

Low-Voltage Built-in Brushless Driver
EA-BLDC20-120-L2-C User Manual

Version V1.04
English Edition

Revision Summary

The following table summarizes the revisions and updates made to this document.

Version	Date	Revision Description	Revised By
V1.01	2021.01.26	Initial release	Shen Yangyang
V1.02	2021.09.25	Contact information updated	Hua Rongyu
V1.03	2022.01.11	PLC wiring diagram updated	Shen Yangyang
V1.04	2024.08.15	Content revised	Yu Chuang

Before Use

Read and observe all safety information before operating this product to protect personnel and equipment.

DANGER

- Before wiring or installing the driver, make sure that the power supply is switched off.
- Components on the internal circuit board are vulnerable to electrostatic discharge. Do not touch the circuit board unless proper anti-static precautions have been taken.
- Do not modify internal components or wiring.
- Do not use this product in locations exposed to moisture, corrosive gas, flammable gas, or similar hazardous substances. Electric shock or fire may result.
- Install the driver and accessories away from heat sources, open flames, and flammable materials.
- Before starting the machine, adjust the parameters to match the application. Incorrect settings may cause uncontrolled operation or malfunction.
- Confirm that the emergency-stop device can be activated at any time before starting the machine.
- At power-on, make sure the motor shaft is stationary and cannot be rotated by mechanical inertia or other external forces.
- Do not change wiring while power is on. Electric shock or personal injury may result.
- Ground the motor and driver together with the power-supply equipment. Improper grounding may cause electric shock or equipment damage.
- Do not directly connect the driver to a computer using a USB-to-Micro-USB cable.

WARNING

- Do not apply DC power to the driver COM terminal.
- The rated supply voltage for this driver is DC 24 V.
- Test the driver and motor without load before connecting the load.
- Do not switch the power supply on and off frequently. When repeated switching is necessary, limit it to no more than once per minute.
- Do not use this product for vertical lifting or lowering of a load.
- Only qualified personnel may install, wire, and service the driver.

Notes

1. Some illustrations may show the housing or safety covers removed to explain product details. During operation, always reinstall the housing and covers, complete the wiring correctly, and follow this manual.
2. Illustrations are for explanation only and may differ slightly from the actual product without affecting function or customer rights.
3. Product documentation may be revised without prior notice.
4. Contact the sales representative or technical support for product-use questions.



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1. Product Inspection and Description

1.1 Product Inspection

To prevent problems caused during purchase or transportation, carefully check the following items:

- Confirm that the received product is the intended model by checking the model number on the package nameplate and comparing it with the model description in the next section.
- Visually inspect the product for damage or scratches.
- Check for loose or missing screws.
- Check for missing accessories against the complete component list.

Contact the supplier or sales representative promptly if any issue is found.

A complete operable driver assembly includes:

1. EA-BLDC20-120-L2-C driver - 1 unit
2. 12-pin I/O terminal - 1 piece

1.2 Nameplate / Model Description

Nameplate description:

Model description:

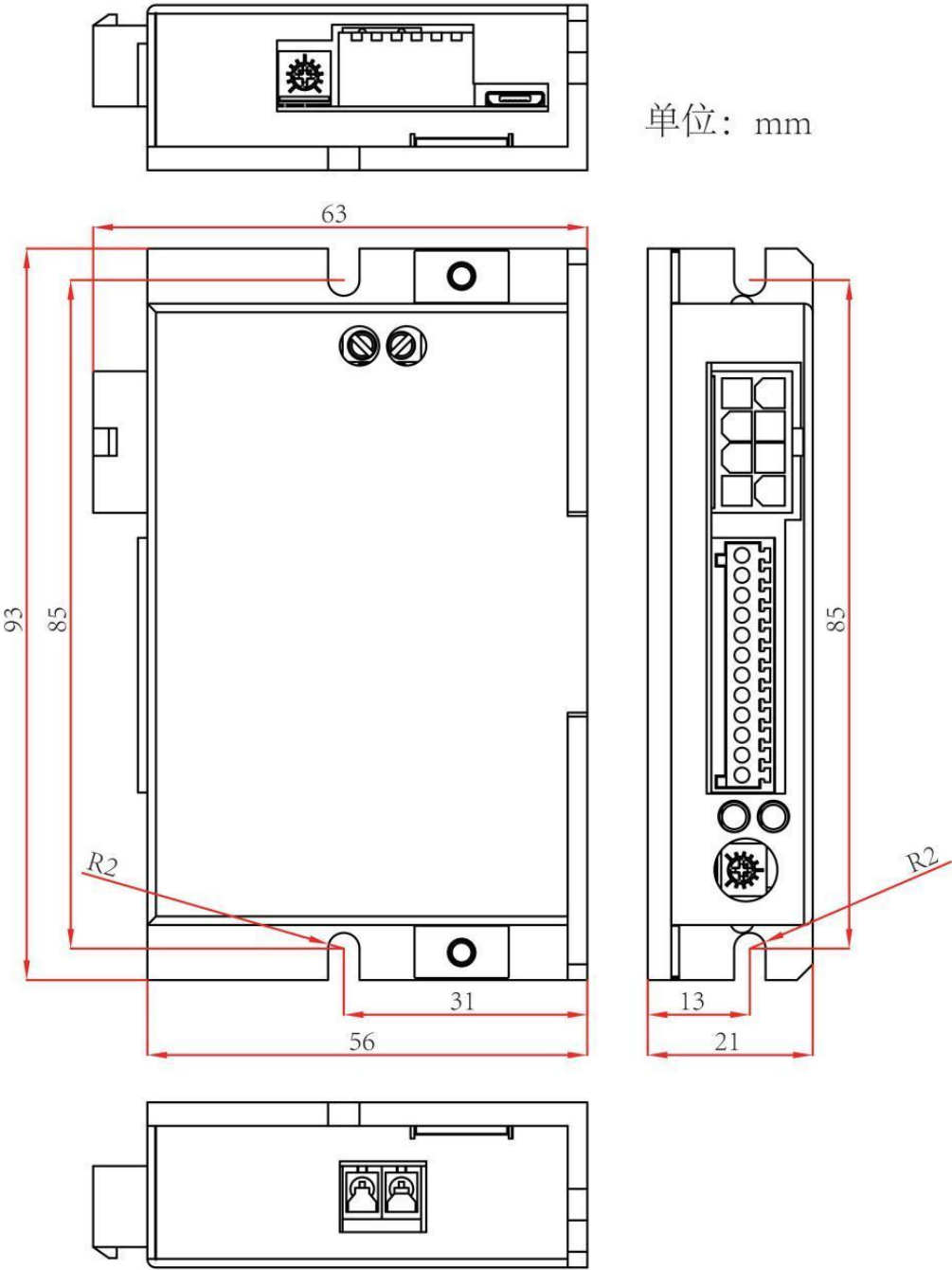
1.3 Specifications

Item	Specification
Model	EA-BLDC20-120-L2-C
Rated input voltage	DC 24 V (+/-10%)
Output current	7.5 A, adjustable through the keypad
Output power	DC 24 V, 120 W
Speed-control accuracy	Closed-loop speed control, accuracy +/-0.5%
Overload capacity	1.5 times rated load
Default maximum speed	3000 rpm
Default motor pole pairs	5 pole pairs; other values can be set by DIP switch, CAN communication, or external keypad
Speed reference	Built-in AI1 knob by default; external analog reference, CAN speed command, and multi-speed settings can be selected by DIP switch, CAN communication, or external keypad
Digital inputs	5 NPN-compatible DI channels; functions can be customized
Digital outputs	2 open-collector transistor outputs; switching capacity 50 mA / 30 V maximum
Built-in speed knob	Analog potentiometer speed control, AI1 by default
Analog input	1 external analog-voltage input, 0-5 V or 0-10 V, or PWM input 3-10 kHz; configurable by DIP switch, CAN communication, or keypad
Bus control	CAN communication, up to 1 Mbit/s; default 125 kbit/s; CAN Modbus and CANopen supported, CAN Modbus by default
Host-computer support	Supported
Operation panel	Optional C20-series handheld keypad for parameter setting and data reading
Protection functions	Undervoltage, overvoltage, overcurrent, overload, stall, short circuit, phase loss, overtemperature, and related protections
Undervoltage trip point	15 V
Overvoltage trip point	30 V
Operating temperature	-10 to 40 deg C at rated current. Above 40 deg C, reduce rated current by 2.5% per deg C. Maximum ambient temperature: 50 deg C
Storage temperature	-30 to 65 deg C
Humidity	Below 90% RH, non-condensing
Cooling	Natural cooling; auxiliary heat dissipation is required at full power
Protection rating	IP20
Installation type	Built-in

2. Product Dimensions, Environmental Conditions, and Installation

2.1 Product Dimension Drawing

Dimensions are shown in the accompanying drawing. Units: mm.



2.2 Operating, Storage, and Transportation Conditions

Do not expose the driver to harsh environments such as dust, direct sunlight, corrosive or flammable gas, grease, moisture, dripping water, or vibration.

The salt content in the air must be below 0.01 mg/cm² per year.

Protection rating: IP20. Protection against solid foreign objects larger than 12 mm; no moisture protection.

Environmental limits

- Ambient temperature, operation, individually installed: -10 to 40 deg C; -20 to -10 deg C or 40 to 50 deg C only with derating.
- Ambient temperature, side-by-side installation: -10 to 30 deg C; -20 to -10 deg C or 30 to 40 deg C only with derating.
- Storage temperature: -33 to 65 deg C.
- Transportation temperature: -20 to 50 deg C.
- Non-condensing and non-freezing.
- Rated humidity during operation: maximum 85% RH.
- Rated humidity during storage or transportation: maximum 90% RH. Condensation is prohibited.
- Atmospheric pressure during operation: 86 to 106 kPa.
- Atmospheric pressure during storage or transportation: 70 to 106 kPa.
- Altitude: below 1000 m. Derating is required above 1000 m; see Section 2.2.2.
- Do not drop the package from a height.
- Do not apply continuous vibration or excessive shock during operation, storage, or transportation.

2.2.1 Storage Conditions

Before installation, keep the product in its original packaging. For temporary storage and to preserve warranty and serviceability:

1. Store in a clean, dry, dust-free location.
2. Keep ambient temperature and relative humidity within the specified limits.
3. Avoid corrosive gases and liquids.
4. Store the packaged unit on a shelf or flat surface.

2.2.2 Operating Conditions

Abnormal ambient temperature: At rated current, operate between -10 and 40 deg C. Above 40 deg C, reduce rated current by 2.5% for each 1 deg C increase. Maximum ambient temperature is 50 deg C.

High altitude: Normal limits apply from 0 to 1000 m. From 1000 to 2000 m, reduce rated current by 1% or reduce the permitted ambient temperature by 0.5 deg C for every 100 m increase. Contact the supplier for use above 2000 m.

For long-term operation, keep the ambient temperature below 40 deg C and install the product in a well-ventilated location to maintain reliability.

At elevations above 1000 m, lower air density reduces insulation strength and heat dissipation. Derated operation is therefore required, and high-altitude use is not recommended.

The installation location must also meet the following conditions:

1. No large heat-generating equipment nearby.
2. No dripping water, steam, dust, or oily dust.
3. No corrosive or flammable gases or liquids.
4. No airborne dust or metal particles.
5. Rigid, stable, and free from vibration.
6. Free from electromagnetic-noise interference.

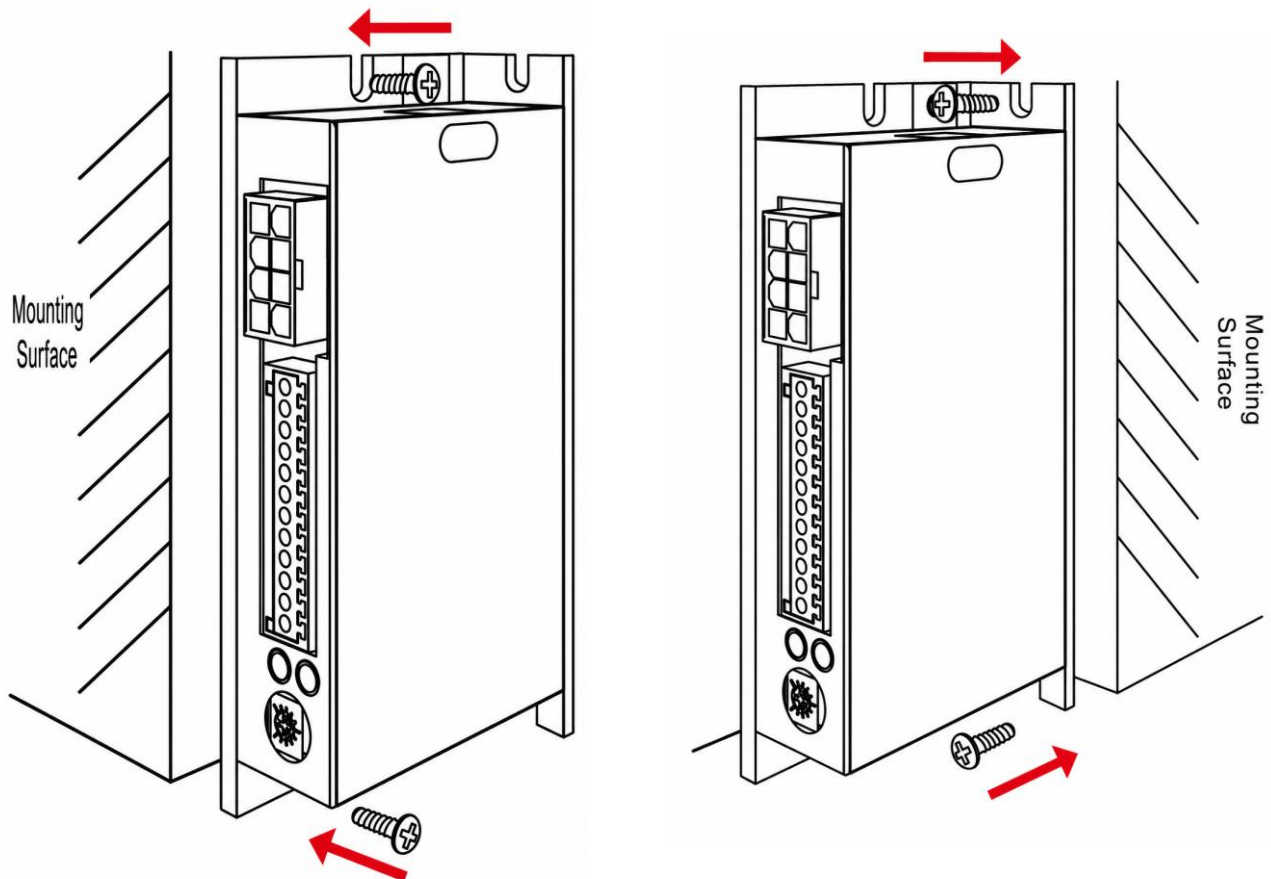
2.3 Installation Instructions

This product is designed for wall mounting. Use M4 screws and washers and mount it on a well-grounded metal surface with good heat dissipation. Improper installation may create a fire hazard.

When multiple drivers are mounted side by side, maintain at least 50 mm spacing for heat dissipation.

When using side ports or CAN communication, increase the installation distance and arrange cables according to Section 6.2.

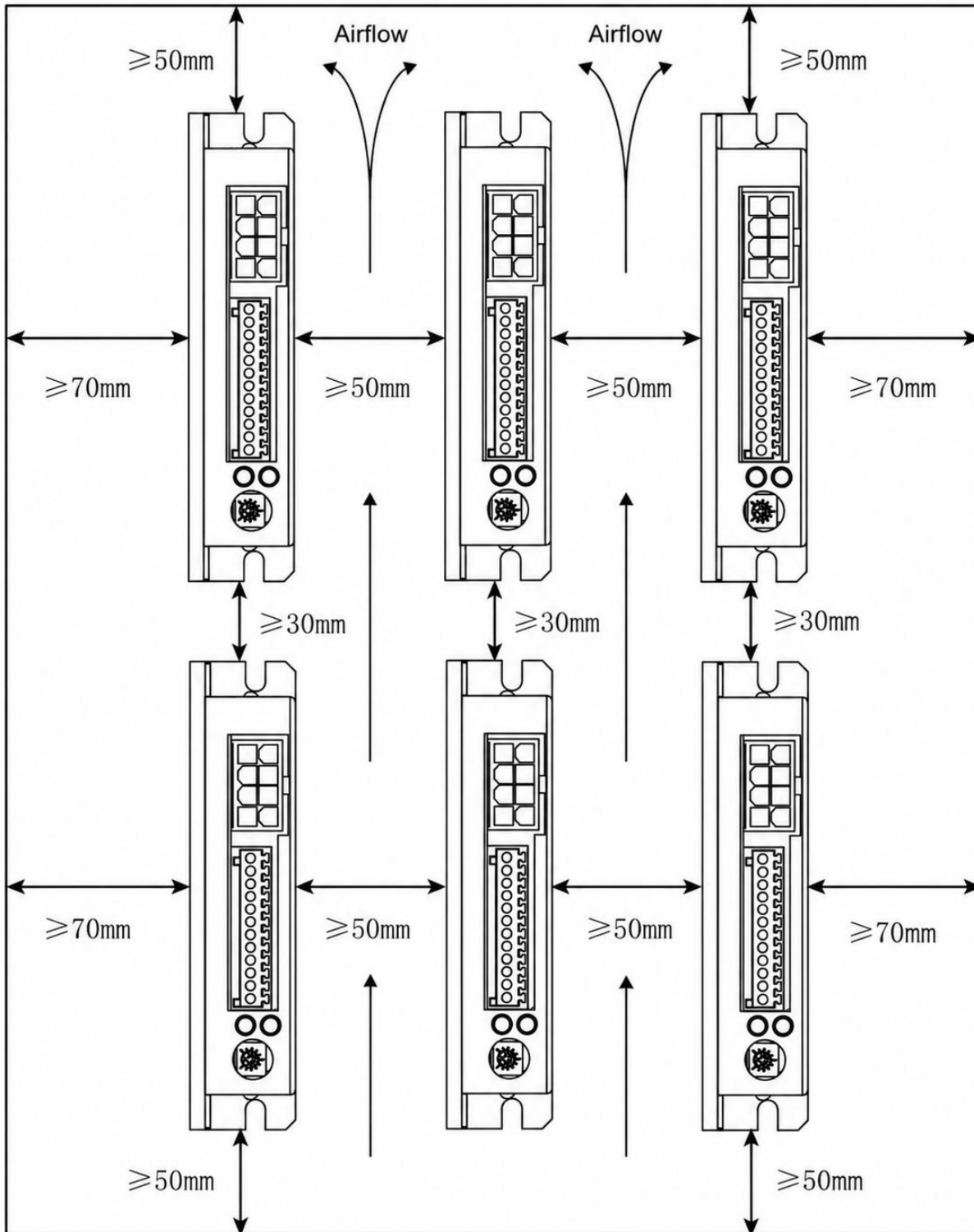
The drawings show recommended mounting directions and spacing. Select the actual orientation to suit the application.



The illustrated spacing is not to scale. Follow the written dimensions.

Precautions

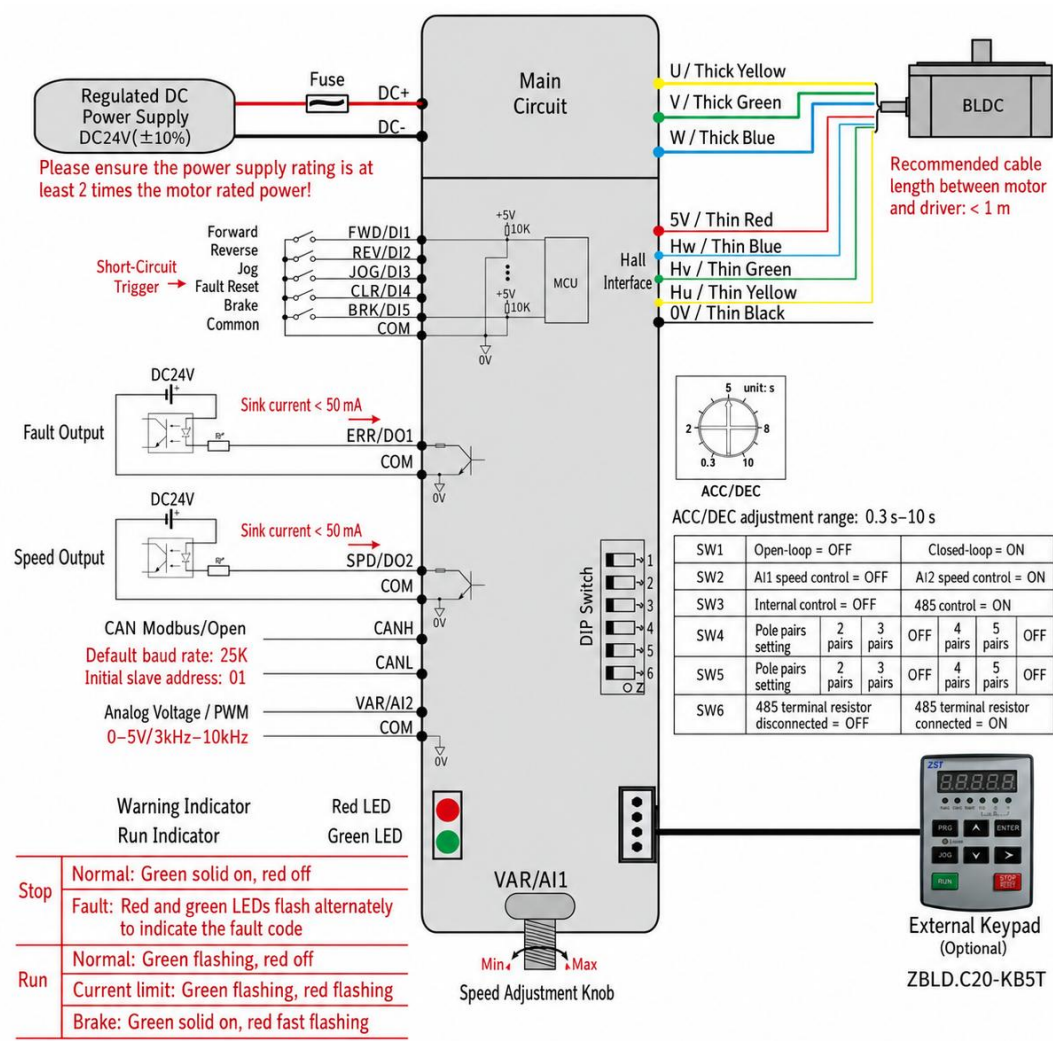
1. Do not pull the cable between the driver and motor tight; this may loosen or disconnect the connection.
2. Tighten all mounting screws when fixing the driver.
3. Use M4 combination screws at the two mounting holes.
4. Recommended tightening torque: 1.2-1.5 N.m.
5. Keep the motor shaft center aligned concentrically with the equipment shaft center.
6. Tighten all motor mounting screws.

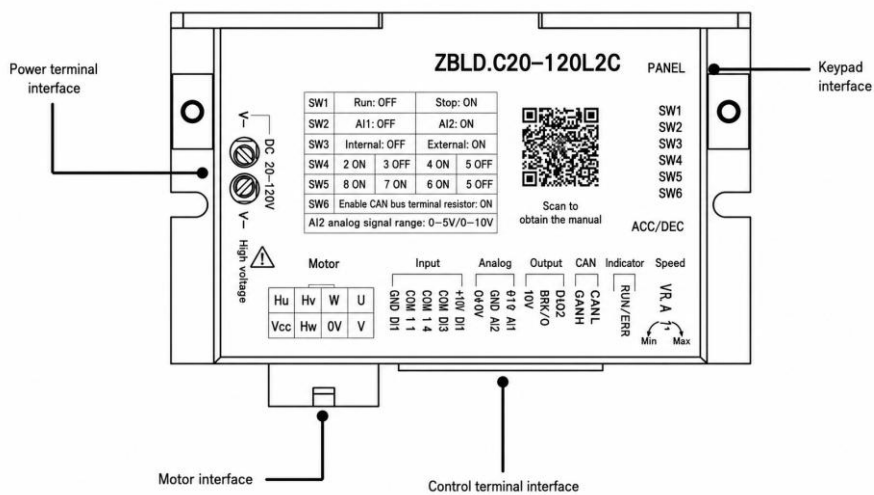


3. Wiring

3.1 Wiring Diagram

The accompanying figure shows the wiring arrangement for the EA-BLDC20-120-L2-C.





