TECO Westinghouse

INVERTER

E510

INSTRUCTION MANUAL

230V Class 1/3~

IP20/NEMA 1

0.4 - 2.2 kW / 0.5 - 3 HP

230V Class 3~

IP20/NEMA 1

0.4 - 30 kW / 0.5 - 40 HP

460V Class 3~

IP20/NEMA 1

0.75- 55 kW / 1 - 75 HP

- Read all operating instructions before installing, connecting (wiring), operating, servicing, or inspecting the inverter.
- Ensure that this manual is made available to the end user of the inverter.
- Store this manual in a safe, convenient location.
- The manual is subject to change without prior notice.

DOCUMENT - TECO-E510N1IM
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**** STATEMENT ****

Si Desea descargar el manual en español diríjase a este Link: www.tecowestinghouse.com

Table of Contents

Preface (English)

The E510 product is an inverter designed to control a three-phase induction motor. Please read this manual carefully to ensure correct operation, safety and to become familiar with the inverter functions.

The E510 inverter is an electrical / electronic product and must be installed and handled by qualified service personnel.

Improper handling may result in incorrect operation, shorter life cycle, or failure of this product as well as the motor.

All E510 documentation is subject to change without notice. Be sure to obtain the latest editions for use or visit our website at www.tecowestinghouse.com

Available Documentation:

1. E510 Start-up and Installation Manual
2. E510 Instruction Manual

Read this Start-up and Installation Manual in conjunction with E510 Instruction Manual thoroughly before proceeding with installation, connections (wiring), operation, or maintenance and inspection. Ensure you have sound knowledge of the device and familiarize yourself with all safety information and precautions before proceeding to operate the inverter. Read E510 Instruction Manual for detailed description on parameters.

IMPORTANT	**For Advanced Installation, Wiring and Programming of the E510 inverter refer to the E510 Instruction Manual.**

Ensure you have sound knowledge of the inverter and familiarize yourself with all safety information and precautions before proceeding to operate the inverter.

Please pay close attention to the safety precautions indicated by the warning and caution symbol.

Warning	Failure to ignore the information indicated by the warning symbol may result in death or serious injury.
Caution	Failure to ignore the information indicated by the caution symbol may result in minor or moderate injury and/or substantial property damage.

Préface (Français)

- Le produit est un lecteur conçu pour commander un moteur à induction triphasé. lire attentivement ce manuel pour garantir le bon fonctionnement, la sécurité et pour se familiariser avec les fonctions d'entraînement.
- Le lecteur est un appareil électrique / électronique et doit être installé et géré par un personnel qualifié
- Une mauvaise manipulation peut entraîner un fonctionnement incorrect, cycle de vie plus court, ou l'échec de ce produit ainsi que le moteur.
- Tous les documents sont sujets à changement sans préavis. Soyez sûr d'obtenir les dernières éditions de l'utilisation ou visitez notre site Web
- Lire le manuel d'instructions avant de procéder à l'installation, les connexions (câblage), le fonctionnement ou l'entretien et l'inspection.
- Vérifiez que vous avez une bonne connaissance de l'entraînement et de vous familiariser avec les consignes de sécurité et les précautions avant de procéder à fonctionner le lecteur.
- prêter attention aux consignes de sécurité indiquées par l'avertissement et symbole Attention .

Avertissement	ignorer les informations indiquées par le symbole d'avertissement peut entraîner la mort ou des blessures graves.
Attention	ignorer les informations indiquées par le symbole de mise en garde peut entraîner des blessures mineures ou modérées et / ou des dommages matériels importants.

1. Safety Precautions (English)

1.1 Before supplying Power to the Inverter

Warning
The main circuit must be correctly wired. For single phase supply use input terminals (R/L1, T/L3) and for three phase supply use input terminals (L1(L), L2, L3(N)). Terminals T1, T2, T3 must only be used to connect the motor. Connecting the input supply to any of the T1, T2 or T3 terminals will cause damage to the inverter.

Caution

- To avoid the front cover from disengaging or other physical damage, do not carry the inverter by its cover. Support the unit by its heat sink when transporting. Improper handling can damage the inverter or injure personnel, and should be avoided.
- To avoid the risk of fire, do not install the inverter on or near flammable objects. Install on nonflammable objects such as metal surfaces.
- If several inverters are placed inside the same control panel, provide adequate ventilation to maintain the temperature below 40°C/104°F (50°C/122°F without a dust cover) to avoid overheating or fire.
- When removing or installing the digital operator, turn off the power first, and then follow the instructions in this manual to avoid operator error or loss of display caused by faulty connections.

Warning
This product is sold subject to IEC 61800-3. In a domestic environment this product may cause radio interference in which case the user may need to apply corrective measures.

1.2 Wiring

Warning

- Always turn OFF the power supply before attempting inverter installation and wiring of the user terminals.
- Wiring must be performed by a qualified personnel / certified electrician.
- Make sure the inverter is properly grounded. (230V Class: Grounding impedance shall be less than 100Ω. 460V Class: Grounding impedance shall be less than 10Ω.)
- Please check and test emergency stop circuits after wiring. (Installer is responsible for the correct wiring.)
- Never touch any of the input or output power lines directly or allow any input of output power lines to come in contact with the inverter case.
- Do not perform a dielectric voltage withstand test (megger) on the inverter this will result in inverter damage to the semiconductor components.

Caution

- The line voltage applied must comply with the inverter's specified input voltage. (See product nameplate section 2.1)
- Use wire gauge recommendations and torque specifications. (See Wire Gauge and Torque Specification section 3.10)
- Never connect input power to the inverter output terminals T1, T2, T3.
- Do not connect a contactor or switch in series with the inverter and the motor.
- Do not connect a power factor correction capacitor or surge suppressor to the inverter output.
- Ensure the interference generated by the inverter and motor does not affect peripheral devices.

1.3 Before Operation

Warning

- Make sure the inverter capacity matches the parameters 13-00.
- Reduce the carrier frequency (parameter 11-01) If the cable from the inverter to the motor is greater than 80 ft (25m). A high-frequency current can be generated by stray capacitance between the cables and result in an overcurrent trip of the inverter, an increase in leakage current, or an inaccurate current readout.
- Be sure to install all covers before turning on power. Do not remove any of the covers while power to the inverter is on, otherwise electric shock may occur.
- Do not operate switches with wet hands, otherwise electric shock may result.
- Do not touch inverter terminals when energized even if inverter has stopped, otherwise electric shock may result.

1.4 Parameter Setting

Caution

- Do not connect a load to the motor while performing a rotational auto-tune.
- Make sure the motor can freely run and there is sufficient space around the motor when performing a rotational auto-tune.

1.5 Operation

Warning

- Be sure to install all covers before turning on power. Do not remove any of the covers while power to the inverter is on, otherwise electric shock may occur.
- Do not connect or disconnect the motor during operation. This will cause the inverter to trip and may cause damage to the inverter.
- Operations may start suddenly if an alarm or fault is reset with a run command active. Confirm that no run command is active upon resetting the alarm or fault, otherwise accidents may occur.
- Do not operate switches with wet hands, otherwise electric shock may result.
- It provides an independent external hardware emergency switch, which emergently shuts down the inverter output in the case of danger.
- If automatic restart after power recovery (parameter 07-00) is enabled, the inverter will start automatically after power is restored.
- Make sure it is safe to operate the inverter and motor before performing a rotational auto-tune.
- Do not touch inverter terminals when energized even if inverter has stopped, otherwise electric shock may result.
- Do not check signals on circuit boards while the inverter is running.
- After the power is turned off, the cooling fan may continue to run for some time.

Caution

- Do not touch heat-generating components such as heat sinks and braking resistors.
- Carefully check the performance of motor or machine before operating at high speed, otherwise Injury may result.
- Note the parameter settings related to the braking unit when applicable.
- Do not use the inverter braking function for mechanical holding, otherwise injury may result.
- Do not check signals on circuit boards while the inverter is running.

1.6 Maintenance, Inspection and Replacement

Warning

- Wait a minimum of five minutes after power has been turned OFF before starting an inspection. Also confirm that the charge light is OFF and that the DC bus voltage has dropped below 25Vdc.
- Never touch high voltage terminals in the inverter.
- Make sure power to the inverter is disconnected before disassembling the inverter.
- Only authorized personnel should perform maintenance, inspection, and replacement operations. (Take off metal jewelry such as watches and rings and use insulated tools.)

Caution

- The Inverter can be used in an environment with a temperature range from 14 -104°F (-10-40°C) and relative humidity of 95% non-condensing.
- The inverter must be operated in a dust, gas, mist and moisture free environment.

1.7 Disposal of the Inverter

Caution

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

1. Consignes de sécurité (Français)

1.1 Avant d'alimenter le disque dur

Avertissement
• Le circuit principal doit être correctement câblée. Pour les terminaux monophasés d'approvisionnement de l'utilisation des intrants (R/L1, T/L3) et de trois bornes d'entrée de l'utilisation de l'offre de phase (R/L1, S/L2, T/L3). U/T1, V/T2, W/T3 ne doivent être utilisés pour connecter le moteur. Raccordement de l'alimentation d'entrée à l'un des U/T1, V/T2 W/T3 ou bornes risque d'endommager le lecteur.

Attention
• Pour éviter que le couvercle ne se désengage ou de tout autre dommage physique, ne portez pas le lecteur par son couverture. Soutenir le groupe par son dissipateur de chaleur lors du transport. Une mauvaise manipulation peut endommager le lecteur ou blesser le personnel, et doit être évitée. • Pour éviter que les risques d'incendie, ne pas installer le lecteur sur ou à proximité d'objets inflammables. Installer sur des objets ininflammables comme les surfaces métalliques. • Si plusieurs disques sont placés dans le même panneau de contrôle, fournir une ventilation adéquate pour maintenir la température en dessous de 40 ° C/104 ° F (50 ° C/122 ° F sans housse de protection) pour éviter la surchauffe ou incendie. • Lors d'un retrait ou d'installation de l'opérateur numérique, éteignez-le d'abord, puis de suivre les instructions de ce manuel pour éviter les erreurs de l'opérateur ou de la perte de l'affichage causé par des connexions défectueuses.

Avertissement
• Lors d'un retrait ou d'installation de l'opérateur numérique, éteignez-le d'abord, puis de suivre les instructions de ce manuel pour éviter les erreurs de l'opérateur ou de la perte de l'affichage causé par des connexions défectueuses....

1.2 Câblage

Avertissement
• Coupez toujours l'alimentation électrique avant de procéder à l'installation d'entraînement et le câblage des terminaux utilisateurs. • Le câblage doit être effectué par un personnel qualifié / électricien certifié. • Assurez-vous que le lecteur est correctement mis à la terre. (220V Classe: impédance de mise à la terre doit être inférieure à 100Ω Classe 440V:. Impédance de mise à la terre doit être inférieure à 10Ω.) • vérifier et tester mes circuits d'arrêt d'urgence après le câblage. (L'Installateur est responsable du câblage.) • Ne touchez jamais de l'entrée ou de lignes électriques de sortie permettant directement ou toute entrée ou de lignes de puissance de sortie à venir en contact avec le boîtier d'entraînement. • Ne pas effectuer un test de tenue en tension diélectrique (mégohmmètre) sur le disque dur ou cela va entraîner des dommages de lecture pour les composants semi-conducteurs.

Attention
• La tension d'alimentation appliquée doit se conformer à la tension d'entrée spécifiée par le lecteur. (Voir la section signalétique du produit) • Raccorder la résistance de freinage et de l'unité de freinage sur les bornes assignées. • Ne pas brancher une résistance de freinage directement sur les bornes CC P (+) et N (-), sinon risque d'incendie. • Utilisez des recommandations de la jauge de fil et les spécifications de couple. (Voir Wire Gauge et la section de spécification de couple)。 • Ne jamais brancher l'alimentation d'entrée aux bornes onduleur de sortie U/T1, V/T2, W/T3. • Ne pas brancher un contacteur ou interrupteur en série avec le variateur et le moteur. • Ne branchez pas un facteur condensateur de correction de puissance ou suppresseur de tension à la sortie du variateur。 • S'assurer que l'interférence générée par l'entraînement et le moteur n'a pas d'incidence sur les périphériques.

1.3 Avant l'opération

Avertissement
• Assurez-vous que la capacité du disque correspond aux paramètres de notation avant d'alimenter. • Réduire le paramètre de la fréquence porteuse si le câble du variateur au moteur est supérieure à 80 pi (25 m). Un courant de haute fréquence peut être générée par la capacité parasite entre les câbles et entraîner un déclenchement de surintensité du variateur, une augmentation du courant ou d'une lecture actuelle inexactes. • Veillez à installer tous les couvercles avant de l'allumer. Ne retirez pas les capots pendant que l'alimentation du lecteur est allumé, un choc électrique peut se produire autrement. • Ne pas actionner d'interrupteurs avec les mains mouillées, un choc électrique pourrait survenir autrement. • Ne touchez pas les bornes d'entraînement lorsqu'il est alimenté, même si le lecteur est arrêté, un choc électrique pourrait survenir autrement.

1.4 Configuration Paramètre

Attention
• Ne branchez pas une charge pour le moteur tout en effectuant un auto-tune. • Assurez-vous que le moteur peut fonctionner librement et il y a suffisamment d'espace autour du moteur lors de l'exécution d'un auto-tune rotation.

1.5 Opération

Avertissement

- Veillez à installer tous les couvercles avant de l'allumer. Ne retirez pas les capots pendant que l'alimentation du lecteur est allumé, un choc électrique peut se produire autrement.
- Ne pas brancher ou débrancher le moteur pendant le fonctionnement. Le variateur pourrai se déclencher et ainsi endommager le lecteur.
- Les opérations peuvent commencer soudainement si une alarme ou un défaut est réarmé avec un ordre de marche active. Assurez-vous qu'un ordre de marche est actif lors de la réinitialisation de l'alarme ou de défaut, autrement des accidents peuvent se produire.
- Ne pas actionner d'interrupteurs avec les mains mouillées, un choc électrique pourrait survenir.
- Un interrupteur d'urgence externe indépendant est fourni, qui s'arrête en urgence vers le bas la sortie de l'onduleur en cas de danger.
- Si le redémarrage automatique après une récupération d'énergie est activée, le variateur démarrera automatiquement après le rétablissement du courant.
- Assurez-vous qu'il est sûr de faire fonctionner le variateur et le moteur avant d'effectuer un auto-tune rotation.
- Ne touchez pas les bornes d'entraînement lorsqu'il est alimenté même si l'onduleur s'est arrêté, un choc électrique pourrait survenir .
- Ne pas contrôler les signaux sur les circuits pendant que le lecteur est en marche.
- Après la mise hors tension, le ventilateur de refroidissement peut continuer à fonctionner pendant un certain temps.

Attention

- Ne touchez pas les composants générant de la chaleur tels que radiateurs et des résistances de freinage.
- Vérifiez soigneusement la performance du moteur ou de la machine avant d'utiliser à grande vitesse, sous peine de blessure.
- Notez les réglages des paramètres liés à l'unité de freinage lorsque applicable.
- Ne pas utiliser la fonction de freinage d'entraînement pour un maintien mécanique, sous peine de blessure.
- Ne pas contrôler les signaux sur les circuits pendant que le lecteur est en marche.

1.6 Entretien, Inspection et remplacement

Avertissement

- Attendre un minimum de 5 minutes après que l'alimentation a été débranchée avant de commencer une inspection. Vérifiez également que le voyant de charge est éteint et que la tension du bus cc a chuté au-dessous de 25Vdc.
- Ne jamais toucher les bornes à haute tension dans le lecteur.
- Assurez-vous que l'alimentation du lecteur est débranché avant de démonter le lecteur.
- Seul le personnel autorisé peuvent faire l'entretien, l'inspection et les opérations de remplacement. (Enlevez les bijoux en métal tels que les montres et les bagues et utiliser des outils isolés.)

⚠ Attention
• Le variateur peut être utilisé dans un environnement avec une gamme de température allant de 14 ° -104 ° F (10-40 ° C) et l'humidité relative de 95% sans condensation. • Le variateur doit être utilisé dans un environnement sans poussière, gaz, vapeur et humidité.

1.7 Mise au rebut du variateur

⚠ Attention
• jeter cet appareil avec soin comme un déchet industriel et selon les réglementations locales nécessaires. • Les condensateurs du circuit principal d'entraînement et circuits imprimés sont considérés comme des déchets dangereux et ne doivent pas être brûlés. • The Plastic enclosure and parts of the drive such as the top cover board will release harmful gases if burned.

2. Model Description

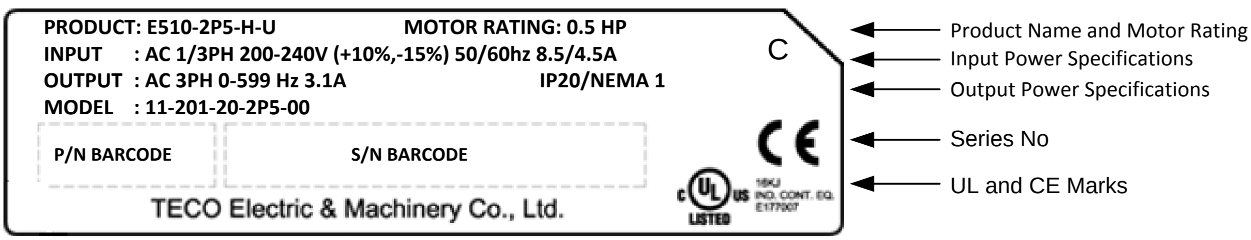
2.1 Nameplate Data

It is essential to verify the E510 inverter nameplate and make sure that the E510 inverter has the correct rating so it can be used in your application with the proper sized AC motor.

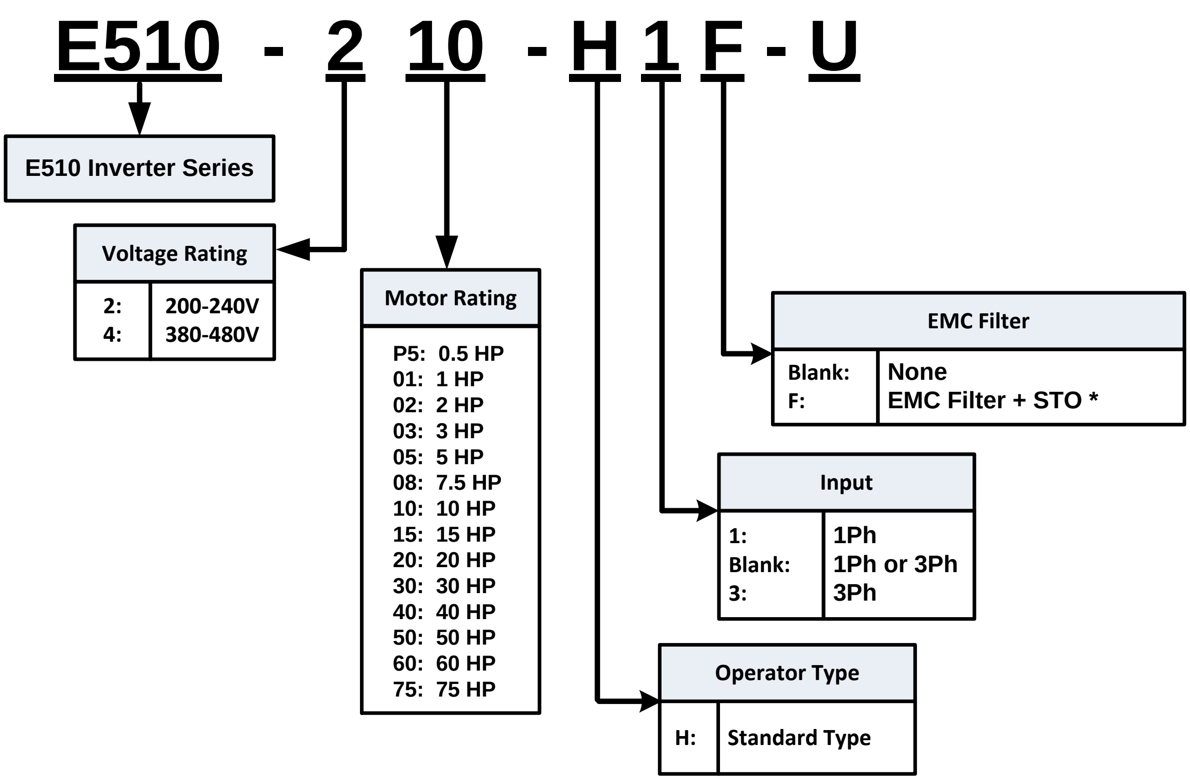
Unpack the E510 inverter and check the following:

(1) The E510 inverter start-up and installation manual (this document) are contained in the package.
(2) The E510 inverter has not been damaged during transportation there should be no dents or parts missing.
(3) The E510 inverter is the type you ordered. You can check the type and specifications on the main nameplate.
(4) Check that the input voltage range meets the input power requirements.
(5) Ensure that the motor HP matches the motor rating of the inverter.

(1HP = 0.746 kW)



Model Identification



*F Version models are not available as standard product in Americas.

2.2 Inverter Models – Motor Power

IP20 / NEMA 1 Type – 200V Class

Model	Supply voltage (Vac)	Horse Power (HP)	Motor (kW)	EMC Filter		STO Function		Frame Size
				V	X	V	X	
E510-2P5-H-U	1 Phase 200~240V +10%-15% 50/60Hz	0.5	0.4		◎		◎	1
E510-201-H-U		1	0.75		◎		◎	1
E510-202-H-U		2	1.5		◎		◎	2
E510-203-H-U		3	2.2		◎		◎	2
E510-2P5-H1F-U*	1 & 3 Phase 200~240V +10%-15% 50/60Hz	0.5	0.4	◎		◎		1
E510-201-H1F-U*		1	0.75	◎		◎		1
E510-202-H1F-U*		2	1.5	◎		◎		2
E510-203-H1F-U*		3	2.2	◎		◎		2
E510-202-H3-U	3 Phase 200~240V +10%-15% 50/60Hz 3 Phase	2	1.5		◎		◎	1
E510-205-H3-U		5	4		◎		◎	2
E510-208-H3-U		7.5	5.5		◎		◎	3
E510-210-H3-U		10	7.5		◎		◎	3
E510-215-H3-U		15	11		◎		◎	4
E510-220-H3-U		20	15		◎		◎	4
E510-225-H3-U		25	18.5 / 22		◎		◎	5
E510-230-H3-U		30	22 / 30		◎		◎	6
E510-240-H3-U		40	30 / 37		◎		◎	6

* F Version models are not available as standard product in Americas.

V: Built-in
X: None

IP20 / NEMA 1 Type – 400V Class

Model	Supply voltage (Vac)	Horse Power (HP)	Motor (kW)	EMC Filter		STO Function		Frame Size
				V	X	V	X	
E510-401-H3-U	3 Phase 380~480V +10%-15% 50/60Hz	1	0.75		◎		◎	1
E510-402-H3-U		2	1.5		◎		◎	1
E510-403-H3-U		3	2.2		◎		◎	2
E510-405-H3-U		5	4		◎		◎	2
E510-408-H3-U		7.5	5.5		◎		◎	3
E510-410-H3-U		10	7.5		◎		◎	3
E510-415-H3-U		15	11		◎		◎	3
E510-420-H3-U		20	15		◎		◎	4
E510-425-H3-U		25	18.5		◎		◎	4
E510-430-H3-U		30	22 / 30		◎		◎	5
E510-440-H3-U		40	30 / 37		◎		◎	6
E510-450-H3-U		50	37 / 45		◎		◎	6
E510-460-H3-U		60	45 / 55		◎		◎	6
E510-475-H3-U		75	55 / 75		◎		◎	6
E510-401-H3F-U*		1	0.75	◎		◎		1
E510-402-H3F-U*		2	1.5	◎		◎		1
E510-403-H3F-U*		3	2.2	◎		◎		2
E510-405-H3F-U*		5	4	◎		◎		2
E510-408-H3F-U*		7.5	5.5	◎		◎		3
E510-410-H3F-U*		10	7.5	◎		◎		3
E510-415-H3F-U*		15	11	◎		◎		3
E510-420-H3F-U*		20	15	◎		◎		4
E510-425-H3F-U*		25	18.5	◎		◎		4
E510-430-H3F-U*		30	22 / 30	◎		◎		5
E510-440-H3F-U*		40	30 / 37	◎		◎		6
E510-450-H3F-U*		50	37 / 45	◎		◎		6
E510-460-H3F-U*		60	45 / 55	◎		◎		6
E510-475-H3F-U*		75	55 / 75	◎		◎		6

* F Version models are not available as standard product in Americas.

V: Built-in
X: None

3. Environment and Installation

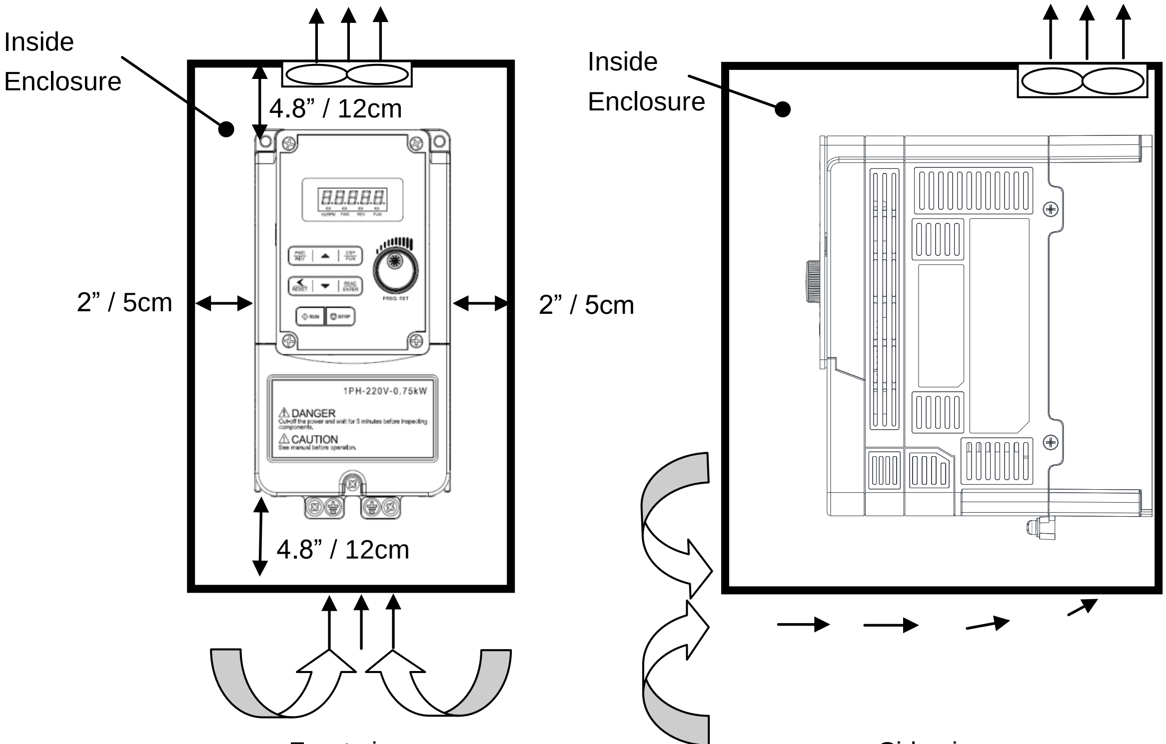
3.1 Environment

The environment will directly affect the proper operation and the life span of the inverter. To ensure that the inverter will give maximum service life, please comply with the following environmental conditions:

Protection	
Protection Class	IP20 / NEMA 1 (Depending on models)
Operating Temperature	IP20 / NEMA 1 type: Inside: -10°C - +50°C (14-122 °F) (without sticker / dust cover) Outside: -10°C - +40°C (14-104 °F) (with sticker / dust cover) If several inverters are placed in the same control panel, provide additional cooling And ventilation to maintain ambient temperatures below 40°C (104 °F)
Storage Temperature	-20°C - +60°C (-4 -140 °F)
Humidity:	95% non-condensing Relative humidity 5% to 95%, free of moisture. (Follow IEC60068-2-78 standard)
Altitude:	< 1000m (3,281 ft.)
Installation Site:	Avoid exposure to rain or moisture.
	Avoid direct sunlight.
	Avoid oil mist and salinity.
	Avoid corrosive liquid and gas.
	Avoid dust, lint fibers, and small metal filings.
	Keep away from radioactive and flammable materials.
	Avoid electromagnetic interference (soldering machines, power machines).
	Avoid vibration (stamping, punching machines etc.). Add a vibration-proof pad if the situation cannot be avoided.
Shock	Maximum acceleration: 1G (9.8m/s²), for <20Hz Maximum acceleration: 0.6G (5.88m/s²), for 20 - 50Hz (IEC60068-2-6 standard)

3.2 Installation

Provide sufficient air circulation space for cooling as shown in examples below. Install the Inverter on surfaces that provide good heat dissipation. Frame1 models：2P5 / 201 / 202 (three phase) / 401 / 402.

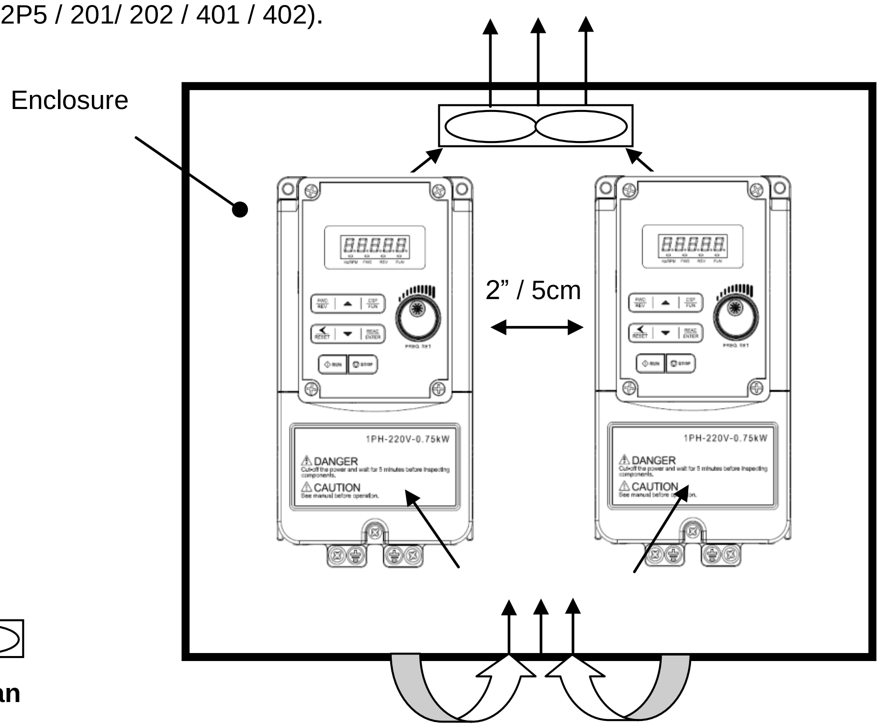


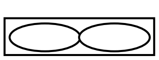
Front view

Side view

Side by side installation

Provide the necessary physical space and cooling based on the ambient temperature and the heat loss in the panel (2P5 / 201/ 202 / 401 / 402).



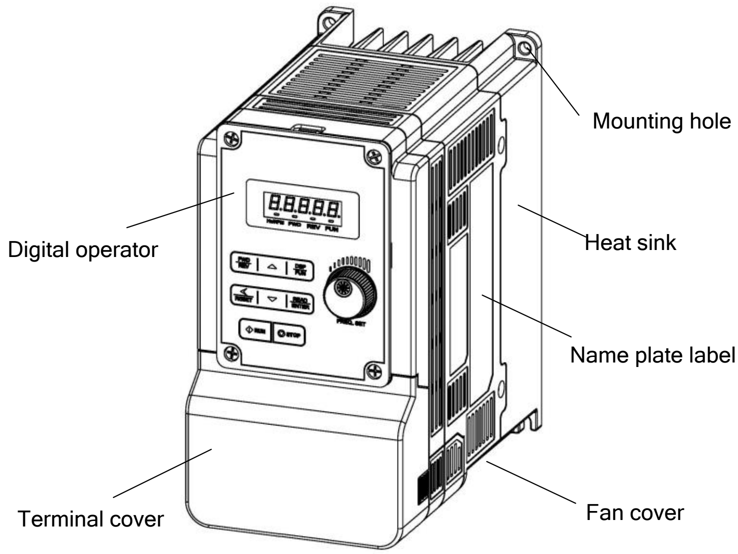


Cooling fan

3.3 External View

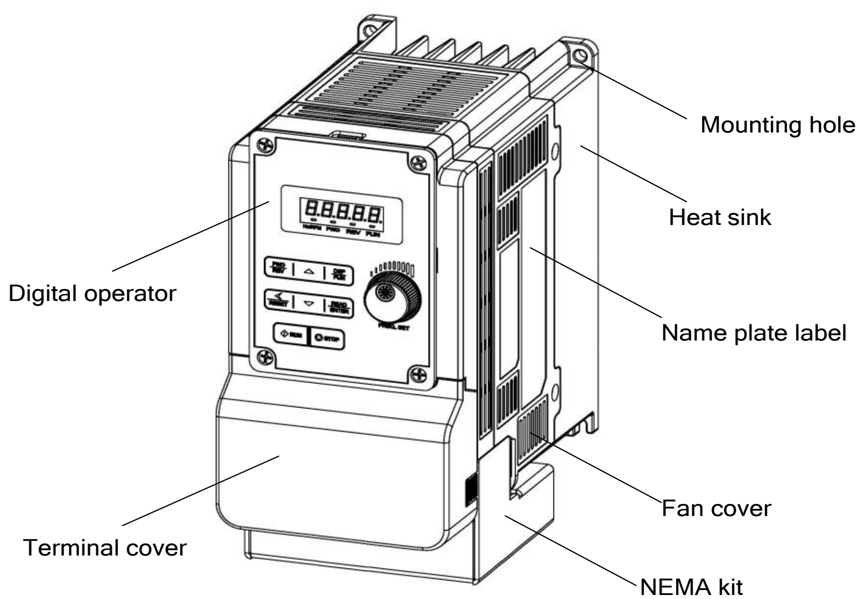
IP20

200V 0.5HP~1HP (Single/Three phase) / 400V 1HP~2HP / 200V 2HP (Three phase)



NEMA1

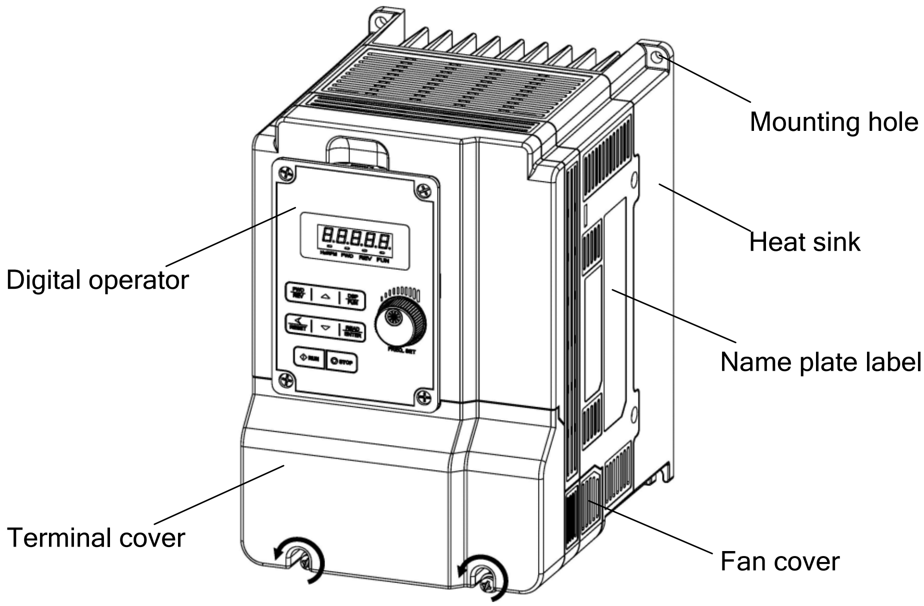
200V 0.5HP~1HP (Single/Three phase) / 400V 1HP~2HP / 200V 2HP (Three phase)



Note: NEMA 1 conduit kit may block access to lower mounting holes and may need to be removed prior to mounting.

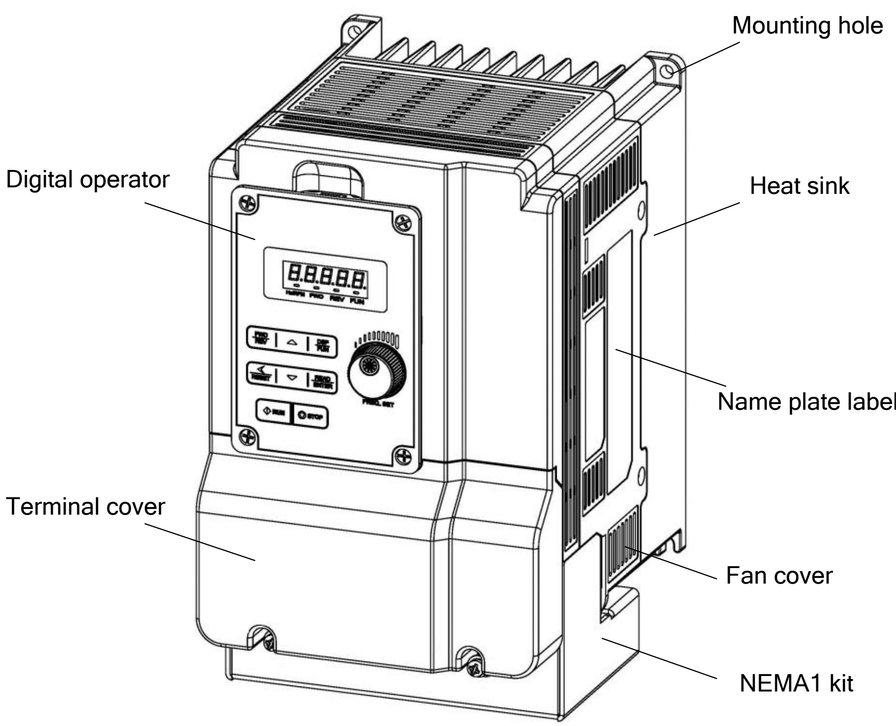
IP20

200V 2-3HP (Single/Three phase) / 200V 3HP~20HP / 400V 3HP~25HP



NEMA1

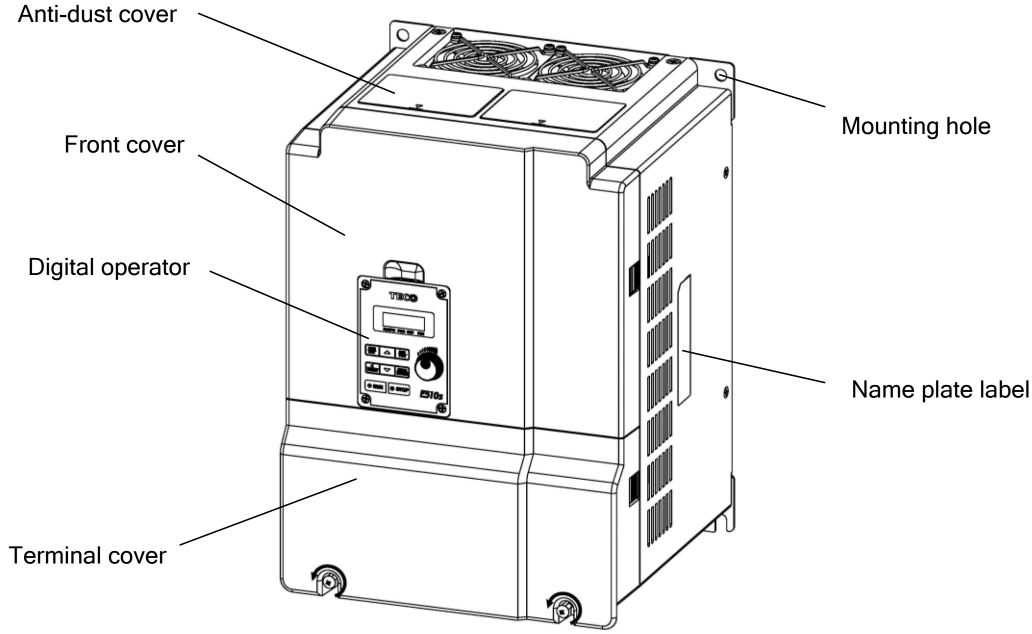
200V 2-3HP (Single/Three phase) / 200V 3HP~20HP / 400V 3HP~25HP



Note: NEMA 1 conduit kit may block access to lower mounting holes and may need to be removed prior to mounting.

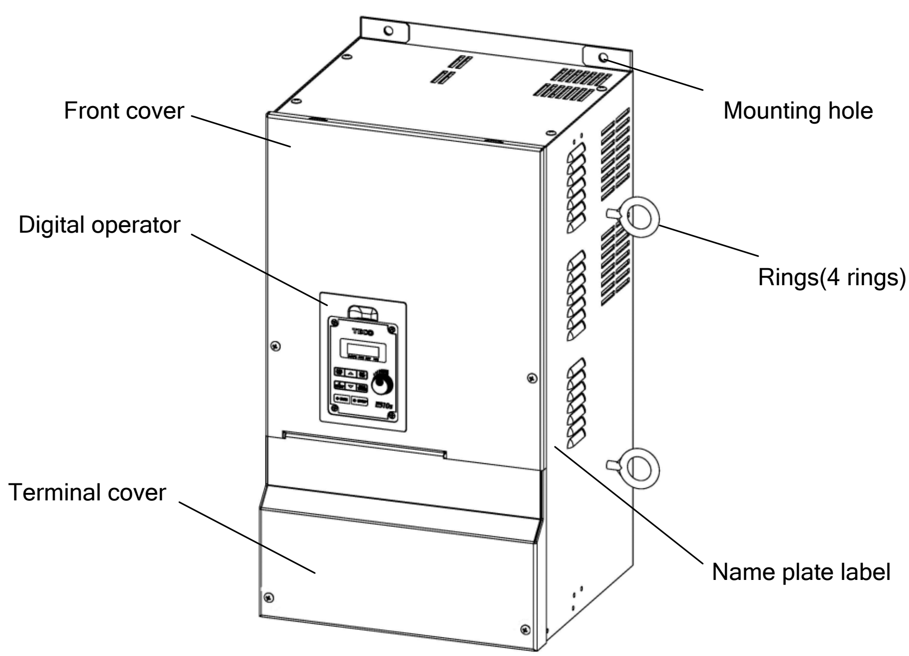
NEMA 1

200V 25HP / 400V 30HP



NEMA 1

200V 30HP~40HP / 400V 40HP~75HP



3.4 Warning Labels

Important: Warning information located on the front cover must be read upon installation of the inverter.

(a) 200V 0.5HP~20HP / 400V 1HP~25HP

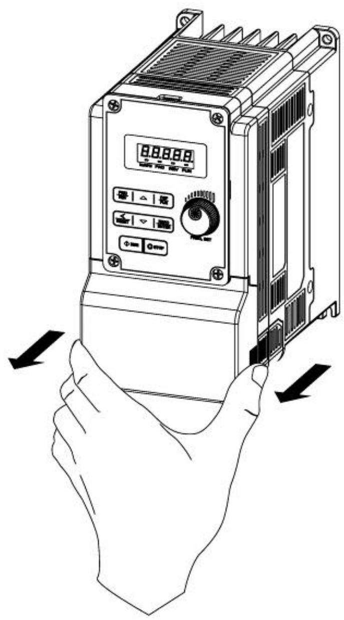
(b) 200V 25HP~40HP / 400V 30HP~75HP

3.5 Removing the Front Cover

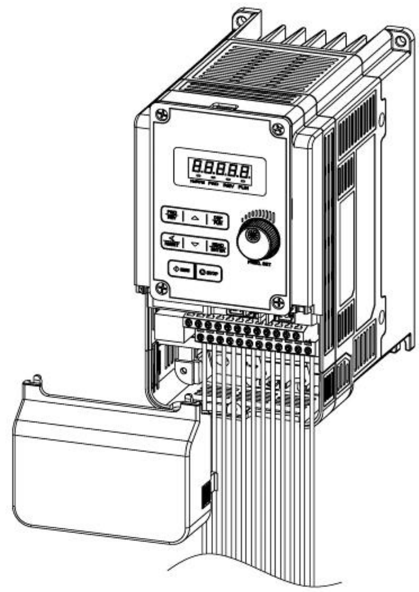
Caution
• Before making any wiring connections to the inverter the front cover needs to be removed.

IP20

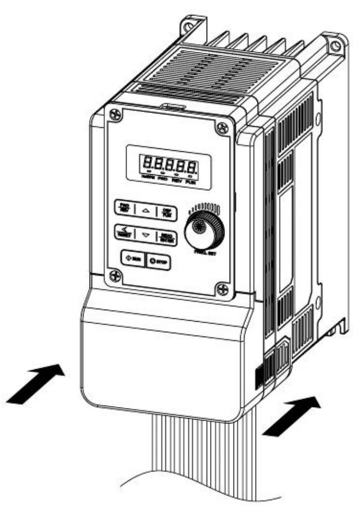
200V 0.5HP~1HP (Single/Three phase)/ 400V 1HP~2HP / 200V 2HP (Three phase)



Step1：Remove terminal cover



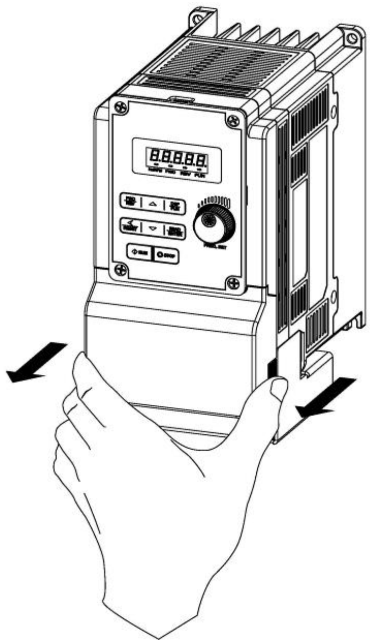
Step2：Wire and reinstall cover



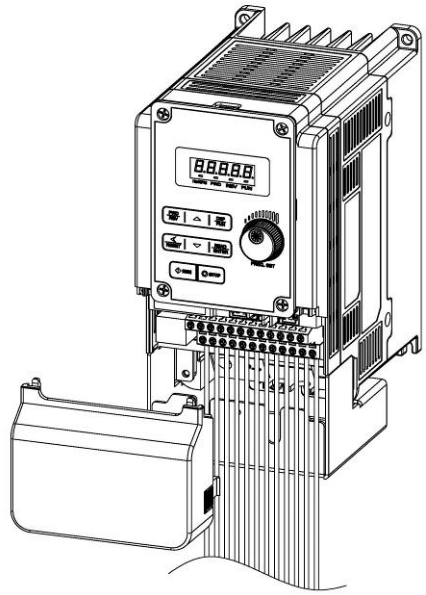
Step3：Put terminal cover back

NEMA 1

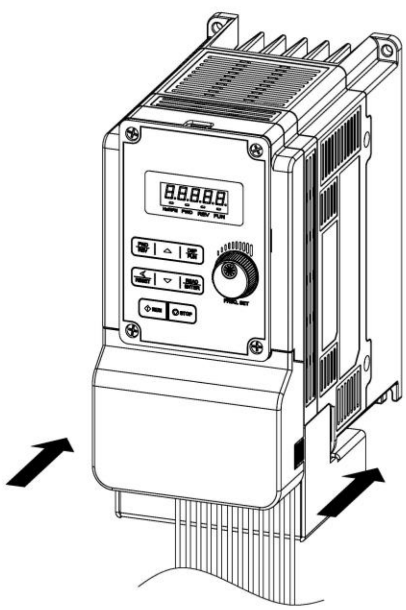
200V 0.5HP~1HP (Single/Three phase)/ 400V 1HP~2HP / 200V 2HP (Three phase)



Step1：Remove terminal cover



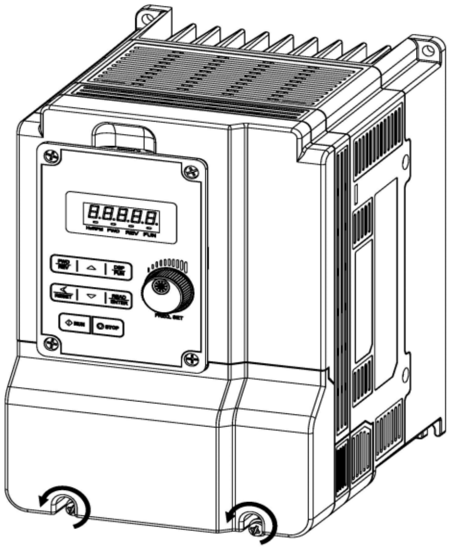
Step2：Wire and reinstall cover



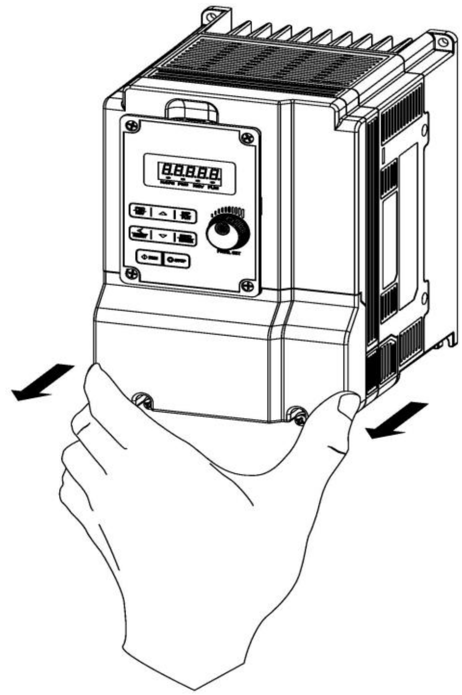
Step3：Put terminal cover back

IP20

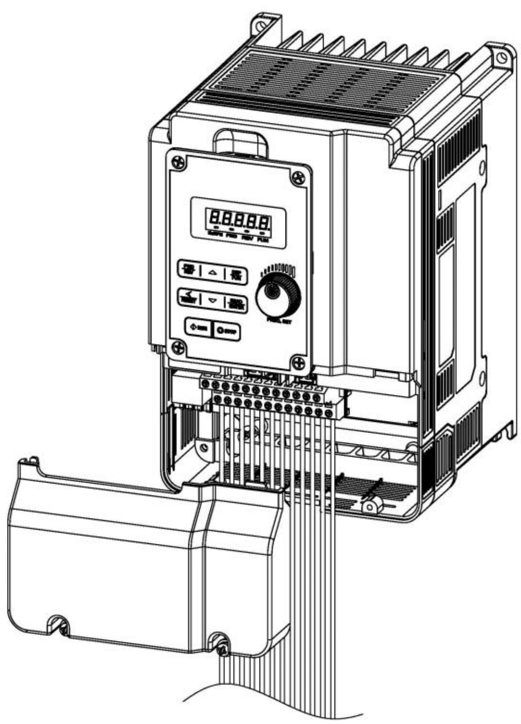
200V 2HP (single/three phase) / 200V 3HP~20HP / 400V 3HP~25HP



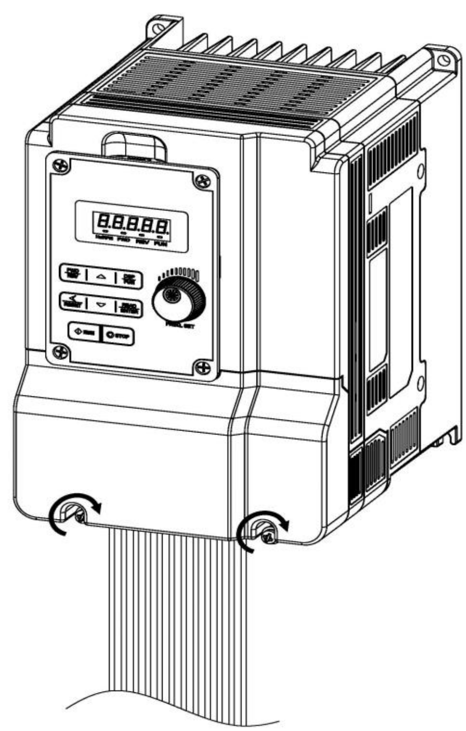
Step1：Unscrew cover



Step2：Remove the terminal cover



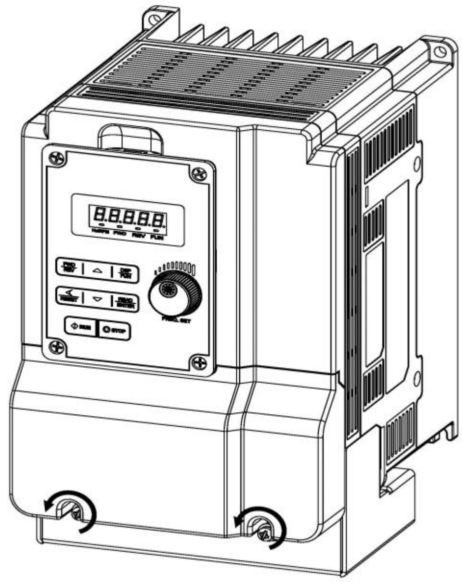
Step3：Wire and reinstall the cover



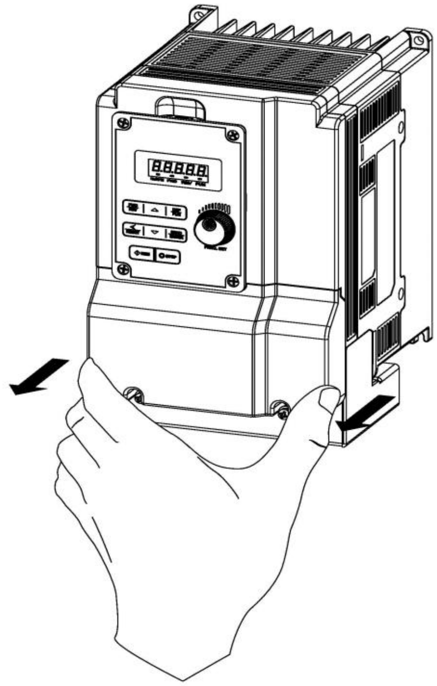
Step4：Tighten the screws

NEMA1

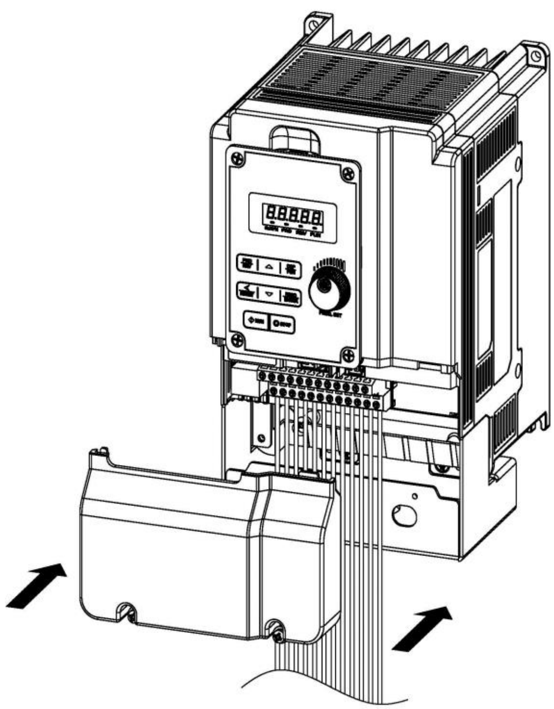
200V 2HP (single/three phase) / 200V 3HP~20HP / 400V 3HP~25HP



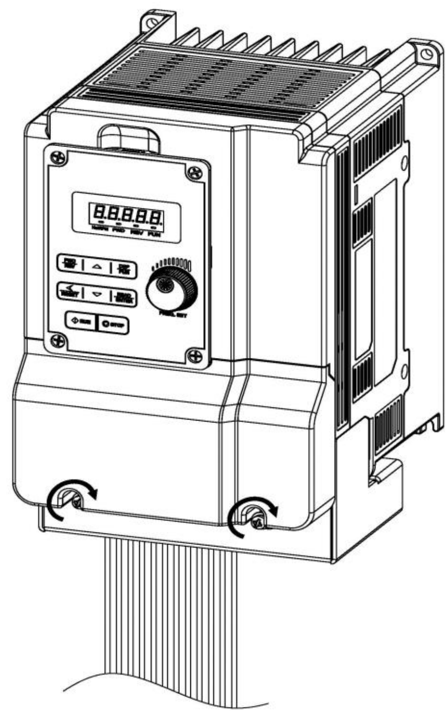
Step1：Unscrew cover



Step2：Remove the terminal cover



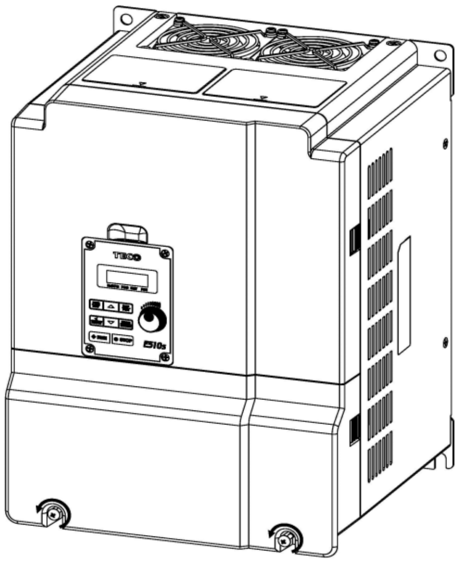
Step3：Wire and reinstall the cover



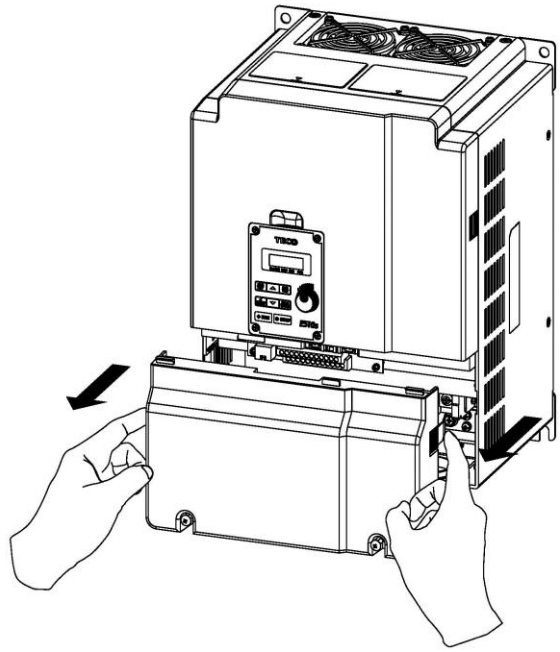
Step4：Tighten the screws

NEMA1

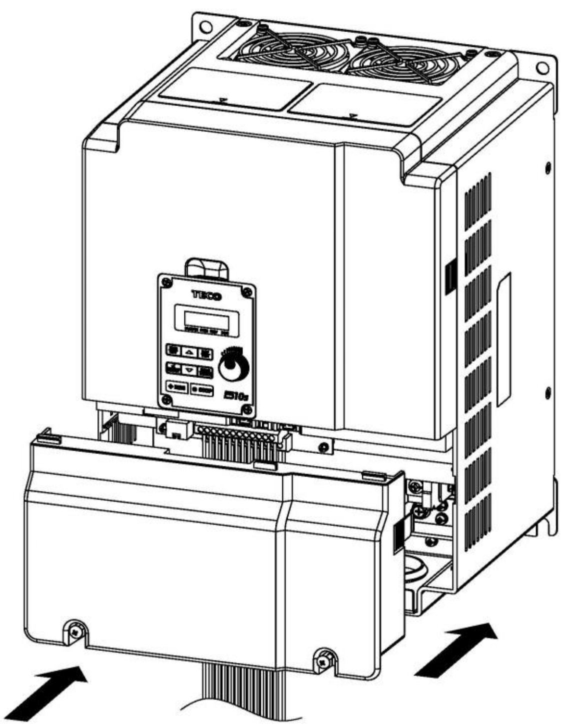
200V 25HP / 400V 30HP



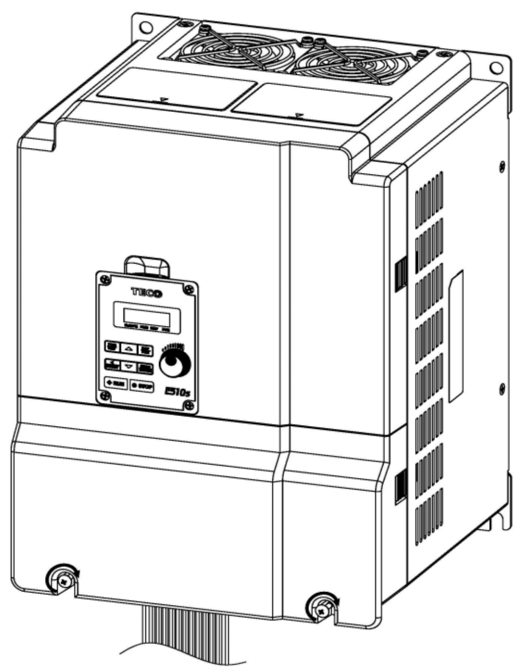
Step1: Unscrew cover



Step2: Remove the terminal cover



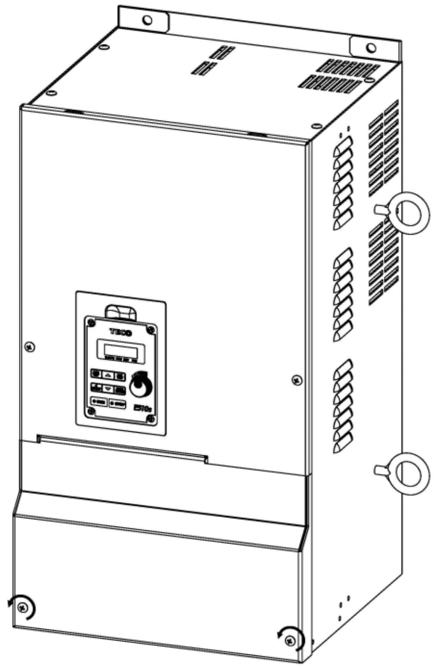
Step3：Wire and reinstall the cover



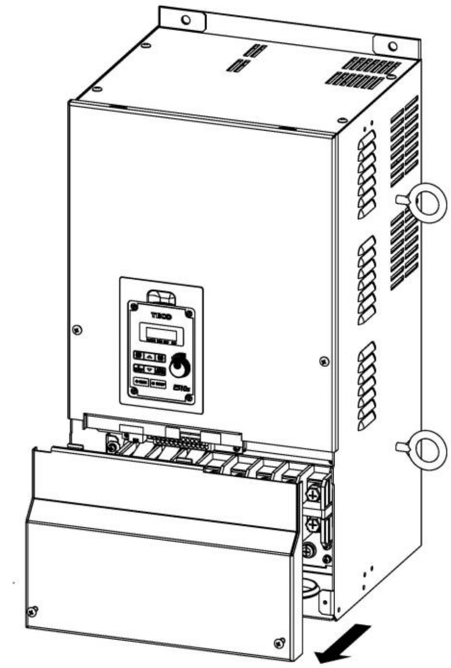
Step4：Tighten the screws

NEMA1

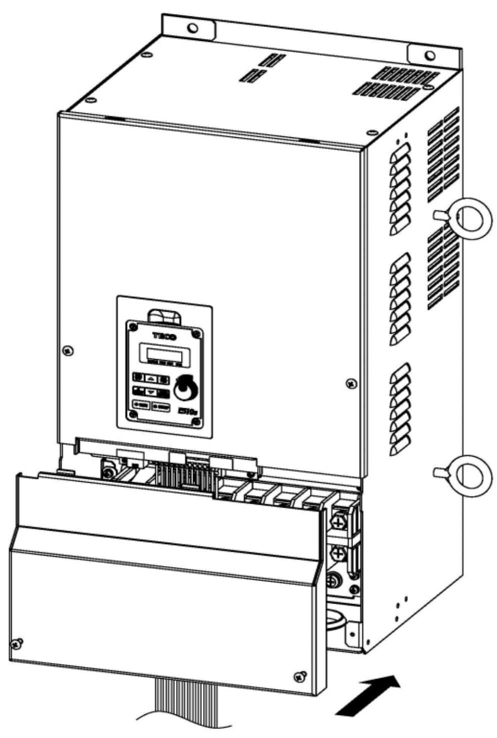
200V 30HP~40HP / 400V 40HP~75HP



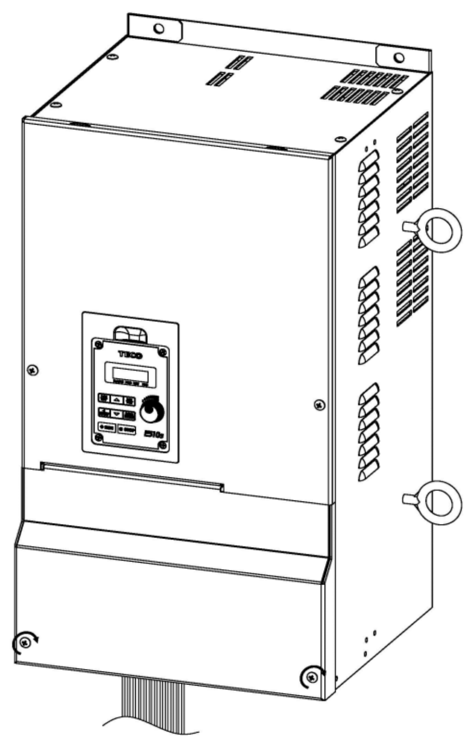
Step1: Unscrew cover



Step2: Remove the terminal cover



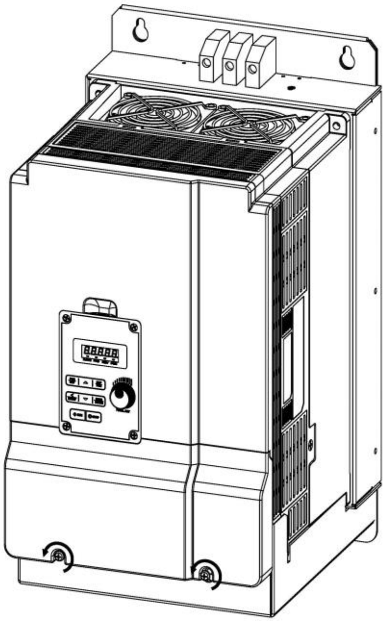
Step3：Wire and Reinstall the cover



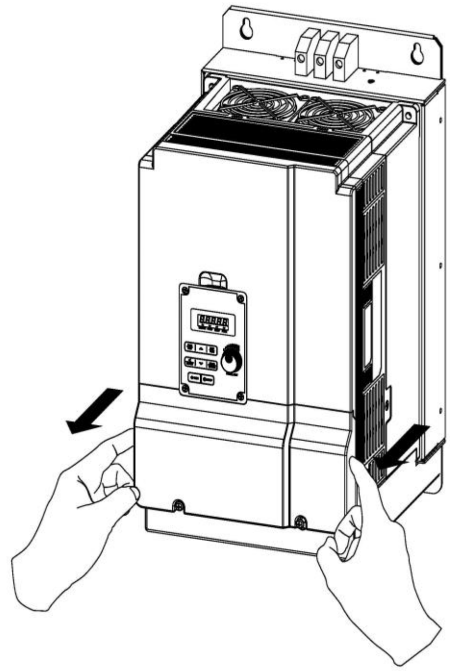
Step4：Tighten the screws

NEMA1

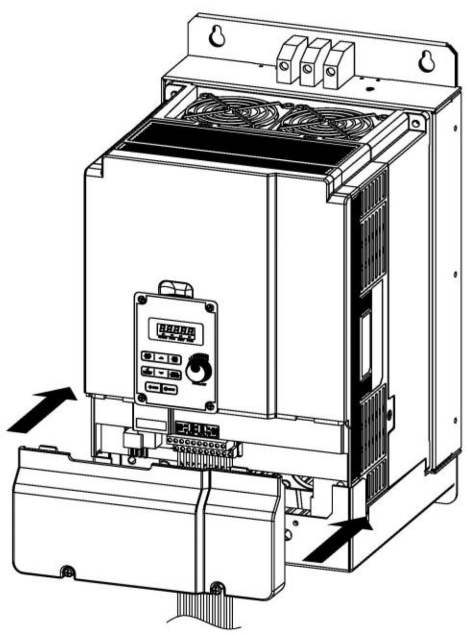
400V 20HP~75HP (with EMC filter)



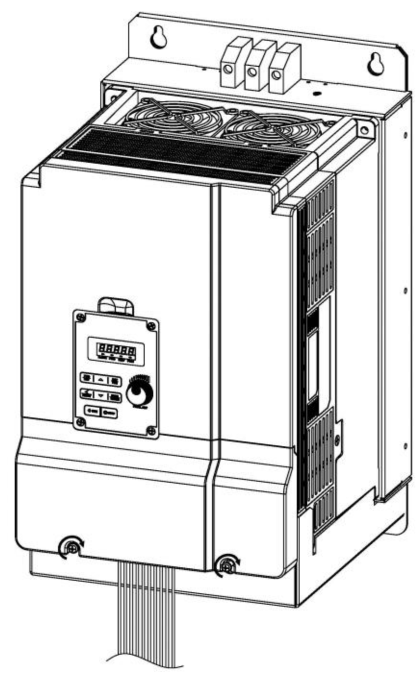
Step1: Unscrew cover



Step2: Remove the terminal cover



Step3：Wire and reinstall the cover



Step4：Tighten the screws

3.6 Wire Gauges, Tightening Torque, Terminal , Short Circuit, Circuit Breaker and Fuse Ratings

Wire Gauges

Frame size	HP	Power specification	Voltage	Amps	TM1 Input wiring (TM1)	TM1 Output wiring (TM1)	TM1 Tightening Torque kgf.cm	TM1 Tightening Torque lbf.in	TM1 Tightening Torque Nm
Frame1	0.5/1	200V～240V	600	20	14 AWG (2.5 mm²)	14 AWG (2.5 mm²)	9.8	8.5	0.96
	1/2	380V～480V			14 – 12 AWG (2.5 – 4.0 mm²)	14 – 12 AWG (2.5 – 4.0 mm²)			
Frame2	2(-H)/3/5	200V～240V	600	45	14 – 8 AWG (2.5 – 10 mm²)	14 – 8 AWG (2.5 – 10 mm²)	18.4	15.9	1.8
	3/5	380V～480V			14 – 8 AWG (2.5 – 10 mm²)	14 – 8 AWG (2.5 – 10 mm²)			
Frame 3/4	7.5/10/15/20	200V～240V	600	100	12 – 6 AWG (4.0 – 16 mm²)	12 – 6 AWG (4.0 – 16 mm²)	24.5	21.2	2.4
	7.5/10/15/20/25	380V～480V	600	65	8 AWG (10 mm²)	8 AWG (10 mm²)			
Frame 5	25	200V～240V	600	100	6 AWG (16 mm²)	6 AWG (16 mm²)	30	26	2.9
	30	380V～480V	600	75	6 AWG (16 mm²)	6 AWG (16 mm²)			
Frame 6	30/40	200V～240V	600	175	0 AWG (50 mm²)	0 AWG (50 mm²)	81.7	70.7	8
	40/50/60/75	380V～480V	600		0 AWG (50 mm²)	0 AWG (50 mm²)			

Frame size	Horsepower	Power specification	TM2 Terminal Wiring Size (TM2)	TM2 Tightening Torque kgf.cm	TM2 Tightening Torque lbf.in	TM2 Tightening Torque Nm
Frame1	0.5/1	200V～240V	26~18 AWG (0.5~1.5 mm²)	5.7	5	0.56
	1/2	380V～480V				
Frame2	2(-H)/3/5	200V～240V				
	3/5	380V～480V				
Frame 3/4	7.5/10/15/20	200V～240V				
	7.5/10/15/20/25	380V～480V				
Frame 5	25	200V～240V	16 AWG (0.5~1.5 mm²)	8	7	0.79
	30	380V～480V				
Frame 6	30/40	200V～240V	14 AWG (0.5~1.5mm²)	8	7	0.79
	40/50/60/75	380V～480V				

NOTES:

* Wire size shown is based on maximum terminal size. Please consult the NEC or local codes for proper size to be used.

* Use only copper wires. Proper diameter wire should be based on ratings at 75°C.

* For safety reasons do not use under sized wiring.

Terminals Electrical Rating

Model	Horsepower	Power Specification	Voltage (Volt)	Current(A)
Frame1	0.5/1	200V~240V	600	20
	1/2	380V~480V		
Frame2	2/3/5	200V~240V		45
	3/5	380V~480V		
Frame 3/4	7.5/10/15/20	200V~240V	600	100
	7.5/10/15/20/25	380V~480V	600	65
Frame 5	25	200V~240V	600	100
	30	380V~480V	600	75
Frame 6	30/40	200V~240V	600	175
	40/50/60/75	380V~480V	600	

Short circuit rating

Device Rating		Short circuit Rating (A)	Maximum Voltage (Volt)
voltage	HP		
230V	0.5~40	5,000	240
460V	1~75	5,000	480

Circuit breaker and Fuse Rating

Model：E510-###-###-U	Circuit breaker current rating	Fuse rating
2P5	15A	15A, 300VAC
201/202	20A	30A, 300VAC
203/205	30A	30A, 300VAC
208	50A	60A, 300VAC
210	60A	100A, 300VAC
215/220	100A	200A, 300VAC
225	100A	200A, 300VAC
230	150A	250A, 600VAC
240	175A	300A, 600VAC
401/402/403/405	15A	15A, 600VAC
408	20A	20A, 600VAC
410	30A	40A, 600VAC
415	50A	70A, 600VAC
420	50A	70A, 600VAC
425	75A	100A, 600VAC
430	75A	120A, 600VAC
440	100A	150A, 600VAC
450	100A	200A, 600VAC
460	150A	250A, 600VAC
475	175A	300A, 600VAC

3.7 Wiring Peripheral Power Devices

Caution

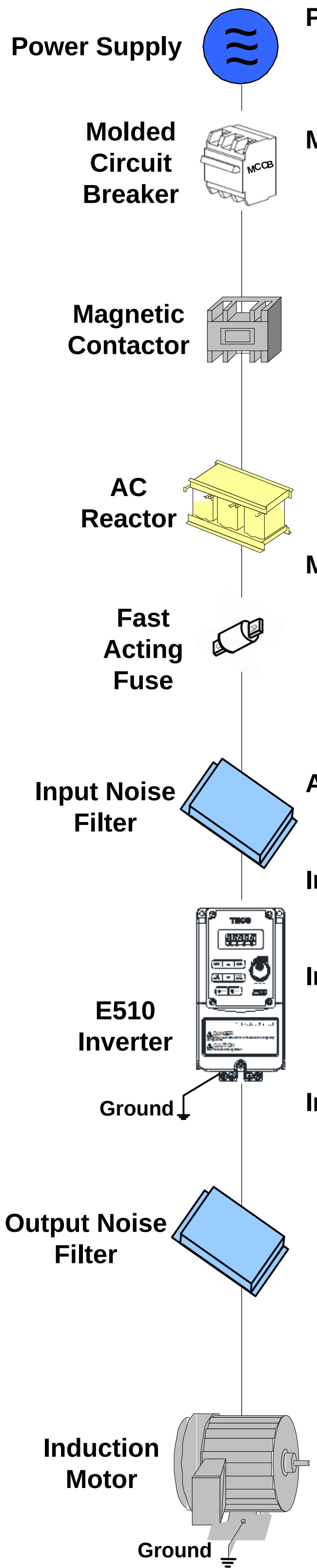
- After power is shut off to the inverter the capacitors will slowly discharge. Do NOT touch and of the inverter circuitry or replace any components until the “CHARGE” indicator is off.
- Do NOT wire or connect/disconnect internal connectors of the inverter when the inverter is powered up or when powered off and the “CHARGE”” indicator is on.
- Do NOT connect inverter output U, V and W to the supply power. This will result in damage to the inverter.
- The inverter must by properly grounded. Use terminal E to connect earth ground and comply with local standards.
- Do NOT perform a dielectric voltage withstand test (Megger) on the inverter this will result in inverter damage to the semiconductor components.
- Do NOT touch any of the components on the inverter control board to prevent damage to the inverter by static electricity.

Caution

- Refer to the recommended wire size table for the appropriate wire to use. The voltage between the power supply and the input of the inverter may not exceed 2%.

  Phase-to-phase voltage drop (V) = $\sqrt{3}$ ×resistance of wire (Ω/km) × length of line m) × current×10^{-3}.
  (km=3280 x feet) / (m=3.28 x feet)

- Reduce the carrier frequency (parameter 11-01) If the cable from the inverter to the motor is greater than 25m (82ft). A high-frequency current can be generated by stray capacitance between the cables and result in an overcurrent trip of the inverter, an increase in leakage current, or an inaccurate current readout.
- To protect peripheral equipment, install fast acting fuses on the input side of the inverter. Refer to section 11.6 for additional information.



Power supply:

- Make sure the correct voltage is applied to avoid damaging the inverter.

Molded-case circuit breaker (MCCB) or fused disconnect:

- A molded-case circuit breaker or fused disconnect must be installed between the AC source and the inverter that conforms to the rated voltage and current of the inverter to control the power and protect the inverter.
- Do not use the circuit breaker as the run/stop switch for the inverter.

Ground fault detector / breaker:

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

Magnetic contactor:

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

AC line reactor for power quality:

- When inverters are supplied by a high capacity power source (> 600KVA), an AC reactor can be connected to improve the power factor.

Install Fast Acting Fuse:

- To protect peripheral equipment, install fast acting fuses in accordance with the specifications in section 11 for peripheral devices.

Input Noise filter:

- A filter must be installed when there are inductive loads affecting the inverter. The inverter meets EN55011 Class A, category C3 when the TECO special filter is used.

Inverter:

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

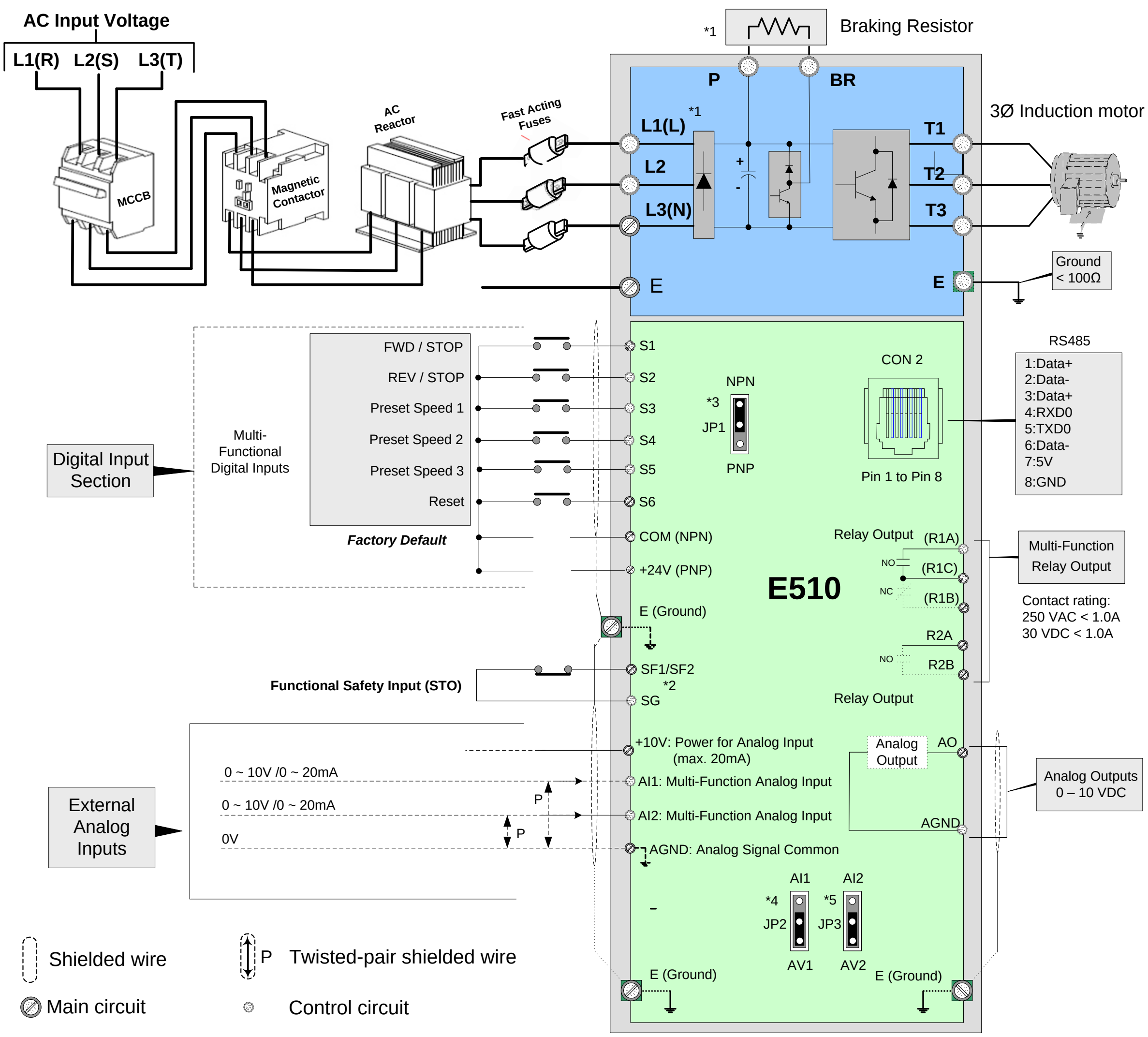
Output Noise filter:

- An output noise filter may reduce system interference and induced noise. See section 11 for peripheral devices.

Motor:

- If the inverter drives multiple motors the output rated current of the inverter must be greater than the total current of all the motors.

3.8 General Wiring Diagram



Notes:

*1: Only 200V 0.5-25HP and 400V 1-40HP have a built-in braking transistor (Terminal B2). The braking resistor can be connected between P and BR.

*2: Run Permissive input SF and SG is a normally closed input. This input should be closed to enable the inverter output. To activate this input place a jumper wire between SF and SG.

*3: Use jumper JP1 to select between Sink (NPN, with 24VG common) or Source (PNP, with +24V common) for multi-function digital input terminals S1~S6.

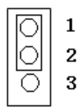
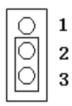
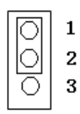
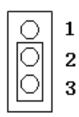
*4: Use jumper JP2 to switch between voltage and current input for Multi-function analog input 1 (AI1).

*5: Use jumper JP3 to switch between voltage and current input for Multi-function analog input 1 (AI2).

3.9 User Terminals (Control Circuit Terminals)

R2A	R2B	R1A	R1B	R1C		S1	S3	S5	24V	AI1	AI2
S(+)	S(-)	SF1	SG		COM	S2	S4	S6	AGND	10V	AO

Jumper function descriptions

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

Description of User Terminals

<table>
<tr><th>Type</th><th>Terminal</th><th colspan="2">Terminal function</th><th>Signal level</th></tr>
<tr><td rowspan="6">Digital inputs</td><td>S1</td><td colspan="2" rowspan="6">Refer to parameter group 3 for more information and default settings.</td><td rowspan="6">24 VDC, 8 mA, Optical coupling isolation (Max, voltage 30 VDC,
Input impedance 3.3kΩ)
High Logic: 13V
Low Logic: 10V</td></tr>
<tr><td>S2</td></tr>
<tr><td>S3</td></tr>
<tr><td>S4</td></tr>
<tr><td>S5</td></tr>
<tr><td>S6</td></tr>
<tr><td rowspan="5">Relay outputs</td><td>R1A</td><td>NO(Normally open)</td><td rowspan="5">Multi-function output: Run, Fault, setting Frequency ,Frequency Reached, Auto Restart, Momentary AC Power Loss, Rapid Stop ,Base Block Stop Mode, Motor Overload Protection, Drive Overload Protection, Over-torque Threshold Level、Preset Current level Reached、Preset Brake Frequency Reached, PID Feedback Signal Loss, Final count value reached, Initial count value reached, PLC Status Indicator ,PLC control…</td><td rowspan="5">250VAC/1A(30VDC/1A)</td></tr>
<tr><td>R1B</td><td>NC(Normally closed)</td></tr>
<tr><td>R1C</td><td>COMMON</td></tr>
<tr><td>R2A</td><td rowspan="2"></td></tr>
<tr><td>R2B</td></tr>
<tr><td rowspan="2">24VPower supply</td><td>COM</td><td colspan="2">Digital signal common terminal (JP1 Switching NPN position)</td><td rowspan="2">±15%,Max output current 60mA</td></tr>
<tr><td>24V</td><td colspan="2">Digital signal common terminal (JP1 Switching PNP position)</td></tr>
<tr><td rowspan="5">Analog inputs</td><td>10V</td><td colspan="2">Built in Power for an external speed potentiometer</td><td>10V(Max current:20mA)</td></tr>
<tr><td>AI1/AV1</td><td colspan="2">Multifunctional analog input: JP2 selects voltage or current input
Voltage: JP2 in AV1 position
Current: JP2 in AI1 position</td><td>0 ~ 10V,(Max current:20mA)
(Input impedance: 153KΩ)</td></tr>
<tr><td>AI2/AV2</td><td colspan="2">Multifunctional analog input: JP3 selects voltage or current input
Voltage: JP3 in AV2 position
Current: JP3 in AI2 position</td><td>0 ~ 10V,0 ~20mA
(Input impedance: 153KΩ)</td></tr>
<tr><td>AGND</td><td colspan="2">The analog common terminal</td><td>----</td></tr>
<tr><td>⏚</td><td colspan="2">Shielding wire connecting terminal (The earth)</td><td>----</td></tr>
<tr><td rowspan="2">Analog output</td><td>AO</td><td colspan="2">Multifunctional analog output terminal*3</td><td>0 ~10V,(Max current:2mA)</td></tr>
<tr><td>AGND</td><td colspan="2">The analog common terminal</td><td>----</td></tr>
<tr><td rowspan="2">Safety switch</td><td>SF1,SF2</td><td colspan="2" rowspan="2">Terminal SF is a safety input and can be used to disable drive externally. Note SF2 only available on ‘F’ version inverters.</td><td></td></tr>
<tr><td>SG</td><td></td></tr>
</table>

Notes:

*1:Multi-function digital input can be referred to in this manual.

- Group 03: External Terminals Digital Input / Output Function Group.

*2:Multi-function analog input can be referred to in this manual.

- Group 04 - External Terminal Analog Signal Input (Output) Function Group.

*3:Multi-function analog output can be referred to in this manual.

- Group 04 - External Terminal Analog Signal Input (Output) Function Group.

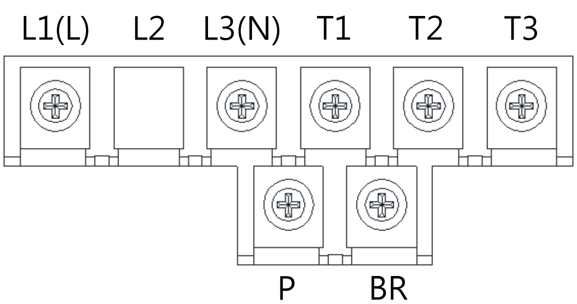
Caution

- Maximum output current capacity for terminal 10V is 20mA.
- Multi-function analog output AO is for use of an analog output meter. Do not use this output for feedback control.
- Control board's is to be used for internal control only, Do not use the internal power-supply to power external devices.

3.10 Power Terminals

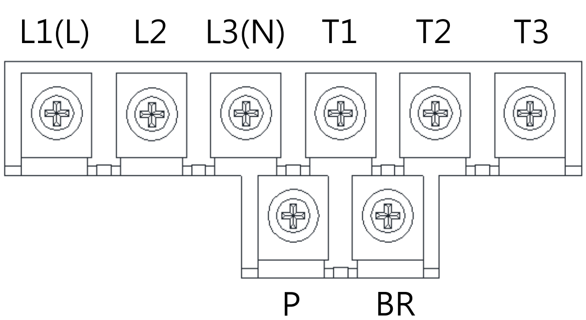
Terminal symbol	TM1 function description		
L1(L)	Main power input,	Single phase：	L1(L)/L3(N)
L2		Single/Three phase：	L1(L)/L2/L3(N)
L3(N)		Three phase：	L1/L2/L3
T1	Inverter output, connect to U/V/W terminals of motor		
T2			
T3			
P	Externally connected braking resistor (Please see the braking resistors reference on section 11.2)		
BR			
⏚	Ground terminal		

Main power terminal of Single phase 200V Class 0.5~1HP

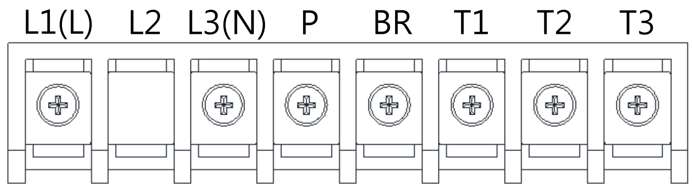


Note：Screw on L2 terminal is removed for single phase input models.

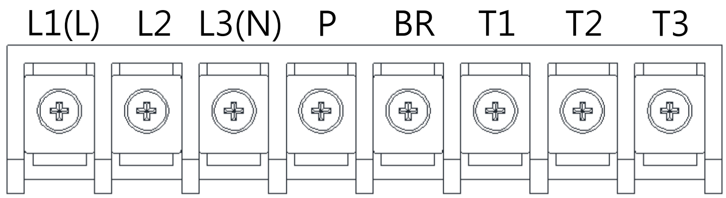
Main power terminal of Single/Three phase 200V Class 0.5~1HP and Three phase 400V Class 1~2HP.



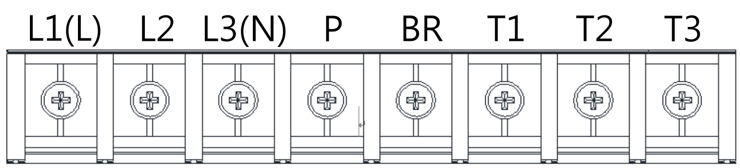
Main power terminal of Single/Three phase 200V Class 2~3HP



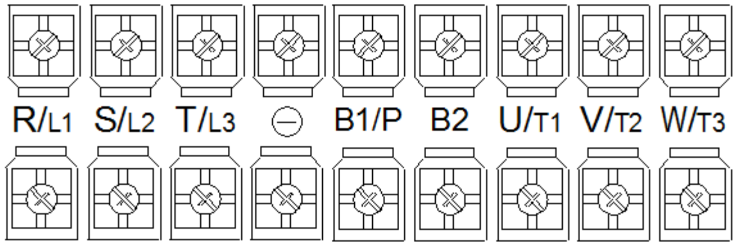
Main power terminal of Single/Three phase 200V Class 2~3HP, Three phase 200V Class 5HP and Three phase 400V Class 3~5HP



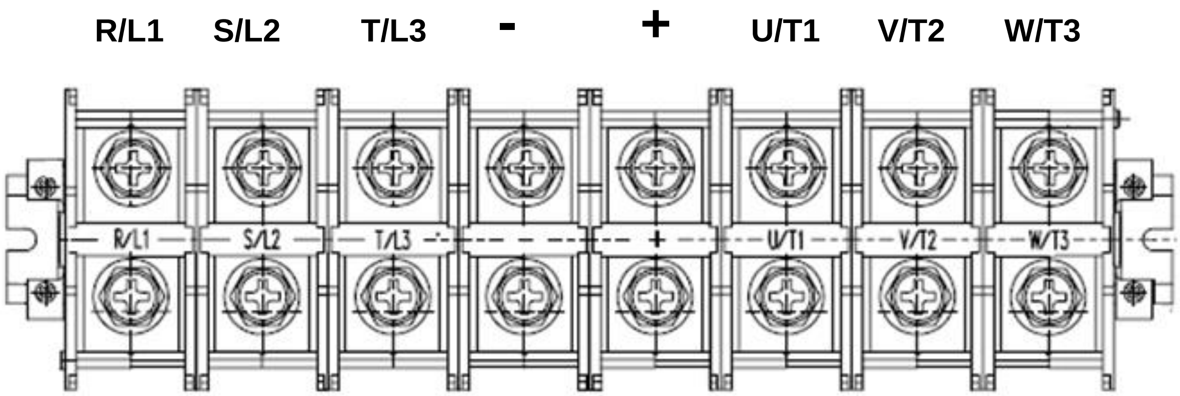
Main power terminal of Three phase 200V Class 7.5~20HP and Three phase 400V Class 7.5~20HP



Main power terminal of Three phase 200V Class 25HP and Three phase 400V Class 30HP



Main power terminal of Three phase 200V Class 30~40HP and Three phase 400V Class 40~75HP



3.11 Inverter Wiring

Wiring Precautions

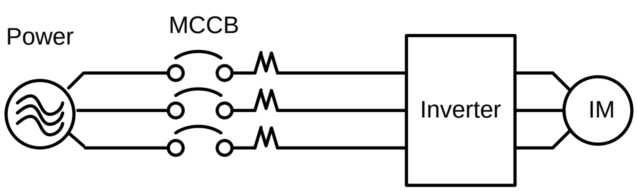
Danger	• Do **NOT** remove any protective covers or attempt any wiring while input power is applied. Connect all wiring before applying input power. When making wiring changes after power up, remove input power and wait a minimum of five minutes after power has been turned off before starting. Also confirm that the charge lamp is off and that DC voltage between terminals B1/P or (+) and (-) does not exceed 25V, otherwise **electric shock may result.** • Only authorized personnel should work on the equipment. (Take off metal jewelry such as watches and rings and use insulated tools.), otherwise **electric shock or injury may result.**

(A) Power input terminals

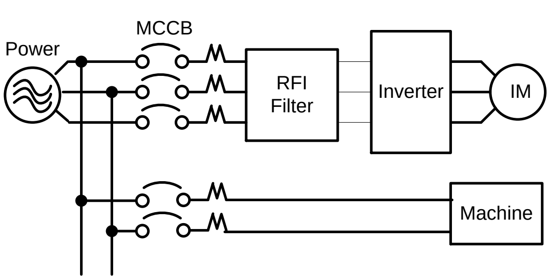
1. The Input power supply voltage can be connected in any phase sequence to power input terminals R/L1, S/L2, or T/L3 on the terminal block.
2. DO NOT connect the AC input power source to the output terminals U/T1, V/T2 and. W/T3.
3. Connect the output terminals U/T1, V/T2, W/T3 to motor lead wires U/T1, V/T2, and W/T3, respectively.
4. Check that the motor rotates forward with the forward run source. If it does not, swap any 2 of the output cables to change motor direction.
5. DO NOT connect phase correcting capacitors or LC/RC noise filter to the output circuit.

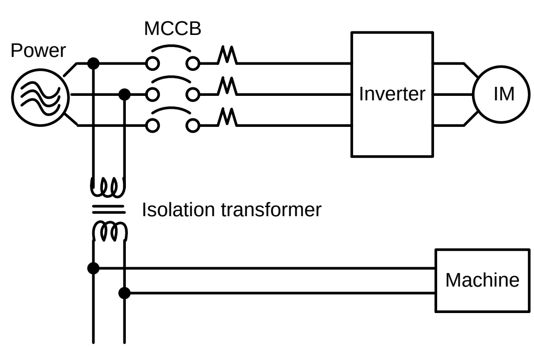
Example power connections:

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.





(B) Grounding

1. Connect the ground terminal (E) to ground having a resistance of less than 100Ω.
2. Do not share the ground wire with other devices, such as welding machines or power tools.
3. Always use a ground wire that complies with the local codes and standards for electrical equipment and minimize the length of ground wire.
4. When using more than one inverter, be careful not to loop the ground wire, as shown below in Fig. 3.11.1.

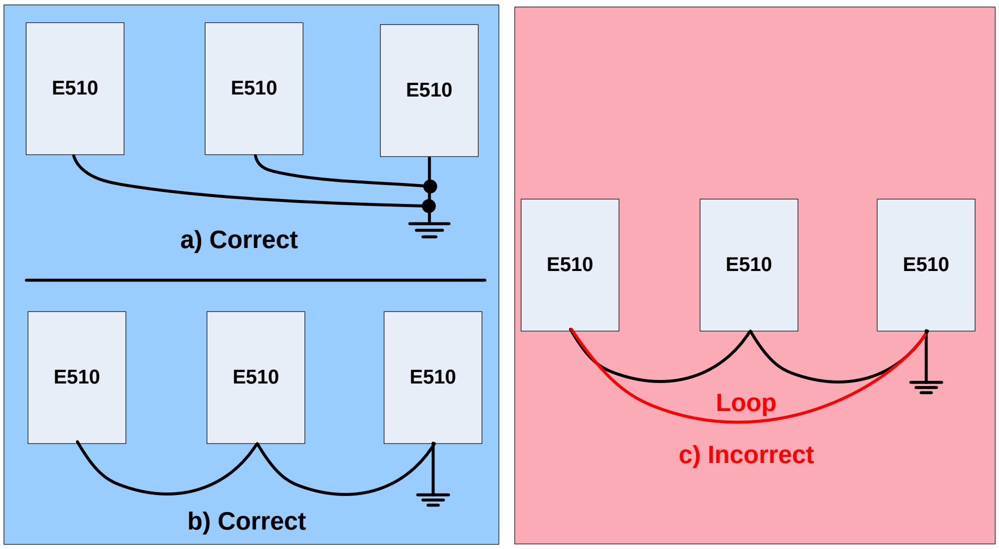


Fig. 3.11.1 Inverter Grounding

3.12 Input Power and Motor Cable Length

The length of the cables between the input power source and /or the motor and inverter can cause a significant phase to phase voltage reduction due to the voltage drop across the cables. The wire size shown in Tables 3.13.1 is based on a maximum voltage drop of 2%. If this value is exceeded, a wire size having larger diameter may be needed. To calculate phase tot phase voltage drop, apply the following formula:

Phase-to-phase voltage drop (V) = $\sqrt{3}$ ×resistance of wire (Ω/km) × length of line m) × current×10^{-3}.

