

**THK Electric Actuator Controller series
Setup Tool**

D-STEP

INSTRUCTION MANUAL

No.6100-1 (1) E

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1. Introduction

About this chapter

This chapter describes the overview of the product.

This chapter includes information that we want you to check and understand before working with the product.



This section includes introduction about the product and this manual.

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This section includes general precautions to follow when using the product. Be sure to read this section before use and observe the precautions.

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1. Introduction

1-1

Acknowledgment

Thank you for purchasing the setup tool D-STEP.

This manual describes the correct methods for handling, installing, and operating the PC setup tool D-STEP. Carefully read and understand this manual before using the product to safely and correctly handle the product.

Be sure to keep this manual after reading it so that you can refer to it when needed.

Please visit THK technical support website (user registration is required) to check the Intended latest manual. <URL:<https://tech.thk.com/>>

1-2

About this manual

1-2-1

Intended Audience

The person in charge of designing embedded systems of the product and installing, wiring, and maintaining the product, and the person who actually uses the product.

1-2-2

Using This Manual

This manual describes correct handling methods and precautions for the product.

For the maximum performance and long life of the product, carefully read and understand this manual to safely and correctly use the product.

If you use the printed version of this manual, be sure to keep it in the place that the intended audience can refer to it when needed.

1-2-3

Notice and attention

- Do not use or handle the product in the ways that are not described in this manual.
- Do not reproduce, reprint, or lend the whole contents or a part of this manual without permission.
- Please note that description in this manual is subject to change without prior notice in the future, due to improvements of the product or other reasons.
- We have made all possible efforts to make the content of this manual accurate. However, if you find any mistake or uncertainty in this manual, please contact our Customer Support (refer to back cover).
- Drawings show representative examples, and may differ from your product.
- If descriptions in this manual differ from the actual operation of the product, the actual operation should be treated as correct, and THK shall not be responsible for matching the actual operation with the description.
- Note that THK shall not be liable for any result incurred by applying this manual, regardless of the reason.
- This manual is also applied to special types. However, the descriptions defined in the delivery specification drawings or the delivery specification documents of those special types should take precedence over this manual. * Special types represent the products that have different materials and specifications from those of the standard products on catalogs.
- Windows XP, Vista, and 7 are the trademarks of Microsoft Corporation in the United States.

Important

- Notes that can lead to unsatisfactory function, error, or damage of the product if not observed while using the product.

Note

- Supplementary information for the description.

Reference

- Reference information for the description.

1-3 How to use this product

- This product cannot be used for the devices or systems that are used under the situations that can affect human life.
- If you consider using this product for special applications such as passenger movement vehicle, medical, aerospace, nuclear power, and electric power devices or systems, be sure to consult with THK in advance.
- This product is manufactured under the strict quality control, however, that does not mean that the product is free from failure. For applications to the equipment that may suffer serious accidents or loss from the failure of this product, install safety devices or backup devices that prevent such serious accidents or loss.

1-4 Saving programs and parameters (Important)

- Please save programs and parameters in preparation for possible loss by failures or operation errors and for fast recovery on the product replacement.
- To save the data, use this software to execute "Save" for "File" on the "PROGRAM" and "Parameter List" screens.
- For more information, see 3-4 "Program" screen (→ P.2-13) and 3-7 "Parameter List" screen (→ P.2-27).

1-5 About related instruction manuals

- When you use the setup tool D-STEP, read the following instruction manuals as necessary.
 - Controller series Driver controller TSC
 - Controller series Driver controller TLC
 - Controller series Driver controller THC
 - Controller series Network unit TNU

1-6 About product support

For the following information, please contact our Customer Support (refer to back cover).

- Technical support for this product

1-7 Product and company information


To find the latest product and company information, we recommend you to periodically access our website.


- Website URL: <http://www.thk.com/>
- Technical support website URL: <https://tech.thk.com/>


2. Safety precautions

2-1 About ranks of precautions

This manual uses the classifications of "Danger," "Warning," and "Caution" for warning indications for safety matters.













**DANGER** Erroneous handling may urgently cause death or serious injury to a person

**WARNING** Erroneous handling may cause death or serious injury to a person

**CAUTION** Erroneous handling may cause injury to a person or property damage only

2-2 About description of precautions

Precautions are classified as "Prohibition," "Instruction," and "Precaution" according to the action.

 This mark indicates "prohibition" of the action.	 Prohibited	 Do not disassemble	
 This mark indicates "instruction" for the action.	 Obligatory	 Provide grounding connection	
 This mark indicates "caution" about the action.	 Caution	 Caution - Electrical shock	 Caution - Flammable
	 Caution - High temperature	 Caution - Getting caught	

2. Safety precautions

2-3

Safety precautions

WARNING



Prohibited

- While the actuator is operating or operable, do not enter the working area of any moving part including the load.

Doing so may cause you to touch the moving part and get injured.



Obligatory

- If the product fails or any abnormality is observed, shut down the power of the driver controller.

Such abnormality may cause a malfunction of actuator, resulting in damage or injury.



Caution -
Electrical shock

- Do not touch the internal part of the driver controller.

Doing so may cause electric shocks.

- Do not damage, tuck, or apply excessive stresses on the cable.

Doing so may cause electric shocks.



Do not
disassemble

- Do not modify, disassemble, or alter the product.

Doing so may cause injury or fault.



Caution - High
temperature

- During the operation, or for a while after turning the power off, do not touch the driver controller or motor cover because they should be hot.

Doing so may cause burns.

CAUTION



Prohibited

- Do not impact the product and do avoid rough handling such as throwing it.

Doing so may cause the fault or damage that leads to injury.

- Do not frequently switch the power between on and off.

Doing so may generate heat from the internal parts of the driver controller, which results in fault or burns.

- Do not set the speed or acceleration setting or place the load on the table that exceed the actuator specification.

Doing so may cause motor failure, which leads to unexpected accidents or damages.



Obligatory

- If an alarm is generated, remove the cause, check the safety, deactivate the alarm, and restart the operation.

Failure to do so may result in failure, which leads to injury.



Caution -
Flammable

- Use the combination of a driver controller and an actuator that is specified beforehand.

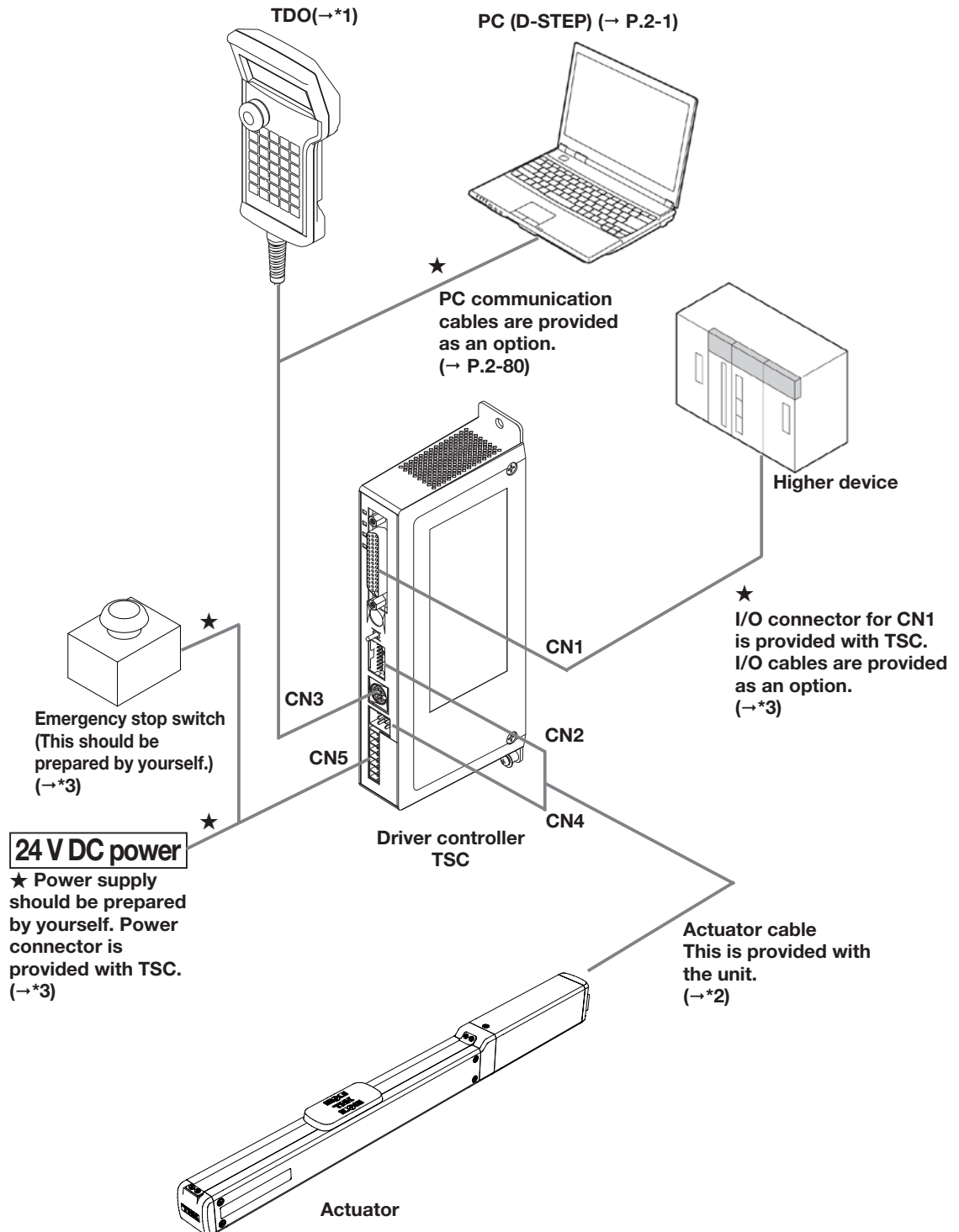
Failure to do so may cause fire or fault.

- Observe the specified input voltage.

Failure to do so may cause fire or fault.

3-1 System configuration diagram (Example)

- The diagram below shows a representative example for using the economy series ES (with motor) with the driver controller TSC.
- Cables used for connecting the devices shown with ★ should be prepared by yourself.



* 1: See the separate TDO instruction manual.
 * 2: See the separate ES/EC instruction manual.
 * 3: See the separate TSC instruction manual.

2. How to Use This Product

About this chapter

This chapter describes how to use D-STEP.



This section describes the overview of the product.

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This section describes the introduction and execution of this product.

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2. How to Use This Product

About this chapter

This chapter describes how to use D-STEP.



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2. How to Use This Product

About this chapter

This chapter describes how to use D-STEP.



This section describes parameters.

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This section describes the precautions on use of this product.

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This section describes the communication cable.

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This section describes how to install the communication cable.

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1. Product overview

1-1 Product configuration

- Product model number: D-STEP
(You can download this free program from the electrical actuator site: <https://tech.thk.com/>)
- To use this product, install the PC setup tool D-STEP on your PC, and use the PC communication cable (sold separately, the model number: CBL-COM-03) (→ **P.2-80**) to connect to the driver controller when RS-485 port is provided on your PC. (→ **P.2-81**)
- When your PC does not have RS-485 port, connect the connection cable to the USB port via the included conversion cable.
- Program input, parameter setting, various monitors and waveform acquisition functions of the driver controller provided by this software enables efficient adjustment, program creation and operation check through combining with actuator.

1-2 Application of this manual

- The contents of this manual is for setup tool D-STEP.
- The screens shown in this manual are the examples when the product is used on Windows XP. The screens for other Windows versions are slightly varied but basically the same.

1-3 Configuration of required devices

1-3-1 PC

- 32 bit OS: Japanese version Microsoft Windows XP SP-3, Vista, 7
English version, Chinese version
64 bit OS: Japanese version Microsoft Windows XP SP-3, Vista, 7
English version, Chinese version
This product does not guarantee operations on Windows Emulator.
- The hardware specifications that allow adequate performance of each Microsoft Windows version
- This program occupies about 200 MB of HDD capacity.
- RS-485 port (D-sub 9 pin). Make sure to check the COM port sequence beforehand.
For more information, see " **3-3-2 Method to check the port number(→P.2-12).**"
When there is no RS-485 port, connect to the USB port via the conversion cable.
- USB port (when there is no RS-485 port). Using the included conversion cable with the connection cable enables communication with the PC.
Check the COM port sequence when the cable is connected to the USB port beforehand.
For more information, see " **3-3-2 Method to check the port number(→P.2-12).**"
- Prepare a display unit that can display 1024 x 768 pixels (XGA) or more, and 32 bit color.

1-3-2 PC communication cable

- To connect your PC to our driver controller, you need to prepare the dedicated communication cable (model number: CBL-COM-03).

1. Product overview

- When your PC does not have RS-485 port, connect the connection cable to the USB port using the included conversion cable.
- For more information, see (→ P.2-80).

1-3-3 Applicable driver controllers

- The usable driver controllers and network units for this software are as follows (as of January 11, 2013).

· Controller series	Driver controller TSC
· Controller series	Driver controller TLC
· Controller series	Driver controller THC
· Controller series	Network unit TNU

Important

- To operate TLC, THC and TNU, D-STEP Ver.1.10 or higher is required. Download the latest version from the electrical actuator site in our Website.

Note

- The method for connecting to network unit TNU and how to operate are described in the separate manual, TNU/TJU Instruction Manual.

2. Introduction and execution

2-1

How to obtain

- Download the product from electrical actuator site in our website (<https://tech.thk.com/>), free of charge.
- User registration is required to download.
- Since programs are updated from time to time, use the latest version.

2-2

Installation

- ① Administrative privileges of OS are required to install the product.
- ② Execute (double click) the downloaded D-STEP.exe in an arbitrary folder (the desktop is recommended).
- ③ The installer starts up and the installation is started. Follow the on-screen instructions.
- ④ If you agree with the "License Agreement" in the course of installation, you shall agree with the contents of this manual, especially with **1-2-3 Notice and attention(→P.1-2)**.
- ⑤ To prevent any false operations, make sure to exit all other programs including security softwares beforehand.
- ⑥ When the old version of the software has been installed, install the new version over the old version. Parameter, program and waveform files are preserved.
- ⑦ If you want to retain the old version, change the "installation destination folder."

2-3

Uninstallation

- ① From the "Start" on the taskbar, select "All programs" → "THK D-STEP" → "Uninstall."
- ② Click the "Uninstall" button in the "D-STEP Uninstall: Confirmation" screen.
To cancel the uninstallation, click the "Cancel" button.
- ③ Click the "Close" button in the "D-STEP Uninstall: Completed" screen to complete.
- ④ Delete unnecessary folders and start menu manually (administrative privileges are required).
- ⑤ Note that you cannot uninstall the program from "Add or Remove Programs."

2-4

Installing the driver of the conversion cable

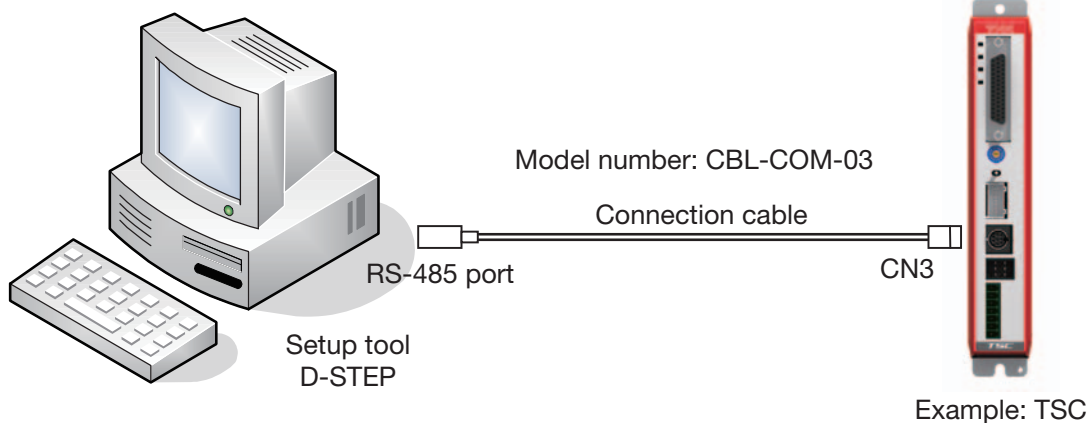
- When your PC does not have a RS-485 port and you need to use **9-3 Conversion cable(→ P.2-81)**, you must install the driver.
- When you connect the conversion cable to your PC for the first time, you are asked to install the driver. Use the CD that comes with the product to install (follow the on-screen instructions for details).
- Administrative privileges of OS are required to install the driver.
- For more information, see " **10-1 Conversion cable driver installation guide(→ P.2-82)**."

2. Introduction and execution

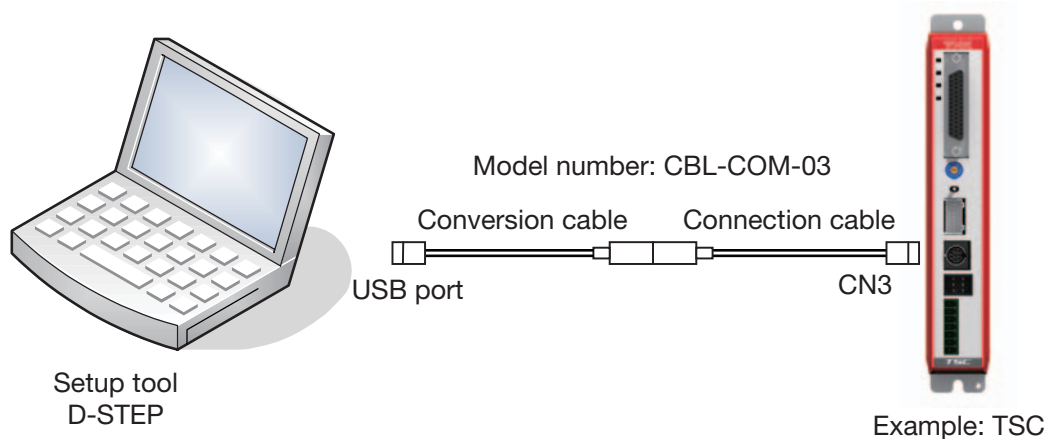
2-5

Connection

When your PC has an RS-485 port



When your PC does not have an RS-485 port



- For the cable model number: CBL-COM-03, see (→ P.2-80).
- For the connection to the actuator, see the instruction manual of each driver controller.

Important

- When you connect the plug to CN3 of the driver controller, adjust the arrow of the plug to meet the arrow of TSC before insertion. If you insert the plug while rotating it, the connection pins may be damaged.

Important

- When you use the cable by extending the length, the product may fail to operate correctly because the extended cable can be largely influenced by the exogenous noise. In addition, even when the cable is not extended, a high level of noise may prevent normal operation.

Reference

- When there is no RS-485 port on your PC, you can communicate with the driver controller by connecting to the USB port with the conversion cable. For more information, see "9-3 Conversion cable(→ P.2-81)."


Reference

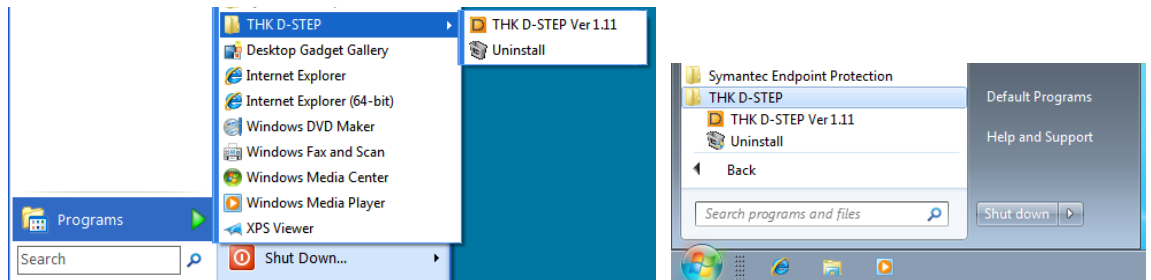
- When a communicating program other than D-STEP is being executed on your PC, D-STEP may fail to operate correctly. In this case, avoid using such program simultaneously with D-STEP.

2. Introduction and execution

2-6

Startup

- If you installed D-STEP with the standard setting, a shortcut icon  has been created on the desktop. Double click it to start.
- Alternatively, from the "Start" on the taskbar, select "All programs" → "THK D-STEP" → "THK D-STEP" to start.

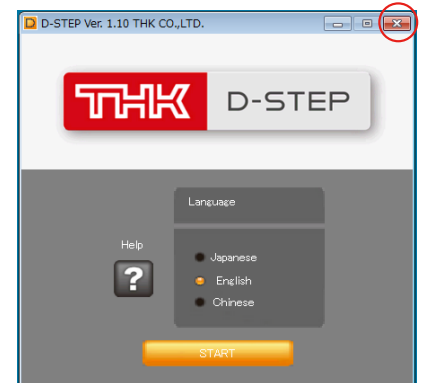


- When D-STEP is started normally, **3-1 Start screen(→ P.2-9)** appears.

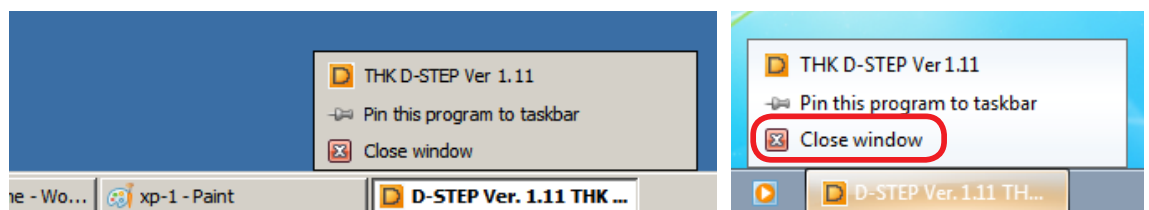
2-7

Exit

- Click the Close button at the upper right corner of the "Start" screen.
When the "Start" screen is behind some other screen, close, minimize or move the front screen to display the Close button in the "Start" screen.



- Alternatively, right click "D-STEP..." on the taskbar, and click "Close" from the menu that appears.



3. Operation method

3-1 Start screen

- When you start D-STEP following **2-6 Startup**(→ **P.2-8**), the "Start" screen appears.

3-1-1 Description of the screen



- ① THK D-STEP logo: When clicked, you will move to the THK Web site, provide that you are connected to the internet.
- ② Language: Switches the display language. (Japanese/English/Chinese)
- ③ Help: Invokes the Help screen.
- ④ START: Displays the "Connect Start" screen (→**P.2-10**).

3-1-2 Language selection

- Select the language to use in " ② Language." This screen will be displayed again in the selected language.
- Clicking " ④ START" displays the subsequent screens in the selected language.

3. Operation method

3-2 Connect Start screen

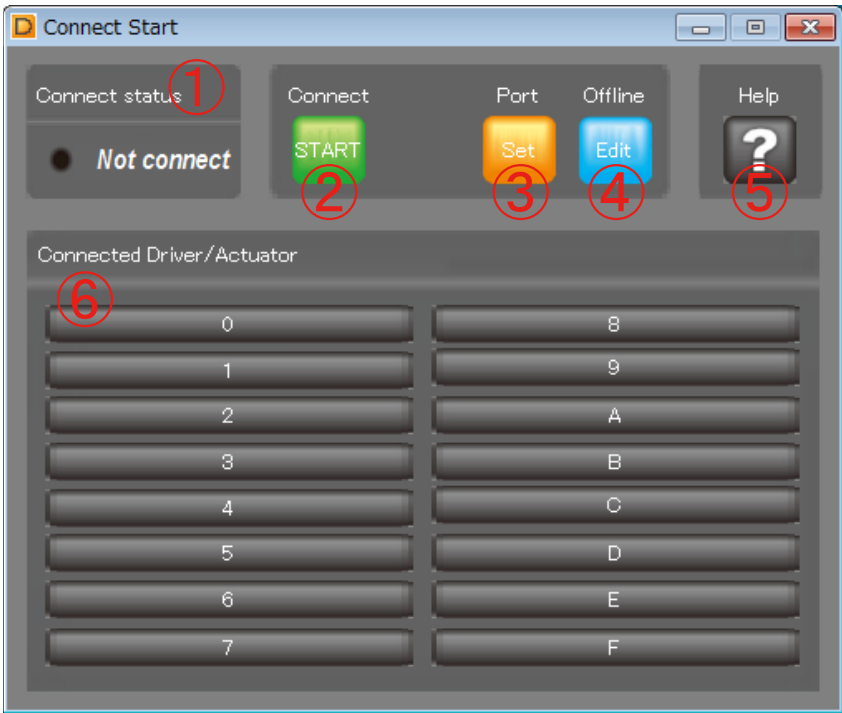
- Make selection between the online edit, which require driver controller connection, and offline edit, which does not require the connection.
 - * Offline edit can be done even when the driver controller is connected.

Edit	Description
Online edit	Edited data can be written to the driver controller and reflected in the operation immediately. It can also be saved in a file.
Offline edit	The edited data can only be saved in a file. This file will be read out for writing when the driver controller is connected.

Note

- The method for connecting to network unit TNU and how to operate are described in the separate manual, TNU/TJU Instruction Manual.

3-2-1 Description of the screen



- ① Connect status: Shows the status of the connection with the driver controller. It displays "Not connect" when started, "Connecting" during searching, "Connected successfully" when search is completed and the driver controller is found. When the driver controller is not found, it displays "Not connect".
- ② Connect START: Searches driver controllers connected to the PC sequentially in the order of ID number from 0 to F (16 axes).
When there is no response to the search signal within 30 milliseconds, it starts the search to the next axis.
- ③ Port Set: Opens the "Port setting" screen (→P.2-12).
- ④ Offline Edit: Opens the "Offline edit screen selection" screen (→P.2-11).
- ⑤ Help: Invokes the Help screen.
- ⑥ Connected Driver/Actuator: After the search, the button of the connected driver controller is displayed in white, and clicking it displays the "PROGRAM" screen (→P.2-14).

3. Operation method

On the button, the "ID number/model name/comments" which were read out from the driver controller are displayed.

You can set the contents of the comments in the parameter No.39 **{(TSC: (→P.2-59),TLC: (→P.2-64),THC: (→P.2-70))}** (within 16 one-byte alphanumeric characters).