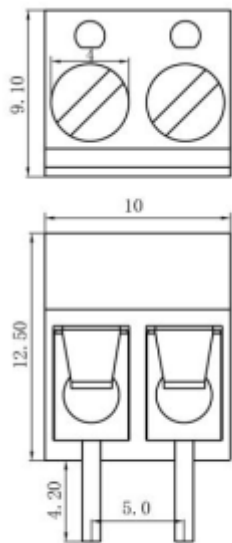
Wiring Precautions

1. Switch off the power supply before wiring. Wiring must be performed by qualified personnel.
2. Do not connect the power cable to terminals other than the power input; the driver may be damaged.
3. Ground the grounding terminal reliably.
4. Tighten terminal screws securely to prevent loosening caused by vibration.
5. Select conductor size in accordance with applicable electrical regulations.
6. Use a power supply with a capacity greater than twice the rated motor power.
7. Keep the motor-to-driver cable shorter than 1 m whenever possible.
8. After wiring, check again:
 - a. Are all connections correct, especially the power-supply polarity and terminal assignment?
 - b. Is any required wiring missing?
 - c. Is there any short circuit between terminals, between wires, or to ground?

3.2 Ports

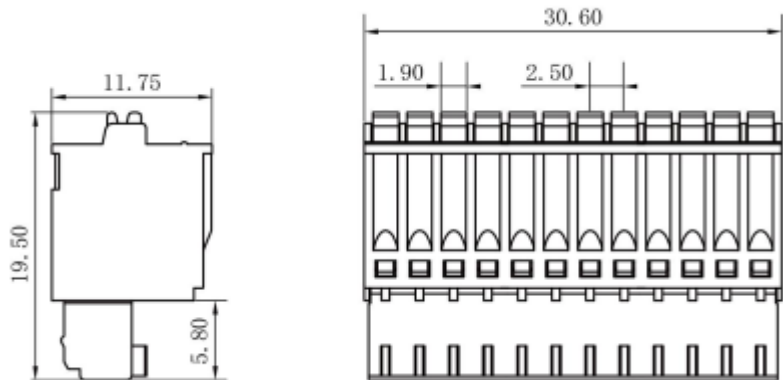
3.2.1 Power Terminal

Two-pole screw terminal. Use a flat-blade screwdriver with a blade width of 4 mm or less. Input is DC 24 V. Follow the markings on the top cover and do not reverse the polarity.



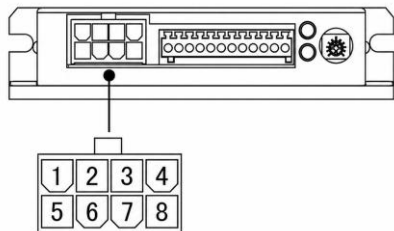
3.2.2 Control Terminal

Twelve-pole pluggable spring terminal. Use a flat-blade screwdriver with a blade width of 2 mm or less. Press the button above the wiring hole, insert the conductor, then release the button and confirm that the conductor is retained.



3.2.3 Motor Interface

Low-voltage motor socket signal and wire-color assignment:



Pin No.	1 (Yellow)	2 (Green)	3 (Blue)	4 (Yellow-White)
Signal	Hu	Hv	W	U
Pin No.	5 (Red)	6 (Blue)	7 (Black)	8 (Green-White)
Signal	Vcc	Hw	0V	V

3.2.4 Keypad Interface

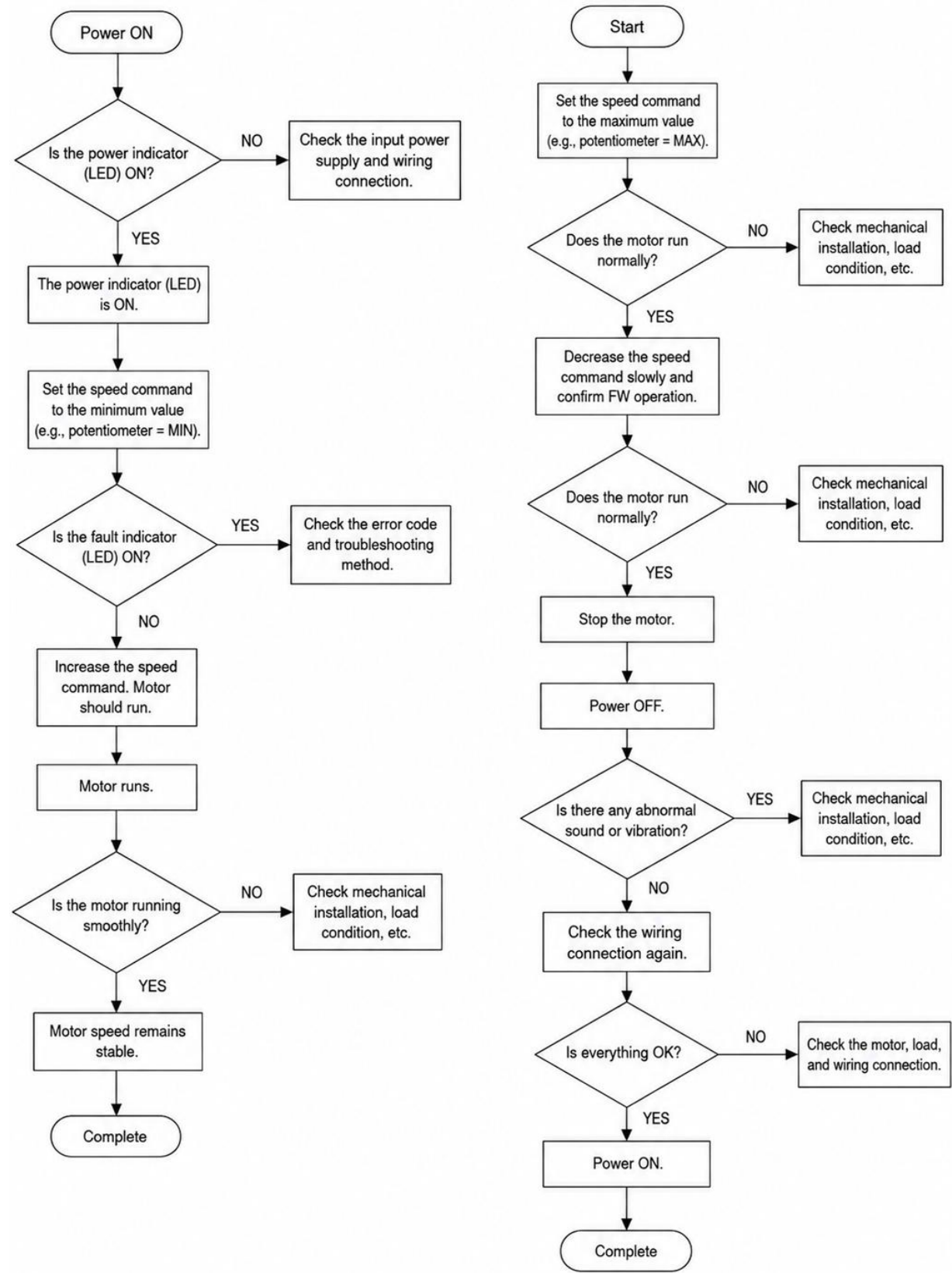
The keypad interface is USB. Use the separately purchased keypad cable specified for the compatible C20-series keypad.

4. Operation Instructions

Precautions

1. Unless otherwise specified, the factory default is terminal control. Keypad control requires the optional C20-series handheld keypad.
2. The keypad function codes in this manual apply to the EA-BLDC20-120-L2-C and other compatible C20-series products. Refer to the C20 Series Keypad Function Code Manual for additional details.
3. Operation must be performed by personnel who understand the product.
4. Perform no-load commissioning before normal operation. The accompanying flowcharts show terminal control on the left and keypad control on the right using factory-default settings.

No-load commissioning flowcharts are shown in the accompanying image.



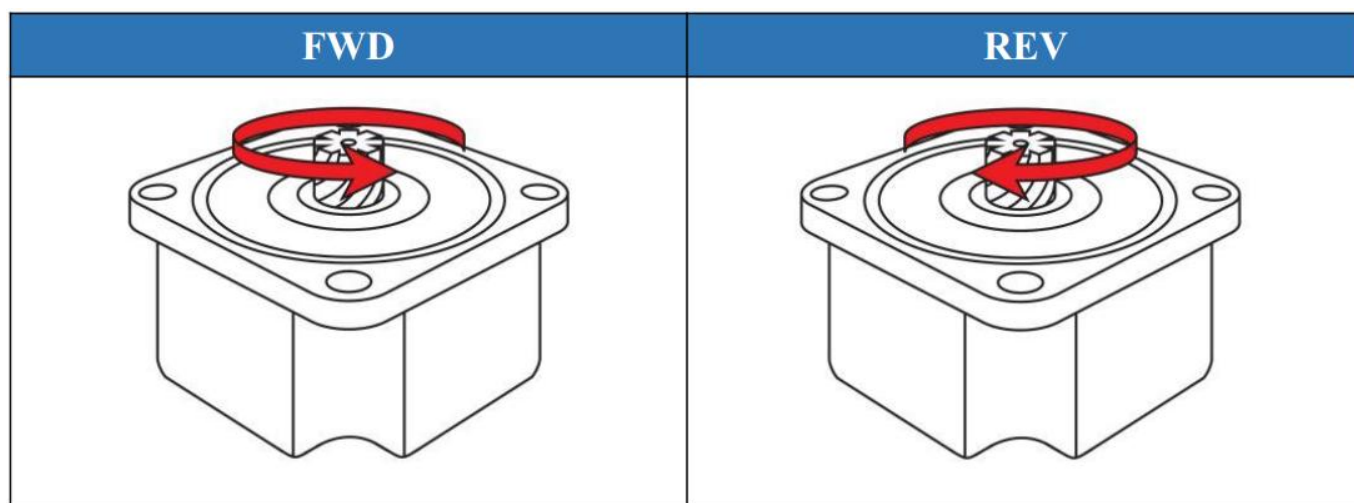
4.1 Terminal Control

4.1.1 Port Description

Users without the optional keypad can refer to the default function-code values in Section 4.2.3.

Category	Port	Function
Input	FWD/DI1	Forward rotation
Input	REV/DI2	Reverse rotation
Input	JOG/DI3	Jog
Input	CLR/DI4	Fault reset
Input	BRK/DI5	Brake, electronic braking
Common	COM	0 V
Analog	VAR/AI2	Analog voltage or PWM input, 0-5 V / 0-10 V
Analog	+5V	+5 V output
Output	ERR/DO1	Fault output, open collector
Output	SPD/DO2	Speed output, open collector
CAN	CANH	CAN high
CAN	CANL	CAN low

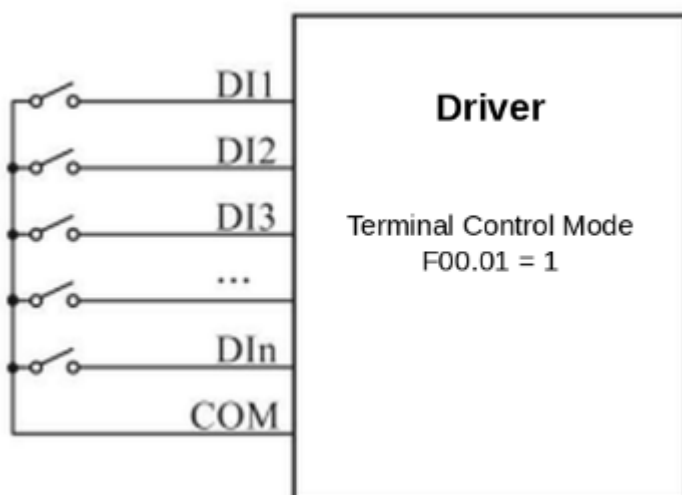
The default motor direction may differ according to the number of pole pairs. Always perform a no-load test and confirm the direction before use.



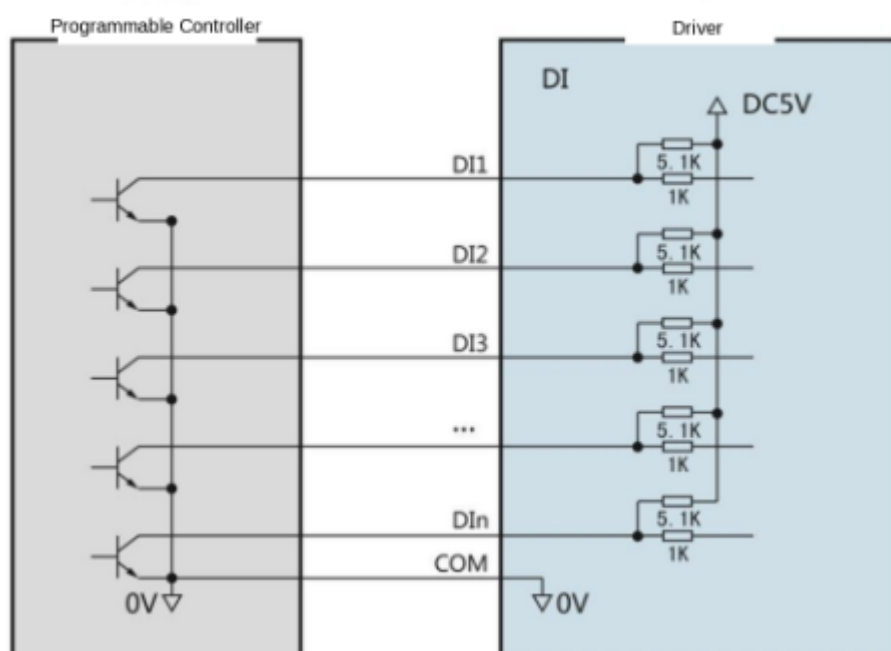
4.1.2 Input Terminals

- Short FWD to COM to run the motor forward.
- Short REV to COM to run the motor in reverse.
- Short JOG to COM to start jog operation at low speed.
- When a driver fault occurs, short CLR to COM to reset the fault.
- Short BRK to COM during operation to apply electronic braking. Except for an emergency stop, avoid braking at high speed or with large load inertia. Reduce the speed to a safe range before braking whenever possible.

An external switch or relay may be connected by the user.



External PLC (NPN) control is shown in the accompanying wiring diagram.



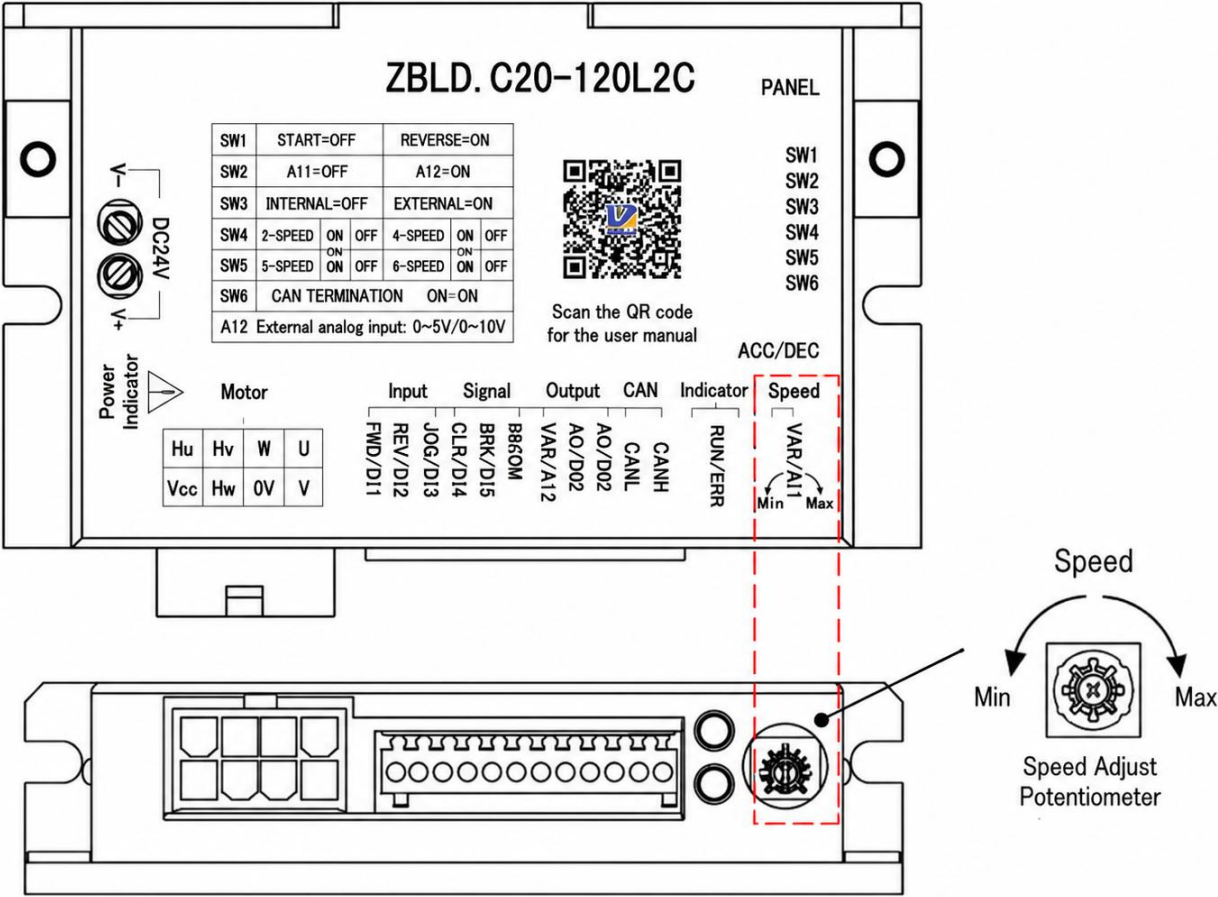
Cautions

1. Do not connect FWD and REV at the same time.
2. Avoid changing direction at high motor speed. Stop the motor before reversing whenever possible.
3. When using the brake function, calculate a safe braking speed and ensure that motor speed is below that value before braking.

4.1.3 Analog AI1 Speed Reference - Built-in Knob Potentiometer

The built-in AI1 knob is the factory-default speed reference. Turn the knob to adjust speed.

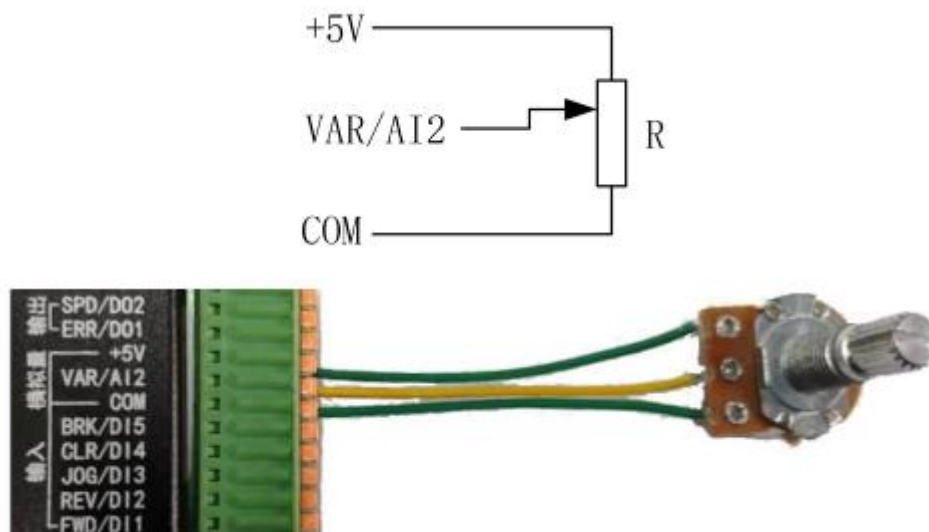
Use a Phillips screwdriver with a tip diameter of 3 mm or less. Turn clockwise to increase speed and counterclockwise to decrease speed.



4.1.4 Analog AI2 Speed Reference - External Voltage

To use AI2, set function code F00.02 to 2 using the keypad. Adjust speed by changing the external input voltage, 0-5 V by default. Connect an external potentiometer; a resistance of 10 kOhm is recommended.

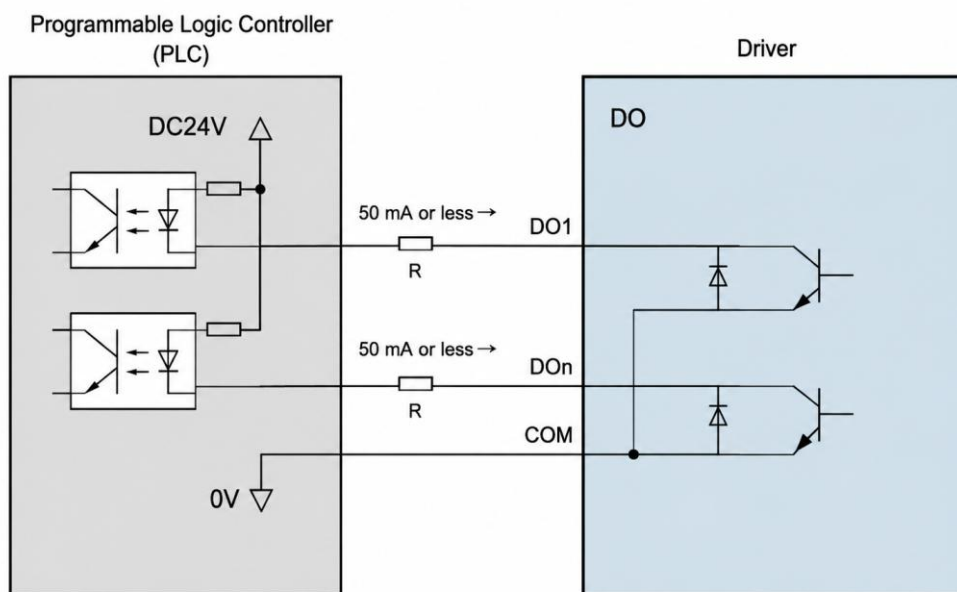
For a 0-10 V input, set F05.39 to 10 using the keypad. The maximum input is 10 V. The connection and physical wiring are shown in the accompanying figures.



4.1.5 Output Terminals

The outputs are open-collector outputs with sink current below 50 mA. DO1 is assigned to fault output by default, and DO2 is assigned to speed output by default. Change F06.01 and F06.02 using the keypad to select other output functions.

The outputs can be connected to a PLC as shown in the accompanying diagram.



Note: COM is the driver 0 V reference.

