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SV660N Series Servo Drive

Commissioning Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code19011433C00

Preface

Introduction

The SV660N series high-performance AC servo drive covers a power range from 50 W to 7.5 kW. It supports EtherCAT communication protocol and carries Ethernet communication interfaces to work with the host controller for a networked operation of multiple servo drives.

The SV660N series servo drive supports stiffness level setting, inertia auto-tuning and vibration suppression to simplify the operation process. It allows a quiet and stable operation together with an MS1 series servo motor with low or medium inertia and a 23-bit single-turn or multi-turn absolute encoder.

The drive aims to implement fast and accurate control in automation equipment such as semi-conductor manufacturing equipment, chip mounters, PCB punching machines, handling machineries, food processing machineries, machine tools, and transmission machineries.

This manual presents drive commissioning, parameter descriptions, including the operating panel, commissioning software, commissioning procedure and a parameter list.

More documents

Name	Data Code	Description
SV660N Series Servo Drive Hardware Guide	19011432	This guide describes the installation and wiring of the drive, including pre-installation preparations, unpacking and transportation,mechanical installation, and electrical installation.
SV660N Series Servo Drive Selection Guide	19011431	Presents technical data and dimensions of the servo drive, and specifications and models of optional parts (installation accessories, cables, and periphery electrical parts).
SV660N Series Servo Drive Commissioning Guide	19011362	Presents servo commissioning, parameter descriptions, including the operating panel, commissioning software, commissioning procedure and a parameter list.
SV660N Series Servo Drive Function Guide	19011434	Presents functions and parameters, including function overview, basic servo functions, adjustment and parameter list.
SV660N Series Servo Drive Communication Guide	19011435	Presents functions and parameters of the servo drive, including EtherCAT communication configuration, parameter description, and communication application cases.

Name	Data Code	Description
SV660N Series Servo Drive Troubleshooting Guide	19011908	Introduces faults and fault levels, the troubleshooting process, warning codes and fault codes.
SV660N Series Servo Drive Safety Guide	19011883	Presents the safety function and related certifications and standards, wiring, commissioning process, troubleshooting, and functions.
SV660N Series Servo Drive Manual Package	PS00005512	Provides information on selection, installation, commissioning, function, troubleshooting and parameters of the equipment.

Revision History

Date	Version	Description
2023-04	C00	Added information on the -NS model.
2023-01	B01	• Added warranty information in the preface. • Changed the MS1-Z motor to MS1-R motor. • Added hexadecimal parameters in parameter description.
2022-08	B00	• Replaced the brake sequence diagram for a rotating motor. • Deleted section Faults. • Updated the list of parameters and description of parameters.
2022-01	A04	• Added other safety precautions to the safety precautions. • Modified the numeral system of HXX.YY group numbers and the group offset. • Optimized the 220 V energy data table in section 2.2.4. • Optimized the fault reset timing diagram in section 2.2.5 servo operation;. • Added the recommended range of load inertia ratio and modified the reference table for adjusting the rigidity rating in section 3.3.2.3. • Changed E731.0 to 0x7305. • Added H0d.20 after 200D.15h. • Changed the data type of H0b.03 to 16-bit. • Changed power line breakage to a No. 2 recoverable fault.

Date	Version	Description
2021-10	A03	• Optimized section Operation Panel. • Optimized section User Password. • Added sections Adjustment and Commissioning Software. • Optimized section Parameter Setting. • Optimized section Servo Operation. • Optimized section Servo Stop. • Optimized the list of fault and warning codes. • Added description for E108.4, E120.9, E939.0, E939.1, E939.2 and E939.3. • Added description for H0E.33. • Modified the data type and factory setting of 60E3h and its subindexes. • Minor corrections.
2021-01	A02	Minor corrections.
2021-01	A01	Minor corrections.
2020-10	A00	First release

Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following way:

- Visit *http://www.inovance.com*, go to Support > Download, search by keyword, and then download the PDF file.
- Scan the QR code on the equipment to acquire more.

Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. You will be charged for any repair work after the warranty period expires.

Within the warranty period,maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance fee is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see the Product Warranty Card.

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General Safety Instructions

Safety Precautions

- This section explains the safety precautions that need to be observed to use this product correctly. Before using this product, please read the instruction manual and correctly understand the relevant information of safety precautions. Failure to comply with the safety precautions may result in death, serious injury, or equipment damage.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper use.

Safety Levels and Definitions



Indicates that failure to comply with the notice will result in death or severe personal injuries.



Indicates that failure to comply with the notice may result in death or severe personal injuries.



Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

General Safety Instructions

- Drawings in the selection guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions. Install the covers or protective guards as specified, and use the equipment in accordance with the instructions described in the user guide.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.

Unpacking



- Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.
- Do not install the equipment if you find water seepage or missing or damaged components upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.



- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking.
- Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation



- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.

CAUTION

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation

DANGER

- The equipment can be operated by well-trained and qualified professionals only. Non-professionals are not allowed.

WARNING

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the equipment onto an incombustible object such as a metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.



- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, cut off power connections with all equipment. Residual voltage exists after power cut-off. Therefore, wait at least the time designated on the equipment warning label before further operations. Measure the DC voltage of the main circuit and make sure it is below the safe voltage, otherwise there will be the danger of electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply will result in an electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply will result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.



- During wiring, follow the proper electrostatic discharge (ESD) procedure, and wear an antistatic wrist strap. Failure to comply will damage the equipment or the internal circuits of the equipment.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on



- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in an electric shock.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, make sure that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may resulting in a fire. Failure to comply may result in a fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injuries.

Operation



- The equipment must be operated only by professionals. Failure to comply will result in death or personal injuries.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in an electric shock.



- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply will result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.



- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment with power ON. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injuries or equipment damage.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal



- Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Additional Precautions

Cautions for the dynamic brake

- Dynamic braking can only be used for emergency stop in case of failure and sudden power failure. Do not trigger failure or power failure frequently.
- Ensure that the dynamic braking function has an operation interval of more than 5 minutes at high speed, otherwise the internal dynamic braking circuit may be damaged.

- Dynamic braking is common in rotating mechanical structures. For example, when a motor has stopped running, it keeps rotating due to the inertia of its load. In this case, this motor is in the regenerative state and short-circuit current passes through the dynamic brake. If this situation continues, the drive, and even the motor, may be burned.

Safety Label

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Label	Description
	• Never fail to connect Protective Earth (PE) terminal. Read the manual and follow the safety instructions before use. • Do not touch terminals within 15 minutes after disconnecting the power supply to prevent the risk of electric shock. • Do not touch the heatsink with power ON to prevent the risk of burn.

1 Commissioning Tools

1.1 Operating Panel

1.1.1 Display Panel Components

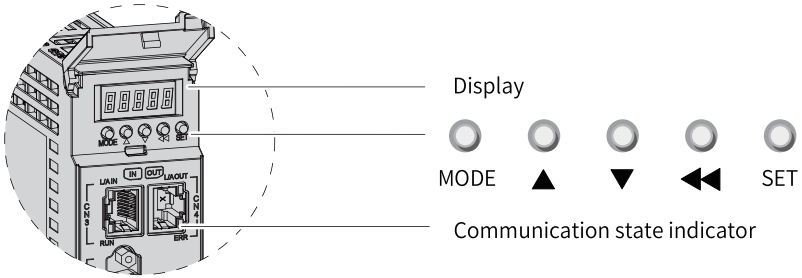


Figure 1-1 Magnified view of the keypad

The operation panel of the SV660 Series servo drive consists of an LED (5-digit, 8-segment) and five buttons. The keypad is used for value display, parameter setting, user password setting and general function execution. The following table takes parameter setting as an example to describe the general functions of the keys.

Table 1–1 Descriptions of keys

Parameter Name	Illustration	Description
MODE	MODE	Switches among different modes. Returns to the previous menu.
UP	▲	Increases the value of the blinking digit for the LED.
DOWN	▼	Decreases the value of the blinking digit for the LED.
SHIFT	◀◀	Shifts the blinking digit for the LED. You can view the high digits of the number consisting of more than 5 digits.
SET	SET	Switches to the lower-level menu. Executes commands such as storing parameter setting value.

Indicators

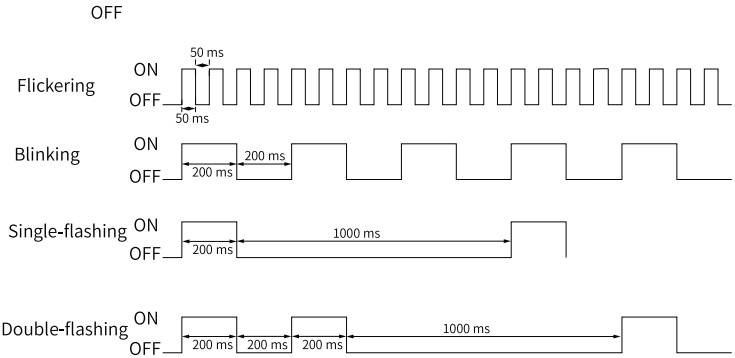


Figure 1-2 Description of indicators

Table 1–2 Description of indicators

Indicator	Status	Status Indication
RUN	OFF	Initialization.
	Blinking (on for 200 ms and off for another 200 ms)	Pre-Operational.
	Single flash (on for 200 ms and off for 1000 ms)	Safe-Operational.
	ON	Operational.
ERR	OFF	No Network error.
	Blinking (on for 200 ms and off for another 200 ms)	Communication setting error.
	Single flash (on for 200 ms and off for 1000 ms)	Sync event error.
	Double flash (on for 200 ms and off for 200 ms, and then on for 200 ms and off for 1000 ms)	Watchdog timeout.
L/A IN indicator[1] L/A OUT indicator	OFF	Link is not established.
	Flickering (on for 50 ms and off for another 50 ms)	Link is established. A data transceiving signal is present.
	ON	Link is established. No data transceiving signal is present.

Note

- [1]: L/A IN and L/A OUT indicate the LINK state and operation state of the physical layer of each port.
- The color of the ERR indicator is red, and the other three indicators are green.
- The status indicators are only available for the -NS model.

1.1.2 Panel Display

The operating panel can display the running status, parameter, faults, and monitoring information during running of the servo drive.

- Status display: Displays current servo drive status, such as servo ready or servo running.
- Parameter display: Displays parameters and their setpoints
- Fault display: Displays faults and warnings that occurred on the servo drive.
- Monitored value display: Displays values of monitoring parameters.

Transition relation between the panel display and the operation object of the host controller

The mapping relation between the parameter displayed on the keypad (in decimal) and the object dictionary operated by the host controller (in hexadecimal, "Index" and "Sub-index") is as follows.

Object dictionary index = 0x2000 + Parameter group number

Object dictionary sub-index = Hexadecimal offset within the parameter group + 1 For example:

Panel Display	Object dictionary operated by the host controller
H02.15	2002-10h

Note

The following section only describes the display and parameter settings on the keypad side (in decimal), which are different from those displayed in the software tool (in hexadecimal). Make necessary value conversions during use.

Display mode switchover

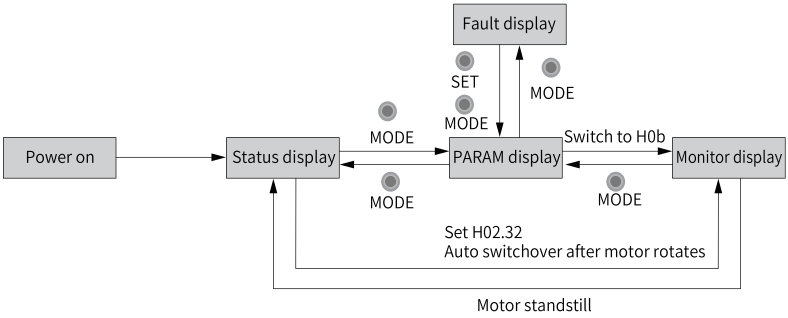
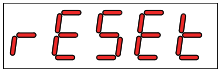


Figure 1-3 Switchover among different display modes

- The keypad enters status display immediately upon power-on.
- Press MODE to switch among different display modes based on the conditions shown in *"Figure 1–3 " on page 17* .
- In status display, set H02.32 to select the parameter to be monitored. When the motor rotates, the keypad automatically switches to monitored value display. After the motor stops, the keypad automatically returns to status display.
- In the parameter display mode, after you select the parameter to be monitored in group H0b, the keypad switches to monitored value display.
- Once a fault occurs, the keypad switches to fault display immediately, with all the five LEDs blinking. Press SET to stop the LEDs from blinking, and then press MODE to switch to parameter display.

Status display

Display	Parameter Name	Applicable Occasion	Meaning
	reset Servo drive initializing	Upon power-on	The servo drive is in the initialization or reset status. After initialization or reset is done, the servo drive automatically switches to other status.
	nr Servo not ready	Initialization done, but servo drive not ready.	The servo drive is not ready to run because the main circuit is not powered on. For details, see the Troubleshooting Guide.
	ry Servo ready	Servo drive ready	The servo drive is ready to run and waits for the enabling signal from the host controller.

Display	Parameter Name	Applicable Occasion	Meaning
	rn Servo running	Servo ON (S-ON) signal activated (S-ON signal switched on)	The servo drive is running.
	1–A: Control modes	-	Displays present operation mode of the servo drive in hexadecimal digits. 1: Profile position control 3: Profile velocity mode 4: Profile torque mode 6: Homing mode 8: Cyclic synchronous position mode 9: Cyclic synchronous velocity mode A: Cyclic synchronous torque mode
	1–8: communication statuses	-	Displays the status of the slave EtherCAT state machine in characters. 1: Initialization 2: Pre-operational 4: Safe-operational 8: Running
	- CN4 connection indication	EtherCAT output connected successfully	OFF: no communication connection is detected in the physical layer. ON: communication connection is detected in the physical layer.
	- CN3 connection indication	EtherCAT input connected successfully	

Parameter Display

Parameters are divided into 14 groups based on their functions. A parameter can be located quickly based on the parameter group it belongs to. For details on parameters, See section Description of Parameters.

- Display of parameter groups

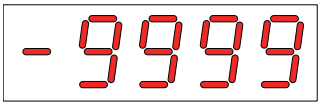
Display	Parameter Name	Description
HXX.YY	Parameter group	XX: Parameter group No. (Hexadecimal) YY: Offset within the parameter group (decimal)

For example, "H02.00" is displayed as follows.

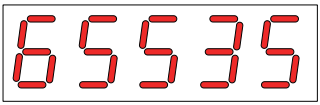
Display	Parameter Name	Description
	H02.00	02: Parameter group No. 00: Offset within the parameter group

- Display of negative numbers and numbers with different lengths
  - Signed number with 4 digits and below or unsigned number with 5 digits and below
    Such numbers are displayed in a single page (five digits). For signed numbers, the highest bit "-" represents the negative symbol.

    For example, "-9999" is displayed as follows:

    For example, "65535" is displayed as follows:

  - Signed number with more than 4 digits or unsigned number with more than 5 digits
    Such numbers are displayed from low to high bits in several pages (5 digits per page): current page + values on current page, as shown in the following figure. Hold down SHIFT for more than 2s to switch to the next page.

    For example, "-1073741824" is displayed as follows:

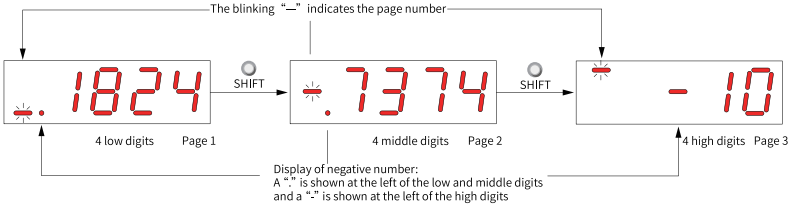
    

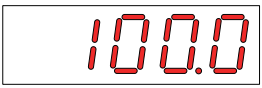
    Figure 1-4 Display of "-1073741824"

    Example: "1073741824" is displayed as follows:

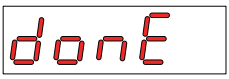
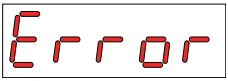
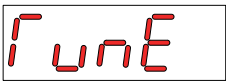


Figure 1-5 Display of "1073741824"

- Display of the decimal point
  The segment "." of the ones indicates the decimal point, which does not blink.

Display	Parameter Name	Description
	Decimal point	100.0

- Display of parameter setting status

Display	Parameter Name	Applicable Occasion	Meaning
	Done Parameter setting completed	The parameter is set successfully.	The parameter is set and saved to the servo drive (Done). The servo drive can execute other operations.
	F.InIt (Restored to default settings)	Parameter initialization is in progress (H02.31 = 1).	The servo drive is in the process of parameter initialization. After parameter initialization is done, switch on the control power supply again.
	Error (wrong password)	The user password (H02.30) is activated and the password entered is wrong.	A wrong password is entered. You need to enter the password again.
	TunE	Auto-tuning with one-key enabled	The function of auto-tuning with one-key is in progress.
	FAIL	Auto-tuning with one-key enabled	The function of auto-tuning with one-key fails.

Fault Display

- The panel displays the active or history faults and warning codes. For troubleshooting, see the Troubleshooting Guide.
- When a fault or warning occurs, the operating panel displays the corresponding fault or error code immediately. When multiple faults or errors occur, the keypad displays the fault or error code of the highest fault level.
- You can select the previous fault/warning to be viewed through H0b.33 and view the code of the selected fault/warning in H0b.34.
- You can clear the latest 10 faults or warnings saved in the servo drive by setting H02.31 to 2.

For example, "E941.0" is displayed as following:

Display	Parameter Name	Description
	E941.0 Warning code	E: A fault or warning occurs on the servo drive. 941.0: Warning code

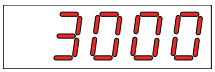
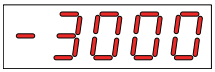
Note

- If the panel displays Hault/Fault, a system fault has occurred.
- The possible causes include bugs of the program, external interference like static electricity or electromagnetic interference, extreme operating temperature or radiation.
- In this case, record the values of H16.00–H16.19, and consult with our R&D engineers.

Monitored value display

- Group H0b: Displays parameters used to monitor the operating state of the servo drive.
- Set H02.32 (Default keypad display) properly. After the motor operates normally, the keypad switches from status display to parameter display. The parameter group number is H0b and the offset within the group is the setpoint of H02.32.
- For example, if H02.32 is set to 00 and the motor speed is not 0 rpm, the keypad displays the value of H0b.00.

The following table describes the monitoring parameters in H0b.00.

Param.	Parameter Name	Unit	Meaning	Example
H0b.00	Motor speed actual value	RPM	Displays the actual value of the motor speed after round-off, which can be accurate to 1 rpm.	Display of 3000 rpm:  -3000 rpm: 

1.1.3 Parameter Settings

Example of parameter settings

You can set parameters through the keypad. For details on parameters, see section Description of Parameters. The following figure shows how to switch from position control mode to speed control mode using the keypad after power-on.

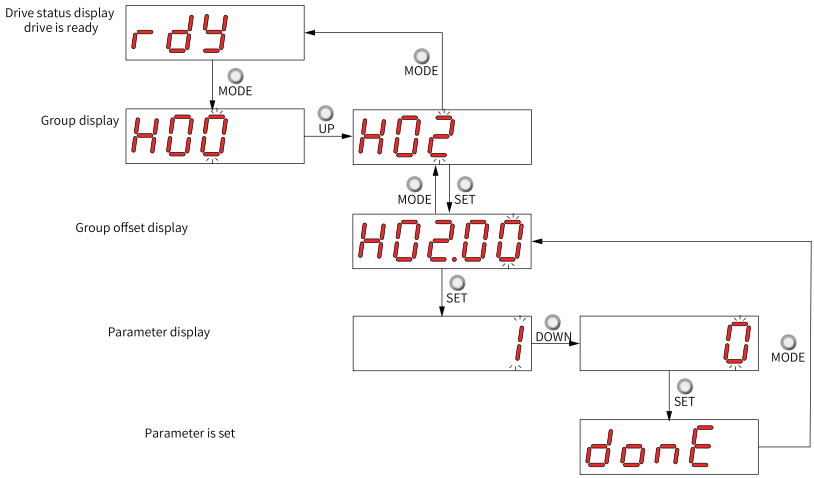


Figure 1-6 Example of parameter setting

- MODE: Used to switch the keypad display mode and return to the previous interface.
- UP/DOWN: Used to increase or decrease the value of the blinking digit.
- SHIFT: Used to shift the blinking digit.
- SET: Used to save the present setpoint or switch to the next interface.

After parameter setting is done, that is, "donE" is displayed on the keypad, press MODE to return to the parameter group interface (interface of "H02.00").

Forced DI/DO signals

There are five DI and 3 DO signals on the CN1 terminal.

Users can allocate the DI/DO function and terminal logic to parameters in group H03/ H04 by using the keypad (or host controller communication), so that the host controller can control corresponding servo functions through the DI or use the DO signal output by the servo drive.

The servo drive also provides forced DI/DO functions. The forced DIs can be used to test the DI functions of the servo drive, and the forced DOs can be used to check the DO signal connection between the host controller and the servo drive.

- Forced DI signal input
  After this function is enabled, all DI signal levels are controlled by the forced DI setting (H0d.18), independent of external DI signal status.
  - Operating procedure:

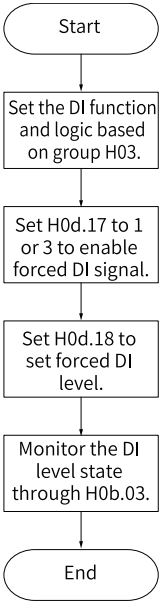


Figure 1-7 Procedure for setting forced DI function

H0d.18 is used to set the forced DI level. The keypad displays the value in hexadecimal. After the hexadecimal value is converted to a binary value, the value "1" indicates high level and "0" indicates low level.

The DI logic is defined by parameters in group H03. H0b.03 is used to monitor the DI level status. The keypad displays the level, and the value of H0b.03 (Monitored DI signal) read in the software tool is hexadecimal.

- Example:
  To activate the DI function allocated to DI1 and deactivate DI functions allocated to DI2 to DI5 (all the DIs are active at low level), set as follows:

  As the value "1" indicates high level and the value "0" indicates low level, the corresponding binary value and hexadecimal value are "11110" and "1E" respectively. Therefore, set H0d.18 to "1E" through the keypad.

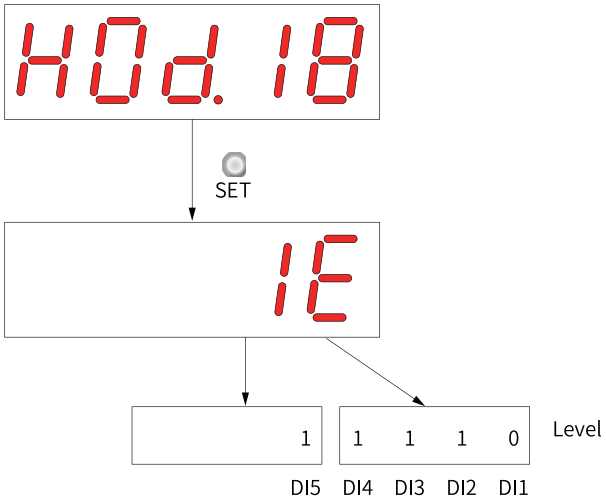


Figure 1-8 Meaning of the H0d.18 setpoint

Monitoring the DI level status through H0b.03:

If the DI function is normal, the display value of H0b.03 is always the same as that of H0d.18.

In this case, DI1 is displayed as low level and DI2 to DI5 are displayed as high level on the keypad, and the value of H0b.03 read by the software is 1E (hexadecimal).

Display on the operating panel:

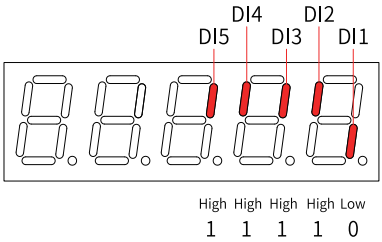


Figure 1-9 DI level status corresponding to H0b.03

- Exit
  The forced DI signal function is not retentive upon power-off. Normal DIs apply after restart, or you can set H0d.17 to 0 (No operation) to return to the normal DI mode.

- Forced DO function
  After this function is enabled, all DO signal levels are controlled by H0d.19 (Forced DO value), regardless of the internal DO status of the servo drive.

Caution

If the motor is used in vertical motion, when the brake output signal is set to Enabled, the brake will open and the load may fall. Take protective measures on the machine to prevent the risk of falling.

- Operating process

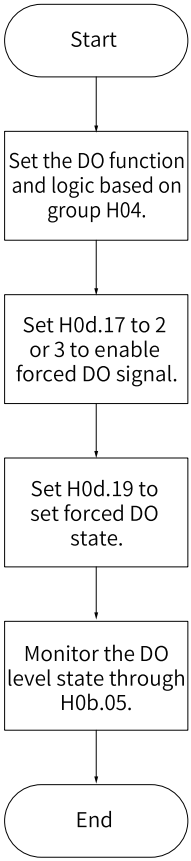


Figure 1-10 Procedure for setting forced DO function

H0d.19 (Forced DO value) is used to set whether the DO function is active. The keypad displays the value in hexadecimal. After the hexadecimal value is converted to a binary value, the value "1" indicates the DO function is active and "0" indicates the DO function is inactive.

The DO logic is defined by parameters in group H04. H0b.05 is used to monitor the DO level status. The keypad displays the level, and the value of H0b.05 (monitored DO signal) read in the software tool is hexadecimal.

- Example:
  To activate the DO function assigned to DO1 and deactivate DO functions assigned to DO2 and DO3, set as follows:

  As the value "1" indicates the DO function is active and "0" indicates the DO function is inactive, the binary value is "110", which corresponds to the

hexadecimal value "6". Therefore, set H0d.19 (Forced DO value) to 6 through the keypad.

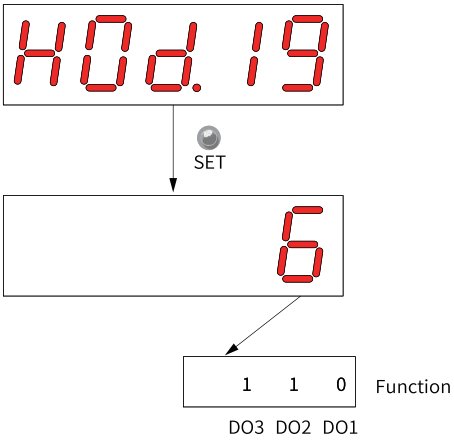


Figure 1-11 Meaning of the H0d.19 setpoint

Monitoring the DO level status through H0b.05:

If the logic of all the three DO terminals are "active at low level", the DO1 terminal is high level and DO2 to DO3 terminals are low level, and the corresponding binary number is "001". In this case, the value of H0b.05 (Monitored DO signal) read by the software tool is 1 (decimal). Display on the operating panel:

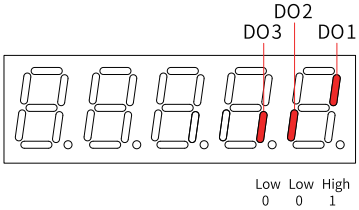


Figure 1-12 Display H0b.05 when all DO are "active low"

If the logic of all the three DO terminals are "active high", the DO1 terminal is low level and DO2 to DO3 terminals are high level, and the corresponding binary number is "110". In this case, the value of H0b.05 (Monitored DO signal) read by the software tool is 6 (decimal). Display on the operating panel:

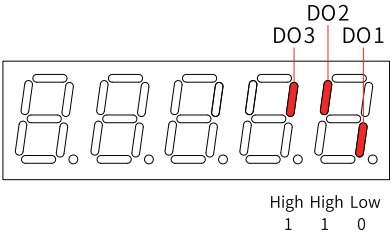


Figure 1-13 Display H0b.05 when all DO are "active high"

- Exit
  The forced DO signal function is not retentive upon power-off. Normal DOs apply after restart, or you can set H0d.17 to 0 (No operation) to return to the normal DO mode.

- Forced EtherCAT DO
  After this function is enabled, all DO signal levels are controlled by 60FE.01h (Physical output) and are unrelated to the internal DO signal status.

  If the motor is used in vertical motion, when the brake output signal is set to Enabled, the brake will open and the load may fall. Take protective measures on the machine to prevent the risk of falling.

  - Operating process

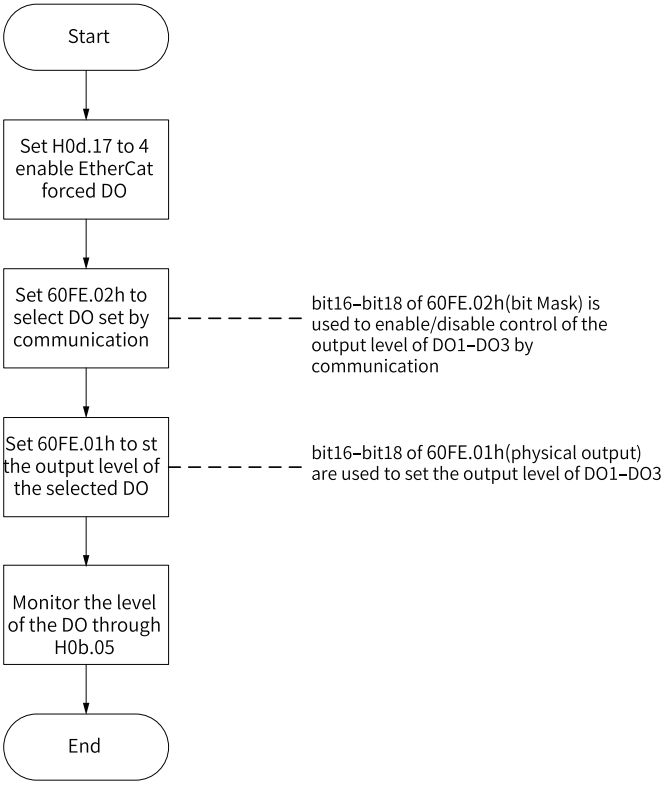


Figure 1-14 Procedure for setting EtherCAT forced DO

When H0d.17 is set to 4, 60FE (Digital output) can be used to forcibly set the DO terminal level through EtherCAT communication, regardless of the internal DO status of the drive.

bit	Related DO	Output mask: 60FE.02h	Physical output: 60FE.01h
16	DO1	1: DO1 forced output enabled	DO1 forced output (0: OFF, 1: ON)
17	DO2	1: DO2 forced output enabled	DO2 forced output (0: OFF, 1: ON)
18	DO3	1: DO3 forced output enabled	DO3 forced output (0: OFF, 1: ON)

When H0d.17 is set to 4 and any bit among bit16...bit18 of 60FE.02h is set to 1, the corresponding forced DO is OFF.

H0b.05 is used to monitor the DO level status. The keypad displays the level, and the value of H0b.05 (monitored DO signal) read in the software tool is hexadecimal.

Example: To make the output levels of DO1...DO3 be forcibly set by the bus, in which DO1 outputs low level and DO2 to DO3 output high level, set as follows:

Set H0d.17 to 4, 60FE.02h to 0x00070000, and 60FE.01h to 0x00060000. Monitor the DO level status through H0b.05 (Monitored DO signal). The keypad displays as follows.

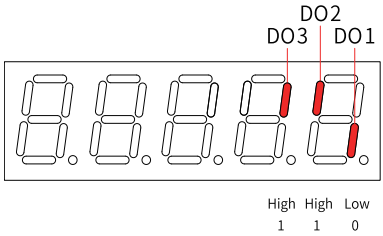


Figure 1-15 Display of H0b.05 when DO signals are controlled by EtherCAT

- Exit
  The forced DO output is not retentive upon power-off. Normal DO functions are restored after restart, or you can set H0d.17 (200d.12h) to 0 to return to the normal DO mode.

User password

After the user password (H02.30) is activated, only authorized operators can set parameters.

Set bit5 of H0A. 71 to 1. After setting the user password, you can't view and change the parameters after H02 group through the panel and Inovance servo commissioning platform.

- Setting the user password
  The following figure shows how to set the user password to "00001".

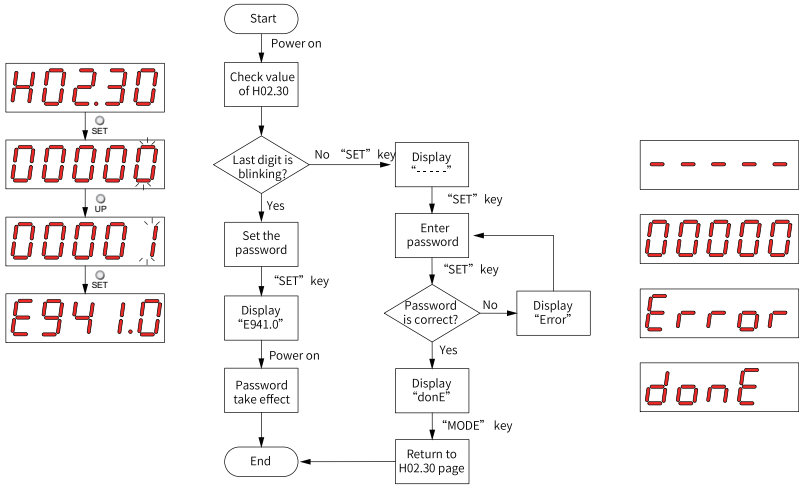


Figure 1-16 Procedure for setting the user password

To change the user password, input current password first to authorize the access to parameter setting. Next, enter H02.30 again to set a new password based on the procedure shown in the preceding figure.

Note

If the last bit does not blink, the access to parameters is password protected. If the last bit blinks, password is not needed or the password entered is correct.

- Canceling user password
  Enter the set user password, and set H02.30 to "00000" to cancel the user password.

1.2 Commissioning Software

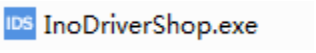
1.2.1 Overview

The software tool InoDriverShop can be downloaded from *http://www.inovance.com*.

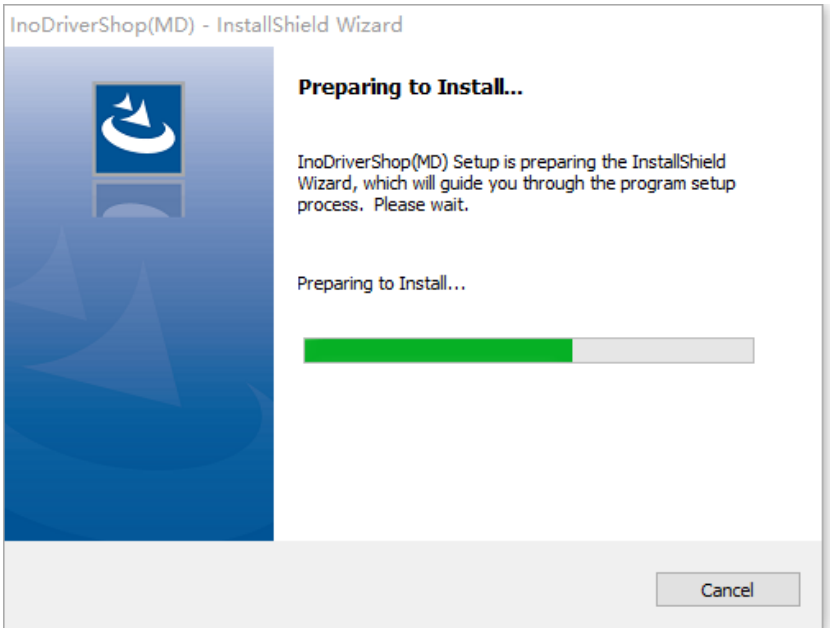
Use an S6-L-T00-3.0 communication cable for communication between the drive and the PC.

InoDriverShop supports 32-bit/64-bit Windows 7 and 64-bit Windows 10 operating systems. For details on how to use InoDriverShop, see the help document of InoDriverShop.

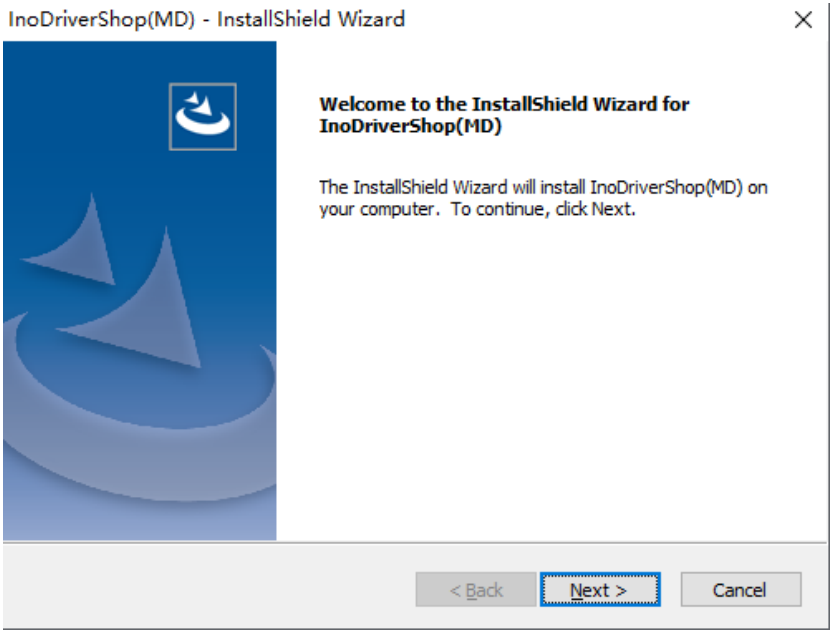
1.2.2 Installation

1. Software
   a. Visit the official website of Inovance as shown below.
   http://www.inovance.com
   b. Choose Support → Download, and then type in the keyword InoDriverShop and click Search.
   c. Click Download.
2. Unzip the package downloaded.
3. Click 

to start installing InoDriverShop.

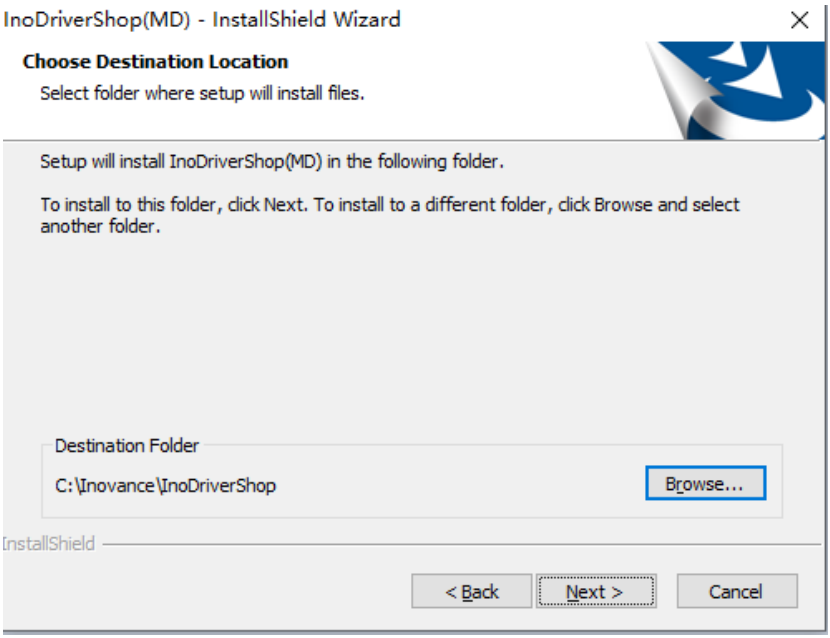


4. Click Next.

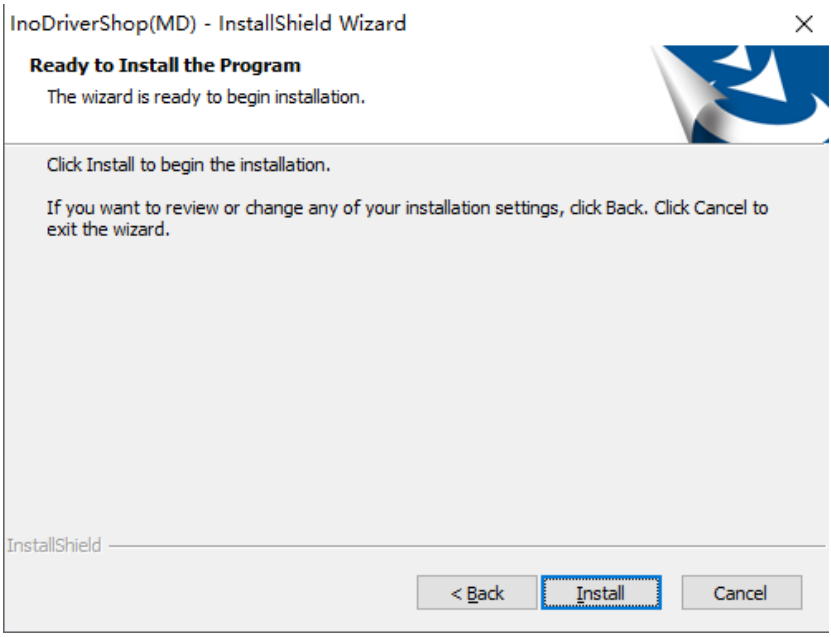


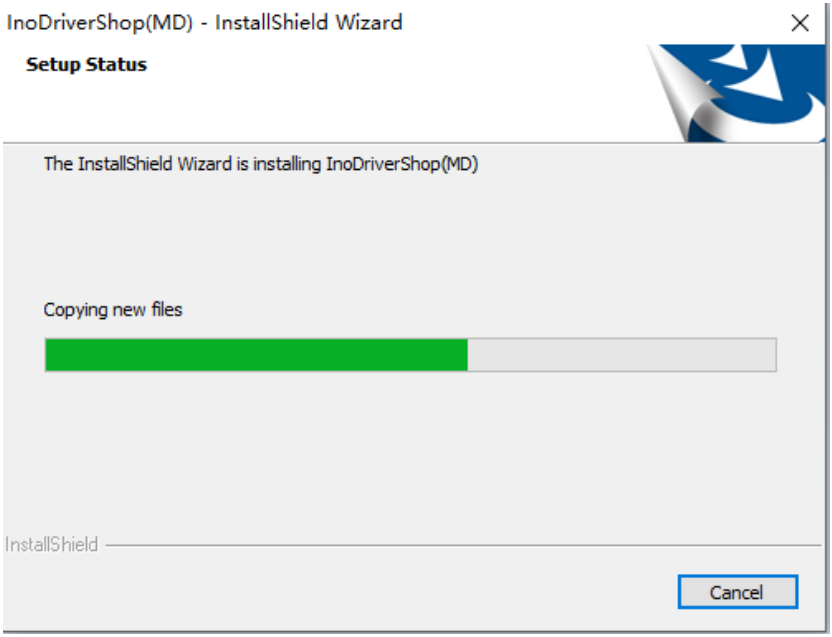
5. You can select the directory for installation as needed through the Browse button. The default directory for installation is "C:\Program Files\Inovance\InoDriverShop". In online upgrade, InoDriverShop will be upgraded directly in the original directory.

   After selecting the directory for installation, click Next.

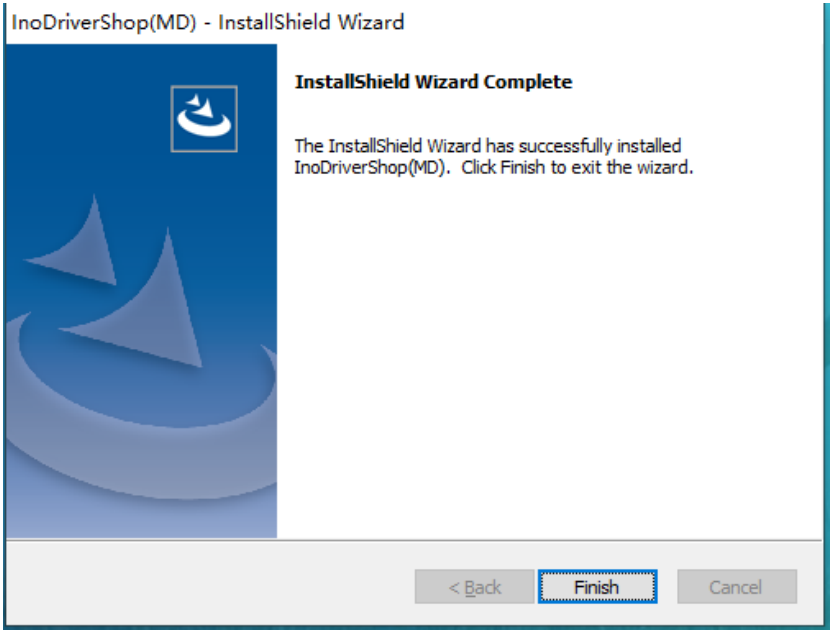


6. Click Install to start installation.





7. After installation is done, click Finish.



8. A shortcut icon for InoDriverShop will be generated automatically on the desktop.



1.2.3 Connection

1. Start InoDriverShop.

   - Double-click  to start the InoDriverShop.
   - If there is no shortcut for InoDriverShop on your desktop, click Start and search for InoDriverShop.

2. Create a project.

   a. Click ① shown in the following figure to create a project.

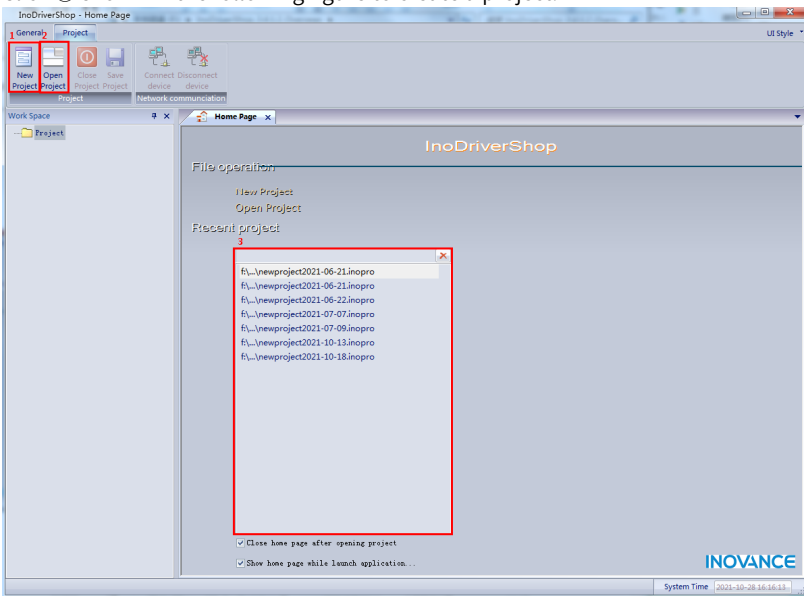


Figure 1-17 Start interface

Note

You can click 2 or 3 shown in the preceding figure to open the project saved before.

---

   b. Open the Project Guide interface.

Click Online or Offline in area ①. Next, click the product series in area ②. Finally, load default communication parameters in area ③ based on the product series selected.



Figure 1-18 Project Guide interface

c. Click Next page to create a project.

- Creating a project for online device brings you to the following interface. The device is scanned automatically. Select the device to be commissioned and click Finish.

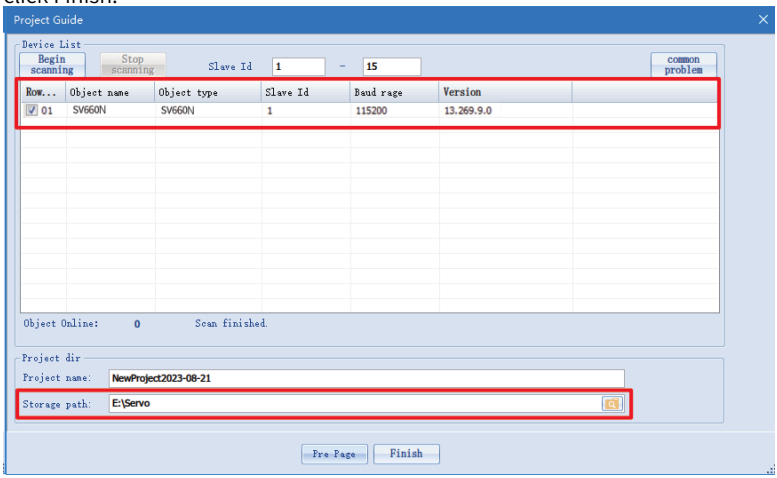


Figure 1-19 Scan interface

- Creating a project for offline device brings you to the following interface. You can select the Slave ID, Object Type, and Software Version as needed and add different standards or customized devices. You can also designate the directory for storage or create multiple offline devices.

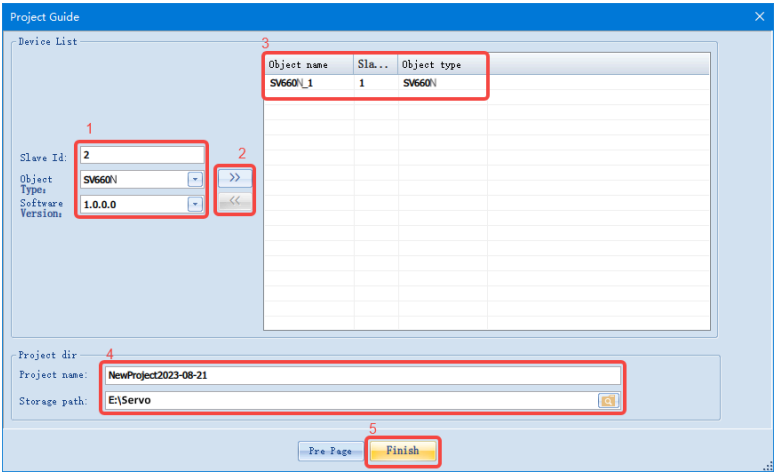


Figure 1-20 Project Guide interface for offline device

Note

① Station No., ④ Project name, and the storage directory can be changed as needed.

d. The project has been created.

3. The main interface is shown as follows.

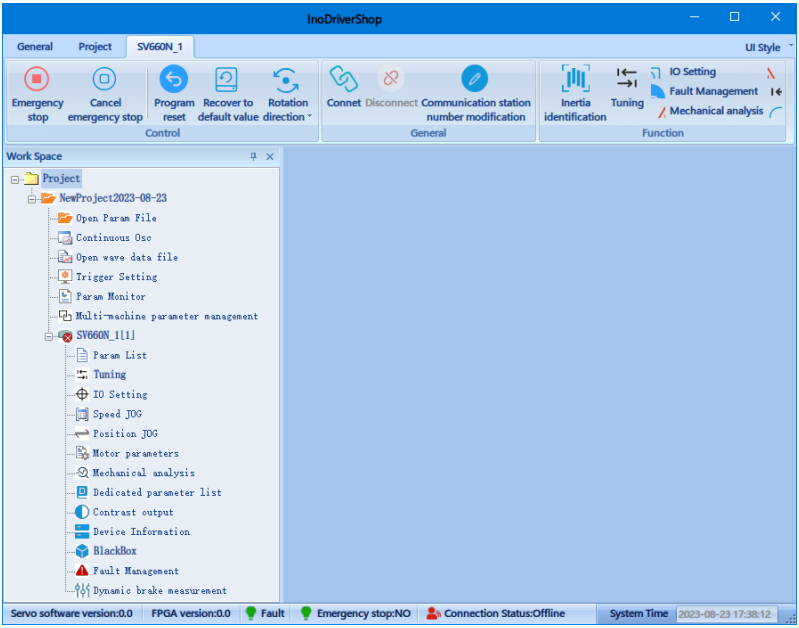
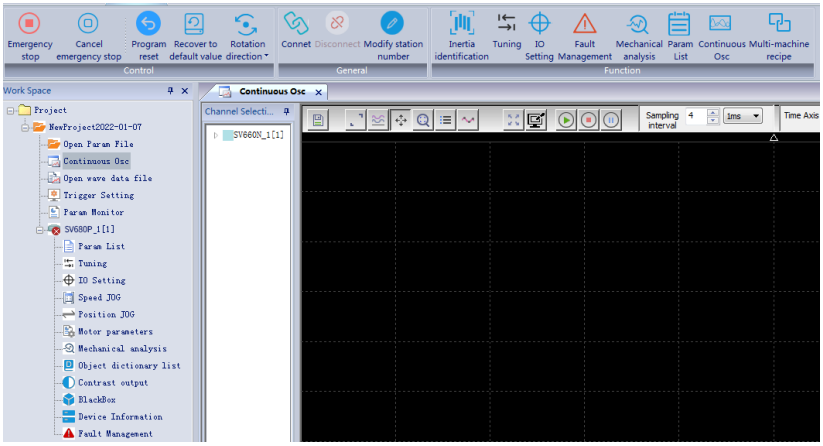


Figure 1-21 Main interface

1.2.4 Introduction to the Software Tool

InoDriverShop features the following functions:

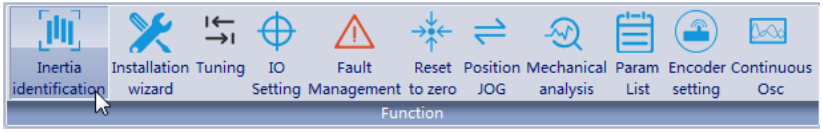
- Oscilloscope: Detects and saves the instantaneous data during operation.

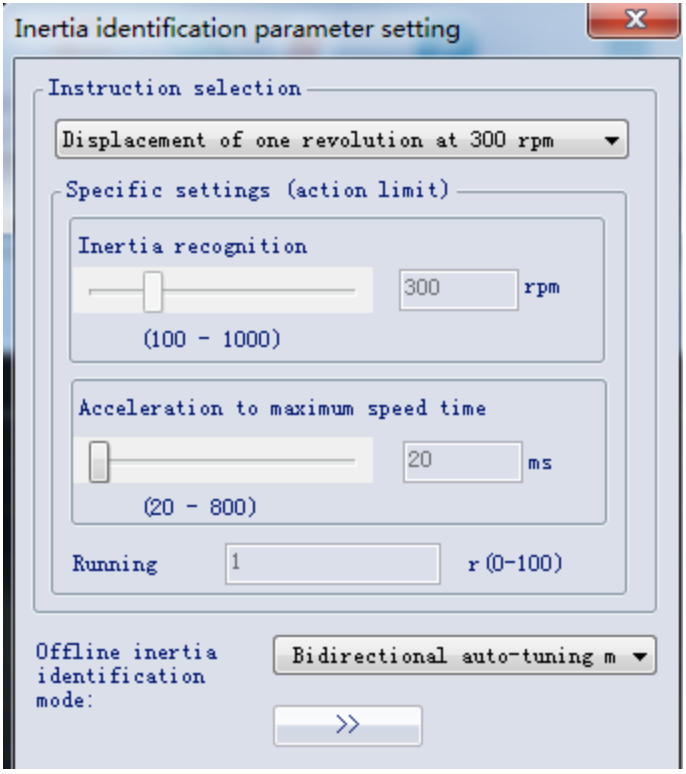


- Parameter management: Reads and downloads parameters in batches.

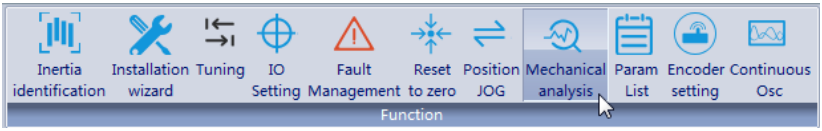


- Inertia auto-tuning: Generates the load inertia ratio automatically.

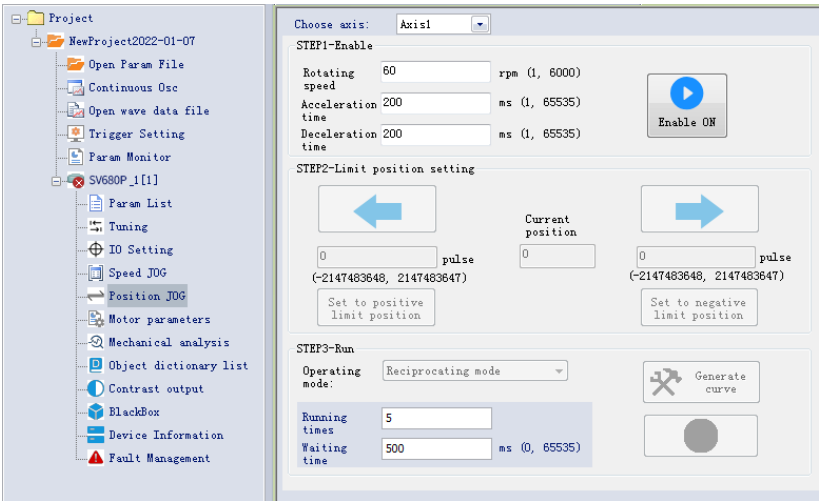




- Mechanical characteristic analysis: Analyzes the resonance frequency of the mechanical system.



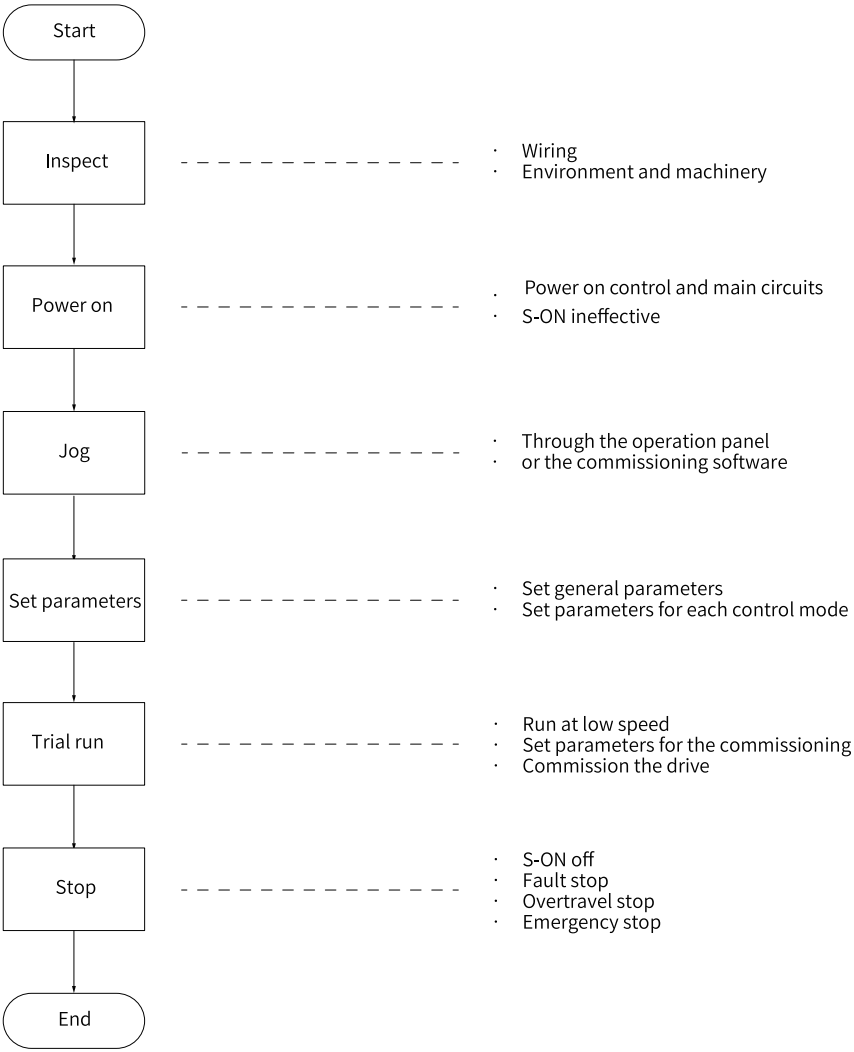
- Motion JOG: Generates position references to make the motor reciprocate.



- Gain tuning: Adjusts the stiffness level and monitors the motion data.

2 Commissioning and Operation

2.1 Commissioning Flowchart



2.2 Inspection Before Commissioning

Check the following items before commissioning the servo drive and the servo motor.

