INSTRUCTION MANUAL
使用說明書

TECO INVERTER

110V Class 0.2~0.75KW
(0.2~1HP)

220V Class 0.2~2.2KW
(0.2~3HP)

440V Class 0.75~2.2KW
(1~3HP)

TECO EVP PUMP

恆壓泵浦專用機
For constant-pressure pump

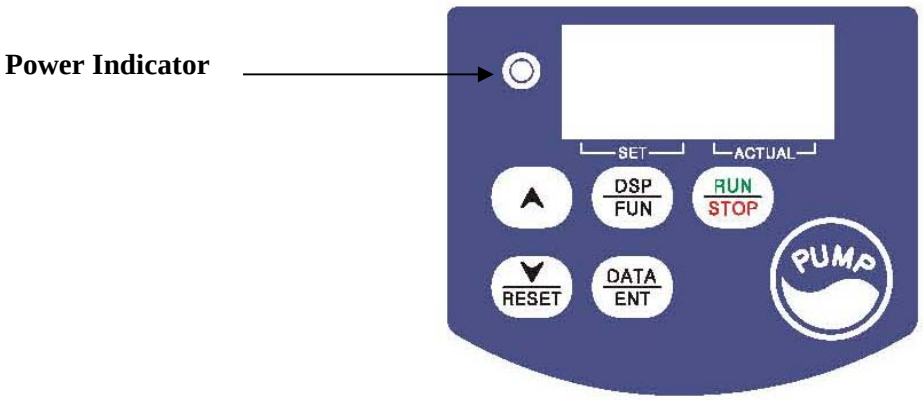
Quick Start Guide

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

Step 1 Before starting the inverter

Please refer to chapter one (Preface) and chapter two (Safety Precautions) of the EVP Instruction Manual. Verify drive was installed in accordance with the procedures as described in chapter three (Environment description and installation). If you feel this was abnormal, do not start the drive until qualified personnel have corrected the situation. (Failure to do so could result in serious injury.)

- **Check inverter and motor nameplates to determine that they have the same HP and voltage ratings. (Ensure that full load motor amps do not exceed that of the inverter.)**
- **Remove the terminal cover to expose the motor and power terminals.**
  - **a. Verify that AC power is wired to L1(L), L2, and L3(N) .**
  - **b. Verify that Motor leads are connected to T1, T2, and T3 .**
  - **c. IF brake module is necessary, please connect terminal voltage of the braking unit to + and - of the inverter.**



Step2 Apply power to the drive.

Apply AC power to the drive and observe operator. Four 7-segment display should show power voltage for 3~5 seconds and then show SET pressure and ACTUAL pressure, the factory setting of SET pressure is 2.0 Bar. (Pressure Command of 7-segment display should be flashed all the time.)

Step3 Check motor rotation without load.

- **Push DSP key, switch to output frequency, release the pump pressure.**
- **Press RUN Key. 7-segment Display will indicates 00.0F to 60.0F. Such value is the frequency output value.**
- **Check the operation direction of the motor.**
  IF the direction of the motor is incorrect:
  Press STOP Key, turn off the AC power supply. After Power indicator LED is off, change over theT1 and T2.
  Supply the power again, then check the motor direction.
- **Press STOP key.**

Step4 Check full speed at 50Hz/60Hz

- **Push DSP key, switch to output frequency, release the pump pressure.**
- **Set frequency to 50Hz/60Hz according to the above regulations.**
- **Press RUN Key, inspect the motor operation as motor accelerates to full load.**
- **Press STOP Key, inspect the motor operation as motor deceleration.**

EVP user manual

Table of Contents

Preface

Preface

To extend the performance of the product and ensure personnel safety, read this manual thoroughly before using the inverter. Should there be any problem in using the product that can not be solved with the information provided in the manual, contact your nearest TECO distributor 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 carrying, installing, operating, and checking the inverter. Be sure to follow the instructions for highest safety.

Danger	Indicates a potential hazard that causes 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 connect any wires when the inverter is powered. Do not check parts and signals on circuit boards when the inverter is in operation.
- Do not disassemble the inverter nor modify any internal wires, circuits, or parts.
- Ground the ground terminal of the inverter properly, for 200V class ground to 100 Ω or below, 400v class ground to 10Ω or below.

Caution

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

Product Inspection

TECO's inverters have all passed the function test before delivery. Please check the following when you receive and unpack the inverter:

- The model and capacity of the inverter is the same as those specified on your order.
- Is there any damage caused by transportation. If so, do not apply the power.
  Contact TECO's sales representatives if any of the above problems happened.

Chapter 1 Safety Precautions

1.1 Operation Precautions

1.1.1 Before Power Up

Danger

Make sure the main circuit connections are correct. L1(L), L2, and L3(N) are power-input terminals and must not be confused with T1, T2 and T3. Otherwise, inverter 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 damage do not carry the inverter by its covers. Support the drive by the heat sink when transpoting. Improper handling can damage the inverter or injure personnel and should be avoided.
- To avoid fire, do not install the inverter on a flammable object. Intall 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 degree C to avoid overheat or fire.
- When removing or installing the operator, turn the power off first, and follow the instructions in the diagram to avoid operator error or no display caused by bad connections.

Warning

This product complies with IEC 61800-3, with built-in Filter in an unrestricted distribution and with use of external filter in restricted distribution. Under some environments with electric-magnetic interruption, product should be tested before used.

Caution

- Work on the device/system by unqualified personnel or failure to comply with warnings cam 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.

1.1.2 During Power up

Danger

- The inverter still has control power immediately after power loss. When the power is re-supplied, the inverter operation is controlled by C-41.
- The inverter operation is controlled by F04 and C09 and the status of (FWD/REV RUN switch) when power is re-supplied. (C-08) Power loss ride through / Auto reset after fault).
  1. When C-08=001 and operation switches (FWD/REV RUN) is OFF, the inverter will not auto restart when power is re-supplied.
  2. When C-08=001and operation switch ON, the inverter will auto restart when power is re-supplied. Please turn OFF the run (start) switch to avoid damage to machine and injury to personnel before the power is re-supplied.

1.1.3 Before operation

Caution

Make sure the model and inverter capacity match the C-55 setting.

Warning

Warning! EVP series built in Filter type leakage current can exceed the IEC standard limit of 3.5mA. Please ground the inverter as shown in figures 3.5 and 3.6.

Operation with ungrounded supplies:

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

Operation with Residual Current Device(RCD):

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

1.1.4 During operation

Danger

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

Danger

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

Caution

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

Caution

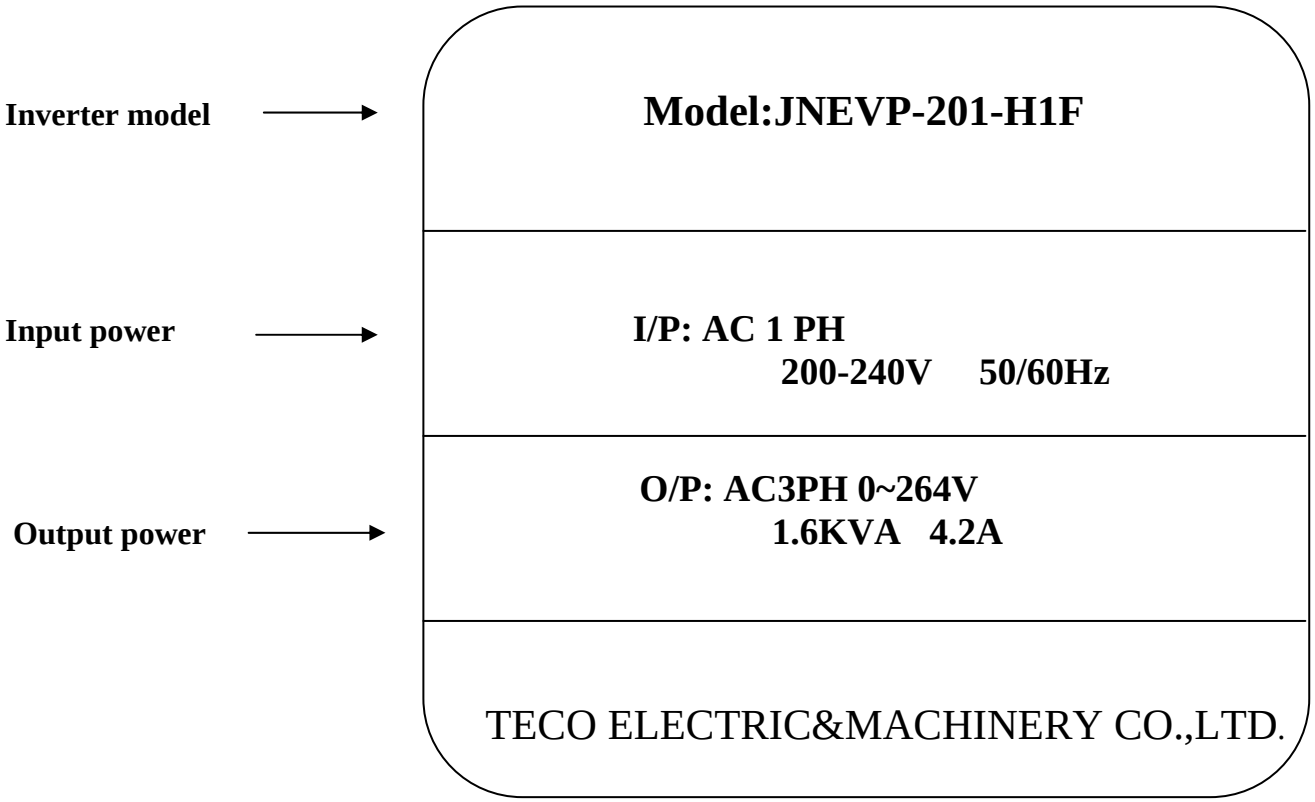
Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. It is not permissible to open the equipment until 5 minutes after the power has been removed.

1.1.5 Useable environment

Caution

When the IP20 inverter top dust cover has been removed the drive can be installed in a non-condensing environment with temperature ranging between –10 degree C to +50 degree C and relative humidity of 95% or less, but the environment should be free from water and metal dust.

Chapter 2 Model description



JNEVP -	2	P5	-	H	1	F
Series:	Input voltage :	Max suitable motor capacity:		SPEC	Power supply	Noise filter
For constant-pressure pump	1: 110V	P2: 0.25 HP		H: standard	1:single phase	Blank : none
	2: 220V	P5: 0.5 HP			3:three phase	F: built-in
	4: 440V	01: 1.0 HP				
		02: 2.0 HP				
		03: 3.0 HP				

Chapter 3 Mounting and installation of the EVP drive

3.1 Environment

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

- Ambient temperature: 14~122 deg F (-10 to 50 deg C)
- Avoid exposure to rain or moisture.
- Avoid direct sunlight.
- Avoid smoke and salinity.
- Avoid corrosive liquid and gas.
- Avoid dust, lint fibers, and metal filings.
- Keep away from radio active and flammable materials.
- Avoid electromagnetic interference (soldering machines, power machine).
- Avoid vibration (stamping, punchpress). Add a vibration-proof pad if the situation can not be avoided.
- If several inverters are placed in the same control panel, provide heat remoual means to maintain the temperature below 50 degree C.

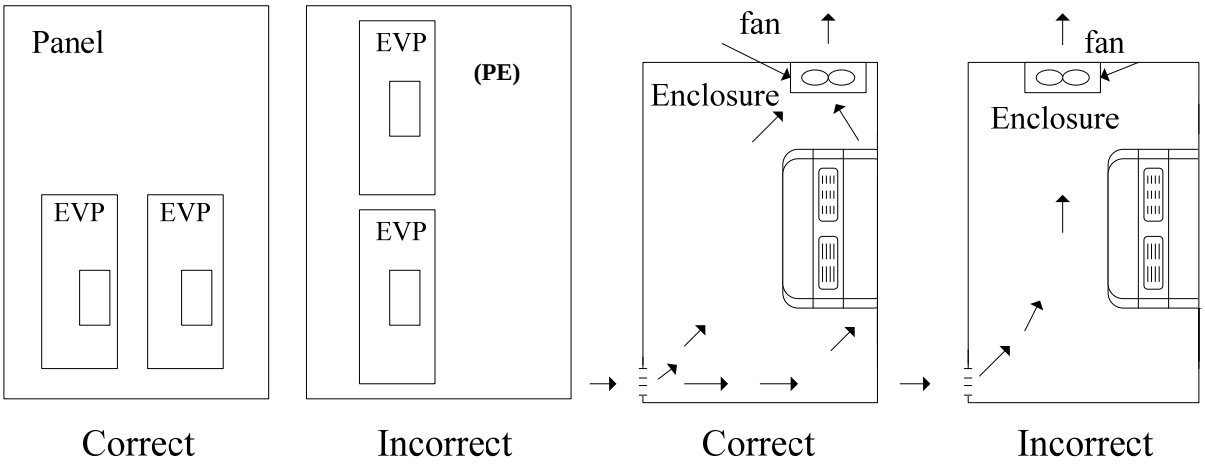


Figure 3-1 Panel and enclosure arrangement for drives

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

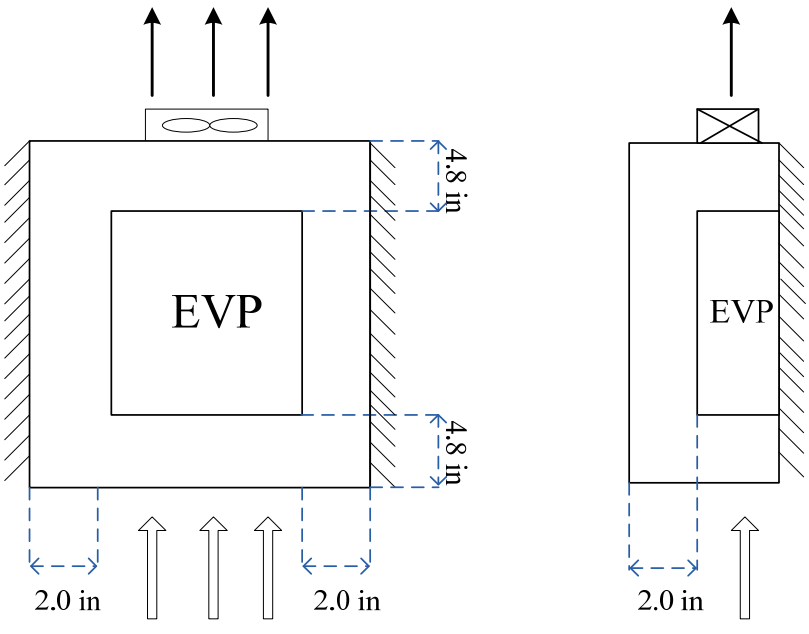
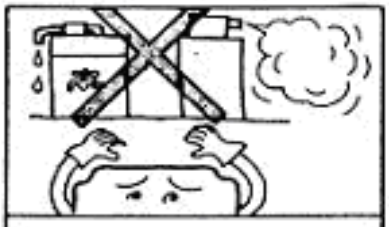


Figure 3-2 Mounting and clearance requirements

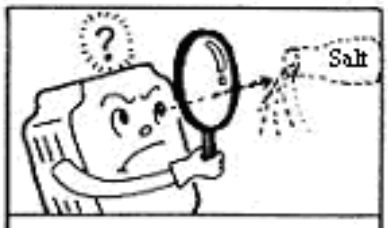
3.2 Mounting and installation

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


Direct sunlight

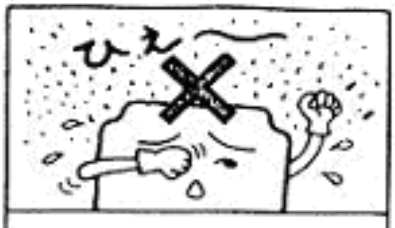

Corrosive gas and liquid

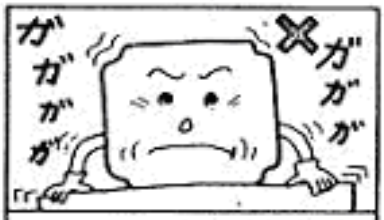
Oil



Salt


Wind, rain, and water drops may get into

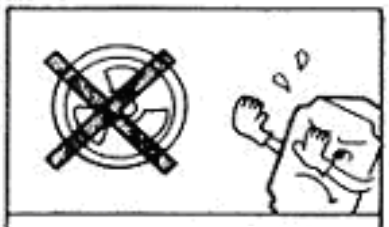

Iron filings, dust


Excessive vibration


Extreme low temperature

Excessive high temperature

Electromagnetic wave and ultra high wave


Radioactive materials


Inflammable materials

3.3 Wiring Rules

3.3.1 Notice for wiring

A. Tightening torque:

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

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

B. Power wires:

Power wires connect to terminals L1(L), L2, L3 (N), T1, T2, T3, P and N. Select power wire in accordance with the following criteria:

(1) Use wires with copper core only. Insulating materials with diameters should be based on working conditions at 221^{o}F (105 degree C).

(2) The minimum nominal voltage of 240Vac type connectors is 300V, and 480Vac type connector is 600V.

C. Control wire:

Control wire is connected to the TM2 control terminal. Select wire in accordance with the following criteria:

(1) Use copper core only. The insulating materials with diameters should be based on working conditions at 221^{o}F (105 degree C).

(2) To avoid noise interference, do not route the control wiring in the same conduit with power wires and motor wiring.

D. Nominal electrical specifications of the terminal block:

The following are nominal values of TM1:

Horsepower	Power source	Volts	Amps
0.25 / 0.5 / 1	100-120V	600	15
0.25 / 0.5 / 1	200-240V		
2 / 3	200-240V	600	40
1 / 2 / 3	380-480V		

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

E. Fuse types

Drive input fuses are provided to disconnect the drive from power in the event that a component fails in the drive's power circuitry. The drive's electronic protection circuitry is designed to clear drive output short circuits and ground faults without blowing the drive input fuses. Below table shows the EVP input fuse ratings.

To protect the inverter most effectively, use fuses with current-limit function.

RK5, CC/T type fuse for EVP

110V class(1 ϕ)

JNEVP-	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
1P2-H1	0.25	0.2	0.53	1.7	10	20
1P5-H1	0.5	0.4	0.88	3.1	15	30
101-H1	1	0.75	1.6	4.2	20	40

220V class(1 ϕ)

JNEVP-	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
2P2-H1	0.25	0.2	0.53	1.7	8	15
2P5-H1	0.5	0.4	0.88	3.1	10	20
201-H1	1	0.75	1.6	4.2	15	30
202-H1	2	1.5	2.9	7.5	20	40
203-H1	3	2.2	4.0	10.5	25	50

220V class(3 ϕ)

JNEVP-	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
2P2-H3	0.25	0.2	0.53	1.7	5	8
2P5-H3	0.5	0.4	0.88	3.1	8	10
201-H3	1	0.75	1.6	4.2	12	15
202-H3	2	1.5	2.9	7.5	15	20
203-H3	3	2.2	4.0	10.5	20	30

440V class(3 ϕ)

JNEVP-	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
401-H3	1	0.75	1.7	2.3	6	10
402-H3	2	1.5	2.9	3.8	10	15
403-H3	3	2.2	4.0	5.2	10	20

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

F. Circuit Protection

The EVP series are "suitable for use in a circuit capable of delivering not more than _ rms symmetrical amperes _ V maximum." Where the rms value symmetrical amperes and V maximum are to be as follows:

Device Rating		Short circuit Rating (A)	Maximum Voltage (V)
Voltage	HP		
110V	0.25 ~ 50	5,000	120V
220V	0.25 ~ 50	5,000	240V
440V	1 ~ 50	5,000	480V

3.3.2 Options and wiring specifications

MCCB/ MC/ Fuse

- Warranty and replacement service does not apply to damage caused by the following conditions.

(1)MCCB or fuse is not installed, improperly installed, or improperly sized, and has resulted in inverter damage.

(2)MC or capacitor or surge absorber is installed between the inverter and the motor.

EVP model	JNEVP□□□H1(F)/H3				JNEVP□□□ H3(F)
	1P2/2P2/1P5/2P5	101/201	202	203	401/402/403
Fuse	10A 300Vac	20A 300Vac	30A 300Vac		15A/600Vac
Main circuit terminal (TM1/TM3) ⊕ ⊖ L1 L2 L3 PE T1 T2 T3 PE	Wire dimension (14AWG)2.0mm^2 Terminal screw M4			Wire dimension (12AWG) 3.5mm^2 Terminal screw M4	Wire dimension (14AWG)2.0mm^2 Terminal screw M4
Signal terminal (TM2) 1~12	Wire dimension (#18AWG)0.75mm^2 Terminal screw M3				

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

3.3.3Precautions for peripheral applications:

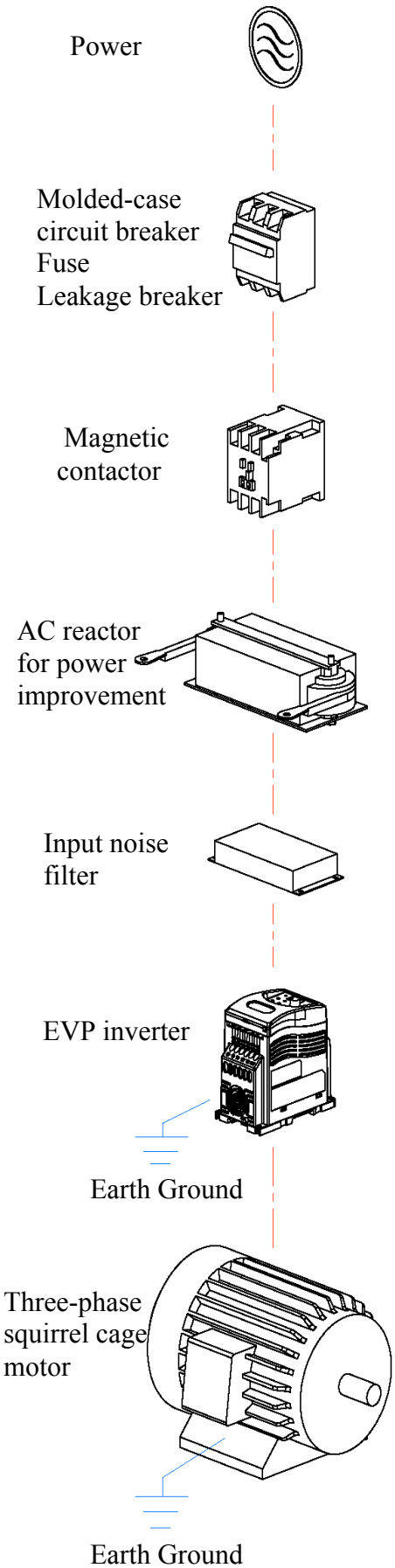


Figure 3-3 Typical installation schematic

Power supply:

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

Molded-case circuit breaker:

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

Fuse:

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

Earth Leakage circuit breaker:

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

Magnetic contactor:

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

AC Line Reactor for power quality:

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

Input noise filter:

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

Inverter:

- Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor. If the motor is reversed while the inverter is set to run forward, just swap any two terminals of T1, T2, and T3.
- To avoid damaging the inverter, do not connect the input terminals T1, T2, and T3 to AC input power.
- Connect the ground terminal properly.(230 V series: Rg <100Ω; 460 V series: Rg <10Ω.)

