MV160 Series Universal Drive

Quick Start and Installation Manual

Document Version:	V1.0
Archive Date:	2018/07/27
BOM Code:	R33010454

Shenzhen Kaidechang Electronic Technology Co., Ltd.

Address: Room 309, Wutong Space, No. 2123, Bixin Road, Longgang District, Shenzhen, China

Email: 3176708292@ qq.com

13265873957@163.com

Tel: +86-13265873957

+86-18123659512

http://www.huoerxin.com

Foreword

Thank you for choosing the MV160 series universal drive of Shenzhen Megmeet Drive Technology Co., Ltd. MV160 drive with a new hardware design platform that integrates V / F and vector control without PG control mode, provide excellent motor driving performance, this series of drive with excellent performance, perfect functions, compact structure, convenient installation, simple debugging, easy maintenance, is the cost-effective products for drive generic and OEM markets.

The relevant precautions during the installation, wiring, parameter setting and troubleshooting will be detailed in this manual. To ensure the correct installation and operation of the MV160 series drive as well as its high performance, please read carefully this user manual before installing the equipment. This manual shall be kept properly and delivered to the actual users of the drive.

Safety Precautions

DANGER	Operation without following instructions can cause death or severe personal injury.
WARNING	Operation without following instructions can cause medium or slight personal injury or damage to the product and other equipment.

DANGER

- Please install the product on the incombustible materials (e.g., metal), do not place any combustible material near the product, otherwise, fire may be caused.
- Do not install the product in the environment with explosive gas, otherwise, explosion may be caused.
- Only qualified personnel can wire the drive, never wire the drive unless the input AC supply is completely disconnected
- The grounding terminal of the drive must be reliably grounded, do not operate the drive with wet hands, maintaince operation can not be conducted until 10 minutes has passed after disconnecting the power supply, the bare parts of the terminal lugs in the main circuit must be wrapped with insulation tape, otherwise, electric shock may be caused.
- When powering up the drive that has been stored for over 2 years, the input voltage must be gradually increased with the voltage regulator, otherwise, electric shock and explosion may be caused.
- Only qualified personnel can replace the components. Do not leave any wire or metal parts inside the drive, otherwise, fire may be caused.
- After changing the control board, the parameters must be properly set before operating the drive, otherwise, property damage may be caused.

⚠ WARNING

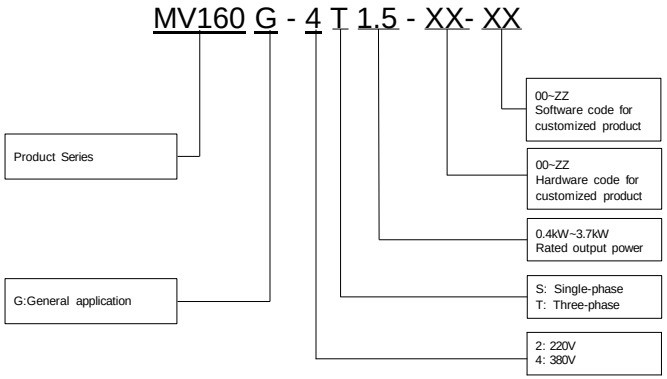
- Do not install the drive in the environment with water splash (e.g., near the water pipe), otherwise, you may suffer the property loss.
- Do not install and operate the drive if it is damaged or its components are not complete, otherwise, fire and human injury may be caused.
- Do not install the product in the place exposed to direct sunlight, otherwise, property damage may be caused.
- Do not short circuit terminal PB and terminal +DC, otherwise, fire and property damage may be caused.
- Cable lugs must be firmly connected to the terminals of main circuit, otherwise, property damage may be caused.
- Do not connect AC 220V input to the control terminals other than terminal TA, TB, TC, otherwise, property damage may be caused.

Contents

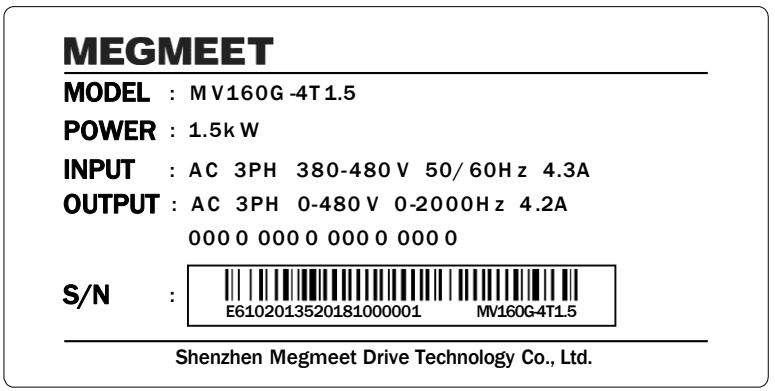
Chapter 1 Introduction of MV160 Drive

1.1 Product model and nameplate

Product model



Product nameplate



1.2 Technical specifications of product

Various series power specifications

Table 1-1 Three-phase 380V series power specifications

Three-phase 380V series					
Drive model		MV160G-4T0.75	MV160G-4T1.5	MV160G-4T2.2	MV160G-4T3.7
Applicable motor power		0.75kW	1.5kW	2.2kW	3.7kW
Applicable motor power		1HP	2HP	3HP	5HP
Input power	Input current	3.2A	4.3A	7.1A	11.2A
	Rated voltage	Three-phase 380~480V			
	Voltage fluctuation range	±10%(342~528V)			
	Rated frequency	50Hz/60Hz			
	Frequency fluctuation range	±5%(47~63Hz)			
Output	Rated output capacity	2kVA	3.3kVA	4.4kVA	6.8kVA
	Rated output current	2.5A	4.2A	5.5A	8.5A
	Output voltage	0 ~ the corresponding three-phase input voltage, the error is less than ± 3%			
	Output frequency range	V/F: 0.0~2000.0Hz (unit: 0.1Hz); vector control: 0~650.0Hz			
	Carrier frequency	0.7~15kHz			
	Overload capacity	1 min for 150% rated current, 3s for 180% rated current, 1s for 200% rated current			
Cooling mode		Forced air cooling			

Table 1-2 Single-phase 220V series power specifications

Single-phase 220V series					
Drive model		MV160G-2S0.4	MV160G-2S0.75	MV160G-2S1.5	MV160G-2S2.2
Applicable motor power		0.4kW	0.75kW	1.5kW	2.2kW
Applicable motor power		0.5HP	1HP	2HP	3HP
Input	Input current	6.5A	9.7A	15.4A	24A

power	Rated voltage	Single-phase 200~240V			
	Voltage fluctuation range	±10%(180~264V)			
	Rated frequency	50Hz/60Hz			
	Frequency fluctuation range	±5%(47~63Hz)			
Output	Rated output capacity	1kVA	1.6kVA	2.9kVA	4.2kVA
	Rated output current	2.5A	4.2A	7.5A	11A
	Output voltage	0 ~ the corresponding three-phase input voltage, the error is less than ± 3%			
	Output frequency range	V/F: 0.0~2000.0Hz (unit: 0.1Hz); vector control: 0~650.0Hz			
	Carrier frequency	0.7~15kHz			
	Overload capacity	1 min for 150% rated current, 3s for 180% rated current, 1s for 200% rated current			
Cooling mode		Forced air cooling			

Control Specifications

Table 1-3 Control Specifications

Operation control features	Control mode	Vector control without PG, V/F control without PG
	Maximum output frequency	2000.0Hz for V/F control, 650.0Hz for vector control
	Speed adjusting range	1: 100
	Speed control precision	±0.5%
	Speed fluctuation	±0.3%
	Startup torque	150% @ 0.5Hz
Product functions	Key functions	Torque limit, multi-stage speed operation, auto-tuning, skip frequency operation, PID adjustment, non-stop upon instantaneous power interruption, switching of multi-command, MODBUS communication, automatic restart, DC braking, dynamic braking, dwell function
	Basic frequency	0.1Hz~2000.0Hz
	Startup frequency	0.0Hz~60.0Hz
	Frequency setting mode	Digital panel setting, terminal UP/DN setting, host device communication setting, analog setting (AI1/AI2/), terminal pulse setting
	Acceleration/deceleration time	0.1~3600.0 (unit can be selected among 0.1s, s and min)
	Dynamic braking capacity	Built-in braking unit, braking rate 0.0~100.0%
	DC braking capacity	Initial frequency: 0.0Hz~60.0Hz Braking time: 0.1s~30.0s Braking current: 0%~100%
Protection function	Overcurrent, overvoltage, undervoltage , overheat , overload protection, etc.	
Others	Efficiency	≥93%
	Installation method	Wall-mounted
	Protection degree	IP20
	Cooling mode	Air cooling
Environment	Operating site	Indoor, away from direct sunlight, free from corrosive gas, combustible gas, oil mist, water vapor, water dripping or salt
	Altitude	Used at the place lower than 1000m, (derated at the place above 1000m, derated 1% for every increase of 100m)
	Ambient temperature	-10℃~+40℃ (derated when used in the ambient temperature of 40℃~50℃)
	Humidity	5%~95%RH, non-condensing
	Vibration	less than 5.9m/s2(0.6g)
	Storage temperature	-40℃~+70℃

1.3 Outline, mounting dimensions and gross weight of drive

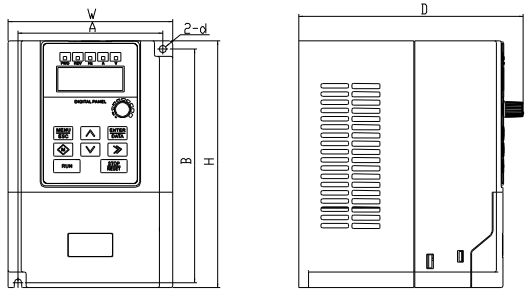


Fig. 1-1 Outline, mounting dimensions for products

Table 1-4 Outline, mounting dimensions and gross weight

Enclosure model	A(mm)	B(mm)	H(mm)	W(mm)	D(mm)	Diameter of mounting aperture d(mm)	Gross weight ±0.5 (kg)
R1	88	142	150	100	136	4.5	1.3

Table 1-5 Model list

Series	0.4kW	0.75kW	1.5kW	2.2kW	3.7kW
Three-phase 380V		MV160G-4T0.75	MV160G-4T1.5	MV160G-4T2.2	MV160G-4T3.7
Single-phase 220V	MV160G-2S0.4	MV160G-2S0.75	MV160G-2S 1.5	MV160G-2S2.2	

1.4 Outline and mounting dimensions of operation panel

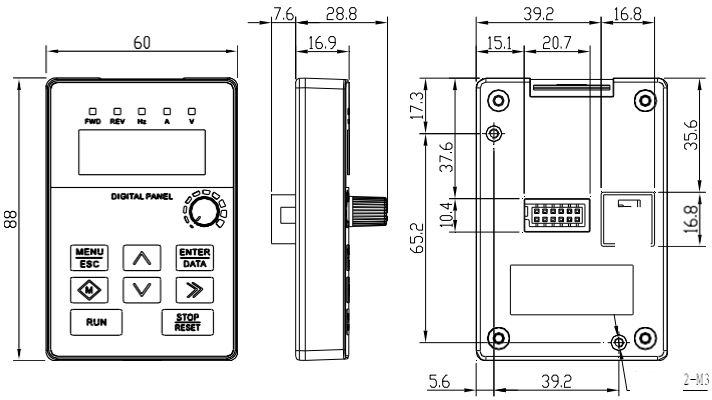


Fig. 1-2 Outline and mounting dimensions of operation panel

1.5 Outline and mounting dimensions of operation panel box

The outline dimensions of the box used for mounting operation panel is as shown in Fig. 1-3.

