

Indverter
AC Drive

INSTRUCTION MANUAL

INTRODUCTION:

Dear Customer,

Thank you for buying our “ Indverter ” series AC Drive. It gives us great pleasure to explain the features of this quality product.

We will be happy to assist you in case of any doubts, clarifications, suitability for particular application etc.

Thanking you and assuring you of our best attention and services.

For HEXMOTO CONTROLS PVT.LTD.,

GLOSSARY OF TERMS:

1. **Function code:** Refers to the parameter that can be programmed OR the parameter number that has to be programmed.
Example: Function code "00" corresponds to "LED Display"
2. **Data Code:** value settable for the given Function code.
For example
Function code 00 LED Display
Data Code 00 Hertz
Data Code 01 RPM
Data Code 02 DC BUS Voltage
Data Code 03 Iout

The LED display will be as below:

0001

The first two digits "00" indicate function code and the second two digits "01" indicate the Data code.

3. **Authorized personnel :**
Person having knowledge in using the equipment and safety practices in Electrical & Electronic equipments.
4. **Danger :** Operation which may cause severe personal injury or failure of Inverter
5. **Caution:** Operation which may cause minor personal injury or damage to the Inverter
6. **Attention:** Draws attention to certain important aspects.

Caution: For interfacing or commissioning, the Inverter should be opened by an authorized personnel only.

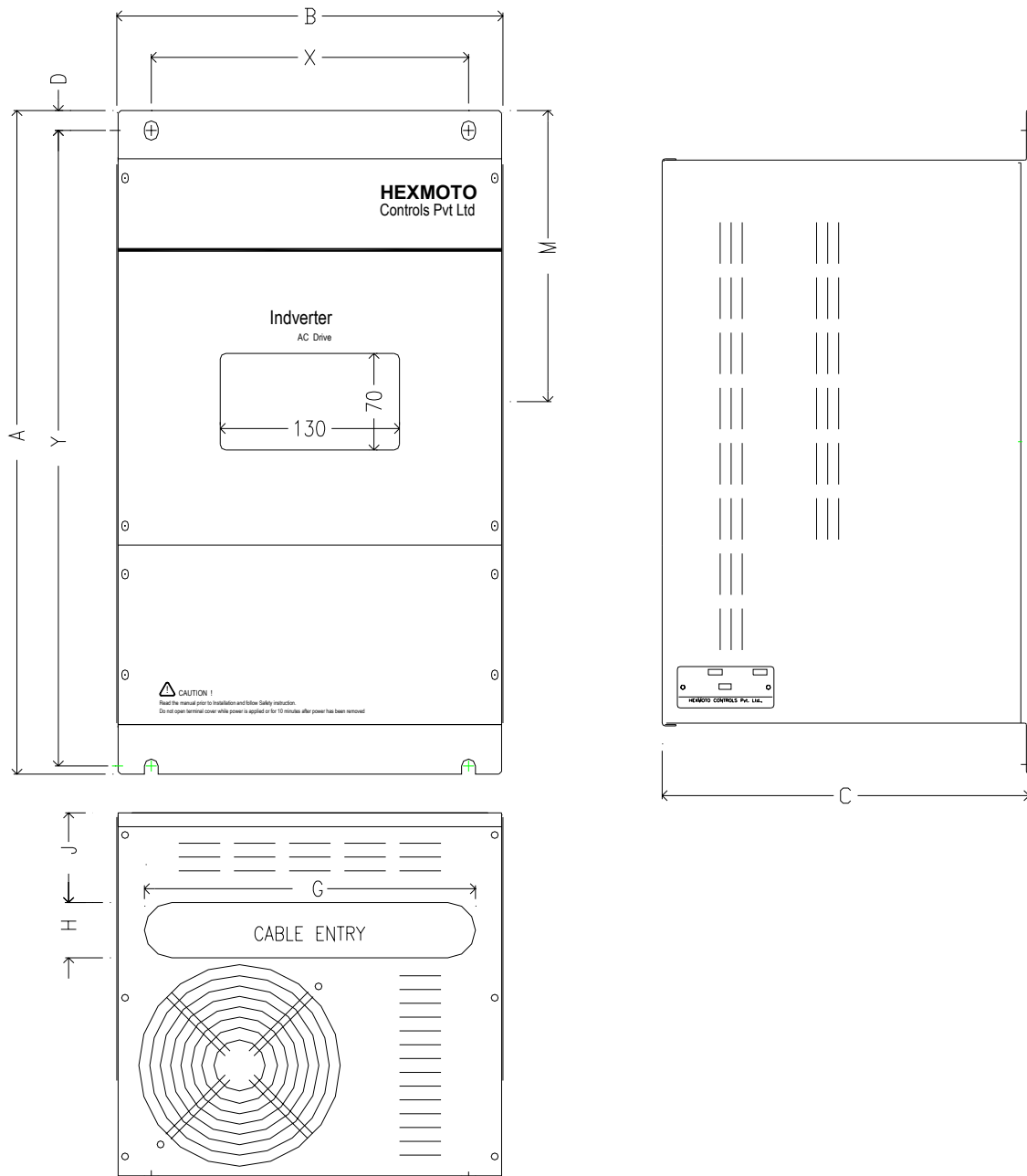
Danger: Do not open the Inverter Module with Input Power ON. Inverter should be opened only after the LED display switches OFF. The internal components or PCBs should be handled/removed only after the charge LED on the Power Supply Card is OFF. Contact with internal components while Input Power is ON or the charge LED is ON, may cause severe electric Shock.

RATING PLATE DETAILS:

TYPE : IND	<input type="text"/>	CODE	<input type="text"/>
SOURCE : AC 3Ph, 415V, -15%, +10%, 50/60 Hz.			
<input type="radio"/>	O/P : CURRENT	<input type="text"/>	FREQ.:1-128Hz. <input type="radio"/>
SERIAL No. <input type="text"/>			
HEXMOTO CONTROLS Pvt. Ltd., MYSORE 570 018 - INDIA			

Attention: Check for any transit damage before switching ON the Inverter into operation.

CONSTRUCTION:



MODEL	KW	A	B	C	D	X	Y	M	G	H	J	FIX	WEIGHT(Appr.)
IND 2K2	2.2	364	218	201	7	186	349	226	150	30	79	M6	9Kg.
IND 3K7, 5K5, 7K5	3.7, 5.5, 7.5	400	240	229	9	190	382	195	150	30	65	M6	13Kg.
IND 11K, 15K	11, 15	480	278	236	14	230	460	210	240	40	65	M6	18Kg.
IND 18K5, 22K	18.5, 22	480	278	266	14	230	460	210	240	40	65	M6	19Kg.

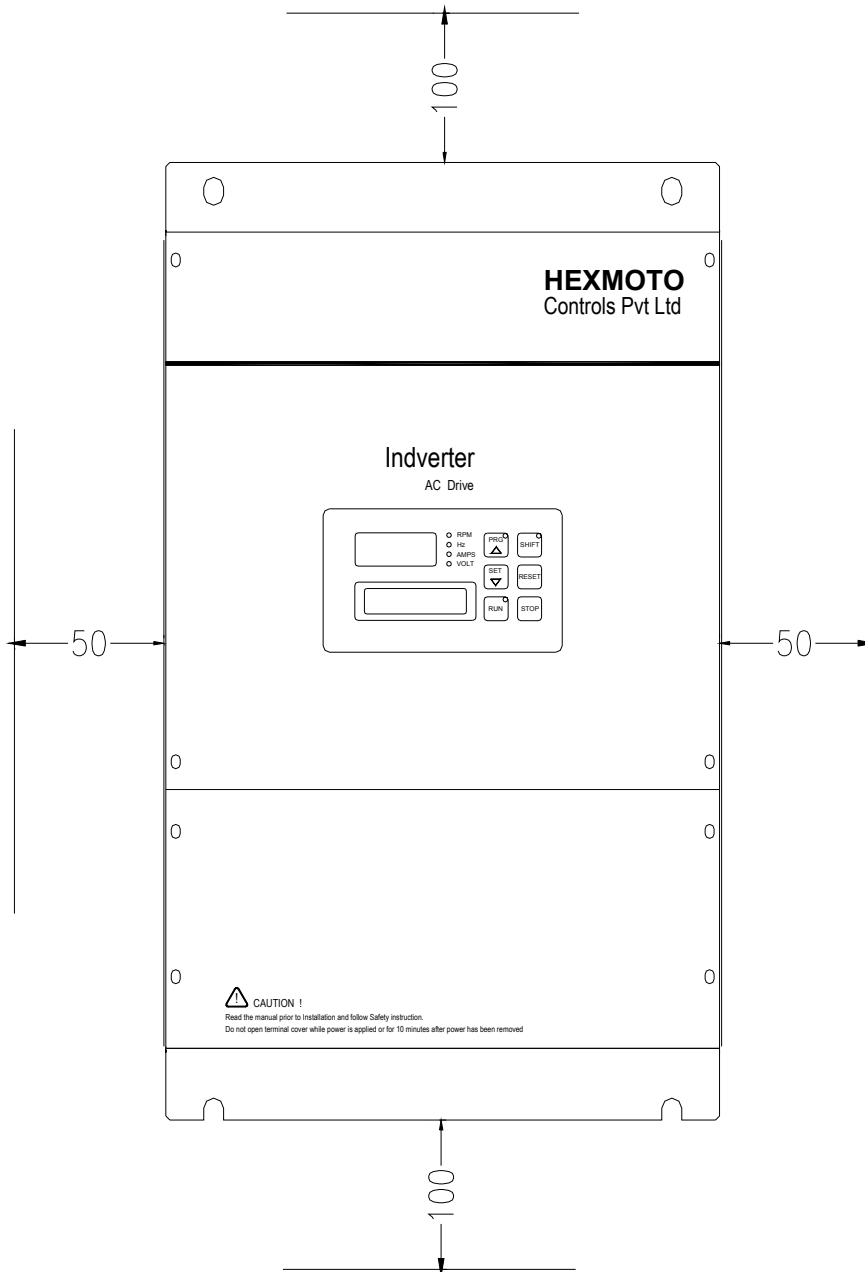
ALL DIMENSIONS ARE IN MM

INSTALLATION:

The inverter is suitable for operation with

- 1 Ambient temperature of 0-50°C
- 2 Humidity 0 – 90% RH
- 3 Altitude less than 1000m from Sea Level
- 4 Maximum vibration of 0.6G.

The installation of the Inverter should be done with the following spacing:



Caution: Do not install the Inverter in any place exposed to dust, direct sunlight, corrosive gas, inflammable gas or oil.

SPECIFICATIONS:

🌀 Items of rating

PARAMETERS	UNIT	INDVERTER MODELS							
		IND 2K2	IND 3K7	IND 5K5	IND 7K5	IND 11K	IND 15K	IND 18K5	IND 22K
Applicable Motor Output	KW	2.2	3.7	5.5	7.5	11.0	15.0	18.5	22.0
Inverter Output at 415V	KVA	4.3	7.18	10.8	14.4	18	21.6	28.8	32.3
Output Current	A	6	10	15	20	25	30	40	45

ATTENTION: Applicable motor kW is indicative only. Select a Inverter with a current rating always equal or more than the motor rated current.

🌀 Common items:

Item	Specifications
Input power supply	3 Phase, 380V/415V/460V +10%/-15% and 50Hz/60Hz
Output	3 Phase,0- 380/415/460V(Same as input) and 1-128Hz
Control functions:	
Control method	Space Vector Modulation V/f control with third harmonic superimposition.
Frequency Range	1 to 128Hz
Carrier frequency	5.3kHz/10.6kHz/15.9kHz (Deration is required for higher switching frequency)
Frequency accuracy	0.01% Digital (0.1% analog input) of Maximum Freq.
Inverter efficiency	Over 95% (at rated load)
V/f ratio	Linear (Torque boost function available)
Base frequency	50Hz or 60Hz
Boost	0 to 100% (selectable through keypad)
Starting torque	150%
Acceleration/deceleration rate	0.5Hz/sec to 128Hz/sec
Automatic voltage regulation	Available through Dynamic DC bus voltage monitor
Automatic restart after instantaneous power failure	Possible
Over load capacity	150% current of inverter rating for one minute
Revolution direction	Forward and reverse running are possible
Dynamic brake	Optional
Frequency limiter	Both upper limit and lower limit are possible

Protective functions:	
Stall Prevention: When the output current reaches current limit , the frequency is reduced . Similarly during the deceleration, sensing of over voltage elongates the deceleration time.	
Input Power failure: The inverter operates through 15ms during the input power interruption.	
Automatic Restart: The Inverter will restart after the instantaneous power failure. The restart time is programmable from 0 seconds to 10 seconds.	
Emergency Stop : The Inverter can be stopped immediately by switching OFF all the IGBTs by ascertaining the Digital Input (BX)	
Inverter Trip display in LCD : Over Voltage, Under Voltage, Over current during acceleration, over-current during deceleration, over-current while running, Heat sink overheating, external trip, Thermal Over load, CMOS Error.	
Input/output functions:	
Frequency setting signals	Digital setting (through keypad ▲▼ keys) Terminal block: 0-10V / 0 to -10V/0-5V/-10V to +10V/ 4 to 20mA / 0-20mA /Serial link
Operation signal	Digital: Touch key Terminal block: Contact input
Multifunction digital inputs	Available
Multifunction output terminals (Total three Numbers)	Two programmable open collector and a programmable relay contact output. One non-programmable relay contact indicates trip condition
Frequency meter output	One programmable Analog output (0 – 10V)
Ambient conditions:	
Temperature	0 to 50°C
Humidity	Less than 90% (non condensing)
Installation site	Indoor (free from inflammable/corrosive gas, dust and direct rays of sun)
Altitude	Less than 1000m from sea level
Storage temperature	-20 to 60°C (for short time such as transport)
Cooling	Forced air cooling
Others:	
Enclosure	IP00
Safety monitor	In charge (LED illumination)
Main indicator	7 segment 4 digits LED indication
Indicator	16x2 line dot matrix LCD
Data setting	Through keypad (6 programming keys)
Memory	Last 19 faults can be stored
Communication(Optional)	RS232/RS485 with open protocol