Make external connections as shown in figure 3-4. Check after wiring to make sure all connections are correct. (Do not use the control circuit buzzer to check connections)

(A) Main circuit must be separated from other high voltage or high current power line to avoid noise interference. Refer to following figures:

- The inverter uses dedicated power line

correct results

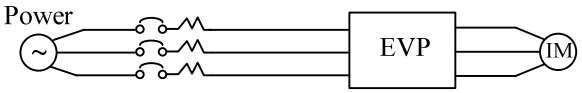
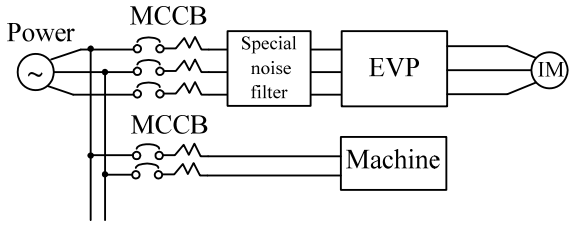
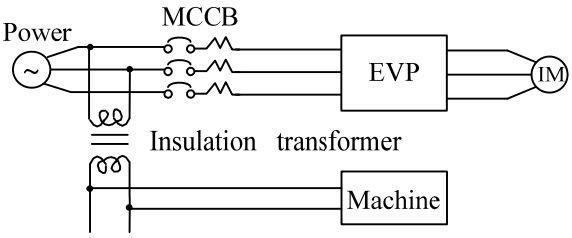


Figure3-4a Installation examples

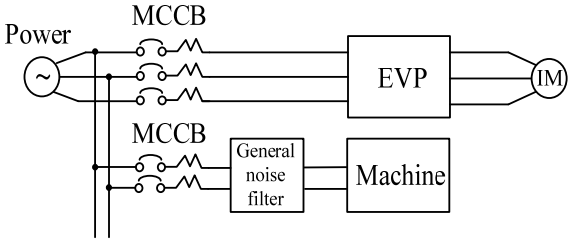
- Please added a noise filter or separation transformer when the inverter shares the power line with other machines.



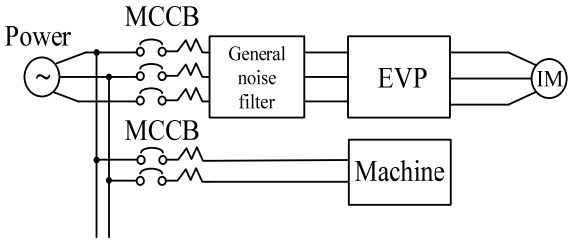


Correct

- A general noise filter may not provide



Incorrect



Incorrect

Figure3-4 b Installation examples using a filter

- A noise filter in the output of the main circuit can suppress conductive noise. To prevent radiative noise, the wires should be put in a ferromagnetic metal pipe and separated from all other signal lines by at least 1ft.

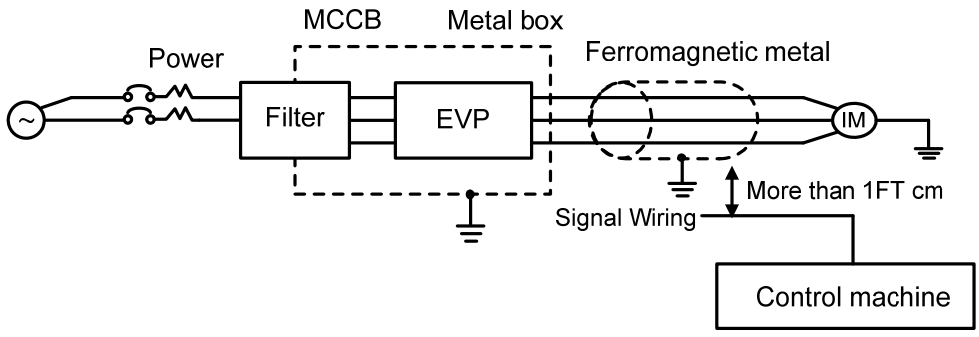
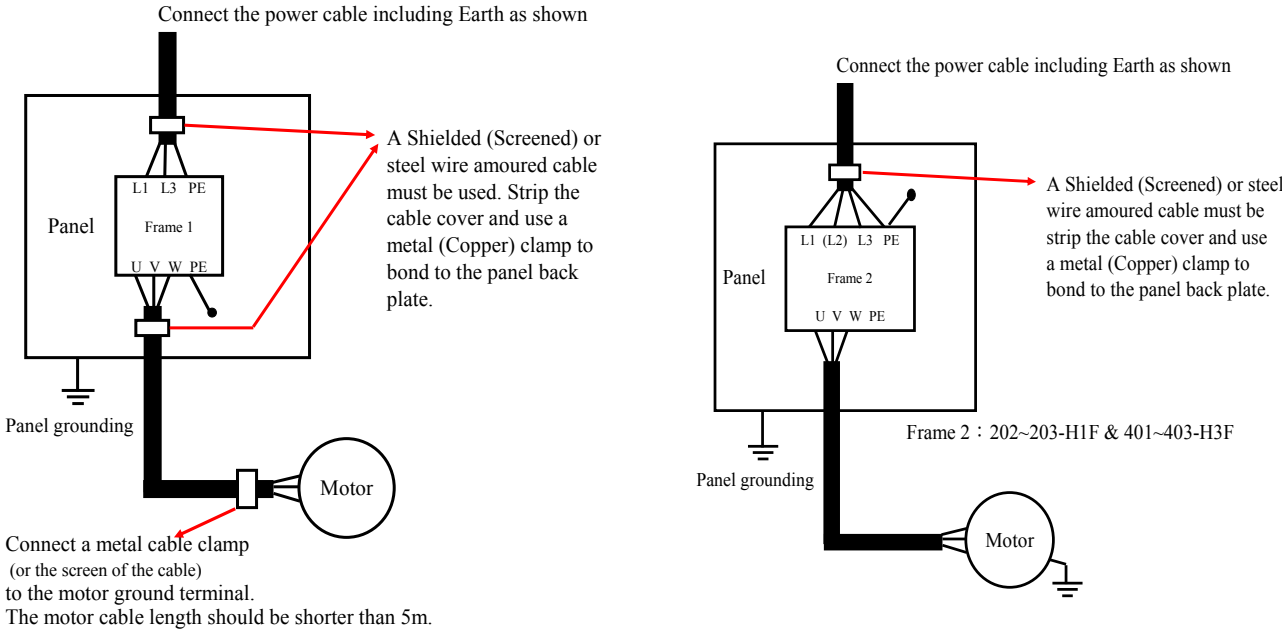


Figure 3-4c Installation examples with adjacent signal conductors

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



(A)The control circuit wiring and main circuit wire/ other high voltage/current power wiring should be separated to avoid noise interruption.

- In order to prevent noise interference which could cause inverter faults, the control circuit signal should be shielded and twisted. Please refer to figure 3-5. The wiring distance should be less than 150ft (50m).

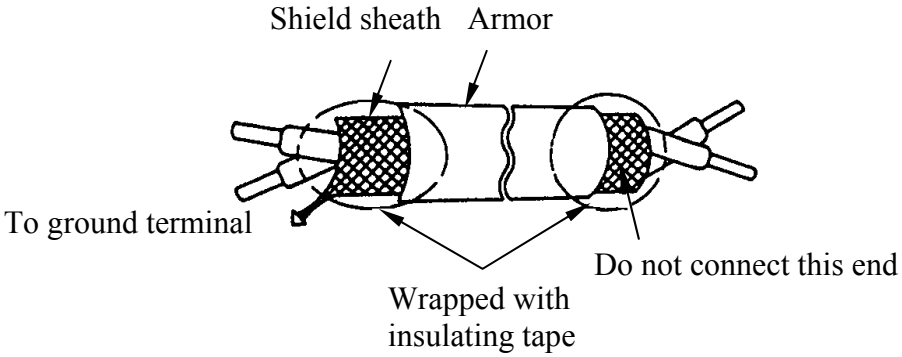
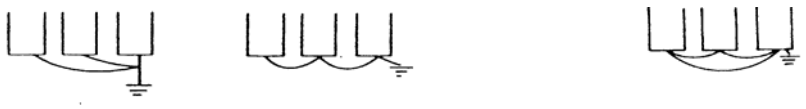


Figure 3-5 Processing the ends of twisted pair cables

(B)Connect ground terminals as follows: (200V class ground <100Ω ; 400V class ground <10Ω .)

- Ground wiring AWG is sized per the electrical equipment specifications and should be made as short as possible.
- Do not share the ground of the inverter with other high current loads (welding machine, high power motor).Connect the terminal to its own ground.
- Do not make a loop when several inverters share a common ground point.



(a) Good **(b) Good** **(c) Bad**

Figure 3-6 Grounding examples: multiple drives

(C) To ensure maximum safety, use correct wire size for the main power circuit and control circuit. (See table in section 3.2.2)

(D) Verify that all wiring is correct, wires are intact, and terminal screws are secured.

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

The length of the line between the inverter and the motor	Below 25m	Below 50m	Below 100m	Over100m
Carrier Frequency	Below 16KHz	Below 12KHz	Below 8KHz	Below 5KHz
Settings of C-11 parameter	16	12	8	5

3.4 Inverter Specification

3.4.1 Basic specification

Model	110V model			220V model									
	EVP-□□□-H1			Single phase EVP-□□□-H1(F)					Three phase EVP-□□□-H3				
	1P2	1P5	101	2P2	2P5	201	202	203	2P2	2P5	201	202	203
Horsepower (HP)	0.25	0.5	1	0.25	0.5	1	2	3	0.25	0.5	1	2	3
Max.Applicable Motor output.HP*1 (KW)	0.25 (0.2)	0.5 (0.4)	1 (0.75)	0.25 (0.2)	0.5 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	0.5 (0.2)	0.5 (0.4)	1 (0.75)	2 (1.50)	3 (2.2)
Rated output current (A)	1.7	3.1	4.2	1.7	3.1	4.2	7.5	10.5	1.7	3.1	4.2	7.5	10.5
Rated capacity (KVA)	0.53	0.88	1.60	0.53	0.88	1.60	2.90	4.00	0.53	0.88	1.60	2.90	4.00
Input voltage range(V)	1PH 100~120V+10%, -15%(50/60Hz)			1PH 200~240V+10%, -15%(50/60Hz)					3PH 200~240V+10%, -15%(50/60Hz)				
Output voltage range(V)	3PH 0~240V												
Input current (A)	7.1	12.2	17.9	4.3	5.4	10.4	15.5	21	3.0	4.0	6.4	9.4	12.2
Inverter Weight Lb Inverter with filter weight Kb (KG)	1.37 (0.62)	1.50 (0.68)	1.59 (0.72)	1.43 (0.65) 1.57 (0.71)	1.48 (0.67) 1.71 (0.73)	1.48 (0.67) 1.71 (0.73)	2.20 (1) 2.76 (1.25)	2.31 (1.05) 2.87 (1.3)	1.34 (0.61)	1.34 (0.61)	1.46 (0.66)	2.09 (0.95)	2.20 (1.0)
Maximum momentary power loss time (S)	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0
Enclosure	IP20												

Model	440V model		
	EVP-□□□-H3(F)		
	401	402	403
Horse power (HP)	1	2	3
Max.applicable Motor Output HP*1(KW)	1.0(0.75)	2.0(1.50)	3.0(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)	3PH 380~480V+10%,-15%(50/60Hz)		
Output voltage range(V)	3PH 0~480V		
Input current (A)	3	4.8	6.6
Inverter Weight Lb (KG) Inverter with filter Weight Lb (KG)	3.31(1.26) 3.70(1.37)	3.35(1.29) 3.75(1.4)	3.42(1.34) 3.82(1.45)
Maximum momentary power loss time (S)	1.0	1.0	2.0
Enclosure	IP20		

* Based on a 4-Pole Motor

3.4.2 General Specifications

Frequency control	Range	0~200Hz
	Initial Drive	100%/3Hz (Vector mode)
	Speed Control Range	1:20 (Vector mode)
	Speed Control Precision	±0.5%(Vector mode)
	Setting resolution※1	Digital: 0.1Hz(0~99.9Hz)/1Hz(100~200Hz); analog: 0.06Hz/ 60Hz
	Keypad setting	Set directly with▲▼ keys or the VR on the keypad
	Display	7 segment*3 Displays; frequency/DC Voltage/Output Voltage / Current/ inverter parameters/fault log/program version/PID feedback control potentiometer.
	External signal setting	•External / 0(2)-10V/ 0(4)-20mA •Performs up/down controls with multi-functional contacts on the terminal base
	Frequency limit function	Upper/lower frequency limits, and two skip frequencies.
General control	Carrier frequency	4~16KHz (default 10KHz, above 10KHz with De-rating)
	V/F pattern	6 fixed patterns 50Hz/60Hz, 1 programmable
	Acc/dec control	Two-stage acc/dec time (0.1~999s)
	Multi-functional input	9 functions (refer to C-27~C-30 description)
	Multi-functional output	12 functions (refer to C12 description)
	DI(digital input)	NPN/PNP alternative : 3 points standard
	DO(digital output)	Relay output *Form A contact ---- set to multi-function output. External multi-function output *option 1 point
	AI(analog input)	Set speed command and PID feedback signal (speed ,PID 4~20mA /0~10V)
	Other functions	Instantaneous power loss on restart, Speed search, fault restart, DC injection braking, torque boost, PID function
	Communication control	•RS485 Option card: Modbus RTU/ASCII mode, 4800~38400 bps, max. 32 stations •PC/PDA software •Communication port 2 used for multi-pump operation, please refer to the diagram in the manual
	Operation temperature	14~122 deg F(-10~50 deg C)
	Storage temperature	-4~140 deg F(-20~60 deg C)
	Humidity	0 – 95% RH (non condensing)
	Height	Below 1000M
	Vibration immunity	1G(9.8m/s^2)
	EMI/EMS Compatibility	Built-in / external: class A, accordance with EN61800-3 first environment
	LVD	Accordance with EN50178
	Enclosure	IP20
	Safety Class	UL508C

Protective Functions	Over load protection	Inverter rated current 150%/1min
	International conformity	UL/CE
	Over voltage	230V Class: DC voltage >410V 460V Class: DC voltage >820V
	Under voltage	230V Class: DC voltage <190V 460V Class: DC voltage <380V
	Instantaneous power loss restart	Set to enable or disable
	Stall prevention	ACC/DEC/ Operation stall prevention and stall prevention level.
	Output terminal short circuit	Electronic circuit protection
	Other faults	Electronic circuit protection
	Other functions	Over current, over voltage, under voltage, over load, instantaneous power loss restart, ACC/DEC/ Operation stall prevention, output terminal sort circuit, grounding error, reverse limit, directly start as power on and fault reset limit.

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

3.5 EVP Wiring diagram

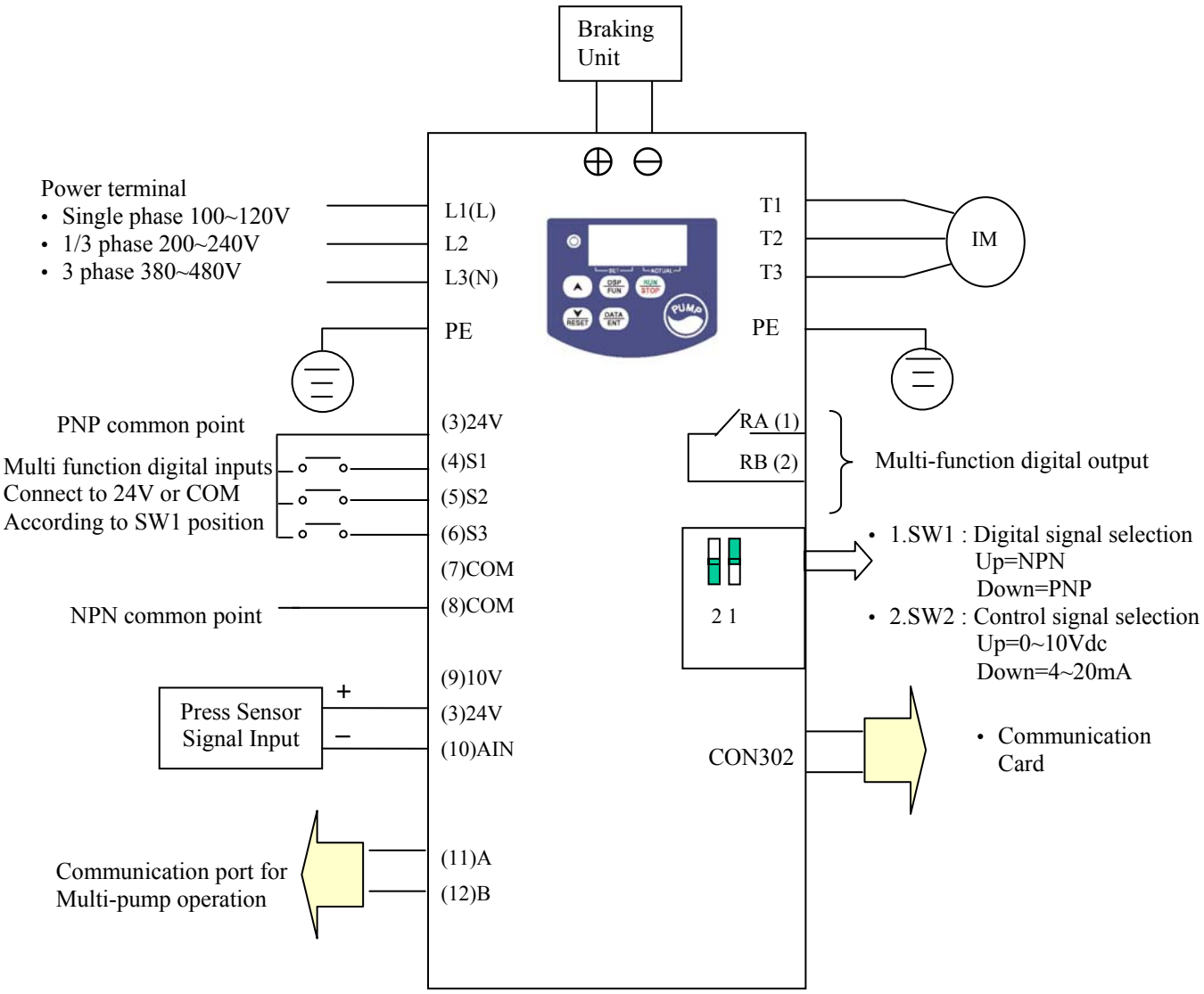
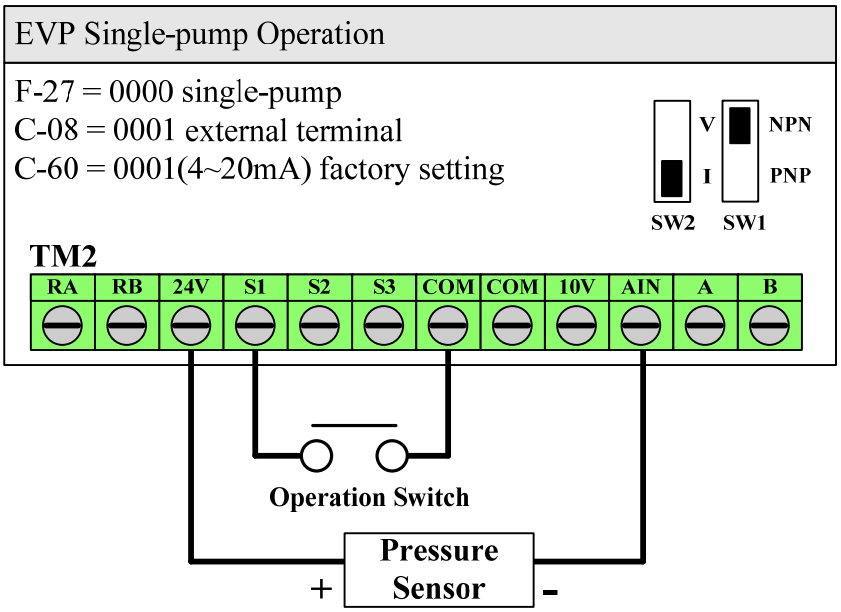


Figure 3-7 Wiring diagram

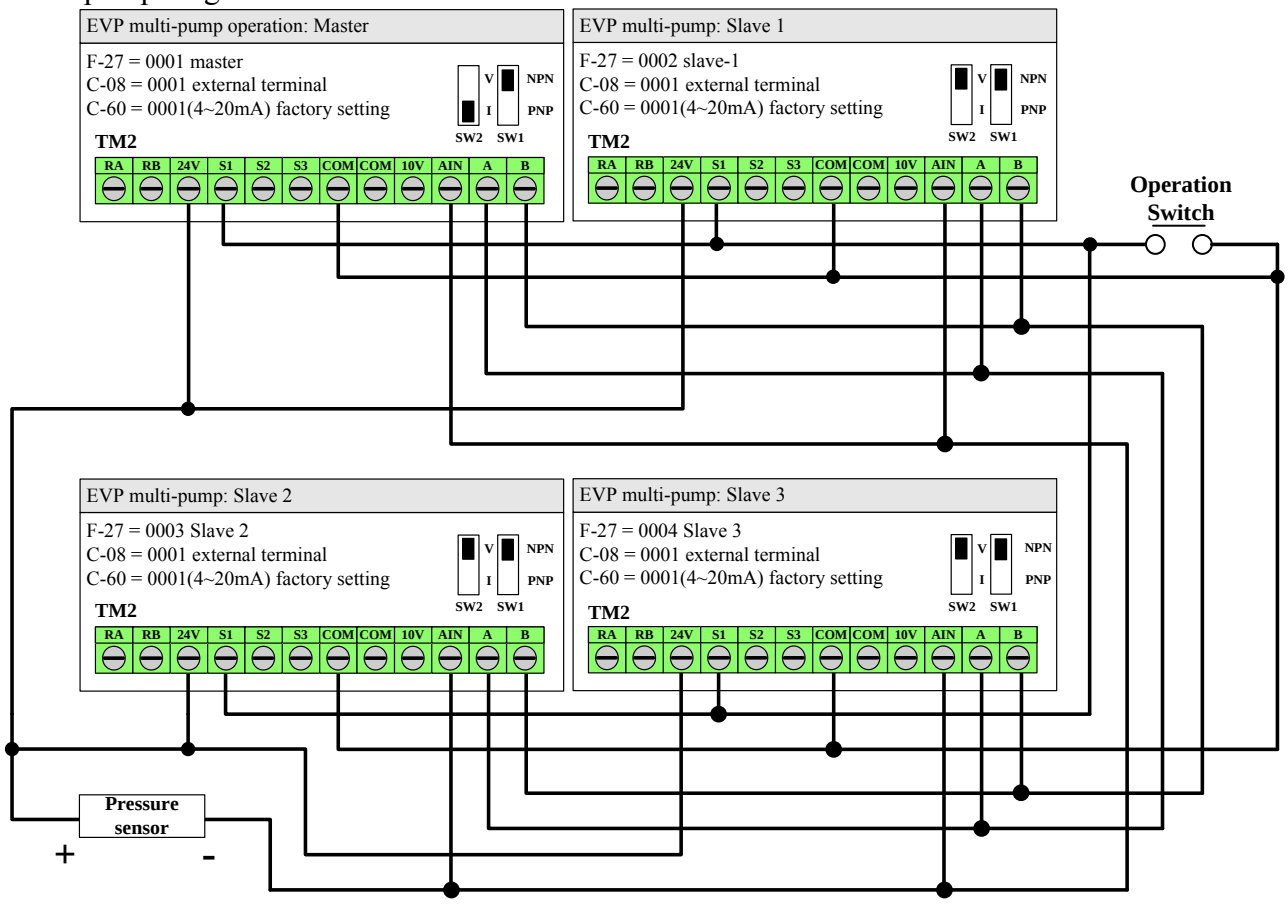
Note 1:- Connect inputs to Terminal 3 (internal 24vdc) for PNP mode (Positive switching).
Or to terminal 8 (Common) for NPN mode(Negative switching).

