

INDVERTER C1

Ratings: 120~560Watts

Indverter – C1 *User Manual*

Rev 0 3rd September 2014

HEXMOTO
Controls Pvt.Ltd

Introduction

Dear Customer,

We thank you for buying our “Inverter-C1” series AC Drive.

Please read this user manual carefully before installation, operation, maintenance or inspection of the drive system.

This manual is intended to provide sufficient information for installation and operation of the drive system. Also, information on trouble-shooting and various features of the drive controller is included to enable the user for getting optimum performance out of the drive system.

We will be happy to assist you in case of any doubts, clarifications regarding drive configuration and usage for a particular application.

Thanking you and assuring you of our best attention and services

HEXMOTO Controls Pvt. Ltd

| SELECTION CHART | | | | |
|---------------------------------|----------------|----------------|----------------|--|
| Type | 120 Watts | 250 Watts | 560 Watts | |
| Applicable Motor output in KW | 0.12 | 0.25 | 0.56 | |
| Inverter Output at 230V in KVA | 0.4 | 0.7 | 1.3 | |
| Rated Output Current in Amperes | 1.0 Amps | 1.75 Amps | 3.3 Amps | |
| Net Weight (Kg) | | | | |
| Dimensions (W D H) in mm | 107 x 66 x 185 | 107 x 66 x 185 | 107 x 66 x 185 | |

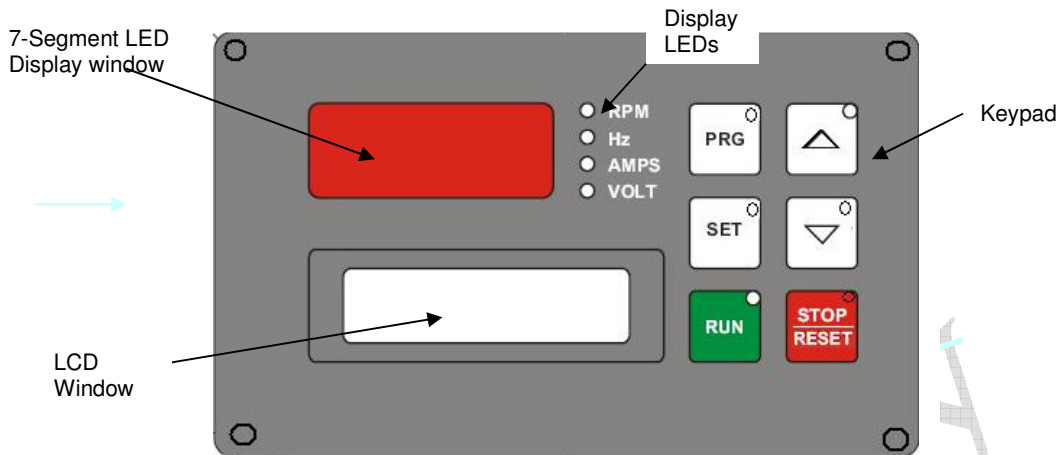
1. TECHNICAL SPECIFICATIONS









| Specifications | | |
|--------------------------|----------------------------------|---|
| Input Rating | Power Supply | 1 Phase 230V, 50/60Hz |
| | | Tolerance Voltage: +10%, -15%, Frequency: +/-5%, |
| Output Rating | Output Voltage | 3 Phase, 220V AC RMS (Maximum) |
| | Output Frequency Range | 1Hz to 400Hz |
| | Frequency Stability | Digital setting: +/-0.01% of max. Frequency Analog setting: +/-0.2% of max. Frequency (at temperatures -10°C to +50°C ambient) |
| | Overload Capacity | 150% for one minute |
| Control Specification | Control system | Space vector modulation with bus ripple compensation |
| | Adjustable current limit | Programmable 30 to 200% of drive rated current |
| | Base Frequency | 30 to 400Hz |
| | Carrier frequency | 2kHz to 10kHz (by default 6kHz) |
| | Frequency setting | Up/Down keys Raise/Lower Switch 0-10V, 0-20mA 4-20mA 3 Preset frequencies with X1, X2 Serial communication. Programmable digital inputs : X1,2 |
| | Frequency resolution | Digital: 0.01Hz step up to 100Hz Analog: 0.05Hz step (at Fmax. 50Hz) |
| | Acceln./Deceln. Rate | Acceleration : 0.1 to 999.9 in steps of 0.1 seconds 1000 to 9999 in seconds Deceleration: 0.1 to 999.9 in steps of 0.1 seconds 1000 to 9999 in seconds |
| | External output | 2No. Programmable relay output rated for 24V 1A |
| | Display unit (Optional) | Serial display unit |
| | Fault history display | Present fault and up to 3 previous faults. |
| Protection | Inverter trip and Error messages | Under voltage, Over voltage, Over current during acceln/decln/Steady state condition, External fault, Heat sink over temperature, Short circuit, Electronic thermal overload trip and output unbalance. |
| | Functions | Stall prevention, Auto restart during power failure |
| Environmental Conditions | Installation location | Indoor not more than 1000m above sea level. Do not install in a dirty location or expose to corrosive gases or direct sunrays. Protection class: IP20 |

Rev 0 03rd September 2014






| | | |
|----------------------------|--|--|
| | Ambient temperature | 10°C to +40°C (-10°C to +50°C when mounted inside the switch board) |
| | Humidity | 90% RH or less (non-condensing) |
| | Cooling system | Forced air cooling type / Natural air cooling type (Optional) |
| Communication (Optional) | RS-485 with MODBUS RTU protocol. | |
| Synchronization (Optional) | Multiple drives can be synchronized by programming one drive as MASTER. The synchronization is done through the serial communication which is most accurate and fine adjustments can be done locally | |
| Applications | | |

2. DISPLAY AND KEYPAD (Optional)



| Keys | Description |
|---|---|
|  | Used as Program Key <ul style="list-style-type: none"> Use to enter Programming mode, when the drive is not running. When the drive is running, this key is used to select RPM, Hz, AMPS, VOLTS display on first line of LCD display |
|  | Used as UP key <ul style="list-style-type: none"> When Main speed reference is from Keypad, UP key is used to increase the reference frequency/ speed when the drive is running or in ready to run mode. In programming mode, UP key is used to increase Function code Or increase data for a function code or Parameter |
|  | Used as DOWN key <ul style="list-style-type: none"> When Main speed reference is from Keypad, DOWN key is used to decrease the reference frequency/ speed when the drive is running or in ready to run mode. In programming mode, DOWN key is used to decrease Function code or decrease data for a function code. |
|  | Used as RUN Key <ul style="list-style-type: none"> If the Start command is from Keypad, RUN Key is used to start a drive LED on RUN Key glows when drive is in RUN Mode |
|  | Used as SET Key <ul style="list-style-type: none"> Used to set the parameter value in Programming mode In ready mode / RUN mode, used to set the frequency / RPM value. If set, the value will be stored in the memory (possible only when Parameter 03 is set to Keypad) |
|  | Used as STOP or RESET Key <ul style="list-style-type: none"> If the Start command is from Keypad,  Key is used to stop a drive STOP/RESET is also used as return from Menu if in programming mode In case of fault,  is used to reset the fault. Refer to "Maintenance and Troubleshooting" section for more details |