DESCRIPTION OF POWER CONNECTION:

R	Y	B	BR	+	-		U	V	W		E
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R,Y,B : Input Power Terminals

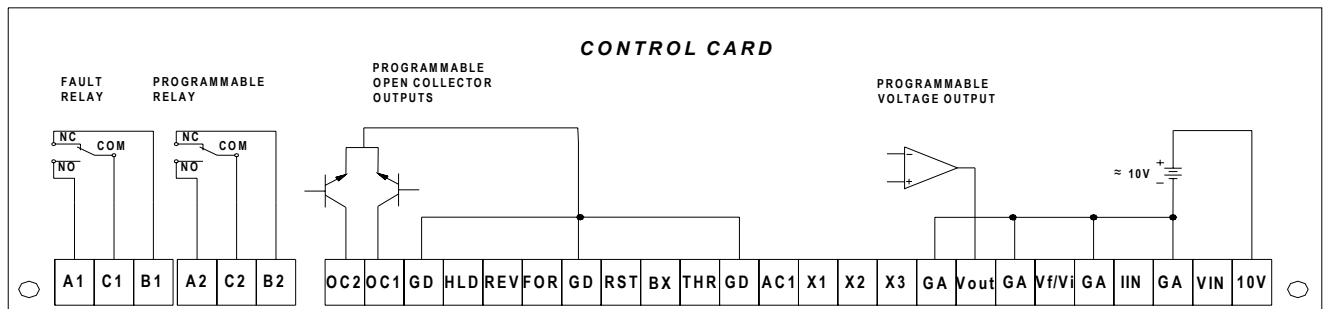
U,V,W : Output Connection to Motor

BR , + : Dynamic Braking Terminals

- : DC Bus -ve Terminals

E : Earthing Terminal

DESCRIPTION OF CONTROL TERMINALS:



- OC1 : Programmable Open Collector Output 1.
- OC2 : Programmable Open Collector Output 2
- HLD : Hold input for 3 wire operation or Multi Acc/Dec input.
- REV : Reverse running digital input
- FOR : Forward running digital input.
- BX : Coast to stop digital input
- RST : Fault Reset digital input.
- THR : External Fault digital Input.
- AC1 : Digital input and when closed (shorted to GND_EAR) causes different Acceleration/Deceleration rate profile. When 3 wire operation is disabled, the ACC/DEC is decided along with HLD input
- X1,X2,X3 : Multi-speed Digital Inputs. When Raise/Lower, Raise/Lower-STOP or Speed2 Ref are enabled/selected, X1, X2 and X3 can not be used for Multi-speed Inputs.
- GD : These terminals are common return for all digital inputs.
- GA : These terminals are common return for all analog inputs.
- Vout : 0-10V analog output corresponding to the selected variable in the program (Output Frequency and Motor Current)
- Vf/If : For future development. Do not connect any signal to this terminal.
- Iin : Inverter Frequency Setting analog Current input.
Can be set for 0-20mA or 4 to 20mA by closing the appropriate Jumpers.
- Vin : Inverter Frequency Setting analog Voltage input
Selection can be done for 0-10V, 0 to -10V, -10V to 10V, 0-5V through programming
- 10V : Regulated Voltage output. Capacity :10V, 10mA
- A1,B1,C1 : Trip Relay outputs.
- A2,B2,C2 : Programmable Relay Output.

EXPLANATIONS OF CONNECTION TERMINALS:

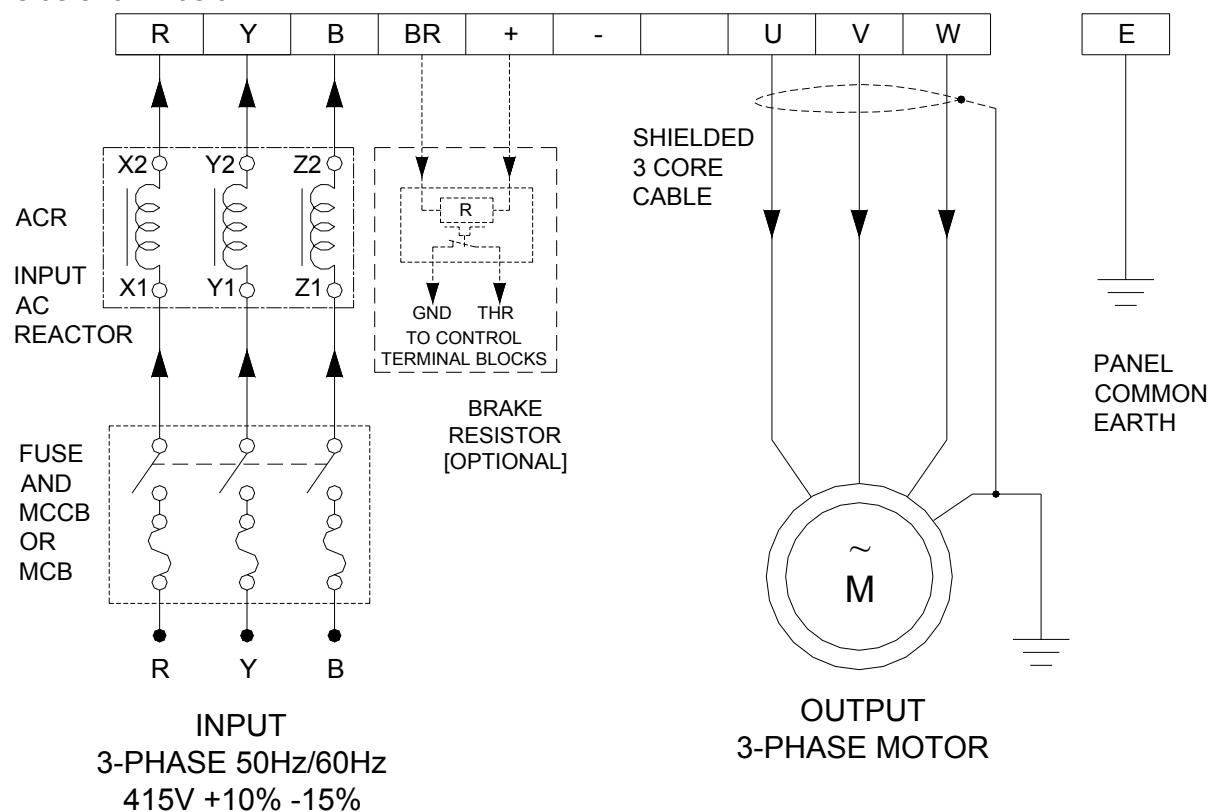
POWER SUPPLY WIRING:

1. **R, Y and B** are input Power supply terminals for 415V-15%+10%, 3-phase supply. The Connection is not Phase sensitive. The connection can be done with any phase sequence.
2. **U, V, W** are output terminals to the Motor. The motor direction being arbitrary and dictated by the motor winding pattern. To change the direction of rotation of the motor, change the connection sequence to the motor or the direction (FOR/REV digital input) command to the Inverter. It is recommended to use a 3 core armored cable or cable inside a earthed metallic conduit for motor connection to reduce the electromagnetic emission and interference.

Attention: When using the Inverter for application where the direction of rotation is critical, check the motor direction by running it with the load disconnected

3. **BR and +** are connections for optional dynamic braking.
4. **+ and -** are DC Bus connections. + will be connected to +ve of the DC Bus and - will be connected to -ve of the DC Bus.
5. Do not operate the Inverter without proper grounding. Ground the Terminal **E** with a wire of proper thickness and as short as possible.

The connection diagram including the connection for Optional Dynamic Braking Resistors is as shown below:

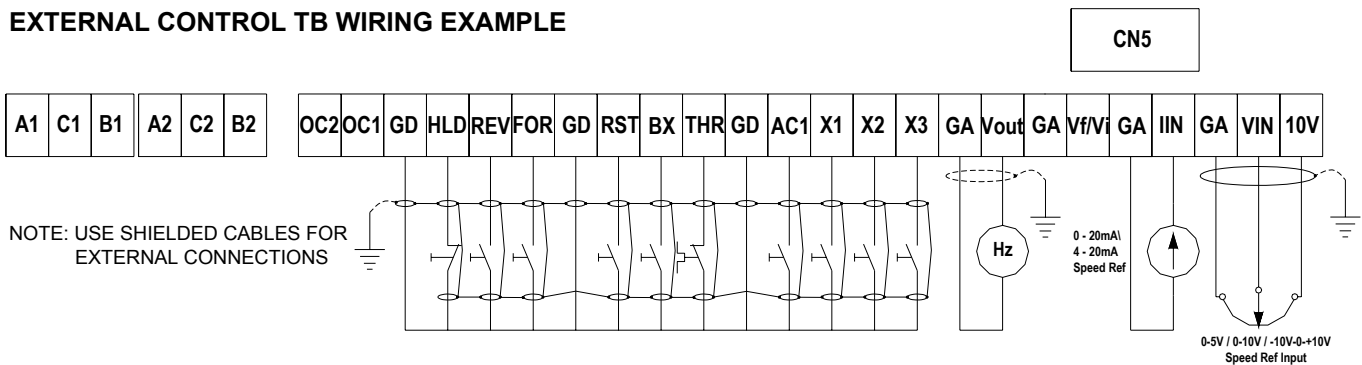


Attention: The NC contact of the Thermal Sensor at the optional resistor Bank provides protection to Resistors in case of over dissipation. Connect this to THR and GD, which provides External Fault Condition to the Inverter in case the contact is opened.

Caution: Make sure that all the connections to the control block like THR and GND are shielded properly. The shield has to be connected to GD terminal of the Inverter and other end is left open. Otherwise unintended trip may occur.

CONTROL TERMINAL CONNECTION:

EXTERNAL CONTROL TB WIRING EXAMPLE



Attention: All digital inputs are sensed as enabled when they are connected to the GD terminal. All the analog inputs and outputs are with reference to GA terminals.

Caution: Don't short GA and GD terminals.

1. **GD** is the ground return for all digital input and output signals to the inverter. Terminals shown GD are internally connected.
2. **GA** is the ground return for all analog input and output signals to the inverter. Terminals shown GA are internally connected.
3. **OC1** is a programmable Open collector output (refer to programming details) with a rating of 30V, 50mA.
4. **OC2** is also another programmable Open Collector output with a rating of 30V, 50mA
5. **HLD** is a digital input terminal used for 3 wire operation when 3-Wire operation is enabled. Otherwise the input is used for Acceleration profile selection. When 3-wire operation is selected, the Inverter will run as long as the HLD is enabled. The momentary enabling of FOR/REV digital inputs cause the START of the Inverter. Momentary enable of the REV digital input while Inverter is running in Forward direction (In 3 wire operation and HLD is enabled) will cause the Inverter to decelerate to zero and then accelerate in the Reverse direction. When 2 Wire operation is selected, HLD input along with AC1 input decides the acceleration/deceleration rate profile of the Inverter.

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6. **REV** is a digital input which decides the direction of rotation of motor as Reverse. The direction is relatively opposite to that of the direction of rotation of motor caused by FOR digital input. When 3-Wire operation is selected, a momentary enable of this digital input will run the Inverter in Reverse direction. (If the Inverter is already running in the Forward direction, it will decelerate to zero and then accelerate in the reverse direction) For 2 Wire operation the input should be closed continuously, which means that the Inverter will run in Reverse direction as long as the REV digital input is enabled. When the "Display unit" is selected as "Control Location", (Function code 01) the Inverter will Start in Reverse direction if the REV digital input is enabled and the RUN key in the display unit is pressed momentarily. When the "main speed reference" is "-10V to +10V", the input causes Start of the drive only and the direction of the rotation depends on the polarity of the signal voltage.
 7. **FOR** is a digital input which decides the direction of rotation of motor as Forward. The direction is relatively opposite to that of the direction of rotation of motor caused by REV digital input. When 3-Wire operation is selected, a momentary enable of this digital input will run the Inverter in Forward direction. (If the Inverter is already running in the Reverse direction, it will decelerate to zero and then accelerate in the reverse direction) For 2 Wire operation the input should be closed continuously, which means the Inverter will run in Forward direction as long as the FOR digital input is enabled. When the "Display unit" is selected as "Control Location", (Function code 01) the Inverter will Start in Reverse direction if the REV digital input is enabled and the RUN key in the display unit is pressed momentarily. When the "main speed reference" is "-10V to +10V", the input causes Start of the drive only and the direction of the rotation depends on the polarity of the signal voltage.