Note2:- External 24 Vdc may be used to supply the external contacts at each input
(Connect the 0V of the external supply to Common (terminal 8).)
* L2 is not used for single-phase operation

Single-pump diagram:



Multi-pump diagram:



3.6 Description of Inverter Terminal

Descriptions of power terminals

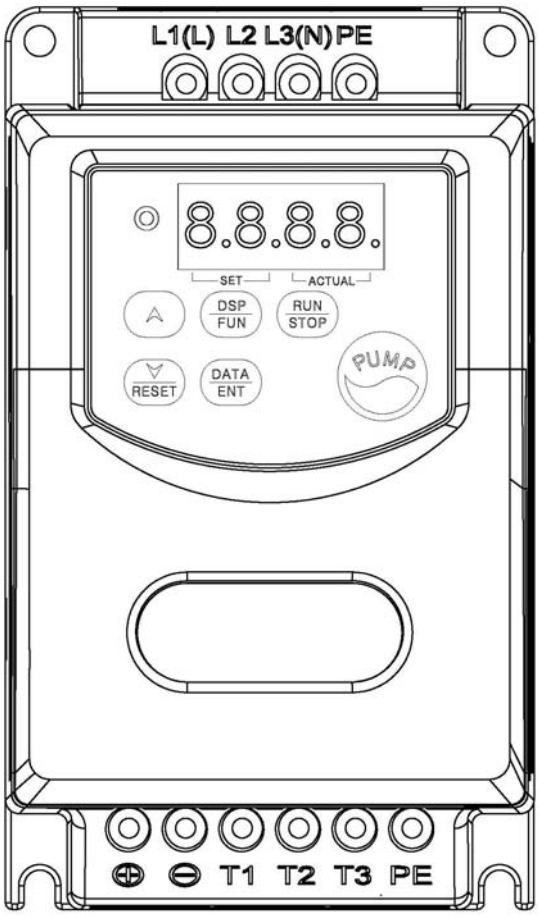


Figure 3-8 Power terminals locations

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

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

Control signal terminals block description

TM2

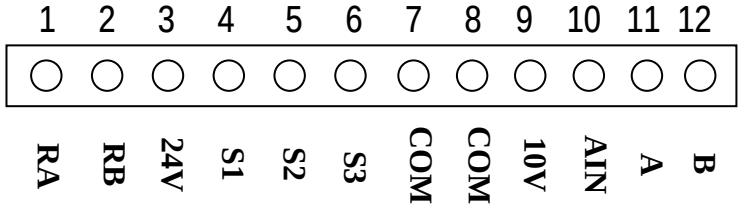
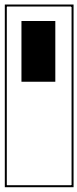


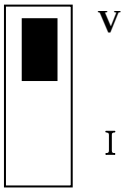
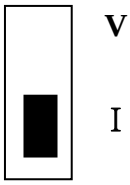
Figure 3-9 Signal terminal locations

Symbol	Description	
RA	Multi-functional output terminal Normally open contact	Rated contact capacity: (250VAC/1A) (30VDC/1A) Contact description: (refer to parameter C-12)
RB		
10V	Supply for external potentiometer for speed reference.	
AIN	Analog frequency signal input terminal	
24V	PNP (SOURCE) input, S1~S3 common terminal, (set SW1 to PNP and connect option card power.)	
COM	NPN (SINK) input, S1~S3 common terminal, (set SW1 to NPN, and analog input, connect option card power, output signal common terminal.)	
A	Multi-pump operation communication port +	
B	Multi-pump operation communication port -	

Symbol	Description
S1	Multi-function input terminals (refer to parameters C-27~C-29 description)
S2	
S3	

SW function description

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

SW2	Type of external signal	Remarks
	0~10V DC analog signal	Factory setting is current input
	4~20mA analog signal	

3.7 Dimension

(1) IP20 Frame1: Single phase: JNEVP-1P2~201-H1/H1F
Three phase: JNEVP-2P2~201-H3

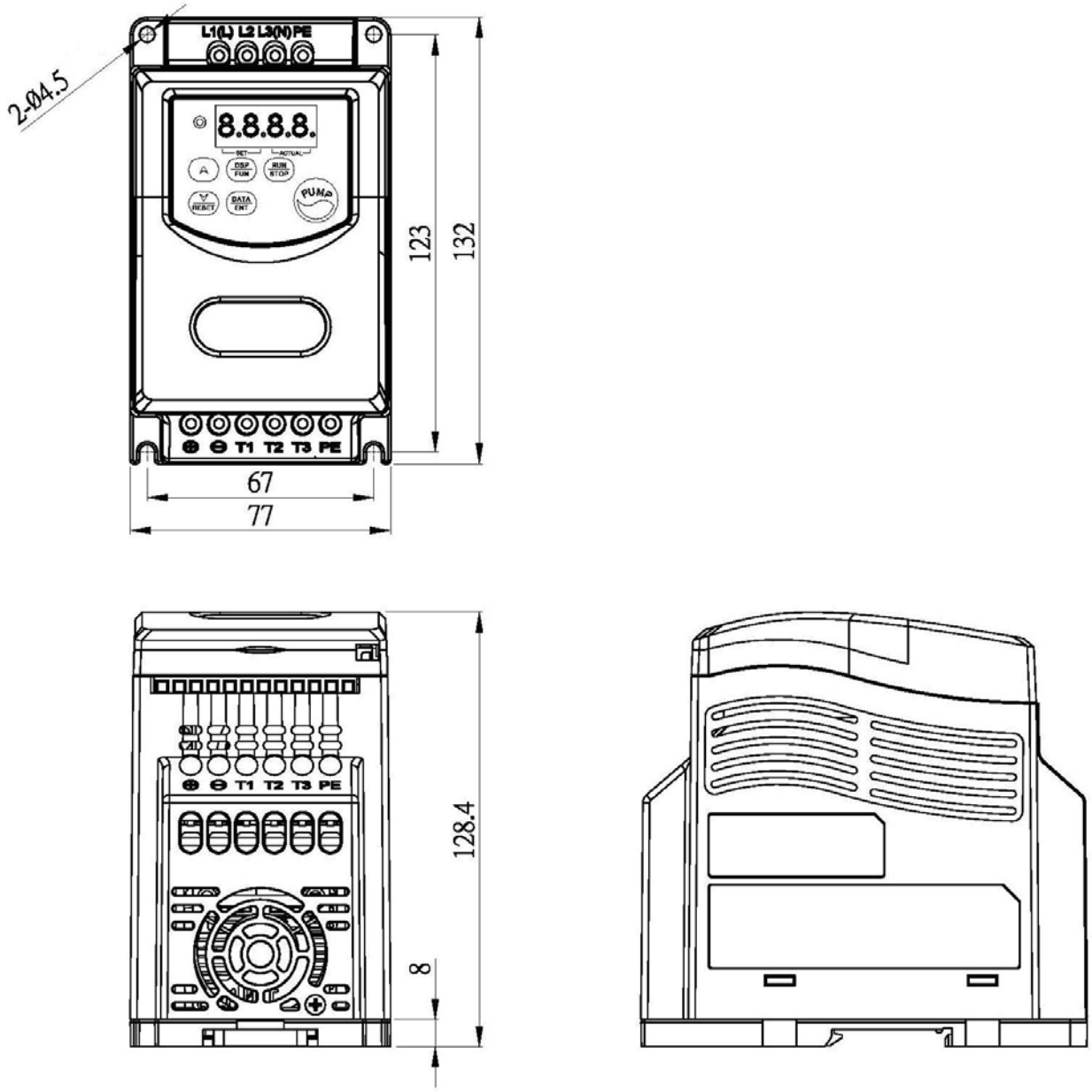


Figure 3-10 EVP drive frame1 dimensions

(2) IP20 Frame2: Single phaseJNEVP-202~203-H1/H1F
Three phase JNEVP-202~203-H3
Three phase JNEVP-401~403-H3/H3F

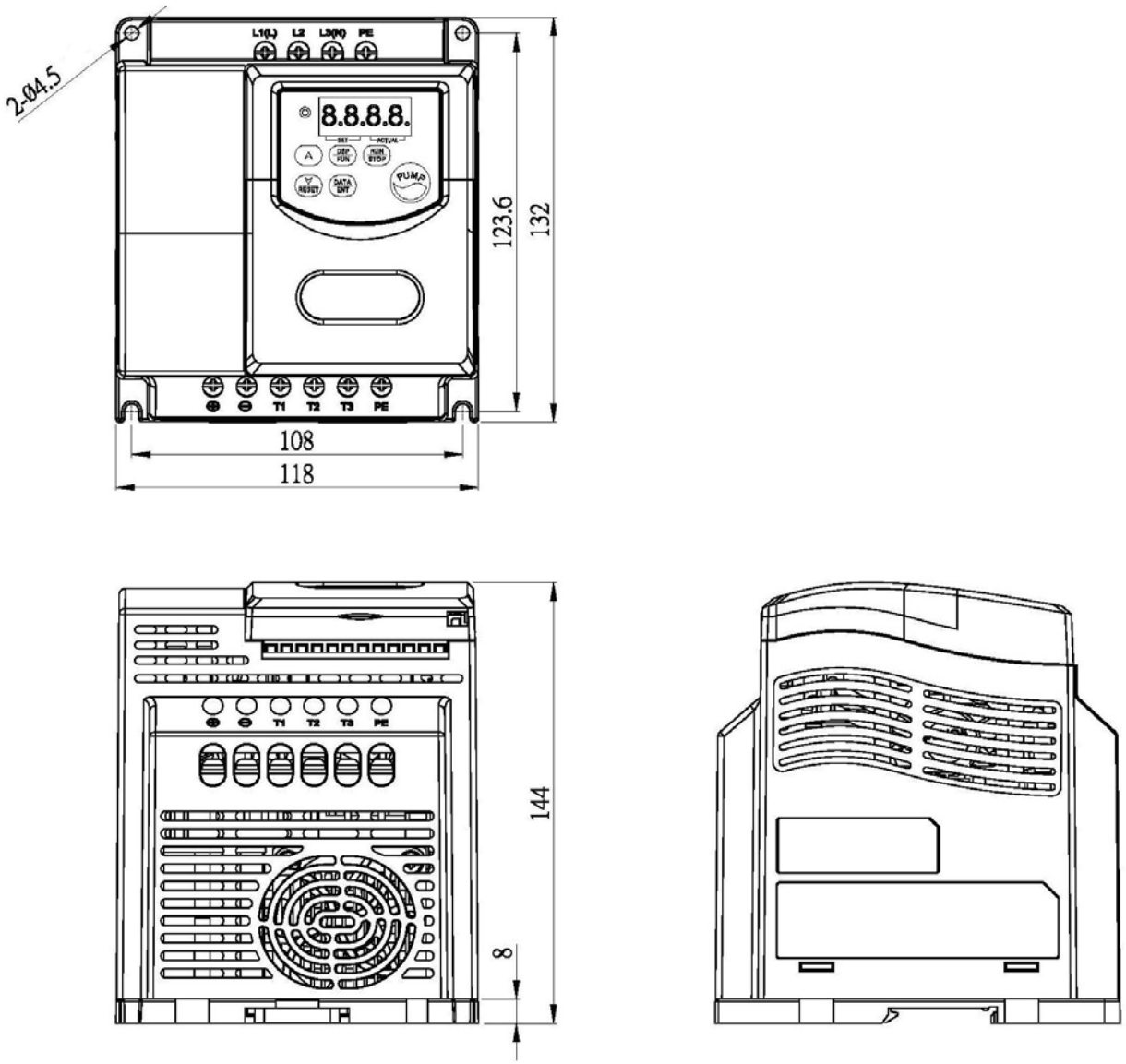


Figure 3-11 EVP drive frame2 dimensions

Chapter 4 Software Index

4.1 Operation Instruction

4.1.1 Keypad display and operation instruction

Display Area : Pressure Value(Setting and Actual), Parameter, Frequency, Voltage, Amp

: Value of Setting Pressure

: Value of Actual Pressure

: Pressure Setting

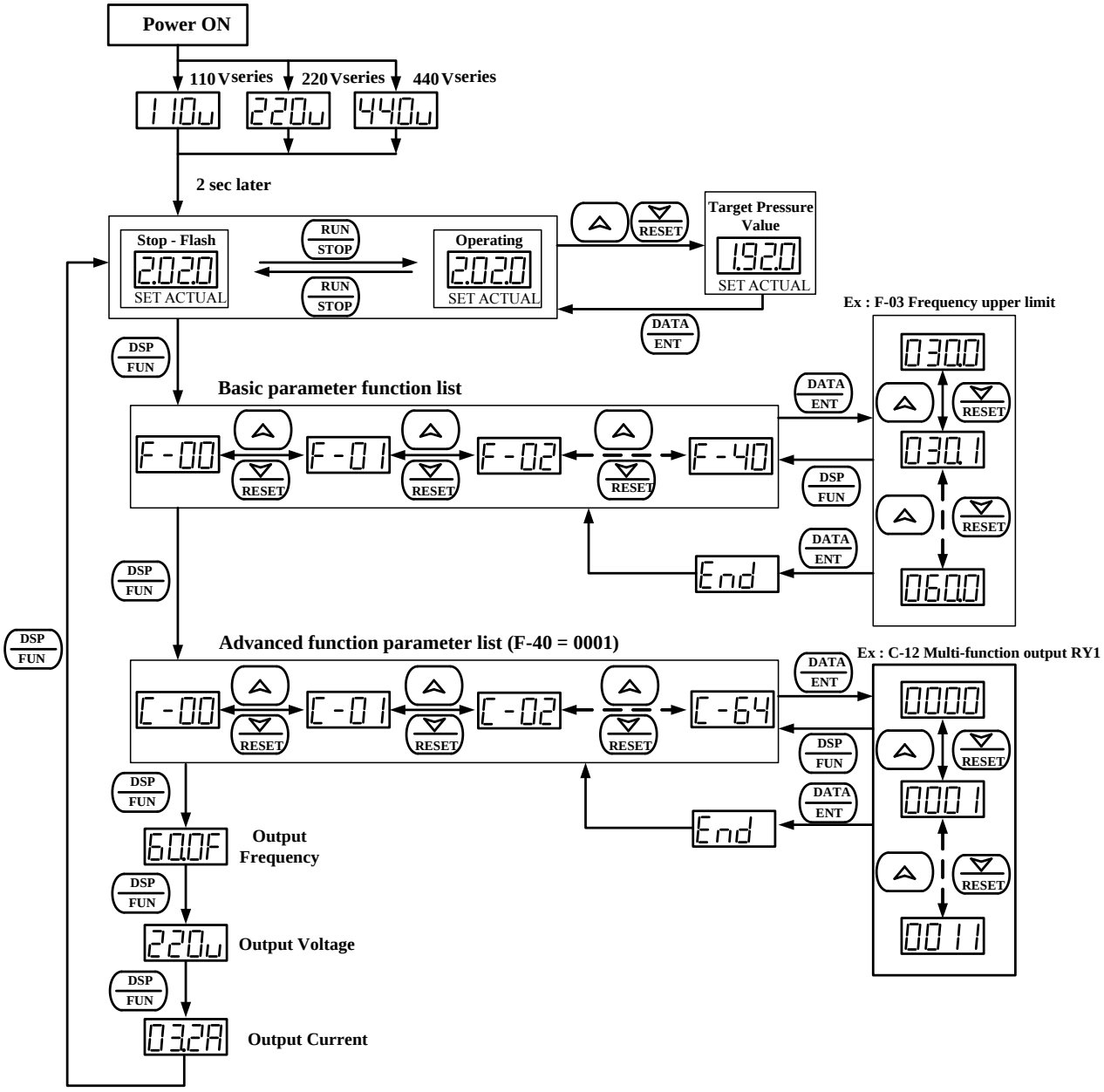
: Pressure Setting , Reset

: Display Mode Select

: Pressure and Parameter Setting

: Run / Stop

4.1.2 Keypad operation instruction



4.2 Programmable functions list

Basic parameter function list

F	Function Description	Range / Code	Factory Default	Remarks
00	Acceleration	0.1 – 999 (sec)	5.0 (sec)	*1*2
01	Deceleration	0.1 – 999 (sec)	5.0 (sec)	*1*2
02	Sleep Deceleration Time	0.1 – 999 (sec)	3.0 (sec)	*1*2
03	Frequency upper limit	1.0 – 200 (Hz)	60.0 (Hz)	*2
04	Frequency lower limit	0.0 – 200 (Hz)	0.0 (Hz)	*2
05	P : Proportional gain	0.0 – 10.0 (rate)	3.0 (rate)	*1
06	I : Integral time(s)	0.0 – 100.0 (sec)	0.5 (sec)	*1
07	PID Error gain	0.00 – 10.00 (rate)	1.00 (rate)	*1
08	Feedback signal scan time (F)	1 – 100 (base on 8ms)	5 (40ms of 5*8ms)	*1
09	Max. Pressure of Pressure Transmitter	0.10 –25.50 (Bar)	10.00 (Bar)	
10	Target Pressure Value	0.10 – (F-09) (Bar)	2.00 (Bar)	*1
11	Max. Pressure limit	0.10 – (F-09) (Bar)	5.00 (Bar)	
12	Min. Pressure limit	0.10 – (F-09) (Bar)	0.50 (Bar)	
13	High Pressure Alarm Time	0.0 – 600 (sec)	10.0 (sec)	*1*2
14	High Pressure Stop Time	0.0 – 600 (sec)	20.0 (sec)	*1*2
15	Low Pressure Alarm Time	0.0 – 600 (sec)	10.0 (sec)	*1*2
16	Low Pressure Stop Time	0.0 – 600 (sec)	20.0 (sec)	*1*2
17	Sleep Delay Time	0.0 – 120 (sec)	0.0 (sec)	*1*2
18	Sleep Tolerance Range	0.00 – 5.00 (Bar)	0.50 (Bar)	*1
19	Sleep Frequency	0.0 – 200 (Hz)	35.0 (Hz)	*1*2
20	Forced operation frequency	0 - 200 (Hz)	0	*1*5
21	Direction of water usage	0000 : Upward 0001 : Downward	0001	*1*2
22	Pressure Range of Water Used Detection	0.00 – 2.50 (Bar)	0.10 (Bar)	*1
23	Cycle of water usage detection	0.0 – 200 (sec)	20.0 (sec)	*1*2
24	Acceleration time of water usage detection	0.1 – 999 (sec)	12.0 (sec)	*1*2
25	Deceleration time of water usage detection	0.1 – 999 (sec)	30.0 (sec)	*1*2
26	HiP/LoP/1brE Protection auto restart Time	0 – 200 (min)	20 (min)	
27	Liquid leakage detection Time	0.0 – 10.0 (sec)	0.1 (sec)	*1
28	Change Level within detection time	0.01 – 2.50 (Bar)	0.10 (Bar)	*1
29	Restart level for liquid leakage detection	0.01 – 2.50 (Bar)	1.50 (Bar)	*1
30	Single/Dual pump and Master/Slave selection	0000: Single Pump 0001: Multi Pump - Master 0002: Multi Pump - Slave1 0003: Multi Pump - Slave2 0004: Multi Pump - Slave3	30	
31	Auto shift time	0 – 240 (Hour)	3 (Hour)	

F	Function Description	Range / Code	Factory Default	Remarks
32	Launch delay time (Slave Unit)	0 – 30.0 (Sec)	5.0 (Sec)	*1
33	AIN Gain (%)	0 – 200 (%)	100 (%)	*1
34	AIN Bias (%)	0 – 100	0	*1
35	AIN Slope direction	0000: Positive 0001: Negative	0000	*1
36	Start Frequency for slave pump running	0 – 100 (%) (100% = F-07)	0 (%)	*1
37	Stop frequency for slave pump running	0 – 100 (%) (100% = F-07)	0 (%)	*1
38	Parameter Lock	0000: all function can be write and read 0001: Only about pressure function can be write and read 0002: all function can read but not to write	0000	
39	Software version	---	---	*3*4
40	Factory default	0010: Reset to factory default (50Hz) 0020: Reset to factory default (60Hz)	0000	
41	Latest 3 fault records			*3*4
42	Run state memory	0000: Restart with memory 0001: Restart without memory	0000	*1
43	Advance parameter function display	0000: Disable 0001: Enable	0000	*1
44	HiP/LoP/1BrE Protection auto restart times	0~999	999	*1*5
45	Dual pump synchronal setting	0000: Disable 0001: Target Pressure Value & Run/Stop 0002: Only Target Pressure Value 0003: Only Run/Stop	0000	*1*5
46	Display of Pressure setting	0000: Setting & Feedback 0001: Only Setting 0002: Only Feedback	0000	*1*5
47	Password setting of parameter lock	0000 ~ 0999	0000	*6
48	Pressure losing prevention level (%)	0 – 100 (%)	0	*1*5
49	Detection time of pressure losing	0.0 - 25.5 (sec)	0	*1*5

Advanced function parameter list
(Enable access to the parameter by setting F-40 = 0001)

C	Function Description	Range / Code	Factory Default	Remarks
00	Reserve	---		
01	Acceleration stall-prevention	0000: Acceleration stall prevention enable 0001: Acceleration stall prevention disable	0000	
02	Acceleration stall-prevention level (%)	50 – 300	200	
03	Deceleration stall-prevention	0000: Deceleration stall prevention enable 0001: Deceleration stall prevention disable	0000	
04	Deceleration stall-prevention level (%)	50 – 300	200	
05	Run stall-prevention	0000: Run stall prevention available 0001: Run stall prevention unavailable	0000	
06	Run stall-prevention level (%)	50 – 300	200	
07	Reserve	---		
08	Run command source	0000: Keypad 0001: External Terminal 0002: Communication Control	0000	
09	Pressure command source	0000: UP/Down Key on control panel 0001: RS-485 Communication pressure setting	0000	
10	Stopping method	0000: Decelerate to stop 0001: Coast to stop	0000	
11	Carrier frequency	0004 ~ 0016	10	
12	Multi-function output RY1	0000: Run 0001: Fault terminal 0002: Auto reset and restart 0003: Momentary power loss 0004: Emergency Stop(E.S.) 0005: Base Block (b.b). 0006: Motor overload protection 0007: Inverter overload protection 0008: High/Low pressure alarm 0009: Power On 0010: Communication error 0011: Output current detection (>C-31)	0000	
13	Fan control	0000: Auto-run at set temperature 0001: Run when inverter runs 0002: Always run 0003: Always stop	0001	