(km=3280 x feet)
(m=3.28 x feet)

3.13 Cable Length vs. Carrier Frequency

The allowable setting of the PWM carrier frequency is also determined by motor cable length and is specified in the following Table 3.13.1.

Table 3.13.1 Cable Length vs. Carrier Frequency

Cable length between the inverter and Motor in m (ft.).	< 30m (100)	30 – 50 (100 – 165)	50 – 100 (166 - 328)	$\geq$ 100 (329)
Recommended carrier frequency allowed Parameter 11-01	16kHz (max)	10 kHz (max)	5 kHz (max)	2 kHz (max)

3.14 Installing an AC Line Reactor

If the inverter is connected to a large-capacity power source (600kVA or more), install an optional AC reactor on the input side of the inverter. This also improves the power factor on the power supply side.

3.15 Power Input Wire Size, and NFB

The following table shows the recommended wire size for each frame of the E510. It depends on the application whether or not to install a circuit breaker. The NFB must be installed between the input power supply and the inverter input (L1 (L), L2, L3 (N)).

Note: When using a ground protection make sure the current setting is above 200mA and trip delay time is 0.1 sec of higher.

Table 3.13.1 Wire size and tightening torque for frame 1 ~ 6

TM1					TM2			
Frame size	**Wire Size**	**Tightening Torque**			**Wire Size**	**Tightening Torque**		
		kgf.cm	**lbf.in**	**Nm**		**kgf.cm**	**lbf.in**	**Nm**
Frame1	14 AWG (2.5 mm²) 14 – 12 AWG (2.5 – 4.0 mm²)	9.8	8.5	0.96	26~18 AWG (0.5~1.5 mm²)	5.7	5	0.56
Frame2	14 – 8 AWG (2.5 – 10 mm²) 14 – 8 AWG (2.5 – 10 mm²)	18.4	15.9	1.8				
Frame 3/4	12 – 6 AWG (4.0 – 16 mm²) 8 AWG (10 mm²)	24.5	21.2	2.4				
Frame 5	6 AWG (16 mm²) 6 AWG (16 mm²)	30	26	2.9	16 AWG (0.5~1.5 mm²)	8	7	0.79
Frame 6	0 AWG (50 mm²) 0 AWG (50 mm²)	81.7	70.7	8	14 AWG (0.5~1.5mm²)	8	7	0.79

3.16 Control Circuit Wiring

(1) Separate the wiring for control circuit terminals from main circuit wiring for terminals (R/L1, S/L2, T/L3, U/T1, V/T2, W/T3).

(2) Separate the wiring for control circuit terminals R1A-R1B-R1C or R2A, R2B (Relay outputs) from wiring for terminals S1 – S6, A0, AGND, +10V, AI1, AI2 and GND wiring.

(3) Use shielded twisted-pair cables (#24 - #14 AWG / 0.5 -2 mm^2) shown in Fig. 3.14.1 for control circuits to minimize noise problems. The maximum wiring distance should not exceed 50m (165 ft).

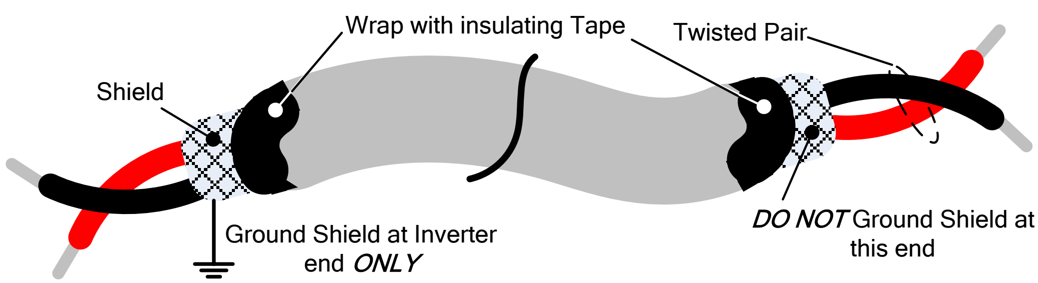


Fig. 3.14.1 Shielded Twisted-Pair

3.17 Inverter Specification

200V Class：Single phase

Model：E510-□□□-H1F-U*	2P5	201	202	203
Horse power (HP)	0.5	1	2	3
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：200~240V, 50/60HZ			
Allowable voltage fluctuation	-15%~+10%			
Output voltage range(V)	Three phase：0~240V			
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	IP20/NEMA1			

200V Class：Single/Three phase

Model：E510-□□□-H-U	2P5	201	202	203
Horse power (HP)	0.5	1	2	3
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/Three：200~240V, 50/60HZ			
Allowable voltage fluctuation	-15%~+10%			
Output voltage range(V)	Three phase：0～240V			
Input current (A)*	8.5/4.5	12/6.5	16/11	23.9/12.5
Inverter net weight (KG)	1.6	1.6	2.5	2.5
Allowable momentary power loss time(s)	2.0	2.0	2.0	2.0
Enclosure	IP20/NEMA1			

* F Version models are not available as standard product in Americas.

200V Class：Three phase

Model：E510-□□□-H3-U	202	205	208	210	215	220
Horse power (HP)	2	5	7.5	10	15	20
Suitable motor capacity (KW)	1.5	4	5.5	7.5	11	15
Rated output current (A)	7.5	17.5	26	35	48	64
Rated capacity (KVA)	2.9	6.7	9.9	13.3	20.6	27.4
Input voltage range(V)	Three phase：200~240V,50/60HZ					
Allowable voltage fluctuation	-15%~+10%					
Output voltage range(V)	Three phase：0~240V					
Input current (A)*	11	20.5	33	42	57	70
Inverter net weight (KG)	1.6	2.5	6.5	6.5	10.1	10.4
Allowable momentary power loss time(s)	2.0	2.0	2.0	2.0	2.0	2.0
Enclosure	IP20/NEMA1					

Model：E510-□□□-H3-U	225	230	240
Horse power (HP)	25	30	40
HD/ND Suitable motor capacity (kW)	18.5/22	22/30	30/37
HD/ND Rated output current (A)	73/80	85/110	115/138
HD/ND Rated capacity (KVA)	27.8/30.1	32.4/41.9	43.8/52.6
Input voltage range(V)	Three phase：200~240V,50/60HZ		
Allowable voltage fluctuation	-15%~+10%		
Output voltage range(V)	Three phase：0~240V		
Input current (A)*	79.4/85.9	92.4/119.6	125/150
Inverter net weight (KG)	10	30	30
Allowable momentary power loss time(s)	2.0	2.0	2.0
Enclosure	IP20/NEMA1		

400V Class：Three phase

Model：E510-□□□-H3(F*)-U	401	402	403	405
Horse power (HP)	1	2	3	5
Suitable motor capacity (KW)	0.75	1.5	2.2	4.0
Rated output current (A)	2.5	3.8	5.3	9.2
Rated capacity (KVA)	1.7	2.9	4.0	6.7
Input voltage range(V)	Three phase：380~480V,50/60HZ			
Allowable voltage fluctuation	-15%~+10%			
Output voltage range(V)	Three phase：0～480V			
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	IP20/NEMA1			

Model：E510-□□□-H3(F*)-U	408	410	415	420	425
Horse power (HP)	7.5	10	15	20	25
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：380~480V,50/60HZ				
Allowable voltage fluctuation	-15%~+10%				
Output voltage range(V)	Three phase：0~480V				
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	IP20/NEMA1				

Model：E510-□□□- H3(F*)-U	420	425
Horse power (HP)	20	25
Suitable motor capacity (KW)	15	18.5
Rated output current (A)	32	40
Rated capacity (KVA)	24	30.5
Input voltage range(V)	Three phase：380~480V,50/60HZ	
Allowable voltage fluctuation	-15%~+10%	
Output voltage range(V)	Three phase：0~480V	
Input current (A)*	38	48
Inverter net weight (KG)	10	10
Allowable momentary power loss time(s)	2.0	2.0
Enclosure	IP20/NEMA1	

* F Version models are not available as standard product in Americas.

400V Class：Three phase

Model：E510-□□□- H3(F*)-U	430	440
Horse power (HP)	30	40
HD/ND Suitable motor capacity (kW)	22/30	30/37
HD/ND Rated output current (A)	45/58	60/73
HD/ND Rated capacity (KVA)	34.3/44.2	45.7/55.6
Input voltage range(V)	Three phase : 380~480V,50/60HZ	
Allowable voltage fluctuation	+10%-15%	
Output voltage range(V)	Three phase : 0~480V	
Input current (A)*	48.9/63	65.2/78.3
Inverter net weight (KG)	20	30
Allowable momentary power loss time(s)	2.0	
Enclosure	IP20/NEMA1	

Model：E510-□□□- H3(F*)-U	450	460	475
Horse power (HP)	50	60	75
HD/ND Suitable motor capacity (kW)	37/45	45/55	55/75
HD/ND Rated output current (A)	75/88	91/103	118/145
HD/ND Rated capacity (KVA)	57.2/67.1	69.3/78.5	89.9/111
Input voltage range(V)	Three phase : 380~480V,50/60HZ		
Allowable voltage fluctuation	+10%-15%		
Output voltage range(V)	Three phase : 0~480V		
Input current (A)*	81.5/95.7	98.9/112	130/159
Inverter net weight (KG)	30	30	35
Allowable momentary power loss time(s)	2.0	2.0	2.0
Enclosure	IP20/NEMA1		

* F Version models are not available as standard product in Americas.

3.18 General Specification

Item		E510
Control Mode		V/F, SLV, PMSLV control mode
Frequency	Output Frequency	0.01 ~ 599.00Hz
	Starting Torque	150% / 1Hz (SLV mode) · 150% / 3Hz (V/F mode)
	Speed Control Range	1:50
	Setting resolution	Digital input: 0.01Hz
		Analog input:0.06Hz/60Hz
	Setting	Keypad: Set directly with ▲▼ keys or the VR on the keypad
		External Input Terminals: AI1(0/2~10V), AI2(0/4~20mA)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	Keypad run, stop button
		External terminals: Multi- operation-mode2 / 3 wire selection Jog operation
		Run signal by communication method.
Main Control Features	V / F curve setting	15 fixed curves and one customized curve
	Carrier frequency	1~16KHz (factory setting is 5kHz)
	Acceleration and deceleration control	2 Acceleration / deceleration time parameters. 4 off S curve parameters.
	Multifunction input	Refer to description in group 3
	Multifunction output	Refer to description in group 3
	Multifunction analog output	Refer to description in group 4
	Main features	Overload Detection,16 preset speeds, Auto-run, Acc/Dec Switch (2 Stages),Main/Alt run Command select, Main/Alt Frequency Command selection, PID control, torque boost, V/F start Frequency, Fault reset.
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 (OL1)	Electrical overload protection curve
	Overload Protection (OL2)	H.D mode：150% rated current for 1 minute. N.D mode：120% rated current for 1 minute
	Over voltage	200V Class：DC bus voltage higher than 410Vdc 400V Class：DC bus voltage higher than 820Vdc
	Under Voltage	200V Class：DC bus voltage lower than 190V 400V Class：DC bus voltage lower than 380V
	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 decreases based on the temperature, Fault output, Reverse prohibit, Prohibit for direct start after power up and error recovery ,parameter lock up, STO (Safety Torque Off)
	All frames include brake transistor	
Communication control		Built-in RS485 communication multi-drop communication. Built-in BACnet communication for building control. (Ex：Fire protection system, Air conditioning system, Monitoring system and Access control system)
Environment	Operating temperature	IP20/NEMA1 type： -10~50°C(without sticker or upper dust cover) -10~40°C(with sticker or upper dust cover)
	Storage temperature	-20~60°C
	Humidity	95% RH or less (no condensation) (Compliance with IEC 60068 - 2-78)
	Vibration	1G. (9.8m/s²) for < 20Hz. 0.6G (5.88m/s²) 20Hz~50Hz (Follow IEC60068-2-6 standard
	Enclosure	IP20/NEMA1

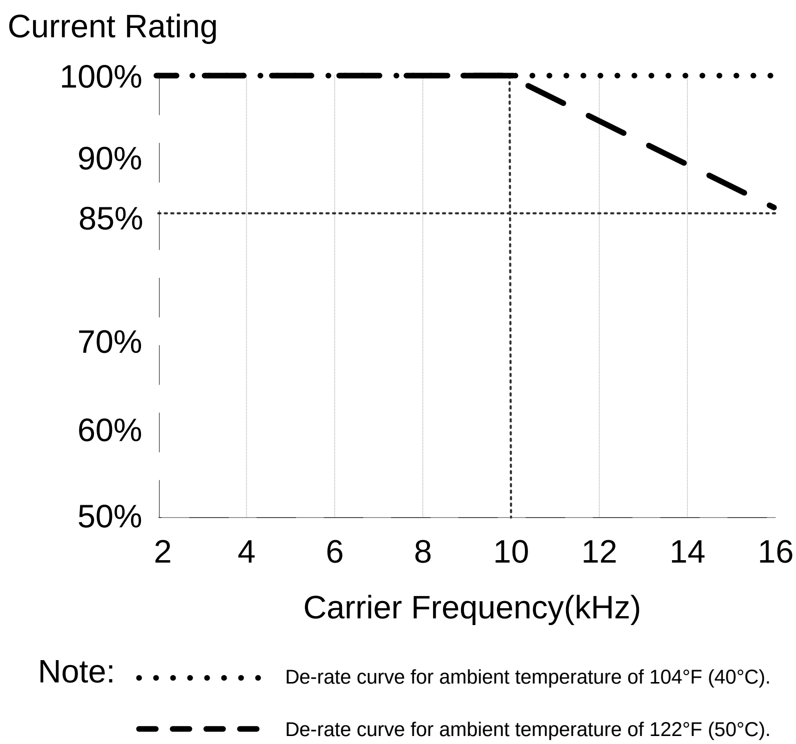
3.19 Inverter derating based on Carrier Frequency

The curves are showing the applicable output current de-rate due to setting of carrier frequency and the ambient operating temperatures of 40 and 50 degrees.

When the carrier frequency is below 10 KHz ambient temperature will not affect rated current.

When the carrier frequency is higher than 10 KHz
If the ambient temperature is below 40°C (104°F), 100% output rated current at 16 KHz.
If the ambient temperature is below 50°C (122°F), 85% output rated current at 16 KHz.

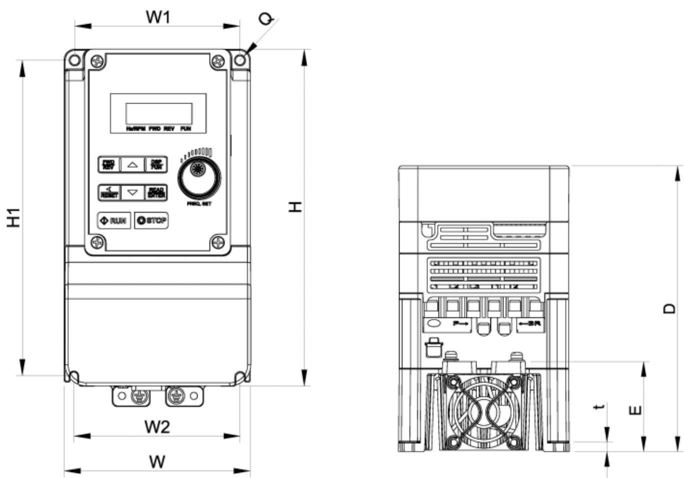
It is required to derate 1.5% of output rated current each additional degree when the ambient temperature rises above 50 degrees °C (122°F)..



3.20 Inverter Dimensions

IP20 Dimensions

200V Class single phase：0.5HP~1HP
200V Class three phase：2HP
400V Class three phase：1HP~2HP



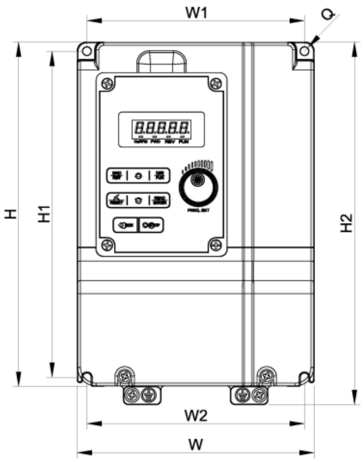
Inverter Model	Dimensions in mm (inch)									Net Weight in kg/(lbs)
	W	W1	W2	H	H1	D	E	t	Q	
E510-2P5-H-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.6/(3.5)
E510-201-H-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.6/(3.5)
E510-2P5-H1F-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)
E510-201-H1F-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)
E510-202-H3-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)
E510-401-H3-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)
E510-402-H3-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)
E510-401-H3F-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)
E510-402-H3F-U	90.6 (3.57)	80.5 (3.17)	80.5 (3.17)	164 (6.46)	153 (6.02)	151.4 (5.96)	47 (1.85)	5 (0.19)	M4	1.7/(3.8)

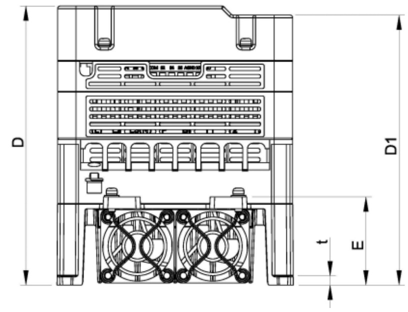
* F Version models are not available as standard product in Americas.

200V Class single/three phase：2HP

400V Class three phase：3~25HP

200V Class three phase：3~20HP





Inverter Model	Dimensions in mm (inch)											Net Weight in Kg/(lbs)
	W	W1	W2	H	H1	H2	D	D1	E	t	Q	
E510-202-H-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-203-H-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-202-H1F-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-203-H1F-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-205-H3-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-403-H3-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-405-H3-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-403-H3F-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-405-H3F-U	128.7 (5.07)	118 (4.65)	118 (4.65)	187.6 (7.39)	177.6 (6.99)	197.5 (7.78)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	5 (0.19)	M4	2.5/(5.5)
E510-208-H3-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.5/(14.3)
E510-210-H3-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.5/(14.3)
E510-408-H3-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.5/(14.3)
E510-410-H3-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.5/(14.3)

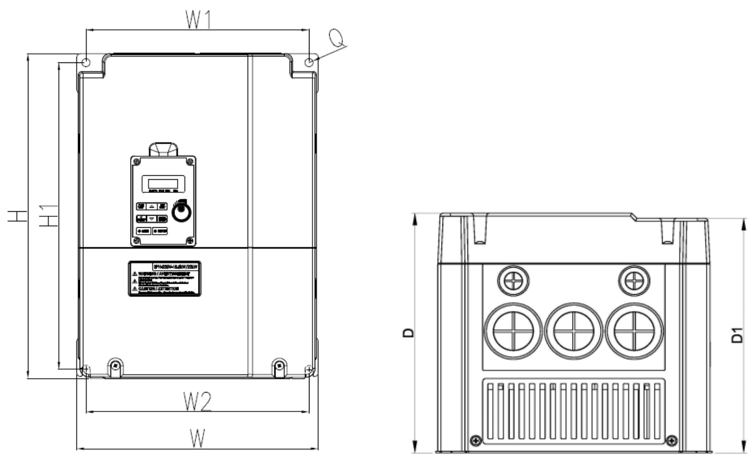
* F Version models are not available as standard product in Americas.

Inverter Model	Dimensions in mm (inch)											Net Weight in Kg/(lbs)
	W	W1	W2	H	H1	H2	D	D1	E	t	Q	
E510-415-H3-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.5/(14.3)
E510-408-H3F-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.7/(14.8)
E510-410-H3F-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.7/(14.8)
E510-415-H3F-U	186.9 (7.36)	175 (6.89)	176 (6.93)	260.9 (10.27)	249.8 (9.83)	273 (10.75)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	6.5 (0.26)	M4	6.7/(14.8)
E510-215-H3-U	224.6 (8.84)	207 (8.15)	207 (8.15)	321.6 (12.66)	303.5 (11.95)	330.9 (13.03)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	8 (0.31)	M5	10.1/(22.3)
E510-220-H3-U	224.6 (8.84)	207 (8.15)	207 (8.15)	321.6 (12.66)	303.5 (11.95)	330.9 (13.03)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	8 (0.31)	M5	10.4/(22.9)
E510-420-H3-U	224.6 (8.84)	207 (8.15)	207 (8.15)	321.6 (12.66)	303.5 (11.95)	330.9 (13.03)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	8 (0.31)	M5	10.5/(23.2)
E510-425-H3-U	224.6 (8.84)	207 (8.15)	207 (8.15)	321.6 (12.66)	303.5 (11.95)	330.9 (13.03)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	8 (0.31)	M5	10.5/(23.2)

* F Version models are not available as standard product in Americas.

200V Class three phase：25HP

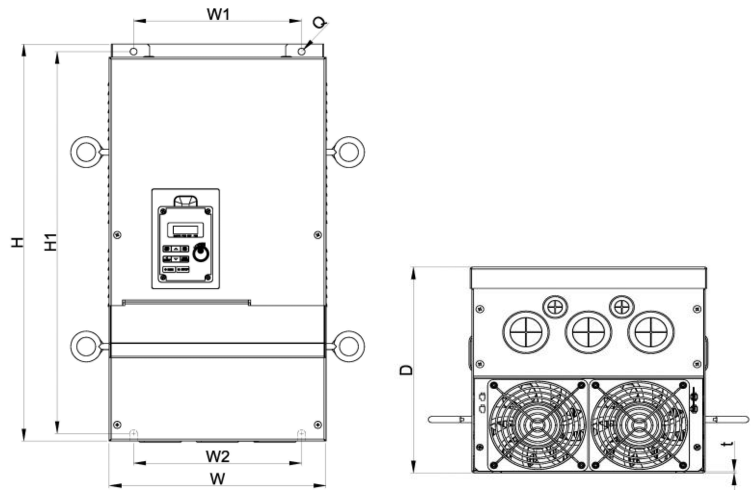
400V Class three phase：30HP



Inverter Model	Dimensions in mm (inch)									Net Weight in Kg/(lbs)
	W	**W1**	**W2**	**H**	**H1**	**D**	**D1**	**t**	**Q**	
E510-225-H3-U	265 (10.43)	245 (9.65)	245 (9.65)	360 (14.17)	340 (13.39)	238.2 (9.38)	233.2 (9.18)	1.6 (0.06)	M8	10/(22.1)
E510-430-H3-U	265 (10.43)	245 (9.65)	245 (9.65)	360 (14.17)	340 (13.39)	238.2 (9.38)	233.2 (9.18)	1.6 (0.06)	M8	10/(22.1)

200V Class three phase：30~40HP

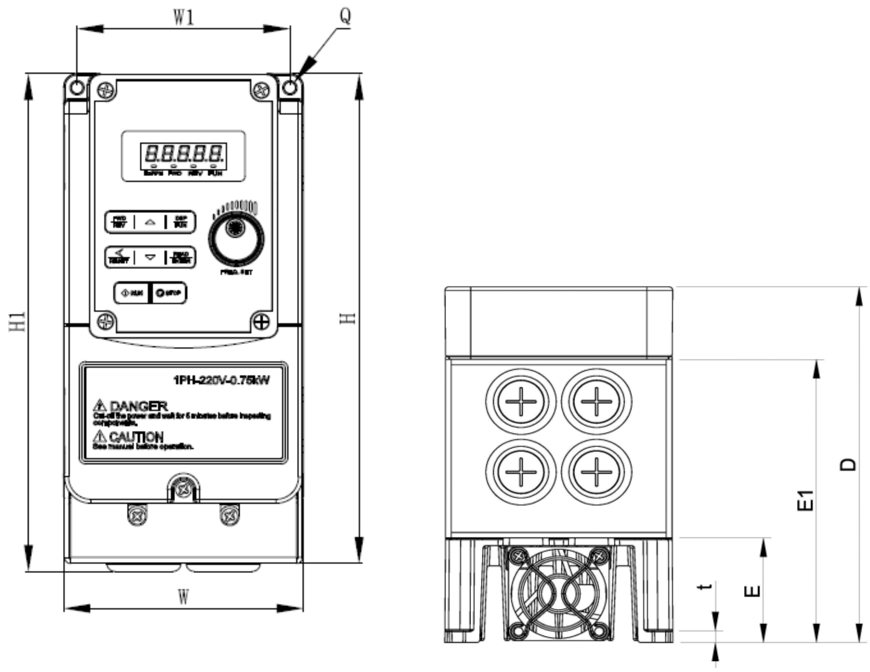
400V Class three phase：40~75HP



Inverter Model	Dimensions in mm (inch)								Net Weight in Kg/(lbs)
	W	W1	W2	H	H1	D	t	Q	
E510-230-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-240-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-440-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-450-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-460-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-475-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	35/(77.2)

NEMA 1 Dimensions

200V Class single phase：0.5~1HP
400V Class three phase：1~2HP
200V Class three phase：2HP



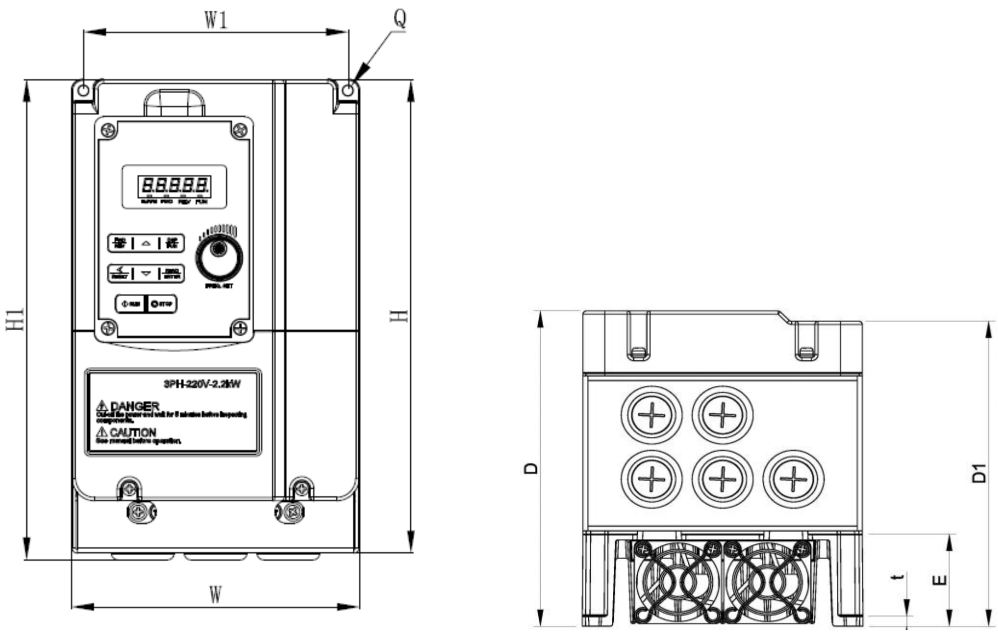
Inverter Model	Dimensions in mm (inch)									Net Weight in Kg/(lbs)
	W	W1	H	H1	D	E	E1	t	Q	
E510-2P5-H-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.8/(3.9)
E510-201-H-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.8/(3.9)
E510-2P5-H1F-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)
E510-201-H1F-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)
E510-202-H3-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)
E510-401-H3-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)
E510-402-H3-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)
E510-401-H3F-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)
E510-402-H3F-U	90.6 (3.57)	80.5 (3.17)	186.2 (7.33)	189.2 (7.45)	151.4 (5.96)	47 (1.85)	120.5 (4.74)	5 (0.19)	M4	1.9/(4.2)

* F Version models are not available as standard product in Americas.

200V Class single phase/three phase：2HP

400V Class three phase：3~25HP

200V Class three phase：3~20HP



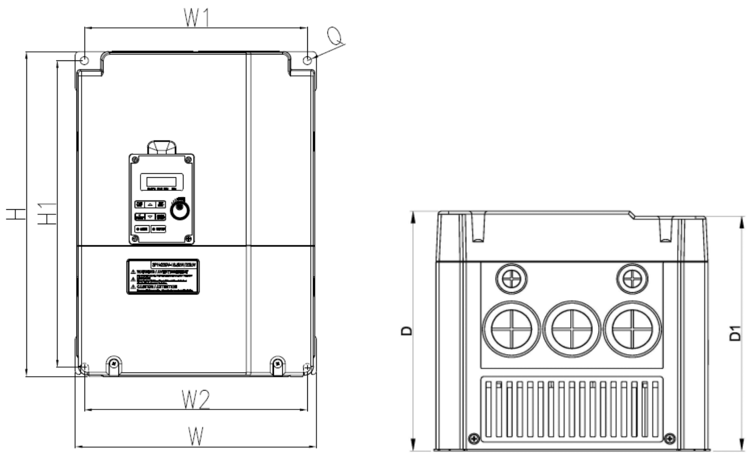
Inverter Model	Dimensions in mm (inch)										Net Weight in kg/(lbs)
	W	**W1**	**H**	**H1**	**D**	**D1**	**E**	**E1**	**t**	**Q**	
E510-202-H-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.7/(5.9)
E510-203-H-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.7/(5.9)
E510-202-H1F-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-203-H1F-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-205-H3-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-403-H3-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-405-H3-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-403-H3F-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-405-H3F-U	128.7 (5.06)	118 (4.65)	210.6 (8.29)	213.6 (8.41)	152.4 (6)	147.4 (5.8)	48.2 (1.9)	121.1 (4.77)	5 (0.19)	M4	2.8/(6.2)
E510-208-H3-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	6.9/(15.2)
E510-210-H3-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	6.9/(15.2)

E510-408-H3-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	6.9/(15.2)
E510-410-H3-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	6.9/(15.2)
E510-415-H3-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	6.9/(15.2)
E510-408-H3F-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	7.1/(15.7)
E510-410-H3F-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	7.1/(15.7)
E510-415-H3F-U	186.9 (7.36)	175 (6.89)	291 (11.47)	293.5 (11.56)	202.6 (7.98)	197.6 (7.78)	76.7 (3.02)	170.6 (6.72)	6.5 (0.26)	M4	7.1/(15.7)
E510-215-H3-U	224.6 (8.84)	207 (8.15)	358.3 (14.1)	363.3 (14.3)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	174 (6.85)	8 (0.31)	M4	10.5/(23.2)
E510-220-H3-U	224.6 (8.84)	207 (8.15)	358.3 (14.1)	363.3 (14.3)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	174 (6.85)	8 (0.31)	M4	10.5/(23.2)
E510-420-H3-U	224.6 (8.84)	207 (8.15)	358.3 (14.1)	363.3 (14.3)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	174 (6.85)	8 (0.31)	M4	10.9/(24)
E510-425-H3-U	224.6 (8.84)	207 (8.15)	358.3 (14.1)	363.3 (14.3)	206.1 (8.11)	201.1 (7.92)	94 (3.7)	174 (6.85)	8 (0.31)	M4	11/(24.3)

* F Version models are not available as standard product in Americas.

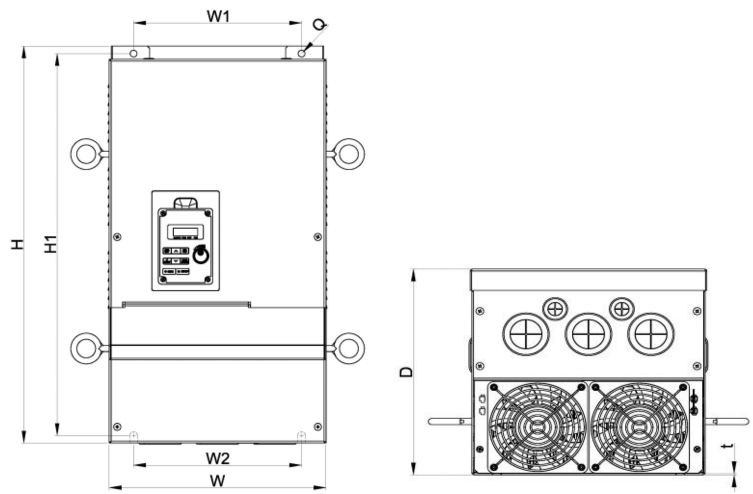
200V Class three phase：25HP

400V Class three phase：30HP



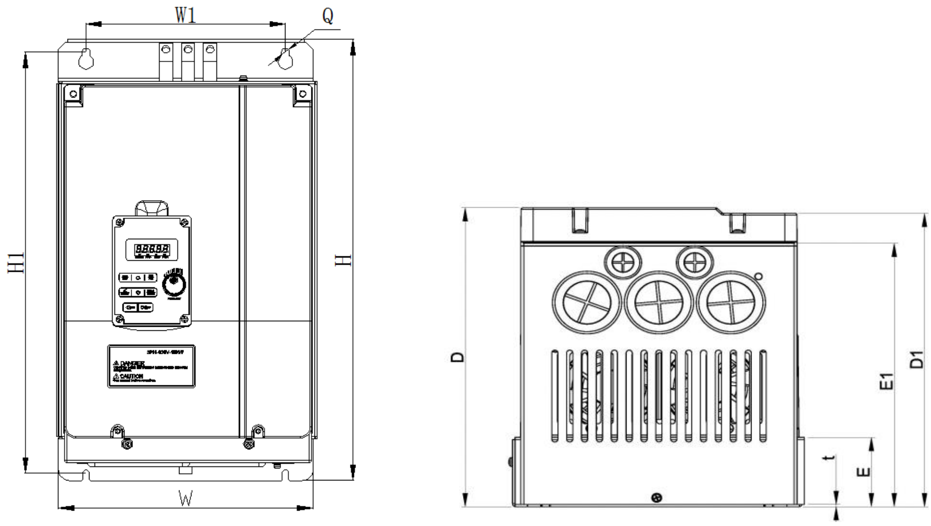
Inverter Model	Dimensions in mm (inch)									Net Weight in Kg/(lbs)
	W	**W1**	**W2**	**H**	**H1**	**D**	**D1**	**t**	**Q**	
E510-225-H3-U	265 (10.43)	245 (9.65)	245 (9.65)	360 (14.17)	340 (13.39)	238.2 (9.38)	233.2 (9.18)	1.6 (0.06)	M8	10/(22.1)
E510-430-H3-U	265 (10.43)	245 (9.65)	245 (9.65)	360 (14.17)	340 (13.39)	238.2 (9.38)	233.2 (9.18)	1.6 (0.06)	M8	10/(22.1)

200V Class three phase：30~40HP
400V Class three phase：40~75HP



Inverter Model	Dimensions in mm (inch)								Net Weight in Kg/(lbs)
	W	W1	W2	H	H1	D	t	Q	
E510-230-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-240-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-440-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-450-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-460-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	30/(66.1)
E510-475-H3-U	286.5 (11.28)	220 (8.66)	220 (8.66)	525 (20.67)	505 (19.88)	269.8 (10.62)	3.3 (0.13)	M8	35/(77.2)

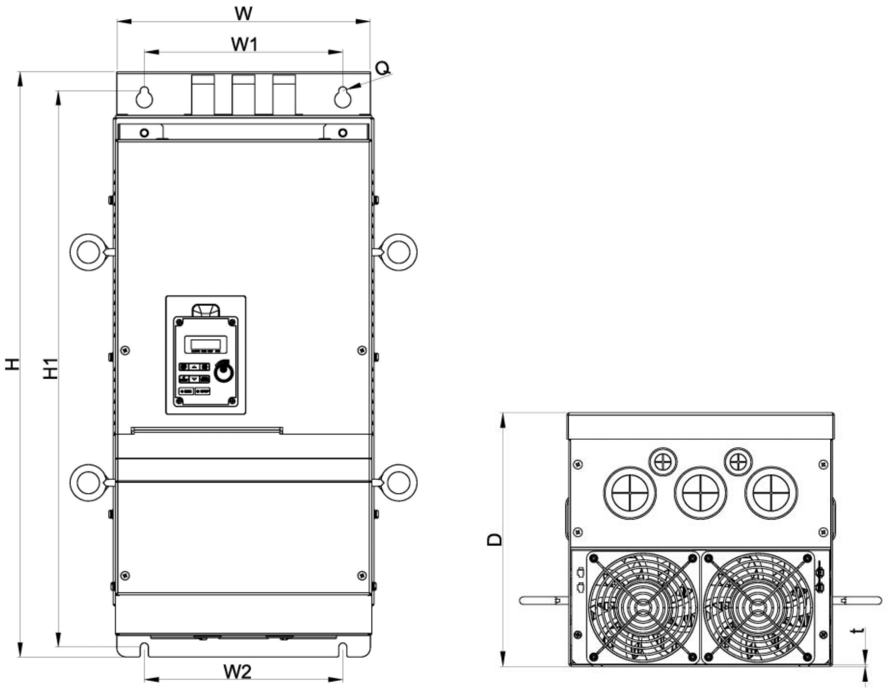
400V Class three phase：20~30HP (built-in EMC filter)



Inverter Model	Dimensions in mm (inch)										Net Weight in Kg/(lbs)
	W	W1	H	H1	D	D1	E	E1	t	Q	
E510-420-H3F-U	235.6 (9.28)	180 (7.09)	400 (15.75)	381.5 (15.02)	267.1 (10.52)	262.1 (10.32)	62 (2.44)	237 (9.33)	4 (0.16)	M6	13.8/(30.4)
E510-425-H3F-U	235.6 (9.28)	180 (7.09)	400 (15.75)	381.5 (15.02)	267.1 (10.52)	262.1 (10.32)	62 (2.44)	237 (9.33)	4 (0.16)	M6	13.8/(30.4)
E510-430-H3F-U	269 (10.59)	230 (9.05)	462 (18.19)	440 (17.32)	318.2 (12.53)	313.2 (12.33)	80 (3.15)	267.6 (10.54)	4 (0.16)	M8	13.8/(30.4)

* F Version models are not available as standard product in Americas.

400V Class three phase：40~75HP (built-in EMC filter)



Inverter Model	Dimensions in mm (inch)										Net Weight in kg (lbs)
	W	W1	W2	H	H1	D	E	E1	t	Q	
E510-440-H3F-U	288.9 (11.37)	220 (8.66)	220 (8.66)	652 (25.67)	620 (24.41)	369.8 (14.56)	90 (3.54)	331.1 (13.04)	4 (0.16)	M8	35.9 (80)
E510-450-H3F-U	288.9 (11.37)	220 (8.66)	220 (8.66)	652 (25.67)	620 (24.41)	369.8 (14.56)	90 (3.54)	331.1 (13.04)	4 (0.16)	M8	35.9 (80)
E510-460-H3F-U	288.9 (11.37)	220 (8.66)	220 (8.66)	652 (25.67)	620 (24.41)	369.8 (14.56)	90 (3.54)	331.1 (13.04)	4 (0.16)	M8	35.9 (80)
E510-475-H3F-U	288.9 (11.37)	220 (8.66)	220 (8.66)	652 (25.67)	620 (24.41)	369.8 (14.56)	90 (3.54)	331.1 (13.04)	4 (0.16)	M8	40.9 (90)

* F Version models are not available as standard product in Americas.

4. Keypad and Programming Functions

4.1 LED / LCD Keypad

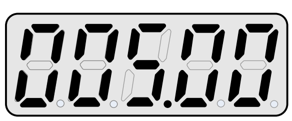
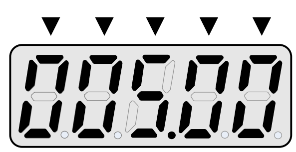
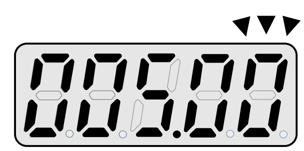
4.1.1 LED Keypad Display and Keys

DISPLAY	Description
5 Digit LED Display	Monitor inverter signals, view / edit parameters, fault / alarm display.
LED INDICATORS	
Hz/RPM	LED **ON** when frequency or line speed is displayed.
FWD	LED **ON** when inverter is running in forward direction, flashing when stopping.
REV	On when inverter is running in reverse direction, flashing when stopping.
FUN	LED **ON** when parameters are displayed.

KEYS (8)	Description
RUN	RUN Inverter in Local Mode
STOP	STOP Inverter
▲	Parameter navigation Up, Increase parameter or reference value
▼	Parameter navigation down, decrease parameter or reference value
FWD/REV	FWD: Forward Run / REV: Reverse Run
DSP/FUN	DSP: Switch between available display modes FUN: View/Edit parameter value
READ/ENTER	Used to display parameter settings and save parameter changed settings
< / RESET	Use to reset alarms or resettable faults

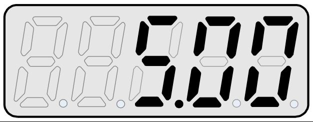
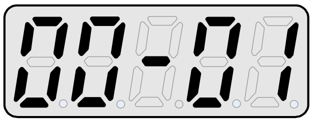
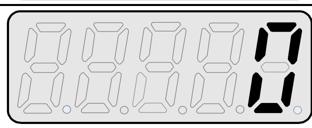
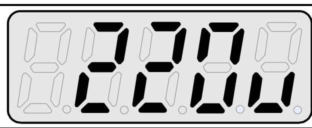
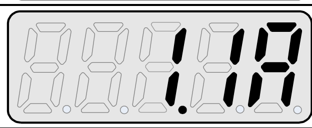
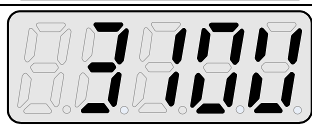
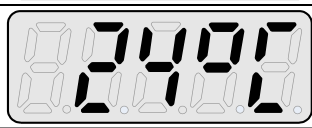
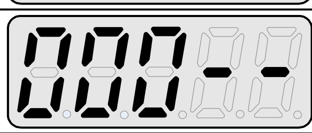
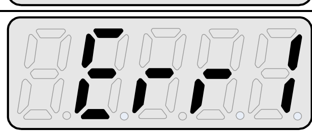
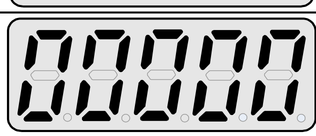
4.1.2 Display Description

Actual	LED Display	Actual	LED Display	Actual	LED Display	Actual	LED Display
0	0	A	A	L	L	Y	y
1	1	B	b	n	n	-	-
2	2	C	C	o	0	°	°
3	3	D	d	P	P	_	_
4	4	E	E	q	q	.	
5	5	F	F	r	r		
6	6	G	G	S	S		
7	7	H	H	t	t		
8	8	I	I	u	u		
9	9	J	J	V	U		

Display output frequency	Frequency Reference	Set Frequency Reference
LED lights on	LED flashes	Flashing digit
		

At power-up the display will show the frequency reference setting, all LEDs are flashing. Press the ▲UP or ▼DOWN key to enter the frequency reference edit mode, use the **◄/ENT** key to select which digit to edit (flashing). Use the ▲UP or ▼DOWN key to modify the value. During run operation the display will show the output frequency.

LED display examples

Seven Segment display	Description
	1. Displays the frequency reference at power-up 2. Display the actual output frequency in operation status.
	Display parameter code
	Display the setting value of parameter
	Display input voltage
	Display inverter current.
	Display DC Bus Voltage
	Display temperature
	Display PID feedback value. The displayed digit is set by 12-01.
	Error display, refer to Chapter 5 Troubleshooting and maintenance
	Analog Current / Voltage AI1 / AI2. Range **(0~1000)**

4.1.3 LED Status description

Hz/ RPM LED

State	Description	Hz/RPM LED
Off	Display doesn't show frequency or line speed	
Illuminated	Display shows frequency or line speed	

Forward LED

State	Description	FWD LED
Off	Inverter in reverse direction	
Illuminated	Inverter is running in forward direction	
Flashing	Forward direction active, no run command	

Reverse LED

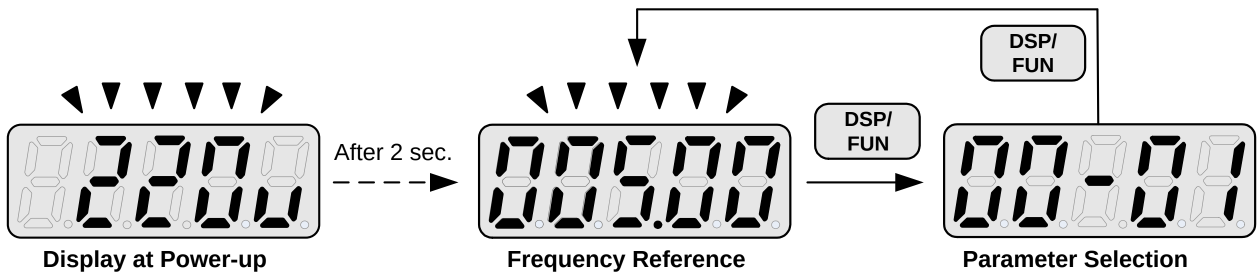
State	Description	REV LED
Off	Inverter in forward direction	
Illuminated	Inverter is running in reverse direction	
Flashing	Reverse direction active, no run command	

FUN LED

State	Description	FUN LED
Off	Display doesn't show parameter	
Illuminated	Display shows parameter	
Flashing	Firemode Enabled	

4.1.4 Power-Up Monitor

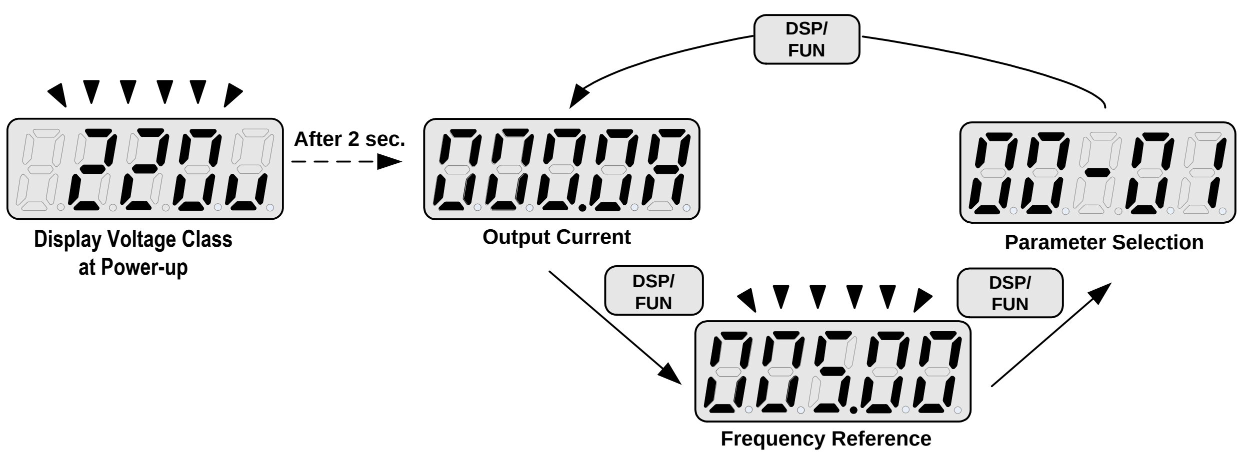
Power Up:



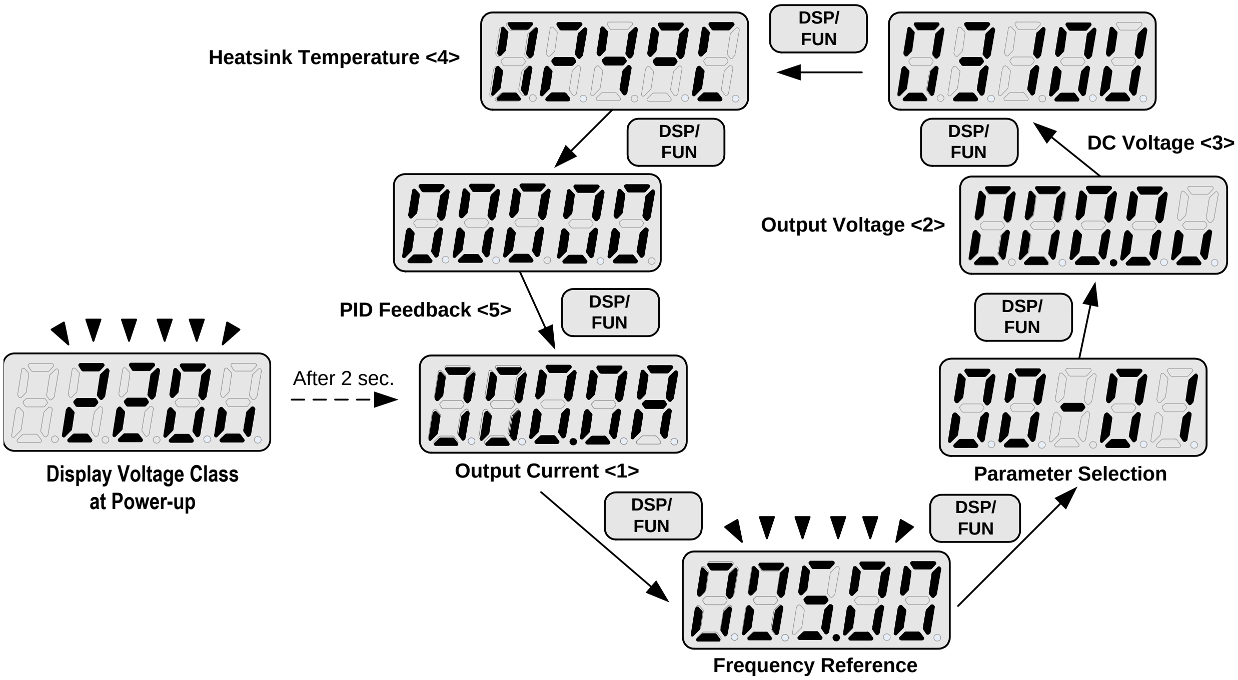
Change Monitor at Power-Up

12-00	Display selection		
Range	**Highest bit -> 0 0 0 0 0 <- Lowest bit** The setting range for each bit is **0 ~ 8** from the highest bit to the lowest bit**.**		
	0: No display **1:** Output current **2:** Output voltage **3:** DC voltage	**4:** Temperature **5:** PID feedback **6:** AI1 value **7:** AI2 value	**8:** Count value

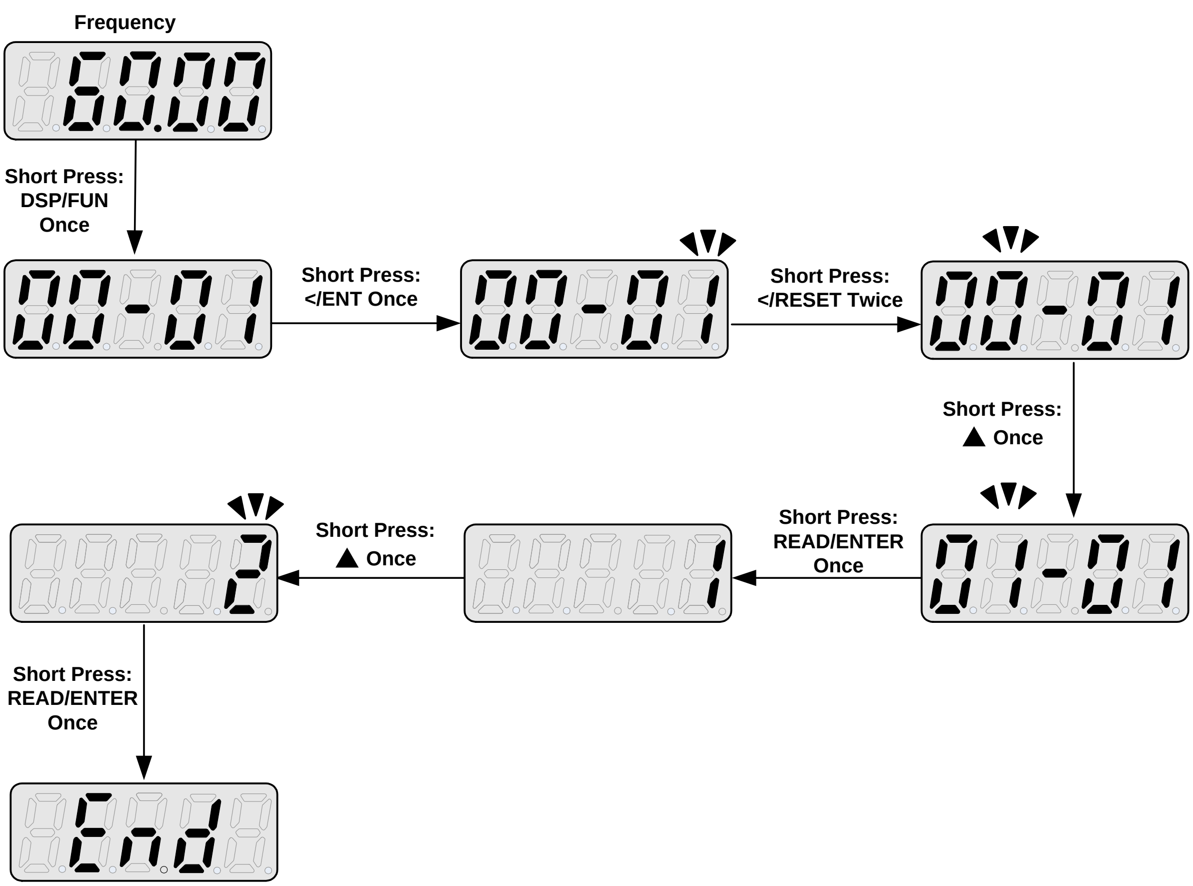
Example: 12-00 = 10000



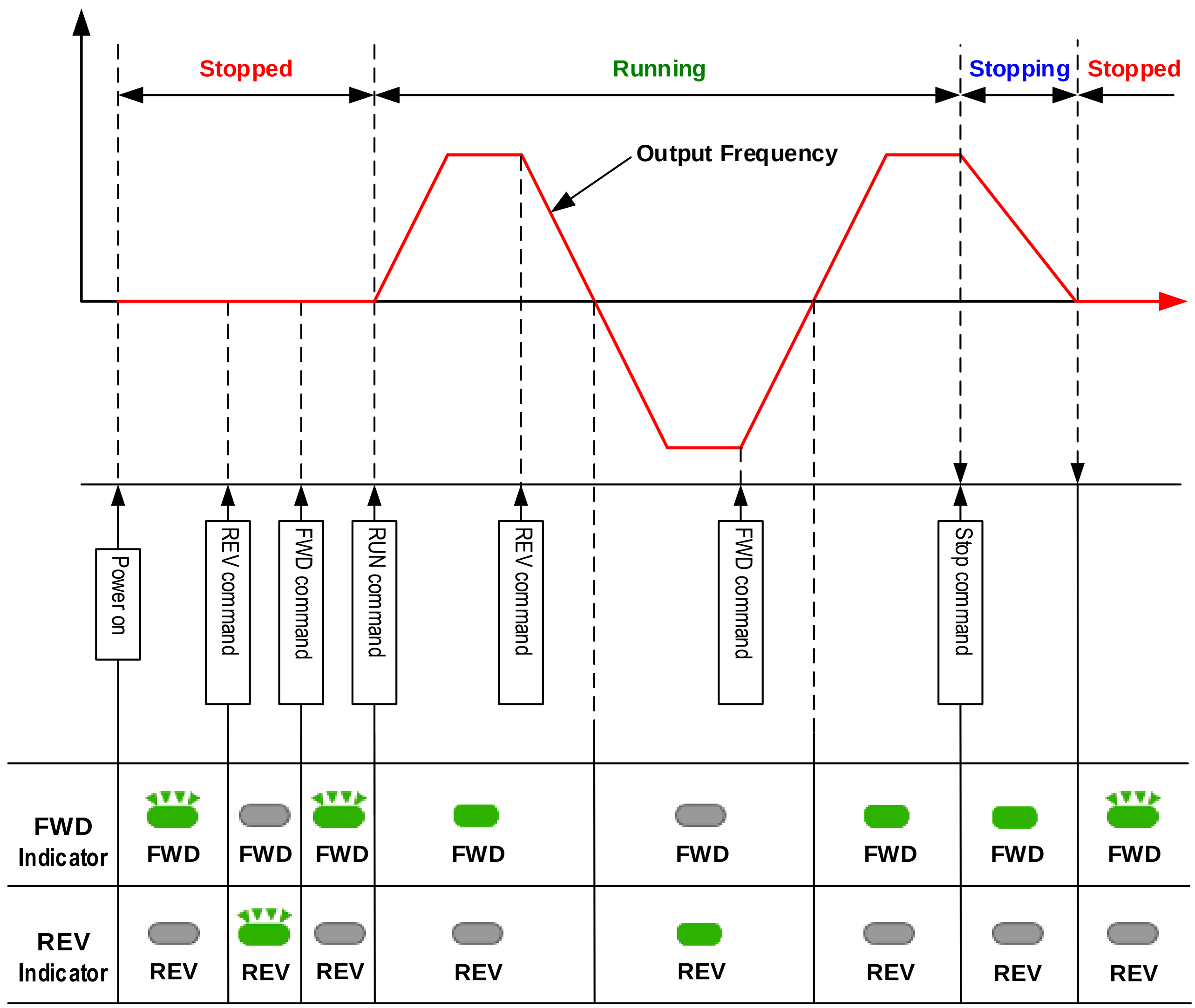
Example: 12-00 = 12345



4.1.5 Modifying Parameters / Set Frequency Reference



4.1.6 Operation Control



4.1.6 LCD Keypad Display and Keys

Note: LCD Copy Keypad is an optional keypad for remote mounting only.

The LCD keypad (PN: JN5-OP-A02) has a built-in parameter copy function (non-volatile memory) to copy parameters from one inverter to another one.

DISPLAY	Description
LCD Display	Monitor inverter signals, view / edit parameters, fault / alarm display.
LED INDICATORS	
FAULT	LED ON when a fault or alarm is active.
FWD	LED ON when inverter is running in forward direction, flashing when stopping.
REV	On when inverter is running in reverse direction, flashing when stopping.
SEQ	LED ON when RUN command is from the external control terminals or from serial communication
REF	LED ON when Frequency Reference command is from the external control terminals or from serial communication

KEYS (8)	Description
RUN	RUN Inverter in Local Mode
STOP	STOP Inverter
▲	Parameter navigation Up, Increase parameter or reference value
▼	Parameter navigation down, decrease parameter or reference value
FWD/REV	Used to switch between Forward and Reverse direction
DSP/FUN	Used to scroll to next screen Frequency screen →Function selection→Monitor parameter
◄ / RESET	Selects active seven segment digit for editing with the ▲▼ keys Used to reset fault condition.
READ / ENTER	Used to read and save the value of the active parameter

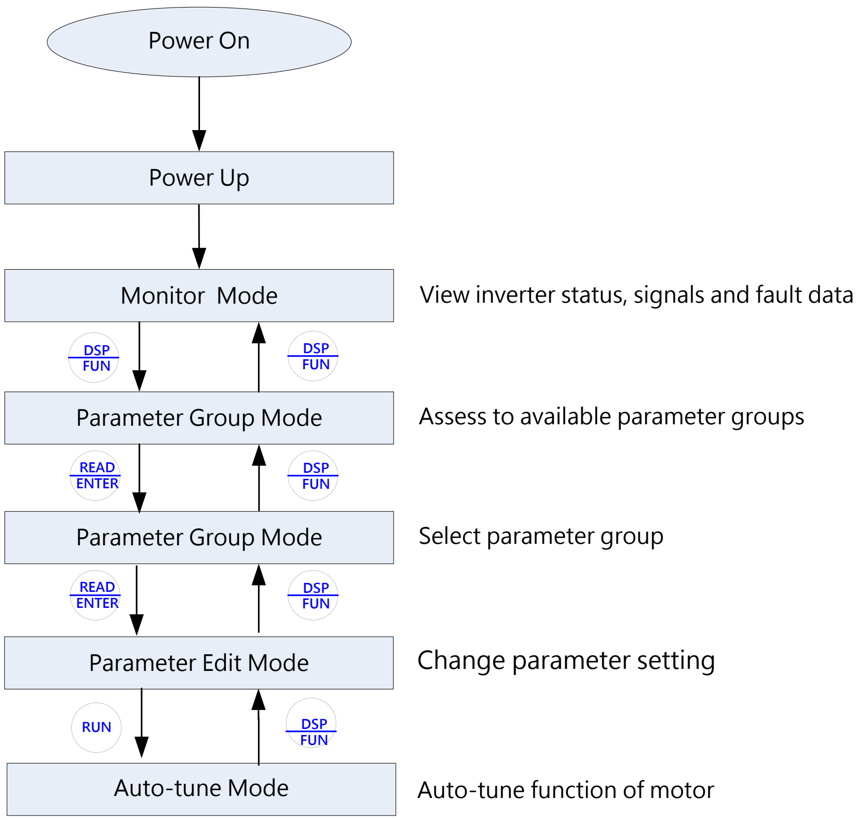
Auto-Repeat Keys

Holding the ▲UP or ▼DOWN key for a longer period of time will initiate the auto-repeat function resulting in the value of the selected digit to automatically increase or decrease.

4.1.8 Keypad Menu Structure

Main Menu

The E510 inverter main menu consists of four main groups (modes). The DSP/FUN key is used to switch between the modes.



Mode	Description
Monitor Mode	View inverter status, signals and fault data.
Parameter Group Mode	Access to available parameter groups.
Auto-tune Mode	Auto-tuning of the Motor

All the available parameter groups are listed in the Parameter Group Mode use the up and down keys to select a group and press Read/Enter key to access its parameters.

Notes:

- Always perform an auto-tune on the motor before operating the inverter in vector control (sensorless vector or flux vector). Auto-tuning mode will not be displayed when the inverter is running or when a fault is active.

- To scroll through the available modes, parameter groups or parameter list press and hold the up or down key.

Monitor Mode

In monitor mode inverter signals can be monitored such as output frequency, output current and output voltage, etc…) as well as fault information and fault trace. See Fig 4.1.8.1 for keypad navigation.

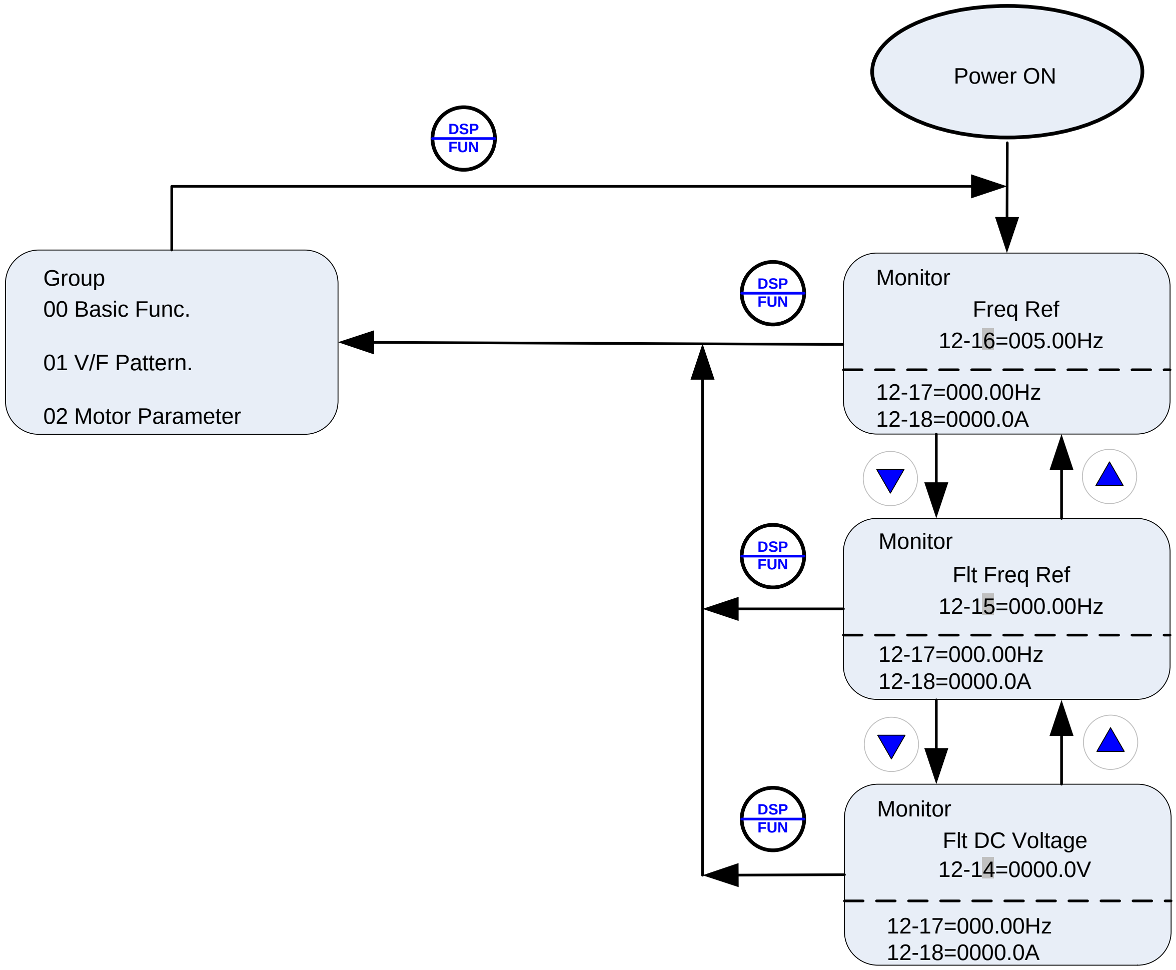


Fig 4.1.8.1 Monitor Mode

Notes:

- To scroll through the available monitor parameter list, press and hold the ▲ (up) or ▼ (down) key.

Programming Mode

In programming mode inverter parameters can be read or changed. See Fig 4.1.8.2 for keypad navigation.

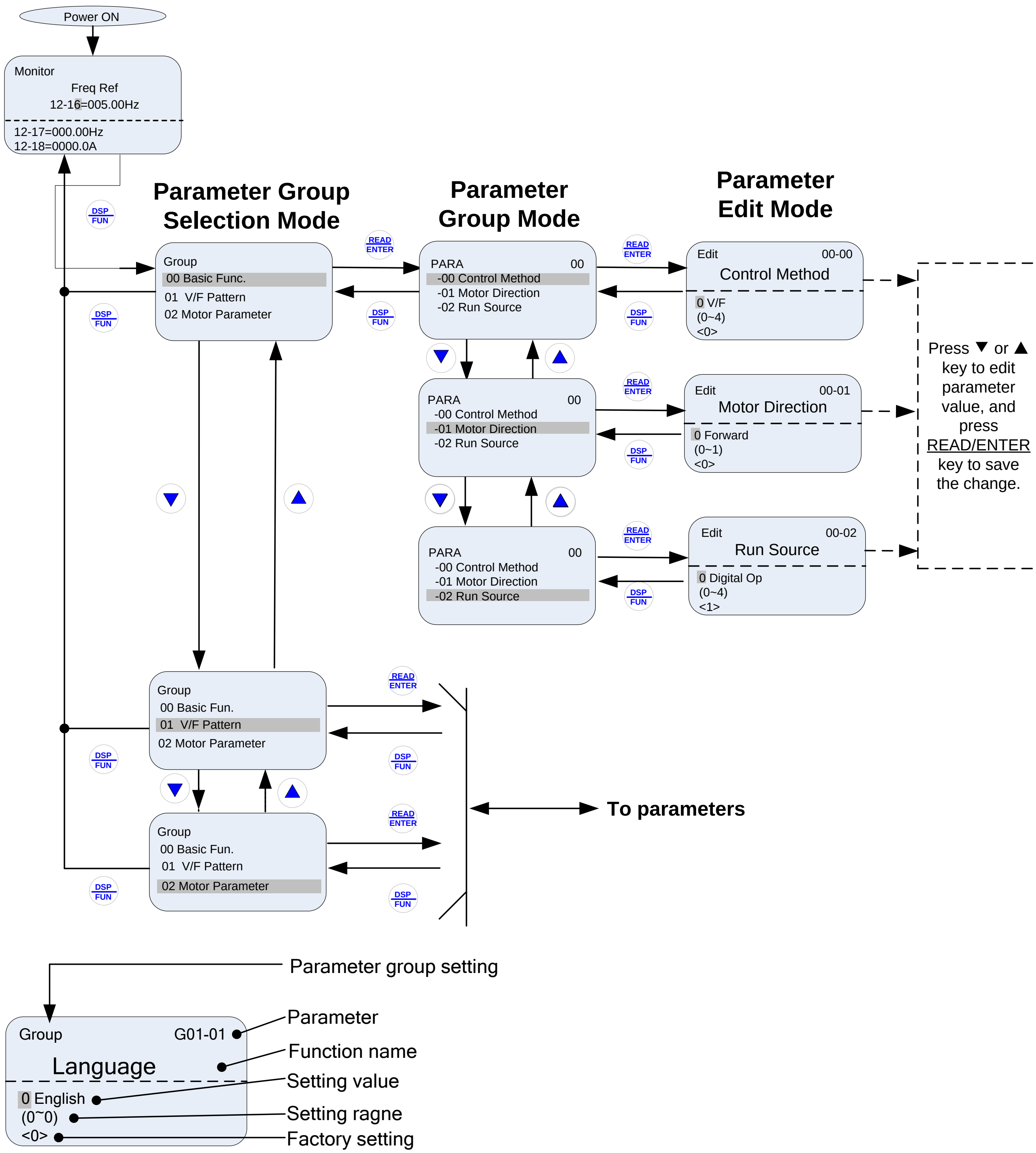


Fig 4.1.8.2 Programming Mode

Notes:

- The parameters values can be changed from the Edit screen with the up, down and < / RESET shift key.
- To save a parameter press the READ/ENTER key.
- Refer to section 4.3 for parameter details.
- Press the ▲ (up) or ▼ (down) key to scroll parameter groups or parameter list.

Auto-tuning Mode

In the auto-tuning mode motor parameters can be calculated and set automatically based on the selected control mode. See Fig 4.1.8.3 for keypad navigation.

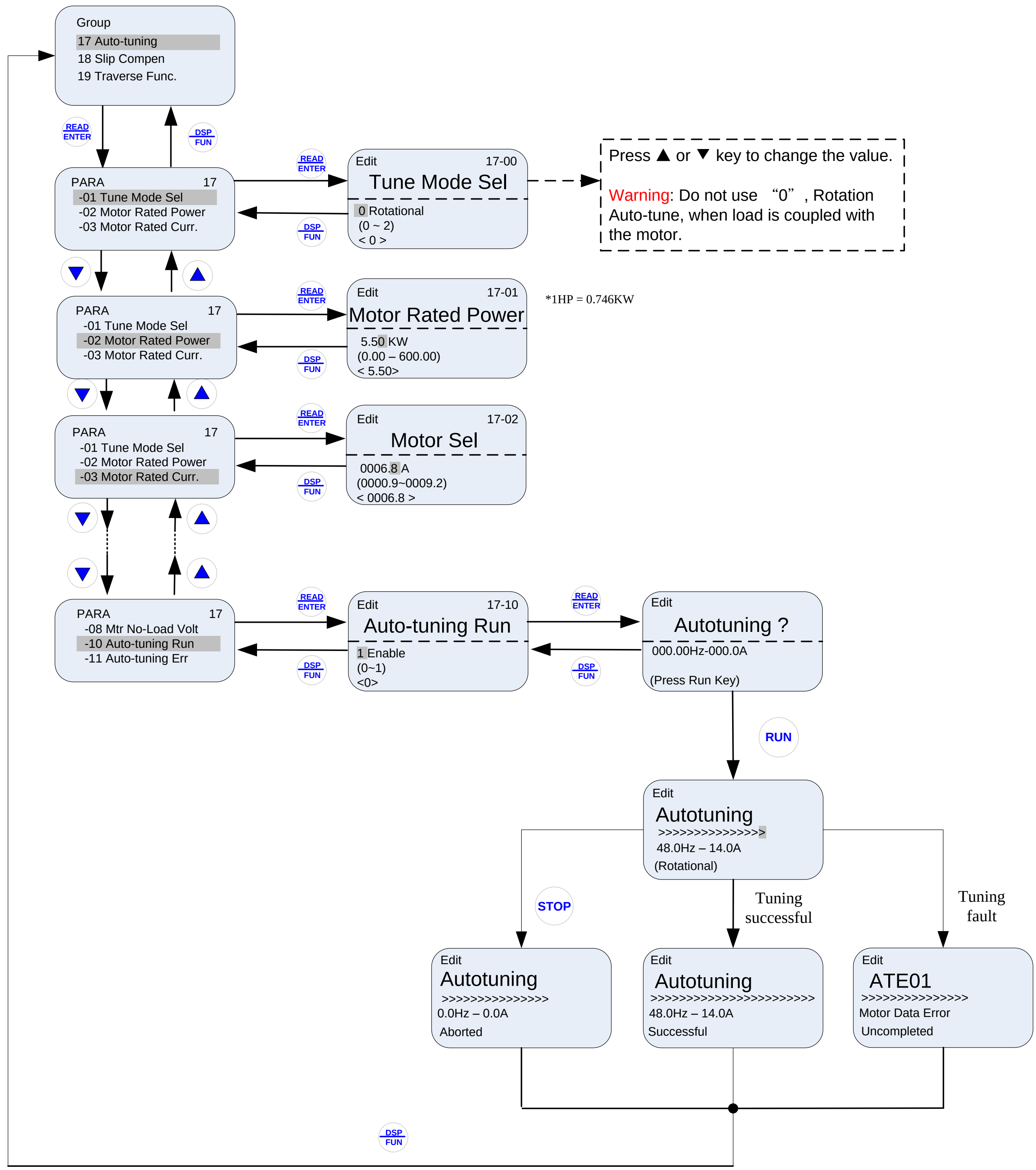


Fig 4.1.8.3 Auto-tuning Mode

Notes:

- Set correct motor parameters based on the information on the motor nameplate.
- Refer to section 4.3 for parameter details.

Notes:

1. Use the up and down keys to scroll though the auto-tuning parameter list. Depending on the selected control mode in parameter 00-00, some of the auto-tuning parameters will not be accessible. (Refer to the Auto-tuning Group 17 parameters).

2. After entering the motor nameplate rated output power (17-01), rated current (17-02), rated voltage (17-03), rated frequency (17-04), rated speed (17-05) and number of motor poles (17-06), select the automatic tuning mode and press the RUN key to perform the auto-tuning operation. When auto-tuning is successful the calculated motor parameters will be saved into parameter group 02 (motor parameters).

3. (a) "Atune "(LED) / "Rotational" will be displayed during rotational auto-tuning (17-00=0) and the motor will rotate during auto-tuning. Ensure that it is safe to operate the motor before pressing the RUN key.
   (b) "Stationary" will be displayed during stationary auto-tuning (17-00=1), the motor shaft does not rotate.
   (c) The RUN LED (in the upper left corner of the RUN key) will be lit during auto-tuning.
   (d) The LCD display shows ">>>" or "Atund" during the auto-tuning process.

4. Press the STOP key on the keypad to abort the auto-tuning operation.

5. In case of an auto-tuning fault, a fault message and the uncompleted message are displayed on the keypad. The RUN LED will be flashing and the motor will coast to stop. (Refer to section 10.4 for the Auto-tuning Faults.) The auto-tuning fault can be cleared by pressing the RESET key after which the keypad displays the auto-tuning mode again.

   All motor parameters (group 02 and group 17 parameters) will revert back to their factory settings if a fault occurs. The motor data must be entered again before re-starting auto-tuning. The keypad shows ">>>" during an auto-tuning fault.

6. Upon successful completion of an auto-tune, the RUN LED will turn off. Press the DSP/FUN key to return to the main menu to select the next operation. The auto-tuning procedure takes approximately 50 seconds.

4.2 Parameters

Parameter group	Name
Group 00	Basic Parameters
Group 01	V/F Control Parameters
Group 02	Motor Parameters
Group 03	External Digital Input and Output Parameters
Group 04	External Analog Input and Output Parameters
Group 05	Preset-Speed Parameters
Group 06	Automatic Program Operation Parameters
Group 07	Start /Stop Parameters
Group 08	Protection Parameters
Group 09	Communication Parameters
Group 10	PID Parameters
Group 11	Performance Control Parameters
Group 12	Monitoring Parameters
Group 13	Maintenance Parameters
Group 14	PLC Parameters
Group 15	PLC Monitoring Parameters
Group 16	LCD Parameters
Group 17	Automatic Tuning Parameters
Group 18	Slip Compensation Parameters
Group 20	Speed Control Parameters
Group 21	PM Motor Parameters

Parameter Notes	
***1**	Parameter can be changed during running.
***2**	Reserved
***3**	Parameter will not reset to default during a factory reset (initialization).
***4**	Read-only parameter
***5**	Parameter will be displayed in being coupled with the option card.
***6**	Parameter will be displayed only when using the LED keypad.
***7**	Parameter will be displayed only when using the LCD keypad.
***8**	Parameter value / default setting is dependent on drive size/model

Group 00 Basic Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
00-00	Control Mode Selection	0：V/F 2：SLV 5：PMSLV	0	-	O	O	O	*3
00-01	Motor’s Rotation Direction	0：Forward 1：Reverse	0	-	O	O	O	*1
00-02	Main Run Command Source Selection	0：Keypad 1：External Terminal (Control Circuit) 2：Communication Control (RS-485) 3：PLC	0	-	O	O	O	
00-03	Alternative Run Command Selection	0：Keypad 1：External Terminal (Control Circuit) 2：Communication Control (RS-485) 3：PLC	2	-	O	O	O	
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	-	O	O	O	*7
00-05	Main Frequency Command Source Selection	0：UP/DOWN from Keypad 1：Potentiometer on Keypad 2：External AI1 Analog Signal Input 3：External AI2 Analog Signal Input 4：External Up/Down Frequency 5：Communication Setting Frequency 6：Reserved 7：Pulse Input(*6)	0	-	O	O	O	
00-06	Alternative Frequency Command Source Selection	0：UP/DOWN on Keypad 1：Potentiometer on Keypad 2：External AI1 Analog Signal Input 3：External AI2 Analog Signal Input 4：External Up/Down Frequency 5：Communication Setting Frequency 6：Reserved 7：Pulse Input(*6)	4	-	O	O	O	
00-07	Main and Alternative Frequency Command Modes	0：Main or Alternative Frequency 1：Main Frequency+ Alternative Frequency	0	-	O	O	O	
00-08	Communication Frequency Command	0.00~599.00	0.00	Hz	O	O	O	*4
00-09	Frequency Command Save on Power Down	0：Disabled 1：Enabled	0	-	O	O	-	
00-10	Initial Frequency Selection (keypad mode)	0：by Current Frequency Command 1：by 0 Frequency Command 2：by 00-11	0	-	O	O	O	
00-11	Initial Frequency Setpoint	0.00-599.00	50/60	Hz	O	O	O	

Group 00 Basic Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
00-12	Frequency Upper Limit	0.01-599.00	0.0	Hz	O	O	O	
00-13	Frequency Lower Limit	0.00-598.99	0.0	Hz	O	O	O	
00-14	Acceleration Time 1	0.1~6000.0	*	s	O	O	O	*1
00-15	Deceleration Time 1	0.1~6000.0	*	s	O	O	O	*1
00-16	Acceleration Time 2	0.1~6000.0	*	s	O	O	O	*1
00-17	Deceleration Time 2	0.1~6000.0	*	s	O	O	O	*1
00-18	Jog Frequency	0.00~599.00	2.00	Hz	O	O	O	*1*7
00-19	Jog Acceleration Time	0.1~0600.0	*	s	O	O	O	*1*7
00-20	Jog Deceleration Time	0.1~0600.0	*	s	O	O	O	*1*7
00-26	Emergency Stop Time	0.1~6000.0	5.0	s	O	O	O	
00-27	HD/ND Mode (F5/F6 Only)(***)	0：HD (Heavy Duty Mode) 1：ND (Normal Duty Mode)	0	-	O	X	X	
00-34	Language	0：English 1：Simplified Chinese 2：Traditional Chinese 3：Turkish	0	-	O	O	O	
00-35	Minimum Frequency Detection	0：Alarm 1：Keep Running At Lower Frequency	0	-	O	O	O	
00-36	PID Lower Frequency Selection	0：Lower Frequency of PID Sleep Mode 1：0Hz of PID Sleep Mode	0	-	O	O	O	

*** : If parameter 00-27 is set to ND mode, group 02 motor 1 parameter will automatically be adjusted.
If parameter 00-27 is set to HD mode, group 02 motor 1 parameter will automatically be adjusted.
It is recommended that parameter 00-27 be set first before performing an auto-tune because motor parameters will be updated automatically.

Group 01 V/F Control Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode V/F	Control mode SLV	Control mode PM SLV	Attribute
01-00	Volts/Hz Pattern of Motor 1	0~FF	F	-	O	X	X	*3
01-02	Maximum Frequency of Motor 1	4.8~599.0	50.0/60.0	Hz	O	O	O	*8
01-03	Maximum Output Voltage of Motor 1	200V：0.1~255.0 400V：0.2~510.0	230.0 400.0	V	O	X	X	*8
01-04	Middle Output Frequency 2 of Motor 1	0.0~599.0	0.0	Hz	O	X	X	
01-05	Middle Output Voltage 2 of Motor 1	200V：0.0~255.0 400V：0.0~510.0	0.0	V	O	X	X	*8
01-06	Middle Output Frequency 1 of Motor 1	0.0~599.0	3.0	Hz	O	X	X	
01-07	Middle Output Voltage 1 of Motor 1	200V：0.0~255.0 400V：0.0~510.0	*	V	O	X	X	*8
01-08	Minimum Output Frequency of Motor 1	0.0~599.0 V/F: SLV: PMSLV:	1.5 0.6 10.0	Hz	O	O	O	
01-09	Minimum Output Voltage of Motor 1	200V：0.0~255.0 400V：0.0~510.0	*	V	O	X	X	*8
01-10	Torque Compensation Gain	0.0~2.0	0.5	-	O	X	X	*1
01-11	Selection of Torque Compensation Mode	0：Mode 0 (Normal) 1：Mode 1 (High Speed)	0	-	O	X	X	
01-12	Base Frequency of Motor 1	4.8~599.0	50.0/60.0	Hz	O	O	O	*8
01-13	Base Output Voltage of Motor 1	200V：0.0~255.0 400V：0.0~510.0	230.0 400.0	V	O	X	X	*8
01-14	Input Voltage Setting	200V：55.0~255.0 400V：10.0~510.0	230.0 400.0	V	O	O	O	*8
01-15	Torque Compensation Time	0~10000	200	ms	O	X	X	
01-16	Maximum Output Frequency of Motor 2	4.8~599.0	50.0/60.0	Hz	O	X	X	*8
01-17	Maximum Output Voltage of Motor 2	200V：0.1~255.0 400V：0.2~510.0	230.0 400.0	V	O	X	X	*8
01-18	Middle Output Frequency 2 of Motor 2	0.0~599.0	0.0	Hz	O	X	X	
01-19	Middle Output Voltage 2 of Motor 2	200V：0.0~255.0 400V：0.0~510.0	0.0	V	O	X	X	
01-20	Middle Output Frequency 1 of Motor 2	0.0~599.0	3.0	Hz	O	X	X	
01-21	Middle Output Voltage 1 of Motor 2	200V：0.0~255.0 400V：0.0~510.0	KVA	V	O	X	X	
01-22	Minimum Output Frequency of Motor 2	0.0~599.0	1.5	Hz	O	X	X	
01-23	Minimum Output Voltage of Motor 2	200V: 0.0~255.0 400V: 0.0~510.0	KVA	V	O	X	X	
01-24	Base Frequency of Motor 2	4.8~599.0	50.0/60.0	Hz	O	X	X	*8
01-25	Base Output Voltage of Motor 2	200V: 0.0~255.0 400V: 0.0~510.0	230.0 400.0	V	O	X	X	*8
01-26	V/F Curve Selection of Motor 2	0~FF	F	-	O	X	X	*3

Group 02 IM Motor Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
02-00	No-Load Current of Motor1	0.01~600.00	-	A	O	X	X	
02-01	Rated Current of Motor1	V/F mode: 10%~200% of inverter rated current. SLV mode: 25%~200% of inverter rated current.	-	A	O	O	X	
02-03	Rated Rotation Speed of Motor1	0~60000	-	rpm	O	O	X	
02-04	Rated Voltage of Motor1	200V: 50.0~240.0	230.0	V	O	O	X	*8
		400V: 100.0~480.0	400.0					
02-05	Rated Power of Motor1	0.01~600.00	-	kW	O	O	X	
02-06	Rated Frequency of Motor1	4.8~599.0	50.0/60.0	Hz	O	O	X	*8
02-07	Number of Motor Poles of Motor 1	2~16(Even)	4	-	O	O	X	
02-09	Excitation Current of Motor 1	15%~70% of motor rated current	-	%	X	O	X	
02-10	Core Saturation Coefficient 1	1~100	-	%	X	O	X	
02-11	Core Saturation Coefficient 2 of Motor 1	1~100	-	%	X	O	X	
02-12	Core Saturation Coefficient 3 of Motor 1	80~300	-	%	X	O	X	
02-13	Core loss of Motor 1	0.0~15.0	-	%	O	X	X	
02-15	Line-to-line Resistance Motor 1	1~60.000		Ω	O	O	X	
02-16	Rotor Resistance of Motor 1	1~60.000		Ω	O	O	X	
02-17	Leakage Inductance of Motor 1	0.01~200.00	-	mH	O	O	X	
02-19	No-Load Voltage of Motor 1	200V：50~240	-	V	X	O	X	
		400V：100~480	-					
02-20	No-Load Current of Motor 2	0.01~600.00	-	A	O	X	X	
02-21	Rated Current of Motor 2	10%~200% of inverter rated current	-	A	O	X	X	
02-22	Rated Rotation Speed of Motor 2	0~60000	-	Rpm	O	X	X	*8
02-23	Rated Voltage of Motor 2	200V：50.0~240.0	230.0	V	O	X	X	
		400V：100.0~480.0	400.0					
02-24	Rated Power of Motor 2	0.01~600.00	-	kW	O	X	X	
02-25	Rated Frequency of Motor 2	4.8~599.0	50.0/60.0	Hz	O	X	X	*8
02-26	Number of Motor Poles of Motor 2	2~16 (Even)	4	-	O	X	X	
02-32	Line-to-line Resistance Motor 2	0.001~60.000	-	Ω	O	X	X	
02-33	Proportion of Motor Leakage Inductance	0.1~15.0	3.4	%	X	O	X	
02-34	Slip Frequency of Motor	0.10~20.00	1.00	Hz	X	O	X	

Group 03 External Digital Input and Output Parameters

Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
03-00	Multifunction Input Terminal S1	0：Forward/Stop Command	0	-	O	O	O	
		1：Reverse/Stop Command			O	O	O	
		2：Multi-Speed/Position Setting Command 0			O	O	O	
		3：Multi-Speed/Position Setting Command 1			O	O	O	
		4：Multi-Speed/Position Setting Command 2			O	O	O	
		5：Multi-Speed/Position Setting Command 3			O	O	O	
		6：Forward Jog Run Command			O	O	O	
03-01	Multifunction Input Terminal S2	7：Reverse Jog Run Command	1	-	O	O	O	
		8：UP Frequency Increasing Command			O	O	O	
		9：DOWN Frequency Decreasing Command			O	O	O	
		10：Acceleration/ Deceleration Time Selection 2			O	O	O	
		11：Inhibit Acceleration/ Deceleration Command			O	O	O	
		12：Main/ Alternative Run Switch Function			O	O	O	
		13：Main/ Alternative Frequency Switch Function			O	O	O	
03-02	Multifunction Input Terminal S3	14：Emergency Stop (decelerate to zero and stop)	2	-	O	O	O	
		15：External Baseblock Command (coast to stop)			O	O	O	
		16：PID Control Disabled			O	O	O	
		17：Fault Reset			O	O	O	
		18：Auto Run Mode Enable			-	-	-	
		19：Speed Search			O	O	X	
		20：Energy Saving (V/F only)			O	X	X	
03-03	Multifunction Input Terminal S5	21：Reset PID integral value to Zero	3	-	O	O	O	
		22：Counter Input			-	-	-	
		23：Counter reset			-	-	-	
		24：PLC Input			O	O	O	
		25：Pulse width modulation measurement (S3)			O	O	O	
		26：Pulse frequency measure (S3)			O	O	O	
03-04	Multifunction Input Terminal S5	27：Local/Remote selection	4	-	O	O	O	
		28：Remote mode selection		-	O	O	O	
		29：Jog Frequency Selection						
		33：DC Braking		-	O	O	O	
03-05	Multifunction Input Terminal S6	34：Speed Search 2	17	-	O	O	X	
		40：Motor 1/Motor 2 selection		-	O	O	X	
		47：Fire mode			O	O	O	
		48：KEB Acceleration			O	X	X	
		65：Short-circuit braking		-	X	X	O	
03-06	Up/Down frequency step	0.00~5.00			O	O	O	

Group 03 External Digital Input and Output Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode V/F	Control mode SLV	Control mode PM SLV	Attribute
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 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. 3：When acceleration is used, the output frequency will be updated.	0	-	O	O	O	
03-08	S1 ~ S6 scan confirmation	1~200	1	-	O	O	O	
03-09	S1~ S4 switch type select	xxx0b：S1 A Contact xxx1b：S1 B Contact xx0xb：S2 A Contact xx1xb：S2 B Contact x0xxb：S3 A Contact x1xxb：S3 B Contact 0xxxb：S4 A Contact 1xxxb：S4 B Contact	0000b	-	O	O	O	
03-10	S5~ S6 switch type select	xxx0b：S5A Contact xxx1b：S5 B Contact xx0xb：S6 A Contact xx1xb：S6 B Contact	0000b	-	O	O	O	
03-11	Relay (R1A-R1C) Output	0：During Running	0	-	O	O	O	
		1：Fault Contact Output			O	O	O	
		2：Frequency Agree			O	O	O	
		3：Setting Frequency Agree (03-13±03-14)			O	O	O	
		4：Frequency Detection 1 (≧03-13+03-14)			O	O	O	
		5：Frequency Detection 2 (≦ 03-13+03-14)			O	O	O	
		6：Automatic Restart			O	O	O	
		7：Momentary AC Power Loss			-	-	-	
		8：Rapid Stop			-	-	-	
		9：Base Block			O	O	O	
		10：Motor Overload Protection (OL1)			-	-	-	
		11：Drive Overload Protection (OL2)			-	-	-	
		12：Over-torque Threshold Level (OL3)			O	O	O	
		13：Preset Output Current Reached			O	O	O	

Group 03 External Digital Input and Output Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
		14：Brake Control			O	O	O	
		15：PID Feedback Signal Loss			-	-	-	
		16：Single pre-set count (3-22~23)			-	-	-	
		17：Dual pre-set count (3-22~23)			-	-	-	
		18：PLC Status Indicator (00-02)			O	O	O	
		19：PLC control *			O	O	O	
		20：Zero Speed			O	O	O	
03-12	Relay (R2A-R2C) Output	54：Turn on short-circuit braking	1	-	X	X	O	
		55：Low Current Detection			O	O	O	
03-13	Frequency Detection Level	0.0~599.0	0.0	Hz	O	O	O	
03-14	Frequency Detection Width	0.1~25.5	2.0	Hz	O	O	O	
03-15	Current Agree Level	0.1~999.9	0.1	A	O	O	O	
03-16	Delay Time of Current Agree Detection	0.1~10.0	0.1	s	O	O	O	
03-17	* Mechanical Braking Release Level	0.00~599.00	0.00	Hz	O	O	O	
03-18	* Mechanical Braking Level Set	0.00~599.00	0.00	Hz	O	O	O	
03-19	Relay (R1A-R2A) Type	xxx0b：R1 A Contact xxx1b：R1 B Contact	0000b	-	O	O	O	
		xx0xb：R2 A Contact xx1xb：R2 B Contact						
03-20	Internal / External Multi-Function Input Terminal Selection	0~63	0		O	O	O	
03-21	Action To Set The Internal Multi-Function Input Terminals	0~65	0		O	O	O	
03-22	Pre-Set Count 1	0~9999	0		O	O	O	
03-23	Pre-Set Count 2	0~9999	0		O	O	O	
03-24	Output Under Current Detection	0：Invalid			O	O	O	
		1：Valid						
03-25	Output Under Current Detection Level	0~999.9A			O	O	O	
03-26	Output Under Current Detection Delay Time	0.0~655.35s			O	O	O	
03-27	Pulse Frequency	50~25000		Hz	O	O	O	
03-28	Pulse Input Gain	0.0~1000.0		%	O	O	O	
03-29	Photo-coupler Output Selection	xxx0b：Photo-coupler A Contact xxx1b：Photo-coupler B Contact	0000b		O	O	O	

Group 03 External Digital Input and Output Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
03-30	Selection of Pulse Input	0：General Pulse Input 1：PWM	0	-	O	O	O	
03-33	Pulse Input Bias	-100.0~100.0	0.0	%	O	O	O	
03-34	Filter Time of Pulse Input	0.00~2.00	0.1	Sec	O	O	O	

*：If the maximum output frequency of motor is over 300HZ, the frequency resolution is changed to 0.1Hz

Group 04 Analog signal inputs / Analog output								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
04-00	Analog Input Signal Type	0：AI1 0~10V AI2 0~10V / 0~20mA 1：AI1 0~10V AI2 4~20mA / 2~10V 2：AI1 2~10V AI2 0~10V / 0~20mA 3：AI1 2~10V AI2 4~20mA / 2~10V	1	-	O	O	O	
04-01	AI1 Signal Scanning and Filtering Time	0.00~2.00	0.03	s	O	O	O	
04-02	AI1 Gain	0.0~1000.0	100.0	%	O	O	O	*1
04-03	AI1 Bias	-100.0~100.0	0	%	O	O	O	*1
04-05	AI1 Slope	0：Positive 1：Negative	0	-	O	O	O	
04-06	AI2 Signal Scanning and Filtering Time	0.00~2.00	0.03	s	O	O	O	
04-07	AI2 Gain	0.0~1000.0	100.0	%	O	O	O	
04-08	AI2 Bias	-100.0~100.0	0	%	O	O	O	
04-10	AI2 Slope	0：Positive 1：Negative	0	-	O	O	O	
04-11	Analog Output (AO) Mode	0：Output Frequency	0	-	O	O	O	
		1：Frequency Command			O	O	O	
		2：Output Voltage			O	O	O	
		3：DC Bus Voltage			O	O	O	
		4：Output Current			O	O	O	
04-12	AO Gain	0.0~1000.0	100.0	%	O	O	O	
04-13	AO Bias	-100.0~100.0	0	%	O	O	O	
04-15	AO Slope	0：Positive 1：Negative	0	-	O	O	O	
04-16	F-Gain	0：Disable 1：Enable	0	-	O	O	O	
04-20	AO Signal Scanning and Filtering Time	0.00~0.50	0.00	s	O	O	O	

Group 05 Preset Frequency Selection								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
05-00	Preset Speed Control Mode Selection	0：Accel/Decel 1~4 apply to all speeds 1：Individual Accel/Decel for each preset speed	0	-	O	O	O	
05-01	* Preset Speed 0	0.00~599.00	5.00	Hz	O	O	O	*1
05-02	* Preset Speed 1	0.00~599.00	5.00	Hz	O	O	O	*1
05-03	* Preset Speed 2	0.00~599.00	10.00	Hz	O	O	O	*1
05-04	* Preset Speed 3	0.00~599.00	20.00	Hz	O	O	O	*1
05-05	* Preset Speed 4	0.00~599.00	30.00	Hz	O	O	O	*1
05-06	* Preset Speed 5	0.00~599.00	40.00	Hz	O	O	O	*1
05-07	* Preset Speed 6	0.00~599.00	50.00	Hz	O	O	O	*1
05-08	* Preset Speed 7	0.00~599.00	50.00	Hz	O	O	O	*1
05-09	* Preset Speed 8	0.00~599.00	5.00	Hz	O	O	O	*1
05-10	* Preset Speed 9	0.00~599.00	5.00	Hz	O	O	O	*1
05-11	* Preset Speed 10	0.00~599.00	5.00	Hz	O	O	O	*1
05-12	* Preset Speed 11	0.00~599.00	5.00	Hz	O	O	O	*1
05-13	* Preset Speed 12	0.00~599.00	5.00	Hz	O	O	O	*1
05-14	* Preset Speed 13	0.00~599.00	5.00	Hz	O	O	O	*1
05-15	* Preset Speed 14	0.00~599.00	5.00	Hz	O	O	O	*1
05-16	* Preset Speed 15	0.00~599.00	5.00	Hz	O	O	O	*1
05-17	Preset Speed 0-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-18	Preset Speed 0-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-19	Preset Speed 1-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-20	Preset Speed 1-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-21	Preset Speed 2-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-22	Preset Speed 2-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-23	Preset Speed 3-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-24	Preset Speed 3-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-25	Preset Speed 4-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-26	Preset Speed 4-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-27	Preset Speed 5-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-28	Preset Speed 5-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-29	Preset Speed 6-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-30	Preset Speed 6-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-31	Preset Speed 7-Acc time	0.1~6000.0	10.0	s	O	O	O	