3-2-2

Online edit

- After setting up the connection port, click " ② Connect START."
For details on the setting of the connection port, see " **3-3 Port setting screen(→P.2-12).**"
- Since the connected driver controllers are displayed in " ⑥ Connected Driver/Actuator," click the button of the driver controller you wish to edit to display the "PROGRAM" screen (online).
For details on the "PROGRAM" screen (online), see " **3-4-1 Online standard screen(→P.2-14).**"
* When no driver controllers are displayed, check " **3-3 Port setting screen(→P.2-12).**"

CAUTION



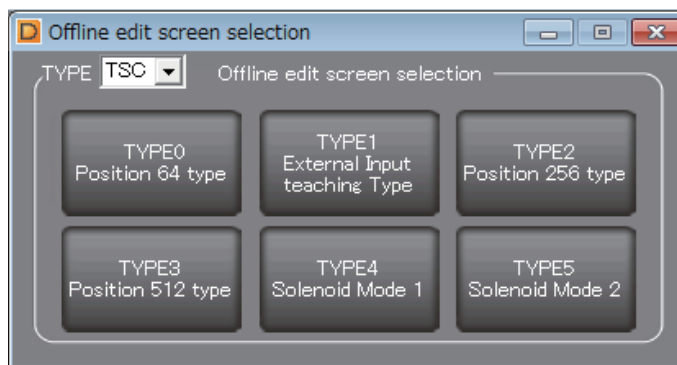
Obligatory

- **Do not remove the communication cable or shut down the power of the driver controller and network unit during connection.**
Doing so may cause the failures.

3-2-3

Offline edit screen selection

- Clicking " ④ Offline Edit" displays the "Offline edit screen selection" screen.



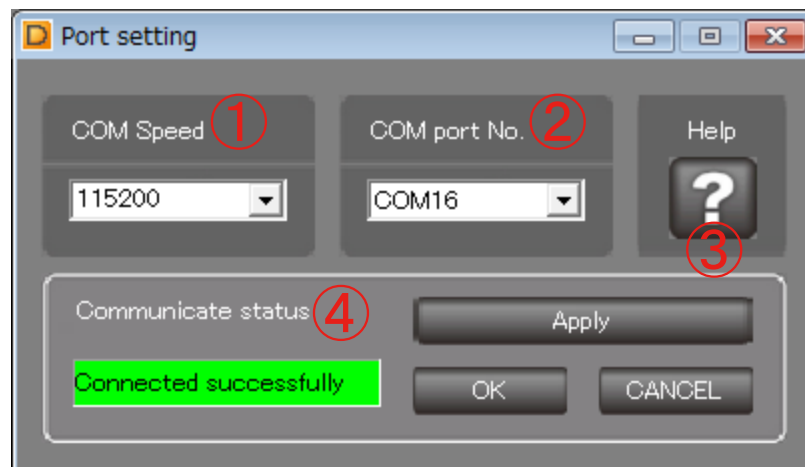
- Select the driver controller or network unit you wish to edit from the "TYPE" list.
- When you click the button of the operation mode (type) you wish to edit, the corresponding "PROGRAM" screen (offline) appears.
For details on the "PROGRAM" screen (offline), see " **3-4-5 Offline standard screen(→P.2-19).**"
* For details on the operation mode (type), see (→P.2-28).
* Since the upper limits of configurable parameters vary among actuators, there are some parameters you cannot edit in offline edit.

3. Operation method

3-3 Port setting screen

- Configure the connection settings for PC and the driver controller. If these settings do not match, no communication can happen to each other.

3-3-1 Description of the screen




- ① COM Speed: Select the initial communication speed when searching the connected driver controller in the "Connect Start" screen.
If any other communication speed is set up on a driver controller, it will be automatically detected and the communication speed is changed accordingly. After the driver controller is detected and connected, the display of this screen will also be changed.
* Whatever speed has been selected, the speed will eventually be changed to the one at which the connection is made successfully.
- ② COM port No.: Specify the COM port number of the PC to which RS-485 is assigned. For details on how to check this, see " **3-3-2 Method to check the port number(→P.2-12).**"
- ③ Help: Invokes the Help screen.
- ④ Communicate status: Displays the status of the communication port (presence/absence of the port, availability of the communication).
 - i) Apply: Tests the presence/absence of the selected COM port number, and whether it is possible to communicate at the selected speed.
When the port is present and the communication is available, "Connected successfully" appears. (This does not mean that the driver controller is being connected.)
If the communication is not available, "Not connect" appears.
 - ii) OK: Configures the port settings with the selected COM port number and speed.
Note that the settings are configured as specified even if the communication is not available with that settings. In this case, no connection is made of course.
 - iii) CANCEL: Cancels the change of settings and returns it to the state before opening the "Port setting" screen.

3-3-2 Method to check the port number

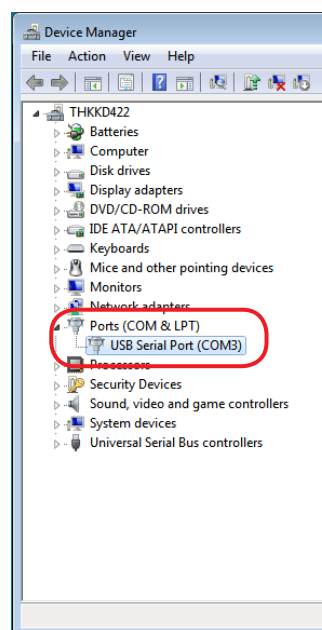
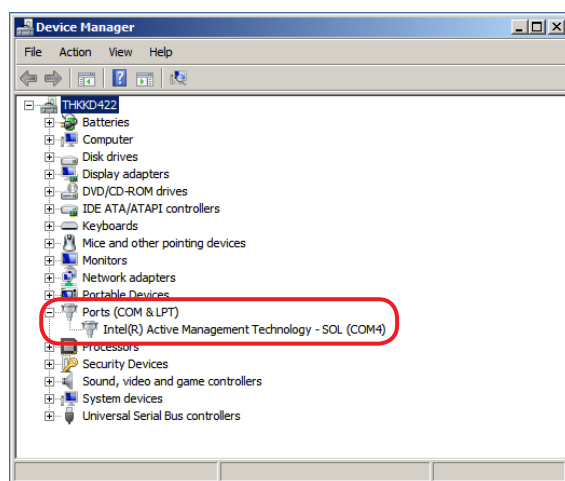
- ① When you use the conversion cable, make sure to connect it to the USB port of the PC beforehand.
- ② Right click "My Computer" on Explorer or Desktop, and then click "Properties."
- ③ In "System Properties," select "Hardware."

3. Operation method

- ④ Click "Device Manager."
- ⑤ Click  of "Ports (COM & LPT)," and display a lower-level device.
- ⑥ "Communications Port (COM□)" or "USB Serial Port (COM□)" appears. "□" will be displayed as "COM port No."

Note: When multiple COM □ are displayed, check the connection to driver controllers one by one.
Alternatively insert and remove the conversion cable, and identify the port that appears and disappears as the connection port.

Note: The name of COM □ can be other than "Communications Port" or "USB Serial Port."



3-4

PROGRAM screen

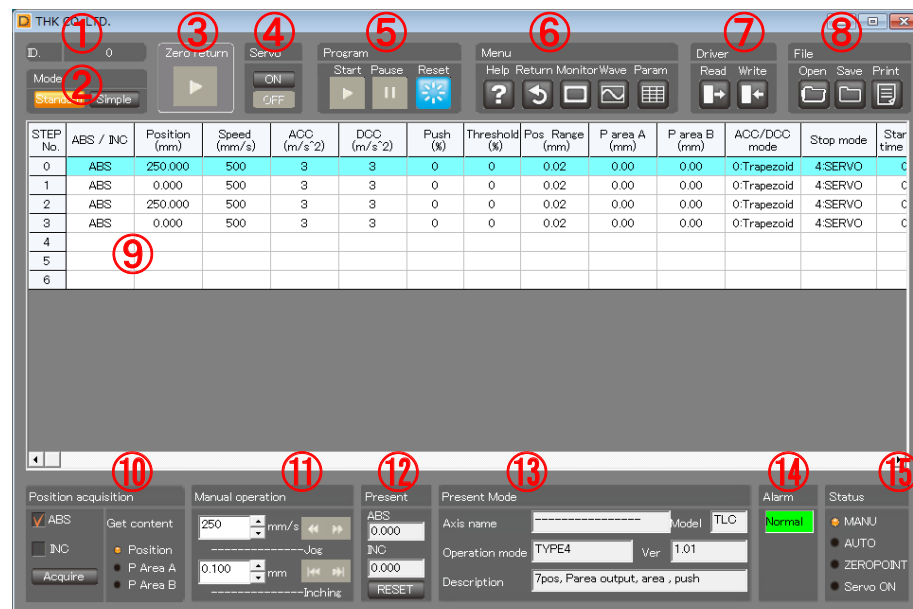
- There are two types of edit method, "online edit" and "Offline Edit," which depend on the status of the connection to the driver controller. For details on how to switch the two, see " **3-2 Connect Start screen(→ P.2-10).**"
 - i) Online edit: There is a connection with the driver controller. Edited data can be written to the driver and reflected in the operation immediately. It can also be saved in a file.
 - ii) Offline Edit: There is no connection with the driver controller. The edited data can only be saved in a file.
This file will be read out for writing when the driver controller is connected.
* This can be selected even when a driver controller is connected.
- The "PROGRAM" screen has two modes, "Standard" and "Simple."
 - i) Standard: Displays all items that the driver controller can configure.
 - ii) Simple: You can create an operational program easily by omitting applied operation settings such as Push, P area settings and Stop mode (dedicated to positioning operation).

3. Operation method

3-4-1 Online standard screen

- This is the main screen of this setup tool.
- This screen will be displayed when the driver controller is connected and in Standard mode.
- From this screen
 - ① You can program all operations that the driver controller can execute.
 - ② You can write a program to the driver controller or read it from the driver controller.
 - ③ You can execute a program that was written to the driver controller.
 - ④ You can open, save and print a program.
 - ⑤ You can manually operate the actuator.
 - ⑥ You can display various screens for "Monitor", "Wave" and "Param."

3-4-2 Description of online standard screen







- ① ID.: Displays the ID number of the driver controller.
- ② Mode: Switches the mode of the screen display.
 - i) Standard: Displays "⑨ Program table" for the Standard mode (figure above).
Displays all items that can be configured.
For details on how to configure each item, see " **5-2 Setting item(→P.2-31).**"
 - ii) Simple: Displays "⑨ Program table" (→P.2-18) for the Simple mode.
It displays only the items necessary for positioning operation.
Push and area output settings cannot be configured.

3. Operation method

- ③ Zero return: Returns to the zero point when "④Servo" is ON.
When it completes returning to the zero point, the "ZEROPOINT" lamp in "⑮ Status" will turn on.
- ④ Servo: Turns the servo ON/OFF.
 - i) ON: Turn the servo ON. The "Servo ON" lamp in "⑮ Status" will turn on.
 - ii) OFF: Turn the servo OFF. The "Servo ON" lamp in "⑮ Status" will be turned off.
- ⑤ Program: Starts, pauses and resets the program operation.
 - i) Start: Executes a program from the selected row (highlighted in aqua blue) in "⑨Program table."
 - ii) Pause: Pauses the program. When "Start" is pressed again, the program is restarted to execute the remaining moves. While in pause, "Pause" is displayed in "⑭ Alarm."
 - iii) Reset: Pressing this during "Pause" cancels the remaining travel.
When an alarm is generated, pressing this resets the alarm.
- ⑥ Menu: This is a menu to display other screens.
 - i) Help: Displays the Help screen.
 - ii) Return: Displays the "Start" screen (→P.2-9).
 - ii) Monitor: Displays the "Status" screen (→P.2-21).
 - iv) Wave: Displays the "Waveform" screen (→P.2-22).
 - v) Param: Displays the "Parameter List" screen (→P.2-27).
- ⑦ Driver: Reads and writes a program with the connected driver controller.
 - i) Read: Reads a program in the driver controller to "⑨ Program table."
 - ii) Write: Writes a program in "⑨ Program table" to the driver controller.
- ⑧ File: You can open, save and print a program.
 - i) Open: Opens an external program file and lays out the contents to "⑨ Program table."
It only lays out the parameters and does not write them to the driver controller. Writing operation is performed by "Write" in "⑦ Driver."
 - ii) Save: Saves a program in "⑨ Program table" to an external file.
 - iii) Print: Prints a program in "⑨ Program table."
- ⑨ Program table: You can input, select and execute an operation program.
For details on input method and each item, see (→P.2-30).
Input is done in Servo OFF. No input operations can be performed in Servo ON.
Execution is done in Servo ON. No execution operations can be performed in Servo OFF.
 - i) Program input mode: Inputs an operation program. When you click an arbitrary STEP No. the initial value set in the parameter is substituted. Change the initial value of each item as necessary. For more information, see (→P.2-30).
 - ii) Program execution mode: Executes the specified program. When you click an arbitrary STEP No. (the entire row will be displayed in aqua blue) and press the "Start" button, the program is executed from the row.
For more information, see " 6-2-3 Execution of program(→P.2-41)."

3. Operation method

- ⑩ Position acquisition: When inputting a program, you can enter the current actuator position as is.
For more information, see " **5-8 Position acquisition(→P.2-38).**"
- i) ABS/INC: You can select the absolute or relative coordinate for the acquisition position.
For more information, see " **5-3 Absolute position/relative position(→P.2-33).**"
- ABS: The position in the absolute coordinate considering the position after zero return as the zero point
 - INC: The position in the relative coordinate considering the position after applying " ⑫ Present/RESET" as the zero point
- ii) Get content: Select the position you wish to acquire from "Position," "P Area A" and "P Area B."
The setting values of "P Area A" and "P Area B" are treated as absolute position when executing a program even if the values are acquired with "INC."
- iii) Acquire: Writes the selected "ABS" or "INC" coordinate value to the "Get content" field for the selected STEP No.
- ⑪ Manual operation: You can operate manually independent of the program.
For more information, see " **6-3 Manual operation(→P.2-42).**"
- Jog speed and inching distance can be changed.
 - Inching speed will be the same as jog speed.
- i) Jog: Operates at the configured speed while the buttons   are pressed.
- ii) Inching: Operates at the configured speed for the configured distance each time the buttons   are pressed.
- ⑫ Present: Displays the positions in the absolute and relative coordinates.
For more information, see " **5-3 Absolute position/relative position(→P.2-33).**"
The "ABS" position always displays the position where the place after zero return is considered as the zero point.
When "RESET" is pressed, only "INC" position will be changed to 0.00. The "INC" position considers this point as the zero point.
- ⑬ Present Mode: Displays the current status of the driver controller (Axis name, Model, Operation mode, Ver, Description).
- i) Axis name: This is configured in the parameter No.39 **{TSC: (→P.2-59),TLC: (→P.2-64),THC: (→P.2-70)}.**
- ii) Model: Displays the model name of the driver controller that is connected.
- iii) Operation mode: This is configured in the parameter No.36 **{TSC: (→P.2-59),TLC: (→P.2-64),THC: (→P.2-69)}.**
- iv) Ver: Displays the firmware version of the driver controller that is connected.
- v) Description: A brief Description of the configured "Operation mode."
- ⑭ Alarm: Shows the alarm status.
- Normal (Background color: green): Normal
 - Pause (Background color: yellow) : Suspended
 - Alarm (Background color: red) : Abnormal (For more information, see " **8-1 Alarm lists(→P.2-71).**")

3. Operation method

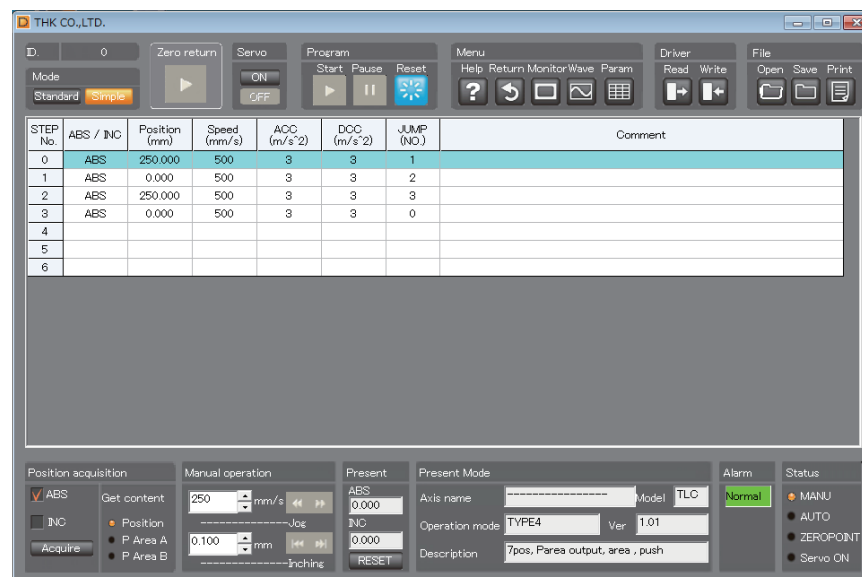
- ⑮ Status: Displays the basic status of the driver controller, MANU/AUTO, ZEROPOINT and Servo ON status. For further details of the status, see " **3-5 Status screen(→P.2-21).**"
- i) MANU/AUTO: The lamp of the operating mode turns on.
 - ii) ZEROPOINT: When completed, the lamp turns on.
 - iii) Servo ON: Turns on when Servo ON.

3. Operation method

3-4-3 Online simple screen

- This screen appears when Offline Edit is selected in the Connect Start screen.
- From this screen
 - ① Only positioning operation can be programmed.
You cannot program pushing operation, P area output, and stop mode, etc.
 - ② You can write a program to the driver controller or read it from the driver controller.
 - ③ You can execute a program that was written to the driver controller.
 - ④ You can open, save and print a program.
 - ⑤ You can manually operate the actuator.
 - ⑥ You can display various screens for "Monitor", "Wave" and "Param."

3-4-4 Description of online simple screen



- The function of each button is the same as online standard mode. See **3-4-2 Description of online standard screen(→ P.2-14)**.
- The items that are not displayed in "program table" cannot be configured.
When you need to configure these items, switch to the standard mode.

3. Operation method

3-4-5 Offline standard screen

- This screen appears when Offline Edit is selected in the Connect Start screen.
- From this screen
 - ① You can program all operations that the driver controller can execute.
 - ② You cannot write a program to the driver controller or read it from the driver controller.
 - ③ You cannot execute a program that was written to the driver controller.
 - ④ You can open, save and print a program.
 - ⑤ You cannot manually operate the actuator.
 - ⑥ You cannot display the screen for "Monitor." You can display the screens for "Wave" and "Param."
- The operations restricted in Offline Edit can be performed in online edit.

3-4-6 Description of offline standard screen

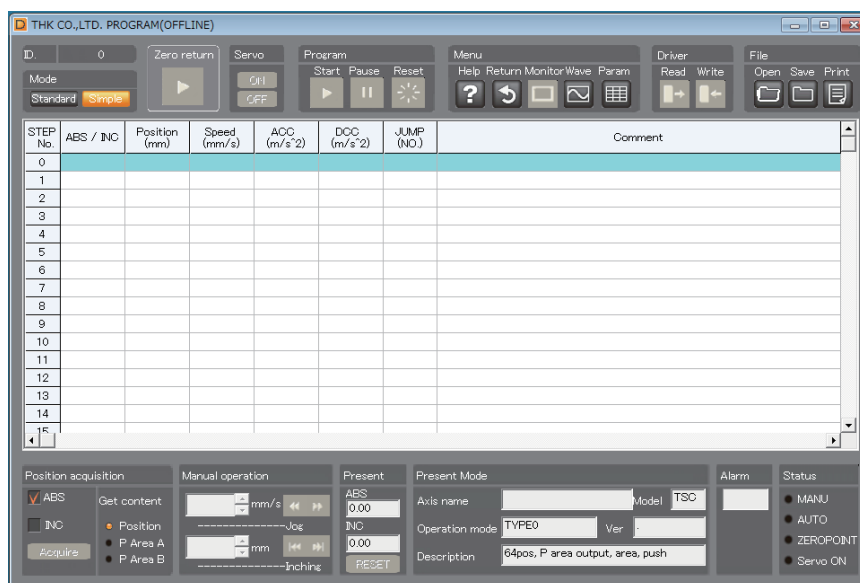
- The function of each button is the same as online standard mode. See **3-4-2 Description of online standard screen(→ P.2-14)**.
- The buttons displayed in gray cannot be executed in offline.

3. Operation method

3-4-7 Offline simple screen

- This screen will be displayed when the driver controller is not connected and in Simple mode.
- From this screen
 - ① Only positioning operation can be programmed.
You cannot program pushing operation, P area output, and stop mode, etc.
 - ② You cannot write a program to the driver controller or read it from the driver controller.
 - ③ You cannot execute a program that was written to the driver controller.
 - ④ You can open, save and print a program.
 - ⑤ You cannot manually operate the actuator.
 - ⑥ You cannot display the screen for "Monitor." You can display the screens for "Wave" and "Param."
- The operations restricted in Offline Edit can be performed in online edit.

3-4-8 Description of offline simple screen



- The function of each button is the same as online standard mode. See **3-4-2 Description of online standard screen(→ P.2-14)**.
- The buttons displayed in gray cannot be executed in offline.
- The items that are not displayed in "program table" cannot be configured.
When you need to configure these items, switch to the standard mode.

3. Operation method

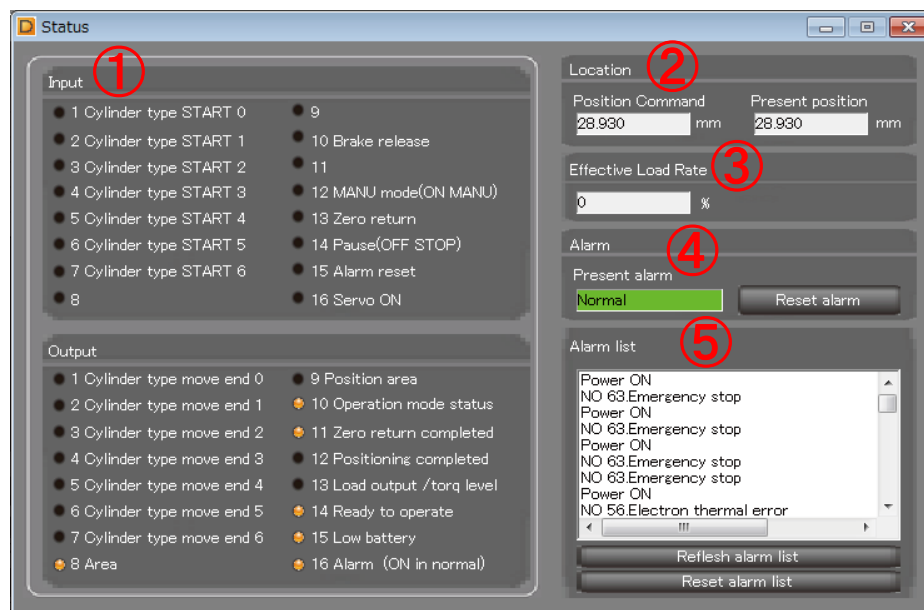
3-5

Status screen

- This screen displays the input/output status of the connected driver controller in relation to the higher device.
- This screen displays the Location information, Command current and Alarm status of the connected driver controller.
- This screen can be used only in online. It is not available in offline.

3-5-1

Description of Status screen



- ① Input/Output: Displays the status of input/output with the higher device (the status of the I/O connector (CN1)).
The lamp turns on when ON (conducting at 0 V).
The displayed names vary among operation modes. The screen shown here is an example of TSC operation mode 0.
"EMG stop (ON in normal)" and "Alarm" for output turn on (ON) in the normal status.
- ② Location: Displays "Position Command" that the driver controller outputted to the actuator and "Present position" where the actuator actually operated.
* The display resolution varies depending on the driver controller connected.
- ③ Command current: Displays the ratio of the output current to the rated output.
* It displays Command current for TSC, and Effective Load Rate for TLC and THC.
- ④ Alarm: Displays the current alarm status.
 - Normal (Background color: green): Normal
 - Unormal (Background color: red) : An alarm has been generated
If an alarm has been generated, remove the cause of the alarm completely before clicking "Reset alarm" button to deactivate the alarm. (See " **8-2 Causes and counter measures of alarms(→P.2-74).**")
- ⑤ Alarm list: Displays up to 50 alarms (including Power ON) going back to the past.
To display alarms, you need to click "Refresh alarm list" to read the data from the driver controller. (The history is not recorded in D-STEP.)
Pressing "Reset alarm list" resets the history recorded in the driver controller. (Before resetting, a confirmation message is displayed.)

3. Operation method

3-6

Waveform screen

- The motor control status of the driver controller can be displayed as a waveform.
- The waveforms that can be displayed are the ones for Present speed and Command current.
- You can use either of the two as the source for triggering.
- You can scale up/down and move the displayed waveform.
- You can open, save and print a waveform.

3-6-1

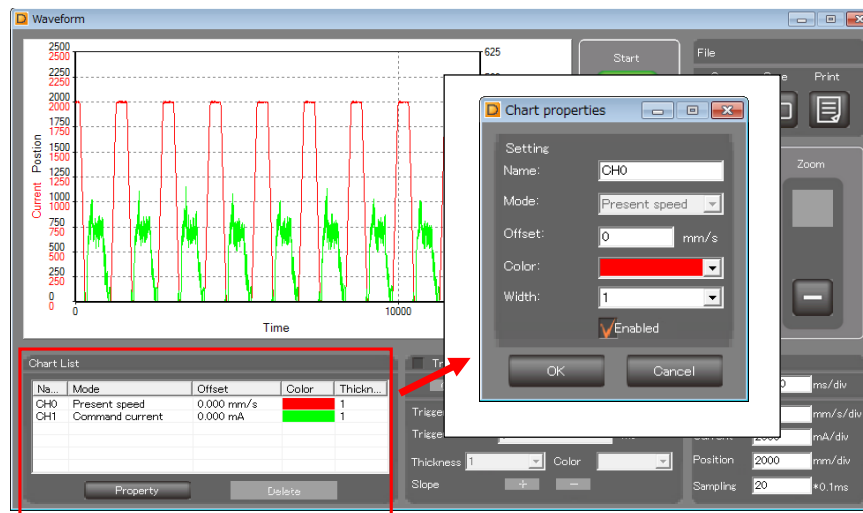
Description of Waveform screen



- ① Waveform display: Displays the acquired waveform. For details on the operation method, see "**3-6-2 Waveform acquisition operation(→P.2-23).**"
- ② Start/Stop acquiring waveform: Starts/stops the acquisition of the waveform.
- ③ File: You can open, save and print a waveform.
 - i) Open: Opens an external waveform file to display on the screen.
 - ii) Save: Saves the waveform displayed on the screen to an external waveform file.
 - iii) Print: Prints the waveform displayed on the screen.
- ④ Waveform display operation: You can scroll the displayed waveform to right/left/up/down, and also scale up/down.
Pressing the "home button" at the center of the scroll will return the display to initial screen.
- ⑤ Chart List: Sets the waveforms to acquire. When clicking "Property," you can configure Offset, Color and Width. Also you can switch between Valid/Invalid display of the acquired waveform.
- ⑥ Trigger Setting: By setting the trigger, you can configure the condition to start acquisition.
For details on the operation method, see "**3-6-3 Trigger operation(→P.2-26).**"
Auto Scroll: Updates the acquired data automatically. However, there is some time lag between the actual operation and waveform display.
- ⑦ Scaling: You can set the scale of vertical and horizontal axes for "① Waveform display."
You can also set the sampling cycle. The smaller the value, the higher the resolution, which causes the shorter period of acquiring the data. The larger the value, the lower the resolution, which causes the longer period of acquiring the data. When the value is too small, the transfer from TSC cannot catch up and the operation stops automatically without scrolling (when the value is about 50 x 0.1 ms or smaller).

