MX2 Quick Start Guide

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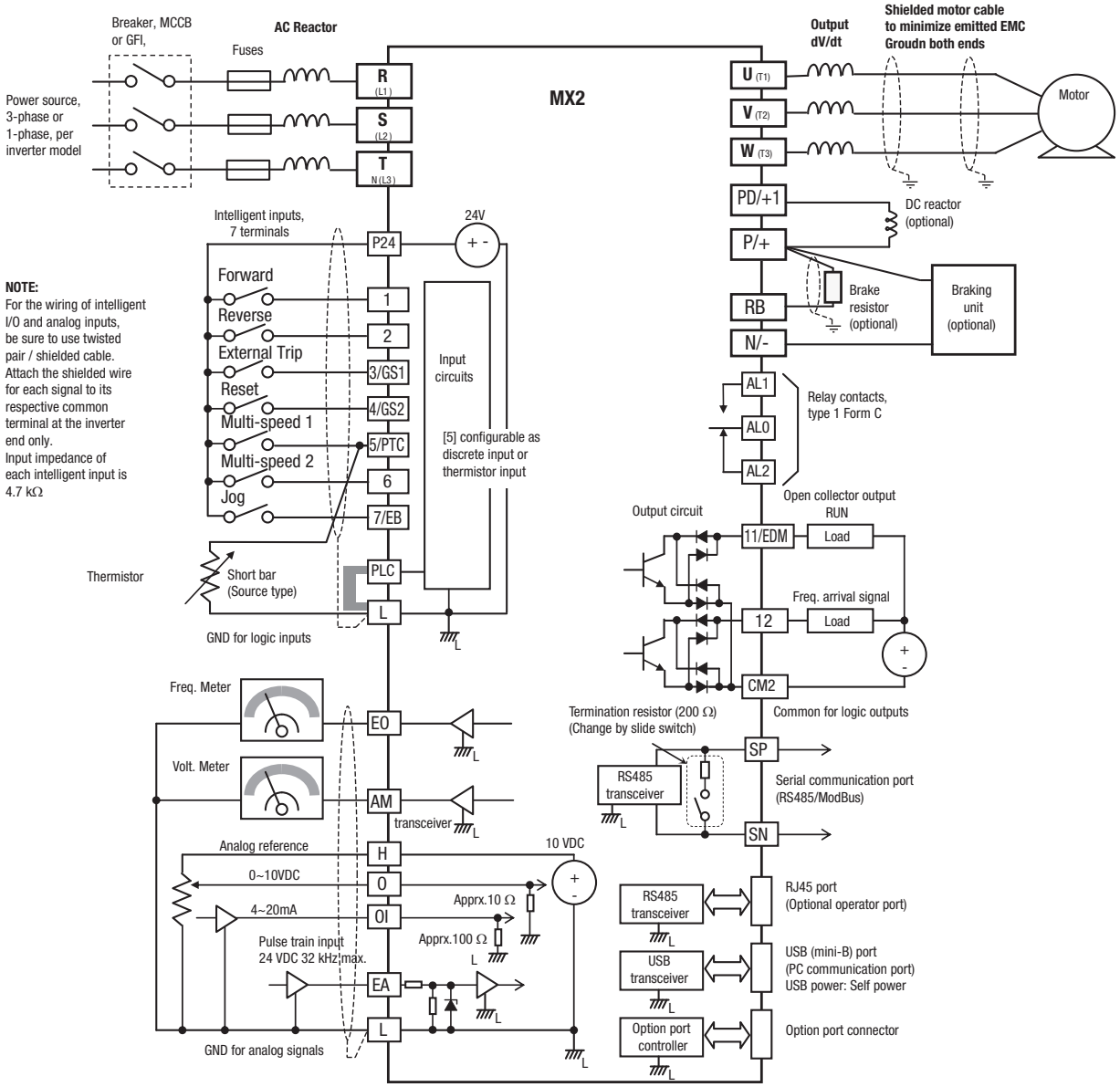
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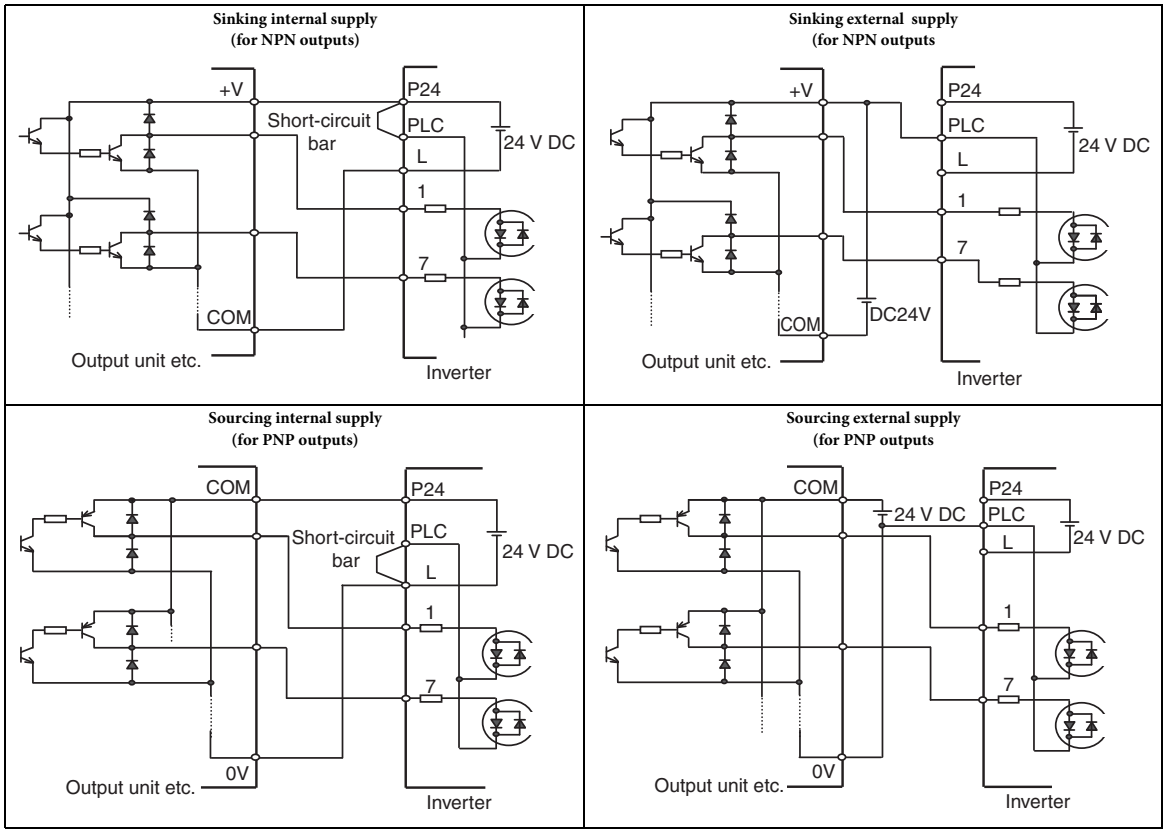
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2.4 Wiring overview



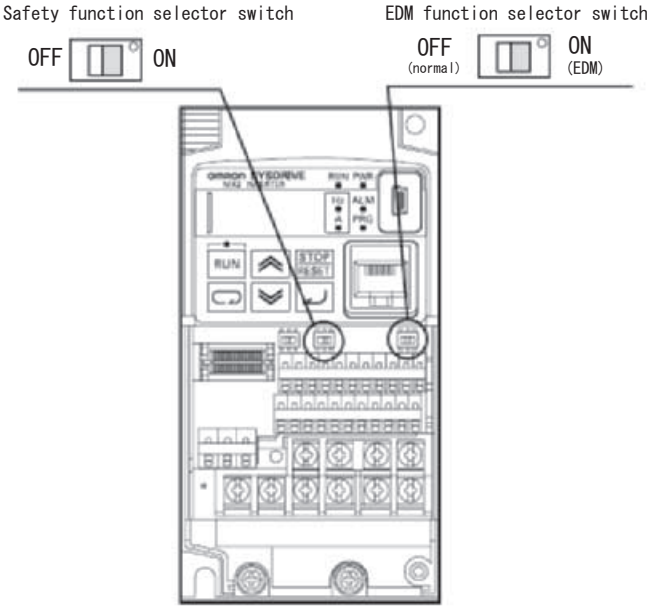
2.8 Digital inputs SINK/SOURCE (NPN/PNP) settings



2.9 Safe stop disable function

MX2 inverter incorporates a SAFE STOP function at hardware level according with EN60204-1 stop category 0. It is designed to meet the requirements of the ISO13849-1, PL=d and IEC61508 SIL 2 only in a system in which EDM signal is monitored by an "external device monitor". Two redundant inputs are required (3/GS1 and 4/GS2). The function is purely hardware based. but to activate it you should set below switches to ON. This will fix the configuration of multi-function inputs 3 (C003=77) and 4 (C004=78) and also for the multi-function output 11 (C021=62).

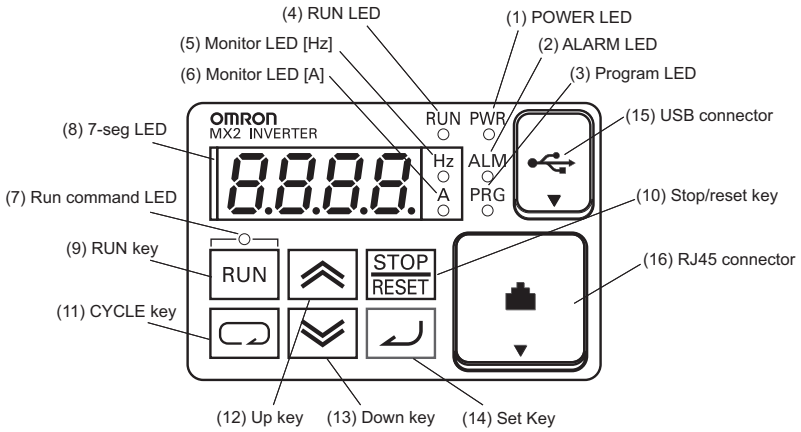
When the switches are set to OFF the multi-function input and output the configuration is set to No function selection



3 PROGRAMMING MX2

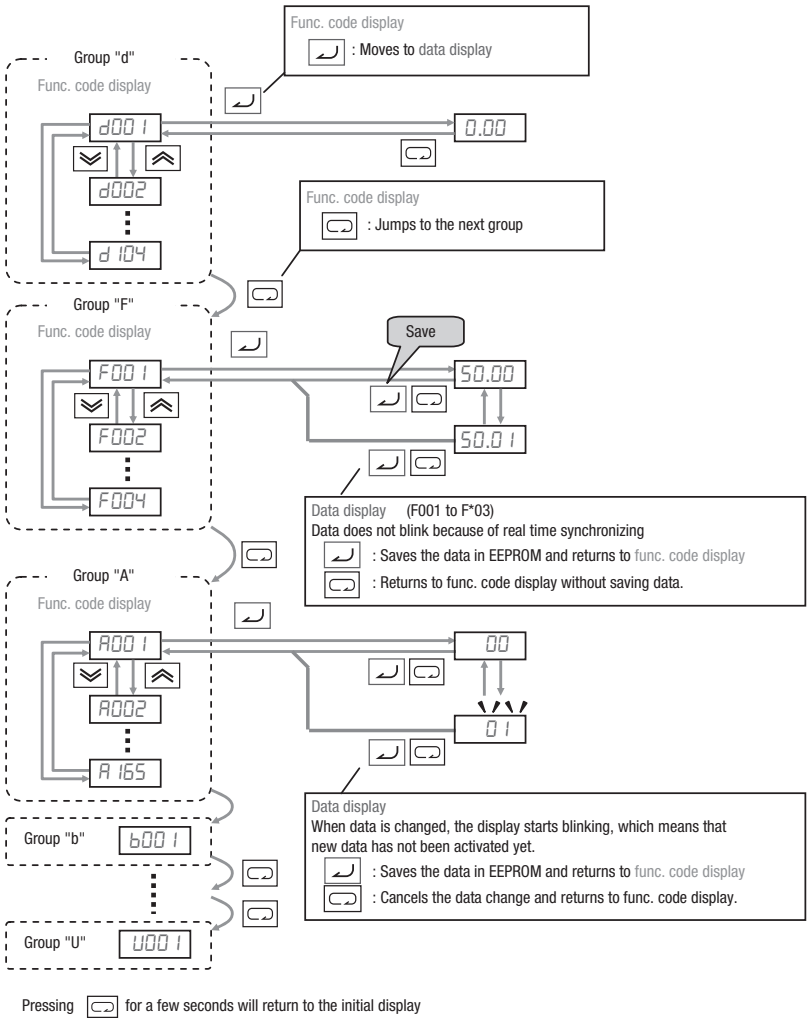
3.1 Digital operator

The display is used in programming the inverter's parameters, as well as monitoring specific parameter values during operation



Items	Contents
(1) POWER LED	Turns ON (Green) while the inverter is powered up.
(2) ALARM LED	Turns ON (Red) when the inverter trips.
(3) Program LED	Turns ON (Green) when the display shows changeable parameter. Blinks when there is a mismatch in setting.
(4) RUN LED	Turns ON (Green) when the inverter is driving the motor.
(5) Monitor LED [Hz]	Turns ON (Green) when the displayed data is frequency related.
(6) Monitor LED [A]	Turns ON (Green) when the displayed data is current related.
(7) Run command LED	Turns ON (Green) when a Run command is set to the operator. (Run key is effective.)
(8) 7-seg LED	Shows each parameter, monitors etc.
(9) Run key	Makes inverter run.
(10) Stop/reset key	Makes inverter decelerates to a stop. Reset the inverter when it is in trip situation
(11) CYCLE key	Go to the top of next function group, when a function mode is shown Cancel the setting and return to the function code, when a data is shown Moves the cursor to a digit left, when it is in digit-to-digit setting mode Pressing for 1 second leads to display data of **d001**, regardless of current display.
(12) Up key (13) Down key	Increase or decrease the data. Pressing the both keys at the same time gives you the digit-to-digit edit.
(14) SET key	Go to the data display mode when a function code is shown Stores the data and go back to show the function code, when data is shown. Moves the cursor to a digit right, when it is in digit-to-digit display mode
(15) USB connector	Connect USB connector (mini-B) for using PC communication
(16) RJ45 connector	Connect RJ45 jack for remote operator

3.2 Keypad navigation



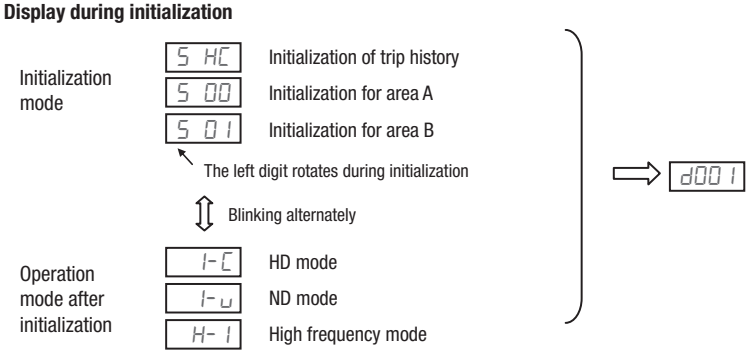
Pressing at the same time the up and down key in function code or data display will enable the single-digit edit mode that allows a faster navigation, refer to the manual for more details.

3.3 Initialization

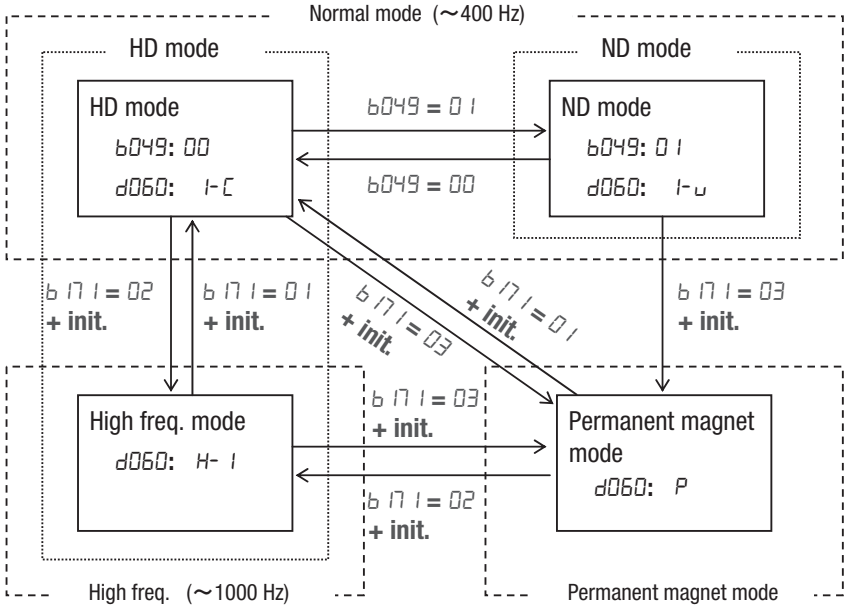
You can restore all inverter parameters to the original factory (default) settings according to area of use. After initializing the inverter, use the power up test in Chapter 2 to get the motor running again. If operation mode (std. or high frequency) mode is changed, inverter must be initialized to activate new mode. To initialize the inverter, follow the steps below.

