

Electric Gripper Instruction Manual

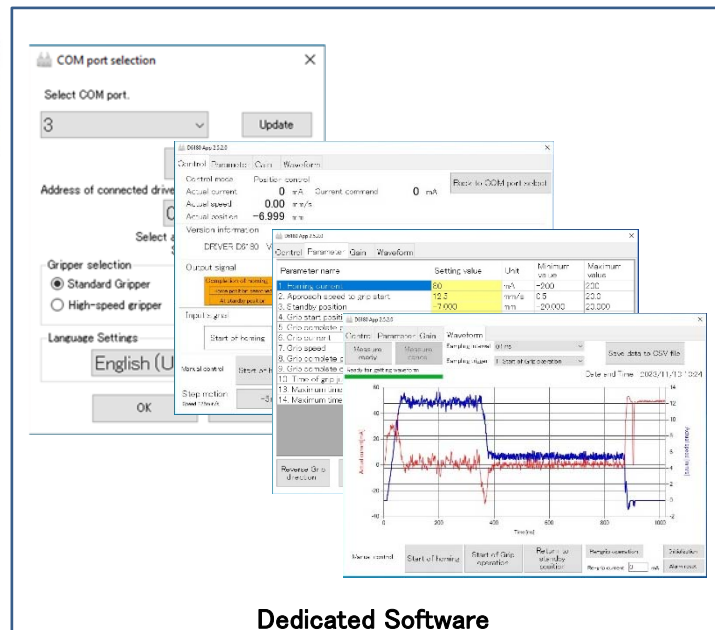
Dedicated Software



Electric Gripper
(CGS0402 Series)



Servo Driver (D6180)



Dedicated Software
(D6180 Controller)

Revision History

Date	Rev.	Details
September 15 th , 2020	0.0	First Edition
December 22 nd , 2021	1.0	Revised edition due to update (Ver. 1.01) of driver D6180
July 13 th , 2022	1.1	Errata correction

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Introduction

This instruction manual describes the operation method of KSS Electric Grippers for test runs and parameter settings using the driver-dedicated software.

For information on handling Electric Grippers and Servo Drivers, please refer to the instruction manuals "CGS0402 Series edition" and "Servo Driver edition".

1. Equipment Required for This Manual

- Electric Gripper (CGS0402 Series)
- Servo Driver (D6180)
- Connection Cable (ASE-CC□□)
- Power supply (24 V DC, 1 A or more)
- RS485-USB Converter
- Power Cable (ASE-PW□□)
- Communication Cable (ASE-CM□□)
- USB Cable
- PC

OS: Windows7 SP1, Windows8.1, Windows10 (Windows 10, Version 1607 or higher)