3. Operation method

3-6-2 Waveform acquisition operation



- ① Configure the display settings of the acquired waveform by "⑤ Chart List." Double clicking any part of the row CH0 or CH1 in "⑤ Chart List," or clicking the "Property" button after selecting the row will display the setting screen "Chart properties."

i) Mode: CH0 Present speed: Displays the actual speed of the actuator as the waveform.

CH1 Command current: Displays the command current inside the driver controller as the waveform.

ii) Offset: The acquired waveform will move to Y-direction according to the entered value.

iii) Color: Select the color of the waveform line.

iv) Width: Select the thickness of the waveform line. A larger value gives thicker line.

v) Enabled: When you do not wish to display the waveform, clear the "Valid" box.

- ② Configure the scaling of each axis by "⑦ Scaling." You can change the scaling even when the waveform is being acquired. (Except for Sampling. It requires restart.)

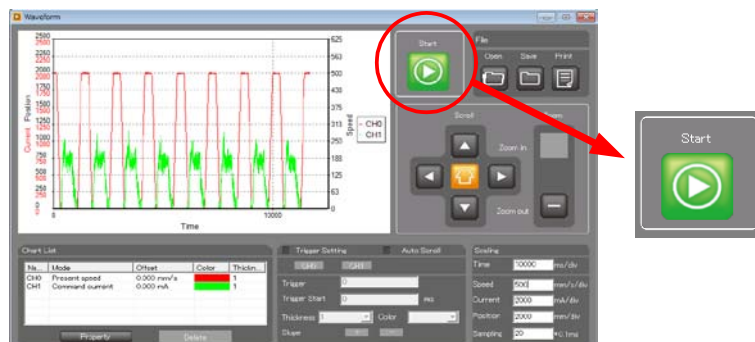
The notation of the scaling "div" means for each one division respectively.

In "① Waveform display," the horizontal axis is "Time (ms)" while horizontal axis is "Speed (mm/s)" or "Current (mA)."

"Sampling" sets the interval of acquiring the waveform. The set value x 0.1 ms will be the sampling interval.

3. Operation method

- ③ Start the acquisition of the waveform by clicking the “Start” button.



- ④ Even when the waveform is being acquired, you can display the waveform by scrolling up/down/right/left with “Scroll.”

The waveform can be scaled up/down by using “Zoom.”

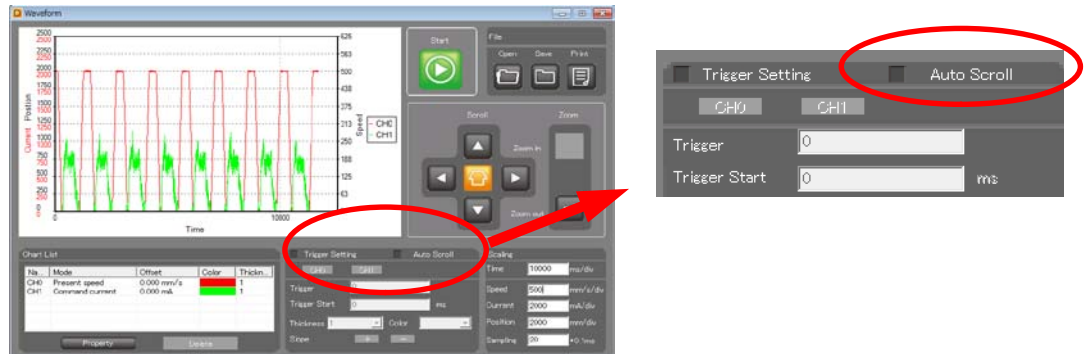
Pressing the “home” button (home icon) will return the display to initial screen.



3. Operation method

- ⑤ In addition to manually scrolling the waveform in a horizontal direction, you can also use the automatic scroll.

To scroll the waveform automatically, check the “Auto Scroll” box at the bottom of the screen.



- ⑥ Stop the acquisition of the waveform by pressing the “Stop” button.

After acquiring the waveform, you can manipulate the display by using “Scroll” or “Zoom,” and change the “Scaling.”



3. Operation method

3-6-3 Trigger operation

- ① To use the trigger function, check the "⑥ Trigger Setting" box. The "waveform display" screen will be displayed in light green, and "Trigger" appears at the top in red.



- ② Select "CH" to use as the trigger source from CH0/CH1.
- ③ Set the "Trigger" level to start acquisition. (The unit depends on the trigger signal.)
- ④ Set the position on the time axis (X axis) when "Trigger Start" happens after the trigger condition is met.
- ⑤ When the trigger function is enabled, the trigger level is displayed as the right arrow line on the "waveform display" screen.
Set the "Thickness" and "Color" of this line.
- ⑥ Select the slope of the signal to turn the trigger ON from "Slope + / -" ("+" when going up and "-" when going down).
- ⑦ Start the acquisition of the waveform by pressing the "② Start" button.
- ⑧ The waveform acquisition will start when the time of "Trigger Start" elapses after the "CH" signal to use as the trigger exceeds the "Trigger" level at the slope set in "Slope."
- ⑨ Checking "Auto Scroll" automatically scrolls the screen during the waveform acquisition.
- ⑩ Even when the waveform is being acquired, the screen display can be manipulated by using "Scroll," "Zoom" or "Scaling."
- ⑪ Stop the acquisition of the waveform by pressing the "② Stop" button.

Note

- This waveform acquisition function depends on the communication speed. Set the communication speed to 115200 bps. Selecting slower speed tends to develop more display errors.

3. Operation method

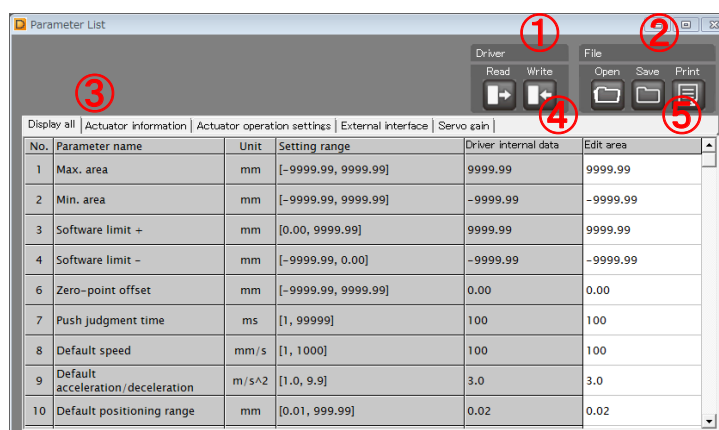
3-7

Parameter List screen

- You can configure and save following items as the parameters.
 - Basic operations/constants of the driver controller/actuator
 - Initial values entered into "program table"
 - Constants related to servo operations
- Depending on the operation modes (→ P.2-28), some parameters do not function.
Example) "Max. area" and "Min. area" of the operation mode 1 ← Due to the lack of area output
- There are some missing numbers or non-disclosed parameters due to circumstances.

3-7-1

Description of Parameter List screen



- Driver: Reads and writes parameters with the connected driver controller.
 - Read: Reads the parameters in the driver controller to "⑤ Edit area."
 - Write: Writes a parameter in "⑤ Edit area" to the driver controller.
 - File: You can open, save and print parameters.
 - Open: Opens an external parameter file and lays out the parameters to "⑤ Edit area." It only lays out the parameters and does not write them to the driver controller. Writing operation is performed by "Write" in "① Driver."
 - Save: Saves parameters in "⑤ Edit area" to an external file.
 - Print: Prints parameters in "⑤ Edit area."
 - Switching tab: Parameters are classified by categories, and the display can be switched by tab sheets.
The items are classified into "Display all," "Actuator information," "Actuator operation settings," "External interface" and "Servo gain."
 - Driver internal data: Displays the parameters in the driver controller memory. You cannot change the values directly in this area. Change the parameter in the following "⑤ Edit area," and then execute "Write."
 - Edit area: This is the area to edit parameters, and the portions that vary with "Driver internal data" will be displayed in red. After changing the value, click the "Write" button in "① Driver," and then confirm that the value is reflected to "④ Driver internal data."
- * The color of the changed value turns from black to red. The written value changes from red to black.

4. Operation modes

4-1

Driver controller TSC/TLC/THC

- The mode changing types of TSC/TLC/THC has six operation modes. Select the mode according to the function you wish to use.
- You can change the mode in the parameter No.36 **{TSC: (→ P.2-59), TLC: (→ P.2-64), THC: (→ P.2-69)}**.
- While program of each STEP in each mode is configured by this software, the execution from outside will be performed by input/output signals. For more information, see the instruction manual of each driver controller.

Operation modes		Overview	Number of steps	Pressing operation
Multi-point positioning type	0: Position 64 type	Multi-point positioning operation with 64 points With area output, with P area output	64	○
	1: External unit input instruction type	Multi-point positioning operation with 64 points External instruction mode by I/O Without area output, with P area output	64	—
	2: Position 256 type	Multi-point positioning operation with 256 points Without area output, with P area output	256	○
	3: Position 512 type	Multi-point positioning operation with 512 points Without area output, without P area output	512	○
Electromagnetic valve type	4: Solenoid mode 1 type	Multi-point positioning operation with 7 points Direct move command input With area output, with P area output	7	○
	5: Solenoid mode 2 type	Multi-point positioning operation with 3 points Direct move command input Position sensor auto-switch output With area output, with P area output	3	—

4-1-1

Selection by intended use

Intended use	Mode: 0 Position 64 type	Mode: 1 External input instruction type	Mode: 2 Position 256 type	Mode: 3 Position 512 type	Mode: 4 Solenoid mode 1	Mode: 5 Solenoid mode 2
Move and instruction from I/O	—	○	—	—	—	—
Brake release from I/O	○	—	○	○	○	○
Pressing operation	○	—	○	○	○	—
Torque determination	○	—	○	○	○	—
Area output	○	—	—	—	○	○
P area output	○	○	○	—	○	○
Signal output during operation	○	○	—	—	—	—

4. Operation modes

4-1-2 External input signal

- Allocation of external input and output signals varies depending on the operation mode of TSC/ TLC/THC.
- Each input and output have different functions depending on the move operation and determination function in each operation mode.

For more information, see the instruction manual of each driver controller.

Pin number	Input/output	Signal name					
		Operation mode 0	Operation mode 1	Operation mode 2	Operation mode 3	Operation mode 4	Operation mode 5
		Position 64	External input instruction	Position 256	Position 512	Solenoid 1	Solenoid 2
1,2	--	P24O	P24O	P24O	P24O	P24O	P24O
3	Input	PI 0	PI 0	PI 0	PI 0	ST 0	ST 0
4		PI 1	PI 1	PI 1	PI 1	ST 1	ST 1
5		PI 2	PI 2	PI 2	PI 2	ST 2	ST 2
6		PI 3	PI 3	PI 3	PI 3	ST 3	---
7		PI 4	PI 4	PI 4	PI 4	ST 4	---
8		PI 5	PI 5	PI 5	PI 5	ST 5	---
9		---	MODE	PI 6	PI 6	ST 6	---
10		---	JOG/INCHING	PI 7	PI 7	---	---
11		---	JOG P	---	PI 8	---	---
12		BKRL	JOG N	BKRL	BKRL	BKRL	BKRL
13		STRT	STRT/PWRT	STRT	STRT	---	---
14		MANU	MANU	MANU	MANU	MANU	MANU
15		HOME	HOME	HOME	HOME	HOME	HOME
16		PAUSE	PAUSE	PAUSE	PAUSE	PAUSE	PAUSE
17		REST	REST	REST	REST	REST	REST
18		SV-ON	SV-ON	SV-ON	SV-ON	SV-ON	SV-ON
19	Output	PO 0	PO 0	PO 0	PO 0	PE 0	LS 0
20		PO 1	PO 1	PO 1	PO 1	PE 1	LS 1
21		PO 2	PO 2	PO 2	PO 2	PE 2	LS 2
22		PO 3	PO 3	PO 3	PO 3	PE 3	---
23		PO 4	PO 4	PO 4	PO 4	PE 4	---
24		PO 5	PO 5	PO 5	PO 5	PE 5	---
25		MOVE	MOVE	PO 6	PO 6	PE 6	---
26		AREA	MODE S	PO 7	PO 7	AREA	AREA
27		P AREA	P AREA	P AREA	PO 8	P AREA	P AREA
28		MANU S	MANU S	MANU S	MANU S	MANU S	MANU S
29		HEND	HEND	HEND	HEND	HEND	HEND
30		INPS	INPS	INPS	INPS	INPS	---
31		LOAD/TRQS	WEND	LOAD/TRQS	LOAD/TRQS	LOAD/TRQS	---
32		SVRDY	SVRDY	SVRDY	SVRDY	SVRDY	SVRDY
33*		EMGS*	EMGS*	EMGS*	EMGS*	EMGS*	EMGS*
34		ALM	ALM	ALM	ALM	ALM	ALM
35	--	---	---	---	---	---	---
36	--	---	---	---	---	---	---
37	--	---	---	---	---	---	---
38	--	---	---	---	---	---	---
39	--	---	---	---	---	---	---
40	--	---	---	---	---	---	---
41,42	--	FG	FG	FG	FG	FG	FG
43,44	--	GO	GO	GO	GO	GO	GO
case		FG	FG	FG	FG	FG	FG

* Pin number 33 is EMGS for TSC, but it will be BALM for TLC and THC.

5. Program input

5-1

Input method

- Input program with servo OFF.

5-1-1

Selecting input row and performing input

- Enter the initial value set by a parameter in a blank row.
 - ① Double-click in a row for input. Or, select a blank cell and press Enter.
 - ② The initial value set by a parameter will be entered.

5-1-2

Changing a set value

- Change a set value of the cell which has a value such as the initial value.
 - ① Double-click the target cell. Or, select the target cell and press Enter.
 - ② After entered into the input mode, change the set value and press Enter to confirm.
 - ③ The modified settings will not be enabled until they are written to the driver controller.

5-1-3

Selecting a setting range

- ① When you click any cell in the STEP No. column, the entire row will be selected.
- ② When you click the "STEP No." cell on the upper left corner of the program table, the entire table will be selected.
- ③ When you click the item name cell in the top row of the program table, the entire column will be selected.
- ④ When you press Shift while selecting cells, you can select a rectangular area.

5-1-4

Operations for cells

- The following operations can be performed for cells in the selected area as well as a cell selected alone.
- Operations can be performed as long as the area before and after the operation match, such as areas selected by row.
 - ① Delete : Deletes the set value and returns the cell to blank.
 - ② Ctrl + C : Copies the content.
 - ③ Ctrl + X : Cuts the content.
 - ④ Ctrl + V : Pastes the content previously copied or cut.

5-1-5

Moving the cells in focus

- ① Home : Moves to the start of a row.
- ② End : Moves to the end of a row.
- ③ Ctrl + Home : Moves to the cell on the upper-left corner of the program table.
- ④ Ctrl + End : Moves to the cell on the lower-right corner of the program table.
- ⑤ Ctrl + Arrow key : Moves to the end cell at such direction of the program table that is the same as the arrow direction.

5. Program input

5-2

Setting item

- You can execute program to operate the actuator by populating each item in the program table on the "Program" screen (→ P.2-14).
- The number of STEP No. to be displayed varies depending on the operation mode.
- Items to be displayed vary depending on the operation mode.

5-2-1

STEP No.

- The number that indicates single operation within the program. Specify this number in "JUMP (NO.)."

5-2-2

ABS / INC

- Select a coordinate to indicate a moving position from the absolute coordinate or relative coordinate.
- For more information, see "5-3 Absolute position/relative position(→ P.2-33)."
- For the absolute coordinate, set the target point with considering the position after zero return as the zero point.
- For the relative coordinate, set the travel distance with considering the "position command" point as the zero point.
- Select "ABS" for the operation mode 5.

5-2-3

Position (mm)

- Note that the behavior is different between "ABS" and "INC."
For more information, see "5-3 Absolute position/relative position(→P.2-33)."
- Set the moving position for absolute coordinate.
- Set the travel distance from the "position command" point for relative coordinate.
- You can enter an input value to two decimal places for TSC and to three decimal places for TLC/THC.

5-2-4

Speed (mm/s)

- Set the moving speed.
- You can set the initial value in the parameter No.8 (Default speed) {TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→ P.2-66)}.
- If a value other than 100% is set in the parameter No.20 (Speed override) {TSC: (→ P.2-57),TLC: (→ P.2-62),THC: (→ P.2-67)}, the speed will be reduced accordingly.
- You cannot enter any value with decimal places.

5-2-5

ACC (m/s²) / DCC (m/s²)

- Set acceleration and deceleration separately.
For more information, see "5-4 Acceleration/deceleration(→P.2-34)."
- The larger value results in sudden operation and the smaller value results in gradual operation.
- You can set the initial value in the parameter No.9 (Default acceleration/deceleration) {TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→ P.2-66)}.
- You can enter a value to one decimal place.

5-2-6

Push (%)

- Set the current limit for pressing operation.
For more information, see "6-7 Pressing operation(→P.2-50)."
- The larger value results in the larger pressing force.
- When the set value is "0," positioning operation will be performed without pressing operation.

5. Program input

5-2-7 Threshold (%)

- Set the threshold current value for outputting load output determination signal or torque level signal. For more information, see " **6-8 Torque determining operation(→P.2-52).**"

5-2-8 Pos Range (mm)

- For positioning operation, signal for arrival completion "INPS" will be output if the current value is within the range of the positioning width from the target point (except the operation mode 5). For more information, see " **6-6-1 Signal for positioning completion(→P.2-49).**"
- For pressing operation, this value is configured as the impressing range from the target point. For more information, see " **6-7 Pressing operation(→P.2-50).**"
- You can set the initial value in the parameter No.10 (Default positioning range) **{TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→ P.2-66)}**.
- You can enter a value to two decimal places.

5-2-9 P area A (mm) / P area B (mm)

- For positioning operation, set the area where the "P AREA" output signal turns ON in "P area A (mm)" and "P area B (mm)."
- "P AREA" output signal is enabled in the operation mode 0, 1, 2, 4, and 5. For more information, see " **6-9 Area determining operation(→P.2-54).**"
- For pressing operation, configure the determination range for threshold in "P area A (mm)" and "P area B (mm)" if the parameter No.24 (Threshold judgment range) **{TSC: (→ P.2-58), TLC: (→ P.2-63), THC: (→ P.2-68)}** is "Valid."
- Pressing operation can be performed in the operation mode 0, 2, 3 and 4. For more information, see " **6-8 Torque determining operation(→P.2-52).**"
- You can enter a value to two decimal places.

5-2-10 ACC mode

- Select operation pattern of acceleration and deceleration rate. 0: Trapezoid, 1: S-shape motion
* For TSC, only 0 : Trapezoid can be selected.
* S-shape motion : acceleration and deceleration rate configured for STEP No. become the maximum travel speed for sine wave.

You can compute acceleration/deceleration time using the formula shown below. Configure appropriate value for S-shape by adjusting the acceleration and deceleration rate. * Configure a value that does not exceed the maximum acceleration of the actuator.

$$t = \frac{\pi}{2} \times \frac{v}{\alpha}$$

t: Acceleration/deceleration time [s]
v: Velocity [m/s]
α: Acceleration and deceleration rate [m/s²]

5-2-11 Stop mode

- Select a stop mode (power-saving method) to enter after reaching the target point.
0: Invalid, 1: Auto servo OFF 1 (ASO 1), 2: Auto servo OFF 2 (ASO 2),
3: Auto servo OFF 3 (ASO 3), 4: Full servo control (SERVO)
- For more information, see " **5-5 Stop mode(→ P.2-35).**"
- You can set the initial value in the parameter No.25 (Default standstill mode) **(TSC: (→ P.2-58), TLC: (→ P.2-63), THC: (→ P.2-68))**.

5. Program input

5-2-12 Standby time (ms)

- Configure the waiting time after the end of an operation. After the elapse of the waiting time, the next operation (JUMP No.) will be performed.
- For more information, see "5-6 Waiting time(→ P.2-37)."

5-2-13 Repeat (Count)

- Configure the number of times to repeat an operation. This is valid only when you select the relative coordinate.
- For more information, see "5-7 Repetition(→ P.2-37)."

5-2-14 JUMP (No.)

- Specify the number (STEP No.) to perform after the completion of an operation.
- If you want to finish the operation at that STEP, enter "E."

5-2-15 Comment

- You can enter comment in each row (within 30 one-byte alphanumeric characters).
Brief Descriptions of operations for each STEP No. make it easier to manage program.

5-3 Absolute position/relative position

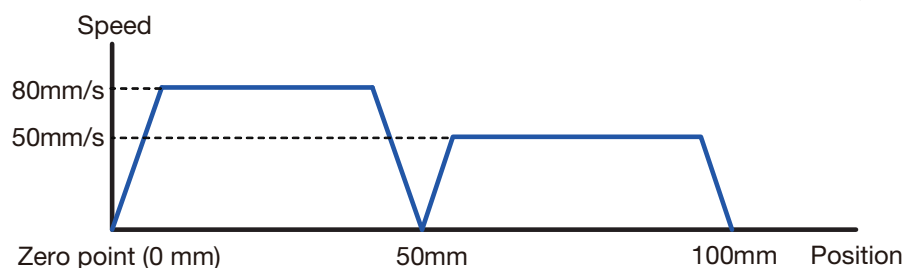
- When you set a "Position" in positioning operation, operation method varies depending on the coordinate system.
- **Select "ABS" for the operation mode 5.**
* If you select "INC," the alarm code No.25 (Position data anomaly) will be generated after completing zero return.

5-3-1 Absolute position

- The position in the absolute coordinate considering the position after zero return as the zero point.
- If you have configured the parameter No.6 (Zero-point offset) **{TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→ P.2-66)}**, the offset position becomes the zero point.
- **Select "ABS" for the operation mode 5.**
* If you select "INC," the alarm code No.25 (Position data anomaly) will be generated after completing zero return.

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	ACC (m/s ²)	DCC (m/s ²)	Push (%)	JUMP (No.)	Comment
0	ABS	50.00	80	3	3	0	1	Absolute coordinate system feeding operation 1
1	ABS	100.00	50	3	3	0	E	Absolute coordinate system feeding operation 2

Some of the setting fields are omitted.



5. Program input

5-3-2 Relative position

- "Relative position" means the travel distance from the position you execute the program in that row.
- "Program" screen displays the relative travel distance in reference to the position you have "reset" at the "present position."

When you "reset," the present position becomes the relative zero point, which is 0.00.

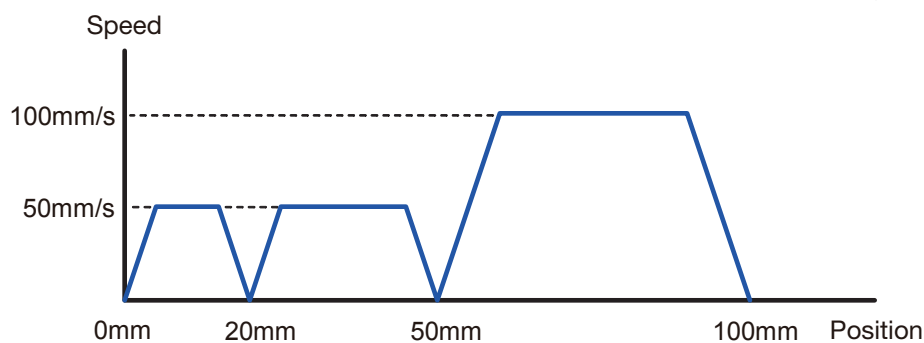
- For program execution, move operation will be performed using the position to start executing the row as the relative zero point and using "Position (mm)" as the travel distance.

- **Select "ABS" for the operation mode 5.**

* If you select "INC," the alarm code No.25 (Position data anomaly) will be generated after completing zero return.

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	ACC (m/s ²)	DCC (m/s ²)	Push (%)	JUMP (No.)	Comment
0	INC	20.00	50	3	3	0	1	Relative coordinate system feeding operation 1
1	INC	30.00	50	3	3	0	2	Relative coordinate system feeding operation 2
2	INC	50.00	100	3	3	0	E	Relative coordinate system feeding operation 3

Some of the setting fields are omitted.

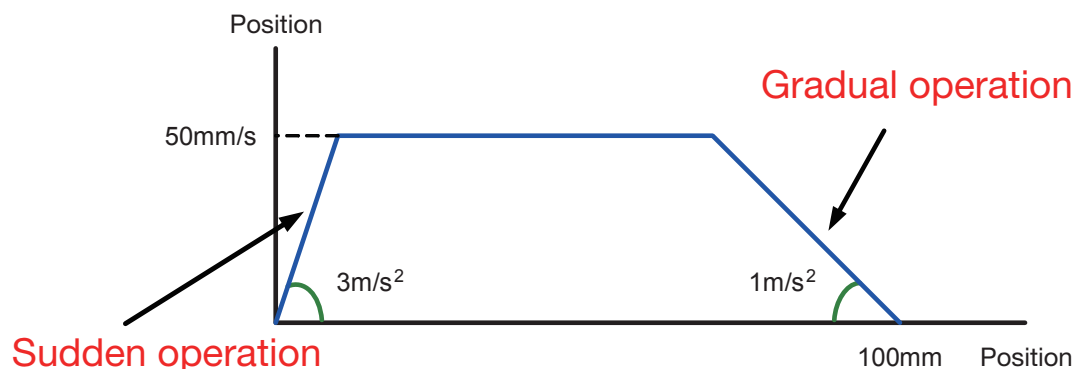


5-4 Acceleration/deceleration

- You can set acceleration and deceleration separately.
- The larger value results in sudden operation and the smaller value results in gradual operation.
- You can set the initial value in the parameter No.9 (Default acceleration/deceleration) {TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→ P.2-66)}.