- Select initialization mode in b084.
  00 Initialization disable
  01 Clears trip history
  02 Initializes all Parameters
  03 Clears Trip history and initializes all parameters
  04 Clears Trip history and initializes all parameters and drive programming
- If **b084**=**02**, **03** or **04**, select initialization target data in **b094**.
  00 All parameters
  01 All parameters except I/O configuration
  02 Only parameters register in Uxxx
  03 All parameter except the ones registered in Uxxx and b037
- Set **b180=01**

The following display appears for a few seconds, and initialization is completed with **d001** displayed



3.4 Inverter modes



Display code	Function name	Setting range/content	Initial value	Remarks
A044	V/f characteristic curve	00: Constant torque	0	For the second motor use parameter A244
		01: Reduced torque		
		02: Free V/F		
		03: Sensorless Vector Control		
b049	Dual rating selection	00: Constant torque 150% overload during 60s	00	Some parameters default and ranges depends off this setting. Refer to below table for details
		01: Variable torque 120% overload during 60s		
b171	Inverter mode selection	00: No function	00	To enable the new mode is necessary to initialize the inverter
		01: Standard Induction Motor		
		02: High Frequency Induction Motor		
		03: Permanent Magnet Motor		
d060	Inverter mode monitor	IM-CT (Induction motor constant torque)	-	Displays the current inverter mode use this one to check configuration as b171 returns to 0 after initialize
		IM-VT(Induction motor variable torque)		
		Hi-IM (High frequency induction motor)		
		PM (Permanent magnet motor)		

Neither the A044 or the b049 needs a initialization but remember to initialize the drive setting b180=01 when the inverter mode is changed on b171.

This table shows the parameters that change with the dual rating selectiong is modified

Name	Func. code	HD		ND	
		Range	initial data	Range	initial data
V/f characteristic curve	A044	00: Const. torque 01: Reduced torque 02: Free V/F 03: SLV	00: Const. tq.	00: Const. torque 01: Reduced tq. 02: Free V/F	00: Const. tq.
DC braking force for deceleration	A054	0 to 100 (%)	50 (%)	0 to 70 %	50 (%)
DC braking force at start	A057	0 to 100 (%)	0 (%)	0 to 70 %	0 (%)
Carrier frequency during DC braking	A059	2.0 to 15.0(kHz)	5.0(kHz)	2.0 to 10.0(kHz)	2.0(kHz)
Overload restriction level	b022	(0.20 to 2.00)	1.50 x Rated current	(0.20 to 1.50)	1.20 x Rated current
Overload restriction level 2	b025	x Rated current (A)	(A)	x Rated current (A)	(A)
Carrier frequency	b083	2.0 to 15.0(kHz)	5.0(kHz)	2.0 to 10.0(kHz)	2.0(kHz)
Motor capacity	H003	0.1 to 15(kW)	Depends on type	0.2 to 18.5(kW)	One size up than HD

3.5 Basic settings

After selecting the inverter mode follow next steps for a basic operation of the inverter

- Select frequency reference source on parameter A001

Parameter nº	Parameter Name	Details
A001	Frequency source	00 Potentiometer of ext. operator
		01 Control terminals
		02 Digital operator (F001)
		03 ModBus Network
		04 Option
		06 Pulse train input
		07 Via Drive programming
		10 Calculate function output

- Select Run command source on parameter A002

Parameter nº	Parameter Name	Details
A002	Run command source	01 Control terminals
		02 Run key on keypad or digital operator
		03 Modbus network input
		04 Option

- Adjust the stopping method by b091 and the acceleration/deceleration ramps on parameters F002 and F003

Parameter	Parameter Name	Details
b091	Stop mode selection	00: Deceleration to stop
		01: Free Run
F002	Acceleration time (1)	0.01 to 3600.00
F003	Deceleration time(1)	0.01 to 3600.00

- Set the motor base frequency and AVR voltage of the motors in parameters A003 and A082

Parameter	Parameter Name	Details
A003	Base Frequency	30.0 to maximum frequency in A004
A082	AVR voltage select	200V: 200 to 240V 400V: 380 to 480V

- Set the motor data: rated current (b012), rated power (H003) and number of poles (H004)

Parameter	Parameter Name	Details
b012	Level of electronic thermal	20% to 100% of inverter rated current
H003	Motor capacity	0.1 to 18.5KW
H004	Motor poles settings	2 to 48 poles

- When working in sensorless vector control perform motor auto tuning by parameter H001 (see next section for details)

At this point the inverter is ready to run the motor for the first time, but first review this check-list:

- Verify the power LED is ON. If not, check the power connections.
- Verify the PRG LED is OFF. If it is ON, review the instructions above.
- Make sure the motor is disconnected from any mechanical load.
- Make sure that you have a frequency reference checking the content of F001 and the Hz Led on operator
- Now give the RUN command from the selected source. The RUN LED will turn ON.
- The motor should start turning.
- Remove the RUN command or press the STOP key to stop the motor rotation.

3.6 Auto tuning (SLV Mode)

The MX2 inverter has auto-tuning function to get suitable motor control performance by measuring the motor constants automatically. Auto-tuning is effective only for sensorless vector control. Basically two modes are available the static and the rotative one:

- Static is less accurate but it could be used in situations where motor rotation could damage the mechanics. For this mode neither the I0 (no-load current) or the J (inertia) are calculated.
- Rotative auto-tuning moves the motor following a special operation pattern to find the motor characteristics. However, the torque during auto-tuning is not sufficient so is recommended to detach the mechanical system and don't use for example with vertical loads.

The Auto-tuning mode is selected by parameter H001 and after it finish succefully is necessary to to select the auto-tuning parameters by parameter H002.

Parameter	Parameter Name	Description
H001	Auto-tuning selection	00: Disable
		01: Enabled with motor stop
		02: Enabled with motor rotation
H002	Motor constant selection	00: Standard motor
		02: Auto tuned data

For a correct auto-tuning calculation please take into account following recommendations before starting:

- Use only a motor of the same size or one size lower than the inverter.
- Be sure to disable the DC braking setting (A051=00)
- Be sure to deactivate ATR digital input (52: Enable torque cmd. input)
- Motor rotates up to 80% of base frequency, check if it's a problem for the application.
- Motor should not be driven by any other external force.
- All the brakes should be released
- Be sure that physical limtis of the machine will not be reach
- Even for none-rotative auto-tuning there is a risk that motor moves slightly

After checking the above points and setting parameter H001 procced with the activation of the Run command from the source selected on A002 and the auto-tuning will start. Please check the diagram on next page for detailed information of all the steps.

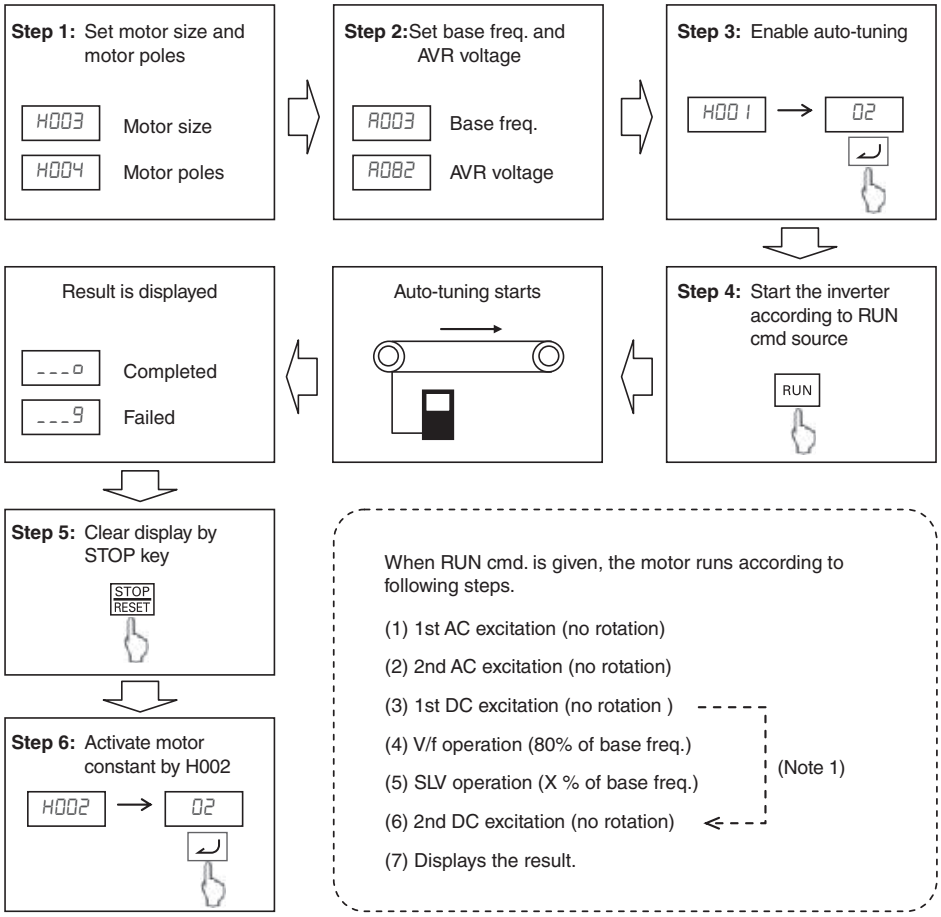
After the tuning the H001 returns to "00" status and the motor characteristics are transferred to those parameter, remember to set H002 to use them.

Parameter	Parameter Name	Description
H030	Motor constant R1	0.001 to 65.535 Ohms
H031	Motor constant R2	0.001 to 65.535 Ohms
H032	Motor constant L	0.01 to 655.35 mH
H033	Motor constant I0	0.01 to 655.35 A
H034	Motor constant J	0.001 to 9999 kgm2

Note: In case rotary tuning is not possible or autotuning results in very high No Load current (H033) (this is possible with small motors), please use this formula to calculate theoretical value:

H033 = Inom * sin (arccos(cos phi)).

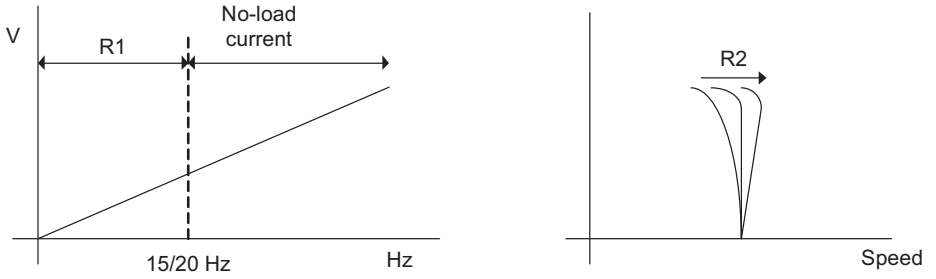
Next diagram shows the auto-tuning procedure with motor rotation



A fine tuning could be achived setting parameter H005 that adjust the motor speed response. If the motor vibrates at constant speed then you should reduce the H005 setting, if on the contrary the response of the motor is not enough you could increase the value.

The H005 acts as a global gain response but also is possible to adjust the motor response at certain areas adjusting the motor parameters separately.

- The R1 parameter is adjusting the voltage applied at low speed, below 15-20Hz
- No load current I0 is used for adjusting the voltage above this 15-20Hz
- Finally R2 value is used to adjust the slip of the motor

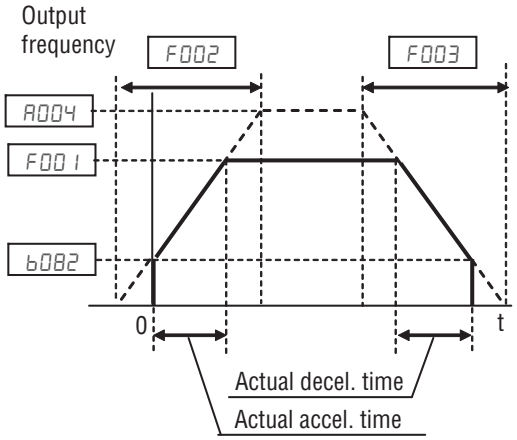


3.7 Ramps adjustment

The basic frequency (speed) profile is defined by parameters contained in the "F" Group as shown to the right. The set running frequency is in Hz, but acceleration and deceleration are specified in the time duration of the ramp (from zero to maximum frequency, or from maximum frequency to zero).

Acceleration 1 and Deceleration 1 are the standard default accel and decel values for the main profile. Accel and decel values for an alternative profile are specified by using parameters **A092** through **A093**.

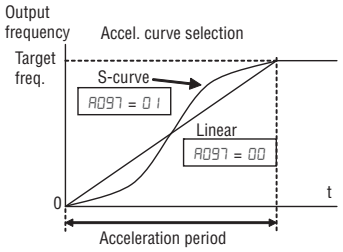
Acceleration and deceleration can be set via Drive programming as well via parameter P031



Parameter	Parameter Name	Description
A004	Maximum frequency	30.0 to 400.0Hz
b082	Start frequency	0.01 to 9.99Hz
F001	Output frequency setting	0.00 to 400.00Hz
F002	Acceleration time(1)	0.01 to 3600.00s
F003	Deceleration time(1)	0.01 to 3600.00s
P031	Accel/Decel setting source selection	00: Via operator
		01: Via Drive Programming

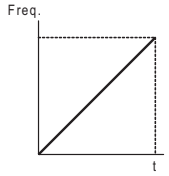
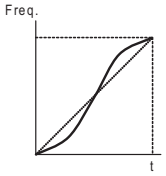
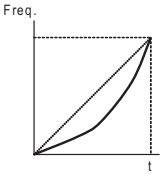
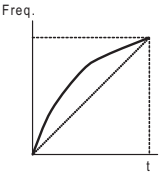
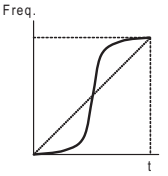
Standard acceleration and deceleration is linear. The inverter CPU can also calculate an S-curve acceleration or deceleration curve as shown. This profile is useful for favoring the load characteristics in particular applications. Even if the shape of the ramps change the time keeps being the same one set in F002/F003

Curve settings for acceleration and deceleration are indepenently selected. To enable the S-curve, use function **A097** (acceleration) and **A098** (deceleration).



Parameter	Parameter Name	Description
A097	Acceleration curve selection	00: Linear curve 01: S-curve 02: U-curve 03: Inverse U-curve 04: EL-S curve
A098	Deceleration curve selection	
A131	Acceleration curve constant	Range is 01 to 10.
A132	Deceleration curve constant	Range is 01 to 10.
A150	Curvature of EL-S-curve at the start of acceleration	Range is 0 to 50%
A151	Curvature of EL-S-curve at the end of acceleration	Range is 0 to 50%
A152	Curvature of EL-S-curve at the start of deceleration	Range is 0 to 50%
A153	Curvature of EL-S-curve at the end of deceleration	Range is 0 to 50%

This table shows the different acceleration shapes

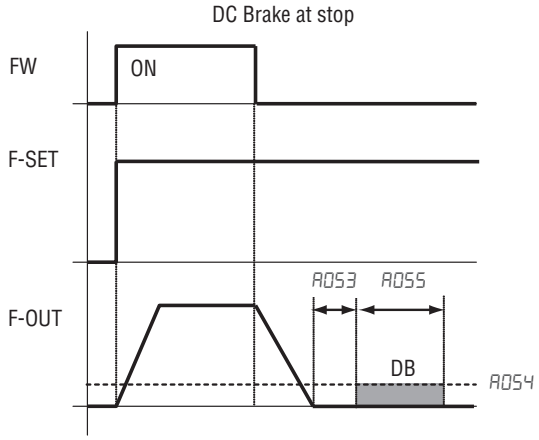
Setting	00	01	02	03	04
Curve	Linear	S-curve	U-curve	Inverse U-curve	EL S-curve
A097 (Accel. pattern) A098 (Decel. pattern)					

3.8 DC Braking

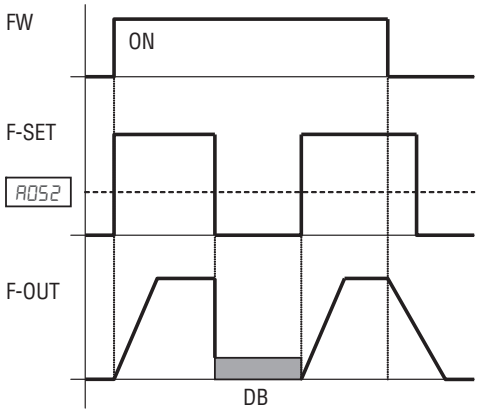
The DC braking feature can provide additional stopping torque during deceleration or before acceleration and is particulary useful at low speeds when normal deceleration torque is minimal. This function injects a DC voltage into the motor windings which generates a DC current that force the motor to stop.

There are several modes available depending on the application requirements:

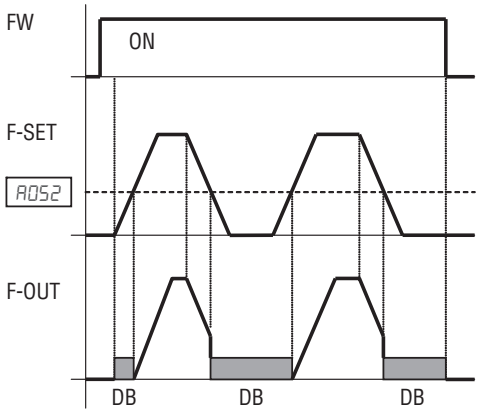
- Normal DC braking is used when A051 is set to "01" (Enable during stop) and the RUN command (FW/RV) is turned OFF, at the moment that deceleration stops the DC brake starts with a settable power (A054) and duration (A055). Additionally is possible to specify a wait time between the end of the ramp and the DC braking on parameter A053, during which the motor will free run. If free-run is selected as stopping method the DC braking will start just when the Run commands turns OFF.



- DC braking by frequency detection can be selected setting a051 to "02" (Frequency detection). In this case DC braking operates when the output frequency comes down to the one you specified in A052 while the RUN command is still active. External DB and internal DC braking are invalid during the frequency detection mode.

