid any damages to the machinery, all necessary safety measure must be considered, including disconnection of power to the inverter.

07-01	Auto Restart Delay Time
Range	[0.0~800.0] s
07-02	Number of Auto Restart Attempts
Range	[0~10]

07-02=[0]: The inverter will not auto restart after trips due to fault.

07-02>[0], 07- 01=[0]. After a trip due to fault the inverter will run with the same frequency before power loss, and restarts after an internal delay of 0.5 seconds.

07-02>[0], 07- 01>[0]. After a fault trip the inverter will run with the same frequency before power loss, and restart with a delay according the preset in parameter 07-01.

Note: Auto restart after a fault will not function while DC injection braking or decelerating to stop.

07-03	Reset Mode Setting
Range	[0] Enable Reset Only when Run Command is Off [1] Enable Reset when Run Command is On or Off

07-03=0 Once the inverter is detected a fault, please turn Run switch Off and then On again to perform reset, otherwise restarting will not be possible.

07-04	Direct Running on Power Up
Range	[0] Enable Direct running after power up [1] Disable Direct running after power up
07-05	Delay-ON Timer (Seconds)
Range	[1.0~300.0] S

When direct run on power up is selected by 07-04=0 and the inverter is set to external run by (00-02/00-03=1), if the run switch is ON as power is applied, the inverter will auto start.

It is recommend that the power is turned off and the run switch is also off to avoid possibility of injury to operators and damage to machines as the power is reapplied.

Note: If this mode is required all safety measures must be considered including warning labels.

When direct run on power up is disabled by 07-04=1and if the inverter is set to external run by (00-02/00-03=1), if the run switch is ON as power is applied, the inverter will not auto start and the display will flash with STP1. It will be necessary to turn OFF the run switch and then ON again to start normally.

07-06	DC Injection Brake Start Frequency (Hz)
Range	[0.10~10.00] Hz

When DC Injection braking is active DC voltage is applied to the motor, increasing the braking current and resulting in an increase in the strength of the magnetic field trying to lock the motor shaft. To enable DC injection braking during a stop operation set the DC injection braking current (07-07) and the DC injection braking time at stop (07-08) to a value greater than 0.

Notes:
- Increasing the DC braking time (07-08) can reduce the motor stop time
- Increasing the DC braking current (07-07) can reduce the motor stop time.
- During stop operation: If the DC braking start frequency < minimum output frequency (01-08), DC braking is activated when the output frequency reaches the minimum output frequency level.

07-07	DC Injection Brake Level (%)
Range	[0~20] %

Frame A/B models, please refer the formula below.
    In V/F mode, the value is equal to 0~20% of max output voltage(01-01)
    In SLV mode, the value is equal to 0~20% of max output voltage(02-04)
Frame C/D models, the value is the equal to 0~100% of inverter rated output current.

07-08	DC Injection Brake Time (s)
Range	[0.0~25.5] s

07- 08/07- 06 set the DC injection brake duration and the brake start frequency as shown below.
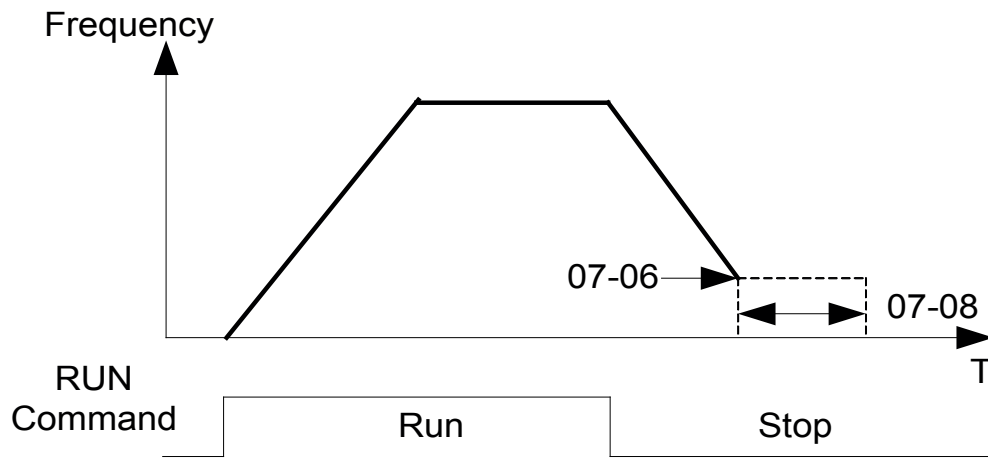
07-09	Stopping Method
Range	[0]: Deceleration to stop [1]: Cost to stop

07-09 = [0]: After receiving stop command, the motor will decelerate to stop according to setting of 00-15, deceleration time 1.

07-09 = [1]: After receiving stop command, the motor will free-run (coast) to stop.

07-10	DC Braking Level at Start
Range	[0~100]%

- Frame Size A and Frame Size B:
  100%: Corresponds to 100% motor rated voltage.
- Frame Size C and Frame Size D:
  100%:Corresponds to 100% drive rated current.

07-11	DC Braking Level at Start
Range	[0~25.5]%

- When DC braking time reached, ouptut frequency will be based on V/F curve

08- Protection function group

08-00	Trip Prevention Selection
Range	[xxxx0]: Enable trip prevention during acceleration [xxxx1]: Disable trip prevention during acceleration [xxx0x]: Enable trip prevention during deceleration [xxx1x]: Disable trip prevention during deceleration [xx0xx]: Enable trip prevention in run mode [xx1xx]: Disable trip prevention in run mode [x0xxx]: Enable over voltage prevention in run mode [x1xxx]: Disable over voltage prevention in run mode

08-01	Trip Prevention Level During Acceleration
Range	[50~200]%

Trip prevention adjustment level during acceleration to prevent over current (OC-A) trips.

If trip prevention during acceleration is enabled and an over current occurs due to the load, then the acceleration is interrupted until the over current level is dropped below the setting in 08-01 then the acceleration is resumed.

08-02	Trip Prevention Level During Deceleration
Range	[50~200]%

Trip prevention adjustment level during deceleration to prevent over voltage (OV-C) trips.

If trip prevention during deceleration is enabled and an over voltage occurs during stopping due to the load, then the deceleration is interrupted until the over voltage level is dropped below the setting in 08-02 then the deceleration is resumed.

08-03	Trip Prevention Level during continuous Run Mode
Range	[50~200]%

Trip prevention adjustment level during continuous run to prevent over current (OC-C) trips.
If trip prevention during continuous run is enabled and an over current occurs due the load such as a sudden transient load, then the output frequency is reduced by decelerating to a lower speed until the over current level is dropped below the preset in 08-03, then the output frequency accelerates back to the normal running frequency.

08-04	Over voltage Prevention Level during Run Mode
Range	200: [350~390] VDC 400: [1] VDC

Over voltage prevention level can be set by parameter 08-04 when necessary.
When the DC bus voltage is higher than 08-04, inverter will keeps running, the output frequency will be decreased once the DC bus voltage reduced. It's the over voltage prevention function, inverter will not appear any error message.
(If the DC bus voltage higher than OV protection level, inverter will appear "OV" message)

08-05	Over voltage Prevention Level during Run Mode
Range	xxxx0: Disable Electronic Motor Overload Protection xxxx1: Enable Electronic Motor Overload Protection xxx0x: Motor Overload Cold Start xxx1x: Motor Overload Hot Start xx0xx: Standard Motor xx1xx: Invertor Duty Motor (Force Vent)

Electronic Motor Overload Protection OL1 (08-05)
When more than one motor is connected to the inverter set the Overload protection level parameter 02-01 to the total current of all motors and provide external overload relay protection for each motor.
When using normal power supply switch, motor overload protection 08-05=xxx1x (hot start protection curve) . Because whenever power is turned off, value of heat will return to default setting.
08-05 = xx0xx. (Standard motor Overload protection). For standard motors with integrated cooling fan when running at low speeds the heat dissipation is not very effective, consider Force vent cooling then set parameter 08-05=xx1xx for the correct overload protection.
08-05 = xxxx1: Enable electronic overload protection for motor according to Setting in parameter 02-01(motor rated current).
Refer to the curve below as an example for overload protection for a standard motor. (08-05=xx0xx)

08-06	Operation after overload protection operation mode
Range	[0] Coast-to-stop after overload protection is activated [1] Drive will not trip when overload protection is activated (OL1)

08-06 = [0]: On overload condition the inverfter coast to stop as the thermal relay detects the overload and the display will flash OL1. To reset press the 'Reset' key or use an external reset to continue to run.

08-06 = [1]: On overload condition the inverter continues to run, display flash with OL1, until the current falls below the overload level.

08-08	AVR function (auto voltage regulation)
Range	[0] AVR function enable [1] AVR function disable [2] AVR function disable for stop [3] AVR function disable for deceleration [4] AVR function disabled for stop & deceleration from one speed to another speed [5] When VDC>(360V/740V), AVR function is disabled for stop and Deceleration

Automatic voltage regulator function provides a level of output voltage stability when there is input voltage instability. So when 08-08=0, input voltage fluctuations will not effect the output voltage.

08-08=1. Input voltage fluctuations will cause fluctuations on output voltage.

08-08=2. AVR is disabled during stopping to avoid an increase in stopping time.

08-08=3. AVR is disabled only during deceleration from one speed to another speed.

This will avoid longer than required deceleration time.

08-08=4, AVR function disabled for stop & Deceleration from one speed to another speed.

08-08=5, When VDC>360(200V series) or VDC>740V(400V series), AVR function is disabled for stop and deceleration.

08-09	Input phase loss protection
Range	[0] Disabled [1] Enabled

08-09= [1]: On phase loss warring message PF is displayed

08-10	PTC Motor Overheat Function
Range	[0]: Disable [1]: Decelerate to stop [2]: Coast to stop [3]: Continue running, when warning level is reached. Coast to stop, when protection level is reached.
08-11	**PTC Signal Smoothing Time**
Range	[0.00 ~ 10.00]Sec
08-12	**PTC Detection Time Delay**
Range	[1 ~ 300] Sec
08-13	**PTC Protection Level**
Range	[0.1 ~ 10.0]V
08-14	**PTC Detection Level Reset**
Range	[0.1 ~ 10.0]V
08-15	**PTC Warning Level**
Range	[0.1 ~ 10.0] V

PTC (Positive temperature coefficient) sensors are used in motor windings to provide additional motor protection from overheat.

PTC thermistor can be connected to terminals AVI and AGND.
A voltage divider resistor R is necessary to be connected as shown below in figure (b).
1) If 08-10 =1 or 2 (Decelerate or Cost to stop on over temperature detection). When over set in parameter 08-15 and the delay time set in parameter. 08-12 is reached, the display will show "OH4" (motor over heat detection), then output frequency will decelerate or coast to stop according to the selection 1 or 2.
2) If 08-10 = 3 Continue running when warning level is reached.(08-15). Coast to stop when protection level is reached.(08-13).When over temperature is detected by signal at terminal AVI increasing above the Warning detection limit set in parameter 08-15, then the display will show "OH3"(motor over heat warning level) and the motor will continue to run.
If temperature detected increases above the set limit in parameter 08-13 and for the delay time set in parameter 08-12 then the display will show "OH4" (motor over heat detection), and the motor will coast to stop.
3) Motor over heat detection "OH4" can be reset when the temperature detection level at terminal AVI becomes lower then the set level in parameter [08-14 PTC reset level].
4) External PTC thermistor characteristics
Diagram in figure (a) shows two curves for Class F and Class H temperatures.

Tr = 150°C in class F,
Tr = 180°C in class H.

Tr - 5°C RPTC≤ 550Ω, put value of RPTC into formula to calculate the value of V to be set in parameter[08-14 PTC reset level]

Tr+ 5°C RPTC≥1330Ω, put value of RPTC into formula to calculate, the value of V to be set in parameter[08-13 PTC protection level]

5) For different specifications of PTC thermistor, set the values for parameters 08-13 and 08-14 by calculating from the formula shown below.

$$V = \frac{1}{2} \times 10 \times \frac{R_{PTC} \ // \ Rin}{R + (R_{PTC} \ // \ Rin)}$$

(a) PTC Thermistor Characteristics

Resistance (ohms)

Class F 150°C   Class H 180°C

1330

550

Temperature

Tr'

Tr - 5   Tr   Tr + 5
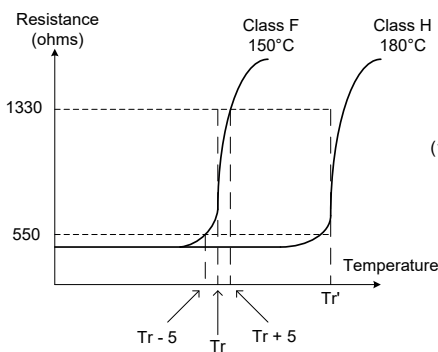
Tr : Temperature threshold value
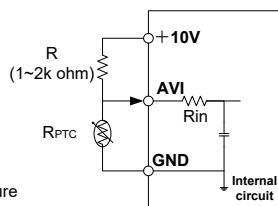
(b) PTC Thermistor Connections

R (1~2k ohm)

+10V

AVI
Rin

RPTC

GND

Internal circuit

**
Frame1&Frame2: Rin=164k ohm
Frame3&Frame4: Rin=204k ohm

08-19	Motor Overload (OL1) Protection Level
Motor Overload Protection Level	0: Motor Overload Protection Level 0 1: Motor Overload Protection Level 1 2: Motor Overload Protection Level 2

Motor overload protection level (08-19)

- Set motor overload protection level according to current motor nameplate.
- Turn off the motor overload protection when using two or more motors connected to the inverter (set 08 05 = xxx0b), and provide external overload protection for each motor (e.g. thermal overload switch).
- When 08-05=xx1xb (Hot start), the value of hot start will be reset once power-off.
- The motors without cooling fan (general standard motor), heat dissipation of lower speed is low, 08-05 can be set to x0xxb.
- The motors with cooling fan (special motor or V/F motor), heat dissipation is not related with output speed, 08-05 can be set to x1xxb.
- To use the built-in motor overload protection function parameter 02-01 (motor rated current) has to match the motor rated current on the motor nameplate.
- Refer to the following examples (08-05=x0xxb) and the overload curves will be based on parameter setting of 08-19.

When 08-19=0:
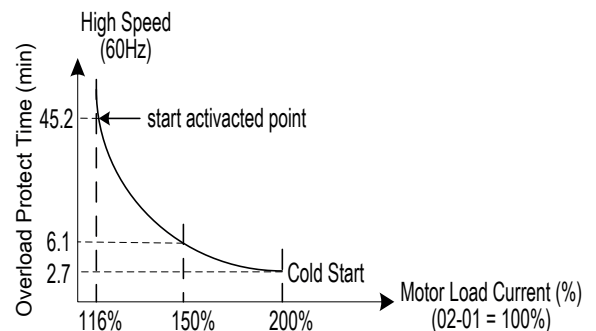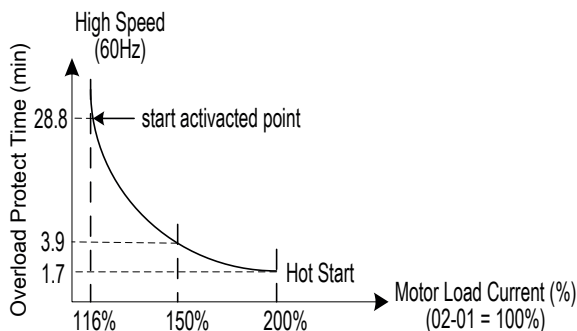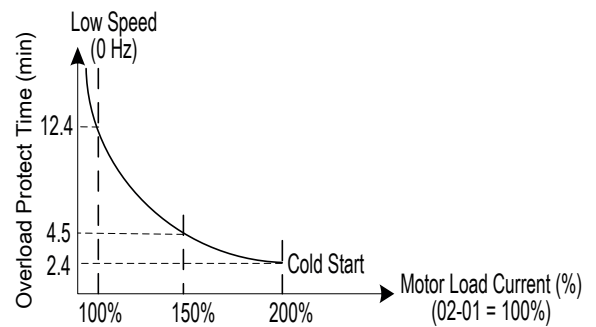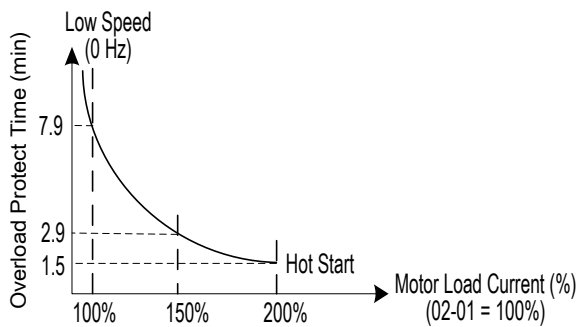
When 08-19=1:
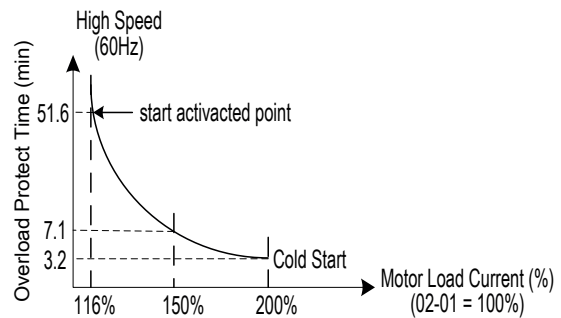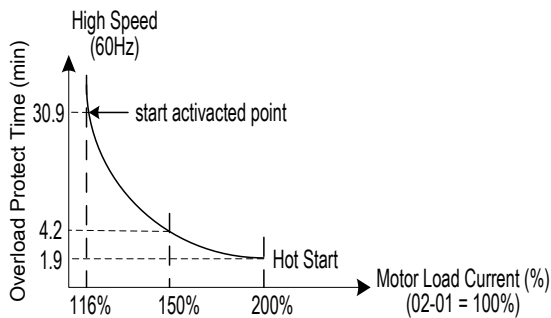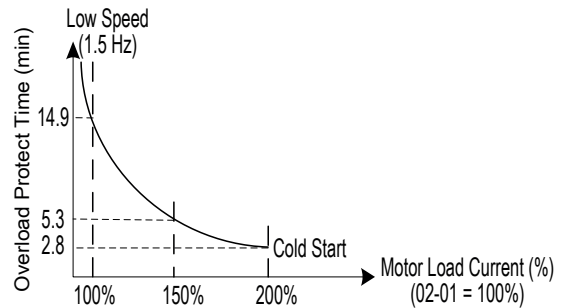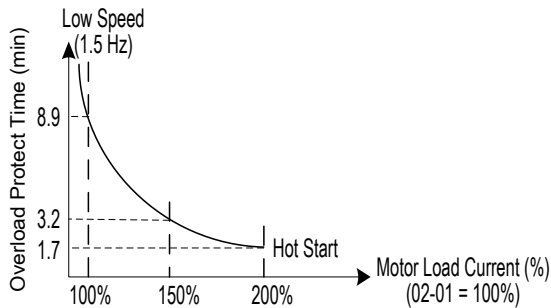
When 08-19=2:
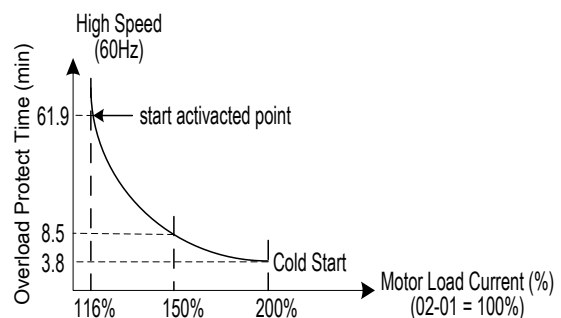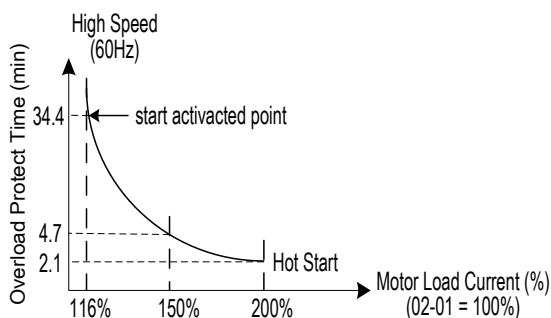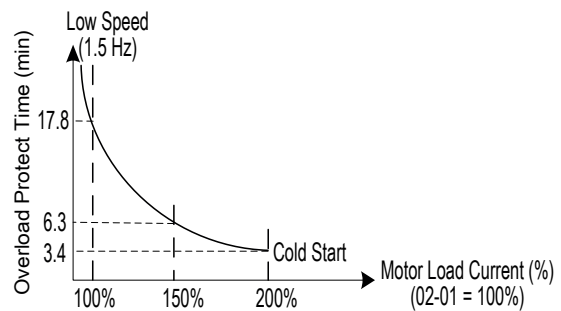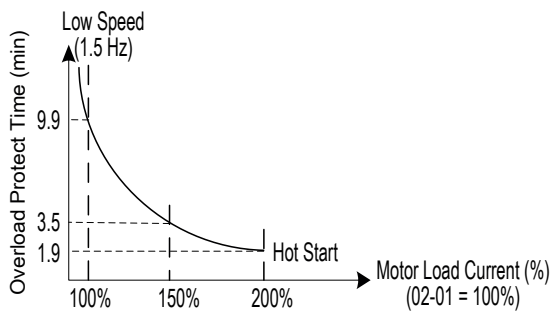
Motor overload curves (for general motor)

09-00	Assigned Communication Station Number
Range	[1~32]

09-00 sets the communication station number when there are more that one unit on the communication network. Up to 32 slave units can be controlled from one master controller such as a PLC.

09-01	Assigned Communication Station Number
Range	[0]: RTU [1]: ASCII
09-02	Baud Rate Setting (bps)
Range	[0]: 4800 [1]: 9600 [2]: 19200 [3]: 38400
09-03	Stop Bit Selection
Range	[0]: 1 bit stop [1]: 2 bit stop
09-04	Parity Selection
Range	[0]: No parity [1]: Even parity [2]: Odd parity
09-05	Data Format Selection
Range	[0]: 8 bit data [1]: 7 bit data

Set 09-01~09-05 to configure communication format before starting communication.
09-Communication function group

09-06	Communication time-out detection time
Range	[0.0~25.5] s

09-06 is against communication test messages. When a test message is not responded within the time specified by 09-06, Inverter will be stopped according to the setting of 09-07, and then appear "COT" on keypad display. Once the 09-06=0, inverter will not appear "time-out".

09-07	Baud Rate Setting (bps)
Range	[0]: Stop in deceleration time 1 and show COT after communication timeout [1]: Stop in free run mode and show COT after communication timeout [2]: Stop in deceleration time 2 and show COT after communication timeout [3]: Keep running and show COT after Communication timeout

Time-out detection time: 00.0~25.5 seconds; setting 00.0 seconds: disables time-out function.

09-08	Err 6 fault tolerance times
Range	[0~20]

09-08 is against real communication messages. When a real message does not pass error check, that message is resent. The number of errors for the same message are counted and accumulated and if it reaches the setting of 09-08, RVLF will show Err6 and stop according to the setting of 07-09.

09-09	Err6 fault tolerance times
Range	[5~65] ms

This parameter is used to set the converter to receive data from the sending date to the beginning of the time.
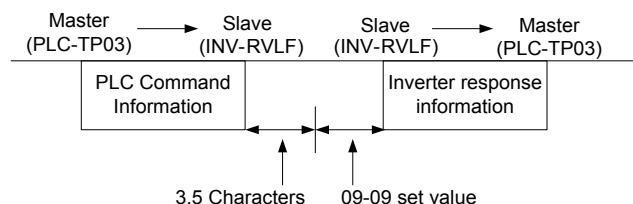
09-10	BACnet Stations
Range	[1~254] ms

10-PID function Setup

PID block diagram
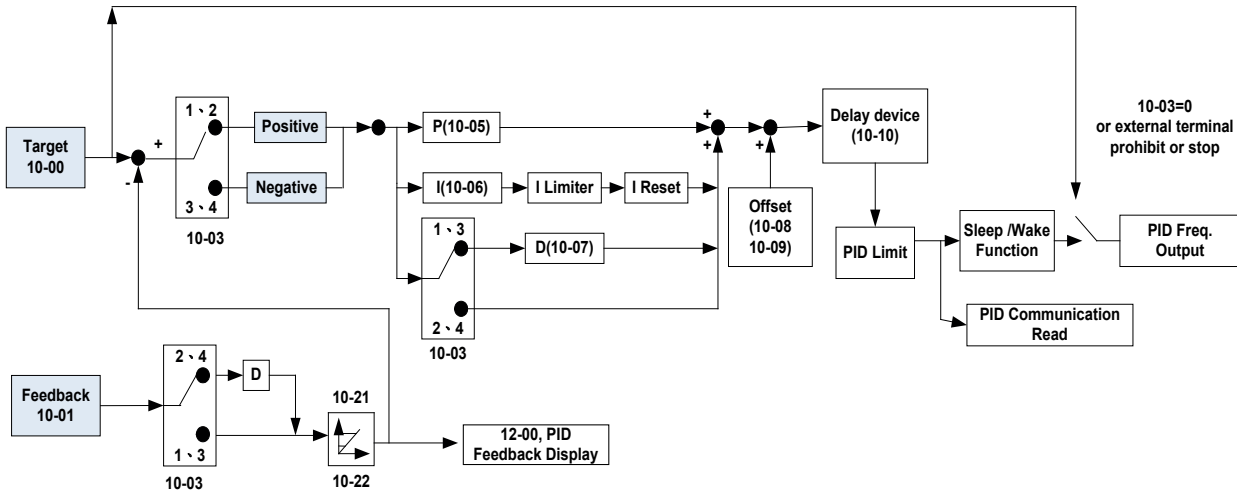
10-00	PID target value selection
Range	[0]: Potentiometer on keypad [1]: External AVI analog signal Input [2]: External ACI analog signal Input [3]: Target frequency set by communication method [4]: Set from keypad by parameter 10-02 [5]: Set from preset frequency

10-00 selections are only effective when frequency source selection is set to PID by parameters 00-05 \ 00-06= 6.

When 10-00=5, PID target value is set according to Parameter Group 05 "preset frequency".

Ex : When 00-05=6, 10-00=5, 10-03=1, 03-00=2, 03-01=3, 03-02=4, turn on S1~S3 sequentially (0 : OFF, 1 : ON), please check the output frequency on display is consistent with the 05-01 ~ 05-08

	S1	S2	S3
	03-00=2	03-01=3	03-02=4
Preset frequency 0 (05-01)	0	0	0
Preset frequency 1(05-02)	1	0	0
Preset frequency 2(05-03)	0	1	0
Preset frequency 3(05-04)	1	1	0
Preset frequency 4(05-05)	0	0	1
Preset frequency 5(05-06)	1	0	1
Preset frequency 6(05-07)	0	1	1
Preset frequency 7(05-08)	1	1	1

10-01	PID target value selection
Range	[0]: Potentiometer on keypad [1]: External AVI analog signal input [2]: External ACI analog signal input [3]: Communication setting frequency

Note: 10-00 and 10-01 can not be set to the same value.

10-02	PID keypad input
Range	[0.0~100.0] %

10-03	PID operation selection	
Range	[0] PID Function disabled	
	[1] FWD Characteristic.	Deviation is D-controlled
	[2] FWD Characteristic.	Feedback is D-controlled
	[3] REW Characteristic.	Deviation is D-controlled
	[4] REW Characteristic.	Feedback is D-controlled
	[5] FWD Characteristic.	Frequency command+ Deviation is D-controlled
	[6] FWD Characteristic	Frequency command+ Feedback is D-controlled
	[7] REW Characteristic.	Frequency command+ Deviation is D-controlled
	[8] REW Characteristic.	Frequency command+ Feedback is D-controlled

10-03 =[1].
Deviation (target - detected value) is derivative controlled in unit time set in parameter 10-07.

10-03 =[2]
Feedback (detected value) is derivative controlled in unit time set in parameter 10-07.

10-03 =[3]
Deviation (target value - detected value) is derivative controlled in unit time set in parameter 10- 07. If the deviation is positive, the output frequency decreases, vice versa.

10-03 =[4]
Feed back (detected value) is derivative controlled in unit time set in parameter 10-07.
If the deviation is positive, the output frequency decreases, vice versa.
Note:
For 10-03 = 1 or 2, If the deviation is positive, the output frequency increases and, vice versa.
For 10-03 = 3 or 4, If the deviation is positive, the output frequency decreases, vice versa.
When 10-03 = [5~8], Output frequency = PID frequency + frequency command (10-03 = [1~4]).

10-04	Feedback Gain coefficient
Range	[0.00~10.00] %

10-04 is the calibration gain. Deviation = set point – (feedback signal×10-04)

10-05	Proportional Gain
Range	[0.0~10.0] %

10-05 Proportion gain for P control.

10-06	Integral Time
Range	[0.0~100.0] %

10-06 Integration time for I control.

10-07	Derivative Time
Range	[0.00~10.00] %

10-07 Differential time for D control

10-08	PID Offset
Range	[0] : Positive Direction [1] : Negative Direction
10-09	PID Offset Adjust
Range	[0~109] %

10-08 /10-09: Calculated PID output is offset by 10-09 (the polarity of offset is according to 10-08).

10-10	PID Output Lag Filter Time
Range	[0.0~2.5] %

10-10 Update time for output frequency.

10-11	Feedback Loss Detection Mode
Range	[0] Disabled [1] Drive keeps running after Feedback loss [2] Drive stops after Feedback loss

10-11= [1]: On feed back loss detection, continue running, and display 'PDER'.
10-11= [2]: On feed back loss detection, stop, and display 'PDER'.

10-12	Feedback Loss Detection Level
Range	[0~100]

10-12 is the level for signal loss. Error = (Set point – Feedback value). When the error is larger than the loss level setting, the feedback signal is considered lost.

10-13	Feedback Loss Detection Delay Time
Range	[0~25.5] s

10-13 The minimum time delay before feedback signal loss is determined.

10-14	Integration Limit Value
Range	[0~109] %

10-14 the Limiter to prevent the PID from saturating.

10-15	Integration Value Resets to Zero when Feedback Signal Equals the target Value
Range	[0] Disabled [1] After 1 s [30] After 30 s (Range: 1~30 S)

10-15=0. As PID feedback value reaches the set point, the integral value will not be reset.

10-15=1~30. As PID feedback value reaches the set point, reset to 0 in 1~30 seconds and inverter stops. The inverter will run again when the feedback value differs from the set point value.

10-16	Allowable Integration Error Margin (Unit) (1 Unit = 1/8192)
Range	[0~100] %

10-16 = 0~100% unit value: Restart the tolerance after the integrator reset to 0.

10-17	PID Sleep Frequency Level
Range	[0.00~650.00] Hz
10-18	**PID Sleep Function Delay Time**
Range	[0.0~25.5] s
10-19	**PID Wake up frequency Level**
Range	[0.00~650.00] Hz
10-20	**PID Wake up function Delay Time**
Range	[0.0~25.5] s

When PID output frequency is less than the sleep threshold frequency and exceeds the time of sleep delay, the inverter will decelerate to 0 and enters PID sleep mode.

When PID output frequency is larger than the wake up threshold frequency inverter will enter the PID mode again as shown in the timing diagram below.

	PID output frequency
- - - - -	Actual output frequency
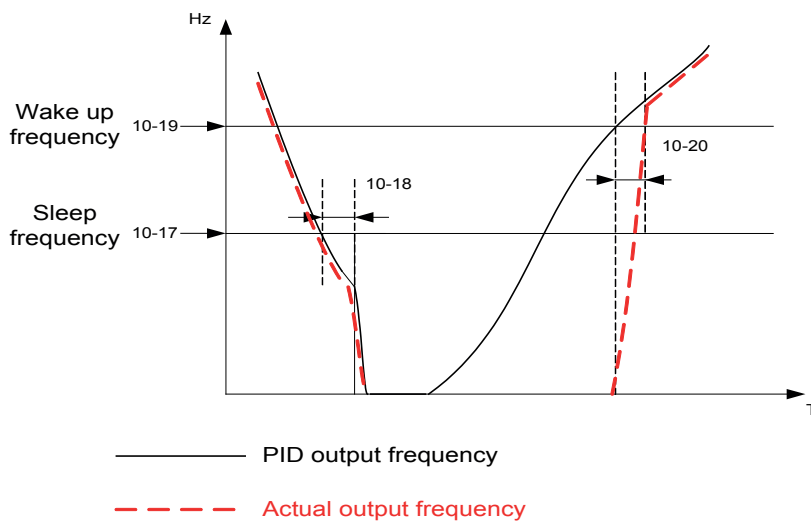
10-21	Max PID Feedback Level
Range	[0~999] Hz
10-22	Min PID Feedback Level
Range	[0~999] s

Example: If 10-21=100 and 10-22=50 and the unit for the range from 0 to 999 will be defined with the parameters setting of 12-02 , actual feedback value variation range, will be scaled to 50 and 100 only for display, as shown below.
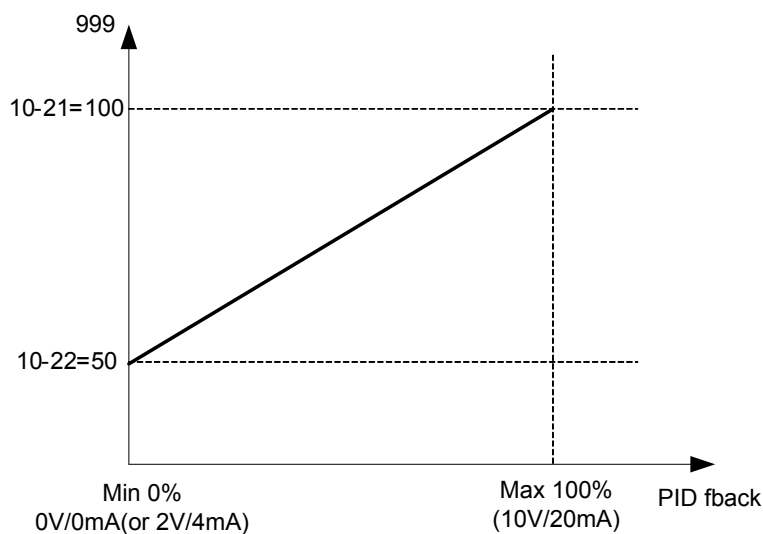
11 Performance control functions

11-00	Integration Value Resets to Zero when Feedback Signal Equals the target Value
Range	[0] Reverse command is enabled [1] Reverse command is disabled

11-00=1, the reverse command is disabled.

11-01	Carrier Frequency
Range	[1~16] KHz

11-02	Carrier mode selection
Range	[0] Carrier mode 0 3-phase PW/M modulation [1] Carrier mode 1 2-phase PW/M modulation [2] Carrier mode 2 2-phase randomized PW/M modulation

The function can be used for audible noise reduction from a motor. It can be used in cases where the 100% torque from motor is not critical but it is necessary to reduce the audible noise.