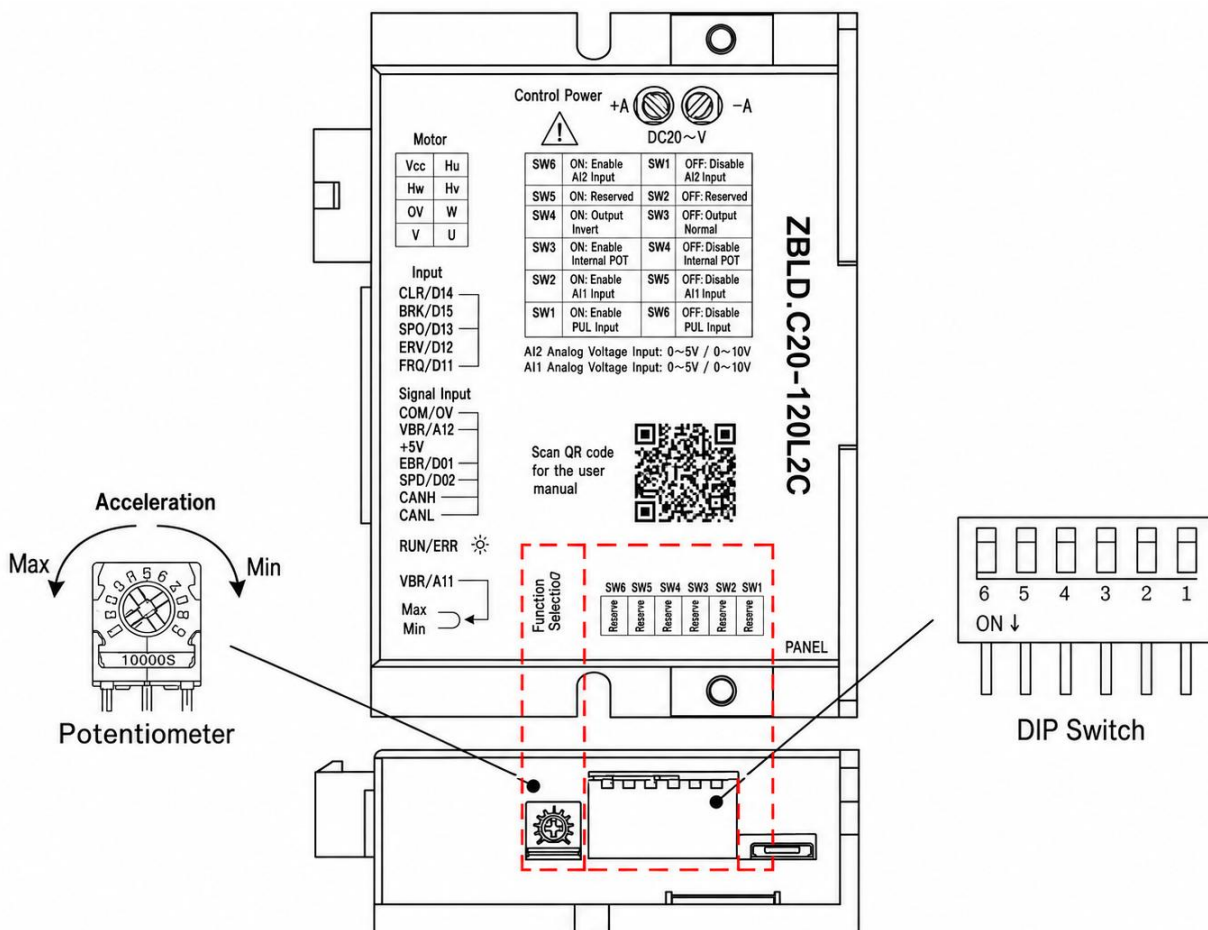
4.1.6 CAN Communication Port

The product supports CAN communication using the CAN Modbus protocol described in Chapter 6 and the CANopen protocol described in Chapter 7.

4.1.7 Analog ACC/DEC Acceleration/Deceleration Time Reference

The built-in ACC/DEC knob is the factory-default acceleration/deceleration time reference. Turn the knob to adjust both times. To set acceleration and deceleration separately, set F00.08 to 0, then set acceleration time with F00.11 and deceleration time with F00.12.

Use a Phillips screwdriver with a tip diameter of 3 mm or less. Turn clockwise to increase the acceleration/deceleration time and reduce acceleration. Turn counterclockwise to reduce the time and increase acceleration.

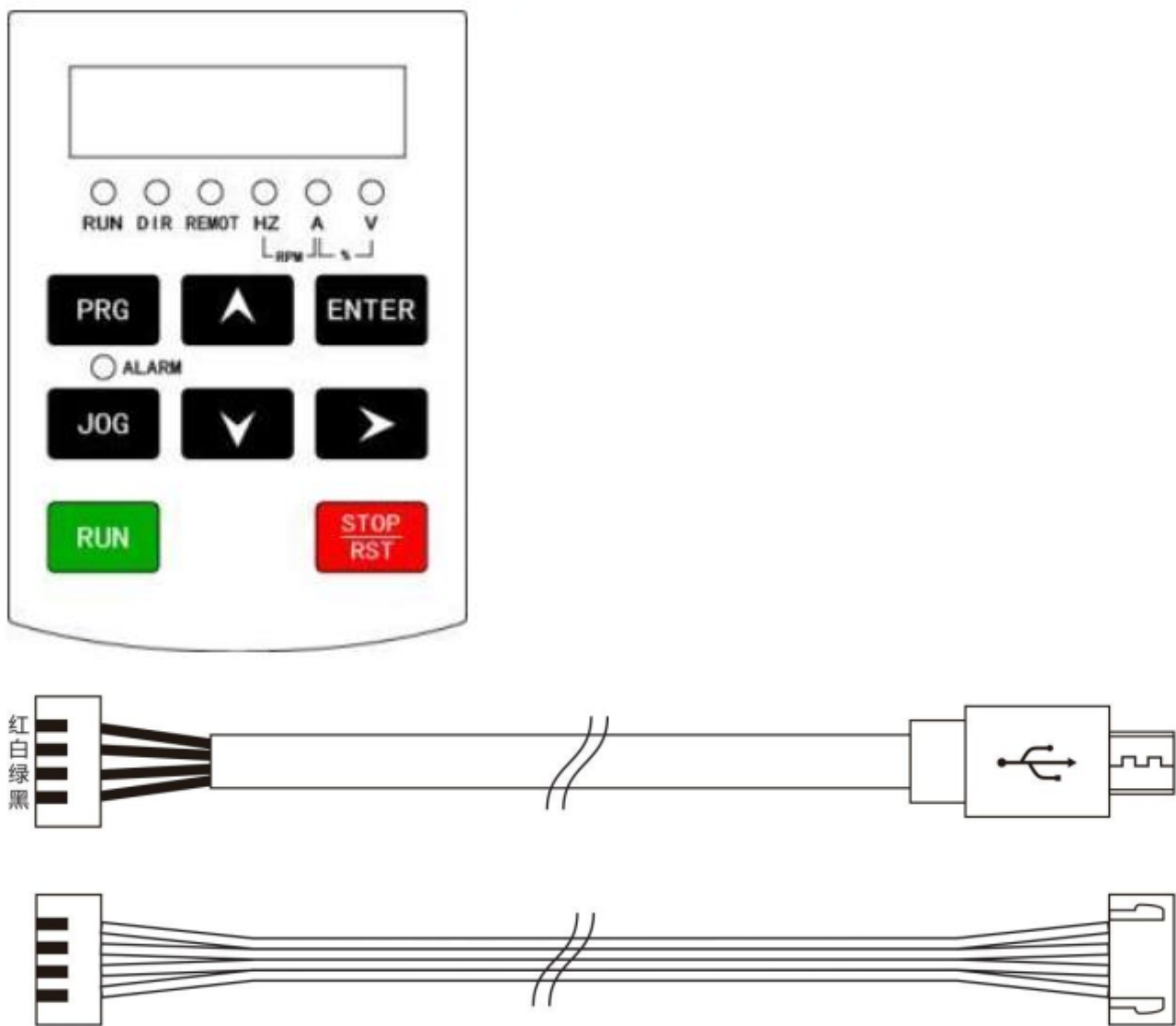


4.1.8 DIP Switches

The driver has six DIP switches, SW1-SW6. The down position is ON.

Switch	Function	OFF	ON
SW1	Open-loop / closed-loop selection	Open loop	Closed loop
SW2	Analog input selection	AI1	AI2
SW3	Control-method selection	Internal control	Communication control
SW4 / SW5	Motor pole-pair matching	2 pole pairs: SW4 ON, SW5 ON; 3 pole pairs: SW4 OFF, SW5 ON; 4 pole pairs: SW4 ON, SW5 OFF; 5 pole pairs: SW4 OFF, SW5 OFF	
SW6	CAN terminating resistor	Disconnected	Connected

4.2 Keypad Control
4.2.1 Keypad Description



The optional C20-series external keypad can set driver parameters and read driver status. Select the correct keypad cable for the interface type.

No.	Item	Description
1	Digital display	Five-digit display for function codes, operating parameters, and fault alarms
2	RUN indicator	Off: stopped; flashing: parameter identification; on: running
2	DIR indicator	Off: forward; on: reverse
2	REMOT indicator	Off: keypad control; flashing: terminal control; on: communication control
2	ALARM indicator	Off: no fault; flashing: pre-alarm; on: fault
3	Hz	Frequency unit
3	A	Current unit
3	V	Voltage unit
3	RPM	Speed unit
3	%	Percentage

No.	Item	Description
4	PRG	Enter or exit the first-level menu
4	ENTER	Enter menu levels and confirm parameter settings
4	Up key	Increase data or function-code value
4	Down key	Decrease data or function-code value
4	Right-shift key	Move the cursor or cycle through display items; select a digit while editing a parameter

4.2.1 Keypad Description (continued)

JOG	Jog key	Starts jog operation; available on the external keypad only
RUN	Run key	Starts operation
STOP/RST	Stop/Reset key	Stops the driver during operation; resets a fault in the fault state

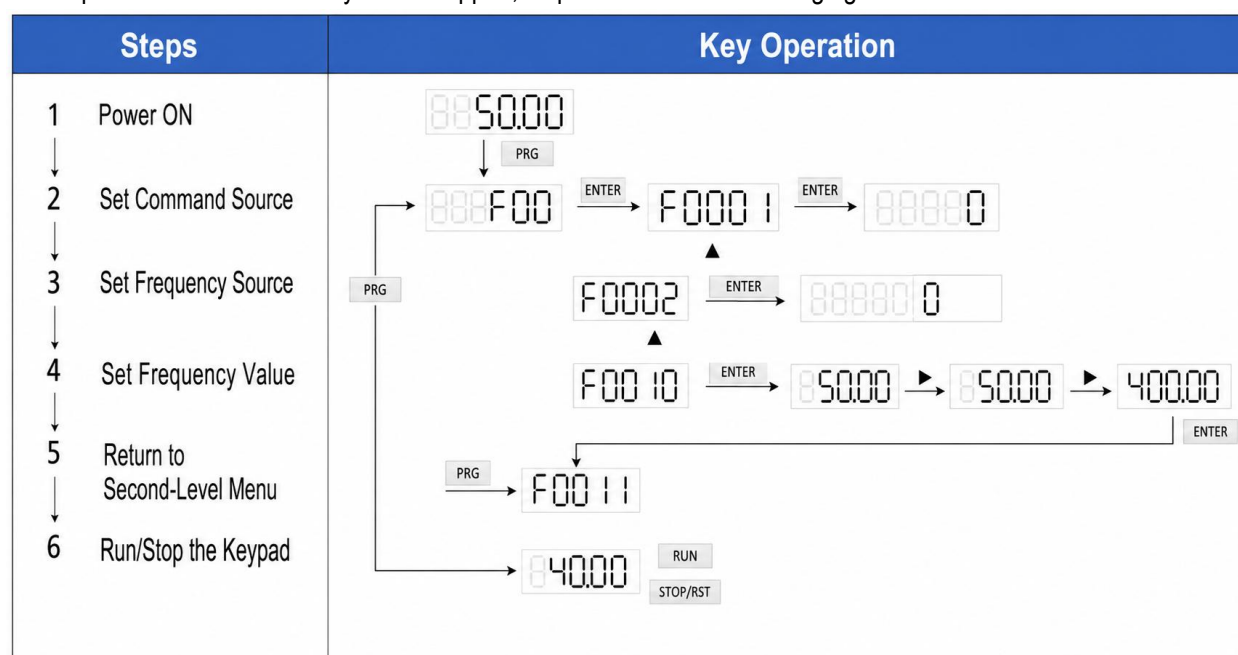
4.2.2 Keypad Operation

The driver uses a three-level menu:

1. Function-code group, first-level menu, for example F00.
2. Function-code number, second-level menu, for example F00.00.
3. Function-code value, third-level menu, for example 50.00 Hz.

If no digit flashes in the third-level menu, the function code cannot be changed. Possible reasons:

1. The parameter is read-only, such as operating frequency or a fault code.
2. The parameter is writable only when stopped; stop the driver before changing it.



4.2.3 Function Codes

C20 driver parameters are grouped by function. Groups F00-F10 are used; other groups are reserved.

Attribute definitions: R/W = readable and writable; R/W* = writable when stopped and readable at any time; RO = read-only; N = reserved.

Parameter	Name	Setting Range	Default	Attribute
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F00 Basic Function Group

F00.00	Control mode	0 Test mode; 1 Hall open loop; 2 Hall closed loop; 3 DIP-switch setting, SW1 on supported models	3	R/W*
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Function Codes - F00 Basic Function Group

Parameter	Name	Setting Range	Default	Attribute
F00.01	Run-command selection	0 Keypad command, LED off; 1 Terminal command, LED flashing; 2 Communication command, LED on; 3 DIP-switch setting, SW3 on supported models	3	R/W
F00.02	Speed-reference selection	0 Keypad digital setting; 1 Analog AI1, knob potentiometer; 2 Analog AI2, external voltage; 3 Modbus communication; 4 Multi-speed; 5 DIP-switch setting, SW2/SW3; 6 Simple PLC, F04 group; 7 High-speed pulse input, HDI selected by F05.00; 8 CAN communication on supported models	5	R/W
F00.03	Upper operating-frequency limit	F00.04-500.00 Hz	250.00 Hz	R/W*
F00.04	Lower operating-frequency limit	0.00 Hz-F00.03	5.00 Hz	R/W*
F00.05	Communication run-command channel	0 Modbus; 1 CAN on supported models	0	R/W*
F00.06	Pole-pair setting source	0 Function code F02.05; 1 DIP switch on supported models	1	R/W*
F00.07	Current setting source	0 Function code F02.04; 1 Analog setting on supported models	1	R/W*
F00.08	Acceleration/deceleration time setting source	0 Function codes F00.11 and F00.12; 1 Analog setting for keypad and terminal models	1	R/W*
F00.09	Jog frequency	0.00 Hz-F00.03	10.00 Hz	R/W
F00.10	Keypad frequency	0.00 Hz-F00.03	250.00 Hz	R/W
F00.11	Acceleration time 1	0.1-600.0 s	1.0 s	R/W
F00.12	Deceleration time 1	0.1-600.0 s	1.0 s	R/W
F00.13	Rotation-direction selection	0 Default direction; 1 Opposite direction; 2 Reverse operation disabled	0	R/W
F00.14	Carrier frequency	8.0-20.0 kHz	Model dependent	R/W*

Parameter	Name	Setting Range	Default	Attribute
F00.15	Parameter restore selection	0 No action; 1 Restore function-code defaults; 2 Restore CANopen communication defaults; 3 Restore all parameters	0	R/W*

F01 Start/Stop Control Group

Function Codes - F01 Start/Stop Control Group

Parameter	Name	Setting Range	Default	Attribute
F01.05	Stop mode	0 Deceleration stop; 1 Coast stop	1	R/W
F01.06	Forward/reverse dead time	0.000-9.999 s	0.200 s	R/W
F01.07	Reserved	0-1	0	R/W*
F01.08	Electronic-brake current limit	0.1%-200.0%	5.0%	R/W
F01.09	Electronic-brake adjustment time	0.1-999.9 s	5.0 s	R/W
F01.10	Stop speed	0.00-50.00 Hz; valid for deceleration stop	0.20 Hz	R/W
F01.11	Direction-change limit frequency	0.0-500.0 Hz; valid for deceleration stop	50.0 Hz	R/W
F01.12	Electronic-brake torque hold time	0.1-600.0 s	0.0 s	R/W
F01.13	Brake during deceleration stop	0 Disabled; 1 Enabled when F01.05=0	1	R/W
F01.14	Reduction-ratio numerator	1-9999. Displayed speed = motor speed / (numerator / denominator)	1	R/W
F01.15	Reduction-ratio denominator	1-9999	1	R/W

F02 Motor Parameter Group

F02.00	Rated motor power	15-2200 W	Model dependent	R/W*
F02.01	Rated motor frequency	0.01-500 Hz	Model dependent	R
F02.02	Rated motor speed	1-9999 rpm	Model dependent	R
F02.03	Rated motor voltage	0-1200 V	Model dependent	R
F02.04	Rated motor current	0.8-999.9 A	Model dependent	R/W*
F02.05	Motor pole pairs	1-20	5	R/W*
F02.08	Special parameter setting	Bit 0: 0 Hall count in default direction, 1 reversed Hall count, F09.29/F09.30. Bit 1: 0 display actual speed, 1 display set speed	0	R/W*

F03 Control Parameter Group

F03.00-F03.18	Reserved	Reserved	16.0	N
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F04 Simple PLC and Multi-speed Group

F04.00	Simple PLC mode	0 Stop after one run	0	R/W
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Function Codes - F04 Simple PLC and Multi-speed Group

F04.00 continued: 1 Continue running at the final value after one cycle; 2 Continuous cycles; 3-n Stop after n-1 cycles, maximum n=9999.

Parameter	Name	Setting Range	Default	Attribute
F04.01-F04.16	Multi-speed 0 through Multi-speed 15	-100.0% to 100.0%	0.0%	R/W
F04.17	Segment 0 run time	0.0-999.9 s or min	0.0 s	R/W
F04.18	Segment 1 run time	0.0-999.9 s or min	0.0 s	R/W
F04.19	Segment 2 run time	0.0-999.9 s or min	0.0 s	R/W
F04.20	Segment 3 run time	0.0-999.9 s or min	0.0 s	R/W
F04.21	Segment 4 run time	0.0-999.9 s or min	0.0 s	R/W
F04.22	Segment 5 run time	0.0-999.9 s or min	0.0 s	R/W
F04.23	Segment 6 run time	0.0-999.9 s or min	0.0 s	R/W
F04.24	Segment 7 run time	0.0-999.9 s or min	0.0 s	R/W
F04.25	Segment 8 run time	0.0-999.9 s or min	0.0 s	R/W
F04.26	Segment 9 run time	0.0-999.9 s or min	0.0 s	R/W
F04.27	Segment 10 run time	0.0-999.9 s or min	0.0 s	R/W
F04.28	Segment 11 run time	0.0-999.9 s or min	0.0 s	R/W

Function Codes - F04 continued and F05 Input Terminal Group

Parameter	Name	Setting Range	Default	Attribute
F04.29	Segment 12 run time	0.0-999.9 s or min	0.0 s	R/W
F04.30	Segment 13 run time	0.0-999.9 s or min	0.0 s	R/W
F04.31	Segment 14 run time	0.0-999.9 s or min	0.0 s	R/W
F04.32	Segment 15 run time	0.0-999.9 s or min	0.0 s	R/W
F04.33	PLC restart mode	0 Restart from segment 1; 1 Continue at the stage frequency present when interrupted	0	R/W*
F04.34	Multi-segment time unit	0 Seconds; 1 Minutes	0	R/W*

F05 Input Terminal Parameter Group

F05.00	HDI function selection	0 DI3 as normal I/O input; 1 DI3 as HDI high-speed pulse input	0	R/W*
F05.01	DI1 terminal function	0 No function; 1 Forward run; 2 Reverse run; 3 Three-wire control; 4 Forward jog; 5 Reverse jog; 6 Coast stop; 7 Fault reset; 8 Electronic brake; 9 External fault input; 10-13 Reserved; 14 Forward limit; 15 Reverse limit; 16 Multi-speed 1; 17 Multi-speed 2; 18 Multi-speed 3; 19 Multi-speed 4; other values reserved	1	R/W*
F05.02	DI2 terminal function	Same options as F05.01	2	R/W*
F05.03	DI3 terminal function	Same options as F05.01	4	R/W*
F05.04	DI4 terminal function	Same options as F05.01	7	R/W*
F05.05-F05.08	DI5-DI8 terminal function	Same options as F05.01	0	R/W*
F05.09	Reserved	-	0	R/W*
F05.10	Input-terminal polarity	0x000-0x1FF	0x000	R/W
F05.11	Digital-input filter time	0.000-1.000 s	0.010 s	R/W
F05.12	Virtual-terminal setting	0x000-0x10F; 0 disabled, 1 enabled. Bit 0 DI1, Bit 1 DI2, Bit 2 DI3, Bit 3 DI4, Bit 4 DI5, Bit 5 DI6, Bit 6 DI7, Bit 7 DI8	0x000	R/W*

Function Codes - F05 Input Terminal Parameter Group continued

Parameter	Name	Setting Range	Default	Attribute
F05.13	Terminal-control run mode	0 Two-wire control 1; 1 Two-wire control 2; 2 Three-wire control 1; 3 Three-wire control 2	0	R/W*
F05.14	DI1 ON delay	0.000-9.999 s	0.000 s	R/W
F05.15	DI1 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.16	DI2 ON delay	0.000-9.999 s	0.000 s	R/W
F05.17	DI2 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.18	DI3 ON delay	0.000-9.999 s	0.000 s	R/W
F05.19	DI3 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.20	DI4 ON delay	0.000-9.999 s	0.000 s	R/W
F05.21	DI4 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.22	DI5 ON delay	0.000-9.999 s	0.000 s	R/W
F05.23	DI5 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.24	DI6 ON delay	0.000-9.999 s	0.000 s	R/W
F05.25	DI6 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.26	DI7 ON delay	0.000-9.999 s	0.000 s	R/W
F05.27	DI7 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.28	DI8 ON delay	0.000-9.999 s	0.000 s	R/W
F05.29	DI8 OFF delay	0.000-9.999 s	0.000 s	R/W
F05.30-F05.31	Reserved	0.000-9.999 s	0.000 s	R/W
F05.32	AI1 lower-limit voltage	0.00 V-F05.34	0.50 V	R/W
F05.33	AI1 lower-limit corresponding setting	-300.0%-300.0%	0.0%	R/W
F05.34	AI1 upper-limit voltage	F05.32-10.00 V	8.50 V	R/W
F05.35	AI1 upper-limit corresponding setting	-300.0%-300.0%	100.0%	R/W
F05.36	AI1 input filter time	0.000-9.999 s	0.030 s	R/W
F05.37	AI2 lower-limit voltage	0.00 V-F05.39	0.20 V	R/W
F05.38	AI2 lower-limit corresponding setting	-300.0%-300.0%	0.0%	R/W

Function Codes - F05 continued and F06 Output Terminal Group

Parameter	Name	Setting Range	Default	Attribute
F05.39	A12 upper-limit voltage	F05.37-10.00 V	4.80 V	R/W
F05.40	A12 upper-limit corresponding setting	-300.0%-300.0%	100.0%	R/W
F05.41	A12 input filter time	0.000-9.999 s	0.030 s	R/W
F05.42	A13 lower-limit voltage	0.00 V-F05.44	0.50 V	R/W
F05.43	A13 lower-limit corresponding setting	-300.0%-300.0%	0.0%	R/W
F05.44	A13 upper-limit voltage	F05.42-10.00 V	8.50 V	R/W
F05.45	A13 upper-limit corresponding setting	-300.0%-300.0%	100.0%	R/W
F05.46	A13 input filter time	0.000-9.999 s	0.030 s	R/W
F05.47	A14 lower-limit voltage	0.00 V-F05.49	0.50 V	R/W
F05.48	A14 lower-limit corresponding setting	-300.0%-300.0%	0.0%	R/W
F05.49	A14 upper-limit voltage	F05.47-10.00 V	8.50 V	R/W
F05.50	A14 upper-limit corresponding setting	-300.0%-300.0%	100.0%	R/W
F05.51	A14 input filter time	0.000-9.999 s	0.030 s	R/W
F05.52	HDI lower-limit frequency	0.00 kHz-F05.54	0.00 kHz	R/W
F05.53	HDI lower-limit corresponding setting	-100.0%-100.0%	0.0%	R/W
F05.54	HDI upper-limit frequency	F05.52-20.00 kHz	19.99 kHz	R/W
F05.55	HDI upper-limit corresponding setting	-100.0%-100.0%	100.0%	R/W
F05.56	HDI input filter time	0.000-9.999 s	0.030 s	R/W