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	ACC (m/s ²)	DCC (m/s ²)	Push (%)	JUMP (No.)	Comment
0	ABS	100.00	50	3	1	0	E	About acceleration and deceleration

Some of the setting fields are omitted.



5. Program input

5-5

Stop mode

- You can select a stop mode to enter after reaching the target point.
- Selecting an appropriate mode reduces heat generation and power usage.
- You can check the current passing through the motor on the "Status" screen (→ P.2-21).
- You can change the output method of "INPS" output, signal for positioning completion, in the parameter No.37 (Positioning complete signal output system) (→ P.2-59) (→ P.2-64) (→ P.2-69).
- You can set the initial value in the parameter No.25 (Default standstill mode) (→ P.2-58) (→ P.2-63) (→ P.2-68).

5-5-1

Invalid

<Driver controller TSC>

- The servo will be turned OFF immediately after reaching and the current set in the parameter No.11 (Current limit at standstill) (→ P.2-56) (→ P.2-61) (→ P.2-66) continues to flow.
- The actuator retains the present position with the torque generated by this current. However, since the servo is OFF, any position deviation will not be corrected.

<Driver controller TLC/THC>

- Selecting invalid makes the same result as that of "5-5-5 Full servo control (SERVO)."
- The servo continues to control the actuator.
- If position deviation is caused due to external force, a torque to correct it will be generated (the current will increase).

5-5-2

Auto servo OFF 1 (ASO 1)

<Driver controller TSC/TLC/THC>

- Once reached, the servo will be turned OFF after the elapse of the time set in the parameter No.17 {TSC: (→ P.2-57), TLC: (→ P.2-62), THC: (→ P.2-67)}.
- The present position cannot be retained because the current becomes 0 after the servo is turned OFF.
- If the position deviation caused by external force (difference between the command value and the current value) exceeds the parameter No.30 (Permissible deviation) {TSC: (→ P.2-58), TLC: (→ P.2-63), THC: (→ P.2-68)}, the alarm of the alarm code No.32 (Excessive position error (deviation)) {TSC: (→ P.2-71), TLC: (→ P.2-72), THC: (→ P.2-73)} will be generated.
Note that the alarm will be generated only when the next move command is executed.
- If the position deviation is within the permissible position deviation, the operation can be continued by specifying and starting the next STEP No.
You also can continue to use the current STEP No. to start an operation (returning to the "Position" of this STEP No.).

5. Program input

5-5-3 Auto servo OFF 2 (ASO 2)

<Driver controller TSC/TLC/THC>

- Once reached, the servo will be turned OFF after the elapse of the time set in the parameter No.18 (Auto servo OFF time 2) {TSC: (→ P.2-57), TLC: (→ P.2-62), THC: (→ P.2-67)}.
- Other operations are same as "5-5-2 Auto servo OFF 1 (ASO 1)(→ P.2-35)."

5-5-4 Auto servo OFF 3 (ASO 3)

<Driver controller TSC/TLC/THC>

- Once reached, the servo will be turned OFF after the elapse of the time set in the parameter No.19 (Auto servo OFF time 3) {TSC: (→ P.2-57), TLC: (→ P.2-62), THC: (→ P.2-67)}.
- Other operations are same as "5-5-2 Auto servo OFF 1 (ASO 1)(→ P.2-35)."

5-5-5 Full servo control (SERVO)

<Driver controller TSC/TLC/THC>

- The servo continues to control the actuator.
- If position deviation is caused due to external force, a torque to correct it will be generated (the current will increase).

<Driver controller TSC>

- Vibration or abnormal noise may occur depending on the status at stop.
Do not use the controller if vibration or abnormal noise affects the performance.

5. Program input

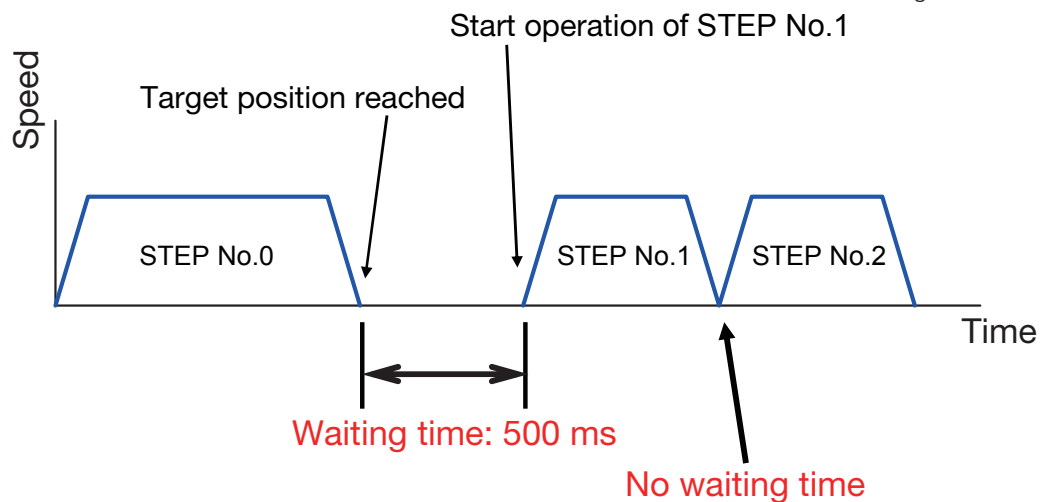
5-6

Waiting time

- You can configure the waiting time between the end of one STEP operation and the execution of the next STEP operation.
(This is applicable only when "JUMP (No.)" is other than "E")
- This setting will be ignored for pressing operation because of possible additional move after the end of pressing.
Pressing continues with the configured Push (%) until the next execution command.

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	Standby time (ms)	JUMP (No.)	Comment
0	ABS	60.00	50	500	1	Waiting for 500 ms after the end of an operation
1	ABS	90.00	50	0	2	No waiting after the end of an operation
2	ABS	120.00	50	0	E	

Some of the setting fields are omitted.



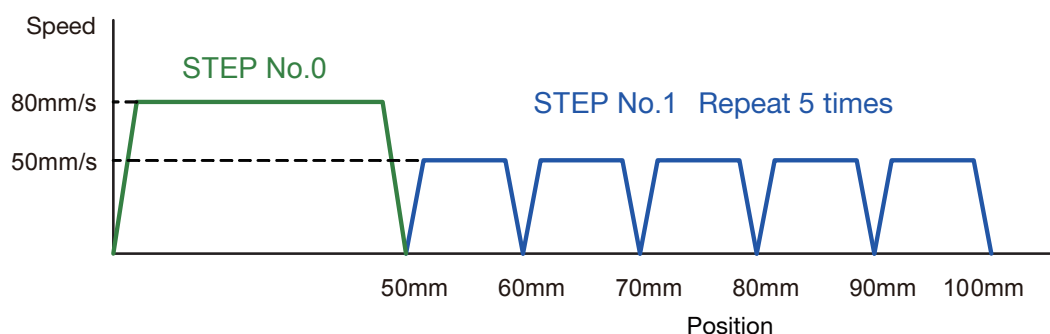
5-7

Repetition

- For the relative coordinate setting, you can configure the number of repetition when you want to repeat the same operation.

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	Standby time (ms)	Repeat (Count)	JUMP (No.)	Comment
0	ABS	50.00	80	0	1	1	
1	INC	10.00	50	0	5	E	Repeat the same operation 5 times

Some of the setting fields are omitted.

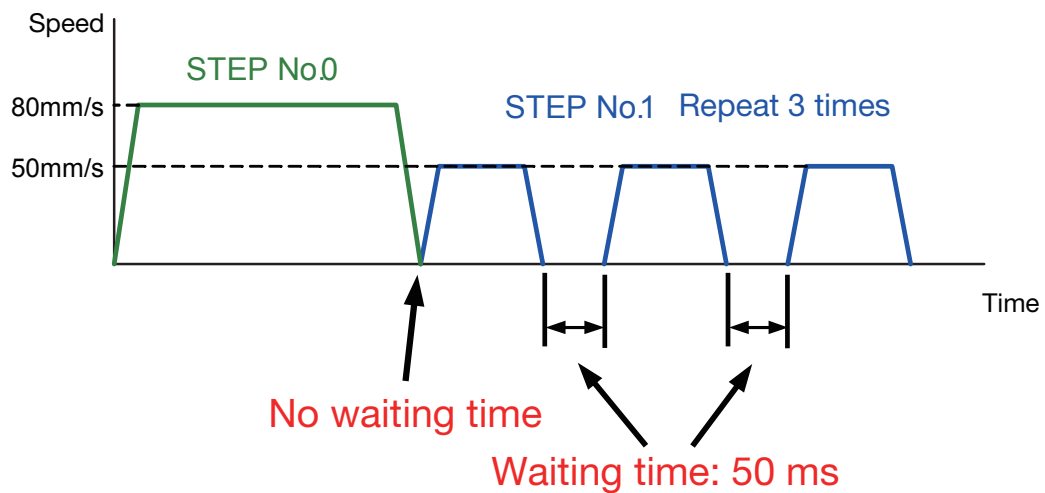


5. Program input

- Since STEP operation is repeated in repeat operation, "Standby time" is also repeated.

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	Standby time (ms)	Repeat (Count)	JUMP (No.)	Comment
0	ABS	50.00	80	0	1	1	
1	INC	10.00	50	50	3	E	Repeat the same operation 3 times

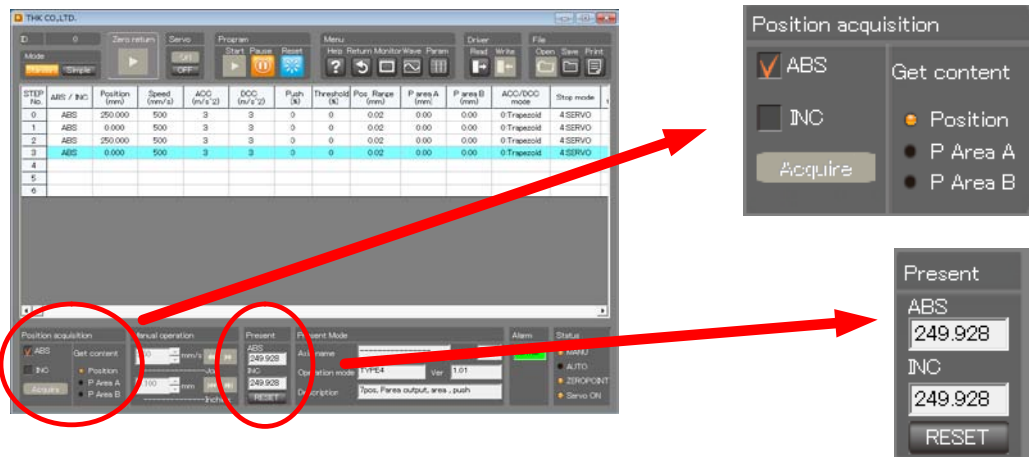
Some of the setting fields are omitted.



5-8

Position acquisition

- You can acquire the current position data aligned by manual operation and write it to the program table.



CAUTION



Obligatory

- Be sure to perform "Position acquisition" after zero return. Otherwise, unexpected behavior may occur.

5. Program input

5-8-1

Acquisition method

- ① Check to select the "ABS" or "INC" coordinate for the position information to acquire.
For details on the absolute coordinate and relative coordinate, see " **5-3 Absolute position/relative position(→P.2-33).** "
- ② Check to select the type of position to acquire from "Position," "P Area A," and "P Area B." For details on "Position," see " **5-2-3 Position (mm)(→P.2-31).** " For "P Area A" and "P Area B," see " **5-2-9 P area A (mm) / P area B (mm)(→P.2-32).** "
- ③ Select STEP (No.) to write the acquired position to.
Click the applicable STEP (No.) row to highlight in blue.
If you select a row that already has an input value, only the "acquisition position" will be changed.
For a blank row, the initial value set by a parameter will be entered.
- ④ Click the "Acquire" button and check that the content is written to the intended item field.
The value in "Present" at the bottom center of the screen will be acquired.
If the value different from the value already configured is entered, it is displayed in red.
- ⑤ Only writing a value to the program table does not save it to the driver controller.
Click the "Write" button of "Driver" to write to the driver controller.
- ⑥ Once the "Write" operation has been successfully completed, the character color will change from red to black. Make sure that all characters in the program table are black. Also make sure that the content you configured is correct.

6. Operations

WARNING



Obligatory

- For vertical application, note that the moving part may fall if the torque is not sufficient.
- If you are using the driver controller TSC, note that it moves back and forth in a direction the reverse of zero return for the distance about a half length of the lead right after turning the servo ON.
- To prevent unexpected accidents, make sure to have the driver controller power ready to be shut down at any time before executing a program.
Otherwise, you may get injured.



Prohibited

- Do not touch the actuator while it is running.
Otherwise, you may get injured.

CAUTION



Obligatory

- Be sure to perform "Position acquisition" after zero return.
Otherwise, unexpected behavior may occur.

6-1

Servo ON

- To operate the actuator, be sure to turn the servo ON.
Click the "ON" button of "Servo" on the "Program" screen.
- If you are using the driver controller TSC, it moves back and forth for the distance about a half length of the lead of the actuator you use in order to improve reading accuracy of the encoder.
You cannot change the move direction, which is the reverse of zero return.
- For the actuator with a brake, the brake is released simultaneously with the servo ON.
When using the actuator in a vertical direction, take extra care because a falling accident may be occurred if the torque is not sufficient.
- When you turn the servo OFF while the actuator is running, motor current will be interrupted and the actuator will stop. Leave it ON unless you need to turn it OFF. For more information on current limit during the actuator stop, see "5-5 Stop mode(→ P.2-35)."

6-2

Execution of program

- This section explains the procedure before program execution. For more information, see each reference page.

6-2-1

Parameter settings

- ① Configure necessary parameter settings on the "Parameter" screen. (See "3-7 Parameter List screen(→P.2-27).")
- ② The modified set value turns to red.
- ③ Click the "Write" button of "Driver" to write the parameter to the driver controller after completing the setting.
- ④ If you want to restore all the parameter to the internal data of the driver controller without writing it, click the "Read" button of "Driver."
- ⑤ Once the write operation has been successfully completed, the character color will change from red to black. Make sure that all characters in "Edit area" of the parameter are black. Also make sure that the content you configured is correct.

6. Operations

6-2-2

Program settings

- ① Configure necessary program settings on the "Program" screen. (See (→P.2-30).)
- ② The number of STEP rows varies according to the parameter No.36 (Function mode selection) **{TSC: (→P.2-59),TLC: (→P.2-64),THC: (→P.2-69)}**.
- ③ The modified set value turns to red.
- ④ Click the "Write" button of "Driver" to write the program to the driver controller after completing the setting.
- ⑤ If you want to restore all items to the internal data of the driver controller without writing them, click the "Read" button of "Driver."
- ⑥ Once the write operation has been successfully completed, the character color will change from red to black. Make sure that all set values in the program table are black. Also make sure that the content you configured is correct.

6-2-3

Execution of program

- ① Click the "ON" button of "Servo" to turn the servo ON.
- ② Click the "Zero return" button to return the actuator to the zero point.
* If you execute a program without zero return, the alarm of the alarm code No.22 (External input inching distance) **{TSC: (→P.2-71),TLC: (→P.2-72),THC: (→P.2-73)}** will be generated.
- ③ After zero return, double-click to select STEP No. to be executed or any cell in that row (the entire row will be highlighted in aqua blue), then click the "Start" button of "Program" to start the program.
- ④ When you click the "Pause" button of "Program," the operation will pause even it is in progress. Click the "Start" button again to resume the operation and perform the remaining move.
- ⑤ When you click "Reset" during "Pause," the remaining travel will be canceled and the operation will stop at that point.
* JUMP (No.) will not be executed at this time.
- ⑥ Set "Servo" to "OFF" when you edit a program.

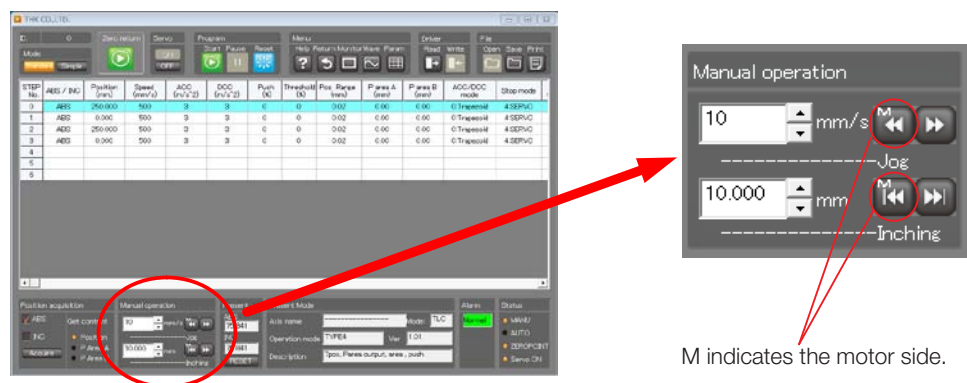
6. Operations

6-3 Manual operation

- You can perform "Jog" and "Inching" operations at "Manual operation" at the bottom of the "Program" screen.

6-3-1 Manual operation settings

- You can set the initial speed to be applied when the driver controller is connected in the parameter No.16 (Jog speed) **{TSC: (→ P.2-57), TLC: (→ P.2-62), THC: (→ P.2-67)}**.
- This speed is applied to both "Jog" and "Inching" operations.
- You can set the initial inching travel distance to be applied when the driver controller is connected in the parameter No.31 (Inching distance) **{TSC: (→ P.2-58), TLC: (→ P.2-63), THC: (→ P.2-68)}**.



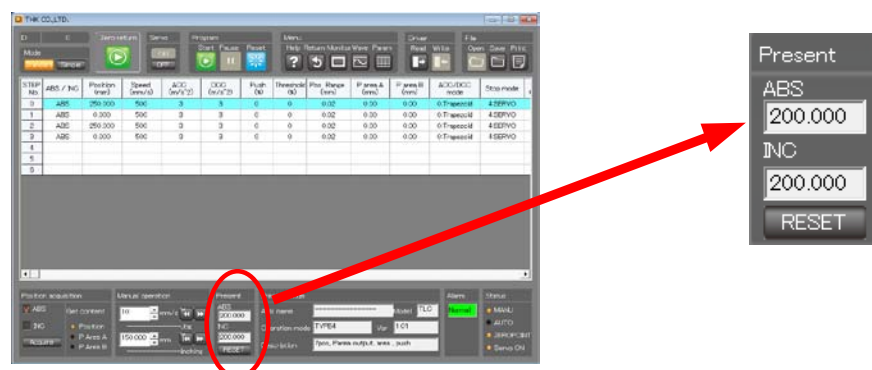
M indicates the motor side.

6-3-2 Manual operation

- Jog operation :The actuator moves at the configured speed while pressing the direction button.
- Inching operation: The actuator moves at the configured speed (same as the jog speed) for the configured travel distance each time you press the direction button.
- "M" on the direction button is a mark to indicate the motor side. When you press the button with this mark, the actuator moves toward the motor.

6-3-3 Travel distance check

- Travel distance is displayed at "Present" at the bottom of the "Program" screen for your reference.
- When you click the "Reset" button, the "INC" position becomes "0.00."
- ABS: The position in the absolute coordinate considering the position after zero return as the zero point
- INC: The position in the relative coordinate considering the position after "Reset" as the zero point



6. Operations

! WARNING



Obligatory

- To prevent unexpected accidents, make sure to have the driver controller power ready to be shut down at any time before performing manual operation.
Otherwise, you may get injured.



Prohibited

- Do not touch the actuator while it is running.
Otherwise, you may get injured.

! CAUTION



Obligatory

- Configure and check appropriate settings of parameter before operation.
Otherwise, unexpected operation may occur.

6-4

Zero return

- The zero return type varies depending on the driver controller. See the corresponding table below.
For THC, you can choose pressing zero return or sensor zero return in the parameter No.14 (Method of ORG) (→P.2-67).

Driver controller	Pressing zero point	Sensor zero point
TSC	○	×
TLC	○	×
THC	○	○

6-4-1

INC/ABS encoder

- TSC is an incremental encoder. If the control power of the driver controller is shut down, the present position of the actuator will be lost. Zero return operation is required each time.
- TLC/THC are absolute encoders. After performing zero return once, the present position is recognized by the battery provided with the driver controller even after the shutdown of the control power of the driver controller. You can also change the encoder type to incremental in the parameter No.47 (Encoder type) {TLC: (→ P.2-63), THC: (→ P.2-69)}.

Driver controller	INC	ABS
TSC	○	×
TLC	○	○
THC	○	○

Important

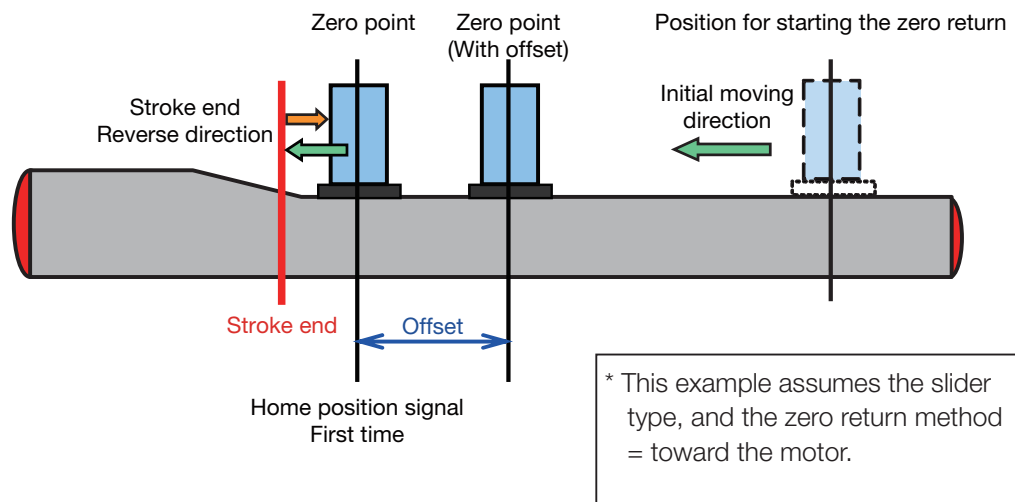
- Note that you may lose the present position and the zero point even when you are using an absolute encoder if:
 - ① Battery power is dead
 - ② Battery connector CN6 is removed and then inserted
 - ③ Battery cable is disconnected
 - ④ Encoder cable connector is removed and then inserted
 - ⑤ Encoder cable is disconnected
 - ⑥ Motor (encoder) has a fault
 - ⑦ Driver controller board has a fault

6. Operations

6-4-2 Pressing zero return

<Pressing zero return (without OT sensor)>

- Perform pressing zero return using the following procedure.
 - Be sure to configure the program settings before starting the operation.
- ① Click the "ON" button of "Servo" on the "Program" screen.
 - ② Click the "Zero return" button on the "Program" screen.
 - ③ The actuator (slider/cylinder) starts moving in the preset direction (toward the motor or the reverse of the motor).
 - * You cannot change the moving direction or speed.
 - * You can set the current during movement in the parameter No.12 (Current limit during zero return) **{TSC: (→P.2-56),TLC: (→P.2-61),THC: (→P.2-66)}**.
 - ④ When the actuator has reached the stroke end, it turns around and starts moving in the reverse direction.
 - ⑤ The position where the first zero point signal (included in the encoder/one output per rotation) is input after inversion will become the zero point.
 - ⑥ If you have configured the parameter No.6 (Zero-point offset) **{TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→P.2-66)}**, the position which is offset by the set value becomes the zero point.

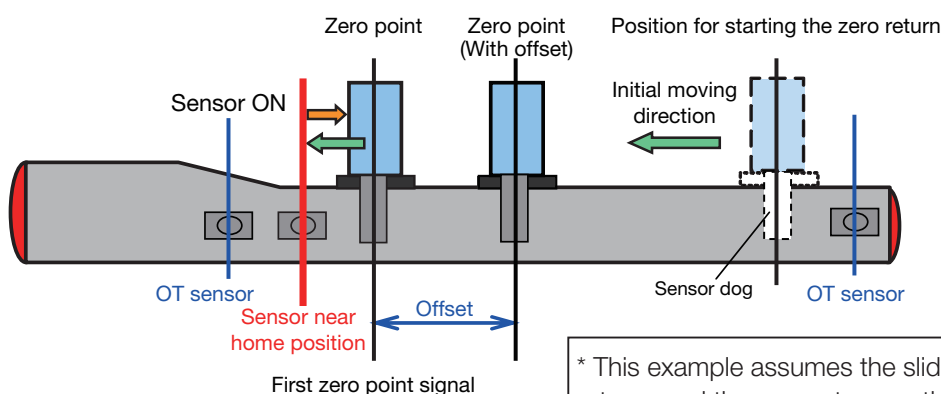


6. Operations

6-4-3 Sensor zero return

<Zero point sensor only; a sensor dog is located between the zero point sensor and the reverse motor side OT sensor>

- Perform sensor zero return using the following procedure.
 - Be sure to configure the program settings before starting the operation.
- ① Click the "ON" button of "Servo" on the "Program" screen.
 - ② Click the "Zero return" button on the "Program" screen.
 - ③ The actuator (slider/cylinder) starts moving in the preset direction (toward the motor or the reverse of the motor).
 - * You cannot change the moving direction or speed.
 - ④ When the near zero point sensor of the actuator turns ON, the actuator turns around and starts moving in the reverse direction.
 - * Type of a near zero point sensor varies depending on each actuator.
 - ⑤ The position where the first zero point signal (included in the encoder/one output per rotation) is input after the move direction was inverted and the near zero point sensor was turned OFF will become the zero point.
 - ⑥ If you have configured the parameter No.6 (Zero-point offset) **{TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→P.2-66)}**, the position which is offset by the set value becomes the zero point.