- Mode 0: 3-phase PWM Modulation. Three Output transistors are ON at the same time (Full Duty).Carrier frequency is set according to Parameter 11-01
- Mode 1: 2-phase PWM Modulation. Two output transistors are ON at the same time (2/3 Duty).
This mode is suitable for variable torque applications such as Fan & pump. It reduces the output transistor switching losses. Carrier frequency will be according to parameter 11-01 with the exception noted below:
Note:
If 11-01 > 2KHz and 11-03=0 (Auto carrier frequency change is disabled) and the listed conditions below apply then 2-phase PWM will automatically change to 3- phase PWM with The carrier frequency = 2/3* (11-01)

Conditions:
• During Acceleration If Output frequency is < 0.7*Fmax.
• During Deceleration when output frequency is < 0.6*Fmax
• Fmax = (01-02) In V/f control mode (00-00) = 0
• Fmax = (02-06) In SLV mode (00-00) = 1

- Mode 2: Mode 2: 2-phase soft PWM modulation (Random PWM Modulation).
This modulation method will use 3-phase PWM and 2-phase PWM modulation in a random combination. Carrier frequency will be according to parameter 11-01

Modes	Name	IGBT Duty	Heat Losses	Torque Performance	Waveform Distortion	Motor Noise
0	3-Phase PWM	100%	High	High	Low	Low
1	2-Phase PWM	66.6%	Low	Low	High	High
2	Randomized PWM	Between mode 0 & mode 1	Mid	Mid	Mid	Mid (Leverage)

11-03	Carrier Frequency auto reduction due to temperature rise
Range	[0] Disable [1] Enable

When inverter (heatsink) temperature rises above 80°C, the carrier frequency is reduced to 4kHz. When the temperature falls below less than 70°C, the carrier frequency is reset to default. Temperature can be displayed by setting parameter 12-00=04000.
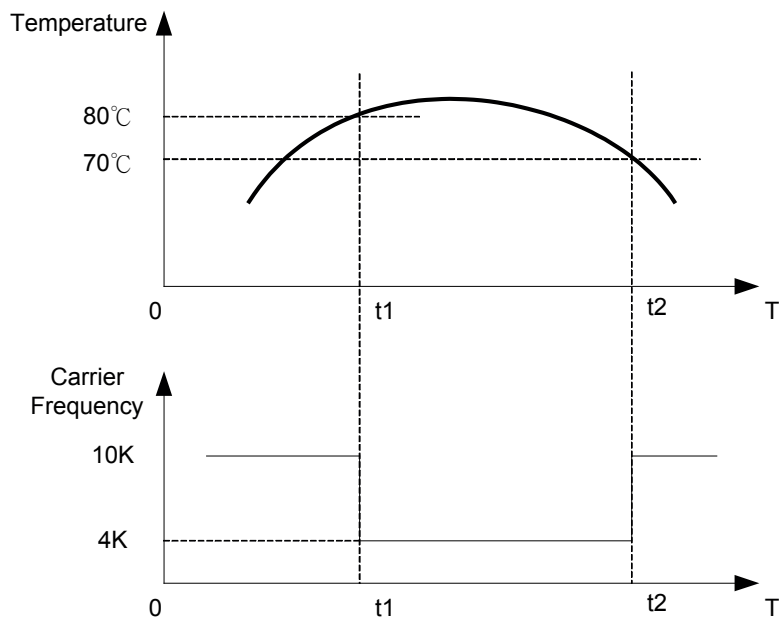
11-04	S-Curve Acc 1
11-05	S-Curve Acc 2
11-06	S-Curve Dec 3
11-07	S-Curve Dec 4
Range	[0.0~4.0] s

Use S curve parameters where a smooth acceleration or deceleration action is required, this will prevent possible damage to driven machines by sudden acceleration/deceleration.
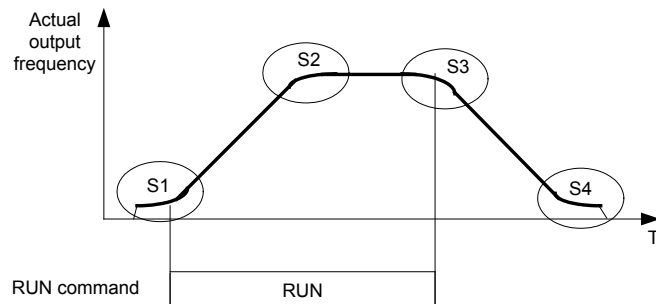
Note:
Regardless of the stall prevention period, actual acceleration and deceleration time =preset acceleration/deceleration time + S curve time.
Please set the required individual S curve times in the parameters (11-04~11-07).
When S curve time (11-04~11-07) is set as 0, the S curve function is disabled.
The calculation of S curve time is based on the maximum output frequency of motor (01-02), Please refer to the parameters (00-14/00-15/00-16/00-17).

11-08	Skip frequency 1
11-09	Skip frequency 2
11-10	Skip frequency 3
Range	[0.00~650.00] Hz
11-11	Skip frequency range. (± frequency band)
Range	[0.00~30.00] Hz

Skip frequency parameters can be used to avoid mechanical resonance in certain applications. Example: 11-08=10.00(Hz); 11-09=20.00(Hz); 11-10=30.00(Hz); 11-11=2.00(Hz).
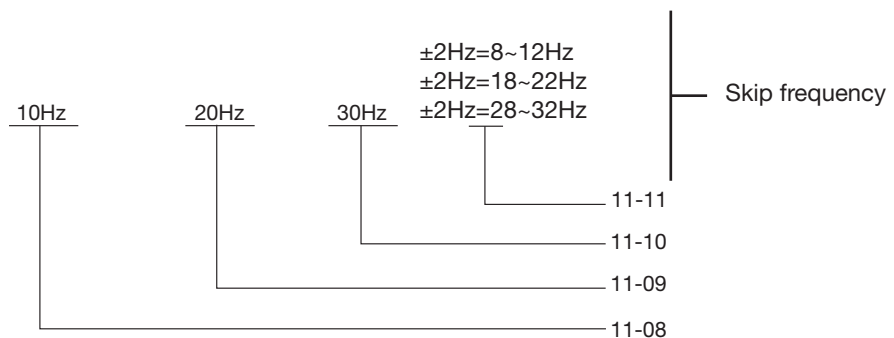
11-13	Regeneration Prevention Function
Range	[0] Regeneration prevention function is disabled [1] Regeneration prevention function is enabled [2] Regeneration prevention function is enabled during constant speed

Regeneration Prevention Function:

During excessive energy regeneration, the Vpn (DC bus) voltage will Increase and lead to OV (over voltage), to avoid over voltage due to regeneration the output frequency will be increased.

Regeneration prevention function can be set according to the selections above.

Example: Regeneration prevention during acceleration.
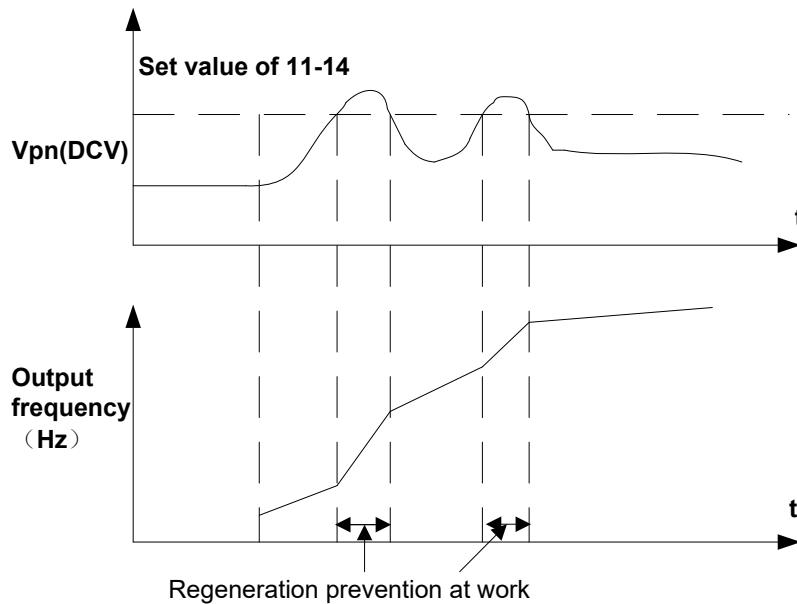
Regeneration prevention at work

Example: Regeneration prevention during acceleration.

Regeneration prevention at work

Example: Regeneration prevention during deceleration
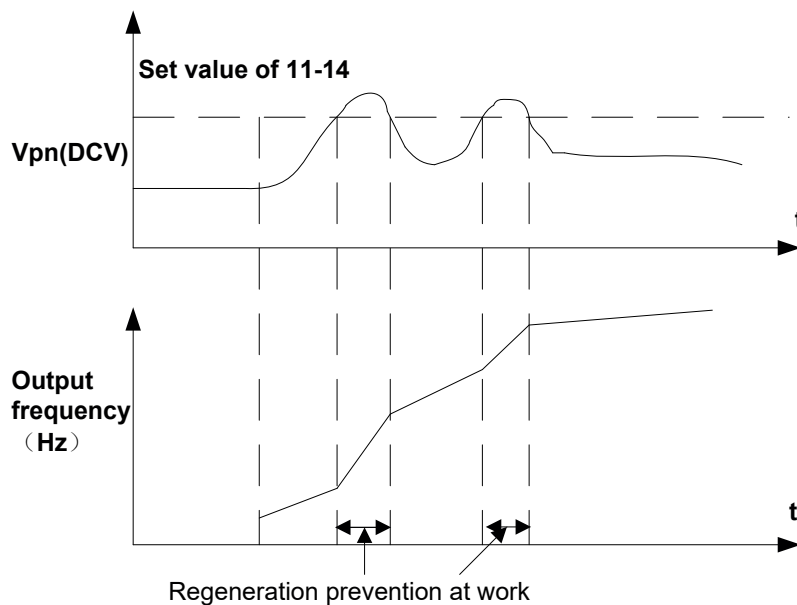
Regeneration prevention at work
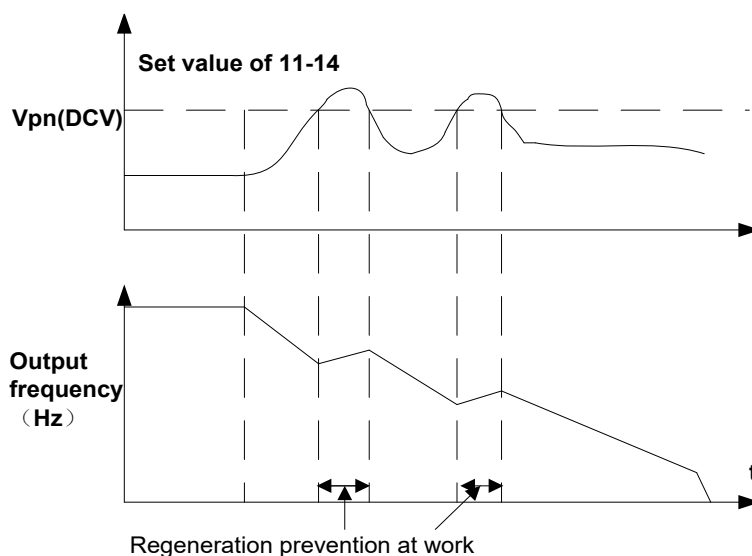
11-14	Regeneration Prevention Voltage Level
Range	200v: 300.0~400.0 V 400v: 600.0~800.0 V

Regeneration prevention voltage level: if the DC bus voltage level is set too low, then over-voltage protection will not be reached, but the actual deceleration time will be extended.

11-15	Regeneration Prevention Frequency Limit
Range	[0.00~15.00]Hz

Sets the regeneration prevention frequency limit.

11-16	Regeneration Prevention Voltage Gain
Range	[0~200]Hz
11-17	Regeneration Prevention Frequency Gain
Range	[0~200]Hz

11-16/11-17 represents the effect for regeneration prevention. It will enhance the response of DC bus voltage variation by enlarging the setting. However, it will lead to instability of output frequency. If setting 11-16 to be smaller still can't suppress the shake, please set 11-17 to be smaller.

11-18	Speed loop proportion gain
Range	[0~65535]Hz
11-19	Speed loop integration gain
Range	[0~65535]Hz

11-20	Speed loop integration gain
Range	[0~65535]Hz

SLV control mode use a output speed estimator as speed feedback value. Speed control system to adjust the output frequency to follow the value of speed feedback command. The output torque command is by the controller output with a limiter.

11-21	Stop Key Selection
Range	[0]: Enable Stop Key when Run Command not from Keypad [1]: Disable Stop Key when Run Command not from Keypad

When run command comes from control terminal (00-02=1) or communication (00-02=2), this parameter can be enabled or disabled the stop key function of operator.
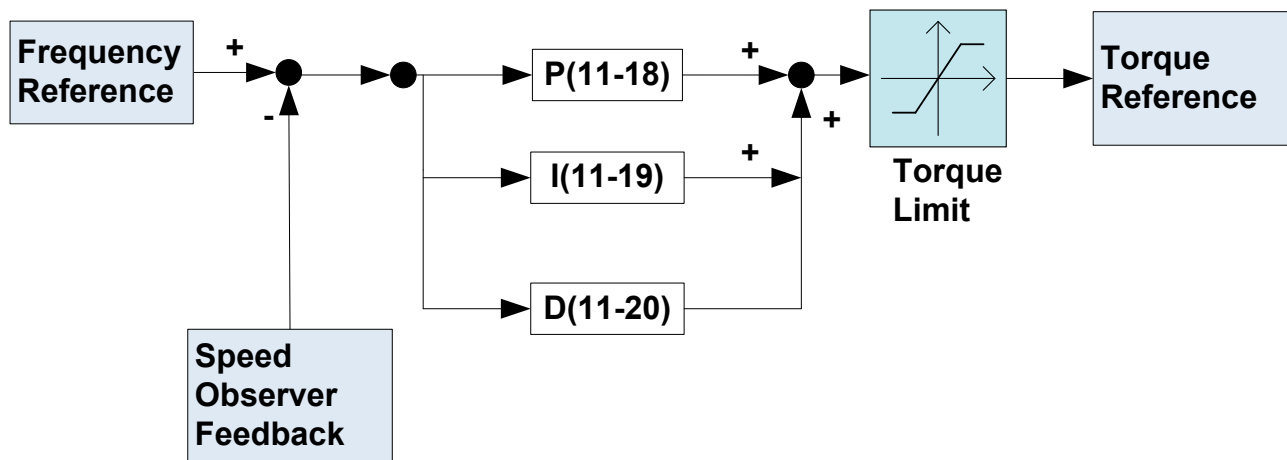
12 Monitor function group

12-00	Display Mode
Range	0 0 0 0 0 MSD LSD 00000~77777 / Each digit can be set from 0 to 7 as listed below. [0]: Disable display [1]: Output current [2]: Output voltage [3]: DC voltage [4]: Temperature of Heat Sink [5]: PID feedback [6]: AVI [7]: ACI

MSD= Most significant digit. LSD= Least significant digit.
Note: MSD of parameter 12-00 sets the power on display, other digits set user selected displays. (refer to P4-4).

12-01	PID Feedback Display Mode
Range	[0] Displayed in integer (xxx) [1] Displayed with one decimal place (xx.x) [2] Displayed with two decimal places (x.xx)
12-02	PID Feedback Display Unit Setting
Range	[0] xxx [1] xxxpb (pressure) [2] xxxfl (flow)

12-03	Custom Units (Line Speed) Value
Range	[0~65535] rpm

Set motor rated RPM in this parameter if required then the display will show this value when inverter output frequency reaches the motor name plate frequency. 50Hz or 60 Hz as appropriate.
The line speed display is linearly proportional to the output frequency 0 to 50Hz or 0-60 Hz as appropriate. Motor synchronous speed = 120 x Rated frequency/Number of poles.

12-04	Custom Units (Line Speed) Display Mode
Range	[0] Drive output frequency is displayed [1] Line speed is displayed in integer (xxxxx) [2] Line speed is displayed with one decimal place (xxxx.x) [3] Line speed is displayed with two decimal places (xxx.xx) [4] Line speed is displayed with three decimal places (xx.xxx)

12-04≠0, line speed is displayed while the inverter is running or stopped.

12-05	Input and output terminal status display
Range	Read only(Panel read only)

When any of S1~S5 is turned on, corresponding segments on the digital display digits will be on. When relay output RY1 is on, the corresponding digit will be on as shown below.
When no digital input and no relay output, they will show - - - - - .

Example 1: The following figure shows 12-05 display status, when S1, S3, S5 Inputs are ON and S2, S4 and RY1 are OFF.
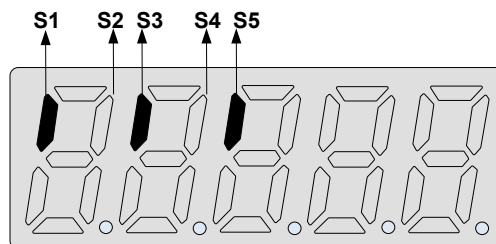
Example 2: The following figure shows 12-05 display status when S2, S3, S4 inputs are ON and S1, S5 are OFF but RY1 is ON.
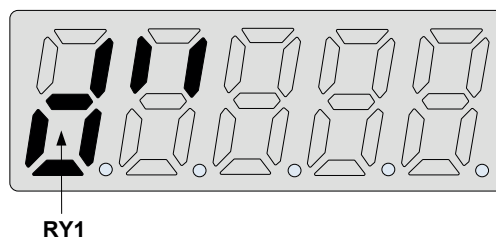
12-06	Output power
Range	____

It needs to set motor rated power correctly (parameter 02-05)

12-07	Motor Current Percentage
Range	____

The ratio of drive output current and motor rated current, it needs to set motor rated current correctly (parameter 02-01)

13 Inspection & Maintenance functions

13-00	Drive Horsepower Code
Range	-----

Inverter Model:	13-00 show	Inverter Model:	13-00 show
RVLFA120020FA	120020FA	RVLFA110040A	110040A
RVLFA120040FA	120040FA	RVLFA110075A	110075A
RVLFA120075FA	120075FA	RVLFB340075FA	340075FA
RVLFB120150FA	120150FA	RVLFB340150FA	340150FA
RVLFB120220FA	120220FA	RVLFB340220FA	340220FA
RVLFA320040A	320040A	RVLFC340370FA	340370FA
RVLFA320075A	320075A	RVLFC340550FA	340550FA
RVLFB320150A	320150A	RVLFD340750FA	340750FA
RVLFB320220A	320220A	RVLFD3401100FA	3401100FA

13-01	Software Version
Range	-----

13-02	Fault Log Display (Latest 3 faults)
Range	-----

Last three faults are stored in a stack and whenever there is a new fault the previous faults are pushed down the stack. So the fault stored in 2.xxx will be transferred to 3.xxx, and the one in 1.xxx to 2.xxx. The recent fault will be stored in the empty register 1.xxx.
Use up and down keys to scroll between the fault registers.
Pressing reset key when parameter 13-02 is displayed then all three fault registers will be cleared and the display for each register will change to 1. ---, 2. ---, 3. ---.
E.g. fault log content is '1.OC-C'; this indicates the latest fault is OC-C, etc.

13-03	Accumulated Inverter Operation Time 1
Range	[0~23] Hours
13-04	Accumulated Inverter Operation Time 2
Range	[0~65535] Days
13-05	Accumulated Inverter Operation Time Mode
Range	[0] Power on time [1] Operation time

When the operation time recorded in accumulator 1 (Parameter 13-03) reaches 24 hours, the recorded value in accumulator 2 (parameter 13-04) changes to 1 day and the value in accumulator 1 is reset to 0000.

13-06	Parameter lock
Range	[0] Enable all functions [1] Preset speeds 05- 01~05- 08 cannot be changed [2] All Functions cannot be changed except for preset speeds set in 05-01~05- 08 [3] Disable all function except 13-06

When the 13-07=00000 (not set a password), you can adjust the parameters 05-01~05-08 from 13-06.

13-07	Parameter Lock Key Code
Range	[00000~65535]

When a parameter lock key number is entered in parameter 13-07. For any parameter modification the key number has to be entered.

See following parameter lock key setting example:-

Setting parameter lock key number example:

Step 1:

Step 2:

Key code (password) unlock

Password failed to lift

Lifting Password

Password successfully lifted

13-08	Reset Drive to Factory Settings
Range	[1150]: Initialization (50Hz,220V/380V system) [1160]: Initialization (60Hz,220V/380V system) [1250]: Initialization (50Hz,230V/400V system) [1260]: Initialization (60Hz,230V/460V system) [1350]: Initialization (50Hz,220V/415V system) [1360]: Initialization (60Hz,230V/400V system)

When a parameter lock key number has been entered in parameter 13–07. This key number must be entered first before parameter 13-08 can be used

Reset 13-08 to default setting will reset parameter 02 group.

For built-in EMC filter models, the default setting of 13-08 is "1250".

For without built-in EMC filter models, the default setting of 13-08 is "1360"

5. Troubleshooting and Maintenance

5.1. Error Display and Corrective Action

5.1.1. Manual Reset and Auto-Reset

Faults which can not be recovered manually			
Display	**Content**	**Cause**	**Corrective action**
-oV- -oU-	Voltage too high when stopped	Detection circuit malfunction	Consult with the supplier
-LV- -LU-	Voltage too low when stopped	1. Power voltage too low 2. Pre-charge resistor or fuse burnt out. 3. Detection circuit malfunction	1.Check if the power voltage is correct 2. failed resistor or fuse 3. Consult with the supplier
-oH- -oH-	The inverter is overheated when stopped	1. Detection circuit malfunction 2. Ambient temperature too high or bad ventilation	Improve the ventilation conditions, if no result then replace the inverter
OH-C OH-C	The inverter is overheated during running	1. IGBT temperature is too high or bad ventilation 2. temperature sensor error or circuit malfunctions	1. Reduce carrier frequency 2. Improve the ventilation conditions, if no result then replace the inverter
CtEr CtEr	Current sensor detection error	Current sensor error or circuit malfunction	Consult with the supplier
EPr EPr	EEPROM problem	Faulty EEPROM	Consult with the supplier
Cot Cot	Communication error	Communications disruption	Check the wiring

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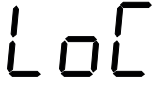
Faults which can not be recovered manually and automatically			
Display	**Content**	**Cause**	**Corrective action**
oC-A oC-A	Over-current at acceleration	1. Acceleration time too short 2. The capacity of the motor exceeds the capacity of the inverter 3. Short circuit between the motor coil and the case 4. Short circuit between motor wiring and ground 5. IGBT module damaged	1. Set a longer acceleration time 2. Replace inverter with one that has the same rating as that of the motor 3. Check the motor 4. Check the wiring 5. Consult with the supplier
oC-C oC-C	Over-current at fixed speed	1. Transient load change 2. Transient power change	1. Increase the capacity of the inverter 2. Install inductor on the power supply input side
oC-d oC-d	Over-current at deceleration	The preset deceleration time is too short.	Set a longer deceleration time
oC-S oC-S	Over current at start	1. Short circuit between the motor coil and the case 2. Short circuit between motor coil and ground 3. IGBT module damaged	1. Inspect the motor 2. Inspect the wiring 3. Consult with the supplier
oV-C oU-C	Excessive voltage during operation/deceleration	1. Deceleration time setting too short or excessive load inertia 2. Power voltage varies widely (fluctuates)	1. Set a longer deceleration time 2. Consider use of a brake resistor and/or brake module (in case of 400V models) 3. Consider use of a reactor at the power input side
PF PF	Input phase loss	Abnormal fluctuations in the main circuit voltage	1. Check the main circuit power supply wiring. 2. Check the power supply voltage

Faults which can be recovered manually but not automatically

Display	Content	Cause	Corrective action
oC o☐	Over-current during stop	Detection circuit malfunction	Consult with the supplier
oL1 oL1	Motor overload	loading too large	Consider increasing the motor capacity
oL2 oL2	Inverter overload	Excessive Load	Consider increasing the inverter capacity
LV-C LU-C	Voltage too low during operation	1. Power voltage too low 2. Power voltage varies widely (fluctuates)	1.Improve power quality 2.Consider adding a reactor at the power input side
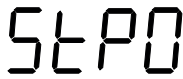
5.1.2. Keypad Operation Error Instruction

Display	Content	Cause	Corrective action
LoC LoC	1. Parameter already locked 2. Motor direction locked 3. Parameter password (13-07) enabled	1. Attempt to modify frequency parameter while 13-06>0. 2. Attempt to reverse direction when 11- 00=1. 3. Parameter (13 - 07) enabled, set the correct password will show LOC.	1. Adjust 13-06 2. Adjust 11-00
Err1 $Err1$	Keypad operation error	1. Press Δ or ∇while 00 - 05 / 00 - 06 > 0 or running at preset speed. 2. Attempt to modify the Parameter. Can not be modified during operation (refer to the parameter list)	1. The Δ or ∇ is available for modifying the parameter only when 00-05/00-06=0 2. Modify the parameter in STOP mode.

$Err2$	Parameter setting error	1.00-13 is within the range of (11-08 ±11-11)
		  OR (11-09 ±11-11)
		  OR (11-10 ±11-11)
		2. 00-12 ≤ 00-13
		3. 00-05/00-06 or 10-00/10-01 set the same value
		4. Modifying parameters 01-01 to 01-09 when 01-00≠7.
		5. a.If this parameter is parameterized for both functions (AVI/PTC) at the same time.
		b.PTC function is enabled by setting 08-10≠0;
		6. Parameter password (13-07) set incorrect
			1. Modify 11-08~11-10 or 11-11
			2. 00-12>00-13
			3. Set 00-05 / 00-06 or 10-00 / 10-01 to be different value
			4. Set 01-00=7
			5. PTC function source can not be the same as frequency source or PID command via AVI.
			6. Please set correct password

Display	Content	Cause	Corrective action
Err5 ErrS	Modification of parameter is not available in communication	1. Control command sent during communication. 2. Attempt to modify the function 09-02~ 09-05 during communication	1. Issue enable command before communication 2. Set parameters 09-02~ 09-05 function before communication
Err6 Err6	Communication failed	1. Wiring error 2. Communication parameter setting error. 3. Incorrect communication protocol	1. Check hardware and wiring 2. Check Functions (09-00~09- 05).
Err7 Err7	Parameter conflict	1. Attempt to modify the function 13-00/13-08. 2. Voltage and current detection circuit is abnormal.	If reset is not possible, please consult with the supplier.

5.1.3. Special conditions

Faults which can not be recovered manually		
Display	**Fault**	**Description**
StP0 StP0	Zero speed at stop	In V/f mode, STP0 comes out at less than 1.3Hz (50Hz set) or at less than 1.5Hz (60Hz set) In SLV mode, STP0 comes out at less than 1Hz
StP1 StP1	Fail to start directly On power up.	1. If the inverter is set for external terminal control mode (00-02/00-03=1) and direct start is disabled (07-04=1) 2. The inverter cannot be started and will flash STP1. 3. The run input is active at power-up, refer to descriptions of (07-04).
StP2 StP2	Keypad Stop Operated when inverter in external Control mode.	1. If the Stop key is pressed while the inverter is set to external control mode (00-02/00-03=1) then'STP2'flashes after stop. 2. Release and re-activate the run contact to restart the inverter.
E.S. E.S.	External rapid stop	When external rapid stop input is activated the inverter will decelerate to stop and the display will flash with E.S. message.
b.b. b.b.	External base block	When external base block input is activated the inverter stops immediately and then the display will flash with b.b. message.
PdEr PdEr	PID feedback loss	PID feedback loss is detected.

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5.2. General Troubleshooting

Status	Checking point	Remedy
Motor runs in wrong direction	Is the wiring for the output terminals correct?	Wiring must match U, V, and W terminals of the motor.
	Is the wiring for forward and reverse signals correct?	Check for correct wiring.
The motor speed can not be regulated.	Is the wiring for the analog frequency inputs correct?	Check for correct wiring.
	Is the setting of operation mode correct?	Check the frequency source set in parameters 00-05/00-06.
	Is the load too excessive?	Reduce the load.
Motor running speed too high or too low	Check the motor specifications (poles, voltage…) correct?	Confirm the motor specifications.
	Is the gear ratio correct?	Confirm the gear ratio.
	Is the setting of the highest output frequency correct?	Confirm the highest output frequency
Motor speed varies unusually	Is the load too excessive?	1. Minimize the variation of the load. 2. Consider increasing the capacities of the inverter and the motor.
	Does the load vary excessively?	Consider adding an AC reactor at the power input side if using single-phase power.
	Is the input power unstable or is there a phase loss?	2. Check wiring if using three-phase power
Motor can not run	Is the power connected to the correct L1, L2, and L3 terminals? is the charging indicator lit ?	1. Is the power applied? 2. Turn the power OFF and then ON again. 3. Make sure the power voltage is correct. 4. Make sure screws are secured firmly.
	Is there voltage across the output terminals T1, T2, and T3?	Turn the power OFF and then ON again.
	Is overload causing the motor to stall?	Reduce the load so the motor will run.
	Are there any abnormalities in the inverter?	See error descriptions to check wiring and correct if necessary.
	Is there a forward or reverse run command?	
	Has the analog frequency signal been input?	1. Is analog frequency input signal wiring correct? 2. Is voltage of frequency input correct?
	Is the operation mode setting correct?	Operate through the digital keypad

5.3. Troubleshooting of the Inverter

5.3.1. Quick troubleshooting of the Inverter

```
                    ┌─────────────────┐
                    │    INV Fault    │
                    └────────┬────────┘
                             ▼
                   < Is fault known? >────────NO──────────┐
                             │                             │
                            YES                            ▼
      ┌──────────────────────────┐         < Any Symptoms of burn >──YES──►┌──────────────────┐
      │ Symptoms other than burn │──NO──►  <   out and damage?     >       │ Check burnt and  │
      │  out, damage, or fuse    │                                         │  damaged parts   │
      │ meltdown in the inverter?│                    │                    └──────────────────┘
      └────────────┬─────────────┘                   NO
                  YES                                  ▼
                   ▼                       < Is the main circuit DM >──NO──►( Consult with the supplier )
          < Fault signal? >──NO──►         <       intact?         >
                   │                                  │
                  YES                                YES
                   ▼                                  ▼
      ┌──────────────────────────┐        < Is the fuse intact ? >──NO──►( Replace fuse )
      │   Check according to     │                    │
      │ displayed fault messages │                  YES
      └──────────────────────────┘                    ▼
                   │                      < Is the main circuit >──NO──►( Consult with the supplier )
                   │                      <   I.G.B.T intact?   >
                   │                                  │
                   │                                YES
                   │                                  ▼
   ( Consult with the supplier )◄─────     ┌────────────────────────┐
                                    YES     │ Visually check controller│
                                            │    and Drive boards     │
                                            └────────────┬───────────┘
                                                         ▼
                                            < Any visual abnormalities? >
                                                         │
                                              ┌────NO────┘
                                              ▼
                                    ┌──────────────────┐
                                    │  Apply the power  │◄──────────────────────────┐
                                    └─────────┬────────┘                            │
                                              ▼                                     │
                              < Are displays and indicators of the >──NO──► < Is LED lit? >──NO──►( Replace the pre-charge resistor )
                              <   operating unit working normally?  >              │
                                              │                                  YES
                                             YES                                   ▼
                                              ▼              < Is the DC input voltage controlling the >──NO──►( Check terminals and wiring )
                                    < Any fault display? >   <        power correct        >
                                              │                                  │
                                             YES                               YES
                                              ▼                                   ▼
                                    < What's the message? >   < Is +5V control voltage correct? >──NO──►( Consult with the supplier )
                                              │                                  │
                                             NO                                 YES
                                              ▼                                   ▼
                                    ┌──────────────────┐     ┌──────────────────────────┐
                                    │  *to next page   │     │ Replace control board    │
                                    └──────────────────┘     │ and digital operating unit│
                                                             └────────────┬─────────────┘
                                                                          ▼
                                              < Is the error eliminated after replacing >──NO──►( Perform detailed check and consult with the supplier )
                                              <         control board?        >
```

```
┌─────────────────────────────┐
│     From previous page      │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│   Check Inverter parameters │
└─────────────────────────────┘
              │
        Perform parameter
         initializations
              │
        Specify operation
          control mode
              │
      Does the FWD or REV  ──NO──→  Replace the control
      LED light flash?                     board
              │
             YES
              │
┌─────────────────────────────┐
│    Set up frequency command │
└─────────────────────────────┘
              │
       Is the frequency value  ──NO──→  Replace the control
       displayed on the display?                board
              │
             YES
              │
      Are there voltage outputs at  ──NO──→  Replace the control
      terminals U, V and W                          board
              │                                       │
             YES                                      │
              │                          Does the control Board
┌─────────────────────────────┐  ←─YES─  function after replacement
│   Connect the motor to run  │                       │
└─────────────────────────────┘                      NO
              │
             NO
              │
      Is there any fault display?  ──YES──┐
              │                           │
             NO                           │
              │                           │
        Are output                        │
      currents of each  ──NO──────────→  ● ←──────NO
        phase even?                       │
              │                           │
             YES                          ▼
              │              Perform detailed check and
      The inverter is OK     consult with the supplier.
```

5.3.2. Troubleshooting for OC, OL error displays

```
The inverter displays OC, OL errors
        │
        ▼
Is the main circuit I.G.B.T working ──NO──► Replace I.G.B.T
        │
       YES
        ▼
Any visual abnormalities? ──YES──► Replace faulty circuit board
        │
       NO
        ▼
Apply power
        │
       NO
        ▼
Any abnormal indications? ──YES──► Is the current detector OK? ──YES──► Replace the current controller
        │                                   │
       (down)                              NO
        ▼                                   ▼
Input operation command              Replace control board
        │
        ▼
Is FWD LED illuminated? ──NO──► Replace control board
        │
       YES
        ▼
Input frequency command
        │
        ▼
Is the output frequency of the operating unit displayed? ──NO──► Replace control board
        │
       YES
        ▼
Is there Voltage at U,V and W output terminals? ──NO──► Replace control board
        │
       YES
        ▼
Connect the motor to run ◄──YES── Is the inverter operation OK after board replacement ?
        │                                                          │
        ▼                                                         NO
Any fault values displayed? ──YES──►●◄──────────────────────────┘
        │
       NO
        ▼
Is the output current of each phase even? ──NO──►●
        │                                        │
       YES                                       ▼
        ▼                              The inverter is faulted
The inverter's output is OK           （Perform detailed check）
```

5.3.3. Troubleshooting for OV, LV error

```
┌─────────────────────────────┐
│  The inverter displays OV, LV │
└─────────────────────────────┘
              │
              ▼
    ⬡ Is the main circuit fuse intact? ⬡ ──NO──▶ ( Consult with the supplier )
              │
             YES
              ▼
    ⬡ Any visual abnormalities? ⬡ ──YES──▶ ( Consult with the supplier )
              │
             NO
              ▼
    ┌──────────────┐
    │  Apply power  │
    └──────────────┘
              │
              ▼
    ⬡ Any abnormal indications? ⬡ ──YES──▶ ( Consult with the supplier )
              │
             NO
              ▼
    ┌────────────────────────┐
    │ Input operation command │
    └────────────────────────┘
              │
              ▼
    ⬡ Is FWD LED still illuminated after flash ⬡ ──NO──▶ ( Consult with the supplier )
              │
             YES
              ▼
    ┌──────────────────────────┐
    │ Input frequency commands  │
    └──────────────────────────┘
              │
              ▼
    ⬡ Is the output frequency of the operating unit displayed? ⬡ ──NO──▶ ( Replace the control board )
              │
             YES
              ▼
    ⬡ Is there Voltage at T1,T2,T3 output terminals? ⬡ ──NO──▶ ( Replace the control board )
              │                                                          │
             YES                                                         ▼
              │                                        ⬡ Is the inverter operation OK after board replacement? ⬡ ──NO──▶ ●
              ▼                                                          │
    ┌──────────────────────┐ ◀──────YES──────────────────────────────── YES
    │ Connect the motor to run │
    └──────────────────────┘
              │
              ▼
    ⬡ Any abnormal value? ⬡ ──YES──▶ ●
              │
             NO
              ▼
    ⬡ Is the current on all phases even? ⬡ ──NO──▶ ●
              │
             YES
              ▼
    ┌────────────────────────┐
    │ The inverter's output is OK │        ● ──▶ ( Perform detailed check and consult with the supplier )
    └────────────────────────┘
```

5.3.4. The Motor can not Run

```
                    ┌─────────────────────────┐
                    │   The motor can not run  │
                    └─────────────────────────┘
                                 │
                                 ▼
                          ⬡ Is MCCB On? ⬡ ──────────────────────────┐ YES
                                 │ NO                                 │
                                 ▼                                    │
                    ⬡ Can MCCB be turned On? ⬡ ──── NO ──▶ ( Short circuited wiring )
                                 │ YES                               │
                                 ▼                                    │
            ⬡ Are voltages between power terminals correct? ⬡ ── NO ──▶ ( 1.The power is abnormal  2.Incorrect wiring )
                                 │ YES ◀──────────────────────────────┘
                                 ▼
                          ⬡ Is LED lit? ⬡ ──── NO ──▶ ( INV fault )
                                 │ YES
                                 ▼
            ⬡ Is the operation switch in "RUN"? ⬡ ── NO ──▶ ( The operation switch is set to "RUN" position )
                                 │ YES
                                 ▼
   ⬡ Are there outputs between the U,V, and W terminals of the motor? ⬡ ── NO ──▶ ( INV fault )
                                 │ YES
                                 ▼
            ⬡ Are outputs between U,V,W the same? ⬡ ── NO ──▶ ( INV fault )
                                 │ YES
                                 ▼
                    ( 1. Motor
                      2. Motor faults
                      3. Incorrect wiring )
```

5.3.5. The Motor can not Run

```
┌─────────────────────────────┐
│      Motor Overheating      │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────┐              ┌──────────────────────────────────┐
│ Is load or current      │              │ Consider reducing the load and    │
│ exceeding the specified │──YES────────▶│ increasing the capacities of the  │
│ value?                  │              │ inverter and motor                │
└─────────────────────────┘              └──────────────────────────────────┘
              │
             NO
              ▼
┌─────────────────────────┐              ┌──────────────────────────────────┐
│ Is motor running at low │              │                                  │
│ speed for a long time?  │──YES────────▶│       Select the motor again     │
└─────────────────────────┘              └──────────────────────────────────┘
              │
             NO
              ▼
┌─────────────────────────┐              ┌──────────────────────────────────┐
│ Is motor voltage        │              │                                  │
│ between U-V,V-W,W-U      │──NO─────────▶│            INV faults            │
│ correct?                │              │                                  │
└─────────────────────────┘              └──────────────────────────────────┘
              │
            YES
              ▼
┌─────────────────────────┐              ┌──────────────────────────────────┐
│ Is there any deterrence │              │                                  │
│ preventing cooling of   │──YES────────▶│        Clear the deterrence      │
│ the motor               │              │                                  │
└─────────────────────────┘              └──────────────────────────────────┘
              │
             NO
              ▼
┌─────────────────────────┐              ┌──────────────────────────────────┐
│ Bad connection between  │              │                                  │
│ drive and the motor     │──YES────────▶│     Correct the bad connection   │
└─────────────────────────┘              └──────────────────────────────────┘
```

5.3.6. Motor Runs Unbalanced

```
┌─────────────────────────┐
│   Motor runs unevenly   │
└─────────────────────────┘
              │
              ▼
      ╱Does it happen╲──YES──▶╱Is the acceleration╲──NO──▶( Increase the Acc/Dec time )
      ╲during eceleration?╱    ╲  time correct ?   ╱
              │                         │
              NO                       YES──────────▶┌──────────────────────────┐
              │                                      │ Reduce the load.Increase │
              ▼                                      │ capacities of INV and the │
      ╱Are the output voltages╲                      │        motor.            │
      ╲between U-V,V-W,W-U     ╱──NO──────▶( INV faults )
      ╱balanced?              ╲
              │
             YES
              │
              ▼
      ◁Is the load fluctuating ?▷──YES──────▶┌──────────────────────────┐
              │                              │ Reduce the load fluctuation│
              NO                             │   or add a flywheel.      │
              │
              ▼
      ╱Any mechanical vibration or╲──YES──────▶┌──────────────────────┐
      ╲gear backlash              ╱            │ Inspect the mechanical│
              │                                │       system         │
              NO
              │
              ▼
      ( INV faults )
```

5.4. Routine and Periodic Inspection

To ensure stable and safe operations, check and maintain the inverter at regular intervals.
Use the checklist below to carry out inspection.
Disconnect power after approximately 5 minutes to make sure no voltage is present on the output terminals before any inspection or maintenance.