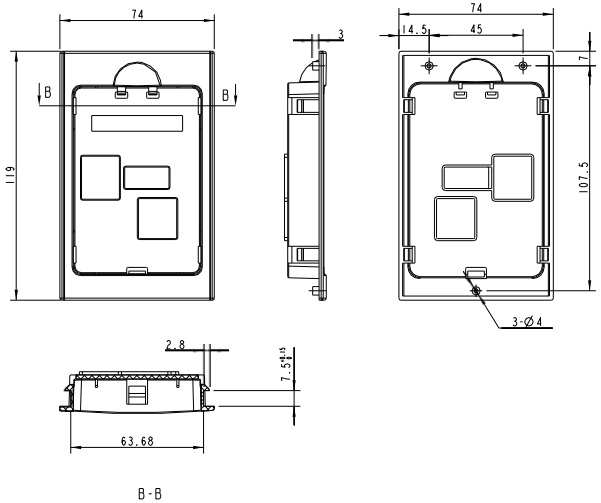


Fig. 1-3 Outline dimensions of operation panel box

The mounting dimensions of the operation panel box is as shown in Fig. 1-4.

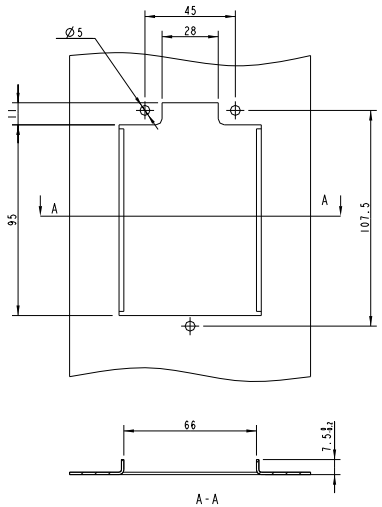
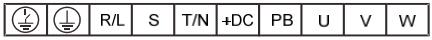


Fig. 1-4 Mounting dimensions of operation panel box

Chapter 2 Wiring of Drive

2.1 Wiring and configuration of main circuit terminals



Terminal	Function
R, S, T / L, N	Three-phase AC 380V/ Single phase AC 220V input terminals
+DC, PB	Reserved terminals for an external braking resistor (configuration information of built-in braking unit refer to Table 2-2)
U, V, W	Three-phase AC output terminals
⏚	Safety grounding terminal
	Safety capacitor (EMC) to ground jumper position, after the leakage circuit breaker is configured, the start jump leakage phenomenon occurs.

Recommended fuse capacity and cross section area of the copper-cored insulation wire

Table 2-1 Recommended fuse capacity and cross section area of the copper-cored insulation wire

Series	Drive model	MCCB circuit breaker (A)	Main circuit (mm^2)				Control circuit (mm^2)
			Input wire	Brake wire	Output wire	Ground wire	
Three-phase 380V	MV160G-4T0.75	10	1.0	1.0	1.0	2.5	1
	MV160G-4T1.5	16	1.5	1.0	1.5	2.5	1
	MV160G-4T2.2	16	1.5	1.5	1.5	2.5	1
	MV160G-4T3.7	25	2.5	1.5	2.5	2.5	1
Single-phase 220V	MV160G-2S0.4	16	1.5	1.0	1.0	2.5	1
	MV160G-2S0.75	20	2.5	1.0	1.0	2.5	1
	MV160G-2S1.5	32	2.5	1.5	2.5	2.5	1
	MV160G-2S2.2	50	4	1.5	2.5	2.5	1

Recommended braking resistor specifications

Braking resistor connected between PB and + DC, the selection is as shown in the following table. The three-phase 380V corresponding model is equipped with a brake unit. When dynamic braking, only the external braking resistor can be used. The single-phase 220V corresponding model does not have a brake unit. If it needs to be equipped with a brake unit, it must be customized through the non-standard process, and the corresponding model is distinguished by the letter B, such as MV160G-2S1.5B.

Table 2-2 Recommended braking resistor specifications and configuration

Series	Drive model	Specification	Utilization (%)	Braking torque (%)	Maximum continuous use time (s)
Three-phase 380V	MV160G-4T0.75	400Ω/300W	10	100	10
	MV160G-4T1.5	300Ω/500W	10	100	10
	MV160G-4T2.2	200Ω/650W	10	100	10
	MV160G-4T3.7	125Ω/1000W	10	100	10
Single-phase 220V	MV160G-2S0.4	150Ω/180W	10	100	10
	MV160G-2S0.75	100Ω/250W	10	100	10
	MV160G-2S1.5	70Ω/400W	10	100	10
	MV160G-2S2.2	50Ω/600W	10	100	10

Wiring for basic operation

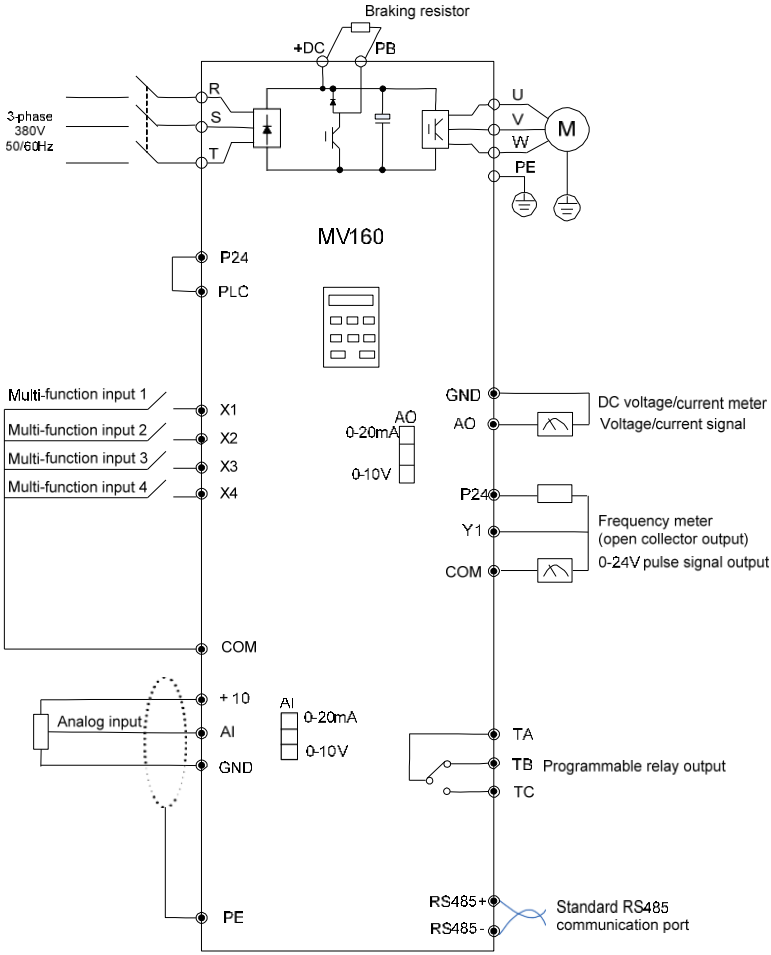


Fig. 2-1 Basic wiring diagram 1

Fig. 2-1 applicable models: Three-phase 380V series

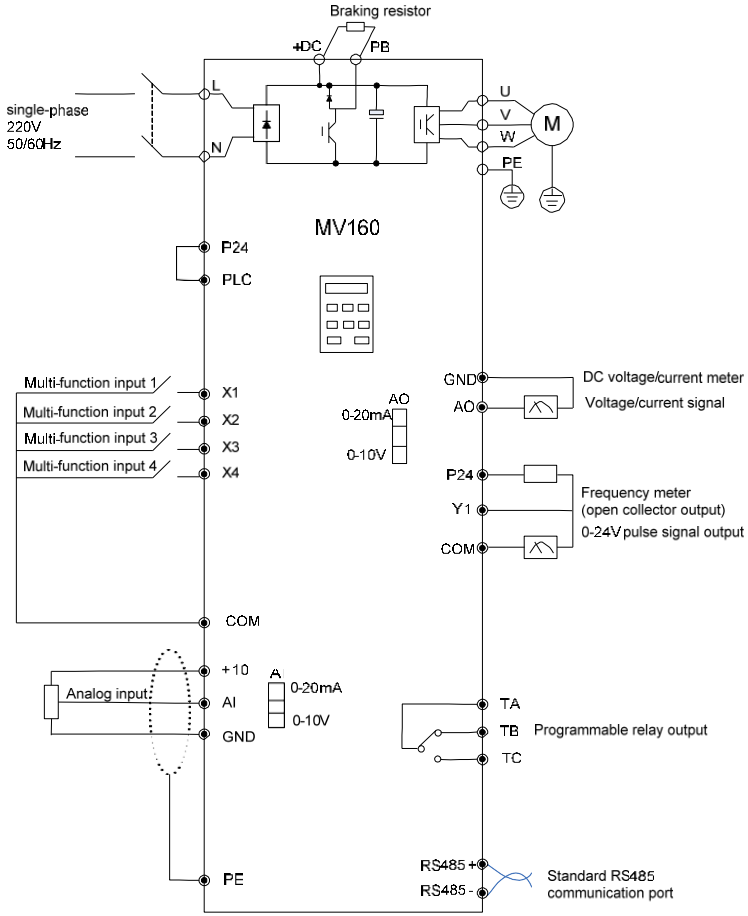


Fig. 2-2 Basic wiring diagram 2

Fig. 2-2 applicable models: single-phase 220V series

Note:"○" in the figure is main circuit terminal and " ◉ " in the figure is control circuit terminal.

2.2 Wiring and configuration of control circuit

The arrangement sequence diagram of the control circuit terminals

+RS485-		GND	X1	X2	X3	X4	TA	TB
AI	AO	+10V	COM	PLC	24V	Y1	COM	TC

Wiring of control circuit terminals

It is suggested to use the wire with cross section area over 1mm^2 as the connecting wire of the control circuit terminals.

Control terminal function

Table 2-3 Control terminal function

Terminal	Function	Specifications and others
GND	The reference ground for +10 V power, analog signals and communication signals	Internal isolated with COM
+10	To provide +10V reference power for external load (reference grounding: GND)	Allowable maximum output current: 10mA
AI	Analog input, voltage/current is selected via the jumper (reference grounding: GND)	Input voltage range:0~10V (input resistance: 20kΩ) Input current range: 0~20mA (input resistance: 489Ω)
AO	Analog output, voltage/current is selected via the jumper (reference grounding: GND)	Voltage output range: 0/2~10V Current output range: 0/4~20mA
+RS485-	RS485 communication interface, differential signal (reference grounding: GND)	"+" Indicates the positive end, "-" indicates the negative end, use twisted pair wire or shielded wire.
COM	The reference ground for 24V power, multi-function input	Internal isolated with GND, CME
P24	To provide +24V power for external load (reference grounding: GND)	Maximum output current: 200mA
X1	Common signal multi-function input, opto-isolated inputs (common terminal: PLC or COM)	Input resistance: R=3.1kΩ Maximum input frequency: 200Hz Input voltage range: 10V~30V
X2		
X3		
X4		
Y1	Open collector output terminal 1 (common terminal: COM)	Opto-isolated output Maximum operating voltage: 30V Maximum output current: 50mA
TA	Relay output	TA-TB: normally closed; TA-TC: normally open Contact capacity: AC 250V/2A（COSΦ＝1） AC 250V/1A（COSΦ＝0.4） DC 30V/1A
TB		
TC		

Chapter 3 Operation Panel

Panel appearance

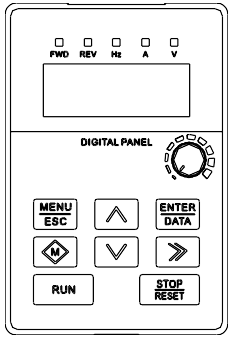


Fig. 3-1 Panel appearance

Panel function description

Table 3-1 Panel function description

Panel structure	Panel function name and description of each part
Keys	MENU/ESC: Program/exit key ∧: Increase key ENTER/DATA: Function/data key M:Multi-functional key ∨: Decrease key 》: Shift key RUN: Run key STOP/RESET: Stop/reset key
Digital tube	Display the function code number and content or other parameters
Potentiometer	Run frequency setting
Status lights	FWD: forward indicator REV: Reverse Indicator
Unit lights	Hz: Frequency Indicator A: Current indicators V:Voltage Indicator