Table 2–1 Checklist

Log	No.	Description
Wiring		
☐	1	The power input terminals (L1, L2/L1, L2, L3/L1C, L2C/R, S, T) of the servo drive are connected properly.
☐	2	The main circuit cables (U, V, W) of the motor are connected to the U/V/W terminals of the drive correctly.
☐	3	No short circuit exists in the power input terminals (L1, L2/L1, L2, L3/R, S, T) or main circuit output terminals (U, V, W) of the servo drive.
☐	4	The signal cables of the servo drive are connected correctly. The external signal cables such as the brake cable and the overtravel protection cable are connected reliably.
☐	5	The servo drive and servo motor are grounded properly.
☐	6	The stress suffered by the cable is within the specified range.
☐	7	All the wiring terminals are insulated properly.
Environment and Mechanical Conditions		
☐	1	There are no unwanted objects (such as cable terminals and metal chippings) that may cause short circuit of the signal cable and power cable inside or outside the servo drive.
☐	2	The servo drive and the external regenerative resistor are placed on incombustible objects.
☐	3	The servo motor is installed properly. The motor shaft is connected to the machine securely.
☐	4	The servo motor and the connected machine are in good condition and ready to run.

2.3 Power-on

1. Switching on the input power supply

- The power input terminals for a single-phase 220 V power supply are L1 and L2.
- The power input terminals for a three-phase 220 V power supply are L1/L2/L3 (main circuit power input terminals) and L1C/L2C (control circuit power input terminals).
- The power input terminals for a three-phase 380 V power supply are R/S/T (Main circuit power input terminals) and L1C/L2C (control circuit power input terminals).

After the power supply is switched on, if the bus voltage indicator is in the normal state and the keypad displays "reset"→"ry" in sequence, the servo drive is ready to run and waits for the S-ON signal.

Note

- If the operation panel keeps displaying "nr", rectify the fault according to the Troubleshooting Guide.
- If the operation panel keeps displaying any other fault, rectify the fault according to the Troubleshooting Guide.

2. Turn off the servo ON signal.
   Deactivate the S-ON signal sent from the host controller when switching the servo status.

2.4 Jog



When using the jog function, set the S-ON signal to OFF. Otherwise, this function cannot be used.

The jog function can be used in trial run to check whether the motor rotates properly, without abnormal vibration or noise generated during rotation. This operation can be performed via the keypad in speed mode, Inovance servo commissioning software in speed mode and keypad in position mode.

Note

The acceleration and deceleration time constants of speed and position references can be set through H06.12 during jogging.

Using the keypad (speed control mode)

- Commissioning Steps

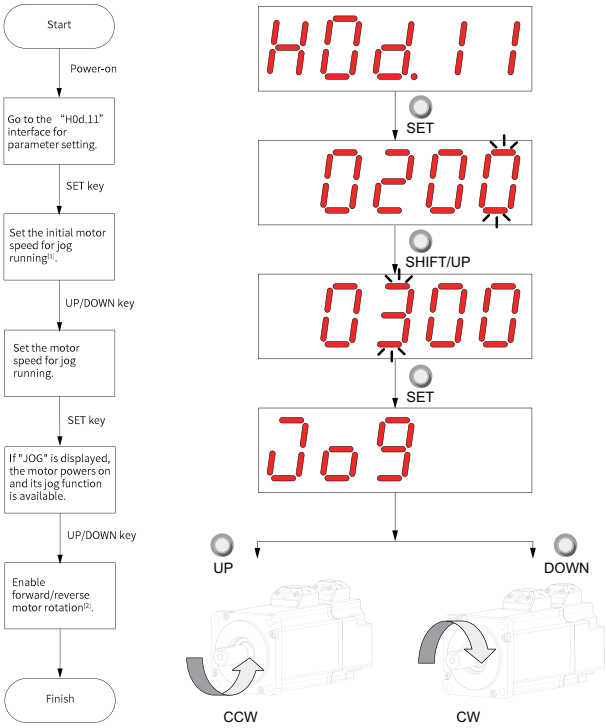


Figure 2-1 Procedure for setting the jog function

Note

- [1]: Press the UP or DOWN key to increase or decrease the jog speed. After exiting from the jog mode, the motor reverts to the initial speed.
- [2]: Press the UP or DOWN key to make the motor rotate forwardly or reversely. After you release the key, the motor stops immediately.

- Procedure:

  1. Enter the jog mode by setting H0d.11 through the keypad.

     The keypad displays the default jog speed at this moment.
  2. Adjust the jog speed through the UP/DOWN key and press the SET key to enter the jog state.

     The keypad displays "JOG" at this moment, and the motor is energized.
  3. Hold the UP/DOWN key down to make the motor jog forwardly or reversely.
  4. Press the MODE key to exit the jog mode and return to the upper-level menu.

Jogging through the software tool

Procedure:

1. Open the Speed JOG interface in the software tool.
2. Set the jog speed.
3. After switching the servo status to ON, press the forward/reverse arrow displayed on the interface to switch between forward and reverse jog.

Using the keypad (position control mode)

Procedure:

1. Enter the jog mode by setting H0d.08 through the keypad.
   The keypad displays the default jog speed at this moment.
2. Adjust the jog speed through the UP/DOWN key and press the SET key to enter the jog state.
   The keypad displays "JOG-P" at this moment, and the motor is energized.
3. Hold the UP/DOWN key down to make the motor jog forwardly or reversely.
   Press the MODE key to exit from jogging and return to the previous menu.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H06.12	2006-0Dh	Acceleration ramp time of jog speed	0ms to 65535ms	10	ms	Real-time	*" H06_en.12" on page 178*

2.5 Setting Parameters

Rotation direction selection

Set H02.02 (2002.03h) (Direction of rotation) to change the motor direction of rotation without changing the polarity of the input reference.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H00.00	2000-01h	Motor SN	0 to 65535	14101	-	At stop	*" H00_en.00" on page 140*
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	*" H02_en.02" on page 148*

The change of 2002.03h does not affect the pulse output form or the sign (+/-) of monitoring parameter values.

The direction of "forward drive" in overtravel prevention is the same as that defined by H02.02 (2002.03h).

Brake setting

The brake is used to lock the motor position when the servo drive is in the non-operational status, preventing the mechanical load from moving under the influence of gravity or external force.

Caution

- Use the built-in brake for position-lock purpose only. Do not use this brake for any other purposes (such as braking) other than position-lock in the stop state.
- The brake coil has no polarity.
- Switch off the S-ON signal after the motor stops.
- When the motor with brake runs, the brake may generate a click sound, which does not affect its function.
- When brake coils are energized (the brake is released), flux leakage may occur on the shaft end. Pay special attention when using magnetic sensors around the motor.

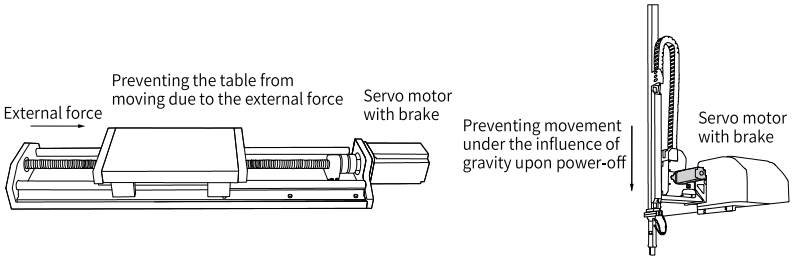


Figure 2-2 Application of the brake

Table 2–2 Brake specifications

Motor Model	Holding Torque (N·m)	Supply Voltage (VDC) ±10%	Rated power (W)	Coil Resistance (Ω)±7%	Exciting Current (A)	Release Time (ms)	Apply Time (ms)	Backlash (°)
MS1H1-05B/10B MS1H4-10B	0.32	24	6.1	94.4	0.25	⩽ 20	⩽ 40	⩽ 1.5
MS1H1-20B/40B MS1H4-20B/40B	1.5		7.6	75.79	0.32	⩽ 20	⩽ 60	⩽ 1.5
MS1H1-75B/10C MS1H4-75B/10C	3.2		10	57.6	0.42	⩽ 40	⩽ 60	⩽ 1
MS1H2-10C/ 15C/20C/25C	8		17.6	32.73	0.73	⩽ 40	⩽ 100	⩽ 1
MS1H2-30C/ 40C/50C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-85B/ 13C/18C	16		24	24	1	⩽ 60	⩽ 120	⩽ 1
MS1H3-29C/ 44C/55C/75C	50		31	18.58	1.29	⩽ 100	⩽ 200	⩽ 1

Note

- Do not use a holding brake for braking.
- The release time and operation time of the brake depend on the discharge circuit. Be sure to confirm the operation delay of your equipment before use.
- You need to prepare the 24 VDC power supply yourself.

- Brake software setting
  For the motor with brake, assign FunOUT.9 (BK, brake output) to DO3 (default DO terminal) and set the active logic of DO3.

  ☆ Related parameters:

Code	Parameter Name	Function Name	Function
FunOUT.9	BK	Brake output	Inactive: The brake power supply is switched off and the brake applies. In this case, the motor is locked. Active: The brake power supply is switched on and the brake is released. In this case, the motor can rotate.

  The operating sequences of the brake are different in the normal state and fault state.

- Brake sequence in normal state

The brake sequence in the normal state is further divided into the following two types:

- Standstill: The actual motor speed is lower than 20 RPM.
- Rotating: The motor speed is equal to or higher than 20 RPM.

- Brake sequence for motor at standstill
  If the servo enabling (S-ON) signal changes from ON to OFF, and the present motor speed is lower than 20 RPM, the servo drive acts according to the brake time sequence in the static state of the motor.



- After the brake output signal changes from "OFF" to "ON", do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- When the motor is used to drive a vertical axis, the motion part may move slightly under the influence of gravity or external force. If the S-ON signal is switched off, the brake output is set to "OFF" immediately when the motor is at standstill. However, within the time defined by H02.10, the motor is still energized, preventing the load from moving under the influence of gravity or external force.

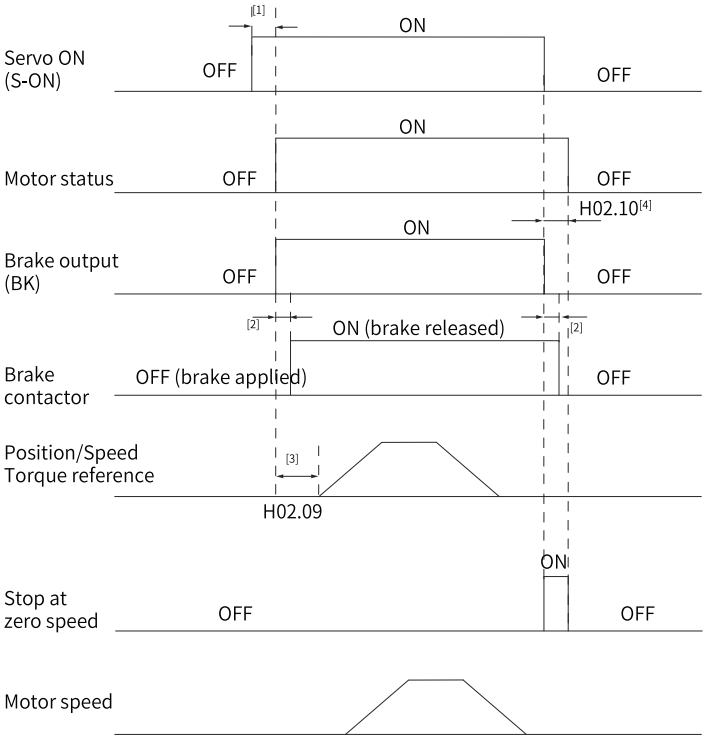


Figure 2-3 Brake sequence for motor at standstill

Note

- When the S-ON signal is switched on, the brake (BK) output signal is set to "ON" at a delay of about 100 ms, and the motor is energized at the same time.
- For delay of brake contactor actions, see *"Table 2–2 " on page 48*.
- The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- When the S-ON signal is switched off with motor at standstill (motor speed lower than 20 rpm), the brake output is set to "OFF". You can set in H02.10 the delay of the motor in entering the de-energized state after the brake output is set to "OFF".

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.09	2002-0Ah	Delay from brake output ON to command received	0ms to 500ms	250	ms	Real-time	" H02_en.09" on page 153
H02.10	2002-0Bh	Delay from brake output OFF to motor de-energized	50ms to 1000ms	150	ms	Real-time	" H02_en.10" on page 153

- Brake sequence for motor in the rotation state
  If the S-ON signal changes from ON to OFF, and the present motor speed is equal to or higher than 20 RPM, the servo drive acts according to the brake time sequence in motor rotating state.

Caution

- When the S-ON signal is switched on, do not input a position/speed/torque reference within the time defined by H02.09. Otherwise, reference loss or an operation error may occur.
- If the S-ON signal is switched off when the motor is still rotating, the motor ramps to stop as defined by 6085h, but the brake (BK) output can be set to "OFF" only when one of the following conditions is met:
  - The motor has decelerated to the value defined by H02.11, but the time defined by H02.12 is not reached.
  - The time defined by H02.12 has been reached, but the motor speed is still higher than the value defined by H02.11.
- After the brake (BK) output signal changes from ON to OFF, the motor remains energized within the time defined by H02.10, preventing the motion part from moving under the influence of gravity or external force.

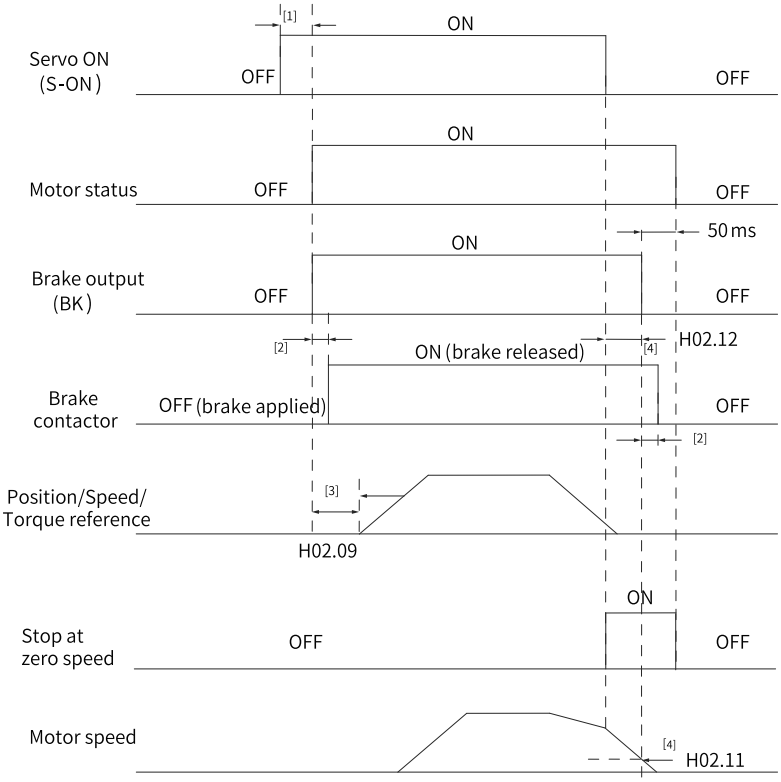


Figure 2-4 Brake sequence for a rotating motor

Note

- When the S-ON signal is switched on, the brake (BK) output signal is set to "ON" at a delay of about 100 ms, and the motor is energized at the same time.
- For delay of brake contactor actions, see *"Table 2–2 " on page 48*.
- The interval time, starting from the moment when brake output is set to "ON" to the moment when a command is input, must be higher than the setpoint of H02.09.
- When the S-ON signal is switched off with motor at standstill (motor speed lower than 20 rpm), the brake output is set to "OFF". You can set in H02.10 the delay of the motor in entering the de-energized state after the brake output is set to "OFF".

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	RPM	Real-time	" H02_en.11" on page 154
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1ms to 1000ms	500	ms	Real-time	" H02_en.12" on page 154

- Brake sequence in quick stop
  The status after quick stop can be divided into de-energized or position-lock depending on the stop mode. For the de-energized state (605Ah < 4), the brake (BK) output condition is the same as that in the brake sequence for a rotating motor.

- Brake sequence in the fault state
  Based on stop mode, servo faults are classified into class 1 (No.1) faults and class 2 (No.2) faults. For details, see the Troubleshooting Guide. The brake sequences in the fault state are further divided into the following two types:

  - In case of No. 1 faults:
    When a No. 1 fault occurs and the brake is enabled, the stop mode is forced to "Stop by DB, keeping dynamic braking status". The condition for brake output is the same as the brake sequence for the motor in the rotation state.

  - In case of No. 2 faults:
    When a No. 2 fault occurs and the brake is enabled, the stop mode is forced to "Ramp to stop as defined by 6085h, keeping DB status". The condition for brake output is the same as the brake sequence for the motor in the rotation state.

Note

Recommended setpoint: When the brake is used, the setpoint of 6085h (Stop deceleration) must meet the following requirement: Deceleration time ＜ H02.12 If the preceding requirement is not fulfilled, the deceleration command will be generated based on H02.12.

Braking settings

When the motor torque direction is opposite to the direction of rotation, the energy is fed back to the servo drive from the motor side, leading to bus voltage rise. Once the bus voltage rises to the braking threshold, the excessive energy must be consumed by

a regenerative resistor. Otherwise, the servo drive will be damaged. The regenerative resistor can be a built-in or an external one. The internal and built-in regenerative resistors must not be used together. Specifications of the regenerative resistor are as follows.

Table 2–3 Specifications of the regenerative resistor

Servo Drive Model	Specifications of Built-in Regenerative Resistor			External regenerative resistor Min. Allowable Resistance (Ω) (H02.21)
	Resistance (Ω)	Power (Pr) (W)	Processing Power (Pa) (W)	
SV660NS1R6I	-	-	-	50
SV660NS2R8I	-	-	-	45
SV660NS5R5I	50	50	25	40
SV660NS7R6I	25	80	40	20
SV660NS012I				15
SV660NT3R5I	100	80	40	80
SV660NT5R4I	100	80	40	60
SV660NT8R4I	50	80	40	45
SV660NT012I				40
SV660NT017I	35	100	50	35
SV660NT021I				25
SV660NT026I				

Note

The built-in regenerative resistor is not available in S2R8 models. For these models, you can install an external regenerative resistor as needed.

- Without external load torque
  The kinetic energy generated upon braking of a reciprocating motor is converted into electric energy that fed back to the bus capacitor. When the bus voltage rises above the braking voltage threshold, the regenerative resistor starts consuming the excessive energy fed back by the motor. The following figure shows the motor speed curve in no-load operation from 3000 rpm to a standstill.

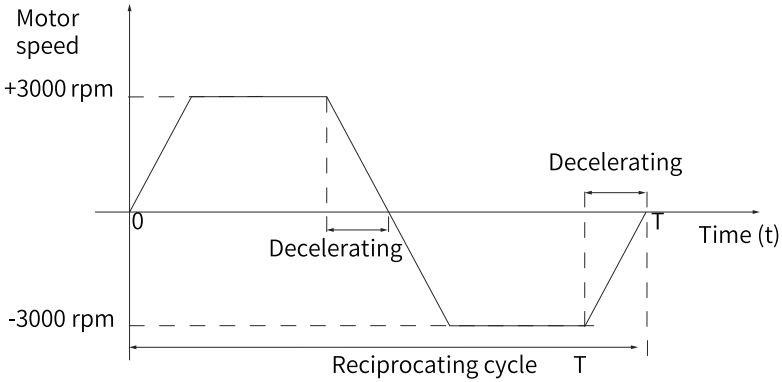


Figure 2-5 Example of motor speed curve (without external load torque)

- Energy calculation
  The built-in regenerative resistor is not available in SV660PS1R6I or SV660PS2R8I models. The energy that can be absorbed by a capacitor is described in section "Wiring and Setting of the Regenerative Resistor" in the Hardware Guide. An external regenerative resistor is needed when the rotational energy of the motor and the load exceeds the values listed in the following table.

Drive Model	Regenerative Energy Can Be Absorbed	Remarks
SV660NS1R6I	13.15	The input voltage of the main circuit power supply is 220 VAC.
SV660NS2R8I	26.29	

  - The following table shows the energy generated by a 220 V motor in decelerating from the rated speed to a standstill during no-load operation.

Table 2–4 220 V motor energy data

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (10^{-4} kgm ^{2})	EO Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by Capacitor E C (J)
0.05	MS1H1-05B30CB-A330Z MS1H1-05B30CB-A332Z	0.026 (0.028)	0.13 (0.14)	7.86
0.1	MS1H1-10B30CB-A330Z MS1H1-10B30CB-A332Z	0.041 (0.043)	0.20 (0.21)	
0.2	MS1H1-20B30CB-A331R MS1H1-20B30CB-A334R	0.0938 (0.106)	0.46 (0.52)	
0.4	MS1H1-40B30CB-A331R MS1H1-40B30CB-A334R	0.145 (0.157)	0.72 (0.78)	15.72
0.55	MS1H1-55B30CB-A331R	0.55	2.72	22.39
0.75	MS1H1-75B30CB-A331R MS1H1-75B30CB-A334R	0.68 (0.71)	3.36 (3.51)	22.39

Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (10^{-4} kgm ^{2})	EO Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by Capacitor E C (J)
1	MS1H1-10C30CB-A331R MS1H1-10C30CB-A334R	0.82 (0.87)	4.05 (4.30)	32.39
1	MS1H2-10C30CB-A331R MS1H2-10C30CB-A334R	1.78 (2.6)	8.80 (12.86)	32.39
1.5	MS1H2-15C30CB-A331R MS1H2-15C30CB-A334R	2.35 (3.17)	11.6 (15.68)	32.39
2.0	MS1H2-20C30CB-A331R MS1H2-20C30CB-A334R	2.92 (3.74)	14.44 (18.49)	32.39
0.85	MS1H3-85B15CB-A331R MS1H3-85B15CB-A334R	13.56 (15.8)	16.45 (17.3)	32.39
1.3	MS1H3-13C15CB-A331R MS1H3-13C15CB-A334R	19.25 (21.5)	22 (22.86)	32.39
0.1	MS1H4-10B30CB-A330Z MS1H4-10B30CB-A332Z	0.102 (0.104)	0.50 (0.51)	7.86
0.2	MS1H4-20B30CB-A331R MS1H4-20B30CB-A334R	0.22 (0.23)	1.09 (1.14)	7.86
0.4	MS1H4-40B30CB-A331R MS1H4-40B30CB-A334R	0.43 (0.44)	2.13 (2.18)	15.72
0.55	MS1H4-55B30CB-A331R	1.12	5.54	22.39
0.75	MS1H4-75B30CB-A331R MS1H4-75B30CB-A334R	1.46 (1.51)	7.22 (7.47)	22.39
1.0	MS1H4-10C30CBA331R MS1H4-10C30CBA334R	1.87 (1.97)	9.25 (9.74)	32.39

- The following table shows the energy generated by a 380V motor in decelerating from the rated speed to a standstill during no-load operation.

Table 2–5 380 V motor energy data

– Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (10^{-4} kgm ^{2})	Braking Energy E O Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by Capacitor E C (J)
1.0	MS1H2-10C30CD-A331R MS1H2-10C30CD-A334R	1.78 (2.6)	8.8 (12.86)	28.18
1.5	MS1H2-15C30CD-A331R MS1H2-15C30CD-A334R	2.35 (3.17)	11.62 (15.68)	34.22
2.0	MS1H2-20C30CD-A331R MS1H2-20C30CD-A334R	2.92 (3.74)	14.44 (18.49)	50.32
2.5	MS1H2-25C30CD-A331R MS1H2-25C30CD-A334R	3.49 (4.3)	17.26 (21.26)	50.32
3.0	MS1H2-30C30CD-A331R MS1H2-30C30CD-A334R	6.4 (9.38)	31.65 (46.38)	50.32

– Capacity (kW)	Servo Motor Model MS1H*-*******-*****	Rotor Inertia J (10^{-4} kgm ^{2})	Braking Energy E_O Generated During Decelerating from Rated Speed to a Standstill (J)	Max. Braking Energy Absorbed by Capacitor E_C (J)
4.0	MS1H2-40C30CD-A331R MS1H2-40C30CD-A334R	9 (11.98)	44.51 (59.24)	82.53
5.0	MS1H2-50C30CD-A331R MS1H2-50C30CD-A334R	11.6 (14.58)	57.36 (72.10)	100.64
0.85	MS1H3-85B15CD-A331R MS1H3-85B15CD-A334R	13.56 (15.8)	16.76 (19.53)	28.18
1.3	MS1H3-13C15CD-A331R MS1H3-13C15CD-A334R	19.25 (21.5)	23.8 (26.58)	34.22
1.8	MS1H3-18C15CD-A331R MS1H3-18C15CD-A334R	24.9 (27.2)	30.78 (33.63)	50.32
2.9	MS1H3-29C15CD-A331R MS1H3-29C15CD-A334R	44.7 (52.35)	55.26 (64.72)	50.32
4.4	MS1H3-44C15CD-A331R MS1H3-44C15CD-A334R	64.9 (72.55)	80.23 (89.69)	82.53
5.5	MS1H3-55C15CD-A331R MS1H3-55C15CD-A334R	86.9 (94.55)	107.43 (116.89)	100.64
7.5	MS1H3-75C15CD-A331R MS1H3-75C15CD-A334R	127.5 (135.15)	157.62 (167.08)	100.64

Note

Values inside the parentheses "()" are for the motor with a brake.

Note

If the total braking time T is known, you can determine whether an external regenerative resistor is needed and the power required using the following flowchart and formula.

- Regenerative resistor selection

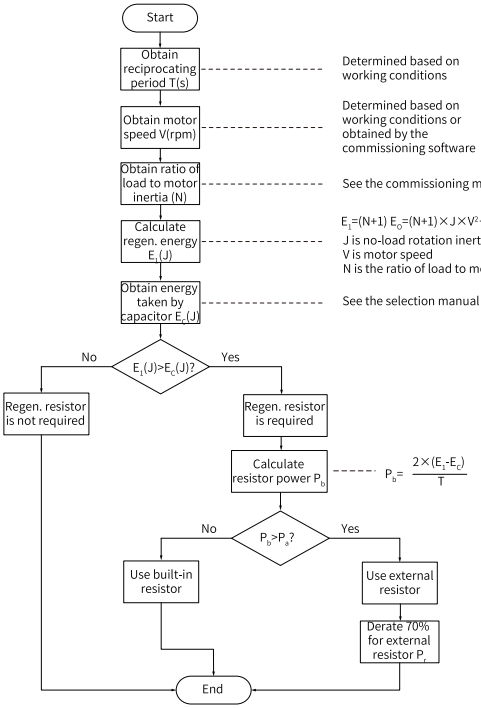


Figure 2-6 Flowchart for selecting the regenerative resistor

Note

- Take the process in which the motor decelerates from 3000 RPM to 0 RPM as an example. Assume that the load inertia is (N x Motor inertia), then the braking energy is (N + 1) x E_O when the motor decelerates from 3000 RPM to 0 RPM. The energy consumed by the braking resistor is (N + 1) x E_O - E_C (E_C represents the energy absorbed by the capacitor). Suppose the reciprocating cycle is T, then the power of the regenerative resistor needed is 2 x [(N + 1) x E_O - E_C]/T. See *"Table 2–4 220 V motor energy data" on page 55* *"Table 2–5 380 V motor energy data" on page 56* for values of E_O and E_C .
- Determine whether to use the regenerative resistor according to the preceding figure and select a built-in or an external regenerative resistor as needed. Then, set H02.25 accordingly.
- The resistor with aluminum case is recommended.
- For the specification of the braking resistor, see *"Table 2–3 Specifications of the regenerative resistor" on page 54*

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.25	2002-1Ah	Regenerative resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	0	-	Real-time	*" H02_en.25" on page 157*

Take the H1 series 750 W model as an example. Assume that the reciprocating cycle (T) is 2s, the maximum speed is 3000 RPM, and the load inertia is (4 x Motor inertia), then the required power of the braking resistor is as follows:

$$P_b = \frac{2\times[(N+1)\times E_O - E_C]}{T} = \frac{2\times[(4+1)\times 6.8 - 22.4]}{2} = 11.6W$$

The calculated result is smaller than the processing capacity (Pa = 40 W) of the built-in regenerative resistor, so a built-in regenerative resistor is enough.

If the inertia ratio in the preceding example is changed to 10 x motor inertia, and other conditions remain the same, the power of the regenerative resistor required will be as follows:

$$P_b = \frac{2\times[(N+1)\times E_O - E_C]}{T} = \frac{2\times[(10+1)\times 6.8 - 22.4]}{2} = 52.4W$$

The calculated result is larger than the processing capacity (Pa = 40 W) of the built-in regenerative resistor, so an external regenerative resistor is needed. so an external braking resistor is required. The recommended power of the external regenerative resistor is Pb/(1 – 70%) = 174.67W.

- Using an external regenerative resistor
  When P_b is greater than P_a, use an external braking resistor. Set H02.25 to 1 or 2 based on the cooling mode of the braking resistor.

  Use the external regenerative resistor with 70% derated, that is, $P_r = P_b/(1 – 70\%)$, and ensure the resistance of the regenerative resistor is higher than the minimum permissible resistance allowed by the servo drive. Remove the jumper bar between terminals P⊕ and D, and connect the external regenerative resistor between terminals P⊕ and C.

  See section "Wiring of the Regenerative Resistor" in the Hardware Guide for the wiring diagram of the external regenerative resistor and the specifications of the jumper bar. Set H02.25 to 1 or 2 based on the cooling mode of the braking resistor.

  ☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.21	2002-16h	Permissible minimum resistance of regenerative resistor	1Ω to 1000 Ω	40	Ω	Unchangeable	" H02_en.21" on page 155
H02.26	2002-1Bh	Power of external regenerative resistor	1W–65535W	40	W	Real-time	" H02_en.26" on page 157
H02.27	2002-1Ch	Resistance of external regenerative resistor	15 Ω to 1000 Ω	50	Ω	Real-time	" H02_en.27" on page 158

Caution

- Set the power (H02.26) and resistance (H02.27) of the external regenerative resistor.
- Ensure the resistance of the external regenerative resistor is higher than or equal to the permissible minimum resistance.
- When the regenerative resistor is used at its rated power rather than the processing power (average value) in environments within the specified temperature range, the temperature of the resistor will rise to above 120°C under continuous braking. To ensure safety, cool the resistor down through forced air cooling, or use the resistor with thermal switch. For the load characteristics of the regenerative resistor, consult with the manufacturer.

Set the heat dissipation coefficient based on the heat dissipation condition of the external regenerative resistor.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.24	2002-19h	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	" H02_en.24" on page 156

Note

Higher resistor heat dissipation coefficient indicates higher braking efficiency.

- Using the built-in braking resistor

When $P_b < P_a$ and $E_1 > E_C$, use the built-in regenerative resistor. In this case, set H02.25 to 0.

When using the built-in regenerative resistor, connect terminals P⊕ and D with a jumper bar.

- Regenerative resistor not needed
  When $E_1 < E_C$, the regenerative resistor is not needed because the braking energy can be absorbed by the bus capacitor. In this case, set H02.25 to 3.

- External load torque applied, motor in generating state
  When the motor direction of rotation is the same with the shaft direction of rotation, the motor outputs energy to the outside. In some applications where the motor direction of rotation is opposite to the shaft direction of rotation, the motor is in the generating state and feeds the electric energy back to the servo drive.

  When the load is in the generating state continuously, it is recommended to adopt the common DC bus mode.

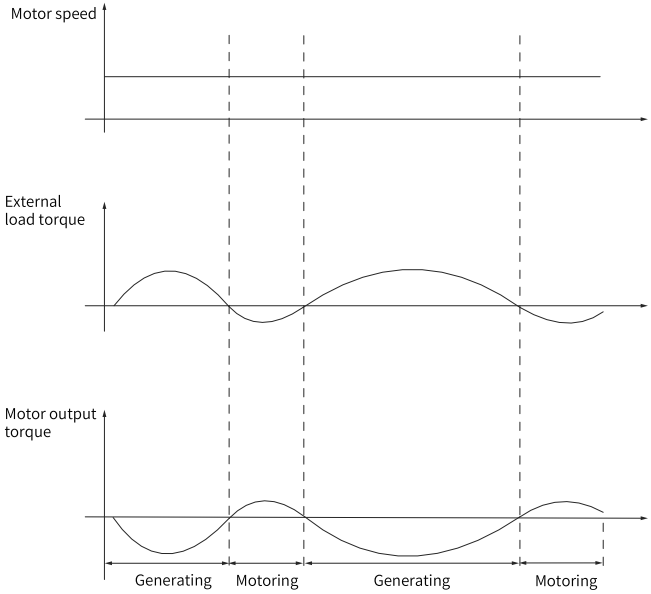


Figure 2-7 Example of the curve with external load torque

Take H1 series 0.75kW models (rated torque: 2.39 N·m) as an example. When the external load torque is 60% of the rated torque and the motor speed reaches 1500 rpm, the power fed back to the drive is (60% x 2.39) x (1500 x 2π/60) = 225 W. As the regenerative resistor needs to be derated by 70%, the power of the external regenerative resistor is 225/(1 – 70%) = 0.75kW, with resistance being 50 Ω.

2.6 Trial Run

Switch on the S-ON signal.

When the S-ON signal is switched on, the keypad displays "rn", but if there is no command input at this moment, the servo motor does not rotate and stays locked. After a reference is input, the motor starts rotating.

Table 2–6 Operation of the servo drive

Log	No.	Description
☐	1	During initial operation, set a proper command to make the motor run at low speed and check whether the motor rotates properly.
☐	2	Observe whether the motor rotating direction is correct. If the direction of rotation is opposite to the expected direction, check the reference signal input and the reference direction setting signal.
☐	3	If the motor rotates in the correct direction, you can view the actual speed in H0b.00 (200b.01h) and the average load rate in H0b.12 (200b.0dh) through the keypad or the software tool.
☐	4	After checking preceding conditions, adjust related parameters to make the motor operate as desired.
☐	5	Perform gain auto-tuning according to section "Adjustment" in the Function Guide.

Power-on sequence diagram

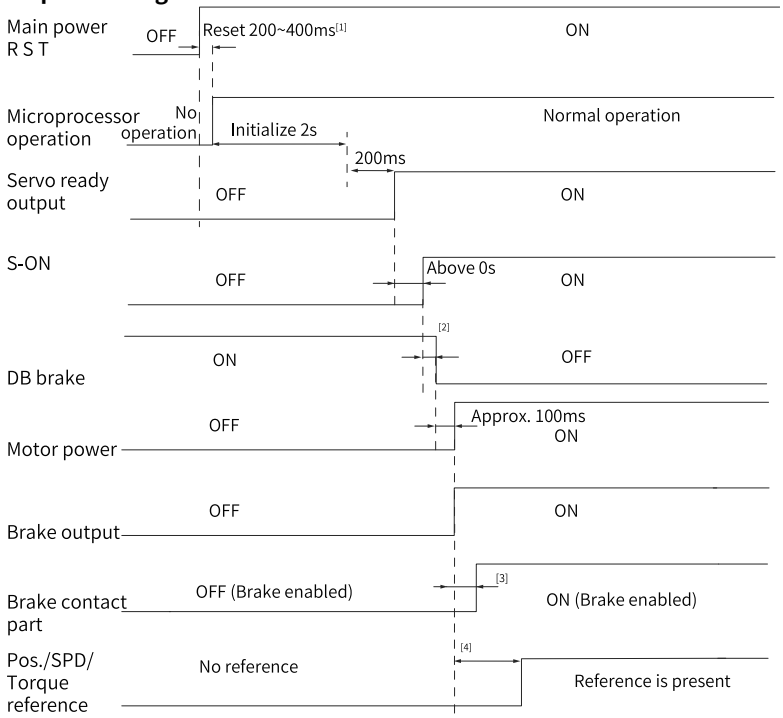


Figure 2-8 Power-on sequence diagram

Note

- [1] The reset time is determined by the setup time of the +5V power supply of the microprocessor.
- [2] The dynamic brake is included in the standard configuration.
- [3] For delay of brake contactor actions, see *"Table 2–2 " on page 48*.
- [4] When FunOUT.9 (BK, brake output) is not used, H02.09 is invalid.

Sequence diagram for stop at warning or fault

- No. 1 fault: Coast to stop, keeping de-energized status

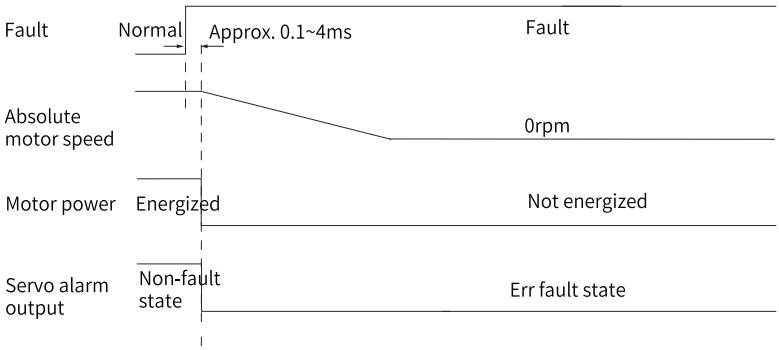


Figure 2-9 Sequence of "Coast to stop, keeping de-energized state" at No. 1 fault

- No. 1 fault (without brake): Dynamic braking stop, keeping de-energized status

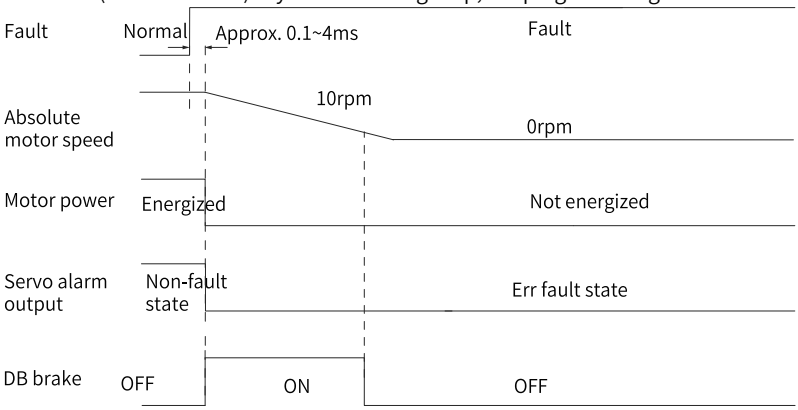


Figure 2-10 Sequence of "Dynamic braking stop, keeping de-energized state" at No. 1 fault

- No .1 fault (with brake): Dynamic braking stop, keeping dynamic braking status

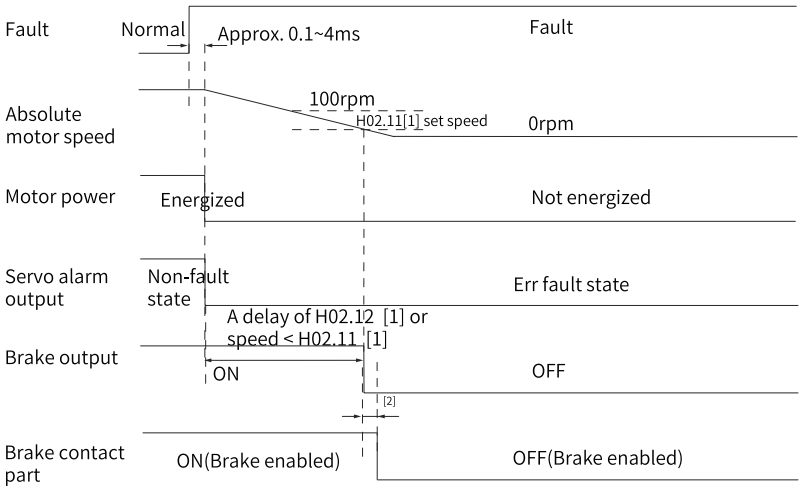


Figure 2-11 Sequence of "Dynamic braking stop, keeping dynamic braking status" at No. 1 fault

Note

- [1] When FunOUT.9 (BK, brake output) is not used, H02.11 and H02.12 are invalid.
- [2] For delay of brake contactor actions, see *"Table 2–2 " on page 48*.

- No. 1 fault (without brake): Dynamic braking stop, keeping dynamic braking status

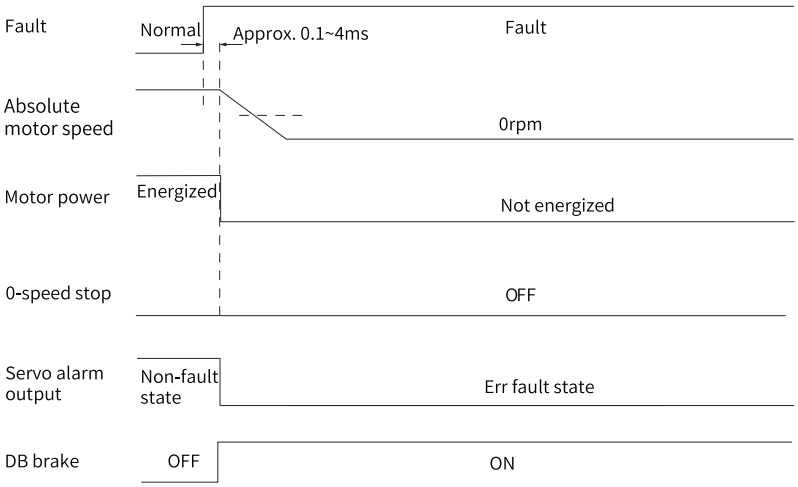


Figure 2-12 Sequence diagram of "Dynamic braking stop, keeping dynamic braking status" at No. 1 fault

- No. 2 fault (without brake): Coast to stop, keeping de-energized status Same as "Coast to stop at No. 1 fault", see *"Figure 2–9 Sequence of "Coast to stop, keeping de-energized state" at No. 1 fault" on page 64*
- No. 2 fault: Dynamic braking stop, keeping dynamic braking status[1]

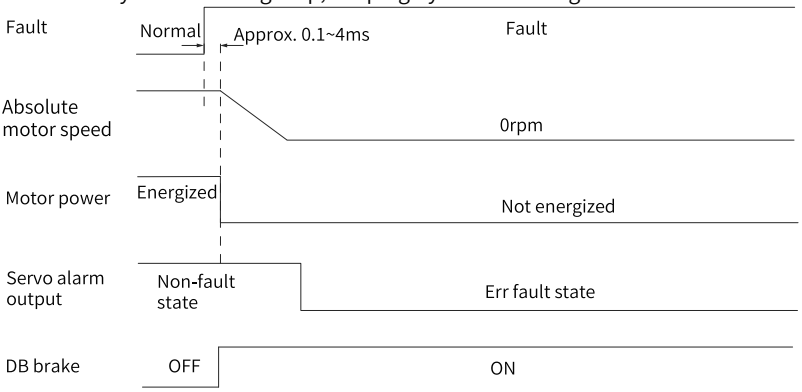


Figure 2-13 Sequence of "Dynamic braking stop, keeping dynamic braking state" at No. 2 fault

Note

After DB is enabled.

- No. 2 fault: Ramp to stop/Stop at emergency-stop torque, keeping de-energized/ dynamic braking status[1]

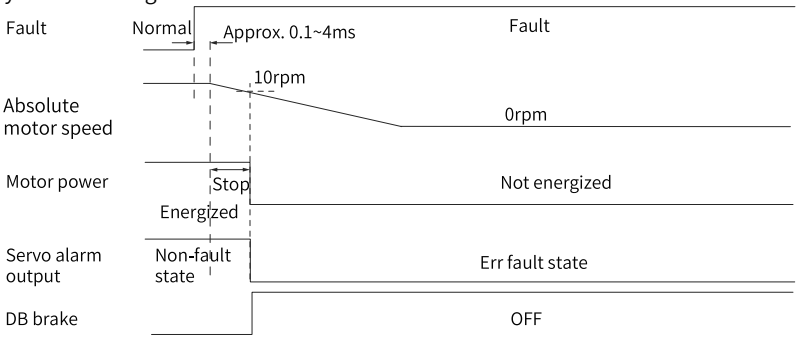


Figure 2-14 Sequence of "Ramp to stop or stop at emergency stop torque, keeping de-energized/DB status" at No. 2 fault (without brake)

Note

After DB is enabled.

- No. 2 fault (with brake): Ramp to stop, keeping dynamic braking status

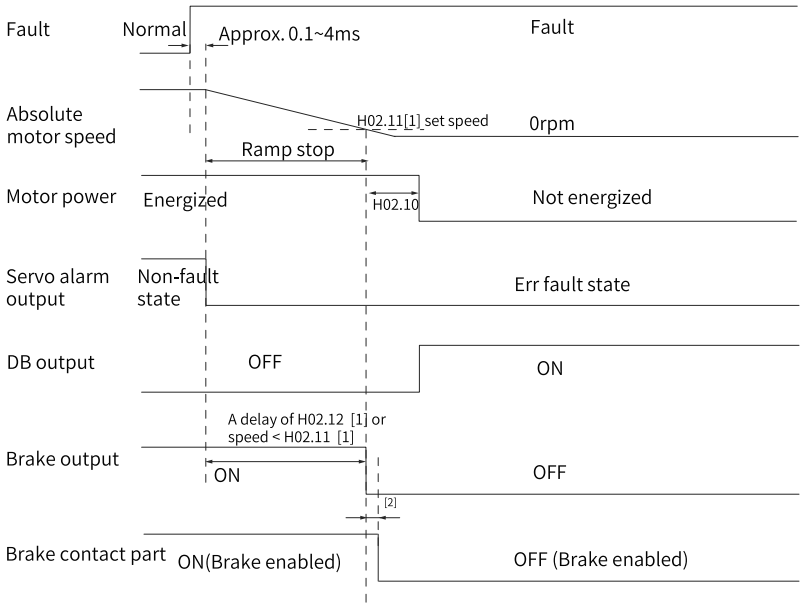


Figure 2-15 Sequence of "Ramp to stop, keeping dynamic braking status" at No. 2 fault (with brake)

Note

- [1] When FunOUT.9 (BK, brake output) is not used, H02.11 and H02.12 are invalid.
- [2] For delay of brake contactor actions, see *"Table 2–2 " on page 48*.

- When a No. 3 warning occurs, such as E950.0 (Forward overtravel warning) and E952.0 (Reverse overtravel warning), the servo drive stops based on the sequence shown below.
- Overtravel warning:
  When the brake function is enabled, the motor ramps to stop as defined by 6085h, keeping position lock status.

  When the brake function is not enabled, the motor stops at zero speed by default, keeping position lock status.

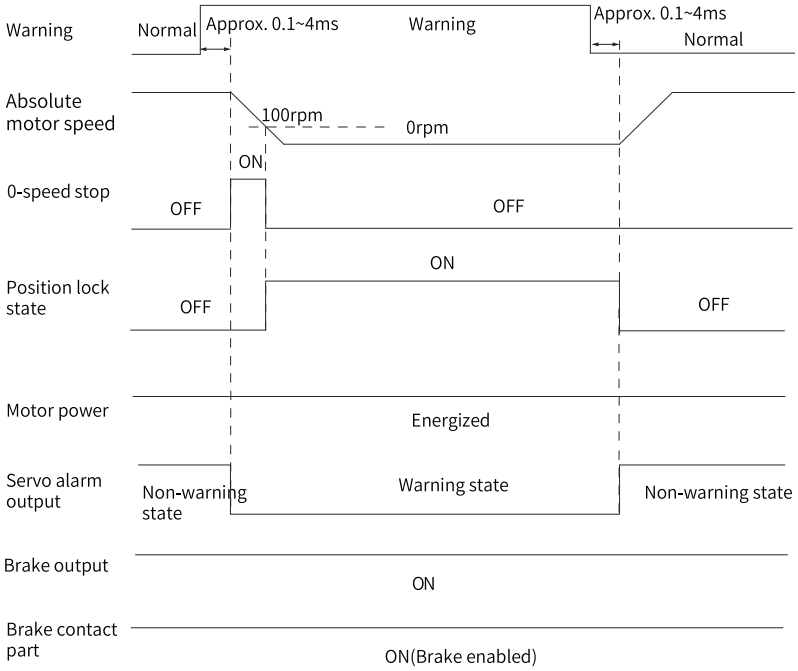


Figure 2-16 Sequence for warnings that cause stop

Note

The other warnings do not affect the operating state of the servo drive. The sequence diagram for these warnings is as follows.

- Warnings that do not cause stop

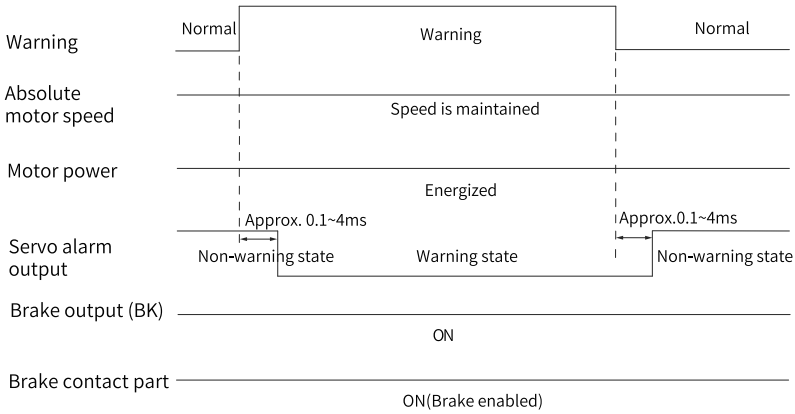


Figure 2-17 Sequence for warnings that do not cause stop

- Fault reset

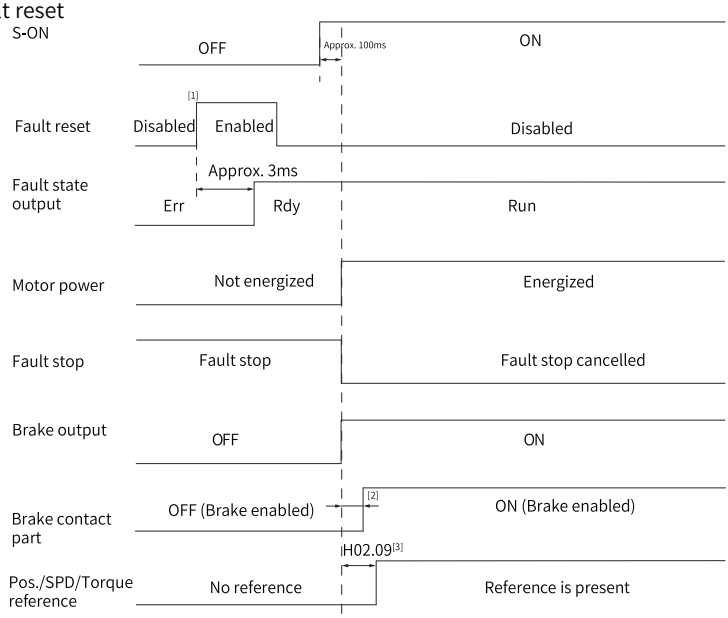


Figure 2-18 Sequence for fault reset

Note

- [1] The fault reset signal is edge-triggered.
- [2] For delay of brake contactor actions, see *"Table 2–2 " on page 48*.
- [3] The command delay is invalid when the brake function is not enabled.

2.7 Servo OFF

A total of three type of stop modes are available for the servo drive: coast to stop, stop at zero speed, and dynamic braking stop, along with three kinds of stop status: de-energized, dynamic braking, and position lock. When brake output is enabled, the stop mode is forcibly set by the drive. If you want to change it, set bit 2 of H0A.71 to 1 as follows:

Table 2–7 Comparison of the stop modes

Stop Mode	Description	Feature
Coast to stop	The motor is de-energized and coasts to 0 RPM. The deceleration time is affected by the mechanical inertia and mechanical friction.	This mode features smooth and slow deceleration with small mechanical shock.
Stop at zero speed	The motor takes 0 RPM as the target speed and decelerates immediately to 0 RPM and stops.	Features quick deceleration with obvious mechanical shock.
Ramp to stop	The motor decelerates to 0 rpm smoothly upon position/speed/ torque reference input.	Features smooth and controllable deceleration with small mechanical shock.
Stop at emergency-stop torque	The servo drive outputs reverse braking torque to stop the motor.	Features quick deceleration with obvious mechanical shock.
Dynamic braking	The servo motor is in the dynamic braking status.	Features quick deceleration with obvious mechanical shock.

Table 2–8 Comparison of the stop status

Stop Status	Description
De-energized	The motor is de-energized and the motor shaft can be rotated freely after the motor stops rotating.
Position Lock	The motor shaft is locked and cannot be rotated freely after the motor stops rotating.
DB state	The motor is de-energized and the motor shaft can be rotated freely after the motor stops rotating.

The stop events can be divided into the following types: stop at S-ON OFF, stop at fault, stop at overtravel, stop at emergency, quick stop, halt, and ramp to stop. See the following descriptions for details.

Stop at S-ON OFF

Switch off the S-ON signal through communication, and the servo drive stops accordingly.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: Stop at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state 2: Stop at zero speed, keeping de-energized state	0	-	At stop	*" H02_en.05" on page 149*
605Ch	605Ch	Stop mode at S-OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	At stop	*" 605Ch" on page 305*

Note

The stop mode can be set in H02.05 or 605Ch. If the value of one changes, the other also changes.

Fault reaction

The stop mode varies according to the fault type. For fault classification, see SV660N Series Servo Drive Troubleshooting Guide.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.06	2002-07h	Stop mode at No.2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah, keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state	2	-	At stop	*" H02_en.06" on page 150*
H02.08	2002-09h	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state1: DB stop, keeping de-energized state2: DB stop, keeping DB state	2	-	At stop	*" H02_en.08" on page 152*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
605Eh	605Eh	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	At stop	*" 605Eh" on page 306*

Note

The "Stop mode at No. 2 fault " can be set in H02.06 or 605Eh. If the value of one changes, the other also changes.

Stop at overtravel

★ Definition of terms:

- "Overtravel": The distance of the mechanical movement exceeds the designed range of safe movement.
- Stop at overtravel: When a motion part moves beyond the range of safe movement, the limit switch outputs a level change signal, and the servo drive forcibly stops the motor.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp, keeping de-energized state 4: Stop based on ramp, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop	" H02_en.07" on page 151

When overtravel occurs on a motor used to drive a vertical axis, the workpiece may fall. To prevent the workpiece from falling, set H02.07 (2002.08h Stop mode at overtravel) to 1 (Stop at zero speed, keeping the position lock status). When the workpiece moves linearly, install the limit switch to prevent mechanical damage. When overtravel occurs, input a reverse running command to make the motor (workpiece) run in the opposite direction.

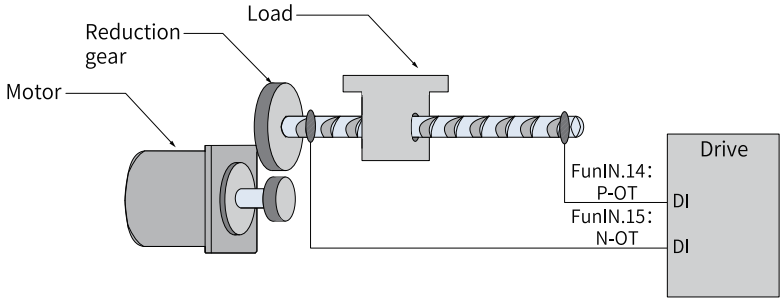


Figure 2-19 Installation of limit switches

To use the limit switches, assign FunIN.14 (P-OT, positive limit switch) and FunIN.15 (N-OT, negative limit switch) to two DIs of the servo drive and set the active logic of these DIs. This is to enable the servo drive to receive the level signals input from the limit switches. The servo drive determines whether to enable the limit switch function based on the state of the DI terminal level.

☆ Related parameters:

Code	Parameter Name	Function Name	Function
FunIN.14	P-OT	Positive limit switch	When the machine moves beyond the specified range, overtravel prevention applies. Inactive: Forward drive permitted Active: Forward drive inhibited
FunIN.15	N-OT	Negative limit switch	When the machine moves beyond the specified range, overtravel prevention applies. Inactive: Reverse drive permitted Active: Reverse drive inhibited

Emergency stop

The servo drive supports two emergency stop modes:

- Using DI function 34: FunIN.34 (EmergencyStop)
- Use the auxiliary emergency stop function in H0d.05 (200D.06h).

☆ Related parameters:

Code	Parameter Name	Function Name	Function
FunIN.34	EmergencyStop	Braking	Inactive: Current operating state unaffected Active: The servo drive stops according to the stop mode defined by 605Ah.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0d.05	200d-06h	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time	*" H0d_en.05" on page 248*

Quick stop

Quick stop applies when bit2 (Quick stop) in the control word 6040h is set to 0 (Valid). The quick stop mode is defined by 605Ah.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
605Ah	605Ah	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state 6: Ramp to stop as defined by 6085h, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	At stop	*" 605Ah" on page 304*

Halt

The halt function applies when bit8 in the control word 6040h is set to 1 (Valid). The halt mode is defined by 605Dh.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
605Dh	605Dh	Halt mode	1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state 2: Ramp to stop as defined by 6085h, keeping position lock state 3: Stop at emergency stop torque, keeping position lock state	1	-	At stop	*" 605Dh" on page 305*



Do not set the acceleration/deceleration time to an excessively low value. An excessively low value will lead to a long stop distance, incurring the risk of collision.

Ramp to stop

When the stop mode is set to "Ramp to stop as defined by 6084h/609Ah (HM)" or "Ramp to stop as defined by 6085h", set the maximum time for ramp-to-stop through H0A.72 (200A.49h) to prevent a long stop distance caused by an excessively small deceleration setpoint. When 6084h/609Ah (HM) or 6085h is set to an excessively small value, the stop deceleration is restricted to the deceleration rate corresponding to H0A.72 (200A.49h).

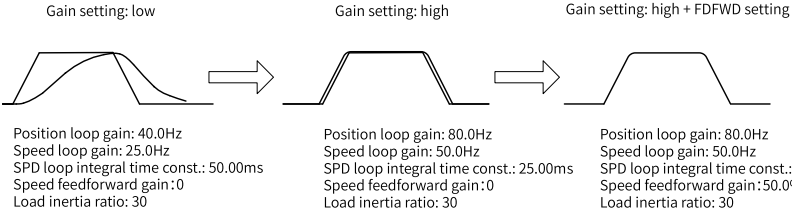
☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0A.72	200A-49h	Maximum stop time in ramp-to-stop	0ms to 65535ms	10000	ms	At stop	*" H0A_en.72" on page 228*

3 Adjustment

3.1 Overview

The servo drive must drive the motor as quick and accurate as possible to follow the commands from the host controller or internal setting. A proper gain tuning is required therefore.



Gains are defined by a combination of multiple parameters that affect each other, including the position loop gain, speed loop gain, filter, and load moment of inertia ratio. The values of these parameters must be balanced against each other during gain tuning.

Note

Before gain tuning, perform a trial run through jogging to ensure the motor operates properly.

The following figure shows the general flowchart for gain tuning.