Items	Details	Checking period		Methods	Criteria	Remedies
		Daily	1Year			
Environment & Ground connection						
Ambient conditions at the installation	Confirm the temperature and humidity at the machine	●		Measure with thermometer and hygrometer	Temperature: -10~+40°C (14~+120°F) Humidity: below 95%RH	Improve the ambient or relocate the drive to a better area.
Installation grounding	Is the grounding resistance correct?		●	Measure the resistance with a multi-tester	200Vclass: below 100Ω	Improve the grounding if needed.
Terminals & Wiring						
Connection terminals	Any loose parts or terminals?		●	Visual check. Check with a screwdriver	Correct installation requirement	Secure terminals and remove rust
	Any damage to the base ?		●			
	Any corroded Terminals?		●			
Wiring	Any broken wires?		●	Visual check	Correct wiring requirement	Rectify as necessary
	Any damage to the wire insulation?		●			
Voltage						
Input power voltage	Is the voltage of the main circuit correct?	●		Measure the voltage with a multi-tester	Voltage must conform with the spec.	Improve input voltage if necessary.
Circuit boards and components						
Printed circuit board	Any contamination or damage to printed circuit board?		●	Visual check	Correct component condition	Clean or replace the circuit board
Power component	Any dust or debris		●			Clean components
	Check resistance between terminals		●	Measure with a multi-tester	No short circuit or broken circuit in three phase output	Consult with the supplier
Cooling System						
Cooling fan	Unusual vibration and noise?		●	Visual and sound check	Correct cooling	Consult with the supplier
	Excessive dust or debris	●				Clean the fan
Heat sink	Excessive dust or debris	●		Visual check		Clean up debris or dust
Ventilation Path	Is the ventilation path blocked?	●				Clear the path

5.5. Maintenance

To ensure long-term reliability, follow the instructions below to perform regular inspection. Turn the power off and wait for a minimum of 5 minutes before inspection to avoid potential shock hazard from the charge stored in high-capacity capacitors.

1. Maintenance Check List.

• Ensure that temperature and humidity around the inverters is as required in the instruction manual, installed away from any sources of heat and the correct ventilation is provided..
• For replacement of a failed or damaged inverter consult with the local supplier.
• Ensure that the installation area is free from dust and any other contamination.
• Check and ensure that the ground connections are secure and correct.
• Terminal screws must be tight, especially on the power input and output of the inverter.
• Do not perform any insulation test on the control circuit.

2. Insulation test Method.
Single Phase
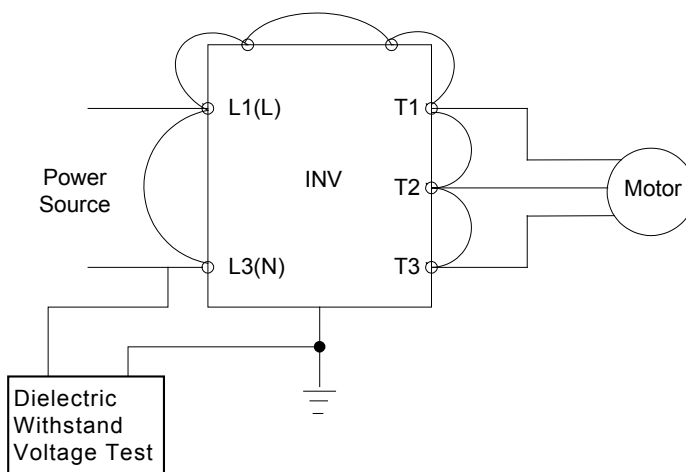
Three Phase
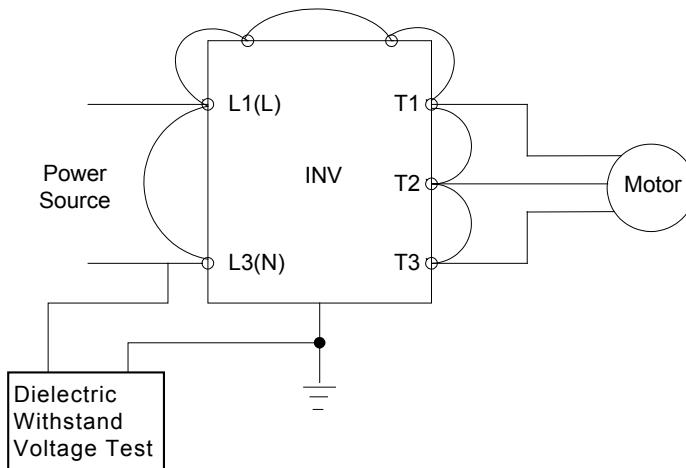
6 . Peripherals Components

6.1. Reactor Specifications

Model	Specification	
	Current (A)	Inductance (mH)
RVLF*2***040**	7.2	3.05
RVLF*2***075**	11.0	2.44
RVLF*2***150**	15.5	
RVLF*2***220**	21.0	1.42
RVLF*4***075**	4.2	1.05
RVLF*4***150**	5.6	5.25
RVLF*4***220**	7.3	3.94
RVLF*4***370**	12.0	3.02
RVLF*4***550**	17.0	1.84
RVLF*4***750**	23.0	1.30
RVLF*4***1100**	31.0	0.96

6.2. Electromagnetic Contactor and No Fuse Circuit Breaker

Model	HP	KW	Rating
RVLFA110040A	0.5	0.4	15A, 300VAC
RVLFA110075A	1	0.75	20A, 300VAC
RVLFA*2*040**	0.5	0.4	15A, 300VAC
RVLFA*2*075**	1	0.75	15A, 300VAC
RVLFA*2*150**	2	1.5	30A, 300VAC
RVLFA*2*220**	3	2.2	30A, 300VAC
RVLFB340075FA	1	0.75	5A, 600VAC
RVLFB340150FA	2	1.5	15A, 600VAC
RVLFB340220FA	3	2.2	20A, 600VAC
RVLFC340370FA	5	3.7	20A, 600VAC
RVLFC340550FA	7.5	5.5	40A, 600VAC
RVLFD340750FA	10	7.5	40A, 600VAC
RVLFD3401100FA	15	11	70A, 600VAC

6.3. Fuse Specification

Model	HP	KW	Rating
RVLFA120040F	0.5	0.4	10A, 300VAC
RVLFA120075F	1	0.75	20A, 300VAC
RVLFB120150F	2	1.5	30A, 300VAC
RVLFB120220F	3	2.2	30A, 300VAC
RVLFB340075F	1	0.75	5/10A, 600VAC
RVLFB340150F / RVLFB340220F	2/3	1.5/2.2	16/20A, 600VAC

6.4. Fuse Specification (UL Model Recommended)

Model	Manufacture	Type	Rating
RVLFA110040A	Bussmann	20CT	690V 20A
RVLFA110075A	Bussmann	25ET	690V 25A
RVLFA120040FA	Bussmann	10CT/16CT	690V 10A/690V 16A
RVLFA120075FA	Bussmann	16CT/20CT	690V 16A/690V 20A
RVLFB120150FA	Bussmann	30FE	690V 30A
RVLFB120220FA	Bussmann	50FE	690V 50A
RVLFA320075A	Bussmann	10CT	690V 10A
RVLFB320150A	Bussmann	16CT	690V 16A
RVLFB320220A	Bussmann	20CT	690V 20A
RVLFB340075FA	Bussmann	10CT	690V 10A
RVLFB340150FA	Bussmann	16CT	690V 16A
RVLFB340220FA	Bussmann	20CT	690V 20A
RVLFC340370FA	Bussmann	25ET	690V 25A
RVLFC340550FA	Bussmann	40FE	690V 40A
RVLFD340750FA	Bussmann	50ET	690V 50A
RVLFD3401100FA	Bussmann	63ET	690V 63A

6.5. Braking Resistor. 400V range

Model	Braking detection module		(HP)	(kW)	Braking resistor			ED (%)	Braking torque (%)
	Model	Parallel Number			(W)	(Ω)	Parallel Number		
RVLFA320075A	-	-	5	3.5	390	40	-	10	117
RVLFB320150A	-	-	7.5	5.5	600	25	-	10	123
RVLFB320220A	-	-	10	7.5	780	20	-	10	117
RVLFB340075FA			1	0.75	60	750		8	123
RVLFB340150FA			2	1.5	150	400		10	117
RVLFB340220FA			3	2.2	200	250		8	123
RVLFC340370FA			5	3.5	400	150		10	123
RVLFC340550FA			7.5	5.5	600	100		10	123
RVLFD340750FA			10	7.5	750	80		10	117
RVLFD3401100FA			15	11	1600	50		10	123

6.6   Copy Unit (RV-CU)

The copy unit is used to copy an inverter parameter setup to another inverter. The copy unit saves time in applications with multiple inverters requiring the same parameter setup

6.7   Communication Modules

(a) PROFIBUS communication interface module (RV-PDP)
(b) DEVICENET communication interface module (RV-DNET)
(c) CANopen communication interface module (RV-CAN**)**
(d) TCP-IP communication interface module (RV-TCPIP)

6.8   RJ45 to USB Connecting Cable

RV-USB has the function of converting USB communication format to RS485 to achieve the inverter communication control being similar with PC or other control equipment with USB port

Appendix 1: RVLF parameters setting list

CARLO GAVAZZI

Customer		Inverter Model	
Using Site		Contact Phone	
Address			

Parameter Code	Setting Content	Parameter Code	Setting Content	Parameter Code	Setting Content	Parameter Code	Setting Content
00-00		03-04		05-17		07-01	
00-01		03-05		05-18		07-02	
00-02		03-06		05-19		07-03	
00-03		03-07		05-20		07-04	
00-04		03-08		05-21		07-05	
00-05		03-09		05-22		07-06	
00-06		03-10		05-23		07-07	
00-07		03-11		05-24		07-08	
00-08		03-12		05-25		08-00	
00-09		03-13		05-26		08-01	
00-10		03-14		05-27		08-02	
00-11		03-15		05-28		08-03	
00-12		03-16		05-29		08-04	
00-13		03-17		05-30		08-05	
00-14		03-18		05-31		08-06	
00-15		03-19		05-32		08-07	
00-16		04-00		06-00		08-08	
00-17		04-01		06-01		08-09	
00-18		04-02		06-02		09-00	
00-19		04-03		06-03		09-01	
00-20		04-04		06-04		09-02	
01-00		04-05		06-05		09-03	
01-01		04-06		06-06		09-04	
01-02		04-07		06-07		09-05	
01-03		04-08		06-16		09-06	
01-04		04-09		06-17		09-07	
01-05		04-10		06-18		09-08	
01-06		04-11		06-19		09-09	
01-07		04-12		06-20		10-00	
01-08		04-13		06-21		10-01	
01-09		04-14		06-22		10-02	
01-10		04-15		06-23		10-03	
01-11		05-00		06-32		10-04	
02-00		05-01		06-33		10-05	
02-01		05-02		06-34		10-06	
02-02		05-03		06-35		10-07	
02-03		05-04		06-36		10-08	
03-00		05-05		06-37		10-09	
03-01		05-06		06-38		10-10	
03-02		05-07		06-39		10-11	
03-03		05-08		07-00		10-12	

Parameter Code	Setting Content	Parameter Code	Setting Content	Parameter Code	Setting Content	Parameter Code	Setting Content
10-13		11-02		12-03			
10-14		11-03		12-04			
10-15		11-04		12-05			
10-16		11-05		13-00			
10-17		11-06		13-01			
10-18		11-07		13-02			
10-19		11-08		13-03			
10-20		11-09		13-04			
10-21		11-11		13-05			
10-22		12-00		13-06			
11-00		12-01		13-07			
11-01		12-02		13-08			

Appendix 2: Instructions for UL

Safety Precautions

DANGER
Electrical Shock Hazard **Do not connect or disconnect wiring while the power is on.** Failure to comply will result in death or serious injury.

WARNING
Electrical Shock Hazard **Do not operate equipment with covers removed.** Failure to comply could result in death or serious injury. The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual. **Always ground the motor-side grounding terminal.** Improper equipment grounding could result in death or serious injury by contacting the motor case. **Do not touch any terminals before the capacitors have fully discharged.** Failure to comply could result in death or serious injury. Before wiring terminals, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components. **Do not allow unqualified personnel to perform work on the drive.** Failure to comply could result in death or serious injury. Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of AC drives. **Do not perform work on the drive while wearing loose clothing, jewelry, or lack of eye protection.** Failure to comply could result in death or serious injury. Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the drive. **Do not remove covers or touch circuit boards while the power is on.** Failure to comply could result in death or serious injury. **Fire Hazard** **Tighten all terminal screws to the specified tightening torque.** Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. **Do not use an improper voltage source.** Failure to comply could result in death or serious injury by fire. Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power. **Do not use improper combustible materials.** Failure to comply could result in death or serious injury by fire. Attach the drive to metal or other noncombustible material.

NOTICE
Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards. Failure to comply may result in ESD damage to the drive circuitry.
Never connect or disconnect the motor from the drive while the drive is outputting voltage. Improper equipment sequencing could result in damage to the drive.
Do not use unshielded cable for control wiring. Failure to comply may cause electrical interference resulting in poor system performance. Use shielded twisted-pair wires and ground the shield to the ground terminal of the drive.
Do not modify the drive circuitry. Failure to comply could result in damage to the drive and will void warranty. Carlo Gavazzi is not responsible for any modification of the product made by the user. This product must not be modified.
Check all the wiring to ensure that all connections are correct after installing the drive and connecting any other devices. Failure to comply could result in damage to the drive.

UL Standards

The UL/cUL mark applies to products in the United States and Canada and it means that UL has performed product testing and evaluation and determined that their stringent standards for product safety have been met. For a product to receive UL certification, all components inside that product must also receive UL certification.

UL Standards Compliance

This drive is tested in accordance with UL standard UL508C and complies with UL requirements. To ensure continued compliance when using this drive in combination with other equipment, meet the following conditions:

Installation Area

Do not install the drive to an area greater than pollution severity 2 (UL standard).

Main Circuit Terminal Wiring

UL approval requires crimp terminals when wiring the drive's main circuit terminals. Use crimping tools as specified by the crimp terminal manufacturer. Carlo Gavazzi recommends crimp terminals made by NICHIFU for the insulation cap.
The table below matches drives models with crimp terminals and insulation caps. Orders can be placed with a Carlo Gavazzi representative or directly with the Carlo Gavazzi sales department.

Closed-Loop Crimp Terminal Size

Drive Model RVLF	Wire Gauge mm², (AWG)		Terminal Screws	Crimp Terminal Model No.	Tool Machine No.	Insulation Cap Model No.
	R/L1 x S/L2 x T/L3	U/T1 x V/T2 x W/T3				
RVLFA110040A	2.1 (14)					TIC2
RVLFA110075A	3.3 (12)		M4	R3.5-4		TIC3.5
RVLFA*20040**	1.3 (16)					TIC2
RVLFA*20075**	2.1 (14)					TIC2
RVLFB*20150**	3.3 (12)			R5.5-4		TIC 3.5
RVLFB*20220**	5.3 (10)			R5.5-4		TIC 3.5
RVLFB340075FA	2.1 (14)		M4			TIC2
RVLFB340150FA	2.1 (14)			R3.5-4		TIC2
RVLFB340220FA	2.1 (14)					TIC2
RVLFC340370FA	2.1 (14)			R2-3.5		TIC2
RVLFC340550FA	8.4 (8)					TIC8
RVLFD340750FA	8.4 (8)		M5	R8-5		TIC8
RVLFD3401100FA	8.4 (8)					TIC8

Type 1
During installation, all conduit hole plugs shall be removed, and all conduit holes shall be used.

Drive Model RVLF	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
200 V Class Single-Phase Drives		
RVLFA110040A	Bussmann 20CT	690V 20A
RVLFA110075A	Bussmann 25ET	690V 25A

Drive Model RVLF	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
200 V Class Single-Phase Drives		
RVLFA120040FA	Bussmann 10CT/16CT	690V 10A/ 690V 16A
RVLFA120075FA	Bussmann 10CT/20CT	690V 10A/ 690V 20A
RVLFB120150FA	Bussmann 16CT	690V 16A
RVLFB120220FA	Bussmann 20CT	690V 20A

Drive Model RVLF	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
200 V Class Three-Phase Drives		
RVLFA320075A	Bussmann 10CT	690V 10A
RVLFB320150A	Bussmann 16CT	690V 16A
RVLFB320220A	Bussmann 20CT	690V 20A

Drive Model RVLF	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
400 V Class Three-Phase Drives		
RVLFB340075FA	Bussmann 10CT	690V 10A
RVLFB340150FA	Bussmann 16CT	690V 16A
RVLFB340220FA	Bussmann 20CT	690V 20A
RVLFC340370FA	Bussmann 25ET	690V 25A
RVLFC340550FA	Bussmann 40FE	690V 40A
RVLFD340750FA	Bussmann 50ET	690V 50A
RVLFD3401100FA	Bussmann 63ET	690V 63A

• Motor Overtemperature Protection
Motor overtemperature protection shall be provided in the end use application.

• Field Wiring Terminals
All input and output field wiring terminals not located within the motor circuit shall be marked to indicate the proper connections that are to be made to each terminal and indicate that copper conductors, rated 75°C are to be used.

• Drive Short-Circuit Rating
This drive has undergone the UL short-circuit test, which certifies that during a short circuit in the power supply the current flow will not rise above value. Please see electrical ratings for maximum voltage and table below for current.

• The MCCB and breaker protection and fuse ratings (refer to the preceding table) shall be equal to or greater than the short-circuit tolerance of the power supply being used.

• Suitable for use on a circuit capable of delivering not more than (A) RMS symmetrical amperes for (Hp) Hp in 240 / 480 V class drives motor overload protection.

Horse Power (Hp)	Current (A)	Voltage (V)
1-50	5	240 / 480
51-160	10	240 / 480

• Drive Motor Overload Protection

Set parameter 02-01 (motor rated current) to the appropriate value to enable motor overload protection. The internal motor overload protection is UL listed and in accordance with the NEC and CEC.

• 02-01 Motor Rated Current

Setting range: Model dependent
Factory default: Model dependent
The motor rated current parameter (02-01) protects the motor and allows for proper vector control when using open loop vector or flux vector control methods (00-00 = 2 or 3). The motor protection parameter 08-05 is set as factory default. Set 02-01 to the full load amps (FLA) stamped on the nameplate of the motor.

• 08-05 Motor Overload Protection Selection

The drive has an electronic overload protection function (OL1) based on time, output current, and output frequency, which protects the motor from overheating. The electronic thermal overload function is UL-recognized, so it does not require an external thermal overload relay for single motor operation.

This parameter selects the motor overload curve used according to the type of motor applied.

Setting	Description
---0	Disabled
---1	Enabled

Sets the motor overload protection function in 08-05 according to the applicable motor.

Setting 08-05 = ---0B. Disables the motor overload protection function when two or more motors are connected to a single inverter. Use an alternative method to provide separate overload protection for each motor such as connecting a thermal overload relay to the power line of each motor.

Motor Overload Protection Time

08-06 Motor Overload Operation Selection

Setting	Description
0	Free Run Stop (default setting)
1	Alarm Only

Appendix 3: RVLF MODBUS protocol

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1. Communication Data Frame

RVLF series inverter can be controlled by a PC or other controller with the communication protocol, Modbus ASCII Mode & Mode RTU, RS485 or RS232. Frame length maximum 80 bytes.
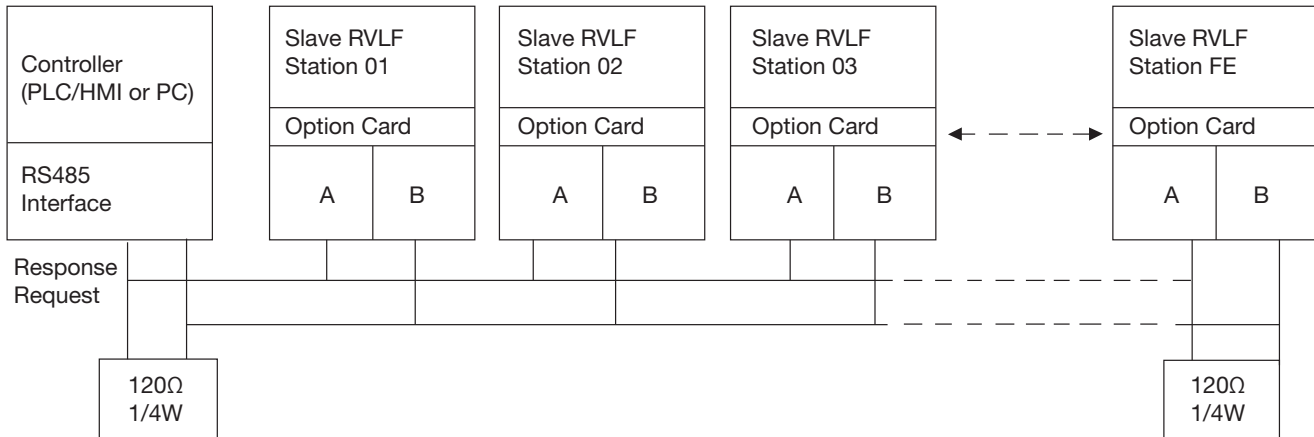
The network is terminated at each end with an external terminating resistor (120Ω, 1/4W)

1.2. Data Format ASCII MODE

STX(3AH)	Start bit = 3AH
Address Hi	Communication address (station):
Address Lo	2-digit ASCII code
Function Hi	Function code (command):
Function Lo	2-digit ASCII code
Command start address	
Command start address	Command start byte:
Command start address	4-digit ASCII code
Command start address	
Data length	
Data length	The length of the command:
Data length	4-digit ASCII code
Data length	
LRC check Hi	LRC check code:
LRC check Lo	2-digit ASCII code
END Hi	End byte :
END Lo	END Hi = CR (0DH), END Lo= LF (0AH)

MASTER(PLC etc.) send request to SLAVE, whereas response to MASTER.
The signal receiving is illustrated here.
The data length is varied with the command(Function).

SLAVE Address
Function Code
DATA
CRC CHECK
Signal Interval

** The interval should be maintained at 10ms between command signal and request.

1.3. SLAVE (Address)

00H: Broadcast to all the drivers
01H: To the No.01 Drivers
0FH: To the No.15 Drivers
10H: To the No.16 Driver
and so on...., max to 32 (20H)

1.4. Function Code

03H: Read the register contents
06H: Write a WORD to register
08H: Loop test
10H: Write several data to register (complex number register write)

2. CMS (Checksum and time-out definition)

2.1 LRC CHECK

ex:	ADDRESS	01H
	FUNCTION	03H
	COMMAND	01H
		00H
	DATA LENGT	0AH

                        0FH------------true complement
Checksum =   F1H
CS (H) =   46H (ASCII)
CS (L) =   31H (ASCII)

2.2 CRC CHECK: CRC check code is calculated from SLAVE address to end of the data. The calculation method is illustrated as follow:

(1). Load a 16-bit register with FFFF hex (all's1). Call this the CRC register.

(2). Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC register, putting the result in the CRC register.

(3). Shift the CRC register one bit to the right (toward the LSB), zero-filling the MSB, extract and examines the LSB.

(4). (If the LSB was 0): Repeat steps (3) (another shift). (If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001), putting the result in the CRC register.

(5). Repeat steps (3) and (4) until 8 shifts been performed. When this is done, a complete 8-bit byte will be processed .

(6). Repeat steps (2) through (5) for next 8-bit byte of the message, continue doing this until all bytes have been processed. The final content of the CRC register is the CRC value. Placing the CRC into the message: When the 16-bit CRC (2 8-bit bytes) is transmitted in the message, the Low-order byte will be transmitted first, followed by the high-order byte, for example, if the CRC value is 1241 hex, the CRC-16 Upper put the 41h, the CRC-16 lower put the 12h.

- CRC calculation application program

```
UWORD ch_sum (UBYTE long , UBYTE *rxdbuff)
{
            BYTE i = 0;
            UWORD wkg = 0xFFFF;
            while (long--)
{

            wkg ^= rxdbuff++;
            for (i = 0 ; i < 8; i++)
{

            if (wkg & 0x0001)
{

            wkg = (wkg >> 1) ^ 0xa001;
    }
     else
{

     wkg = wkg >> 1;
    }
   }
  }
  return(wkg);
}
```

3. Error Code

ASCII Mode

STX	':'
Address	'0'
	'1'
Function	'8'
	'6'
Exception code	'5'
	'1'
LRC Check	'2'
	'8'
END	'CR'
	'LF'

RTU Mode

SLAVE Address		02H
Function		83H
Exception code		52H
CRC-16	High	C0H
	Low	CDH

Under communication linking, the driver responses the exception code and send function code AND 80H to main system if there is error happened.

Error Code	Description
51	Function code error
52	Address error
53	Data amount error
54	DATA over range
55	Writing mode error

4. Inverter Control
4.1 Command Data (Readable and writable)

Register No.	Bit	Content
2500H	Reserved	
2501H		Operation Signal
	0	Operation Command 1: Run 0: Stop
	1	Reverse Command 1: Reverse 0: Forward
	2	Abnormal 1: EFO
	3	Fault Reset 1: Reset
	4	Jog Forward Command 1: Jog Forward
	5	Jog Reverse Command 1: Jog Reverse
	6	Multi-function CommandS1 1: "ON" 0: "OFF"
	7	Multi-function CommandS2 1: "ON" 0: "OFF"
	8	Multi-function CommandS3 1: "ON" 0: "OFF"
	9	Multi-function CommandS4 1: "ON" 0: "OFF"
	A	Multi-function CommandS5 1: "ON" 0: "OFF"
	B	Reserved
	C	Relay R1 1: "ON" 0: "OFF"
	D	Reserved
	E~F	Reserved
2502H	Frequency Command	
2503~251FH	Reserved	

Note: Write in zero for not used BIT, do not write in data for the reserved register.

4.2 Monitor Data (Only for reading)

Register No.	Bit	Content
2520H	0	Operation state 1: Run 0: Stop
	1	Direction state 1: Reverse 0: Forward
	2	Inverter operation prepare state 1: Ready 0: Unready
	3	Abnormal 1: Abnormal
	4	DATA setting error 1: Error
	5-F	Reserved

Register No.	Content				
	Abnormity				
	00	The inverter is normal	24	Over voltage during decelerating (OV-C)	
	01	Inverter over heat (OH)	25	Inverter over heat during running (OH-C)	
	02	Over current at stop (OC)	26	Stop at 0 speed (STP0)	
	03	Under voltage (LV)	27	Direct start malfunction (STP1)	
	04	Over voltage (OV)	28	Control panel emergency stop (STP2)	
	05	Reserved	29	Keypad operation error (Err1)	
	06	External BB (bb)	30	Parameter setting error (Err2)	
	07	CPU error by external signal (CTER)	31	Analog transferred error (Err4)	
	08	PID feedback signal loss(PDER)	32	Parameter changed during Communication (Err5)	
	09	EEPROM abnormal(EPR)	33	Communication failure (Err6) (Note)	
	10	Parameters auto measure error (ATER)	34	Parameter setting error (Err7)	
	11	Over Torque (OL3)	35	Restore factory setting error (Err8)	
2521H	12	Inverter over load (OL2)	36	Reserved	
	13	Motor over load (OL1)	37	Reserved	
	14	External communication error (EFO)	38	Parameters copy error via copy unit (EPR1)	
	15	External Stop (E.S)	39	Parameters copy incorrect via copy unit (EPR2)	
	16	Parameter Locked (LOC)	40	Inverter over speed (OVSP)	
	17	Reserved	41	Input phase lost (PF)	
	18	Over current at constant speed (OC-C)	42	Horsepower setting error (HPERR)	
	19	Over current during accelerating (OC-A)	43	Reserved	
	20	Over current during decelerating (OC-D)	44	Motor temperature overheat error (OH4)	
	21	Over current at starting to run (OC-S)	45	Motor temperature overheat alarm (OH3)	
	22	Reserved	46	Output current reaches current limit level (CL)	
	23	Under voltage during running (LV-C)			

Register No.	Content			
	Sequence input status			
	0	Terminal S1	1 :"ON"	0:"OFF"
	1	Terminal S2	1 :"ON"	0:"OFF"
	2	Terminal S3	1 :"ON"	0:"OFF"
	3	Terminal S4	1 :"ON"	0:"OFF"
2522H	4	Terminal S5	1 :"ON"	0:"OFF"
	5	Terminal S6	1 :"ON"	0:"OFF"
	Contact output			
	6	Relay R1	1 :"ON"	0:"OFF"
	7	Relay R2	1 :"ON"	0:"OFF"
	9~F	Reserved		

Note: Err6 error: Inverter gets communication error with external devices.
When inverter gets communication error:
If the controller writes "1" to "2501H bit 2", inverter appears "EFO" on display.
If the controller does not write "1" to "2501H bit 2", inverter appears "Err6" on display

Register No.	Content
2523H	Frequency command(100/1Hz)
2524H	Output frequency (100/1Hz)
2525H	Output voltage command (10/1V)
2526H	DC voltage command (1/1V)
2527H	Output current (10/1A)
2528H	Reserved
2529H	Reserved
252AH	PID feedback (100% / fmax , 10/1%)
252BH	PID input (100% / fmax, 10/1%)
252CH	TM2 AVI input value (1000 / 10V) *1
252DH	TM2 ACI input value (1000 / 10V) *1
252EH	Reserved
252FH	RVLF identification: 0x0100

4.3 Read the data in the holding register [03H]

Master unit reads the contents of the holding register with the continuous number for the specified quantity.

Note:
1 Limit number of read data, RTU: 37, ASCII:17.
2 Can only continuous read the address of the same group
3 Read data quantity ≥1.
(Example) read the SLAVE station No: 01, RVLF drive's frequency command.

ASCII Mode

Instruction Message

3AH	STX
30H	SLAVE
31H	Address
30H	Function
33H	Code
41H	
30H	Start
32H	Address
33H	
30H	
30H	
30H	Quantity
31H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	SLAVE
31H	Address
30H	Function Code
33H	
30H	DATA
32H	Number
31H	
37H	First
37H	holding
30H	register
?	LRC CHECK
?	
0DH	END
0AH	

Response (Fault)

3AH	STX
30H	SLAVE
31H	Address
38H	Function Code
33H	
35H	Error Code
32H	
?	LRC CHECK
?	
0DH	END
0AH	

RTU Mode

Instruction Message

SLAVE Address		01H
Function Code		03H
Start Address	High	A0H
	Low	23H
Quantity	High	00H
	Low	01H
CRC-16	High	57H
	Low	C0H

Response Message (Normal)

SLAVE Address		01H
Function Code		03H
DATA Number		02H
First holding register	High	07H
	Low	D0H
CRC-16	High	BBH
	Low	E8H

Response (Fault)

SLAVE Address		01H
Function Code		83H
Error Code		52H
CRC-16	High	C0H
	Low	CDH

4.4 LOOP BACK testing [08H]

The function code checks communication between MASTER and SLAVE, the instruction message is returned as a response message without being changed, any values can be used for test codes or data.

ASCII Mode

Instruction Message			Response Message (Normal)			Response (Fault)		
3AH	STX		3AH	STX		3AH	STX	
30H	SLAVE		30H	SLAVE		30H	SLAVE	
31H	Address		31H	Address		31H	Address	
30H	Function		30H	Function		38H	Function	
38H	Code		38H	Code		38H	Code	
30H			30H			32H	Error Code	
30H	Test Code		30H	Test Code		30H		
30H			30H			37H	LCR CHECK	
30H			30H			35H		
41H			41H			0DH	END	
35H	DATA		35H	DATA		0AH		
33H			33H					
37H			37H					
31H	LCR CHECK		31H	LCR CHECK				
42H			42H					
0DH	END		0DH	END				
0AH			0AH					

RTU Mode

Instruction Message			Response Message (Normal)			Response (Fault)		
SLAVE Address		01H	SLAVE Address		01H	SLAVE Address		01H
Function Code		08H	Function Code		08H	Function Code		88H
Test Code	High	00H	Test Code	High	00H	Error Code		20H
	Low	00H		Low	00H	CRC-16	High	47H
DATA	High	A5H	DATA	High	A5H		Low	D8H
	Low	37H		Low	37H			
CRC-16	High	DAH	CRC-16	High	DAH			
	Low	8DH		Low	8DH			

4.5 Write holding register [06H]

Specified data are written into the several specified holding registers from the specified respectively.

(Example) set SLAVE station No: 01, write RVLF drive frequency reference 60.0 HZ.

ASCII Mode

Instruction Message

3AH	STX
30H	SLAVE Address
31H	
30H	Function Code
36H	
41H	Start Address
30H	
30H	
32H	
31H	DATA
37H	
37H	
30H	
?	LCR CHECK
?	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	SLAVE Address
31H	
30H	Function Code
36H	
41H	Start Address
30H	
30H	
32H	
31H	DATA
37H	
37H	
30H	
?	LCR CHECK
?	
0DH	END
0AH	

Response (Fault)

3AH	STX
30H	SLAVE Address
31H	
38H	Function Code
36H	
35H	Error Code
32H	
?	LCR CHECK
?	
0DH	END
0AH	

RTU Mode

Instruction Message

SLAVE Address		01H
Function Code		06H
Start Address	High	A0H
	Low	02H
DATA	High	17H
	Low	70H
CRC-16	High	04H
	Low	1EH

Response Message (Normal)

SLAVE Address		01H
Function Code		06H
Start Address	High	A0H
	Low	02H
DATA	High	17H
	Low	70H
CRC-16	High	04H
	Low	1EH

Response (Fault)

SLAVE Address		01H
Function Code		86H
Error Code		52H
CRC-16	High	C3H
	Low	9DH

4.6 Write in several holding registers [10H]

Specified data are written into the several specified holding registers from the specified number respectively.