Environment (runtime): NET Framework 4.6.1

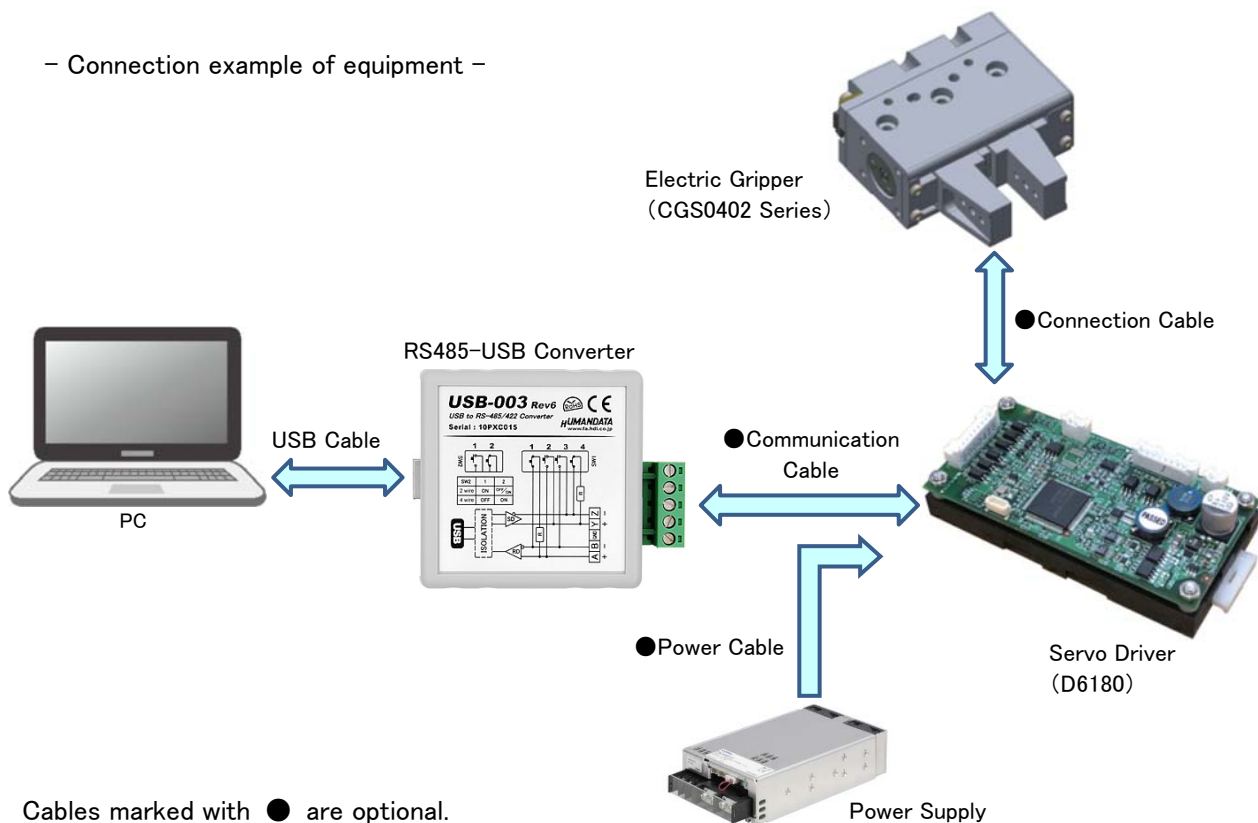
CPU/memory: Environment recommended for the OS installed or higher

Display: 1024 x 768 resolution or higher, 16-bit color or higher

Disk space required: Runtime 280 MB (x86), 610MB(x64)

Application 2 MB

– Connection example of equipment –



Cables marked with ● are optional.

Note: Connectors used for connecting to the Servo Driver are not provided as accessories.

2. Installation

The driver-dedicated software and driver for the RS485-USB converter must be installed to perform operations with RS485 communications on the PC. This section describes the installation procedure for each software.