Attention: If the programmed command location is "Display Unit" and when the RUN is 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 contact closed.

Caution: When both digital inputs viz FOR/REV are closed, the Inverter will not start if it is in READY TO RUN mode or it will stop if it is in RUN mode

8. **BX** is a digital input which causes all the PWMS to be OFF immediately when enabled. Applying this signal when the motor is running switches OFF the motor from supply and motor will be free running. This signal is useful for application of mechanical brake to the motor shaft. The input does not have any effect in READY TO RUN /PROGRAM mode
9. **RST** is fault reset digital input. Whenever a fault occurs the Inverter will latch to the fault condition and corresponding fault message will be displayed on the LCD. In fault mode the Inverter will not respond to any of the Digital inputs except RST and all the IGBTs will be in OFF condition. The user has to clear the fault and then reset the system by either pushing RST key on the keypad or by enabling the RST digital input. When reset signal is enabled the Inverter will come out of the Fault condition and will go to READY TO RUN mode. The input does not have any effect in READY TO RUN /PROGRAM/RUN Mode.

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10. **THR** is external fault input terminal. Inverter will trip if the contact is open. This can be used to interlock external thermal overload relays, external trip contacts or the thermal contact of the dynamic braking resistor unit. Inverter will trip even if it is in READY TO RUN mode. This input does not have any effect in PROGRAM mode. If not used always short the THR terminal to GND-EAR terminal. From the factory the Inverter will have this terminal shorted to GND-EAR with a link.
 11. **AC1** is a digital input to determine the acceleration and deceleration profile other than the normal profile ACCEL RATE and DECEL RATE. In normal running Inverter will use ACCEL RATE for increasing the speed of the motor and DECEL RATE for decreasing the speed. AC1 with HLD terminal (If 3 wire operation is not enabled) decides which Acceleration and deceleration rates to be followed. This input does not have any effect in READY TO RUN /PROGRAM mode. Refer to the table below for further details.

When 3 wire operation is enabled:

AC1	HLD	Selected Profile
0	NA	Accelern rate / Decelern rate (Function code 05 & 06)
1	NA	Accelern1 rate / Decelern1 rate (Function code 22 & 23)

When 2 wire operation is enabled :

AC1	HLD	Selected Profile
0	0	Accelern rate / Decelern rate (Function code 05 & 06)
0	1	Accelern2 rate / Decelern2 rate (Function code 24 & 25)
1	0	Accelern1 rate / Decelern1 rate (Function code 22 & 23)
1	1	Accelern3 rate / Decelern3 rate (Function code 26 & 27)

Attention: The Number 0 means the digital input is disabled and vice versa.

12. **X1** is a multispeed digital input. Parameters named SPEED1 to SPEED7 can be programmed through keypad. The Inverter will use one of these values as speed reference depending on the conditions of X1, X2 and X3. Multispeed reference overrides the analog reference. That is when the digital input X1 or X2 or X3 is enabled for Multispeed operation, the inverter will neglect the analog speed reference with which it was running and will run at the SPEED1 to SPEED7 whichever is selected. Multispeed function will not be available When Speed Reference is programmed as RAISE-LOWER / RAISE-LOWER ST0, DIGITAL. In case of RAISE-LOWER/RAISE-LOWER ST0 X1 will cause increase of Speed Reference. This input is valid in READY TO RUN mode and does not have any effect in PROGRAM mode.
13. **X2** is a multispeed digital input similar to X1. In case of RAISE-LOWER/RAISE-LOWER ST0 X2 will cause decrease of speed reference This input is valid in READY TO RUN mode and does not have any effect in PROGRAM mode.
14. **X3** is a multispeed digital input similar to X1 or X2. When Speed2 Ref is enabled, closure of X3 will cause the Inverter to Run with a reference which is programmed in SPEED2 REF Input. This input is valid for READY TO RUN mode. The input does not have any effect in PROGRAM mode.

Preliminary conditions	X1	X2	X3	Speed Reference selected
Main-Speed-Ref : Anlg 0-5V or Anlg 0-10V or Anlg 0 to -10V or Anlg -10V to +10 or Anlg 4-20mA (Function code : 02)	0	0	0	Main-Speed-Ref (Function code : 02)
	0	0	1	Frequency-1 (Function code :28)
	0	1	0	Frequency-2 Function code :29)
	0	1	1	Frequency-3 (Function code :30)
AuxSpeed-ref : Disable (Function Code 12)	1	0	0	Frequency - 4 Function code :31)
	1	0	1	Frequency - 5 (Function code :32)
	1	1	0	Frequency - 6 Function code :33)
	1	1	1	Frequency -7 (Function code :34)

Attention: The number 0 indicates that the particular Digital input is disabled and vice versa.

15. **VOUT** is analog out pin having a rating of 0 – 10V @ 20mA. This analog output can be programmed as Frequency Out or Motor Current Out (Function code 20). When programmed as Frequency out, the output voltage will be from 0 to 10V for 0 to Max Frequency. When programmed as Motor Current out, the same will be 0 to 10 V for 0 to Rated Inverter Current. When Inverter is in INVETER READY/ TRIP/ PROGRAM modes the out will be 0V.

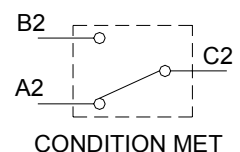
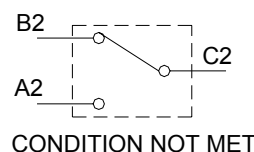
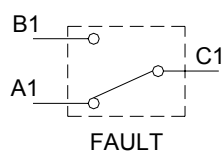
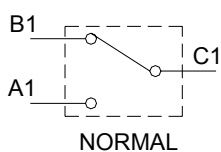
Caution: Do not operate the potentiometers present on the control card to avoid any offsets and nonlinearity

16. **Vf/If** Analog input for future development.
17. **Iin** is analog speed reference input with a specification of 4 – 20mA. The signal will be considered as speed reference when the corresponding parameter is programmed as ANALOG (4 – 20mA). 0 - 20mA signals also can be used.
18. **Vin** is analog speed reference input with a specification of 0-10V / 0-5V / 0 to – 10V / – 10V to +10V. The signal will be considered as speed reference when the corresponding parameter "Main-Speed-ref" (Function code: 02) is programmed as ANALOG (0-10V) / ANALOG (0-5V) / ANALOG (0 to -10V) / ANALOG (-10V to +10V). When the parameter is programmed as -10V to +10V, the direction of the rotation depends on the polarity of the signal (that is the direction will be forward when the polarity is positive and vice versa). The input signal is also valid for the speed reference when the parameter "AuxSpeed-ref" (Function code: 12) is programmed as 'Enable" and parameter "Aux-Ref-Type" (Function code: 13) is programmed as Anlg 0-10V. During the RUN mode the Inverter will accept the Auxiliary speed reference overriding the Main-Speed-Reference only when the X3 is closed.

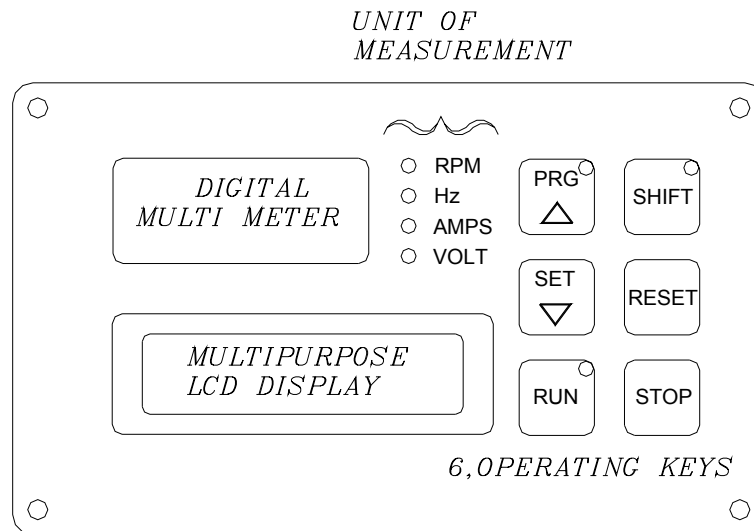
Main-Speed-ref : (Function code : 02)	AuxSpeed-ref: (Function code: 12)	X3	Reference selected	Comments
Digital	Disable/Enable	0	Δ/∇ keys of Keypad	No other reference like voltage at terminals will be considered
Digital	Disable/Enable	1	Δ/∇ keys of Keypad	No other reference like voltage at terminals will be considered
Anlg 0-5V Anlg 0-10V Anlg 0 to -10 Anlg -10V +10 Anlg 4-20mA	Disable	0	Vin input OR Iin input	5V input will cause Max Frequency in case of Anlg 0 -5V (Function code : 03)
Anlg 0-5V Anlg 0-10V Anlg 0 to -10 Anlg -10V +10 Anlg 4-20mA	Disable	1	Multispeed	Depending on X1, X2 and X3 inputs and the Multispeed overrides the Vin input ref.
Anlg 0-5V Anlg 0-10V Anlg 0 to -10 Anlg -10V +10 Anlg 4-20mA	Enable	0	Vin input OR Iin input	---
Anlg 0-5V Anlg 0-10V Anlg 0 to -10 Anlg -10V +10 Anlg 4-20mA	Enable	1	Vin input or Iin input depending on Aux-Ref-Type (Function code : 13)	Aux-Ref-Type should be selected other than Main-Speed-ref.

Attention: In case of AuxSpeed-ref is enabled, select Aux-Ref-Type different from that of Main-Speed-ref.

19. **10V** is the regulated output power supply terminal with a rating of 10V,10mA which can be used for connecting the potentiometer as shown in the diagram. Do not connect a potentiometer of value less than 1K.
20. **A1,B1,C1**: Potential free output contacts for the trip indication. The rating is 230V, 1A. The condition of Normal mode persists in READY TO RUN /PROGRAM Modes. The contact position are as shown below :
21. **A2,B2,C2**: Programmable potential free contact outputs with a rating of 230V, 1A. The contact can be programmed similar to Open Collector Outputs. The first status (mentioned in the figure as "Condition not met") will be the condition in READY TO RUN /PROGRAM mode. Please refer the FUNCTION CODE : 41 for programming. The pictorial representation is as below :



DISPLAY UNIT:



The display unit shown above is provided with 18 inch flat cable and can be detached from the Inverter. This can be mounted any where for the convenience of the user.

Caution: The display Unit is detachable after setting the parameters. It is not necessary to be connected for proper Inverter operation. However do not connect the display Unit, when the Inverter unit is in energized condition.

1. **DIGITAL MULTIMETER:** This consists of 4 Seven segment LEDs. During Operation the LEDs will be showing the parameter selected. Refer to the Function code:00. In PROGRAM Mode the first two LEDs will be displaying the FUNCTION CODE and the second two will be displaying the DATACODE. There is exception for second two LEDs when the parameters are like frequency etc. which are more than 2 digits long. When these are chosen during the PROGRAM, the second two LEDs will be blank.
2. **UNIT OF MEASUREMENT:** When running the LED will be ON depending the parameter that is being displayed in Seven segment LED. For example if LED which is next to legend RPM is glowing, then the seven Segment LEDs will be displaying RPM. The RPM thus displayed is product of Output Frequency and the RPM multiplier.
3. **MULTIPURPOSE LCD DISPLAY:** 2 X 16 Character display with back-light enables the user to program the Inverter or view the clear text display during RUN or FAULT modes. During programming the first line will display the Function Description and the second line will display the Data code and Values.
4. **6, OPERATING KEYS:** There are six keys in the unit of which some are multiplexed. The sequence of key operation is explained along with the parameter that can be changed. When the user encounters with the Numbers that have to be increased or decreased, Δ or ∇ keys to be pressed

Attention: If the Δ key is held pressed for long time and the Fractional part is XX.99, it will be clamped and the mantissa only is incremented.

There are four operating modes for inverter:

- 1 READY TO RUN
- 2 RUN
- 3 PROGRAM MODE
- 4 FAULT MODE

READY TO RUN: As soon as the power is switched ON, the inverter will go to READY TO RUN mode. During this mode:

1. LED will be blinking with a value depending on the programmed parameter " LED DISPLAY" (Function code: 00). The LED display will be as below :
 - a) SET Frequency when Frequency is programmed.
 - b) DC BUS voltage when DC BUS Volt is programmed
 - c) SET RPM when RPM is programmed
 - d) Set freq when Iout is programmed.
2. First line of LCD will display FSET " SET FREQUENCY"
3. Second line of LCD will display "READY TO RUN"
4. RUN mode can be entered from READY TO RUN mode by issuing START command. (START can be initiated by enabling the FOR/REV digital inputs or by pressing RUN key on the keypad)
5. PROGRAM mode can be entered from REDAY TO RUN mode by pressing RESET key and then PRG/Δ key. Digital inputs will be disabled in PROGRAM mode.