Group 05 Preset Frequency Selection								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
05-32	Preset Speed 7-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-33	Preset Speed 8-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-34	Preset Speed 8-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-35	Preset Speed 9-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-36	Preset Speed 9-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-37	Preset Speed 10-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-38	Preset Speed 10-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-39	Preset Speed 11-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-40	Preset Speed 11-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-41	Preset Speed 12-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-42	Preset Speed 12-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-43	Preset Speed 13-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-44	Preset Speed 13-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-45	Preset Speed 14-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-46	Preset Speed 14-Dec time	0.1~6000.0	10.0	s	O	O	O	
05-47	Preset Speed 15-Acc time	0.1~6000.0	10.0	s	O	O	O	
05-48	Preset Speed 15-Dec time	0.1~6000.0	10.0	s	O	O	O	

* ：If the maximum output frequency of motor is over 300Hz, the frequency resolution is changed to 0.1Hz

Group 06 Automatic Program Operation								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
06-00	Auto Run Mode Selection	0：Disabled 1：Execute a single cycle operation mode. Restart speed is based on the previous stopped speed. 2：Execute continuous cycle operation mode. Restart speed is based on the previous stopped speed. 3：After the completion of a single cycle, the on-going operation speed is based on the speed of the last stage. Restart speed is based on the previous stopped speed. 4：Execute a single cycle operation mode. Restart speed will be based on the speed of stage 0. 5：Execute continuous cycle operation mode. Restart speed will be based on the speed of stage 0. 6：After the completion of a single cycle, the on-going operation speed is based on the speed of the last stage. Restart speed is based on the speed of stage 0.	0	-	O	O	X	
06-01	* Frequency Setting of Operation-Stage 1	0.00~599.00	5.00	Hz	O	O	X	*1
06-02	* Frequency Setting of Operation-Stage 2	0.00~599.00	10.00	Hz	O	O	X	*1
06-03	* Frequency Setting of Operation-Stage 3	0.00~599.00	20.00	Hz	O	O	X	*1
06-04	* Frequency Setting of Operation-Stage 4	0.00~599.00	30.00	Hz	O	O	X	*1
06-05	* Frequency Setting of Operation-Stage 5	0.00~599.00	40.00	Hz	O	O	X	*1
06-06	* Frequency Setting of Operation-Stage 6	0.00~599.00	50.00	Hz	O	O	X	*1
06-07	* Frequency Setting of Operation-Stage 7	0.00~599.00	50.00	Hz	O	O	X	*1
06-08	* Frequency Setting of Operation-Stage 8	0.00~599.00	5.00	Hz	O	O	X	*1
06-09	* Frequency Setting of Operation-Stage 9	0.00~599.00	5.00	Hz	O	O	X	*1

Group 06 Automatic Program Operation								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
06-10	* Frequency Setting of Operation-Stage 10	0.00~599.00	5.00	Hz	O	O	X	*1
06-11	* Frequency Setting of Operation-Stage 11	0.00~599.00	5.00	Hz	O	O	X	*1
06-12	* Frequency Setting of Operation-Stage 12	0.00~599.00	5.00	Hz	O	O	X	*1
06-13	* Frequency Setting of Operation-Stage 13	0.00~599.00	5.00	Hz	O	O	X	*1
06-14	* Frequency Setting of Operation-Stage 14	0.00~599.00	5.00	Hz	O	O	X	*1
06-15	* Frequency Setting of Operation-Stage 15	0.00~599.00	5.00	Hz	O	O	X	*1
06-16	Operation Time Setting of Speed-Stage 0	0.0~6000.0	0.0	s	O	O	X	*1
06-17	Operation Time Setting of Speed-Stage 1	0.0~6000.0	0.0	s	O	O	X	*1
06-18	Operation Time Setting of Speed-Stage 2	0.0~6000.0	0.0	s	O	O	X	*1
06-19	Operation Time Setting of Speed-Stage 3	0.0~6000.0	0.0	s	O	O	X	*1
06-20	Operation Time Setting of Speed-Stage 4	0.0~6000.0	0.0	s	O	O	X	*1
06-21	Operation Time Setting of Speed-Stage 5	0.0~6000.0	0.0	s	O	O	X	*1
06-22	Operation Time Setting of Speed-Stage 6	0.0~6000.0	0.0	s	O	O	X	*1
06-23	Operation Time Setting of Speed-Stage 7	0.0~6000.0	0.0	s	O	O	X	*1
06-24	Operation Time Setting of Speed-Stage 8	0.0~6000.0	0.0	s	O	O	X	*1
06-25	Operation Time Setting of Speed-Stage 9	0.0~6000.0	0.0	s	O	O	X	*1
06-26	Operation Time Setting of Speed-Stage 10	0.0~6000.0	0.0	s	O	O	X	*1
06-27	Operation Time Setting of Speed-Stage 11	0.0~6000.0	0.0	s	O	O	X	*1
06-28	Operation Time Setting of Speed-Stage 12	0.0~6000.0	0.0	s	O	O	X	*1
06-29	Operation Time Setting of Speed-Stage 13	0.0~6000.0	0.0	s	O	O	X	*1
06-30	Operation Time Setting of Speed-Stage 14	0.0~6000.0	0.0	s	O	O	X	*1
06-31	Operation Time Setting of Speed-Stage 15	0.0~6000.0	0.0	s	O	O	X	*1

Group 06 Automatic Program Operation								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
06-32	Operation Direction Selection of Speed Stage 0	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-33	Operation Direction Selection of Speed Stage 1	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-34	Operation Direction Selection of Speed Stage 2	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-35	Operation Direction Selection of Speed Stage 3	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-36	Operation Direction Selection of Speed Stage 4	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-37	Operation Direction Selection of Speed Stage 5	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-38	Operation Direction Selection of Speed Stage 6	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-39	Operation Direction Selection of Speed Stage 7	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-40	Operation Direction Selection of Speed Stage 8	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-41	Operation Direction Selection of Speed Stage 9	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-42	Operation Direction Selection of Speed Stage 10	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-43	Operation Direction Selection of Speed Stage 11	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-44	Operation Direction Selection of Speed Stage 12	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-45	Operation Direction Selection of Speed Stage 13	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	
06-46	Operation Direction Selection of Speed Stage 14	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	

Group 06 Automatic Program Operation								
Code	**Parameter Name**	**Setting Range**	**Default**	**Unit**	**Control mode**			**Attribute**
					V/F	**SLV**	**PM SLV**	
06-47	Operation Direction Selection of Speed Stage 15	0：Stop 1：Forward 2：Reverse	0	-	O	O	X	

* ：**If the maximum output frequency of motor is over 300Hz, the frequency resolution is changed to 0.1Hz**

Group 07 Start/Stop Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
07-00	Momentary Power Loss and Restart	0：Disable 1：Enable	0	-	O	O	X	
07-01	Fault Reset Time	0~7200	0	s	O	O	O	
07-02	Number of Auto Restart Attempts	0~10	0	-	O	O	O	
07-03	Reset Mode Setting	0：Enable Reset Only when Run Command is Off 1：Enable Reset when Run Command is On or Off						
07-04	Momentary Power Loss and Restart	0：Enable Direct run on power up 1：Disable Direct run on power up	1	-	O	O	O	
07-05	Delay-ON Timer	1.0~300.0	1.0	s	O	O	O	
07-06	DC Injection Braking Start Frequency	0.0~10.0	1.5	Hz	O	O	O	
07-07	DC Injection Braking Level (Current Mode)	0~100	50	%	O	O	O	
07-08	DC Injection Braking Time	0.00~100.00	0.50	s	O	O	O	
07-09	Stop Mode Selection	0：Deceleration to Stop 1：Coast to Stop 2：DC Braking Stop in All Fields 3：Coast to Stop with Timer	0	-	O	O	O	
07-10	Speed Search Mode Selection	0：Normal Start 1：Execute Speed Search Once 2：Speed Search Start			O	O	O	
07-13	Low Voltage Detection Level	200V：150~300 400V：250~600	190 380	V	O	O	O	
07-15	DC Injection Brake Mode	0：Voltage Mode 1：Current Mode	1		O	O	X	
07-16	DC Injection Braking Time at Start	0.00~100.00	0.00	s	O	O	O	
07-18	Minimum Base block Time	0.1~5.0	-	Sec	O	O	O	
07-19	Speed Direction Search Operation Current	0~100	50	%	O	O	X	
07-20	Speed Search Operating Current	0~100	20	%	O	O	X	
07-21	Integral Time of Speed Searching	0.1~10.0	2.0	Sec	O	O	X	
07-22	Delay Time of Speed Searching	0.0~20.0	0.2	Sec	O	O	X	
07-23	Voltage Recovery Time	0.1~5.0	2.0	Sec	O	O	X	
07-24	Direction-Detection Speed Search Selection	0：Invalid 1：Valid	1	-	O	O	X	

Group 07 Start/Stop Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	V/F	V/F	
07-25	Low Voltage Detection Time	0.00~1.00	0.02	Sec	O	O	O	
07-33	Start Frequency of Speed Search Selection	0：Maximum Output Frequency 1：Frequency Command	0	-	O	O	X	
07-34	Start Short-Circuit Braking Time	0.00~100.00	0.00	Sec	X	X	O	
07-35	Stop Short-Circuit Braking Time	0.00~100.00	0.50	Sec	X	X	O	
07-36	Short-Circuit Braking Current Limited	0.0~200.0	100.0	%	X	X	O	
07-37	Pre-Excitation Time	0.00~10.00	2.00	Sec	X	O	X	
07-38	Pre-Excitation Level	50~200	100	%	X	O	X	
07-39	Short-Circuit Braking Time of PM Motor Speed Search Function	0.00~100.00	0.00	Sec	X	X	O	
07-40	DC Injection Braking Time of PM Motor Speed Search Function	0.00~100.00	0.00	Sec	X	X	O	

*：**If the maximum output frequency of motor is over 300Hz, the frequency resolution is changed to 0.1Hz**

Group 08 Protection Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
08-00	Stall Prevention Function	xxx0b：Stall prevention is enabled in acceleration. xxx1b：Stall prevention is disabled in acceleration. xx0xb：Stall prevention is enabled in deceleration. xx1xb：Stall prevention is disabled in deceleration. x0xxb：Stall prevention is enabled in operation x1xxb：Stall prevention is disabled in operation 0xxxb：Stall prevention in operation is based on deceleration time of speed-stage 1. 1xxxb：Stall prevention in operation is based on deceleration time of speed-stage 2.	0000b	-	O	O	O	
08-01	Stall Prevention Level During Acceleration	20~200	HD：150 ND：120	%	O	O	O	
08-02	Stall Prevention Level During Deceleration	200V：330V~410V 400V：660V~820V	385V 770V	V	O	O	O	
08-03	Stall Prevention Level During Run	30~200	HD：160 ND：120	%	O	O	O	
08-05	Selection for Motor Overload Protection (OL1)	xxx0b：Overload Protection is disabled. xxx1b：Overload Protection is enabled. xx0xb：Cold Start of Motor Overload xx1xb：Hot Start of Motor Overload x0xxb：Standard Motor x1xxb：Inverter Duty Motor 0xxxb：Reserved 1xxxb：Reserved	0001b	-	O	O	O	
08-06	Start-up Mode of Overload Protection Operation (OL1)	0：Stop Output after Overload Protection 1：Continuous Operation after Overload Protection.	0	-	O	O	O	
08-07	Over Heat Protection (Cooling Fan Control)	0：Auto (Depends on temp.) 1：Operate while in RUN Mode 2：Always Run 3：Stop Operation	1	-	O	O	O	
08-08	Auto Voltage Regulation (AVR)	0：Enable 1：Disable	0	-	O	O	O	
08-09	Selection of Input Phase Loss Protection	0：Disable 1：Enable	0	-	O	O	O	
08-10	Selection of Output	0：Disable	0	-	O	O	O	

Group 08 Protection Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
	Phase Loss Protection	1：Enable						
08-13	Selection of Over-Torque Detection	0：Over-Torque Detection is Disabled. 1：Start detection when reaching the set frequency. 2：Start detection during running	0	-	O	O	O	
08-14	Selection of Over-Torque Action	0：Decelerate to Stop when Over Torque is Detected. 1：Display Warning when Over Torque is Detected. Continue operation. 2：Coast to Stop when Over Torque is Detected	0	-	O	O	O	
08-15	Level of Over-Torque Detection	0~300	160	%	O	O	O	
08-16	Time of Over-Torque Detection	0.0~10.0	0.1	Sec	O	O	O	
08-17	Fire Mode	0：Disabled 1：Enabled	0	-	O	O	O	
08-21	Limit of Stall Prevention During Acceleration	1~100	50	%	O	O	O	
08-22	Stall Prevention Detection Time During Run	2~100	100	ms	O	O	O	
08-23	Ground Fault (GF) Selection	0：Disable 1：Enable	0	-	O	O	O	
08-30	STO function selection (***)	0：Deceleration to Stop 1：Coast to Stop	0	-	O	O	O	
08-35	Motor Overheating Fault Selection	0：Disable 1：Deceleration to Stop 2：Coast to Stop 3：Continue Running	0	-	O	O	O	
08-36	PTC Input Filter Time Constant	0.00 ~ 5.00	2.00	Sec	O	O	O	
08-38	Delay Time of Fan Off	0~600	60	Sec	O	O	O	
08-39	Delay Time of Motor Overheat Protection	1~300	60	Sec	O	O	O	
08-40	Motor2 Acceleration Stall Prevention Level	20~200	HD: 150 ND: 120	%	O	O	X	
08-41	Motor2 Acceleration Stall Prevention Limit	1~100	50	%	O	O	X	
08-42	PTC Protection Level	0.1~10.0V	0.7	V	O	O	O	
08-43	PTC Restart Level	0.1~10.0V	0.3	V	O	O	O	

Group 08 Protection Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
08-44	PTC Warning Level	0.1~10.0V	0.5	V	O	O	O	

*****STO function only available in inverters with built-in EMC filter.**

Group 09 Communication Parameters								
Code	Parameter Name	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
09-00	INV Communication Station Address	1~32	1	-	O	O	O	*3
09-01	Communication Mode Selection	0：MODBUS 1：BACnet 2：Reserved 3：Reserved 4：Reserved	0		O	O	O	*3 *5
09-02	Baud Rate Setting (bps)	2：4800 3：9600 4：19200 5：38400	4	-	O	O	O	*3
09-03	Stop Bit Selection	0：1 Stop Bit 1：2 Stop Bit	0	-	O	O	O	*3
09-04	Parity Selection	0：No Parity 1：Even Bit 2：Odd Bit	0	-	O	O	O	*3
09-05	Communication Data Bit Selection	0：8 Bit Data 1：7 Bit Data	0	-	O	O	O	*3
09-06	Communication Error Detection Time	0.0~25.5	0.0	S	O	O	O	*3
09-07	Fault Stop Selection	: Deceleration to Stop By Deceleration Time 1 1: Coast to Stop 2: Deceleration to Stop By Deceleration Time 2 3: Continue	3	-	O	O	O	*3
09-08	Comm. Fault Tolerance Count	1~20	1	-	O	O	O	*3
09-09	Waiting Time	5~65	5	ms	O	O	O	*3
09-10	BACNET Device Instance Number	1~254	1		O	O	O	

*3：Parameter group 09 settings are NOT set to factory default when inverter is initialized (13-08).

Note: Changes to group 09 require the power to be cycled to take effect.

Group 10 PID Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
10-00	PID Target Value Source Setting	0：Keypad 1：AI1 Input 2：AI2 Input 3：Communication 4：10-02 given	1	-	O	O	O	
10-01	PID Feedback Value Source Setting	0：Keypad 1：AI1 Input 2：AI2 Input 3：Communication	2	-	O	O	O	
10-02	PID Target Value	0.00~100.00	0.00	%	O	O	O	*1
10-03	PID Control Mode	xxx0b：PID Disable xxx1b：PID Enable xx0xb：PID Positive Characteristic xx1xb：PID Negative Characteristic x0xxb：PID Error Value of D Control x1xxb：PID Feedback Value of D Control 0xxxb：PID Output 1xxxb：PID Output+Frequency Command	0000b	-	O	O	O	
10-04	Feedback Gain	0.01~10.00	1.00	-	O	O	O	*1
10-05	Proportional Gain (P)	0.00~10.00	1.00	-	O	O	O	*1
10-06	Integral Time (I)	0.00~100.00	1.00	s	O	O	O	*1
10-07	Differential Time (D)	0.00~10.00	0.00	s	O	O	O	*1
10-09	PID Bias	-100.0~100.0	0	%	O	O	O	*1
10-11	PID Feedback Loss Detection Selection	0：Disable 1：Warning 2：Fault	0	-	O	O	O	*1
10-12	PID Feedback Loss Det. Lev.	0~100	0	%	O	O	O	
10-13	PID Feedback Loss Det. Time	0.0~10.0	1.0	s	O	O	O	
10-14	PID Integral Limit	0.0~100.0	100.0	%	O	O	O	*1
10-15	PID Trim Mode	0 ~ 30	0		O	O	O	
10-16	PID Trim Scale	0 ~ 100	0		O	O	O	
10-17	* Start Frequency of PID Sleep	0.00~599.00	0.00	Hz	O	O	O	
10-18	Delay Time of PID Sleep	0.0~255.5	0.0	s	O	O	O	
10-19	* Frequency of PID Waking up	0.00~599.00	0.00	Hz	O	O	O	
10-20	Delay Time of PID Waking up	0.0~255.5	0.0	s	O	O	O	
10-21	Reserved							
10-22	Reserved							
10-23	PID Output Limit	0.00~100.0	100.0	%	O	O	O	*1
10-24	PID Output Gain	0.0~25.0	1.0	-	O	O	O	

Group 10 PID Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
10-25	PID Reversal Output Selection	0：No Allowing Reversal Output 1：Allow Reversal Output	0	-	O	O	O	
10-26	PID Target Acceleration/ Deceleration Time	0.0~25.5	0.0	s	O	O	O	
10-27	PID Feedback Display Bias	0 ~ 9999	0	-	O	O	O	
10-28	PID Feedback Display Gain	0.00~100.00	100.00		O	O	O	
10-29	PID Sleep Selection	0：Disable 1：Enable 2：Set By DI	1	-	O	O	O	
10-30	Upper Limit of PID Target	0.0 ~ 100.0	100.0	%	O	O	O	
10-31	Lower Limit of PID Target	0.0 ~ 100.0	0.0	%	O	O	O	
10-33	Maximum Value of PID Feedback	1 ~ 10000	999	-	O	O	O	
10-34	PID Decimal Width	0 ~ 4	1		O	O	O	
10-35	PID Unit	0：% 1：FPM 2：CFM 3：SPI 4：GPH 5：GPM 6：IN 7：FT 8：/s 9：/m 10：/h 11：°F 12：inW 13：HP 14：m/s 15：MPM 16：CMM 17：W 18：KW 19：m 20：°C 21：RPM 22：Bar 23：Pa	0		O	O	O	*7
10-39	* Output Frequency Setting of PID Disconnection	00.00~599.00	30.00	Hz	O	O	O	
10-40	Selection of PID Sleep Compensation Frequency	0：Disable 1：Enable	0	-	O	O	O	

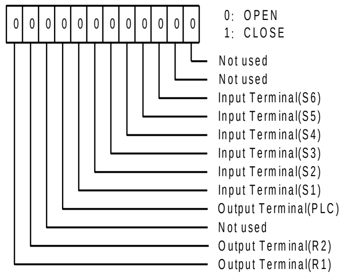
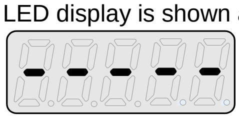
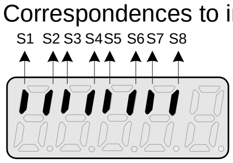
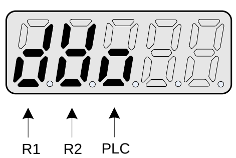
Group 11 Auxiliary Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
11-00	Direction Lock Selection	0：Allow Forward and Reverse Rotation 1：Only Allow Forward Rotation 2：Only Allow Reverse Rotation	0	-	O	O	O	
11-01	Carrier frequency	0：Carrier Output Frequency Tuning 1~16：1~16KHz	*	-	O	O	O	*1
11-02	Soft PWM Function Selection	0：Disable 1：Soft PWM 2：Random PWM	0	-	O	O	O	
11-03	Automatic carrier lowering selection	0：Disable 1：Enable	0	-	O	X	X	
11-04	S-curve Time Setting at the Start of Acceleration	0.00~2.50	0.20	s	O	O	O	
11-05	S-curve Time Setting at the Stop of Acceleration	0.00~2.50	0.20	s	O	O	O	
11-06	S-curve Time Setting at the Start of Deceleration	0.00~2.50	0.20	s	O	O	O	
11-07	S-curve Time Setting at the Stop of Deceleration	0.00~2.50	0.20	s	O	O	O	
11-08	Jump Frequency 1	0.0~599.0	0.0	Hz	O	O	O	
11-09	Jump Frequency 2	0.0~599.0	0.0	Hz	O	O	O	
11-10	Jump Frequency 3	0.0~599.0	0.0	Hz	O	O	O	
11-11	Jump Frequency Width	0.00 ~ 30.0	1.0	Hz	O	O	O	
11-12	Manual Energy Saving Gain (V/F)	0~100	80	%	O	X	X	
11-14	OV Prevention Selection	230V：200V~400V 400V：400V~800V	370 740		O	X	X	
11-17	Acceleration/Deceleration Gain	0.1~10.0	1		O	X	X	
11-18	Manual Energy Savings Frequency	0.0~599.0	0.0	Hz	O	O	O	
11-28	Frequency Gain of Over Voltage Prevention 2	1 ~ 200		%	O	O	X	
11-33	DC Voltage Filter Rise Amount	0.1 ~ 10.0		V	O	O	X	
11-34	DC Voltage Filter Fall Amount	0.1 ~ 10.0		V	O	O	X	
11-35	DC Voltage Filter Dead-band Level	0.0 ~ 99.0		V	O	O	X	

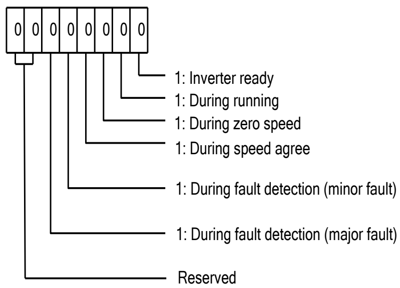
Group 11 Auxiliary Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
11-36	Frequency gain of OV Prevention	0.000 ~ 1.000			O	O	X	
11-37	Frequency limit of OV Prevention	0.00 ~ 599.00		Hz	O	O	X	
11-38	Deceleration start voltage of OV prevention	230V：200V~400V	300	V	O	O	X	
		400V：400V~800V	600					
11-39	Deceleration end voltage of OV Prevention	230V：300V~400V	350	V	O	O	X	
		400V：600V~800V	700					
11-40	OV Prevention Selection	0~3	0		O	X	X	
11-47	KEB Deceleration Time	0.0~25.5	0.0	s	O	X	X	
11-48	KEB Detection Level	230V：190~210	200V	V	O	X	X	
		400V：380~420	400V					
11-55	STOP Key Selection	0：Stop Key is Disabled when the Operation Command is not Provided by Operator.	1	-	O	O	O	
		1：Stop Key is Enabled when the Operation Command is not Provided by Operator.						
11-59	Gain of Preventing Oscillation	0.00~2.50	*		O	X	X	
11-60	Upper Limit of Preventing Oscillation	0~100	*	%	O	X	X	
11-61	Time Parameter of Preventing Oscillation	0~100	0		O	X	X	
11-62	Selection of Preventing Oscillation	0：Mode 1	1	-	O	X	X	
		1：Mode 2						
		2：Mode 3						
11-63	Strong Magnetic Selection	0：Disable	1	-	X	O	X	
		1：Enable						
11-66	2/3 Phase PWM Switch Frequency	6.00~60.00	20	-	X	O	X	
11-67	RPWM Frequency Bias	0~12000	0	-	X	O	X	
11-68	RPWM Switch Frequency	6.00~60.00	20.00	Hz	X	O	X	
11-69	Gain of Preventing Oscillation 2	0.00~200.00	5.00	%	O	X	X	
11-70	Upper Limit of Preventing Oscillation 2	0.01~100.00	5.00	%	O	X	X	
11-71	Time of Preventing Oscillation 2	0~30000	100	ms	O	X	X	
11-72	Switch Frequency 1 of Preventing Oscillation 2	0.01~300.00	30.00	Hz	O	X	X	
11-73	Switch Frequency 2 of Preventing Oscillation 2	0.01~300.00	50.00	Hz	O	X	X	

*** If the maximum output frequency of motor is over 300Hz, the frequency resolution is changed to 0.1Hz**

Note：The parameter of 11-01 can be changed during run operation, the range is 1~16KHz.

Group 12 Monitoring Parameters								
Code	**Parameters**	**Setting Range**	**Default**	**Unit**	**Control Mode**			**Attribute**
					V/F	**SLV**	**PM SLV**	
12-00	Display Screen Selection (LED)	00000~88888 From the leftmost bit, it displays the screen when press DSP key in order. 0：no display 1：Output Current 2：Output Voltage 3：DC Bus Voltage 4：Heatsink Temperature* 5：PID Feedback 6：AI1 Value 7：AI2 Value 8：Counter Value	00000	-	O	O	O	*1 *6
12-01	PID Feedback Display Mode (LED)	0：Display the Feedback Value by Integer (xxx) 1：Display the Feedback Value by the Value with One Decimal Place (xx.x) 2：Display the Feedback Value by the Value with Two Decimal Places (x.xx)	0		O	O	O	*6
12-02	PID Feedback Display Unit Setting (LED)	0：xxxxx (no unit) 1：xxxPb (pressure) 2：xxxFL (flow)	0		O	O	O	*6
12-03	Line Speed Display (LED)	0~60000	1500/ 1800	RPM	O	O	O	*1 *6
12-04	Modes of Line Speed Display (LED)	0：Display Inverter Output Frequency 1：Display Line Speed with integer (xxxxx) 2：Display Line Speed with the First Decimal Place (xxxx.x) 3：Display Line Speed with the Second Decimal Place (xxx.xx) 4：Display Line Speed with the Third Decimal Place (xx.xxx)	0	-	O	O	O	*1 *6
12-05	Status Display of Digital Input & Output Terminal (LED/LCD)	LCD display is shown as below	-		O	O	O	

Group 12 Monitoring Parameters									
Code	**Parameters**	**Setting Range**	**Default**	**Unit**	**Control Mode**			**Attribute**
					V/F	**SLV**	**PM SLV**	
		 LED display is shown as on the next page.  Correspondences to input and output  						
12-11	Output Current of Current Fault	Display the output current of current fault	-	A	O	O	O	
12-12	Output Voltage of Current Fault	Display the output voltage of current fault	-	V	O	O	O	
12-13	Output Frequency of Current Fault	Display the output frequency of current fault	-	Hz	O	O	O	
12-14	DC Voltage of Current Fault	Display the DC voltage of current fault	-	V	O	O	O	
12-15	Frequency Command of Current Fault	Display the frequency command of current fault	-	Hz	O	O	O	
12-16	Frequency Command	If LED enters this parameter, it only allows monitoring frequency command.	-	Hz	O	O	O	
12-17	Output Frequency	Display the current output frequency	-	Hz	O	O	O	
12-18	Output Current	Display the current output current	-	A	O	O	O	
12-19	Output Voltage	Display the current output voltage	-	V	O	O	O	
12-20	DC Voltage (Vdc)	Display the current DC voltage	-	V	O	O	O	
12-28	Motor Torque Current (Iq)	Display the current q-axis current		%	X	O	O	
12-29	Motor Excitation Current (Id)	Display the current d-axis current		%	X	O	O	
12-36	PID Input	Display input error of the PID controller (PID target value - PID feedback) (100% corresponds to the maximum frequency set by 01-02 or 01-16)		%	O	O	O	
12-37	PID Output	Display output of the PID controller		%	O	O	O	

Group 12 Monitoring Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
		(100% corresponds to the maximum frequency set by 01-02 or 01-16)						
12-38	PID Setting	Display the target value of the PID controller (100% corresponds to the maximum frequency set by 01-02 or 01-16)		%	O	O	O	
12-39	PID Feedback	Display the feedback value of the PID controller (100% corresponds to the maximum frequency set by 01-02 or 01-16)		%	O	O	O	
12-41	Heatsink Temperature*	Display the heatsink temperature / IGBT temperature**		℃	O	O	O	
12-43	Inverter Status				O	O	O	

Group 13 Maintance Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
13-00	Inverter Capacity Selection	----	-	-	O	O	O	*4
13-01	Software Version	0.00-9.99	-	-	O	O	O	*4
13-02	Fault Record		0	-	O	O	O	*1
13-03	Cumulative Operation Hours 1	0~23	-	hr	O	O	O	*4
13-04	Cumulative Operation Hours 2	0~65535	-	day	O	O	O	*4
13-05	Selection of Cumulative Operation Time	0: Cumulative time in power on 1: Cumulative time in operation	0	-	O	O	O	*1
13-06	Parameters Locked	0: Parameters are read-only except 13-06 and main frequency 1 : Reserved 2: Advanced Level, all parameters are accesible	2	-	O	O	O	*1
13-07	Parameter Password Function	00000~65534	00000	-	O	O	O	*1
13-08	Restore Factory Setting	1：2 wire initialization (50Hz) (220V/380V) 2：2 wire initialization (60Hz) (220V/380V) 3：2 wire initialization (50Hz) (230V/400V) 4：2 wire initialization (60Hz) (230V/460V) 5：2 wire initialization (50Hz) (220V/415V) 6：2 wire initialization (60Hz) (230V/400V) 7：2 wire initialization (50Hz) (220V/440V) 8：2 wire initialization (60Hz) (220V/440V) 1112：PLC initialization (RESET)	-	-	O	O	O	
13-10	Parameter Password Function 2	0~9999	0		O	O	O	
13-51	Operation Time Clearance Function	0: Do not clear operation time 1: Clear operation time	0		O	O	O	

Group 14 PLC Setting Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
14-00	T1 Set Value 1	0~9999	0	-	O	O	O	
14-01	T1 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-02	T2 Set Value 1	0~9999	0	-	O	O	O	
14-03	T2 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-04	T3 Set Value 1	0~9999	0	-	O	O	O	
14-05	T3 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-06	T4 Set Value 1	0~9999	0	-	O	O	O	
14-07	T4 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-08	T5 Set Value 1	0~9999	0	-	O	O	O	
14-09	T5 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-10	T6 Set Value 1	0~9999	0	-	O	O	O	
14-11	T6 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-12	T7 Set Value 1	0~9999	0	-	O	O	O	
14-13	T7 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-14	T8 Set Value 1	0~9999	0	-	O	O	O	
14-15	T8 Set Value 2 (Mode 7)	0~9999	0	-	O	O	O	
14-16	C1 Set Value	0~65535	0	-	O	O	O	
14-17	C2 Set Value	0~65535	0	-	O	O	O	
14-18	C3 Set Value	0~65535	0	-	O	O	O	
14-19	C4 Set Value	0~65535	0	-	O	O	O	
14-20	C5 Set Value	0~65535	0	-	O	O	O	
14-21	C6 Set Value	0~65535	0	-	O	O	O	
14-22	C7 Set Value	0~65535	0	-	O	O	O	
14-23	C8 Set Value	0~65535	0	-	O	O	O	
14-24	AS1 Set Value 1	0~65535	0	-	O	O	O	
14-25	AS1 Set Value 2	0~65535	0	-	O	O	O	
14-26	AS1 Set Value 3	0~65535	0	-	O	O	O	
14-27	AS2 Set Value 1	0~65535	0	-	O	O	O	
14-28	AS2 Set Value 2	0~65535	0	-	O	O	O	
14-29	AS2 Set Value 3	0~65535	0	-	O	O	O	
14-30	AS3 Set Value 1	0~65535	0	-	O	O	O	
14-31	AS3 Set Value 2	0~65535	0	-	O	O	O	
14-32	AS3 Set Value 3	0~65535	0	-	O	O	O	
14-33	AS4 Set Value 1	0~65535	0	-	O	O	O	
14-34	AS4 Set Value 2	0~65535	0	-	O	O	O	

Group 14 PLC Setting Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
14-35	AS4 Set Value 3	0~65535	0	-	O	O	O	
14-36	MD1 Set Value 1	0~65535	1	-	O	O	O	
14-37	MD1 Set Value 2	0~65535	1	-	O	O	O	
14-38	MD1 Set Value 3	0~65535	1	-	O	O	O	
14-39	MD2 Set Value 1	0~65535	1	-	O	O	O	
14-40	MD2 Set Value 2	0~65535	1	-	O	O	O	
14-41	MD2 Set Value 3	0~65535	1	-	O	O	O	
14-42	MD3 Set Value 1	0~65535	1	-	O	O	O	
14-43	MD3 Set Value 2	0~65535	1	-	O	O	O	
14-44	MD3 Set Value 3	0~65535	1	-	O	O	O	
14-45	MD4 Set Value 1	0~65535	1	-	O	O	O	
14-46	MD4 Set Value 2	0~65535	1	-	O	O	O	
14-47	MD4 Set Value 3	0~65535	1	-	O	O	O	

Group 15 PLC Monitoring Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
15-00	T1 Current Value1	0~9999	0	-	O	O	O	
15-01	T1 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-02	T2 Current Value 1	0~9999	0	-	O	O	O	
15-03	T2 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-04	T3 Current Value 1	0~9999	0	-	O	O	O	
15-05	T3 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-06	T4 Current Value 1	0~9999	0	-	O	O	O	
15-07	T4 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-08	T5 Current Value 1	0~9999	0	-	O	O	O	
15-09	T5 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-10	T6 Current Value 1	0~9999	0	-	O	O	O	
15-11	T6 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-12	T7 Current Value 1	0~9999	0	-	O	O	O	
15-13	T7 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-14	T8 Current Value 1	0~9999	0	-	O	O	O	
15-15	T8 Current Value 2 (Mode7)	0~9999	0	-	O	O	O	
15-16	C1 Current Value	0~65535	0	-	O	O	O	
15-17	C2 Current Value	0~65535	0	-	O	O	O	
15-18	C3 Current Value	0~65535	0	-	O	O	O	
15-19	C4 Current Value	0~65535	0	-	O	O	O	
15-20	C5 Current Value	0~65535	0	-	O	O	O	
15-21	C6 Current Value	0~65535	0	-	O	O	O	
15-22	C7 Current Value	0~65535	0	-	O	O	O	
15-23	C8 Current Value	0~65535	0	-	O	O	O	
15-24	AS1 Current Value	0~65535	0	-	O	O	O	
15-25	AS2 Current Value	0~65535	0	-	O	O	O	
15-26	AS3 Current Value	0~65535	0	-	O	O	O	
15-27	AS4 Current Value	0~65535	0	-	O	O	O	
15-28	MD1 Current Value	0~65535	0	-	O	O	O	
15-29	MD2 Current Value	0~65535	0	-	O	O	O	
15-30	MD3 Current Value	0~65535	0	-	O	O	O	
15-31	MD4 Current Value	0~65535	0	-	O	O	O	
15-32	TD Current Value	0~65535	0	-	O	O	O	

Group 16 LCD Function Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
16-00	Main Screen Monitoring	5~39 when using LCD to operate, the monitored item displays in the first line. (default is frequency command)	16	-	O	O	O	*1
16-01	Sub-Screen Monitoring 1	5~39 when using LCD to operate, the monitored item displays in the second line. (default is output frequency)	17	-	O	O	O	*1
16-02	Sub-Screen Monitoring 2	5~39 when using LCD to operate, the monitored item displays in the third line. (default is output current))	18	-	O	O	O	*1
16-03	Display Unit	0~39999 Determine the display way and unit of frequency command 0：Frequency display unit is 0.01Hz 1：Frequency display unit is 0.01% 2：Frequency display unit is rpm. 3~39：Reserved 40~9999： Users specify the format, Input 0XXXX represents the display of XXXX at 100%. 10001~19999： Users specify the format; Input 1XXXX represents the display of XXX.X at 100%. 20001~29999： Users specify the format, Input 2XXXX represents the display of XX.XX at 100%. 30001~39999： Users specify the format, Input 3XXXX represents the display of X.XXX at 100%.	0	-	O	O	O	
16-04	Engineering Unit	0：Without using engineering units 1：FPM 2：CFM 3：PSI 4：GPH	0	-	O	O	O	

Group 16 LCD Function Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
		5：GPM						
		6：IN						
		7：FT						
		8：/s						
		9：/m						
		10：/h						
		11：°F						
		12：inW						
		13：HP						
		14：m/s						
		15：MPM						
		16：CMM						
		17：W						
		18：KW						
		19：m						
		20：°C						
		21：RPM						
		22：Bar						
		23：Pa						
16-05	LCD Backlight	0~7	5	-	O	O	O	
16-07	Copy Function Selection	0：Do not copy parameters	0	-	O	O	O	
		1：Read inverter parameters and store parameters settings in the operator.						
		2：Write the operator parameters to the inverter.						
		3：Compare operator parameters against inverter.						
16-08	Selection of Allowing Reading	0：Do not allow to read inverter parameters or save them to the operator.	0	-	O	O	O	
		1：Allow to read inverter parameters and save to the operator.						
16-09	Selection of Operator Removed (LCD)	0：Continue operation when LCD operator is removed.	0	-	O	O	O	
		1：Display fault when LCD operator is removed						

<table>
<tr><th colspan="10">Group 17 Automatic Tuning Parameters</th></tr>
<tr><th rowspan="2">Code</th><th rowspan="2">Parameter Name</th><th rowspan="2">Setting Range</th><th rowspan="2">Default</th><th rowspan="2">Unit</th><th colspan="3">Control Mode</th><th rowspan="2">Attribute</th></tr>
<tr><th>V/F</th><th>SLV</th><th>PM SLV</th></tr>
<tr><td rowspan="7">17-00</td><td rowspan="7">Mode Selection of Automatic Tuning*</td><td>0：Rotation Auto-tuning</td><td rowspan="7">V/F: 2
SLV: 6</td><td rowspan="7">-</td><td rowspan="7">O</td><td rowspan="7">O</td><td rowspan="7">X</td><td rowspan="7"></td></tr>
<tr><td>1：Static Auto-tuning</td></tr>
<tr><td>2：Stator Resistance Measurement</td></tr>
<tr><td>3：Reserved</td></tr>
<tr><td>4：Loop Tuning</td></tr>
<tr><td>5：Rotation Auto-tuning Combination (item: 4+2+0)</td></tr>
<tr><td>6：Static Auto-tuning Combination (item: 4+2+1)</td></tr>
<tr><td>17-01</td><td>Motor Rated Output Power</td><td>0.00~600.00</td><td>KVA</td><td>KW</td><td>O</td><td>O</td><td>X</td><td></td></tr>
<tr><td>17-02</td><td>Motor Rated Current</td><td>0.1~1200.0</td><td>KVA</td><td>A</td><td>O</td><td>O</td><td>X</td><td></td></tr>
<tr><td rowspan="2">17-03</td><td rowspan="2">Motor Rated Voltage</td><td>200V：50.0~240.0</td><td>220</td><td rowspan="2">V</td><td rowspan="2">O</td><td rowspan="2">O</td><td rowspan="2">X</td><td rowspan="2"></td></tr>
<tr><td>400V：100.0~480.0</td><td>440</td></tr>
<tr><td>17-04</td><td>Motor Rated Frequency</td><td>4.8~599.0</td><td>60.0</td><td>Hz</td><td>O</td><td>O</td><td>X</td><td></td></tr>
<tr><td>17-05</td><td>Motor Rated Speed</td><td>0~24000</td><td>KVA</td><td>rpm</td><td>O</td><td>O</td><td>X</td><td></td></tr>
<tr><td>17-06</td><td>Pole Number of Motor</td><td>2~16(Even)</td><td>4</td><td>Pole</td><td>O</td><td>O</td><td>X</td><td></td></tr>
<tr><td rowspan="2">17-08</td><td rowspan="2">Motor no-load Voltage</td><td>200V：50~240</td><td rowspan="2">-</td><td rowspan="2">V</td><td rowspan="2">O</td><td rowspan="2">O</td><td rowspan="2">X</td><td rowspan="2"></td></tr>
<tr><td>400V：100~480</td></tr>
<tr><td>17-09</td><td>Motor Excitation Current</td><td>0.01~600.00</td><td>-</td><td>A</td><td>X</td><td>O</td><td>X</td><td></td></tr>
<tr><td rowspan="2">17-10</td><td rowspan="2">Automatic Tuning Start</td><td>0：Disable</td><td rowspan="2">0</td><td rowspan="2">-</td><td rowspan="2">O</td><td rowspan="2">O</td><td rowspan="2">X</td><td rowspan="2"></td></tr>
<tr><td>1：Enable</td></tr>
<tr><td rowspan="10">17-11</td><td rowspan="10">Error History of Automatic Tuning</td><td>0：No error</td><td rowspan="10">0</td><td rowspan="10">-</td><td rowspan="10">O</td><td rowspan="10">O</td><td rowspan="10">X</td><td rowspan="10"></td></tr>
<tr><td>1：Motor data error</td></tr>
<tr><td>2：Stator resistance tuning error</td></tr>
<tr><td>3：Leakage induction tuning error</td></tr>
<tr><td>4：Rotor resistance tuning error</td></tr>
<tr><td>5：Mutual induction tuning error</td></tr>
<tr><td>6：DT Error</td></tr>
<tr><td>7：Encoder error</td></tr>
<tr><td>8：Motor’s acceleration error</td></tr>
<tr><td>9：Warning</td></tr>
<tr><td>17-12</td><td>Proportion of Motor Leakage Inductance</td><td>0.1~15.0</td><td>3.4</td><td>%</td><td>X</td><td>O</td><td>X</td><td></td></tr>
<tr><td>17-13</td><td>Motor Slip Frequency</td><td>0.10~20.00</td><td>1.00</td><td>Hz</td><td>X</td><td>O</td><td>X</td><td></td></tr>
</table>

17-14	Selection of Rotation Auto-tuning	0: V/f Rotation Auto-tuning 1: Vector Rotation Auto-tuning	0	-	O	O	X	

KVA：The default value of this parameter will be changed by different capacities of inverter

It is suggested that HD/ ND mode (00-27) be selected first before motor performs auto-tuning.

Note：The value of mode selection of automatic tuning is 6 (Static Auto-tuning Combination). When do auto-tuning with no-load motor, it is suggested to select 17-00=5 (Rotation Auto-tuning Combination)

Group 18 Slip Compensation Parameters								
Code	**Parameters**	**Setting Range**	**Default**	**Unit**	**Control mode**			**Attribute**
					V/F	**SLV**	**PM SLV**	
18-00	Slip Compensation Gain at Low Speed.	0.00~2.50	VF：0.00 SLV：*	-	O	O	X	*1
18-01	Slip Compensation Gain at High Speed.	-1.00~1.00	0.0	-	O	O	X	*1
18-02	Slip Compensation Limit	0~250	200	%	O	X	X	
18-03	Slip Compensation Filter Time	0.0~10.0	1.0	Sec	O	X	X	
18-04	Regenerative Slip Compensation Selection	0：Disable 1：Enable	0	-	O	X	X	
18-05	FOC Delay Time	1~1000	100	ms	X	O	X	
18-06	FOC Gain	0.00~2.00	0.1	-	X	O	X	

*****：Refer to attachment 1.

Group 20 Speed Control Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
20-00	ASR Gain 1	0.00~250.00	-	-	X	O	O	*1
20-01	ASR Integral Time 1	0.001~10.000	-	Sec	X	O	O	*1
20-02	ASR Gain 2	0.00~250.00	-	-	X	O	O	*1
20-03	ASR Integral Time 2	0.001~10.000	-	Sec	X	O	O	*1
20-04	ASR Integral Time Limit	0~300	200	%	X	O	O	
20-07	Selection of Acceleration and Deceleration of P/PI	0：PI speed control will be enabled only in constant speed. For speed acceleration and deceleration, only use P control. 1：Speed control is enabled either during acceleration or deceleration.	0	-	X	O	X	
20-08	ASR Delay Time	0.000~0.500	0.004	Sec	X	O	O	
20-09	Speed Observer Proportional (P) Gain1	0.00~2.55	0.61	-	X	O	X	*1
20-10	Speed Observer Integral(I) Time 1	0.01~10.00	0.05	Sec	X	O	X	*1
20-11	Speed Observer Proportional (P) Gain2	0.00~2.55	0.61	-	X	O	X	*1
20-12	Speed Observer Integral(I) Time 2	0.01~10.00	0.06	Sec	X	O	X	*1
20-13	Low-pass Filter Time Constant of Speed Feedback 1	1~1000	4	ms	X	O	X	
20-14	Low-pass Filter Time Constant of Speed Feedback 2	1~1000	30	ms	X	O	X	
20-15	ASR Gain Change Frequency 1	0.0~599.0	4.0	Hz	X	O	O	
20-16	ASR Gain Change Frequency 2	0.0~599.0	8.0	Hz	X	O	O	
20-17	Torque Compensation Gain at Low Speed	0.00~2.50	1.00	-	X	O	X	*1
20-18	Torque Compensation Gain at High Speed	-10~10	0	%	X	O	X	*1
20-33	Detection Level at	0.1~5.0	1.0		X	O	O	*1

Group 20 Speed Control Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
	Constant Speed							
20-34	Compensation Gain of Derating	0~25600	0		X	O	O	*1
20-35	Compensation Time of Derating	0~30000	100	ms	X	O	O	*1

Group 21 Torque And Position Control Parameters								
Code	Parameters	Setting Range	Default	Unit	Control mode			Attribute
					V/F	SLV	PM SLV	
21-05	Positive Torque Limit	0~300	*	%	X	O	O	*
21-06	Negative Torque Limit	0~300	*	%	X	O	O	*
21-07	Forward Regenerative Torque Limit	0~300	*	%	X	O	O	*
21-08	Reversal Regenerative Torque Limit	0~300	*	%	X	O	O	*

*****：Refer to attachment 1.

Group 22 PM Motor Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
22-00	PM Motor Rated Power	0.00~600.00	KVA	kW	X	X	O	
22-02	PM Motor Rated Current	25%~200% inverter rated current	KVA	A	X	X	O	
22-03	PM Motor‘s Pole Number	2~96	8	poles	X	X	O	
22-04	PM Motor’s Rotation Speed	6~65535	1500	rpm	X	X	O	
22-05	PM Motor’s Maximum Rotation Speed	6~65535	1500	rpm	X	X	O	
22-06	PM Motor Rated Frequency	4.8~599.0	75.0	Hz	X	X	O	
22-10	PM SLV Start Current	20% ~ 120% Motor Rated Current	50	%	X	X	O	
22-11	I/F Mode Start Frequency Switching Point	1.0 ~ 20.0	10.0	%	X	X	O	
22-14	Armature Resistance of PM Motor	0.001 ~ 30.000	1.000	Ω	X	X	O	
22-15	D-axis Inductance of PM Motor	0.01 ~300.00	10.00	mH	X	X	O	

Group 22 PM Motor Parameters								
Code	Parameters	Setting Range	Default	Unit	Control Mode			Attribute
					V/F	SLV	PM SLV	
22-16	Q-axis Inductance of PM Motor	0.01 ~ 300.00	10.00	mH	X	X	O	
22-18	Flux-Weakening Limit	0~100	0	%	X	X	O	
22-21	PM Motor Tuning	0：PM Motor Tuning is not Active. 1：Parameter Auto-tune	0	-	X	X	O	
22-23	PMSLV acceleration time	0.1~10.0	1.0	Sec	X	X	O	
22-25	Initial Position Detection of PM Motor	0：Disable 1：Detected when inverter is running	1	-	X	X	O	

Attachment 1：Parameter default values and ranges dependent on inverter model.

Model	Frame	Maximum Output Frequency (Hz) in SLV Mode for 11-01 <= 8KHz	Maximum Output Frequency (Hz) in SLV Mode for 11-01 > 8KHz	Heat Sink Temperature Displayed, Parameter 12-41	SLV default value(18-00) (Low speed slip compensation
2P5	1	150	150	YES	1.00
201					
202H3					
202H1	2	150	150	YES	1.00
203					
205					
208	3	150	150	YES	1.00
210					
215	4	110	110	YES	1.00
220					
225	5	100	80	YES	0.70
230	6	100	80	YES	0.70
240					
401	1	150	150	YES	1.00
402					
403	2	150	150	YES	1.00
405					
408	3	150	150	YES	1.00
410					
415					
420	4	110	110	YES	1.00
425		100	100		
430	5	100	80	YES	0.70
440	6	100	80	YES	0.70
450					
460					
475					

Model	Default value of 21-05~21-08 (Torque limit)	Default value of 20-08 (ASR filter time)	Default value of 00-14~00-17 00-23~00-27	Factory setting of 11-01 in HD mode	The maximum value of 11-01 in HD mode (SLV control mode)	The maximum value of 11-01 in HD mode (Other control modes)
2P5	200%	0.001	10.0	5	16	16
201				5	16	16
202H3				5	16	16
202H1	200%	0.001	10.0	5	16	16
203				5	16	16
205				5	16	16
208	200%	0.001	10.0	5	16	16
210				5	16	16
215	200%	0.002	15.0	5	16	16
220				5	16	16
225	160%	0.002	20.0	5	8	12
230	160%	0.004	20.0	5	8	12
240				5	8	12
401	200%	0.001	10.0	5	16	16
402				5	16	16
403	200%	0.001	10.0	5	16	16
405				5	16	16
408	200%	0.001	10.0	5	16	16
410				5	16	16
415				5	16	16
420	200%	0.002	15.0	5	16	16
425				5	16	16
430	160%	0.002	20.0	5	8	16
440	160%	0.004	20.0	5	8	12
450				5	8	12
460				5	8	10
475				5	8	10

4.3 Description of Parameters

00 Basic Parameters

00-00	Control Mode Selection
Range	**【0】:** V/F **【2】:** SLV **【5】:** PMSLV

The inverter offers the following control modes:

00-00 Value	Mode	Information	Application
0	V/F	V/F Control without PG	General Purpose Applications which do not require high precision speed control - Auto-tuning is not required.
2	SLV	Sensorless Vector Control without PG	General Purpose Applications that require higher precision speed control and torque response without the use of an encoder.
5	PMSLV	Sensorless Current Vector Control without PG (for Permanent magnet motor)	PM Motor Applications that require higher precision speed control and torque response without the use of an encoder.

00-00=0: V/F Mode
Select the required V/F curve (01-00) based on your motor and application.
Perform a stationary auto-tune (17-00=2), if the motor cable is longer than 50m (165ft); see parameter 17-00 for details.

00-00=2: Sensorless Vector Control
Verify the inverter rating matches the motor rating. Perform rotational auto-tune to measure and store motor parameters for higher performance operation. Perform non-rotational auto-tune if it’s not possible to rotate the motor during auto-tune. Refer to parameter group 17 for details on auto-tuning.

00-00=5: PM Sensorless Vector Control
Verify the inverter rating matches the motor rating. Perform rotational auto-tune to measure and store motor parameters for higher performance operation.

Perform auto-tuning before operation to enhance the performance of PMSLV mode. Refer to parameter 22-21 for the descriptions of PM motor tuning function.

Select the appropriate motor rating and braking resistor based on your motor and applications. Please install the braking module for models of 200V 30HP / 400V 40HP and above.

Note: Parameter 00-00 is excluded from initialization.

00-01	Motor’s Rotation Direction
Range	**【0】: Forward** **【1】: Reverse**

Use the FWD/REV key to change motor direction when Run Command Selection (00-02 = 0) is set to keypad control.

00-02	Main Run Command Source Selection
00-03	**Alternative Run Command Source Selection**
Range	**【0】: Keypad control** **【1】: External terminal control** **【2】: Communication control** **【3】: PLC**

Note: To switch the command source between the setting of main (00-02) and alternative (00-03) assign one of the DI (S1 to S6) to be the “Run Command Switch Over” (03-00~03-05=12).

00-02=0: Keypad Control
Use the keypad to start and stop the inverter and set direction with the forward / reverse key. Refer to section 4-1 for details on the keypad.

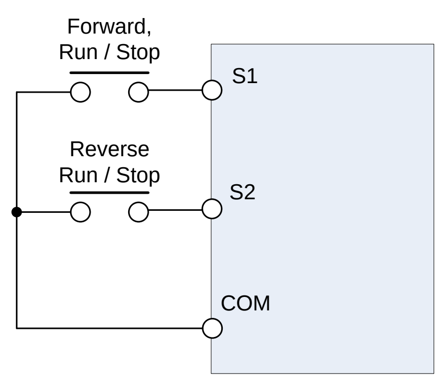
00-02=1: External Terminal Control
External terminals are used to start and stop the inverter and select motor direction. There are three different types: 2-wire and 3-wire operation and 2-wire self-holding (latching) mode.

■ 2-wire operation

For 2-wire operation, set 03-00 (S1 terminal selection) to 0 and 03-01 (S2 terminal selection) to 1

Terminal S1	Terminal S2	Operation
Open	Open	Stop Inverter
Closed	Open	Run Forward
Open	Closed	Run Reverse
Closed	Closed	Stop Inverter, Display EF9 Alarm after 500ms

Figure 4.3.1 Wiring example of 2-wire



■ **3-wire operation**

Set parameter 00-04 to 2 for 3-wire program initialization, multi-function input terminal S1 is set to run operation, S2 for stop operation and S3 for forward/reverse command.

Note: Terminal S1 must be closed for a minimum of 50ms to activate operation.

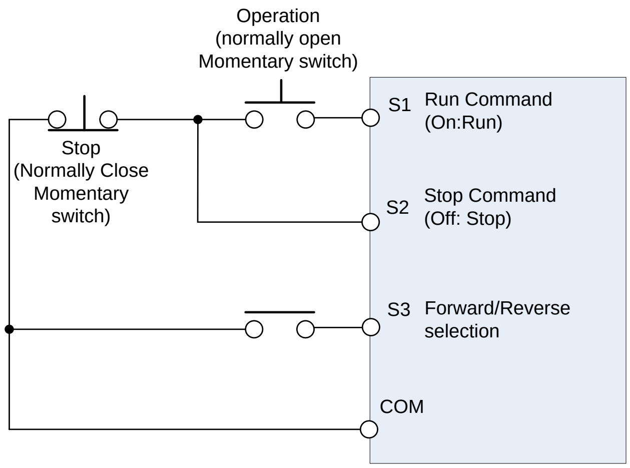


Figure 4.3.2 Wiring example of 3-wire

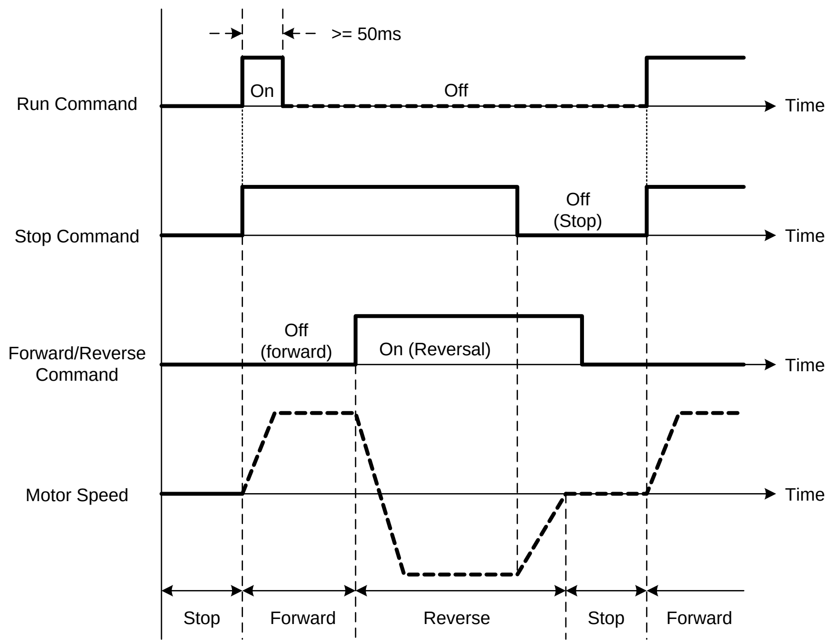


Figure 4.3.3 3-wire operation

00-03=2: Communication control

The inverter is controlled by the RS-485 port. Refer to parameter group 9 for communication setup.

00-03=3: PLC control

The inverter is controlled by the inverter built-in PLC logic. Refer to section 4.4.

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 S1, S2, S3 are used in a combination to enable 3 wire run/stop mode.
Settings for 03-00, 03-01, and 03–02 will not be effective... (Refer to group 03)

00-05	Main Frequency Command Source Selection
00-06	Alternative Frequency Source Selection
Range	【0】: Up/Down on 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】: Reserved 【7】: Pulse Input

00-05/00-06= 0: Keypad

Use the keypad to enter the frequency reference or by setting parameter 05-01 (frequency reference 1). Note that once the frequency command is switched to alternative frequency reference and 00-06 is set to 0, the frequency can be adjusted using parameter 05-01.

00-05/00-06= 1: Potentiometer on Keypad

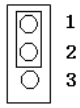
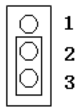
Use the keypad potentiometer to set frequency reference

00-05/00-06= 2, 3: External Analog Input AI1 / External Analog Input AI2

Set any of the multi-function terminals (03-00~03-05) to 13, to switch between main and alternate frequency.

Use analog reference from analog input AI1 or AI2 to set the frequency reference (as shown in Figure 4.3.4). Refer to parameter 04-00 to select the signal type.

		AI1	AI2	
04-00	Analog Input Signal Type Select (AI1/AI2)	(0): 0~10V (0~20mA)	0~10V (0~20mA)	
		(1): 0~10V (0~20mA)	2~10V (4~20mA)	**Factory Default**
		(2): 2~10V (4~20mA)	0~10V (0~20mA)	
		(3): 2~10V (4~20mA)	2~10V (4~20mA)	

JP2/JP3		External signal type selection	0~20mA / 4~20mA Analog signal
			0~10VDC / 2~10VDC Analog signal

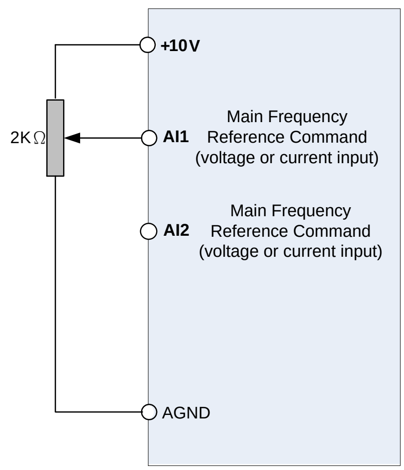


Figure 4.3.4 Analog input as main frequency reference command

00-05/00-06= 4: Terminal UP / DOWN

The inverter accelerates with the UP command closed and decelerates with the DOWN command closed. Please refer to parameter 03-00 ~ 03-05 for additional information.

Note: To use this function both the UP and DOWN command have to be set to any of the input terminals.

00-05/00-06= 5: Communication Control

The frequency reference command is set via the RS-485 communication port.

Refer to parameter group 9 for additional information.

00-05/00-06= 6: Reserved

00-05/00-06= 7: Pulse Input

Frequency reference from an external pulse input. Can be used only with multi-function input terminal S3 (03-02 = 25 or 26). See parameter group 3 multi-function input selections 25 and 26.

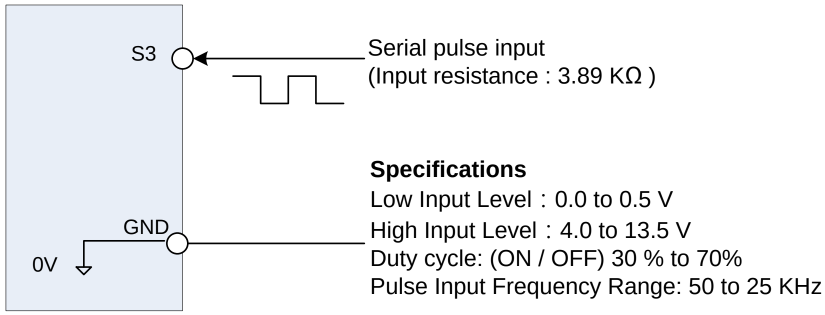


Figure 4.3.5 Frequency reference from pulse input

00-07	Main and Alternative Frequency Command Modes
Range	【0】: Main reference frequency 【1】: Main frequency + alternative frequency

When set to 0 the reference frequency is set by the main reference frequency selection of parameter 00-05. When set to 1 the reference frequency is sum of the main reference frequency (00-05) and alternative frequency (00-06).

Note: The inverter will display the SE1 error when 00-07 = 1 and parameter 00-05 and 00-06 are set to the same selection.

When parameter 00-06 is set to 0 (Keypad) the alternative frequency reference is set by parameter 05-01 (Frequency setting of speed-stage 0).

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

Display the frequency reference when 00-05 or 00-06 is set to communication control (3).

00-09	Communication Frequency Command Memory
Range	【0】: Do not store the communication frequency command at power down 【1】: Store communication frequency reference at power down

Note: This parameter is only effective when frequency reference is set via communication (00-05 / 00-06 = 3).

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

Notes:
- 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 is set by parameter 00-11.

00-12	Upper Limit Frequency
Range	**【0.01~599.00】Hz**

Set the maximum frequency reference. Maximum output frequency depends on motor selection.
Motor Maximum frequency parameter 01-02.

00-13	Lower Limit Frequency
Range	**【0.00~598.99】Hz**

Set the maximum frequency reference is 100% of the 01-02 or 01-16.

The inverter will display the SE01 error when 00-12 value is set lower than value in parameter 00-13.

Frequency upper and lower limits are active for all frequency reference modes.

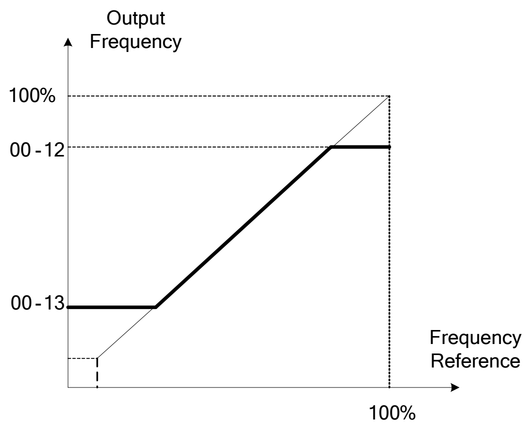


Figure 4.3.6 Frequency reference upper and lower limits

00-14	Acceleration Time 1
Range	**【0.1~6000.0】Sec**
00-15	**Deceleration Time 1**
Range	**【0.1~6000.0】Sec**
00-16	**Acceleration Time 2**
Range	**【0.1~6000.0】Sec**
00-17	**Deceleration Time 2**
Range	**【0.1~6000.0】Sec**

Notes:
- Acceleration time is the time required to accelerate from 0 to 100% of maximum output frequency.
- Deceleration time is the time required to decelerate from 100 to 0% of maximum output frequency.
- Maximum frequency is set by parameter 01-02 or 01-16.
- If parameter 01-00=18, Maximum output frequency is set by parameter 01-02 or 01-16.
- If parameter 01-00≠18, Maximum output frequency = 50.00 or 60.00 depending on initialization mode.

The default values for the acceleration / deceleration times are dependent on the inverter size.

Size		Acceleration / Deceleration Default Value
200V series	**400V series**	
1~10HP	1~15HP	10s
15~20HP	20~30HP	15s
30~40HP	40~75HP	20s

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

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

A:Select acceleration and deceleration time via the digital input terminals

The following table shows the acceleration / deceleration selected when the digital input function Accel/ Decel time 1 is used.

Table 4.3.1 Acceleration/Deceleration Time Selection

Accel/decel time 1 (Set 03-00 to 03-05 = 10)	Acceleration Time	Deceleration Time
0	Taccc1(00-14)	Tdec1(00-15)
1	Taccc2(00-16)	Tdec2(00-17)
0 : OFF (open) 1 : ON (closed)		

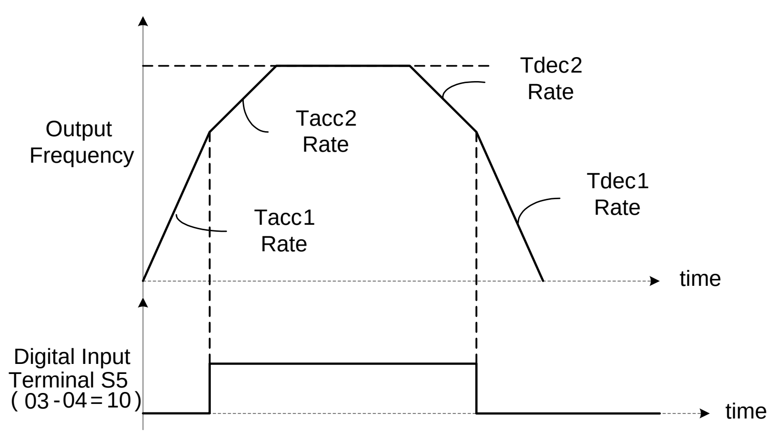


Figure 4.3.7 Digital input S5 switch between Tacc1/Tacc2 and Tdec1/Tdec2

B. Switch of Acceleration/Deceleration time based on motor selection

When 03-00~03-05 is set to 40 (motor 1/motor 2 selection), motor 1 or motor 2 can be selected via the digital input. This function is only available in V/F control mode.

00-18	Jog Frequency
Range	【0.00~599.00】Hz
00-19	Jog Acceleration Time
Range	【0.1~600.0】Sec
00-20	Jog Deceleration Time
Range	【0.1~600.0】Sec

The JOG function is operational by using the multi-function input terminals S1 to S6 and setting the relevant parameters 03-00~03-05 to 【6】JOG FWD or【7】JOG REV. Refer to parameter group 3.

Notes:

- To activate the JOG FWD function set any of the multi-function input terminals S1 to S6 to 6.
- To activate the JOG REV function set any of the multi-function input terminals S1 to S6 to 7.
- Jog acceleration time (00-19) is the time required to accelerate from 0 to 100% of maximum output frequency.
- Jog deceleration time (00-20) is the time required to decelerate from 100 to 0% of maximum output frequency.
- Maximum frequency is set by parameter 01-02 or 01-16.
- The inverter uses the Jog frequency (00-18, default 6.0 Hz) as its frequency reference when jog is active.

00-26	Emergency stop time
Range	【0.1~6000.0】 Sec

The emergency stop time is used in combination with multi-function digital input function #14 (Emergency stop) or #15 (Base block). When emergency stop input is activated the inverter will decelerate to a stop using the Emergency stop time (00-26).

Note: To cancel the emergency stop condition the run command has to be removed and emergency stop input deactivated.

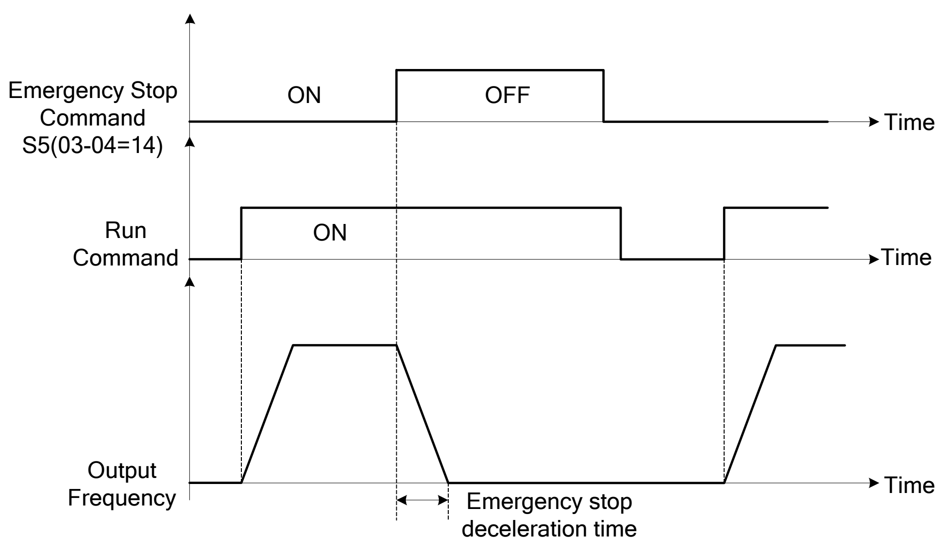


Figure 4.3.9 Emergency stop example

Multi-function digital input terminals (03-00 ~ 03-05) set to 14: When the emergency stop input is activated the inverter will decelerate to a stop using the time set in parameter 00-26.

Note: After an emergency stop command the run command and emergency stop command have to be removed before the inverter can be restarted. Please refer to Figure 4.3.9. The emergency stop function can be used to stop inverter in case of an external event.

Multi-function digital input terminals (03-00 ~ 03-05) set to 15: When the base block input is activated the inverter output will turn off and the motor will coast to a stop.

00-27	HD/ND Mode
Range	【0】: HD (Heavy Duty / Constant Torque) 【1】: ND (Normal Duty / Variable Torque)

The inverter overload curve, carrier frequency, stall prevention level, rated input/output current and maximum frequency are automatically set based on the inverter duty (HD/ND) selection.

Please refer to table 4.3.2 for detailed information

Table 4.3.2 Heavy Duty (Constant torque) / Normal Duty (Variable torque)

00-27	Overload capacity	Carrier frequency	Maximum output frequency	Stall prevention level	Rated input / output current
0 (Heavy Duty)	150%, 1min	2-16KHz (KVA dependent)	599.00Hz	150% (08-00, 08-01)	Refer to section 3.15
1 (Normal Duty)	120%, 1min	2-16KHz (KVA dependent)	120.00Hz	120% (08-00, 08-01)	

Note: Dual rating only can be used for 200V Class 25HP and above and 3400V class 30HP and above.
Select V/F curve (Group 1) and enter motor data (Group 2) to match your application. In Heavy Duty mode the maximum output frequency is 599Hz for all control modes, except for SLV mode (Sensorless Vector / Open Loop Vector Mode) where the maximum output frequency is limited based on the inverter rating, see table below.

Horsepower	Carrier Frequency Limit	Maximum output frequency
220V 1~10HP, 440V 1~15HP	-	150Hz
220V 15~25HP, 440V 20HP	-	110Hz
440V 25~30HP	-	100Hz
220V 30~40HP, 440V 40~75HP,	11-01 set 8KHz or below	100Hz
220V 30~40HP, 440V 40~75HP,	11-01 set 8KHz or higher	80Hz

Note: Normal duty mode only available in V/F mode. All other modes must use the Heavy Duty setting.

00-34	Language
Range	【0】: English 【1】: Simplified Chinese 【2】: Traditional Chinese 【3】: Turkish

LCD keypad is required to display languages.

Selection of parameter 00-34

00-34=0: LCD keypad displays in English.

00-34=1: LCD keypad displays in Simplified Chinese.

00-34=2: LCD keypad displays in Traditional Chinese.

00-04=3: LCD keypad displays in Turkish.

Note: Parameter 00-34 Language setting is not affected by drive initializing (see parameter 13-08).

00-35	Minimum Frequency Detection
Range	【0】: Alarm 【1】: Keep Running at Lower Frequency

00-35=0: When output frequency falls below the minimum frequency (01-08), display shows STP0 alarm.

00-35=1: When the frequency command falls below the minimum frequency, the inverter will keeping running at minimum frequency.

00-36	PID Lower Frequency Selection
Range	【0】: Lower Frequency of PID Sleep Mode 【1】: 0Hz of PID Sleep Mode

00-36=0: PID sleep frequency is used (parameter 10-17).

00-36=1: PID sleep frequency is 0Hz.

01 V/F Control Parameters

01-00	Volts/Hz Patterns
Range	【0~FF】

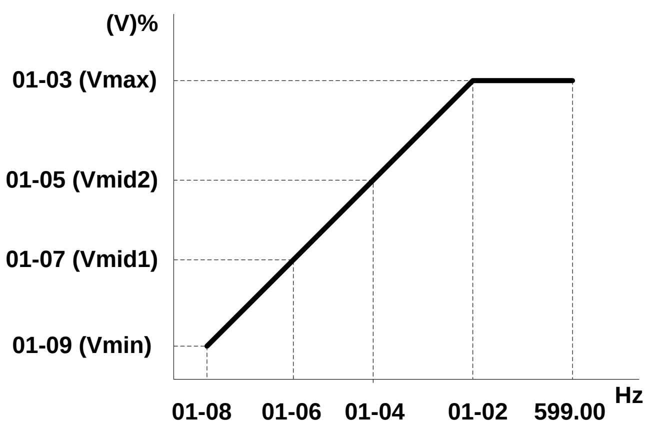
The V/F curve selection is enabled for V/F mode. Make sure to set the inverter input voltage parameter 01-14.

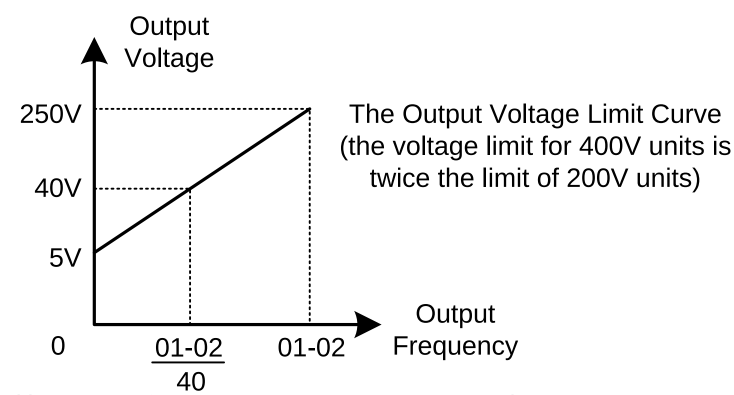
There are three ways to set V/F curve:
(1) 01-00 = 0 to 0E: choose any of the 15 predefined curves (0 to 17).
(2) 01-00 = 0F, use 01-02~01-09 and 01-12 ~ 01-13, with voltage limit
(2) 01-00 = FF, use 01-02~01-09 and 01-12 ~ 01-13, without voltage limit

The default parameters (01-02 ~ 01-09 and 01-12 ~ 01-13) are the same when 01-00 is set to 0F and 01-00 is set to 1 depending on the initialization mode.

Parameters 01-02 ~ 01-13 are automatically set when any of the predefined V/F curves are selected.

Consider the following items as the conditions for selecting a V/F pattern.
(1) The voltage and frequency characteristic of motor.
(2) The maximum speed of motor.

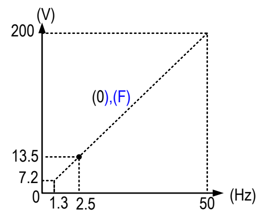
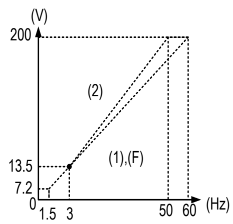
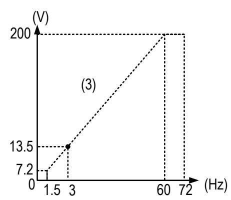
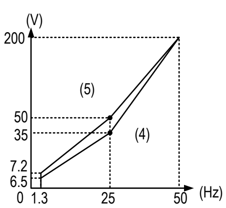
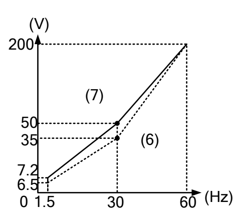




(the output frequency Versus max. voltage)

Note: Parameter 01-00 V/f Pattern setting is not affected by drive initializing (see parameter 13-08).

Table 4.3.3 2P5 - 2HP V/F curve selection (200V)

<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General purpose</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2">
</td></tr>
<tr><td>F
(50Hz Default setting)</td></tr>
<tr><td rowspan="3">60 Hz</td><td rowspan="2">60Hz Saturation</td><td>1</td><td rowspan="3">
</td></tr>
<tr><td>F
(60Hz Default setting.)</td></tr>
<tr><td>50Hz Saturation</td><td>2</td></tr>
<tr><td rowspan="5">Variable Torque Characteristic</td><td colspan="2">72Hz</td><td>3</td><td>
</td></tr>
<tr><td rowspan="2">50 Hz</td><td>Variable Torque 1</td><td>4</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 2</td><td>5</td></tr>
<tr><td rowspan="2">60 Hz</td><td>Variable Torque 3</td><td>6</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 4</td><td>7</td></tr>
</table>

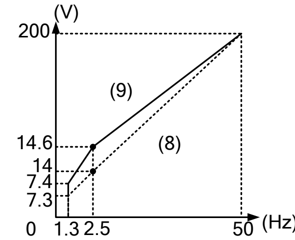
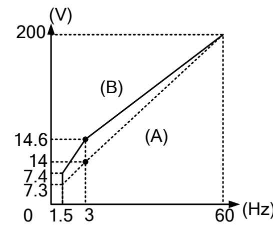
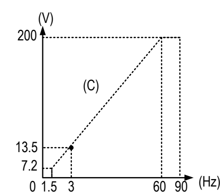
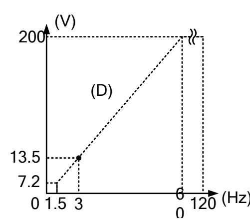
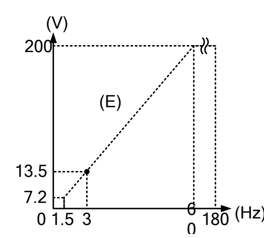
<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="4">High Staring Torque‡</td><td rowspan="2">50Hz</td><td>Low Starting Torque</td><td>8</td><td rowspan="2">
</td></tr>
<tr><td>High Starting Torque</td><td>9</td></tr>
<tr><td rowspan="2">60Hz</td><td>Low Starting Torque</td><td>A</td><td rowspan="2">
</td></tr>
<tr><td>High Starting Torque</td><td>B</td></tr>
<tr><td>Constant-power torque(Reducer)</td><td colspan="2">90Hz</td><td>C</td><td>
</td></tr>
<tr><td rowspan="2"></td><td colspan="2">120Hz</td><td>D</td><td>
</td></tr>
<tr><td colspan="2">180Hz</td><td>E</td><td>
</td></tr>
</table>

Table 4.3.4 3 - 30HP V/F curve selection (200V)

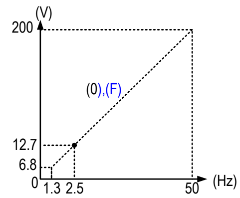
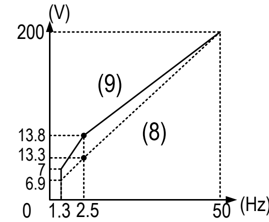
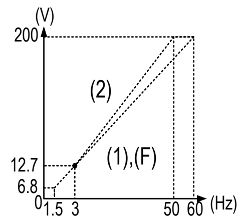
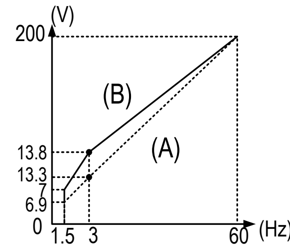
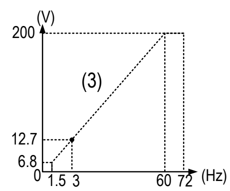
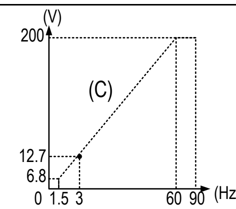
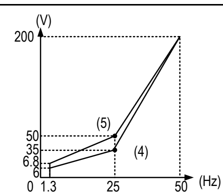
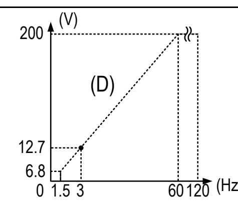
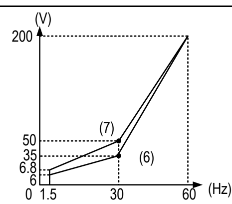
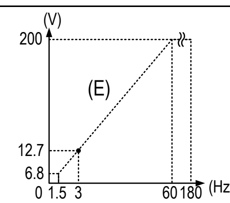
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting.)						
		50Hz Saturation	2				High Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.5 40HP and above V/F curve selection (200V)

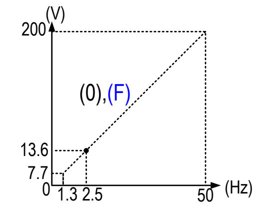
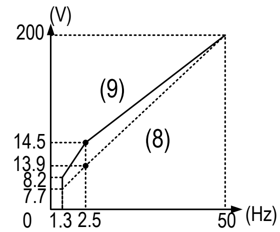
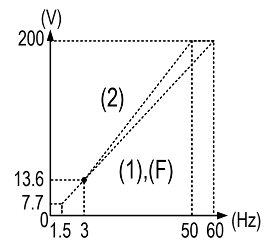
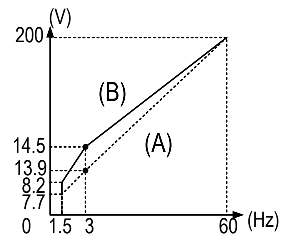
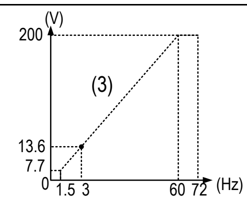
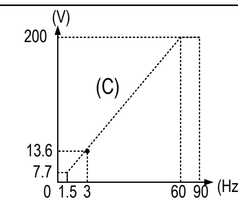
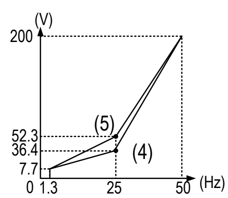
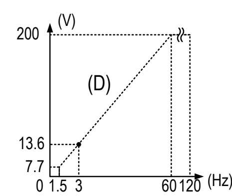
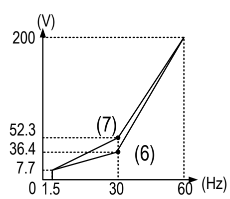
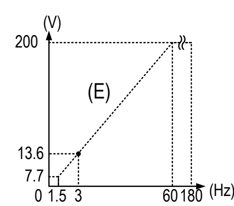
<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General application</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2"></td><td rowspan="4">High Staring Torque‡</td><td rowspan="2">50Hz</td><td>Low Starting Torque</td><td>8</td><td rowspan="2"></td></tr>
<tr><td>F (50Hz Default setting)</td><td>High Starting Torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60Hz Saturation</td><td>1</td><td rowspan="3"></td><td rowspan="3">60Hz</td><td rowspan="2">Low Starting Torque</td><td rowspan="2">A</td><td rowspan="3"></td></tr>
<tr><td>F (60Hz Default setting)</td></tr>
<tr><td>50Hz Saturation</td><td>2</td><td>High Starting Torque</td><td>B</td></tr>
<tr><td rowspan="5">Variable Torque Characteristic</td><td colspan="2">72Hz</td><td>3</td><td></td><td rowspan="5">Constant-power torque (Reducer)</td><td colspan="2">90Hz</td><td>C</td><td></td></tr>
<tr><td rowspan="2">50Hz</td><td>Variable Torque 1</td><td>4</td><td rowspan="2"></td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2"></td></tr>
<tr><td>Variable Torque 2</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Variable Torque 3</td><td>6</td><td rowspan="2"></td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2"></td></tr>
<tr><td>Variable Torque 4</td><td>7</td></tr>
</table>

Table 4.3.6 2P5- 2HP V/F curve selection (220V)

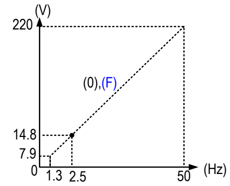
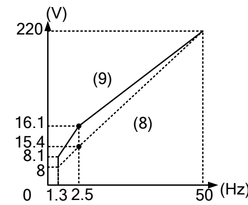
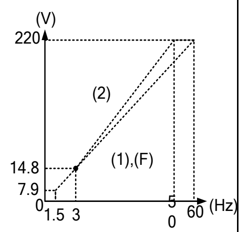
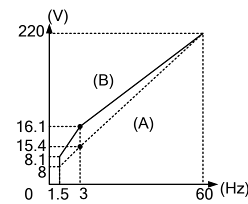
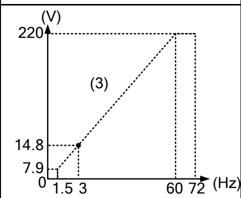
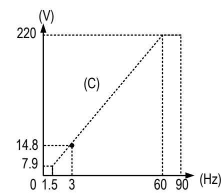
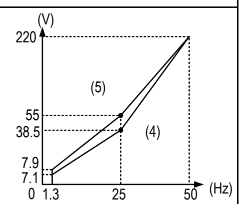
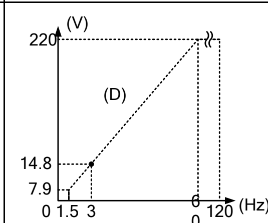
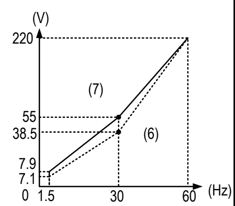
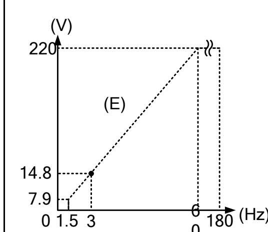
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.7 3 - 30HP V/F curve selection (220V)

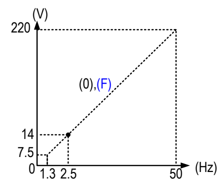
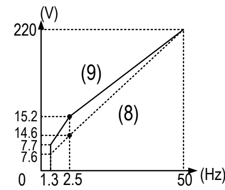
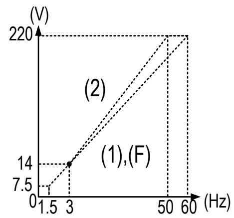
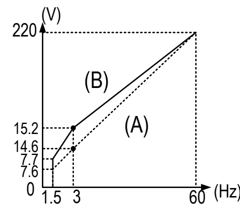
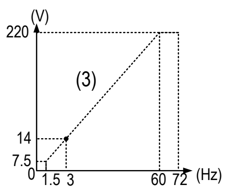
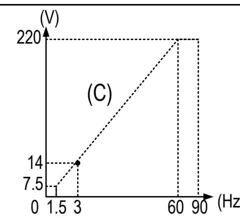
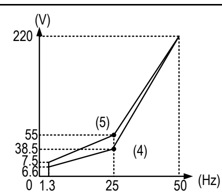
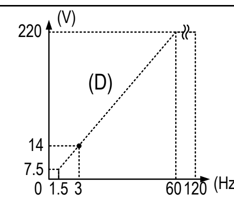
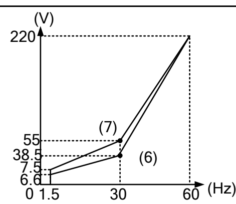
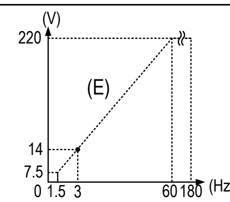
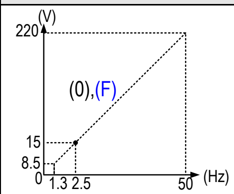
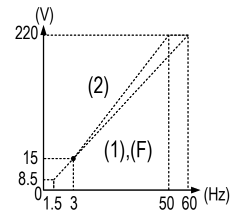
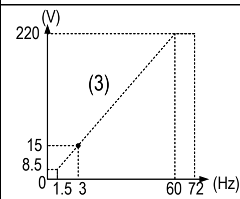
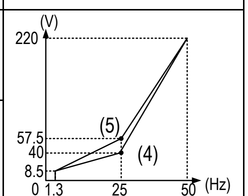
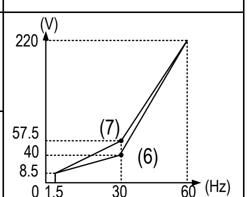
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.8 40HP and above V/F curve selection (220V)

Type	Specification		01-00	V/F curve
General application	50Hz		0	
			F (50Hz Default setting	
	60Hz	60Hz Saturation	1	
			F (60Hz Default setting)	
		50Hz Saturation	2	
Variable Torque Characteristic	72Hz		3	
	50Hz	Variable Torque 1	4	
		Variable Torque 2	5	
	60Hz	Variable Torque 3	6	
		Variable Torque 4	7	

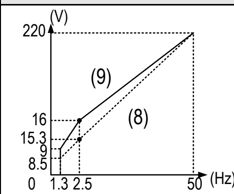
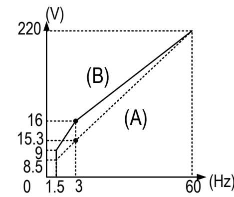
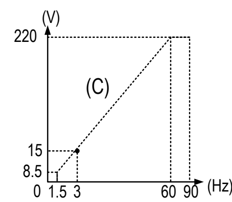
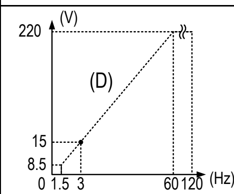
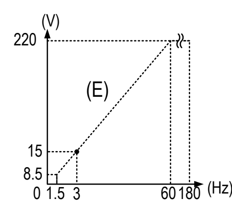
Type	Specification		01-00	V/F curve
High Staring Torque‡	50Hz	Low Starting Torque	8	
		High Starting Torque	9	
	60Hz	Low Starting Torque	A	
		Low Starting Torque	B	
Constant-power torque (Reducer)	90Hz		C	
	120Hz		D	
	180Hz		E	

Table 4.3.9 2P5 - 2HP V/F curve selection (230V)

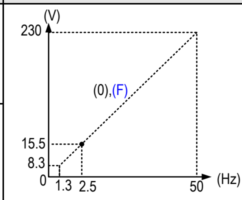
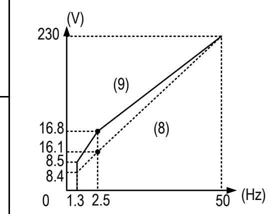
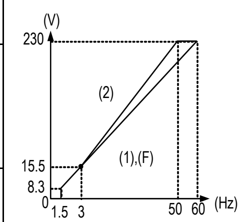
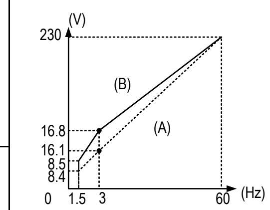
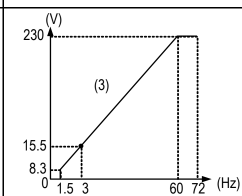
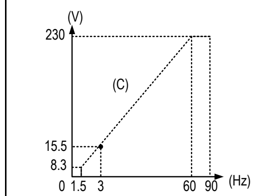
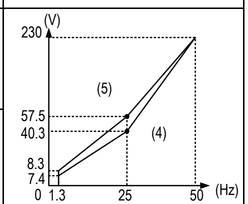
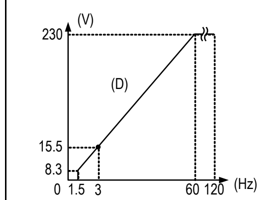
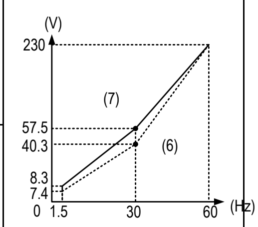
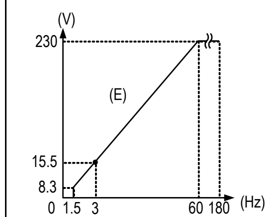
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.10 3 - 30HP V/F curve selection (230V)

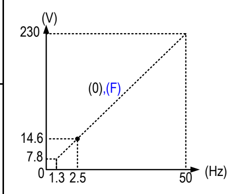
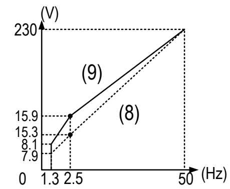
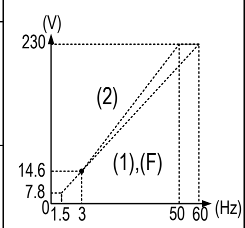
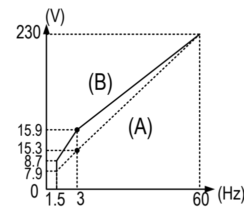
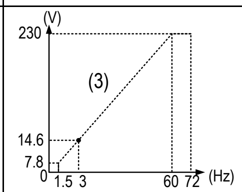
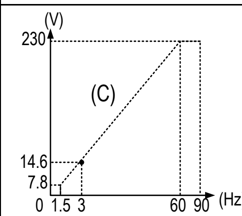
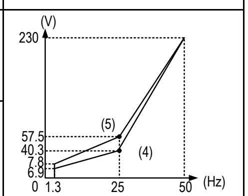
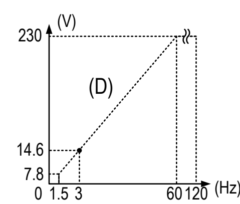
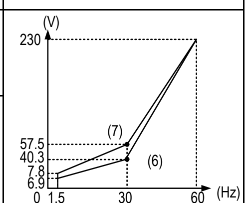
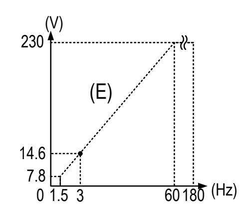
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.11 40HP and above V/F curve selection (230V)

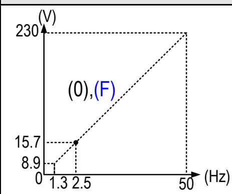
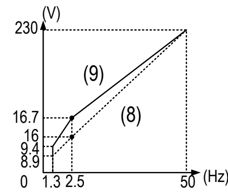
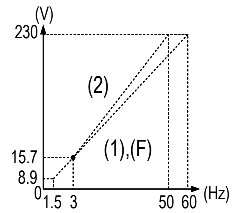
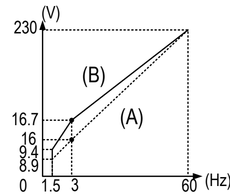
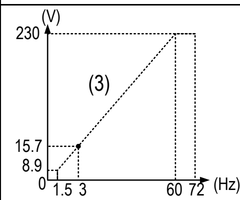
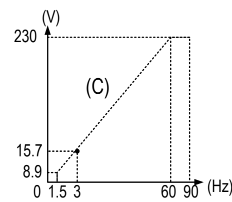
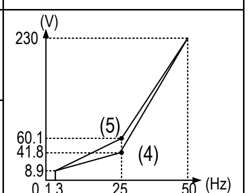
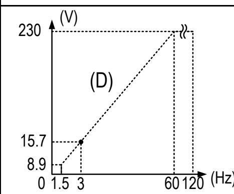
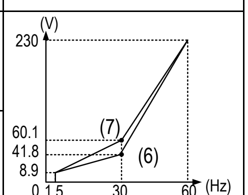
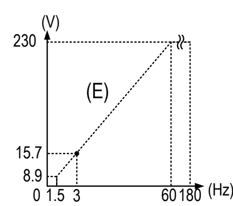
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.12 2P5 - 2HP V/F curve selection (380V)

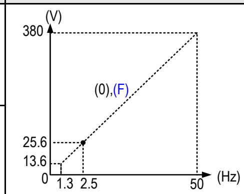
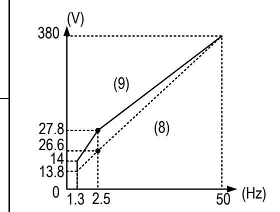
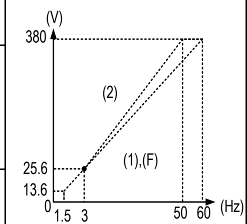
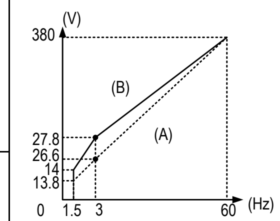
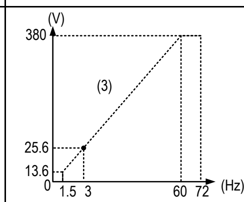
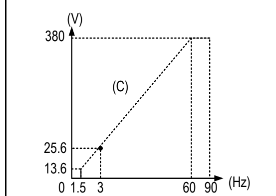
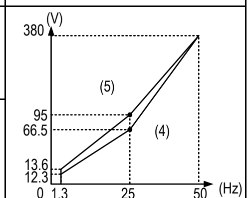
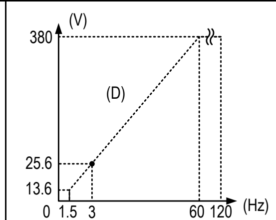
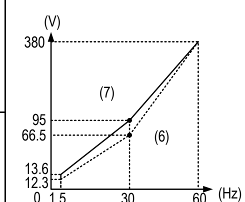
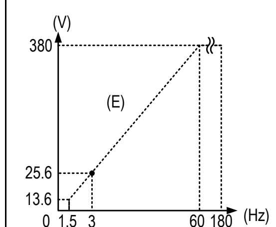
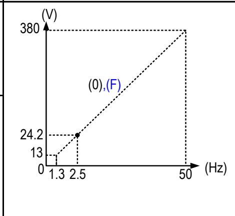
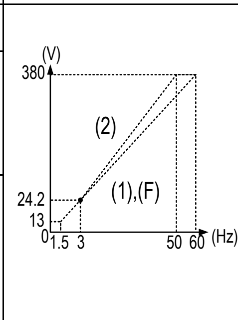
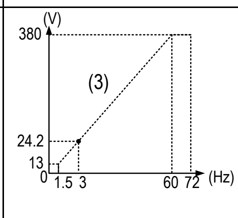
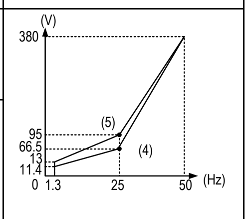
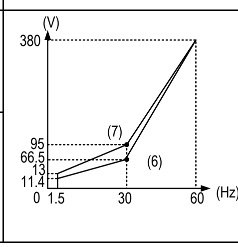
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.13 3 - 30HP V/F curve selection (380V)