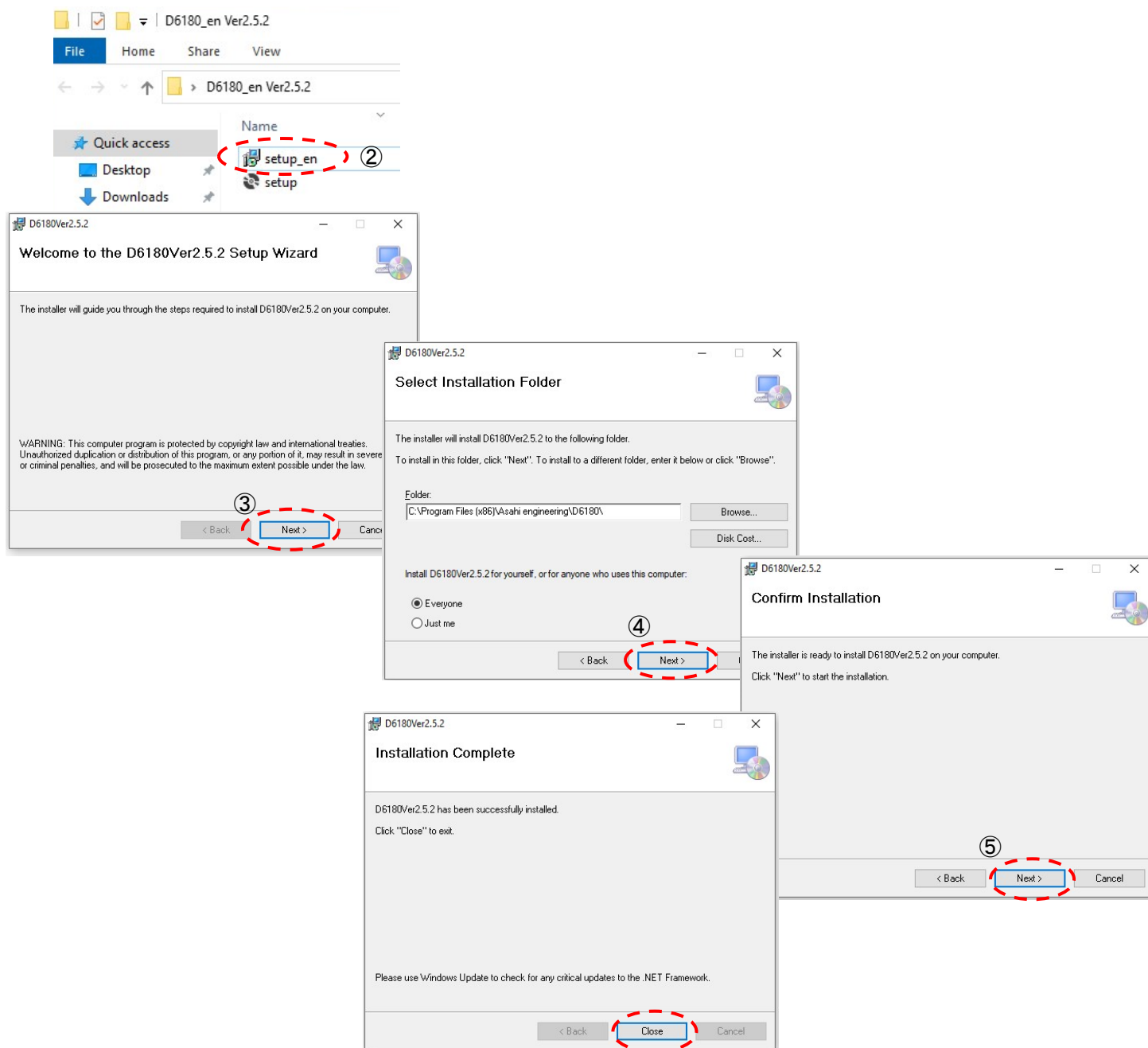
2. 1. Driver-Dedicated Software

Install the driver-dedicated software with the following procedure.

- ① Unzip the compressed file .zip.
 - ② Open the "D6180Setup" file.
- Complete the installation in order from ③ to ⑤.

* The driver-dedicated software can be downloaded from the KSS website.

Access link <https://www.kssballscrew.com/us/product/product-14.html>



2. 2. Device driver of RS485-USB converter (USB-003)

The servo driver (D6180) communicates with the PC via RS485 communication. USB-003 converter from HuMANDATA will be explained as an example of a commercially available RS-422/485 converter.

For details of USB-003 devices, refer to the instruction manual and CD (driver installer) provided with USB-003 by HuMANDATA or visit their website.

Access link <https://www.hdl.co.jp/en/faspc/Drivers/>

[Product Documents]

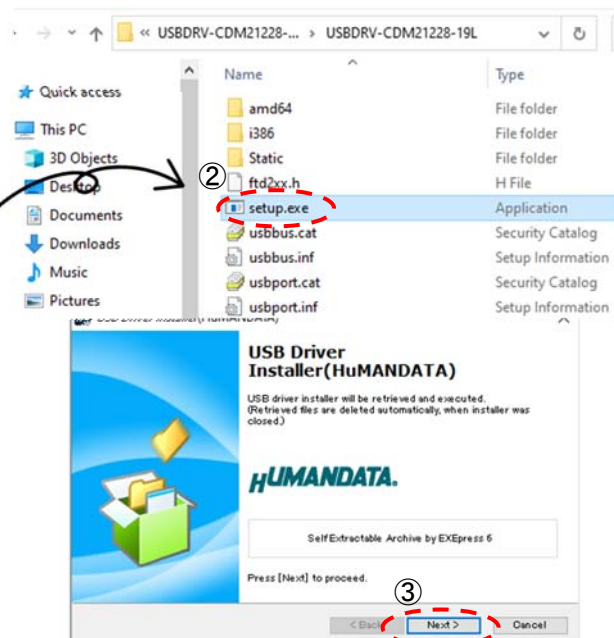
[USB/LNX series] Device Driver Downloads

The date is for management. It is different from the date of the actual file. There are two types of drivers. Please do not confuse refer to the product model.