RUN MODE: This mode can be entered from READY TO RUN mode by issuing START command. The RUN mode will be entered if all the preconditions are clearly satisfied. During this mode:

- 1 The first line of the LCD will display SET FREQUENCY and its value.
- 2 The SHIFT key will be active and when pressed the second line will scroll through the parameters FOUT (FREQUENCY OUT), Iout (CURREENT OUT), DC Bus Volts, RPM.
- 3 LED will be displaying the value of the parameter selected. (The parameter has to be selected in PROGRAM mode and its Function Code is 00) The parameter may be Hertz, RPM, DC Bus Volts and Iout
- 4 No key will be active during this mode. However if the 'Control location' is programmed as Display Unit the STOP key will be active.
- 5 Digital Inputs will be active depending on the parameters programmed.

PROGRAM MODE: Program mode can be entered from READY TO RUN mode by pressing RESET key and then PRG/ Δ key. Program mode is used for changing the parameters which are used to customize the Inverter by the user.

- 1 First two LEDs of the LED Display will be displaying the Function code.
- 2 Second two LEDs will be displaying the Data Code (Data code will not be displayed for parameters having larger numbers. For example Maximum frequency)
- 3 All 4 LEDs in UNIT OF MEASUREMERT BLOCK will be ON.
- 4 The LCD display will show LED PRAMATER in the first line and the parameter in the second line. (LED will be Displaying 00XX where XX is the data code of the parameter which may vary from 00 to 03. As PRG and Δ keys are multiplexed there is every chance that FUNCTION CODE other than 00 may be displayed. In that case press ∇ key to get Function code 00)
- 5 If PRG/ Δ key is pressed, the Function code will increase and the second parameter will be displayed. At the same time the LED also will change to show the current Function Code.
- 6 To change the parameter in the given Function Code, press the Shift key. LED embedded in the SHIFT key will glow. Press Δ/∇ key. The data code will change. It will be clearly displayed in the second line of the LCD. After selecting the required data press the SHIFT Key. The embedded LED will be OFF. Press the RESET KEY and the LED embedded with RUN key will glow. Press SET key to save the parameters permanently.
- 7 If further parameters have to be changed, press the RESET KEY. The LED embedded in RUN key will be OFF. Press the Δ/∇ so that required Function code is displayed in the LCD module. Then the repeat the procedure mentioned in the Point No. 6 mentioned above.
- 8 Pressing the PRG key while LED embedded in RUN key is ON, will make the Inverter to go to READY TO RUN mode.

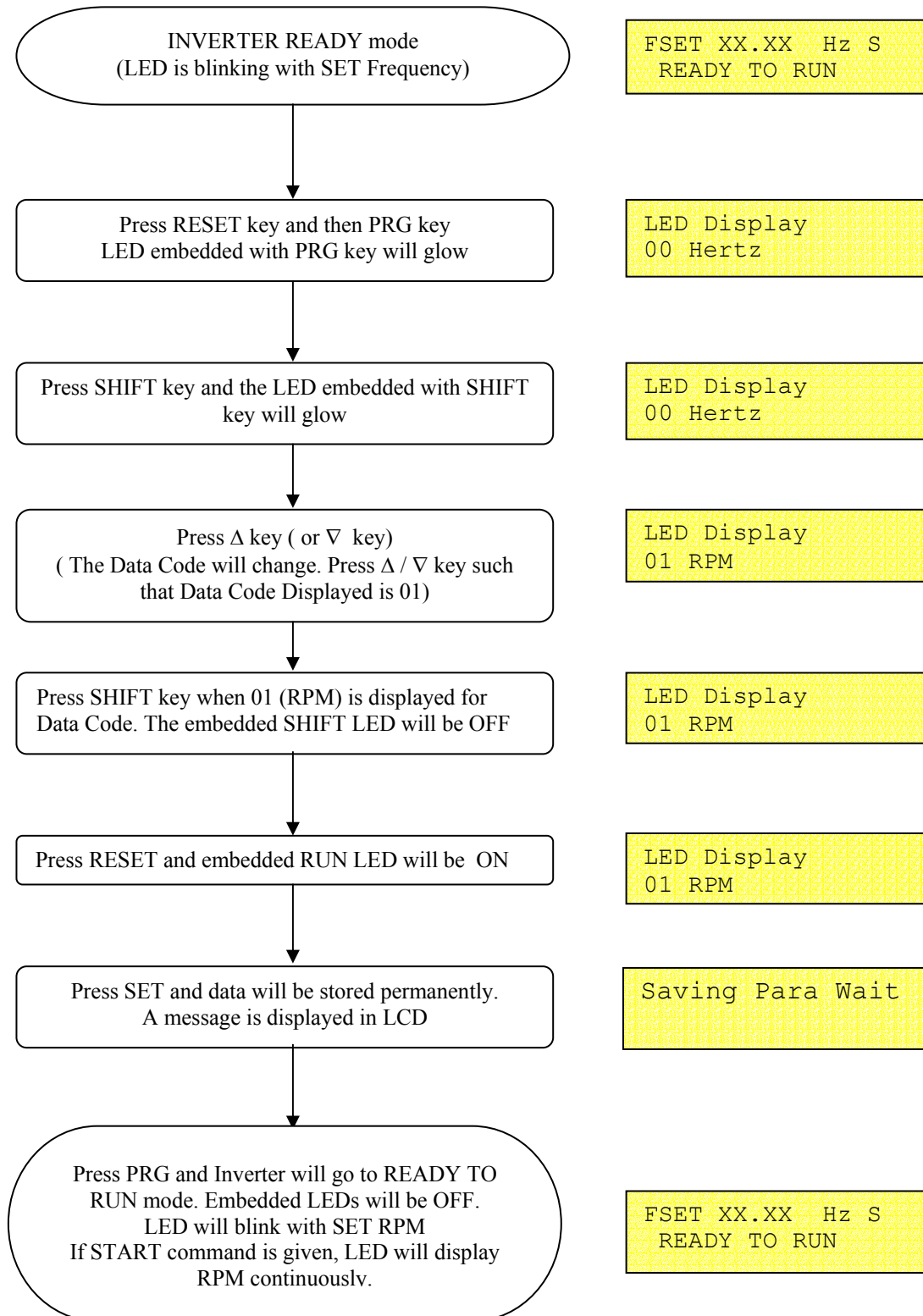
FAULT MODE: Whenever a fault occurs the Inverter will enter into FAULT MODE.

- 1 All the IGBTs will be OFF immediately.
- 2 NO key will be active in this mode except RESET key.
- 3 No digital input will be active except RST input.
- 4 The fault message will be displayed in the second line of LCD.
- 5 Seven Segment LEDs will be displaying 9.999 continuously and all other LEDs will be glowing.
- 6 After clearing the fault, enable RESET input either in KEY PAD or in the DIGITAL INPUT.
- 7 Enabling reset input will bring out the Inverter from Fault mode and Inverter will go to READY TO RUN mode.

EXAMPLES OF CHANGING THE PARAMETER:

1	Changing the parameter "<u>LED Display</u>" (Function code 00): The parameter to be displayed through the seven Segment LED Display during RUN mode. The parameters that can be displayed are Hertz, RPM, DC Bus Volts and Iout
2	Lets us assume that the inverter is programmed for Hertz at LED Display (Function Code: 00) and we want to change it to RPM.
3	When the Inverter is in READY TO RUN mode the LED will be blinking with SET FREQUENCY, First line of the LCD will be displaying the SET FREQUENCY and the second line of the LCD will be displaying the "READY TO RUN" (LCD Display is shown below)
	<pre>FSET XX.XX Hz S READY TO RUN</pre>
4	When the Inverter is in READY TO RUN mode, Press RESET key and then PRG/Δ key.
5	The LED Display will become 0000. The first two Zeroes indicating the Function code and the second two zeroes indicating the Data code corresponding to Hertz.(There is every chance that the Function code might have increased to 02 or so. In such case press ∇ key to bring down to Function code 00)
6	The LCD display will be as below :
	<pre>LED Display 00 Hertz</pre>
7	Press the SHIFT key. The LED embedded in the key will start glowing.
8	PRESS Δ key, the Data code will increase. This will be displayed in the second two digits of the LED display and the second line of the LCD display. (Press the Δ key to increase the Data Code when the embedded LED in SHIFT Key is glowing and ∇ key to decrease the Data Codes . When increasing, the Data Code will be stopped at its maximum that is 03 and further pressing of Δ key has no effect. Similarly when decreasing the Data Code will decrease till the minimum value.)
9	Press the Δ key (when the LED embedded in SHIFT key is ON) till the second line of LCD displays the parameter RPM.
	<pre>LED Display 01 RPM</pre>
10	Press SHIFT key and the embedded LED with it will be OFF
11	Press RESET key , the embedded Led with RUN key will be ON
12	Press SET key - the LCD will show PARA SAVING WAIT for a moment.
	<pre>Saving Para Wait</pre>
13	The setting is stored in the memory permanently
14	Press PRG key (The LED embedded in RUN key should be ON)
15	The Inverter will go to READY TO RUN mode and LED will blink with SET RPM depending on the SET Frequency and RPM Multiplier
16	If START command is issued, then the LED will be displaying the RPM continuously. (This will be the product of Output Frequency and RPM Multiplier)

FLOWCHART REPRESENTATION FOR CHANGING THE PARAMETER IS AS BELOW:



PROGRAMMING PARAMETERS:

FUNCTION CODE	FUNCTION NAME (First line of LCD)	LED display	DATA VALUES (Second Line of LCD)	FACTORY SETTING
00	LED Display	0000 0001 0002 0003	00 Hertz 01 RPM 02 DC Bus Volt 03 Iout	Hertz
01	Control Location	0100 0101 0102	00 Display-Unit 01 Terminal-Blk 02 Serial-Link	Display-Unit
02	Main-Speed-Ref	0200 0201 0202 0203 0204 0205 0206 0207 0208	00 Digital 01 Anlg 0-5V 02 Anlg 0-10V 03 Anlg 0 to -10 04 Anlg -10 +10 05 Anlg 4 -20mA 06 Serial-Link 07 Raise-Lower 08 Raise-Low St0	Anlg 0-10V
03	Max Frequency	03	1.00 to 127.99 Hz	50.00
04	Base Frequency	0400 0401	00 60 Hz 01 50 Hz	50 Hz
05	Accelern rate	05	0.50 TO 127.99 Hz/S	5.00 Hz/S
06	Decelern rate	06	0.50 TO 127.99 Hz/S	5.00 Hz/S
07	Trq-Boost-Level	07	000 TO 100 %	5 %
08	Under Volt set	08	000 to 517 V	307 V
09	RPM Multiliplier	09	0.00 TO 99.99	30.00
10	Current Limit	10	030 TO 200 %	150 %
11	Para protection	1100 1101	00 Disable 01 Enable	Disable
12	AuxSpeed-Ref	1200 1201	00 Disable 01 Enable	Disable
13	Aux-Ref-Type	1300 1301	00 Anlg 4-20mA 01 Anlg 0-10V	Anlg 4-20mA
14	Inverse-OverLoad	14	000 TO 100 %	000 %
15	Offset Frequency	15	000 TO 100 %	000 %
16	FreqLimit-Lower	16	000 TO 99 %	00
17	FreqLimit-Upper	17	001 TO 100 %	100
18	Power Ride	1800 1801	00 Disable 01 Enable	Disable
19	Power ride Time	19	0.00 to 10.99 S	00
20	Analog-Output	2000 2001	00 Motor Freq 01 Motor Current	Motor Freq
21	StartStop Method.	2100 2101	00 2-Wire-Oper 01 3-Wire-Oper	2-Wire-Oper

FUNCTION CODE	FUNCTION NAME (First line of LCD)	LED display	DATA VALUES (Second Line of LCD)	FACTORY SETTING
22	Accelern1 rate	22	0.5 TO 127.99 Hz/S	5.00 Hz/S
23	Decelern1 rate	23	0.5 TO 127.99 Hz/S	5.00 Hz/S
24	Accelern2 rate	24	0.5 TO 127.99 Hz/S	5.00 Hz/S
25	Decelern2 rate	25	0.5 TO 127.99 Hz/S	5.00 Hz/S
26	Accelern3 rate	26	0.5 TO 127.99 Hz/S	5.00 Hz/S
27	Decelern3 rate	27	0.5 TO 127.99 Hz/S	5.00 Hz/S
28	Frequency-1	28	1.00 TO 127.99 Hz	10.00 Hz
29	Frequency -2	29	1.00 TO 127.99 Hz	15.00 Hz
30	Frequency-3	30	1.00 TO 127.99 Hz	20.00 Hz
31	Frequency - 4	31	1.00 TO 127.99 Hz	25.00 Hz
32	Frequency-5	32	1.00 TO 127.99 Hz	30.00 Hz
33	Frequency -6	33	1.00 TO 127.99 Hz	35.00 Hz
34	Frequency - 7	34	1.00 TO 127.99 Hz	40.00 Hz
35	UnderVolt-Latch	3500 3501	00 Disable 01 Enable	Disable
36	OverLoad Warning	36	000 TO 150 %	150 %
37	Freq-Detection	37	0.00 TO 127.99 Hz	20 Hz
38	StopFreq-Signal	38	0.00 TO 10.00 Hz	10.00 Hz
39	Open-Coll-1	3900 3901 3902 3903 3904 3905 3906 3907 3908 3909 3910 3911 3912	00 Freq-Detect 01 Stop-Sig-Freq 02 UV Signal 03 OL-Early-Warn 04 Run Indicate 05 Fmax Reached 06 Speed1 Reach 07 Speed2 Reach 08 Speed3 Reach 09 Speed4 Reach 10 Speed5 Reach 11 Speed6 Reach 12 Speed7 Reach	Freq Detect
40	Open-Coll-2	4000 4001 4002 4003 4004 4005 4006 4007 4008 4009 4010 4011 4012	00 Freq-Detect 01 Stop-Sig-Freq 02 UV Signal 03 OL-Early-Warn 04 Run Indicate 05 Fmax Reached 06 Speed1 Reach 07 Speed2 Reach 08 Speed3 Reach 09 Speed4 Reach 10 Speed5 Reach 11 Speed6 Reach 12 Speed7 Reach	Stop-Sig-Freq

