

Bonfiglioli Vectron

S2U IP66

Operating Instructions



1 General Information about the documentation

1.1 Instruction manuals

For better clarity, the documentation is structured according to the customer-specific requirements made on the frequency inverter.

Quick start guide

The Quick Start Guide describes the basic steps required for mechanical and electrical installation of the frequency inverter. The guided commissioning supports you in the selection of necessary parameters and the configuration of the frequency inverter by the software.

Operating instructions

The Operating Instructions describe all functions of the frequency inverter. The parameters required for adapting the frequency inverter to specific applications and the numerous additional functions are described in detail.

Application manual

The application manual supplements the documentation for purposeful installation and commissioning of the frequency inverter. Information on various subjects connected with the use of the frequency inverter is described specific to the application.



If you need a copy of the documentation or additional information, contact your local representative of BONFIGLIOLI.

The present documentation was prepared with great care and was subjected to extensive and repeated reviews. For reasons of clarity, it was not possible to include all details of all types of the product in the documentation. Neither was it possible to consider all conceivable installation, operation or maintenance situations. If you require further information or if you encounter specific problems which are not dealt with in sufficient detail in the documentation, contact your local BONFIGLIOLI agent.

The present document was created in English. Other language versions are translations.

1.2 This document

This document contains important information on the installation and use of the product in its specified application range. Compliance with this document contributes to avoiding risks, minimizing repair cost and downtimes and increasing the reliability and service life of the frequency inverter.

For this reason, make sure you read the document carefully.

The present operating instructions is valid for the frequency inverters series **S2U IP66**.

IMPORTANT:

Compliance with the documentation is required to ensure safe operation of the frequency inverter. BONFIGLIOLI VECTRON GmbH shall not be held liable for any damage caused by any non-compliance with the documentation.



In case any problems occur which are not covered by the documentation sufficiently, please contact the manufacturer.

1.3 Warranty and liability

BONFIGLIOLI VECTRON GmbH (hereinafter referred to as "manufacturer") notes that the contents of this Operating Instructions document do not form part of any previous or existing agreement, assurance or legal relationship between the manufacturer and the user of these Operating Instructions (hereinafter referred to as the "User"). Neither are they intended to supplement or replace such agreements, assurances or legal relationships. Any obligations of the manufacturer shall solely be based on the relevant purchase agreement which also includes the complete and solely valid warranty stipulations. These contractual warranty provisions are neither extended nor limited by the specifications contained in this documentation.

The manufacturer reserves the right to correct or amend the specifications, product information and omissions in these operating instructions without prior notice. The manufacturer assumes no responsibility to update these Operating Instructions. The manufacturer shall not be liable for any damage, injuries or costs which may be caused by the aforementioned reasons.

In addition, the manufacturer excludes any warranty and disclaims all liability, including without limitation direct, indirect, special, punitive, incidental, exemplary or consequential damages arising out of or in connection with one or more of the following causes:

- inappropriate use of the frequency inverter,
- non-compliance with the instructions, warnings and prohibitions contained in the documentation,
- unauthorized modifications of the solar inverter,
- insufficient monitoring of parts of the machine/plant which are subject to wear,
- repair work at the machine/plant not carried out properly or in time,
- catastrophes by external impact and Force Majeure.

1.4 Obligation

This Operating Instructions document must be read before commissioning. Anybody entrusted with tasks in connection with the

- transport,
- assembly,
- installation of the frequency inverter and
- operation of the frequency inverter

must have read and understood the Operating Instructions and, in particular, the safety instructions in order to prevent personal and material losses.

1.5 Copyright

Any copyrights relating to this document shall remain with

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Germany

This document is intended for the operator of the frequency inverter. Any disclosure or copying of this document, exploitation and communication of its contents (as hardcopy or electronically) shall be forbidden, unless permitted expressly.

Any non-compliance will constitute an offense against the copyright law, the law against unfair competition and the German Civil Code and may result in claims for damages. All rights relating to patent, utility model or design registration reserved.

1.6 Storage

The documentation forms an integral part of the frequency inverter. It must be stored such that it is accessible to operating staff at all times. In case the frequency inverter is sold to other users, this Operating Instructions document must also be handed over.

2 General safety instructions and information on use

The chapter "General safety instructions and information on use" contains general safety instructions for the Operator and the Operating Staff. At the beginning of certain main chapters, some safety instructions are included which apply to all work described in the relevant chapter. Special work-specific safety instructions are provided before each safety-relevant work step.

2.1 Terminology

According to the documentation, different activities must be performed by certain persons with certain qualifications.

The groups of persons with the required qualification are defined as follows:

Operator

This is the entrepreneur/company who/which operates the frequency inverter and uses it according to the specifications or has it operated by qualified and instructed staff.

Operating staff

The term Operating Staff covers persons instructed by the Operator of the frequency inverter and tasked with operating the frequency inverter.

Skilled Personnel

The term Skilled Personnel covers staff that are assigned special tasks by the Operator of the frequency inverter, e.g. installation, maintenance and service/repair and troubleshooting. Based on their qualification and/or know-how, Skilled Personnel must be capable of identifying defects and assessing functions.

Qualified electrician

The term Qualified Electrician covers qualified and trained staff who have special technical know-how and experience with electrical installations. In addition, Qualified Electricians must be familiar with the applicable standards and regulations, they must be able to assess the assigned tasks properly and identify and eliminate potential hazards.

Instructed person

The term Instructed Person covers staff who were instructed and trained about/in the assigned tasks and the potential hazards that might result from inappropriate behavior. In addition, instructed persons must have been instructed in the required protection provisions, protective measures, the applicable directives, accident prevention regulations as well as the operating conditions and verified their qualification.

Expert

The term Expert covers qualified and trained staff who have special technical know-how and experience relating to frequency inverter. Experts must be familiar with the applicable government work safety directives, accident prevention regulations, guidelines and generally accepted rules of technology in order to assess the operationally safe condition of the frequency inverter.

2.2 Designated use

The frequency inverter is designed according to the state of the art and recognized safety regulations.

The frequency inverters are electrical drive components intended for installation in industrial plants or machines. Commissioning and start of operation is not allowed until it has been verified that the machine meets the requirements of the EC Machinery Directive 2006/42/EC and DIN EN 60204-1.

The frequency inverters meet the requirements of the low voltage directive 2006/95/EEC and DIN EN 61800-5-1. CE-labeling is based on these standards. Responsibility for compliance with the EMC Directive 2004/108/EC lies with the operator. Frequency inverters are only available at specialized dealers and are exclusively intended for commercial use as per EN 61000-3-2.

No capacitive loads may be connected to the frequency inverter.

The technical data, connection specifications and information on ambient conditions are indicated on the rating plate and in the documentation and must be complied with in any case.

2.3 Misuse

Any use other than that described in "Designated use" shall not be permissible and shall be considered as misuse.

For example, the machine/plant must not be operated

- by uninstructed staff,
- while it is not in perfect condition,
- without protection enclosure (e.g. covers),
- without safety equipment or with safety equipment deactivated.

The manufacturer shall not be held liable for any damage resulting from such misuse. The sole risk shall be borne by the operator.

Disclaimer of failure liability

The manufacturer bears no responsibility for any failures or damaged caused to the inverter if the recommendations in this instruction manual have not been followed. This pertains specifically to the points listed below.

- If a correctly rated Fuse or Circuit breaker has not been installed between the power source and the inverter.
- If a magnetic contactor, a phase capacitor, burst absorber and LC or RC circuits have been connected between the inverter and the motor.
- If an incorrectly rated three-phase squirrel cage induction motor has been used
- When one inverter is driving several motors, the total current of all motors running simultaneously must be less than the rated current of the inverter, and each motor has to be equipped with a correctly rated thermal overload relay.
- "Only Intended For Use In A Pollution Degree 2 Environment" or equivalent.
- Since there is no over speed protection there will be no liability due to overspeed damage.

2.3.1 Explosion protection

The frequency inverter is an IP 66 protection class device. For this reason, use of the device in explosive atmospheres is not permitted.

2.4 Residual risks

Residual risks are special hazards involved in handling of the frequency inverter which cannot be eliminated despite the safety-compliant design of the device. Remaining hazards are not obvious and can be a source of possible injury or health damage.

Typical residual risks include:

Electrical hazard

Danger of contact with energized components due to a defect, opened covers or enclosures or improper working on electrical equipment.

Danger of contact with energized components in frequency inverter if no external disconnection device was installed by the operator.

Electrostatic charging

Touching electronic components bears the risk of electrostatic discharges.

Thermal hazards

Risk of accidents by hot machine/plant surfaces, e.g. heat sink, transformer, fuse or sine filter.

Charged capacitors in DC link

The DC link may have dangerous voltage levels even up to three minutes (or up to eight minutes with bigger devices) after shutdown.

Danger of equipment falling down/over, e.g. during transport

The center of gravity is not the in middle of the electric cabinet modules.

2.5 Safety and warning signs on the frequency inverter

- Comply with all safety instructions and danger information provided on the frequency inverter.
- Safety information and warnings on the frequency inverter must not be removed.

2.6 Warning information and symbols used in the operating instructions

2.6.1 Hazard classes

The following hazard identifications and symbols are used in the Operating Instructions to mark particularly important information:



DANGER

Identification of immediate threat holding a **high** risk of death or serious injury if not avoided.



WARNING

Identification of immediate threat holding a **medium** risk of death or serious injury if not avoided.








CAUTION

Identification of immediate threat holding a **low** risk of minor or moderate physical injury if not avoided.


NOTICE

Identification of a threat holding a risk of material damage if not avoided.



2.6.2 Hazard symbols

Symbol	Meaning	Symbol	Meaning
	General hazard		Suspended load
	Electric voltage		Hot surfaces
	Danger of crushing		


2.6.3 Prohibition signs

Symbol	Meaning
	No switching; it is forbidden to switch the machine/plant, assembly on


2.6.4 Personal safety equipment

Symbol	Meaning
	Wear body protection
	Wear ear protectors


2.6.5 Recycling

Symbol	Meaning
	Recycling, to avoid waste, collect all materials for reuse


2.6.6 Grounding symbol

Symbol	Meaning
	Ground connection

2.6.7 ESD symbol

Symbol	Meaning
	ESD: Electrostatic Sensitive Devices, i.e. components and assemblies sensitive to electrostatic energy

2.6.8 Information signs

Symbol	Meaning
	Tips and information making using the frequency inverter easier.

2.6.9 Font style in documentation

Example	Font style	Use
1234	bold	Representation of parameter numbers
<i>Parameter</i>	inclined, font: Times New Roman	Representation of parameter names
1234	font: Courier New	Representation of parameter values
P.1234	bold	Representation of parameter numbers without name, e.g. in formulas
Q.1234	bold	Representation of source numbers
•	Bullet point	Indicates an action to be taken
_	Bullet dash	Indicates a list of items

2.7 Directives and guidelines to be adhered to by the operator

The operator must follow the following directives and regulations:

- Ensure that the applicable workplace-related accident prevention regulations as well as other applicable national regulation are accessible to the staff.
- An authorized person must ensure, before using the frequency inverter, that the device is used in compliance with its designated use and that all safety requirements are met.
- Additionally, comply with the applicable laws, regulations and directives of the country in which the frequency inverter is used.
- Any additional guidelines and directives that may be required additionally shall be defined by the operator of the machine/plant considering the operating environment.

2.8 Operator's general plant documentation

- In addition to the Operating Instructions, the operator should issue separate internal user manuals for the frequency inverter. The Operating Instructions of the frequency inverter must be included in the Operating Instructions of the whole plant.

2.9 Operator's/operating staff's responsibilities

2.9.1 Selection and qualification of staff

- Any work on the frequency inverter may only be carried out by Skilled Personnel. The staff must not be under the influence of any drugs. Note the minimum age required by law. Define the staff's responsibility pertaining to all work on the frequency inverter clearly.
- Work on the electrical components may only be performed by a qualified electrician according to the applicable rules of electrical engineering.
- The operating staff must be trained for the relevant work to be performed.

2.9.2 General work safety

- In addition to the Operating Instructions of the machine/plant, any applicable legal or other regulations relating to accident prevention and environmental protection must be complied with. The staff must be instructed accordingly.
Such regulations and/or requirements may include, for example, handling of hazardous media and materials or provision/use of personal protective equipment.
- In addition to these Operating Instructions, issue any additional directives that may be required to meet specific operating requirements, including supervision and reporting requirements, e.g. directives relating to work organization, workflow and employed staff.
- Unless approved of expressly by the manufacturer, do not modify the frequency inverter in any way, including addition of attachments or retrofits.
- Only use the frequency inverter if the rated connection and setup values specified by the manufacturer are met.
- Provide appropriate tools as may be required for performing all work on the frequency inverter properly.

2.9.3 Ear protectors

- The frequency inverter produces noise. For this reason it should be installed in areas where people normally don't stay.
- Noise emission in operation is < 85 dB(A) in the case of sizes 1 through 7.
- Noise emission in operation is approx. 86 dB(A) in the case of size 8. Ear protectors must be used when staying near the frequency inverter

2.10 Organizational measures

2.10.1 General

- Train your staff in the handling and use of the frequency inverter and the machine/plant as well as the risks involved.
- Use of any individual parts or components of the frequency inverter in other parts of the operator's machine/plant is prohibited.
- Optional components for the frequency inverter must be used in accordance with their designated use and in compliance with the relevant documentation.

2.10.2 Use in combination with third-party products

- Please note that Bonfiglioli Vectron MDS GmbH will not accept any responsibility for compatibility with third-party products (e.g. motors, cables or filters).
- In order to enable optimum system compatibility Bonfiglioli Vectron MDS GmbH offers components facilitating commissioning and providing optimum synchronization of the machine/plant parts in operation.
- If you use the frequency inverter in combination with third-party products, you do so at your own risk.

2.10.3 Handling and installation

- Do not commission any damaged or destroyed components.
- Prevent any mechanical overloading of the frequency inverter. Do not bend any components and never change the isolation distances.
- Do not touch any electronic construction elements and contacts. The frequency inverter is equipped with components which are sensitive to electrostatic energy and can be damaged if handled improperly. Any use of damaged or destroyed components will endanger the machine/plant safety and shall be considered as non-compliance with the applicable standards.
- Only install the frequency inverter in a suitable operating environment. The frequency inverter is exclusively designed for installation in industrial environments.
- If seals are removed from the case, this can result in the warranty becoming null and void.

2.10.4 Electrical connections

- The five safety rules must be complied with.
- Never touch live terminals. The DC-link may have dangerous voltage levels for up to 5 minutes after shutdown.
- When performing any work on/with the frequency inverter, always comply with the applicable national and international regulations/laws on work on electrical equipment/plants of the country in which the frequency inverter is used.
- The cables connected to the frequency inverters may not be subjected to high-voltage insulation tests unless appropriate circuitry measures are taken before.
- Only connect the frequency inverter to suitable supply mains. The frequency inverter may be operated in TN, TT and IT grid types. Precautions must be taken for operation in IT grids. Operation in a corner-grounded TN grid shall not be permissible.

The five safety rules

When working on/in electrical plants, always follow the five safety rules:

- 1 Disconnect
- 2 Secure to prevent restarting
- 3 check for absence of voltage,
- 4 carry out earthing and short-circuiting
- 5 cover or shield neighboring live parts

2.10.5 Safe operation

- During operation of the frequency inverter, always comply with the applicable national and international regulations/laws on work on electrical equipment/plants.
- Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to the applicable national and international safety directives.
- During operation, all covers must be installed correctly, and all electrical cabinet doors must be closed. During operation, never open the machine/plant.
- No connection work shall be carried out while power supply is on.
- The machine/plant is live with high voltage levels during operation, is equipped with rotating parts (fan) and has hot surfaces. Any unauthorized removal of covers, improper use, wrong installation or operation may result in serious injuries or material damage.
- Some components, e.g. the heat sink or braking resistor, may be hot even some time after the machine/plant was shut down. Don't touch any surfaces directly after shutdown. Wear safety gloves where necessary.
- The frequency inverter may hold dangerous voltage levels until the capacitor in the DC link is discharged. After shutdown, wait for at least 5 minutes before starting any electrical or mechanical work on the frequency inverter. Even after this waiting time, make sure that the equipment is de-energized in accordance with the safety rules before starting the work.
- In order to avoid accidents or damage, only qualified staff and electricians may carry out the work such as installation, commissioning or setup.
- In the case of a defect of terminals and/or cables, immediately disconnect the frequency inverter from mains supply.

- Persons not familiar with the operation of the frequency inverter and children must not have access to the device.
- Do not bypass nor decommission any protective devices.
- The frequency inverter may be connected to power supply every 60 s. This must be considered when operating a mains contactor in jog operation mode. For commissioning or after an emergency stop, a non-recurrent, direct restart is permissible.
- After a failure and restoration of the power supply, the motor may start unexpectedly if the AutoStart function is activated. If staff are endangered, a restart of the motor must be prevented by means of external circuitry.
- Before commissioning and the start of the operation, make sure to fix all covers and check the terminals. Check the additional monitoring and protective devices according to EN 60204 and applicable the safety directives (e.g. Working Machines Act or Accident Prevention Directives).

2.10.6 Maintenance and service/troubleshooting

- Visually inspect the frequency inverter when carrying out the required maintenance work and inspections at the machine/plant.
- Perform the maintenance work and inspections prescribed for the machine carefully, including the specifications on parts/equipment replacement.
- Work on the electrical components may only be performed by a qualified electrician according to the applicable rules of electrical engineering. Only use original spare parts.
- Unauthorized opening and improper interventions in the machine/plant can lead to personal injury or material damage. Any repair work may only be carried out by the manufacturer or persons approved/licensed by the manufacturer. Any repair work must be carried out by qualified electricians. Check protective equipment regularly.
- Before performing any maintenance work, the machine/plant must be disconnected from mains supply and secured against restarting. The five safety rules must be complied with.

2.10.7 Final decommissioning

Unless separate return or disposal agreements were made, recycle the disassembled frequency inverter components:

- Scrap metal materials
- Recycle plastic elements
- Sort and dispose of other component materials



Electric scrap, electronic components, lubricants and other utility materials must be treated as special waste and may only be disposed of by specialized companies.



In any case, comply with any applicable national disposal regulations as regards environmentally compatible disposal of the frequency inverter. For more details, contact the competent local authorities.

2.11 Before Power-Up



WARNING

Physical injuries / material damage due to inappropriate handling

Inappropriate handling of the device may result in serious physical injuries or major material damage.

- Only qualified persons are allowed to work with the device.

WARNING**Material damage**

Incorrect wiring of the power circuit can result in permanent destruction of the frequency inverter.

- Strictly take care to wire the power circuit correctly. The terminals L1(L) and L3(N) are for connection to a one-phase mains. The terminals L1, L2, L3 are for connection to a three-phase mains.
- Do not confound the power input terminals with the power output terminals U, V and W.

CAUTION**Material damage**

If the control terminals are accessible to touch during operation, this may lead to material damage. Safe operation as defined in EN 61800-5-1 is not guaranteed.

- In order to guarantee safe operation as defined in EN 61800-5-1, the control terminals must not be accessible to touch during operation.

NOTICE**High-frequency interferences possible**

The frequency inverter meets the requirements of the standards EN 61800-3 and EN 61800-5-1. In a residential environment, the device may produce high-frequency interferences.

- In such cases, the operator must take suitable measures to compensate.

NOTICE**Mains voltage compatibility**

The mains voltage must match the input voltage of the frequency inverter.

- Check the name plate.

NOTICE**Device damage**

The mains must be hard-wired with the frequency inverter. The control terminals meet the standard EN 61800-5-1 (system voltage 300 V, overvoltage category 3).

- Hard-wire the mains with the frequency inverter.

2.12 During Power-Up

WARNING**Immediate starting at power-up**

If immediate restarting after power-up is configured and external FWD/REV switch is switched on, the device will start immediately. This may result in serious physical injuries or major material damage.

- Re-consider all risks and safety-relevant aspects before application.
- If restarting after mains failure is set and the failure duration is short, the control circuit operates with stored energy. Because of this, the inverter starts according to the setting of the parameters **07-00** and **07-01** of the complete parameter set or parameter **F_23** of the simplified parameter set, respectively.

In the case of a short mains failure of over 2 seconds the energy stored inside the frequency inverter does not suffice to supply the control circuit. Therefore, the operating behavior depends on the settings of the following parameters:

- Parameter **00-02** or **00-03** of the complete parameter set (or parameter **F_10** of the simplified parameter set).
- Immediate restarting after power-up. Parameter **07-04** and the state of the external power-up-switch.

2.13 Before Operation

NOTICE

Power compatibility

The power setting selected for the device must match the power rating.

- Check the name plate.
- Verify that the setting of the parameter **13-00** matches the data on the name plate.
- Note: at application of mains voltage the value set in parameter **01-01** flashes on the display for 2 seconds.

2.14 During operation

DANGER



Risk of death and irreversible destruction of material

Electrical connection work during operation will result in severe permanent injury or death and irreversible destruction of the device.

- The motor must not be connected or disconnected during operation of the frequency inverter.

DANGER



Risk of death and irreversible destruction of material

Removing the front cover will result in electric shock and result in severe permanent injury or death and irreversible destruction of the device.

The functionality of the stop switch differs from the functionality of the EMERGENCY OFF switch. The stop switch is activated for its designated function. The EMERGENCY OFF switch is deactivated.

- Do not remove the front cover while the supply voltage is applied.
- Before removing assemblies or checking the components, ensure and verify that the supply voltage is deactivated.

DANGER



Risk of death and irreversible destruction of material due to immediate starting at power-up

If immediate restarting after power-up is configured, the device will start immediately. This will result in serious physical injuries, death or irreversible destruction of the device.

- Execute utmost caution when in the operating range of the device or its peripheral components.

DANGER**Risk of electric shock**

The DC-link capacitors will hold dangerous voltage levels until the capacitors in the DC link are discharged.

- After shutdown, wait for at least 5 minutes before starting any electrical or mechanical work on the frequency inverter.
- Even after this waiting time, make sure that the equipment is de-energized in accordance with the safety rules before starting the work.
- Do not make any connections when the inverter is powered on.
- Do not check parts and signals on circuit boards during the inverter operation.
- Do not disassemble the inverter or modify any internal wires, circuits, or parts.
- Ensure that the inverter ground terminal is connected correctly.

CAUTION**Hot surfaces**

Some components, e.g. the heat sink or braking resistor, may be hot even some time after the machine/plant was shut down.

- Do not touch any surfaces directly after shutdown. Wear safety gloves where necessary.

CAUTION**Material damage**

The frequency inverter can operate the motor at low and at high speed. Inappropriate speed setting may result in motor or machine damage.

- Ensure that the rotation speed corresponds to the permissible speed range of the motor and of the machine.

CAUTION**Material damage**

High voltage can destroy the semiconductor components.

- Do not perform a voltage test on parts inside the inverter.
- Do not connect U, V, and W terminals of the inverter to any AC input power supply.
- CMOS ICs on the inverter's main board are susceptible to static electricity. Do not touch the main circuit board.



The device can be operated at ambient temperatures of -10 ... 40 °C (14 ... 104 °F) and a relative air humidity of max. 95 % (non-condensing).

3 Storage and transport

3.1 Storage

NOTE

Damage caused by incorrect storage

- Wrong or inappropriate storage may result in damage, e.g. due to moisture and dirt. Avoid major temperature variations and high air humidity.
- During storage, protect the device against moisture and dirt.
- The frequency inverters must be stored in an appropriate way. During storage, the devices must remain in their original packaging.
- The units may only be stored in dry rooms which are protected against dust and moisture and are exposed to small temperature deviations only. The requirements of DIN EN 60721-3-1 for storage, DIN EN 60721-3-2 for transport and labeling on the packaging must be met.

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

- 1 to 2 years storage: Apply 100% rated voltage for one hour.
- 2 to 3 years storage: Apply 25%, 50 % , 75% and 100% at 30 minutes intervals.

3.2 Special safety instructions on transport of heavy frequency inverters

WARNING



High weight and unusual center of gravity!

Due to the size and weight of the frequency inverter, there is the risk of accidents during transport. Center of gravity may not be in the middle of the frequency inverter.

- Take utmost care during transport in order to prevent damage and deformation. Transport, attachment and lifting of loads may only be carried out by specially instructed staff who are familiar with the work.
- Only use suitable transport and lifting equipment with sufficient carrying capacity. The lifting cables/chains used must be able to carry the weight of the frequency inverter. Check the ropes or chains for damage.
- Wear appropriate safety clothing.
- When lifting the frequency inverter up ensure that it does not fall over, is displaced, swings out or falls down.
- Do not step under suspended loads.
- Do not put the frequency inverter down in upright position without providing a suitable supporting structure.

3.3 Dimensions/weight



For information on the weight and dimensions of the frequency inverter, refer to chapter 4 "Technical data".

3.4 Transfer to place of installation

CAUTION



Inappropriate method of transportation

Inappropriate handling of the device may result in material damage or in physical injuries.

- Do not carry the device while holding it by the cover. The front cover can come off. In order to guarantee safe operation as defined in EN 61800-5-1, the control terminals must not be accessible to touch during operation.

Transfer to the place of installation is done with the product in its original packaging. A fork lift truck or crane with crane fork can be used for transfer to the place of installation.

- Apply the fork in the middle of the transport unit.
- Secure the transport unit to prevent it from falling down and overturning.
- Lift the transport unit up carefully.
- At the place of installation, put the transport unit down on a level and bearing surface.

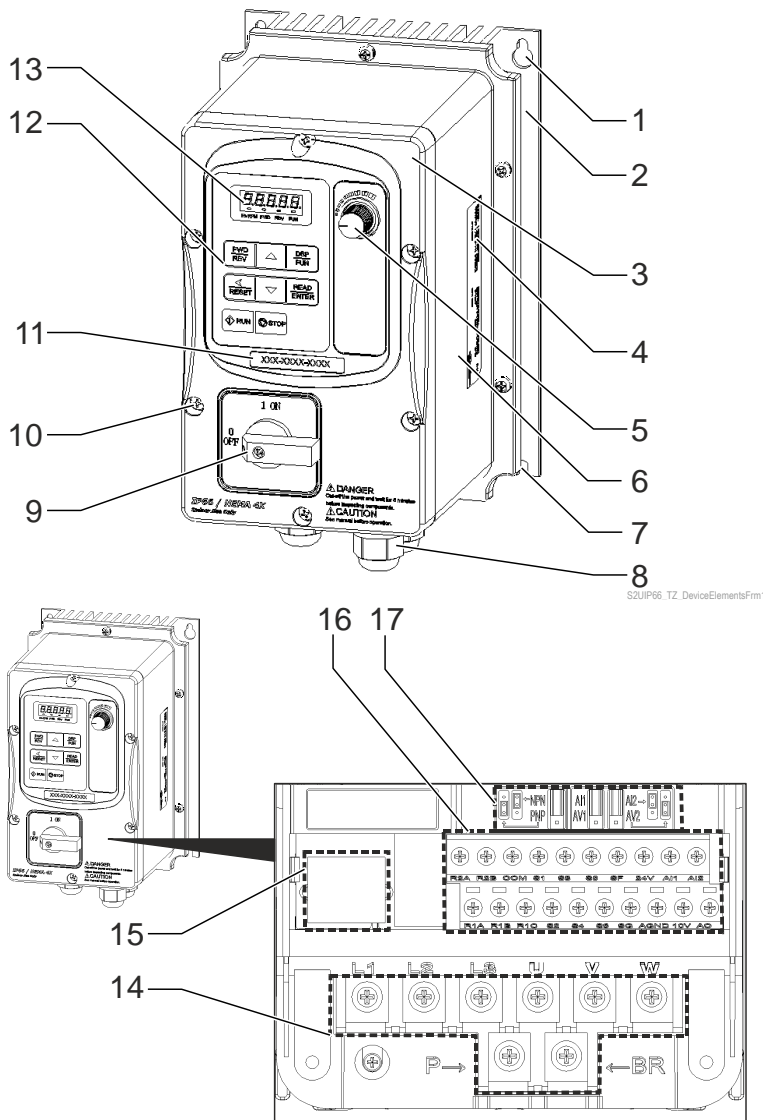
3.5 Unpacking the device

- Carefully remove packaging.
- Check if the delivered devices corresponds to the order.
- Check the device for transport damage and completeness.
- Any defects/damage must be reported to the supplier immediately.



Ensure that all packaging materials are disposed of in an environmentally compatible manner.

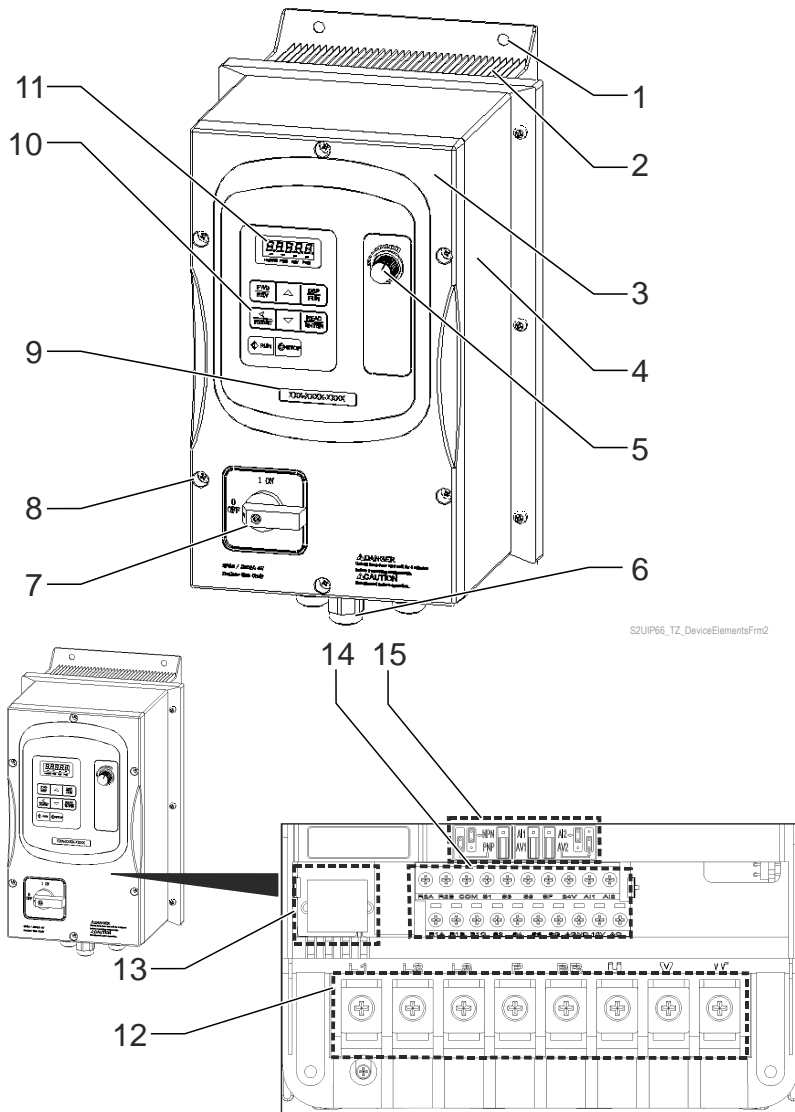
4 Technical data



SZUIP66_TZ_InteriorLayoutFrm1

Figure 4-1: frame 1 device element identification

1	Mounting hole	10	Screw
2	Heat sink	11	Model label
3	Front cover	12	Operator panel
4	Name plate label	13	5-digit display
5	VR	14	Terminal block TM1
6	Bottom cover	15	RJ45 interface
7	Mounting hole	16	Terminal block TM2
8	Waterproof cable gland	17	Jumpers
9	Power switch		

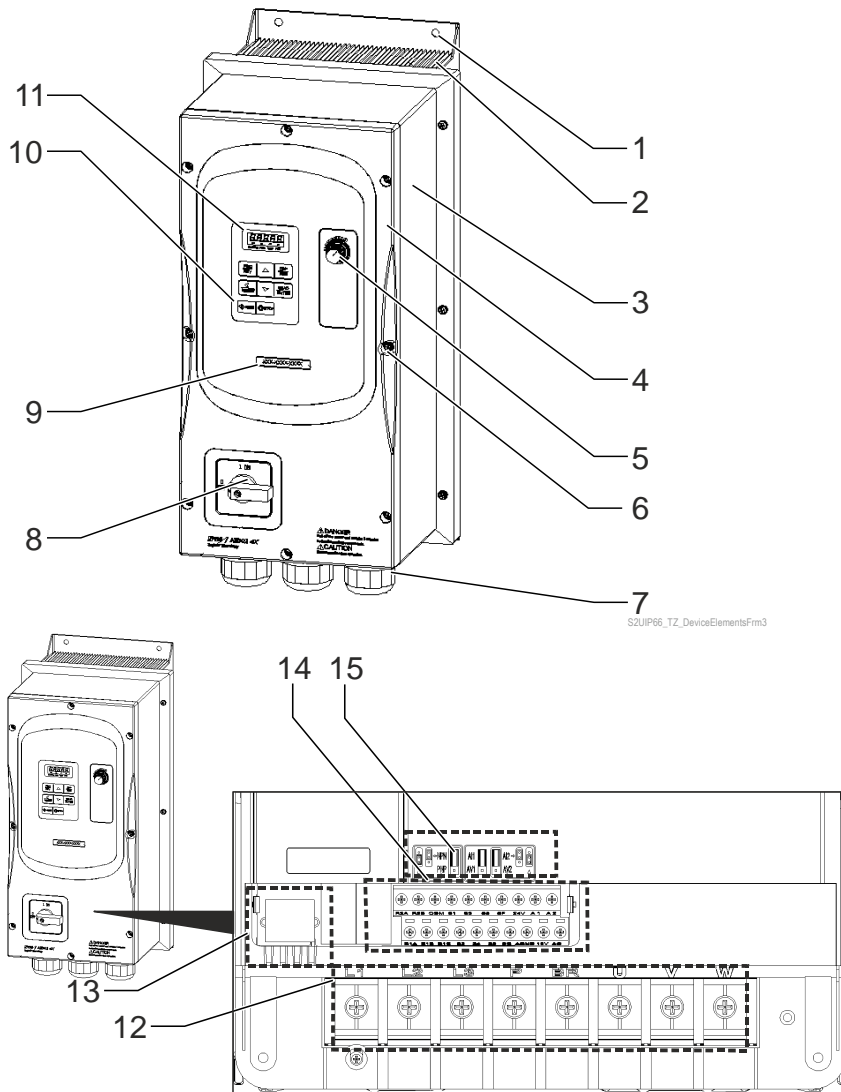


S2UIP66_TZ_DeviceElementsFrm2

S2UIP66_TZ_InteriorLayoutFrm2

Figure 4-2: frame 2 device element identification

1	Mounting hole	9	Model label
2	Heat sink	10	Operator panel
3	Front cover	11	5-digit display
4	Bottom cover	12	Terminal block TM1
5	VR	13	RJ45 interface
6	Waterproof cable gland	14	Terminal block TM2
7	Power switch	15	Jumpers
8	Screw		



S2UIP66_TZ_DeviceElementsFm3

S2UIP66_TZ_InteriorLayoutFm3

Figure 4-3: frame 3 device element identification

1	Mounting hole	9	Model label
2	Heat sink	10	Operator panel
3	Bottom cover	11	5-digit display
4	Front cover	12	Terminal block TM1
5	VR	13	RJ45 interface
6	Screw	14	Terminal block TM2
7	Waterproof cable gland	15	Jumpers
8	Power switch		

4.1 General technical data

CE conformity	The S2U frequency inverters meet the requirements of the low voltage directive 2006/95/EEC and DIN EN 61800-5-1.
EMC directive	For proper installation of the frequency inverter in order to meet the requirements of EN 61800-3, please comply with the installation instructions in these operating instructions.
Interference immunity	The S2U frequency inverters meet the requirements of EN 61800-3 for use in industrial environments.
UL Approval	The frequency inverters are also marked with the UL label according to UL508c, which proves that they also meet the requirements of the CSA Standard C22.2-No. 14.
Ambient temperature	Storage: -20 ... 60 °C (-4 ... 140 °F) Operation: -10 ... 50 °C (14 ... 122 °F) If several inverters are installed in the same Operator panel, ensure adequate spacing and provide the necessary cooling and ventilation for successful operation.
Environmental conditions	Operation: 3K3 (EN60721-3-3) Relative humidity: max95%, no water condensation Notice prevention of inverter freezing up.(Compliance with IEC 60068-2-78).
Ingress protection rating	IP66
Shock resistance	1G. (9.8m/s ²) for 20 Hz and below 0.6G (5.88m/s ²) from 20 Hz to 50 Hz (Compliance with IEC 60068-2-6)
Storage	Storage according to EN 50178. After one year of storage, connect the device to mains voltage for 60 minutes.

Control Mode		V/F Control, Vector Control
Frequency	Output Frequency	0.01~599.00 Hz
	Starting Torque	150%/1 Hz(Vector)
	Speed Control Range	1:50
	Setting resolution	Digital input: 0.01 Hz Analog input:0.06 Hz/60 Hz
	Setting	Keypad:Set directly with ▲ ▼ keys or the VR on the keypad External Input Terminlas: AI1 (0/2~10 V), AI2 (0/4~20 mA)input Multifunction input up/down function (Group3)
		Setting frequency by communication method.
	Frequency limit	Lower and upper frequency limits 3 skip frequency settings.
	Run	Operation set
		Run signal by communication method.
Current		Overload current 1.5 x rated current (for 60 s)

Main Control Features	V / F curve setting	18 fixed curves and one customized curve
	Carrier frequency	1~16 kHz
	Acceleration and deceleration control	2 off Acc / dec time parameters. 4 off S curve parameters.
	Multifunction input	29 functions (refer to description on group3)
	Multifunction output	21 functions (refer to description on group3)
	Multifunction analog output	5 functions (refer to description on group4)
	Main features	Overload Detection, 16 preset speeds, Auto-run, Acc/Dec Switch (2 Stages), Main/Alt run Command select, Main/Alt Frequency Command select, PID control, torque boost, V/F start Frequency, Fault reset, Firemode.
Display	LED	Display :parameter / parameter value / frequency / line speed / DC voltage / output voltage / output current / PID feedback / input and output terminal status / Heat sink temperature / Program Version / Fault Log.
	LED Status Indicator	Run / Stop / Forward / Reverse ,and etc.
Protective Functions	Overload Protection	The relays to protect the motor and the inverter. (150%/1min)
	Over voltage	230 V: >410 V , 400 V: >820 V
	Under Voltage	230 V: <190V , 400 V: <380 V
	Momentary Power Loss Restart	Inverter auto-restart after a momentary power loss.
	Stall Prevention	Stall prevention for Acceleration/ Deceleration/ Operation.
	Short-circuit output terminal	Electronic Circuit Protection
	Grounding Fault	Electronic Circuit Protection
Other protection features	Protection for overheating of heat sink, The carrier frequency decreasing with the temperature function, fault output, reverse prohibit, prohibit for direct start after power up and error recovery, parameter lock up	
All frames include brake transistor		
Communication control		Standard built-in RS485 communication (Modbus), One to one or One to many control.

De-rating curves

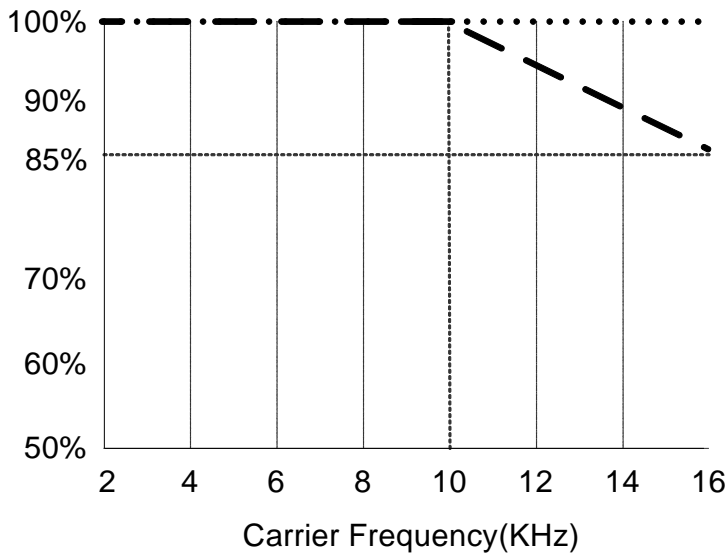
Curves below show the applicable output current de-rate due to setting of carrier frequency and the ambient operating temperatures of 40 and 50 degrees C.

Frame1/2/3

(Single phase: 230 V: 0.4 ... 2.2 kW;

Three phase: 400 V: 0.75 ... 18.5 kW)

Rating Current(I_n)



Note: De-rate curve for ambient temperature of 40 degree C.

----- De-rate curve for ambient temperature of 50 degree C.

Figure 4-4: Derating by frequency and ambient temperature

4.2 Model-specific technical data

4.2.1 Name plate (example)

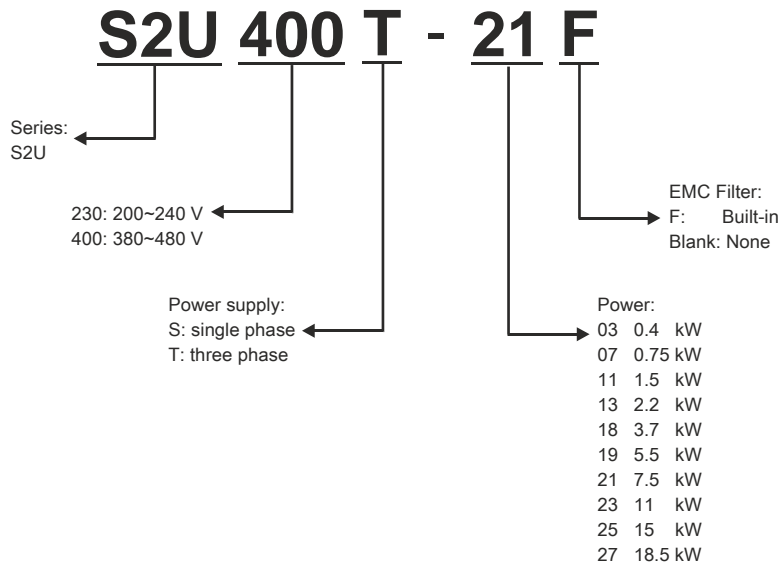
MODEL	S2U400T-21 F IP66	MOTOR RATING :	10HP/7.5kW	
INPUT	AC 3 PH 50/60Hz	380-480V(+10%,-15%)	23A	
OUTPUT	AC 3 PH 0-599Hz	0-480V	17.5A	IP20

P/N	S/N	
S2U00000000	(10)173700000(21)20201F0000002010000	LISTED
		Power Conversion Equipment
		E23486

Made In China

Figure 4-5: Name plate (example)

4.2.2 Model identification



S2UIP66-TD_ModelBez-V00

Figure 4-6: Model identification

IP66 / NEMA 4X Type

Model	[kW]	Filter	Switch	Frame Size
S2U230S-03 F IP66	0.4	X	X	1
S2U230S-07 F IP66	0.75	X	X	1
S2U230S-11 F IP66	1.5	X	X	2
S2U230S-13 F IP66	2.2	X	X	2
S2U400T-07 F IP66	0.75	X	X	1
S2U400T-11 F IP66	1.5	X	X	1
S2U400T-13 F IP66	2.2	X	X	2
S2U400T-18 F IP66	3.7	X	X	2
S2U400T-19 F IP66	5.5	X	X	3
S2U400T-21 F IP66	7.5	X	X	3
S2U400T-23 F IP66	11	X	X	3
S2U400T-25 IP66	15	-	-	3
S2U400T-27 IP66	18.5	-	-	3

X : Built-in / - : None

4.2.3 200 V Class: Single phase

Model: S2U230S-□□ F IP66	03	07	11	13
Suitable motor capacity [kW]	0.4	0.75	1.5	2.2
Rated output current [A]	3.1	4.5	7.5	10.5
Rated capacity [KVA]	1.2	1.7	2.90	4.00
Input voltage range[V]	Single Phase: 200~240 V, 50/60 Hz			
Allowable voltage fluctuation	+10%-15%			
Output voltage range[V]	Three phase: 0~240 V			
Input current [A]*	8.5	12	16	23.9
Inverter net weight [kg]	1.65	1.65	2.5	2.5
Allowable momentary power loss time [s]	2.0	2.0	2.0	2.0
Enclosure	IP66/NEMA4X			

*The input current is calculated value at full rated output current.

4.2.4 400 V Class:Three phase

Model: S2U400T-□□ F IP66	07	11	13	18
Suitable motor capacity [kW]	0.75	1.5	2.2	3.7
Rated output current [A]	2.3	3.8	5.2	8.8
Rated capacity [kVA]	1.7	2.9	4.0	6.7
Input voltage range[V]	Three phase:380~480 V, 50/60 Hz			
Allowable voltage fluctuation	+10%-15%			
Output voltage range[V]	Three phase: 0~480 V			
Input current [A]*	4.2	5.6	7.3	11.6
Inverter net weight [kg]	1.7	1.7	2.5	2.5
Allowable momentary power loss time [s]	2.0	2.0	2.0	2.0
Enclosure	IP66/NEMA4X			

*The input current is calculated value at full rated output current.

Model: S2U400T-□□ (F) IP66	19	21	23	25	27
Suitable motor capacity [kW]	5.5	7.5	11	15	18.5
Rated output current [A]	13.0	17.5	24	32	40
Rated capacity [kVA]	9.9	13.3	19.1	24	30.5
Input voltage range[V]	Three phase: 380~480 V, 50/60 Hz				
Allowable voltage fluctuation	+10%-15%				
Output voltage range[V]	Three phase: 0~480 V				
Input current [A]*	17	23	31	38	48
Inverter net weight [KG]	6.7	6.7	6.7	13.7	13.7
Allowable momentary power loss time [s]	2.0	2.0	2.0	2.0	2.0
Enclosure	IP66/NEMA4X				

*The input current is calculated value at full rated output current.