Note:

1: Limit number of read data, RTU: 35, ASCII: 15.

2: Can only continuous read the address of the same group.

3: Read data quantity ≥1.

(Example) set SLAVE station No: 01, RVLF drive as forward run at frequency reference 60.0 HZ.

ASCII Mode

Instruction Message

3AH	STX
30H	SLAVE
31H	Address
31H	Function
30H	Code
41H	
30H	Start
30H	Address
31H	
30H	
30H	
30H	Quantity
32H	
30H	Data
34H	Number *
30H	
30H	First
30H	DATA
31H	
31H	
37H	Next
37H	DATA
30H	
?	LRC CHECK
?	
0DH	END
0AH	

Response Message (Normal)

3AH	STX
30H	SLAVE
31H	Address
31H	Function
30H	Code
41H	
30H	Start
30H	Address
31H	
30H	
30H	Quantity
30H	
32H	
?	LRC CHECK
?	
0DH	END
0AH	

Response (Fault)

3AH	STX
30H	SLAVE
31H	Address
39H	Function
30H	Code
35H	Error
32H	Code
?	LRC CHECK
?	
0DH	END
0AH	

RTU Mode

Instruction Message

SLAVE Address		01H
Function Code		10H
Start Address	High	A0H
	Low	01H
Quantity	High	00H
	Low	02H
DATA Number *		04H
First DATA	High	00H
	Low	01H
Next DATA	High	17H
	Low	70H
CRC-16	High	95H
	Low	B0H

Response Message (Normal)

SLAVE Address		01H
Function Code		10H
Start Address	High	A0H
	Low	01H
DATA	High	00H
	Low	02H
CRC-16	High	32H
	Low	08H

Response (Fault)

SLAVE Address		01H
Function Code		90H
Error Code		52H
CRC-16	High	CDH
	Low	FDH

* DATA numbers are the actual number timers 2

Appendix 4: BACNet Protocol Description

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BACnet is in compliance with four-layer of seven-layer structure models in OSI (Open Systems Interconnection) of International Standard Organization (ISO). These four-layer structure models are application layer, network layer, data link layer and physical layer. Besides, BACnet is definced by the view of standard "object" and "property." All BACnet devices are controlled via the property of objects. Every controller with BACnet devices is considered an object collector so that every controller device can execute different kinds of functions of objects to achieve the communication control and monitor control.

BACnet Simple Model					OSI Corresponding Model
Application Layer of BACnet					Application Layer
Network Layer of BACnet					Network Layer
ISO- 8802-2 (IEEE802.2)		MS/TP	PTP	LonkTalk	Data Link Layer
ISO- 8802-3 (IEEE802.3)	ARCNET	EIA-485	EIA-232		Physical Layer
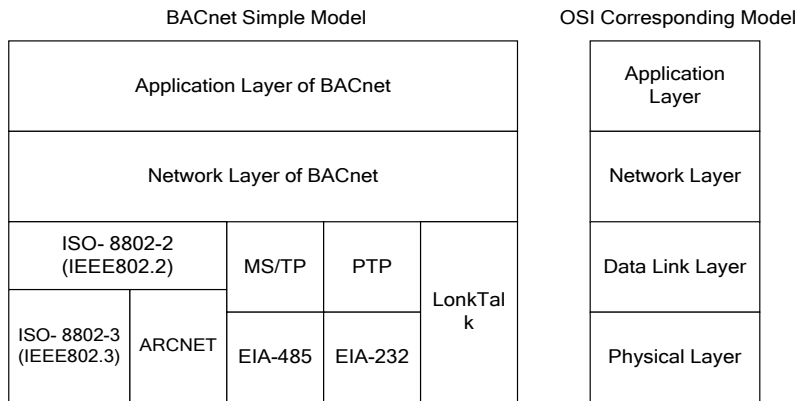
1. BACnet Services

Services provide some commands to save or control information and some functions to achieve the purpose of monitoring and control. Namely, one BACnet device reveive certain information or command to complete specific work from other BACnet device so the two devices need to support the same service to complete communication. To complete the exchange of these service messages, these communication requirements are specified in the communication protocol of application layer by BACnet. Thus, services are parts of the communication protocol data unit (PDU) in the application layer and build the communication modes via the relationship of Server – Client. Client will send the message of sevice requirements to Server and Server needs to respond to Client to execute this service. Refer to the following figure.

Client

Request

Send	→	Request for PDU	→	**Server** **Respond** Receive

| Receive | ← | Respond to PDU | ← | Send |
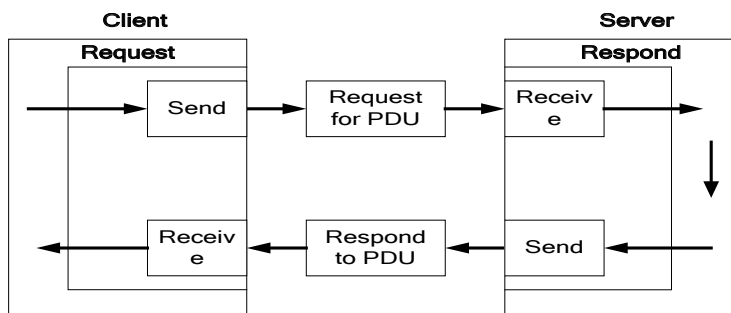
All BACnet devices have the application programs to manage the requirements of device motion and executing services. Take work station for example, the application program needs to keep the display value of every input so it requires sending the service request to the object of other device to update the display value of input. The application program of the device needs to respond to the service requirements. Refer to the following figure.

BACnet Device
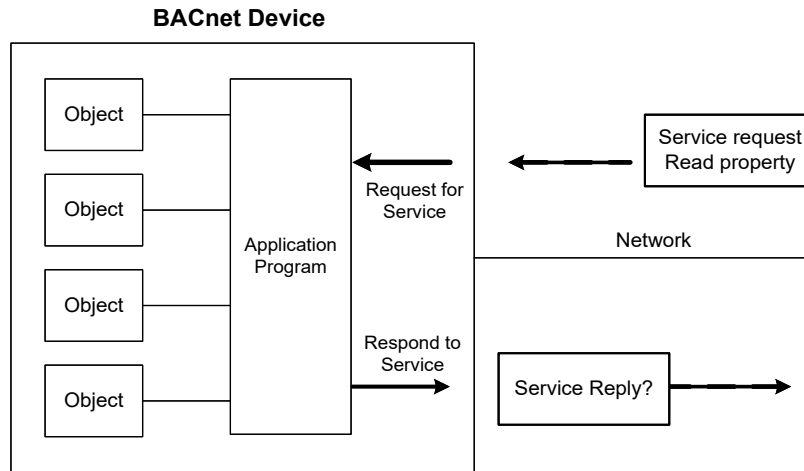
2. BACnet Protocol Structure

BACnet is the communication protocol by way of protocol stack so the pocket is composed of stacked layer types. Refer to the following figure.
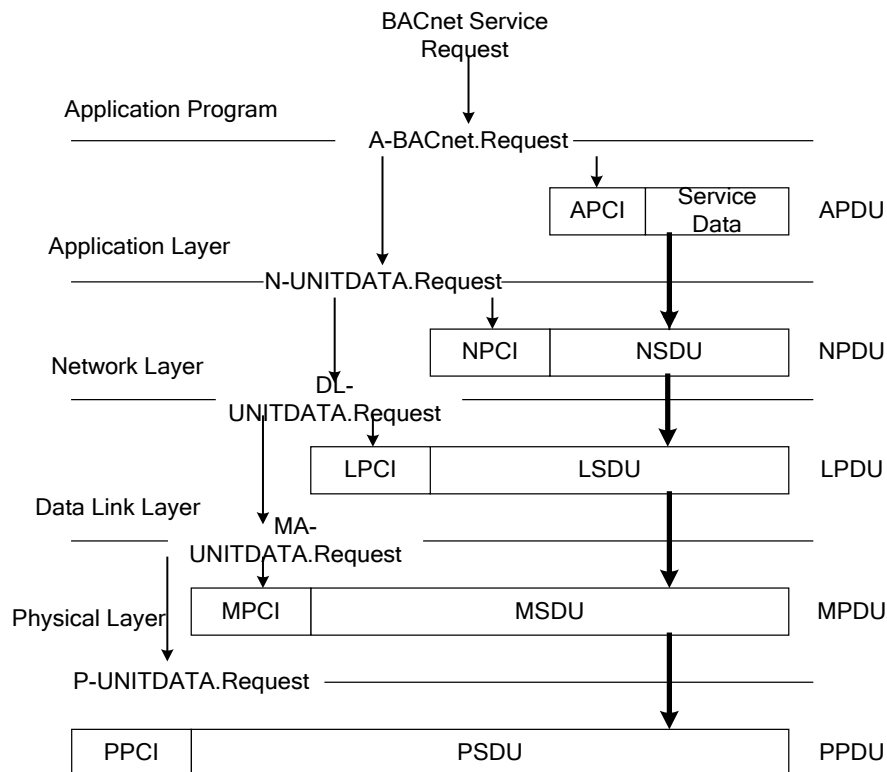
When application program sends the BACnet service request for the pocket, it requires requesting for executing BACnet request program in the application layer via application program interface. The requirements of the program are sent to the application layer and application protocol data unit (APDU) consists of Application Protocol Control Information (APCI) and Servie Data of application program. Then APDU passes its messages downward to BACnet request program in the network layer. APDU becomes Network Layer Protocol Data Unit (NPDU) composed of Network Service Data Unit (NSDU) and Network Protocol Control Information (NPCI). And so forth for the data link layer and physical layer to complete the full service for the packet.

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3. BACnet Specifications

Inverter RVLF model is built-in standard BACnet MS/TP communication protocol structure to meet the demand of automatic communication equipment. Control or monitor RVLF via BACnet to be allowable to read and modify specific parameter. RVLF includes the following supports of standard objects:

- Inverter Objects
- Analog Input
- Digital Input
- Analog Output
- Digital Output
- Analog Value
- Digital Value

Refer to Table 3.1 for RVLF supporting the property information of object classification. User can collect related properties of objects required via the dedicated communication software of BACnet to give control or monitor command for each object.

Table 3.1 Object and property supporting list

Proerty	Inverter (VFD)	Analog Input (AI)	Analog Output (AO)	Analog Value (AV)	Digital Input (BI)	Digital Output (BO)	Digital Value (BV)
Object_Identifier	V	V	V	V	V	V	V
Object_Name	V	V	V	V	V	V	V
Object_Type	V	V	V	V	V	V	V
System_Status	V						
Vendor_Name	V						
Vendor_ Identifier	V						
Model_Name	V						
Firmware_Revision	V						
Applocation_Software_Supported	V						
Protocol_Version	V						
Protocol_Revision	V						
Protocol_Services_Supported	V						
Protocol_Object_Type_Supported	V						
Object_List	V						

Proerty	Inverter (VFD)	Analog Input (AI)	Analog Output (AO)	Analog Value (AV)	Digital Input (BI)	Digital Output (BO)	Digital Value (BV)
Max_APDU_Length_Accepted							
Segmentation_Supported							
APDU_Timeout							
Number_Of_APDU_Retries							
Max_Masters	V						
Max_Info_Frames	V						
Device_Address_Binding							
Location	V						
Presnent_Value		V	V	V	V	V	V
Status_Flags							
Event_State							
Relibility							
Out_Of_Service							
Units		V	V	V			
Priority_Array							
Relinquish_Default							
Polarity							
Inactive_Text							
Active_Text							

4. BACnet Object Properties

This section provides the predetermined configuration of the inverter. User can achieve the optimizazed situation at any necessary modification.

Refer to Table 4.1 for the property information of inverter objects and user can learn the inverter messages from the inverter objects.

Refer to Table 4.2 ~ Table 4.7 for the related object information that inverter supports. User can control/ read each object with the application requirements.

Property	Inverter
Object_Identifier	VFD
Object_Name	CG RVLF
Object_Type	8
System_Status	0
Vendor_Name	CG RVLF
Vendor_ Identifier	461
Model_Name	CG.Inc
Firmware_Revision	0.14
Applocation_Software_Supported	0.14
Protocol_Version	1
Protocol_Revision	5
Protocol_Services_Supported	{ readProperty , writeProperty , who is }
Protocol_Object_Type_Supported	{ Analog_Input , Analog_Output, Analog_Value Binary_ Input, Binary_Output, Binary_Value, Device}
Max_Masters	127
Max_Info_Frames	1
Location	R.O.C

Table 4.2 Analog input property list (READ)

No.	Object Name	Description	Unit	Classification	Range
AI0	TM2 AVI	AVI input	Percent	R	0 - 100
AI1	TM2 ACI	ACI input	Percent	R	0 - 100
AI2	Error code	Recent fault message	No Units	R	0 –43
AI3	Freq cmd	Frequency command	HZ	R	0 - 599
AI4	Frequency	Output frequency	HZ	R	0 -599
AI5	Current	Output current	Amps	R	
AI6	Control Mode	Control mode	No Units	R	0 - 1
AI7	Motor R-Volt	Motor rated voltage	Volt	R	
AI8	Motor R-HP	Motor rated power	horsepower	R	
AI9	Motor R-RPM	Motor rated rotation speed	rpm	R	
AI10	Motor R-Hz	Motor rated frequency	HZ	R	
AI11	CarrierFreq	Carrier frequency	KiloHertz	R	1 - 16
AI12	Comm Station	INV communication station	No Units	R	1 – 32
AI13	BaudRate	Baudrate setting	No Units	R	0 – 3
AI14	BacnetSel	Communication mode selection	No Units	R	0 – 2
AI15	DevInstance	Inverter number	No Units	R	1 - 254

Table 4.3 – Analog output property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
AO0	Set Frequency	Frequency command	HZ	R/W	0 - 599
AO1	AO	Output voltage	Volt	R	0 - 10
AO3	Motor R-Amp	Motor rated current	Amps	R/W	0-65535
AO4	PwrL Sel	Momentary stop and restart selection	No Units	R	0 - 1
AO5	RestartSel	Number of Fault Au-to-Restart Attempts	No Units	R	0 – 10
AO6	RestartDelay	Fault Auto-Restart Time	seconds	R	0 - 800
AO7	FreqCommand1	Speed frequency set-ting-stage 0	HZ	R/W	0 - 599
AO8	FreqCommand2	Speed frequency set-ting-stage 1	HZ	R/W	0 - 599
AO9	FreqCommand3	Speed frequency set-ting-stage 2	HZ	R/W	0 - 599
AO10	FreqCommand4	Speed frequency set-ting-stage 3	HZ	R/W	0 - 599
AO11	FreqCommand5	Speed frequency set-ting-stage 4	HZ	R/W	0 - 599
AO12	FreqCommand6	Speed frequency set-ting-stage 5	HZ	R/W	0 - 599
AO13	FreqCommand7	Speed frequency set-ting-stage 6	HZ	R/W	0 - 599
AO14	FreqCommand8	Speed frequency set-ting-stage 7	HZ	R/W	0 - 599
AO23	RunMode	Main run command source selection	No Units	R/W	0 - 2
AO24	ReverseOper	Direction locked command	No Units	R/W	0 - 1
AO25	StoppingSel	Stop modes selection	No Units	R/W	0 - 1
AO26	FrequenceComm	Main frequency com-mand source selection	No Units	R/W	0 - 6
AO27	FreqUpperLim	Upper limit frequency	HZ	R/W	0.01 - 599
AO28	FreqLowerLim	Lower limit frequency	HZ	R/W	0 – 598.99
AO29	Acc Time1	Acceleration time 1	seconds	R/W	0.1 - 3600
AO30	Dec Time1	Deceleration time 1	seconds	R/W	0.1 - 3600

Table 4.4 – value property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
AV0	PID – P Gain	Proportional gain (P)	No Units	R/W	0 - 10
AV1	PID – I Time	Integral time (I)	No Units	R/W	0 - 100
AV2	PID – D Time	Differential time (D)	No Units	R/W	0 – 10

Table 6 Digital output property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
BI0	Run/Stop	Operation status	Stop / Run	R	0 - 1

Table 4.7 Digital value property list (READ/ WRITE)

No.	Object Name	Description	Unit	Classification	Range
BV0	RUN/STOP	RUN/STOP	Stop / Run	R/W	0 - 1
BV1	FWD/REV	FWD/REV	FWD/REV	R/W	0 - 1

Appendix 5: RV-USB instruction manual

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1. Model number and specification

1.1 Model number and function instruction

RV-USB is a RS232 USB type to RS485 converter. It is used for communication between PC and inverter.

1.2 Dimensions of RV-USB

Unit: mm
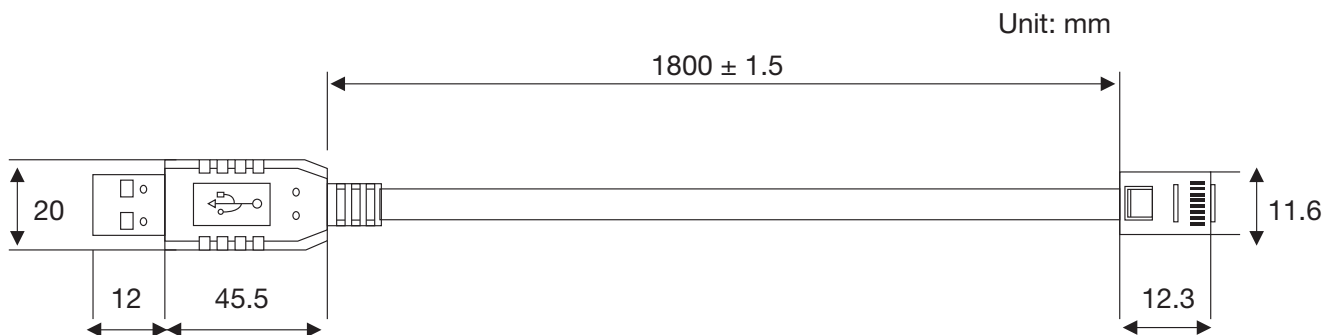
1.3 Connection between inverter and computer.
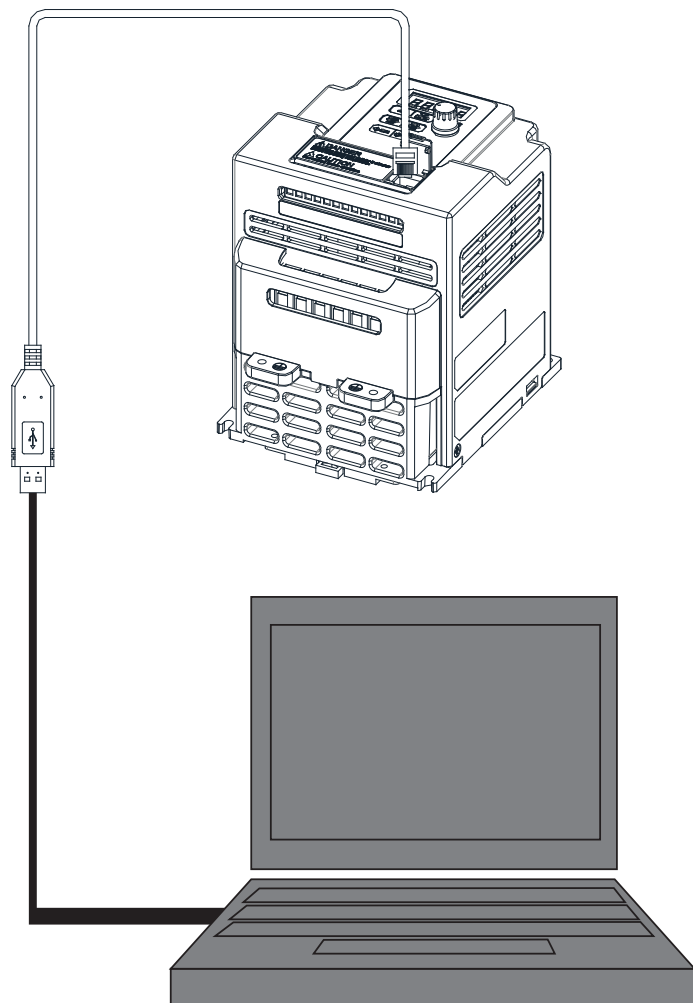
2. USB Interface Cable Pin Definition
2.1 RS232/USB at PC side
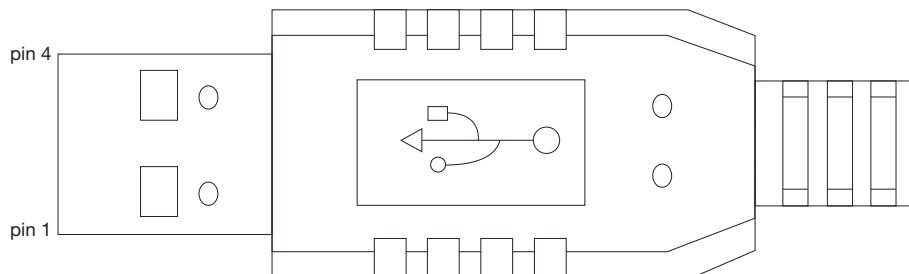
RS485/RJ45 connector at inverter side.
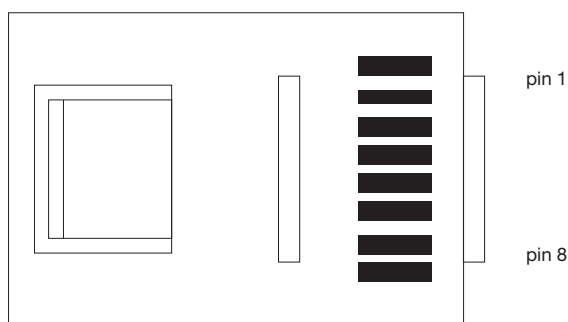
2.2 RS485/RJ45 Pin Definition.

Pin No.	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
Define	B+	A-	NC	NC	NC	NC	VCC	GND

1. A/B phase signal (Pin1&Pin2) is differential mode data signal of RS485.
2. VCC&GND is the +5Vdc power supply provided by inverter internal power source.

3. Notice
3-1. Please turn off the power before you connect the cable.
3-2. Once inverter is powered off during communication. PC software will show "communication error".
3-3. If there is any error during communication, please check the wiring connection and restart the pc software.

Appendix 6: RVLF accessories manual

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Accessories	Model	Function	Notes
Keypad Extension cable	RV-CAB01	Keypad extension cable for RV series	1m
	RV-CAB02		2m
	RV-CAB03		3m
	RV-CAB05		5m
Copy module	RV-CU	• Duplicating parameters setting from one inverter to another inverter • As a remote keypad to be used • Using RJ45 line to connect inverter	
Communication modules	RV-PDP	For connection of Profibus-DP communication protocol	For RV series
	RV-TCPIP	For connection of TCP-IP communication protocol	
	RV-DNET	For connection of DeviceNet communication protocol	
	RV-CAN	For connection of CANopen communication protocol	
RJ45 to USB connection cable	RV-USB	Using the Carlo Gavazzi exclusive PC-software line	1.8m
	RV-USB3		3m

Appendix 7: RV-CU Copy Unit

1. Model Name and Specification

1.1 Model name and function description
Model Name: RV-CU
Function:

• Copy function:

When plenty of same model inverters need to be set as the same parameters, user can set one inverter first, then connect to the copy unit and download the parameter setting from inverter. After that, user can use copy unit to upload the setting to the other inverters. By repeating the procedure, you can have all inverter in same setting as user requirement.

• Keypad function:

Can display status, more detail please refer to the manual.

1.2 Dimension (Unit: mm)
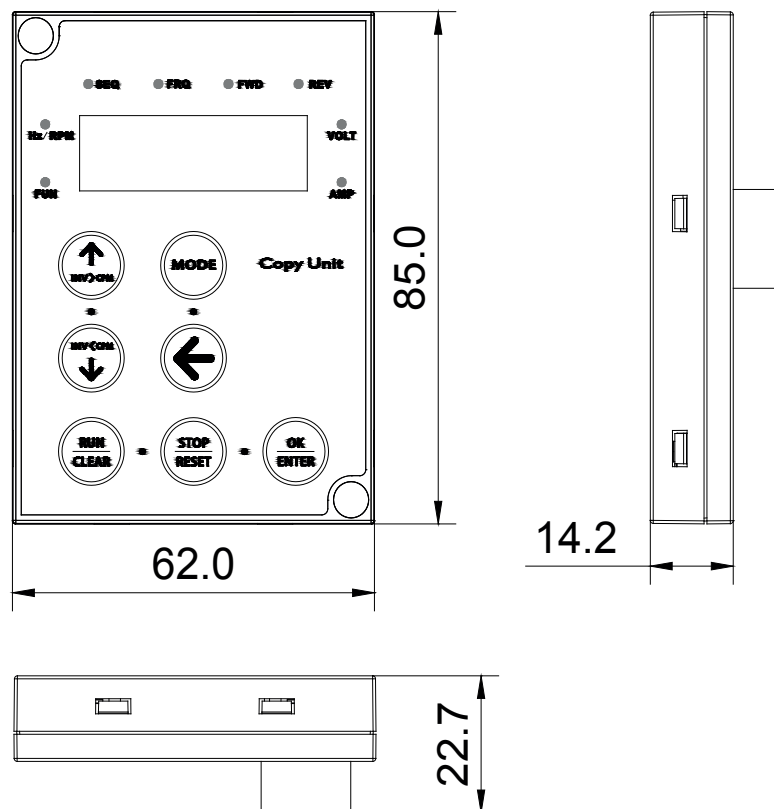
2. Keypad Description
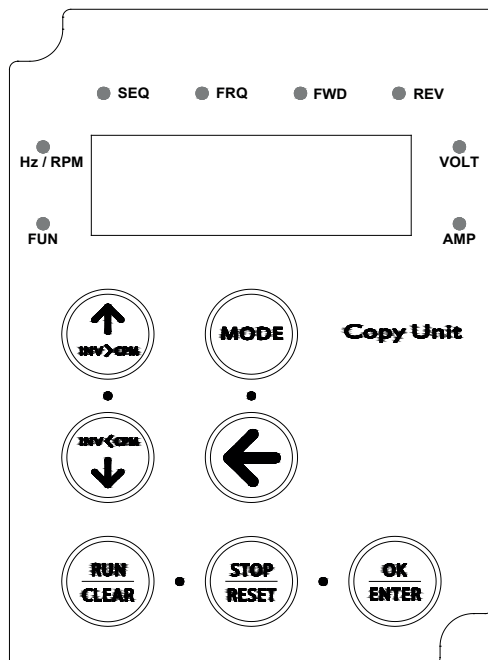
2.1. Copy unit function

Button	Description
INV → CPM	Download setting from Inverter to Copy Unit
INV ← CPM	Upload setting from Copy Unit to Inverter
CLEAR	Clear

OK	Confirm
	Value Adjusting
	Cancel
Reset	Return

2.2. Button Function

OK	Description
	Value Adjusting
	Inverter Run
Reset	Display Mode Switching
	Shift
STOP/ RESET	1. Inverter Stop 2. Reset inverter when manual reset error occur 3. Switch to copy function
ENTER	Value Reading or Adjusting

3. Copy Unit Operating Description
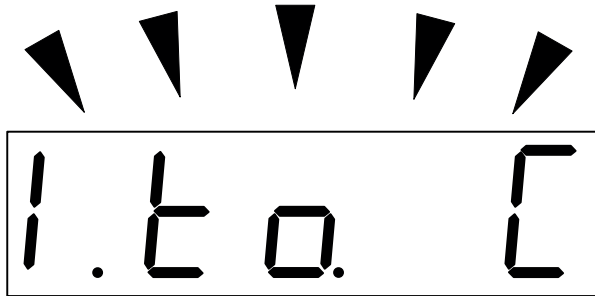
When LED digits are blinking, this means stand by status.

3.1. Inverter Preset

Please make the parameters were set as follows before connecting with the copy unit:

Parameter	Value
Serial Comm Adr	1
RTU/ASCII	RTU
Baud Rate Setting	19200
Stop Bit Selection	1Bit
Parity Selection	No
Data length Selection	8Bit

Attention: 1.If user connect to the copy unit before the presetting, the copy unit will show err0.

3.2 Function Detail
Attention:
1. Make sure the inverter is in stop status before enter copy mode.
2. Please follow installation figure to connect the copy unit and the inverter.
3. Available RVLF firmwareV1.0(and above).
• Enter the Copy Mode
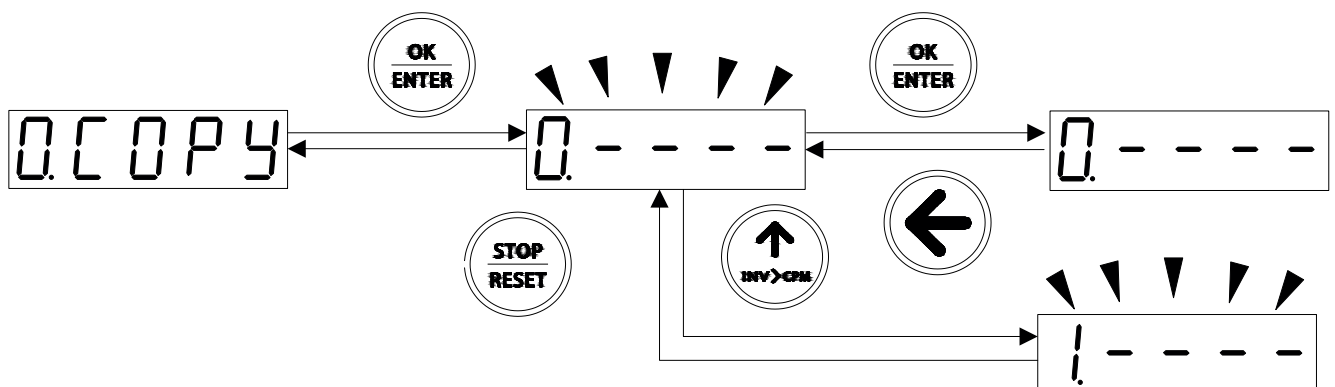
This copy unit can save 4 different parameters, the order is 0 to 3.

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Download Parameter to Copy Unit

```
0.----        1.to. C        1.to. C

0. Inverter model                    End
```
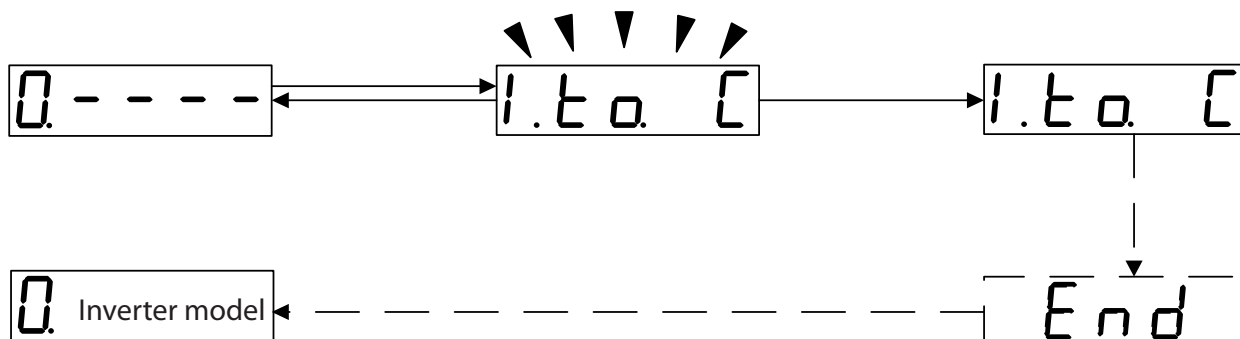
Upload Parameter to Inverter

```
0. Inverter model    INV>CPM    C.to.1.1    INV>CPM    C.to.1.2

        STOP/RESET        OK/ENTER    INV<CPM        OK/ENTER

0. Inverter model        C.to.1.1            C.to.1.2

                    C.to.1.1            C.to.1.2
```
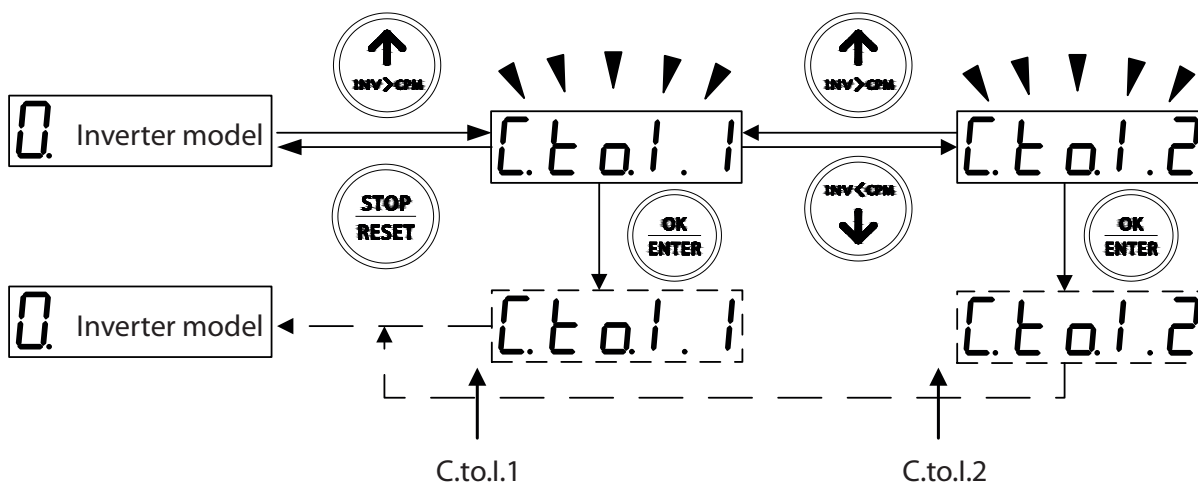
Two choices when uploading parameters to inverter:
C.to.I.1 — Including copy motor parameters   C.to.I.2 — Not including copy motor parameter

Attention:
1. RVLF series only support C.to.I.2
2. When RVLF/RVFF series copy parameters between same model inverters, both C.to.I.1 and C.to.I.2 are available.
3. When RVLF/RVFF series copy parameters between different model inverter, only C.to.I.2 is available. Delete the parameters in copy unit.