Panel operation example

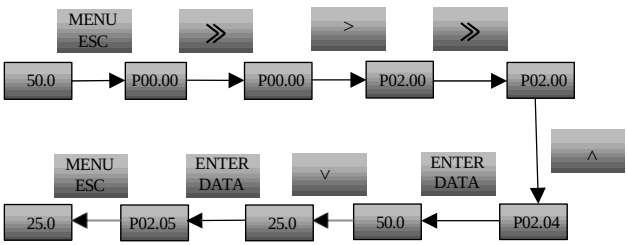


Fig. 3-2 Operation example for setting the set frequency

Chapter 4 Parameter List

Explanation to the terms in the function code parameter table

Table field	Explanation
Function code number	Representing the number of the function code, e.g. P00.00
Function code name	Name of the function code, explaining it
Leave-factory value	The value of the function code after restoring the leave-factory settings
Set range	The minimum and maximum values of the function code allowed to set
Unit	V: voltage; A: current; ℃: temperature; Ω: resistance; mH: inductance; rpm: rotate speed; %: percentage; bps: baud rate; Hz/ kHz: frequency; ms/s/min/h/kh: time; kW: power
Property	○: Means the function code can be changed during running; ×: Means the function code can be changed in the stop state; *: Means the function code can be read only, can not be changed

Basic menu function code parameter table

Function code	Name	Setting range	Default value
Group P00: System management			
P00.00	User password	0: No password Other: Password protection	0
P00.01	Parameter protection	0: All the data can be changed; 1: Only the main set frequency (digital setting P02.04) and this function code can be changed 2: Only this function code can be changed	1
P00.02	Parameter initialization	0: Parameter changing status 1: Clear fault memory information 2: Restore to leave-factory value	0
P00.03	Parameter copy	0: Disabled 1: Uploading parameter 2: Downloading parameters 3: Downloading parameters (except the motor parameters) Note: The drive parameters will not be uploaded/downloaded	0
P00.04	Selection of key functions	Reserved	0100H
P00.05	LED display parameter selection 1 when running	Binary setting: 0: No display; 1: Display Unit place of LED: BIT0: Output frequency (Hz) BIT1: Preset frequency (Hz ,flashing) BIT2: Output current (A) Tens place of LED: BIT0: Running rotating speed (r/min)	007H

		BIT1: Set rotating speed (r/min, flashing) BIT2: Running line speed（m/s） BIT3: Preset line speed (m/s, flashing) Hundreds place of LED: BIT0: Output power BIT1: Output toque (%) Note: the default display shall be output frequency when all the parameters are 0	
P00.06	LED display parameter selection 2 when running	Binary setting: 0: No display; 1: Display Unit place of LED: BIT0: Output voltage (V) BIT1: AI1（V） BIT2: AI2（V） BIT3: Reserved Tens place of LED: BIT0: Analog closed loop feedback (%) BIT1: Analog closed loop reference (%, flashing) BIT2: Terminal status (without unit) BIT3: DC bus voltage	00H
P00.07	LED display parameter selection when stop	Binary setting: 0: No display; 1: Display Unit place of LED: BIT0: Preset frequency (Hz) BIT1: Running speed (r/min) BIT2: Preset speed (r/min) BIT3: DC bus voltage (V) Tens place of LED: BIT0: Running line speed (m/s) BIT1: Preset line speed (m/s) BIT2: Analog closed loop feedback (%) BIT3: Analog closed reference (%) Hundreds place of LED: BIT0: AI1 (V) BIT1: AI2 (V) BIT2: Reserved BIT3: Terminal status (without unit) Note: The default display shall be set frequency when all the parameters are 0	009H
Group P01: Status display parameters			
P01.00	Main reference frequency channel	0: Disabled 1: Digital reference 1: Keyboard ∧∨ reference 2: Digital reference 2: Terminal UP/DN reference 3: Digital reference 3:Serial port communication reference 4: AI analog reference 5: Terminal PULSE reference (Only set for X4, need to be customized)	0

		6: Panel potentiometer reference 7: Process closed loop PID	
P01.01	Main reference set frequency	-2000.00~2000.00Hz	0.0
P01.02	Auxiliary reference set frequency	-2000.00~2000.00Hz	0.0
P01.03	Set frequency	-2000.00~2000.00Hz	0.0
P01.04	Output frequency	-2000.00~2000.00Hz	0.0
P01.05	Output voltage	0~480V	0
P01.06	Output current	0.0~3Ie	0.0
P01.07	Output torque	-300.0~+300.0%	0.0
P01.08	Motor power	0.0%~200.0% (relative to the rated power of the motor)	0.0
P01.09	Bus voltage	0~800V	0
P01.10	Operation state of the drive	0~7FFFH: Bit 0: RUN/STOP Bit 1: REV/FWD Bit 2: Running at zero speed Bit 3: Accelerating Bit 4: Decelerating Bit 5: Running at constant speed Bit 6: Reserved Bit 7: Tuning Bit 8: Over-current limiting Bit 9: DC over-voltage limiting Bit 10: Torque limiting Bit 11: Speed limiting Bit 12: Drive in fault Bit 13: Speed control	0
P01.11	State of digital input terminal	0~FFH, 0: off; 1: on The high-speed pulse reference will not be refreshed synchronously	00
P01.12	State of digital output terminal	0~FH, 0: open; 1: close The high-speed pulse output will not be refreshed synchronously	0
P01.13	AI1 input voltage	0.00~10.00V	0.00
P01.14	Reserved		0.00
P01.15	AO1 output	0.0~100.0% (percentage relative to the full range)	0.0
P01.16	Reserved		0.0
P01.17	Reserved		0.0
P01.18	X4 terminal pulse frequency reference	0.0~100.0kHz	0.0
P01.19	Radiator 1 temperature	-40.0~100.0℃	0.0

P01.20	Accumulated power-on hours	0 ~ maximum 65535 hours	0
P01.21	Accumulated running hours	0 ~ maximum 65535 hours	0
Group P02: Basic parameters			
P02.00	Control mode selection	Induction motor control mode selection 0: Vector control without PG 1: V/F control without PG	1
P02.01	Running command channel selection	0: Keyboard control 1: Terminal control 2: Communication control	0
P02.02	Running direction setting	0: Forward running; 1: Reverse running	0
P02.03	Main reference frequency source selection	0: Digital reference 1: Keyboard ∧∨ reference 1: Digital reference 2: Terminal UP/DN reference 2 : Digital reference 3:Serial port communication reference 3: AI analog reference 4: Terminal PULSE reference 5: Panel potentiometer reference 6: Process closed loop PID	0
P02.04	Digital setting of main reference frequency	P02.13~P02.12	50.00
P02.05	Main & auxiliary reference digital frequency control	Unit place of LED: Main digital frequency saving control 0: Save when power down 1: Do not save when power down Tens place of LED: Main digital frequency control when stop 0: Maintained when stop 1: Reset P02.04 when stop Hundreds place of LED: Reserved Thousands place of LED: Auxiliary digital frequency control when stop 0: Maintained when stop 1: Reset when stop Note: The unit and tens places are only applicable for P02.03=0, 1, 2; hundreds and thousands place are only applicable for P02.06=1, 2, 3.	0000H
P02.06	Auxiliary reference frequency source selection	0: No auxiliary reference 1: Digital reference 1: Keyboard ∧∨ reference 2: Digital reference 2: Terminal UP/DN reference 3: Digital reference 3: Serial port communication reference 4: AI analog reference 5: Terminal PULSE reference 6: Panel potentiometer reference 7: Process closed loop PID	0
P02.07	Auxiliary reference coefficient	0.00~9.99	1.00
P02.08	Main/auxiliary reference	0:+	0

	calculation	1:-	
P02.09	Acceleration time	0.0~3600.0	6.0
P02.10	Deceleration time	0.0~3600.0	6.0
P02.11	Unit of acceleration/deceleration time	0: 0.1s 1: s 2: min	1
P02.12	Maximum output frequency	Upper limit frequency P02.13~ 2000.00Hz	50.00
P02.13	Upper limit frequency	P02.14~P02.12	50.00
P02.14	Lower limit frequency	0.0~P02.13	0.0
P02.15	Upper limit of skip frequency	P02.16~2000.00	0.0
P02.16	Lower limit of skip frequency	0.00~P02.15	0.0
P02.17	Jog acceleration /deceleration time	0.1~60.0s	6.0
P02.18	Reserved		
P02.19	Frequency of jog running	0.1~50.00Hz	5.00
Group P03: Motor parameters			
P03.00	Rated power of motor	0.1~999.9kW	Depending on model
P03.01	Rated voltage of motor	0~ rated voltage of drive (P98.05)	Depending on model
P03.02	Rated current of motor	0.1~999.9A	Depending on model
P03.03	Rated frequency of motor	1.0~2000.00Hz	Depending on model
P03.04	Rated rotating speed of motor	0~60000rpm	Depending on model
P03.05	Power factor of motor	0.001~1.000 It shall be used when calculating the motor parameters with the nameplates	Depending on model
P03.06	Stator resistance of motor %R1	0.00%~50.00%	Depending on model
P03.07	Leakage inductance of motor %X	0.00%~50.00%	Depending on model
P03.08	Rotator resistance of motor %R2	0.00%~50.00%	Depending on model
P03.09	Mutual inductance of motor %Xm	0.0%~2000.0%	Depending on model
P03.10	No-load current (I_o) of motor	0.1~999.9A	Depending on model
P03.11	Overload protection factor of motor	20.0%~110.0% Set action level (%) = motor rated current/ drive rated current × 100	100.0

		Low speed compensation actual action level = set action level × (output frequency/ 30HZ × 45 + +55) Actual converted current of overload protection = sampling current/overload protection action level	
P03.12	Parameter auto-tuning	0: Disabled 1: Enabled (motor in static status) 2: Enabled (motor in rotate status) 3: Reserved (according to the nameplate setting)	0
P03.13~ P03.15	Reserved		
Group P05: Vector and torque control parameters			
P05.00	Speed loop low-speed proportional gain (ASR1-P)	0.1~200.0	20.0
P05.01	Speed loop low-speed integral time （ASR1-I）	0.000~10.000S	0.200s
P05.02	ASR switching frequency 1	0.0%~50.0%	10.0%
P05.03	Speed loop high-speed proportional gain （ASR2-P）	0.1~200.0	10.0
P05.04	Speed loop high-speed integral time (ASR2-I)	0.000~10.000S	0.600s
P05.05	ASR switching frequency 2	0.0%~100.0%	20.0%
P05.06	Speed/torque control mode	0: Speed control mode 1: Torque control mode	0
P05.07	Torque reference selection	0: Digital reference 1: AI reference 2: Terminal PULSE reference 3: Communication reference 4: Closed loop output 5: PLC card or bus reference (reserved)	0
P05.08	Digital reference of torque	-300.0%~300.0%	0.0%
P05.09	Electric torque limit value	0.0%~+300.0%	180.0%
P05.10	Braking torque limit value	0.0%~+300.0%	180.0%
P05.11	FWD speed limit value	0.0%~+100.0%	100.0%
P05.12	REV speed limit value	0.0%~+100.0%	100.0%
Group P07: VF control parameters			
P07.00	Motor V/F curve setting	0: User-customized V/F curve 1: 2 times power curve 2: 1.7 times power curve 3: 1.2 times power curve	0
P07.01	Motor V/F frequency 3	P07.03~P02.12	0.0