C	Function Description	Range / Code	Factory Default	Remarks
14	Control mode	0000: Vector control 0001: V/F control	0001	*4
15	V/F Pattern setting	1 ~ 7	1/4	
16	VF base output voltage set	198~265V / 380~530V	220/440	
17	Max output frequency (Hz)	00.2 – 200	50.0/60.0	
18	Output voltage ratio at max frequency (%)	00.0 – 100	100	
19	Mid frequency (Hz)	00.1 – 200	25.0/30.0	
20	Output voltage ratio at mid frequency (%)	00.0 – 100	50.0	
21	Min output frequency (Hz)	00.1 – 200	00.5/00.6	
22	Output voltage ratio at min frequency (%)	00.0 – 100	01.0	
23	Torque Boost Gain (V/F)	00.0 ~ 30.0%	00.0	*1
24	Slip Compensation Gain (V/F)	00.0 ~100%	00.0	*1
25	Motor no load current			
26	Electronic thermal relay protection for motor (OL1)	0000: Enable motor protection 0001: Disable motor protection	0000	
27	Terminal S1 Function	0000: Forward 0001: Emergency stop(E.S.) 0002: Base Block (b.b.) 0003: Reset 0004: Control signal switch 0005: Communication control signal switch 0006: PID function disable 0007: Force operating frequency 0008: Detection of valve piston position	0000	
28	Terminal S2 Function		0001	
29	Terminal S3 Function		0002	
30	Reserve	---		
31	Output current set value	0~100%	0	
32	Output current detection time	00.0~25.5 (Sec)	00.0	
33	Motor rated current			*4
34	Motor rated voltage			*4
35	Motor rated frequency			*4
36	Motor rated power			*4
37	Motor rated speed	0~120 (*100 RPM)		*4
38	Torque Boost Gain (Vector)	1~450		
39	Slip Compensation Gain (Vector)	1~450		

C	Function Description	Range / Code	Factory Default	Remarks
40	Lower frequency voltage compensation	0~40		
41	Auto Restart for power-loss	0000: Effective 0001: Ineffective	0001	
42	Auto-restart times	0 ~ 5	0	
43	Multi-function input terminal S1~S3 signal scan time (ms ×8)	1~100	10	
44	DC braking time	00.0 ~ 25.5Sec	00.5	
45	DC braking start frequency	01.0 ~ 10.0 Hz	01.5	
46	DC braking level	0 ~ 020%	5	
47	Reserve	---		
48	Inverter communication address	1 ~ 254	1	*3*4
49	Baud rate (bps)	0000: 4800 0001: 9600 0002: 19200 0003: 38400	0003	*3*4
50	Stop bit	0000: 1 Stop bit 0001: 2 Stop bit	0000	*3*4
51	Parity bit	0000: No parity 0001: Even parity 0002: Odd parity	0000	*3*4
52	Date bits	0000: 8 bits data 0001: 7 bits data (Only for Modbus ASCII Mode)	0000	*3*4
53	Communication time-Out detection time	0.0 ~ 25.5 Sec		*3
54	Communication time-Out operation selection	0000: Deceleration (F-01 : Deceleration time) 0001: Coast to stop 0002: continue operation	0000	*3
55	Inverter horse power capacity			
56	Copy module	0000: Copy module disable 0001: copy to module from inverter 0002: copy to inverter from module 0003: read / write check	0000	
57	PID operation mode	0000: PID Function unavailable 0001: PID Control, Bias D control 0002: PID Control, Feedback D control 0003: PID Control, Bias D reverse characteristics control 0004: PID Control, Feedback D reverse characteristics control	0001	
58	D : Differential time (s)	0.00 – 10.00 (sec)	0.00 (sec)	*1
59	PID Update time (s)	0.0 – 2.5 (sec)	0.0 (sec)	*1

C	Function Description	Range / Code	Factory Default	Remarks
60	AIN signal select	0000: 0~10 V 0001: 4~20 mA	0001	
61	PID OFFSET	0000: Positive direction 0001: Negative direction	0000	
62	PID OFFSET adjust (%)	0 – 109	0	*1
63	Reserve	---		
64	AIN Slope Direction	0000: Positive direction 0001: Negative direction	0000	

Note : *1 : Can be modified in Run mode
*2 : Value resolution is 1 for settings above 100.
*3 : Cannot be modified during communication
*4 : Do not change while marking factory setting
*5 : F-41~F-43 are only available for the software version 1.1 and above.
*6: Available in Software version 1.2 or later.

4.3 Parameter function description
Basic function parameter list

F-00 Acceleration time : 00.1 – 999 (sec)
F-01 Deceleration time : 00.1 – 999 (sec)

Formula for acceleration/deceleration time: Denominator is based on the setting of C-14
a) Motor rating frequency (Sensor less vector control C-14=0000)
b) Max output frequency (V/f mode C-14=0001)

a)

$$\text{Acceleration time} = \text{F-00} \times \frac{\text{Set frequency}}{\text{C-35(rated frequency)}} \quad \text{Deceleration time} = \text{F-01} \times \frac{\text{Set frequency}}{\text{C-35(rated frequency)}} \quad \text{(vector)}$$

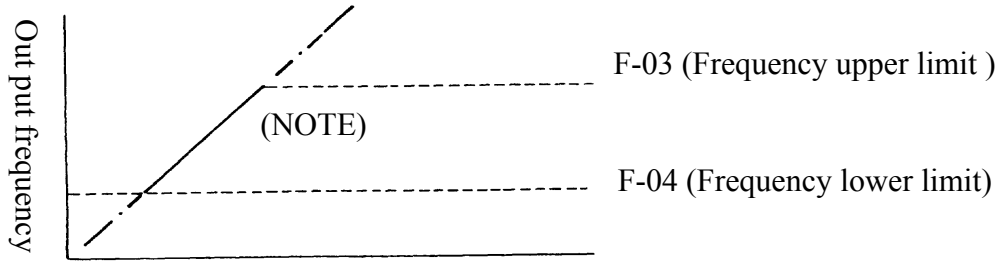
b)

$$\text{Acceleration time} = \text{F-00} \times \frac{\text{Set frequency}}{\text{C-17(Max output frequency)}} \quad \text{Deceleration time} = \text{F-01} \times \frac{\text{Set frequency}}{\text{C-17(Max output frequency)}} \quad \text{(V/F)}$$

F-02 Sleep Deceleration Time : 00.1 – 999 (sec)

If pump running conform to sleep condition, the deceleration time according to F-01.

F-03 Frequency upper limit 01.0 – 200 (Hz)
F-04 Frequency lower limit 00.0 – 200 (Hz)



※Note : If F-03 = 0 Hz and frequency command = 0 Hz, the inverter will 0-speed stop.
If F-04 > 0 Hz and frequency command ≦F-04, inverter will run at F-04 set value.

F-05 P : Proportional gain : 0.00 - 10.0 (%)

F-05: Proportional gain for P control.

F-06 I : Integral time(s) : 00.0 – 100 (sec)

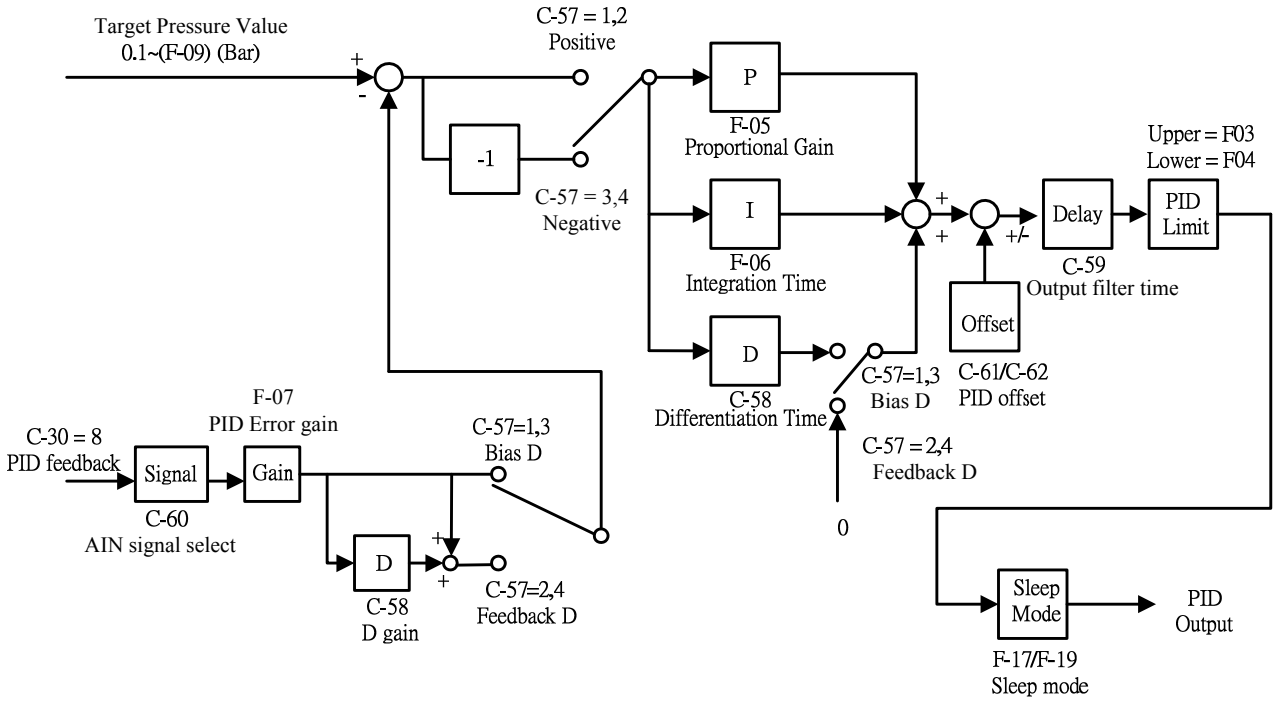
F-06: Integral time for I control

F-07 PID Error gain : 0.00 - 10.0 (rate)

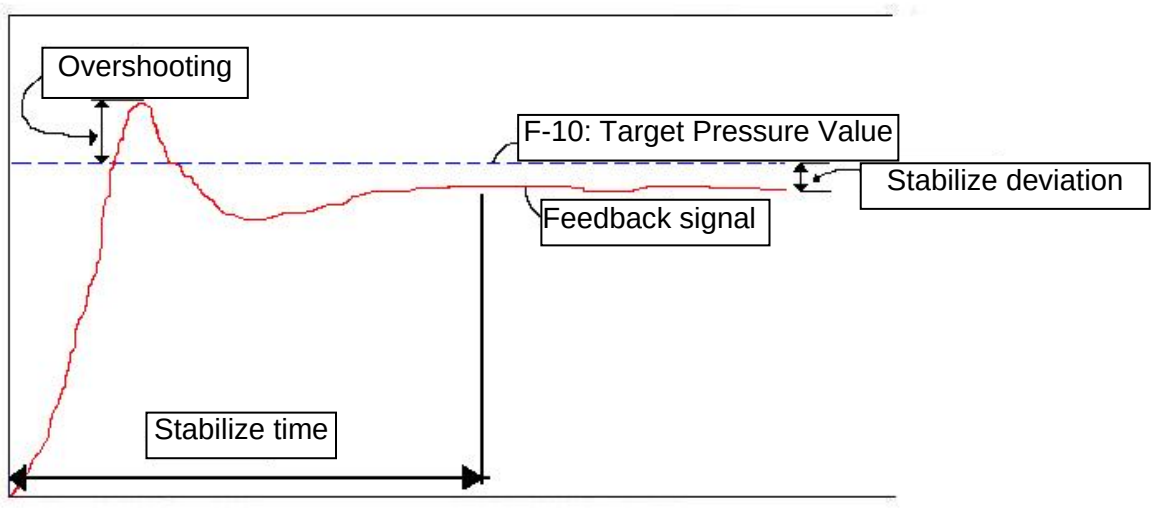
F-07 is PID error gain, that is feedback value = feedback value × F-07.

F-08 Feedback signal scan time(F) : 1 – 100 (Base on 8ms)

1.) If the "F-08" scan time is set to 80 ms as an example (i.e N=10) then digital input signals on for less than 80 msec will be ignored.
2.) One scan time: 8ms.
3.) User can set scan interval time according to noise in the operation environment. Extend "F-08" if noise is a problem, however this will reduce the scan response time.



PID flow control diagram



Constant pressure control diagram

PID Parameter Adjustment Guide:

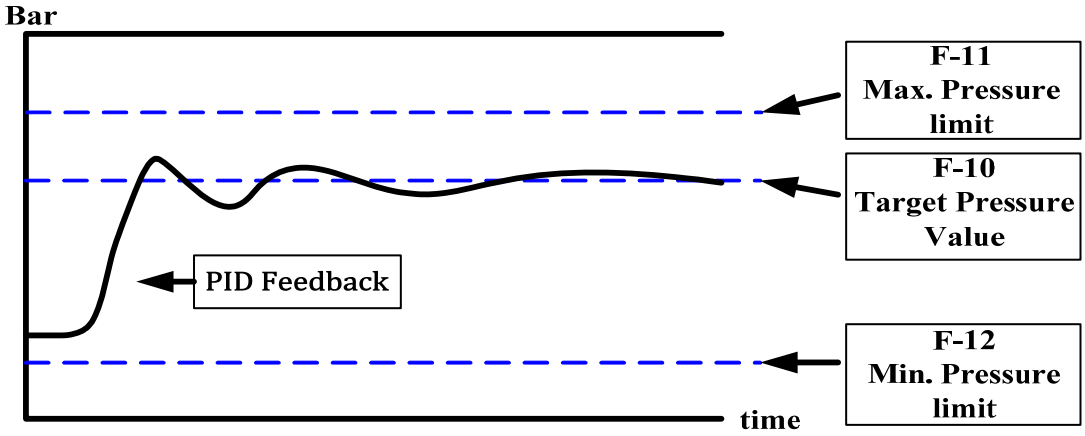
PID Parameters	Increase Setting Value	Decrease Setting Value	Main Feature
Proportional Gain (P)	(G) Increase response time (B) Might cause pump vibration	(G) Reduce vibration (B) Slow down response	Increase stabilize time
Integration Time (I)	(G) Smooth output frequency (B) Slow down response	(G) Fast response (B) Change rapidly of output frequency.	For smooth feedback variations
Differentiation Time (D)	(G) Avoid overshooting (B) System unstable or motor vibration	(G) System stable (B) Overshooting easily	Respond to system rapid variations

Notes: PID parameters can be changed during the inverter is running.
Notes: (G) means good, (B) means bad.

F-09 Max. Pressure of Pressure Transmitter : 0.10 – 25.50 (Bar)

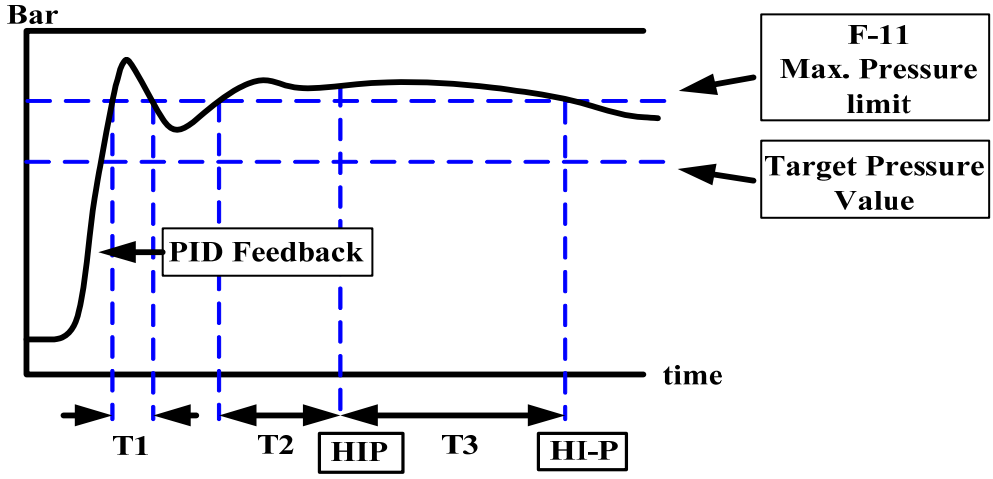
According to the specification of pressure transmitter to set pump system pressure base.

F-10 Target Pressure Value : 0.10 – (F-09) (Bar)
F-11 Max. Pressure limit : 0.10 – (F-09) (Bar)
F-12 Min. Pressure limit : 0.10 – (F-09) (Bar)



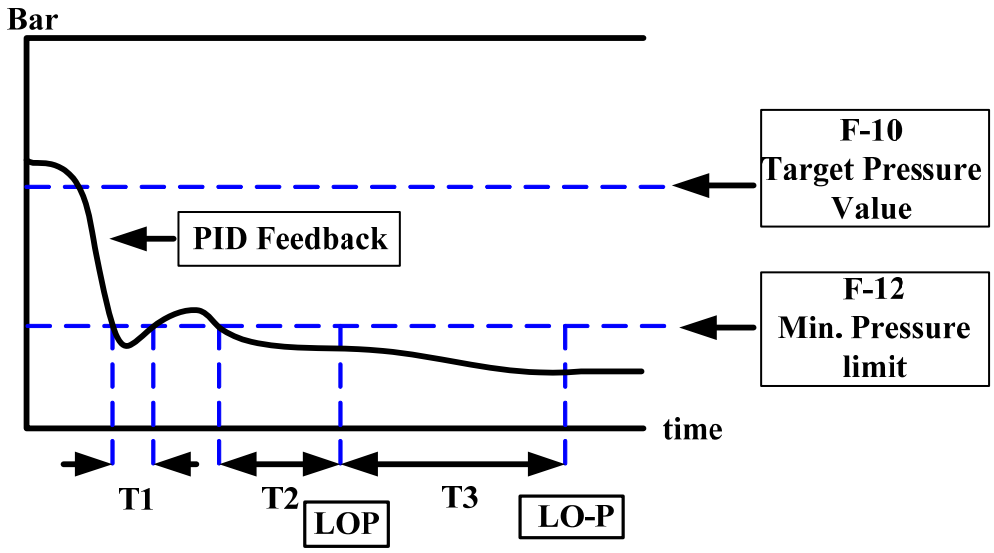
✸ Under PID control, system pressure will intervene (F-11 Max. Pressure limit) and (F-12 Min. Pressure limit).

F-13 High Pressure Alarm Time : 0.0 - 600 (sec)
F-14 High Pressure Stop Time : 0.0 - 600 (sec)



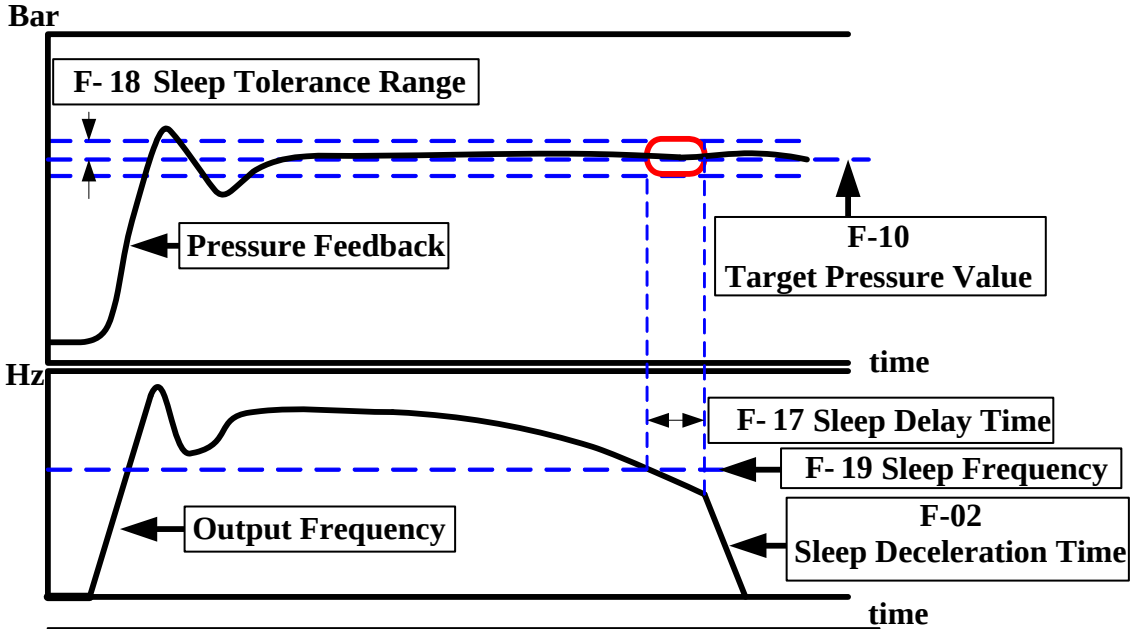
T1 < F-13(High Pressure Alarm Time) : Hip accumulate time will be reset after T1.
T2 ≥ F-13(High Pressure Alarm Time) : Counting high pressure time again and keypad blink Hip.
T3 ≥ F-14(High Pressure Stop Time) : Keypad blink Hi-p and deceleration to stop.

F-15 Low Pressure Alarm Time : 0.0 - 600 (sec)
F-16 Low Pressure Stop Time : 0.0 - 600 (sec)



T1 < F-15(Low Pressure Alarm Time) : Lop accumulate time will be reset after T1.
T2 ≥ F-15(Low Pressure Alarm Time) : Counting low pressure time again and keypad blink Lop.
T3 ≥ F-16(Low Pressure Stop Time) : Keypad blink Lo-p and deceleration to stop.