⑤Remote Control Mode

⑥Software version

MODE Switch
1.Inverter Display
2.Frequency Command（Frequency setting）
3.Output Frequency
4.Group Parameter（Parameter setting）
5.Output Voltage
6.DC Bus Voltage
7.Output Current

Interface selection

1 rE-C——remote control

2 OP.SL——Open Select
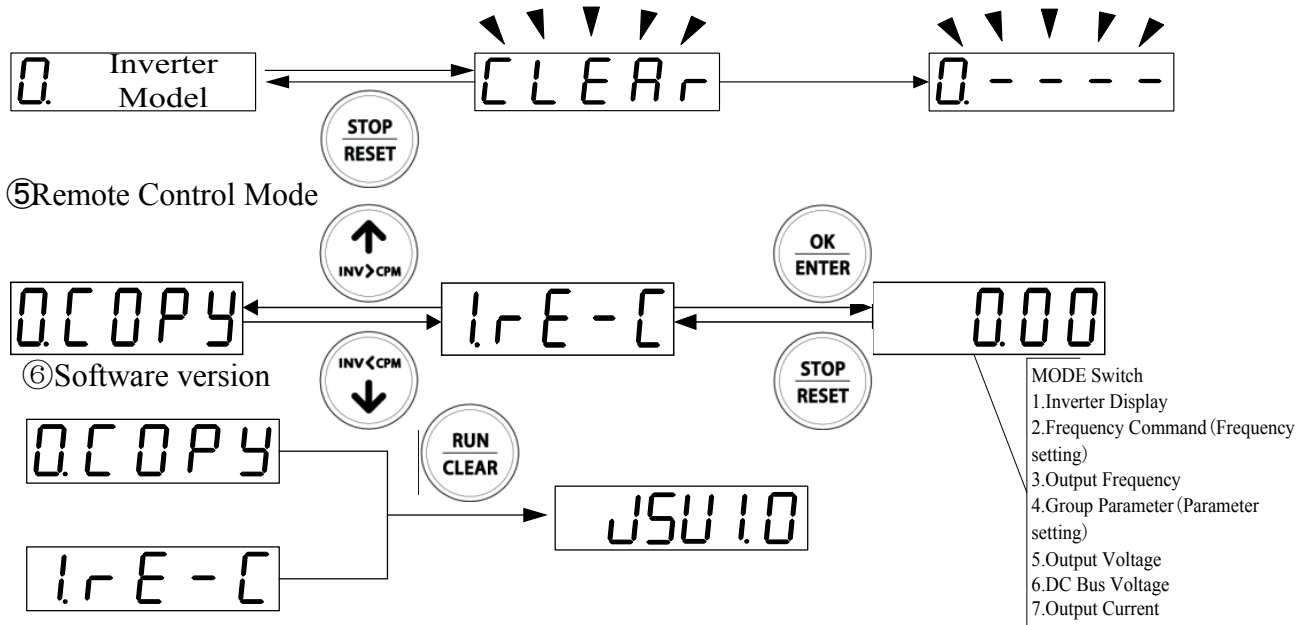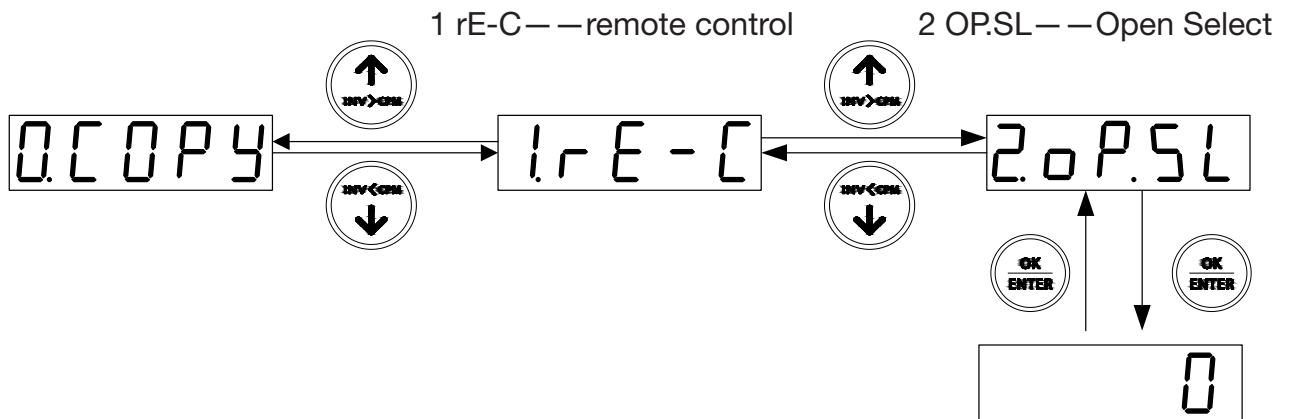
0: After power on, it directly went into the copy function.
1: After power on, it directly went into remote control.

Note:
1. Available for above V1.01 .
2. The function of the V1.01 version only supports RVLF

4. Trouble Diagnosis and Shooting

Error	Description	Cause	Corrective action
Err0	Communication error	1.Signal interfere 2.Cannot connect to inverter	3.Change inverter 4.Check the connector 5. Return copy unit.
Err1	No parameter in this position	No parameter in this position No parameter to upload to inverter	Save parameter in copy unit.
Err2	Cannot upload parameters	Parameter setting error	----
Err7	Firmware version do not support the inverter	Old firmware	Upgrade firmware
EPR	EEPROM error	EEPROM fail	Replace EEPROM
I-err	Inverter error in control process	Inverter error	3.Press STOP/RESET 4.Check inverter

5. Installation Diagram
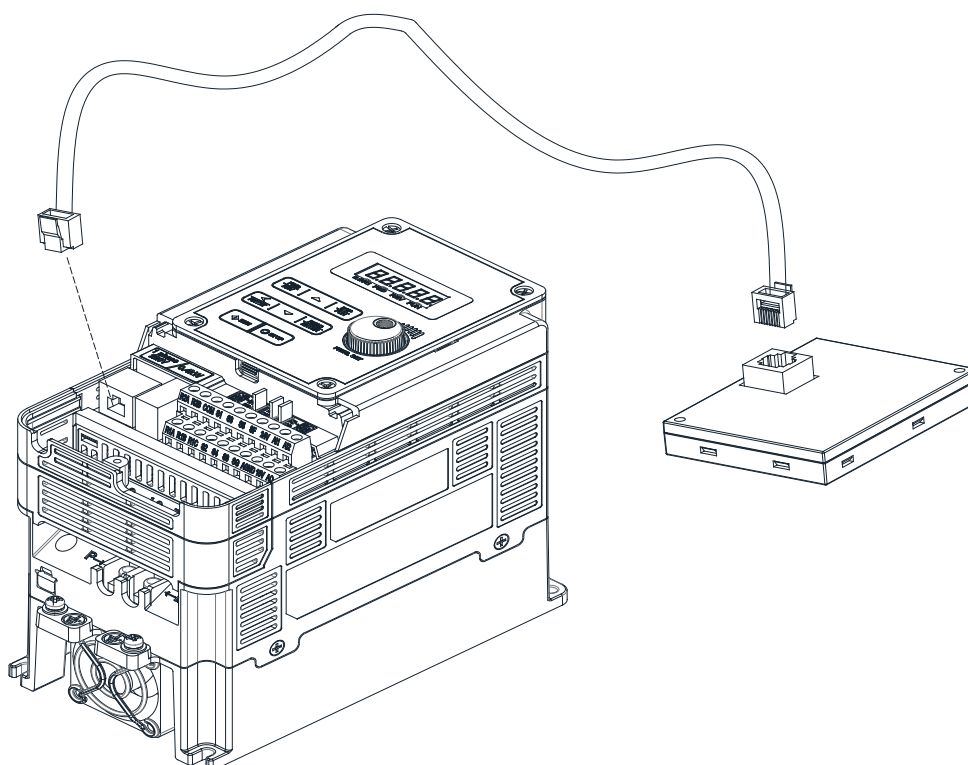
Appendix 8: RV-DNET DeviceNet Unit

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1. Summary

RV-DNET can connect with DeviceNet by DeviceNet Extended Communication Module. To DeviceNet, RV-DNET DeviceNet Communication Module is a Group2 Only Slave device; it is a slave station of DeviceNet.

To Inverter, RV-DNET Communication Module connected with Inverter by RS485 communication port.

DIP switch SW1_8 is required to be set OFF if RV-DNET Module is connected with the inverters of RVLF series, while DIP switch SW1_8 is required to be set ON if RV-DNET Module.

The RVLF series have built-in RS485 interface so they can connect with different extended communication module by Modbus protocol, such as DeviceNet Communication module, Profibus Communication module. If Inverter connected with DeviceNet Communication module, it can`t connected with other communication modules.

1.1. System Structural Diagram

It is the slave station of DeviceNet when RV-DNET Communication Module is connected with the inverter via RS485. Refer to Fig.1.1:
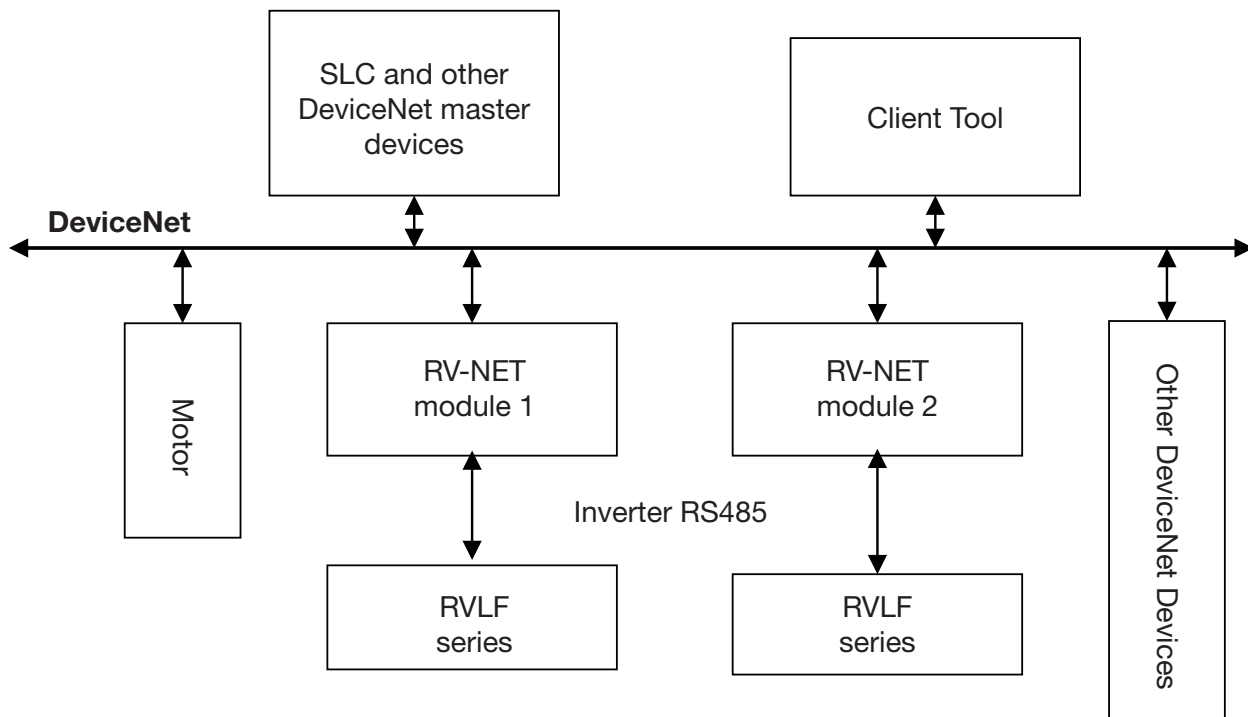
Figure 1.1: Bus System Structure of DeviceNet
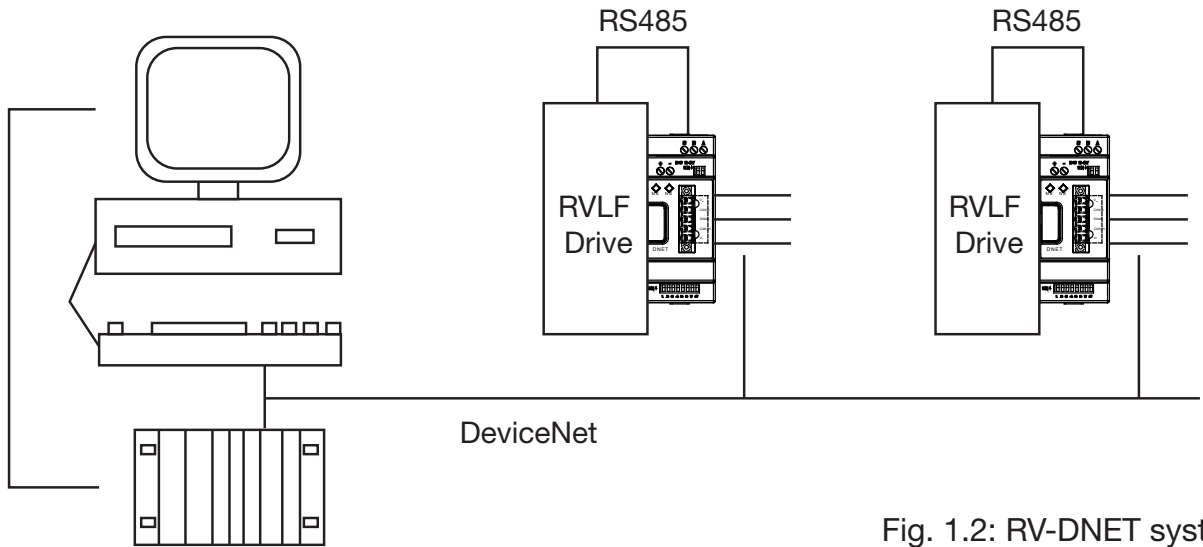
Fig. 1.2: RV-DNET system

1.2. Structure of the unit

1	Power supply terminals	
2	Retractable mounting feet	
3	DIP Switch (2PIN: Selection of Network Terminating Resistor)	
4	Module Status indicator/Network Status indicator	
5	Press-button	
6	DIP Switch (8PIN: Settings of Network ID and functions)	
7	RS485	
8	Terminals	

Figure 1.3: Structure of the RV-DNET Extended Module

1.3. Description of Communication Module

• DeviceNet Communication
Support Self-adjust Baud Rate

- Support
- Support duplicate MAC Id check
- Support predefine master slave connection
- Support predefine explicit message connection
- Support predefine poll IO message connection
- Support explicit and IO message fragment

2. Installation

2.1. Installation and Dimensions

• Installation

RV-DNET Module can be installed vertically shown as the left side of Fig. 2.1. Fix the module to DIN rail and the rail is gripped accurately to the plastic groove. It is suggested to add clips at rail terminal to fix it. It is also suggested to install the screw M4 directly to RV-DNET module, shown as the right side of Fig.2.1.
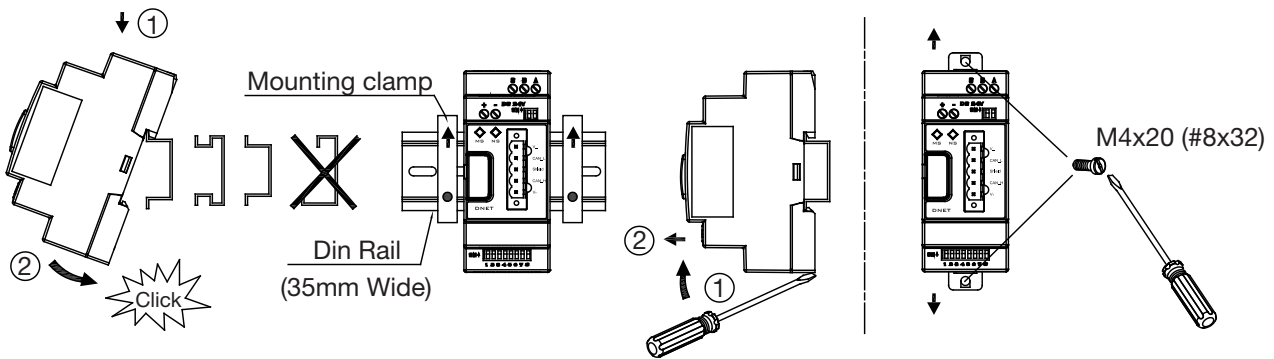
Figure 2.1: Fixed Installation

• Dimensions
  Unit: mm (1 inch=25.4mm)
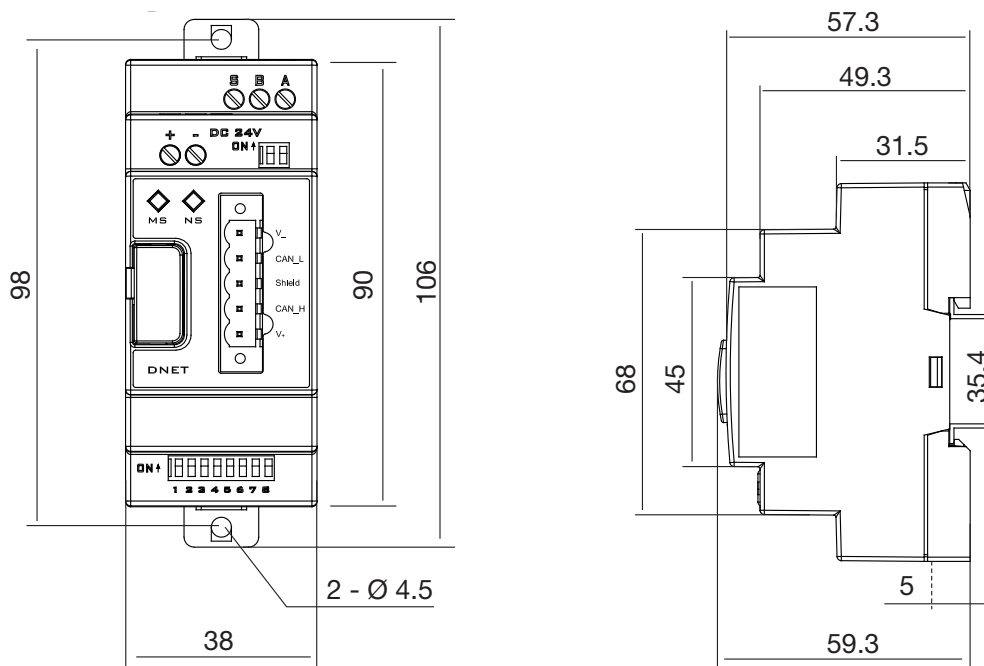
2.2. Connecting power supply

Network power supply and 24VDC backup power supply are applied to RV-DNET module.
Warning: Ensure the safe electrical isolation between Extra Low Voltage and 24V power supply.

1 Fast Fuse, Breaker, Circuit Protection
2 Filter
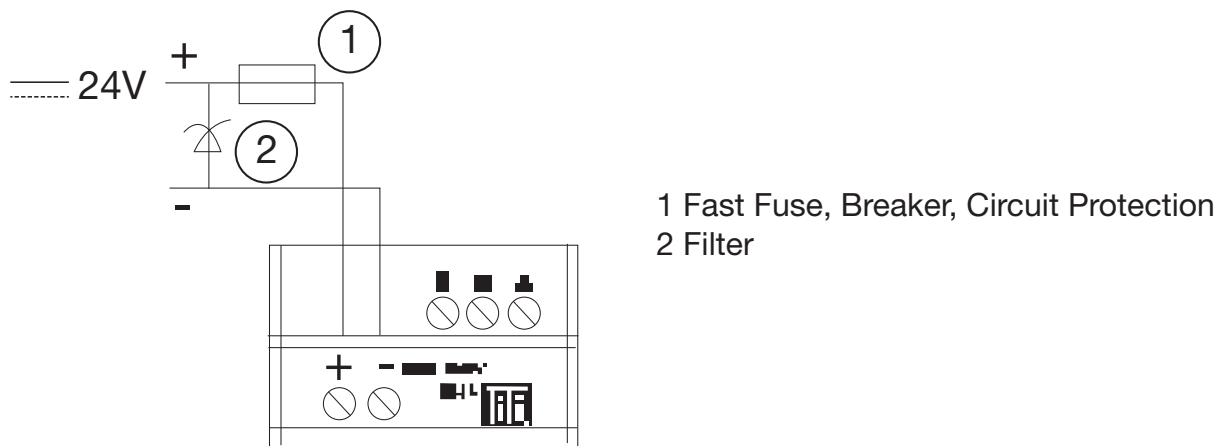
Figure 2.3: Connection of Backup Power Supply

2.3. Connected with DeviceNet system

Using 5 pins connector connecting with device net bus system.
Using bus connector and cable defined by ODVA.
The type of cable used determines the permissible maximum bus length and the transfer rate.

Pin	Signal		Name	Color
1	V-	1	GND	Black
2	CAN_L	2	CAN_L	Blue
3	Shield	3	screen	Bare-wire
4	CAN_H	4	CAN_H	White
5	V+ (24V)	5	24V	Red
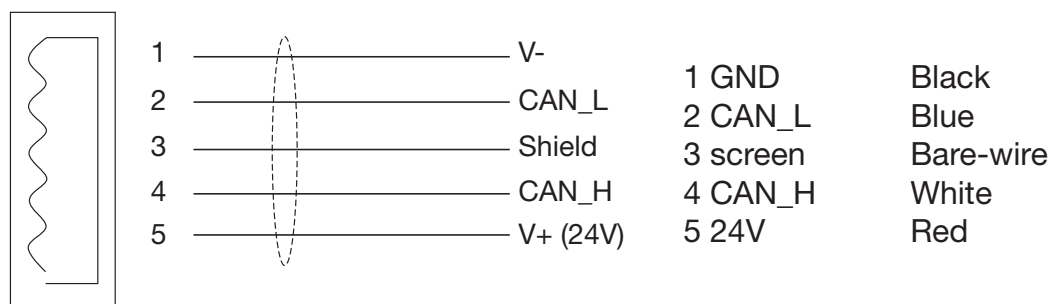
Figure 2.4 connector defines

All pins must be connected accurately, it can ensure bus communication safety and accurately.
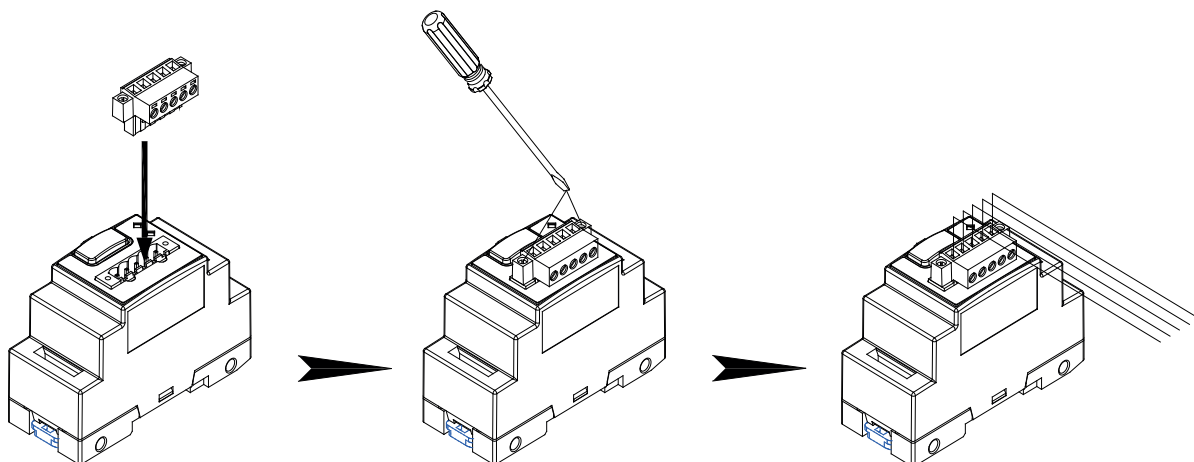
Figure 2.5: Installation of Terminal Blocks

2.4. Connected with Inverter by Modbus

Communication module setting is regular to be 19200bps of baud rates, 8bit of data bits, and 1bit of stop bits. The parity bits do not exist in this module. The communication protocol is ModBus RTU and ID is fixed at 1. Refer to the sections of communication parameters and interface usage in the user manuals of inverter VLF series for more details of communication setting and wiring.

2.5. Terminating resistors

DeviceNet requires a terminating resistor to be installed at each end of the trunk.
It is controlled by the 2-bit SW2 on the module to set in or not.
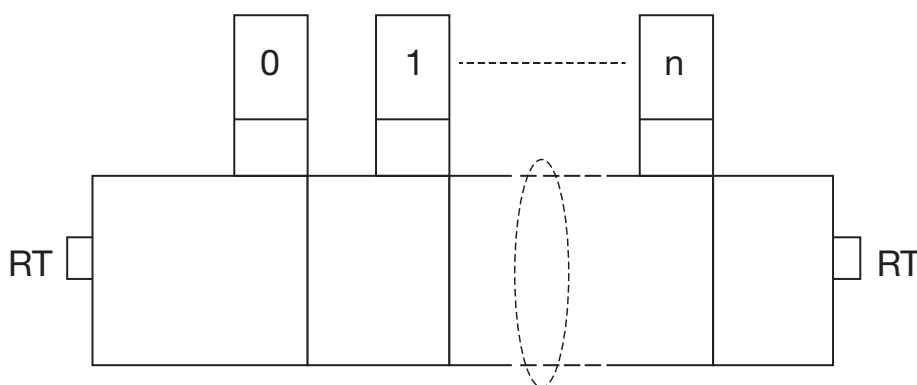
Figure 2.6 terminating register RT=120Ω

2.6. Baud rate and max transmit length

RV-DNET can support baud rate prescribed by ODVA.
- 125kbps
- 250kbps
- 500kbps

Bus maximum length is decided by cable type:
- Thin cable
- Thick cable
- Flat cable

ODVA prescribes the cable transmission length:

Baud rate (kbps)	Max length of cable (m)		
	Thick cable	Thick cable	Thick cable
125	500	100	420
250	250	100	200
500	100	100	100

Chapter 3 Operation

3.1. Initial power up

RV-DNET can use net power, if power is lower because many devices in devicenet system and, it also can use DC power with itself.
Before power up, check that you have connected the power supply, the bus connection and the connection to the basic unit correctly.
If the RV-DNET unit is factory setting, the net address and baud rate of the station must be set.

3.2. Networking Settings

RV-DNET module is built in the function of automatic identification drive. Use DIP switch SW1_8 (8PIN) to set up. Set SW1_8 to be OFF if it is connected to the inverter of RVLF series and to be ON if it is connected to the inverter.

3.3. Network Address Settings and Self-adjust Baud Rate

In the net system, each device has one unique node address (MAC ID), user can set node address form 0 to 63, and each node MAC ID must be unique in the net system.
RV-DNET module use SW 1.1~SW 1.6 to setting node address.

RV-DNET communication module supports the self-adjust communication baud rate, three kinds of 123K, 250K and 500K in compliance with DeviceNet specifications. When device is at power on, the module is only connected to network and obtains the baud rate from the detection of network package. After the baud rate is self-adjusted, it is connected to Device-Net in normal operating mode.

After powering on the device at the basis of hardware setting address, it is disabled when baud rate and network bits address are modified by network tool.

Functions	DIP Switch position	DIP Switch status	Information
Adderss setting	SW1_6~SW1_1	000000	Net address is 0
		000001	Net address is 1
		000010	Net address is 2
		……	……
		111110	Net address is 62
		111111	Net address is 63
Function setting	SW1_8	0	Connect RV series
			Reserved

3.4. LED indicator

There are two LED indicators built in RV-DNET communication module to quickly determine and monitor its state and bus communication.

• Module status LED (MS)
Two colors LED (green and red) indicate RV-DNET module status, it can be used watch the device working correctly or not.

NS LED information:

LED status	Status	Information	Remark
Off	No exist	No power up	
Green and red flash	Self check	Power up self checking	
Green flash	Waiting	Connected with Inverter basic unit error	
Green on	Operation	The device is operating in a normal condition	
Red flash	Recoverable Fault	Recoverable Fault.	Communication with Inverter basic unit error.
Red on	Unrecoverable Fault	The device has an unrecoverable fault; may need replacing.	Device hardware error.

Chapter 4 Communication module functions

4.1. Net Description

DeviceNet is a connection based protocol. That is data exchange among devices should be through connected cable.

Net stations can communication with IO message or explicit message.

4.1.1. IO message

IO message transmits application and process data in DeviceNet. The related IO message, sent via higher CAN identifier, is always sent from producer to consumer. The connection identifier provides the related information. The transmission is realized through the connected object which is setup before message transmitted.

The most important feature of IO message frame is transmission data through CAN data layer. The nod terminal judges the importance of the proceed data via the CAN message identifier.

4.1.2. Explicit message

Explicit message is used on ordinary data exchange between two devices in DeviceNet. It is sent via lower CAN identifier. Explicit message is point and point transmitted with the typically request/response mode. It is commonly used in equipment configuration and trouble shooting. The transmission of the explicit message should be through connected objects. The Explicit message request specifies object, instance, property, and the called classified service through the path to the related object.

The most important feature of explicit message is the any parts of CAN identifier can not be used in explicit message transmission protocol. All the protocol should be included in CAN data layer which is used in connecting ID. Each Explicit message channel needs 2 CAN identifier, one is for request message, and the other is for response message. The identifier is already specified as the connection sets up.

4.1.3. RV-DNET deviceNet function

• Support self-adjust baud rate

• Support duplicate nodes and check the packet

• Support predefine master slave connection

• Support predefine explicit message connection

• Support predefine poll IO message connection

• Support explicit and IO message fragment

4.2. RV-DNET Object Modeling

DeviceNet describes seeable data and function through the object modules. One DeviceNet equipment can be defined as a group which is based on a clear device module.
DeviceNet object module describes all the RV-DNET communication function which is the basic principal of the application layer.
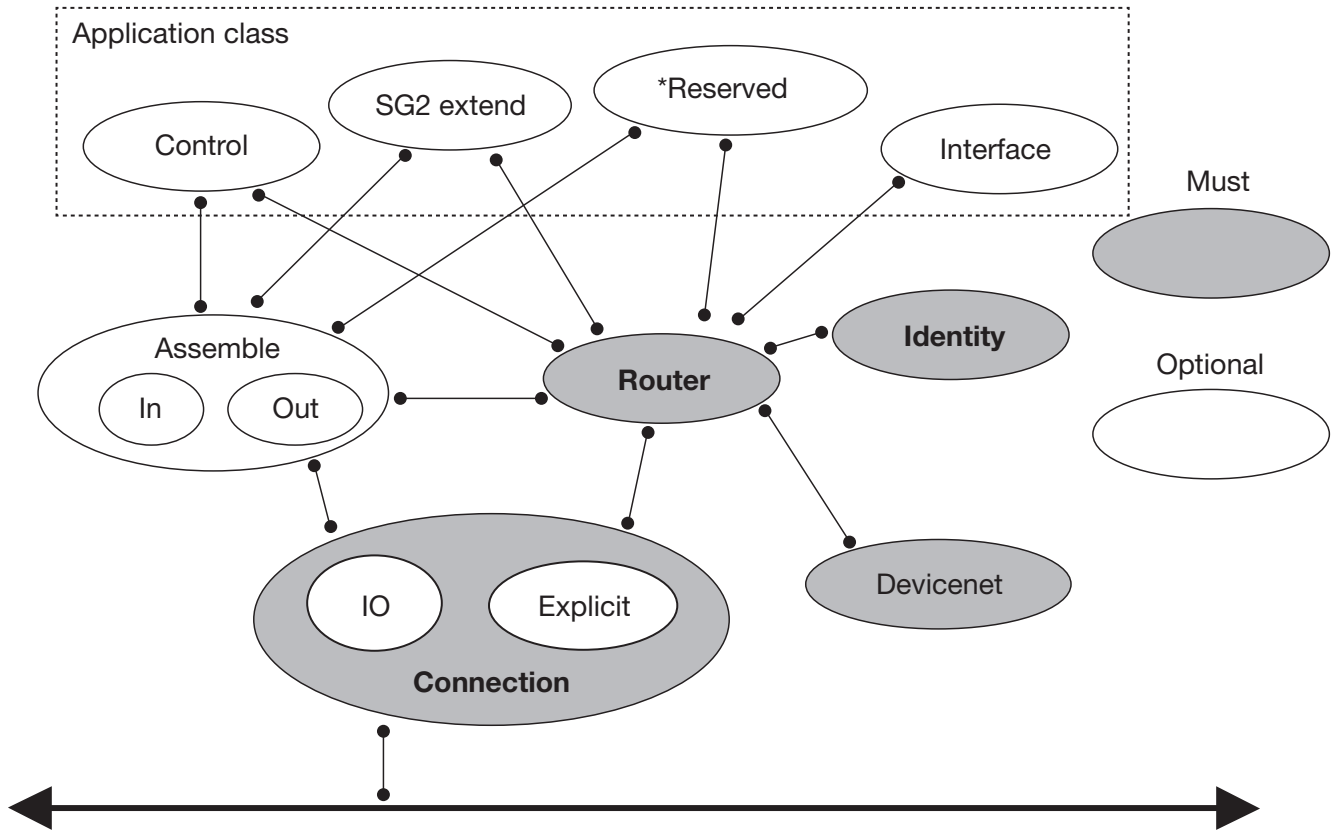
Figure 4.1 Communication module object modeling

RV-DNET object class:

Class code	Object class name	Instance number
0x01	Identity	1
0x02	Router	1
0x03	DeviceNet	1
0x04	Assemble	6
0x05	Connection	2
0x28	Motor	1
0x29	Control Supervisor	1
0x2A	AC Driver	1
0x64	Interface Object	1
0x65	Driver Object1	1
0x66	Driver Object2	1

The said object can be classified into 3 parts:

• Managing class
• Connection class
• Application class

4.2.1. Managing class

Define the data and function of the device should be supported by all the equipments in the net.
• **Identity object class**
Identity object (class code: 01hex) provides identification of and general information about the device. Such as vendor id, device type, device code, it also include device status, series number, slaver name.

• **Router object class**
Router object (class code: 02hex) provides a messaging connection point through which a Client may address a service to any object class or instance residing in the physical device.

4.2.2. Connection class

Define the message transmission in net.

• **Devicenet object class**
All net devices must be support devicenet object (class code: 03hex). It provides the configuration and status of a DeviceNet port. DeviceNet product must support one (and only one) DeviceNet object per physical connection to the DeviceNet communication link.

• **Connection object class**
All net devices must support at least one object instance. It provides operation net data by IO message or explicit message, producer/consumer data router and length.

4.2.3. Application class

Define the certain data and function of the equipment (application object, parameter object, and assemble object).

• **Application object class**
Extend object (class code: 28hex, 2Ahex, 65hex, 66hex) provides the parameters of Inverter, it can be used in automation project.

• **Assemble object class**
Assemble object (class code: 04hex) allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections

4.3. Object Class Define

4.3.1 Identity Object
Class code: 0x01
The Identity Object is required on all DeviceNet devices. It provides product identification and general information.

Class attribute

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Class Revision	UINT	Revision of this class	1	2

Istance

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Vendor ID	UINT	Identification of each vendor by number.	8988	2
2	Get	Device Type	UINT	Indication of general type of product.	0x0C	2
3	Get	Product Code	UINT	Indication of a particular product of an individual vendor.	0x07	2
4	Get	Revision	STRUCT	Revision of the item the identity object represents.		2
		Major	USINT	Major revision	0x02	1
		Minor	USINT	Minor revision	0x01	1
5	Get	Status	WORD	Present state of the device as represented by the state transition diagram. 0 = Nonexistent 1 = Device Self testing 2 = Standby 3 = Operational 4 = Recoverable Fault 5 = Major Unrecoverable Fault	0x00	2
6	Get	Serial	UDINT	Serial number of number	0x12345678	4
7	Get	Product name	STRUCT	Product Name		32
			BYTE	Length	11	1
			STRING	Name	RVLF-DNET	11
8	Get	State	USINT	Device status	0x00	1

Class Service

Service code	Service Name	Description
0x0E	Get Attribute Single	Returns the contents of the specified attribute.

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	Returns the contents of the specified attribute.
0x05	Reset	Invokes the Reset service for the device.

4.3.2. Router Object

Class code: 0x02
The Message Router Object provides a messaging connection point through which a Client may address a service to any object class or instance residing in the RV-DNET devices.

Class Attribute

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Class Revision	UINT	Revision of this class	1	2

Class Service

Service code	Service Name	Description
0x0E	Get Attribute Single	Returns the contents of the specified attribute.

Instance Attributes
   No.
Instance Service
   No.

4.3.3. DeviceNet Object

Class code: 0x03
The DeviceNet Object contains information about the RV-DNET DeviceNet interface configuration.

Class attribute

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Class Revision	UINT	Revision of this class	2	2

Instance Attribute

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Mac ID	USINT	Node Address, Range 0~63	63	1
2	Get	Baud Rate	USINT	Baud rate setting 0 125K 1 250K 2 500K	0	1
5	Get	Allocation	STRUCT	Allocate Master/Slave Connection Set		2
		Choice	BYTE	Indicates which Connections from the Predefined Master/Slave Connection Set is to be allocated/configured for use by the Master.	0x00	1
		My Master	USINT	MAC ID of Master	0xFF	1
8	Get	Mac Switch Value	USINT	Actual value of Node		1

Class Service

Service code	Service Name	Description of service
0x0E	Get Attribute Single	Returns the contents of the specified attribute.

Class Service

Service code	Service Name	Description of service
0x0E	Get Attribute Single	Returns the contents of the specified attribute.
0x4B	Allocate Master Slave Connection Set	Requests the use of the Pre-defined Master/Slave Connection Set.
0x4C	Release Master Slave	Indicates that the specified Connections within the Predefined Master/Slave Connection Set are no longer desired. These Connections are to be released (Deleted).

4.3.4. Connection Object

Class code: 0x05
The Connection Class allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections.