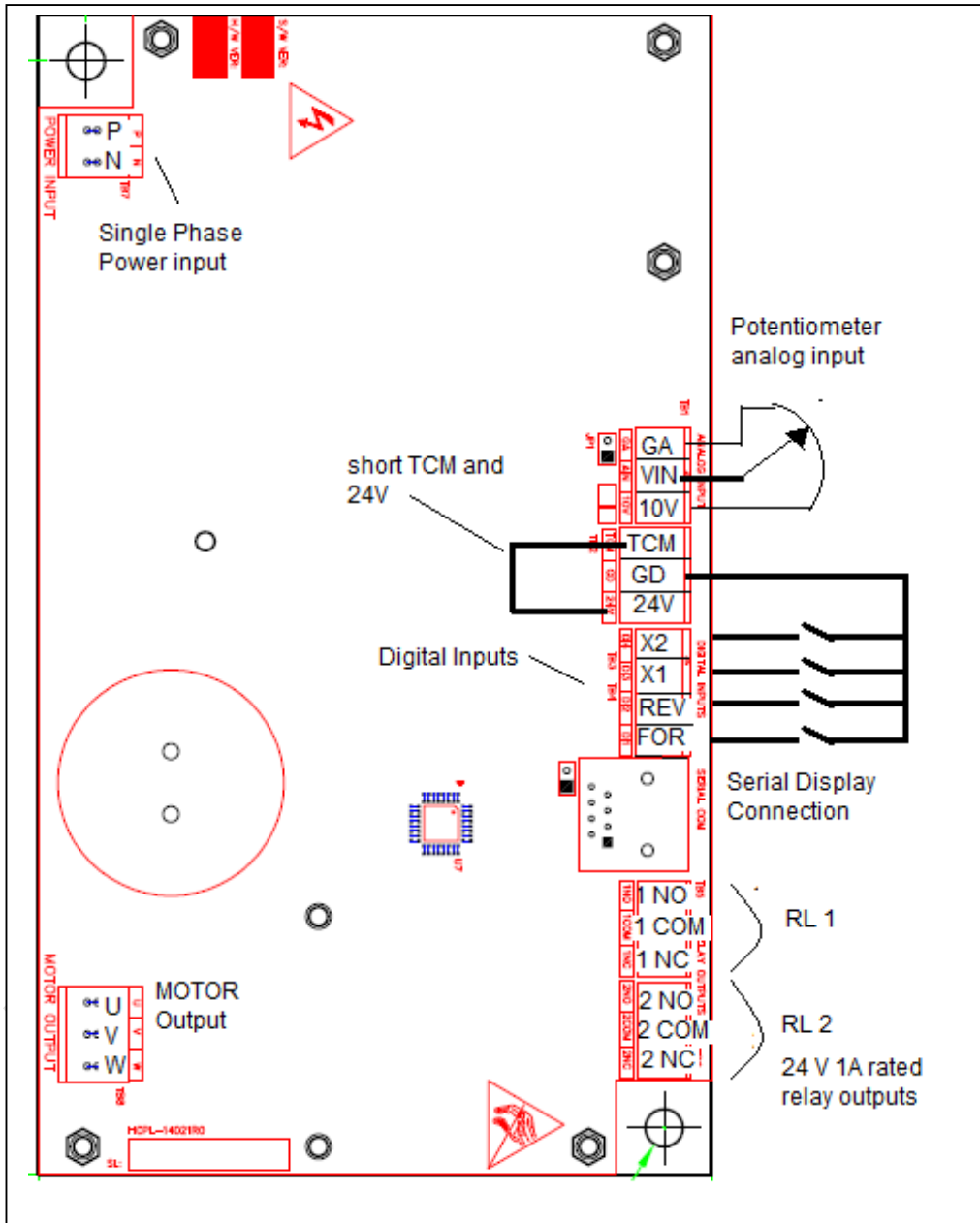
Description of Display LEDs

| Display LED | Description |
|--|--|
|  RPM | LED is ON when display is showing RPM. This selection of display function is based on Parameter 01. |
|  Hz | LED is ON when display is showing Frequency. This selection of display function is based on function Parameter 01. |
|  AMPS | LED is ON when display is showing drive output current. This selection of display function is based on Parameter 01. |
|  VOLT | LED is ON when display is showing DC bus voltage of the drive. This selection of display function is based on Parameter 01 |
| LED on PRG | If user enters Programming mode by pressing PRG key, PRG LED is ON. This is to indicate to the user that drive is in programming mode and drive cannot be started by giving a start command. User can exit from programming mode by pressing  key. Once drive comes out of programming mode, PRG LED is OFF. |
| LED on RUN | RUN LED RUN LED is ON when the drive is in RUN Mode. |
| LED on STOP/RESET | STOP LED STOP LED is ON when the drive is stopped. |

- Pressing PRG again in programming mode, user can modify the data. In this mode, first line of LCD starts blinking to indicate data being modified.
- For detailed description on programming refer to “Description of parameters and programming”

3. DESCRIPTION OF CONTROL CONNECTIONS

6.1) Overview of the Control card connections



6.2) Digital Inputs on TB 2,3,4

| | | | |
|------------|------------|-----------|-----------|
| DI1 FOR | DI2 REV | DI3 X1 | DI4 X2 |
|------------|------------|-----------|-----------|

| Name | Function | Description |
|------|-------------|---|
| DI 1 | FOR | FOR input is used as START in Forward direction |
| DI 2 | REV | REV input is used as START in Reverse direction |
| DI 3 | X1 OR Raise | Multi-speed Digital Input 1 or Raise based on Para 03 |
| DI 4 | X2 OR Lower | Multi-speed Digital Input 2 or Lower based on Para 03 |

| | Name | Description |
|-----|------|---|
| RL1 | 1NC | Programmable Relay Normally Closed contact (24V, 1A) |
| | 1COM | Programmable Relay Common |
| | 1NO | Programmable Relay Normally Open contact (24V, 1A) |
| RL2 | 2NC | Programmable Relay Normally Closed contact (24V, 1A) |
| | 2COM | Programmable Relay Common |
| | 2NO | Programmable Relay Normally Open contact (24V, 1A) |

LIST OF PARAMETERS Inverter C1

| Func Code | Name | Data | | | | |
|-----------|-------------------|-----------|--|---------------------------|-------------------------------|-----------------|
| | | Selection | Description | Range | Set accuracy | Factory Setting |
| 01 | Para Lock | 0 to 1000 | Set password as 339 | | | 0000 |
| 01 | LED display | 0000 | RPM | 0 to 3 | 0001 | 0000 |
| | | 0001 | Hz | | | |
| | | 0002 | Amps | | | |
| | | 0003 | DCBus | | | |
| 02 | Control Location | 0000 | Keypad Display Unit | 0 to 4 | 0001 | 0001 |
| | | 0001 | 2-Wire TB FOR/REV | | | |
| | | ---- | ---- | | | |
| 03 | Main spd Ref | 0000 | From Keypad Digital | 0 to 9 | 0001 | 0000 |
| | | 0001 | Analog VIN TB Volts In | | | |
| | | ---- | ---- | | | |
| | | ---- | ---- | | | |
| | | 0006 | Raise-Lower Stop 0 | | | |
| | | 0007 | Raise-Lower TB-Norm | | | |
| | | 0008 | Raise-Lower App 1 | | | |
| | | 0009 | Raise-Lower App 2 | | | |
| | | 04 | Maximum Freq | | | |
| 05 | BASE Freq | Hz | Base or Synchronous frequency | 30 to 400 | 00.01 | 50.00 |
| 06 | Start Freq | Hz | Starting frequency selection | 1.0 to 6.0 Hz | 0.01 | 1.00 |
| 07 | Slip Com | Hz | Slip compensation | 0.0 to 6.0 Hz | 0.01 | 0.0 |
| 08 | Acceln time | Seconds | Acceleration time to reach maximum speed | 1.0 to 9999 | 0.1 1Sec for > 1000 | 10.0 |
| 09 | Deceln time | Seconds | Deceleration time to reach zero speed from maximum speed | 0.1 to 9999 | 0.1 1Sec for > 1000 | 10.0 |
| 10 | Torque boost | % | Initial torque boost voltage in % of output voltage | 0 - 100 | 0001 | 0005 |
| 11 | Freq of Boost | % | % of Base frequency at which Torque boost becomes zero | 0 - 100 | 0001 | 0050 |
| 12 | RPM Multiplier | k | RPM Display = k* Frequency | 00.00 – 99.99 | 00.01 | 28.80 |
| 13 | Current Limit | % | Drive Current limit. Percentage of Motor current in Para 14. | 0030 - 0200 | 0001 | 0150 |
| 14 | Motor Current | Amps | Rated current of the motor connected. Set by the user. | 0 to Module rated current | 00.01 | 1.0 Amps |
| 15 | Thermal OL | 0000 | No overload function | 0000 - 0002 | 0001 | 0001 |
| | | 0001 | Forced Cooled motor | | | |
| | | 0002 | Self-cooled motor | | | |