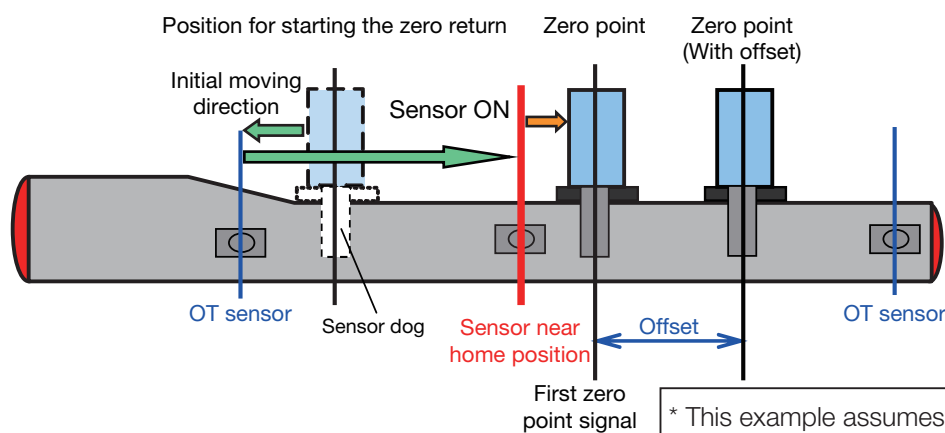


* This example assumes the slider type, and the zero return method = toward the motor.

6. Operations

<Sensor dog is located between the zero point sensor and the motor side OT sensor, or on the motor side OT sensor>

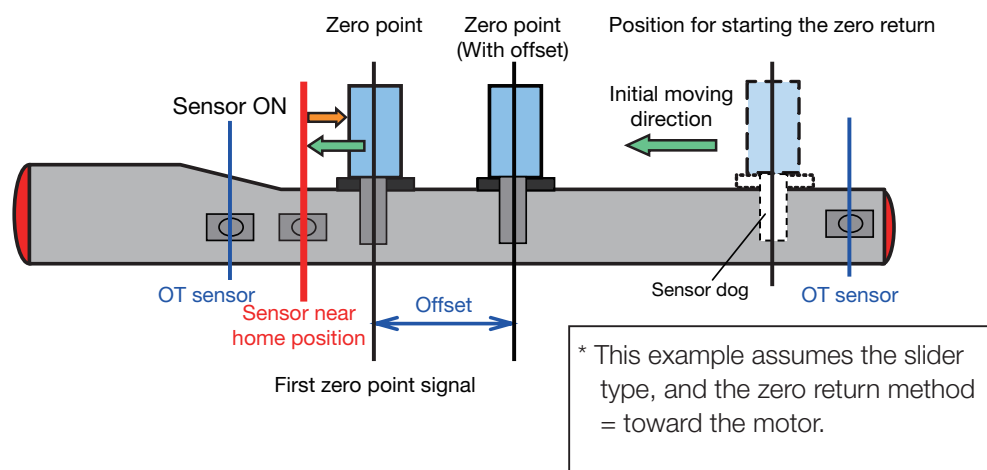
- Perform sensor zero return using the following procedure.
 - Be sure to configure the program settings before starting the operation.
- ① Click the "ON" button of "Servo" on the "Program" screen.
 - ② Click the "Zero return" button on the "Program" screen.
 - ③ The actuator (slider/cylinder) starts moving in the preset direction (toward the motor or the reverse of the motor).
 - * You cannot change the moving direction or speed.
 - ④ When the motor side OT sensor turns ON, the actuator turns around and starts moving in the reverse direction.
 - * Type of an OT sensor varies depending on each actuator.
 - ⑤ When the near zero point sensor of the actuator turns ON, the actuator continues to move in the traveling direction.
 - * Type of a near zero point sensor varies depending on each actuator.
 - ⑥ The position where the first zero point signal (included in the encoder/one output per rotation) is input after the near zero point sensor was turned OFF will become the zero point.
 - ⑦ If you have configured the parameter No.6 (Zero-point offset) **{TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→P.2-66)}**, the position which is offset by the set value becomes the zero point.



* This example assumes the slider type, and the zero return method = toward the motor.

<Sensor dog is located on the reverse motor side OT sensor>

- Perform sensor zero return using the following procedure.
 - Be sure to configure the program settings before starting the operation.
- ① Click the "ON" button of "Servo" on the "Program" screen.
 - ② Click the "Zero return" button on the "Program" screen.
 - ③ The actuator (slider/cylinder) starts moving in the preset direction (toward the motor or the reverse of the motor).
 - * You cannot change the moving direction or speed.
 - ④ When the near zero point sensor of the actuator turns ON, the actuator turns around and starts moving in the reverse direction.
 - * Type of a near zero point sensor varies depending on each actuator.
 - ⑤ The position where the first zero point signal (included in the encoder/one output per rotation) is input after the move direction was inverted and the near zero point sensor was turned OFF will become the zero point.
 - ⑥ If you have configured the parameter No.6 (Zero-point offset) **{TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→P.2-66)}**, the position which is offset by the set value becomes the zero point.

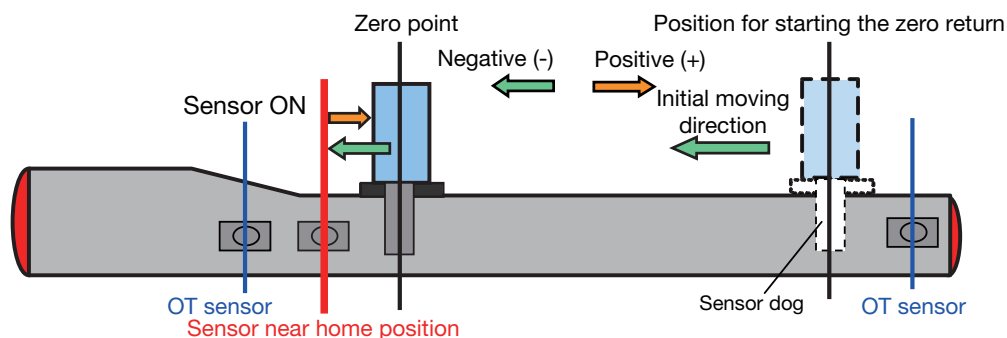


6. Operations

6-5

Positive/negative of the position and travel distance

- For definition of positive and negative in configuring the position and travel distance, the direction after the actuator's inversion because of the zero point sensor ON or at the stroke end in performing zero return is considered as positive (+) direction.



Note) If the zero return direction is reverse motor side, the positive (+) and negative (-) will be opposite of the figure above.

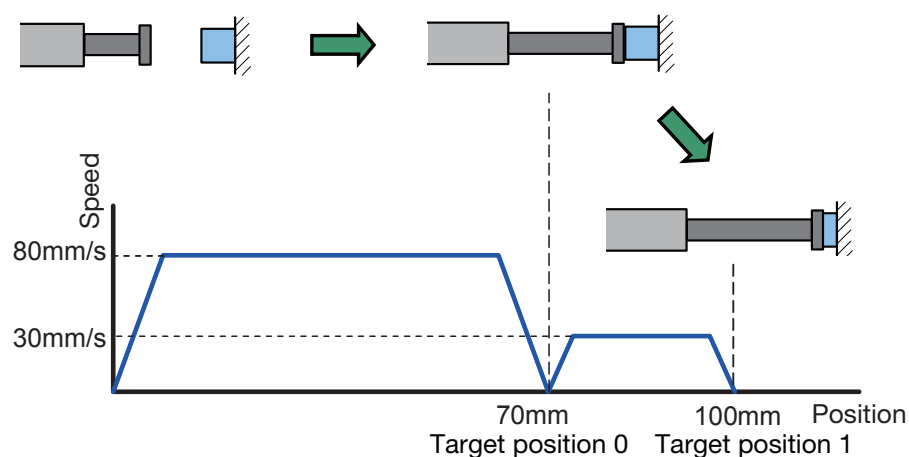
6-6

Positioning operation

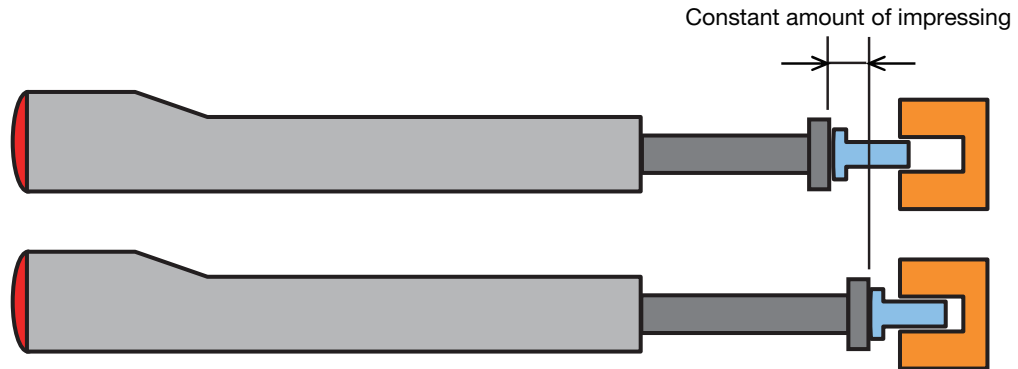
- You can perform this in all operation modes.
- When "Push (%)" is "0," positioning operation will be performed to move the actuator to the target "Position."

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	ACC (m/s ²)	DCC (m/s ²)	JUMP (No.)	Comment
0	ABS	70.00	80	3	3	1	Positioning operation 1
1	ABS	100.00	30	3	3	E	Positioning operation 2

Some of the setting fields are omitted.

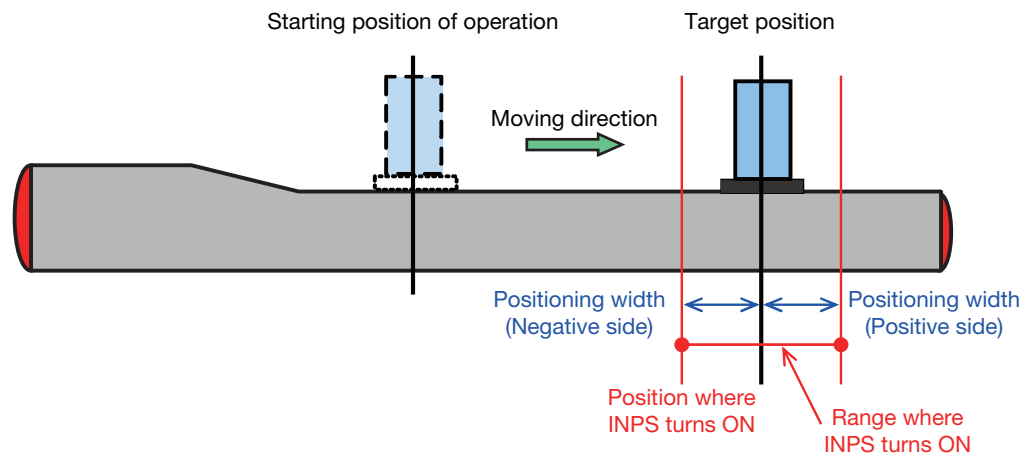


- If "Push (%)" is "0," you can also use this as pressing operation with the constant amount. Note that this is just a position control (impressing end position control), which is different from the pressing operation with torque control.



6-6-1 Signal for positioning completion

- When the actuator reaches the position which is the target "Position" minus "Pos Range," the signal for positioning completion "INPS" turns ON (negative side of the target position).
- Until the actuator passes the distance of "Pos Range" from the target "Position," the signal for positioning completion "INPS" remains turned ON (positive side of the target position).
- You can change the output method of "INPS" in the parameter No.37 (Positioning complete signal output system) {TSC: (→ P.2-59), TLC: (→ P.2-64), THC: (→ P.2-69)}.
- Operation mode 5 does not have "INPS" output.



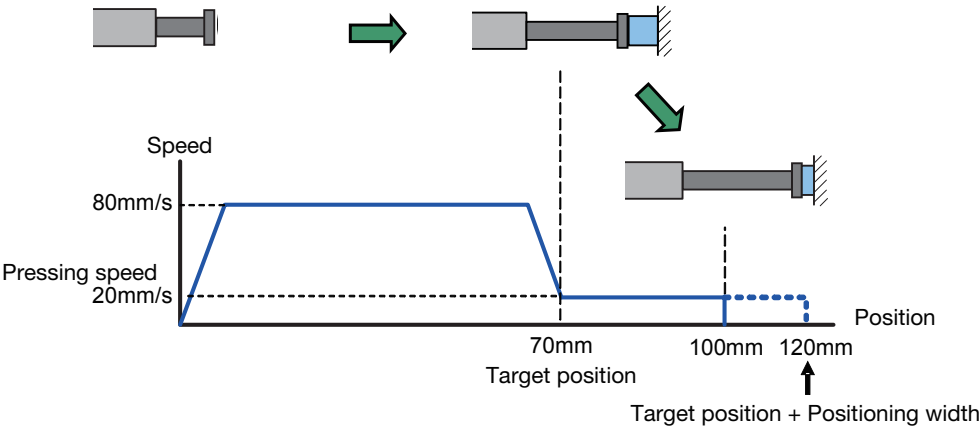
6. Operations

6-7 Pressing operation

- You can perform this in the operation mode 0, 2, 3, and 4.
- When "Push (%)" is other than "0," pressing operation will be performed to press the object with thrust limit (current limit).
- "Stop mode" for pressing operation is limited to **"Full servo."**

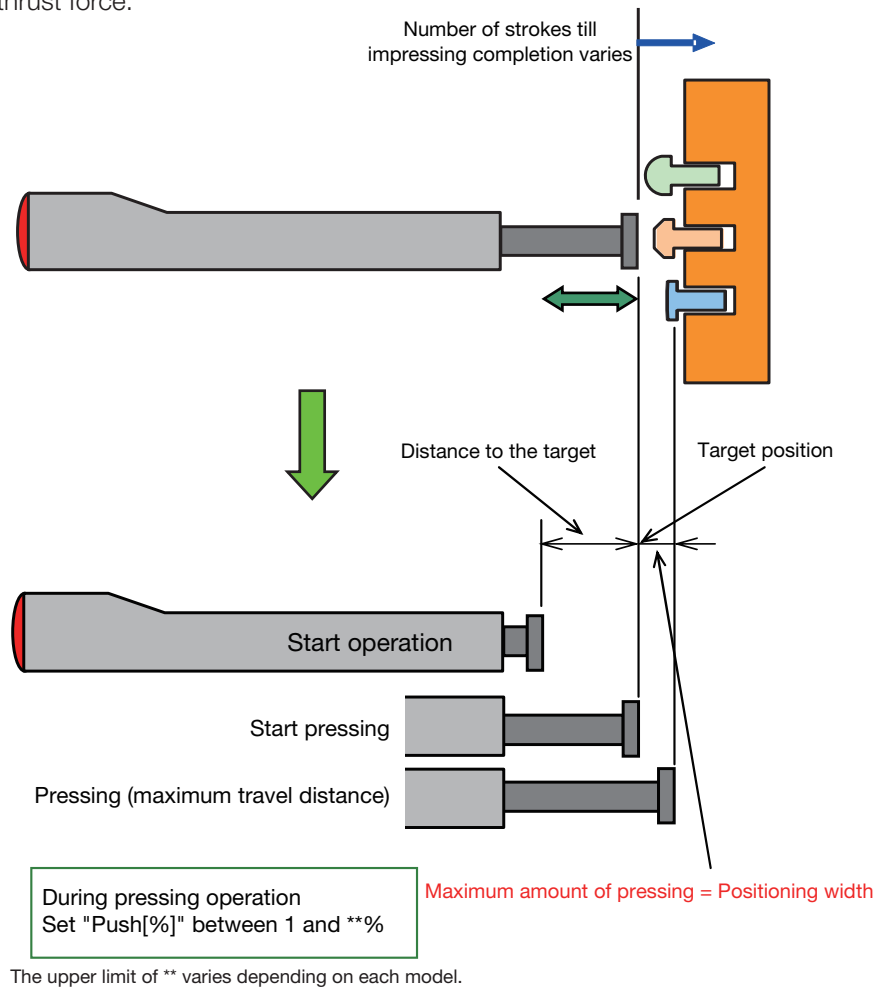
STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	Push (%)	Pos Range (mm)	JUMP (No.)	Comment
0	ABS	70.00	80	70	50.00	E	Pressing operation

Some of the setting fields are omitted.



6. Operations

- Even when the amount of impressing is not constant, you can perform pressing by controlling the thrust force.



6-7-1

Pressing operation settings

- The value configured at "Push (%)" represents the proportion of the current limit. The larger the set value results in the greater current flow and thus the larger pressing force.
- Configure the pressing speed in the parameter No.15 (Push speed) **{TSC: (→ P.2-57), TLC: (→ P.2-62), THC: (→ P.2-67)}**.

6-7-2

Sign of positioning range

- The sign of "Pos Range" varies depending on the positional relationship between the present position and the target position.
 - ① If the target position is located before the present position, "Pos Range" should be "+" (the sign can be omitted).
Example) If the present position is 50 and the target position is 100, "Pos Range" should be +30.
 - ② If the target position is located after the present position, "Pos Range" should be "-" (the sign cannot be omitted).
Example) If the present position is 100 and the target position is 50, "Pos Range" should be -30.
- If you specify an incorrect sign, the alarm code No.25 (Position data anomaly) **{TSC: (→ P.2-71), TLC: (→ P.2-72), THC: (→ P.2-73)}** will be generated.

6. Operations

6-7-3

Pressing operation determination

① Pressing complete

When the current configured in "Push (%)" continues for the (Push judgment time) **{TSC: (→P.2-56), TLC: (→P.2-61), THC: (→P.2-66)}** configured in the parameter No.7, the pressing is determined as "complete" and the signal for positioning completion "INPS" turns ON.

② Pressing failed (missed)

If pressing is not completed even after moving the distance configured in "Pos Range," the signal for positioning completion "INPS" does not turn ON.

Since the alarm signal will not be generated, the upper controller should consider the pressing as failed when the "MOVE" signal turns OFF without "INPS" turning ON after the estimated time has elapsed.

* "MOVE" signal exists only in the operation mode 1. Determination depends on the time in the mode 2, 3, and 4.

③ Moved after pressing complete

If the work moves toward the pressing direction after the pressing has completed, the actuator tracks it within "Pos Range." At this time, the signal for positioning completion "INPS" turns OFF, but it will turn ON again when all the conditions for determination are met.

④ Pushed back because of large reactive force

If the work is pushed back by large reactive force after the pressing has completed, it will be pushed back until the pressing force and the reactive force balance out. At this time, the signal for positioning completion "INPS" remains turned ON.

After the work is pushed back to the target position, the alarm code No.34 (Push & hold operation range over-error) **{TSC: (→P.2-71), TLC: (→P.2-72), THC: (→P.2-73)}** will be generated.

6-8

Torque determining operation

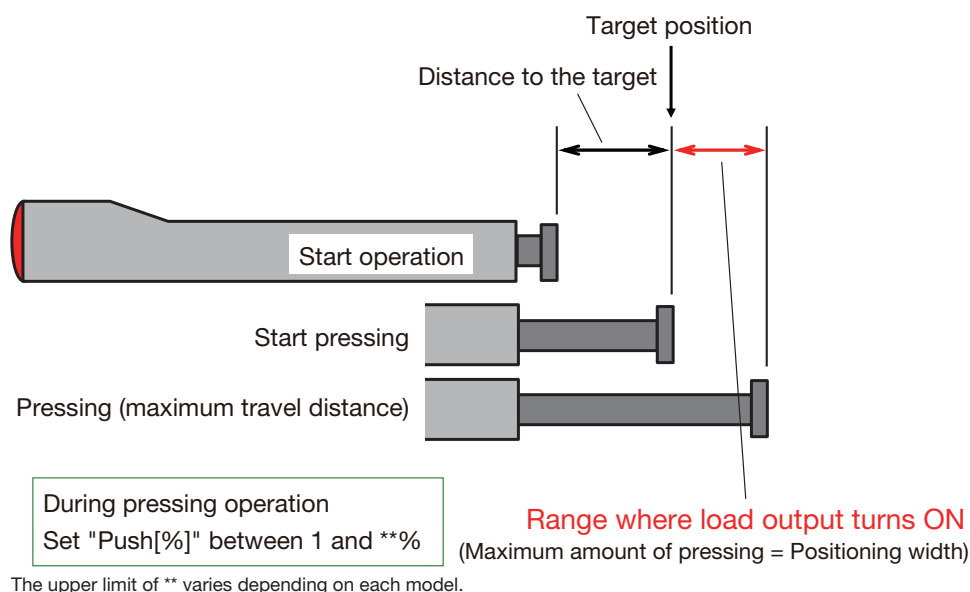
- You can perform this in the operation mode 0, 2, 3, and 4.
- You can set the current during "Pressing operation" as "Push (%)," and moreover you can set "Threshold" as a guide for torque determination.
- Set this "Threshold" in "Threshold (%)" on the program table as the proportion (%) of the output current.

6-8-1

If you do not configure the determination range

- When you set the parameter No.24 (Threshold judgment range) **{TSC: (→ P.2-58), TLC: (→ P.2-63), THC: (→ P.2-68)}** to "Invalid" the range from the start position of the pressing operation (target position) to the maximum amount of impressing (positioning range) becomes the determination range (the entire area of pressing operation).
- If the current greater than that configured in "Threshold (%)" continues for the period set in the parameter No.23 (Threshold judgment time) **(TSC: (→ P.2-57), TLC: (→ P.2-62), THC: (→ P.2-67))**, the torque level signal "TRQS" turns ON.
- If the current falls below "Threshold (%)" during determination, the corresponding time is deducted from the duration until that point and accumulation will be started after the current reaches "Threshold (%)" again.

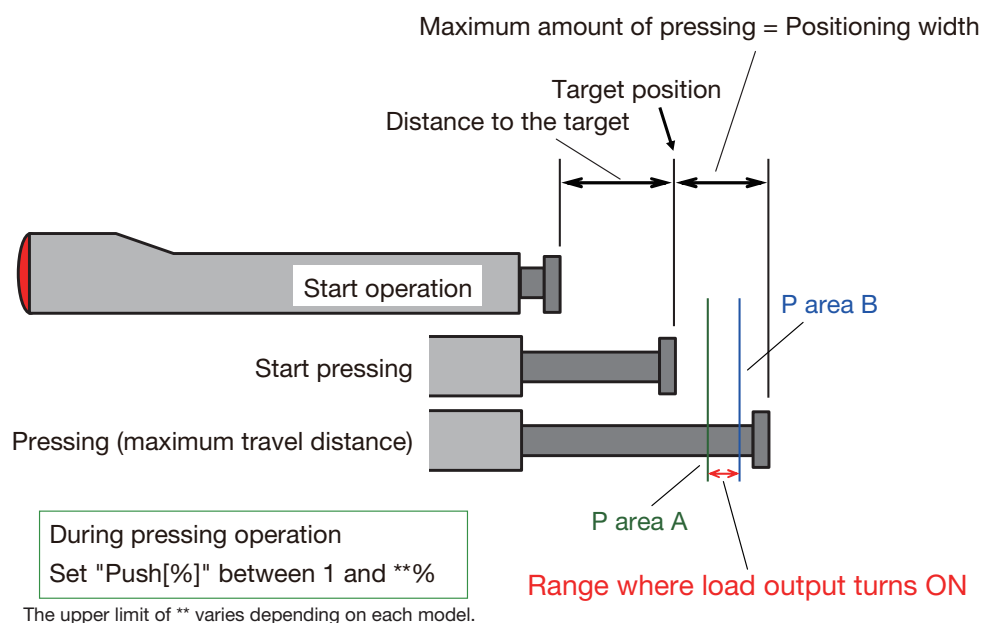
6. Operations



6-8-2

If you configure the determination range

- When you set the parameter No.24 (Threshold judgment range) **{TSC: (→ P.2-58), TLC: (→ P.2-63), THC: (→ P.2-68)}** to "Valid" the range between "P area A" and "P area B" on the program table becomes the determination range.
- Use the absolute coordinate system to input "P area A" and "P area B."
- If the current greater than that configured in "Threshold (%)" continues for the period set in the parameter No.23 (Threshold judgment time) **{TSC: (→ P.2-57), TLC: → P.2-62), THC: (→ P.2-67)}** in the determination range, the load output signal "LOAD" turns ON.
- If the current falls below "Threshold (%)" during determination, the corresponding time is deducted from the duration until that point and accumulation will be started after the current reaches the "Threshold" again.



6. Operations

6-9 Area determining operation

6-9-1 Area output "AREA"

- You can perform this in the operation mode 0, 4, and 5.
- When the actuator enters into the range configured in the parameter No.1 (Max. area) and No.2 (Min. area) {TSC: (→ P.2-56),TLC: (→ P.2-61),THC: (→ P.2-66)}, "AREA" output signal turns ON.
- "AREA" output signal will also be output during job and inching operations.

6-9-2 P area output signal "P AREA"

- You can perform this in the operation mode 0, 1, 2, 4, and 5.
- When the actuator enters into the range between "P area A (mm)" and "P area B (mm)" configured for the STEP No. being executed on the program table, "P AREA" output signal turns ON.

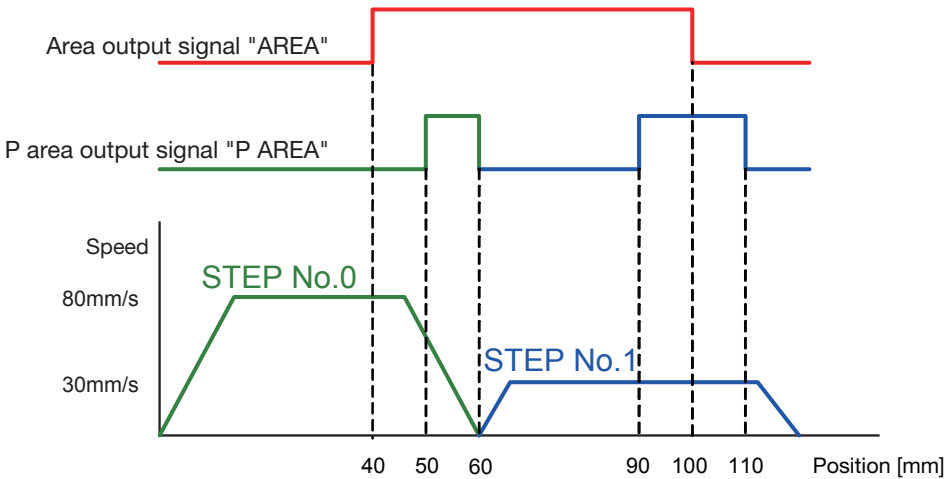
6-9-3 Difference of output signals

- "AREA" output signal is determined against all "STEPS."
- "P AREA" output signal is only determined at the time of execution of the "STEP No." row that is configured for.