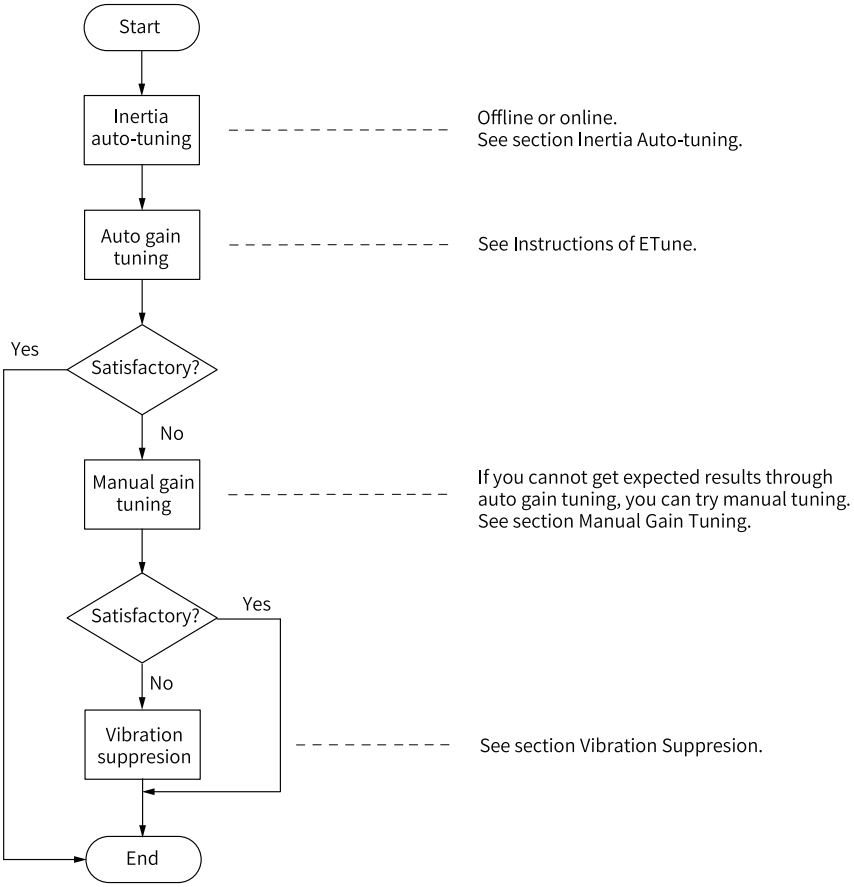


Figure 3-1 Steps

Table 3–1 Description of gain tuning

Steps			Function	Reference
1	Inertia Identification	Offline	The servo drive calculates the load inertia ratio automatically through inertia auto-tuning.	*"3.2.1 Offline Inertia Identification" on page 84*
		Online	The host controller sends a command to make the motor rotate, and the drive calculates the inertia ratio in real time.	*"3.2.2 Online Inertia Auto-tuning" on page 86*
2	Auto Gain Tuning		The servo drive generates a group of gain parameters based on the correct inertia ratio.	*"3.3.1 ETune" on page 88*and *"3.3.2 STune" on page 95*
3	Manual Gain Tuning	Basic gains	If the auto-tuned gain values fail to deliver desired performance, fine-tune the gains manually to improve the performance.	*"3.4.1 Basic Parameters" on page 103*
		Reference filter	Smoothens the position, speed, and torque references.	*"3.4.3 Position reference filter" on page 113*
		Feedforward gain	The feedforward function is enabled to improve the following performance.	*"3.4.4 Feedforward Gain Adjustment" on page 113*
		Pseudo differential regulator	Adjusts the speed loop control mode to improve the anti-interference capability at low frequency range.	*"3.4.5 PDFF Control" on page 116*
		Torque disturbance observer	Improves the resistance against torque disturbance.	*"3.4.6 Torque Disturbance Observer" on page 118*

Steps			Function	Reference
4	Vibration suppression	Mechanical resonance	Enable the notch function to suppress the mechanical resonance.	"3.6.1 Mechanical Resonance Suppression" on page 128
		Low-frequency resonance	Activate the filter for suppressing low-frequency resonance.	"3.6.2 Low-Frequency Resonance Suppression at the Mechanical End" on page 135

3.2 Inertia Identification

The load inertia ratio (2008.10h(H08.15)) is calculated using the following formula.

$$\text{Load inertia ratio} = \frac{\text{Total moment of inertia of mechanical load}}{\text{Motor moment of inertia}}$$

The inertia ratio is an important parameter of the servo system, and quick commissioning can be implemented with the correct setting of this parameter.

You can set the load inertia ratio manually or get the inertia ratio through inertia auto-tuning.

The following two inertia auto-tuning modes are available:

- Offline Inertia Identification
  To enable offline inertia auto-tuning, use 200d.03h (H0d.02: offline inertia auto-tuning) and make the motor rotate and execute inertia auto-tuning through the keypad. Offline inertia auto-tuning does not involve the host controller.
- Online Inertia Auto-tuning
  Send a command to the servo drive through the host controller to make motor act accordingly to finish inertia auto-tuning. Online inertia auto-tuning involves the host controller.

Note

The following requirements must be met to ensure correct calculation of the inertia ratio:

1. The actual maximum speed of the motor is higher than 150 RPM.
2. The actual acceleration rate during acceleration/deceleration is higher than 3000 RPM/s.
3. The load torque is stable without dramatic changes.
4. The actual inertia ratio does not exceed 120.

If the actual inertia ratio is large but the gain is low, the motor may not be able to meet the maximum speed and acceleration requirements as motor actions will be slowed down. In this case, increase the speed loop gain 2008.01h (H08.00) and perform auto-tuning again.

If vibration occurs during auto-tuning, stop inertia auto-tuning immediately and decrease the gains.

Inertia auto-tuning may also fail in case of a large backlash of the transmission mechanism.

3.2.1 Offline Inertia Identification

1. In the parameter display mode, switch to H0d.02 and press the SET key to enable offline inertia auto-tuning.
   Check the following before performing offline inertia auto-tuning:

   The motor travel distance must meet the following requirements:

   - A travel distance of more than one revolutions in the forward/reverse direction is available between the limit switches.
     Before offline inertia auto-tuning, ensure limit switches are installed to the machine and a travel distance of more than one revolutions is reserved for the motor. This is to prevent overtravel during auto-tuning.
   - The required number of revolutions (H09.09) is fulfilled.
     View the value of H09.06 (Maximum speed of inertia auto-tuning), H09.07 (Time constant for accelerating to the maximum speed during inertia auto-tuning), and H09.09 (Number of revolutions per inertia auto-tuning) to ensure the motor travel distance starting from the stop position is larger than the value of H09.09. If the motor travel distance is smaller than the value of H09-09, decrease the value of H09.06 or H09.07 until the requirement is met.
2. Press the UP/DOWN key to perform offline auto-tuning.
   To stop the servo drive, release the UP/DOWN key. To start auto-tuning again, press the UP/DOWN key again. The operating direction at start is determined by the UP/DOWN key. For applications requiring unidirectional movement, set H09.05 to 1.

Increase the stiffness level (H09.01) of the servo drive properly so that the actual motor speed can reach the value defined by H09.06 (Maximum speed for inertia auto-tuning).

The following figure shows general flowchart for offline inertia auto-tuning.

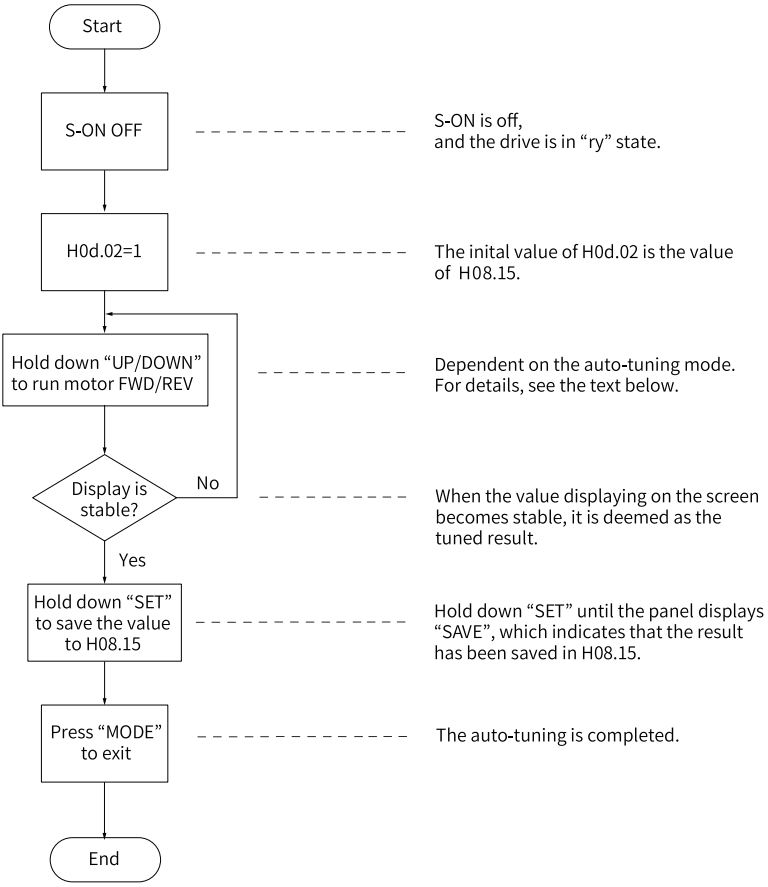


Figure 3-2 Offline inertia auto-tuning flowchart

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.15	2008-10h	Load moment of inertia ratio	0.00 to 120.00	3.00	-	Real-time	*" H08_en.15" on page 193*
H09.05	2009-06h	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop	*" H09_en.05" on page 205*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.06	2009-07h	Max. speed of inertia auto-tuning	100rpm to 1000rpm	500	RPM	At stop	*" H09_en.06" on page 206*
H09.07	2009-08h	Time constant for accelerating to max. speed during inertia auto-tuning	20ms to 800ms	125	ms	At stop	*" H09_en.07" on page 206*
H09.08	2009-09h	Interval time after an individual inertia auto-tuning	50ms to 10000ms	800	ms	At stop	*" H09_en.08" on page 206*
H09.09	2009-0Ah	Number of motor revolutions per inertia auto-tuning	0.00 to 100.00	1.00	-	Real-time	*" H09_en.09" on page 207*

3.2.2 Online Inertia Auto-tuning

The servo drive supports online inertia auto-tuning. The online inertia auto-tuning flowchart is shown as follows.

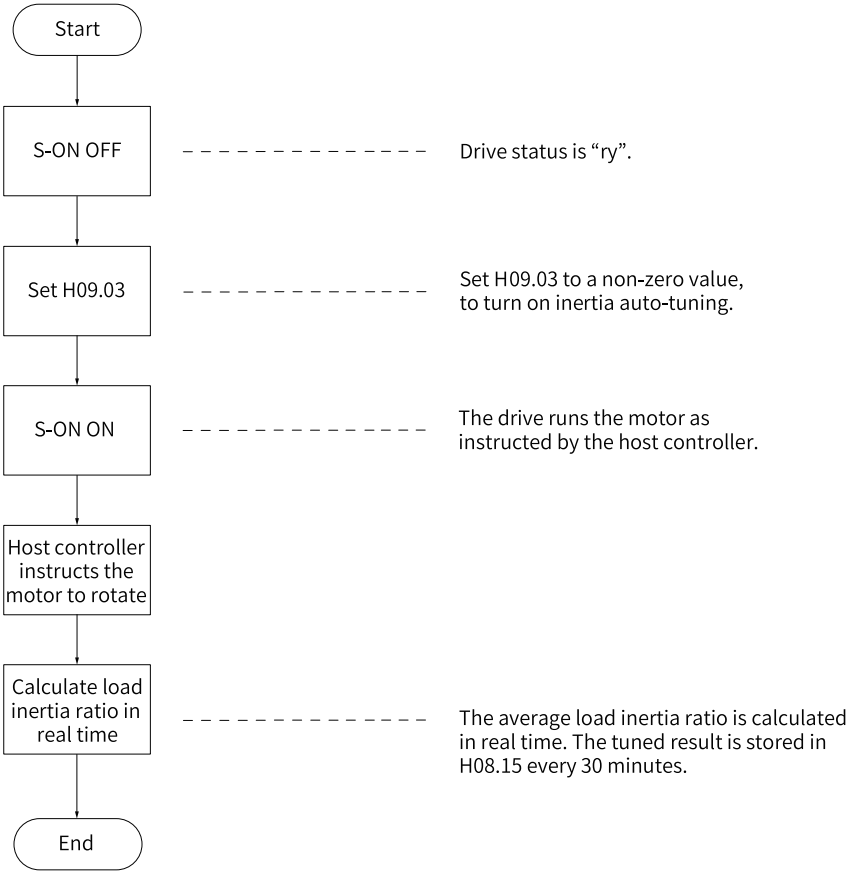


Figure 3-3 Online inertia auto-tuning flowchart

Note

H09.03 defines the real-time updating speed of the load moment of inertia ratio (H08.15).

1. H09.03 = 1: Applicable to cases where the actual load inertia ratio rarely changes, such as machine tools and wood carving machines
2. H09.03 = 2: Applicable to cases where the load inertia ratio changes slowly
3. H09.03 = 3: Applicable to cases where the actual inertia ratio changes rapidly, such as manipulators

Do not use online inertia auto-tuning in applications involving hitting against limit switches and press hitting.

☆Related parameters

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.03	2009-04h	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time	*" H09_en.03" on page 205*

3.3 Auto Gain Tuning

3.3.1 ETune

Overview

ETune is a wizard-type auto-adjustment function used to guide users to set corresponding curve trajectories and response parameters. After the curve trajectories and response parameters are set, the servo drive performs auto-tuning automatically to generate the optimal gain parameters. The auto-tuned parameters can be saved and exported as a recipe for use in other devices of the same model.

The ETune function is intended to be used in applications featuring slight load inertia change.

Description of ITune operation

- **Operation flowchart**

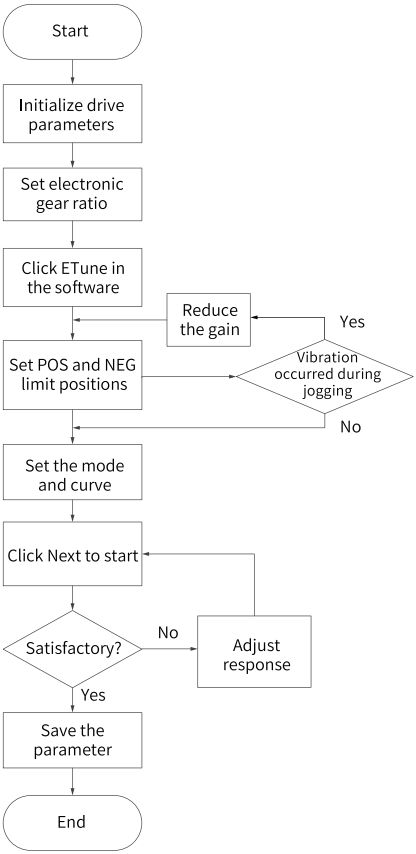
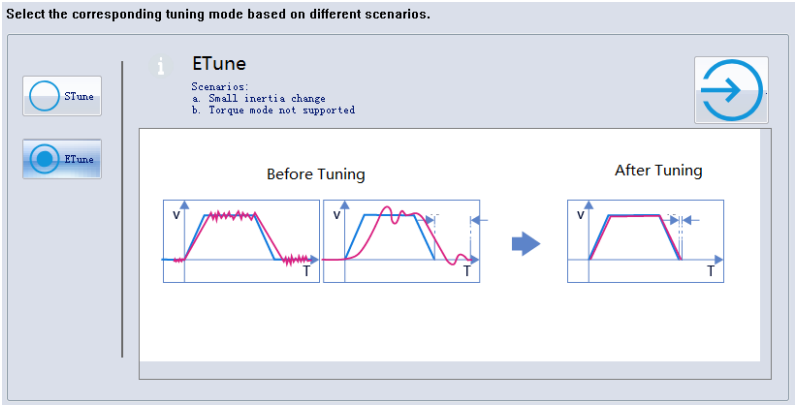


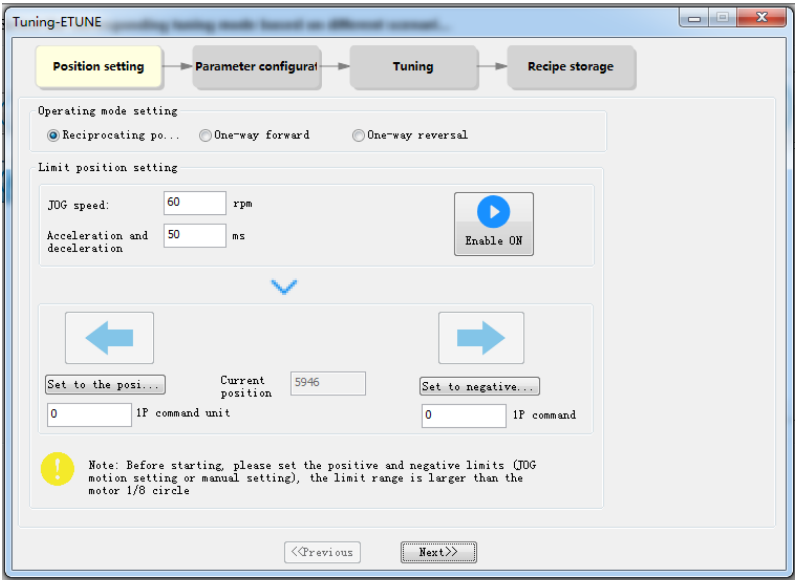
Figure 3-4 Operation flowchart

- **Detailed Description**

  1. Click Usability adjustment in the software tool, and then click ETune.



2. Select any of the following three operation modes based on the operating direction allowed by the machine.
   - In the Reciprocating po... mode, the motor keeps reciprocating within the positive and negative position limits.
   - In the One-way forward mode, the motor takes the difference between the positive and negative position limits as the maximum distance per action and keeps running in the forward direction.
   - In the One-way forward mode, the motor takes the difference between the positive and negative position limits as the maximum distance per action and keeps running in the reverse direction.



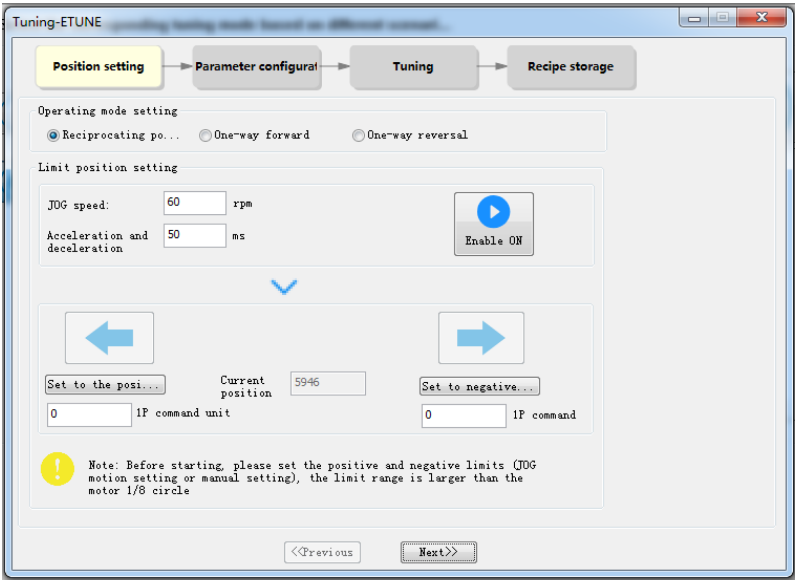
3. Designate the positive and negative limit positions allowed by the motor. The difference between the positive and negative limits defines the position reference pulses for the motor, which is also the value before multiplication/ division by the electronic gear ratio.

   You can set the positive and negative position limits through the following two methods.

   - Method 1: Click "Enable ON", and then click ⬅ to make the motor move to the positive position limit. Next, click "Set to positive limit position". Follow the same procedure for setting the negative position limit, and click "Enable OFF" (the "Enable ON" button turns to "Enable OFF" after a click).
   - Method 2: Enter the positive and negative limits directly.

Note

The difference between the positive and negative position limits must be larger than 1/8 of one revolution. The larger the value of the limit position, the better the adaptability of the auto-tuned parameters, but the longer will ETune adjustment take.

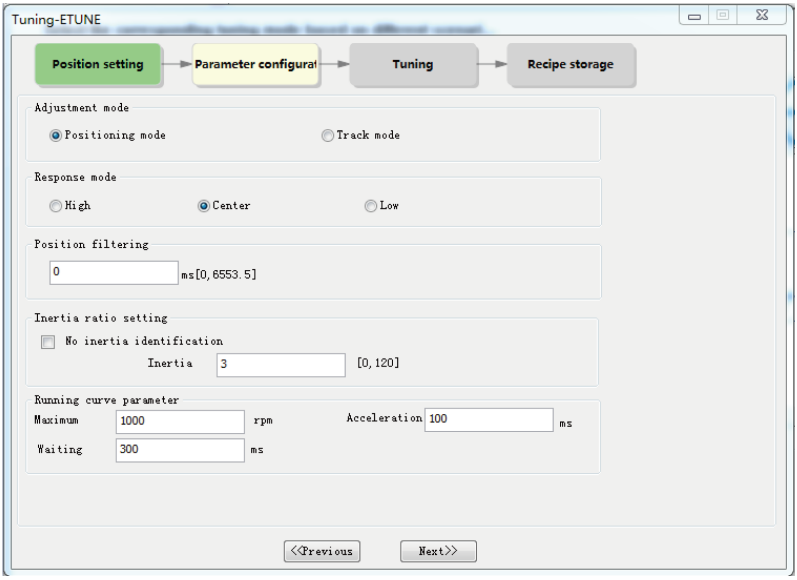


4. Click Next to switch to the mode parameter setting interface.

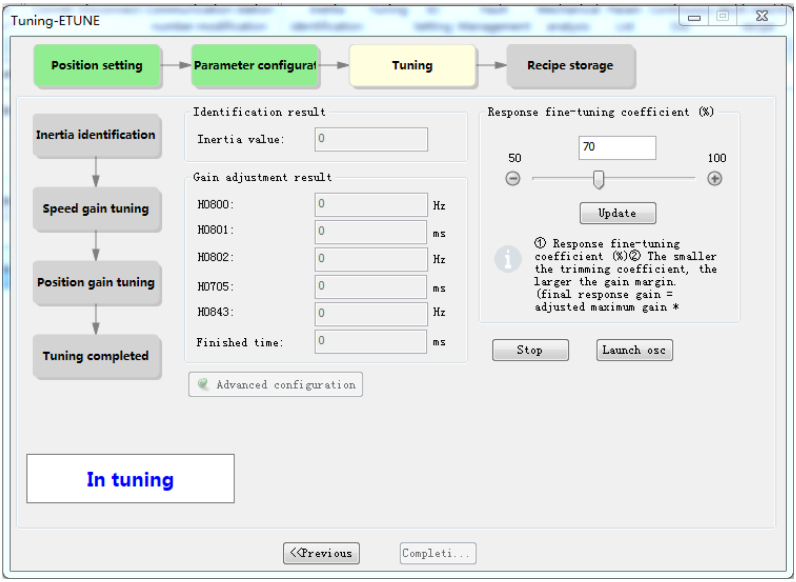
   The adjustment mode is divided into Positioning mode and Track mode.

   Auto-tuning of the inertia ratio is optional. If you choose not to perform inertia auto-tuning, set the correct inertia ratio (the inertia ratio can be

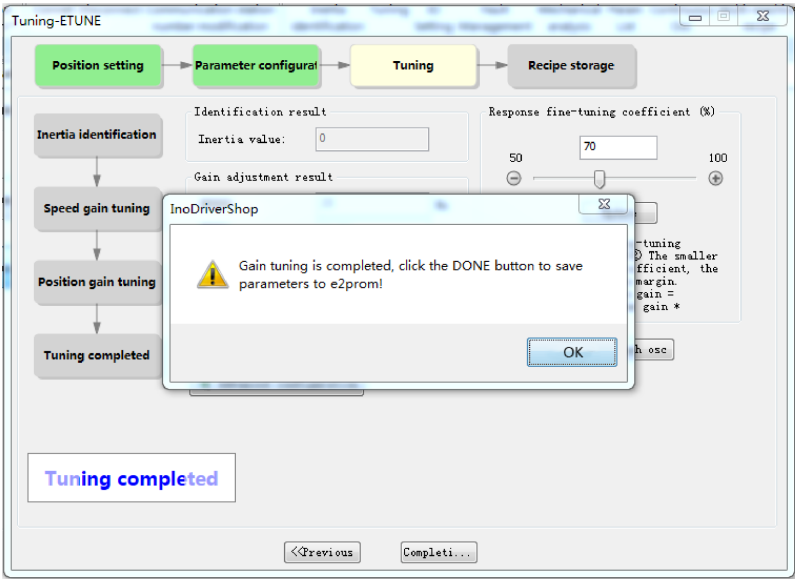
modified directly). You can adjust the response level and position filter time constant based on the responsiveness needed and the position reference noise generated during operation. Then configure the motion profile by setting the maximum speed, acceleration/deceleration time and interval time for auto-tuning.

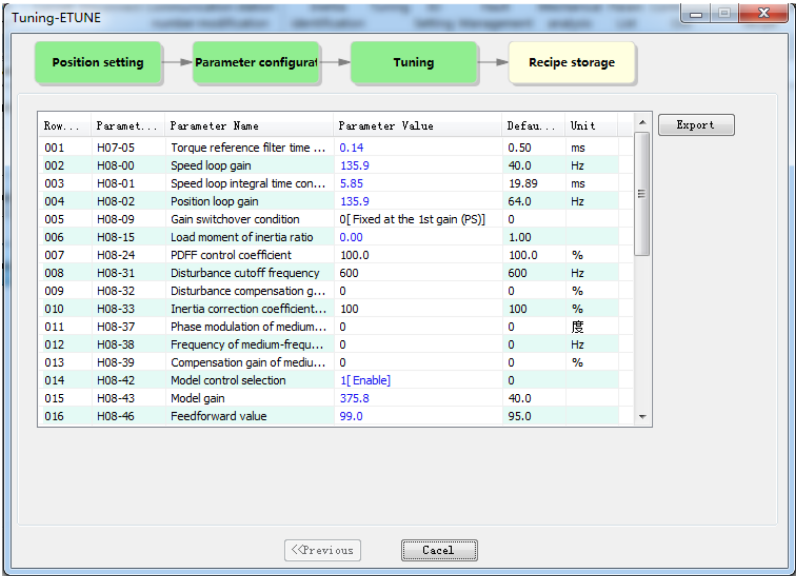


5. Click **"Next"** to start auto-tuning.
   - If you choose to perform inertia auto-tuning, the drive starts inertia auto-tuning based on the set motion profile. After inertia auto-tuning is done, the drive starts gain auto-tuning.
   - If you choose not to perform inertia auto-tuning on the start page, the drive starts gain auto-tuning directly after start.



6. During gain auto-tuning, if you modify the Response fine-tuning coefficient and click **"Update"**, gain auto-tuning will be continued based on the fine-tuning coefficient entered. After gain auto-tuning is done, you can click **"Done"** to save parameters to EEPROM and export parameters as a recipe file.





Row...	Paramet...	Parameter Name	Parameter Value	Defau...	Unit
001	H07-05	Torque reference filter time ...	0.14	0.50	ms
002	H08-00	Speed loop gain	135.9	40.0	Hz
003	H08-01	Speed loop integral time con...	5.85	19.89	ms
004	H08-02	Position loop gain	135.9	64.0	Hz
005	H08-09	Gain switchover condition	0[Fixed at the 1st gain (PS)]	0	
006	H08-15	Load moment of inertia ratio	0.00	1.00	
007	H08-24	PDFF control coefficient	100.0	100.0	%
008	H08-31	Disturbance cutoff frequency	600	600	Hz
009	H08-32	Disturbance compensation g...	0	0	%
010	H08-33	Inertia correction coefficient...	100	100	%
011	H08-37	Phase modulation of medium...	0	0	度
012	H08-38	Frequency of medium-frequ...	0	0	Hz
013	H08-39	Compensation gain of mediu...	0	0	%
014	H08-42	Model control selection	1[Enable]	0	
015	H08-43	Model gain	375.8	40.0	
016	H08-46	Feedforward value	99.0	95.0	

Precautions

- The maximum speed and acceleration/deceleration time of the motion profile can be set as needed. You can also increase the acceleration/deceleration time properly to enable quick positioning after auto-tuning is done.
- If the acceleration/deceleration time is too short, overload may occur. In this case, increase the acceleration/deceleration time properly.
- For vertical axes, take anti-drop measures beforehand and set the stop mode upon fault to "Stop at zero speed".
- For lead screw transmission, shorten the travel distance if the tuning duration is too long.

Solutions to Common Faults

Fault	Cause	Solution
E661: Gains too low	1. Vibration cannot be suppressed.	1. Enable the vibration suppression function manually.
	2. The positioning overshoot is too large.	2. Check whether the positioning threshold is too low. Increase the acceleration/deceleration time and reduce the response level.
	3. The reference is disturbed by noise.	3. Modify the electronic gear ratio to improve the reference resolution or increase the reference filter time constant in the "Parameter configuration" interface.
	4. The current fluctuates.	4. Check whether the current of the machine fluctuates regularly.
E600: Inertia auto-tuning failure	1. Vibration cannot be suppressed.	1. Enable the vibration suppression function manually and perform ETune again.
	2. The auto-tuned values fluctuate dramatically.	2. Increase the maximum operating speed and decrease the acceleration/deceleration time. For the lead screws, shorten the travel distance.
	3. Mechanical couplings of the load are loose or the mechanism is eccentric.	3. Rectify the mechanical fault.
	4. Interruption occurs due to a fault that occurs during auto-tuning.	4. Clear the fault and perform ETune again.
	5. The position reference filter time is set to an excessively high value.	Decrease the values of H05.04–H05.06 and perform ETune again.

3.3.2 STune

Overview

STune performs gain auto-tuning based on the set stiffness level to fulfill the needs for rapidity and stability.

STune (mode 4) is turned on by default and will be turned off automatically after the servo drive operates as commanded for 10 min.

STune is intended to be used in applications featuring slight load inertia change. For applications featuring dramatic inertia change or where inertia auto-tuning is

unavailable (due to low operating speed or low acceleration rate), turn off STune after initial power-on.

Note

For STune modes 4 and 6, you need to perform load inertia auto-tuning through online inertia auto-tuning and ensure the following conditions are met:

- The load inertia changes quickly.
- The load torque changes quickly.
- The motor is running at a speed lower than 120 r/min.
- Acceleration/Deceleration is slow (lower than 1000 r/min per second).
- The acceleration/deceleration torque is lower than the unbalanced load/viscous friction torque.
- If the conditions for online inertia auto-tuning cannot be fulfilled, set the correct inertia ratio manually.

Description of ITune operation

- **Operation flowchart**

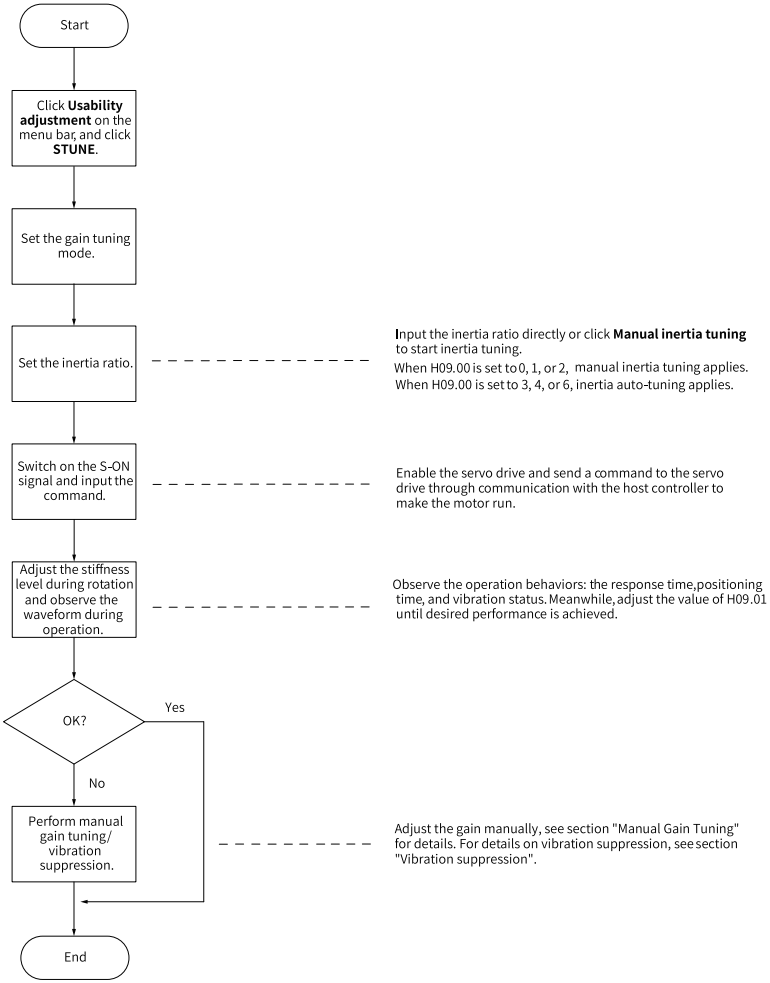


Figure 3-5 Operation flowchart

- **Detailed Description**

  You can set the gain auto-tuning mode through the keypad or the software tool.

  1. Select the gain auto-tuning mode. In modes 0, 1 and 2 shown in the following table, you need to set the inertia ratio before stiffness tuning. If the inertia is unknown, perform inertia tuning manually. If vibration occurs on the machine, decrease the stiffness level before gain tuning. In modes 3, 4, and 6 shown in the following table, you can perform adjustment through the wizard-type interface directly, without the need for setting the inertia ratio.

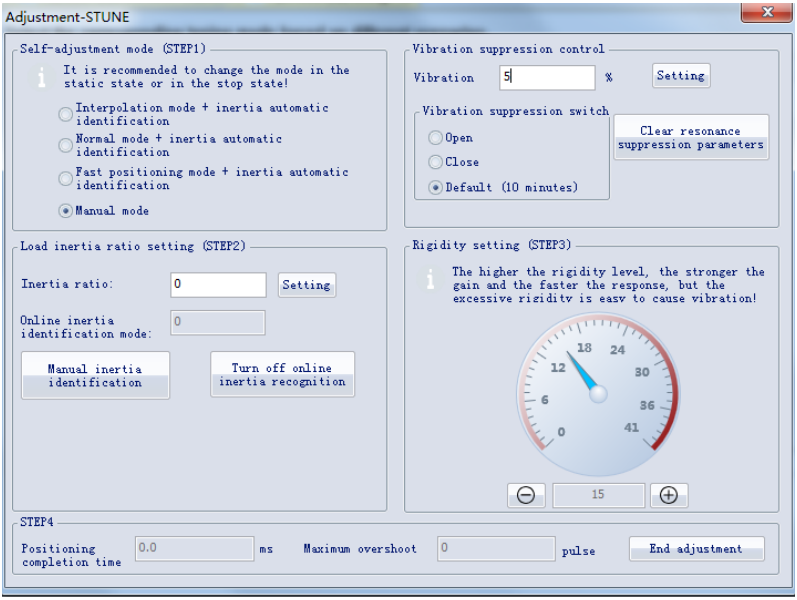
Table 3–2

Mode	Parameter Name	Applicable Occasion
0	Inactive	The gains need to be adjusted manually.
1	Standard stiffness level mode	Gains are set automatically based on the set stiffness level.
2	Positioning mode	Gains are set automatically based on the set stiffness level. This mode is applicable to occasions requiring quick positioning.
3	Interpolation mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. In this mode, inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to multi-axis interpolation.
4	Normal mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. The inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to trajectory tracking.
6	Quick positioning mode + Inertia auto-tuning	Gains are set automatically based on the set stiffness level. Inertia is auto-tuned and vibration is suppressed automatically. This mode is applicable to occasions requiring quick positioning.

2. Adjust the stiffness level gradually during operation of the load. The present stiffness level value will be written to the drive automatically. Keep monitoring the operating waveform after increasing the stiffness level (increase by one level at a time) until the desired performance is achieved.
3. For STune modes 4 and 6, when the speed keeps higher than 100 r/min for more than 5 min, H09.00 reverts to 0, which is to exit from the STune mode.

   After tuning, you can set H09.00 to 0 to exit the STune mode.

   To modify the STune time, set H09.37.
4. For STune modes 4 and 6, resonance suppression will be applied automatically. If the performance of automatic resonance suppression is inadequate, set H09.58 to 1 to clear resonance suppression parameters, reduce the stiffness level, and perform STune again.
5. For multi-axis trajectories, perform single-axis commissioning first to determine the highest response of each axis and modify the response of each axis manually to ensure position responses of different axes are consistent.
   - STune mode 4: Determine the minimum value of H08.02 (Position loop gain). Then set H09-00 of each axis to 0 and set H08.02 of each axis to the same value.
   - STune mode 6: Determine the minimum value of H08.43 (Model gain). Then set H09-00 of each axis to 0, and set H08.43 of each axis to the same value.



Note

To ensure a stable operation of STune mode 4 with default parameter settings, gain parameters will be adjusted along with the inertia ratio when the inertia ratio is higher than 13. In multi-axis trajectories, responses may be inconsistent under the same stiffness level.

Precautions

Load inertia ratio range

- In scenarios requiring high response, the inertia ratio must be lower than 500% and should not exceed 1000%.
  - For belt pulley or gear rack requiring not high rigidity and accuracy, the inertia ratio should not exceed 1000%.
  - For lead screw or cardan shaft requiring high rigidity and accuracy, the inertia ratio should not exceed 500%.
  - In scenarios where high positioning accuracy or response is required, the inertia ratio should not exceed 200%.
- In scenarios requiring a certain accuracy and dynamic response, the inertia ratio should not exceed 3000%.
- When the inertia ratio exceeds 3000%, it is hard to adjust and the trajectory control cannot be performed. It is only applicable to mechanisms for point-to-

point control and rotary motion but the acceleration/deceleration time should be large.

Rigidity meter setting

The setting range of H09.01 (Stiffness level selection) is 0–41. The level 0 indicates the weakest stiffness and lowest gain and level 41 indicates the strongest stiffness and highest gain.

The following table lists the stiffness levels for different load types for your reference.

Table 3–3 Reference of stiffness levels

Recommended Stiffness Level	Load Mechanisms
Level 8 to level 12	Large-scale machineries
Level 12 to level 18	Applications with low stiffness such as the conveyors
Above level 18	Applications with high stiffness such as the ball screws and direct-connected motors

The following five gain auto-tuning modes are available.

- Standard rigidity meter mode (H09.00 set to 1)
  The 1st gain parameters (H08.00 to H08.02 and H07.05) are automatically updated and saved based on the rigidity level set in H09.01.

Table 3–4 Parameters updated automatically in the standard mode

Param.	Parameter Name
H08.00	Speed loop gain
H08.01	Speed loop integral time constant
H08.02	Position loop gain
H07.05	Filter time constant of torque reference

- Positioning mode (H09.00 = 2)
  Based on , the 2nd gain parameters (H08.03 to H08.05 and H07.06) are also automatically updated and saved based on the rigidity level set in H09.01. In addition, the position loop gain in the 2nd gain parameters has a higher rigidity level than that in the 1st gain parameters.

Table 3–5 Parameters updated automatically in the positioning mode

Param.	Parameter Name	Description
H08.03	2nd speed loop gain	-
H08.04	2nd speed loop integral time constant	If H08.04 is set to remain at 512.00 ms, the 2nd speed loop integral action is invalid and only proportional control is used in the speed loop.

Param.	Parameter Name	Description
H08.05	2nd position loop gain	-
H07.06	2nd torque reference filter time constant	-

Values of speed feedforward parameters are fixed.

Table 3–6 Parameters with fixed values in the positioning mode

Param.	Parameter Name	Value
H08.19	Speed feedforward gain	30.00%
H08.18	Time constant of speed feedforward filter	0.50ms

Values of gain switchover parameters are fixed.

Gain switchover is activated automatically in the positioning mode.

Param.	Parameter Name	Value	Description
H08.08	2nd gain mode setting	1	In the positioning mode, switchover between the 1st gain set (H08.00...H08.02, H07.05) and the 2nd gain set (H08.03...H08.05, H07.06) is active. In other modes, the original settings are used.
H08.09	Gain switchover condition	10	In the positioning mode, gain switchover is active only if H08.09 is set to 10. In other modes, the original settings are used.
H08.10	Gain switchover delay	5.0ms	In the positioning mode, the gain switchover delay is 5.0 ms. In other modes, the original settings are used.
H08.11	Gain switchover level	50	In the positioning mode, the gain switchover level is 50. In other modes, the original settings are used.
H08.12	Gain switchover hysteresis	30	In the positioning mode, the gain switchover dead time is 30. In other modes, the original settings are used.

Note

In the gain auto-tuning mode, parameters updated along with H09.01 and those with fixed setpoints cannot be modified manually. To modify these parameters, set H09.00 (Gain auto-tuning mode) to 0 (Invalid) first.

- For STune mode 3/4/6, resonance suppression will be applied automatically. When the load changes or the mechanical structure is re-installed, the system resonance frequency changes accordingly. Set H09.58 to 1 (Enable) and enable the STune mode again after clearing resonance suppression parameters.

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.37	2008-26h	Phase modulation for medium-frequency jitter suppression 2	-90° to 90°	0	°	Real-time	" H08_en.37" on page 199
H08.38	2008-27h	Medium-frequency suppression 2 frequency	0Hz to 1000Hz	0	Hz	Real-time	" H08_en.38" on page 200
H08.39	2008-28h	Compensation gain of medium-frequency jitter suppression 2	0% to 300%	0	%	Real-time	" H08_en.39" on page 200
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz to 8000 Hz	8000	Hz	Real-time	" H09_en.18" on page 209
H09.19	2009-14h	Width level of the 3rd notch	0 to 20	2	-	Real-time	" H09_en.19" on page 210
H09.20	2009-15h	Depth level of the 3rd notch	0 to 99	0	-	Real-time	" H09_en.20" on page 210
H09.21	2009-16h	Frequency of the 4th notch	50 Hz to 8000 Hz	8000	Hz	Real-time	" H09_en.21" on page 210
H09.22	2009-17h	Width level of the 4th notch	0 to 20	2	-	Real-time	" H09_en.22" on page 210
H09.23	2009-18h	Depth level of the 4th notch	0 to 99	0	-	Real-time	" H09_en.23" on page 211
H09.58	2009-3Bh	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	" H09_en.58" on page 217

Note

- If H09.00 is set to 3, 4, or 6, the servo drive will suppress the vibration and perform inertia auto-tuning automatically within 10min (or other time defined by H09-37) after power-on or stiffness level setting, and then the servo drive exits from automatic adjustment. The time can be adjusted by the vibration suppression switch (H09.37). If the function of inertia auto-tuning is deactivated automatically, switching to modes 3, 4, or 6 will not activate inertia auto-tuning.
- Do not set H09.00 to 3, 4, or 6 in applications with slow acceleration/deceleration, large vibration, and unstable mechanical couplings.
- In applications where the inertia does not change, set H09.03 (Online inertia auto-tuning mode) to 1 (Enabled, changing slowly). In applications where the inertia changes quickly, set H09.03 to 3 (Enabled, changing quickly).

Solutions to Common Faults

E661: Gains too low

When the torque fluctuation detected by the drive exceeds the setpoint of H09.11 and cannot be suppressed, the rigidity level will be reduced automatically until reaching level 10 where E661 is reported.

1. Vibration cannot be suppressed. Enable vibration suppression manually.
2. The current fluctuates. Check whether the current of the machine fluctuates periodically.

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.37	2008-26h	Phase modulation for medium-frequency jitter suppression 2	-90° to 90°	0	°	Real-time	*" H08_en.37" on page 199*
H08.38	2008-27h	Medium-frequency suppression 2 frequency	0Hz to 1000Hz	0	Hz	Real-time	*" H08_en.38" on page 200*
H08.39	2008-28h	Compensation gain of medium-frequency jitter suppression 2	0% to 300%	0	%	Real-time	*" H08_en.39" on page 200*

3.4 Manual Gain Tuning

3.4.1 Basic Parameters

When gain auto-tuning cannot fulfill the application needs, perform manual gain tuning. to achieve better result.

The servo system consists of three control loops, which are position loop, speed loop, and current loop from external to internal. The basic control diagram is shown in the following figure.

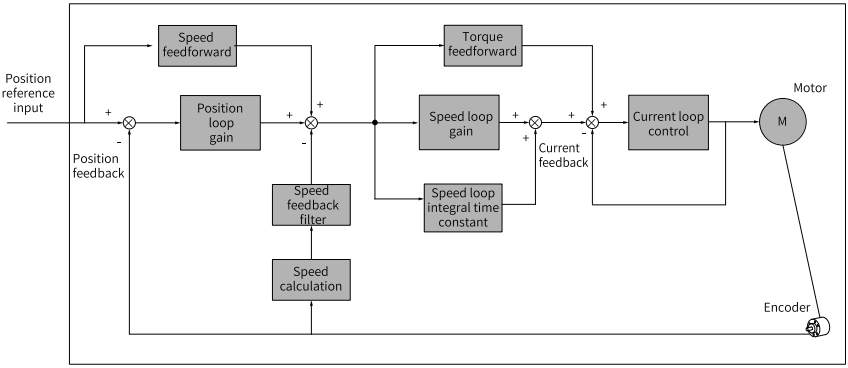
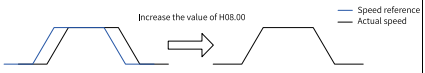
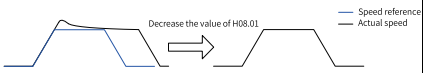


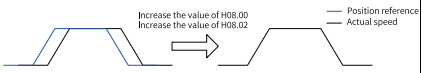
Figure 3-6 Basic control for manual gain tuning

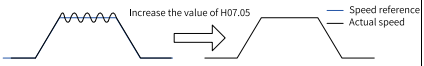
The response level of the inner loop must be higher than that of the outer loop. If it is not observed, the system may be unstable.

The current loop gain is set with the highest level of responsiveness by default, avoiding the need for adjustment. You only need to adjust the position loop gain, speed loop gain, and other auxiliary gains. For gain tuning in the position control mode, the position loop gain must be increased together with the speed loop gain, and the responsiveness of the former must be lower than the latter.

The following table describes how to adjust the basic gain parameters.

Step	Param.	Parameter Name	Description
1	H08.00	Speed loop gain	• Function:Determines the maximum frequency of a variable speed reference that can be followed by the speed loop. When the average load rotational inertia ratio (H08.15) is correct, it can be considered:Maximum follow-up frequency of speed loop = H08.00  • Note:Increasing the setpoint without incurring extra noise or vibration shortens the positioning time, stabilizes the speed, and improves the follow-up behavior.If noise occurs, decrease the setpoint.If mechanical vibration occurs, activate resonance suppression according to section *" Vibration suppression" on page 127 "Vibration Suppression"* .
2	H08.01	Speed loop integral time constant	• Function:Eliminates the speed loop deviation.  • Note:Select the value as follows: 500 ⩽ H08.00 x H08.01 ⩽ 1000For example, if H08.00 is set to 40.0 Hz, the setpoint of H08-01 must meet the following requirement: 12.50 ms ⩽ H08-01 ⩽ 25.00 msDecreasing the setpoint strengthens the integral action and shortens the positioning time, but an excessively low setpoint may easily lead to mechanical vibration.An excessively high setpoint prevents the speed loop deviation from being cleared.When H08.01 is set to 512.00 ms, there is no integral action.

Step	Param.	Parameter Name	Description
3	H08.02	Position loop gain	• Function:It sets the position reference maximum frequency followed by the position loop.Maximum follow-up frequency of position loop = H08.02  • Note:To ensure system stability, the maximum following frequency of the speed loop must be 3 to 5 times higher than that of the position loop. Therefore, the following formula applies. $3 \leqslant \frac{2 \times \pi \times H08.00}{H08.02} \leqslant 5$ For example, when H08.00 is set to 40.0 Hz, H08.02 must meet the following requirement: 50.2 Hz ⩽ H08-02 ⩽ 83.7 HzAdjust the setting based on the positioning time. Increasing the setpoint shortens the positioning time and improves the disturbance resistance capacity of the motor at a standstill.An excessively high setpoint may easily lead to system instability and oscillation.

Step	Param.	Parameter Name	Description
4	H07.05	Torque reference filter time constant	• Function:Eliminates the high-frequency noise and suppresses mechanical resonance.  • Note:Ensure the cutoff frequency of the torque reference low-pass filter is 4 times higher than the maximum following frequency of the speed loop. Therefore, the following formula applies. $\frac{1000}{2 \times \pi \times H07.05} \geqslant (H08.00) \times 4$ For example, when H08.00 is set to 40.0 Hz, the setpoint of H07.05 must be lower than or equal to 1.00 ms.If increasing the setpoint of H08.00 incurs vibration, adjust the setpoint of H07.05 to suppress vibration. For details, see section "*Vibration suppression" on page 127* “*Vibration Suppression*”. An excessively high setpoint weakens the responsiveness of the current loop.To suppress vibration upon stop, increase the setpoint of H08.00 and decrease the setpoint of H07.05.If strong vibration occurs upon stop, decrease the setpoint of H07.05.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H07.05	2007-06h	Torque reference filter time constant 1	0.00ms to 30.00ms	0.50	ms	Real-time	*" H07_en.05" on page 181*
H08.00	2008-01h	Speed loop gain	0.1Hz to 2000.0Hz	40.0	Hz	Real-time	*" H08_en.00" on page 187*
H08.01	2008-02h	Speed loop integral time constant	0.15ms to 512.00ms	19.89	ms	Real-time	*" H08_en.01" on page 187*
H08.02	2008-03h	Position loop gain	0.1Hz to 2000.0Hz	64.0	Hz	Real-time	*" H08_en.02" on page 188*

3.4.2 Gain Switchover

Gain switchover can be triggered by the internal state of the drive. It is only effective in position and speed control modes. achieve the following purposes:

- Switching to the lower gain when the motor is at a standstill (servo ON) to suppress vibration
- Switching to the higher gain when the motor is at a standstill to shorten the positioning time
- Switching to the higher gain when the motor is running to achieve better command tracking performance
- Switching between different gain settings through an external signal to fit different conditions of the load devices

H08.08 = 0

The first gain set (H08.00...H08.02, H07.05) are used, but proportional/proportional integral control switchover is available through bit26 (Gain switchover) of 60FE in the speed loop.

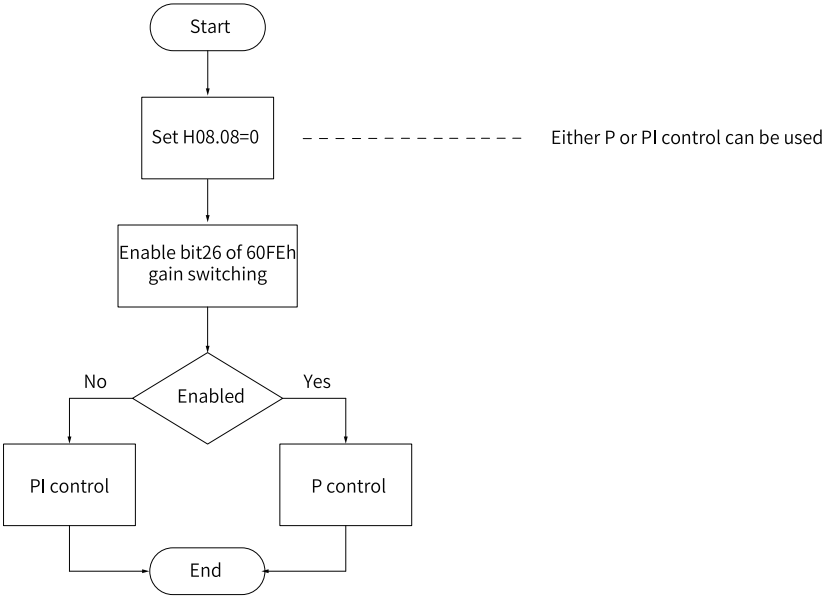


Figure 3-7 Gain switchover flowchart (H08.08 = 0)

H08.08 = 1

You can switch between the 1st gain set (H08.00...H08.02, H07.05) and 2nd gain set (H08.03...H08.05, H07.06) based on the condition defined by H08.09.

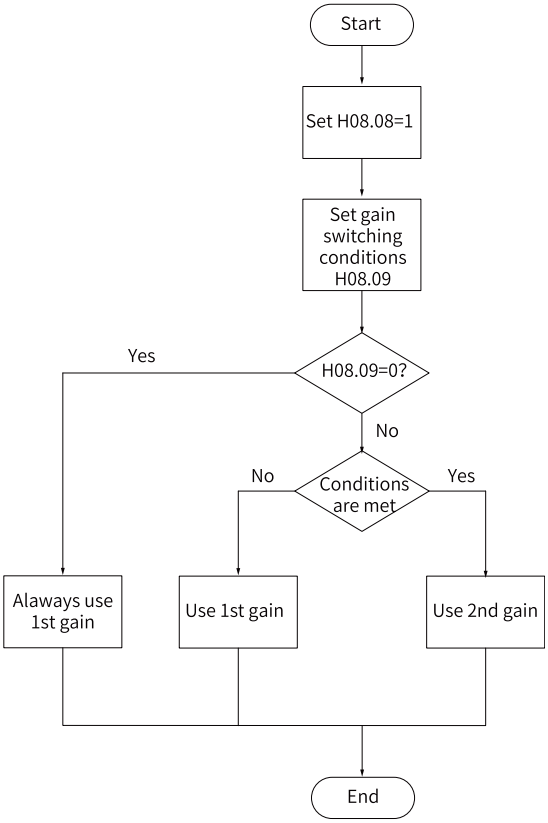
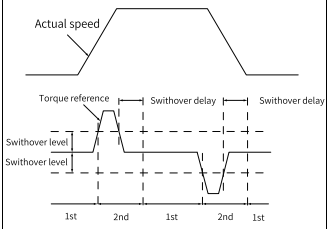
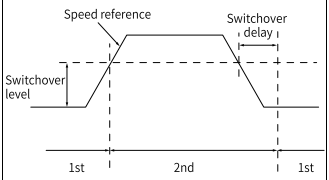
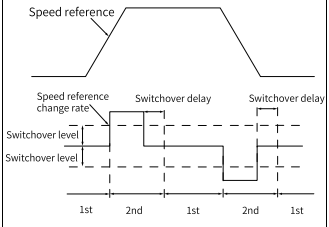
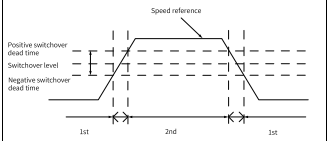
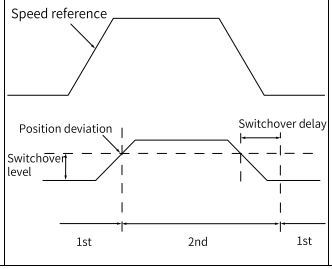


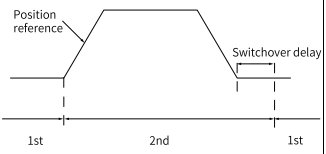
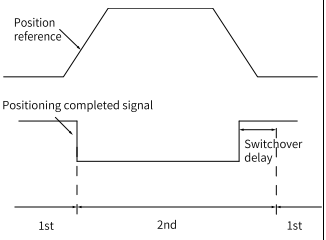
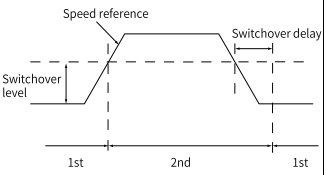
Figure 3-8 Gain switchover flowchart when H08.08 is set to 1

There are 11 conditions for gain switchover. The following table describes diagrams and related parameters for different conditions. The following table describes the diagrams and related parameters of different conditions.

Table 3–7 Conditions for gain switchover

Gain Switchover Condition			Related Parameters		
H08.09	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
0	Fixed to the 1st gain set	-	Inactive	Inactive	Inactive
1	Switched as defined by bit26 of of 60FEh	-	Inactive	Inactive	Inactive

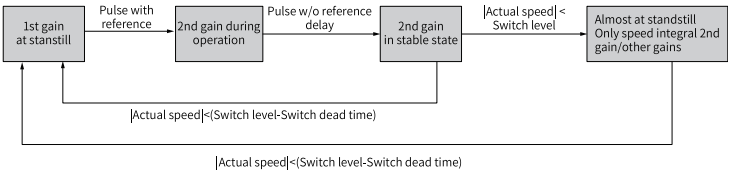
Gain Switchover Condition			Related Parameters		
H08.09	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
2	Torque reference		Active	Active (%)	Active (%)
3	Speed reference		Active	Active	Active
4	Speed reference change rate		Active	Active (10 RPM/s)	Active (10 RPM/s)
5	Speed reference high/low-speed threshold		Inactive	Active (RPM)	Active (RPM)
6	Position deviation		Active	Active (encoder unit)	Active (encoder unit)

Gain Switchover Condition			Related Parameters		
H08.09	Condition	Diagram	Delay Time (H08.10)	Gain switchover level (H08.11)	Switchover Dead Time (H08.12)
7	Position reference		Active	Inactive	Inactive
8	Positioning uncompleted		Active	Inactive	Inactive
9	Actual speed		Active	Active (RPM)	Active (RPM)
10	Position reference + Actual speed	See the following note for details.	Active	Active (RPM)	Active (RPM)

Note

H08.10 (Gain switchover delay) is valid only during switching to the 1st gain set.

Note



☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.08	2008-09h	2nd gain mode setting	0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh 1: Switched between the 1st and 2nd gain sets as defined by H08.09	1	-	Real-time	" H08_en.08" on page 189
H08.09	2008-0Ah	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by bit26 of 60FEh 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time	" H08_en.09" on page 190
H08.10	2008-0Bh	Gain switchover delay	0.0 ms to 1000.0 ms	5.0	ms	Real-time	" H08_en.10" on page 192
H08.11	2008-0Ch	Gain switchover level	0 to 20000	50	-	Real-time	" H08_en.11" on page 192
H08.12	2008-0Dh	Gain switchover hysteresis	0 to 20000	30	-	Real-time	" H08_en.12" on page 193
H08.13	2008-0Eh	Position gain switchover time	0.0 ms to 1000.0 ms	3.0	ms	Real-time	" H08_en.13" on page 193

3.4.3 Position reference filter

Parameter Name	Function	Applicable Occasion	Impact of Excessive Filtering
Position reference filter	Filters the position references (encoder unit) divided or multiplied by the electronic gear ratio to smoothen the operation process of the motor and reduce shock to the machine.	The acceleration/ deceleration process is not performed on the position references sent from the host controller. The pulse frequency is too low. The electronic gear ratio is higher than 10.	The response delay is prolonged.

3.4.4 Feedforward Gain Adjustment

Speed feedforward

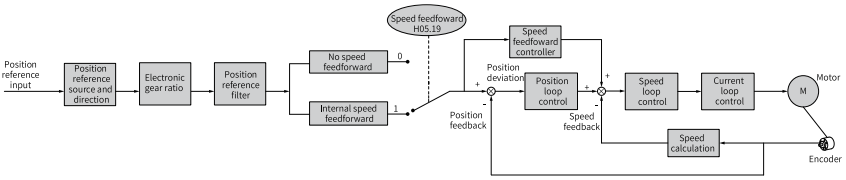


Figure 3-9 Block diagram of speed feedforward control

Speed feedforward can be applied to position control mode. The speed feedforward function can be used to improve the speed reference responsiveness and reduce the position deviation at fixed speed.

Operating procedure for speed feedforward:

1. Setting the speed feedforward signal source
   Set H05.19 (Speed feedforward control) to a non-zero value to enable the speed feedforward function. The corresponding signal source will be selected as well.

Param.	Parameter Name	Value	Remarks
H05.19	Speed feedforward control	0: No speed feedforward	-
		1: Internal speed feedforward	Defines the speed corresponding to the position reference (encoder unit) as the speed feedforward signal source.
		2: 60B1h used as speed offset	-
		3: Zero phase control	-

2. Setting speed feedforward parameters
   Set the speed feedforward gain (H08.19) and speed feedforward filter time constant (H08.18).