| Func Code | Name | Data | | | | |
|-----------|---|----------------|---|--|--------------|-----------------|
| | | Selection | Description | Range | Set accuracy | Factory Setting |
| 16 | UV Trip Latch | 0000 | Trip and Latch | 0000 - 0001 | 0001 | 0001 |
| | | 0001 | Stop and Start with start frequency | | | |
| 17 | PWM Frequency | kHz 2 to 10 | Switching frequency of the power devices for PWM generation | To be modified by authorized service personnel only | | 0006 |
| 18 | | Reserved | | | | |
| 19 | RL1 Select Conditions for which RL1 Operates | 0000 | Motor Running | 0000-0025 | 0001 | 0000 |
| | | 0001 | Drive accelerating ACC | | | |
| | | 0002 | Drive decelerating DEC | | | |
| | | 0003 | RUN Command Received | | | |
| | | 0004 | STORING Parameters | | | |
| | | 0005 | | | | |
| | | 0006 | Heat sink Over temperature Warn | | | |
| | | 0008 | FORWARD | | | |
| | | 0009 | REVERSE | | | |
| | | 0011 | STOPPED | | | |
| | | 0012 | | | | |
| | | 0013 | | | | |
| | | 0014 | | | | |
| | | 0015 | UV Warning | | | |
| | | 0016 | OL Warning | | | |
| | | 0017 | FREQUENCY DETECT | | | |
| | | 0018 | STOP FREQUENCY REACHED | | | |
| | | 0019 | TRIP Fault | | | |
| | | 0020 | Reference frequency reached | | | |
| | | 0021 | Zero speed | | | |
| | | 0022 | Forward Acceleration | | | |
| | | 0023 | Forward Deceleration | | | |
| | | 0024 | Reverse Acceleration | | | |
| | | 0025 | Reverse Deceleration | | | |
| | | 20 | Fault Memory | | | |
| 01-03 | Previous faults | | | <i>This parameter is Read-Only, not modifiable</i> | | |
| 21 | | Reserved | | | | |
| 22 | Stop Type | 0000 | Stop with Deceleration | | 01 | 00 |
| | | 0001 | Free stop | | | |

| | | | | | | |
|-------|--|------------------------|--|----------------------------|---------------------------|-------|
| 23 | RL2 Select Conditions for which RL2 Operates | 0000 | Motor Running | 0000-0025 | 0001 | 0000 |
| | | 0001 | Drive accelerating ACC | | | |
| | | 0002 | Drive decelerating DEC | | | |
| | | 0003 | RUN Command Received | | | |
| | | 0004 | STORING Parameters | | | |
| | | 0005 | | | | |
| | | 0006 | Heat sink Over temperature Warn | | | |
| | | 0008 | FORWARD | | | |
| | | 0009 | REVERSE | | | |
| | | 0011 | STOPPED | | | |
| | | 0012 | | | | |
| | | 0013 | | | | |
| | | 0014 | | | | |
| | | 0015 | UV Warning | | | |
| | | 0016 | OL Warning | | | |
| | | 0017 | FREQUENCY DETECT | | | |
| | | 0018 | STOP FREQUENCY REACHED | | | |
| | | 0019 | TRIP Fault | | | |
| | | 0020 | Reference frequency reached | | | |
| | | 0021 | Zero speed | | | |
| | | 0022 | Forward Acceleration | | | |
| | | 0023 | Forward Deceleration | | | |
| | | 0024 | Reverse Acceleration | | | |
| | | 0025 | Reverse Deceleration | | | |
| | | 24 | Detect Frequency | | | |
| 25 | Stop Sig Freq | Hz | Frequency at which Stop signal is generated when decelerating. <i>Refer to Para 22</i> | 01.00 – Para 04 | 00.01 | 01.00 |
| 26~28 | Reserved | | | | | |
| 29 | STALL Dec | 0.1 to 20.0 Seconds | If there is increased output current due to Motor stalling, drive controller decelerates motor with this deceleration value. | 0.1 to 999.9 Seconds | 0.1 | 3.0 |
| 30 | OC Trip Level | 0 ~ 8.00 Amps | RMS output current at which drive trips for Over Current. Depends on drive rating selection. | 0 ~ 8.00 Amps | 1 | 3.50 |
| 31~32 | Reserved | | | | | |
| 33 | Freq Low Limit | 0 – 99% | %age of maximum frequency | | 1 | 0% |
| 34 | Freq High Limit | 0 – 100% | %age of maximum frequency | | 1 | 100% |
| 35 | Acc time-1 | Seconds | Acceleration time selected when AC1 TB is operated | 1.0 to 9999 | 0.1 1Sec for > 1000 | 10.0 |
| 36 | Dec time-1 | Seconds | Deceleration time selected when AC1 TB is operated | 0.5 to 9999 | 0.1 1Sec for > 1000 | 10.0 |

| Func Code | Name | Data | | | | |
|-----------|--|---------------------|---|-----------------|--------------|-----------------|
| | | Selection | Description | Range | Set accuracy | Factory Setting |
| 37 | Vin-Min | % | Minimum value for Analog input through VIn TB | 0~ 99% | 1 | 5% |
| 38 | Vin-Max | % | Maximum value for Voltage input through VIn TB | 0 ~ 100% | 1 | 95% |
| 39 | Vin-Filt | 0000 | No Filter | 0000 – 0006 | 0001 | 0002 |
| | | 0001 to 0006 | 50Hz to 1 Hz Digital filter cut-off frequency | | | |
| 40 | Vin-Neg | 0000 | No inversion | 0000 – 0001 | 0001 | 0000 |
| | | 0001 | Analog input is inverted | | | |
| 41 | OL Warn | % | Over load warning level <i>Refer to Para 22</i> | 0000 – 0200 | 0001 | 0100 |
| 42 | MODBUS ID | 0000 | Disable Serial Communication | Not Implemented | | |
| | | 0001 | Enable as Master | | | |
| | | 0002 – 0033 | Enable as slave with address 1 to 32 Refer to “Serial Communication Interface” | | | |
| 43 | Ser Time Out | 0.0 | Disable Time-out function | 0.0 Disabled | | |
| | | 0.1 to 60.0 seconds | No communication activity time-out in seconds. If a module configured as slave, does not get error-free messages for the period set here, slave device takes action as per the settings in Para 105. Communication faults are cleared when a error-free message is received by the master | | | |
| 44 | Ser Flt Act | 0000 | No Warning | 0000 | | |
| | | 0001 | Warning | | | |
| | | 0002 | Trip for Fault | | | |
| 45 | Serial Bias | 0 – 99% | Input bias for AI+/ AI- scaling inputs to get accurate scaling adjustments. Frequency bias in % of maximum frequency. <i>Refer to Synchronization of drives manual for more information</i> | 0000 | | |
| 46 | Arun Mode | 0000 | Auto Run Disabled | 0000 | | |
| | | 0001 | After completion of one cycle, runs at Main speed reference Freq. | | | |
| | | 0002 | Cycle is repeated | | | |
| | | 0003 | After completion of one cycle, drive stops | | | |
| | | 0004 | Use Reference frequency set by para 3 | | | |
| 0005 | Use Reference frequency and Multi-1 set frequency, alternatively. Refer to AUTO Run mode description | | | | | |

