HS30 Series

Servo System

Starting Guide

V2.3 2023.08

HS30 Series Servo System

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Thank you for using the HS30 Series Servo System developed by Shenzhen Hpmont Technology Co., Ltd.

Version and Revision Records

Time: 2023/08
Version: V2.3

Chapter	Contents
	• Optimize document structure and description

Chapter 1	• Delete I25 encoder (incremental 2500 pulse), add M17M encoder (multi-turn absolute magnetic encoder), see section 1.1 and 1.5
	• Modify driver product, see section 1.2 and 1.5
	  • Add: 4T020, 2S012
	  • Delete: General (HS30-□□□□□-I-P), HS30-2T
	• Modify motor product, see section 1.1 and 1.5
	  • Add: HSM-N180-48015 (220V), HSM-B130
	  • Delete: HSM-N130-15025, HSM-N180 (220V), HSM-NE (5 pairs)
	• Motor side plugs (plastic) of motor cables adds a shell, see section 1.3

Chapter 2	• Only high speed pulse input terminals support differential wiring, see sectio 2.3.2

Chapter 4	• Group d
	  • Add parameter: d01.43, d01.45, d01.70 - d01.76, d01.21, d02.25
	  • Modify parameter: d01.10 - d01.16
	  • Delete parameter: d02.05
	• Group F
	  • Add parameter: F00.21-F00.30, F02.18, F02.19, F04.07 - F04.10, F04.23, group F05, F06.30, F06.64, F08.10, F0c.03, F0c.05, F0d.09, F0d.12, F0d.23, group F0F, F20.11, group F21
	  • Delete parameter: F00.08, F00.17, F01.22, F01.39, F01.41, F03.15, F04.04, F04.05, F04.22, F07.02, F0d.39 - F0d.42, F0E.00, F0E.01, F0E.04 - F0E.22

Chapter 5	• Add fault or warning: E085.0, A006.1, A060.1, E081.0, A831.0 • Delete fault: E069.0

Safety Information

Before the storage, installation, wiring, operation, inspection or maintenance of the product, the user must be familiar with and comply with important matters to safely use the product.

For details, please refer to "HS30 Series Servo System User Manual".

Danger

Danger: A Danger contains information which is critical for avoiding safety hazards.

Warning

Warning: A Warning contains information which is essential for avoiding a risk of damage to products or other equipements.

Note

Note: A Note contains information which helps to ensure correct operation of the product.

Warning

- Before the mechanical equipment starts to run, the parameters must be set correctly. Otherwise, it may cause the mechanical equipment to lose control or malfunction.
- Before starting to run, please confirm that the emergency switch can be started at any time to stop.
- Please test the normal run of the motor under no load, and then connect the load to avoid unnecessary loss.
- Do not turn on or turn off the power frequently, otherwise it causes overheating and damage to the driver.
- Do not touch the heat sink of the driver or the external brake resistor during power on or short-term power off, otherwise there may be a danger of burns.
- Please set a stop device on the mechanical side to ensure safety.
- Do not modify the product, otherwise it may cause mechanical damage and personal accidents.

Danger

- When the motor is running, please do not touch any rotating parts, otherwise it causes personal injury or death.
- When the equipment is running, please do not touch the driver and motor, otherwise it causes electric shock or scald.
- When the equipment is running, please do not move the connecting cables, otherwise it causes personal injury or equipment damage.

Contents

Chapter 1 Servo System

1.1 Servo Motor

Warning

Before running the system for the first time, make sure the motor code (F01.00) is correct.
Incorrect F01.00 affects the control effect.

1.1.1 Motor Model

HSM-NE110-05030A23-2A2A
1 2 3 4 5 6 7 8 9 10 11

Code	Description			
1	Product series	• **HSM**: Three phase AC PM servo motor		
2	Inertia	• **N**: Standard	• **B**: Small inertia	
3	Motor pole pairs	• **E**: 5 pairs	• **No E**: 4 pairs	
4	Frame	• **060**: 60 flange • **080**: 80 flange	• **090**: 90 flange • **110**: 110 flange	• **130**: 130 flange • **180**: 180 flange
5	Rated torque	• **006:** 0.64N·m • **013**: 1.27N·m • **019**: 1.91N·m • **024**: 2.39N·m • **024**: 2.4N·m • **035**: 3.5N·m • **040**: 4N·m	• 050: 5N·m • **060**: 6N·m • **077**: 7.70N·m • **080**: 8N·m • **100**: 10N·m • **150**: 15N·m • **170**: 17N·m	• **190**: 19N·m • **215**: 21.5N·m • **250**: 25N·m • **270**: 27N·m • **350**: 35N·m • **480**: 48N·m
6	Rated RPM	• **10**: 1000rpm • **15**: 1500rpm	• **20**: 2000rpm • **25**: 2500rpm	• **30**: 3000rpm
7	Encoder	• **A17**: 17Bit absolute photoelectric encoder • **A23**: 23Bit absolute photoelectric encoder • **S17**: 17Bit serial incremental • **M17**: 17Bit absolute magnetic encoder • **M17M**: 17Bit absolute magnetic encoder (multi-turn)		
8	Input voltage	• **2**: 220V	• **3**: 380V	
9	Shaft end structure	• **A**: Flat key, key width 6mm • **B**: Flat key, key width 5mm • **C**: Flat key, key width 3mm	• **D**: Flat key, key width 10mm • **E**: Flat key, key width 12mm • **F**: Flat key, key width 8mm	
10	Option	• **1**: No option • **2**: Oil seal • **3**: Electromagnetic brake • **4**: Permanent magnet brake • **5**: Oil seal, electromagnetic brake • **6**: Oil seal, permanent magnet brake		

Code	Description		
11	Special requirement	• **A**: Regular product • **B**: Add fan • **C**: Straight lead motor	• **E**: Shaft extension 20mm • **F**: Waterproof terminal

1.1.2 Motor Specifications

Model■■■ = A17/A23/S17/M17/M17M, corresponding motor code■ = 1/2/4/3/3.
Model □A = 2A, without brake.
Model □A = 5A, with brake (80/90/110/130/180 flange).
Model □A = 6A, with brake (60 flange).

Motor Type: HSM-N (N060/N080/N090/N110/N130/N180)							
Motor Model	Flange	Input Voltage	Rated Torque	Rated RPM	Rated Current	Rotor Inertia	Motor Code
		V	N·m	rpm	A	10^{-4} kg·m^2	
HSM-N060							
HSM-N060-00630■■■-2B□A	60	220	0.64	3000	1.8	0.264	□0■01
HSM-N060-01330■■■-2B□A	60	220	1.27	3000	2.6	0.407	□0■02
HSM-N060-01930■■■-2B□A	60	220	1.91	3000	3.1	0.526	□0■03
HSM-N080							
HSM-N080-01330■■■-2A□A	80	220	1.27	3000	2	1.05	□0■10
HSM-N080-02430■■■-2A□A	80	220	2.39	3000	3	1.82	□0■11
HSM-N080-03520■■■-2A□A	80	220	3.5	2000	3	2.63	□0■12
HSM-N080-03530■■■-2A□A	80	220	3.5	3000	4.0	2.63	□0■13
HSM-N080-04025■■■-2A□A	80	220	4	2500	4.4	2.97	□0■14
HSM-N080-04030■■■-2A□A	80	220	4	3000	4.5	2.97	□0■15
HSM-N080-02430■■■-3A□A	80	380	2.39	3000	1.6	1.82	□1■10
HSM-N080-03520■■■-3A□A	80	380	3.5	2000	1.8	2.63	□1■11
HSM-N080-04025■■■-3A□A	80	380	4	2500	2.3	2.97	□1■12
HSM-N090							
HSM-N090-02430■■■-2B□A	90	220	2.4	3000	3	2.45	□0■20
HSM-N090-03520■■■-2B□A	90	220	3.5	2000	3	3.4	□0■21
HSM-N090-04025■■■-2B□A	90	220	4	2500	4	3.7	□0■22
HSM-N110							
HSM-N110-02030■■■-2A□A	110	220	2	3000	2.5	3.1	□0■30
HSM-N110-04020■■■-2A□A	110	220	4	2000	3.5	5.4	□0■31
HSM-N110-04030■■■-2A□A	110	220	4	3000	5	5.4	□0■32
HSM-N110-05030■■■-2A□A	110	220	5	3000	6	6.3	□0■33
HSM-N110-06020■■■-2A□A	110	220	6	2000	4.5	7.6	□0■34
HSM-N110-06030■■■-2A□A	110	220	6	3000	6	7.6	□0■35
HSM-N110-04030■■■-3A□A	110	380	4	3000	3	5.4	□1■30
HSM-N110-05030■■■-3A□A	110	380	5	3000	4.5	6.3	□1■31
HSM-N110-06020■■■-3A□A	110	380	6	2000	3	7.6	□1■32
HSM-N110-06030■■■-3A□A	110	380	6	3000	4.5	7.6	□1■33

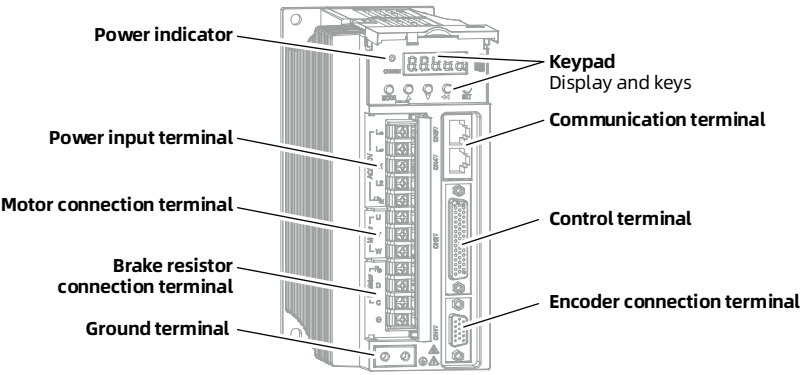
Motor Type: HSM-N (N060/N080/N090/N110/N130/N180)							
Motor Model	Flange	Input Voltage	Rated Torque	Rated RPM	Rated Current	Rotor Inertia	Motor Code
		V	N·m	rpm	A	10^{-4} kg·m^2	
HSM-N130							
HSM-N130-04025■■■-2A□A	130	220	4	2500	4	8.5	□0■40
HSM-N130-05025■■■-2A□A	130	220	5	2500	5	10.6	□0■41
HSM-N130-06025■■■-2A□A	130	220	6	2500	6	12.6	□0■42
HSM-N130-07725■■■-2A□A	130	220	7.7	2500	7.5	15.3	□0■43
HSM-N130-10010■■■-2A□A	130	220	10	1000	4.5	19.4	□0■44
HSM-N130-10015■■■-2A□A	130	220	10	1500	6	19.4	□0■45
HSM-N130-10020■■■-2A□A	130	220	10	2000	8	19.4	□0■49
HSM-N130-10025■■■-2A□A	130	220	10	2500	10.0	19.4	□0■46
HSM-N130-15015■■■-2A□A	130	220	15	1500	9.5	27.7	□0■47
HSM-N130-04025■■■-3A□A	130	380	4	2500	2.6	8.5	□1■45
HSM-N130-05025■■■-3A□A	130	380	5	2500	3	10.6	□1■46
HSM-N130-06025■■■-3A□A	130	380	6	2500	3.7	12.6	□1■47
HSM-N130-07725■■■-3A□A	130	380	7.7	2500	4.7	15.3	□1■48
HSM-N130-10010■■■-3A□A	130	380	10	1000	2.5	19.4	□1■40
HSM-N130-10015■■■-3A□A	130	380	10	1500	3.5	19.4	□1■41
HSM-N130-10025■■■-3A□A	130	380	10	2500	6.0	19.4	□1■42
HSM-N130-15015■■■-3A□A	130	380	15	1500	5	27.7	□1■43
HSM-N130-15025■■■-3A□A	130	380	15	2500	8.8	27.7	□1■44
HSM-N180							
HSM-N180-19015■■■-3D□A	180	380	19	1500	7.5	70	□1■50
HSM-N180-21520■■■-3D□A	180	380	21.5	2000	9.5	79.6	□1■51
HSM-N180-27015■■■-3D□A	180	380	27	1500	10	96.4	□1■52
HSM-N180-27020■■■-3D□A	180	380	27	2000	13	61	□1■53
HSM-N180-35010■■■-3D□A	180	380	35	1000	10	122.5	□1■54
HSM-N180-35015■■■-3D□A	180	380	35	1500	12	122.5	□1■55
HSM-N180-48015■■■-3D□A	180	380	48	1500	20	16.72	□1■56

Motor Type: HSM-B (B080)							
Motor Model	Flange	Input Voltage	Rated Torque	Rated RPM	Rated Current	Rotor Inertia	Motor Code
		V	N·m	rpm	A	10^{-4} kg·m^2	
HSM-B080							
HSM-B080-01330■■■-2A□A	80	220	1.3	3000	2.4	0.84	□0■60
HSM-B080-02430■■■-2A□A	80	220	2.4	3000	3.5	1.08	□0■61
HSM-B080-03230■■■-2A□A	80	220	3.2	3000	4.0	1.59	□0■62
HSM-B130							
HSM-B130-08015■■■-2A□A	130	220	8	1500	4.5	5.4	□0■80
HSM-B130-10015■■■-2A□A	130	220	10	1500	5	6.3	□0■81

Motor Type: HSM-B (B080)							
Motor Model	Flange	Input Voltage	Rated Torque	Rated RPM	Rated Current	Rotor Inertia	Motor Code
		V	N·m	rpm	A	10^{-4} kg·m^2	
HSM-B130-10030■■■-2A□A	130	220	10	3000	12	6.3	□0■82
HSM-B130-15015■■■-2A□A	130	220	15	1500	7.7	7.6	□0■83
HSM-B130-15020■■■-2A□A	130	220	15	2000	12	7.6	□0■84
HSM-B130-25010■■■-2A□A	130	220	25	1000	9	13	□0■85

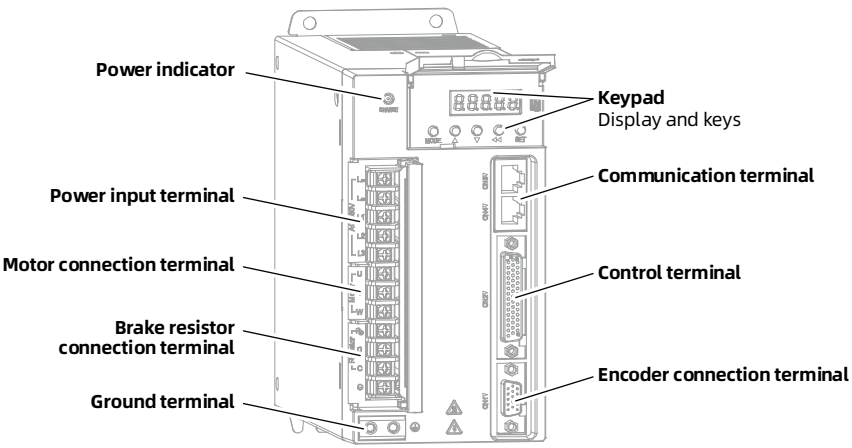
1.2 Servo Driver

1.2.1 Driver Layout



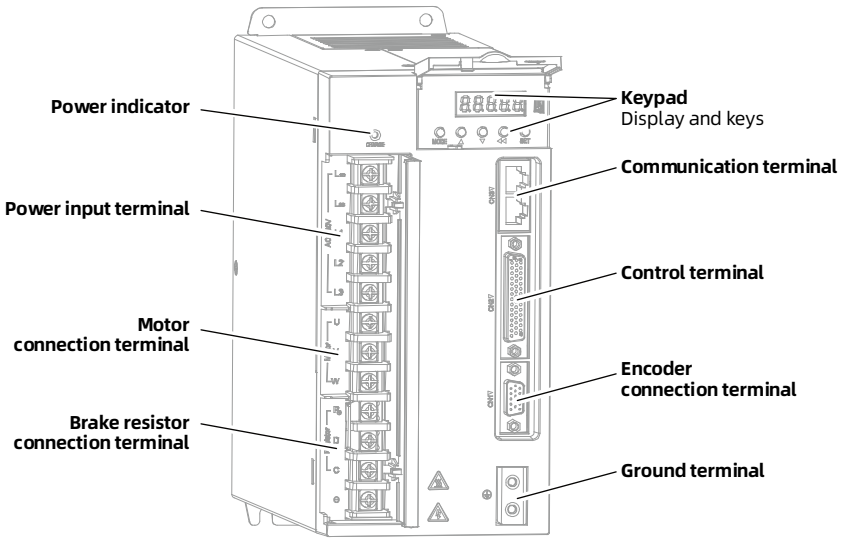
SizeA/SizeB

HS30-2S■■■-□-P (1A6/3A1/5A1/6A3/8A4)



SizeB2

HS30-4T■■■-□-P (3A0/3A5/6A0/8A0)



SizeC

HS30-2S■■■-□-P (012), HS30-4T■■■-□-P (010/012)

Name	Description
Power indicator	When the bus capacitor is charged, the indicator light is on. • When the indicator light is on, please do not touch the power terminal to avoid electric shock (even if the main circuit power is OFF, the internal capacitor of the driver may still be charged).
Keypad	Set function parameters, display status and parameters.
Power input terminal L1C, L2C, L1, L2, L3, L3/N	• L1C, L2C: Input terminal of control power supply. • L1, L2, L3/N: Input terminals of power supply (single phase). • L1, L2, L3: Input terminals of power supply (three phase).
Motor connection terminal U, V, W	Output terminal of power supply (three phase), connect the motor.
Brake resistor connection terminal P⊕, D, C, ⊖	Default: Short-circuit P⊕ and D, use built-in brake resistor. • When connecting an external brake resistor, remove the short-circuit piece first, and then connect the brake resistor between P⊕ and C. P⊕ and ⊖ are DC bus terminals, used for multiple drivers with a common DC bus.
Ground terminal PE	Connect the ground terminal of the power supply and the motor.
Communication terminal CN3, CN4	Internal parallel connection, connect RS232, RS485 or CAN communication device.
Control terminal CN2	Command input and other I/O signal terminal.
Encoder connection terminal CN1	Connect the encoder.

1.2.2 Driver Model

HS30-2T012-A-P

1 2 3 4 5

Code	Description	
1	Product series	• **HS30**: Servo driver
2	Voltage level	• **2S**: Single phase 220V • **4T**: Three phase 380V
3	Continuous output current	• **1A6**: 1.6A • **6A0**: 6.0A • **010**: 10A • **3A0**: 3.0A • **6A3**: 6.3A • **012**: 12A • **3A1**: 3.1A • **8A0**: 8.0A • **017**: 17A • **3A5**: 3.5A • **8A4**: 8.4A • **020**: 20A • **5A1**: 5.1A
4	Encoder	• **A**: Absolute photoelectric encoder or serial incremental • **M**: Magnetic encoder
5	Servo type	• **P**: Pulse type • **N**: Bus type

1.2.3 Driver Specifications

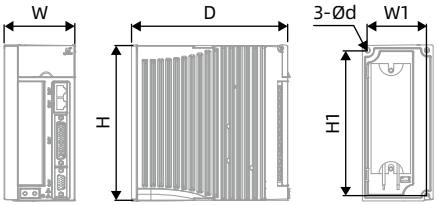
Size	SizeA			SizeB	
Model HS30-	2S1A6-■-P	2S3A1-■-P	2S5A1-■-P	2S6A3-■-P	2S8A4-■-P
Output power (kW)	0.2	0.4	0.75	1.0	1.5
Continuous output current (A)	1.6	3.1	5.1	6.3	8.4
Max. output current (A)	4.8	9.3	15.3	18.9	25.2
Main circuit power supply	Single phase 200 - 240VAC, ±10%, 50/60Hz				
Control circuit power supply	Single phase 200 - 240VAC, ±10%, 50/60Hz				

Size	SizeB2				SizeC			
Model HS30-	4T3A0-■-P	4T3A5-■-P	4T6A0-■-P	4T8A0-■-P	4T010-■-P	4T012-■-P	4T020-■-P	2S012-■-P
Output power (kW)	1.0	1.5	2.0	3.0	4.5	5.5	7.5	2.0
Continuous output current (A)	3	3.5	6	8	10	12	20	12
Max. output current (A)	8.4	9.8	16	19.2	28	33	56	33.6
Main circuit power supply	Three phase 380 - 460VAC, ±10%, 50/60Hz							Three phase 200 - 240VAC, ±10%, 50/60Hz
Control circuit power supply	Single phase 380 - 460VAC, ±10%, 50/60Hz							Single phase 200 - 240VAC, ±10%, 50/60Hz

1.2.4 Driver Size

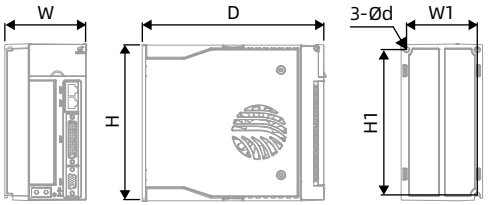
SizeA

HS30-2S■■■-□-P
(1A6/3A1/5A1)



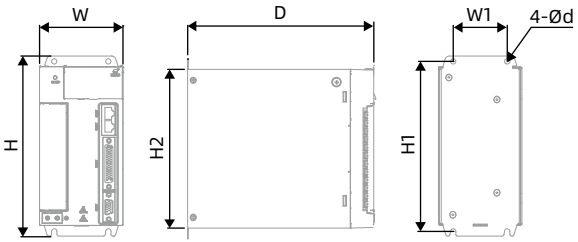
SizeB

HS30-2S■■■-□-P
(6A3/8A4)



SizeB2

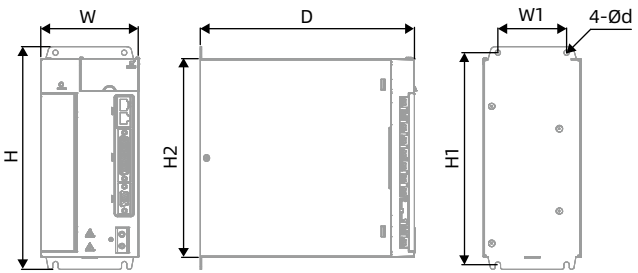
HS30-4T■■■-□-P
(3A0/3A5/6A0/8A0)



SizeC

HS30-2S■■■-□-P
(012)

HS30-4T■■■-□-P
(010/012/020)



Servo Driver Size	Dimension (mm)			Mounting Size (mm)				G. W. (kg)
	W	H	D	W1	H1	H2	d	
SizeA	74	162	163	62	152	/	5.5	1.9
SizeB	85	163	190	74	152	/	5.5	2.2
SizeB2	85	184	190	55	173.5	162	5.5	3.5
SizeC	100	227	218	70	216	203	5.5	4.5

1.2.5 Installation Site

Confirm the installation site meets the following conditions.