Type	Specification		01-00	V/F curve
General application	50Hz		0	
			F (50Hz Default setting)	
	60Hz	60Hz Saturation	1	
			F (60Hz Default setting)	
		50Hz Saturation	2	
Variable Torque Characteristic	72Hz		3	
	50Hz	Variable Torque 1	4	
		Variable Torque 2	5	
	60Hz	Variable Torque 3	6	
		Variable Torque 4	7	

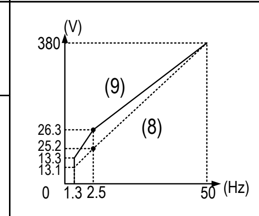
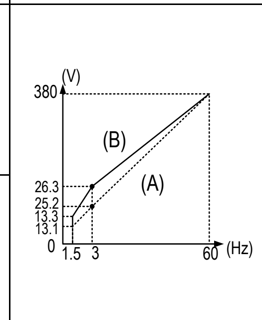
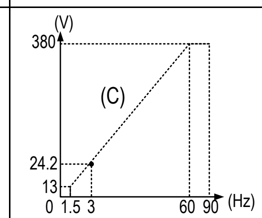
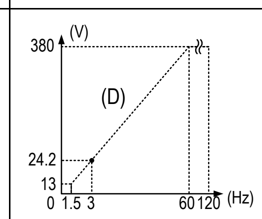
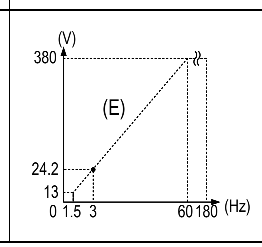
Type	Specification		01-00	V/F curve
High Staring Torque‡	50Hz	Low Starting Torque	8	
		High Starting Torque	9	
	60Hz	Low Starting Torque	A	
		Low Starting Torque	B	
Constant-power torque (Reducer)	90Hz		C	
	120Hz		D	
	180Hz		E	

Table 4.3.14 40HP and above V/F curve selection (380V)

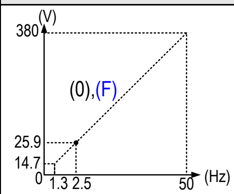
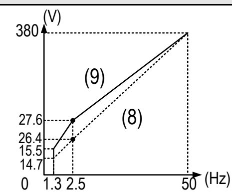
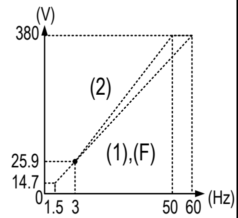
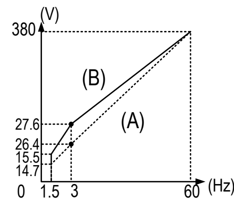
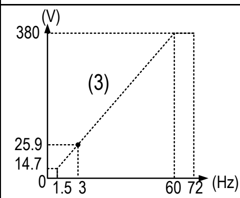
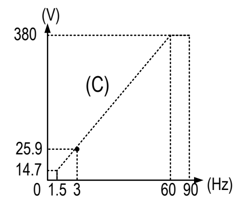
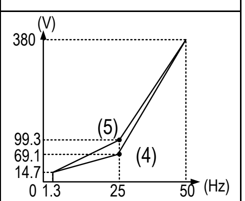
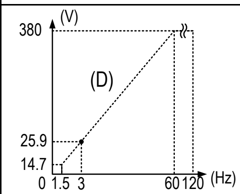
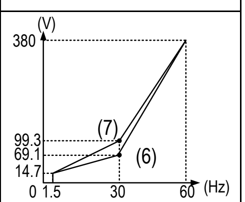
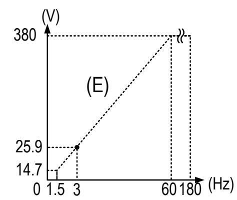
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.15 2P5 - 2HP V/F curve selection (400V)

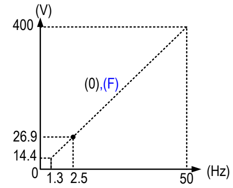
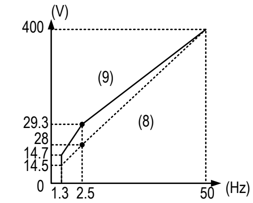
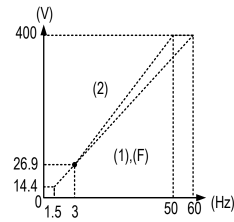
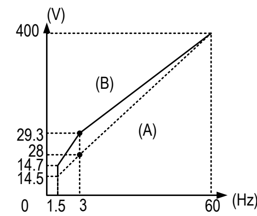
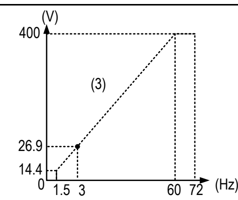
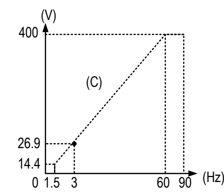
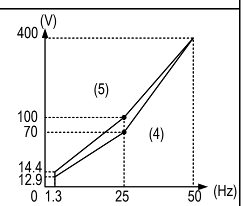
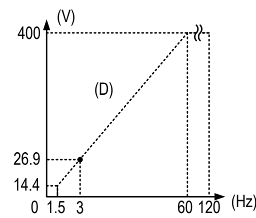
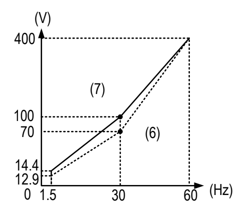
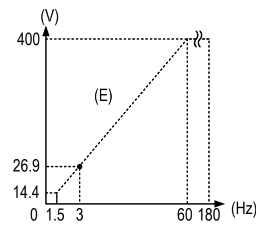
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.16 3 - 30HP V/F curve selection (400V)

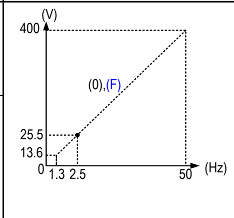
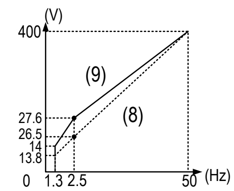
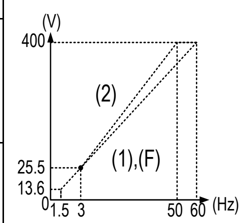
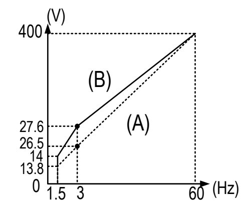
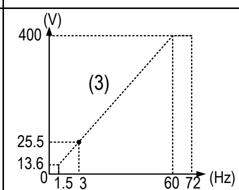
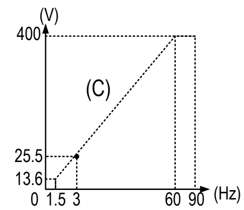
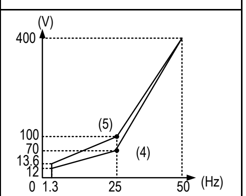
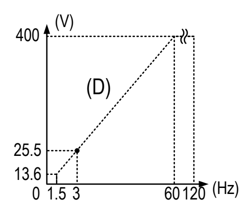
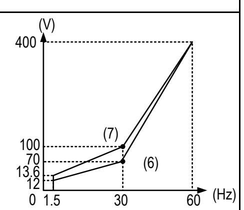
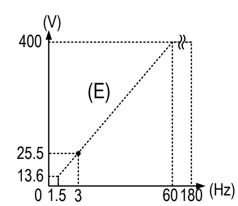
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.17 40HP and above V/F curve selection (400V)

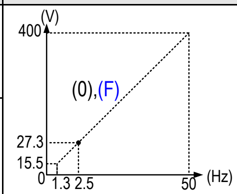
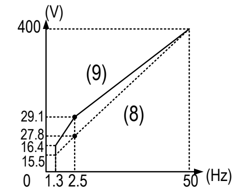
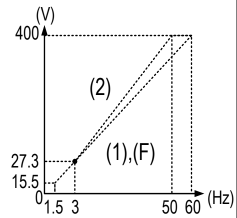
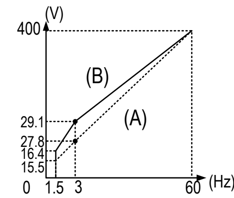
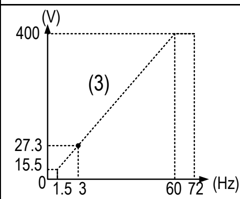
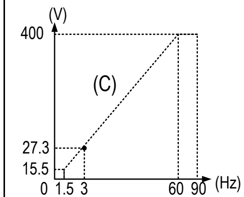
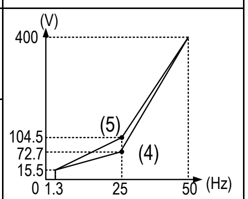
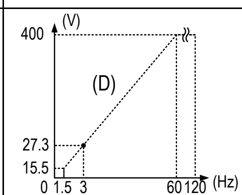
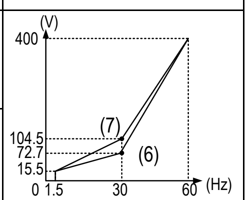
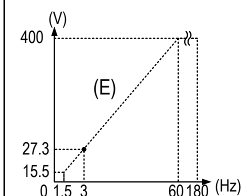
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.18 2P5 - 2HP V/F curve selection (415V)

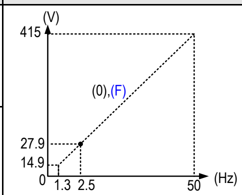
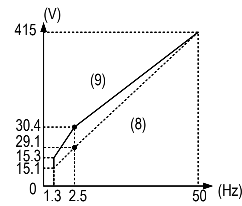
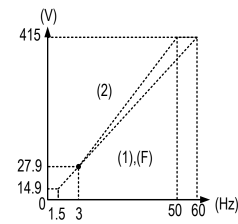
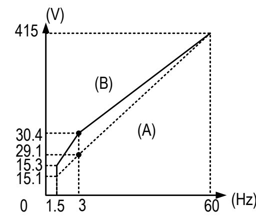
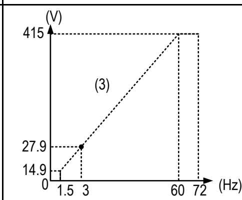
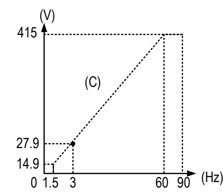
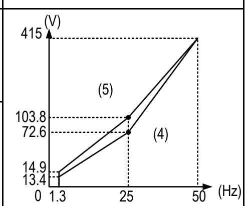
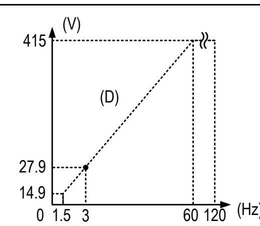
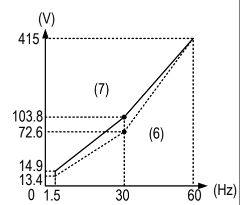
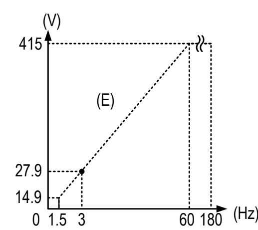
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.19 3 - 30HP V/F curve selection (415V)

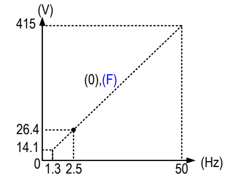
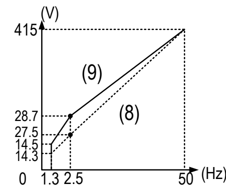
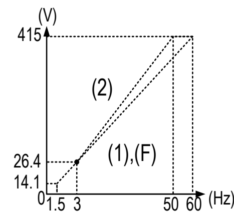
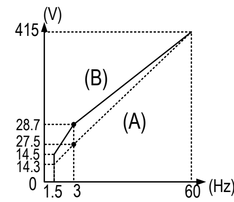
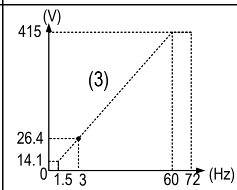
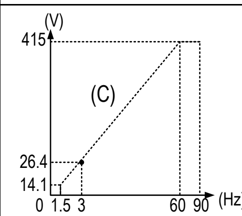
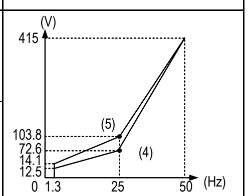
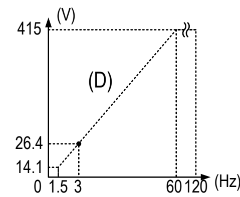
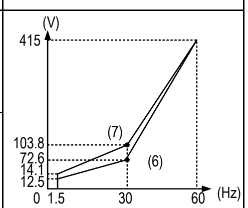
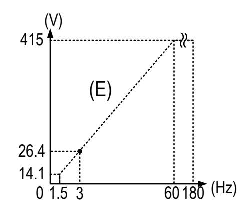
<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General application</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2">
</td><td rowspan="5">High Staring Torque‡</td><td rowspan="2">50Hz</td><td>Low Starting Torque</td><td>8</td><td rowspan="2">
</td></tr>
<tr><td>F (50Hz Default setting)</td><td>High Starting Torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60Hz Saturation</td><td>1</td><td rowspan="3">
</td><td rowspan="3">60Hz</td><td rowspan="2">Low Starting Torque</td><td rowspan="2">A</td><td rowspan="3">
</td></tr>
<tr><td>F (60Hz Default setting)</td></tr>
<tr><td>50Hz Saturation</td><td>2</td><td>Low Starting Torque</td><td>B</td></tr>
<tr><td rowspan="5">Variable Torque Characteristic</td><td colspan="2">72Hz</td><td>3</td><td>
</td><td rowspan="5">Constant-power torque (Reducer)</td><td colspan="2">90Hz</td><td>C</td><td>
</td></tr>
<tr><td rowspan="2">50Hz</td><td>Variable Torque 1</td><td>4</td><td rowspan="2">
</td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 2</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Variable Torque 3</td><td>6</td><td rowspan="2">
</td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 4</td><td>7</td></tr>
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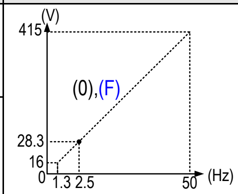
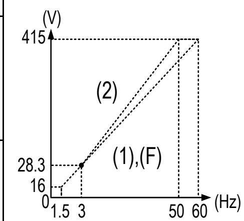
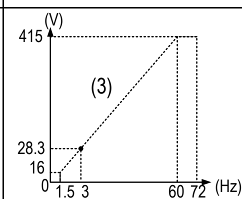
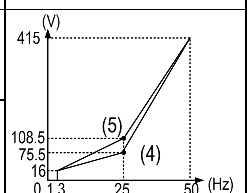
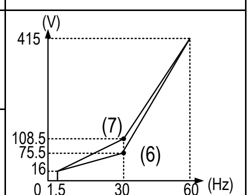
Table 4.3.20 40HP and above V/F curve selection (415V)

Type	Specification		01-00	V/F curve
General application	50Hz		0	
			F (50Hz Default setting)	
	60Hz	60Hz Saturation	1	
			F (60Hz Default setting)	
		50Hz Saturation	2	
Variable Torque Characteristic	72Hz		3	
	50Hz	Variable Torque 1	4	
		Variable Torque 2	5	
	60Hz	Variable Torque 3	6	
		Variable Torque 4	7	

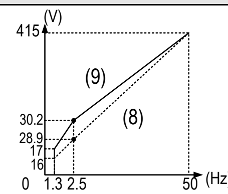
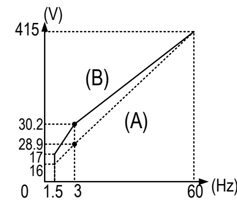
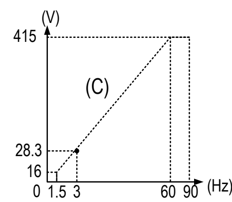
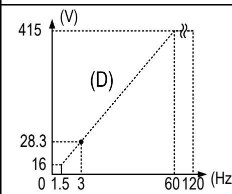
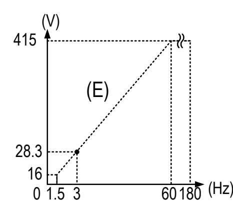
Type	Specification		01-00	V/F curve
High Staring Torque‡	50Hz	Low Starting Torque	8	
		High Starting Torque	9	
	60Hz	Low Starting Torque	A	
		Low Starting Torque	B	
Constant-power torque (Reducer)	90Hz		C	
	120Hz		D	
	180Hz		E	

Table 4.3.21 2P5 - 2HP V/F curve selection (440V)

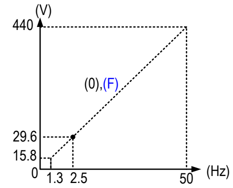
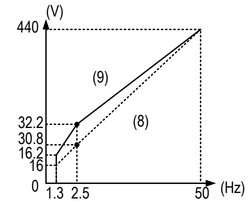
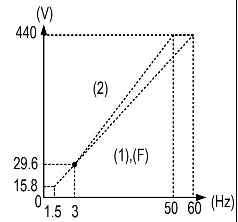
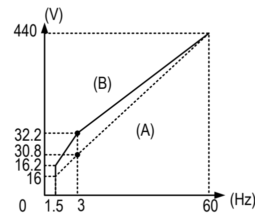
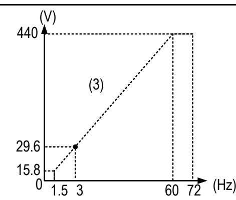
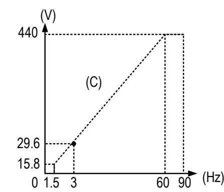
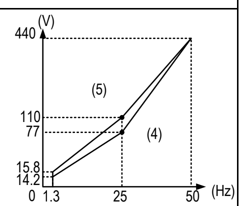
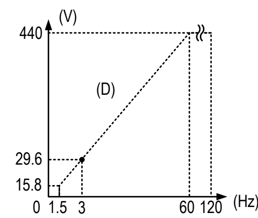
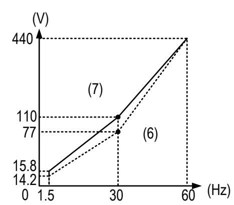
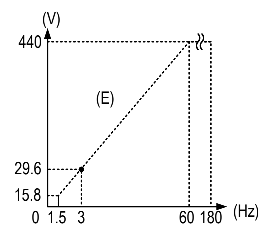
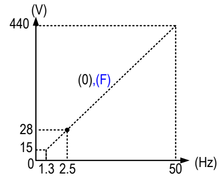
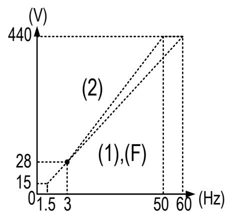
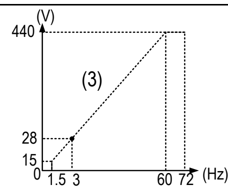
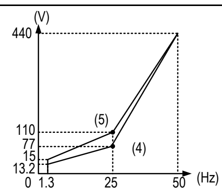
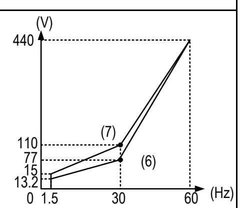
<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General application</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2"></td><td rowspan="5">High Staring Torque‡</td><td rowspan="2">50Hz</td><td>Low Starting Torque</td><td>8</td><td rowspan="2"></td></tr>
<tr><td>F
(50Hz Default setting)</td><td>High Starting Torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60Hz Saturation</td><td>1</td><td rowspan="3"></td><td rowspan="3">60Hz</td><td rowspan="2">Low Starting Torque</td><td rowspan="2">A</td><td rowspan="3"></td></tr>
<tr><td>F
(60Hz Default setting)</td></tr>
<tr><td>50Hz Saturation</td><td>2</td><td>Low Starting Torque</td><td>B</td></tr>
<tr><td rowspan="5">Variable Torque Characteristic</td><td colspan="2">72Hz</td><td>3</td><td></td><td rowspan="5">Constant-power torque (Reducer)</td><td colspan="2">90Hz</td><td>C</td><td></td></tr>
<tr><td rowspan="2">50Hz</td><td>Variable Torque 1</td><td>4</td><td rowspan="2"></td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2"></td></tr>
<tr><td>Variable Torque 2</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Variable Torque 3</td><td>6</td><td rowspan="2"></td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2"></td></tr>
<tr><td>Variable Torque 4</td><td>7</td></tr>
</table>

Table 4.3.22 3 - 30HP V/F curve selection (440V)

<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General application</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2">
</td></tr>
<tr><td>F (50Hz Default setting)</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60Hz Saturation</td><td>1</td><td rowspan="3">
</td></tr>
<tr><td>F (60Hz Default setting)</td></tr>
<tr><td>50Hz Saturation</td><td>2</td></tr>
<tr><td rowspan="5">Variable Torque Characteristic</td><td colspan="2">72Hz</td><td>3</td><td>
</td></tr>
<tr><td rowspan="2">50Hz</td><td>Variable Torque 1</td><td>4</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 2</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Variable Torque 3</td><td>6</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 4</td><td>7</td></tr>
</table>

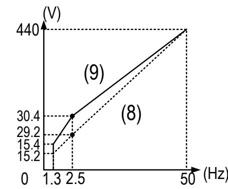
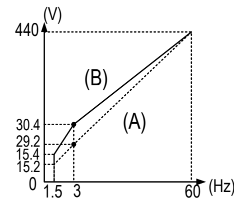
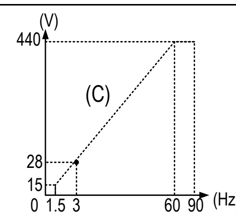
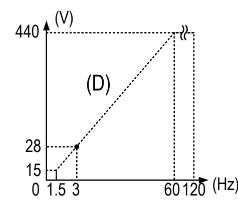
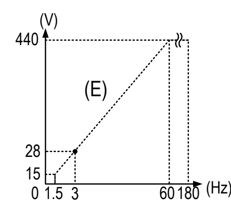
<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="4">High Staring Torque‡</td><td rowspan="2">50Hz</td><td>Low Starting Torque</td><td>8</td><td rowspan="2">
</td></tr>
<tr><td>High Starting Torque</td><td>9</td></tr>
<tr><td rowspan="2">60Hz</td><td>Low Starting Torque</td><td>A</td><td rowspan="2">
</td></tr>
<tr><td>Low Starting Torque</td><td>B</td></tr>
<tr><td rowspan="3">Constant-power torque (Reducer)</td><td colspan="2">90Hz</td><td>C</td><td>
</td></tr>
<tr><td colspan="2">120Hz</td><td>D</td><td>
</td></tr>
<tr><td colspan="2">180Hz</td><td>E</td><td>
</td></tr>
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Table 4.3.23 40HP and above V/F curve selection (440V)

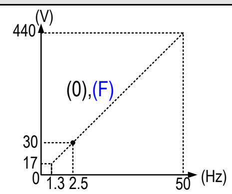
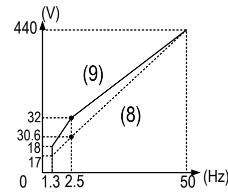
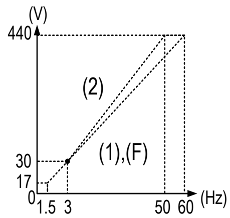
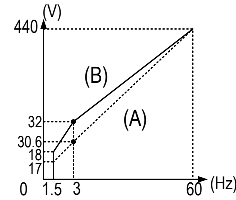
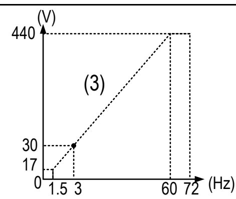
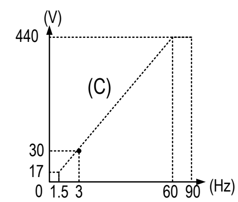
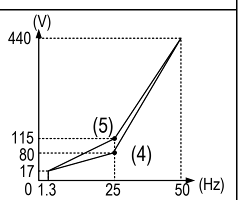
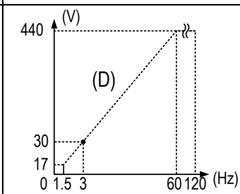
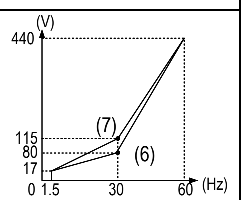
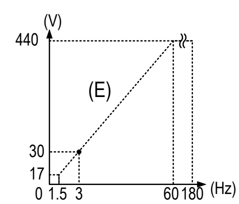
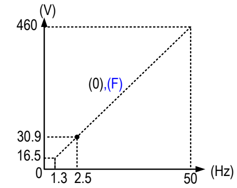
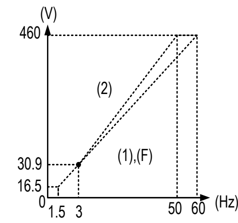
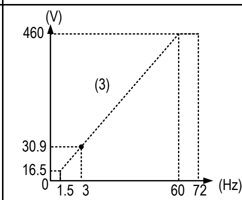
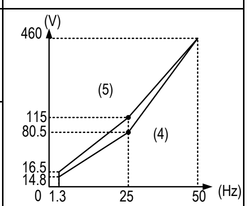
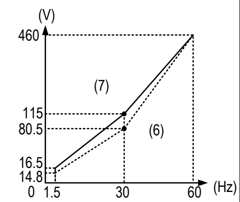
<table>
<tr><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th><th>Type</th><th colspan="2">Specification</th><th>01-00</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General application</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2">
</td><td rowspan="5">High Staring Torque‡</td><td rowspan="2">50Hz</td><td>Low Starting Torque</td><td>8</td><td rowspan="2">
</td></tr>
<tr><td>F (50Hz Default setting)</td><td>High Starting Torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60Hz Saturation</td><td>1</td><td rowspan="3">
</td><td rowspan="3">60Hz</td><td rowspan="2">Low Starting Torque</td><td rowspan="2">A</td><td rowspan="3">
</td></tr>
<tr><td>F (60Hz Default setting)</td></tr>
<tr><td>50Hz Saturation</td><td>2</td><td>Low Starting Torque</td><td>B</td></tr>
<tr><td rowspan="5">Variable Torque Characteristic</td><td colspan="2">72Hz</td><td>3</td><td>
</td><td rowspan="5">Constant-power torque (Reducer)</td><td colspan="2">90Hz</td><td>C</td><td>
</td></tr>
<tr><td rowspan="2">50Hz</td><td>Variable Torque 1</td><td>4</td><td rowspan="2">
</td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 2</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Variable Torque 3</td><td>6</td><td rowspan="2">
</td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2">
</td></tr>
<tr><td>Variable Torque 4</td><td>7</td></tr>
</table>

Table 4.3.24 2P5 - 2HP V/F curve selection (460V)

Type	Specification		01-00	V/F curve
General application	50Hz		0	
			F (50Hz Default setting)	
	60Hz	60Hz Saturation	1	
			F (60Hz Default setting)	
		50Hz Saturation	2	
Variable Torque Characteristic	72Hz		3	
	50Hz	Variable Torque 1	4	
		Variable Torque 2	5	
	60Hz	Variable Torque 3	6	
		Variable Torque 4	7	

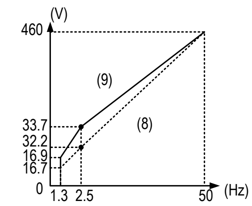
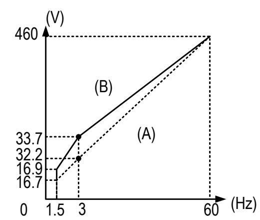
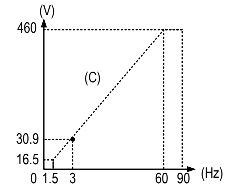
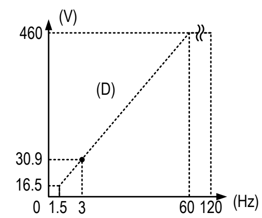
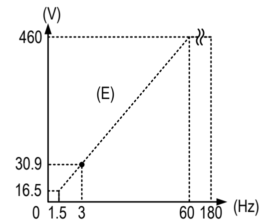
Type	Specification		01-00	V/F curve
High Staring Torque‡	50Hz	Low Starting Torque	8	
		High Starting Torque	9	
	60Hz	Low Starting Torque	A	
		Low Starting Torque	B	
Constant-power torque (Reducer)	90Hz		C	
	120Hz		D	
	180Hz		E	

Table 4.3.25 3 - 30HP V/F curve selection (460V)

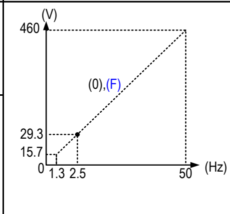
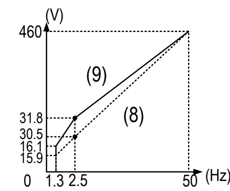
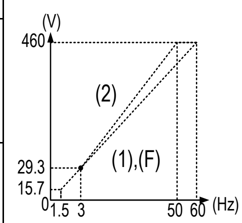
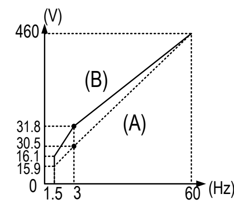
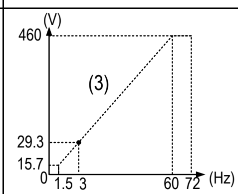
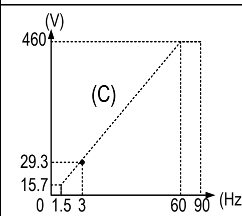
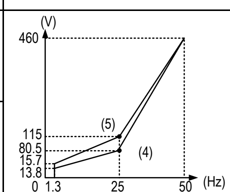
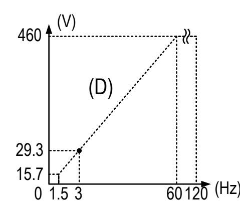
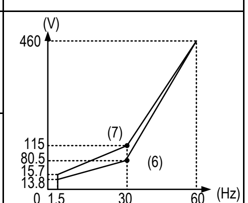
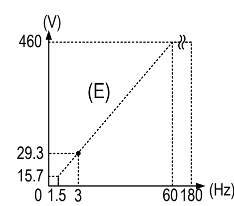
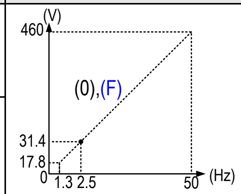
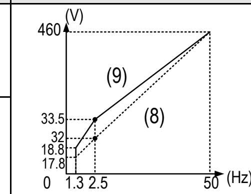
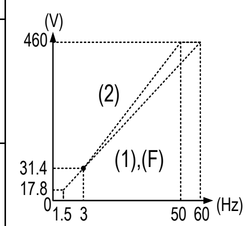
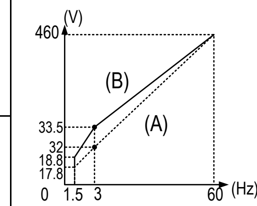
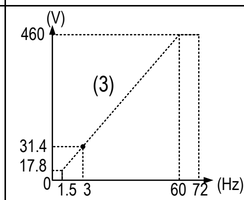
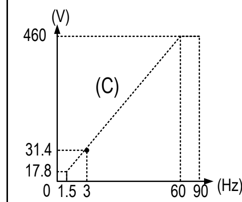
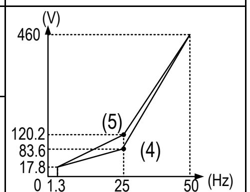
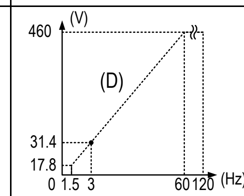
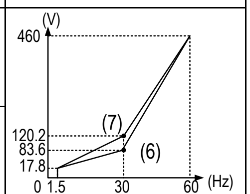
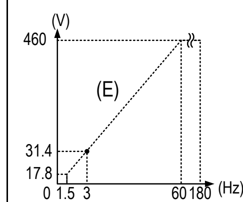
Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Table 4.3.26 40HP and above V/F curve selection (460V)

Type	Specification		01-00	V/F curve	Type	Specification		01-00	V/F curve
General application	50Hz		0		High Staring Torque‡	50Hz	Low Starting Torque	8	
			F (50Hz Default setting)				High Starting Torque	9	
	60Hz	60Hz Saturation	1			60Hz	Low Starting Torque	A	
			F (60Hz Default setting)						
		50Hz Saturation	2				Low Starting Torque	B	
Variable Torque Characteristic	72Hz		3		Constant-power torque (Reducer)	90Hz		C	
	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

01-02	**Maximum frequency of motor 1**
Range	【4.8~599.0】Hz
01-03	**Maximum output voltage of motor 1**
Range	200V:【0.1~255.0】V 400V:【0.2~510.0】V
01-04	**Middle output frequency 2 of motor 1**
Range	【0.0~599.0】Hz
01-05	**Middle output voltage 2 of motor 1**
Range	200V:【0.0~255.0】V 400V:【0.0~510.0】V
01-06	**Middle output frequency 1 of motor 1**
Range	【0.0~599.0】Hz
01-07	**Middle output voltage 1 of motor 1**
Range	200V:【0.0~255.0】V 400V:【0.0~510.0】V
01-08	**Minimum output frequency of motor 1**
Range	【0.0~599.0】Hz
01-09	**Minimum output voltage of the motor 1**
Range	200V:【0.0~255.0】V 400V:【0.0~510.0】V
01-12	**Base frequency of motor 1**
Range	【4.8~599.0】Hz
01-13	**Base output voltage of motor 1**
Range	200V:【0.0~255.0】V 400V:【0.0~510.0】V

V/F curve setting (01-02~01-09 and 01-12~01-13)

Select any of the predefined V/F curves setting ‘0’ to ‘E’ that best matches your application and the load characteristic of your motor, choose a custom curve setting ‘F’ or ‘FF’ to set a custom curve.

Important:

Improper V/F curve selection can result in low motor torque or increased current due to excitation.

For low torque or high speed applications, the motor may overheat. Make sure to provide adequate cooling when operating the motor under these conditions for a longer period of time.

If the automatic torque boost function is enabled (parameter 01-10), the applied motor voltage will automatically change to provide adequate motor torque during start or operating at low frequency.

Custom V/F Curve Setting:

A custom curve selection allows users to set parameters 01-02 ~ 01-13 whereas a predefined curve selection does not.

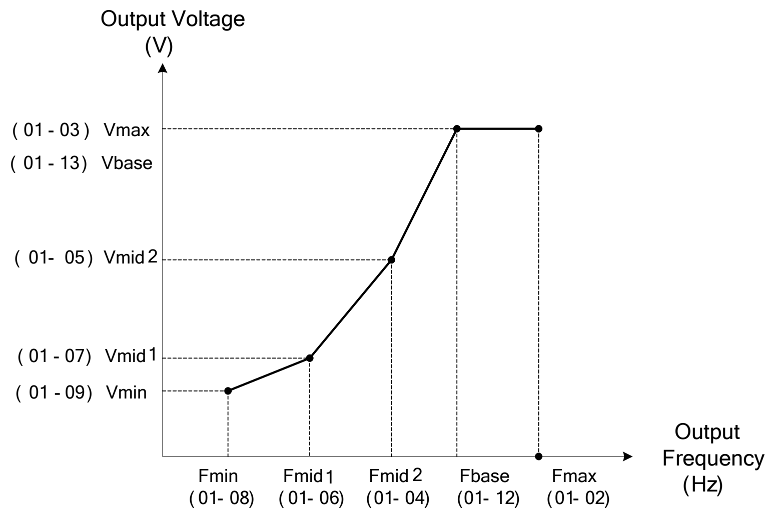


Figure 4.3.12 Custom V/F curve

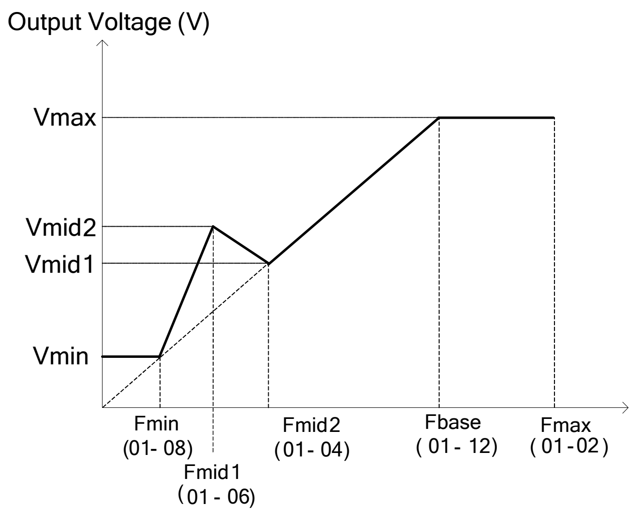


Figure 4.3.13 Torque boosting

When setting the frequency related parameters for a custom V/F curve values make sure that:

F_{max} >	F_{base} >	F_{mid2} >	F_{mid1} >	F_{min}
(01-02)	(01-12)	(01-04)	(01-06)	(01-08)

The 'SE03' V/F curve tuning error is displayed when the frequency values are set incorrectly.

When 01-04 and 01-05 (or 01-18 and 01-19) are set to 0, the inverter ignores the set values of Fmin2 and Vmin2.

The voltage values for 01-02~01-09 become irrelevant.

The value for maximum output voltage of the motor 1(01-03) and the value for base output voltage of the motor (01-13) will depend on the initial setting of 13-08 which sets the value of voltage upon initialization.

When the control mode is changed parameter 00-00, 01-08 (F_{min}) and 01-09 (V_{min}) will automatically be changed to the default setting of the selected control mode.

SLV Mode (Sensorless Vector Control)

Enter the motor data in parameter group 17 for SLV control mode (00-00) and perform auto-tuning.

In the SLV mode the V/F curve normally does not have to be re-adjusted after a successful auto-tune.

The maximum output frequency setting 01-02 (Fmax), base frequency 01-12 (Fbase), minimum output frequency 01-08 (Fmin), maximum output voltage 01-03 (Vmax) or base output voltage 01-13 (Vbase) can be adjusted but the voltage is automatically adjusted by the internal current controller.

Set the base frequency (01-12, Fbase) to the motor rated frequency on the motor nameplate.

Perform the auto-tuning procedure after adjusting parameters 02-19 or 17-04 to reduce the voltage at no-load operation.

Motor jitter can be reduced by lowering the no-load voltage. Please note that lowering the no-load voltage increases the current at no-load.

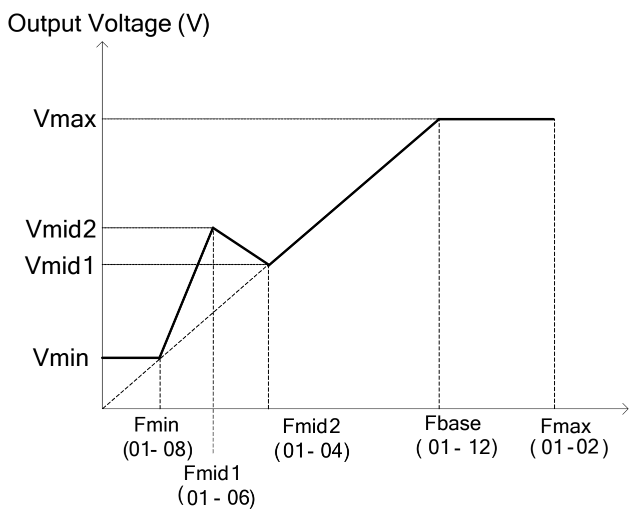


Figure 4.3.13 Torque Boost / Compensation

01-10	Torque compensation gain
Range	【0.0~2.0】
01-11	Selection of Torque Compensation Mode
Range	**0:**Mode 0 **1:**Mode 1

Torque compensation gain (01-10)
In V/F mode the inverter automatically adjusts the output voltage to increase output torque during start or during load changes based on the calculated loss of the motor voltage.

Torque compensation gain (01-10) can be adjusted at run time. There is no need to adjust torque compensation gain except in the following cases:

- Wire length between inverter and motor is too long, increase value of 01-10
- Motor rating is smaller than inverter rating, increase value of 01-10.
- Motor vibration, reduce value of 01-10

Refer to the torque compensation gain adjustment graph shown in Figure 4.3.14 for more information.

Selection of Torque compensation mode (01-11)

01-11=0: Torque compensation mode 0 is for use in general applications.

01-11=1: Torque Compensation Mode 1 is for use in high speed (120~160Hz) application where the torque compensation decreases as the frequency increases. When the output frequency is between 0~120Hz the torque compensation amount is the same as when using torque compensation mode 0.

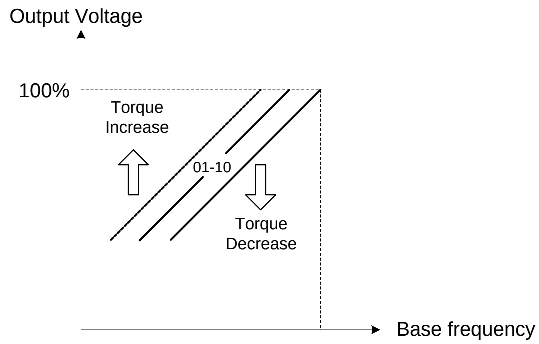


Figure 4.3.14 Torque compensation gain to increase/decrease output torque

01-14	Input voltage setting
Range	200V:【155.0~255.0】**V** 400V:【310.0~510.0】**V**

This parameter is used as a reference for predefined V/F curve calculation (01-00=0 to E), over-voltage protection level, stall prevention, etc. If the setting value of 01-14 is lower than actual input voltage, the value of output voltage (12-19) and output power (12-21) on the keypad will not be correct.

Set the correct input voltage (200V/208V/230V/240V or 380V/415V/440V/460V/480V).

Note: Default value of parameter 01-14 depends on the initialization mode selected (13-08).

01-15	Torque compensation time
Range	【0~10000】**ms**

Set the torque compensation delay time in milliseconds.

Only adjust in the following situations:

- Increase the value when experiencing motor vibration.
- Decrease the value when motor torque response is too slow.

01-16	**Maximum output frequency of motor 2**
Range	【4.8~599.0】**Hz**
01-17	**Maximum output voltage of motor 2**
Range	200V:【0.1~255.0】**V** 400V:【0.2~510.0】**V**
01-18	**Middle output frequency 2 of motor 2**
Range	【0.0~599.0】**Hz**
01-19	**Middle output voltage 2 of motor 2**
Range	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01-20	**Middle output frequency 1 of motor 2**
Range	【0.0~599.0】**Hz**
01-21	**Middle output voltage 1 of motor 2**
Range	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01-22	**Minimum output frequency of motor 2**
Range	【0.0~599.0】**Hz**
01-23	**Minimum output voltage of motor 2**
Range	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01-24	**Base frequency of motor 2**
Range	【4.8~599.0】**Hz**
01-25	**Base voltage of motor 2**
Range	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01-26	**V/F Curve Selection of Motor 2**
Range	**【0~FF】**

Note 1: Motor 2 V/F curve uses the same settings as motor 1.

Note 2: Motor 2 V/F curve is the same as V/f curve of Motor 1.

Note 3: Parameter 01-16~01-25 are changed when the value of 01-26 is changed.

02 IM Motor Parameters

02-00	**No-load current of motor 1**
Range	【0.01~600.00】A
02-01	**Rated current of motor 1**
Range	V/F mode is 10%~200% of inverter rated current SLV mode is 25%~200% of inverter rated current
02-03	**Rated rotation speed of motor1**
Range	【0~60000】rpm
02-04	**Rated voltage of motor1**
Range	200V:【50.0~240.0】V 400V:【100.0~480.0】V
02-05	**Rated voltage of motor1**
Range	【0.01~600.00】KW
02-06	**Rated frequency of motor 1**
Range	【4.8~599.0】Hz
02-07	**Number of Motor Poles of Motor 1**
Range	【2~16】
02-09	**Excitation current of motor 1** <1>
Range	【15~70】% motor rated current
02-10	**Core saturation coefficient 1 of motor 1** <1>
Range	【1~100】%
02-11	**Core saturation coefficient 2 of motor 1** <1>
Range	【1~100】%
02-12	**Core saturation coefficient 3 of motor 1** <1>
Range	【80~300】%
02-13	**Core loss of motor 1**
Range	【0.0~15.0】%
02-19	**No-Load Voltage of motor 1**
Range	200V:【50~240】V 400V:【100~480】V

Motor parameters are automatically set when performing an auto-tune (17-10=1). In most case no adjustment is required after performing an auto-tune except when using the inverter in special applications (e.g. machine tool, positioning, etc.…). Please refer to parameter group 22 for permanent magnet motor parameters.

02-00: Motor no-load current

Value is calculated based on the motor rated frequency (17-05) and motor rated current (17-03).

02-01: Motor rated current

Set the motor rated current according to the motor nameplate.

1. The value of 02-01 needs to be set to a value greater than the value set in parameter 02-00; otherwise warning message "SE01" out of range error is displayed.

2. In V/F control mode, slip compensation function is active when this output current is greater than the motor no load current.

3. In V/F control mode, the drive output current is greater than the no-load current with slip compensation is enabled.

02-03: Rated rotation speed of motor 1

Set the motor rpm according to the motor nameplate.

02-04: Motor rated voltage

Set the motor rated voltage according to the motor nameplate.

Set the motor rated voltage and it will adjust maximum output voltage of V/F curve.

02-05: Motor rated power

Set the motor power according to the motor nameplate.

02-06: Rated frequency of motor 1

Set the motor rated frequency according to the motor nameplate.

02-07: Number of motor poles

Set the number of motor pole according to the motor nameplate.

02-09: Motor excitation current

1. The excitation current is set by performing a rotational auto-tuning. It is required to perform manual tuning if the inverter cannot rotational auto-tune.

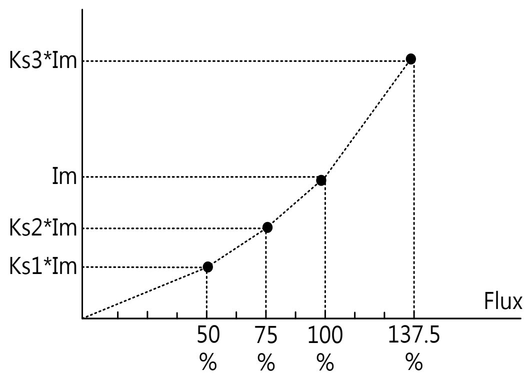
2. When the manual tuning is performed, start from 33% and observe the no-load voltage (the output value) of parameter 12-67. If parameter 12-67 is higher than no-load voltage set in parameter 17-08, decrease the value perform of parameter 02-09; if no-load voltage is lower increase the value for parameter 02-09.

3. Tuning motor excitation current of parameter 02-09 changes the motor leakage inductance of parameter 02-17 and motor mutual inductance of parameter 02-18.

4. It is required to refer to the actual no-load voltage of parameter 12-76 to tune the motor excitation current parameter 02-09. Changing the excitation current affects the no-load voltage fluctuation; adjust parameter 02-09 to a value so the output voltage matches the no-load voltage (17-08).

Setting of motor core's saturation coefficient 1, 2 and 3 (02-10, 02-11, 02-12)

These parameters are automatically set during auto-tune. No adjustment required. Parameters are set to 50% for 02-10, 75% for 02-11 and 137.5% for 02-12 to reduce the impact of core saturation. The motor core's saturation coefficient is defined as a percentage of the motor excitation current. When the motor flux reaches 137.5% level, the core's saturation coefficient shall be greater than 137.5%. When the motor flux is 50% or 75%, the core's saturation coefficient is required to be less than 50% and 75%.



Im : 02-09 Excitation Current
Ks1: 02-10 Motor Core Saturation Coefficients 1
Ks2: 02-11 Motor Core Saturation Coefficients 2 Ks3: 02-12 Motor Core Saturation Coefficients 3

02-013: Motor core loss

Set motor core loss as the percentage of the motor rated power

$$\% W_{core}\text{(02-13)} = \frac{3 \times \text{Motor core loss (watt)}}{\text{Motor rated power (watts, 02-05)}} \times 100\%$$

Note: In V/F mode motor core loss (02-13) is used to for torque compensation

02-15	**Line-to-line Resistance of motor 1**
Range	【1~60.000】Ω
02-16	**Rotor resistance of motor 1**
Range	【1~60.000】Ω
02-17	**Leakage Inductance of Motor 1**
Range	【0.01~200.00】 mH
02-19	**No-Load Voltage of motor 1**
Range	【0.01~600.00】A
02-20	**No-Load Current of motor 2**
Range	【0.01~600.00】A
02-21	**Rated current of motor 2**
Range	10%~200% of inverter rated current
02-22	**Rated rotation speed of motor 2**
Range	【0~60000】rpm

02-23	**Rated voltage of motor 2**
Range	200V:【50.0~240.0】V 400V:【100.0~480.0】V
02-24	**Rated power of motor 2**
Range	【0.01~600.00】KW
02-25	**Rated frequency of motor 2**
Range	【4.8~599.0】Hz
02-26	**Number of Motor Poles of Motor 2**
Range	【2~16】
02-32	**Line-to-line Resistance of motor 2**
Range	【0.001~60.000】Ω
02-33	**Proportion of Motor Leakage Inductance** <1>
Range	【0.1~15.0】%

02-15: Motor line-to-line resistance

Refer to figure 4.3.15, Y-equivalent model of an induction motor

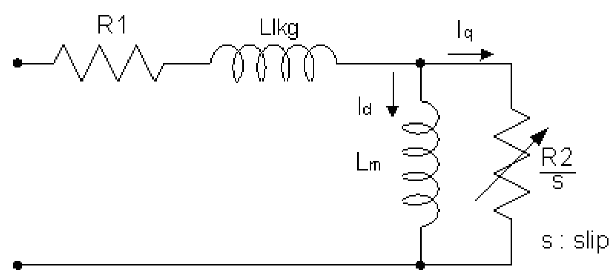


Figure 4.3.15 Y-equivalent model an induction motor

02-19: No-load motor voltage

Parameter determines the rated flux during motor’s rated rotation in SLV control mode. Set the value of this parameter to the same value as parameter 17-08. A value of 10~50V below the input voltage level ensures that the motor is capable of providing adequate torque performance when operating at nominal speed (or higher speed). Setting the value too small can result in a reduction in no-load current, weakened motor flux and an increase in motor current while the motor is loaded.

02-33: Proportion of Motor Leakage Inductance

1. In most applications motor leakage current does not need to be adjusted. The value is not set by the auto-tuning function.

$$\xi = \frac{LlKg}{Lr}$$

2. Leakage inductance proportion is the ratio between leakage inductance and rotor inductance. The default value is set to 3.4%.

3. If the motor leakage inductance proportion value is set too small or too large will cause motor jittering, increased motor noise and unable to run the motor. In general the value needs to be between 3.0%~5.0%. 4.0% is the universal adjustment value to allow the motor to run normally. Leakage inductance proportion setting depends on the motor rating.

02-34	**Motor Slip** <1>
Range	【0.1~20.0】Hz

Normally, it is not required for this parameter to be adjusted but can be set manually.

The default value of motor slip is set to 1 Hz. Motor slip is obtained from the nameplate.

Take 60Hz, 4-pole motor for example, synchronous speed: $N = \frac{120 \times Frequency}{Pole} = \frac{120 \times 60}{4} = 1800$ rpm

Rated speed in the nameplate is 1700 rpm, then $Slip = \frac{1800 - 1700}{60} = 1.67Hz$

Adjusting motor slip will change the rotor resistance parameter. The motor slip is adjusted depending on the motor performance.

When auto-tuning is successful, parameters of group 2 will be updated by auto-tuning result values of group 17, please refer to group 17 for more details.

03 External Digital Input and Output Parameters

03-00	Multi-function input terminal S1
03-01	Multi-function input terminal S2
03-02	Multi-function input terminal S3
03-03	Multi-function input terminal S4
03-04	Multi-function input terminal S5
03-05	Multi-function input terminal S6
Range	【0】: Forward/Stop command 【1】: Reverse/Stop command 【2】: Multi-speed/position setting command 0 【3】: Multi-speed/position setting command 1 【4】: Multi-speed/position setting command 2 【5】: Multi-speed/position setting command 3 【6】: Forward jog run command 【7】: Reverse jog run command 【8】: UP frequency increasing command 【9】: DOWN frequency decreasing command 【10】: Acceleration/deceleration time selection 2 【11】: Inhibit Acceleration/deceleration command 【12】: Main/ Alternative Run Switch Function 【13】: Main/ Alternative Frequency Switch Function 【14】: Emergency Stop (decelerate to zero and stop) 【15】: External Baseblock Command(rotation freely to stop) 【16】: PID control disable 【17】: Fault reset (Reset) 【18】: Auto Run Mode Enable 【19】: Speed Search (from the maximum frequency) 【20】: Energy Saving (V/F mode only) 【21】: Reset PID Integral Value to Zero 【22】: Counter Input 【23】: Counter Reset 【24】: PLC Input 【25】: Pulse width modulation measurement (S3) 【26】: Pulse frequency measure(S3) 【27】: Local/Remote Selection 【28】: Remote Mode Selection 【29】: Jog Frequency Selection 【33】: DC Braking 【34】: Speed Search 2 (From The Frequency Command) 【40】: Motor 1/Motor 2 Selection 【47】: Fire Mode (Forced Operation Mode) 【48】: KEB Acceleration 【65】: Short-Circuit Breaking

Refer to the multi-function digital input and parameters in the following figure 4.3.16

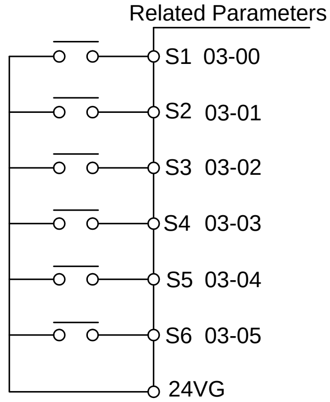


Figure 4.3.16 Multi-function digital input and related parameters

Table 4.3.27 Multi-function digital input setting (03-00 to 03-05) ("O":Enable, "X":Disable)

Value	Function		Description	Control Mode		
	Name	LCD Display		V/F	SLV	PM SLV
0	Forward/Stop command	2-Wire (FWD-RUN)	2- wire Forward/Stop command (ON: Forward operation command).	O	O	O
1	Reverse/Stop command	2-Wire (REV-RUN)	2- wire Reverse/Stop command (ON: Reverse operation command).	O	O	O
2	Multi-speed/position setting command 0	Muti-Spd/Pos Ref 0	Multi-Speed Reference / Position Reference 0	O	O	O
3	Multi-speed/position setting command 1	Muti-Spd/Pos Ref 1	Multi-Speed Reference / Position Reference 1	O	O	O
4	Multi-speed/position setting command 2	Muti-Spd/Pos Ref 2	Multi-Speed Reference / Position Reference 2	O	O	O
5	Multi-speed/position setting command 3	Muti-Spd/Pos Ref 3	Multi-Speed Reference / Position Reference 3	O	O	O
6	Forward jog run command	FJOG	ON: Forward operation in jog mode (00-18).	O	O	O
7	Reverse jog run command	RJOG	ON: Reverse operation in jog mode (00-18).	O	O	O
8	UP frequency increasing command	UP command	ON: Increase output frequency (Up/Down Function, only active when DOWN command is programmed).	O	O	O
9	DOWN frequency decreasing command	DOWN command	ON: Decrease output frequency (Up/Down Function, only active when ON command is programmed).	O	O	O
10	Acceleration/deceleration time selection 2	Acc/Decel Time Selection 1	Acceleration/deceleration time selection command 1	O	O	O
11	Inhibit Acceleration /deceleration command	ACC/DEC Inhibit	ON: Acceleration/ deceleration prohibition	O	O	O
12	Main/ Alternative Run Switch Function	Run Change Sel	Run Command Source is set in parameter of alternative frequency command (00-03)	O	O	O

Value	Function		Description	Control Mode		
	Name	LCD Display		V/F	SLV	PM SLV
13	Main/ Alternative Frequency Switch Function	Freq Change Sel	Frequency Command Source is set in parameter of alternative frequency command (00-06)	O	O	O
14	Emergency Stop (decelerate to zero and stop)	E-Stop	ON: Emergency stop active	O	O	O
15	External Baseblock Command (rotation freely to stop)	Ext. BB	ON: Base block active	O	O	O
16	PID control disable	PID Disable	ON: PID control disabled	O	O	O
17	Fault reset (Reset)	Fault Reset	ON: Fault reset	O	O	O
18	Auto Run Mode Enable		ON: Auto run mode enabled (06-00)	-	-	-
19	Speed Search (from the maximum frequency)	Speed Search 1	ON: Speed search from the maximum output frequency	O	O	X
20	Energy Saving	Energy saving	ON: Manual energy saving control is based on the settings of 11-12 and 11-18.	O	X	X
21	Reset PID Integral Value to Zero	PID I-Reset	ON:PID integral reset	O	O	O
22	Counter Input	Cnt Input	ON: Counter input by digital input	O	O	O
23	Counter Reset	Cnt Reset	ON: Counter input by digital input	O	O	O
24	PLC Input	PLC Input	ON:PLC input	O	O	O
25	Pulse Width Measurement (S3)	Pulse Input-Width Measure	ON: Switch to pulse width measurement	O	O	O
26	Pulse frequency Measurement (S3)	Pulse Input-Freqency Measure	ON: Switch to pulse frequency measurement	O	O	O
27	Local/Remote Selection	Local/Remote	ON: Local mode (via the digital operator) OFF: Frequency command and operation command will be determined according to the setting of parameter (00-02 and 00-05).	O	O	O
28	Remote Mode Selection	Remote Mode Sel	ON: RS-485 communication control active OFF: Control circuit terminal active	O	O	O
29	Jog Frequency Selection	JOG Freq sel	ON: Jog Frequency Active	O	O	O
30	Reserved	Reserved	Reserved	-	-	-
31	Reserved	Reserved	Reserved	-	-	-
32	Reserved	Reserved	Reserved	-	-	-
33	DC Braking	DC Brake Command	ON: DC braking active	O	O	O
34	Speed Search 2 (From The Frequency Command)	Speed Search 2	ON: Speed search from set frequency	O	O	X
35	Reserved	Reserved	Reserved	-	-	-
36	Reserved	Reserved	Reserved	-	-	-
37	Reserved	Reserved	Reserved	-	-	-
38	Reserved	Reserved	Reserved	-	-	-
39	Reserved	Reserved	Reserved	-	-	-

Value	Function		Description	Control Mode		
	Name	LCD Display		V/F	SLV	PM SLV
40	Motor 1/Motor 2 Selection	Motor 2 Switch	ON: Select motor 2	O	O	X
41	Reserved	Reserved	Reserved	-	-	-
42	Reserved	Reserved	Reserved	-	-	-
43	Reserved	Reserved	Reserved	-	-	-
44	Reserved	Reserved	Reserved	-	-	-
45	Reserved	Reserved	Reserved	-	-	-
46	Reserved	Reserved	Reserved	-	-	-
47	Fire Mode (Forced Operation Mode)	Fire Mode	ON: Fire Mode Active (disables hardware and software fault /alarm protection and runs inverter at 08-17 frequency).	O	O	O
48	KEB Acceleration	KEB Accel.	ON:KEB acceleration start enabled	O	O	O
49	Reserved	Reserved	Reserved	-	-	-
50	Reserved	Reserved	Reserved	-	-	-
51	Reserved	Reserved	Reserved	-	-	-
52	Reserved	Reserved	Reserved	-	-	-
53	Reserved	Reserved	Reserved	-	-	-
54	Reserved	Reserved	Reserved	-	-	-
55	Reserved	Reserved	Reserved	-	-	-
56	Reserved	Reserved	Reserved	-	-	-
57	Reserved	Reserved	Reserved	-	-	-
58	Reserved	Reserved	Reserved	-	-	-
59	Reserved	Reserved	Reserved	-	-	-
60	Reserved	Reserved	Reserved	-	-	-
61	Reserved	Reserved	Reserved	-	-	-
62	Reserved	Reserved	Reserved	-	-	-
63	Reserved	Reserved	Reserved	-	-	-
64	Reserved	Reserved	Reserved	-	-	-
65	Short-Circuit Breaking	SC Brk	ON: Short-Circuit Braking active	X	X	O

(1) 2-wire control forward operation (03-0X=00)

(2) 2-wire control: reverse operation (03-0X=01)

(3) Multi-speed/position setting command 1 (03-0X=02)

(4) Multi-speed/position setting command 2 (03-0X=03)

(5) Multi-speed/position setting command 3 (03-0X=04)

(6) Multi-speed/position setting command 4 (03-0X=05)

(7) Jog frequency selection, select frequency reference using the multi-function digital input. (03-0X=29)

Table 4.3.28 Multi-speed operation selection

Speed	Multi-function digital input (S1 to S6)[*1]					Frequency selection
	Jog frequency reference	Multi-speed frequency 3	Multi-speed frequency 2	Multi-speed frequency 1	Multi-speed frequency 0	
1	0	0	0	0	0	Frequency command 0(05-01) or main speed frequency [*2]
2	0	0	0	0	1	Frequency command 1 (05-02) *3
3	0	0	0	1	0	Frequency command 2 (05-03)
4	0	0	0	1	1	Frequency command 3 (05-04)
5	0	0	1	0	0	Frequency command 4 (05-05)
6	0	0	1	0	1	Frequency command 5 (05-06)
7	0	0	1	1	0	Frequency command 6 (05-07)
8	0	0	1	1	1	Frequency command 7 (05-08)
9	0	1	0	0	0	Frequency command 8 (05-09)
10	0	1	0	0	1	Frequency command 9 (05-10)
11	0	1	0	1	0	Frequency command 10(05-11)
12	0	1	0	1	1	Frequency command 11 (05-12)
13	0	1	1	0	0	Frequency command 12 (05-13)
14	0	1	1	0	1	Frequency command 13(05-14)
15	0	1	1	1	0	Frequency command 14 (05-15)
16	0	1	1	1	1	Frequency command 15 (05-16)
17	1[*1]	—	—	—	—	Jog frequency command (00-18)

"0":OFF, "1":ON, "-":Ignore

*1: Jog frequency terminal has a higher priority than multi-speed reference 1 to 4.

*2: When parameter 00-05=0 (frequency reference input = digital operator), multi-speed frequency 1 will be set by 05-01 frequency reference setting1). When parameter 00-05=1 (frequency reference input=control circuit terminal), multi-speed frequency command 1 is input through analog command terminal AI1 or AI2).

*3: Multi-speed operation is disabled when PID is enabled.

Wiring Example:
Figure 4.3.17 and 4.3.18 is the example of a 9 speed operation selection

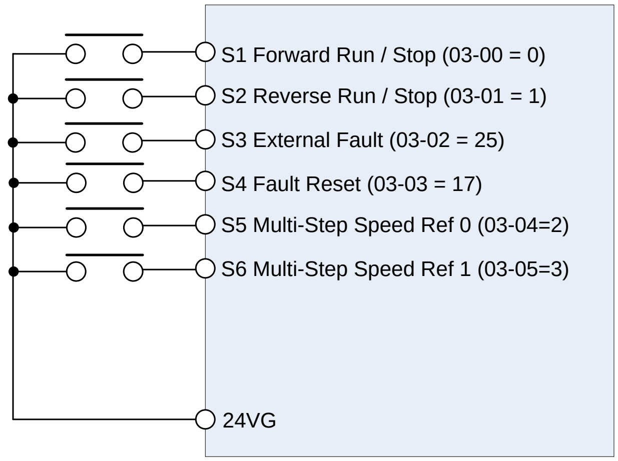


Figure 4.3.17 Control Terminal Wiring Example

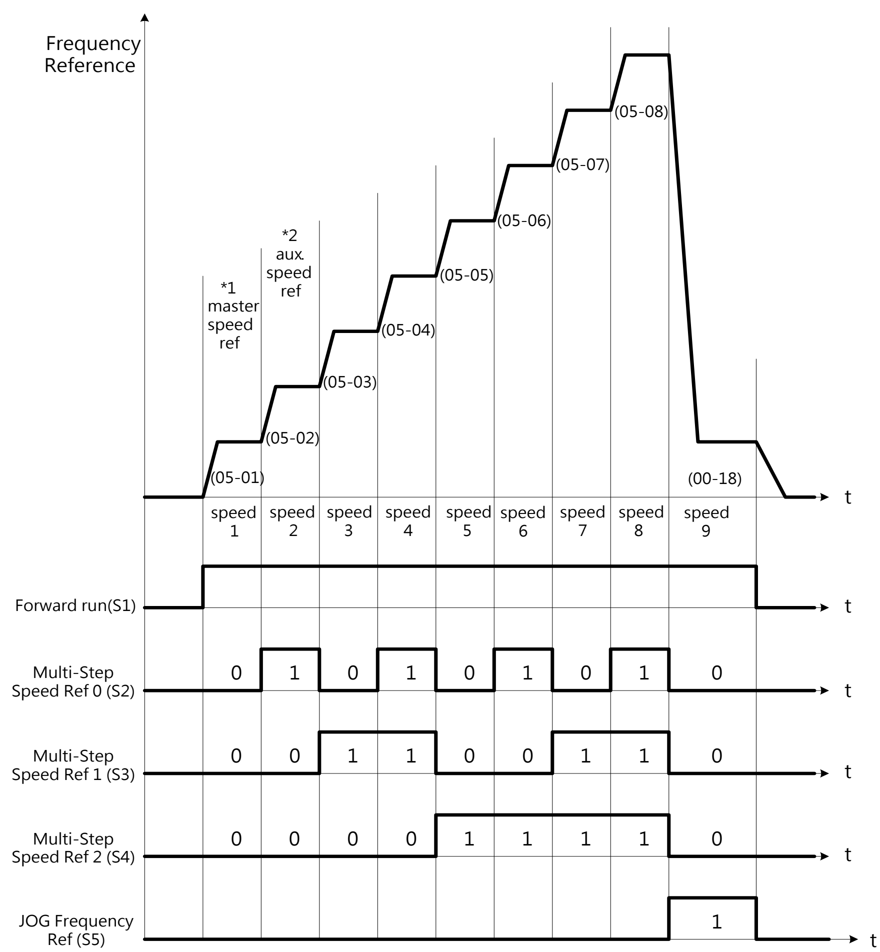


Figure 4.3.18 9-speed timing diagram

*1: **00-05=1**, multi-speed frequency reference is set by analog input AI1 or AI2.
00-05=0, multi-speed frequency reference is set by 05-01.

03-0X =06: Forward jog run command, uses jog frequency parameter 00-18.

Note:
- Jog command has a higher priority than other frequency reference commands.
- Jog command uses stop mode set in parameter 07-09 when Jog command is active > 500ms.

03-0X =07: Reverse jog run command, uses jog frequency parameter 00-18.

03-0X =08: UP frequency command

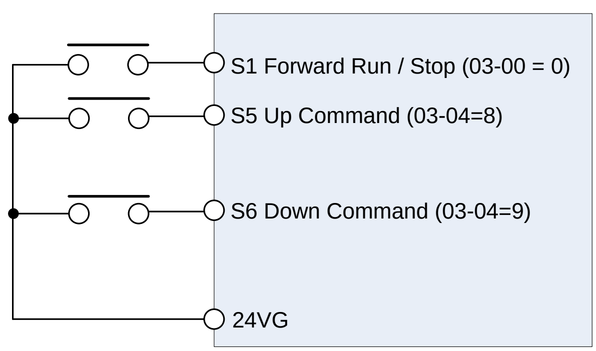
03-0X =09: Down frequency command

Inverter can use the digital operator and external digital input (S1~S6) to increase or decrease output frequency while motor is running. To use the external digital inputs are used to perform UP/DOWN, set 00-02=1, 00-05=4 and 03-0X=8 and 9, this function requires both UP and DOWN functions 08 and 09 to be programmed to two of the digital input terminals.

UP/DOWN frequency command follows the standard acceleration and deceleration times
SE02 DI terminal error will be displayed when:

- When only one UP or DOWN command is programmed for the digital inputs.
- When DOWN command and Inhibit Acceleration/deceleration command are activate simultaneously.
- When UP command and Inhibit Acceleration/deceleration command are active simultaneously.

For an example of UP/DOWN control wiring and operation, please refer to figure 4.3.19 and figure 4.3.20.



UP Command (Terminal S5)	1	0	0	1
Down Command (Terminal S6)	0	1	0	1
Operation	Accel (UP)	Decel (DWN)	Hold	Hold

Figure 4.3.19 UP/DOWN wiring and operation example

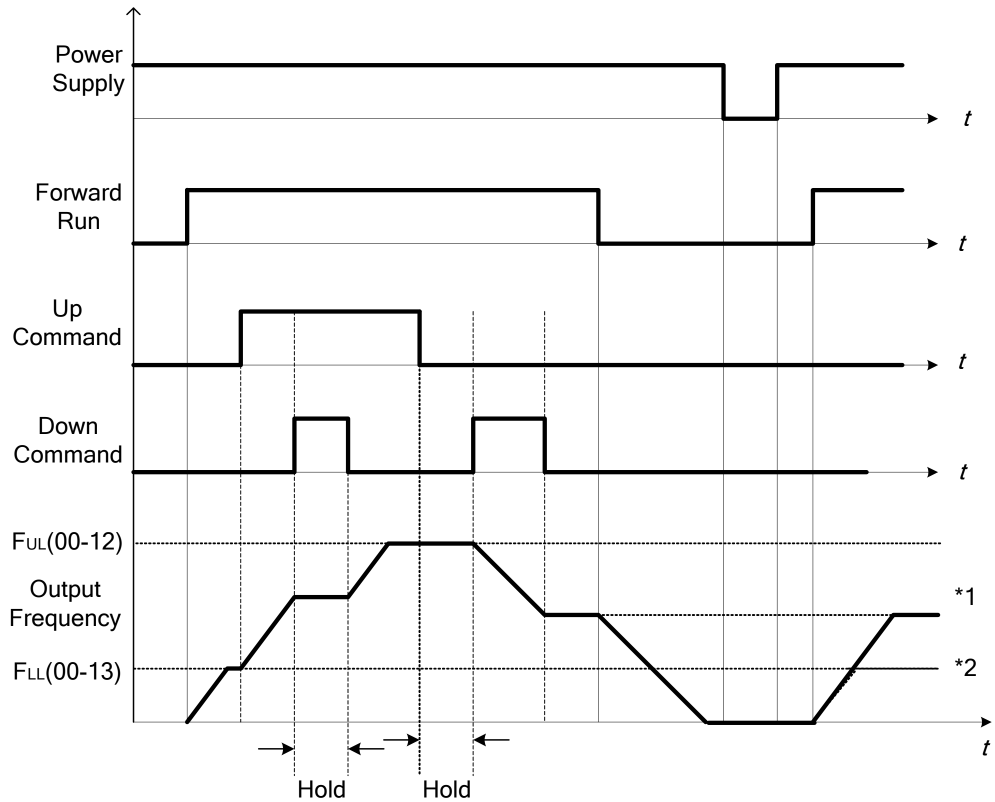


Figure 4.3.20 UP / DOWN command timing diagram

UP / DOWN Command Operation

When the Forward Run command is active and the UP or Down command is momentarily activated the inverter will accelerate the motor up to the lower limit of the frequency reference (00-13).

When using the UP / Down command, the output frequency is limited to the upper limit of frequency reference (00-12) and the lower limit of frequency reference (00-13).

The UP / DOWN command uses acceleration 1 or 2 / deceleration time 1 or 2 for normal operation Tacc1 / Tdec1 (00-14, 00-15) or Tacc2 / Tdec 2 (00-16, 00-17).

03-0X =10: Acceleration/deceleration 1 selection

03-0X =30: Acceleration/deceleration 2 selection
Refer to the "multi-function digital input terminals select acceleration / deceleration time"

03-0X =11: Inhibit Acceleration/deceleration command (hold command)

When activated suspends the acceleration / deceleration operation and maintains the output frequency at current level.
Operation of inhibit Acceleration/deceleration function, please refer figure 4.3.21.

The frequency reference value is saved when the acceleration/deceleration inhibit command is active and the frequency reference value is saved even when powering down the inverter.

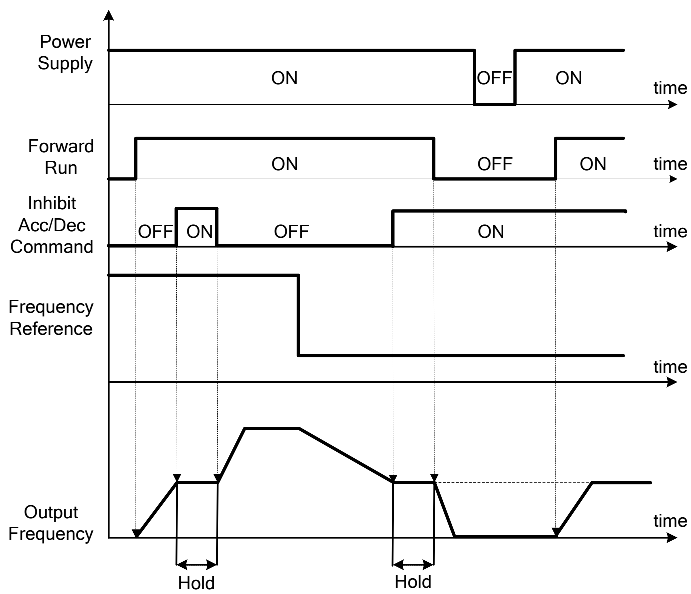


Figure 4.3.21 Inhibit acceleration / deceleration command operation

03-0X =12: Main / Alternative Run Switch Function

When active, run command source is set to the alternative run command (00-03).
Note: Digital input function 27 (Local/ Remote control selection) has a higher priority than the main/alternative run switch.

03-0X =13: Main/ Alternative Frequency Switch Function

When active, frequency command source is set to the alternative frequency command (00-06). When PID function is active (10-03=XXX1B), this function is disabled and the frequency reference is set by the PID function.
Note: Digital input function 27 (Local/ Remote control selection) has a higher priority than the main/alternative run switch.

03-0X =14: Emergency stop (decelerate to zero and stop)
Refer to the "deceleration time of emergency stop" of parameter 00-26

03-0X =15: External Baseblock Command (coast to stop)
When active the inverter output is turned off.

During run: When an external base block command is activated, the keypad displays "BBn BaseBlock (Sn)", indicating the inverter output is turned off (n indicates the digital input number 1 – 6). Upon removing the base block signal, the motor will run at the frequency reference. If speed search from frequency reference is active the inverter output frequency starts from the frequency reference and searches for the coasting motor speed and continue to operate. If speed search is not active the output frequency starts at 0Hz.

During deceleration: When an external base block command is activated, the keypad displays "BBn BaseBlock (Sn)", indicating the inverter output is turned off (n indicates the digital input number 1 – 6). Upon removing the base block signal, the motor is stopped or will coast to a stop and the inverter remains in the stop condition.

During acceleration: When an external base block command is activated, the keypad displays "BBn BaseBlock (Sn)", indicating the inverter output is turned off (n indicates the digital input number 1 – 6). Upon removing the base block signal, the motor will run at the frequency reference. If speed search from frequency reference is active the inverter output frequency starts from the frequency reference and searches for the coasting motor speed and continue to operate. If speed search is not active the output frequency starts at 0Hz.

Please refer figure 4.3.22 for external base block operation.

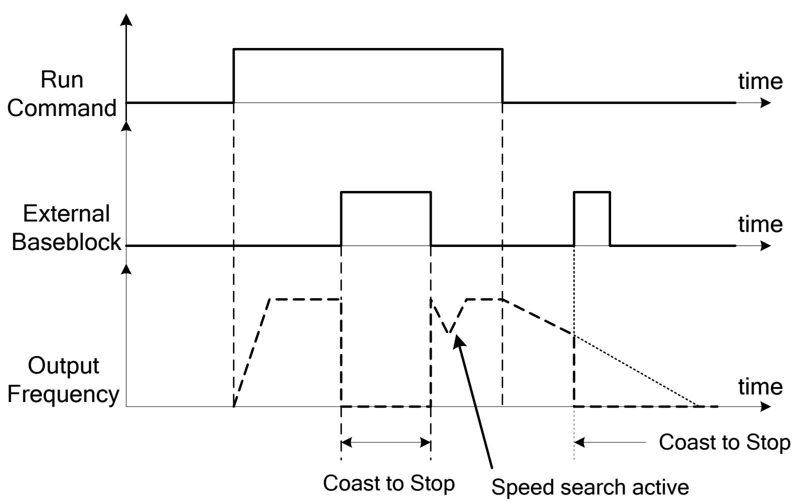


Figure 4.3.22 External base block operation

03-0X =16: PID control disabled.

03-0X =17: Fault reset

When the inverter trips on a fault the fault output contact is activated, the inverter output is turned off (base block) and the keypad displays a dedicated fault message.

The following options are available to reset a fault:

1. Program one of the multi-function digital inputs (03-00 to 03-05) to 17 (reset fault) and activate input.*****
2. Press the reset key of the digital operator (RESET).*****
3. Cycle power to the inverter. ***Important Note:*** If a run command is active during power-up, the inverter will start running automatically.

***** To reset an active fault the run command has to be removed.

03-0X =18: Auto run mode enable

When active auto run mode function is enabled, please refer to group 06 for more information.

03-0X =19: Speed Search 1 (from the maximum frequency).

03-0X =34: Speed Search 2 (from the frequency command).

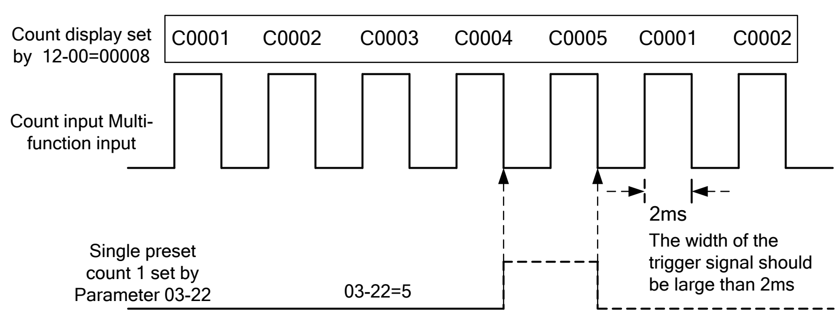
Refer to the "speed search" function.

03-0X =20: Energy saving enabled
Manual energy savings function is set with parameters 11-12 and 11-18.
For the manual energy saving operation refer to Figure 4.3.88.

03-0X =21: PID integral reset

03-0X =22: Counter Input 1

When input goes from OFF to ON the counter value increased by ‘1’,



03-0X =23: Counter Reset

When active counter is reset to 0 and the inverter display shows “C0000”. Deactivate the counter reset input to enable counter.

03-0X =24: PLC Input

It is required to be with the software of Drive Link. PLC software program conducts the ladder diagram editing. When the signal output conducts, it will be transmitted to the inverter to be active.

03-0X =25: Pulse Width Measurement

Can only be used for terminal S3 (03-02=25) for pulse width measurement functions.

To following parameters have to be set to use the pulse width function.
00-05=7: Pulse with speed control
03-02=25: Pulse input width measure
03-27=0.05 ~ 25 kHz: pulse input frequency
03-28=100.0 ~ 1000.0%: pulse input gain setting
Inverter reference frequency= Duty cycle x (00-12) x (03-28) Hz, and below the frequency upper limit

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

Example:
To use the pulse input as a speed reference set the following parameters:
00=05=7, 03-0X=26，X=0~6 (except select 2), 03-27=pulse input frequency
03-28=100.0 (adjust as required)

Pulse input frequency is 200Hz, set 03-27=0.20kHz.

Example 1:
Pulse input frequency is 200Hz (03-27=0.20), duty cycle is 50%, frequency upper limit is 50Hz (00-12=50.00), and 03-28=100.0. Inverter reference frequency is 50% x 50.00=25.00Hz

Example 2:
Pulse input frequency is 200Hz (03-27=0.20), duty cycle is 30%, frequency upper limit is 50Hz (00-12=50.00), and 03-28=200.0. Inverter reference frequency is 30% x 50.00 x 2=30.00Hz

Example 3:
Pulse input frequency is 200Hz (03-27=0.20), duty cycle is 15%, frequency upper limit is 599Hz (00-12=599.00), and 03-28=500.0. Inverter reference frequency is 15% x 599.00 x 5.00=499.25Hz

Note:
The examples are based on the digital inputs set for NPN input configuration. To use PNP, the relationship between duty cycle and inverter reference frequency is inverted, so 20% duty cycle translates to 80% inverter reference frequency.

03-0X =26: Pulse Input Frequency

To following parameters have to be set to use the Pulse Input Frequency function.
00-05=7: Pulse with speed control
03-02=26: Pulse input frequency
03-28=100.0 ~ 1000.0%: pulse input gain setting
Inverter reference frequency= (Pulse input frequency) x (03-28) Hz, reference frequency limit is the inverter frequency upper limit

Example 1:
Pulse input frequency is 20Hz, frequency upper limit is 50Hz (00-12=50.00), and 03-28=100.0, Inverter reference frequency is 20.00Hz.

Example 2:
Pulse input frequency is 50Hz, frequency upper limit is 50Hz (00-12=50.00), and 03-28=100.0, Inverter reference frequency is 50.00Hz.

Example 3:
Pulse input frequency is 55Hz, frequency upper limit is 50Hz (00-12=50.00), and 03-28=100.0, Inverter reference frequency is 50.00Hz.

Example 4:
Pulse input frequency is 599Hz, frequency upper limit is 599Hz (00-12=599.00), and 03-28=20.0, Inverter reference frequency is 599 x 0.2 = 119.9Hz

Notes:
- Pulse Input frequency range is 0.05~25.00 kHz.
- Only terminal S3 can be used for pulse input.

Digital Inputs configured for PNP: (set switch JP1 to PNP)
The pulse output terminal (Y0) of PLC needs to connect to S3 terminal of inverter.
The common terminal of the pulse generator (e.g. PLC) output needs to be connected to the +24V terminal of the inverter.

Digital Inputs configured for NPN: (set switch JP1 to NPN)
The pulse output terminal (Y0) of PLC needs to connect to S3 terminal of inverter.
The common terminal of the pulse generator (e.g. PLC) output needs to be connected to the COM terminal of the inverter.

03-0X =27: Local / Remote selection.

Switch the inverter frequency reference source between Local (keypad) or Remote (control circuit terminals or RS485). Use parameter 00-05 (Main frequency command source selection) and 00-02 (Run command selection) to select the remote source.

Note: In 3-wire operation terminal S1 and S2 are reserved for run/stop operation and the Local / Remote function can only be set to digital input terminals S3 to S6 (03-02 to 03-05).

Note: To switch between local and remote the inverter has to be stopped.

Input	Mode	Frequency Reference / Run/Stop Command Source
ON	Local	- Frequency reference and Run-Stop from keypad. - LEDs SEQ and REF are off.
OFF	Remote	- Frequency reference source selected by parameter 00-05 and Run-Stop source selected by parameter 00-02. - LEDs SEQ and REF are on.

03-0X =28: Local/Remote selection

Switch between terminal source and communication (RS-422/RS-485) source for frequency reference and operation command.

In Remote mode, indicators of SEQ and REF are on; you can use terminals AI1 and AI2 to control the frequency command, and use terminals S1, S2 or communication terminal RS-485 to control the operation command.

Input	Mode	Frequency Reference / Run/Stop Command Source
ON	Communication	- Frequency reference and run/stop command control via communication (RS-422/RS-485).
OFF	Terminal	- Frequency reference source from AI1 / AI2 input (00-05=1) and Run-Stop command from terminals S1 / S2 (00-02=1).

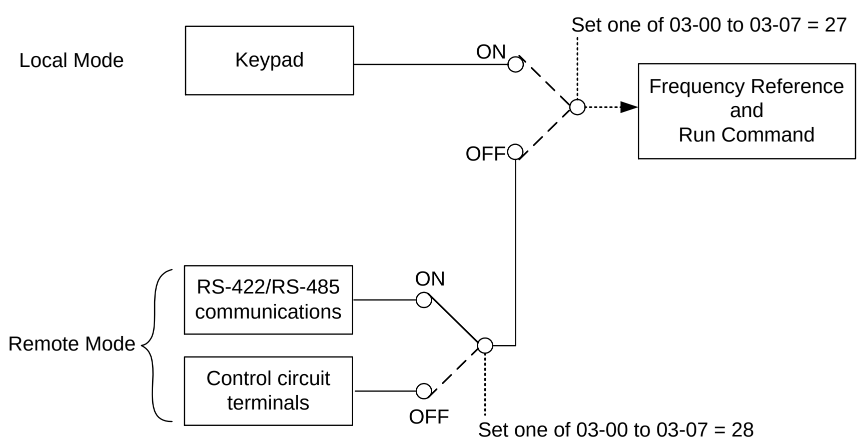


Figure 4.3.23 Remote mode operation selection

03-0X =29: Jog Frequency Selection
When jog frequency selection is on, the inverter will depend on the parameter 00-18 (jog frequency) as the command.

03-0X =33: DC braking

When input is active DC-Injection braking is enabled during start and stopping of the inverter.
DC Injection braking is disabled when a run or jog command is active. Refer to the DC braking time diagram in Figure 4.3.24.

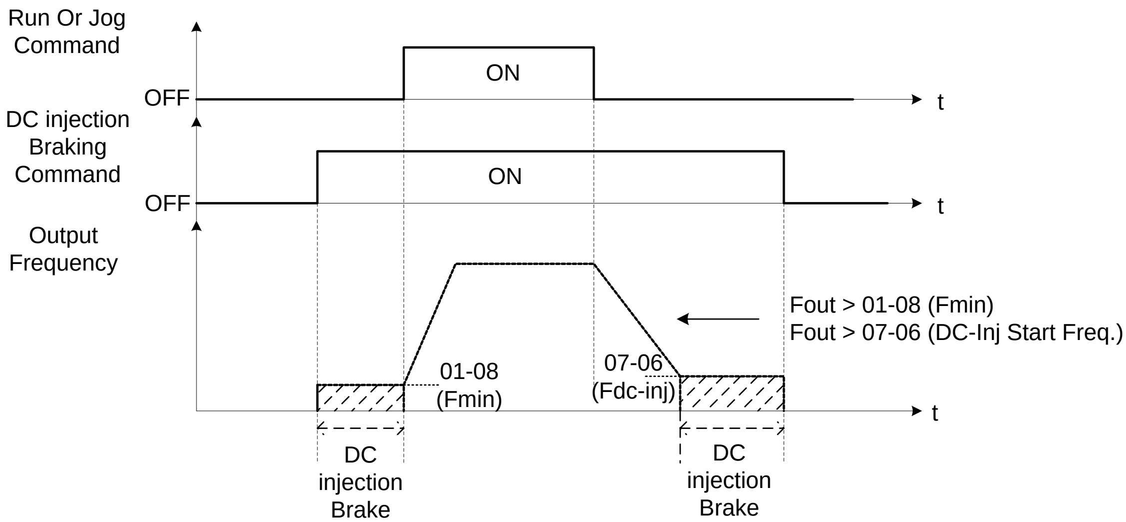


Figure 4.3.24 DC braking timing diagram

03-0X =34: Speed Search
Activate speed search function

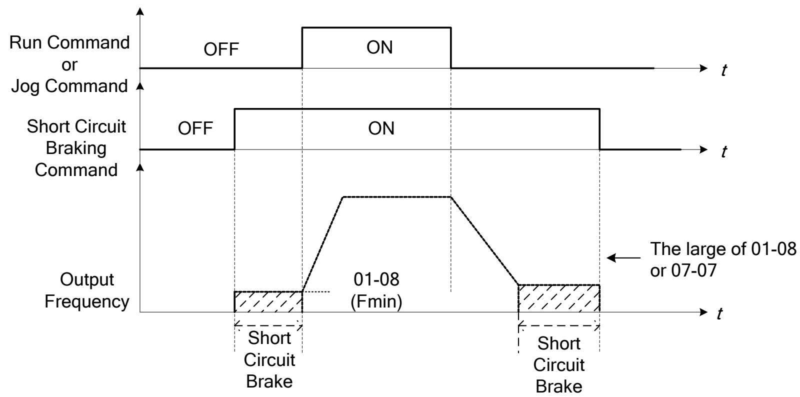
03-0X =40: Motor 2 Selection
Activate speed search function

03-0X =47: Fire mode
When input is active disables all inverter warning and hardware protections. This function is commonly used in commercial applications where the inverter controls an exhaust fan and needs run to destruction in case of a fire.

03-0X =48: KEB acceleration
When input is active enables KEB (Kinetic Energy Braking) during acceleration. Refer to the parameter description of 11-47 and 11-48. Note: To enable set parameter 11-47 to a value greater than 0.

03-0X =65: Short Circuit braking

When active stops inverter by turning on Short-circuit braking. Short-circuit braking is disabled when a run or jog command is active.



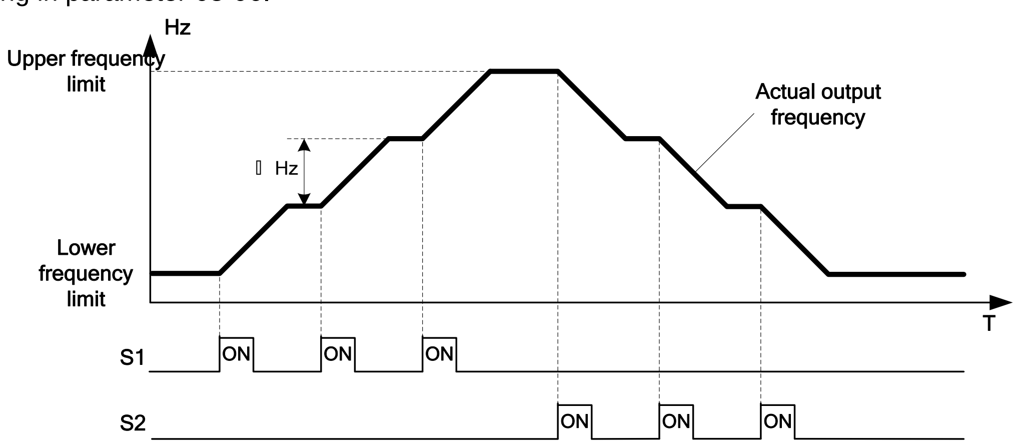
03-06	UP/DOWN Frequency Step
Range	【**0.00~5.00**】Hz

When 03-06 = 0 Hz, Up / Down function is maintained.
When 03-06 > 0 Hz, frequency command is the run frequency plus the value set in parameter 03-06.

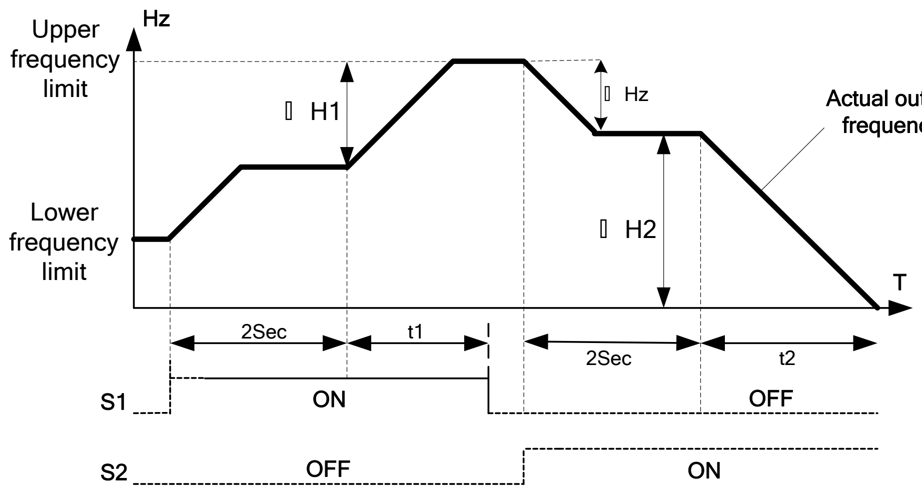
Example:
03-00=8 (S1 terminal set to “UP” frequency command)
03-01=9 (S2 terminal set to “Down” frequency command)
03-06=△Hz

Mode 1: When 03-40 = 0 Hz, Up / Down function is maintained. See Fig. 4.3.20.

Mode 2: When 03-06 > 0 Hz and multi-function input terminals are active less than 2 sec, frequency change (△Hz) based on setting in parameter 03-06.



Mode 3: When 03-40 > 0 Hz and multi-function input terminals are active for more than 2 sec, frequency changes based upon acceleration / deceleration ramp.



Notes:

ΔH1: frequency increase during acceleration, **t1:** Multi-function Input active time during acceleration,
ΔH2: frequency increase during deceleration, **t2:** Multi-function Input active time during deceleration.

$$\triangle \mathbf{H1} = \frac{\text{Upper frequency limit}}{\text{Acceleration time 2}} \quad \text{x input terminal active time (t1)}$$

$$\triangle \mathbf{H2} = \frac{\text{Upper frequency limit}}{\text{Acceleration time 2}} \quad \text{x input terminal active time (t2)}$$

03-07	UP/DOWN Keep Frequency Status after Stop Command
Range	0: Hold last set frequency when stopped 1: Set frequency to 0 when stopped 2: Allow speed changes from last set frequency when stopped 3: Refresh frequency during acceleration

03-07=0: When the run command is removed the UP/DOWN frequency reference before deceleration is stored. The next time the run command is applied the output frequency will ramp up to the previously stored frequency reference (05-01).

03-07=1: When the run command is removed the UP/DOWN frequency reference command is cleared (set to 0). The next time the run command is applied the output frequency will start at 0.

03-07=2: UP/DOWN command is active when run command is not active.

03-07=3: Retains frequency command. UP/DOWN key active during acceleration.

03-08	(S1~S6) DI scan time
Range	1~200 (x 2ms)

Set the digital input CPU scan time. The digital input signal needs to be present for the minimum scan time to qualify as a valid command.

Note:

- For noisy environments select scan time of 8ms (results in a slower response time).
- Scan period unit is 2ms.

03-09	Multi-function terminal S1-S4 type selection
Range	xxx0b**:** S1 A contact xxx1b**:** S1 B contact xx0xb**:** S2 A contact xx1xb**:** S2 B contact x0xxb**:** S3 A contact x1xxb**:** S3 B contact 0xxxb**:** S4 A contact 1xxxb**:** S4 B contact

03-10	Multi-function terminal S5-S6 type selection
Range	xxx0b**:** S5 A contact xxx1b**:** S5 B contact xx0xb**:** S6 A contact xx1xb**:** S6 B contact

Parameter 03-09 and 03-10 selects the digital input type between a normally open and a normally closed switch/contact.

Each bit of 03-09/03-10 represents an input:

03-09=	**0**	**0**	**0**	**0**	**0:** normally open switch
	s4	**s3**	**s2**	**s1**	**1:** normally close switch
03-10=	**0**	**0**	**0**	**0**	**0:** normally open switch
			s6	**s5**	**1:** normally close switch

Example: S1 and S2 wired to a normally closed contact / switch set 03-09=0011.

Do not set the operation command parameter 00-02 to terminal control before setting the digital input type. Failure to comply may cause death or serious injury.