Class attribute

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Class Revision	UINT	Revision of this class	1	2

Instance 1: Explicit Message Connection

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	State	USINT	0 = non-existent 3 = established 5 = Deferred Delete	00	1
2	Get	Instance Type	USINT	Indicates either I/O or Messaging Connection: 0 explicit connection, 1 IO connection	00	1
3	Get	Transport Class Trigger	BYTE	Defines behavior of the Connection	0x83	1
4	Get	Produced Conxn ID	UINT	Placed in CAN Identifier Field when the Connection transmits, ****** is MAC ID	10****011	1

5	Get	Consumed Conxn ID	UINT	CAN Identifier Field value that denotes message to be received, ****** is MAC ID	10****100	2
6	Get	Initial Comm Characteristics	BYTE	Defines the Message Group across which productions and consumptions associated with this Connection occur.	0x21	1
7	Get	Produced Conxn Size	UINT	Maximum number of bytes transmitted across this connection.	40	2
8	Get	Consumed Conxn Size	UINT	Maximum number of bytes received across this connection.	40	2
9	Get/Set	Expected Packet Rate	UINT	Defines timing associated with this connection.	2500 (ms)	2
12	Get/Set	Watchdog Time-out Action	USINT	Defines how to handle Inactivity/Watchdog timeouts: 1Auto delete, 3 Deferred delete	3	2
13	Get	Produced Conxn Path Length	USINT	Number of bytes in the produced connection path attributes.	0	1
14	Get	Produced Conxn Path	SEG	Specifies the Application object whose data is to be produced by this connection object.	Null	2
15	Get	Consumed Conxn Path Length	USINT	Number of bytes in the Consumed connection path attribute.	0	2
16	Get	Consumed Conxn Path	SEG	Specifies the Application Object that is to receive the data consumed by this connection Object.	Null	2
17	Get	Production Inhibit Time	UINT	Defines minimum time between new data production.	0	1

Instance 2: Poll IO message connection

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	State	USINT	State of the object: 00Nonexistent, 01Configuring, 03Established, 04TimedOut	00	1
2	Get	Instance Type	USINT	Indicates either I/O or Messaging Connection: 0 explicit connection, 1 IO connection	01	1
3	Get	Transport Class Trigger	BYTE	Defines behavior of the Connection	0x83	1
4	Get	Produced Conxn ID	UINT	Placed in CAN Identifier Field when the Connection transmits, ****** is MAC ID	01111****	2
5	Get	Consumed Conxn ID	UINT	CAN Identifier Field value that denotes message to be received, ****** is MAC ID	10****101	2
6	Get	Initial Comm Characteristics	BYTE	Defines the Message Group across which productions and consumptions associated with this Connection occ	0x01	1
7	Get	Produced Conxn Size	UINT	Maximum number of bytes transmitted across this connection.	4, the maximum value is 8.	2
8	Get	Consumed Conxn Size	UINT	Maximum number of bytes received across this connection.	4, the maximum value is 8.	2
9	Get/Set	Expected Packet Rate	UINT	Defines timing associated with this connection.	0 (MS)	2
12	Get	Watchdog Timeout Action	USINT	Defines how to handle Inactivity/Watchdog timeouts: 0 Transition to timed out. 2 Auto Reset.	6	1
13	Get	Produced Conxn Path Length	USINT	Number of bytes in the produced connection path attributes.	6	2

14	Get	Produced Conxn Path	SEG	Specifies the Application object whose data is to be produced by this connection object. Input assemble default is 6.	20,04// 24,46// 30,03 (hex)	6
15	Get	Consumed Conxn Path Length	USINT	Number of bytes in the Consumed connection path attribute.	6	2
16	Get	Consumed Conxn Path	SEG	Specifies the Application object that is to receive the data consumed by this connection object. Output assemble default is 36.	20,04// 24,46// 30,03 (hex)	6
17	Get	Production Inhibit Time	UINT	Defines behavior of the Connection	0	2

Common services

Service code	Implemented for		Service name
	Class	Instance	
0x05	Yes *1	Yes *2	Reset
0x0E	Yes	Yes	Get attribute single
0x10	No	Yes	Set attribute single

*1To class: reset all connections to non-exist state.

*2To instance: Used to reset the Inactivity/Watchdog Timer associated with a Connection Object. When a Connection in the Timed Out or Deferred Delete state receives a Reset request it also transitions back to the Established state.

4.3.5. Assemble Object

Class code: 0x04

It provides assembled controlling IO states of RVLF/RVFF.

Class Attribute

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	Class Revision	UINT	Revision of this class	1	2

• Instance 70, 71, 110 Attributes (Input assemble, default is 70)

• Instance 70, 71, 110 Attributes (Input assemble, default is 70)

Attribute ID	Access rule	Name	Data type	Description
3	Get	Date Stream	STRUCT of: WORD	Inverter status data

• Instance 20, 21, 100 Attributes (Output assemble, default is 20)

Attribute ID	Access rule	Name	Data type	Description
3	Get/Set	Date Stream	STRUCT of: WORD	Inverter control data

Class Service

Service code	Service Name	Description of service
0x0E	Get Attribute Single	Returns the contents of the specified attribute.

Instance Service

Service code	Service Name	Description of service
0x0E	Get Attribute Single	Returns the contents of the specified attribute.
0x10	Set Attribute Single	Modifies an attribute

IO Assemble Data Define

The default IO Assemble is 6 (input assemble) and 6 (out assemble). Configuration is effectual after the device is replacing.

• Base inputs assemble 70

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0					Faulted			Running1
1								
2	Actual Speed low byte (SpeedActual) *3							
3	Actual Speed high byte (SpeedActual) *3							

• Base inputs assemble 71

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0				Warning	Faulted	Ready	Running2	Running1
1	Drive State *1							
2	Actual Speed low byte (SpeedActual) *3							
3	Actual Speed high byte (SpeedActual) *3							

• Base inputs assemble 110

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0				Warning	Faulted	Ready	Running2	Running1
1			S6	S5	S4	S3	S2	S1
2							R2A	R1A
3								
4	Actual Frequency low byte (ActualFrequency)							
5	Actual Frequency high byte (ActualFrequency)							
6	Actual torque low byte (TorqueActual)							
7	Actual torque high byte (TorqueActual)							

• Base inputs assemble 21

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0					FaultRst		Run2	Run1
1								
2	Reference Speed low byte (SpeedRef) *3							
3	Reference Speed high byte (SpeedRef) *3							

• Base inputs assemble 100

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0				Jog *2	FaultRst	Force Fault	Run2	Run1
1			S6 Ctrl	S5 Ctrl	S4 Ctrl	S3 Ctrl	S2 Ctrl	S1 Ctrl
2							R2A Ctrl	R1A Ctrl
3								
4	Reference Frequency low byte (RefFrequency)							
5	Reference Frequency high byte (RefFrequency)							
6	Reference torque low byte *1							
7	Reference torque high byte *1							

*1: Not Support temporarily
*2: Ref Frequency is the example of actual assembly.

4.3.6. Motor Parameters Object (Motor)

Class code: 0x28
Motor parameters are controlled by the nameplate in the inverter of RVLF/RVFF

Instance Attributes

Attribute ID	Access rule	Name	Data type	Description	Default value	Number of bytes
6	Get/Set	Rated Current	UINT	Rated Current: 0.1A	00	2
7	Get/Set	Rate Voltage	UINT	Rated Voltage: 0.1V	2200	2
9 *1	Get/Set	RateFreq	UINT	Rated Frequency: 0.1Hz	500	2
15	Get/Set	BaseSpeed	UINT	RPM Speed	1500	2

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	-
0x10	Set Attribute Single	-

4.3.7. Control Supervisor

Class code: 0x29
The class describes the behavior of RVLF/RVFF control devices.
Instance Attributes

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
3	Get/Set	Run1	BOOL	1 = Run 0 = Stop	0	1
4	Get/Set	Run2	BOOL	1 = Reversal 0 = Forward	0	1
5 *1	Get/Set	NetCtrl	BOOL	1 = Network Control 0 = Site Control	1	1
7	Get	Runing1	BOOL	1 = During running 0 = Stop	0	1
8	Get	Runing2	BOOL	1 = During running in reverse direction 0 = During running in forward direction	0	1
9	Get	Ready	BOOL	1 = Ready 0 = Unready	0	1
10	Get	Fault	BOOL	1 = Fault 0 = Normal	0	1
11	Get	Warning	BOOL	1 = Warning 0 = Normal		
12	Get/Set	FaultRst	BOOL	0->1 = Fault Reset 0 = No Action	0	1
13	Get	FaultCode	UINT	Failure Record	0	1
14	Get	WarnCode	UINT	Warning Cause Record	0	2
15 *1	Get	CtrlFrom-Net	BOOL	Current Control State 1 = Network Control 0 = Site Control	0	2
16	Get/Set	DNFault-Mode	UINT	Network Failure 0->1 = Fault + Stop 0 = No Action	1	1
17	Get/Set	ForceFault	BOOL	0->1 Force 0 = No Action	0	1
100 *2	Get/Set	Jog	BOOL	1 = Jog (positive) 0 = No Action	0	1

*1: Network control is the selection of main operation command source to be communication control; site control is the command source to be others (not communication control). When NetCtr is set to be site control, the setting value of main operation command source is the default (refer to parameter 00-02 in the inverter of RVLF/RVFF series).
*2: Parameter Jog operation is not supported in RVLF.

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	-
0x10	Set Attribute Single	-

4.3.8. AC Driver

Class code: 0x2A
The description of operating parameters in the inverter of RVLF/RVFF series:
Instance Attributes

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
4 *1	Get/Set	NetRef	BOOL	1 = Reference Frequency of Network Settings 0 = Reference Frequency of Site Settings	1	1
6	Get/Set	DriveMode	USINT	0 = Control Modes 0 = External Modes	0	1
7	Get	Speed Actual	INT	Output Speed (RPM)	0	2
8	Get/Set	SpeedRef	INT	Setting Speed (RPM)	150	2
9	Get	Current Actual	INT	Output Current : 0.1A	0	2
11	Get	Torque Actual	INT	Output Torque : Nm	0	2
17	Get	Output Voltage	INT	Output Voltage : 0.1V	0	2
29 *1	Get	RefFrom-Net	BOOL	Current Frequency Control Modes: 1 = Reference Frequency of Network Settings 0 = Reference Frequency of Site Settings	0	1

*1: Reference frequency of network settings is the selection of main frequency command source to be the communication control; reference frequency of site settings is the command source to be others (not communication control). When NetRef is set to be site settings, the setting value of reference frequency command source is the default (refer to parameter 00-05).

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	-
0x10	Set Attribute Single	-

4.3.9. AC Driver

Class code: 0x64
The description of communication module parameters:
Instance attributes

Attribute ID	Access rule	Name	Data type	Description	Default value	Byte number
1	Get/Set	In Asm Cfg	USINT	Input Assembly Settings		
				70, 71, 110		
2	Get/Set	Out Asm Cfg	USINT	Output Assembly Settings		
				20, 21, 100		
3	Get	Nonvolatile Node Address	USINT	Node Address 0~63		
4	Get	Nonvolatile Baud Rate	USINT	Baud rate setting 0 = 125K 1 = 250K 2 = 500K		
5	Get	Soft Ver	Struct of	Software Version		2
			USINT		1	
			USINT		1	
6	Get	DRVType	USINT	Inverter modes 0 RVFF 0 RVLF	0	1
7	Get	DRVSoftVer	INT	Software version of module connecting to the inverter	0	2

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	Returns the contents of the specified attribute.
0x10	Set Attribute Single	Modifies an attribute

4.3.10. Inverter extend-1 Object

Class code: 0x65
The class describes the parameters of RVLF/RVFF series.

Instance attributes

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get	DCOutpu-Voltage	INT	DC output voltage 0.1V	0	2
2	Get	PID Fee-dback	UINT	PID feedback : 0.01	0	2
3	Get	PIDInput	UINT	PID input : 0.01	0	2
4	Get	A1_IN	UINT	Analogy input1 0.1	0	2
5	Get	A2_IN	UINT	Analogy input 2 0.1	0	2
6	Get	S1FromNet	BOOL	Status of S1 input	0	1
7	Get	S2FromNet	BOOL	Status of S2 input	0	1
8	Get	S3FromNet	BOOL	Status of S3 input	0	1
9	Get	S4FromNet	BOOL	Status of S4 input	0	1
10	Get	S5FromNet	BOOL	Status of S5 input	0	1
11	Get	S6FromNet	BOOL	Status of S6 input	0	1
12	Get	R1AFrom-Net	BOOL	Status of R1A	0	1
13	Get	R2AFrom-Net	BOOL	Status of R2A	0	1
14	Get/Set	S1Ctrl	BOOL	S1 Control input	0	1
15	Get/Set	S2 Ctrl	BOOL	S2 Control input	0	1
16	Get/Set	S3 Ctrl	BOOL	S3 Control input	0	1
17	Get/Set	S4Ctrl	BOOL	S4 Control input	0	1
18	Get/Set	S5 Ctrl	BOOL	S5 Control input	0	1
19	Get/Set	S6 Ctrl	BOOL	S6 Control input	0	1
20	Get/Set	R1A Ctrl	BOOL	R1A Control	0	1
21	Get/Set	R2A Ctrl	BOOL	R2A Control	0	1
22	Get	ActualFre-quency	UINT	Output frequency 0.01Hz		2
23	Get/Set	RefFre-quency	UINT	Setting Frequency (0.01Hz)	500	2
24	Get	Ref freq from NET	UINT	Reflected Setting Fre-quency (0.01Hz)		2
25	Get	Ref speed from NET	UINT	Reflected Setting Speed (RPM)		2

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	Returns the contents of the specified attribute.
0x10	Set Attribute Single	Modifies an attribute

4.3.11. Inverter extend-2 Object

Class code: 0x66
The description of specific functions in the inverter of Carlo Gavazzi RVLF series:
Instance properties: 0~x, in correspondence with the code of parameter groups in the inverter of RVLF/RVFF series.

Attribute ID	Access rule	Name	Data type	Description of Attributes and Semantics	Default value	Byte number
1	Get/Set				0	2
…	Get/Set				0	2
n	Get/Set				0	2

Property ID: 0~n, in correspondence with the parameter code in the inverter of RVLF/RVFF series. For example, if the instance property of parameter 00-05 (selection of main frequency command source) is 0, the property ID is 5.

Refer to manuals of RVLF/RVFF series and Modbus communication protocol for more details of instance properties, numbers of property ID and access rule.

Instance Service

Service code	Service Name	Description
0x0E	Get Attribute Single	Returns the contents of the specified attribute.
0x10	Set Attribute Single	Modifies an attribute

4.4. EDS file

Electronic data documentation (EDS) is included in the user files, describing the configuration data and common interface. EDS offers all the necessary information of accessing and changing the device. EDS is used for the user configuration tool , easy to update and seldom required to correct the configuration software tool.
Please contact your vendor for the document of <<EDS 231C000C00070100.eds>>.

Key information of EDS is as follows

```
[Device]
        VendCode      = 8988;                    $ Vendor Code
        VendName      = "Taian-tech";
        ProdType          = 12;
        ProdTypeStr          = "Communication Adapter";
        ProdCode      = 7;
        MajRev        = 1;
        MinRev        = 1;
        ProdName      = "RV-DNET";
        Catalog          = "A510-Axxxx";


[IO_Info]
        Default       =       0x0001;

        PollInfo      =       0x0001,
                              1,
                              1;

$       StrobeInfo          = 0x0000, 2, 1;
$       COSInfo             = 0x0000, 2, 1;
$       CyclicInfo    = 0x0000, 2, 1;

        Input1    =   4,
                      0,
                      0x0001,
                      "Basic Input Assemble 70",
                      6, "20 04 24 46 30 03",
                      "Drive Monitoring data";

        Input2    =   4,
                      0,
                      0x0001,
                      "Extended Input Assemble 71",
                      6, "20 04 24 47 30 03",
                      "Drive Monitoring data";

        Input3    =   8,
                      0,
```

```
                    0x0001,
                    "Extended Input Assemble 110",
                    6, "20 04 24 6E 30 03",
                    "Drive Monitoring data";


Output1    =    4,
                0,
                0x0001,
                "Basic Output Assemble 20",
                6, "20 04 24 14 30 03",
                "Drive Control data";

Output2    =    4,
                0,
                0x0001,
                "Extended Output Assemble 21",
                6, "20 04 24 15 30 03",
                "Drive Control data";

Output3    =    8,
                0,
                0x0001,
                "Extended Output Assemble 100",
                6, "20 04 24 64 30 03",
                "Drive Control data";
```

CARLO GAVAZZI

Chapter 5 Diagnostics fast

LED indicator Diagnosis

Module status LED	Explanation	Correct or prevent fault
Off	No power	Power up
Green on	Normal operation status	No
Green flash	No connected with Inverter basic unit	Connected with Inverter correctly.
Red flash	Connect with Inverter but communication error.	Set Inverter IO number correctly.
Red on	Device hardware error.	Use a new module.

Net status LED	Explanation	Correct or prevent fault
Off	No power	Power up. Add other device in the net.
	The device is a single node in the net.	
	Baud rate is in self-adjusting	
Green on	Normal operation mode, and connected with master.	No
Green flash	Normal operation mode, but not connected with master or had be set free	No
Red flash	IO connection time out, waiting green flash after a few seconds	No
Red on	Dup_mac_id check error. Communication error and restart	Replace node address and power up again.
	Normal operation mode, and connected with master.	No

Annex A: Technical Parameters

Basic parameters		
Size length×width×high mm		
weight g		
Ambient		
Operation temperature °C		
Storage temperature °C		
Operation humidity %		
Power supply		
Power supply voltage		
LED indicator		
Module status LED colors	green/red	
Net status LED colors	green/red	
Devicenet		
Connector	5 pins	
Isolation		
Function	Only group2 slaver	
Max baud rate kbps	500	
Bus termination resistors Ω	120	
Bus address	0~63	

Appendix 9: RV-TCPIP Unit

• APPLICATIONS

RV-TCPIP is applied to communicating with the inverter that supports RS485 communication protocol and it can perform remote control.

• DIMENSIONS:

Unit: mm (1inch=25.4mm)
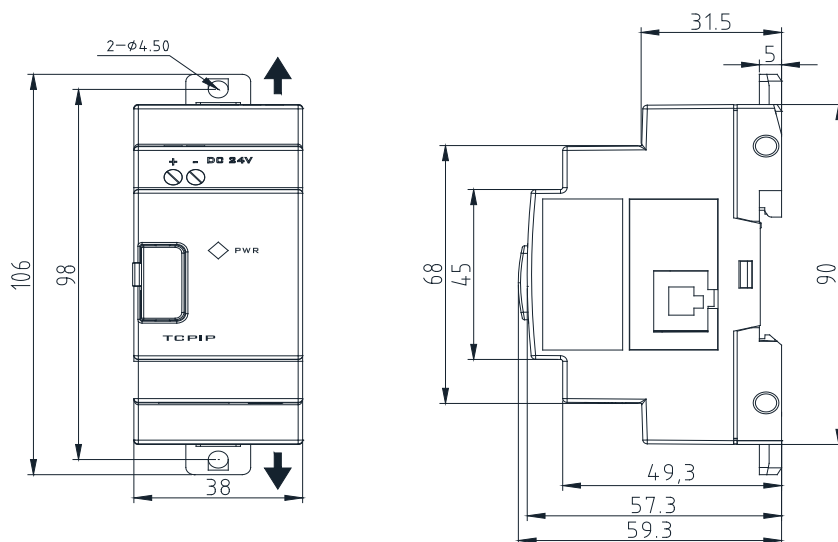
• INSTALLATION
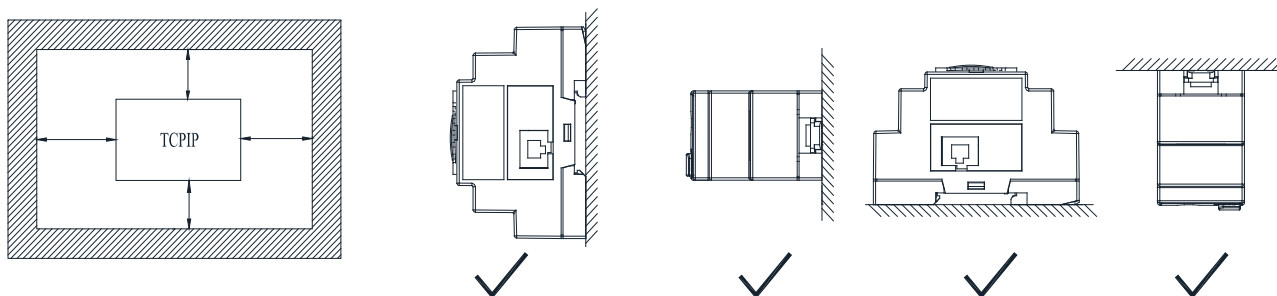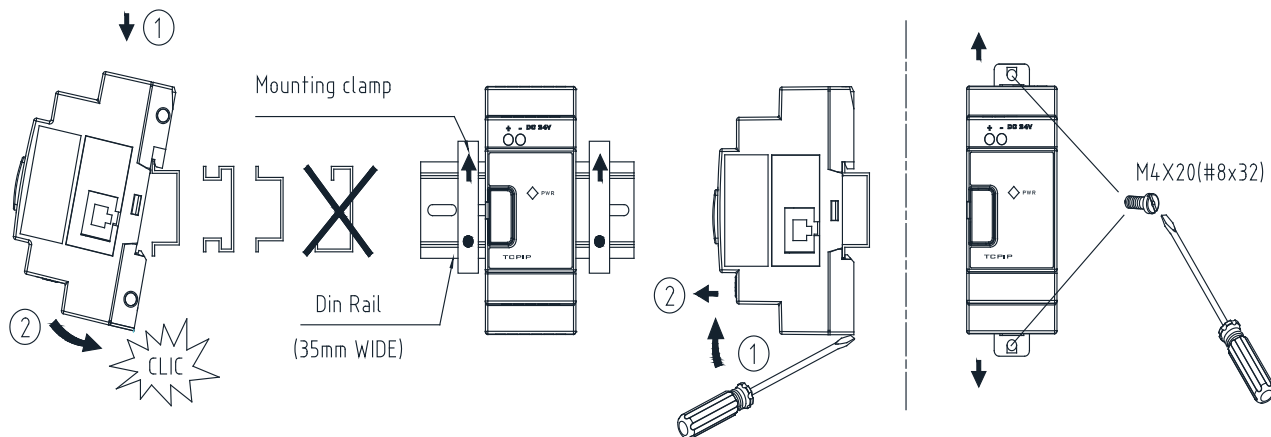
• CONNECTING

Take connecting the inverter of RVFF for example:
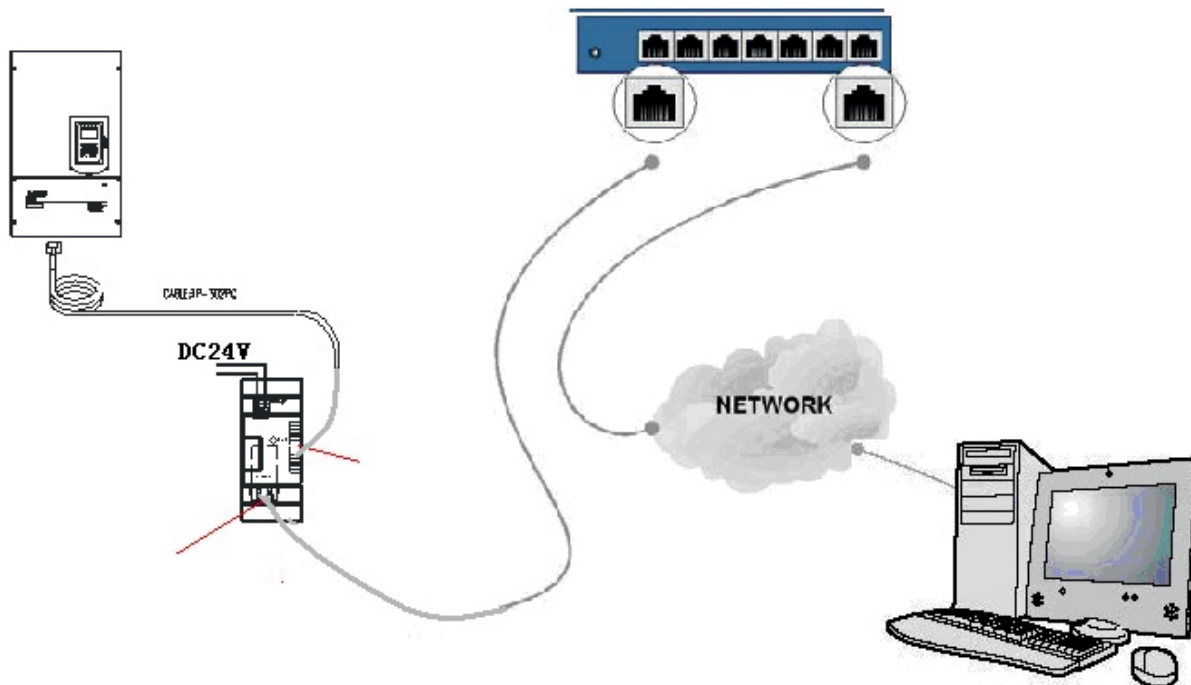
Figure 1: Connecting RV-TCPIP with the inverter of RVFF

Notes:

1. RV-TCPIP module port can connect directly with PC, which is applied to short-distance monitor.

2. RV-TCPIP module port can connect with network that will be in the same subnet as PC, shown as figure 1 so that it can perform remote control.

• INSTALLING SOFTWARE:

1. Installing document of XPortInstallerSetup.msi.

2. Installing document of red32bit_3.1.0.1.exe.

Notes: After installing the above files, it requires to restart computer.

• CONFIGURATIONS:

If you have correct connection following figure 1 and provide 24V power supply to RV-TCPIP module, you can see the orange LED light on the cover of RV-TCPIP. It displays that it has the power and you can find the lights on both sides of the port. Then, take the steps as the followings:

1. Xport Installer Instructions

(1). Click "START" ⟶ "PROGRAM" ⟶ "Xport Installer" ⟶ "Xport Installer" and enter the user interface of Lantronix Xport Installer 3.2, shown as figure 2:
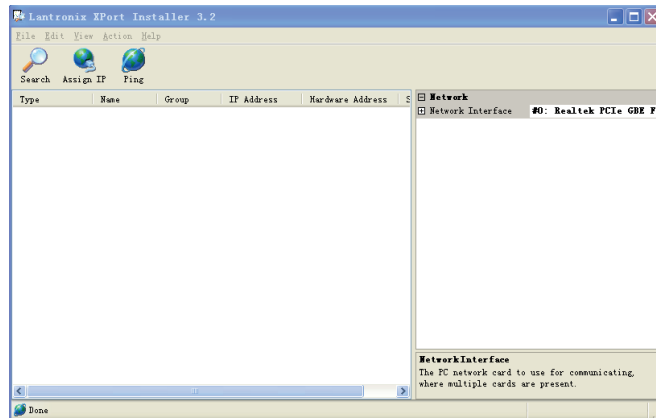
Figure 2: User interface of Lantronix Xport Installer 3.2

(2). Click the icon of , then you can search for the IP address of RV-TCPIP, shown as figure 3:
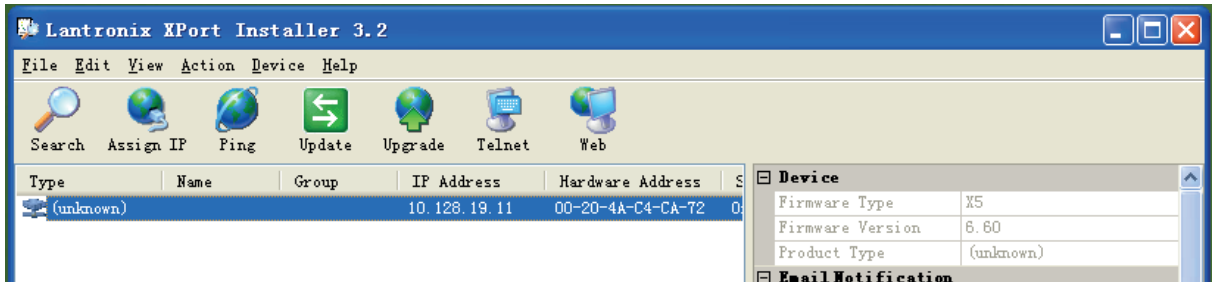
Figure 3: Searching for IP address of RV-TCPIP

A. IP Address:

Each RV-TCPIP will search out the unique IP address which will be in the same subnet as PC and is the only one, different from other IP addresses.

B. Hardware Address:

Format: 00-20-4A-XX-XX-XX,"XX"presents the unique one.

(3). While you select the IP address, click the icon of and you can modify the IP address of RV-TCPIP.

For example: Modifying the following IP address to "10.128.19.12."
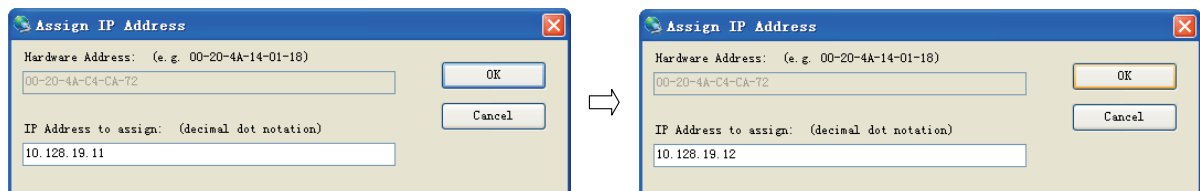
Click "OK" and you succeed in modification of IP address. You search for IP again and you can find that IP address has been changed to "10.128.19.12," shown as figure 4.
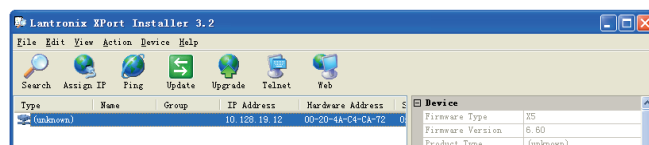
Figure 4: Revised IP address

Notes: The revised IP address should be enabled, or you can not succeed in modifications

(4). After you select the IP address, click the icon of [Assign IP] Ping button displays the information of IP, shown as figure 5:
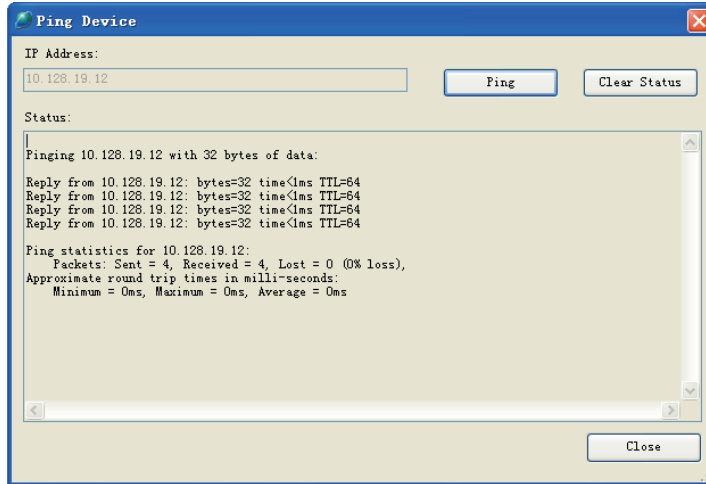
Figure 5: Display interface of Ping Device

Check if the IP address shown in the display interface of Ping Device is the only one and enabled for PC network. If it is correct, click "Close."
(5). Click "Port" at the right corner of the user interface of Lantronix Xport Installer 3.2 so it can display the user interface of Port Collection Editor, shown as figure 6:

Figure 6: User interface of Port Collection Editor

In the user interface of Port Collection Editor, you can set parameters of Baud Rate member, Data Bits member, Stop Bits member and etc. for situations of actual operations.

2. lantronix Instructions (under the conditions of Xport Installer searching for enabled IP address)
(1). Click"**START**"⟶ "**PROGRAM**"⟶"**lantronix**"⟶ "**Redirector**"⟶ "**Configuration**" and enter the user interface of Lantronix Redirector Configuration, shown as figure 7:
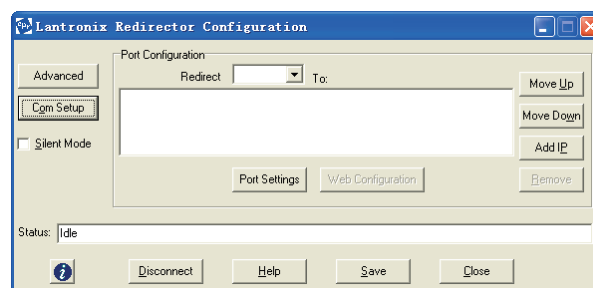
Figure 7: User interface of Lantronix Redirector Configuration

(2). **Click"Com Setup"** and enter the user interface of Com Setup, shown as figure 8. In this user interface, set up 79 virtual serial ports of Com2- Com80 for PC. Com1 is the existing serial port of PC so you can not set up virtual serial ports. Select one or several serial ports and click "OK."
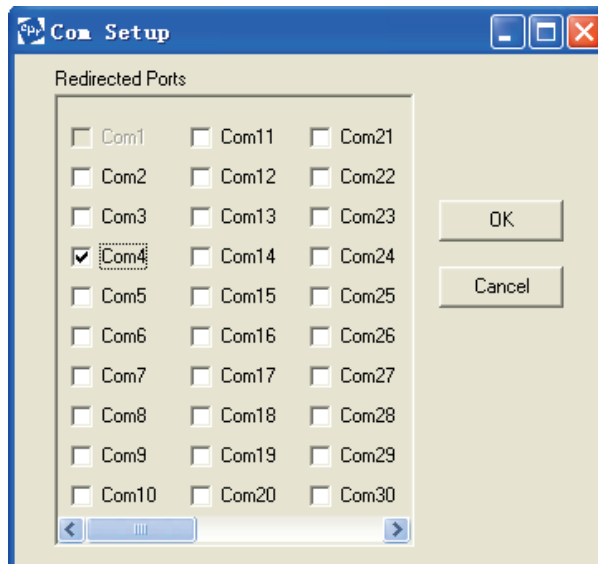
Figure 8: User interface of Com Setup

(3). Click "Add IP" and enter the interface of IP Service Setup, shown as figure 9:
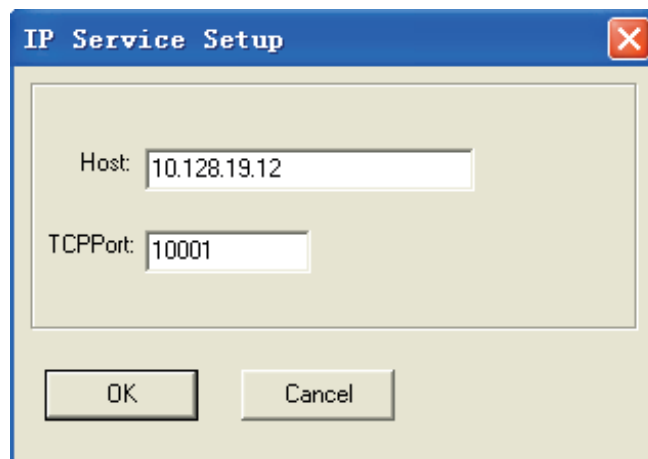
Figure 9: Interface of IP Service Setup

• Host column is filled out the configured IP address of RV-TCPIP.
• TCPPort column is filled out **"10001."**
(4). Click **"Port Settings"** and enter the interface of Port Setting, shown as figure 10. Select **"Raw Mode"** and click **"OK."**
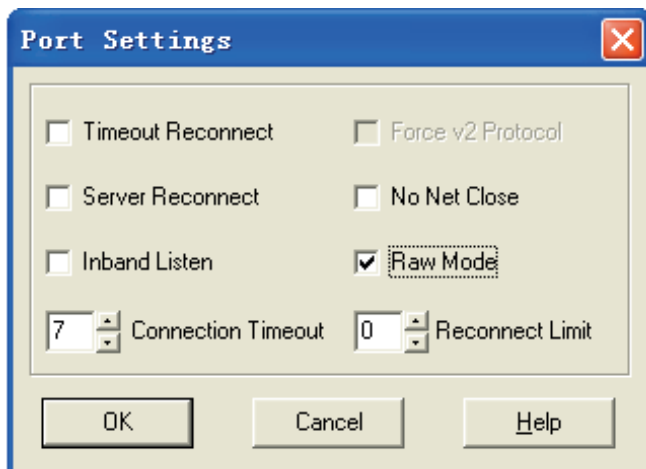
Figure 10: Interface of Port Settings

(5). Select **"Silent Mode"** in the user interface of Lantronix Redirector Configuration. It can hide pop-up window, shown as figure 11:
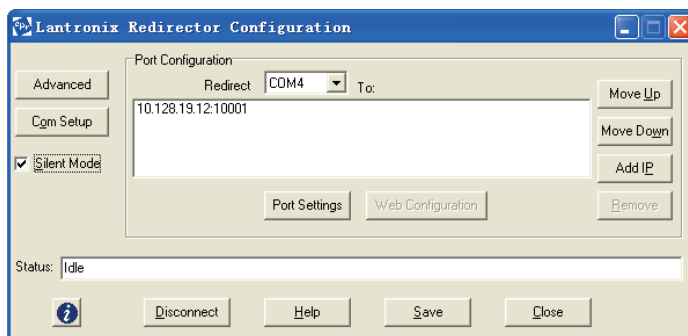
Figure 11: Selecting "Silent Mode"

(6). Click **"Save"** in the interface of Lantronix Redirector Configuration so as to keep the above configurations. Then click "Close."