4.2.5 Dimensions by frame size

Frame 1

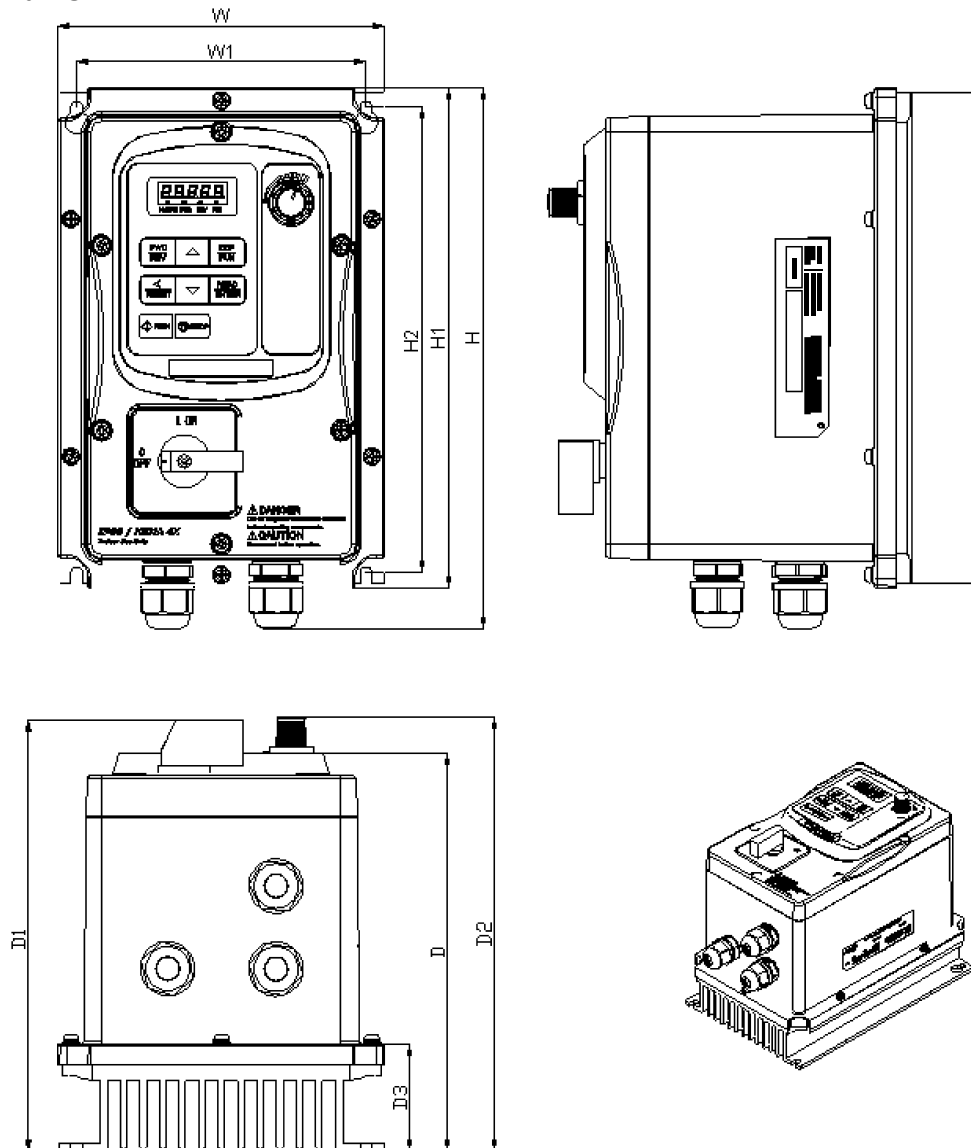


Figure 4-7: dimensions frame size 1

Model	Dimensions in mm (inch)											
	W	W1	H	H1	H2	D	D1	D2	D3	Q1	Q2	Q3
S2U230S-03 F IP66	150.8 (5.94)	133.3 (5.25)	248.7 (9.79)	230.2 (9.06)	214.2 (8.43)	183 (7.20)	200 (7.87)	200 (7.87)	49.5 (1.95)	5.4 (0.21)	5.4 (0.21)	10.6 (0.42)
S2U230S-07 F IP66							200 (7.87)	200 (7.87)				
S2U400T-07 F IP66							200 (7.87)	200 (7.87)				
S2U400T-11 F IP66							200	200				

Unit weight: 2.9 kg

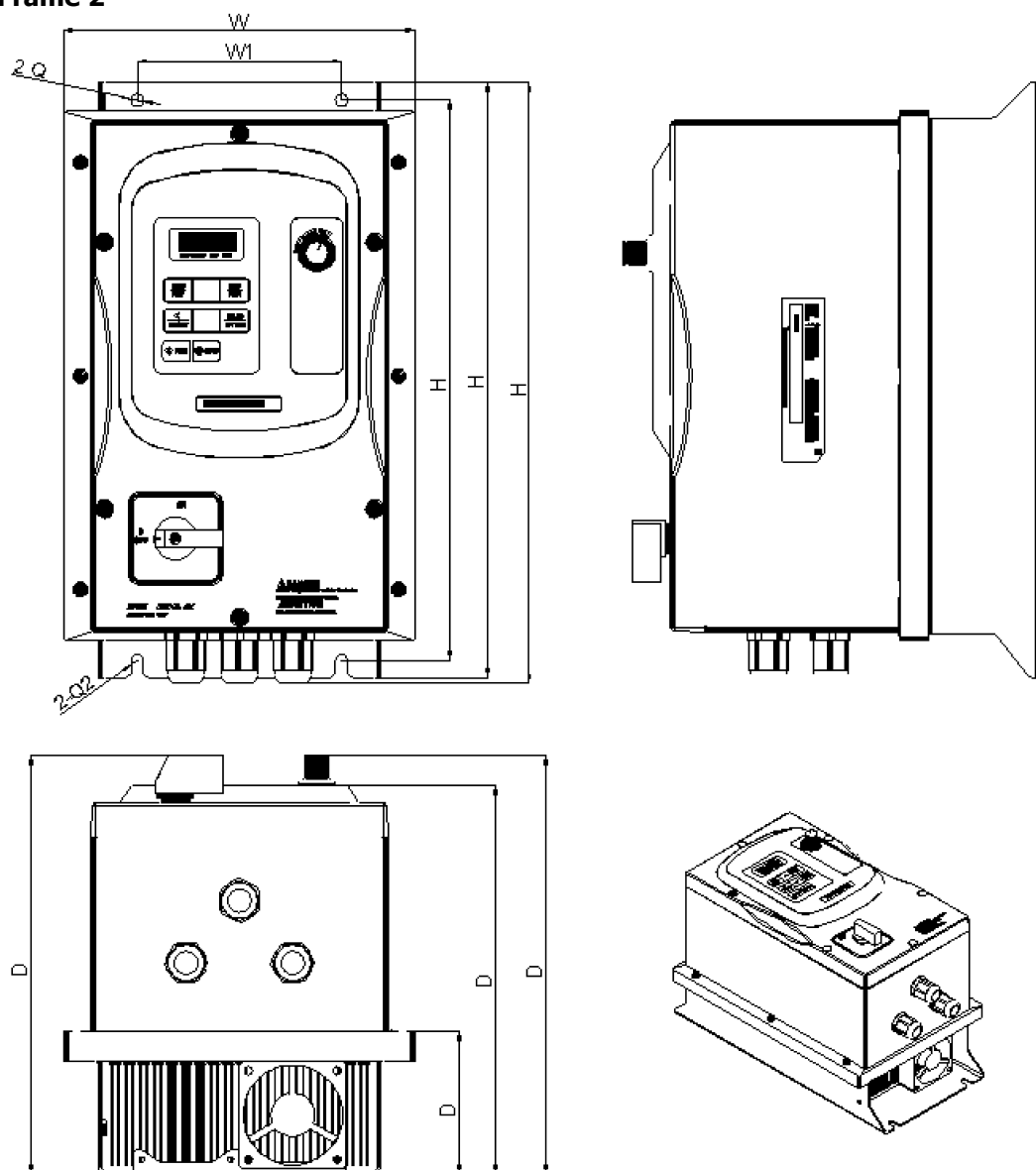
Frame 2


Figure 4-8: dimensions frame size 2

Model	Dimensions in mm (inch)										
	W	W1	H	H1	H2	D	D1	D2	D3	Q1	Q2
S2U230S-11 F IP66	198 (7.80)	115 (4.53)	335 (13.19)	315 (12.40)	337.9 (13.30)	218.4 (8.60)	235.2 (9.26)	235.2 (9.26)	79.8 (3.14)	7 (0.28)	7 (0.28)
S2U230S-13 F IP66							235.2 (9.26)	235.2 (9.26)			
S2U400T-13 F IP66							235.2 (9.26)	235.2 (9.26)			
S2U400T-18 F IP66							235.2 (9.26)	235.2 (9.26)			

Unit weight: 5.98 kg

Frame 3

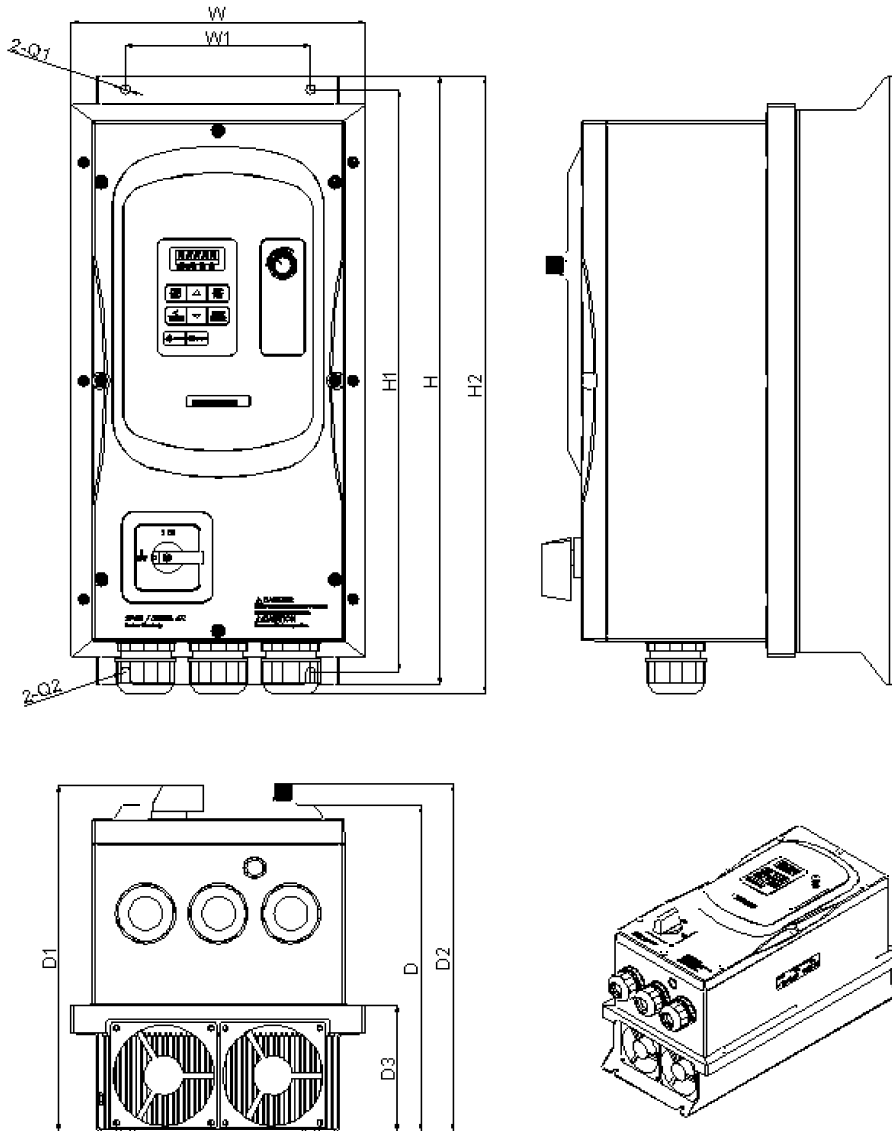


Figure 4-9: dimensions frame size 3

Model	Dimensions in mm (inch)										
	W	W1	H	H1	H2	D	D1	D2	D3	Q1	Q2
S2U400T-19 F IP66							266.5 (10.49)	263.5 (10.37)			
S2U400T-21 F IP66							266.5 (10.49)	263.5 (10.37)			
S2U400T-23 F IP66	222.8 (8.77)	140 (5.51)	460 (18.11)	440 (17.32)	466.3 (18.36)	246.6 (9.71)	266.5 (10.49)	263.5 (10.37)	96 (3.78)	7 (0.28)	7 (0.28)
S2U400T-25 IP66											
S2U400T-27 IP66											

Unit weight: 12.68 kg

5 Peripheral components

5.1 Reactor specifications

	Specification	
	Current [A]	Calc. inductance based on 3% reactance [mH]
S2U230S-03 F IP66	8.5	2.59
S2U230S-07 F IP66	12	1.83
S2U230S-11 F IP66	19.0	1.16
S2U230S-13 F IP66	25.0	0.88

	Specification	
	Current [A]	Calc. inductance based on 3% reactance [mH]
S2U400T-07 F IP66	4.5	5.25
S2U400T-11 F IP66	6	3.94
S2U400T-13 F IP66	7.5	3.02
S2U400T-18 F IP66	12	1.90
S2U400T-19 F IP66	17.0	1.30
S2U400T-21 F IP66	23.0	0.96
S2U400T-23 F IP66	31.0	0.71
S2U400T-25 IP66	38	0.58
S2U400T-27 IP66	48	0.46

5.2 Fuse specification

	Fuse type
S2U230S-03/07 F IP66	15 A, 300 VAC
S2U400T-11/13 F IP66	30 A, 300 VAC
S2U400T-07 F IP66	5 A, 600 VAC
S2U400T-11 F IP66	10 A, 600 VAC
S2U400T-13 F IP66	15 A, 600 VAC
S2U400T-18 F IP66	20 A, 600 VAC
S2U400T-19/21 F IP66	40 A, 600 VAC
S2U400T-23 F IP66	70 A, 600 VAC

5.3 UL fuse specification (UL model recommendation)

	Manufacturer	Type	Rating
S2U230S-03 F IP66	Bussmann	20CT	690 V 20 A
S2U230S-07 F IP66	Bussmann	20CT	690 V 20 A
S2U230S-11 F IP66	Bussmann	30FE	690 V 30 A
S2U230S-13 F IP66	Bussmann	50FE	690 V 50 A
S2U400T-07 F IP66	Bussmann	10CT	690 V 10 A
S2U400T-11 F IP66	Bussmann	16CT	690 V 16 A
S2U400T-13 F IP66	Bussmann	16CT	690 V 16 A
S2U400T-18 F IP66	Bussmann	25ET	690 V 25 A
S2U400T-19 F IP66	Bussmann	40FE	690 V 40 A
S2U400T-21 F IP66	Bussmann	50FE	690 V 50 A
S2U400T-23 F IP66	Bussmann	63FE	690 V 63 A
S2U400T-25 IP66	Bussmann	80FE	690 V 80 A
S2U400T-27 IP66	FERRAZ SHAWMUT	A50QS100-4	500 V 100 A

5.4 Brake resistor specification

	Motor Power (KW)	Specification		ED (%)	Brake Torque (%)	Minimum Resistance		Brake resistor model
		(W)	(Ω)			(W)	(Ω)	
S2U230S-03 F IP66	0.4	80	200	10	214	210	70	BR160/100
S2U230S-07 F IP66	0.75	80	200	10	117	210	70	BR160/100
S2U230S-11 F IP66	1.5	150	100	10	117	210	70	BR160/100
S2U230S-13 F IP66	2.2	200	80	10	112	210	70	BR160/100
S2U400T-07 F IP66	0.75	80	750	10	123	500	120	BR213/300
S2U400T-11 F IP66	1.5	150	400	10	117	500	120	BR213/300
S2U400T-13 F IP66	2.2	250	250	10	123	600	100	BR471/136
S2U400T-18 F IP66	3.7	400	150	10	123	1000	60	BR471/136
S2U400T-19 F IP66	5.5	500	130	10	123	1200	50	BR696/92
S2U400T-21 F IP66	7.5	600	100	10	117	1200	50	BR696/92
S2U400T-23 F IP66	11	1000	60	10	149	1200	50	BR696/92
S2U400T-25 IP66	15	1500	40	10	100	2400	25	BR2000/32
S2U400T-27 IP66	18.5	2000	32	10	120	4000	15	BR2000/32

Note: Formula for brake resistor: $W = (V_{pnb} * V_{pnb}) * ED\% / R_{min}$

1. W: braking resistor power (Watts)
2. V_{pnb} : braking voltage (220 V=380 VDC, 440 V=760 VDC)
3. ED%: braking effective period
4. R_{min} : braking resistor minimum value (ohms)

5.5 EMC filter specification

Frame	model	rated input	Noise filter model name	rated Current [A]
1	S2U230S-03 F IP66	1ψ 200 ~ 240V	FTV016A	16
1	S2U230S-07 F IP66	1ψ 200 ~ 240V	FTV016A	16
2	S2U230S-11 F IP66	1ψ 200 ~ 240V	FTV030A	30
2	S2U230S-13 F IP66	1ψ 200 ~ 240	FTV030A	30
1	S2U400T-07 F IP66	3ψ 380 ~ 480V	FTV016A	16
1	S2U400T-11 F IP66	3ψ 380 ~ 480V	FTV016A	16
2	S2U400T-13 F IP66	3ψ 380 ~ 480V	FTV016A	16
2	S2U400T-18 F IP66	3ψ 380 ~ 480V	FTV016A	16
3	S2U400T-19 F IP66	3ψ 380 ~ 480V	FTV030A	30
3	S2U400T-21 F IP66	3ψ 380 ~ 480V	FTV030A	30
3	S2U400T-23 F IP66	3ψ 380 ~ 480V	FTV055A	55
4	S2U400T-25 IP66	3ψ 380 ~ 480V	FTV055A	55
4	S2U400T-27 IP66	3ψ 380 ~ 480V	FTV055A	55

*Note : The above models do not feature built-in filters.

6 Mechanical installation



CAUTION

Risk of short circuit and fire!

Insufficient air circulation may result in major material damage, which may in turn result in physical injuries.

- Mount the devices with sufficient clearance to other components so that the cooling air can circulate freely.
- Avoid soiling by grease and air pollution by dust, aggressive gases, etc.
- Fan inlet and outlet openings must not be covered.
- If the frequency inverter is mounted inside a switching cabinet, prevent the ambient temperature from rising above 50 °C.

NOTICE

Risk of fire

Mounting the frequency inverter on flammable mounting materials may result in fire.

- Only mount the frequency inverters on a non-flammable mounting panel such as metal panel. Ideally, the mounting panel should be galvanized, not painted.

6.1 Installation site

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

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

6.2 Size 1: S2U230S-03/07 and S2U400T-07/11

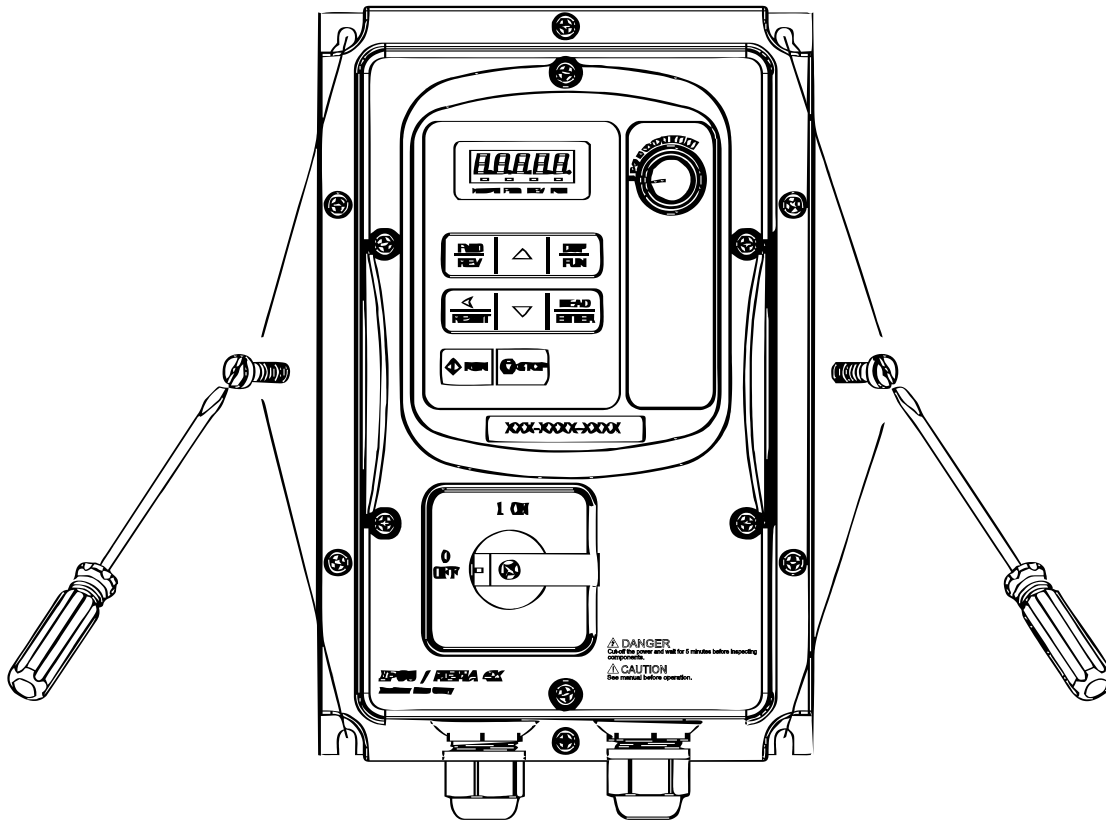


Figure 6-1: standard installation

S2UIP66-TZ_Frame1-V00

Screw size: M5

6.3 Size 2: S2U230S-11/13 and S2U400T-13/18

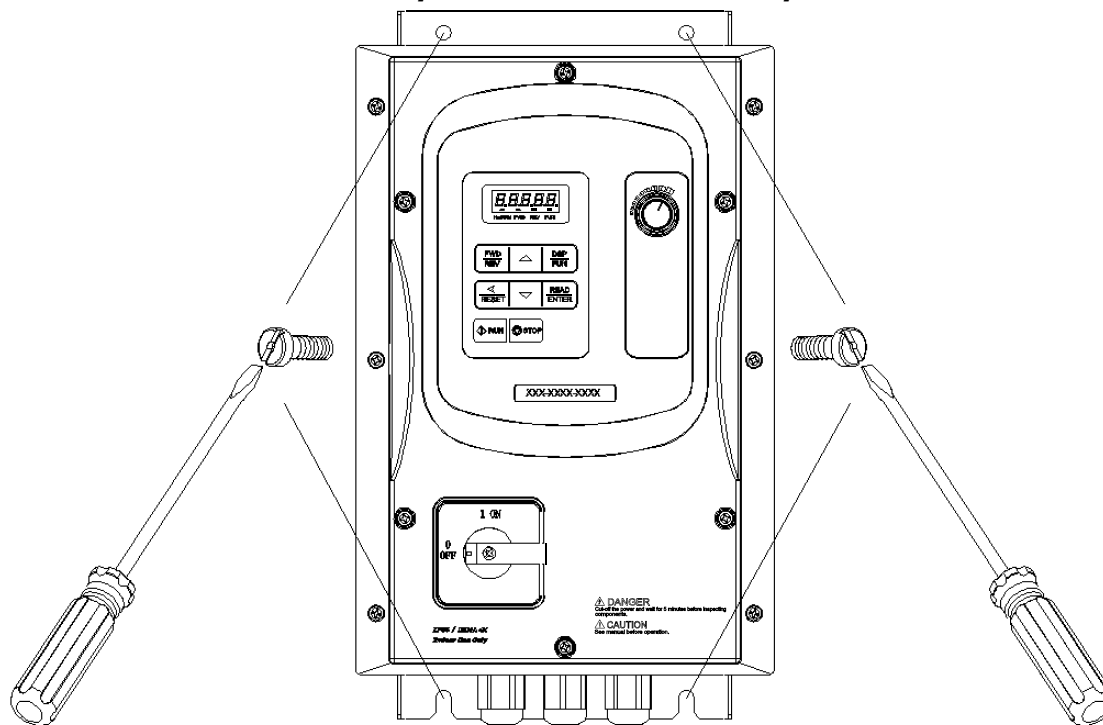


Figure 6-2: standard installation

S2UIP66-TZ Frame2-V00

Screw size: M6

6.4 Size 3: S2U400T-19 to 27

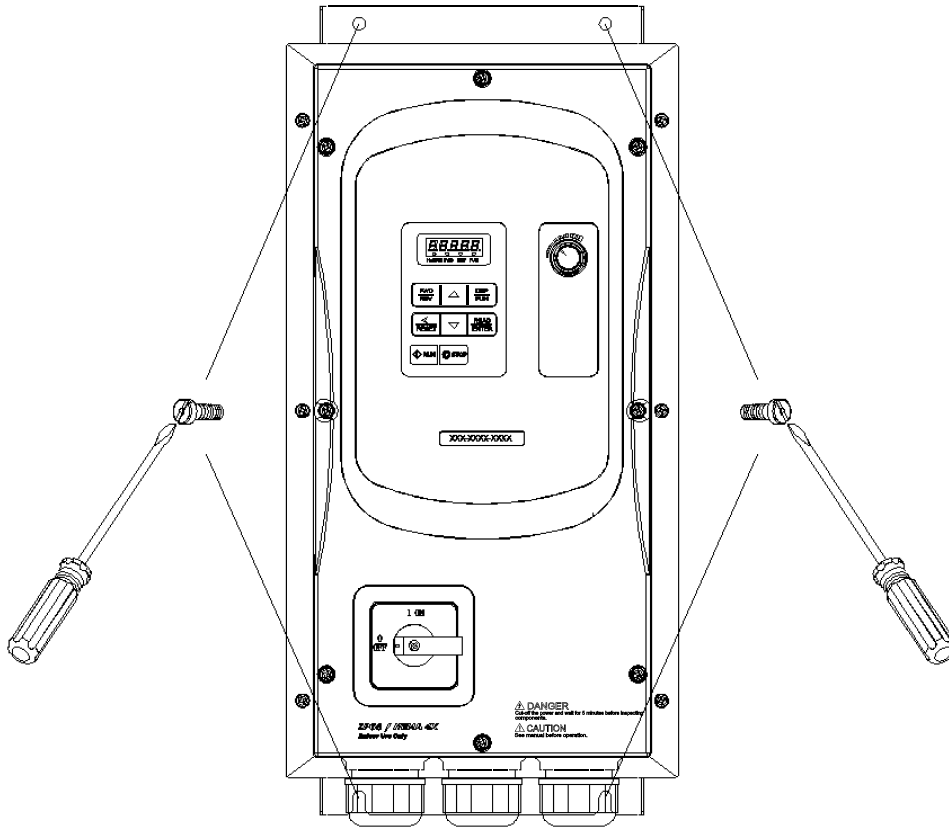


Figure 6-3: standard installation

Screw size: M6

7 Electrical installation



DANGER

Risk of electric shock

The DC-link capacitors will hold dangerous voltage levels until the capacitors in the DC link are discharged.

- After shutdown, wait for at least 5 minutes before starting any electrical or mechanical work on the frequency inverter.
- Even after this waiting time, make sure that the equipment is de-energized in accordance with the safety rules before starting the work.
- Do not make any connections when the inverter is powered on.
- Do not check parts and signals on circuit boards during the inverter operation.
- Do not disassemble the inverter or modify any internal wires, circuits, or parts.
- Ensure that the inverter ground terminal is connected correctly.



CAUTION

Device damage possible!

Routing the lines inappropriately may lead to device damage.

- The control, mains and motor lines must be kept physically separate from one another.
- The cables connected to the frequency inverters may not be subjected to high-voltage insulation tests unless appropriate circuitry measures are taken before.



CAUTION

Improperly mounted covers

IP66 ingress protection rating is only achieved with terminals plugged and properly mounted covers. Improperly mounted covers lead to ingress of dirt or foreign objects into the housing of the device and might lead to malfunctions.

- Take care to mount all covers correctly and properly.
- Insert all terminal connectors and mount all covers before starting operation.

7.1 Tightening torque for terminals

Model	TM1					TM2				
	Cable Size		Tightening torque			Cable Size		Tightening torque		
	AWG	mm ²	kgf.cm	Ibf.in	Nm	AWG	mm ²	kgf.cm	Ibf.in	Nm
Frame1	20~12	0.52~3.33	10.20	0.006	1.0	26~14	0.13~2.08	8.16	0.005	0.8
Frame2	18~8	0.81~8.37	18.35	0.010	1.8	26~14	0.13~2.08	8.16	0.005	0.8
Frame3	14~6	2.08~13.30	24.47	0.014	2.4	26~14	0.13~2.08	8.16	0.005	0.8

7.2 Electrical ratings of terminals

Model	Power [kW]	Voltage Specification	Terminal Voltage Rating [V]	Terminal Current Rating [A]
Frame 1	0.4/0.75	200V~240V	600	20
Frame 1	0.75 /1.5	380V~480V		
Frame 2	1.5/2.2/3.7	200V~240V	600	45
Frame 2	2.2/3.7	380V~480V		
Frame 3	5.5/7.5/11/15	200V~240V	600	65
Frame 3	5.5/7.5/11/15/18.5	380V~480V	600	100

7.3 Maximum rms symmetrical short circuit ratings

Device Rating		Short circuit Rating	Max. Voltage
[V]	[kW]	[A]	[V]
220 V	0.4~15	5000	240
440 V	0.75~18.5	5000	480

7.4 Wiring guidelines

7.4.1 Power cables

- Connect Supply power cables to TM1 terminal block, terminals L1(L), L2, L3(N).

L1(L) and L3(N) for single phase 230V supply.

- Connect motor cables to TM1 terminals U, V, W.

WARNING

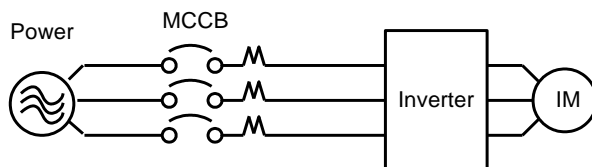


Serious damage to the device

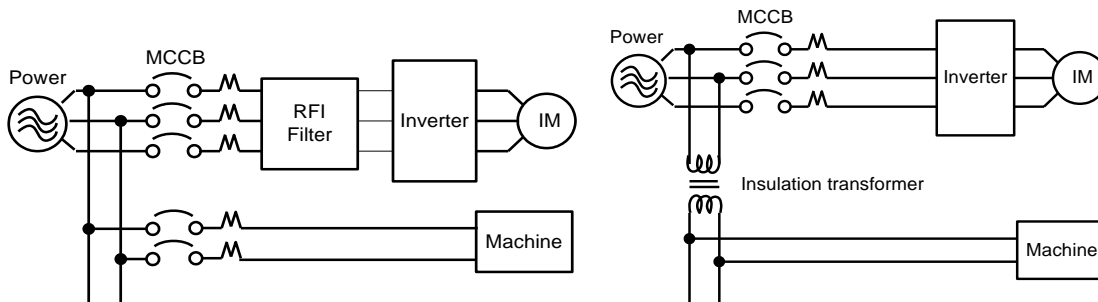
Connection of supply line cable to terminals U, V, W will result in serious damage to the drive components.

- Strictly observe the correct wiring procedure.

Example power connections: Inverter with dedicated power line.



- Install a Supply RFI filter or Isolation transformer when the power source is shared with other high power electrical equipment as shown below.

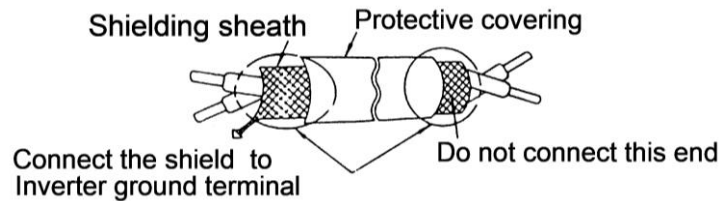


7.4.2 Control cable selection and wiring

Control cables should be connected to terminal block TM2.

Choose power and Control cables according to the following criteria:

- Use copper wires with correct diameter and temperature rating of 65/70°C.
- Minimum cable voltage rating for 200 V type inverters should be 300 VAC. Minimum cable voltage rating for 400 V type inverters should be 600 VAC.
- Route all cables away from other high voltage or high current power lines to reduce interference effects.
- Use a twisted pair shielded cable and connect the shield (screen) wire to the ground terminal at the inverter end only. Cable length should not exceed 50 meters.



7.5 EMC guidelines

For effective interference suppression, do not route power and control cables in the same conduit or trunking.

To prevent radiated noise, motor cable should be put in a metal conduit. Alternatively, an armored or shielded motor cable type should be used.

For effective suppression of noise emissions the cable armor or shield must be grounded at both ends to the motor and the inverter ground. These connections should be as short as possible.

Motor cable and signal lines of other control equipment should be at the least 30 cm apart.

S2U IP66 has a built in Class "A" EMC filter to first Environment Restricted. (Category C2).

Typical Wiring

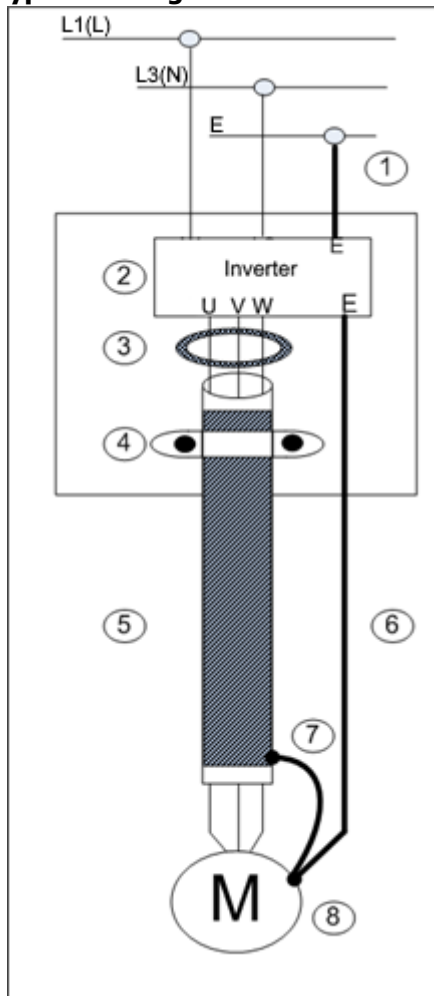


Figure 7-1: typical wiring diagram

- 1 Protective Earth Conductor.

Conductor size for enclosure and Back plate must comply with the local electrical standards. Minimum 10 mm².

- 2 Back plate. Galvanized steel (Unpainted).
- 3 Ferrite core / Output reactor

Ferrite cores can be used to reduce radiated noise due to long motor cables.

If ferrite core is used, loop motor wires 3 times round the core. Install core as close to the inverter as possible.

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

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



If no enclosure and back plate is used, connect the cable shield by a good 360 degree termination to the Inverter output terminal E.

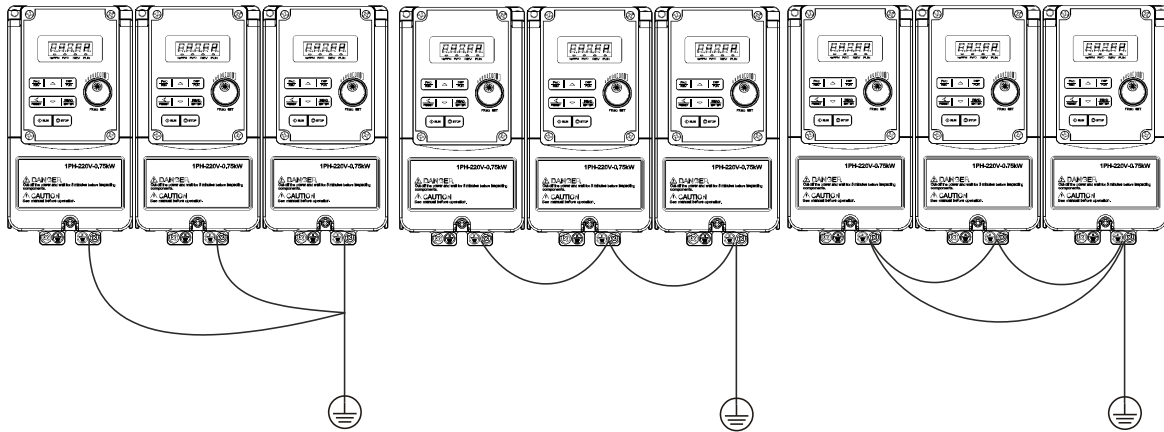
- 5 Screened (Shielded four core cable).
- 6 Separate Protective Earth wire, routed outside motor cable separated be at least 100 mm.



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

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

7.6 Ground Connection



S2UIPP66_TD_GroundConnect-V00





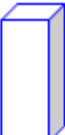

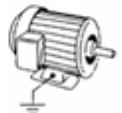
(a) Correct

(b) Correct

(c) Incorrect

Figure 7-2: ground connection wiring example

7.6.1 Considerations for peripheral equipment

	Power	<p>Ensure that the supply voltage is correct. A molded-case circuit breaker or fused disconnect must be installed between the AC source and the inverter</p>
	Circuit Breaker & RCD	<p>Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter. Do not use the circuit breaker as the run/stop switch for the inverter. Residual Current Circuit Breaker(RCD) Current setting should be 200 mA or above and the operating time at 0.1 second or longer to prevent malfunctions.</p>
	Magnetic contactor	<p>Normally, a magnetic contactor is not needed. A contactor can be used to perform functions such as external control and auto restart after power failure. Do not use the magnetic contactor as the run/stop switch of the inverter.</p>
	AC reactor for power quality improvement	<p>When a 200V/400V inverter with rating below 15 kW is connected to a high capacity power source (600 KVA or above) then an AC reactor can be connected for power factor improvement and reducing harmonics.</p>
	Input noise filter	<p>S2U has a built-in filter (Class A/First Environment Category C2, except for 15 & 18.5 kW) To satisfy the required EMC regulations for your specific application you may require an additional EMC filter.</p>
	Inverter	<p>Connect the single phase power to Terminals, L1(L) & L3(N). <u>Warning! Connecting the input terminals U, V, and W to AC input power will damage the inverter.</u> Output terminals U, V, and W are connected to U, V, and W terminals of the motor. To reverse the motor rotation direction just swap any two wires at terminals U, V, and W.</p> <ul style="list-style-type: none"> • Ground the Inverter and motor correctly. • Ground Resistance for 200V power < 100 Ohms. • Ground Resistance for 400V power < 10 Ohms
	Motor	<p>Three-phase induction motor. Voltage drop on motor due to long cable can be calculated. Volts drop should be < 10%. Phase-to-phase voltage drop (V) = $\sqrt{3} \times \text{resistance of wire } (\Omega/\text{km}) \times \text{length of line (m)} \times \text{current} \times 10^{-3}$</p>

7.7 Electrical installation procedure

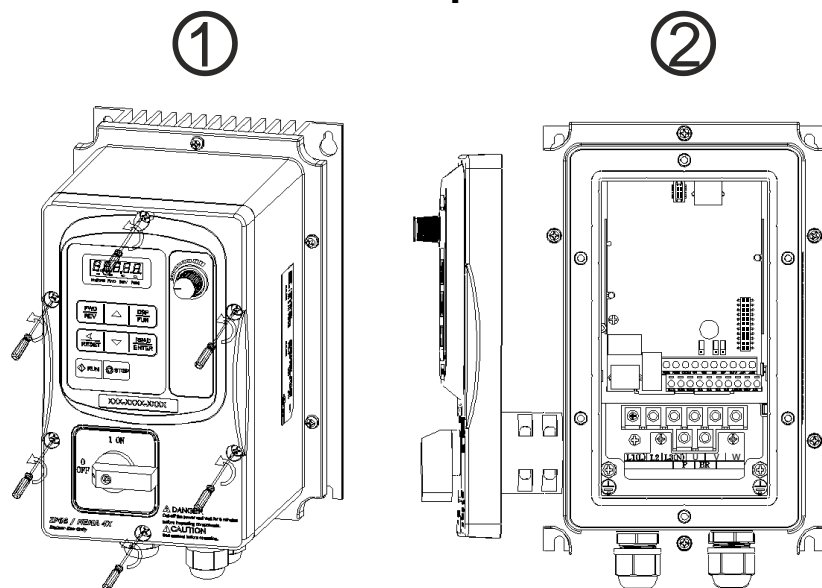


Figure 7-3: installation procedure

SZUIP66-TZ_Install01-V00

- 1 Loosen the screws,
- 2 lift and rest the cover next to the machine

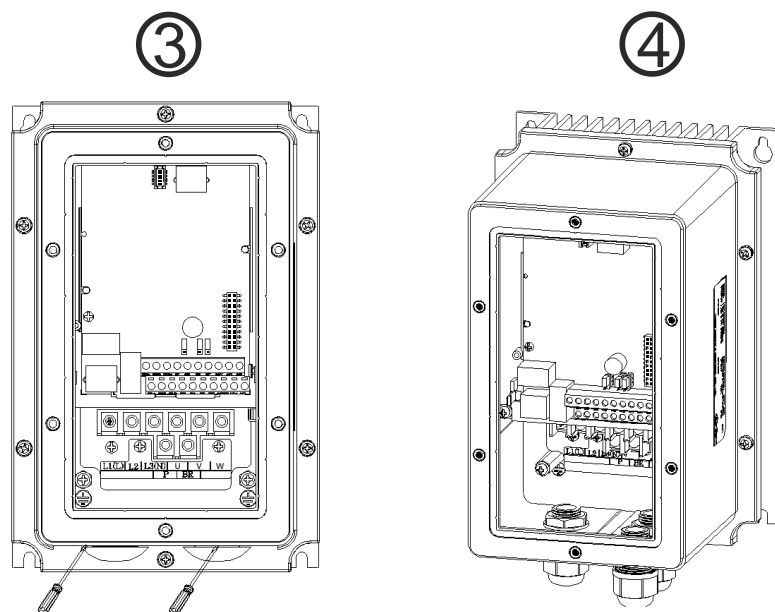


Figure 7-4: installation procedure

SZUIP66-TZ_Install02-V00

- 3 Remove the rubber plugs and
- 4 use the waterproof cable glands provided to connect cables.

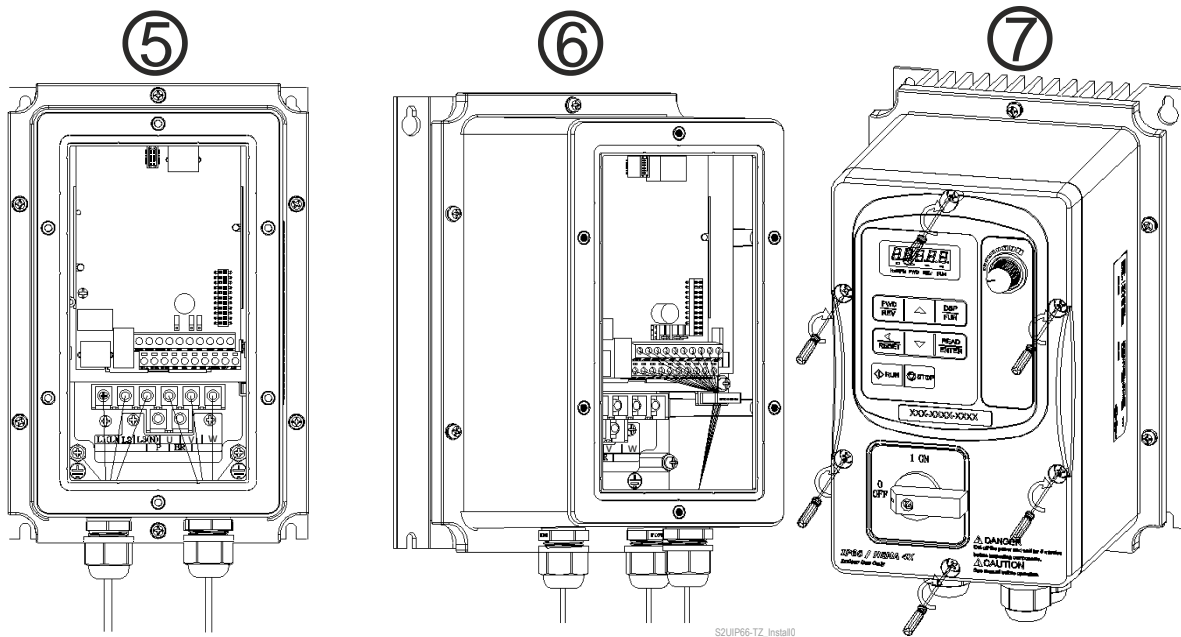


Figure 7-5: installation procedure

- 5 Connect power & motor cables through the cable glands to the correct terminals.
- 6 Connect the control cable through the top gland and secure by the cable clamp.
- 7 Ensure that the cable glands are tightened and the cover waterproof gasket is in place. Then place the cover and tighten the screws.

7.8 EMC filter disconnection

EMC filter may be disconnected:

Inverter drives with built-in EMC filter are not suitable for connection to certain type of supply systems, such as listed below; in these cases the RFI filter can be disabled.

In all such cases consult your local electrical standards requirements.

IT type supply systems (ungrounded) & certain supply systems for medical equipment

For ungrounded supply systems:

If the filter is not disconnected, the supply system becomes connected to Earth through the Y capacitors on the filter circuit. This could result in danger and damage to the Drive.

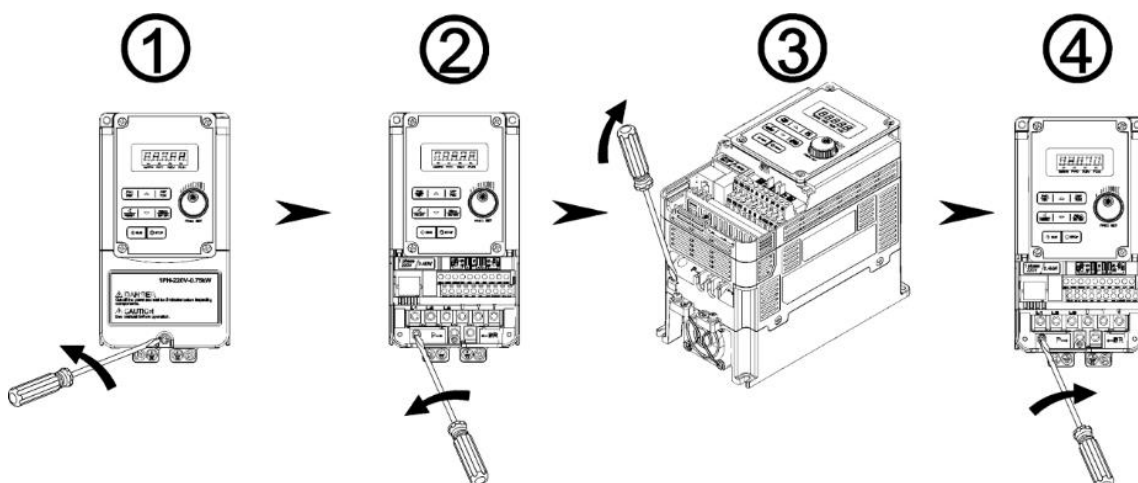


Figure 7-6: disconnecting the EMC filter

Disconnection steps :

1	Remove the front cover.	2	Loosen the screw.
3	Remove the metal link.	4	Tighten the screw. Re-install the front cover.



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

7.9 Standard wiring

7.9.1 Single phase

The diagram below applies to the following models: S2U230S-03 F IP66 / S2U230S-07 F IP66 / S2U230S-11 F IP66 / S2U230S-13 F IP66

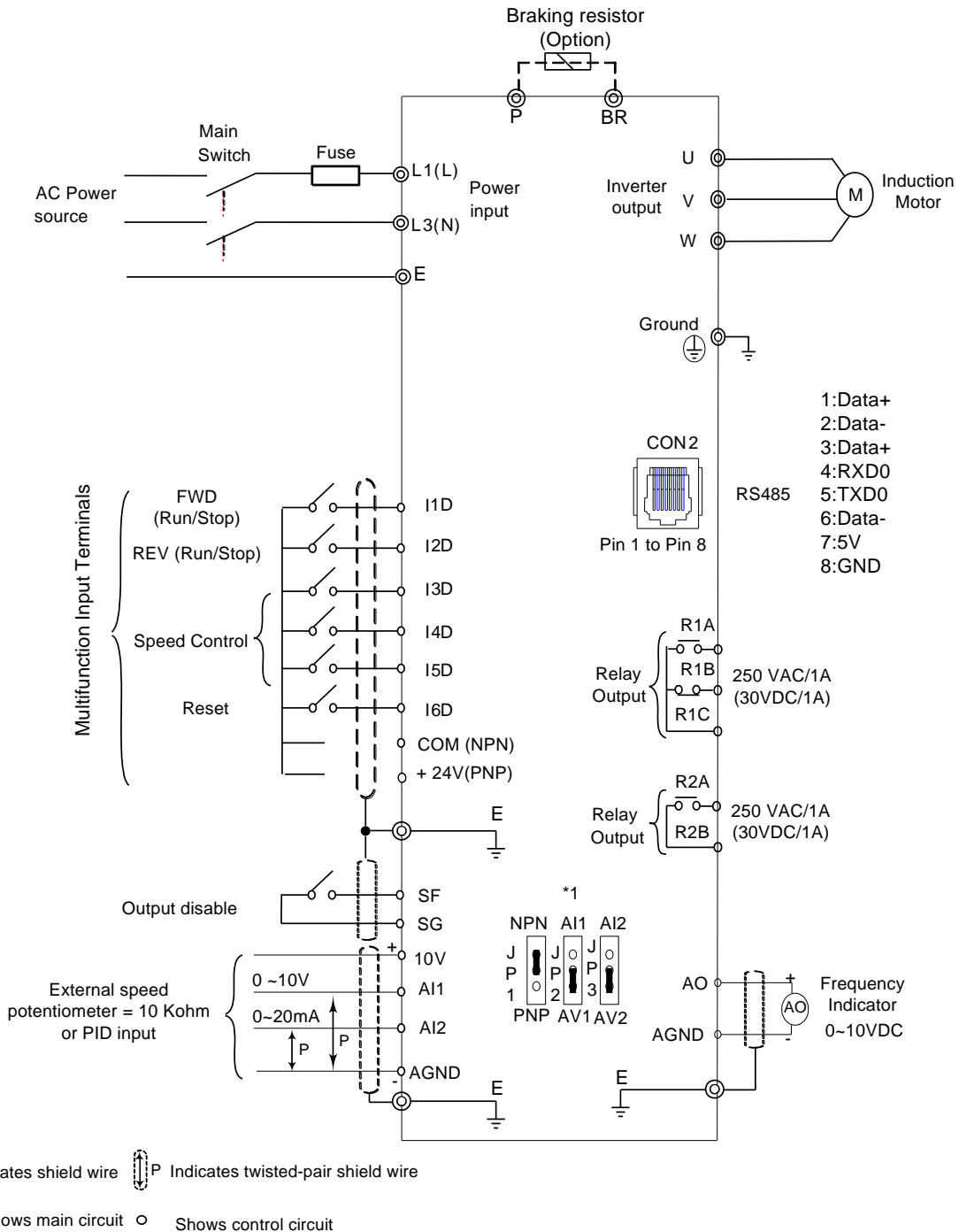
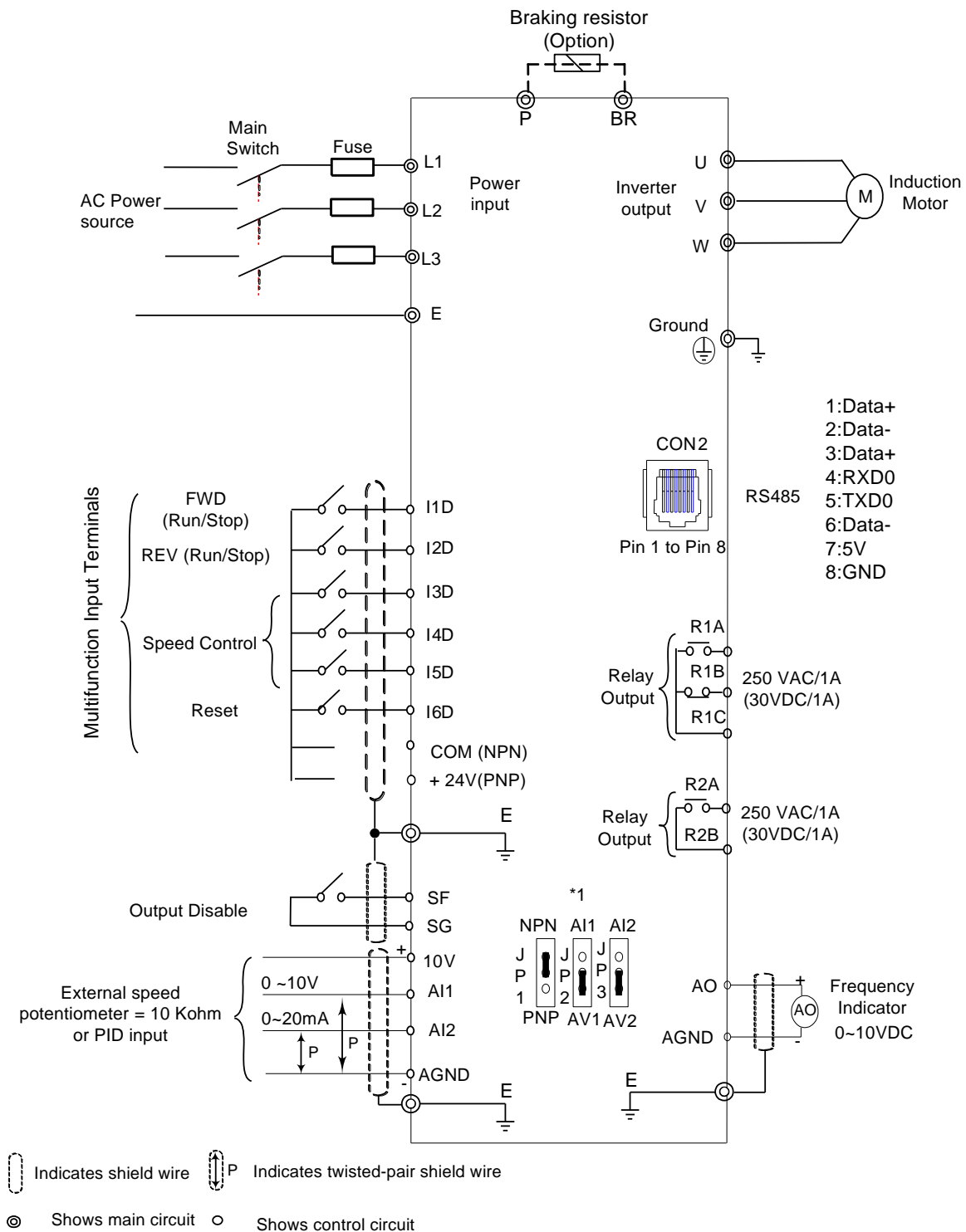


Figure 7-7: standard wiring single phase

7.9.2 Three phase

The diagram below applies to the following models: S2U400T-07 F IP66 / S2U400T-11 F IP66 / S2U400T-13 F IP66 / S2U400T-18 F IP66 / S2U400T-19 F IP66 / S2U400T-21 F IP66 / S2U400T-23 F IP66 / S2U400T-25 IP66 / S2U400T-27 IP66




*1: JP1:NPN/PNP selection, JP2:AI1 0~10V/0~20mA selection, JP3:AI2 0~10V/0~20mA selection

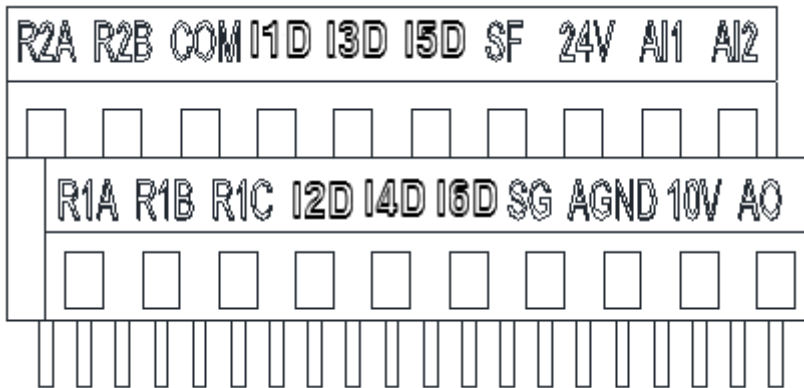
Figure 7-8: standard wiring three phase

7.10 Terminal Description

7.10.1 Control circuit terminal description

Type	Terminal	Terminal function	Signal level
Digital input signal	I1D	Forward—Stop (Preset), Multi function input terminal	24 VDC, 8 mA, Optical coupling isolation(Max,voltage30 Vdc, Input impedance 3.3kΩ)
	I2D	Reverse—Stop (Preset), Multi function input terminal	
	I3D	Preset Speed0(5-02), Multi function input terminal	
	I4D	Preset Speed1(5-03), Multi function input terminal	
	I5D	Preset Speed2(5-05), Multi function input terminal	
	I6D	Fault reset input, Multi function input terminal	
Relay output	R1A	NO(Normally open)	250VAC/1A(30VDC/1A)
	R1B	NC(Normally closed)	
	R1C	COMMON	
	R2A		
	R2B		
24V Power supply	COM	Digital signal common terminal (JP1 Switching NPN position)	±15%,Max output current 60mA
	24V	Digital signal common terminal (JP1 Switching PNP position)	
The analog input signal	10V	Built in Power for an external speed potentiometer	10V(Max current:20mA)
	AI1	Multifunctional analog input: JP2 selects voltage or current input Voltage: JP2 in AV1 position Current: JP2 in AI1 position	0 ~ 10V,(Max current:20mA) (Input impedance: 153KΩ)
	AI2	Multifunctional analog input: JP3 selects voltage or current input Voltage: JP3 in AV2 position Current: JP3 in AI2 position	0 ~ 10V,0 ~20mA (Input impedance: 153KΩ)
	AGND	The analog common terminal	----
		Shielding wire connecting terminal (The earth)	----
The analog output signal	AO	Multifunctional analog output terminal*3	0 ~10V,(Max current:2mA)
	AGND	The analog common terminal	----
Safety switch	SF	Terminal SF is for output disable	
	SG		

Control circuit terminal:

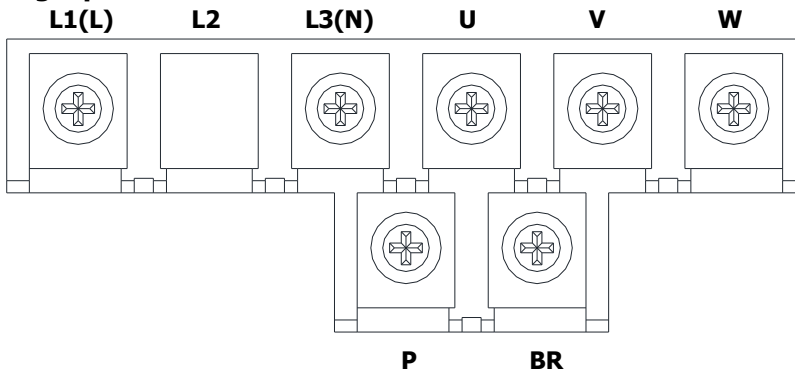


7.10.2 Description of main circuit terminals

Terminal symbols	TM1 Function Description
L1(L)	Main power input: Single phase: L1(L)/L3(N) Single/Three phase:L1(L)/L2/L3(N) Three phase:L1/L2/L3
L2	
L3(N)	
U	Inverter output, connect to U/V/W terminals of motor
V	
W	
P	Braking resistor connection terminal: Used in applications when it is required to stop a high inertia load rapidly. (refer to specifications of the braking resistor)
BR	
	Ground terminal

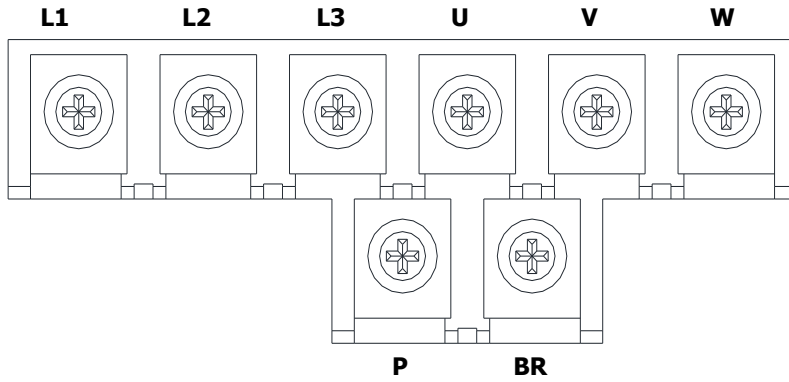
Frame1

Single phase: 230V 0.4~0.75 kW



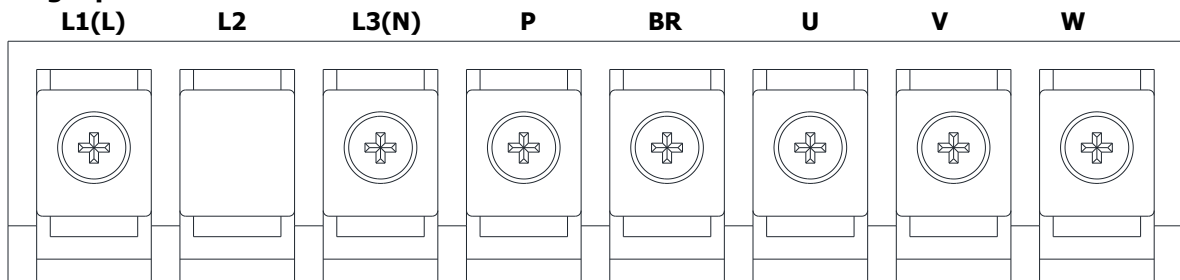
The screw on L2 terminal is removed for the single phase input supply models.