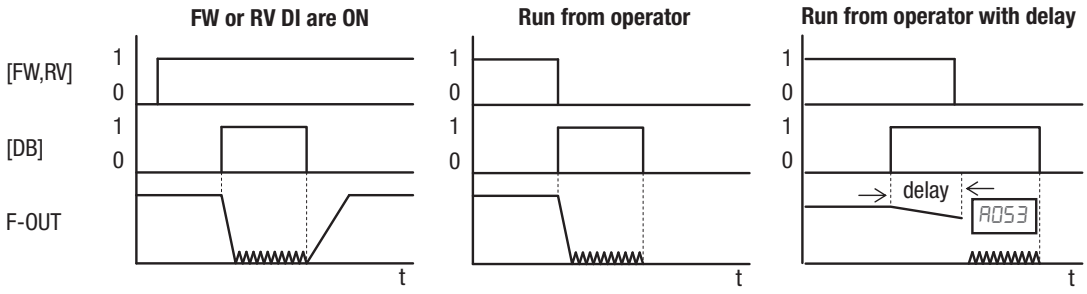


Eample 1: Step change in F-SET



Example 2: Analog change in F-SET

- Last option is to trigger the DC injection by a digital input when the terminal (DB) is turned ON. Set parameters A053 and A054 to setup this function. There are several cases depending on the motor rotation and Run command status.



DC braking at startup is also possible by independent setup of parameters A057 and A058. This is useful in aplications were load should be totally stopped before starting the movement.

Parameter	Parameter Name	Description
A051	DC braking enable	Three options; select codes: 00... Disable 01... Enable during stop 02... Frequency detection
A052	DC braking frequency	The frequency at which DC braking begins, range is from the start frequency (B082) to 60Hz
A053	DC braking wait time	The delay from the end of controlled deceleration to start of DC braking (motor free runs until DC braking begins), range is 0.0 to 5.0 sec.
A054	DC braking force for deceleration	Level of DC braking force, settable from 0 to 100%
A055	DC braking time for deceleration	Sets the duration for DC braking, range is from 0.0 to 60.0 seconds
A056	DC braking / edge or level detection for [DB] input	Two options; select codes: 00... Edge detection 01... Level detection
A057	DC braking force at start	Level of DC braking force at start, settable from 0 to 100%
A058	DC braking time at start	Sets the duration for DC braking, range is from 0.0 to 60.0 seconds
A059	Carrier frequency during DC braking	Carrier frequency of DC braking performance, range is from 2.0 to 15.0 kHz

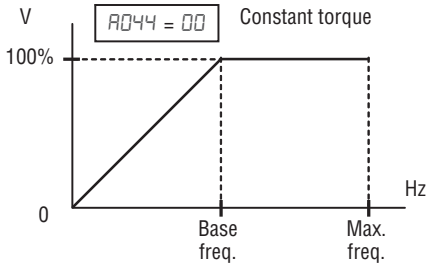
Be careful to avoid specifying to long braking time or to hihg carrier frequency that can cause motor overheating. If you use DC braking is recommended to use motors with a built-in thermistor and wire it to inverter's thermistor input.

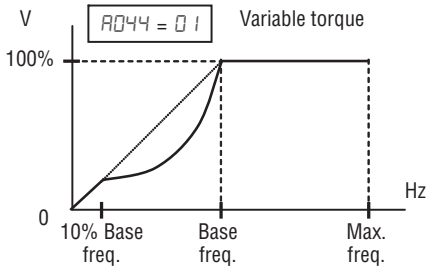
3.9 V/F Curve

The inverter generates the motor output according to the V/f algorithm selected on parameter A044. The factory default is Constant torque ("00"). Review the following description to help you choose the best torque control algorithm for your application.

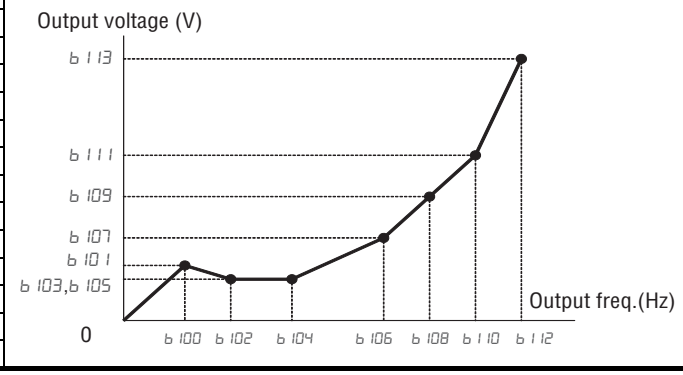
Review following description to help you choose the best torque control algorithm for your application:.

- **Constant and Variable (Reduced) Torque** - The graph at right shows the constant torque characteristic from 0 Hz to the base frequency **A003**. The voltage remains constant for output frequencies higher than the base frequency.
- **Variable torque** - The graph at right shows the variable (reduced) torque curve, which has a constant torque characteristic from 0 Hz to 10% of the base frequency. This helps to achieve higher torque at low speed with reduced torque curve at higher speeds.
- **Sensorless Vector Control** - You can achieve high torque performance (200% torque at 0.5 Hz of output frequency) without motor speed feedback but a god tuning of the motor is necessary to do it. Please remember to perform auto-tuning for this control method. (A044="3")
- **Free V/F Control** - The free V/F setting function allows you to set an arbitrary V/F characteristics by specifying the voltages and frequencies (**b100**~**b113**) for seven points on the V/F characteristic curve (A044="2")





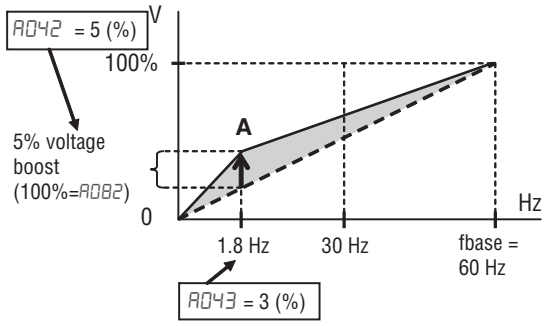
This table shows the details about the Free V/F control

Parameter	Parameter Name	Diagram	Range
b100	Free-setting V/F freq(1)		0 to b102(Hz)
b101	Free-setting V/F volt (1)		0.0 to 800.0(V)
b102	Free-setting V/F freq(2)		b100 to b104(Hz)
b103	Free-setting V/F volt (2)		0.0 to 800.0(V)
b104	Free-setting V/F freq(3)		b102 to b106(Hz)
b105	Free-setting V/F volt (3)		0.0 to 800.0(V)
b106	Free-setting V/F freq(4)		b104 to b108(Hz)
b107	Free-setting V/F volt (4)		0.0 to 800.0(V)
b108	Free-setting V/F freq(5)		b106 to b110(Hz)
b109	Free-setting V/F volt (5)		0.0 to 800.0(V)
b110	Free-setting V/F freq(6)		b108 to b112(Hz)
b111	Free-setting V/F volt (6)		0.0 to 800.0(V)
b112	Free-setting V/F freq(7)		0 to 400.0(Hz)
b113	Free-setting V/F volt (7)		0.0 to 800.0(V)

3.10 Torque boost function

Manual torque boost - Constant and Vairable torque algorithms feature and asjustable torque boost curve that could help during the startup of load with very big inertia or friction. On those cases it may be necessary to increase the low frequency starting torque characteristic by boosting the voltage above the normal V/F ratio. Basically it attempsts to compensate for voltage drop in the motor primary winding in the low speed range.

Be aware that running the motor at a low speed for a long time can cause motor overheating and this is particularly true when manual torque boost is activated and motor doesn't have force ventilation.

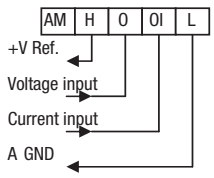


Automatic torque boost- Use the voltage compensation (A046) and slip compensation (A047) to obtain a better performance under automatic torque boost mode (A041=01) ajusting the output frequency and output voltage automatically depending on the load. The output voltage due automatic boost is added to the manual torque boost voltage so both should be adjusted.

Parameter	Parameter Name	Description
A041	Torque boost select	Two options: 00... Manual torque boost 01... Automatic torque boost
A042	Manual torque boost value	Can boost starting torque between 0 and 20% above normal V/f curve, range is 0.0 to 20.0%
A043	Manual torque boost frequency	Sets the frequency of the V/f breakpoint for torque boost, range is 0.0 to 50.0%
A044	V/f characteristic curve	00... Constant torque 01... Reduced torque (1.7) 02... Free V/F 03... Sensorless vector (SLV)
A045	V/f gain	Sets voltage gain of the inverter, range is 20. to 100.%
A046	Voltage compensation gain for automatic torque boost	Sets voltage compensation gain under automatic torque boost, range is 0. to 255.
A047	Slip compensation gain for automatic torque boost	Sets slip compensation gain under automatic torque boost, range is 0. to 255.

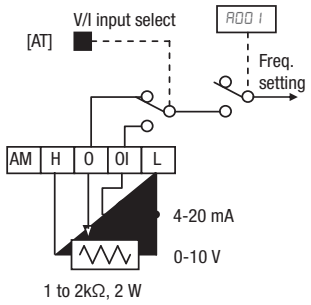
3.11 Analog inputs

MX2 provides two analog inputs, the input terminal group includes the [L], [OI], [O], and [H] terminals on the control connector, which provide for Voltage [O] or Current [OI] input. All analog input signals must use the analog ground [L].



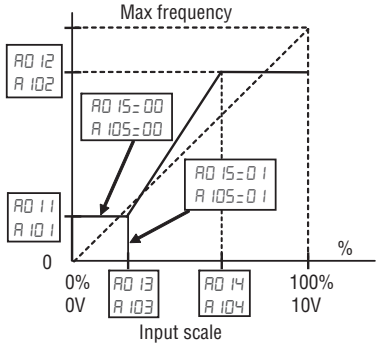
If you use either the voltage or current analog input, you must select one of them using the logic input terminal function [AT] analog type. Refer to next table for details about the combinations between A005 and [AT] terminal. Remember that you must also set A001=01 to select analog input as the frequency source.

If [AT] function is not assigned to any digital input the inverter recognizes the [AT] as OFF and [O]+[OI] will be used as analog input. In case either (O) or (OI) is to be referred, please ground the other.



A005	[AT] Input	Analog Input Configuration
00	ON	[O]
	OFF	[OI]
02	ON	[O]
	OFF	Integrated POT on external panel
03	ON	[OI]
	OFF	Integrated POT on external panel

For [O] input and using parameters A013 and A014 you could select the portion of the voltage input range. Parameters A011 and A012 select the start and end frequency of the converted output frequency range, respectively. When the line does not begin at the origin (A011 and A013 > 0), then A015 defines whether the inverter outputs 0 Hz or the A011 specified frequency for analog input below A013.



Parameter	Parameter name	Description
A011	[O] start frequency	0.00 to 400.00
A012	[O] end frequency	0.00 to 400.00
A013	[O] start voltage	0. to 100%
A014	[O] end voltage	0. to 100%
A015	[O] start frequency enable	00... Use offset (A011 value) 01.. Use 0Hz
A101	[OI] start frequency	0.00 to 400.00
A102	[OI] end frequency	0.00 to 400.00
A103	[OI] start voltage	0. to 100%
A104	[OI] end voltage	0. to 100%
A105	[OI] start frequency enable	00... Use offset (A101 value) 01.. Use 0Hz
A016	Analog input filter	Range n = 1 to 31, 1 to 30 : ×2ms filter 31: 500ms fixed filter with ±0.1kHz hys.

3.12 Digital inputs

The function codes in the following table let you assign between a wide range of functions to any of the seven logic inputs for the MX2 inverter. The functions C001 through C007 configure the terminals [1] through [7] respectively. The "value" of these particular parameters is not a scalar value, but it is a discrete number that selects one option from many available options.

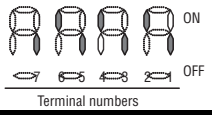
Input Function Summary Table

Option Code	Terminal Symbol	Function Name	Description	
00	FW	FORWARD Run/Stop	ON	Inverter is in Run Mode, motor runs forward
			OFF	Inverter is in Stop Mode, motor stops
01	RV	Reverse Run/Stop	ON	Inverter is in Run Mode, motor runs reverse
			OFF	Inverter is in Stop Mode, motor stops
02	CF1	Multi-speed Select, Bit 0 (LSB)	ON	Binary encoded speed selection bit 3 to bit 0
03	CF2	Multi-speed Select, Bit 1		
04	CF3	Multi-speed Select, Bit 2	OFF	
05	CF4	Multi-speed Select, Bit 3 (MSB)		
06	JG	Jogging	ON	Inverter is in Run Mode, output to motor runs at jog parameter frequency
07	DB	External DC braking	ON	DC braking will be applied during deceleration
08	SET	Set (select) 2nd motor Data	ON	The inverter uses 2nd motor parameters for generating frequency output to motor
			OFF	The inverter uses 1st (main) motor parameters for generating frequency output to motor
09	2CH	2-stage Acceleration and Deceleration	ON	Frequency output uses 2nd-stage acceleration and deceleration values
			OFF	Frequency output uses standard acceleration and deceleration values
11	FRS	Free-run Stop	ON	Causes output to turn OFF, allowing motor to free run (coast) to stop
12	EXT	External Trip	ON	When assigned input transitions OFF to ON, inverter latches trip event and displays E 12
			OFF	No trip event for ON to OFF, any recorded trip events remain in history until reset
13	USP	Unattended Start Protection	ON	On powerup, the inverter will not resume a Run command
			OFF	On powerup, the inverter will resume a Run command that was active before power loss
14	CS	Commercial power source switchover	ON	Motor can be driven by commercial power
			OFF	Motor is driven via the inverter
15	SFT	Software Lock	ON	The keypad and remote programming devices are prevented from changing parameters
			OFF	The parameters may be edited and stored
16	AT	Analog Input Voltage/Current Select	ON	Refer to Analog In put selection
			OFF	
18	RS	Reset Inverter	ON	The trip condition is reset, the motor output is turned OFF, and powerup reset is asserted
			OFF	Normal power-ON operation
19	PTC	PTC thermistor Thermal Protection (C005 only)	ANLG	When a thermistor is connected to terminal [5] and [L], the inverter checks for over-temperature and will cause trip event and turn OFF output to motor
			OPEN	A disconnect of the thermistor causes a trip event, and the inverter turns OFF the motor
20	STA	Start (3-wire interface)	ON	Starts the motor rotation
21	STP	Stop (3-wire interface)	ON	Stops the motor rotation
22	F/R	FWD, REV (3-wire interface)	ON	Selects the direction of motor rotation: ON = FWD. While the motor is rotating, a change of F/R will start a deceleration, followed by a change in direction
			OFF	Selects the direction of motor rotation: OFF = REV. While the motor is rotating, a change of F/R will start a deceleration, followed by a change in direction
23	PID	PID Disable	ON	Temporarily disables PID loop control. Inverter output turns OFF as long as PID Enable is active (A071=01)
			OFF	Has no effect on PID loop operation, operates normally if PID Enable is active (A071=01)
24	PIDC	PID Reset	ON	Resets the PID loop controller. Main consequence is that integrator sum is forced to zero
27	UP	Remote Control UP Function (motorized speed pot.)	ON	Accelerates (increases output frequency) motor from current frequency
28	DWN	Remote Control Down Function (motorized speed pot.)	ON	Decelerates (decreases output frequency) motor from current frequency
29	UDC	Remote Control Data Clearing	ON	Clears the UP/DWN frequency memory by forcing it to equal the set frequency parameter F001. Setting C101 must be set=00 to enable this function to work
31	OPE	Operator Control	ON	Forces the source of the output frequency setting A001 and the source of the Run command A002 to be from the digital operator
			OFF	Source of output frequency set by A001 and source of Run command set by A002 is used
32	SF1	Multi-speed Select, Bit 1	ON	Bit encoded speed select, Bit 1 to Bit 7
33	SF2	Multi-speed Select, Bit 2		
34	SF3	Multi-speed Select, Bit 3		
35	SF4	Multi-speed Select, Bit 4	OFF	
36	SF5	Multi-speed Select, Bit 5		
37	SF6	Multi-speed Select, Bit 6		
38	SF7	Multi-speed Select, Bit 7		
39	OLR	Overload Restriction Source Changeover	ON	Perform overload restriction
			OFF	Normal operation

Input Function Summary Table				
Option Code	Terminal Symbol	Function Name	Description	
40	TL	Torque Limit Selection	ON	Setting of b040 is enabled
			OFF	Max. torque is limited with 200%
41	TRQ1	Torque limit switch 1	ON	Torque limit related parameters of Powering/regen, and FW/RV modes are selected by the combinations of these inputs.
42	TRQ2	Torque limit switch 2	OFF	
44	BOK	Brake confirmation	ON	Brake confirmation signal received
			OFF	Brake confirmation signal not received
46	LAC	LAD cancellation	ON	Set ramp times are ignored. Inverter output immediately follows the freq. command.
			OFF	Accel. and/or decel. is according to the set ramp time
47	PCLR	Pulse counter clear	ON	Clear the position deviation data
			OFF	Maintain the position deviation data
50	ADD	ADD frequency enable	ON	Adds the A145 (add frequency) value to the output frequency
			OFF	Does not add the A145 value to the output frequency
51	F-TM	Force Terminal Mode	ON	Force inverter to use input terminals for output frequency and Run command sources
			OFF	Source of output frequency set by A001 and source of Run command set by A002 is used
52	ATR	Enable torque command input	ON	Torque control command input is enabled
			OFF	Torque control command input is disabled
53	KHC	Clear watt-hour data	ON	Clear watt-hour data
56	MI1	General purpose input (1)	ON	General purpose input (1) to (7) under Drive programming
57	MI2	General purpose input (2)		
58	MI3	General purpose input (3)		
59	MI4	General purpose input (4)	OFF	
60	MI5	General purpose input (5)		
61	MI6	General purpose input (6)		
62	MI7	General purpose input (7)		
65	AHD	Analog command hold	ON	Analog command is held
			OFF	Analog command is not held
66	CP1	Multistage-position switch (1)	ON	Multistage position commands are set according to the combination of these switches.
67	CP2	Multistage-position switch (2)	OFF	
68	CP3	Multistage-position switch (3)		
69	ORL	Limit signal of homing	ON	Limit signal of homing is ON
70	ORG	Trigger signal of homing	ON	Starts homing operation
73	SPD	Speed/position changeover	ON	Speed control mode
			OFF	Position control mode
77	GS1 *	GS1 input	ON	EN60204-1 related signals: Signal input of "Safe torque off" function.
78	GS2 *	GS2 input	OFF	
81	485	Start EzCOM	ON	Starts EzCOM
			OFF	No execution
82	PRG	Executing Drive programming	ON	Executing Drive program
			OFF	No execution
83	HLD	Retain output frequency	ON	Retain the current output frequency
84	ROK	Permission of Run command	ON	Run command permitted
85	EB	Rotation direction detection (C007 only)	ON	Forward rotation
			OFF	Reverse rotation
86	DISP	Display limitation	ON	Only a parameter configured in b038 is shown
			OFF	All the monitors can be shown
255	no	No function	ON	(input ignored)

All this functions could be assigned to any of the multi-function inputs on parameters C001 to C007, select if the input will be normally open or normally close and the response time of the input.