Condition	Description
Installation place	Inside the electrical control panel • No direct sunlight and water droplets • No flammable, explosive, corrosive gas and liquid • No oily dust and fiber • No metal powder • Mounting surface is fire-retardant and strong enough to support the driver
Running temperature	-10 - +50℃ When the temperature exceeds 40°C, the driver needs to be derated. For every 1°C increase, derate by 2%
Running humidity	Less than 85%RH, no condensation
Vibration resistance	IEC 60721-3-3 2 ≤ f < 9Hz, displacement 0.3mm 9 < f ≤ 200Hz, acceleration 1m/s²
Protection class	IP10
Pollution level	2 (dry, non conducting dust pollution)

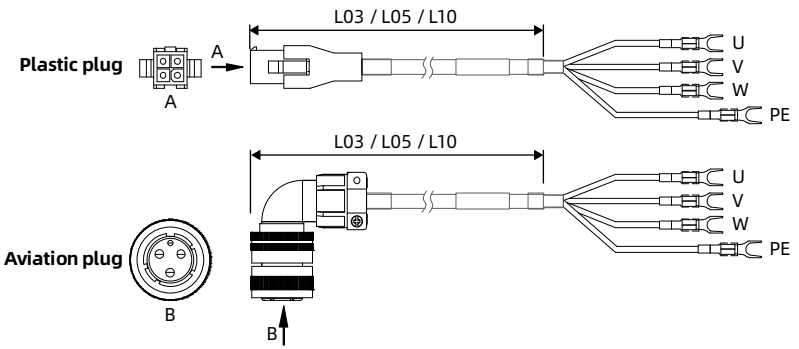
1.3 Motor Cable

1.3.1 Motor Cable Model

HS - MOT - 01 - L03 - P 4 - T

1 2 3 4 5 6 7

Code	Description	
1	Product series	• **HS**: Servo system
2	Cable or plug	• **MOT**: Motor cable (fork cable lug)
3	Current	• **01**: ≤5A • **02**: ≤10A • **03**: ≤15A • **04**: ≤25A • **05**: ≤35A • **06**: ≤50A
4	Cable length	• **L03**: 3m • **L05**: 5m • **L10**: 10m
5	Motor side plug	• **P**: 172159 plastic plug (60/80/90 flange) • **A**: YD28K4 aviation plug (110/130 flange) • **B**: YD32K4 aviation plug (180 flange)
6	Driver size	• **4**: SizeA/B/B2 • **5**: SizeC
7	Cable	• **T**: High flexible towline cable • **No T**: Normal cable

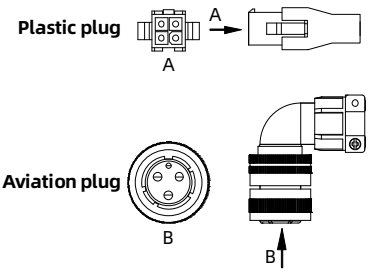


1.3.2 Motor Cable Plug Model

HS - MOTP - A - YD32

1 2 3 4

Code	Description	
1	Product series	• **HS**: Servo system
2	Cable or plug	• **MOTP**: Motor cable plug
3	Motor side plug	• **P**: Plastic plug (60/80/90 flange) • **A**: Aviation plug (110/130/180 flange)
4	Motor side aviation plug	• **YD28**: 110/130 flange motor plug • **YD32**: 180 flange motor plug • **No T**: Non-aviation plug



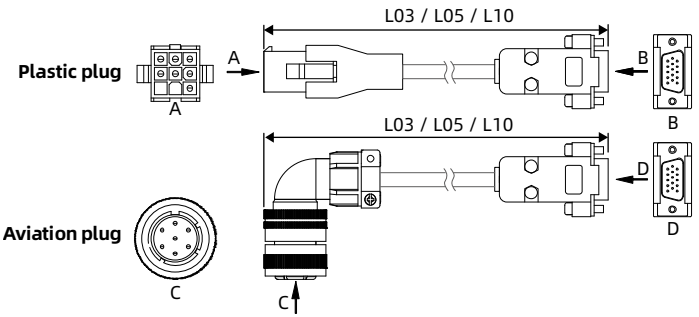
1.4 Encoder Cable

1.4.1 Encoder Cable Model

HS - ENC - A23 - L03 - P - T

1 2 3 4 5 6

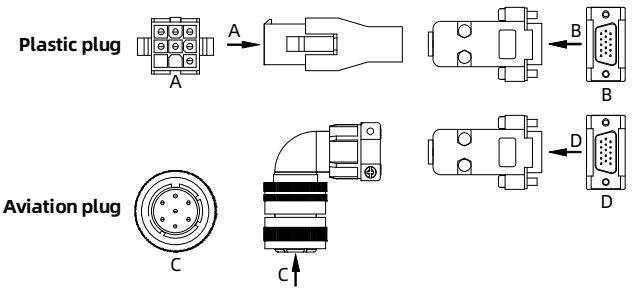
Code	Description	
1	Product series	• **HS**: Servo system
2	Cable or plug	• **ENC**: Encoder cable (DB15)
3	Encoder	• **A23**: Absolute photoelectric encoder (17/23Bit), magnetic encoder (17Bit), serial incremental (17Bit)
4	Cable length	• **L03**: 3m • **L05**: 5m • **L10**: 10m
5	Motor side plug	• **P**: Plastic plug (60/80/90 flange) • **A**: Aviation plug (110/130/180 flange)
6	Cable	• **T**: High flexible towline cable • **No T**: Normal cable



1.4.2 Encoder Cable Plug Model

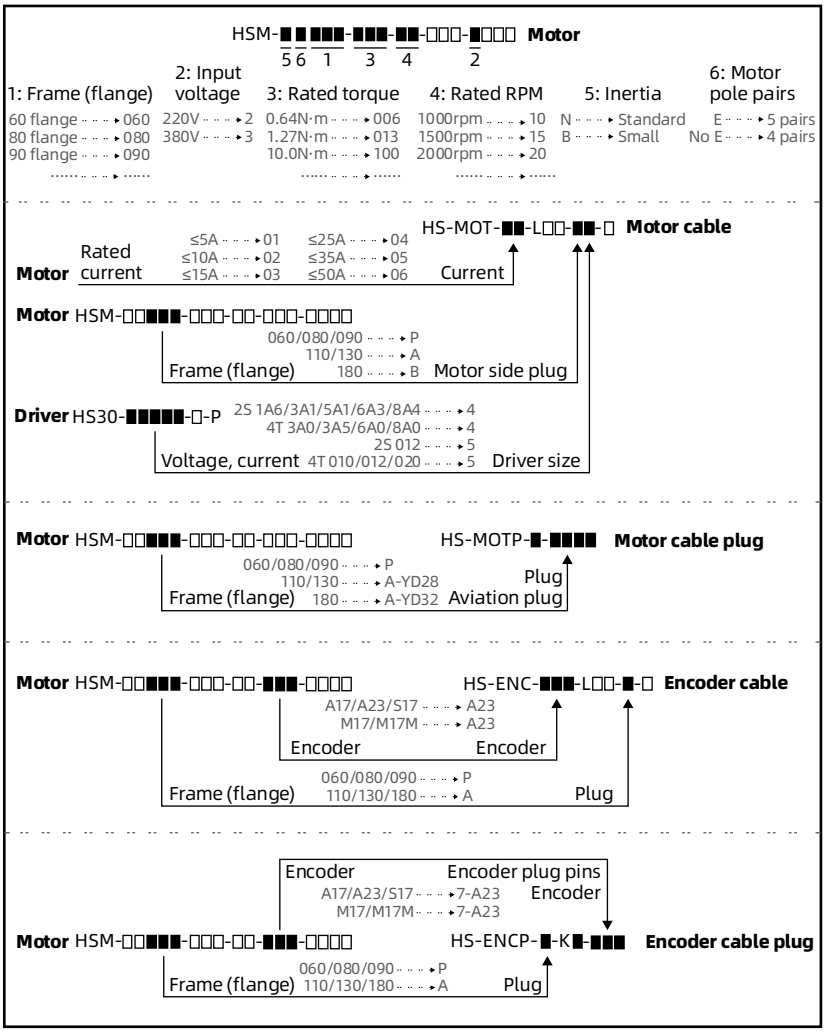
HS - ENCP - A - K15 - A23
1 2 3 4 5

Code	Description	
1	Product series	• **HS**: Servo system
2	Cable or plug	• **ENCP**: Encoder cable plug (DB15)
3	Motor side plug	• **P**: Plastic plug (60/80/90 flange) • **A**: Aviation plug (110/130/180 flange)
4	Encoder plug pins	• **K7**: Support up to 7pin signal
5	Encoder	• **A23**: Absolute photoelectric encoder (17/23Bit), magnetic encoder (17Bit), serial incremental (17Bit)



1.5 Servo System Selection

1.5.1 System Selection Guide



1.5.2 Product Selection Table

Motor Type: HSM-N (N060/N080/N090/N110/N130/N180)								
Motor						**Driver**	**Motor Cable**	**Encoder Cable**
Flange	Input V V	Rated TRQ N·m	Rated RPM rpm	Rated C A	Model HSM-	Model HS30-	Cable HS-MOT- Cable Plug HS-MOTP-	Cable HS-ENC- Cable Plug HS-ENCP-
					■■■ = A17/A23/S17	■ = A		
					■■■ = M17/M17M	■ = M		
60	220	0.64	3000	1.8	N060-00630■■■-2B□A	2S1A6-■-P	MOT-01-L□□-P4-□ MOTP-P	ENC-A23-L□□-P-□ ENCP-P-K7-A23
60	220	1.27	3000	2.6	N060-01330■■■-2B□A	2S3A1-■-P		
60	220	1.91	3000	3.1	N060-01930■■■-2B□A			
80	220	1.27	3000	2	N080-01330■■■-2A□A			
80	220	2.39	3000	3	N080-02430■■■-2A□A			
80	220	3.5	2000	3	N080-03520■■■-2A□A			
80	220	3.5	3000	4.0	N080-03530■■■-2A□A	2S5A1-■-P		
80	220	4	2500	4.4	N080-04025■■■-2A□A			
80	220	4	3000	4.5	N080-04030■■■-2A□A			
80	380	2.39	3000	1.6	N080-02430■■■-3A□A	4T3A0-■-P		
80	380	3.5	2000	1.8	N080-03520■■■-3A□A			
80	380	4	2500	2.3	N080-04025■■■-3A□A			
90	220	2.4	3000	3	N090-02430■■■-2B□A	2S3A1-■-P		
90	220	3.5	2000	3	N090-03520■■■-2B□A			
90	220	4	2500	4	N090-04025■■■-2B□A	2S5A1-■-P		
110	220	2	3000	2.5	N110-02030■■■-2A□A	2S3A1-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	ENC-A23-L□□-A-□ ENCP-A-K7-A23
110	220	4	2000	3.5	N110-04020■■■-2A□A	2S5A1-■-P		
110	220	4	3000	5	N110-04030■■■-2A□A			
110	220	5	3000	6	N110-05030■■■-2A□A	2S6A3-■-P	MOT-02-L□□-A4-□ MOTP-A-YD28	
110	220	6	2000	4.5	N110-06020■■■-2A□A	2S5A1-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	
110	220	6	3000	6	N110-06030■■■-2A□A	2S6A3-■-P	MOT-02-L□□-A4-□ MOTP-A-YD28	

Motor Type: HSM-N (N060/N080/N090/N110/N130/N180)								
Motor						**Driver**	**Motor Cable**	**Encoder Cable**
Flange	Input V V	Rated TRQ N·m	Rated RPM rpm	Rated C A	Model HSM-	Model HS30-	Cable HS-MOT- Cable Plug HS-MOTP-	Cable HS-ENC- Cable Plug HS-ENCP-
					■■■ = A17/A23/S17	■ = A		
					■■■ = M17/M17M	■ = M		
110	380	4	3000	3	N110-04030■■■-3A□A	4T3A5-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	ENC-A23-L□□-A-□ ENCP-A-K7-A23
110	380	5	3000	4.5	N110-05030■■■-3A□A	4T6A0-■-P		
110	380	6	2000	3	N110-06020■■■-3A□A	4T3A5-■-P		
110	380	6	3000	4.5	N110-06030■■■-3A□A	4T6A0-■-P		
130	220	4	2500	4	N130-04025■■■-2A□A	2S5A1-■-P		
130	220	5	2500	5	N130-05025■■■-2A□A			
130	220	6	2500	6	N130-06025■■■-2A□A	2S6A3-■-P	MOT-02-L□□-A5-□ MOTP-A-YD28	
130	220	7.7	2500	7.5	N130-07725■■■-2A□A	2S8A4-■-P		
130	220	10	1000	4.5	N130-10010■■■-2A□A	2S5A1-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	
130	220	10	1500	6	N130-10015■■■-2A□A	2S6A3-■-P	MOT-02-L□□-A4-□ MOTP-A-YD28	
130	220	10	2000	8	N130-10020■■■-2A□A	2S8A4-■-P		
130	220	10	2500	10	N130-10025■■■-2A□A	2S012-■-P	MOT-02-L□□-A5-□ MOTP-A-YD28	
130	220	15	1500	9.5	N130-15015■■■-2A□A			
130	380	4	2500	2.6	N130-04025■■■-3A□A	4T3A0-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	
130	380	5	2500	3	N130-05025■■■-3A□A	4T3A5-■-P		
130	380	6	2500	3.7	N130-06025■■■-3A□A	4T6A0-■-P		
130	380	7.7	2500	4.7	N130-07725■■■-3A□A			
130	380	10	1000	2.5	N130-10010■■■-3A□A	4T3A0-■-P		
130	380	10	1500	3.5	N130-10015■■■-3A□A	4T6A0-■-P		
130	380	10	2500	6	N130-10025■■■-3A□A	4T8A0-■-P	MOT-02-L□□-A4-□ MOTP-A-YD28	

Motor Type: HSM-N (N060/N080/N090/N110/N130/N180)								
Motor						**Driver**	**Motor Cable**	**Encoder Cable**
Flange	Input V V	Rated TRQ N·m	Rated RPM rpm	Rated C A	Model HSM-	Model HS30-	Cable HS-MOT- Cable Plug HS-MOTP-	Cable HS-ENC- Cable Plug HS-ENCP-
					■■■ = A17/A23/S17	■ = A		
					■■■ = M17/M17M	■ = M		
130	380	15	1500	5	N130-15015■■■-3A□A	4T6A0-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	ENC-A23-L□□-A-□ ENCP-A-K7-A23
130	380	15	2500	8.8	N130-15025■■■-3A□A	4T010-■-P	MOT-02-L□□-A5-□ MOTP-A-YD28	
180	380	19	1500	7.5	N180-19015■■■-3D□A	4T010-■-P	MOT-02-L□□-B5-□ MOTP-A-YD32	
180	380	21.5	2000	9.5	N180-21520■■■-3D□A	4T012-■-P		
180	380	27	1500	10	N180-27015■■■-3D□A			
180	380	27	2000	13	N180-27020■■■-3D□A		MOT-03-L□□-B5-□ MOTP-A-YD32	
180	380	35	1000	10	N180-35010■■■-3D□A		MOT-02-L□□-B5-□ MOTP-A-YD32	
180	380	35	1500	12	N180-35015■■■-3D□A		MOT-03-L□□-B5-□ MOTP-A-YD32	
180	380	48	1500	20	N180-48015■■■-3D□A	4T020-■-P	MOT-04-L□□-B5-□ MOTP-A-YD32	

Motor Type: HSM-B (B080/B130)								
Motor						**Driver**	**Motor Cable**	**Encoder Cable**
Flange	Input V V	Rated TRQ N·m	Rated RPM rpm	Rated C A	Model HSM-	Model HS30-	Cable HS-MOT- Cable Plug HS-MOTP-	Cable HS-ENC- Cable Plug HS-ENCP-
					■■■ = A17/A23/S17	■ = A		
					■■■ = M17/M17M	■ = M		
80	220	1.3	3000	2.4	B080-01330■■■-2A□A	2S3A1-■-P	MOT-01-L□□-P4-□ MOTP-P	ENC-A23-L□□-P-□ ENCP-P-K7-A23
80	220	2.4	3000	3.5	B080-02430■■■-2A□A	2S5A1-■-P		
80	220	3.2	3000	4.0	B080-03230■■■-2A□A			
130	220	8	1500	4.5	B130-08015■■■-2A□A	2S5A1-■-P	MOT-01-L□□-A4-□ MOTP-A-YD28	ENC-A23-L□□-A-□ ENCP-A-K7-A23
130	220	10	1500	5	B130-10015■■■-2A□A			
130	220	10	3000	12	B130-10030■■■-2A□A	2S012-■-P	MOT-03-L□□-A5-□ MOTP-A-YD28	
130	220	15	1500	7.7	B130-15015■■■-2A□A	2S8A4-■-P	MOT-02-L□□-A4-□ MOTP-A-YD28	
130	220	15	2000	12	B130-15020■■■-2A□A	2S012-■-P	MOT-03-L□□-A5-□ MOTP-A-YD28	
130	220	25	1000	9	B130-25010■■■-2A□A			

1.6 Brake Resistor Selection

Driver Model	Min. Resistance	Built-in	Recommended Resistance
HS30-2S1A6-■-P*	≥ 50Ω	-	50 - 100Ω
HS30-2S3A1-■-P	≥ 40Ω	100Ω/60W	40 - 100Ω
HS30-2S5A1-■-P	≥ 40Ω	100Ω/60W	40 - 100Ω
HS30-2S6A3-■-P	≥ 25Ω	40Ω/80W	25 - 50Ω
HS30-2S8A4-■-P	≥ 25Ω	40Ω/80W	25 - 50Ω
HS30-2T012-■-P	≥ 20Ω	20Ω/100W	20 - 50Ω
HS30-2T017-■-P	≥ 15Ω	20Ω/100W	15 - 50Ω
HS30-4T3A0-■-P	≥ 80Ω	100Ω/60W	80 - 120Ω
HS30-4T3A5-■-P	≥ 80Ω	100Ω/60W	80 - 120Ω
HS30-4T6A0-■-P	≥ 50Ω	50Ω/80W	50 - 100Ω
HS30-4T8A0-■-P	≥ 45Ω	50Ω/80W	45 - 100Ω
HS30-4T010-■-P	≥ 45Ω	50Ω/100W	45 - 100Ω
HS30-4T012-■-P	≥ 45Ω	50Ω/100W	45 - 100Ω
HS30-4T020-■-P	≥ 25Ω	40Ω/100W	25 - 100Ω
*: No built-in brake resistor.			

Chapter 2 Electrical Installation

2.1 System Configuration

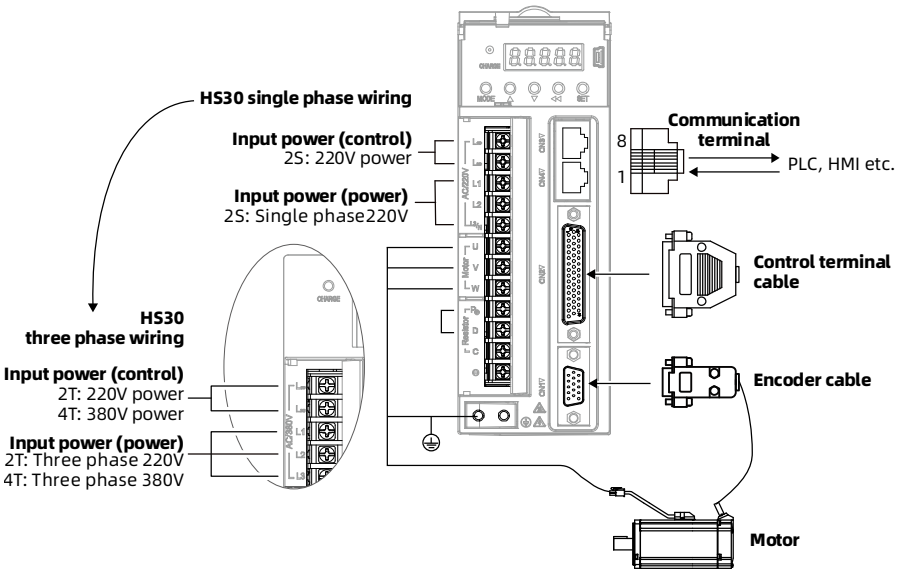


Figure 2-1 Servo system configuration

2.2 Connect Power Terminal

2.2.1 Motor Cable Plug Description

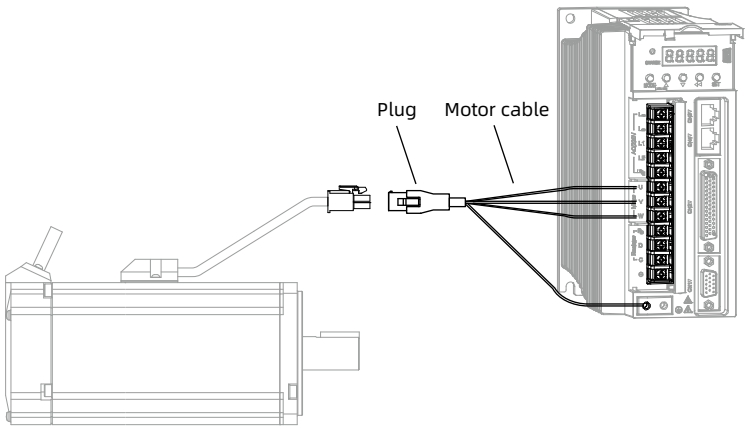
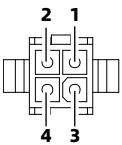
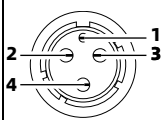


Figure 2-2 Connect motor cable

Table 2-1 Motor cable plug definition (motor side)

Motor Frame: 60/80/90 Flange		Motor Frame: 110/130/180 Flange	
			
	Pin / **Signal**		**Pin** / **Signal**
	1 / U		1 / PE
	2 / V		2 / U
	3 / W		3 / V
	4 / PE		4 / W

2.2.2 Encoder Cable Plug Description

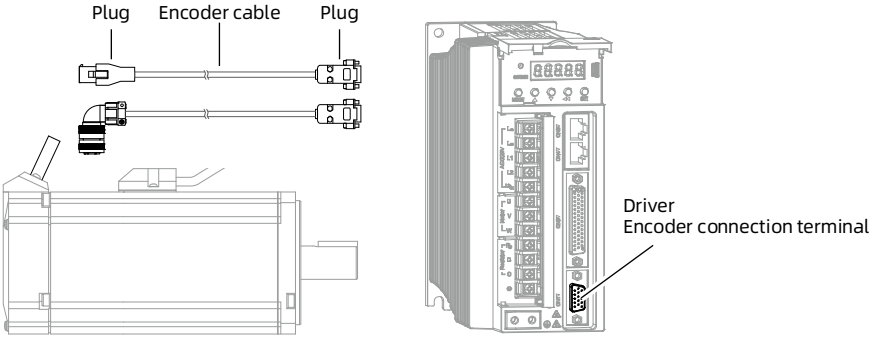
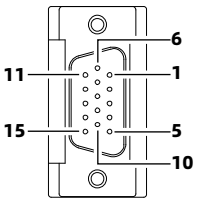


Figure 2-3 Connect encoder cable

Table 2-2 Encoder cable plug definition (driver side)

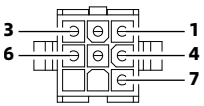


DB15

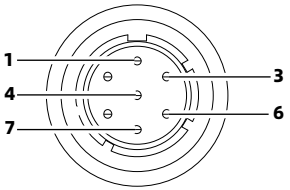
Pin	Definition
12	GND
13	+5V
14	D+
15	D-

Table 2-3 Encoder cable plug definition (motor side)

Pin	Definition		Pin	Definition		Pin	Definition	
	60/80/90	110/130/180		60/80/90	110/130/180		60/80/90	110/130/180
1	PE	PE	4	D-	D-	6	D+	D+
2	E-*	E-*	5	GND	GND	7	5V	5V
3	E+*	E+*						
*: When the encoder uses battery, connect E+ and E-. Otherwise, do not connect E+ and E-.								



60/80/90 flange



110/130/180 flange

2.2.3 Power Terminal Wiring

The wiring using single phase 220V power supply is shown in Figure 2-4.

Note:

1. Power input contactor: Electromagnetic contactor. 1D: Current-continuing diode.
2. DO is set to alarm output function (ALM+/-).
   When HS30 alarms, HS30 can automatically cut off the power supply and the alarm light is on.
3. HS30-2S1A6-□-P has no built-in brake resistor, no need to connect P⊕ and D.
   If you need to use brake resistor, please remove the short-circuit piece first, and then connect the brake resistor between P⊕ and C.

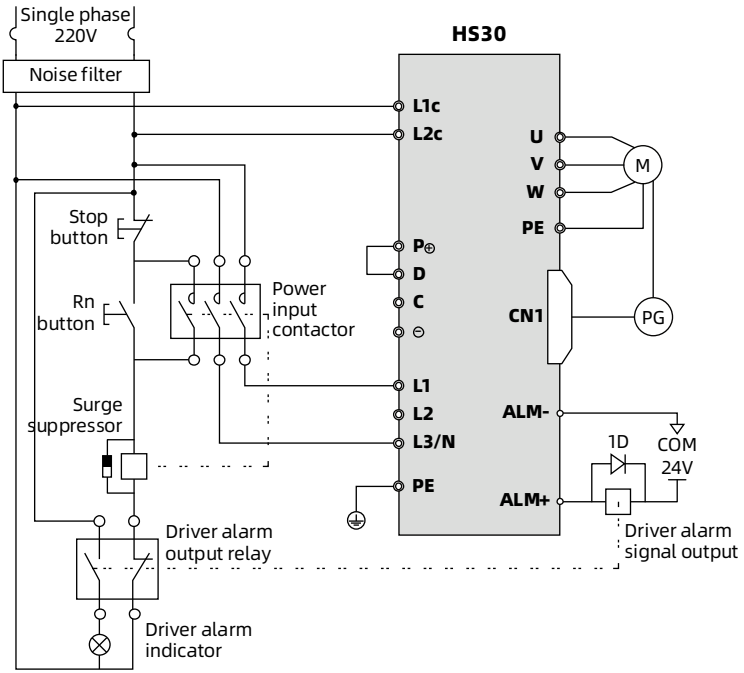


Figure 2-4 Single phase 220V power terminal wiring (HS30-2S□□□-□-P)

The wiring using three phase 380V power supply is shown in Figure 2-5.

Note:

1. Power input contactor: Electromagnetic contactor. 1D: Current-continuing diode.
2. DO is set to alarm output function (ALM+/-).
   When HS30 alarms, HS30 can automatically cut off the power supply and the alarm light is on.