P07.02	Motor V/F voltage 3	P07.04~100.0%	0.0
P07.03	Motor V/F frequency 2	P07.05~P07.01	0.0
P07.04	Motor V/F voltage 2	P07.06~P07.02	0.0
P07.05	Motor V/F frequency 1	0.0~P07.03	0.0
P07.06	Motor V/F voltage 1	0.0~P07.04	0.0
P07.07	Motor torque increase	0.0%~30.0%	0.0
P07.08	Motor torque increase cut-off point	0.0%~50.0% (corresponds to P03.03)	10.0
P07.09	Motor stable factor	0~255	10
P07.10	AVR function	0: Disabled 1: Always enabled 2: Disabled only in deceleration situation	2
Group P08: Start and stop control parameters			
P08.00	Startup mode	0: Start from the startup frequency 1: Start from the startup frequency after braking	0
P08.01	Startup delay time	0.00~30.00s	0.0
P08.02	Startup frequency	0.0~MIN (P02.13, 60.00)	0.0
P08.03	Startup frequency retention time	0.00~10.00s	0.00
P08.04	Startup DC braking current	5.0% ~ 100.0% of the rated current of the drive	0.0
P08.05	Startup DC braking time	0.00 (Disabled) 0.01~30.00s	0.00
P08.06	Stop mode	0: Decelerate to stop 1: Coast to stop 2: Decelerate to stop + DC braking	0
P08.07	Stop frequency detection	0.0~150.0Hz	0.5
P08.08	Stop frequency detection retention time	0.00~10.00s	0.00
P08.09	Stop speed detection mode	0: Speed set value (the only one detection mode under the V/F mode) 1: Speed detection value	1
P08.10	Stop (dwell) frequency	0.00~150.00Hz	2.00Hz
P08.11	Stop (dwell) frequency retention time	0.00~10.00s	0.00s
P08.12	Initial frequency for stop DC braking	0.0~MIN (P02.13, 60.0)	0.0
P08.13	Waiting time for stop DC braking	0.00~10.00s	0.00
P08.14	Stop DC braking current	20.0% ~ 100.0% of the rated current of the drive	0.0
P08.15	Stop DC braking time	0.0 (Disabled) 0.01~30.00s	0.00
P08.16	Selecting restart function upon power fault	0: Disabled 1: Enabled	0

P08.17	Waiting time for restart upon power fault	0.0~3600.0s	0.0
P08.18	Anti-reverse selection	0: Reverse operation is allowed 1: Reverse operation is prohibited (run at zero frequency upon reverse running command)	0
P08.19	FWD/REV dead- time	0.00~360.00s	0.00s
P08.20	FWD/REV switching mode	0: Switch once over the zero frequency 1: Switch once over the startup frequency	0
P08.21	Use ratio of dynamic braking	0.0~100.0%	0.0
P08.22	Braking startup voltage	380V model: 700 ~ 780V	750
		220V model: 330 ~ 370V	350
P08.23	Deceleration time for emergency stop	0.00~100.00s	0.00s
Group P09: Digital input/output parameters			
P09.00	Function selection of input terminals X1	0: No function 1: Forward running (FWD) 2: Reverse running (REV) 3: External jog forward running control input 4: External jog reverse running control input 5: Three-wire operation control 6: Multi-frequency terminals 1 7: Multi-frequency terminals 2 8: Multi-frequency terminals 3 9: Multi-frequency terminals 4 10~11: Reserved 12: Main reference frequency pulse input (Only set for X4, need to be customized) 13: Auxiliary reference frequency pulse input(Only set for X4, need to be customized) 14: Frequency increase command (UP) 15: Frequency decrease command (DN) 16: External fault normally open input 17: External fault normally closed input 18: External interrupt normally open contact input 19: External interrupt normally closed contact input 20~21: Reserved 22: External reset (RESET) input 23: Coast to stop input (FRS) 24: Reserved 25: Stop DC braking input command 26~28: Reserved 29:Closed-loop disabled 30~33: Reserved 34: Main reference frequency source selection 1 35: Main reference frequency source selection 2	1
P09.01	Function selection of input terminals X2		2
P09.02	Function selection of input terminals X3		0
P09.03	Function selection of input terminals X4		0
P09.04	Reserved		0

		36: Main reference frequency source selection 3 37: Switching main reference frequency to AI 38: Command source selection 1 39: Command source selection 2 40: Switching command to terminal 41: FWD disabled 42: REV disabled 43: Drive running disabled 44: External stop command (it is valid for all the control modes, the device will be stopped in accordance with the current stop mode) 45: Auxiliary reference frequency reset 46: Reserved 48~52: Reserved 54~59: Reserved 60: Emergency stop 61~73: Reserved 74: PID reference frequency pulse input (Only set for X4, need to be customized) 75: PID feedback frequency pulse input (Only set for X4, need to be customized)	
P09.05	FWD/REV running mode setting	0: Two-wire control mode 1 1: Two-wire control mode 2 2: Three-wire running control 1 3: Three-wire running control 2	0
P09.06	Terminal UP/DN acceleration/deceleration rate	0.01~99.99Hz/s	1.00
P09.07	Terminal filtering time	0~500ms	10
P09.08	Maximum input pulse frequency	0.1~100.0kHz	10.0
P09.09	Pulse reference central point selection	0: Without central point 1: With central point, it is (P09.08)/2. It is positive when the frequency is less than the central point frequency 2: With central point, it is (P09.08)/2. It is positive when the frequency is larger than the central point frequency	0
P09.10	Pulse reference filtering time	0.00~10.00s	0.05
P09.11	Input terminal enabled status setting	Binary setting: 0: Normal logical, enabled upon connection 1: Inverted logical, enabled upon disconnection Unit place of LED: BIT0~BIT3: X1~X4 Tens place of LED: BIT0~BIT3:	00H
P09.12	Virtual input terminal	Binary setting:	00H

	setting	0: Disabled 1: Enabled Unit place of LED: BIT0~BIT3: X1~X4 Tens place of LED: BIT0~BIT3:	
P09.13	Output selection of Multi-functional output terminal Y1	0: Open collector output terminal Y1 1: Reserved	0
P09.14	Open collector output terminal Y1	0: Drive in running state signal (RUN) 1: Frequency arrival signal (FAR)	0
P09.15	Reserved	2: Reserved	1
P09.16	Relay R1 output function selection	3: Frequency level detection signal (FDT) 4: Reserved 5: Overload detection signal (OL) 6: Lockout for under-voltage (LU) 7: External fault stop (EXT) 8: Frequency upper limit (FHL) 9: Frequency lower limit (FLL) 10: Drive running at zero-speed 11~14: Reserved 15: Drive ready for running (RDY) 16: Drive fault 17: Host device switch signal 18~19: Reserved 20: Drive FWD/REV indication terminal 21~24: Reserved	15
P09.17	Output terminal enabled status setting	Binary setting: 0: Enabled upon connection 1: Enabled upon disconnection Unit place of LED: BIT0~BIT3:Y1,Y2,R1	0
P09.18	Relay R output delay	0.1~10.0s	0.1
P09.19	Frequency arrival (FAR) detection width	0.0~P02.13	2.5
P09.20	FDT level upper limit	P09.21~P02.13	50.0
P09.21	FDT level lower limit	0.0~P09.20	49.0
P09.22	DO terminal output	0: No function 1: Output frequency 2: Set frequency (0~Maximum output frequency) 3: Output current Iei (0~2 * Iei) 4: Output current Iem (0~2 * Iem) 5: Output torque (0~3 * Tem) 6: Reserved 7: Motor rotating speed (0~Maximum output frequency) 8: Output voltage (0~1.5 * Ve)	0

		9: Adjusted AI1（0~10V/4～20mA） 10: Adjusted AI2（0~10V/4～20mA） 11: Reserved 12: Output power (0~2*Pe) 13~15: Reserved 17: Percentage of host device (0~65535) 18~19: Reserved	
P09.23	Maximum output pulse frequency	0.1~50.0	10.0
P09.24	Pulse output central point selection	0: Without central point 1: With central point It is (P09.23)/2. It is positive when the frequency is less than the central point frequency 2: With central point It is (P09.23)/2. It is positive when the frequency is larger than the central point frequency	0
P09.25	Pulse output filtering time	0.00~10.00s	0.05
Group P10: Analog input/output terminal parameters			
P10.00	Analog input properties	Unit place: AI1 0: Voltage input 1: Current input Tens place: AI2 Reserved	00H
P10.01	Analog AI function selection	Unit place of LED: AI1 function selection 0: No function 1: Main reference frequency setting 2: Auxiliary reference frequency setting 3~7: Reserved 8: Torque command (reference) Tens place of LED: AI2 function selection Reserved	00H
P10.02	AI1 zero offset	-100.0%~100.0%	0.0
P10.03	Reserved		
P10.04	AI1 filtering	0.000~10.000s	0.010
P10.05	Reserved		
P10.06	Reserved		
P10.07	Reserved		
P10.08	Reserved		
P10.09	Reserved		
P10.10	Curve selection	Unit place of LED: AI1 curve selection 0: Curve 1 1: Curve 2 Tens place of LED: AI2 curve selection Reserved	000H

		Hundreds place of LED: Pulse input curve selection 0: Curve 1 1: Curve 2	
P10.11	Maximum reference of curve 1	P10.13~100.0%	100.0
P10.12	Actual value corresponds to the maximum reference of curve 1	Frequency reference: 0.0~100.0% of Fmax Process closed loop reference: synchronous speed of 0.0~100.0% maximum frequency (ie., the corresponding analog input of 0~10V)	100.0
P10.13	Minimum reference of curve 1	0.0%~P10.11	0.0
P10.14	Actual value corresponds to the minimum reference of curve 1	The same as P10.12	0.0
P10.15	Maximum reference of curve 2	P10.17~100.0%	100.0
P10.16	Actual value corresponds to the maximum reference of curve 2	The same as P10.12	100.0
P10.17	Minimum reference of curve 2	0.0%~P10.15	0. 0
P10.18	Actual value corresponds to the minimum reference of curve 2	The same as P10.12	0. 0
P10.19	Types of analog output	Unit place of LED: AO1 selection 0: 0~10V(0~20mA) 1: 2~10V(4~20mA) Tens place of LED: AO2 selection 0: 0~10V(0~20mA) 1: 2~10V(4~20mA)	00H
P10.20	Analog output terminal AO1 functions	0: Output frequency (0~ maximum frequency) 1: Set frequency (0~ maximum frequency) 2: Set frequency (after acceleration/deceleration) (0~ maximum frequency) 3: Motor rotating speed (0~ maximum rotating speed) 4: Output current (0~2*Ie) 5: Output current (0~2*Iem) 6: Output torque (0~3 * Tem) 7: Reserved 8: Output voltage (0~1.2*Ve) 9: Bus voltage (0~800V) 10: AI1 after adjustment 11: AI2 after adjustment 12: Reserved 13: Output power (0~2*Pe) 14: Percentage of host device (0~4095)	0