F06 Output Terminal Parameter Group

F06.00	Reserved	0-1	0	R/W*
F06.01	DO1 output selection	0 Invalid; 1 Running; 2 Forward running; 3 Reverse running; 4 Jog running; 5 Driver fault; 6 Overload warning; 7 Underload warning; 8 Communication virtual-terminal output; 9 Low DC-bus voltage; 10 Speed output, Hall signal; other values reserved	5	R/W
F06.02	DO2 output selection	Same options as F06.01	10	R/W
F06.03	DO3 output selection	Same options as F06.01	0	R/W

F06.00	Reserved	0-1	0	R/W*
F06.04	DO4 output selection	Same options as F06.01	0	R/W
F06.05	Output-terminal polarity selection	00-0F	00	R/W

Function Codes - F06 continued and F07 Fault/Protection Group

Parameter	Name	Setting Range	Default	Attribute
F06.06	DO1 ON delay	0.000-9.999 s	0.000 s	R/W
F06.07	DO1 OFF delay	0.000-9.999 s	0.000 s	R/W
F06.08	DO2 ON delay	0.000-9.999 s	0.000 s	R/W
F06.09	DO2 OFF delay	0.000-9.999 s	0.000 s	R/W
F06.10	DO3 ON delay	0.000-9.999 s	0.000 s	R/W
F06.11	DO3 OFF delay	0.000-9.999 s	0.000 s	R/W
F06.12	DO4 ON delay	0.000-9.999 s	0.000 s	R/W
F06.13	DO4 OFF delay	0.000-9.999 s	0.000 s	R/W

F07 Fault and Protection Group

F07.00	Driver or motor overload/underload pre-alarm selection	0x000-0x131. Units digit: 0 motor pre-alarm relative to rated motor current; 1 driver pre-alarm relative to rated driver current. Tens digit: 0 continue after overload/underload alarm; 1 continue after underload alarm but stop on overload; 2 continue after overload alarm but stop on underload; 3 stop on either overload or underload fault. Hundreds digit: 0 detect continuously; 1 detect at constant speed only	0x000	R/W
F07.01	Overload pre-alarm detection level	F07.03-200%	140%	R/W
F07.02	Overload pre-alarm detection time	0.1-999.9 s	1.0 s	R/W
F07.03	Underload pre-alarm detection level	0%-F07.01	50%	R/W
F07.04	Underload pre-alarm detection time	0.1-999.9 s	1.0 s	R/W
F07.05	Motor overload protection	0 Disabled; 1 Enabled	0	R/W*
F07.06	Motor overload protection coefficient	20.0%-120.0%	100.0%	R/W
F07.07	MOS self-test enable	0 Disabled; 1 Enabled	0	R/W*
F07.08	Automatic current-limit level	10.0%-420.0% of driver rating	260.0%	R/W*

Function Codes - F07 continued and F08 Communication Group

Parameter	Name	Setting Range	Default	Attribute
F07.09	Fault auto-reset time	0.0-999.9 s	5.0 s	R/W
F07.10	Number of fault auto-resets	0 Disabled; 1-9999 reset attempts	0	R/W
F07.11	Stall detection time	0.0-999.9 s	3.0 s	R/W*
F07.12	Stall current limit	1.0%-200.0% of driver rated current	70.0%	R/W*
F07.13	UP/DN keypad function	0 Fine adjustment of speed reference, valid only for keypad speed reference; 1 UP forward jog and DN reverse jog, valid on keypad stop/run screens	0	R/W
F07.14	Undervoltage detection time	0-9.999 s	1.0 s	R/W
F07.15	Phase-loss detection time	0-999.9 s	3.0 s	R/W
F07.16	User password	0 Clear password; 1-9999 enable password protection	0	R/W
F07.19	Fan control	0 Fan on during operation; 1 Fan runs continuously	-	-

F08 Communication Group

F08.00	RS485 slave address	1-247; 0 is broadcast	1	R/W*
F08.01	RS485 baud rate	0 1200; 1 2400; 2 4800; 3 9600; 4 19200 default; 5 38400; 6 57600 bps. Some models do not permit baud-rate changes	4	R/W*
F08.02	RS485 data/parity setting	0 No parity N,8,1; 1 Even E,8,1; 2 Odd O,8,1; 3 No parity N,8,2. Some models do not permit parity changes	0	R/W*
F08.03	RS485 response delay	0-200 ms	5 ms	R/W*
F08.04	RS485 timeout-fault time	0.0 disabled; 0.1-60.0 s	0.0 s	R/W*
F08.05	Reserved	-	0	R/W*
F08.06	RS485 processing action	0x0-0x1. Units digit: 0 write operation returns a response; 1 write operation returns no response	0x00	R/W*

Function Codes - F08 CAN Communication and F09 Monitoring Group

Parameter	Name	Setting Range	Default	Attribute
F08.10	CAN slave address	1-127	1	R/W*
F08.11	CAN baud rate	0 10 kbit/s, unsupported on some models; 1 20 kbit/s; 2 50 kbit/s; 3 100 kbit/s; 4 125 kbit/s default; 5 250 kbit/s; 6 500 kbit/s; 7 1 Mbit/s	4	R/W*
F08.12	CAN response delay	0-200 ms	5 ms	R/W*
F08.13	CAN protocol selection	0 CAN Modbus; 1 CANopen on supported models	0	R/W*
F08.14	CAN function setting	CANopen bits 0-7: Bit 0 action when not Operational during running, 0 stop and report E.CAN5, 1 retain previous state. Bit 1 heartbeat timeout action, 0 stop and report E.CAN4, 1 retain previous state. Bit 2 CAN receive/transmit fault detection, 0 disable E.CAN2/E.CAN3, 1 enable. CAN Modbus bits 8-15: Bit 8 broadcast response, 0 no response, 1 response	0x00	R/W*

F09 Monitoring Parameter Group

F09.00	Set frequency	0.00 Hz-F00.03	0.00 Hz	RO
F09.01	Output frequency	0.00 Hz-F00.03	0.00 Hz	RO
F09.02	Ramp set frequency	0.00 Hz-F00.03	0.00 Hz	RO
F09.03	Output voltage	0.0-1200.0 V	0.0 V	RO
F09.04	Output current	0.00-100.00 A	0.00 A	RO
F09.05	Set speed	0-65535 rpm	0 rpm	RO
F09.06	Motor speed	0-65535 rpm	0 rpm	RO

Function Codes - F09 Monitoring Group continued

F09.07	Output power	0-2200 W	0 W	RO
F09.08	DC-bus voltage	0.0-2000.0 V	0 V	RO
F09.09	Hall value	0-7	0	RO
F09.10	Software version	1.00-99.99	1.00	RO
F09.11	Current fault type	0 No fault; 1 Hardware acceleration overcurrent E.OCH1; 2 Hardware deceleration overcurrent E.OCH2; 3 Hardware constant-speed overcurrent E.OCH3; 4 Acceleration overcurrent E.OC1; 5 Deceleration overcurrent E.OC2; 6 Constant-speed overcurrent E.OC3; 7 Acceleration overvoltage E.OV1; 8 Deceleration overvoltage E.OV2; 9 Constant-speed overvoltage E.OV3; 10 DC-bus undervoltage E.UV; 11 Motor overload E.OL1; 12 Driver overload E.OL2; 13 Hall fault E.HALL; 14 Stall fault E.LOC; 15 Rectifier-module overtemperature E.OH1; 16 Inverter-module overtemperature E.OH2; 17 External fault E.EF; 18 RS485 communication fault E.485; 19 Current-detection fault E.CUr; 20 Inverter U-phase fault E.OUT1; 21 Inverter V-phase fault E.OUT2; 22 Inverter W-phase fault E.OUT3; 23 Electronic overload E.OL3; 24 Underload fault E.LL; 25 MOS short-circuit fault E.Sht; 26 Keypad communication fault E.boAd; 27 EEPROM storage fault E.EEP; 28 MOS conduction fault E.Cnd; 29 Hardware overcurrent-feedback	0	RO

F09.07	Output power	0-2200 W	0 W	RO
		fault E.OCHF; 30 Output phase-loss fault E.POUT; 31 CAN bus- off E.CAN1; 32 CAN transmit error E.CAN2; 33 CAN receive error E.CAN3; 34 Internal communication fault E.Conn; 35 CANopen heartbeat timeout E.CAN4; 36 CANopen NMT operation fault E.CAN5		
F09.12	Previous fault 1	Same fault-code list	0	RO
F09.13	Previous fault 2	Same fault-code list	0	RO
F09.14	Previous fault 3	Same fault-code list	0	RO
F09.15	Previous fault 4	Same fault-code list	0	RO

Function Codes - F09 Monitoring Group continued

Parameter	Name	Setting Range	Default	Attribute
F09.16	Inverter temperature	-20.0 to 120.0 deg C	0.0 deg C	RO
F09.17	Digital input-terminal status	0000-1FF; Bit 0 DI1, Bit 1 DI2, Bit 2 DI3, Bit 3 DI4, Bit 4 DI5	0	RO
F09.18	Digital output-terminal status	0000-000F; Bit 0 DO1, Bit 1 DO2	0	RO
F09.19	AI1 input voltage	0.00-10.00 V	0.00 V	RO
F09.20	AI2 input voltage	0.00-10.00 V	0.00 V	RO
F09.21	AI3 input voltage	0.00-10.00 V	0.00 V	RO
F09.22	Peak current	0.00-100.00 A	0.00 A	RO
F09.23	DIP-switch status	0x00-0xFF	0x00	RO
F09.24	Rated-current setting	0.00-100.00 A	0.00 A	RO
F09.25	AI4 input voltage	0.00-10.00 V	0.00 V	RO
F09.26	HDI input frequency	0.00-20.00 kHz	0.00 kHz	RO
F09.27	Simple PLC cycle count	0-9999	0	RO
F09.28	Pole-pair setting	1-20	0	RO
F09.29	Hall count, high 16 bits	0-65535	0	RO
F09.30	Hall count, low 16 bits	0-65535	0	RO

5. Status Display and Fault Maintenance

Precautions

- Except for faults that require parameter changes using the keypad, perform troubleshooting and maintenance with the power disconnected.
- Before use, confirm that the indicator lamps or keypad operate normally.
- Do not move, wire, or service the driver while an indicator is lit.
- After initial troubleshooting, perform a trial run.
- Basic maintenance must be carried out by personnel familiar with this product.
- Do not remove the driver housing if a fault cannot be resolved. Contact the supplier or qualified technical support.

5.1 LED Fault Indication

Operating state	Normal indication	Other indication
Stopped	Green continuously on; red off	Fault: red and green flash alternately to indicate the fault number
Running	Green flashing; red off	Current limiting: green and red flash; braking: green continuously on and red flashes rapidly

Fault-number calculation: one green flash represents 5 and one red flash represents 1.

Fault number = green flashes x 5 + red flashes.

Fault No.	Fault	LED indication	Main causes	Corrective action
1-6	Hardware/software overcurrent during acceleration, deceleration, or constant speed	0-1 green and 1-5 red	Acceleration/deceleration too fast; low voltage; driver power too low; sudden load; phase-to-phase short circuit; strong interference	Increase acceleration/deceleration time; check input voltage; use a larger driver; inspect the load; inspect/replace cable or motor; remove interference
7-9	Overvoltage during acceleration, deceleration, or constant speed	1 green and 2-4 red	High input voltage; rapid forward/reverse switching; motor driven by external force and regenerating	Check supply voltage; increase direction-change time; add external braking equipment
10	DC-bus undervoltage	1 green and 5 red	Low supply voltage; acceleration too fast causing supply protection; supply dip; driver hardware fault	Check supply; increase acceleration time; reset fault; obtain technical service

5.1 LED Fault Indication (continued)

Fault No.	Fault	LED indication	Main causes	Corrective action
11	Motor overload	2 green, 1 red	Low supply voltage; motor power or rated-current setting too high; stalled motor or sudden load change	Check supply; set the rated motor current correctly; reduce load and inspect the motor/mechanism
12	Driver overload	2 green, 2 red	Low supply voltage; acceleration too fast; excessive load	Check supply; increase acceleration time; select the next larger driver
13	Hall fault	2 green, 3 red	Hall wiring open; strong external interference	Check Hall wiring; remove interference
14	Stall fault	2 green, 4 red	Excessive load; motor mechanically jammed	Check mechanical connection and motor cable
16	Driver overtemperature	3 green, 1 red	Excessive load; driver hardware fault	Lower temperature; derate the driver
19	Current-detection fault	3 green, 4 red	Driver hardware damaged	Replace the driver
27	Parameter-storage fault	5 green, 2 red	Maximum number of writes during one power cycle reached	Power cycle the driver
29	Overcurrent-feedback fault	5 green, 4 red	Driver hardware damaged	Replace the driver
30	Output phase loss	5 green, 5 red	U/V/W output phase missing; driver hardware damaged	Check U/V/W connections; replace the driver if required

5.2 Keypad Fault Indication

When an external keypad is connected, the following codes are displayed after a fault stop.

Fault No.	Code	Fault name	Typical causes	Corrective action
1	E.OCH1	Hardware overcurrent during acceleration	Acceleration/deceleration too fast; low voltage; undersized driver; sudden load; ground/phase short circuit; interference	Increase ramp time; check input voltage; use a larger driver; inspect load/cable/motor; remove interference
2	E.OCH2	Hardware overcurrent during deceleration	Same as E.OCH1	Same as E.OCH1
3	E.OCH3	Hardware overcurrent at constant speed	Same as E.OCH1	Same as E.OCH1
4	E.OC1	Software overcurrent during acceleration	Same as E.OCH1	Same as E.OCH1
5	E.OC2	Software overcurrent during deceleration	Same as E.OCH1	Same as E.OCH1
6	E.OC3	Software overcurrent at constant speed	Same as E.OCH1	Same as E.OCH1
7	E.OV1	Overvoltage during acceleration	High input voltage; electronic braking too strong	Check supply voltage; adjust electronic-brake parameters

Fault No.	Code	Fault name	Typical causes	Corrective action
8	E.OV2	Overvoltage during deceleration	Same as E.OV1	Same as E.OV1
9	E.OV3	Overvoltage at constant speed	Same as E.OV1	Same as E.OV1

5.2 Keypad Fault Indication (continued)

Fault No.	Code	Fault name	Typical causes	Corrective action
10	E.UV	DC-bus undervoltage	Low supply; acceleration too fast causing supply protection; momentary power loss; driver hardware fault	Check supply; increase acceleration time; reset; obtain technical service
11	E.OL1	Motor overload	Low supply; incorrect motor rated-current setting; motor stalled or load changed abruptly	Check voltage; set rated current; reduce load and inspect motor/mechanism
12	E.OL2	Driver overload	Acceleration too fast; low supply; excessive load	Increase acceleration time; check supply; use a larger driver
13	E.HALL	Hall fault	Hall wire open; strong interference	Check Hall wiring; remove interference
14	E.LOC	Stall fault	Excessive load; motor jammed; motor phase-to-phase short circuit	Use a larger driver; inspect mechanics and wiring
15	E.OH1	Module overtemperature 1	Ambient temperature too high; thermistor damaged; inverter module damaged	Reduce ambient temperature; replace the complete unit
16	E.OH2	Module overtemperature 2	Same as E.OH1	Same as E.OH1
17	E.EF	External input fault	External-fault input is active	Check the external input source
18	E.485	RS485 communication fault	Incorrect baud/parity; wiring fault; wrong address; strong interference	Verify settings, wiring, and address; use shielded cable and improve noise immunity
19	E.CUr	Current-detection fault	Internal circuit fault	Replace the driver
20	E.OUT1	Inverter U-phase fault	Acceleration too fast; inverter circuit damaged; interference	Increase acceleration time; replace power devices/driver; remove interference
21	E.OUT2	Inverter V-phase fault	Same as E.OUT1	Same as E.OUT1
22	E.OUT3	Inverter W-phase fault	Same as E.OUT1	Same as E.OUT1
23	E.OL3	Electronic overload	Overload pre-alarm enabled	Check load and overload threshold
24	E.LL	Electronic underload	Underload pre-alarm enabled	Check load and underload threshold
25	E.Sht	Short-circuit fault	MOS/inverter short circuit; phase-to-ground short circuit	Replace driver; check wiring
26	E.boAd	Keypad communication fault	Keypad cable connection/interference problem	Reconnect cable; shorten cable and remove interference

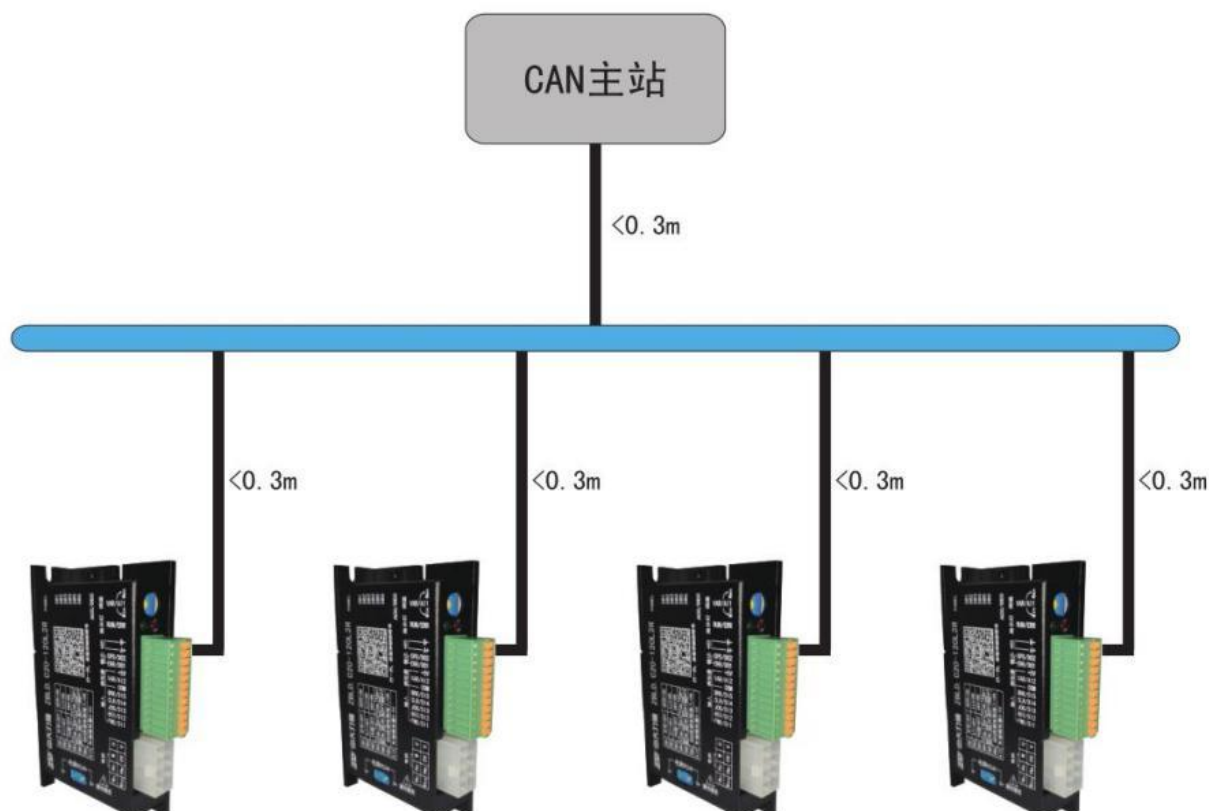
5.2 Keypad Fault Indication (continued)

Fault No.	Code	Fault name	Typical causes	Corrective action
27	E.EEP	Parameter-storage fault	EEPROM damaged; write limit reached during one power cycle	Reset or power cycle; obtain technical service
28	E.Cnd	Conduction self-test fault	Motor not connected during self-test; MOS/inverter damaged	Check motor wiring; replace driver
29	E.OCHF	Overcurrent-feedback fault	Driver hardware damaged	Replace driver
30	E.POUT	Output phase loss	U/V/W phase missing; driver hardware fault	Check driver-to-motor wiring; obtain technical service
31	E.CAN1	CAN bus-off	Excessive CAN errors	Check and reconnect the CAN network
32	E.CAN2	CAN transmit error	Too many transmit error frames	Check nodes, wiring, and baud rate
33	E.CAN3	CAN receive error	Too many receive error frames	Check baud rate and interference sources
34	E.Conn	Internal communication fault	Internal hardware damaged	Replace driver
35	E.CAN4	Heartbeat timeout	Consumer timeout reached for a CANopen node	Clear the fault; confirm node is online; check CANopen configuration
36	E.CAN5	NMT operation fault	NMT initialize/stop command received while motor is running	Clear the fault; stop the motor before changing NMT state

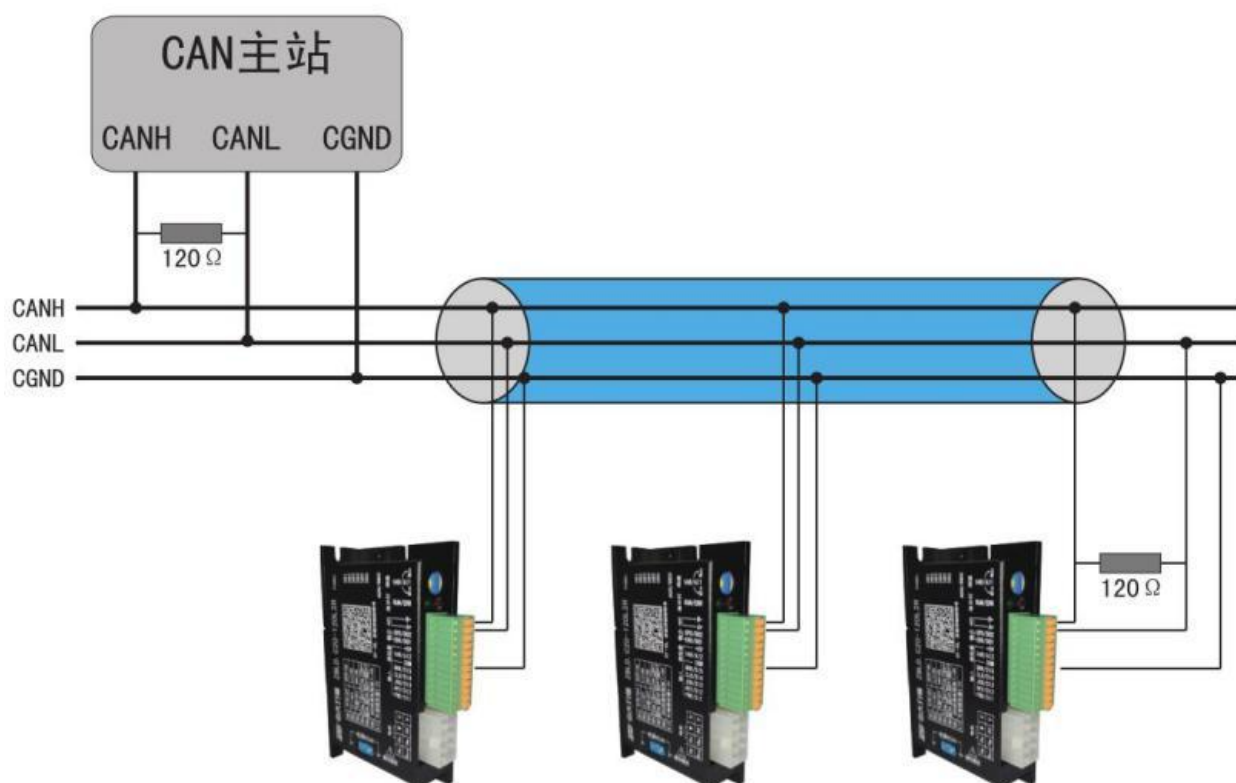
6. CAN Modbus Communication

6.1 CAN Communication Network

Use a bus topology. Connect all CAN transceivers to the main bus and keep every branch no longer than 10 m; longer branches can cause reflections and communication errors.