Three phase: 400V 0.7~1.5 kW



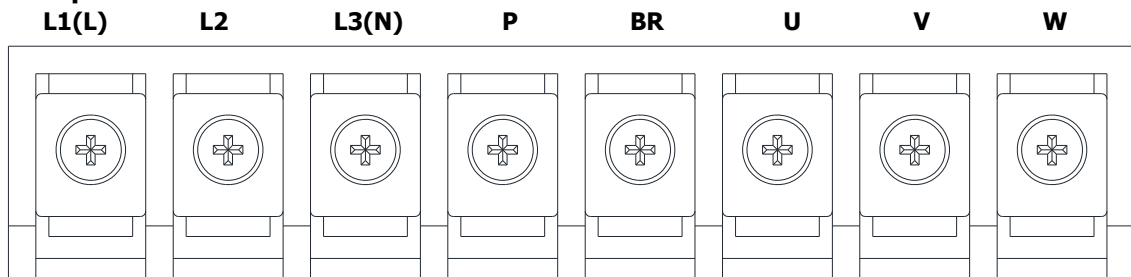
Frame2

Single phase: 230V 1.5~2.2 kW



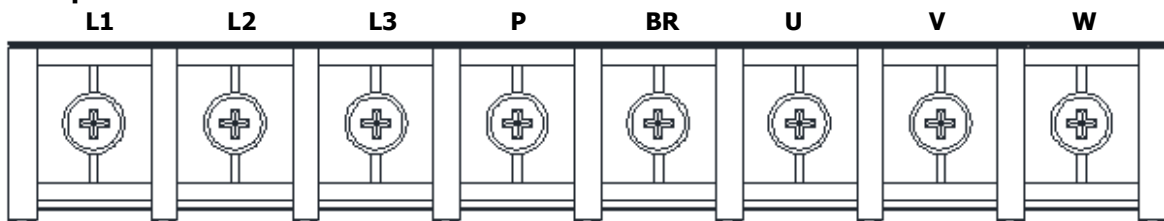
The screw on L2 terminal is removed for the single phase input supply models.

Three phase: 400V 2.2~3.7 kW

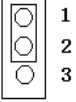
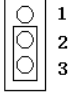
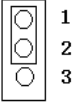
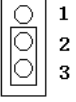


Frame3

Three phase: 400V 5.5~18.5 kW



7.10.3 JUMPER function description

Jumper	Symbol	Function	Signal Reference	Note
JP1	 1 2 3	NPN/PNP selectable	NPN Input	
	 1 2 3		PNP Input	Factory Default setting
JP2/JP3	 1 2 3	External signal type selection	0~ 20mA / 4~20 mA Analog signal	Set parameters 00-05/00-06 to 2 or 3 (external analog input) to become effective
	 1 2 3		0~10 VDC / 2~10 VDC Analog signal	

8 Control unit

8.1 Operator panel functions



Figure 8-1: Operator panel

Type	Item	Function
Digital display & LEDs	Main digital displays	Frequency Display, Parameter, voltage, Current, Temperature, Fault messages.
	LED Status	Hz/RPM: ON when the frequency or line speed is displayed. OFF when the parameters are displayed. FWD: ON while the inverter is running forward. Flashes while stopped. REV: ON while the inverter is running reverse. Flashes while stopped. FUN: ON when the parameters are displayed. OFF when the frequency is displayed.
Variable Resistor	FREQ SET	Used to set the frequency
Keys On Keypad (8 buttons)	RUN	RUN: Run at the set frequency.
	STOP	STOP: Decelerate or Coast to Stop.
	▲	Increment parameter number and preset Values.
	▼	Decrement parameter number and preset Values.
	FWD/REV (Dual function keys)	FWD: Forward Run REV: Reverse Run
	DSP/FUN (Dual function keys)	DSP: Switch between available displays FUN: Used to examine the parameter content
	READ/ENTER (Dual function keys)	READ:ENTER: Used to display the preset Value of parameters and for saving the changed parameter Values.
</ RESET (Dual function keys)	"<"Left Shift: used while changing the parameters or parameter Values RESET: Use to Reset alarms or resettable faults	

8.2 Digital display description



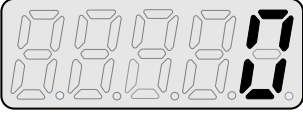

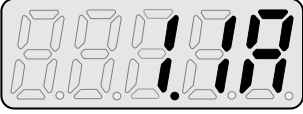



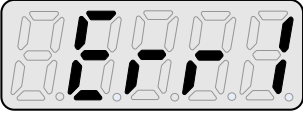

Alpha numerical display format

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








Digital tube lights flashing instructions

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

LED display examples

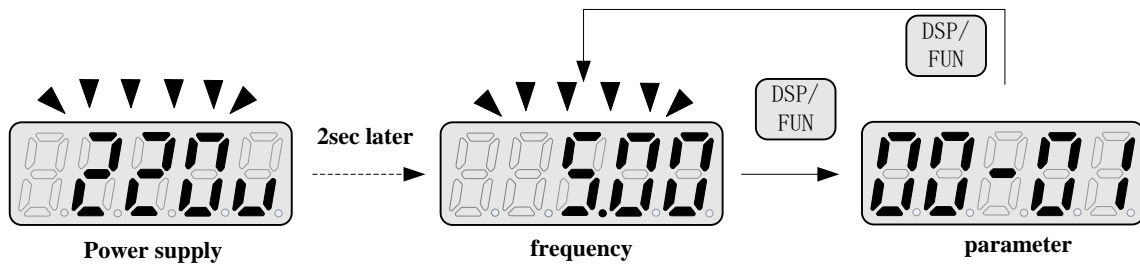
Display	Description
	In stop mode shows the set frequency In run mode shows the actual output frequency
	Selected Parameter
	Parameter Value
	Output Voltage
	Output Current in Amps
	DC Bus voltage
	Temperature
	PID feedback Value
	Error display
	Analogue Current / Voltage AI1 / AI2 . Range (0~1000)

LED Status description

		LED Indicator light status		
Frequency / Line speed Indicator	 Hz/RPM	ON while displaying frequency or linear speed		
Menu mode indicator	 FUN	ON while not displaying frequency or line speed	 FUN	Flashing while fire mode enabled
FWD indicator	 FWD	ON while running forward	 FWD	Flashing while stopped in Forward mode.
REV indicator	 REV	ON while running reverse	 REV	Flashing while stopped in Reverse mode

8.3 Digital display setup

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

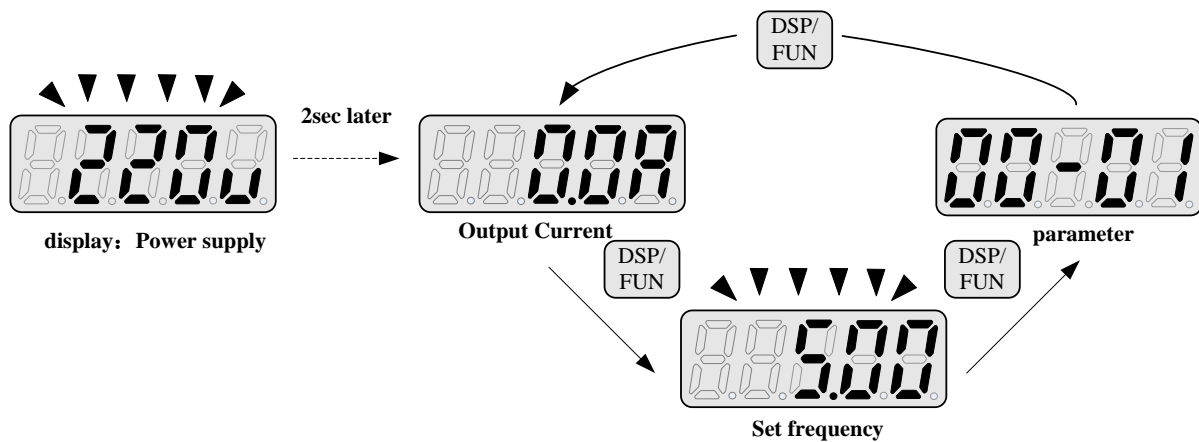


User selectable display formats:

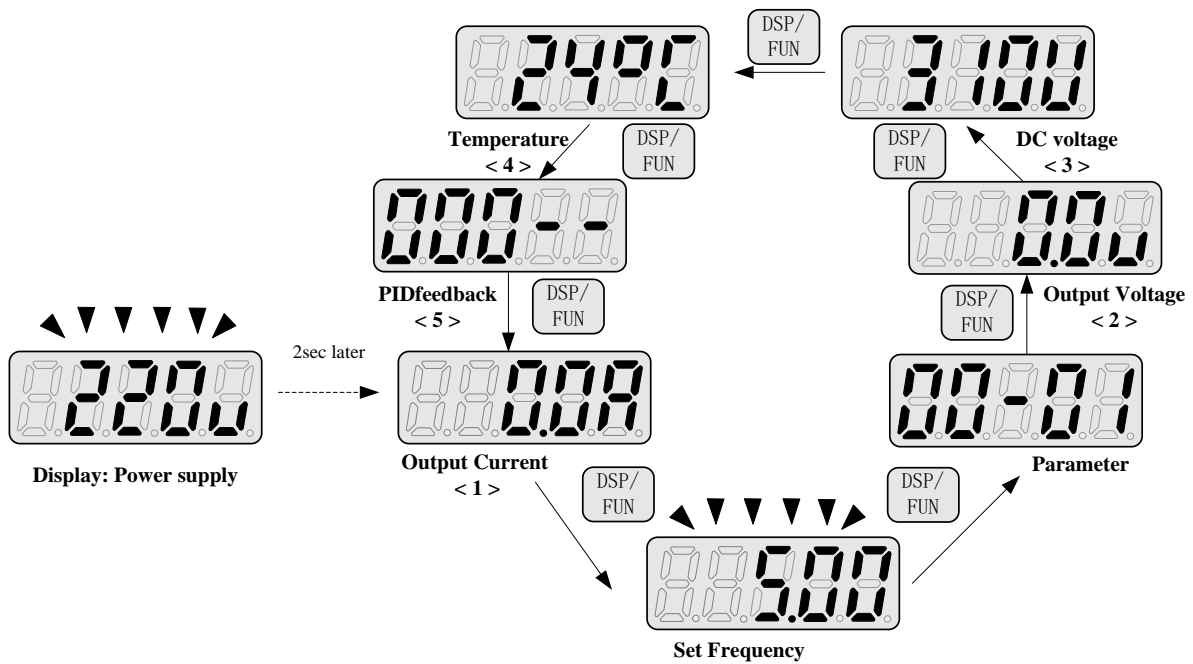
12-00	Display Mode
Range	0 0 0 0 0
	High Low
	Each of the above 5 digits can be set to any of the selections below from 0 to 8
	【0】 :Disable display 【1】 :output Current
	【2】 :output Voltage 【3】 :DC voltage
	【4】 :Temperature 【5】 :PID feedback
	【6】 :AI1 【7】 :AI2 【8】 :count Value

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

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

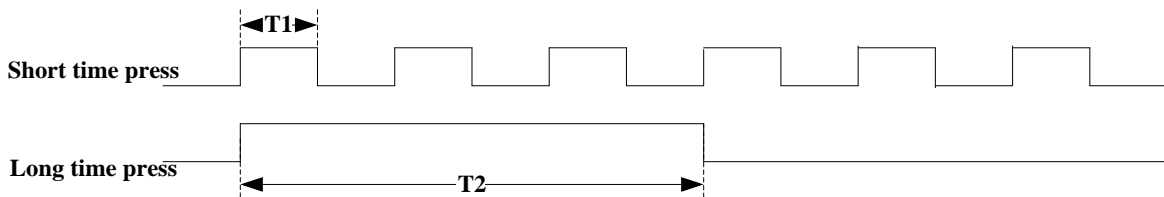


Example 2. Set parameter 12- 00= [12345] to obtain the display format shown below.



Increment/ Decrement key functions:

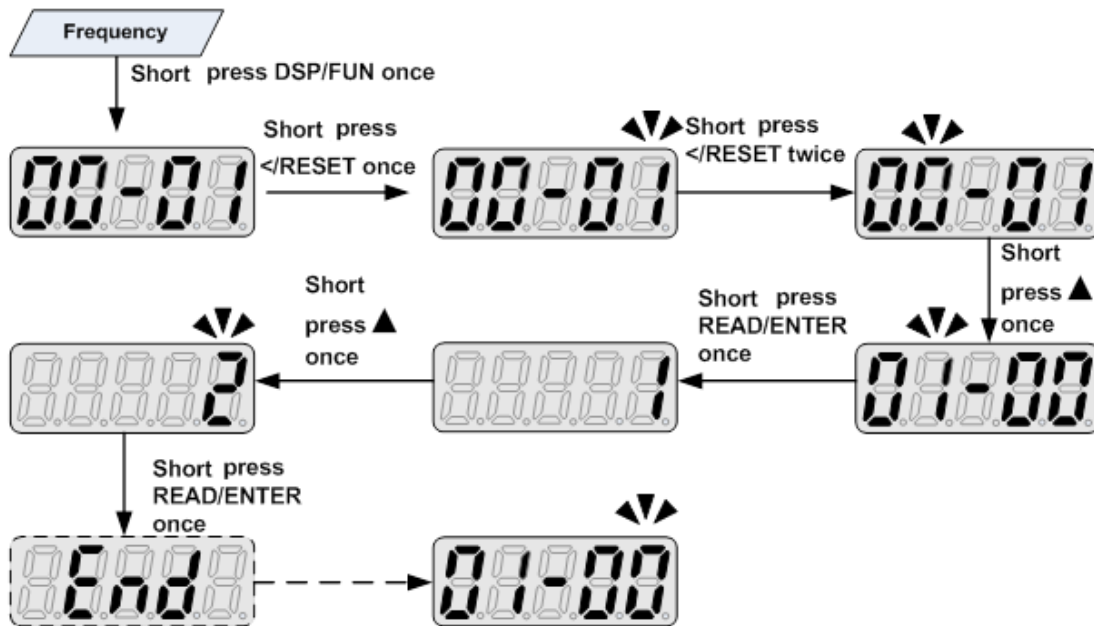
“▲”/“▼”:



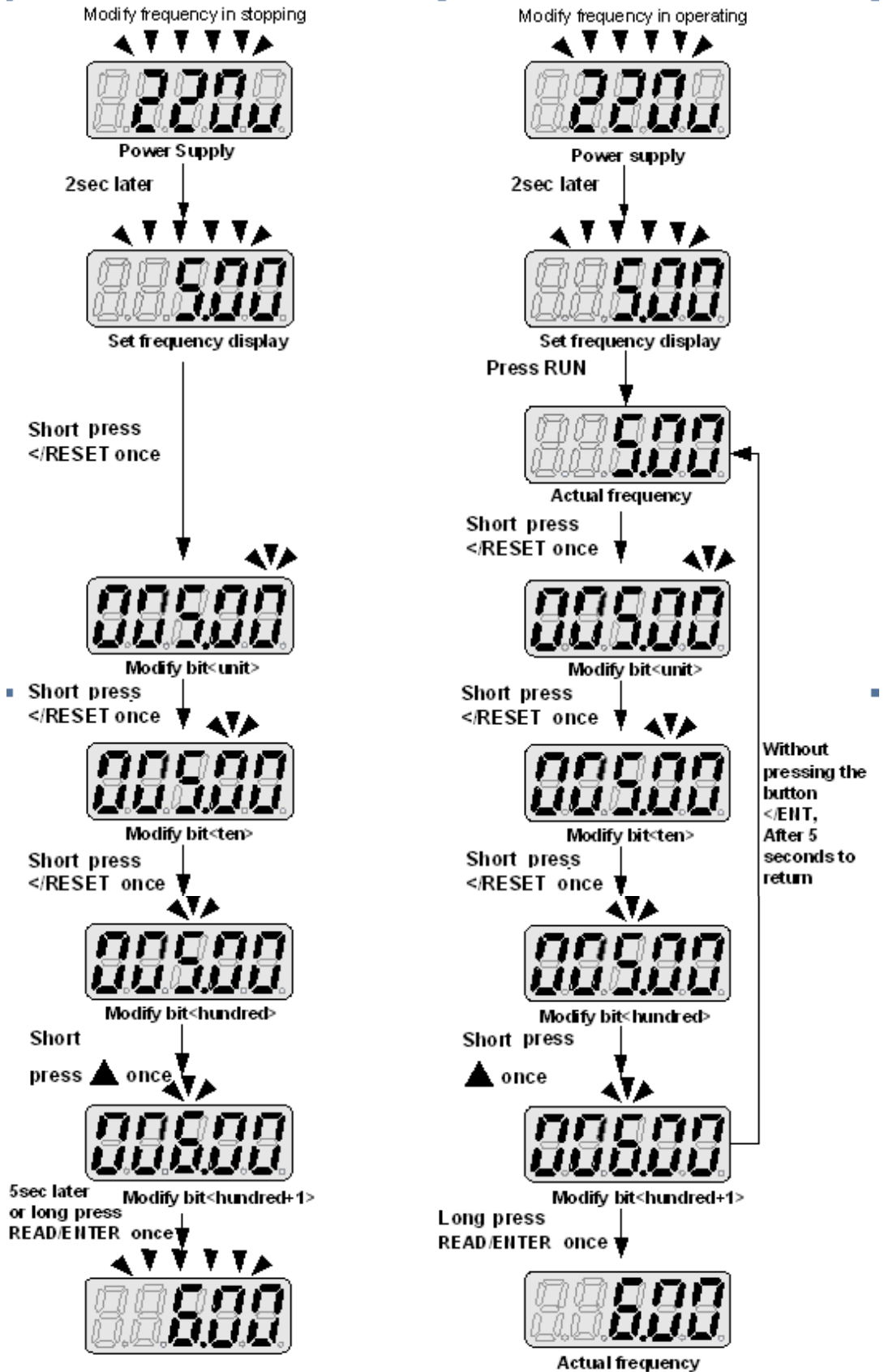
Quick pressing of these keys will Increment or Decrement the selected digit by one.
Pressing and holding will Increment or Decrement the selected digit continuously.

8.4 Example of keypad operation

Example1: Modifying Parameters

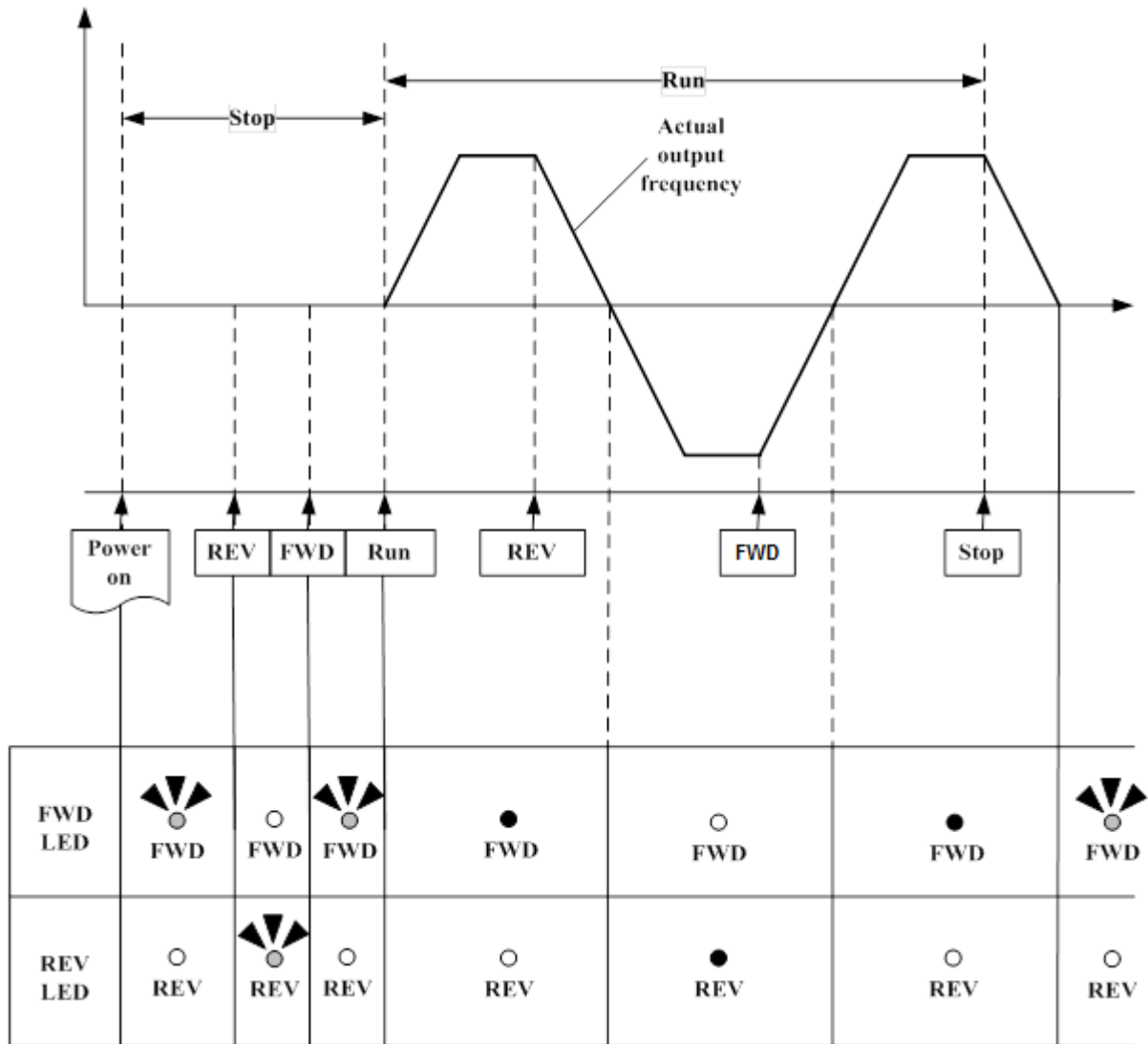


Example2: Modifying the frequency from keypad in run and stop modes.



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

8.5 Operation Control



9 Parametrization

WARNING



Faulty parametrization

Faulty or incorrect parametrization may lead to unwanted device behavior. This may lead to device damage or to personal injuries.

- Parameter settings may only be changed by skilled personnel. Before starting the commissioning process, read the documentation carefully and comply with the safety instructions.

Parametrization using PC software S2U Manager

To edit parameter settings, you can use the operator panel or you can access the parameters via the software Vplus - S2U Manager. The software shall be provided to you by the manufacturer upon request. In order to employ a PC with the S2U Manager installed on it, you have to connect the inverter to the PC via the RS485 interface (see also chapter "Technical Data").

To establish the connection, the "USB-serial adapter" and the "Interface Line RJ45 IP66" are required. It shall be provided to you by the manufacturer upon request.

The product order numbers are:

- USB-serial adapter: **DS179679107**
- Interface Line RJ45 IP66: **DS179679120.**

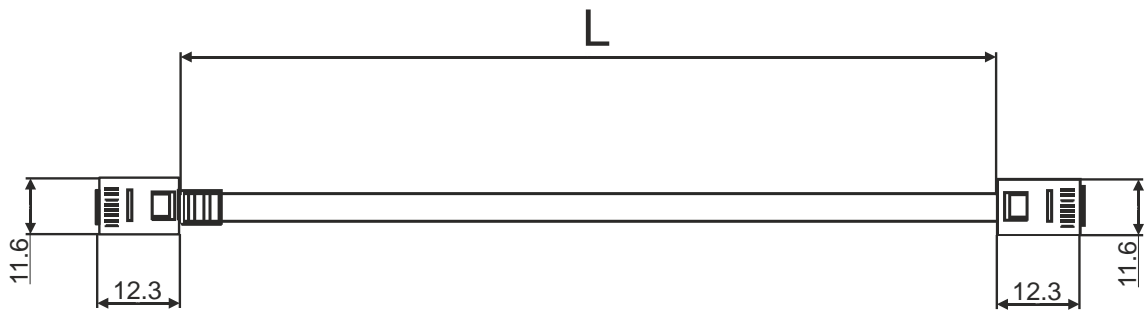


Figure 9-1: Interface line RJ45 S2U IP66

L = 500 mm



Figure 9-2: USB-serial adapter

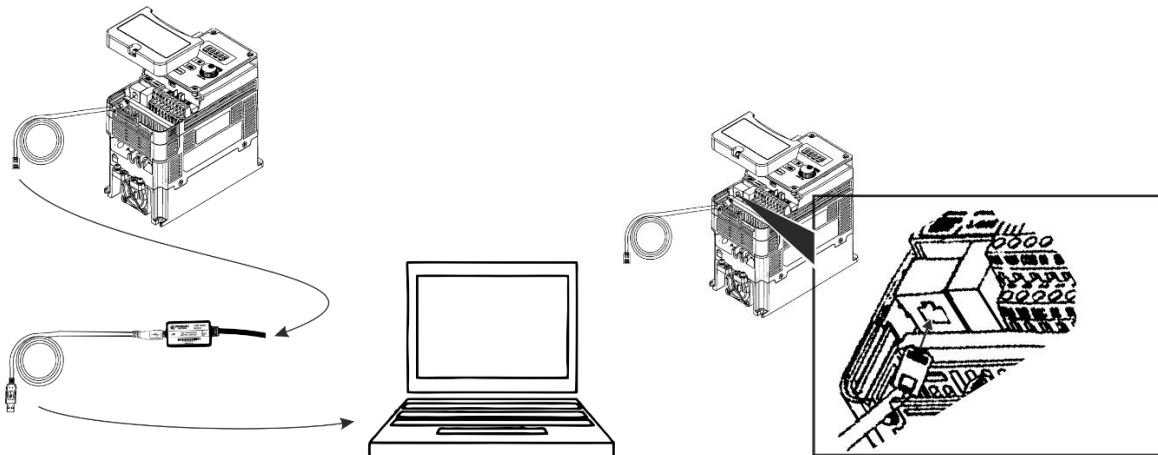


Figure 9-3: connecting to PC

To connect the inverter to the PC perform the following steps:

- 1 Make sure the inverter is deenergized. Disconnect the power supply and prevent from being reconnected/reactivated.
- 2 Remove the front cover of the inverter to gain access to the RS485 port of the inverter.
- 3 Remove the grey RJ45 cable from the USB-serial adapter and plug the red Interface Line RJ45 IP66 cable into the RJ45 port of the USB-serial adapter, if necessary.
- 4 Insert the USB cable of the USB-serial adapter into the USB port of the PC.
- 5 Take safety precautions to prevent unintended contact with live parts of the inverter. Connect the inverter to the power supply.
- 6 Start the S2U Manager software installed on the PC.
- 7 In the "Operation" menu of the S2U Manager, select "Connect".
 - a. In the "Link" dialogue, enter the data corresponding to the inverter presently connected to the PC.
 - b. At the bottom of the dialogue window, click the "Link" button .
 - c. After the connection with the inverter is established, you can edit the parameters of the inverter.

9.1 Programmable Parameter Groups

Parameter Group No.	Description
Group 00	Basic Parameters
Group 01	V/F Pattern Selections and Setup
Group 02	Motor Parameters
Group 03	Multi Function Digital Inputs/Outputs
Group 04	Analog Signal Inputs/Output
Group 05	Preset Frequency Selections
Group 06	Auto Run Function(Auto Sequencer)
Group 07	Start/Stop Command Setup
Group 08	Drive and Motor Protection
Group 09	Communication Function Setup
Group 10	PID Function Setup
Group 11	Performance Control Functions
Group 12	Digital Display & Monitor Functions
Group 13	Inspection & Maintenance Functions
Group 14	PLC Setting Function
Group 15	PLC Monitoring Function
Group F	Simplified Parameter Set

Parameter notes for Parameter Groups – see column "Note" in the Tables below	
*1	Parameter can be adjusted during running mode
*2	Cannot be modified in communication mode
*3	Does not change with factory reset
*4	Read only
*5	Available for above V1.1
*6	Available for above V1.3
*7	Available for above V1.7

Simplified parameter Group F_						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
F_1	Acceleration Time 1	0.1 ~ 3600.0	10.0	s	*1	00-14
F_2	Deceleration Time 1	0.1 ~ 3600.0	10.0	s	*1	00-15
F_3	Operation modes for external terminals	0: Forward/Stop-Reverse/Stop 1: Run/Stop-Reverse/Forward 2: 3-Wire Control Mode-Run/Stop	0	-		00-04
F_4	Reserved	-	-	-	-	
F_5	Volts/Hz Patterns	0 ~ 18	0	-		01-00
F_6	Frequency Upper Limit	0.01 ~ 599.00	50.00/60.00	Hz		00-12
F_7	Frequency Lower Limit	0.00 ~ 589.99	0.00	Hz		00-13
F_8	Preset Speed 0 (Keypad Freq)	0.00 ~ 599.00	5.00	Hz		05-01
F_9	Jog Frequency	0.00 ~ 599.00	2.00	Hz	*1	00-18
F_10	Main Run Source Selection	0: Keypad 1 :External Run/Stop Control 2: Communication	1	-		00-02
F_11	Main Frequency Source Selection	0: Keypad 1: Potentiometer on Keypad 2: External AI1 Analog Signal Input 3 :External AI2 Analog Signal Input 4: External Up/Down Frequency Control 5: Communication setting Frequency 6: PID output frequency 7: Pulse Input	2	-		00-05
F_12	Carrier Frequency (kHz)	1 ~ 16	5	KHz		11-01
F_13	Volts/Hz Curve Modification (Torque Boost)	0 ~ 10.0	0.0	%	*1	01-10
F_14	Stopping Method	0: Deceleration to stop 1: Coast to stop	0			07-09
F_15	DC Injection Brake Time (Seconds) In stop mode	0.0 ~ 25.5	0.5	s		07-08
F_16	DC Injection Brake Start Frequency (Hz) In Stop mode	0.10 ~ 10.00	1.5	Hz		07-06
F_17	DC Injection Brake Level (%) In stop mode	0 ~ 150.0	50.0	%		07-07
F_18	Motor Rated Current (OL1)	0.2 ~ 3.8	1.7	A		02-01

Simplified parameter Group F_						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
F_19	Multifunction Input Term. I1D	0: Forward/Stop Command 1: Reverse/Stop Command 2: Speed Selection 1 3: Speed Selection 2 4: Speed Selection 3 5: Speed Selection 4 6: Jog forward Command 7: Jog reverse Command 8: Up Command 9: Down Command 10: Acc/Dec 2 11: Acc/Dec disabled 12: Main/Alternative run source select 13: Main/Alternative frequency command select 14: rapid stop (Decel to stop) 15: Base block 16: Disable PID function 17: Fault reset 18: Auto Run Mode enable 19: Speed search 20: Energy saving (only V/F) 21: Reset PID integral value to zero 22: Counter input 23: Counter reset 24: PLC input 25: Pulse input-width measure (I3D) 26: Pulse input-frequency measure (I3D) 27: Enable KEB function 28: Fire mode function	0	-		03-00
F_20	Multifunction Input Term. I2D	0: Forward/Stop Command 1: Reverse/Stop Command 2: Speed Selection 1 3: Speed Selection 2 4: Speed Selection 3 5: Speed Selection 4 6: Jog forward Command 7: Jog reverse Command 8: Up Command 9: Down Command 10: Acc/Dec 2 11: Acc/Dec disabled 12: Main/Alternative run source select 13: Main/Alternative frequency command select 14: rapid stop (Decel to stop) 15: Base block 16: Disable PID function 17: Fault reset 18: Auto Run Mode enable 19: Speed search 20: Energy saving (only V/F) 21: Reset PID integral value to zero 22: Counter input 23: Counter reset 24: PLC input 25: Pulse input-width measure (I3D) 26: Pulse input-frequency measure (I3D) 27: Enable KEB function 28: Fire mode function	1	-		03-01

Simplified parameter Group F_						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
F_21	Output Relay (RY1)	0: Run 1: Fault 2: Setting Frequency Reached 3 :Frequency Reached (3-13 ± 3-14) 4: Output Frequency Detection1 (> 3-13) 5: Output Frequency Detection2 (< 3-13) 6: Auto-Restart 7: Momentary AC Power Loss 8: Rapid Stop 9: Base Block 10: Motor Overload Protection (OL1) 11: Drive Overload Protection (OL2) 12: Over-torque threshold level (OL3) 13: Preset Output Current Reached (03-15~16) 14: Brake Control (03-17~18) 15: PID feedback signal loss 16:Single pre-set count (03-22) 17: Dual pre-set count (3-22~23) 18: PLC Status indicator (00-02) 19: PLC control 20: zero speed 21: Low current detection	0	-		03-11
F_22	Reverse operation control	0: Reverse command is enabled 1: Reverse command is disabled	0	-		11-00
F_23	Momentary Power Loss and Restart	0: Momentary Power Loss and Restart disable 1: Momentary power loss and restart enable	0	s		07-00
F_24	Number of Auto Restart Attempts	0 ~ 10	0	-		07-02
F_25	Reset Drive to Factory Settings	1150: Reset to factory setting (50 Hz,220 V/380 V system) 1160: Reset to factory setting(60 Hz,220 V/380 V system) 1250: Reset to factory setting(50 Hz,230 V/400 V system) 1260: Reset to factory setting(60 Hz,230 V/460 V system) 1350: Reset to factory setting (50 Hz,220 V/415 V system) 1360: Reset to factory setting (60 Hz,230 V/400 V system) 1112: Reset PLC	0000	-		13-08
F_26	Auto _ Run Mode frequency command 1	0.00 ~ 599.00	0.00	Hz	*1	06-01
F_27	Auto _ Run Mode frequency command 2		0.00	Hz	*1	06-02
F_28	Direct Running After Power Up	0: Enable Direct run on power up 1: Disable Direct run on power up	1	-		07-04

Simplified parameter Group F_						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
F_29	Software Version	----	-	-	*3*4	13-01
F_30	Fault Log (Last 3 Faults)	----	-	-	*3*4	13-02
F_31	Parameter Set Select	0: Simplified Parameter Set 1: Complete Parameter Set	0	-		
13-09	Parameter Set Select	0: Complete Parameter Set 1: Simplified Parameter Set	1	-		

Group 00-Basic parameters						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
00-00	Control Mode Selection	0:V/F Mode 1:Vector Mode	0	-		
00-01	Reserved					
00-02	Main Run Command Source Selection	0:Keypad 1:External Run/Stop Control 2:Communication 3:PLC	0	-		F_10
00-03	Alternative Run Command Source Selection	0:Keypad 1:External Run/Stop Control 2:Communication	0	-		
00-04	Operation Modes for External Terminals	0:Forward/Stop-Reverse/Stop 1:Run/Stop-Reverse/Forward 2: 3 Wire Control Mode-Run/Stop	0	-		F_3
00-05	Main Frequency Command Source Selection	0:UP/DOWM of Keypad 1:Potentiometer on Keypad 2:External AI1 Analog Signal Input 3:External AI2 Analog Signal Input 4:External Up/Down Frequency Control 5:Communication Setting Frequency 6:PID Ouput Frequency 7:Pulse Input	0	-		F_11
00-06	Alternative Frequency Command Source Selection	0:UP/DOWM of Keypad 1:Potentiometer on Keypad 2:External AI1 Analog Signal Input 3:External AI2 Analog Signal Input 4:External Up/Down Frequency Control 5:Communication Setting Frequency 6:PID Ouput Frequency 7:Pulse Input	4	-		

Group 00-Basic parameters						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
00-07	Main and Alternative Frequency Command Modes	0:Main or Alternative Frequency 1:Main Frequency+ Alternative Frequency	0	-		
00-08	Communication Frequency Command	0.00~599.00	0.00	Hz	*4	
00-09	Frequency Command Save on Power Down	0: Disable	0	-		
		1: Enable				
00-10	Initial Frequency Selection (keypad mode)	0:by Current Frequency Command 1:by 0 Frequency Command 2:by 00-11	0	-		
00-11	Initial Frequency Setpoint	0.00~599.00	50.00/60.00	Hz		
00-12	Frequency Upper Limit	0.01~599.00	50.00/60.00	Hz		F_6
00-13	Frequency Lower Limit	0.00~598.99	0.00	Hz		F_7
00-14	Acceleration Time 1	0.1~3600.0	10.0	Sec	*1	F_1
00-15	Deceleration Time 1	0.1~3600.0	10.0	Sec	*1	F_2
00-16	Acceleration Time 2	0.1~3600.0	10.0	Sec	*1	
00-17	Deceleration Time 2	0.1~3600.0	10.0	Sec	*1	
00-18	Jog Frequency	0.00~599.00	2.00	Hz	*1*7	F_9
00-19	Jog Acceleration Time	0.1~3600.0	0.5	Sec	*1*7	
00-20	Jog Deceleration Time	0.1~3600.0	0.5	Sec	*1*7	

Group 01-V/F Pattern selection & Setup						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
01-00	Volts/Hz Patterns	0~18	0/9	-		F_5
01-01	V/F Max voltage	200V:170.0~264.0 400V:323.0~528.0	Based on 13-08	Vac		
01-02	Base Frequency	0.20 ~ 599.00	50.00/60.00	Hz		
01-03	Max Frequency Voltage Ratio	0.0 ~ 100.0	100.0	%		
01-04	Mid Frequency 2	0.10 ~ 599.00	25.00/30.00	Hz		
01-05	Mid Frequency Voltage Ratio 2	0.0 ~ 100.0	50.0	%		
01-06	Mid Frequency 1	0.10 ~ 599.00	10.00/12.00	Hz		
01-07	Mid Frequency Voltage Ratio 1	0.0 ~ 100.0	20.0	%		
01-08	Min Frequency	0.10 ~ 599.00	0.50/0.60	Hz		
01-09	Min Frequency Voltage Ratio	0.0 ~ 100.0	1.0	%		
01-10	Volts/Hz Curve Modification (Torque Boost)	0 ~ 10.0	0.0	%	*1	
01-11	V/F start Frequency	0.00~10.00	0.00	Hz		
01-12	Slip compensation gain	0.05~10.00	0.10	S		
01-13	V/F Mode Select	0 : Mode 0 1 : Mode 1	by models	-	*7	F_13

Group 02-Motor parameters						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
02-00	Motor No Load Current	0~[(Parameter 02-01)-0.1]	-	Amps(AC)	*3	
02-01	Motor Rated Current (OL1)	0.2~100	-	A	*3	F_18
02-02	Motor rated Slip Compensation	0.0 ~ 200.0	0.0	%	*1	
02-03	Motor rated speed	0~39000	-	Rpm	*3	
02-04	Motor rated voltage	200V: 170.0~264.0 400V: 323.0~528.0	220.0/440.0	V		
02-05	Motor rated power	0.1~37.0	-	KW		
02-06	Motor rated frequency	0~599.0	50.0/60.0	Hz		
02-07	Motor pole number	2 ~16	4	-		
02-08 ~ 02-13	Reserved					
02-14	Auto Tune	0: Disable	0			
		1: Start Auto tune function.				
02-15						
02-16	Rotor resistance gain	----			*3*4	

Group 03-External Digital Inputs and Relay Output Functions						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
03-00	Multifunction Input Term. I1D	0:Forward/Stop Command	0	-		F_19
03-01	Multifunction Input Term. I2D	1:Reverse/Stop Command				
03-02	Multifunction Input Term. I3D	2:Speed Selection 1	1	-		F_20
		3:Speed Selection 2				
03-03	Multifunction Input Term. I4D	4:Speed Selection 3	2	-		
		5:Speed Selection 4				
03-04	Multifunction Input Term. I5D	6:Jog Forward Command	3	-		
		7:Jog Reverse Command				
03-05	Multifunction Input Term. I6D	8:Up Command	4	-		
		9:Down Command				
03-06	Up/Down frequency step	10:Acc/Dec 2	17	-		
		11:Acc/Dec Disabled				
03-07	Multifunction Input Term. I7D	12:Main/Alternative run source select				
		13:Main/ Alternative Frequency Command select				
03-08	Multifunction Input Term. I8D	14:Rapid Stop (Decel to stop)				
		15:Base Block				
03-09	Multifunction Input Term. I9D	16:Disabl PID Function				
		17: Fault Reset				
03-10	Multifunction Input Term. I10D	18:Auto Run Mode Enable				
		19:Speed Search				
03-11	Multifunction Input Term. I11D	20:Energy Saving (only V/F)				
		21:Reset PID integral value to Zero				
03-12	Multifunction Input Term. I12D	22:Counter Input				
		23:Counter reset				
03-13	Multifunction Input Term. I13D	24:PLC Input				
		25:Pulse Input-Width Measure (I3D)				
03-14	Multifunction Input Term. I14D	26:Pulse Input-Frequenct Measure (I3D)				*6 *6
		27:Enable KEB Function				
03-15	Multifunction Input Term. I15D	28:Fire mode function				*5

Group 03-External Digital Inputs and Relay Output Functions						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
03-07	Up/Down Keep Frequency Status after Stop Command	0:When Up/Down is used, the preset frequency is held as the inverter stops, and the UP/Down function is disabled	0	-		
		1:When Up/Down is used, the preset frequency is reset to 0 Hz as the inverter stops.				
		2:When Up/Down is used, the preset frequency is held as the inverter stops, and the UP/Down is available.				
03-08	I1D ~ I6D scan confirmation	1~200 Number of Scan cycles	10	2ms		
03-09	I1D ~ I5D switch type select	xxxx0:I1D NO xxx1:I1D NC	00000	-		
		xxx0x:I2D NO xxx1x:I2D NC				
		xx0xx:I3D NO xx1xx:I3D NC				
		x0xxx:I4D NO x1xxx:I4D NC				
		0xxxx:I5D NO 1xxxx:I5D NC				
03-10	I6D switch type select	xxxx0:I6D NO xxx1:I6D NC	00000	-		
03-11	Output Relay RY1 (Terminals R1A,R1B, R1C)	0:Run	0	-		F_21
03-12	Output Relay RY2 (Terminals R2A, R2B)	1: Fault 2: Output Frequency Reached 3: Output Frequency Reached within Preset Range (3-13±3-14) 4: Output Frequency Detection1(> 3-13) 5: Output Frequency Detection2(< 3-13) 6: Auto Restart 7: Momentary AC Power Loss 8: Rapid Stop 9: Base Block 10: Motor Overload Protection(OL1) 11: Drive Overload Protection(OL2) 12: Over-torque Threshold Level (OL3) 13: Preset Output Current Reached (03-15~16) 14: Brake Control (03-17~18) 15: PID Feedback Signal Loss 16: Single pre-set count (3-22) 17: Dual pre-set count (3-22~23) 18:PLC Status Indicator (00-02) 19:PLC control 20:Zero Speed 21:Low current	1			
03-13	Preset Frequency Reached Level	0.00~599.00	0.00	Hz	*1	
03-14	Frequency Reached Detection Range (±)	0.00~30.00	2.00	Hz	*1	
03-15	Preset output current reached	0.1~15.0	0.1	A		

Group 03-External Digital Inputs and Relay Output Functions						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
03-16	Preset output Current detection delay Time	0.1~10.0	0.1	Sec		
03-17	Brake Release level	0.00~20.00	0.00	Hz		
03-18	Brake Engage Level	0.00~20.00	0.00	Hz		
03-19	Relay Output function type	0:A (Normally open) 1:B (Normally close)	0	-		
03-20	Internal / external multi-function input terminal selection	0~63	0	-		
03-21	Action to set the internal multi-function input terminals	0~63	0	-		
03-22	Pre-set count 1	0~9999	0	-		
03-23	Pre-set count 2	0~9999	0	-		
03-24	Output under current detection	0:Disable	0	-		
		1:Enable				
03-25	Output under current detection level	5%~100%	20%	%		
03-26	Output under current detection delay time	0.0~50.0s	20.0	Sec		
03-27	Pulse Frequency	0.01~0.20	0.1	kHz	*7	
03-28	Pulse Frequency Gain	0.01~9.99	1.00		*6	
03-29	Low Current Detection Mode	0: Operate while in RUN mode 1: Operate once power on	0			
03-30	Low Current Detection Level	0~100	0	%		
03-31	Low Current Detection Time	0.0~50.0	0	Sec		

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

Group 04-Analog signal inputs / Analog output					
No.	Description	Range	Factory Setting	Unit	Note
04-00	Analog Input Signal Type Select (AI1/AI2)	AI1 AI2	1	-	*7
		(0): 0~10V (0~20mA) 0~10V (0~20mA)			
		(1): 0~10V (0~20mA) 2~10V (4~20mA)			
		(2): 2~10V (4~20mA) 0~10V (0~20mA)			
		(3): 2~10V (4~20mA) 2~10V (4~20mA)			
04-01	AI1 Signal Verification Scan Rate	1~200	50	2ms	
04-02	AI1 Gain	0 ~ 1000	100	%	*1
04-03	AI1 Bias	0 ~ 100	0	%	*1
04-04	AI1 Bias Selection	0: Positive 1: Negative	0	-	*1
04-05	AI1 Slope	0: Positive 1: Negative	0	-	*1
04-06	AI2 Signal Verification Scan Rate	1~200	50	2ms	
04-07	AI2 Gain	0 ~ 1000	100	%	*1
04-08	AI2 Bias	0 ~ 100	0	%	*1
04-09	AI2 Bias Selection	0: Positive 1: Negative	0	-	*1
04-10	AI2 Slope	0: Positive 1: Negative	0	-	*1
04-11	Analog Output (AO) Mode	0: Output Frequency 1: Frequency Command 2: Output Voltage 3: DC Bus Voltage 4: Motor Current (100% rated current)	0	-	*1
04-12	Analog Output (AO) Gain	0 ~ 1000	100	%	*1
04-13	Analog Output (AO) Bias	0 ~ 100	0	%	*1
04-14	AO Bias Selection	0: Positive 1: Negative	0	-	*1
04-15	AO Slope	0: Positive 1: Negative	0	-	*1
04-16	F-Gain Function	0: Invalid 1: Effective	0	-	*1

Group 05-Preset Frequency Selections					
No.	Description	Range	Factory Setting	Unit	Note
05-00	Preset Speed Control Mode Selection	0: Common Accel/Decel Accel/Decel 1 or 2 apply to all speeds	0	-	
		1: Individual Accel/Decel for each preset speed 0-15 apply to the selected preset speeds (Acc0/Dec0~Acc15/Dec15)			
05-01	Preset Speed 0 (Keypad Freq)	0.00 ~ 599.00	5.00	Hz	F_8
05-02	Preset Speed1 (Hz)		5.00	Hz	*1
05-03	Preset Speed2 (Hz)		10.00	Hz	*1
05-04	Preset Speed3 (Hz)		20.00	Hz	*1

Group 05-Preset Frequency Selections						
No.	Description	Range	Factory Setting	Unit	Note	
05-05	Preset Speed4 (Hz)		30.00	Hz	*1	
05-06	Preset Speed5 (Hz)		40.00	Hz	*1	
05-07	Preset Speed6 (Hz)		50.00	Hz	*1	
05-08	Preset Speed7 (Hz)		50.00	Hz	*1	
05-09	Preset Speed8 (Hz)		0.00	Hz	*1	
05-10	Preset Speed9 (Hz)		0.00	Hz	*1	
05-11	Preset Speed10 (Hz)		0.00	Hz	*1	
05-12	Preset Speed11 (Hz)		0.00	Hz	*1	
05-13	Preset Speed12 (Hz)		0.00	Hz	*1	
05-14	Preset Speed13 (Hz)		0.00	Hz	*1	
05-15	Preset Speed14 (Hz)		0.00	Hz	*1	
05-16	Preset Speed15 (Hz)		0.00	Hz	*1	
05-17	Preset Speed0-Acctime		0.1 ~ 3600.0	10.0	Sec	*1
05-18	Preset Speed0-Decctime			10.0	Sec	*1
05-19	Preset Speed1-Acctime			10.0	Sec	*1
05-20	Preset Speed1-Decctime	10.0		Sec	*1	
05-21	Preset Speed2-Acctime	10.0		Sec	*1	
05-22	Preset Speed2-Decctime	10.0		Sec	*1	
05-23	Preset Speed3-Acctime	10.0		Sec	*1	
05-24	Preset Speed3-Decctime	10.0		Sec	*1	
05-25	Preset Speed4-Acctime	10.0		Sec	*1	
05-26	Preset Speed4-Decctime	10.0		Sec	*1	
05-27	Preset Speed5-Acctime	10.0		Sec	*1	
05-28	Preset Speed5-Decctime	10.0		Sec	*1	
05-29	Preset Speed6-Acctime	10.0		Sec	*1	
05-30	Preset Speed6-Decctime	10.0		Sec	*1	
05-31	Preset Speed7-Acctime	10.0		Sec	*1	
05-32	Preset Speed7-Decctime	10.0		Sec	*1	
05-33	Preset Speed8-Acctime	10.0		Sec	*1	
05-34	Preset Speed8-Decctime	10.0		Sec	*1	
05-35	Preset Speed9-Acctime	10.0		Sec	*1	
05-36	Preset Speed9-Decctime	10.0		Sec	*1	
05-37	Preset Speed10-Acctime	10.0		Sec	*1	
05-38	Preset Speed10-Decctime	10.0		Sec	*1	
05-39	Preset Speed11-Acctime	10.0		Sec	*1	
05-40	Preset Speed11-Decctime	10.0		Sec	*1	
05-41	Preset Speed12-Acctime	10.0		Sec	*1	
05-42	Preset Speed12-Decctime	10.0		Sec	*1	
05-43	Preset Speed13-Acctime	10.0		Sec	*1	
05-44	Preset Speed13-Decctime	10.0		Sec	*1	
05-45	Preset Speed14-Acctime	10.0		Sec	*1	
05-46	Preset Speed14-Decctime	10.0		Sec	*1	
05-47	Preset Speed15-Acctime	10.0		Sec	*1	
05-48	Preset Speed15-Decctime	10.0		Sec	*1	

Group 06-Auto Run Function (Auto Sequencer)					
No.	Description	Range	Factory Setting	Unit	Note
06-00	Auto Run Mode Selection (Sequencer)	0: Disabled. 1: Single cycle. (Continues to run from the Unfinished step if restarted). 2: Periodic cycle. (Continues to run from the unfinished step if restarted). 3: Single cycle, then holds the speed Of final step to run. (Continues to run from the unfinished step if restarted). 4: Single cycle. (Starts a new cycle if restarted). 5: Periodic cycle. (Starts a new cycle if restarted). 6: Single cycle, then hold the speed of final step to run. (Starts a new cycle if restarted).	0	-	
06-01	Auto _ Run Mode Frequency Command 1	0.00~599.00	0.00	Hz	*1 F_26
06-02	Auto _ Run Mode Frequency Command 2		0.00	Hz	*1 F_27
06-03	Auto _ Run Mode Frequency Command 3		0.00	Hz	*1
06-04	Auto _ Run Mode Frequency Command 4		0.00	Hz	*1
06-05	Auto _ Run Mode Frequency Command 5		0.00	Hz	*1
06-06	Auto _ Run Mode Frequency Command 6		0.00	Hz	*1
06-07	Auto _ Run Mode Frequency Command 7		0.00	Hz	*1
06-08	Auto _ Run Mode Frequency Command 8		0.00	Hz	*1
06-09	Auto _ Run Mode Frequency Command 9		0.00	Hz	*1
06-10	Auto _ Run Mode Frequency Command10		0.00	Hz	*1
06-11	Auto _ Run Mode Frequency Command 11		0.00	Hz	*1
06-12	Auto _ Run Mode Frequency Command 12		0.00	Hz	*1
06-13	Auto _ Run Mode Frequency Command 13		0.00	Hz	*1
06-14	Auto _ Run Mode Frequency Command 14		0.00	Hz	*1
06-15	Auto _ Run Mode Frequency Command 15		0.00	Hz	*1
06-16	Auto_ Run Mode Running Time Setting 0	~ 3600.0	0.0	Sec	
06-17	Auto_ Run Mode Running Time Setting 1		0.0	Sec	
06-18	Auto_ Run Mode Running Time Setting 2		0.0	Sec	
06-19	Auto_ Run Mode Running Time Setting 3		0.0	Sec	
06-20	Auto_ Run Mode Running Time Setting 4		0.0	Sec	
06-21	Auto_ Run Mode Running Time Setting 5		0.0	Sec	
06-22	Auto_ Run Mode Running Time Setting 6		0.0	Sec	

Group 06-Auto Run Function (Auto Sequencer)						
No.	Description	Range	Factory Setting	Unit	Note	
06-23	Auto_Run Mode Running Time Setting 7		0.0	Sec		
06-24	Auto_Run Mode Running Time Setting 8		0.0	Sec		
06-25	Auto_Run Mode Running Time Setting 9		0.0	Sec		
06-26	Auto_Run Mode Running Time Setting 10		0.0	Sec		
06-27	Auto_Run Mode Running Time Setting 11		0.0	Sec		
06-28	Auto_Run Mode Running Time Setting 12		0.0	Sec		
06-29	Auto_Run Mode Running Time Setting 13		0.0	Sec		
06-30	Auto_Run Mode Running Time Setting 14		0.0	Sec		
06-31	Auto_Run Mode Running Time Setting 15		0.0	Sec		
06-32	Auto_Run Mode Running Direction 0		0: Stop 1: Forward 2: Reverse	0	-	
06-33	Auto_Run Mode Running Direction 1			0	-	
06-34	Auto_Run Mode Running Direction 2			0	-	
06-35	Auto_Run Mode Running Direction 3			0	-	
06-36	Auto_Run Mode Running Direction 4			0	-	
06-37	Auto_Run Mode Running Direction 5			0	-	
06-38	Auto_Run Mode Running Direction 6	0		-		
06-39	Auto_Run Mode Running Direction 7	0		-		
06-40	Auto_Run Mode Running Direction 8	0		-		
06-41	Auto_Run Mode Running Direction 9	0		-		
06-42	Auto_Run Mode Running Direction10	0		-		
06-43	Auto_Run Mode Running Direction 11	0		-		
06-44	Auto_Run Mode Running Direction12	0		-		
06-45	Auto_Run Mode Running Direction13	0		-		
06-46	Auto_Run Mode Running Direction 14	0		-		
06-47	Auto_Run Mode Running Direction 15	0	-			

* Frequency of the step 0 is set by parameter 05-01, keypad frequency.