| | | | | | | | | | |
|------|--|---|--|-------------|-------------|--------------|--|----------|------|
| 47 | Arun Dir (Direction of rotation for each step of Auto Run function) | 0000 | Same as FOR/REV TB | | | | St1, St2, St3 and St4 represents Step1, Step2, Step3 and Step4 of the Auto run function F= Forward R = Reverse Range 0000 - 0014 | 0001 | 0000 |
| | | | St 4 | St 3 | St 2 | St 1 | | | |
| | | 0001 | F | F | F | R | | | |
| | | 0002 | F | F | R | F | | | |
| | | 0003 | F | F | R | R | | | |
| | | 0004 | F | R | F | F | | | |
| | | 0005 | F | R | F | R | | | |
| | | 0006 | F | R | R | F | | | |
| | | 0007 | F | R | R | R | | | |
| | | 0008 | R | F | F | F | | | |
| | | 0009 | R | F | F | R | | | |
| | | 0010 | R | F | R | F | | | |
| | | 0011 | R | F | R | R | | | |
| | | 0012 | R | R | F | F | | | |
| 0013 | R | R | F | R | | | | | |
| 0014 | R | R | R | F | | | | | |
| 48 | AutoRun Time-1 | Seconds | Time for which drive runs in Multi-1 Speed | | | 0001 to 9999 | 0001 | 0000 | |
| 49 | AutoRun Time-2 | Seconds | Time for which drive runs in Multi-2 Speed | | | 0001 to 9999 | 0001 | 0000 | |
| 50 | AutoRun Time-3 | Seconds | Time for which drive runs in Multi-3 Speed | | | 0001 to 9999 | 0001 | 0000 | |
| 51 | AutoRun Time-4 | Seconds | Time for which drive runs in Multi-4 Speed | | | 0001 to 9999 | 0001 | 0000 | |
| 52 | AutoRun Ramp-1 | Seconds | Acceleration time for AUTO RUN Step1 | | | 1.0 to 9999 | 0.1 | 10.0 | |
| 53 | AutoRun Ramp -2 | Seconds | Acceleration time for AUTO RUN Step2 | | | 1.0 to 9999 | 0.1 | 10.0 | |
| 54 | AutoRun Ramp -3 | Seconds | Acceleration time for AUTO RUN Step3 | | | 1.0 to 9999 | 0.1 | 10.0 | |
| 55 | AutoRun Ramp -4 | Seconds | Acceleration time for AUTO RUN Step4 | | | 1.0 to 9999 | 0.1 | 10.0 | |
| 56 | Reserved | | | | | | | | |
| 57 | MultiSpd-1 | 1.0 to 400.0 Hz | | | | | | 10.00 Hz | |
| 58 | MultiSpd-2 | 1.0 to 400.0 Hz | | | | | | 20.00 Hz | |
| 59 | MultiSpd-3 | 1.0 to 400.0 Hz | | | | | | 30.00 Hz | |
| 60 | MultiSpd-4 | 1.0 to 400.0 Hz | | | | | | 40.00 Hz | |
| 61 | Reserved | | | | | | | | |
| 62 | Service Paswd | Enter service password here to proceed to next set of parameters. | | | | | | 0000 | |
| 63 | Para Default | Setting this to '0001' will reset all the parameters to default factory set value | | | | | | 0000 | |
| 64 | INV Rating | Not Implemented | | | | | | 0000 | |
| 65 | Reserved | | | | | | | | |
| 66 | Output Volts | Output volts can be set from 0 to 240V, Maximum voltage is limited by the input voltage | | | | | | 220V | |
| 67 | DC Calib | Not Implemented | | | | | | | |
| 68 | Reserved | | | | | | | | |
| 69 | Select App | Not Implemented | | | | | | | |
| 70 | Reserved | | | | | | | | |

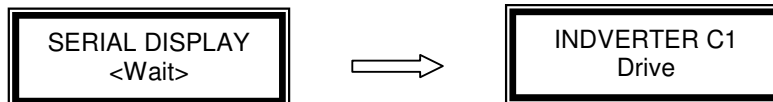
4. DESCRIPTION OF PARAMETERS AND PROGRAMMING (With Optional serial display Unit)

Function codes and data for setting up drive functionality are described below in detail. Understanding different modes of operation of drive controller is essential before setting up the drive parameters. Operation of the drive controller is divided into 5 modes

- a. Start-up mode
- b. Ready To Run Mode
- c. Run Mode
- d. Programming Mode
- e. Fault Mode

Start-up Mode

Each time the drive controller is switched-ON, LCD display will show

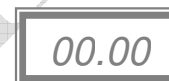
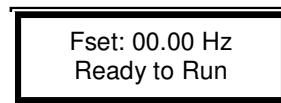


If input voltage is sufficiently high and if there are no faults, drive enters Ready To Run mode

Ready To Run Mode

Drive controller is Ready to accept Run command. User can enter Programming mode from this menu. Based on the selection of Display parameter in Para 01, LED displays set reference speed in Hz or RPM.

LCD
Indicates Ready

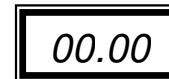
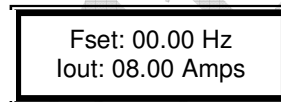


LED
Blinking display

Run Mode

Drive is running in the direction selected by FOR/REV TB input. In this mode, programming of parameters is disabled. Instead, LCD display Line-2 will scroll from Amps→Volts→RPM each time PRG Key is pressed. However, by default, Line-2 shows RMS Current output. Sensing of faults is enabled here. If the reference is from keypad, user can increase or decrease the set frequency using UP/DOWN keys.

LCD
Indicates RUN

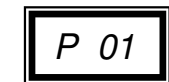


LED
Stops blinking
indicating RUN

Programming Mode


From Ready To Run mode, pressing PRG key will enable user to enter programming mode where Function codes can be selected. In this mode start commands are not accepted. Pressing PRG key again will enable user to modify data.

LCD
Parameter



LED
Indicates
Parameter No.