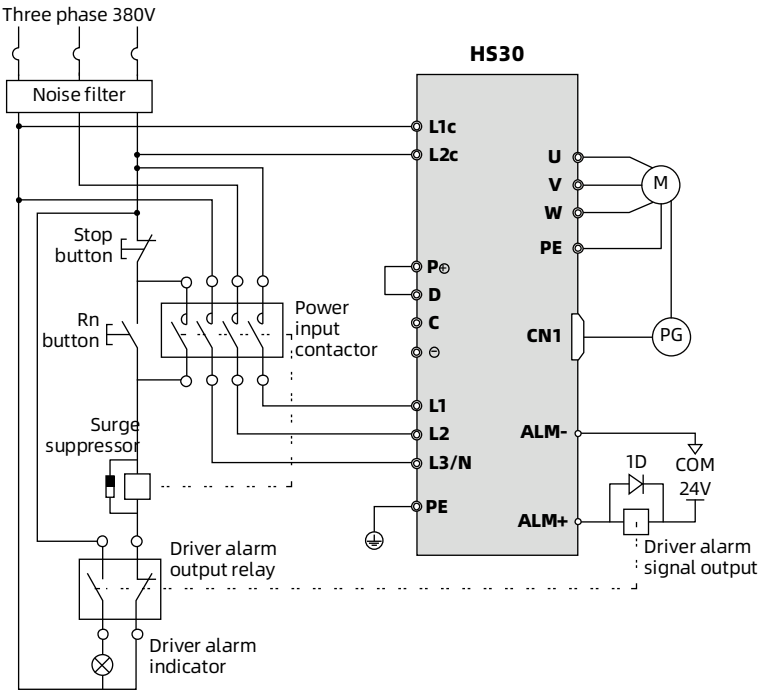
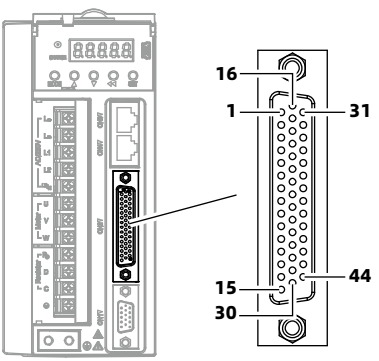


Figure 2-5 Three phase 380V power terminal wiring (HS30-4T□□□-□-P)

2.3 Connect Control Terminal

2.3.1 Control Terminal Description



1	DO4+	GND	DI7	31
	DO3-	+24V	DI6	
	DO3+	AI2	DI5	
	DO2-	AO1	DI3	
	DO2+	AI1	PULLHI	
6	DO1-	PAO+	HPULS-	36
	DO1+	PAO-	SIGN+	
	DI4	PBO-	HPULS+	
	DI1	PZO-	SIGN-	
	DI2	PBO+	HSIGN-	
11	DICOM	DO4-	PULS+	41
	+5V	DO5-	HSIGN+	
	PZO+	DO5+	PULS-	
	COM	AO2	OCZ+	44
15	+10V	COM		

Figure 2-6 Control terminal

Table 2-4 Control terminal description

Terminal		Pin	Description
Digital	DI1, DI2, DICOM	9, 10, 11	Digital input Max. input frequency: 4kHz (DI1 - DI2), 1kHz (DI3 - DI7) Refer to 2.3.3 for wiring
	DI3, DI4, DICOM	34, 8, 11	
	DI5, DI6, DI7, DICOM	33, 32, 31, 11	
	DO1+, DO1-	7, 6	Digital output, 24VDC Output current: Max. 50mA Output frequency: 333Hz Refer to 2.3.4 for wiring
	DO2+, DO2-	5, 4	
	DO3+, DO3-	3, 2	
	DO4+, DO4-	1, 26	
	DO5+, DO5-	28, 27	
	DO6+, DO6-	/	
Analog	AI1, GND	20, 16	Analog input (voltage input) Voltage: -10 - +10V Impedance: About 32kΩ Refer to 2.3.5 for wiring
	AI2, GND	18, 16	
	AO1, GND	19, 16	Analog output (voltage output) Voltage: 0 - 10V Current: Max. 1mA Refer to 2.3.5 for wiring
	AO2, GND	29, 16	
Power supply	+5V, +10V, GND	12, 15, 16	5/10V power supply
	+24V, COM	17, 30	24V power supply
Pulse	PULLHI, COM	35, 14	Pulse plus power input
	SIGN+, SIGN-	37, 39	Low speed pulse direction (or connect with quadrature B or CCW input)
	HSIGN+, HSIGN-	42, 40	High speed pulse direction (or connect with quadrature B or CCW input)

Terminal		Pin	Description
	PULS+, PLUS-	41, 43	Low speed pulse command (or connect with quadrature A or CW input)
	HPULS+, HPULS-	38, 36	High speed pulse command (or connect with quadrature A or CW input)
Frequency division (FD) output	OCZ+, GND	44, 16	Encoder collector signal output Refer to 2.3.6 for wiring
	PAO+, PAO-, GND	21, 22, 16	Encoder differential FD output Refer to 2.3.6 for wiring
	PBO+, PBO-, GND	25, 23, 16	
	PZO+, PZO-, GND	13, 24, 16	

2.3.2 Pulse Input Wiring

Pulse Input is Differential Mode

Only high speed pulse input terminals support differential wiring.

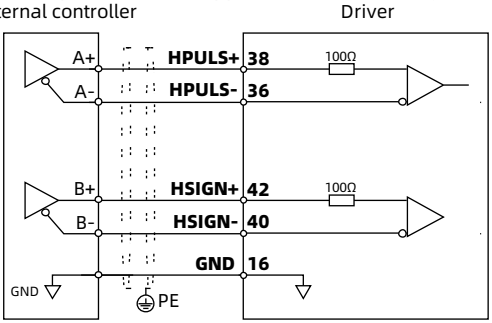


Figure 2-7 Differential wiring

Pulse Input is Open Collector Mode (Using Internal 24V Power Supply)

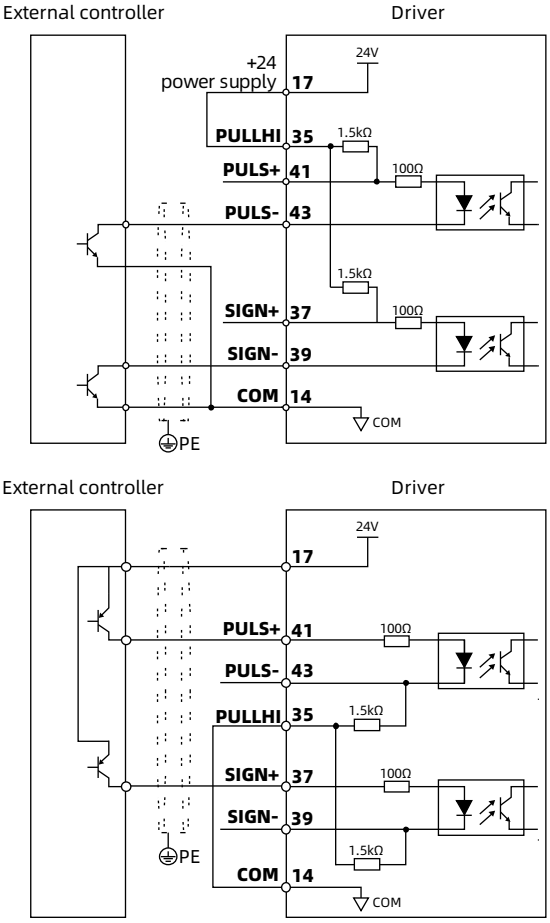


Figure 2-8 Collector wiring (using internal power supply)

Pulse Input is Open Collector Mode (Using External Power Supply and Internal Resistor)

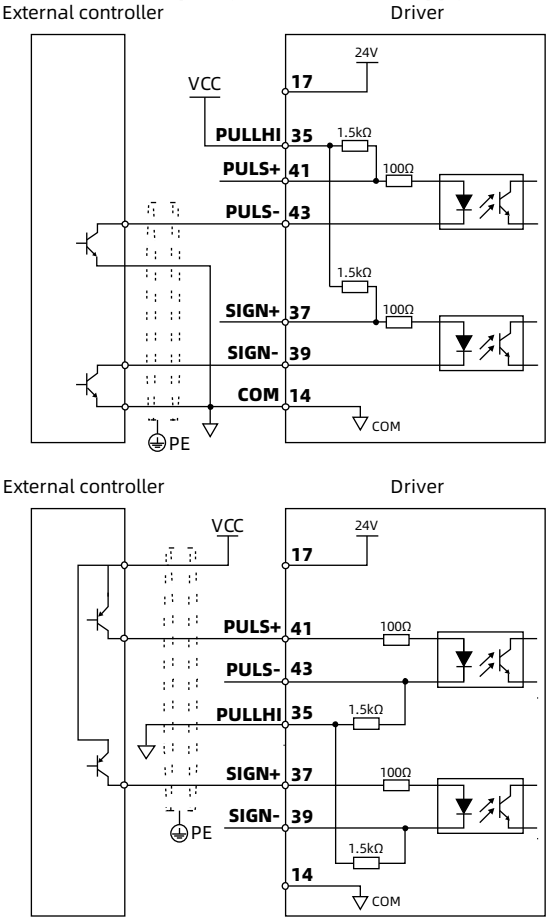


Figure 2-9 Collector wiring (using external power supply and internal resistor)

Pulse Input is Open Collector Mode (Using External Power Supply and External Resistor)

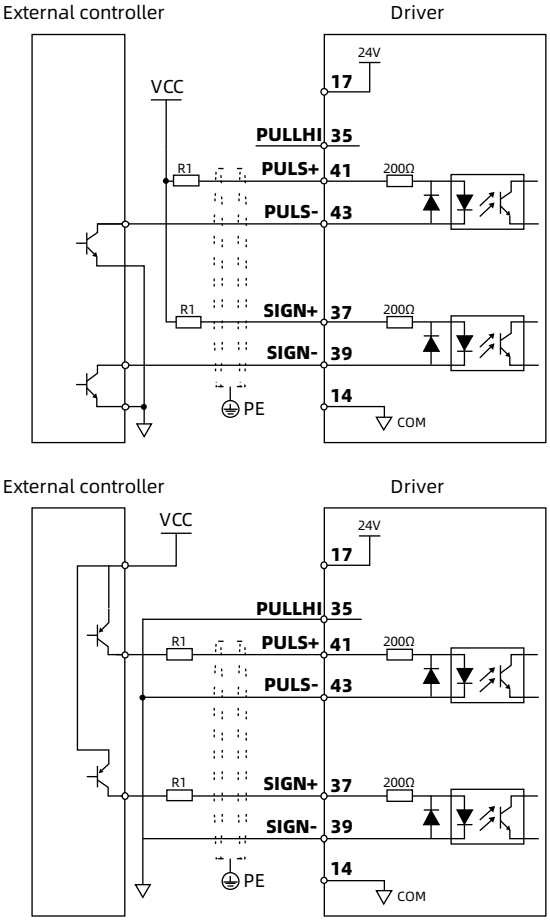


Figure 2-10 Collector wiring (using external power supply and external resistor)

Select the external resistance R1 according to the formula, and the recommended resistor is shown in Table 2-5.

$$\frac{VCC - 1.5}{R1 + 200} = 15mA$$

Table 2-5 Recommended resistor R1

VCC Voltage	R1 Resistance	R1 Power
24V	1.5kΩ	>0.5W
12V	0.75kΩ	>0.5W

2.3.3 Digital Input Wiring

Take DI1 as an example, DI2 - DI7 terminals have the same wiring.

When the External Controller is Relay Output

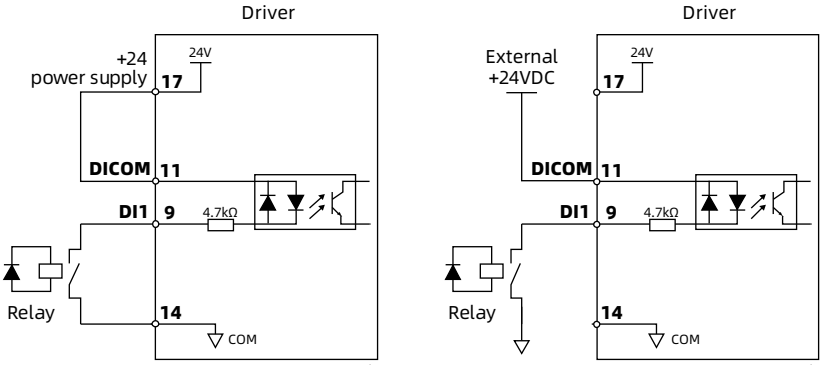


Figure 2-11 Wiring when the external controller is relay output

When the External Controller is Open Collector Output

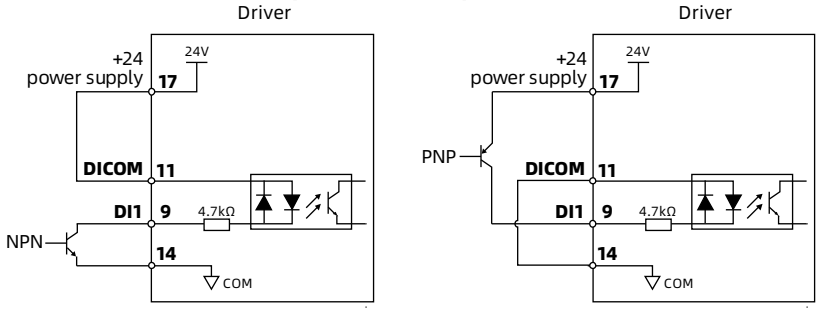


Figure 2-12 Wiring when the external controller is open collector output (using internal power supply)

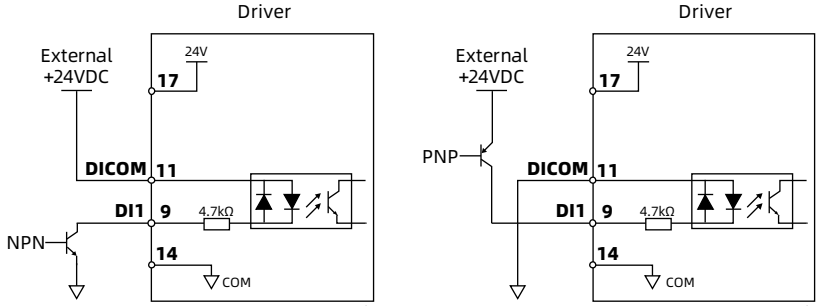


Figure 2-13 Wiring when the external controller is open collector output (using external power supply)

2.3.4 Digital Output Wiring

Take DO1 as an example, DO2 - DO6 terminals have the same wiring.

When the External Controller is Relay or Optocoupler Input

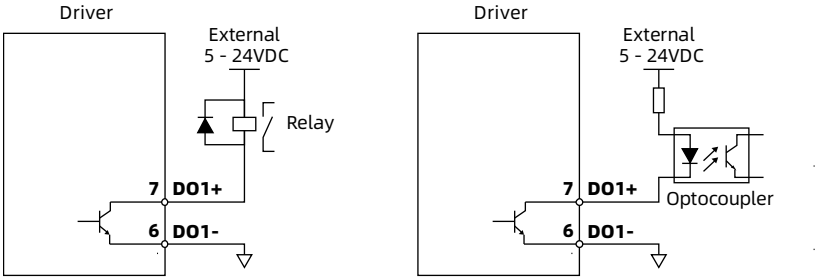


Figure 2-14 Digital output wiring

2.3.5 Analog Input and Output Wiring

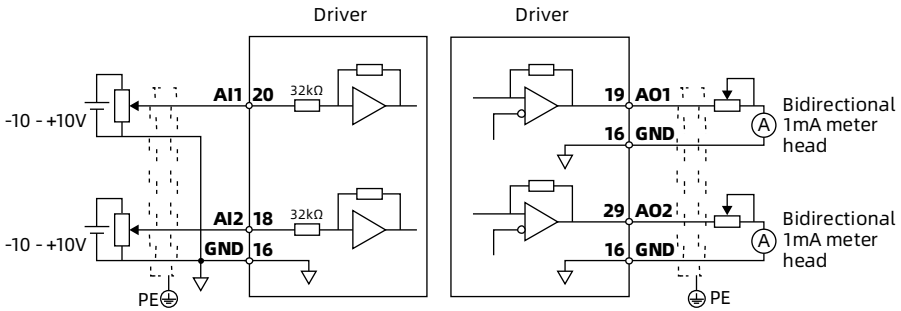


Figure 2-15 Analog input and output wiring

2.3.6 Frequency Division (FD) Output Wiring

The FD Output is Differential Mode

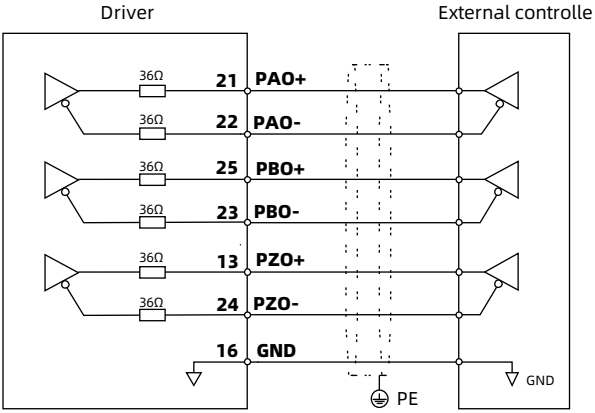


Figure 2-16 Differential wiring

Z Signal is Open Collector Mode

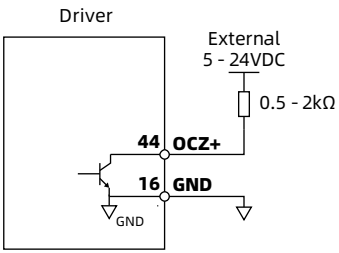
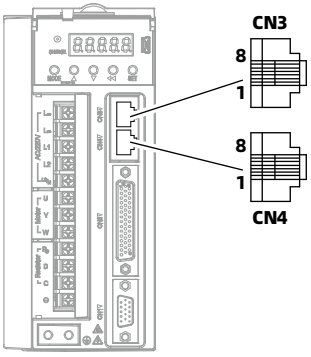


Figure 2-17 Z signal collector wiring

2.4 Communication Terminal

Pin Definition

Table 2-6 Pin definition



Pin	Definition	
1	CANH	CAN communication interface
2	CANL	
3	CGND	CAN communication ground
4	RS485+	RS485 communication interface
5	RS485-	
6*	RS232-TXD	RS232 sender
7*	RS232-RXD	RS232 receiver
8	GND	Ground
Shell	PE	Shield
*: Only CN3 supports RS232 communication.		

Communication Network

PLC products take HC10 as an example.

When using CAN communication, connect GND terminal of PLC to CGND (3) of HS30.

- Do not connect to GND (8) of HS30, connecting to GND damage HS30.

When using RS485 communication, connect V- terminal of PLC to GND (8) of HS30.

- Do not connect to CGND (3) of HS30, connecting to CGND damage HS30.

The CAN/RS485 communication network is shown in the figure below.

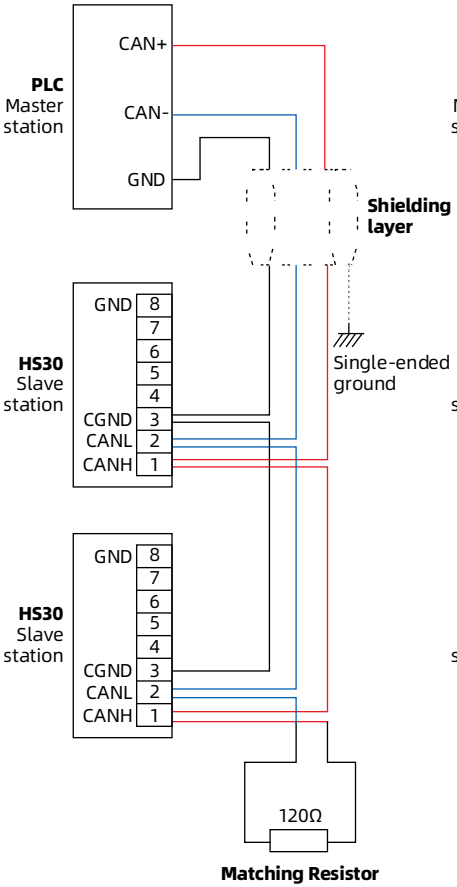


Figure 2-18 CAN communication network

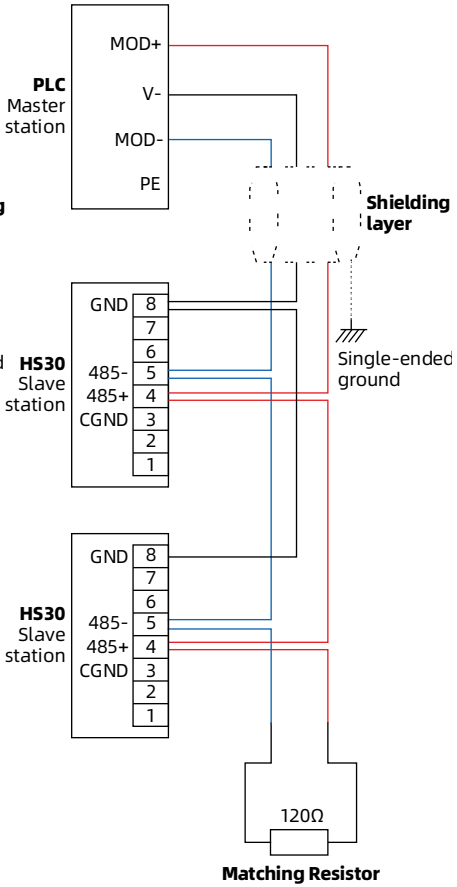


Figure 2-19 RS485 communication network

Note:

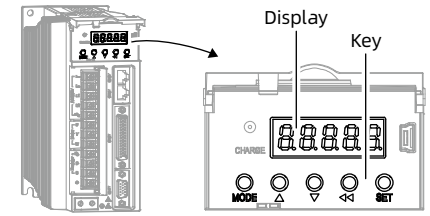
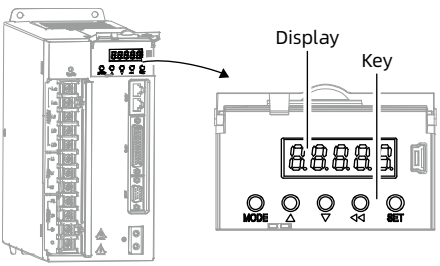
Single-ended grounding is recommended for the shielding layer.

The grounding cable and high-power equipment do not share the same ground.

Chapter 3 Keypad

3.1 Keypad Description

Table 3-1 Keypad description

Keypad	Description	
 SizeA/SizeB  SizeC SizeB2 has the same keypad as SizeC	Display	Display running status, parameter setting and fault
	MODE	Enter or exit the menu
	▲	Increase the value of the current flashing digit, long press to increase quickly
	▼	Decrease the value of the current flashing digit, long press to decrease quickly
	◀◀	Move the selected flashing digit one bit to the left
	SET	Save the settings or enter the next menu

3.2 Display Mode

When the power is on, the keypad enters the status display mode.

Press **MODE** key to switch different display modes, as shown in the figure below.

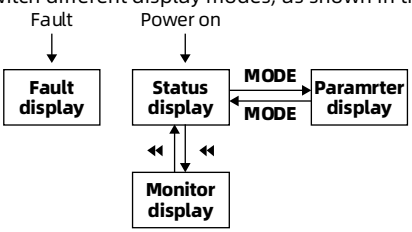


Figure 3-1 Keypad switch display mode

3.2.1 Running Status Display

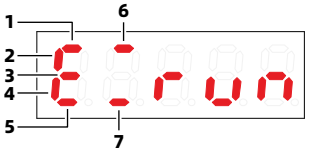


Figure 3-2 Running status display

Table 3-2 Running status display description

In Speed (S) or Torque (T) Control Mode		
Running Status		**Description**
1	Speed consistent signal	When the absolute value of the speed deviation between the motor actual speed and the motor given speed < F07.14, the light is on. • F07.14: Threshold of speed consistent signal (unit: rpm).
2	Motor forward	When the motor is running in the forward direction, the light is on.
3	Zero speed clam	When the zero speed clamp signal starts to run, the light is on.
4	Motor reverse	When the motor runs in the reverse direction, the light is on.
5	Motor rotation	When the motor actual speed > F07.13, the light is on. • F07.13: Speed threshold of motor rotation signal (unit: rpm).
6	Torque limit	When the torque limit value limits the torque, the light is on. • F08.03 - F08.08 set the torque limit value.
7	Speed limit	In torque control, when the speed limit value limits the speed, the light is on. • F08.09, F08.11 and F08.12 set the speed limit value.

In Position (P) Control Mode		
Running Status		**Description**
1	Positioning completed	When the absolute value of the position deviation between the given position and the actual position < F06.21, the light is on. • F06.21: Threshold of positioning completed (unit: command pulse).
2	Motor forward	When the motor is running in the forward direction, the light is on.
3	Positioning near	When the absolute value of the position deviation between the given position and the actual position < F06.22, the light is on. • F06.22: Threshold of positioning near (unit: command pulse).
4	Motor reverse	When the motor runs in the reverse direction, the light is on.
5	Motor rotation	When the motor actual speed > F07.13, the light is on. • F07.13: Speed threshold of motor rotation signal (unit: rpm).
6	Torque limit	When the torque limit value limits the torque, the light is on. • F08.03 - F08.08 set the torque limit value.

3.2.2 Special Status Display

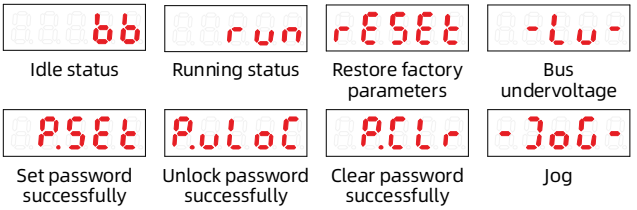


Figure 3-3 Special status display

bb: Always on, indicating that the driver is ready and waiting for the enable signal.

run: Always on, indicating that the driver is enabled and is in running status.