Group 07-Start/Stop Command Setup						
No.	Description	Range	Factory Setting	Unit	Note	Corr. to Param. No
07-00	Momentary Power Loss and Restart	0: Momentary Power Loss and Restart Disable 1: Momentary Power Loss and Restart Enable	0	-		F_23
07-01	Auto Restart Delay Time	0.0~800.0	0.0	Sec		
07-02	Number of Auto Restart Attempts	0~10	0	-		F_24
07-03	Reset Mode Setting	0: Enable Reset Only when Run Command is Off 1: Enable Reset when Run Command is On or Off	0	-		
07-04	Direct Running on Power Up	0: Enable Direct run on power up 1: Disable Direct run on power up	1	-		F_28
07-05	Delay-ON Timer	1.0~300.0	1.0	Sec		
07-06	DC Injection Brake Start Frequency	0.10 ~ 10.00	1.5	Hz		F_16
07-07	DC Injection Brake Level (Current Mode)	0.0 ~ 150.0	50.0	%		F_17
07-08	DC Injection Brake Time	0.0 ~ 25.5	0.5	Sec		F_15
07-09	Stopping Method	0: Deceleration to stop 1: Coast to stop	0	-		F_14
07-10	Starting Methods	0: Normal Start 1: Speed Search	0	-		
07-11	Starting method for auto restart after fault	0: Speed Search 1: Normal start	0	-		
07-12	Power Loss Ride Through Time	0.0 ~ 2.0	0.5	Sec		
07-13	Main Circuit Low Voltage Detection Level	150.0~210.0 300.0~420.0	190.0/380.0	Vac		
07-14	Kinetic Energy Back-up Deceleration Time	0.0~25.0: KEB Deceleration Time	0.0	Sec		
07-15	DC Injection Brake Mode	0 : Current Mode 1 : Voltage Mode	1	-	*6	
07-16	DC Injection Brake Level (Voltage Mode)	0.0~10.0	4.0	%	*6	

Group 08-Drive & Motor Protection Functions					
No.	Description	Range	Factory Setting	Unit	Note
08-00	Trip Prevention Selection	xxxx0: Enable Trip Prevention During Acceleration xxxx1: Disable Trip Prevention During Acceleration xxx0x: Enable Trip Prevention During Deceleration xxx1x: Disable Trip Prevention During Deceleration xx0xx: Enable Trip Prevention in Run Mode xx1xx: Disable Trip Prevention in Run Mode x0xxx: Enable Over Voltage Prevention in Run Mode x1xxx: Disable Over Voltage Prevention in Run Mode	01000	-	*5
08-01	Trip Prevention Level During Acceleration (%)	50 ~ 200	200	% ¹	
08-02	Trip Prevention Level During Deceleration (%)	50 ~ 200	200		
08-03	Trip Prevention Level in Run Mode (%)	50 ~ 200	200		
08-04	Over Voltage Prevention Level in Run Mode	350.0~390.0/700.0~780.0	380.0/760.0	VDC	
08-05	Electronic Motor Overload Protection Operation Mode	0: Disable 1: Enable	1	-	*7
08-06	Operation After Overload Protection is Activated	0: Coast-to-Stop After Overload Protection is Activated 1: Drive Will Not Trip when Overload Protection is Activated (OL1)	0	-	
08-07	Over Heat Protection (cooling fan control)	0: Auto (Depends on temp.) 1: Operate while in RUN Mode 2: Always Run 3: Disabled	1	-	
08-08	AVR Function (Auto Voltage Regulation)	0: AVR Function is enabled 1: AVR Function is disabled 2: AVR Function is disabled for Stop 3: AVR Function is disabled for Deceleration. 4: AVR Function is disabled for Stop and Deceleration. 5: When VDC>360V, AVR Function is disabled for Stop and Deceleration.	4	-	*5
08-09	Input Phase Loss Protection	0: Disable 1: Enable	0	-	
08-10	Output Phase Loss Protection	0: Disable 1: Enable	0	-	
08-11	Motor Type Selection	0: Overload protection (Standard Motor) 1: Overload protection (Inverter Duty Motor)	0	-	
08-12	Motor Overload Protection Curve	0: Motor Overload Protection for General loads (OL=103 %) (150% for 1 Minutes)	0	-	

¹ Based on the percentage of inverter rated current.

Group 08-Drive & Motor Protection Functions					
No.	Description	Range	Factory Setting	Unit	Note
		1: Motor Over load Protection for HVAC (Fan & Pump) (OL=113%) (123% for 1 Minutes).			
08-13	Over Torque Detection Control	0: Over Torque Detection Disabled	0	-	
		1: Over torque detection after set frequency is reached			
		2: Over torque detection after run command			
08-14	Over torque protection action	0: Stop Output After Over Torque Detection (Free Run to Stop)	0	-	
		1: Continue Running After Over Torque Detection (Display only OL3)			
08-15	Over Torque Detection Level	30~300	160	-	
08-16	Over Torque Detection Time	0.0~25.0	0.1	-	
08-17	Fire Mode (for firmware below v1.1)	0: Disable	0	-	
		1: Enable			
08-18	Ground Fault Detection	0: Disable	0		*7
		1: Enable			

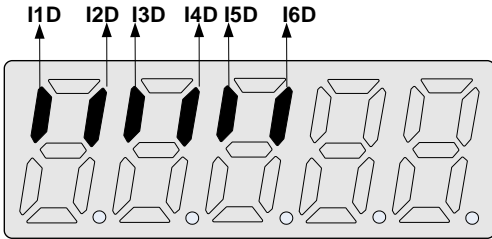
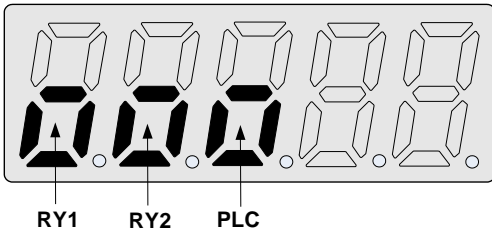
Notes: Regarding fire mode function, please refer to the conditions below

1. Below firmware v1.1, Fire Mode is enabled by setting 08-17 = 1
2. Above (including) firmware v1.1, Fire Mode is enabled by setting digital inputs 03-00~03-05 = 28. Parameter 08-17 is then removed.
3. 08-18 is applicable to frame 3 and 4 only.

Group 09-Communication function setup					
No.	Description	Range	Factory Setting	Unit	Note
09-00	Assigned Communication Station Number	1 ~ 32	1	-	*2*3
09-01	RTU/ASCII Code Selection	0:RTU Code 1:ASCII Code	0	-	*2*3
09-02	Baud Rate Setting (bps)	0:4800 1:9600 2:19200 3:38400	2	bps	*2*3
09-03	Stop Bit Selection	0:1 Stop Bit 1:2 Stop Bits	0	-	*2*3
09-04	Parity Selection	0:Without Parity 1:With Even Parity 2:With Odd Parity	0	-	*2*3
09-05	Data Format Selection	0: 8-Bits Data 1: 7-Bits Data	0	-	*2*3
09-06	Communication Time-Out Detection Time	0.0 ~ 25.5	0.0	Sec	
09-07	Communication Time Out Operation Selection	0:Deceleration to Stop (00-15: Deceleration Time 1) 1:Coast to Stop 2:Deceleration to Stop (00-17: Deceleration Time 2) 3:Continue Operating	0	-	
09-08	Comm. Fault Tolerance Count.	1 ~ 20	3		
09-09	Wait Time of Inverter Transmission	5 ~ 65	5	ms	

Group 10-PID Function Setup					
No.	Description	Range	Factory Setting	Unit	Note
10-00	PID Target Value Selection (When 00-05\00-06=6 This Function is Enabled)	0: Potentiometer on Keypad 1: Analog Signal Input. (AI1) 2: Analog Signal Input. (AI2) 3: Frequency Set by Communication 4: Keypad Frequency Parameter 10-02	1	-	*1
10-01	PID Feedback Value Selection	0: Potentiometer on Keypad 1: Analog Signal Input. (AI1) 2: Analog Signal Input. (AI2) 3: Frequency Set by Communication	2	-	*1
10-02	PID Target(Keypad Input)	0.0~100.0	50.0	%	*1
10-03	PID Mode Selection	0: Disable 1: Deviation D Control. FWD Characteristic. 2: Feedback D Control FWD Characteristic. 3: Deviation D Control Reverse Characteristic. 4: Feedback D Control Reverse Characteristic.	0	-	
10-04	Feedback Gain Coefficient	0.00 ~ 10.00	1.00		*1
10-05	Proportional Gain	0.0 ~ 10.0	1.0		*1
10-06	Integral Time	0.0 ~ 100.0	10.0	Sec	*1
10-07	Derivative Time	0.00 ~ 10.00	0.00	Sec	*1
10-08	PID Offset	0: Positive 1: Negative	0	-	*1
10-09	PID Offset Adjust	0 ~ 109	0	%	*1
10-10	PID Output Lag Filter Time	0.0 ~ 2.5	0.0	Sec	*1
10-11	Feedback Loss Detection Mode	0: Disable 1: Enable - Drive Continues to Operate After Feedback Loss 2: Enable - Drive "STOPS" After Feedback Loss	0	-	
10-12	Feedback Loss Detection Level	0 ~ 100	0	%	
10-13	Feedback Loss Detection Delay Time	0.0 ~25.5	1.0	Sec	
10-14	Integration Limit Value	0 ~ 109	100	%	*1
10-15	Integral Value Resets to Zero when Feedback Signal Equals the Target Value	0: Disable 1: After 1 Second 30: After 30 Second (0~30)	0	-	
10-16	Allowable Integral value Error Margin (Units, 1 Unit = 1/8192)	0 ~ 100	0	-	
10-17	PID Sleep Frequency Level	0.00~599.00	0.00	Hz	
10-18	PID Sleep Function Delay Time	0.0 ~25.5	0.0	Sec	
10-19	PID Wake up frequency Level	0.00~599.00	0.00	Hz	
10-20	PID Wake up function Delay Time	0.0 ~ 25.5	0.0	Sec	
10-21	Max PID Feedback Setting Level	0 ~999	100	-	*1
10-22	Min PID Feedback Setting Level	0 ~999	0	-	*1

Group 11-Performance Control Functions					
No.	Description	Range	Factory Setting	unit	Note
11-00	Reverse Operation Control	0: Reverse Command is Enabled 1: Reverse Command is Disabled	0	-	F_22
11-01	Carrier Frequency (kHz)	1~16	5	KHz	F_12
11-02	Carrier Mode Selection	0: Mode0, 3Phase PWM modulation 1: Mode1, 2Phase PWM modulation 2: Mode2, 2Phase Soft PWM Modulation	0	-	
11-03	Carrier Frequency Reduction by Temperature Rise	0:Disable 1:Enable	0	-	
11-04	S-Curve Acc 1	0.0 ~ 4.0	0.2	Sec	
11-05	S-Curve Acc 2	0.0 ~ 4.0	0.2	Sec	
11-06	S-Curve Dec 3	0.0 ~ 4.0	0.2	Sec	
11-07	S-Curve Dec 4	0.0 ~ 4.0	0.2	Sec	
11-08	Skip Frequency 1	0.00 ~ 599.00	0.00	Hz	*1
11-09	Skip Frequency 2	0.00 ~ 599.00	0.00	Hz	*1
11-10	Skip Frequency 3	0.00 ~ 599.00	0.00	Hz	*1
11-11	Skip Frequency Range Bandwith (±)	0.00 ~ 30.00	0.00	Hz	*1
11-12	Energy Saving Gain (V/F Mode)	0 ~ 100	80	%	
11-13	Regeneration Prevention Function	0:Disable	0	-	
		1:Enable			
		2:Enable (only during constant speed)			
11-14	Regeneration Prevention Voltage Level	200V:300.0~400.0	380.0	V	
		400V:600.0~800.0	760.0		
11-15	Regeneration Prevention Frequency Limit	0.00 ~ 15.00	3.00	Hz	
11-16	Regeneration Prevention Voltage Gain	0~200	100	%	
11-17	Regeneration Prevention Frequency Gain	0~200	100	%	

Group 12 Digital Display & Monitor Functions					
No.	Description	Range	Factory Setting	Unit	Note
12-00	Extended Display Mode	00000~88888 Each digit can be set from 0 to 8 as listed below.	00000	-	*1
		0: Default Display (Frequency and Parameters)			
		1: Output Current			
		2: Output Voltage			
		3: DC Voltage			
		4: Temperature			
		5: PID Feedback			
		6: Analog Signal Input. (AI1)			
		7: Analog Signal Input. (AI2)			
8: Count Status					
12-01	PID Feedback Display Format	0: Integer (xxx)	0	-	*1
		1: One Decimal Place (xx.x)			
		2: Two Decimal Places (x.xx)			
12-02	PID Feedback Display Unit Setting	0: xxx--	0	-	*1
		1: xxxpb (pressure)			
		2: xxxfl (flow)			
12-03	Custom Units (Line Speed) Value	0~65535	1500/1800	RPM	*1
12-04	Custom Units (Line Speed) Display Mode	0: Drive Output Frequency is Displayed	0	-	*1
		1: Line Speed. Integer. (xxxxx)			
		2: Line Speed. One Decimal Place. (xxxx.x)			
		3: Line Speed. Two Decimal Places (xxx.xx)			
		4: Line Speed. Three Decimal Places (xx.xxx)			
12-05	Inputs and Output Logic Status Display (I1D~I6D, RY1 and RY2)		-	-	*4
					
12-06	Alarm Selections for Inverter Components Life Expectancy	xxx0: Life Alarm of Inrush Current Suppression Circuit is Invalid	00000	-	*1
		xxx1: Life Alarm of Inrush Current Suppression Circuit is Valid			
		xxx0x: Life Alarm of Control Circuit Capacitors is Invalid			
		xxx1x: Life Alarm of Control Circuit Capacitors is Valid			

Group 12 Digital Display & Monitor Functions					
No.	Description	Range	Factory Setting	Unit	Note
		xx0xx:Life Alarm of Main Circuit Capacitors is Invalid xx1xx:Life Alarm of Main Circuit Capacitors is Valid			
12-07	Detect Main Circuit Capacitors	Reserved			
12-08	Display of Inrush Current Suppression Circuit	0~100	100	%	
12-09	Display of Control Circuit Capacitors	0~100	100	%	
12-10	Reserved				
12-11	Output Current when Fault Appeared	----	0	A	
12-12	Output Voltage when Fault Appeared	----	0	Vac	
12-13	Output Frequency when Fault Appeared	----	0	Hz	
12-14	DC Bus Voltage when Fault Appeared	----	0	Vac	
12-15	Frequency Command when Fault Appeared	----	0	Hz	

Group 13 Inspection & Maintenance Functions						
No.	Description	Range	Factory Setting	unit	Note	Corr. to Param. No
13-00	Drive Horsepower Code	----	-	-	*3	
13-01	Software Version	----	-	-	*3*4	F_29
13-02	Fault Log (Latest 3 Faults)	----	-	-	*3*4	F_30
13-03	Accumulated Inverter Operation Time 1	0~23	-	hour	*3	
13-04	Accumulated Inverter Operation Time 2	0~65535	----	day	*3	
13-05	Accumulated Inverter Operation Time Mode	0: Power On time 1: Operation time	0	-	*3	
13-06	Parameter Lock	0:Enable all Functions 1:Preset Speeds from 05-01 to 05-15 Can't be Changed 2:All Functions Can't be Changed Except for Preset speeds from 05-01 to 05-15 3:Disable All Functions Except 13-06	0	-		
13-07	Parameter Lock Code	00000~65535	00000	-		
13-08	Reset Drive to Factory Settings	1150: Reset to factory setting. 50 Hz,220 V/380 V system. 1160: Reset to factory setting. 60 Hz,220 V/380 V system. 1250: Reset to factory setting 50 Hz,230 V/400 V system. 1260: Reset to factory setting 60 Hz,230 V/460 V system. 1350: Reset to factory setting 50 Hz,220 V/415 V system. 1360: Reset to factory setting 60 Hz,230 V/400 V system. 1112: Reset PLC	00000	-		F_25

Group 14 PLC Setting function					
No.	Description	Range	Factory Setting	unit	Note
14-00	Setting Value1 of T1	0~9999	0	-	
14-01	Setting Value1 of T1 (mode 7)	0~9999	0	-	
14-02	Setting Value1 of T2	0~9999	0	-	
14-03	Setting Value1 of T2 (mode 7)	0~9999	0	-	
14-04	Setting Value1 of T3	0~9999	0	-	
14-05	Setting Value1 of T3 (mode 7)	0~9999	0	-	
14-06	Setting Value1 of T4	0~9999	0	-	
14-07	Setting Value1 of T4 (mode 7)	0~9999	0	-	
14-08	Setting Value1 of T5	0~9999	0	-	
14-09	Setting Value1 of T5 (mode 7)	0~9999	0	-	
14-10	Setting Value1 of T6	0~9999	0	-	
14-11	Setting Value1 of T6 (mode 7)	0~9999	0	-	
14-12	Setting Value1 of T7	0~9999	0	-	
14-13	Setting Value1 of T7 (mode 7)	0~9999	0	-	
14-14	Setting Value1 of T8	0~9999	0	-	
14-15	Setting Value1 of T8 (mode 7)	0~9999	0	-	
14-16	Setting Value1 of C1	0~65535	0	-	
14-17	Setting Value1 of C2	0~65535	0	-	
14-18	Setting Value1 of C3	0~65535	0	-	
14-19	Setting Value1 of C4	0~65535	0	-	
14-20	Setting Value1 of C5	0~65535	0	-	
14-21	Setting Value1 of C6	0~65535	0	-	
14-22	Setting Value1 of C7	0~65535	0	-	
14-23	Setting Value1 of C8	0~65535	0	-	
14-24	Setting Value1 of AS1	0~65535	0	-	
14-25	Setting Value2 of AS1	0~65535	0	-	
14-26	Setting Value3 of AS1	0~65535	0	-	
14-27	Setting Value1 of AS2	0~65535	0	-	
14-28	Setting Value2 of AS2	0~65535	0	-	
14-29	Setting Value3 of AS2	0~65535	0	-	
14-30	Setting Value1 of AS3	0~65535	0	-	
14-31	Setting Value2 of AS3	0~65535	0	-	
14-32	Setting Value3 of AS3	0~65535	0	-	
14-33	Setting Value1 of AS4	0~65535	0	-	
14-34	Setting Value2 of AS4	0~65535	0	-	
14-35	Setting Value3 of AS4	0~65535	0	-	
14-36	Setting Value1 of MD1	0~65535	1	-	
14-37	Setting Value2 of MD1	0~65535	1	-	
14-38	Setting Value3 of MD1	1~65535	1	-	
14-39	Setting Value1 of MD2	0~65535	1	-	
14-40	Setting Value2 of MD2	0~65535	1	-	
14-41	Setting Value3 of MD2	1~65535	1	-	
14-42	Setting Value1 of MD3	0~65535	1	-	
14-43	Setting Value2 of MD3	0~65535	1	-	
14-44	Setting Value3 of MD3	1~65535	1	-	
14-45	Setting Value1 of MD4	0~65535	1	-	
14-46	Setting Value2 of MD4	0~65535	1	-	
14-47	Setting Value3 of MD4	1~65535	1	-	

Group 15 PLC Monitoring function					
No.	Description	Range	Factory Setting	unit	Note
15-00	Current Value of T1	0~9999	0	-	
15-01	Current Value of T1(mode 7)	0~9999	0	-	
15-02	Current Value of T2	0~9999	0	-	
15-03	Current Value of T2(mode 7)	0~9999	0	-	
15-04	Current Value of T3	0~9999	0	-	
15-05	Current Value of T3(mode 7)	0~9999	0	-	
15-06	Current Value of T4	0~9999	0	-	
15-07	Current Value of T4(mode 7)	0~9999	0	-	
15-08	Current Value of T5	0~9999	0	-	
15-09	Current Value of T5(mode 7)	0~9999	0	-	
15-10	Current Value of T6	0~9999	0	-	
15-11	Current Value of T6(mode 7)	0~9999	0	-	
15-12	Current Value of T7	0~9999	0	-	
15-13	Current Value of T7(mode 7)	0~9999	0	-	
15-14	Current Value of T8	0~9999	0	-	
15-15	Current Value of T8(mode 7)	0~9999	0	-	
15-16	Current Value of C1	0~65535	0	-	
15-17	Current Value of C2	0~65535	0	-	
15-18	Current Value of C3	0~65535	0	-	
15-19	Current Value of C4	0~65535	0	-	
15-20	Current Value of C5	0~65535	0	-	
15-21	Current Value of C6	0~65535	0	-	
15-22	Current Value of C7	0~65535	0	-	
15-23	Current Value of C8	0~65535	0	-	
15-24	Current Value of AS1	0~65535	0	-	
15-25	Current Value of AS2	0~65535	0	-	
15-26	Current Value of AS3	0~65535	0	-	
15-27	Current Value of AS4	0~65535	0	-	
15-28	Current Value of MD1	0~65535	0	-	
15-29	Current Value of MD2	0~65535	0	-	
15-30	Current Value of MD3	0~65535	0	-	
15-31	Current Value of MD4	0~65535	0	-	
15-32	Current Value of TD	0~65535	0	μs	

9.2 Parameter Function Description

00 -Basic Parameters Group

00-00	Control Mode Selection
Range	【0】 :V/F Mode 【1】 :Vector Mode

To select the appropriate vector or V/F control mode according to the load characteristics.

- If V/F mode is selected, please set parameters, group1 to comply with the load features.
- Vector is best suited to control the general load or rapidly-changed torque load.

00-02	Main Run Command Source Selection
Range	【0】 :Keypad 【1】 :External Run/Stop Control 【2】 :Communication 【3】 :PLC

- Parameter 00 - 02 sets the inverter operation command source. For switching between 00-02 and 00-03, use any of the external inputs I1D to I6D and set the relevant parameters (03-00~03-05) to【12】. Refer to parameter group3 for details.

*Note: 00- 02= **【3】** , **RUN key**: Enable the built-in PLC run operation; **STOP key**: Enable the built-in PLC stop operation.

00- 03	Alternative Run Command Source Selection
Range	【0】 :Keypad 【1】 :External Run/Stop Control 【2】 :Communication

- Parameter 00- 03 sets the inverter Alternative Run operation source. For switching between 00-02 and 00-03, use any of the external inputs I1D to I6D and set the relevant parameter (03-00~03-05) to【12】. Refer to parameter group3 for details.

00- 04	Operation Modes for External Terminals
Range	【0】 :Forward/Stop-Reverse/Stop 【1】 :Run/Stop- Reverse/ Forward 【2】 :3 Wire Control Mode - Run/Stop

00-04 is valid when run command is set to external mode by 00- 02/00- 03 =1.

2 Wire Operation Mode,

Set 00-04= **【0/1】** first, before setting (03-00,03-04) to **【0】** or **【1】**

00- 04= **【0】** , Set external terminals (03-00 to 03-05) function to 0 for FWD/Stop or Set to 1 for REV/Stop..

00- 04= **【1】** , Set external terminals (03-00 to 03-05) function to 0 for Run/Stop or Set to 1 for FWD/REV

3 Wire Operation Mode,

00-04 = **【2】** Terminals I1D, I2D, I3D are used in a combination to enable 3 wire run/stop mode.

Settings for 03-00, 03-01,03-02 will not be effective.(refer to group 03)

00-05	Main Frequency Command Source Selection
00-06	Alternative Frequency Command Source Selection
Range	【0】 :Up/Down of Keypad 【1】 :Potentiometer on Keypad 【2】 :External AI1 Analog Signal Input 【3】 :External AI2 Analog Signal Input 【4】 :External Up/Down Frequency Control 【5】 :Communication Setting Frequency 【6】 :PID Output Frequency 【7】 :Pulse Input

Parameter 00-05/00-06 sets the inverter frequency command source.

When 00-05/00-06 = **【6】** , frequency command source is output of the PID.

***Note: 00-05 (Main Frequency Command Source) and 00- 06 (Alternative Frequency Command Source) can not be the same. Otherwise the panel will display Err2.**

00-07	Main and Alternative Frequency Command Modes
Range	【0】 : Main or Alternative Frequency. 【1】 : Main Frequency + Alternative Frequency

When 00-07 = **【0】** , the frequency source is set by the Main frequency parameter 00-05 (Default) or by the Alternative frequency parameter 00-06.

- Use any of the external terminals I1D to I6D and set the relevant parameter 03-00 to 03-05 = **【13】**to switch from Main to Alternative source.

When 00 - 07 = **【1】** , The frequency command will be the result of setting of main and alternative frequencies.

00-08	Communication Frequency Command
Range	【0.00~599.00】 Hz

This parameter can be used to read the set frequency in communication mode

This parameter is only effective in the communication mode.

00-09	Frequency Command save on power down (Communication mode)
Range	【0】 : Disable 【1】 : Enable

00-09= **【0】** Keypad frequency is saved.

00-09= **【1】** Frequency set by communication is saved.

00-10	Initial Frequency Selection
Range	【0】 :By Current Freq Command 【1】 :By Zero Freq Command 【2】 :By 00-11
00-11	Initial Frequency Setpoint
Range	【0.00~599.00】 Hz

This parameter is only effective in keypad mode

When 00-10= **【0】** ,the initial frequency will be current frequency.

When 00-10= **【1】** ,the initial frequency will be 0.

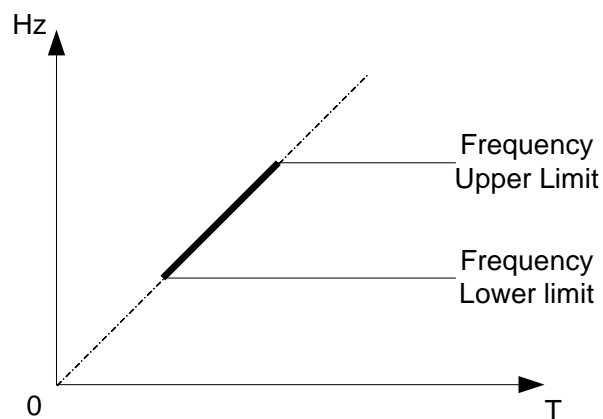
When 00-10= **【2】** ,the initial frequency will be as set by parameter 00-11..

00-12	Frequency Upper limit
Range	【0.01~599.00】 Hz
00-13	Frequency Lower limit
Range	【0.00~598.99】 Hz

When 00-13 and the command frequency are both set to 0.00, if RUN is pressed "Stpo" is displayed.

When Frequency command is higher than preset in 00-13 inverter output will ramp up from 0.00 to the command frequency.

When 00-13 > 0, and the frequency command value ≤ 00-13, inverter output will ramp up from preset in lower limit to the command frequency.



00-14	Acceleration Time 1
Range	[0.1~3600.0] s
00-15	Deceleration Time 1
Range	[0.1~3600.0] s
00-16	Acceleration Time 2
Range	[0.1~3600.0] s
00-17	Deceleration Time 2
Range	[0.1~3600.0] s

Preset Acceleration and Deceleration times set by above parameters are the time taken for the output frequency to ramp up or ramp down between the Upper and the lower frequency limits.

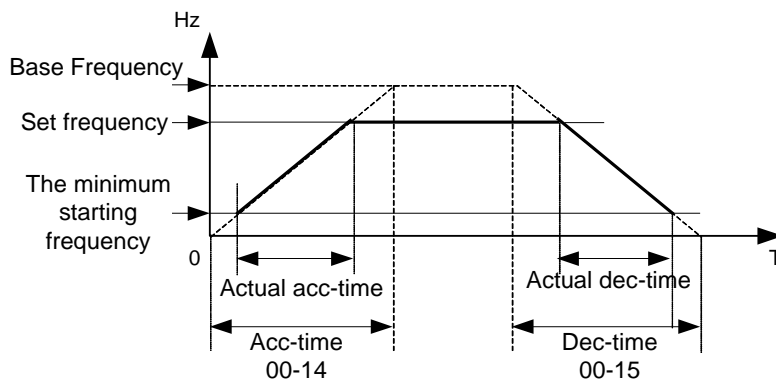
When 01- 00=18, Base frequency= the setting value of parameter 01-02;

When 01- 00≠18, Base frequency =50.00 (or 60.00)

Actual acceleration and deceleration time is calculated as follows:

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

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



00-18	Jog Frequency
Range	[0.00~599.00]Hz
00-19	Jog Acceleration Time
Range	[0.1~3600.0]Sec
00-20	Jog Deceleration Time
Range	[0.1~3600.0]Sec

The JOG function is operational by using the multi-function input terminals I1D to I6D and setting the relevant parameters 03-00~03-05 to **【6】** JOG FWD or **【7】** JOG REV. Refer to parameter group 3.

01-V/F Pattern selections & setup

01-00	Volts/Hz Patterns (V/F)
Range	[0~18]

- Set 01-00 to one of the following preset V/f selections [0~17] according to the required application.

Parameters 01-02~01-09 are not applicable.

- Six fixed V/f patterns are shown below. [1~8] for 50 Hz systems and [9~17] for 60 Hz

TYPE	50Hz		60Hz	
	01-00	V/F pattern	01-00	V/F pattern
General Use	= [0]		= [9]	
	= [1]		= [10]	
	= [2]		= [11]	
= [3]	= [12]			
Decreasing torque	= [4]		= [13]	
	= [5]		= [14]	
Decreasing torque	= [6]		= [15]	
	= [7]		= [16]	
	= [8]		= [17]	

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

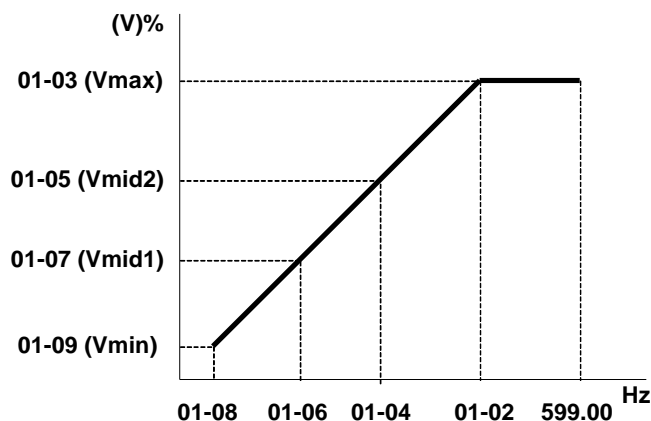
01-00	B(Xb)	C(Xc)
0 / 9	7.5%	4.5%
1 / 10	10.0%	7.0%
2	11.0%	8.5%
3	12.0%	9.5%
4	17.5%	4.0%
5	25.0%	5.0%
11	11.0%	8.0%
12	12.0%	9.0%
13	20.5%	7.0%
14	28.5%	8.0%
6 / 15	45.0%	1.0%
7 / 16	55.0%	1.0%
8 / 17	65.0%	1.0%

Setting 01-00 = [18] provides a flexible V/F curve which can be selected by experienced users by setting parameters (01-02~01-09).

01-01	V/F Max Voltage
Range	【200V:170.0~264.0, 400V: 323.0~528.0】 V
01-02	Base Frequency
Range	【0.20 ~ 599.00】Hz
01-03	Maximum Frequency Voltage Ratio
Range	【0.0 ~ 100.0】 %
01-04	Medium Frequency 2
Range	【0.10 ~ 599.00】 Hz
01-05	Medium Frequency Voltage Ratio 2
Range	【0.0 ~ 100.0】 %
01-06	Medium Frequency 1
Range	【0.10 ~ 599.00】 Hz
01-07	Medium Frequency Voltage Ratio 1
Range	【0.0 ~ 100.0】 %
01-08	Minimum Frequency
Range	【0.10 ~ 599.00】 Hz
01-09	Minimum Frequency Voltage Ratio
Range	【0.0 ~ 100.0】 %

Base frequency depends on parameter 01-00 , for 01-00= 【18】 It can be set by parameter 01-02.

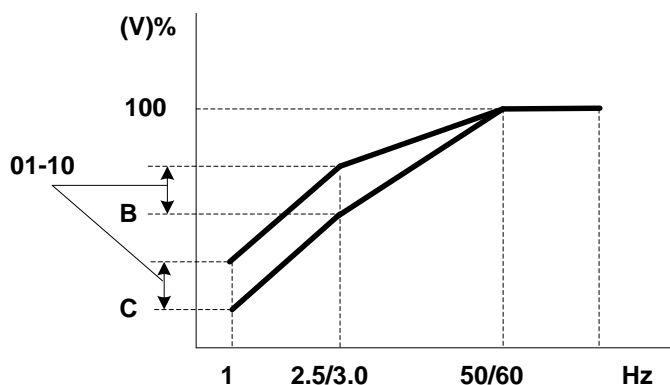
For 01-00 ≠ 【18】 , the Base frequency will depending on parameter 00-12, frequency upper limit.



01-10	Volts/Hz Curve Modification (Torque Boost)
Range	【0 ~ 10.0】 %

Inverter output V / F curve settings for points B, C can be adjusted by parameter 01-10 to improve the output torque.

Calculation of B, C point voltage: B point voltage = $X_b \times$ maximum output voltage, C point voltage = $X_c \times$ maximum output voltage (X_b, X_c see P4-30). When 01-10 = 0, the torque improvement is disabled.



01-11	V/F Start Frequency
Range	【0.00 ~10.00】 Hz
01-12	Slip Compensation Gain
Range	【0.05 ~10.00】 s

VF Start Frequency is for occasion where Start Frequency higher than zero Hz is needed.

01-13	V/F Mode Select
Range	【0】 : Close Loop 【1】 : Open Loop

0: make use of CT to estimate motor speed, enhancing accuracy

1: no estimation of motor speed; open loop control based on V/F curve.

02-Motor parameters

02-00	Motor No Load Current
Range	【0~ 【 (Parameter 02-01)-0.1】 】
02-01	Motor Rated Current
Range	【0.2~100】
02-02	Motor Rated Slip Compensation
Range	【0.0 ~ 200.0】 (%)
02-03	Motor Rated Speed
Range	【0~39000】

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

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

Motor slip= Motor synchronization speed - Motor Rated Speed

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

Motor synchronization speed (Marked on the motor nameplate)

$$\text{Motor synchronization speed(RPM)} = \frac{120}{\text{Motor Poles}} \times \text{Motor rate frequency}(50/60\text{Hz})$$

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

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

02-04	Motor Rated Voltage
Range	【200V: 170.0~264.0 / 400V: 323.0~528.0】
02-05	Motor Rated Power
Range	【0.1~37.0】
02-06	Motor Rated Frequency
Range	【0~599.0】
02-07	Motor Pole Number
Range	【2~ 16】
02-14	Auto Tune
Range	【0】 : Disable 【1】 : Enable
02-15	Stator Resistance Gain
Range	----
02-16	Rotor Resistance Gain
Range	----

In vector mode, selected by parameter 00-00= **【1】** , set the motor name plate data in parameters 02-01, 02-03~02-06 then activate the out auto tune function by setting parameter 02-14 = 1.

Auto tune function will set the inverter to run with the specific motor connected to obtain the best motor performance.

During the Auto tune. "AT" will be displayed on the inverter and there will be an automatic motor parameter measurements which will be stored in parameters 02-15~02-16.

After successful auto tune function the display will return to command frequency display.

Auto tune function must be carried out again if the motor is replaced.

03-External Digital Inputs and Relay Output Functions

03-00	Multifunction Input Term. I1D
03-01	Multifunction Input Term. I2D
03-02	Multifunction Input Term. I3D
03-03	Multifunction Input Term. I4D
03-04	Multifunction Input Term. I5D

03-05 Range	Multifunction Input Term. I6D
	<p>【0】 :Forward/Stop Command----- (Parameters 00- 02/00-03=1& 00-04)</p> <p>【1】 :Reverse/Stop Command----- (Parameters 00- 02/00-03=1& 00-04)</p> <p>【2】 :Speed Selection 1</p> <p>【3】 :Speed Selection 2</p> <p>【4】 :Speed Selection 3</p> <p>【5】 :Speed Selection 4</p> <p>【6】 :JOG Forward Command----- (Parameters 00-18~00-20)</p> <p>【7】 :JOG Reverse Command----- (Parameters 00-18~00-20)</p> <p>【8】 :Up Command----- (Parameters 00- 05/00- 06=4& 03-06/03-07)</p> <p>【9】 :Down Command----- (Parameters 00- 05/00- 06=4& 03-06/03-07)</p> <p>【10】 : 2nd Acc/Dec Times</p> <p>【11】 : Disable Acc/Dec</p> <p>【12】 : Main/ Alternative Run Source Select---- (Parameters 00- 02/00- 03)</p> <p>【13】 : Main/ Alternative Frequency Command Select---- (Parameters 00- 05/00- 06)</p> <p>【14】 : Rapid Stop (controlled deceleration stop)</p> <p>【15】 : Base Block (Coast to stop)</p> <p>【16】 : Disable PID Function ----- (Parameter Goup10)</p> <p>【17】 : Reset</p> <p>【18】 : Enable Auto Run Mode----- (Parameter Goup6)</p> <p>【19】 : Speed Search</p> <p>【20】 : Energy Saving(V/F)</p> <p>【21】 : Reset PID integral value to Zero</p> <p>【22】 : Counter Input</p> <p>【23】 : Counter Reset</p> <p>【24】 : PLC Input</p> <p>【25】 : Pulse Input-Width Measure (I3D)</p> <p>【26】 : Pulse Input-Frequenct Measure (I3D)</p> <p>【27】 : Enable KEB Function</p> <p>【28】 : Fire mode function (Valid for software issued after rev. 1.1)</p>

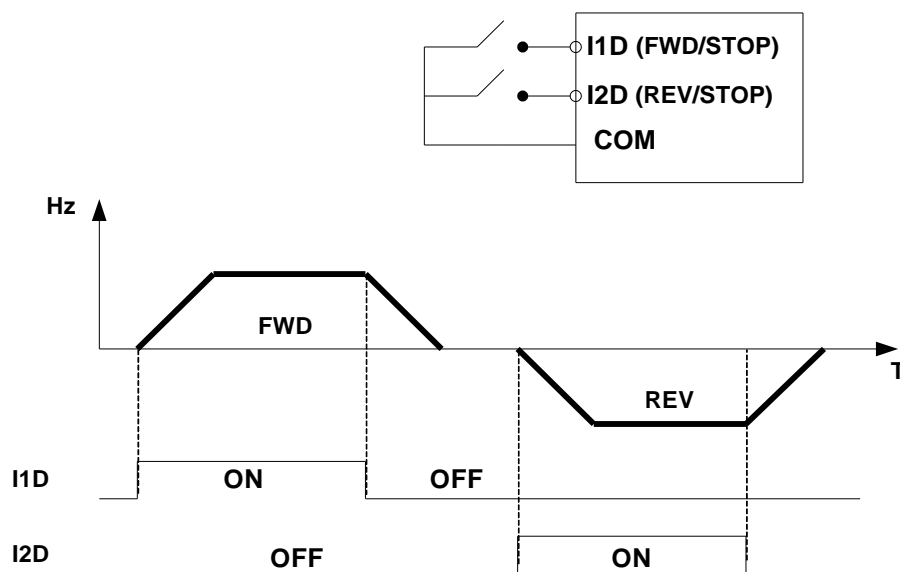
Set up examples and descriptions for Parameters 03-00 to 03-05 are noted in the following pages sections 1 to 13.

1. For setting parameters 03- 00~03- 05 to 【0, 1】 External Run/Stop Control, refer to 00- 04.

1A) 2-wire method. Mode 1.

Example: FWD/STOP and REV/STOP from two inputs (I1D&I2D)

- Set 00- 04={0}; I1D:03- 00={0}(FWD/STOP); I2D:03- 01={1}(REV/STOP);

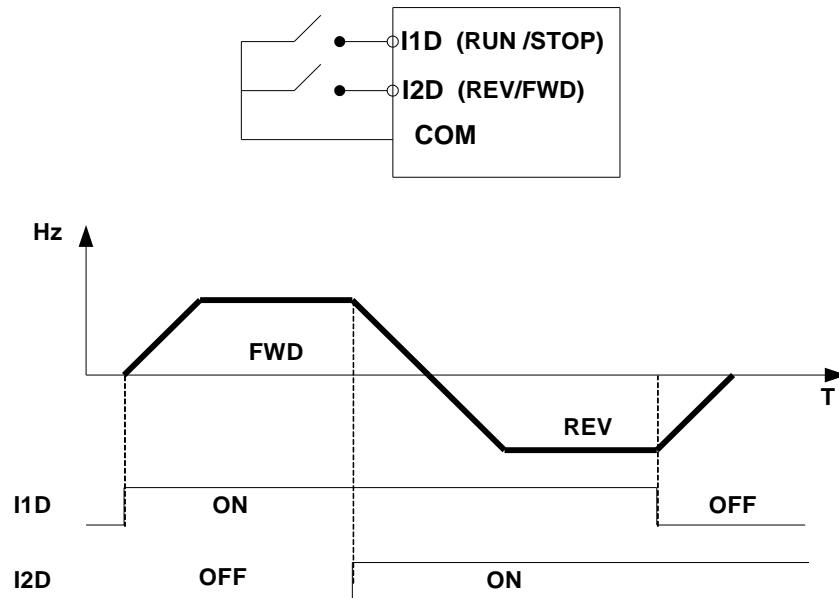


***Note: If both forward and reverse commands are ON, it will be treated as a STOP.**

1B) 2-wire method. Mode 2.

Example: RUN/STOP and REV/FWD from two inputs (I1D&I2D)

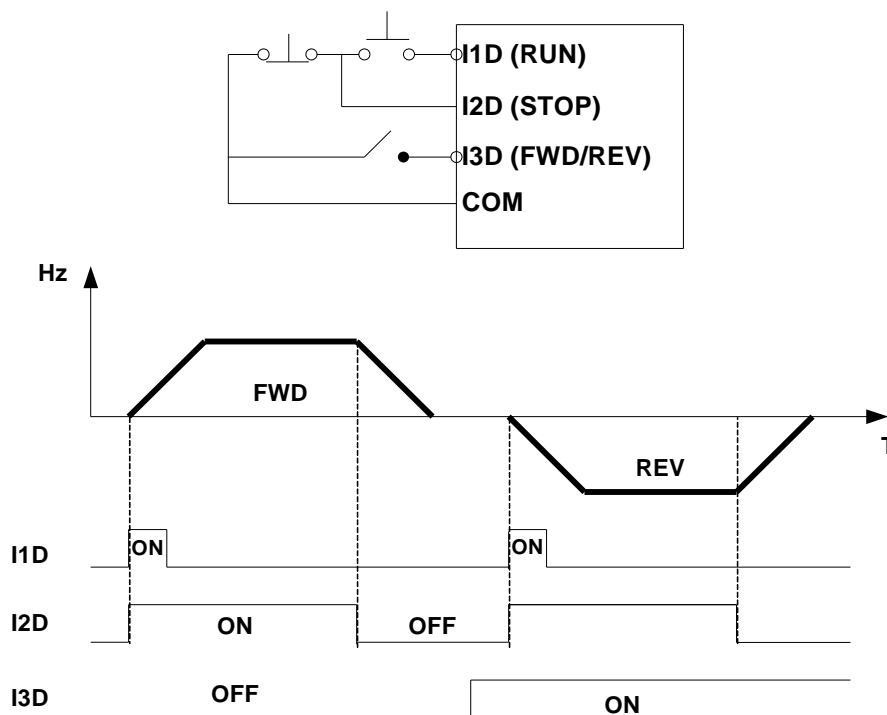
- Set 00- 04=[1]; I1D:03- 00=[0](RUN/STOP); I2D:03- 01=[1](REV/FWD);



1C) 3-wire method.

Example: Two separate push buttons for RUN & STOP and two position switch for FWD/ REV

Set 00- 04 =2 (3 wire control mode), then terminals I1D, I2D and I3D are dedicated to this function and Preset selections for parameters 03-00, 03-01 and 03-02 are not relevant.



2. 03- 00~03- 05 = Sx = [5, 4, 3, 2] Preset speed selections

Any digital input from I1D to I6D can be used to select between 16 different preset speeds (from preset speed 0 to preset speed 15).

Four Speed selection bits are available and can be assigned to any digital input. The selected preset speed based on the Speed Selection bits is given in the table below.

For example, if I3D is used as speed selection 1 bit, then [03-02] = 2, if I4D is used as speed select 2 bit, then [03-03] = 3, if I5D is used as speed select 3 bit, then [03-04] = 4, if I6D is used as speed select 4 bit, then [03-05] = 5

Preset speed	Function setting and state of any four of terminal I1D ~ I6D				Frequency	Acc-time	Dec-time
	Speed Select 4 (IxD=5)	Speed Select 3 (IxD=4)	Speed Select 2 (IxD=3)	Speed Select 1 (IxD=2)			
speed 0	OFF	OFF	OFF	OFF	05- 01	05- 17	05-18
speed 1	OFF	OFF	OFF	ON	05- 02	05- 19	05-20
speed 2	OFF	OFF	ON	OFF	05- 03	05- 21	05-22
speed 3	OFF	OFF	ON	ON	05- 04	05- 23	05-24
speed 4	OFF	ON	OFF	OFF	05- 05	05- 25	05-26
speed 5	OFF	ON	OFF	ON	05- 06	05- 27	05-28
speed 6	OFF	ON	ON	OFF	05- 07	05- 29	05-30
speed 7	OFF	ON	ON	ON	05- 08	05- 31	05-32
speed 8	ON	OFF	OFF	OFF	05- 09	05- 33	05-34
speed 9	ON	OFF	OFF	ON	05- 10	05- 35	05-36
speed 10	ON	OFF	ON	OFF	05- 11	05- 37	05-38
speed 11	ON	OFF	ON	ON	05- 12	05- 39	05-40
speed 12	ON	ON	ON	ON	05- 13	05- 41	05-42
speed 13	ON	ON	ON	ON	05- 14	05- 43	05-44
speed 14	ON	ON	ON	ON	05- 15	05- 45	05-46
speed 15	ON	ON	ON	ON	05- 16	05- 47	05-48

3. 03- 00~03- 05=[6, 7]Forward/ Reverse JOG

When an input terminal is set to function **【6】** and is turned on, inverter will work in jog forward mode.

When an input terminal is set to function **【7】** and is turned on, inverter will work in jog reverse mode.

Note: If jog forward and jog reverse function is enabled at the same time, inverter will enter stop mode.

4. 03- 00~03- 05=[8, 9]UP/DOWN

When an input terminal is set to function **【8】** and turned on ,frequency command will increased according to the UP/DOWN and increment/decrement step set in parameter 03-06.

If the input is kept on continuously, the frequency command increases accordingly until the upper frequency limit is reached.

When an input terminal is set to function **【9】** and is turned on , frequency command decreases according to the UP/DOWN increment/decrement step set in parameter 03-06.

If the input is kept on continuously, the frequency command decreases accordingly and in relation to settings for parameter 03-06 and 3-07 until Zero speed is reached.