Fault Mode

Drive enters fault mode if it encounters any fault when it is running. The fault can be reset only if the system returns to healthy condition. For resetting of faults, use  button on the display Keypad or use RST input from TP

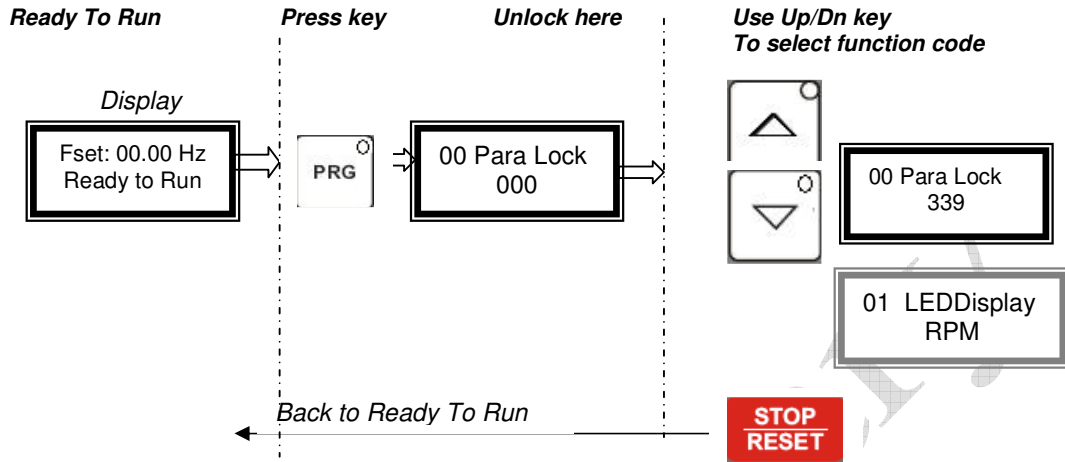


LED
Indicates Over
Voltage Fault

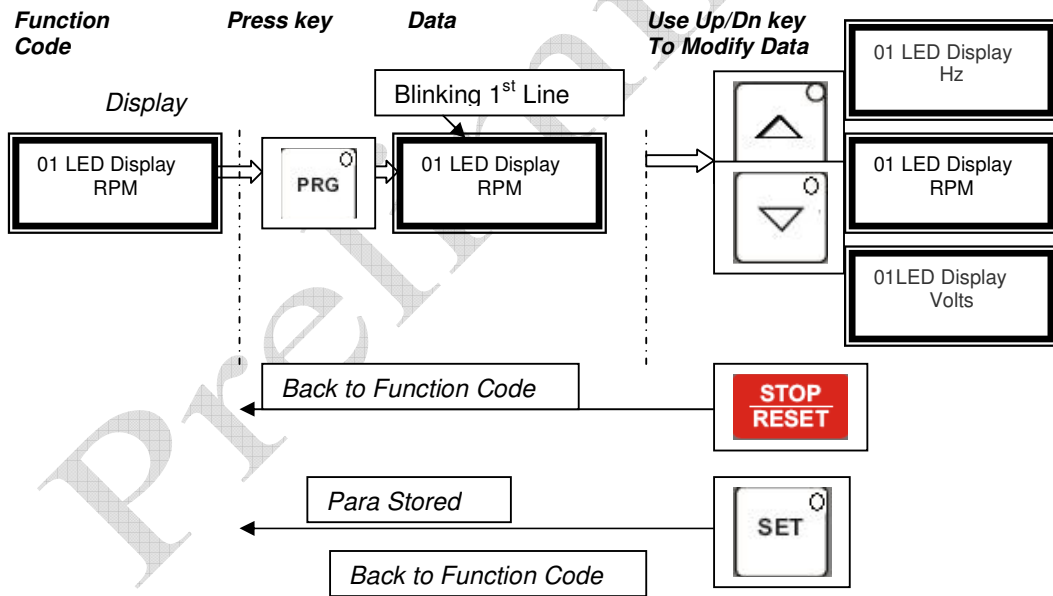
* Refer to "Maintenance and Troubleshooting" Chapter for more details

Programming the Drive Module

Step-1 Parameter LOCK and selecting function code



Step-2 Modify Function data



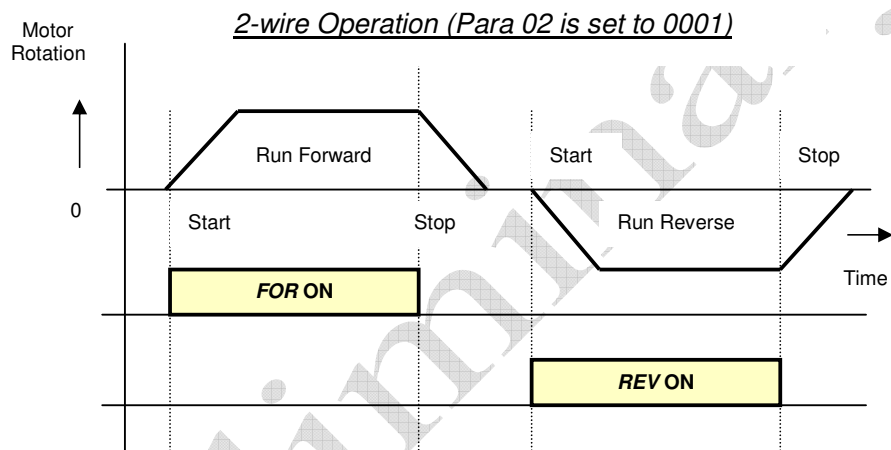
01 LED Display

By default, drive is configured to display Set Frequency when in Ready To Run Mode and Running frequency in Run mode. Setting Para 01 to various other options such as Motor RPM, Motor Current, and DC bus voltage will enable user to view these values in the same LED display. But, when in Ready To Run mode display either shows Hz or RPM based on the selection and other values can only be observed in Run mode. **Display unit is optional.**

02 Control Location

Operation of FOR, REV inputs

- * If programmed command location in Para 02 is Display unit and when RUN key is pressed, Inverter will start provided either of the FOR/REV digital inputs are connected to GD terminal. The direction of rotation depends on the FOR/REV selection on TB.
- * When both TB inputs FOR/REV are closed, the Inverter will not start if it is in *Ready to Run* Mode OR it will stop if in *Run* Mode



By default, drive is configured to be controlled using **RUN SET** key and **STOP RESET** key on the display Unit. User can modify this parameter to enable control of RUN/STOP commands from other inputs such as from Terminal block

- Setting 0000 → Press **RUN SET** button to start when in Ready To Run mode
- Press **STOP RESET** button to stop drive when in Run mode
- Setting 0001 → **TB input FOR/REV (2-Wire Operation)**
Start/Stop operation is from TB FOR/REV terminal

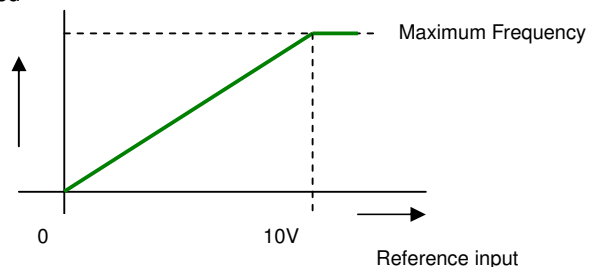
03 Main Speed Reference

Speed or Frequency reference is given to the drive controller using

- Setting → 0000 Display keypad UP/DOWN keys
Use UP/DOWN keys on display unit to increase or decrease speed reference
- 0001 Analog input from VIN terminal on TB
Potentiometer input using 10VA and GA from TB. Voltage range is 0-10V
0 – 10V corresponds to 0 to Maximum frequency in Para 04.
Refer Para 48-51.
- 0006 Function is similar to selection 0007. Except for if the drive is stopped or switched-OFF, when the start command is issued again, the drive always starts from minimum/ starting frequency. Also, X1 and X2 can be activated in *Run mode* only
- 0007 Activating terminal X1 on TB will increase the speed. The digital input X2 will decrease the speed. If the drive is stopped or switched-OFF, the current frequency/ RPM are stored in the drive memory. When the start command is issued, the drive will initially start running at this stored frequency/ RPM.
- 0008 Application 1: X2 is not used. Raise frequency when X1 is ON and lower when X1 is OFF.
- 0009 Application 2: Similar to 0007, except that the set frequency returns to minimum when drive is stopped

04 Maximum Frequency

This is the maximum frequency output possible from the drive. All the other parameters, which control frequency, are limited to this value. Maximum reference input from any source such as analog input or Digital keypad is scaled to Maximum Frequency value.