FUNCTION CODE	FUNCTION NAME (First line of LCD)	LED display	DATA VALUES (Second Line of LCD)	FACTORY SETTING
41	Program Relay	4100 4101 4102 4103 4104 4105 4106 4107 4108 4109 4110 4111 4112	00 Freq-Detect 01 Stop-Sig-Freq 02 UV Signal 03 OL-Early-Warn 04 Run Indicate 05 Fmax Reached 06 Speed1 Reach 07 Speed2 Reach 08 Speed3 Reach 09 Speed4 Reach 10 Speed5 Reach 11 Speed6 Reach 12 Speed7 Reach	UV Signal
42	Auto-Run-Mode	4200 4201	00 Disable 01 Enable	Disable
43	Initial-Time	43	0.00 to 255.99 Min	0.00 Min
44	Initial-Freq	44	1.00 to Max Frequency Hz	50.00 Hz
45	Jog-Rlst0	4500 4501	00 Disable 01 Enable	Disable
46	Max-Jog-Speed	46	0.00 to Max Frequency	50.00 Hz
47	Fault Memory	47##	Up to 20 Past Faults	
48	-----	4800	-----	
49	-----	4900	-----	
50	-----	5000	-----	
51	-----	5100	-----	
52	-----	5200	-----	
53	-----	5300	-----	
54	-----	5400	-----	
55	-----	5500	-----	
56	-----	5600	-----	
57	-----	5700	-----	
58	-----	5800	-----	
59	-----	5900	-----	
60	-----	6000	-----	
61	-----	6100	-----	
62	-----	6200	-----	
63	-----	6300	-----	
64	-----	6400	-----	
65	-----	6500	-----	
66	-----	6600	-----	
67	Service Password	67	XXXXXXXXXX	

DETAILED DESCRIPTION OF THE PROGRAMMING PARAMETERS:

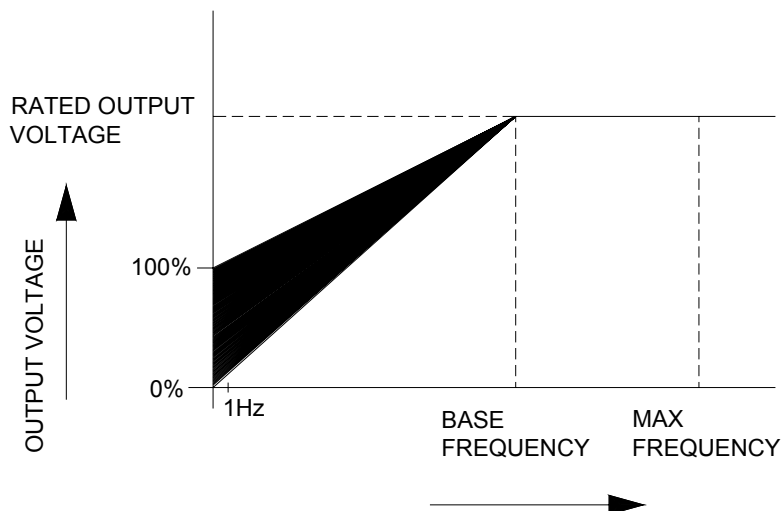
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
□□	LED Display	00 Hertz	LED displays output frequency (during RUN mode) and Set Frequency (During READY TO RUN mode)	□□□□
		01 RPM	LED displays Output RPM (During RUN mode) and Set RPM (During READY TO RUN mode)	□□□1
		02 DC Bus Volt	LED Displays the DC Bus Voltage	□□□2
		03 Iout	LED Displays Output current (During RUN mode) and SET Frequency (During READY TO RUN MODE)	□□□3
<p>Attention: In RUN mode the second line of the LCD Display is not dependent of the above parameter. In READY TO RUN or RUN mode the same can be changed by pressing the SHIFT key.</p>				
□1	Control Location	00 Display-Unit	The Inverter will RUN when START key is pressed provided FOR/REV digital inputs are enabled. The direction depends on the FOR/REV inputs. When speed reference is -10V to +10V, the direction of rotation depends on the polarity. (+ve polarity corresponds to Forward direction)	□1□□
		01 Terminal-Blk	The Inverter will Start/Stop according to the Digital Inputs (FOR/REV) Also refer to 2/3 wire operation	□1□1
		02 Serial Link	The Run command will be accepted through the serial link.	□1□2

FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
<p>Attention : Direction of Rotation: The direction of rotation will be Forward when FOR digital input is enabled. It will be Reverse when the REV digital input is enabled. The RUN key on the display unit acts only as START command and not the direction command when display unit is selected as Control Location. When the Control Location is Terminal Block, the FOR/REV inputs themselves act as START inputs apart from the direction commands. When the Analog input is selected as -10V to +10V , the FOR/REV inputs act like START inputs only. The direction will be Forward if the input is positive and vice versa.</p>				
02	Main-Speed-Ref	00 Digital	The speed reference can be changed through UP/DOWN keys in the Keypad. The rate of change is equal to the Acceleration /Deceleration rate programmed	0200
		01 Anlg 0-5V	The speed reference is varied through 0-5V to Vin input (5V being for FMAX)	0201
		02 Anlg 0-10V	The speed reference is varied through 0-10V to Vin input (10V being for FMAX)	0202
		03 Anlg 0 to -10	The speed reference is varied through 0- -10V to Vin input (-10V being for FMAX)	0203
		04 Anlg -10 +10	The speed reference is varied through -10V to +10V to Vin input (-10V being for FMAX in reverse direction and +10V being for Fmax in forward direction)	0204
		05 Anlg 4-20mA	The speed reference is varied through 4-20mA to Iin input (4mA being for Fmin and 20mA being for Fmax)	0205
		06 Serial Link	The speed reference is provided through Serial Communication	0206

FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		07 Raise-Lower	The speed reference from the raise lower inputs X1 and X2. When X1 is enabled the Speed Reference will increase with a profile of Accelern Rate programmed. Similarly the speed reference decreases when X2 is enabled.	0207
		08 Raise-Low St0	The speed reference from the raise lower inputs X1 and X2. When X1 is enabled the Speed Reference will increase with a profile of Accelern Rate programmed. Similarly the speed reference decreases when X2 is enabled. Whenever the Inverter encounters the STOP command the reference becomes Zero.	0208
<p>Attention: In case of Raise-Lower, the closure of X1 causes increase in Speed Reference. As soon as X1 is closed the SET FREQUENCY will start increasing with exactly with a rate of Accelern Rate programmed. Similar is the procedure for decrement of SET FREQUENCY using X2. The above explanation is valid for "Digital" reference too (when using Δ/∇key) In case of Raise/Lower and Digital speed reference, once the required frequency is attained by enabling the X1,X2 or Δ/∇ keys, the SET FREQUENCY value will be available for next START command to the Inverter. However the value will be lost once the Power to the Inverter is turned OFF.</p>				
03	Max Frequency	xxx.xx HZ	The Maximum frequency can be set from 01.00 to 127.99Hz. The setting is carried out by pressing Δ/∇ keys	03
04	Base Frequency		Depending the geographic region of use, the Motor rated frequency to be entered here. This may be either 50Hz or 60Hz.	
		00 50 Hz	Programmed Base Frequency is 50HZ	0400
		01 60 Hz	Programmed Base Frequency is 60Hz	0401

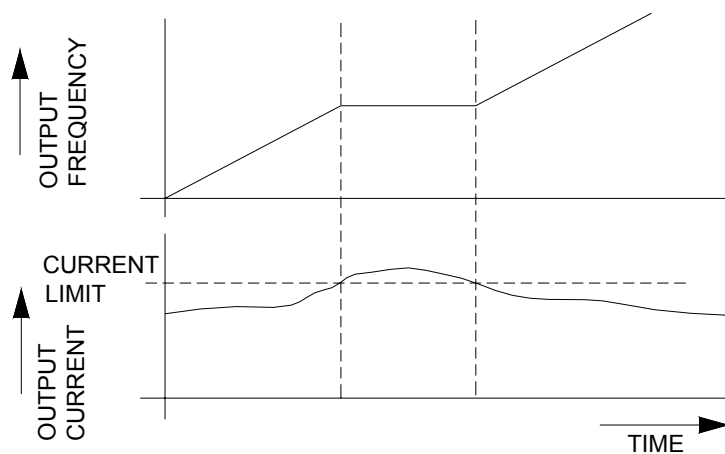
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
05	Accelern rate	XXX.XX Hz/S	00.50 TO 127.99HZ/S The Inverter will Ramp up with this rate when a START command is issued or when there is increase in speed reference. The Acceleration profile can be changed by enabling the AC1 input.	05
06	Decelern rate	XXX.XX Hz/S	00.50 TO 127.99HZ/S The Inverter will Ramp down with this rate when the STOP command is issued or when there is a decrease in speed reference	06
07	Trq-Boost-Level	XXX %	000 TO 100 % The setting allows the motor to generate the rated torque at lower speed.	07

An AC Induction motor is designed to draw a fixed magnetizing current. With V/F control the voltage is reduced as the frequency is reduced. As the voltage is reduced, the drop in stator resistance increases. This has the effect of reduction in magnetizing current. The following voltage profile is used to overcome such an effect.

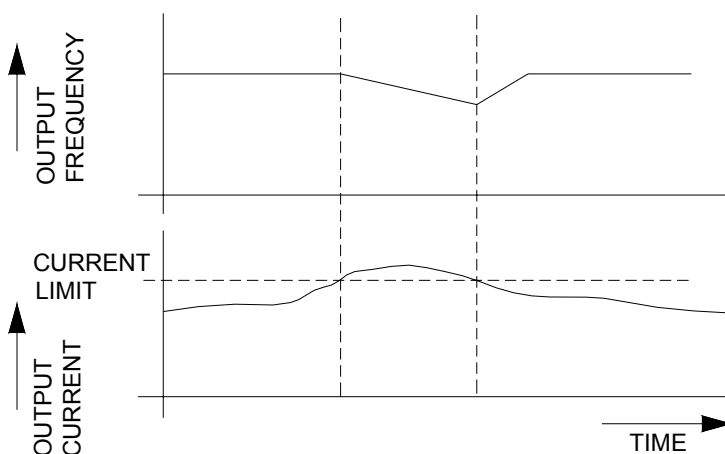


FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
08	Under Volt set	000 to 504 V	The Inverter will trip if the UnderVolt-Latch (Function code 35) is enabled. Or all the IGBTs will be OFF when the DC Bus voltage goes below the this programmed Voltage. Working of the Inverter will be normal once the DC Bus voltage is more than this programmed voltage	08
09	RPM Multiplier	XX.XX	00.00 TO 99.99 This parameter is used to display the RPM in LED or LCD. The displayed number will be the product of the Fout and the RPM Multiplier.	09
10	Current Limit	XXX	030 TO 200 % During acceleration whenever the Inverter output current reaches the above percentage value of Inverter Rated current, the increase in frequency is held. That is the Inverter output frequency will be held constant as long as the output current is equal to the programmed current. It will increase once the current reduces. This avoids the "Overcurrent Trip During Acceleration". In steady state, if the same condition appears, the Inverter will try to reduce the frequency slowly. This avoids the motor stalling because of sudden load variation.	10

During acceleration:

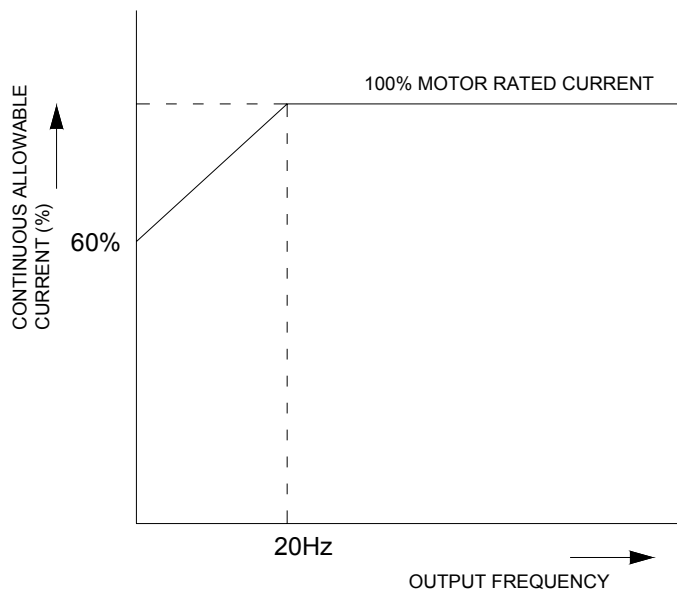
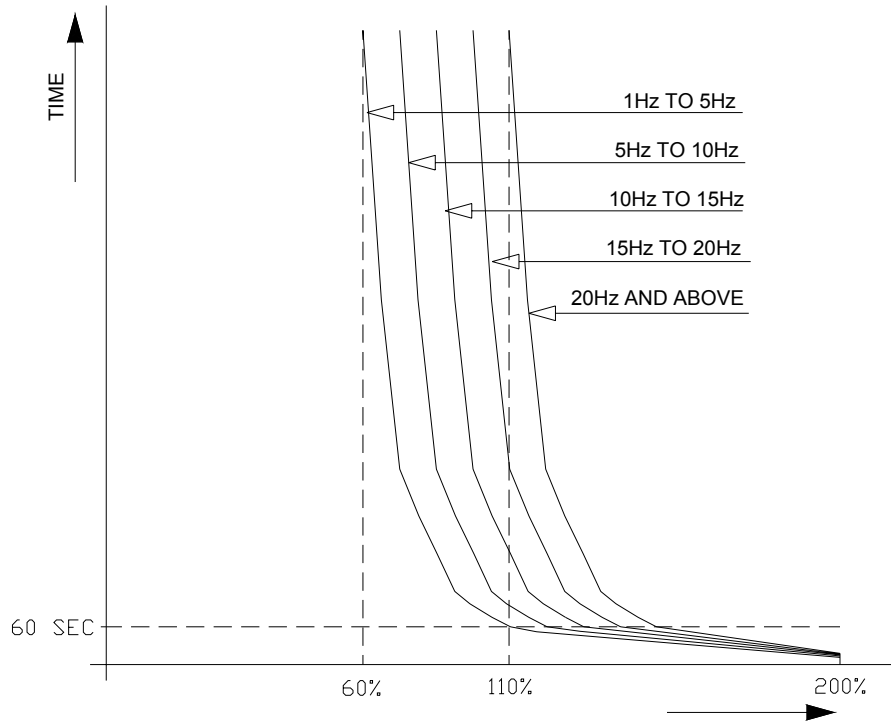


During Steady State:

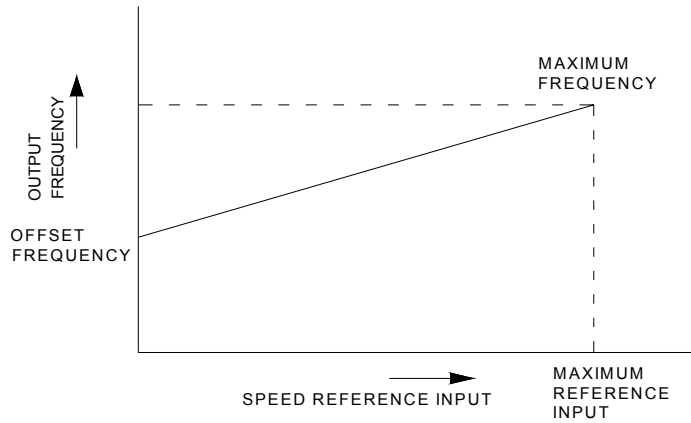


FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
1 1	Para protection		If this parameter is enabled, the other parameters can't be changed. Whenever there is attempt to store the changed parameter, the LCD will display "Para Protected"	
		00 Disable	Parameter Protection is disabled. Any parameter can be changed and stored.	1 1 0 0
		01 Enable	Parameter Protection is enabled. No parameter can be changed and stored	1 1 0 1

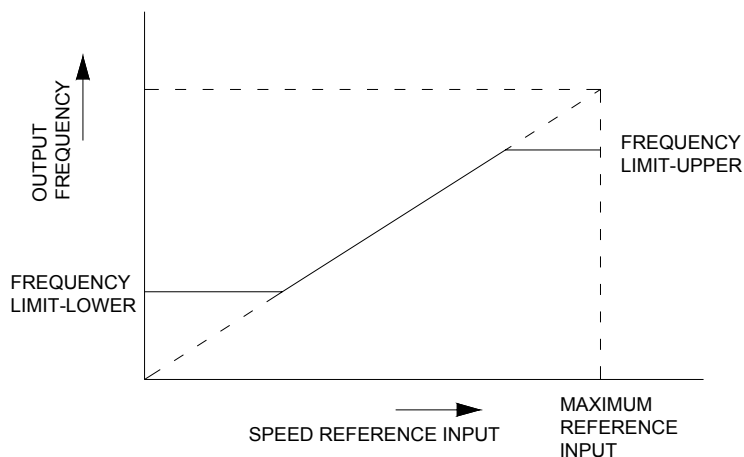
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
1 2	AuxSpeed-Ref		Inverter will accept Auxiliary reference whenever digital input X3 is enabled	
		00 Disable	Auxiliary Speed Reference is disabled	1 2 0 0
		01 Enable	Inverter will accept the speed reference of type mentioned in AuxRef-Type (Function Code:13), when digital input X3 is enabled.	1 2 0 1
1 3	Aux-Ref-Type		Specifies whether Inverter has to accept 0-10V or 4-20mA as auxiliary reference when digital input X3 is enabled.	
		00 4-20mA	Auxiliary reference is of the type 4-20mA	1 3 0 0
		01 0-10V	Auxiliary reference is of the type 0-10V	1 3 0 1
1 4	Inverse-OverLoad	0-100%	If 00 is programmed the Thermal Over Load is bypassed If 01 is programmed, Thermal Overload will work like a standard bimetallic overload relay with a current rating of Inverter Rated current If programmed with other than 00 or 01, the Thermal overload relay will work with freq-consideration and rated current equal to (Programmed value * Rated Current) / 100	



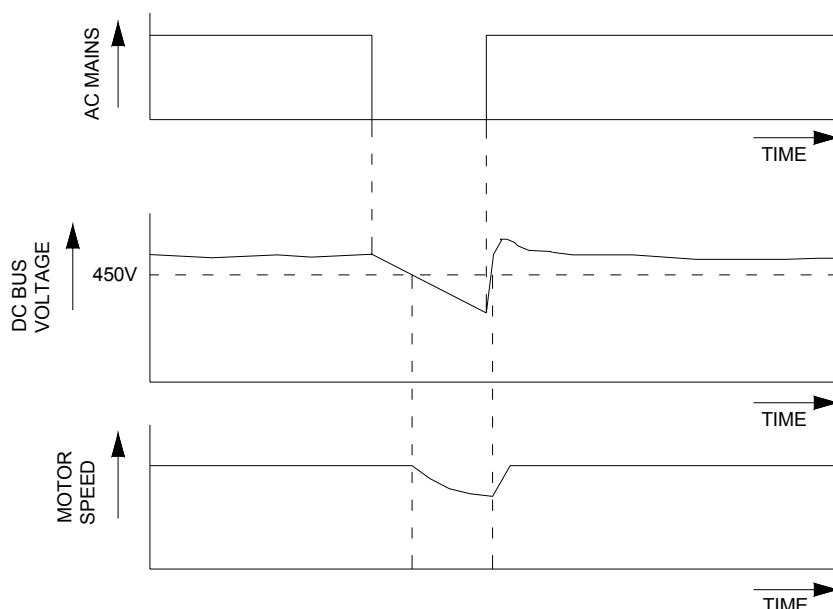
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
15	Offset Frequency	XXX %	000 TO 100% This is entered as a percentage of Maximum frequency. It causes the offset for the input reference and increases the resolution of analog setting	15



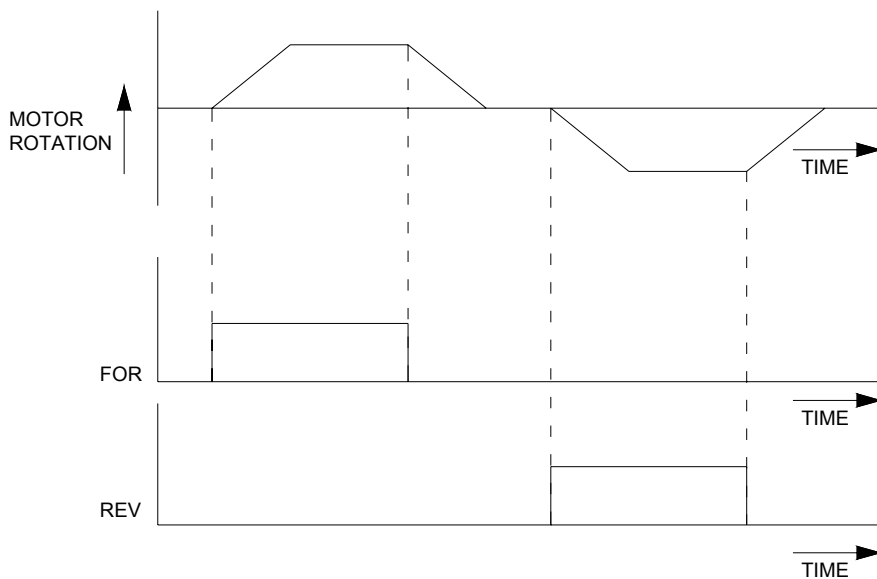
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
16	FreqLimit-Lower	XXX %	000 to 099 % Limits the Running frequency irrespective of the input reference. For example if the low limit is 50% and Max Frequency is 50Hz, the Inverter will show and run at 25Hz in steady state, even if the input reference is 5Hz This parameter should always be less than FreqLimit-Upper value.	16
17	FreqLimit-Upper	XXX %	000 to 100 % Increase in Speed reference beyond this has no effect on output frequency of the Inverter. The parameter should be always more than FreqLimit-Lower value	17

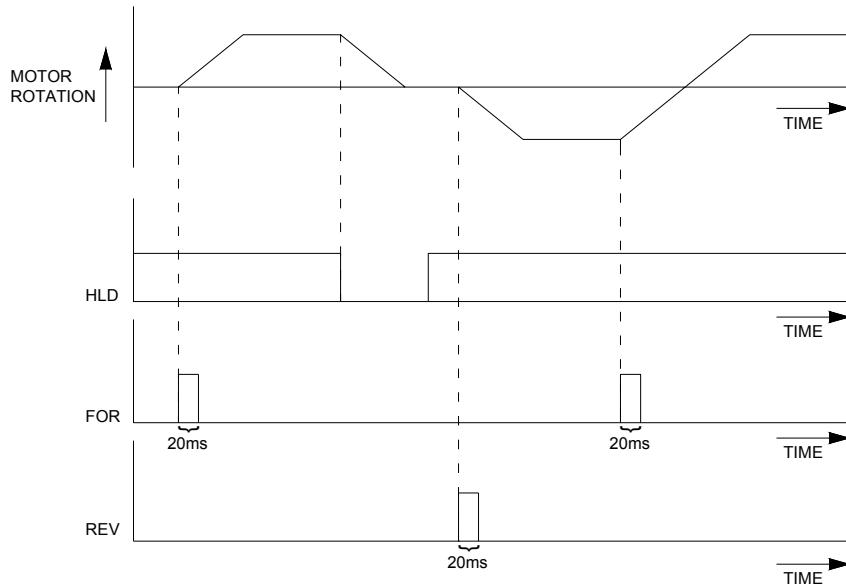


FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
18	Power Ride		Enables or disables Auto-restart after power failure. The time by which the auto-restart has to occur to be programmed in "Power ride time". During this time the commands for START should be ON continuously.	
		00 Disable	Disables the Auto-restart feature	1800
		01 Enable	Enables the Auto-restart feature. The UnderVolt-Latch (Function Code No.35) should be disabled to enable this.	1801
19	Power ride Time	XX seconds	00.00 to 10.99 seconds Specifies the maximum time for the auto-restart feature to work after Power Failure.	19



FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
20	Analog-Output		Specifies Vout Variable.	
		00 Motor Freq	The 0-10V analog output will be proportional to the Motor frequency. (10 V corresponds to the Maximum Frequency programmed)	2000
		01 Motor Current	The 0 - 10V output corresponds to 0 to Rated Output current of the Inverter	2001
21	StartStop Method		2 Wire or 3 wire Operation can be selected. The 3 wire operation emulates the latched relay operation.	
		2-Wire-Oper	2-Wire Operation is enabled. The Inverter will Run as long as the FOR/REV digital inputs held enabled.	2100
		3-Wire-Oper	3-Wire Operation is enabled. The Inverter will RUN when the FOR/REV digital inputs are closed momentarily provided HLD is enabled continuously. The Stoppage of Inverter is caused by disabling the HLD input.	2101





FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
22	Accelern1 rate	XXX.XX Hz/S	00.50 to 127.99 Hz/S The Inverter follows this acceleration profile depending on AC1 and HLD inputs	22
23	Decelern1 rate	XXX.XX Hz/S	00.50 to 127.99 Hz/S The Inverter follows this Deceleration profile depending on AC1 and HLD inputs	23
24	Accelern2 rate	XXX.XX Hz/S	00.50 to 127.99 Hz/S The Inverter follows this acceleration profile depending on AC1 and HLD inputs	24
25	Decelern2 rate	XXX.XX Hz/S	00.50 to 127.99 Hz/S The Inverter follows this Deceleration profile depending on AC1 and HLD inputs	25
26	Accelern3 rate	XXX.XX Hz/S	00.50 to 127.99 Hz/S The Inverter follows this acceleration profile depending on AC1 and HLD inputs	26
27	Decelern3 rate	XXX.XX Hz/S	00.50 TO 127.99 Hz/S The Inverter follows this Deceleration profile depending on AC1 and HLD inputs	27