Refer to group 3 parameter description.

***Note: The UP/DOWN target frequency is determined by the time that the signal is kept on, including the acceleration / deceleration time.**

5. 03- 00~03- 05= [10] 2nd Acc/Dec time

When an input terminal is set to function **【 10 】** and is turned on, the actual acceleration and deceleration time will be according to the time for 2nd Accel/Decel set in parameters 00-16 and 00-17. if the input is turned off, the acceleration and deceleration times will be according to the default accel/decal 1 set in parameters 00-14 & 00-15.

Example:

- 00-12 (Frequency upper limit)=50Hz(Defaults)
- 03-00 (Termina I1D)= 8
- 03-06 (up/down frequency step)=0
- 00-14 (accelerating time 1)=5S
- 00-16 (accelerating time 2) =10S(Defaults)

When I1D is ON for 5 s, the actual accelerating time of inverter will be 2.5s.

Explain:

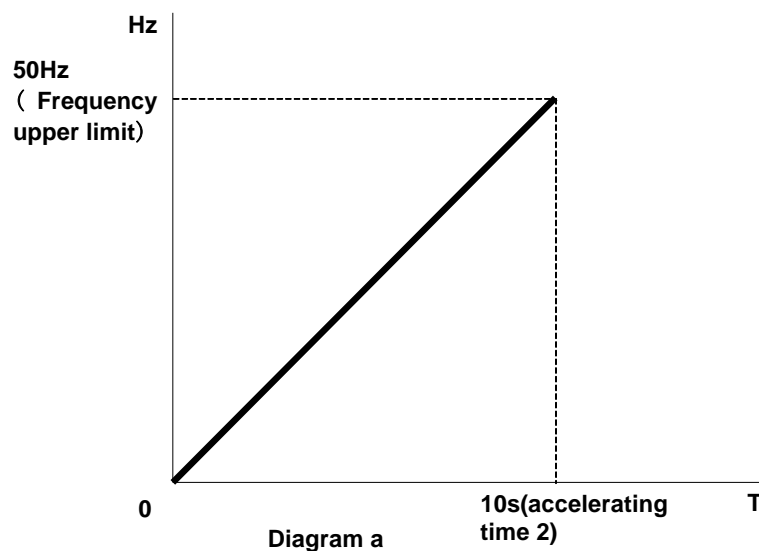


Diagram a: Target frequency is determined by the Frequency upper limit, the on-time and accelerating time 2.

$$Target\ frequency = \frac{upper\ frequency}{accelerating\ time2} * ontime\ of\ I1D = \frac{50Hz}{10s} * 5s = 25Hz$$

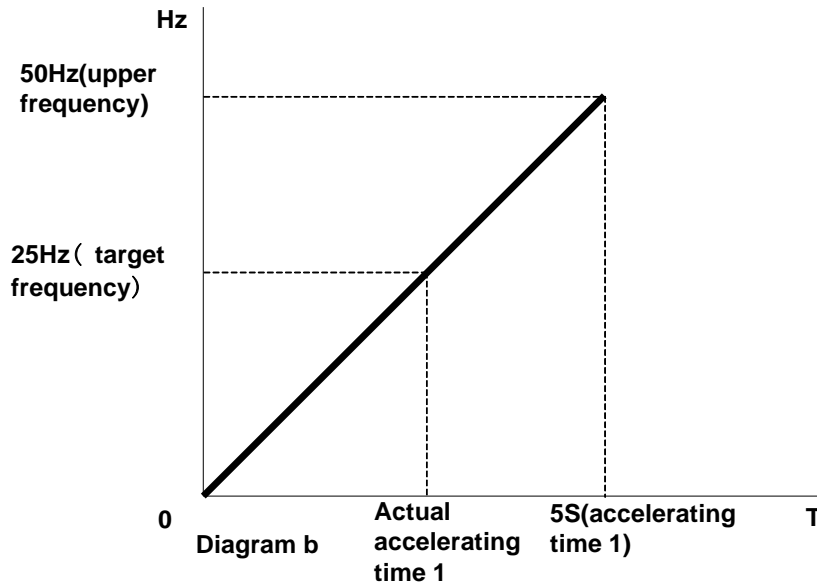


Diagram b: The actual accelerating time :

$$\text{actual accelerating time} = \frac{\text{target frequency}}{\text{upper frequency}} \times \text{accelerating time 1} = \frac{25\text{Hz}}{50\text{Hz}} \times 5\text{S} = 2.5\text{s}$$

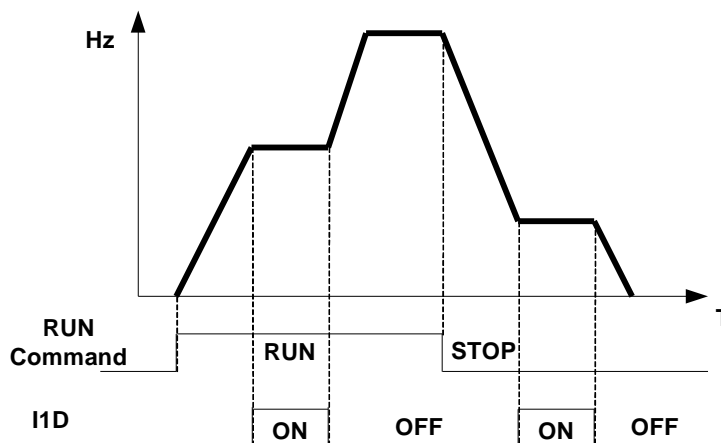
6. 03- 00~03- 05= [11] Disable Acc/Dec function

When an input terminal is set to function **[11]** and is turned on, acceleration and deceleration function will be disabled and the frequency at the time is maintained. (constant speed mode)

If the input is turned off , acceleration and deceleration function is enabled again.

For an example see the following diagram.

Accel/Decel & Enable/Disable timing diagram using terminal I1D and parameter 03-00 = 11.



7. 03- 00~03- 05= [12] Main / Alternative Run Source Select

When an input terminal is set to function **[12]** and is turned on, the run command source is according to parameter 00-03(Alternative Run source).If the Input is off it will be according to 00-02 (Main run source).

8. 03- 00~03- 05=[13] Main/ Alternative Frequency Source Select

When an input terminal is set to function **【13】** and is turned on, the frequency source is according to parameter 00-06(Alternative Frequency source).If the Input is off it will be according to 00-05 (Main Frequency Source).

9. 03- 00~03- 05=[14]Rapid Stop (controlled deceleration stop)

When an input terminal is set to function **【14】** and is turned on , inverter decelerates to stop according to deceleration time 2.

10. 03- 00~03- 05=[15]Base Block (Coast to stop)

When an input terminal is set to function **【15】** and is turned on, inverter output is turned off.

11. 03- 00~03- 05=[16]Disable PID Function

When an input terminal is set to function **【16】** and is turned on, PID functions is disabled, if it is turned off , PID function is enabled again.

12. 03- 00~03- 05=[17]Reset

When a failure that can be manually reset occurs ,turn on a terminal with function **【17】** , the failure will be reset. (Same function as the Reset button on keypad).

13. 03- 00~03- 05=[18]Auto _ Run Mode

When an input terminal is set to function **【18】** , the programmable auto- sequencer function is enabled, Refer to description of parameter group 6.

14. 03- 00~03- 05=[19]Speed Search Stop

When starting, the inverter detects the current speed of the motor, and then accelerates from the current speed to target speed.

15. 03- 00~03- 05=[20]Energy-saving operation

FAN, PUMP or other high inertia loads need greater starting torque, but once the operational speed is reached they need much less torque. In this mode the output voltage to the motor is reduced to match the required torque demand, hence providing a saving in energy.

The output voltage gradually declines as the input is ON. It will gradually increase (to the original voltage) when the input is OFF.

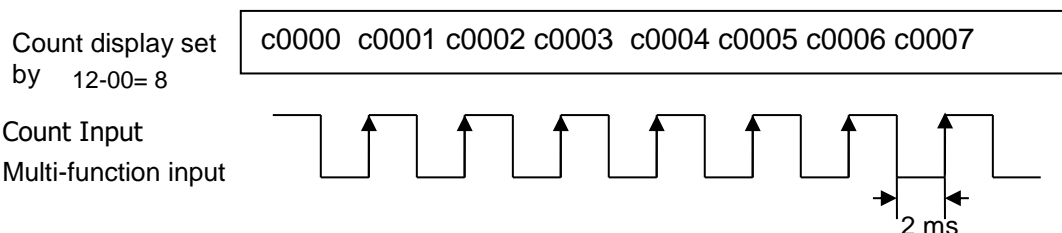
*Note: The acceleration and deceleration speed of energy saving operation is the same as the speed of speed search.

16. 03- 00~03- 05=[21]Reset PID Integral value to Zero

When input is engaged, PID integral value is reset to zero.

17. 03- 00~03- 05=[22]Counter Input

Use any of the multi-function inputs (I1D ~I6D) and set the relevant parameter (03-00 ~03-05) to 22. Count Status can be displayed on the inverter by setting parameter 12-00 =8



18. 03- 00~03- 05=[23] Counter Reset

Counter counts can be reset to 0 at any time by using an external input connected to one of the multi-function inputs (I1D~I6D) and by setting the relevant parameter (03-00 ~03-05) to 23.

19. 03- 00~03- 05=[24] PLC Input

When anyone of the external terminals I1D to I6D set to 24 and turned on, the PLC program inputs will be enabled.

20. 03- 02= [25] Pulse Input-Width Measure (I3D)

When 03-02=25, I3D is the input port of pulse width measurement functions. Parameters setting and applying are as the followings:

00-05=7 (Pulsed Speed Control)

03-27= 0.01~0.20 kHz (Pulse Input Frequency)

03-28=0.01~9.99 (Inverter Frequency $_F = \text{duty cycle} * (00-12) *(03-28) \text{ Hz}$, and below the Frequency Upper limit)

To adjust speed through pulse input duty cycle, set parameters as follows:

00-05=7; 03-02=25; 03-27=pulse input frequency; 03-28=1 (as per actual need)

When pulse input frequency is 200 Hz, set 03-27=0.20 (must be correct). Along with the duty cycle of this 200 Hz pulse input, inverter frequency is varied.

Example 1:

Pulse input frequency is 200 Hz (03-27=0.20), duty cycle is 50%, frequency upper limit is 50 Hz (00-12=50.00), and 03-28=1

Inverter frequency is $50\% \times 50.00 \times 1 = 25.00 \text{ Hz}$

Example 2:

Pulse input frequency is 100 Hz (03-27=0.10), duty cycle is 30%, frequency upper limit is 50 Hz (00-12=50.00), and 03-28=2

Inverter frequency is $30\% \times 50.00 \times 2 = 30.00 \text{ Hz}$

Example 3:

Pulse input frequency is 200 Hz (03-27=0.20), duty cycle is 15%, frequency upper limit is 599 Hz (00-12=599.00), and 03-28=5

Inverter frequency is $15\% \times 599.00 \times 5 = 499.25 \text{ Hz}$

Note 1: In this mode, the frequency range of pulse input is 0.01 to 0.20 kHz.

Note 2: The above examples are under assumption of a NPN input configuration. If PNP is used, the relationship between duty cycle and inverter frequency is reversed, that is, 20% duty cycle means 80% inverter frequency

21)03- 02= [26] Pulse Input-Frequency Measure (I3D)

When 03-02=26, I3D is the input port of the frequency measurement function. Parameters setting and applying are as the followings:

00-05=7 (Pulsed Speed Control)

03-02=26 (I3D is the pulse input- frequency measurement)

03-28=0.01~9.99

(Inverter Frequency $_F = f*(3-28) \text{ Hz}$, and below the Frequency Upper limit.

f: Pulse Input Frequency.)

To adjust speed through pulse input frequency, set parameters as follows:

00-05=7; 03-02=26; 03-28=1 (as per actual need); 03-27 is not used.

Along with the pulse input frequency, inverter frequency is varied.

Example 1:

Pulse input frequency is 20 Hz, frequency upper limit is 50 Hz (00-12=50.00), and 03-28=1

Inverter frequency is 20.00 Hz

Example 2:

Pulse input frequency is 45Hz, frequency upper limit is 50 Hz (00-12=50.00), and 03-28=1
 Inverter frequency is 45.00 Hz

Example 3:

Pulse input frequency is 55Hz, frequency upper limit is 50 Hz (00-12=50.00), and 03-28=1
 Inverter frequency is 50.00 Hz

Example 4:

Pulse input frequency is 2000 Hz, frequency upper limit is 599 Hz (00-12=599.00), and 03-28=0.2
 Inverter frequency is 2000 x 0.2 = 400.00 Hz

Note: In this mode, the frequency range of pulse input is 0.01 kHz to 10.00 kHz.

* Pulse input can only select I3D and when I3D is the terminal of pulse input, PLC output ground need to connect to COM from TM2.

22) 03- 00~03- 05= [27] Enable KEB Function

Once the KEB enable input is activated the deceleration time to stop will be according to parameter 07-14.

23) 03- 00~03- 05= [28] Fire Mode Function

Fire Mode function can be used for applications where following a fire it is necessary for a motor to continue running, without interruption by the normal Inverter protection functions.

Example of such application is smoke extract fans used in buildings for fire evacuation.

CAUTION



Material Damage
 The Fire Mode allows override of inverter protection functions.
 The correct use of this function is the responsibility of the installer of the fire safety system. The manufacturer will bare no responsibility for direct or indirect damages or loss incurred as a result of use of this function.
 If inverter damage is caused by use of Fire Mode, inverter will lose its warranty.

- Employ the Fire Mode only after due consideration by an expert.

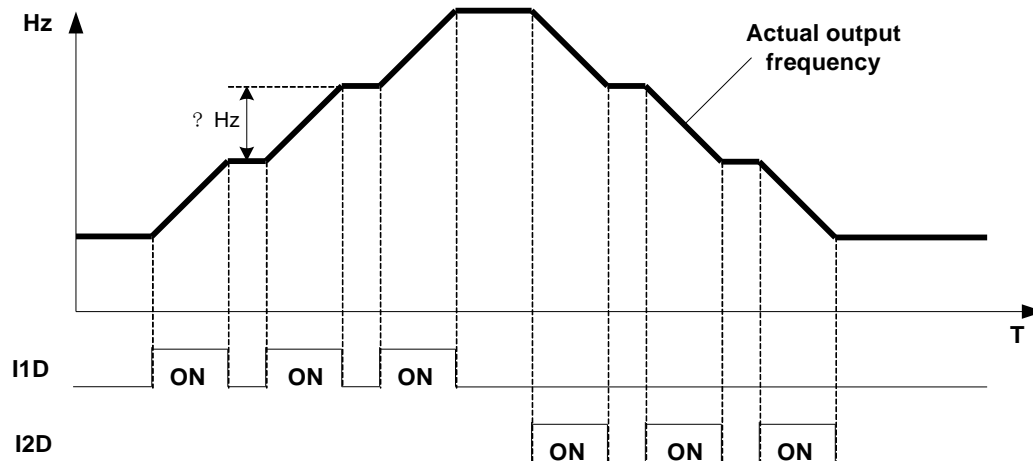
- The fire Mode function is activated by using one of the external multifunction inputs I1D to I6D and setting the relevant parameter for the selected input by 03-00~03-05 = [28]
- Fire mode can also be enabled by setting the functions of I1D to I6D by communication method.
- Once Fire Mode is activated following takes place:

1. The operator panel indicates FIRE, and the FIRE will be recorded in inverter fault log.
2. The inverter will run at full speed up to the maximum of inverter running frequency as set in 00-12, unless the main power is lost or cut off or the inverter itself breaks down.
3. When Fire Mode is activated, all protectional functions and alarms, such as ES, BB, OV, OC etc, will be ignored. STOP key on the operator panel becomes ineffective.
4. To reset fire mode: turn power off, remove fire mode input signal, and power on.

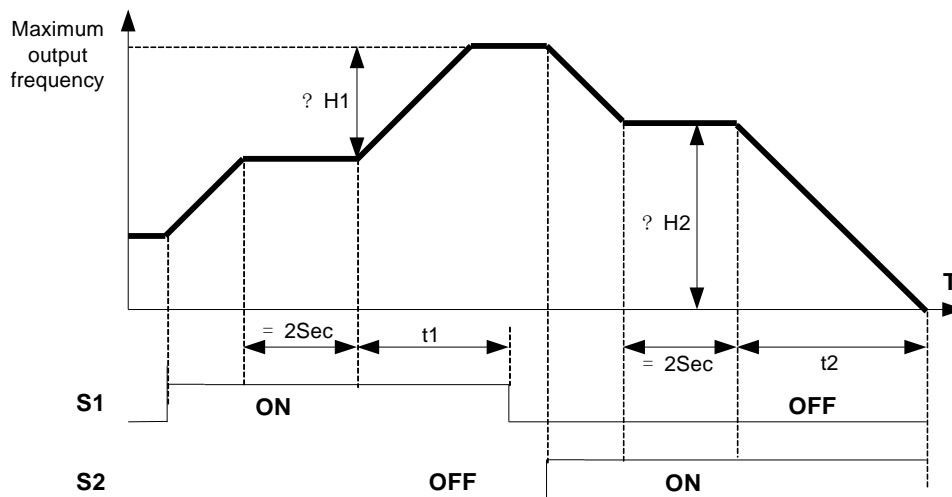
03-06	Up/Down Frequency Step
Range	[0.00~5.00]Hz

Example: I1D: 03- 00= [8]Up frequency command, I2D: 03- 01= [9]Down frequency command, 03- 06= [Δ]Hz

Mode1: UP or DOWN input terminals are turned on for less than 2 sec, for every On operation frequency changes by Δ Hz.



Mode 2: If UP or DOWN input terminals are turned on for more than 2 sec, the original UP/DOWN mode is restored output frequency ramps up or down as long as the input is kept ON.



03-07	Up/Down Keep Frequency Status after Stop Command
Range	[0]: After a stop command in Up/Down mode, the preset frequency is held as the inverter stops, and the UP/Down function is disabled. [1] After a stop command in Up/Down mod, the preset frequency is reset to 0 Hz as the inverter stops. [2]: After a stop command in Up/Down mode,, the preset frequency is held as the inverter stops, and the UP/Down function remains enabled.

- 03 - 07 = **[0]** , When run signal is removed (Stop Command), the output frequency is stored in parameter 05-01(Key pad Frequency).
- 03 - 07 = **[0]** In stop mode since frequency can not be increased or decreased from Up/Down terminals then keypad can be used to change the frequency by modifying parameter 05-01.
- Set 03 - 07 = **[1]** , In Up/down frequency mode inverter will ramp up from 0Hz on Run command and Ramp down to 0 Hz on stop command.

03-08	Multifunction terminals I1D~I6D scan time
Range	[1~200]2ms

- Multifunction input terminal On/Off periods will be scanned for the number of cycles according to the set value in parameter 03-08. If the signal status for ON or OFF period is less than the set period it will be treated as noise.
- Scan period unit is 2ms.
- Use this parameter if unstable input signal is expected, however setting long scan time periods results in slower response times.

*Note: Terminal SF is for safety switch, SF can cut off the inverter voltage output.

03-09	I1D~I5D Input Type Selection NO & NC
Range	[xxxx0]:I1D NO [xxx1]:I1D NC [xxx0x]:I2D NO [xxx1x]:I2D NC [xx0xx]:I3D NO [xx1xx]:I3D NC [x0xxx]:I4D NO [x1xxx]:I4D NC [0xxxx]:I5D NO [1xxxx]:I5D NC
03-10	I6D Input Type Selection NO & NC
Range	[xxxx0]:I6D NO [xxx1]:I6D NC

➤ “NO”: Normally open, “NC”: Normally closed. . Select as required

For selecting Normally Open (NO) or Normally Closed (NC) set the relevant digit in parameter 03-09/03-10 to 0 or 1 as required.

In order to enable parameters 03-09/03-10, please set 03-20 = 1 (internal control) beforehand.

Set Parameter 03-09 first before you use the Parameters 00-02/00-03=1 to set the inverter run mode to External multifunction inputs.

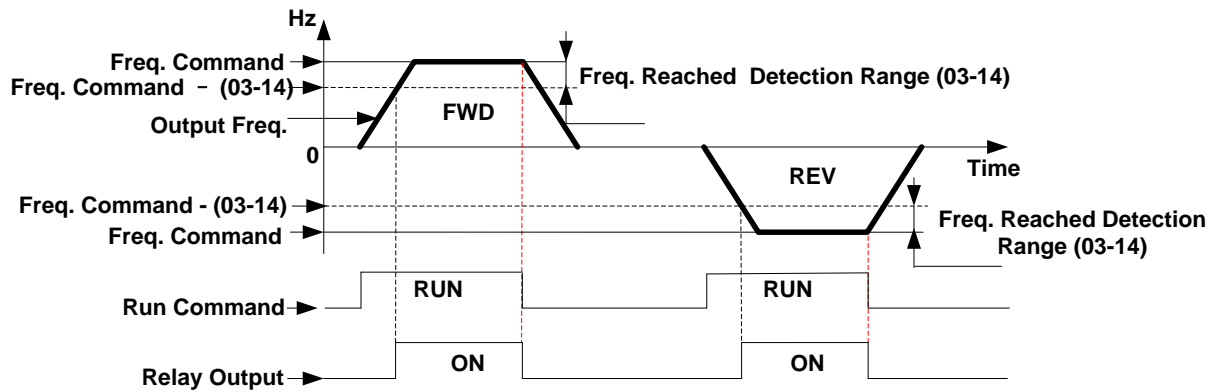
For example, to select I1D, I2D as NC, while I3D, I4D, I5D as NO, set 03-09 = 00011

03-11	Multifunction Output Relay RY 1 functions. (Terminals R1C,R1B, R1A)
03-12	Multifunction Output Relay RY 2 functions. (Terminals R2B, R2A)
Range	[0]:Run [1]:Fault [2]:Output Frequency Reached [3]:Output Frequency Reached within Preset Range (3-13±3-14) [4]:Output Frequency Detection 1 (> 03-13) [5]:Output Frequency Detection 2 (< 03-13) [6]:Auto-restart [7]:Momentary AC Power Loss------(refer to 07-00) [8]:Rapid Stop (Decelerate to Stop) [9]:Base Block Stop Mode [10]:Motor Overload Protection (OL1) [11]:Drive Overload Protection (OL2) [12]:Over Torque Threshold Level (OL3) [13]:Preset Current level Reached -----(refer to 03-15/03-16) [14]:Preset Brake Frequency Reached -----(refer to 03-17/03-18) [15]:PID Feedback Signal Loss [16]:Single pre-set count (3-22) [17]:Dual pre-set count (3-22~23) [18]:PLC status indicator (00-02) [19]:PLC control [20]:Zero Speed
03-13	Preset Frequency Reached Level
Range	[0.00~599.00] Hz
03-14	Frequency Reached Detection Range (±)
Range	[0.00~30.00] Hz

Output relay RY function descriptions:

- 1) 03-11/03-12 = **[0]** . RY will be ON with Run signal.
- 2) 03-11/03-12 = **[1]** . RY will be ON with inverter Faults.
- 3) 03-11/03-12 = **[2]** . RY will be ON when Freq. Command - Freq. Detection Range (03-14) is reached.

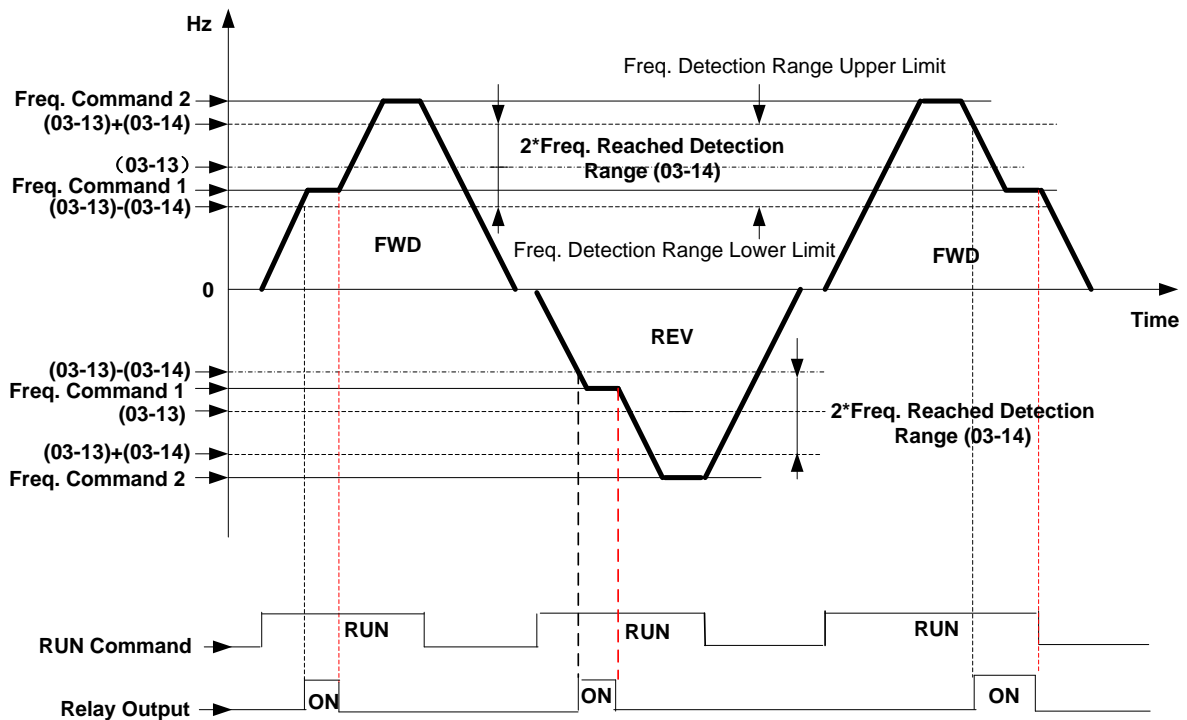
When Output Freq. = Freq. Command - Freq. Reached Detection Range (03-14),
Relay Output will be ON



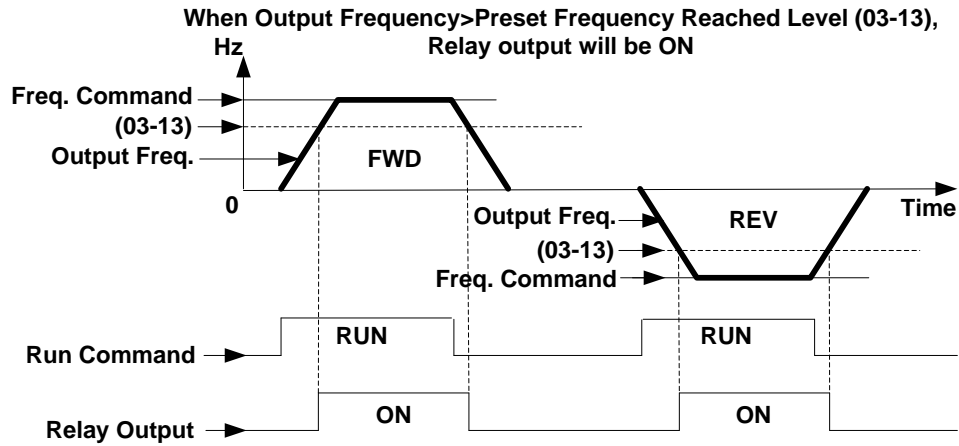
Example: Freq. command=30 Hz and 03-14=5 Hz. Relay turns ON when output freq. reaches 25 Hz to 30 Hz.

4) 03-11= **【3】** . RY will be ON according to the information below:

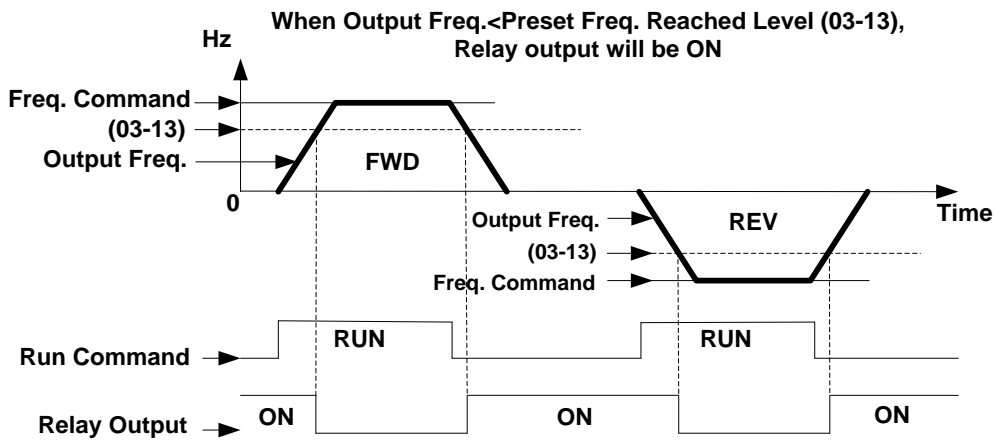
When, Freq. Detection Range Lower Limit < Freq. Command < Freq. Detection Range Upper Limit
And, Freq. Detection Range Lower Limit < Output Freq. < Freq. Detection Range Upper Limit,
Relay output will be ON (Allowable tolerance ± 0.01)



5) 03-11= **【4】** . RY will be on as soon as the Output frequency > Preset frequency reached level (03-13)

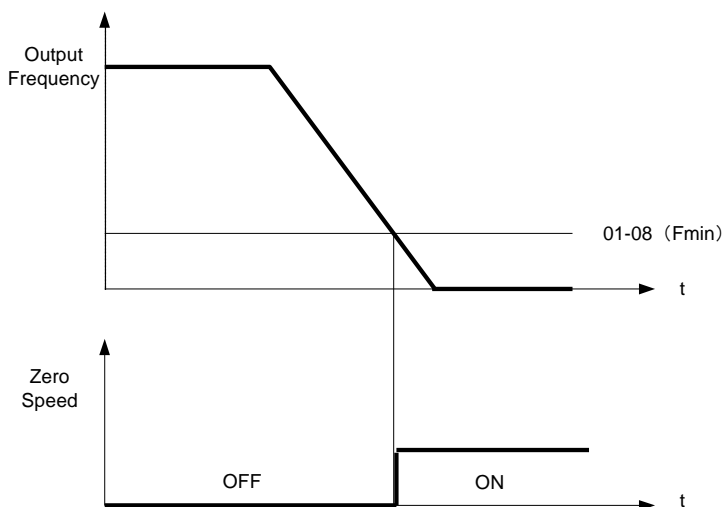


6) 03-11= **【5】** . RY will be on as soon as the Output frequency < Preset frequency reached level (03-13)



7) 03-11/03-12= **【20】** Zero Speed

Off	Output Frequency => Minimum Frequency (01-08, Fmin)
On	Output Frequency < Minimum Frequency (01-08, Fmin)

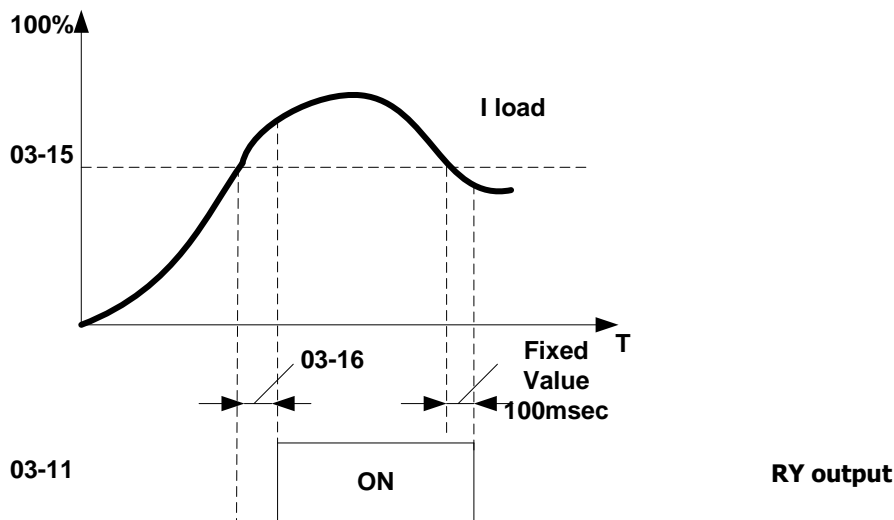


03-15	Preset output current reached
Range	[0.1~15.0] A
03-16	Preset output Current detection delay Time
Range	[0.1~10.0] Sec

03-11= **【13】** RY1 will be on as soon as the output current value > preset current setting (03-15).

03-15: Setting range (0.1~15.0 Amps) as required according to the rated motor current.

03-16: Setting range (0.1~10.0) unit: seconds

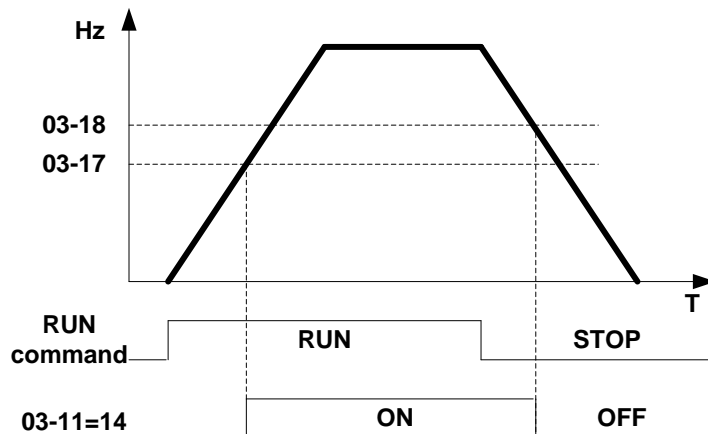


03-17	Brake Release Level
Range	[0.00~20.00] Hz
03-18	Brake Engage Level
Range	[0.00~20.00] Hz

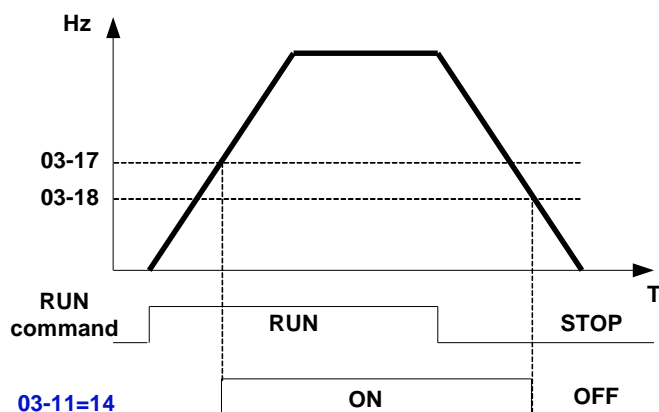
- If 03-11 = **【14】**
- In accelerating mode, RY will be ON as soon as the actual output frequency reaches the external Brake release level set in parameter 03-17.
- In decelerating mode, RY will be OFF as soon as the actual output frequency reaches the external Brake engage level set in parameter 03-18.

➤

Timing diagram for $03-17 \leq 03-18$ is shown below:



Timing diagram for $03-17 \geq 03-18$ is shown below:



03-19	Relay Output Status Type
Range	[0]:A (Normally open) [1]:B (Normally close)

- When 03-19=0,
- When the set conditions of 03-11, 03-12 are met , relay contact is closed, otherwise it will be open.
- When 03-19=1,
- When the set conditions of 03-11, 03-12 are met ,relay contact will open, otherwise it will be closed.

03-20	Internal / External Multi-Function Input Terminal Selection
Range	[0~63]
03-21	Action to Set the Internal Multi-Function Input Terminals
Range	[0~63]

Parameter 03-20 determines if external/ internal control for multi-function inputs I1D-I6D is selected. The corresponding contact is set to 1 when internal multi-tunction input is selected and it is set to 0 when the external one is selected.

The input selection is according to the decimal value set.

DI	I6D	I5D	I4D	I3D	I2D	I1D
Binary	2^5	2^4	2^3	2^2	2^1	2^0
Decimal	32	16	8	4	2	1

The definition of bits in 03-20:

03- 20= 0 0 0 0 0 0 **0**: external control according to 03-00 to 03-05.
 I6D I5D I4D I3D I2D I1D **1**: internal ON/OFF status control according to 03-21.

The definition of bits in 03-21:

03- 21= 0 0 0 0 0 0 **0**: internal multi-function input terminal is OFF.
 I6D I5D I4D I3D I2D I1D **1**: internal multi-function input terminal is ON.

For example, it is required to set the ON/OFF status of terminals I2D, I4D, I6D internally.

1. Set 03-20 = 42 (2+8+32) to select I2D, I4D, and I6D, which is binary 101010.
2. Set 03-21 = 10 (2+8), which is binary 001010, meaning I2D and I4D are ON.

03-22	Pre-set count 1
Range	[0~9999]
03-23	Pre-set count 2
Range	[0~9999]

The internal counter function can be used to count external pulses and activate RY1 & RY2 output relays to indicate the pre-set counts reached set in parameters 03-22 & 03-23.

Internal counter counts can be checked against a single pre-set value or a dual pre-set value.

- For single pre-set count, set parameter 03-22 to the required pre-set count.
- To activate relays RY1 or RY2 for a single pre-set count set parameter 03-11 (RY1) or 03-12 (RY2) as required to 16.

Pulse inputs at the selected terminal will increment the internal counter until the pre-set count in parameter 03-22 is reached then the selected Ry1 or Ry2 relay will be **turned ON**.

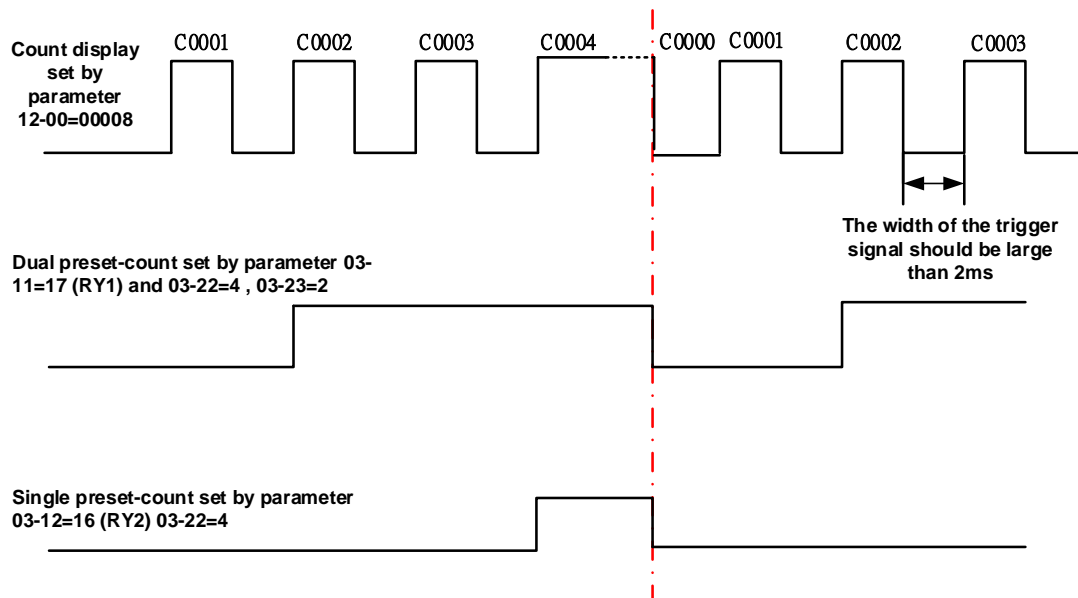
Removing the input signal when the pre-set count is reached the counter is reset to zero and the selected relay will be **turned off**.

- For **Dual pre-set count**, set 03-23 to **turn ON** the selected relay and Set parameter 03-22 to **turn off** the selected Relay.
- To activate relays RY1 or RY2 for a Dual pre-set count, set parameter 03-11 (RY1) or 03-12 (RY2) as required to 17.

Pulse inputs at the selected terminal will increment the internal counter until the pre-set count in parameter 03-23 is reached then the selected Ry1 or Ry2 relay will be turned ON. Then as the pulse input is continued, the counts will be incremented until the pre-set count set in parameter 03-22 is reached as soon as the input pulse is removed the counter is reset to zero and the selected Relay is turned off.

03-22 pre-set value must be \geq pre-set value of 03-23

➔ Example diagram for single&dual preset counts using RY1&RY2

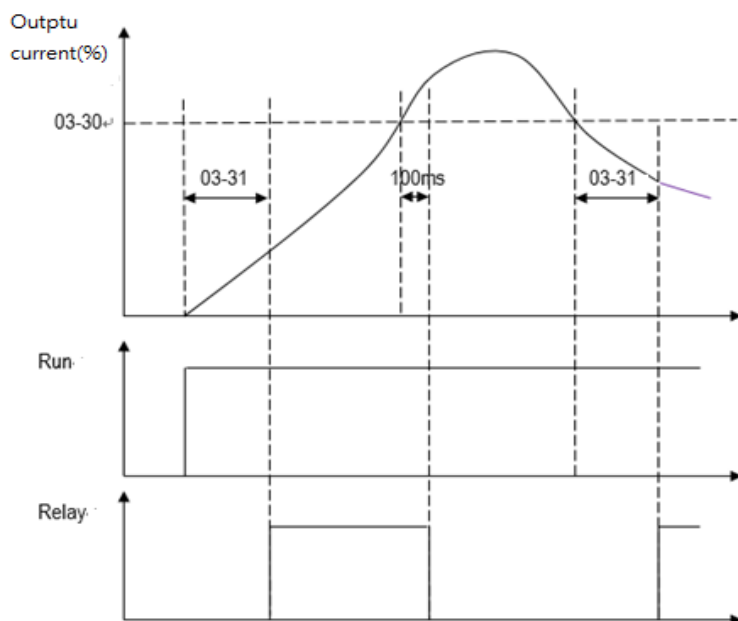


03-24	Output Under Current Detection
Range	[0]:disable [1]:enable
03-25	Output Under Current Detection Level
Range	[5%~100%]
03-26	Output under Current Detection Delay Time
Range	[0.0~50.0s]

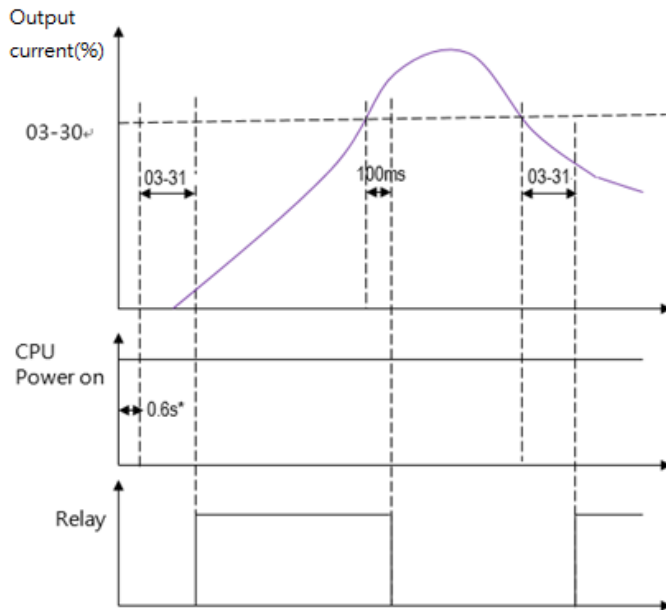
When 03-24 = 1, if output current is less than under current detection level, for a preset time 03-26 then ud-C fault will be displayed.

03-27	Pulse Frequency
Range	[0.01~0.20]
03-28	Pulse Frequency Gain
Range	[0.01~9.99]
03-29	Low Current Detection Mode
Range	[0]: Operate while in RUN mode [1]: Operate once power on
03-30	Low Current Detection Level
Range	[0~100]%
03-31	Low Current Detection Time
Range	[0.0~50.0]s

When 03-29= **【0】** , if output current lower than Low current detection level (setting value of 03-30), relay will be closed by lower current detection time (setting value of 03-31). (output current is the inverter rating current)



When **03-29=【1】** , if output current lower than low current detection time (setting value of 03-30), relay will be closed by lower current detection time (setting value of 03-31). (There is a 0.6 s sampling delay time at power on)



04-External Analog Signal Input / Output Functions

04-00	Analog Voltage & Current Input Selections AI1/AI2	
Range	AI1	AI2
	[0]: 0~10V (0~20mA)	0~10V (0~20mA)
	[1]: 0~10V (0~20mA)	2~10V (4~20mA)
	[2]: 2~10V (4~20mA)	0~10V (0~20mA)
	[3]: 2~10V (4~20mA)	2~10V (4~20mA)

- Use JP2/JP3 to set analog signal type to voltage or current input. Parameter 04-00 must be set according to JP2/JP3 setting.

Analog input scaling formula as shown below.

Current Input Mode

$$\text{AI (0~20mA)} : F (\text{Hz}) = \frac{I (\text{mA})}{20(\text{mA})} \times (00 - 12)$$

$$\text{AI (4~20mA)} : F (\text{Hz}) = \frac{I - 4(\text{mA})}{20 - 4(\text{mA})} \times (00 - 12), I \geq 4$$

Voltage Input Mode

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

$$\text{AI (2~10V)} : F (\text{Hz}) = \frac{V - 2(\text{v})}{10 - 2(\text{v})} \times (00 - 12), V \geq 2$$

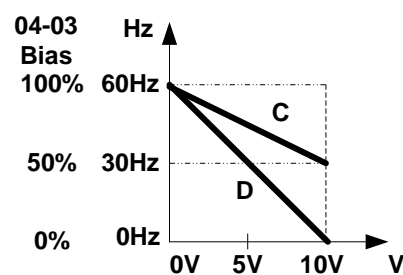
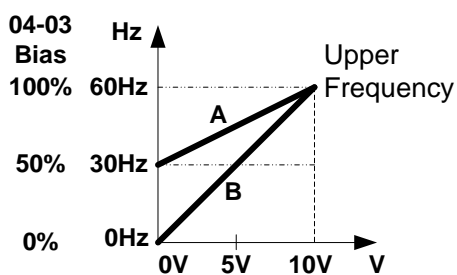
04-01	AI1 Signal Verification Scan Rate
Range	[1~200]2msec
04-02	AI1 Gain
Range	[0 ~ 1000]%
04-03	AI1 Bias
Range	[0~ 100]%
04-04	AI1 Bias Selection
Range	[0]: Positive [1]: Negative
04-05	AI1 Slope
Range	[0]: Positive [1]: Negative
04-06	AI2 signal verification Scan Rate
Range	[1~200]2msec
04-07	AI2 Gain
Range	[0 ~ 1000]%
04-08	AI2 Bias
Range	[0 ~ 100]%
04-09	AI2 Bias Selection
Range	[0]: Positive [1]: Negative
04-10	AI2 Slope
Range	[0]: Positive [1]: Negative

➤ Set 04- 01 and 04- 06 for analog signal verification.
Inverter reads the average values of A/D signal once per (04- 01/04- 06 x 2ms). Set scan intervals according to the application and with consideration for signal instability or interference effects on the signal by external sources. Long scan times will result in slower response time.

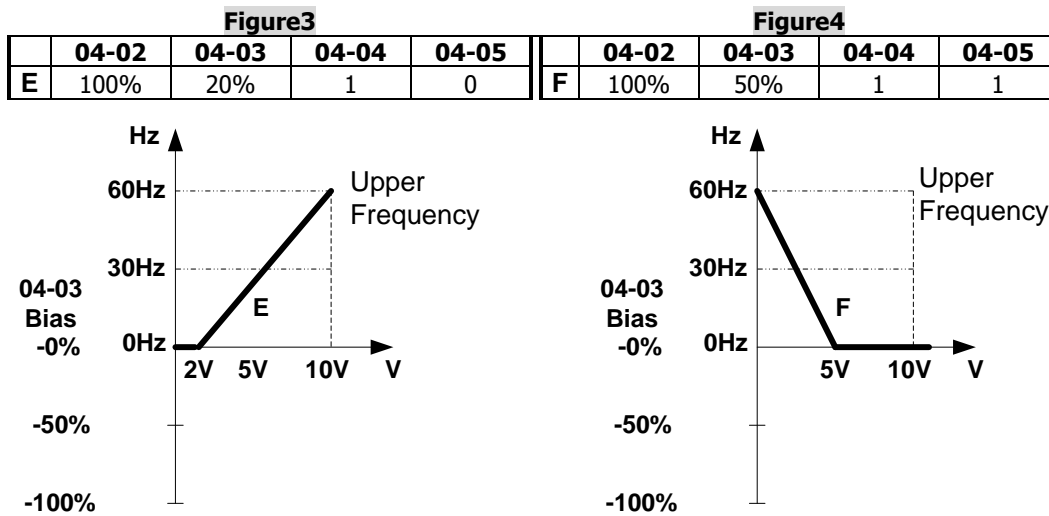
AI1.Analog Voltage input scaling examples by adjusting Gain, Bias & Slope parameters (04-02~04-05)

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

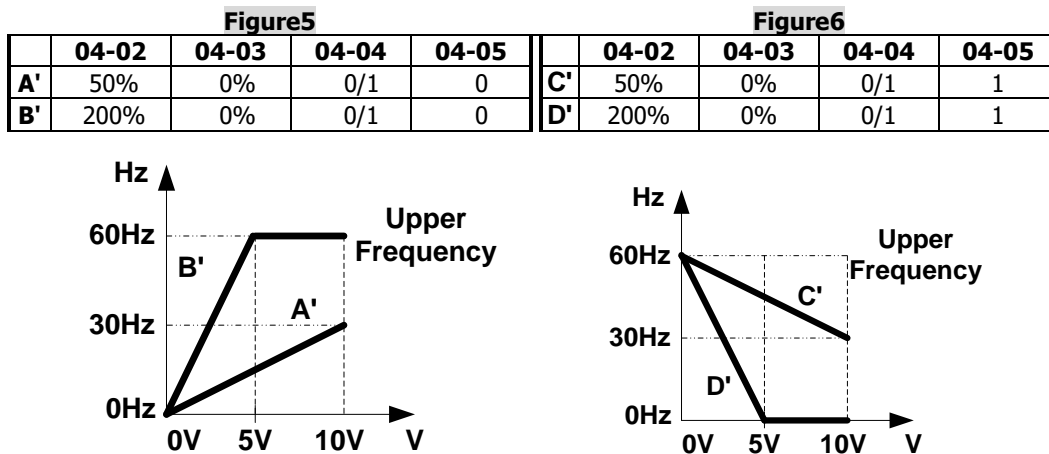
Figure1					Figure2				
	04-02	04-03	04-04	04-05		04-02	04-03	04-04	04-05
A	100%	50%	0	0	C	100%	50%	0	1
B	100%	0%	0	0	D	100%	0%	0	1



2) **Negative Bias type** and effects of modifying Bias amount by parameter 04-03 and Slope type with parameter 04-05 are shown in Fig 3&4.



3) **Offset bias** set to 0% (04-03) and effect of modifying Analog Gain (04-02), Bias type (04-04) and slope type(04-05) are shown in shown Fig 5&6.



(4) Various other examples of analog input scaling and modification are shown in following figures 7,8,9 & 10.