USB Driver for FTDI device

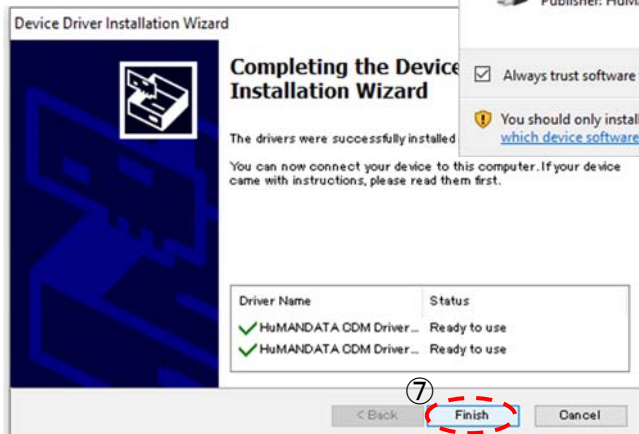
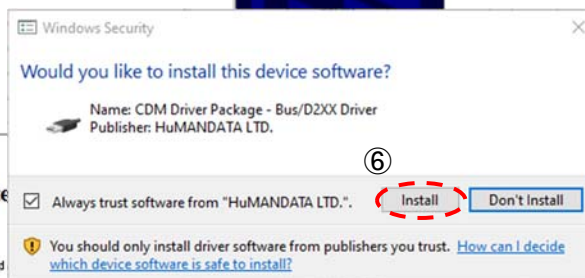
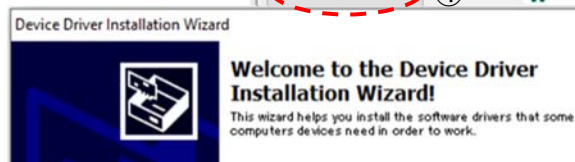
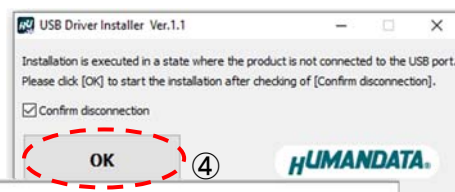
Model	Content	File Type	Date	Size	Download
USB-003	Support OS : Windows 10/8.1/8/7 USBDRV-CDM21228-19L Driver Version : CDM 2.12.28	ZIP	2020/01/22	4.8 MB	Download
USB-010					
USB-013					
USB-033					
USB-033SI	Support OS : Windows XP/Vista USBDRV-CDM20824-19L Driver Version : CDM 2.08.24	ZIP	2020/01/22	3.5 MB	Download
USB-039					
USB-301					
USB-302					
USB-304	USB Driver Installation Guide (Ver.1.5)	PDF	2020/01/22	335 K	Download
USB-401					
USB-402					
USB-503					
USB-503-RJ45					

Website of HuMANDATA LTD.



- ① Download the device driver (compressed file .zip) and unzip the file.
- ② Open the setup file.
- ③ Click "Next".
- ④ Check ☒ the "Confirm disconnection" checkbox and click the OK button to start the installation.

Complete the installation by clicking the buttons from ⑤ to ⑦.



3. Setting of RS485-USB converter (USB-003)

The communication specifications of the dedicated driver (D6180) are given below. Configure the USB-003 settings.

Communication specifications

- RS-485 compliant Half-duplex method
- Start-stop synchronization system
38.4kbit/sec (baud rate 38400 bps)

USB-003 switch settings

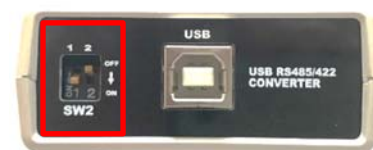
SW1

	1	2	3	4
With termination	ON	ON	ON	OFF

Echo cancellation enabled (no echo)

SW2

	1	2
Two-wire system	ON	OFF



4. Connection

Connect the servo driver (D6180), power supply, and USB-003, referring to the connection example in section "1. Equipment Required for this Manual" and the following connector pin layout. The cable connectors and contacts are not supplied with the servo driver.