3.2.3 Parameter Display

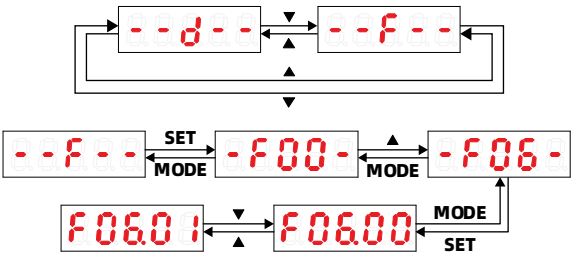


Figure 3-4 Parameter display

3.2.4 Display of Data and Command (32 bit)

The display of 32 bit data and 32 bit command is the same.

Display in pages from low to high, press and hold ◀◀ key for 1s to switch pages cyclically.

For example: Display -1,073,741,824 and +1,073,741,823 as shown in Figure 3-5.

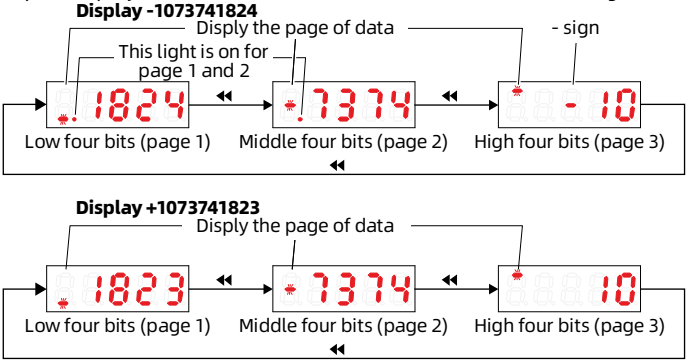


Figure 3-5 Display 32 bit data

3.3 Description of Use

3.3.1 Set Parameter

Change the setting of F07.01 from 200rpm to 500rpm.

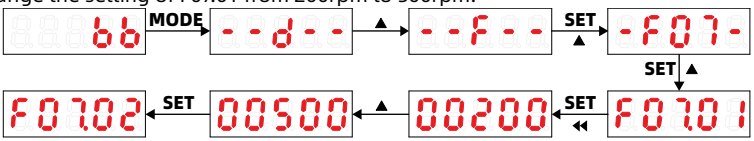


Figure 3-6 Set parameter

When setting the parameter value, if the value does not flash, it means that the parameter cannot be set.

Possible reason:

- This parameter cannot be set, such as actual detection parameter, running record parameter, etc.
- This parameter cannot be set when the driver is running, set this parameter after the driver stops.
- The driver has a user password. Enter the correct user password first, and then set this parameter.

3.3.2 Enable Servo

Enable: Set F00.03 = 3, F0b.02 = 1. The driver is forced to enter the running status (**run**). After power on again, the enable is invalid.

Cancel enable: Set F00.03 = 3, F0b.02 = 0. The driver returns to the idle state (**bb**).

3.3.3 Restore to Factory Setting

Set F0b.10 = 1, the driver starts to restore the factory parameters, and the keypad displays "rESET".

After the end, the driver enters the status display without power off.

3.3.4 Clear Fault

Set F0b.11 = 1, clear the fault record.

3.3.5 User Password Operation

After setting the user password (F0b.20), the parameters can only be checked but not set, and can only be set after unlocking.

For example: The user password is "00003", and the servo is in idle state (**bb**).

Set User Password

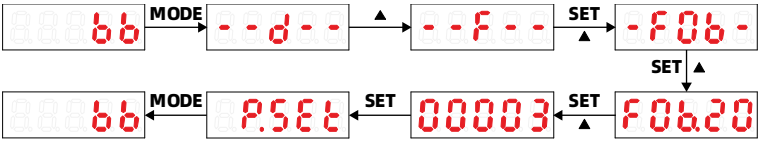


Figure 3-7 Set user password

Unlock User Password

Set F0b.20 = 00003, the keypad displays "P.uLoC".

Modify User Passerword

Unlock the user password first, and then set F0b.20.

When the keypad displays "P.SET", the password is changed successfully.

Cancel User Passerword

After unlocking the user password, set F0b.20 = 00000.

When the keypad displays "P.CLr", the password is canceled successfully.

3.4 Description of Auxiliary Functions

3.4.1 Identify Initial Angle

1.	Disconnect the load.
2.	Set F20.06 = 1, the keypad displays "tunE".
3.	After the end, the keypad displays "bb".

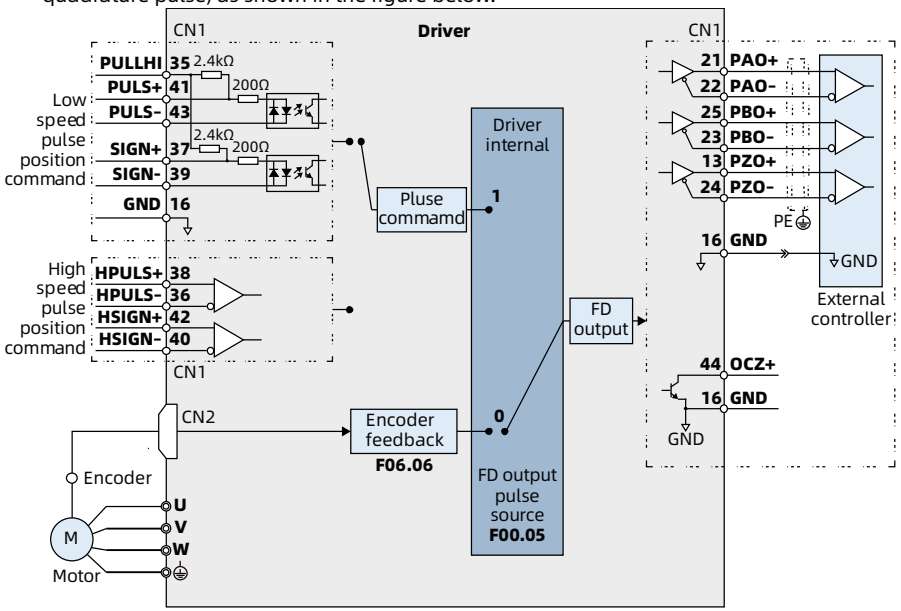
3.4.2 Frequency Division (FD) Output

For FD output wiring, see section 2.3.6 on page 31.

Support any frequency division (pulse command, encoder feedback).

Function Description

Output the position pulse (pulse command or encoder feedback) with A/B phase quadrature pulse, as shown in the figure below.



F00.05 Set the FD Output Pulse Source

- When multi-axis servo pulse synchronous tracking, please use the pulse command output mode (F00.05 = 1).
- When the host computer is used as closed loop feedback, plese use the encoder feedback output mode (F00.05 = 0).

FD Output Signal Description

The FD output signal is shown in the table below. The high-precision FD output uses the Z-phase signal, and F00.07 sets the output change edge.

- Falling edge: F00.07 = 0.
- Rising edge: F00.07 = 1.

Pulse Signal		Description
PAO+, PAO-	A phase pulse	Differential output • Max. output pulse frequency: 2Mpps
PBO+, PBO-	B phase pulse	
PZO+, PZO-	Z phase pulse	
OCZ+, GND	Z signal	Open collector output • Max. output pulse frequency: 100kpps

Any Frequency Division (FD) Output

When using any FD output, set the parameters:

- Resolution: F01.31 (encoder resolution).
- Pulse: F00.05 (pulse source), F00.06 (pulse phase), F00.07 (output polarity).
- FD ratio: F06.06 (encoder FD output pulses), F06.12 (electronic gear ratio numerator 2), F06.14 (electronic gear ratio denominator 2).

When the output source is encoder feedback pulse (F00.05 = 0), the motor rotates 1 circle.

- A/B phase output pulses: Determined by F01.31 (encoder resolution) and F06.06 (encoder FD output pulses).
- The Z signal outputs once.

3.4.3 Multi-turn Encoder Function

High-performance system can not only obtain the position information from single-turn feedback, but also memorize the historical turns with 16-bit multi-turn feedback.
In the multi-turn mode, the multi-turn position is backed up by the battery, and the system is divided into two modes: Absolute position linear mode and absolute position rotary mode.
Support multi-turn encoder with battery.

1. Confirm: The encoder cable connects to the battery, and the battery box has no severe vibration.
2. Use the encoder cable to connect the encoder and the driver.
3. Set F01.35 = 1, F00.30 = 1 or 2.
4. Power on.

   When powering on for the first time, the driver reports E060.0 (the encoder battery is faulty).

   Take measures: Set F20.03 = 1 or 2, and then power on again.
5. Check d00.31 (number of absolute encoder turns).

Chapter 4 Parameter Description

4.1 Parameter List

Warning

Before running the system for the first time, make sure the motor code (F01.00) is correct.
Incorrect F01.00 affects the control effect.

Bus Type Encoder

Using communication to read data, non-normal quadrature AB output.
Including: Absolute photoelectric encoder, absolute magnetic encoder, and serial incremental encoder, etc.

Parameter Unit

Encoder unit: (32 bit) The Min. value of the input position command processed by the electronic gear ratio, corresponding to the encoder position feedback.

Command unit: (32 bit) The Min. value that can be recognized by the external controller input to the driver, that is, the unit of the original position command.

Parameter Setting Mode [Set]

***:** You cannot set the parameter.

×: When the driver is running, you cannot set the parameter.

○: When the driver is running, you can set the parameter.

-: The same as the mapping parameter.

Parameter Valid [Valid]

R: Valid in position control mode.

S: Valid in speed control mode.

T: Valid in torque control mode.

Parameters Take Effect [Effect]

R: After setting the parameters, the driver needs to be powered off and on again. Otherwise, the driver reports E055.0 fault.

Ref. Code	Function	Range	Default	Set	Valid	Effect
d00: Commandmonitoring parameters						
d00.00	Motor speed	-4000 - +4000rpm	-	*	PST	
d00.01	Speed command	-4000 - +4000rpm	-	*	PS	
d00.02	Torque command	-300.0 - +300.0%	-	*	T	
d00.03	Output torque	-300.0 - +300.0%	-	*	PST	
d00.04	DI signal monitoring	0x00 - 0x7F Bit0 - Bit6: DI1 - DI7	-	*	PST	
d00.05	DO signal monitoring	0x00 - 0x3F Bit0 - Bit5: DO1 - DO6	-	*	PST	
d00.06	Motor mechanical angle	0.0 - 360.0°	-	*	PST	
d00.07	Motor electrical angle	0.0 - 360.0°	-	*	PST	
d00.08	Motor speed corresponding to input position command	-4000 - +4000rpm	-	*	P	
	Valid in running.					
d00.09	Position tracking error	-2,147,483,648 - +2,147,483,647 (32 bit data)	-	*	P	
d00.11	Input command pulse counter	-2,147,483,648 - +2,147,483,647 (command unit)	-	*	P	
d00.13	Encoder feedback pulse counter	-2,147,483,648 - +2,147,483,647 (32 bit data)	-	*	PST	
d00.15	Input pulse frequency	0 - +2,147,483,647 (32 bit data)	-	*	P	
d00.17	DC bus voltage	0 - 999V	-	*	PST	
d00.18	Output frequency of motor	0.00 - 655.35Hz	-	*	PST	
d00.20	Output current of driver	0.01 - 99.00A	-	*	PST	
d00.21	Output voltage of driver	0 - 999V	-	*	PST	
d00.22	AI1 sampling voltage	-10.00 - +10.00V	-	*	PST	
d00.23	AI1 processed voltage		-	*	PST	
d00.24	AI2 sampling voltage		-	*	PST	
d00.25	AI2 processed voltage		-	*	PST	
d00.26	AO1 output voltage	0.00 - 10.00V	-	*	PST	
d00.27	AO2 output voltage		-	*	PST	
d00.31	Number of absolute encoder turns	0 - 65535	-	*	PST	
d00.32	Single-turn position of commnunication encoder	0 - 4,294,967,295	-	*	PST	
d00.36	FPGA system status information	Actual	-	*	PST	
d00.37	FPGA system fault information		-	*	PST	
d00.38	Communication encoder fault information from FPGA		-	*	PST	
d00.39	FPGA system fault information 2		-	*	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
d00.42	Average load ratio of motor	0.0 - 100.0%	-	*	PST	
d00.43	Control voltage	0 - 999V	-	*	PST	
d00.45	Real-time output torque	-350.0 - +350.0%	-	*	PST	
d00.46	Encoder feedback pulse counter	-2,147,483,648 - +2,147,483,647 (command unit)	-	*	PST	
	d00.56 is the command unit form of d00.13. In position (P) mode, d00.46 is the current absolute position of the motor.					
d00.50	Position tracking error	-2,147,483,648 - +2,147,483,647 (command unit)	-	*	PST	
	d00.50 is the command unit form of d00.09.					
d00.54	Absolute mechanical position (low 32 bit)	0 - 4,294,967,295	-	*	PST	
d00.56	Absolute mechanical position (high 32 bit)		-	*	PST	
d00.58	Position of multi-turn absolute encoder (low 32 bit)		-	*	PST	
d00.60	Position of multi-turn absolute encoder (high 32 bit)		-	*	PST	
	d00.58 and d00.60 are only used for F00.30 = 1 (absolute position linear mode) or F00.30 = 1 (absolute position rotating mode).					
d00.68	Real-time pulse counter of input command	-2,147,483,648 - +2,147,483,647 (command unit)	-	*	P	
d00.70	Real time feedback current of phase U	-99.99 - +99.99A	-	*	PST	
d00.71	Real time feedback current of phase V	-99.99 - +99.99A	-	*	PST	
d00.72	Real time feedback current of phase W	-99.99 - +99.99A	-	*	PST	
d00.74	Virtual DI signal monitoring	Actual	-	*	PST	
d00.75	Virtual DO signal monitoring		-	*	PST	
d00.76	Power factor in Q13 format	-9999 - +9999	-	*	PST	
d01: Fault Record Parameters						
d01.00	Fault record	0: The latest fault ..... 9: Last 9 fault	-	○	PST	
d01.01	Fault code of selected fault record	Actual	-	*	PST	
d01.02	U phase current of selected fault		-	*	PST	
d01.03	V phase current of selected fault		-	*	PST	
d01.04	Motor speed of selected fault		-	*	PST	
d01.05	Bus voltage of selected fault		-	*	PST	
d01.06	Output voltage of selected fault		-	*	PST	
d01.07	DI terminal status of selected fault		-	*	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
d01.08	DO terminal status of selected fault		-	*	PST	
d01.09	Output current of selected fault		-	*	PST	
d01.10	Position tracking error of selected fault		-	*	P	
d01.12	FPGA system status information of selected fault		-	*	PST	
d01.13	FPGA system status information of selected fault		-	*	PST	
d01.14	FPGA system fault information of selected fault		-	*	PST	
d01.16	FPGA system fault information 2 of selected fault		-	*	PST	
d01.18	Parameter group of abnormal parameter fault		-	*	PST	
d01.19	Parameter group offset in of abnormal parameter fault		-	*	PST	
d01.20	Servo running state	0 - 3	-	*	PST	
	0: The servo is not ready. 1: The servo is ready. 2: The servo is running normally. 3: The servo is in faulty state.					
d01.21	Current fault code	Actual	-	*	PST	-
d02: System Version Parameters						
d02.00	Driver series		-	*	PST	
d02.01	Driver software version		-	*	PST	
d02.02	Non-standard version of driver software		-	*	PST	
d02.03	Driver model		-	*	PST	
d02.04	Motor code		-	*	PST	
d02.06	Encoder version		-	*	PST	
d02.07	CAN software version	Actual	-	*	PST	
d02.08	The Min. allowable brake resistor		-	*	PST	
d02.09	Internal brake resistor power		-	*	PST	
d02.10	Internal brake resistor resistance		-	*	PST	
d02.11	Driver software sub version		-	*	PST	
d02.12	FPGA software major version		-	*	PST	
d02.13	FPGA software sub version		-	*	PST	
d02.25	Rated current of driver		-	*	PST	
F00: Basic Control Parameters						
F00.00	Control mode	0 - 6	0	×	PST	
	0: Position mode (P). 1: Speed mode (S). 2: Torque mode (T). 3: Position ↔ Speed mode.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	4: Position ↔ Torque mode. 5: Speed ↔ Torque mode. 6: Position ↔ Speed ↔ Torque mode.					
F00.01	Max. speed	1000 - 4000rpm	3000rpm	×	PST	
F00.02	Max. torque	100.0 - 300.0%	300.0%	×	PST	
	The Max. input of analog and pulse corresponds to the maximum torque.					
F00.03	Servo ON enable mode	0 - 3	1	×	PST	
	0: Keypad enable. 1: IO/SON terminal enable. 2: Host computer enable. 3: Software enable.					
F00.04	Rotating direction	0, 1	0	×	PST	R
	0: CCW direction is forward direction. The motor rotates C.C.W. (counterclockwise). 1: CW direction is forward direction. The motor rotates C.W. (clockwise).					
F00.05	FD (Frequency division) output pulse source	0 - 2	2	×	PST	R
	0: Encoder position information. 1: Input pulse command. 2: Inhibited FD output.					
F00.06	FD output pulse phase	0, 1	0	×	PST	R
	0: Phase A leading Phase B. 1: Phase B leading phase A.					
F00.07	Output polarity of Z signal	0, 1	0	×	PST	R
	0: Negative polarity, transient low-level signal. 1: Positive polarity, transient high-level signal.					
F00.09	Stop mode at S-ON off	0 - 5	0	○	PST	
	0: Coast to stop, keep de-energized state. 1: Emergency stop with target-zero speed control, keep de-energized state. 2: Emergency stop with F08.14 (set torque control), keep de-energized state. 3: Ramp speed stop based on F00.18 (Dec. time), keep de-energized state. 4: Ramp speed decelerating, then ramp torque stop, keep de-energized state. 5: Software DB (dynamic brake) stop, keep de-energized state.					
F00.10	Fault stop mode setting enable	0, 1	1	○	PST	
	0: Default coast to stop. 1: Group F0F set.					
F00.11	Stop mode at NO.1 fault	0 - 5	0	×	PST	
F00.12	Stop mode at NO.2 fault	0 - 5	0	×	PST	
	0: Coast to stop, keep de-energized state. 1: Emergency stop with target-zero speed control, keep de-energized state. 2: Emergency stop with F08.14 (set torque control), keep de-energized state. 3: Ramp speed stop based on F00.18 (Dec. time), keep de-energized state. 4: Ramp speed decelerating, then ramp torque stop, keep de-energized state. 5: Software DB (dynamic brake) stop, keep de-energized state.					
F00.13	Stop mode at limit switch signal	0 - 5	2	○	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
	0: Coast to stop, keep de-energized state. 1: Emergency stop with target-zero speed control, keep de-energized state. 2: Emergency stop with target-zero speed control, keep position locked state. 3: Ramp speed stop based on F00.18 (Dec. time), keep de-energized state. 4: Ramp speed decelerating, then ramp torque stop, keep de-energized state. 5: Software DB (dynamic brake) stop, keep de-energized state.					
F00.14	Stop mode at servo alarm	0 - 2	0	○	PST	
	0: Coast to stop, keep de-energized state. 1: Emergency stop with target-zero speed control, keep de-energized state. 2: Ramp speed stop based on F00.18 (Dec. time), keep de-energized state.					
F00.15	Bus voltage control gain ratio upon DB braking	0 - 100.0%	50.0%	○	PST	
	The given value is the overvoltage point voltage and the feedback value is the actual bus voltage. The current output duty value = the closed loop run result + the last output result. Used to enhance or diminish the dynamic braking effect. If the braking effect needs to be enhanced, increase F00.15, otherwise decrease F00.15.					
F00.16	Feedback current control gain ratio upon DB braking	0 - 100.0%	3.0%	○	PST	
	The given value is the rated output current of the driver and the feedback value is the actual three phase Max. current. The current output duty value = the closed loop run result + the last output result. Used to enhance or diminish the dynamic braking effect. If the braking effect needs to be enhanced, increase F00.16, otherwise decrease F00.16.					
F00.18	Speed Dec. time of ramp speed stop	0 - 60000ms	25ms	○	PST	
	Valid when the stop mode is ramp speed stop, or ramp decelerating, then ramp torque stop. Set the time to decelerate the speed from 1000rpm to 0rpm.					
F00.19	Torque Dec. time of ramp torque stop	0 - 60000ms	50ms	○	PST	
	Valid when the stop mode is ramp decelerating, then ramp torque stop. Set the time to decelerate the speed from 1000rpm to 0rpm.					
F00.20	Switching speed for stop mode and stop state	0 - 3000rpm	10rpm	○	PST	
	Stop process, when speed < switchover speed, switch the stop state.					
F00.21	Delay from Servo ON to brake output ON	0 - 500ms	0ms	○	PST	
	After the driver is powered on, the brake output is ON, and the delay time from the servo enable ON.					
F00.22	Delay from brake output ON to receiving command	0 - 500ms	250ms	○	PST	
	After the driver is powered up, the driver starts receiving input command with a delay time from the brake input ON. The driver does not receive position, speed, and torque command during the F00.22 time.					
F00.23	Delay from brake output OFF to motor de-energized in static state	0 - 1000ms	150ms	○	PST	
	After the brake output is OFF, delay F00.23 time, and the motor enters the de-energized state.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
F00.24	Motor speed threshold at break output OFF in rotating state	0 - 3000rpm	30rpm	○	PST	
	The motor is in the rotating state, set the motor speed threshold when the brake output is OFF.					
F00.25	Delay from Servo OFF to break output OFF in rotating state	1 - 1000ms	500ms	○	PST	
	When the motor is rotating, if the servo enable is OFF, when condition 1 or condition 2 is met, the brake output is OFF. • Condition 1: The time does not reached F00.25, but the motor decelerates to F00.24. • Condition 2: The time reaches F00.25.					
F00.30	Absolute position detection system	0 - 2	0	×	PST	R
	0: Incremental position mode. 1: Absolute position linear mode. 2: Absolute position rotating mode.					
F01: Motor Parameters						
F01.00	Motor code	0 - 65535	Depend on HS30	×	PST	R
F01.01	Rated power	0.01 - 5.50kW		×	PST	
F01.02	Rated voltage	1 - 380V		×	PST	R
F01.03	Rated current	0.01 - 99.99A		×	PST	R
F01.04	Max. current	0.01 - 99.99A		×	PST	R
F01.05	Rated torque	0.01 - 655.35N·m		×	PST	R
F01.06	Max. torque	0.01 - 655.35N·m		×	PST	R
F01.07	Rated speed	100 - 4000rpm		×	PST	R
F01.08	Max. speed	100 - 4000rpm		×	PST	R
F01.09	Pole pairs	1 - 50		×	PST	R
F01.10	Stator resistance	0.001 - 65.535Ω		×	PST	R
F01.11	Stator d-axis inductance	0.01 - 655.35mH		×	PST	R
F01.12	Stator q-axis inductance	0.01 - 655.35mH		×	PST	R
F01.13	Back EMF constant	0.01 - 655.35 mV/rpm	Depend on HS30	×	PST	R
F01.14	Torque coefficient	0.01 - 655.35 Nm/Arms		×	PST	R
F01.15	Electrical constant	0.01 - 655.35ms		×	PST	
F01.16	Mechanical constant	0.01 - 655.35ms		×	PST	
F01.17	Motor rotor inertia	0.01 - 655.35kg.cm²		×	PST	R
F01.18	Electrical angle for encoder mounting	0.0 - 359.9°		×	PST	R
F01.20	Position offset for encoder mounting	0 - 65535	8192	*	PST	R
F01.23	Identify current	0 - 100%	100%	×	PST	
F01.27	Motor UVW phase sequence recognition enable	0, 1	1	×	PST	
	0: Disable. 1: Enable					
F01.30	Encoder type	0 - 6	6	*	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
	1: 17Bit serial incremental encoder. 3: 17Bit absolute encoder. 6: 23Bit absolute encoder.					
F01.31	Encoder resolution	0 - 1,073,741,824 (32 bit data)	2500	×	PST	R
F01.33	Encoder direction	0, 1	0	×	PST	
	0: Phase A leading Phase B. 1: Phase A lagging Phase B.					
F01.35	Encoder turn type	0, 1	0	×	PST	R
	0: Single-turn encoder. 1: Multi-turn encoder.					
F01.37	Reading and writing selction of the encoder EEPROM	0, 1	0	×	PST	
	0: Enable RW. 1: Disable RW.					
F02: Input Terminal Parameters						
F02.00	DI1 terminal function	0 - 29	1	×	PST	
F02.01	DI2 terminal function		2	×	PST	
F02.02	DI3 terminal function		21	×	PST	
F02.03	DI4 terminal function		22	×	PST	
F02.04	DI5 terminal function		0	×	PST	
F02.05	DI6 terminal function		0	×	PST	
F02.06	DI7 terminal function		0	×	PST	
	Ten&Unit: Input function (see DI function, section 4.2)					
F02.07	DI active set for first power on (low 16 bit)	0000 - FFFF	0	○	PST	R
F02.08	DI active set for first power on (high 16 bit)		0	○	PST	R
F02.10	DI1 filter time	1 - 255 (unit: 10ns)	200	○	PST	
F02.11	DI2 filter time		200	○	PST	
F02.12	DI3 filter time	1 - 1000ms	5ms	○	PST	
F02.13	DI4 filter time	1 - 1000ms	5ms	○	PST	
F02.14	DI5 filter time	1 - 1000ms	5ms	○	PST	
F02.15	DI6 filter time	1 - 1000ms	5ms	○	PST	
F02.16	DI7 filter time	1 - 1000ms	5ms	○	PST	
F02.17	Filter time of servo ON signal	0 - 64	0	○	PST	
F02.18	AI negative input	0, 1	0	○	PST	
	0: Disabled. 1: Enable.					
F02.19	AI automatic zero shift adjustment	0 - 2	0	×	PST	
	0: No adjustment. 1: AI1 adjustment. 2: AI2 adjustment.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
F02.20	AI1 gain	0.5 - 1.5	1.0	○	PST	
F02.21	AI1 offset	-5000 - +5000mV	0mV	○	PST	
	When the driver sampling voltage value is 0 after zero drift correction, set the actual input voltage of AI1.					
F02.22	AI1 filter time	0.0 - 6000.0ms	2.0ms	○	PST	
F02.23	AI1 dead zone	0 - 500mV	30mV	○	PST	
	When the driver sampling voltage value is 0, set the input voltage range of AI1.					
F02.24	AI1 zero drift	-500 - +500mV	0mV	○	PST	
F02.25	AI2 gain	0.5 - 1.5	1.0	○	PST	
F02.26	AI2 offset	-5000 - +5000mV	0mV	○	PST	
F02.27	AI2 filter time	0.0 - 6000.0ms	2.0ms	○	PST	
F02.28	AI2 dead zone	0 - 500mV	30mV	○	PST	
F02.29	AI2 zero drift	-500 - +500mV	0mV	○	PST	
F02.30	DI1 terminal logic	0 - 4	0	○	PST	
F02.31	DI2 terminal logic		0	○	PST	
F02.32	DI3 terminal logic		0	○	PST	
F02.33	DI4 terminal logic		0	○	PST	
F02.34	DI5 terminal logic		0	○	PST	
F02.35	DI6 terminal logic		0	○	PST	
F02.36	DI7 terminal logic		0	○	PST	
	0: Low level valid. 1: High level valid. 2: Rising edge valid. 3: Falling edge valid. 4: Rising edge and falling edge both valid.					
F03: Output Terminal Parameters						
F03.00	DO1 terminal function	0 - 16	1	○	PST	
F03.01	DO2 terminal function		14	○	PST	
F03.02	DO3 terminal function		5	○	PST	
F03.03	DO4 terminal function		0	○	PST	
F03.04	DO5 terminal function		0	○	PST	
	Ten&Unit: Output function (see DO function, section 4.3)					
F03.06	DO source	0 - 7	0	○	PST	
F03.20	AO1 terminal function		0	○	PST	
F03.21	AO2 terminal function		0	○	PST	
	0: Unused. 1: Motor speed, 10V corresponding to the Max. speed (F00.01). 2: Speed command, 10V corresponding to the Max. speed (F00.01). 3: Torque command, 10V corresponding to the Max. torque (F00.02). 4: Position deviation, 0.05V corresponding to the position deviation of 1 command unit. 5: Position command speed, 10V corresponding to the Max. speed (F00.01). 6: AI1 voltage (absolute voltage value after processing). 7: AI2 voltage (absolute voltage value after processing).					