F-17 Sleep Delay Time : 0.0 – 120 (sec)
F-18 Sleep Tolerance Range : 0.00 – 5.00 (Bar)
F-19 Sleep Frequency : 0.0 – 200 (Hz)



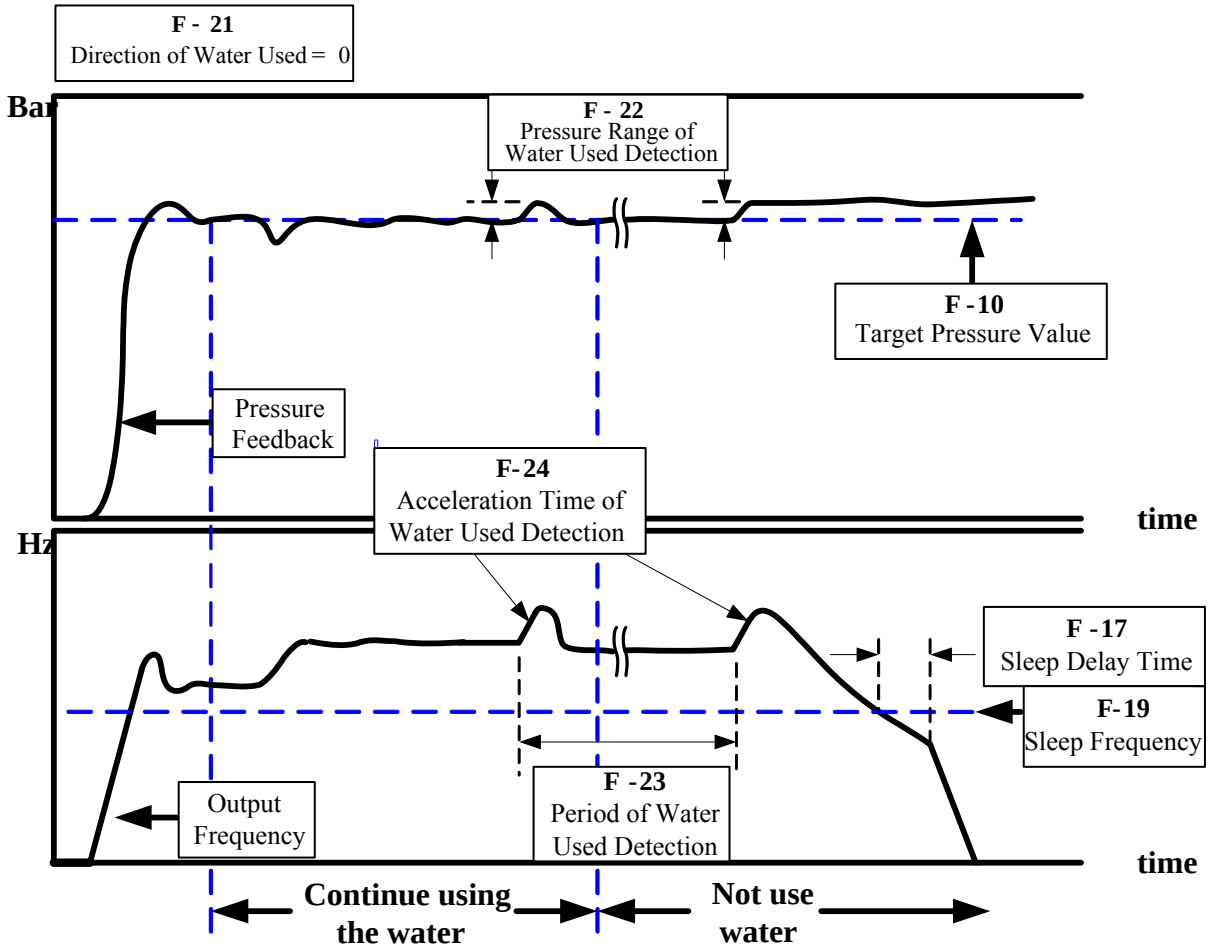
Sleep Tolerance Range : | (F-10) − PID Feedback | < F-18

Notes: Sleep function can save energy when pressure reached target pressure value.

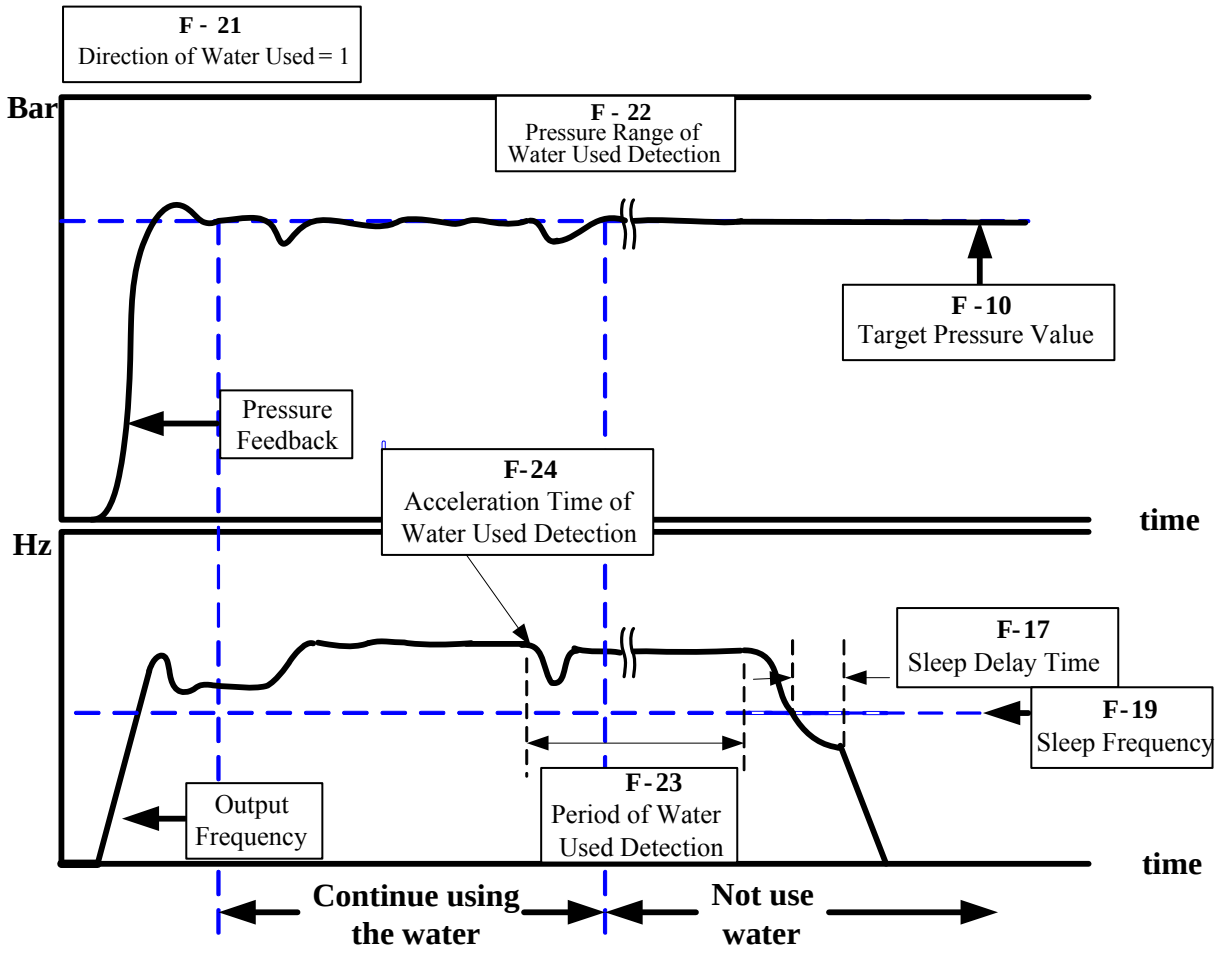
F-20 Forced operating frequency	**0 – 200 (Hz)**

C27 ~ C29 function setting = 0007, when external control terminal ON, the output frequency depend on F-47.

F-21 Direction of water usage 0000 : Upward
0001 : Downward
F-22 Pressure range of water usage detection : 0.00 – 2.50 (Bar)
F-23 Cycle of water usage detection : 0.0 – 200 (sec)
F-24 Acceleration time of water usage detection : 0.1 – 999 (sec)
F-25 Deceleration time of water usage detection : 0.1 – 999 (sec)



★F-23 = 0.0 (sec), Disable the water usage detection.
★When this function is enabling, it helps the pump to go to sleep more effectively.
★When using water frequently, we suggest that set F-23 (Cycle of water usage detection) longer to reduce detection times, this would be helpful for lessening unstable pressure which cause by water usage detection function.
★When upward water usage detection is operating, the pressure will slightly increase, if users do care about the situation, we suggest you can adjust F-22 (Pressure range of water usage detection) lower. In other hand, it will extend the time of getting to sleep when we are not using water or using small amount of water.



★F-20 = 0.0 (sec), Disable the water usage detection.

★When this function is enable, it can help the pump get into sleep more effectively.

★When using water frequently, we suggest that set F-23 (Cycle of water usage detection) longer to reduce detection times, this would be helpful for reducing unstable pressure cause by water usage detection function.

★When downward water usage detection is operating; the frequency will decrease according to F-25 (Deceleration time of water usage detection). In the condition of using water, the pressure will decrease and then the frequency will rise to reach the original setting pressure, it is judge by pressure feedback is lower than F-10 (working pressure) – F-22(Pressure range of water usage detection). If the condition is small amount or not using water, the operating frequency will decrease continuously. The detecting process will cause the pressure slightly unstable in a very short time. So F-22(Pressure range of water usage detection) must be adjusted appropriately. In the decreasing process, if small amount of leakage cause the pressure lower than F-10 (working pressure) – F-22(Pressure range of water usage detection) before it reach the sleeping frequency, the frequency will rise again.

	Advantage	**Disadvantage**
Direction of Water Used (Upward)	1. Keep the actual pressure always higher than command pressure in the operating process, especially for strict and precise applications.	1. If the lift is too high which cause the operating frequency higher than usual even if little water usage or not using water. The efficiency of upward water usage detection won't be as good as we expect . 2. When multi pump operate in parallel, the slave is hard to get into sleep.
Direction of Water Used (Downward)	1. Get into sleep more efficient in only small amount water usage or not using water situation. 2. When multi pumps operate in parallel, the drives have more efficient to control the operating drive quantity and output frequency in downward water usage	1. It could cause pressure shock wave if we didn't adjust (F-22) Pressure range of water usage detection and (F-25) Deceleration time of water usage detection appropriately.

	detection. 3. The operating order is master, slave1, slave 2, slave 3, and the sleeping order is slave 3, slave 2 ,slave 3, the master and slave will exchange after (F-31)Auto Shift Time ,it also helps the product life.	

F-26 HiP/LoP/1BrE Protection Auto Restart Time : 0 – 200 (min)

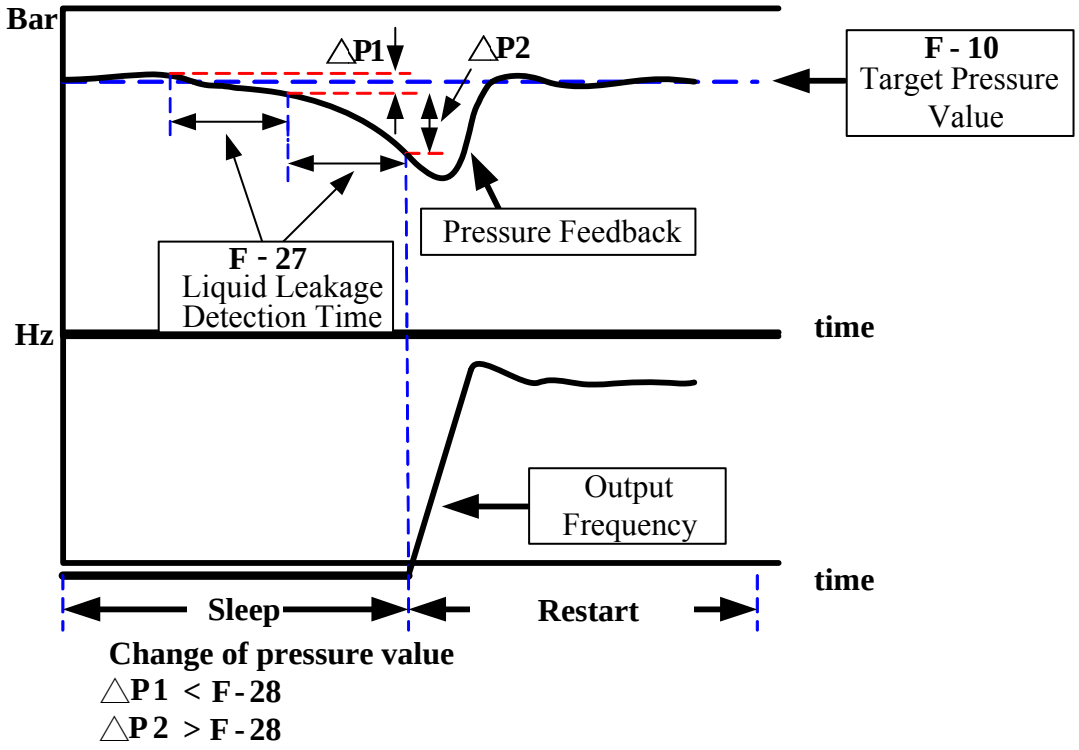
★F-23 = 0(min): Disable auto restart function.

★When Hi-p or Lo-p protection happens, the pump will stop. It will auto restart after F-23 auto restart time.

★When 1BrE is occurred during dual pump operation and the message will disappear after F-23 auto restart time. When 1brE is reset, it is never occurred again, until Master and Slave unit change states. (Reference dual pump parameter)

F-27 Liquid Leakage Detection Time : 0.0 – 10.0 (sec)
F-28 Variation within Detection Time : 0.01 – 2.50 (Bar)
F-29 Restart Level for Liquid Leakage Detection : 0.01 – 2.50 (Bar)

Liquid Leakage Detection CASE 1 : Change of pressure value is over than F-28



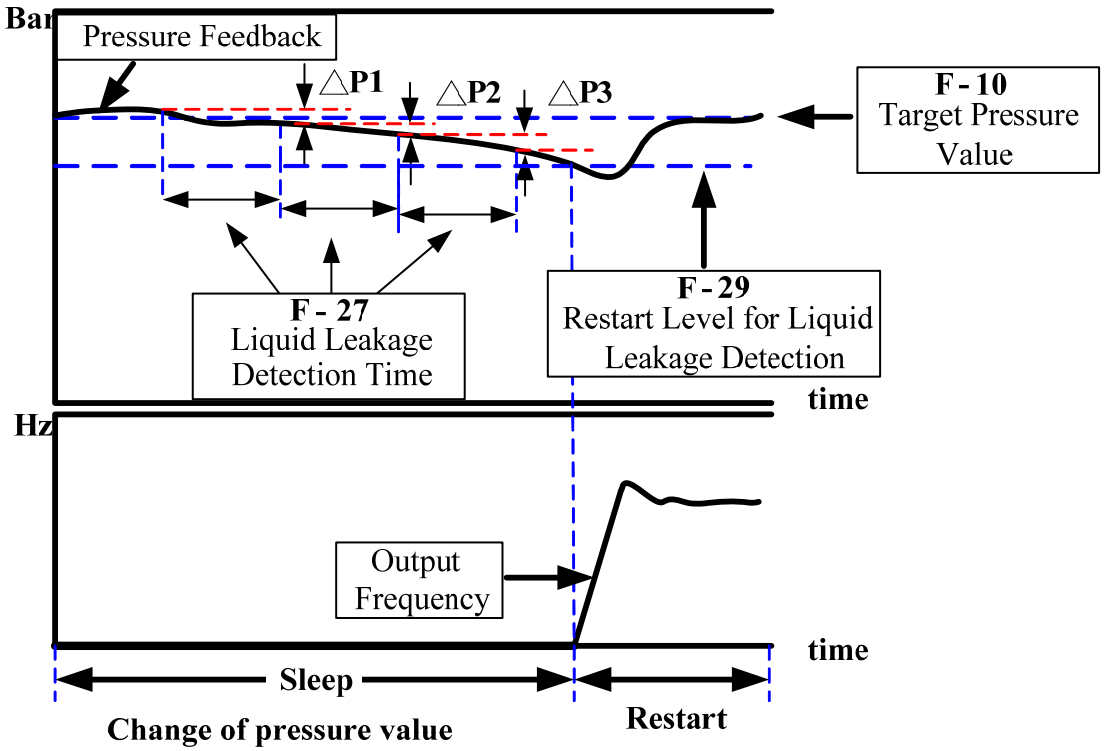
Change of pressure value
△P1 < F-28
△P2 > F-28

★ Only for single pump used.

★ F-27 = 0.0 (sec), Disable Liquid Leakage Detection.

★ When pump is sleeping, the pressure value maybe decrease due to the liquid leakage, if the change of pressure value is higher than F-28 under each detection time (F-27), the pump will start again.

Liquid Leakage Detection CASE 2 : Change of pressure value is less than F - 28



Change of pressure value

△P1 < F-28
△P2 < F-28
△P3 < F-28

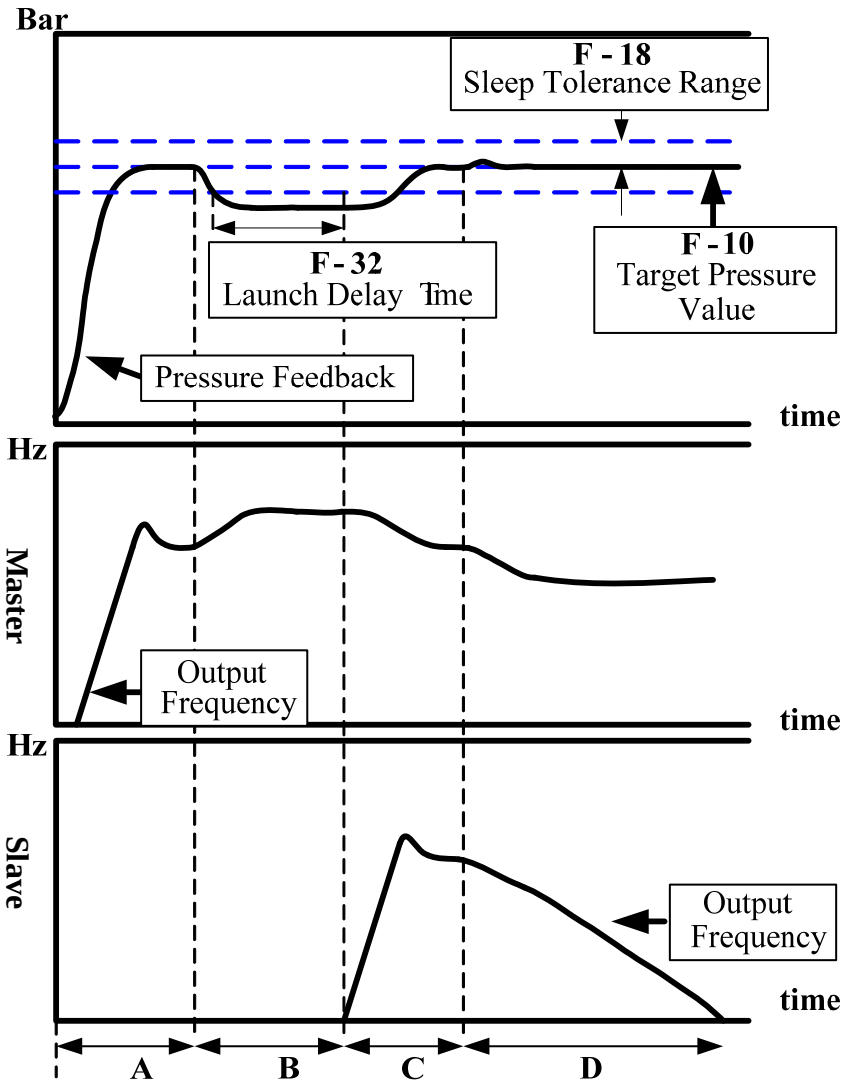
★ Only for single pump used.

★F-27 = 0.0 (sec) : Disable Liquid Leakage Detection.

★When pump is sleeping, the pressure value maybe decrease because liquid leakage, if the change of pressure value is lower than F-28 during every F-27 detection time, the pump will keep in sleep mode, until the pressure value is higher than the setting of F-29 (restart level).

★Setting the value of F-27 / F-28 / F-29 properly can improve the pump restart condition due to the liquid leakage.

F-30 Single/Dual Pump and Master/Slave Selection
0000 : Single Pump
0001 : Multi Pump – Master
0002 : Multi Pump – Slave1
0003 : Multi Pump – Slave2
0004 : Multi Pump – Slave3
F-31 Auto Shift Time : 0 – 240 (Hour)
F-32 Launch Delay Time (Slave Unit) : 0 – 30.0 (sec)



A : Multi pump operate, Master start and Slave (1~3) is standby, then system is in the constant pressure operation.

B : When the water used quantitative change is large, then the output frequency of Master will increase. If the pressure does not reach setting range of F-18 and F-32 is not finished, Slave is still standby.

C : When F-32 is finished, Master request Slave1 to start. After Slave1 running the pressure still does not reach setting range of F-18, Master request the other Slave until the pressure reach setting range. if the flow is stable, the output frequency of Master and Slave will decrease until pump sleep.

D : When the water used quantitative change is small, then the output frequency of Master and Slave will drops. Because the water used quantitative is small than multi-pump, Slave can get into sleep mode, only the Master operation may achieve the constant pressure operation.

E : When multi pumps operate in parallel, and upward water usage detection is enable, only the master will do the water detection to decrease the operating sleep frequency, the sleeping order in not fixed it depends on master and slave frequency.

F : When multi pumps operate in parallel, and downward water usage detection is enable, the water usage detection will detect in sequence and start from which last operated , and the one has first priority to get into sleep.

Note : 1. Multi Pump operate, when F-28 is finished, the stance of Master and Slave change.
2. When F-27 ≠ 0000, the function F-27 cannot to repeat.

F-33 AIN Gain (%) : 0 – 200 (%)
F-34 AIN Bias (%) : 0 – 100
F-35 AIN Bias 0000 : Positive
0001 : Negative

1.) F-35 = 0000 : 0V(4mA) corresponding to Min. Pressure limit of Pressure Transmitter.
10V (20mA) corresponding to Max. Pressure limit of Pressure Transmitter.

2.) F-35 = 0001 : 10V(20mA) corresponding to Min. Pressure limit of Pressure Transmitter.
0V (4mA) corresponding to Max. Pressure limit of Pressure Transmitter.

Figure (1):

	F-33	F-34	F-35	C-64
A	100%	050%	0	0
B	100%	000%	0	0

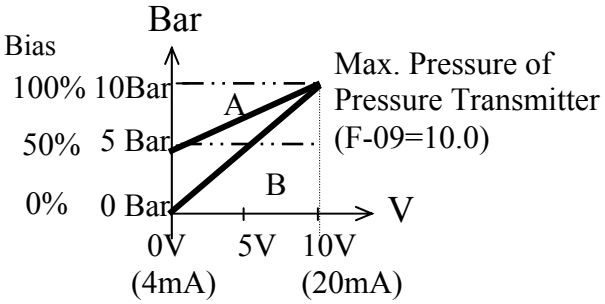


Figure (2):

	F-33	F-34	F-35	C-64
C	100%	050%	0	1
D	100%	000%	0	1

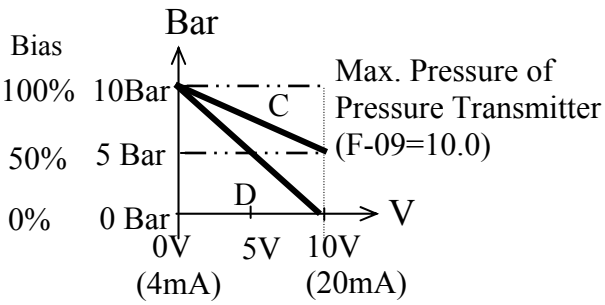


Figure (3):

	F-33	F-34	F-35	C-64
E	100%	020%	001	000

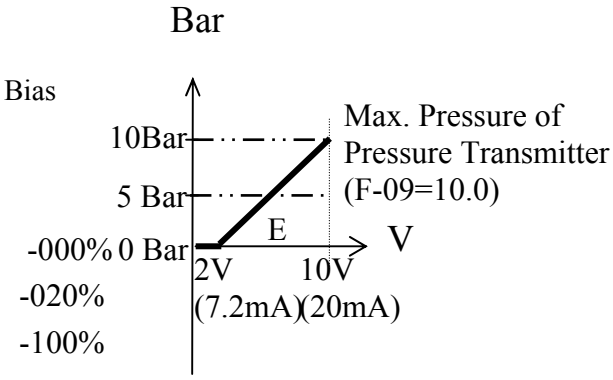
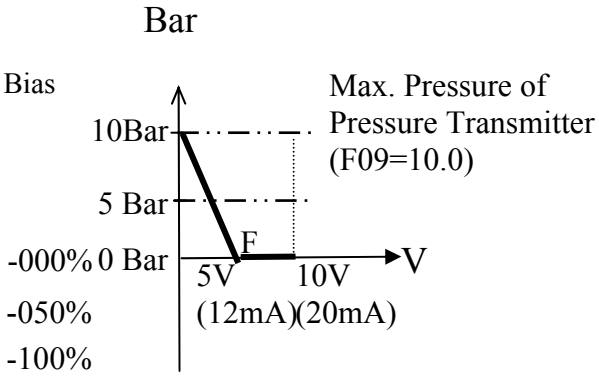


Figure (4):

	F-33	F-34	F-35	C-64
F	100%	050%	001	001



F-36 Start Frequency for Slave Pump Running 0 – 100 (%) (100% = F-03) **F-37 Stop Frequency for Slave Pump Running 0 – 100 (%) (100% = F-03)**

F-36 = 0% : Disable the condition of the start frequency.
F-37 = 0% : Disable the condition of the stop frequency.