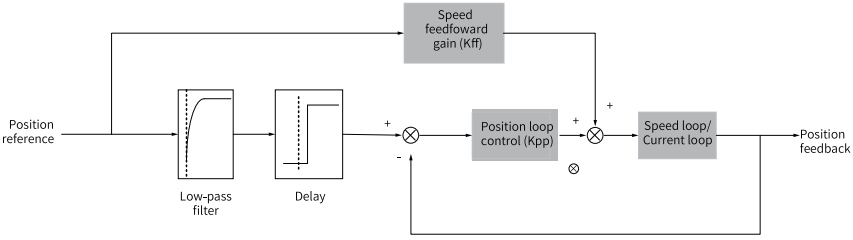
   ☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.18	2008-13h	Time constant of speed feedforward filter	0.00ms to 64.00ms	0.50	ms	Real-time	*" H08_en.18" on page 194*
H08.19	2008-14h	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time	*" H08_en.19" on page 195*

Zero phase control

Zero phase control is used to compensate for the position deviation generated upon start delay of the position reference, reducing the position deviation upon start/stop in the position control mode.

The loop calculation model is shown in the following figure.



☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H05.04	2005-05h	First-order low-pass filter time constant	0.0 ms to 6553.5ms	0.0	ms	At stop	" H05_en.04" on page 169
H05.19	2005-14h	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: 60B1h used as speed feedforward 3: Zero phase control	1	-	At stop	" H05_en.19" on page 170
H08.17	2008-12h	Zero phase delay	0.0 ms to 4.0ms	0.0	ms	Real-time	" H08_en.17" on page 194

Torque feedforward

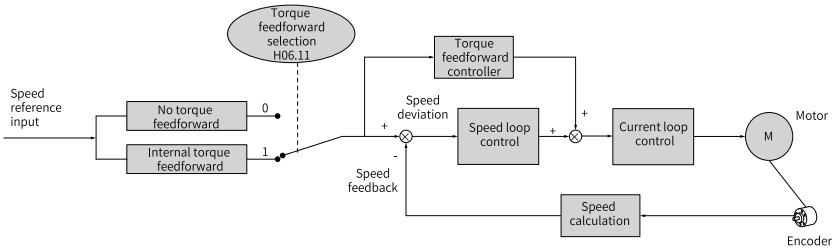


Figure 3-10 Block diagram of torque feedforward control

Torque feedforward can be applied to the position control mode to improve torque reference responsiveness and reduce the position deviation during acceleration/ deceleration at a constant speed. Torque feedforward can also be applied to the speed control mode to improve torque reference responsiveness and reduce the speed deviation during operation at a constant speed.

The procedure for setting torque feedforward is as follows:

1. Setting the torque feedforward signal source
   Set H06.11 to 1 to enable speed feedforward. The corresponding signal source will be selected as well.

Param.	Parameter Name	Value	Remarks
H06.11	Torque feedforward control	0: No torque feedforward	-
		1: Internal torque feedforward	Use the speed reference as the source of the torque feedforward signal. In the position control mode, the speed reference is outputted from the position controller.

2. Setting torque feedforward parameters

Param.	Parameter Name	Description
H08.20	Torque feedforward filter time constant	• Function:Increasing the value of H08.21 improves responsiveness but may cause overshoot during acceleration/deceleration.Decreasing the value of H08.20 suppresses overshoot during acceleration/deceleration. Increasing the value of H08.20 suppresses the noise. • Note:Keep H08.20 to the default value, and then gradually increase the value of H08.21 from 0 to a certain value at which torque feedforward achieves the desired effect. Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.
H08.21	Torque feedforward gain	For details, see *"3.4.4 Feedforward Gain Adjustment" on page 113 "Feedforward Gain"* .

3.4.5 PDFF Control

The pseudo derivative feedback and feedforward (PDFF) control can be used to adjust speed loop control in the non-torque control modes.

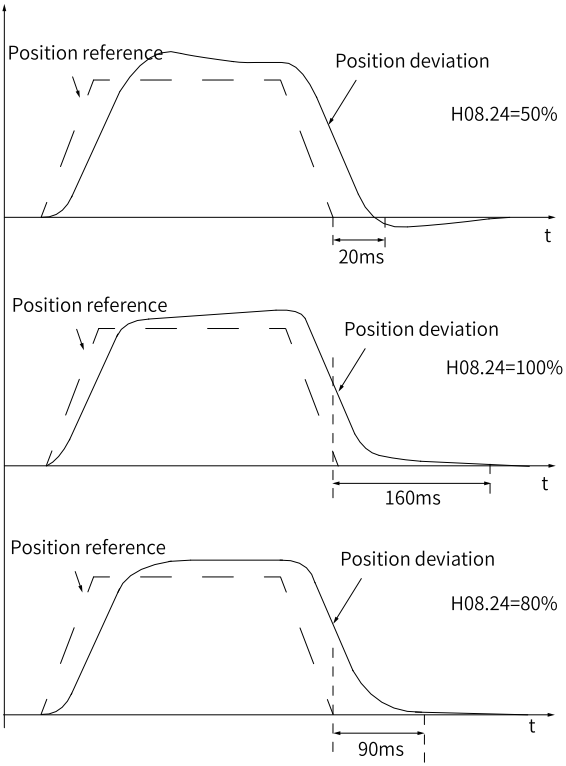


Figure 3-11 Example of PDFF control

Through adjusting the speed loop control method, PDFF control enhances the anti-disturbance capacity of the speed loop and improves the performance in following the speed references.

Param.	Parameter Name	Description
H08.24	PDFF control coefficient	• Function:Defines the control method of the speed loop in the non-torque control modes. • Note:Setting H08.24 to an excessively low value slows down the responsiveness of the speed loop. When the speed feedback overshoots, decrease the setpoint of H08.24 gradually from 100.0 to a certain value at which the PDFF control achieves the desired effect.When H08.24 is set to 100.0, the speed loop control mode does not change and proportional integral control is applied by default.

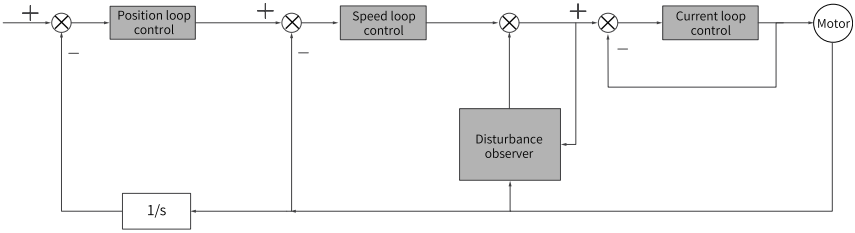
3.4.6 Torque Disturbance Observer

This function is intended to be used in the non-torque control modes.

Disturbance observer

The disturbance observer observes the external disturbance. Disturbances within the frequency range can be observed and suppressed with different cutoff frequencies and compensation values.

The following figure depicts the control block diagram, showing the location of the disturbance observer in the control structure.



Note

1/s: Integral element

☆Related parameters

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.31	2008-20h	Disturbance cutoff frequency	10Hz to 4000Hz	600	Hz	Real-time	" H08_en.31" on page 198
H08.32	2008-21h	Disturbance compensation gain	0% to 100%	0	%	Real-time	" H08_en.32" on page 198
H08.33	2008-22h	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time	" H08_en.33" on page 198

3.4.7 Model Tracking

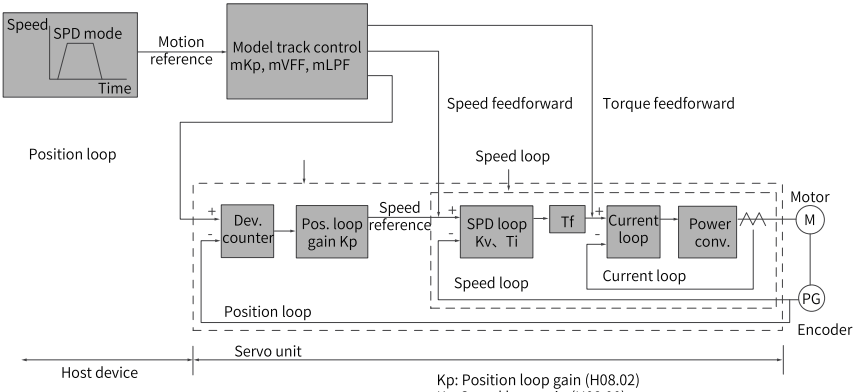
The model tracking control, which is only available in the position control mode, can be used to improve responsiveness and shorten the positioning time. It is only available in the position control mode.

Parameters used by model tracking are normally set automatically through ITune or ETune along with the gain parameters.

However, manual tuning is needed in the following situations:

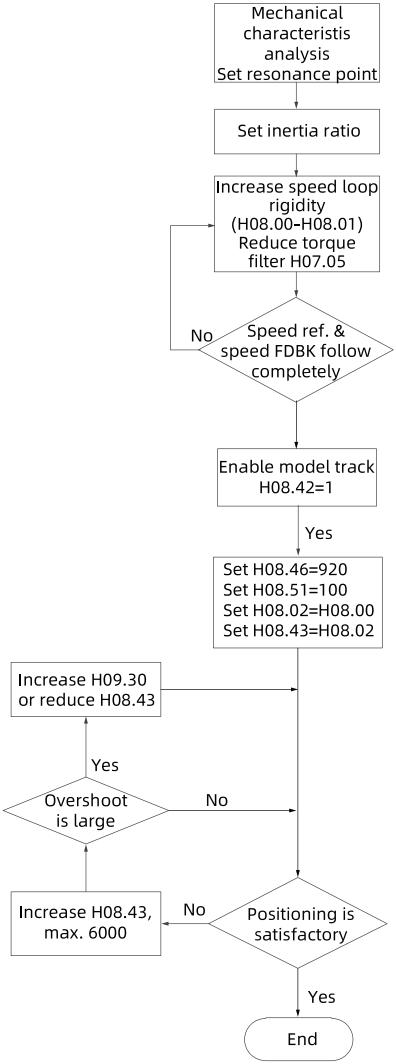
- The auto-tuned values cannot deliver desired performance.
- Improving the responsiveness takes priority over the auto-tuned or customized values.
- User-defined gain parameters or model tracking control parameters are needed.

The block diagram for model tracking control is as follows.



Kp: Position loop gain (H08.02)
Kv: Speed loop gain (H08.00)
Ti: Speed loop integral time constant (H08.01)
Tf: Torque reference filter time constant (H07.05)
mKp: Model track control gain (H08.43)
mVFF: Model track control SPD FDFWD compensation (H08.46)
mLPF: Model filter time

Commissioning Steps



Related parameters

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H07.05	2007-06h	Torque reference filter time constant 1	0.00ms to 30.00ms	0.50	ms	Real-time	*" H07_en.05" on page 181*
H08.00	2008-01h	Speed loop gain	0.1Hz to 2000.0Hz	40.0	Hz	Real-time	*" H08_en.00" on page 187*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.01	2008-02h	Speed loop integral time constant	0.15ms to 512.00ms	19.89	ms	Real-time	" H08_en.01" on page 187
H08.02	2008-03h	Position loop gain	0.1Hz to 2000.0Hz	64.0	Hz	Real-time	" H08_en.02" on page 188
H08.42	2008-2Bh	Model control selection	0: Disabled 1: Enabled 2: Dual-inertia model	0	-	Real-time	" H08_en.42" on page 201
H08.43	2008-2Ch	Model gain	0.1 to 2000.0	40.0	-	Real-time	" H08_en.43" on page 201
H08.46	2008-2Fh	Feedforward value	0.0 to 102.4	95.0	-	Real-time	" H08_en.46" on page 201

Note

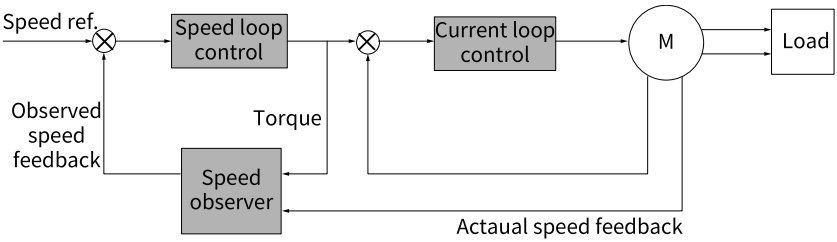
Ensure the set inertia is accurate. Otherwise, motor vibration may occur.

3.4.8 Speed Observer

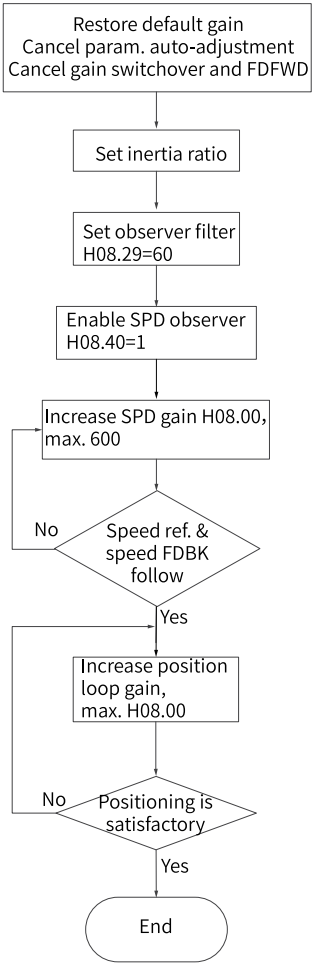
The speed observer, which facilitates quick positioning, applies in applications with slight load characteristic change and constant inertia.

It improves the responsiveness and filters high frequencies automatically, improving the gains and shortening the positioning time without incurring high-frequency vibration.

The block diagram for the speed observer is shown as follows.



Commissioning Steps



Related parameters

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.00	2008-01h	Speed loop gain	0.1Hz to 2000.0Hz	40.0	Hz	Real-time	*" H08_en.00" on page 187*
H08.27	2008-1Ch	Speed observer cutoff frequency	50 Hz to 600Hz	170	Hz	Real-time	*" H08_en.27" on page 197*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.28	2008-1Dh	Speed observer inertia correction coefficient	1% to 1600%	100	%	Real-time	" H08_en.28" on page 197
H08.29	2008-1Eh	Speed observer filter time	0.00ms to 10.00ms	0.80	ms	Real-time	" H08_en.29" on page 198
H08.40	2008-29h	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time	" H08_en.40" on page 200

Note

- Before using the speed observer, set H08.15 (Load inertia ratio) to a proper value or perform inertia auto-tuning. A wrong inertia ratio can cause vibration.
- Setting H08.27, H08-28, or H08.29 to excessively low or high values will result in motor vibration.

3.4.9 Friction Compensation

Friction compensation is used to reduce the impact of the friction on the operating effect during mechanical transmission. Use different positive/negative compensation values according to the direction of operation.

Note

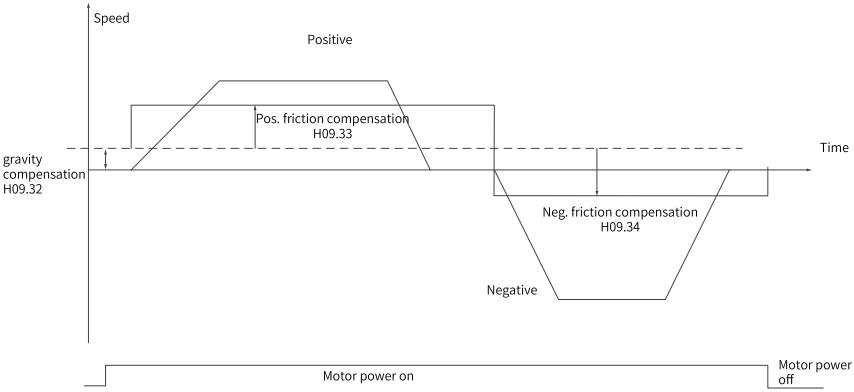
Friction compensation is valid only in the position control mode.

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.32	2009-21h	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time	" H09_en.32" on page 212
H09.33	2009-22h	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time	" H09_en.33" on page 212
H09.34	2009-23h	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time	" H09_en.34" on page 212

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.35	2009-24h	Friction compensation speed	0.0 to 20.0	2.0	-	Real-time	" H09_en.35" on page 213
H09.36	2009-25h	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0	-	Real-time	" H09_en.36" on page 213

The diagram for friction compensation is as follows.



Note

Note: When the speed is less than the speed threshold, static friction applies. When the speed exceeds the speed threshold, dynamic friction applies. The compensation direction is determined by the direction of the position reference. Forward direction requires a positive compensation value. Reverse direction requires a negative compensation value.

3.5 Parameter Adjustment in Different Control Modes

Perform parameter adjustment in the sequence of "Inertia auto-tuning" → "Gain auto-tuning → "Manual gain tuning" in all the control modes.

3.5.1 Parameter Adjustment in the Position Control Mode

1. Obtain the value of H08.15 (Load inertia ratio) through inertia auto-tuning.
2. 2) Perform gain adjustment.

- 1st gain set:

Param.	Parameter Name	Function	Default
H07.05	Torque reference filter time constant	Defines the torque reference filter time constant.	0.79ms
H08.00	Speed loop gain	Defines the speed loop proportional gain.	40.0Hz
H08.01	Speed loop integral time constant	Defines the integral time constant of the speed loop.	19.89ms
H08.02	Position loop gain	Defines the position loop proportional gain.	64.0Hz

- 2nd gain set:

Param.	Parameter Name	Function	Default
H07.06	2nd torque reference filter time constant	Defines the torque reference filter time constant.	0.27 ms
H08.03	2nd speed loop gain	Defines the speed loop proportional gain.	75.0Hz
H08.04	2nd speed loop integral time constant	Defines the integral time constant of the speed loop.	10.61ms
H08.05	2nd position loop gain	Defines the position loop proportional gain.	120.0Hz
H08.08	2nd gain mode setting	Defines the mode of the 2nd gain set.	1
H08.09	Gain switchover condition	Defines the gain switchover condition.	0
H08.10	Gain switchover delay	Defines the gain switchover delay.	5.0ms
H08.11	Gain switchover level	Defines the gain switchover level.	50
H08.12	Gain switchover hysteresis	Defines the dead time of gain switchover.	30
H08.13	Position gain switchover time	Defines the position loop gain switchover time.	3.0ms

- Common gains

Param.	Parameter Name	Function	Default
H08.18	Time constant of speed feedforward filter	Defines the filter time constant of the speed feedforward signal.	0.50ms
H08.19	Speed feedforward gain	Defines the speed feedforward gain.	0.00%
H08.20	Torque feedforward filter time constant	Defines the filter time constant of the torque feedforward signal.	0.50ms

Param.	Parameter Name	Function	Default
H08.21	Torque feedforward gain	Defines the torque feedforward gain.	0.00%
H08.22	Speed feedback filtering option	Used to set the speed feedback filtering function.	0
H08.23	Cutoff frequency of speed feedback low-pass filter	Defines the cutoff frequency of the first-order low-pass filter for speed feedback.	8000Hz
H08.24	PDFF control coefficient	Defines the coefficient of the PDFF controller.	100.00%
H09.30	Tension fluctuation compensation gain	Defines the disturbance torque compensation gain.	0.00%
H09.31	Tension fluctuation compensation filter time	Defines the filter time constant of the disturbance observer.	0.5ms
H09.38	Frequency of low-frequency resonance suppression 1 at the mechanical end	Defines the frequency of the low-frequency resonance suppression filter.	100.0Hz
H09.39	Low-frequency resonance suppression 1 at the mechanical end	Defines the setting of low-frequency resonance suppression filter.	2

3. Perform gain auto-tuning to get the initial values of the 1st gain set (or 2nd gain set) and the common gain set.
   Fine-tune the following gains manually.

Param.	Parameter Name	Function	Default
H07.05	Torque reference filter time constant	Defines the torque reference filter time constant.	0.2ms
H08.00	Speed loop gain	Defines the speed loop proportional gain.	39.0Hz
H08.01	Speed loop integral time constant	Defines the integral time constant of the speed loop.	20.51ms
H08.02	Position loop gain	Defines the position loop proportional gain.	55.7Hz
H08.19	Speed feedforward gain	Defines the speed feedforward gain.	0.0%

3.5.2 Parameter Adjustment in the Speed Control Mode

Parameter adjustment in the speed control mode is the same as that in the position control mode except the position loop gains (H08-02 and H08-05). See section *"3.5.1 Parameter Adjustment in the Position Control Mode" on page 125“位置模式 下的参数调整”* for details.

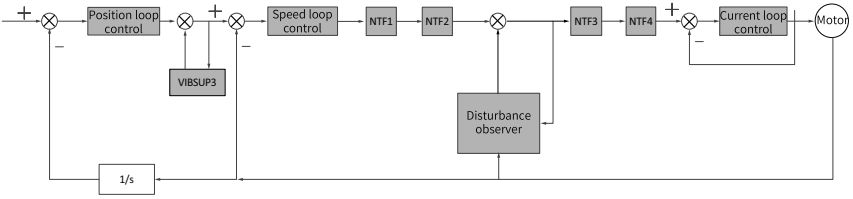
3.5.3 Parameter Adjustment in the Torque Control Mode

Parameter adjustment in the torque control mode are differentiated based on the following conditions:

- If the actual speed reaches the speed limit, the adjustment method is the same as that described in *"3.5.2 Parameter Adjustment in the Speed Control Mode" on page 126“速度模式下的参数调整”*.
- If the actual speed does not reach the speed limit, the adjustment method is the same as that described in section *"3.5.2 Parameter Adjustment in the Speed Control Mode" on page 126“速度模式下的参数调整”*, except the position /speed loop gain and speed loop integral time constant.

3.6 Vibration Suppression

The block diagram for vibration suppression is as follows.



- NTF1–4: 1st notch to 4th notch
- VIBSUP3: Suppression of medium- and low-frequency vibration reduction applied at a carrier frequency lower than 8 k under 300 Hz
- 1/s: Integral element

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.53	2008-36h	Medium- and low-frequency jitter suppression frequency 3	0.0Hz to 300.0Hz	0.0	Hz	Real-time	*" H08_en.53" on page 201*
H08.54	2008-37h	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time	*" H08_en.54" on page 202*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H08.56	2008-39h	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time	" H08_en.56" on page 202
H08.59	2008-3Ch	Medium- and low-frequency jitter suppression frequency 4	0.0Hz to 300.0Hz	0.0	Hz	Real-time	" H08_en.59" on page 202
H08.60	2008-3Dh	Medium- and low-frequency jitter suppression compensation 4	0% to 200%	0	%	Real-time	" H08_en.60" on page 202
H08.61	2008-3Eh	Medium- and low-frequency jitter suppression phase modulation 4	0% to 600%	100	%	Real-time	" H08_en.61" on page 203

Note

Vibration suppression phase modulation coefficient: synchronous phase adjustment of the compensation value. It is recommended to use the default value. Adjustment is needed when the compensation value phase differs greatly from the vibration phase.

Jitter suppression frequency: Defines the jitter frequency to be suppressed.

Jitter suppression compensation: Defines the compensation magnitude for jitter suppression.

3.6.1 Mechanical Resonance Suppression

Resonance frequency is present in the mechanical system. When the gain of the drive increases, resonance may occur near the resonance frequency, disabling further increase of the gain.

- Mechanical resonance can be suppressed in the following two methods:
  - Torque reference filter (H07.05, H07.06)

To suppress the mechanical resonance, set the filter time constant to enable the torque reference to be attenuated in the frequency range above the cutoff frequency.

Filter cutoff frequency fc (Hz) = 1/[2π x H07.05 (ms) x 0.001]

- Notch
  The notch reduces the gain at certain frequencies to suppress mechanical resonance. After the vibration is suppressed by the notch, you can continue to increase the gain.

  The operating principle of the notch is shown in the following figure.

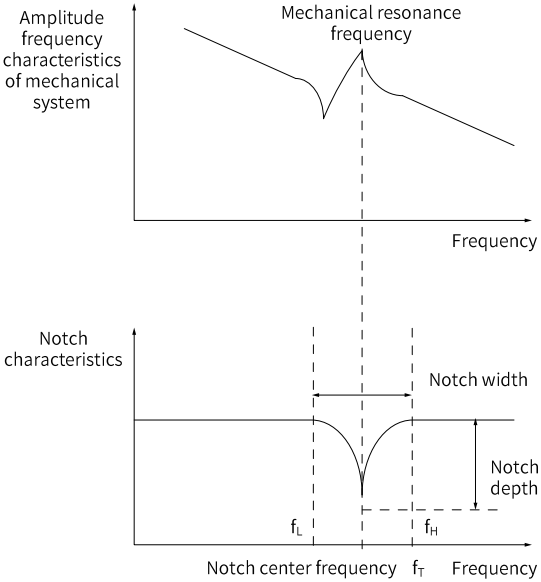


Figure 3-12 Operating principle of the notch

A total of four notches can be used, and each is defined by three parameters: frequency, width level, and depth level. The 1st and 2nd notches are manual notches whose parameters needs to be set by the user. Parameters of the 3rd and 4th notches can be either set by the user or set automatically after being configured as an adaptive notch (H09.02 =1 or 2).

Table 3–8 Description of notch parameters

Item	Manual Notch		Manual/Adaptive Notch	
	1st Notch	2nd Notch	3rd Notch	4th Notch
Frequency	H09.12	H09.15	H09.18	H09.21
Width level	H09.13	H09.16	H09.19	H09.22
Depth level	H09.14	H09.17	H09.20	H09.23

Note

- When the frequency is 8000 Hz (default), the notch is invalid.
- The adaptive notch is preferred for resonance suppression. The manual notch can be used in cases where the adaptive notch cannot deliver desired performance.

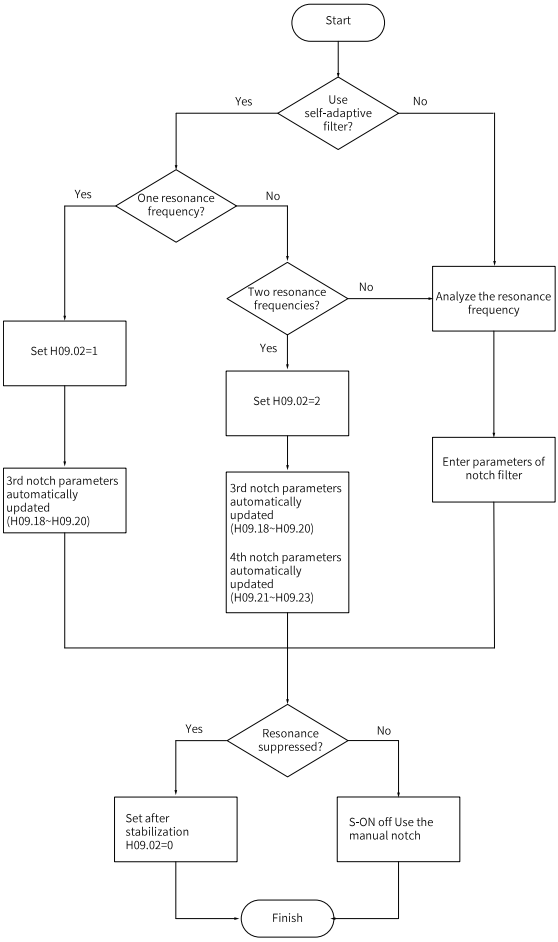


Figure 3-13 Using the notch

- Procedure for setting the adaptive notch:

  1. Set H09.02 (Adaptive notch mode) to 1 or 2 based on the number of resonance points.
  2. When resonance occurs, set H09.02 to 1 first to enable one adaptive notch. If resonance occurs again after gain tuning, set H09.02 to 2 to enable two adaptive notches.
  3. Parameters of the 3rd or 4th notches are updated automatically during operation, and parameter values are saved automatically to the corresponding parameters in group H09 every 30 min.

4. If resonance is suppressed, the adaptive notch works. After the servo drive runs stably for a period of time, set H09.02 to 0 and the parameters of the adaptive notch are fixed to the last updated values.

   This is to prevent notch parameters from being updated to wrong values due to misoperation. Wrong values will intensity resonance.
5. If resonance persists after the notch is working for a period of time, switch off the S-ON signal.
6. If there are more than two resonance frequencies, use both the adaptive notch and the manual notch to suppress resonance or use the four notches as manual notches (H09.02 = 0).

Note

When adaptive notch is applied, if the S-OFF signal is activated within 30 min, the notch parameters will not be saved to the corresponding parameter

When the resonance frequency is lower than 300 Hz, the suppression effect of the adaptive notch will be affected.

- Procedure for setting the manual notch:

  1. Step 1: Analyze the resonance frequency.
  2. When using the manual notch, set the notch frequency to same value as the actual resonance frequency obtained in the following ways:

     The resonance frequency can be obtained by using the following methods:

     a. Use the "Mechanical characteristic analysis" function in Inovance software tool.
     b. Calculate the resonance frequency based on the motor phase current displayed on the oscilloscope interface of the software tool.
     c. Set H09.02 (Adaptive notch mode) to 3. The servo drive detects the resonance frequency and saves the detected value to H09.24 automatically after start.

  3. Input the resonance frequency obtained in step a to the parameter of the selected notch, and input the width level and depth level of this notch.
  4. If resonance has been suppressed, it indicates the notch functions well and you can continue adjusting the gain. If resonance occurs again, repeat steps a and b.
  5. If resonance persists after the notch is working for a period of time, switch off the S-ON signal.

- Notch width level
  The width level indicates the ratio of the notch width to the center frequency of the notch.

$$\text{Width level of the notch} = \frac{f_H - f_L}{f_T}$$

Where:

f_T: center frequency of the notch, which is also the mechanical resonance frequency

$f_H - f_L$ is the notch width, that is, the frequency bandwidth with an amplitude attenuation rate of –3 dB relative to the notch central frequency.

The following figure shows the correspondence. Use the default value 2 in normal cases.

- Depth level of the notch
  The notch depth level indicates the ratio of the input to the output at the center frequency.

  When the depth level is 0, the input is completely suppressed at the center frequency. When the depth level is 100, the input can be fully passed at the center frequency. Therefore, the lower the depth level is, the higher the notch depth is, and the stronger the suppression effect will be.

Note

If the amplitude frequency characteristic curve obtained through the mechanical analysis function does not have obvious peak, it indicates that vibration occurs actually. Such vibration may not be mechanical resonance, and cannot be suppressed by the notch. It occurs because the gain reaches the limit, and can be suppressed only by reducing the gain or the filter time of torque reference.

The following figure shows the frequency characteristics of the notch.

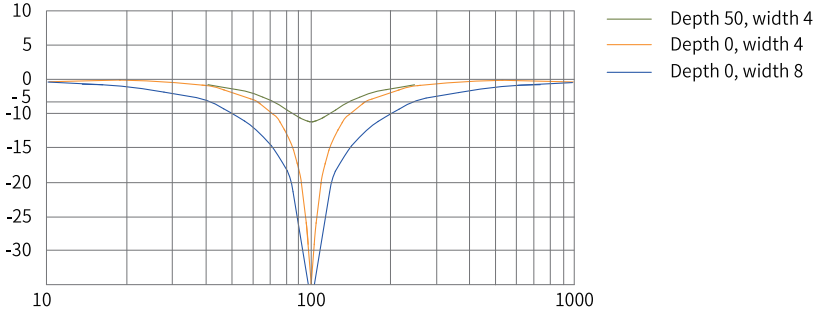


Figure 3-14 Notch frequency characteristics

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.02	2009-03h	Adaptive notch mode	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time	*" H09_en.02" on page 205*
H09.12	2009-0Dh	Frequency of the 1st notch	50 Hz to 8000 Hz	8000	Hz	Real-time	*" H09_en.12" on page 207*
H09.13	2009-0Eh	Width level of the 1st notch	0 to 20	2	-	Real-time	*" H09_en.13" on page 208*
H09.14	2009-0Fh	Depth level of the 1st notch	0 to 99	0	-	Real-time	*" H09_en.14" on page 208*
H09.15	2009-10h	Frequency of the 2nd notch	50 Hz to 8000 Hz	8000	Hz	Real-time	*" H09_en.15" on page 208*
H09.16	2009-11h	Width level of the 2nd notch	0 to 20	2	-	Real-time	*" H09_en.16" on page 209*
H09.17	2009-12h	Depth level of the 2nd notch	0 to 99	0	-	Real-time	*" H09_en.17" on page 209*
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz to 8000 Hz	8000	Hz	Real-time	*" H09_en.18" on page 209*
H09.19	2009-14h	Width level of the 3rd notch	0 to 20	2	-	Real-time	*" H09_en.19" on page 210*
H09.20	2009-15h	Depth level of the 3rd notch	0 to 99	0	-	Real-time	*" H09_en.20" on page 210*
H09.21	2009-16h	Frequency of the 4th notch	50 Hz to 8000 Hz	8000	Hz	Real-time	*" H09_en.21" on page 210*
H09.22	2009-17h	Width level of the 4th notch	0 to 20	2	-	Real-time	*" H09_en.22" on page 210*
H09.23	2009-18h	Depth level of the 4th notch	0 to 99	0	-	Real-time	*" H09_en.23" on page 211*
H09.24	2009-19h	Auto-tuned resonance frequency	0Hz to 5000Hz	0	Hz	Unchangeable	*" H09_en.24" on page 211*

3.6.2 Low-Frequency Resonance Suppression at the Mechanical End

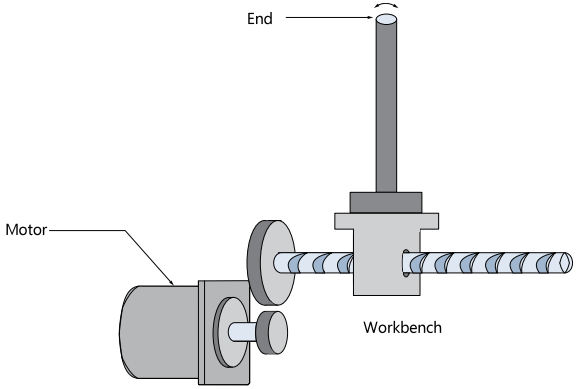


Figure 3-15 Low-frequency vibration at the mechanical end

If the mechanical load end is long and heavy, vibration may easily occur in this part during emergency stop, affecting the positioning effect. Such vibration is called low-frequency resonance as its frequency is generally within 100 Hz, which is lower than the mechanical resonance frequency mentioned in . Use the low-frequency resonance suppression function to reduce such vibration.

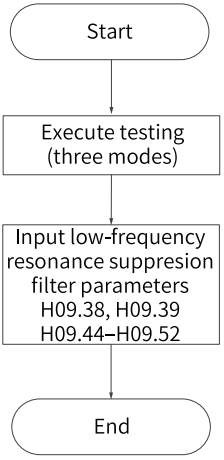


Figure 3-16 Procedure for setting low-frequency resonance suppression filter

First, collect the position deviation waveform in the motor positioning state through the oscilloscope function in the software tool and calculate the position deviation fluctuation frequency, which is the low-frequency resonance frequency. Then, input the values of H09.38 (or H09.44) and H09.49 manually and keep the values of other

parameters to the default ones. Observe the resonance suppression effect after using the low-frequency resonance suppression filter.

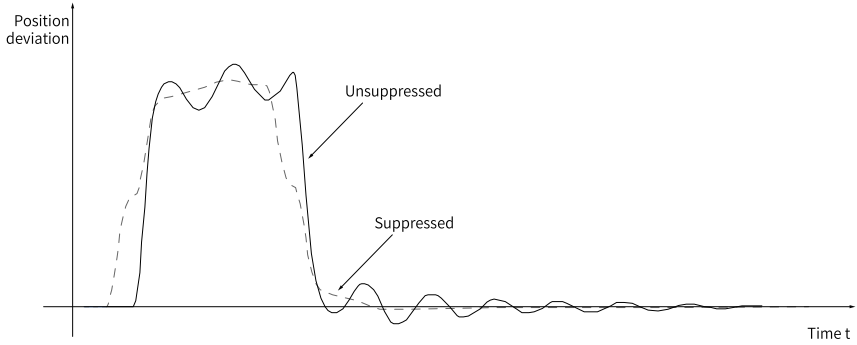


Figure 3-17 Low-frequency resonance suppression effect

☆ Related parameters:

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.38	2009-27h	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0Hz to 100.0Hz	100.0	Hz	At stop	*" H09_en.38" on page 214*
H09.39	2009-28h	Low-frequency resonance suppression 1 at the mechanical end	0 to 3	2	-	At stop	*" H09_en.39" on page 214*
H09.44	2009-2Dh	Frequency of low-frequency resonance suppression 2 at mechanical load end	0.0 to 200.0	0.0	-	At stop	*" H09_en.44" on page 214*
H09.45	2009-2Eh	Responsiveness of low-frequency resonance suppression 2 at mechanical load end	0.01 to 10.00	1.00	-	At stop	*" H09_en.45" on page 215*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H09.47	2009-30h	Width of low-frequency resonance suppression 2 at mechanical load end	0.00 to 2.00	1.00	-	At stop	" H09_en.47" on page 215
H09.49	2009-32h	Frequency of low-frequency resonance suppression 3 at mechanical load end	0.0 to 200.0	0.0	-	At stop	" H09_en.49" on page 215
H09.50	2009-33h	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01 to 10.00	1.00	-	At stop	" H09_en.50" on page 215
H09.52	2009-35h	Width of low-frequency resonance suppression 3 at mechanical load end	0.00 to 2.00	1.00	-	At stop	" H09_en.52" on page 216

3.7 Mechanical Characteristic Analysis

Overview

Mechanical characteristic analysis is used to determine the mechanical resonance point and system bandwidth. A maximum of 8 kHz response characteristic analysis is available and three modes including mechanical characteristic, speed open loop and speed closed loop are supported.

Operation Flowchart

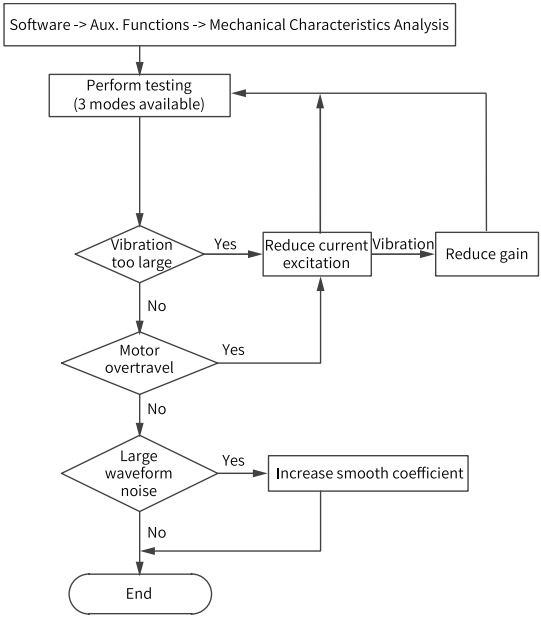


Figure 3-18 Operating procedure for mechanical characteristic analysis

Note

- To avoid strong vibration during testing, set the initial current excitation to 10%.
- The analysis waveform may be distorted if the current excitation is too low.
- If the vibration generated during test cannot be suppressed after reducing the current excitation, the possible causes and solutions may be: 1) The gain is too high, reduce the speed gain or set the notch based on the auto-tuned resonance point. 2) The set inertia is too high, set the correct inertia.
- In the mechanical characteristic test mode, waveforms before and after notch settings are consistent. In the speed closed loop and speed open loop modes, waveforms are attenuated after notch settings.

An example of the waveform obtained with the mechanical characteristic analysis is shown in the following figure.

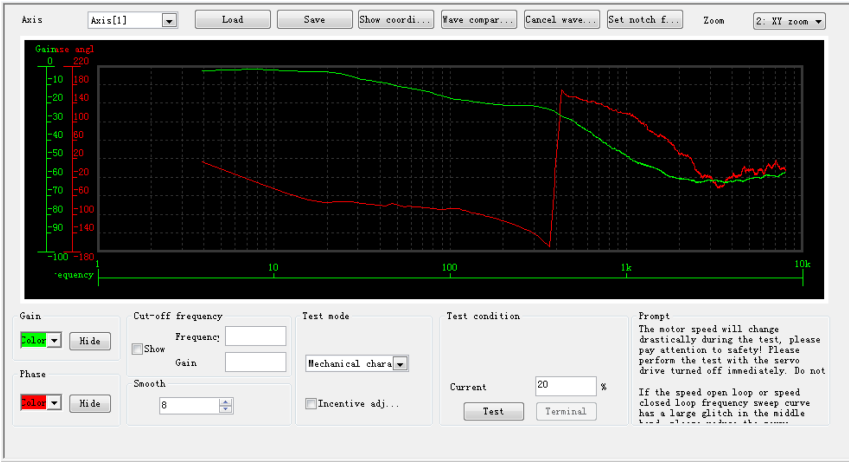


Figure 3-19 Example of the waveform obtained

4 Description of Parameters

4.1 H00 Servo Motor Parameters

H00.00 Motor SN

Hex:	2000-01h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	14101	Change:	At stop

Value Range:

0 to 65535

Description

Defines the code of the servo motor. The SV660N and SV630N series servo drive is intended to be used with a serial-type motor. The motor code is fixed to "14XXX". See H00.05 for details on serial-type motor models.

Setting the motor code to a wrong value will result in E120.0 (Unknown motor model).

H00.02 Customized No.

Hex:	2000-03h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	42949672.95	Data Type:	UInt32
Default:	0.00	Change:	Unchangeable

Value Range:

0.00 to 42949672.95

Description

Displays customized software code in hexadecimal.

The display format is: XXX.YY.

XXX: Fixed No. for customized software

YY: Upgrade record No. for customized software

H00.04 Encoder version

Hex:	2000-05h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

Displays the encoder software version in the form of 2XXX.Y, with one decimal place.

The display format is 2XXX.Y.

H00.05 Serial-type motor code

Hex:	2000-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Displays the code of the serial-type motor, which is determined by the motor model and unmodifiable.

H00.06 FPGA customized SN

Hex:	2000-07h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00 to 655.35

Description

-

H00.07 STO version

Hex:	2000-08h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

-

H00.08 Bus encoder type

Hex:	2000-09h	Effective mode:	Real time

Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 to 6553.5

Description

-

4.2 H01 Servo Drive Parameters

H01.00 MCU software version

Hex:	2001-01h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

It displays the MCU firmware version.

The display format is XXXX.Y, with one decimal place.

H01.01 FPGA software version

Hex:	2001-02h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 to 6553.5

Description

It displays the FPGA firmware version.

The display format is XXXX.Y, with one decimal place.

H01.10 Drive series No.

Hex:	2001-0Bh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	3	Change:	At stop

Value Range:

2: S1R6
3: S2R8
5: S5R5
60005: S6R6
: S7R6
7: S012
10001: T3R5
10002: T5R4
10003: T8R4
10004: T012
10005: T017
10006: T021
10007: T026

Description

Defines the servo drive model. SV660N and SV630N series servo drive serial numbers are listed in the following table.

Value	Serial No.	Remarks
2	S1R6	The rated drive power is 0.2 kW and single-phase 220 V is input.
3	S2R8	The rated drive power is 0.4 kW and single-phase 220 V is input.
5	S5R5	The rated drive power is 0.75 kW and single-phase 220 V is input.
60005	S6R6	Rated power of the servo drive: 0.85 kW; Power supply of the main circuit: Single-phase/Three-phase 220 V [1]
6	S7R6	Rated power of the servo drive: 1.0 kW; Power supply of the main circuit: Single-phase/Three-phase 220 V [1]
7	S012	Rated power of the servo drive: 1.5 kW; Power supply of the main circuit: Single-phase/Three-phase 220 V [1]
10001	T3R5	The rated drive power is 1.0 kW and three-phase 380 V is input.
10002	T5R4	The rated drive power is 1.5 kW and three-phase 380 V is input.
10003	T8R4	The rated drive power is 2.0 kW and three-phase 380 V is input.
10004	T012	The rated drive power is 3.0 kW and three-phase 380 V is input.
10005	T017	The rated drive power is 5.0 kW and three-phase 380 V is input.
10006	T021	The rated drive power is 6.0 kW and three-phase 380 V is input.
10007	T026	The rated drive power is 7.5 kW and three-phase 380 V is input.

If the voltage input to the main circuit of the servo drive does not comply with the preceding specifications, E420.0 (Main circuit phase loss) occurs.

Note [1]: The main circuit of the servo drive supports single-phase 220 V power supplies without derating.

H01.11 DC-AC voltage class

Hex:	2001-0Ch	Effective mode:	-
Min.:	0	Unit:	VAC
Max.:	65535	Data Type:	UInt16
Default:	220	Change:	Unchangeable

Value Range:

0 VAC–65535 VAC

Description

-

H01.12 Drive rated power

Hex:	2001-0Dh	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	655.35	Data Type:	UInt32
Default:	0.40	Change:	Unchangeable

Value Range:

0.00 kW–655.35kW

Description

-

H01.14 Max. output power of the drive

Hex:	2001-0Fh	Effective mode:	-
Min.:	0.00	Unit:	kW
Max.:	655.35	Data Type:	UInt32
Default:	0.40	Change:	Unchangeable

Value Range:

0.00 kW–655.35kW

Description

-

H01.16 Rated output current of the drive

Hex:	2001-11h	Effective mode:	-
Min.:	0.00	Unit:	A
Max.:	655.35	Data Type:	UInt32
Default:	2.80	Change:	Unchangeable

Value Range:

0.00A to 655.35A

Description

-

H01.18 Max. output current of the drive

Hex:	2001-13h	Effective mode:	-
Min.:	0.00	Unit:	A

Max.:	655.35	Data Type:	UInt32
Default:	10.10	Change:	Unchangeable

Value Range:
0.00A to 655.35A
Description
-

H01.40 DC bus overvoltage protection threshold

Hex:	2001-29h	Effective mode:	-
Min.:	0	Unit:	VDC
Max.:	2000	Data Type:	UInt16
Default:	420	Change:	Unchangeable

Value Range:
0 VDC to 2000 VDC
Description
-

4.3 H02 Basic Control Parameters

H02.00 Control mode

Hex:	2002-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	9	Change:	At stop

Value Range:
0: Velocity mode
1: Position mode
2: Torque mode
9: EtherCAT mode
Description
Defines the control mode of the servo drive.

When the servo drive is in the EtherCAT bus control mode, bit 9 of the status word 6041h is set to 1.
For the operation modes of the servo drive, see section "Basic Functions" in the Function Guide.

Value	Description
0	Speed control mode
1	Position control mode
2	Torque control mode
9	EtherCAT mode

H02.01 Absolute system selection

Hex:	2002-02h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Incremental mode
1: Absolute position linear mode
2: Absolute position rotation mode
3: Absolute position linear mode (without encoder overflow warning)
4: Absolute position single-turn mode

Description

Defines the mode of the absolute system.

Value	Absolute system selection	Remarks
0	Incremental position mode	The encoder is used as a serial incremental encoder without power-off memory.
1	Absolute position linear mode	The encoder is used as an absolute encoder with power-off memory. This mode is applicable to applications where the load travel range is fixed and multi-turn data does not overflow.
2	Absolute position rotation mode	The encoder is used as an absolute encoder with power-off memory. This mode applies to applications where the load travel range is not limited and the number of unidirectional revolutions is lower than 32767.
3	Absolute position linear mode (encoder overflow not detected)	Encoder overflow will not be detected in this mode.
4	Absolute position single-turn mode	-

H02.02 Rotation direction selection

Hex:	2002-03h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

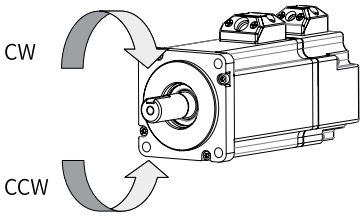
0: Counterclockwise (CCW) as forward direction

1: Clockwise (CW) as forward direction

Description

Defines the forward direction of the motor when viewed from the motor shaft side.

Value	Rotating direction	Remarks
0	Counterclockwise (CCW) as forward direction	Defines the CCW direction as the forward direction when a forward run command is received, indicating the motor rotates in the CCW direction when viewed from the motor shaft side.
1	Counterclockwise (CW) as forward direction	When a forward command is input, the motor rotates in CW direction viewed from the motor shaft side, that is, the motor rotates clockwise.



H02.05 Stop mode at S-ON OFF

Hex:	2002-06h	Effective mode:	Real time
Min.:	-4	Unit:	-
Max.:	2	Data Type:	Int16
Default:	0	Change:	At stop

Value Range:

–4: Ramp to stop as defined by 6085h, keeping dynamic braking state

–3: Stop at zero speed, keeping dynamic braking state

–2: Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state

2: Stop at zero speed, keeping de-energized state

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.

Value	Stop Mode
-4	Ramp to stop as defined by 6085h, keeping dynamic braking status
-3	Stop at zero speed, keeping dynamic braking status
-2	Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking status
-1	Dynamic braking stop, keeping dynamic braking status
0	Coast to stop, keeping de-energized status
1	Ramp to stop as defined by 6084h/609Ah, keeping de-energized status
2	Stop at zero speed, keeping de-energized status

Set a proper stop mode according to the mechanical status and operation requirements.

For comparison of stop modes, see section "Servo OFF" in the Commissioning Guide.

After the brake output function is enabled, and motor stop mode is “forced braking” (bit2 of H0A.71 is 0), the stop mode for S-ON OFF is forcibly set to "Ramp to stop as defined by 6085h, keeping DB status". For NDB models, the stop mode is forced to “Ramp to stop as defined by 6084h/609Ah, keeping de-energized status”.

H02.06 Stop mode at No.2 fault

Hex:	2002-07h	Effective mode:	Real time
Min.:	-5	Unit:	-
Max.:	3	Data Type:	Int16
Default:	2	Change:	At stop

Value Range:

–5: Stop at zero speed, keeping dynamic braking state

–4: Stop at emergency stop torque, keeping dynamic braking state

–3: Ramp to stop as defined by 6085h, keeping dynamic braking state

–2: Ramp to stop as defined by 6084h/ 609Ah, keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state

3: Stop at emergency stop torque, keeping de-energized state[1]

Description

Defines the deceleration mode of the motor for stopping rotating upon occurrence of a No. 2 fault and the motor status after stop.
–5: Stop at zero speed, keeping dynamic braking state
–4: Stop at emergency stop torque, keeping dynamic braking state
–3: Ramp to stop as defined by 6085h, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/ 609Ah, keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
4: Dynamic braking stop, keeping de-energized state

Value	Stop Mode
-5	Stop at zero speed, keeping dynamic braking status
-4	Stop at emergency-stop torque, keeping dynamic braking status
-3	Ramp to stop as defined by 6085h, keeping dynamic braking status
-2	Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking status
-1	Dynamic braking stop, keeping dynamic braking status
0	Coast to stop, keeping de-energized status
1	Ramp to stop as defined by 6084h/609Ah, keeping de-energized status
2	Ramp to stop as defined by 6085h, keeping the de-energized status
3	Stop at emergency-stop torque, keeping de-energized status
4	Dynamic braking stop, keeping de-energized status Note: This setpoint 4 is for the -NS model only.

After the brake output function is enabled, and motor stop mode is “forced braking” (bit2 of H0A.71 is 0), the stop mode on a No. 2 fault is forcibly set to "Ramp to stop as defined by 6085h, keeping de-energized state".

H02.07 Stop mode at overtravel

Hex:	2002-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state
1: Stop at zero speed, keeping position lock state
2: Stop at zero speed, keeping de-energized state
3: Stop based on ramp, keeping de-energized state
4: Stop based on ramp, keeping position lock state
5: Dynamic braking stop, keeping de-energized state
6: Dynamic braking stop, keeping dynamic braking state
7: Not responding to overtravel

Description

Defines the deceleration mode of the motor for stopping rotating upon overtravel and the motor status after stop.

Value	Stop Mode
0	Coast to stop, keeping de-energized status
1	Stop at zero speed, keeping position lock status
2	Stop at zero speed, keeping de-energized status
3	Ramp to stop as defined by 6085h, keeping the de-energized state
4	Ramp to stop as defined by 6085h, keeping position lock status
5	Dynamic braking stop, keeping de-energized status
6	Dynamic braking stop, keeping dynamic braking status
7	Not responding to overtravel

When the servo motor drives vertical axis, set H02.07 to 1 or 4 to make the motor axis in position locking state after the limit switch signal is active to ensure safety. For comparison of stop modes, see section Servo OFF in the Commissioning Guide.

After the brake output function is enabled, and motor stop mode is “forced braking” (bit2 of H0A.71 is 0), the stop mode at overtravel is forcibly set to "Ramp to stop as defined by 6085h, keeping position lock status".

H02.08 Stop mode at No.1 fault

Hex:	2002-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state1: DB stop, keeping de-energized state2: DB stop, keeping DB state

Description

Defines the deceleration mode of the motor for stopping rotating when a No. 1 fault occurs and the motor status after stop.

Value	Stop Mode
0	Coast to stop, keeping de-energized state
1	Dynamic braking stop, keeping de-energized status
2	Dynamic braking stop, keeping dynamic braking status

For details on No. 1 faults, see the Troubleshooting Guide.

For comparison of stop modes, see section Servo OFF in the Commissioning Guide.

After the brake output function is enabled, and motor stop mode is “forced braking” (bit2 of H0A.71 is 0), the stop mode on a No. 1 fault is forcibly set to "DB stop, keeping DB state". For a NDB mode, the stop mode is forced to “coast to stop, keeping de-energized state”.

H02.09 Delay from brake output ON to command received

Hex:	2002-0Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	500	Data Type:	UInt16
Default:	250	Change:	Real-time

Value Range:

0ms to 500ms

Description

Defines the delay from the moment the brake (BK) output signal is ON to the moment the servo drive starts to receive commands after power-on.

Within the time defined by H02.09, the servo drive does not receive position/ speed/torque reference.

See section "Brake Settings" in the Commissioning Guide to check the brake sequence for the motor at standstill.

H02.10 Delay from brake output OFF to motor de-energized

Hex:	2002-0Bh	Effective mode:	Real time
Min.:	50	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

50ms to 1000ms

Description

Defines the delay from the moment brake (BK) output is OFF to the moment when the motor at standstill enters the de-energized status.
See section "Brake Settings" in the Commissioning Guide to check the brake sequence for the motor at standstill.

H02.11 Motor speed threshold at brake output OFF in rotation state

Hex:	2002-0Ch	Effective mode:	Real time
Min.:	20	Unit:	RPM
Max.:	3000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
20 rpm to 3000 rpm
Description
Defines the motor speed threshold when brake (BK) output is OFF in the rotation state.
See section "Brake Settings" in the Commissioning Guide to check the brake sequence for a rotating motor.

H02.12 Delay from S-ON OFF to brake output OFF in rotation state

Hex:	2002-0Dh	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	Real-time

Value Range:
1 ms to 1000 ms[1]
Description
Defines the delay from the moment the S-ON signal is OFF to the moment the brake (BK) output is OFF in the rotation state.
See section "Brake Settings" in the Commissioning Guide to check the brake sequence for a rotating motor.
Note [1]: For the -NS model, the setpoint is 1 ms to 65535 ms.

H02.15 LED warning display

Hex:	2002-10h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Output warning information immediately
1: Not output warning information

Description

Defines whether to switch the keypad to the fault display mode when a No. 3 fault occurs.
For details on No. 3 Warnings, see the Troubleshooting Guide.

H02.17 Stop mode upon main circuit power failure

Hex:	2002-12h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0: Keep current operation
1: Stop according to H02.06
2: Stop at S-ON OFF as defined by H02.05
3: Stop according to 605A

Description

Defines the stop mode of the motor for stopping rotating upon main circuit power failure.
Note: This parameter is only for the -NS model.

H02.21 Permissible minimum resistance of regenerative resistor

Hex:	2002-16h	Effective mode:	-
Min.:	1	Unit:	Ω
Max.:	1000	Data Type:	UInt16
Default:	40	Change:	Unchangeable

Value Range:

1Ω to 1000 Ω

Description

The permissible minimum resistance of the regenerative resistor is only related to the servo drive model.

H02.22 Power of built-in regenerative resistor

Hex:	2002-17h	Effective mode:	-
Min.:	0	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Unchangeable

Value Range:

0W–65535W

Description

The power of the built-in regenerative resistor is only related to the servo drive model, which is unmodifiable.

H02.23 Resistance of built-in regenerative resistor

Hex:	2002-18h	Effective mode:	-
Min.:	0	Unit:	Ω
Max.:	65535	Data Type:	UInt16
Default:	50	Change:	Unchangeable

Value Range:

0Ω to 65535Ω

Description

The resistance of the built-in braking resistor is only related to the servo drive model, which is unmodifiable.

The built-in braking resistor comes into rescue when the maximum braking energy calculated exceeds the absorption capacity of the capacitor.

When using the built-in braking resistor, connect a jumper bar between terminals P and D.

When H01-02 (servo drive No.) = 2 or 3, there is no built-in braking resistor.

Servo drive model (SV660, SV630)		Specifications of Built-in Regenerative Resistor	
		Resistance (Ω)	Power (W)
Single-phase 220V	SV6 x 0NS1R6I	-	-
	SV6 x 0NS2R8I	-	-
	SV6 x 0NS5R5I	50	50
Three-phase 220V	SV6 x 0NS7R6I	25	80
	SV6 x 0NS012I		
Three-phase 380 V	SV6 x 0NT3R5I	100	80
	SV6 x 0NT5R4I	100	80
	SV6 x 0NT8R4I	50	80
	SV6 x 0NT012I		
	SV6 x 0NT017I	35	100
	SV6 x 0NT021I		
	SV6 x 0NT026I		

H02.24 Resistor heat dissipation coefficient

Hex:	2002-19h	Effective mode:	Real time
Min.:	10	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:

10% to 100%

Description

Defines the heat dissipation coefficient of the regenerative resistor, which is applicable to both external and built-in regenerative resistors.

Set this parameter properly according to actual heat dissipation conditions of the resistor.

Recommendations:

Generally, the value of H02.24 cannot exceed 30% for natural cooling.

The setting of H02.24 cannot exceed 50% for forced air cooling.

H02.25 Regenerative resistor type

Hex:	2002-1Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0[1]	Change:	Real-time

Value Range:

0: Built-in

1: External, natural cooling

2: External, forced air cooling

3: No resistor needed

Description

Defines the regenerative resistor type and the mode of absorbing and releasing the braking energy.

Select the regenerative resistor type based on section "Wiring and Setting of Regenerative Resistor" in SV660N Series Servo Drive Hardware Guide.

Note: [1]: For the -NS model, the default value is 3.

H02.26 Power of external regenerative resistor

Hex:	2002-1Bh	Effective mode:	Real time
Min.:	1	Unit:	W
Max.:	65535	Data Type:	UInt16
Default:	40	Change:	Real-time

Value Range:

1W–65535W

Description

Defines the power of the external braking resistor.

Note: The value of this parameter cannot be lower than the calculated braking power.

H02.27 Resistance of external regenerative resistor

Hex:	2002-1Ch	Effective mode:	Real time
Min.:	15	Unit:	Ω
Max.:	1000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

15 Ω to 1000 Ω

Description

Defines the power of the external braking resistor.

Note: The value of H02.27 (Resistance of external braking resistor) must not be lower than the value of H02.21 (Permissible min. resistance of external braking resistor).

H02.30 User password

Hex:	2002-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65535

Description

-

H02.31 System parameter initialization

Hex:	2002-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Restore default settings

2: Clear fault records

Description

Used to restore default values or clear fault records.

Value	Description	Remarks
0	No operation	-
1	Restore default setting	Restore parameters to default values except parameters in groups H00 and H01.
2	Clear fault records	Clear the latest 10 faults and warnings.

If necessary, use Inovance software tool to back up parameters except those in groups H00 and H01.

H02.32 Selection of parameters in group H0b

Hex:	2002-21h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 to 99

Description

According to the setting, the keypad can switch to monitoring parameter display mode (parameters in group H0b) automatically. H02.32 is used to set the offset in group H0b.

If a parameter not in group H0b is set, the keypad does not switch to the monitored value display mode.

H02.35 Keypad data update frequency

Hex:	2002-24h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0Hz to 20Hz

Description

-

H02.38 Overload time of external resistor

Hex:	2002-27h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	200	Data Type:	UInt16

Default: 40 Change: Real-time

Value Range:

0s to 200s

Description

Set the overload time threshold of the external braking resistor.

Note: This parameter is only for the -NS model.