03-11	Relay (R1A-R1C) output
03-12	**Relay (R2A-R2C) output**
Range	【0】: During Running 【1】: Fault Contact Output 【2】: Frequency Agree 【3】: Setting Frequency Agree (03-13 ± 03-14) 【4】: Frequency Detection 1 (≧ 03-13, hysteresis range is the setting value of 03-14) 【5】: Frequency Detection 2 (≦03-13, hysteresis range is the setting value of 03-14) 【6】: Automatic 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 【14】: Brake Control 【15】: PID Feedback Signal Loss 【16】: Single Pre-set Count (03-22~03-23) 【17】: Dual Pre-set Count (03-22~03-23) 【18】: PLC Status Indicator (00-02) 【19】: PLC Control 【20】: Zero Speed 【30】: Motor 2 Selection 【54】: Turn On Short-Circuit Braking 【55】: Low Current Detection

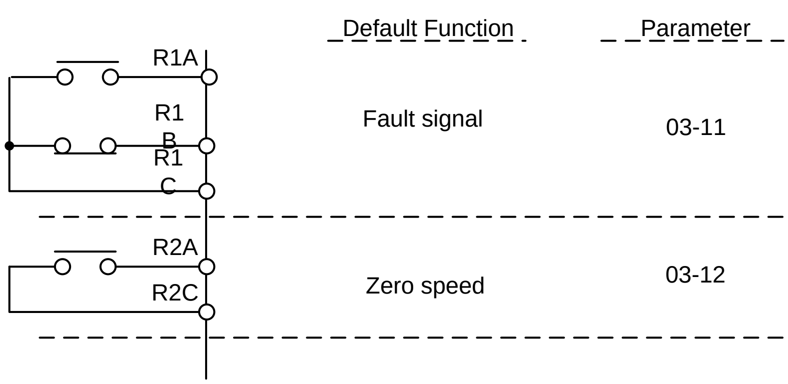


Figure 4.3.25 Multi-function digital output and related parameters

Table 4.3.29 Function table of multi-function digital output

Value	Function: Name	Function: LCD display	Contents	Control mode: V/F	Control mode: SLV	Control mode: PM SLV
0	During Running	Running	ON:Dring running (Run command is ON)	O	O	O
1	Fault Contact Output	Fault	ON:Fault contact output (except CF00 and CF01)	O	O	O
2	Frequency Agree	Freq. Agree	ON:Frequency agree (frequency agree width detection is set by 03-14)	O	O	O
3	Setting Frequency Agree (03-13 ± 03-14)	Setting Freq Agree	ON:Output frequency = allowed frequency detection level (03-13) ± frequency bandwidth (03-14)	O	O	O
4	Frequency Detection 1 (≧ 03-13, hysteresis range is the setting value of 03-14)	Freq. Detect 1	ON:Output frequency > 03-13, Hysteresis range is 03-14	O	O	O
5	Frequency Detection 2 (≦03-13, hysteresis range is the setting value of 03-14)	Freq. Detect 2	OFF:Output frequency > 03-13, Hysteresis range is 03-14	O	O	O
6	Automatic Restart	Auto Restart	ON:the period of automatic restart	O	O	O
7	Momentary AC Power Loss	Invalid Do Func.	Reserved	O	O	O
8	Rapid Stop	Invalid Do Func.	Reserved	O	O	O
9	Base Block	Baseblock	ON:During Baseblock	O	O	O
10	Motor Overload Protection (OL1)	Invalid Do Func.	Reserved	O	O	O
11	Drive Overload Protection (OL2)	Invalid Do Func.	Reserved	O	O	O
12	Over Torque Threshold Level (OL3)	Over Torque	ON:Over torque detection is ON	O	O	O
13	Preset Output Current Reached	Currebt Agree	ON:When output current > 03-15 is ON	O	O	O
14	Brake Control	Invalid Do Func.	ON:Mechanical braking release frequency OFF:Mechanical braking run frequency	O	O	O
15	PID Feedback Signal Loss	Invalid Do Func.	Reserved	O	O	O
16	Single Pre-set Count (03-22~03-23)	Invalid Do Func.	Reserved	O	O	O
17	Dual Pre-set Count (03-22~03-23)	Invalid Do Func.	Reserved	O	O	O
18	PLC Status Indicator (00-02)	PLC statement	ON:When 00-02 is set to 3 (PLC operation command source)	O	O	O
19	PLC Control	Control From PLC	ON:Control from PLC	O	O	O

20	Zero Speed	Zero Speed	ON:Output frequency < Minimum output frequency (Fmin)	O	O	O
21	Reserved	Reserved	Reserved	-	-	-
22	Reserved	Reserved	Reserved	-	-	-
23	Reserved	Reserved	Reserved	-	-	-
24	Reserved	Reserved	Reserved	-	-	-
25	Reserved	Reserved	Reserved	-	-	-
26	Reserved	Reserved	Reserved	-	-	-
27	Reserved	Reserved	Reserved	-	-	-
28	Reserved	Reserved	Reserved	-	-	-
29	Reserved	Reserved	Reserved	-	-	-
30	Motor 2 Selection	Motor 2 Selection	ON:Switch to Motor 2	O	O	X
31	Reserved	Reserved	Reserved	-	-	-
32	Reserved	Reserved	Reserved	-	-	-
33	Reserved	Reserved	Reserved	-	-	-
34	Reserved	Reserved	Reserved	-	-	-
35	Reserved	Reserved	Reserved	-	-	-
36	Reserved	Reserved	Reserved	-	-	-
37	Reserved	Reserved	Reserved	-	-	-
38	Reserved	Reserved	Reserved	-	-	-
39	Reserved	Reserved	Reserved	-	-	-
40	Reserved	Reserved	Reserved	-	-	-
41	Reserved	Reserved	Reserved	-	-	-
42	Reserved	Reserved	Reserved	-	-	-
43	Reserved	Reserved	Reserved	-	-	-
44	Reserved	Reserved	Reserved	-	-	-
45	Reserved	Reserved	Reserved	-	-	-
46	Reserved	Reserved	Reserved			
47	Reserved	Reserved	Reserved	-	-	-
48	Reserved	Reserved	Reserved	-	-	-
49	Reserved	Reserved	Reserved	-	-	-
50	Reserved	Reserved	Reserved	-	-	-
51	Reserved	Reserved	Reserved	-	-	-
52	Reserved	Reserved	Reserved	-	-	-
53	Reserved	Reserved	Reserved	-	-	-
54	Turn On Short-Circuit Braking	SC Brk	ON:Turn on short-circuit braking	X	X	O
55	Low Current Detection	Low Current Detect	ON:Output Current ≦ 03-48 Low Current detection level	-	-	-

03-1X=0: During Running

ON: Run command is ON or output frequency is greater than 0

OFF: Run command is OFF and the inverter is stopped.

03-1X=1: Fault contact output
Output is active during fault condition.
Note: Communication error (CF00, CF01) do not activate the fault contact.

03-1X=2: Frequency Agree
Output is active when the output frequency falls within the frequency reference minus the frequency detection width (o3-14).

03-1X=3: Setting Frequency Agree
Output is active when the output frequency falls within the frequency detection width (03-14) of the set frequency detection level (o3-13).

03-1X=4: Frequency detection 1
Output is active when the output frequency rises above the frequency detection level (03-13) + frequency detection width (o3-14) and deactivates when the output frequency falls below frequency detection level (o3-13).

03-1X=5: Frequency detection 2
Output is active when the output frequency is below the frequency detection level (03-13) + frequency detection width (03-14) and turns off when the output frequency falls below frequency detection level.

Refer to table 4.3.9 for the operation of frequency detection.

03-1X=6: Automatic restart.
Output is active during an auto-restart operation.

03-1X=7: Baseblock (B.B.)
Output is active during a momentary AC power loss

03-1X=8: Rapid Stop
Output is active during a rapid stop

03-1X=9: Baseblock (B.B.)
Output is active when the inverter output is turned off during a Baseblock command.

03-1X=10: Motor Overload Protection (OL1)
Output is active during motor overload detection (OL1)

03-1X=11: Drive Overload Protection (OL2)
Output is active during inverter overload detection (OL2)

03-1X=12: Over torque detected (Normally Open)
Output is active during an over torque detection see parameters 08-13 ~ 08-16.

03-1X=13: Preset Output Current Reached
When output current > 03-15 and output current > 03-15 duration >03-16, it is ON.

03-1X=14: Motor Overload Protection (OL1)
Output is active when brake control is active

03-1X=15: Motor Overload Protection (OL1)
Output is active when PID feedback signal is lost (e.g. wire break)

03-1X=18: PLC status (setting =18)
Output is active when operation command parameter (00-02) is set to 3: PLC Control.

03-1X=19: PLC control contact
Output is controlled by the PLC logic

03-1X=20: Zero-speed
Output is active during zero-speed when output frequency ≦ minimum output frequency (01-08).

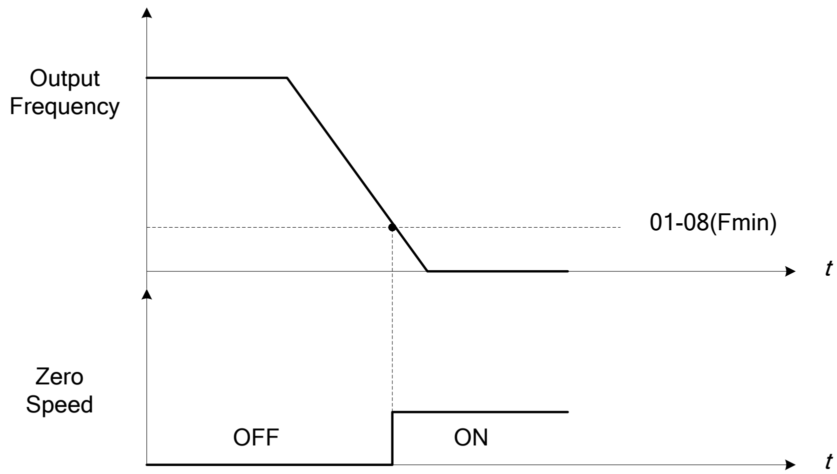


Figure 4.3.26 Zero speed operation

03-1X=30: Motor 2 Selection
Output is active when motor 2 is selected

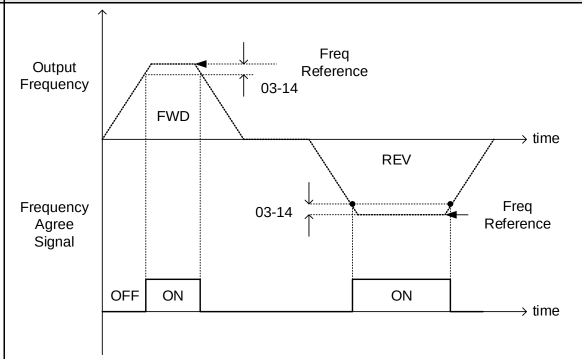
03-1X=54: Short Circuit Braking
Output is active during short circuit braking

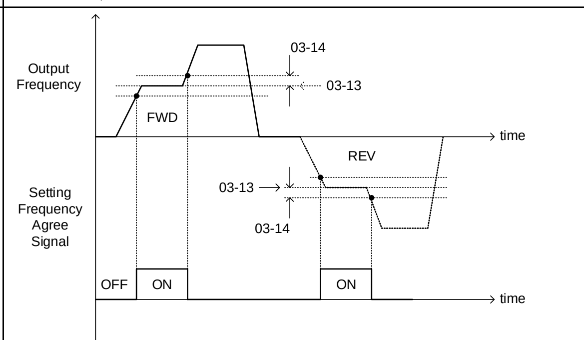
03-1X=55: Low Current Detection
Output is active when low current detection is active, output current <= 03-48.

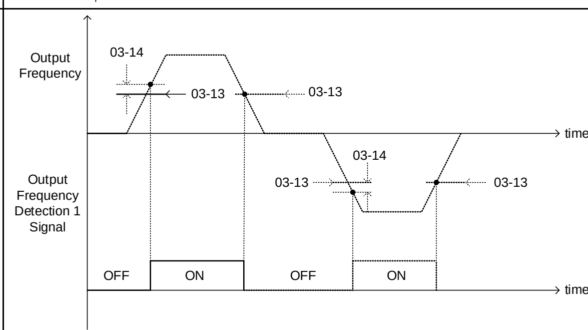
03-13	**Frequency detection Level**
Range	【0.0~599.0】 Hz
03-14	**Frequency detection width**
Range	【0.1~25.5】 Hz

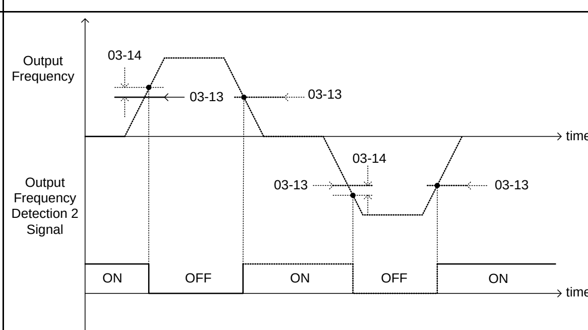
Frequency detection Level: set the multi-function output terminals R1A-R1C, R2A-R2C or PH1 (03-11, 03-12) to the desired detection level and bandwidth for use with multi-function output functions 1 to 6.

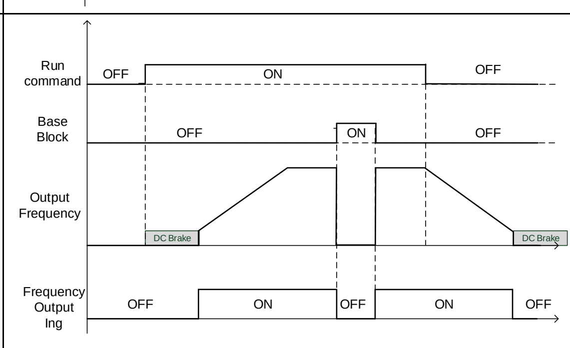
The time charts for the Frequency Agree Detection operation are shown in the following table 4.3.30.

<table>
<tr><th>Function</th><th>Frequency Detection Function</th><th>Description</th></tr>
<tr><td>Frequency agree</td><td>
</td><td>Output is active when the output frequency falls within the frequency reference minus the frequency detection width (03-14).

Any of the digital outputs function (03-11, 03-12 or 03-28) can be set to 2 (Frequency agree).</td></tr>
<tr><td>Set frequency agree</td><td>
</td><td>Output is active the output frequency falls within the frequency detection width (03-14) of the set frequency detection level (03-13).

Any of the digital outputs function (03-11, 03-12 or 03-28) can be set to 3 (Set frequency agree).</td></tr>
<tr><td>Output frequency detection 1</td><td>
</td><td>Output is active when the output frequency rises above the frequency detection level (03-13) + frequency detection width (o3-14) and deactivates when the output frequency falls below frequency detection level (03-13).

Any of the digital outputs function (03-11, 03-12 or 03-28) can be set to 4 (Output frequency detection 1).</td></tr>
<tr><td>Output frequency detection 2</td><td>
</td><td>Output is active when the output frequency is below the frequency detection level (03-13) + frequency detection width (03-14) and turns off when the output frequency falls below frequency detection level.

Any of the digital outputs function (03-11, 03-12 or 03-28) can be set to 5 (Output frequency detection 2).</td></tr>
<tr><td>Frequency Output</td><td>
</td><td>Output is active when the inverter output frequency is greater than 0.</td></tr>
</table>

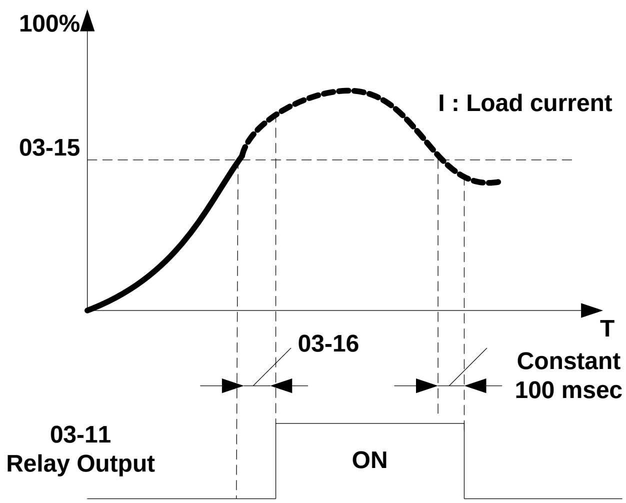
03-15	Current Agree Level
Range	【0.1~999.9】A
03-16	Delay Time of Current Agree Detection
Range	【0.1~10.0】 Sec

03-11=13, then,
Output is active when the output current > 03-15 for time specified in 03-16.

03-15: Sets the output current level (0.1~the motor rated current).

03-16: Output Current detection delay time
ON: Output current has to rise above specified level (03-15) for time specified in 03-16.
OFF: Output current has to fall below specified level (03-15) for time specified in 03-16.

Example:

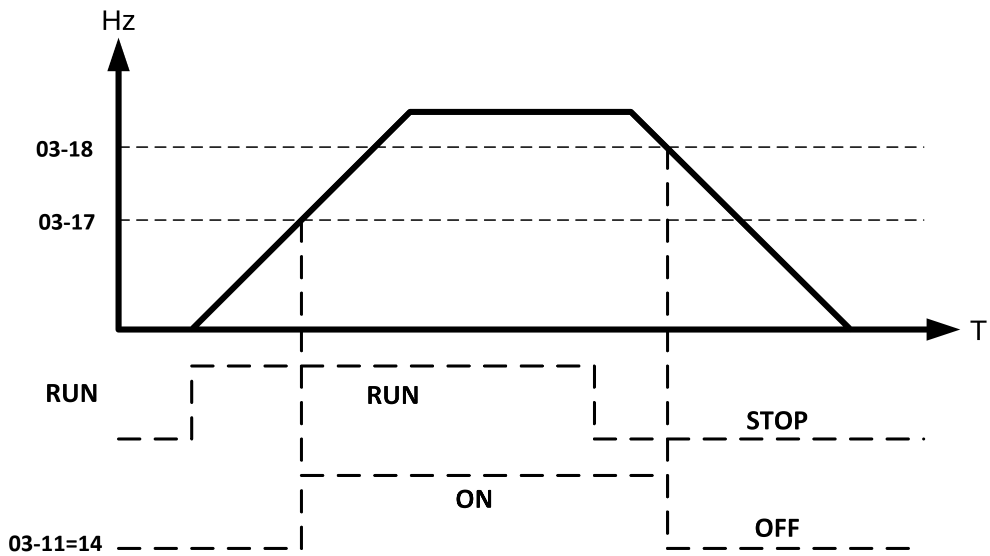


03-17	Mechanical Braking Set Level
Range	【0.00~20.00】 Hz
03-18	Mechanical Braking Release Level
Range	【0.00~20.00】 Hz

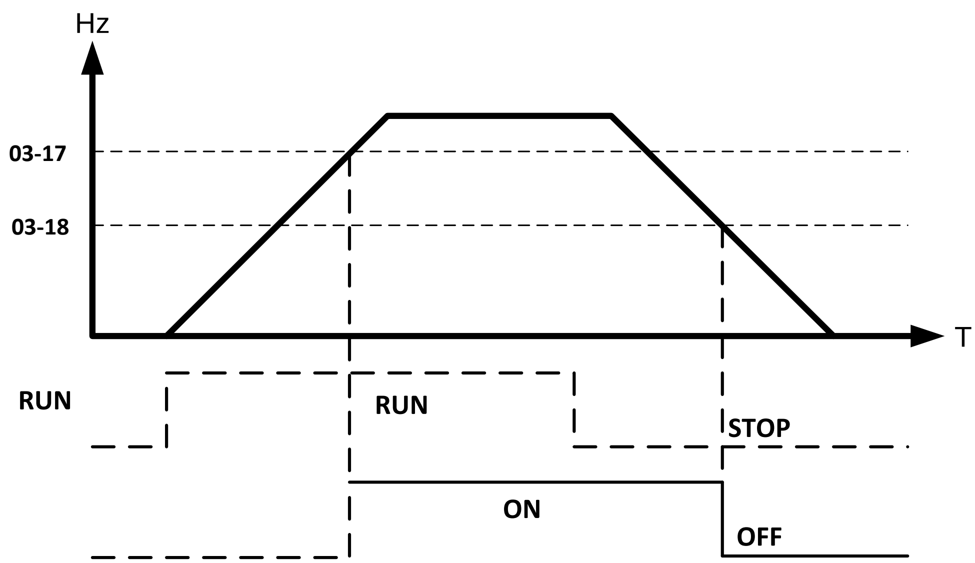
When 03-11=14, when the output frequency is greater or equal to the value set in 03-17 (Brake Set Level) during acceleration, the relay output will activate.

When 03-11=14, when the output frequency falls below the value set in 03-18 (Brake Release Level) during deceleration, the relay output will de-activate.

03-17≤03-18, the following is the sequence applies:



03-17≥03-18, the following is the sequence applies



03- 19	Relay (R1A-R2A) Type
Range	xxx0b**:** R1 A contact xxx1b**:** R1 B contact xx0xb**:** R2 A contact xx1xb**:** R2 B contact

Parameter 03-19 selects the digital output type between a normally open and a normally closed contact.

Each bit of 03-19 represents an output:

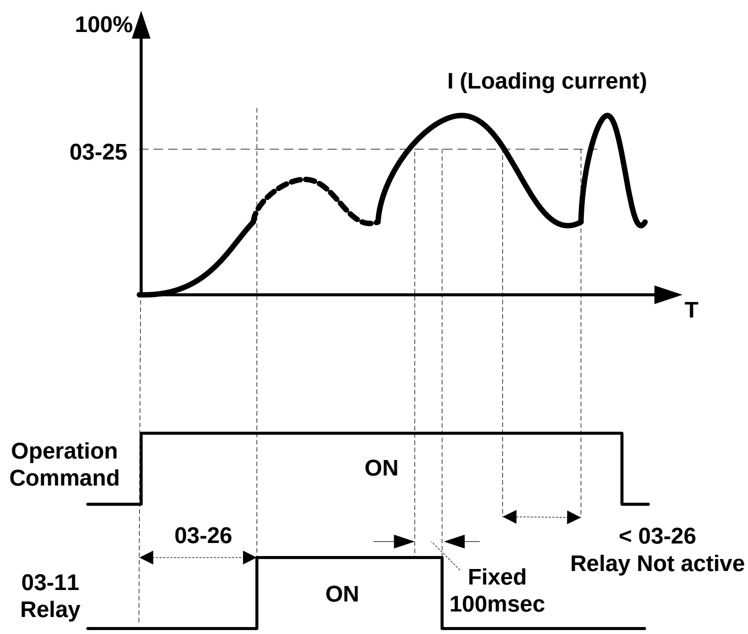
03-19 = **<u>0</u>** **<u>0</u>**   **0:** normally open contact
R2 **R1**   **1:** normally close contact

Example: R1 normally open and R2 normally closed contact set 03-19=xxx01.

03-24	Output Under Current Detection
Range	【0】: Invalid 【1】: Valid
03-25	Output Under Current Detection Level
Range	【0~999.9】A
03-26	Output Under Current Detection Delay Time
Range	【0.0~655.35】 Sec

If 03-11=55 Low Current Detection
Relay ON: When output current ≦ 03-25 for the time specified in 03-26.
Relay OFF: When output current ＞ 03-25 for the time specified in 03-26.

Example:



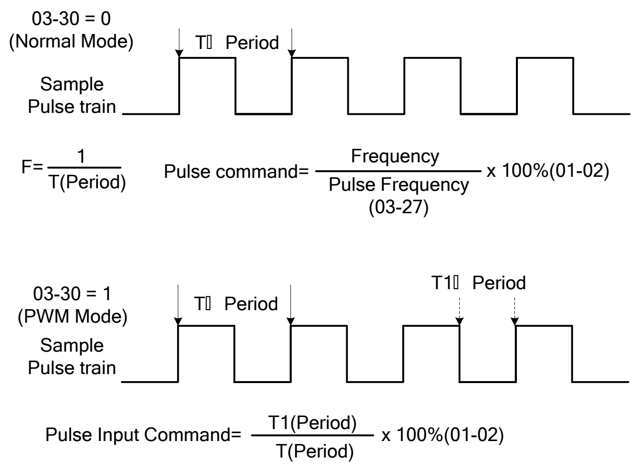
03-27	Pulse Frequency Selection (S3)
Range	50~32000Hz
03-28	Pulse Frequency Gain
Range	【0.0~1000.0】**%**
03-30	Pulse Input Selection
Range	【0】: General Pulse input 【1】: PWM

There are two ways to use the pulse input:

1. Pulse Frequency (Frequency reference = pulse frequency divided by 03-27 x max. frequency (01-02)
2. PWM (Frequency reference = pulse duty cycle (%) x max. frequency (01-02)

Note: The time deviation in PWM mode is ±12.5%. If pulse PWM is outside of the deviation range the pulse input is not active.

Diagram for pulse input selection:



03-33	Pulse Input Bias
Range	【-100.0~100.0】%
03-34	**Filter Time of Pulse Input**
Range	【0.00~2.00】Sec

* Refer to section 3.7 table 2 control terminals for details.
* Refer to figure 4.3.27 for the pulse input specification.

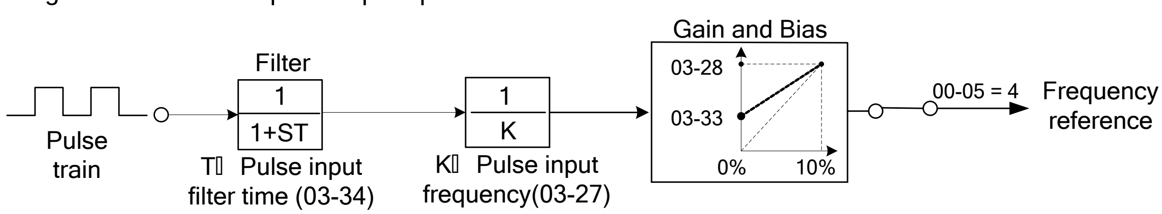


Figure 4.3.27 Pulse input adjustment

Setup Pulse Input as Frequency Reference

Set parameter 00-05 to 4 and 03-30 to 0 to use the pulse input terminal PI as the frequency reference source. Refer to Figure 4.3.5. for details. Next set the pulse input scaling (03-27), enter the pulse input frequency to match the maximum output frequency. Adjust the pulse input filter time (03-34) in case interference or noise is encountered.

04 Analog Signal Inputs / Analog Output

04-00	Analog Input Signal Type
Range	【0】: AI1 0~10V / 0~20mA AI2 0~10V / 0~20mA 【1】: AI1 0~10V / 0~20mA AI2 2~10V / 4~20mA 【2】: AI1 2~10V / 4~20mA AI2 0~10V / 0~20mA 【3】: AI1 2~10V / 4~20mA AI2 2~10V / 4~20mA
04-01	AI1 Signal Scaling and Filter Time
Range	【0.00~2.00】Sec
04-02	AI1 Gain
Range	【0.0~1000.0】%
04-03	AI1 Bias
Range	【-100~100.0】%
04-05	AI1 Slope
Range	【0】: Positive 【1】: Negative
04-06	AI2 Signal Scaling and Filter Time
Range	【0】: Positive 【1】: Negative
04-07	AI2 Gain
Range	【0.0~1000.0】%
04-08	AI2 Bias
Range	【-100.0~100.0】%
04-10	AI2 Gain
Range	【0】: Positive 【1】: Negative

Analog input signal type selection (04-00):

- AI1 is 0~10V, switch JP2 of control board to V, set parameter 04-00 to 0 or 1.
- AI1 is 2~10V, switch JP2 of control board to V, set parameter 04-00 to 2 or 3.
- AI1 is 0~20mA, switch JP2 of control board to I, set parameter 04-00 to 0 or 1.
- AI1 is 4~20mA, switch JP2 of control board to I, set parameter 04-00 to 2 or 3.

- AI2 is 0~10V, switch JP3 of control board to V, set parameter 04-00 to 1 or 3.
- AI2 is 2~10V, switch JP3 of control board to V, set parameter 04-00 to 2 or 4.
- AI2 is 0~20mA, switch JP3 of control board to I, set parameter 04-00 to 1 or 3.
- AI2 is 4~20mA, switch JP3 of control board to I, set parameter 04-00 to 2 or 4.

(1) Analog Input Level Adjustment AI1, AI2 (04-02, 04-03, 04-07, 04-08)
Each analog input AI1and AI2 has a separate gain and bias parameter associated with it.

Analog input signal AI1 can be adjusted with parameter 04-02 and 04-03; Analog input signal AI2 can be adjusted with parameter 04-07 and 04-08. Refer to Figure 4.3.35.

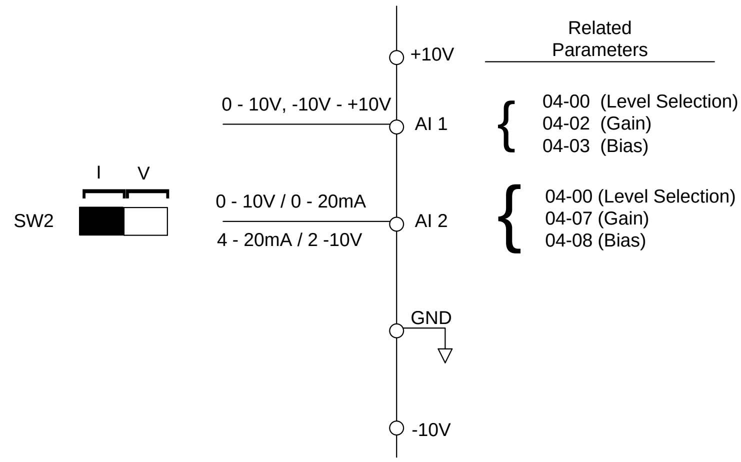


Figure 4.3.35 Analog inputs and related parameters

Gain setting: Sets the level in % that corresponds to a 10V, -10V or 20mA signal at the analog input.
(Set the maximum output frequency 01-02 to 100 %)
Bias setting: Sets the level in % that corresponds to a 0V or 4mA signal at the analog input.
(Set the maximum output frequency 01-02 to 100%)

Use both gain and bias setting to scale the input signal.

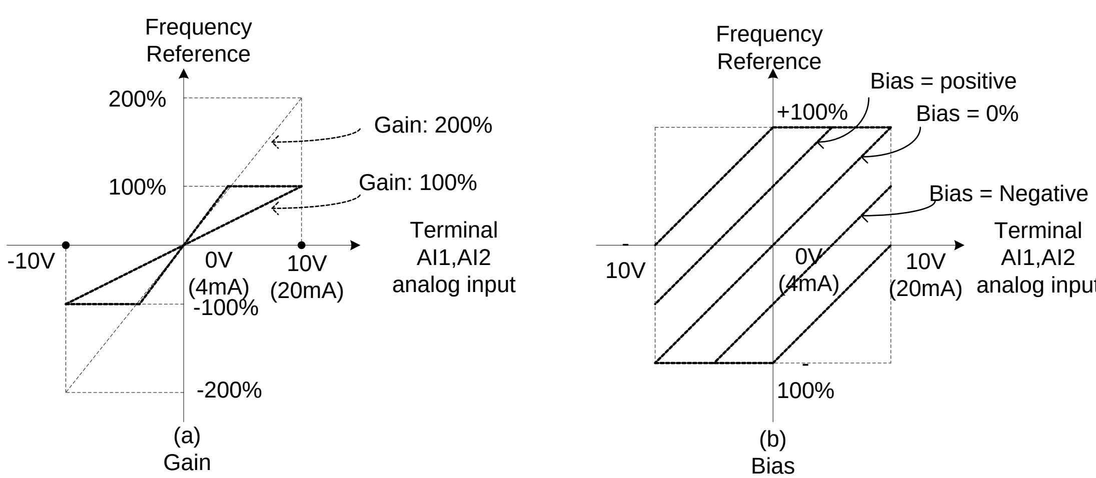


Figure 4.3.36 Gain and bias operations (for frequency reference signal)

(2) AI1 signal filtering time **(04-01)**

(3) AI2 signal filtering time **(04-06)**

All analog inputs (AI1, AI2) have a 1st order programmable input filter that can be adjusted when noise is present on each of the incoming analog signal to prevent erratic drive control.

The filter time constant (range: 0.00 to 2.00 seconds) is defined as the time that the input step signal reaches 63% of its final value.

Note: Increasing the filter time causes the drive operation to become more stable but less responsive to change to the analog input.

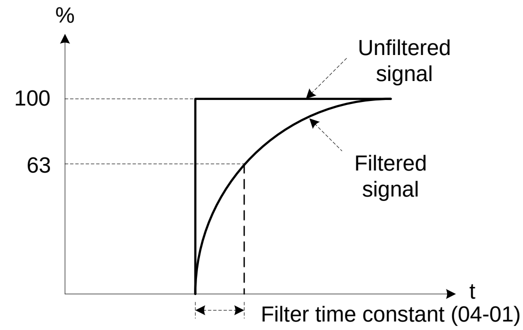


Figure 4.3.37 Filter time constant

04-11	**AO function setting**
Range	【0】: Output frequency 【1】: Frequency command 【2】: Output voltage 【3】: DC voltage 【4】: Output current
04-12	**AO gain**
Range	【0.0~1000.0】%
04-13	**AO bias**
Range	【-100.0~100.0】%
04-15	**AO Slope**
Range	【0】: Positive 【1】: Negative
04-16	**F-Gain / Proportional Gearing function**
Range	【0】: Disable 【1】: Enable

For the analog output and related parameters, please refer to figure 4.3.50.

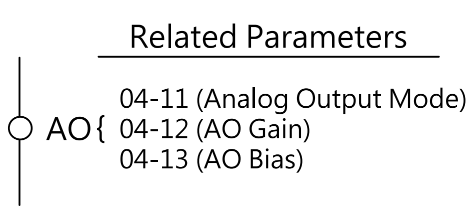


Figure 4.3.50 Analog outputs and related parameters

Analog output AO adjustment (04-12, 04-13 and 04-15)

Signal: Use parameter 04-11 to select the analog output signal for AO.

Gain: Use parameter 04-12 to adjust the gain for AO. Adjust the gain so that the analog output (10V) matches 100% of the selected analog output signal (04-11 for AO).

Bias: Use parameter 04-13 to adjust the bias for AO. Adjust the bias so that the analog output (0V) matches 0% of the selected analog output signal (04-11 for AO).

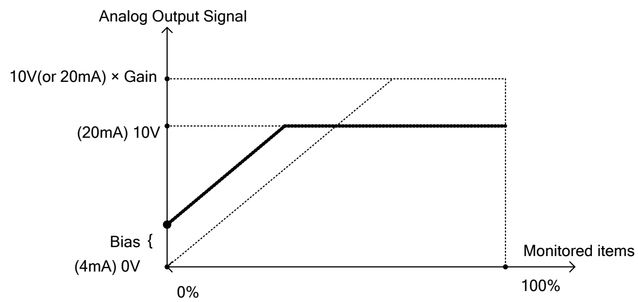


Figure 4.3.51 Analog output level adjustment

Analog output terminal function selection (04-11)

Please refer to the following table 4.3.33.

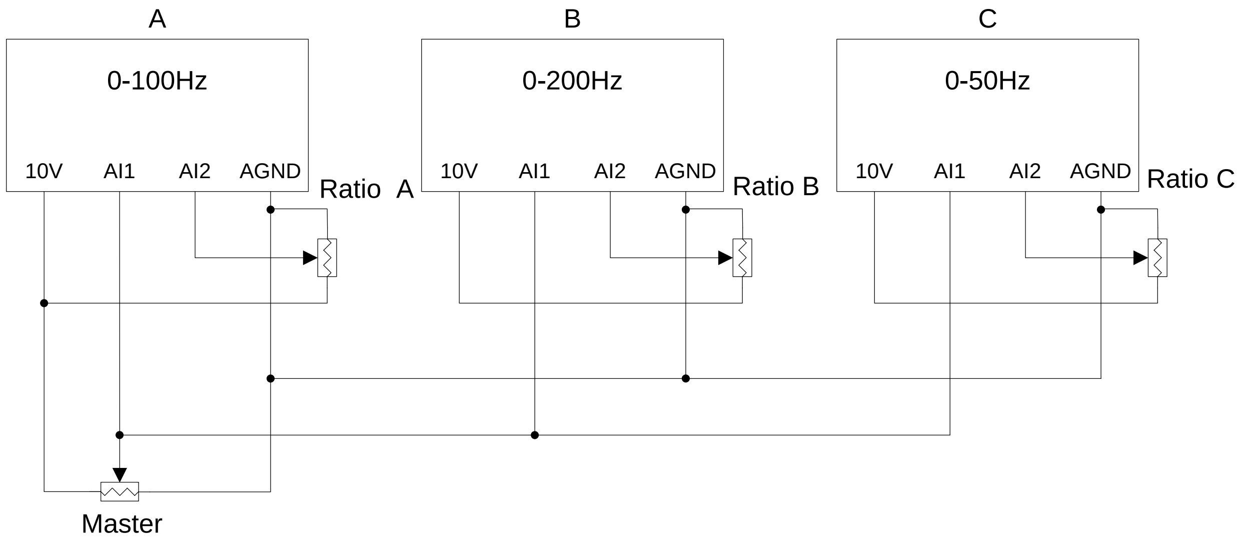
04-11 parameter setting	**Function (Keypad display)**	**Monitoring Parameters 12 Group**	**Control Mode**		
			VF	**SLV**	**PMSLV**
0	Output Freq	12-17	O	O	O
1	Freq Ref	12-16	O	O	O
2	Output Voltage	12-19	O	O	O
3	DC Voltage	12-20	O	O	O
4	Output Current	12-18	O	O	O

Table 4.3.33 Selection of analog output terminals function (04-11)

F-Gain Function:

The F- Gain function offers the ability to use a single frequency reference set by a master potentiometer to more than one inverter. The master frequency can be scaled by three individual potentiometers for each inverter as show in the diagram below.

To enable set parameter 04-16=1 and set parameter 00-05 =2 (external Analog input AI1). Analog input 2 (AI2) can now be used for external 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

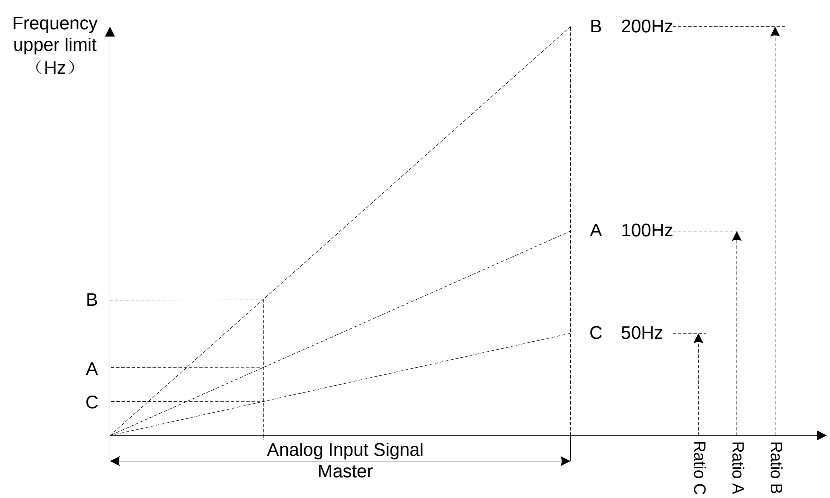


Figure 4.3.53 Diagram of F-Gain function

04-20	AO signal scanning and filtering time
Range	【0.00~0.50】**Sec**

Parameter 04-20 can be used to filter momentary changes in the analog output signal.
Note: Increasing the filter time results in a slower system response, decreasing the filter time may cause instability of the analog output signal.

05 Preset Frequency Parameters

05-00	**Preset Speed Control mode Selection**
Range	【0】: Acceleration and deceleration time 1 ~ 4 used. 【1】: Use independent acceleration and deceleration time for each multi-speed setting.
05-01	**Preset Speed 0 (Keypad Frequency)**
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 11Acceleration 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**

05-00=0: Standard Acceleration and deceleration times parameters 00-14 ~ 00-17 apply to all preset speeds.

05-00=1: Each multi-speed uses a dedicated acceleration and deceleration time parameters 05-17 ~ 05-48. There are two different modes for acceleration / deceleration timing when 05-00 is set to 1, see time example on the next page.

Acceleration time calculation formula

$$\text{Time it takes to reach set frequency} = \frac{\text{Acceleration time x (set frequency - output frequency)}}{\text{Maximum output frequency}}$$

Deceleration time calculation formula

$$\text{Time it takes to reach set frequency} = \frac{\text{Deceleration time x (output frequency - set frequency)}}{\text{Maximum output frequency}}$$

Maximum output frequency: Parameter 01-00=18, maximum output frequency set by 01-02, 01-00 ≠ 18, maximum output frequency determined by V/F curve selected (50.0 / 60.0 / 90.0 / 120.0 / 180.0).

Example: 01-00=01 (50Hz (maximum output frequency), 05-02=10 Hz (multi-step speed 0), 05-17=5.0s (Acceleration time), 05-18=20.0 sec. (Deceleration time).

Acceleration time calculation formula

$$\text{Time it takes to reach set frequency} = \frac{\text{5.0 x 10 Hz}}{\text{50 Hz}} = \text{1.0 sec.}$$

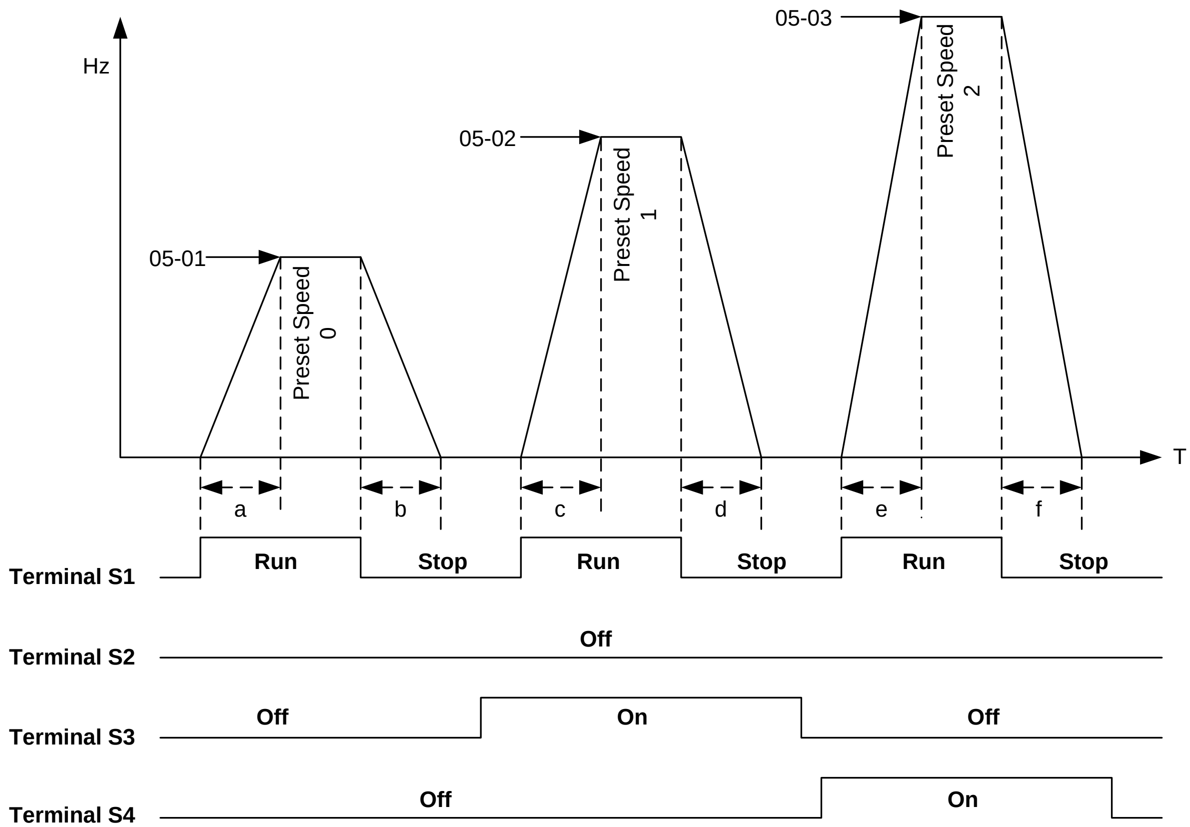
Deceleration time calculation formula

$$\text{Time it takes to reach set frequency} = \frac{\text{20.0 x 10 Hz}}{\text{50 Hz}} = \text{4.0 sec.}$$

Example: Acceleration / deceleration timing when 05-00 is set to 1. In this example the following parameters are set:

00-02=【1】(External Terminal Operation**)**
00-04=【1】(Operation Mode: Run/Stop-Forward/Reverse).
03-00=【0】(Terminal S1: Run /Stop)
03-01=【1】(Terminal S2: Reversal /Stop)
03-02=【2】(Terminal S3: Preset Speed 0)
03-03=【3】(Terminal S4: Preset Speed 1)
03-03=【4】(Terminal S5: Preset Speed 2)

If the run command is cycled on and off, acceleration and deceleration time (a ~ f) is calculated based on the active speed command as follows:

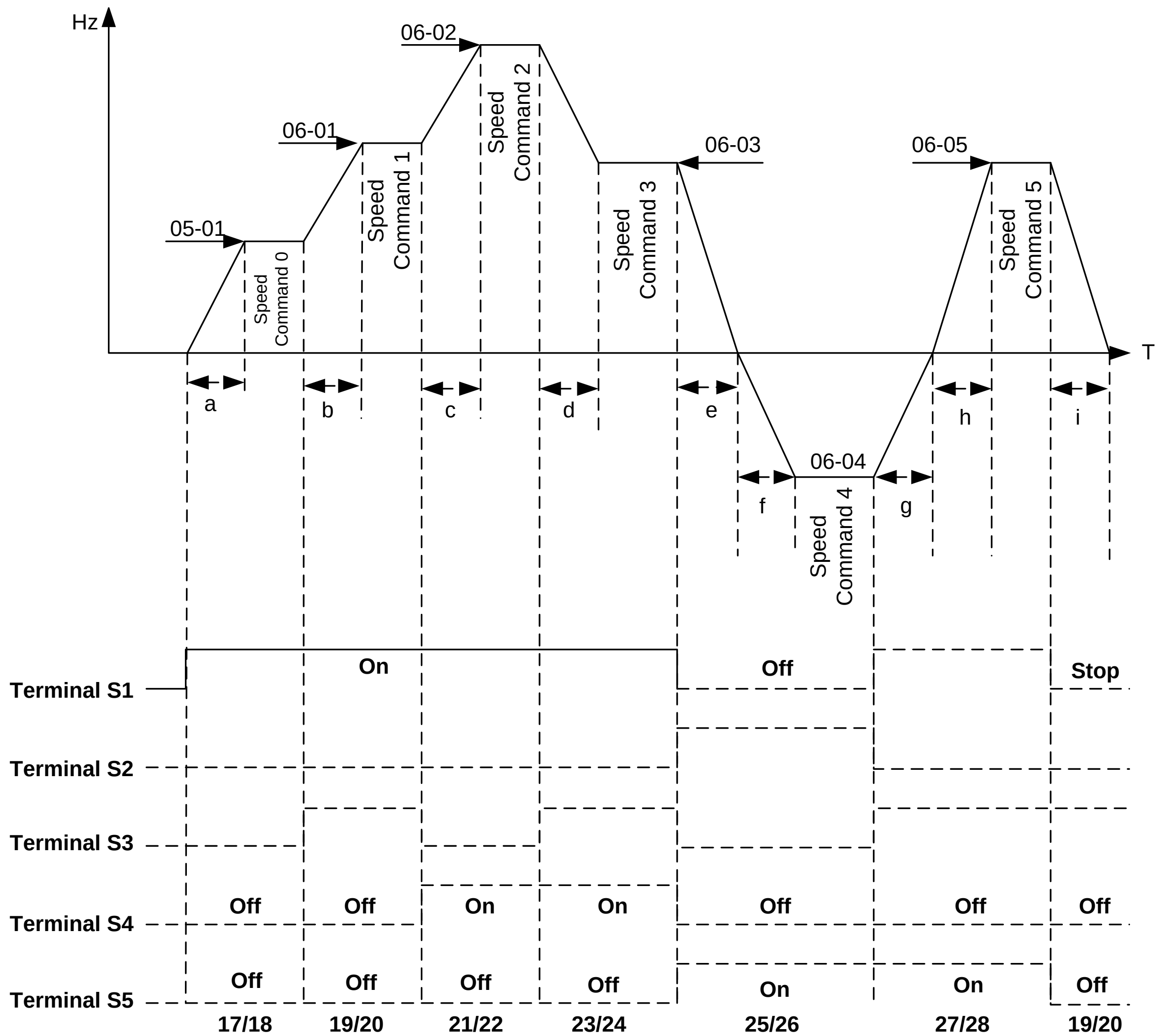


$$a = \frac{(05\text{-}17) \times (05\text{-}01)}{(01\text{-}02)} \qquad b = \frac{(05\text{-}18) \times (05\text{-}01)}{(01\text{-}02)} \qquad c = \frac{(05\text{-}19) \times (05\text{-}02)}{(01\text{-}02)} \quad \text{in sec.}$$

$$d = \frac{(05\text{-}20) \times (05\text{-}02)}{(01\text{-}02)} \qquad e = \frac{(05\text{-}21) \times (05\text{-}02)}{(01\text{-}02)} \qquad f = \frac{(05\text{-}22) \times (05\text{-}03)}{(01\text{-}02)} \quad \text{in sec.}$$

Acceleration / Deceleration Calculation Mode 2:

If the run command is remains on, acceleration and deceleration time (a ~ f) is calculated based on the active speed command as follows:



$$a = \frac{(05\text{-}17) \times (05\text{-}01)}{(01\text{-}02)} \quad b = \frac{(05\text{-}19) \times [(05\text{-}02)-(05\text{-}01)]}{(01\text{-}02)} \quad c = \frac{(05\text{-}21) \times [(05\text{-}02) - (06\text{-}01)]}{(01\text{-}02)} \text{ in sec.}$$

$$d = \frac{(05\text{-}24) \times [(05\text{-}01) - (05\text{-}02)]}{(01\text{-}02)} \quad e = \frac{(05\text{-}26) \times (05\text{-}02)}{(01\text{-}02)} \quad f = \frac{(05\text{-}25) \times (05\text{-}03)}{(01\text{-}02)} \text{ in sec.}$$

$$g = \frac{(05\text{-}27) \times (05\text{-}03)}{(01\text{-}02)} \quad h = \frac{(05\text{-}27) \times (05\text{-}04)}{(01\text{-}02)} \quad i = \frac{(05\text{-}19) \times (05\text{-}04)}{(01\text{-}02)} \text{ in sec.}$$

06 Automatic Program Operation

06- 00	Auto Run Mode Select
Range	【0】: Disabled 【1】: Execute a single cycle operation. Restart speed is based on the previous stopped speed. 【2】: Execute continuous cycle operation. Restart speed is based on the previous cycle stop speed. 【3】: After completion of a single cycle, the on-going operation speed is based on the speed of the last stage. Restart speed is based on the previous stopped speed. 【4】: Execute a single cycle operation. Restart speed is based on the Speed-Stage 0. 【5】: Execute continuous cycle operation. Restart speed is based on the Speed-Stage 0. 【6】: After completion of a single cycle, the on-going operation speed is based on the speed of the last stage. Restart speed is based on the Speed-Stage 0

Range	【0.00~599.00】Hz
Frequency setting of speed-stage 0 is based on parameter 05-01	
06-01	Frequency setting of speed-stage 1
06-02	Frequency setting of speed-stage 2
06-03	Frequency setting of speed-stage 3
06-04	Frequency setting of speed-stage 4
06-05	Frequency setting of speed-stage 5
06-06	Frequency setting of speed-stage 6
06-07	Frequency setting of speed-stage 7
06-08	Frequency setting of speed-stage 8
06-09	Frequency setting of speed-stage 9
06-10	Frequency setting of speed-stage 10
06-11	Frequency setting of speed-stage 11
06-12	Frequency setting of speed-stage 12
06-13	Frequency setting of speed-stage 13
06-14	Frequency setting of speed-stage 14
06-15	Frequency setting of speed-stage 15

Range	【0.0~6000.0】Sec
06-16	Operation time setting of speed-stage 0
06-17	Operation time setting of speed-stage 1
06-18	Operation time setting of speed-stage 2
06-19	Operation time setting of speed-stage 3
06-20	Operation time setting of speed-stage 4
06-21	Operation time setting of speed-stage 5
06-22	Operation time setting of speed-stage 6
06-23	Operation time setting of speed-stage 7
06-24	Operation time setting of speed-stage 8

06-25	Operation time setting of speed-stage 9
06-26	Operation time setting of speed-stage 10
06-27	Operation time setting of speed-stage 11
06-28	Operation time setting of speed-stage 12
06-29	Operation time setting of speed-stage 13
06-30	Operation time setting of speed-stage 14
06-31	Operation time setting of speed-stage 15

Range	**【0】: Stop** **【1】: Forward** **【2】: Reverse**
06-32	Operation direction selection of speed-stage 0
06-33	Operation direction selection of speed-stage 1
06-34	Operation direction selection of speed-stage 2
06-35	Operation direction selection of speed-stage 3
06-36	Operation direction selection of speed-stage 4
06-37	Operation direction selection of speed-stage 5
06-38	Operation direction selection of speed-stage 6
06-39	Operation direction selection of speed-stage 7
06-40	Operation direction selection of speed-stage 8
06-41	Operation direction selection of speed-stage 9
06-42	Operation direction selection of speed-stage 10
06-43	Operation direction selection of speed-stage 11
06-44	Operation direction selection of speed-stage 12
06-45	Operation direction selection of speed-stage 13
06-46	Operation direction selection of speed-stage 14
06-47	Operation direction selection of speed-stage 15

- Enable Auto Run (sequencer) by setting any of the multi-function inputs S1-S5, parameter 03-00~03-05 to selection 18.
- Various Auto Run (sequencer) modes can be selects with parameter 06-00.
- Auto Run frequency commands1 to 15 are set by parameters (06-01 ~ 06-15)
- Sequence run times are set by parameters (06-16 ~ 06-31)
- FWD/REV Direction for each sequence can be set with parameters (06-32 ~ 06-47)
- Auto sequence 0, frequency is set from keypad using parameter 05-01; sequence run time and direction are set by parameters 06-16 and 06-32
- Auto run mode uses acceleration parameters 00-14/00-15 and deceleration time parameters 00-16/00-17.
- In auto run mode, multi-speed frequency reference of external signal 1~4 (03-00~03-05=2~5) are disabled.

Note: The automatic operation mode is disabled when any of the following functions are enabled:

- PID function
- Parameters 06-16 to 06-31 are set to 0.

Example 1: Automatic operation mode – Single cycle

In this example the inverter executes a single cycle and then stops.

Parameter Settings:

06-00 =	1 or 4 (Single cycle operation)
06-32~06-34=	1 (Forward for multi-step speed 0 - 2)
06-47=	2 (Reversal for multi-step speed 15)
06-35~06-46=	0 (Stop for multi-step speed 3 - 14)
05-01=	15 Hz (Multi-step speed 0:15 Hz)
06-01=	30 Hz (Multi-step speed 1:30 Hz)
06-02=	50 Hz (Multi-step speed 2:50 Hz)
06-15=	20 Hz (Multi-step speed 15:20 Hz)
06-16=	20 sec (Operation time stage 0:20 sec)
06-17=	25 sec (Operation time stage 0:25 sec)
06-18=	30 sec (Operation time stage 0:30 sec)
06-31=	40 sec (Operation time stage 15:40 sec)

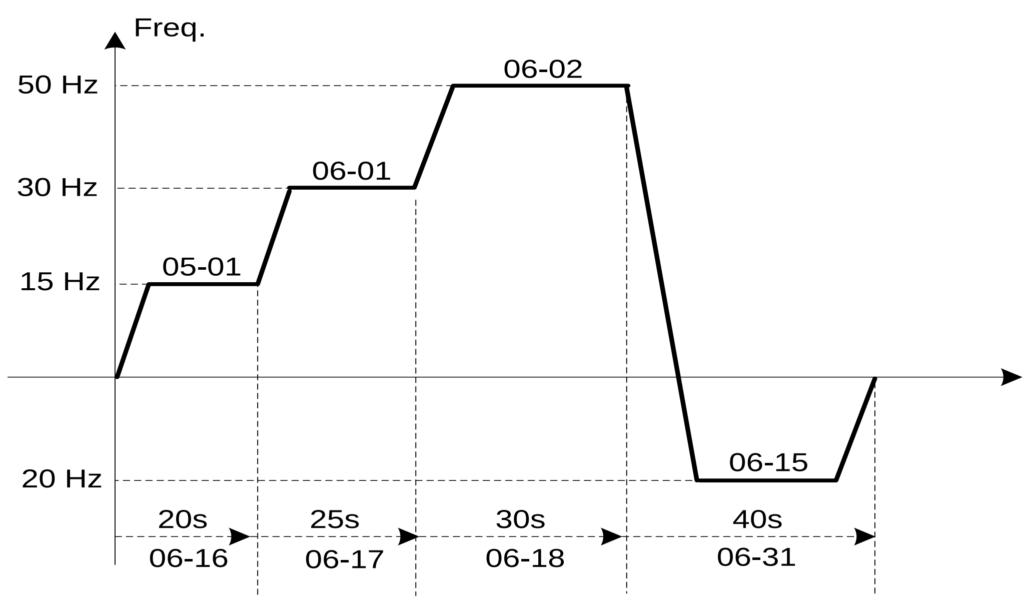


Figure 4.3.52 Single cycle operation (Stop)

Example 2: Automatic operation mode – Continuous cycle

In this example the inverter repeats the same cycle.

Parameter Settings:

06-00 = 2 or 5 (Continuous cycle operation)
06-01~06-47= Enter same setting as that of Example 1.

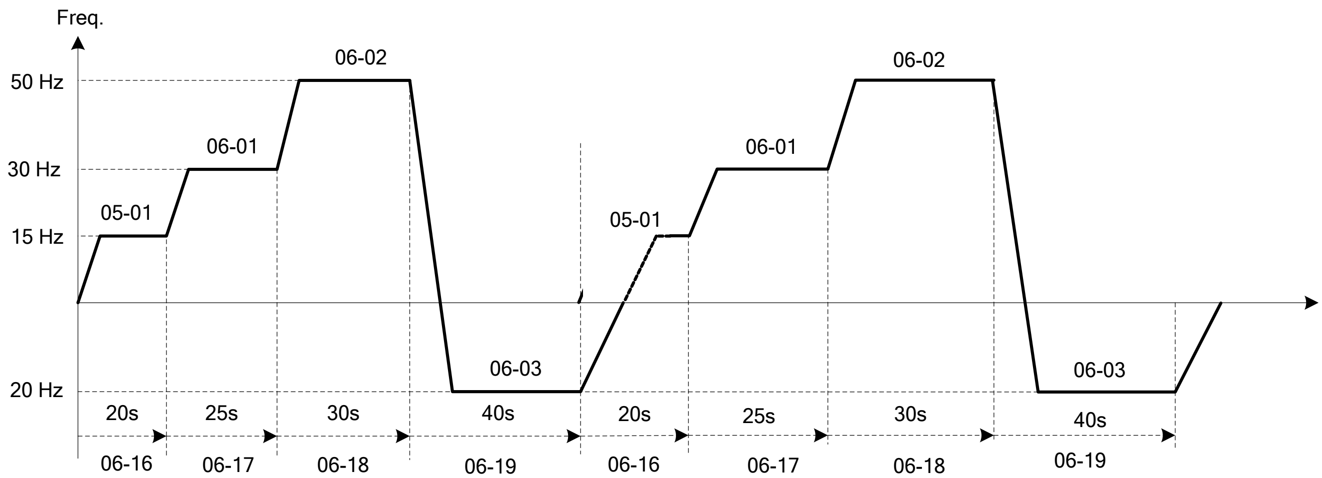


Figure 4.3.53 Periodic cycle run

Example 3: Automatic operation mode – Single cycle and continue running at last speed of the cycle

In this example the inverter executes a single cycle and continue running at last speed of the cycle.

Parameter Settings:

06-00= 3 or 6 (Single cycle operation)
06-32~06-35= 1 (Forward)
06-36~06-47= 0
Other parameter = Enter same setting as that of Example 1.

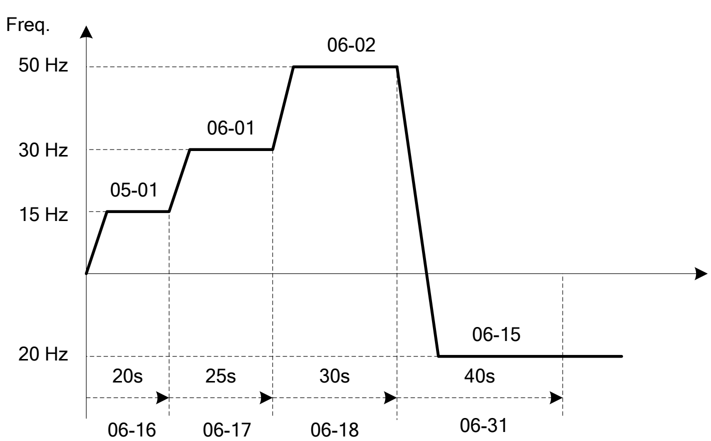
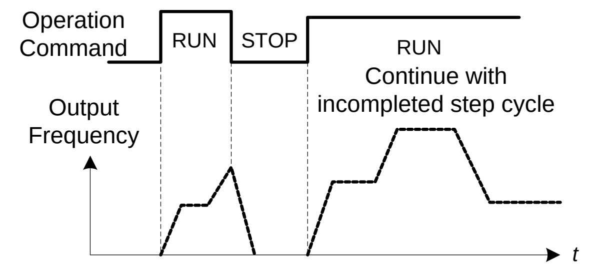
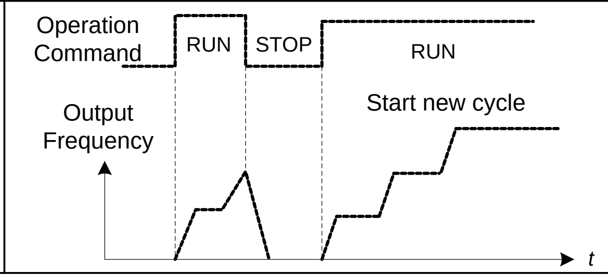


Figure 4.3.54 Auto Run Mode for Single Cycle

06-00= 1 to 3:
After a stop the inverter will start with the incomplete step when the run command is re-applied.

06-00= 4 to 6:
After a stop the inverter will start with the first step of the cycle when the run command is re-applied.

06-00	1 to 3	06-00	4 to 6
Output Frequency			

Notes:

- ACC/DEC time in Auto run mode will be according to the setting of 00-14/00-15.
- When Auto sequence is set to 0.The run frequency used is the keypad frequency set by parameter 05-01 and parameters 06-16 and 06-31 are used to set the sequence Run time and Run direction.

07 Start/Stop Parameters

07-00	Momentary power loss and restart
Range	【0】: Disabled 【1】: Enabled
07-01	**Fault reset time**
Range	【0~7200】 Sec
07-02	**Number of restart attempts**
Range	【0~10】
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

Inverter output will be turned off during a sudden drop in input voltage below the under voltage level.
07-00=0: Inverter trips on "UV" fault on power loss and will not restart.
07-00=1: Inverter resumes operation at half of the output frequency before power-loss after power has been restored. There is no limitation on the number of restarts.

The momentary power loss function is enabled as long as the inverter CPU still has power and the inverter will restart when power is restored based on the setting of parameters 00-02, 07-04 and status of External run command.

Caution: After a power loss and Run mode is set to External Run (00-02=1) and Direct start on power up is enabled (07-04=0) the inverter will automatically start when power is restored.

To ensure safety of operators and to avoid any damages to the machinery, all necessary safety measure must be taken and an inverter input disconnect switch must be used.

The automatic restart function can be used for the following faults. Please note that when the fault is not listed in the table the inverter will not attempt an automatic restart.

Fault Code	Description	Number of Restarts
UV:	Under voltage	Unlimited
OC:	Over current	(07-02)
OCA:	Over current during acceleration	(07-02)
OCC:	Over current during constant speed	(07-02)
OCd:	Over current during deceleration	(07-02)
OL1:	Motor overload	(07-02)
UT:	Under torque detection	(07-02)
IPL:	Input phase loss	(07-02)
GF:	Ground fault	(07-02)
OV:	Overvoltage	(07-02)
OL2:	Inverter overload	(07-02)
OT:	Over-torque detection	(07-02)

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

Notes:

(1) Fault restart function contains momentary power loss restart and auto reset restart.

(2) Refer to chapter 10 for the for troubleshooting and fault diagnostics.

(3) Refer to speed search function (07-19~07-24) for speed search modes selection when power is restored.

Fault reset time (07-01)

Time the inverter waits to reset fault.

Momentary power loss restart time is the same as Fault reset time.

07-01 <07-18: Automatic restart time interval is set by minimum baseblock time (07-18).

07-01> 07-18: Automatic restart time interval is set by fault reset time (07-01).

Note: Total automatic restart interval time is 07-18 plus 07-01 plus speed search delay time (07-22).

Refer to Figure 4.3.55 for automatic restart interval time.

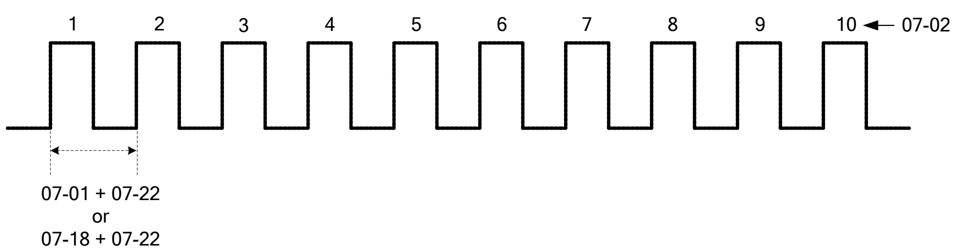


Figure 4.3.55 Automatic restart interval

Number of restart attempts (07-02)

When the total number of restart attempts has exceed the number of automatic restart attempts set in parameter 07-02, the inverter will turn off the output and the fault contact is activated. Manually resetting the inverter is required at this time.

When the automatic restart function is enabled the internal automatic restart attempt counter is reset based on the following actions:

1. No fault occurs in 10 minutes or longer after the automatic restart
2. Reset command to clear fault via input terminal or using the keypad (press reset/◄ key)
3. Power to the inverter is turned off and back on again

Note:

Multi-function digital output R1A-R1C, R2A-R2C can be programmed to activate during an automatic reset attempt, refer to parameter 03-11, 03-12, function 06.

Automatic restart operation:

Inverter trips and inverter output is turned off, keypad shows the active fault. Next inverter waits for the minimum baseblock time parameter 07-18 to expire before accepting an automatic restart command.

After the minimum baseblock time (07-18) and speed search delay time have expired, the active fault is reset and a speed search operation is performed. The time between each fault restart attempt is set by parameter 07-01.

When the total number of restart attempts has exceed the number of automatic restart attempts set in parameter 07-02, the inverter will turn off the output and the fault contact is activated. Manually resetting the inverter is required at this time.

Please refer to figure 4.3.56 for the automatic restart operation.

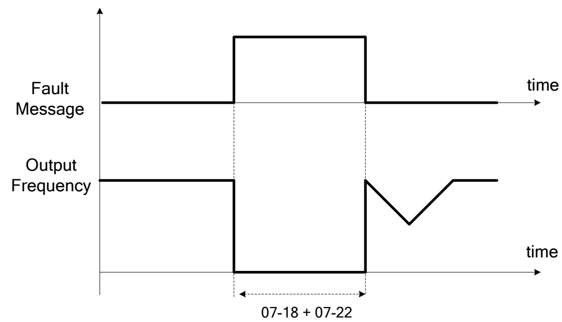


Figure 4.3.56 Auto-restart operation

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 Cycle input run command to reset and restart inverter.

Note: Damage to the Inverter may occur when the auto restart function is used frequently.

07-04	Momentary Power Loss and Restart
Range	【0】: Enable Direct Running on Power Up 【1】: Disable Direct Running on Power Up
07-05	**Delay-ON Timer**
Range	【1.0~300.0】 Sec

When direct run on power up is enabled (07-04=0) and the inverter is set to accept an external run command (00-02/00-03=1), the inverter will automatically start when power is applied and the run switch is ON.

It is recommend turning off the run switch when power to the inverter is turned off to avoid possibility of injury to operators and damage to machines when power is applied to the inverter.

Note: If this mode is required for the application all safety measures must be taken to ensure safe operation, including adding and posting warning labels.

When direct run is disabled (07-04 =1) and the inverter is set to accept an external run command (00-02/00-03=1), the inverter will not start when power is applied. In this condition the display will flash with STP1. To start the inverter turn the run switch to OFF and back ON again.

07-05	Delay-ON Timer (Seconds)
Range	**【1.0~300.0】 Sec**

When 07-04=0 the inverter will wait for the time specified in 07-05 to start after power is applied.

Note: If this mode is required for the application all safety measures must be taken to ensure safe operation, including warning labels.

07-06	DC Injection Braking Start Frequency
Range	【0.0~10.0】**Hz**

DC Injection braking functionality depends on the selected control mode (00-00), please refer to the description below for each control mode.

V/f or SLV Control mode (00-00 = 0, 2):

DC Injection Brake Start Frequency parameter (07-06) is the level the output frequency has to reach before DC braking injection function is de-activated at start and activated at stop.

DC Injection Brake Level (07-07) is set as percentage of the inverter rated current. Increasing this level will increase the amount of heat generated by the motor windings. Do not set this parameter higher than the level necessary to hold the motor shaft.

DC Injection Brake Time at Start (07-16) specifies the time DC injection braking time is active at start. DC injection braking at stop is disabled when parameter 07-08 is set to 0 sec.

DC Injection Brake Time at Stop (07-08) specifies the time DC injection braking is active during a stop operation. DC injection braking at stop is disabled when parameter 07-08 is set to 0 sec.

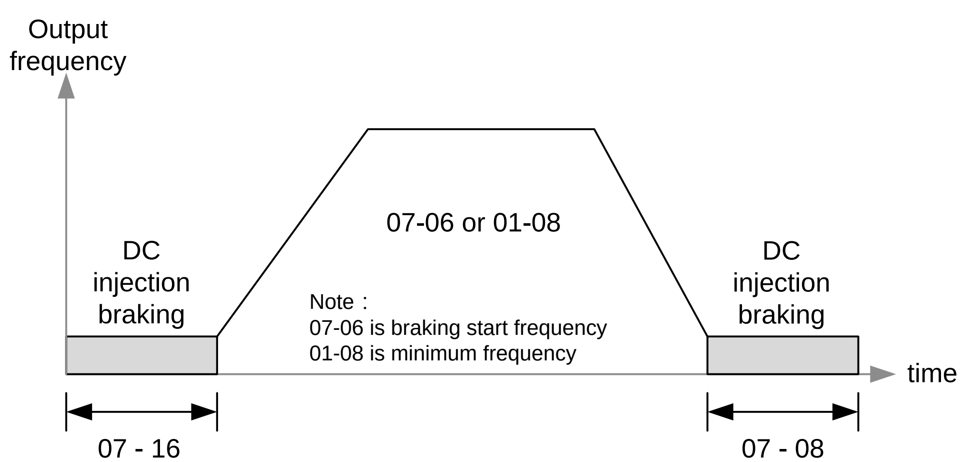


Figure 4.3.57a VF and SLV DC injection braking

Note: When 07-06 < 01-08, DC injection braking starting frequency becomes frequency set in parameter 01-08.

PMSLV Control Mode (00-00=5):

In this control mode short-circuit braking is used.

Short Circuit Braking Start Frequency parameter (07-06) is the level the output frequency has to reach before Short Circuit Braking function is de-activated at start. The same level is used to activate Short Circuit Braking when the output frequency falls below this level.

DC Injection Brake Level (07-07) is set as percentage of the inverter rated current. Increasing this level will increase the amount of heat generated by the motor windings. Do not set this parameter higher than the level necessary to hold the motor shaft.

Start Short-circuit Braking Time (07-34) specifies the time short-circuit braking is active at start. Short Circuit Braking at stop is disabled when parameter 07-34 is set to 0 sec.

Stop Short-circuit Braking Time (07-35) specifies the time short-circuit braking is active during a stop operation. Start Short-circuit Braking Time at stop is disabled when parameter 07-35 is set to 0 sec.

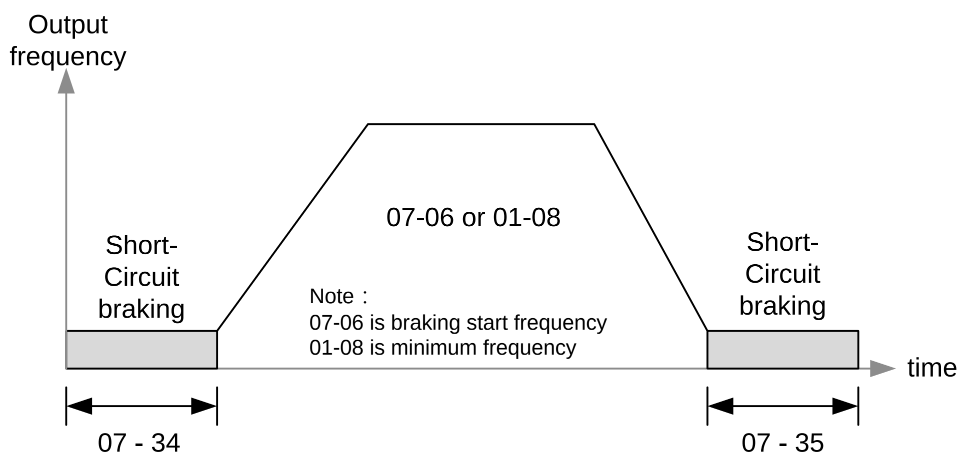


Figure 4.3.57b PMSLV short-circuit braking

Note: When 07-06 < 01-08, DC injection braking starting frequency becomes frequency set in parameter 01-08.

07-07	**DC Injection Braking Level**
Range	【0~100】**%**
07-08	**DC Injection Braking time**
Range	【0.00~100.00】**Sec**
07-16	**DC injection braking time at start**
Range	【0.00~100.00】**Sec**

DC Injection Braking Operation (V/f + SLV Mode)

When DC Injection braking is active DC voltage is applied to the motor, increasing the braking current and resulting in an increase in the strength of the magnetic field trying to hold the motor shaft.

To enable DC injection braking during a start operation set the DC injection braking current (07-07) to a value greater than 0. DC injection braking at start can be used to prevent "wind milling effect" in fan applications.

To enable DC injection braking during a stop operation set the DC injection braking current (07-07) and the DC injection braking time at stop (07-08) to a value greater than 0.

Notes:
- Increasing the DC braking time (07-08, 07-16) can reduce the motor stop time.
- Increasing the DC braking current (07-07) can reduce the motor stop time.

DC braking operation can be controlled via any one of the multi-function input terminals (03-00 to 05) set to function 33. Refer to figure 4.3.57a and 4.3.57b for DC braking operation.

07-34	**Start short-circuit braking time**
Range	【0.00~100.00】Sec
07-35	**Stop Short-circuit braking time**
Range	【0.00~100.00】Sec
07-36	**Short-circuit braking current limited**
Range	【0.0~200.0】%

Short-circuit braking is available only in PMSLV control mode (00-00 = 5) and functions switching the IGBTs to producing braking torque. Use parameters 07-06, 07-34 and 07-36 to adjust braking settings. The value of 07-36 is set as a percentage of the inverter rated current.

When 07-35 is set to 0 short-circuit braking during stop is disabled.

Short-circuit Braking can be controlled via any one of the multi-function input terminals (03-00 to 05) set to function 65.

07-09	**Stop Mode Selection**
Range	**【0】:** Deceleration to stop **【1】:** Coast to stop **【2】:** DC braking to stop **【3】:** Coast to stop with timer

When a stop command is issued the inverter stops according to the stop method selected. There are four types of stop modes:

07-09 =0: Deceleration to stop

When a stop command is issued, the motor will decelerate to the minimum output frequency (01-08) Fmin and then stop. Deceleration rate depends on the deceleration time (factory default: 00-15).

When the output frequency reaches the DC braking stop frequency (07-06) or the minimum output frequency (01-08), DC injection braking is activated and the motor stops.

$$\text{Deceleration time} = \frac{\text{Output frequency when stop command is issued}}{\text{Maximum output frequency } F_{max} \text{ (01-02)}} \times \text{deceleration time setting}$$

Note: S curve setting will add to the overall stop time, refer to figure 4.3.58

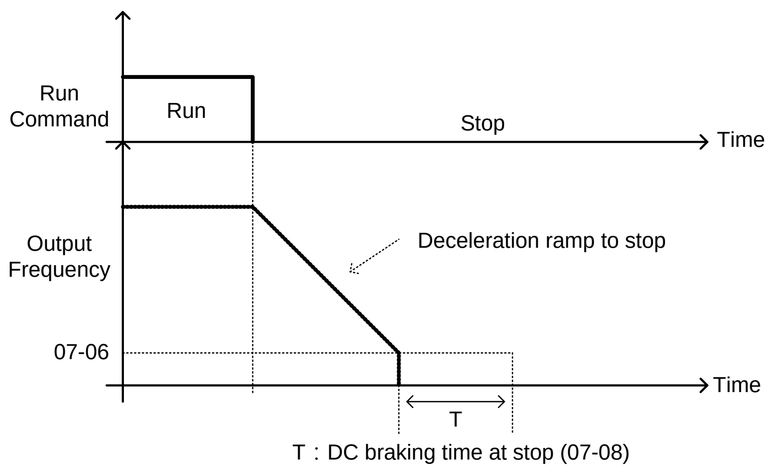


Figure 4.3.58 Deceleration to stop

07-09 =1: Coast to stop

When a stop command is issued, the motor will coast to a stop. Stop time depends on motor load and friction of the system.

Notes:

- The inverter waits for the time set in the minimum baseblock time (07-18) before accepting the next run command.
- In SLV mode (00-00=2) the speed search function is automatically enabled upon the next run command.

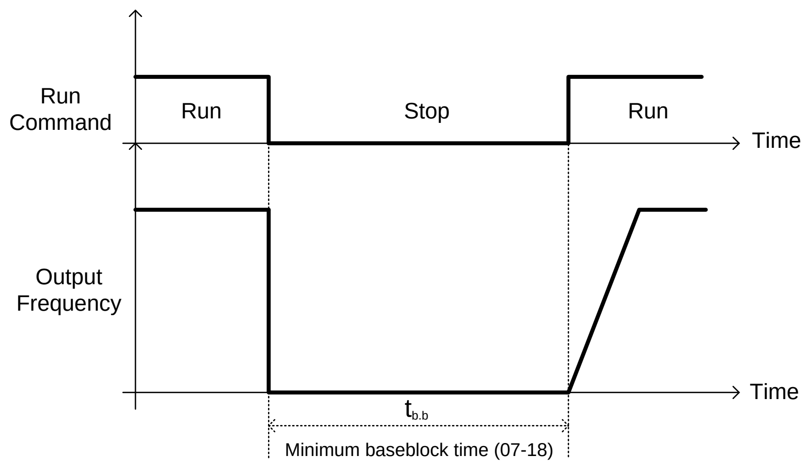


Figure 4.3.59 Coast to Stop

07-09 =2: DC braking to stop

When a stop command is issued, the inverter will turn off the output (Baseblock) and after the minimum Baseblock time (07-18) has expired activate DC braking (07-07).

The DC braking time (tDCDB) of Figure 4.3.60 is determined by the value of 07-08 (DC Braking start time) and the output frequency at the time the stop command was issued.

$$\text{DC Inj. Braking time} = \frac{(07\text{-}08) \times 10 \times \text{Output frequency}}{\text{Maximum output frequency } F_{max}\ (01\text{-}02)} \times \text{deceleration time setting}$$

Note: Increase the minimum Baseblock time (07-18) in case an Overcurrent trip occurs during the DC braking.

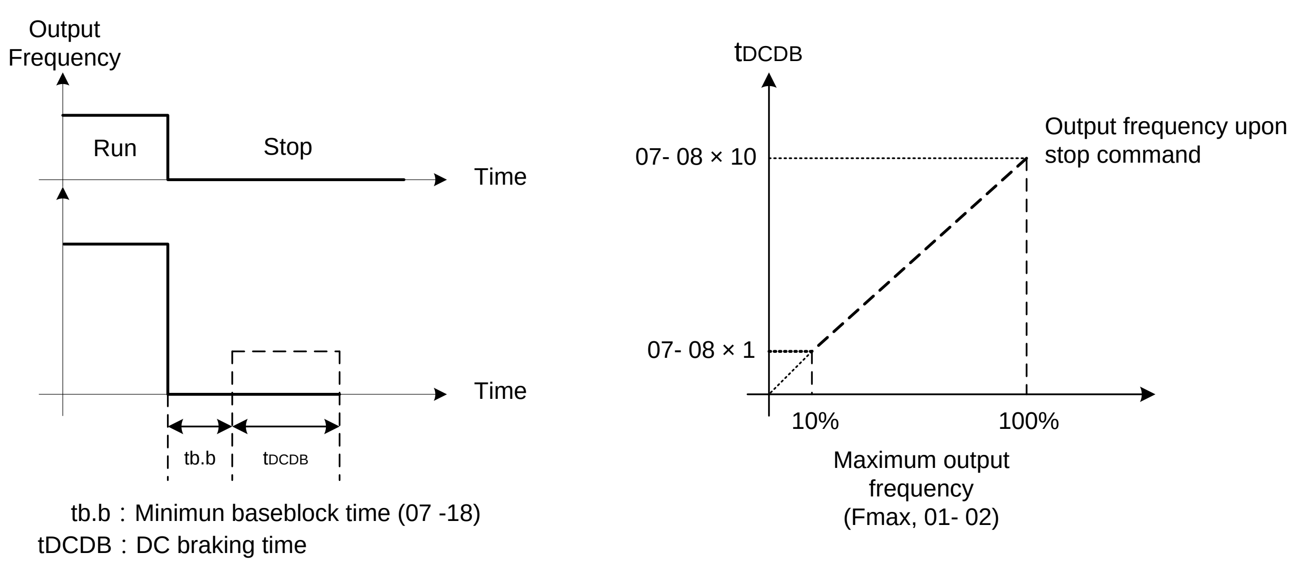


Figure 4.3.60 DC braking to stop

07-09 =3: Coast to stop with timer

When a stop command is issued the motor will coast to a stop after the minimum Baseblock time (07-18) has expired and the inverter ignores the run command until the timer has expired.

The total time of the timer is determined by the deceleration time (00-15, 17, 22 or 24) and the output frequency upon stop, refer to figure 4.3.61 for details.

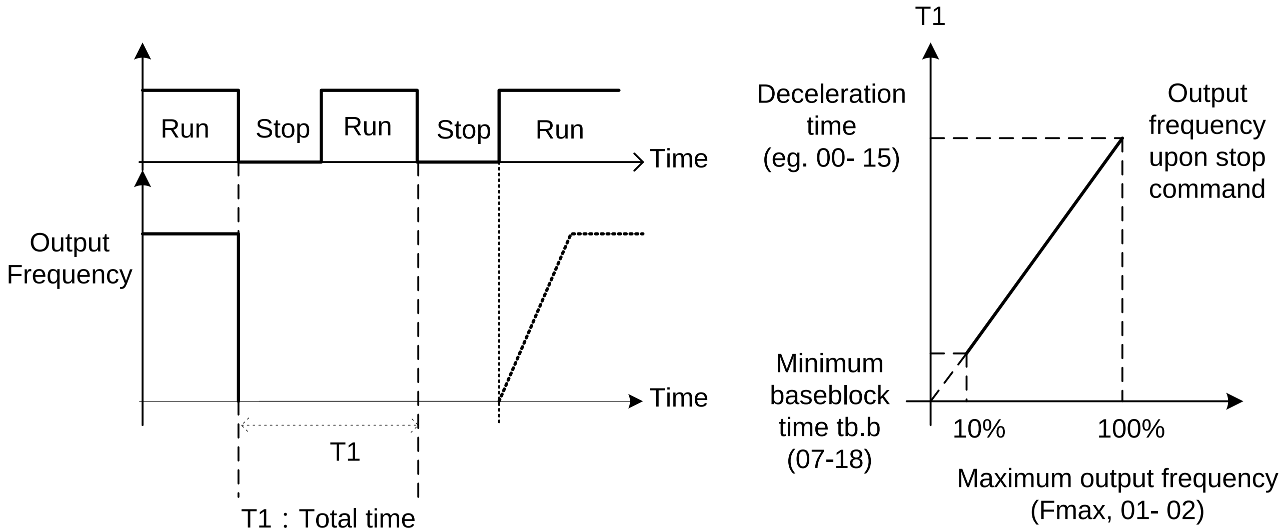


Figure 4.3.61 Coast to stop with timer

07-10	Speed Search Mode Selection
Range	【0】: Disabled 【1】: Execute speed search once 【2】: Speed Search Start

07-10 = 0: Speed search is disabled and the inverter output frequency starts from min. frequency (01-08).
07-10 = 1: Speed search is enabled and activated only once after power-up and first run command.
07-10 = 2: Speed search is enabled and activated after every run command

Note: Speed search function is unavailable for inverter size 1 and 2 and control mode set to PMSLV (00-00=5).

07-13	Low voltage detection level
Range	【200V Class:150~300V】 【400V Class:250~600V】
07-25	**Low voltage detection time**
Range	【0.00~1.00】**Sec**

Parameter 07-13 low voltage detection level can be adjusted from 150 to 300 Vdc (200V class) or 250 to 600 Vdc (400V class).

When the AC input voltage is lower than the value set in 07-13 divided by 1.414 (AC voltage detection level) for the time specified in 07-25 a low-voltage error "UV" will be displayed. If 07-25 = 0.00 sec., the UV error will be displayed immediately.

Important Notes:

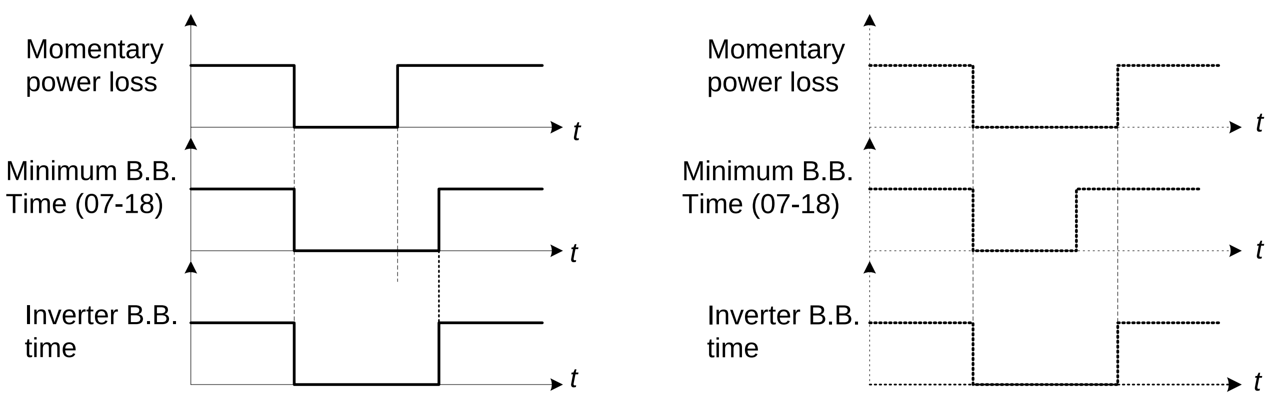
1. The inverter input voltage can limit the output voltage. The connected motor may stall if the input voltage drops excessively or if the load is too big.
2. If the input voltage drops below the value set in 07-13 then the inverter output is turned off momentarily. The inverter will ***not*** automatically start when power is restored.

07-18	Minimum base block time
Range	【0.1~5.0】**Sec**

During a momentary power failure, the inverter continues to operate after power has been restored when parameter 07-00 is set to 1.

When a momentary power failure is detected; the inverter will automatically shut off the output and stay in base block mode (B.B.) for the time set in (07-18).

The inverter will automatically perform a speed search when power is restored and power outage time exceeded the minimum base block time (07-18); refer to the following figure 4.3.63 for additional information.



(a) Minimum baseblock time (07-18) greater than momentary power loss time

(b) Minimum baseblock time (07-18) is shorter than momentary power loss time

Figure 4.3.63 Minimum base block time and momentary power loss time

Notes:

- Minimum base block time (07-18) is also used by the DC injection braking function
- Set the minimum base block time as required (07-18).
- Increase minimum Baseblock time if over-current "OC" condition occurs.
- After speed search has ended the inverter returns to normal operation.

07-19	**Speed Direction Search Operation Current**
Range	【0~100】%
07-20	**Speed Search Operating Current**
Range	【0~100】%
07-21	**Integral time of speed searching**
Range	【0.1~10.0】Sec
07-22	**Delay time of speed searching**
Range	【0.0~20.0】Sec
07-23	**Voltage recovery time**
Range	【0.1~5.0】Sec
07-24	**Direction-Detection Speed Search Selection**
Range	【0】: Disable 【1】: Enable
07-33	**Start Frequency of Speed Search Selection**
Range	【0】: Maximum Output Frequency of Motor 【1】: Frequency Command

Speed search function is used to find the speed of a coasting motor and continue operation from that point. The speed search function is active after a momentary power loss.

Speed Search from Multi-function digital inputs

Set the multi-function digital input to external speed search command 1 or 2. External speed search command 1 (value = 19) and 2 (value = 34) cannot be set at the same time, otherwise "SE02" (digital input terminal error) warning occurs.

Speed search function must be enabled before applying the run command to ensure proper operation. See relay logic in figure 4.3.64.

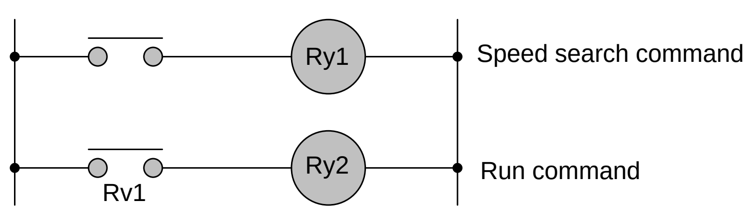


Figure 4.3.64 Speed search and operation commands

Notes: Speed Search Operation
- The speed search cannot be used when the motor rated power is greater than the inverter rated power.
- The speed search cannot be used when the motor rated power is two inverter sizes smaller than the inverter currently used.
- The speed search cannot be used in combination with a high-speed motor.
- In V/F mode, it is necessary to perform a static auto-tune.
- In SLV mode, it is necessary to perform a rotational auto-tune. Perform a static auto-tune when using long motor leads.

07-19: Speed Direction Search Operating Current

- Used in bidirectional speed search only (07-24 = 1).
- Set bidirectional current level.
- Increase value if speed search is not successful at low speeds (above 5Hz)
  Note: If value is too high may cause DC braking effect.

07-20: Speed Search Operating Current

- Can be used for bidirectional (07-24 = 1) or unidirectional (07-24 = 0) speed search.
- Sets speed search current Level.
- The set value must be lower than the excitation current (02-09) and must equal to the no-load current. If the no-load current is unknown it is recommended to set value at 20%.
- Excessive speed search current will cause inverter output to saturate.
- It is recommended to use speed search in case of a momentary power loss. Increase the minimum base block time (07-18) in case of an over-current condition.

07-21: Integral time of speed searching

- Can be used for bidirectional (07-24 = 1) or unidirectional (07-24 = 0) speed search.
- Set the integral time during speed search.
- If an OV fault occurs, increase the set value to increase the speed search time. Decrease the value if a quick start is required

07-22: Delay time of speed searching

- Use delay time when using a contactor on the inverter output side.
- The inverter speed search starts after the delay time expires.
- Speed search delay time is disabled when set to 0.0 sec. (07-22 = 0.0)

07-23: Voltage recovery time

(1) Sets the voltage recovery time.

(2) Sets the time for the inverter to restore the output voltage from 0V to the specified V/f level after speed search function is completed.

07-24: Direction-Detection Speed Search Selection

0: Disable Direction-Detection Speed Search

Speed search is executed using speed search operating current defined in parameter 07-20. In case speed search is not successful (e.g. motor speed is too low) a speed search time-out warning is displayed. Set 07-19 to value greater than 0 to enable DC braking at speed search if a time-out occurs frequently.

1: Enable Direction-Detection Speed Search

At start the current controller will send a step current to the motor (07-19) to determine the motor direction. Once direction is determined the current controller will perform a speed search using speed search operating current defined in parameter 07-20. Speed search is executed after a momentary power loss (external speed search command 2, 03-00 to 03-05 = 34) or from max. frequency (external speed search command 1, 03-00 to 03-05 = 19). Speed search direction will follow the speed command.

07-33: Start Frequency of Speed Search Selection

0: The speed search starts from the maximum output frequency of motor.

1: The speed search starts from frequency command.

(a) Speed search at starting

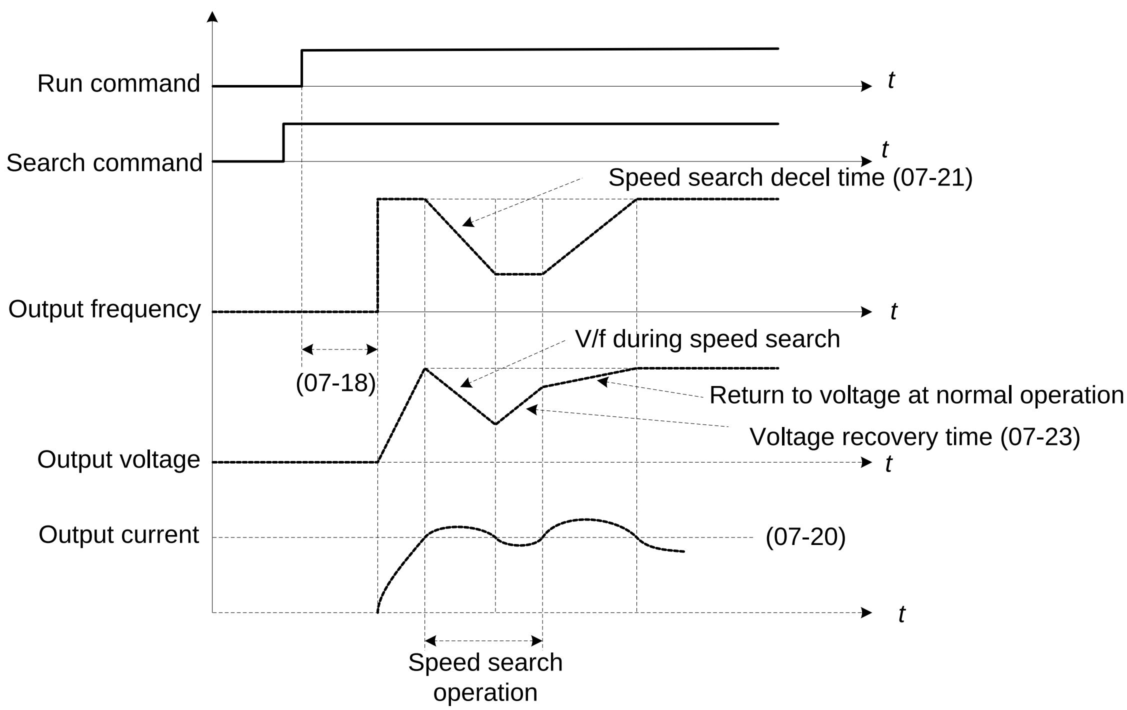


Figure 4.3.65 Speed search at starting

(b) Speed search in recovery period of momentary power failure

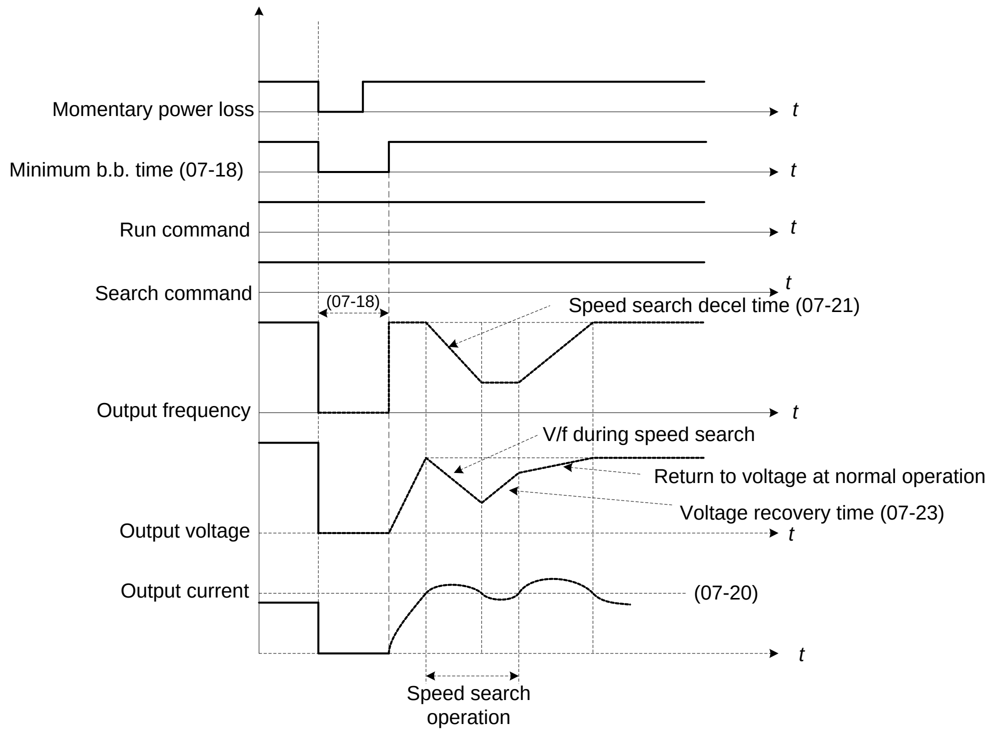


Figure 4.3.66 Speed search in recovery period of momentary power failure

Notes:

If the minimum base block time (07-18) is longer than the momentary power failure time, the speed search starts operation after the minimum base block time (07-18).

If the minimum base block time (07-18) is too short, the speed search operation begins immediately after power has been restored.

07-37	**Pre-excitation time**
Range	【0.00~10.00】**Sec**
07-38	**Pre-excitation level**
Range	【50~200】**%**

If a high starting torque is required for the application, especially for a large horsepower motors, the pre-excitation operation can be used to pre-flux (magnetize) the motor.