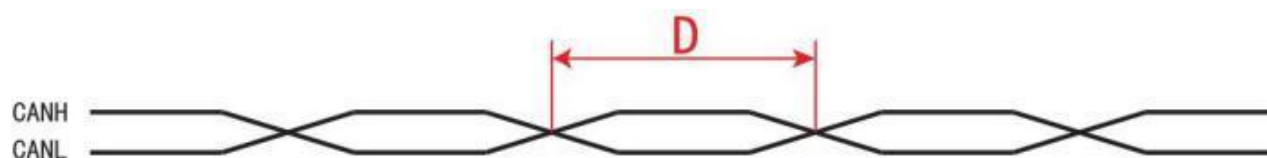
Recommendations



1. Use shielded twisted-pair cable. Install one 120-ohm termination resistor at each end of the bus. Ground the shield reliably at one point unless the site standard specifies otherwise.
2. With power off, measure resistance between CANH and CANL. A correctly terminated bus should measure approximately 60 ohms because the two 120-ohm resistors are in parallel.

3. Connect no more than 32 devices to one network.
4. For long-distance communication, interconnect the CGND/common references of the CAN circuits so all devices use the same reference potential.

6.2 CAN Communication Cable



- Use twisted-pair cable. A twist pitch D below 2 cm provides better high-frequency noise rejection and reduces radiation.
- For short-distance, low-speed communication, shielded twisted pair may be used with the shield connected to PE at both ends.
- For long-distance, high-speed communication, a shield may introduce distributed capacitance and delay; evaluate the site carefully.

Supported baud rates and typical maximum distances

Baud rate	Typical distance
1 Mbit/s	25 m
500 kbit/s	100 m
250 kbit/s	250 m
125 kbit/s	500 m
100 kbit/s	500 m
50 kbit/s	1000 m
20 kbit/s	1000 m

Typical distance, rate, nodes, and conductor size

No.	Distance	Rate	Nodes	Conductor size
1	25 m	1 Mbit/s	32	0.20 mm ²
2	100 m	500 kbit/s	32	0.35 mm ²
3	550 m	100 kbit/s	32	0.50 mm ²
4	1100 m	50 kbit/s	32	0.75 mm ²

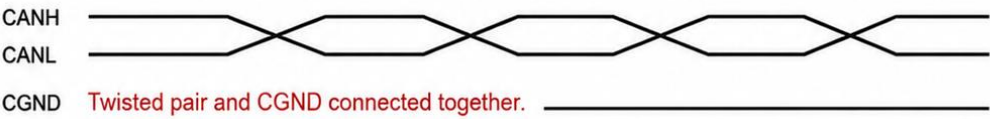
Two-node reference distances

Cable	500 kbit/s	1 Mbit/s
3 x 0.3 mm ²	95 m	30 m
3 x 0.5 mm ²	95 m	30 m
3 x 0.75 mm ²	100 m	30 m

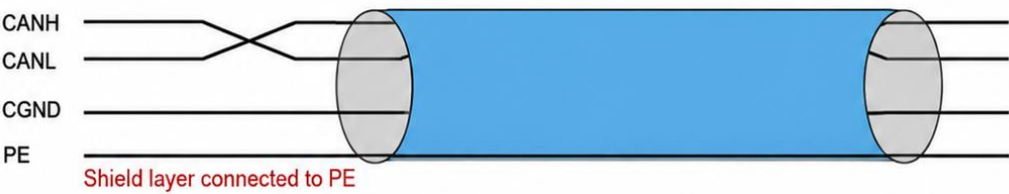
6.2.1 Recommended CAN Wiring Methods

The figures on this page show five recommended bus-wiring arrangements. Follow the bus topology, maintain correct CANH/CANL polarity, connect common reference as required, and place 120-ohm termination only at the two physical ends of the bus.

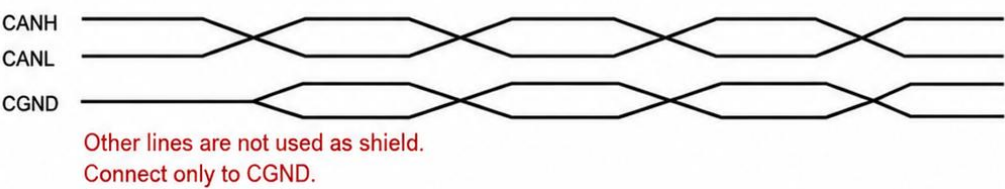
Recommended Solution 1



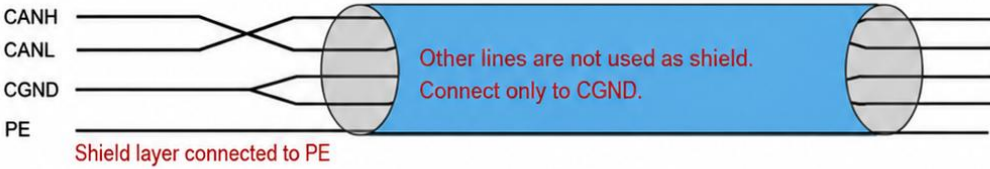
Recommended Solution 2



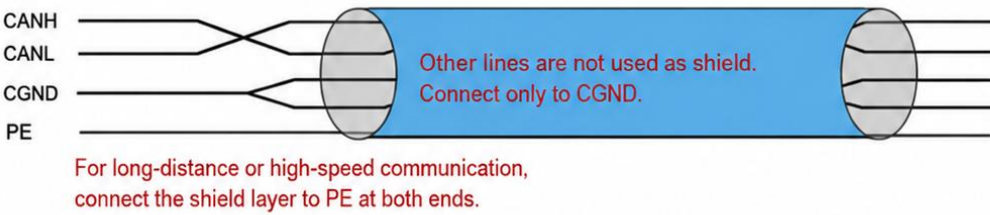
Recommended Solution 3



Recommended Solution 4

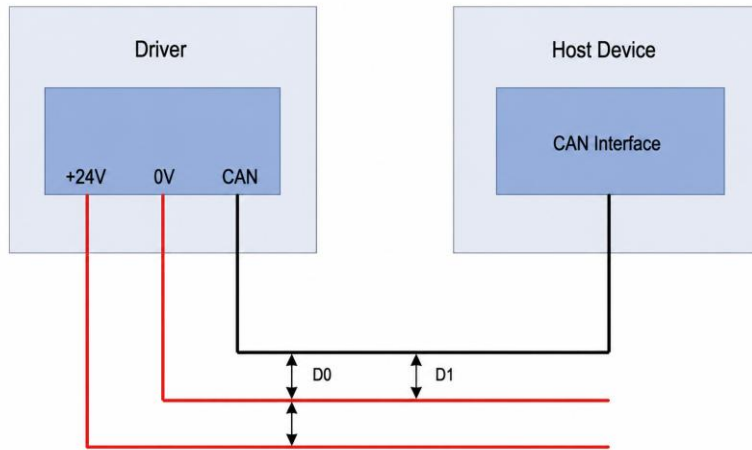


Recommended Solution 5



6.2.2 Recommended CAN Cable Routing

CAN wiring is susceptible to interference when installed close to noise sources.



- Route interference cables and CAN cables perpendicular to each other whenever possible.
- When parallel routing is unavoidable, maintain $D1 > 10$ cm between power-supply cables and CAN signal cables.
- Maintain $D2 > 20$ cm between U/V/W motor-power cables and CAN signal cables.
- Outside the cabinet, route supply cables, U/V/W cables, and CAN communication cables separately.
- When cables must share a tray, maintain the same spacing requirements.

6.3 System Settings

Item	Description
Link-layer protocol	CAN bus
Application-layer protocol	Custom CAN Modbus protocol
CAN-ID type	11-bit CAN 2.0A
Baud rates	1 M, 500 K, 250 K, 125 K default, 100 K, 50 K, 20 K
Maximum nodes	32
CAN frame length	0-8 bytes
Application CAN frame type	Data frames; remote frames not supported
Termination resistor	120 ohms

Required function-code settings

Function code	Name	Required value
F00.00	Control mode: 0 Test; 1 Hall open loop; 2 Hall closed loop; 3 DIP switch	2
F00.01	Run command: 0 Keypad; 1 Terminal; 2 Communication; 3 DIP switch	2
F00.02	Speed reference: 0 Keypad; 1 AI1; 2 AI2; 3 Modbus; 4 Multi-speed; 5 DIP switch; 6 Simple PLC; 7 High-speed pulse; 8 CAN	8
F00.05	Communication channel: 0 RS485 Modbus; 1 CAN	1
F08.10	CAN slave address	1
F08.11	CAN baud rate: 0 10K; 1 20K; 2 50K; 3 100K; 4 125K; 5 250K; 6 500K; 7 1M	4

6.3 System Settings (continued)

Function code	Name	Setting	Required value
F08.12	CAN response delay	0-200 ms	5 ms
F08.13	CAN protocol	0 CAN Modbus default; 1 CANopen	0
F08.14	CAN function setting	CANopen Bit 0: action when not Operational during running, 0 stop/E.CAN5, 1 retain state. Bit 1: heartbeat timeout action, 0 stop/E.CAN4, 1 retain state. Bit 2: CAN receive/transmit fault detection, 0 disable E.CAN2/E.CAN3, 1 enable. CAN Modbus Bit 8: broadcast response, 0 no response, 1 response	0
F00.15	Restore parameters	0 No action; 1 restore function codes; 2 restore CANopen communication parameters; 3 restore all parameters	0

6.4 CAN Modbus Data-Frame Format

CAN identifier, 11 bits	Frame data, 8 bytes		
Host address M_ADDR, 3 bits	Slave address S_ADDR, 8 bits	Command CMD, 1 byte	DATA, 7 bytes

Default baud rate: 125 kbit/s. Only standard frames are supported.

CAN identifier fields

Field	Description
Host address, bits 8-10	0-7
Slave address, bits 0-7	0 Broadcast; 1-127 point-to-point slave address

Note: For point-to-point communication, host and slave addresses must not be identical.

Commands

CMD	Description
03h	Read 1-2 registers
06h	Write one register
08h	Diagnostic test

6.4.1 Read Register Operation

Host request field	Length	Content
Command	1 byte	0x03
Register address	2 bytes	High byte then low byte; see register list
Number of registers	2 bytes	1-2, high byte then low byte

Normal slave response field	Length	Content
Command	1 byte	0x03
Register address	2 bytes	Same as request
Byte count	1 byte	Total data bytes
Data 1	2 bytes	High byte then low byte
Data 2	2 bytes	Included when two registers are read

Exception response field	Length	Content
Command	1 byte	0x83
Register address	2 bytes	Same as request
Exception code	1 byte	0x00-0x08; see 6.4.3

6.4.1 Read Register Examples

All register addresses and values are two bytes, high byte first.

Read registers 2001h-2002h

Direction	Identifier	Data
Host request	0x701	03 20 01 00 02
Slave response	0x701	03 20 01 03 E8 00 05

The response returns 0x03E8 for 2001h and 0x0005 for 2002h.

Read-register exception

Direction	Identifier	Data
Host request	0x701	03 20 30 00 01
Slave response	0x701	83 20 30 [exception code]

6.4.2 Write Register Operation

Host request field	Length	Content
Command	1 byte	0x06
Register address	2 bytes	High byte then low byte
Data	2 bytes	High byte then low byte

Normal slave response repeats the command, address, and written data.

An exception response uses command 0x86, repeats the address, and includes one exception-code byte.

6.4.2 Write Register Examples

Write register 2001h

Direction	Identifier	Data
Host request	0x701	06 20 01 03 E8
Slave response	0x701	06 20 01 03 E8

Write-register exception

Direction	Identifier	Data
Host request	0x701	06 20 01 10 00
Slave response	0x701	86 20 01 [exception code]

6.4.3 Communication Exception Codes

Code	Meaning	Description
0x01	Illegal command	The slave does not support the command or request type
0x02	Illegal data address	Requested address is outside the supported range
0x03	Illegal data value	Received data contains a prohibited value
0x04	Operation failed	The setting is invalid, for example function-code writing attempted before enabling 0x200E
0x05	Password error	Incorrect password written to the password-verification address
0x06	Frame error	Incorrect frame length or format
0x07	Read-only parameter	A write was attempted to a read-only parameter
0x08	Not writable while running	A write was attempted to a stop-only parameter while the driver was running

6.5 CAN Modbus Register List

Function	Address	Data meaning	Attribute
Communication control command	2000H	0001H Forward run; 0002H Reverse run; 0003H Forward jog; 0004H Reverse jog; 0005H Stop; 0006H Coast/emergency stop; 0007H Fault reset; 0008H Jog stop	W/R
Communication set speed	2001H	0-3000 rpm, unit 1 rpm	W/R
Motor pole pairs	2002H	1-20	W/R*
Acceleration time	2003H	1-6000, unit 0.1 s	W/R
Deceleration time	2004H	1-6000, unit 0.1 s	W/R
Control mode	2005H	0 Test; 1 Open loop; 2 Closed loop; 3 DIP switch SW1, model dependent	W/R*
Run-command selection	2006H	0 Keypad; 1 Terminal; 2 Communication; 3 DIP switch SW3, model dependent	W/R
Speed-reference selection	2007H	0 Keypad; 1 AI1; 2 AI2; 3 RS485; 4 Multi-speed; 5 DIP switch; 6 Simple PLC; 7 High-speed pulse; 8 CAN	W/R
CAN slave address	2008H	1-247	W/R*

6.5 CAN Modbus Register List (continued)

Function	Address	Data meaning	Attribute
CAN baud rate	2009H	0 10K; 1 20K; 2 50K; 3 100K; 4 125K default; 5 250K; 6 500K; 7 1M	W/R*
Communication command channel	200AH	0 RS485 default; 1 CAN	W/R*
Function-code write enable	200EH	0 Function codes F00-F10 cannot be written by CAN; 1 writing enabled	W/R
Restore defaults	200FH	0 No action; 1 restore function codes; 2 restore CANopen parameters; 3 restore all	W/R*
Driver status word 1	2100H	0001 Forward; 0002 Reverse; 0003 Stopped; 0004 Fault; 0005 OFF; 0006 Electronic brake	R
Driver status word 2	2101H	Bit 0: 0 bus voltage not established, 1 established. Bit 4: 0 not overloaded, 1 overloaded. Bits 5-6: 00 keypad, 01 terminal, 10 communication	R
Current fault code	2102H	Keypad fault code; see 5.2	R
Driver identification code	2103H	C20 series, 0x0020	R
Set frequency	3000H	0-Fmax, unit 0.01 Hz	R
Output frequency	3001H	0-Fmax, unit 0.01 Hz	R
Ramp set frequency	3002H	0-Fmax, unit 0.01 Hz	R

6.5 CAN Modbus Register List (continued)

Function	Address	Data meaning	Attribute
Output voltage	3003H	0.0-2000.0 V, unit 0.1 V	R
Output current	3004H	0.00-300.00 A, unit 0.01 A	R
Set speed	3005H	0-3000 rpm	R
Motor output speed	3006H	0-3000 rpm	R
Motor output power	3007H	0-2200 W	R
DC-bus voltage	3008H	0.0-2000.0 V, unit 0.1 V	R
Hall value	3009H	0-7	R
Software version	300AH	1.00-99.00	R
Historical fault type	300BH	Keypad fault code; see 5.2	R
Inverter temperature	300CH	-20.0 to 120.0 deg C on supported hardware	R
Input-terminal status	300DH	000-1FF	R
Output-terminal status	300EH	00-0F	R
Analog input 1 voltage	300FH	0.00-10.00 V, unit 0.01 V	R
Analog input 2 voltage	3010H	0.00-10.00 V, unit 0.01 V	R
Analog input 3 voltage	3011H	0.00-10.00 V, unit 0.01 V	R

Register attributes

W/R = writable and readable in any state. W/R* = writable only while stopped and readable in any state. R = read-only.

6.6 CAN Modbus Application Examples

6.6.1 Point-to-Point Communication

Host address 0x07, slave address 0x01, default baud rate 125 kbit/s.

Operation	Data frame	Description
Diagnostic	Send ID=0x701, Data=08 00 01 02 03 04 05; Response ID=0x701, same data	CMD 08h diagnostic test
Forward command	Send/response ID=0x701, Data=06 20 00 00 01	Write 0x0001 to 2000H
Reverse command	Send/response ID=0x701, Data=06 20 00 00 02	Write 0x0002 to 2000H
Stop command	Send/response ID=0x701, Data=06 20 00 00 05	Write 0x0005 to 2000H
Set 2500 rpm	Send/response ID=0x701, Data=06 20 01 09 C4	Write 0x09C4 to 2001H
Read status word 1	Send ID=0x701, Data=03 21 00 00 01; Response ID=0x701, Data=03 21 00 02 00 05	Read 2100H
Read status word 2	Send ID=0x701, Data=03 21 01 00 01; Response ID=0x701, Data=03 21 01 02 00 41	Read 2101H
Read fault code	Send ID=0x701, Data=03 21 02 00 01; Response ID=0x701, Data=03 21 02 02 00 0A	Fault 0x0A, undervoltage
Address exception	Send ID=0x701, Data=03 00 32 00 01; Response ID=0x701, Data=83 00 32 02	Illegal address 0x02
Data exception	Send ID=0x701, Data=06 00 00 00 05; Response ID=0x701, Data=86 00 00 03	Illegal value 0x03

6.6.2 Broadcast Communication

Host address 0x07; default slave address 0x01; default baud rate 125 kbit/s. Broadcast response is controlled by F08.14 Bit 8: 0 no response; 1 response.

Broadcast with response enabled

Operation	Host frame ID=0x700	Slave response ID=0x701
Read status word 1	03 21 00 00 01	03 21 00 02 00 05
Enable function-code writing	06 20 0E 00 01	06 20 0E 00 01
Write function code F00.10	06 00 0A 09 C4	06 00 0A 09 C4

Broadcast without response

Operation	Host frame ID=0x700	Response
Read status word 1	03 21 00 00 01	None
Enable function-code writing	06 20 0E 00 01	None
Write function code F00.10	06 00 0A 09 C4	None

6.7 CAN Fault Handling

Fault	Name	Cause	Action
E.CAN1	CAN bus-off	Excessive errors	Check and reconnect the CAN network
E.CAN2	CAN transmit error	Excessive transmit error frames	Check nodes, wiring, and baud rate
E.CAN3	CAN receive error	Excessive receive error frames	Check baud rate and interference
E.CAN4	Heartbeat timeout	Consumer timeout	Confirm node online, check CANopen configuration, clear fault
E.CAN5	NMT operation fault	NMT initialize/stop received while motor running	Stop motor before changing NMT state, then clear fault

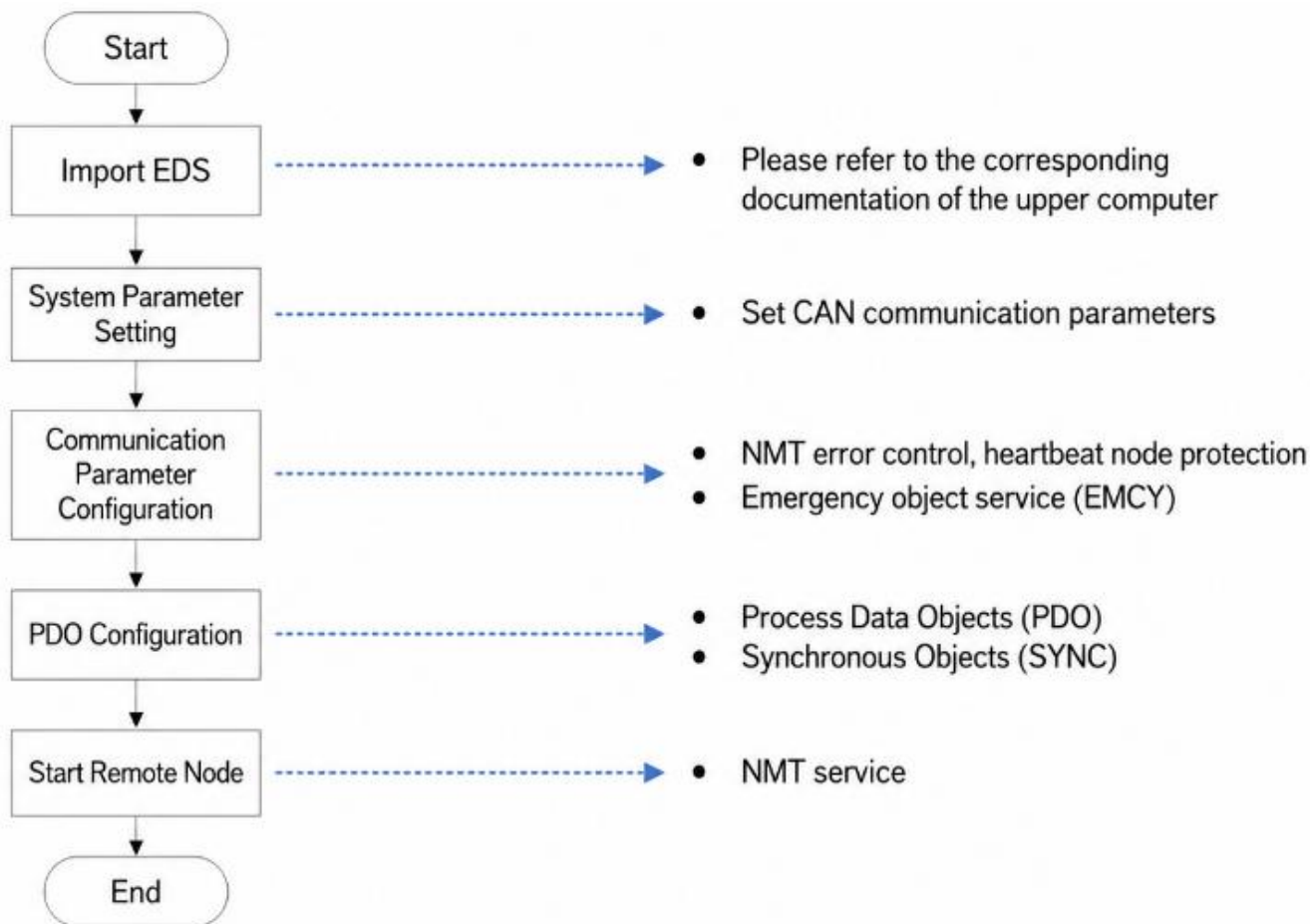
7. CANopen Communication

7.1 CANopen Communication Network

For CAN network cabling and layout, refer to Sections 6.1 and 6.2.

7.2 CANopen Network Configuration

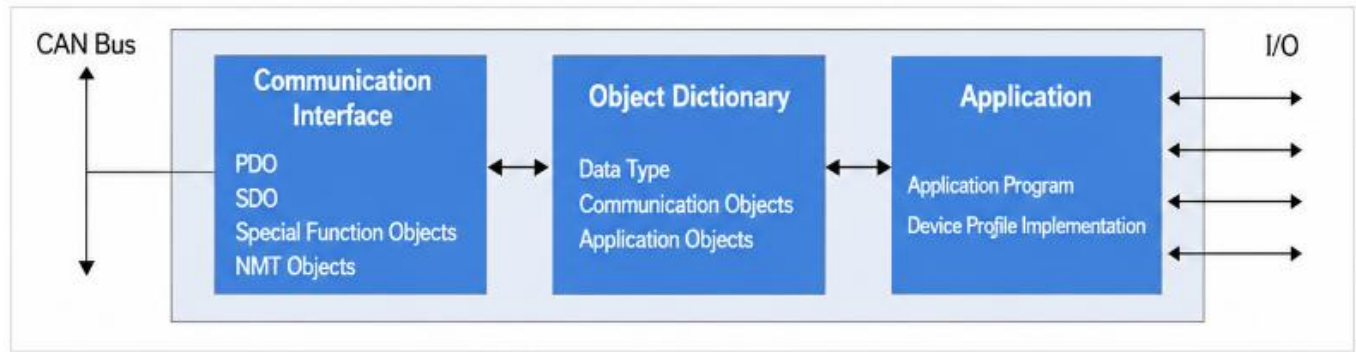
Follow the configuration flow shown in the figure on this page.