No.	Parameter name	Set value
1	Max. area	100.00
2	Min. area	40.00

STEP No.	ABS / INC	Position (mm)	Speed (mm/s)	P area A (mm)	P area B (mm)	JUMP (No.)	Comment
0	ABS	60.00	80	50.00	70.00	1	STEP No.0 operation (green)
1	ABS	120.00	30	90.00	110.00	E	STEP No.1 operation (blue)

Some of the setting fields are omitted.



6. Operations

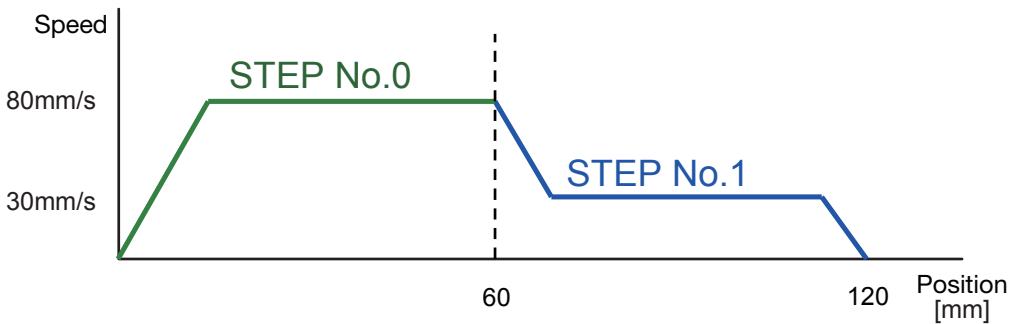
6-10 Speed switching

6-10-1 Speed switching

- This function is not available for operations from D-STEP (MANUAL mode). (The machine always pauses.) Perform this from the AUTO mode.
(For more information on the MANUAL and AUTO modes, see the instruction manual of each driver controller.)
- While moving, you can change the speed and continue the operation without pausing by issuing the execution command for the next program STEP No. (specify STEP No. STRT ON).
- If the execution command for the next program STEP No. is delayed, the operation continues after a pause.
- The acceleration and deceleration rate from the speed changing point to the next speed will be "ACC (m/s²)" for the next STEP.
Note that the rate will always be "ACC (m/s²)" even for deceleration operation.
- For STEP No. in which you will perform speed switching, set "E" to "JUMP (No.)."
- You can switch speed only in the operation mode 0, 2, and 3.

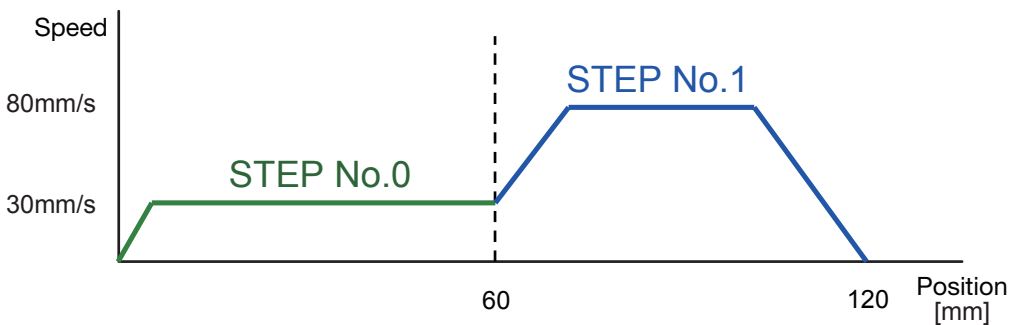
STEP No.	ABS / INC	Position [mm]	Speed [mm/s]	P area A [mm]	P area B [mm]	JUMP [No.]	Comment
0	ABS	60.00	80	50.00	70.00	E	STEP No.0 operation (green)
1	ABS	120.00	30	90.00	110.00	E	STEP No.1 operation (blue)

* Some of the setting fields are omitted.



STEP No.	ABS / INC	Position [mm]	Speed [mm/s]	P area A [mm]	P area B [mm]	JUMP [No.]	Comment
0	ABS	60.00	30	50.00	70.00	E	STEP No.0 operation (green)
1	ABS	120.00	80	90.00	110.00	E	STEP No.1 operation (blue)

* Some of the setting fields are omitted.



7-1 TSC parameters

7-1-1 TSC parameter: Actuator information

No.	Parameter name	Unit	Setting range	Default value
1	Max. area	mm	-9999.99 to 9999.99	9999.99
	Description	Sets the + side (MAX side) of the area where the AREA signal (OUT8) turns ON.		
2	Min. area	mm	-9999.99 to 9999.99	-9999.99
	Description	Sets the - side (MIN side) of the area where the AREA signal (OUT8) turns ON.		
3	Software limit +	mm	0.00 to 9999.99	9999.99
	Description	Sets the + side (MAX side) of the actuator-movable area.		
4	Software limit -	mm	-9999.99 to 0.00	-9999.99
	Description	Sets the - side (MIN side) of the actuator-movable area.		
6	Zero-point offset	mm	-9999.99 to 9999.99	0.00
	Description	Enables the zero point of absolute coordinate system to be set in an arbitrary position.		

7-1-2 TSC parameter: Actuator operation settings

No.	Parameter name	Unit	Setting range	Default value
7	Push judgment time	ms	1 to 99999	100
	Description	Sets the time from when the actuator hits a work in the pressing operation until when the operation is judged to be completed.		
8	Default speed	mm/s	1 to 1000	100
	Description	Inputs the default value of "Speed" entered when double-clicking an arbitrary row of the program table.		
9	Default acceleration/deceleration	m/s ²	1 to 100	3
	Description	Inputs the default values of "ACC" and "DCC" entered when double-clicking an arbitrary row of the program table. See "5-4 Acceleration/deceleration(→P.2-34)" for details.		
10	Initial value of positioning completion width	mm	0.00 to 999.99	0.02
	Description	Inputs the default value of "Pos Range" entered when double-clicking an arbitrary row of the program table.		
11	Current limit on stop status	%	1 to 70	70
	Description	Sets the current applied to the motor when the actuator is in stop status. Increasing the value increases the stoppage holding torque (settable to the linear), but also increases the heat generation and the electric power usage. The current value tailored to the standard specification of the actuator is set before shipment.		
12	Current limit on zero return	%	1 to 100	80
	Description	Sets the current applied to the motor when the actuator returns to zero point. Increasing the value increases the zero return torque (settable to the linear), but also increases the heat generation and the electric power usage. The current value tailored to the standard specification of the actuator is set before shipment.		

No.	Parameter name	Unit	Setting range	Default value
13	Move command method	[Select]	Level/Edge	Level
	Description	Selects the method of inputting move command (ST 0 to 6) (pin. 3 to 9) for operation mode 4. Level: The movement is started when turning the input signal ON and is stopped when turning it OFF on the way. Edge: The movement is started at the rising edge of the input signal and is not stopped even when turning it OFF on the way.		
15	Pressing speed	mm/s	1 to 20	10
	Description	Defines the pressing speed after reaching the target position during pressing operation. A default value tailored to the actuator characteristics is set before shipment.		
*16	Jog speed	mm/s	1 to 250	10
	Description	D-STEP: Sets the jog speed on the PROGRAM screen. For the speed setting by I/O input, see No. 21.		
17	Auto servo OFF time 1	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO1." See "5-5-2 Auto servo OFF 1 (ASO 1) (→P.2-35)." for details.		
18	Auto servo OFF time 2	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO2." (See "5-5-3 Auto servo OFF 2 (ASO 2) (→P.2-36)" for details.		
19	Auto servo OFF time 3	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO3." (See "5-5-4 Auto servo OFF 3 (ASO 3) (→P.2-36)" for details.		
*20	Speed override	%	1 to 100	100
	Description	For protection against the danger in trial operation, this is used when you want to operate the actuator at a low speed. In the operation, it is possible to multiply the movement speed in the "Speed" field of the program table by the ratio of the value set here.		
*21	External input jog speed	mm/s	1 to 250	10
	Description	Sets the speed in jog operation when external input teaching by I/O (Operation mode 1) is selected. For the speed setting by D-STEP, see No. 16.		
*22	External input inching distance	mm	1 to 5000	10
	Description	Sets the movement distance by inching operation when external input teaching by I/O (Operation mode 1) is selected. For the speed setting by D-STEP, see No. 31.		
23	Threshold judgment time	ms	1 to 9999	10
	Description	When performing the torque determination in pressing operation, this sets the time after reaching the threshold until the condition is judged to be met.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

No.	Parameter name	Unit	Setting range	Default value
24	Threshold judgment range	[Select]	Invalid/Valid	Invalid
	Description	When performing the torque determination in pressing operation, Valid: Sets the judgment range. Invalid: Does not set the judgment range.		
25	Default standstill mode	[Select]	Invalid/Automatic turn off 1 to 3/ Full servo	Invalid
	Description	Sets the default value of "Stop mode" after reaching the target position of each STEP. Selecting an appropriate mode reduces heat generation and power usage. Invalid : The servo turns OFF but No. 11 current continues to flow. Automatic turn off 1: After the elapse of the time in No. 17, the servo turns OFF and the flowing current becomes 0. Automatic turn off 2: After the elapse of the time in No. 18, the servo turns OFF and the flowing current becomes 0. Automatic turn off 3: After the elapse of the time in No. 19, the servo turns OFF and the flowing current becomes 0. Full servo: The servo is always turned ON even when in stop status. (The current increases or decreases depending on the external force) (See "5-5 Stop mode(→P.2-35)" for details)		
26	Ball screw lead length	mm	0.0 to 99.9	Depends on models
	Description	Sets the length of ball screw lead. A value tailored to the actuator is set before shipment.		
28	Selection of current in in-vain stop status	[Select]	Current limit on stop status/Limit for pressing	Current limit on stop status
	Description	Sets the current limit after the pressing operation being in vain. Current limit on stop status: Current set in No. 11 Limit for pressing: Current set in "Push (%)"		
29	Maximum speed	mm/s	1 to 1000	Depends on models
	Description	Sets the maximum speed settable in the program table.		
30	Allowable position deviation	mm	0.00 to 999.99	Depends on models
	Description	Sets the value to output alarm code No. 32 (Excessive position error (deviation)) (→P.2-71).		
*31	Inching distance	mm	0.1 to 200.0	10.0
	Description	D-STEP: Sets the inching distance on the PROGRAM screen. For the distance setting by I/O input, see No. 22.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

7-1-3 TSC parameter: External interface

No.	Parameter name	Unit	Setting range	Default value
33	Selection of invalid for pause input	[Select]	Invalid/Valid	Valid
	Description	The "PAUSE" input of the driver controller is configured to be N.C. contact from the viewpoint of fail safe. Therefore, this should be turned ON (shorted to 0V) during the operation. However, if it is not used, setting "Invalid" does not require the contact to turn ON. Valid: "PAUSE" input (pin. 16) will be valid. Invalid: "PAUSE" input (pin. 16) will be invalid.		
*34	Communication speed	[Select]	38400/57600/115200	115200
	Description	Sets the speed for communication between PC and TDO via RS-485. The change will be valid by turning on the power again.		
35	Selection of servo ON input method	[Select]	External input/Always ON	External input
	Description	Selects the method to turn the servo ON. External input: Turning on the "SV-ON" (pin. 18) input turns the servo ON. Always ON: Turning on the power turns the servo ON.		
36	Operation mode selection	[Select]	Type 0/1/2/3/4/5	Type 0
	Description	Selects the driver controller operation mode. See (→P.2-28).		
37	Positioning completion signal output method	[Select]	PEND/INP	INP
	Description	Selects the output method for positioning completion signal "INPS" (pin. 30). When the servo is OFF, this is unconditionally turned OFF regardless of the current position. PEND: Servo ON → Once "INPS" is turned ON, this remains in ON status even when the position is out of "Pos Range." INP: Servo On → Turns ON only when the position is within "Pos Range."		
38	MANU input prohibition	[Select]	Invalid/Valid	Invalid
	Description	Selects the operation when the driver controller is in AUTO mode and the "MANU" (pin. 14) input turns ON. Invalid: The driver controller will be in MANUAL mode. Valid: The driver controller remains in AUTO mode.		
*39	Comment on axis	— —	16 one-byte alphanumeric characters	-----
	Description	Enter any comment on the axis displayed on the Connect Start and PROGRAM screens.		
48	TDO enable function	[Select]	Invalid/Valid	Valid
	Description	When TDO is connected to the driver controller, this selects the TDO enable switch operation. Valid: The enable switch will be valid. (Turning it OFF stops the operation) Invalid: The enable switch will be invalid. (Even when turning it OFF, the operation does not stop)		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

Note: [- -] in the "Unit" field is any character input specified in "Setting range."

7. Parameters

7-1-4 TSC parameter: Servo gain

No.	Parameter name	Unit	Setting range	Default value
*40	Position gain	1/s	1 to 100	Depends on models
	Description	This is a parameter to determine the responsiveness of position control loop. Increasing the setting value improves the follow-up performance to the position command but is likely to cause the overshoot.		
*41	Speed loop proportional gain	Hz	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of speed control loop. As the load inertia increases, the setting value should be increased. Increasing the value improves the follow-up performance to the speed command (the servo rigidity is enhanced), but is likely to cause the overshoot and oscillation, resulting in mechanical vibration.		
*42	Speed loop integral gain	0.01ms	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of speed control loop. Increasing the value reduces the responsiveness to the speed command and the repulsion force against the load change. Decreasing the value increases the responsiveness and repulsion force, but excessive decreasing is likely to cause the overshoot and oscillation, resulting in mechanical vibration.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

7-2 TLC parameters

7-2-1 TLC parameter: Actuator information

No.	Parameter name	Unit	Setting range	Default value
1	Max. area	mm	-9999.99 to 9999.99	9999.99
	Description	Sets the + side (MAX side) of the area where the AREA signal (OUT8) turns ON.		
2	Min. area	mm	-9999.99 to 9999.99	-9999.99
	Description	Sets the - side (MIN side) of the area where the AREA signal (OUT8) turns ON.		
3	Software limit +	mm	0.00 to 9999.99	9999.99
	Description	Sets the + side (MAX side) of the actuator-movable area.		
4	Software limit -	mm	-9999.99 to 0.00	-9999.99
	Description	Sets the - side (MIN side) of the actuator-movable area.		
6	Zero-point offset	mm	-9999.99 to 9999.99	0.00
	Description	Enables the zero point of absolute coordinate system to be set in an arbitrary position.		

7-2-2 TLC parameter: Actuator operation settings

No.	Parameter name	Unit	Setting range	Default value
7	Push judgment time	ms	1 to 99999	100
	Description	Sets the time from when the actuator hits a work in the pressing operation until when the operation is judged to be completed.		
8	Default speed	mm/s	1 to 9999	100
	Description	Inputs the default value of "Speed" entered when double-clicking an arbitrary row of the program table.		
9	Default acceleration/deceleration	m/s ²	1.0 to 99.9	Depends on models
	Description	Inputs the default values of "ACC" and "DCC" entered when double-clicking an arbitrary row of the program table. See "5-4 Acceleration/deceleration(→P.2-34)" for details.		
10	Initial value of positioning completion width	mm	0.01 to 999.99	Depends on models
	Description	Inputs the default value of "Pos Range" entered when double-clicking an arbitrary row of the program table.		
11	Current limit on stop status	%	1 to 70	70
	Description	Sets the current applied to the motor when the actuator is in stop status.		
12	Current limit on zero return	%	1 to Depends on models	Depends on models
	Description	Sets the current applied to the motor when the actuator returns to zero point. Increasing the value increases the zero return torque.		

7. Parameters

2. How to Use This Product

No.	Parameter name	Unit	Setting range	Default value
13	Move command method	[Select]	Level/Edge	Level
	Description	Selects the method of inputting move command (ST 0 to 6) (pin. 3 to 9) for operation mode 4. Level: The movement is started when turning the input signal ON and is stopped when turning it OFF on the way. Edge: The movement is started at the rising edge of the input signal and is not stopped even when turning it OFF on the way.		
15	Pressing speed	mm/s	1 to 20	10
	Description	Defines the pressing speed after reaching the target position during pressing operation. A default value tailored to the actuator characteristics is set before shipment.		
*16	Jog speed	mm/s	1 to 250	10
	Description	D-STEP: Sets the jog speed on the PROGRAM screen. For the speed setting by I/O input, see No. 21.		
17	Auto servo OFF time 1	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO1." (See "5-5-2 Auto servo OFF 1 (ASO 1) (→P.2-35)" for details.)		
18	Auto servo OFF time 2	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO2." (See "5-5-3 Auto servo OFF 2 (ASO 2) (→P.2-36)" for details.)		
19	Auto servo OFF time 3	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO3." (See "5-5-4 Auto servo OFF 3 (ASO 3) (→P.2-36)" for details.)		
*20	Speed override	%	1 to 100	100
	Description	For protection against the danger in trial operation, this is used when you want to operate the actuator at a low speed. In the operation, it is possible to multiply the movement speed in the "Speed" field of the program table by the ratio of the value set here.		
*21	External input jog speed	mm/s	1 to 250	10
	Description	Sets the speed in jog operation when external input teaching by I/O (Operation mode 1) is selected. For the speed setting by D-STEP, see No. 16.		
*22	External input inching distance	mm	0.000 to 5000.000	1.000
	Description	Sets the movement distance by inching operation when external input teaching by I/O (Operation mode 1) is selected. For the speed setting by D-STEP, see No. 31.		
23	Threshold judgment time	ms	1 to 9999	10
	Description	When performing the torque determination in pressing operation, this sets the time after reaching the threshold until the condition is judged to be met.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

7. Parameters

2. How to Use This Product

No.	Parameter name	Unit	Setting range	Default value
24	Threshold judgment range	[Select]	Invalid/Valid	Invalid
	Description	When performing the torque determination in pressing operation, Valid: Sets the judgment range. Invalid: Does not set the judgment range.		
25	Default standstill mode	[Select]	Invalid/Automatic turn off 1 to 3/ Full servo	Full servo
	Description	Sets the default value of "Stop mode" after reaching the target position of each STEP. Selecting an appropriate mode reduces heat generation and power usage. Invalid : The servo turns OFF but No. 11 current continues to flow. Automatic turn off 1: After the elapse of the time in No. 17, the servo turns OFF and the flowing current becomes 0. Automatic turn off 2: After the elapse of the time in No. 18, the servo turns OFF and the flowing current becomes 0. Automatic turn off 3: After the elapse of the time in No. 19, the servo turns OFF and the flowing current becomes 0. Full servo: The servo is always turned ON even when in stop status. (The current increases or decreases depending on the external force) (See "5-5 Stop mode(→P.2-35)" for details)		
26	Ball screw lead length	mm	0.000 to 999.999	Depends on models
	Description	Sets the length of ball screw lead. A value tailored to the actuator is set before shipment.		
28	Selection of current in in-vain stop status	[Select]	Current limit on stop status/Limit for pressing	Current limit on stop status
	Description	Sets the current limit after the pressing operation being in vain. Current limit on stop status: Current set in No. 11 Limit for pressing: Current set in "Push (%)"		
29	Maximum speed	mm/s	1 to 9999	Depends on models
	Description	Sets the maximum speed settable in the program table.		
30	Allowable position deviation	mm	0.00 to 999.99	Depends on models
	Description	Sets the value to output alarm code No. 32 (Excessive position error (deviation)) (→P.2-72).		
*31	Inching distance	mm	0.000 to 5000.000	10.0
	Description	D-STEP: Sets the inching distance on the PROGRAM screen. For the distance setting by I/O input, see No. 22.		
43	Reduction ratio numerator	-	1 to 999	Depends on models
	Description	The numerator of the reduction ratio		
44	Reduction ratio denominator	-	1 to 999	Depends on models
	Description	The denominator of the reduction ratio		
47	Encoder type	[Select]	Incremental/Absolute	Absolute
	Description	Sets the actuator encoder type. Incremental: When the control power turns OFF, the current position will be lost. In this case, zero return is required. This is selected when the battery is dead or is not used. Absolute: When the control power turns OFF, the current position will not be lost.		
119	Load inertia ratio	-	0.000 to 100.000	Depends on models
	Description	Sets inertia ratio between the motor and load. Basically, this is not need to be changed.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

7-2-3 TLC parameter: External interface

No.	Parameter name	Unit	Setting range	Default value
33	Selection of invalid for pause input	[Select]	Invalid/Valid	Valid
	Description	The "PAUSE" input of the driver controller is configured to be N.C. contact from the viewpoint of fail safe. Therefore, this should be turned ON (shorted to 0V) during the operation. However, if it is not used, setting "Invalid" does not require the contact to turn ON. Valid: "PAUSE" input (pin. 16) will be valid. Invalid: "PAUSE" input (pin. 16) will be invalid.		
*34	Communication speed	[Select]	38400/57600/115200	115200
	Description	Sets the speed for communication between PC and TDO via RS-485. The change will be valid by turning on the power again.		
35	Selection of servo ON input method	[Select]	External input/Always ON	External input
	Description	Selects the method to turn the servo ON. External input: Turning on the "SV-ON" (pin. 18) input turns the servo ON. Always ON: Turning on the power turns the servo ON.		
36	Operation mode selection	[Select]	Type 0/1/2/3/4/5	Type 0
	Description	Selects the driver controller operation mode. See (→P.2-286).		
37	Positioning completion signal output method	[Select]	PEND/INP	INP
	Description	Selects the output method for positioning completion signal "INPS" (pin. 30). When the servo is OFF, this is unconditionally turned OFF regardless of the current position. PEND: Servo ON → Once "INPS" is turned ON, this remains in ON status even when the position is out of "Pos Range." INP: Servo On → Turns ON only when the position is within "Pos Range."		
38	MANU input prohibition	[Select]	Invalid/Valid	Invalid
	Description	Selects the operation when the driver controller is in AUTO mode and the "MANU" (pin. 14) input turns ON. Invalid: The driver controller will be in MANUAL mode. Valid: The driver controller remains in AUTO mode.		
*39	Comment on axis	--	16 one-byte alphanumeric characters	-----
	Description	Enter any comment on the axis displayed on the Connect Start and PROGRAM screens.		
48	TDO enable function	[Select]	Invalid/Valid	Valid
	Description	When TDO is connected to the driver controller, this selects the TDO enable switch operation. Valid: The enable switch will be valid. (Turning it OFF stops the operation) Invalid: The enable switch will be invalid. (Even when turning it OFF, the operation does not stop)		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

Note: [- -] in the "Unit" field is any character input specified in "Setting range."

7. Parameters

7-2-4 TLC parameter: Servo gain

No.	Parameter name	Unit	Setting range	Default value
*40	Position gain	1/s	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of position control loop. Increasing the setting value improves the follow-up performance to the position command but is likely to cause the overshoot.		
*41	Speed loop proportional gain	Hz	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of speed control loop. As the load inertia increases, the setting value should be increased. Increasing the value improves the follow-up performance to the speed command (the servo rigidity is enhanced), but is likely to cause the overshoot and oscillation, resulting in mechanical vibration.		
*42	Speed loop integral gain	ms	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of speed control loop. Increasing the value reduces the responsiveness to the speed command and the repulsion force against the load change. Decreasing the value increases the responsiveness and repulsion force, but excessive decreasing is likely to cause the overshoot and oscillation, resulting in mechanical vibration.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

7-3 THC parameters

7-3-1 THC parameter: Actuator information

No.	Parameter name	Unit	Setting range	Default value
1	Max. area	mm	-9999.99 to 9999.99	9999.99
	Description	Sets the + side (MAX side) of the area where the AREA signal (OUT8) turns ON.		
2	Min. area	mm	-9999.99 to 9999.99	-9999.99
	Description	Sets the - side (MIN side) of the area where the AREA signal (OUT8) turns ON.		
3	Software limit +	mm	0.00 to 9999.99	9999.99
	Description	Sets the + side (MAX side) of the actuator-movable area.		
4	Software limit -	mm	-9999.99 to 0.00	-9999.99
	Description	Sets the - side (MIN side) of the actuator-movable area.		
6	Zero-point offset	mm	-9999.99 to 9999.99	0.00
	Description	Enables the zero point of absolute coordinate system to be set in an arbitrary position.		

7-3-2 THC parameter: Actuator operation settings

No.	Parameter name	Unit	Setting range	Default value
7	Push judgment time	ms	1 to 99999	100
	Description	Sets the time from when the actuator hits a work in the pressing operation until when the operation is judged to be completed.		
8	Default speed	mm/s	1 to 9999	100
	Description	Inputs the default value of "Speed" entered when double-clicking an arbitrary row of the program table.		
9	Default acceleration/deceleration	m/s ²	1.0 to 99.9	Depends on models
	Description	Inputs the default values of "ACC" and "DCC" entered when double-clicking an arbitrary row of the program table. See "5-4 Acceleration/deceleration(→P.2-34)" for details.		
10	Initial value of positioning completion width	mm	0.01 to 999.99	Depends on models
	Description	Inputs the default value of "Pos Range" entered when double-clicking an arbitrary row of the program table.		
11	Current limit on stop status	%	1 to 70	70
	Description	Sets the current applied to the motor when the actuator is in stop status. Increasing the value increases the stoppage holding torque (settable to the linear), but also increases the heat generation and the electric power usage. The current value tailored to the standard specification of the actuator is set before shipment.		
12	Current limit on zero return	%	1 to Depends on models	Depends on models
	Description	Sets the current applied to the motor when the actuator returns to zero point. Increasing the value increases the zero return torque (settable to the linear), but also increases the heat generation and the electric power usage. The current value tailored to the standard specification of the actuator is set before shipment.		