When multi-pump is operation and Master is running, as the pressure is lower than (F-10 – F-18), the Slave will restart by follow condition:

1. F-36= 0% : Disable restart frequency condition
   After the setting time of F-32, Master request Slave to start.
2. F-36 = 1 ~ 100% : Enable restart frequency condition
   When the output frequency of Master is over than F-36(%) × F-03, and after the setting time of F-32, then Master request Slave to start.

When Master and Slave are running, the Slave will stop by follow condition:

1. F-37 = 0% : Disable stop frequency condition
   When output frequency of Slave is less then F-19 Sleep Frequency, and persist time is bigger than F-17 Sleep delay time, then Slave will get into sleep mode.
2. F-37 = 1 ~ 100% : Enable stop frequency condition
   When the output frequency of Master is less than F-37(%) × F-03, and F-32 is finished, or output frequency of Slave is less then F-19 Sleep Frequency, and persist time is bigger than F-17 Sleep delay time, then Slave will get into sleep mode.

Note: The F-36 / F-37 setting values of Master and Slave must be the same.

F-38 Parameter Lock	**0000 : all function can be write and read** **0001 : only about pressure function can be write and read** **0002 : all function can read but not to write**

F-39 Software version

F-40 Factory default	**0010 : Reset to factory default (50Hz)** **0020 : Reset to factory default (60Hz)**

F-41 Latest 3 fault recoeds

F-42 Run state memory	**0000 : Restart with memory** **0001 : Restart without memory**

Effective of C-08 = 0000(Keypad)

F-43 Advanced parameter function display	**0000 : Don't display** **0001 : Display**

F-44 HiP/LoP/1BrE Protection Auto Restart times	0000~0999

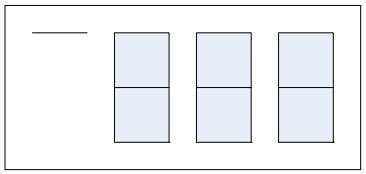
★ When F-44 = 0000 : Restart infinitely.
★ When Hi-p or Lo-p protection or 1BrE happens, the pump will stop. It will auto restart after F-26 auto restart time if F-44 > 0 until the auto restart times are all used.

F-45 Dual Pump Synchronal Setting	0000 : Disable 0001 : Target Pressure Value && Run/Stop 0002 : Only Target Pressure Value 0003 : Only Run/Stop

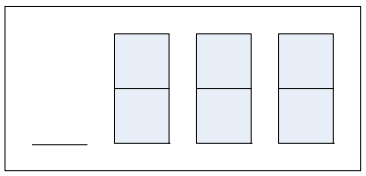
1.) When F-45 = 0000 : Disable.
2.) When F-45 = 0001 : The Pressure Value and Run/Stop of Slave will follow the Master setting.
3.) When F-45 = 0002 : The Pressure Value of Slave will follow the Master setting.
4.) When F-45 = 0003 : Run/Stop of Slave will follow the Master setting.

F-46 Display of Pressure Value Setting	0000 : Setting && Feedback 0001 : Only Setting 0002 : Only Feedback

1.) When F-46 = 0000 : Display of Pressure setting and Pressure feedback simultaneously.
2.) When F-46 = 0001 : Only display of Pressure value setting.
3.) When F-46 = 0002 : Only display of Pressure feedback.



← When F-46 = 0001, there have a up-line in the left on behalf of the Pressure setting.



←When F-46 = 0002, there have a down-line in the left on behalf of the Pressure feedback.

F-47 Password setting of Parameter Lock	0000 - 0999

Establish the password procedure:
F-44 = 888 (establish the password command) → F-44 = establish the password (establish the password that the customer appoints) → Completion

Unlock the parameter:
When the parameter is locked, only F-44 can be used, if want to unlock the parameter, input the primitive password of establishing on F-44, other parameters can make an modification after unlocking.

Remove the password by force:
When forget the primitive password that establishes, remove the settlement of the primitive password with this procedure, when need to do the password to lock, please operate it in accordance with above-mentioned "Establish the password procedure".
F-44 = 123 (remove the password command 1) → F-44 = 999 (remove the password command 2) → The original password has already been removed.

Note:
1. When inverter needs to establish a new password, please input the primitive password first to unlock parameter, can just use “Establish the password procedure” to establish the new password.
2. If the inverter has password of establishing, the inverter will lock the parameter automatically after power on.
3. Please avoid the value of F-44 to use 123, 888, 999, 000.

F-48 Pressure loss prevention level (%)	**0 – 100 (%)**

1.) When F-48 = 0: Disable.
2.) When F-48 > 0: If Pressure feedback is less than **(**Pressure setting (F-10) x Pressure lossing prevention level (F-48)**)** and exceed the detection time (F-49), the pump will stop and show “PbL”

F-49 Detection time of pressure losing	**0.0 – 25.5 (sec)**

When F-49 = 0: Pressure losing prevention disable.

Advanced Parameters List (Group C parameters : F-40 = 0001)

C-00 Reserve

C-01 Acceleration stall-prevention:
0000: Enable Stall prevention during Acceleration.
0001: Disable Stall prevention during Acceleration.
C-02 Acceleration stall-prevention level: 050% ~ 300%
C-03 Deceleration stall-prevention:
0000: Enable Stall prevention during deceleration.
0001: Disable Stall prevention during deceleration.
C-04 Deceleration stall-prevention level: 050% ~ 300%
C-05 Run stall-prevention:
0000: Enable Stall prevention in Run mode.
0001: Disable Stall prevention in Run mode.
C-06 Run stall-prevention level: 50% ~ 300%

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

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

3.) The Inverter could trip (Stall) during run mode due to an impact load or sudden change of the load.
Stall prevention in run mode will detect a programmed stall level (C-06) for a period of time. If the level exceeds "C-06", then the inverter reduces its frequency (speed) to provide the required additional torque to overcome the stall. Once this level is below the programmed stall level, then it ramps up to its normal running speed.

C-07 Reserve

C-08 Run signal source	**0000 : keypad** **0001 : External Terminal** **0002 : Communication Control**

1.) C-08 = 0000, inverter is controlled by keypad.
2.) C-08 = 0001, inverter is controlled by external terminal.
3.) C-08 = 0002, inverter is controlled by serial communication.

C-09 Pressure command source	**0000 : UP/Down Key on control panel** **0001 : RS-485 Communication pressure setting**

1.) C-09 = 0000 Pressure command setting by UP/Down Key (control panel).

2.) C-09 = 0001 Pressure command setting by RS-485.

C-10 Stopping method	**0000: Decelerate to stop** **0001: Free run (Coast) to stop**

1.) C-10 = 0000: after receiving stop command, the motor will decelerate to stop according to setting of F02, deceleration time 1.

2.) C-10 = 0001: after receiving stop command, the motor will free-run (Coast) to stop.

C-11 Carrier frequency (KHz) : 004-016

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

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

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

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

Corresponding list of current and carrier frequency

Model / Carrier frequency	EV-1P2/2P2 H1/H1F/H3	EV-1P5/2P5 H1/H1F/H3	EV-101/201 H1/H1F/H3	EV-202 H1/H1F/H3	EV-203 H1/H1F/H3	EV-401 H3/H3F	EV-402 H3/H3F	EV-403 H3/H3F
4~10K	1.7	3.1	4.2	7.5	10.5	2.3	3.8	5.2
12K	1.7	3.1	4.2	7.5	10.5	2.2	2.2	3.7
14K	1.6	3.0	4.0	7.0	10.0	2.2	2.2	3.6
16K	1.5	2.8	3.8	6.8	8.7	2.1	2.1	3.5

C-12 Multi function output RY1

0000 : Run
0001 : Fault output
0002 : Auto restart
0003 : Momentary power loss
0004 : Emergency Stop(E.S.)
0005 : Base Block(b.b.)
0006 : Motor overload protection
0007 : Inverter overload protection
0008 : High/Low pressure alarm
0009 : Power On
0010 : Communication error
0011 : Output current detection(>C-31 setting)

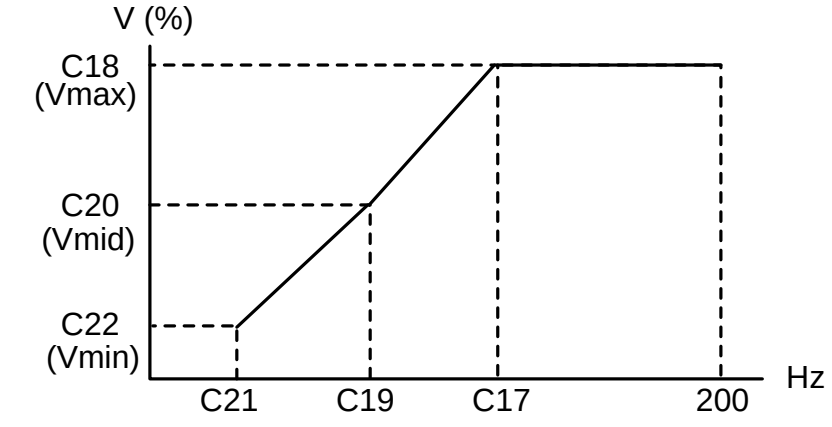
C-13 Fan control	**0000 : Auto-run by temperature** **0001 : Run when inverter running** **0002 : Always run.** **0003 : Always stop.**

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

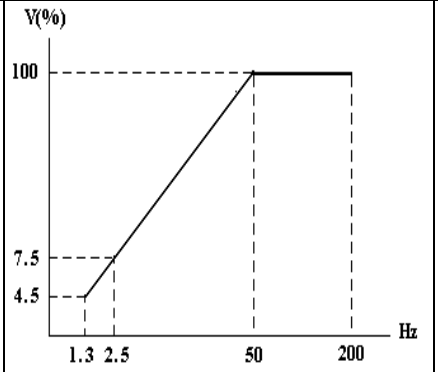
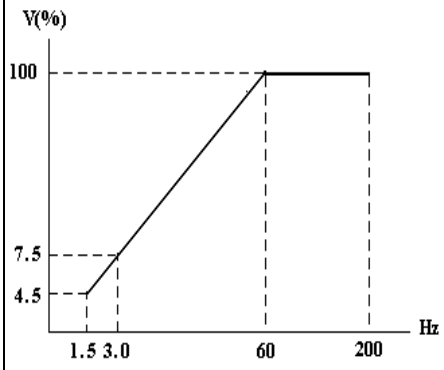
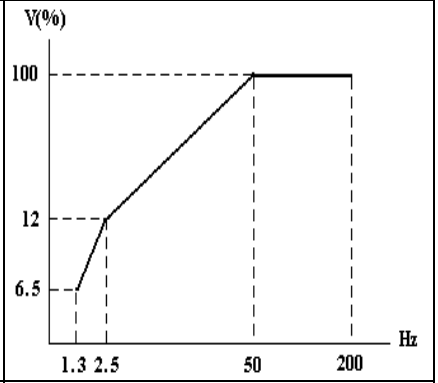
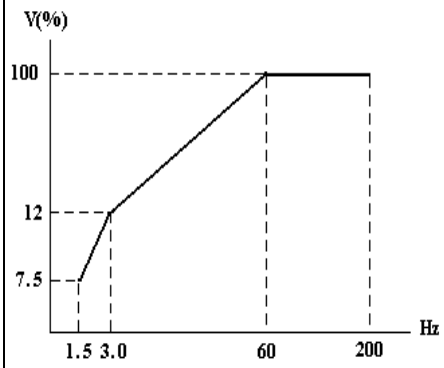
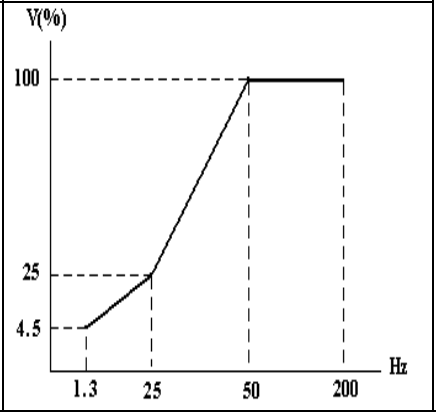
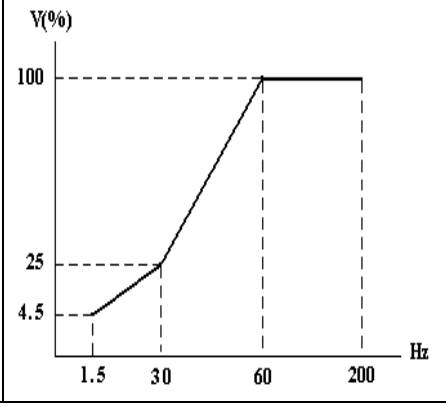
C-14 Control mode	**0000 : Vector control** **0001 : V/F control**

C-15 Preset V/F patterns = 1 – 7

C15 = 0007. Select user-set v/f pattern by setting parameters C17~C22.
See the diagram below. Care should be taken when this feature is used as improper setting of these parameters will have an adverse effect on motor performance.



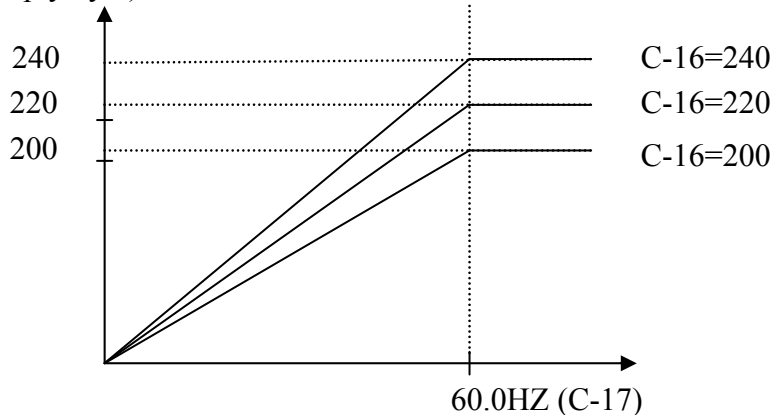
C15 = 001– 006 fixed V/F patterns (see below).

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

C-16 VF base output voltage set : 198 ~ 265 (V) (110V/220V series)
380 ~ 530 (V) (440V series)

At C17=60HZ C18=100%

For 200~240V, patterns based an output voltage are shown below. (Corresponding settings for 400-480 volts input: multiply by 2)



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

C-17 Max. output frequency (HZ): 50.0 – 200 (Hz)
C-18 Output voltage ratio at max. frequency (%): 0.0 – 100 (%)
C-19 Mid frequency (HZ): 00.1 –200 (Hz)
C-20 Output voltage ratio at mid. frequency (%): 00.0 – 100 (%)
C-21 Min. output frequency (HZ) : 00.1 –200 (Hz)
C-22 Output voltage ratio at min. frequency (%): 00.0 – 100 (%)

C-17~C-22 please refer to C-15 description

C-23 Torque Boost Gain (V/F) (%) 00.0 – 30.0%

C-24 Slip Compensation Gain (V/F) (%) 00.0 – 100%

C-25 Motor no load current (A)

Motor no load current varies with inverter capacity C-55. Please adjust according the actual conditions.

C-26 Electronic thermistor protection for motor (OL1) :	**000: Protection Enabled** **001: Protection Disabled**

C-27 ~ C-29	**Selectable Functions for input terminals (S1-S3)** **0000 : Forward run** **0001 : External Emergency stop(E.S.)** **0002 : Base block (b.b.)** **0003 : Reset** **0004 : Control signal switch** **0005 : Communication mode. Disable – Enable.** **0006 : PID function prohibit** **0007 : Force Frequency running** **0008 : Force Sleep.**

1.) S1-S3 on TM2 are multi-function input terminals which can be set to the above 7 functions.
2.) C-27 ~ C-29 Function descriptions:

C-27 ~ C-29 = 0000 Forward run

Forward command ON sets the inverter running forward, while OFF stops, the inverter. C-27 factory default is forward command.

C-27 ~ C-29 = 0001: External Emergency Stop (E.S)

The inverter will decelerate to stop by F-01 setting on receiving the external emergency stop signal regardless of C-10 setting.
The display will be blinking with "E.S".
The inverter will only start again when the Emergency Stop signal is removed and the start signal is turned off and then on again (remote start mode) or the Run key is pressed (keypad mode).
Removing the Emergency Stop signal before the inverter has fully stopped will not inhibit the Emergency Stop operation.
Output relay can be set to Emergency. Stop fault by setting C-12 = 0004.

C-27 ~ C-29 = 0002: Base Block (b.b.)

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

C-27 ~ C-29 = 0003: Reset

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

C-27 ~ C-29 = 0004: Control signal switch

External control terminal OFF: operation signal/ frequency signal is controlled by C-08 / C-09.
External control terminal ON: Operation signal/frequency signal is controlled by Keypad display.

C-27 ~ C-29 = 0005: Communication mode select.

External control terminal OFF: in communication, the inverter is controlled by master (PC or PLC) run/ frequency signal and allows parameter modification. The Keypad and TM2 run/frequency signal is not available for inverter at this time. The keypad is only available for display of voltage/ current/ frequency and read parameters but cannot modify them. It is also available for emergency stop.
External control terminal ON: PC/PLC can read and modify parameters. BUT all controls are from the keypad. (Not affected by settings of C-08 & C-09).

C-27 ~ C-29 = 0006: PID function disable

When input terminal is on, PID functions set by C-57 are disabled.
When input terminal is the PID functions are enabled.

C-27 ~ C-29 = 0007: Forced operating frequency

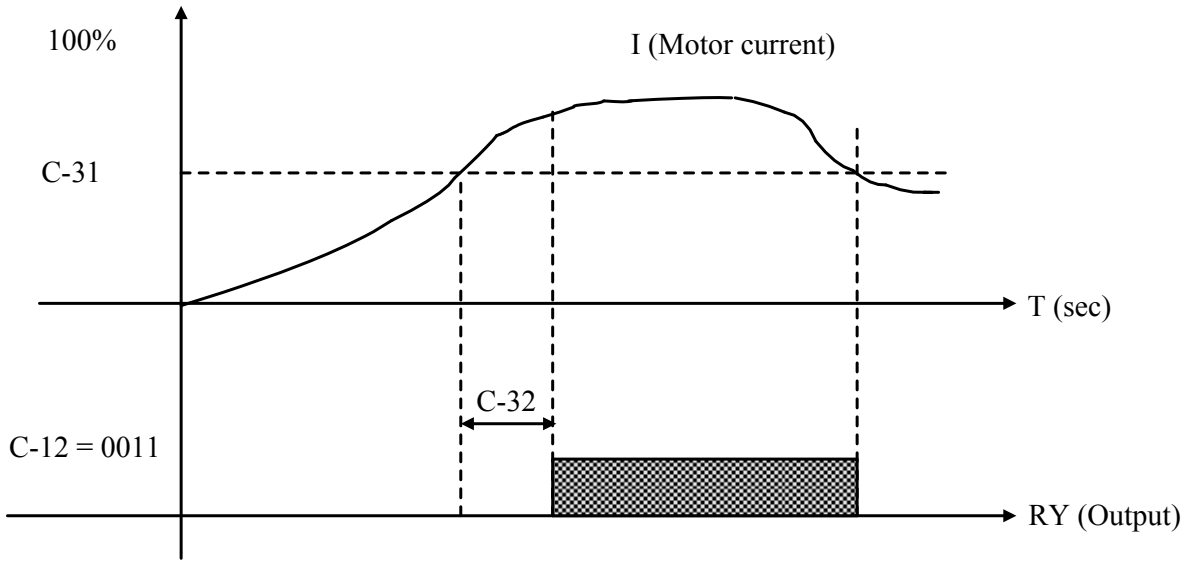
When input terminal is on, output frequency is depending on F-47.
When input terminal is off, output frequency is depending on PID control.

C-27 ~ C-29 = 0008: Detection of valve piston position

Switch on when the piston position in upper position.
Switch off when the piston position in lower position.

C-31 Output current reached setting value: 0 ~ 100 (%)
C-32 Output current detection time: 0.0 ~ 25.5 (sec)

C-12 : Output current detection value > C-31 when setting value is 0011
C-31 : Setting value (000~100%) by motor rated current (C-33)
C-32 : Setting value (00.0~25.5) unit : sec



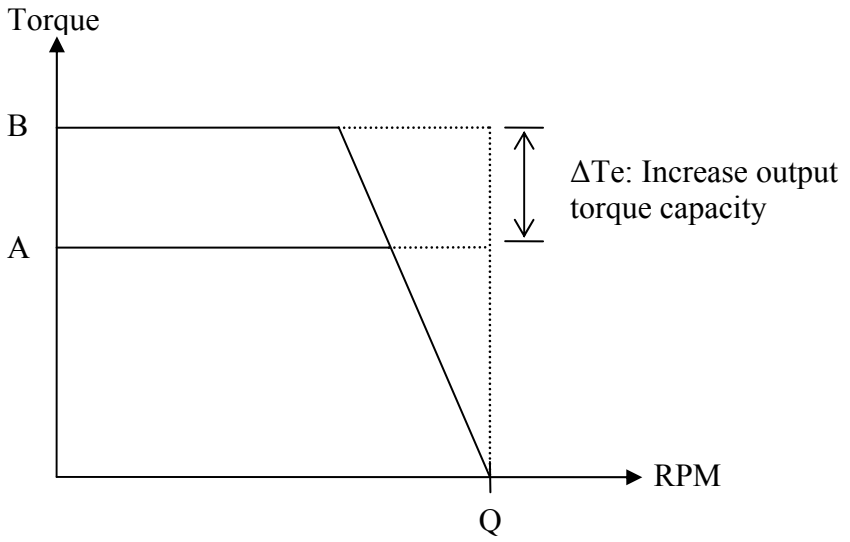
C-33 Motor rated current (A)
C-34 Motor rated voltage (Vac)
C-35 Motor rated frequency (Hz)
C-36 Motor rated power (KW)
C-37 Motor rated speed (RPM) : C-37 X 100= Motor rated speed

C-38 Torque boost gain (Vector), (C-14 = 0000)

Performance: If the motor load is too large by its estimation, it will increase the output torque.

$$\Delta Te \fallingdotseq \underset{\text{(load current)}}{I} \times \underset{\text{(compensation gain)}}{Gain}$$

• Torque/Speed curve pattern:



A: before torque boost
B: after torque boost

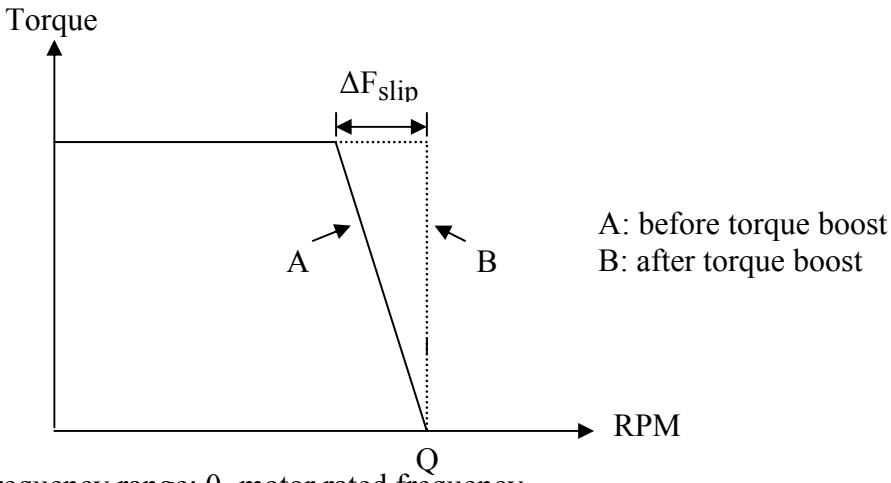
• Operating frequency range: 0~Motor rate frequency
• When the motor output torque is not enough and increase C-38 setting value.
• When the motor is erratic or vibrates decrease C-38 setting value.
• The max. Output torque limit to the inverter is current rated.
• If increase C-38 setting value then the output current is too large. Please increase C-39 setting value on the same time.