H02.41 Manufacturer password

Hex:	2002-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65535

Description

-

H02.47 Delay from S-ON OFF to brake output OFF in rotation state (effective on power line breakage)

Hex:	2002-30h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms to 1000ms

Description

It is the same as H02.12. In case of power line breakage, this parameter is used instead of H02.12 to avoid the vertical axis falling.

4.4 H03 Terminal Input Parameters

H03.02 DI1 function selection

Hex:	2003-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	14	Change:	Real-time

Value Range:

0: Undefined
1: Drive enable
2: Fault reset
14: Positive limit switch
15: Negative limit switch
31: Home switch
34: Emergency stop
38: Touch probe 1
39: Touch probe 2

Description

Defines the function of DI1. Descriptions for the setpoints are shown in the following table.

Value	DI Function
0	No assignment
1	Servo ON
2	Fault reset
14	Positive limit switch
15	Negative limit switch
31	Home switch
34	Emergency stop
38	Touch probe 1
39	Touch probe 2

Set H03.02 to a value listed in the table. Otherwise, E902.0 (invalid DI setting) will occur.

Do not assign the same function to different DIs. Otherwise, E122.1 will occur.

After assigning a certain function to a DI and activate the logic of this DI, this function will remain active even if you cancel the function assignment.

DI1–DI5 are high-speed DI terminals. The width of the input signal must be larger than 0.25 ms.

When the touch probe function is enabled, DI5 and DI4 are assigned with touch probe 1 and touch probe 2 respectively by default.

H03.03 DI1 logic selection

Hex:	2003-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Used to set the level logic of DI1 when the function assigned to DI1 is active. DI1–DI5 are high-speed DI terminals. The width of the input signal must be larger than 0.25 ms. The width of the input signal must be larger than 3 ms. Set the valid logic correctly according to the host controller and peripheral circuits. The width of the input signal is shown in the following table.

Value	DI Logic Upon Active DI Function	Remarks
0	Low level	Low level must remain active for more than 0.25ms.
1	High level	High level must remain active for more than 0.25ms.

H03.04 DI2 function selection

Hex:	2003-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

Same as H03.02.

Description

-

H03.05 DI2 logic selection

Hex:	2003-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

-

H03.06 DI3 function selection

Hex:	2003-07h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16

Default:	31	Change:	Real-time

Value Range:

Same as H03.02.

Description

-

H03.07 DI3 logic selection

Hex:	2003-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

-

H03.08 DI4 function selection

Hex:	2003-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	39	Change:	Real-time

Value Range:

Same as H03.02.

Description

-

H03.09 DI4 logic selection

Hex:	2003-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

-

H03.10 DI5 function selection

Hex:	2003-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	40	Data Type:	UInt16
Default:	38	Change:	Real-time

Value Range:

Same as H03.02.

Description

-

H03.11 DI5 logic selection

Hex:	2003-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

-

H03.60 DI1 fitter time

Hex:	2003-3Dh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	0.50[1]	Change:	Real-time

Value Range:

0.00ms to 500.00ms

Description

Note [1]: For the -NS model only, the default value is 3.

H03.61 DI2 fitter time

Hex:	2003-3Eh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	0.50[1]	Change:	Real-time

Value Range:

0.00ms to 500.00ms

Description

Note [1]: For the -NS model only, the default value is 0.5.

H03.62 DI3 fitter time

Hex:	2003-3Fh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	0.50[1]	Change:	Real-time

Value Range:

0.00ms to 500.00ms

Description

Note [1]: For the -NS model only, the default value is 0.5.

H03.63 DI4 fitter time

Hex:	2003-40h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	0.50[1]	Change:	Real-time

Value Range:

0.00ms to 500.00ms

Description

Note [1]: For the -NS model only, the default value is 0.5.

H03.64 DI5 fitter time

Hex:	2003-41h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	500.00	Data Type:	UInt16
Default:	0.50[1]	Change:	Real-time

Value Range:

0.00ms to 500.00ms

Description

Note [1]: For the -NS model only, the default value is 0.5.

4.5 H04 Terminal Output Parameters

H04.00 DO1 function selection

Hex:	2004-01h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Undefined
1: Servo ready
2: Motor rotation
5: Positioning completed
9: Brake output
10: Warning
11: Fault
18: Torque reached
25: Comparison output
31: EtherCAT forced output
32: EDM safe state

Description

Defines the function of DO1.
Descriptions for the setpoints are shown in the following table.

Value	DO Function
0	No assignment
1	Ready to switch on
2	Motor rotation
5	Positioning completed
9	Brake output
10	Warning
11	Fault
18	Torque reach
25	Comparison output
31	EtherCAT-forced output
32	EDM safety state output

Set H04.00 to a value listed in the preceding table.
Different VDOs can be assigned with the same function.

H04.01 DO1 logic selection

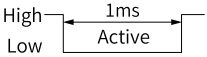
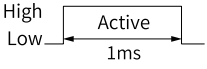
Hex:	2004-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

Defines the level logic of DO1 when the function assigned to DO1 is active.
DO1 to DO3 are normal DOs, requiring the minimum output signal width to be 1 ms. The host controller must be able to receive valid DO logic changes.

Value	DO1 Logic Upon Active DO Function	Transistor Status	Minimum Signal Width
0	Low level	ON	
1	High level	OFF	

Before receiving DO logic changes, view the setpoint of H0d.17 (Forced DI/DO selection) to check whether the DO level is determined by the actual operating status of the drive or by forced DO (H0d.19 or 60FEh).

H04.02 DO2 function selection

Hex:	2004-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	11	Change:	Real-time

Value Range:

Same as H04.00.

Description

-

H04.03 DO2 logic selection

Hex:	2004-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open
1: Closed

Description

-

H04.04 DO3 function selection

Hex:	2004-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	32	Data Type:	UInt16
Default:	9	Change:	Real-time

Value Range:

Same as H04.00.

Description

-

H04.05 DO3 logic selection

Hex:	2004-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Normally open

1: Closed

Description

-

H04.23 EtherCAT forced DO logic in non-OP status

Hex:	2004-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Status of DO1, DO2, and DO3 unchanged in the non-OP status

1: No output in DO1 and status of others unchanged in the non-OP status

2: No output in DO2 and status of others unchanged in the non-OP status

3: No output in DO1 or DO2 and status of DO3 unchanged in the non-OP status

4: No output in DO3 and status of others unchanged in the non-OP status

5: No output in DO1 or DO3 and status of DO2 unchanged in the non-OP status

6: No output in DO2 or DO3 and status of DO1 unchanged in the non-OP status

7: No output in DO1, DO2, or DO3 in the non-OP status

Description

Descriptions for the setpoints are shown in the following table.

Value	DO Function
0	Status of DO1, DO2, and DO3 unchanged in the non-OP status
1	No output in DO1 and status of others unchanged in the non-OP status
2	No output in DO2 and status of others unchanged in the non-OP status
3	No output in DO1 or DO2 and status of others unchanged in the non-OP status
4	No output in DO3 and status of others unchanged in the non-OP status
5	No output in DO1 or DO3 and status of others unchanged in the non-OP status
6	No output in DO2 or DO3 and status of others unchanged in the non-OP status
7	No output in DO1, DO2, or DO3 in the non-OP status

4.6 H05 Position Control Parameters

H05.04 First-order low-pass filter time constant

Hex:	2005-05h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 ms to 6553.5ms

Description

-

H05.05 Moving average filter time constant 1

Hex:	2005-06h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 ms to 1000.0 ms

Description

-

H05.06 Moving average filter time constant 2

Hex:	2005-07h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	128.0	Data Type:	UInt16
Default:	0.0	Change:	At stop

Value Range:

0.0 ms to 128.0ms

Description

-

H05.07 Numerator of electronic gear ratio

Hex:	2005-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	Real-time

Value Range:

0–4294967295[1]

Description

Note [1]: For the -NS model, the set point is 0 to 1073741824.

H05.09 Denominator of electronic gear ratio

Hex:	2005-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	Real-time

Value Range:

0 to 4294967295[1]

Description

Note [1]: For the -NS model, the setpoint is 0 to 1073741824

H05.19 Speed feedforward control

Hex:	2005-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: No speed feedforward
1: Internal speed feedforward
2: 60B1h used as speed feedforward
3: Zero phase control

Description

Defines the source of the speed loop feedforward signal.

In the position control mode, speed feedforward can be used to improve the position reference response speed.

Value	Speed feedforward source	Remarks
0	No speed feedforward	-
1	Internal speed feedforward	The speed information corresponding to the position reference (encoder unit) is used as the speed loop feedforward source.
2	60B1 used as speed feedforward	60B1h is used as the source of external speed feedforward signal in the CSP mode. The polarity of 60B1h can be set in bit6 of 607Eh.
3	Zero phase control	Zero phase control can be used together with H08.17 (Zero phase delay) to reduce the position follow-up deviation during startup.

Speed feedforward control parameters include H08.18 (Speed feedforward filter time constant) and H08.19 (Speed feedforward gain). See section "Feedforward Gain" for details.

H05.21 Threshold of positioning completed

Hex:	2005-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	5872	Change:	Real-time

Value Range:

0 to 65535

Description

-

H05.30 Local homing

Hex:	2005-1Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	8	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

6: Current position as the home

Description

Used to execute local homing when the homing method in CiA402 profile cannot be called by the host controller through operating bit4 of the control word.
Use this function in the S-OFF state only. Failure to comply may result in malfunction of the motor due to sudden change in the position feedback. After homing is done successfully, the present position feedback will be cleared.

Value	Description
0	0: No operation
6	6: Current position as the home

H05.35 Home search time limit

Hex:	2005-24h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt16
Default:	5000.0	Change:	Real-time

Value Range:

0.0s to 6553.5s

Description

Defines the maximum homing time.
Setting H05.35 to a too small value or if the home is not found within the time defined by H05.35, E601.0 (Homing timeout) will occur.

H05.36 Local home offset

Hex:	2005-25h	Effective mode:	Real time
Min.:	-1073741824	Unit:	Encoder unit
Max.:	1073741824	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-1073741824 to 1073741824 (in encoder unit)[1]

Description

H05.36 is used together with H05.30. After homing is done, the present position feedback is the value of H05.36.
Note [1]: For the -NS model, the setpoint is -2147483648 to 2147483647.

H05.50 Mechanical gear ratio (numerator)

Hex:	2005-33h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 to 65535
Description
-

H05.51 Denominator of mechanical gear ratio

Hex:	2005-34h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
1 to 65535
Description
Defines the ratio of the feedback pulses (encoder unit) per load revolution to the absolute position fed back by the encoder when the absolute encoder system works in the rotation mode (H02.01 = 2).
Assume that the encoder resolution is RE, the encoder pulses per load revolution is RM, and H05.52 and H05.54 are 0, then RM =RE*H05.50/H05.51.

H05.52 Pulses per load revolution in absolute position rotation mode (low 32 bits)

Hex:	2005-35h	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	At stop

Value Range:
0 to 4294967295
Description
-

H05.54 Pulses per load revolution in absolute position rotation mode (high 32 bits)

Hex:	2005-37h	Effective mode:	Real time
Min.:	0	Unit:	Encoder unit
Max.:	4294967295	Data Type:	UInt32

Default:	0	Change:	At stop

Value Range:

0 to 4294967295

Description

Defines the feedback pulses (encoder unit) per load revolution when the absolute encoder system works in the rotation mode (H02.01 = 2).

Assume the encoder pulses per load revolution is RM and H05.52 or 05.54 is not 0, RM = H05.54×2^32+H05.52.

H05.57 Single-turn absolute mode homing offset[1]

Hex:	2005-3Ah	Effective mode:	Upon the next power-on
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	At stop

Value Range:

-2147483648 to 2147483647

Description

Note [1]: For the -NS model, the corresponding parameter is H05.67.

H05.59 Hard limit homing torque limit[1]

Hex:	2005-3Ch	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	400.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

0.0 to 400.0

Description

Note [1]: For the -NS model, the corresponding parameter is H05.58.

H05.64 Optocoupler state for probe rising edge

Hex:	2005-41h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Off

1: On

Description

-

4.7 H06 Speed Control Parameters

H06.03 Speed reference

Hex:	2006-04h	Effective mode:	Real time
Min.:	-6000	Unit:	RPM
Max.:	6000	Data Type:	Int16
Default:	200	Change:	Real-time

Value Range:

–6000 rpm to +6000 rpm

Description

2006-04h is valid in the local speed mode and invalid in the EtherCAT mode.

H06.04 DI jog speed setpoint

Hex:	2006-05h	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	6000	Data Type:	UInt16
Default:	150	Change:	Real-time

Value Range:

0rpm to 6000rpm

Description

-

H06.05 Acc. ramp time of speed reference

Hex:	2006-06h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

2006-06h is valid in the local speed mode and invalid in the EtherCAT mode.

H06.06 Dec. ramp time of speed reference

Hex:	2006-07h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

2006-0Ah is valid in the local speed mode and invalid in the EtherCAT mode.

H06.08 Forward speed limit

Hex:	2006-09h	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	6000	Data Type:	UInt16
Default:	6000	Change:	Real-time

Value Range:

0rpm to 6000rpm

Description

2006-09h is valid in the local speed mode and invalid in the EtherCAT mode.

H06.09 Reverse speed limit

Hex:	2006-0Ah	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	6000	Data Type:	UInt16
Default:	6000	Change:	Real-time

Value Range:

0rpm to 6000rpm

Description

2006-0Ah is valid in the local speed mode and invalid in the EtherCAT mode.

H06.10 Deceleration unit in emergency stop

Hex:	2006-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Multiplied by 1
1: Multiplied by 10
2: Multiplied by 100

Description

The default value is 0. When 6085h (Quick stop deceleration) is set to the maximum value but the ramp time still exceeds the expected value, enlarge the value of 6085h through this parameter to reduce the stop time.

Value	Parameter Name
0	x 1
1	x 10
2	x 100

Note: When the brake function is enabled and the stop mode at S-ON OFF is set to "Ramp to stop", the maximum time of ramp-to-stop is Min (H02.12, stop time defined by 6085h).

H06.11 Torque feedforward control

Hex:	2006-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: No torque feedforward
1: Internal torque feedforward
2: 60B2h as external torque feedforward

Description

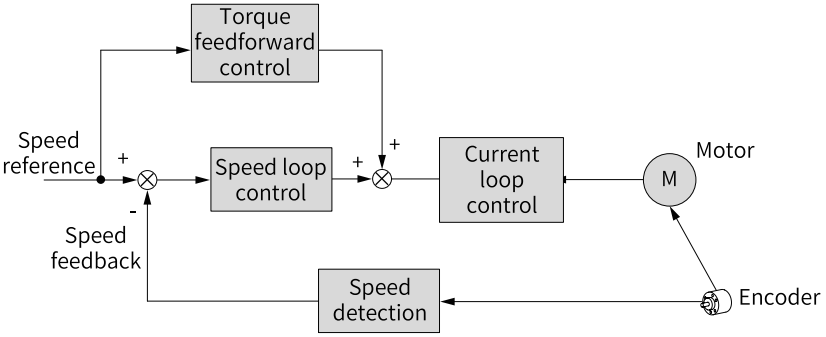
Defines whether to enable internal torque feedforward in the control modes other than torque control.

Torque feedforward can be used to improve the torque reference response speed and reduce the position deviation during acceleration/deceleration at constant speed.

Value	Torque feedforward control	Remarks
0	N/A	-
1	Internal torque feedforward	The speed reference is used as the torque feedforward signal source, which is further divided into the following two situations: In the position control mode, the speed reference refers to that output from the position controller. In the speed control mode, the speed reference refers to that set by the user.
2	60B2h used as external torque feedforward source	60B2h is used as the external torque feedforward signal source in the CSP and CSV modes. The polarity of the torque feedforward signal can be set in bit5 of 607Eh. Note: When 60B2h is used as the torque feedforward signal, you can adjust (H08.21) and time constant (H08.20) to achieve the desired performance.

Parameters of the torque feedforward function include H08.21 (Torque feedforward filter time constant) and H08.20 (Torque feedforward gain). For details, see section Feedforward Gain.

In non-torque control, the control block diagram of torque feedforward is shown in the following figure.



H06.12 Acceleration ramp time of jog speed

Hex:	2006-0Dh	Effective mode:	Real time
Min.:	0	Unit:	ms

Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Defines the acceleration/deceleration time of jog speed references in the jog mode set through H0d.11 or the software tool.

H06.13 Speed feedforward smoothing filter

Hex:	2006-0Eh	Effective mode:	Real time
Min.:	0	Unit:	us
Max.:	2000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 us–2000 us[1]

Description

Defines the speed feedforward filter time constant.

Note [1]: For the -NS model, the setpoint is 0 us–65535 us.

H06.14 CSV instruction interpolation

Hex:	2006-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

-

H06.16 Threshold of TGON (motor rotation) signal

Hex:	2006-11h	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	1000	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

0 rpm to 1000 rpm

Description

-

H06.28 Cogging torque compensation selection

Hex:	2006-1Dh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

-

H06.36 Sine velocity superposition enable

Hex:	2006-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

-

H06.37 Sine velocity superposition frequency

Hex:	2006-26h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	100	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0Hz to 100Hz

Description

-

H06.38 Sine velocity superposition amplitude

Hex:	2006-27h	Effective mode:	Real time

Min.:	0	Unit:	RPM
Max.:	100	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
0 RPM –100 RPM
Description
-

4.8 H07 Torque Control Parameters

H07.03 **Torque reference set using the operating panel**

Hex:	2007-04h	Effective mode:	Real time
Min.:	-400.0	Unit:	%
Max.:	400.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-400.0% to 400.0%
Description
-

H07.05 **Torque reference filter time constant 1**

Hex:	2007-06h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:
0.00ms to 30.00ms
Description
-

H07.06 **Torque reference filter time constant 2**

Hex:	2007-07h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	30.00	Data Type:	UInt16
Default:	0.27	Change:	Real-time

Value Range:
0.00ms to 30.00ms
Description

Defines the torque reference filter time constant.
Low-pass filtering of torque references helps smoothen torque references and reduce vibration.
Pay attention to the responsiveness during setting as an excessively high setpoint lowers down the responsiveness.

H07.09 Forward internal torque limit

Hex:	2007-0Ah	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
-

H07.10 Reverse internal torque limit

Hex:	2007-0Bh	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	350.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
-

H07.15 Emergency-stop torque

Hex:	2007-10h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:
0.0% to 400.0%
Description
-

H07.19 Internal speed limit in torque control

Hex:	2007-14h	Effective mode:	Real time

Min.:	0	Unit:	RPM
Max.:	6000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:

0rpm to 6000rpm

Description

-

H07.20 Negative internal speed limit in torque control

Hex:	2007-15h	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	6000	Data Type:	UInt16
Default:	3000	Change:	Real-time

Value Range:

0rpm to 6000rpm

Description

H07.19 and H07.20 are effective in the local torque mode only (H02.00 = 2). Use 607Fh for speed limit in the EtherCAT mode, CST mode and PT mode.

H07.21 Torque reach base value

Hex:	2007-16h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

-

H07.22 Output torque upon torque reach and DO signal activation

Hex:	2007-17h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	20.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

-

H07.23 Output torque upon torque reach and DO signal deactivation

Hex:	2007-18h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	10.0	Change:	Real-time

Value Range:

0.0% to 400.0%

Description

The torque reach function is used to judge whether the actual torque reference reaches the range of valid torque reach. If yes, the servo drive outputs the corresponding flag (bit10 of status word) to the host controller.

Actual torque reference (viewed in H0b.02): A;

Reference value for torque arrival (H07.21): B;

Threshold of valid torque arrival (H07.22:) C;

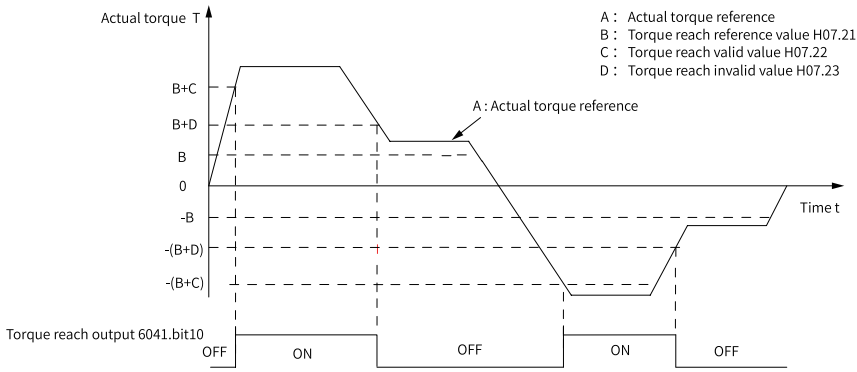
Threshold of invalid torque arrival (H07.23): D;

C and D are the offset based on B.

The torque reach signal is activated only when the actual torque reference meets the following condition: $|A| \geqslant B + C$

Otherwise, the torque reach signal remains inactive.

The torque reach signal is deactivated only when the actual torque reference meets the following condition: $|A| < B + D$.



H07.24 Field weakening depth

Hex:	2007-19h	Effective mode:	Real time
Min.:	60	Unit:	%
Max.:	115	Data Type:	UInt16
Default:	115	Change:	Real-time

Value Range:

60% to 115%

Description

Use the default value in general cases. Reducing the flux weakening depth improves the dynamic performance of flux-weakening area and reduces current ripple, but also leads to load rate rise.

H07.25 Max. permissible demagnetizing current

Hex:	2007-1Ah	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0%–200%[1]

Description

Use the default value in general cases. Increasing the demagnetizing current extends the motor speed range, but also poses a greater challenge on the bearing capacity of the motor. If you need to increase the setpoint of 2007-1Ah, contact Inovance first.

Note [1]: For the -NS model, the setpoint is 0% to 300%.

H07.26 Field weakening selection

Hex:	2007-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

0: Disabled; 1: Enabled

H07.27 Flux weakening gain

Hex:	2007-1Ch	Effective mode:	Real time
Min.:	0.001	Unit:	-
Max.:	1.000	Data Type:	UInt16
Default:	0.030	Change:	Real-time

Value Range:

0.001 to 1.000

Description

-

H07.28 Speed of flux weakening point

Hex:	2007-1Dh	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 RPM to 65535 RPM

Description

-

H07.36 Time constant of low-pass filter 2

Hex:	2007-25h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.00	Change:	Real-time

Value Range:

0.00ms to 10.00ms

Description

-

H07.37 Torque reference filter selection

Hex:	2007-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: First-order filter

1: Biquad filter

Description

0: First-order filter

1: Biquad filter

H07.38 Biquad filter attenuation ratio

Hex:	2007-27h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	50	Data Type:	UInt16
Default:	16	Change:	At stop

Value Range:
0 to 50
Description
-

H07.40 Time threshold of speed limit

Hex:	2007-29h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	300	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:
0ms to 300ms
Description
-

4.9 H08 Gain Parameters

H08.00 Speed loop gain

Hex:	2008-01h	Effective mode:	Real time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:
0.1Hz to 2000.0Hz
Description
Defines the proportional gain of the speed loop.
2008-01h determines the responsiveness of the speed loop. The higher the setpoint, the higher the responsiveness. Note that an excessively high setpoint may cause vibration.
In the position control mode, the position loop gain must be increased together with the speed loop gain.

H08.01 Speed loop integral time constant

Hex:	2008-02h	Effective mode:	Real time

Min.:	0.15	Unit:	ms
Max.:	512.00	Data Type:	UInt16
Default:	19.89	Change:	Real-time

Value Range:

0.15ms to 512.00ms

Description

Defines the integral time constant of the speed loop.

The lower the setpoint, the better the integral action, and the quicker will the deviation value be close to 0.

There is no integral action when H08.01 is set to 512.00.

H08.02 Position loop gain

Hex:	2008-03h	Effective mode:	Real time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	64.0	Change:	Real-time

Value Range:

0.1Hz to 2000.0Hz

Description

Defines the proportional gain of the position loop.

Defines the responsiveness of the position loop. A high setpoint shortens the positioning time.

Note that an excessively high setpoint may cause vibration. The 1st group of gain parameters include H08.00 (Speed loop gain), H08.01 (Speed loop integral time constant), H08.02, and H07.06 (Filter time constant of torque reference).

H08.03 2nd speed loop gain

Hex:	2008-04h	Effective mode:	Real time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	75.0	Change:	Real-time

Value Range:

0.1Hz to 2000.0Hz

Description

-

H08.04 2nd speed loop integral time constant

Hex:	2008-05h	Effective mode:	Real time

Min.:	0.15	Unit:	ms
Max.:	512.00	Data Type:	UInt16
Default:	10.61	Change:	Real-time

Value Range:

0.15ms to 512.00ms

Description

-

H08.05 2nd position loop gain

Hex:	2008-06h	Effective mode:	Real time
Min.:	0.1	Unit:	Hz
Max.:	2000.0	Data Type:	UInt16
Default:	120.0	Change:	Real-time

Value Range:

0.1Hz to 2000.0Hz

Description

Defines the second gain set of the position loop and speed loop. The 2nd group of gain parameters include H08.03 (Speed loop gain), H08.04 (Speed loop integral time constant), H08.05, and H07.06 (Torque reference filter time constant 2). For information about gain switching, see "Gain Switching" in the Commissioning Guide.

H08.08 2nd gain mode setting

Hex:	2008-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh

1: Switched between the 1st and 2nd gain sets as defined by H08.09

Description

Defines the mode for switching to the 2nd gain set.

Value	Mode
0	0: Fixed to the 1st gain set, P/PI switched by bit26 of 60FE (switched to P when bit26 of 60FE is set to 1)
1	Switchover between the 1st gain and the 2nd gain, determined by H08.09. The 1st gain includes H08.00 (Speed loop gain), H08-01 (Speed loop integral time constant), H08.02 (Position loop gain), and H07.05 (Filter time constant of torque reference). The 2nd gain includes H08.03 (2nd speed loop gain), H08-04 (2nd speed loop integral time constant), H08.05 (2nd position loop gain), and H07.06 (Filter time constant of 2nd torque reference).

H08.09 Gain switchover condition

Hex:	2008-0Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Fixed to the 1st gain set (PS)
1: Switched as defined by bit26 of 60FEh
2: Torque reference too large (PS)
3: Speed reference too large (PS)
4: Speed reference change rate too large (PS)
5: Speed reference low/high speed threshold (PS)
6: Position deviation too large (P)
7: Position reference available (P)
8: Positioning unfinished (P)
9: Actual speed (P)
10: Position reference + Actual speed (P)

Description

See the following table for gain switchover conditions.

Table 4–1 Conditions for gain switchover

Value	Gain switchover condition	Remarks
0	Fixed to the 1st gain set	The 1st gain set applies.
1	DI	Gains are switched through bit26 of 60FE. bit26 signal inactive: 1st gain set (H08.00 to H08.02, H07.05) bit26 signal active: 2nd gain set (H08.03 to H08.05, H07.06) If the bit26 signal cannot be assigned to DI, the 1st gain set applies.

Value	Gain switchover condition	Remarks
2	Torque reference too large	If the torque reference absolute value exceeds (Level + Dead time) [%] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of the torque reference is lower than (level – Dead time) [%] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set.
3	Speed reference too large	If the speed reference absolute value exceeds (Level + Dead time) [rpm] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of the speed reference is lower than (level - Dead time) [rpm] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set.
4	Speed reference too large	Active in the control modes other than speed control If the absolute value of the change rate of the speed reference exceeds (Level + Dead time) [10 rpm/s] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of the speed reference change rate is lower than (level – hysteresis) [10 rpm/s] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set. In the speed control mode, the 1st gain set always applies.
5	Speed reference high/ low-speed threshold	If the speed reference absolute value exceeds (Level - Dead time) [rpm] in the last 1st gain set, the drive starts to switch to the 2nd gain set, with gains changed gradually. When the speed reference absolute value reaches (Level + Dead time) [rpm], the 2nd gain set applies. If the speed reference absolute value is lower than (Level + Dead time) [rpm] in the last 2nd gain set, the drive starts to return to the 1st gain set, with gains changed gradually. When the speed reference absolute value reaches (Level - Dead time) [rpm], the 1st gain set applies.
6	Position deviation too large	Active only in the position control mode If the position deviation absolute value exceeds (Level + Dead time) [encoder unit] in the last 1st gain set, the drive switches to the 2nd gain set. When the absolute value of the position deviation is lower than (Level - Dead time) [encoder unit] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set. The 1st gain set applies in control modes other than position control.
7	Position reference available	Active only in the position control mode If the position reference is not 0 in the last 1st gain set, the drive switches to the 2nd gain set. When the position reference is 0 and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain, the drive returns to the 1st gain set. The 1st gain set applies in control modes other than position control.
8	Positioning completed	Active only in the position control mode If positioning has not been completed in the last 1st gain set, the drive switches to the 2nd gain set. If positioning is not completed and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain set, the servo drive returns to the 1st gain set. The 1st gain set applies in control modes other than position control.

Value	Gain switchover condition	Remarks
9	Actual speed too high	Active only in the position control mode If the absolute value of actual speed exceeds (Level + Dead time) [rpm] in the last 1st gain set, the drive switches to the 2nd gain set. If the absolute value of actual speed is lower than (Level - Dead time) [rpm] and such status lasts within the delay defined by H08.10 (Gain switchover delay) in the 2nd gain set, the drive returns to the 1st gain set. The 1st gain set applies in control modes other than position control.
10	Position reference + Actual speed	Active only in the position control mode If the position reference is not 0 in the last 1st gain set, the drive switches to the 2nd gain set. If the position reference keeps being 0 within the delay defined by H08.10 in the last 2nd gain set, the 2nd gain set applies. When the position reference keeps being 0 after the time defined by H08.10 elapses, if the absolute value of actual speed does not reach (Level) [RPM], the servo drive switches to the 1st gain set (except the speed integral time constant which is fixed to H08.04 (2nd speed loop integral time constant)); if the absolute value of the actual speed is lower than (Level - Dead time) [RPM], the servo drive switches to the 1st gain set without any exception. The 1st gain set applies in control modes other than position control.

H08.10 Gain switchover delay

Hex:	2008-0Bh	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0 ms to 1000.0 ms

Description

Defines the delay when the drive switches from the 2nd gain set to the 1st gain set.

H08.11 Gain switchover level

Hex:	2008-0Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 to 20000

Description

Defines the gain switchover level.
Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover level varies with the switchover condition.

H08.12 Gain switchover hysteresis

Hex:	2008-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:
0 to 20000
Description
Defines the dead time for gain switchover.
Gain switchover is affected by both the level and the dead time, as defined by H08.09. The unit of gain switchover hysteresis varies with the switchover condition.

H08.13 Position gain switchover time

Hex:	2008-0Eh	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	1000.0	Data Type:	UInt16
Default:	3.0	Change:	Real-time

Value Range:
0.0 ms to 1000.0 ms
Description
In position control, if H08.05 (2nd position loop gain) is much higher than H08.02 (Position loop gain), set the time for switching from H08.02 to H08.05.
This parameter can be used to reduce the impact caused by an increase in the position loop gain.
If the set value of H08.05 is no more than that of H08.02, H08-13 will be invalid and the servo drive switches to the 2nd gain immediately.

H08.15 Load moment of inertia ratio

Hex:	2008-10h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	120.00	Data Type:	UInt16
Default:	3.00	Change:	Real-time

Value Range:

0.00 to 120.00

Description

Defines the mechanical load inertia ratio relative to the motor moment of inertia. When H08.15 is set to 0, it indicates the motor carries no load; if it is set to 1.00, it indicates the mechanical load inertia is the same as the motor moment of inertia. The servo drive automatically calculates and updates the value of H08.15 through inertia auto-tuning (including offline and online).

When online inertia auto-tuning (H09.03 set to a non-zero value) is used, the servo drive set H08-15 automatically. To set H08-15 manually set H09.03 (Online inertia auto-tuning mode) to 0 (Disabled).

H08.16 Save ITune parameter

Hex:	2008-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65535

Description

-

H08.17 Zero phase delay

Hex:	2008-12h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	4.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0 ms to 4.0ms

Description

-

H08.18 Time constant of speed feedforward filter

Hex:	2008-13h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	64.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:

0.00ms to 64.00ms

Description

Defines the filter time constant of speed feedforward.

H08.19 Speed feedforward gain

Hex:	2008-14h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 100.0%

Description

In the position control mode, speed feedforward is the value of H08.19 multiplied by the speed feedforward signal, which is part of the speed reference.

Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.

Set H08.18 to a fixed value first, and then increase the value of H08.19 gradually from 0 to a certain value at which speed feedforward achieves the desired effect.

Adjust H08.18 and H08.19 repeatedly until a balanced performance is achieved.

H08.20 Torque feedforward filter time constant

Hex:	2008-15h	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	64.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:

0.00ms to 64.00ms

Description

Defines the filter time constant of torque feedforward.

H08.21 Torque feedforward gain

Hex:	2008-16h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0% to 300.0%

Description

In control modes other than torque control, torque feedforward is the product of torque feedforwad signal multiplied by H08.21 and is part of the torque reference.
Increasing the setpoint improves the responsiveness to variable speed references.
Increasing the setpoint improves the responsiveness to position references and reduces the position deviation during operation at a constant speed.
During parameter adjustment, set H08.20 (Torque feedforward filter time constant) to the default value first, and then increase H08.21 gradually to enhance the effect of torque feedforward. When speed overshoot occurs, keep H08.21 unchanged and increase the value of H08.20. Adjust H08.20 and H08.21 repeatedly until a balanced performance is achieved.

H08.22 Speed feedback filtering option

Hex:	2008-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Inhibited
1: 2 times
2: 4 times
3: 8 times
4: 16 times

Description

Defines the moving average filtering times for speed feedback.
The higher the setpoint, the weaker the speed feedback fluctuation, but the longer the feedback delay will be.

H08.23 Cutoff frequency of speed feedback low-pass filter

Hex:	2008-18h	Effective mode:	Real time
Min.:	100	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

100Hz to 8000 Hz

Description

Defines the cutoff frequency for first-order low-pass filtering on the speed feedback.

H08.24 PDFF control coefficient

Hex:	2008-19h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	100.0	Change:	Real-time

Value Range:

0.0% to 200.0%

Description

Defines the control mode of the speed loop.

When the parameter is set to 200.0, PI control (default control mode of the speed loop) is applied to the speed loop, which features fast dynamic response.

When this parameter is set to 0.0, speed loop integral action is enhanced, which filters out low-frequency interference but also slows down the dynamic response.

H08.24 can be used to keep a good responsiveness of the speed loop, with the anti-interference capacity in low-frequency bands improved and the speed feedback overshoot unaffected.

H08.27 Speed observer cutoff frequency

Hex:	2008-1Ch	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	600	Data Type:	UInt16
Default:	170	Change:	Real-time

Value Range:

50 Hz to 600Hz

Description

-

H08.28 Speed observer inertia correction coefficient

Hex:	2008-1Dh	Effective mode:	Real time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1% to 1600%

Description

-

H08.29 Speed observer filter time

Hex:	2008-1Eh	Effective mode:	Real time
Min.:	0.00	Unit:	ms
Max.:	10.00	Data Type:	UInt16
Default:	0.80	Change:	Real-time

Value Range:

0.00ms to 10.00ms

Description

-

H08.31 Disturbance cutoff frequency

Hex:	2008-20h	Effective mode:	Real time
Min.:	1	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	600	Change:	Real-time

Value Range:

1Hz to 4000Hz

Description

Note: For the -NS model, the setpoint is 10 Hz to 4000 Hz.

H08.32 Disturbance compensation gain

Hex:	2008-21h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	100	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 100%

Description

-

H08.33 Disturbance observer inertia correction coefficient

Hex:	2008-22h	Effective mode:	Real time
Min.:	1	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

1% to 1600%

Description

-

H08.34 The constant ratio of APF for perturbation observation

Hex:	2008-23h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	1600	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 1600%

Description

-

H08.35 Vibration suppression frequency

Hex:	2008-24h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	1600	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0Hz to 1600Hz

Description

-

H08.36 Vibration suppression coefficient of disturbance observation

Hex:	2008-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 200

Description

-

H08.37 Phase modulation for medium-frequency jitter suppression 2

Hex:	2008-26h	Effective mode:	Real time
Min.:	-90	Unit:	°
Max.:	90	Data Type:	Int16

Default:	0	Change:	Real-time

Value Range:
-90° to 90°
Description
-

H08.38 Medium-frequency suppression 2 frequency

Hex:	2008-27h	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	1000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0Hz to 1000Hz
Description
-

H08.39 Compensation gain of medium-frequency jitter suppression 2

Hex:	2008-28h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	300	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0% to 300%
Description
-

H08.40 Speed observer selection

Hex:	2008-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled
Description
-

H08.42 Model control selection

Hex:	2008-2Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

2: Dual-inertia model

Description

-

H08.43 Model gain

Hex:	2008-2Ch	Effective mode:	Real time
Min.:	0.1	Unit:	-
Max.:	2000.0	Data Type:	UInt16
Default:	40.0	Change:	Real-time

Value Range:

0.1 to 2000.0

Description

-

H08.46 Feedforward value

Hex:	2008-2Fh	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	102.4	Data Type:	UInt16
Default:	95.0	Change:	Real-time

Value Range:

0.0 to 102.4

Description

-

H08.53 Medium- and low-frequency jitter suppression frequency 3

Hex:	2008-36h	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0Hz to 300.0Hz

Description

-

H08.54 Medium- and low-frequency jitter suppression compensation 3

Hex:	2008-37h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0% to 200%

Description

-

H08.56 Medium- and low-frequency jitter suppression phase modulation 3

Hex:	2008-39h	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

0% to 600%

Description

-

H08.59 Medium- and low-frequency jitter suppression frequency 4

Hex:	2008-3Ch	Effective mode:	Real time
Min.:	0.0	Unit:	Hz
Max.:	300.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:

0.0Hz to 300.0Hz

Description

-

H08.60 Medium- and low-frequency jitter suppression compensation 4

Hex:	2008-3Dh	Effective mode:	Real time
Min.:	0	Unit:	%

Max.:	200	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0% to 200%
Description
-

H08.61 Medium- and low-frequency jitter suppression phase modulation 4

Hex:	2008-3Eh	Effective mode:	Real time
Min.:	0	Unit:	%
Max.:	600	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:
0% to 600%
Description
-

H08.62 Position loop integral time constant

Hex:	2008-3Fh	Effective mode:	Real time
Min.:	0.15	Unit:	-
Max.:	512.00	Data Type:	UInt16
Default:	512.00	Change:	Real-time

Value Range:
0.15 to 512.00
Description
-

H08.63 2nd position loop integral time constant

Hex:	2008-40h	Effective mode:	Real time
Min.:	0.15	Unit:	-
Max.:	512.00	Data Type:	UInt16
Default:	512.00	Change:	Real-time

Value Range:
0.15 to 512.00
Description
-

H08.64 Speed observer feedback source

Hex:	2008-41h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

-

4.10 H09 Auto-tuning Parameters

H09.00 Auto-adjustment mode

Hex:	2009-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

0: Disabled, manual gain tuning required

1: Enabled, gain parameters generated automatically based on the stiffness level

2: Positioning mode, gain parameters generated automatically based on the stiffness level

3: Interpolation mode+Inertia auto-tuning

4: Normal mode+Inertia auto-tuning

6: Quick positioning mode+Inertia auto-tuning

Description

2009-01h is set to 4 by default.

H09.01 Stiffness level selection

Hex:	2009-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	41	Data Type:	UInt16
Default:	15	Change:	Real-time

Value Range:

0 to 41

Description

Defines the stiffness level of the servo system. The higher the stiffness level, the stronger the gains and the quicker the response will be. But an excessively high stiffness level will cause vibration.
The setpoint 0 indicates the weakest stiffness and 41 indicates the strongest stiffness.

H09.02 Adaptive notch mode

Hex:	2009-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Adaptive notch no longer updated
1: One adaptive notch activated (3rd notch)

2: Two adaptive notches activated (3rd and 4th notches)
3: Resonance point tested only (displayed in H09.24)
4: Adaptive notch cleared, values of 3rd and 4th notches restored to default

Description
Defines the operation mode of the adaptive notch.

H09.03 Online inertia auto-tuning mode

Hex:	2009-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled, changing slowly
2: Enabled, changing normally
3: Enabled, changing quickly

Description
Defines whether to enable online inertia auto-tuning and the inertia ratio update speed during online inertia auto-tuning.

H09.05 Offline inertia auto-tuning mode

Hex:	2009-06h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Bi-directional

1: Unidirectional

Description

Defines the offline inertia auto-tuning mode. The offline inertia auto-tuning function can be enabled through H0d.02.

For details on offline inertia auto-tuning, see section Inertia Auto-tuning in the Commissioning Guide.

H09.06 Max. speed of inertia auto-tuning

Hex:	2009-07h	Effective mode:	Real time
Min.:	100	Unit:	RPM
Max.:	1000	Data Type:	UInt16
Default:	500	Change:	At stop

Value Range:

100rpm to 1000rpm

Description

Defines the maximum permissible speed reference in offline inertia auto-tuning mode.

During inertia auto-tuning, the higher the speed, the more accurate the auto-tuned values. Use the default setpoint in general cases.

H09.07 Time constant for accelerating to max. speed during inertia auto-tuning

Hex:	2009-08h	Effective mode:	Real time
Min.:	20	Unit:	ms
Max.:	800	Data Type:	UInt16
Default:	125	Change:	At stop

Value Range:

20 ms to 800 ms[1]

Description

Defines the time for the motor to accelerate from 0 rpm to the maximum speed of inertia auto-tuning (H09.06) during offline inertia auto-tuning.

Note [1]: For the -NS model, the setpoint is 10 ms to 5000 ms.

H09.08 Interval time after an individual inertia auto-tuning

Hex:	2009-09h	Effective mode:	Real time

Min.:	50	Unit:	ms
Max.:	10000	Data Type:	UInt16
Default:	800	Change:	At stop

Value Range:

50ms to 10000ms

Description

Defines the time interval between two consecutive speed references when H09.05 (Offline inertia auto-tuning mode) is set to 0 (Bidirectional).

H09.09 Number of motor revolutions per inertia auto-tuning

Hex:	2009-0Ah	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	100.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time

Value Range:

0.00 to 100.00

Description

Defines the number of motor revolutions needed when H09.05 (Offline inertia auto-tuning mode) is set to 0 (Bidirectional).

H09.11 Vibration threshold

Hex:	2009-0Ch	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	5.0	Change:	Real-time

Value Range:

0.0% to 100.0%

Description

Defines the threshold of vibration detected by the notch. When the current feedback exceeds the threshold, the notch starts working.

H09.12 Frequency of the 1st notch

Hex:	2009-0Dh	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:

50 Hz to 8000 Hz

Description

Defines the center frequency of the notch, which is the mechanical resonance frequency.

In the torque control mode, setting the notch frequency to 8000Hz deactivates the notch function.

H09.13 Width level of the 1st notch

Hex:	2009-0Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0 to 20

Description

Defines the width level of the notch. Use the default setpoint in general cases.

Width level is the ratio of the notch width to the notch center frequency.

H09.14 Depth level of the 1st notch

Hex:	2009-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 99

Description

Defines the depth level of the notch.

The depth level of the notch is the ratio between the input to the output at the notch center frequency.

The higher the setpoint, the lower the notch depth and the weaker the mechanical resonance suppression will be. Note that an excessively high setpoint may cause system instability.

For details on offline inertia auto-tuning, see section Inertia Auto-tuning in the Commissioning Guide.

H09.15 Frequency of the 2nd notch

Hex:	2009-10h	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16

Default:	8000	Change:	Real-time

Value Range:
50 Hz to 8000 Hz
Description
-

H09.16 Width level of the 2nd notch

Hex:	2009-11h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
-

H09.17 Depth level of the 2nd notch

Hex:	2009-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99
Description
Descriptions for parameters of the 2nd notch are the same as that of the 1st notch.

H09.18 Frequency of the 3rd notch

Hex:	2009-13h	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz to 8000 Hz
Description
-

H09.19 Width level of the 3rd notch

Hex:	2009-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20
Description
-

H09.20 Depth level of the 3rd notch

Hex:	2009-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 99
Description
See H09.12 (Frequency of the 1st notch), H09.13 (Width level of the 1st notch) and H09.14 (Depth level of the 1st notch) for parameters descriptions of the 3rd notch.

H09.21 Frequency of the 4th notch

Hex:	2009-16h	Effective mode:	Real time
Min.:	50	Unit:	Hz
Max.:	8000	Data Type:	UInt16
Default:	8000	Change:	Real-time

Value Range:
50 Hz to 8000 Hz
Description
-

H09.22 Width level of the 4th notch

Hex:	2009-17h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:
0 to 20

Description

-

H09.23 Depth level of the 4th notch

Hex:	2009-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	99	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 99

Description

See H09.12 (Frequency of the 1st notch), H09.13 (Width level of the 1st notch) and H09.14 (Depth level of the 1st notch) to understand the 4th notch parameters.

H09.24 Auto-tuned resonance frequency

Hex:	2009-19h	Effective mode:	-
Min.:	0	Unit:	Hz
Max.:	5000	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0Hz to 5000Hz

Description

When H09.02 (Adaptive notch mode) is set to 3, the current mechanical resonance frequency is displayed.

H09.30 Tension fluctuation compensation gain

Hex:	2009-1Fh	Effective mode:	Real time
Min.:	-100.0	Unit:	-
Max.:	100.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:

-100.0 to 100.0

Description

-

H09.31 Tension fluctuation compensation filter time

Hex:	2009-20h	Effective mode:	Real time

Min.:	0.00	Unit:	-
Max.:	25.00	Data Type:	UInt16
Default:	0.50	Change:	Real-time

Value Range:
0.00 to 25.00
Description
-

H09.32 Gravity compensation value

Hex:	2009-21h	Effective mode:	Real time
Min.:	-100.0	Unit:	%
Max.:	100.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-100.0% to 100.0%
Description
-

H09.33 Positive friction compensation value

Hex:	2009-22h	Effective mode:	Real time
Min.:	0.0	Unit:	%
Max.:	100.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time

Value Range:
0.0% to 100.0%
Description
-

H09.34 Negative friction compensation value

Hex:	2009-23h	Effective mode:	Real time
Min.:	-100.0	Unit:	%
Max.:	0.0	Data Type:	Int16
Default:	0.0	Change:	Real-time

Value Range:
-100.0% to 0.0%
Description
-

H09.35 **Friction compensation speed**

Hex:	2009-24h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	20.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:

0.0 to 20.0

Description

-

H09.36 **Friction compensation speed**

Hex:	2009-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	19	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Slow mode+Speed reference
1: Slow mode+Model speed
2: Slow mode+Speed feedback
3: Slow mode+Observe speed
16: Quick mode +Speed reference
17: Quick mode +Model speed
18: Quick mode +Speed feedback
19: Quick mode+Observe speed

Description

Description

Value	Description
0	Slow speed mode + Speed reference
1	Slow speed mode + Model speed
2	Slow-speed mode + Speed feedback
3	Slow speed mode + Observed speed
16	High-speed mode + Speed reference
17	High-speed mode + Model speed
18	High-speed mode + Speed feedback
19	High speed mode + Observed speed

H09.37 Vibration monitoring time

Hex:	2009-26h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	300	Change:	Real-time

Value Range:
0 to 65535
Description
-

H09.38 Frequency of low-frequency resonance suppression 1 at the mechanical end

Hex:	2009-27h	Effective mode:	Real time
Min.:	1.0	Unit:	Hz
Max.:	100.0	Data Type:	UInt16
Default:	100.0	Change:	At stop

Value Range:
1.0Hz to 100.0Hz
Description
-

H09.39 Low-frequency resonance suppression 1 at the mechanical end

Hex:	2009-28h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	2	Change:	At stop

Value Range:
0 to 3
Description
-

H09.44 Frequency of low-frequency resonance suppression 2 at mechanical load end

Hex:	2009-2Dh	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time[1]

Value Range:
0.0 to 200.0

Description

Note [1]: For the -NS model, the effective mode is at stop.

H09.45 Responsiveness of low-frequency resonance suppression 2 at mechanical load end

Hex:	2009-2Eh	Effective mode:	Real time
Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time[1]

Value Range:

0.01 to 10.00

Description

Note [1]: For the -NS model, the effective mode is at stop.

H09.47 Width of low-frequency resonance suppression 2 at mechanical load end

Hex:	2009-30h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time[1]

Value Range:

0.00 to 2.00

Description

Note [1]: For the -NS model, the effective mode is at stop.

H09.49 Frequency of low-frequency resonance suppression 3 at mechanical load end

Hex:	2009-32h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Real-time[1]

Value Range:

0.0 to 200.0

Description

Note [1]: For the -NS model, the effective mode is at stop.

H09.50 Responsiveness of low-frequency resonance suppression 3 at mechanical load end

Hex:	2009-33h	Effective mode:	Real time

Min.:	0.01	Unit:	-
Max.:	10.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time[1]

Value Range:

0.01 to 10.00

Description

Note [1]: For the -NS model, the effective mode is at stop.

H09.52 Width of low-frequency resonance suppression 3 at mechanical load end

Hex:	2009-35h	Effective mode:	Real time
Min.:	0.00	Unit:	-
Max.:	2.00	Data Type:	UInt16
Default:	1.00	Change:	Real-time[1]

Value Range:

0.00 to 2.00

Description

Note [1]: For the -NS model, the effective mode is at stop.

H09.54 Resonance detection torque threshold

Hex:	2009-37h	Effective mode:	Real time
Min.:	0.0	Unit:	-
Max.:	300.0	Data Type:	UInt16
Default:	50.0	Change:	Real-time

Value Range:

0.0 to 300.0

Description

-

H09.55 Medium frequency vibration suppression 2 cut-off frequency

Hex:	2009-38h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	1200	Change:	Real-time

Value Range:

0 to 65535

Description

-

H09.56 **Max. overmodulation one-key adjustment**

Hex:	2009-39h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	2936	Change:	Real-time

Value Range:
0 to 65535
Description
-

H09.57 **STune resonance suppression switchover frequency**

Hex:	2009-3Ah	Effective mode:	Real time
Min.:	0	Unit:	Hz
Max.:	4000	Data Type:	UInt16
Default:	900	Change:	Real-time

Value Range:
0Hz to 4000Hz
Description
-

H09.58 **STune resonance suppression reset selection**

Hex:	2009-3Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disabled
1: Enabled
Description
-

4.11 H0A Fault and Protection Parameters

H0A.00 **Power input phase loss protection**

Hex:	200A-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:

0: Enabled

1: Disabled

3: Enable power-off detection

Description

Servo drives supporting single-phase/three-phase 220 V and three-phase 380 V power supplies are available. When voltage fluctuation or phase loss occurs on the power supply, the drive triggers power input phase loss protection based on H0A.00.

H0A.01 Absolute position limit

Hex:	200A-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

2: Enabled after homing

Description

Defines whether the absolute position limit is active and the condition for activation.

After the absolute position limit is enabled, when the target position reference exceeds the position limit in the position control mode, the servo drive takes the position limit as the target and stops after reaching the limit; when the absolute position feedback reaches the position limit in other control modes, the servo drive reports an overtravel warning and stops in the mode defined by H02.07 (Stop mode at overtravel).

H0A.04 Motor overload protection gain

Hex:	200A-05h	Effective mode:	Real time
Min.:	50	Unit:	-
Max.:	300	Data Type:	UInt16
Default:	100	Change:	Real-time

Value Range:

50 to 300

Description

Determines the motor overload duration before E620.0 (Motor overload) is reported.

You can change the setpoint to advance or delay the time when overload protection is triggered based on the motor temperature. The setpoint 50% indicates the time is cut by half; 150% indicates the time is increased by 50%. Set this parameter based on the actual temperature of the motor.

H0A.08 Overspeed threshold

Hex:	200A-09h	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0rpm to 20000rpm

Description

Defines the overspeed threshold of the motor.

H0A.10 Threshold of excessive local position deviation

Hex:	200A-0Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	27486951	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold for reporting EB00.0 (Position deviation too large). The function is the same as 6065h (Following error window), both of which are active.

H0A.12 Runaway protection enable

Hex:	200A-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disable

1: Enable

Description

Used to enable runaway protection.

H0A.18 IGBT over-temperature threshold

Hex:	200A-13h	Effective mode:	Real time
Min.:	120	Unit:	°C
Max.:	175	Data Type:	UInt16
Default:	135	Change:	Real-time

Value Range:

120°C to 175°C

Description

Defines the over-temperature protection threshold of the power module.

H0A.19 Filter time constant of touch probe 1

Hex:	200A-14h	Effective mode:	Real time
Min.:	0.00	Unit:	us
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00us–6.30us

Description

-

H0A.20 Filter time constant of touch probe 2

Hex:	200A-15h	Effective mode:	Real time
Min.:	0.00	Unit:	us
Max.:	6.30	Data Type:	UInt16
Default:	2.00	Change:	Real-time

Value Range:

0.00us–6.30us

Description

Touch probe 1 and touch probe 2 are high-speed DIs. When external input signals suffer from spike interference, set H0A.19 or H0A.20 to filter the out spike interference.

Note: The oscilloscope in the software tool displays the unfiltered signals of touch probe 1 and touch probe 2. Signals with width lower than 0.25 ms will not be displayed.

H0A.21 STO function display selection

Hex:	200A-16h	Effective mode:	Real time
Min.:	0	Unit:	-

Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 3

Description

Defines whether to display the STO status or report E150.0 after the STO function is triggered.

0: Displays the STO status. The keypad displays "sto_" after the STO function is triggered. In this case, no fault is reported and no output is generated from the fault DO.

1: Displays the STO fault. The keypad displays "E150.0" after the STO function is triggered. In this case, the dive reports the fault and the faulty DO outputs.

H0A.22 Sigma_Delta filter time

Hex:	200A-17h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:

0 to 3

Description

-

H0A.23 TZ signal filter time

Hex:	200A-18h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	25ns
Max.:	31	Data Type:	UInt16
Default:	15	Change:	At stop

Value Range:

0ns to 31ns

Description

-

H0A.25 Filter time constant of speed feedback display value

Hex:	200A-1Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	50[1]	Change:	Real-time

Value Range:

0ms to 5000ms

Description

Defines the filter time constant of the speed feedback display value to smoothen the speed feedback.

H0b.00 displays the actual motor speed filtered by this parameter.

Note: [1]: For the -NS model, the default value is 0.

H0A.26 Motor overload detection

Hex:	200A-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Show motor overload warning (E909.0) and fault (E620.0)

1: Hide motor overload warning (E909.0) and fault (E620.0)

Description

Defines whether to enable motor overload detection.

H0A.27 Motor rotation DO speed filter time

Hex:	200A-1Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	5000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

0 ms to 5000 ms[1]

Description

Defines the low-pass filter time constant of speed feedback signals.

This parameter is effective only when the speed feedback signals are used to judge the speed-related DO signals.

Note [1]: For the -NS model, the setpoint is 0 ms to 100 ms.

H0A.32 Time threshold for locked motor overheat protection

Hex:	200A-21h	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	200	Change:	Real-time

Value Range:

10ms to 65535ms

Description

Defines the overtemperature duration before E630.0 (Motor stall) is detected by the servo drive.

H0A.32 can be used to adjust the sensitivity of motor stall overtemperature detection.

H0A.33 Locked motor overheat protection

Hex:	200A-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

Defines whether to enable the detection for E630.0 (Motor stall overtemperature protection).

H0A.36 Encoder multi-turn overflow fault selection

Hex:	200A-25h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Not hide

1: Hide

Description

Defines whether to mask E735.0 (Encoder multi-turn counting overflow) in the absolute position linear mode.

H0A.40 Overtravel compensation selection

Hex:	200A-29h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 to 7

Description

Bit0: Overtravel compensation

Bit1: Probe rising edge compensation

Bit2: Probe falling edge compensation

H0A.49 Regenerative resistor overtemperature threshold

Hex:	200A-32h	Effective mode:	Real time
Min.:	100	Unit:	℃
Max.:	175	Data Type:	UInt16
Default:	115	Change:	Real-time

Value Range:

100℃ to 175℃

Description

-

H0A.50 Encoder communication fault tolerance threshold

Hex:	200A-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

0 to 31

Description

-

H0A.51 Phase loss detection filter times

Hex:	200A-34h	Effective mode:	Real time
Min.:	3	Unit:	55ms
Max.:	36	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

3ms to 36ms

Description

-

H0A.52 Encoder temperature protection threshold

Hex:	200A-35h	Effective mode:	Real time

Min.:	0	Unit:	℃
Max.:	175	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0℃ to 175℃

Description

0: Disable

H0A.53 Probe rising edge compensation time

Hex:	200A-36h	Effective mode:	Real time
Min.:	-30000	Unit:	25ns
Max.:	30000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-30000 ns to 30000 ns[1]

Description

Note: [1]: For the -NS model, the setpoint is -3000 ns to 3000 ns.

H0A.54 Probe falling edge compensation time

Hex:	200A-37h	Effective mode:	Real time
Min.:	-30000	Unit:	25ns
Max.:	30000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:

-30000 ns to 30000 ns[1]

Description

Note: [1]: For the -NS model, the setpoint is -3000 ns to 3000 ns.

H0A.55 Runaway current threshold

Hex:	200A-38h	Effective mode:	Real time
Min.:	100.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	200.0	Change:	Real-time

Value Range:

100.0% to 400.0%

Description

-

H0A.56 Fault reset delay

Hex:	200A-39h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	60000	Data Type:	UInt16
Default:	10000	Change:	Real-time

Value Range:

0ms to 60000ms

Description

Faults E620.0, E630.0, E640.0, E640.1, and E650.0 can be reset only after the set delay.

H0A.57 Runaway speed threshold

Hex:	200A-3Ah	Effective mode:	Real time
Min.:	1	Unit:	RPM
Max.:	1000	Data Type:	UInt16
Default:	50	Change:	Real-time

Value Range:

1 rpm to 1000 rpm

Description

-

H0A.58 Runaway speed filter time

Hex:	200A-3Bh	Effective mode:	Upon the next power-on
Min.:	0.1	Unit:	ms
Max.:	100.0	Data Type:	UInt16
Default:	2.0	Change:	Real-time

Value Range:

0.1ms to 100.0ms

Description

-

H0A.59 Runaway protection detection time

Hex:	200A-3Ch	Effective mode:	Real time
Min.:	10	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	30	Change:	Real-time

Value Range:

10ms to 1000ms

Description

-

H0A.70 Overspeed threshold 2

Hex:	200A-47h	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	20000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0rpm to 20000rpm

Description

-

H0A.71 Servo function switch

Hex:	200A-48h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65535

Description

bit	Function	Description
0	MS1 overload curve selection	0: New 1: Old
1	Power failure bleeder switch	0: On 1: Off
2	Forced brake motor stop	0: Enabled 1: Disabled
3	Reserved	-
4	E120.3 mask switch	0: Disabled 1: Enabled
5	Prohibit software reading function code	0: Disabled 1: Enabled
6	E108.4 mask switch	0: Disabled 1: Enabled
7	CSV command update timing	0: At SyncActive 1: At IRQ interrupt
8	Reserved	-
9	Power line breakage detection	0: Enabled 1: Disabled
10	Torque limit source	0: Auto switch acc. to H02.00 1: H07.09 and H07.10
11	Reserved	-
12	Homing completion signal power failure retention	0: Disabled 1: Enabled
13	Status word selection in STO state	0: Switch on disable 1: Fault
14	Reserved	-
15	Reserved	-

H0A.72 Maximum stop time in ramp-to-stop

Hex:	200A-49h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	10000	Change:	At stop

Value Range:

0ms to 65535ms

Description

Defines the maximum time taken by the motor in decelerating from 6000 RPM to 0 RPM when the stop mode is set to "Ramp to stop as defined by 6084h/609Ah (HM)" or "Ramp to stop as defined by 6085h".

H0A.73 STO 24 V disconnection filter time

Hex:	200A-4Ah	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	5	Data Type:	UInt16
Default:	5	Change:	Real-time

Value Range:

0 ms to 5 ms[1]

Description

Defines the filter time from the moment when STO2 is disconnected from the 24 V power supply to the moment when the STO status is displayed or E150.0 is reported.