4. 1. Servo Driver (D6180) Connector Pin Layout

N1: Connector for communication Connector housing: PAP-03V-S (JST) Contact: SPHD-002T-P0.5 (JST)		
Pin No.	Name	Explanation
1	COM A	Signal line A
2	COM B	Signal line B
3	SG	Signal GND

CN1: Connector for power supply Connector housing: PAP-02V-S (JST) Contact: SPHD-002T-P0.5 (JST)		
Pin No.	Name	Explanation
1	DC24V	DC 24 V Power supply input
2	GND	

CN2: Connector for encoder input and motor output Connector housing: PAP-09V-S (JST) Contact: SPHD-002T-P0.5 (JST)		
Pin No.	Name	Explanation
1	E/C A+	Encoder phase A + signal input
2	E/C A-	Encoder phase A - signal input
3	E/C B+	Encoder phase B + signal input
4	E/C B-	Encoder phase B - signal input
5	5V OUT	Encoder power supply output 5 V
6	GND	Encoder power supply output GND
7	CS	Shielded wire connection
8	M +	Motor output +
9	M -	Motor output -

4. 2. USB-003 Connector Pin Layout

USB-003 Connector			Driver Pin No.
Pin No.	Name	Explanation	
1	A	Receive data +	1
2	B	Receive data -	2
3	GND	Signal ground	3
4	Y	Transmit data +	NC
5	Z	Transmit data -	NC

5. Operations of the Dedicated Software

This section explains everything from setting up communication to setting parameters.

5. 1. Setting Up Communication

- ① Turn on the power after all devices are connected.
- ② Start "D6180 Controller" from the PC start selection.
- ③ Select the COM port and address of connected driver, and click OK.
Select "0" if the driver uses a single shaft (standard product).
- ④ Once communication is established, the "control screen" of the dedicated software is launched.

When "Open Device Manager" is clicked, the device manager of the PC will open, and the connection status of the COM port (communication port) can be checked.



Do not connect or disconnect the communication cable while the power is turned on.
Not following this instruction may damage the servo driver.
Be sure to connect and disconnect the driver when the power supply is turned off.

③ Select the COM port to which the RS485-USB converter is connected in the pull-down menu.

④

– Control Screen –

5. 2. Description of Control Screen

Starting various operations and monitoring various parameters can be done from the control screen.
A description of names is given below.

Control input name

"Start of homing"

When shipped from the factory, the encoder count is zero at the machine end in the closed direction, and then it moves to the standby position in the open direction, completing homing. Start of homing can also be used as a function to reset alarms (refer to the instruction manual of the servo driver for resettable alarms).

"Start of Grip operation"

Starts the grip operation.

If a return to standby position is initiated during a grip operation, the return to standby position takes priority, and the return to standby position is executed.

"Return to standby position"

Moves to the standby position. Even if the start of the grip operation is initiated during the return to standby position, the operation will not be executed. It can also be used as a function to reset the grip error alarm.

"Re-grip operation"

It enables changing the gripping force while holding the workpiece. Input [Re-grip current] and execute the re-grip operation.

"Alarm reset"

Performs the cancellation of various alarms.

"Initialization"

Restores the internal data of the driver to its power-on state. Start operation from homing.

To return parameters to default (factory defaults), use the "Initializing all settings" parameter screen.

"Step motion"

Performs positioning in steps of 1 mm and 5 mm. When shipped from the factory, "+" is the close direction and "-" is the open direction.

Control output name

"Completion of homing"

Lights up in orange on completion of homing.

"At standby position"

After completion of homing, lights up in orange while stopped at the standby position.

"Grip complete"

Lights up in orange on completion of gripping. The determination of grip completion will be explained later.

"Grip complete (position)"

Lights up in orange when in the grip complete (position) set by the parameter.

"Grip complete (current)"

Lights up in orange when within the grip current range set by the parameter.

Switching to the "Control" screen

Displays the control status of the Electric Gripper

Displays the control input status from the Servo Driver

Back to COM port select

Displays the version of the Servo Driver

D6180 App 2.5.2.0

Control	Parameter	Gain	Waveform
Control mode	Position control		
Actual current	0 mA	Current command	0 mA
Actual speed	0.00 mm/s		
Actual position	-6.999 mm		
Version information			
DRIVER D6180 Ver01.01			
Output signal			
<div>Completion of homing</div> <div>Home position searched</div> <div>At standby position</div> <div>Grip complete</div> <div>Grip complete (position)</div> <div>Grip complete (current)</div>			
Alarm information No alarm			
Input signal			
<div>Start of homing</div> <div>Start of Grip operation</div> <div>Return to standby position</div>			
Manual control			
<div>Start of homing</div> <div>Start of Grip operation</div> <div>Return to standby position</div> <div>Re-grip operation</div> <div>Re-grip current 0 mA</div> <div>Alarm reset</div>			
Step motion			
Speed 12.5mm/s			
<div>+5mm</div> <div>+1mm</div> <div>-1mm</div> <div>-5mm</div>			

- Control Screen -

5. 3. Explanation of the Parameters Screen

Various parameters can be set and saved on the parameters screen. A description of names is given below.