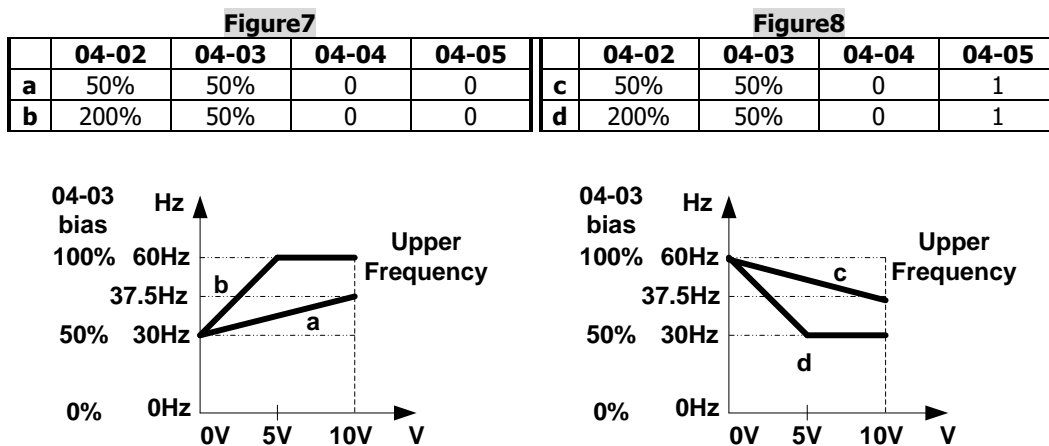
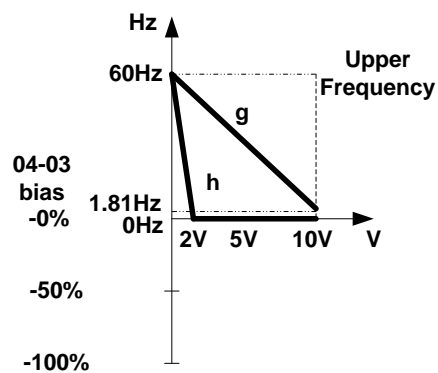
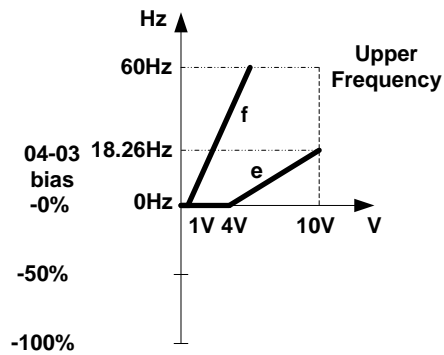
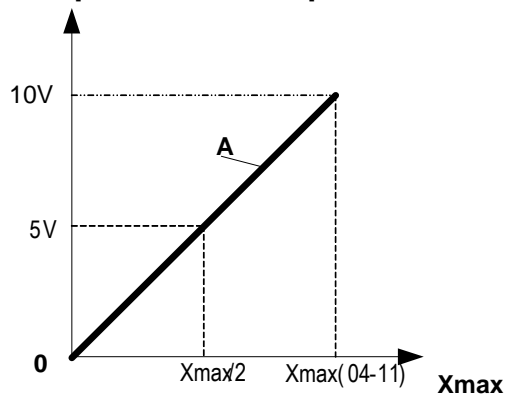


Figure9					Figure10				
	04-02	04-03	04-04	04-05		04-02	04-03	04-04	04-05
e	50%	20%	1	0	g	50%	50%	1	1
f	200%	20%	1	0	h	200%	0%	0	1



04-11	Analog Output (AO) Function Selection.
Range	[0]:Output Frequency [1]:Frequency Command [2]:Output Voltage [3]:DC Bus Voltage [4]:Output Current

Example: Set 04-11 required according to the table below.



04-11	A	Xmax
[0]	Output frequency	upper frequency limit
[1]	Frequency Setting	upper frequency limit
[2]	Output voltage	Motor Rated Voltage
[3]	DC Bus Voltage	220V: 0~400V 440V: 0~800V
[4]	Output current	rated current of inverter

04-12	AO Gain
Range	[0 ~ 1000]%
04-13	AO Bias
Range	[0 ~ 100]%
04-14	AO Bias Selection
Range	[0]: positive [1]: Negative
04-15	AO Slope
Range	[0]: positive [1]: Negative
04-16	F-Gain
Range	[0]: Invalid [1]: Effective

Select the Analog output type for the multifunction analog output on terminal (TM2) as required by parameter 04-11. Output format is 0-10V dc.

The output voltage level can be scaled and modified by parameters 04-12 to 04-15 If necessary.

The modification format will be same as the examples shown previously for Analog Voltage Input (AI1) parameters 4-02 to 4-05.

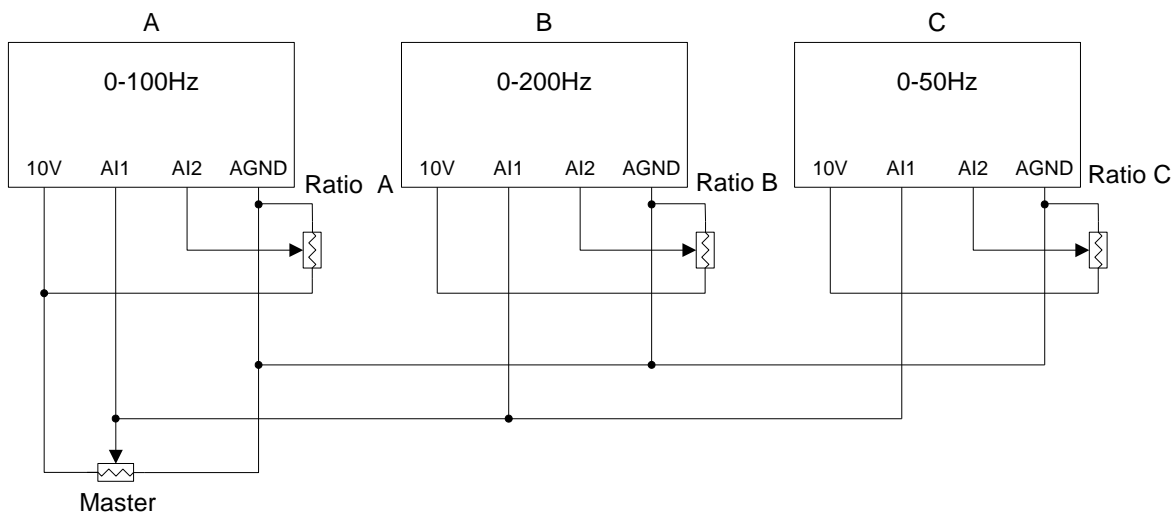
Note: the max output voltage is 10V due to the hardware of the circuit.

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

F-Gain Functions:

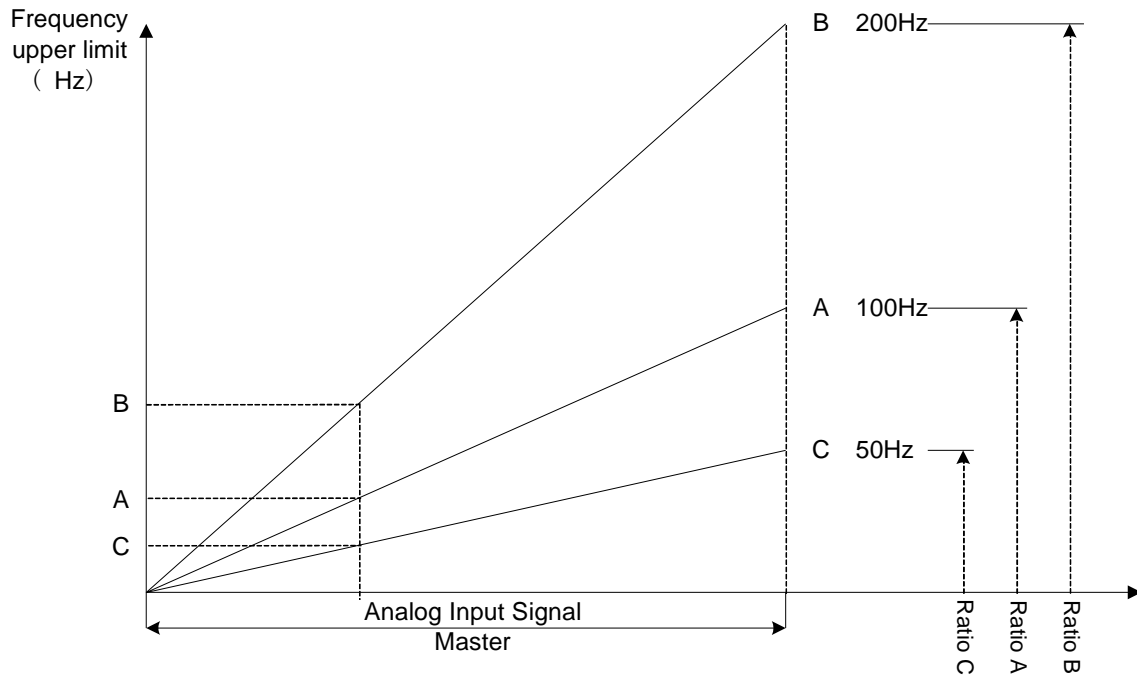
F- Gain function provides the facility for setting the frequency reference to more than one inverter set by a master potentiometer then the master frequency can be scaled by three individual potentiometers for each inverter as show in the diagram below.

To use this function set Parameter 04-16=1 and set parameter 00-05 =2 (external Analog input AI1) and AI2 will be the scaling potentiometer.



Parameter Preset:

A	B	C
00-05=2	00-05=2	00-05=2
00-12=100	00-12=200	00-12=50
04-16=1	04-16=1	04-16=1



05-Preset Frequency Selections

05-00	Preset Speed Control mode Selection
Range	[0]: Common Accel/Decel [1]: Individual Accel/Decel for each preset speed 0-15

05-01	Preset Speed 0 (Keypad Freq)
05-02	Preset Speed 1
05-03	Preset Speed 2
05-04	Preset Speed 3
05-05	Preset Speed 4
05-06	Preset Speed 5
05-07	Preset Speed 6
05-08	Preset Speed 7
05-09	Preset Speed 8
05-10	Preset Speed 9
05-11	Preset Speed 10
05-12	Preset Speed 11
05-13	Preset Speed 12
05-14	Preset Speed 13
05-15	Preset Speed 14
05-16	Preset Speed 15
Range	[0.00 ~ 599.00] Hz

05-17	Preset Speed 0 Acceleration time
05-18	Preset Speed 0 Deceleration time
05-19	Preset Speed 1 Acceleration time
05-20	Preset Speed 1 Deceleration time
05-21	Preset Speed 2 Acceleration time
05-22	Preset Speed 2 Deceleration time
05-23	Preset Speed 3 Acceleration time
05-24	Preset Speed 3 Deceleration time
05-25	Preset Speed 4 Acceleration time
05-26	Preset Speed 4 Deceleration time
05-27	Preset Speed 5 Acceleration time
05-28	Preset Speed 5 Deceleration time
05-29	Preset Speed 6 Acceleration time
05-30	Preset Speed 6 Deceleration time
05-31	Preset Speed 7 Acceleration time
05-32	Preset Speed 7 Deceleration time
05-33	Preset Speed 8 Acceleration time
05-34	Preset Speed 8 Deceleration time
05-35	Preset Speed 9 Acceleration time
05-36	Preset Speed 9 Deceleration time
05-37	Preset Speed 10 Acceleration time
05-38	Preset Speed 10 Deceleration time
05-39	Preset Speed 11 Acceleration time
05-40	Preset Speed 11 Deceleration time
05-41	Preset Speed 12 Acceleration time
05-42	Preset Speed 12 Deceleration time
05-43	Preset Speed 13 Acceleration time
05-44	Preset Speed 13 Deceleration time
05-45	Preset Speed 14 Acceleration time
05-46	Preset Speed 14 Deceleration time
05-47	Preset Speed 15 Acceleration time
05-48	Preset Speed 15 Deceleration time
Range	[0.1 ~ 3600.0] Sec

When 05-00 = **[0]**, Accel /Decel 1 or 2 set by parameters 00-14/00-15 or 00-16/00-17 apply to all speeds.

When 05- 00 = **【1】** , When 05- 00 = **【1】** Individual Accel/Decel apply to each preset speed 0-15. Parameters 05-17 to 05-48.

Formula for calculating acceleration and deceleration time:

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

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

Base frequency = parameter 01-02 when programmable V/F is selected by 01- 00= **【18】**

Base frequency = 50.00 Hz or 60.00 Hz when preset V/F patterns are selected by 01-00≠ **【18】**

Example: 01- 00≠ **【18】** , 01- 02= **【50】** Hz, 05- 02= **【10】** Hz (preset speed1), 05-19= **【5】** s(Acc-time), 05-20= **【20】** s (Dec-time)

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

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

Multi speed run/stop cycles with Individual accel/dec time. 05-00= **【1】**

Two modes are shown below:-

Mode1 = On/Off run command

Mode2= Continuous run command

Mode1 Example:

00- 02= **【1】** (External Run/Stop Control).

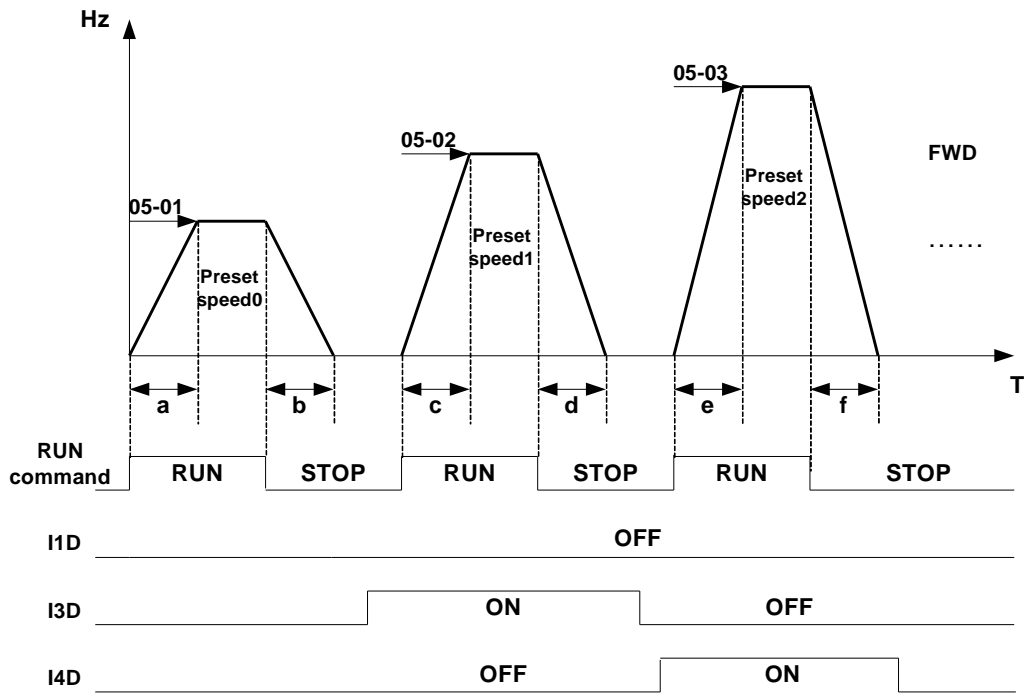
00- 04= **【1】** (Operation Mode: Run/stop-forward/reverse).

I1D: 03- 00= **【0】** (RUN/STOP)

I2D: 03- 01= **【0】** (Forward/Reserve)

I3D: 03- 02= **【2】** (Preset speed 1)

I4D: 03- 03= **【3】** (Preset speed 2);



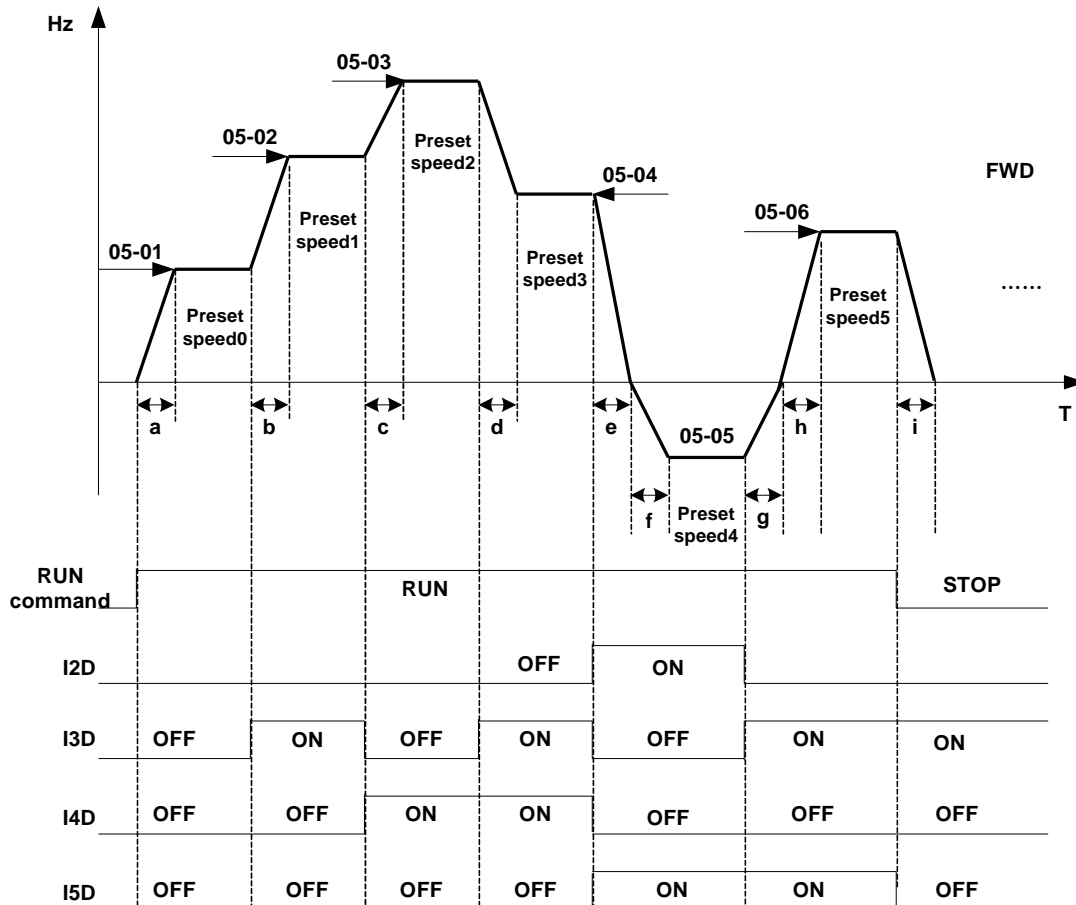
When the run command is On/Off, acceleration and deceleration times for each cycle can be calculated as below:- time unit is in seconds.

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

Unit (sec)

Mode2 Example. Continuous run command.

- Set I1D for Continuous Run
- Set I2D For Forward /Reverse direction selection
- Set multi function terminals I3D, I4D & I5D for setting three different preset speeds



When the run command is continuous, acceleration and deceleration times for each segment can be calculated as below:

$$a = \frac{(05-17) \times (05-01)}{01-02}, \quad b = \frac{(05-19) \times [(05-02) - (05-01)]}{01-02}, \quad c = \frac{(05-21) \times [(05-03) - (05-02)]}{01-02}$$

$$d = \frac{(05-24) \times [(05-03) - (05-04)]}{01-02}, \quad e = \frac{(05-26) \times (05-05)}{01-02}, \quad f = \frac{(05-25) \times (05-05)}{01-02},$$

$$g = \frac{(05-28) \times (05-05)}{01-02}, \quad h = \frac{(05-27) \times (05-06)}{01-02}, \quad i = \frac{(05-28) \times (05-06)}{01-02} \dots \text{Unit (sec)}$$

06-Auto Run(Auto Sequencer) Function

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

Frequency of the step 0 is set by parameter 05-01 keypad Frequency.	
06-01	Auto_ Run Mode Frequency Command 1
06-02	Auto_ Run Mode Frequency Command 2
06-03	Auto_ Run Mode Frequency Command 3
06-04	Auto_ Run Mode Frequency Command 4
06-05	Auto_ Run Mode Frequency Command 5
06-06	Auto_ Run Mode Frequency Command 6
06-07	Auto_ Run Mode Frequency Command 7
06-08	Auto_ Run Mode Frequency Command 8
06-09	Auto_ Run Mode Frequency Command 9
06-10	Auto_ Run Mode Frequency Command 10
06-11	Auto_ Run Mode Frequency Command 11
06-12	Auto_ Run Mode Frequency Command 12
06-13	Auto_ Run Mode Frequency Command 13
06-14	Auto_ Run Mode Frequency Command 14
06-15	Auto_ Run Mode Frequency Command 15
Range	[0.00 ~ 599.00]Hz

06-16	Auto_ Run Mode Running Time Setting0
06-17	Auto_ Run Mode Running Time Setting1
06-18	Auto_ Run Mode Running Time Setting2
06-19	Auto_ Run Mode Running Time Setting3
06-20	Auto_ Run Mode Running Time Setting4
06-21	Auto_ Run Mode Running Time Setting5
06-22	Auto_ Run Mode Running Time Setting6
06-23	Auto_ Run Mode Running Time Setting7
06-24	Auto_ Run Mode Running Time Setting8
06-25	Auto_ Run Mode Running Time Setting9
06-26	Auto_ Run Mode Running Time Setting10
06-27	Auto_ Run Mode Running Time Setting11
06-28	Auto_ Run Mode Running Time Setting12
06-29	Auto_ Run Mode Running Time Setting13
06-30	Auto_ Run Mode Running Time Setting14
06-31	Auto_ Run Mode Running Time Setting15
Range	[0.00 ~ 3600.0]Sec

06-32	Auto_ Run Mode Running Direction 0
06-33	Auto_ Run Mode Running Direction1
06-34	Auto_ Run Mode Running Direction2
06-35	Auto_ Run Mode Running Direction3
06-36	Auto_ Run Mode Running Direction4
06-37	Auto_ Run Mode Running Direction5
06-38	Auto_ Run Mode Running Direction6
06-39	Auto_ Run Mode Running Direction7
06-40	Auto_ Run Mode Running Direction8
06-41	Auto_ Run Mode Running Direction9
06-42	Auto_ Run Mode Running Direction10
06-43	Auto_ Run Mode Running Direction11
06-44	Auto_ Run Mode Running Direction12
06-45	Auto_ Run Mode Running Direction13
06-46	Auto_ Run Mode Running Direction14
06-47	Auto_ Run Mode Running Direction15
Range	[0]: STOP [1]: Forward [2]: Reverse

Auto Run (sequencer) mode has to be enabled by using one of the multifunctional inputs I1D to I6D and setting the relevant parameter 03-00 to 03-04 to selection **【18】** .

Various Auto Run (sequencer) modes can be selected by parameter (06-00) as listed above.

15 Auto Run (sequencer) modes can be selected by parameters (06-01~06-47)

Auto Run frequency commands 1 to 15 are set with Parameters (06-01 ~ 06-15),

Sequence run times are set with parameters (06-17 ~ 06-31)

FWD/REV Direction for each sequence can be set with parameters (06-33 ~ 06-47).

Auto sequence 0, frequency is set from keypad by parameter 05-01, sequence run time and direction are set by parameters 06-16 and 06-32.

Auto RUN (Auto Sequencer) examples are shown in the following pages:

Example 1. Single Cycle (06- 00=1,4)

The inverter will run for a single full cycle based on the specified number of sequences, then it will stop. In this example 4 sequences are set, three in forward direction and one in Reverse.

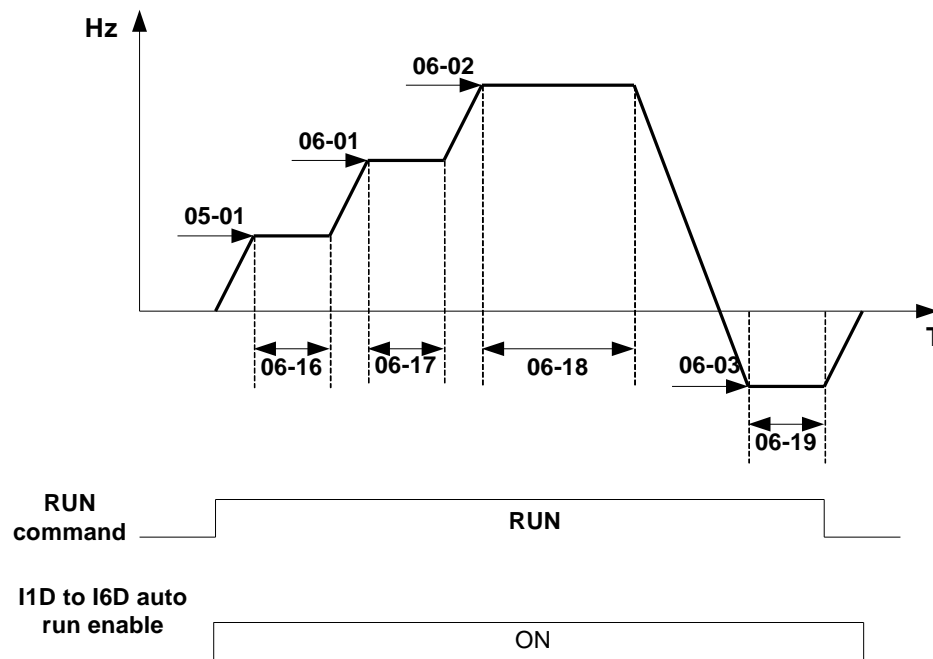
Auto Run Mode 06- 00= **【1】** (or **【4】**),

Frequency 05-01= **【15】** Hz, 06- 01= **【30】** Hz, 06- 02= **【50】** Hz, 06- 03= **【20】** Hz

Sequence Run Time 06-16= **【20】** s, 06-17= **【25】** s, 06-18= **【30】** s 06-19= **【40】** s,

Direction 06-32= **【1】** , 06-33= **【1】** , 06-34= **【1】** (FWD), 06-35= **【2】** (REV),

Unused Sequence Parameters 06-04~ 06-15= **【0】** Hz, 06-20~06-31= **【0】** s, 06-36~06-47= **【0】**

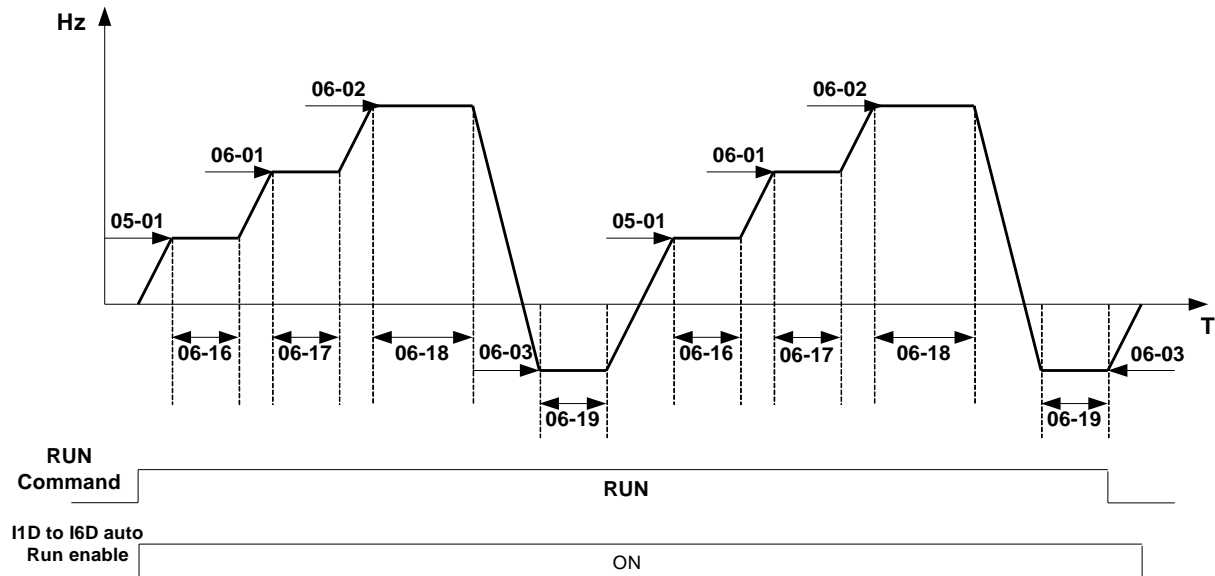


Example 2: Periodic Cycle Run.

Mode: 06- 00= **【2】** or **【5】**

The inverter will repeat the same cycle periodically.

All other Parameters are set same as Example 1. shown above



Example 3. Auto_Run Mode for Single Cycle 06-00=【3 or 6】

The speed of final step will be held to run.

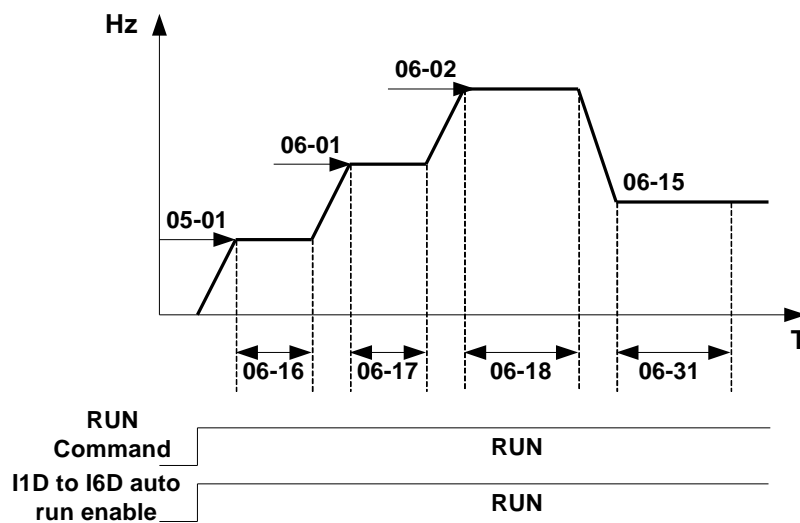
Auto Run Mode 06-00 = 【3】 (or 【6】),

Frequency 05-01=【15】 Hz, 06-01=【30】 Hz, 06-02=【50】 Hz, 06-15=【20】 Hz,

Sequence Run Time 06-16=【20】 s, 06-17=【25】 s, 06-18=【30】 s, 06-31=【40】 s,

Direction 06-32=【1】 , 06-33=【1】 , 06-34 =【1】 , 06-47=【1】 (FWD),

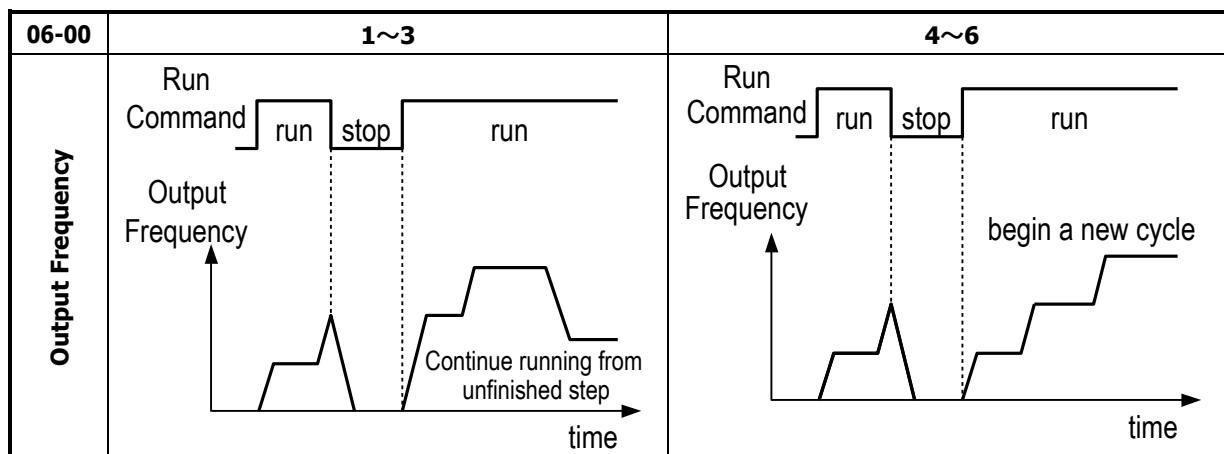
Unused Sequence Parameters 06-04~06-15=【0】 Hz , 06-19~06-30=【0】 s , 06-35~06-46 =【0】



Example 4&5 .

Auto_Run Mode 06-00=【1~3】 . After a restart, it continues to run from the unfinished step.

Auto_Run Mode 6-00=【4~6】 . After a restart, it will begin a new cycle.



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

07- Start/Stop Command Setup

07-00	Momentary power loss and restart
Range	[0]:Momentary Power Loss and Restart Disable [1]:Momentary Power Loss and Restart Enable

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

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

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

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

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

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

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

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

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

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

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

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

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

07-04	Direct Running on Power Up
Range	[0]:Enable Direct Running on Power Up [1]:Disable Direct Running on Power Up
07-05	Delay-ON Timer (Seconds)
Range	[1.0~300.0] Sec

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

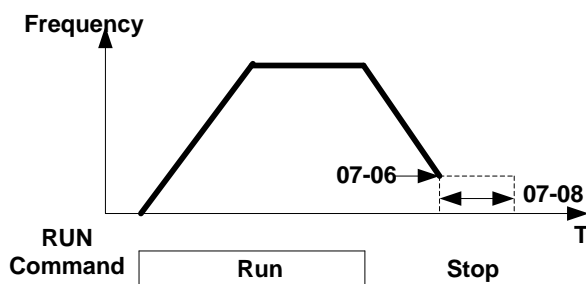
It is recommend that the power is turned off and the run switch is also off to avoid possibility of injury to operators and damage to machines as the power is reapplied.

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

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

07-06	DC Injection Brake Start Frequency (Hz)
Range	[0.10 ~ 10.00]Hz
07-07	DC Injection Brake Level (%) (Current Mode)
Range	[0.0~ 150.0]%
07-08	DC Injection Brake Time(Seconds)
Range	[0.0 ~ 25.5]Sec

- 07- 08 / 07- 06 set the DC injection brake duration and the brake start frequency, as shown below:



07-09	Stopping Method
Range	[0]: Deceleration to stop [1]: Coast to stop

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

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

07-10	Starting Methods
Range	[0]: Normal Start [1]: Speed Search

07-10=0: On starting, the inverter accelerates from 0 to target frequency in the set time.

07-10=1: On starting, the inverter accelerates to target frequency from the detected speed of motor.

07-11	Starting method for auto restart after fault
Range	[0]: Speed Search [1]: Normal Start

07-11=0: When auto-restarting the inverter will detect the rotating speed of the motor. The Motor will be controlled to accelerate from the present speed to the target speed.

07-11=1: The inverter restart from 0 speed to set frequency in acceleration time when auto-restart.

07-12	Power loss ride trough time
Range	[0.0 ~ 2.0]

Power loss ride through allows continued operation after a momentary power failure as long as the power has recovered within the set time in parameter 07-12, otherwise Inverter will trip with LVC fault due to power loss.

On power recovery the inverter will carry out a speed search function after which the inverter output frequency is ramped up the running frequency before the power failure.

Power loss recovery time setting depends on the Inverter rating; the range will be from 1 to 2 secs.

When 07-00 = 0: Power loss ride through is disabled.

When 07-00 = 1: If the power loss time is less than setting in 07-12, the drive will restart with speed search after 0.5 seconds delay, and there is no limits on the number of restarts.

*** Caution**

If there is a long power loss (loss time exceeds the set value of parameter 07-12) while power loss ride through function is selected by 07-00=1 and also the Run command is set to external switch 00-02=1, to avoid any danger to persons on power recovery, must ensure that the power and Run switch are in off position.

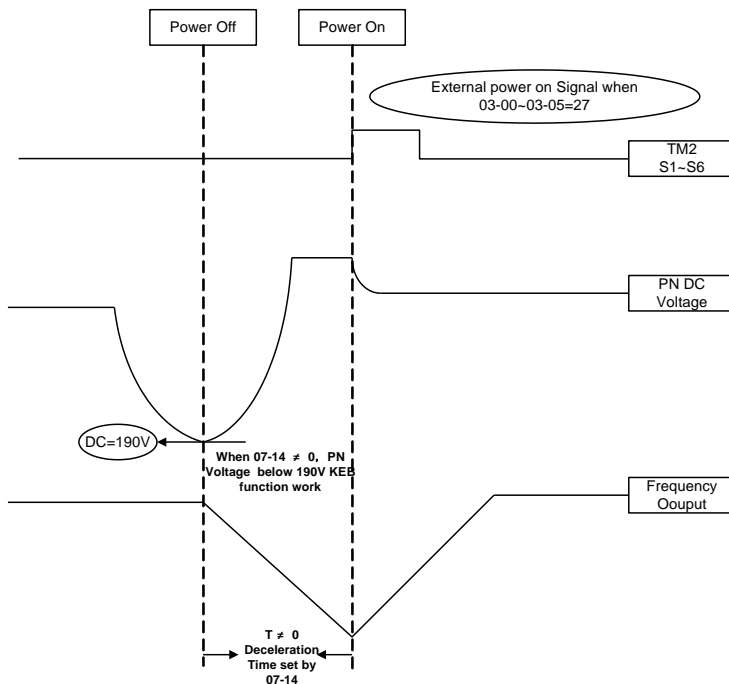
07-13	Main Circuit Low Voltage Detection
Range	220V Class[150.0~210.0] 440V Class[300.0~420.0]

07-14	Kinetic Energy Back-up Deceleration Time (KEB)
Range	[0.0]: Disable [0.1~25.0]: KEB Deceleration Time

07-14 = 0 KEB function disable

07-14 ≠ 0 KEB function enable

Example: 220V system



Note:

1. When **07-14**≠0, the momentary power loss and restart is disabled, the inverter will do KEB function.
2. When input power is turned off, CPU detects the DC bus Voltage and as soon as DC bus Voltage becomes lower than 190V (220V system) or 380V (440V system), then the KEB function is activated.
3. When KEB function is enabled, the inverter decelerate to zero by **07-14**, and the inverter stop
4. IF the power on signal enabled during the KEB function, the inverter accelerate to original frequency.

07-15	DC injection Brake Mode
Range	[0] Current Mode [1] Voltage Mode
07-16	DC Injection Brake Level (Voltage Mode)
Range	[0.0~10.0] %

Note: DC braking functions of voltage and current modes share two parameters of DC braking frequency (07-06) and DC braking time (07-08).

Parameters:

- (1) 07-15 is used to select DC braking mode (voltage mode or current mode)
 - When 07-15=0, DC Injection Brake Level is determined by 07-07;
 - When 07-15=1, DC Injection Brake Level is determined by 07-16.

Note: 07-07 references on rated current. 07-16 references on 20% of V/f max output voltage.

- (2) 07-16 is used to set the DC braking level in the voltage mode.

08-Protection function group

08-00	Trip Prevention Selection
Range	[xxxx0]:Enable Trip Prevention During Acceleration [xxxx1]:Disable Trip Prevention During Acceleration [xxx0x]:Enable Trip Prevention During Deceleration [xxx1x]:Disable Trip Prevention During Deceleration [xx0xx]:Enable Trip Prevention in Run Mode [xx1xx]:Disable Trip Prevention in Run Mode [x0xxx]:Enable over voltage Prevention in Run Mode [x1xxx]:Disable over voltage Prevention in Run Mode

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

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

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

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

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

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

08-03	Trip Prevention Level During Continuous Run Mode
Range	[50 ~ 200]%

Trip prevention adjustment level during continuous Run to prevent over current (OC-C) trips.

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

08-04	Over Voltage Prevention Level During Run Mode
Range	[350.0VDC~390.0VDC](200V class) [700.0VDC~780.0VDC](400V class)

Over voltage prevention level can be set by parameter 08-04 when necessary.

When the DC bus voltage is higher than the level set in 08-04, the over voltage fault will occur

08-05	Electronic Motor Overload Protection Operation Mode (OL1)
	[0]: Disable [1]: Enable

08-06	Operation After Overload Protection is Activated
Range	[0]:Coast-to-Stop After Overload Protection is Activated [1]:Drive Will Not Trip when Overload Protection is Activated (OL1)

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

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

08-07	OH Over Heat Protection
Range	[0]:Auto (Depends on heat sink temp.) [1]:Operate while in RUN mode [2]:Always Run [3]:Disabled

08- 07= 【0】 : Cooling fan runs as the inverter detects temperature rise.

08- 07= 【1】 : Cooling fan runs while the inverter is running.

08- 07= 【2】 : Cooling fan runs continuously.

08- 07= 【3】 : Cooling fan is Disabled.

08-08	AVR function
Range	[0]:AVR function enable [1]:AVR function disable [2]:AVR function disable for stop [3]:AVR function disable for Deceleration [4]:AVR function disabled for stop and Deceleration [5]:when VDC>360/740V, AVR function is disabled for stop and Deceleration

Automatic voltage regulator function provides a level of output voltage stability when there is input voltage instability. So when

08-08=0, Input voltage fluctuations will not effect the output voltage.

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

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

08-08=3. AVR is disabled only during deceleration from one speed to another speed. This will avoid longer than required deceleration time.

08-08=4 AVR function disabled for stop and deceleration.

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

08-09	Input Phase Loss Protection
Range	[0]:Disabled [1]:Enabled

When 08-09= **【1】** :On phase loss warning message PF is displayed..

08-10	Output phase lost protection
Range	[0]:Disabled [1]:Enabled

When 08-10= **【1】** : On output phase loss ,warning message LF is displayed...

08-11	Motor type selection:
Range	[0]:Electronic relays protect standard motor [1]: Electronic relays protect inverter duty motor
08-12	Motor Overload Protection Curve Selection:
Range	[0]:Constant Torque (OL =103 %) (150 % for 1 Minute) [1]:Variable Torque (OL = 113 %)(123 % for 1 Minute)

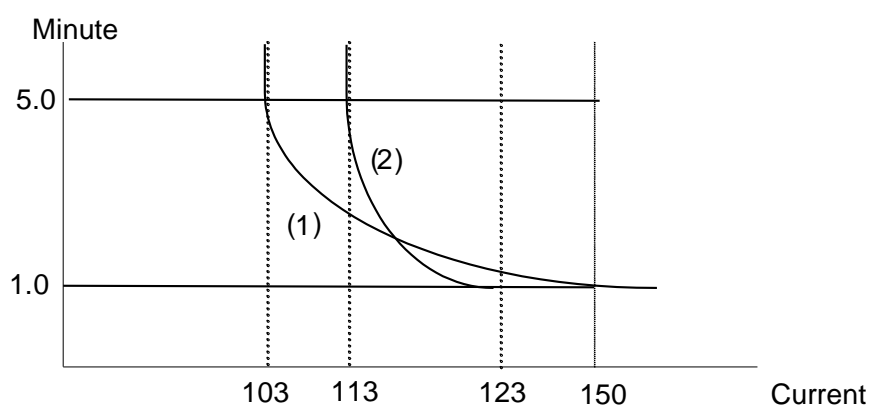
When 08-11= **【0】** : Set 02-06 as the rated frequency of the motor.

Motor overload protection level is according to the setting of 08-11 and 08-12, as follows:

OL1 level Frequency (base on rated F)	08-11=0	08-11=0	08-11=1	08-11=1
	08-12=0	08-12=1	08-12=0	08-12=1
F<=33.3%	63%	63%	103%	113%
33.3%<F<90%	85%	88%		
F>=90%	103%	113%		

When 08-12= **【0】** : Overload protection for motors used in general purpose applications, as long as the load demand is less than 103% of the rated current, the motor continues to run. If the load is larger than 150% rated current, the motor will run for 1 minute only. (curve1).

When 08-12= **【1】** : Overload protection for motors used in HVAC applications(FAN, PUMP...so on).as long as the load demand is less than 113% of the rated current, the motor continues to run. If the load is larger than 123% rated current, the motor will run for 1 minute only (curve2).



08-13	Over torque detection Control
Range	[0]: Over-torque detection is not valid [1]: Over torque detection after set frequency is reached [2]: Over torque detection after run command
08-14	Over torque protection action
Range	[0]: Stop output after over-torque detection (Free-run stop) [1]: Continue to run after over-torque detection (Display only OL3)
08-15	Over Torque Detection Level
Range	[30 ~ 300]
08-16	Over Torque Detection Time
Range	[0.0~25.0]
08-17	Fire Mode (for firmware below v1.1)
Range	[0]: Disable [1]: Enable

Over Torque is detected when the output torque level exceeds the level set in Parameter 08-15 (Inverter rated torque is 100%) and if it is detected for a duration of time which is set in parameter 08-16.

When 08-14= **【0】** : If there is over torque, the inverter coasts to stop and flashes OL3. It is necessary to press 'RESET' or signal reset from input terminal to continue to run.

When 08-14= **【1】** : If there is over torque, the inverter can continue to run and flashes OL3 until the output torque is less than the 08-15 set value.

Parameter 03-11/12(Multifunction output terminal) = 12, the output terminal signal will be set for over torque condition.

Note: Over torque detection will be enabled only when parameter 08-13 is set to options 1 or 2.

08-18	Ground Fault Detection
Range	[0]: Disable [1]: Enable

ON detection of Ground fault if 08-18 = 1, fault message (GF) will be displayed.

*** Note: this function is only available for inverter Frames 3, 4.**

09-Communication function setup

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

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

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

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

RTU can only used for 8 bits

09-06	Communication time-out detection time
Range	[0.0~25.5]s
09-07	Communication time-out operation selection
Range	[0]:Stop in deceleration time 1 and show COT after communication timeout [1]:Stop in free run mode and show COT after communication timeout [2]:Stop in deceleration time 2 and show COT after communication timeout [3]:Keep running and show COT after communication timeout

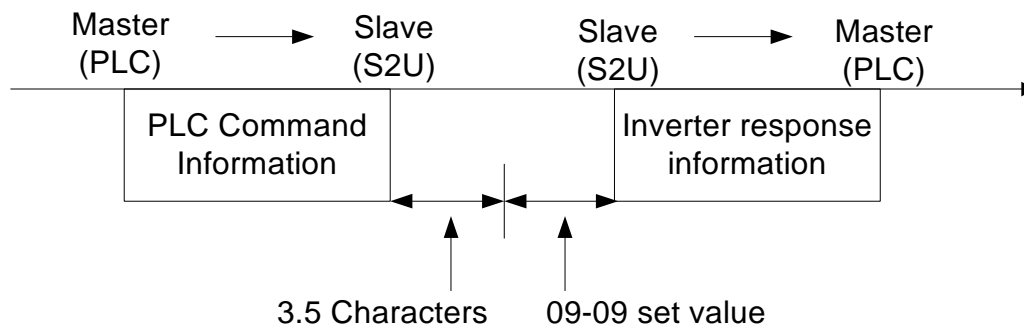
Time-out detection time: 00.0~25.5sec; setting 00.0 sec: disable time-out function.

09-08	Comm. fault tolerance count.
Range	[1~20]

When number of communication errors \geq 09-08 setting, keypad display shows ERR6.

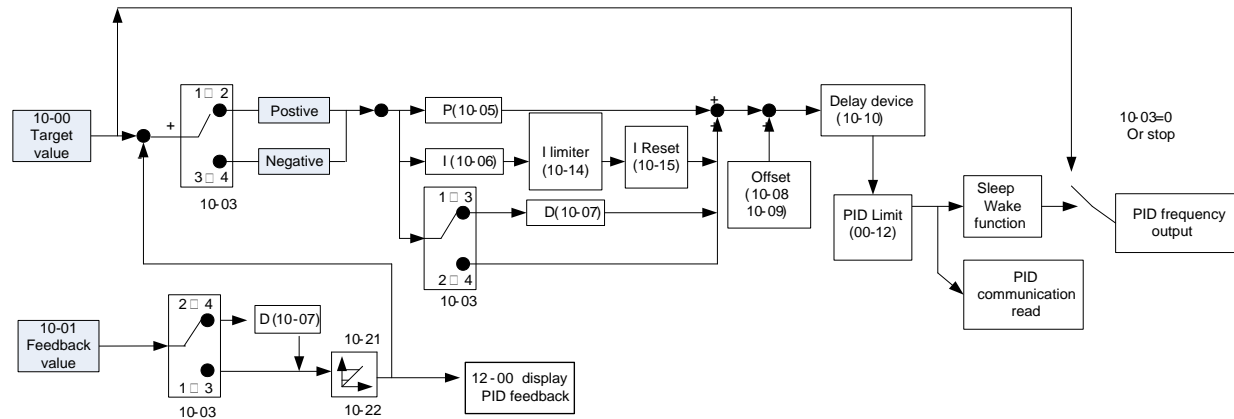
09-09	Wait time of inverter transmission
Range	[5~65]ms

- Sets the inverter response delay time. This is the time between the controller message and the start of the inverter response message. Refer to figure. Set the controller receive time-out to a greater value than the wait time parameter (09-09).



10-PID function Setup

PID block diagram



10- 00	PID target value selection
Range	【0】 :Potentiometer on Keypad 【1】 :External AI1 Analog Signal Input 【2】 :External AI2 Analog Signal Input 【3】 :Target Frequency set by Communication method. 【4】 :Set from keypad by parameter 10-02.

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

10- 01	PID feedback value selection
Range	【0】 :Potentiometer on Keypad 【1】 :External AI1 Analog Signal Input 【2】 :External AI2 Analog Signal Input 【3】 :Communication setting Frequency

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

10- 02	PID Keypad Input
Range	[0.0~100.0]%

10- 03	PID Mode Selection	
Range	[0]:PID Function disabled	
	[1]:FWD Characteristic.	Deviation is D-controlled
	[2]:FWD Characteristic.	Feedback is D-controlled
	[3]:REV Characteristic.	Deviation is D-controlled
	[4]:REV Characteristic.	Feedback is D-controlled

10- 03 = **[1]**

Deviation (target/detected value) is derivative controlled in unit time set in parameter 10-07.

10- 03 = **[2]**

Feed back (detected value) is derivative controlled in unit time set in parameter 10- 07.

10- 03 = **[3]**

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

10- 03 = **[4]**

Feed back (detected value) is derivative controlled in unit time set in parameter 10- 07. If the deviation is positive, the output frequency decreases, vice versa.

Note:-

For 10-03 = 1 or 2, If the deviation is positive, the output frequency increases and, vice versa.

For 10-03 = 3 or 4, If the deviation is positive, the output frequency decreases, vice versa.

10- 04	Feedback Gain Coefficient
Range	[0.00 ~ 10.00]

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

10- 05	Proportional Gain
Range	[0.0 ~ 10.0]

10- 05: Proportion gain for P control.

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

10- 06: Integrate time for I control

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

10- 07: Differential time for D control

10- 08	PID Offset
Range	[0]: Positive Direction
	[1]: Negative Direction

10- 09	PID Offset
Range	[0 ~ 109]%

10- 08 /10- 09: Calculated PID output is offset by 10-09 (the polarity of offset is according to10-08)

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

10-10: Update time for output frequency.

10-11	Feedback Loss Detection Mode
Range	[0]:Disable [1]:Enable – Drive Continues to Operate After Feedback Loss [2]:Enable – Drive "STOPS" After Feedback Loss

10-11= **【0】** : Disable;

10-11= **【1】** : On feed back loss detection, continue running, and display 'PDER';

10-11= **【2】** : On feed back loss detection, stop, and display 'PDER'.

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

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

10-13	Feedback Loss Detection Delay Time
Range	[0.0 ~25.5]Sec

10-13:The minimum time to consider the feedback signal loss is determined.

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

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

10-15	Integral Value Resets to Zero when Feedback Signal Equals the Target Value
Range	[0]: Disable [1]: After 1 Sec 【30】 : After 30 Sec (Range:-1 ~ 30Sec)

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

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

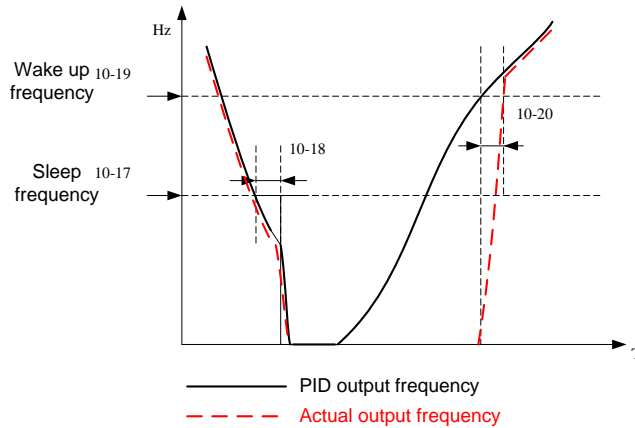
10-16	Allowable Integration Error Margin (Unit) (1 Unit = 1/8192)
Range	[0 ~ 100]%

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

10-17	PID Sleep Frequency Level
Range	[0.00~599.00]Hz
10-18	PID Sleep Function Delay Time
Range	[0.0 ~25.5]Sec
10-19	PID Wake up Frequency Level
Range	[0.00 ~ 599.00]Hz
10-20	PID Wake Up Function Delay Time
Range	[0.0 ~ 25.5]Sec

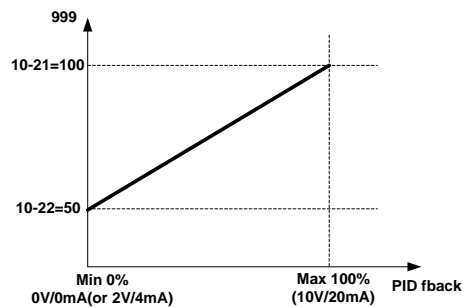
When PID output frequency is less than the sleep PID threshold frequency and exceeds the time of sleep delay, the inverter will decelerate to 0 and enters PID sleep mode.