Note: For SDO operation, refer to Section 7.4.2.

7.2.1 CANopen Protocol Overview

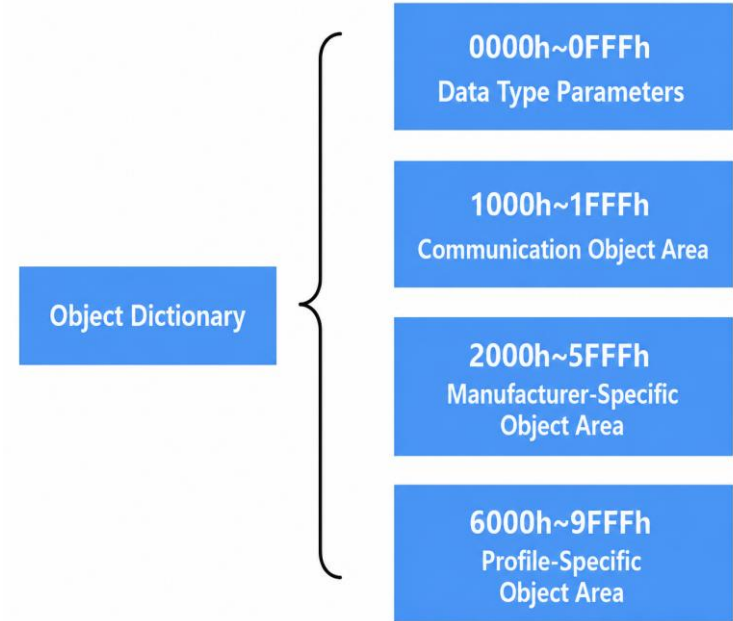
CANopen is an application-layer protocol for network transmission over the CAN serial bus and follows the ISO/OSI model. Devices exchange data through objects in an object dictionary. A master can obtain or modify data in another node's object dictionary using Process Data Objects, PDOs, or Service Data Objects, SDOs.



7.2.2 Object Dictionary

The object dictionary is an ordered collection of device parameters and variables, including the device description and network-state data. It uses a 16-bit index and an 8-bit sub-index.

Index range	Object category
000h	Unused
0001h-001Fh	Static standard data types, such as Boolean and Integer16
0020h-003Fh	Complex predefined data types, such as PDO and SDO structures
0040h-005Fh	Manufacturer-defined complex data types
0060h-007Fh	Device-profile static data types
0080h-009Fh	Device-profile complex data types
00A0h-0FFFh	Reserved
1000h-1FFFh	Communication-profile area, such as device type, error register, and PDO support
2000h-5FFFh	Manufacturer-specific area, including function-code mapping
6000h-9FFFh	Standard device-profile area, such as DSP-402
A000h-FFFFh	Reserved



Object-Dictionary Mapping

Object-dictionary index = 0x5000 + function-code group number.

Object-dictionary sub-index = hexadecimal function-code offset + 1.

Example: Function code F01.10 maps to object 0x5001, sub-index 0Bh.

Example object definition

Index	Sub-index	Name	Meaning
2000h	00h	Number of 2000h-group sub-indexes	Number of data objects, excluding sub-index 00h
2000h	01h	Communication control command	Forward/reverse, fault reset, and related commands
2000h	02h	Communication set speed	0-3000 rpm
2000h	03h	Motor pole pairs	1-20 pole pairs

7.2.3 Common Communication Objects

1. Network Management, NMT: includes Boot-up, Heartbeat, and NMT messages. It manages node-state control, error control, and node startup in a master/slave system.

2. Service Data Object, SDO: includes receive SDO and transmit SDO. Index and sub-index identify an object-dictionary entry. Data longer than four bytes is segmented. Each request receives a response, and SDO request/response messages contain eight data bytes.

7.2.3 Common Communication Objects (continued)

3. Process Data Object, PDO: includes RPDO and TPDO. PDOs carry real-time data from one producer to one or more consumers. Data length is 1-8 bytes. Each device provides four default RPDO channels and four default TPDO channels. Communication parameters determine synchronous or asynchronous transfer; mapping parameters determine the payload.

4. Synchronization Object, SYNC: a periodic broadcast from the CANopen master that supplies a network clock. Each device may use it to synchronize communication.

5. Emergency Object, EMCY: transmitted when an internal communication or application fault occurs.

7.2.4 Communication Object Identifier

The 11-bit COB-ID corresponds to the CAN 2.0A identifier. It contains a 4-bit function code and a 7-bit node address.

Object	Function code	Node address	Default COB-ID	Related object
NMT	0000b	0	000h	-
SYNC	0001b	0	080h	1005h, 1006h
EMCY	0001b	1-127	080h + Node_ID	1014h
TPDO1	0011b	1-127	180h + Node_ID	1800h
RPDO1	0100b	1-127	200h + Node_ID	1400h
TPDO2	0101b	1-127	280h + Node_ID	1801h
RPDO2	0110b	1-127	300h + Node_ID	1401h
TPDO3	0111b	1-127	380h + Node_ID	1802h
RPDO3	1000b	1-127	400h + Node_ID	1402h
TPDO4	1001b	1-127	480h + Node_ID	1803h
RPDO4	1010b	1-127	500h + Node_ID	1403h
T-SDO	1011b	1-127	580h + Node_ID	1200h
R-SDO	1100b	1-127	600h + Node_ID	1200h
NMT error control	1110b	1-127	700h + Node_ID	1016h, 1017h

Example: TPDO2 for node 4 uses COB-ID $280h + 4 = 284h$.

7.3 System Settings

Set the following function codes before connecting the driver to a CANopen fieldbus.

Function code	Name	Required value
F00.00	Control mode: 0 Test; 1 Hall open loop; 2 Hall closed loop; 3 DIP switch	2
F00.01	Run command: 0 Keypad; 1 Terminal; 2 Communication; 3 DIP switch	2
F00.02	Speed reference: 0 Keypad; 1 AI1; 2 AI2; 3 Modbus; 4 Multi-speed; 5 DIP switch; 6 Simple PLC; 7 High-speed pulse; 8 CAN	8
F00.05	Communication channel: 0 RS485 Modbus; 1 CAN	1
F08.10	CAN slave address	1
F08.11	CAN baud rate: 0 10K; 1 20K; 2 50K; 3 100K; 4 125K default; 5 250K; 6 500K; 7 1M	4
F08.12	CAN response delay, 0-200 ms	5 ms
F08.13	CAN protocol: 0 CAN Modbus default; 1 CANopen	1

7.3 System Settings (continued)

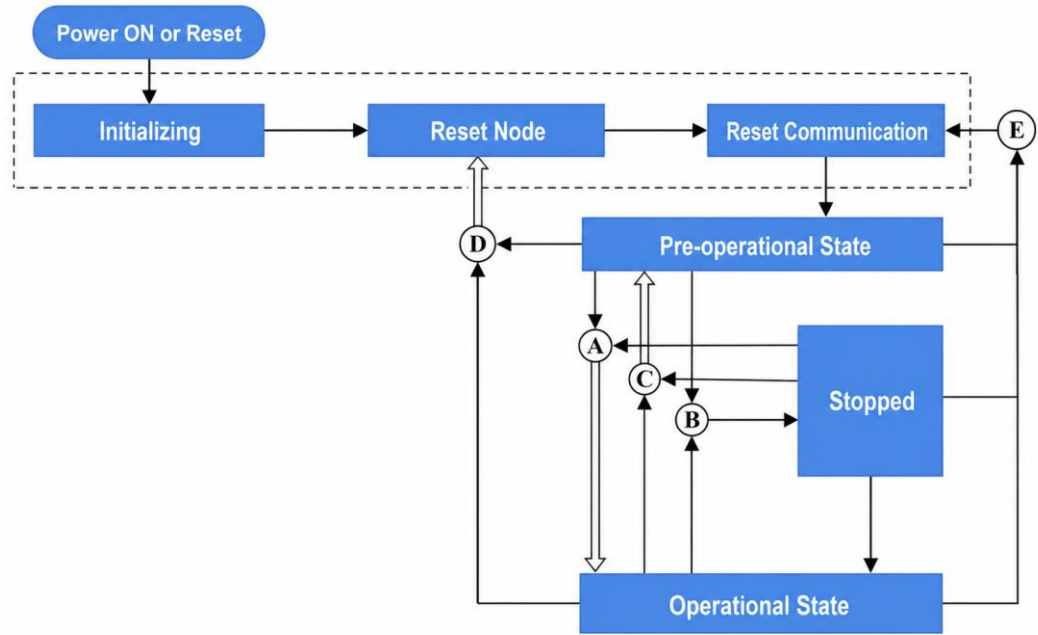
Function code	Name	Setting	Required value
F08.14	CAN function setting	CANopen Bit 0: action when not Operational during running, 0 stop/E.CAN5, 1 retain state. Bit 1: heartbeat timeout action, 0 stop/E.CAN4, 1 retain state. Bit 2: transmit/receive fault detection, 0 disable E.CAN2/E.CAN3, 1 enable. CAN Modbus Bit 8: broadcast response, 0 no response, 1 response	0
F00.15	Parameter restore	0 No action; 1 restore function codes; 2 restore CANopen communication parameters; 3 restore all parameters	0

7.4 Communication Objects

7.4.1 Network Management, NMT

NMT initializes, starts, and stops the network and its devices. A CANopen network has exactly one NMT master.

7.4.1.1 NMT Services



Some node-state transitions occur automatically; others require an NMT message from the master.

NMT message format

COB-ID	RTR	Data byte 0	Data byte 1
0x000	0	Command specifier	Node_ID

Node_ID 0 broadcasts the command to all slave devices.

Command	Transition	Description
0x01	A	Start remote node
0x02	B	Stop remote node
0x80	C	Enter Pre-operational state
0x81	D	Reset node
0x82	E	Reset communication

After power-on, the device enters Initialization, including module initialization, Reset Node, and Reset Communication. Reset Node restores saved manufacturer and device-profile parameters. Reset Communication restores saved communication parameters. The device then sends Boot-up and automatically enters Pre-operational state for configuration.

7.4.1 NMT Services (continued)

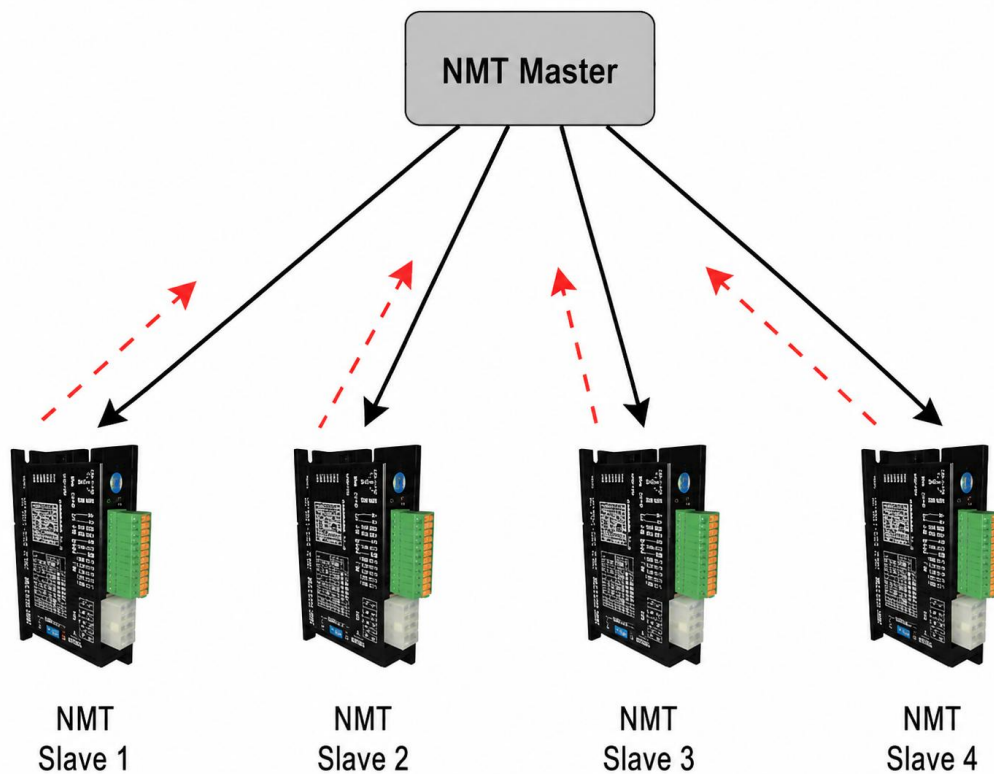
After configuration, the NMT master must command the node to Operational state for normal CANopen operation. A Stop Node command places the device in Stopped state, where only NMT and error-control services remain active.

Service	Pre-operational	Operational	Stopped
PDO	No	Yes	No
SDO	Yes	Yes	No
SYNC	Yes	Yes	No
EMCY	Yes	Yes	No
NMT	Yes	Yes	Yes
Error control	Yes	Yes	Yes

7.4.1.2 NMT Heartbeat

Heartbeat detects whether a node is online and identifies its NMT state. The producer sends heartbeats at the interval in object 1017h, in milliseconds. Consumers monitor the producer using object 1016h. If no heartbeat arrives before the configured consumer timeout, the producer is considered offline.

- Producer heartbeat starts after 1017h is set.
- Consumer monitoring starts after a valid 1016h sub-index is configured and the first heartbeat is received.



- Set consumer timeout at least twice the relevant producer period to avoid false alarms.
- The heartbeat payload contains one status byte; its most significant bit is 0.

Heartbeat Message

COB-ID	RTR	Data
0x700 + Node_ID	0	One status byte

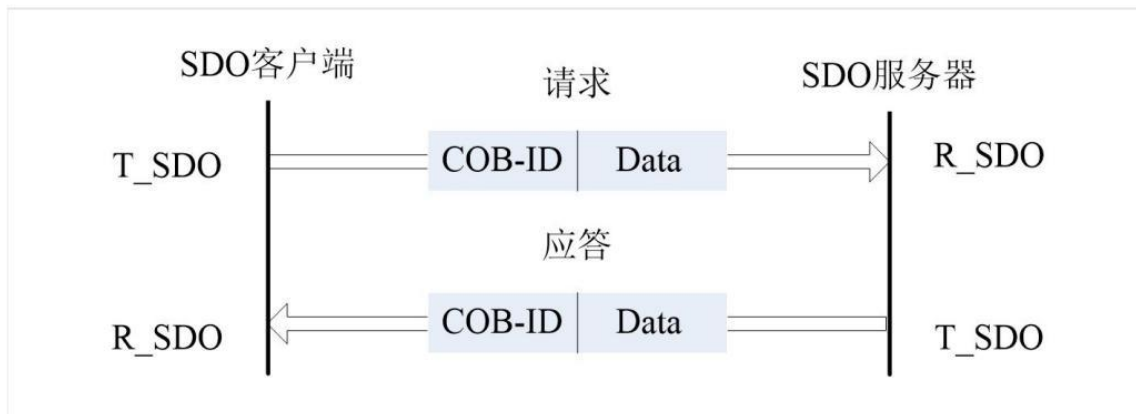
The driver can be both a heartbeat producer and a consumer for up to five nodes. Recommended minimum producer period: 20 ms. Recommended minimum consumer timeout: 40 ms and at least twice the corresponding producer period.

7.4.2 Service Data Object, SDO

SDO accesses an object-dictionary entry by index and sub-index. It can read object data and can modify writable objects.

7.4.2.1 SDO Transfer Model

SDO uses a client-server request/response model. The client sends a request and the server sends a response, so at least two CAN frames with different identifiers are required.



7.4.2.2 SDO Messages

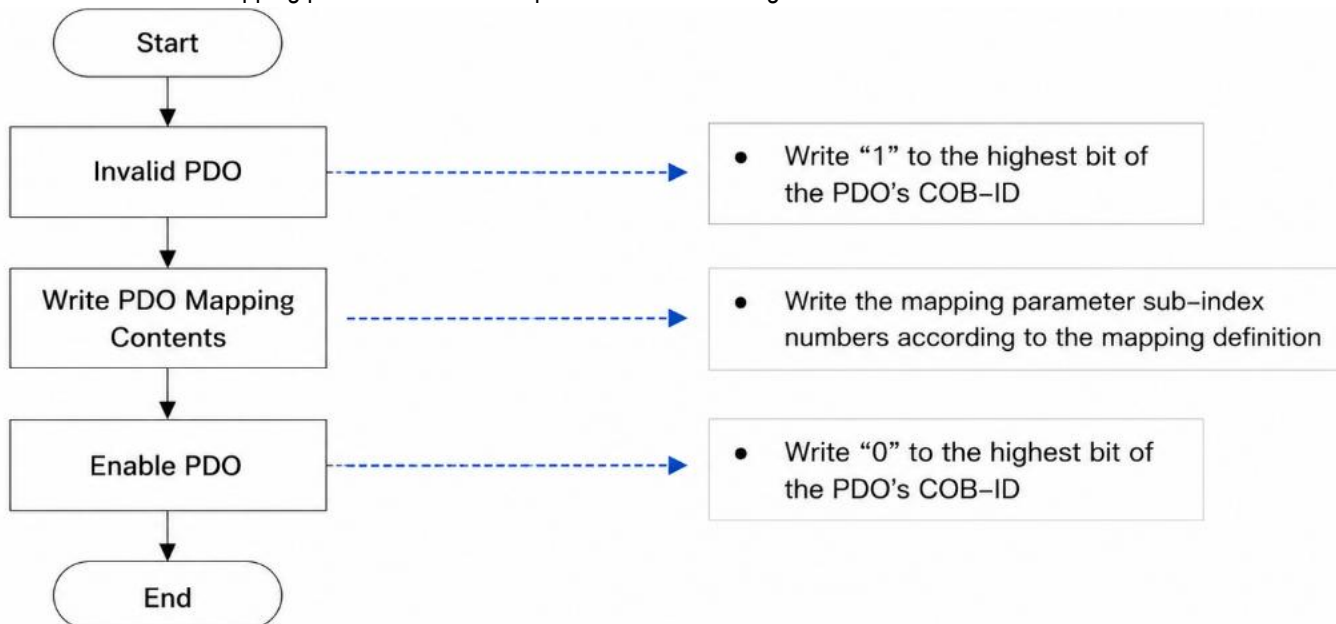
Objects up to four bytes use expedited SDO transfer. Larger objects use segmented or block transfer; this driver supports expedited and segmented transfer.

All SDO payloads are eight bytes and use little-endian data order.

COB-ID	Byte 0	Bytes 1-2	Byte 3	Bytes 4-7
580h + Node_ID or 600h + Node_ID	Command	Index	Sub-index	Data

7.4.3 Process Data Object, PDO

PDO carries real-time data without a response. Its payload can be shorter than eight bytes, enabling fast transfer. Configure communication and mapping parameters in the sequence shown in the figure.



7.4.3.1 PDO Transfer Model

PDO follows the producer-consumer model. A TPDO produced on the CAN bus is received by one or more RPDO consumers according to its COB-ID. This driver supports point-to-point PDO transfer.



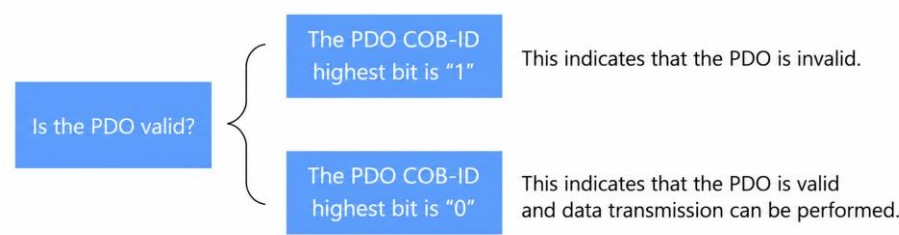
7.4.3.2 PDO Objects

PDO	No.	Default COB-ID	Communication object	Mapping object
RPDO	1	200h + Node_ID	1400h	1600h
RPDO	2	300h + Node_ID	1401h	1601h
RPDO	3	400h + Node_ID	1402h	1602h
RPDO	4	500h + Node_ID	1403h	1603h
TPDO	1	180h + Node_ID	1800h	1A00h
TPDO	2	280h + Node_ID	1801h	1A01h
TPDO	3	380h + Node_ID	1802h	1A02h
TPDO	4	480h + Node_ID	1803h	1A03h

7.4.3.3 PDO Communication Parameters

1. CAN identifier

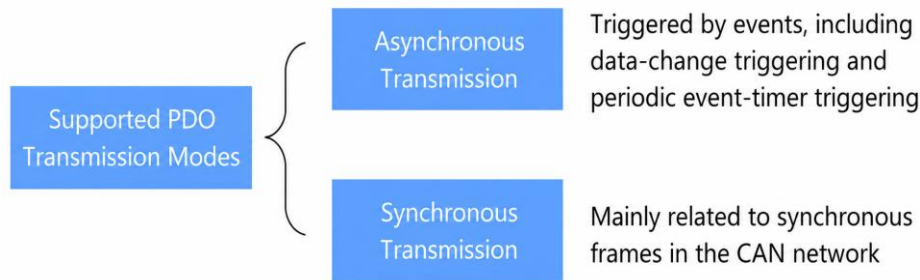
The PDO COB-ID is stored at sub-index 01 of the communication parameter objects: RPDO 1400h-1403h and TPDO 1800h-1803h. The most significant bit controls validity: 0 valid, 1 invalid. Because only point-to-point PDO transfer is supported, the low seven bits must match the node address.



Example: for node 4, disabled TPDO3 uses 0x80000384. Writing 0x00000384 activates it.

2. Transfer type

Sub-index 02 selects the transfer method.



Value	Synchronous	Asynchronous	Cyclic	Acyclic
0	Yes	No	No	Yes
1-240	Yes	No	Yes	No
241-253	Reserved	Reserved	Reserved	Reserved
254-255	No	Yes	Event-driven	-

- TPDO type 0 is sent at the next SYNC only when mapped data changed.
- TPDO types 1-240 are sent after the configured number of SYNC frames.
- TPDO types 254/255 are sent when mapped data changes or the event timer expires.
- RPDO supports 254/255 and updates the application immediately when received.

7.4.3.3 PDO Communication Parameters (continued)

3. Inhibit time

TPDO inhibit time is stored at sub-index 03 of objects 1800h-1803h. Unit: 100 microseconds. It sets the minimum interval between transmissions of the same TPDO. Example: value 300 gives a minimum interval of 30 ms.

4. Event timer

For asynchronous TPDO types 254/255, sub-index 05 of objects 1800h-1803h sets an event timer in milliseconds. Timer expiry triggers the TPDO. A different event, such as mapped-data change, also triggers transmission and resets the timer.

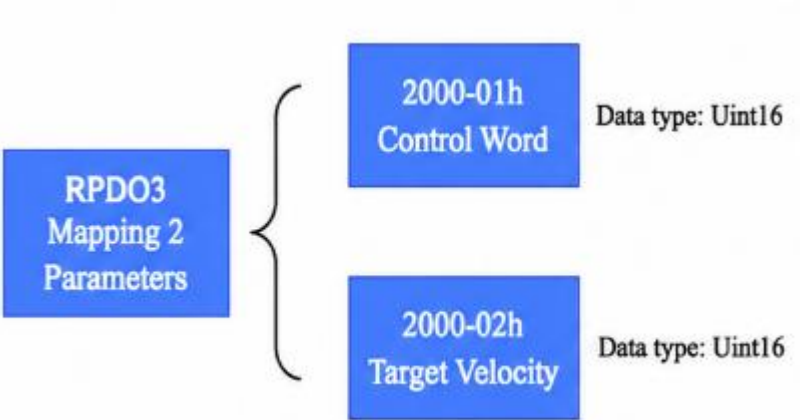
7.4.3.4 PDO Mapping Parameters

Each mapping entry points to process data using index, sub-index, and object length. A PDO can contain one or more mapped objects with a total of up to eight bytes. Sub-index 0 stores the number of mapped objects; sub-indexes 1-8 store mapping entries.