Parameter name

No.	Items [Unit]	Initial value	Explanation
1	Homing current [mA]	80	Push-on current during the start of homing.
2	Approach speed to grip start [mm/s]	12.5	Approach speed for start of homing, grip start, and standby positions.
3	Standby position [mm]	-7.000	Determines the standby position of the Electric Gripper.
4	Grip start position [mm]	-2.500	Determines the start position of grip operation.
5	Grip complete position [mm]	0.000	Reference position to determine the completion of grip operation.
6	Grip current [mA]	50	Value of motor current during gripping. This parameter determines the gripping force.
7	Grip speed [mm/s]	5.0	Value of speed limit during the grip operation.
8	Grip complete position range [mm]	1.250	Reference to determine the completion of grip operation. Grip operation is determined to be complete when the actual position is grip complete position \pm this parameter range.
9	Grip complete current range [mA]	25	Reference to determine the completion of grip operation. Grip operation is determined to be complete when motor current is grip current \pm this parameter.
10	Time of grip judgement [ms]	100	Final determination of grip completion is made when the gripping operation completion determination of the grip complete position and the grip complete current continues for more than this parameter.
13	Maximum time of homing [s]	5	Determines the maximum time for the start of homing. A homing error occurs if homing is not complete even after the start of homing and this parameter has been exceeded.
14	Maximum time of Gripping operation [s]	5	Determines the maximum time for grip operation. A grip error occurs if gripping is not complete even after the start of grip operation and this parameter has been exceeded.

*All speeds and positions given are for one side.

Function name

"Reverse Grip direction"

If the grip direction is to be reversed, this function allows the polarity of the parameter values affected by the gripping direction to be reversed in a batch. Since the homing direction is also reversed, start the operation from homing.

The target parameters are No. 1, No. 3, No. 4, No. 5, and No. 6.

Continued on the next page.

"Open file"

Displays the parameter values that have been saved as data in the dedicated software. Use "Write onto driver" to write the displayed parameters to the driver.

"Save data"

This is used to save parameter values as data.

"Initializing all settings"

This returns parameter values to their default values (factory defaults).

Executing this function completes initialization ("Write onto driver" is not required to be executed).

"Read from driver"

Reads parameter values stored in the servo driver.

"Write onto driver"

Writes the displayed parameter values to the driver.

Switching to the "Parameter" screen

Input the changed values

Displays the input range

Parameter name	Setting value	Unit	Minimum value	Maximum value
1. Homing current	80	mA	-200	200
2. Approach speed to grip start	12.5	mm/s	0.5	20.0
3. Standby position	-7.000	mm	-20.000	20.000
4. Grip start position	-2.500	mm	-20.000	20.000
5. Grip complete position	0.000	mm	-20.000	20.000
6. Grip current	50	mA	-200	200
7. Grip speed	5.0	mm/s	0.5	20.0
8. Grip complete position range	1.250	mm	0.000	20.000
9. Grip complete current range	25	mA	5	100
10. Time of grip judgement	100	ms	0	32767
13. Maximum time of homing	5	s	1	60
14. Maximum time of Gripping operation	5	s	1	60

Reverse Grip direction Open file Save data Initializing all settings Read from driver Write onto driver

- Parameter Screen -

Parameter setting points

When operating [Approach speed to grip start] at high speeds up to 20 mm/s, set [Homing current] to 50 mA or more, and when operating [Grip speed] at high speeds up to 20 mm/s, set [Grip current] to 50 mA or more.