07-37 Pre-excitation time
When an operation command (forward or reverse) is activated, the inverter will automatically start pre-excitation based on the time set in parameter 07-37.

Notes:

1. The time for the flux to reach 100% is a function of the motor's electrical time constant, see figure 4.3.62.
2. Electrical time constant can be calculated by using the motor parameter settings (group 02).

$$\text{Electrical time constant T2} = \frac{\text{Motor leakage inductance (02-17) + motor mutual inductance (02-18)}}{\text{Motor leakage resistance}}$$

Set the pre-excitation time (07-37) based on the electrical time constant T2

07-38 Pre-excitation initial level

Use the pre-excitation initial level (07-38) to provide a higher excitation current during the pre-excitation time (07-37); this will increase the speed and stability for motors.

In order to quickly magnetize the motor, reduce the pre-excitation time (07-37) and set the pre-excitation level (07-38) to a high level.

If 07-38 is set to a value greater than 100%, providing a high excitation current during the pre-excitation time (07-37), the motor's magnetization time is shorted. When the setting reaches 200%, magnetization is reduced by roughly half.

A high pre-excitation level (07-15) might result in excessive motor sound during pre-excitation.

When the flux reaches 100%, pre-excitation current reverts back to 100% and pre-excitation is completed, refer to figure 4.3.62 for more information.

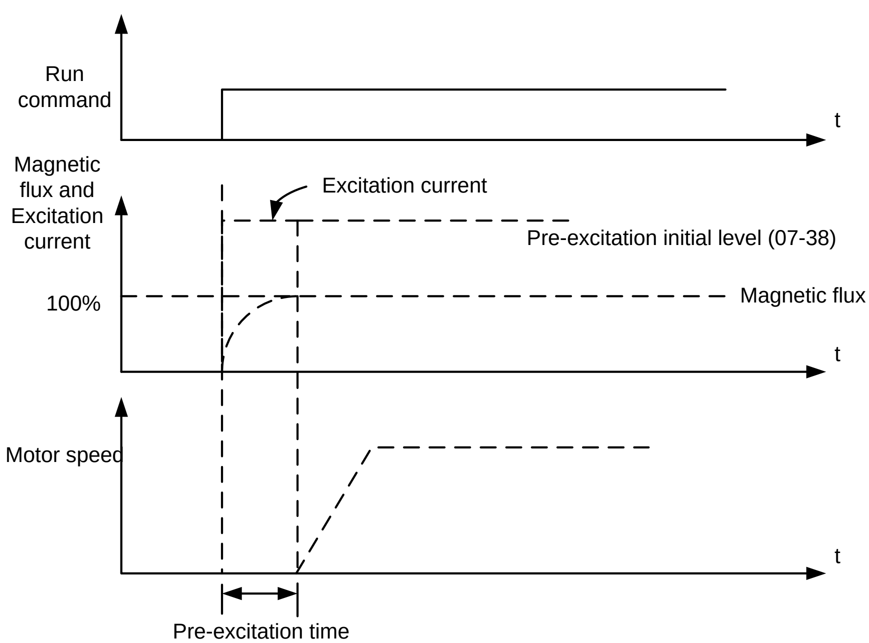


Figure 4.3.62 Pre-excitation operation

08 Protection Parameters

08-00	Stall prevention function
Range	【xxx0b】: Stall prevention function is enabled during acceleration. 【xxx1b】: Stall prevention function is disabled during acceleration. 【xx0xb】: Stall prevention function is enabled during deceleration. 【xx1xb】: Stall prevention function is disabled during deceleration. 【x0xxb】: Stall prevention function is enabled during operation. 【x1xxb】: Stall prevention function is disabled during run. 【0xxxb】: Stall prevention function during run is based on the first acceleration time. 【1xxxb】: Stall prevention function during run is based on the second acceleration time.
08-01	**Stall prevention level during acceleration**
Range	【20~200】%
08-02	**Stall prevention level during deceleration**
Range	200V :【330V~410V】 400V :【660V~820V】
08-03	**Stall prevention level during run**
Range	【30~200】%
08-21	**Limit of stall prevention during acceleration**
Range	【1~100】%
08-22	**Stall prevention detection time during run**
Range	【2~100】ms
08- 40	**Motor 2 Acceleration Stall Prevention Level**
Range	【20~200】%
08-41	**Motor 2 Acceleration Stall Prevention Limit**
Range	【1~100】%

Stall prevention during acceleration (08-00=xxx0b)

Prevents the inverter from faulting (Overcurrent, Motor overload, Inverter overload) when accelerating with heavy loads.

When the inverter output current reaches the level set in parameter 08-01 minus 15% the acceleration rate starts to decrease. When the inverter output current reaches the level set in parameter 08-01 the motor stops accelerating. Refer to figure 4.3.67 for more information.

Notes:
- Reduce stall prevention level during acceleration (08-01) in case the motor stalls (when the motor power is smaller than the inverter rating.
- The inverter rated output current should be set to 100%.

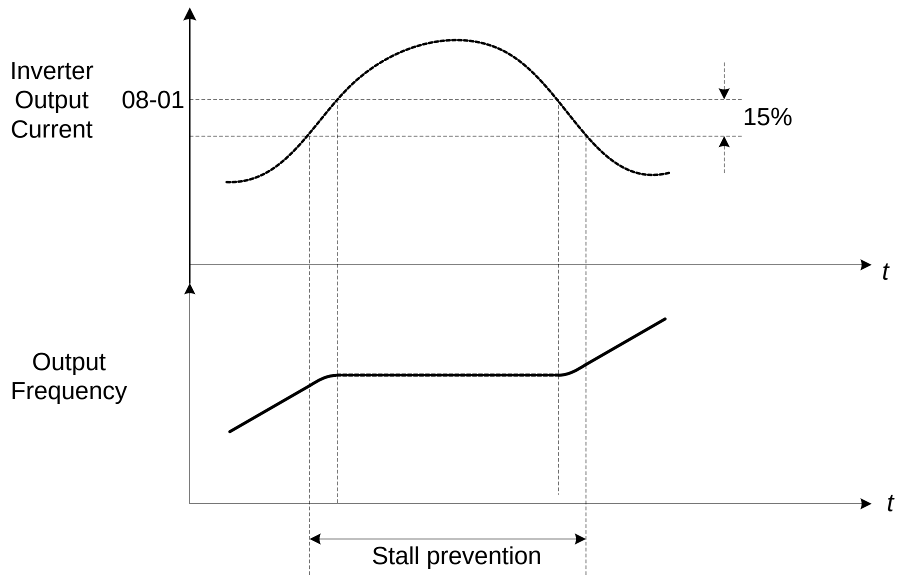


Figure 4.3.67 Stall prevention during acceleration

If the motor is used in the constant power (CH) region, the stall prevention level (08-01) is automatically reduced to prevent the stall.

Stall prevention level during acceleration (Constant horsepower)

$$\text{Stall Prev. Lev. Acceleration (CH)} = \frac{\text{Stall prevention level in acceleration (08-01) x Fbase (01-12)}}{\text{Output frequency}}$$

Parameter 08-21 is the stall prevention limit value in Constant Horsepower region. Refer to Figure 4.3.68.

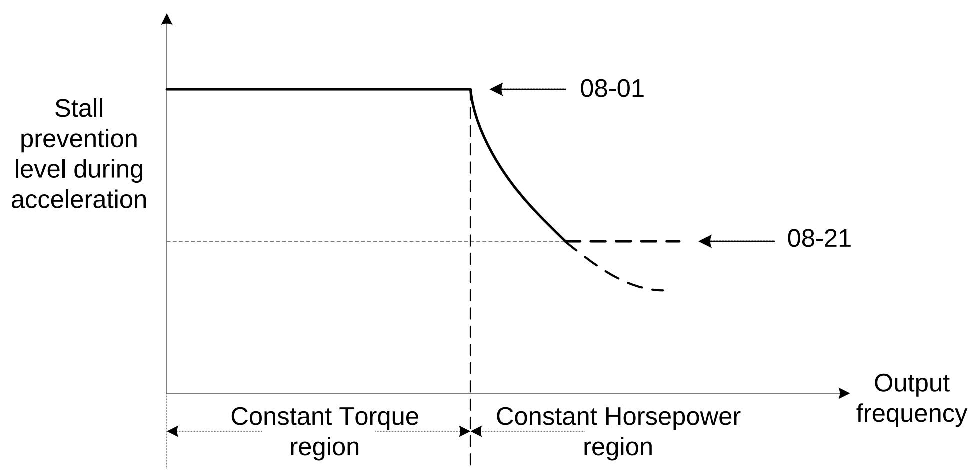


Figure 4.3.68 Stall prevention level and limit in acceleration

Motor2 Acceleration Stall Prevention Level (08-40) and Motor2 Acceleration Stall Prevention Limit (08-41) are

Used when 03-00~03-07=40 (Switching between Motor 1/Motor 2)

Stall prevention selection during deceleration (08-00=xx0xb)

Stall prevention during deceleration automatically increases the deceleration time based on the DC-bus voltage to prevent over-voltage during deceleration. Refer to Figure 4.3.69 for stall prevention during deceleration

When the DC-bus voltage exceeds the stall prevention level, deceleration will stop and the inverter will wait for the DC-bus voltage to fall below the stall prevention level before continuing deceleration. Stall prevention level can be set by 08-02, see Table 4.4.13.

Stall prevention level can be set by 08-02, see table 4.3.34.

Table 4.3.34 Stall prevention level

Inverter model	08-02 default value
200V class	385VDC
400V class	770VDC

Stall prevention during deceleration function (08-00 to xx1xb) has to be set to disabled when using a braking resistor or braking module.

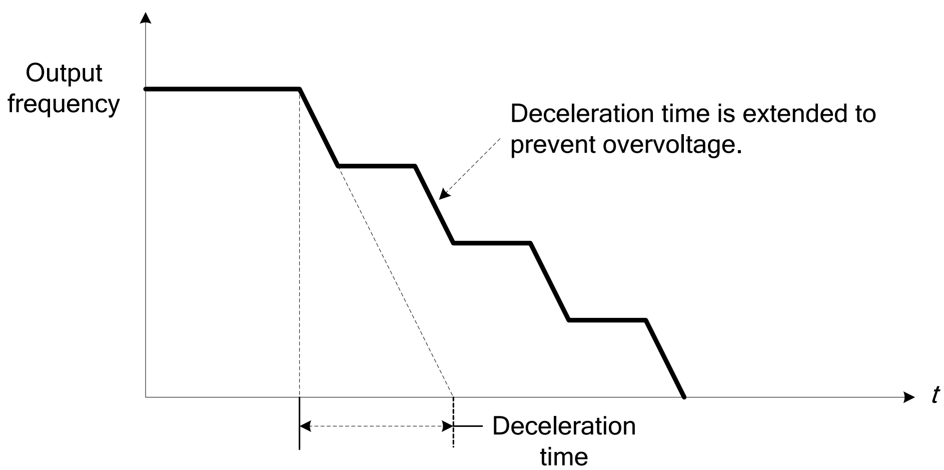


Figure 4.3.69 Stall prevention selection in deceleration

Stall prevention selection during run (08-00=x0xxb)

Stall prevention during run can only be used in V/F and SLV control mode.

This function prevents the motor from stalling by automatically reducing the output frequency during run.

If the inverter output current rises above the level set in parameter 08-03 for the time specified in parameter 08-22, the inverter output frequency is automatically decreased following deceleration time 1 (00-15) or deceleration time 2 (00-17).

When the inverter output current falls below the level set in parameter (08-03) minus 2%, normal operation continues and the output frequency increases to the frequency reference using the acceleration time 1 or acceleration time 2. Refer to the following Figure 4.3.70.

Note: The stall prevention level during run can be set by using multi-function analog input AI2 (04-05=7).

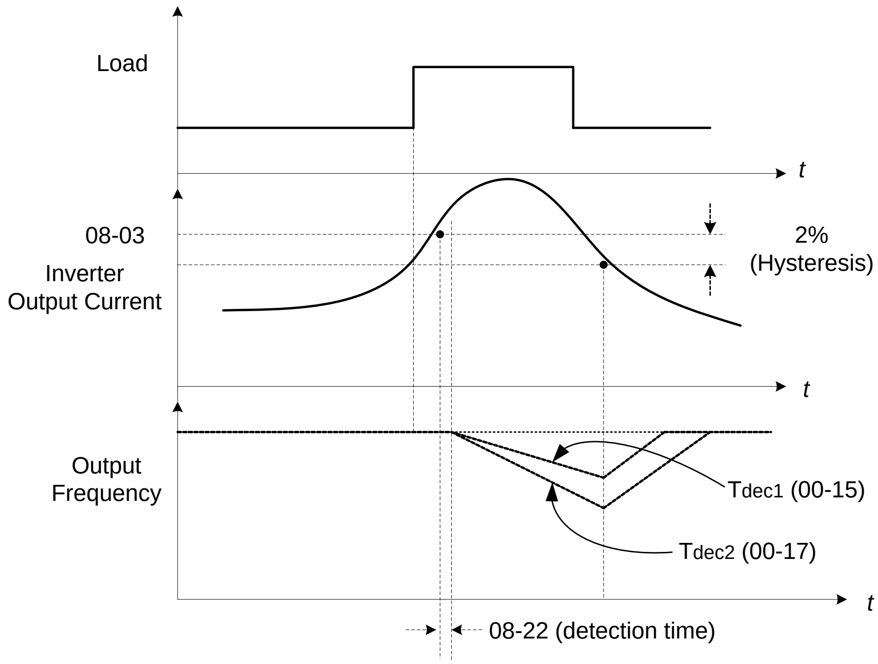


Figure 4.3.70 Stall prevention selection in operation

08-05	Selection for motor overload protection (OL1)
Range	**【xxx0b】:** Motor overload is disabled **【xxx1b】:** Motor overload is enabled **【xx0xb】:** Cold start of motor overload **【xx1xb】:** Hot start of motor overload **【x0xxb】:** Standard motor **【x1xxb】:** Special motor **【0xxxb】:** Reserved **【1xxxb】:** Reserved

The motor overload protection function estimates the motor overload level based on the output current, output frequency, motor characteristics and time. The motor overload trip time depends on the motor rated current when the output frequency is greater than 60Hz.

On inverter power-up the motor overload protection internal thermal accumulation register is automatically reset.

To use the built-in motor overload protection function parameter 02-01 (motor rated current) has to match the motor rated current on the motor nameplate.

Turn off the motor overload protection when using two or more motors connected to the inverter (set 08-05 = xxx0b), and provide external overload protection for each motor (e.g. thermal overload switch).

With cold start enabled (08-05 = xx0xb), motor overload protection occurs in 5 and a half minutes when operating the motor at 150% of the motor rated current at an output frequency greater than 60Hz.

With hot start enabled (08-05 = xx1xb), motor overload protection occurs in 3 and a half minutes when operating the motor at 150% of the motor rated current at an output frequency greater than 60Hz.

Refer to the following figure 4.3.71 for an example of motor overload protection curve.

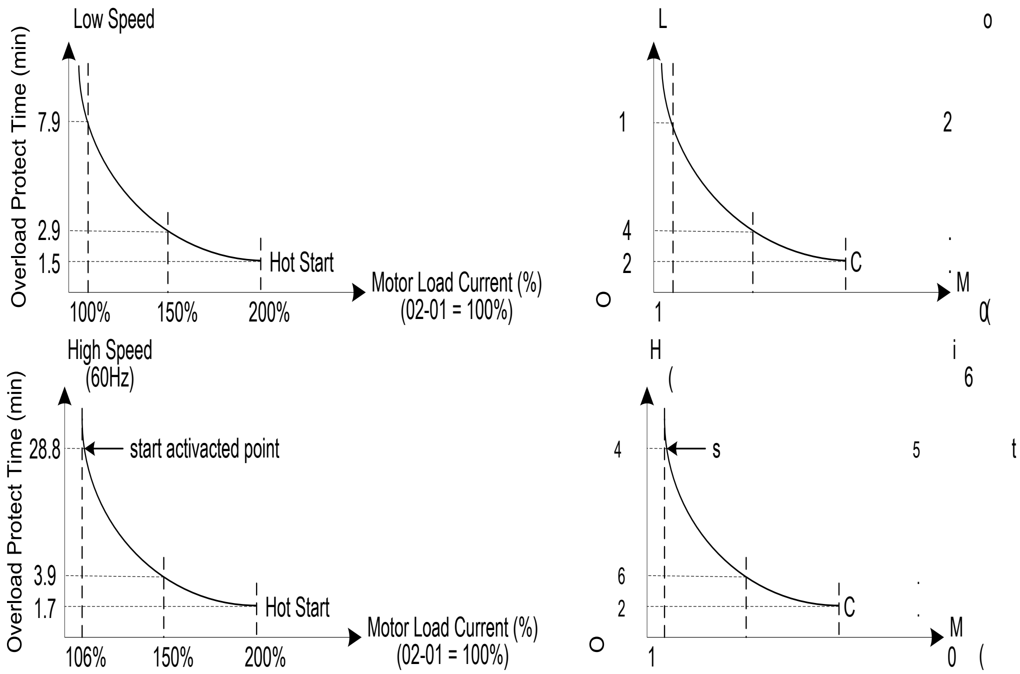


Figure 4.3.71 Motor overload protection curve (example: standard motor)

When using force cooled motors (Special inverter motor), thermal characteristics are independent of the motor speed, set 08-05 = x1xxb.

When 08-05 = x1xxb, overload protection function is based on motor rated current for output frequencies between 6 and 60Hz. If the output frequency is less than 1Hz, the overload protection function uses 83% of the motor rated current to determine an overload condition.

When 08-05 = x0xxb, overload protection function is based on 70% of the motor rated current for an output frequency of 20Hz. If the output frequency is lower than 1Hz, the overload protection function uses 40% of the motor rated current to determine an overload condition.

Motor overload rating at different output frequencies is shown at Figure 4.3.72.

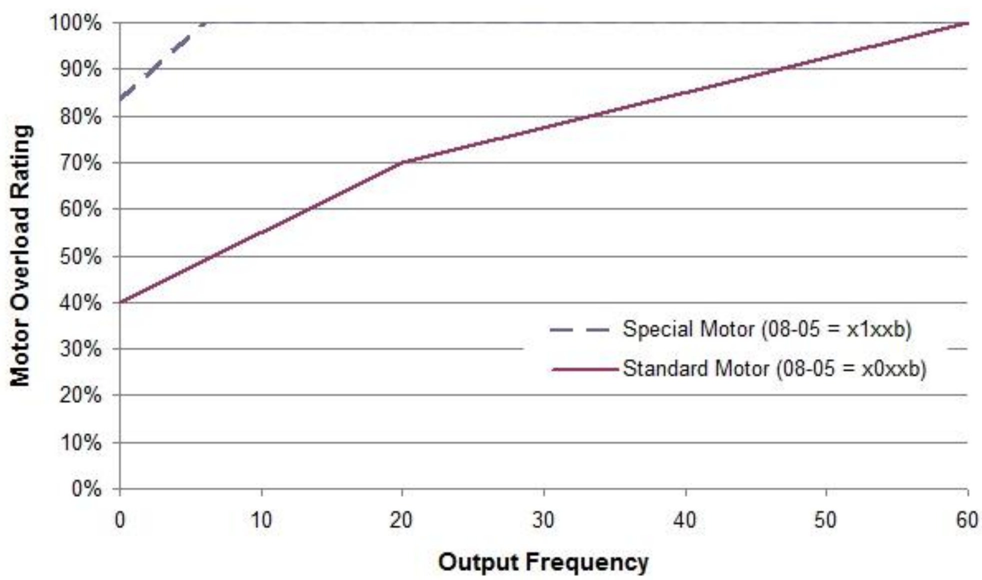


Figure 4.3.72 Motor overload rating at different output frequencies

08-06	**Start-up mode of overload protection operation (OL1)**
Range	**【0】:** Stop output after overload protection **【1】:** Continuous operation after overload protection.

08-06=0: When the inverter detects a motor overload the inverter output is turned off and the OL1 fault message will flash on the keypad. Press RESET button on the keypad or activate the reset function through the multi-function inputs to reset the OL1 fault.

08-06=1: When the inverter detects a motor overload the inverter will continue running and the OL1 alarm message will flash on the keypad until the motor current falls within the normal operating range.

08-07	**Over heat protection (Cooling fan control)**
Range	**【0】:** Start in operation **【1】:** Permanent Start **【2】:** Start in high temperature **【3】:** Disable
08 -38	**Delay Time of Fan Off**
Range	【0 ~ 600】

Over heat protection (Cooling fan control) (08-07)

08-07=0: The fan turns on when the inverter is in run mode. When the inverter has stopped the fan stays running for the time specified in 08-38 before the fan is turned off.

08-07=1: Fan turns on when power is applied to the inverter.

08-07=2: Fan turns on when the heat-sink temperature rises above the maximum heat-sink temperature. When the heat-sink temperature falls below the maximum heat-sink temperature for the time specified in 08-38, the fan turns off.

Note: The cooling fan stays running when 08-07=0 and the heatsink temperature is still above the maximum heat-sink temperature

08-08	Automatic voltage regulation (AVR)
Range	**【0】:** AVR is enabled **【1】:** AVR is disabled

Automatic voltage regulation stabilizes the motor voltage independent of fluctuation to the input voltage.

08-08=0: Automatic voltage regulation is active. It will limit the maximum output voltage. When input three-phase voltage fluctuates and the voltage is smaller than the value of 01-14, the output voltage will fluctuate with the fluctuation of input voltage.

08-08=1: Automatic voltage regulation is not active, motor voltage follows the input voltage fluctuation. When input three-phase voltage fluctuates, the output voltage won't fluctuate with the fluctuation of input voltage.

08-09	Selection of input phase loss protection
Range	【0】: Disable 【1】: Enable

08-09=0: Input phase loss detection is disabled.

08-09=1: Input phase loss detection is enabled. Keypad shows "IPL input Phase Loss" (IPL), when an input phase loss is detected the inverter output is turned off and the fault contact is activated.

Note: The input phase loss detection is disabled when the output current is less than 30% of the inverter rated current.

08-10	Selection of output phase loss protection
Range	【0】: Disable 【1】: Enable

08-10=0: Output phase loss detection is disabled.

08-10=1: Output phase loss detection is enabled. When an output phase loss is detected the inverter output is turned off , inverter fault contact is activated and the keypad shows "OPL Output Phase Loss" (OPL),

Note: The output phase loss detection is disabled when the output current is less than 10% of the inverter rated current.

08-13	Selection of over-torque detection
Range	【0】: Over-torque detection is disabled 【1】: Start detection when reaching the set frequency 【2】: Start detection during running
08-14	Selection of over-torque action
Range	【0】: Deceleration to stop when over-torque is detected. 【1】: Displays warning when over-torque is detected. Continue operation. 【2】: Coast to stop when over-torque is detected
08-15	Level of over-torque detection
Range	【0~300】%
08-16	Time of over-torque detection
Range	【0.0~10.0】Sec

The over torque detection function monitors the inverter output current or motor torque and can be used to detect an increase in inverter current or motor torque (e.g. heavy load).

The torque detection level (08-15) is based on the inverter rated output current (100% = inverter rated output current) when operating the inverter in V/F control and motor output torque (100% = motor rated torque) when operating the inverter in SLV control.

Over-torque detection

Parameter 08-13 selects over-torque detection function. An over-torque condition is detected when the output current / torque rises above the level set in parameter 08-15 (Over-torque detection level) for the time specified in parameter 08-16 (Over-torque detection time).

08-13=0: Over-torque detection is disabled.

08-13=1: Over-torque detection is enabled when the output frequency reaches the set frequency.

08-13=2: Over-torque detection is enabled during running.

Parameter 08-14 selects the way the inverter acts when an over-torque condition is detected.

08-14=0: When an over-torque condition is detected the inverter displays an over-torque detection fault and the motor decelerates to a stop.

08-14=1: When an over-torque condition is detected the inverter displays an over-torque detection alarm and continues to run.

08-14=2: When an over-torque condition is detected the inverter displays an over-torque detection fault and the motor coasts to a stop

Multi-function digital outputs (R1A-R1C, R2A-R2C) can be set to an over torque detection condition by setting parameters 03-11 or 03-12 to 12. Refer to figure 4.3.72

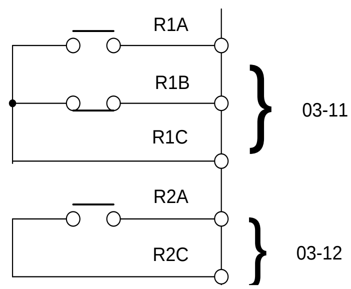


Figure 4.3.72 Over/Low torque detection for DI/DO terminals

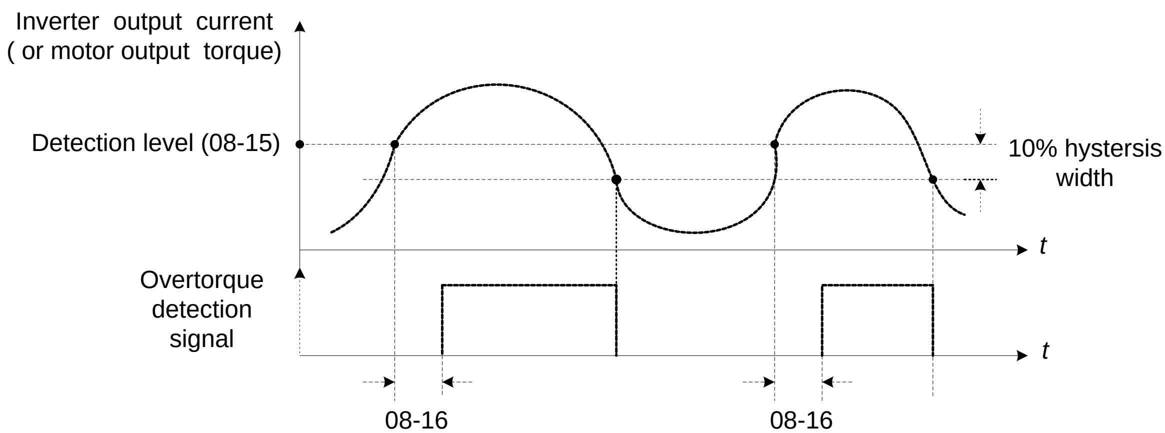


Figure 4.3.73 Over-torque detection operation

08-17	Fire Mode
Range	**【0】:** Disabled **【1】:** Enabled

08-17=0: Fire Mode disabled
08-17=1: Fire Mode enabled

Warning: Use of this mode for any application must be considered carefully and all safety implications must be taken into account. When enabled and Fire Mode is activated (See multi-function digital inputs, **03-00~03-05=【28】,** all protection features of the inverter will be disabled and the unit will continue to operate until its possible destruction. All liabilities for the use of this function will remain user’s responsibility.

08-23	Ground Fault (GF) selection
Range	**【0】:** Disabled **【1】:** Enabled

If the inverter leakage current is greater than 50% of inverter rated current and the ground fault function is enabled (08-23=1), the keypad will display a "GF", motor will coast to a stop and fault contact is activated.
Note: this function is only available for inverter Frames 3, 4.

08-35	Motor Overheat Fault Selection
Range	【0】: Disabled 【1】: Deceleration to Stop 【2】: Free run to Stop 【3】: Continue Running
08-36	PTC Input Filter Time Constant
Range	【0.00 ~ 5.00】
08-39	Delay Time of Motor Overheat Protection
Range	【1 ~ 300】Sec
08-42	PTC Protection Level
Range	【0.1 ~ 10.0】V
08-43	PTC Restart Level
Range	【0.1 ~ 10.0】V
08-44	PTC Warning Level
Range	【0.1 ~ 10.0】V

Motor Overheat Fault Selection

Enabled the motor overheat protection by using the PTC resistor built-into the motor. Connect the PTC resistor between AI2 and GND and a resistor R between AI2 and +10V, see figure 4.3.65(b)

08-35=0: Motor overheats fault function is off.

08-35=1: When the motor is overheating, decelerating to stop.

08-35=2: When the motor is overheating, coast to stop.

08-35=3: When the motor is overheating, continue running until value set in 08-42 is reached.

08-35=1 ~ 2: The inverter will display [OH4 Motor Temp Warning] when the motor temperature increases and AI2 voltage level rises above the value set in 08-44. In this condition the motor will decelerate or coast to stop depending on setting 08-35=1 ~ 2.

08-35=3: The inverter will display [OH3 Motor Temp Warning] when the motor temperature increases and AI2 voltage level rises above the value set in 08-44. In this condition the motor will continue running. If AI2 voltage level rises above the value set in 08-42 for the time specified in 08-39 the motor coast to stop.

08-35=1, 2 or 3: When the motor cools down and AI2 voltage level falls below the value in 08-43, [OH3/OH4 Motor Overheat] will reset.

Note: The resistor (PTC) according to the British Standards Institution:

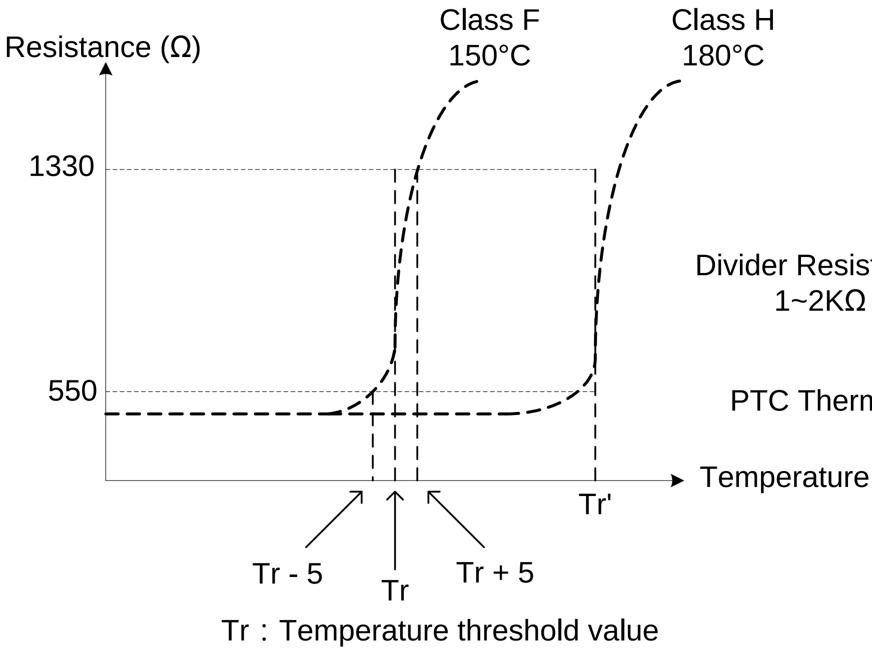
Tr is 150°C for Class F and is 180°C for Class H

Tr - 5°C : RT≦ 550Ω, insert value of RT into formula (1) and set 08-43 to the calculated value.

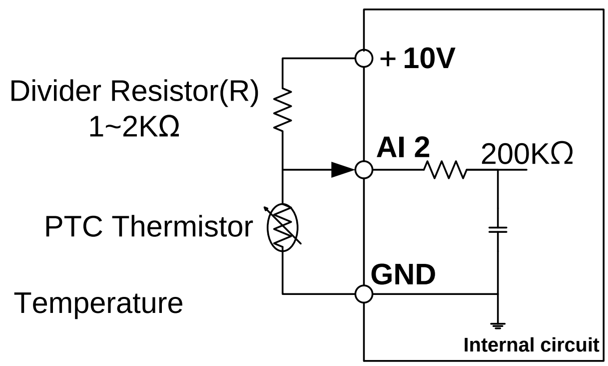
Tr+ 5°C: RT≧1330Ω, put the value of RT in formula (1), and set 08-44 to the calculated value..

Formula (1) can also be used for different values of PTC resistors.

$$V = \frac{1}{2} \times 10 \times \frac{R_{PTC} // 200}{R + \left(R_{PTC} // 200\right)}$$ -------- **Formula (1)**



(a) PTC Thermistor Characteristics



(b) PTC Thermistor connections

Figure 4.3.65 (a) PTC Thermistor Characteristics (b) PTC Thermistor Connections

09 Communication Parameters

09-00	INV Communication Station Address
Range	【1~32】
09-01	Communication Mode Selection
Range	【0】: MODBUS 【1】: BACnet 【2】: Reserved 【3】: Reserved 【4】: Reserved
09-02	Baud Rate Setting (bps)
Range	【2】: 4800 【3】: 9600 【4】: 19200 【5】: 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 bit 【2】: Odd bit
09-05	Communication Data Bit Selection
Range	【0】: 8 Bit Data 【1】: 7 Bit Data
09-06	Communication Error Detection Time
Range	【0.0~25.5】Sec
09-07	Fault Stop Selection
Range	【0】: Deceleration to stop based on deceleration time 1 【1】: Coast to stop when communication fault occurs 【2】: Deceleration to stop based on deceleration time 2 【3】: Continue operation
09-08	Comm. Fault Tolerance Count
Range	【1~20】
09-09	Waiting Time
Range	【5~65】ms
09-10	BACNET Device Instance Number
Range	1~254

The built-in RS-485 can support the following communication protocols:

- Modbus communication protocol
- BACnet communication protocol

The communication port RJ45 (S+, S-) can be used to monitor, control, program and trouble-shoot the inverter.

Modbus communication can perform the following operations, independent of the frequency command selection (00-05) setting and Operation command selection (00-02) setting:

- Monitor inverter signals
- Read and write parameters.
- Reset fault
- Control multi-function inputs

Note: Modbus RTU 8 bits data only (09-05).

Modbus (RS-485) communication specification:

Items	Specification
Interface	RS-485
Communication type	Asynchronous (start - stop synchronization)
Communication parameters	Baud rate: 4800, 9600, 19200 and 38400 bps Data Length: 7 or 8 bits Parity: options of none, even and odd bit. For even and odd selection stop bit is fixed at 1 bit.
Communication protocol	Modbus RTU / ASCII
Number of inverters	Maximum 31 units

Communication wiring and setup

(1) Turn off power to the inverter.
(2) Connect communication lines of the controller to the inverter (RJ45).
(3) Turn power on.
(4) Set the required communication parameters (09-00) via the keypad.
(5) Turn off power to the inverter and wait until keypad is completely off.
(6) Turn power on
(7) Start communication between controller and inverter.

Modbus (485) communication architecture

(1) Modbus communication configuration uses a master controller (PC, PLC), communicating to a maximum of 32 inverters.
(2) The master controller is directly connected to the inverter via the RS-485 interface. If the master controller has a RS-232 port, a converter must be used to convert the signals to RS-485 to connect the master controller to the inverter.
(3) A maximum 32 inverters can be connected to a network, following the Modbus communication standard.

Communication Parameters:

09-00: Inverter station addresses: Range 1-32

09-02: RS-485 communication baud rate setting

= 2: 4800 bps
= 3: 9600 bps
= 4: 19200 bps
= 5: 38400 bps

09-03: Stop bit selection

= 0: 1 stop bit
= 1: 2 stop bits

09-04: Parity selection of RS-485 communication

= 0: No parity.
= 1: even parity.
= 2: odd parity.

09-05: Communication Data Bit Selection

= 0:8 bits data

= 1:7 bits data

09-06: RS-485 communication error detection time

09-07: Stop selection of RS-485 communication failure

= 0: Deceleration to stop by deceleration time 00-15, display shows “COT” fault code.
= 1: Coast to stop
= 2: Deceleration to stop using the deceleration time 2
= 3: Continue to operate (only shows a warning message “COT”, press the stop button to stop operation)

09-08: Comm. fault tolerance count

When the number of communication errors exceeds the value set in parameter 09-08 the inverter will display the comm. Fault alarm “ERR6”.

09-09: Wait time of inverter transmission (09-09).

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 4.3.76. Set the controller receive time-out to a greater value than the wait time parameter (09-09).

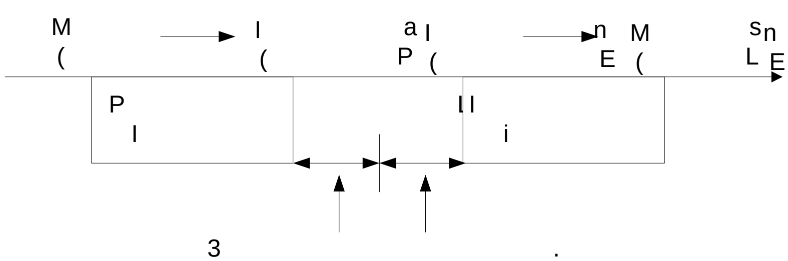


Figure 4.3.76 Communication Message Timing

09-10: BACnet device instance number

10 PID Parameters

10-00	PID target value source setting
Range	【0】: Keypad 【1】: AI1 (Analog Input 1) 【2】: AI2 (analog Input 2) 【3】: Communication 【4】: Use 10-02 setting

Parameter 10-00 sets the PID target selection when frequency source selection is set to PID parameters 00 - 05 / 00 - 06= 6.

10-01	PID feedback value source setting
Range	**【0】:** Keypad 【1】: AI1 (Analog Input 1) 【2】: AI2 (analog Input 2) **【3】:** Communication

Parameter 10-01 sets the PID feedback selection when frequency source.

Note: 10-00 and 10-01 cannot be set to the same value or keypad will show an SE05 alarm.

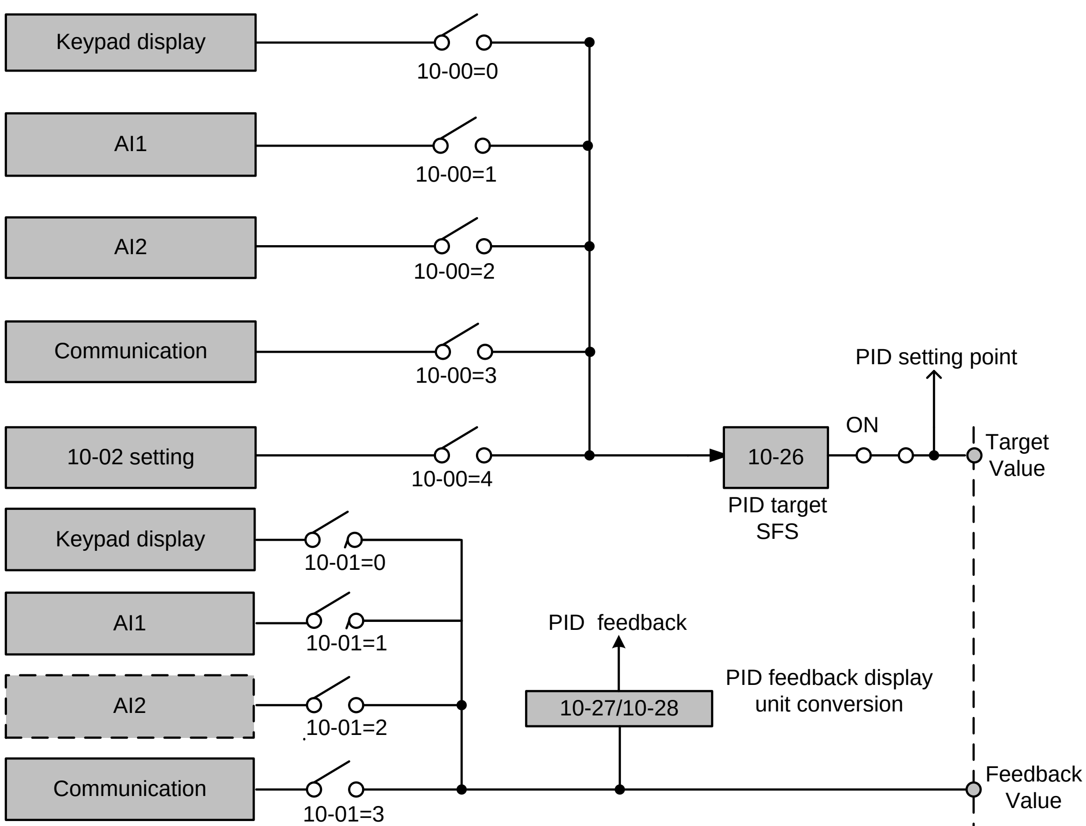


Figure 4.3.80a PID input selection

10-02	PID target value
Range	【0.00~100.00】**%**

Parameter 10-02 sets the PID target from the keypad when 10-00=4.

10-03	PID control mode
Range	**【xxx0b】:** PID disable **【xxx1b】:** PID enable **【xx0xb】:** PID positive characteristic **【xx1xb】:** PID negative characteristic **【x0xxb】:** PID error value of D control **【x1xxb】:** PID feedback value of D control **【0xxxb】:** PID output **【1xxxb】:** PID output + Frequency Command

PID Mode Selection Type

The inverter offers two types of PID control:

(a) Basic PID control: (10-03 = 1, 3)

This is the basic type of PID control. Refer to the figure 4.3.7.

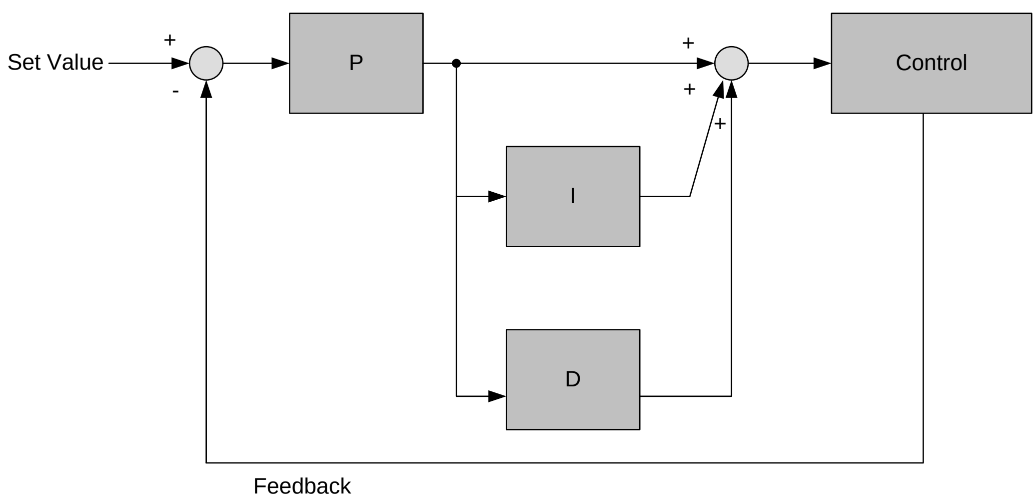


Figure 4.3.80b Basic PID control

Error signal (target minus feedback) is derivative controlled and set by parameter 10-07.

(b) PID control with differential feedback: (10-03 = 2, 4)

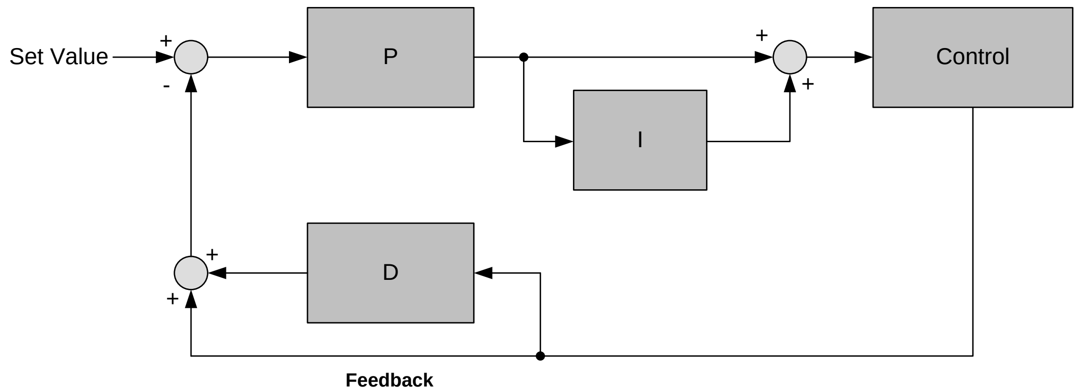


Figure 4.3.80c PID control for feedback differential value

Feedback (detected value) is derivative controlled and set by parameter 10-07.

Make sure to adjust the PID parameters without causing system instability. Refer to Figure 4.3.9 for PID control for feedback value differential.

For 10-03 = 1 or 2, if the error signal (target minus feedback) is positive, the output frequency increases and vice versa.
For 10-03 = 3 or 4, if the error signal (target minus feedback) is positive, the output frequency decreases and vice versa.

10-04	**Feedback gain**
Range	【0.01~10.00】

Parameter 10-04 sets the feedback calibration gain.

10-05	**Proportional gain (P)**
Range	【0.00~10.00】
10-06	**Integral time (I)**
Range	【0.0~100.0】Sec
10-07	**Differential time (D)**
Range	【0.00~10.00】Sec

PID Adjustments

10-05 Proportional Gain control: The error signal (deviation) between the input command (set value) and the actual control value (feedback). This error signal or deviation is amplified by the proportional gain (P) to control the offset between the set value and the feedback value.

10-06 Integral control: The output of this control is the integral of the error signal (difference between set value and feedback value) and is used to minimize the offset signal that is left over from the gain control. When the integral time (I) is increased, the system response becomes slower.

10-07 Differential control: This control is the inverse from integral control and tries to guess the behavior of the error signal by multiplying the error with the differential time. The result is added to the PID input. Differential control slows down the PID controller response and may reduce system oscillation. **Note:** Most applications that

PID control (fan and pump) do not require differential control.

Refer to Figure 4.3.77 for PID control operation

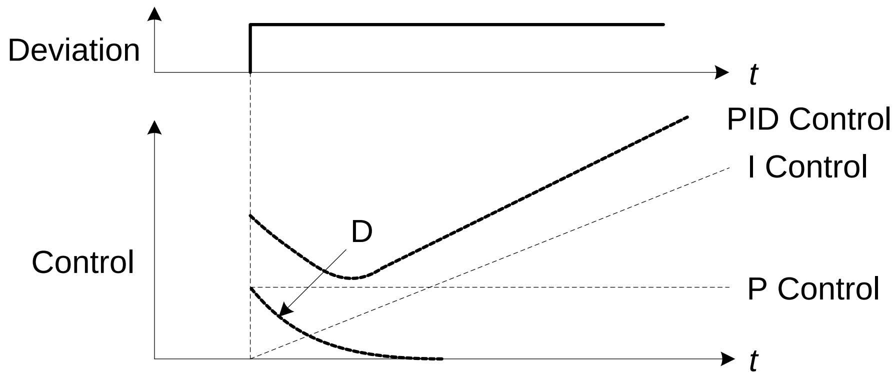


Figure 4.3.80d PID Control

PID Control Setting

PID control block diagram, the following figure shows PID control block diagram.

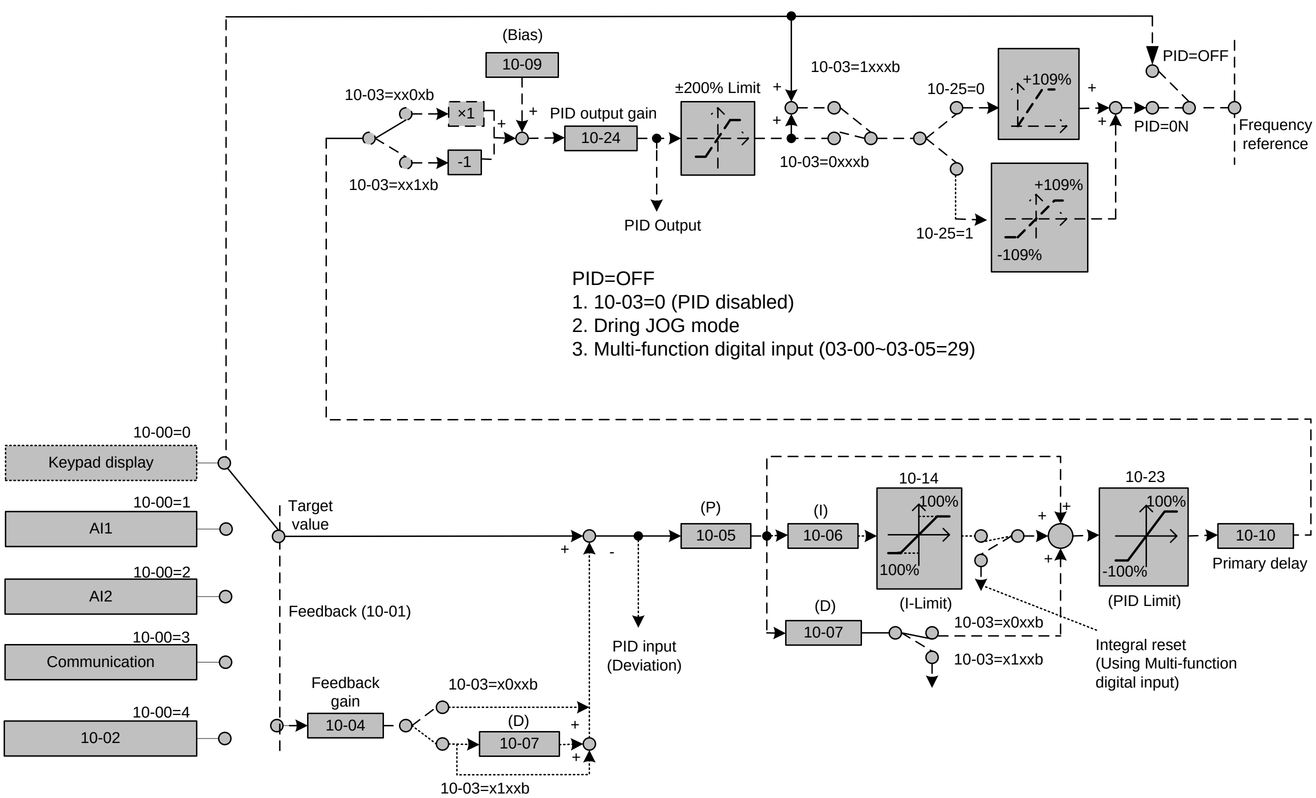


Figure 4.3.81 PID control block diagram

PID Tuning

Use the following procedures to enable PID control:

(1) Enable PID control (set 10-03 to a value greater than "xxx0b").
(2) Increase the proportional gain (10-05) to the highest value possible without causing the system to become unstable.
(3) Decrease the integral time (10-06) to the lowest value possible without causing the system to become unstable.
(4) Increase the differential time (10-07) to the highest value possible without causing the system to become unstable.

The PID control serves to maintain a given process within certain limits whether it is pressure, flow etc. To do this the **feedback** signal is compared to the **set value** and the difference becomes the error signal for the PID control.

The PID control then responds by trying to minimize this error. The error is multiplied times the value of the **Proportional gain** set by parameter **10-05**. An increased gain value results in a larger error. However, in any system as the gain is increased there is a point that the system will become unstable (oscillate).

To correct this instability, the response time of the system may be **slowed** down by increasing the **Integral time** set by parameter **10-06**. However slowing the system down too much may be unsatisfactory for the process.

The end result is that these two parameters in conjunction with the acceleration time (01-14) and deceleration (**01-15**) times require to be adjusted to achieve optimum performance for a particular application.

PID output polarity can be selected with parameter 10-03 (setting = xx0xb: PID output forward, setting = xx1xb: PID output reversal). When PID output is chosen to reverse, and if PID input is negative, the output frequency of PID will gain. On the contrary, PID output is chosen to forward, and if PID input is minus, the output frequency of PID will decrease.

PID feedback value can be adjusted using parameter 10-04 (PID feedback gain) as well as with the analog input gain and bias for terminal AI1 or AI2.

10-09	**PID bias**
Range	【-100~100】**%**

Parameter used to adjust the offset of the PID control. The offset value is added to the frequency reference as compensation. Use parameter 10-24 (PID output gain) to control the amount of compensation.

10-14	**PID integral limit**
Range	【0.0~100.0】**%**

Parameter used to limit the integral output to prevent motor stall or damage to the system in case of a rapid change in the feedback signal. Reduce the value of 10-14 to increase the inverter response.

10-23	**PID limit**
Range	【0.00~100.0】**%**

Sets the PID output limit. Maximum output frequency is 100%.

10-24	PID output gain
Range	【0.0~25.0】

Use parameter 10-24 to adjust PID output.

10-25	PID reversal output selection
Range	**【0】:** Do not allow the reversal output **【1】:** Allow the reversal output

In case the PID control output value goes negative, parameter 10-25 (PID reversal output selection) can be used to reverse the motor direction.

10-26	PID target acceleration / deceleration time
Range	【0.0~25.5】**Sec**

Sets the PID target value acceleration and deceleration ramp time. The acceleration/deceleration time is set to 00-14~17 and 00-21~24. Reduce the acceleration/deceleration time in case load resonance or system instability is encountered.

PID Fine Tuning

All PID control parameters are related to each other and require to be adjusted to the appropriate values. Therefore, the procedure achieving the minimum steady-state is shown as following:

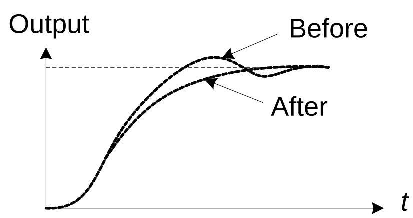
(1) Increase or decrease the proportion (P) gain until the system is stable using the smallest possible control change.

(2) The integral (I) reduces the system stability which is similar to increasing the gain. Adjust the integral time so that the highest possible proportional gain value can be used without affecting the system stability. An increase in the integral time reduces system response.

(3) Adjust the differential time if necessary to reduce overshoot on startup. The acceleration / deceleration time can also be used for the same purpose.

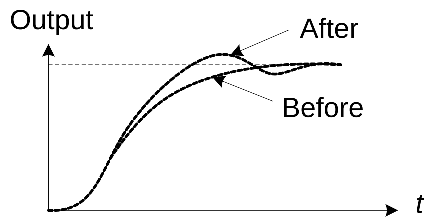
Fine-tuning PID control parameters:

(1) Reduce overshoot



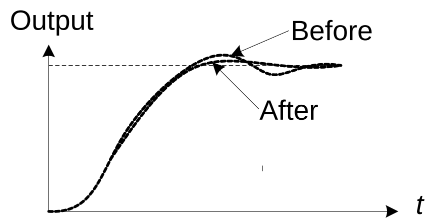
In case overshoot occurs, reduce the derivative time (D) and increase the integral time (I).

(2) Stabilize PID control



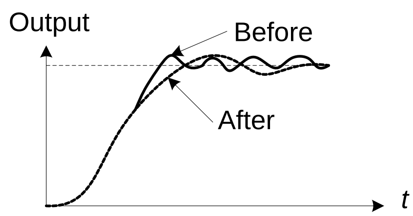
To quickly stabilize the PID control, reduce the integral time (I) and increase the differential time (D) in case overshoot occurs.

(3) Reduce long-period oscillation



Adjust the integral time (I) in case of long-periodical system oscillation.

(4) Reduce short-period oscillation



Adjusting the differential time (D) and proportional (P) gain when experiencing short-periodical oscillation.

10-11	PID feedback loss detection selection
Range	【0】: Disabled 【1】: Warning 【2】: Fault
10-12	**PID feedback loss detection level**
Range	【0~100】%
10-13	**PID feedback loss detection time**
Range	【0.0~10.0】Sec

The PID control function provides closed-loop system control. In case PID feedback is lost, the inverter output frequency may be increase to the maximum output frequency.

It is recommended to enable to the PID feedback loss when the PID function is used.

PID feedback loss detection

10-11=0: Disabled

10-11=1: Warning
A feedback loss condition is detected when the PID feedback value falls below the value set in parameter 10-12 (PID feedback loss detection level) for the time set in parameter 10-13 (PID feedback loss detection time). PID feedback loss warning message "Pb" will be displayed on the keypad and the inverter will continue to operate.

10-11=2: Fault
A feedback loss condition is detected when the PID feedback value falls below the value set in parameter 10-12

(PID feedback loss detection level) for the time set in parameter 10-13 (PID feedback loss detection time). PID feedback loss fault message "Pb" will be displayed on the keypad, the inverter stops and the fault contact is activated.

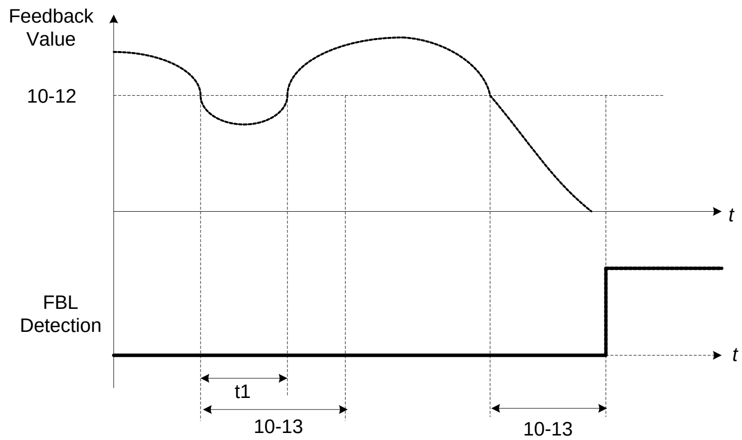


Figure 4.3.82 PID feedback loss detection

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

10-15=0: Integral accumulator reset function is disabled.
10-15=1~30: When PID feedback value reaches the set point, the integral accumulator is reset after 1~30 seconds upon an inverter stop condition. The inverter will start running again based on the target and feedback value.

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

10-16 sets integrator tolerance level after being reset to 0.

10-17	Start frequency of PID sleep
Range	【0.00~599.00】**Hz**
10-18	Delay time of PID sleep
Range	【0.0~255.5】**Sec**
10-19	Frequency of PID wakeup
Range	【0.00~599.00】Hz
10-20	Delay time of PID wakeup
Range	【0.0~255.5】Sec
10-29	PID sleep selection
Range	【0】: Disabled 【1】: Enabled 【2】: Set by DI

10-40	Selection of PID Sleep Compensation Frequency
Range	【0】: Disabled 【1】: Enabled

The PID Sleep function is used to stop the inverter when the PID output falls below the PID sleep frequency level (10-17) for the time specified in the PID sleep delay time parameter (10-18).

The inverter wakes up from a sleep condition when the PID output (Reference frequency) rises above the PID wake-up frequency level (10-19) for the time specified in the PID wake-up delay time (10-20).

Set parameter 10-17 to a value greater than 0 to enable the PID sleep function.

Refer to figure 4.3.83 (a), (b) and (c) for PID sleep/wakeup operation:

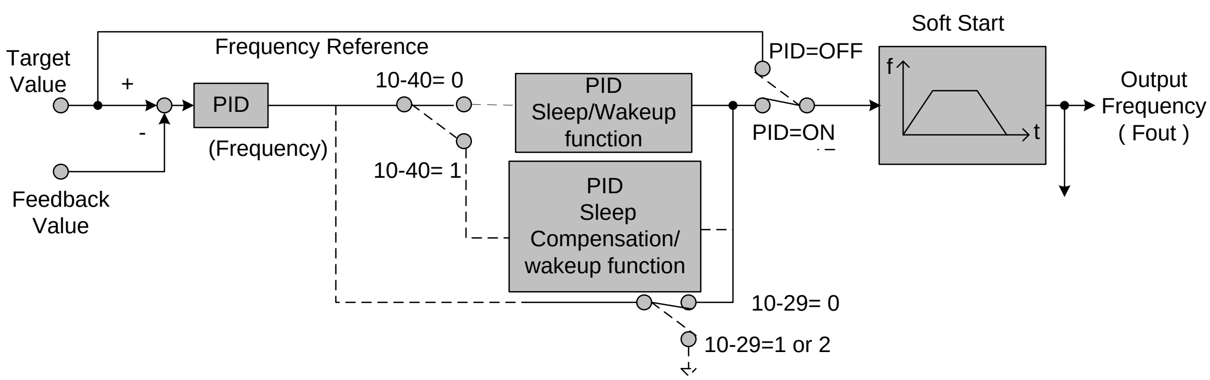


Figure 4.3.83 (a) PID control block diagram

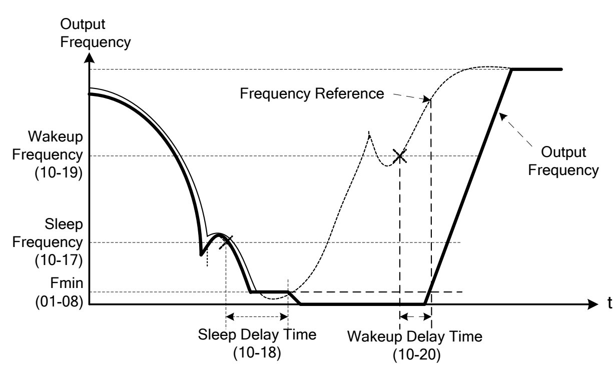


Figure 4.3.83 (b) Timing diagram PID sleep / wakeup

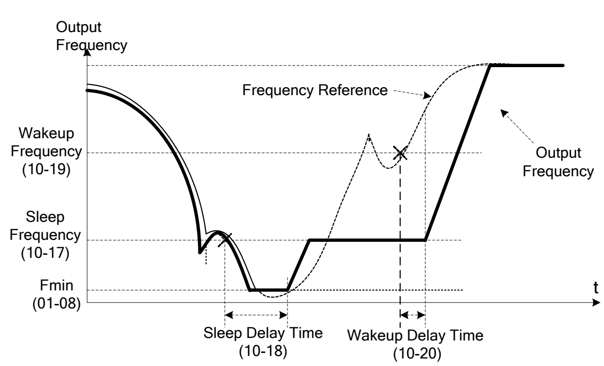


Figure 4.3.83 (c) Timing diagram of PID sleep compensation/ wakeup

10-40: Selection of PID Sleep Compensation Frequency

10-40=0, refer to Figure 4.3.83(b)

When the output frequency (Fout) falls below the PID sleep frequency (10-17) for the time specified in in the PID sleep delay time (10-18) the inverter will decelerate to a stop and enter sleep mode.

10-40=1, refer to Figure 4.3.83(c)

When the output frequency (Fout) falls below the PID sleep frequency (10-17), the PID sleep timer starts and the inverter decelerates to the minimum output frequency (Fmin) set by 01-08. When the sleep timer expires the inverter will enter sleep mode and run at the sleep frequency set by 10-17.

While sleep mode is active and the motor has stopped, the internal PID control is still operating. When the reference frequency increases and exceeds the wakeup frequency parameter 10-19 for the time specified in the wakeup delay time parameter 10-20, the inverter will restart and the output frequency will ramp up to the reference frequency.

10-27	PID Feedback Display Bias
Range	【0~9999】

PID Feedback Display Scaling

The PID feedback signal can be scaled to represent actual engineering units.

Example:

Feedback signal is a pressure transducer (0-10V or 4-20mA) with a range of 0 – 20.0 PSI
4mA (0V) = 0 PSI, 20mA (10V) = 20.0 PSI.

Set parameter 10-27 to 20.

Refer to the Figure 4.3.84 for displaying the unit conversion.

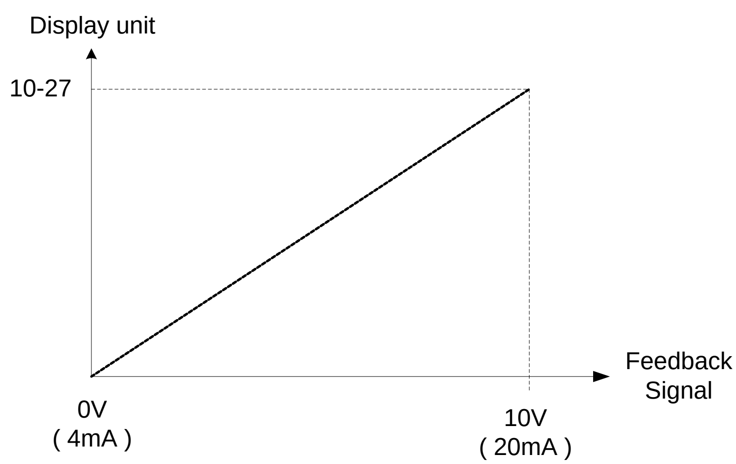


Figure 4.3.84 Feedback signal scaling

10-30	**Upper Limit of PID Target**
Range	【0 ~ 100】**%**
10-31	**Lower Limit of PID Target**
Range	【0 ~ 100】**%**

PID target value will be limited to the range specified in the upper & lower limit set by 10-30 and 10-31.

10-33	**Maximum Value of PID Feedback**
Range	【1~10000】

Set the PID feedback scaling, 100% of the PID feedback equals value set in 10-33.

Note: When using an LED keypad, 10-33 has to be set to a value lower than 1000 and 10-34=1, otherwise the keypad will show a SE05 alarm (PID setting error).

10-34	**PID Decimal Width**
Range	【0~4】

Set PID target and feedback value decimal point.

Example: 10-34=1, keypad displays shows XXX.X; 10-34=2, keypad displays XX.XX.

10-35	**PID Unit**
Range	【0~23】

Select PID engineering unit (e.g. PSI) depending on the application.

10-39	**Output Frequency Setting of PID Disconnection**
Range	【0.00~599.00】**Hz**

During a PID feedback loss condition the inverter will run at a fixed output frequency set by parameter 10-39. PID operation continues when feedback loss condition is no longer active.

11-00	Direction Lock Selection
Range	【0】: Allow forward and reverse rotation 【1】: Only allow forward rotation 【2】: Only allow reverse rotation

If Direction Lock Selection parameter 11-01 is set to 1 or 2, the motor only operates in that specific direction. A run command for the opposite direction will run in the selected direction. Forward or reverse commands can be issued via the control terminals, keypad or communication.

Note: This parameter can be used in fan and pump application where reverse rotation is prohibited.

11-01	Carrier frequency
Range	【1~16】**KHz**

Sets the inverter carrier frequency in kHz (IGBT switching frequency).

Notes:
(1) Value 1 to 16 represents kHz.
(2) Setting range depends on inverter rating (13-00) and HD/ND mode (00-27).
(3) Refer to section 3 inverter derating based on carrier frequency.
(4) A low carrier frequency increases motor noise but reduces motor losses and temperature.
(5) A low carrier frequency decreases RFI, EMI interference and motor leakage current.

Refer to the carrier frequency table 4.3.35

Table 4.3.35 Carrier frequency settings

Carrier Frequency	1KHz	6KHz	10KHz	16KHz
Motor noise	High	------------------------		Low
Output current waveform (similar to sinusoidal wave)	Fair	-------- Good -------		Better
Noise interference	Low	------------------------		High
Leakage current	Low	------------------------		High
Heat loss	Low	-------------------------		High

If cable length between the inverter and the motor is too long, the high-frequency leakage current will cause an increase in inverter output current, this might affect peripheral devices. Adjust the carrier frequency to avoid this as shown in table 4.3.36.

Table 4.3.36 Cable length and carrier frequency

Wire length	< 30m (<98ft)	<50m (<164ft)	<100m (<328ft)	>100m (>328ft)
Carrier frequency (11-01 value)	Max value 16KHz (11-01=16KHz)	Max value 10KHz (11-01=10KHz)	Max value 5KHz (11-01=5KHz)	Max value 2KHz (11-01=2KHz)

➢ Reduce the carrier frequency if the torque does not match the speed.

11-02	Soft PWM Function Selection
Range	**【0】:** Disable **【1】:** Soft PWM 1 enabled **【2】:** Soft PWM 2 enabled

11-02=0: Soft PWM control disabled.

11-02=1: Soft PWM 1 control enabled. Software PWM control can improve noise produced by the motor, more comfortable for the human ear. At the same time, Software PWM also limits RFI noise to a minimum level. The default setting of Soft PWM control is disabled.

11-02=2: Soft PWM 2 control enabled. Use parameters 11-66 (2_3 Phase PWM Switch Frequency), 11-67 (Soft PWM 2 Frequency Range) and 11-68 (Soft PWM 2 Switch Frequency) to manually adjust for noise coming from the motor.

11-03	Automatic Carrier Lowering Selection
Range	【0】: Disabled 【1】: Enabled

11-03=0: Automatic carrier frequency reduction during an overheat condition is disabled.

11-03=1: Carrier frequency is automatically lowered in case the inverter heatsink overheated and will return to carrier frequency set in parameter 11-01 when the inverter temperature returns to normal. See section 3 for more information.

11-04	S-Curve Time Setting at the Start of Acceleration
11-05	S-Curve time setting at the End of Acceleration
11-06	S-Curve time setting at the Start of Deceleration
11-07	S-Curve time setting at the End of Deceleration
Range	【0.00~2.50】Sec

The S-Curve function for acceleration / deceleration is used to reduce mechanical impact caused by the load during momentary starting and stopping of the inverter. To use the S curve function set the time for acceleration start point (11-04), acceleration end point (11-05), deceleration start point (11-06) and deceleration end point (11-07). Refer to Figure 4.3.85 for more information.

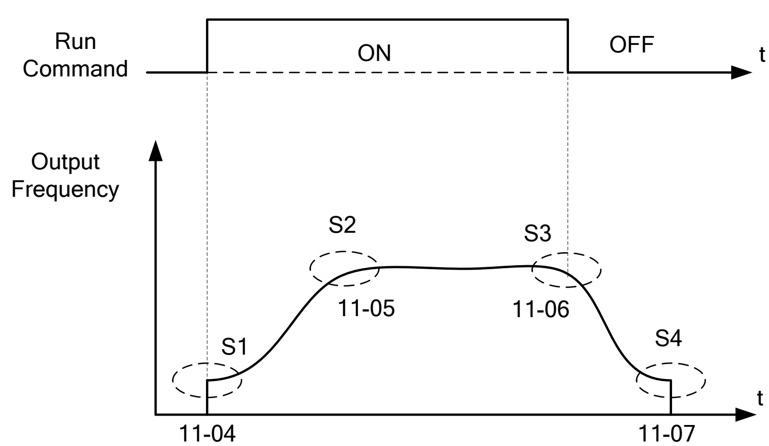


Figure 4.3.85 S-Curve characteristic

Total acceleration and deceleration time when the S curve is used:

$$\text{Accelerating time} = \text{Accelerating time 1 (or 2)} + \frac{(11\text{-}04) + (11\text{-}05)}{2}$$

$$\text{Deceleration time} = \text{Deceleration time 1 (or 2)} + \frac{(11\text{-}06) + (11\text{-}07)}{2}$$

11-08	**Jump Frequency 1**
11-09	**Jump Frequency 2**
11-10	**Jump Frequency 3**
Range	【0.0~599.0】**Hz**
11-11	**Jump Frequency Width**
Range	【0.0~30.0】**Hz**

These parameters allow “jumping over” certain frequencies that can cause unstable operation due to mechanical resonance in certain applications.

Note: Prohibit any operation within the jump frequency range. During acceleration and deceleration the frequency is continuous without skipping the jump frequency.

To enable jump frequency 1 – 3 (11-08 – 11-10) set the frequency to a value greater than 0.0 Hz.

Use the jump frequency width (11-11) to create a jump frequency range. Refer to Figure 4.3.86.

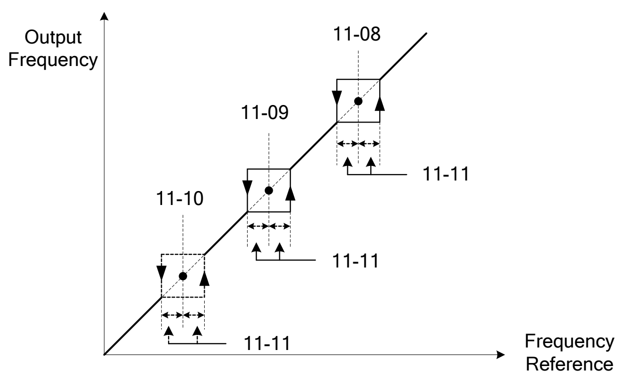


Figure 4.3.86 Jump frequency operation

Jump frequency via Analog Input.

Set parameter 04-05 (AI2 function selection) to 9 (frequency jump setting 4) to control the jump frequency via analog input AI2.

Note: When jump frequency overlap the sum of the overlapped jump frequencies will be used as the jump frequency range. Refer to Figure 4.3.87.

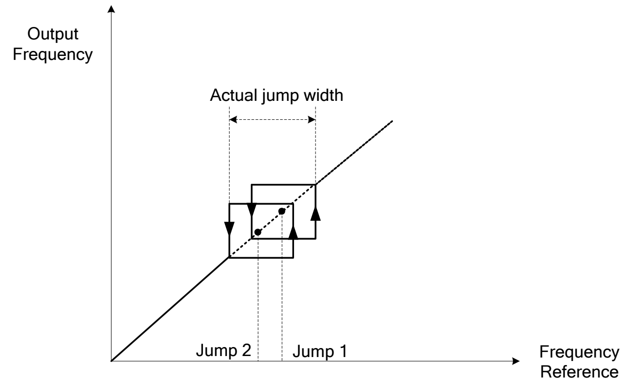


Figure 4.3.87 Jump frequency overlap

11-12	**Manual Energy Saving Gain (VF)**
Range	【0~100】**%**
11-18	**Manual Energy Saving Frequency**
Range	【0.0~599.0】**Hz**

Manual energy savings reduces the output voltage for the purpose of saving energy.

To enable manual energy savings set one of the multi-function digital input (03-00 to 03-05) to 20 and activate the input or use parameter 11-18 to set the manual energy savings activation frequency.

When the output frequency rises above the value set in parameter 11-18 manual energy savings function is enabled. Setting parameter 11-18 manual energy savings frequency to 0.0 Hz disables the manual energy savings frequency activation function. Refer to Figure 4.3.88 for more information.

Note: Only use manual energy savings functions in combination with light loads.

Manual energy saving gain (11-12) determines the output voltage of the inverter when manual energy savings is enabled. Output voltage is percentage gain times the V/F voltage.

Manual energy saving control uses the voltage recovery time (07-23) to change the output voltage, refer to figure 4.3.88.

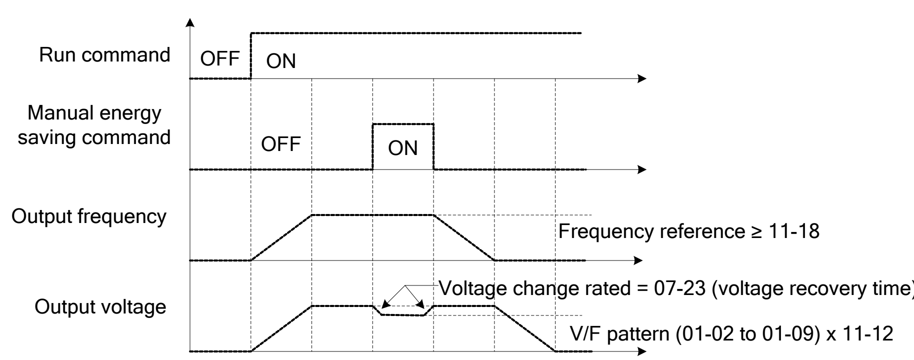


Figure 4.3.88 Manual energy saving operation

11-14	OV Prevention Level
Range	**230V :**【200~400】**V** **400V :**【400~800】**V**
11- 17	**Acceleration/Deceleration Gain**
Range	【0.1~10.0】

When 11-40=3, the inverter will increase the output frequency to prevent an "OV" condition. The output frequency in this mode will not exceed the maximum output frequency of motor 1, set 01-02 according to the application.

Parameter 11-14 sets the Regeneration prevention voltage level. If an "OV" condition still occurs when 11-40=3, increase the value of 11-17 in steps of 0.1 V.

Note: If this level is set too low over-voltage protection will not work properly and the actual deceleration time will be extended.

Regeneration prevention response time can be adjusted by increasing 11-17. This will improve the response to voltage changes on the DC bus but may cause output frequency instability.

11-28	Frequency Gain of Over Voltage Prevention 2
Range	【1~200】**%**
11-33	**DC Voltage Filter Rise Amount**
Range	【0.1~10.0】**V**
11-34	**DC Voltage Filter Fall Amount**
Range	【0.1~10.0】**V**
11-35	**DC Voltage Filter Dead-band Level**
Range	【0.0~99.0】**V**
11-36	**Frequency gain of OV Prevention**
Range	【0.000~1.000】
11-37	**Frequency limit of OV Prevention**
Range	【0.00~599.00】**Hz**
11-38	**Deceleration start voltage of OV prevention**
Range	**230V:**【200~400】**V** **400V:**【400~800】**V**
11-39	**Deceleration end voltage of OV Prevention**
Range	**230V:**【300~400】**V** **400V:**【600~800】**V**
11-40	**OV Prevention Selection**
Range	**【0】:** Disable **【1】:** OV prevention Mode 1 **【2】:** OV prevention Mode 2 **【3】:** OV prevention Mode 3

Overvoltage suppression is used in application that will likely cause regenerative energy.

Example: Press Application

In this application there are two conditions causing regenerative energy back to the inverter and therefore recharging the DC bus.

(1) When the brake is not set, the motor will accelerate and rotate the flywheel. When motor decelerates, the rotation speed will exceed the motor speed due to the large flywheel's inertia feeding back regenerative energy to the inverter resulting in an increased DC bus.

(2) When the brake is set, the motor will rotate the flywheel and compress the spring. At the highest point when the press moves beyond its center, the spring will release its stored energy back to the flywheel and therefore feeding back regenerative energy to the inverter resulting in an increased DC bus.

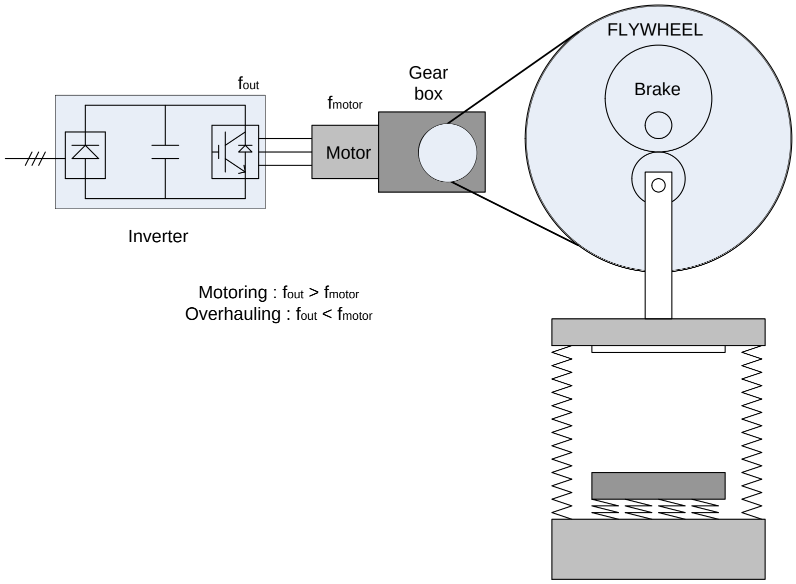


Figure 4.3.90 Press Operation

Over-voltage prevention (OVP) function monitors the DC-bus voltage and adjusts the speed reference, acceleration and deceleration rate, to prevent the inverter from tripping on an overvoltage condition.

When the speed reference is reduced, the motor will start to decelerate. When the inverter is operating at a fixed output frequency and excessive regenerative energy back to the inverter is detected the inverter will accelerate the motor in order to reduce the DC-bus voltage. Refer to Figure 4.3.91.

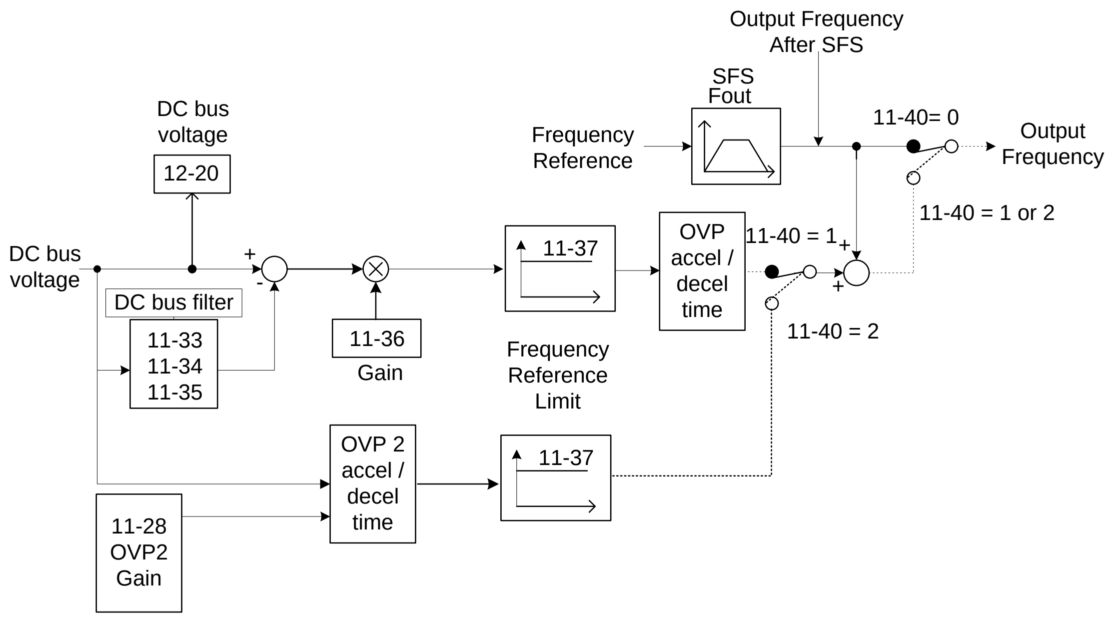


Figure 4.3.91 OVP operation

11-40=1: OV prevention Mode 1

1) DC voltage filter is used to provide a stable reference value for determining the change in DC voltage during regenerative operation.

- Adjust the DC voltage filtering increase rate parameter 11-33 (DC Voltage Filter Rise Amount). When the DC voltage exceeds 11-33 +11-35 (DC Voltage Filter Dead-band Level), the output of the filter will increase.

- Adjust the DC voltage filtering decrease rate parameter 11-34 (DC Voltage Filter Fall Amount). When the DC voltage exceeds 11-33 +11-35 (DC Voltage Filter Dead-band Level), the output of the filter will decrease.

- Monitor the DC voltage filter output by 12-20 (DC voltage filter value).

- Set the DC voltage filter decrease rate (11-34) to a greater value than the value of the DC voltage filtering increase rate (11-33).

2) When the inverter is operating at a fixed output frequency, the OVP function will monitor the DC-bus voltage to detect regenerative operation.

In case of a regenerative condition the inverter calculates the delta DC bus voltage value and multiplies the value with parameter 11-36, the result is added to the frequency reference accelerating the motor to prevent on an overvoltage condition.

When the regenerative energy decreases, the inverter output frequency will return to the actual frequency reference. Deceleration rate is based on the DC voltage, as shown in Figure 4.3.92.

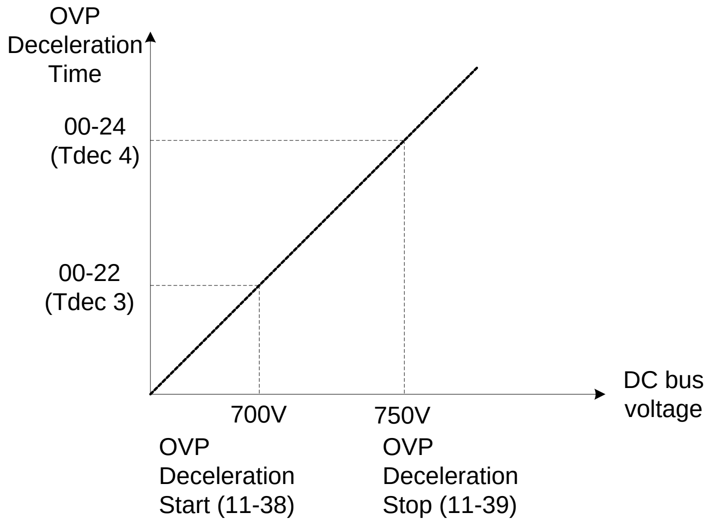


Figure 4.3.92 OVP deceleration time

3) When the inverter is stopped, the deceleration rate can be set with parameter 00-15 (Tdec1). In case the DC voltage is too high, the inverter will decelerate based on the OVP deceleration time as shown in Figure 4.3.92.

- Set DC-bus voltage in parameter 11-38 (start voltage of OVP deceleration) and set OVP deceleration rate in 00-22 (Tdec3).

- When the DC voltage reaches this level, it is necessary to decelerate rapidly in order to prevent the delta DC voltage of becoming too large.

- When DC voltage reaches the setting of 11-39 (stop voltage of OVP deceleration), it will decelerate based on the set value of 00-24 (Tdec4)

- Deceleration rate is linear based on the slope defined by the start point (11-38) and end point (11-39).

4). Enable the OVP function with parameter 11-40 set to 1 or 2. The following parameter default values will be changed when the OVP function is enabled:

07-09=1 (Stop mode: coast to stop)
00-14(Tacc1) = 5.0 Sec (the frequency reference acceleration rate when DC voltage is too high.)
00-22(Tdec3) = 20.0 Sec (low setting point of OVP deceleration rate).
00-24(Tdec4) = 100.0 Sec (high setting point of OVP deceleration rate).

Note: S curve should be disabled when using the OVP function (11-04~11-07=0.0sec).

11-40=2: OV prevention Mode 2

This mode is similar to OV prevention mode 1 but uses frequency gain of OV prevention 2 (11-28) in combination with the accel/decel times, see Fig. 4.4.91 and 4.4.92 for additional information.

11-40=3: OV prevention Mode 3

In this mode the inverter will raise the output frequency temporarily to avoid an OV condition; the output frequency will not go higher than the value of 01-02 (Maximum Output Frequency of Motor 1). Please adjust the value of 01-02 according to application. Raise the value of 11-64 in 0.1 increments if an OV condition still occurs when 11-40=3 is selected.

11-47	KEB Deceleration Time
Range	【0.0~25.5】**Sec**
11-48	**KEB Detection Level**
Range	**230V :**【190~210】**V** **400V :**【380~420】**V**

KEB function can be used to keep the inverter from tripping on a under voltage condition due to a momentary power-loss. To enable the KEB function set parameter 11-47 to a value greater than 0.0 sec.

Upon detection of a power-loss the inverter uses the KEB deceleration time (11-47) to decelerate the motor and using the regenerative energy from the motor to maintain the DC-bus at a nominal level.

11-48: KEB detection level

If the DC-bus voltage falls below the value set in 11-48, the KEB is activated and the inverter starts decelerating according to the value set in 11-47.

To accelerate back to the original output frequency one of the digital inputs (03-00 to 03-07) set for 48 (KEB acceleration) has to be activated and the DC voltage has to rise above 11-48 + delta V (Delta V = +10V for 200V Class, Delta V = +20 V for 400V Class).

Refer to the example in Figure 4.3.95.

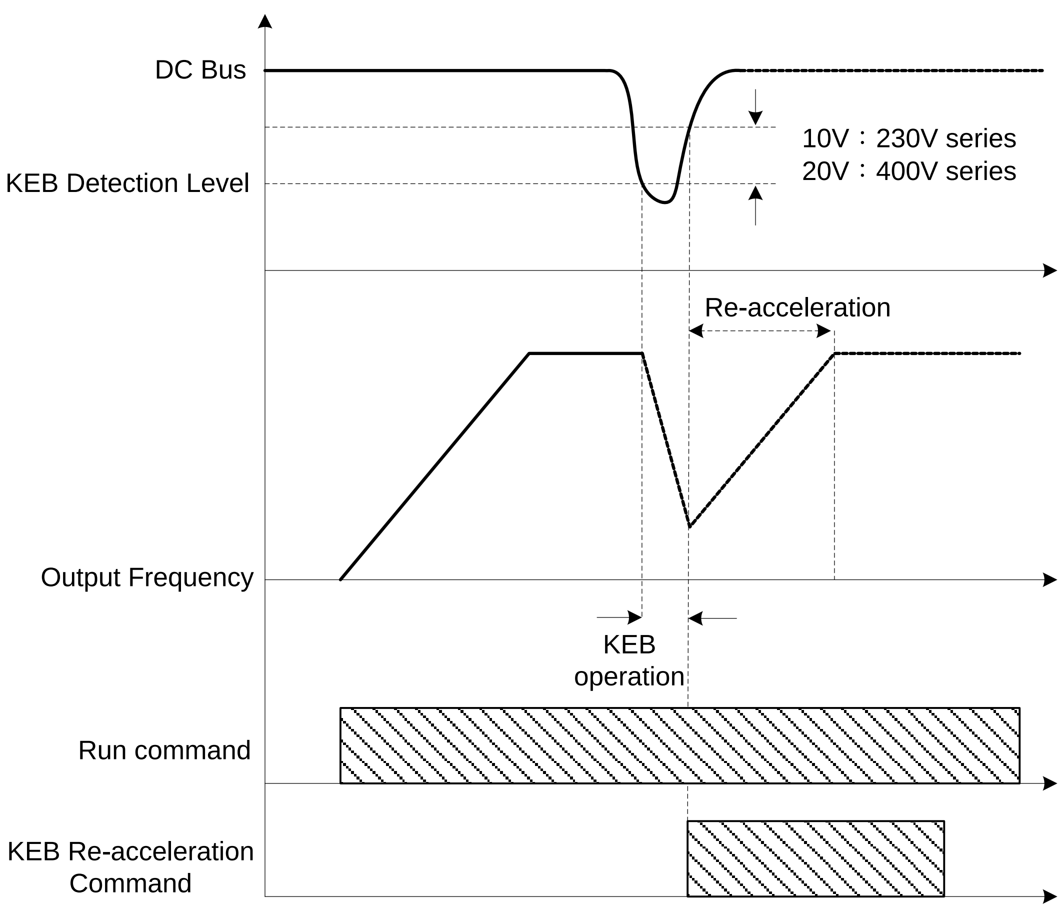


Figure 4.3.95 KEB operation

11-55	STOP Key Selection
Range	【0】: Stop key is disabled when the operation command is not set to operator control 【1】: Stop key is enabled when the operation command is not set to operator control

This function can be used to enable or disable the stop key on keypad display when 00-02 is set to 1 (external terminal) or 00-02 is set to 3 (communication).
11-55= 0: Stop button disabled.
11-55= 1: Stop button enabled.

11-59	Gain of Preventing Oscillation
Range	【0.00~2.50】

This parameter is used to prevent motor oscillation (hunting prevention).
If oscillation (hunting) occurs under normal operation (normal duty mode), increase the setting value by 0.01 increments.

11-60	Upper Limit of Preventing Oscillation
Range	【0~100】%

Motor oscillation (hunting) prevention upper limit.

11-61	Time Parameter of Preventing Oscillation
Range	【0~100】

Hunting prevention response delay time is the delay time used to prevent motor oscillation.

11-62	Selection of Preventing Oscillation
Range	【0】: Mode 1 【1】: Mode 2 【2】: Mode 3

11-62=0: Mode 1, lower response to prevent oscillation.
11-62=1: Mode 2, medium response to prevent oscillation.
11-62=2: Mode 3, fast response to preventing oscillation.

11-63	Strong Magnetic Selection
Range	【0】: Disable 【1】: Enable

11-63=0: No adjustment of the magnetizing current. The magnetizing current is the same at low and high speeds.
11-63=1: Magnetizing current is automatically increased at lower speed (increase in motor torque). Best used in constant torque applications where increased starting toque is required.

11-66	2/3 Phase PWM Switch Frequency
Range	【6.00~60.00】

Inverter will modulation mode from 2 phase PWM to 3 phase PWM when the output frequency is higher than the value set in parameter 11-66.

11-67	RPWM Frequency Bias
Range	【0~12000】
11-68	RPWM Switch Frequency
Range	【6.00~60.00】Hz

Noise detection function is enabled when the inverter output frequency rises above the value set in parameter 11-68 and the Inverter will change the electromagnetic noise in operation according to the PWM mode setting of parameter 11-67.

Notes:
When 11-02=2, the sum of 11-01+11-67 cannot higher than the upper limit of carrier frequency, please refer to the error conditions:

An error message is shown when parameter 11-02=2 and the sum of 11-66+11-67 is higher than the upper limit of the carrier frequency, adjust the value of 11-02 or 11-67.

11-69	Gain of Preventing Oscillation 2
Range	【0.00~200.00】%

Increase value in steps of 0.01 in case of motor vibration in ND mode.

11-70	Upper Limit of Preventing Oscillation 2
Range	【0.01~100】%

Set upper limit for the oscillation prevention function.

11-71	Time Parameter of Preventing Oscillation 2
Range	【0~30000】ms

Set oscillation 2 prevention response time. A lower value increases response time but may cause instability.

11-72	**Switching Frequency 1 of Preventing Oscillation 2**
Range	【0.01~300.00】**Hz**
11-73	**Switching Frequency 2 of Preventing Oscillation 2**
Range	【0.01~300.00】**Hz**

Parameters 11-72 and 11-73 define the oscillation prevention mode switching frequencies.

12 Monitoring Parameters

12-00	Display Screen Selection (LED)
Range	**0 0 0 0 0** **MSD LSD** **00000~88888 Each digit can be set from 0 to 8 as listed below.** 【0】: No display 【1】: Output current 【2】: No display 【3】: DC bus voltage 【4】: heatsink temperature 【5】: PID feedback 【6】: AI1 value 【7】: AI2 value 【8】: Counter

Note: The highest bit is used for power-up monitor. The 4 least significant bits can be used to customize the display sequence see chapter 4.1.4.

12-01	PID Feedback Display Mode (LED)
Range	**【0】:** Display the feedback value as integer (xxx) **【1】:** Display the feedback value with one decimal (xx.x) **【2】:** Display the feedback value (x.xx) with two decimals
12-02	**PID Feedback Display Unit Setting (LED)**
Range	**【0】:** xxxxx (no unit) **【1】:** xxxPb (pressure) **【2】:** xxxFL (flow)
12-03	**Line Speed Display (LED)**
Range	【0~60000】RPM

Set motor rated RPM for the inverter to display the actual motor speed based on the output frequency.
Motor synchronous speed = 120 x Rated frequency ÷ Number of poles.

12- 04	Line Speed Display Mode (LED)
Range	【0】: Display Inverter Output Frequency 【1】: Line Speed Display at Integer. (xxxxx) 【2】: Line Speed Display at One Decimal Place. (xxxx.x) 【3】: Line Speed Display at Two Decimal Places. (xxx.xx) 【4】: Line Speed Display at Three Decimal Places. (xx.xxx)

12-04≠0, line speed is always displayed in run or stop mode. Set 12-03 to the maximum line speed that corresponds to the maximum output frequency.

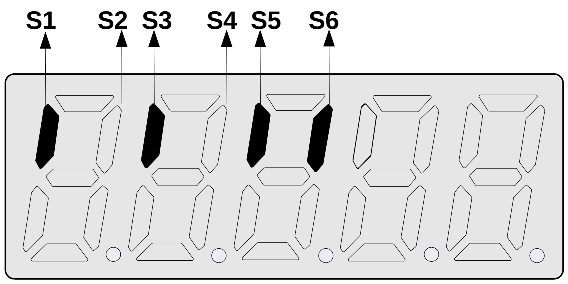
Example: Line speed display 12-03 is 1800, the keypad display will show 900 when the output frequency is 30Hz.

12-05	Status display of digital input terminal (LED / LCD)
Range	Read-only

Terminals S1-S6 are represented using two segments of each digit. Segment turns on when input is active. The bottom segments of each of the first three digits are used to represent the digital outputs (R1, R2). Segments turn on when output is active.

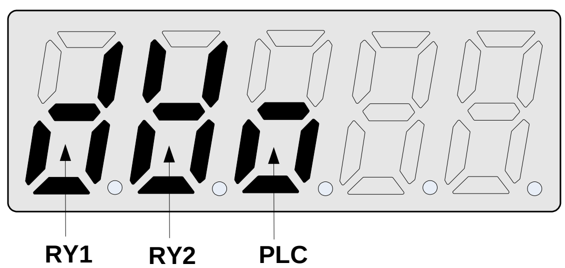
Example 1:

S1/S3/S5/S6 are ON, S2/S4 are OFF, 12-05 will turn on when RY1 without output. (LED)



Example 2:

S2/S3/S4 are ON, S1/S5/S6 are OFF, RY1/RY2 outputs are turned on.



13 Maintenance Parameters

13-00	Inverter Capacity Selection
Range	----

Inverter Model	13-00 Display	Inverter Model	13-00 Display
E510-2P5	2P5	E510-401	401
E510-201	201	E510-402	402
E510-202	202	E510-403	403
E510-203	203	E510-405	405
E510-205	205	E510-408	408
E510-208	208	E510-410	410
E510-210	210	E510-415	415
E510-215	215	E510-420	420
E510-220	220	E510-425	425
E510-225	225	E510-430	430
E510-230	230	E510-440	440
E510-240	240	E510-450	450
		E510-460	460
		E510-475	475

13-01	Software Version
Range	----
13-02	**Fault Record**
Range	----
13-03	**Cumulative Operation Hours 1**
Range	【0~23】hours
13-04	**Cumulative Operation Hours 2**
Range	【0~65535】days
13-05	**Selection of Cumulative Operation Time**
Range	【0】: Accumulative operation time while power on 【1】: Accumulative operation time when it is operating.

13-05= 0: Inverter logs the time when the inverter is powered-up.
13-05= 1: Inverter logs the time when the inverter is running.