05 Base Frequency

Base frequency is one at which the rated voltage is fed to the motor. The Inverter will maintain the linear relation with the frequency (That is V/F ratio) and the rated output voltage will be applied to the motor at Base frequency.

Further increase in the frequency will not have any effect on the output voltage and it remains constant.

⚠ Setting wrong base frequency value may result in damage to the drive and connected motor

08 Acc time

This is the time in seconds for the Inverter to reach Maximum frequency in **Para 04** from Zero frequency when start command is given. The setting resolution is 0.1 Sec until 999.9 seconds and 1 Seconds for a maximum value of 9999 seconds. Minimum setting is 0.1 Seconds

09 Dec time

This is the time in seconds for the Inverter to reach Zero frequency from Maximum frequency in Para 04 when STOP is activated(Removal of start input as defined by Para 01). The setting resolution is 0.1 Sec until 999.9 seconds and 1 Seconds for a maximum value of 9999 seconds. Minimum setting is 0.1 Seconds

10 Torque boost

Different motors will have different stator IR drops. This causes drastic torque reduction in some situations at low speed. To overcome this effect, stator voltage is increased at lower speeds and eventually it follows the V/F curve based on the Boost Frequency selection **Para 11**

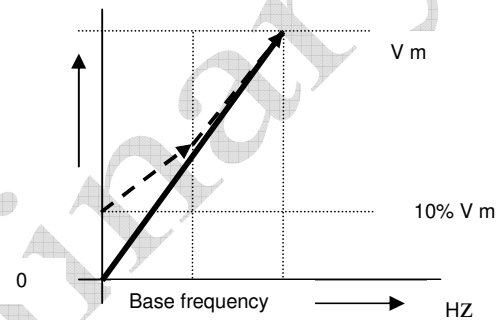
11 Frequency of Torque boost

Sets the frequency after which the torque boost component in **Para 10** becomes zero.

Using this parameter, it is possible to select required V/F patterns for the application

Example

If the torque boost is 10% at minimum frequency of 1 Hz, 10% of the rated voltage is applied to the motor. As the frequency increases, the amount of boost added is slowly decreased and catches up with the V/F curve at 50% of the base frequency value (25Hz).

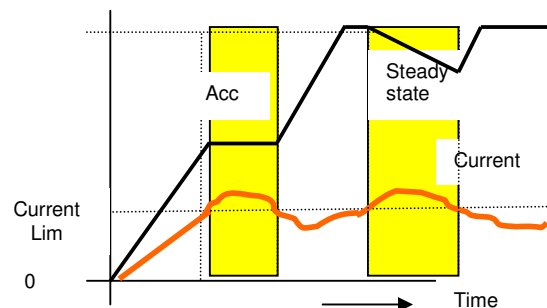
**12 RPM Multiplier (for optional display unit)**

This value is used for displaying the motor rpm or line speed. When the LED display **Para 01** is set as "Motor RPM", the seven segment LEDs will display the product of output frequency and RPM Multiplier.

13 Current Limit

When the motor is accelerating, if the output current reaches the level programmed here, the output frequency will be steady. It will start accelerating once the current is less than the value programmed.

This avoids the "Over current Trip During Acceleration" If the Inverter is running in steady state, crossing the current limit will decrease the output frequency. This avoids stalling because of sudden load variations.

**14 Motor Current**

Rated Current of the motor to be entered by the user. By default motor current is selected for the rating of the inverter such as for 250W drive rating, 1.75 Amps is selected. User can reduce the motor current value based on the motor selected for the drive system. *Maximum current entered here is limited by the Inverter rating.*

15 Electronic Thermal Overload

By default Thermal overload function is set to 0001.

Selection 0001

Force Cooled Motor

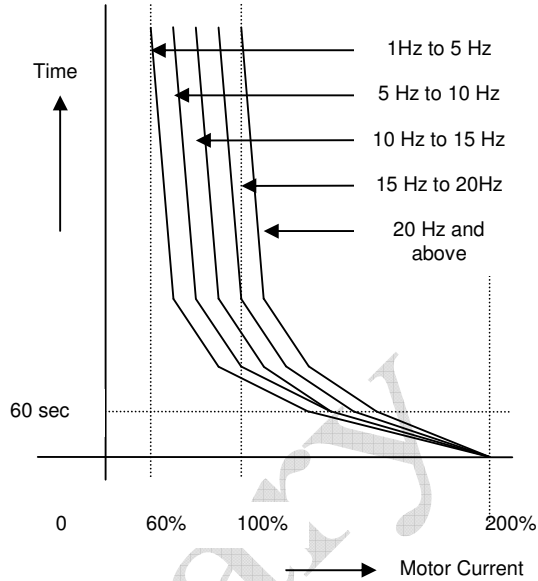
When the motor is cooled from an external fan at fixed speed, the cooling will be same irrespective of the motor speed. Hence the Electronic Thermal Overload Function will act like a standard bimetallic Overload Relay. In the figure, 20Hz and above curve is selected.

Selection 0002

Self-Cooled Motor

When the motor is cooled from shaft-mounted fan at variable speed, the effect of cooling depends on shaft speed. This is taken into account here and Electronic Thermal Overload function works accordingly. In the figure, 1 Hz to 20 Hz curves are selected when the motor speed corresponds to less than 20 Hz.

The example curve shown is for a motor with base frequency of 50Hz.



16 UV Trip Latch

Setting → 0000

Trip and Latch

When the DC bus voltage goes below the Under voltage, the Inverter will coast to stop. Under voltage trip will be indicated and latched. Upon return to normalcy user has to RESET the fault.

0001

Stop and start with starting frequency

No Latching of fault

The Inverter will disable outputs as soon as the DC bus voltage reduces to the under voltage setting and the motor stops. When the power returns or the DC bus voltage rises above healthy level the inverter will start from start frequency if the START Command is enabled

17 PWM Frequency

PWM Frequency for the drive control is fixed internally by the controller for optimum performance. User is not allowed to change this parameter.

19 and 23 RL1 and RL2 Select (*Programmable relay*)

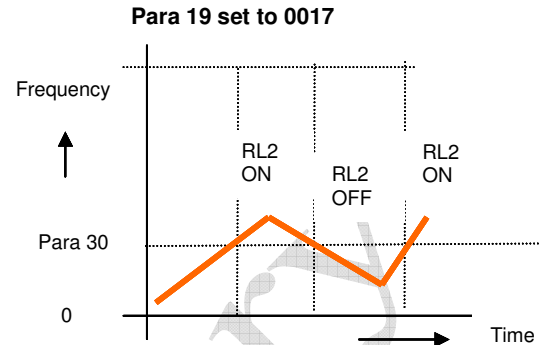
Programmable relays RL1 and RL2 can be made to operate for various conditions of the drive. Select the functionality required using this parameter.