Parameter	Parameter name	Description
C001	Input [1] function	Select input terminal [1] function
C002	Input [2] function	Select input terminal [2] function
C003	Input [3] function [GS1 assignable]	Select input terminal [3] function
C004	Input [4] function [GS2 assignable]	Select input terminal [4] function
C005	Input [5] function [PTC assignable]	Select input terminal [5] function
C006	Input [6] function	Select input terminal [6] function
C007	Input [7] function	Select input terminal [7] function

Parameter	Parameter name	Description
C011	Input [1] active state	Select logic conversion, two option codes: 00... normally open [NO] 01... normally closed [NC]
C012	Input [2] active state	
C013	Input [3] active state	
C014	Input [4] active state	
C015	Input [5] active state	
C016	Input [6] active state	
C017	Input [7] active state	
C160	Input [1] response time	Sets response time of each input terminal, set range: 0 (x 2 [ms]) to 200 (x 2 [ms])
C161	Input [2] response time	
C162	Input [3] response time	
C163	Input [4] response time	
C164	Input [5] response time	
C165	Input [6] response time	
C166	Input [7] response time	
d005	Intelligent input terminal status	

An input terminal configured for option code 18 ([RS] Reset command) cannot be configured for normally closed operation.

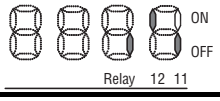
3.13 Digital outputs

Function codes in the following table let you assign different options into logical outputs (terminals [11],[12] and [AL]) on parameter C021, C022 and C026..

Input Function Summary Table				
Option Code	Terminal Symbol	Function Name	Description	
00	RUN	Run Signal	ON	When the inverter is in Run Mode
01	FA1	Frequency Arrival Type 1-Constant Speed	ON	When output to motor is at the set frequency
			OFF	When output to motor is OFF, or in any acceleration or deceleration ramp
02	FA2	Frequency Arrival Type 2-Over frequency	ON	When output to motor is at or above the set freq., even if in accel (C042) or decel (C043) ramps
			OFF	When output to motor is OFF, or at a level below the set frequency
03	OL	Overload Advance Notice Signal 1	ON	When output current is more than the set threshold (C041) for the overload signal
04	OD	Output Deviation for PID Control	ON	When PID error is more than the set threshold for the deviation signal
05	AL	Alarm Signal	ON	When an alarm signal has occurred and has not been cleared
06	FA3	Frequency Arrival Type 3-Set frequency	ON	When output to motor is at the set frequency, during accel (C042) and decel (C043).
07	OTQ	Over/under Torque Signal	ON	Estimated motor torque exceeds the specified level
09	UV	Undervoltage	ON	Inverter is in Undervoltage
10	TRQ	Torque Limited Signal	ON	Torque limit function is executing
11	RNT	Run Time Expired	ON	Total running time of the inverter exceeds the specified value
12	ONT	Power ON time Expired	ON	Total power ON time of the inverter exceeds the specified value
13	THM	Thermal Warning	ON	Accumulated thermal count exceeds the C061 set value
19	BRK	Brake Release Signal	ON	Output for brake release
20	BER	Brake Error Signal	ON	Brake error has occurred
21	ZS	Zero Hz Speed Signal	ON	Output frequency falls below the threshold specified in C063
22	DSE	Speed Deviation Excessive	ON	Deviation of speed command and actual speed exceeds the specified value P027.
23	POK	Positioning Completion	ON	Positioning is completed
24	FA4	Frequency Arrival Type 4-Over frequency	ON	When output to motor is at or above the set freq., even if in accel (C045) or decel (C046) ramps
25	FA5	Frequency Arrival Type 5-Set frequency	ON	When output to motor is at the set frequency, during accel (C045) and decel (C046).
26	OL2	Overload Advance Notice Signal 2	ON	When output current is more than the set threshold (C111) for the overload signal
27	ODc	Analog Voltage Input Disconnect Detection	ON	When the [O] input value < B070 setting (signal loss detected)
28	OIDc	Analog Current input Disconnect Detection	ON	When the [OI] input value < B071 setting (signal loss detected)

Input Function Summary Table				
Option Code	Terminal Symbol	Function Name	Description	
31	FBV	PID Second Stage Output	ON	Transitions to ON when the inverter is in RUN Mode and the PID Process Variable (PV) is less than the Feedback Low Limit (C053)
			OFF	Transitions to OFF when the PID Process Variable (PV) exceeds the PID High Limit (C052), and transitions to OFF when the inverter goes from Run Mode to Stop Mode
32	NDc	Network Disconnect Detect	ON	When communications watchdog timer (period specified by C077) has time out
33	LOG1	Logic Output Function 1	ON	When the Boolean operation specified by C143 has a logical "1" result
34	LOG2	Logic Output Function 2	ON	When the Boolean operation specified by C146 has a logical "1" result
35	LOG3	Logic Output Function 3	ON	When the Boolean operation specified by C149 has a logical "1" result
39	WAC	Capacitor Life Warning Signal	ON	Lifetime of internal capacitor has expired.
40	WAF	Cooling Fan Warning Signal	ON	Lifetime of cooling fan has expired.
41	FR	Starting Contact Signal	ON	Either FW or RV command is given to the inverter
			OFF	No FW or RV command is given to the inverter, or both are given to the inverter
42	OHF	Heat Sink Overheat Warning	ON	Temperature of the heat sink exceeds a specified value (C064)
43	LOC	Low load detection	ON	Motor current is less than the specified value (C039)
44	MO1	General Output 1	ON	General output 1 is ON (Used by Drive programing)
45	MO2	General Output 2	ON	General output 2 is ON (Used by Drive programing)
46	MO3	General Output 3	ON	General output 3 is ON (Used by Drive programing)
50	IRDY	Inverter Ready Signal	ON	Inverter can receive a run command
51	FWR	Forward Rotation	ON	Inverter is driving the motor in forward direction
52	RVR	Reverse Rotation	ON	Inverter is driving the motor in reverse direction
53	MJA	Major Failure Signal	ON	Inverter is tripping with major failure
54	WCO	Window Comparator for Analog Voltage Input	ON	Analog voltage input value is inside of the window comparator
55	WCOI	Window Comparator for Analog Current Input	ON	Analog current input value is inside of the window comparator
58	FREF	Frequency Command Source	ON	Frequency command is given from the operator
59	REF	Run Command Source	ON	Run command is given from the operator
60	SETM	2nd motor Selection	ON	2nd motor is being selected
62	EDM	STO (Safe Torque Off) Performance Monitor (Output terminal 11 only)	ON	STO is being performed
63	OPO	Option card output	ON	(output terminal for option card)
255	no	Not used	ON	–

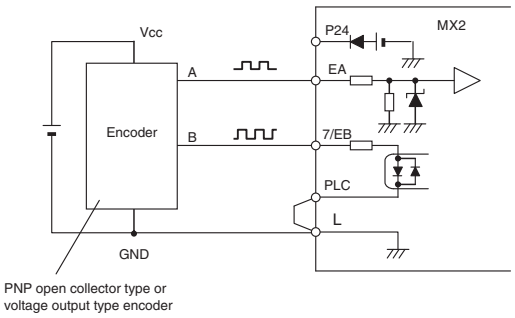
In the same way of that the digital inputs is possible to choose between normally close and normally open and even is possible to use some On and Off delay for each of the outputs.

Parameter	Parameter name	Description
C021	Output [11] function [EDM assignable]	Programmable functions available for logic (discrete) outputs transistor type
C022	Output [12] function	
C026	Alarm relay function	Programmable functions available for logic (discrete) outputs relay type
C031	Output [11] active state	Select logic conversion, two option codes: 00... normally open [NO] 01... normally closed [NC]
C032	Output [12] active state	
C036	Alarm relay active state	
C130	Output [11] on delay	Set range is 0.0 to 100.0 sec.
C131	Output [11] off delay	
C132	Output [12] on delay	Set range is 0.0 to 100.0 sec.
C133	Output [12] off delay	
C140	Relay output on delay	Set range is 0.0 to 100.0 sec.
C141	Relay output off delay	
C132	Output [12] on delay	Set range is 0.0 to 100.0 sec.
C133	Output [12] off delay	
d006	Intelligent output terminal status	

3.14 Pulse input

Pulse train input in terminal EA could be used as frequency reference, PID input, encoder feedback for position control and also as an input for Drive Programming. The maximum frequency for this pulse input is 32KHz and the selection is done by parameter P003.

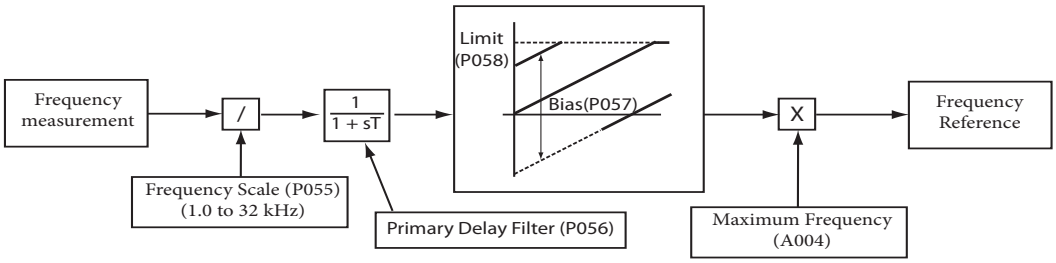
Encoder feedback setting is set in parameter P004, but please remember that this is just for positioning function and close loop vector control can't be performed with MX2 because this encoder reading is not included into the speed loop. For selection "01" and "02" on P004 is possible to use a 2-phase differential encoder but the second channel should be connect to multi-funciton input 7 with the function code "EB".



.

Parameter	Parameter name	Description
P003	[EA] terminal selection	00… Speed reference (incl. PID) 01… For control with encoder feedback 02… Extended terminal for EzSQ
P004	Pulse train input mode selection for feedback	Four option codes: 00…Single-phase pulse [EA] 01…2-phase pulse (90° difference) 1 ([EA] and [EB]) 02…2-phase pulse (90° difference) 2 ([EA] and [EB]) 03…Single-phase pulse [EA] and direction signal [EB]
P011	Encoder pulse setting	Sets the pulse number (ppr) of the encoder, set range is 32~1024 pulses
P055	Pulse train input frequency scale setting	Sets the pulse numbers at max. frequency, set range is 1.0~32.0 kHz
P056	Pulse train input frequency filter time constant setting	Set range is 0.01~2.00 sec.
P057	Pulse train input bias setting	Set range is -100~100 %
P058	Limitation of the pulse train input setting	Set range is 0~100 %

The pulse input when used as frequency reference could be adjusted with parameters P055 to P058 according to this diagram



3.15 Analogue and pulse outputs

Several monitors are available through the pulse output [EO] or the analogue output [AM].

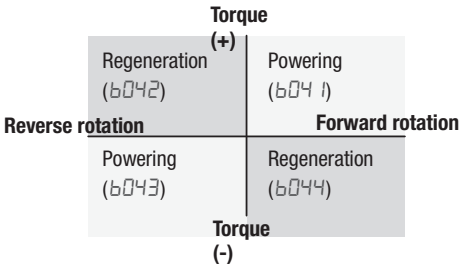
Parameter	Parameter name	Description
C027	[EO] terminal selection (Pulse/PWM output)	00... Output frequency (PWM) 01... Output current (PWM) 02... Output torque (PWM) 03... Output frequency (Pulse train) 04... Output voltage (PWM) 05... Input power (PWM) 06... Electronic thermal load ratio (PWM) 07... LAD frequency (PWM) 08... Output current (Pulse train) 10... Heat sink temperature (PWM) 12... General output (PWM) 15... Pulse train input monitor 16... Option(PWM)
C028	[AM] terminal selection (Analog voltage output 0...10V)	00... Output frequency 01... Output current 02... Output torque 04... Output voltage 05... Input power 06... Electronic thermal load ratio 07... LAD frequency 10... Heat sink temperature 11... Output torque (with code) 13... General output 16... Option
C030	Digital current monitor reference value	Current with digital current monitor output at 1,440Hz Range is 20%~200% of rated current
C047	Pulse train input/output scale conversion	If EO terminal is configured as pulse train input (C027=15), scale conversion is set in C047. Pulse-out = Pulse-in (C047) Set range is 0.01 to 99.99

For the pulse train output there are two types of outputs, code “03”, “08” and “15” outputs a pulse train with a 50% duty cycle while the PWM has a fixed frequency of 156.25Hz were the duty cycle is changed depending on the output.

3.16 Torque limit

Torque limit function allows you to limit the motor output when sensorless vector control (SLV) is selected in A044. This function has limited accuracy and repeatability and is realiable only above 15 - 20Hz. You can choose between models using parameter b040.

Quadrant specific setting mode (b040=00) in which individual torque limit value are applied on the four quadrants (forward powering, reverse regeneration..) by torque limits 1 to 4 (b041 to b044)



Digital inputs TRQ2	TRQ1	Torque limit selection
OFF	OFF	→ b041
OFF	ON	→ b042
ON	OFF	→ b043
ON	ON	→ b044

Terminal-switching mode (b040=01) where the torque limit values set in torque limits 1 to 4 (b041 to b044) are switched depending on the combination of the states of the torque limit switch terminals 1 and 2 (TRQ1 and TRQ2) assigned to digital inputs.

Analog voltage input mode (b040=02) where the torque limit value is set by a voltage applied to the terminal O. Range 0 to 10V corresponds with torque limit range between 0 and 200% that is valid for all operating states.

If “TL” torque limit enable functions has been assigned to any of the multi-function inputs the setting of parameter b040 only is valid when this input is ON. No torque limitation will be applied whe the input is OFF.

Parameter	Parameter name	Description
b040	Torque limit selection	00 Quadrant-specific setting mode 01 Terminal-switching mode 02 Analog voltage input mode(O)
b041	Torque limit 1 (fwd/power)	Torque limit level in forward powering quadrant, range is 0 to 200% / no(disabled)

Parameter	Parameter name	Description
b022	Torque limit 2 (rev/regen.)	Torque limit level in reverse regen. quadrant, range is 0 to 200% / no(disabled)
b043	Torque limit 3 (rev/power)	Torque limit level in reverse powering quadrant, range is 0 to 200% / no(disabled)
b044	Torque limit 4 (fwd/regen.)	Torque limit level in forward regen. quadrant, range is 0 to 200% / no(disabled)
b045	Torque LAD STOP selection	00 Disable 01 Enable

100% torque is referred to inverter rated current, absolute torque value is up the motor to be combined.

3.17 Torque control

Torque control in open loop could be achieve with following parameters. 100% torque is referred to inverter rated current but absolute torque value depends on the motor connected. It has limited accuracy and working range so is recomended only above 15 - 20Hz and over 20 - 30% of the motor torque capacity.

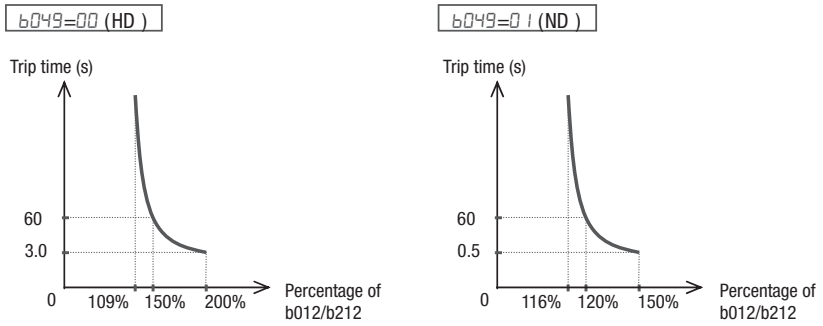
Parameter	Parameter name	Description
P033	Torque command input selection	00… Analog voltage input [O] 01… Analog current input [OI] 03… Operator, 06…Option
P034	Torque command level input	Set range is 0~200%
P036	Torque bias mode selection	00… According to the sign 01… According to the rotation direction 05… Option
P037	Torque bias value setting	Range is -200~200%
P038	Torque bias polar selection	00… No bias 01… Operator
P039	Speed limit of Torque control (Forward rotation)	Set range is 0.00~120.00Hz
P040	Speed limit of Torque control (Reverse rotation)	Set range is 0.00~120.00Hz
P041	Speed / Torque control switching time	Set range is 0 to 1000 ms

To enable the torque control is necessary to assign the "ATR" (Enable torque command input) to one of the multi-function inputs and set it to ON. When the input is OFF the inverter will work in speed mode.