7. Parameters

2. How to Use This Product

No.	Parameter name	Unit	Setting range	Default value
13	Move command method	[Select]	Level/Edge	Level
	Description	Selects the method of inputting move command (ST 0 to 6) (pin. 3 to 9) for operation mode 4. Level: The movement is started when turning the input signal ON and is stopped when turning it OFF on the way. Edge: The movement is started at the rising edge of the input signal and is not stopped even when turning it OFF on the way.		
14	Zero return method	[Select]	Pressing/Sensor	Depends on models
	Description	Sets the zero return method for the actuator. Pressing: When it moves in a preset direction and reaches the stroke end, it turns around and treats the position where the first zero point signal (included in the encoder/one output per rotation) is input as the zero point. Sensor: When it moves in a predetermined direction and the zero-point sensor turns ON, it turns around and treats the position where the first zero point signal (included in the encoder/one output per rotation) is input as the zero point.		
15	Pressing speed	mm/s	1 to 20	10
	Description	Defines the pressing speed after reaching the target position during pressing operation. A default value tailored to the actuator characteristics is set before shipment.		
*16	Jog speed	mm/s	1 to 250	10
	Description	D-STEP: Sets the jog speed on the PROGRAM screen. For the speed setting by I/O input, see No. 21.		
17	Auto servo OFF time 1	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO1." (See "5-5-2 Auto servo OFF 1 (ASO 1) (→P.2-35)" for details.)		
18	Auto servo OFF time 2	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO2." (See "5-5-3 Auto servo OFF 2 (ASO 2) (→P.2-36)" for details.)		
19	Auto servo OFF time 3	s	0 to 9999	9999
	Description	Sets the time after completing the positioning until the servo turns OFF when "Stop mode" of the program table is "ASO3." (See "5-5-4 Auto servo OFF 3 (ASO 3) (→P.2-36)" for details.)		
*20	Speed override	%	1 to 100	100
	Description	For protection against the danger in trial operation, this is used when you want to operate the actuator at a low speed. In the operation, it is possible to multiply the movement speed in the "Speed" field of the program table by the ratio of the value set here.		
*21	External input jog speed	mm/s	1 to 250	10
	Description	Sets the speed in jog operation when external input teaching by I/O (Operation mode 1) is selected. For the speed setting by D-STEP, see No. 16.		
*22	External input inching distance	mm	0.000 to 5000.000	1.000
	Description	Sets the movement distance by inching operation when external input teaching by I/O (Operation mode 1) is selected. For the speed setting by D-STEP, see No. 31.		
23	Threshold judgment time	ms	1 to 9999	10
	Description	When performing the torque determination in pressing operation, this sets the time after reaching the threshold until the condition is judged to be met.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

7. Parameters

2. How to Use This Product

No.	Parameter name	Unit	Setting range	Default value
24	Threshold judgment range	[Select]	Invalid/Valid	Invalid
	Description	When performing the torque determination in pressing operation, Valid: Sets the judgment range. Invalid: Does not set the judgment range.		
25	Default standstill mode	[Select]	Invalid/Automatic turn off 1 to 3/ Full servo	Full servo
	Description	Sets the default value of "Stop mode" after reaching the target position of each STEP. Selecting an appropriate mode reduces heat generation and power usage. Invalid : Same as Full servo. Automatic turn off 1: After the elapse of the time in No. 17, the servo turns OFF and the flowing current becomes 0. Automatic turn off 2: After the elapse of the time in No. 18, the servo turns OFF and the flowing current becomes 0. Automatic turn off 3: After the elapse of the time in No. 19, the servo turns OFF and the flowing current becomes 0. Full servo: The servo is always turned ON even when in stop status. (The current increases or decreases depending on the external force) (See " 5-5 Stop mode(→P.2-35) " for details)		
26	Ball screw lead length	mm	0.000 to 999.999	Depends on models
	Description	Sets the length of ball screw lead. A value tailored to the actuator is set before shipment.		
27	OT sensor logic	[Select]	Positive logic/Negative logic	Depends on models
	Description	Sets the contact method of OT sensors. If you do not use OT sensors, select Positive logic. Positive logic: N.O. contact (normally open contact point) Negative logic: N.C. contact (normally closed contact point)		
28	Selection of current in in-vain stop status	[Select]	Current limit on stop status/Limit for pressing	Current limit on stop status
	Description	Sets the current limit after the pressing operation being in vain. Current limit on stop status: Current set in No. 11 Limit for pressing: Current set in "Push (%)"		
29	Maximum speed	mm/s	1 to 9999	Depends on models
	Description	Sets the maximum speed settable in the program table.		
30	Allowable position deviation	mm	0.00 to 999.99	Depends on models
	Description	Sets the value to output alarm code No. 32 (Excessive position error (deviation)) (→P.2-73).		
*31	Inching distance	mm	0.000 to 5000.000	1.000
	Description	D-STEP: Sets the inching distance on the PROGRAM screen. For the distance setting by I/O input, see No. 22.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

7. Parameters

43	Reduction ratio numerator	-	1 to 999	Depends on models
	Description	The numerator of the reduction ratio		
44	Reduction ratio denominator	-	1 to 999	Depends on models
	Description	The denominator of the reduction ratio		
47	Encoder type	[Select]	Incremental/Absolute	Absolute
	Description	Sets the actuator encoder type. Incremental: When the control power turns OFF, the current position will be lost. In this case, zero return is required. This is selected when the battery is dead or is not used. Absolute: When the control power turns OFF, the current position will not be lost.		
49	Selection of EMG stop circuit function	[Select]	Valid/Invalid	Valid
	Description	Enables the valid/invalid setting of EMG stop circuit input (CN7 and TDO). Invalid: The EMG stop circuit (CN7 and TDO) will be invalid. Valid: The EMG stop circuit (CN7 and TDO) will be valid.		
119	Load inertia ratio	-	0.000 to 100.000	Depends on models
	Description	Sets inertia ratio between the motor and load. Basically, this is not need to be changed.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

7-3-3

THC parameter: External interface

No.	Parameter name	Unit	Setting range	Default value
33	Selection of invalid for pause input	[Select]	Invalid/Valid	Valid
	Description	The "PAUSE" input of the driver controller is configured to be N.C. contact from the viewpoint of fail safe. Therefore, this should be turned ON (shorted to 0V) during the operation. However, if it is not used, setting "Invalid" does not require the contact to turn ON. Valid: "PAUSE" input (pin. 16) will be valid. Invalid: "PAUSE" input (pin. 16) will be invalid.		
*34	Communication speed	[Select]	38400/57600/115200	115200
	Description	Sets the speed for communication between PC and TDO via RS-485. The change will be valid by turning on the power again.		
35	Selection of servo ON input method	[Select]	External input/Always ON	External input
	Description	Selects the method to turn the servo ON. External input: Turning on the "SV-ON" (pin. 18) input turns the servo ON. Always ON: Turning on the power turns the servo ON.		
36	Operation mode selection	[Select]	Type 0/1/2/3/4/5	Type 0
	Description	Selects the driver controller operation mode. See (→P.2-28).		
37	Positioning completion signal output method	[Select]	PEND/INP	INP
	Description	Selects the output method for positioning completion signal "INPS" (pin. 30). When the servo is OFF, this is unconditionally turned OFF regardless of the current position. PEND: Servo ON → Once "INPS" is turned ON, this remains in ON status even when the position is out of "Pos Range." INP: Servo On → Turns ON only when the position is within "Pos Range."		
38	MANU input prohibition	[Select]	Invalid/Valid	Invalid
	Description	Selects the operation when the driver controller is in AUTO mode and the "MANU" (pin. 14) input turns ON. Invalid: The driver controller will be in MANUAL mode. Valid: The driver controller remains in AUTO mode.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

Note: [-] in the "Unit" field is any character input specified in "Setting range."

7. Parameters

No.	Parameter name	Unit	Setting range	Default value
*39	Comment on axis	--	16 one-byte alphanumeric characters	-----
	Description	Enter any comment on the axis displayed on the Connect Start and PROGRAM screens.		
48	TDO enable function	[Select]	Invalid/Valid	Valid
	Description	When TDO is connected to the driver controller, this selects the TDO enable switch operation. Valid: The enable switch will be valid. (Turning it OFF stops the operation) Invalid: The enable switch will be invalid. (Even when turning it OFF, the operation does not stop)		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

Note: [Select] in the "Unit" field is selected from the items displayed in "Setting range."

Note: [- -] in the "Unit" field is any character input specified in "Setting range."

7-3-4 THC parameter: Servo gain

No.	Parameter name	Unit	Setting range	Default value
*40	Position gain	1/s	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of position control loop. Increasing the setting value improves the follow-up performance to the position command but is likely to cause the overshoot.		
*41	Speed loop proportional gain	Hz	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of speed control loop. As the load inertia increases, the setting value should be increased. Increasing the value improves the follow-up performance to the speed command (the servo rigidity is enhanced), but is likely to cause the overshoot and oscillation, resulting in mechanical vibration.		
*42	Speed loop integral gain	0.01ms	1 to 65536	Depends on models
	Description	This is a parameter to determine the responsiveness of speed control loop. Increasing the value reduces the responsiveness to the speed command and the repulsion force against the load change. Decreasing the value increases the responsiveness and repulsion force, but excessive decreasing is likely to cause the overshoot and oscillation, resulting in mechanical vibration.		

Note: The parameter with "*" attached in "No." can be changed while keeping the servo ON.

8-1

Alarm lists

8-1-1

TSC alarm list

Code	Alarm name	*	Content
1	Motor overvolt	×	Overvoltage is applied to the motor power supply
2	Control overvolt	×	Overvoltage is applied to the input power supply
3	Control low-volt	×	The input power supply voltage is being reduced
11	Parameter error	×	The value set in the parameter exceeds the effective range
21	Move comm. at SV OFF	×	Move command has been entered with the servo OFF
22	Move comm. befor ORG	○	① Position move command had been entered when zero return was not completed ② Move command has been entered during the movement for zero return
23	ORG time out	×	After starting the zero return operation, it has not been completed even after the elapse of preset time
24	Writing error on move	○	During manual movement in Operation mode 1, writing signal (PWRT signal) has been entered
25	Position data anomaly	○	① There is no data in the specified program table ② In Operation mode 5, target position in the "Position" field is specified using a relative coordinate ③ "Pos Range" sign for pressing operation has unrighteously been set
31	Position comm. error	○	Actual speed has exceeded the preset maximum value
32	Excessive position error (deviation)	×	The deviation between commanded position and current position has exceeded the parameter No. 30 Note: When the Stop mode is ASO1 to 3, alarm generates when the following move command is executed (usually generates immediately after exceeding the parameter)
33	Soft limit over	○	The current position has exceeded the parameter No. 3 or 4
34	Push & hold operation range over-error	×	During the pressing operation, the unit has been pushed back to the target position due to the too strong push-back force
51	EEPROM error	×	Abnormal data was detected in non-volatile memory checking during the start-up operation
52	Detection error	×	① There is no encoder feedback when performing the excitation detection ② Since there is an obstacle during the initial servo behavior after turning on the power, the servo cannot be successfully turned on
53	Encoder error	×	The encoder was disconnected.
54	Servo error	×	After receiving the move command, the motor operation cannot be performed for 2 seconds or more before reaching the target position
55	Overheat in driver controller	×	The surrounding temperature of the power transistor within the driver controller is too high
63	EMG stop	×	EMG stop has been entered

As for "*", see "8-1-2 About the status of the servo when TSC alarm is generated(→P.2-71)."

8-1-2

About the status of the servo when TSC alarm is generated

- In *-indicated column in the above table, ○: The servo keeps ON status
X: The servo changes to OFF status

8-1-3

TLC alarm list

Code	Alarm name	*	Content
1	Motor overvolt	×	Overvoltage is applied to the motor power supply
2	Control overvolt	×	Overvoltage is applied to the input power supply
3	Control low-volt	×	The input power supply voltage is being reduced
4	Motor supply voltage drop	×	The motor power supply voltage is being reduced
5	Serial communication error	○	Error in CN3 communication
11	Parameter error	×	The value set in the parameter exceeds the effective range
21	Move comm. at SV OFF	×	Move command has been entered with the servo OFF
22	Move comm. befor ORG	○	①Position move command had been entered when zero return was not completed ②Move command has been entered during the movement for zero return
23	ORG time out	×	After starting the zero return operation, it has not been completed even after the elapse of preset time
24	Writing error on move	○	During manual movement in Operation mode 1, writing signal (PWRT signal) has been entered
25	Position data anomaly	○	①There is no data in the specified program table ②In Operation mode 5, target position in the "Position" field is specified using a relative coordinate ③"Pos Range" sign for pressing operation has unrighteously been set
31	Position comm. error	○	Actual speed has exceeded the preset maximum value
32	Excessive position error (deviation)	×	The deviation between commanded position and current position has exceeded the parameter No. 30 Note: When the Stop mode is ASO1 to 3, alarm generates when the following move command is executed (usually generates immediately after exceeding the parameter)
33	Soft limit over	○	The current position has exceeded the parameter No. 3 or 4
34	Push & hold operation range over-error	×	During the pressing operation, the unit has been pushed back to the target position due to the too strong push-back force
35	Encoder communication error	×	Error in communication with encoder
36	Encoder error	×	Failure of encoder unit
37	Battery error	×	①The battery is not connected ②The battery power is dead
38	Battery low-volt	○	Low battery voltage
51	EEPROM error	×	Abnormal data was detected in non-volatile memory checking during the start-up operation
52	Detection error	×	There is no encoder feedback when performing the excitation detection
54	Servo error	×	After receiving the move command, the motor does not operate for 2 seconds or more before reaching the target position.
55	Overheat in driver controller	×	The surrounding temperature of the power transistor within the driver controller is too high
56	Thermal error	×	Current has flowed exceeding the protective characteristic
57	Motor overcurrent	×	Overcurrent has flowed into the motor
58	Abnormal operation	×	When thrust force has been generated in a direction opposite to the velocity direction when accelerating or at constant velocity
59	System alarm	×	Microcomputer error
61	Regenerative overload	×	Overload has been applied to the regenerative circuit within the TLC
62	IPM Module error	×	Failure of motor drive circuit
63	EMG stop	×	EMG stop has been entered

As for "*", see "8-1-4 About the status of the servo when TLC alarm is generated(→P.2-72)."

8-1-4

About the status of the servo when TLC alarm is generated

- In *-indicated column in the above table, O: The servo keeps ON status
X: The servo changes to OFF status

8-1-5

THC alarm list

Code	Alarm name	*	Content
1	Motor overvolt	×	Overvoltage is applied to the motor power supply
3	Control low-volt	×	The input power supply voltage is being reduced
4	Motor supply voltage drop	×	The motor power supply voltage is being reduced
5	Serial communication error	○	Error in CN3 communication
11	Parameter error	×	The value set in the parameter exceeds the effective range
21	Move comm. at SV OFF	×	Move command has been entered with the servo OFF
22	Move comm. befor ORG	○	①Position move command had been entered when zero return was not completed ②Move command has been entered during the movement for zero return
23	ORG time out	×	After starting the zero return operation, it has not been completed even after the elapse of preset time
24	Writing error on move	○	During manual movement in Operation mode 1, writing signal (PWRT signal) has been entered
25	Position data anomaly	○	①There is no data in the specified program table ②In Operation mode 5, target position in the "Position" field is specified using a relative coordinate ③"Pos Range" sign for pressing operation has unrighteously been set
31	Position comm. error	○	Actual speed has exceeded the preset maximum value
32	Excessive position error (deviation)	×	The deviation between commanded position and current position has exceeded the parameter No. 30 Note: When the Stop mode is ASO1 to 3, alarm generates when the following move command is executed (usually generates immediately after exceeding the parameter)
33	Soft limit over	○	The current position has exceeded the parameter No. 3 or 4
34	Push & hold operation range over-error	×	During the pressing operation, the unit has been pushed back to the target position due to the too strong push-back force
35	Encoder communication error	×	Error in communication with encoder
36	Encoder error	×	Failure of encoder unit
37	Battery error	×	①The battery is not connected ②The battery power is dead
38	Battery low-volt	○	Low battery voltage
39	OT detection	×	When detected by the OT sensor
51	EEPROM error	×	Abnormal data was detected in non-volatile memory checking during the start-up operation
52	Detection error	×	There is no encoder feedback when performing the excitation detection
53	Motor overload	×	When overload is applied to the motor
54	Servo error	×	After receiving the move command, the motor does not operate for 2 seconds or more before reaching the target position.
55	Overheat in driver controller	×	The surrounding temperature of the power transistor within the driver controller is too high
56	Thermal error	×	Current has flowed exceeding the protective characteristic
57	Motor overcurrent	×	Overcurrent has flowed into the motor
58	Abnormal operation	×	When thrust force has been generated in a direction opposite to the velocity direction when accelerating or at constant velocity
59	System alarm	×	Microcomputer error
61	Regenerative overload	×	Overload has been applied to the regenerative circuit within the THC
62	IPM Module error	×	Failure of motor drive circuit
63	EMG stop	×	EMG stop has been entered

As for "*", see "8-1-6 About the status of the servo when TLC alarm is generated(→P.2-73)."

8-1-6

About the status of the servo when THC alarm is generated

- In *-indicated column in the above table, O: The servo keeps ON status
X: The servo changes to OFF status

8-2

Causes and counter measures of alarms

8-2-1

Causes and counter measures of TSC alarms

No.	Alarm name	Generation status	Causes	Counter measures
1	Motor overvolt	When 24 V power is activated (Opening of CN4 and MPI to MPO is used)	Driver controller board has a fault	Replace the driver controller with new one
		When MPO power is activated (Short-circuiting of CN4 and MPI to MPO is used)	The input voltage is high	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one
		During normal operation	The input voltage is high (depending on excessive voltage variation)	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one
		When the motor decelerates in speed	The motor speed is high and load mass is too large	Reconsider the load condition and driving condition
2	Control overvolt	During 24 V power energizing	The input voltage is high	Set the input voltage within the product specification range
3	Control low-volt	During 24 V power energizing	The input voltage is low	Set the input voltage within the product specification range
11	Parameter error	When 24 V power is activated	Driver controller board has a fault	Replace the driver controller with new one
		When reading out or writing in the parameter file	An inappropriate parameter file has been selected	Select an appropriate parameter file
21	Move comm. at SV OFF	When starting the normal operation	Operation starting procedures are not appropriate	Issue directive to move after servo ON and zero return
22	Move comm. before ORG	When starting the normal operation	Operation starting procedures are not appropriate	Issue directive to move after zero return
23	ORG time out	When in zero return	Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
24	Writing error on move	When entering external input instruction mode writing signal PWRT	Zero return is not completed	Execute the zero return
			The movement is going on by manual operation	Enter the signal after the operation completely stops
25	Position data anomaly	The program is being executed	There is some fault (omission, non-conformity, unreason, etc.) in the data to be executed	Correct the fault
			Specify the target point with operation mode 5 in the relative coordinate	Specify the target point in the absolute coordinate
31	Position comm. error	During normal operation	Driver controller board has a fault	Replace the driver controller with new one
32	Excessive position error (deviation)	Positioning operation is going on	Inhibition of operation by external force	Remove the inhibitor
			Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Lack of gain adjustment	Readjust the gain
			Driver controller board has a fault	Replace the driver controller with new one
33	Soft limit over	Positioning operation is going on	Position setting is out of limit	Set the position within the limit
34	Push & hold operation range over-error	During the pressing operation	The amount of pressing is not enough	Increase the Push[%]

8. Alarm

2. How to Use This Product

No.	Alarm name	Generation status	Causes	Counter measures
51	EEPROM error	When 24 V power is activated	Driver controller board has a fault	Replace the driver controller with new one
52	Detection error	When the servo is turned ON	Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
			The unit hits an obstacle, etc.	Remove the obstacle
53	Encoder error	At 24 V power ON	Actuator connection cable fault	Replace the cable with new one
54	Servo error	When in positioning operation	Inhibition of operation by external force	Remove the inhibitor
			Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Brake has a fault (when a brake is provided)	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
55	Overheat	While energizing	Ambient temperature is hot	Set the ambient temperature within the product specification range
			Bad ventilation is likely to cause the heat to be stayed inside the unit	Set the surrounding space according to the product specifications
			Driver controller board has a fault	Replace the driver controller with new one
63	EMG stop	While energizing	External emergency stop switch has operated	Restore the external emergency stop to the normal status
			Motor supply voltage drop	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one

- After removing the alarm cause and then implementing the counter measure, clicking the "PROGRAM" or "Reset" in "Program" screen or clicking the "Reset alarm" in "Status" screen allows the alarm to be reset.

If the alarm cannot be reset, the alarm cause is not removed.

8-2-2

Causes and counter measures of TLC alarms

No.	Alarm name	Generation status	Causes	Counter measures
1	Motor overvoltage	When 24 V power is activated (Opening of CN4 and MPI to MPO is used)	Driver controller board has a fault	Replace the driver controller with new one
		When MPO power is activated (Opening of CN4 and MPI to MPO is used.)	The input voltage is high	Set the input voltage within the product specification range
		During normal operation	Driver controller board has a fault	Replace the driver controller with new one
			The input voltage is high (depending on excessive voltage variation)	Set the input voltage within the product specification range
		When the motor decelerates in speed	Driver controller board has a fault	Replace the driver controller with new one
2	Control overvoltage	During 24 V power energizing	The input voltage is high	Set the input voltage within the product specification range
3	Control low-voltage	During 24 V power energizing	The input voltage is low	Set the input voltage within the product specification range
4	Motor supply voltage drop	During the servo ON	The input voltage is low	Set the input voltage within the product specification range
5	Serial communication error	When communicating by CN3	Noise from outside	Isolate with a noise source
11	Parameter error	When 24 V power is activated	Driver controller board has a fault	Replace the driver controller with new one
		When reading out or writing in the parameter file	An inappropriate parameter file has been selected	Select an appropriate parameter file
21	Move comm. at SV OFF	When starting the normal operation	Operation starting procedures are not appropriate	Issue directive to move after servo ON and zero return
22	Move comm. before ORG	When starting the normal operation	Operation starting procedures are not appropriate	Issue directive to move after zero return
23	ORG time out	When in zero return	Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
24	Writing error on move	When entering external input instruction mode writing signal PWRT	Zero return is not completed	Execute the zero return
			The movement is going on by manual operation	Enter the signal after the operation completely stops
25	Position data anomaly	The program is being executed	There is some fault (omission, non-conformity, unreason, etc.) in the data to be executed	Correct the fault
			Specify the target point with operation mode 5 in the relative coordinate	Specify the target point in the absolute coordinate
31	Position comm. error	During normal operation	Driver controller board has a fault	Replace the driver controller with new one
32	Excessive position error (deviation)	Positioning operation is going on	Inhibition of operation by external force	Remove the inhibitor
			Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Lack of gain adjustment	Readjust the gain
33	Soft limit over	Positioning operation is going on	Position setting is out of limit	Set the position within the limit
34	Push & hold operation range over-error	During the pressing operation	The amount of pressing is not enough	Increase the Push[%]
35	Encoder communication error	When in start-up operation	Disconnection of encoder cable	Connect the encoder cable in proper way Replace the encoder cable with new one
			Encoder has a fault	Replace the motor (with the encoder)
36	Encoder error	While energizing	Fault in encoder	Restart
			Encoder has a fault	Replace the motor (with the encoder)
37	Battery error *	While energizing	A battery is not connected to CN6	Connect the cable to CN6 in proper way
			Battery power is dead	Replace the battery
38	Battery low-voltage	While energizing	Battery power is consumed	Replace the battery

* A battery error occurs at the initial power ON when you connect/disconnect the battery or the encoder cable with the control power shut off.
In this case, please execute an alarm reset.

No.	Alarm name	Generation status	Causes	Counter measures
51	EEPROM error	When power is activated	Driver controller board has a fault	Replace the driver controller with new one
52	Detection error	When the servo is turned ON	Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
			The unit hits an obstacle, etc.	Remove the obstacle
53	Motor overload	During the servo ON	Exceeds the motor's maximum torque	Reduce the load Reduce the acceleration and deceleration rate
54	Servo error	When in positioning operation	Inhibition of operation by external force	Remove the inhibitor
			Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Brake has a fault (when a brake is provided)	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
			Gain value is not appropriate	Adjust the gain value (parameter No. 40, 41, 42) to appropriate one
55	Overheat	While energizing	Ambient temperature is hot	Set the ambient temperature within the product specification range
			Bad ventilation is likely to cause the heat to be stayed inside the unit	Set the surrounding space according to the product specifications
			Driver controller board has a fault	Replace the driver controller with new one
56	Thermal error	During the servo ON	The motor is overheated	Turn off the power and wait until the motor becomes cooled Reduce the load Reduce the acceleration and deceleration rate Reduce the tact
57	Motor overcurrent	During the servo ON	Excessive current has flowed to the motor	Reduce the load Reduce the acceleration and deceleration rate
			Motor has a fault	Replace the motor with new one
58	Abnormal operation	During the operation	Encoder has a fault	Replace the motor (with the encoder)
			False wiring in motor cable	Connect the motor cable in proper way
59	System alarm	While energizing	Fault in CPU	Restart Isolate with a noise source Replace the driver controller with new one
61	Regenerative overload	During the operation	Excessive regeneration power has generated	Reduce the load Reduce the acceleration and deceleration rate
62	IPM Module error	During the servo ON	Driver controller board has a fault	Replace the driver controller board with new one
		While energizing	The input power supply capacity is not sufficient	Check the input power supply capacity
63	EMG stop	While energizing	External emergency stop switch has operated	Restore the external emergency stop to the normal status
			Motor supply voltage drop	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one

- After removing the alarm cause and then implementing the counter measure, clicking the "PROGRAM" or "Reset" in "Program" screen or clicking the "Reset alarm" in "Status" screen allows the alarm to be reset.

If the alarm cannot be reset, the alarm cause is not removed.

8-2-3

Causes and counter measures of THC alarms

No.	Alarm name	Generation status	Causes	Counter measures
1	Motor overvolt	When power is activated	The input voltage is high	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one
		During normal operation	The input voltage is high (depending on excessive voltage variation)	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one
		When the motor decelerates in speed	The motor speed is high and load mass is too large	Reconsider the load condition and driving condition. Attach an external regeneration resistance
3	Control low-volt	During power energizing	The input voltage is low	Set the input voltage within the product specification range
4	Motor supply voltage drop	During the servo ON	The input voltage is low	Set the input voltage within the product specification range
5	Serial communication error	When communicating by CN3	Noise from outside	Isolate with a noise source
11	Parameter error	When power is activated	Driver controller board has a fault	Replace the driver controller with new one
		When reading out or writing in the parameter file	An inappropriate parameter file has been selected	Select an appropriate parameter file
21	Move comm. at SV OFF	When starting the normal operation	Operation starting procedures are not appropriate	Issue directive to move after servo ON and zero return
22	Move comm. before ORG	When starting the normal operation	Operation starting procedures are not appropriate	Issue directive to move after zero return
23	ORG time out	When in zero return	Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
24	Writing error on move	When entering external input instruction mode writing signal PWRT	Zero return is not completed	Execute the zero return
			The movement is going on by manual operation	Enter the signal after the operation completely stops
25	Position data anomaly	The program is being executed	There is some fault (omission, non-conformity, unreason, etc.) in the data to be executed	Correct the fault
			Specify the target point with operation mode 5 in the relative coordinate	Specify the target point in the absolute coordinate
31	Position comm. error	During normal operation	Driver controller board has a fault	Replace the driver controller with new one
32	Excessive position error (deviation)	Positioning operation is going on	Inhibition of operation by external force	Remove the inhibitor
			Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Lack of gain adjustment	Readjust the gain
			Driver controller board has a fault	Replace the driver controller with new one
33	Soft limit over	Positioning operation is going on	Position setting is out of limit	Set the position within the limit
34	Push & hold operation range over-error	During the pressing operation	The amount of pressing is not enough	Increase the Push[%]
35	Encoder communication error	When in start-up operation	Disconnection of encoder cable	Connect the encoder cable in proper way Replace the encoder cable with new one
			Encoder has a fault	Replace the motor (with the encoder)
36	Encoder error	While energizing	Fault in encoder	Restart
			Encoder has a fault	Replace the motor (with the encoder)
37	Battery error *	While energizing	A battery is not connected to CN6	Connect the cable to CN6 in proper way
			Battery power is dead	Replace the battery
38	Battery low-volt	While energizing	Battery power is consumed	Replace the battery

* A battery error occurs at the initial power ON when you connect/disconnect the battery or the encoder cable with the control power shut off.
In this case, please execute an alarm reset.