Note: [1]: For the -NS model, the setpoint is 1 ms to 5 ms.

H0A.74 Filter time for two inconsistent STO channels

Hex:	200A-4Bh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 ms to 1000 ms[1]

Description

Defines the filter time from the moment when STO2 is input with different voltage to the moment when E150.1 is reported.

Note: [1]: For the -NS model, the setpoint is 1 ms to 1000 ms.

H0A.75 Servo OFF delay after STO triggered

Hex:	200A-4Ch	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	25	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

0ms to 25ms

Description

Defines filter time from the moment when the STO status is displayed or E150.0/ E150.1 is reported to the moment when the servo drive is off.

H0A.85 Wire breakage detection torque threshold

Hex:	200A-56h	Effective mode:	Real time
Min.:	4.0	Unit:	%
Max.:	400.0	Data Type:	UInt16
Default:	5.0	Change:	At stop

Value Range:

4.0% to 400.0%

Description

-

H0A.86 Wire breakage detection filter time

Hex:	200A-57h	Effective mode:	Real time
Min.:	5	Unit:	ms
Max.:	1000	Data Type:	UInt16
Default:	30	Change:	At stop

Value Range:

5ms to 1000ms

Description

-

4.12 H0b Monitoring Parameters

H0b.00 Motor speed actual value

Hex:	200b-01h	Effective mode:	-
Min.:	-32767	Unit:	RPM
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767rpm to 32767rpm

Description

It displays the actual speed of the servo motor after round-off, in unit of 1 RPM. Set in H0A.25 (Filter time constant of speed feedback display) the filter time constant for H0b.00.

H0b.01 Speed reference

Hex:	200b-02h	Effective mode:	-
Min.:	-32767	Unit:	RPM
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32767rpm to 32767rpm

Description

Indicates the present speed reference (accurate to 1rpm) of the drive in the position and speed control modes.

H0b.02 Internal torque reference

Hex:	200b-03h	Effective mode:	-
Min.:	-3276.7	Unit:	%
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:

-3276.7% to 3276.7%

Description

Displays present torque reference (accurate to 0.1%). The value 100.0% corresponds to the rated torque of the motor.

H0b.03 Input (DI) signal monitoring

Hex:	200b-04h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

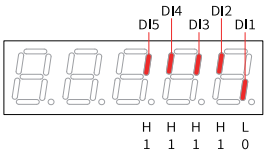
0 to 65535

Description

Indicates the level status of DI1 to DI5 without filtering.

Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0") For example, if DI1 is low level and DI2 to DI5 are high level, and the binary value is 11110, then the decimal value read from H0b.03 in the Inovance servo commissioning software is 30.

The panel display is as follows:



H0b.05 Output (DO) signal monitoring

Hex:	200b-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

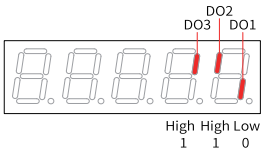
0 to 65535

Description

It displays the level states of the 3 DO terminals without filtering.

Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0") For example, if DO1 is low level and DO2 to DO3 are high level, and the binary value is 110, then the decimal value of H0b.05 read from Inovance servo commissioning software is 6, and the keypad displays the following figure:

The panel display is as follows:



H0b.07 Absolute position counter

Hex:	200b-08h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

It displays the current motor absolute position (reference unit) in the position control mode.

This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.09 Mechanical angle

Hex:	200b-0Ah	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Displays present mechanical angle (encoder unit) of the motor. The setpoint 0 indicates the mechanical angle is 0°.

H0b.10 Electrical angle

Hex:	200b-0Bh	Effective mode:	-
Min.:	0.0	Unit:	°
Max.:	360.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0° to 360.0°

Description

Indicates the present electrical angle of the motor, which is accurate to 0.1°.
The electrical angle varies from -360° to +360.0° when the motor is rotating.
Similarly, if the motor has 4 pairs of poles, each revolution generates 4 rounds of angle changes from 0° to 359.9°.
Also, if the motor has 5 pairs of poles, each revolution generates 5 rounds of angle changes from 0° to 359.9°.

H0b.12 Average load ratio

Hex:	200b-0Dh	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	800.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 800.0%

Description

Displays the percentage of the average load torque to the rated torque of the motor, which is accurate to 0.1%. The value 100.0% corresponds to the rated torque of the motor.

H0b.15 Position following error (encoder unit)

Hex:	200b-10h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Used to count the position pulses fed back by the encoder in any control mode.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.17 Feedback pulse counter

Hex:	200b-12h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.19 Total power-on time

Hex:	200b-14h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	6553.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s to 6553.5s

Description

Used to record the total operating time of the servo drive.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.

H0b.24 Phase current RMS value

Hex:	200b-19h	Effective mode:	-
Min.:	0.0	Unit:	A
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0A to 6553.5A

Description

Displays the RMS value of the phase current of the motor, accurate to 0.1A.

H0b.26 Bus voltage

Hex:	200b-1Bh	Effective mode:	-
Min.:	0.0	Unit:	VDC
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 VDC–6553.5 VDC

Description

Displays the DC bus voltage of the main circuit input voltage after rectification, which is accurate to 0.1V.

H0b.27 Module temperature

Hex:	200b-1Ch	Effective mode:	-
Min.:	-20	Unit:	℃
Max.:	200	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-20℃ to 200℃

Description

Indicates the temperature of the module inside the servo drive, which can be used as a reference for estimating the actual temperature of the drive.

H0b.28 Absolute encoder fault information given by FPGA

Hex:	200b-1Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H0b.29 Axis status information given by FPGA

Hex:	200b-1Eh	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.30 Axis fault information given by FPGA

Hex:	200b-1Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.31 Encoder fault information

Hex:	200b-20h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 65535
Description
-

H0b.33 Fault log

Hex:	200b-22h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	9	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Active fault
1: Last fault
2: 2nd to last fault
3: 3rd to last fault
4: 4th to last fault
5: 5th to last fault
6: 6th to last fault
7: 7th to last fault
8: 8th to last fault
9: 9th to last fault

Description

Used to view any one of the latest 10 faults that occurred on the servo drive. For -NS models, 20 faults can be recorded.

H0b.34 Fault code set by H0B-33

Hex:	200b-23h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H0b.35 Timestamp of the selected fault

Hex:	200b-24h	Effective mode:	-
Min.:	0.0	Unit:	-
Max.:	429496729.5	Data Type:	UInt32
Default:	0.0	Change:	Unchangeable

Value Range:

0.0s–429496729.5s

Description

-

H0b.37 Motor speed upon occurrence of the selected fault

Hex:	200b-26h	Effective mode:	-
Min.:	-32767	Unit:	RPM
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-32767rpm to 32767rpm
Description
-

H0b.38 Motor phase U current upon occurrence of the selected fault

Hex:	200b-27h	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7A to 3276.7A
Description
-

H0b.39 Motor phase V current upon occurrence of the selected fault

Hex:	200b-28h	Effective mode:	-
Min.:	-3276.7	Unit:	A
Max.:	3276.7	Data Type:	Int16
Default:	0.0	Change:	Unchangeable

Value Range:
-3276.7A to 3276.7A
Description
-

H0b.40 Bus voltage upon occurrence of the selected fault

Hex:	200b-29h	Effective mode:	-
Min.:	0.0	Unit:	VDC
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:
0.0 VDC–6553.5 VDC
Description
-

H0b.41 Input terminal state on selected fault

Hex:	200b-2Ah	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.43 Output terminal status upon occurrence of the selected fault

Hex:	200b-2Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
H0b.35 to H0b.43 display the related data when the fault displayed in H0b.34 occurs.

H0b.45 Internal fault code

Hex:	200b-2Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.46 Absolute encoder fault information given by FPGA upon occurrence of the selected fault

Hex:	200b-2Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.47 System status information given by FPGA upon occurrence of the selected fault

Hex:	200b-30h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.48 System fault information given by FPGA upon occurrence of the selected fault

Hex:	200b-31h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.49 Encoder fault information upon occurrence of the selected fault

Hex:	200b-32h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0b.51 Internal fault code upon occurrence of the selected fault

Hex:	200b-34h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H0b.53 Position following error (reference unit)

Hex:	200b-36h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.55 Motor speed actual value

Hex:	200b-38h	Effective mode:	-
Min.:	-214748364.8	Unit:	RPM
Max.:	214748364.7	Data Type:	Int32
Default:	0.0	Change:	Unchangeable

Value Range:

-214748364.8rpm to 214748364.7rpm

Description

Indicates the actual value of motor speed, which is accurate to 0.1 rpm.
This parameter is a 32-bit integer, which is displayed as a decimal on the keypad.
H0A.25 (Filter time constant of speed feedback display) can be used to set the filter time constant of the speed feedback.

H0b.57 Control circuit bus voltage

Hex:	200b-3Ah	Effective mode:	-
Min.:	0.0	Unit:	VDC
Max.:	6553.5	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0 VDC–6553.5 VDC

Description

It displays the DC bus voltage of the input control power after rectification.

H0b.58 Mechanical absolute position (low 32 bits)

Hex:	200b-3Bh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the low 32-bit value (encoder unit) of the mechanical position feedback when the absolute encoder is used.

H0b.60 Mechanical absolute position (high 32 bits)

Hex:	200b-3Dh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.63 NotRdy state

Hex:	200b-40h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	5	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0: None

1: Control power abnormal (H0b.57)

2: Abnormal condition detected in phase loss detection

3: Abnormal condition detected in main circuit power detection (including short-to-ground fault)

4: Other faults

5: Short circuit to ground detection failure

Description

Display Value	Description
0	None
1	Control circuit power supply error (H0b.57)
2	Phase loss detection error
3	Main circuit power supply error (including short-circuited-to-ground error)
4	Other servo drive faults
5	Detection on short circuit to ground failed

H0b.66 Encoder temperature

Hex:	200b-43h	Effective mode:	-
Min.:	-32768	Unit:	°C
Max.:	32767	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-32768°C to 32767°C

Description

Indicates the encoder temperature value.

H0b.67 Load rate of regenerative resistor

Hex:	200b-44h	Effective mode:	-
Min.:	0.0	Unit:	%
Max.:	200.0	Data Type:	UInt16
Default:	0.0	Change:	Unchangeable

Value Range:

0.0% to 200.0%

Description

Indicates the brake load rate. When the load rate exceeds 100%, the servo drive stops braking.

H0b.70 Number of absolute encoder revolutions

Hex:	200b-47h	Effective mode:	-
Min.:	0	Unit:	Rev
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0Rev to 65535Rev

Description

Indicates the number of revolutions of the absolute encoder.

H0b.71 Single-turn position fed back by the absolute encoder

Hex:	200b-48h	Effective mode:	-
Min.:	0	Unit:	Encoder unit
Max.:	2147483647	Data Type:	UInt32
Default:	0	Change:	Unchangeable

Value Range:

0 to 2147483647

Description

It displays the single-turn position feedback of the absolute encoder.

H0b.74 System fault information given by FPGA

Hex:	200b-4Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H0b.77 Encoder position (low 32 bits)

Hex:	200b-4Eh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.79 Encoder position (high 32 bits)

Hex:	200b-50h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit

Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.81 Single-turn position of the rotary load (low 32 bits)

Hex:	200b-52h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Displays the low 32-bit value (encoder unit) of the position feedback of the rotating load when the absolute encoder system works in the rotation mode (H02.01 = 2).

H0b.83 Single-turn position of the rotary load (high 32 bits)

Hex:	200b-54h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.85 Single-turn position of the rotary load (reference unit)

Hex:	200b-56h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

-

H0b.87 IGBT junction temperature

Hex:	200b-58h	Effective mode:	-
Min.:	0	Unit:	°C
Max.:	200	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0°C to 200°C
Description
-

H0b.90 No. of the group with abnormal parameters

Hex:	200b-5Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the group number of the abnormal parameter when E101 occurs.

H0b.91 Offset in the group with abnormal parameters

Hex:	200b-5Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the offset of the abnormal parameter within the parameter group when E101 occurs.

4.13 H0d Auxiliary Parameters

H0d.00 Software Reset

Hex:	200d-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16

Default: 0 Change: At stop

Value Range:

0: No operation

1: Enable

Description

Defines whether to enable software reset.

Software reset is available in the following cases:

The servo is in the S-OFF state.

No. 1 non-resettable faults do not occur.

No e2prom operation is performed. The software reset function is invalid when H0A.03 (Retentive at power failure) is set to 1 (Enabled).

Value	Function	Remarks
0	No operation	-
1	Software Reset	Programs in the drive are reset automatically (similar to the program reset upon power-on) after the software reset function is enabled, without the need for a power cycle.

H0d.01 Fault reset

Hex: 200d-02h Effective mode: Real time

Min.: 0 Unit: -

Max.: 1 Data Type: UInt16

Default: 0 Change: At stop

Value Range:

0: No operation

1: Enable

Description

Defines whether to enable fault reset.

Value	Function	Remarks
0	No operation	-
1	Fault reset	When a No. 1 or No. 2 resettable fault occurs, you can enable the fault reset function in the non-operational state after rectifying the fault cause, stopping the keypad from displaying the fault. When a No. 3 warning occurs, you can enable the fault reset function directly, regardless of the servo drive status.

For fault classification, see the Troubleshooting Guide.

The fault reset function, once enabled, stops the keypad from displaying the fault only. It does not activate modifications made on parameters.

This function is not applicable to non-resettable faults. Use this function with caution in cases where the fault causes are not rectified.

H0d.02 Offline inertia auto-tuning selection

Hex:	200d-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65

Description

Used to enable offline inertia auto-tuning through the keypad.

In the parameter display mode, switch to H0d.02 and press the SET key to enable offline inertia auto-tuning. For details on offline inertia auto-tuning, see section “Inertia Auto-tuning”.

H0d.04 Read/write in encoder ROM

Hex:	200d-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: No operation

1: Write ROM

2: Read ROM

3: ROM failure

Description

Value	Function
0	No operation
1	Write ROM
2	Read ROM
3	ROM failed

H0d.05 Emergency stop

Hex:	200d-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: No operation

1: Emergency stop

Description

Defines whether to enable emergency stop.

Value	Function
0	No operation
1	Enable

When this function is enabled, the servo drive immediately stops according to the Stop mode at S-ON OFF 605Ch regardless of its state.

H0d.12 Phase U/V current balance correction

Hex:	200d-0Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0: Disabled

1: Enabled

Description

-

H0d.17 Forced DI/DO enable switch

Hex:	200d-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0:0-No operation

1: Forced DI enabled, forced DO disabled

2: Forced DO enabled, forced DI disabled

3: Forced DI and DO enabled

4: EtherCAT-controlled forced DO enabled[1]

Description

Forced DI/DO selection.

Note [1]: For the -NS model, the setpoint is

0: No operation

1: Forced DI enabled, forced DO disabled

2: Forced DI disabled, forced DO enabled3: Forced DI and DO enabled

H0d.18 Forced DI value

Hex:	200d-13h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	31	Data Type:	UInt16
Default:	31	Change:	Real-time

Value Range:

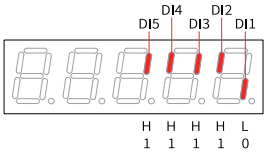
0 to 31

Description

Defines whether the DI functions set in group H03 is active when forced DI is activated (H0d.17 = 1 or 3).

The value of H0d.18 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the level logic of DI function is high level; "bit(n) = 0" indicates the level logic of the DI function is low level.

Example:



H0d.18 value is 0x1E, and the corresponding binary value is 11110, indicating that DI1 is low level and DI2 to DI5 are high level. The 5 DI levels can also be monitored through H0b.03 (Monitored DI states).

View also the DI terminal logic in group H03 when checking whether a DI function is valid.

H0d.19 Forced DO value

Hex:	200d-14h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

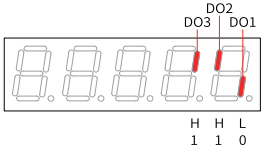
0 to 7

Description

Defines whether the DO functions assigned in group H04 are active when forced DO is active (H0d.17 = 2 or 3).

The value of H0d.19 is displayed as a hexadecimal on the keypad. When it is converted to a binary value, "bit(n) = 1" indicates the DO function is active; "bit(n) = 0" indicates the DO function is inactive.

Example:
If H0d.19 value is 0x06, the corresponding binary is 110, indicating that the DO1 function is effective and functions of DO2 to DO3 are ineffective. DO level is output based on DO level settings of H04. Assume that DO1 to DO3 logics in group H04 use 0 to indicate low level output for ineffective function, then H0B.05 displays the following results:



H0d.20 Absolute encoder reset

Hex:	200d-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	2	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:
0: No operation
1: Reset
2: Reset the fault and multi-turn data

Description
You can reset the encoder error or the multi-turn data fed back by the encoder by setting H0d.20.

Value	Function
0	No operation
1	Reset encoder fault
2	Reset encoder fault and multi-turn data

Note: After reset of encoder feedback multi-turn data, the absolute position of the encoder changes abruptly. In this case, perform the mechanical homing operation.

4.14 H0E Communication Function Parameters

H0E.00 Node address

Hex:	200E-01h	Effective mode:	Real time
Min.:	1	Unit:	-

Max.:	127	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

1 to 127

Description

Defines the servo drive axis address during RS232 communication.

1 to 127: Each of the servo drive networked must have a unique address. Otherwise, communication error or failure will occur.

H0E.01 **Save objects written through communication to EEPROM**

Hex:	200E-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3[1]	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0: Not save

1: Save parameters

2: Save object dictionaries

3: Save both[2]

Description

Sets if parameters written through 232 and/or EtherCAT communication (SDO) are saved to e2prom.

Note:

- [1]: For the –NS model, the maximum value is 255.
- [2: For the -NS model, the setpoints are
  0: Not save
  1: Save parameters
  2: Save object dictionaries
  3: Save parameters and object dictionaries
  4: Save object dictionaries written before communication (OP)
  255: Determine through H0E03 and H0E04

H0E.03 **Save objects written through software (commissioning protocol) to e2prom**

Hex:	200E-04h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:

0: Do not save

1: Save

Description

Saves objects written through software (commissioning protocol) to e2prom, including the parameter and object dictionary.

Note: This parameter is only for the -NS model.

H0E.04 Save objects written through communication to e2prom (excluding commissioning protocol)

Hex:	200E-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Do not save

1: Save

Description

You can use this parameter to determine whether to save communication written data in e2prom (excluding commissioning protocol) (Ethernet COE). The data include the function code and object dictionary.

Note: This parameter is only for the -NS model.

H0E.20 EtherCAT slave name

Hex:	200E-15h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Indicates the station number assigned to the slave by the master during EtherCAT communication.

H0E.21 EtherCAT slave alias

Hex:	200E-16h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	At stop

Value Range:

0 to 65535

Description

For masters that fail to assign the station numbers, set the slave station numbers through the parameter during EtherCAT communication.
H0E.21 = 0: The master assigns the station numbers by default.
H0E.21 ≠ 0: Use the set station number, and the one assigned by master is deactivated.

H0E.22 Number of synchronous loss events allowed by EtherCAT

Hex:	200E-17h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	20	Data Type:	UInt16
Default:	8	Change:	Real-time

Value Range:
1 to 20
Description
Defines the maximum number of master signal loss events allowed by the slave. The slave reports EE08.2 (IRQ loss) if the value of 200E-17h.

H0E.24 Sync loss count

Hex:	200E-19h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H0E.25 Max. error value and invalid frames of EtherCAT port 0 per unit time

Hex:	200E-1Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Port0 terminal CRC check error. If there is a count, the frame received by the port0 terminal is damaged. Possible cause: Cable, PHY terminal. 0x301RXER included. Normally, 0x300 = 0x301. If 0x300 > 0x301, the CRC check error is still present in the network.

H0E.26 Max. error value and invalid frames of EtherCAT port 1 per unit time

Hex:	200E-1Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Port1 terminal CRC check error. If there is a count, the frame received by the port0 terminal is damaged. Possible cause: Cable, PHY terminal. 0x301RXER included. Normally, 0x300 = 0x301. If 0x300 > 0x301, the CRC check error is still present in the network.

H0E.27 Max. transfer error of EtherCAT port per unit time

Hex:	200E-1Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

If the received data is wrong and ended with an extra error flag, it indicates the data has been processed by other stations.

H0E.28 Max. EtherCAT data frame processing unit error per unit time

Hex:	200E-1Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 255

Description

If data exchange error occurs between ESC and internal MCU, keep the setpoint to 0. If the counting value increases, the internal anti-disturbance performance of the board is abnormal.

H0E.29 Max. link loss value of EtherCAT port 0 per unit time

Hex:	200E-1Eh	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
If data link loss is detected by the ESC port, the counting value of the corresponding link loss counter increases. Such scenario may be caused by poor contact or damaged cables.

H0E.30 E15 alarm detection delay

Hex:	200E-1Fh	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	60000	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 60000
Description
-

H0E.31 EtherCAT synchronization mode setting

Hex:	200E-20h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	1	Change:	At stop

Value Range:
0 to 3[1]
Description
Defines the synchronization mode.
Note [1]: For the -NS model, the range is 0 to 2.

H0E.32 EtherCAT synchronization error threshold

Hex:	200E-21h	Effective mode:	Real time
Min.:	100	Unit:	ns
Max.:	10000	Data Type:	UInt16
Default:	3000[1]	Change:	At stop

Value Range:
100ns to 10000ns

Description

Defines the permissible jitter range of synchronization signals when the servo drive works in synchronization mode 1 (H0E.31 = 1).

Note: [1]: For the -NS model, the default value is 4000.

H0E.33 EtherCAT state machine status and port connection status

Hex:	200E-22h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Displays the connection status of the servo state machine and EtherCAT network ports.

bit	Value
0 to 7	Correspond to EtherCAT state machines: 1/2/4/8
8 to 15	Correspond to terminal connection state: • 0: No link • 1: IN port linked • 2: OUT port linked • 3: IN and OUT ports linked

H0E.34 Allowed duration of CSP position reference error

Hex:	200E-23h	Effective mode:	Real time
Min.:	1	Unit:	ms
Max.:	30	Data Type:	UInt16
Default:	20	Change:	Real-time

Value Range:

1ms to 30ms

Description

Defines the counting value when the position reference increment exceeds the maximum position reference increment threshold. When the counting value exceeds the threshold, EB01.0 or EB01.1 will be reported.

H0E.35 AL fault code

Hex:	200E-24h	Effective mode:	-
Min.:	0	Unit:	-

Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H0E.36 EtherCAT enhanced link enable

Hex:	200E-25h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

-

H0E.37 EtherCAT XML reset selection

Hex:	200E-26h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disabled

1: Enabled

Description

-

H0E.59 PHY chip half-duplex mode

Hex:	200E-3Ch	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Enabled

1: Disabled

Description

-

H0E.74 **Link signal delay**

Hex:	200E-4Bh	Effective mode:	Upon the next power-on
Min.:	1	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	400	Change:	At stop

Value Range:

1ms to 65535ms

Description

Sets the delay time of the Link signal.

Note: This parameter is only for the -NS model.

H0E.80 **Modbus baud rate**

Hex:	200E-51h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	9	Change:	Real-time

Value Range:

0: 300 bps
1: 600 bps
2: 1200 bps
3: 2400 bps
4: 4800 bps
5: 9600 bps
6: 19200 bps
7: 38400 bps
8: 57600 bps
9: 115200 bps

Description

Defines the communication rate between the servo drive and the host controller. The baud rate set in the servo drive must be the same as that in the host controller. Otherwise, communication will fail.

Value	Baud rate (bps)
0	300
1	600
2	1200
3	2400
4	4800
5	9600
6	19200
7	38400
8	57600
9	115200

H0E.81 Modbus data format

Hex:	200E-52h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0: No parity, 2 stop bits (8-N-2)

1: Even parity, 1 stop bit (8-E-1)

2: Odd parity, 1 stop bit (8-O-1)

3: No parity, 1 stop bit (8-N-1)

Description

Defines the data check mode between the servo drive and the host controller during communication.

The data format set in the servo drive must be the same as that in the host controller. Otherwise, communication will fail.

H0E.82 Modbus response delay

Hex:	200E-53h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	20	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 20ms

Description

-

H0E.83 Modbus communication timeout

Hex:	200E-54h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	600	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 600ms

Description

-

H0E.90 Communication version

Hex:	200E-5Bh	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:

0.00 to 655.35

Description

-

H0E.93 PHY hardware version

Hex:	200E-5Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 3

Description

-

H0E.96 XML version information

Hex:	200E-61h	Effective mode:	-
Min.:	0.00	Unit:	-
Max.:	655.35	Data Type:	UInt16
Default:	0.00	Change:	Unchangeable

Value Range:
0.00 to 655.35
Description
-

4.15 H18 Position Comparison Output

H18.00 Position comparison output selection

Hex:	2018-01h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0: Disable
1: Enable (rising edge-triggered)
Description
-

H18.02 Position comparison resolution

Hex:	2018-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	UInt16
Default:	1	Change:	Real-time

Value Range:
0: 24-bit
1: 23-bit
2: 22-bit
3: 21-bit
4: 20-bit
5: 19-bit
6: 18-bit
7: 17-bit
Description
-

H18.03 Position comparison mode

Hex:	2018-04h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Single

1: Cyclic comparison mode

Description

-

H18.04 Current position as zero

Hex:	2018-05h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0: Disable

1: Enable (rising edge-triggered)

Description

Note: This function needs to be used when the comparison state is inactive, otherwise the comparison logic may malfunction.

H18.05 Position comparison output width

Hex:	2018-06h	Effective mode:	Real time
Min.:	0.0	Unit:	ms
Max.:	204.7	Data Type:	UInt16
Default:	0.0[1]	Change:	Real-time

Value Range:

0.0 ms to 204.7 ms[2]

Description

Note:

[1]: The default value is 0.1.

[2]: For the -NS model, the setpoint is 0.1 ms to 204.7 ms.

H18.07 Position comparison start point

Hex:	2018-08h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	30	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 30
Description
-

H18.08 Position comparison end point

Hex:	2018-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	30	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 30
Description
-

H18.09 Current state of position comparison

Hex:	2018-0Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1024	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 1024
Description
-

H18.10 Real-time position of position comparison

Hex:	2018-0Bh	Effective mode:	-
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:
-2147483648 to 2147483647
Description
-

H18.12 Zero offset of position comparison

Hex:	2018-0Dh	Effective mode:	Real time

Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H18.18 Position comparison switch

Hex:	2018-13h	Effective mode:	Upon the next power-on
Min.:	0	Unit:	-
Max.:	257	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Bit 0: Comparison logic independently enabled

bit 8: Target position reference unit

Description

-

4.16 H19 Target Position Parameters

H19.00 Target value of position comparison 1

Hex:	2019-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.02 Attribute value of position comparison 1

Hex:	2019-03h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

bit	Description
0	0-Enables passing through the point in the forward direction. 1-Enables passing through the point in the reverse direction. • When bit0 = 0 and bit1 = 0, the comparison logic skips the point. • When bit0=1 and bit1=0, DO active signal is output if current position changes from "less than" to "more than" the comparison point. • When bit0=0 and bit1=1, DO active signal is output if current position changes from "more than" to "less than" the comparison point. • When bit0=1 and bit1=1, DO active signal is output in both situations.
1	
2 to 6	N/A
7	Bit7 and bit8[1] are used to configure which DO outputs the pulse signal when the position comparison is valid. • When bit7 = 0 and bit8 = 0, the original design method is retained and the DO serial number of position comparison is selected from group H04. • When bit7 = 1 and bit8 = 0, the pulse signal is output from DO1 when the position comparison is valid. • When bit7 = 0 and bit8 = 1, the pulse signal is output from DO2 when the position comparison is valid. • When bit7 = 1 and bit8 = 1, the pulse signal is output from DO3 when the position comparison is valid.
8	

Description

[1]: For the -NS model, there is no bit7 or bit8.

H19.03 Target value of position comparison 2

Hex:	2019-04h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.05 Attribute value of position comparison 2

Hex:	2019-06h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.06 Target value of position comparison 3

Hex:	2019-07h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.08 Attribute value of position comparison 3

Hex:	2019-09h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.09 Target value of position comparison 4

Hex:	2019-0Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.11 Attribute value of position comparison 4

Hex:	2019-0Ch	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.12 Target value of position comparison 5

Hex:	2019-0Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.14 Attribute value of position comparison 5

Hex:	2019-0Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.15 Target value of position comparison 6

Hex:	2019-10h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.17 Attribute value of position comparison 6

Hex:	2019-12h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.18 Target value of position comparison 7

Hex:	2019-13h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.20 Attribute value of position comparison 7

Hex:	2019-15h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.21 Target value of position comparison 8

Hex:	2019-16h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.23 Attribute value of position comparison 8

Hex:	2019-18h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.24 Target value of position comparison 9

Hex:	2019-19h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.26 Attribute value of position comparison 9

Hex:	2019-1Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.27 Target value of position comparison 10

Hex:	2019-1Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32

Default: 0 Change: Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.29 Attribute value of position comparison 10

Hex: 2019-1Eh Effective mode: Real time

Min.: 0 Unit: -

Max.: 387 Data Type: UInt16

Default: 0 Change: Real-time

Value Range:

Same as H19.02.

Description

-

H19.30 Target value of position comparison 11

Hex: 2019-1Fh Effective mode: Real time

Min.: -2147483648 Unit: -

Max.: 2147483647 Data Type: Int32

Default: 0 Change: Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.32 Attribute value of position comparison 11

Hex: 2019-21h Effective mode: Real time

Min.: 0 Unit: -

Max.: 387 Data Type: UInt16

Default: 0 Change: Real-time

Value Range:

Same as H19.02.

Description

-

H19.33 Target value of position comparison 12

Hex: 2019-22h Effective mode: Real time

Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.35 Attribute value of position comparison 12

Hex:	2019-24h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	3	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.36 Target value of position comparison 13

Hex:	2019-25h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.38 Attribute value of position comparison 13

Hex:	2019-27h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.39 Target value of position comparison 14

Hex:	2019-28h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.41 Attribute value of position comparison 14

Hex:	2019-2Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.42 Target value of position comparison 15

Hex:	2019-2Bh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.44 Attribute value of position comparison 15

Hex:	2019-2Dh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.

Description

-

H19.45 Target value of position comparison 16

Hex:	2019-2Eh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.47 Attribute value of position comparison 16

Hex:	2019-30h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.48 Target value of position comparison 17

Hex:	2019-31h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.50 Attribute value of position comparison 17

Hex:	2019-33h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16

Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.51 Target value of position comparison 18

Hex:	2019-34h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.53 Attribute value of position comparison 18

Hex:	2019-36h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.54 Target value of position comparison 19

Hex:	2019-37h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.56 Attribute value of position comparison 19

Hex:	2019-39h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.57 Target value of position comparison 20

Hex:	2019-3Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.59 Attribute value of position comparison 20

Hex:	2019-3Ch	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.60 Target value of position comparison 21

Hex:	2019-3Dh	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.62 Attribute value of position comparison 21

Hex:	2019-3Fh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.63 Target value of position comparison 22

Hex:	2019-40h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.65 Attribute value of position comparison 22

Hex:	2019-42h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.66 Target value of position comparison 23

Hex:	2019-43h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.68 Attribute value of position comparison 23

Hex:	2019-45h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.69 Target value of position comparison 24

Hex:	2019-46h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

-

H19.71 Attribute value of position comparison 24

Hex:	2019-48h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

Same as H19.02.

Description

-

H19.72 Target value of position comparison 25

Hex:	2019-49h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32

Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.74 Attribute value of position comparison 25

Hex:	2019-4Bh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.75 Target value of position comparison 26

Hex:	2019-4Ch	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.77 Attribute value of position comparison 26

Hex:	2019-4Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.78 Target value of position comparison 27

Hex:	2019-4Fh	Effective mode:	Real time

Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.80 Attribute value of position comparison 27

Hex:	2019-51h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.81 Target value of position comparison 28

Hex:	2019-52h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.83 Attribute value of position comparison 28

Hex:	2019-54h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.84 Target value of position comparison 29

Hex:	2019-55h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.86 Attribute value of position comparison 29

Hex:	2019-57h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.
Description
-

H19.87 Target value of position comparison 30

Hex:	2019-58h	Effective mode:	Real time
Min.:	-2147483648	Unit:	-
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

H19.89 Attribute value of position comparison 30

Hex:	2019-5Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	387	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
Same as H19.02.

Description

-

4.17 H1F Software Tool Parameters

H1F.90 **DI function state 1 read through communication**

Hex:	201F-5Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H1F.91 **DI function state 2 read through communication**

Hex:	201F-5Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H1F.92 **DI function state 3 read through communication**

Hex:	201F-5Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

H1F.93 **DI function state 4 read through communication**

Hex:	201F-5Eh	Effective mode:	-

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H1F.94 DO function state 1 read through communication

Hex:	201F-5Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H1F.95 DO function state 2 read through communication

Hex:	201F-60h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

4.18 H30 Related Variables Read through Communication

H30.16 Encoder communication timeout count

Hex:	2030-11h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535

Description
Indicates the total number of timeout errors in encoder communication.
Note: This parameter is only for the -NS model.

H30.17 Encoder communication CRC error count

Hex:	2030-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
Indicates the total number of CRC errors in encoder communication.
Note: This parameter is only for the -NS model.

H30.18 Encoder communication frame stop bit error count

Hex:	2030-13h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
It indicates the total number of frame stop bit errors in encoder communication.
Note: This parameter is only for the -NS model.

H30.20 Servo SN code digits 0 & 1

Hex:	2030-15h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
H30.20–H30.27 are servo 16-bit SN codes, which are displayed in the form of ASSIC codes.

H30.21 **Servo SN code digits 2 & 3**

Hex:	2030-16h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H30.22 **Servo SN code digits 4 & 5**

Hex:	2030-17h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H30.23 **Servo SN code digits 6 & 7**

Hex:	2030-18h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H30.24 **Servo SN code digits 8 & 9**

Hex:	2030-19h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535

Description
-

H30.25 **Servo SN code digits 10 & 11**

Hex:	2030-1Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H30.26 **Servo SN code digits 12 & 13**

Hex:	2030-1Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

H30.27 **Servo SN code digits 14 & 15**

Hex:	2030-1Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

4.19 1000h Object Dictionary

1000.00h Device type

Hex:	1000-00h	Effective mode:	-

Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	131474	Change:	Unchangeable

Value Range:
0 to 2147483647
Description
-

1001.00h Error Register

Hex:	1001-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	255	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 255
Description
-

1018.01h Vendor ID

Hex:	1018-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	1048576	Change:	Unchangeable

Value Range:
0 to 2147483647
Description
-

1018.02h Product code

Hex:	1018-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	786701	Change:	Unchangeable

Value Range:
0 to 2147483647
Description
-

1018.03h Revision number

Hex:	1018-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	2147483647	Data Type:	UInt32
Default:	65537	Change:	Unchangeable

Value Range:

0 to 2147483647

Description

-

1600.00h Number of valid mapped objects in RPDO1

Hex:	1600-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	3	Change:	Real-time

Value Range:

0 to 10

Description

This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1600.01h Mapped object 1 in RPDO1

Hex:	1600-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1614807056	Change:	Real-time

Value Range:

0 to 4294967295

Description

The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.

Sub-indexes are written in the following format:

bit31 to bit16: index
bit15 to bit8: sub-index
bit7 to bit0: object length

1600.02h Mapped object 2 in RPDO1

Hex:	1600-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1616904200	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.03h Mapped object 3 in RPDO1

Hex:	1600-03h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1622671376	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.04h Mapped object 4 in RPDO1

Hex:	1600-04h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.05h Mapped object 5 in RPDO1

Hex:	1600-05h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295

Description
Same as 1600.01h.

1600.06h Mapped object 6 in RPDO1

Hex:	1600-06h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.07h Mapped object 7 in RPDO1

Hex:	1600-07h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.08h Mapped object 8 in RPDO1

Hex:	1600-08h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.09h Mapped object 9 in RPDO1

Hex:	1600-09h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32

Default: 0 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1600.01h.

1600.0Ah Mapped object 10 in RPDO1

Hex: 1600-0Ah Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 0 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1600.01h.

1600.0Bh Mapped object 11 in RPDO1

Hex: 1600-0Bh Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 0 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1600.01h.

1600.0Ch Mapped object 12 in RPDO1

Hex: 1600-0Ch Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 0 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1600.01h.

1600.0D-h Mapped object 13 in RPDO1

Hex:	1600-0Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.0Eh Mapped object 14 in RPDO1

Hex:	1600-0Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.0Fh Mapped object 15 in RPDO1

Hex:	1600-0Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.10h Mapped object 16 in RPDO1

Hex:	1600-10h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295

Description
Same as 1600.01h.

1600.11h Mapped object 17 in RPDO1

Hex:	1600-11h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.12h Mapped object 18 in RPDO1

Hex:	1600-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.13h Mapped object 19 in RPDO1

Hex:	1600-13h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1600.14h Mapped object 20 in RPDO1

Hex:	1600-14h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32

Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1600.01h.

1A00.00h Number of valid mapped objects in TPDO1

Hex:	1A00-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt16
Default:	7	Change:	Real-time

Value Range:
0 to 10
Description
This object can be modified only when PDO is inactive. When 0 is written, the mapping objects of other sub-indexes are cleared.

1A00.01h Mapped object 1 in TPDO1

Hex:	1A00-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1614872592	Change:	Real-time

Value Range:
0 to 4294967295
Description
The total length of a mapping object cannot exceed 64 bits. Mapping based on bytes instead of bits is supported. The indexes and sub-indexes of mapping objects must exist in the object dictionary list. The attribute of mapping objects is readable and the objects can be mapped.
Sub-indexes are written in the following format:
bit31 to bit16: index
bit15 to bit8: sub-index
bit7 to bit0: object length

1A00.02h Mapped object 2 in TPDO1

Hex:	1A00-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32

Default: 1617166368 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1A00.01h.

1A00.03h Mapped object 3 in TPDO1

Hex: 1A00-03h Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 1622736912 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1A00.01h.

1A00.04h Mapped object 4 in TPDO1

Hex: 1A00-04h Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 1622802464 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1A00.01h.

1A00.05h Mapped object 5 in TPDO1

Hex: 1A00-05h Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 1622933536 Change: Real-time

Value Range:

0 to 4294967295

Description

Same as 1A00.01h.

1A00.06h Mapped object 6 in TPDO1

Hex: 1A00-06h Effective mode: -

Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1614741520	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.07h Mapped object 7 in TPDO1

Hex:	1A00-07h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1627193360	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.08h Mapped object 8 in TPDO1

Hex:	1A00-08h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.09h Mapped object 9 in TPDO1

Hex:	1A00-09h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.0Ah Mapped object 10 in TPDO1

Hex:	1A00-0Ah	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.0Bh Mapped object 11 in TPDO1

Hex:	1A00-0Bh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.0Ch Mapped object 12 in TPDO1

Hex:	1A00-0Ch	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.0Dh Mapped object 13 in TPDO1

Hex:	1A00-0Dh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.0Eh Mapped object 14 in TPDO1

Hex:	1A00-0Eh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.0Fh Mapped object 15 in TPDO1

Hex:	1A00-0Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.10h Mapped object 16 in TPDO1

Hex:	1A00-10h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.11h Mapped object 17 in TPDO1

Hex:	1A00-11h	Effective mode:	-

Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.12h Mapped object 18 in TPDO1

Hex:	1A00-12h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.13h Mapped object 19 in TPDO1

Hex:	1A00-13h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1A00.14h Mapped object 20 in TPDO1

Hex:	1A00-14h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
Same as 1A00.01h.

1C12.00h Number of assigned PDOs

Hex:	1C12-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt8
Default:	1	Change:	Real-time

Value Range:
0 to 1
Description
-

1C12.01h PDO mapping object index of assigned RxPDO1

Hex:	1C12-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	5889	Change:	Real-time

Value Range:
0 to 65535
Description
-

1C13.00h Number of assigned PDOs

Hex:	1C13-00h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt8
Default:	1	Change:	Real-time

Value Range:
0 to 1
Description
-

1C13.01h PDO mapping object index of assigned TxPDO1

Hex:	1C13-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	6913	Change:	Real-time

Value Range:
0 to 65535

Description

-

1C32.01h Sync mode

Hex:	1C32-01h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	2	Change:	Real-time

Value Range:

0 to 65535

Description

-

1C32.02h Cycle time

Hex:	1C32-02h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:

0 to 4294967295

Description

-

1C32.04h Sync modes supported

Hex:	1C32-04h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	4	Change:	Real-time

Value Range:

0 to 65535

Description

-

1C32.05h Minimum cycle time

Hex:	1C32-05h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32

Default: 250000 Change: Real-time

Value Range:

0 to 4294967295

Description

-

1C33.01h Sync mode

Hex: 1C33-01h Effective mode: -

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 2 Change: Real-time

Value Range:

0 to 65535

Description

-

1C33.02h Cycle time

Hex: 1C33-02h Effective mode: -

Min.: 0 Unit: -

Max.: 4294967295 Data Type: UInt32

Default: 0 Change: Real-time

Value Range:

0 to 4294967295

Description

-

1C33.04h Sync modes supported

Hex: 1C33-04h Effective mode: -

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 4 Change: Real-time

Value Range:

0 to 65535

Description

-

1C33.05h Minimum cycle time

Hex: 1C33-05h Effective mode: -

Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	250000	Change:	Real-time

Value Range:
0 to 4294967295
Description
-

4.20 6000h Object Dictionary

603Fh **Error code**

Hex:	603Fh	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:
0 to 65535
Description
When an error described in the DSP402 profile occurs on the servo drive, 603Fh is as described in DSP402.
When an error specified by the user occurs on the servo drive, 603Fh is 0xFF00.
The value of 603Fh is in hexadecimal.
In addition, the object dictionary 203Fh displays auxiliary bytes of fault codes in hexadecimal.
203Fh is a UInt32 value, in which the high 16 bits indicate the internal fault code of the manufacturer, and the low 16 bits indicate the external fault code of the manufacturer.

6040h **Control word**

Hex:	6040h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0 to 65535
Description
For description of status words, see section Basic Functions of the function guide.

6041h Status word

Hex:	6041h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

For description of status words, see section Basic Functions of the function guide.

605Ah Quick stop mode

Hex:	605Ah	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	7	Data Type:	Int16
Default:	2	Change:	At stop

Value Range:

0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Ramp to stop as defined by 6085h, keeping de-energized state
3: Stop at emergency stop torque, keeping de-energized state
5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state
6: Ramp to stop as defined by 6085h, keeping position lock state
7: Stop at emergency stop torque, keeping position lock state

Description

Defines the deceleration mode of the motor for stopping rotating upon quick stop and the motor status after stop.

Value	Stop Mode
0	Coast to stop, keeping de-energized status
1	Ramp to stop as defined by 6084h/609Ah (HM), keeping the de-energized status
2	Ramp to stop as defined by 6085h, keeping the de-energized state
3	Stop at the emergency stop torque, keeping de-energized state
4	N/A
5	Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock status
6	Ramp to stop as defined by 6085h, keeping position lock status
7	Stop at emergency-stop torque, keeping position lock status

When the brake function is enabled and the value of 605Ah is lower than 4, the stop mode is forcibly set to "Ramp to stop as defined by 6085h, keeping de-energized state".

605Ch Stop mode at S-OFF

Hex:	605Ch	Effective mode:	Real time
Min.:	-4	Unit:	-
Max.:	2	Data Type:	Int16
Default:	0	Change:	At stop

Value Range:

–4: Ramp to stop as defined by 6085h, keeping dynamic braking state
–3: at zero speed, keeping dynamic braking state
–2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state
–1: Dynamic braking stop, keeping dynamic braking state
0: Coast to stop, keeping de-energized state
1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state
2: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the motor for stopping rotating upon S-ON OFF and the motor status after stop.

Value	Stop Mode
-4	Ramp to stop as defined by 6085h, keeping dynamic braking status
-3	Stop at zero speed, keeping dynamic braking status
-2	Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking status
-1	Dynamic braking stop, keeping dynamic braking status
0	Coast to stop, keeping de-energized status
1	Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized status
2	Dynamic braking stop, keeping de-energized status

605Dh Halt mode

Hex:	605Dh	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	3	Data Type:	Int16
Default:	1	Change:	At stop

Value Range:

1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state
2: Ramp to stop as defined by 6085h, keeping position lock state
3: Stop at emergency stop torque, keeping position lock state

Description

Defines the halt mode.

Defines the deceleration mode of the motor for stopping rotating upon halt and the motor status after stop.

PP/PV/HM mode:

Value	Stop Mode
1	Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock status
2	Ramp to stop as defined by 6085h, keeping position lock status
3	Stop at emergency-stop torque, keeping position lock status

PT mode:

Value	Stop Mode
1/2/3	Ramp to stop as defined by 6087h, keeping position lock status

605Eh Stop mode at No. 2 fault

Hex:	605Eh	Effective mode:	Real time
Min.:	-5	Unit:	-
Max.:	4	Data Type:	Int16
Default:	2	Change:	At stop

Value Range:

–5: Stop at zero speed, keeping dynamic braking state

–4: Stop at emergency stop torque, keeping dynamic braking state

–3: Ramp to stop as defined by 6085h, keeping dynamic braking state

–2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state

–1: Dynamic braking stop, keeping dynamic braking state

0: Coast to stop, keeping de-energized state

1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state

2: Ramp to stop as defined by 6085h, keeping de-energized state

3: Stop at emergency stop torque, keeping de-energized state

4: Dynamic braking stop, keeping de-energized state

Description

Defines the deceleration mode of the motor for stopping rotating upon occurrence of a No. 2 fault and the motor status after stop.

Value	Stop Mode
-5	Stop at zero speed, keeping dynamic braking status
-4	Stop at emergency-stop torque, keeping dynamic braking status
-3	Ramp to stop as defined by 6085h, keeping dynamic braking status
-2	Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking status
-1	Dynamic braking stop, keeping dynamic braking status
0	Coast to stop, keeping de-energized status
1	Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized status
2	Ramp to stop as defined by 6085h, keeping de-energized status
3	Stop at emergency-stop torque, keeping de-energized status
4	Dynamic braking stop, keeping de-energized status

After the brake (BK) output function is enabled, the stop mode at No. 2 fault is forcibly set to "Ramp to stop as defined by 6085h, keeping dynamic braking status".

6060h Servo drive mode

Hex:	6060h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	11	Data Type:	UInt8
Default:	0	Change:	Real-time

Value Range:

1: Profile position (PP) mode
3: Profile velocity (PV) mode
4: Profile torque (PT) mode
6: Homing (HM) mode
8: CSP mode
9: CSV mode
10: CST mode

Description

It defines the operation mode of the servo drive.

- If an unsupported operation mode is set through SDO, an SDO error will be returned.
- If an operation mode not supported is set through PDO, this operation mode is invalid.

Value	Servo mode	
0	N/A	Reserved
1	Profile position (PP)	See section Profile Position Mode in the Function Guide.
2	N/A	Reserved
3	Profile Velocity (PV) Mode	See section Profile Velocity Mode in the Function Guide.
4	Profile torque (PT) mode	See section Profile Torque Mode in the Function Guide.
5	N/A	Reserved
6	Homing (HM) mode	See section Homing Mode in the Function Guide.
7	Interpolated position (IP) mode	Not supported
8	Cyclic Synchronous Position (CSP) Mode	See section Cyclic Synchronous Position Mode in the Function Guide.
9	Cyclic synchronous velocity (CSV) mode	See section Cyclic Synchronous Velocity Mode in the Function Guide.
10	Cyclic synchronous torque (CST) mode	See section Cyclic Synchronous Torque Mode in the Function Guide.

6061h Operation mode display

Hex:	6061h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	10	Data Type:	UInt8
Default:	0	Change:	Unchangeable

Value Range:

1: Profile position (PP) mode

3: Profile velocity (PV) mode
4: Profile torque (PT) mode
6: Homing (HM) mode
8: CSP mode
9: CSV mode
10: CST mode

Description

Indicates the actual operation mode.

Value	Servo mode	
0	N/A	Reserved
1	Profile position (PP)	See section Profile Position Mode in the Function Guide.
2	N/A	Reserved

Value	Servo mode	
3	Profile Velocity (PV) Mode	See section Profile Velocity Mode in the Function Guide.
4	Profile torque (PT) mode	See section Profile Torque Mode in the Function Guide.
5	N/A	Reserved
6	Homing (HM) mode	See section Homing Mode in the Function Guide.
7	Interpolated position (IP) mode	Not supported
8	Cyclic Synchronous Position (CSP) Mode	See section Cyclic Synchronous Position Mode in the Function Guide.
9	Cyclic synchronous velocity (CSV) mode	See section Cyclic Synchronous Velocity Mode in the Function Guide.
10	Cyclic synchronous torque (CST) mode	See section Cyclic Synchronous Torque Mode in the Function Guide.

6062h Position reference

Hex:	6062h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

The baud rate set in the servo drive must be the same as that in the host controller. Otherwise, communication will fail.

6063h Position actual value

Hex:	6063h	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the absolute position feedback (encoder unit) of the motor in real time.

6064h Position actual value

Hex:	6064h	Effective mode:	-

Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the absolute position feedback (reference unit) in real time.

Position actual value in user-defined unit (6064h) x Gear ratio (6091h) = Position actual value in encoder unit (6063h)

6065h Following error window

Hex:	6065h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32
Default:	27486951	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold of excessive position deviation (reference unit).

When the difference value between position demand value (6062h) and position actual value (6064h) keeps exceeding ±6065h after the time defined by 6066h elapses, B00.0 (Position deviation too large) occurs.

6066h Defines the time lapse to trigger excessive position deviation (EB00.0).

Hex:	6066h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Defines the time lapse to trigger excessive position deviation (EB00.0), which must be used together with 6065h.

6067h Position window

Hex:	6067h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit
Max.:	4294967295	Data Type:	UInt32

Default:	5872	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the threshold for position reach.

If the difference between 6062h and 6064h is within ±6067h and the time reaches 6068h, the position is reached. In this case, bit 10 of 6041h is set to 1 in the profile position mode.

This flag bit is valid only when the S-ON signal is valid in profile position control mode.

6068h Position window time

Hex:	6068h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Defines the window time for position reach, which must be used together with 6067h.

606Ch Actual speed

Hex:	606Ch	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

–2147483648 to +2147483647

Description

It indicates the velocity actual value.

606Dh Velocity window

Hex:	606Dh	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 RPM to 65535 RPM

Description

Defines the threshold for speed reach.

If the difference value between the target speed 60FFh and the actual speed 606Ch is within ±606Dh and the time reaches 606Eh, the speed is reached and bit 10 of the status word 6041h is set to 1 in the profile velocity (PV) mode.

This flag bit is meaningful only when the servo drive is enabled in PV mode.

606Eh Velocity window time

Hex:	606Eh	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0ms to 65535ms

Description

Defines the time window for speed reach, which must be used together with 606Dh.

606Fh Zero speed signal threshold

Hex:	606Fh	Effective mode:	Real time
Min.:	0	Unit:	RPM
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Real-time

Value Range:

0 RPM to 65535 RPM

Description

Defines the threshold for determining whether the user velocity is 0.

When 606Ch is within ±606Fh and the time reaches the value set by 6070h, the user velocity is 0. When either condition is not met, the user velocity is not 0.

This flag bit is valid only in PV mode.

This flag bit is unrelated to the enable/disable state of the servo drive.

6070h Velocity threshold time

Hex:	6070h	Effective mode:	Real time
Min.:	0	Unit:	ms
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:
0ms to 65535ms
Description
Defines the time window for determining whether the user velocity is 0, which must be used together with 606Fh.

6071h Target torque

Hex:	6071h	Effective mode:	Real time
Min.:	-4000	Unit:	-
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Real-time

Value Range:
-4000 to 4000
Description
Defines the target torque of the servo drive in the profile torque mode.
The value 1000 corresponds to the rated torque of the motor.

6072h Max. torque reference

Hex:	6072h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4000	Data Type:	UInt16
Default:	3500	Change:	Real-time

Value Range:
0 to 4000
Description
Defines the maximum torque reference limit.
The value 1000 corresponds to the rated torque of the motor.

6074h Torque reference

Hex:	6074h	Effective mode:	-
Min.:	-4000	Unit:	-
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:
-4000 to 4000
Description
Defines the target torque value.
The value 1000 corresponds to the rated torque of the motor.

6077h Actual torque

Hex:	6077h	Effective mode:	-
Min.:	-4000	Unit:	-
Max.:	4000	Data Type:	Int16
Default:	0	Change:	Unchangeable

Value Range:

-4000 to 4000

Description

It displays the internal actual torque of the servo drive.

The value 1000 corresponds to the rated torque of the motor.

607Ah Target position

Hex:	607Ah	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the target position of the servo drive in the profile position mode.

Table 4–2 bit6 setpoint of 6040h

Bit6 setpoint	Description	Remarks
0	607Ah is the absolute target position of the current segment.	After positioning of the current segment is complete, the user absolute position 6064h= 607Ah.
1	607Ah indicates the target increment displacement of the current segment.	After positioning of the current segment is complete, the user displacement increment is equal to 607Ah.

607Ch Home offset

Hex:	607Ch	Effective mode:	At stop
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the physical location of mechanical zero that deviates from the home of the motor in position control modes (profile position mode, interpolation mode, and homing mode).

The home offset takes effect in the following conditions: The device is powered on, the homing operation is complete, and bit15 of 6041h is set to 1.

After homing is done, the position actual value (6064h) will be the same as the value of 607Ch.

If 607Ch is outside the value of 607Dh (Software position limit), EE09.1 (Home setting error) will occur.

607D.01-h Min. position limit

Hex:	607D-01h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	-2147483648	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the minimum software position limit relative to the mechanical zero point.

Minimum software position limit = (607D.01h)

The software position limit is used to judge the absolute position. When homing is not performed, the internal software position limit is invalid.

The condition for activating the software position limit is set in H0A.01 (object dictionary 0x200A.02h).

607D.02-h Max. position limit

Hex:	607D-02h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	2147483647	Change:	Real-time

Value Range:

-2147483648 to 2147483647

Description

Defines the maximum software position limit relative to the mechanical zero.

Maximum software position limit = (607D.02h)

607Eh Reference polarity

Hex:	607Eh	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	127	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 127

Description

Defines the polarity of position or speed references.

Bit	Description
0 to 4	Undefined
5	Torque reference polarity 0: Multiply by 1 1: Multiply by -1 PT: Inverts the target torque (6071h). CSP/CSV: Inverts the torque offset (60B2h). CST: Inverts the torque reference (6071h + 60B2h).
6	Speed reference polarity 0: Multiply by 1 1: Multiply by -1 PV: Inverts the target torque (6071h). CSP: Reverse to speed feedforward 60B1h CSV: Inverts the speed reference (60FFh + 60B1h).
7	Position reference polarity 0: Multiply by 1 1: Multiply by -1 PP: Inverts the target position (607Ah) CSP: Inverts the position reference (607Ah + 60B0h).

607Fh Max. speed

Hex:	607Fh	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	838860800	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the maximum user running speed.

Set a proper gear ratio (8:1 recommended) when using a 23-bit encoder. Otherwise, the motor speed will be limited to 3840 RPM.

6081h Profile velocity

Hex:	6081h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	13981013	Change:	Real-time

Value Range:

0 to 4294967295

Description

It sets the average velocity normally attained at the end of the acceleration ramp during a profiled motion.

The setpoint takes effect after the slave receives the displacement reference.

6083h Profile acceleration

Hex:	6083h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s2
Max.:	4294967295	Data Type:	UInt32
Default:	1398101333	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the acceleration rate in the acceleration stage of the displacement reference in the profile position mode.

The following formula applies if a motor equipped with 23-bit encoder needs to run at 400 RPM (6081h: 400 x 8388608/60) with acceleration rate being 400 RPM/s (6083h: 400 x 8388608/60) and deceleration rate being 200 RPM/s (6084h: 200 x 8388608/60) under a gear ratio of 1:1:

Acceleration time tup = Δ6081h/ Δ6083h = 1 (s); Deceleration time tdown = Δ6081h/ Δ6084h = 2 (s).

For 609Ah, the setpoint 0 will be forcibly changed to 1.

6084h Profile deceleration

Hex:	6084h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s2
Max.:	4294967295	Data Type:	UInt32
Default:	1398101333	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the deceleration rate in the deceleration stage of the displacement reference in the profile position mode.
The following formula applies if a motor equipped with 23-bit encoder needs to run at 400 RPM (6081h: 400 x 8388608/60) with acceleration rate being 400 RPM/s (6083h: 400 x 8388608/60) and deceleration rate being 200 RPM/s (6084h: 200 x 8388608/60) under a gear ratio of 1:1:
Acceleration time tup = Δ6081h/ Δ6083h = 1 (s); Deceleration time tdown = Δ6081h/ Δ6084h = 2 (s).
For 609Ah, the setpoint 0 will be forcibly changed to 1.

6085h Quick stop deceleration

Hex:	6085h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s2
Max.:	4294967295	Data Type:	UInt32
Default:	2147483647	Change:	Real-time

Value Range:
0 to 4294967295
Description
Defines the deceleration rate when the quick stop command (6040h = 0x0002) is active and 605Ah (Quick stop option code) is set to 2 or 5.
For 609Ah, the setpoint 0 will be forcibly changed to 1.

6087h Torque slope

Hex:	6087h	Effective mode:	Real time
Min.:	0.0	Unit:	%/s
Max.:	429496729.5	Data Type:	UInt32
Default:	429496729.5	Change:	Real-time

Value Range:
0.0%/S to 429496729.5%/s
Description
It sets the rate of change of torque in profile torque mode, in unit of torque increment per second.
In the profile torque mode, if 605Ah is set to 1, 2, 5, or 6, or 605Dh is set to 1 or 2, the servo drive decelerates to stop as defined by 6087h.
If the value exceeds the torque reference limit, the servo drive runs at the limit.
The setting value 0 will be forcibly changed into 1.

6091.01h Motor resolution

Hex:	6091-01h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	At stop

Value Range:

1 to 4294967295

Description

Defines the numerator of the gear ratio.

Defines the proportional relation between the load shaft displacement designated by the user and the motor shaft displacement.

The relation between motor position feedback (encoder unit) and load shaft position feedback (reference unit) is as follows.

Motor position feedback = Load shaft position feedback x Gear ratio

The relation between the motor speed (RPM) and the load shaft speed (reference unit/s) is as follows:

$$\text{Motor speed (rpm)} = \frac{\text{Loaded shaft speed} \times \text{Gear ratio 6091h}}{\text{Encoder resolution}} \times 60$$

The motor acceleration (RPM/ms) and the load shaft acceleration (reference unit/s2) is in the following relationship:

$$\text{Motor acceleration} = \frac{\text{Loaded shaft acc.} \times \text{Gear ratio 6091h}}{\text{Encoder resolution}} \times \frac{1000}{60}$$

6091.02h Shaft resolution

Hex:	6091-02h	Effective mode:	Real time
Min.:	1	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	1	Change:	At stop

Value Range:

1 to 4294967295

Description

Defines the denominator of the gear ratio.

6098h Homing method

Hex:	6098h	Effective mode:	Real time
Min.:	-3	Unit:	-
Max.:	35	Data Type:	Int16

Default: 1 Change: Real-time

Value Range:

-3 to 35

Description

It selects the homing method.

Table 4–3 Description of homing method

Value	Description
-3	The initial direction is automatically determined, and the stop occurs at the nearest Z signal.
-2	Forward, positive mechanical limit as deceleration point and Z signal as home
-1	Reverse, negative mechanical limit as deceleration point and Z signal as home
1	Reverse, negative limit switch as deceleration point and Z signal as home, falling edge of the negative limit switch signal must be reached before Z signal
2	Forward, positive limit switch as deceleration point and Z signal as home, falling edge of positive limit switch signal must be reached before Z signal
3	Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal
4	Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal
5	Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal
6	Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal
7	Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal
8	Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal
9	Forward, home switch as deceleration point and Z signal as home, rising edge on the other side of the home switch signal must be reached before Z signal
10	Forward, home switch as deceleration point and Z signal as home, falling edge on the other side of the home switch signal must be reached before Z signal
11	Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal
12	Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal
13	Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, rising edge on the other side of the home switch signal must be reached before Z signal
14	Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, falling edge on the other side of the home switch signal must be reached before Z signal

Value	Description
15 to 16	Undefined. The servo drive does not perform the homing operation.
17 to 30	Similar to setpoints 1...14 except that the deceleration point coincide with the home
31 to 32	Undefined. The servo drive does not perform the homing operation.
33	Reverse, Z signal as home
34	Forward, Z signal as home
35	Current position as home

6099.01h Speed during search for switch

Hex:	6099-01h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	13981013	Change:	At stop

Value Range:

0 to 4294967295

Description

Defines the speed during search for the deceleration point signal. A large setpoint helps prevent E601.0 (Homing timeout).