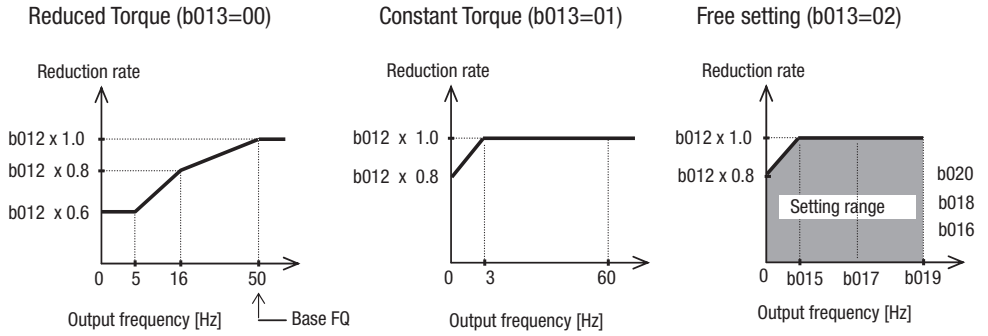
At low speed, small torque command or 4 quadrant control applications the perfomance of this function will be limited due the open loop system.

3.18 Electronic thermal overload

The thermal overload detection protects the inverter and motor from overheating due to an excessive load using a current inverse time curve to determine the trip point. The characteristic curve depends on dual rate setting in b049 and is unique for both inverter and motor but reduction rate depending on the frequency could be selected in parameter b013.



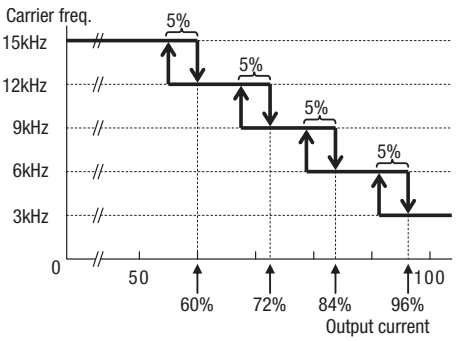
b013 could be used to match the torque characteristic with the load. Output current on the winding is used for this calculation as is proportional to the torque generated by the motor. That's why the current level has to be set in parameter b012 with a range that goes from 20 to 100% of the inverter rated current.



Parameter	Parameter name	Description
b012	Level of electronic thermal	Set a level between 20% and 100% for the rated inverter current.
b013	Electronic thermal characteristic	Select from three curves, option codes: 00... Reduced torque 01... Constant torque 02... Free setting
b015	Free setting electronic thermal ~freq.1	Range is 0 to 400 Hz
b016	Free setting electronic thermal ~current1	Range is 0 to inverter rated current Amps
b017	Free setting electronic thermal ~freq.2	Range is 0 to 400 Hz
b018	Free setting electronic thermal ~current2	Range is 0 to inverter rated current Amps
b019	Free setting electronic thermal ~freq.3	Range is 0 to 400 Hz
b020	Free setting electronic thermal ~current3	Range is 0 to inverter rated current Amps

3.19 Carrier frequency (PWM)

The internal switching frequency of the inverter circuitry (also called chopper frequency) defines the IGBT communtation speed that is used to generated the output frequency. Is adjustable from 2.0 to 15KHz (depending on the inverter size) where the audible noise decrease at higher frequencies while the RFI noise and leakage current increase.

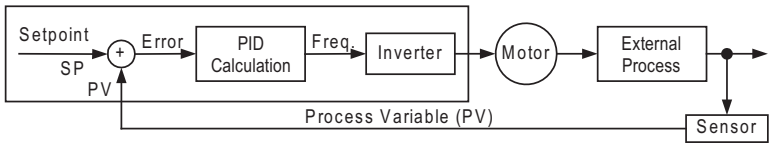


The carrier frequency is adjusted by parameter b083 but the activation of the aumatic carrier frequency reduction on parameter b089 could reduce the selected value when the output current increase or when the heat sink temperature is too high. On this way is possible to have a high carrier frequency with light loads and avoid the derating when the load increase. The upper limit is defined by b083 while the lower one is 3KHz with 2KHz per second reduction rate.

Parameter	Parameter name	Description
b083	Carrier frequency	Sets the PWM carrier (internal switching frequency), range is 2.0 to 15.0 kHz
b089	Automatic carrier frequency reduction	Three option codes: 00 Disabled 01 Enabled, depending on the output current 02 Enabled, depending on the heat-sink temperature

3.20 PID Function

When enabled, the built-in PID loop calculates an ideal inverter output value that cause the loop feedback process variable (PV) to move closer to the set point value (SP). The frequency command is used as SP and the PID loop algorithm will read the analog input for the process variable and calculate the proper inverter output to reach it.



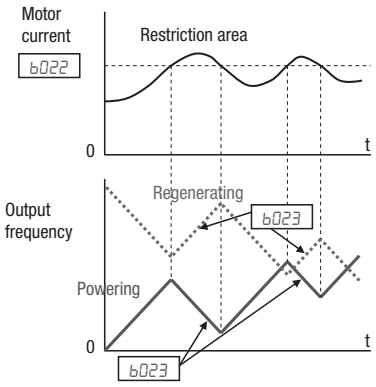
In standard operation, inverter uses a reference source selected by A001 for the output frequency which may be a fixed or variable value. To enable PID operation is necessary to set A071 to "01" and this will cause the inverter to calculate the target frequiency or set point. This presents some advantges like potential energy saving and direct control over the process variable instead of the motor speed.

Parameter	Parameter name	Description
A071	PID enable	00... PID Disable 01... PID Enable 02... PID Enable with reverse output
A072	PID proportional gain	Proportional gain has a range of 0.00 to 25.00
A073	PID integral time constant	Integral time constant has a range of 0.0 to 3600 seconds
A074	PID derivative time constant	Derivative time constant has a range of 0.0 to 100 seconds
A075	PV scale conversion	Process Variable (PV), scale factor (multiplier), range of 0.01 to 99.99
A076	PV source	Selects source of Process Variable (PV), option codes: 00.. [OI] terminal (current in) 01.. [O] terminal (voltage in) 02 .. ModBus network 03.. Pulse train input 10 Calculate function output
A077	Reverse PID action	Two option codes: 00 PID input = SP-PV 01 PID input = -(SP-PV)
A078	PID output limit	Sets the limit of PID output as percent of full scale, range is 0.0 to 100.0%
A079	PID feed forward selection	00... Disabled 01... [O] terminal (voltage in) 02... [OI] terminal (current in)
A156	PID sleep function action threshold	Sets the threshold for the action, set range 0.0~400.0 Hz
A157	PID sleep function action delay time	Sets the delay time for the action, set range 0.0~25.5 sec
A071	PID enable	00... PID Disable 01... PID Enable 02... PID Enable with reverse output

3.21 Current limitation functions

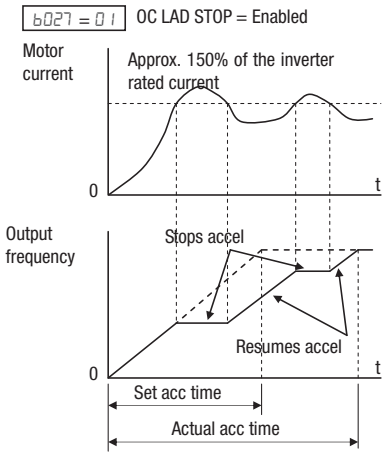
Overload Restriction reduce the output frequency while motoring or increase it during regeneration to restrict the overload when the output current exceeds a certain limit. You can adjust the inverter to apply overload retriction only during constant speed allowing higher currents for acceleration.

Additionally two separate set of parameters are avaiable and is possible to choose between them by intelligent input terminal "39: OLR".



Over-current Trip Suppression function monitors the motor current and actively changes the output frequency profile to keep the motor current below 150% of the motor rated current. Basically the acceleration ramp is at stopped above this current and it only restarts when the current goes below again. It avoids the trip but the total acceleration time could be longer when this function is enable.

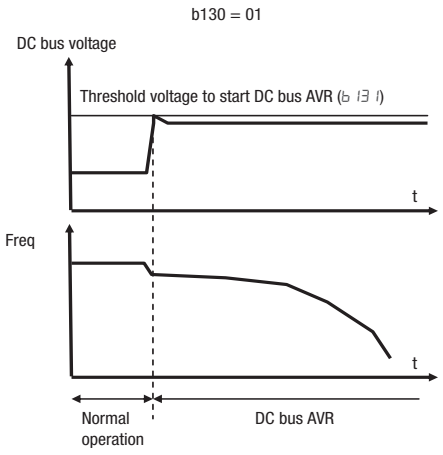
Additionally should be considered that this function doesn't operate keeping a constant motor current so is still possible to have an over-current trip during extreme acceleration.



Parameter	Parameter name	Description
b021	Overload restriction operation mode	00 Disabled 01 Enabled for acceleration and constant speed 02 Enabled for constant speed only 03 Enabled for acceleration and constant speed, increase speed at regen.
b022	Overload restriction level	Sets the level of overload restriction, between 20% and 200% of the rated current of the inverter, setting resolution is 1% of rated current
b023	Deceleration rate at overload restriction	Sets the deceleration rate when inverter detects overload, range is 0.1 to 3000.0, resolution 0.1
b024	Overload restriction operation mode 2	00 Disabled 01 Enabled for acceleration and constant speed 02 Enabled for constant speed only 03 Enabled for acceleration and constant speed, increase speed at regen.
b025	Overload restriction level 2	Sets the level of overload restriction, between 20% and 200% of the rated current of the inverter, setting resolution is 1% of rated current
b026	Deceleration rate 2 at overload restriction	Sets the deceleration rate when inverter detects overload, range is 0.1 to 3000.0, resolution 0.1
b027	OC suppression selection *	00 Disabled 01 Enabled

3.22 Overvoltage protection

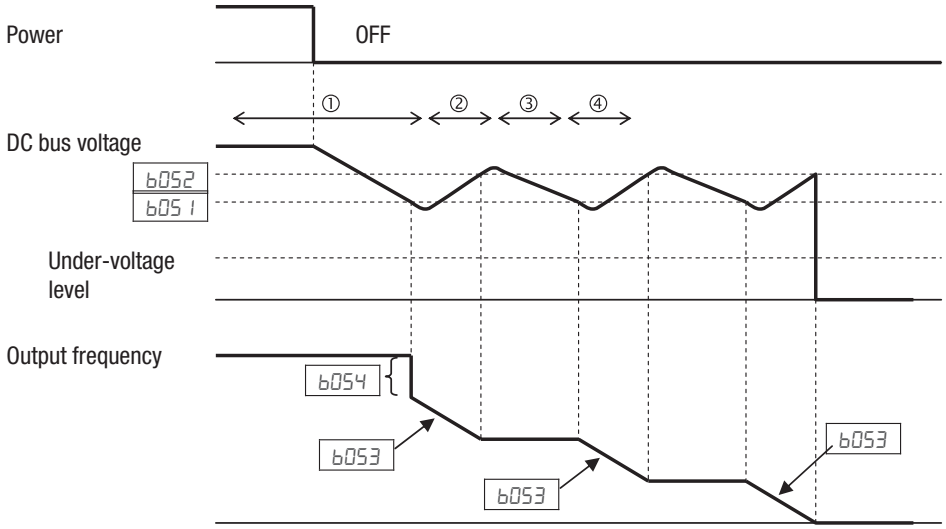
DC Bus AVR (Automatic Voltage regulation) helps to avoid an overvoltage trip when the DC bus voltage increase due regeneration during deceleration. The function keeps the DC bus voltage stable at certain level regulating the deceleration ramp by a PI function. Please note that the actual deceleration time can be longer in this case.



Parameter	Parameter name	Description
b130	Deceleration overvoltage suppression enable	00 Disabled 01 Enabled 02 Enabled with accel.
b131	Decel. overvolt. suppress level	DC bus voltage of suppression. Range is: 200 V class 330 to 395 400 V class 660 to 790
b132	Decel. overvolt. suppress const.	Accel. rate when b130=02. Set range: 0.10 ~ 30.00 sec.
b133	Decel. overvolt. suppress proportional gain	Proportional gain when b130=01. Range is: 0.00 to 5.00
b134	Decel. overvolt. suppress integral time	Integration time when b130=01. Range is: 0.00 to 150.0

3.23 Controlled stop at power loss

This function is intended to achieve a controlled stop and avoid free-running of the motor when power is lost during run mode. Inverter controls the internal DC bus voltage while decelerating the motor using the regenerative energy to keep the DC bus at a level that allows to reduce the motor speed and avoid a long coasting time. Next diagram shows how the function works:



When the DC voltage of the inverter goes down to b051 level, inverter decrease the output frequency by a amount set in b054 to force the motor to regenerate energy that is used to increase the DC bus value. After this the deceleration continue at the rate set in b053 until the upper limit b052 is reach were the deceleration ramp stops until the DC bus drops again. This operation is repated until the motor is totally stopped or there is not enough regeneration from the motor and the DC bus goes below the under-voltage level.

Parameter	Parameter name	Description
b050	Controlled deceleration on power loss	00 Trips 01 Decelerates to a stop 02 Decelerates to a stop with DC bus voltage controlled 03 Decelerates to a stop with DC bus voltage controlled, then restart
b051	DC bus voltage trigger level of ctrl. decel.	Setting of DC bus voltage to start controlled decel. operation. Range is 0.0 to 1000.0
b052	Over-voltage threshold of ctrl. decel.	Setting the OV-LAD stop level of controlled decel. operation. Range is 0.0 to 1000.0
b053	Deceleration time of ctrl. decel.	Range is 0.01 to 3600.0
b054	Initial freq. drop of ctrl. decel.	Setting of initial freq. drop. Range is 0.0 to 10.0 Hz

4 PARAMETER LIST

The PDU (Process Data Unit) register number are addressed starting at zero. Therefore register numbered "0012h" addressed as "0011h". Register address value (transmited on Modbus line) is 1 less than the Register number of the table

4.1 Parameter group D: Monitors

Function code	Function name	Monitoring and setting items	Units	Modbus Register No.
d001 (32-bits)	Output frequency monitor	0 to 40000(100000)	0.01 [Hz]	1001h
				1002h
d002	Output current monitor	0 to 65530	0.01 [A]	1003h
d003	Rotation direction minitoring	0: Stopping, 1: Forward rotation, 2: Reverse rotation	0.1 [Hz]	1004h
d004 (32-bits)	Process variable (PV), PID feedback monitoring	0 to 1000000	0.1	1005h
				1006h
d005	Intelligent input terminal status	2^0: Terminal 1 to 2^6: Terminal 7	1 bit	1007h
d006	Intelligent output terminal status	2^0: Terminal 11 to 2^1: Terminal 12/ 2^2: Relay Terminal	1 bit	1008h
d007 (high)	Scaled output frequency monitor	0 to 4000000(10000000)	0.01	1009h
d007 (low)				100Ah
d008 (high)	Actual-frequency monitor	-100000 to +100000	0.01 [Hz]	100Bh
d008 (low)				100Ch
d009	Torque command monitor	-200 to +200	1 [%]	100Dh

Function code	Function name	Monitoring and setting items	Units	Modbus Register No.
d010	Torque bias monitor	-200 to +200	1 [%]	100Eh
d012	Torque monitor	-200 to +200	1 [%]	1010h
d013	Output voltage monitor	0 to 6000	0.1 [V]	1011h
d014	Power monitor	0 to 1000	0.1 [kW]	1012h
d015 (32-bits)	Watt-hour monitor	0 to 9999000	0.1	1013h
				1014h
d016 (32-bits)	Elapsed RUN time monitor	0 to 999900	1 [h]	1015h
				1016h
d017 (32-bits)	Elapsed power-on time monitor	0 to 999900	1 [h]	1017h
				1018h
d018	Heat sink temperature monitor	-200 to 1500	0.1 [?]	1019h
d022	Life-check monitor	2^0: Capacitor on main circuit board 2^1: cooling-fan	1 bit	101Dh
d023	Drive programming program counter	0~1024		101Eh
d024	Drive programming program number	0~9999		101Fh
d025(32-bits)	User monitor 1	-2147483647 to 2147483647	1	102Eh
				102Fh
d026(32-bits)	User monitor 2	-2147483647 to 2147483647	1	1030h
				1031h
d027(32-bits)	User monitor 3	-2147483647 to 2147483647	1	1032h
				1033h
d029(32-bits)	Position setting monitor	-268435455 to 268435455	1	1036h
				1037h
d030(32-bits)	Position feedback monitor	-268435455 to 268435455	1	1038h
				1039h
d60	Inverter mode monitor	0 (IM CT) 2(IM High Freq mode) 1(IM VT)		1057h
d80	Trip counter	0 to 65530	-	0011h
d081	Trip info 1	Trip factor Inverter status Output frequency (32-bit) Output current Output voltage Running time (32-bit) Power-on time (32-bit)	-	0012h to 001Bh
d082	Trip info 2		-	001Ch to 0025h
d083	Trip info 3		-	0026h to 002Fh
d084	Trip info 4		-	0030h to 0039h
d085	Trip info 5		-	003Ah to 0043h
d086	Trip info 6		-	0044h to 004Ch
d090	Warning monitor	Warning code	-	004Eh
d102	DC voltage monitoring (across P and N)	0 to 10000	0.1 [V]	1026h
d103	BRD load factor monitoring	0 to 1000	0.1 [%]	1027h
d104	Electronic thermal overload monitoring	0 to 1000	0.1 [%]	1028h