C-39 Slip compensation gain (vector), (C-14 = 0000)

Performance: If the motor load is too large by its estimation, it will increase slip compensation.

$$\Delta F_{slip} \fallingdotseq \underset{\text{(load current)}}{I} \times \underset{\text{(compensation gain)}}{Gain}$$

• Torque/Speed curve pattern:

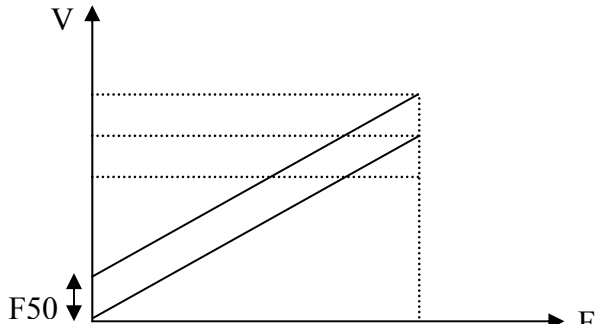


• Operating frequency range: 0~motor rated frequency.
• When the motor output rotation speed is too low increase C-39 setting value.
• When the motor is erratic or vibrates, decrease C-38 setting value.
• The max. output rotation speed limit to the motor max. setting frequency.
• If increase C-38 setting value then the output current is too large. Increase C-39 setting value at the same time.

C-40 Low frequency voltage compensation, C14=000

Performance:
At low frequency, increase C-40 setting value to increase output voltage and low frequency torque, and decrease C-40 setting value to decrease output voltage and low frequency torque.

• Output voltage/frequency curve pattern:



· Operating freque 0~12HZ / 60HZ
0~10HZ / 50HZ

• Used at low frequency:
When the motor output torque is insufficient, increase C-40 setting value.
When the motor is vibrating excessively, decrease C-40 setting value.

C-41 Auto restart on momentary power loss.	**0000 : Enable** **0001 : Disable**

C-41 = 0000: Auto restart after a momentary power loss is enabled on resumption of power and applying the run signal, according to setting of parameter C-08.
The Inverter will carry out an auto speed search, once the motor rotation speed is found then it will accelerate to the running speed before the power loss.
C-41 = 0001: Disable.

C-42 Auto restart times: 000 ~ 005

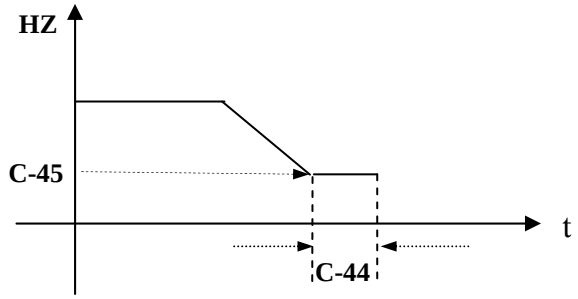
1.) C-42=000: The inverter will not auto-restart on fault trip.
2.) C-42>000
The Inverter will carry out an auto search 0.5 sec after the fault trip, and while the inverter output is switched off and the motor is coasting to stop.
Once the rotation speed is determined the inverter will accelerate or decelerate to speed before the fault.
3.) When OL1, OL2, OH, BB faults happens, Auto restart doesn't work.
Note: Auto restart doesn't work while DC injection braking or deceleration to stop is performed.

C-43 Multi-function input terminal S1~S3 signal scan time (N. msec ×8), N = (1~100 times).

1.) If the C-43 scan time is set to 80 ms as an example (i.e N=10) then digital input signals on for less than 80 msec will be ignored.
2.) If the scan signal is seen for N times (scan times), the inverter takes it as signal change. If it is seen for less than N times, it is seed as noise. One scan time: 8ms.
3.) User can set scan interval time according to noise in the operation environment. Extend C-43 if noise is a problem, however this will reduce the scan response time.

C-44 DC braking time (s) : 00.0~25.5
C-45 DC braking start frequency (Hz) : 01.0~10.0
C-46 DC braking level (%) : 00.0~20.0%

C-44 / C-45 : DC braking time and start frequency, refer to the following figure:



C-47 Reserve

C-48 Inverter communication address: 001~ 254

C-48 set communication address, for the specific inverter when multi-inverters are controlled by communication method.

C-49 Baud rate (bps)	**0000 : 4800** **0001 : 9600** **0002 : 19200** **0003 : 38400**
C-50 Stop bit	**0000 : 1 Stop bit** **0001 : 2 Stop bit**
C-51 Parity bit	**0000 : No parity** **0001 : Even parity** **0002 : Odd parity**
C-52 Data bits	**0000 : 8 bits data** **0001 : 7 bits data**

1. RS-485 communication: (requires RS485 port device)

1 to 1 control: PC or PLC or controller controls one inverter (C-48 is set to 001~254).

1 to multiple drives control: PC or PLC or other controllers control several inverters (The maximum of inverter could be controlled is 32). When the communication address =000, the inverter is controlled by communication regardless of the C-48 setting.

2. RS-232communication: (requires RS232 port)

1 to 1 control: PC or PLC or controller controls one inverter (C-48 is set to 001~254).

Note: a. The BAUD RATE(C-49) and communication format (C-50/C-51/C-52) of PC (or PLC Or other controller) and inverter should be the same.

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

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

d. Parameter C-48~C-52 can't be changed via communication module

C-53/ C-54 Communication time-out detection time / Communication time-out operation selection

(1) Time-out detection time: 00.0~25.5sec; setting 00.0 sec: disable time-out function.
Default: 00.0sec

Communication time-out detection enable or not is according to C-53, not relationship with Run/Frequency command.

***Cannot be modified during communication.**

(2) Time-out operation selection:
0000: Deceleration to stop (F-01: Deceleration time).
0001: Free run to stop.
0002: Continue operating.

Default = 0000

Reset method:

a. Push the "Reset" button directly.

b. Receive correct Modbus data from Master.

After communication time-out, the motor decelerates to stop (C-54 = 000, 001). And the motor does not run automatic after reset, the inverter must set the run command again to restart.

*Cannot be modified during communication.

*Detail list please see Appendix.

C-55 Inverter horse power capacity

C-55	Inverter model	
1P2	JNEVP	1P2
1P5		1P5
101		101
2P2		2P2
2P5		2P5
201		201
202		202

C-55	Inverter model	
203	JNEVP	203
401		401
402		402
403		403

C-56 Copy module	**000: Copy module Disabled** **001: Copy to module from inverter (Read)** The display will be blinking with "COPy" **002: Copy to inverter from module (write)** The display will be blinking with "COPy" **003: Read/ write check (Compare the parameters)** The display will be blinking with "COPr"

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

C-57 PID operation mode	**0000: PID Function disabled.** **0001: PID Control, Deviation is derivative controlled** **0002: PID Control, Feedback is derivative controlled.** **0003: Same as 001 but (reverse characteristics control).** **0004: Same as 002 but (reverse characteristics control).**

C-57 = 1 : D is the deviation of PID error in the unit time (C-58).

= 2 : D is the deviation of feedback value in the unit time (C-58).

= 3 : D is the deviation of PID error in the unit time (C-58). If the deviation is positive, the output frequency decreases, and vice versa.

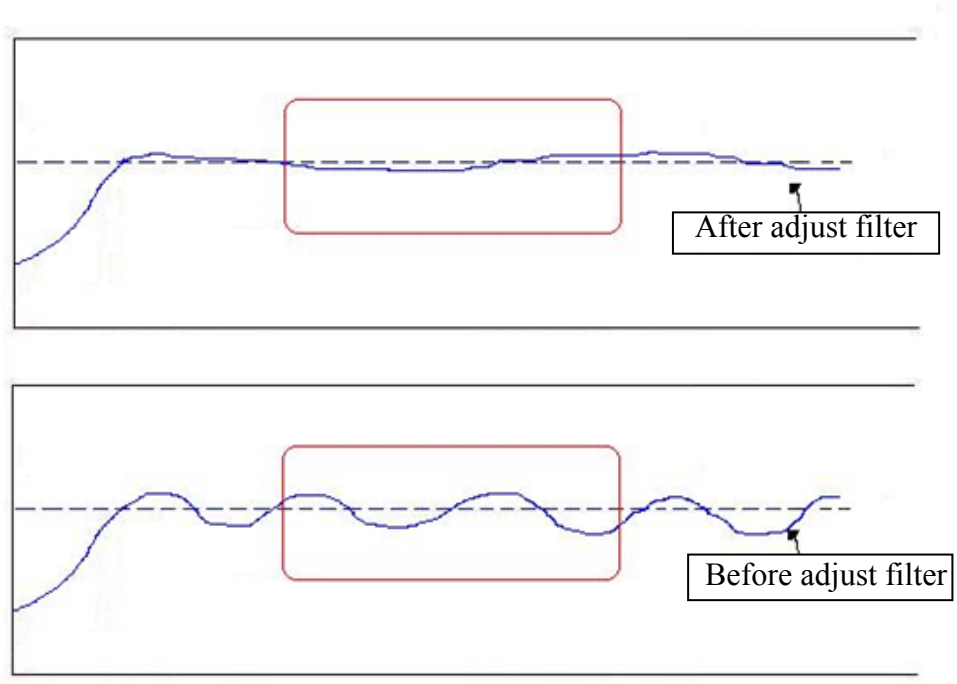
= 4 : D is the deviation of feedback value in unit time (C-58).When the deviation is positive, the frequency decreases, and vice versa.

C-58 D: Differential time (s) : 0.00 - 10.0

C-58: Differential time for D control.

C-59 PID Update time (s) : 00.0 - 2.5 (sec)

C-59 : the refresh time of the PID output command.



★Smooth the PWM output by increase filter time setting.
★Setting a bigger filter time will get a slower system response time.

C-60 AIN signal select **0000 : 0~10 V / 0~20 mA**
0001 : 2~10 V / 4~20 mA

C-60 : **AIN signal select** : set SW2 to appropriate V/I signal selection

C-60 = 0000 : 0~10V/0~20 mA
C-60 = 0001 : 2~10V/4~20 mA

C-61 PID offset **0000 : Positive direction**
0001 : Negative direction

C-62 PID offset adjust (%) : 000 ~ 109 (%)

PID operation result can be adjusted by C-62 (C-61 effects the polarity of C-62).

C-63 Reserved

C-64 AIN signal slope direction. **0000 : Positive direction**
0001 : Negative direction

Please refer to the description of F-30~F-32.

Chapter 5 Troubleshooting and maintenance

5.1 Trouble indication and corrective action

5.1.1 Fault / Error display and Diagnostics

1. Un-reset able / un recoverable Errors

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

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

2. Errors which can be recovered both manually and automatically

Display	Error	Cause	Corrective Action
OC-S	Over current at start	1. Motor winding and frame short circuit 2. Motor and ground short circuit 3. Power module is damaged	1. Check the motor 2. Check the wiring 3. Replace the power module
OC-D	Over-current at deceleration	The preset deceleration time is too short	Set a longer deceleration time
OC-A	Over-current at acceleration	1. Acceleration time is too short 2. The capacity of the motor is higher than the capacity of the inverter 3. Short circuit between the motor winding and frame. 4. Short circuit between motor wiring and earth 5. IGBT module is damaged	1. Set a longer acceleration time 2. Replace the inverter with the same or greater capacity as that of the motor 3. Check the motor 4. Check the wiring 5. Replace the IGBT module
OC-C	Over-current during run	1. Transient load change 2. Transient power change	Increase inverter capacity
OV-C	Over voltage during operation/ deceleration	1. Deceleration time setting is too short or excessive load inertia 2. Power voltage varies widely	1. Set a longer deceleration time 2. Add a braking resistor or braking unit 3. Add a reactor at the input line side 4. Increase inverter capacity
OH-C	High heat sink temperature during operation	1. Heavy load 2. Ambient temperature too high or bad ventilation	1. Check if there are any problems with the load 2. Increase inverter capacity 3. Improve ventilation conditions 4. Inspect the setting value of parameter C-13
COT	Communication time-out detection	1. C-53 communication time-out detection time is too short. 2. Inverter communication is broke. 3. Inverter can not receive the correct Modbus data within detection time.	1. Increase C-53 communication time-out detection time. 2. Keep the inverter communication. 3. Check the received Modbus data is correct from Master.
OVSP	Over Speed	The acceleration or deceleration time is too short.	Set a longer acceleration or deceleration time.
LOP	Low Pressure Alarm	Pressure lower than min. pressure limit, low pressure persist time greater than low pressure alarm time setting	1. Decrease setting value of min. pressure limit 2. Check pressure meter

Display	Error	Cause	Corrective Action
LO-P	High Pressure Alarm	Pressure higher than max. pressure limit, High pressure persist time greater than high pressure alarm time setting.	1. Increase setting value of max. pressure limit 2. Check pressure meter
HIP	Low Pressure Stop	Pressure lower than min. pressure limit, low pressure persist time greater than low pressure stop time setting	1. Decrease setting value of min. pressure limit 2. Check pressure meter
HI-P	High Pressure Stop	Pressure higher than max. pressure limit, High pressure persist time greater than high pressure stop time setting.	1. Increase setting value of max. pressure limit 2. Check pressure meter
PbL	Pressure Loss Stop	Pressure lower than (Pressure setting x Pressure loss prevention level), and detection time of Pressure loss	1. Decrease setting value of pressure loss prevention level. 2. Check pressure meter

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

Display	Error	Cause	Corrective Action
-OC-	Over-current during stop	1. OC Detection circuit malfunction 2. Bad connection for CT signal cable	Send the inverter back for repair
OL1	Motor overload	1. Heavy load 2. Improper settings of C-33	1. Increase motor capacity 2. Set C-33 correctly according to motor nameplate.
OL2	Inverter overload	Excessively heavy load	Increase inverter capacity
LV-C	Under voltage during operation	1. Power voltage too low 2. Power voltage varies widely	1. Improve power quality. 2. Set a longer acceleration time 3. Add a reactor at the power input side 4. Contact technical support

5.1.2 Set up Configuration, Interface Errors.

Display	Error	Description
STP0	Zero speed stop	Set frequency is <0.1Hz Increase set frequency
STP2	Keypad emergency stop	1. If the inverter is set to external control mode (C-08 = 0001), the inverter will stop according to the setting of C-10 when the stop key is pressed. STP2 flashes after stop. Turn the Run switch to OFF and then ON again to restart the inverter. 2. If the inverter is in communication mode and Stop key is enabled, the inverter will stop in the way set by C-10 when Stop key is pressed during operation and then flashes STP2. The PC has to send a Stop command then a Run command to the inverter for it to be restarted.
E.S.	External emergency stop	The inverter will decelerate to stop and flashes E.S. when there is an external emergency stop signal via the multi-function input terminals(see descriptions of C-27 ~ C-30).
b.b.	External base block	The inverter stops immediately and then flashes b.b. when external base block is input through the multi-functional input terminal (see descriptions of C-27 ~ C-30).
PDER	PID feedback loss	PID feedback loss detect
1brE	Inverter mal-function	When one unit show " 1brE " error the other unit can operate continuously.

5.1.3 Keypad operation error description

Display	Error	Cause	Corrective Action
Err1	Key operation error	1. Attempt to Press▲ or ▼ keys when C-09 > 0 or in speed operation. 2. Attempt to modify parameters, which can not be modified during Run (see parameter list).	1. ▲ or ▼ keys can be used to modify frequencies only when C-09 = 0000. 2. Modify parameters only in stop mode.
Err2	Parameter setting error	1. F-03 ≦ F-04	1. F-03 > F-04
Err5	Modification of parameter is not allowed during communication	1. Issue a control command during communication disabled 2. Modify C-48~C-52 during communication.	1. Issue the enabling command before while communicating. 2. Set up parameters before communicating.
Err6	Communication error	1. Incorrect wiring. 2. Incorrect settings of communication parameters. 3. Check-sum error. 4. Incorrect communication verification.	1. Check the hardware and wiring. 2. Check C-48~C52
Err7	Incorrect parameter settings	1. Attempt to modify C-55 2. Voltage and current detection circuits are malfunctioning.	Reset inverter or contact technical support
EPR1	Parameter set error, Copy Unit failure	1. Set C-56 = 0001、0002, can not connect with Copy Unit. 2. Copy Unit failure. 3. The voltage and drive rating on Copy Unit & the inverter are different.	1. Modify C-56 2.Change Copy Unit 3.Copy from keypad to inverter with only matched HP ratings
EPR2	Parameters do not match	Copy the parameter to inverter to verify the parameter not matched.	1. Change Copy Unit 2. The voltage and HP rating of Copy Unit is different than the inverter.