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



10-21	Max PID Feedback Level.
Range	[0 ~ 999]
10-22	Min PID Feedback Level.
Range	[0 ~ 999]

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



11 Performance Control Functions

11- 00	Prevention of Reverse operation
Range	[0]:Reverse command is enabled [1]:Reverse command is disabled

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

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

While IGBT-driven inverter can provide low-noise working environment, the high frequency devices have carrier frequency waveform cutting, it may interfere with external electronic device, even caused vibration when connected with motor, and then need to adjust the carrier frequency.

11- 02	Carrier mode selection
Range	[0] :Carrier mode0 3-phase PW M modulation [1] :Carrier mode1 2-phase PW M modulation [2] :Carrier mode2 Soft PWM modulation

Mode 0: 3-phase PWM Modulation Three Output transistors on at the same time (Full Duty).

Mode 1: 2-phase PWM Modulation Two output transistors on at the same time (2/3 Duty).

Mode 2: Random PWM Modulation This modulation method will use 3-phase PWM and 2-phase PWM modulation in a random mode.

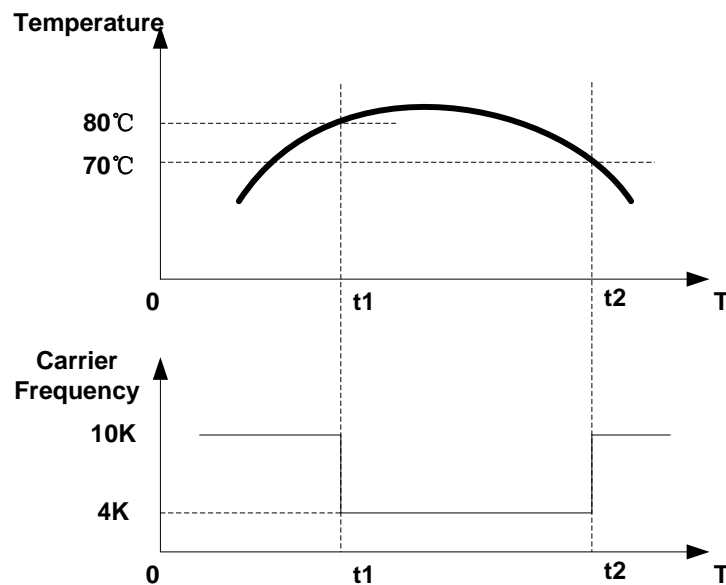
Modes	Name	IGBT Duty	Heat Losses	Torque Performance	Waveform Distortion	Motor Noise
0	3-Phase PWM	100%	High	High	Low	Low
1	2-Phase PWM	66.6%	Low	Low	High	High
2	Soft PWM	Between mode0 & mode1	Medium	Medium	Medium	Medium

11- 03	Carrier Frequency Reduction by temperature rise
Range	[0]:Disable [1]:Enable

When inverter (heat sink) temperature rises above 80°C the Carrier Frequency is reduced by 4K.

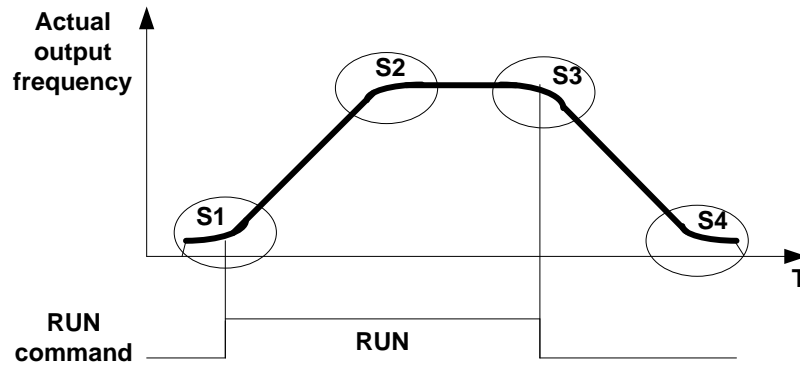
When the temperature falls below less than 70°C, Carrier Frequency is reset to default.

Temperature can be displayed by setting parameter 12-00=04000.



11- 04	S-Curve Acc 1
11- 05	S-Curve Acc 2
11- 06	S-Curve Dec 3
11- 07	S-Curve Dec 4
Range	[0.0 ~ 4.0]Sec

Use S Curve parameters where a smooth acceleration or deceleration action is required, this will prevent possible damage to driven machines by sudden acceleration/deceleration.


Note:

Regardless of the stall prevention period, actual acceleration and deceleration time = preset acceleration / deceleration time + S curve time.

Please set the required individual S curve times in the parameters (11-04~11-07)

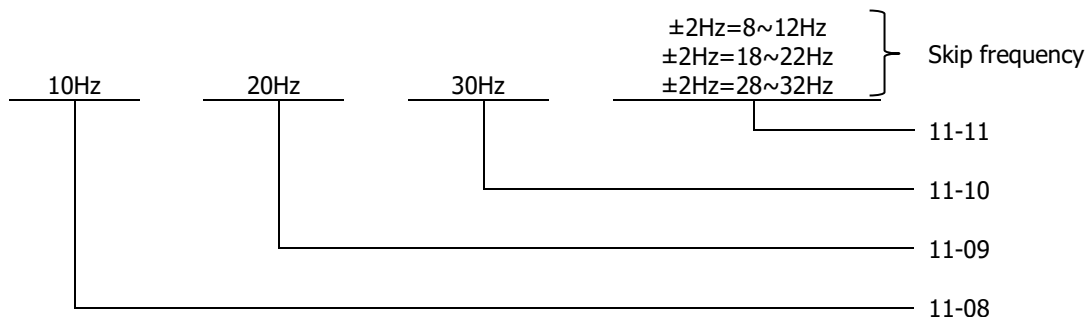
When S curve time (11-04~11-07) is set as 0, the S curve function is disabled.

The calculation of S curve time is based on the Maximum output frequency of motor (01-02), Please refer to the parameter (00-14/00-15/00-16/00-17).

11- 08	Skip frequency 1
11- 09	Skip frequency 2
11-10	Skip frequency 3
Range	[0.00 ~ 599.00]Hz
11-11	Skip frequency Range (\pmfrequency band)
Range	[0.00 ~ 30.00]Hz

Skip frequency parameters can be used to avoid mechanical resonance in certain applications.

Example: 11-08=10.00 (Hz); 11-09=20.00 (Hz); 11-10=30.00 (Hz); 11-11=2.00 (Hz).



11- 12	V/F Energy Saving Gain (VF)
Range	[0 ~ 100] %

11- 13	Regeneration Prevention Function
Range	【0】 : Regeneration prevention function is disabled 【1】 : Regeneration prevention function is enabled 【2】 : Regeneration prevention function is enabled only during constant speed

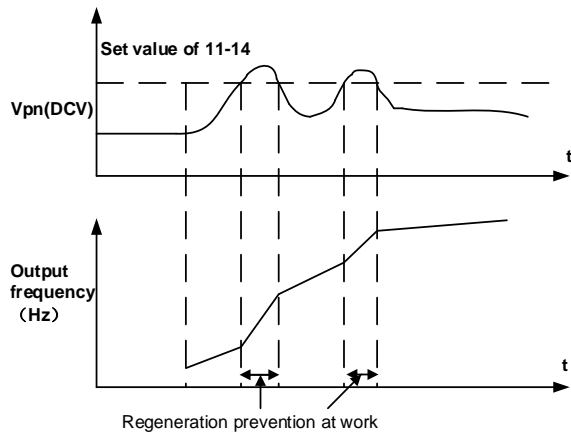
Regeneration Prevention Function:

During excessive energy regeneration, the V_{pn} (DC bus) voltage will increase and lead to OV (over voltage), to avoid over voltage due to regeneration, the output frequency will be increased.

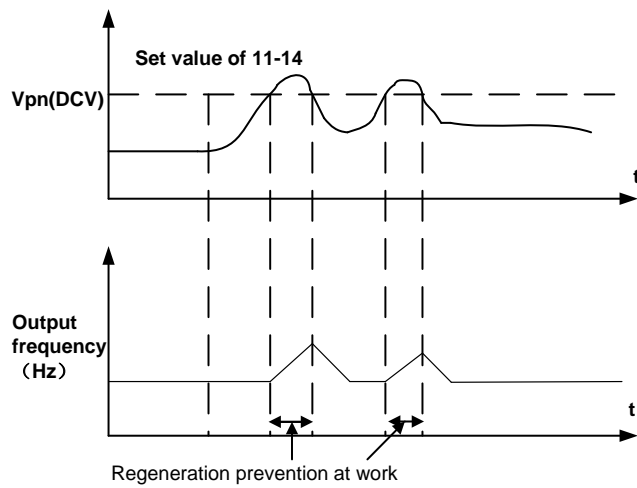
Regeneration prevention function can be set according to the selections above.

Example:

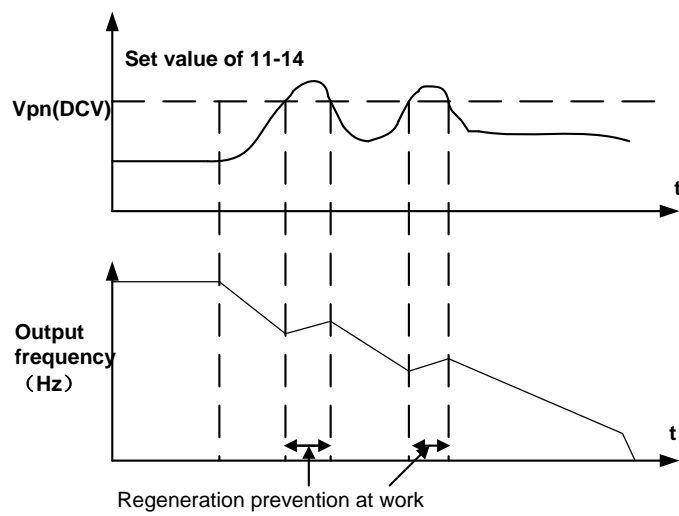
Regeneration prevention during acceleration.



Example: Regeneration prevention during constant speed.



Example: Regeneration prevention during deceleration.



11- 14	Regeneration Prevention Voltage Level
Range	[200V:300.0~400.0, 400V: 600.0~800.0]V

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

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

Sets the regeneration **prevention** frequency limit.

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

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

Regeneration avoidance function response can be improved by increasing 11-16/11-17. This will improve the response to voltage changes on the DC bus, but may cause output frequency instability. Set 11-16 as low as possible to reduce output frequency instability if this does not correct the instability then reduce the setting of parameter 11-17.

Set 11-16 as low as possible to reduce the output frequency instability. If this does not correct the instability then reduce the setting of parameter 11-17, and re-adjust 11-16.

12 Monitor Function Group

12- 00	Display Mode
Range	0 0 0 0 0 MSD LSD 00000~88888 Each digit can be set from 0 to 8 as listed below. [0]:Disable display(frequency& parameters) [1]:output Current [2]:output Voltage [3]:DC voltage [4]:Temperature [5]:PID feedback [6]:AI1 [7]:AI2 [8]:Count Status

MSD= Most significant digit. LSD= Least significant digit.

Note: MSD of parameter 12-00 sets the power on display; other digits set user selected displays.

12- 01	PID Feedback Display format
Range	[0]:Displayed in Integer (xxx) [1]:One Decimal Place (xx.x) [2]:Two Decimal Places (x.xx)
12- 02	PID Feedback Display Unit Setting
Range	[0]:xxx-- [1]:xxxpb(pressure) [2]:xxxfl(flow)

12- 03	Custom Units (Line Speed) Display Mode
Range	[0~65535]Rpm

Set motor rated RPM in this parameter if required then the display will show this value when inverter output frequency reaches the motor name plate frequency. 50 Hz or 60 Hz as appropriate.

The line speed display is linearly proportional to the output frequency 0 to 50 Hz or 0-60 Hz as appropriate. Motor synchronous speed = 120 x Rated frequency/Number of poles.

12- 04	Custom Units (Line Speed) Display Mode
Range	[0]:Drive Output Frequency is Displayed [1]:Line Speed is Displayed in Integer (xxxxx) [2]:Line Speed is Displayed with One Decimal Place (xxxx.x) [3]:Line Speed is Displayed with Two Decimal Places (xxx.xx) [4]:Line Speed is Displayed with Three Decimal Places (xx.xxx)

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

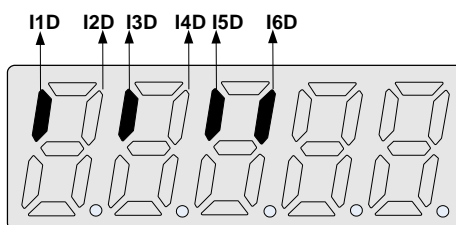
12- 05	Inputs and output Logic status display (I1D to I6D) & RY1~2
Range	Read only(Panel read only)

When any of I1D ~ I6D is turned on, corresponding segments on the digital display digits will be on.

When relay output RY1/RY2 are on, the corresponding digit will be on as shown below.

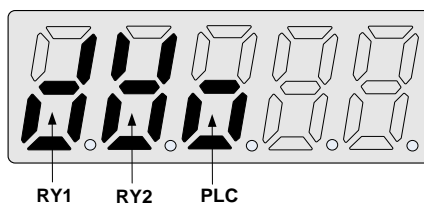
Example 1:

The following figure shows 12 - 05 display status, when I1D, I3D, I5D,I6D Inputs are ON and I2D, I4D, RY1 and RY2 are OFF.



Example 2:

The following figure shows 12 - 05 display status when I2D, I3D, I4D inputs are ON and I1D, I5D, I6D are OFF but RY1, RY2, PLC are ON.



12- 06	Alarm Selections for Inverter Components Life Expectancy
Range	xxxx0 : life alarm of inrush current suppression circuit is invalid
	xxxx1 : life alarm of inrush current suppression circuit is valid
	xxx0x : life alarm of control circuit capacitors is invalid
	xxx1x : life alarm of control circuit capacitors is valid
	xx0xx : life alarm of main circuit capacitors is invalid
	xx1xx : life alarm of main circuit capacitors is valid

Example:set 12- 06=00111,if inrush current suppression circuit or control circuit capacitors or main circuit capacitors is damaged,display LIFE1,LIFE2,LIFE3 respectively. Alerts the user that inverter needs repair

12- 08	Display of inrush current suppression circuit
Range	0~100

For every 1000 power on cycle, the percentage value will reduce by 1%. When this becomes lower than 30%, inverter displays "Life1".

12- 09	Display of control circuit capacitors
Range	0~100

For every 80-hour operation, the percentage value will reduce by 1%. When this becomes lower than 5%, inverter displays "Life2".

12- 11	Output current when Fault appeared
Range	----
12- 12	Output voltage when fault appeared
Range	----
12- 13	Output frequency when fault appeared
Range	----
12- 14	DC bus voltage when fault appeared
Range	----
12- 15	Frequency command when fault appeared
Range	----

In addition to the main circuit capacitors above, the theoretical value of life diagnosis are only for reference.

13 Inspection & Maintenance Functions

13- 00	Drive Kilowatts Code
Range	----

Inverter Model :	13- 00 show	Inverter Model :	13- 00 show
S2U230S-03 F IP66	0.4	S2U400T-07 F IP66	0.75
S2U230S-07 F IP66	0.75	S2U400T-11 F IP66	1.5
S2U230S-11 F IP66	1.5	S2U400T-13 F IP66	2.2
S2U230S-13 F IP66	2.2	S2U400T-18 F IP66	3.7
		S2U400T-19 F IP66	5.5
		S2U400T-21 F IP66	7.5
		S2U400T-23 F IP66	11
		S2U400T-25 IP66	15
		S2U400T-27 IP66	18.5

13- 01	Software Version
Range	----

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

Last three faults are stored in a stack and whenever there is a new fault the previous faults are pushed down the stack. So the fault stored in 2.xxx will be transferred to 3.xxx, and the one in 1.xxx to 2.xxx. The recent fault will be stored in the empty register 1.xxx.

Use Up ▲ and Down ▼ keys to scroll between the fault registers.

Pressing reset key when parameter 13-02 is displayed then all three fault registers will be cleared and the display for each register will change to 1. ---, 2. ---, 3. ---.

E.g. fault log content is '1.OC-C'; this indicates the latest fault is OC-C, etc.

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

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

13- 06	Parameter Lock
Range	[0]:Enable all Functions [1]:Preset speeds 05- 01~05- 15 cannot be changed [2]:All Functions cannot be changed Except 05- 01~05- 16 [3]:Disable All Function Except 13-06

- When the 13-07=00000 (not set a password), you can adjust the parameters 05-01~ 05-016 from 13-06.

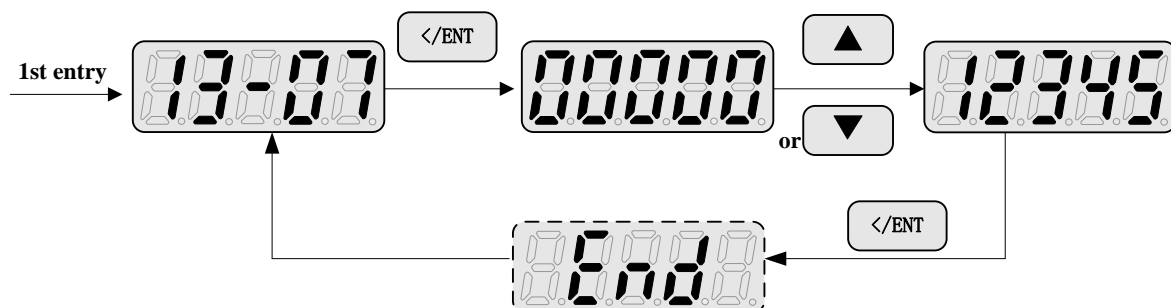
13- 07	Parameter Lock Key Code
Range	[00000~65535]

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

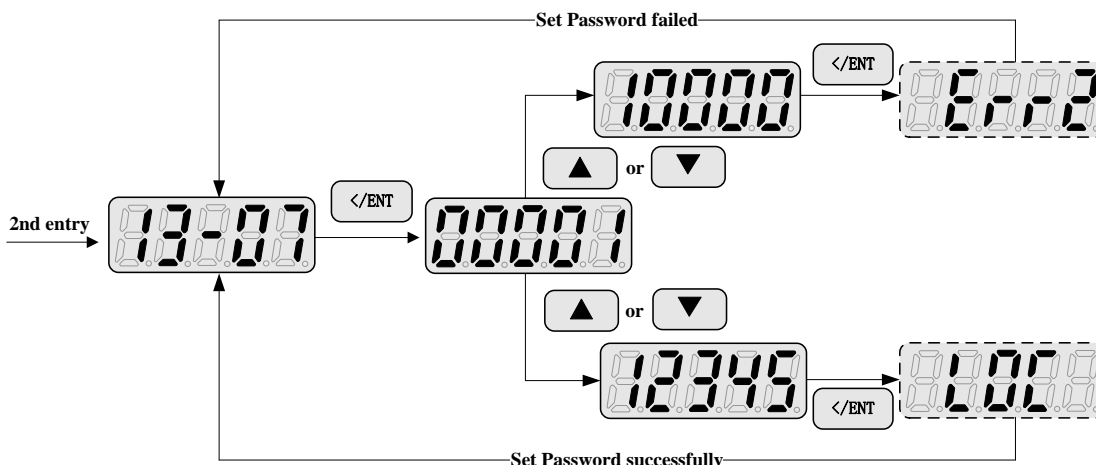
See following Parameter lock key setting example:-

Setting Parameter lock key number example:

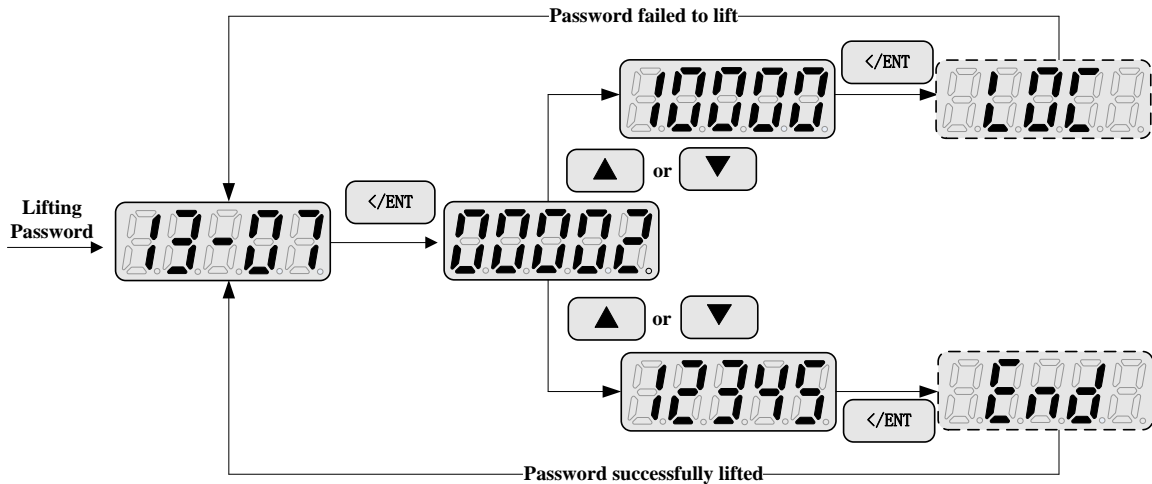
Step1:



Step2:



Key code (password) unlock



13- 08	Reset Drive to Factory Settings
Range	1150: Reset to factory setting. 50Hz,220V/380V system. 1160: Reset to factory setting. 60Hz,220V/380V system. 1250: Reset to factory setting 50Hz,230V/400V system. 1260: Reset to factory setting 60Hz,230V/460V system. 1350: Reset to factory setting 50Hz,220V/415V system. 1360: Reset to factory setting 60Hz,230V/400V system. 1112: Reset PLC.

Note: When a Parameter lock key number has been entered in parameter 13-07. This key number must be entered first before parameter 13-08 capable to be used.

14 PLC Setting function

14- 00	Setting value1 of T1
14- 01	Setting value1 of T1 (mode 7)
14- 02	Setting value1 of T2
14- 03	Setting value1 of T2 (mode 7)
14- 04	Setting value1 of T3
14- 05	Setting value1 of T3 (mode 7)
14- 06	Setting value1 of T4
14- 07	Setting value1 of T4 (mode 7)
14- 08	Setting value1 of T5
14- 09	Setting value1 of T5 (mode 7)
14- 10	Setting value1 of T6
14- 11	Setting value1 of T6 (mode 7)
14- 12	Setting value1 of T7
14- 13	Setting value1 of T7 (mode 7)
14- 14	Setting value1 of T8
14- 15	Setting value1 of T8 (mode 7)
Range	[0~9999]

T1~T8 is 8 TIMER of built-in PLC.

14- 16	Setting value1 of C1
14- 17	Setting value1 of C2
14- 18	Setting value1 of C3
14- 19	Setting value1 of C4
14- 20	Setting value1 of C5
14- 21	Setting value1 of C6
14- 22	Setting value1 of C7
14- 23	Setting value1 of C8
Range	[0~65535]

C1~C8 is 8 COUNTER of built-in PLC.

14- 24	Setting value1 of AS1
14- 25	Setting value2 of AS1
14- 26	Setting value3 of AS1
14- 27	Setting value1 of AS2
14- 28	Setting value2 of AS2
14- 29	Setting value3 of AS2
14- 30	Setting value1 of AS3
14- 31	Setting value2 of AS3
14- 32	Setting value3 of AS3
14- 33	Setting value1 of AS4
14- 34	Setting value2 of AS4
14- 35	Setting value3 of AS4
Range	[0~65535]

AS1~AS4 is 4 Modified modules of built-in PLC.

14- 36	Setting value1 of MD1
14- 37	Setting value2 of MD1
14- 38	Setting value3 of MD1
14- 39	Setting value1 of MD2
14- 40	Setting value2 of MD2
14- 41	Setting value3 of MD2
14- 42	Setting value1 of MD3
14- 43	Setting value2 of MD3
14- 44	Setting value3 of MD3
14- 45	Setting value1 of MD4
14- 46	Setting value2 of MD4
14- 47	Setting value3 of MD4
Range	[0~65535]

MD1~MD4 is 4 Multiplication modules of built-in PLC.

15 PLC Monitoring function

15- 00	Current value of T1
15- 01	Current value of T1(mode 7)
15- 02	Current value of T2
15- 03	Current value of T2(mode 7)
15- 04	Current value of T3
15- 05	Current value of T3(mode 7)
15- 06	Current value of T4
15- 07	Current value of T4(mode 7)
15- 08	Current value of T5
15- 09	Current value of T5(mode 7)
15- 10	Current value of T6
15- 11	Current value of T6(mode 7)
15- 12	Current value of T7
15- 13	Current value of T7(mode 7)
15- 14	Current value of T8
15- 15	Current value of T8(mode 7)
Range	[0~9999]

15-16	Current value of C1
15-17	Current value of C2
15-18	Current value of C3
15-19	Current value of C4
15-20	Current value of C5
15-21	Current value of C6
15-22	Current value of C7
15-23	Current value of C8
Range	[0~65535]

15-24	Current value of AS1
15-25	Current value of AS2
15-26	Current value of AS3
15-27	Current value of AS4
15-28	Current value of M1
15-29	Current value of M2
15-30	Current value of M3
15-31	Current value of M4
15-32	Current value of T
Range	[0~65535]

Note: TD (15-32) displays the current value of the current PLC program execution time spent in units of μ s.

9.3 Specification Description on Built-in PLC Function

PLC programs can be developed on PC (Windows base software) or PDA (WinCE base software) for download to S2U IP66.

S2U Inputs and outputs can be set for PLC functionality. Speed functions can be set using the built-in PLC functionality. .

PLC function is selected by setting inverter Run mode by parameter (00-00=3). Inputs can be set by parameters 03-00~03-05 = 24 (PLC Application).

9.3.1 Basic Instruction Set

				P			NO / NC
Input Instruction					I	i	I1~I6 / i1~i6
Output Instruction	Q	Q	Q	Q	Q	q	Q1~Q2 / q1~q2
Auxiliary Instruction	M	M	M	M	M	m	M1~MF / m1~mF
Special Register							V1~V7
Counter Instruction	C				C	c	C1~C8 / c1~c8
Timer Instruction	T				T	t	T1~T8 / t1~t8
Analog Comparing Instruction	G				G	g	G1~G8 / g1~g8
Encoder Comparing Instruction	F				F	f	F1~F8 / f1~f8
ADD-SUB Instruction	AS						AS1~4
Mul-DIV Instruction	MD						MD1~4

Description for Special Register

- V1: Setting Frequency Range: 0.1~599.0Hz
- V2: Operation Frequency Range: 0.1~599.0Hz
- V3: AI1 Input Value Range: 0~1000
- V4: AI2 Input Value Range: 0~1000
- V5: Keypad VR Input Value Range: 0~1000
- V6: Operation Current Range: 0.1~999.9A
- V7: Torque Value Range: 0.1~200.0%

	Upper differential	Lower differential	Other Instruction Symbol
Differential Instruction	D	d	
SET Instruction			
RESET Instruction			
P Instruction			P

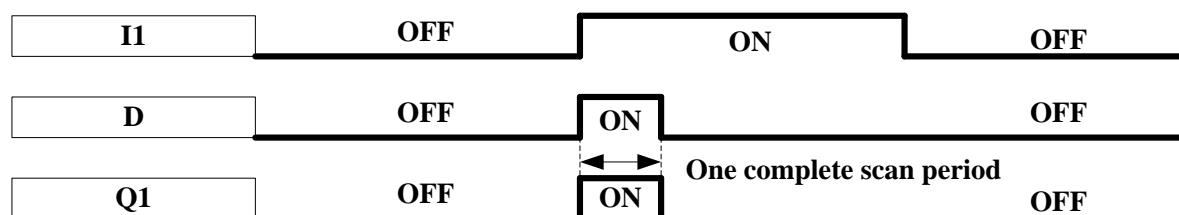
Open circuit (On status)	" "	
Short circuit (Off status)	"_"	

Connection symbol	Description
—	Connecting left and right Components
⊥	Connecting left, right and upper Components
⊕	Connecting left, right, upper and lower Components
⊓	Connecting left, right and lower Components

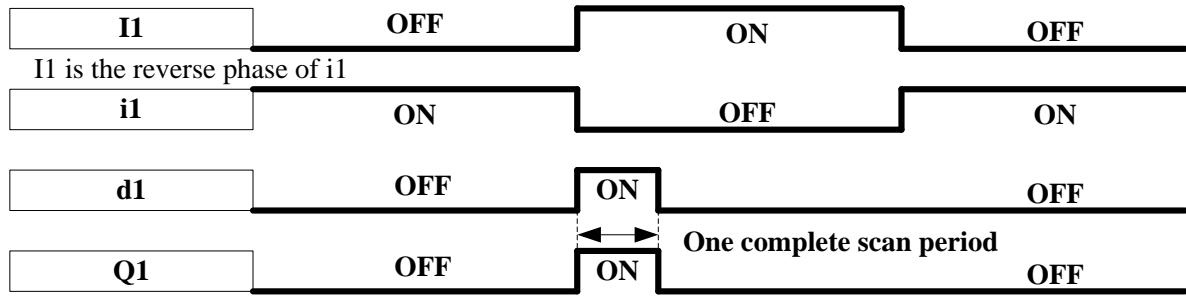
9.3.2 Function of Basic Instructions

©Function D (d) Command

Sample 1: I1—D—[Q1

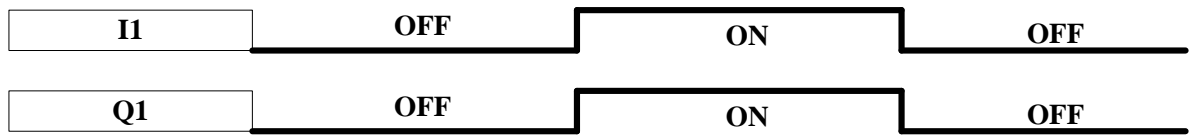


Sample 2: i1—d—[Q1



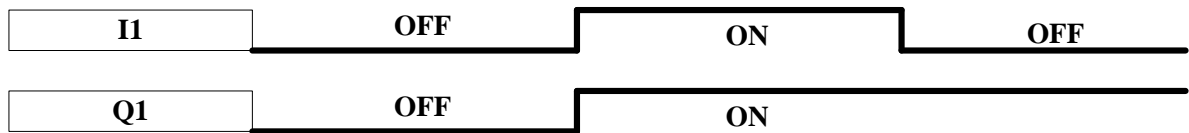
◎ ◎ NORMAL (- []) Output

I1 — [Q1



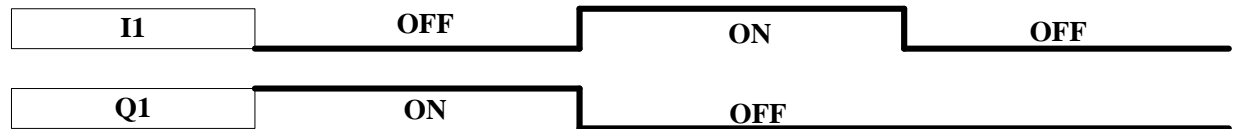
◎ SET (^) Output

I1 — ^ Q1



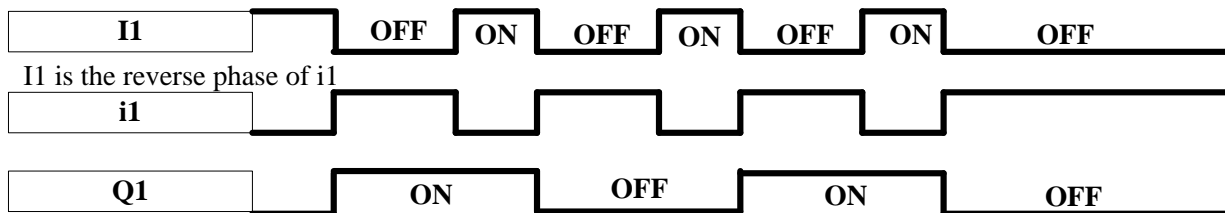
◎ RESET (v) Output

I1 — v Q1



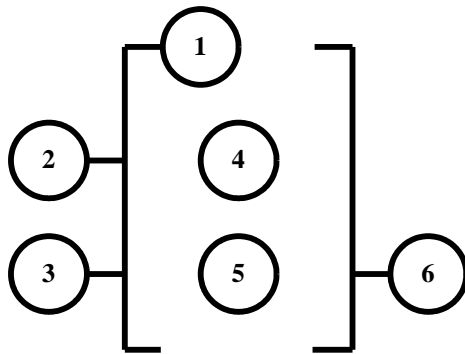
◎ P Output

i1 — PQ1



9.3.3 Application Instructions

9.3.3.1 Counter



Symbol	Description
①	Counting Mode (1-4)
②	Use (I1 ~ f8) to set counting up or counting down
	OFF:counting up (0, 1, 2, 3, 4...) ON :counting down (...3, 2, 1, 0)
③	Use (I1 ~ F8) to RESET the counting value
	ON :the counter is initialized to zero and⓪OFF OFF: the counter continues to count
④	Present Counting Value
⑤	Target (Setting) Value(AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, count) (0~65535)
⑥	Code of the counter (C1 ~ C4 total: 4 groups).

Mode 1:

The count value is locked to the set value, Off electricity didn't keep

Mode 2:

Count value unlocked, Off electricity didn't keep

Mode 3:

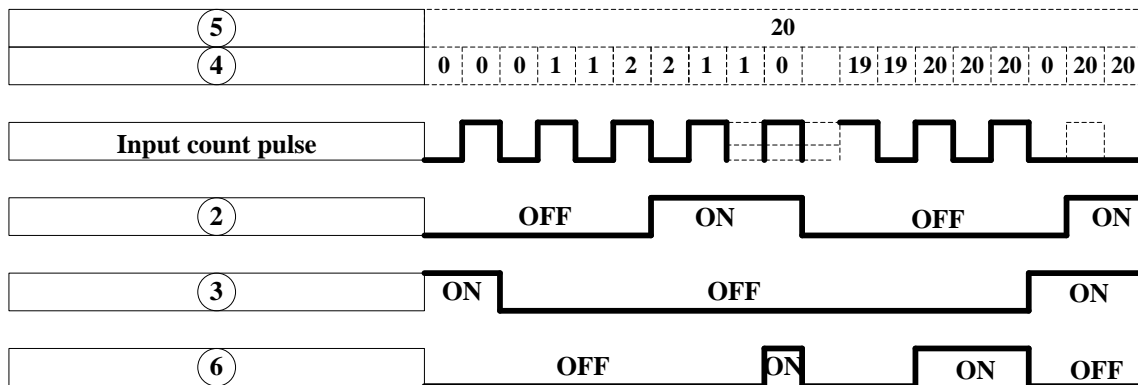
Count value locked, Off electricity keep

Mode 4:

Count value unlocked, Off electricity keep

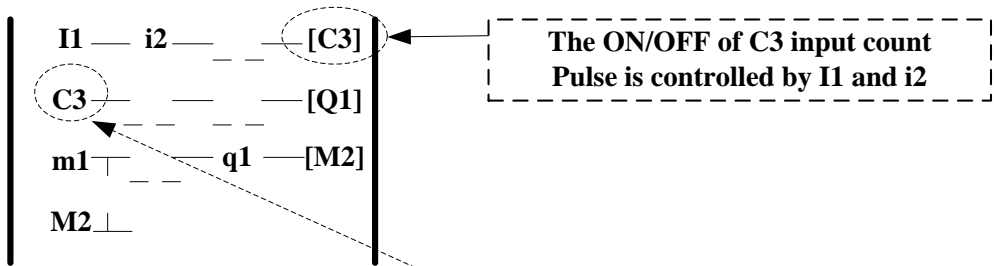
(1) Counter Mode 1

① =1

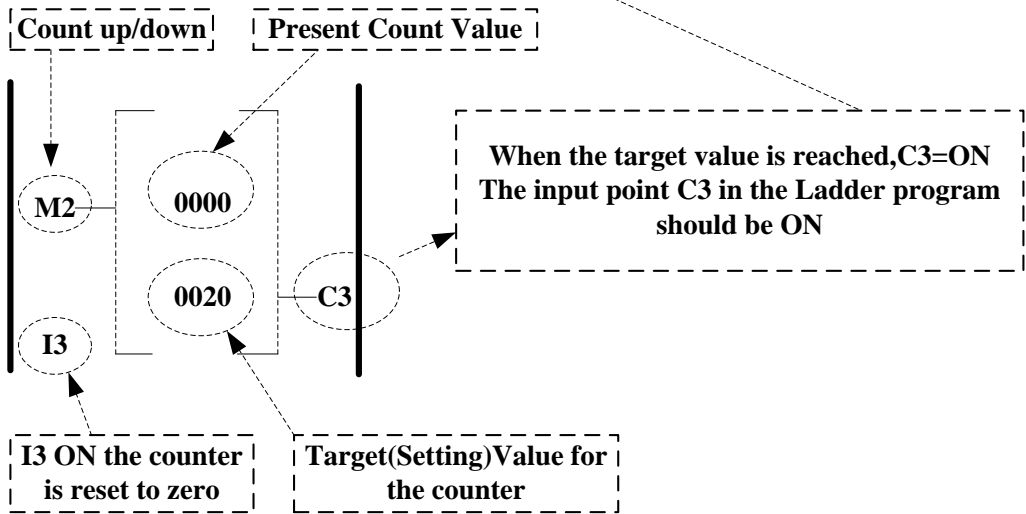


Sample:

Input under the Ladder Program Mode

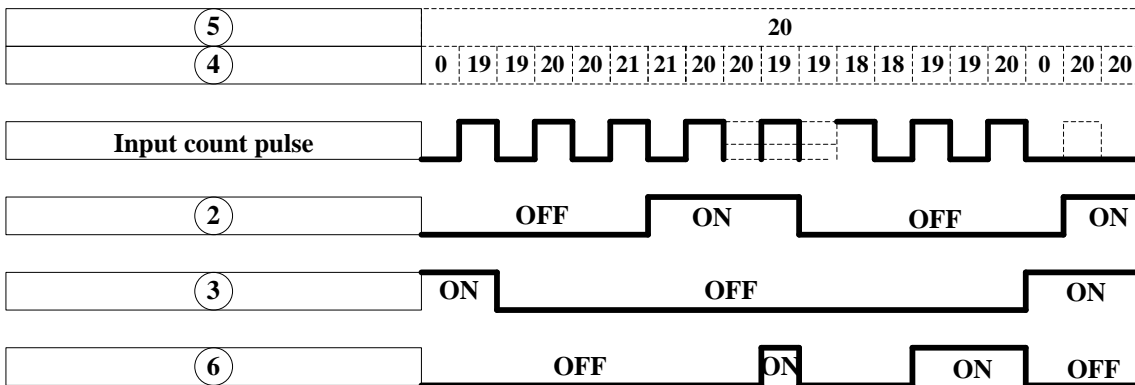


Input under the function Program Mode



(2) Counter Mode 2

① =2

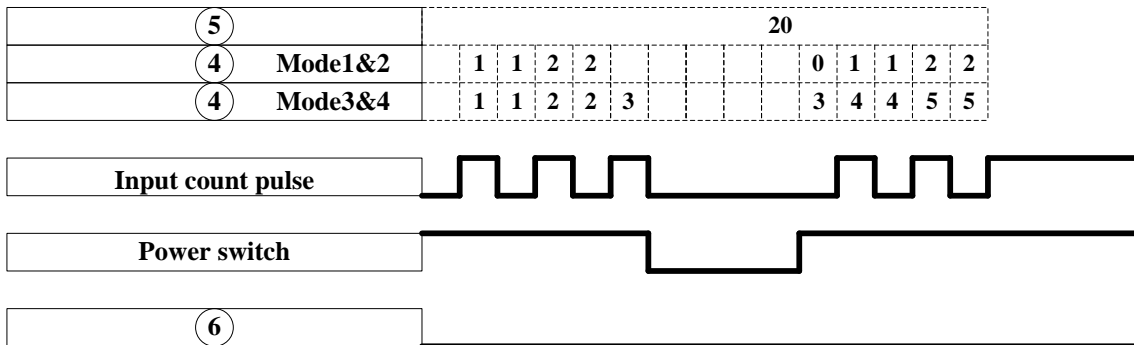


Note:

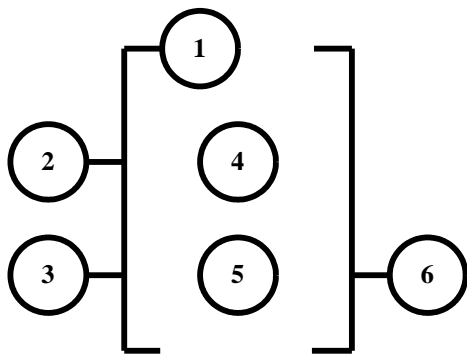
*Under this Mode, the counting present value appeared will be greater than 20, unlike the Mode 1 in which the value is locked at 20.

(1) The counter Mode 3 is similar to the counter Mode 1 except that the former can save the value after the power is cut off and continue counting when the power is turned on at the next time

(2) The counter Mode 4 is similar to the counter Mode 2 except that the former can memory the recorded value after the power is cut off and continu counting when the power is turned on at the next time.

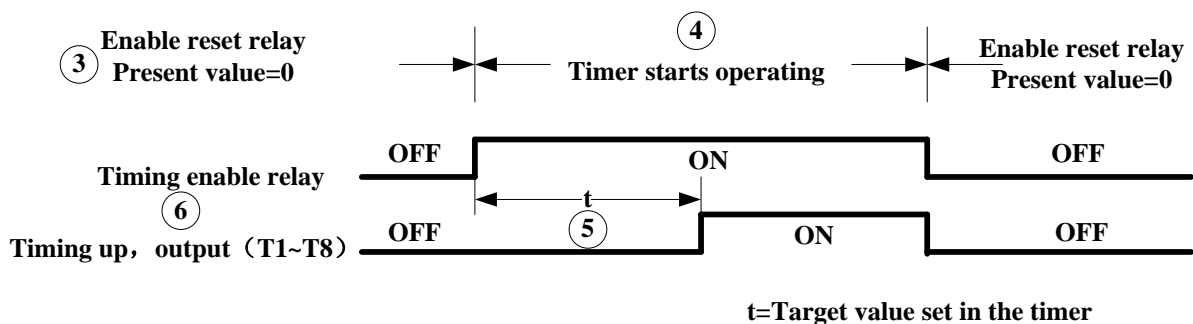


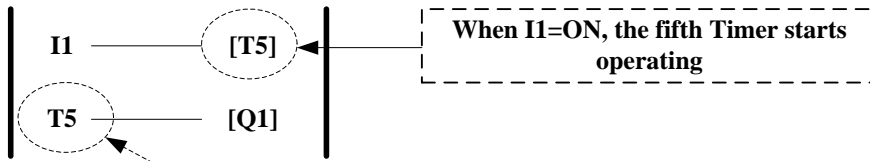
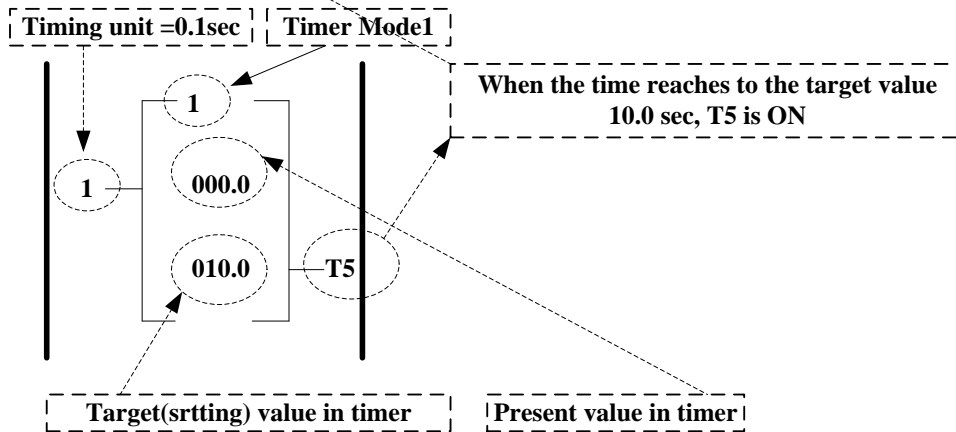
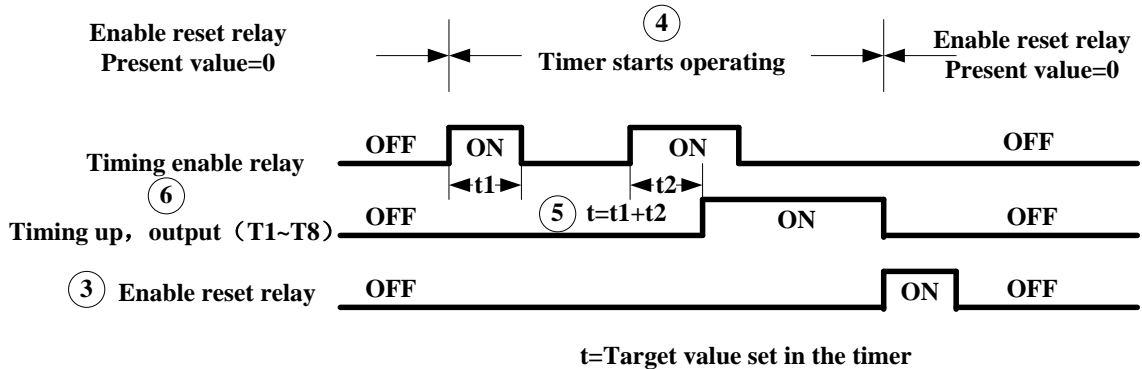
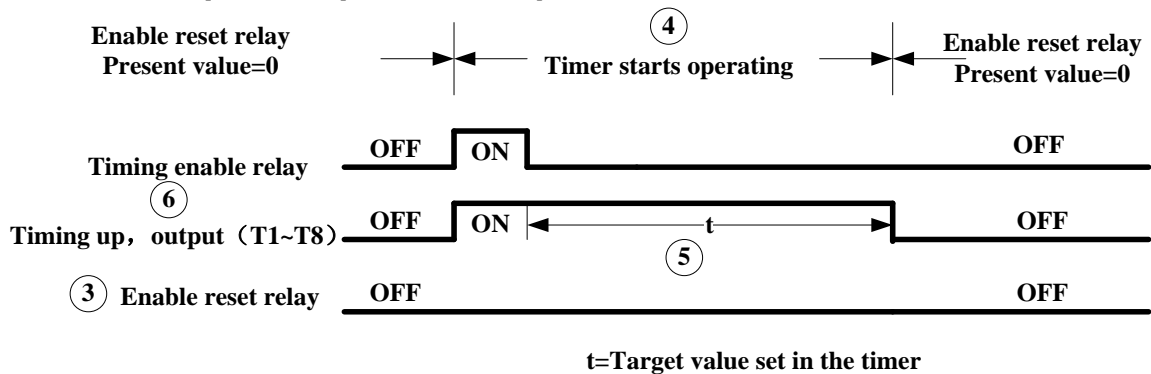
9.3.3.2 Timer

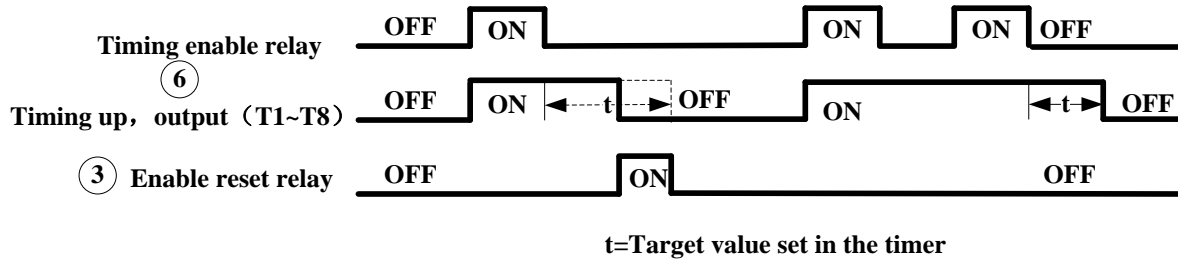


Symbol	Description
①	Timing Mode (1-7)
②	Timing unit: 1: 0.0 – 999.9 sec
	2: 0 – 9999 sec
	3: 0 – 9999 min
③	Use (I1 ~ f8) to RESET the timing value.
	ON: the counter is reset to zero and ⑥ OFF OFF: the counter continues to count
④	Present Timing Value
⑤	Target (setting) Timing Values(AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7,count)
⑥	The code of the Timer (T1 ~T8 total: 8 groups).