4.2 Parameter group A

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register Nº	Default
A001	Frequency source	0 (keypad potentiometer), 1 (control circuit terminal block), 2 (digital operator), 3 (Modbus), 4 (option), 6 (pulse train input), 7 (easy sequence), 10 (operation function result)	–	×	1201h	01
A002	Run command source (*)	1 (control circuit terminal block), 2 (digital operator), 3 (Modbus), 4 (option)	–	×	1202h	01
A003	Base frequency	300 to "maximum frequency"	0.1 [Hz]	×	1203h	50.0
A004	Maximum frequency	300 to 4000 (10000)	0.1 [Hz]	×	1204h	50.0
A005	[AT] selection	0 (switching between O and OI terminals), 2 (switching between O terminal and keypad potentiometer), 3 (switching between OI terminal and keypad potentiometer)	–	×	1205h	00
A011 (32-bits)	[O] input active range start frequency	0 to 40000(100000)	0.01 [Hz]	×	120Bh	0.00
					120Ch	
A012 (32-bits)	[O] input active range end frequency	0 to 40000(100000)	0.01 [Hz]	×	120Dh	0.00
					120Eh	
A013	[O] input active range start voltage	0 to "[O]-[L] input active range end voltage"	1 [%]	×	120Fh	0
A014	[O] input active range end voltage	"[O]-[L] input active range start voltage" to 100	1 [%]	×	1210h	100
A015	[O] input start frequency select	00 (external start frequency), 01 (0 Hz)	–	×	1211h	01
A016	Analog input filter.	1 to 30 or 31 (500 ms filter ±0.1 Hz with hysteresis)	1	×	1212h	8
A017	EzSQ selection	00 (disabling), 01 (PRG terminal) , 02 (Always)	–	×	1213h	00
A019	Multi speed operation selection	00 (binary), 01 (bit)	–	×	1215h	00
A020 (32-bits)	Multi-speed freq. 0	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1216h	6.00
					1217h	
A021 (32-bits)	Multi-speed freq. 1	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1218h	0.00
					1219h	

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register Nº	Default
A022 (32-bits)	Multi-speed freq. 2	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	121Ah 121Bh	0.00
A023 (32-bits)	Multi-speed freq. 3	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	121Ch 121Dh	0.00
A024 (32-bits)	Multi-speed freq. 4	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	121Eh 121Fh	0.00
A025 (32-bits)	Multi-speed freq. 5	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1220h 1221h	0.00
A026 (32-bits)	Multi-speed freq. 6	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1222h 1223h	0.00
A027 (32-bits)	Multi-speed freq. 7	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1224h 1225h	0.00
A028 (32-bits)	Multi-speed freq. 8	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1226h 1227h	0.00
A029 (32-bits)	Multi-speed freq. 9	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1228h 1229h	0.00
A030 (32-bits)	Multi-speed freq. 10	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	122Ah 122Bh	0.00
A031 (32-bits)	Multi-speed freq. 11	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	122Ch 122Dh	0.00
A032 (32-bits)	Multi-speed freq. 12	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	122Eh 122Fh	0.00
A033 (32-bits)	Multi-speed freq. 13	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1230h 1231h	0.00
A034 (32-bits)	Multi-speed freq. 14	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1232h 1233h	0.00
A035 (32-bits)	Multi-speed freq. 15	0 or "start frequency" to "maximum frequency"	0.01 [Hz]	✓	1234h 1235h	0.00
A038	Jog frequency	0.0, "Start frequency" to 999(10000)	0.01 [Hz]	✓	1238h	6.00
A039	Jog stop mode	0 (free-running after jogging stops [disabled during operation]) 1 (deceleration and stop after jogging stops [disabled during operation]) 2 (DC braking after jogging stops [disabled during operation]) 3 (free-running after jogging stops [enabled during operation]) 4 (deceleration and stop after jogging stops [enabled during operation]) 5 (DC braking after jogging stops [enabled during operation])	-	×	1239h	04
A041	Torque boost method selection	00 (manual torque boost), 01 (automatic torque boost)	–	×	123Bh	00
A042	Manual torque boost value	0 to 200	0.1 [%]	✓	123Ch	1.0
A043	Manual torque boost frequency	0 to 500	0.1 [%]	✓	123Dh	5.0
A044	V/F characteristic curve selection, 1st motor	00 (VC), 01 (VP), 02 (free V/f), 03 (sensorless vector control),	–	×	123Eh	00
A045	V/f gain	20 to 100	1 [%]	✓	123Fh	100
A046	Voltage compensation gain setting for automatic torque boost, 1st motor	0 to 255	1 [%]	✓	1240h	100
A047	Slippage compensation gain setting for automatic torque boost, 1st motor	0 to 255	1 [%]	✓	1241h	100
A051	DC braking enable	00 (disabling), 01 (enabling), 02 (output freq < [A052])	–	×	1245h	00
A052	DC braking frequency	0 to 6000	0.01 [Hz]	×	1246h	0.50
A053	DC braking wait time	0 to 50	0.1 [sec.]	×	1247h	0.0
A054	DC braking force during deceleration	0 to 100	1 [%]	×	1248h	50
A055	DC braking time for deceleration	0 to 600	0.1 [sec.]	×	1249h	0.5
A056	DC braking/edge or level detection for [DB] input	00 (edge operation), 01 (level operation)	–	×	124Ah	01
A057	DC braking force for starting	0 to 100	1 [%]	×	124Bh	0
A058	DC braking time for starting	0 to 600	0.1 [sec.]	×	124Ch	0.0
A059	DC braking carrier frequency setting	20 to 150	0.1 [kHz]	×	124Dh	5.0
A061 (32-bits)	Frequency upper limit	0 or "maximum frequency limit" to "maximum frequency"	0.01 [Hz]	×	124Fh 1250h	0.00
A062 (32-bits)	Frequency lower limit	0 or "maximum frequency limit" to "maximum frequency"	0.01 [Hz]	×	1251h 1252h	0.00
A063 (32-bits)	Jump freq. (center) 1	0 to 40000(100000)	0.01 [Hz]	×	1253h 1254h	0.00
A064	Jump freq. width (hysteresis) 1	0 to 1000(10000)	0.01 [Hz]	×	1255h	0.50
A065 (32-bits)	Jump freq. (center) 2	0 to 40000(100000)	0.01 [Hz]	×	1256h 1257h	0.00
A066	Jump freq. width (hysteresis) 2	0 to 1000(10000)	0.01 [Hz]	×	1258h	0.50
A067 (32-bits)	Jump freq. (center) 3	0 to 40000(100000)	0.01 [Hz]	×	1259h 125Ah	0.00
A068	Jump freq. width (hysteresis) 3	0 to 1000(10000)	0.01 [Hz]	×	125Bh	0.50
A069 (32-bits)	Acceleration hold frequency	0 to 40000	0.01 [Hz]	×	125Ch 125Dh	0.00
A070	Acceleration hold time	0 to 600	0.1 [sec.]	×	125Eh	0.0

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register Nº	Default
A071	PID Function Enable	00 (disabling), 01 (enabling), 02 (enabling inverted-data output)	–	×	125Fh	00
A072	PID proportional gain	0 to 2500	0.10	✓	1260h	1.00
A073	PID integral time constant	0 to 36000	0.1 [sec.]	✓	1261h	1.0
A074	PID derivative gain	0 to 10000	0.01 [sec.]	✓	1262h	0.00
A075	PV scale conversion	1 to 9999	0.01	×	1263h	1.00
A076	PV source	00 (input via OI), 01 (input via O), 02 (external communication), 03 (pulse train frequency input), 10 (operation result output)	–	×	1264h	00
A077	Reverse PID	00 (disabling), 01 (enabling)	–	×	1265h	00
A078	PID output limiter	0 to 1000	0.1 [%]	×	1266h	0.0
A079	PID feed forward selection	00 (disabled), 01(O input), 02 (OI input)	–	×	1267h	00
A081	AVR function select	00 (always on), 01 (always off), 02 (off during deceleration)	–	×	1269h	02
A082	AVR voltage select	200 V class: 0 (200)/1 (215)/2 (220)/3 (230)/4 (240 400 V class: 5 (380)/6 (400)/7 (415)/8 (440)/9 (460)/ 10 (480))	–	×	126Ah	-
A083	AVR filter time constant	0.000 to 10.00	0.001[sec]	×	126Bh	0.300
A084	AVR deceleration gain	50 to 200	1[%]	×	126Ch	100
A085	Energy-saving operation mode	00 (normal operation), 01 (energy-saving operation)	–	×	126Dh	00
A086	Energy-saving mode tuning	0 to 1000	0.1 [%]	×	126Eh	50.0
A092 (32-bits)	Acceleration time (2)	1 to 360000	0.01 [sec.]	✓	1274h 1275h	10.00
A093 (32-bits)	Deceleration time (2)	1 to 360000	0.01 [sec.]	✓	1276h 1277h	10.00
A094	Select method to switch to Acc2/Dec2 profile	00 (switching by 2CH terminal),01 (switching by setting) 02 (Forward and reverse)	–	×	1278h	00
A095 (32-bits)	Acc1 to Acc2 frequency transition point	0 to 40000(100000)	0.01 [Hz]	×	1279h 127Ah	0.00
A096 (32-bits)	Dec1 to Dec2 frequency transition point	0 to 40000(100000)	0.01 [Hz]	×	127Bh 127Ch	0.00
A097	Acceleration curve selection	0 (linear), 1 (S curve), 2 (U curve), 3 (inverted-U curve), 4 (EL-S curve)	–	×	127Dh	01
A098	Deceleration curve setting	0 (linear), 1 (S curve), 2 (U curve), 3 (inverted-U curve), 4 (EL-S curve)	–	×	127Eh	01
A101 (32-bits)	[OI] input active range start frequency	0 to 40000(100000)	0.01 [Hz]	×	1281h 1282h	0.00
A102 (32-bits)	[OI] input active range end frequency	0 to 40000(100000)	0.01 [Hz]	×	1283h 1284h	0.00
A103	[OI] input active range start current	0 to "[OI]-[L] input active range end current"	1 [%]	×	1285h	20
A104	[OI] input active range end current	"[OI]-[L] input active range start current" to 100	1 [%]	×	1286h	100
A105	[OI] input start frequency select	00 (external start frequency), 01 (0 Hz)	–	×	1287h	00
A131	Acceleration curve constant	1 (smallest swelling) to 10 largest swelling)	–	×	12A5h	2
A132	Deceleration curve constant	1 (smallest swelling) to 10 (largest swelling)	-	×	12A6h	2
A141	Operation-target frequency selection 1	00 (digital operator), 01 (keypad potentiometer), 02 (input via O), 03 (input via OI), 04 (external communication), 05 (option), 07 (pulse train frequency input)	-	×	12AFh	02
A142	Operation-target frequency selection 2	00 (digital operator), 01 (keypad potentiometer), 02 (input via O), 03 (input via OI), 04 (external communication), 05 (option), 07 (pulse train frequency input)	–	×	12B0h	03
A143	Operator selection	00 (addition: A141 + A142), 01 (subtraction: A141 - A142), 02 (multiplication: A141 x A142)	–	×	12B1h	00
A145 (32-bits)	Frequency to be added	0 to 40000(100000)	0.01 [Hz]	×	12B3h 12B4h	0.00
A146	Sign of the frequency to be added	00 (frequency command + A145), 01 (frequency command - A145)	–	×	12B5h	00
A150	EL-S-curve acceleration/deceleration ratio 1	0 to 50	1 [%]	×	12B9h	10
A151	EL-S-curve acceleration/deceleration ratio 2	0 to 50	1 [%]	×	12BAh	10
A152	EL-S-curve deceleration/deceleration ratio 1	0 to 50	1 [%]	×	12BBh	10
A153	EL-S-curve deceleration/deceleration ratio 2	0 to 50	1 [%]	×	12BCh	10
A154 (32-bits)	Deceleration hold frequency	0~40000(100000)	0.01 [Hz]	×	12BDh 12BEh	0.00
A155	Deceleration hold time	0~600	0.1 [sec.]	×	12BFh	0.0
A156 (32-bits)	PID sleep function triggering level	0~40000(100000)	0.01 [Hz]	×	12C0h 12C1h	0.00
A157	PID sleep function action delay time	0~255	0.1 [sec.]	×	12C2h	0.0
A161 (32-bits)	[VR] input active range start frequency	0~40000(100000)	0.01 [Hz]	×	12C6h 12C7h	0.00
A162 (32-bits)	[VR] input active range end frequency	0~40000(100000)	0.01 [Hz]	×	12C8h 12C9h	0.00
A163	[VR] input active range start %	0~100	1 [%]	×	12CAh	0
A164	[VR] input active range end %	0~100	1 [%]	×	12CBh	100
A165	[VR] input start frequencyselect	00(start frequency A161) / 01(0Hz)	–	×	12CCh	01

4.3 Parameter group B

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
b001	Restart mode on power failure/ under-voltage trip	00 (tripping), 01 (starting with 0 Hz), 02 (starting with matching frequency), 03 (tripping after deceleration and stopping with matching frequency), 04 (restarting with active matching frequency)	–	×	1301h	00
b002	Allowable under-voltage power failure time	3 to 250	0.1 [sec.]	×	1302h	1.0
b003	Retry wait time before motor restart	3 to 1000	0.1 [sec.]	×	1303h	1.0
b004	Instantaneous power failure/under-voltage trip alarm enable	00 (disabling), 01 (enabling), 02 (disabling during stopping and decelerating to stop)	–	×	1304h	00
b005	Number of restarts on power failure/under-voltage trip events	0 (16 times), 1 (unlimited)	–	×	1305h	00
b007 (32-bits)	Restart frequency threshold	0 to 40000	0.01 [Hz]	×	1307h 1308h	0.00
b008	Restart mode on over voltage / over current	00 (tripping), 01 (starting with 0 Hz), 02 (starting with matching frequency), 03 (tripping after deceleration and stopping with matching frequency), 04 (restarting with active matching frequency)	–	×	1309h	00
b010	Number of retry on over voltage / over current	1 to 3	1 [time]	×	130Bh	3
b011	Retry wait time on over voltage / over current	3 to 1000	0.1 [sec.]	×	130Ch	1.0
b012	Level of electronic thermal	200 to 1000	0.1 [%]	×	130Dh	-
b013	Electronic thermal characteristic	00 (reduced-torque characteristic),01 (constant-torque characteristic), 02 (free setting)	–	×	130Eh	01
b015	Free setting, electronic thermal frequency (1)	0 to 400	1 [Hz]	×	1310h	0
b016	Free setting, electronic thermal current (1)	0 to Rated current	0.1 [A]	×	1311h	0.00
b017	Free setting, electronic thermal frequency (2)	0 to 400	1 [Hz]	×	1312h	0
b018	Free setting, electronic thermal current (2)	0 to Rated current	0.1 [A]	×	1313h	0.00
b019	Free setting, electronic thermal frequency (3)	0 to 400	1 [Hz]	×	1314h	0
b020	Free setting, electronic thermal current (3)	0 to Rated current	0.1 [A]	×	1315h	0.00
b021	Overload restriction operation mode	00 (disabling), 01 (enabling during acceleration and constant-speed operation),02 (enabling during constant-speed operation), 03 (enabling during acceleration and constant-speed operation [speed increase at regeneration])	–	×	1316h	01
b022	Overload restriction level	200 to 2000	0.1 [%]	×	1317h	-
b023	Deceleration rate at overload restriction	1 to 30000	0.1 [sec.]	×	1318h	1.0
b024	Overload restriction operation mode (2)	00 (disabling), 01 (enabling during acceleration and constant-speed operation), 02 (enabling during constant-speed operation), 03 (enabling during acceleration and constant-speed operation [speed increase at regeneration])	–	×	1319h	01
b025	Overload restriction level 2	200 to 2000	0.1 [%]	×	131Ah	-
b026	Deceleration rate at overload restriction (2)	1 to 30000	0.1 [sec.]	×	131Bh	1.0
b027	Overcurrent suppression enable	00 (disabling), 01 (enabling)	–	×	131Ch	00
b028	Current level of active freq. matching	100 to 2000	0.1 [%]	×	131Dh	-
b029	Deceleration rate of active freq. matching	1 to 30000	0.1 [sec.]	×	131Eh	0.5
b030	Start freq. of active frequency matching	00 (frequency at the last shutoff), 01 (maximum frequency), 02 (set frequency)	–	×	131Fh	00
b031	Software lock mode selection	00 (disabling change of data other than "b031" when SFT is on), 01 (disabling change of data other than "b031" and frequency settings when SFT is on), 02 (disabling change of data other than "b031"), 03 (disabling change of data other than "b031" and frequency settings), 10 (enabling data changes during operation)	–	×	1320h	01
b033	Motor cable length parameter	5 to 20	–	×	1322h	10
b034 (32-bits)	Run/power-on warning time	0 to 65535	1 [10h]	×	1323h 1324h	0
b035	Rotation direction restriction	00(Enable for both dir)/ 01 (Enable for forward only)/ 02 (Enable for reverse only)	–	×	1325h	00
b036	Reduced voltage start selection	0 (minimum reduced voltage start time) to 255 (maximum reduced voltage start time)	–	×	1326h	2
b037	Function code display restriction	00 (full display), 01 (function-specific display), 02 (user setting), 03 (data comparison display), 04 (basicdisplay),05(monitor display)	–	×	1327h	00
b038	Initial display selection	001-060	–	×	1328h	001
b039	Automatic user parameter registration	00 (disabling), 01 (enabling)	–	×	1329h	00
b040	Torque limit selection	00 (quadrant-specific setting), 01 (switching by terminal), 02 (analog input)	–	×	132Ah	00
b041	Torque limit 1 (fwd-power in 4-quadrant mode)	0 to 200/255 (no)	1 [%]	×	132Bh	200
b042	Torque limit 2 (rev/regen. in 4-quadrant mode)	0 to 200/255 (no)	1 [%]	×	132Ch	200
b043	Torque limit 3 (rev/power in 4-quadrant mode)	0 to 200/255 (no)	1 [%]	×	132Dh	200
b044	Torque limit 4 (fwd/regen. in 4-quadrant mode)	0 to 200/255 (no)	1 [%]	×	132Eh	200
b045	Torque limit LADSTOP enable	00 (disabling), 01 (enabling)	–	×	132Fh	00
b046	Reverse Run protection enable	00 (disabling), 01 (enabling)	–	×	1330h	00
b049	Dual Rating Selection	00(CT mode)/01(VT mode)	–	×	1333h	00
b050	Controlled deceleration on power loss	00 (disabling), 01 (enabling), 02 (nonstop operation at momentary power failure (no restoration)) 03 (nonstop operation at momentary power failure (restoration to be done))	–	×	1334h	00
b051	DC bus voltage trigger level of ctrl. decel.	0 to 10000	0.1 [V]	×	1335h	220.0
b052	Over-voltage threshold of ctrl. decel.	0 to 10000	0.1 [V]	×	1336h	360.0
b053 (32-bits)	Deceleration time of ctrl. decel.	0.01 to 36000	0.01 [sec.]	×	1337h 1338h	1.00