Bits 31-16	Bits 15-8	Bits 7-0
Object index	Object sub-index	Object length in bits

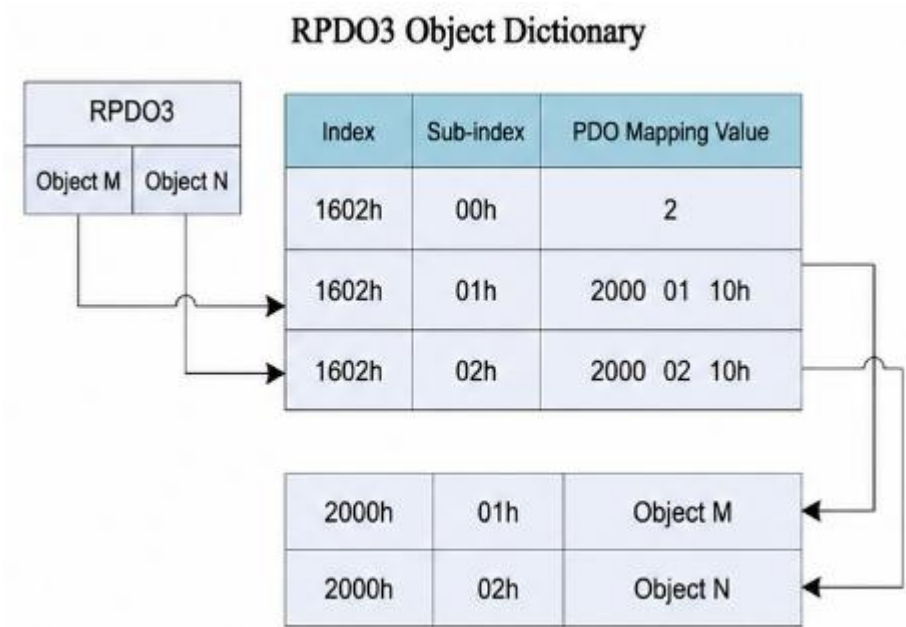
Length code	Bit length
08h	8 bits
10h	16 bits
20h	32 bits

Example: mapping the 16-bit communication control command 2000h:01h uses 20000110h.

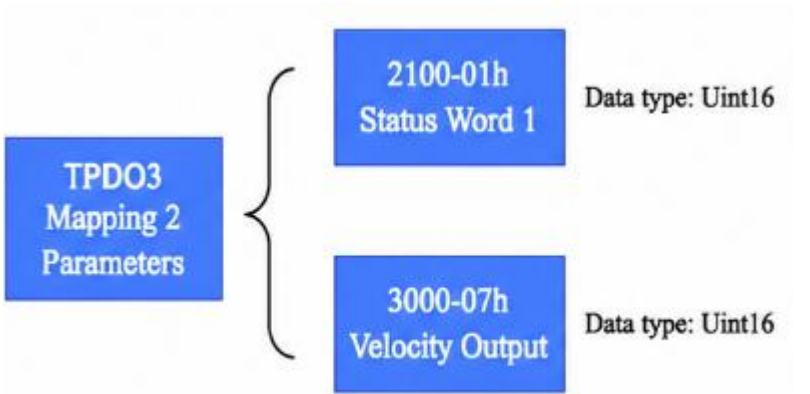


PDO Mapping Examples

An RPDO decodes received bytes according to its mapping. A TPDO encodes outgoing values in the reverse direction.
Example RPDO3



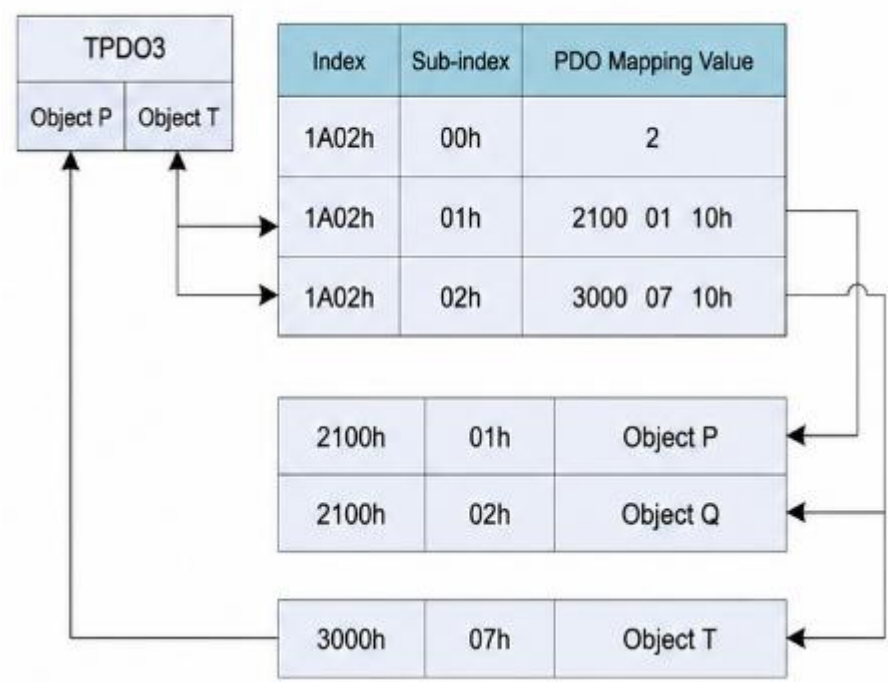
Mapped object 1: 2000h:01h, 16-bit communication control command.
Mapped object 2: 2000h:02h, 16-bit communication set speed.
Total payload length: 4 bytes.
Example TPDO3



Mapped object 1: 2100h:01h, 16-bit status word 1.
Mapped object 2: 3000h:07h, 16-bit motor output speed.
Total payload length: 4 bytes.

The figures on this page illustrate the byte order and mapping direction.

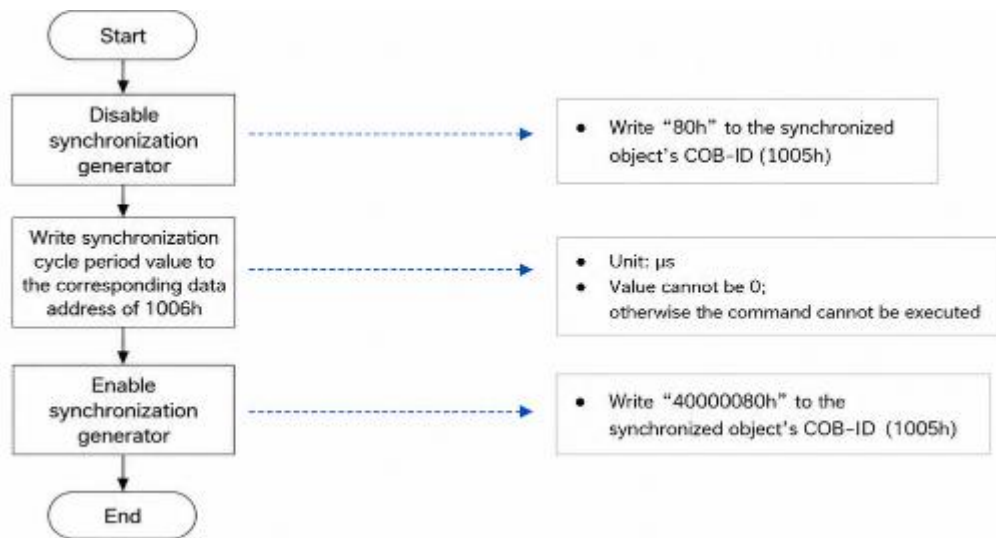
TPDO3 Object Dictionary



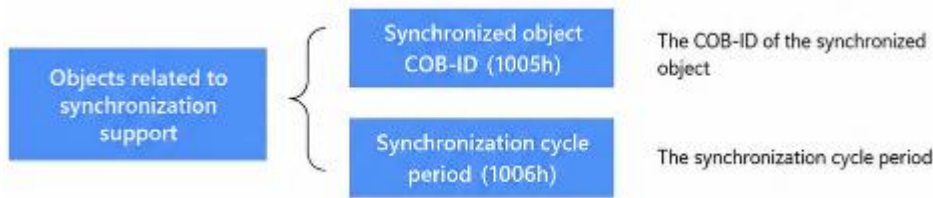
7.4.4 Synchronization Object, SYNC

SYNC coordinates synchronous transmission and reception among multiple nodes, especially synchronous PDO operation. Follow the configuration flow shown in the figure.

Recommended minimum SYNC cycle period: 5 ms.

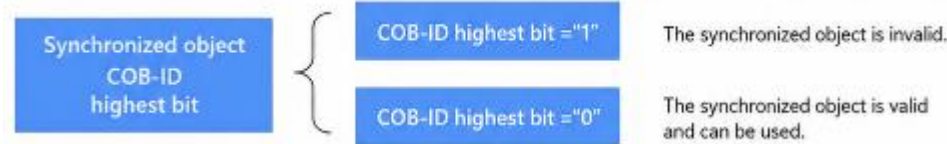


7.4.4.1 SYNC Producer



The driver can be both a SYNC consumer and a SYNC producer. Related objects are 1005h, SYNC COB-ID, and 1006h, communication cycle period.

- The second-highest bit of 1005h enables or disables the SYNC producer.
- Object 1006h applies to the producer and sets the period in microseconds.



7.4.4.2 SYNC Transfer Model

SYNC uses a producer-consumer model. One producer broadcasts a SYNC frame; all other nodes may consume it without replying. Only one active SYNC producer is permitted on a CAN network.



For synchronous TPDOs, transfer can be synchronous acyclic or synchronous cyclic.



SYNC Example

TPDO1 transfer type = 0 and TPDO2 transfer type = 20.

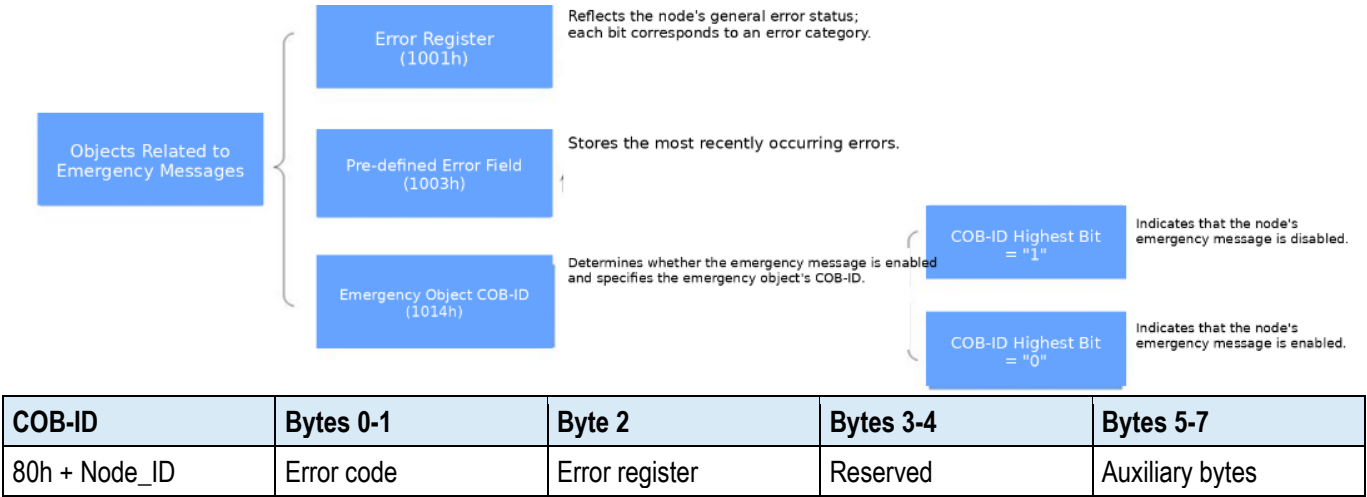
- TPDO1 is sent at the next SYNC only when its mapped data has changed.
- TPDO2 is sent after every 20 SYNC frames whether or not its data changed.

7.4.5 Emergency Object Service, EMCY

When a CANopen node detects an error, it can send one emergency frame using the producer-consumer model. This driver produces EMCY messages but does not process EMCY messages from other nodes.

When any fault occurs, the error register and predefined error field are updated whether or not EMCY transmission is enabled.

EMCY frame



The error register matches object 1001h.

- Communication errors use DS301-compatible error codes; auxiliary bytes are zero.
- Driver/application-specific errors use error code 0xFF00 and place the driver fault code in the auxiliary bytes. See Section 7.5.

7.5 Fault Handling

When a communication or driver fault occurs, the node may produce an EMCY message. An abnormal SDO transfer returns an abort response.

7.5.1 Fault Recovery

Fault	Name	Cause	Corrective action
E.CAN1	CAN bus-off	Excessive CAN errors	Check and reconnect CAN network
E.CAN2	CAN transmit error	Excessive transmit error frames	Check nodes, wiring, and baud rate
E.CAN3	CAN receive error	Excessive receive error frames	Check baud rate and interference
E.CAN4	Heartbeat timeout	Consumer timeout	Confirm node online, check CANopen configuration, clear fault
E.CAN5	NMT operation fault	NMT initialize/stop received while motor running	Stop motor before changing NMT state, then clear fault

7.5.2 SDO Abort Codes

Abort code	Description
0503 0000	Toggle bit not alternated
0504 0000	SDO protocol timeout
0504 0001	Illegal or unknown client/server command specifier
0504 0005	Out of memory
0601 0000	Unsupported object access
0601 0001	Attempt to read a write-only object
0601 0002	Attempt to write a read-only object
0602 0000	Object does not exist in the object dictionary
0604 0041	Object cannot be mapped to PDO
0606 0000	Object access failed due to hardware error
0607 0010	Data type or service-parameter length mismatch
0609 0011	Sub-index does not exist
0609 0030	Value range exceeded
0609 0031	Value too high
0609 0032	Value too low
0800 0000	General error
0800 0021	Data cannot be transferred/stored because of local control
0800 0022	Data cannot be transferred/stored because of current device state

7.6 Object Dictionary

7.6.1 Object Classification

Definitions

- Index: hexadecimal location of an object in the object dictionary.
- Data type: defines numeric range and data length.
- Access: RW read/write; RW* writable while stopped and readable at any time; WO write-only; RO read-only; CONST read-only constant.
- Object code: VAR single value; ARR array of values with the same type; REC record containing different types.

Data type	Range	Length	DS301 code
Int8	-128 to 127	1 byte	0002
Int16	-32768 to 32767	2 bytes	0003
Int32	-2147483648 to 2147483647	4 bytes	0004
UInt8	0 to 255	1 byte	0005
UInt16	0 to 65535	2 bytes	0006
UInt32	0 to 4294967295	4 bytes	0007
String	ASCII	Variable	0009

Object code	Meaning	DS301 value
VAR	Single simple value	7
ARR	Block of values with the same type	8
REC	Block containing different types	9

7.6.2 Object Group 1000h Parameters

Index	Sub-index	Name	Access	PDO mappable	Data type/object code	Default
1000h	-	Device type	RO	No	UInt32/VAR	0x00000000
1001h	-	Error register	RO	No	UInt8/VAR	0x00
1003h	00h	Number of errors	RW	No	UInt8/ARR	0
1003h	01h-04h	Predefined error field	RW	No	UInt32	0
1005h	-	SYNC COB-ID	RW	No	UInt32/VAR	0x80
1006h	-	Communication cycle period, us	RW	No	UInt32/VAR	0
1008h	-	Manufacturer device name	CONST	No	String/VAR	EA-BLDC20
1009h	-	Hardware version	CONST	No	String/VAR	Vx.xx
100Ah	-	Software version	CONST	No	String/VAR	Vx.xx

7.6.2 Object Group 1000h Parameters (continued)

Index	Sub-index	Name	Access	Mappable	Type	Default
100Ch	-	Reserved	RW	No	Uint16/VAR	0
100Dh	-	Reserved	RW	No	Uint8/VAR	0
1010h	00h	Highest sub-index supported	RO	No	Uint8/ARR	4
1010h	01h	Save all object parameters, command "save"	RW	No	Uint32	1
1010h	02h	Save communication parameters	RW	No	Uint32	1
1010h	03h	Save application parameters	RW	No	Uint32	1
1010h	04h	Save manufacturer-defined parameters	RW	No	Uint32	2
1011h	00h	Highest sub-index supported	RO	No	Uint8/ARR	4
1011h	01h	Restore all default parameters, command "load"	RW	No	Uint32	1
1011h	02h	Restore communication defaults	RW	No	Uint32	1
1014h	-	EMCY COB-ID	RW	No	Uint32/VAR	0x80 + Node_ID
1016h	00h	Highest sub-index supported	RO	No	Uint8/ARR	5
1016h	01h-05h	Consumer heartbeat times	RW	No	Uint32	0
1017h	-	Producer heartbeat time, ms	RW	No	Uint16/VAR	0
1018h	00h	Highest sub-index supported	RO	No	Uint8/REC	4
1018h	01h	Vendor ID	RO	No	Uint32	0x2896
1018h	02h	Product code	RO	No	Uint32	0xC2003
1018h	03h	Revision number	RO	No	Uint32	0x00000100
1018h	04h	Reserved	RO	No	Uint32	0
1200h	00h	Highest sub-index supported	RO	No	Uint8/REC	2
1200h	01h	Client-to-server COB-ID	RO	No	Uint32	0x600 + Node_ID
1200h	02h	Server-to-client	RO	No	Uint32	0x580 +

Index	Sub-index	Name	Access	Mappable	Type	Default
		COB-ID				Node_ID
1400h	01h	RPDO1 COB-ID	RW	No	UInt32	0x00000200 + Node_ID
1400h	02h	RPDO1 transfer type	RW	No	UInt8	255
1401h	01h	RPDO2 COB-ID	RW	No	UInt32	0x00000300 + Node_ID
1401h	02h	RPDO2 transfer type	RW	No	UInt8	255
1402h	01h	RPDO3 COB-ID	RW	No	UInt32	0x00000400 + Node_ID
1402h	02h	RPDO3 transfer type	RW	No	UInt8	255
1403h	01h	RPDO4 COB-ID	RW	No	UInt32	0x00000500 + Node_ID
1403h	02h	RPDO4 transfer type	RW	No	UInt8	255

7.6.2 Object Group 1000h Parameters (continued)

Index	Sub-index	Name	Access	Mappable	Type	Default
1600h-1603h	00h	Number of valid RPDO mappings	RW	No	UInt8/REC	Model default
1600h-1603h	01h-08h	RPDO mapping entries	RW	No	UInt32	See mapping tables
1800h	01h	TPDO1 COB-ID	RW	No	UInt32	0x40000180 + Node_ID
1800h	02h	TPDO1 transfer type	RW	No	UInt8	255
1800h	03h	TPDO1 inhibit time	RW	No	UInt16	0
1800h	05h	TPDO1 event timer	RW	No	UInt16	0
1801h	01h	TPDO2 COB-ID	RW	No	UInt32	0xC0000280 + Node_ID
1801h	02h	TPDO2 transfer type	RW	No	UInt8	255
1801h	03h	TPDO2 inhibit time	RW	No	UInt16	0
1801h	05h	TPDO2 event timer	RW	No	UInt16	0
1802h	01h	TPDO3 COB-ID	RW	No	UInt32	0xC0000380 + Node_ID
1802h	02h	TPDO3 transfer type	RW	No	UInt8	255
1802h	03h	TPDO3 inhibit time	RW	No	UInt16	0
1802h	05h	TPDO3 event timer	RW	No	UInt16	0
1803h	01h	TPDO4 COB-ID	RW	No	UInt32	0xC0000480 + Node_ID
1803h	02h	TPDO4 transfer type	RW	No	UInt8	255
1803h	03h	TPDO4 inhibit time	RW	No	UInt16	0
1803h	05h	TPDO4 event timer	RW	No	UInt16	0
1A00h-1A03h	00h	Number of valid TPDO mappings	RW	No	UInt8/REC	Model default
1A00h-1A03h	01h-08h	TPDO mapping entries	RW	No	UInt32	See mapping tables

7.6.3 Object Groups 2000h-3000h

These manufacturer-defined motor-control and monitoring objects support PDO mapping. Some correspond directly to function codes.

2000h Control Parameters

Sub-index	Name / setting	Access	PDO	Type	Default
01h	Communication command: 01h Forward; 02h Reverse; 03h Forward jog; 04h Reverse jog; 05h Stop; 06h Coast stop; 07h Fault reset; 08h Jog stop. Not retained after power-off	W/R	Yes	Uint16	0
02h	Communication set speed, 0-3000 rpm. Not retained after power-off	W/R	Yes	Uint16	0
03h	Motor pole pairs, 1-20	W/R*	Yes	Uint16	5
04h	Acceleration time, 1-6000, unit 0.1 s	W/R	Yes	Uint16	10
05h	Deceleration time, 1-6000, unit 0.1 s	W/R	Yes	Uint16	10
06h	Control mode: 0 Test; 1 Open loop; 2 Closed loop; 3 DIP switch SW1	W/R*	Yes	Uint16	Model dependent
07h	Run command: 0 Keypad; 1 Terminal; 2 Communication; 3 DIP switch SW3	W/R	Yes	Uint16	Model dependent

2000h Control Parameters (continued)

Sub-index	Name / setting	Access	PDO	Type	Default
08h	Speed reference: 0 Keypad; 1 AI1; 2 AI2; 3 RS485; 4 Multi-speed; 5 DIP switch SW2/SW3; 6 Simple PLC; 7 High-speed pulse; 8 CAN	W/R	Yes	Uint16	1
09h	CAN slave address, 1-247	W/R*	Yes	Uint16	1
0Ah	CAN baud rate: 0 10K; 1 20K; 2 50K; 3 100K; 4 125K default; 5 250K; 6 500K; 7 1M. 10K available only on some models	W/R*	Yes	Uint16	4
0Eh	Communication command channel: 0 RS485; 1 CAN	W/R*	Yes	Uint16	Model dependent
0Fh	Function-code write enable: 0 disabled; 1 enabled. Not retained after power-off	W/R	Yes	Uint16	0
10h	Parameter restore: 0 No action; 1 restore function codes; 2 restore CAN communication parameters; 3 restore all	W/R*	Yes	Uint16	0

2100h Status Parameters

Sub-index	Name / meaning	Access	PDO	Type	Default
01h	Status word 1: 01h Forward; 02h Reverse; 03h Stopped; 04h Fault; 05h OFF; 06h Electronic brake	RO	TPDO	Uint16	0
02h	Status word 2: Bit 0, bus voltage not established/established; Bit 4, not overloaded/overloaded; Bits 5-6, 00 keypad, 01 terminal, 10 communication	RO	TPDO	Uint16	0
03h	Current fault code; see Section 5.2	RO	TPDO	Uint16	0
04h	Driver series code, 20h for C20 series	RO	TPDO	Uint16	0x20

3000h Status Parameters

Sub-index	Name / range	Access	PDO	Type	Default
01h	Set frequency, 0-Fmax, unit 0.01 Hz	RO	TPDO	Uint16	0
02h	Output frequency, 0-Fmax, unit 0.01 Hz	RO	TPDO	Int16	0
03h	Ramp set frequency, 0-Fmax, unit 0.01 Hz	RO	TPDO	Uint16	0
04h	Output voltage, 0-20000, unit 0.1 V	RO	TPDO	Uint16	0
05h	Output current, 0-30000, unit 0.01 A	RO	TPDO	Uint16	0
06h	Set speed, 0-3000 rpm	RO	TPDO	Uint16	0
07h	Motor output speed, 0-3000 rpm	RO	TPDO	Uint16	0
08h	Motor output power, 0-2200 W	RO	TPDO	Uint16	0

3000h Status Parameters (continued)

Sub-index	Name / range	Access	PDO	Type	Default
09h	DC-bus voltage, 0-20000, unit 0.1 V	RO	TPDO	Uint16	0
0Ah	Hall value, 0-7	RO	TPDO	Uint16	0
0Bh	Software version, 1.00-99.00	RO	TPDO	Uint16	-
0Ch	Historical fault type; see Section 5.2	RO	TPDO	Uint16	0
0Dh	Inverter temperature, -200 to 1200, unit 0.1 deg C	RO	TPDO	Int16	0
0Eh	Input-terminal status, 00h-1FFh	RO	TPDO	Uint16	0
0Fh	Output-terminal status, 00h-0Fh	RO	TPDO	Uint16	0
10h	Analog input 1 voltage, 0-1000, unit 0.01 V	RO	TPDO	Uint16	0
11h	Analog input 2 voltage, 0-1000, unit 0.01 V	RO	TPDO	Uint16	0
12h	Analog input 3 voltage, 0-1000, unit 0.01 V	RO	TPDO	Uint16	0
13h	Reserved	RO	TPDO	Uint16	0
14h	Hall count, high 16 bits	RO	TPDO	Uint16	0
15h	Hall count, low 16 bits	RO	TPDO	Uint16	0

7.6.4 Detailed Description of 1000h Group Objects

1000h - Device Type

Structure VAR; type Uint32; RO; not mappable; default 0x00000000. Describes the device profile or application specification.