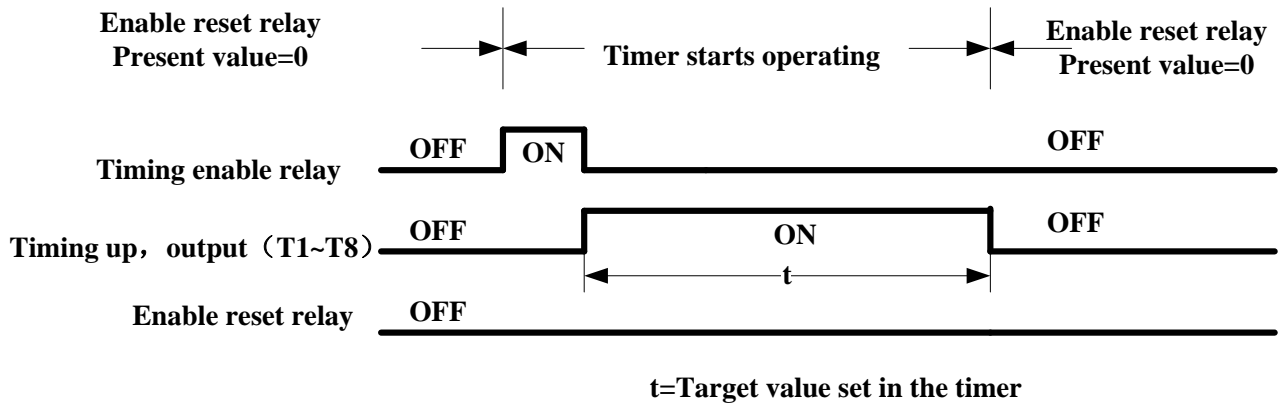
(1) Timer Mode 1(ON-Delay Timer Mode1)



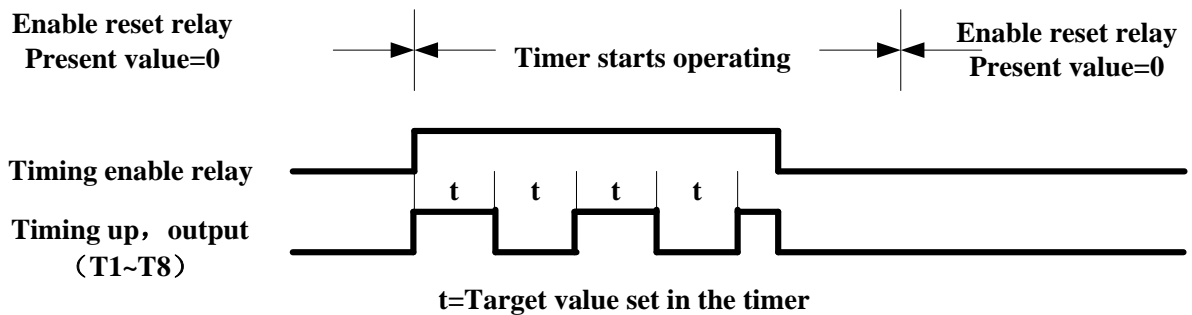
Sample:
Input under the Ladder Program Mode

Input under function Program Mode

(2) Timer Mode 2(ON-Delay Timer Mode2)

(3) Timer Mode 3 (OFF-Delay Timer Mode1)




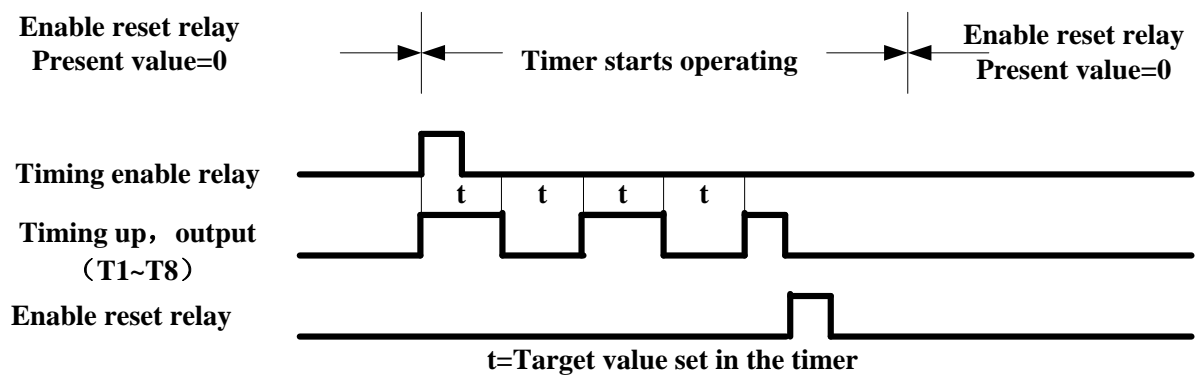
(4) Timer Mode 4 (OFF-Delay Timer Mode 2)



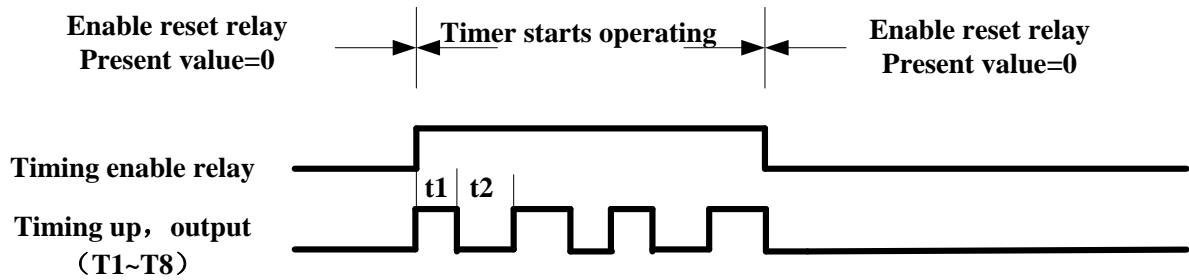
(5) Timer Mode 5 (FLASH Timer Mode 1)



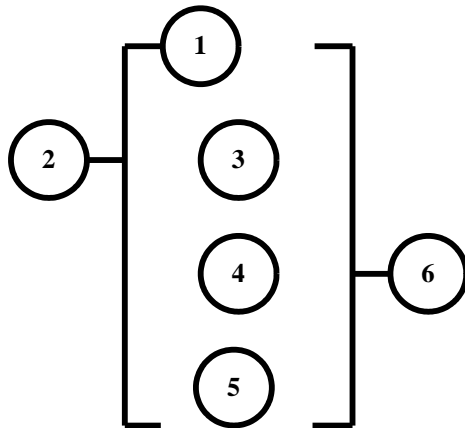
(6) Timer Mode 6 (FLASH Timer Mode 2)



(7) Timer Mode 7 (FLASH Timer Mode 3)



9.3.3.3 Analog comparator

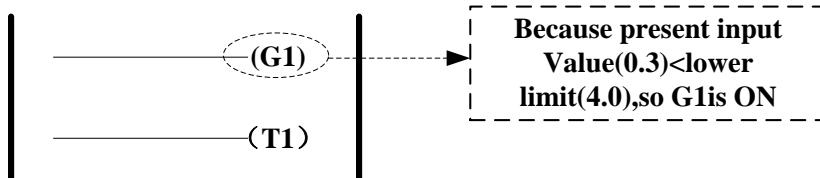


Symbol	Description
①	Analog comparison mode (1-3)
②	Selection of the input comparison value (AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7)
③	Setting reference comparison value (upper limit)
④	Setting reference comparison value (Upper Limit) (AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, count)
⑤	Setting reference comparison value (Lower Limit) (AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, count)
⑥	Output terminals of analog comparator (G1~G4)

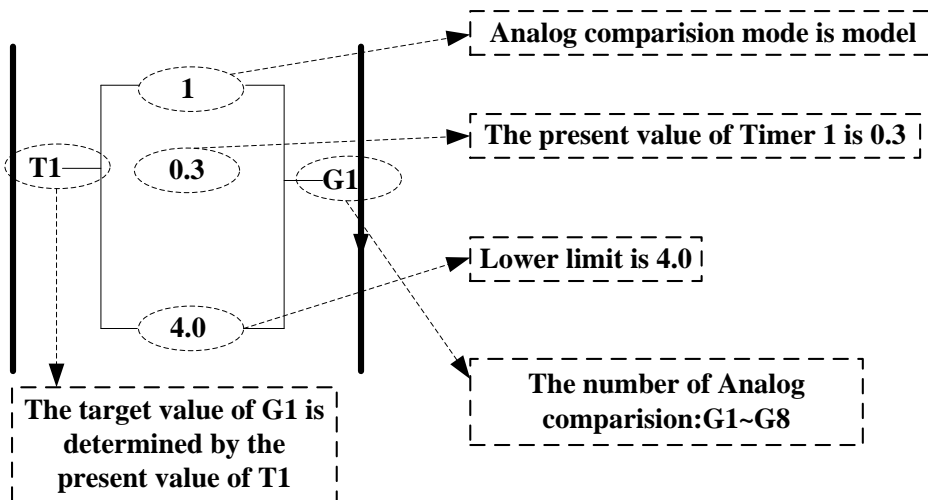
Analog Comparison Mode (1-3)

(1) Analog comparator mode 1 (③ ≤ ⑤, ⑥ ON)

Input under the Ladder Program Mode



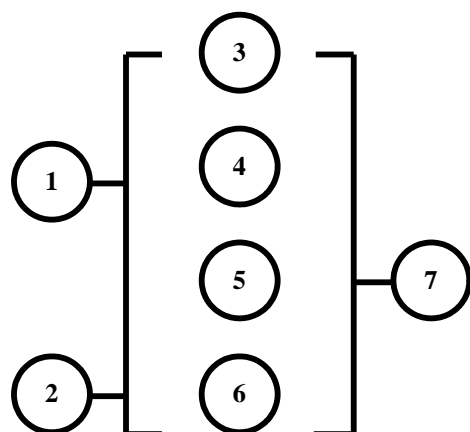
Input under the Function Program Mode



(2) Analog comparator mode 2 (③ ≥ ④, ⑥ ON)

(3) Analog comparator mode 3 (⑤ ≤ ③ ≤ ④, ⑥ ON)

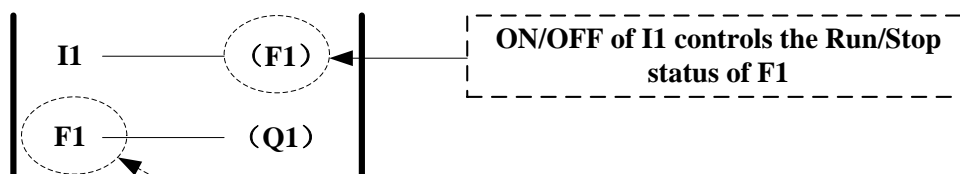
9.3.3.4 Running Instruction



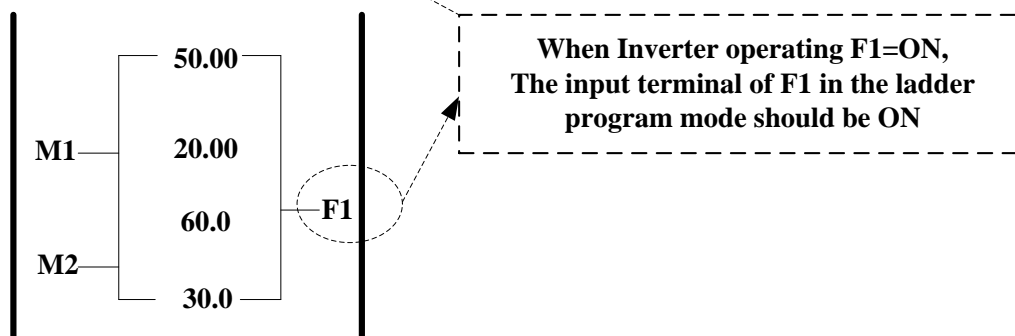
Symbol	Description
①	Running mode could be set via I1~f8 OFF:(FWD) ON:(REV)
②	Preset Speed could be set via I1~f8 OFF:Operating at the frequency set on ③ ON:Operating at the frequency set on ④
③	Selected frequency for constant or V3, V4, V5
④	Selected Preset frequency for constant or V3, V4, V5
⑤	Acceleration Time (ACC Time)
⑥	Deceleration Time(DEC Time)
⑦	Instruction code of operation (F1~F8, Total: 8Groups)

Sample:

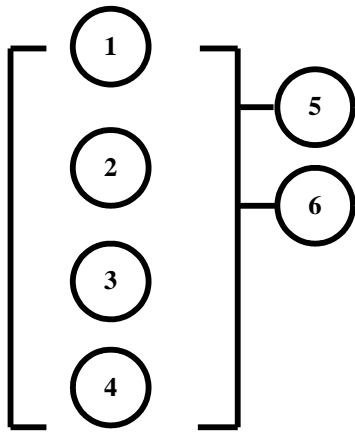
Input under the Ladder Program Mode



Input under the Function Program Mode



9.3.3.5 ADD-SUB module

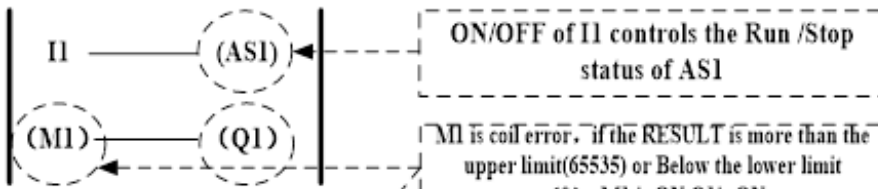


symbol	Description
①	Calculation results RESULT
②	addend V1(AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, constant)
③	addend V2(AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, constant)
④	filamentous V3(AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, constant)
⑤	Error signal coil output (NOP /M1~MF)
⑥	Instruction code of ADD-SUB module

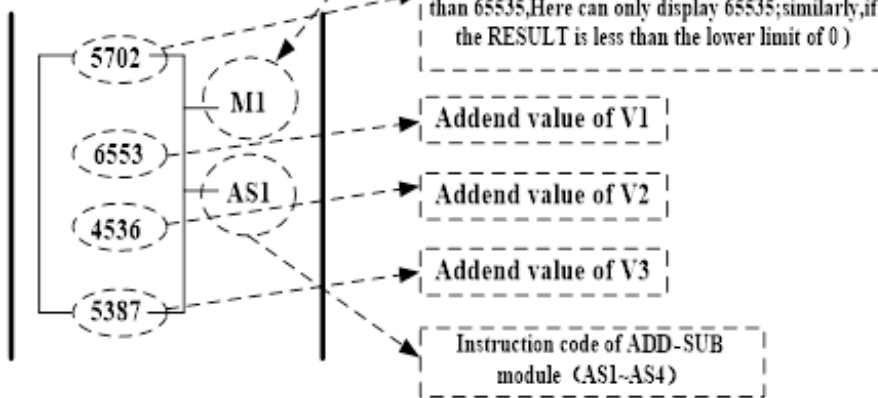
RESULT= V1+V2-V3

Sample:

Input under the Ladder Program Mode



Input under the Function Program Mode



ON/OFF of I1 controls the Run /Stop status of AS1

M1 is coil error, if the RESULT is more than the upper limit(65535) or Below the lower limit (0) ,M1 is ON,Q1is ON

The RESULT of AS1(Note:if the RESULT is more than 65535,Here can only display 65535;similarly,if the RESULT is less than the lower limit of 0)

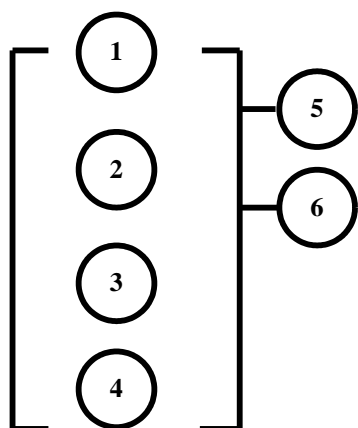
Addend value of V1

Addend value of V2

Addend value of V3

Instruction code of ADD-SUB module (AS1-AS4)

9.3.3.6 MUL- DIV module

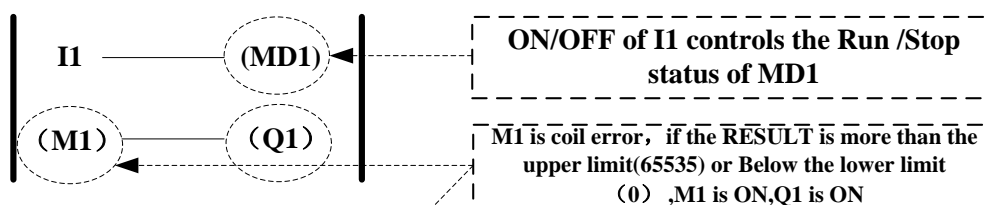


sympo	Description
①	Calculation results RESULT
②	multiplierA(AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, constant)
③	multiplierB (AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, constant)
④	divisor (AS1~AS4,MD1~MD4,T1~T8,C1~C8,V1~V7, constant)
⑤	Error signal coil output (NOP /M1~MF)
⑥	Instruction code of MUL- DIV module

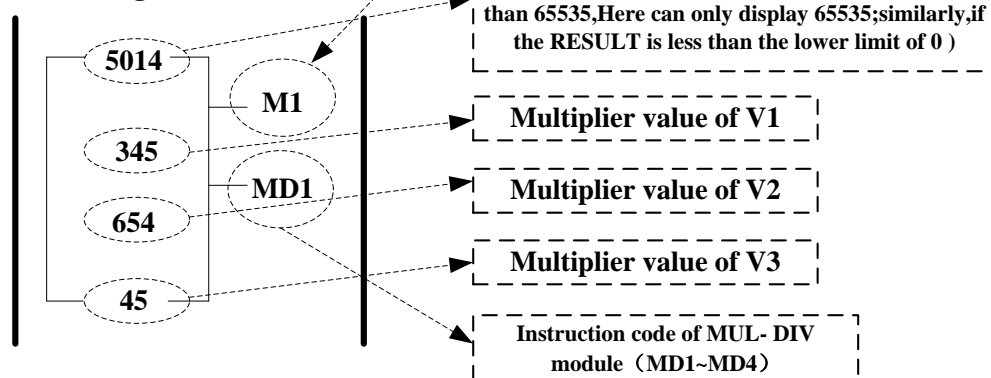
$$\text{RESULT} = V1 * V2 / V3$$

Sample:

Input under the Ladder Program Mode



Input under the Function Program Mode






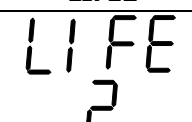
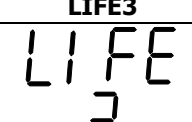

10 Troubleshooting and maintenance

10.1 Error display and corrective action

10.1.1 Manual Reset and Auto-Reset

Display	Content	Cause	Corrective action
Faults which can not be recovered manually			
-OV-	Voltage too high when stopped	Detection circuit malfunction	Consult with the supplier
-OU-			
-LV-	Voltage too low when stopped	1. Power voltage too low 2. Pre-charge resistor or fuse burnt out. 3. Detection circuit malfunction	1. Check if the power voltage is correct 2. Replace the pre-charge resistor or the fuse 3. Consult with the supplier
-LU-			
-OH-	The inverter is overheated when stopped	1. Detection circuit malfunction 2. Ambient temperature too high or bad ventilation	Improve the ventilation conditions, if no result then replace the inverter
-OH-			
OH-C	The inverter is overheated during running	1. IGBT temperature is too high or bad ventilation 2. Temperature sensor error or circuit malfunctions	1. Reduce carrier frequency 2. Improve the ventilation conditions, if no result then replace the inverter
OH-C			
Err4	CPU Illegal interrupt	External noise	If it occurs too often, please consult with the supplier
Err4			
r-OFF	power relay off error	power relay or relative circuit broken	Consult with the supplier
r-OFF			
EPr	EEPROM problem	Faulty EEPROM	Consult with the supplier
EPr			
COt	Communication error	Communication disruption	Check the wiring
COt			
CtEr	Current Sensor detection error	Current sensor error or circuit malfunction	Consult with the supplier
CtEr			
CdEr	OC, CL circuit detection error	OC, CL detection circuit malfunction	Return the inverter
CdEr			


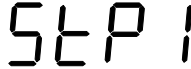
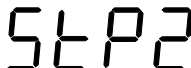


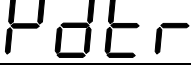
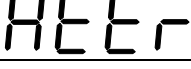
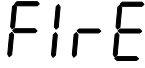
Display	Content	Cause	Corrective action
Faults which can be recovered manually and automatically			
OC-A OC-A	Over-current at acceleration	<ol style="list-style-type: none"> 1. Acceleration time too short 2. The capacity of the motor exceeds the capacity of the inverter 3. Short circuit between the motor coil and the case 4. Short circuit between motor wiring and ground 5. IGBT module damaged 	<ol style="list-style-type: none"> 1. Set a longer acceleration time 2. Replace inverter with one that has the same rating as that of the motor 3. Check the motor 4. Check the wiring 5. Consult with the supplier
OC-C OC-C	Over-current at fixed speed	<ol style="list-style-type: none"> 1. Transient load change 2. Transient power change 	<ol style="list-style-type: none"> 1. Increase the capacity of the inverter 2. Install inductor on the power supply input side
OC-d OC-d	Over-current at deceleration	The preset deceleration time is too short.	Set a longer deceleration time
OC-S OC-S	Over current at start	<ol style="list-style-type: none"> 1. Short circuit between the motor coil and the case 2. Short circuit between motor coil and ground 3. the IGBT module damaged 	<ol style="list-style-type: none"> 1. Inspect the motor 2. Inspect the wiring 3. Consult with the supplier
OV-C OU-C	Excessive Voltage during operation/ deceleration	<ol style="list-style-type: none"> 1. Deceleration time setting too short or excessive load inertia 2. Power voltage varies widely (fluctuates) 	<ol style="list-style-type: none"> 1. Set a longer deceleration time 2. Add a brake resistor or brake module 3. Add a reactor at the power input side
PF PF	Input phase Loss	Abnormal fluctuations in the main circuit voltage	<ol style="list-style-type: none"> 1. Check the main circuit power supply wiring. 2. Check the power supply voltage
ud-C ud-C	Output under current detection	Output current < Output under current detection level	Set the level according to application
LF LF	Output phase loss	Loss of output voltage on any of the phases	<ol style="list-style-type: none"> 1. Check output cable connection 2. Determine resistance between the lines 3. Check whether the terminals are loose
Faults which can be recovered manually but not automatically			
OC OC	Over-current during stop	Detection circuit malfunction	Consult with the supplier
OL1 OL1	Motor overload	loading too large	Consider increasing the Motor capacity
OL2 OL2	Inverter overload	Excessive Load	Consider increasing the inverter capacity
OL3 OL3	Over torque	<ol style="list-style-type: none"> 1. Load too large 2. the setting of (8-15, 8-16) too small 	<ol style="list-style-type: none"> 1. Increase the inverter capacity 2. Set(8-15, 8-16) as needed

Display	Content	Cause	Corrective action
LV-C 	Voltage too low during operation	1.Power voltage too low 2.Power voltage varies widely (fluctuates)	1.Improve power quality 2.Consider adding a reactor at the power input side
OVSP 			
LIFE1 	Inrush current suppression circuit life expectancy alarm	Inrush current suppression circuit is damaged	Consult with the supplier
LIFE2 			
LIFE3 	Main Circuit Capacitor life expectancy alarm	Capacitor Main Circuit is damaged	Consult with the supplier
GF 			
	Output side ground Fault	If ground fault detection is enabled by 08-18, then for any ground faults (short circuit to ground) the inverter output will switch off.	<ol style="list-style-type: none"> 1. Check the motor winding resistance for failures. 2. Check the motor cable for ground short circuits 3. If the above is correct, then consult with the supplier

10.1.2 Keypad Operation Error Instruction

Display	Content	Cause	Corrective action
LOC	1. Parameter already locked 2. Motor direction locked 3. Parameter password(13 - 07) enabled	1. Attempt to modify frequency parameter while 13-06>0. 2. Attempt to reverse direction when 11- 00=1. 3. Parameter (13 - 07) enabled, set the correct password will show LOC.	1. Adjust 13-06 2. Adjust 11-00
Err1	Keypad operation error	1. Press ▲ or ▼ while 00-05/00-06>0 or running at preset speed. 2. Attempt to modify the Parameter.Can not be modified during operation (refer to the parameter list).	1.The ▲ or▼ is available for modifying the parameter only when 00-05/00-06=0 2. Modify the parameter in STOP mode.
Err2	Parameter setting error	00-13 is within the range of(11-08 ± 11-11) or (11-09 ± 11-11) or (11-10 ± 11-11) 00-12≤00-13 3. 00-05 = 00-06	Modify 11-08~11-10 or 11-11 Set 00-12>00-13 3. Set 00-05 and 00-06 to different value
Err5	Modification of parameter is not available in communication	1.Control command sent during communication. 2.Attempt to modify the function 09-02 ~ 09-05 during communication	1. Issue enable command before communication 2. Set parameters 09-02 ~ 09-05 function before communication
Err6	Communication failed	1.Wiring error 2.Communication parameter setting error. 3.Incorrect communication protocol	1. Check hardware and wiring 2. Check Functions (09-00~09- 05).
Err7	Parameter conflict	1.Attempt to modify the function 13-00/13-08. 2.Voltage and current detection circuit is abnormal.	If reset is not possible, please consult with the supplier.

10.1.3 Special conditions

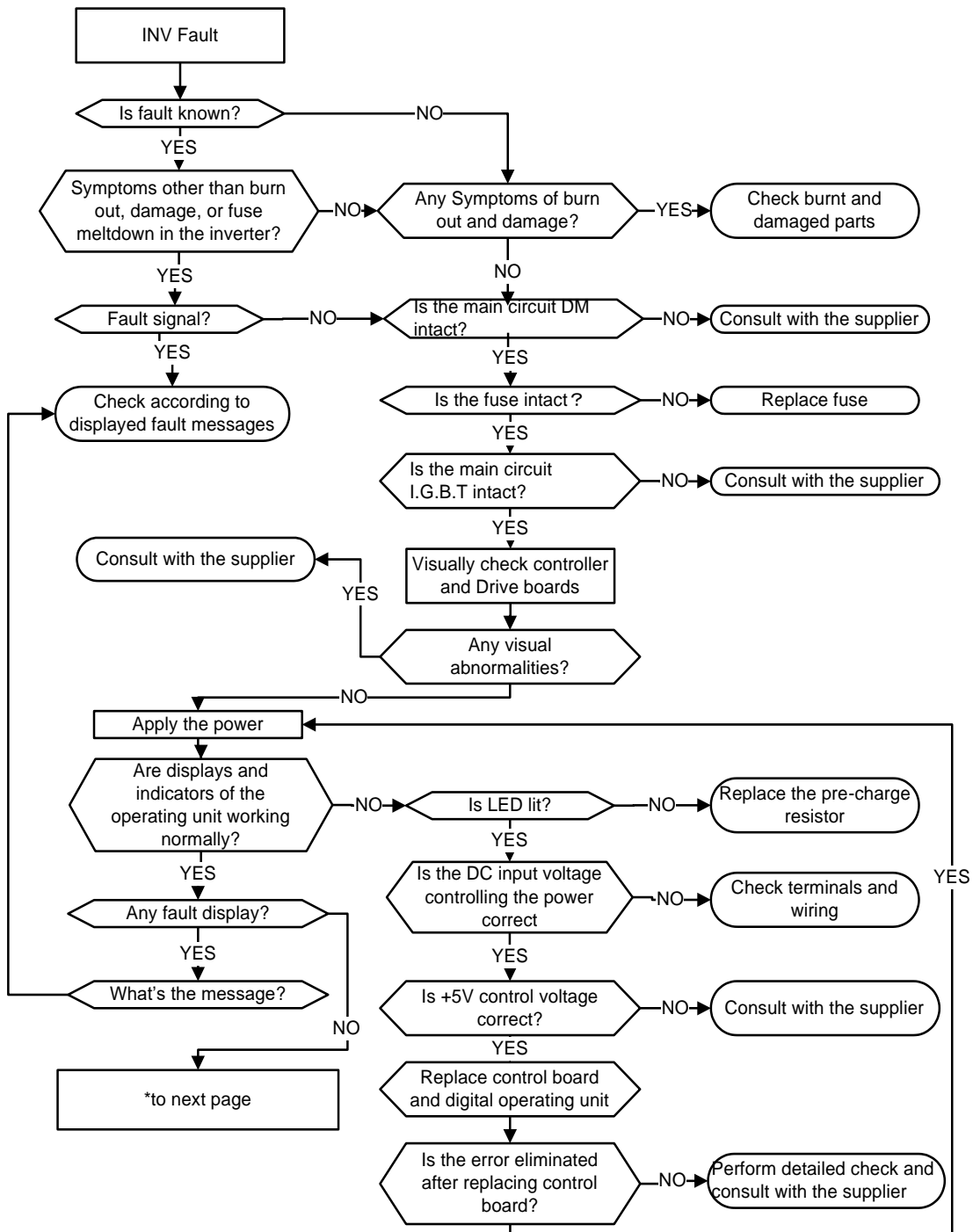
Display	Fault	Description
StP0 	Zero speed at stop	Occurs when preset frequency <0.1Hz
StP1 		
StP2 	Keypad Stop Operated when inverter in external Control mode.	If the Stop key is pressed while the inverter is set to external control mode (00-02/00-03=1) then 'STP2' flashes after stop. Release and re-activate the run contact to restart the inverter.
E.S. 		
b.b. 	External base block	When external base block input is activated the inverter stops immediately and then the display will flash with b.b. message.
PdEr 		
AtEr 	Auto tuning error	<ol style="list-style-type: none"> 1. Motor nameplate data Input errors. 2. Emergency stop is activated while auto tuning.
FirE 		
	Fire Mode	Software rev below 1.1, the fire mode is enabled when 08-17 = 1 Software ver 1.1 and above, the fire mode is enabled when 03-00~03-05 = 【28】 The display on the keypad indicates FirE Under fire mode function, the inverter will run at full speed

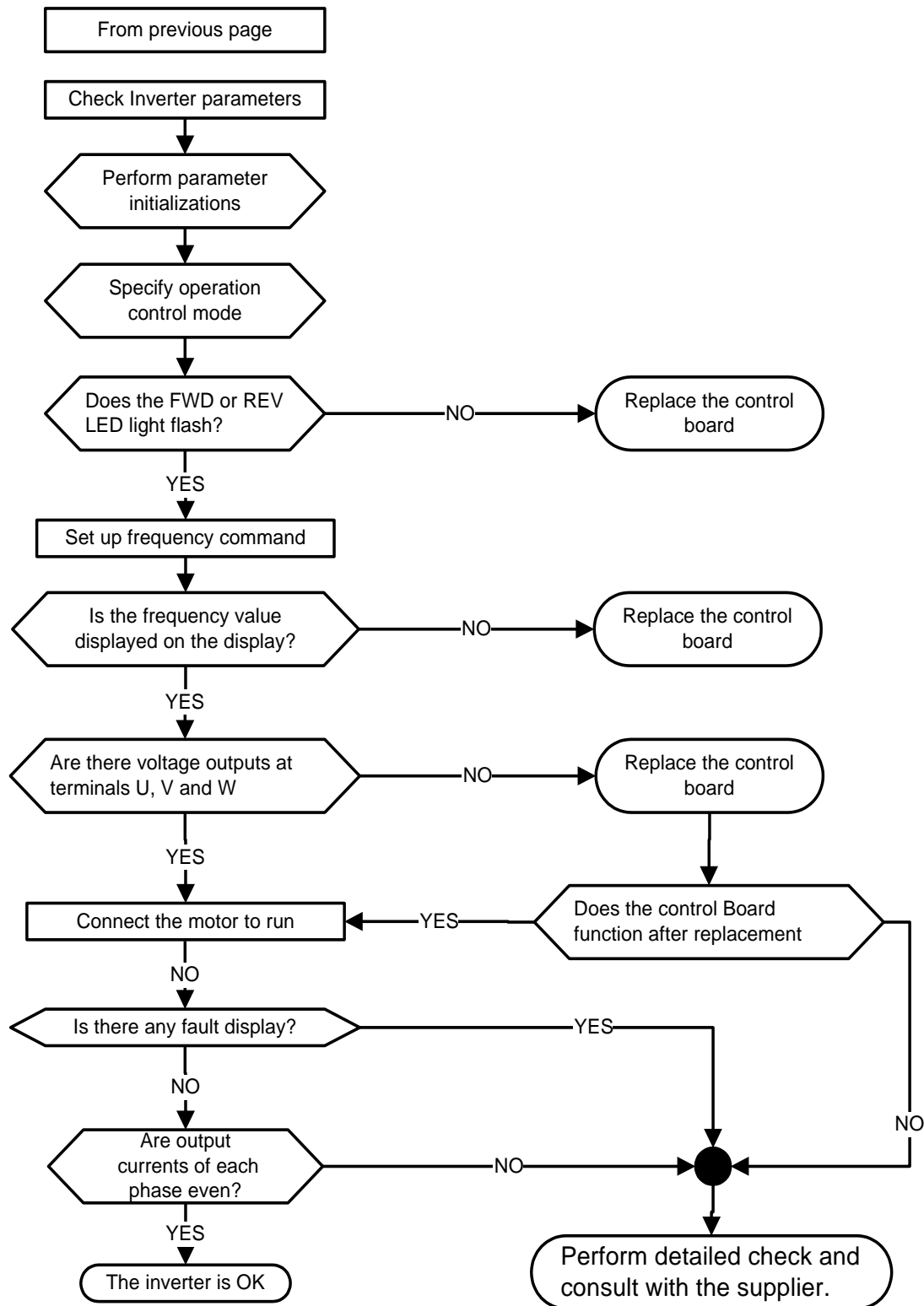
10.2 General troubleshooting

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

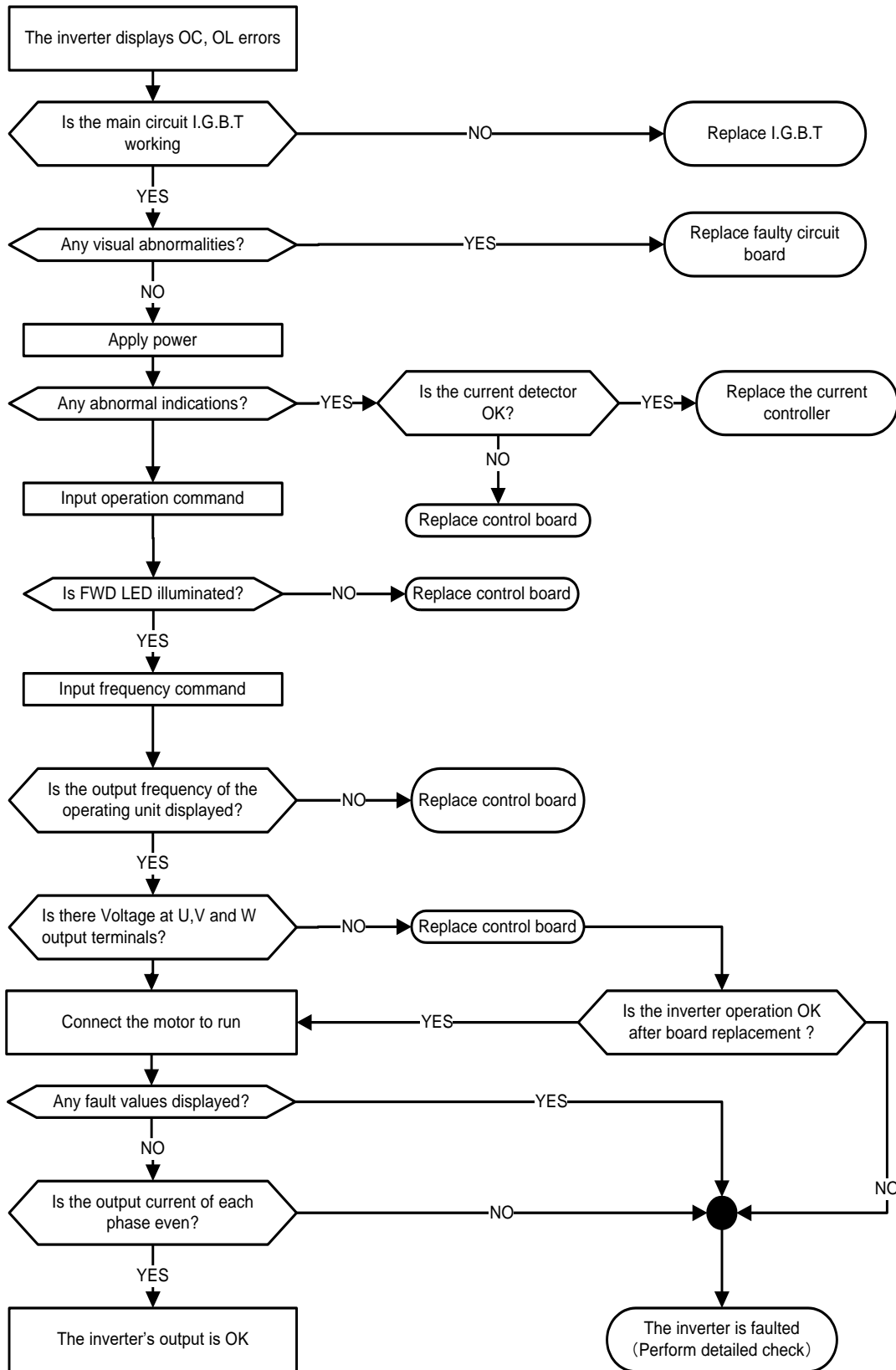
10.35.3 Troubleshooting of the Inverter

10.3.1 Quick troubleshooting of the Inverter

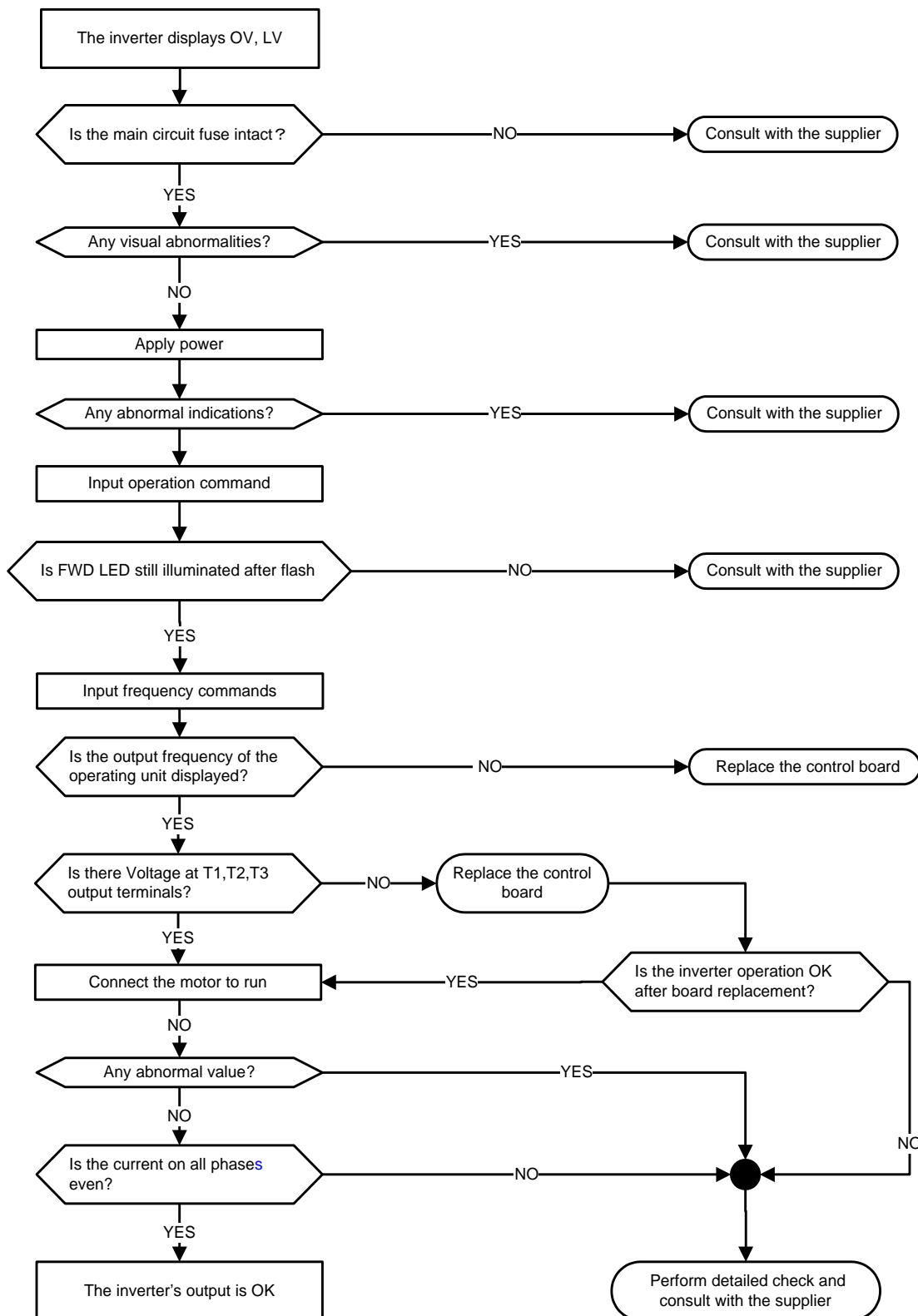




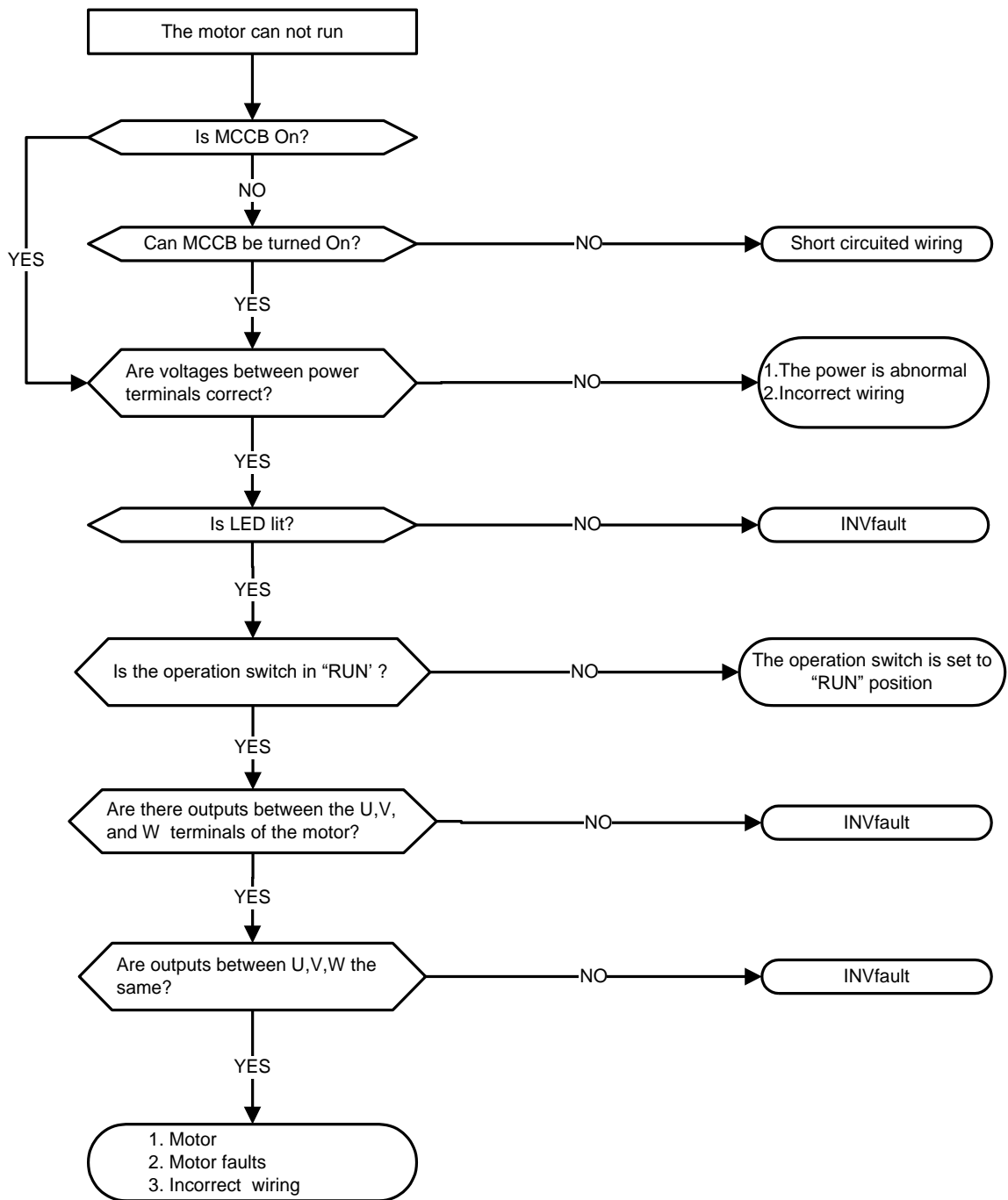
10.3.2 Troubleshooting for OC, OL error displays



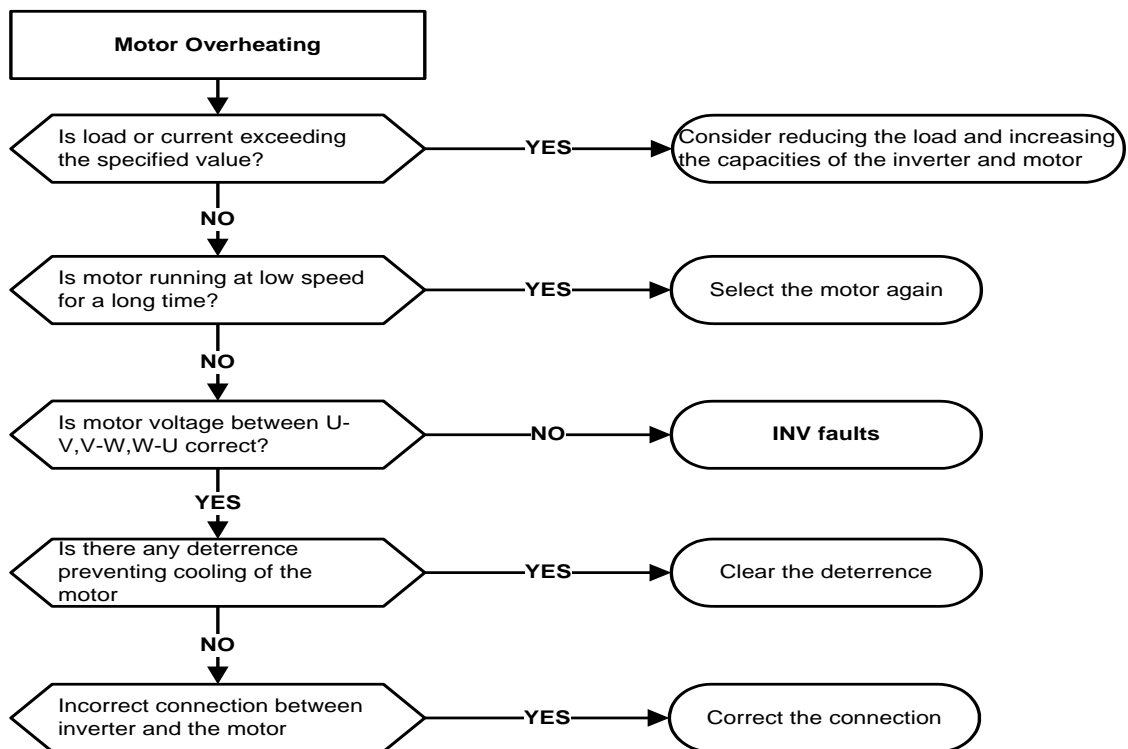
10.3.3 Troubleshooting for OV, LV error



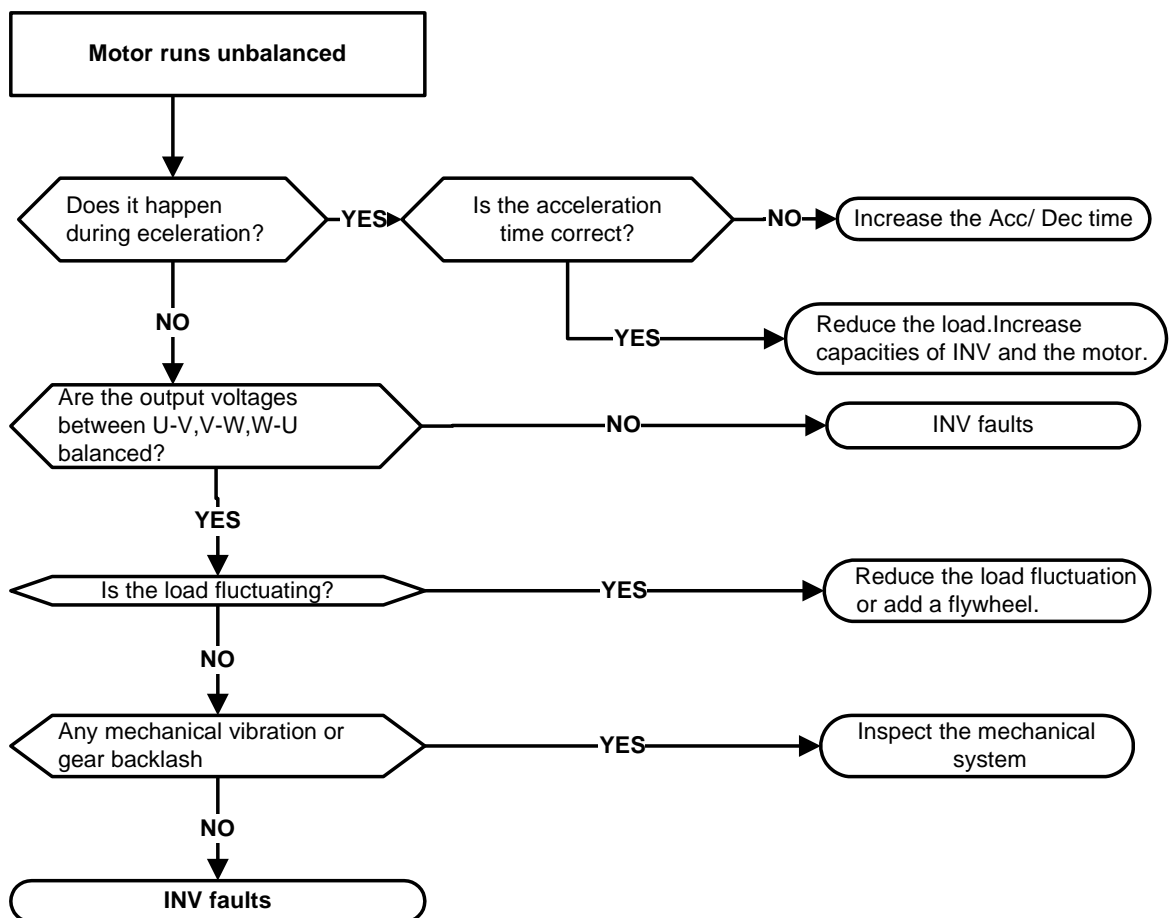
10.3.4 Motor not running



10.3.5 Motor Overheating



10.3.6 Motor runs unbalanced



10.4 Routine and periodic inspection

To ensure stable and safe operation, check and maintain the inverter at regular intervals.

Use the checklist below to carry out inspection.

Disconnect power after approximately 5 minutes to make sure no voltage is present on the output terminals before any inspection or maintenance.

Items	Details	Checking period		Methods	Criteria	Remedies
		Daily	1Year			
Environment & Ground connection						
Ambient conditions at the installation	Confirm the temperature and humidity at the machine	☉		Measure with thermometer and hygrometer	Temperature: -10 – 40oC (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 Grounding	Any unusual vibration from the machine	☉		Visual, hearing check	Keep area clear	Secure screws
	Is the grounding resistance correct?		☉	Measure the resistance with a multi-tester	200Vclass: below 100Ω	Improve the grounding if needed.
Terminals & Wiring						
Connection terminals	Any loose parts or terminals?		☉	Visual check Check with a screwdriver	Correct installation requirement	Secure terminals and remove rust
	Any damage to the base ?		☉			
	Any corroded Terminals?		☉			
Wiring	Any broken wires?		☉	Visual check	Correct wiring requirement	Rectify as necessary
	Any damage to the wire insulation?		☉			
Voltage						
Input power voltage	Is the voltage of the main circuit correct?	☉		Measure the voltage with a multi-tester	Voltage must conform with the spec.	Improve input voltage if necessary.
Circuit boards and components						
Printed circuit board	Any contamination or damage to printed circuit board?		☉	Visual check	Correct component condition	Clean or replace the circuit board
	Discolored, overheated, or burned parts		☉			
Capacitor	Any unusual odor or leakage	☉				
	Any physical damage or protrusion		☉			
Power component	Any dust or debris		☉			
	Check resistance between each terminals		☉			Measure with a multi-tester

Peripheral device						
Rheostat	Whether rheostat wiring or connector are damaged		⊙	Visual check	No abnormalities	Replacement rheostat
Electromagnetic Contactor	Check contacts and connections for any abnormality.	⊙				Replacement Contactor
	Unusual vibration and noise	⊙		hearing check		
Reactor	Is there any abnormalities?	⊙		Visual check	Replacement Reactor	
Cooling System						
Cooling fan	Unusual vibration and noise		⊙	Visual or hearing check	Correct cooling	Consult with the supplier
	Excessive dust or debris	⊙				Clean the fan
Heat sink	Excessive dust or debris	⊙		Visual check		Clean up debris or dust
Ventilation Path	Is the ventilation path blocked?	⊙				Clear the path

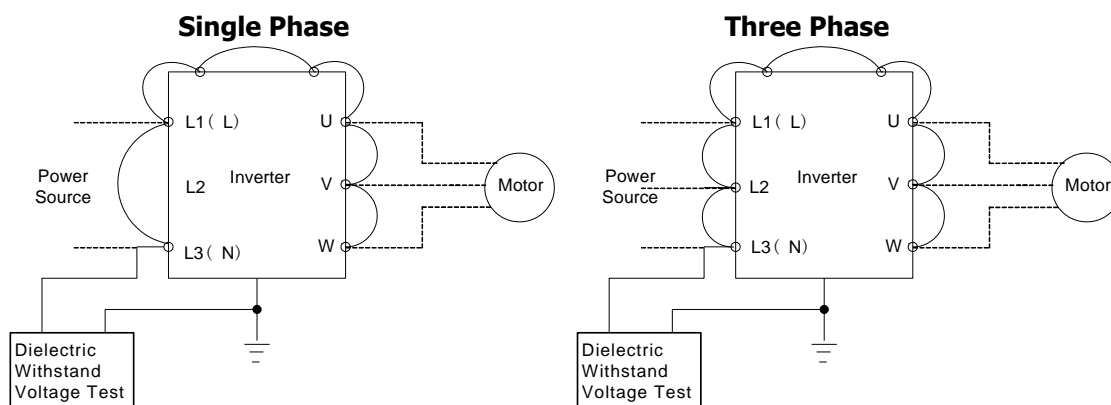
10.5 Maintenance

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

10.5.1 Maintenance Check List

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

10.5.2 Insulation test Method



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Bonfiglioli has been designing and developing innovative and reliable power transmission and control solutions for industry, mobile machinery and renewable energy applications since 1956.