Ref. Code	Function	Range	Default	Set	Valid	Effect
F03.10	DO1 terminal logic	0, 1	0	○	PST	
F03.11	DO2 terminal logic		0	○	PST	
F03.12	DO3 terminal logic		0	○	PST	
F03.13	DO4 terminal logic		0	○	PST	
F03.14	DO5 terminal logic		0	○	PST	
	0: Positive logic. 1: Negative logic.					
F03.22	AO1 gain	0.1 - 10.0	1.0	○	PST	
F03.23	AO2 gain		1.0	○	PST	
F03.24	AO1 offset	-5000 - +5000mV	0mV	○	PST	
F03.25	AO2 offset		0mV	○	PST	
	AO actual output voltage = set theoretical output voltage × gain + offset.					
F04: Loop Parameters						
F04.00	Speed loop KP1	0.1 - 300.0Hz	25.0Hz	○	PST	
F04.02	Speed loop KP2	0.1 - 300.0Hz	40.0Hz	○	PST	
	Set the proportional gain of the speed loop. Determine the response of the speed loop. The larger the setting value, the faster the response of the speed loop, but too large a setting value may cause vibration.					
F04.01	Speed loop Ti1	0.01 - 650.00ms	32.00ms	○	PST	
F04.03	Speed loop Ti2	0.01 - 650.00ms	20.00ms	○	PST	
	Set the time integration constant for the speed loop. The smaller the set value, the stronger the integration effect.					
F04.06	Speed loop parameters switchover condition	0 - 7	0	×	PST	
	0: Fixed at group 1 gain. 1: Switchover by DI. • Set DI terminal = 28 (GAIN-SEL: Gain switchover). • GAIN-SEL signal is invalid: Group 1 gain parameter (F04.00, F04.01, F04.20, F04.34). • GAIN-SEL signal is valid: Group 2 gain parameter (F04.02, F04.03, F04.21, F04.35). 2: Speed command. • In the group 1 gain, when the absolute value of the speed command > (level + hysteresis), switch to the group 2 gain. • In the group 2 gain, when the absolute value of the speed command < (level - hysteresis), after F04.07 time, return to the group 1 gain. 3: Position deviation. • Valid only for position control (other modes are fixed to group 1 gain). • In the group 1 gain, when the absolute value of the position deviation > (level + hysteresis), switch to the group 2 gain. • In the group 2 gain, when the absolute value of the position deviation < (level - hysteresis), after F04.07 time, return to the group 1 gain. 4: Positioning completed. • Valid only for position control (other modes are fixed to group 1 gain). • In the group 1 gain, when positioning is not completed, switch to the group 2 gain. • In the group 2 gain, when positioning is completed, after F04.07 time, return to the group 1 gain.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	5: Motor speed feedback. • Valid only for position control (other modes are fixed to group 1 gain). • In the group 1 gain, when the absolute value of the motor feedfack speed > (level + hysteresis), switch to the group 2 gain. • In the group 2 gain, when the absolute value of the motor feedfack speed < (level - hysteresis), after F04.07 time, return to the group 1 gain. 6: Position command + motor speed feedback. • Valid only for position control (other modes are fixed to group 1 gain). • In the group 1 gain, when the position command ≠ 0, switch to the group 2 gain. • In the group 2 gain, when the position command ≠ 0, the duration > F04.07 time, and the absolute value of the motor feedfack speed < (level - hysteresis), return to the group 1 gain. 7: Switching speed loop to P or PI. • Set DI terminal = 28 (GAIN-SEL: Gain switchover). • GAIN-SEL signal is valid: Switch to proportional (P) control. • GAIN-SEL signal is invalid: Switch to proportional integral (PI) control.					
F04.07	Gain switchover delay	0 - 1000.0ms	5.0ms	○	PST	
	Valid only when group 1 gain switch to group 2 gain (group 2 gain > group 1 gain).					
F04.08	Gain switchover level	F04.09 - 20000	50	○	PST	
F04.09	Gain switchover hysteresis	0 - F04.08	30	○	PST	
	Level ≥ hysteresis. If level < hysteresis, level = hysteresis.					
F04.10	Torque feedforward gain	0.0 - 100.0%	0.0%	○	PST	
F04.11	Torque feedforward filter time	0.00 - 64.0ms	0.50ms	○	PST	
F04.20	Position loop KP1	0.0 - 800.0s^{-1}	40.0s^{-1}	○	P	
F04.21	Position loop KP2	0.0 - 800.0	40.0	○	P	
	Set the proportional gain of the position loop. Determines the response of the position loop. The larger the setting value, the shorter the positioning time, but too large a setting may cause vibration					
F04.23	Position loop gain switching time	0.0 - 1000.0ms	3.0ms	○	P	
	Valid only when group 1 position gain switch to group 2 position gain (group 2 position gain > group 1 position gain).					
F04.24	Speed feedforward signal source	0, 1	1	○	P	
	0: No speed feedforward. 1: Internal speed feedforward.					
F04.25	Speed feedforward gain	0.0 - 100.0%	0.0%	○	P	
F04.26	Speed feedforward filter time	0.00 - 64.0ms	0.50ms	○	P	
F04.30	Current loop d-axis KP gain 1	0.000 - 5.000	1.000	○	PST	
F04.31	Current loop d-axis KI gain 1	0.00 - 5.00	1.00	○	PST	
F04.32	Current loop q-axis KP gain 1	0.000 - 5.000	1.000	○	PST	
F04.33	Current loop q-axis KI gain 1	0.00 - 5.00	1.00	○	PST	
F04.34	Torque command filter time constant 1	0.00 - 50.00ms	0.79ms	○	PST	
F04.35	Torque command filter time constant 2	0.00 - 50.00ms	0.79ms	○	PST	
F04.39	Current loop d-axis KP gain 2	0.000 - 5.000	1.000	○	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
F04.40	Current loop d-axis KI gain 2	0.00 - 5.00	1.00	○	PST	
F04.41	Current loop q-axis KP gain 2	0.000 - 5.000	1.000	○	PST	
F04.42	Current loop q-axis KI gain 2	0.00 - 5.00	1.00	○	PST	
F04.48	d-axis voltage decoupling ratio	0.000 - 1.000	1.000	○	PST	R
F04.49	q-axis voltage decoupling ratio	0.000 - 1.000	1.000	×	PST	R
F05: Auto-tuning Parameters						
F05.00	Auto-tuning mode for modifying loop parameter	0 - 2	0	○	PST	
	0: Manully modifying loop parameter. 1: Standard mode, basing on rigid level set. 2: Quick positioning mode, basing on rigid level set.					
F05.01	Rigid level	1 - 31	12	○	PST	
	Recommended settings: • Large mechanical load: 4 - 8. • Lower rigidity load such as belt: 8 - 15. • Load with high rigidity such as ball screw and direct connection: 15 - 20.					
F05.02	Load inertia ratio	0.00 - 30.00	4.00	○	PST	
	Load inertia ratio = total mechanical load inertia / motor inertia. **Note:** When F05.02 = actual inertia ratio, the speed loop gain (F04.00/F04.02) is the Max. following frequency of actual speed loop. Increasing the inertia ratio, the proportion and integral effects of the speed loop are enhanced. Conversely, the effects are weakened.					
F05.04	Offline inertia identification mode	0, 1	0	○	PST	
	0: Forward and reverse triangular wave mode. 1: Forward and reverse JOG mode.					
F05.05	Rotational cycles for complete single offline inertia identification	0 - 655.35	1.04	*	PST	
F05.06	Max. speed during offline inertia identification	100 - 1000rpm	500rpm	×	PST	
F05.07	Time to accelerate to Max. speed during offline inertia identification	20 - 800ms	500ms	×	PST	
F05.08	Waiting time after each offline inertia identification	50 - 10000ms	800ms	×	PST	
F06: Position Control Parameters						
F06.00	Position command source	0, 1	0	×	P	
	0: External pulse command. 1: Internal multi-position command.					
F06.01	External pulse command form	0 - 3	0	×	P	R
	0: Direction + pulse (positive logic) 1: Direction + pulse (negative logic). 2: Phase A + phase B quadrature pulse (4-frequency multiplication). 3: CW + CCW pulse. F06.01 and F00.04 determine the forward and reverse of the pulse command. When F00.04 = 0, see the table below. When F00.04 = 1, forward and reverse are interchanged.					

<table>
<tr><th>Ref. Code</th><th>Function</th><th>Range</th><th>Default</th><th>Set</th><th>Valid</th><th>Effect</th></tr>
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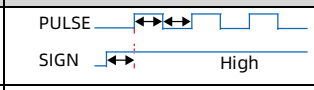
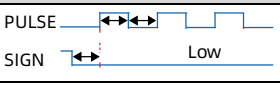
<table>
<tr><td>F06.01</td><td>Forward Pulse</td><td>Reverse Pulse</td></tr>
<tr><td>0</td><td> 
</td><td> 
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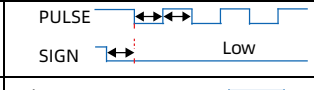
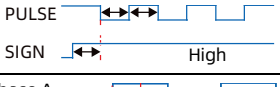
<tr><td>1</td><td> 
</td><td> 
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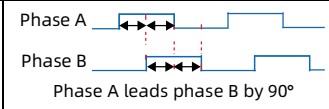
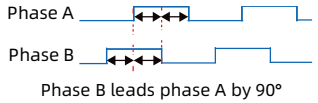
<tr><td>2</td><td> 
</td><td> 
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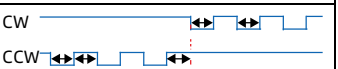
</td><td> 
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<tr><td>F06.02</td><td>Position command low-pass filter time</td><td>0 - 2000ms</td><td>0ms</td><td>×</td><td>P</td><td></td></tr>
<tr><td>F06.03</td><td>Position command smoothing filter time</td><td>0 - 400.0ms</td><td>0.0ms</td><td>×</td><td>P</td><td></td></tr>
<tr><td>F06.04</td><td>Postition command pulses per revolution</td><td>1 - 1,073,741,824
(32 bit data)</td><td>0</td><td>×</td><td>P</td><td>R</td></tr>
<tr><td></td><td colspan="6">Set the position commands for each rotation of the motor.
F06.04 has higher priority than electronic gear ratio.
• When F06.04 = 0, Electronic gear ratio 1 (F06.08/F06.10), Electronic gear ratio 2 (F06.12/F06.14) and F06.16 are valid.
• When F06.04 ≠ 0, Electronic gear ratio 1 (F06.08/F06.10) and Electronic gear ratio 2 (F06.12/F06.14) are invalid.
Electronic gear ratio = encoder resolution (F01.31).</td></tr>
<tr><td>F06.06</td><td>Encoder FD output pulses per revolution (before 4-frequency multiplication)</td><td>0 - 262,143
(32 bit data)</td><td>2500</td><td>×</td><td>PST</td><td>R</td></tr>
<tr><td></td><td colspan="6">In encoder FD output mode, the output pulses from the AB quadrature is 4 times of F06.06.</td></tr>
<tr><td>F06.08</td><td>Electronic gear ratio numerator 1</td><td>1 - 1,073,741,824</td><td>F01.31</td><td>○</td><td>PST</td><td></td></tr>
<tr><td>F06.10</td><td>Electronic gear ratio denominator 1</td><td>1 - 1,073,741,824</td><td>10000</td><td>○</td><td>P</td><td></td></tr>
<tr><td>F06.12</td><td>Electronic gear ratio numerator 2</td><td>1 - 1,073,741,824</td><td>1</td><td>○</td><td>P</td><td></td></tr>
<tr><td>F06.14</td><td>Electronic gear ratio denominator 2</td><td>1 - 1,073,741,824</td><td>1</td><td>○</td><td>P</td><td></td></tr>
<tr><td></td><td colspan="6">When the FD output source selects the pulse command, F06.08 is the FD numerator (after 4 frequency multiplication), and the upper limit is F06.14.
When the FD output source selects the pulse command, F06.10 is the FD denominator, the lower limit is F06.12, and the upper limit is 2^{18} - 1.
Reset after setting (power on again or software).
Select electronic gear ratio 1 or electronic gear ratio 2 according to F06.16.</td></tr>
<tr><td>F06.16</td><td>Electronic gear ratio switchover condition</td><td>0, 1</td><td>0</td><td>×</td><td>P</td><td></td></tr>
<tr><td></td><td colspan="6">Switch according to DI terminal (No. 23 function).
0: Switchover if position command (command unit) = 0 and the duration reaches 2ms.
1: Real-time switchover.</td></tr>
</table>

Ref. Code	Function	Range	Default	Set	Valid	Effect
F06.17	Position deviation clear	0 - 2	0	×	P	
	0: When S-ON is off or a fault occurs. 1: When a fault occurs. 2: When the ClrPosErr signal is input from DI.					
F06.18	Position deviation threshold	1 - 1,073,741,824 (encoder / command unit)	Depend on HS30	○	P	
F06.20	Output condition of positioning completed / near signal	0 - 3	1	○	P	
	0: When the absolute value of position deviation < F06.21/F06.22. 1: After the command ends, when the absolute value of position deviation < F06.21/F06.22. 2: After the command ends, when the motor speed < rotation speed threshold (F07.13), and absolute value of position deviation < F06.21/F06.22. 3: After the command ends, the absolute value of position deviation < F06. 21/F06.22, and the output keeps F06.23 time.					
F06.21	Threshold of positioning completed	1 - F06.22	Depend on HS30	○	P	
F06.22	Threshold of positioning near	1 - 65535 (encoder / command unit)	Depend on HS30	○	P	
F06.23	Positioning completed holding time	0 - 50000ms	0ms	○	P	
F06.24	Homing enabling mode	0 - 7	0	○	P	
	0: Disabled, prohibit homing. 1: Start homing immediately. • When the servo enable signal is valid, perform homing immediately, and F06.24 = 0 when the homing is successful. 2: Input homing start signal from DI to enable homing. • Set any DI terminal = 24 (ORG-ENA: Homing function). 3: Start electrical home immediately. • After the servo enable signal is valid, perform electrical homing immediately, and F06.24 = 0 when the homing is successful. 4: Input homing start signal from DI to enable electrical home attaining. • Set any DI terminal = 24 (ORG-ENA: Homing function). 5: Start homing immediately after power on. • Power on again. When the first servo enable signal is valid, start homing immediately. 6: Take current position as the home. • F06.24 = 0 when the homing is successful. 7: Take the current DI edge as the home. • Set any DI terminal = 25 (DI-ORG: Current DI edge as the home).					
F06.25	Homing mode	0 - 9	0	○	P	
	0: Forward direction (Dec. point is forward travel signal and home is motot Z signal). 1: Reverse direction (Dec. point is reverse travel signal and home is motot Z signal). 2: Forward direction (Dec. point and home are forward travel signal). 3: Reverse direction (Dec. point and home are reverse travel signal). 4: Forward direction (Dec. point and home are home switch signal). 5: Reverse direction (Dec. point and home are home switch signal). 6: Forward direction (Dec. point and home are motot Z signal).					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	7: Reverse direction (Dec. point and home are motot Z signal). 8: Forward direction (Dec. point is home switch signal, and home is motot Z signal). 9: Reverse direction (Dec. point is home switch signal, and home is motot Z signal). 4 DI terminals: No. 21 function (P-OT: Forward travel signal), No. 22 function (N-OT: Reverse travel signal), No. 24 function (ORG-ENA: Homing function), No. 26 function (ORGP: Home switch).					
F06.26	High speed of homing	0rpm - F00.01	100rpm	○	P	
F06.27	Low speed of homing	0rpm - F00.01	10rpm	○	P	
F06.28	Acc. / Dec. time of homing	0 - 5000ms	1000ms	○	P	
F06.29	Duration limit of homing	0 - 60000 F06.30 sets unit	30000	×	P	
	Valid when F06.25 = 0 or 1.					
F06.30	Duration limit time unit of homing	0 - 2	0	×	P	
	Set the unit of F06.29. 0: The unit is 1ms. 1: The unit is 10ms. 2: The unit is 100ms.					
F06.31	Mechanical home offset and action after reaching limit switch	0 - 3	0	○	P	
	0: F06.32 as coordinate for homing, trigger homing and find home reversely after reaching limit switch. • Mechanical home: Does not coincide with the mechanical zero position. After homing, the motor stops at the mechanical home, and the mechanical home coordinate is forced to F06.32. • Overtravel processing: The trigger signal of homing is given again, and the servo performs homing in reverse direction. 1: F06.32 as relative offset for homing, trigger homing and find home reversely after reaching limit switch. • Mechanical home: Coincides with the mechanical zero position. After the motor locates the mechanical home, continue to move F06.32 and stop. • Overtravel processing: The trigger signal of homing is given again, and the servo performs homing in reverse direction. 2: F06.32 as coordinate for homing, automatically find zero position reversely after reaching limit switch. • Mechanical home: Does not coincide with the mechanical zero position. After homing, the motor stops at the mechanical home, and the mechanical home coordinate is forced to F06.32. • Overtravel processing: The servo automatically reverses and continues to perform homing. 3: F06.32 as relative offset for homing, automatically find zero position reversely after reaching limit switch. • Mechanical home: Coincides with the mechanical zero position. After the motor locates the mechanical home, continue to move F06.32 and stop. • Overtravel processing: The servo automatically reverses and continues to perform homing. **Note:** 1. After homing, the current absolute position of the motor (d00.46) is consistent with F06.32.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	2. ORG-CMP (home attaining output) signal or EORG-CMP (electrical home attaining output) signal output condition: After d00.46 = F06.32, and independent of the servo enable signal state. 3. When using limit processing, please set F00.13 (stop mode at limit switch signal) = 2 (emergency stop with target-zero speed control, keep position locked state), otherwise the driver reports overcurrent fault.					
F06.32	Mechanical home offset	-1,073,741,824 - +1,073,741,823 (32 bit data)	0	○	P	
F06.34	Encoder and command unit	0, 1	0	×	P	
	0: The units of F06.21, F06.22, F06.18 are encoder units. 1: The units of F06.21, F06.22, F06.18 are command units.					
F06.35	High or low speed selection of input pulse	0, 1	0	×	P	R
	0: Low-speed input pulse. 1: High-speed input pulse.					
F06.36	Terminal filter time constant of FPGA low-speed pulse	0 - 255 (unit: 10ns)	75	×	P	
F06.37	Terminal filter time constant of FPGA high-speed pulse	0 - 255 (unit: 10ns)	7	×	P	
F06.39	Encoder multi-turn data offset	0 - 65535	0	×	P	
	When F06.39 ≠ 0, the multi-turn data = the original encoder feedback multi-turn date - F06.39. F06.39 affects the multi-turn data of d00.31, d00.58 and d00.60.					
F06.43	Multi-turn absolute position offset (low 32 bit)	0 - 429,4967,295	0	*	P	
F06.45	Multi-turn absolute position offset (high 32 bit)		0	*	P	
	F06.43 and F06.45 are only used for F00.30 = 1 (absolute position linear mode).					
F06.51	Position change on fly	0, 1	0	×	P	
	0: Disabled. 1: Enabled.					
F06.57	Display filter time of input pulse frequency and motor speed	0 - 5000ms	10ms	○	P	
F06.58	The Max. position pulse input frequency	100 - 4000kHz	4000kHz	×	PS	
F06.64	Selection of real-time updates for the first group of electronic gear ratios	0, 1	0	○	P	
	0: Do not update. 1: Real time update.					
F07: Speed Control Parameters						
F07.00	Speed command source	0 - 5	0	×	S	