13- 06	Parameters lock
Range	**【0】:** Parameters are read-only except 13-06 and main frequency **【1】:** Reserved **【2】:** Advanced Level, all parameters are accessible

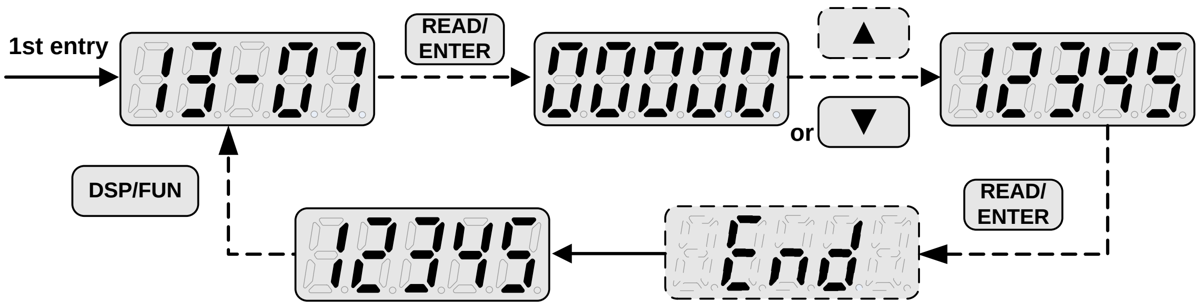
Note: Main frequency is displayed in 12-16. The value shown is equal to frequency setting of speed-stage 0 (05-01)

13-07	Parameter Lock Key Code
Range	【00000~65534】

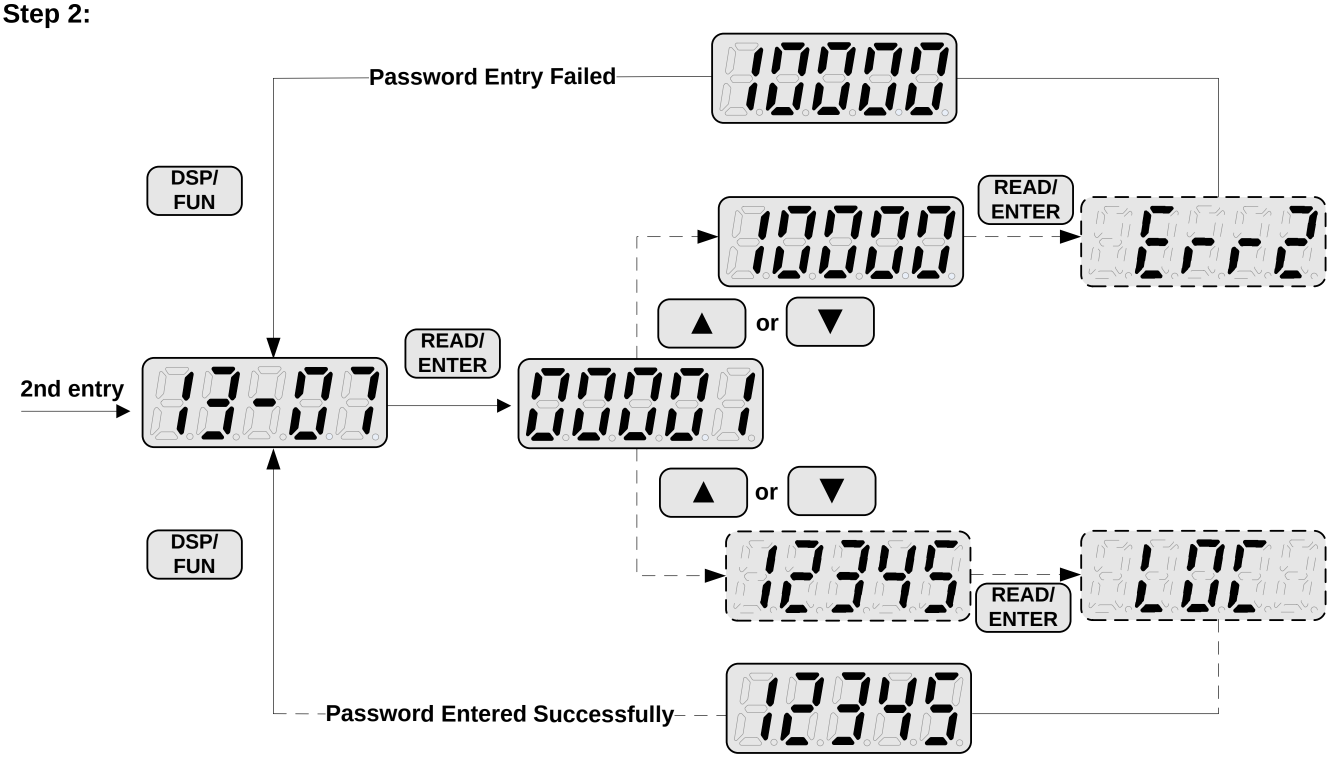
When parameter lock key code is enabled (13- 07>0), all parameters except the main frequency can be modified.

Example: Setting parameter lock key number

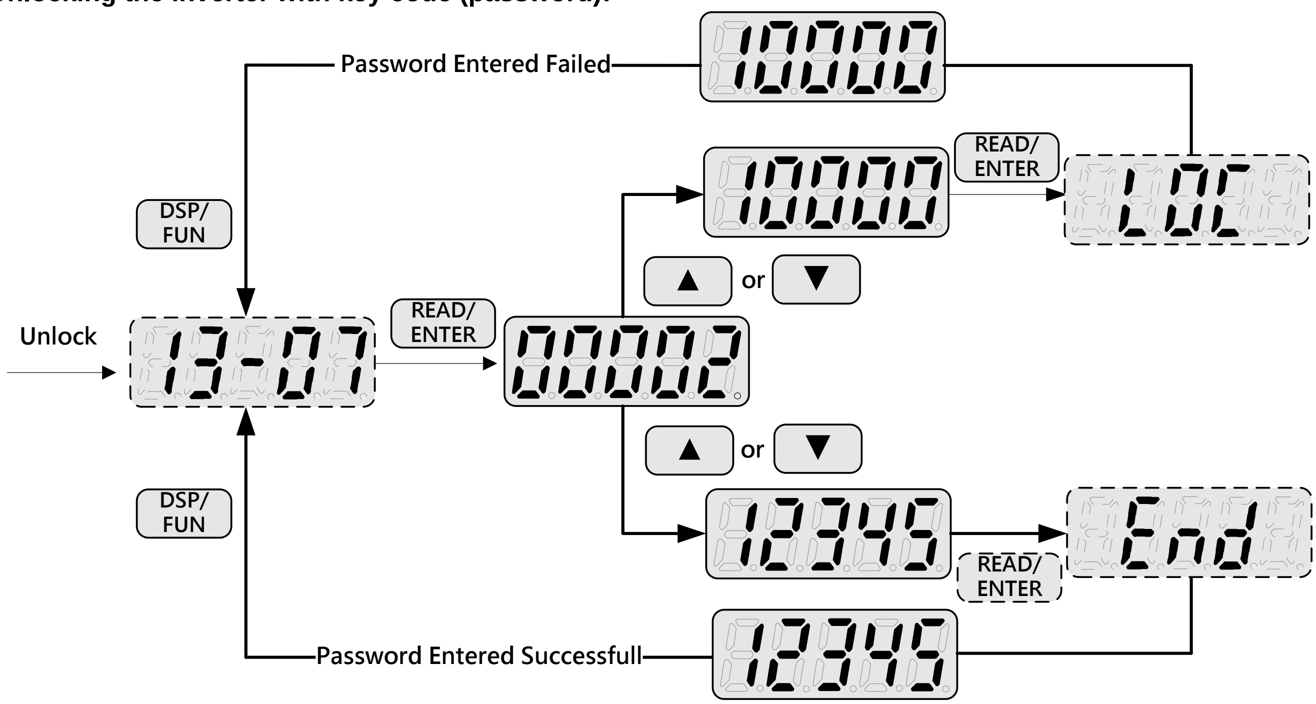
Step 1:



Step 2:



Unlocking the inverter with key code (password):



13-08	Restore factory setting / Initialize
Range	【1】: 2 wires initialization (50Hz) (220V/380V) 【2】: 2 wires initialization (60Hz) (220V/380V) 【3】: 2 wires initialization (50Hz) (230V/400V) 【4】: 2 wires initialization (60Hz) (230V/460V) 【5】: 2 wires initialization (50Hz) (220V/415V) 【6】: 2 wires initialization (60Hz) (230V/400V) 【7】: 2 wires initialization (50Hz) (220V/440V) 【8】: 2 wires initialization (60Hz) (220V/440V) 【1112】: PLC initialization (RESET)

Use parameter 13-08 to initialize the inverter to factory default. It is recommended to write down the modified parameters before initializing the inverter. After initialization, the value of 13-08 will return to zero automatically

13-08=1: 2 Wire Initialization (220V/380V)

Multi-function digital input terminal S1 controls forward operation / stop command and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 380V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically be set to 50Hz.

13-08=2: 2 Wire initialization (220V/380V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 380V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 60Hz.

13-08=3: 2 Wire Initialization (230V/400V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 400V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 50Hz.

13-08=4: 2 Wire Initialization (230V/460V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 460V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 60Hz.

13-08=5: 2 Wire Initialization (220V /415V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 415V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 50Hz.

13-08=6: 2 Wire Initialization (230V/400V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 230V (220V class) or 400V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 60Hz.

13-08=7: 2 Wire Initialization (220V/440V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 440V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 50Hz.

13-08=8: 2 Wire Initialization (220V/440V)

Multi-function digital input terminal S1 controls forward operation / stop command, and S2 controls reverse operation / stop command. Refer to figure 4.3.1. Inverter input voltage (01-14) is automatically set to 220V (220V class) or 440V (440V class). When 01-00 (V/F curve) = F, 01-02 will automatically set to 60Hz.

13-08=1112: PLC Initialization

Clear built-in PLC ladder logic and related values.

The following parameters are not affected parameter 13-08 Restore to Factory / Initialization

No.	parameters
00-00	Control Mode Selection
00-34	Language
00-27	HD/ND Mode Selection *******
01-00	V/F Curve Selection
01-26	V/F Curve Selection of Motor 2
13-00	Inverter Capacity Selection
13-03	Cumulative Operation Hours 1
13-04	Cumulative Operation Hours 2
13-05	Selection of Cumulative Operation Time

13-10	Parameter Password Function 2
Range	【0~9999】
13-51	**Clear Cumulative Operation Hours**
Range	**【0】:** Do not clear Cumulative Operation Hours **【1】:** Clear Cumulative Operation Hours

14 PLC Parameters

Range	【0~9999】
14-00	T1 set value 1
14-01	T1 set value 2 (mode 7)
14-02	T2 set value 1
14-03	T2 set value 2 (mode 7)
14-04	T3 set value 1
14-05	T3 set value 2 (mode 7)
14-06	T4 set value 1
14-07	T4 set value 2 (mode 7)
14-08	T5 set value 1
14-09	T5 set value 2 (mode 7)
14-10	T6 set value 1
14-11	T6 set value 2 (mode 7)
14-12	T7 set value 1
14-13	T7 set value 2 (mode 7)
14-14	T8 set value 1
14-15	T8 set value 2 (mode 7)
Range	【0~65535】
14-16	C1 set value
14-17	C2 set value
14-18	C3 set value
14-19	C4 set value
14-20	C5 set value
14-21	C6 set value
14-22	C7 set value
14-23	C8 set value
Range	【0~65535】
14-24	AS1 set value 1
14-25	AS1 set value 2
14-26	AS1 set value 3
14-27	AS2 set value 1
14-28	AS2 set value 2
14-29	AS2 set value 3
14-30	AS3 set value 1
14-31	AS3 set value 2
14- 32	AS3 set value 3
14-33	AS4 set value 1
14-34	AS4 set value 2
14-35	AS4 set value 3

Range	【0~65535】
14-36	MD1 set value 1
14-37	MD1 set value 2
14-38	MD1 set value 3
14-39	MD2 set value 1
14-40	MD2 set value 2
14-41	MD2 set value 3
14-42	MD3 set value 1
14-43	MD3 set value 2
14-44	MD3 set value 3
14-45	MD4 set value 1
14-46	MD4 set value 2
14-47	MD4 set value 3

Please refer to section 4.5 for built-in PLC function

15 PLC Monitoring Parameters

Range	【0~9999】
15-00	T1 Current Value1
15-01	T1 Current Value 2 (Mode7)
15-02	T2 Current Value 1
15-03	T2 Current Value 2 (Mode7)
15-04	T3 Current Value 1
15-05	T3 Current Value 2 (Mode7)
15-06	T4 Current Value 1
15-07	T4 Current Value 2 (Mode7)
15-08	T5 Current Value 1
15-09	T5 Current Value 2 (Mode7)
15-10	T6 Current Value 1
15-11	T6 Current Value 2 (Mode7)
15-12	T7 Current Value 1
15-13	T7 Current Value 2 (Mode7)
15-14	T8 Current Value 1
15-15	T8 Current Value 2 (Mode7)

Range	【0~65535】
15-16	C1 Current Value
15-17	C2 Current Value
15-18	C3 Current Value
15-19	C4 Current Value
15-20	C5 Current Value
15-21	C6 Current Value
15-22	C7 Current Value
15-23	C8 Current Value

Range	【0~65535】
15-24	AS1 Current Value
15-25	AS2 Current Value
15-26	AS3 Current Value
15-27	AS4 Current Value
15-28	MD1 Current Value
15-29	MD2 Current Value
15-30	MD3 Current Value
15-31	MD4 Current Value
15-32	TD Current Value

16 LCD Function Group

Note: LCD Copy Keypad is an optional keypad for remote mounting only.

16-00	Main Screen Monitoring
Range	【5~43】
16-01	Sub-Screen Monitoring 1
Range	【5~43】
16-02	Sub-Screen Monitoring 2
Range	【5~43】

At power-up the inverter shows two monitor sections on the display, main monitor section consisting of one monitor (large font) and a sub-screen monitor section consisting of two monitors (smaller font).

Choose the monitor signal to be displayed on the main-screen monitor screen using parameter 16-00, and the monitor signals to be displayed on the sub-screen monitor with parameters 16-01 and 16-02, similar to monitor parameters 12-5 ~ 12-43.

16- 03	Display unit			
Range	【0】: Frequency display unit is Hz (Resolution is 0.01Hz) 【1】: Frequency display unit is % (Resolution is 0.01%) 【2】: Frequency display unit is rpm 【3~39】: Reverse 【40~9999】: 100% is XXXX with no decimals (integer only) 【10001~19999】: 100% is XXX.X with 1 decimal 【20001~29999】: 100% is XX.XX with 2 decimals 【30001~39999】: 100% is X.XXX with 3 decimals			
16- 04	Engineering Unit			
Range	【0】: No Unit	【6】: IN	【12】: inW	【18】: KW
	【1】: FPM	【7】: FT	【13】: HP	【19】: m
	【2】: CFM	【8】: /s	【14】: m/s	【20】: °C
	【3】: PSI	【9】: /m	【15】: MPM	【21】: RPM
	【4】: GPH	【10】: /h	【16】: CMM	【22】: Bar
	【5】: GPM	【11】: °F	【17】: W	【23】: Pa

16-03: Display unit of digital operator

Set the units of the following items to be displayed, the frequency reference (05-01, 00-18, 06-01~06-15) and the monitoring frequency 12-16, 12-17 (Output frequency)

16-04: Display unit of engineering

When 16-03 = 00040-39999, engineering units are enabled. The displayed set range and the frequency range of unit (05-01, 06-01~06-15) as well as the monitoring frequency (12-16, 12-17) are changed by parameters 16-04 and 16-03.

<table>
<tr><th>16-03</th><th>Set / displayed contents</th></tr>
<tr><td>0</td><td>0.01 Hz</td></tr>
<tr><td>1</td><td>0.01 % (maximum output frequency 01-02=100%)</td></tr>
<tr><td>2</td><td>Frequency display unit is rpm</td></tr>
<tr><td>3- 39</td><td>Reserved</td></tr>
<tr><td>00040 - 39999</td><td>Set the decimal point by using the fifth place
i.e. □ □□□□
Sets full display scaling excluding decimals
Set the number of decimal places

00040 - 09999: □□□□ (Integer only e.g. 1000)
10001 - 19999: □□□. □ (1 decimal place e.g. 10.0)
20001 - 29999: □□. □□ (2 decimal places, e.g. 10.00)
30001 - 39999: □. □□□ (3 decimal places, e.g. 10.000)

<Example>:
<table>
<tr><th>16-03</th><th>Display</th><th>Display Unit</th><th>Display example</th></tr>
<tr><td>00040-09999</td><td>□□□□</td><td rowspan="4">Use 16-04 Setting</td><td>Example: 100 % speed is 0200
> set 16-03=00200 (from 05-01, 06-01 to 06-15, set range from 0040 to 9999).
> set 16-04=0 (no unit)</td></tr>
<tr><td>10001–19999</td><td>□□□. □</td><td>Example: 100 % speed is 200.0 CFM
> set 16-03=12000 (05-01, 06-01 to 06-15, set range from 0000 to 9999).
> set 16-04=2 (CFM)
> 60% speed will be displayed as 120.0 CFM</td></tr>
<tr><td>20001–29999</td><td>□□. □□</td><td>Example: 100 % speed is 65.00ºC
> set 16-03=26500 (05-01, 06-01 to 06-15, set range from 0000 to 9999)
> set 16-04=20 (ºC)
> 60% of speed is displayed as 39.00 ºC</td></tr>
<tr><td>30001- 9999</td><td>□. □□□</td><td>Example: 100 % speed is 2.555 m/s
> set 16-03=32555
> set 16-04=14 (m/s)
> 60% speed is displayed as 1.533 m/s</td></tr>
</table>
</td></tr>
</table>

16-05	LCD Backlight
Range	【0~7】

Adjust the screen contrast of the digital operator. If set to 0 the screen backlight is turned off.

16-07	Copy Function Selection
Range	【0】: Do not copy parameter 【1】: Read inverter parameters and save to the keypad 【2】: Write the keypad parameters to inverter 【3】: Compare parameters of inverter and keypad
16-08	Selection of allowing reading
Range	【0】: Do not allow to read inverter parameters and save to the keypad 【1】: Allow to read inverter parameters and save to the keypad

LCD digital operator with built-in memory (EEPROM) can be used to store and retrieve parameters:

(1) Read: Save inverter parameters to the digital operator (INV → OP).
(2) Write: Write the parameters from the digital operator to the inverter and save (OP → INV).
(3) Verify: Compare the inverter parameters against the parameters in the digital operator.

16-07=0: No action

16-07=1: Read (all parameters are copied from the inverter to the keypad).

16-07=2: Write (all parameter are copied from the keypad to the inverter).

16-07=3: Verify (Compare the set value of the inverter to the parameter of the digital operator).

Set 16-08 = 0, to prevent the saved parameter data stored in the digital operator from accidentally being overwritten.

When parameter 16-08=0 and the read operation is executed (16-07=1) a warning message of "RDP Read Prohibited" will be displayed on the keypad and the read operation is cancelled.

For the write-in operation requires the following items to match.
(1) Inverter type
(2) Inverter rated capacity and voltage

■ READ: Copy inverter parameters to the keypad

Steps	LCD Display (English)	Description
1	Group 14 PLC Setting 15 PLC Monitor 16 LCD Keypad Func.	Select function group (16) from the group menu.
2	PARA 16 -07：Copy Sel -08：READ Sel -09：Keypad Loss Sel	Press the Read / Enter key and select parameter (16-07) copy sel.
3	Edit 16-07 Copy Sel 0 Normal (0 – 3) < 0 >	Press the Read / Enter key to change value of 16-07.
4	Edit 16-07 Copy Sel 1 READ (0 – 3) < 0 >	Change the set value to 1 (READ) by using the up arrow key.
5	-ADV- READ INV → OP	(1) Use Read / Enter key to enable the read operation. (2) The bottom of LCD display will show a status bar to indicate the read progress.
6	-ADV- READ COMPLETE	"READ COMPLETE" will be displayed on the keypad when read operation was successful.
	RDP Read Prohibited	(1) The error message of "RDP Read Prohibited" is displayed when reading parameters from the inverter is prohibited. (2) If this error is displayed, press any key to continue go back to parameter 16-07.
7	Edit 16-07 Copy Sel 1 READ (0 – 3) < 0 >	When DSP/FUN key is pressed, the display returns back to parameter 16-07.

■ WRITE: Copy Keypad parameters to the Inverter

Steps	LCD Display (English)	Description
1	Group 14 PLC Setting 15 PLC Monitor 16 LCD Keypad Func.	Select function group (16) from the group menu.
2	PARA 16 -07：Copy Sel -08：READ Sel -09：Keypad Loss Sel	Press the Read / Enter key and select parameter (16-07) copy sel.
3	Edit 16-07 Copy Sel 0 Normal (0 – 3) < 0 >	Press the Read / Enter key to change value of 16-07.
4	Edit 16-07 Copy Sel 2 WRITE (0 – 3) < 0 >	Change the set value to 2 (WRITE) by using the up arrow key.
5	-ADV- WRITE INV → OP	(1) Use Read / Enter key to enable the write operation. (2) The bottom of LCD display will show a status bar to indicate the read progress.
6	-ADV- WRITE COMPLETE	“WRITE COMPLETE” will be displayed on the keypad when write operation was successful.
	WRE Write Error	(1) The error message of "WRE Write Error" is displayed when writing parameters to the inverter is prohibited. (2) If this error is displayed, press any key to continue go back to parameter 16-07.
7	Edit 16-07 Copy Sel 2 WRITE (0 – 3) < 0 >	When DSP/FUN key is pressed, the display returns back to parameter 16-07.

- **Verify: Compare Inverter Parameters against Keypad Parameters.**

Steps	LCD Display (English)	Description
1	Group 14 PLC Setting 15 PLC Monitor 16 LCD Keypad Func.	Select function group (16) from the group menu.
2	PARA 16 -07：Copy Sel -08：READ Sel -09：Keypad Loss Sel	Press the Read / Enter key and select parameter (16-07) copy sel.
3	Edit 16-07 Copy Sel 0 Normal (0 – 3) < 0 >	Press the Read / Enter key to change value of 16-07.
4	Edit 16-07 Copy Sel 3 VERIFY (0 – 3) < 0 >	Change the set value to 3 (VERIFY) by using the up arrow key.
5	-ADV- VERIFY INV → OP	(1) Use Read / Enter key to enable the write operation. (2) The bottom of LCD display will show a status bar to indicate the read progress.
6	-ADV- VERIFY COMPLETE	“VERIFY COMPLETE” will be displayed on the keypad when parameter compare was successful.
	VERY Verify Error	(1) The error message of "VERY Verify Error" is displayed when writing parameters to the inverter is prohibited. (2) If this error is displayed, press any key to continue go back to parameter 16-07.
7	Edit 16-07 Copy Sel 3 VERIFY (0 – 3) < 0 >	When DSP/FUN key is pressed, the display returns back to parameter 16-07.

16- 09	Selection of keypad removed (LCD)
Range	【0】: Keep operating when LCD keypad is removed 【1】: Display fault when LCD keypad is removed

16-09=0: Continue operation when keypad is removed.

16-09=1: Trip inverter when keypad is removed while operating in local mode.

17 Automatic Tuning Parameters

17-00	Mode selection of automatic tuning
Range	【0】: Rotational auto-tuning 【1】: Static auto-tuning 【2】: Stator resistance measurement 【3】: Reserved 【4】: Loop tuning 【5】: Rotational Auto-tuning Combination (Item: 4+2+0) 【6】: Static Auto-tuning Combination (Item: 4+2+1)
17-01	**Motor rated output power**
Range	【0.00~600.00】KW
17-02	**Motor rated current**
Range	VF mode : 10%~120% of the inverter rated current SLV mode : 25%~120% of the inverter rated current
17-03	**Motor rated voltage**
Range	200V:【50.0~240.0】V 400V:【100.0~480.0】V
17-04	**Motor rated frequency**
Range	【5.0~599.00】 Hz
17-05	**Motor rated speed**
Range	【0~24000】rpm
17-06	**Pole number of motor**
Range	【2~16】pole
17-08	**Motor no-load voltage**
Range	200V:【50~240】V 400V:【100~480】V
17-09	**Motor excitation current**
Range	【15~70】% of motor rated current
17-10	**Automatic tuning start**
Range	【0】: Disabled 【1】: Enabled
17-12	**Proportion of Motor Leakage Inductance**
Range	【0.1~15.0】%
17-13	**Motor Slip Frequency**
Range	【0.10~20.00】Hz
17-14	**Rotational Auto-tuning**
Range	【0】: V/F type rotational auto-tuning 【1】: Vector type rotational auto-tuning

***1. Values of motor rated voltage are for 200V class, double the values for 400V class.**

***2. The setting range of motor rated frequency is 0.0 to 400.0 Hz in HD Mode (00-27=0), 0.0 to 120.0 Hz in ND Mode (00-27=1) and 0.0 to 599.0 Hz in high frequency mode.**

Auto-tuning

Based on the motor nameplate set the motor rated output power (17-01), motor output rated current (17-02), motor rated voltage (17-03), motor rated frequency (17-04), motor rated speed (17-05) and number of motor poles (17-06) to perform an auto-tune.

Automatic tuning mode selection (17-00=0)

Rotational auto-tuning (17-00=0)
Perform rotational auto-tune (High performance auto-tune)

Static auto-tuning (17-00=1)
Motor does not rotate during auto-tuning and this tuning causes lower power at low speed.

Stator resistance measurement (17-00=2)
Perform stator resistance non-rotational auto-tune (V/F mode) suitable when using long motor leads. This tuning mode causes results in lower torque at low speed.

Loop tuning (17-00=4)
Performance improvement (speed and torque regulation) in vector control mode

Rotation Auto-tuning Combination (17-00=5)
This tuning mode is a combination of three auto-tuning modes, Loop tuning (17-00=4), Stator resistance tuning (17-00=2) and Rotational auto-tuning (17-00=0).

Static Auto-tune Combination (17-00=6)
This tuning mode is a combination of three auto-tuning modes, Loop tuning (17-00=4), Stator resistance measurement (17-00=2) and Static auto-tuning (17-00=1)

Motor rated output power (17-01)
Set motor power rating based on the motor nameplate, input range depends on the inverter rating (13-00).

Motor rated current (17-02)
(1) Set motor FLA based on the motor nameplate, input range depends on the inverter rating (13-00).
(2) In V/F mode, range is 10~120 % of the inverter rated current.
(3) In SLV mode, range is 25~120% of the inverter rated current.

Motor rated voltage (17-03)
Set motor voltage based on the motor nameplate. Prevent motor from saturating when the motor rated voltage is greater than the inverter input voltage (see Example 1).

Motor rated frequency (17-04)

Set motor base frequency based on the motor nameplate.

Motor rated speed (17-05)

Set motor base speed frequency based on the motor nameplate.

Number of poles (17-06)

Set number of motor poles, range is 2~16 poles.

Motor no-load voltage (17-08)

(1) Motor no-load voltage is mainly used in SLV mode, set to a value of 10~50V lower than the input voltage to ensure good torque performance at the motor rated frequency.
(2) Set 17-08 to 85~95% of the motor rated voltage. In general, the no-load voltage can be closer to the motor rated voltage for larger motors, but cannot exceed the motor rated voltage.
(3) The motor no-load voltage can be set to a value greater than the actual input voltage. In this condition the motor can only operate at relatively low frequency. If the motor operates at the rated frequency an over voltage condition may occur.
(4) The higher the motor power, the higher the no-load voltage is.
(5) A smaller no-load voltage will reduce the no-load current. When a load is applied the magnetic flux weakens and the motor current increases.
(6) A higher no-load voltage results in a higher no-load current. When a load is applied the magnetic flux weakens and the motor current increases. Increasing the magnetic flux generates back EMF and results in poor torque control.

Motor excitation current (17-09)

(1) Only available for static-type or stator resistance measurement auto-tuning (17-00=1 or 17-00=2). The data can be obtained by manual tuning. Normally this parameter does not have to be adjusted.
(2) Motor excitation current is used for rotational auto-tune.
(3) Set motor excitation current to 33% of the motor rated current. During auto-tune the keypad will display “Atune“ to indicate Auto-tuning is in progress. When the motor is successfully tuned, the keypad shows "AtEnd".

Error history of automatic tuning (17-11)

(1) If auto-tuning fails the keypad will display the AtErr" message and the auto-tune cause is shown in parameter 17-11.
(2) Refer to section 10 for auto-tuning troubleshooting and possible causes.

Note:

The motor tuning error history (17-11) shows the tuning result of the last auto-tune. Tuning history does not show any error when auto-tune is aborted or when the last auto-tune was successful.

Proportion of Motor Leakage Inductance (17-12)

(1) Parameter can only be set when using stator resistance auto tuning (17-00=2).

(2) Static non-rotational and rotational type auto tuning automatically measure the proportion of motor leakage inductance so there for this parameter is not active in these tuning modes.

(3) Default value is 4%. It is required to perform an auto tune to save the adjusted value into parameter 02-33.

Motor Slip Frequency (17-13)

(1) Parameter can only be set when using stator resistance auto tuning (17-00=2).

(2) Static non-rotational and rotational type auto tuning automatically measure the proportion of motor leakage inductance so there for this parameter is not active in these tuning modes.

(3) It is required to perform an auto tune to save the adjusted value into parameter 02-34.

Example 1:

Motor rated voltage (440V/60Hz) is higher than the inverter input voltage (380V/50 Hz).

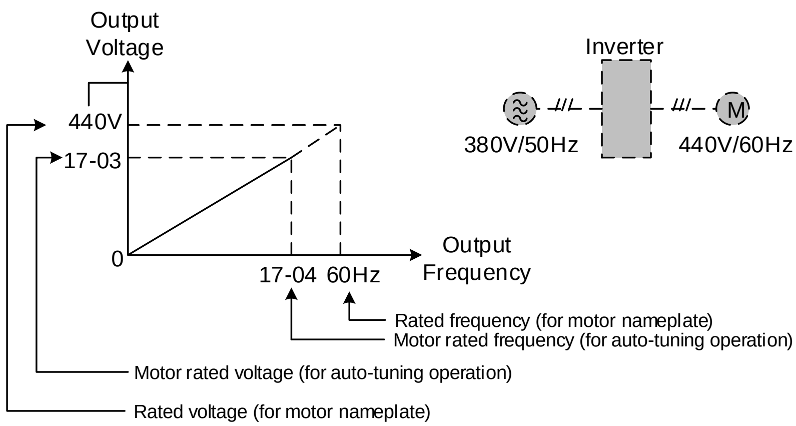


Figure 4.3.98 Rated voltage and frequency settings

Step 1: Select auto-tuning mode (17-00) and set motor rated output power (17-01) and motor rated current (17-02) based on the motor nameplate data.

Step 2: Set the motor rated voltage (17-03) to 440V based on the motor nameplate data.

Step 3: Set the motor rated frequency (17-04) to 60Hz

Step 4: Set the motor rated speed (17-05) and number of motor poles (17-06)

Step 5: Set the motor no-load voltage (17-08) to 360V and value 20V lower than input voltage when using torque control.

Step6: Execute auto-tuning by setting auto-tuning parameter 17-10 to 1, next go to main screen and press RUN to start auto-tuning. The value of motor rated frequency (17-04) is automatically set the base frequency of motor 1. The inverter will automatically adjust the value of maximum output frequency of motor 1(01-02) to the same value as base frequency of the motor 1 (01-12) if the maximum output frequency set in parameter 01-02 is different from the base frequency of the motor 1 (01-12),

When the inverter input voltage (or frequency) is higher than the motor rated voltage (or frequency), set the motor rated voltage (17-03) and the motor rated frequency (17-04) to the values of the motor nameplate.

Example 2:

The inverter input voltage and frequency (460V/50Hz) are higher than the motor rated voltage and frequency (380V/33Hz), set 17-03 to 380V (rated motor voltage) and 17-04 to 33Hz (motor rated frequency).

Rotational Auto-tuning (17-14)

(1) The parameter can only be set when rotational auto-tuning (17-00=0) or rotational auto-tuning combination (17-00=5) is selected.

(2) VF type rotational auto-tuning (17-14=0) is best suited for unloaded IM motors

(3) Vector type rotational auto-tuning (17-14=1) is best suited for unloaded vector duty IM motors. This tuning mode can be used for high speed motors. Use Vector type rotational auto-tuning if VF type rotational auto-tuning (17-14=0) is unsuccessfully.

(4) Vector type rotational auto-tuning (17-14=1) measures the motor no-loading current to avoid motor current oscillation that can be present in V/F mode.

18 Slip Compensation Parameters

18-00	Slip compensation gain at low speed
Range	【0.00~2.50 】
18-01	Slip compensation gain at high speed
Range	【-1.00~1.00】
18-02	Slip compensation limit
Range	【0~250】%
18-03	Slip compensation filter
Range	【0.0~10.0】Sec
18-04	Regenerating slip compensation selection
Range	【0】: Disabled 【1】: Enabled
18-05	FOC delay time
Range	【1~1000】ms
18-06	FOC gain
Range	【0.00~2.00】

Slip compensation automatically adjusts the output frequency based on the motor load to improve the speed accuracy of the motor mainly in V/F mode.

The slip compensation function compensates for the motor slip to match the actual motor speed to the reference frequency.

Slip compensation adjustment in V/F mode

18-00: Slip compensation gain at low speed

The adjustment of slip compensation gain at low speed follows the below procedure:

1. Set the rated slip and the motor no-load current (02-00).
2. Set the slip compensation (18-00) to1.0 (factory default setting is 0.0 in V / F control mode)
3. For the operation with a load attached, measure the speed and adjust the slip gain (18-00) accordingly (increase in steps of 0.1).
   - If the motor speed is lower than frequency reference, increase the value of 18-00.
   - If the motor speed is higher than frequency reference, decrease the value of 18-00.

When the output current is greater than the no-load current (02-00), the slip compensation is enabled and the output frequency increases from f1 to f2. Refer to Fig.4.3.99, the slip compensation value is calculated as follows:

$$\text{Slip Compensation Value} = \text{Motor rated slip frequency} \times \frac{[\text{ Output current (12-18) - no-load current of Motor 1 (02-00) }]}{[\text{ Rated current of Motor 1(02-01) - no-load current of Motor 1 (02-00) }]}$$

$$\text{Motor Rated Slip Frequency (f)} = \frac{\text{(Motor no-load synchronous speed-Motor full load rated speed)(N)} \times \text{Motor Poles (P)}}{120}$$

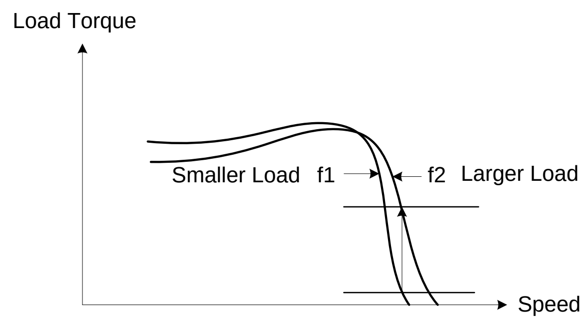


Figure 4.3.99 Slip compensation output frequency

18-01: Slip compensation gain at high speed

(1) It is not required to adjust the Slip compensation gain at high speed for a loaded motor.

(2) After adjusting parameter 18-00 it is recommended to increase the reference frequency and check the motor speed. Increase the value of 18-01 to adjust the slip compensation in case the motor speed does not match.

(3) To reduce speed errors Increase the motor rated frequency (01-12 base frequency) and increase the value of 18-01.

(3) Compared to 18-00, 18-01 serves as a variable gain for the full speed range.

(4) If the speed accuracy becomes worse due to an increase in motor temperature it is recommended to use a combination of 18-00 and 18-01 to adjustment motor slip.

Parameter 18-01 determines the slip compensation at the motor rated speed and is calculated follows:

$$\text{Slip Compensation Gain} = (\text{Slip Compensation Gain at low speed} + \text{Slip Compensation Gain at high speed}) \times \frac{\text{Reference Frequency}}{\text{Motor rated frequency (01-12)}}$$

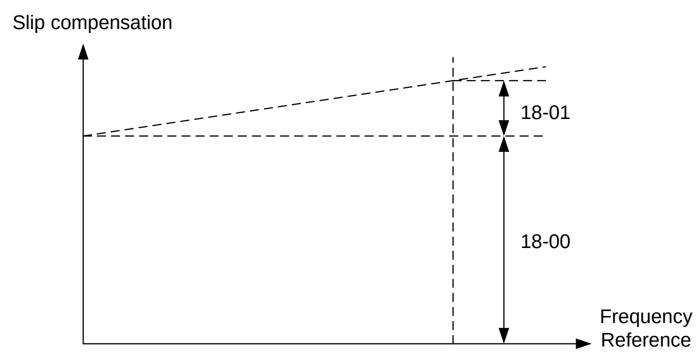


Figure 4.3.102 Parameter 18-00/18-01 Slip compensation gain versus frequency reference

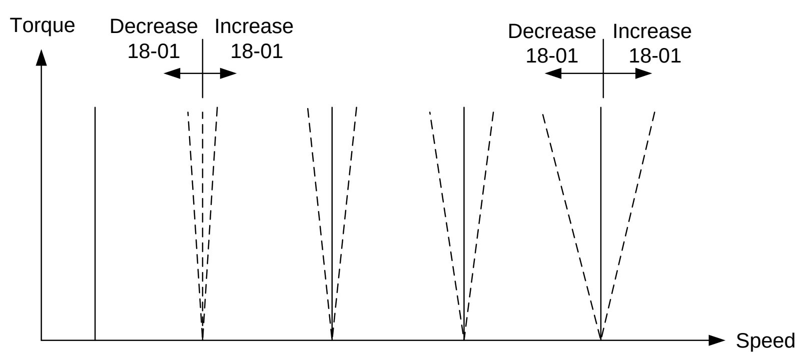


Figure 4.3.103 Parameter 18-01 Effect on speed/torque curve

18-02: Slip compensation limit

Sets slip compensation limit in constant torque and the constant power operation (Figure 4.3.100). If 18-02 is set to 0%, the slip compensation limit is disabled.

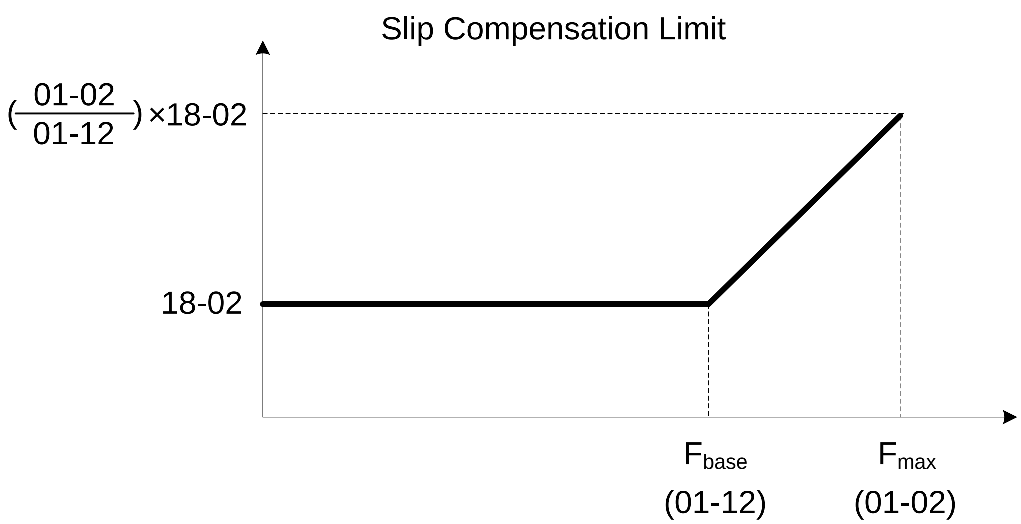


Figure 4.3.100 Slip compensation limit

When the slip compensation gain 18-00 at low speed is adjusted, and the actual motor speed is still lower than the reference frequency, the motor may be limited by the slip compensation limit.

18-03: Slip compensation filter

Sets slip compensation filter time in V/F mode

18-04: Regenerating slip compensation selection

Enable or disable slip compensation during regeneration.

Enable slip compensation during regeneration (18-04=1) in case speed accuracy is required when experiencing regeneration caused by deceleration (SLV mode). When the slip compensation function is used regenerative energy might increase temporarily (18-04=1) and a braking module might be required.

SLV mode adjustment

18-00: Slip compensation gain

a) Slip compensation can be used to control the full range speed accuracy under load condition.
b) If the output frequency is lower than 2 Hz and the motor speed decreases, increase the value of 18-00.
c) If the output frequency is lower than 2 Hz and the motor speed increases, reduce the value of 18-00.

Slip compensation gain uses a single value for the full speed range. As a result the slip compensation accuracy at low speed is high but slight inaccuracies might occur at high speeds. Slip compensation gain is fixed for the full speed range. Adjust 18-00 or 18-01 to improve speed accuracy at higher speed, however adjusting these parameters might impact the accuracy at lower speeds.

The impact of 18-00 on the speed and torque are shown in figure 4.3.101

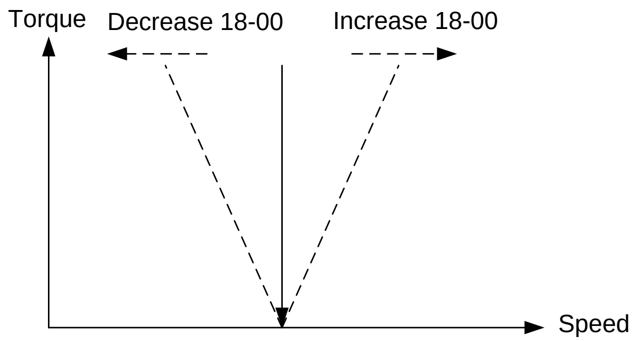


Figure 4.3.101 18-00 Effect on the torque and speed

18-05: FOC (Flux Orient Control) delay time (18-05)

In the SLV mode, the slip compensation of the magnetic flux depends on the torque current and excitation current. If the motor load rises above 100% while running at the motor rated frequency, the motor voltage and resistance drop sharply, which may cause the inverter output to saturate and current jitter may occur.

The magnetic flux slip compensation will independently control the torque current and the excitation current to prevent increasing and decreasing of the current (jitter). For slow speed or fixed speed operation, 18-05 may be increased. For fast operation adjust 18-06.

18-06: Slip compensation gain (18-06)

If the motor is jittering at the rated frequency under full load, the value of 18-06 may gradually be reduced to zero to reduce current jitter.

20 Speed Control Parameters

20-00	**ASR gain 1**
Range	【0.00~250.00】
20-01	**ASR integral time 1**
Range	【0.001~10.000】**Sec**
20-02	**ASR gain 2**
Range	【0.00~250.00】
20-03	**ASR integral time 2**
Range	【0.001~10.000】**Sec**
20-04	**ASR integral time limit**
Range	【0~300】**%**
20-07	**Selection of acceleration and deceleration of P/PI**
Range	【**0**】**:** PI speed control will be enabled only in constant speed. For the speed acceleration and deceleration, only use P control. 【1】**:** Speed control is enabled either in acceleration or deceleration.
20-08	**ASR delay time**
Range	【0.000~0.500 】**Sec**
20-09	**Speed Observer Proportional(P) Gain1**
Range	【0.00~2.55】
20-10	**Speed Observer Integral(I) Time 1**
Range	【0.01~10.00】**Sec**
20-11	**Speed Observer Proportional(P) Gain2**
Range	【0.00~2.55】
20-12	**Speed Observer Integral(I) Time 2**
Range	【0.01~10.00】**Sec**
20-13	**Low-pass filter Time constant of speed feedback 1**
Range	【1~1000】**ms**
20-14	**Low-pass filter Time constant of speed feedback 2**
Range	【1~1000】**ms**
20-15	**ASR gain change frequency 1**
Range	【0.0~599.0】**Hz**
20-16	**ASR gain change frequency 2**
Range	【0.0~599.0】**Hz**
20-17	**Torque compensation gain at low speed**
Range	【0.00~2.50】
20-18	**Torque compensation gain at high speed**
Range	【-10~10】**%**
20-33	**Detection Level at Constant Speed**
Range	【0.1~5.0】**%**

Parameter 20-33 is used when 20-07 is set to 0 and frequency command source is set to analog input. A noisy analog input signal might cause a problem where the inverter determines that the operation does not reach its constant speed. Adjust parameter 20-33 according to avoid this situation from occurring.

The following diagram is an overview of the automatic speed regulator (ASR) block.

SLV control mode:

The ASR function adjusts the output frequency to control the motor speed to minimize the difference between the frequency reference and actual motor speed.

The ASR controller in SLV mode uses a speed estimator to estimate the motor speed. In order to reduce speed feedback signal interference, a low-pass filter and speed feedback compensator can be enabled.

The ASR integrator output can be disabled or limited (03-00 to 03-05= 43). The ASR output is passed through a low-pass filter.

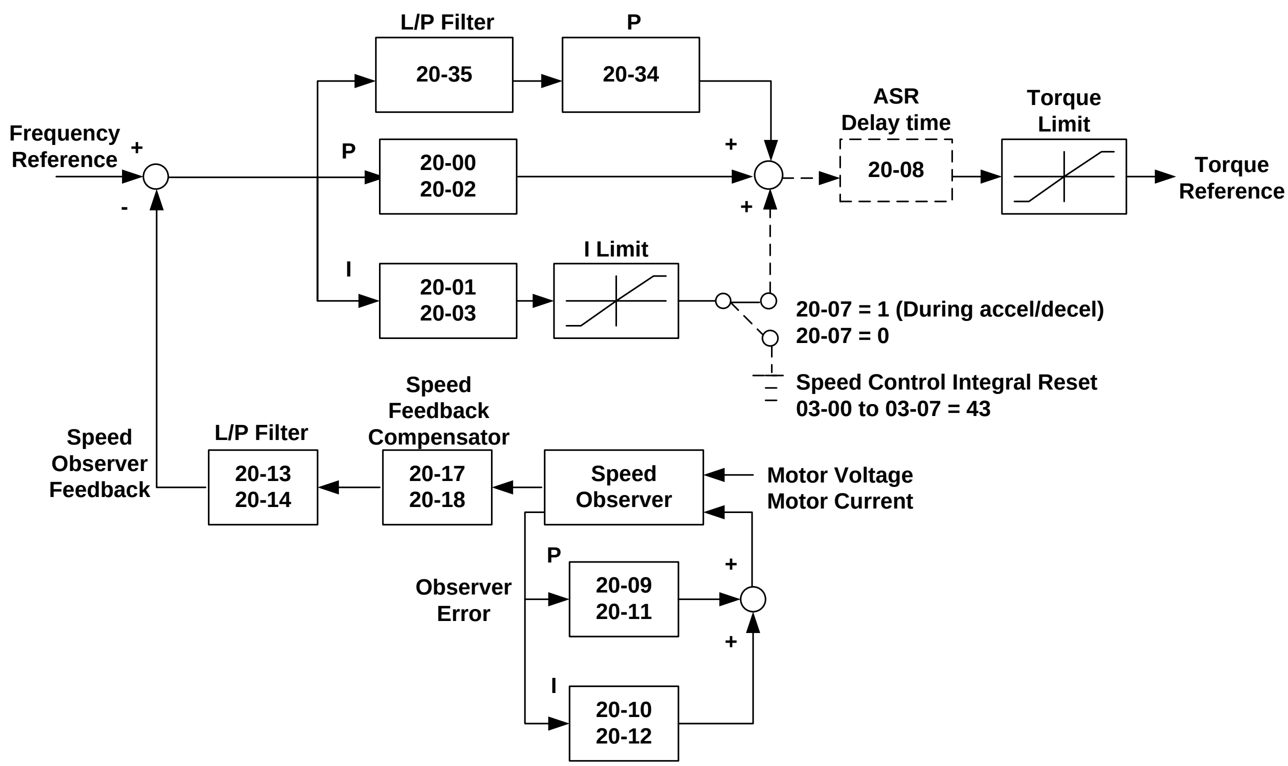


Figure 4.3.108 ASR speed control diagram (SLV mode)

ASR Setting (SLV/PMSLV control mode)

In SLV mode the ASR gain is divided into a high-speed and low-speed section. The speed controller has a high-speed gain 20-00/20-01 and a low-speed gain 20-02/20-03 that can be set independently.

a) The high/low switch frequency can be set with parameter 20-15 and 20-16. Similar to the ASR gain, the speed estimator has a high-speed gain 20-09/20-10 and a low-speed gain 20-11/20-12.
b) The speed estimator has a low-pass filter to reduce the speed feedback interference, parameter 20-13 and 20-14 are active at high speed as well as low speed. The switch between the high-speed and the low-speed is set by parameter 20-15 and 20-16.
c) 20-17 sets the low-speed compensation gain of the speed feedback.
d) 20-18 sets the high-speed compensation gain of the speed feedback.
e) When the frequency reference rises above the value set in 20-16, the ASR gain used is set by parameters 20-00 and 20-01.
f) When the frequency reference falls below the value set in 20-15, the ASR gain used is set by parameters 20-02 and 20-03.
g) Gain time constant is adjusted linearly when the speed command falls within the range of 20-15 to 20-16, for a smooth operation.

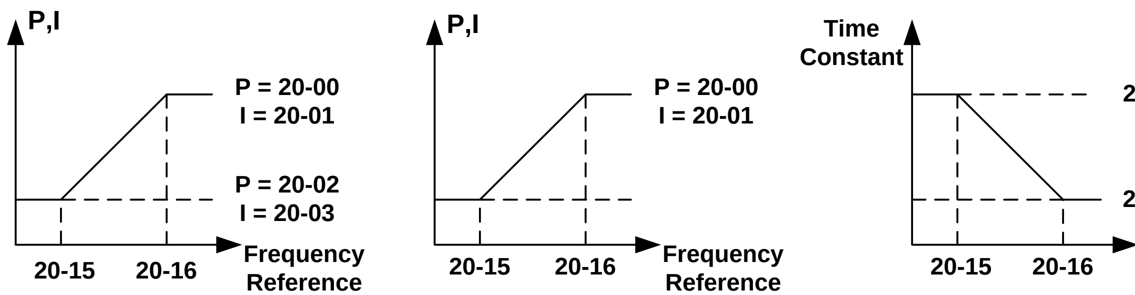


Figure 4.3.112 ASR gain setting (SLV mode)

Tuning the speed control gain

During ASR gain tuning, the multi-function analog output (AO1 terminal) can be used to monitor the output frequency and motor speed (as shown in figure 4.3.112).

SLV mode gain tuning (20-00~20-03, 20-09~20-18)

1) Tune the low-speed ASR P and I gain 20-02 ~ 20-03, make sure the reference frequency is set below the value of parameter 20-15.
2) Tune the high-speed ASR PI gain 20-00~20-01, make sure the reference frequency is above the value set in parameter 20-16 value.
3) Both low-speed ASR gain and the high-speed gain can be set to the same values and only require to be adjusted in case of system instability.
4) reduce the low-pass filter time constant 20-13~20-14 to decrease the bandwidth of the feedback system and re-tune the ASR gain, in case tuning of the ASR P and I gain 20-00~20-03 does not improve the system response.
5) Tune low-speed low-pass filter time constant 20-14, make sure the reference frequency is below parameter 20-15 value.
6) Tune high-speed low-pass filter time constant 20-13 at frequency reference, make sure the reference frequency is above parameter 20-16 value.
7) Increasing the low-pass filter time constant can limit the bandwidth of the speed feedback system and may reduce the system response. Increasing the low-pass time reduces the speed feedback signal interference but may results in sluggish system response when the load suddenly changes. Adjust the low-pass filter time if the load stays fairly constant during normal operation. The low bandwidth of the speed feedback must be supported by the low gain of ASR to ensure the stable operation.
8) Decreasing the low-pass filter time constant may increase the bandwidth of the speed feedback and the system response. Decreasing the low-pass time may increase the speed feedback interference resulting in system instability when the load suddenly changes. Decrease the low-pass filter time is a quick system response is required for rapidly changing loads. The high bandwidth of the speed feedback allows for a relative high ASR gain.
9) In case tuning 20-00~20-03 and the low-pass filter time constant 20-13~20-14 do not improve the system response time, tuning the PI gain 20-09~20-12 of the speed estimator may be required.
10) Setting a high gain for the speed estimator (high proportion (P) gain and small integral (I) time) increases the bandwidth of the speed feedback, but may cause speed feedback interference resulting in system instability.
11) Setting a low gain for the speed estimator (small proportion (P) gain and high integral time) decreases the bandwidth of the speed feedback, may improve speed feedback interference resulting in a more stable system.
12) The default values for the ASR can be used in most applications, no adjustment is required. Adjusting the low-pass filter time and speed estimator gain requires a good understanding of the overall system. If a high-speed system response in combination with stable operation is required consider using SLV control mode.
13) Parameter 20-15 sets the gain switch frequency at low-speed and parameter 20-16 sets the gain switch frequency at high-speed.
14) Operating at a speed below 20-15 will result in an increased excitation current for low-speed operation accuracy. When the frequency reference rises above 20-16, the inverter will output the rated excitation current at the no-load voltage (02-19).
15) For general purpose applications parameter 20-15 should be set to a value of 5~50% of the motor base frequency. If this value is too high, the inverter output may saturate. Parameter 20-16 should be set to a value of 4Hz or more above the value of 20-08.
16) When experiencing speed jitter at high speed and stable operation during mid-range speed while operating a heavy load (>100%), it is recommended to reduce the no-load voltage (02-19) or tune the FOC parameters (18-05 ~ 18-06).
17) Parameter 20-17 and 20-18 are for compensating speed feedback at low speed and high speed.

18) Use parameter 20-17 to adjust the torque compensation gain for the low speed range. By tuning 20-17 an offset is added to the torque-speed curve. Increase 20-17 when the no-load speed is lower than the frequency reference. Decrease 20-17 when the no-load speed is higher than the frequency reference.

The effect on the speed-torque curve from 20-17 is shown in the following figure

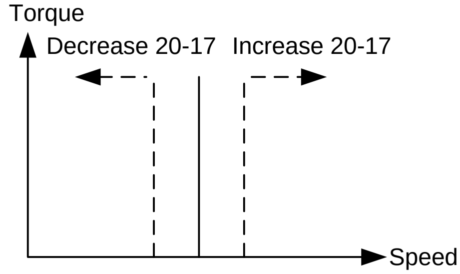


Figure 4.3.115 20-17 Effect on the torque-speed curve

Use parameter 20-18 to adjust the torque compensation gain for medium to high speed range. For most general purpose applications it is not necessary to adjust the 20-18. The effect on the speed-torque curve by parameter 20-18 is shown in figure 4.3.116.

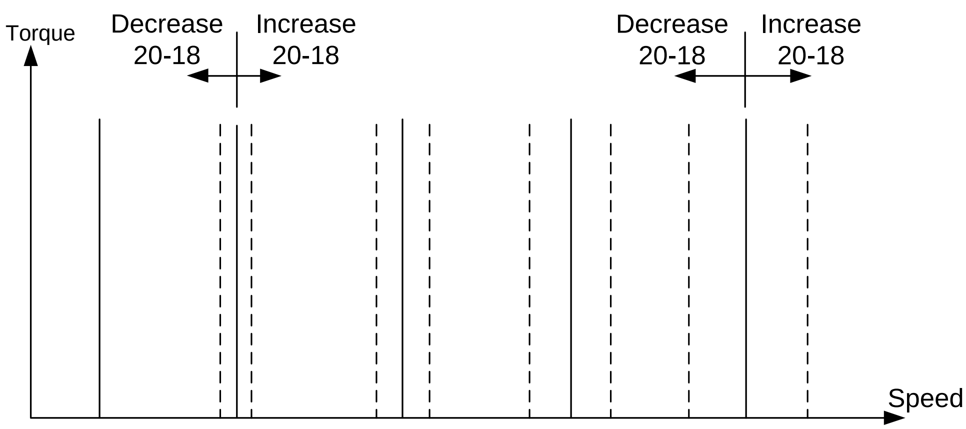


Figure 4.3.116 Effect on the torque-speed curve by parameter 20-18

20-04: ASR integral limit

Setting the ASR integral limit to a low value may prevent a large system response when the load suddenly changes.

20-08: ASR main delay time

(1) Does not require to be adjusted for general purpose applications.

(2) When the value of 20-08 is set high, speed response and system response will decrease and therefore improve system stability.

20-34	**Compensation Gain of Derating**
Range	【0 ~25600】
20-35	**Compensation Time of Derating**
Range	【0~30000】**ms**

This gain effect is the same as ASR proportional gain (20-00, 20-02). And if this parameter is coupled with low-pass filter time constant (20-35), it can avoid oscillation. It is suggested that the setting value of parameter 20-34 is 30~50.

This time constant is used for suppressing the oscillation produced by 20-34. But too large compensation time constant will cause slower output response and then is unfavorable for turned compensation. It is suggested that the setting value of parameter 20-35 is 50~100ms.

Decreasing the torque compensation value can reduce the response of the ASR during a momentary change in load. Refer to Fig. 4.3.108 & Fig. 4.3.109.

20-34 Compensation Gain During Speed Drop:

The effect of parameter 20-34 is the same as the proportional gain of the ASR (20-00, 20-02) but active only for the time specified in 20-35 for large speed fluctuation to prevent system instability.

20-35 Compensation Time During Speed Drop:

This parameter sets the time constant used to prevent system instability caused by parameter 20-34. An increased compensation time can lead to a slower output response which is can affect derating compensation in a negative way.

The recommended setting value of 20-34 is between 30~50 and for 20-35 between 50~100ms.

21-05	Positive torque limit
Range	【0~300】%
21-06	Negative torque limit
Range	【0~300】%
21-07	Forward regenerating torque limit
Range	【0~300】%
21-08	Reversal regenerating torque limit
Range	【0~300】%

SLV and PMSLV control mode offer four torque limits that can be adjusted independently:

I. Positive torque limit in forward direction (21-05 positive torque limit)
II. Positive torque limit of reverse direction (21-06 negative torque limit)
III. Negative torque limit in reverse direction (21-07 forward regenerating torque limit)
IV. Negative torque limit in forward direction (21-08 reversal regenerating torque limit)

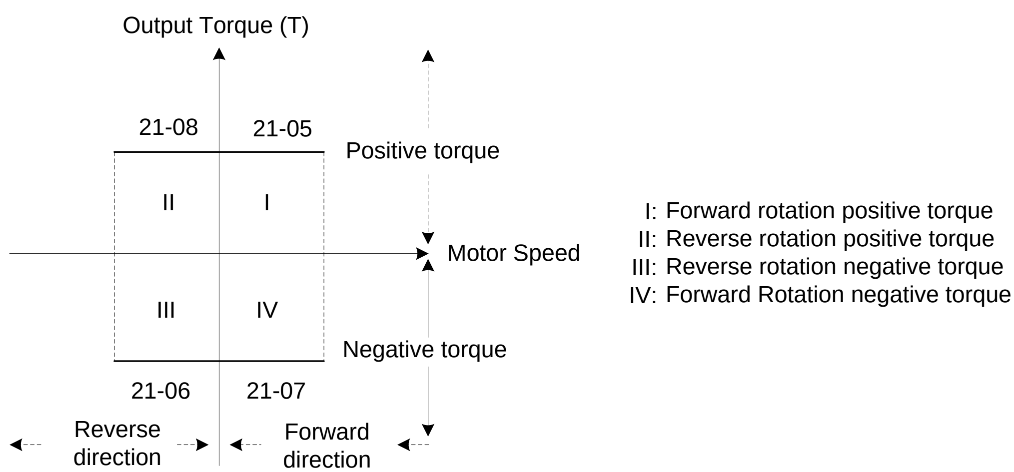


Figure 4.3.117 Torque limit setting

22 PM Motor Parameters

22-00	PM Motor Rated Power
Range	【0.00~600.00】kW
22-02	PM Motor Rated Current
Range	25%~200% inverter's rated current
22-03	PM Motor's Pole Number
Range	【2~96】Poles
22-04	PM Motor's Rated Rotation Speed
Range	【6~65535】rpm
22-05	PM Motor's Maximum Rotation Speed
Range	【6~65535】rpm
22-06	PM Motor Rated Frequency
Range	【4.8~599.0】Hz

The PM parameter group can be restored to factory default be initializing the inverter (13-08). Set the motor rating before initializing the inverter (13-00).

22-00: PM motor rated power

Set the motor power according to the motor nameplate.

22-02: PM motor rated current

Set the motor full load according to the motor nameplate.

22-03: PM motor pole number

Set the number of motor poles according to the motor nameplate.

22-04: PM motor rated speed

Set parameter 22-04 or 22-06, the inverter will automatically calculate one or the other.

Set the motor rated speed in rpm according to the motor nameplate.

Note:
Only set parameter 22-04 or 22-06, the inverter will automatically calculate the other one.
Formula (22-04) = 120*f (22-06) / Number of Poles (22-03)

22-05: PM motor maximum rotation speed
Set the maximum motor rated speed in rpm according to the motor nameplate.

22-06: PM motor rated frequency

Set the motor rated frequency according to the motor nameplate.

Only one of the two values is required, either PM motor rated speed (22-04) or PM motor rated frequency (22-06), the inverter will automatically calculate the other upon entering the data based on the formula below:

$$\text{(PM motor rated speed) N} = \frac{120 \text{ x f (PM motor rated frequency}}{\text{P (PM motor pole number)}}$$

22-10	PM SLV Start Current
Range	【20.0 ~ 120.0】% (Motor Rated Current)
22-11	**I/F Mode Start Frequency Switching Point**
Range	【1.0 ~ 20.0】%
22-14	**Armature Resistance of PM Motor**
Range	【0.001 ~ 30.000】**Ω**
22-15	**D-axis Inductance of PM Motor**
Range	【0.01 ~ 300.00】**mH**
22-16	**Q-axis Inductance of PM Motor**
Range	【0.01 ~ 300.00】**mH**
22-18	**Flux-Weakening Limit**
Range	【0 ~ 100】**%**
22-21	**PM motor tuning**
Range	【0】: PM Motor Tuning is not Active 【1】: Parameter Auto-tune (for PMSLV Tuning)
22-23	**PM SLV acceleration time**
Range	【0.1~10.00】 Sec

22-10: PMSLV Start Current

Set the torque current at start up as % of motor rated current.

22-11: I/F Mode Start Frequency Switching Point

Function for the switching from open-loop to closed-loop in PMSLV mode. The unit is percentage of rated speed of the motor. It recommended setting this parameters to a value greater than 5% for 400V and a value greater than 10% for 200V.

22-14: Armature Resistance of PM Motor

Set resistor for each phase of the motor in increments of 0.001Ω. Value is set automatically during motor tuning (22-21).

22-15: D-axis Inductance of PM Motor

Set motor D-axis inductance in increments of 0.001mH. Value is set automatically during motor tuning (22-21).

22-16: Q-axis Inductance of PM Motor

Set motor's Q-axis Inductance in increments of 0.001mH. Value is set automatically during motor tuning (22-21).

22-18: Flux-Weakening Limit

Sets the flux-weakening limit as a percentage of the motor rated current. If the motor maximum rotation speed (22-05) is set to a value greater than the motor rated rotation speed (22-04) the inverter will automatically enable flux-weakening control.

22-21: PM Motor Tuning

WARNING!

Sudden start: The inverter and motor may start unexpectedly during Auto-Tuning, which could result in death or serious injury. Make sure the area surrounding of the motor and load are clear before proceeding with Auto-Tuning.

WARNING! Electric Shock Hazard

High voltage is applied to the motor when performing an auto-tune, even when the motor is stopped, which could result in death or serious injury. Do not touch the motor before performing the auto-tuning procedure is completed.

WARNING! Holding Brake

Do not perform an auto-tuning procedure when the motor is connected to a brake this may result in incorrect motor data calculation. Disconnect the motor and the load and confirm that the motor can freely run.

(1) Set parameter 00-00=5, and select tuning mode with parameter 22-21.
(2) Next press the enter key to go to the PM motor tuning screen. The keypad will display "IPrdy" (Ready to Tune).
(3) Press run key to start the PM motor tuning. The keypad will display “IPtun" during auto-tune.
(4) If the motor tuning is successfully, the message of "IPEnd " will be displayed. If auto-tune is aborted with the stop key, the operator will displays " IPbrd " (PM motor tuning aborted).

Note:

Once an auto-tune is performed successfully it is not required to perform motor tuning again when powering up the inverter.

22-23: PM SLV acceleration time

PM SLV acceleration time is the acceleration time used to go from static to I/F Mode Start Frequency Switching Point (22-11).

Note: In case of an error or vibration in PMSLV mode increase or decrease acceleration time.

22-25: Initial position detection of PM motor

Use in PMSLV control mode only. When 22-25=1, the inverter will automatically detect the initial position of motor rotor while the motor running to prevent the motor from running in the opposite direction.

When 22-25=0, detection function is disabled, inverter will not perform any detection while the motor is running.

5. Check motor rotation and direction

This test is to be performed solely from the inverter keypad. Apply power to the inverter after all the electrical connections have been made and protective covers have been re-attached. At this point, **DO NOT RUN THE MOTOR**, the keypad should display as shown below in Fig. 5.1 and the speed reference **5.00Hz** should be blinking at the parameter code "05-01".

Important: Motor rotation and direction only applies to standard AC motors with a base frequency of 60Hz. For 50Hz or other frequency AC motors please set V/F pattern in group 01 before running the motor.

LED Operator

Fig 5.1: Keypad (Stopped)

Fig 5.2: Keypad (Running)

Next press the **RUN** key, see Fig 5.2. The motor should now be operating at low speed running in forward (clockwise) direction. Next press **STOP** key to stop the motor.

If the motor rotation is incorrect, power down the inverter.

After the power has been turned OFF, wait <u>at</u> <u>least</u> <u>ten minutes</u> until the charge indicator extinguishes <u>completely</u> before touching any wiring, circuit boards or components.

Using Safety precaution, and referring to section 3.9 exchange any two of the three output leads to the motor (U/T1, V/T2 and W/T3). After the wiring change, repeat this step and recheck motor direction.

LCD Operator (Optional Keypad)

Fig 5.1: Keypad (Stopped)

Fig 5.2: Keypad (Running)

Next press the **RUN** key, see Fig 5.2. The motor should now be operating at low speed running in forward (clockwise) direction. The parameter code 12-17 shown at the bottom left corner of the screen will change from 12-17=000.00Hz to 12-17=005.00Hz. Next press **STOP** key to stop the motor.

If the motor rotation is incorrect, power down the inverter.

After the power has been turned OFF, wait <u>at</u> <u>least</u> <u>ten minutes</u> until the charge indicator extinguishes <u>completely</u> before touching any wiring, circuit boards or components.

Using Safety precaution, and referring to section 3.8 exchange any two of the three output leads to the motor (U/T1, V/T2 and W/T3). After the wiring change, repeat this step and recheck motor direction.

6. Speed Reference Command Configuration

The inverter offers users several choices to set the speed reference source. The most commonly used methods are described in the next sections.

Frequency reference command is selected with parameter 00-05.

00-05: Main Frequency Command (Frequency Source)

This function sets the frequency command source.

Setting Range: 0 to 7

To set parameter 00-05:
- After power-up press the **DSP/FUN** key
- Select **00 Basic Fun**
- Press **READ/ ENTER** key
- Select parameter -05 with the **UP/DOWN** ▲ and ▼ keys and press the **READ/ ENTER** key.

In the parameter list move cursor to 00-05 with the **UP/DOWN** keys and press **READ/ ENTER** key to select.

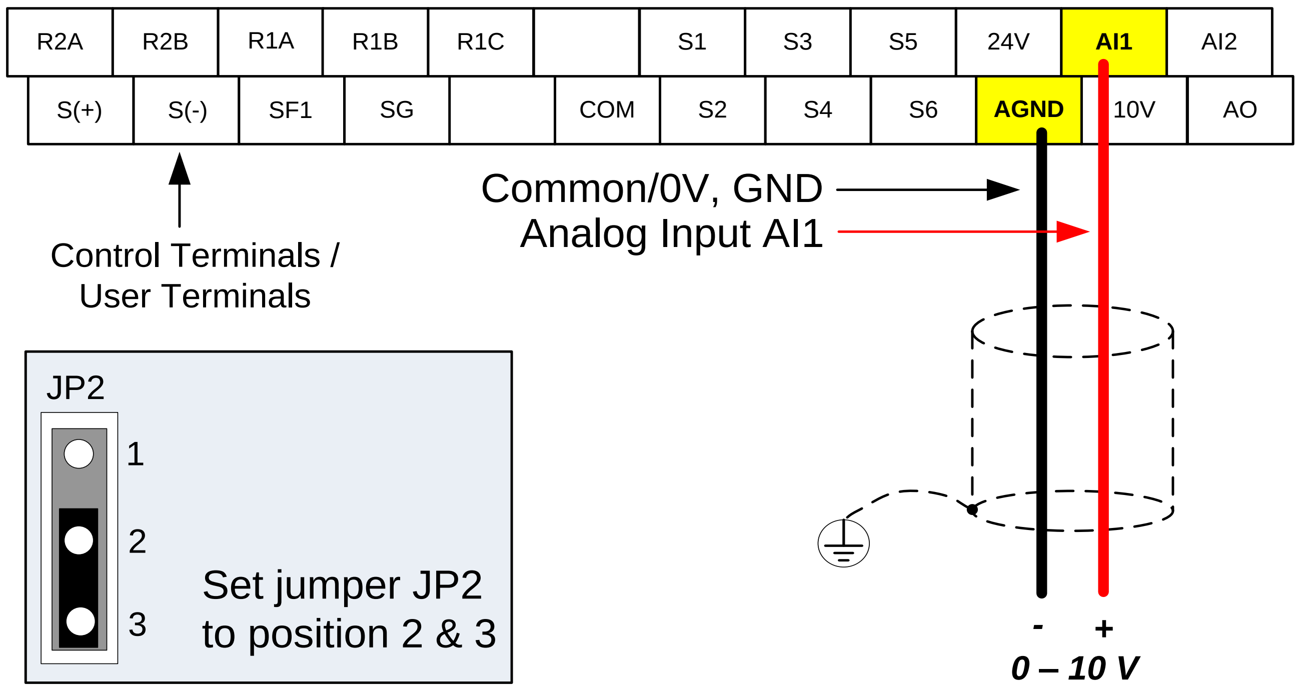
00-05	Main Frequency Command Source Selection
Range	【0】:Up/Down of Keypad 【1】:Potentiometer on Keypad 【2】:External AI1 Analog Signal Input 【3】:External AI2 Analog Signal Input 【4】:External Up/Down Frequency Control 【5】:Communication Setting Frequency 【6】:Reserved 【7】:Pulse Input

6.1 Reference from Keypad

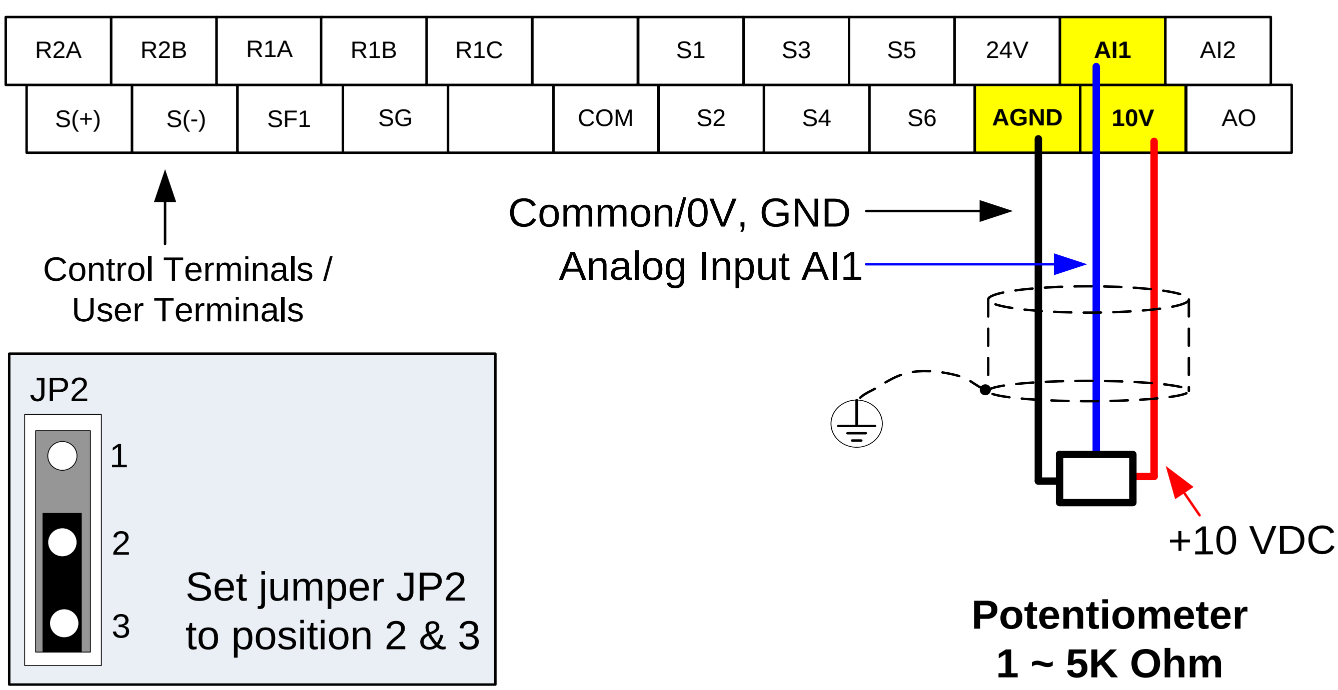
Speed reference from the keypad is the default setting. Press the **READ/ ENTER** key first and use the </RESET, ▲ and ▼ keys to change the speed reference.

6.2 Reference from External Analog Signal (0-10V / 4-20mA)

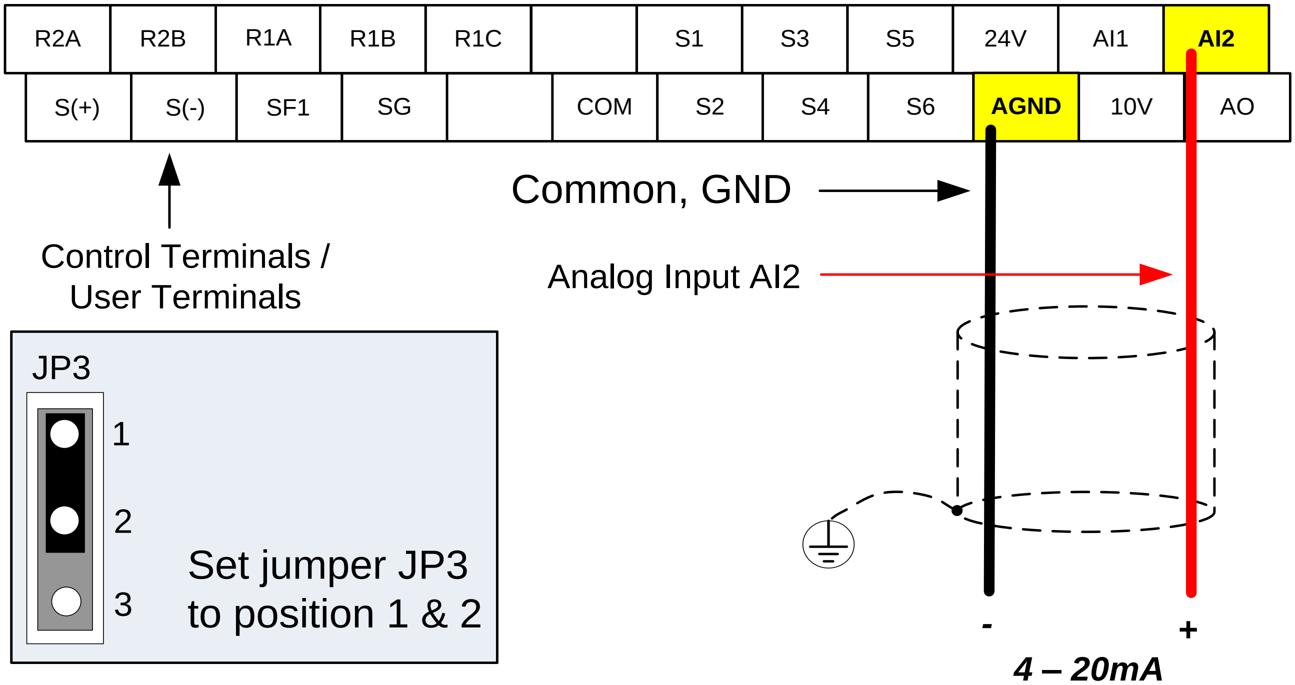
Analog Reference: 0 – 10 V (Setting 00-05 = 2)



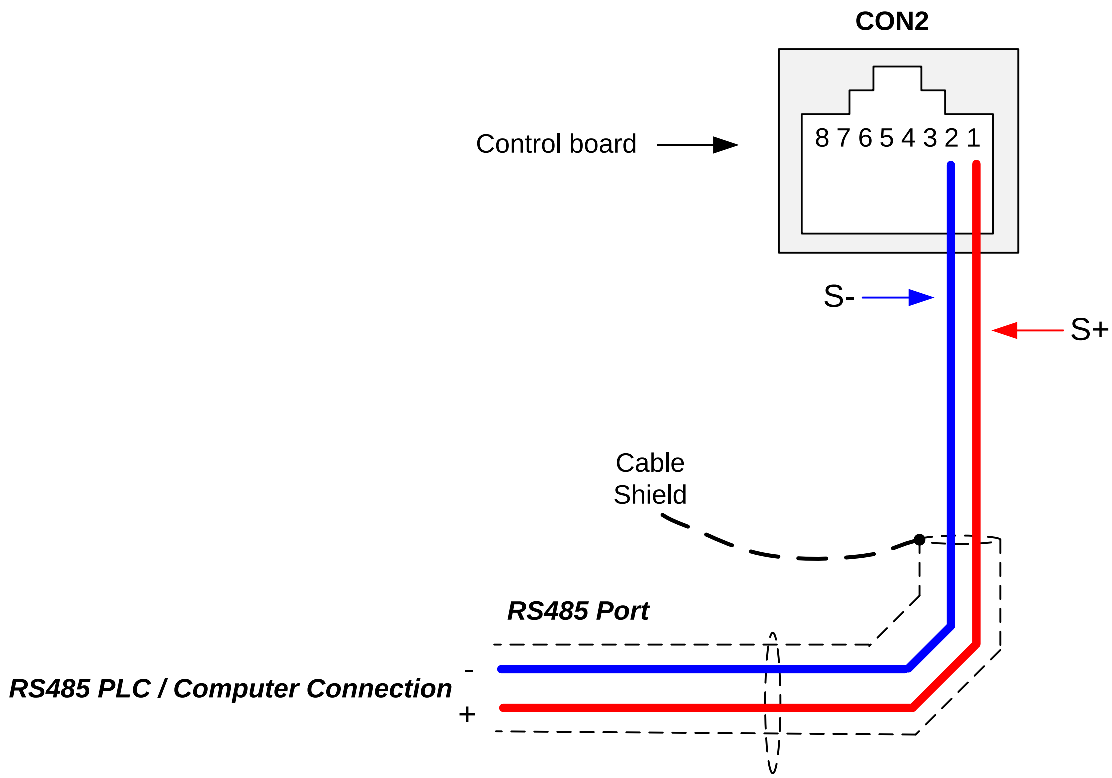
Analog Reference: Potentiometer / Speed Pot (Setting 00-05 = 2)



Analog Reference: 4 – 20mA (Setting 00-05 = 2)



6.3 Reference from Serial Communication RS485 (00-05=5)



To set the speed reference for the inverter via serial communication parameter 00-05 has be set to “5” for frequency command via serial communication.

Default Communication Setting is: Address “1”, 9600 Bits/sec, 1 Start Bit, 1 Stop Bit, and No Parity

The serial communication link function uses RS485 Modbus RTU protocol and allows for:

1) Monitoring (data monitoring, function data check).
2) Frequency setting.
3) Operation command (FWD, REV, and other commands for digital input).
4) Write function data.

Frequency Reference Command Register

Inverter Frequency Reference Register: 2502 (Hexadecimal) - Bit 0 – Bit 15: 0.00 ~ 599.00 Hz

Examples:

Frequency Reference Command: 10.00 Hz (Inverter Node Address: 01)

Command String (hexadecimal): 01 06 25 02 03 E8 23 B8

To set the frequency reference to 10.00, a value of ‘1000’ (03E8h) has to be send to the inverter.

Frequency Reference Command: 30.00 Hz (Inverter Node Address: 01)

Command String (hexadecimal): 01 06 25 02 0B B8 24 44

To set the frequency reference to 30.00, a value of ‘3000’ (0BB8h) has to be send to the inverter.

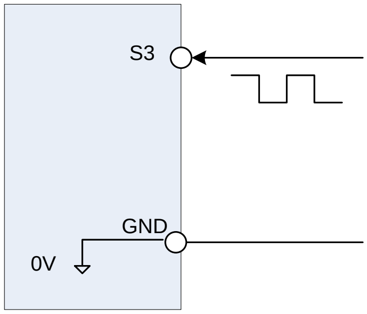
Frequency Reference Command: 60.00 Hz (Inverter Node Address: 01)

Command String (hexadecimal): 01 06 25 02 17 70 2D 12

To set the frequency reference to 60.00, a value of ‘6000’ (1770h) has to be send to the inverter

Note: The last 2 bytes of the command strings consist of a CRC16 checksum, please refer to section 4.5 of the instruction manual for additional information.

6.4 Reference from Pulse Input (00-05=7)



Serial pulse input
(Input resistance : 3.89 K)

Specifications
Low Input Level：0.0 to 0.5 V
High Input Level：4.0 to 13.5 V
Duty cycle：(ON / OFF) 30 % to 70%
Pulse Input Frequency Range：50 to 25 KHz

Set Pulse Input Setup as Frequency Reference

Set parameter 00-05 to 7 and 03-02 to 26 to use the pulse input terminal S3 as the frequency reference source. Next set the pulse frequency (03-27).

When 03-02=26, S3 is used for frequency measurement.

Set the following parameters to use pulse input for speed command:

00-05=7

03-02=26

03-28=1 (adjust if needed)

Example 1:
Pulse input frequency is 20Hz, frequency upper limit is 50Hz (00-12=50.00), and 03-28=1.
Inverter frequency is 20.00Hz

Example 2:
Pulse input frequency is 45Hz, frequency upper limit is 50Hz (00-12=50.00), and 03-28=1.
Inverter frequency is 45.00Hz

Example 3:
Pulse input frequency is 55Hz, frequency upper limit is 50Hz (00-12=50.00), and 03-28=1.
Inverter frequency is 50.00Hz

Example 4:
Pulse input frequency is 2000Hz, frequency upper limit is 599 Hz (00-12=599.00), and 03-28=0.2.
Inverter frequency is 2000 x 0.2 = 400.00Hz

6.5 Change Frequency Unit from Hz to rpm

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

Set motor rated RPM for the inverter to display the actual motor speed based on the output frequency.
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)

Set parameter 12-04 to a value greater than 0 to display motor speed.

7. Operation Method Configuration (Run / Stop)

The inverter offers users several choices to run and stop from different sources. The most commonly used methods are described in the next sections.

Operation command is selected with parameter 00-02.

00-02: Run Command Selection

This function sets the frequency command source.

Setting Range: 0 to 3

To set parameter 00-01:
- After power-up press the **DSP/FUN** key
- Select **00 Basic Fun**
- Press **DATA/ENTER** key
- Select parameter -01 with the **UP/DOWN** ▲ and ▼ keys and press the **DATA/ENTER** key.

In the parameter list move cursor to 00-01 with the **UP/DOWN** keys and press **DATA/ENTER** key to select.

00-02	Run Command Selection
Range	**0:** Keypad control **1:** External terminal control **2:** Communication control **3:** PLC

7.1 Run/Stop from the Keypad (00-02=0) – Default Setting

Use the **RUN** key to run the drive in forward direction and the **FWD/REV** key to change the motor direction. (Note: to disable reverse direction set parameter 11-00 to 1)

Press **STOP** key to stop the inverter. (Note: Stop method can be set with parameter 07-09, default is **deceleration to stop)**.

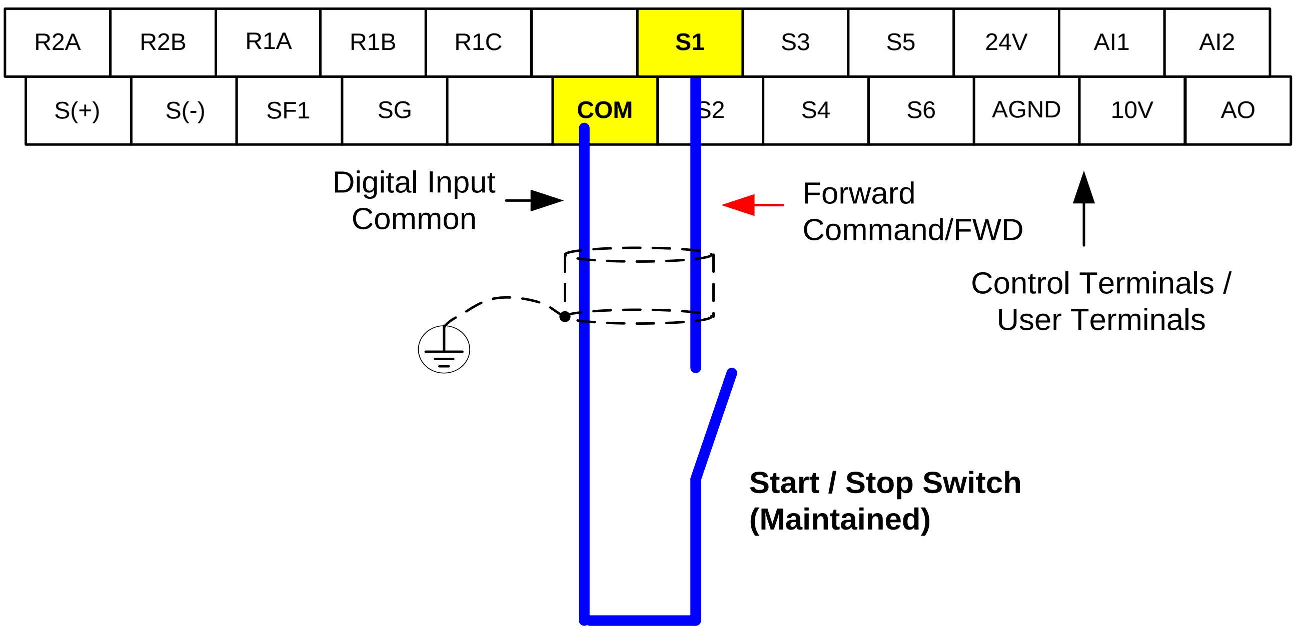
7.2 Run/Stop from External Switch / Contact or Pushbutton (00-02=1)

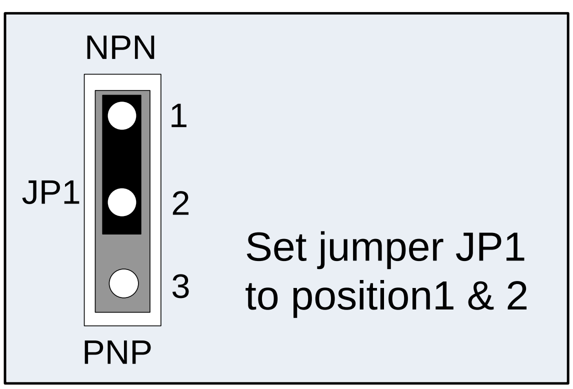
Use an external contact or switch to Run and Stop the inverter.

Set parameter 00-04 to 0 for 2-wire operation, multi-function input terminal S1 is set to run operation forward command.

00-02 Run Command Selection = 1

Permanent Switch / Contact



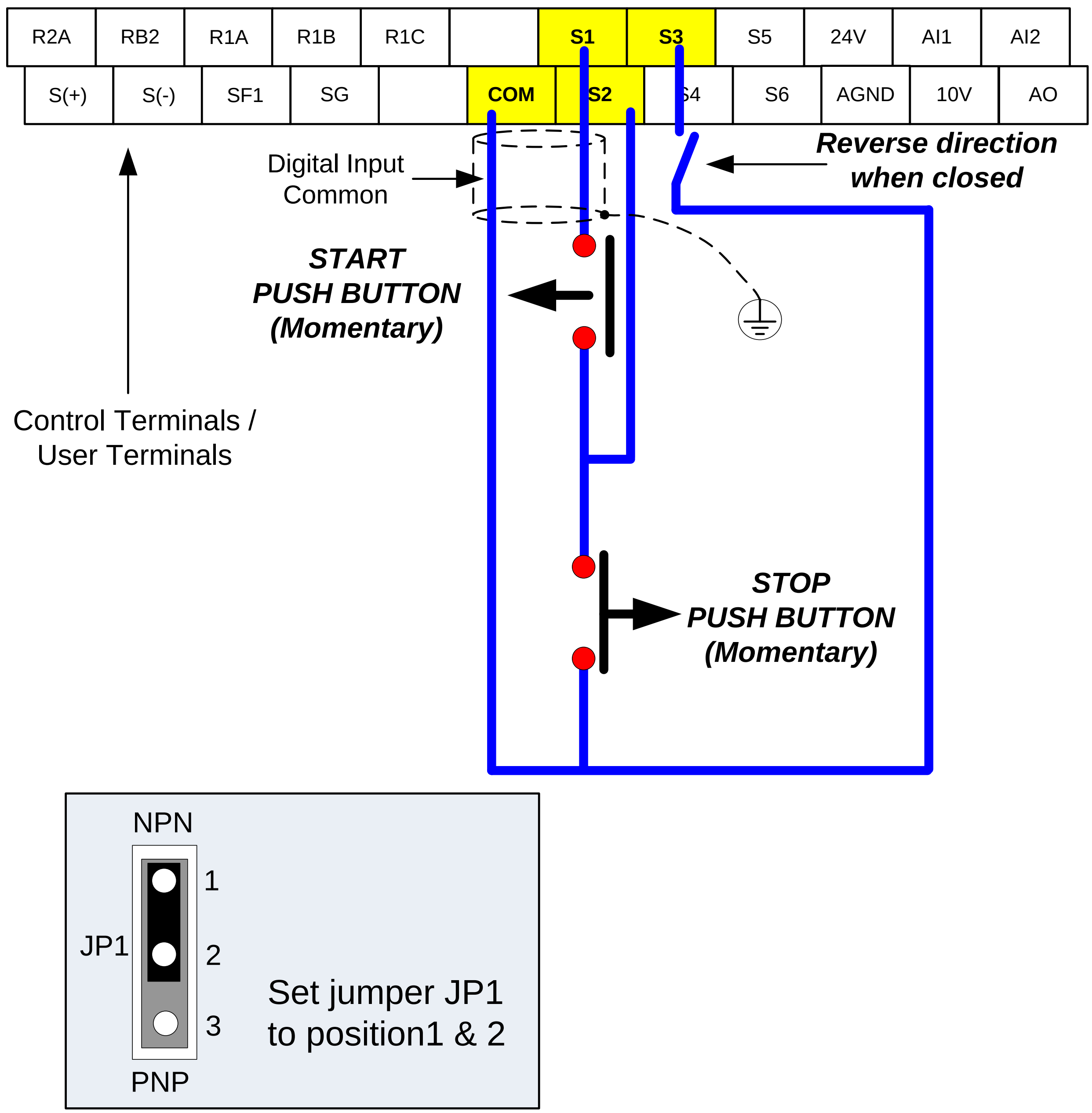


Momentary Contacts (Push Buttons)

Use push button / momentary switch to Run and Stop the inverter.

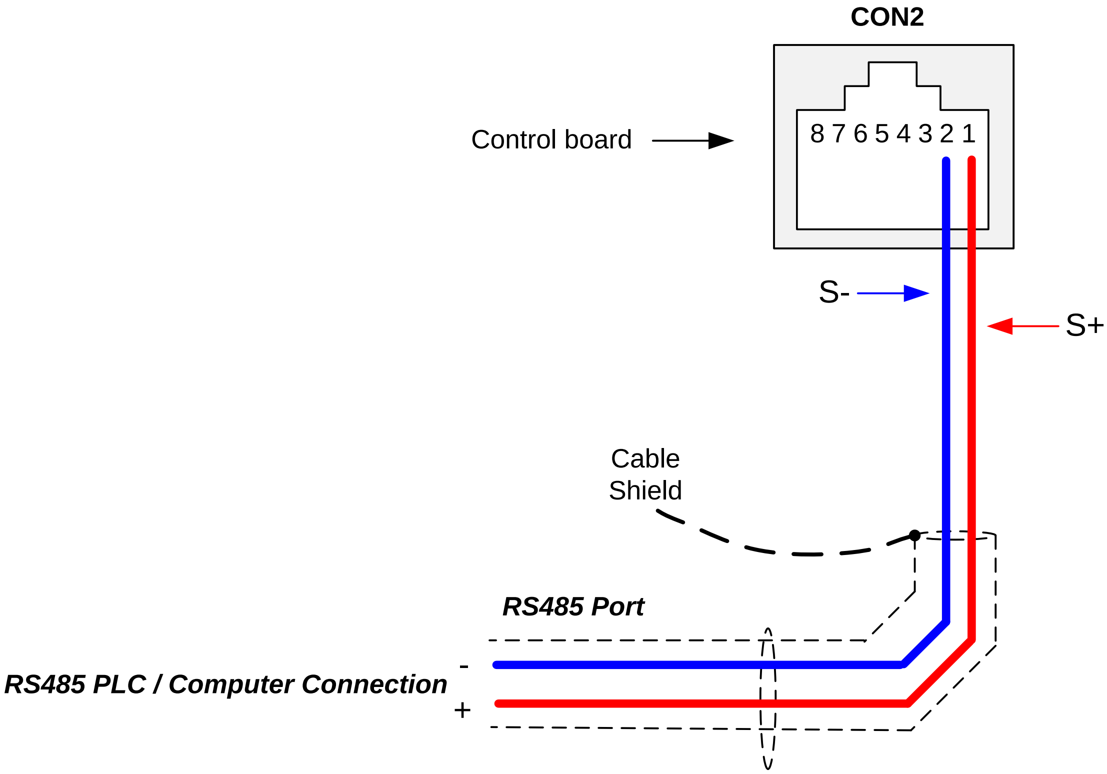
Set parameter 00-04 to 2 for 3-wire operation, multi-function input terminal S1 is set to run operation, S2 for stop operation and S3 for forward/reverse command.

00-02 Run Command Selection = 1



Note: Stop mode selection can be set with parameter 07-09, default is **deceleration to stop**.

7.3 Run/Stop from Serial Communication RS485 (00-02=2)



To control (Run/Stop) the inverter via serial communication parameter 00-02 has be set to a “2” for communication control.

Default Communication Setting is: Address “1”, 9600 Bits/sec, 1 Start Bit, 1 Stop Bit, and No Parity

The serial communication link function uses RS485 Modbus RTU protocol and allows for:

1) Monitoring (data monitoring, function data check).
2) Frequency setting.
3) Operation command (FWD, REV, and other commands for digital input).
4) Write function data.

Command Register

Inverter Command Register: 2501 (Hexadecimal)

Bit 0: Run Forward

Bit 1: Run Reverse

Bit 2 ~ Bit 15: Refer to the chapter XX of this manual

Examples:

Run Forward Command (Inverter Address: 01)

Command String (hexadecimal): 01 06 25 01 00 01 12 C6

Run Reverse Command (Inverter Address: 01)

Command String (hexadecimal): 01 06 25 01 00 03 93 07

Stop Command (Inverter Address: 01)

Command String (hexadecimal): 01 06 25 01 00 00 D3 06

Note: The last 2 bytes of the command strings consist of a CRC16 checksum, please refer to section 4.5 of the instruction manual for additional information.

8. Motor and Application Specific Settings

It is essential that before running the motor, the motor nameplate data matches the motor data in the inverter.

8.1 Set Motor Nameplate Data (02-01, 02-05)

02-05 Motor Rated Power

The nominal motor rated capacity is set at the factory. Please verify that the motor name plate data matches the motor rated capacity shown in parameter 02-05. The setting should only be changed when driving a motor with a different capacity.

Range: 0.1 to 600.0 kW (1HP = 0.746 kW)

To set parameter 02-05:

- After power-up press the **DSP/FUN** key
- Select **02 Motor Parameter**
- Press **READ/ ENTER** key
- Select parameter -01 with the **UP/DOWN ▲** and ▼ keys and press the **READ/ ENTER** key.

Default values vary based on the inverter model.

02-01 Motor Rated Current

The motor rated current is set at the factory based on the inverter model. Enter the motor rated current from the motor nameplate if it does not match the value shown in parameter 02-01.

Setting range: V/F mode: 10%~200% of inverter rated current. SLV mode: 25%~200% of inverter rated current.

To set parameter 02-01:

- After power-up press the **DSP/FUN** key
- Select **02 Motor Parameter**
- Press **READ/ ENTER** key
- Select parameter -01 with the **UP/DOWN ▲** and ▼ keys and press the **READ/ ENTER** key.