6099.02h Speed during search for zero

Hex:	6099-02h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s
Max.:	4294967295	Data Type:	UInt32
Default:	1398101	Change:	At stop

Value Range:

0 to 4294967295

Description

Defines the speed in searching for the home signal. Setting this speed to a low value prevents overshoot during stop at high speed, avoiding excessive deviation between the stop position and the set mechanical home.

609Ah Homing acceleration

Hex:	609Ah	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s2
Max.:	4294967295	Data Type:	UInt32
Default:	1398101333	Change:	Real-time

Value Range:
0 to 4294967295
Description
It sets the acceleration during the homing operation.

60B0h Position offset

Hex:	60B0h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
-2147483648 to 2147483647
Description
-

60B1h Velocity offset

Hex:	60B1h	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
–2147483648 to +2147483647
Description
-

60B2h Torque offset

Hex:	60B2h	Effective mode:	Real time
Min.:	-4.000	Unit:	-
Max.:	4.000	Data Type:	Int16
Default:	0.000	Change:	Real-time

Value Range:
-4.000 to 4.000
Description
-

60B8h Touch probe function

Hex:	60B8h	Effective mode:	Real time

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Real-time

Value Range:

0 to 65535

Description

Defines the functions of touch probe 1 and touch probe 2.

For absolute encoders, Z signal refers to the zero point of the single-turn position feedback.

See the following table for descriptions of each bit of 60B8.

Bit	Description	Description
0	Probe 1 enable: 0: Disabled 1: Enabled	Bit0 to bit5: settings related to probe 1 When a DI is used to trigger the touch probe function, the DI source cannot be changed once the touch probe function is enabled. For absolute encoders, Z signal refers to the zero point of the single-turn position feedback.
1	Touch probe 1 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
2	Touch probe 1 trigger signal selection 0: DI signal 1: Z signal	
3	N/A	
4	Touch probe 1 positive edge 0: Switch off latching at positive edge 1: Enable latching at positive edge	
5	Touch probe 1 negative edge 0: Switch off latching at negative edge 1: Enable latching at negative edge	

Bit	Description	Description
6 to 7	N/A	Bit8 to bit13: settings related to probe 2
8	Touch probe 2 function selection 0: Switch off touch probe 2 1: Enable touch probe 2	
9	Touch probe 2 trigger mode 0: Single trigger mode (Latches the position at the first trigger event.) 1: Continuous trigger mode	
10	Touch probe 2 trigger signal selection 0: DI signal 1: Z signal	
11	N/A	
12	Touch probe 2 positive edge 0: Switch off latching at positive edge 1: Enable latching at positive edge	
13	Touch probe 2 negative edge 0: Switch off latching at negative edge 1: Enable latching at negative edge	
14 to 15	N/A	-

60B9h Touch probe status

Hex:	60B9h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

Indicates the status of touch probe 1 and touch probe 2.

Bit	Description	Description
0	Probe 1 enable: 0: Switch off Touch probe 1 1: Enabled	Bit0 to bit7: Status of probe 1
1	Touch probe 1 positive edge value 0: No positive edge value latched 1: Positive edge value latched	
2	Touch probe 1 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
3 to 5	N/A	-
6 to 7	When the function of probe 1 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 1 is selected as continuous sampling, the total number of times (0–3) the probe is triggered
8	Touch probe 2 function selection 0: Switch off Touch probe 2 1: Enable touch probe 2	Bit8 to bit10: Status of probe 2
9	Touch probe 2 positive edge value 0: No positive edge value latched 1: Positive edge value latched	
10	Touch probe 2 negative edge value 0: No negative edge value latched 1: Negative edge value latched	
11 to 13	N/A	-
14 to 15	When the function of probe 2 is selected as continuous sampling, the total number of times the probe is triggered	When the function of probe 2 is selected as continuous sampling, the total number of times (0–3) the probe is triggered

60BAh Touch probe 1 positive edge

Hex:	60BAh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at positive edge of touch probe 1 signal.

60BBh Touch probe 1 negative edge

Hex:	60BBh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at negative edge of touch probe 1 signal.

60BCh Touch probe 2 positive edge

Hex:	60BCh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at positive edge of touch probe 2 signal.

60BDh Touch probe 2 negative edge

Hex:	60BDh	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32

Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position feedback value (reference unit) latched at negative edge of touch probe 2 signal.

60C5h Max. acceleration

Hex:	60C5h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s2
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the maximum permissible acceleration rate of the acceleration segment in the profile position mode, profile velocity mode, and homing mode.
For 609Ah, the setpoint 0 will be forcibly changed to 1.

60C6h Max. deceleration

Hex:	60C6h	Effective mode:	Real time
Min.:	0	Unit:	Reference unit/s2
Max.:	4294967295	Data Type:	UInt32
Default:	4294967295	Change:	Real-time

Value Range:

0 to 4294967295

Description

Defines the maximum permissible deceleration in the profile position mode, profile velocity mode, and homing mode.
For 609Ah, the setpoint 0 will be forcibly changed to 1.

60D5h Touch probe 1 positive edge counter

Hex:	60D5h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The counting value is added by "1" each time this object is triggered.

60D6h Touch probe 1 negative edge counter

Hex:	60D6h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The counting value is added by "1" each time this object is triggered.

60D7h Touch probe 2 positive edge counter

Hex:	60D7h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The counting value is added by "2" each time this object is triggered.

60D8h Touch probe 2 negative edge counter

Hex:	60D8h	Effective mode:	-
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	0	Change:	Unchangeable

Value Range:

0 to 65535

Description

The counting value is added by "2" each time this object is triggered.

60E0h Positive torque limit

Hex:	60E0h	Effective mode:	Real time
Min.:	0.000	Unit:	-
Max.:	4.000	Data Type:	UInt16

Default: 3.500 Change: Real-time

Value Range:

0.000 to 4.000

Description

It sets the maximum positive torque in the motor.

60E1h Negative torque limit

Hex: 60E1h Effective mode: Real time

Min.: 0.000 Unit: -

Max.: 4.000 Data Type: UInt16

Default: 3.500 Change: Real-time

Value Range:

0.000 to 4.000

Description

It sets the maximum negative torque in the motor.

60E3.01h Supported homing method 1

Hex: 60E3-01h Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 1 Change: Unchangeable

Value Range:

0 to 65535

Description

bit	Function
bit0 to bit7	The low 8 bits indicate the supported homing method. Set 6098h to the corresponding value.
bit8	Relative position homing 0: Not supported 1: Supported
bit9	Absolute position homing 0: Not supported 1: Supported
bit10 to bit15	N/A

60E3.02h Supported homing method 2

Hex: 60E3-02h Effective mode: N/A

Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 2 Change: Unchangeable

Value Range:
0 to 65535
Description
-

60E3.03h Supported homing method 3

Hex: 60E3-03h Effective mode: N/A
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 3 Change: Unchangeable

Value Range:
0 to 65535
Description
-

60E3.04h Supported homing method 4

Hex: 60E3-04h Effective mode: N/A
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 4 Change: Unchangeable

Value Range:
0 to 65535
Description
-

60E3.05h Supported homing method 5

Hex: 60E3-05h Effective mode: N/A
Min.: 0 Unit: -
Max.: 65535 Data Type: UInt16
Default: 5 Change: Unchangeable

Value Range:
0 to 65535
Description
-

60E3.06h Supported homing method 6

Hex:	60E3-06h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	6	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.07h Supported homing method 7

Hex:	60E3-07h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	7	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.08h Supported homing method 8

Hex:	60E3-08h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	8	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.09h Supported homing method 9

Hex:	60E3-09h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	9	Change:	Unchangeable

Value Range:
0 to 65535

Description

-

60E3.10h Supported homing method 10

Hex:	60E3-10h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	10	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

60E3.11h Supported homing method 11

Hex:	60E3-11h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	11	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

60E3.12h Supported homing method 12

Hex:	60E3-12h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	12	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

60E3.13h Supported homing method 13

Hex:	60E3-13h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default: 13 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.14h Supported homing method 14

Hex: 60E3-14h Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 14 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.15h Supported homing method 17

Hex: 60E3-15h Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 17 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.16h Supported homing method 18

Hex: 60E3-16h Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 18 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.17h Supported homing method 19

Hex: 60E3-17h Effective mode: N/A

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	19	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.18h Supported homing method 20

Hex:	60E3-18h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	20	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.19h Supported homing method 21

Hex:	60E3-19h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	21	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.20h Supported homing method 22

Hex:	60E3-20h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	22	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.21h Supported homing method 23

Hex:	60E3-21h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	23	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.22h Supported homing method 24

Hex:	60E3-22h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	24	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.23h Supported homing method 25

Hex:	60E3-23h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	25	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.24h Supported homing method 26

Hex:	60E3-24h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	26	Change:	Unchangeable

Value Range:
0 to 65535

Description

-

60E3.25h Supported homing method 27

Hex:	60E3-25h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	27	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

60E3.26h Supported homing method 28

Hex:	60E3-26h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	28	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

60E3.27h Supported homing method 29

Hex:	60E3-27h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	29	Change:	Unchangeable

Value Range:

0 to 65535

Description

-

60E3.28h Supported homing method 30

Hex:	60E3-28h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16

Default: 30 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.29h Supported homing method 33

Hex: 60E3-29h Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 33 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.30h Supported homing method 34

Hex: 60E3-30ht Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 34 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.31h Supported homing method 35

Hex: 60E3-31h Effective mode: N/A

Min.: 0 Unit: -

Max.: 65535 Data Type: UInt16

Default: 35 Change: Unchangeable

Value Range:

0 to 65535

Description

-

60E3.32h Supported homing method -1

Hex: 60E3-32h Effective mode: N/A

Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	-1	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.33h Supported homing method -2

Hex:	60E3-33h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	-2	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E3.34h Supported homing method -3

Hex:	60E3-34h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	65535	Data Type:	UInt16
Default:	-3	Change:	Unchangeable

Value Range:
0 to 65535
Description
-

60E6h Actual position calculation method

Hex:	60E6h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	1	Data Type:	UInt8
Default:	0	Change:	Real-time

Value Range:
0 to 1

Description

Defines the method for calculating the mechanical position after homing is done. After homing is triggered, changes in 60E6h will be blocked.

Value	Actual position calculation method
0	Absolute homing After homing is completed: 6064h (Position actual value) = 607Ch (Home offset)
1	Relative homing After homing is completed: 6064h (Position actual value) = Present position feedback + 607Ch (Home offset)

60F4h Position deviation

Hex:	60F4h	Effective mode:	-
Min.:	-2147483648	Unit:	Reference unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position deviation (reference unit).

60FCh Position reference

Hex:	60FCh	Effective mode:	-
Min.:	-2147483648	Unit:	Encoder unit
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Unchangeable

Value Range:

-2147483648 to 2147483647

Description

Indicates the position reference (encoder unit).

If no warning is detected when the S-ON signal is active, the relation between the position reference in reference unit and that in encoder unit is as follows:

60FCh (in encoder unit) = 6062h (in reference unit) x 6091h

60FDh DI state

Hex:	60FDh	Effective mode:	Real time
Min.:	0	Unit:	-

Max.: 4294967295 Data Type: UInt32
Default: 0 Change: Unchangeable

Value Range:

0 to 4294967295

Description

Indicates current DI logic of the drive.

0: Inactive

1: Active

The signal indicated by each bit is described as follows:

Table 4–4 The DI signal indicated by each bit

bit	Description
0	Reverse overtravel active
1	Forward overtravel active
2	Home signal active
3 to 15	N/A
16	DI1 input active
17	DI2 input active
18	DI3 input active
19	DI4 input active
20	DI5 input active
21 to 26	N/A
27	STO1 signal input
28	STO2 signal input
29	EDM output active
30	Z signal active[1]
31	N/A

60FE.01h Physical output

Hex: 60FE-01h Effective mode: Real time
Min.: 0 Unit: -
Max.: 4294967295 Data Type: UInt32
Default: 0 Change: Real-time

Value Range:

0 to 4294967295

Description

Indicates the DO logic.
The signal indicated by each bit is described as follows:

bit	Related Signal	Description
0 to 15	N/A	-
16	DO1	Forced output (0: off, 1: on); when bit 16 of 60FE.02 is set to 1
17	DO2	Forced output (0: off, 1: on); when bit 17 of 60FE.02 is set to 1
18 to 25	N/A	-
26	Gain Switchover	Switched between P and PI, only when bit26 of 60FE.02 is set to 1
27 to 31	N/A	-

60FE.02h Bitmask

Hex:	60FE-02h	Effective mode:	Real time
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	0	Change:	Real-time

Value Range:
0 to 4294967295
Description
0 to 15: N/A
16: Forced DO1 output enable
17: Forced DO2 output enable
18 to 25: N/A
26: P/PI switchover enable
27 to 31: N/A

60FFh Target speed

Hex:	60FFh	Effective mode:	Real time
Min.:	-2147483648	Unit:	Reference unit/s
Max.:	2147483647	Data Type:	Int32
Default:	0	Change:	Real-time

Value Range:
–2147483648 to +2147483647
Description
Defines the target speed in the cyclic synchronous velocity mode/profile velocity mode.

6502h Supported drive mode

Hex:	6502h	Effective mode:	N/A
Min.:	0	Unit:	-
Max.:	4294967295	Data Type:	UInt32
Default:	941	Change:	Unchangeable

Value Range:

0 to 4294967295

Description

Defines the target speed in the cyclic synchronous velocity mode/profile velocity mode.

5 Parameter List

5.1 Parameter Group H00

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H00.00	2000-01h	Motor SN	0 to 65535	14101	-	At stop	*" H00_en.00" on page 140*
H00.02	2000-03h	Customized No.	0.00 to 42949672.95	0.00	-	Unchangeable	*" H00_en.02" on page 140*
H00.04	2000-05h	Encoder version	0.0 to 6553.5	0.0	-	Unchangeable	*" H00_en.04" on page 140*
H00.05	2000-06h	Serial-type motor code	0 to 65535	0	-	Unchangeable	*" H00_en.05" on page 141*
H00.06	2000-07h	FPGA customized SN	0.00 to 655.35	0.00	-	Unchangeable	*" H00_en.06" on page 141*
H00.07	2000-08h	STO version	0.0 to 6553.5	0.0	-	Unchangeable	*" H00_en.07" on page 141*
H00.08	2000-09h	Bus encoder type	0.0 to 6553.5	0.0	-	At stop	*" H00_en.08" on page 141*

5.2 Parameter Group H01

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H01.00	2001-01h	MCU software version	0.0 to 6553.5	0.0	-	Unchangeable	*" H01_en.00" on page 142*
H01.01	2001-02h	FPGA software version	0.0 to 6553.5	0.0	-	Unchangeable	*" H01_en.01" on page 142*
H01.10	2001-0Bh	Drive series No.	2: S1R6 3: S2R8 5: S5R5 6: S7R6 7: S012 10001: T3R5 10002: T5R4 10003: T8R4 10004: T012 10005: T017 10006: T021 10007: T026	3	-	At stop	*" H01_en.10" on page 142*
H01.11	2001-0Ch	DC-AC voltage class	0 VAC–65535 VAC	220	VAC	Unchangeable	*" H01_en.11" on page 144*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H01.12	2001-0Dh	Drive rated power	0.00 kW–655.35kW	0.40	kW	Unchangeable	" H01_en.12" on page 145
H01.14	2001-0Fh	Max. output power of the drive	0.00 kW–655.35kW	0.40	kW	Unchangeable	" H01_en.14" on page 145
H01.16	2001-11h	Rated output current of the drive	0.00A to 655.35A	2.80	A	Unchangeable	" H01_en.16" on page 145
H01.18	2001-13h	Max. output current of the drive	0.00A to 655.35A	10.10	A	Unchangeable	" H01_en.18" on page 145
H01.40	2001-29h	DC bus overvoltage protection threshold	0 VDC to 2000 VDC	420	VDC	Unchangeable	" H01_en.40" on page 146

5.3 Parameter Group H02

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.00	2002-01h	Control mode	0: Velocity mode 1: Position mode 2: Torque mode 9: EtherCAT mode	9	-	At stop	" H02_en.00" on page 146
H02.01	2002-02h	Absolute system selection	0: Incremental mode 1: Absolute position linear mode 2: Absolute position rotation mode 3: Absolute position linear mode (without encoder overflow warning) 4: Absolute position single-turn mode	0	-	At stop	" H02_en.01" on page 147
H02.02	2002-03h	Rotation direction selection	0: Counterclockwise (CCW) as forward direction 1: Clockwise (CW) as forward direction	0	-	At stop	" H02_en.02" on page 148

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.05	2002-06h	Stop mode at S-ON OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: Stop at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah, keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state 2: Stop at zero speed, keeping de-energized state	0	-	At stop	*" H02_en.05" on page 149*
H02.06	2002-07h	Stop mode at No.2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah, keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah, keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state	2	-	At stop	*" H02_en.06" on page 150*

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.07	2002-08h	Stop mode at overtravel	0: Coast to stop, keeping de-energized state 1: Stop at zero speed, keeping position lock state 2: Stop at zero speed, keeping de-energized state 3: Stop based on ramp, keeping de-energized state 4: Stop based on ramp, keeping position lock state 5: Dynamic braking stop, keeping de-energized state 6: Dynamic braking stop, keeping dynamic braking state 7: Not responding to overtravel	1	-	At stop	*" H02_en.07" on page 151*
H02.08	2002-09h	Stop mode at No.1 fault	0: Coast to stop, keeping de-energized state1: DB stop, keeping de-energized state2: DB stop, keeping DB state	2	-	At stop	*" H02_en.08" on page 152*
H02.09	2002-0Ah	Delay from brake output ON to command received	0ms to 500ms	250	ms	Real-time	*" H02_en.09" on page 153*
H02.10	2002-0Bh	Delay from brake output OFF to motor de-energized	50ms to 1000ms	150	ms	Real-time	*" H02_en.10" on page 153*
H02.11	2002-0Ch	Motor speed threshold at brake output OFF in rotation state	20 rpm to 3000 rpm	30	RPM	Real-time	*" H02_en.11" on page 154*
H02.12	2002-0Dh	Delay from S-ON OFF to brake output OFF in rotation state	1ms to 1000ms	500	ms	Real-time	*" H02_en.12" on page 154*
H02.15	2002-10h	LED warning display	0: Output warning information immediately 1: Not output warning information	0	-	Real-time	*" H02_en.15" on page 154*
H02.17	2002-12h	Stop mode upon main circuit power failure	0: Keep current operation 1: Stop according to H02.06 2: Stop at S-ON OFF as defined by H02.05 3: Stop according to 605A	2	-	Real-time	*" H02_en.17" on page 155*

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.21	2002-16h	Permissible minimum resistance of regenerative resistor	1Ω to 1000 Ω	40	Ω	Unchangeable	" H02_en.21" on page 155
H02.22	2002-17h	Power of built-in regenerative resistor	0W–65535W	50	W	Unchangeable	" H02_en.22" on page 155
H02.23	2002-18h	Resistance of built-in regenerative resistor	0Ω to 65535Ω	50	Ω	Unchangeable	" H02_en.23" on page 156
H02.24	2002-19h	Resistor heat dissipation coefficient	10% to 100%	30	%	Real-time	" H02_en.24" on page 156
H02.25	2002-1Ah	Regenerative resistor type	0: Built-in 1: External, natural cooling 2: External, forced air cooling 3: No resistor needed	0	-	Real-time	" H02_en.25" on page 157
H02.26	2002-1Bh	Power of external regenerative resistor	1W–65535W	40	W	Real-time	" H02_en.26" on page 157
H02.27	2002-1Ch	Resistance of external regenerative resistor	15 Ω to 1000 Ω	50	Ω	Real-time	" H02_en.27" on page 158
H02.30	2002-1Fh	User password	0 to 65535	0	-	Real-time	" H02_en.30" on page 158
H02.31	2002-20h	System parameter initialization	0: No operation 1: Restore default settings 2: Clear fault records	0	-	At stop	" H02_en.31" on page 158
H02.32	2002-21h	Selection of parameters in group H0b	0 to 99	50	-	Real-time	" H02_en.32" on page 159
H02.35	2002-24h	Keypad data update frequency	0Hz to 20Hz	0	Hz	Real-time	" H02_en.35" on page 159
H02.38	2002-27h	Overload time of external resistor	0s to 200s	40	-	Real-time	" H02_en.38" on page 159

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H02.41	2002-2Ah	Manufacturer password	0 to 65535	0	-	Real-time	" H02_en.41" on page 160
H02.47	2002-30h	Delay from S-ON OFF to brake output OFF in rotation state (effective on power line breakage)	0ms to 1000ms	10	ms	Real-time	" H02_en.47" on page 160

5.4 Parameter Group H03

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H03.02	2003-03h	DI1 function selection	0: Undefined 1: Drive enable 2: Fault reset 14: Positive limit switch 15: Negative limit switch 31: Home switch 34: Emergency stop 38: Touch probe 1 39: Touch probe 2	14	-	Real-time	" H03_en.02" on page 160
H03.03	2003-04h	DI1 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H03_en.03" on page 161
H03.04	2003-05h	DI2 function selection	Same as H03.02.	15	-	Real-time	" H03_en.04" on page 162
H03.05	2003-06h	DI2 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H03_en.05" on page 162
H03.06	2003-07h	DI3 function selection	Same as H03.02.	31	-	Real-time	" H03_en.06" on page 162
H03.07	2003-08h	DI3 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H03_en.07" on page 163
H03.08	2003-09h	DI4 function selection	Same as H03.02.	39	-	Real-time	" H03_en.08" on page 163
H03.09	2003-0Ah	DI4 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H03_en.09" on page 163
H03.10	2003-0Bh	DI5 function selection	Same as H03.02.	38	-	Real-time	" H03_en.10" on page 164
H03.11	2003-0Ch	DI5 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H03_en.11" on page 164
H03.60	2003-3Dh	DI1 fitter time	0.00ms to 500.00ms	0.50	ms	Real-time	" H03_en.60" on page 164

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H03.61	2003-3Eh	DI2 fitter time	0.00ms to 500.00ms	0.50	ms	Real-time	" H03_en.61" on page 164
H03.62	2003-3Fh	DI3 fitter time	0.00ms to 500.00ms	0.50	ms	Real-time	" H03_en.62" on page 165
H03.63	2003-40h	DI4 fitter time	0.00ms to 500.00ms	0.50	ms	Real-time	" H03_en.63" on page 165
H03.64	2003-41h	DI5 fitter time	0.00ms to 500.00ms	0.50	ms	Real-time	" H03_en.64" on page 165

5.5 Parameter Group H04

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H04.00	2004-01h	DO1 function selection	0: Undefined 1: Servo ready 2: Motor rotation 5: Positioning completed 9: Brake output 10: Warning 11: Fault 18: Torque reached 25: Comparison output 31: EtherCAT forced output 32: EDM safe state	1	-	Real-time	" H04_en.00" on page 165
H04.01	2004-02h	DO1 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H04_en.01" on page 166
H04.02	2004-03h	DO2 function selection	Same as H04.00.	11	-	Real-time	" H04_en.02" on page 167
H04.03	2004-04h	DO2 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H04_en.03" on page 167
H04.04	2004-05h	DO3 function selection	Same as H04.00.	9	-	Real-time	" H04_en.04" on page 168

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H04.05	2004-06h	DO3 logic selection	0: Normally open 1: Closed	0	-	Real-time	" H04_en.05" on page 168
H04.23	2004-18h	EtherCAT forced DO logic in non-OP status	0: Status of DO1, DO2, and DO3 unchanged in the non-OP status 1: No output in DO1 and status of others unchanged in the non-OP status 2: No output in DO2 and status of others unchanged in the non-OP status 3: No output in DO1 or DO2 and status of DO3 unchanged in the non-OP status 4: No output in DO3 and status of others unchanged in the non-OP status 5: No output in DO1 or DO3 and status of DO2 unchanged in the non-OP status 6: No output in DO2 or DO3 and status of DO1 unchanged in the non-OP status 7: No output in DO1, DO2, or DO3 in the non-OP status	0	-	Real-time	" H04_en.23" on page 168

5.6 Parameter Group H05

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H05.04	2005-05h	First-order low-pass filter time constant	0.0 ms to 6553.5ms	0.0	ms	At stop	" H05_en.04" on page 169
H05.05	2005-06h	Moving average filter time constant 1	0.0 ms to 1000.0 ms	0.0	ms	At stop	" H05_en.05" on page 169
H05.06	2005-07h	Moving average filter time constant 2	0.0 ms to 128.0ms	0.0	ms	At stop	" H05_en.06" on page 170
H05.07	2005-08h	Numerator of electronic gear ratio	0 to 4294967295	1	-	Real-time	" H05_en.07" on page 170
H05.09	2005-0Ah	Denominator of electronic gear ratio	0 to 4294967295	1	-	Real-time	" H05_en.09" on page 170

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H05.19	2005-14h	Speed feedforward control	0: No speed feedforward 1: Internal speed feedforward 2: 60B1h used as speed feedforward 3: Zero phase control	1	-	At stop	" H05_en.19" on page 170
H05.21	2005-16h	Threshold of positioning completed	0 to 65535	5872	-	Real-time	" H05_en.21" on page 171
H05.30	2005-1Fh	Local homing	0: No operation 6: Current position as the home	0	-	Real-time	" H05_en.30" on page 171
H05.35	2005-24h	Home search time limit	0.0s to 6553.5s	5000.0	-	Real-time	" H05_en.35" on page 172
H05.36	2005-25h	Local home offset	-1073741824 to 1073741824	0	Encoder unit	Real-time	" H05_en.36" on page 172
H05.50	2005-33h	Mechanical gear ratio (numerator)	1 to 65535	1	-	At stop	" H05_en.50" on page 173
H05.51	2005-34h	Denominator of mechanical gear ratio	1 to 65535	1	-	At stop	" H05_en.51" on page 173
H05.52	2005-35h	Pulses per load revolution in absolute position rotation mode (low 32 bits)	0 to 4294967295	0	Encoder unit	At stop	" H05_en.52" on page 173
H05.54	2005-37h	Pulses per load revolution in absolute position rotation mode (high 32 bits)	0 to 4294967295	0	Encoder unit	At stop	" H05_en.54" on page 173
H05.57	2005-3Ah	Single-turn absolute mode homing offset	-2147483648 to 2147483647	0	-	At stop	" H05_en.57" on page 174
H05.59	2005-3Ch	Hard limit homing torque limit	0.0 to 400.0	200.0	-	Real-time	" H05_en.59" on page 174
H05.64	2005-41h	Optocoupler state for probe rising edge	0: Off 1: On	0	-	At stop	" H05_en.64" on page 174

5.7 Parameter Group H06

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H06.03	2006-04h	Speed reference	–6000 rpm to +6000 rpm	200	RPM	Real-time	" H06_en.03" on page 175
H06.04	2006-05h	DI jog speed setpoint	0rpm to 6000rpm	150	RPM	Real-time	" H06_en.04" on page 175
H06.05	2006-06h	Acc. ramp time of speed reference	0ms to 65535ms	0	ms	Real-time	" H06_en.05" on page 175
H06.06	2006-07h	Dec. ramp time of speed reference	0ms to 65535ms	0	ms	Real-time	" H06_en.06" on page 176
H06.08	2006-09h	Forward speed limit	0rpm to 6000rpm	6000	RPM	Real-time	" H06_en.08" on page 176
H06.09	2006-0Ah	Reverse speed limit	0rpm to 6000rpm	6000	RPM	Real-time	" H06_en.09" on page 176
H06.10	2006-0Bh	Deceleration unit in emergency stop	0: Multiplied by 1 1: Multiplied by 10 2: Multiplied by 100	0	-	At stop	" H06_en.10" on page 176
H06.11	2006-0Ch	Torque feedforward control	0: No torque feedforward 1: Internal torque feedforward 2: 60B2h as external torque feedforward	1	-	Real-time	" H06_en.11" on page 177
H06.12	2006-0Dh	Acceleration ramp time of jog speed	0ms to 65535ms	10	ms	Real-time	" H06_en.12" on page 178
H06.13	2006-0Eh	Speed feedforward smoothing filter	Note [1]: For the -NS model, the setpoint is 0% to 300 ms.	0	us	Real-time	" H06_en.13" on page 179
H06.14	2006-0Fh	CSV instruction interpolation	0: Disabled 1: Enabled	0	-	At stop	" H06_en.14" on page 179
H06.16	2006-11h	Threshold of TGON (motor rotation) signal	0 rpm to 1000 rpm	20	RPM	Real-time	" H06_en.16" on page 179
H06.28	2006-1Dh	Cogging torque compensation selection	0: Disabled 1: Enabled	1	-	At stop	" H06_en.28" on page 180
H06.36	2006-25h	Sine velocity superposition enable	0: Disabled 1: Enabled	0	-	Real-time	" H06_en.36" on page 180

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H06.37	2006-26h	Sine velocity superposition frequency	0Hz to 100Hz	50	Hz	Real-time	" H06_en.37" on page 180
H06.38	2006-27h	Sine velocity superposition amplitude	0 RPM –100 RPM	30	RPM	Real-time	" H06_en.38" on page 180

5.8 Parameter Group H07

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H07.03	2007-04h	Torque reference set using the operating panel	-400.0% to 400.0%	0.0	%	Real-time	" H07_en.03" on page 181
H07.05	2007-06h	Torque reference filter time constant 1	0.00ms to 30.00ms	0.50	ms	Real-time	" H07_en.05" on page 181
H07.06	2007-07h	Torque reference filter time constant 2	0.00ms to 30.00ms	0.27	ms	Real-time	" H07_en.06" on page 181
H07.09	2007-0Ah	Forward internal torque limit	0.0% to 400.0%	350.0	%	Real-time	" H07_en.09" on page 182
H07.10	2007-0Bh	Reverse internal torque limit	0.0% to 400.0%	350.0	%	Real-time	" H07_en.10" on page 182
H07.15	2007-10h	Emergency-stop torque	0.0% to 400.0%	100.0	%	Real-time	" H07_en.15" on page 182
H07.19	2007-14h	Internal speed limit in torque control	0rpm to 6000rpm	3000	RPM	Real-time	" H07_en.19" on page 182
H07.20	2007-15h	Negative internal speed limit in torque control	0rpm to 6000rpm	3000	RPM	Real-time	" H07_en.20" on page 183
H07.21	2007-16h	Torque reach base value	0.0% to 400.0%	0.0	%	Real-time	" H07_en.21" on page 183
H07.22	2007-17h	Output torque upon torque reach and DO signal activation	0.0% to 400.0%	20.0	%	Real-time	" H07_en.22" on page 183

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H07.23	2007-18h	Output torque upon torque reach and DO signal deactivation	0.0% to 400.0%	10.0	%	Real-time	" H07_en.23" on page 184
H07.24	2007-19h	Field weakening depth	60% to 115%	115	%	Real-time	" H07_en.24" on page 184
H07.25	2007-1Ah	Max. permissible demagnetizing current	0% to 200%	100	%	Real-time	" H07_en.25" on page 185
H07.26	2007-1Bh	Field weakening selection	0: Disabled 1: Enabled	0	-	At stop	" H07_en.26" on page 185
H07.27	2007-1Ch	Flux weakening gain	0.001 to 1.000	0.030	-	Real-time	" H07_en.27" on page 185
H07.28	2007-1Dh	Speed of flux weakening point	0 RPM to 65535 RPM	0	RPM	At stop	" H07_en.28" on page 186
H07.36	2007-25h	Time constant of low-pass filter 2	0.00ms to 10.00ms	0.00	ms	Real-time	" H07_en.36" on page 186
H07.37	2007-26h	Torque reference filter selection	0: First-order filter 1: Biquad filter	0	-	Real-time	" H07_en.37" on page 186
H07.38	2007-27h	Biquad filter attenuation ratio	0 to 50	16	-	At stop	" H07_en.38" on page 186
H07.40	2007-29h	Time threshold of speed limit	0ms to 300ms	10	ms	Real-time	" H07_en.40" on page 187

5.9 Parameter Group H08

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H08.00	2008-01h	Speed loop gain	0.1Hz to 2000.0Hz	40.0	Hz	Real-time	" H08_en.00" on page 187
H08.01	2008-02h	Speed loop integral time constant	0.15ms to 512.00ms	19.89	ms	Real-time	" H08_en.01" on page 187
H08.02	2008-03h	Position loop gain	0.1Hz to 2000.0Hz	64.0	Hz	Real-time	" H08_en.02" on page 188

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H08.03	2008-04h	2nd speed loop gain	0.1Hz to 2000.0Hz	75.0	Hz	Real-time	" H08_en.03" on page 188
H08.04	2008-05h	2nd speed loop integral time constant	0.15ms to 512.00ms	10.61	ms	Real-time	" H08_en.04" on page 188
H08.05	2008-06h	2nd position loop gain	0.1Hz to 2000.0Hz	120.0	Hz	Real-time	" H08_en.05" on page 189
H08.08	2008-09h	2nd gain mode setting	0: Fixed to the 1st gain, switched between P and PI as defined by bit26 of external 60FEh 1: Switched between the 1st and 2nd gain sets as defined by H08.09	1	-	Real-time	" H08_en.08" on page 189
H08.09	2008-0Ah	Gain switchover condition	0: Fixed to the 1st gain set (PS) 1: Switched as defined by bit26 of 60FEh 2: Torque reference too large (PS) 3: Speed reference too large (PS) 4: Speed reference change rate too large (PS) 5: Speed reference low/high speed threshold (PS) 6: Position deviation too large (P) 7: Position reference available (P) 8: Positioning unfinished (P) 9: Actual speed (P) 10: Position reference + Actual speed (P)	0	-	Real-time	" H08_en.09" on page 190
H08.10	2008-0Bh	Gain switchover delay	0.0 ms to 1000.0 ms	5.0	ms	Real-time	" H08_en.10" on page 192
H08.11	2008-0Ch	Gain switchover level	0 to 20000	50	-	Real-time	" H08_en.11" on page 192
H08.12	2008-0Dh	Gain switchover hysteresis	0 to 20000	30	-	Real-time	" H08_en.12" on page 193
H08.13	2008-0Eh	Position gain switchover time	0.0 ms to 1000.0 ms	3.0	ms	Real-time	" H08_en.13" on page 193
H08.15	2008-10h	Load moment of inertia ratio	0.00 to 120.00	3.00	-	Real-time	" H08_en.15" on page 193

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H08.16	2008-11h	Save ITune parameter	0 to 65535	0	-	Real-time	" H08_en.16" on page 194
H08.17	2008-12h	Zero phase delay	0.0 ms to 4.0ms	0.0	ms	Real-time	" H08_en.17" on page 194
H08.18	2008-13h	Time constant of speed feedforward filter	0.00ms to 64.00ms	0.50	ms	Real-time	" H08_en.18" on page 194
H08.19	2008-14h	Speed feedforward gain	0.0% to 100.0%	0.0	%	Real-time	" H08_en.19" on page 195
H08.20	2008-15h	Torque feedforward filter time constant	0.00ms to 64.00ms	0.50	ms	Real-time	" H08_en.20" on page 195
H08.21	2008-16h	Torque feedforward gain	0.0% to 300.0%	0.0	%	Real-time	" H08_en.21" on page 195
H08.22	2008-17h	Speed feedback filtering option	0: Inhibited 1: 2 times 2: 4 times 3: 8 times 4: 16 times	0	-	At stop	" H08_en.22" on page 196
H08.23	2008-18h	Cutoff frequency of speed feedback low-pass filter	100Hz to 8000 Hz	8000	Hz	Real-time	" H08_en.23" on page 196
H08.24	2008-19h	PDFF control coefficient	0.0% to 200.0%	100.0	%	Real-time	" H08_en.24" on page 197
H08.27	2008-1Ch	Speed observer cutoff frequency	50 Hz to 600Hz	170	Hz	Real-time	" H08_en.27" on page 197
H08.28	2008-1Dh	Speed observer inertia correction coefficient	1% to 1600%	100	%	Real-time	" H08_en.28" on page 197
H08.29	2008-1Eh	Speed observer filter time	0.00ms to 10.00ms	0.80	ms	Real-time	" H08_en.29" on page 198
H08.31	2008-20h	Disturbance cutoff frequency	1Hz to 4000Hz	600	Hz	Real-time	" H08_en.31" on page 198
H08.32	2008-21h	Disturbance compensation gain	0% to 100%	0	%	Real-time	" H08_en.32" on page 198

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H08.33	2008-22h	Disturbance observer inertia correction coefficient	1% to 1600%	100	%	Real-time	" H08_en.33" on page 198
H08.34	2008-23h	The constant ratio of APF for perturbation observation	0% to 1600%	0	%	Real-time	" H08_en.34" on page 199
H08.35	2008-24h	Vibration suppression frequency	0Hz to 1600Hz	0	Hz	Real-time	" H08_en.35" on page 199
H08.36	2008-25h	Vibration suppression coefficient of disturbance observation	0 to 200	0	-	Real-time	" H08_en.36" on page 199
H08.37	2008-26h	Phase modulation for medium-frequency jitter suppression 2	-90° to 90°	0	°	Real-time	" H08_en.37" on page 199
H08.38	2008-27h	Medium-frequency suppression 2 frequency	0Hz to 1000Hz	0	Hz	Real-time	" H08_en.38" on page 200
H08.39	2008-28h	Compensation gain of medium-frequency jitter suppression 2	0% to 300%	0	%	Real-time	" H08_en.39" on page 200
H08.40	2008-29h	Speed observer selection	0: Disabled 1: Enabled	0	-	Real-time	" H08_en.40" on page 200
H08.42	2008-2Bh	Model control selection	0: Disabled 1: Enabled 2: Dual-inertia model	0	-	Real-time	" H08_en.42" on page 201
H08.43	2008-2Ch	Model gain	0.1 to 2000.0	40.0	-	Real-time	" H08_en.43" on page 201
H08.46	2008-2Fh	Feedforward value	0.0 to 102.4	95.0	-	Real-time	" H08_en.46" on page 201
H08.53	2008-36h	Medium- and low-frequency jitter suppression frequency 3	0.0Hz to 300.0Hz	0.0	Hz	Real-time	" H08_en.53" on page 201

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H08.54	2008-37h	Medium- and low-frequency jitter suppression compensation 3	0% to 200%	0	%	Real-time	" H08_en.54" on page 202
H08.56	2008-39h	Medium- and low-frequency jitter suppression phase modulation 3	0% to 600%	100	%	Real-time	" H08_en.56" on page 202
H08.59	2008-3Ch	Medium- and low-frequency jitter suppression frequency 4	0.0Hz to 300.0Hz	0.0	Hz	Real-time	" H08_en.59" on page 202
H08.60	2008-3Dh	Medium- and low-frequency jitter suppression compensation 4	0% to 200%	0	%	Real-time	" H08_en.60" on page 202
H08.61	2008-3Eh	Medium- and low-frequency jitter suppression phase modulation 4	0% to 600%	100	%	Real-time	" H08_en.61" on page 203
H08.62	2008-3Fh	Position loop integral time constant	0.15 to 512.00	512.00	-	Real-time	" H08_en.62" on page 203
H08.63	2008-40h	2nd position loop integral time constant	0.15 to 512.00	512.00	-	Real-time	" H08_en.63" on page 203
H08.64	2008-41h	Speed observer feedback source	0: Disabled 1: Enabled	0	-	Real-time	" H08_en.64" on page 204

5.10 Parameter Group H09

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H09.00	2009-01h	Auto-adjustment mode	0: Disabled, manual gain tuning required 1: Enabled, gain parameters generated automatically based on the stiffness level 2: Positioning mode, gain parameters generated automatically based on the stiffness level 3: Interpolation mode+Inertia auto-tuning 4: Normal mode+Inertia auto-tuning 6: Quick positioning mode+Inertia auto-tuning	4	-	Real-time	" H09_en.00" on page 204
H09.01	2009-02h	Stiffness level selection	0 to 41	15	-	Real-time	" H09_en.01" on page 204
H09.02	2009-03h	Adaptive notch mode	0: Adaptive notch no longer updated 1: One adaptive notch activated (3rd notch) 2: Two adaptive notches activated (3rd and 4th notches) 3: Resonance point tested only (displayed in H09.24) 4: Adaptive notch cleared, values of 3rd and 4th notches restored to default	0	-	Real-time	" H09_en.02" on page 205
H09.03	2009-04h	Online inertia auto-tuning mode	0: Disabled 1: Enabled, changing slowly 2: Enabled, changing normally 3: Enabled, changing quickly	0	-	Real-time	" H09_en.03" on page 205
H09.05	2009-06h	Offline inertia auto-tuning mode	0: Bi-directional 1: Unidirectional	0	-	At stop	" H09_en.05" on page 205
H09.06	2009-07h	Max. speed of inertia auto-tuning	100rpm to 1000rpm	500	RPM	At stop	" H09_en.06" on page 206
H09.07	2009-08h	Time constant for accelerating to max. speed during inertia auto-tuning	20ms to 800ms	125	ms	At stop	" H09_en.07" on page 206

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H09.08	2009-09h	Interval time after an individual inertia auto-tuning	50ms to 10000ms	800	ms	At stop	" H09_en.08" on page 206
H09.09	2009-0Ah	Number of motor revolutions per inertia auto-tuning	0.00 to 100.00	1.00	-	Real-time	" H09_en.09" on page 207
H09.11	2009-0Ch	Vibration threshold	0.0% to 100.0%	5.0	%	Real-time	" H09_en.11" on page 207
H09.12	2009-0Dh	Frequency of the 1st notch	50 Hz to 8000 Hz	8000	Hz	Real-time	" H09_en.12" on page 207
H09.13	2009-0Eh	Width level of the 1st notch	0 to 20	2	-	Real-time	" H09_en.13" on page 208
H09.14	2009-0Fh	Depth level of the 1st notch	0 to 99	0	-	Real-time	" H09_en.14" on page 208
H09.15	2009-10h	Frequency of the 2nd notch	50 Hz to 8000 Hz	8000	Hz	Real-time	" H09_en.15" on page 208
H09.16	2009-11h	Width level of the 2nd notch	0 to 20	2	-	Real-time	" H09_en.16" on page 209
H09.17	2009-12h	Depth level of the 2nd notch	0 to 99	0	-	Real-time	" H09_en.17" on page 209
H09.18	2009-13h	Frequency of the 3rd notch	50 Hz to 8000 Hz	8000	Hz	Real-time	" H09_en.18" on page 209
H09.19	2009-14h	Width level of the 3rd notch	0 to 20	2	-	Real-time	" H09_en.19" on page 210
H09.20	2009-15h	Depth level of the 3rd notch	0 to 99	0	-	Real-time	" H09_en.20" on page 210
H09.21	2009-16h	Frequency of the 4th notch	50 Hz to 8000 Hz	8000	Hz	Real-time	" H09_en.21" on page 210
H09.22	2009-17h	Width level of the 4th notch	0 to 20	2	-	Real-time	" H09_en.22" on page 210
H09.23	2009-18h	Depth level of the 4th notch	0 to 99	0	-	Real-time	" H09_en.23" on page 211
H09.24	2009-19h	Auto-tuned resonance frequency	0Hz to 5000Hz	0	Hz	Unchangeable	" H09_en.24" on page 211
H09.30	2009-1Fh	Tension fluctuation compensation gain	-100.0 to 100.0	0.0	-	Real-time	" H09_en.30" on page 211

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H09.31	2009-20h	Tension fluctuation compensation filter time	0.00 to 25.00	0.50	-	Real-time	" H09_en.31" on page 211
H09.32	2009-21h	Gravity compensation value	-100.0% to 100.0%	0.0	%	Real-time	" H09_en.32" on page 212
H09.33	2009-22h	Positive friction compensation value	0.0% to 100.0%	0.0	%	Real-time	" H09_en.33" on page 212
H09.34	2009-23h	Negative friction compensation value	-100.0% to 0.0%	0.0	%	Real-time	" H09_en.34" on page 212
H09.35	2009-24h	Friction compensation speed	0.0 to 20.0	2.0	-	Real-time	" H09_en.35" on page 213
H09.36	2009-25h	Friction compensation speed	0: Slow mode+Speed reference 1: Slow mode+Model speed 2: Slow mode+Speed feedback 3: Slow mode+Observe speed 16: Quick mode +Speed reference 17: Quick mode +Model speed 18: Quick mode +Speed feedback 19: Quick mode+Observe speed	0	-	Real-time	" H09_en.36" on page 213
H09.37	2009-26h	Vibration monitoring time	0 to 65535	300	-	Real-time	" H09_en.37" on page 214
H09.38	2009-27h	Frequency of low-frequency resonance suppression 1 at the mechanical end	1.0Hz to 100.0Hz	100.0	Hz	At stop	" H09_en.38" on page 214
H09.39	2009-28h	Low-frequency resonance suppression 1 at the mechanical end	0 to 3	2	-	At stop	" H09_en.39" on page 214

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H09.44	2009-2Dh	Frequency of low-frequency resonance suppression 2 at mechanical load end	0.0 to 200.0	0.0	-	Real-time	" H09_en.44" on page 214
H09.45	2009-2Eh	Responsiveness of low-frequency resonance suppression 2 at mechanical load end	0.01 to 10.00	1.00	-	Real-time	" H09_en.45" on page 215
H09.47	2009-30h	Width of low-frequency resonance suppression 2 at mechanical load end	0.00 to 2.00	1.00	-	Real-time	" H09_en.47" on page 215
H09.49	2009-32h	Frequency of low-frequency resonance suppression 3 at mechanical load end	0.0 to 200.0	0.0	-	Real-time	" H09_en.49" on page 215
H09.50	2009-33h	Responsiveness of low-frequency resonance suppression 3 at mechanical load end	0.01 to 10.00	1.00	-	Real-time	" H09_en.50" on page 215
H09.52	2009-35h	Width of low-frequency resonance suppression 3 at mechanical load end	0.00 to 2.00	1.00	-	Real-time	" H09_en.52" on page 216
H09.54	2009-37h	Resonance detection torque threshold	0.0 to 300.0	50.0	-	Real-time	" H09_en.54" on page 216
H09.55	2009-38h	Medium frequency vibration suppression 2 cut-off frequency	0 to 65535	1200	-	Real-time	" H09_en.55" on page 216

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H09.56	2009-39h	Max. overmodulation one-key adjustment	0 to 65535	2936	-	Real-time	" H09_en.56" on page 217
H09.57	2009-3Ah	STune resonance suppression switchover frequency	0Hz to 4000Hz	900	Hz	Real-time	" H09_en.57" on page 217
H09.58	2009-3Bh	STune resonance suppression reset selection	0: Disabled 1: Enabled	0	-	Real-time	" H09_en.58" on page 217

5.11 Parameter Group H0A

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H0A.00	200A-01h	Power input phase loss protection	0: Enabled 1: Disabled 3: Enable power-off detection	0	-	Real-time	" H0A_en.00" on page 217
H0A.01	200A-02h	Absolute position limit	0: Disabled 1: Enabled 2: Enabled after homing	0	-	Real-time	" H0A_en.01" on page 218
H0A.04	200A-05h	Motor overload protection gain	50 to 300	100	-	Real-time	" H0A_en.04" on page 218
H0A.08	200A-09h	Overspeed threshold	0rpm to 20000rpm	0	RPM	Real-time	" H0A_en.08" on page 219
H0A.10	200A-0Bh	Threshold of excessive local position deviation	0 to 4294967295	27486951	-	Real-time	" H0A_en.10" on page 219
H0A.12	200A-0Dh	Runaway protection enable	0: Disable 1: Enable	1	-	Real-time	" H0A_en.12" on page 219
H0A.18	200A-13h	IGBT over-temperature threshold	120°C to 175°C	135	°C	Real-time	" H0A_en.18" on page 220
H0A.19	200A-14h	Filter time constant of touch probe 1	0.00us–6.30us	2.00	us	Real-time	" H0A_en.19" on page 220
H0A.20	200A-15h	Filter time constant of touch probe 2	0.00us–6.30us	2.00	us	Real-time	" H0A_en.20" on page 220

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H0A.21	200A-16h	STO function display selection	0 to 3	0	-	Real-time	*" H0A_en.21" on page 220*
H0A.22	200A-17h	Sigma_Delta filter time	0 to 3	1	-	At stop	*" H0A_en.22" on page 221*
H0A.23	200A-18h	TZ signal filter time	0ns to 31ns	15	25ns	At stop	*" H0A_en.23" on page 221*
H0A.25	200A-1Ah	Filter time constant of speed feedback display value	0ms to 5000ms	50	ms	Real-time	*" H0A_en.25" on page 221*
H0A.26	200A-1Bh	Motor overload detection	0: Show motor overload warning (E909.0) and fault (E620.0) 1: Hide motor overload warning (E909.0) and fault (E620.0)	0	-	Real-time	*" H0A_en.26" on page 222*
H0A.27	200A-1Ch	Motor rotation DO speed filter time	0ms to 5000ms	50	ms	Real-time	*" H0A_en.27" on page 222*
H0A.32	200A-21h	Time threshold for locked motor overheat protection	10ms to 65535ms	200	ms	Real-time	*" H0A_en.32" on page 222*
H0A.33	200A-22h	Locked motor overheat protection	0: Disabled 1: Enabled	1	-	Real-time	*" H0A_en.33" on page 223*
H0A.36	200A-25h	Encoder multi-turn overflow fault selection	0: Not hide 1: Hide	0	-	Real-time	*" H0A_en.36" on page 223*
H0A.40	200A-29h	Compensation function selection	0 to 7	0	-	At stop	*" H0A_en.40" on page 223*
H0A.49	200A-32h	Regenerative resistor overtempera ture threshold	100°C to 175°C	115	°C	Real-time	*" H0A_en.49" on page 224*
H0A.50	200A-33h	Encoder communication fault tolerance threshold	0 to 31	31	-	Real-time	*" H0A_en.50" on page 224*
H0A.51	200A-34h	Phase loss detection filter times	3ms to 36ms	20	55ms	Real-time	*" H0A_en.51" on page 224*

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H0A.52	200A-35h	Encoder temperature protection threshold	0°C to 175°C	0	°C	Real-time	" H0A_en.52" on page 224
H0A.53	200A-36h	Probe rising edge compensation time	-30000ns to 30000ns	0	25ns	Real-time	" H0A_en.53" on page 225
H0A.54	200A-37h	Probe falling edge compensation time	-30000ns to 30000ns	0	25ns	Real-time	" H0A_en.54" on page 225
H0A.55	200A-38h	Runaway current threshold	100.0% to 400.0%	200.0	%	Real-time	" H0A_en.55" on page 225
H0A.56	200A-39h	Fault reset delay	0ms to 60000ms	10000	ms	Real-time	" H0A_en.56" on page 226
H0A.57	200A-3Ah	Runaway speed threshold	1 rpm to 1000 rpm	50	RPM	Real-time	" H0A_en.57" on page 226
H0A.58	200A-3Bh	Runaway speed filter time	0.1ms to 100.0ms	2.0	ms	Real-time	" H0A_en.58" on page 226
H0A.59	200A-3Ch	Runaway protection detection time	10ms to 1000ms	30	ms	Real-time	" H0A_en.59" on page 226
H0A.70	200A-47h	Overspeed threshold 2	0rpm to 20000rpm	0	RPM	Real-time	" H0A_en.70" on page 227
H0A.71	200A-48h	Servo function switch	0 to 65535	0	-	Real-time	" H0A_en.71" on page 227
H0A.72	200A-49h	Maximum stop time in ramp-to-stop	0ms to 65535ms	10000	ms	At stop	" H0A_en.72" on page 228
H0A.73	200A-4Ah	STO 24 V disconnection filter time	0ms to 5ms	5	ms	Real-time	" H0A_en.73" on page 229
H0A.74	200A-4Bh	Filter time for two inconsistent STO channels	0ms to 1000ms	10	ms	Real-time	" H0A_en.74" on page 229
H0A.75	200A-4Ch	Servo OFF delay after STO triggered	0ms to 25ms	20	ms	Real-time	" H0A_en.75" on page 229

Param.	Object Dictionary	Name	Value	Default	Unit	Change Mode	Page
H0A.85	200A-56h	Wire breakage detection torque threshold	4.0% to 400.0%	5.0	%	At stop	" H0A_en.85" on page 230
H0A.86	200A-57h	Wire breakage detection filter time	5ms to 1000ms	30	ms	At stop	" H0A_en.86" on page 230

5.12 Parameter Group H0b

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0b.00	200b-01h	Motor speed actual value	-32767rpm to 32767rpm	0	RPM	Unchangeable	" H0b_en.00" on page 230
H0b.01	200b-02h	Speed reference	-32767rpm to 32767rpm	0	RPM	Unchangeable	" H0b_en.01" on page 231
H0b.02	200b-03h	Internal torque reference	-3276.7% to 3276.7%	0.0	%	Unchangeable	" H0b_en.02" on page 231
H0b.03	200b-04h	Input (DI) signal monitoring	0 to 65535	0	-	Unchangeable	" H0b_en.03" on page 231
H0b.05	200b-06h	Output (DO) signal monitoring	0 to 65535	0	-	Unchangeable	" H0b_en.05" on page 232
H0b.07	200b-08h	Absolute position counter	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.07" on page 232
H0b.09	200b-0Ah	Mechanical angle	0.0° to 360.0°	0.0	°	Unchangeable	" H0b_en.09" on page 233
H0b.10	200b-0Bh	Electrical angle	0.0° to 360.0°	0.0	°	Unchangeable	" H0b_en.10" on page 233
H0b.12	200b-0Dh	Average load ratio	0.0% to 800.0%	0.0	%	Unchangeable	" H0b_en.12" on page 233
H0b.15	200b-10h	Position following error (encoder unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.15" on page 234
H0b.17	200b-12h	Feedback pulse counter	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.17" on page 234
H0b.19	200b-14h	Total power-on time	0.0s to 6553.5s	0.0	-	Unchangeable	" H0b_en.19" on page 234
H0b.24	200b-19h	Phase current RMS value	0.0A to 6553.5A	0.0	A	Unchangeable	" H0b_en.24" on page 234
H0b.26	200b-1Bh	Bus voltage	0.0 VDC–6553.5 VDC	0.0	VDC	Unchangeable	" H0b_en.26" on page 235

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0b.27	200b-1Ch	Module temperature	-20°C to 200°C	0	°C	Unchangeable	" H0b_en.27" on page 235
H0b.28	200b-1Dh	Absolute encoder fault information given by FPGA	0 to 65535	0	-	Unchangeable	" H0b_en.28" on page 235
H0b.29	200b-1Eh	Axis status information given by FPGA	0 to 65535	0	-	Unchangeable	" H0b_en.29" on page 235
H0b.30	200b-1Fh	Axis fault information given by FPGA	0 to 65535	0	-	Unchangeable	" H0b_en.30" on page 236
H0b.31	200b-20h	Encoder fault information	0 to 65535	0	-	Real-time	" H0b_en.31" on page 236
H0b.33	200b-22h	Fault log	0: Active fault 1: Last fault 2: 2nd to last fault 3: 3rd to last fault 4: 4th to last fault 5: 5th to last fault 6: 6th to last fault 7: 7th to last fault 8: 8th to last fault 9: 9th to last fault	0	-	Real-time	" H0b_en.33" on page 236
H0b.34	200b-23h	Fault code set by H0B-33	0 to 65535	0	-	Unchangeable	" H0b_en.34" on page 237
H0b.35	200b-24h	Timestamp of the selected fault	0.0s–429496729.5s	0.0	-	Unchangeable	" H0b_en.35" on page 237
H0b.37	200b-26h	Motor speed upon occurrence of the selected fault	-32767rpm to 32767rpm	0	RPM	Unchangeable	" H0b_en.37" on page 237
H0b.38	200b-27h	Motor phase U current upon occurrence of the selected fault	-3276.7A to 3276.7A	0.0	A	Unchangeable	" H0b_en.38" on page 238
H0b.39	200b-28h	Motor phase V current upon occurrence of the selected fault	-3276.7A to 3276.7A	0.0	A	Unchangeable	" H0b_en.39" on page 238

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0b.40	200b-29h	Bus voltage upon occurrence of the selected fault	0.0 VDC–6553.5 VDC	0.0	VDC	Unchangeable	" H0b_en.40" on page 238
H0b.41	200b-2Ah	Input terminal state on selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.41" on page 238
H0b.43	200b-2Ch	Output terminal status upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.43" on page 239
H0b.45	200b-2Eh	Internal fault code	0 to 65535	0	-	Unchangeable	" H0b_en.45" on page 239
H0b.46	200b-2Fh	Absolute encoder fault information given by FPGA upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.46" on page 239
H0b.47	200b-30h	System status information given by FPGA upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.47" on page 240
H0b.48	200b-31h	System fault information given by FPGA upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.48" on page 240
H0b.49	200b-32h	Encoder fault information upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.49" on page 240

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0b.51	200b-34h	Internal fault code upon occurrence of the selected fault	0 to 65535	0	-	Unchangeable	" H0b_en.51" on page 240
H0b.53	200b-36h	Position following error (reference unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.53" on page 241
H0b.55	200b-38h	Motor speed actual value	-214748364.8rpm to 214748364.7rpm	0.0	RPM	Unchangeable	" H0b_en.55" on page 241
H0b.57	200b-3Ah	Control circuit bus voltage	0.0 VDC–6553.5 VDC	0.0	VDC	Unchangeable	" H0b_en.57" on page 241
H0b.58	200b-3Bh	Mechanical absolute position (low 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.58" on page 242
H0b.60	200b-3Dh	Mechanical absolute position (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.60" on page 242
H0b.63	200b-40h	NotRdy state	0: None 1: Control power abnormal (H0b.57) 2: Abnormal condition detected in phase loss detection 3: Abnormal condition detected in main circuit power detection (including short-to-ground fault) 4: Other faults 5: Short circuit to ground detection failure	0	-	Unchangeable	" H0b_en.63" on page 242
H0b.66	200b-43h	Encoder temperature	-32768°C to 32767°C	0	°C	Unchangeable	" H0b_en.66" on page 243
H0b.67	200b-44h	Load rate of regenerative resistor	0.0% to 200.0%	0.0	%	Unchangeable	" H0b_en.67" on page 243
H0b.70	200b-47h	Number of absolute encoder revolutions	0Rev to 65535Rev	0	Rev	Unchangeable	" H0b_en.70" on page 243
H0b.71	200b-48h	Single-turn position fed back by the absolute encoder	0 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.71" on page 244

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0b.74	200b-4Bh	System fault information given by FPGA	0 to 65535	0	-	Unchangeable	" H0b_en.74" on page 244
H0b.77	200b-4Eh	Encoder position (low 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.77" on page 244
H0b.79	200b-50h	Encoder position (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.79" on page 244
H0b.81	200b-52h	Single-turn position of the rotary load (low 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.81" on page 245
H0b.83	200b-54h	Single-turn position of the rotary load (high 32 bits)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.83" on page 245
H0b.85	200b-56h	Single-turn position of the rotary load (reference unit)	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	" H0b_en.85" on page 245
H0b.87	200b-58h	IGBT junction temperature	0°C to 200°C	0	°C	Unchangeable	" H0b_en.87" on page 246
H0b.90	200b-5Bh	Group No. of the abnormal parameter	0 to 65535	0	-	Unchangeable	" H0b_en.90" on page 246
H0b.91	200b-5Ch	Offset of the abnormal parameter within the parameter group	0 to 65535	0	-	Unchangeable	" H0b_en.91" on page 246