After completing the configurations of **"Xport Installer"** and **"lantronix,"** the inverter can communicate with the machine supporting RS485 communication protocol and monitor it.

• A brief description of communication ways between RV-TCPIP and RVFFB3401100F:
Wiring diagram is shown as the following:
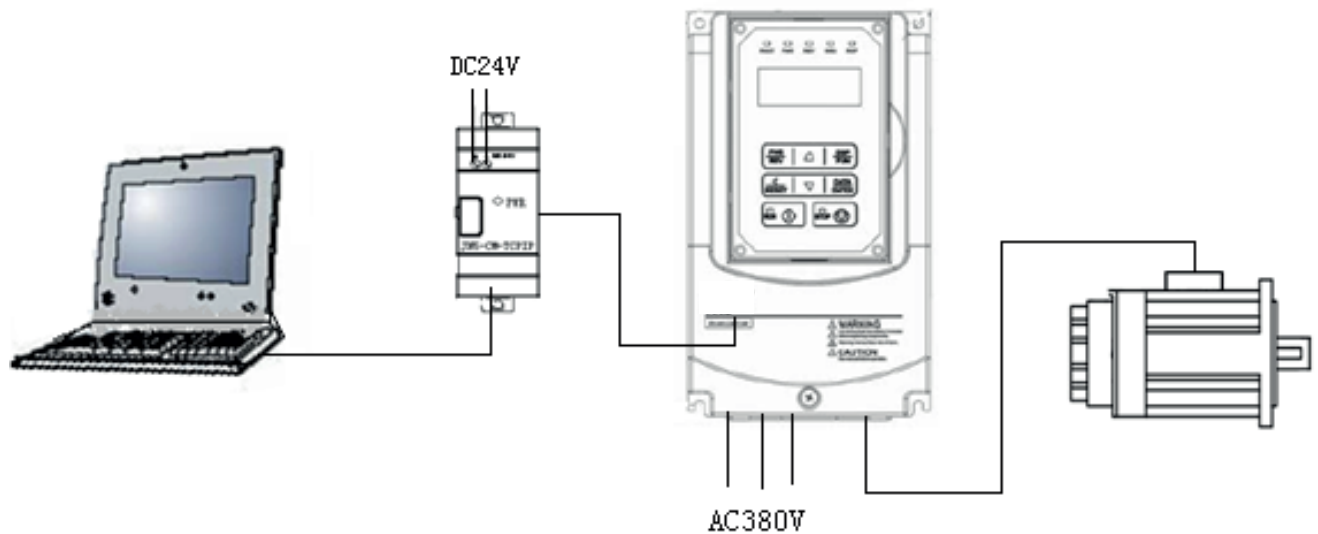
1. Installing host computer software and open it to establish new engineering of RVFFB3401100F.
2. The communicating connection ways between RV-TCPIP and RVFFB3401100F are virtual COM port and TCPIP.
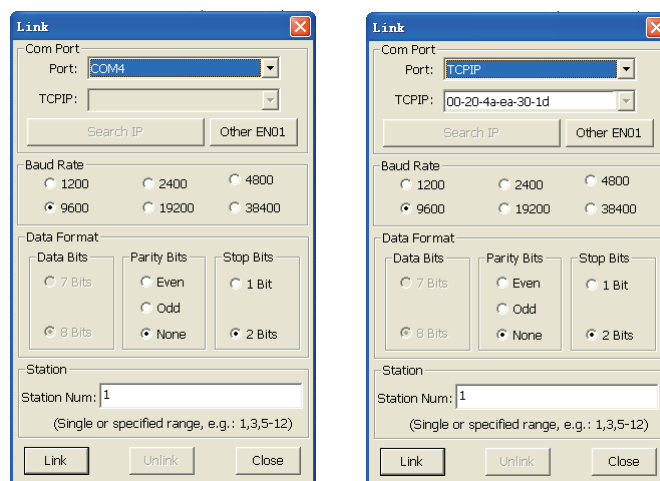
It requires selecting "Baud Rate," "Parity Bit," "Stop Bit" and "Station Number" according to the actual parameter when communicating connections. It will succeed in connecting upon the right selection. If the virtual COM port unexpectedly can not be connected, you can apply the way of TCPIP connection first since it will be self-configuration under the actual condition and then make the virtual COM port be connected.

Appendix 10: Profibus DP

1. Summary

RV-PDP module was developed for automation tasks using the PROFIBUS-DP field bus system. RV-PDP module is a "gateway" and can only be operated in combination with other base units.

RV-PDP module can be connected with different type base units when selecting different GSD file.

RV-PDP for RVLF module: selecting Carlo Gavazzi_RV.GSD file, connected with RVLF series drive.

RVLF drive with PROFIBUS-DP gateway PBUS module always operates as network slaver.

1.1. System Overview

RV-PDP modules connect with RVLF via RS485 as network slavers.

CARLO GAVAZZI
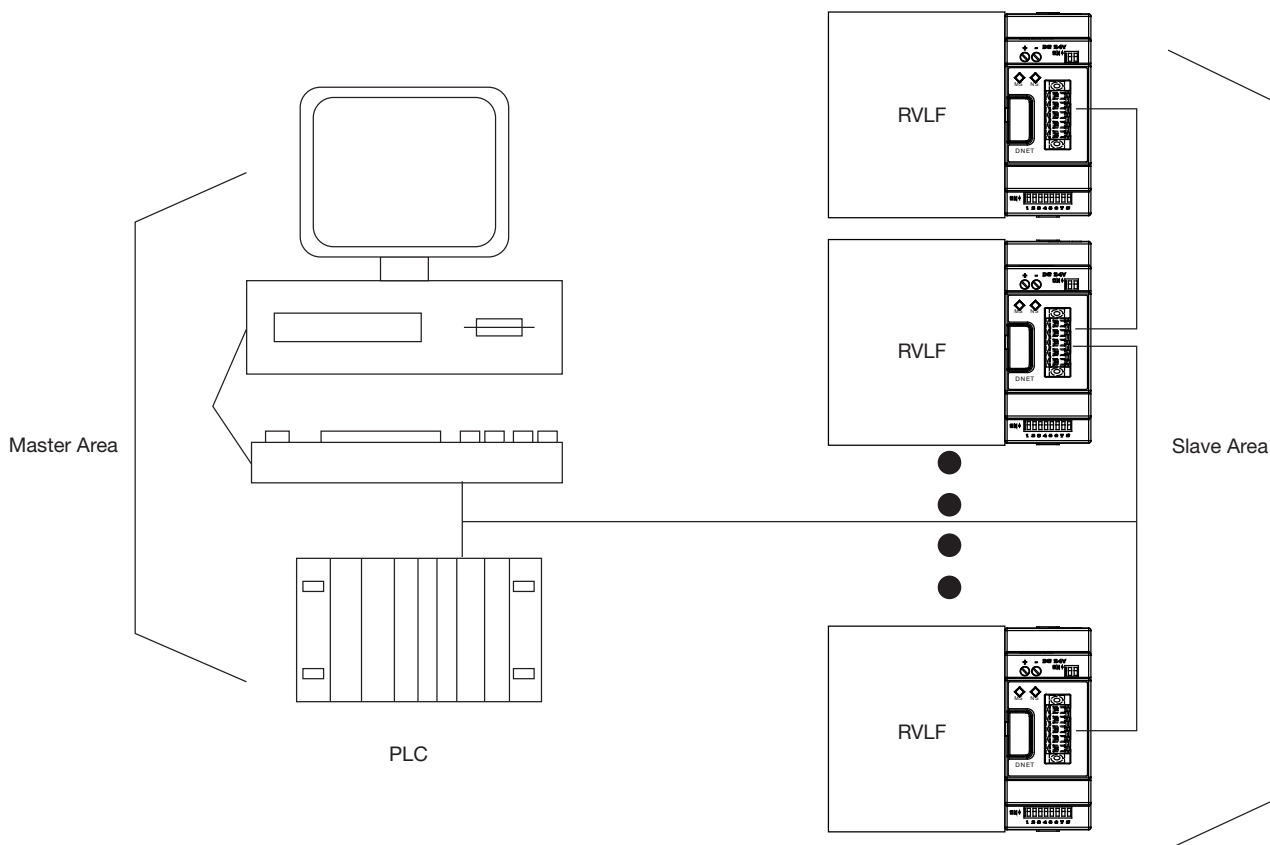
1.2. Structure of the Unit
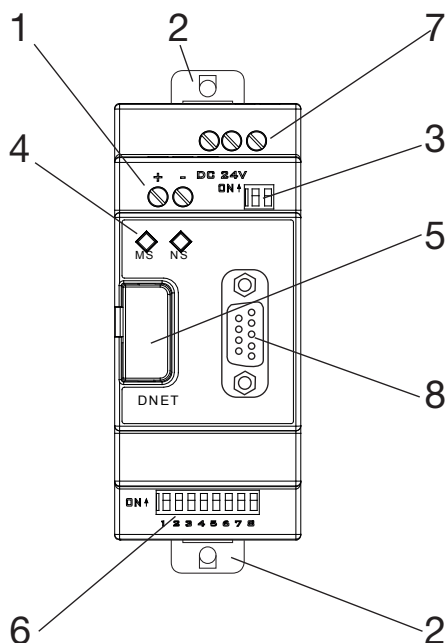
- 24vDC power supply
- Retractable mounting feet
- 2bits DIP switch (terminal resistor)
- POW & BUS LED
- PRESS
- 8bits DIP switch (setting address)
- RS485 port (Interface to connect with RVLF)
- PROFIBUS-DP connection (9 pin D-SUB socket)

1.3. PROFIBUS-DP Function Description

RV-PDP communication module PROFIBUS-DP function is decided by GSD file.
You can select the following 4 functions described in the 'Carlo Gavazzi_RV.GSD' file via network configuration tools. More function describe refer to 'chapter-3 Communication'.
1. Cyclical process data exchange (PZD).
2. Parameter accessing: cyclical accessing of parameters (PKW).
3. PROFIBUS supports the control commands SYNC and FREEZE for data synchronization between master and slaves.
4. Support the configuration of data structure for data exchange with RVLF series.

2. Installation

2.1. Installation and Dimension

• Installation

The RV-PDP module should always be mounted vertically. Press the slots on the back of the module onto the rail until the plastic clamps hold the rails in place.
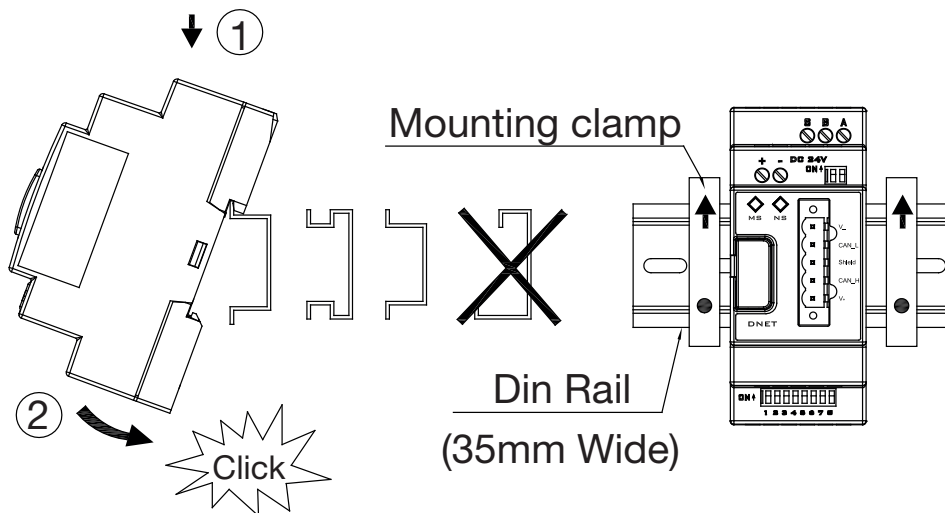
Use M4 screws to direct mount the PBUS module as shown Figure 2.

CARLO GAVAZZI
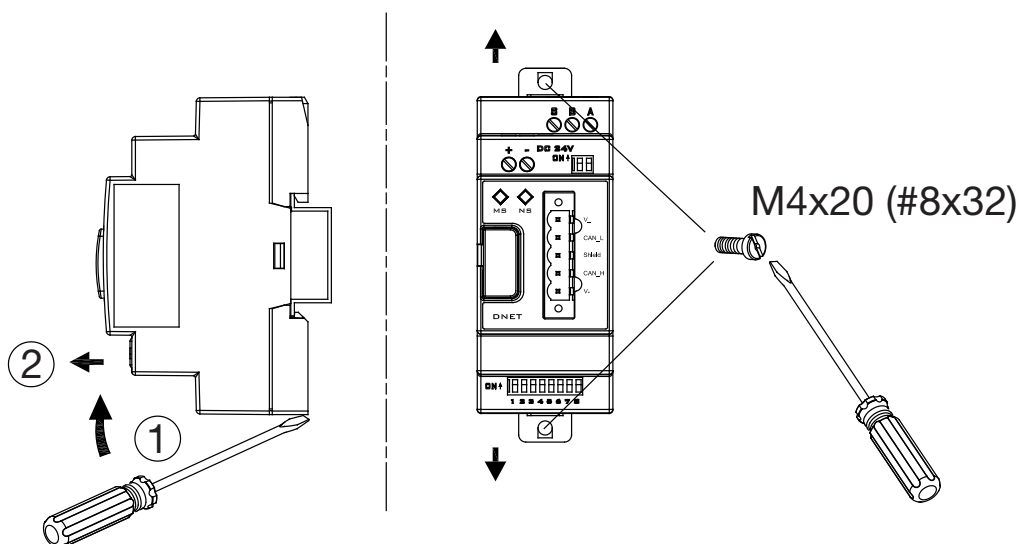
• Dimension:

Unit: mm (1 inch = 25.4mm)
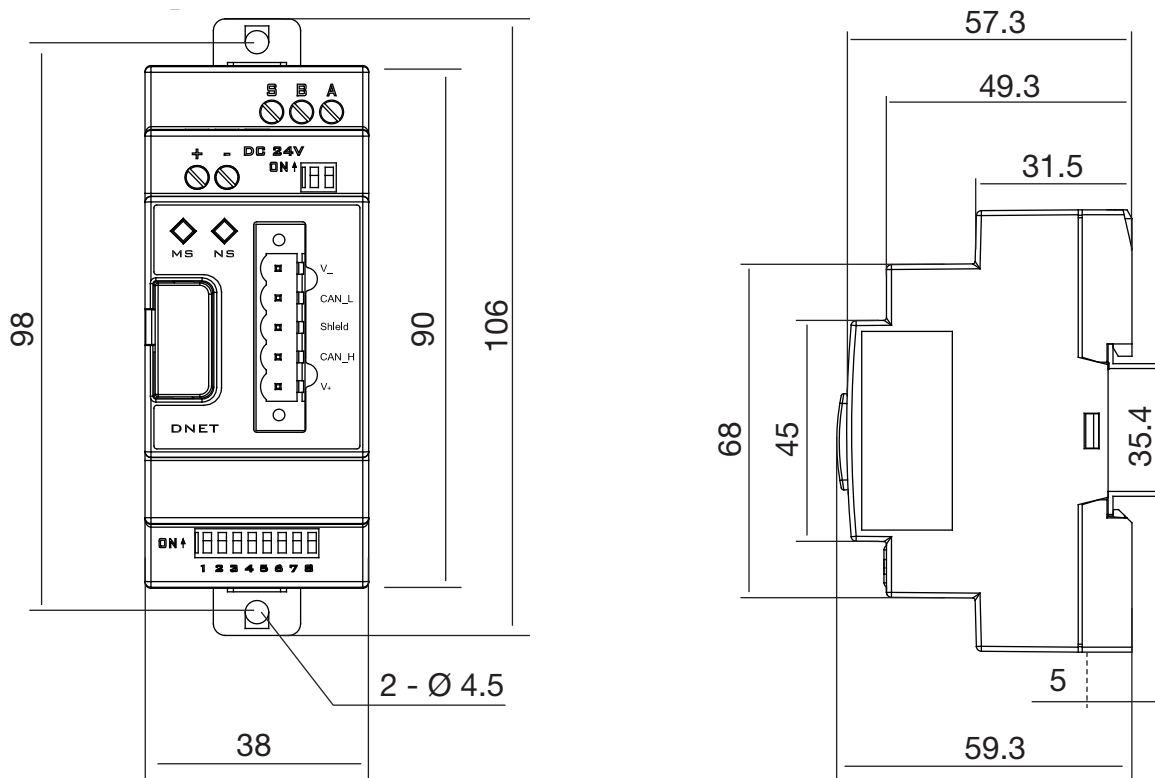
2.2. Connecting Power Supply
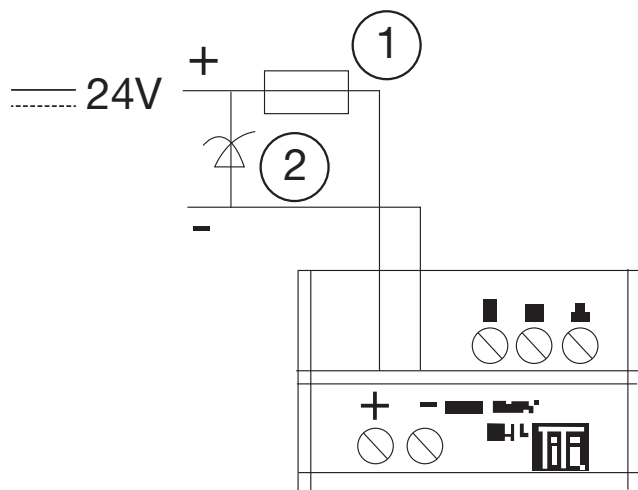
RV-PDP module operates with a 24vDC supply voltage.

User can use an external 24vDC power.

- 1A quick-blowing fuse, circuit-breaker or circuit protector
- Surge absorber

 12/10/2018

2.3. Connect with Base Unit and Setting Parameters

RV-PDP module connected with base unit via a RS485 port with MODBUS RTU protocol. Setting for RS485 port: Baud Rate 19200kbps, 8 bit data length, 1bit for stop bit, and no parity bit.

Users have to set parameters as shown in the table below.

Function	Description	Setting value	Default value
00-02	Run source	2: communication control	0
00-05	Frequency source	5: communication setting	0
09-00	Communication address	1: address=1	0
09-01	RTU/ASCII mode	0: RTU mode	0
09-02	Serial Baud Rate	2: 19200bps	2
09-03	Stop Bit	0: 1stop bit	0
09-04	Parity Bit	0: no parity bit	0
09-05	Data Length	0: 8bit data length	0

More information for setting and wiring refer to see: RVLF User Manual

CARLO GAVAZZI
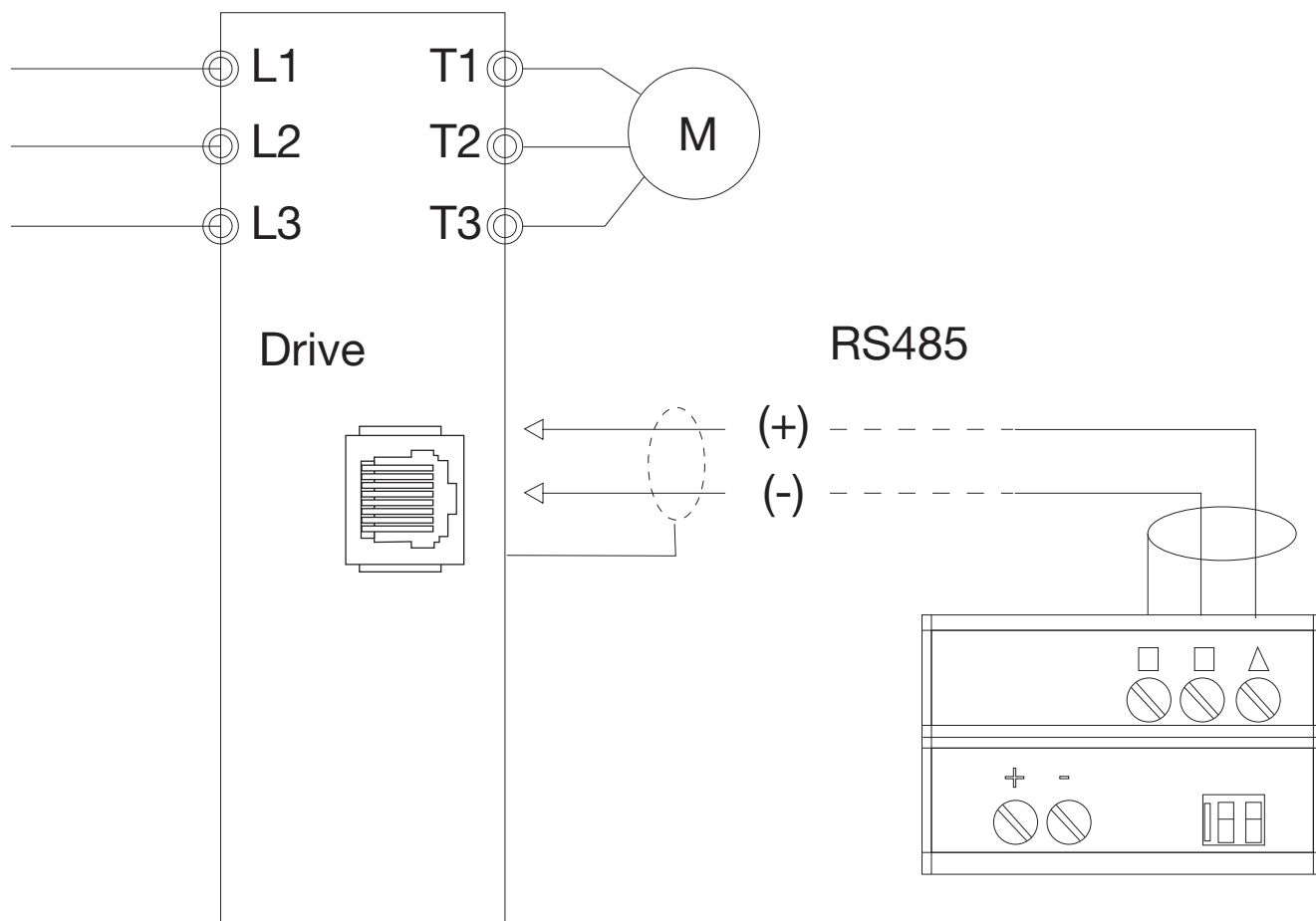
2.4. Connect with PROFIBUS-DP Bus

Please use a 9-pole D-SUB to connect the RV-PDP module to the PROFIBUS-DP field bus.
For this use the special PROFIBUS-DP plug and the special PROFIBUS-DP cable.
The type of cable used determines the permissible maximum bus length and the transfer rate.
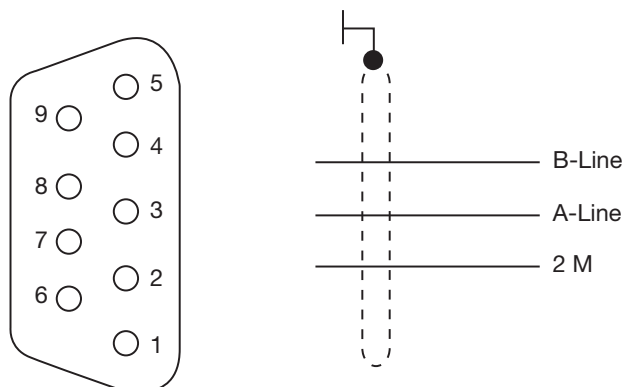
Pin	Signal name	Designation
1	Not assigned	-
2	Not assigned	-
3	RXD/TXD-P (B- Line)	Receive/Send data -P
4	Not assigned	-
5	DGND (2M)	Data reference potential
6	Not assigned	-
7	Not assigned	-
8	RXD/TXD-N (A-Line)	Receive/Send data -N
9	Not assigned	-

2.5. Bus Terminating Resistors
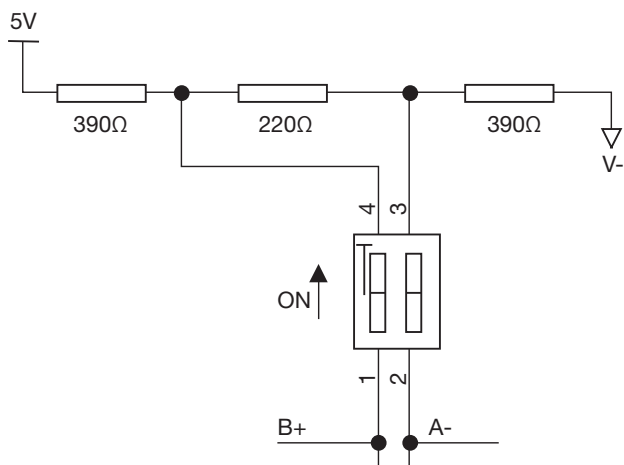
The first and last station in a bus segment must be connected to the bus with the bus terminating resistor switched on.
RV-PDP modules have integrated bus termination.
The 2bit DIP switch of module enables the bus terminating resistors to be switched on.

Bus terminating resistor

2.6. Electronic Isolation

The following electrical isolation should be provided for the RV-PDP module:
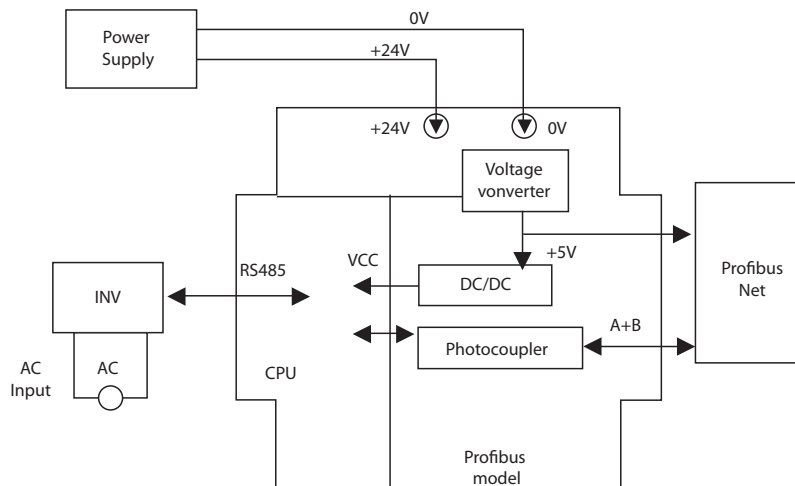
Note: Can't use RVLF user 24V to connect RV-PDP input, otherwise RV-PDP is no islanded with RVLF.

2.7. Data Transfer Rate and Distance

The following electrical isolation should be provided for the RV-PDP module:

RV-PDP module automatically detects the baud rate in the PROFIBUS-DP network after it is power on. However, this requires that at least one master station sends valid telegrams in the network.

The following transfer rates are supported: 9.6Kbit/s to 6000Kbit/s.

Two types of bus cable are specified in IEC 61158. Cable type B should no longer be used with new applications because it has bee discontinued. Cable type A allows all transfer rates up to 12000Kbit/s to be used. Cables for burial in the ground, festoon suspension and drum cables are also available.

The cable parameters are as follows:

Parameter	Cable type A
Surge impedance in Ω	135~165Ω (at 3~20MHz)
Effective capacitance	<30 (pF/m)
Loop resistance	<110 (Ω/Km)
Core diameter	>0.64 (mm)
Core cross section	>0.34 (mm²)

Distance between stations when using type A cable to IEC 61158:

Baud rate (Kbit/s)	Max. cable length type A cable (m)
9.6	1200
19.2	1200
93.75	1200
187.5	1000
500	400
1500	200
3000	100
6000	100

3. Communication

3.1. Initial Power Up

Before you power on the RV-PDP module, verify that it is properly connected to the power supply, to the bus connector and to the base unit. If the RV-PDP unit is factory set, the station address of the PROFIBUS-DP station must be set.

3.2. PROFIBUS-DP Address

Every PROFIBUS-DP station requires a unique address in the PROFIBUS-DP structure. User can use the integrated 8bits DIP switch on the RV-PDP to set address. The SW1-1 is the lowest bit, and the SW1-7 is highest bit, the SW1-8 is not used.

Valid PROFIBUS Address range is 1~125

SW_7	SW-6	SW-5	SW-4	SW-3	SW-2	SW-1	Address
OFF	OFF	OFF	OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	OFF	OFF	ON	ON	3
OFF	OFF	OFF	OFF	ON	OFF	OFF	4
☐	☐	☐	☐	☐	☐	☐	☐
ON	ON	ON	ON	ON	OFF	ON	125

NOTE: Setting address changes via DIP switch will not be effective immediately.
This will be effective after RV-PDP module power re-boot.

3.3. RV-PDP Cyclical Data Exchange

RV-PDP is controlled via cyclical PROFIBUS-DP channel.
This channel can be used to access the parameters of RVLF series diver.

3.3.1. PPO configuration

The structure of useful data for the cyclical channel is defined in the PROFIDrive Profile version2.0. Please refer to the Parameter Process data Object (PPO).

PKW				PZD									
PKE	IND	PWE		PZD1 STW ZSW	PZD2 HSW HIW	PZD3	PZD4	PZD5	PZD6	PZD7	PZD8	PZD9	PZD10
1st word	2nd word	3rd word	4th word	1st word	2nd word	3rd word	4th word	5th word	6th word	7th word	8th word	9th word	10th word
PKW													
PKW													
		PKW											
		PKW											
PKW													

PKW: Parameter ID/value	STW: Control word
PZD: Process data	ZSW: Status word
PKE: Parameter ID	HSW: Main set point
IND: Sub-index	HIW: Main actual value
PWE: Parameter value	

NOTE: RV-PDP supports PPO1 and PPO3 structure only.

3.3.2. Extended configuration

In addition to the PPO types, cyclical data can also be configured to EXT CONF1 or EXT CONF2 (shown as the table below). These two extended configuration both have four process data words.

PKW				PZD									
PKE	IND	PWE		PZD1 STW ZSW	PZD2 HSW HIW	PZD3	PZD4	PZD5	PZD6	PZD7	PZD8	PZD9	PZD10
1st word	2nd word	3rd word	4th word	1st word	2nd word	3rd word	4th word	5th word	6th word	7th word	8th word	9th word	10th word
EXT CONF 1													
				EXT CONF 2									

3.3.3. Default settings of PZD structure

RV-PDP must receive the user parameters from master that configured via GSD file. The default settings of PZD structure are as follows:

STW1: Control Word, mapping to MODBUS address 0x2501 of RVLF series drive.
HSW: Main set point, mapping to MODBUS address 0x2502 of RVLF series drive.
ZSW1: Drives status, mapping to MODBUS address 0x2520 of RVLF series drive.
HIW: Main actual value, mapping to MODBUS address 0x2524 of RVLF series diver.

PROFIBUS-DP master RVLF series drive
PZD3: Not used.
PZD4: Not used.

RVLF series drive PROFIBUS-DP master
RVLF output status, mapping to MODBUS address 0x2520~0x252D of RVLF series drive. The default settings of PZD3/PZD4 as follows:

PZD3: Default Multi-function terminal on/off status, mapping to MODBUS address 0x2522 of RVLF series drive.
PZD4: Default output current, mapping to MODBUS address 0x2527 of RVLF series drive.

3.3.4. Control and Status words

RV-PDP supports the PPO1 and PPO3 data structure. However, it does not support the bit assignments of control and status words in PROFIDrive profile. It only supports the RVLF series drive control and status words.

Control word (data from PROFIBUS-DP to RVLF series drive)

Bit	Meaning	1	0
0	Operation Command	Run	Stop
1	Reverse Command	Reverse	Forward
2	External Fault	Fault	
3	Fault Reset	Reset	
4	Jog Command	Jog	
5	Jog Reverse Command	Jog reverse	
6	Multi function Command S1	ON	OFF
7	Multi function Command S2	ON	OFF
8	Multi function Command S3	ON	OFF
9	Multi function Command S4	ON	OFF
A	Multi function Command S5	ON	OFF
B	(unused)		
C	Relay R1	ON	OFF
D	(unused)	ON	OFF
E~F	(unused)		

Status word (data from RVLF series drive to PROFIBUS-DP)

Bit	Meaning	1	0
0	Operation State	Run	Stop
1	Direction State	Reverse	Forward
2	Inverter operation prepare state	ready	unready
3	Abnormal	Abnormal	normal
4	Data setting error	Error	No error
5~F	(unused)		

3.3.5. Accessing parameter via PKW area

In cyclical data, RV-PDP can provide request and response message to access the RVLF series parameters. Due to the request and response mechanism, the master must send the request until receives a corresponding response. Following 4 words are for PKW area:

Word 1	Parameter ID (PKE)	
bit	**15** **AK**	**12** **11** **Parameter number(PNU)** **0**
Word 2	IND Reserved	
Word 3	PWE1	

bit	**15** **Reserved**	**8** **7** **Fault number** **0**
Word 4	PWE2 Read/Write parameters	

• PKE

Bit 0 to 11 (PNU) contain the MODBUS address of the relevant parameter.
Please refer to Appendix B: RVLF series drive MODBUS address allocation.
Bits 12 to 15(AK) contain the request or the response identifier.

Request identifier (Master RV-PDP)

Request Identifier	Description
0	No request
1	Read parameter value
2	Modify parameter value

Response identifier (RV-PDP Master)

Request Identifier	Description
0	No response
1	Request parameter value processed
7	Request parameter value cannot process

If request parameter value cannot be processed, and the fault numbers following will be stored in the low byte of PWE1.

NO.	Description
0	Parameter does not exist
1	Parameter can not change in current state
2	Parameter value minimum/maximum not reached/exceeded
101	Other SP communication error occur, e.g. response time over

• PKE

All parameters for the RVLF series drive are 16-bit. A 16-bit parameter value is transferred by PWE2 (4th word). PWE1 (3rd word) must be set to 0 on the PROFIBUS-DP master in this case.

• Example for PKW mechanism

Read data of parameter 00-05 (frequency source command).
To read value of 00-05, first set the request ID to 1. Then refer to the appendix to find out the corresponding MODBUS address 0x0005. Thus, the data sequence is as follows:
Master RV-PDP: 1005 0000 0000 0000
RV-PDP Master: 1005 0000 0000 000

Request	
Word 1 (PKE)	1005
Word 2 (IND)	0000
Word 3 (PWE1)	0000
Word 4 (PWE2)	0000

Request	
Word 1 (PKE)	1005
Word 2 (IND)	0000
Word 3 (PWE1)	0000
Word 4 (PWE2)	0004

4. GSD File and Parameters

A GSD file is a text file used to identify PROFIBUS-DP device (master or slave), which contains the necessary data for the configuration of DP slaves within a standard DP master. Typical information in a GSD file are Vendor information, supported Baud rates, Timing information, supported Options/features and Available I/O signals. The parameters in GSD file are used for the configuration of the PROFIBUS network. The parameters descriptions are shown as below.