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
b054	Initial freq. drop of ctrl. decel.	0 to 1000	0.01 [Hz]	×	1339h	0.00
b060	Maximum-limit level of window comparators O	0. to 100. (lower limit : b061 + b062 *2) (%)	1 [%]	×	133Fh	100
b061	Minimum-limit level of window comparators O	0. to 100. (lower limit : b060 - b062*2) (%)	1 [%]	✓	1340h	0
b062	Hysteresis width of window comparators O	0. to 10. (lower limit : b061 - b062 / 2) (%)	1 [%]	✓	1341h	0
b063	Maximum-limit level of window comparators OI	0. to 100. (lower limit : b064 + b066 *2) (%)	1 [%]	✓	1342h	100
b064	Minimum-limit level of window comparators OI	0. to 100. (lower limit : b063 - b066 *2) (%)	1 [%]	✓	1343h	0
b065	Hysteresis width of window comparators OI	0. to 10. (lower limit : b063 - b064 / 2) (%)	1 [%]	✓	1344h	0
b070	Operation level at O disconnection	0. to 100. (%) or "no" (ignore)	1 [%]	×	1349h	no
b071	Operation level at OI disconnection	0. to 100. (%) or "no" (ignore)	1 [%]	×	134Ah	no
b075	Ambient temperature	-10 to 50	1 [?]	✓	134Eh	40
b078	Cumulative input power data clearance	Clearance by setting "1"	–	✓	1351h	00
b079	Watt-hour display gain	1 to 1000	1	✓	1352h	1
b082	Start frequency	10 to 999	0.01 [Hz]	×	1355h	0.50
b083	Carrier frequency	20 to 150	0.1 [kHz]	×	1356h	10.0
b084	Initialization mode (parameters or trip history)	00(disable), 01 (clearing the trip history), 02 (initializing the data), 03 (clearing the trip history and initializing the data), 04 (clearing the trip history and initializing the data and EzSQ program)	–	×	1357h	00
b085	Initial value code	00 (JPN/US), 01 (EU)	–	×	1358h	01
b086	Frequency scaling conversion factor	1 to 9999	0.01	×	1359h	1.00
b087	STOP key enable	00 (enabling), 01 (disabling), 02 (disabling only stop)	–	×	135Ah	00
b088	Restart mode after FRS	0 (starting with 0 Hz), 1 (starting with matching frequency), 2 (starting with active matching frequency)	-	×	135Bh	00
b089	Automatic carrier frequency reduction	0(disabling)/1(enabling(output current controlled))/ 2(enabling(fin temperature controlled))	–	×	135Ch	01
b090	Dynamic braking usage ratio	0 to 1000	0.1 [%]	×	135Dh	0.0
b091	Stop mode selection	00 (deceleration until stop), 01 (free-run stop)	–	×	135Eh	00
b092	Cooling fan control	01 (always operating the fan), 01 (operating the fan only during inverter operation [including 5 minutes after power-on]) , 02 (operating by temperature)	–	×	135Fh	01
b093	Clear elapsed time of cooling fan	0(count)/1(clear)	–	×	1360h	00
b094	Initialization target data	0 to 3	–	×	1361h	00
b095	Dynamic braking control	0 (disabling), 1 (enabling [disabling while the motor is stopped]), 2 (enabling [enabling also while the motor is stopped])		×	1362h	00
b096	Dynamic braking activation level	330 to 380, 660 to 760	1. [V]	×	1363h	360
b097	BRD resistor value	Min. Resitance to 600.0	0.1 [W]	×	1364h	100.0
b100	Free-setting V/f frequency (1)	0. to "free-setting V/f frequency (2)"	1 [Hz]	×	1367h	0
b101	Free-setting V/f voltage (1)	0. to 8000	0.1 [V]	×	1368h	0.0
b102	Free-setting V/f frequency (2)	0. to "free-setting V/f frequency (3)"	1 [Hz]	×	1369h	0
b103	Free-setting V/f voltage (2)	0. to 8000	0.1 [V]	×	136Ah	0.0
b104	Free-setting V/f frequency (3)	0. to "free-setting V/f frequency (4)"	1 [Hz]	×	136Bh	0
b105	Free-setting V/f voltage (3)	0. to 8000	0.1 [V]	×	136Ch	0.0
b106	Free-setting V/f frequency (4)	0. to "free-setting V/f frequency (5)"	1 [Hz]	×	136Dh	0
b107	Free-setting V/f voltage (4)	0. to 8000	0.1 [V]	×	136Eh	0.0
b108	Free-setting V/f frequency (5)	0. to "free-setting V/f frequency (6)"	1 [Hz]	×	136Fh	0
b109	Free-setting V/f voltage (5)	0. to 8000	0.1 [V]	×	1370h	0.0
b110	Free-setting V/f frequency (6)	0. to "free-setting V/f frequency (7)"	1 [Hz]	×	1371h	0
b111	Free-setting V/f voltage (6)	0. to 8000	0.1 [V]	×	1372h	0.0
b112	Free-setting V/f frequency (7)	0. to 400.	1 [Hz]	×	1373h	0
b113	Free-setting V/f voltage (7)	0. to 8000	0.1 [V]	×	1374h	0.0
b120	Brake Control Enable	00 (disabling), 01 (enabling)	–	×	137Bh	00
b121	Brake Wait Time for Release	0 to 500	0.01 [sec.]	×	137Ch	0.00
b122	Brake Wait Time for Acceleration	0 to 500	0.01 [sec.]	×	137Dh	0.00
b123	Brake Wait Time for Stopping	0 to 500	0.01 [sec.]	×	137Eh	0.00
b124	Brake Wait Time for Confirmation	0 to 500	0.01 [sec.]	×	137Fh	0.00
b125	Brake Release Frequency	0 to 40000	0.01 [Hz]	×	1380h	0.00
b126	Brake Release Current	0 to 2000	0.1 [%]	×	1381h	-
b127	Braking frequency	0 to 40000	0.01 [Hz]	×	1382h	0.00
b130	Deceleration overvoltage suppression enable	00 (disabling), 01 (enabling), 02 (enabling with acceleration)	–	×	1385h	00
b131	Decel. overvolt. suppress level	200 V class: 330 to 390 (V) 400 V class: 660 to 780 (V)	1 [V]	×	1386h	380
b132	Decel. overvolt. suppress const.	10 to 3000	0.01 [sec.]	×	1387h	1.00
b133	Decel. overvolt. suppress propotional gain	0 to 500	0.01	✓	1388h	0.20
b134	Decel. overvolt. suppress Integral time	0 to 1500	0.1 [sec.]	✓	1389h	1.0
b145	GS input mode	00 (non Trip) /01 (Trip)	–	×	1394h	00
b150	Display ex.operator connected	001 to 060	-	×	139Ah	001
b160	1st parameter of Dual Monitor	001 to 030	–	×	13A3h	001
b161	2nd parameter of Dual Monitor	001 to 030	–	×	13A4h	002
b163	Freq. set in monitoring	00 (disabling), 01 (enabling),	–	✓	13A6h	00
b164	Automatic return to the initial display	00 (disabling), 01 (enabling),	–	✓	13A7h	00
b165	Ex. operator com. loss action	00 (tripping), 01 (tripping after decelerating and stopping the motor), 02 (ignoring errors), 03 (stopping the motor after free-running), 04 (decelerating and stopping the motor)	–	✓	13A8h	02
b166	Data Read/Write select	00 (Read/Write OK), 01 (Protected)	–	×	13A9h	00
b171	Inverter mode selection	00 (disabling), 01 (IM mode), 02 (High Freq. mode), 03 (PM mode)	–	×	13AEh	00
b180	Initialization trigger	00 (disabling), 01 (enabling),	–	×	13B7h	00

4.4 Parameter group C

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
C001	Input [1] function	Check I/O optiosn on page	–	×	1401h	00 (FW)
C002	Input [2] function		–	×	1402h	01 (RV)
C003	Input [3] function		–	×	1403h	12 (EXT)
C004	Input [4] function		–	×	1404h	18 (RS)
C005	Input [5] function		–	×	1405h	02 (CF1)
C006	Input [6] function		–	×	1406h	03 (CF2)
C007	Input [7] function		–	×	1407h	06 (JG)
C011	Input [1] active state	0 (NO), 1 (NC)	–	×	140Bh	00
C012	Input [2] active state	0 (NO), 1 (NC)	–	×	140Ch	00
C013	Input [3] active state	0 (NO), 1 (NC)	–	×	140Dh	00
C014	Input [4] active state	0 (NO), 1 (NC)	–	×	140Eh	00
C015	Input [5] active state	0 (NO), 1 (NC)	–	×	140Fh	00
C016	Input [6] active state	0 (NO), 1 (NC)	–	×	1410h	00
C017	Input [7] active state	0 (NO), 1 (NC)	–	×	1411h	00
C021	Output [11] function	Check I/O options on page	–	×	1415h	00(RUN)
C022	Output [12] function		–	×	1416h	01(FA1)
C026	Alarm relay function		–	×	141Ah	05 (AL)
C027	[EO] terminal selection	Check analog and pulse output on page	–	×	141Bh	07(LAD)
C028	[AM] terminal selection	Check analog and pulse output on page	–	×	141Ch	07(LAD)
C030	Digital current monitor reference value	200 to 2000	0.1 [%]		141Eh	-
C031	Output [11] active state	0 (NO), 1 (NC)	–	×	141Fh	00
C032	Output [12] active state	0 (NO), 1 (NC)	–	×	1420h	00
C036	Alarm relay active state	0 (NO), 1 (NC)	–	×	1424h	01
C038	Output mode of low current detection	0 (output during acceleration/deceleration and constant-speed operation), 1 (output only during constant-speed operation)	–	×	1426h	01
C039	Low current detection level	0 to 2000	0.1 [%]	×	1427h	-
C040	Overload signal output mode	00 (output during acceleration/deceleration and constant-speed operation), 01 (output only during constant-speed operation)	–	×	1428h	01
C041	Overload warning level	0 to 2000	0.1 [%]	×	1429h	-
C042 (high)	Frequency arrival setting for accel.	0 to 40000	0.01 [Hz]	×	142Ah	0.00
C042 (low)					142Bh	
C043 (high)	Frequency arrival setting for decel.	0 to 40000	0.01 [Hz]	×	142Ch	0.00
C043 (low)					142Dh	
C044	PID deviation level	0 to 1000	0.1 [%]	×	142Eh	3.0
C045 (high)	Frequency arrival setting 2 for accel.	0 to 40000	0.01 [Hz]	×	142Fh	0.00
C045 (low)					1430h	
C046 (high)	Frequency arrival setting 2 for decel.	0 to 40000	0.01 [Hz]	×	1431h	0.00
C046 (low)					1432h	
C047	Pulse train input scale conversion for EO output	0.01 - 99.99	–	×	1433h	1.00
C052	Maximum PID feedback data	0 to 1000	0.1 [%]	×	1438h	100.0
C053	Minimum PID feedback data	0 to 1000	0.1 [%]	×	1439h	0.0
C054	Over-torque/under-torqueselection	00(Over torque)/01(under torque)	–	×	143Ah	00
C055	Over-torque (forward-driving) level setting	0 to 200	1 [%]	×	143Bh	100
C056	Over-torque (reverse regenerating) level setting	0 to 200	1 [%]	×	143Ch	100
C057	Over-torque (reverse driving) level setting	0 to 200	1 [%]	×	143Dh	100
C058	Over-torque (forward regenerating) level setting	0 to 200	1 [%]	×	143Eh	100
C059	Signal output mode of Over/under torque	00 (output during acceleration/deceleration and constant-speed operation), 01 (output only during constant-speed operation)	–	×	143Fh	01
C061	Electronic thermal warning level	0 to 100	1 [%]	×	1441h	90
C063	Zero speed detection level	0 to 10000	0.01 [Hz]	×	1443h	0.00
C064	Heat sink overheat warning level	0 to 110	1 [?]	×	1444h	100
C071	Communication speed	03(2400bps), 04(4800bps), 05(9600bps), 06(19.2kbps), 07(38.4kbps),08(57.6kbps), 09(76.8kbps), 10(115.2kbps)	–	×	144Bh	05
C072	Modbus address	1. to 247.	–	×	144Ch	1
C074	Communication parity	00 (no parity), 01 (even parity), 02 (odd parity)	–	×	144Eh	00
C075	Communication stop bit	1 (1 bit), 2 (2 bits)	–	×	144Fh	01
C076	Selection of the operation after communication error	00 (tripping), 01 (tripping after decelerating and stopping the motor), 02 (ignoring errors), 03 (stopping the motor after free-running), 4 (decelerating and stopping the motor)	–	×	1450h	02
C077	Communication timeout limit	0 to 9999	0.01 [sec.]	×	1451h	0.00
C078	Communication wait time	0 to 1000	1 [msec.]	×	1452h	0
C081	[O] input span calibration	0 to 2000	0.1	✓	1455h	100.0
C082	[OI] input span calibration	0 to 2000	0.1	✓	1456h	100.0
C085	Thermistor input tuning	0 to 2000	0.1	✓	1459h	100.0
C091	Debug mode enable	00/01	–	✓	145Fh	00
C096	Communication selection	00 (Modbus-RTU) 01(EzCOM) 02 (EzCOM<administrator>)		×	1464h	00
C098	EzCOM start adr. of master	1~8		×	1466h	1
C099	EzCOM end adr. of master	1~8		×	1467h	1
C100	EzCOM starting trigger	00(Input terminal), 01(Always)		×	1468h	00
C101	Up/Down memory mode selection	00 (not storing the frequency data), 01 (storing the frequency data)	–	×	1469h	00

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
C102	Reset mode selection	00 (resetting the trip when RS is on), 01 (resetting the trip when RS is off), 02 (enabling resetting only upon tripping [resetting when RS is on]), 03(resetting only trip)	–	×	146Ah	00
C103	Restart mode after reset	00(starting with 0 Hz), 01(starting with matching frequency), 02(restarting with active matching freq)	–	×	146Bh	00
C104	UP/DWN clear mode	00 (0Hz)/01 (EEPROM data)	–	×	146Ch	00
C105	FM gain adjustment	50 to 200	1 [%]	✓	146Dh	100
C106	AM gain adjustment	50 to 200	1 [%]	✓	146Eh	100
C109	AM bias adjustment	0 to 100	1 [%]	✓	1471h	0
C111	Overload warning level 2	0 to 2000	0.1 [%]	✓	1473h	-
C130	Output [11] on-delay time	0 to 1000	0.1 [sec.]	×	1486h	0.0
C131	Output [11] off-delay time	0 to 1000	0.1 [sec.]	×	1487h	0.0
C132	Output [12] on-delay time	0 to 1000	0.1 [sec.]	×	1488h	0.0
C133	Output [12] off-delay time	0 to 1000	0.1 [sec.]	×	1489h	0.0
C140	Output RY on-delay time	0 to 1000	0.1 [sec.]	×	1490h	0.0
C141	Output RY off-delay time	0 to 1000	0.1 [sec.]	×	1491h	0.0
C142	Logic output 1 operand A	Same as the settings of C021 to C026 (except those of LOG1 to LOG6, OPO, no)	–	×	1492h	00
C143	Logic output 1 operand B	Same as the settings of C021 to C026 (except those of LOG1 to LOG6, OPO, no)	–	×	1493h	00
C144	Logical output 1 operator	0 (AND), 1 (OR), 2 (XOR)	–	×	1494h	00
C145	Logic output 2 operand A	Same as the settings of C021 to C026 (except those of LOG1 to LOG6, OPO, no)	–	×	1495h	00
C146	Logic output 2 operand B	Same as the settings of C021 to C026 (except those of LOG1 to LOG6, OPO, no)	–	×	1496h	00
C147	Logical output 2 operator	00 (AND), 01 (OR), 02 (XOR)	–	×	1497h	00
C148	Logic output 3 operand A	Same as the settings of C021 to C026 (except those of LOG1 to LOG6, OPO, no)	–	×	1498h	00
C149	Logic output 3 operand B	Same as the settings of C021 to C026 (except those of LOG1 to LOG6, OPO, no)	–	×	1499h	00
C150	Logical output 3 operator	00 (AND), 01 (OR), 02 (XOR)	–	×	149Ah	00
C160	Input [1] response time	0 to 200	-	×	14A4h	1
C161	Input [2] response time	0 to 200	-	×	14A5h	1
C162	Input [3] response time	0 to 200	-	×	14A6h	1
C163	Input [4] response time	0 to 200	-	×	14A7h	1
C164	Input [5] response time	0 to 200	-	×	14A8h	1
C165	Input [6] response time	0 to 200	-	×	14A9h	1
C166	Input [7] response time	0 to 200	-	×	14AAh	1
C169	Multistage speed/position determination time	0 to 200	-	×	14ADh	0