When 3 Wire operation is enabled, HLD is not used for Acc/Dec profile selection. The sequence is as below :

AC1	HLD	Selected Profile
0	NA	Accelern rate / Decelern rate (Function code 05 & 06)
1	NA	Accelern1 rate / Decelern1 rate(Function code 22 & 23)

When 2 Wire operation is enabled, AC1 and HLD together determine Acc/Dec profile. The sequence is as below :

AC1	HLD	Selected Profile
0	0	Accelern rate / Decelern rate (Function code 05 & 06)
0	1	Accelern2 rate / Decelern2 rate (Function code 24 & 25)
1	0	Accelern1 rate / Decelern1 rate (Function code 22 & 23)
1	1	Accelern3 rate / Decelern3 rate (Function code 26 & 27)

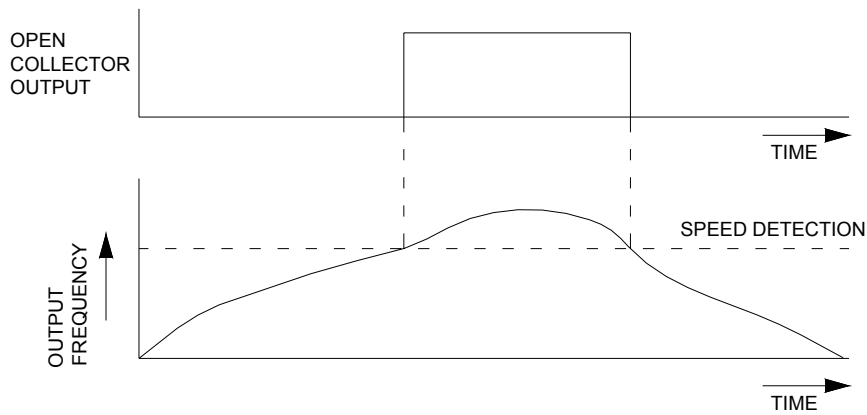
FUNCTIO N CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
28	Frequency-1	XXX.XX Hz	00.50 TO 127.99 Hz This value will be the Inverter Reference frequency depending on the digital inputs X1, X2 and X3. However for multispeed operation to work, it is required to disable Raise-Lower or Raise-Low St0 for Main- Speed-ref(Function code 02) and also AuxSpeed-ref (Function Code: 12)	28
29	Frequency-2	XXX.XX Hz	00.50 TO 127.99 Hz Same as Frequency-1	29
30	Frequency-3	XXX.XX Hz	00.50 TO 127.99 Hz Same as Frequency-1	30
31	Frequency-4	XXX.XX Hz	00.50 TO 127.99 Hz Same as Frequency-1	31
32	Frequency-5	XXX.XX Hz	00.50 TO 127.99 Hz Same as Frequency-1	32
33	Frequency-6	XXX.XX Hz	00.50 TO 127.99 Hz Same as Frequency-1	33
34	Frequency-7	XXX.XX Hz	00.50 TO 127.99 Hz Same as Frequency-1	34

X1	X2	X3	Speed Reference selected
0	0	0	Main-Speed-Ref (Function code : 02)
0	0	1	Frequency-1 (Function code :28)
0	1	0	Frequency-2 Function code :29)
0	1	1	Frequency-3 (Function code :30)
1	0	0	Frequency – 4 Function code :31)
1	0	1	Frequency – 5 (Function code :32)
1	1	0	Frequency – 6 Function code :33)
1	1	1	Frequency –7 (Function code :34)

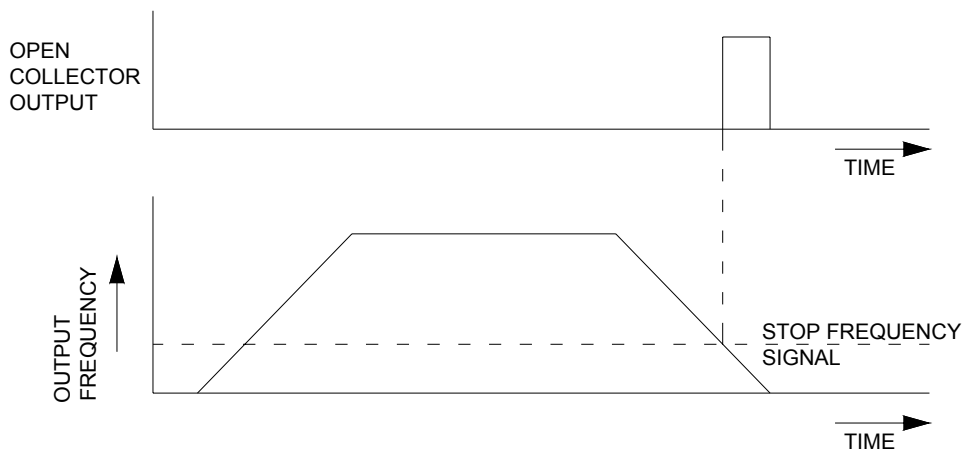
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
35	UnderVolt-Latch			
		Disable	If disabled, the Inverter will switch OFF all the IGBTs when the DC Bus voltage is less than Under Volt Set (Function code 08) and will not enter into Fault mode. That is it will continue the operation once the DC Bus voltage is increased.	3500
		Enable	When enabled and if the DC Bus Voltage becomes less than Under Volt Set (Function code 08), the Inverter will trip for Under Voltage. The Inverter will enter into FAULT mode. Reset clears the Fault mode.	3501

Attention: If the Inverter is in READY TO RUN mode and the DC Bus Voltage goes below the programmed Under Volt Setng (Function code 08), the Inverter will not accept the START command.
However the Inverter will latch to the fault condition only when the UnderVolt Latch is enabled.

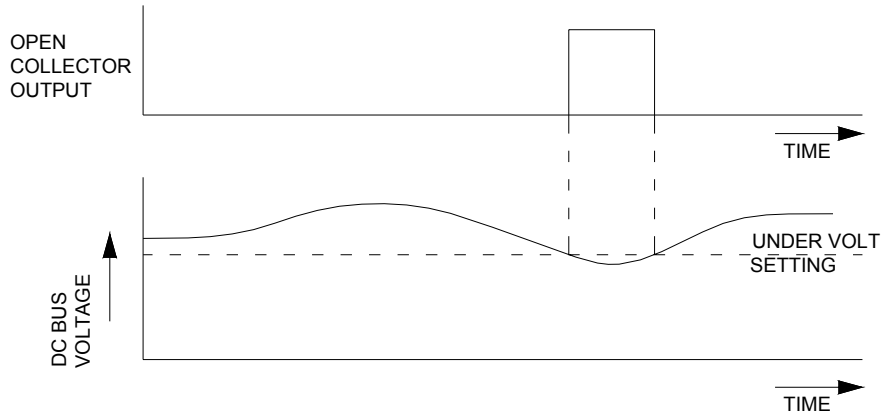
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
36	OverLoad Warning	XXX %	000 TO 150 % When Programmable open collector/relay is programmed for OL-Early-Warn, the respective output will be ON when the output current crosses the % of rated Inverter Current.	36
37	Freq-Detection	XXX.XX Hz	0.00 TO 127.99 Hz When Programmable open collector/relay is programmed for Freq-Detect, the respective output will be ON when the output frequency is more than the Speed-Detection value.	37
38	StopFreq-Signal	XX.XX Hz	00.00 TO 10.00Hz When Programmable open collector/relay is programmed for StopFreq-Signal, the respective output will be ON when the output frequency is less than the "StopFreq-Signal" value and the Inverter is decelerating	38
39	Open-Coll-1		The Open collector output can be programmed to be ON for various operating conditions. When the specified condition is satisfied, the output will be ON.	
		Freq-Detect	The output will be ON when the output frequency is more than "Speed-Detection" value (Function code 37)	3900



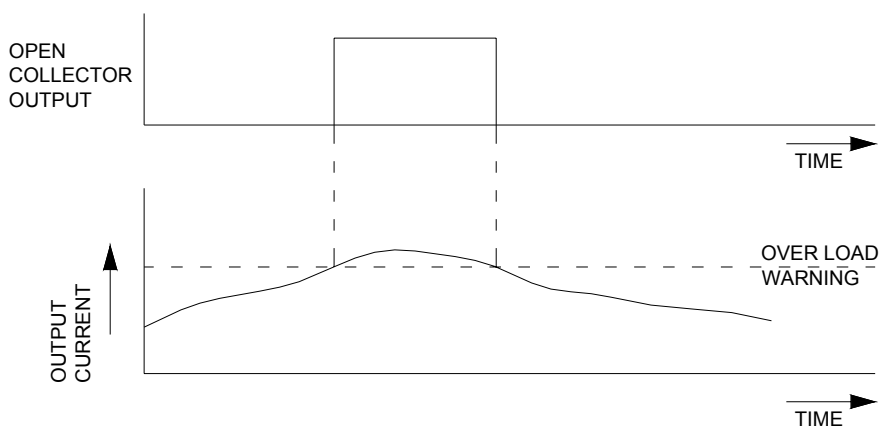
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		Stop-Sig-Freq	The output will be ON when the Inverter is decelerating and the Output frequency is less than "StopFreq-Signal" value (Function code 38)	3901



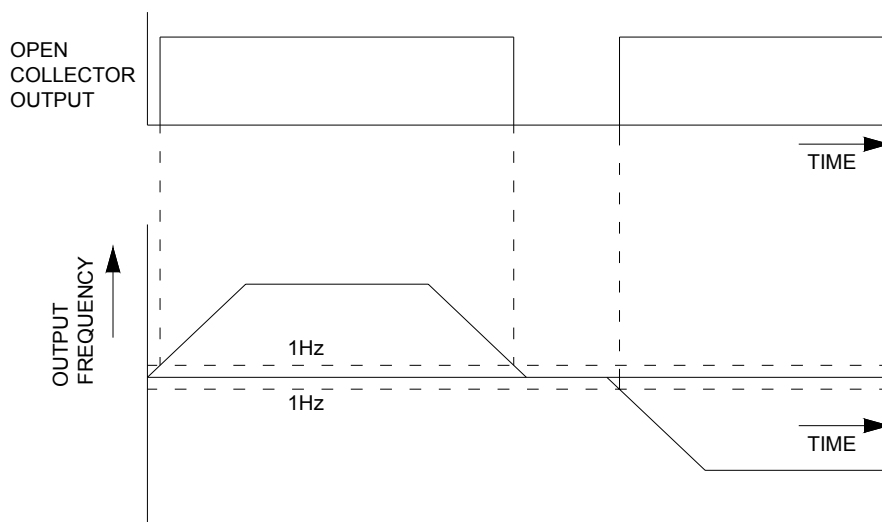
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		UV Signal	The output will be On when the DC Bus Voltage is less than the "UnderVolt setng" value (Function code 08)	3902



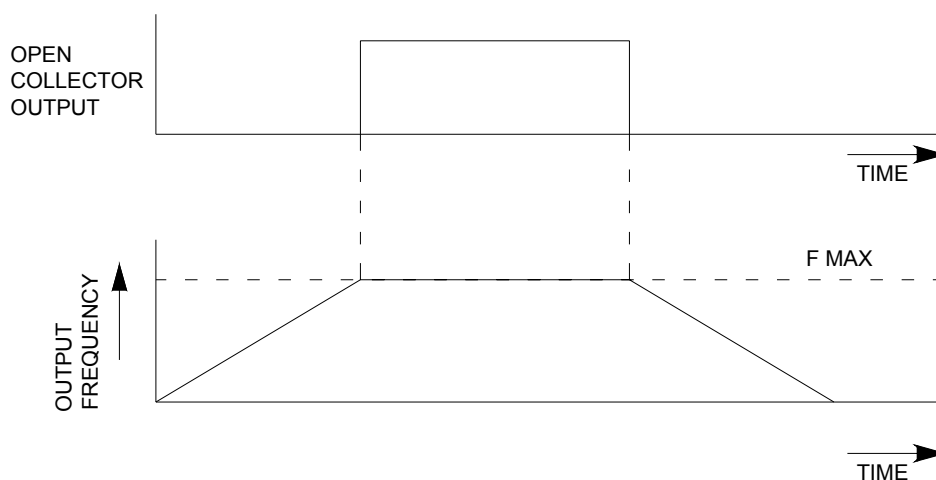
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		OL-Early-Warn	The output will be ON when the Inverter Output current is more than the % value of the Inverter Rated Current programmed in "Overload Warning" (Function code 36)	3903