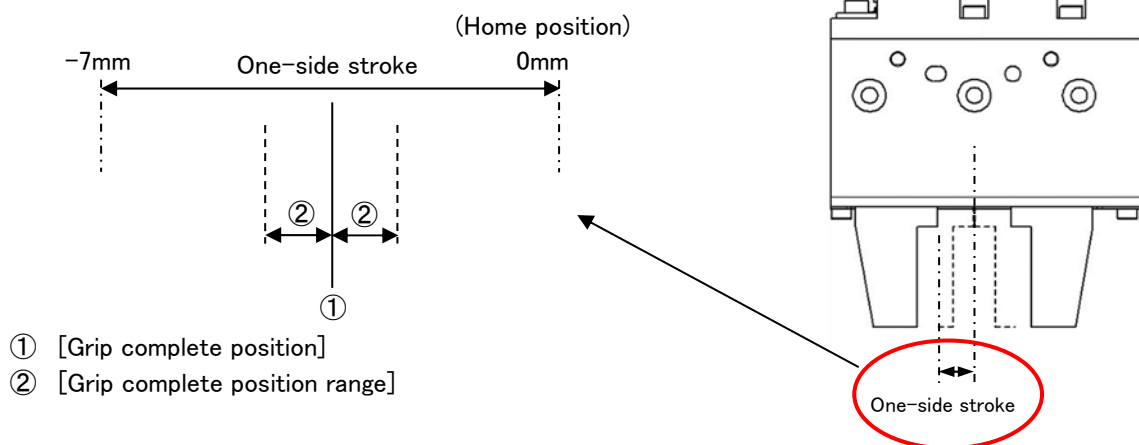
Set [Grip current] to 150mA as the upper limit. The [Grip current] will be $150 \text{ mA} \approx 20 \text{ N}$ (one side).

If grip operation is to be performed directly without approach operation, set [Approach speed to grip start] = [Grip speed] or [Standby position] = [Grip start position]. If [Standby position] = [Grip start position], [Grip speed] is given priority.

Determination of grip complete

If the state that satisfies the following conditions continues beyond the parameter [Time of grip judgement], the grip is complete.

- If the motor output current is within the parameter \pm [Grip complete current range] based on the parameter [Grip current] criteria.
- If the actual position is within the parameter \pm [Grip complete position range] based on the parameter [Grip complete position] criteria.

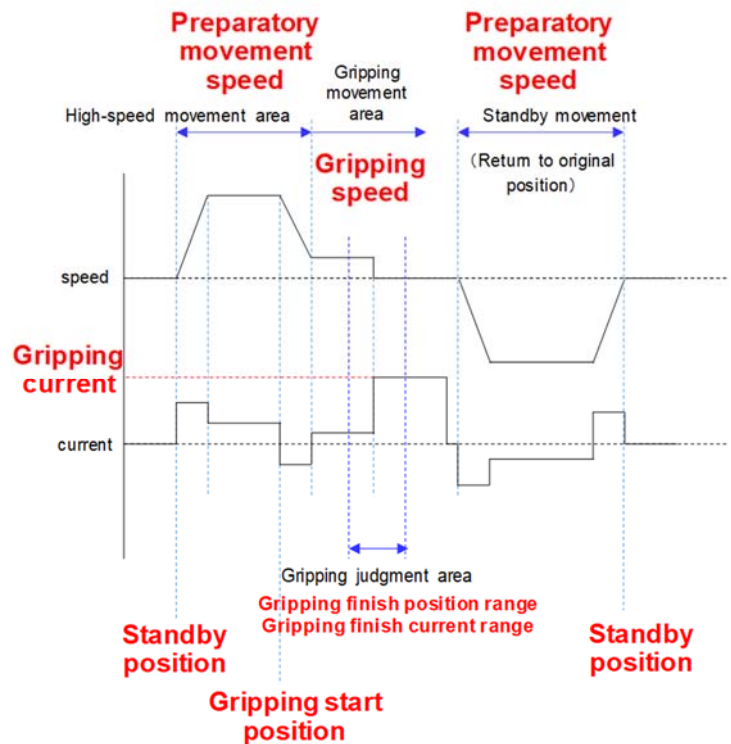
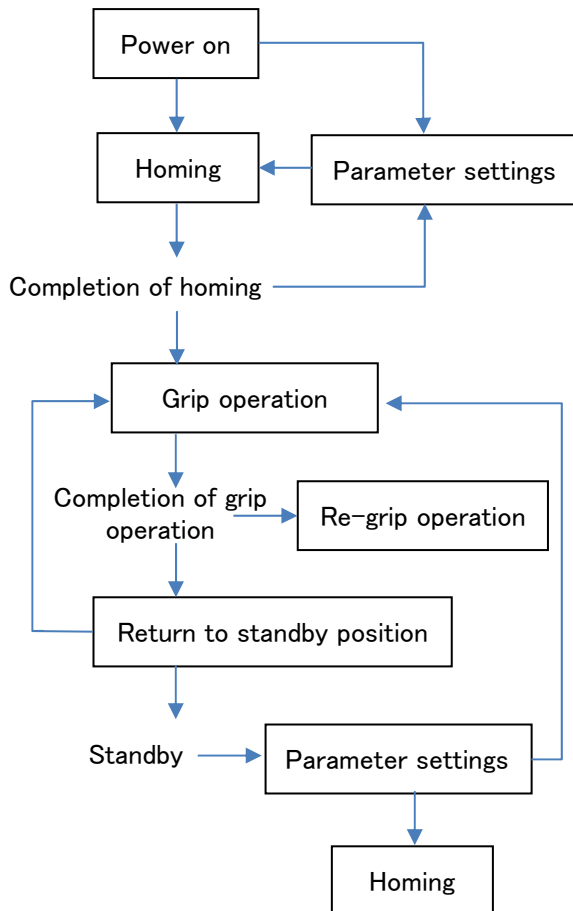