Ref. Code	Function	Range	Default	Set	Valid	Effect
	0: Digital setting (F07.01). 1: AI1. 10V corresponding to the Max. speed (F00.01). 2: AI2. 0V corresponding to the Max. speed (F00.01). 3: Multi-speed setting (F0A). 4: Input frequency setting of external pulse. F07.07 corresponding to the Max. speed (F00.01) 5: Communication.					
F07.01	Setting value of speed command	-F00.01 - +F00.01	200rpm	○	S	
F07.03	Acc. and Dec. mode of speed command	0	0	×	S	
	0: Linear. 1: S-curve.					
F07.04	Acc. time of speed command	0 - 60000ms	0ms	○	S	
	Set the time to accelerate speed from 0rpm to 1000rpm. F07.04 = 0: The driver internally determines the actual Acc. time.					
F07.05	Dec. time of speed command	0 - 60000ms	0ms	○	S	
	Set the time to decelerate the speed from 1000rpm to 0rpm. F07.05 = 0: The driver internally determines the actual Dec. time.					
F07.06	Smoothing time constant of speed command Acc. and Dec.	0 - 1000ms	0ms	○	S	
F07.07	Upper frequency limit of input pulse	0.01 - 500.00kHz	200.00kHz	○	S	
	Valid only when F07.00 = 4.					
F07.08	Pulse filter time of speed command	0.0 - 100.0ms	1.0ms	○	S	
F07.09	Speed threshold for zero speed clamp	0rpm - F00.01	10rpm	○	S	
F07.10	Zero speed clamp mode	0 - 3	0	×	S	
	Set the action when the ZCLAMP input signal is ON. 0: Forced zero speed, when the actual speed drops to F07.09, switch to position mode locking. 1: Forced zero speed. 2: When the actual speed drops to F07.09, switch to position mode locking. 3: When the given speed drops to F07.09, switch to position mode locking, otherwise resume running. Set any DI terminal = 18 (ZCLAMP: Zero speed clamp).					
F07.11	Forward speed command limit	0rpm - F00.01	3000rpm	○	S	
F07.12	Reverse speed command limit		3000rpm	○	S	
F07.13	Speed threshold of motor rotation signal		10rpm	○	S	
	When the motor actual speed ≥ F07.13, the driver output TGON (motor rotation output) signal.					
F07.14	Threshold of speed consistent signal	0rpm - F00.01	10rpm	○	S	
	When the absolute value of the command deviation between the motor actual speed and the given motor speed ≤ F07.14, the driver output SPD-SAME (speed consistent) signal.					
F07.15	Threshold of speed reached signal	10rpm - F00.01	1000rpm	○	S	
	When the absolute value of the motor actual speed ≥ F07.15, the driver output SPD-CMP (speed completed) signal.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
F07.16	Threshold of zero speed output signal	0rpm - F00.01	10rpm	○	S	
	When the motor actual speed ≤ F07.16, the driver output ZERO-SPD (motor zero speed) signal.					
F07.17	Speed DO filter time	0 - 5000ms	10ms	○	S	
F07.18	Speed display filter time 1		50ms	○	S	
F07.19	Speed display filter coefficient 2	0 - 5	4	○	S	
F08: Torque Control Parameters						
F08.00	Torque command	0 - 2	0	×	T	
	0: Digital setting (F08.01). 1: AI1. 10V corresponding to the Max. torque (F00.02). 2: AI2. 10V corresponding to the Max. torque (F00.02).					
F08.01	Digital setting value of torque command	-F00.02 - +F00.02	0.0%	○	T	
	Valid when F08.00 = 0.					
F08.02	Low-pass filter time of input torque command (not from speed loop)	0.0 - 400.0ms	0.0ms	○	T	
F08.03	Torque limit source	0 - 4	0	×	PST	
	0: Internal positive/negative torque limit (F08.05 and F08.06). 1: External positive/negative torque limit (F08.07 and F08.08). 2: TOR-LMT as external torque limit. 3: Min (TOR-LMT, external positive/negative torque limit) is taken as the torque limit. 4: TOR-LMT and internal positive/negativetorque switching.					
F08.04	TOR-LMT	0, 1	0	×	PST	
	0: AI1. 1: AI2. Valid when F08.03 = 2 or 3 or 4.					
F08.05	Internal positive torque limit	0.0% - F00.02	300.0%	○	PST	
F08.06	Internal negative torque limit		300.0%	○	PST	
F08.07	External positive torque limit		300.0%	○	PST	
F08.08	External negative torque limit		300.0%	○	PST	
F08.09	Speed limit source	0 - 2	0	×	T	
	After setting the speed limit, the system limits the motor speed within the limit value. When the motor speed reaches the speed limit value, the motor runs at a constant speed at the limit value. 0: Internal speed limit (F08.11 and F08.12). 1: AI1. 10V corresponding to the Max. speed (F00.01). 2: AI2. 10V corresponding to the Max. speed (F00.01).					
F08.10	Handling method of torque loop saturation output for speed limit	0 - 3	2	○	T	
	0: When the speed exceeds the limit, if the torque loop output is in the same direction as the torque command selected by F08.00, it will be limited based on the torque command. 1: When the speed exceeds the limit, if the torque loop output is in the same direction as the torque command selected by F08.00, it will be limited based on the torque limit value selected by F08.03.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	2: When the speed exceeds the limit, the torque loop output is limited based on the torque command selected by F08.00. 3: When the speed exceeds the limit, the torque loop output is limited based on the torque limit value selected by F08.03.					
F08.11	Positive speed limit in torque control	0rpm - F00.01	3000rpm	○	T	
F08.12	Negative speed limit in torque control	0rpm - F00.01	3000rpm	○	T	
F08.13	Confirmation time to judge over-speed limit	0.0 - 300.0ms	2.0ms	○	PST	
F08.14	Emergency stop torque setting	0.0 - 300.0%	100.0%	○	PST	
F08.15	Base value for torque reached	0.0 - 300.0%	0.0%	○	PST	
F08.16	Output torque value when torque reached (DO signal) is on	F08.17 - F00.02	20.0%	○	PST	
F08.17	Output torque value when torque reached (DO signal) is off	0.0% - F08.16	10.0%	○	PST	
	When the absolute value of the actual output torque of the motor - F08.15 ≥ F08.16, the driver output TOR-CMP (torque reached) signal. When the absolute value of the actual output torque of the motor - F08.15 < F08.17, the TOR-CMP signal is invalid.					
F08.18	Limiting torque selection for over-voltage situation	0, 1	0	×	PST	
	0: Disable. 1: Enable.					
F08.21	Increase/decrease method of torque command	0	0	×	T	
	0: Straight line.					
F08.22	Increasing time of torque command	0 - 60000ms	0ms	×	T	
	Set the time for the torque command to increase from 0.0% to F00.02. 0: The driver internally determines the actual increasing time.					
F08.23	Decreasing time of torque command	0 - 60000ms	0ms	×	T	
	Set the time for the torque command to decrease from F00.02 to 0.0%. 0: The driver internally determines the actual decreasing time.					
F09: Multi-position Parameters						
F09.00	Number of multi-position command profile	1 - 16	1	×	P	
F09.01	Multi-position running mode	0000 - 1131	0010	×	P	
	Unit: Step change mode • 0: Relative positioning. • 1: Absolute positioning. **Ten: Multi-position running mode** • 0: Stop after running single cycle. • 1: Cyclic running. • 2: DI switchover. • 3: Sequential running.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	Hundred: Margin processing method • 0: Complete the remaining distance. • 1: Start running again from 1st position. **Thousand: Time unit** • 0: Time unit of group F09 is millisecond (ms). • 1: Time unit of group F09 is second (s).					
F09.02	Pulses of 1st position	-1,073,741,824 - +1,073,741,823 (command unit)	10000	○	P	
F09.04	Running speed of 1st position	0rpm - F00.01	500rpm	○	P	
F09.05	Acc. and Dec. time of 1st position	0 - 60000ms/s F09.01 thousand sets unit	50ms/s	○	P	
F09.06	Waiting time after 1st position	0 - 60000ms/s F09.01 thousand sets unit	10ms/s	○	P	
F09.07 - F09.81	For the 2nd - 16th position, refer to the description of the 1st position.					
F09.82	Start position of cyclic running	0 - F09.00	0	×	P	
F0A: Multi-speed Parameters						
F0A.00	Number of multi-speed command profile	1 - 16	1	○	S	
F0A.01	Multi-speed running mode	0 - 2	0	○	S	
	0: DI Switchover, by DI functions are from CMD0 to CMD3. 1: Stop after running single cycle. 2: Cyclic running.					
F0A.02	1st speed command	-F00.01 - +F00.01	0rpm	○	S	
F0A.03	Acc. and Dec. time of 1st speed command	0 - 4	1	○	S	
	0: Acc. and Dec. time is 0. 1: Select the group 1 (Acc. time F0A.51, Dec. time F0A.52) 2: Select the group 2 (Acc. time F0A.53, Dec. time F0A.54). 3: Select the group 3 (Acc. time F0A.55, Dec. time F0A.56). 4: Select the group 4 (Acc. time F0A.57, Dec. time F0A.58).					
F0A.04	Running time of 1st speed command	0.0 - 6553.5s/min	5.0s/min	○	S	
F0A.05 - F0A.49	For the 2nd - 16th speed command, refer to the description of the 1st speed command.					
F0A.50	Multi-speed running time unit	0, 1	0	×	S	
	0: Second (s). 1: minute (min).					
F0A.51	Multi-speed Acc. time 1	0 - 65535ms	10ms	×	S	
F0A.52	Multi-speed Dec. time 1		10ms	×	S	
F0A.53	Multi-speed Acc. time 2		50ms	×	S	
F0A.54	Multi-speed Dec. time 2		50ms	×	S	

Ref. Code	Function	Range	Default	Set	Valid	Effect
F0A.55	Multi-speed Acc. time 3		100ms	×	S	
F0A.56	Multi-speed Dec. time 3		100ms	×	S	
F0A.57	Multi-speed Acc. time 4		150ms	×	S	
F0A.58	Multi-speed Dec. time 4		150ms	×	S	
F0b: Auxiliary Parameters						
F0b.02	Software ON enable	0, 1	0	○	PST	
	Enable is invalid after power on again. 0: Disabled. 1: Enabled, servo is in ON state.					
F0b.10	Restore to factory setting	0, 1	0	×	PST	
	0: Not restore. 1: Restore.					
F0b.11	Clear fault record	0, 1	0	×	PST	
	0: Not clear. 1: Clear.					
F0b.17	Speed feedback	0, 1	Depend on HS30	×	PST	
	0: From FPGA. 1: From M method.					
F0b.18	Average filter coefficient of speed feedback	0 - 4	0	×	PST	
F0b.19	Cut-off frequency of speed feedback low-pass filter	0 - 5000Hz	Depend on HS30	×	PST	
F0b.20	User password	0 - 65535	0	○	PST	
F0c: Communication Parameters						
F0c.00	Servo Modbus address	1 - 247	2	○	PST	
	0: Broadcast address.					
F0c.01	485 serial baud rate	0 - 6	2	○	PST	
	0: 2400bps. 1: 4800bps. 2: 9600bps. 3: 19200bps. 4: 38400bps. 5: 57600bps. 6: 115200bps. 7: 384000bps.					
F0c.02	Modbus data format	0 - 3	0	○	PST	
	0: 1-8-2 format, no parity. 1: 1-8-1 format, even parity. 2: 1-8-1 format, odd parity. 3: 1-8-1 format, no parity.					
F0c.03	Selection of updating to EEPROM when writing function code values	0, 1	0	○	PST	
	0: Do not update to EEPROM.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	1: Update to EEPROM. Set F0c.03 = 1 with caution. Setting parameters take effect immediately by default. A large number of long-term setting parameters and storing them in EEPROM can damage the EEPROM. Frequently save the set parameters by power off, please set F0c.03 = 0.					
F0c.04	Modbus response delay	0 - 5000ms	0ms	○	PST	
F0c.05	RS232 serial baud rate	0 - 6	6	○	PST	
	0: 2400bps. 1: 4800bps. 2: 9600bps. 3: 19200bps. 4: 38400bps. 5: 57600bps. 6: 115200bps.					
F0c.08	CAN communication protocol	0, 1	1	○	PST	
	0: CANopen. 1: General communication protocol.					
F0c.10	Servo CAN address	0 - 127	2	×	PST	
	0: Broadcast address.					
F0c.20	CAN communication rate	0 - 6	3	○	PST	
	0: 20kbps. 1: 50kbps. 2: 100kbps. 3: 125kbps. 4: 250kbps. 5: 500kbps. 6: 1Mbps.					
F0c.21	1st set value of CAN communication QDF1	0000 - FFFF	FFFF	○	PST	
F0c.22	2nd set value of CAN communication QDF1		FFFF	○	PST	
F0c.23	3rd set value of CAN communication QDF1		FFFF	○	PST	
F0c.24	4th set value of CAN communication QDF1		FFFF	○	PST	
F0c.25	1st set value of CAN communication QDF2		FFFF	○	PST	
F0c.26	2nd set value of CAN communication QDF2		FFFF	○	PST	
F0c.27	3rd set value of CAN communication QDF2		FFFF	○	PST	
F0c.28	4th set value of CAN communication QDF2		FFFF	○	PST	
F0c.29	1st set value of CAN communication QDF3		FFFF	○	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
F0c.30	2nd set value of CAN communication QDF3		FFFF	○	PST	
F0c.31	1st response value of CAN communication QDF1		FFFF	○	PST	
F0c.32	2nd response value of CAN communication QDF1		FFFF	○	PST	
F0c.33	3rd response value of CAN communication QDF1		FFFF	○	PST	
F0c.34	4th response value of CAN communication QDF1		FFFF	○	PST	
F0c.35	1st response value of CAN communication QDF2		FFFF	○	PST	
F0c.36	2nd response value of CAN communication QDF2		FFFF	○	PST	
F0c.37	3rd response value of CAN communication QDF2		FFFF	○	PST	
F0c.38	4th response value of CAN communication QDF2		FFFF	○	PST	
F0c.39	1st response value of CAN communication QDF3		FFFF	○	PST	
F0c.40	2nd response value of CAN communication QDF3		FFFF	○	PST	
F0c.41	Detection time of PDO disconnection	0 - 5000ms	0ms	○	PST	
F0c.42	Stop mode of PDO disconnection	0, 1	0	○	PST	
	0: No stop. 1: Stop.					
F0d: Fault And Protection Parameters						
F0d.00	Overload pre-alarm detection	0000 - 0110	0000	×	PST	
	Thousand: Unused **Hundred: Overload protection** • 0: Enable. • 1: Shield. **Ten: Pre-alarm detection level** • 0: The detection level is relative to the motor rated current (alarm: motor overload). • 1: The detection level is relative to the driver rated current (alarm: driver overload). **Unit: Unused**					
F0d.01	Overload pre-alarm detection level	20.0 - 500.0%	300.0%	×	PST	
F0d.09	Motor cable disconnection detection	0, 1	1	○	PST	
	0: Shield disconnection protection. 1: Enable disconnection protection (A006.1).					
F0d.10	Detection level of input phase loss protection	0 - 50%	30%	×	PST	
	0: Shield input phase loss protection function.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
F0d.11	Detection time of input phase loss protection	100 - 500ms	100ms	×	PST	
F0d.12	Warning LED display	0, 1	1	○	PST	
	0: Shield. 1: Allow.					
F0d.14	Fan control mode	0 - 2	0	○	PST	
	0: Fan ON for servo running, immediately OFF for stop state. 1: Always on. 2: Fan ON for servo running, OFF after at least 1 min stop.					
F0d.15	Lock-rotor alarming speed	0rpm - F00.01	10rpm	○	PST	
F0d.16	Lock-rotor alarming time	0 - 65535ms	1500ms	○	PST	
F0d.17	Detection time for encoder disconnection	0.00 - 2.00s	0.00s	×	PST	
F0d.19	Motor overspeed detection value	0.0 - 300.0%	120.0%	×	PST	
F0d.20	Motor runaway protection	0, 1	0	×	PST	
	0: No protection. 1: Enable protection. For torque control, if the motor is pulled by the load, etc. causing runaway fault E081.0, you can set F0d.20 = 0.					
F0d.21	Speed deviation detection error between command and feedback speed	0.0 - 100.0%	50.0%	×	PST	
F0d.22	Speed deviation detection time	0.00 - 5.00s	2.50s	×	PST	
	In the speed and position mode, the absolute value of the difference between the motor given speed and the motor feedback speed > F0d.21 × Max. speed, after F0d.22 time, the driver alarms. • No detection in torque mode or when F0d.22 = 0. **Note**: For torque limit, towed or vertical site, please set F0d.22 = 0 (shield speed deviation fault).					
F0d.23	Brake function selection in servo OFF state	0, 1	0	×	PST	
	0: Disable the brake unit. 1: Enable the brake unit.					
F0d.24	Brake resistor type	0 - 3	0	×	PST	
	0: Internal. 1: External, self-cooling. 2: External, air-cooling. 3: No resistor, using only bus capacitor. When using the external brake resistor, please set F0d.27 (resistor heat dissipation coefficient) according to the heat dissipation conditions.					
F0d.25	Power of external brake resistor	1 - 65535W	500W	×	PST	
F0d.26	Resistance of external brake resistor	1 - 1000Ω	40Ω	×	PST	
F0d.27	Resistor heat dissipation coefficient	0.00 - 1.00%	0.30%	○	PST	
	F0d.27 is valid for both internal and external brake resistors.					

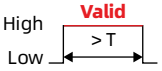
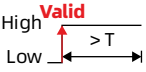
Ref. Code	Function	Range	Default	Set	Valid	Effect
	Normally: When the brake resistor is self-cooled, F0d.27 does not exceed 0.30%. When the brake resistor is air-cooled, F0d.27 does not exceed 0.50%. The larger the F0d.27, the higher the braking efficiency.					
F0d.28	Max. continuous braking time	0.00 - 30.00s	10.00s	×	PST	
F0d.30	Initial limit-torque voltage for overvoltage situation	190.0 - 1000.0V	Depend on HS30	○	PST	
F0d.32	Encoder multi-turn overflow fault	0, 1	0	×	PST	
	0: Enable. 1: Disable.					
F0d.37	Communication timeout timing	0 - 6000	0	×	PST	
F0d.38	Communication disconnection timing	0 - 6000	0	×	PST	
F0d.43	Mismatch selection of motor and driver current	0, 1	0	×	PST	
	0: The driver automatically detects, if the current does not match, the driver reports A028.5. 1: Do not detect.					
F0d.46	Motor overload protection adjust gain	50 - 300	100	○	PST	
F0E: Usability Parameters						
F0E.02	Keypad speed JOG enable	0 - 4000	100	○	PST	
	Press ▲ key, the motor rotates forward. Press ▼ key, the motor rotates reverse.					
F0E.03	JOG speed command set value	0rpm - F00.01	100rpm	○	PST	
F0E.04	JOG speed Acc. and Dec. time	0 - 60000ms	100ms	○	PST	
	0: The driver internally determines the actual Acc. and Dec. time.					
F0F: Fault Stop Parameters						
F0F.00	Fault stop mode 1	0 - 0x5005	0x0000	×	PST	
	0: Coast to stop, keep de-energized state. 1: Emergency stop with target-zero speed control, keep de-energized state. 2: Emergency stop with F08.14 (set torque control), keep de-energized state. 3: Ramp speed stop based on F00.18 (Dec. time), keep de-energized state. 4: Ramp speed decelerating, then ramp torque stop, keep de-energized state. 5: Software DB (dynamic brake) stop, keep de-energized state. **Note:** 1. Each parameter in the F0F group has 16 bits, each 4 bits set a fault stop mode, and one parameter can set 4 faults. 2. For the fault codes, please refer to section 8.2 "Handling of faults and warnings during running" in "HS30 Series Servo System User Manual". Taking F0F.01 as an example, the factory defaults correspond to fault stop modes: • 0 (coast to stop). • 0 (coast to stop). • 3 (ramp speed stop based on F00.18). • 3 (ramp speed stop based on F00.18).					
F0F.01	Fault stop mode 2	0 - 0x4400	0x3300	×	PST	
F0F.02	Fault stop mode 3	0 - 0x0000	0x0000	×	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
F0F.03	Fault stop mode 4	0 - 0x0040	0x0000	×	PST	
F0F.04	Fault stop mode 5	0 - 0x5555	0x0500	×	PST	
F0F.05	Fault stop mode 6	0 - 0x0055	0x0000	×	PST	
F0F.06	Fault stop mode 7	0 - 0x5555	0x5555	×	PST	
F0F.07	Fault stop mode 8	0 - 0x5555	0x5555	×	PST	
F0F.08	Fault stop mode 9	0 - 0x0555	0x0555	×	PST	
F0F.09	Fault stop mode 10	0 - 0x0555	0x0555	×	PST	
F0F.10	Fault stop mode 11	0 - 0x0000	0x0000	×	PST	
F0F.11	Fault stop mode 12	0 - 0x5550	0x0000	×	PST	
F0F.12	Fault stop mode 13	0 - 0x5055	0x0000	×	PST	
F0F.13	Fault stop mode 14	0 - 0x4555	0x3505	×	PST	
F0F.14	Fault stop mode 15	0 - 0x5005	0x5005	×	PST	
F0F.15	Fault stop mode 16	0 - 0x5555	0x5555	×	PST	
F0F.16	Fault stop mode 17	0 - 0x0000	0x0000	×	PST	
F0F.17	Fault stop mode 18	0 - 0x0444	0x0333	×	PST	
F0F.18	Fault stop mode 19	0 - 0x5540	0x5500	×	PST	
F0F.19	Fault stop mode 20	0 - 0x5505	0x5505	×	PST	
F0F.20	Fault stop mode 21	0 - 0x5455	0x5455	×	PST	
F0F.21	Fault stop mode 22	0 - 0x5055	0x5055	×	PST	
F0F.22	Fault stop mode 23	0 - 0x5544	0x5544	×	PST	
F0F.23	Fault stop mode 24	0 - 0x5555	0x5555	×	PST	
F0F.24	Fault stop mode 25	0 - 0x5555	0x5555	×	PST	
F0F.25	Fault stop mode 26	0 - 0x0444	0x0333	×	PST	
F0F.26	Fault stop mode 27	0 - 0x4000	0x3000	×	PST	
F0F.27	Fault stop mode 28	0 - 04404	0x3303	×	PST	
F0F.28	Fault stop mode 29	0 - 0x4554	0x3553	×	PST	
F0F.29	Fault stop mode 30	0 - 0x4444	0x3333	×	PST	
F0F.30	Fault stop mode 31	0 - 0x4444	0x3333	×	PST	
F0F.31	Fault stop mode 32	0 - 0x4444	0x3333	×	PST	
F0F.32	Fault stop mode 33	0 - 0x4444	0x3333	×	PST	
F0F.33	Fault stop mode 34	0 - 0x4444	0x3333	×	PST	
F0F.34	Fault stop mode 35	0 - 0x4444	0x3333	×	PST	
F0F.35	Fault stop mode 36	0 - 0x4404	0x3003	×	PST	
F0F.36	Fault stop mode 37	0 - 0x0004	0x0003	×	PST	
F12: Virtual DI and DO Parameters						
F12.00	VDI1 terminal function	0 - 29	0000	×	PST	
F12.01	VDI2 terminal function		0000	×	PST	
F12.02	VDI3 terminal function		0000	×	PST	
F12.03	VDI4 terminal function		0000	×	PST	
F12.04	VDI5 terminal function		0000	×	PST	
F12.05	VDI6 terminal function		0000	×	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
F12.06	VDI7 terminal function		0000	×	PST	
F12.07	VDI8 terminal function		0000	×	PST	
F12.08	VDI9 terminal function		0000	×	PST	
F12.09	VDI10 terminal function		0000	×	PST	
F12.10	VDI11 terminal function		0000	×	PST	
F12.11	VDI12 terminal function		0000	×	PST	
F12.12	VDI13 terminal function		0000	×	PST	
F12.13	VDI14 terminal function		0000	×	PST	
F12.14	VDI15 terminal function		0000	×	PST	
F12.15	VDI16 terminal function		0000	×	PST	

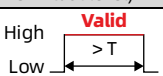
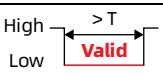
Setting steps for using the VDI terminal function:

1. Set F12.50 = 1 (enable VDI).
2. F12.00 - F12.15 set VDI terminal function.
   - The function is the same as DI, see section 4.2.
   - **Note:** When VDI terminal (group F12) and DI terminal (group F02) are set to the same non-zero function, the driver reports E032.0 fault.
3. F12.16 - F12.31 set the VDI terminal logic, F12.51 set the VDI default virtual level after power on, F12.52 set the VDI terminal level.
   The setting relationship is shown in the table below.

F12.16 - F12.31 (VDI terminal logic)		F12.51 (VDI default after power on) F12.52 (VDI virtual level)
0	Writing 1 valid	
1	Written value is valid from 0 to 1	

F12.16	VDI1 terminal logic	0, 1	0	○	PST	
F12.17	VDI2 terminal logic		0	○	PST	
F12.18	VDI3 terminal logic		0	○	PST	
F12.19	VDI4 terminal logic		0	○	PST	
F12.20	VDI5 terminal logic		0	○	PST	
F12.21	VDI6 terminal logic		0	○	PST	
F12.22	VDI7 terminal logic		0	○	PST	
F12.23	VDI8 terminal logic		0	○	PST	
F12.24	VDI9 terminal logic		0	○	PST	
F12.25	VDI10 terminal logic		0	○	PST	
F12.26	VDI11 terminal logic		0	○	PST	
F12.27	VDI12 terminal logic		0	○	PST	
F12.28	VDI13 terminal logic		0	○	PST	
F12.29	VDI14 terminal logic		0	○	PST	
F12.30	VDI15 terminal logic		0	○	PST	

Ref. Code	Function	Range	Default	Set	Valid	Effect
F12.31	VDI16 terminal logic		0	○	PST	
	0: Writing 1 valid. 1: Written value is valid from 0 to 1.					
F12.32	VDO1 terminal function	0 - 16	0	○	PST	
F12.33	VDO2 terminal function		0	○	PST	
F12.34	VDO3 terminal function		0	○	PST	
F12.35	VDO4 terminal function		0	○	PST	
F12.36	VDO5 terminal function		0	○	PST	
F12.37	VDO6 terminal function		0	○	PST	
F12.38	VDO7 terminal function		0	○	PST	
F12.39	VDO8 terminal function		0	○	PST	
F12.40	VDO9 terminal function		0	○	PST	
F12.41	VDO10 terminal function		0	○	PST	
F12.42	VDO11 terminal function	0 - 16	0	○	PST	
F12.43	VDO12 terminal function		0	○	PST	
F12.44	VDO13 terminal function		0	○	PST	
F12.45	VDO14 terminal function		0	○	PST	
F12.46	VDO15 terminal function		0	○	PST	
F12.47	VDO16 terminal function		0	○	PST	
	Setting steps for using the VDO terminal function: 1. Set F12.53 = 1 (enable VDO). 2. F12.32 - F12.47 set VDO terminal function. • The function is the same as DO, see section 4.3. • **Note:** When VDO terminal (group F12) and DO terminal (group F03) are set to the same non-zero function, the driver reports E033.0 fault. 3. F12.57 - F12.72 set the VDO terminal logic, F12.54 set the VDO default virtual level after power on, F12.55 set the VDO terminal level. The setting relationship is shown in the table below.					
F12.50	VDI function selection	0, 1	0	×	PST	
	0: Disable VDI. 1: Enable VDI.					
F12.51	VDI default value after power on	0 - 0xFFFF	0	○	PST	
F12.52	VDI virtual level		0	○	PST	
	Bit0 = 1: The logic of VDI1 is "1".					