22 Stop Type

Based on the application, for stopping a motor, user may choose deceleration to stop or coast to stop (Free stop). Whenever free stop is chosen as the stop type, PWM pulses are disabled as soon as the drive gets STOP command and time to stop is dependent on load inertia.

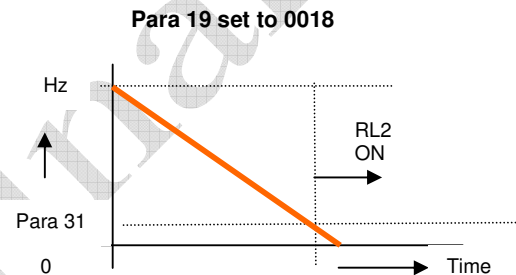
24 Detect Frequency

Programmable relay RL2 on Control card can be operated for Detecting whether running frequency has crossed the frequency set here. This is based on the selection of RL2 function in **Para 22**.



25 Stop Signal Frequency

Programmable relay RL2 on Control card can be operated for stop detection. Whenever, stop command is issued and frequency drops below this level RL2 is operated. This is based on the selection of RL2 function in **Para 22**.



35 and 36 ACC1 and DEC1

Acceleration and deceleration times set here are selected by the drive when Raise / Lower Mains Reference function is selected.

37 – 40 Analog input scaling parameters

Functionality of these parameters are based on **Para 03**. Refer to description of **Para 03**.

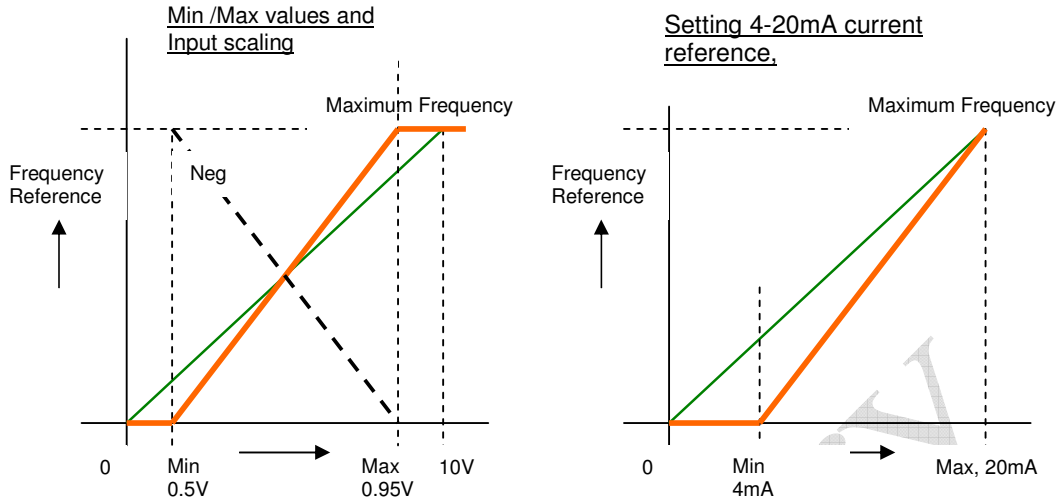
Functionality described below applies to analog reference input VIN, on control TB.

Min → This is the analog input voltage/ current, which is considered as zero reference for the drive controller. As shown in the figure below, Analog input is scaled for new values.

Max → This is the analog input voltage / current, which is considered as maximum reference for the drive controller.

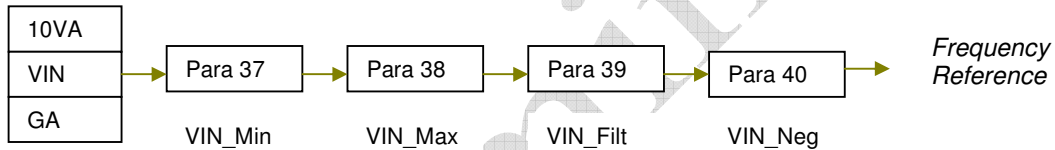
Filt → This determines the level of filtering or the filter crossover frequency for the analog input.

Neg → Reference analog voltage/current input from Control TB can be negated or inverted by enabling this parameter.



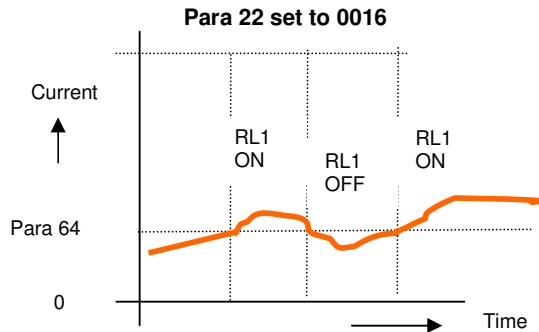
Voltage Input from VIN terminal on TB
 Para 03 set to 0001

TB Analog input



41 OL Warn

Programmable relay RL1 or RL2 on Control card can be operated for over load warning. OL Warn data set here is the percentage of motor current for which Relay RL1 switches ON. This is based on the selection of RL1 function in **Para 19**. Similarly RL2 can be operated by setting the value as 16 in parameter 23.



42- 45 Serial Communication related parameters

For more information, refer to

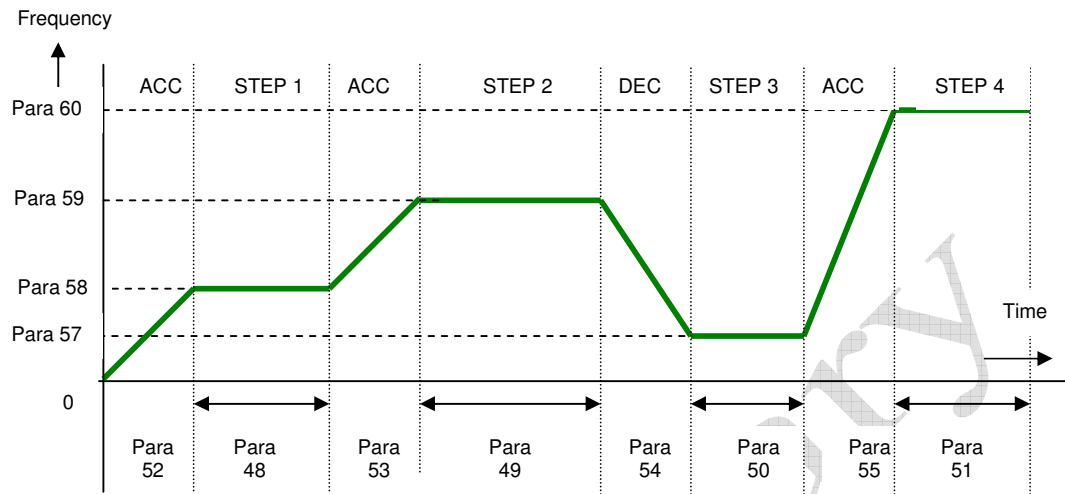
- 1) Serial communication manual.
- 2) Synchronization of drives manual.