P10.21	AO1 filtering	0.000~20.000s	0.010
P10.22	AO1 gain	0.0%~200.0%	100.0
P10.23	AO1 zero offset correction	-100.0%~100.0%	0.0
P10.24	Analog output terminal AO2 functions	Reserved	0
P10.25	AO2 filtering	Reserved	0.010
P10.26	AO2 gain	Reserved	100.0%
P10.27	AO2 zero offset correction	Reserved	0.0
Group P12: Advanced function parameters			
P12.00	Energy-saving running	0: Disabled 1: Enabled	0
P12.01	Carrier wave frequency	0.7~15.0kHz	8.0
P12.02	PWM mode optimization	Unit place: enable the over-modulation 0: Disabled 1: Enabled Tens place: automatic adjustment selection for carrier wave frequency 0: No automatic adjustment 1: Automatic adjustment Hundreds place: modulation mode 0: Two-phase/ three-phase switching 1: Three-phase modulation Thousands place: low frequency carrier limit 0: Disable 1: Enable	1001H
P12.03	Current loop proportional gain ACR-P	1~5000	100
P12.04	Current loop integral time ACR-I	0.5~100.0ms	8.0
P12.05	Anti-trip function enabling	0~1	0
P12.06	Frequency reduction rate upon voltage compensation	0.00~99.99Hz/s	10.00
P12.07	Pre-magnetizing time	0.0~10.0s	0.1
P12.08	Minimum flux reference value	10%~150%	10
P12.09	Flux-weakening adjustment coefficient 1	0~30000	1000
P12.10	Flux-weakening adjustment coefficient 2	0~30000	1000
P12.11	Flux-weakening control mode	0~1	1
P12.12	Fan control	0: Operate automatically 1: Fan operates continually during power-up 2: Fan operates based on command	2

P12.13 ~P12.15	Reserved		
Group P13: Multi-stage speed parameters			
P13.00	Multi-stage frequency 1	P02.13~P02.12	5.00
P13.01	Multi-stage frequency 2		10.00
P13.02	Multi-stage frequency 3		20.00
P13.03	Multi-stage frequency 4		30.00
P13.04	Multi-stage frequency 5		40.00
P13.05	Multi-stage frequency 6		45.00
P13.06	Multi-stage frequency 7		50.00
P13.07	Multi-stage frequency 8		5.00
P13.08	Multi-stage frequency 9		10.00
P13.09	Multi-stage frequency 10		20.00
P13.10	Multi-stage frequency 11		30.00
P13.11	Multi-stage frequency 12		40.00
P13.12	Multi-stage frequency 13		45.00
P13.13	Multi-stage frequency 14		50.00
P13.14	Multi-stage frequency 15		50.00
Group P14: Process PID parameters			
P14.00	Reference channel selection	0: Digital reference 1: Reserved 2: Reserved 3: Terminal PULSE reference 4: Serial port communication reference	0
P14.01	Feedback channel selection	0: AI1 analog reference 1: Reserved 2: Reserved 3: Reserved 4: Reserved 5: Reserved 6: Terminal PULSE reference	0
P14.02	PID digital reference	-100.0%~100.0%	0.0
P14.03	PID command acceleration/deceleration time	0~3600.0s	0.0
P14.04	PID adjustment feature selection	0: Positive interaction 1: Reverse interaction	0
P14.05	Proportional gain KP	0.000~10.000	0.500
P14.06	Integral gain Ki	0.000~10.000	0.008
P14.07	Differential gain Kd	0.000~10.000	0.000
P14.08	Integral separation threshold	0.0~100.0%	30.0%

P14.09	Integral amplitude limit	0.0~100.0%	100.0%
P14.10	Differential control selection	0: Apply differential control to deviation 1: Apply differential control to feedback value	0
P14.11	Differential amplitude limit	0.0~100.0%	10.0%
P14.12	Sampling cycle	0.001~50.000s	0.010s
P14.13	Deviation limit	0.0~20.0%	2.0%
P14.14	PID upper limit channel	0: P14.16 digital reference 1:AI1 2: Reserved 3: Reserved	0.0
P14.15	PID lower limit channel	0: P14.17 digital reference 1:AI1 2: Reserved 3: Reserved	0
P14.16	PID upper limit digital setting	P14.17~100.0%	0
P14.17	PID lower limit digital setting	0.0%~ P14.16	0.0
P14.18	Output filtering time	0.000~10.000s	0.010
P14.19	PID output feature selection	0: PID output is positive 1: PID output is negative	0
P14.20	PID offset value	-100.0~100.0%	0.0%
P14.21	PID output gain	0.0~250.0	1.0
P14.22	REV selection of PID output	0: When the PID output is a negative value, there is no limit 1: When the PID output is a negative value, the output is negative	1
P14.23	PID pre-set frequency	0.00~3000.00Hz	0.00
P14.24	PID pre-set frequency retention time	0.0~3600.0s	0.0
P14.25	PID fault detection selection	Unit place: PID feedbacks fault detection selection 0: Continue to run, no alarm 1: Continue to run and display “AL.FbL” (feedback lost) or “AL.Fbo” (feedback exceeding limit) 2: Coast to stop and display “Er.FbL” (feedback lost) or “Er.Fbo” (feedback exceeding limit) Tens place: PID limit setting error processing selection 0: Continue to run, no alarm 1: Continue to run and display “AL.PIL” 2: Coast to stop and display “Er.PIL”	00
P14.26	PID feedback lost detection value	0.0~100.0%	0.0%
P14.27	PID feedback lost detection time	0.0s~25.0s	1.0
P14.28	PID feedback exceeding limit detection value	0.0~100.0%	100.0%

P14.29	PID feedback exceeding limit detection time	0.0s~25.0s	1.0
Group P15: Communication parameters			
P15.00	Protocol selection	0: MODBUS 1: Reserved	0
P15.01	Communication configuration	Unit place of LED: Baud rate selection 0: 4800bps 1: 9600 bps 2: 19200 bps 3: 38400 bps Tens place of LED: Data format 0: 1-8-2-N format, RTU 1: 1-8-1-E format, RTU 2: 1-8-1-O format, RTU 3: 1-8-1-N format, RTU Hundreds place of LED: Wiring mode 0: Direct cabling (232/485) 1: MODEM (232)	001H
P15.02	Local address	0~247, 0 is the broadcast address	5
P15.03	Communication timeout detection time	0.0~1000.0s	0.0
P15.04	Response delay of the drive	0~1000ms	5
Group P97: Protection and fault parameters			
P97.00	Protection action selection 1	Unit place of LED: Action upon communication fault 0: Activate protection and coast to stop 1: Alarm and keep running 2: Alarm and stop in the stop mode (only in serial port control mode) 3: Alarm and stop in the stop mode (in all control modes) Tens place of LED: Action upon contactor abnormality 0: Activate protection and coast to stop 1: Alarm and keep running Hundreds place of LED: Action upon EEPROM abnormality 0: Activate protection and coast to stop 1: Alarm and keep running Thousands place of LED: Action upon 24V/10V short circuit 0: Activate protection and coast to stop 1: Alarm and keep running	0000H
P97.01	Protection action selection 2	Unit place of LED: Action upon phase loss 0: Activate protection upon input and output phase loss 1: No protection upon input phase loss 2: No protection upon output phase loss 3: No protection upon input and output phase loss Tens place of LED: Action upon analog input (AI1, AI2) fault 0 : Activate protection and decelerate	00H

		1 : Activate protection and coast to stop 2 : Alarm and keep running	
P97.02	Fault indication selection 1	Unit place of LED: Action upon under-voltage fault indication 1 : No action 2 : Action (under-voltage is regarded as a kind of fault) Tens place of LED: Action upon auto-reset interval fault indication 1 : No action 2 : Action Hundreds place of LED: Fault lockup function selection 1 : Prohibited 2 : Open (without fault output) 3 : Open (with fault output)	000H
P97.03	Overload protection setting for motor	Unit place of LED: Overload compensation mode 0: No action 1: Common motor (with low-speed compensation) 2: Variable-frequency motor (without low-speed compensation) Tens place of LED: Overload pre-alarm detection selection 0: Always detect 1: Detect only at constant speed Hundreds place of LED: Overload pre-alarm action selection 0: Alarm and keep running 1: Activate protection and coast to stop Thousands place of LED: Overload detection level selection 0: Relative to rated current of the motor (Er.OL2) 1: Relative to rated current of the drive (Er.oL1)	0001H
P97.04	Overload pre-alarm detection level	20.0%~200.0%	130.0
P97.05	Overload pre-alarm detection time	0.0~60.0s	5.0
P97.06	Over-voltage stall selection	0: Disabled (when the braking resistor is installed) 1: Enabled	1
P97.07	Over-voltage point at stall	120.0%~150.0%Udce	140.0%
P97.08	Auto current limiting action selection	0: Disabled at constant speed 1: Enabled at constant speed Note: Always enabled for acceleration/deceleration	0
P97.09	Auto current limiting level	20.0%~200.0%Ie	150.0
P97.10	Frequency reduction rate upon current limiting	0.0~99.99Hz/s	10.00
P97.11~ P97.12	Reserved		
P97.13	The first fault type	0: No abnormal record 1: Over-current during the drive acceleration (Er.oC1) 2: Over-current during the drive deceleration (Er.oC2) 3: Over-current when the drive is running with constant speed (Er.oC3)	0

		4: Over-voltage during the drive acceleration (Er.oU1) 5: Over-voltage during the drive deceleration (Er.oU2) 6: Over-voltage when the drive is running with constant speed (Er.oU3) 7: Reserved 8: Input side phase loss (Er.IrF) 9: Output side phase loss (Er.odF) 10: Power module protection (Er.drv) 11: Inverter bridge over-temperature (Er.oH1) 12: Reserved 13: Drive overload (Er.oL1) 14: Motor overload (Er.oL2) 15: External fault（Er.EFT） 16: EEPROM read-write error (Er.EEP) 17: Abnormal serial port communication (Er.SC1) 18: Abnormal contactor (Er.rLy1) 19: Abnormal current detection circuit (Er.CUr) 20: Reserved 21: PID feedback lost (Er.FbL) 22: Reserved 23: Keyboard parameter copy error (Er.CoP) 24: Poor auto-tuning (Er.TUn) 25~27: Reserved 28: Parameter setting error (Er.PST) 29: Control board 24V power short circuit (Er.24v) 30~40: Reserved 41: Abnormal AI analog input fault (Er.AIF) 42: Inverter module temperature sampling disconnection protection (Er.THI) 43: Reserved 44: Short circuit of 10V power (Er.10v) Others: Reserved Note: 1. Er.drv fault can not be reset until 10s later; 2.For continuous over-current less than 3 times (including 3 times), it can not be reset until 6s later; if it is more than 3 times, it can not be reset until 200s later; 3.The keyboard displays AL.xxx in case of any fault (e.g. in case of the contactor fault, keyboard displays Er.xxx if there is protection action, and displays AL.xxx if continuing running with alarm)	
P97.14	The second fault type	The same as P97.13	0
P97.15	The third fault type	The same as P97.13	0
P97.16	DC bus voltage at the 3rd fault	0~999V	0V
P97.17	Actual current at the 3rd	0.0~999.9A	0.0

	fault		
P97.18	Running frequency at the 3rd fault	0.0~2000.0Hz	0.0
P97.19	Drive running status at the 3rd fault	0~FFFFH	0000
Group P98: Drive parameters			
P98.00	Serial No.	0~FFFFH	Manufacturer setting
P98.01	MCU software version No.	0.00~99.99	Manufacturer setting
P98.02	User-customized version No.	0~9999	Manufacturer setting
P98.03	DSP software version No.	0.00~99.99	Manufacturer setting
P98.04	Rated capacity	Output power, 0~999.9kVA (Depending on model)	Manufacturer setting
P98.05	Rated voltage	0~999V (Depending on model)	Manufacturer setting
P98.06	Rated current	0~999.9A (Depending on model)	Manufacturer setting
P98.07	Drive series selection	0: 220V 1: 380V	Manufacturer setting

Chapter 5 Troubleshooting

Displaying exception and solutions

All possible fault types for MV160 are summarized as shown in table 5-1. Before consulting the service department, the user can perform self-check according to the hints of the table and record the fault symptoms in detail. To seek for service support, please contact the sales person.