No.	Alarm name	Generation status	Causes	Counter measures
39	OT detection	While energizing	The unit gets in over-travel status	Put the actuator back within a stroke range
			Sensor has a fault	Replace the sensor
			Disconnection of sensor cable	Replace the sensor cable
51	EEPROM error	When power is activated	Driver controller board has a fault	Replace the driver controller with new one
52	Detection error	When the servo is turned ON	Encoder has a fault	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
			The unit hits an obstacle etc	Remove the obstacle
53	Motor overload	During the servo ON	Exceeds the motor's maximum torque	Reduce the load Reduce the acceleration and deceleration rate
54	Servo error	When in positioning operation	Inhibition of operation by external force	Remove the inhibitor
			Actuator has a fault	Replace the actuator with new one
			Motor has a fault	Replace the actuator with new one
			Brake has a fault (when a brake is provided)	Replace the actuator with new one
			Actuator connection cable has a fault	Replace the cable with new one
			Driver controller board has a fault	Replace the driver controller with new one
			Gain value is not appropriate	Adjust the gain value (parameter No. 40, 41, 42) to appropriate one
55	Overheat	While energizing	Ambient temperature is hot	Set the ambient temperature within the product specification range
			Bad ventilation is likely to cause the heat to be stayed inside the unit	Set the surrounding space according to the product specifications
			Driver controller board has a fault	Replace the driver controller with new one
56	Thermal error	During the servo ON	The motor is overheated	Turn off the power and wait until the motor becomes cooled Reduce the load Reduce the acceleration and deceleration rate Reduce the tact
57	Motor overcurrent	During the servo ON	Excessive current has flowed to the motor	Reduce the load Reduce the acceleration and deceleration rate
			Motor has a fault	Replace the motor with new one
58	Abnormal operation	During the operation	Encoder has a fault	Replace the motor (with the encoder)
			False wiring in motor cable	Connect the motor cable in proper way
59	System alarm	While energizing	Fault in CPU	Restart Isolate with a noise source Replace the driver controller with new one
61	Regenerative overload	During the operation	Excessive regeneration power has generated	Reduce the load Reduce the acceleration and deceleration rate Attach an external regeneration resistance
62	IPM Module error	During the servo ON	Driver controller board has a fault	Replace the driver controller board with new one
63	EMG stop	While energizing	External emergency stop switch has operated	Restore the external emergency stop to the normal status
			Motor supply voltage drop	Set the input voltage within the product specification range
			Driver controller board has a fault	Replace the driver controller with new one

- After removing the alarm cause and then implementing the counter measure, clicking the "PROGRAM" or "Reset" in "Program" screen or clicking the "Reset alarm" in "Status" screen allows the alarm to be reset.

If the alarm cannot be reset, the alarm cause is not removed.

9. Communication cable

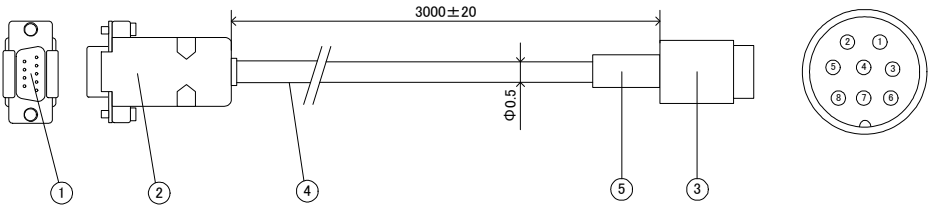
9-1 Overview

- Product model number: CBL-COM-03
 - This is a cable to connect the CN3 of TSC/TLC/THC unit to PC's USB ports.
 - This product consists of a cable to convert a USB port to RS-485 and a cable to connect the cable to the CN3 of TSC/TLC/THC unit.
 - If an RS-485 port is provided in the PC, the conversion cable is not required.
 - If an RS-485 port is not provided in the PC, it is recommended to use **9-3 Conversion cable(→ P.2-81)**.
- Communication by other than this product cannot be guaranteed.

9-2 Connection cable

- This is a cable to connect the CN3 of TSC/TLC/THC unit to PC's RS-485 ports.
- If an RS-485 port is not provided in the PC, it is recommended to use **9-3 Conversion cable(→ P.2-81)** for connection to the USB port.

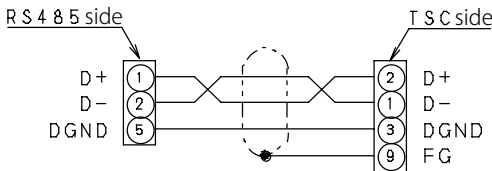
9-2-1 Dimensional drawing



9-2-2 Parts used with this product

1	Plug	1	DB9FMAA: NSXD
2	Cover	1	DT9P: NSXD
3	Plug	1	MD-8P: NSXD
4	Cable	1	22AWG2P (Black): Taiwan Shin Kong
5	Heat contraction tube	1	WOER-7.0 (Black): NDER

9-2-3 Pin assignment

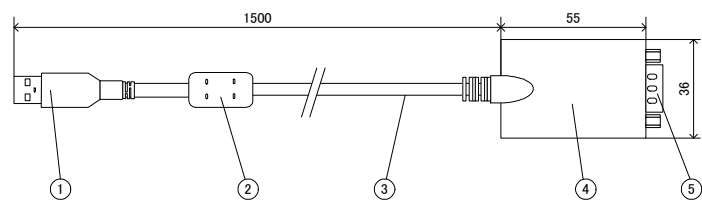


9. Communication cable

9-3 Conversion cable

- This is a cable to convert PC's USB port to RS-485.
- This is included in communication cable CBL-COM-03.
- Using this cable in combination with a connection cable enables the communication with TSC by connection to USB port.

9-3-1 Dimensional drawing



9-3-2 Parts used with this product

1	Standard USB A	1
2	Ferrite core	1
3	Cable	1
4	Converter	1
5	D-SUB 9 female	1

9-3-3 Pin assignment

RS-485 (A+)	①
RS-485 (B+)	②
Ground	⑤

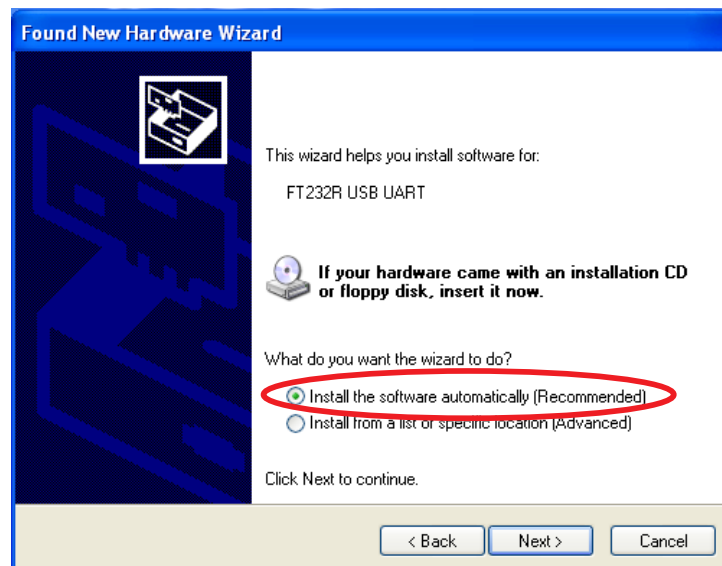
10. Communication cable installation guide

10-1 Conversion cable driver installation guide

- Administrative privileges of OS are required to install the driver.
- Be sure to terminate other programs that are now being executed.
- Screen example shown here is Windows XP.

10-1-1 Installation procedures

- ① Insert the driver CD attached to the product into your PC. Next, connect a conversion cable to PC's USB port and if a wizard shown below is launched, select an item enclosed by a red circle and then press the "Next(N)>". Administrative privileges of OS are required to install the driver.
If the wizard screen is not automatically launched, please refer to **10-1-2 When the wizard screen is not automatically launched(→P.2-86)**

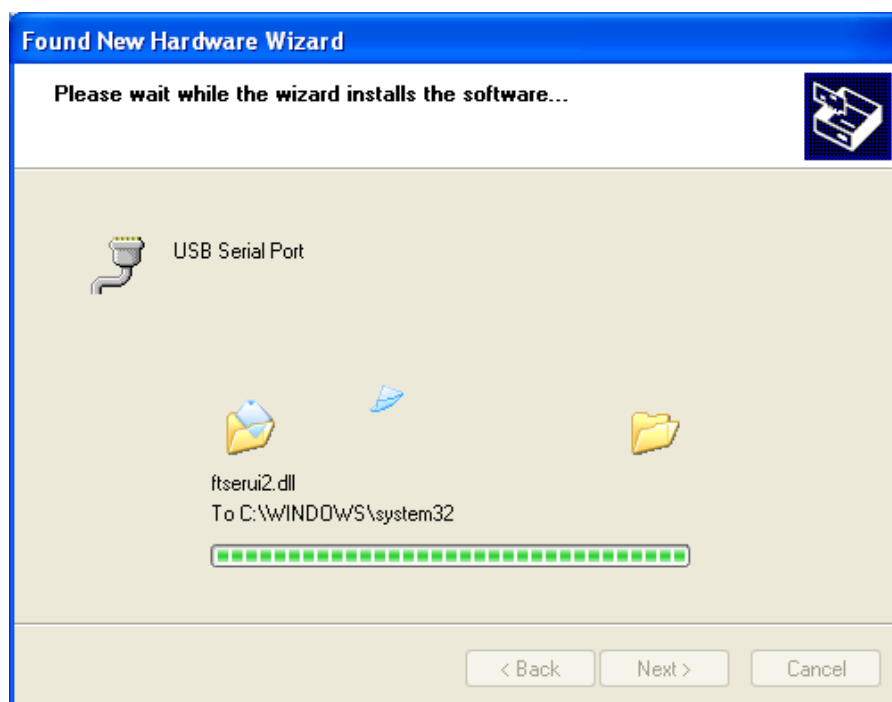


- ② Perform automatic search operation.

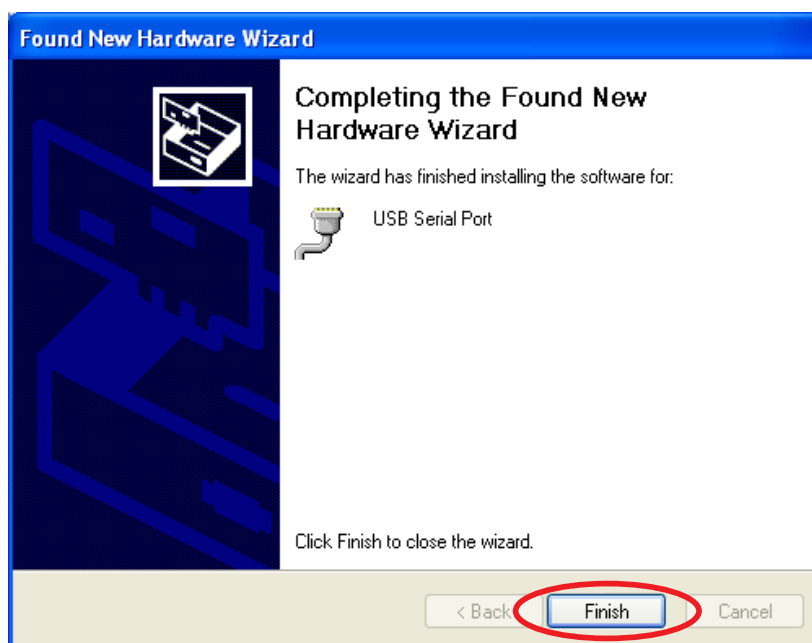


10. Communication cable installation guide

- ③ Start the installation.

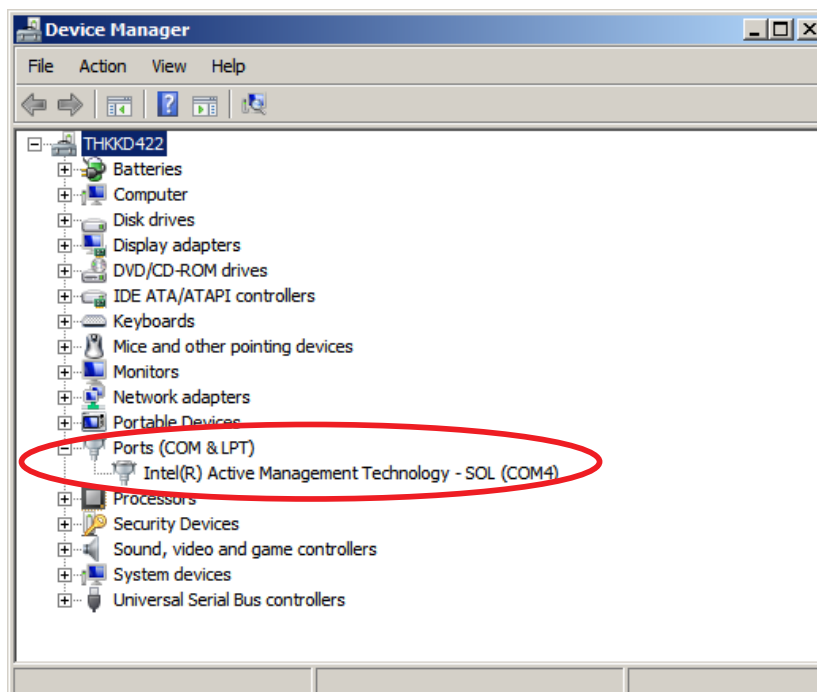


- ④ Complete the installation.

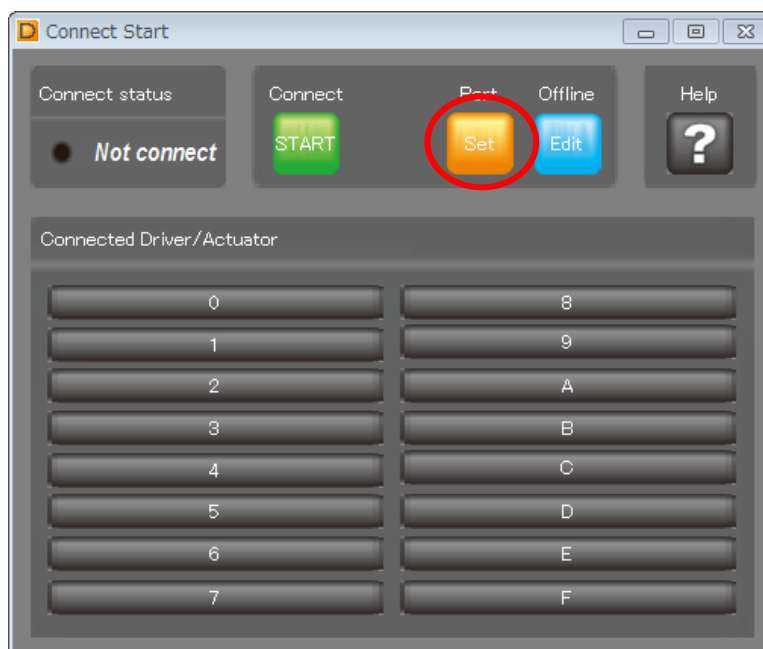


10. Communication cable installation guide

- ⑤ Check the following port. In this example, COM4 is assigned to this USB driver.

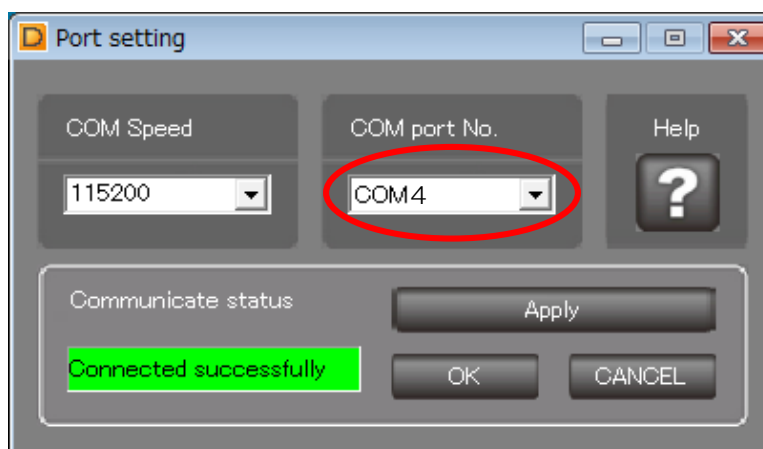


- ⑥ Start up the D-STEP and then select "Port".



10. Communication cable installation guide

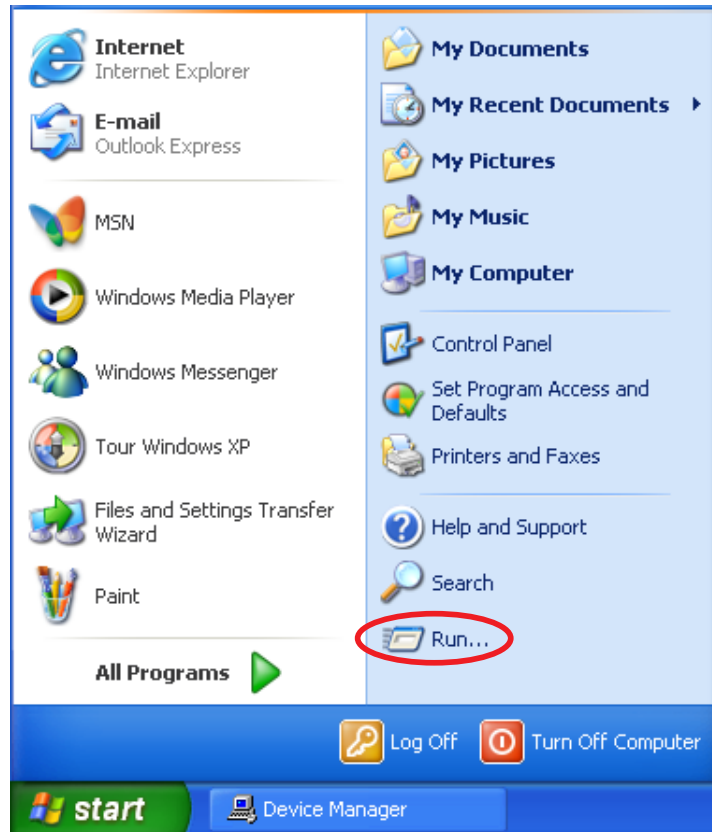
- ⑦ As shown below, using the COM4 enables the connection.



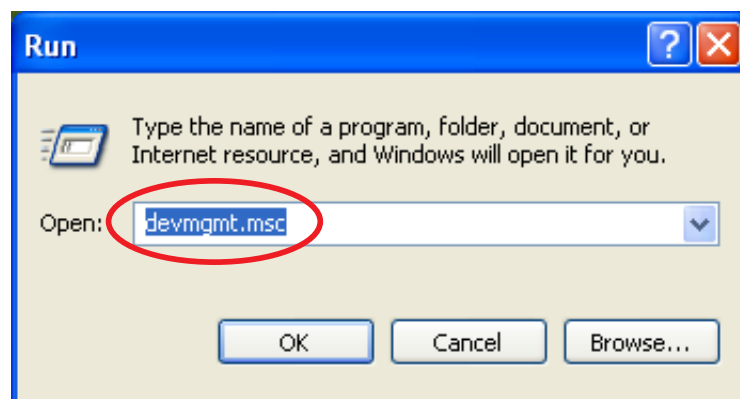
10. Communication cable installation guide

10-1-2 When the wizard screen is not automatically launched

- ① Select the following item from the "Start" menu.

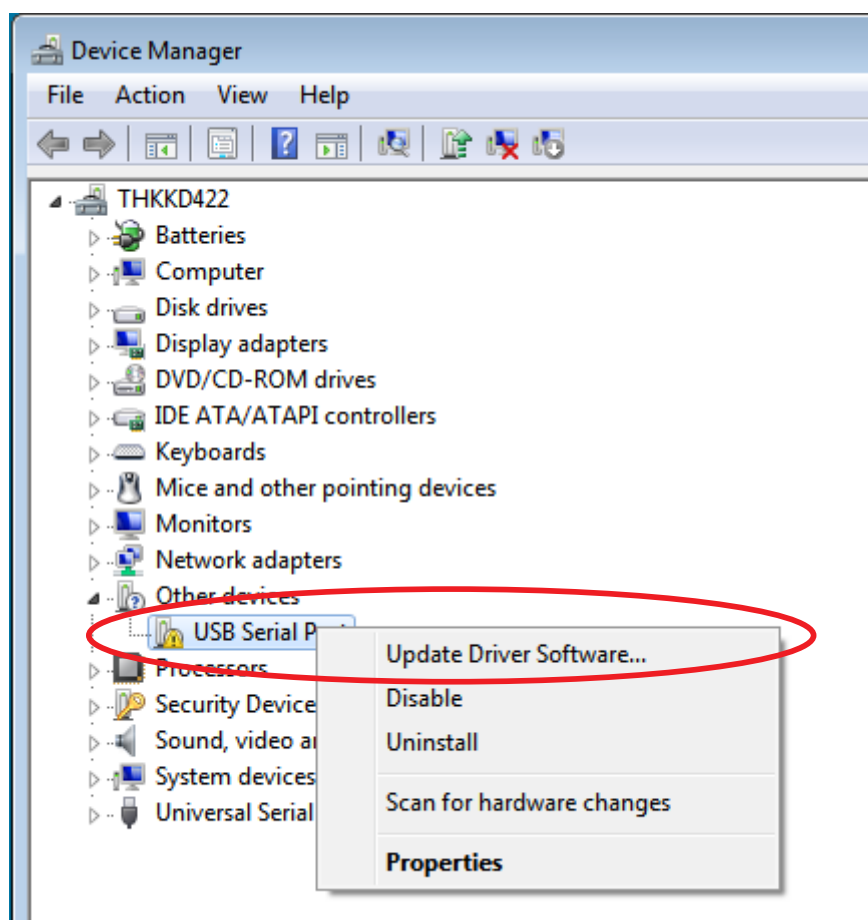


- ② Enter the following content and open the device manager screen.

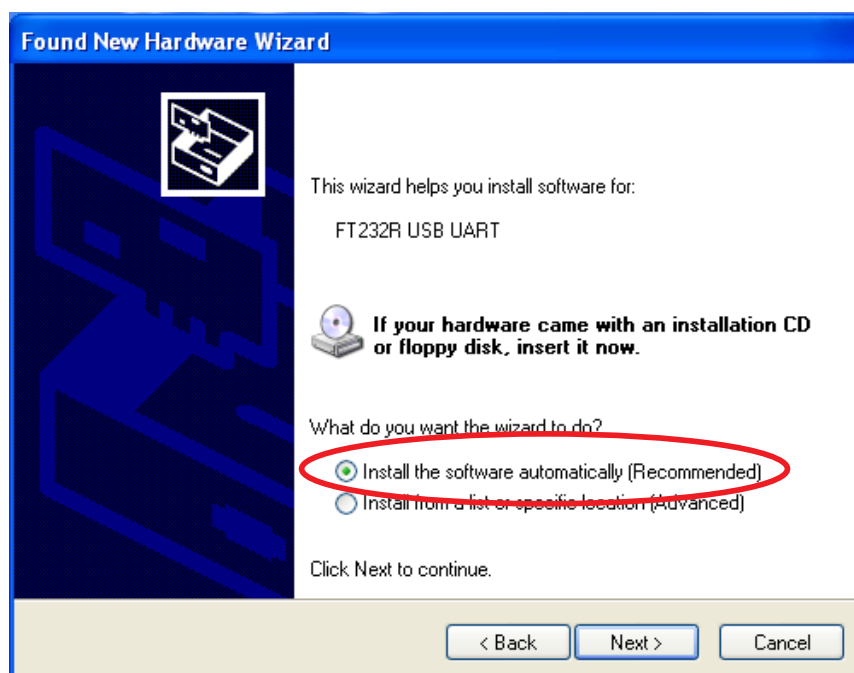


- ③ Display the property with the following ? mark by right-clicking and select the "Update Driver...".

10. Communication cable installation guide



- ④ Select to execute the following item. The procedures following this step are returned to **10-1-1 Installation procedures(→P.2-82).**



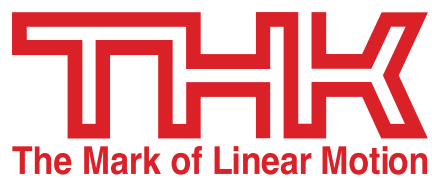
Appendix
MEMO

Appendix

Revision history

The instruction manual No. is described on the back cover.

Date of issue	Instruction manual No.	Details
February 2012	No.364M	First edition
January 2013	No.6100-1(0)	<ul style="list-style-type: none">• Edition published in parts of the instruction manual No.364M<ul style="list-style-type: none">→ No.364M ES/EC+TSC<ul style="list-style-type: none">→ No.1030-1(0) ES/EC→ No.6060-1(0) TSC→ No.6100-1(0) D-STEP→ No.6110-1(0) TDO• Full text<ul style="list-style-type: none">→ Added the items concerning Driver controller TLC and THC
June 2014	No.6100-1(1)	<p>Added OS supported</p> <p>Changed the parameter setting range by the TLC/THC software version changes</p> <p>Added notes on the battery alarm</p>



**THK Electric Actuator Controller series
Setup Tool**

D-STEP

INSTRUCTION MANUAL