46 AUTORun Mode

Auto run is enabled using this parameter. **Para 57-60** determines the motor speed. If the Inverter Stops and Starts again, it will begin a new Auto Run Cycle. **In case AUTO Run Mode is set to 4, Motor speed is determined by parameter 3.**

48- 51 AUTORun Time

Drive runs for time in seconds programmed here for each step in auto run mode. Setting this as 0000 disables the current and next step in Auto run cycle. **Para 57 to 60** determines frequency reference for Step-1 to Step-4. **Para 52 to 55** determines the Acceleration/ Deceleration times for Step-1 to Step-4.



57 ~ 60 MultiSpd-1 to MultiSpd- 4

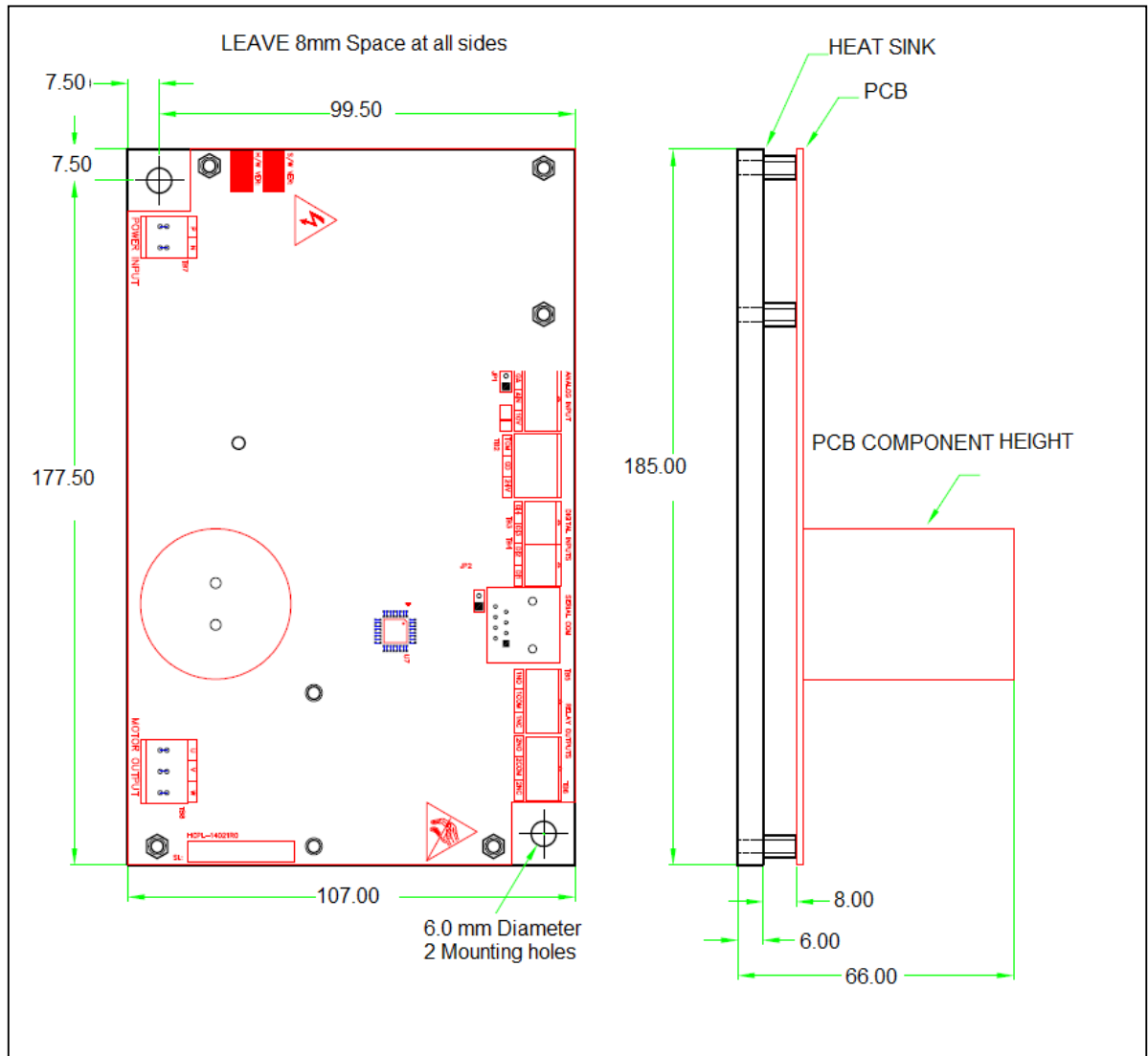
| Para | Select | X1 | X2 | 0 = Open 1 = close | |
|------|---------|----|----|----------------------------|--|
| | | 0 | 0 | Main Speed Reference in Hz | |
| 57 | Speed-1 | 1 | 0 | 10.00 | |
| 58 | Speed-2 | 0 | 1 | 20.00 | |
| 59 | Speed-3 | 1 | 1 | 30.00 | |

Trouble shooting

| Display | Description | Check |
|----------------|---|---|
| dCLo | <ul style="list-style-type: none"> Displayed when input 3-Phase power supply voltage is less. During start-up DC Bus voltage is expected to be at least 400V DC. Otherwise, system will wait for input voltage to build-up before entering Ready To Run Mode. After Power-up, if the drive input voltage falls and goes below UV level of 380V DC, display shows dCLo. If Re-start parameter Para 21 is set as 0000, drive will trip for UV | <p>Measure input AC RMS voltage at R, Y, and B terminals. Line – Line AC voltage must be > 300V and DC Bus measured between Pos and Neg Terminals on Power TB must be > 400V DC.</p> <p>Check for proper 3-Phase connection at the input terminals</p> |
| dCOv | <ul style="list-style-type: none"> Displayed when DC Bus measured by the controller is more than 760 V DC | <p>If this fault appears before Run command is given, verify the input AC RMS voltage.</p> <p>If fault appears when drive is decelerating, Deceleration time is very short for the load inertia. Increase the deceleration time.</p> <p>If optional brake unit is used, check brake terminal connections and Braking resistor value</p> |
| dCUv | | <p>Check for proper 3-Phase connection at the input terminals.</p> <p>If the fault persists even when input voltage is OK, DC bus capacitor/ balancing resistor or the IGBT device may be faulty.</p> |
| OCA | <ul style="list-style-type: none"> Over current during acceleration is displayed when the load current crosses more than 200% of the motor current during acceleration. | <p>Acceleration time is to be increased.</p> <p>Check whether drive rating is sufficient for motor connected.</p> <p>If the fault persists even when Acceleration time is high, problem may be due to wrong output connection.</p> |
| OCD | <ul style="list-style-type: none"> Over current during deceleration is displayed when the load current crosses more than 200% of the motor current during deceleration. | <p>This can happen due to large oscillations/ Resonance at a particular speed of the motor. Use jump speed feature or increase/ decrease deceleration time</p> |

| | | |
|-------------|---|--|
| OC | <ul style="list-style-type: none"> Over current during steady state operation of the drive. | This can happen due to sudden application of load or load oscillations. |
| HSOT | <ul style="list-style-type: none"> Heat sink over temperature | Measure the output current using a clamp-on meter and check whether load current is within the range of drive capacity |
| IOL | <ul style="list-style-type: none"> Inverse over load fault. This is applicable when Para 15 is enabled. | Measure the output current using a clamp-on meter and check whether load current is within the range of drive capacity |
| SC | <ul style="list-style-type: none"> Output short circuit trip | There is short circuit at the output terminals. Check for connections from drive output to motor terminals. |

5. MOUNTING DIMENSIONS



INDVERTER C1 Dimensions

Preliminary

HEXMOTO® Controls Pvt. Ltd
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INDIA

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