Table 5-1 Fault record table

Fault code	Fault type	Possible fault cause	Solutions
Er.oC1	Acceleration over-current of the drive	The acceleration time is too short.	Lengthen the acceleration time
		The motor parameters are incorrect.	Perform the parameter auto-tuning of the motor
		When instantaneous stop happens, restart the rotating motor	Set the start mode P08.00 as the speed tracking restart function
		The drive power is too low.	Adopt the drive with high power class
		V/F curve is improper.	Adjust the V/F curve setting and the manual torque increase
Er.oC2	Deceleration over-current of the drive	The deceleration time is too short.	Lengthen the deceleration time
		There is potential energy load or the load inertial torque is large.	Use additionally appropriate dynamic braking components
		The drive power is low.	Adopt the drive with high power class
Er.oC3	Constant speed over-current of the drive	The acceleration/deceleration time is too short.	Lengthen the acceleration/deceleration time appropriately
		Sudden load change or abnormal load	Check the load
		Low grid voltage	Check the input power supply
		The drive power is low	Adopt the drive with high power class
Er.oU1	Acceleration over-voltage of the drive	Abnormal input voltage	Check the input power supply
		Acceleration time is too short.	Lengthen the acceleration time appropriately
		When instantaneous stop happens, restart the rotating motor	Set the start mode P08.00 as the speed tracking restart function
Er.oU2	Deceleration over-voltage of the drive	The deceleration time is too short (compared with regeneration energy).	Lengthen the deceleration time
		There is potential energy load or the load inertial torque is large.	Select appropriate dynamic braking components
Er.oU3	Constant speed over-voltage of the	When the vector control functions, the ASR parameter setting is	See the ASR parameter setting of Group P05

Fault code	Fault type	Possible fault cause	Solutions
	drive	improper.	
		The acceleration/deceleration time is too short.	Lengthen the acceleration/deceleration time appropriately
		Abnormal input voltage	Check the input power supply
		The input voltage fluctuates abnormally	Install the input reactor
		Large load inertia	Adopt dynamic braking components
Er.IrF	Input side phase loss	There is phase loss in input R.S.T.	Check the installation wiring Check the input voltage
Er.odF	Output side phase loss	There is phase loss in output U.V.W.	Check the output wiring Check the motor and the cables
Er.drv	Power module protection	There is interphase short circuit or grounding short circuit in output three phases.	Rewiring and check if the motor insulation is good.
		Instantaneous over-current of the drive	See the over-current solutions
		The duct is blocked or the fan is damaged.	Unblock the duct or replace the fan
		The ambient temperature is too high.	Lower the ambient temperature
		The wirings or the plug-in units of the control board loosens.	Check them and rewiring
		Abnormal current waveform caused by output phase loss and so on	Check the wiring
		The auxiliary power supply is damaged; the drive voltage is insufficient.	Seek for service support
		Inverter module bridging conduction	Seek for service support
		Abnormal control board	Seek for service support
		Braking pipe damaged	Seek for service support
Er.oH1	Inverter module	The ambient temperature is too high.	Lower the ambient temperature

Fault code	Fault type	Possible fault cause	Solutions
	heatsink over-temperature	The duct is blocked.	Clean the duct
		The fan is damaged.	Replace the fan
		The inverter module is abnormal.	Seek for service support
Er.oL1	Drive overload	The motor parameters are incorrect.	Perform the parameter auto-tuning of the motor
		The load is too large.	Adopt the drive with higher power
		The DC braking amount is too large.	Reduce the DC braking current and lengthen the braking time
		When instantaneous stop happens, restart the rotating motor	Set the start mode P08.00 as the speed tracking restart function
		The acceleration time is too short.	Lengthen the acceleration time
		The grid voltage is too low.	Check the grid voltage
		V/F curve is improper.	Adjust V/F curve and torque increase
Er.oL2	Motor overload	The motor overload protection factor setting is incorrect.	Set the overload protection factor of motor correctly.
		The motor is blocked or the sudden change of load is too large.	Check the load
		The universal motor runs at low speed for a long time, with heavy load.	If long-term low-speed running is required, special motor should be used.
		The grid voltage is too low.	Check the grid voltage
		V/F curve is improper.	Set V/F curve and torque increase correctly
Er.EFT	Emergency stop or external device fault	Stop suddenly by pressing the STOP key	See the function definition of the STOP key in P00.04
		External fault emergency-stop terminal is enabled.	After the external fault is revoked, release the external fault terminal
Er.EEP	EEPROM read/write fault	The read/write error of the control parameters occurs.	Reset by pressing the STOP/RESET key, seek for service support
Er.SC1	Abnormal remote serial port communication	The baud rate is set improperly.	Set the baud rate properly.
		Serial port communication error	Reset by pressing the STOP/RESET key, seek for service support

Fault code	Fault type	Possible fault cause	Solutions
		The fault alarm parameters are set improperly.	Modify the P15.03 and P97.00 settings
		The host device does not work.	Check if the host device is working and if the wiring is correct.
Er.rLy	Abnormal contactor	The grid voltage is too low.	Check the grid voltage
		The contactor is damaged.	Replace the contactor of the main circuit, seek for service support
		The power-up buffer resistance is damaged.	Replace the buffer resistance, seek for service support
		The control circuit is damaged.	Seek for service support
		Input phase loss	Check the input R.S.T. wiring
Er.CUr	Current detection circuit abnormal	Current detection device damage	Seek for service support
		The amplifying circuit is abnormal.	Seek for service support
Er.FbL	Closed loop feedback loss	The parameters for feedback loss are set improperly.	Modify the P14.17 setting
		Feedback wire-break	Rewiring
		The reference of closed loop feedback value is too low.	See the P14.01 setting and increase the feedback reference
Er.CoP	Operation panel parameter copying error	The operation panel parameters are incomplete or the operation panel version is inconsistent with main control panel version.	Refresh the operation panel data and version, use P00.03=1 for uploading the parameters first and then use P00.03=2 or 3 for downloading.
		The operation panel EEPROM is damaged.	Seek for service support
Er.TUn	Poor auto-tuning	The nameplate parameters of the motor are incorrect.	Set the parameters properly according to the motor nameplate
		When reverse running is prohibited, reverse rotating auto-tuning is performed.	Cancel the reverse running prohibition
		Auto-tuning overtime	Check motor wiring
			Check the P02.13 (upper limit frequency) and see whether the P03.03 set value is lower than rated frequency.

Fault code	Fault type	Possible fault cause	Solutions
Er.PST	Parameter setting error	Wrong analog AI function selection setting	The same function shall not be selected for different analogs simultaneously.
Er.24v	Control board 24V power short circuit	Short circuit of P24 and terminal COM	Confirm whether the wiring of P24 and COM is correct
Er.AIF	Abnormal AI analog input	Abnormal control circuit	Seek for service support
		The input analog is out of the range and the absolute value is greater than 11V	Check the analog input
Er.THI	Inverter module temperature sampling disconnection	Abnormal temperature sampling circuit	Seek for service support
		The inverter module temperature sampling wire is poorly connected.	Check the inverter module temperature sampling wire connection
Er.10v	Control board ±10V power short circuit	±10V grounding	Confirm whether the ±10V wiring is correct
		The interface board circuit is damaged.	Replace the interface board, seek for service support

Note:

1. Er.drv fault can not be reset until 10s later;
2.For continuous over-current less than 3 times (including 3 times), it can not be reset until 6s later; if it is more than 3 times, it can not be reset until 200s later;
3.The keyboard displays AL.xxx in case of any fault (e.g. in case of the contactor fault, keyboard displays Er.xxx if there is protection action, and displays AL.xxx if continuing running with alarm).

Appendix 1 Modbus Communication Protocol

1. Networking mode

The drive has two networking modes: single host/multiple slaves mode and single host/single slave mode.

2. Interface mode

RS485 interface: asynchronous and half-duplex. Default: 1-8-N-2, 9600bps, RTU. Refer to Group P15 function code for the parameter setting.

3. Communication mode

1.The communication protocol of the drive is Modbus protocol, which does not only support common register reading and writing, but also expands some commands to manage the drive function codes.

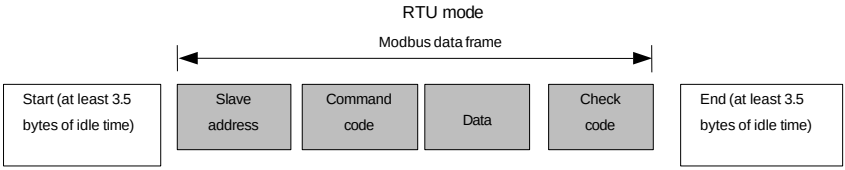
2.The drive is slave, adopting host/salve mode P2P communication. The drive will not response to the command sent by the host via broadcast address.

3.In multiple units communication or long-distance communication, parallel connecting the resistance of 100 to 120 ohms with the positive end and negative end of the communication signal line of the host station can enhance its immunity to interference.

4.MV160 provides RS485 interface only. If the communication interface of the external equipment is RS232, the RS232/RS485 conversion equipment is needed.

4. Protocol format

Modbus protocol supports RTU mode, and the corresponding frame format is as shown in the Attached Fig.1-1.



Attached Fig.1-1 Modbus protocol format

Modbus adopts the ”Big Endian” encoding mode, which sends the high bytes first and then sends the low bytes.

RTU mode

In RTU mode, the larger value between the function code setting value and the Modbus internal convention value shall be selected as the idle time between frames. The minimum idle time value between frames under the Modbus internal convention is as follows: the idle time that the frame head and frame trail pass the bus shall not be less than that of 3.5 bytes to define the frame. The data verification adopts CRC-16 and the verify checksum includes the whole information. The high and low bytes of the checksum can only be sent after their exchanging. Please refer to the example after the protocol for the detailed CRC verification. Please note: At least 3.5

characters of the BUS idle time shall be kept between the frames and it doesn't need to accumulate the start and end idle time.

In the sample below, it is used to read the parameters of the internal register 0101 (P01.01) of No.5 slave in the RTU mode.

Request frame:

Slave address	Command code	Data				Check code	
		Register address		Number of bytes read			
0x05	0x03	0x01	0x01	0x00	0x01	0xD5	0xB2

Response frame:

Slave address	Command code	Data			Check code	
		Number of bytes responded	Register content			
0x05	0x03	0x02	0x13	0x88	0x44	0xD2

In the above table, the check code is the CRC verification value. Please refer to the following text for the computing method of the CRC verification.

5. Protocol functions

The main function of Modbus is reading/writing parameters. Different command codes determine different operation requests. The Modbus protocol of MV160 drive supports the operations as shown in the following table:

Command code	Meaning
0x03	Reading the drive parameters, including function code parameters, control parameters and status parameters.
0x06	Change the single 16-byte function code parameter or control parameter of the drive, and the parameter value will not be saved after power off.
0x08	Line diagnosis.
0x41	Change the single 16-byte function code parameter or control parameter of the drive, and the parameter value will be saved after power off.
0x42	Manage the drive function codes.

All the function code parameters, control parameters and status parameters of the drive are mapped as the read/write registers of Modbus. The read/write features and range of the function code parameter follow the drive user manual. The group number of the drive function code is mapped as the high byte of the register address and the group internal index (i.e. the serial number of the parameter in the group) is mapped as the low byte of the register address. The control parameter and status parameter of the drive are virtual function code groups of the

drive. The correspondence between the group numbers of the function codes and the high bytes of the register address mapped are as shown in the following table:

Drive parameter group	High byte of the address mapped	Drive parameter group	High byte of the address mapped
Group P00	0x00	Group P14	0x0E
Group P01	0x01	Group P15	0x0F
Group P02	0x02	Group P16	0x10
Group P03	0x03	Group P40	0x28
Group P07	0x07	……	……
Group P08	0x08	Group P97	0x61
Group P09	0x09	Group P98	0x62
Group P10	0x0A	Group P99	0x63
Group P11	0x0B	Control parameter group	0x64
Group P12	0x0C	Status parameter group	0x65
Group P13	0x0D	……	……

For example, the register address of the function code parameter P03.02 of the drive is 0x0302, and the register address of the first control parameter (control word 1) is 0x6400.