F12.57 - F12.72 (VDO terminal logic)		F12.54 (VDO default after power on) F12.55 (VDO virtual level)
0	Output 1 when valid	
1	Output 0 when valid	

Ref. Code	Function	Range	Default	Set	Valid	Effect
	Bit15 = 1: The logic of VDI16 is "1".					
F12.53	VDO function selection	0, 1	0	○	PST	
	0: Disable VDO. 1: Enable VDO.					
F12.54	VDO default value after power on	0 - 0xFFFF	0	×	PST	
F12.55	VDO virtual level		0	×	PST	
	Bit0 = 1: The logic of VDO1 is "1". ..... Bit15 = 1: The logic of VDO16 is "1".					
F12.57	VDO1 terminal logic	0, 1	0	○	PST	
F12.58	VDO2 terminal logic		0	○	PST	
F12.59	VDO3 terminal logic		0	○	PST	
F12.60	VDO4 terminal logic		0	○	PST	
F12.61	VDO5 terminal logic		0	○	PST	
F12.62	VDO6 terminal logic		0	○	PST	
F12.63	VDO7 terminal logic		0	○	PST	
F12.64	VDO8 terminal logic		0	○	PST	
F12.65	VDO9 terminal logic		0	○	PST	
F12.66	VDO10 terminal logic		0	○	PST	
F12.67	VDO11 terminal logic		0	○	PST	
F12.68	VDO12 terminal logic		0	○	PST	
F12.69	VDO13 terminal logic		0	○	PST	
F12.70	VDO14 terminal logic		0	○	PST	
F12.71	VDO15 terminal logic		0	○	PST	
F12.72	VDO16 terminal logic		0	○	PST	
	0: Output 1 when valid. 1: Output 0 when valid.					
F20: Operation Command Parameters						
F20.00	Fault reset command	0, 1	0	×	PST	
F20.01	Software reset command	0, 1	0	×	PST	
F20.02	FPGA fault reset command	0, 1	0	×	PST	
	0: Invalid. 1: Valid.					
F20.03	Encoder reset command	0 - 2	0	×	PST	
	0: Invalid. 1: Start reset encoder fault. 2: Start reset encoder fault and multi-turn data.					
F20.04	EEPROM operation command for commnunication encdoer	0 - 2	0	×	PST	
	0: Invalid. 1: Start writing parameters to encoder EEPROM. 2: Start reading encoder EEPROM to parameters.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
	Note: After the encoder reads and writes, if F20.04 = 3, the read and write fails, otherwise F20.04 = 0.					
F20.06	Initial angle tuing of encoder	0, 1	0	×	PST	
F20.10	Linear gain adjusting for UV phase current sampling	0, 1	0	×	PST	
	0: Invalid. 1: Valid.					
F20.11	Offline inertia identification enable	0.00 - 655.35	1.00	×	PST	
	Press and hold ▲ or ▼ key, the motor automatically rotates forward or reverse, and accelerate and decelerate, release the key after F20.11 (inertia identification value) is stable. Press **SET** key 3 times continuously, F05.02 saves the identification result (F20.11).					
F21: Background Mode Parameters						
F21.00	Host computer working mode	0, 1	0	○	PST	
	0: Exit working mode. 1: Control servo JOG or positioning trial run.					
F21.01	Host computer mode	0 - 2	0	×	PST	
	0: Position mode. 1: Speed mode. 2: Torque mode.					
F21.06	Positioning trial run	0, 1	0	×	PST	
	0: JOG. 1: Positioning trial run. **Note:** Trial run in host computer mode (F21.00 = 1, F21.01 = 0).					
F21.07	JOG positioning run direction	0 - 2	0	○	PST	
	0: Not run. 1: CCW direction. 2: CW direction.					
F21.08	JOG positioning limit position	0, 1	0	○	PST	
	0: Not set. 1: Set. First set F21.08 = 0, run to the target position. Then set F21.08 = 1, the current position is the limit position.					
F21.09	JOG positioning limit coordinates in the CCW direction	-1,073,741,824 - +1,073,741,824	-	*	PST	
F21.11	JOG positioning limit coordinates in the CW direction		-	*	PST	
F21.13	Pulses sent for JOG positioning		-	*	PST	
F21.15	Distance setting of positioning trial run		0	○	PST	
F21.17	Positioning trial run mode	0, 1	0	○	PST	
	0: Single time. 1: Continuous.					
F21.18	Positioning trial run direction	0 - 2	0	○	PST	
	0: Not run. 1: CCW direction. 2: CW direction.					

Ref. Code	Function	Range	Default	Set	Valid	Effect
F21.19	Waiting time after positioning trial run	0 - 60000ms	500ms	○	PST	
F21.20	Max. speed of positioning run	0 - 40000rpm	100rpm	○	PST	
F21.21	Acc. and Dec. time of positioning trial run	0 - 60000ms	100ms	○	PST	
	0: The driver internally determines the actual Acc. and Dec. time.					
F21.22	Clear JOG positioning pulses	0, 1	0	○	PST	
	0: Not clear. 1: Clear. Clear the current position, limit position (high and low bit) and limit position setting, clear once for each pulse.					

4.2 DI Function

<table>
<tr><th>No.</th><th colspan="2">Function</th><th>Description</th></tr>
<tr><td>0</td><td>NULL</td><td>No function</td><td></td></tr>
<tr><td>1</td><td>S-ON</td><td>Servo enable</td><td>Invalid: The driver is not enabled, the motor is not powered on
Valid: The driver is enabled, the motor is powered on</td></tr>
<tr><td>2</td><td>ALM-RST</td><td>Fault and warning reset</td><td>Invalid: When the driver alarms, the driver does not clear the alarm
Valid: When the driver alarms, the rising edge of the input signal clears the alarm</td></tr>
<tr><td>3</td><td>CMD0</td><td>Multi-command 1</td><td rowspan="4">Invalid: Multi-command input is invalid
Valid: The corresponding command in the table is valid
<table>
<tr><th>CMD3</th><th>CMD2</th><th>CMD1</th><th>CMD0</th><th>Command number</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1st command</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>2nd command</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>3rd command</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>4th command</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>5th command</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>6th command</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>7th command</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>8th command</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>9th command</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>10th command</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>11th command</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>12th command</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>13th command</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>14th command</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>15th command</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>16th command</td></tr>
</table>
• 0: Invalid
• 1: Valid</td></tr>
<tr><td>4</td><td>CMD1</td><td>Multi-command 2</td></tr>
<tr><td>5</td><td>CMD2</td><td>Multi-command 3</td></tr>
<tr><td>6</td><td>CMD3</td><td>Multi-command 4</td></tr>
<tr><td>7</td><td>JOG-FWD</td><td>Forward jog</td><td>Invalid: Prohibit
Valid: Allow</td></tr>
<tr><td>8</td><td>JOG-REV</td><td>Reverse jog</td><td>Invalid: Prohibit
Valid: Allow</td></tr>
<tr><td>9</td><td>MOD-SEL</td><td>Mode switchover</td><td>When F00.00 = 3 or 4 or 5, the DI terminal selects the control mode</td></tr>
<tr><td>10</td><td>P-CL</td><td>External positive torque limit</td><td>Invalid: CCW direction, F08.07 does not limit the torque
Valid: CCW direction, F08.07 limit torque</td></tr>
<tr><td>11</td><td>N-CL</td><td>External negative torque limit</td><td>Invalid: CW direction, F08.08 does not limit the torque
Valid: CW direction, F08.08 limit torque</td></tr>
<tr><td>12, 13</td><td>Unused</td><td></td><td></td></tr>
</table>

<table>
<tr><th>No.</th><th colspan="2">Function</th><th>Description</th></tr>
<tr><td>14</td><td>POS-DIR</td><td>Position command direction</td><td rowspan="3">Invalid: Run in CCW direction
Valid: Run in CW direction</td></tr>
<tr><td>15</td><td>SPD-DIR</td><td>Speed command direction</td></tr>
<tr><td>16</td><td>TOR-DIR</td><td>Torque command direction</td></tr>
<tr><td>17</td><td>POS-CLR</td><td>Position deviation cleared</td><td>Invalid: Prohibit
Valid: Allow</td></tr>
<tr><td>18</td><td>ZCLAMP</td><td>Zero speed clamp</td><td>Invalid: Do not stall the motor shaft
Valid: Stall the motor shaft</td></tr>
<tr><td>19</td><td>PLSINHIBIT</td><td>Pulse input command inhibit</td><td>Invalid: Allow
Valid: Prohibit</td></tr>
<tr><td>20</td><td>MULP-ENA</td><td>Multi-position enable</td><td>Invalid: Prohibit
Valid: Allow</td></tr>
<tr><td>21</td><td>P-OT</td><td>Forward travel signal</td><td>Invalid: Allow forward run
Valid: Prohibit forward run</td></tr>
<tr><td>22</td><td>N-OT</td><td>Reverse travel signal</td><td>Invalid: Allow reverse run
Valid: Prohibit reverse run</td></tr>
<tr><td>23</td><td>GEAR-SEL</td><td>Electronic gear ratio selection</td><td>Invalid: First gear ratio
Valid: Second gear ratio</td></tr>
<tr><td>24</td><td>ORG-ENA</td><td>Homing function</td><td>Invalid: Prohibit
Valid: Enable</td></tr>
<tr><td>25</td><td>DI-ORG</td><td>Current DI edge as the home</td><td>Invalid: Home is not set
Valid: The position captured by DI edge is taken as the home</td></tr>
<tr><td>26</td><td>ORGP</td><td>Home switch</td><td>Invalid: Does not touch the home switch
Valid: Touch the home switch</td></tr>
<tr><td>27</td><td>DI-EMER</td><td>DI emergency stop</td><td>Invalid: No action
Valid: Emergency stop</td></tr>
<tr><td>28</td><td>GAIN-SEL</td><td>Gain switchover</td><td>Invalid: Group 1 gain parameters
Valid: Group 2 gain parameters</td></tr>
<tr><td>29</td><td>MOD-SEL2</td><td>Mode switchover 2</td><td>When F00.00 = 6, 2 DI terminals select the control mode
<table>
<tr><th>MOD-SEL1 logic No. 9 function</th><th>MOD-SEL2 logic No. 29 function</th><th>Control mode</th></tr>
<tr><td>Valid</td><td>/</td><td>Position mode</td></tr>
<tr><td>Invalid</td><td>Valid</td><td>Speed mode</td></tr>
<tr><td>Invalid</td><td>Invalid</td><td>Torque mode</td></tr>
</table></td></tr>
</table>

4.3 DO Function

No.	Function		Description
0	NULL	No function	
1	S-RDY	Servo ready	Invalid: The driver reports alarm or fault Valid: No alarm or fault
2	TGON	Motor rotation output	Invalid: The motor actual speed < F07.13 Valid: The motor actual speed ≥ F07.13
3	ZERO-SPD	Motor zero speed	Invalid: The motor actual speed > F07.16 Valid: The motor actual speed ≤ F07.16
4	POS-NEAR	Positioning near	Invalid: The absolute value of the position deviation ≥ F06.22 Valid: The absolute value of the position deviation < F06.22
5	POS-CMP	Positioning completed	Invalid: The absolute value of the position deviation ≥ F06.21 Valid: The absolute value of the position deviation < F06.21
6	S-ENA	Servo ON signal	Invalid: Servo disable Valid: Servo enabled, and no alarm and fault
7	SPD-SAME	Speed consistent	Invalid: The deviation between the motor actual speed and the given motor speed > F07.14 Valid: The deviation between the motor actual speed and the given motor speed ≤ F07.14
8	SPD-CMP	Speed completed	Invalid: The absolute value of the motor actual speed < F07.15 Valid: The absolute value of the motor actual speed ≥ F07.15
9	ORG-CMP	Home attaining output	Invalid: Not attain the home Valid: Attain the home
10	EORG-CMP	Electrical home attaining output	Invalid: Not attain the electrical home Valid: Attain the electrical home
11	TOR-LT	Torque limit	Invalid: Not limit motor torque Valid: Limit motor torque
12	SPD-LT	Speed limit (in torque mode)	Invalid: The motor speed does not reach the limit value Valid: The motor speed reaches the limit value
13	WARN	Warning output	Invalid: No alarm Valid: The driver reports alarm
14	ALM	Fault output	Invalid: No fault Valid: The driver reports fault
15	TOR-CMP	Torque reached	Invalid: The absolute value of the actual output torque of the motor - F08.15 < F08.16 Valid: The absolute value of the actual output torque of the motor - F08.15 ≥ F08.16
16	BK	Brake output	Invalid: Not output the brake signal Valid: Output the brake signal

Chapter 5 Troubleshooting

-Lu-, E085.0: Undervoltage fault	
Reasons: 1. The main circuit is unstable or powered off; 2. Power instantaneously cut off; 3. The power supply voltage drops during running; 4. The servo driver is faulty.	Countermeasures: 1. It is normal status of powering on and powering off; 2. Check input power voltage; 3. Check wiring and wire HS30 properly; 4. Set the driver and motor model correctly.
E001.0: Software overcurrent **E002.0: Hardware overcurrent** **E002.1: U phase hardware overcurrent** **E002.2: V phase hardware overcurrent** **E002.3: W phase hardware overcurrent**	
Reasons: 1. The output current is greater than the software current setting value; 2. The braking resistance is too small or short-circuited; 3. The driver power cable U/V/W output phase loss; 4. The driver model or motor model is set incorrectly; 5. The motor burned out; 6. The loop parameter setting is unreasonable; 7. The encoder signal is wrong or severely interfered.	Countermeasures: 1. Increase the command filtering time or acceleration and deceleration time parameters appropriately; 2. Connect the proper brake resistor correctly; 3. Specification wiring, checks whether the internal power cable for damage; 4. Set the driver model or motor code correctly; 5. Check the U/V/W three phase resistance is balanced, if unbalanced, then replace the motor; 6. Set loop parameters reasonably; 7. Check the wiring reliability of the encoder, whether the cables are independent, wiring distance is too long, or the shield line is one side grounded.
E004.0: Bus overvoltage	
Reasons: 1. Input voltage is too high; 2. The brake resistor fails; 3.The resistance of the external brake resistor is too large, and the Max. braking kinetic energy cannot be completely absorbed; 4. When the motor is running in rapid acceleration and deceleration, the Max. braking resistance energy exceeds the absorbable value.	Countermeasures: 1. Check power input; 2. Connect to a valid brake resistor; 3. Select the appropriate brake resistor; Increase the command filtering time or set acceleration and deceleration time parameters appropriately; 4. Select the appropriate brake resistor; Appropriately increase command filtering time and set deceleration time parameters.
E005.0: Input phase loss	
Reasons: For three phase input servo driver, the three phase input power has default phase.	Countermeasures: 1. Detect three phase input; 2. Seek technical support.

E006.0: Output phase loss **A006.1: Output phase loss warning**	
Reasons: 1. The U/V/W wiring on the driver side is bad; 2. The driver's three phase load is seriously unbalanced.	Countermeasures: 1. Correct wiring or replace the power cable; 2. Check and correct settings F0d.12, F0d.13.
E007.0: Current detection fault	
Reasons: Current detection circuit is damaged.	Countermeasures: Contact the supplier for repairing.
E009.0: Short circuited to ground for driver ouput **E009.1: Short circuited to ground for driver ouput**	
Reasons: 1. The U/V/W on the driver side is short circuited to ground; 2. The motor is shorted to ground.	Countermeasures: 1. Correct wiring or replace the power cable; 2. Replace the motor.
A011.2: Motor overload **E011.0: Motor overload** **E011.1: Motor overload**	
Reasons: 1. The U/V/W wiring on the driver side is bad or short-circuited; 2. The load is too large; 3. Acceleration and deceleration are too frequent; 4. The gain adjustment is inappropriate or the rigidity is too strong; 5. The driver model or motor code is set incorrectly; 6. Improper setting of motor overload protection coefficient; 7. Due to the mechanical factors leading to stall, excessive load is caused during the running.	Countermeasures: 1. Correct wiring or replace the power cable; 2. Replacement larger capacity driver, or reduce the load; 3. Increase the Acc. and Dec. running time of single running; 4. Re-adjust the gain; 5. Set the driver model or motor code correctly; 6. Reasonably set the motor overload protection coefficient; 7. Exclude mechanical factors.
E012.0: Driver overheating fault	
Reasons: 1. High ambient temperature; 2. Circuit fault due to temperature detection; 3. Repeatedly resetting the overload fault by turning off the power many times; 4. Unreasonable installation interval between the servo driver and other servo drivers.	Countermeasures: 1. Improve the cooling conditions of the driver and reduce the ambient temperature; 2. Contact our technical support; 3. Change the fault reset method, wait for 60s after overload and then reset; 4. Install according to the installation standard of the servo driver.

E013.0: Runaway fault	
Reasons: 1. The U/V/W wiring on the driver side is abnormal or short-circuited; 2. The interference signals makes the initial phase detection of the motor rotor wrong; 3. Encoder wiring error; 4. The encoder feedback signal is abnormal.	Countermeasures: 1. Correct wiring or replace the power cable; 2. Power on again; 3. Replace our standard encoder cable, and correct wiring; 4. Replace the motor.
E014.0: Motor locked-rotor fault	
Reasons: 1. The driver output phase loss or the phase sequence wiring is wrong; 2. The motor is stalled due to mechanical factors.	Countermeasures: 1. Correctly wiring, or replace the cables, or check the phase sequence of the motor cables. 2. Exclude mechanical factors.
E015.0: Motor overspeed fault	
Reasons: 1. The U/V/W wiring on the driver side is bad or short-circuited; 2. Overspeed detection parameter setting error; 3. The output torque of the driver is insufficient; 4. Improper setting of speed loop PI parameters; 5. Encoder signal error; 6. The encoder pulse number is set incorrectly; 7. The input command exceeds the detected value of the corresponding motor overspeed.	Countermeasures: 1. Correctly wiring; 2. Set F0d.19, F0d.20 correctly; 3. Choose a larger capacity driver; 4. Set the PI parameters of the speed loop correctly; 5. Check whether the encoder wiring and encoder installation are reliable; 6. Correctly set the encoder line number and encoder direction; 7. Set correctly and ensure that the input command is within the motor overspeed detection value.
E016.0: Speed deviation fault **E016.1: Speed deviation fault caused by torque limitation**	
Reasons: 1. The U/V/W wiring on the driver side is bad or short-circuited; 2. Wrong speed out-of-tolerance detection parameter setting; 3. The motor parameters are set incorrectly; 4. The output torque of the driver is insufficient; 5. Stall due to mechanical factors; 6. Improper setting of PI parameters of speed loop; 7. Encoder signal error; 8. The encoder pulse number is set incorrectly; 9. The speed deviation > F0d.21. **Note:** For torque limit, towed or vertical site, please set F0d.22 = 0 (shield fault).	Countermeasures: 1. Correctly wiring; 2. Set F0d.21, F0d.22 correctly; 3. Check and correctly set the relevant parameters of the motor; 4. Choose a larger capacity driver; 5. Exclude mechanical factors; 6. Set the PI parameters of the speed loop correctly; 7. Check whether the encoder wiring and encoder installation are reliable; 8. Set the encoder line number and encoder direction correctly; 9. Correctly set and ensure that the speed difference ≤ F0d.21.

E018.0: Encoder communication timeout fault	
Reasons: 1. The encoder UWV is damaged; 2. The encoder wiring is wrong.	Countermeasures: 1. Replace the encoder; 2. Check whether the encoder wiring and the encoder installation are reliable.
E021.0: Encoder Z signal interference fault **E021.2: Encoder communication interference fault**	
Reasons: 1. The encoder cable is damaged; 2. The encoder wiring is wrong; 3. Serious interference.	Countermeasures: 1. Check and standardize the wiring; 2. Check and standardize the wiring; 3. Check and standardize the wiring.
E023.0: Electronic gear ratio out-of-range fault **E023.1: Group 1 electronic gear out-of-range fault** **E023.2: Group 2 electronic gear out-of-range fault**	
Reasons: 1. The electronic gear ratio setting value exceeds the range value; 2. Parameter change order.	Countermeasures: 1. Set the electronic gear ratio within 0.001 × encoder resolution / 10000 - 0.4 × encoder resolution; 2. The parameter modification sequence may cause overrun, just reset the fault or power on again.
E025.0: Frequently writing E2PROM parameters fault **E025.1: Frequently reading E2PROM parameters fault** **E025.2: Frequently E2PROM storage fault**	
Reasons: 1. Instantly power off during parameter storage; 2. Software update; 3. The number of parameters writes exceeds the Max. value within a certain period of time; 4. Parameter write and read faulty.	Countermeasures: 1. Restore factory settings, re-write parameters; 2. Re-set the driver motor parameters, to restore the factory setting, to write parameters; 3. Change the writing parameter method, and re-write; 4. After changing parameter and powering on again, if the parameter is not saved, and the fault occurs when repeating the running for many times, please contact our customer service or replace the driver.

A026.1: External brake resistance is too small **A026.2: Brake resistor overload fault** **E026.0: Brake unit fault** **E026.3: Brake resistor overload fault** **E026.4: Long-term braking fault**	
Reasons: 1. Circuit fault of brake unit. 2. F0d.24 = 1 is not set when using external brake resistor; 3. F0d.25 and F0d.26 are not set properly when using external brake resistor; 4. Poor wiring of external brake resistance; 5. Insufficient capacity of external brake resistor.	Countermeasures: 1. If the fault is still reported after repeated power on, please contact our customer service for technical support. 2. Set F0d.24 = 1 when using external brake resistor; 3. When using an external brake resistor, set F0d.25 and F0d.26 to the parameters of the actual external brake resistor; 4. Check the wiring and choose a good cable; 5. Choose an external brake resistor with a larger capacity.
A028.5: Motor and driver current mismatch fault **E028.0: Parameter setting fault (no corresponding encoder)** **E028.1: Parameter setting fault (no corresponding motor)** **E028.4: Parameter setting fault (no corresponding driver)**	
Reasons: 1. The rated current of the motor does not belong to the matching range. 2. The motor code is not set correctly.	Countermeasures: 1. Replace the motor so that the rated current meets 0.5 - 1 times the rated current of the drive, and the Max. running current is less than the Max. current of the drive; Set F0d.43 = 1 to shield A028.5. 2. Set the motor code correctly according to the motor nameplate data.
E029.0: Position command input error	
Reasons: The externally given position pulse input frequency is greater than the set value of F06.07.	Countermeasures: Reduce the amount of external position pulse input, not exceed the set Max. pulse value.
E032.0: DI function duplicated assignment	
Reasons: When the DI function is assigned, the same function is assigned to multiple DI terminals.	Countermeasures: Check and confirm that F02.00 - F02.06 and F12.00 - F12.15 terminal have been duplicated, reassigned or zeroed, and then fault reset or software reset.
E033.0: DO function duplicated assignment	
Reasons: When the DO function is assigned, the same function is assigned to multiple DO terminals.	Countermeasures: Check and confirm that F03.00 - F03.05 and F12.32 - F12.47 terminal have been duplicated, reassigned or zeroed, and then fault reset or software reset.
E050.0: MCU and FPGA commnunication timeout fault	
Reasons: MCU access FPGA timeout or abnormal, there may be external interference.	Countermeasures: Check the power supply and PE wiring, power off restart; Or ask for technical support.

E051.0: System configuration fault	
Reasons: 1. Abnormal reading and writing data of FPGA power communication; 2. Abnormal communication cycle of encoder.	Countermeasures: 1. Check the motor code setting F00.01, modify it correctly and restart after powering off; 2. Seek technical support.
E052.0: FPGA version abnormal fault	
Reasons: 1. The FPGA version does not match the MCU version; 2. Incorrect version.	Countermeasures: 1. Seek technical support; 2. Seek technical support.
E053.0: FPGA abnormally triggering interrupt **E053.1: MCU interrupt running overtime fault**	
Reasons: 1. The communication between FPGA and MCU is abnormal; 2. The MCU interrupt execution time is abnormal.	Countermeasures: 1. Seek technical support; 2. Seek technical support.
E054.0: Abnormal system parameters, non-resettable fault **E054.1: Function parameters are abnormal after system initialization**	
Reasons: Parameter setting error.	Countermeasures: Check the parameter settings, or communication write parameters, confirm that it is normal; Then set F0b.10 = 1 to restore factory settings.
A055.1: Power on again to save modified parameter warning **E055.0: Modified parameter taking effect only after power on again**	
Reasons: The parameter takes effect after power off.	Countermeasures: Power off and on again; Or set F20.01 = 1.
E056.0: Error in information check or failure to store parameters in encoder EEPROM **E056.1: Encoder EEPROM information power on check error**	
Reasons: 1. The parameter setting is wrong; 2. Encoder EEPROM has no data or data error.	Countermeasures: 1. Confirm that the encoder is absolute encoder or serial incremental encoder, and check the settings of F01.00 and F01.37, otherwise set F01.37 = 1; 2. Check that the wiring is correct. After the motor code is set to F01.00, set F20.04 = 1, wait for F20.04 to return to 0, then power off and power on.
E057.0: Current sampling timeout fault **E057.1: MCU command update timeout fault** **E057.3: FPGA computing timeout fault**	
Reasons: 1. The timeout error caused by the MCU not updating the torque command in time; 2. Error caused by current sampling timeout.	Countermeasures: 1. Seek technical support; 2. Seek technical support.