1001h - Error Register

Structure VAR; type Uint8; RO; not mappable; default 0x00. When an error occurs, the corresponding bit is 1. Bit 0 is set whenever any error exists.

Bit	Meaning
0	Generic error
1	Current
2	Voltage
3	Temperature
4	Communication
5	Device profile
6	Reserved
7	Manufacturer-specific

1003h - Predefined Error Field

Structure ARR; entries Uint32; not mappable.

Sub-index 00h: number of stored errors, range 0-4. Writing 0 clears all error records.

Sub-indexes 01h-04h: standard error fields. When the count is 0, these entries cannot be read.

Stored format: bits 31-16 manufacturer error code; bits 15-0 standard error code.

1005h - SYNC COB-ID

Structure VAR; type Uint32; RW; not mappable; default 0x80.

Allowed values: 0x00000080 disables the SYNC producer; 0x40000080 enables it. Before enabling, set non-zero cycle period 1006h.

1006h - Communication Cycle Period

VAR, Uint32, RW, not mappable, default 0. Unit: microseconds. Applies only to the SYNC producer. Recommended period is at least 5 ms.

1008h - Manufacturer Device Name

VAR, String, CONST, not mappable. Default: EA-BLDC20.

1009h - Manufacturer Hardware Version

VAR, String, CONST, not mappable. Default: Vx.xx.

100Ah - Manufacturer Software Version

VAR, String, CONST, not mappable. Default: Vx.xx, where x.xx records the software revision.

1010h - Store Parameters

ARR, Uint32, RW, not mappable. Saving writes current values to EEPROM for the next reload at power-on, Reset Node, or Reset Communication.

Write ASCII "save" to the required sub-index:

Byte order MSB to LSB	e	v	a	s
Hex	65h	76h	61h	73h

Readback support value: 0 not supported; 1 command save only; 2 automatic save only; 3 both.

Sub-index	Function	Default support
00h	Highest supported sub-index	4
01h	Save all object parameters	1
02h	Save communication parameters, group 1000h	1
03h	Save application-profile parameters, group 6000h reserved	1
04h	Save manufacturer-defined parameters, groups 2000h-5FFFh	2

1011h - Restore Default Parameters

ARR, Uint32, RW, not mappable. Restored defaults are written to EEPROM and take effect at the next reload, power-on, Reset Node, or Reset Communication.

Write ASCII "load" to the required sub-index:

Byte order MSB to LSB	d	a	o	l
Hex	64h	61h	6Fh	6Ch

Readback support: 0 restore not supported; 1 restore supported.

Sub-index	Function	Default support
00h	Highest supported sub-index	4
01h	Restore all object defaults	1
02h	Restore communication-object defaults, group 1000h	1
03h	Restore application-profile defaults, group 6000h reserved	1
04h	Restore manufacturer-defined defaults, groups 2000h-5FFFh	1

1014h - EMCY COB-ID

VAR, Uint32, RW, not mappable. Default 0x80 + Node_ID.

Write 0x00000080 + Node_ID to enable EMCY transmission. Write 0x80000080 + Node_ID to disable it. When enabled, the transmitted EMCY COB-ID must match this object.

1016h - Consumer Heartbeat Time

ARR, Uint32, RW, not mappable. Each entry contains a monitored node address and timeout in milliseconds. Do not configure two entries for the same node. The timeout must exceed the node's producer period.

Bits 31-24	Bits 23-16	Bits 15-0
Reserved	Monitored node address	Monitor time

Sub-index 00h: highest supported sub-index, 5.

Sub-indexes 01h-05h: consumer heartbeat entries, default 0.

1017h - Producer Heartbeat Time

VAR, Uint16, RW, not mappable, default 0. Unit: milliseconds.

1018h - Identity Object

REC, RO, not mappable.

Sub-index	Name	Type	Default
00h	Highest supported sub-index	Uint8	4
01h	Vendor ID	Uint32	0x2896
02h	Product code	Uint32	0xC2003
03h	Revision number	Uint32	0x00000100
04h	Reserved	Uint32	0

1200h - SDO Server Parameter

REC, read-only, not mappable. The default SDO server always exists.

Sub-index	Name	Type	Default
00h	Highest supported sub-index	Uint8	2
01h	Client-to-server COB-ID	Uint32	0x600 + Node_ID
02h	Server-to-client COB-ID	Uint32	0x580 + Node_ID

1400h-1403h - RPDO Communication Parameters

REC, RW, not mappable.

Sub-index 00h: highest supported sub-index. Default 05h for 1400h and 06h for 1401h-1403h.

Sub-index 01h: RPDO COB-ID, Uint32. Only the most significant validity bit may be changed.

Default COB-IDs:

1400h	0x00000200 + Node_ID
1401h	0x00000300 + Node_ID
1402h	0x00000400 + Node_ID
1403h	0x00000500 + Node_ID

MSB 0 = PDO valid; MSB 1 = PDO invalid.

1400h-1403h RPDO Parameters (continued)

Sub-index 02h: RPDO transfer type, Uint8, RW, default FFh. Modify only while the PDO is invalid.

Decimal	Hex	Meaning
0	00h	Synchronous acyclic
1-240	01h-F0h	Synchronous cyclic
254-255	FEh-FFh	Asynchronous

1600h-1603h - RPDO Mapping Parameters

REC, RW, not mappable. Modify only while the PDO is invalid. Total mapped length must not exceed 64 bits. Byte mapping is supported; bit mapping is not.

Sub-index 00h: number of valid mapped objects, 1-4.

Sub-indexes 01h-04h: Uint32 mapping entries using bits 31-16 index, bits 15-8 sub-index, bits 7-0 object length.

Default mappings

Object	Count	Entry 1	Entry 2
1600h RPDO1	1	0x20000110, communication control command	-
1601h RPDO2	1	0x20000210, communication set speed	-
1602h RPDO3	2	0x20000110, communication control command	0x20000210, communication set speed
1603h RPDO4	2	0x20000110, communication control command	0x20000210, communication set speed

Additional entries are reserved.

1800h-1803h - TPDO Communication Parameters

REC, RW, not mappable.

Sub-index 00h: highest supported sub-index. Default 05h for 1800h and 06h for 1801h-1803h.

Sub-index 01h: TPDO COB-ID, Uint32. MSB 0 enables the PDO; MSB 1 disables it. The next bit relates to remote-frame triggering, which this driver does not support; keeping it 1 is recommended.

Default values

1800h	0x40000180 + Node_ID
1801h	0xC0000280 + Node_ID
1802h	0xC0000380 + Node_ID
1803h	0xC0000480 + Node_ID

Sub-index 02h: transfer type, Uint8, default FFh. Modify only while invalid.

0 = synchronous acyclic; 1-240 = synchronous cyclic; 254/255 = asynchronous.

1800h-1803h TPDO Parameters (continued)

Sub-index 03h: inhibit time, Uint16, RW, default 0. Unit: 100 microseconds. Value 0 disables inhibit time. Modify only while PDO is invalid.

Sub-index 05h: event timer, Uint16, RW, default 0. Unit: 1 ms. Value 0 disables the event timer. Modify only while PDO is invalid.

1A00h-1A03h - TPDO Mapping Parameters

REC, RW, not mappable. Modify only while PDO is invalid. Total mapped length must not exceed 64 bits. Byte mapping is supported; bit mapping is not.

Sub-index 00h: number of valid mapped objects, 1-4.

Sub-indexes 01h-04h: Uint32 entries formatted as index, sub-index, object length.

Default mappings

Object	Count	Entry 1	Entry 2
1A00h TPDO1	1	0x21000110, status word 1	-
1A01h TPDO2	1	0x30000710, motor output speed	-
1A02h TPDO3	2	0x21000110, status word 1	0x30000710, motor output speed

TPDO Default Mapping (continued)

1A03h - TPDO4

Sub-index	Mapping value	Meaning
00h	4	Four mapped objects
01h	0x21000110	Status word 1, 2100h:01h, 16 bits
02h	0x30000710	Motor output speed, 3000h:07h, 16 bits
03h	0x30000510	Output current, 3000h:05h, 16 bits
04h	0x30000C10	Historical fault type, 3000h:0Ch, 16 bits

7.7 CANopen Examples

7.7.1 Prerequisites for CANopen

The driver defaults to CAN Modbus. When no external keypad is available, send the following CAN Modbus commands to enter CANopen mode.

Operation	Data frame	Description
Run-command selection	Send ID=0x701, Data=06 20 06 00 02; Response same	Write 0x02 to 2006H for communication control
Speed-reference selection	Send ID=0x701, Data=06 20 07 00 08; Response same	Write 0x08 to 2007H for CAN speed control
Enable writing	Send ID=0x701, Data=06 20 0E 00 01; Response same	Write 0x01 to 200EH
Acceleration/deceleration source	Send ID=0x701, Data=06 00 08 00 00; Response same	Write 0 to F00.08
Stop mode	Send ID=0x701, Data=06 01 05 00 00; Response same	Write 0 to F01.05 for deceleration stop
CAN protocol	Send ID=0x701, Data=06 08 0D 00 01; Response same	Write 1 to F08.13 for CANopen

After the restart/online frame is observed, CANopen has been configured successfully.

7.7.2 Basic Expedited SDO Operation

Command specifiers

Write	2F one byte; 2B two bytes; 27 three bytes; 23 four bytes
Read	40 request; 4F one-byte response; 4B two-byte response; 47 three-byte response
Response	60 successful write; 80 abort response

Change node address from 1 to 5

Send ID=0x601, Data=2B 00 20 09 05 00 00 00

Response ID=0x581, Data=60 00 20 09 00 00 00 00

2B = write two bytes; 00 20 = index; 09 = sub-index; 05 00 = data; 60 = successful write. Power cycle for the new address to take effect.



保存数据 实时保存 暂停显示 显示模式 清除 滤波设置 高级屏蔽 显示错误帧 错误帧率:0.0									
序号	帧间隔时间us	名称	帧ID	帧类型	帧格式	DLC	数据	帧数量	
00000001	006.782.880	接收	701	DATA	STANDARD	1	00	1	

Object Parameter for Node Address

Index	Sub-index	Name	Access	PDO	Type	Default
2000H	09H	CAN slave address, 1-247	W/R*	Yes	Uint16	1

Note: 701 1 00 is the boot-up frame for address 1; 705 1 00 is the boot-up frame for address 5.

Change Baud Rate from 125 kbit/s to 250 kbit/s

Send ID=0x601, Data=2B 00 20 0A 05 00 00 00

Response ID=0x581, Data=60 00 20 0A 00 00 00 00

2B = write two bytes; 00 20 = index; 0A = sub-index; 05 00 = data; 60 = successful write. Power cycle for the new baud rate to take effect.

Object parameter

Index	Sub-index	Name	Access	PDO	Type	Default
2000H	0AH	CAN baud rate: 0 10K; 1 20K; 2 50K; 3 100K; 4 125K default; 5 250K; 6 500K; 7 1M	W/R*	Yes	Uint16	4

序号	帧间隔时间us	名称	帧ID	帧类型	帧格式	DLC	数据	帧数里
00000001	004. 705. 527	接收	701	DATA	STANDARD	1	00	1
00000002	067. 612. 314	发送成功	000	DATA	STANDARD	2	80 01	1
00000003	008. 101. 424	发送成功	601	DATA	STANDARD	8	2B 00 20 09 05 00 00 00	1
00000004	019. 206. 797	接收	705	DATA	STANDARD	1	00	1
00000005	000. 000. 963	接收	581	DATA	STANDARD	8	60 00 20 09 00 00 00 00	1

序号	帧间隔时间us	名称	帧ID	帧类型	帧格式	DLC	数据	帧数里
00000001	042. 871. 094	接收	701	DATA	STANDARD	1	00	1
00000002	065. 656. 970	发送成功	000	DATA	STANDARD	2	80 01	1
00000003	020. 640. 627	发送成功	601	DATA	STANDARD	8	2B 00 20 0A 05 00 00 00	1

选择设备类型: USBCAN-V5

打开设备

name	Hardware	ID
USBCAN-II-V5	UGP. 31. 52	GC220041134

CAN1

CAN2

通道: CAN1

名称: USBCAN-II-V5

协议: CAN = 1

工作模式: 正常模式

波特率: 250 K

1

序号	帧间隔时间us	名称	帧ID	帧类型	帧格式	DLC	数据	帧数量
00000001	042. 871. 094	接收	701	DATA	STANDARD	1	00	1
00000002	065. 656. 970	发送成功	000	DATA	STANDARD	2	80 01	1
00000003	020. 640. 627	发送成功	601	DATA	STANDARD	8	2B 00 20 0A 05 00 00 00	1
00000004	117. 012. 118	接收	701	DATA	STANDARD	1	00	1

Change Acceleration and Deceleration Times

Operation	Data frame	Description
Enable writing	Send ID=0x601, Data=2B 00 20 0F 01 00 00 00; Response ID=0x581, Data=60 00 20 0F 00 00 00 00	Enable function-code writes
Select function-code ramp times	Send ID=0x601, Data=2B 00 50 09 00 00 00 00; Response ID=0x581, Data=60 00 50 09 00 00 00 00	F00.08 = 0
Select deceleration stop	Send ID=0x601, Data=2B 01 50 06 00 00 00 00; Response ID=0x581, Data=60 01 50 06 00 00 00 00	F01.05 = 0
Set acceleration time	Send ID=0x601, Data=2B 00 20 04 05 00 00 00; Response ID=0x581, Data=60 00 20 04 00 00 00 00	0.5 s
Set deceleration time	Send ID=0x601, Data=2B 00 20 05 32 00 00 00; Response ID=0x581, Data=60 00 20 05 00 00 00 00	5.0 s

Function-code object mapping example

Set F05.03, DI3 terminal function, to 17, Multi-speed 2.

Index = 5000h + 05 decimal = 5005h.

Sub-index = 03 decimal + 1 = 04h.

Data = 17 decimal = 11h.

Frame data: 2B 05 50 04 11 00 00 00.

Relevant 2000h objects

04h Acceleration time, 1-6000, unit 0.1 s, W/R, PDO mappable, default 10.

05h Deceleration time, 1-6000, unit 0.1 s, W/R, PDO mappable, default 10.

Motor Control Examples

Operation	Data frame	Description
Reset node	Send ID=0x000, Data=81 01; boot-up response ID=0x701, Data=00	Reset node 1
Reset communication	Send ID=0x000, Data=82 01; boot-up response ID=0x701, Data=00	Reset communication for node 1
Pre-operational	Send ID=0x000, Data=80 01	Put node 1 in Pre-operational state
Set speed	Send ID=0x601, Data=2B 00 20 02 D0 07 00 00; response 60 00 20 02 00 00 00 00	2000 rpm
Set direction	Send ID=0x601, Data=2B 00 20 01 01 00 00 00; response 60 00 20 01 00 00 00 00	Forward

Motor Control Examples (continued)

Stop

Send ID=0x601, Data=2B 00 20 01 05 00 00 00

Response ID=0x581, Data=60 00 20 01 00 00 00 00

2B = write two bytes; 00 20 = index; 01/02 = sub-index; D0 07, 01 00, and 05 00 are data; 60 = successful write.

2000h Object Parameters

Sub-index	Name	Access	PDO	Type	Default
01h	Communication command: 01h Forward; 02h Reverse; 03h Forward jog; 04h Reverse jog; 05h Stop; 06h Coast stop; 07h Fault reset; 08h Jog stop. Not retained after power-off	W/R	Yes	Uint16	0
02h	Communication set speed, 0-3000 rpm. Not retained after power-off	W/R	Yes	Uint16	0

Read Status Word 1

Send ID=0x601, Data=40 00 21 01 00 00 00 00

Response ID=0x581, Data=4B 00 21 01 03 00 00 00

The response value 03 00 indicates Stopped.

2100h:01h Status Word 1

01h Forward; 02h Reverse; 03h Stopped; 04h Fault; 05h OFF; 06h Electronic brake. RO, TPDO mappable, Uint16, default 0.

7.7.3 Basic PDO Operation

After completing Section 7.7.1, PDO communication can be used. Before changing default TPDO/RPDO parameters, disable the affected PDO and follow the mapping procedure shown in the figure.

1. Motor Control with Default RPDO

Operation	Data frame	Description
Start node	Send ID=0x000, Data=01 01	Start node 1
Run	Send ID=0x401, Data=01 00 D0 07	Forward at 2000 rpm using RPDO3
Stop	Send ID=0x401, Data=05 00	Stop

TPDO:

23	00	18	01	81	01	00	C0	关1800映射	映射1A00数据 (返回数据180+Node_ID)
23	00	18	01	81	01	00	40	开1800映射	
23	01	18	01	81	02	00	C0	关1801映射	映射1A01数据 (返回数据280+Node_ID)
23	01	18	01	81	02	00	40	开1801映射	
23	02	18	01	81	03	00	C0	关1802映射	映射1A02数据 (返回数据380+Node_ID)
23	02	18	01	81	03	00	40	开1802映射	
23	03	18	01	81	04	00	C0	关1803映射	映射1A03数据 (返回数据480+Node_ID)
23	03	18	01	81	04	00	40	开1803映射	

80+Node_ID (16进制的地址)

RPDO:

23	00	14	01	01	02	00	80	关1400映射	映射1600数据 (发送数据200+Node_ID)
23	00	14	01	01	02	00	00	开1400映射	
23	01	14	01	01	03	00	80	关1401映射	映射1601数据 (发送数据300+Node_ID)
23	01	14	01	01	03	00	00	开1401映射	
23	02	14	01	01	04	00	80	关1402映射	映射1602数据 (发送数据400+Node_ID)
23	02	14	01	01	04	00	00	开1402映射	
23	03	14	01	01	05	00	80	关1403映射	映射1603数据 (发送数据500+Node_ID)
23	03	14	01	01	05	00	00	开1403映射	

00+Node_ID (16进制的地址)

2. RPDO Configuration Example

Change RPDO1 so COB-ID 201h carries set speed.

Operation	Data frame	Description
Disable PDO	Send ID=0x601, Data=23 00 14 01 01 02 00 80; response 60 00 14 01 00 00 00 00	Disable object 1400h
Configure mapping entry 1	Send ID=0x601, Data=23 00 16 01 10 02 00 20; response 60 00 16 01 00 00 00 00	Map communication set speed
Enable PDO	Send ID=0x601, Data=23 00 14 01 01 02 00 00; response 60 00 14 01 00 00 00 00	Enable object 1400h

3. TPDO Configuration Example

Change TPDO1 so COB-ID 181h reports motor output speed.

Disable PDO	Send ID=0x601, Data=23 00 18 01 81 01 00 C0; response 60 00 18 01 00 00 00 00	Disable object 1800h
Configure mapping entry 1	Send ID=0x601, Data=23 00 1A 01 10 07 00 30; response 60 00 1A 01 00 00 00 00	Map motor output speed
Enable PDO	Send ID=0x601, Data=23 00 18 01 81 01 00 40; response 60 00 18 01 00 00 00 00	Enable object 1800h

4. Save and Restore PDO Configuration

Save PDO	Send ID=0x601, Data=23 10 10 02 65 76 61 73; response 60 10 10 02 00 00 00 00	Store communication parameters, ASCII "save"
Reset PDO configuration	Send ID=0x601, Data=23 11 10 02 64 61 6F 6C; response 60 11 10 02 00 00 00 00	Restore communication object group 1000h, ASCII "load"
Restore factory settings	Send ID=0x601, Data=23 11 10 01 64 61 6F 6C; response 60 11 10 01 00 00 00 00	Restore all defaults

Default RPDO3, object 1602h

Sub-index 00h = 2 mapped objects.

Sub-index 01h = 0x20000110, communication control command.

Sub-index 02h = 0x20000210, communication set speed.

8. Basic Inspection and Maintenance

8.1 Basic Inspection

Inspection stage	Items
General inspection	Periodically check mounting points, terminals, wiring, motor shaft, mechanical couplings, and screws for looseness. Prevent oil, water, metal powder, corrosive gas, and dust from entering the driver. Verify wiring order whenever wiring is changed.
Before operation, power disconnected	Confirm power is off and motor has stopped. Insulate terminal connections. Verify wiring. Remove screws, metal fragments, and flammable objects from inside/around the driver. Set external control switches to OFF. Verify emergency-stop and power-disconnection circuits. Reduce electromagnetic interference and confirm supply voltage.
Before operation, power applied	Ensure cables do not rub or become tensioned while the motor runs. Investigate abnormal vibration or excessive noise. Confirm parameter settings match the machine. Avoid extreme settings. Change stop-only parameters only while the driver is stopped. Check LED and keypad indications and command settings.

8.2 Maintenance and Service

Routine maintenance

- Store and operate the product under suitable environmental conditions.
- Clean dust and dirt from the driver and motor exterior.
- Do not disassemble mechanical sections during cleaning.
- Clean openings in the driver housing to prevent foreign-material entry.
- Avoid prolonged operation under extreme environmental conditions.

Component Service Life

Electrolytic capacitors

Service life depends mainly on ambient temperature and operating conditions. Supplier data specifies approximately 7000 hours at the maximum operating temperature of 105 deg C. Under ideal conditions, each 10 deg C reduction approximately doubles life. During long-term storage, periodically apply rated voltage to reform the capacitor and maintain electrolyte activity.

Knob potentiometer

Total rotation angle: 250 deg +/-10 deg. Rotational life: 100 cycles. Resistance change: $\Delta R/R \leq \pm (2 \text{ ohms} + 3\%)$.

MTBF

Mean time between failures: greater than 500,000 hours.

Warranty and Service

- Contact the supplier or qualified technical support for operating questions.
- The standard warranty period is one year from shipment and includes repair for qualifying defects.
- For a fault occurring under normal use in accordance with this manual, return the product through the supplier and provide a detailed description of the cause or symptom.
- Damage is the user's responsibility when caused by misuse, unauthorized repair/modification, dropping or transportation after receipt, operation outside specifications, fire, earthquake, lightning, wind, corrosive atmosphere, other natural disasters, or ingress of water, oil, metal fragments, or other foreign matter.
- Components with a stated standard service life are excluded after that service life has expired.