As the format of the whole data frame has been detailed in the above text, the following text will focus on the format and meanings of the “command code” and “data” of Modbus protocol. These two parts constitute the Modbus application layer protocol data unit. Any reference to application layer protocol data unit to below refers to such two parts. The following introduction to the frame format is based on RTU mode.

1. Read the drive parameters

The application-layer protocol data units are as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x03
Start register address	2	0x0000~0xFFFF
Number of registers	2	0x0001~0x000A

If the operation is successful, the response frame is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x03
Number of bytes read	1	2 * Number of registers

Content read	2 * Number of registers	Parameter value

If the operation fails, it will return to the abnormal response frame. The abnormal response frame includes the error code and exception code. In which, the error code = (command code + 0x80), and the exception code indicates the error cause.

Abnormal response frame format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Error code	1	(Command code + 0x80)
Exception code	1	

The exception codes and their meanings are as follows:

Exception code	Meaning
0x01	Invalid command code
0x02	Invalid register address.
0x03	Data error (the data is not within the upper/lower range).
0x04	Slave operation failure (including the error caused by that the data is within the upper/lower range, but it is invalid).
0x05	The command is valid and in process (It is mainly used to save the data into the nonvolatile memory cell).
0x06	The salve is busy, please try again later. It is mainly used to save the data into the nonvolatile memory cell.
0x16	Operation not supported (mainly refer to the control parameter and status parameter, for example, do not support reading the property, leave-factory value and upper/lower limit)
0x17	The number of registers in the request frame is wrong (for example, when the operation is 32-byte, the number of bytes is odd).
0x18	Information frame error (including information length error and verification error).
0x20	Parameters cannot be changed.
0x21	Parameters cannot be changed during the drive running.
0x22	Password required for parameters.

2. Change the single 16-byte function code parameter and status parameter of the drive, and the parameter values will not be saved after power off.

When this command is used, the parameter value changed will not be saved upon power on after power off.

The application-layer protocol data units are as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x06

Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF

If the operation is successful, the response frame is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x06
Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF

If the operation is failed, it will return to the abnormal response frame and its format is as shown above.

3.Change single 16-byte function code parameters and status parameters of the drive, and the parameter values will be saved after power off. The command code 0x41 is used to change the single 16-byte function code parameters or control parameters of the drive, and store the value into the nonvolatile memory cell. Its command format is the same as that of 0x06. The only difference is as follows: the parameter value changed under the 0x06 command will not be saved upon power off, but the parameter value changed under the 0x41 command will be saved upon power off.

4. Manage the drive function codes

The management of the drive function codes includes reading the upper/lower limit of the parameter, reading the parameter features, reading the maximum group internal index of the function code menu, reading the next/previous function group number, reading current display status parameter index, displaying the next status parameter and reading the factory-leave value of the function code parameter.The parameter features include the read/write features, units and scaling relations of the parameter.

The application-layer protocol data units are as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x42
Sub-command code	2	0x0000~0x0008
Data	2	Depends on the drive type

If the operation is successful, the response frame is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x42
Sub-command code	2	0x0000~0x0008
Data	2 or 4	0x00000000~ 0xFFFFFFFF

If the operation request is failed, the response will be error code and exception code. If the operation is failed, the abnormal response will occur. Please refer to the above text for the abnormal response codes.

The values and meanings of sub-command codes supported by the function code management are as shown in the following table:

Sub-command code	Data (request)	Data (response)	Function
0x0000	The parameter group number and group internal index occupies the high byte and the low byte respectively	The upper limit value of the parameter (4-byte)	Read the upper limit value of the parameter (the status parameter does not support this)
0x0001	The parameter group number and group internal index occupies the high byte and the low byte respectively	The lower limit value of the parameter (4-byte)	Read the lower limit value of the parameter (the status parameter does not support this)
0x0002	The parameter group number and group internal index occupies the high byte and the low byte respectively	Parameter features (refer to the list of parameter features for their detailed meanings)	Read the features of the function code parameter (the control parameter and status parameter do not support this)
0x0003	The parameter group number occupies the high byte and the low byte is “00”.	Number of parameters in this group	Read the number of parameters in this group
0x0004	The parameter group number occupies the high byte and the low byte is “00”.	The high byte is the group number of next parameter group and the low byte is “00”	Read the group number of next parameter group
0x0005	The parameter group number occupies the high byte and the low byte is “00”.	The high byte is the group number of previous parameter group and the low byte is “00”	Read the group number of previous parameter group
0x0006	0x6500	Current status parameter index	Read the current status parameter index (please refer to the definition of the status parameter group for its meaning)
0x0007	0x6500	Next status parameter index	Read the next status parameter (please refer to the definition of the status parameter group for its meaning)
0x0008	The parameter group number and	Leave-factory value of the	Read the leave-factory value of the

Sub-command code	Data (request)	Data (response)	Function
	group internal index occupies the high byte and the low byte respectively	parameter	function code parameter (the control parameter and status parameter do not support this)

In the above table, when reading the upper/lower limit value, the data returned is 32 bits long, i.e. 4 bytes. The status parameter does not support this operation. The upper/lower limit value read here is that may be reached by the corresponding function code parameter. If the value range of the parameter is limited by other function code parameters (i.e. having associated function code parameters), it needs to combine the values of associated function code parameters.

Unless otherwise specified, the length of data of the response frame is 2 bytes.

The length of the function code parameter feature is 2 bytes and its bit definition is as follows:

Bit	Features	Value	Meaning
BIT0	Upper limit	0	Decimal system limit
		1	Hexadecimal system limit
BIT3~BIT1	Decimal point	000	No decimals
		010	One decimal
		010	Two decimals
		011	Three decimals
		100	The step length is 2.
		101	The step length is other value.
		Others	Reserved
BIT5~BIT4	Change properties	00	Actual parameter value, unchangeable
		01	Can be changed in the operation
		10	Cannot be changed in the operation or it is set by the manufacturers, cannot be changed by users
		11	Reserved
BIT8~BIT6	Display unit	000	No unit
		001	The unit is Hz
		010	The unit is A
		011	The unit is V
		100	The unit is r/min

Bit	Features	Value	Meaning
		101	The unit is line speed (m/s)
		110	The unit is percentage (%)
		Others	Reserved
BIT9	Reserved		
BIT10	Restore to leave-factory value	1	Restore
		0	Do not restore
BIT11	Quick menu	1	Enabled
		0	Disabled
BIT12	Basic menu	1	Enabled
		0	Disabled
BIT13	16-bit/32-bit parameter	1	32-bit
		0	16-bit
BIT15~BIT14	Reserved		

6. Control parameters and status parameters of drive

The control parameters of the drive can realize the start, stop, running frequency setting and other functions of the drive. Inquiring the status parameters of the drive can get the parameters like the running frequency, output current and output torque of the drive, etc.

1. Control parameters

The control parameters of the drive are as shown in the following table:

Register address	Parameter name	Save upon power off	Remarks
0x6400	Control word 1	No	Refer to its bit definition list
0x6401	Main reference	No	Main reference frequency; the main reference channel uses serial communication, and whether it can be saved is dependent on the setting of P02.06
0x6402	Running frequency reference	No	Same as above
0x6403	Digital process closed loop reference	Yes	Enabled when the process closed loop is enabled
0x6404	Pulse process closed loop reference (reserved)		

Register address	Parameter name	Save upon power off	Remarks
0x6405	Analog output AO1 setting	No	Enabled when P10.23=14
0x6406	Reserved		
0x6407	Digital output DO setting	No	Enabled when P09.29=17
0x6408	Frequency proportion setting (reserved)		
0x6409	Virtual terminal control setting	No	BIT0~BIT5: X1~X6, the corresponding bit selection and channel of P09.16 is enabled BIT10~BIT12: Y1/Y2/RO1/, when P09.18~P09.20=17, the corresponding terminal is enabled.
0x640A	Setting acceleration time 1	Yes	
0x640B	Setting deceleration time 1	Yes	
0x640C	Auxiliary frequency reference	No	Enabled when the auxiliary reference channel is serial port communication and the auxiliary reference is in valid bit (controlling BIT2 of character 2)
0x640D~0x640E	Reserved		
0x640F	Expansion analog output ExAO setting (reserved)	No	Four expansion analog outputs: ExAO1~ExAO4, when P27.20/ P27.24/ P27.28/ P27.22 =14, the corresponding output is enabled
0x6410	Expansion virtual digital input terminal (reserved)	No	BIT0~BIT5:EX1~EX6, the corresponding bit selection and channel of P28.08 is enabled
0x6411	Expansion virtual digital output terminal (reserved)	No	BIT0~BIT1:ExRO1、ExRO2，when P26.09/ P26.11=17, the corresponding terminal is enabled
0x6412	Control word 2	No	Refer to its bit definition list

Note

1. When reading the control parameter, the value returned is the value written in the previous communication;

2.In the control parameters, the maximum length of “main reference”, “running frequency setting” and “auxiliary frequency setting” is 32 bits, and for the others, the length is 16 bits;

3.In the control parameters, for the scaling of each reference, input/output setting range and decimal point, please refer to the corresponding function code parameter.

The bit definition of the control word 1 is as shown in the following table:

Bit	Value	Function	Remarks
BIT2~BIT0	111B	Stop for external fault	Coast to stop and the drive displays external fault
	110B	Stop in mode 1	Coast to stop
	101B	Stop in mode 0	Stop according to the deceleration time set (enabled when the jog is disabled)
	100B	Running commands	Start the drive (enabled when the jog is disabled)
	Others	No command	
BIT3	1	Run reversely	Set the running direction when the running command is valid
	0	Run forward	
BIT4	1	Enable acceleration/deceleration	BIT0~BIT3, BIT7~BIT8 of control character 1 will be enabled only when this bit is enabled
	0	Disable acceleration/deceleration	
BIT5	1	The control character 1 of the host device is valid	The select bit for the validity of the control character 1 of the host device
	0	The control character 1 of the host device is disabled	
BIT6	0	Reserved	
BIT7	1	Jog forward	When both jog forward and reversely are valid, it does not run; when both are disabled, the jog will stop.
	0	The “jog forward” is disabled	
BIT8	1	Jog reversely	
	0	The “jog reversely” is disabled	
BIT9	1	The fault reset is valid	The select bit for the validity of the fault reset of the host device
	0	The fault reset is disabled	
BIT15~BIT10	0	Reserved	

Note

1. The control command (control words 1 and 2) of the host device is valid only when the value of “running command channel selection” is “communication command”; the overall control word 1 is valid only when its BIT5 is valid; BIT0~BIT3, BIT7~ BIT8 are valid only when its BIT4 is valid.

2. The host device processes the faults and alarms as follows: when the drive meets faults, for control words 1 and 2, only the fault reset command is valid, any other commands from the host device are disabled. That is, the host device shall reset the fault first before sending any other commands. When the alarm occurs, the control character is valid.