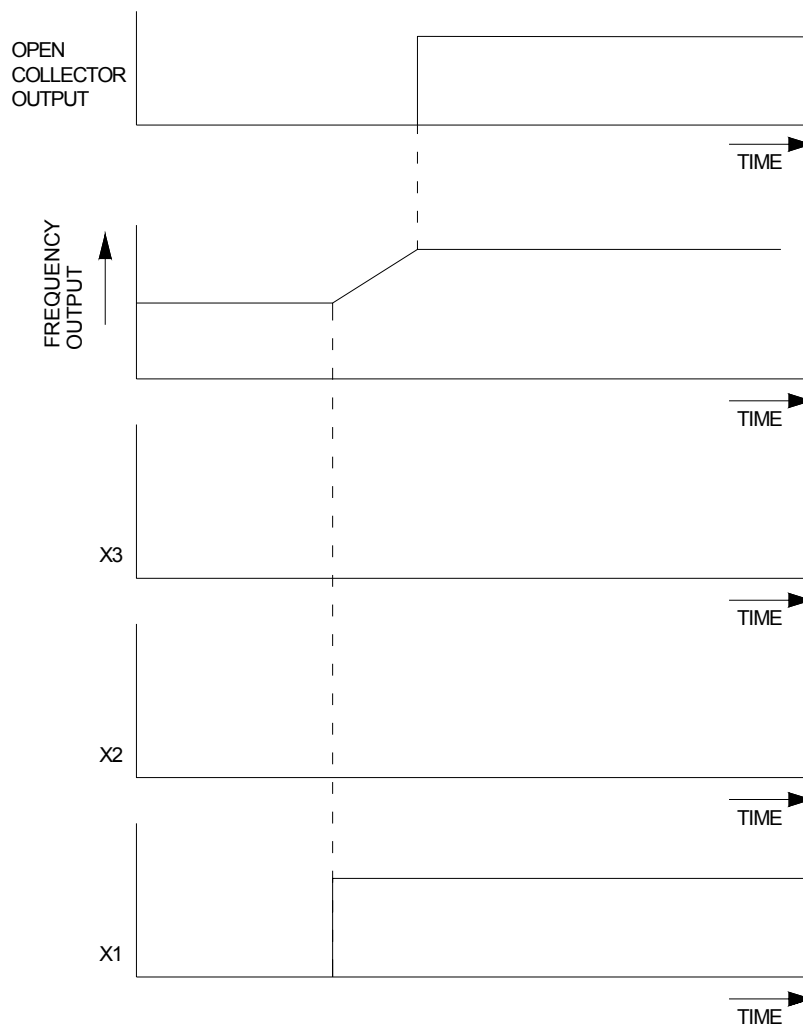
FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		Run Indicate	The output will be ON when the Inverter is in RUN Mode	3904



FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		Fmax Reached	The Output will be ON when the Inverter Output frequency reaches the programmed "Max Frequency" value (Function code 03)	3905



FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		Speed1 Reach	The output will be ON when the "Frequency-1" (Function code 28) is selected through X1, X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-1 value.	3906



Attention: Open Collector will be ON when combination of X1, X2 and X3 are enabled according to the required speed like Speed1 to Speed7 and the output frequency becomes equal to the reference frequency. Similar is the condition for other speeds of Multiple speed pattern

FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
		Speed2 Reach	The output will be ON when the "Frequency-2" (Function code 29) is selected through X1,X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-2 value.	3907
		Speed3 Reach	The output will be ON when the "Frequency-3" (Function code 30) is selected through X1,X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-3 value.	3908
		Speed4 Reach	The output will be ON when the "Frequency-4" (Function code 31) is selected through X1,X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-4 value.	3909
		Speed5 Reach	The output will be ON when the "Frequency-5" (Function code 32) is selected through X1,X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-5 value.	3910
		Speed6 Reach	The output will be ON when the "Frequency-6" (Function code 33) is selected through X1,X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-6 value.	3911
		Speed7 Reach	The output will be ON when the "Frequency-7" (Function code 34) is selected through X1,X2 and X3 Multispeed digital Inputs and the Inverter output frequency reaches the Frequency-7 value.	3912

FUNCTION CODE	FUNCTION NAME	DATA VALUES	DESCRIPTION	LED Display
40	Open-Coll-2	SAME AS Open-Coll-1		4000 TO 4012
41	Program Relay	SAME AS Open-Coll-1		4100 TO 4112
42	Auto-Run-Mode		This parameter supersedes Main/Auxiliary /Multispeed reference for a programmed period and runs the inverter at programmed initial frequency immediately after RUN command is given. After programmed initial time inverter takes Main/Auxiliary/Multispeed reference.	4200
		00 Disable	Auto run mode Disable. Inverter starts with Main/Auxiliary /Multispeed reference. Normally this parameter is set as Disable for normal operation.	4200
		01 Enable	Auto run mode enable. Inverter runs at programmed initial frequency for programmed initial time when starts from zero.	4201
43	Initial time	XXX.XX Min	0.00 to 255.99 Min. This parameter is used to set the initial run time for Auto Run Mode.	43
44	Initial Freq	XXX.XX Hz	1.00 to 127.99 Hz. This parameter is used to set the initial frequency for Auto Run Mode.	44

45	Jog-Rlst0			
		Disable	Override speed function (Jog Speed) when the Main-Speed-Ref is 08 Raise-Low st0 is disabled	4500
		Enable	<p>Override speed function (Jog Speed) when the Main-Speed-Ref is 08 Raise-Low st0 is enabled. This means when the Main-Speed-Ref is raise-LowSt0, closure of X3 to GD will cause Inverter running at Max-Jog-Speed reference. The Inverter will run at this speed as long as X3 is closed. Upon opening of X3, the inverter will run at previously running speed.</p> <p>Priorities for these digital inputs is X1, X2 and X3. that means, when X1, X2 and X3 all are closed, X1 will have effect. X2 and X3 are closed, X2 will have effect. If X1 and X3 both are closed, X1 will have effect.</p> <p>If Max-Jog-Speed ref is chosen as speed reference by way of closing X3, the inverter output will accelerate/decelerate (accelerate in case the Max-Jog-Speed is more than the inverter running frequency and vice versa) with Accelern rateor Decelern rate. (However selection of other acceleran1 rate or so will be in effect by closing AC1)</p>	
46	Max-Jog-Speed	XXX.XX Hz	0 to Max-Frequency. The Inverter will run at this frequency when Main-Speed_ref is Raise-low-St0 (Parameter No. 02) and Jog-Rst0 is enabled (Parameter No. 45)	46

47	Fault Memory	<p>The display will be the latest fault occurred. When the Δ key is pressed, the fault number will increase and the corresponding message will be displayed.</p> <p>For example the Fault Display in LCD shows as below :</p> <p>04 Over Voltage</p> <p>Here the Last Fourth Fault was due to DC BUS Overvoltage.</p> <p>The possible fault messages are as below :</p> <p>Output Short Ckt OC While Running OC During Accln OC During Deceln Overload Heatsink OverTem DC Bus Overvolt DC Bus Undervolt External Fault CMOS ERROR</p>	47
48	-----	Not implemented	
49 TO 66	-----	Do	49 TO 66
67	Service Password	For use of authorized personnel only.	67

DISTRIBUTION AND CONTROL EQUIPMENT RATINGS:

Motor Output (kW)	2.2	3.7	5.5	7.5	11	15	18.5	22.0
Inverter Output kVA	4.3	7.18	10.8	14.4	18	21.6	28.8	32.3
Applicable wire size (sq.mm)	1.5	2.5	4	4	10	10	16	16
MCB	16	16	32	32	32	60	60	60

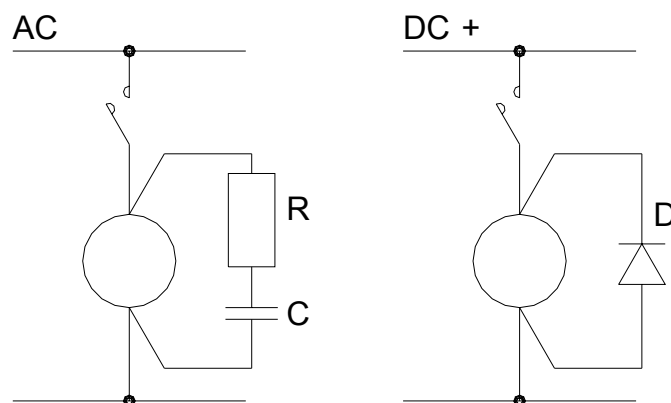
- In cases where the motor rating is too small compared to Inverter rating, output overload relays are recommended depending on Motor rating.
- Input short circuit protection can be provided by suitable HRC fuses.
- It is not recommended to use external contactors in normal operations. However whenever bypass facility is required, use a suitable output contactor mechanically interlocked to the Bypass contactor.

PRECAUTIONS FOR NOISE SOURCE:

Attention: Do not use any magnetic coils/ relays which emit electromagnetic waves very close to the Inverter.

If Magnetic contactors etc. to be used in the cubicle, then prevent the noise interference by using proper filter components as mentioned below :

1. Use RC Filter with $C = 0.22\mu\text{F}, 400\text{V AC}$ and $R=470\Omega, 2\text{W}$
The RC Filter is for AC Magnetic contactor, Auxiliary Relay and Solenoids with coil operating current less than 1A and coil voltage 230V
2. Use diode with capacity 1A, 600V , Surge 35A/10ms for DC coils operating with less than 1A, upto 220V DC.



TROUBLESHOOTING CHART

Sl.No	TRIP MESSAGE	DESCRIPTION	POSSIBLE CAUSES REMEDY
1	CMOS ERROR	Communication problem in control card	1. Replace Control Card
2	External Fault	Control card sensing THR terminal open.	1. Short THR and GD in Control Terminal Block of Control Card. 2. Check the External thermal switch if it is connected (NC).
3	DC Bus Undervolt	Under voltage latch is enabled	1. Disable Under Voltage Latch (Function Code 35) 2. Check Thyristor / Thyristor triggering.
4	DC Bus Overvolt	Drive sensing DC Bus voltage more then 790V DC	1. Check the input voltage. It should be between 325V AC to 480V AC 2. If DC Bus over Voltage occurs during deceleration, reduce the deceleration rate. 3. Check for loose connection in external connection. 4. Measure the displayed DC Bus Voltage actual DC Bus Voltage Using Multimeter. If difference is not within +/- 5% replace PS&GD Card. 5. If CMOS ERROR and DC Bus Overvolt trip appears intermittently, Change Control Card.
5	Heatsink OverTem	Heat sink temperature is more then 80 deg C.	1. Cooling Fan not running. (Ref "Fan not running") 2. Loose connection between Thermal switch and Control Card CN4. 3. Thermal switch failure. (Thermal Switch in normally closed switch opens at 80deg C) 4. Measure the voltage between HLD and GD, if it is less then 6V DC then replace the PS&GD Card.
6	Overload	Over Load detected	1. Thermal Over Load, Check the load current. 2. If current measured does not match with displayed value (+/-10%) Check the Current feedback setting switch and rating setting. 3. Wrong value in Thermal over load setting. (Function Code 14)
7	OC During Deceln	Over Current during deceleration. (300% of Rated)	1. Check the loose connection of output wires. 2. Check the motor winding. 3. Check the motor, coupling and load. 4. Check the output cable.
8	OC During Accln	Over Current during acceleration. (300% of Rated)	
9	OC While Running	Over Current during running. (300% of Rated)	

10	Output Short Ckt	External Problem	<ol style="list-style-type: none"> 1. Disconnect the motor and check. 2. If drive runs OK, <ul style="list-style-type: none"> • Check the loose connection of output wires. • Check the motor winding. • Check the motor, coupling and load. • Check the output cable
		Internal Problem	<ol style="list-style-type: none"> 1. Check the Gate Drive wiring Harness. Connections between CN1 and CN3 of PS&GD Card and PIC Card. 2. Check IGBT. 3. If IGBT found OK, replace PS&GD Card. (Using New PS&GD on failed IGBT may cause PS&GD card Failure and vice-versa)
11	WAIT FOR DC BUS VOLTAGE BUILD UP	Input low voltage	1. Check the input voltage. It should be between 325V AC to 480V AC
		PS&GD Card Failure	1. Measure the actual DC Bus Voltage, If it is more then 450V DC, Replace PS&GD Card.

Causes and Remedies for some of the problems which do not trip the inverter:

Sl.No	Problem	Cause	Remedy
1	Fan not running	One of the Phase failure	Check 3 phase voltage
		Auto transformer Failure	Check the voltage 230V at autotransformer
		Fan Failure	If 230V supply is present, then replace the fan
2	Motor Vibration	One of the six pulses is missing	Connect working motor, run at 1 to 2 Hz, if motor does not run smoothly, replace PS&GD Card.
		Loose connection of output wires	If one of output cable is loose, motor start to vibrate.
3	No display	No supply for Drive	Check the supply voltage.
		Display unit failure	Check with new Display Unit
		Measure the Voltage at + and - of Power Terminal block	If DC Bus voltage is OK, check for loose connection between PS&GD and PIC card (CN2). If DC Bus charge LED in PS&GD card is glowing check for loose connection between PS&GD card and Control card as well as control card and Display unit.
		Charging resistor failure	Check the DC Bus charge LED in PS&GD card, if not glowing, check the charging resistor. (Thyristor failure / thyristor triggering problem may cause charging resistor failure. Check these before replacing charging resistors)
		PS&GD card failure	If DC Bus charge LED in PS&GD card is glowing and no LED display and LCD back light, then replace PS&GD card.
4	Input MCB Trip	MOV Failure	Check the MOV in Surge Suppressor Unit.
		Short circuit in Fan / Auto transformer	Check fan / autotransformer
		Diode module failure	Check Thyristor Diode Module / Diode Module.
		Thyristor Failure	Check Thyristor Diode Module / Thyristor Module.

Notes:

Notes:

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