A060.1: Encoder battery low warning **E060.0: The encoder battery is faulty**	
Reasons: 1. The multi-turn encoder is not connected to the battery; 2. The battery wiring is wrong, or the battery is damaged.	Countermeasures: Confirm that the battery connection is correct, the battery is not invalid, set F20.03 = 1 or 2, and then power on again.
E062.0: Encoder multi-turn counting overflow fault	
Reasons: Set F00.20 ≠ 0 and F01.35 = 1, the encoder multi-turn counting value overflows.	Countermeasures: Set F20.03 = 1 or 2, and power on again.
E065.0: Encoder parameter abnormal fault	
Reasons: Encoder ROM data verification is abnormal.	Countermeasures: Check the encoder wiring and power supply; Or seek technical support.
E070.0: Communication fault on the TX side of the encoder **E070.1: Communication fault on the RX side of the encoder**	
Reasons: Encoder wiring is wrong or communication is affected by external interference.	Countermeasures: Confirm that the wiring of the encoder and PE is correct, and eliminate the interference of the external power supply.
E080.0: Motor three phase wiring error	
Reasons: The UVW wiring is wrong.	Countermeasures: Any two phase wiring needs to be switched.
E081.0: Servo runaway fault	
Reasons: 1. Motor UVW wiring error. 2. In torque control, the motor is pulled by loads and other factors, resulting in overspeed.	Countermeasures: 1. Check motor UVW wiring for proper wiring, motor cables for abnormalities. Or seek technical support. 2. In torque control, set F0d.20 = 0 (no protection).
E082.0: Angle recognition fault	
Reasons: 1. The parameter is wrong; 2. There is a problem with the encoder wiring or large interference.	Countermeasures: 1. Confirm that the motor code F01.00 is set correctly; 2. Standardize the encoder wiring.
E083.0: Angle identification timeout fault	
Reasons: The initial angle recognition time is abnormal.	Countermeasures: Re-power on and re-recognize; Or seek technical support.
E088.0: Servo ON enable command invalid fault	
Reasons: During parameter recognition, an external enable command was received.	Countermeasures: After parameter recognition, the servo enable running can be performed; Or seek technical support.

A094.1: Parameter setting warning of FD pulse output **E094.0: FD (frequency division) output overspeed fault**	
Reasons: 1. Frequency division output frequency is greater than the set value; 2. The frequency division numerator is greater than the frequency division denominator, F06.04, F06.08 and F06.10 are set to exceed the limit and exceed 2^{18}.	Countermeasures: 1. Confirm that the frequency of the frequency division output source is normal, and the frequency division ratio parameter setting is normal; Or seek technical support. 2. Modify F06.04; Or modify F06.08, F06.10.
A102.0: Forward overtravel warning	
Reasons: DI No. 21 function: Prohibit forward driver, terminal logic is valid.	Countermeasures: Check running mode; On the premise of safety, give negative command or rotate the motor to make positive overtravel switch terminal logic becomes invalid.
A103.0: Reverse overtravel warning	
Reasons: DI No. 22 function: Prohibit reverse driver, terminal logic is valid.	Countermeasures: Check running mode; On the premise of safety, give negative command or rotate the motor to make negative overtravel switch terminal logic becomes invalid.
A104.0: Homing timeout warning	
Reasons: 1. The origin switch is faulty; 2. Limited search time; 3. The speed of searching the origin switch signal is too small.	Countermeasures: 1. Check and correctly connect the DI switch; 2. Reasonably increase F06.29; 3. Reasonably increase F06.26.
A104.6: The servo is in a long-time power generation state after being powered on	
Reasons: Power on continuously detects that the motor 10rpm exceeds 10s.	Countermeasures: Check the load and make sure that the servo is no longer in power generation state after powering up.
E105.0: Excessive position deviation fault	
Reasons: 1. The driver output phase loss or the phase sequence wiring is wrong; 2. The motor is blocked due to mechanical factors; 3. The servo driver gain is low; 4. The input pulse frequency is too high; 5. Relative to the operating conditions, the position deviation target value is set too small; 6. The given command is not home and the feedback command is always home.	Countermeasures: 1. Check the wiring and standardize the wiring; 2. Exclude mechanical factors; 3. Manually do gain adjustment; 4. Reduce the position command frequency or reduce the electronic gear ratio; 5. Properly increase F06.18 (position deviation threshold); 6. Check the speed, whether torque control is normal, if normal, restore factory para setting, power on again, if not normal, contact our customer service center.

A110.0: Emergency stop warning	
Reasons: Emergency stop prompt.	Countermeasures: Emergency stop prompt, automatically cleared, and no need to deal with it.
A831.0: zero deviation too large	
Reasons: 1. Wiring error or interference. 2. Driver fault.	Countermeasures: 1. Use twisted pair shielded cables to rewire and shorten the cable length. Increase F02.22/F02.27 (AI1/AI2 filter time); 2. Remove the external wiring of the AI terminal (input is 0) and check if the AI sampling value exceeds 500mv. If it exceeds, replace the driver.

Chapter 6 Communication Protocol

6.1 485/232 Communication

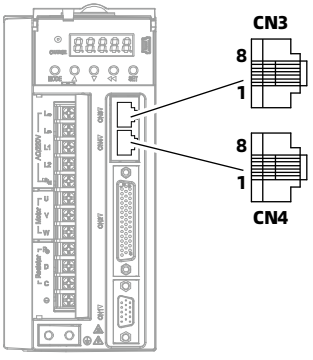
6.1.1 Introduction

HS30 provides two RS485 communication interface.

The user can do the following operations via the external controller (including computer, PLC and other communication equipment): Read and write function parameters, read status parameters, write control commands, etc.

The driver is in slave mode during communication.

Communication Terminal Pin Definition



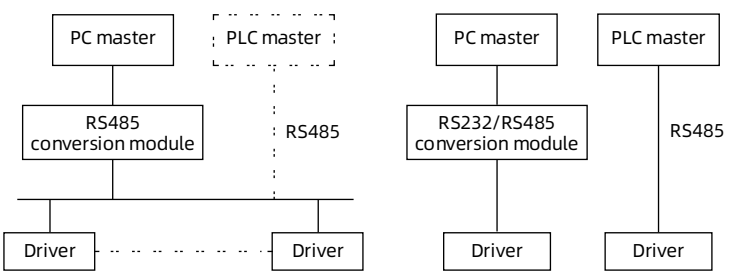
Pin	Definition	
1	CANH	CAN communication interface
2	CANL	
3	CGND	CAN communication ground
4	RS485+	RS485 communication interface
5	RS485-	
6*	RS232-TXD	RS232 sender
7*	RS232-RXD	RS232 receiver
8	GND	Ground
Shell	PE	Shield
*: Only CN3 supports RS232 communication.		

Transmission Mode

RS485 interface: Asynchronous, half-duplex.

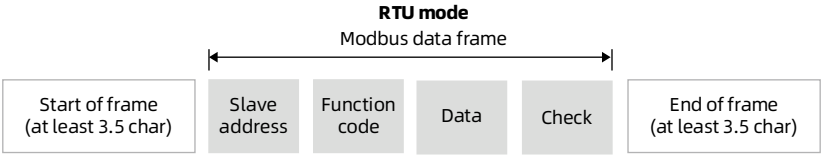
Factory default format and baud rate: 8-N-2, 9600bps.

Networking Mode



Protocol Format

Modbus protocol supports RTU mode, the corresponding frame format is shown in the figure below:



Modbus adopts 'Big Endian' encoding mode, higher byte prior to lower byte at sending.

- Use the bus free time (at least 3.5 characters) to define the start and end of the frame.
- When slave address = 0, the address is broadcast address.
- The data checking uses CRC-16, and the whole message is checked.

6.1.2 Protocol Functions

Support Functions

Supported Function	Function Code
Read function and status parameter	0x03
Write single function or control parameter	0x06
Write multiple function or control parameters	0x10

Read Function and Status Parameter

Function code 0x03, command frame and response frame are shown in the table below.

Command Frame	Address	Code	Starting Register Address	Number of Register	Check Result
Data frame bytes	1	1	2	2	2
Value or range	0 - 247	0x03	0x0000 - 0xFFFF	0x0001 - 0x000C	

Response Frame	Address	Code	Read Byte Number	Register Content	Check Result
Data frame bytes	1	1	1	2 × No. of registers	2
Value or range	1 - 247	0x03	2 × No. of registers	0x0001 - 0x000C	

Write Single Function or Control Parameter

Function code 0x06, command frame and response frame are shown in the table below.

Command Frame	Address	Code	Register Address	Register Content	Check Result
Data frame bytes	1	1	2	2	2
Value or range	0 - 247	0x06	0x0000 - 0xFFFF	0x0000 - 0xFFFF	

Response Frame	Address	Code	Register Address	Register Content	Check Result
Data frame bytes	1	1	2	2	2
Value or range	1 - 247	0x06	0x0000 - 0xFFFF	0x0000 - 0xFFFF	

Write Multiple Function or Control Parameters

Function code 0x10 (F0c.03 sets whether to save when power off), command frame and response frame are shown in the table below.

Command Frame	Address	Code	Starting Register Address	No. of Operation Registers	Byte No. of Register Content	Register Content	Check Result
Data frame bytes	1	1	2	2	1	2 × No. of operation registers	2
Value or range	0 - 247	0x10	0x0000 - 0xFFFF	0x0000 - 0x0004	2 × No. of operation registers		

Response Frame	Address	Code	Starting Register Address	No. of Operation Registers	Check Result
Data frame bytes	1	1	2	2	2
Value or range	1 - 247	0x10	0x0000 - 0xFFFF	0x0000 - 0x0004	

This command writes the contents of continuous data unit from starting register address. The register address is mapped to the function and control parameters of driver, etc. When continuously saving multiple register parameters, the driver starts to save from the low address to the high address of the register.

If the save fails, return from the store address that failed first.

Error and Exception Code

If the command operation fails, the response is error code (function code + 0x80).

The next byte of the error code is the exception code, as shown in the table below.

Exception Code	Description
0x01	Wrong function code
0x02	Wrong register address
0x03	Wrong data (exceeds the upper limit or lower limit)
0x04	Slave operation fails (data is in range, but data is invalid)
0x16	Unsupported operation (mainly for control and status parameters, such as not supporting read attributes, factory values, ranges, etc.)
0x17	Wrong number of registers in command frame
0x18	Wrong message frame (including message length, checking)
0x20	You cannot set the parameter
0x21	When the driver is running, cannot set the parameter
0x22	Parameters are protected by password

Example:

Read 40 parameters continuously from F00.00, the the response frame is:

Address	Error Code	Exception Code	Checksum	
0x01	0x83	0x03	0x01	0x31

6.1.3 Address Mapping

Map the function parameters, control parameters and status parameters of HS30 to read and write registers of Modbus.

- Function parameters (group F): 0x00 - 0x21 (not save) or 0x80 - 0xa1 (save).
- Control parameters: 0x32 (not save).
- Status parameters (group d): 0x33 - 0x35 (not save).

Mapping Address of Function Parameters

The group number of the function parameter (group F) map to the high byte of the register address, as shown in the table below.

The index in the group map to the low byte of the register address, and the index of the F00 - F0F refer to the user manual.

Group No.	High Byte of Register Address (not save to EEPROM)	High Byte of Register Address (save to EEPROM)	Group No.	High Byte of Register Address (not save to EEPROM)	High Byte of Register Address (save to EEPROM)
F00	0x00	0x80	F0A	0x0a	0x8a
F01	0x01	0x81	F0b	0x0b	0x8b
F02	0x02	0x82	F0c	0x0c	0x8c
F03	0x03	0x83	F0d	0x0d	0x8d
F04	0x04	0x84	F0E	0x0e	0x8e
F05	0x05	0x85	F0F	0x0f	0x8f
F06	0x06	0x86	F12	0x12	0x92
F07	0x07	0x87	F20	0x20	0xa0
F08	0x08	0x88	F21	0x21	0xa1
F09	0x09	0x89			

Mapping Address of Control Parameter

The control parameters can start and stop the driver, set the running frequency, etc. Retrieving the status parameters of the servo can obtain the running frequency, output current, etc.

The mapping address (0x32) of the control parameters is shown in the table below.

Register Address	Function	Power Off Save or Not
0x3200	Control command byte	No
0x3210	Run command	No
0x3211	Stop command	No
0x3212	Speed setting (1rpm)	No
0x3213	Emergency stop	No
0x3214	Fault reset	No

The Bit definition of the control command byte (0x3200) are shown in the table below.

Bit	Value		Description
Bit0	0: Run command is invalid	1: Run command is valid	Servo start, stop control (edge trigger mode)
Bit1	0: Forward	1: Reverse	Running direction, equivalent terminal forward/reverse
Bit2	0: Unused	1: Stop mode is Dec. to stop	Servo deceleration to stop control
Bit3	0: Unused	1: Stop mode is emergency stop	Servo emergency stop control
Bit4	0: Unused	1: Stop mode is coast to stop	Servo coast to stop control
Bit5	0:Unused	1: External fault stop	Servo external fault stop
Bit6	0: Jog forward stop	1: Jog forward	Jog forward control
Bit7	0: Jog reverse stop	1: Jog reverse	Jog reverse control
Bit8	0: Fault reset is invalid	1: Fault reset is valid	Servo fault reset control
Bit9 - Bit11	0: Unused		
Bit12	0: The current control is invalid	1: The current control is valid	Whether the currently transmitted control word is valid or not
Bit13 - Bit15	0: Unused		

The register contents of 0x3200 can define as control command (Bit combinations of the control command byte), as shown in the table below.

Register Content	Control Command	Register Content	Control Command	Register Content	Control Command
0x1001	Forward command	0x1008	Emergency stop	0x1040	Jog forward
0x1003	Reverse command	0x1010	Coast to stop	0x1080	Jog reverse
0x1004	Dec. to stop	0x1020	External fault stop	0x1100	Fault reset

Mapping Address of Status Parameter

The group number of the status parameter (group d) map to the high byte of the register address (0x33/0x34/0x35), the index in the group is shown in below.

Address mapping (0x33) of the status parameter (group d01):

Register Address	Function	Register Address	Function
0x3300	Motor speed	0x331f	Number of absolute encoder turns
0x3301	Speed command	0x3320	Single-turn position of commnunication encoder
0x3302	Torque command	0x3324	FPGA system status information
0x3303	Output torque	0x3325	FPGA system fault information
0x3304	DI signal monitoring	0x3326	Communication encoder fault information from FPGA
0x3305	DO signal monitoring	0x3327	FPGA system fault information 2
0x3306	Motor mechanical angle	0x332a	Average load ratio of motor
0x3307	Motor electrical angle	0x332b	Control voltage
0x3308	Motor speed corresponding to input position command	0x332d	Real-time output torque
0x3309	Position tracking error (32bit)	0x332e	Encoder feedback pulse counter (32bit)
0x330b	Input command pulse counter (32bit)	0x3332	Position tracking error (32bit)
0x330d	Encoder feedback pulse counter (32bit)	0x3336	Absolute mechanical position (low 32 bit)
0x330f	Input pulse frequency (32bit)	0x3338	Absolute mechanical position (high 32 bit)
0x3311	DC bus voltage	0x333a	Position of multi-turn absolute encoder (low 32 bit)
0x3312	Output frequency of motor	0x333c	Position of multi-turn absolute encoder (high 32 bits)
0x3314	Output current of driver	0x3344	Real-time pulse counter of input command (32bit)
0x3315	Output voltage of driver	0x3346	Real time feedback current of phase U
0x3316	AI1 sampling voltage	0x3347	Real time feedback current of phase V
0x3317	AI1 processed voltage	0x3348	Real time feedback current of phase W
0x3318	AI2 sampling voltage	0x334a	Virtual DI signal monitoring
0x3319	AI2 processed voltage	0x334b	Virtual DO signal monitoring
0x331a	AO1 output voltage	0x334c	Power factor in Q13 format
0x331b	AO2 output voltage		

Address mapping (0x34) of the status parameter (group d02):

Register Address	Function	Register Address	Function
0x3400	Fault record	0x340a	Position tracking error of selected fault
0x3401	Fault code of selected fault record	0x340c	FPGA system status information of selected fault
0x3402	U phase current of selected fault	0x340d	FPGA system status information of selected fault
0x3403	V phase current of selected fault	0x340e	FPGA system fault information of selected fault
0x3404	Motor speed of selected fault	0x3410	FPGA system fault information 2 of selected fault
0x3405	Bus voltage of selected fault	0x3412	Parameter group of abnormal parameter fault
0x3406	Output voltage of selected fault	0x3413	Parameter group offset in of abnormal parameter fault
0x3407	DI terminal status of selected fault	0x3414	Servo running state
0x3408	DO terminal status of selected fault	0x3415	Current fault code
0x3409	Output current of selected fault		

Address mapping (0x35) of the status parameter (group d03):

Register Address	Function	Register Address	Function
0x3500	Driver series	0x3508	The Min. allowable brake resistor
0x3501	Driver software version	0x3509	Internal brake resistor power
0x3502	Non-standard version of driver software	0x350a	Internal brake resistor resistance
0x3503	Driver model	0x350b	Driver software sub version
0x3504	Motor code	0x350c	FPGA software major version
0x3506	Encoder version	0x350d	FPGA software sub version
0x3507	CAN software version	0x3519	Rated current of driver

6.2 CAN Communication Protocol

The CAN communication protocol is based on the CAN2.0 protocol, use the standard frame format with 11 bits identifier. Used for:

- Communication between our servo and PLC products.
- Communication between our inverter and PLC products.

Currently supports 2 types of communication frames: Access Data Frame (ADF), Quick Data Frame (QDF).

The driver sets F0c.08 to select the general communication protocol.

Ref. Code	Function	Set Value
F0c.08	CAN communication protocol	1: General communication protocol

6.2.1 Communication Frame Structure

The frame structure is shown in below.

bit10 - 7	bit6 - 0	byte0 - 7
Frame ID	Slave ID	Data

The description is shown in below.

Frame Structure	Description
bit10 - 7	Frame ID: Distinguish different communication frames • 1100b: ADF access frame • 1011b: ADF answer frame • 0011b: QDRF (Quick Data Request Frame) • 0100b: QDAF (Quick Data Answer Frame)
bit6 - 0	Slave ID: CAN communication address of the slave device
byte0 - 7	Data

6.2.2 Access Data Frame (ADF)

ADF Access Frame

The master station accesses the data of the slave station via ADF, and the access frame structure is shown in below.

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4 - 7
1100b	Slave ID	Command code	High byte of register address	Low byte of register address	Number of registers	0x00

The description is shown in the table below.

Access Frame	Description
bit6 - 0	**Slave ID** When the slave ID = 0x00, the master station broadcasts the access data frames, and the slave station does not answer.
byte0	**Command code** • 0x03: Read register value. • 0x10: Write register value.
byte1 - 2	**Register address** The functional parameters, control parameters and status parameters of the driver map to the read and write registers in the self-defined protocol. • Group number of parameter: High byte of register address. • Index within parameter group: Low byte of register address. See Section 6.1.3 for address mapping.
byte3	**Number of registers** • 0x01: Read and write 1 register. • 0x02: Read and write 2 registers.

ADF Answer Frame

The slave station answers after receiving the access data frame from the master station, and the answer frame structure is shown in below.

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4 - 7
1011b	Slave ID	Command code	High byte of register address	Low byte of register address	Number of response data bytes	Response data

Example

Example 1: The master station reads F00.01 (3000rpm) of the slave station (slave ID 0x02).

The master station sends:

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4 - 7
1100b	0x02	0x03	0x00	0x01	0x01	0x00

The slave station answers:

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4	byte5	byte6 - 7
1011b	0x02	0x03	0x00	0x01	0x01	0x0B	0xB8	0x00

Example 2: The master station modifies F07.01 of the slave station (slave ID 0x02) to 200rpm.

The master station sends:

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4	byte5	byte6 - 7
1100b	0x02	0x10	0x07	0x01	0x01	0x00	0xC8	0x00

After the modification is successful, the slave station answers:

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4	byte5	byte6 - 7
1011b	0x02	0x10	0x07	0x01	0x01	0x00	0xC8	0x00

Error Frame

When the master sends an error message, the slave answers the error. The error frame format of the answer is shown in below.

bit10 - 7	bit6 - 0	byte0	byte1	byte2 - 7
1011b	Slave ID	Command code + 0x80	Error code	0x00

The description of the error codes is shown in the table below.

Error Code	Description
0x01	Wrong command code
0x02	Wrong register address
0x03	Wrong data range
0x04	Slave operation fails (data is in range, but data is invalid)
0x16	Unsupported operation (mainly for control and status parameters, such as not supporting read attributes, factory values, ranges, etc.)
0x17	Wrong number of registers in access frame
0x18	Wrong message frame length and check
0x20	You cannot set the parameter
0x21	When the driver is running, you cannot set the parameter
0x22	Parameters are protected by password

6.2.3 Quick Data Frame (QDF)

One frame of QDF transmits a lot of data, and does not require the answer frame to correspond to the access frame, so the data transmission is fast.

Frame Description

QDF is divided into: Quick Data Request Frame (QDRF, master→slave), and Quick Data Answer Frame (QDAF, slave→master), the frame structure is shown in below.

bit10 - 7	bit6 - 0	byte0 - 7
Frame ID	Slave ID	Data

The description is shown in the table below:

Frame Structure	Description
bit6 - 0	**Frame ID** • QDRF: 0011b. • QDAF: 0100b.
byte0 - 7	**Data** the value of the register, the mapping table of the slave station determines the register address corresponding to the value. • Slave station receives the data of QDRF: Query the QDRF mapping table to get the register address, and then update the value to the corresponding register. • Slave station sends the QDAF answer: Query the QDAF mapping table to get the register address, and then send the value. F0c.21 - F0c.40 sets the register address of the mapping table.

If the master station only reads and does not modify the data of the slave station, the processing method is:

- QDRF frame does not send data (byte0 - 7).
- The slave station sets the register address of QDRF as a status parameter.

QDF does not support broadcast send messages.

F0c.21 - F0c.40 Set Register Address

The value of F0c.21 - F0c.40 stores other parameters (register address of the mapping table).

- F0c.21 - F0c.30: Set the register address of QDRF.
- F0c.31 - F0c.40: Set the register address of QDAF.

Example: The value of F0c.21 is 0000, then F0c.21 maps as F00.00.

The relationship between the values of F0c.21 - F0c.40 and the mapping parameters is shown in the table below.

Value of F0c.21 - F0c.40		Mapping Parameter (Register Address)
Register address (not save to EEPROM)	Register address (save to EEPROM)	
00xy	80xy	F00.xy
01xy	81xy	F01.xy
02xy	82xy	F02.xy
03xy	83xy	F03.xy

Value of F0c.21 - F0c.40		Mapping Parameter (Register Address)
04xy	84xy	F04.xy
05xy	85xy	F05.xy
06xy	86xy	F06.xy
07xy	87xy	F07.xy
08xy	88xy	F08.xy
09xy	89xy	F09.xy
0axy	8axy	F0A.xy
0bxy	8bxy	F0B.xy
0cxy	8cxy	F0c.xy
0dxy	8dxy	F0d.xy
0exy	8exy	F0E.xy
0fxy	8fxy	F0F.xy
12xy	92xy	F12.xy
20xy	a0xy	F20.xy
21xy	A1xy	F21.xy
32xy	-	Control byte
33xy	-	d00.xy

Example

The slave ID is 0x02

Set the function parameters, as shown in the table below.

Ref. Code	Function	Value	Mapping Parameter (Register Address)
F0c.21	1st set value of CAN communication QDF1	0000	F00.00
F0c.22	2nd set value of CAN communication QDF1	0001	F00.01
F0c.23	3rd set value of CAN communication QDF1	0002	F00.02
F0c.24	4th set value of CAN communication QDF1	0003	F00.03
F0c.31	1st response value of CAN communication QDF1	0004	F00.04
F0c.32	2nd response value of CAN communication QDF1	0005	F00.05
F0c.33	3rd response value of CAN communication QDF1	0006	F00.06
F0c.34	4th response value of CAN communication QDF1	0007	F00.07

Then the QDRF and QDAF mapping table of the slave station is:

QDRF Mapping Table		QDAF Mapping Table	
No.	**Register Address**	**No.**	**Register Address**
1	F00.00	1	F00.04
2	F00.01	2	F00.05
3	F00.02	3	F00.06
4	F00.03	4	F00.07

The master station sends the QDRF1 message:

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
0011b	0x02	0x00	0x01	0x07	0xD0	0x0B	0xB8	0x00	0x01

The slave station get the data (0x0001, 0x07D0, 0x0BB8, 0x0001), queries the QDRF mapping table, and modify the values of the register (F00.00 = 0x0001, F00.01 = 0x07D0, F00.02 = 0x0BB8, F00.03 = 0x0001).

Then the slave station sends the QDAF answer, and queries the QDAF mapping table to get the register addresses (F00.04, F00.05, F00.06, F00.07).

If the corresponding values of the registers are 0x0000, 0x0001, 0x0000, 0x000F, the slave sends the QDAF message:

bit10 - 7	bit6 - 0	byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
0100b	0x00	0x00	0x00	0x00	0x01	0x00	0x00	0x00	0x0F

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