8.2 Acceleration and Deceleration Time (00-14, 00-15)

Acceleration and Deceleration times directly control the system dynamic response. In general, the longer the acceleration and deceleration time, the slower the system response, and the shorter time, the faster the response. An excessive amount of time can result in sluggish system performance while too short of a time may result in system instability.

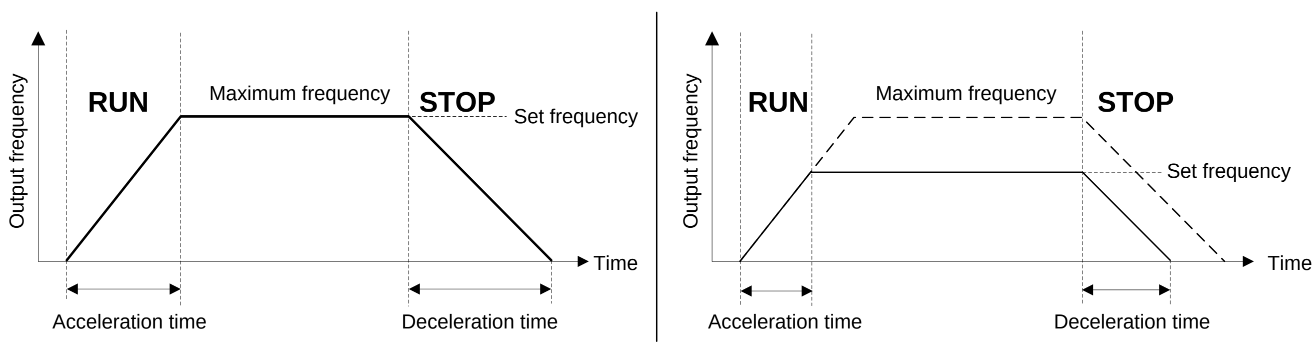
The default values suggested normally result in good system performance for the majority of general purpose applications. If the values need to be adjusted, caution should be exercised, and the changes should be in small increments to avoid system instability.

00-14 Acceleration time 1
00-15 Deceleration time 1

These parameters set the acceleration and deceleration times of the output frequency from 0 to maximum frequency and from maximum frequency to 0.

To set parameter 00-14 or 00-15:
- After power-up press the **DSP/FUN** key
- Select **00 Basic Fun**
- Press **READ/ ENTER** key
- Select parameter -14 or -15 with the **UP/DOWN** ▲ and ▼ keys and press the **READ/ ENTER** key.

Acceleration and deceleration times are represented by the three most significant (high order) digits. Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:



Set Frequency = Maximum Frequency **Set Frequency < Maximum Frequency**

Note: If the set acceleration and deceleration times are set too low, the torque limiting function or stall prevention function can become activated if the load torque and or inertia are relatively high. This will prolong the acceleration and or deceleration times and not allow the set times to be followed. In this case the acceleration and or the deceleration times should be adjusted.

8.3 Torque Boost (V/f Curve Modification) (01-10)

This parameter sets the relationship between output frequency and output voltage. Constant torque applications have the same torque requirements at low speed as well as at high speed.

Initial Setup

For Variable Torque / Normal Duty applications set parameter 01-10 to an initial value of 0.5.

For Constant Torque / Heavy Duty applications set parameter 01-10 to an initial value of 1.0.

01-10 Torque compensation gain

This parameter sets the torque boost for motor 1.

Setting range: 0.0 to 2.0

To set parameter 01-10:
- After power-up press the **DSP/FUN** key
- Select **01 V/F Pattern**
- Press **READ/ ENTER** key
- Select parameter -10 with the **UP/DOWN** ▲ and ▼ keys and press the **READ/ ENTER** key.

Increase value when:
- The wiring between the inverter and the motor very too long
- The motor size is smaller than the inverter size

Note: Gradually increase the torque compensation value and make sure the output current does not exceed inverter rated current.

Reduce value when:
- Experiencing motor vibration
- Over Current Fault
- Overload Fault

Important: Confirm that the output current at low speed does not exceed the rated output current of the inverter.

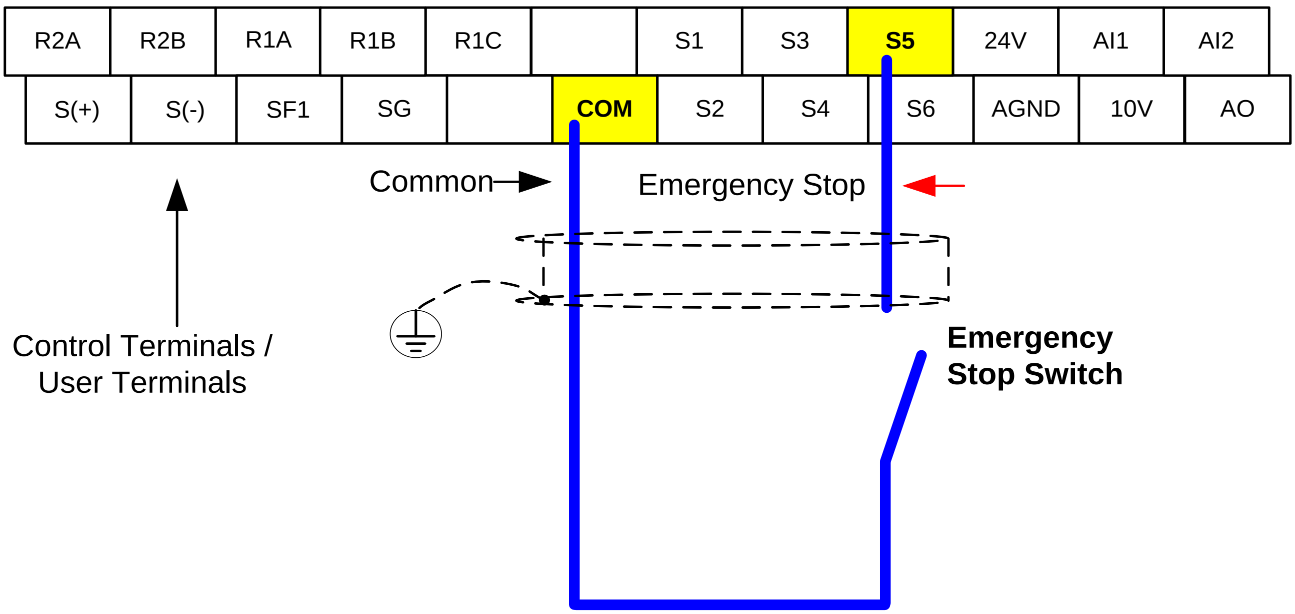
Warning: A larger than required torque compensation gain value creates over-excitation at low speeds, continued operation may cause the motor to overheat. Check the characteristics of the motor for additional information.

8.4 Emergency Stop

Deceleration time 2 is used in combination with multi-function digital input function #14 (Emergency stop). When rapid stop input is activated the inverter will decelerate to a stop using the Deceleration time 2 (00-17) and display the [E.S.] condition on the keypad.

Note: To cancel the emergency stop condition the run command has to be removed and emergency stop input deactivated.

Example: Emergency Stop Switch set for input terminal S5 (03-04 = 14).

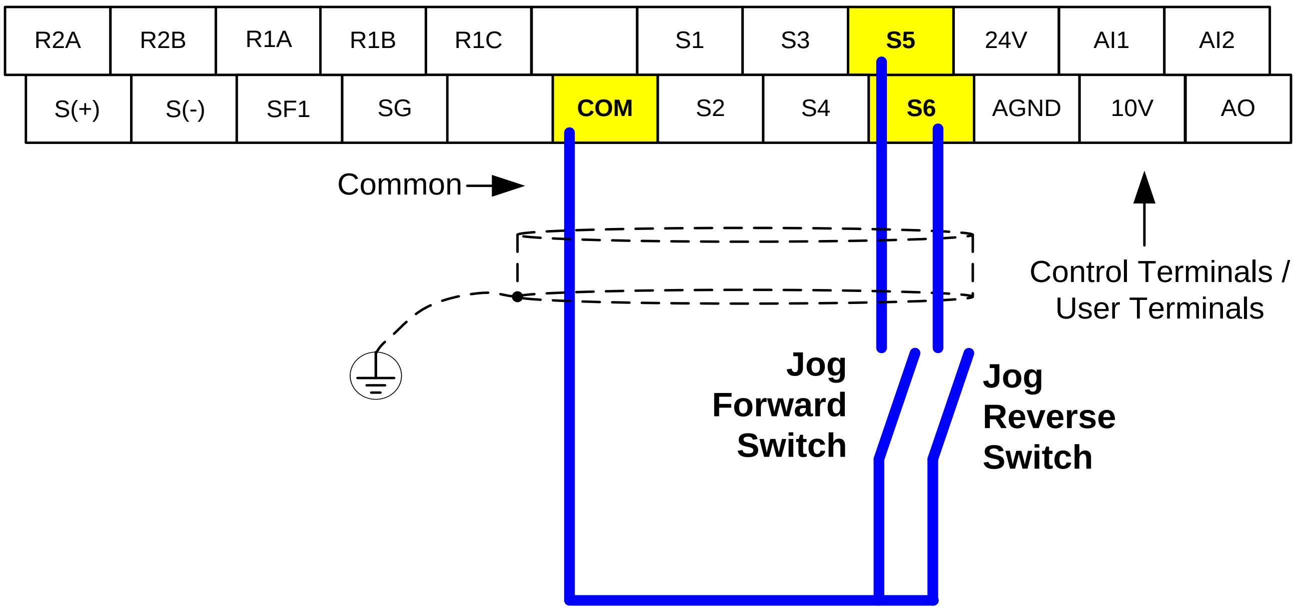


00-17	Deceleration Time 2
Range	0.1~6000.0 Sec

8.5 Forward and Reverse Jog

The jog forward command is used in combination with multi-function digital input function #6 (Jog Forward) and the jog reverse command is used in combination with multi-function digital input function #7 (Jog Reverse).

Example: Jog Forward input terminal S5 (03-04 = 06) and Jog Reverse input terminal S6 (03-05=7)



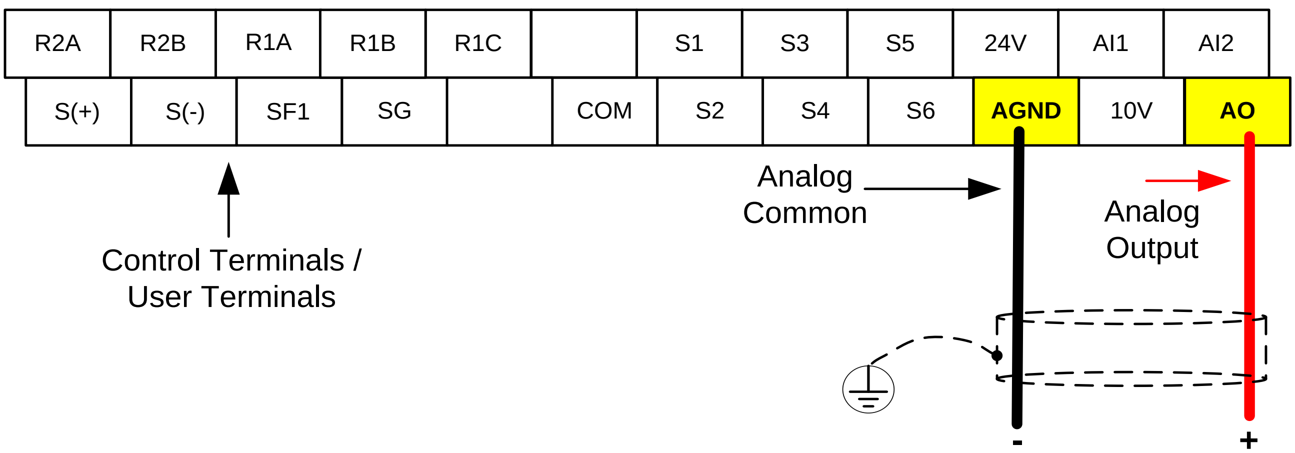
8.6 Analog Output Setup

Signal: Use parameter 04-11 to select the analog output signal for AO.

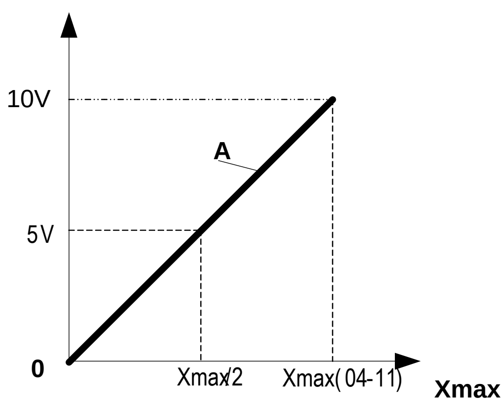
Gain: Use parameter 04-12 to adjust the gain for AO. Adjust the gain so that the analog output (10V) matches 100% of the selected analog output signal (04-11). Use parameter 04-15 to set slope direction.

Bias: Use parameter 04-13 to adjust the bias for AO. Adjust the bias so that the analog output (0V) matches 0% of the selected analog output signal (04-11).

Example: Analog Output Wiring



Example: Set 04-11 as 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 ~ 1000.0】%
04-13	AO Bias
Range	【-100.0 ~ 100.0】%
04-15	AO Slope
Range	【0】: Positive 【1】: Negative

Note: The max output voltage is 10Vdc limited by the inverter hardware. Use external devices that require a maximum of 10Vdc signal.

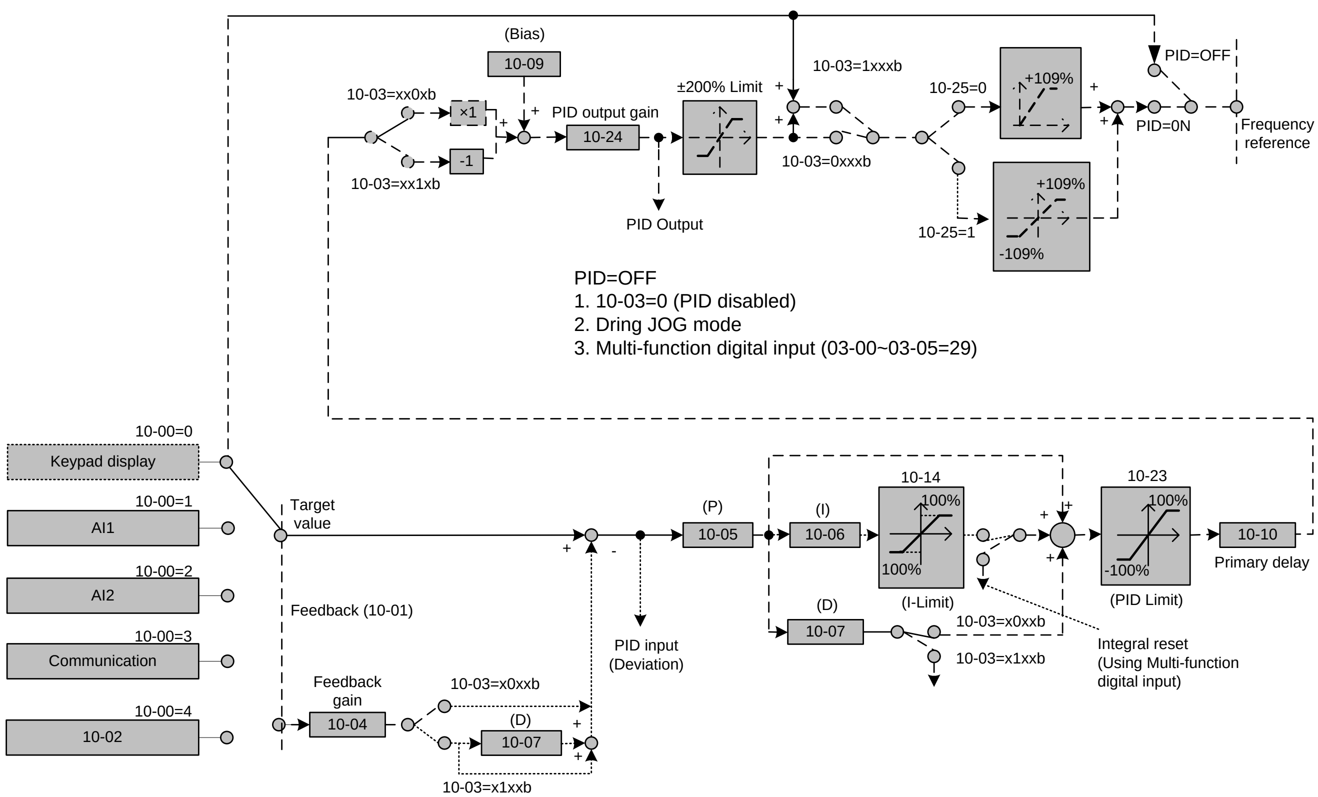
9. Using PID Control for Constant Flow / Pressure Applications

9.1 What is PID Control?

The PID function in the inverter can be used to maintain a constant process variable such as pressure, flow, temperature by regulating the output frequency (motor speed). A feedback device (transducer) signal is used to compare the actual process variable to a specified setpoint.

The difference between the set-point and feedback signal is called the error signal.

The PID control tries to minimize this error to maintain a constant process variable by regulating the output frequency (motor speed).



The amplitude of the error can be adjusted with the Proportional Gain parameter 10-05 and is directly related to the output of the PID controller, so the larger gain the larger the output correction.

Example 1:

Gain = 1.0

Set-Point = 80%

Feedback = 78%

Error = Set-point - Feedback = 2%

Control Error = Gain x Error = 2%

Example 2:

Gain = 2.0

Set-Point = 80%

Feedback = 78%

Error = Set-point - Feedback = 2%

Control Error = Gain x Error = 4%

Please note that an excessive gain can make the system unstable and oscillation may occur.

The response time of the system can be adjusted with the Integral Gain set by parameter 10-06. Increasing the Integral Time will make the system less responsive and decreasing the Integral Gain Time will increase response but may result in instability of the total system.

Slowing the system down too much may be unsatisfactory for the process. The end result is that these two parameters in conjunction with the acceleration (00-14) and deceleration (00-15) times are adjusted to achieve optimum performance for a particular application.

For typical fan and pump applications a Proportional Gain (10-05) of 2.0 and an Integral Time (10-06) of 5.0 sec. is recommended.

10-03 PID control mode

PID control can be enabled by setting parameter 10-03 to a value greater than 0.

10-03	PID Mode Selection
Range	xxx0b：PID Disable
	xxx1b：PID Enable
	xx0xb：PID Positive Characteristic
	xx1xb：PID Negative Characteristic
	x0xxb：PID Error Value of D Control
	x1xxb：PID Feedback Value of D Control
	0xxxb：PID Output
	1xxxb：PID Output + Frequency Command

Commonly used PID control modes

1: Forward operation: PID operation enabled, motor speeds increases when feedback signal is smaller than set-point (most fan and pump applications)

3: Reverse operation: PID operation enabled, motor slows down when feedback signal is smaller than set-point (e.g. level control applications)

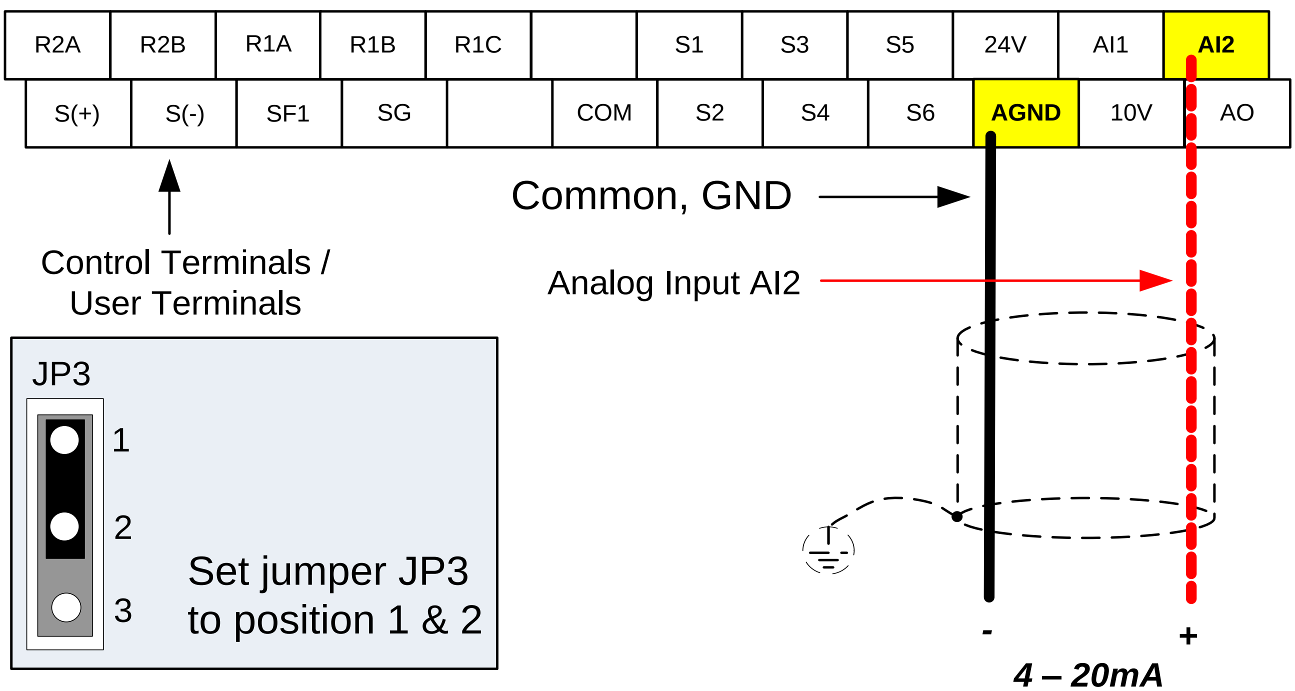
To set parameter 10-03:
- After power-up press the **MODE** key
- Select 10-03 using the arrow keys and up/down keys
- Press **</ENTER** key
- Set parameter 10-03 using the arrow keys and **</ENTER** key to save setting.

9.2 Connect Transducer Feedback Signal (10-01)

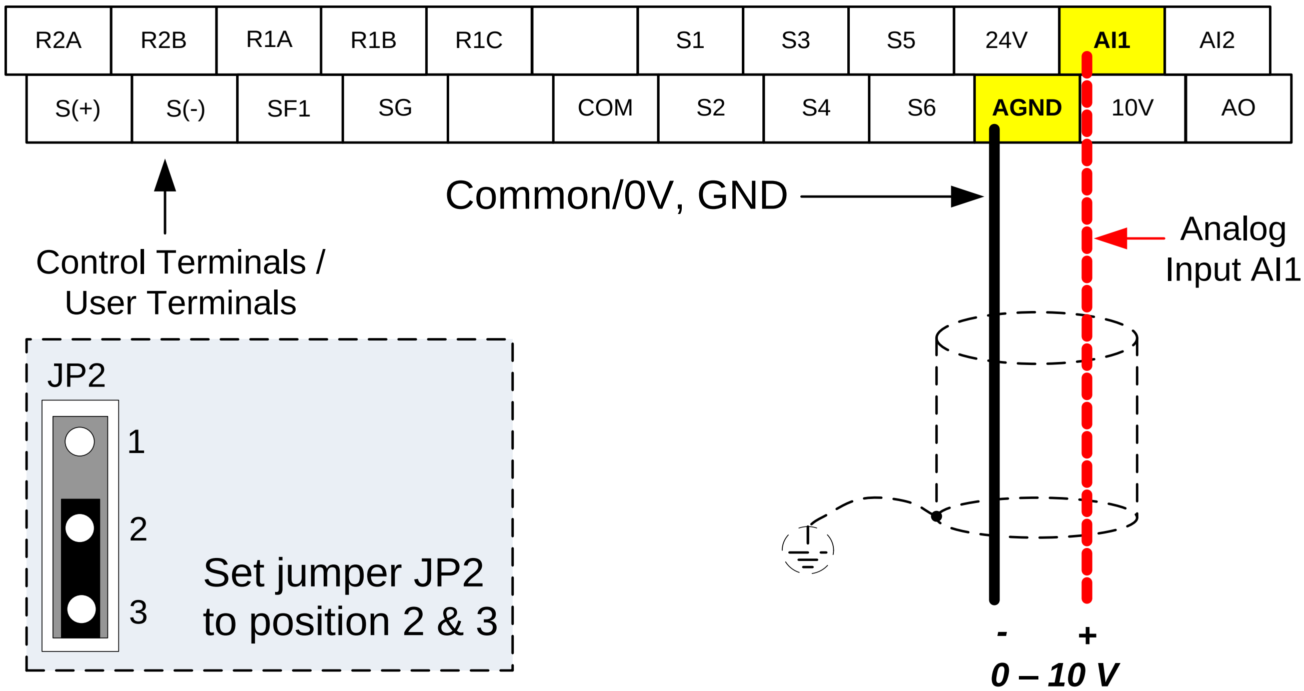
The PID function in the inverter

Depending on the type of feedback transducer used, the inverter can be setup for either 0-10V or a 4-20mA feedback transducer.

Feedback Signal 4 – 20mA (10-01 = 2)



Feedback Signal 0 – 10V (10-01 = 1)



9.3 Engineering Units

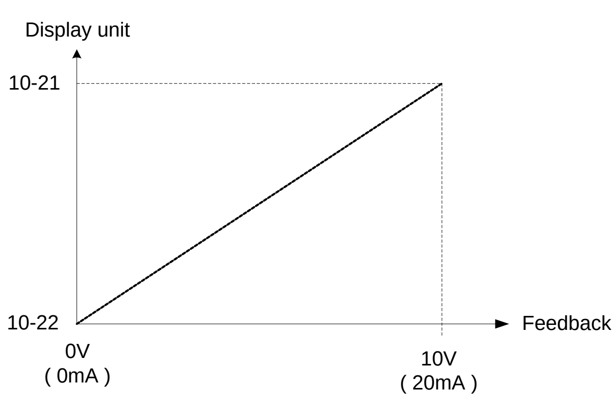
PID Feedback Display Scaling

The PID feedback signal can be scaled to represent actual engineering units. Use parameter 10-33 to set the feedback signal maximum scaling.

Example:

Feedback signal is a pressure transducer (0-10V/0-20mA) with a range of 0 – 200 PSI
0V/0mA = 0 PSI, 10V/20mA = 200 PSI.

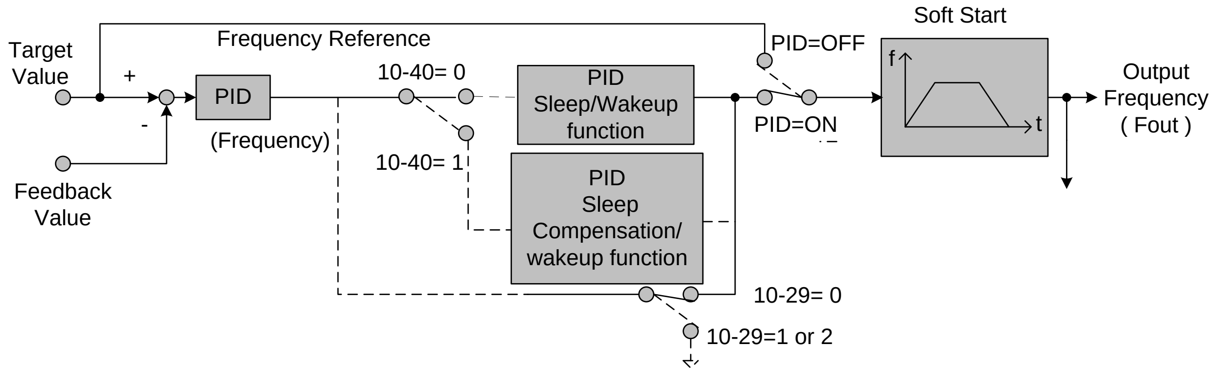
Set parameter 10-33 to 200 maximum of transducer range (100%).

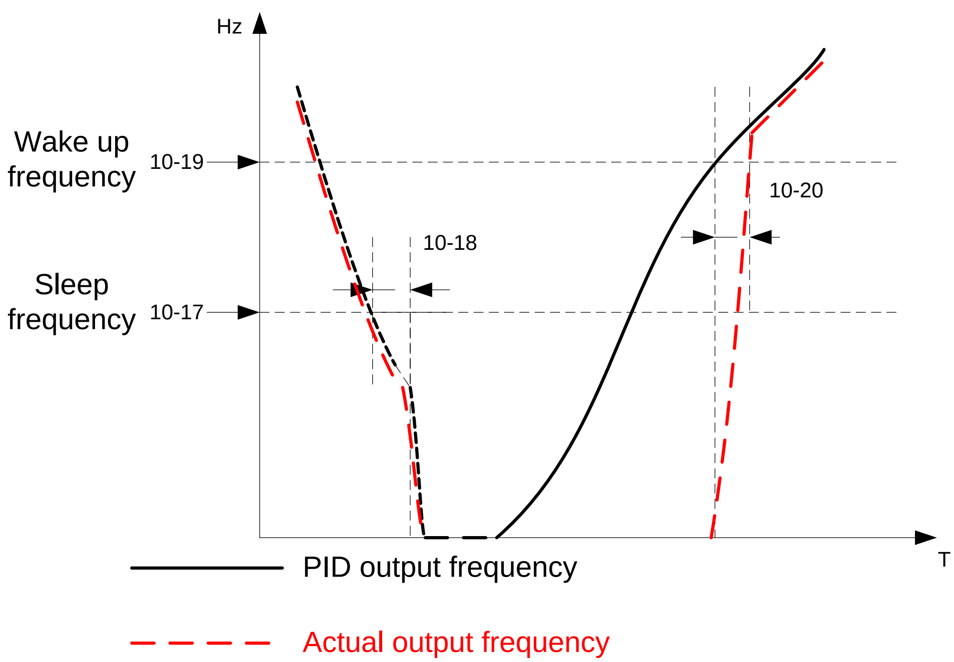


9.4 Sleep / Wakeup Function

The PID Sleep function can be used to prevent a system from running at low speeds and is frequently used in pumping application. The PID Sleep function is turned on setting parameter 10-29 to a value greater than 0. The inverter output turns off when the PID output falls below the PID sleep level (10-17) for the time specified in the PID sleep delay time parameter (10-18).

The inverter wakes up from a sleep condition when the PID output (Reference frequency) rises above the PID wake-up frequency (10-19) for the time specified in the PID wake-up delay time (10-20).





PID Sleep Function

10. Troubleshooting, Fault Diagnostics and Maintenance

10.1 General

Inverter fault detection and early warning / self-diagnosis function. When the inverter detects a fault, a fault message is displayed on the keypad.

When the inverter detects a warning / self-diagnostics error, the digital operator will display a warning or self-diagnostic code, the fault output does not energize in this case. Once the warning is removed, the system will automatically return to its original state.

10.2 Fault Detection Function

When a fault occurs, refer to Table 10.2.1 for possible causes and appropriate measures.

Use one of the following methods to restart:
1. Set one of multi-function digital input terminals (03-00 ~ 03-05) to 17 (Fault reset); activate input
2. Press the reset button on the keypad.
3. Power down inverter wait until keypad goes blank and power-up the inverter again.

When a fault occurs, the fault message is stored in the fault history (see group 12 parameters).

Table 10.2.1 Fault information and possible solutions

LED display	Description	Cause	Possible solutions
Over Current OC	The inverter output current exceeds the overcurrent level (200% of the inverter rated current).	• Acceleration / Deceleration time is set too short. • Contactor installed at the inverter output side. • Motor rating exceeds inverter rating. • Short circuit or ground fault.	• Extend acceleration / deceleration time. • Check the motor wiring. • Disconnect motor and try running inverter.
Over Current OCA	The inverter output current exceeds the overcurrent level in acceleration time	• Acceleration time set too short • Motor rating is exceeds inverter rating. • Short circuit between winding and shell of motor • Short circuit between wire and ground of motor • IGBT failure	• Set the longer acceleration time • Change to bigger capacity of inverter • Examine motor • Check the wire • Replace IGBT module
Over Current OCC	The inverter output current exceeds the overcurrent level in acceleration time	• Acceleration time set too short • Motor rating is exceeds inverter rating • Short circuit between motor winding and motor casing • Short circuit between wire and ground of motor • IGBT failure	• Set the longer acceleration time • Change to bigger capacity of inverter • Check motor • Check wiring • Replace IGBT module

LED display	Description	Cause	Possible solutions
Over Current OCd	The inverter output current exceeds the overcurrent level during deceleration	• Deceleration time is set too short	• Set longer acceleration time
Ground Fault GF	The ground fault exceeds 50% of the inverter rated output current (08-23 = 1, GF function is enabled).	• Motor damaged (insulation). • Wire damage or deterioration. • Inverter DCCT sensors defect.	• Replace motor. • Check motor wiring. • Disconnect motor and try running inverter. • Check resistance between cables and ground. • Reduce carrier frequency.
Over voltage OV	DC bus voltage exceeds the OV detection level: 200V class: 410Vdc 400V class: 820Vdc	• Deceleration time set too short, resulting in regenerative energy flowing back from motor to the inverter. • The inverter input voltage is too high. • Use of power factor correction capacitors. • Excessive braking load. • Braking transistor or resistor defective. • Speed search parameters set incorrectly.	• Increase deceleration time • Reduce input voltage to comply with the input voltage requirements or install an AC line reactor to lower the input voltage. • Remove the power factor correction capacitor. • Use dynamic braking unit. • Replace braking transistor or resistor. • Adjust speed search parameters.
Under Voltage uV	DC bus voltage is lower than the UV detection level or the pre-charge contactor is not active while the inverter is running. 200V class: 190Vdc 400V class: 380Vdc The detection value can be adjusted by 07-13).	• The input voltage is too low. • Input phase loss. • Acceleration time set too short. • Input voltage fluctuation. • Pre-charge contactor damaged. • DC bus voltage feedback signal value not incorrect.	• Check the input voltage. • Check input wiring. • Increase acceleration time. • Check power source • Replace pre-charge contactor • Replace control board or complete inverter.

LED display	Description	Cause	Possible solutions
Input phase loss IPL	Phase loss at the input side of the inverter or input voltage imbalance, active when 08-09 = 1 (enabled).	• Loose wire at inverter input terminal. • Momentary power loss. • Input voltage imbalance.	• Check input wiring. • Fasten wire terminal screws. • Check power supply.
Output phase loss OPL	Phase loss at the output side of the inverter, active when 08-10 = 1 (enabled).	• Wiring loose at inverter output terminal. • Motor rated current is less than 10% of the inverter rated current.	• Check output wiring / fasten screws. • Check motor & inverter rating.
OH1 Heatsink overheat OH1	The temperature of the heat sink is too high. Note: when OH1 fault occurs three times within five minutes, requires to wait 10 minutes before the inverter can be reset.	• Ambient temperature too high. • Cooling fan failed. • Carrier frequency set too high. • Load too heavy.	• Install fan or AC to cool surroundings. • Replace cooling fan. • Reduce carrier frequency. • Reduce load / Measure output current
OH4 Motor overheating OH4	Motor overheating, PTC (Positive Temperature Coefficient) exceeds the overheat protection level.	• The surrounding temperature of the motor is too high. • The PTC input (Positive Temperature Coefficient) exceeds the overheat protection level.	• Check the surrounding Temperature of the motor. • Check the MT and GND terminal wiring.
OL1 Motor overload OL1	Internal motor overload protection tripped, active when protection curve 08-05 = xxx1.	• Voltage setting in V/F mode set too high, resulting in over-excitation of the motor. • Motor rated current (02-01) set incorrectly. • Load too heavy.	• Check V/f curve. • Check motor rated current • Check and reduce motor load, check application operation duty cycle.
OL2 Inverter overload OL2	Inverter thermal overload protection tripped. If an inverter overload occurs 4 times in five minutes, requires to wait 4 minutes before the inverter can be reset.	• Voltage setting in V/F mode set too high, resulting in over-excitation of the motor. • Inverter rating to small. • Load too heavy.	• Check V/f curve. • Replace inverter with larger size inverter. • Check and reduce motor load, check application operation duty cycle.

LED display	Description	Cause	Possible solutions
OT **Over torque detection** Ot	Inverter output torque is higher than 08-15 (over torque detection level) for the time specified in 08-16. Parameter 08-14 = 0 to activate.	• Load too heavy.	• Check over torque detection parameters (08-15 / 08-16). • Check and reduce motor load, check and operation duty cycle.
Comm. Error CE	No Modbus communication received for the time specified in 09-06 (communication error detection time). Active when 09-07(= 0 to 2).	• Connection lost or wire broken. • Host stopped communicating.	• Check connection. • Check host computer / software.
PID feedback loss Fb	PID feedback signal falls below level specified in 10-12 (PID feedback loss detection level) for the time specified in 10-13 (Feedback loss detection time). Active when parameter (10-11 = 2).	• Feedback signal wire broken • Feedback sensor broken.	• Check feedback wiring. • Replace feedback sensor.
Safety 1 Error St01	STO terminal 1 error	• Terminal board Input SF1 and SG are not connected	• Check SF1 and SG Connection.
Safety 2 Error St02	STO terminal 2 error	• Terminal board Input SF2 and SG are not connected	• Check SF2 and SG Connection.
Safety 3 Error St03	STO terminal 3 error	• Transformer voltage output of inverter is not stable.	• Replace the power board • Contact with TECO

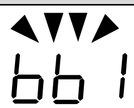
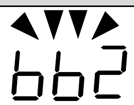
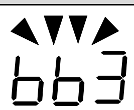
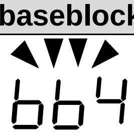
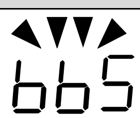
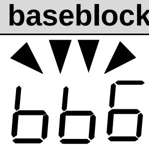
LED display	Description	Cause	Possible solutions
External fault 0 EF0	External fault (Modbus)	• Modbus communication 0x2501 bit 2= "1"	Reset Modbus communication 0x2501 bit 2= "1"
External fault (S1) EF1	External fault (Terminal S1) Active when 03-00= 25, and Inverter external fault selection 08-24=0 or 1.	• Multifunction digital input external fault active.	Multi-function input function set incorrectly. Check wiring
External fault (S2) EF2	External fault (Terminal S2) Active when 03-01= 25, and Inverter external fault selection 08-24=0 or 1.		
External fault (S3) EF3	External fault (Terminal S3) Active when 03-02= 25, and Inverter external fault selection 08-24=0 or 1.		
External fault (S4) EF4	External fault (Terminal S4) Active when 03-03= 25, and Inverter external fault selection 08-24=0 or 1.		
External fault (S5) EF5	External fault (Terminal S5) Active when 03-04= 25, and Inverter external fault selection 08-24=0 or 1.		
External fault (S6) EF6	External fault (Terminal S6) Active when 03-05= 25, and Inverter external fault selection 08-24=0 or 1.		
Motor Control Fault CF07	Motor control fault	• SLV mode is unable to run motor.	Perform rotational or stationary auto-tune Increase minimum output frequency (01-08)

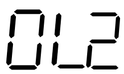
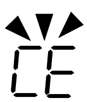
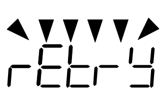
LED display	Description	Cause	Possible solutions
Motor control fault CF08	Motor control fault	• Start or Run fault in PMSLV mode.	• Increase the value of 22-10 and 22-23. • Perform auto-tune (22-21) • Check if the load is too heavy to raise torque output limit.
Operator Communication Error CF00	Communication error between inverter and LCD keypad.	• LCD keypad and inverter cannot transmit data after power on 5 seconds.	• Disconnect the operator and then reconnect. • Replace control board.
Operator Communication Error 2 CF01	Communication error between inverter and LCD keypad.	• LCD keypad and inverter can transmit data but transmission error occurs for more than 2 seconds	• Disconnect the operator and then reconnect. • Replace control board.
Current Transducer Error CtEr	Three phase input voltage detection level error	• Input voltage abnormal • Input voltage noise is too high • Control board malfunction	• Check input voltage and the voltage signal of control board
PTC Error PtCLS	PTC wires disconnected	• PTC wires disconnected for more than 10 seconds.	• Check the MT and GND connection
Operator Disconnection OPr	When 00-02=0 and operator is disconnected while inverter is running. Fault action selection set by parameter 16-09.	• When 00-02=0, warning is displayed when operator is disconnected.	• Check the keypad operator connection.

LED display	Description	Cause	Possible solutions
Short Circuit SC	Inverter output short circuit or ground fault.	• Short circuit or ground fault (08-23 = 1). • Motor damaged (insulation). • Wire damage or deterioration.	Check motor wiring. Disconnect motor and try running the inverter.

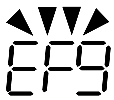
Table 2 Warning/Self-diagnosis and Corrective actions

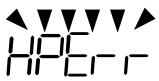
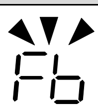
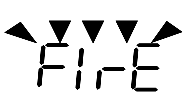
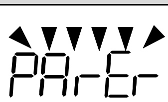
LED display	Description	Cause	Possible solutions
OV (flash) **Over voltage** 	DC bus voltage exceeds the OV detection level： 200V class：410Vdc 400V class：820Vdc (for 400V class, if input voltage 01-14 is set lower than 400V, the OV detection value will is decreased to 700Vdc)	• Deceleration time set too short, resulting in regenerative energy flowing back from motor to the inverter. • The inverter input voltage is too high. • Use of power factor correction capacitors. • Excessive braking load. • Braking transistor or resistor defective. • Speed search parameters set incorrectly.	• Increase deceleration time • Reduce input voltage to comply with the input voltage requirements or install an AC line reactor to lower the input voltage. • Remove the power factor correction capacitor. • Use dynamic braking unit. • Replace braking transistor or resistor. • Adjust speed search parameters.
UV (flash) **under voltage** 	DC bus voltage is lower than the UV detection level or the pre-charge contactor is not active while the inverter is running. 190Vdc：200V class; 380Vdc：400V class (the detection value can be adjusted with parameter 07-13)	• The input voltage is too low. • Input phase loss. • Acceleration time set too short. • Input voltage fluctuation. • Pre-charge contactor damaged. • DC bus voltage feedback signal value incorrect.	• Check the input voltage. • Check input wiring. • Increase acceleration time. • Check power source • Replace pre-charge contactor • Replace control board or complete inverter.
OH1 (flash) **Heatsink overheat** 	The temperature of the heat sink is too high. Note: when OH1 fault occurs three times within five minutes, it is required to wait 10 minutes before the inverter can be reset.	• Ambient temperature too high. • Cooling fan failed • Carrier frequency set too high. • Load too heavy.	• Install fan or AC to cool surroundings. • Replace cooling fan. • Reduce carrier frequency. • Reduce load / Measure output current
OH2 (flash) **Inverter over Heating warning** 	Inverters overheat warning. Multi-function digital input set to 31. (03-00~03-05=31)	• Multifunction digital input overheat warning active	• Multi-function input function set incorrectly. • Check wiring

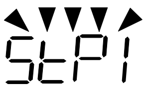
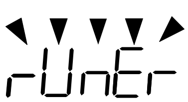
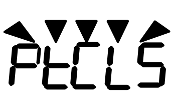
LED display	Description	Cause	Possible solutions
OT (flash) Over torque detection 	Inverter output torque is higher than 08-15 (over torque detection level) for the time specified in 08-16. Parameter 08-14 = 0 to activate.	Load too heavy.	Check over torque detection parameters (08-15 / 08-16). Check and reduce motor load, check and operation duty cycle.
bb1 (flash) External baseblock 	External base block (Terminal S1)	Multifunction digital input external baseblock active.	Multi-function input function set incorrectly. Check wiring
bb2 (flash) External baseblock 	External base block (Terminal S2)		
bb3 (flash) External baseblock 	External base block (Terminal S3)		
bb4 (flash) External baseblock 	External base block (Terminal S4)		
bb5 (flash) External baseblock 	External base block (Terminal S5)		
bb6 (flash) External baseblock 	External base block (Terminal S6)		

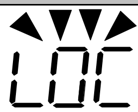
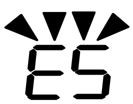
LED display	Description	Cause	Possible solutions
OL1 **Motor overload** 	Internal motor overload protection tripped, active when protection curve 08-05 = xxx1.	• Voltage setting V/F mode too high, resulting in over-excitation of the motor. • Motor rated current (02-01) set incorrectly. • Load too heavy.	Check V/f curve. Check motor rated current Check and reduce motor load, check application duty cycle.
OL2 **Inverter overload** 	Inverter thermal overload protection tripped. If an inverter overload occurs 4 times in five minutes, it is required to wait 4 minutes before resetting the fault.	• Voltage setting V/F mode too high, resulting in over-excitation of the motor. • Motor rated current (02-01) set incorrectly. • Load too heavy.	Check V/f curve. Check motor rated current Check and reduce motor load, check application duty cycle
CE (flash) **communication error** 	No Modbus communication received for 2 sec. Active when 09-07=3.	• Connection lost or wire break. • Host stopped communicating.	Check connection Check host computer / software.
Over current protection level B 	Inverter current reaches the current protection level B.	• Inverter current too high. • Load too heavy.	Check load and application duty cycle.
Retry (flash) **retry** 	Automatic reset activated, warning is displayed until restart delay time set (07-01) expires.	• Parameter 07-01 set to a value greater than 0. • Parameter 07-02 set to a value greater than 0.	Warning disappears after automatic reset.

LED display	Description	Cause	Possible solutions
EF1 (flash) External fault (S1)	External fault (Terminal S1) Active when 03-00= 25, and Inverter external fault selection 08-24=2.	Multifunction digital input external fault active and parameter 08-24 set to 2 for operation to continue.	Multi-function input function set incorrectly. Check wiring.
EF2 (flash) External fault (S2)	External fault (Terminal S2) Active when 03-01= 25, and Inverter external fault selection 08-24=2.		
EF3 (flash) External fault (S3)	External fault (Terminal S3) Active when 03-02= 25, and Inverter external fault selection 08-24=2.		
EF4 (flash) External fault (S4)	External fault (Terminal S4) Active when 03-03= 25, and Inverter external fault selection 08-24=2.		
EF5 (flash) External fault (S5)	External fault (Terminal S5) Active when 03-04= 25, and Inverter external fault selection 08-24=2.		
EF6 (flash) External fault (S6)	External fault (Terminal S6) Active when 03-05= 25, and Inverter external fault selection 08-24=2.		

LED display	Description	Cause	Possible solutions
EF9 (flash) error of forward/ reverse rotation 	Forward run and reverse run are active within 0.5 sec of each other. Stop method set by parameter 07-09.	Forward run and reverse run active (see 2-wire control).	Check run command wiring
Rang setting error 	Parameter setting falls outside the allowed range.	Some parameter ranges are determined by other inverter parameters which could cause an out of range warning when the dependency parameter is adjusted. Example: 02-00>02-01,or 20>02-21 2.00-12>00-13, 00-07 =1, 00-05=00-06 02-03>02-06 or 02-22>02-25 20-16<20-15	Check parameter setting.
Digital input terminal error 	Multi-function input setting error.	Multi-function digital input terminals (03-00 to 03-05) are set to the same function (not including ext. fault and not used.) or: UP/DOWN commands are not set at the same time (they must be used together). UP/DOWN commands (08 and 09) and ACC/DEC commands (11) are set at the same time. Speed search 1 (19: maximum frequency) and Speed search 2 (34:from the set frequency) are set at the same time. 03-00~03-05 set two-wire and three-wire in the same time.	Check multi-function input setting.
V/f curve error 	V/f curve setting error.	V/F curve setting error. 01-02(Fmax)>01-12 (Fbase)>01-06 (Fmid1)>01-08(Fmin) 01-16(Fmax2)> 01-24(Fbase2)> 01-20(Fmid1)> 01-22(Fmin2)	Check V/F parameters

LED display	Description	Cause	Possible solutions
PID selection error 	PID selection error.	• 10-00 and10-01 set to 1(AI1) or set to 2(AI2). • When 23-05=0 and 10-33 >= 1000 or 10-34≠1.	• Check 10-00 and 10-01 • Check 10-33,10-34, 23-05.
Model selection error 	Inverter capacity setting error: Inverter capacity setting 13-00 does not match the rated voltage.	• Inverter capacity setting does not match voltage class (13-00).	• Check inverter capacity setting 13-00.
PI setting error 	Inverter PI setting error	• Inverter pulse input selection (03-30) selection conflicts with PID source (10-00 and 10-01).	• Check pulse input selection (03-30) and PID source (10-00 and 10-01).
FB (flash) PID feedback breaking 	PID feedback signal falls below level specified in 10-12 (PID feedback loss detection level) for the time specified in 10-13 (Feedback loss detection time). Active when parameter (10-11 = 1).	• Feedback signal wire break • Feedback sensor broken.	• Check feedback wiring • Replace feedback sensor.
USP (flash) Unattended Start Protection 	Unattended Start Protection (USP) is enabled (enabled at power-up.)	• USP at power-up (activated by multi-function digital input) is enabled. The inverter will not accept a run command. • While the warning is active the inverter does not accept a run command. (See parameter 03-00 - 03-08 = 50).	• Remove run command or reset inverter via multi-function digital input (03-00 to 03-07 = 17) or use the RESET key on the keypad to reset inverter. • Activate USP input and re-apply the power.
Fire mode enabled 	Fire mode enabled	• Fire mode enabled.	• Check for fire. If case of no fire, turn off the power and power on again.
Parameter setting Error 	Parameter setting error	• The parameter setting is incorrect.	• Please refer to the manual for correct setting

LED display	Description	Cause	Possible solutions
Direct start warning 	The inverter can't start directly, due to 07-04=1	• Run command from the terminal is enabled and 07-04=1	Remove the run command from the terminal first, and enabled later.
External Terminal Stop Error 	External Terminal is main run command source selection (00-02=1) and run command executes but executes stop command from keypad.	• Run command executes from external terminal but executes stop command from keypad.	Remove the run command from external terminal
Voltage on C/B Error 	The voltage on the control board error	• Errors of detecting voltages • Noises too much • Control board failure	Check the voltage on the control board.
EEPROM Save Error 	The data save in EEPROM is wrong.	• EEPROM circuit failure. Parameter check error after power on.	Restore factory setting, then cut off the power and power on again. If warning again, replace control board.
Control Board Error 	Firmware can't meet Control board.	• Firmware not compatible with Control board.	Replace the control board.
Wrong Running Direction Error 	Running direction is different from 11-00	• Direction control selection 11-00 set incorrectly, jog and DI control wired incorrectly.	Revise direction selection 11-00, verify jog and DI control.
PTC Error 	PTC wires disconnected	• PTC wires disconnected for more than 10 seconds.	Check the MT and GND connection

LED display	Description	Cause	Possible solutions
Parameter Lock 	Inverter parameters locked.	Parameter lock key code is already active (13-07)	Remove parameter lock, by entering the correct code in parameter for 13-07
Set password failed 	Parameter key code entered is incorrect.	To enable the parameter lock the Key code has to be correct,	Enter the correct code for 13-07 to enable the parameter lock.
Run Command Error 	Single direction operation only, inverter cannot receive a reverse operation command at the same time a forward command is active.	Check terminal for reverse operation command.	Disconnect reverse operation command from external terminal.
ES (flash) External Emergency Stop 	External emergency stop Enabled.	03-00~03-05 set to 14 and digital input is active.	Turn off run command, and remove external emergency stop command.
Zero Speed Stop Error 	Frequency command below 01-08 without using the DC brake function.	Frequency command set below minimum output frequency.	Adjust frequency command.

Warning Message (LCD display only)

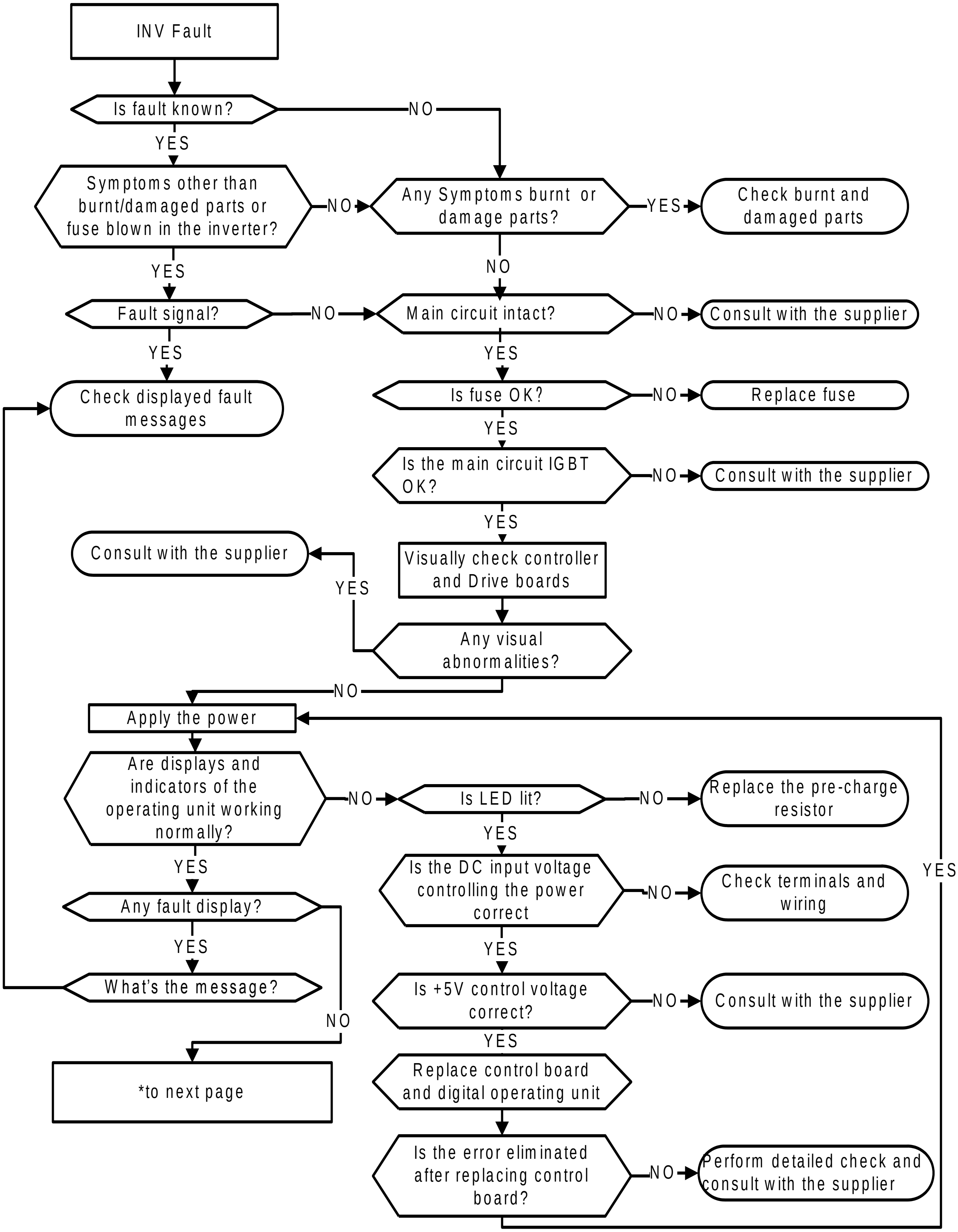
LCD display	Description	Cause	Possible solutions
Operator Copy Error RDE	Parameters cannot be uploaded to the operator	Inverter data transmission error, cannot upload the data to operator	Check operator and control connection
Operator Write Error WRE	Operator cannot write data to the inverter	The control mode in the operator does not match the inverter. The model name in the operator does not match the inverter. The firmware version in the operator does not match the inverter.	Check the control mode, model name and firmware version of the inverter.
Operator Compare Error VRYE	Data compare failed between operator and inverter.	Data in the inverter does not match data saved in the operator.	Check parameters.
Does Not Allow to Read and Save Data RDP	Operator cannot read or save inverter parameters	When 16-08=0, operator read/save function disabled.	Check parameter 16-08 setting.

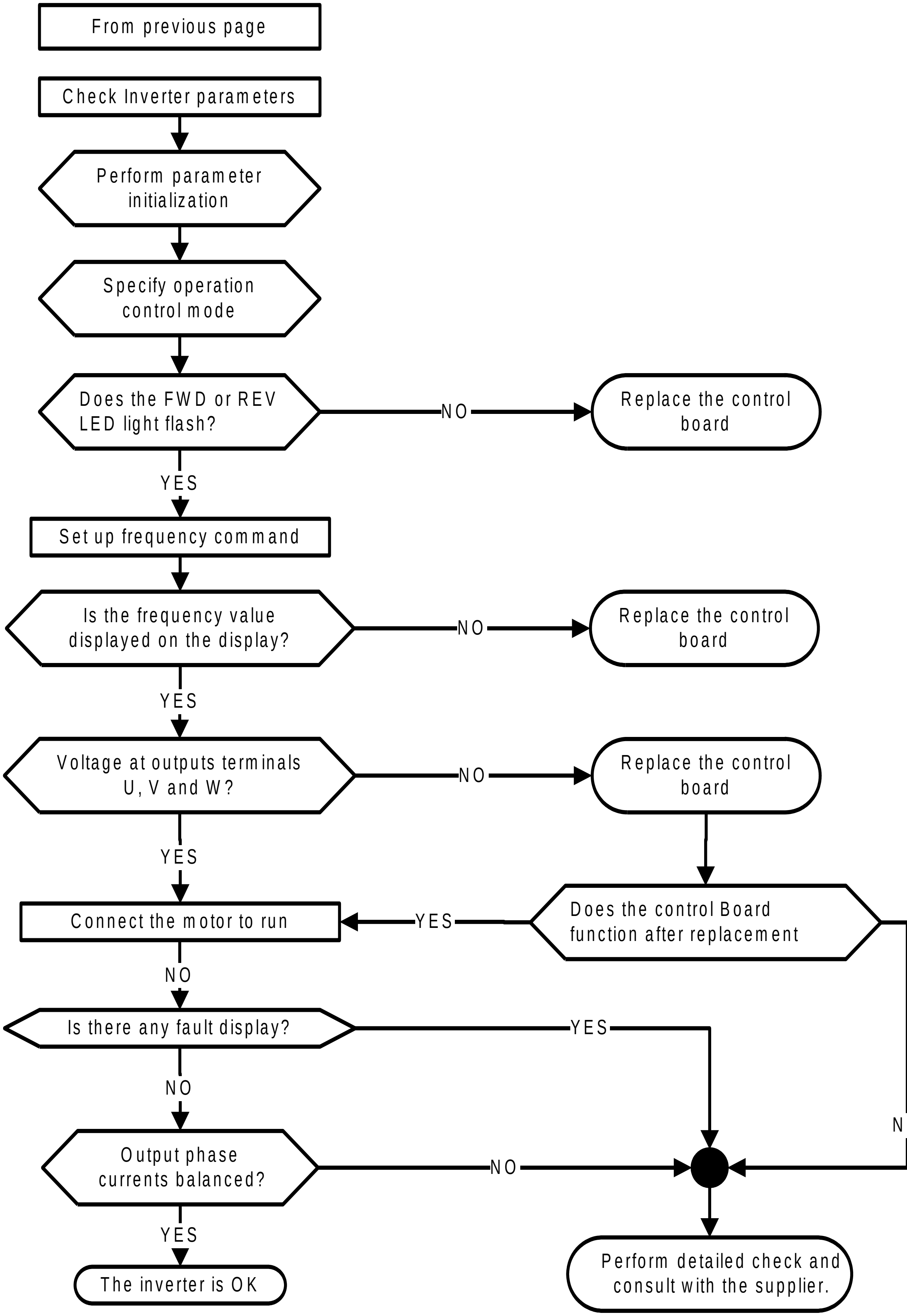
10.3 General Troubleshooting

Status	Checking point	Remedy
Motor runs in wrong direction	Motor wiring correct to inverter output terminals?	Inverter must be connected to U, V, and W terminal of the motor.
	Control wiring correct for forward and reverse commands?	Check wiring.
The motor speed cannot be regulated.	Wiring for the analog frequency reference inputs correct?	Check wiring.
	Operation mode correct?	Check the Frequency source parameters 00-05/00-06.
	Is the load too excessive?	Reduce the load.
Motor speed too high or too low	Check the motor specifications (FLA, voltage, max speed…) correct?	Check motor nameplate.
	Is the gear ratio correct?	Confirm the gear ratio.
	Is the maximum frequency setting correct?	Check maximum frequency settings.
Motor speed unstable	Is the motor load too high?	Reduce motor load.
	Motor load unstable?	(1) Stabilize motor load. (2) Consider increasing inverter and motor size.
	Is the input power unstable or is there a phase loss condition?	(1) Consider adding an AC reactor at the power input side. (2) Check wiring when using three-phase power.
Motor does not run	Input power connected to the correct L1(L), L2, and L3(N) terminals? Charging indicator lit?	(1) Power turned ON? (2) Cycle power to the inverter. (3) Make sure the input voltage is correct. (4) Make sure input terminal screws are fastened.
	Is there voltage across the output terminals T1, T2, and T3?	Cycle power to the inverter.
	Is motor load causing the motor to stall?	Reduce the motor load.
	Are there any errors shown on the inverter keypad?	See error descriptions and check wiring, correct if necessary.
	Forward or reverse run command active?	
	Check analog frequency reference signal?	(1) Analog frequency input signal wired correctly? (2) Check analog input voltage of frequency input.
	Operation mode setting correct?	Check if inverter operation mode 00-02/00-03.

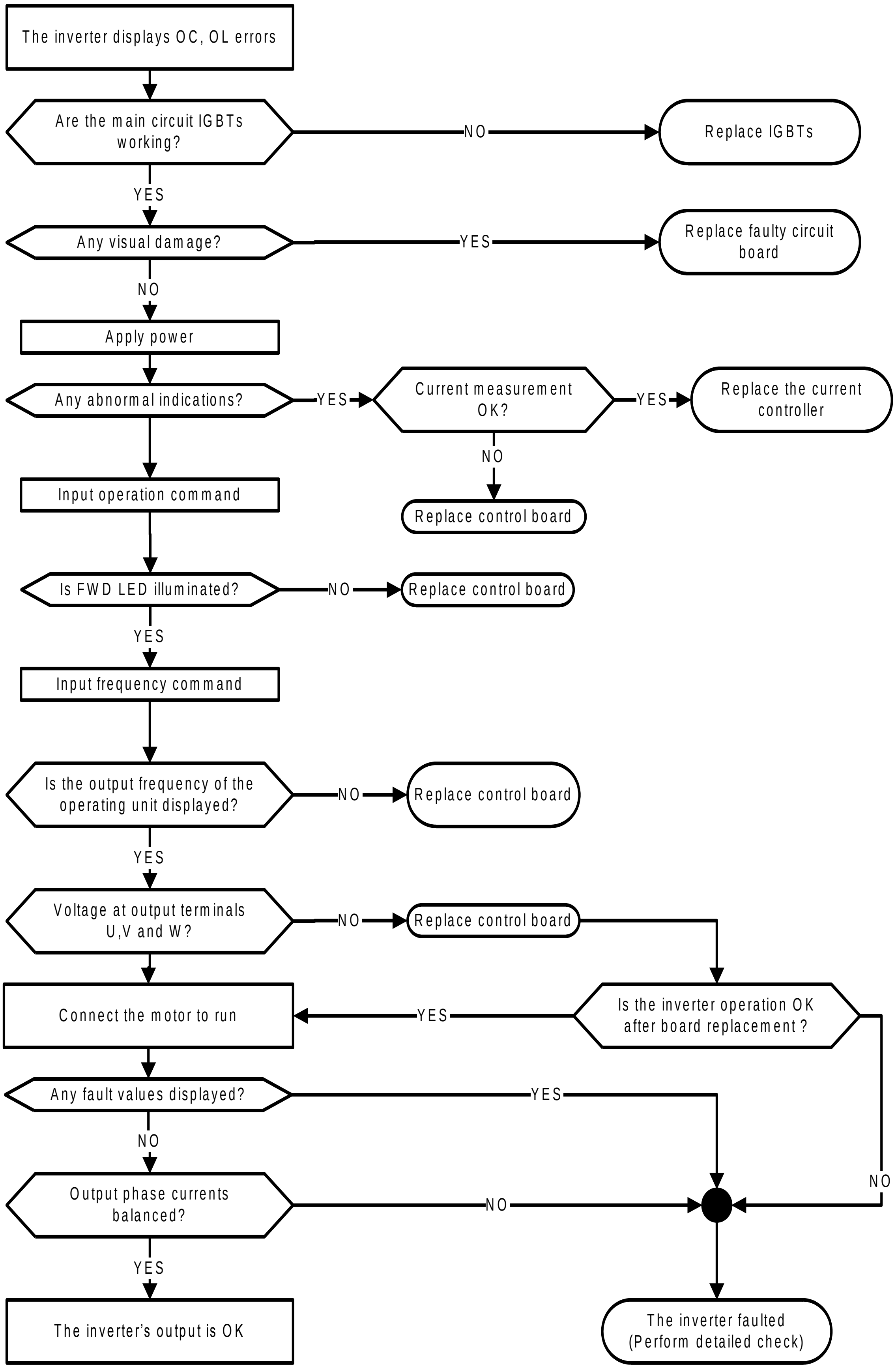
10.4 Inverter Troubleshooting

10.4.1 Quick troubleshooting of inverter

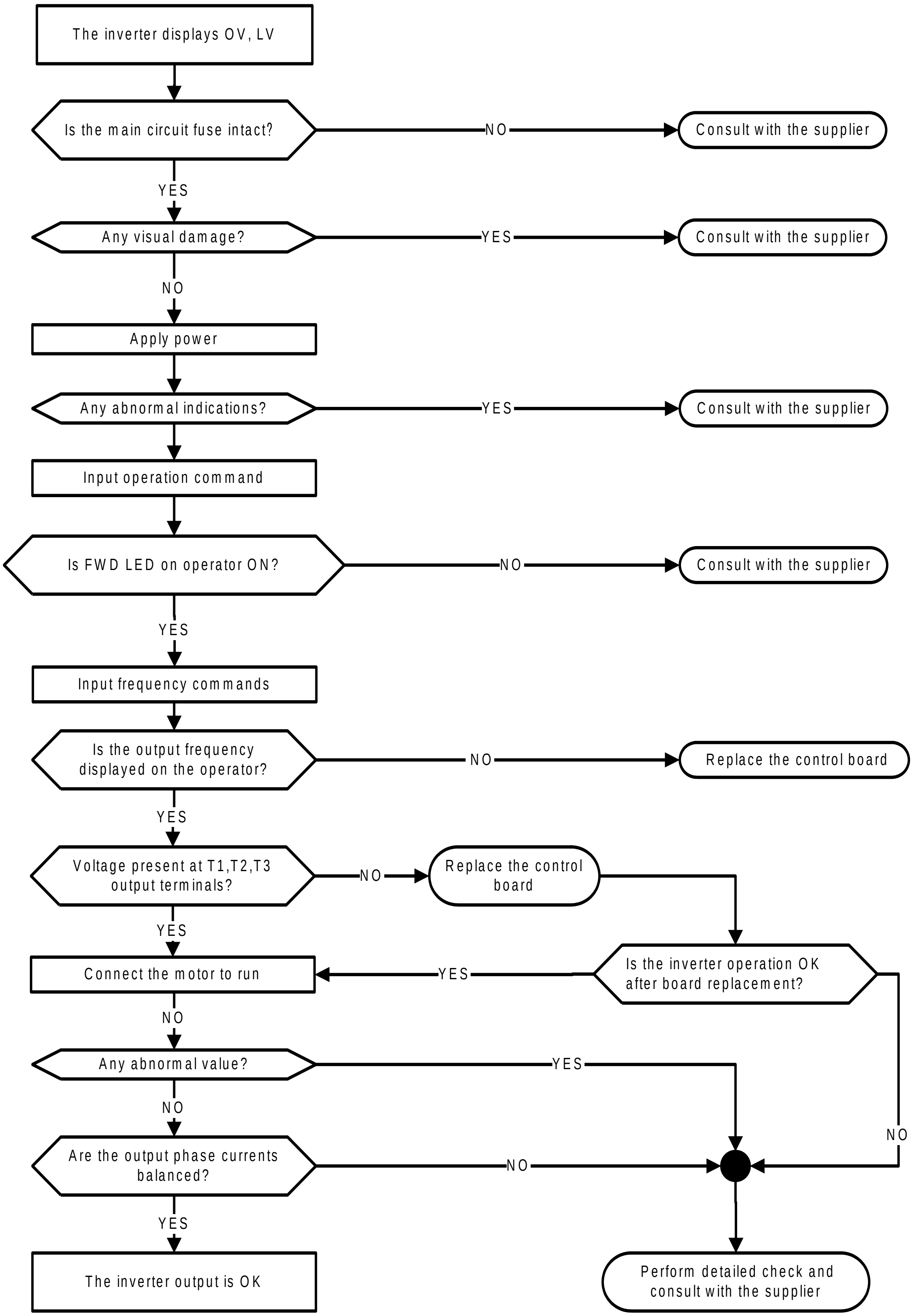



From previous page
Check Inverter parameters
Perform parameter initialization
Specify operation control mode
Does the FWD or REV LED light flash?
NO
Replace the control board
YES
Set up frequency command
Is the frequency value displayed on the display?
NO
Replace the control board
YES
Voltage at outputs terminals U, V and W?
NO
Replace the control board
YES
Connect the motor to run
YES
Does the control Board function after replacement
NO
Is there any fault display?
YES
NO
NO
Output phase currents balanced?
NO
YES
The inverter is OK
Perform detailed check and consult with the supplier.

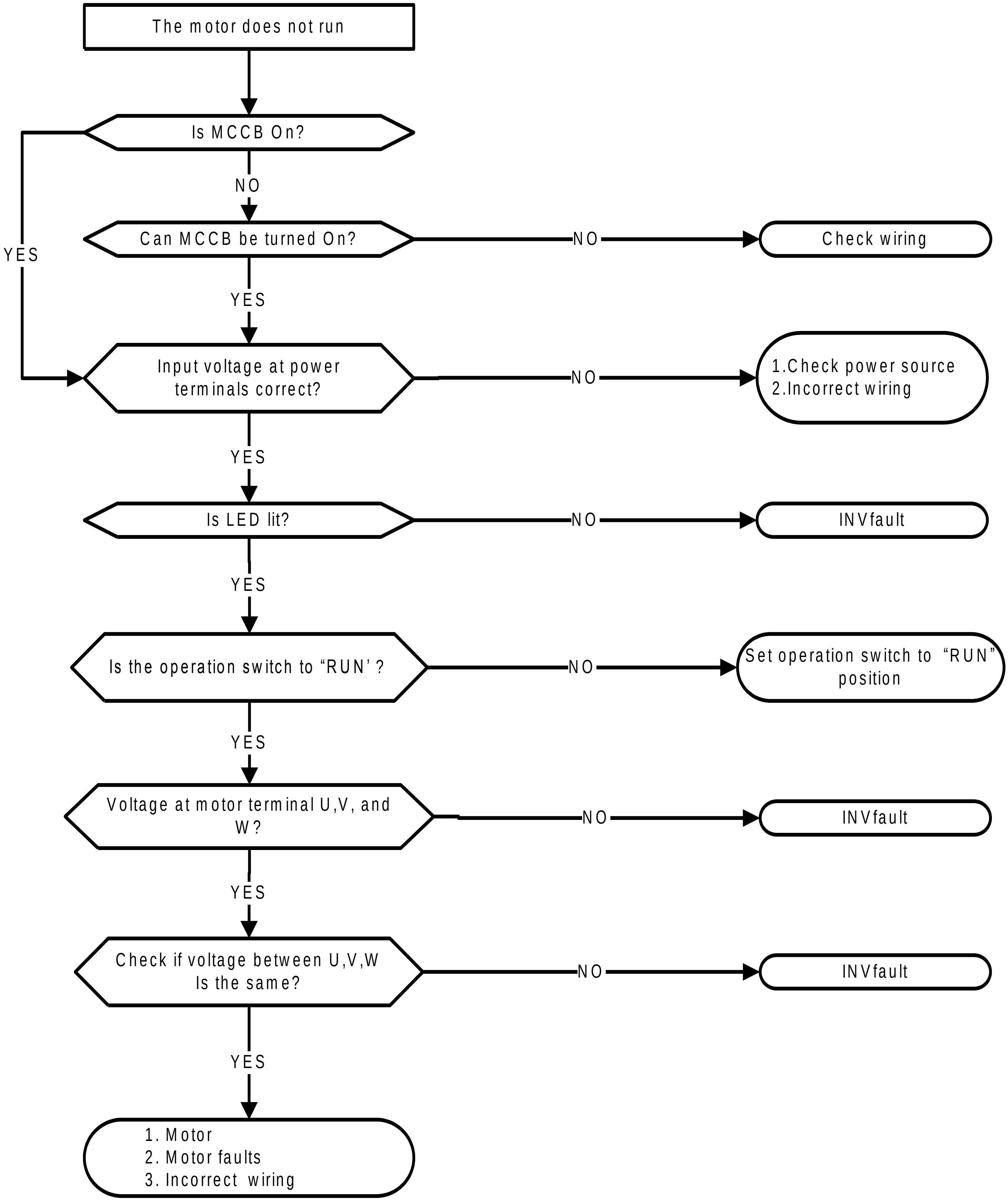
10.4.2 Overcurrent and Overload Troubleshooting



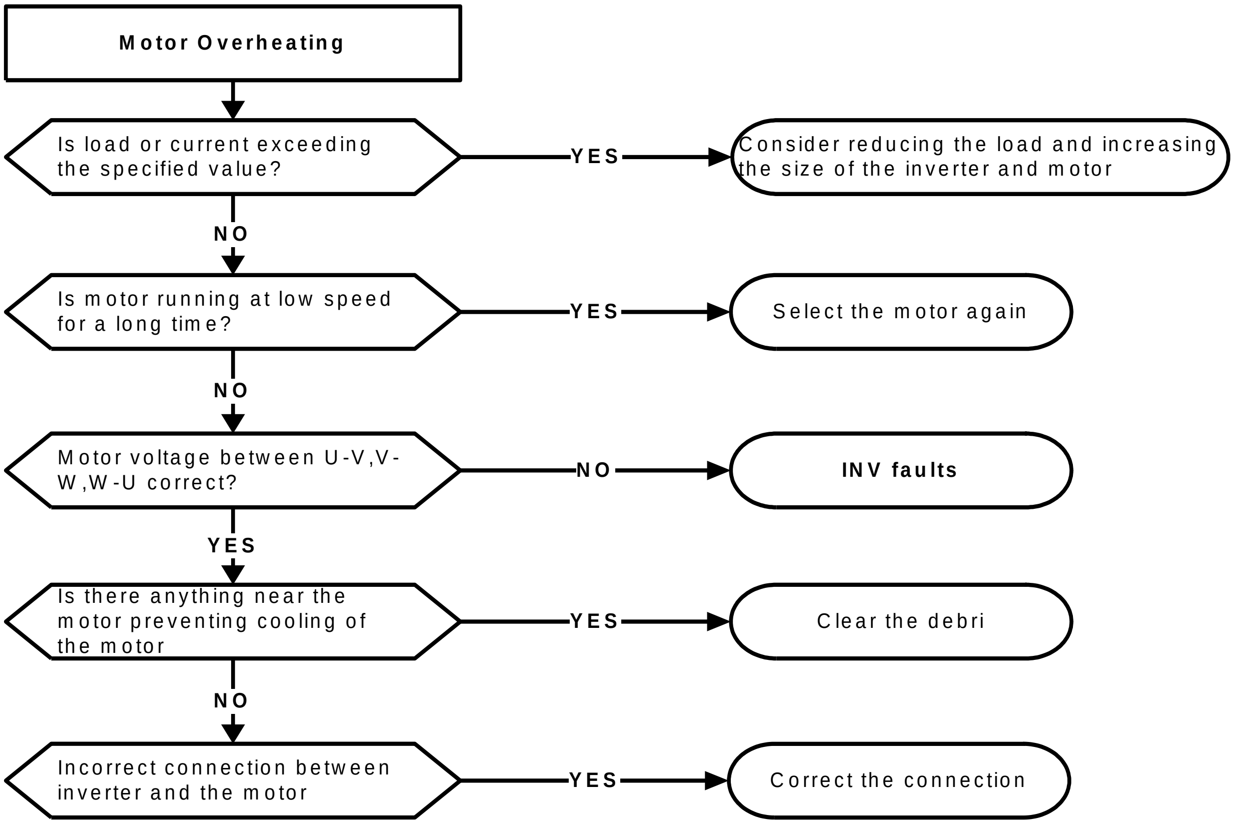
10.4.3 Overvoltage and Undervoltage Troubleshooting



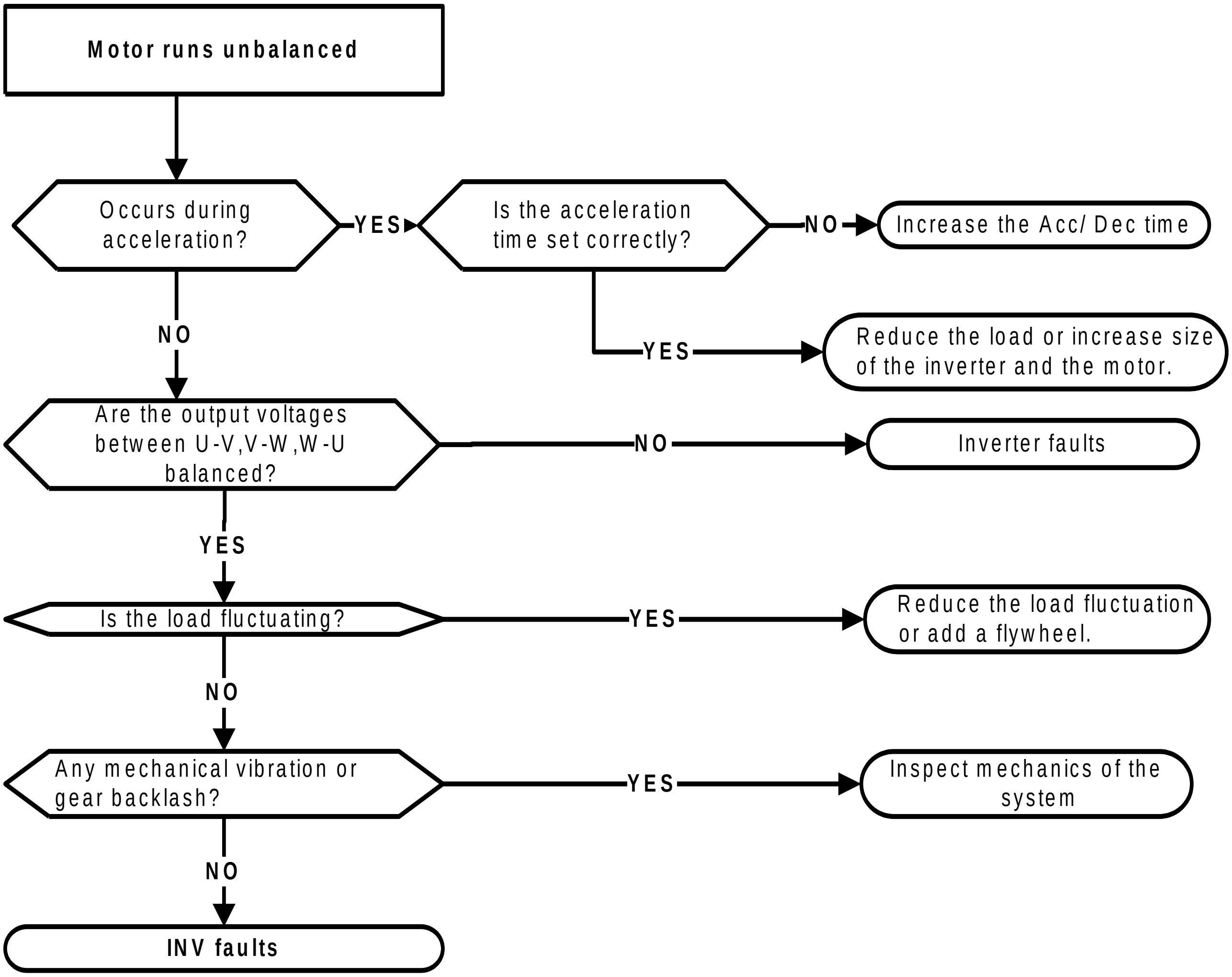
10.4.4 Motor not running



10.4.5 Motor overheating



10.4.6 Motor runs unbalanced



10.5 Routine and periodic inspection

To ensure safe and problem free operation, check and maintain the inverter at regular intervals.
Use the checklist below as a maintenance guideline.
Disconnect power and wait approximately 10 minutes unit charge led is no longer lit to make sure no voltages are present on the output terminals before performing inspection or maintenance.

Items	Details	Checking period		Methods	Criteria	Remedies
		Daily	1Year			
Environment & Ground connection						
Ambient conditions on site	Confirm ambient temperature and relative humidity on site	◎		Measure with thermometer and hygrometer	Temperature: -10 – 40°C (14-120°F) Humidity: Below 95%RH	Improve the ambient or relocate the drive to a better area.
	Are there flammable materials close to the inverter?	◎		Visual check	Keep area clear	
Installation Grounding	Any unusual vibration from surrounding machine	◎		Visual and noise check	Keep area clear	Secure screws
	Is the grounding resistance correct?		◎	Measure the resistance with a multi-meter	200Vclass: below 100Ω	Improve the grounding if needed.
Terminals & Wiring						
Connection terminals	Check for loose terminals		◎	Visual check Check with a screwdriver	Correct installation requirement	Secure terminals and remove rust
	Check for damage to the base of the inverter		◎			
	Check for corroded Terminals		◎			
Wiring	Check for broken wires		◎	Visual check	Correct wiring requirement	Rectify as necessary
	Check wire insulation		◎			
Input Voltage						
Input power voltage	Check input voltage	◎		Measure the voltage with a multi-meter	Voltage must conform with the spec.	Improve input voltage if necessary.

Items	Details	Checking period		Methods	Criteria	Remedies
		Daily	1Year			
Circuit boards and components						
Printed circuit board	Check for damage to PCBs		◎	Visual check	Correct component condition	Clean or replace the circuit board
	Check for discolored, overheated, or burned parts		◎			
Capacitor	Check for unusual odor or leakage	◎				Replace capacitor or inverter
	Check for any physical damage or protrusion		◎			
Power component	Check for any dust or debris		◎			Clean components
	Check resistance between each terminals		◎	Measure with a multi-meter	No short circuit or faulty three-phase output	Consult factory
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	◎		Noise 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	◎		Visual check		Clean the fan
Heat sink	Excessive dust or debris	◎				Clean up debris or dust
Ventilation Path	Is the ventilation path blocked	◎				Clear the path

10.6 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.

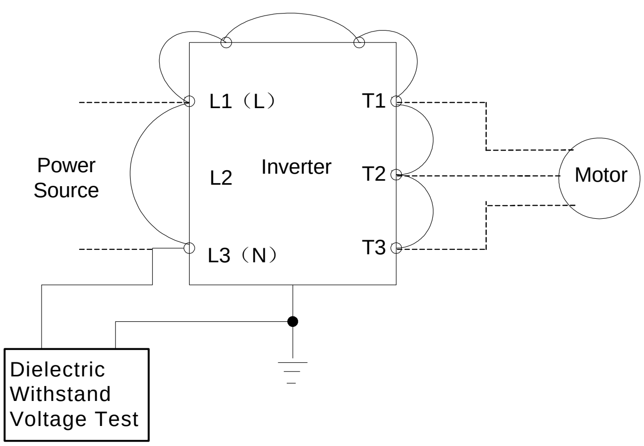
To ensure stable and safe inverter operation it is recommended to perform routine inverter maintenance at regular intervals. Use the checklist below as a guideline for inspection. Make sure to turn power off and wait for a minimum of 5 minutes or until the charge indicator extinguishes before inspecting the inverter to avoid electric shock hazard from the charged capacitors.

1. Maintenance Check List

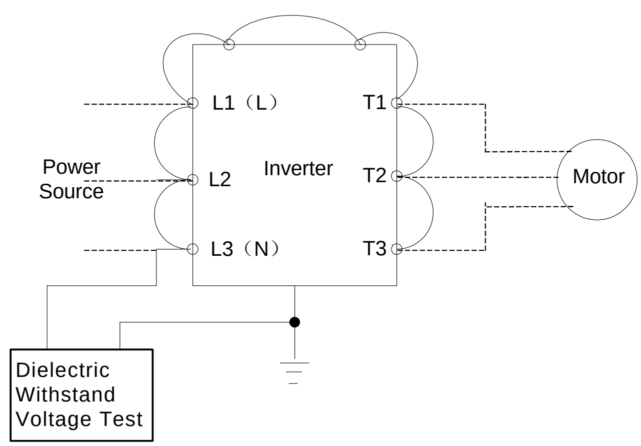
• Ensure that temperature and humidity where the inverter is installed falls within the specification make sure correct ventilation is provided.
• For replacement of a failed or damaged inverter consult factory.
• Ensure that the installation area is free from dust and any other debris.
• Check and ensure that the ground connections are secure and correct.
• Terminal screws cannot be loose, tighten terminal for power input and output of the inverter with power turned off.
• Do not perform any insulation test on the control circuit.

2. Insulation test (megger test)

Single Phase



Three Phase



11. Accessories

11.1 Options

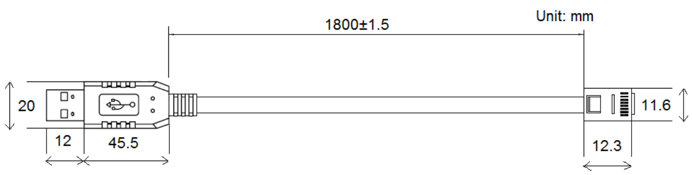
Accessories	Model	Function	Notes
IP20/NEMA1 Digital Operator Extension cable	JN5-CB-01M	Used for remote control purposes with the remote keypad operator (JN5-CU).	3.14ft (1m)
	JN5-CB-02M		6.28ft (2m)
	JN5-CB-03M		9.84ft (3m)
	JN5-CB-05M		16.4ft (5m)
NEMA 1 Kits	JN5-NK-E01	Includes dust cover for top of inverter and conduit box for bottom of the meet NEMA1. (Frame 5/6 have been designed to meet NEMA1 protection level, not kit required)	Frame 1
	JN5-NK-E02		Frame 2
	JN5-NK-E03		Frame 3
	JN5-NK-E04		Frame 4
JN5-CM-USB	RJ45 to USB connecting cable	The communication cable is used to communicate with the TECO Link software directly to the inverter using the PC USB port. Length 1.8 meters / 6ft.	JN5-CM-USB
LCD Digital Operator	JN5-OP-A02	IP20 LCD Operator panel mount.	
Keypad Display Holder	JN5-KEYBOX	Keypad display panel mount.	
Copy module	JN5-CU	Used to copy parameter settings from one inverter to another inverter. Use the RJ45 port to connect to the inverter when a remote keypad is used. Use extension cable JN5-CM-0XM when using the copy module operator as a remote keypad.	

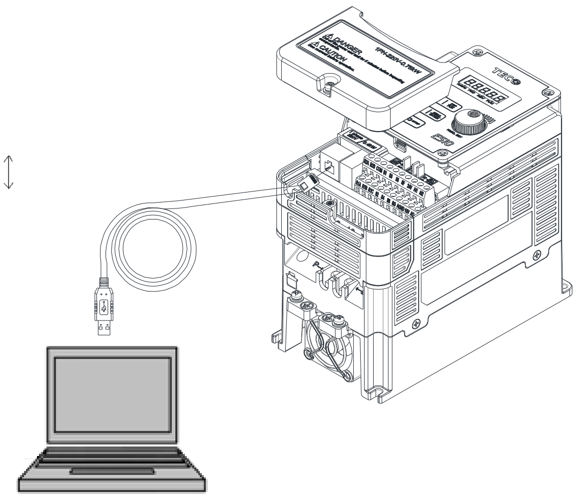
RJ45 to USB Communication Cable (6ft / 1.8m) (JN5-CM-USB) / (JN5-CM-USB for 10ft / 3m cable)

The communication cable is used to communicate with the TECO Link software directly to the inverter using the PC USB port.

Note: Contact factory for software download link.

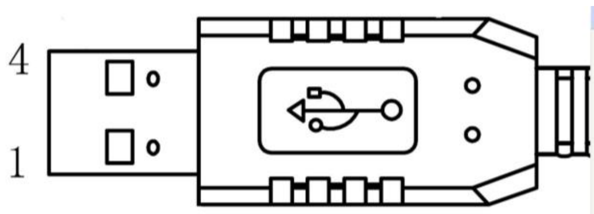
- Cable:



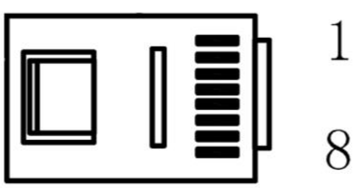


- Connect to the RS45 port:

RS232/USB PC side



RS485/RJ45 connector inverter side



RS485/RJ45 pin definition

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

Note:
A/B phase signal (pin1&pin2) are the RS485 differential mode data signals.
VCC & GND are the +5VDC and common of the inverter's internal power source.

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

11.2 Braking resistors

Inverter			Braking Unit		Resistor Unit		Braking resistor Specification		Duty Cycle	Braking torque	Minimum Resistance	
V	HP	KW	Model	Qty Req.	Model	Qty Req.	(Ω)	(W)	(%)	(%)	(Ω)	(W)
220V 1Ph/3Ph	0.5	0.4	-	-	JNBR-150W200	1	200	150	10	214	70	210
	1	0.75	-	-	JNBR-150W200	1	200	150	10	117	70	210
	2	1.5	-	-	JNBR-150W100	1	100	150	10	117	70	210
	3	2.2	-	-	JNBR-260W70	1	70	260	10	112	70	210
220V 3Ph	5	4	-	-	JNBR-390W40	1	40	390	10	117	30	500
	7.5	5.5	-	-	JNBR-520W30	1	30	520	10	123	25	600
	10	7.5	-	-	JNBR-780W20	1	20	780	10	117	15	1000
	15	11	-	-	JNBR-2R4KW13R6	1	13.6	2400	10	100	10	1500
	20	15	-	-	JNBR-2R4KW13R6	1	13.6	2400	10	100	10	1500
	25	18.5	-	-	JNBR-4R8KW8	1	8	4800	10	119	7	2400
	30	22	-	-	JNBR-4R8KW6R8	1	6.8	4800	10	117	5.5	3000
	40	30	JNTBU-230	2	JNBR-3KW10	2	10	3000	10	119	5.5	3000
400V 3Ph	1	0.75	-	-	JNBR-150W750	1	750	150	10	123	120	500
	2	1.5	-	-	JNBR-150W400	1	400	150	10	117	120	500
	3	2.2	-	-	JNBR-260W250	1	250	260	10	123	100	600
	5	4	-	-	JNBR-400W150	1	150	400	10	123	60	1000
	7.5	5.5	-	-	JNBR-600W130	1	130	600	10	123	50	1200
	10	7.5	-	-	JNBR-800W100	1	100	800	10	117	50	1200
	15	11	-	-	JNBR-1R6KW50	1	50	1600	10	149	50	1200
	20	15	-	-	JNBR-1R5KW40	1	40	1500	10	100	25	2400
	25	18.5	-	-	JNBR-4R8KW32	1	32	4800	10	120	15	4000
	30	22	-	-	JNBR-4R8KW27R2	1	27.2	4800	10	117	14	4800
	40	30	-	-	JNBR-6KW20	1	20	6000	10	117	19.2	3600
	50	37	JNTBU-430	2	JNBR-4R8KW32	2	32	4800	10	117	19.2	3600
	60	45	JNTBU-430	2	JNBR-4R8KW27R2	2	27.2	4800	10	117	19.2	3600
	75	55	JNTBU-430	2	JNBR-6KW20	2	20	6000	10	117	19.2	3600

Note：

Formula to calculate braking resistor wattage：**W= (Vpnb * Vpnb) * ED% / Rmin**

(1) **W**：braking resistor power (Watts)

(2) **Vpnb**：braking voltage (220V=380VDC, 440V=760VDC)

(3) **ED%**：braking duty cycle

(4) **R**min：braking resistor minimum value (ohms)

Appendix: UL Instructions

Danger

Electric Shock Hazard

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

Warning

Electric Shock Hazard

Do not operate equipment with covers removed.
Failure to comply could result in death or serious injury.
The diagrams in this section may show inverters without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the inverters and run the inverters according to the instructions described in this manual.

Always ground the motor-side grounding terminal.
Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not touch any terminals before the capacitors have fully discharged.
Failure to comply could result in death or serious injury.
Before wiring terminals, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the inverter before touching any components.

Do not allow unqualified personnel to perform work on the inverter.
Failure to comply could result in death or serious injury.
Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of inverters.

Do not perform work on the inverter while wearing loose clothing, jewelry, or lack of eye protection.
Failure to comply could result in death or serious injury.
Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the inverter.

Do not remove covers or touch circuit boards while the power is on.
Failure to comply could result in death or serious injury.

Warning

Fire Hazard

Tighten all terminal screws to the specified tightening torque.
Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use an improper voltage source.
Failure to comply could result in death or serious injury by fire.
Verify that the rated voltage of the inverter matches the voltage of the incoming power supply before applying power.

Do not use improper combustible materials.
Failure to comply could result in death or serious injury by fire. Attach the inverter to metal or other noncombustible material.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the inverter and circuit boards.
Failure to comply may result in ESD damage to the inverter circuitry.

Never connect or disconnect the motor from the inverter while the inverter is outputting voltage.
Improper equipment sequencing could result in damage to the inverter.

Do not use unshielded cable for control wiring.
Failure to comply may cause electrical interference resulting in poor system performance. Use shielded twisted-pair wires and ground the shield to the ground terminal of the inverter.

Do not modify the inverter circuitry.
Failure to comply could result in damage to the inverter and will void warranty. TECO is not responsible for any modification of the product made by the user. This product must not be modified.

Check all the wiring to ensure that all connections are correct after installing the inverter and connecting any other devices.
Failure to comply could result in damage to the inverter.

❖ UL Standards

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

C UL US
LISTED
UL/cUL Mark

❖ UL Standards Compliance

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

■ Installation Area

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

■ Motor Over Temperature Protection

Motor over temperature protection shall be provided in the end use application.

■ Field Wiring Terminals

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

■ Inverter Short-Circuit Rating

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

• The MCCB and breaker protection and fuse ratings (refer to the preceding table) shall be equal to or greater than the short-circuit tolerance of the power supply being used.
• Suitable for use on a circuit capable of delivering not more than (A) RMS symmetrical amperes for (HP) HP in 240 / 480 V class drives motor overload protection.

Horse Power (HP)	Current (A)	Voltage (V)
1 - 50	5,000	240 / 480
51 - 200	10,000	240 / 480

❖ Inverter Motor Overload Protection

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

■ 02-01 Motor Rated Current

Setting Range Model Dependent
Factory Default: Model Dependent

The motor rated current parameter (02-01) protects the motor. The motor protection parameter 08-05 is set as factory default. Set 02-01 to the full load amps (FLA) as shown on the nameplate of the motor.

■ 08-05 Motor Overload Protection Selection

The inverter has an electronic overload protection function (OL1) based on time, output current, and output frequency, which protects the motor from overheating. The electronic thermal overload function is UL-recognized, so it does not require an external thermal overload relay for single motor operation.
This parameter selects the motor overload curve used according to the type of motor applied.

08-05	Selection for motor overload protection (OL1)
Range	**【xxx0b】**：Motor overload is disabled **【xxx1b】**：Motor overload is enabled **【xx0xb】**：Cold start of motor overload **【xx1xb】**：Hot start of motor overload **【x0xxb】**：Standard motor **【x1xxb】**：Special motor **【0xxxb】**：Reserved **【1xxxb】**：Reserved

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

08-05 = 0: Disables the motor overload protection function when two or more motors are connected to a single inverter. Use an alternative method to provide separate overload protection for each motor such as connecting a thermal overload relay to 1he power line of each motor.

08-05 = 1: The motor overload protection function should be set to hot start protection characteristic curve when the power supply is turned on and off frequently, because the thermal values are reset each time when the power is turned off.

■ 08-06 Motor Overload Operation Selection

08-06	Start-up mode of overload protection operation (OL1)
Range	**0:** Coast-to-Stop After Overload Protection is Activated **1:** Drive Will Not Trip when Overload Protection is Activated (OL1)

08-06=0: When the inverter detects a motor overload the inverter output is turned off and the OL1 fault message will flash on the keypad. Press RESET button on the keypad or activate the reset function through the multi-function inputs to reset the OL1 fault.

08-06=1: When the inverter detects a motor overload the inverter will continue running and the OL1 alarm message will flash on the keypad until the motor current falls within the normal operating range.

■ 00-27 HD/ND Mode

00-27	HD/ND Mode
Range	【0】: HD (Heavy Duty / Constant Torque) – 150% for 1 Min 【1】: ND (Normal Duty / Variable Torque) – 120% for 1 Min

00-27=0: For constant torque applications with a load less than 150% of the motor rated current. If the load is greater than 150% of the motor rated current, the motor will run for 1 minute before faulting on motor overload.

00-27=1: For variable torque applications (Fan, Pumps…) with a load less than 120% of the motor rated current. If the load is greater than 120% of the motor rated current, the motor will run for 1 minute before faulting on motor overload.

TECO Westinghouse

INVERTER

E510

Distributor

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