2. Status parameters

Register address	Parameter name	Remarks
0x6500	Status word 1 of drive	
0x6501	Actual running value of current main reference	Current running frequency
0x6502	Slave model	
0x6503	Drive series number	
0x6504	Software version	
0x6505	Current running frequency	
0x6506	Output current	
0x6507	Output voltage	
0x6508	Output power	
0x6509	Rotating speed in running	
0x650A	Line speed in running	
0x650B	Analog process closed loop feedback	
0x650C	Bus voltage	
0x650D	Reserved	
0x650E	Output torque	
0x650F	Status of digital input/output terminal	BIT0~BIT5: X1~X6; BIT10~BIT12: Y1/Y2/RO1
0x6510	Reserved	
0x6511	Running frequency after compensation	
0x6512	The 1st running fault	
0x6513	The 2nd running fault	
0x6514	The 3rd (the latest one) running fault	
0x6515	Setting running frequency	
0x6516	Setting rotating speed	
0x6517	Setting analog process closed loop	

Register address	Parameter name	Remarks
0x6518	Setting line speed	
0x6519	AI1	
0x651A	AI2	
0x651B	Setting length (reserved)	
0x651C	Setting acceleration time 1	
0x651D	Setting deceleration time 1	
0x651E	Command reference channel (the same as function code P02.02)	
0x651F	Status word 2 of drive	
0x6520	Frequency reference channel (the same as function code P02.04)	
0x6521	Accumulating length (reserved)	
0x6522	Motor and mode selection (reserved)	
0x6523	Bus voltage at the 3rd fault	
0x6524	Actual current at the 3rd fault	
0x6525	Operation frequency at the 3rd fault	
0x6526	Drive operation status at the 3rd fault	The bit definition is the same as that of the status word 3.
0x6527	Reserved	
0x6528	Status word 3 of drive	

Note

1. The status parameter does not support the writing operation.

2.The encoding rules for the slave models are as follows: for the range from 0 to 9999, the hundreds and thousands are used to identify different drive series, such as AD, MV, etc. The tens and units are used to identify drive series like 100 Series, 200 Series, 300 Series and 600 Series. For example, the slave model of ADXXX Series drive is 0*1000+0*100+XXX/10; and the slave model of MVXXX Series drive is 1*1000+0*100+XXX/10.

3.In the status parameter, the maximum length of “actual running value of current main reference”, “current running frequency”, “running frequency setting” and “running frequency at the 3rd fault” is 32 bits, and for the others, the length is 16 bits.

The bit definition of the status word 1 of the drive is as shown in the following table:

Bit	Value	Function	Remarks
BIT0	1	Enable serial port control	
	0	Disable serial port control	
BIT1	1	Drive runs	
	0	Drive stops	
BIT2	1	Drive runs reversely	
	0	Drive runs forward	
BIT3	1	Enable serial port reference	
	0	Disable serial port reference	
BIT4	1	Meet the main setting	
	0	Does not meet the main setting	
BIT5	1	fault	If the value is 1, it means there is a fault. Please refer to BIT15~BIT8 of status word 1 to identify the current fault type.
	0	No fault	
BIT6	1	Alarm	If the value is 1, it means there is an alarm. Please refer to BIT15~BIT8 of status word 1 to identify the current alarm type.
	0	No alarm	
BIT7	0	Reserved	
BIT15~BIT8	0x00~0xFF	Fault or alarm code	0: No fault or alarm; Not 0: it means there is a fault or alarm, you need to consider both the status of BIT5 and BIT6 to identify if it is a fault or alarm code. Please refer to P97.15 for the fault and alarm types.

The bit definition of the status word 2 of the drive is as shown in the following table:

Bit	Value	Function	Remarks
BIT0	1	Common running	
	0	Non-common running	
BIT1	1	Jog running	
	0	Non-jog running	
BIT2	1	PLC running	
	0	Non-PLC running	

BIT3	1	Multiple frequency running	
	0	Non-multiple frequency running	
BIT4	1	Process closed loop running	
	0	Non-process closed loop running	
BIT5	1	Swing frequency (reserved)	
	0	Non-swing frequency (reserved)	
BIT6	1	Under-voltage	
	0	Normal voltage	
BIT7		Reserved	
BIT8		Reserved (servo running)	
BIT9		Reserved (customized running)	
BIT10		Reserved (synchronized speed running)	
Others		Reserved	

The bit definition of the status word 3 of the drive is as shown in the following table:

Bit	Value	Function	Remarks
BIT0~BIT1		Reserved	
BIT2		Running at zero speed	
BIT3		Accelerating	
BIT4		Decelerating	
BIT5		Running at constant speed	
BIT6		Pre-exciting	
BIT7		Setting	
BIT8		Limiting over-current	
BIT9		Limiting DC over-voltage	
BIT10~ BIT11		Reserved	
BIT12		Drive fault	
BIT13~BIT15		Reserved	

3. Some parameters inside the MV160 drive are reserved and cannot be modified by the communication settings.

The list of these parameters is shown in the following table:

Function code	Function description
P00.00	Menu mode selection
P00.06	Parameter copy
P03.24	Motor parameter auto-tuning

4. The operation of the host device on the user password

1)Managing the read/write and function codes of function code parameters of the user password protection (except for “read the address of the data displayed” and “display the data switching”).

2)If the user password is set (P00.00), the host device can access to the function code parameters only after “decryption” (write the correct user password to P00.00), but the access to the control parameters and status parameters is not restricted by the user password.

3)The host device cannot set, change or cancel the user password and only the operation panel is able to conduct these operations. The writing operation of P00.01 will be valid only in two situations: decrypt with the password, and write 0 without the password. In other situations, the invalid operation information will be returned.

4)The operation of the host device and that of the operation panel on the user password are independent, even if the operation panel has decrypted already, the host device still need to decrypt to access to the function code parameters, and vice versa.

5)When the host device gets the authority to access to parameters, it will read the user password and return to “0000” rather than the actual user password.

6)The host device gets the authority to access to the function code after “decryption”. If there is no communication within 5 minutes, the access authority is invalid. To access to this function code, please re-enter the user password.

7)When the host device has gotten the access authority (no user password or decrypted already), if the user password is set or changed through the operation panel, the host device still has current access authority with no need to re-encrypt. If the access authority becomes invalid, it needs to re-encrypt (write new password) to get the access authority.

7. CRC verification

For the purpose of improving speed, CRC-16 is often realized through the table. The following is the C language source code for realizing CRC-16. Please note: the final results have exchanged high and low bytes, that is, the result is the CRC checksum to be sent.

```
unsigned short CRC16 （unsigned char *msg, unsigned char length）        /* The function returns the CRC as a unsigned short type */
{
    unsigned char uchCRCHi = 0xFF ;                                     /* high byte of CRC initialized */
    unsigned char uchCRCLo = 0xFF ;                                     /* low byte of CRC initialized */
    unsigned uIndex ;                                                   /* index into CRC lookup table */
```

```
    while （length--）                                  /* pass through message buffer */
    {
        uIndex = uchCRCLo ^ *msg++ ;                    /* calculate the CRC */
        uchCRCLo = uchCRCHi ^ （crcvalue[uIndex] >>8）;
        uchCRCHi =crcvalue[uIndex]&0xff;
     }
     return （uchCRCHi | uchCRCLo<<8） ;
}
/* Table of CRC values */
const unsigned int  crcvalue[ ] = {
0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC006,0x8007,0x41C7,
0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD,0x000F,0xC1CF,0x81CE,0x400E,
0x000A,0xC1CA,0x81CB,0x400B,0x01C9,0xC009,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,
0x001B,0xC1DB,0x81DA,0x401A,0x001E,0xC1DE,0x81DF,0x401F,0x01DD,0xC01D,0x801C,0x41DC,
0x0014,0xC1D4,0x81D5,0x4015,0x01D7,0xC017,0x8016,0x41D6,0x01D2,0xC012,0x8013,0x41D3,
0x0011,0xC1D1,0x81D0,0x4010,0x01F0,0xC030,0x8031,0x41F1,0x0033,0xC1F3,0x81F2,0x4032,
0x0036,0xC1F6,0x81F7,0x4037,0x01F5,0xC035,0x8034,0x41F4,0x003C,0xC1FC,0x81FD,0x403D,
0x01FF,0xC03F,0x803E,0x41FE,0x01FA,0xC03A,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,
0x0028,0xC1E8,0x81E9,0x4029,0x01EB,0xC02B,0x802A,0x41EA,0x01EE,0xC02E,0x802F,0x41EF,
0x002D,0xC1ED,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026,
0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01A0,0xC060,0x8061,0x41A1,
0x0063,0xC1A3,0x81A2,0x4062,0x0066,0xC1A6,0x81A7,0x4067,0x01A5,0xC065,0x8064,0x41A4,
0x006C,0xC1AC,0x81AD,0x406D,0x01AF,0xC06F,0x806E,0x41AE,0x01AA,0xC06A,0x806B,0x41AB,
0x0069,0xC1A9,0x81A8,0x4068,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807A,0x41BA,
0x01BE,0xC07E,0x807F,0x41BF,0x007D,0xC1BD,0x81BC,0x407C,0x01B4,0xC074,0x8075,0x41B5,
0x0077,0xC1B7,0x81B6,0x4076,0x0072,0xC1B2,0x81B3,0x4073,0x01B1,0xC071,0x8070,0x41B0,
0x0050,0xC190,0x8191,0x4051,0x0193,0xC053,0x8052,0x4192,0x0196,0xC056,0x8057,0x4197,
0x0055,0xC195,0x8194,0x4054,0x019C,0xC05C,0x805D,0x419D,0x005F,0xC19F,0x819E,0x405E,
0x005A,0xC19A,0x819B,0x405B,0x0199,0xC059,0x8058,0x4198,0x0188,0xC048,0x8049,0x4189,
0x004B,0xC18B,0x818A,0x404A,0x004E,0xC18E,0x818F,0x404F,0x018D,0xC04D,0x804C,0x418C,
0x0044,0xC184,0x8185,0x4045,0x0187,0xC047,0x8046,0x4186,0x0182,0xC042,0x8043,0x4183,
```

0x0041,0xC181,0x8180,0x4040}

If the CRC checksum of each byte to be sent is computed on line, it will take a longer time, but it can save the program space occupied by the table. The code for computing CRC online is as follows:

```
unsigned int crc_check（unsigned char *data,unsigned char length）
{
    int i;
    unsigned crc_result=0xffff;
    while（length--）
    {
        crc_result^=*data++;
        for（i=0;i<8;i++）
        {
            if（crc_result&0x01）
            {
            crc_result=（crc_result>>1）^0xa001;
            }
            else
            {
                crc_result=crc_result>>1;
            }
        }
    }
     return （crc_result=（（crc_result&0xff）<<8）|（crc_result>>8））;
}
```

8. Application example

No.5 drive coast to stop:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x0036	0x1768
Response	0x05	0x06	0x6400	0x0036	0x1768

No.5 drive jog-forward:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x00B0	0x96CA
Response	0x05	0x06	0x6400	0x00B0	0x96CA

No.5 drive jog-stop:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x0130	0x96FA
Response	0x05	0x06	0x6400	0x0130	0x96FA

No.5 drive fault reset:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x0220	0x97C6
Response	0x05	0x06	0x6400	0x0220	0x97C6

Read the running frequency of No.5 drive and the response running frequency is 50.00Hz (16 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x6501	0x0001	None	0xCA82
Response	0x05	0x03	None	0x02	0x1388	0x44D2

Change the acceleration time 1 (i.e. function code P02.13) of No.5 drive to be 10.0s, which cannot be saved upon power off (16 bits mode).

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x020D	0x0064	0x19DE
Response	0x05	0x06	0x020D	0x0064	0x19DE

Read the output current of No.5 drive and the response output current is 30.0A (16 bits mode).

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x6506	0x0001	None	0x7B43
Response	0x05	0x03	None	0x02	0x012C	0x49C9

Read the deceleration time 1 (i.e. P02.14）) of No.5 drive and the response deceleration time is 6.0s (16 bits mode).

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x020E	0x0001	None	0xE5F5
Response	0x05	0x03	None	0x02	0x003C	0x4995

9. Scaling of drive parameters

1. Scaling of the frequency: 1:100

To make the drive run at 50 Hz, the main setting shall be 0x1388 (5000).

2. Scaling of time: 1:10

To make the acceleration time of the drive to be 30 s, the function code shall be set as 0x012C (300).

3. Scaling of current: 1:10

If the feedback current of the drive is 0x012C (300), the present current shall be 30 A.

4. The output power is its absolute value.

5. For other parameters, please refer to the function parameter descriptions.