4.5 Parameter group H

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
H001	Auto-tuning Setting	00 (disabling auto-tuning), 01 (auto-tuning without rotation), 02 (auto-tuning with rotation)	–	×	1501h	00
H002	Motor data selection, 1st motor	00 (Standard motor data), 02 (auto-tuned data)	–	×	1502h	00
H003	Motor capacity, 1st motor	00(0.1kW)- 15 (18.5kW)	–	×	1503h	-
H004	Motor poles setting, 1st motor	0 (2 poles), 1 (4 poles), 2 (6 poles),3 (8 poles), 4 (10)	–	×	1504h	4P
H005	Motor speed constant, 1st motor	1 to 1000	1[%]	✓	1506h	100
H006	Motor stabilization constant, 1st motor	0 to 255	1	✓	1507h	100
H020	Motor constant R1, 1st motor	1 to 65530	0.001 [Ω]	×	1516h	-
H021	Motor constant R2, 1st motor	1 to 65530	0.001 [Ω]	×	1518h	-
H022	Motor constant L, 1st motor	1 to 65530	0.01 mH	×	151Ah	-
H023	Motor constant Io	1 to 65530	0.01 [A]	×	151Ch	-
H024(32-bits)	Motor constant J	1 to 9999000	0.001	×	151Dh 151Eh	-
H030	Auto constant R1, 1st motor	1 to 65530	0.001 [Ω]	×	1525h	-
H031	Auto constant R2, 1st motor	1 to 65530	0.001 [Ω]	×	1527h	-
H032	Auto constant L, 1st motor	1 to 65530	0.01 mH	×	1529h	-
H033	Auto constant Io, 1st motor	1 to 65530	0.01 [A]	×	152Bh	-
H024(32-bits)	Auto constant J, 1st motor	1 to 9999000	0.001	×	152Ch 152Dh	-
H050	Slip compensation P gain for V/f control with FB	0 to 10000	0.1	✓	153Dh	0.20
H051	Slip compensation P gain for V/f control with FB	0 to 10000	1	✓	153Eh	2
H102	PM motor code setting	00 (Standard motor data), 01(auto-tuned data)	–	×	1571h	00
H103	PM motor capacity	0.1/0.2/0.4/0.55/0.75/1.1/1.5/2.2/3.0/3.7/4.0/5.5/7.5/11.0/15.0/18.5	–	×	1572h	-
H104	PM motor poles setting	2(0)/4(1)/6(2)/8(3)/10(4)/12(5)/14(6)/16(7)/18(8)/20(9)/22(10)/24(11)/26(12)/28(13)/30(14)/32(15)/34(16)/36(17)/38(18)/40(19)/42(20)/44(21)/46(22)/48(34) pole	–	×	1573h	4P

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
H105	PM motor rated current	Set a level between 20% and 100% for the rated inverter current	0.01 [A]	×	1574h	-
H106	PM motor constant R	0.001 to 65.535 Ω	0.001 [Ω]	×	1575h	-
H107	PM motor constant Ld	0.01 to 655.35 mH	0.01 mH	×	1576h	-
H108	PM motor constant Lq	0.01 to 655.35 mH	0.01 mH	×	1577h	-
H109	PM motor constant Ke	0.0001 to 6.5535 Vpeak/(rad/s)	0.0001 V/(rad/s)	×	1578h	-
H010(32-bits)	PM constant J	0.001 - 9999.000 kg/m²	0.001 kg/ m²	×	1579h	-
H111	Auto constant R	0.001 to 65.535 Ω	0.001 [Ω]	×	157Bh	-
H112	Auto constant Ld	0.01 to 655.35 mH	0.01 mH	×	157Ch	-
H113	Auto constant Lq	0.01 to 655.35 mH	0.01 mH	×	157Dh	-
H116	PM Speed Response	1 to 1000	–		1581h	100
H117	PM Starting Current	20.00 to 100.00%	–	×	1582h	70.00
H118	PM Starting Time	0.01 to 60.00 s	0.01 [s]	×	1583h	1.00
H119	PM Stabilization Constant	0 to 120%	–	✓	1584h	100
H121	PM Minimum Frequency	0.0 to 25.5%	–	✓	1586h	8.0
H122	PM No-Load Current	0.00 to 100.00%	–	✓	1587h	10.00
H123	PM Starting Method Select	00 (Normal), 01 (IMPE)	–	×	1588h	00
H131	PM Initial Magnet Position Estimation 0 V Wait Times	0 to 255	–	×	158Ah	10
H132	PM Initial Magnet Position Estimation Detect Wait Times	0 to 255	–	×	158Bh	10
H133	PM Initial Magnet Position Estimation Detect Times	0 to 255	–	×	158Ch	30
H134	PM Initial Magnet Position Estimation Voltage Gain	0 to 255	–	×	158Dh	100

4.6 Parameter group P

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No	Default
P001	Operation mode on expansion card 1 error	00 (tripping), 01 (continuing operation)	–	×	1601h	00
P003	[EA] terminal selection	00 (Speed reference, incl. PID) 01 (Encoder feedback) 02 (Extended terminal for EzSQ)		×	1603h	00
P004	Pulse train input mode for feedback	00 (Single-phase pulse [EA]) 01 (2-phase pulse [90° difference] 1 ([EA] and [EB])) 02 (2-phase pulse [90° difference] 2 ([EA] and [EB])) 03 (Single-phase pulse [EA] and direction signal [EB])		×	1604h	00
P011	Encoder pulse-per-revolution (PPR) setting	32 to 1024	1	×	160Bh	512
P012	Simple positioning selection	00 (simple positioning deactivated) 02 (simple positioning activated)	–	×	160Ch	00
P015	Creep speed	"start frequency" to 1000	0.01 [Hz]	×	160Fh	5.00
P026	Over-speed error detection level	0 to 1500	0.1 [%]	×	161Ah	115.0
P027	Speed deviation error detection level	0 to 12000	0.01 [Hz]	×	161Bh	10.00
P031	Accel/decel time input selection	00(digital operator), 03 (easy sequence)	–	×	161Fh	00
P033	Torque command input selection	00 (O terminal), 01 (OI terminal), 03 (digital operator), 06 (Option)	–	×	1621h	00
P034	Torque command setting	0 to 200	1 [%]	✓	1622h	0
P036	Torque bias mode	00 (disabling the mode),01 (digital operator),	–	×	1624h	00
P037	Torque bias value	-200 to +200	1 [%]		1625h	0
P038	Torque bias polarity selection	00 (as indicated by the sign), 01 (depending on the operation direction), 05(Option)	–	×	1626h	00
P039 (32-bits)	Speed limit for torque-controlled operation (forward rotation)	0 to 12000	0.01 [Hz]	×	1627h 1628h	0.00
P040 (32-bits)	Speed limit for torque-controlled operation (reverse rotation)	0 to 12000	0.01 [Hz]	×	1629h 162Ah	0.00
P041	Speed / torque control switching time	0 to 1000	–	×	162Bh	0
P044	Communication watchdog timer	0 to 9999	0.01 sec.	×	162Eh	1.00
P045	Inverter action on communication error	00 (tripping), 01 (tripping after decelerating and stopping the motor), 02 (ignoring errors), 03 (stopping the motor after free-running), 04 (decelerating and stopping the motor)	–	×	162Fh	00
P046	DeviceNet default connection path	0-7	–	×	1630h	1
P048	Inverter action on communication idle mode	00 (tripping), 01 (tripping after decelerating and stopping the motor), 02 (ignoring errors), 03 (stopping the motor after free-running), 04 (decelerating and stopping the motor)	–	×	1632h	00
P049	Motor poles setting for RPM	0 (0 pole), 1 (2 poles), 2 (4 poles), 3 (6 poles), 4 (8 poles), 5 (10 poles), 6 (12 poles), 7 (14 poles), 8 (16 poles), 9 (18 poles), 10 (20 poles), 11 (22 poles), 12 (24 poles),13 (26 poles),14 (28 poles), 15 (30 poles), 16 (32 poles),17 (34 poles), 18 (36 poles), 19 (38 poles)	–	×	1633h	0
P055	Pulse train frequency scale	10 to 320 (input frequency corresponding to the allowable maximum frequency)	0.1 [kHz]	×	1639h	1.5
P056	Time constant of pulse train frequency filter	1 to 200	0.01 sec.	×	163Ah	0.10

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No	Default
P057	Pulse train frequency bias	-100 to +100	1 [%]	×	163Bh	0
P058	Pulse train frequency limit	0 to 100	1 [%]	×	163Ch	100
P060 (32-bits)	Multistage position 0	P073 to P072	1	✓	163Eh	0
					163Fh	
P061 (32-bits)	Multistage position 1	P073 to P072	1	✓	1640h	0
					1641h	
P062 (32-bits)	Multistage position 2	P073 to P072	1	✓	1642h	0
					1643h	
P063 (32-bits)	Multistage position 3	P073 to P072	1	✓	1644h	0
					1645h	
P064 (32-bits)	Multistage position 4	P073 to P072	1	✓	1646h	0
					1647h	
P065 (32-bits)	Multistage position 5	P073 to P072	1	✓	1648h	0
					1649h	
P066 (32-bits)	Multistage position 6	P073 to P072	1	✓	164Ah	0
					164Bh	
P067 (32-bits)	Multistage position 7	P073 to P072	1	✓	164Ch	0
					164Dh	
P068	Homing mode selection	00(Low) / 01(High)	-	✓	164Eh	00
P069	Homing direction	00(FW) / 01(RV)	-	✓	164Fh	01
P070	Low-speed homing frequency	0 to 1000	-	✓	1650h	5.00
P071	High-speed homing frequency	0 to 40000	-	✓	1651h	5.00
P072 (32-bits)	Position range (forward)	0 to 268435455	1	✓	1652h	+26843
					1653h	5455
P073 (32-bits)	Position range (reverse)	-268435455 to 0	1	✓	1654h	-26843
					1655h	5455
P075	Positioning mode	00…With limitation 01…No limitation (fastest control)		×	1657h	00
P077	Encoder disconnection timeout	0 to 100	0.1[sec.]	×	1659h	1.0
P100	Drive programing user parameter U (00)	0 to 65530	1	✓	1666h	0
P101	Drive programing user parameter U (01)	0 to65530	1	✓	1667h	0
P102	Drive programing user parameter U (02)	0 to 65530	1	✓	1668h	0
P103	Drive programing user parameter U (03)	0 to 65530	1	✓	1669h	0
P104	Drive programing user parameter U (04)	0 to 65530	1	✓	166Ah	0
P105	Drive programing user parameter U (05)	0 to 65530	1	✓	166Bh	0
P106	Drive programing user parameter U (06)	0 to 65530	1	✓	166Ch	0
P107	Drive programing user parameter U (07)	0 to 65530	1	✓	166Dh	0
P108	Drive programing user parameter U (08)	0 to 65530	1	✓	166Eh	0
P109	Drive programing user parameter U (09)	0 to 65530	1	✓	166Fh	0
P110	Drive programing user parameter U (10)	0 to 65530	1	✓	1670h	0
P111	Drive programing user parameter U (11)	0 to 65530	1	✓	1671h	0
P112	Drive programing user parameter U (12)	0 to 65530	1	✓	1672h	0
P113	Drive programing user parameter U (13)	0 to 65530	1	✓	1673h	0
P114	Drive programing user parameter U (14)	0 to 65530	1	✓	1674h	0
P115	Drive programing user parameter U (15)	0 to 65530	1	✓	1675h	0
P116	Drive programing user parameter U (16)	0 to 65530	1	✓	1676h	0
P117	Drive programing user parameter U (17)	0 to 65530	1	✓	1677h	0
P118	Drive programing user parameter U (18)	0 to 65530	1	✓	1678h	0
P119	Drive programing user parameter U (19)	0 to 65530	1	✓	1679h	0
P120	Drive programing user parameter U (20)	0 to 65530	1	✓	167Ah	0
P121	Drive programing user parameter U (21)	0 to 65530	1	✓	167Bh	0
P122	Drive programing user parameter U (22)	0 to 65530	1	✓	167Ch	0
P123	Drive programingQ user parameter U (23)	0 to 65530	1	✓	167Dh	0
P124	Drive programing user parameter U (24)	0 to 65530	1	✓	167Eh	0
P125	Drive programing user parameter U (25)	0 to 65530	1	✓	167Fh	0
P126	Drive programing user parameter U (26)	0 to 65530		✓	1680h	0
P127	Drive programing user parameter U (27)	0 to 65530		✓	1681h	0
P128	Drive programing user parameter U (28)	0 to 65530	1	✓	1682h	0
P129	Drive programing user parameter U (29)	0 to 65530	1	✓	1683h	0
P130	Drive programing user parameter U (30)	0 to 65530	1	✓	1684h	0
P131	Drive programing user parameter U (31)	0 to 65530	1	✓	1685h	0
P140	EzCOM number of data	1 to 5	-	✓	168Eh	5
P141	EzCOM destination 1 adderss	1 to 247	-	✓	168Fh	1
P142	EzCOM destination 1 register	0000 to FFFF	-	✓	1690h	0000
P143	EzCOM source 1 register	0000 to FFFF	-	✓	1691h	0000
P144	EzCOM destination 2 adderss	1 to 247	-	✓	1692h	2
P145	EzCOM destination 2 register	0000 to FFFF	-	✓	1693h	0000
P146	EzCOM source 2 register	0000 to FFFF	-	✓	1694h	0000
P147	EzCOM destination 3 adderss	1 to 247	-	✓	1695h	3
P148	EzCOM destination 3 register	0000 to FFFF	-	✓	1696h	0000
P149	EzCOM source 3 register	0000 to FFFF	-	✓	1697h	0000
P150	EzCOM destination 4 adderss	1 to 247	-	✓	1698h	4
P151	EzCOM destination 4 register	0000 to FFFF	-	✓	1699h	0000
P152	EzCOM source 4 register	0000 to FFFF	-	✓	169Ah	0000
P153	EzCOM destination 5 adderss	1 to 247	-	✓	169Bh	5
P154	EzCOM destination 5 register	0000 to FFFF	-	✓	169Ch	0000
P155	EzCOM source 5 register	0000 to FFFF	-	✓	169Dh	0000
P160	Option I/F command register to write 1	0000 to FFFF	–	✓	16A2h	0000

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No	Default
P161	Option I/F command register to write 2	0000 to FFFF	–	✓	16A3h	0000
P162	Option I/F command register to write 3	0000 to FFFF	–	✓	16A4h	0000
P163	Option I/F command register to write 4	0000 to FFFF	–	✓	16A5h	0000
P164	Option I/F command register to write 5	0000 to FFFF	–	✓	16A6h	0000
P165	Option I/F command register to write 6	0000 to FFFF	–	✓	16A7h	0000
P166	Option I/F command register to write 7	0000 to FFFF	–	✓	16A8h	0000
P167	Option I/F command register to write 8	0000 to FFFF	–	✓	16A9h	0000
P168	Option I/F command register to write 9	0000 to FFFF	–	✓	16AAh	0000
P169	Option I/F command register to write 10	0000 to FFFF	–	✓	16ABh	0000
P170	Option I/F command register to read 1	0000 to FFFF	–	✓	16ACh	0000
P171	Option I/F command register to read 2	0000 to FFFF	–	✓	16ADh	0000
P172	Option I/F command register to read 3	0000 to FFFF	–	✓	16AEh	0000
P173	Option I/F command register to read 4	0000 to FFFF	–	✓	16AFh	0000
P174	Option I/F command register to read 5	0000 to FFFF	–	✓	16B0h	0000
P175	Option I/F command register to read 6	0000 to FFFF	–	✓	16B1h	0000
P176	Option I/F command register to read 7	0000 to FFFF	–	✓	16B2h	0000
P177	Option I/F command register to read 8	0000 to FFFF	–	✓	16B3h	0000
P178	Option I/F command register to read 9	0000 to FFFF	–	✓	16B4h	0000
P179	Option I/F command register to read 10	0000 to FFFF	–	✓	16B5h	0000
P180	Profibus Node address	0 to 125	–	×	16B6h	0
P181	Profibus Clear Node address	00(clear)/01(not clear)	–	×	16B7h	00
P182	Profibus Map selection	00(PPO)/01(Comvertional)	–	×	16B8h	00
P190	CompoNet Node address	0 to 63	–	×	16C0h	0
P192	DeviceNet MAC ID	0 to 63	–	×	16C2h	63
P195	ML2 frame length	00 (32 byte) / 01 (17 byte)	-	×	16C5h	00
P196	ML2 Node address	21 - 3E	-	×	16C6h	21

4.7 Parameter group F

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
F001 (32-bits)	Output frequency	0.00 to 400.00	0.01 [Hz]	✓	0001h 0002h	6.00
F002 (32-bits)	Acceleration time (1)	0.01 to 3600.00	0.01 [s]	✓	1103h 1104h	10.00
F003(32-bits)	Deceleration time (1)	0.01 to 3600.00	0.01 [s]	✓	1105h 1106h	10.00
F004	Keypad Run key routing	00: Forward, 01:Reverse	–	×	1107h	00

4.8 Parameter group U: User parameters

Any function code can be register on these 32 parameters. When display mode is set be “user parameter” only U001 to U032 plus d001, F001, b037 are displayed.

Function code	Function name	Monitoring and setting items	Units	Run mode edit	Modbus Register No.	Default
U001	Usesr parameter 1	“no”, d001 - P183	-	✓	-	no
...	....	....	-	✓	-	no
U032	User parameter 32	“no”, d001 - P183	-	✓	-	no