• GSD File for RVLF series drive Appendix A: Carlo Gavazzi_RV.GSD
• Parameters for RVLF series drive

The parameters description is shown as in the table below:

Item	Name	Type	Description	Default
1	Dout1	U16	This is the MODBUS address of STW1. Other addresses are not allowed.	0x2501
2	Dout2	U16	This is the MODBUS address of HSW. Other addresses are not allowed.	0x2502
3	Dout3	U16	Not used	0x0000
4	Dout4	U16	Not used	0x0000
5	Din1	U16	This is the MODBUS address of ZSW1. Other addresses are not allowed.	0x2520
6	Din2	U16	This is the MODBUS address of HIW. Other addresses are not allowed.	0x2524
7	Din3	U16	This is a MODBUS address and should in range of 0x2520 to 0x252D. RV-PDP will monitor this address, and copy the return data to the 3rd word of cyclic input data PZD if selecting module"4 PKW, 4 PZD".	0x2524
8	Din4	U16	This is a MODBUS address and should in range of 0x2520 to 0x252D. RV-PDP will monitor this address, and copy the return data to the 4th word of cyclic input data PZD if selecting module"4 PKW, 4 PZD".	0x2527
9	LossSPComTreat	U16	It is used to decide the method when communication with PROFIBUS network is lost. The settings can be: 00 - Ignore event and continue; 01 - Stop according to 07-09 stop method.	0x0001
10	LossSPComTreat	U16	It is used to decide the method when the SP communication is lost. The settings can be: 00 - Stop data exchange and alarm; 01 - Continue data exchange and alarm; 02 - Ignore and continue data exchange.	0x0000

The default parameter setting is shown as in the following:

```
Properties – DP slave                                                    [X]

 General  Parameter Assignment

 ┌──────────────────────────────────────────────────────────────────────┐
 │ Parameters                                    │ Value                  │
 ├──────────────────────────────────────────────┼────────────────────────┤
 │ ⊟ 📁 Station parameters                        │                        │
 │   ⊟ 📁 Device-specific parameters              │                        │
 │     ▤ Dout 1: STW1(Master->JN5-CM-PDP)        │ 9473                   │
 │     ▤ Dout 2: HSW                             │ 9474                   │
 │     ▤ Dout 3: Not used                        │ 0                      │
 │     ▤ Dout 4: Not used                        │ 0                      │
 │     ▤ Din 1: ZSW1(JN5-CM-PDP->Master)         │ 9504                   │
 │     ▤ Din 2: HIW                              │ 9508                   │
 │     ▤ Din 3: PZD3                             │ 9506                   │
 │     ▤ Din 4: PZD4                             │ 9511                   │
 │     ▤ LossDPComTreat                          │ Stop accord to Pr.Stop method │
 │     ▤ LossSPComTreat                          │ Stop DataExchange & Report... │
 │   ⊟ 📁 Hex parameter assignment                │                        │
 │     ▤ User_Prm_Data (0 to 7)                  │ 25,01,25,02,00,00,00,00│
 │     ▤ User_Prm_Data (8 to 15)                 │ 25,20,25,24,25,22,25,27│
 │     ▤ User_Prm_Data (16 to 19)                │ 00,01,00,00            │
 └──────────────────────────────────────────────┴────────────────────────┘

   [ OK ]                                   [ Cancel ]    [ Help ]
```

5. Troubleshooting

5.1. LED Display

POW LED and BUS LED are used to monitor the RV-PDP communication status.

LED state	Description	Corrective Actions
POWER LED		
OFF	No power	Verify the power supply of RV-PDP unit.
Orange	SPComm not establish	1, Check the connection between the RV-PDP unit and base unit 2, Check the communication setting in base unit is (19200, 8, N, 1)
Flashing Red LED	SPComm error occur	Check the PLC program, and ensure the communication address in RV-PDP unit is correct.
Rapid Flashing Red LED	Invalid PROFIBUS address set via switch	Check whether the switch value is valid, valid value of slave is within 1~125. Set the valid value and re-power.
Green ON	Power supply present	
Green flash	Communication with the base unit correct.	
BUS LED		
OFF	OFF DPComm not establish	1, Verify network installation is OK 2, Check the user parameter assignment of RV-PDP unit is correct
Green on	DPComm is established	

5.2. Bus Diagnostic Data

RV-PDP provides 8 bytes diagnostic data when the abnormal communication occurs or parameter "LossSPComTreat" is set to report alarm.
It includes 6 bytes standard diagnostic data and 2 bytes device related diagnostic data. The following table shows the meanings of the 8 bytes:

Bytes 1~6	Byte 7	Byte 8
Standard diagnostic data	Length in bytes 2	SPComm status 00 - normal 01 - SPComm return error code 02 - SPComm time out

Byte 7 indicates the length of device related diagnostic data, including itself, so byte 7 is always 2. Byte 8 indicates the SP communication status when the error occurs.
If there is a communication error detected between RV-PDP unit and drive base unit (RVLF), the error code will be displayed on the digital keypad of drive.

Annex A: GSD File for RVLF

GSD-File for RVLF series drives Profibus DP
;
; Auto_Baud_supp, 6MBaud
;
; File : Carlo Gavazzi_L51.GSD
;==

#Profibus_DP

; Unit-Definition-List:

```
GSD_Revision=1
Vendor_Name =           "Carlo Gavazzi"
Model_Name =            "RVLF ProfiBus-DP"
Revision =              "Rev1.0"
Ident_Number =          0x0AC2
Protocol_Ident =        0; PROFIBUS DP
Station_Type =          0; DP-slave
FMS_supp =              0
Hardware_Release =      "V1.0"
Software_Release =      "V1.0"
Redundancy =            0
Repeater_Ctrl_Sig =     0
24V_Pins =              0
Implementation_Type = "SPC3"
;Bitmap_Device =         "RVLF DRV"
;Bitmap_Diag =           "RVLF DRV"
;Bitmap_SF =             "RVLF DRV"
Slave_Family =          1@Gavazzi@RVLF; Drives family
```

; Supported Communication Speeds:
```
9.6_supp=               1
19.2_supp=              1
93.75_supp=             1
187.5_supp=             1
500_supp=               1
1.5M_supp=              1
3M_supp=                1
6M_supp=                1
12M_supp=               0
```

```
MaxTsdr_9.6=            60
MaxTsdr_19.2=           60
MaxTsdr_93.75=          60
```

    12/10/2018

```
MaxTsdr_187.5=          60
MaxTsdr_500=            100
MaxTsdr_1.5M=           150
MaxTsdr_3M=             250
MaxTsdr_6M=             450
;MaxTsdr_12M=           800

; DP_Slave Information:
Freeze_Mode_supp=       1
Sync_Mode_supp=         1
Auto_Baud_supp=         1
Set_Slave_Add_supp= 0
Min_Slave_Intervall=    1; 100 micro-second

; Module-Definitions:
Modular_Station=        1; 0-compact; 1-modular
Max_Module=             1
Max_Input_Len=          16
Max_Output_Len=         16
Max_Data_Len=           32

Modul_Offset=           0
Fail_Safe=              0
Max_Diag_Data_Len=  8

; Meaning of "device diagnostic" field
Unit_Diag_Bit ( 0 )=    "SPComm return error code"
Unit_Diag_Bit ( 1 )=    "SPComm time out"

OrderNumber=            "RV-PDP"

; Specify the user parameters:

Max_User_Prm_Data_Len=          20
User_Prm_Data_Len=              20
User_Prm_Data=                  0x25,0x01,\
                                0x25,0x02,\
                                0x00,0x00,\
                                0x00,0x00,\
                                0x25,0x20,\
                                0x25,0x24,\
                                0x25,0x22,\
                                0x25,0x27,\
                                0x00,0x01,\
                                0x00,0x00

Module =                "4 PKW,  2 PZD  (PPO 1)" 0xF3, 0xF1
EndModule
```

Module=   "0 PKW, 2 PZD (PPO 3)" 0xF1
EndModule
Module=   "4 PKW, 4 PZD" 0xF3, 0xF3
EndModule
Module=   "0 PKW, 4 PZD" 0xF3
EndModule

; Extended Description of User-Parameters

PrmText=   1
Text (0)=   "Ignore and Continue"
Text (1)=   "Stop accord to Pr.Stop method"
EndPrmText

PrmText=   2
Text (0)=   "Stop DataExchange & Report Fault"
Text (1)=   "Continue & Report Alarm"
Text (2)=   "Ignore & Continue DataExchange"
EndPrmText

ExtUserPrmData=   1 "Dout 1: STW1 (Master->RV-PDP)"
                           Unsigned16 0x2501 9473-9473
                           EndExtUserPrmData

ExtUserPrmData=   2 "Dout 2: HSW"
                           Unsigned16 0x2502 9474-9474
                           EndExtUserPrmData

ExtUserPrmData=   3 "Dout 3: Not used"
                           Unsigned16 0x0000 0-0
                           EndExtUserPrmData

ExtUserPrmData=   4 "Dout 4: Not used"
                           Unsigned16 0x0000 0-0
                           EndExtUserPrmData

ExtUserPrmData=   5 "Din 1: ZSW1 (RV-PDP->Master)"
                           Unsigned16 0x2520 9504-9504
                           EndExtUserPrmData

ExtUserPrmData=   6 "Din 2: HIW"
                           Unsigned16 0x2524 9508-9508
                           EndExtUserPrmData

ExtUserPrmData=   7 "Din 3: PZD3"
                           Unsigned16 0x2522 9504-9517
                           EndExtUserPrmData

ExtUserPrmData=   8 "Din 4: PZD4"
                       Unsigned16 0x2527 9504-9517
                       EndExtUserPrmData

ExtUserPrmData=   9 "LossDPComTreat"
                       Unsigned16 1 0-1
Prm_Text_Ref=   1
                       EndExtUserPrmData

ExtUserPrmData=   10 "LossSPComTreat"
                       Unsigned16 0 0-2
Prm_Text_Ref=   2
                       EndExtUserPrmData

Ext_User_Prm_Data_Ref (0)=   1
Ext_User_Prm_Data_Ref (2)=   2
Ext_User_Prm_Data_Ref (4)=   3
Ext_User_Prm_Data_Ref (6)=   4
Ext_User_Prm_Data_Ref (8)=   5
Ext_User_Prm_Data_Ref (10)=   6
Ext_User_Prm_Data_Ref (12)=   7
Ext_User_Prm_Data_Ref (14)=   8
Ext_User_Prm_Data_Ref (16)=   9
Ext_User_Prm_Data_Ref (18)=   10

;============ END of GSD file for RVLF Drives ============

Annex B: RVLF MODBUS address allocation

Note: Parameter register No.: "GG means Group number, "nn" means parameter number
For example: the address of Pr 08-03 is 803H. The address of Pr 10-11 is 0A0BH.

Register Code	Function Block	Function Block	Function Block	Register Code	Function Block	Register Code	Function Block	Register Code	Function Block
Group 00		**Group01**		**Group 02**		**Group 03**		**Group 04**	
0000H	00-00	0100H	01-00	0200H	02-00	0300H	03-00	0400H	04-00
0001H	00-01	0101H	01-01	0201H	02-01	0301H	03-01	0401H	04-01
0002H	00-02	0102H	01-02	0202H	02-02	0302H	03-02	0402H	04-02
0003H	00-03	0103H	01-03	0203H	02-03	0303H	03-03	0403H	04-03
0004H	00-04	0104H	01-04			0304H	03-04	0404H	04-04
0005H	00-05	0105H	01-05			0305H	03-05	0405H	04-05
0006H	00-06	0106H	01-06			0306H	03-06	0406H	04-06
0007H	00-07	0107H	01-07			0307H	03-07	0407H	04-07
0008H	00-08	0108H	01-08			0308H	03-08	0408H	04-08
0009H	00-09	0109H	01-09			0309H	03-09	0409H	04-09
000AH	00-10	010AH	01-10			030AH	03-10	040AH	04-10
000BH	00-11	010BH	01-11			030BH	03-11	040BH	04-11
000CH	00-12					030CH	03-12	040CH	04-12
000DH	00-13					030DH	03-13		
000EH	00-14					030EH	03-14		
000FH	00-15					030FH	03-15		
0010H	00-16					0310H	03-16		
0011H	00-17					0311H	03-17		
0012H	00-18					0312H	03-18		
0013H	00-19					0313H	03-19		
0014H	00-20								
Group 05		**Group 05**		**Group 06**		**Group 06**		**Group 07**	
0500H	05-00	051AH	05-26	0600H	06-00	061AH	06-26	0700H	07-00
0501H	05-01	051BH	05-27	0601H	06-01	061BH	06-27	0701H	07-01
0502H	05-02	051CH	05-28	0602H	06-02	061CH	06-28	0702H	07-02
0503H	05-03	051DH	05-29	0603H	06-03	061DH	06-29	0703H	07-03
0504H	05-04	051EH	05-30	0604H	06-04	061EH	06-30	0704H	07-04
0505H	05-05	051FH	05-31	0605H	06-05	061FH	06-31	0705H	07-05
0506H	05-06	0520H	05-32	0606H	06-06	0620H	06-32	0706H	07-06
0507H	05-07	051EH	05-30	0607H	06-07	0621H	06-33	0707H	07-07
0508H	05-08	051FH	05-31	0608H	06-08	0622H	06-34	0708H	07-08
0509H	05-09	0520H	05-32	0609H	06-09	0623H	06-35	0709H	07-09
050AH	05-10			060AH	06-10	0624H	06-36		
050BH	05-11			060BH	06-11				
050CH	05-12			060CH	06-12				
050DH	05-13			060DH	06-13				
050EH	05-14			060EH	06-14				
050FH	05-15			060FH	06-15				
0510H	05-16			0610H	06-16				
0511H	05-17			0611H	06-17				
0512H	05-18			0612H	06-18				
0513H	05-19			0613H	06-19				
0514H	05-20			0614H	06-20				
0515H	05-21			0615H	06-21				
0516H	05-22			0616H	06-22				
0517H	05-23			0617H	06-23				
0518H	05-24			0618H	06-24				
0519H	05-25			0619H	06-25				

Register Code	Function Block	Function Block	Function Block	Register Code	Function Block	Register Code	Function Block	Register Code	Function Block
Group 08		**Group 09**		**Group 10**		**Group 10**		**Group 11**	
0800H	08-00	0900H	09-00	0A00H	10-00	0A0CH	10-12	0B00H	11-00
0801H	08-01	0901H	09-01	0A01H	10-01	0A0DH	10-13	0B01H	11-01
0802H	08-02	0902H	09-02	0A02H	10-02	0A0DH	10-14	0B02H	11-02
0803H	08-03	0903H	09-03	0A03H	10-03	0A0EH	10-15	0B03H	11-03
0804H	08-04	0904H	09-04	0A04H	10-04	0A0FH	10-16	0B04H	11-04
0805H	08-05	0905H	09-05	0A05H	10-05	0A10H	10-17	0B05H	11-05
0806H	08-06	0906H	09-06	0A06H	10-06	0A11H	10-18	0B06H	11-06
0807H	08-07	0907H	09-07	0A07H	10-07	0A12H	10-19	0B07H	11-07
0808H	08-08	0908H	09-08	0A08H	10-08	0A13H	10-20	0B08H	11-08
0809H	08-09	0909H	09-09	0A09H	10-09	0A14H	10-21	0B09H	11-09
				0A0AH	10-10	0A15H	10-22	0B0AH	11-10
				0A0BH	10-11	0A16H	10-23	0B0BH	11-11

Register code of function block of drive (as for the parameter description, please refer to drive user manual)

Command DATA (Readable and Writable)

Register	Content
2501H	Operation signal _see table below_
2502H	Frequency Command
2503H ~ 251FH	(unused)

Operation signal (Register 2501H)

Bit	Meaning	1	0
0	Operation Command	Run	Stop
1	Reverse Command	Reverse	Forward
2	External Fault	Fault (EFO)	
3	Fault Reset	Reset	
4	Jog Command	Jog	
5	Jog Reverse Command	Jog reverse	
6	Multi function Command S1	ON	OFF
7	Multi function Command S2	ON	OFF
8	Multi function Command S3	ON	OFF
9	Multi function Command S4	ON	OFF
A	Multi function Command S5	ON	OFF
B	(unused)		
C	Relay R1	ON	OFF
D	(unused)		
E~F	(unused)		

Note: The unused Bit is defined as 0, the spare register is not available for writing data.

Supervision Data (Only for reading)

Register	Content
2520H	 **Bit / Meaning / 1 / 0 table below**

Bit	Meaning	1	0
0	Operation State	Run	Stop
1	Direction State	Reverse	Forward
2	Inverter operation prepare state	ready	unready
3	Abnormal	Abnormal	normal
4	Data setting error	Error	No error
5~F	(unused)		

Register 2521H — Error content

Code	Meaning	Code	Meaning
00	The inverter is normal	20	Over current during decelerating (OC-D)
01	Inverter over heat (OH)	21	Over current at start (OC_S)
02	Over current at stop (OC)	22	(unused)
03	Under voltage (LV)	23	Under voltage during running (LV-C)
04	Over voltage (OV)	24	Over voltage at constant speed / decelerating (OV-C)
05	(unused)	25	Inverter over heat at constant speed (OH-C)
06	External BB (bb)	26	Run at 0 Hz (STP0)
07	CPU interrupted (CTER)	27	Direct start disable (STP1)
08	PID feedback signal loss (PDER)	28	Control panel emergency stop (STP2)
09	EEPROM abnormal (EPR)	29	Keypad operation error (Err1)
10	Auto testing error (ATER)	30	Parameter setting error (Err2)
11	Over torque detected (OL3)	31	Analog converting error (Err4)
12	Inverter over load (OL2)	32	Modifying the parameter in
13	Motor over load (OL1)	33	Communication (Err5)
14	Communication error (EFO)	34	Communication failure (Err6)
15	Emergency stop (E.S)	35	Parameter setting error (Err7)
16	Parameter locked (LOC)	36	Default setting error (Err8)
17	(Unused)	37	(unused)
18	Over current at constant speed (OC-C)	38	(unused)
19	Over current during accelerating (OC-A)	39	(EPR1)
40	Inverter over speed (OVSP)		

Note: The unused Bit is defined as 0.

Supervision Data (Only for reading)

Register	Content				
2522H	MFIT state				
	Bit		**Meaning**	**1**	**0**
	Sequent input value	0	MFIT S1	ON	OFF
		1	MFIT S2	ON	OFF
		2	MFIT S3	ON	OFF
		3	MFIT S4	ON	OFF
		4	MFIT S5	ON	OFF
		5	(unused)		
		6	Relay R1	ON	OFF
	Terminal output	7	(unused)		
		9~F	(unused)		
2523H	Frequency command				
2524H	Frequency output				
2525H	Voltage command (10/1V)				
2526H	DC voltage command (1/1V)				
2527H	Current output (10/1A)				
2528H	Reserved				
2529H	Reserved				
252AH	PID Feedback value (100% / Max output frequency, 10/1%)				
252BH	PID input value (100% / Max output frequency, 10/1% , sign attached)				
252CH	TM2 AIN input value (1001 / 10V)				
252DH	TM2 AV2 input value (1001 / 10V)				
252EH	Ready-to-use				
252FH	Ready-to-use				

Appendix 11: RV-CAN

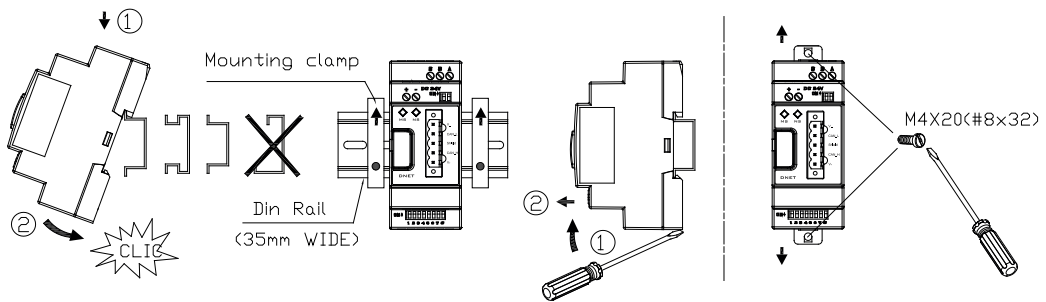This sheet provides brief operating instructions of the RV-CAN type module.
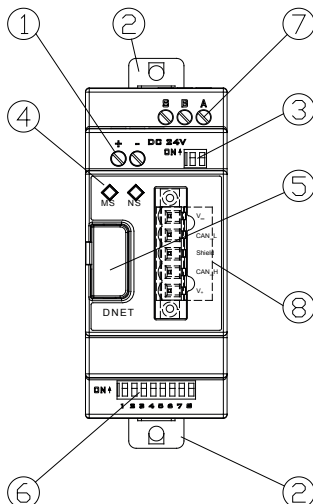For details, please refer to the user's operation m anual.

Dimensions
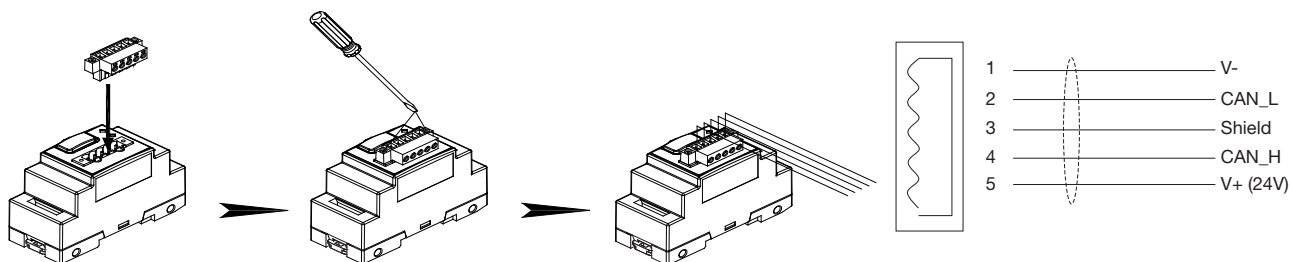## Unit: mm (1 inch = 25.4mm)
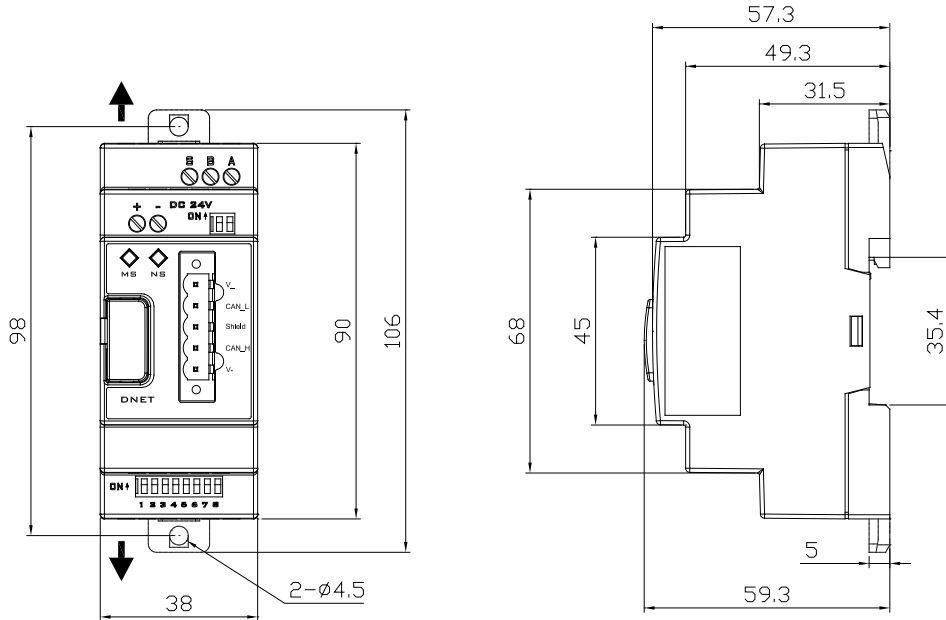
Mounting

Name & function

1	Power supply terminals
2	Retractable mounting feet
3	2PIN dip switch (choosing terminating resistors)
4	Module state LED/ Network state LED
5	Press-button
6	8PIN dip switch (SW1-1~SW1-8) SW1-1~1-6: Setup network ID SW1-7~1-8: Setup baud rate
7	RS485
8	Terminal block(5PIN)

Install the terminal

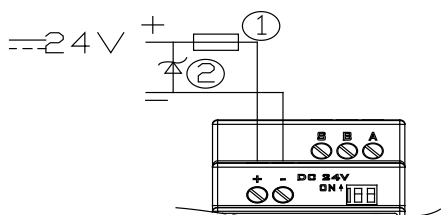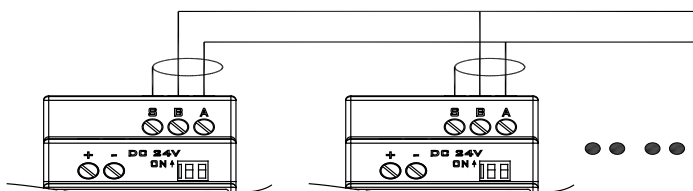|	
1	V-
2	CAN_L
3	Shield
4	CAN_H
5	V+ (24V)

Wiring

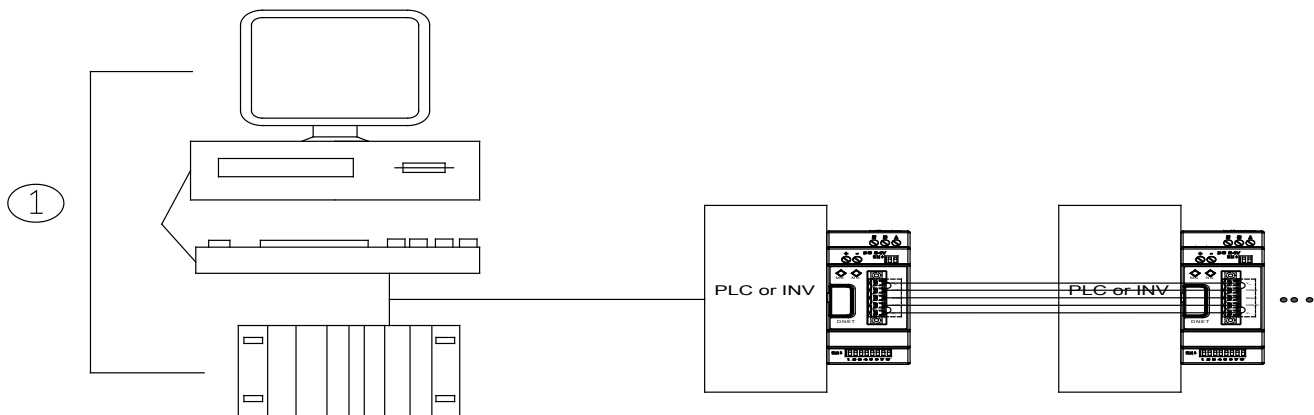DC Power: RS485:

1) A quick-blowing fuse, circuit-breaker or circuit protector.
2) Surge absorber.

Communication (product DNET):

1): Master area, PLC with CANopen master or PC with CANopen master card

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LED (MS)	
OFF	No power supply at RV-CAN
Green on	is in normal operational state
Green flash	Don't be connected with basic unit.
Red on	A fatal error has occured. (Device hardware error).
Red flash	An error has occured. (communicated with Basic unit make a retrievable error).

LED (NS)	
OFF	No power supply at RV-CAN
Green on	RV-CAN is on line and Operating state
Green flash and Red OFF	RV-CAN is Preoperational state
Green on and Red OFF	RV-CAN is on line and Operating state
Green single flash	Stop state.. ON2 00ms, OFF 1000ms
Red on	A fatal error has occured. (RV-CAN has shut down communication).

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Appendix 12: Consignes de sécurité

- Le produit est un lecteur conçu pour commander un moteur à induction triphasé. lire attentivement ce manuel pour garantir le bon fonctionnement, la sécurité et pour se familiariser avec les fonctions d'entraînement.
- Le lecteur est un appareil électrique / électronique et doit être installé et géré par un personnel qualifié
- Une mauvaise manipulation peut entraîner un fonctionnement incorrect, cycle de vie plus court, ou l'échec de ce produit ainsi que le moteur.
- Tous les documents sont sujets à changement sans préavis. Soyez sûr d'obtenir les dernières éditions de l'utilisation ou visitez notre site Web
- Lire le manuel d'instructions avant de procéder à l'installation, les connexions (câblage), le fonctionnement ou l'entretien et l'inspection.
- Vérifiez que vous avez une bonne connaissance de l'entraînement et de vous familiariser avec les consignes de sécurité et les précautions avant de procéder à fonctionner le lecteur.
- Prêter attention aux consignes de sécurité indiquées par l'avertissement et symbole Attention .

Avertissement	ignorer les informations indiquées par le symbole d'avertissement peut entraîner la mort ou des blessures graves.
Attention	ignorer les informations indiquées par le symbole de mise en garde peut entraîner des blessures mineures ou modérées et / ou des dommages matériels importants.

1.1 Avant d'alimenter le disque dur

Avertissement
Le circuit principal doit être correctement câblée. Pour les terminaux monophasés d'approvisionnement de l'utilisation des intrants (R/L1, T/L3) et de trois bornes d'entrée de l'utilisation de l'offre de phase (R/L1, S/L2, T/L3). U/T1, V/T2, W/T3 ne doivent être utilisés pour connecter le moteur. Raccordement de l'alimentation d'entrée à l'un des U/T1, V/T2 W/T3 ou bornes risque d'endommager le lecteur.

Attention
• Pour éviter que le couvercle ne se désengage ou de tout autre dommage physique, ne portez pas le lecteur par son couverture. Soutenir le groupe par son dissipateur de chaleur lors du transport. Une mauvaise manipulation peut endommager le lecteur ou blesser le personnel, et doit être évitée. • Pour éviter que les risques d'incendie, ne pas installer le lecteur sur ou à proximité d'objets inflammables. Installer sur des objets ininflammables comme les surfaces métalliques. • Si plusieurs disques sont placés dans le même panneau de contrôle, fournir une ventilation adéquate pour maintenir la température en dessous de 40 ° C/104 ° F (50 ° C/122 ° F sans housse de protection) pour éviter la surchauffe ou incendie. • Lors d'un retrait ou d'installation de l'opérateur numérique, éteignez-le d'abord, puis de suivre les instructions de ce manuel pour éviter les erreurs de l'opérateur ou de la perte de l'affichage causé par des connexions défectueuses.

Avertissement
Lors d'un retrait ou d'installation de l'opérateur numérique, éteignez-le d'abord, puis de suivre les instructions de ce manuel pour éviter les erreurs de l'opérateur ou de la perte de l'affichage causé par des connexions défectueuses....

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1.2 Câblage

Avertissement
• Coupez toujours l'alimentation électrique avant de procéder à l'installation d'entraînement et le câblage des terminaux utilisateurs. • Le câblage doit être effectué par un personnel qualifié / électricien certifié. • Assurez-vous que le lecteur est correctement mis à la terre. (220V Classe: impédance de mise à la terre doit être inférieure à 100Ω Classe 440V:. Impédance de mise à la terre doit être inférieure à 10Ω.) • vérifier et tester mes circuits d'arrêt d'urgence après le câblage. (L'Installateur est responsable du câblage.) • Ne touchez jamais de l'entrée ou de lignes électriques de sortie permettant directement ou toute entrée ou de lignes de puissance de sortie à venir en contact avec le boîtier d'entraînement. • Ne pas effectuer un test de tenue en tension diélectrique (mégohmmètre) sur le disque dur ou cela va entraîner des dommages de lecture pour les composants semi-conducteurs.

Attention
• La tension d'alimentation appliquée doit se conformer à la tension d'entrée spécifiée par le lecteur. (Voir la section signalétique du produit) • Raccorder la résistance de freinage et de l'unité de freinage sur les bornes assignées. • Ne pas brancher une résistance de freinage directement sur les bornes CC P (+) et N (-), sinon risque d'incendie. • Utilisez des recommandations de la jauge de fil et les spécifications de couple. (Voir Wire Gauge et la section de spécification de couple) • Ne jamais brancher l'alimentation d'entrée aux bornes onduleur de sortie U/T1, V/T2, W/T3. • Ne pas brancher un contacteur ou interrupteur en série avec le variateur et le moteur. • Ne branchez pas un facteur condensateur de correction de puissance ou suppresseur de tension à la sortie du variateur • S'assurer que l'interférence générée par l'entraînement et le moteur n'a pas d'incidence sur les périphériques.

1.3 Avant l'opération

Avertissement
• Assurez-vous que la capacité du disque correspond aux paramètres de notation avant d'alimenter. • Réduire le paramètre de la fréquence porteuse si le câble du variateur au moteur est supérieure à 80 pi (25 m). Un courant de haute fréquence peut être générée par la capacité parasite entre les câbles et entraîner un déclenchement de surintensité du variateur, une augmentation du courant ou d'une lecture actuelle inexactes. • Veillez à installer tous les couvercles avant de l'allumer. Ne retirez pas les capots pendant que l'alimentation du lecteur est allumé, un choc électrique peut se produire autrement. • Ne pas actionner d'interrupteurs avec les mains mouillées, un choc électrique pourrait survenir autrement. • Ne touchez pas les bornes d'entraînement lorsqu'il est alimenté, même si le lecteur est arrêté, un choc électrique pourrait survenir autrement.

1.4 Configuration Paramètre

Attention
• Ne branchez pas une charge pour le moteur tout en effectuant un auto-tune. • Assurez-vous que le moteur peut fonctionner librement et il y a suffisamment d'espace autour du moteur lors de l'exécution d'un auto-tune rotation.

1.5 Opération

Avertissement

• Veillez à installer tous les couvercles avant de l'allumer. Ne retirez pas les capots pendant que l'alimentation du lecteur est allumé, un choc électrique peut se produire autrement.
• Ne pas brancher ou débrancher le moteur pendant le fonctionnement. Le variateur pourrai se déclencher et ainsi endommager le lecteur.
• Les opérations peuvent commencer soudainement si une alarme ou un défaut est réarmé avec un ordre de marche active. Assurez-vous qu'un ordre de marche est actif lors de la réinitialisation de l'alarme ou de défaut, autrement des accidents peuvent se produire.
• Ne pas actionner d'interrupteurs avec les mains mouillées, un choc électrique pourrait survenir .
• Un interrupteur d'urgence externe indépendant est fourni, qui s'arrête en urgence vers le bas la sortie de l'onduleur en cas de danger.
• Si le redémarrage automatique après une récupération d'énergie est activée, le variateur démarrera automatiquement après le rétablissement du courant.
• Assurez-vous qu'il est sûr de faire fonctionner le variateur et le moteur avant d'effectuer un auto-tune rotation.
• Ne touchez pas les bornes d'entraînement lorsqu'il est alimenté même si l'onduleur s'est arrêté, un choc électrique pourrait survenir .
• Ne pas contrôler les signaux sur les circuits pendant que le lecteur est en marche.
• Après la mise hors tension, le ventilateur de refroidissement peut continuer à fonctionner pendant un certain temps.

Attention

• Ne touchez pas les composants générant de la chaleur tels que radiateurs et des résistances de freinage.
• Vérifiez soigneusement la performance du moteur ou de la machine avant d'utiliser à grande vitesse, sous peine de blessure.
• Notez les réglages des paramètres liés à l'unité de freinage lorsque applicable.
• Ne pas utiliser la fonction de freinage d'entraînement pour un maintien mécanique, sous peine de blessure.
• Ne pas contrôler les signaux sur les circuits pendant que le lecteur est en marche.

1.6 Entretien, Inspection et remplacement

Avertissement

• Attendre un minimum de 5 minutes après que l'alimentation a été débranchée avant de commencer une inspection. Vérifiez également que le voyant de charge est éteint et que la tension du bus cc a chuté au-dessous de 25Vdc.
• Ne jamais toucher les bornes à haute tension dans le lecteur.
• Assurez-vous que l'alimentation du lecteur est débranché avant de démonter le lecteur.
• Seul le personnel autorisé peuvent faire l'entretien, l'inspection et les opérations de remplacement. (Enlevez les bijoux en métal tels que les montres et les bagues et utiliser des outils isolés.)

Attention

• Le variateur peut être utilisé dans un environnement avec une gamme de température allant de 14 ° -104 ° F (10-40 ° C) et l'humidité relative de 95% sans condensation.
• Le variateur doit être utilisé dans un environnement sans poussière, gaz, vapeur et humidité.

1.7 Mise au rebut du variateur

Avertissement

• Jeter cet appareil avec soin comme un déchet industriel et selon les réglementations locales nécessaires.
• Les condensateurs du circuit principal d'entraînement et circuits imprimés sont considérés comme des déchets dangereux et ne doivent pas être brûlés.
• The Plastic enclosure and parts of the drive such as the top cover board will release harmful gases if burned.

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