5.13 Parameter Group H0d

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0d.00	200d-01h	Software Reset	0: No operation 1: Enable	0	-	At stop	" H0d_en.00" on page 246
H0d.01	200d-02h	Fault reset	0: No operation 1: Enable	0	-	At stop	" H0d_en.01" on page 247
H0d.02	200d-03h	Offline inertia auto-tuning selection	0 to 65	0	-	Real-time	" H0d_en.02" on page 248

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0d.04	200d-05h	Read/write in encoder ROM	0: No operation 1: Write ROM 2: Read ROM 3: ROM failure	0	-	At stop	" H0d_en.04" on page 248
H0d.05	200d-06h	Emergency stop	0: No operation 1: Emergency stop	0	-	Real-time	" H0d_en.05" on page 248
H0d.12	200d-0Dh	Phase U/V current balance correction	0: Disabled 1: Enabled	0	-	At stop	" H0d_en.12" on page 249
H0d.17	200d-12h	Forced DI/DO enable switch	0:0-No operation 1: Forced DI enabled, forced DO disabled 2: Forced DO enabled, forced DI disabled 3: Forced DI and DO enabled 4: EtherCAT-controlled forced DO enabled	0	-	Real-time	" H0d_en.17" on page 249
H0d.18	200d-13h	Forced DI value	0 to 31	31	-	Real-time	" H0d_en.18" on page 250
H0d.19	200d-14h	Forced DO value	0 to 7	0	-	Real-time	" H0d_en.19" on page 250
H0d.20	200d-15h	Absolute encoder reset	0: No operation 1: Reset 2: Reset the fault and multi-turn data	0	-	At stop	" H0d_en.20" on page 251

5.14 Parameter Group H0E

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0E.00	200E-01h	Node address	1 to 127	1	-	Real-time	" H0E_en.00" on page 251
H0E.01	200E-02h	Save objects written through communication to EEPROM	0: Not save 1: Save parameters 2: Save object dictionaries 3: Save both	3	-	Real-time	" H0E_en.01" on page 252
H0E.03	200E-04h	Save objects written through software (commissioning protocol) to e2prom	0: Do not save 1: Save	1	-	Real-time	" H0E_en.03" on page 252

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0E.04	200E-05h	Save objects written through communication to e2prom (excluding commissioning protocol)	0: Do not save 1: Save	0	-	Real-time	" H0E_en.04" on page 253
H0E.20	200E-15h	EtherCAT slave name	0 to 65535	0	-	Unchangeable	" H0E_en.20" on page 253
H0E.21	200E-16h	EtherCAT slave alias	0 to 65535	0	-	At stop	" H0E_en.21" on page 253
H0E.22	200E-17h	Number of synchronous loss events allowed by EtherCAT	1 to 20	8	-	Real-time	" H0E_en.22" on page 254
H0E.24	200E-19h	Sync loss count	0 to 65535	0	-	Unchangeable	" H0E_en.24" on page 254
H0E.25	200E-1Ah	Max. error value and invalid frames of EtherCAT port 0 per unit time	0 to 65535	0	-	Unchangeable	" H0E_en.25" on page 254
H0E.26	200E-1Bh	Max. error value and invalid frames of EtherCAT port 1 per unit time	0 to 65535	0	-	Unchangeable	" H0E_en.26" on page 255
H0E.27	200E-1Ch	Max. transfer error of EtherCAT port per unit time	0 to 65535	0	-	Unchangeable	" H0E_en.27" on page 255
H0E.28	200E-1Dh	Max. EtherCAT data frame processing unit error per unit time	0 to 255	0	-	Unchangeable	" H0E_en.28" on page 255
H0E.29	200E-1Eh	Max. link loss value of EtherCAT port 0 per unit time	0 to 65535	0	-	Unchangeable	" H0E_en.29" on page 255
H0E.30	200E-1Fh	E15 alarm detection delay	0ms to 60000ms	0	-	Real-time	" H0E_en.30" on page 256

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0E.31	200E-20h	EtherCAT synchronization mode setting	0 to 3	1	-	At stop	" H0E_en.31" on page 256
H0E.32	200E-21h	EtherCAT synchronization error threshold	100ns to 10000ns	3000	ns	At stop	" H0E_en.32" on page 256
H0E.33	200E-22h	EtherCAT state machine status and port connection status	0 to 65535	0	-	Unchangeable	" H0E_en.33" on page 257
H0E.34	200E-23h	Allowed duration of CSP position reference error	1ms to 30ms	20	ms	Real-time	" H0E_en.34" on page 257
H0E.35	200E-24h	AL fault code	0 to 65535	0	-	Unchangeable	" H0E_en.35" on page 257
H0E.36	200E-25h	EtherCAT enhanced link enable	0: Disabled 1: Enabled	0	-	Real-time	" H0E_en.36" on page 258
H0E.37	200E-26h	EtherCAT XML reset selection	0: Disabled 1: Enabled	0	-	Real-time	" H0E_en.37" on page 258
H0E.59	200E-3Ch	PHY chip half-duplex mode	0: Enabled 1: Disabled	0	-	Real-time	" H0E_en.59" on page 258
H0E.74	200E-4Bh	Link signal delay	1ms to 65535ms	400	ms	At stop	" H0E_en.74" on page 259
H0E.80	200E-51h	Modbus baud rate	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	9	-	Real-time	" H0E_en.80" on page 259
H0E.81	200E-52h	Modbus data format	0: No parity, 2 stop bits (8-N-2) 1: Even parity, 1 stop bit (8-E-1) 2: Odd parity, 1 stop bit (8-O-1) 3: No parity, 1 stop bit (8-N-1)	3	-	Real-time	" H0E_en.81" on page 260
H0E.82	200E-53h	Modbus response delay	0ms to 20ms	0	ms	Real-time	" H0E_en.82" on page 260
H0E.83	200E-54h	Modbus communication timeout	0ms to 600ms	0	ms	Real-time	" H0E_en.83" on page 261

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H0E.90	200E-5Bh	Communication version	0.00 to 655.35	0.00	-	Unchangeable	"H0E_en.90" on page 261
H0E.93	200E-5Eh	PHY hardware version	0 to 3	0	-	Unchangeable	"H0E_en.93" on page 261
H0E.96	200E-61h	XML version information	0.00 to 655.35	0.00	-	Unchangeable	"H0E_en.96" on page 261

5.15 Parameter Group H18

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H18.00	2018-01h	Position comparison output selection	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	"H18_en.00" on page 262
H18.02	2018-03h	Position comparison resolution	0: 24-bit 1: 23-bit 2: 22-bit 3: 21-bit 4: 20-bit 5: 19-bit 6: 18-bit 7: 17-bit	1	-	Real-time	"H18_en.02" on page 262
H18.03	2018-04h	Position comparison mode	0: Single 1: Cyclic comparison mode	0	-	Real-time	"H18_en.03" on page 262
H18.04	2018-05h	Current position as zero	0: Disable 1: Enable (rising edge-triggered)	0	-	Real-time	"H18_en.04" on page 263
H18.05	2018-06h	Position comparison output width	0.0 ms to 204.7ms	0.0	ms	Real-time	"H18_en.05" on page 263
H18.07	2018-08h	Position comparison start point	0 to 30	0	-	Real-time	"H18_en.07" on page 263
H18.08	2018-09h	Position comparison end point	0 to 30	0	-	Real-time	"H18_en.08" on page 264
H18.09	2018-0Ah	Current state of position comparison	0 to 1024	0	-	Unchangeable	"H18_en.09" on page 264

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H18.10	2018-0Bh	Real-time position of position comparison	-2147483648 to 2147483647	0	-	Unchangeable	" H18_en.10" on page 264
H18.12	2018-0Dh	Zero offset of position comparison	-2147483648 to 2147483647	0	-	Real-time	" H18_en.12" on page 264
H18.18	2018-13h	Position comparison switch	Bit 0: Comparison logic independently enabled bit 8: Target position reference unit	0	-	Real-time	" H18_en.18" on page 265

5.16 Parameter Group H19

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H19.00	2019-01h	Target value of position comparison 1	-2147483648 to 2147483647	0	-	Real-time	" H19_en.00" on page 265
H19.02	2019-03h	Attribute value of position comparison 1	0 to 387	0	-	Real-time	" H19_en.02" on page 265
H19.03	2019-04h	Target value of position comparison 2	-2147483648 to 2147483647	0	-	Real-time	" H19_en.03" on page 266
H19.05	2019-06h	Attribute value of position comparison 2	Same as H19.02.	0	-	Real-time	" H19_en.05" on page 266
H19.06	2019-07h	Target value of position comparison 3	-2147483648 to 2147483647	0	-	Real-time	" H19_en.06" on page 267
H19.08	2019-09h	Attribute value of position comparison 3	Same as H19.02.	0	-	Real-time	" H19_en.08" on page 267
H19.09	2019-0Ah	Target value of position comparison 4	-2147483648 to 2147483647	0	-	Real-time	" H19_en.09" on page 267
H19.11	2019-0Ch	Attribute value of position comparison 4	Same as H19.02.	0	-	Real-time	" H19_en.11" on page 267
H19.12	2019-0Dh	Target value of position comparison 5	-2147483648 to 2147483647	0	-	Real-time	" H19_en.12" on page 268

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H19.14	2019-0Fh	Attribute value of position comparison 5	Same as H19.02.	0	-	Real-time	"H19_en.14" on page 268
H19.15	2019-10h	Target value of position comparison 6	-2147483648 to 2147483647	0	-	Real-time	"H19_en.15" on page 268
H19.17	2019-12h	Attribute value of position comparison 6	Same as H19.02.	0	-	Real-time	"H19_en.17" on page 269
H19.18	2019-13h	Target value of position comparison 7	-2147483648 to 2147483647	0	-	Real-time	"H19_en.18" on page 269
H19.20	2019-15h	Attribute value of position comparison 7	Same as H19.02.	0	-	Real-time	"H19_en.20" on page 269
H19.21	2019-16h	Target value of position comparison 8	-2147483648 to 2147483647	0	-	Real-time	"H19_en.21" on page 269
H19.23	2019-18h	Attribute value of position comparison 8	Same as H19.02.	0	-	Real-time	"H19_en.23" on page 270
H19.24	2019-19h	Target value of position comparison 9	-2147483648 to 2147483647	0	-	Real-time	"H19_en.24" on page 270
H19.26	2019-1Bh	Attribute value of position comparison 9	Same as H19.02.	0	-	Real-time	"H19_en.26" on page 270
H19.27	2019-1Ch	Target value of position comparison 10	-2147483648 to 2147483647	0	-	Real-time	"H19_en.27" on page 270
H19.29	2019-1Eh	Attribute value of position comparison 10	Same as H19.02.	0	-	Real-time	"H19_en.29" on page 271
H19.30	2019-1Fh	Target value of position comparison 11	-2147483648 to 2147483647	0	-	Real-time	"H19_en.30" on page 271
H19.32	2019-21h	Attribute value of position comparison 11	Same as H19.02.	0	-	Real-time	"H19_en.32" on page 271
H19.33	2019-22h	Target value of position comparison 12	-2147483648 to 2147483647	0	-	Real-time	"H19_en.33" on page 271
H19.35	2019-24h	Attribute value of position comparison 12	Same as H19.02.	0	-	Real-time	"H19_en.35" on page 272

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H19.36	2019-25h	Target value of position comparison 13	-2147483648 to 2147483647	0	-	Real-time	" H19_en.36" on page 272
H19.38	2019-27h	Attribute value of position comparison 13	Same as H19.02.	0	-	Real-time	" H19_en.38" on page 272
H19.39	2019-28h	Target value of position comparison 14	-2147483648 to 2147483647	0	-	Real-time	" H19_en.39" on page 273
H19.41	2019-2Ah	Attribute value of position comparison 14	Same as H19.02.	0	-	Real-time	" H19_en.41" on page 273
H19.42	2019-2Bh	Target value of position comparison 15	-2147483648 to 2147483647	0	-	Real-time	" H19_en.42" on page 273
H19.44	2019-2Dh	Attribute value of position comparison 15	Same as H19.02.	0	-	Real-time	" H19_en.44" on page 273
H19.45	2019-2Eh	Target value of position comparison 16	-2147483648 to 2147483647	0	-	Real-time	" H19_en.45" on page 274
H19.47	2019-30h	Attribute value of position comparison 16	Same as H19.02.	0	-	Real-time	" H19_en.47" on page 274
H19.48	2019-31h	Target value of position comparison 17	-2147483648 to 2147483647	0	-	Real-time	" H19_en.48" on page 274
H19.50	2019-33h	Attribute value of position comparison 17	Same as H19.02.	0	-	Real-time	" H19_en.50" on page 274
H19.51	2019-34h	Target value of position comparison 18	-2147483648 to 2147483647	0	-	Real-time	" H19_en.51" on page 275
H19.53	2019-36h	Attribute value of position comparison 18	Same as H19.02.	0	-	Real-time	" H19_en.53" on page 275
H19.54	2019-37h	Target value of position comparison 19	-2147483648 to 2147483647	0	-	Real-time	" H19_en.54" on page 275
H19.56	2019-39h	Attribute value of position comparison 19	Same as H19.02.	0	-	Real-time	" H19_en.56" on page 275
H19.57	2019-3Ah	Target value of position comparison 20	-2147483648 to 2147483647	0	-	Real-time	" H19_en.57" on page 276

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H19.59	2019-3Ch	Attribute value of position comparison 20	Same as H19.02.	0	-	Real-time	" H19_en.59" on page 276
H19.60	2019-3Dh	Target value of position comparison 21	-2147483648 to 2147483647	0	-	Real-time	" H19_en.60" on page 276
H19.62	2019-3Fh	Attribute value of position comparison 21	Same as H19.02.	0	-	Real-time	" H19_en.62" on page 277
H19.63	2019-40h	Target value of position comparison 22	-2147483648 to 2147483647	0	-	Real-time	" H19_en.63" on page 277
H19.65	2019-42h	Attribute value of position comparison 22	Same as H19.02.	0	-	Real-time	" H19_en.65" on page 277
H19.66	2019-43h	Target value of position comparison 23	-2147483648 to 2147483647	0	-	Real-time	" H19_en.66" on page 277
H19.68	2019-45h	Attribute value of position comparison 23	Same as H19.02.	0	-	Real-time	" H19_en.68" on page 278
H19.69	2019-46h	Target value of position comparison 24	-2147483648 to 2147483647	0	-	Real-time	" H19_en.69" on page 278
H19.71	2019-48h	Attribute value of position comparison 24	Same as H19.02.	0	-	Real-time	" H19_en.71" on page 278
H19.72	2019-49h	Target value of position comparison 25	-2147483648 to 2147483647	0	-	Real-time	" H19_en.72" on page 278
H19.74	2019-4Bh	Attribute value of position comparison 25	Same as H19.02.	0	-	Real-time	" H19_en.74" on page 279
H19.75	2019-4Ch	Target value of position comparison 26	-2147483648 to 2147483647	0	-	Real-time	" H19_en.75" on page 279
H19.77	2019-4Eh	Attribute value of position comparison 26	Same as H19.02.	0	-	Real-time	" H19_en.77" on page 279
H19.78	2019-4Fh	Target value of position comparison 27	-2147483648 to 2147483647	0	-	Real-time	" H19_en.78" on page 279
H19.80	2019-51h	Attribute value of position comparison 27	Same as H19.02.	0	-	Real-time	" H19_en.80" on page 280

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H19.81	2019-52h	Target value of position comparison 28	-2147483648 to 2147483647	0	-	Real-time	" H19_en.81" on page 280
H19.83	2019-54h	Attribute value of position comparison 28	Same as H19.02.	0	-	Real-time	" H19_en.83" on page 280
H19.84	2019-55h	Target value of position comparison 29	-2147483648 to 2147483647	0	-	Real-time	" H19_en.84" on page 281
H19.86	2019-57h	Attribute value of position comparison 29	Same as H19.02.	0	-	Real-time	" H19_en.86" on page 281
H19.87	2019-58h	Target value of position comparison 30	-2147483648 to 2147483647	0	-	Real-time	" H19_en.87" on page 281
H19.89	2019-5Ah	Attribute value of position comparison 30	Same as H19.02.	0	-	Real-time	" H19_en.89" on page 281

5.17 Parameter Group H1F

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H1F.90	201F-5Bh	DI function state 1 read through communication	0 to 65535	0	-	Unchangeable	" H1F_en.90" on page 282
H1F.91	201F-5Ch	DI function state 2 read through communication	0 to 65535	0	-	Unchangeable	" H1F_en.91" on page 282
H1F.92	201F-5Dh	DI function state 3 read through communication	0 to 65535	0	-	Unchangeable	" H1F_en.92" on page 282
H1F.93	201F-5Eh	DI function state 4 read through communication	0 to 65535	0	-	Unchangeable	" H1F_en.93" on page 282

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H1F.94	201F-5Fh	DO function state 1 read through communication	0 to 65535	0	-	Unchangeable	" H1F_en.94" on page 283
H1F.95	201F-60h	DO function state 2 read through communication	0 to 65535	0	-	Unchangeable	" H1F_en.95" on page 283

5.18 Parameter Group H30

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
H30.16	2030-11h	Encoder communication timeout count	0 to 65535	0	-	Unchangeable	" H30_en.16" on page 283
H30.17	2030-12h	Encoder communication CRC error count	0 to 65535	0	-	Unchangeable	" H30_en.17" on page 284
H30.18	2030-13h	Encoder communication frame stop bit error count	0 to 65535	0	-	Unchangeable	" H30_en.18" on page 284
H30.20	2030-15h	Servo SN code digits 0 & 1	0 to 65535	0	-	Unchangeable	" H30_en.20" on page 284
H30.21	2030-16h	Servo SN code digits 2 & 3	0 to 65535	0	-	Unchangeable	" H30_en.21" on page 285
H30.22	2030-17h	Servo SN code digits 4 & 5	0 to 65535	0	-	Unchangeable	" H30_en.22" on page 285
H30.23	2030-18h	Servo SN code digits 6 & 7	0 to 65535	0	-	Unchangeable	" H30_en.23" on page 285
H30.24	2030-19h	Servo SN code digits 8 & 9	0 to 65535	0	-	Unchangeable	" H30_en.24" on page 285
H30.25	2030-1Ah	Servo SN code digits 10 & 11	0 to 65535	0	-	Unchangeable	" H30_en.25" on page 286
H30.26	2030-1Bh	Servo SN code digits 12 & 13	0 to 65535	0	-	Unchangeable	" H30_en.26" on page 286
H30.27	2030-1Ch	Servo SN code digits 14 & 15	0 to 65535	0	-	Unchangeable	" H30_en.27" on page 286

5.19 1000 Parameters

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
1000.00h	1000-00h	Device type	0 to 2147483647	131474	-	Unchangeable	*" 1000_en.00h" on page 286*
1001.00h	1001-00h	Error Register	0 to 255	0	-	Unchangeable	*" 1001_en.00h" on page 287*
1018.01h	1018-01h	Vendor ID	0 to 2147483647	1048576	-	Unchangeable	*" 1018_en.01h" on page 287*
1018.02h	1018-02h	Product code	0 to 2147483647	786701	-	Unchangeable	*" 1018_en.02h" on page 287*
1018.03h	1018-03h	Revision number	0 to 2147483647	65537	-	Unchangeable	*" 1018_en.03h" on page 288*
1600.00h	1600-00h	Number of valid mapped objects in RPDO1	0 to 10	3	-	Real-time	*" 1600_en.00h" on page 288*
1600.01h	1600-01h	RPDO1 mapping object 1	0 to 4294967295	1614807056	-	Real-time	*" 1600_en.01h" on page 288*
1600.02h	1600-02h	RPDO1 mapping object 2	0 to 4294967295	1616904200	-	Real-time	*" 1600_en.02h" on page 289*
1600.03h	1600-03h	RPDO1 mapping object 3	0 to 4294967295	1622671376	-	Real-time	*" 1600_en.03h" on page 289*
1600.04h	1600-04h	RPDO1 mapping object 4	0 to 4294967295	0	-	Real-time	*" 1600_en.04h" on page 289*
1600.05h	1600-05h	RPDO1 mapping object 5	0 to 4294967295	0	-	Real-time	*" 1600_en.05h" on page 289*
1600.06h	1600-06h	RPDO1 mapping object 6	0 to 4294967295	0	-	Real-time	*" 1600_en.06h" on page 290*
1600.07h	1600-07h	RPDO1 mapping object 7	0 to 4294967295	0	-	Real-time	*" 1600_en.07h" on page 290*
1600.08h	1600-08h	RPDO1 mapping object 8	0 to 4294967295	0	-	Real-time	*" 1600_en.08h" on page 290*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
1600.09h	1600-09h	RPDO1 mapping object 9	0 to 4294967295	0	-	Real-time	*" 1600_en.09h" on page 290*
1600.0Ah	1600-0Ah	RPDO1 mapping object 10	0 to 4294967295	0	-	Real-time	*" 1600_en.0Ah" on page 291*
1600.0Bh	1600-0Bh	RPDO1 mapping object 11	0 to 4294967295	0	-	Real-time	*" 1600_en.0Bh" on page 291*
1600.0Ch	1600-0Ch	RPDO1 mapping object 12	0 to 4294967295	0	-	Real-time	*" 1600_en.0Ch" on page 291*
1600.0Dh	1600-0Dh	RPDO1 mapping object 13	0 to 4294967295	0	-	Real-time	*" 1600_en.0Dh" on page 292*
1600.0Eh	1600-0Eh	RPDO1 mapping object 14	0 to 4294967295	0	-	Real-time	*" 1600_en.0Eh" on page 292*
1600.0Fh	1600-0Fh	RPDO1 mapping object 15	0 to 4294967295	0	-	Real-time	*" 1600_en.0Fh" on page 292*
1600.10h	1600-10h	RPDO1 mapping object 16	0 to 4294967295	0	-	Real-time	*" 1600_en.10h" on page 292*
1600.11h	1600-11h	RPDO1 mapping object 17	0 to 4294967295	0	-	Real-time	*" 1600_en.11h" on page 293*
1600.12h	1600-12h	RPDO1 mapping object 18	0 to 4294967295	0	-	Real-time	*" 1600_en.12h" on page 293*
1600.13h	1600-13h	RPDO1 mapping object 19	0 to 4294967295	0	-	Real-time	*" 1600_en.13h" on page 293*
1600.14h	1600-14h	RPDO1 mapping object 20	0 to 4294967295	0	-	Real-time	*" 1600_en.14h" on page 293*
1A00.00h	1A00-00h	Number of valid mapped objects in TPDO1	0 to 10	7	-	Real-time	*" 1A00_en.00h" on page 294*
1A00.01h	1A00-01h	TPDO1 mapping object 1	0 to 4294967295	1614872592	-	Real-time	*" 1A00_en.01h" on page 294*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
1A00.02h	1A00-02h	TPDO1 mapping object 2	0 to 4294967295	1617166368	-	Real-time	" 1A00_en.02h" on page 294
1A00.03h	1A00-03h	TPDO1 mapping object 3	0 to 4294967295	1622736912	-	Real-time	" 1A00_en.03h" on page 295
1A00.04h	1A00-04h	TPDO1 mapping object 4	0 to 4294967295	1622802464	-	Real-time	" 1A00_en.04h" on page 295
1A00.05h	1A00-05h	TPDO1 mapping object 5	0 to 4294967295	1622933536	-	Real-time	" 1A00_en.05h" on page 295
1A00.06h	1A00-06h	TPDO1 mapping object 6	0 to 4294967295	1614741520	-	Real-time	" 1A00_en.06h" on page 295
1A00.07h	1A00-07h	TPDO1 mapping object 7	0 to 4294967295	1627193360	-	Real-time	" 1A00_en.07h" on page 296
1A00.08h	1A00-08h	TPDO1 mapping object 8	0 to 4294967295	0	-	Real-time	" 1A00_en.08h" on page 296
1A00.09h	1A00-09h	TPDO1 mapping object 9	0 to 4294967295	0	-	Real-time	" 1A00_en.09h" on page 296
1A00.0Ah	1A00-0Ah	TPDO1 mapping object 10	0 to 4294967295	0	-	Real-time	" 1A00_en.0Ah" on page 297
1A00.0Bh	1A00-0Bh	TPDO1 mapping object 11	0 to 4294967295	0	-	Real-time	" 1A00_en.0Bh" on page 297
1A00.0Ch	1A00-0Ch	TPDO1 mapping object 12	0 to 4294967295	0	-	Real-time	" 1A00_en.0Ch" on page 297
1A00.0Dh	1A00-0Dh	TPDO1 mapping object 13	0 to 4294967295	0	-	Real-time	" 1A00_en.0Dh" on page 297
1A00.0Eh	1A00-0Eh	TPDO1 mapping object 14	0 to 4294967295	0	-	Real-time	" 1A00_en.0Eh" on page 298
1A00.0Fh	1A00-0Fh	TPDO1 mapping object 15	0 to 4294967295	0	-	Real-time	" 1A00_en.0Fh" on page 298
1A00.10h	1A00-10h	TPDO1 mapping object 16	0 to 4294967295	0	-	Real-time	" 1A00_en.10h" on page 298

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
1A00.11h	1A00-11h	TPDO1 mapping object 17	0 to 4294967295	0	-	Real-time	*" 1A00_ en.11h" on page 298*
1A00.12h	1A00-12h	TPDO1 mapping object 18	0 to 4294967295	0	-	Real-time	*" 1A00_ en.12h" on page 299*
1A00.13h	1A00-13h	TPDO1 mapping object 19	0 to 4294967295	0	-	Real-time	*" 1A00_ en.13h" on page 299*
1A00.14h	1A00-14h	TPDO1 mapping object 20	0 to 4294967295	0	-	Real-time	*" 1A00_ en.14h" on page 299*
1C12.00h	1C12-00h	Number of assigned PDOs	0 to 1	1	-	Real-time	*" 1C12_ en.00h" on page 300*
1C12.01h	1C12-01h	PDO mapping object index of assigned RxPDO1	0 to 65535	5889	-	Real-time	*" 1C12_ en.01h" on page 300*
1C13.00h	1C13-00h	Number of assigned PDOs	0 to 1	1	-	Real-time	*" 1C13_ en.00h" on page 300*
1C13.01h	1C13-01h	PDO mapping object index of assigned TxPDO1	0 to 65535	6913	-	Real-time	*" 1C13_ en.01h" on page 300*
1C32.01h	1C32-01h	Sync mode	0 to 65535	2	-	Real-time	*" 1C32_ en.01h" on page 301*
1C32.02h	1C32-02h	Cycle time	0 to 4294967295	0	-	Real-time	*" 1C32_ en.02h" on page 301*
1C32.04h	1C32-04h	Sync modes supported	0 to 65535	4	-	Real-time	*" 1C32_ en.04h" on page 301*
1C32.05h	1C32-05h	Minimum cycle time	0 to 4294967295	250000	-	Real-time	*" 1C32_ en.05h" on page 301*
1C33.01h	1C33-01h	Sync mode	0 to 65535	2	-	Real-time	*" 1C33_ en.01h" on page 302*
1C33.02h	1C33-02h	Cycle time	0 to 4294967295	0	-	Real-time	*" 1C33_ en.02h" on page 302*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
1C33.04h	1C33-04h	Sync modes supported	0 to 65535	4	-	Real-time	"1C33_en.04h" on page 302
1C33.05h	1C33-05h	Minimum cycle time	0 to 4294967295	250000	-	Real-time	"1C33_en.05h" on page 302

5.20 6000 Parameters

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
603Fh	603Fh	Error code	0 to 65535	0	-	Unchangeable	"603Fh" on page 303
6040h	6040h	Control word	0 to 65535	0	-	Real-time	"6040h" on page 303
6041h	6041h	Status word	0 to 65535	0	-	Unchangeable	"6041h" on page 304
605Ah	605Ah	Quick stop mode	0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 5: Ramp to stop as defined by 6084h/609Ah (HM), keeping position lock state 6: Ramp to stop as defined by 6085h, keeping position lock state 7: Stop at emergency stop torque, keeping position lock state	2	-	At stop	"605Ah" on page 304

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
605Ch	605Ch	Stop mode at S-OFF	–4: Ramp to stop as defined by 6085h, keeping dynamic braking state –3: at zero speed, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/609Ah (HM), keeping de-energized state 2: Dynamic braking stop, keeping de-energized state	0	-	At stop	*" 605Ch" on page 305*
605Dh	605Dh	Halt mode	1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping position lock state 2: Ramp to stop as defined by 6085h, keeping position lock state 3: Stop at emergency stop torque, keeping position lock state	1	-	At stop	*" 605Dh" on page 305*

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
605Eh	605Eh	Stop mode at No. 2 fault	–5: Stop at zero speed, keeping dynamic braking state –4: Stop at emergency stop torque, keeping dynamic braking state –3: Ramp to stop as defined by 6085h, keeping dynamic braking state –2: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping dynamic braking state –1: Dynamic braking stop, keeping dynamic braking state 0: Coast to stop, keeping de-energized state 1: Ramp to stop as defined by 6084h/ 609Ah (HM), keeping de-energized state 2: Ramp to stop as defined by 6085h, keeping de-energized state 3: Stop at emergency stop torque, keeping de-energized state 4: Dynamic braking stop, keeping de-energized state	2	-	At stop	"605Eh" on page 306
6060h	6060h	Servo drive mode	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Real-time	"6060h" on page 307
6061h	6061h	Operation mode display	1: Profile position (PP) mode 3: Profile velocity (PV) mode 4: Profile torque (PT) mode 6: Homing (HM) mode 8: CSP mode 9: CSV mode 10: CST mode	0	-	Unchangeable	"6061h" on page 308
6062h	6062h	Position reference	-2147483648 to 2147483647	0	Reference unit	Unchangeable	"6062h" on page 309
6063h	6063h	Position actual value	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	"6063h" on page 309
6064h	6064h	Position actual value	-2147483648 to 2147483647	0	Reference unit	Unchangeable	"6064h" on page 309

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
6065h	6065h	Following error window	0 to 4294967295	27486951	Reference unit	Real-time	"6065h" on page 310
6066h	6066h	Defines the time lapse to trigger excessive position deviation (EB00.0).	0ms to 65535ms	0	ms	Real-time	"6066h" on page 310
6067h	6067h	Position window	0 to 4294967295	5872	Reference unit	Real-time	"6067h" on page 310
6068h	6068h	Position window time	0ms to 65535ms	0	ms	Real-time	"6068h" on page 311
606Ch	606Ch	Actual speed	–2147483648 to +2147483647	0	Reference unit/s	Unchangeable	"606Ch" on page 311
606Dh	606Dh	Velocity window	0 RPM to 65535 RPM	10	RPM	Real-time	"606Dh" on page 311
606Eh	606Eh	Velocity window time	0ms to 65535ms	0	ms	Real-time	"606Eh" on page 312
606Fh	606Fh	Zero speed signal threshold	0 RPM to 65535 RPM	10	RPM	Real-time	"606Fh" on page 312
6070h	6070h	Velocity threshold time	0ms to 65535ms	0	ms	Real-time	"6070h" on page 312
6071h	6071h	Target torque	-4000 to 4000	0	-	Real-time	"6071h" on page 313
6072h	6072h	Max. torque reference	0 to 4000	3500	-	Real-time	"6072h" on page 313
6074h	6074h	Torque reference	-4000 to 4000	0	-	Unchangeable	"6074h" on page 313
6077h	6077h	Actual torque	-4000 to 4000	0	-	Unchangeable	"6077h" on page 314
607Ah	607Ah	Target position	-2147483648 to 2147483647	0	Reference unit	Real-time	"607Ah" on page 314
607Ch	607Ch	Home offset	-2147483648 to 2147483647	0	Reference unit	Real-time	"607Ch" on page 314
607D.01h	607D-01h	Min. position limit	-2147483648 to 2147483647	-2147483648	Reference unit	Real-time	"607D_en.01h" on page 315

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
607D.02h	607D-02h	Max. position limit	-2147483648 to 2147483647	2147483647	Reference unit	Real-time	"607D_en.02h" on page 315
607Eh	607Eh	Reference polarity	0 to 127	0	-	Real-time	"607Eh" on page 316
607Fh	607Fh	Max. speed	0 to 4294967295	838860800	Reference unit/s	Real-time	"607Fh" on page 316
6081h	6081h	Profile velocity	0 to 4294967295	13981013	Reference unit/s	Real-time	"6081h" on page 317
6083h	6083h	Profile acceleration	0 to 4294967295	1398101333	Reference unit/s2	Real-time	"6083h" on page 317
6084h	6084h	Profile deceleration	0 to 4294967295	1398101333	Reference unit/s2	Real-time	"6084h" on page 317
6085h	6085h	Quick stop deceleration	0 to 4294967295	2147483647	Reference unit/s2	Real-time	"6085h" on page 318
6087h	6087h	Torque slope	0.0%/S to 429496729.5%/s	4294967295	%/s	Real-time	"6087h" on page 318
6091.01h	6091-01h	Motor resolution	1 to 4294967295	1	-	At stop	"6091_en.01h" on page 319
6091.02h	6091-02h	Shaft resolution	1 to 4294967295	1	-	At stop	"6091_en.02h" on page 319
6098h	6098h	Homing method	-3 to 35	1	-	Real-time	"6098h" on page 319
6099.01h	6099-01h	Speed during search for switch	0 to 4294967295	13981013	Reference unit/s	At stop	"6099_en.01h" on page 321
6099.02h	6099-02h	Speed during search for zero	0 to 4294967295	1398101	Reference unit/s	At stop	"6099_en.02h" on page 321
609Ah	609Ah	Homing acceleration	0 to 4294967295	1398101333	Reference unit/s2	Real-time	"609Ah" on page 321
60B0h	60B0h	Position offset	-2147483648 to 2147483647	0	Reference unit	Real-time	"60B0h" on page 322
60B1h	60B1h	Velocity offset	–2147483648 to +2147483647	0	Reference unit/s	Real-time	"60B1h" on page 322

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
60B2h	60B2h	Torque offset	-4.000 to 4.000	0.000	-	Real-time	"60B2h" on page 322
60B8h	60B8h	Touch probe function	0 to 65535	0	-	Real-time	"60B8h" on page 322
60B9h	60B9h	Touch probe status	0 to 65535	0	-	Unchangeable	"60B9h" on page 325
60BAh	60BAh	Touch probe 1 positive edge	-2147483648 to 2147483647	0	Reference unit	Unchangeable	"60BAh" on page 327
60BBh	60BBh	Touch probe 1 negative edge	-2147483648 to 2147483647	0	Reference unit	Unchangeable	"60BBh" on page 327
60BCh	60BCh	Touch probe 2 positive edge	-2147483648 to 2147483647	0	Reference unit	Unchangeable	"60BCh" on page 327
60BDh	60BDh	Touch probe 2 negative edge	-2147483648 to 2147483647	0	Reference unit	Unchangeable	"60BDh" on page 327
60C5h	60C5h	Max. acceleration	0 to 4294967295	4294967295	Reference unit/s2	Real-time	"60C5h" on page 328
60C6h	60C6h	Max. deceleration	0 to 4294967295	4294967295	Reference unit/s2	Real-time	"60C6h" on page 328
60D5h	60D5h	Touch probe 1 positive edge counter	0 to 65535	0	-	Unchangeable	"60D5h" on page 328
60D6h	60D6h	Touch probe 1 negative edge counter	0 to 65535	0	-	Unchangeable	"60D6h" on page 329
60D7h	60D7h	Touch probe 2 positive edge counter	0 to 65535	0	-	Unchangeable	"60D7h" on page 329
60D8h	60D8h	Touch probe 2 negative edge counter	0 to 65535	0	-	Unchangeable	"60D8h" on page 329
60E0h	60E0h	Positive torque limit	0.000 to 4.000	3.500	-	Real-time	"60E0h" on page 329
60E1h	60E1h	Negative torque limit	0.000 to 4.000	3.500	-	Real-time	"60E1h" on page 330
60E3.01h	60E3-01h	Supported homing method 1	0 to 65535	1	-	Unchangeable	"60E3_en.01h" on page 330
60E3.02h	60E3-02h	Supported homing method 2	0 to 65535	2	-	Unchangeable	"60E3_en.02h" on page 330

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
60E3.03h	60E3-03h	Supported homing method 3	0 to 65535	3	-	Unchangeable	" 60E3_en.03h" on page 331
60E3.04h	60E3-04h	Supported homing method 4	0 to 65535	4	-	Unchangeable	" 60E3_en.04h" on page 331
60E3.05h	60E3-05h	Supported homing method 5	0 to 65535	5	-	Unchangeable	" 60E3_en.05h" on page 331
60E3.06h	60E3-06h	Supported homing method 6	0 to 65535	6	-	Unchangeable	" 60E3_en.06h" on page 332
60E3.07h	60E3-07h	Supported homing method 7	0 to 65535	7	-	Unchangeable	" 60E3_en.07h" on page 332
60E3.08h	60E3-08h	Supported homing method 8	0 to 65535	8	-	Unchangeable	" 60E3_en.08h" on page 332
60E3.09h	60E3-09h	Supported homing method 9	0 to 65535	9	-	Unchangeable	" 60E3_en.09h" on page 332
60E3.10h	60E3-10h	Supported homing method 10	0 to 65535	10	-	Unchangeable	" 60E3_en.10h" on page 333
60E3.11h	60E3-11h	Supported homing method 11	0 to 65535	11	-	Unchangeable	" 60E3_en.11h" on page 333
60E3.12h	60E3-12h	Supported homing method 12	0 to 65535	12	-	Unchangeable	" 60E3_en.12h" on page 333
60E3.13h	60E3-13h	Supported homing method 13	0 to 65535	13	-	Unchangeable	" 60E3_en.13h" on page 333
60E3.14h	60E3-14h	Supported homing method 14	0 to 65535	14	-	Unchangeable	" 60E3_en.14h" on page 334
60E3.15h	60E3-15h	Supported homing method 17	0 to 65535	17	-	Unchangeable	" 60E3_en.15h" on page 334
60E3.16h	60E3-16h	Supported homing method 18	0 to 65535	18	-	Unchangeable	" 60E3_en.16h" on page 334
60E3.17h	60E3-17h	Supported homing method 19	0 to 65535	19	-	Unchangeable	" 60E3_en.17h" on page 334

Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
60E3.18h	60E3-18h	Supported homing method 20	0 to 65535	20	-	Unchangeable	" 60E3_en.18h" on page 335
60E3.19h	60E3-19h	Supported homing method 21	0 to 65535	21	-	Unchangeable	" 60E3_en.19h" on page 335
60E3.20h	60E3-20h	Supported homing method 22	0 to 65535	22	-	Unchangeable	" 60E3_en.20h" on page 335
60E3.21h	60E3-21h	Supported homing method 23	0 to 65535	23	-	Unchangeable	" 60E3_en.21h" on page 336
60E3.22h	60E3-22h	Supported homing method 24	0 to 65535	24	-	Unchangeable	" 60E3_en.22h" on page 336
60E3.23h	60E3-23h	Supported homing method 25	0 to 65535	25	-	Unchangeable	" 60E3_en.23h" on page 336
60E3.24h	60E3-24h	Supported homing method 26	0 to 65535	26	-	Unchangeable	" 60E3_en.24h" on page 336
60E3.25h	60E3-25h	Supported homing method 27	0 to 65535	27	-	Unchangeable	" 60E3_en.25h" on page 337
60E3.26h	60E3-26h	Supported homing method 28	0 to 65535	28	-	Unchangeable	" 60E3_en.26h" on page 337
60E3.27h	60E3-27h	Supported homing method 29	0 to 65535	29	-	Unchangeable	" 60E3_en.27h" on page 337
60E3.28h	60E3-28h	Supported homing method 30	0 to 65535	30	-	Unchangeable	" 60E3_en.28h" on page 337
60E3.29h	60E3-29h	Supported homing method 33	0 to 65535	33	-	Unchangeable	" 60E3_en.29h" on page 338
60E3.30h	60E3-30h	Supported homing method 34	0 to 65535	34	-	Unchangeable	" 60E3_en.30h" on page 338
60E3.31h	60E3-31h	Supported homing method 35	0 to 65535	35	-	Unchangeable	" 60E3_en.31h" on page 338
60E3.32h	60E3-32h	Supported homing method -1	0 to 65535	-1	-	Unchangeable	" 60E3_en.32h" on page 338

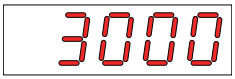
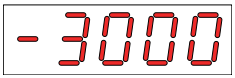
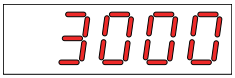
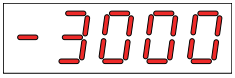
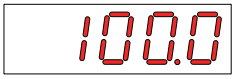
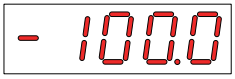
Param.	Hex	Name	Value	Default	Unit	Change Mode	Page
60E3.33h	60E3-33h	Supported homing method -2	0 to 65535	-2	-	Unchangeable	*"60E3_en.33h" on page 339*
60E3.34h	60E3-34h	Supported homing method -3	0 to 65535	-3	-	Unchangeable	*"60E3_en.34h" on page 339*
60E6h	60E6h	Actual position calculation method	0 to 1	0	-	Real-time	*"60E6h" on page 339*
60F4h	60F4h	Position deviation	-2147483648 to 2147483647	0	Reference unit	Unchangeable	*"60F4h" on page 340*
60FCh	60FCh	Position reference	-2147483648 to 2147483647	0	Encoder unit	Unchangeable	*"60FCh" on page 340*
60FDh	60FDh	DI state	0 to 4294967295	0	-	Unchangeable	*"60FDh" on page 340*
60FE.01h	60FE-01h	Physical output	0 to 4294967295	0	-	Real-time	*"60FE_en.01h" on page 341*
60FE.02h	60FE-02h	Bitmask	0 to 4294967295	0	-	Real-time	*"60FE_en.02h" on page 342*
60FFh	60FFh	Target speed	–2147483648 to +2147483647	0	Reference unit/s	Real-time	*"60FFh" on page 342*
6502h	6502h	Supported drive mode	0 to 4294967295	941	-	Unchangeable	*"6502h" on page 343*

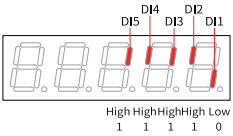
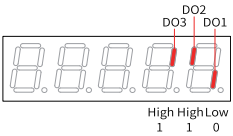
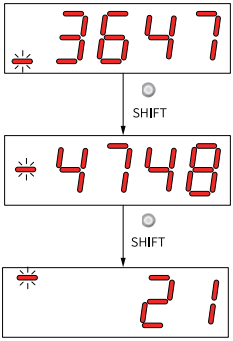
6 Appendix

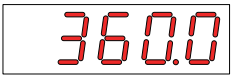
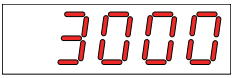
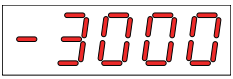
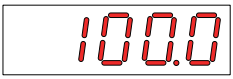
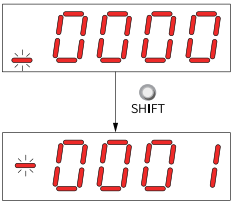
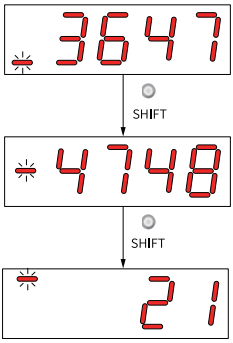
6.1 Display of Monitoring Parameters

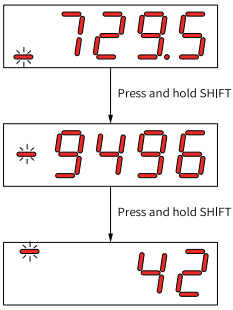
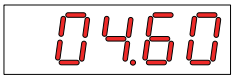
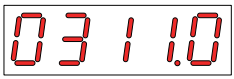
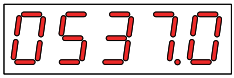
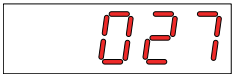
- Group H0b (200b): Displays parameters used to monitor the operating state of the servo drive.
- Set H02.32(2002.21h) (Default keypad display) properly. After the motor operates normally, the keypad switches from status display to parameter display. The parameter group number is H0b(200b) and the offset within the group is the setpoint of H02.32(2002.21h).
- For example, if H02.32 (2002.21h) is set to 00 and the motor speed is not 0 RPM, the keypad displays the value of H0b.00 (200b- 00h).

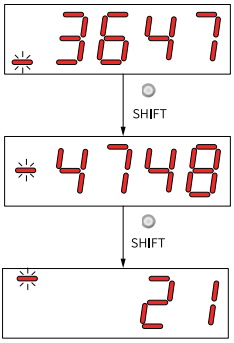
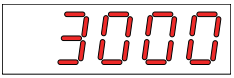
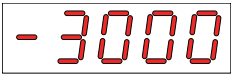
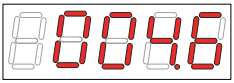
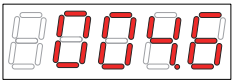
The following table describes the monitoring parameters in group H0b.

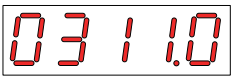
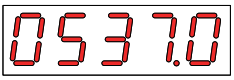
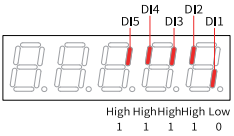
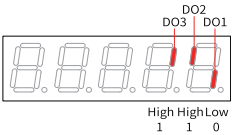
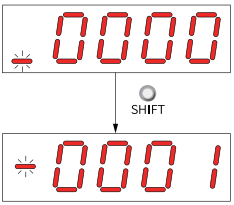
Parameter	Name	Unit	Meaning	Example of Display
H0b.00	Motor speed actual value	rpm	Displays the actual value of the motor speed after round-off, which can be accurate to 1 rpm.	Display of 3000 rpm:  -3000 rpm: 
H0b.01	Speed reference	rpm	Displays the present speed reference of the servo drive.	Display of 3000 rpm:  -3000 rpm: 
H0b.02	Internal torque reference	%	Displays the ratio of actual torque output of the motor to the rated torque of the motor.	Display of 100.0%:  Display of -100.0%: 

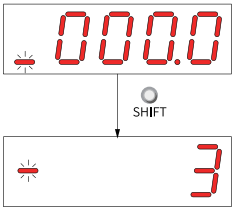
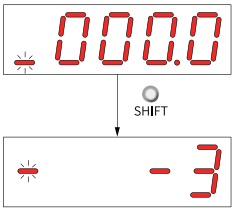
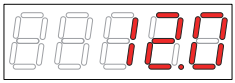
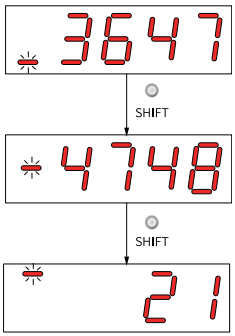
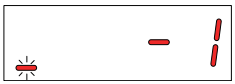
Parameter	Name	Unit	Meaning	Example of Display
H0b.03	Monitored DI status	-	Indicates level status of DI1 to DI5: Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0") The value of H0b.03 read in the software tool is a decimal.	For example, if DI1 is low level and DI2 to DI5 are high level, The corresponding binary value is "11110", and the value of H0b.03 read in the software tool is 0x001E. The keypad displays as follows: 
H0b.05	Monitored DO status	-	Indicates level status of DO1 to DO3: Upper LED segments ON: high level (indicated by "1") Lower LED segments ON: low level (indicated by "0") The value of H0b.05 read in the software tool is a decimal.	For example, if DO1 is low level and DO2 to DO3 are high level, then, the binary value is "110". The value of H0b.05 read in the software tool is 0x0006. The keypad displays as follows: 
H0b.07	Absolute position counter (32-bit decimal)	Reference unit	Displays current absolute position of the motor (reference unit).	Display of 1073741824 in reference unit: 
H0b.09	Mechanical angle	°	Displays current mechanical angle of the motor.	Display of 360.0°: 

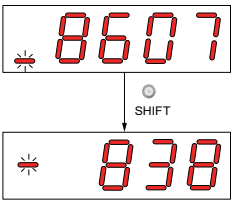
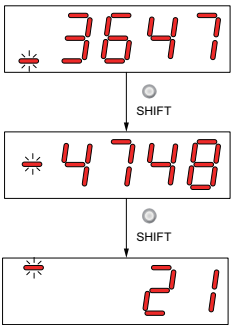
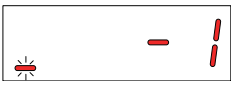
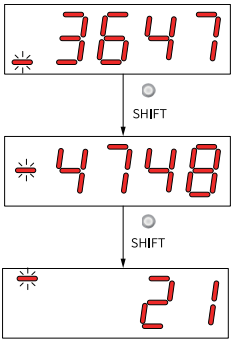
Parameter	Name	Unit	Meaning	Example of Display
H0b.10	Rotation angle (electrical angle)	°	Displays current electrical angle of the motor.	Display of 360.0°: 
H0b.11	Speed corresponding to the input position reference	rpm	Displays the speed corresponding to the position reference per control cycle of the servo drive.	Display of 3000 rpm:  -3000 rpm: 
H0b.12	Average load rate	%	Displays the ratio of the average load torque to the rated torque of the motor.	Display of 100.0%: 
H0b.15	Encoder position deviation counter (32-bit decimal)	Encoder unit	Encoder position deviation = Sum of input position references (encoder unit) – Sum of pulses fed back by the encoder (encoder unit)	Display of 10000 in encoder unit: 
H0b.17	Feedback pulse counter (32-bit decimal)	Encoder unit	Counts and displays the number of pulses fed back by the encoder (encoder unit). ***Note*** When the motor used is equipped with an absolute encoder, H0b.17 only reflects values of the low 32 bits of the motor position feedback. To get the actual motor position feedback, view H0b.77 (Encoder position (low 32 bits) and H0b.79 (Encoder position (high 32 bits).	Display of 1073741824 in encoder unit: 

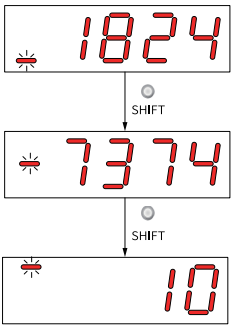
Parameter	Name	Unit	Meaning	Example of Display
H0b.19	Total power-on time (32-bit decimal)	s	Counts and displays the total power-on time of the servo drive.	Display of 429496729.5s: 
H0b.24	RMS value of phase current	A	Displays the RMS value of the phase current of the servo motor.	Display of 4.60 A: 
H0b.26	Bus voltage	V	Indicates the DC bus voltage of the main circuit, namely the voltage between terminals P⊕ and N ⊖ .	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0b.27	Module temperature	℃	Displays the temperature of the power module inside the servo drive.	Display of 27°C: 
H0b.33	Fault log	-	Used to select the previous fault to be viewed. 0: Present fault 1: Last fault 2: 2nd to last fault ... 9: 9th to last fault	0: Display of present fault: 
H0b.34	Fault code of the selected fault	-	Displays the code of the fault selected in H0b.33. When no fault occurs, the value of H0b.34 is 0.	If H0b.33 is 0, and H0b.34 is E941.0, the current fault code is 941.0. Corresponding display: 

Parameter	Name	Unit	Meaning	Example of Display
H0b.35	Time stamp upon occurrence of the selected fault	s	Displays the total operating time of the servo drive when the fault displayed in H0b.34 occurred. When no fault occurs, the value of H0b.35 is 0.	If H0b.34 is E941.0 and H0b.35 is 107374182.4, the current fault code is 941.0 and the total operating time of the servo drive is 107374182.4s when the fault occurs. 
H0b.37	Motor speed upon occurrence of the selected fault	rpm	Displays the servo motor speed when the fault displayed in H0b.34 occurred. When no fault occurs, the value of H0b.37 is 0.	Display of 3000 rpm:  -3000 rpm: 
H0b.38	Motor phase U current upon occurrence of the selected fault	A	Displays the RMS value of motor phase U winding current when the fault displayed in H0b.34 occurred. When no fault occurs, the value of H0b.38 is 0.	Display of 4.60 A: 
H0b.39	Motor phase V current upon occurrence of the selected fault	A	Displays the RMS value of motor phase V winding current when the fault displayed in H0b.34 occurred. When no fault occurs, the value of H0b.39 is 0.	Display of 4.60 A: 

Parameter	Name	Unit	Meaning	Example of Display
H0b.40	Bus voltage upon occurrence of the selected fault	V	Displays the DC bus voltage of the main circuit when the fault displayed in H0b.34 occurred. When no fault occurs, the value of H0b.40 is 0.	Display of 311.0 V rectified from 220 VAC:  Display of 537.0 V rectified from 380 VAC: 
H0b.41	DI status upon occurrence of the selected fault	-	Displays the high/low level status of DI1 to DI5 when the fault displayed in H0b.34 occurred. The method for determining the DI level status is the same as that of H0b.03. When no fault occurs, all DIs are displayed as low level in H0b.41 (indicated by the decimal value 0).	For example, when the value of H0B-41 read in the software tool is 0x0001, the corresponding binary code will be 0000 0000 0000 0001. 
H0b.43	DO status upon occurrence of the selected fault	-	Displays the high/low level status of DO1 to DO3 when the fault displayed in H0b.34 occurred. The method for determining the DO level status is the same as that of H0b.05. When no fault occurs, all DOs are displayed as low level in H0b.42 (indicated by the decimal value 0).	Display of H0b.43 = 0x0003: 
H0b.53	Position deviation counter (32-bit decimal)	Reference unit	Position deviation = Sum of input position references (reference unit) - Sum of pulses fed back by the encoder (reference unit)	Display of 10000 in reference unit: 

Parameter	Name	Unit	Meaning	Example of Display
H0b.55	Motor speed actual value	0.1 rpm	Displays the actual value of the motor speed, which can be accurate to 0.1 RPM.	Display of 3000.0rpm:  Display of –3000.0 RPM: 
H0b.57	Control circuit voltage	V	Displays the DC voltage of the control circuit.	Display of 12.0 V: 
H0b.58	Mechanical absolute position (low 32 bits)	Encoder unit	Displays the mechanical absolute position (low 32 bits) when an absolute encoder is used.	Display of 2147483647 in encoder unit: 
H0b.60	Mechanical absolute position (high 32 bits)	Encoder unit	Displays the mechanical absolute position (high 32 bits) when an absolute encoder is used.	Display of 32767: 
H0b.70	Number of absolute encoder revolutions	Rev	Displays the present number of revolutions of the absolute encoder.	Display of 32767: 

Parameter	Name	Unit	Meaning	Example of Display
H0b.71	Single-turn position feedback of an absolute encoder	Encoder unit	Displays the single-turn position feedback of the absolute encoder.	Display of 8388607 in encoder unit: 
H0b.77	Absolute encoder position (low 32 bits)	Encoder unit	Displays the absolute position (low 32 bits) of the motor when the absolute encoder is used.	Display of 2147483647 in encoder unit: 
H0b.79	Absolute encoder position (high 32 bits)	Encoder unit	Displays the absolute position (high 32 bits) of the motor when the absolute encoder is used.	Display of -1 in encoder unit: 
H0b.81	Single-turn position feedback of the load in rotation mode (low 32 bits)	Encoder unit	Displays the position feedback (low 32 bits) of the mechanical load when the absolute system works in the rotation mode.	Display of 2147483647 in encoder unit: 

Parameter	Name	Unit	Meaning	Example of Display
H0b.83	Single-turn position feedback of the load in rotation mode (high 32 bits)	Encoder unit	Displays the position feedback (high 32 bits) of the mechanical load when the absolute system works in the rotation mode.	Display of 1 in encoder unit: 
H0b.85	Single-turn position of the load in rotation mode	Reference unit	Displays the mechanical absolute position when the absolute system works in the rotation mode.	Display of 1073741824 in reference unit: 

6.2 DIDO Function Assignment

Code	Parameter Name	Function Name	Description	Remarks
Description of DI Signals				
FunIN.1	S-ON	Servo ON	Disabled - Servo motor disabled in local mode Enabled - Servo motor enabled in local mode	The S-ON function is only active in non-bus control mode. The corresponding terminal logic must be level-triggered.
FunIN.2	ALM-RST	Alarm reset signal	Enabled - Fault reset executed in local mode Disabled - Fault reset not executed in local mode	The ALM-RST function is only active in non-bus control mode. The corresponding terminal logic is recommended to be level-triggered.
FunIN.14	P-OT	Positive limit switch	Enabled - Forward drive inhibited Disabled - Forward drive permitted	Overtravel prevention applies when the load moves beyond the limit. The corresponding terminal logic is recommended to be level-triggered.
FunIN.15	N-OT	Negative limit switch	Enabled - Reverse drive inhibited Disabled - Reverse drive permitted	Overtravel prevention applies when the load moves beyond the limit. The corresponding terminal logic is recommended to be level-triggered.

Code	Parameter Name	Function Name	Description	Remarks
FunIN.31	HomeSwitch	Home switch	Disabled - Mechanical load beyond the home switch range Enabled - Mechanical load within the home switch range	The corresponding terminal logic must be level-triggered.
FunIN.34	Emergence Stop	Emergency stop	Enabled: Position lock applied after stop at zero speed Disabled: Current operating state unaffected	The corresponding terminal logic is recommended to be level-triggered.
FunIN.38	TouchProbe1	Touch probe 1	Disabled - Touch probe not triggered Enabled - Touch probe triggerable	The touch probe logic is only related to the touch probe function (60B8h).
FunIN.39	TouchProbe2	Touch probe 2	Disabled - Touch probe not triggered Enabled - Touch probe triggerable	The touch probe logic is only related to the touch probe function (60B8h).
Description of DO signals				
FunOUT.1	S-RDY	Ready to switch on	The servo drive is ready to receive the S-ON signal. Enabled: The servo drive is ready. Disabled: The servo drive not ready.	-
FunOUT.2	TGON	Motor rotation signal	Inactive. Absolute value of filtered motor speed is lower than the setpoint of H06.16. Active. Absolute value of filtered motor speed reaches the setpoint of H06.16.	-
FunOUT.5	COIN	Positioning completed	Inactive - positioning not completed Active - Positioning completed	-
FunOUT.9	BK	Brake output	Enabled - Brake signal outputted Disabled - Brake signal not outputted	-
FunOUT.10	WARN	Warning	Enabled: The servo drive issued a warning. Disabled: The servo drive issued no warning or the warning has been reset.	-
FunOUT.11	ALM	Fault	The servo drive is faulty. Inactive: No fault occurred on the servo drive or the fault has been reset.	-

Code	Parameter Name	Function Name	Description	Remarks
FunOUT.18	ToqReach	Torque reach	Active: Absolute value of torque reference reached setpoint Inactive: Absolute value of torque reference smaller than setpoint	-
FunOUT.25	CMP	Position compare DO	Enabled: The servo drive passed the target position comparison point. Inactive: The servo drive did not pass the target position comparison point.	-
FunOUT.31	EtherCAT forced DO in non-operational status		See *"Table 6–1 Description of EtherCAT forced DO in non-operational status" on page 405*	-
FunOUT.32	EDM	EDM output	Enabled - STO is triggered Disabled - STO is not triggered	The EDM outputs active signals only when both the 24 V input voltages for STO1 and STO2 are disconnected.

Table 6–1 Description of EtherCAT forced DO in non-operational status

Value	Description
0	Status of DO1, DO2, and DO3 unchanged in the non-operational status
1	No output in DO1 and status of DO2 and DO3 unchanged in the non-operational status
2	No output in DO2 and status of DO1 and DO3 unchanged in the non-operational status
3	No output in DO1 or DO3 and status of DO3 unchanged in the non-operational status
4	No output in DO3 and status of DO1 and DO2 unchanged in the non-operational status
5	No output in DO1 or DO3 and status of DO2 unchanged in the non-operational status
6	No output in DO2 or DO3 and status of DO1 unchanged in the non-operational status
7	No output in DO1, DO2, or DO3

This table describes the setpoints of H04.23 (ECAT communication forced DO logic in non-OP status).

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