5.2 General functional troubleshooting

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

5.3 Troubleshooting Flowcharts EVP Series

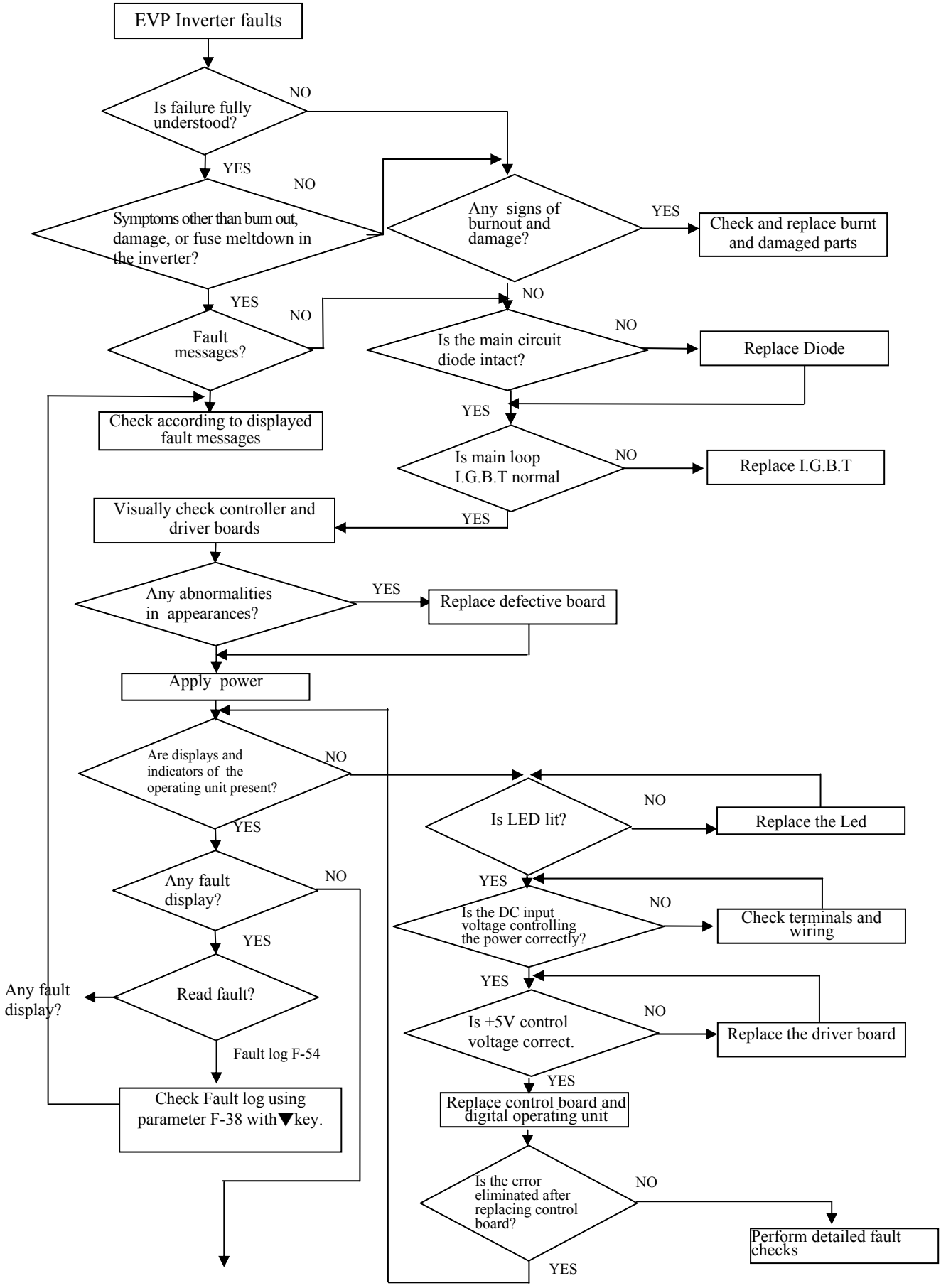


Figure 5-1 General troubleshooting flowchart

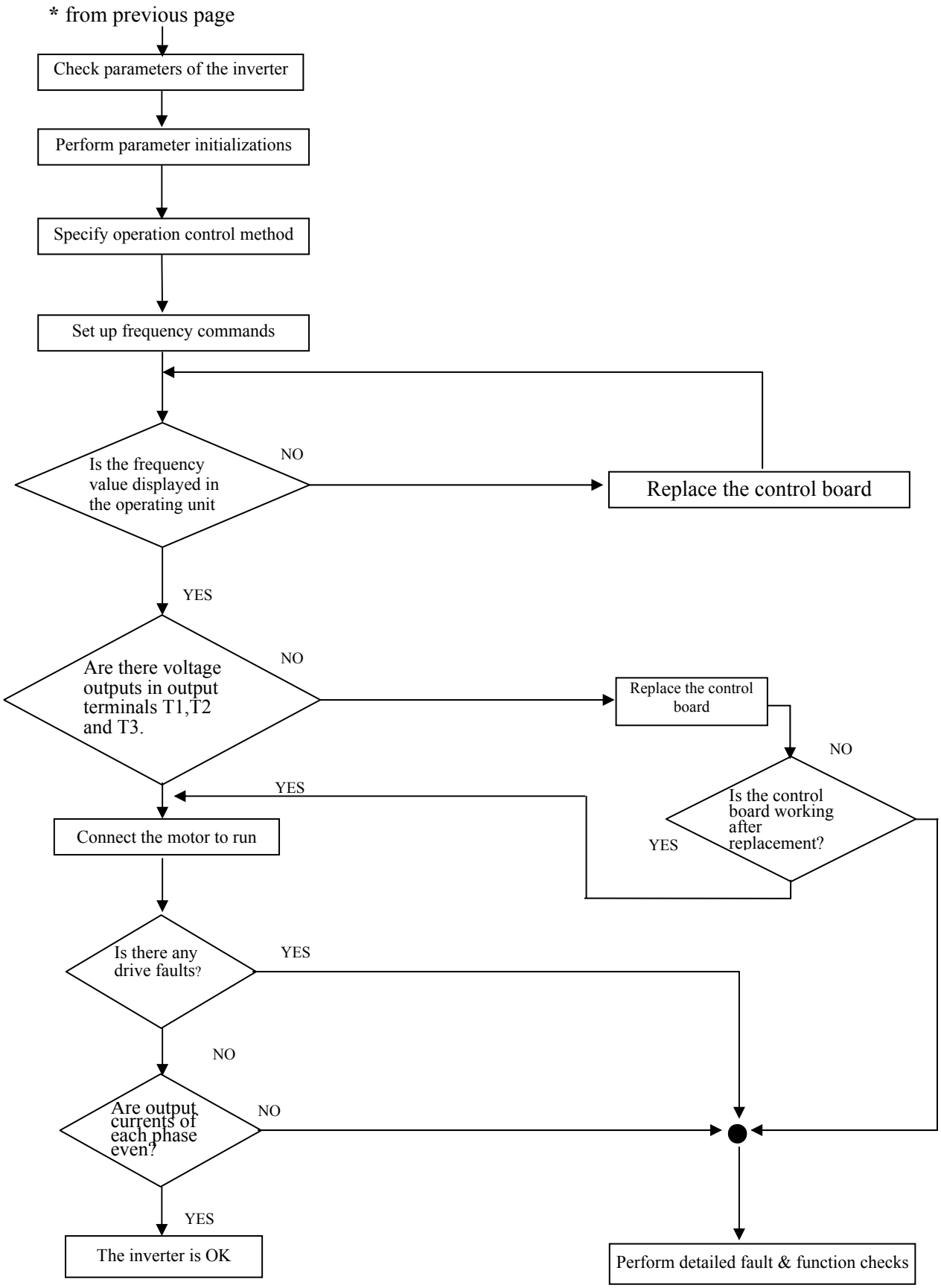


Figure 5-1 General troubleshooting flowchart, CONTD

Troubleshooting for OC, OL error displays

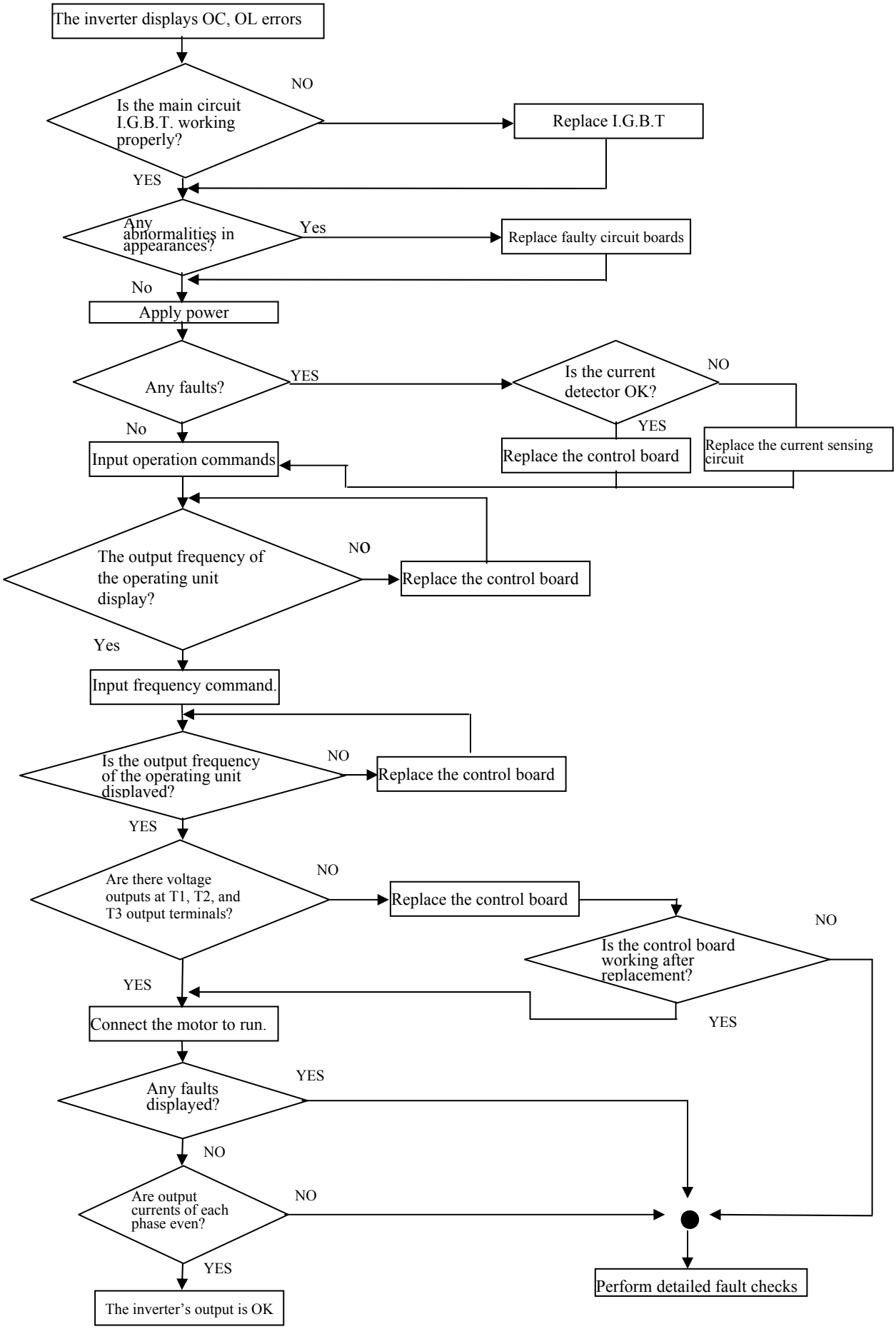


Figure 5-2 OC, OL fault troubleshooting

Troubleshooting for OV, LV error display

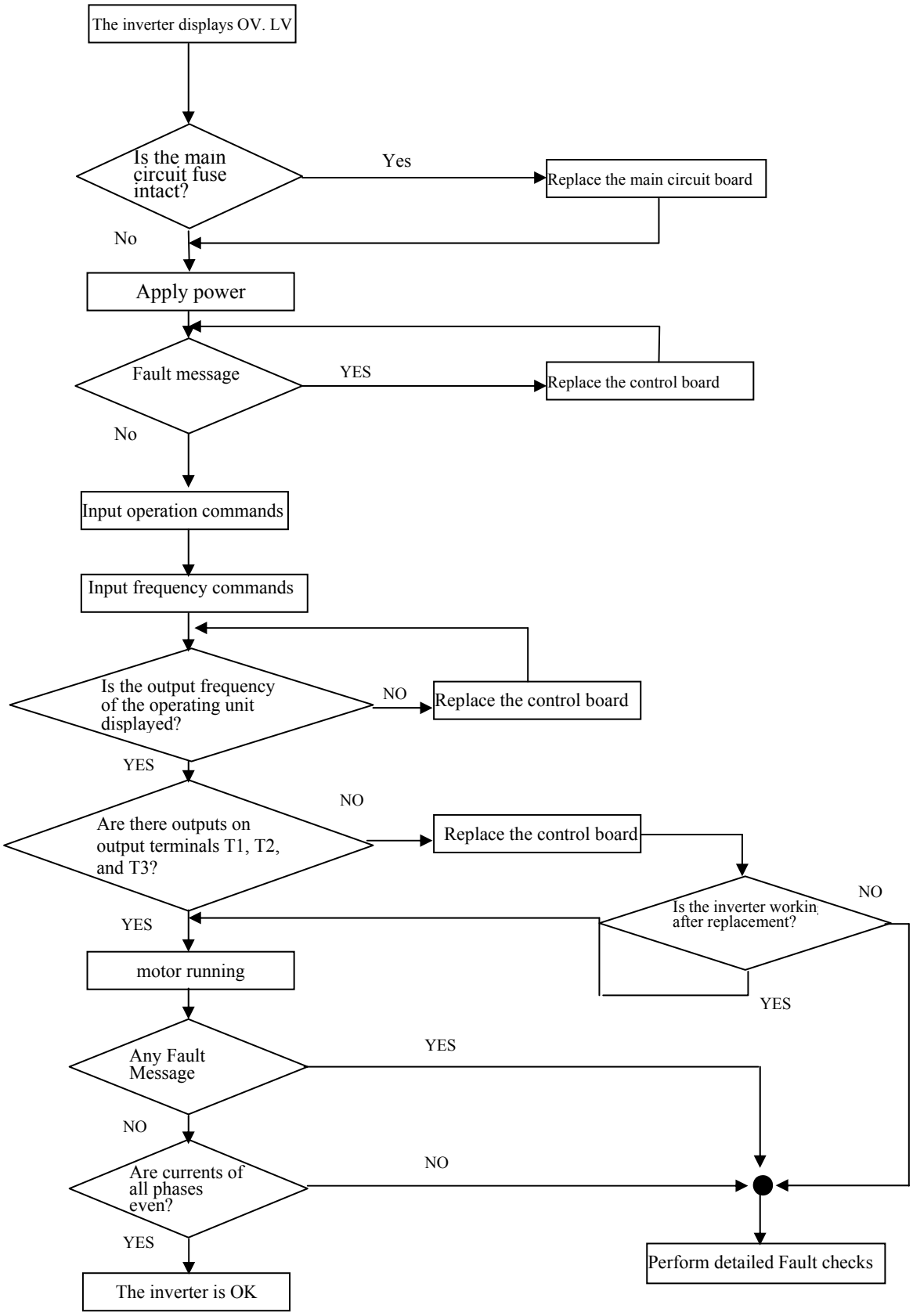


Figure 5-3 OV, Fault Troubleshooting

The motor doesn't run

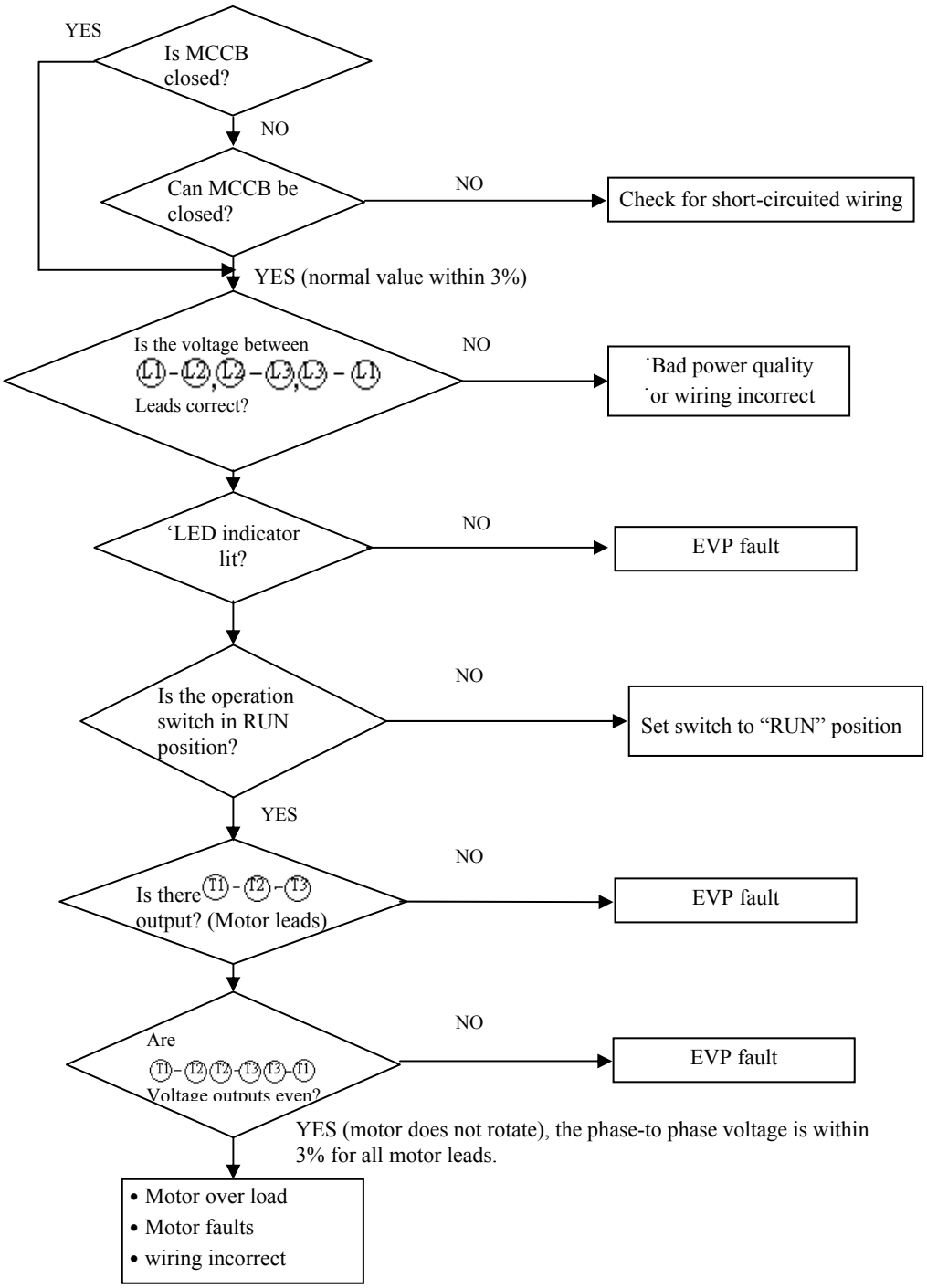


Figure 5-4 Drive Running Troubleshooting diagnostics

Motor is overheated

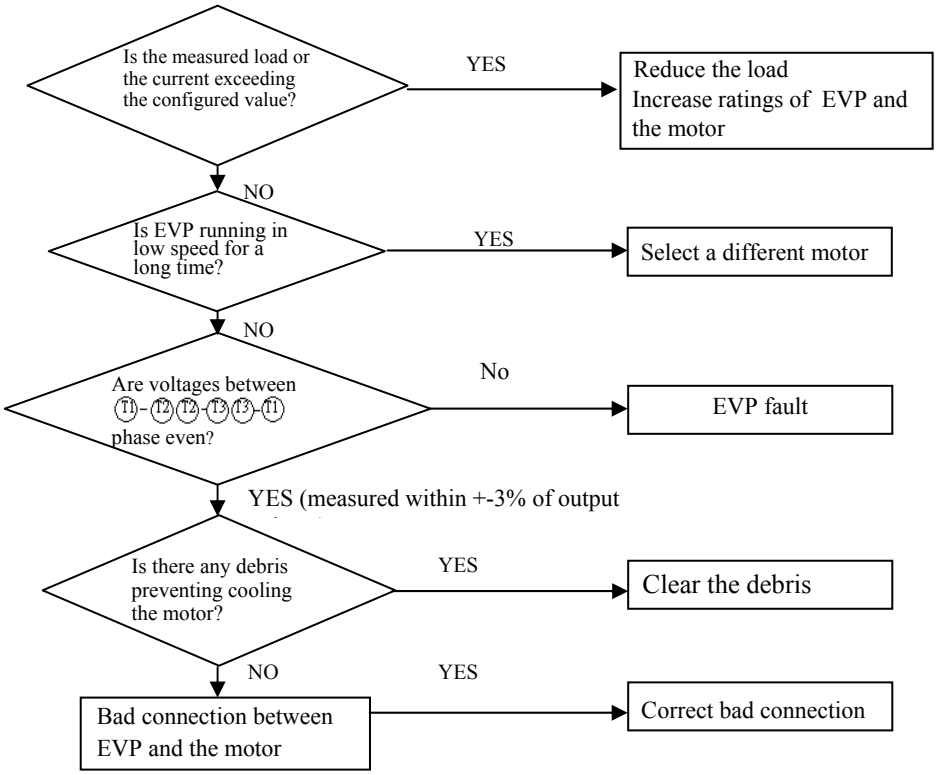


Figure5-5 Motor Overload/Overheating Diagnostics

Motor runs unevenly

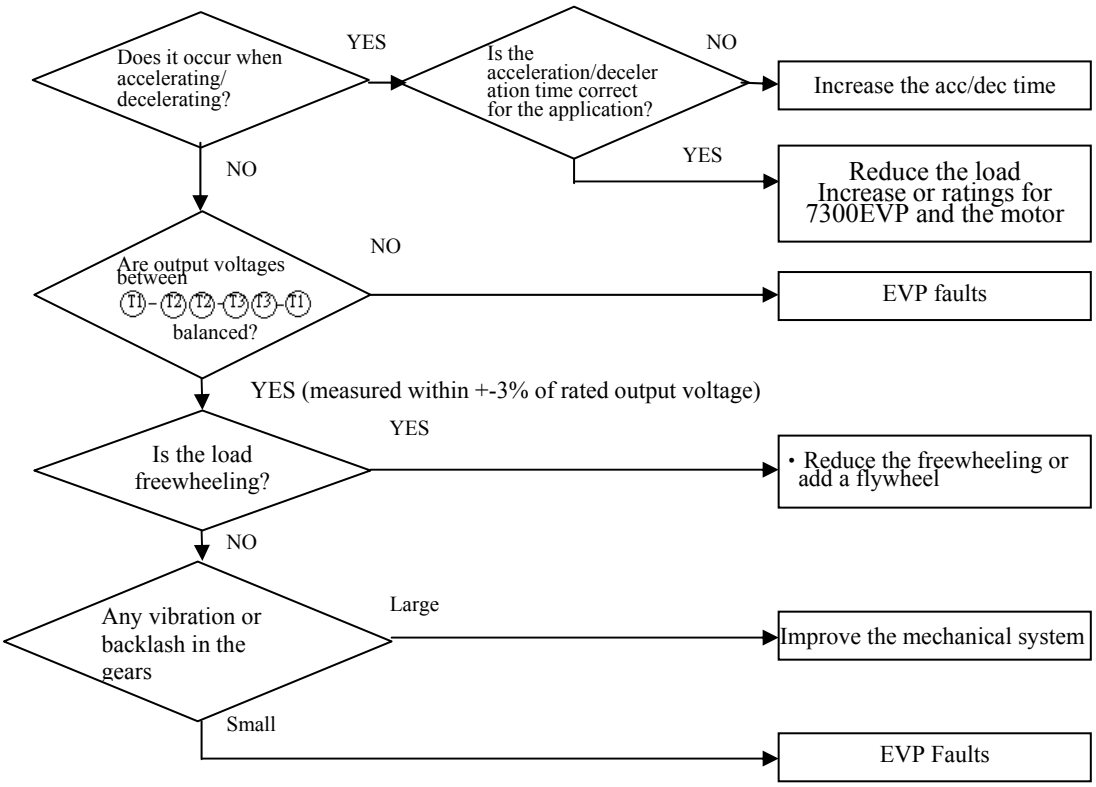


Figure5-6 Oneven Speed Operation Diagnostics

5.4 Routine and periodic checks

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

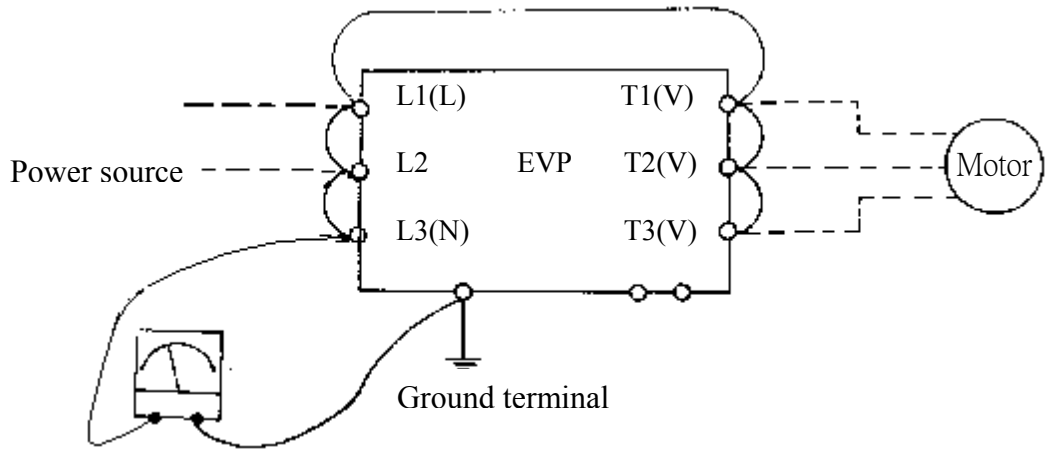
Items	Details	Checking period		Methods	Criteria	Remedies
		Daily	1 year			
Ambient conditions around the machine	Confirm the temperature and humidity at the machine	○		Measure with thermometer and hygrometer according to installation notices.	Temperature: -10 – 50°C (14~120°F) Humidity: Below 95% RH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

5.5 Maintenance and Inspection

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

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

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



DC-500V high resistance meter

Appendix

The definition of Pressure:

$$P = \frac{F}{A} \quad \text{or} \quad P = \frac{dF}{dA}$$

Where:

p is the pressure,
F is the normal force,
A is the area.

Non-SI measures such as *pound per square inch* (psi) and *bar* are used in parts of the world Conversion between Kg/Cm^2 and P.S.I are list as below formula:

1 Kg/Cm^2 = 14.22 P.S.I or 1P.S.I = 0.07 Kg/Cm^2

1 Bar = 1 00 kPa = 1.02 Kg/Cm^2 = 14.5 P.S.I

Conversion of the Pressure unit						
MPa	**KPa**	**Bar**	**Kg/cm^2**	**P.S.I**	**atm**	**mHg**
1	1000	10	10.2	145	9.87	7.5
0.001	1	0.01	0.011	0.145	$9.87x10^{-3}$	$7.5x10^{-1}$
0.1	100	1	1.02	14.5	0.987	0.75
0.09807	98.07	0.981	1	14.22	0.968	0.736
0.00689	6.89	0.069	0.07	1	0.068	0.052
0.101	$1.01x10^2$	1.013	1.033	14.7	1	0.76
0.133	$1.33x10^2$	1.33	1.36	19.3	1.32	1

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