Measurement of workpiece dimensions

Calculate the dimensions with the dedicated software based on the actual position information on the "Control screen". For measurement with the customer's PLC or host device, please use RS485 communication or encoder output.

5. 4. Operation Sequence and Operation Pattern

The operation sequence and operation pattern are shown in the figure below. Parameters should be set when power is turned on, homing is completed, or when return to standby position is completed, and the gripper is in standby.



—Operation Pattern —

5. 5. Explanation of the Gain Screen

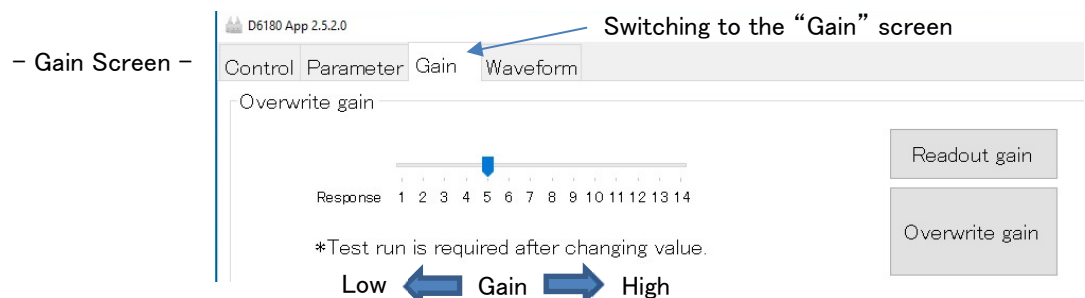
The default setting for the scale is 5 when shipped from the factory. Normally, sufficient operation can be ensured without changing the gain; set the gain to lower than 5 on the scale if vibration is not desired, or set it higher than 5 on the scale if speed tracking is to be increased.



An excessively high gain may cause oscillation, abnormal noise, or vibration.

[Operation method]

- ① Change the scale with the slider bar.
- ② The setting is written to the driver with "Overwrite gain" and is retained even when the power is turned on again.
- ③ Reads out the gain value set in the driver with "Readout gain".



5. 6. Explanation of the Waveform Screen

Actual current and actual speed during various operations can be monitored on the software screen, and data can be saved in CSV format. Please follow the procedure below to obtain and save the waveforms in CSV format.

① Selection of sampling interval

The sampling interval can be selected from the table below.

0: 1ms
1: 2ms
2: 5ms
3: 10ms

[Data volume limit for waveform sampling]

Waveform data sampling length [ms] = Sampling interval [ms] x 1,000 (Sampling count)

Example: If the sampling interval is set to 1 ms, waveform data sampling length = 1,000 [ms]

② Selection of waveform sampling trigger

The control input signal to be triggered when sampling a waveform can be selected from the table below.

0: Import starts by Ready button
1: Start of Grip operation
2: Return to standby position
3: Start of homing
4: Start of Re-grip operation

③ Measure ready

Preparation for sampling the waveform. The "Measure cancel" button places the gripper in standby mode, and "Measure ready" again places it in a ready state to sample the waveform.

④ Input control signal

Actual operation starts with various control inputs.

⑤ Display of waveform

The waveform is automatically displayed after a certain acquisition time has elapsed. The waveforms displayed are actual current (red) and actual speed (blue).

⑥ Save data to CSV file

The data items saved in CSV format are shown in the table below.

Numeric data	1 (ON)/0 (OFF) Data	
Time [μ s]	Return to standby position	Grip complete
Actual speed [mm/s]	Start of Grip operation	Completion of homing
Actual current [mA]	Start of homing	
Actual position [mm]	At standby position	

