Current-Controlled Screwdriver

DCD-40L (115W)

Instruction Manual

ET-A070 19A

HIOS Inc.

■ Introduction

This manual describes the touch panel operations and functions of the screwdriver.

■ Abbreviations and terminology

The abbreviations and terminology used in this manual are defined in the table below.

Abbreviation/terminology	Definition
SVC or controller	SV-NET Controller
SVD or driver	SV-NET compatible driver
Servo motor or motor	AC servo motor

Contents

■ Startup screen

1. Startup screen

The title screen is displayed when the touch panel first starts up.

After a few moments, the main window is displayed.

Fig.1-1 Title screen

■ Main screen

2. Main screen

On the main screen, select the screen that you want to display.

Touch a button to display the corresponding screen.

Fig.2-1 Main screen

If the external I/O is set to auto operation mode input, operation starts when the external I/O start signal is ON, even while the main window is displayed.

* If the external I/O channel No. and pattern No. are not selected, an operation error (103) occurs.

The [Program Preview] screen and [Edit] screen cannot be opened in auto operation mode.

3. [Program Preview] screen

On the [Program Preview] screen, you can select the tightening operation pattern, load the saved parameters, and check the parameters.

Fig.3-1 [Program Preview] screen (1/2)

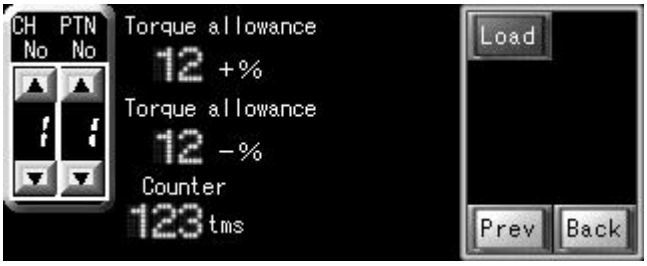


Fig.3-2 [Program Preview] screen (2/2)

3.1 Screen display items

■ Screen display items (buttons)

Screen display button	Description
	Select the channel No. Touch the [▲] button to increase the number, and touch the [▼] to decrease it. A value from 1 to 8 can be selected.
	Select the pattern No. Touch the [▲] button to increase the number, and touch the [▼] to decrease it. A value from 1 to 4 can be selected.
	Load the saved parameters for the combination of channel No. and pattern No. When loading is complete, the [Data loaded] message window is displayed.
	Display the next or previous page to check the parameters.
	Return to the main screen.

■ [Operate] screen

■ Screen display items (numeric values)

Numeric value display item	Description
Angle 1 (Rotation angle 1)	Rotation angle setting for temporary tightening. The unit is ° (degrees).
Angle 2 (Rotation angle 2)	Rotation angle setting for loosening. The unit is ° (degrees).
Angle 3 (Rotation angle 3)	Rotation angle setting for additional tightening. The unit is ° (degrees).
Rotation 1 (Rotation speed 1)	Rotation speed setting for temporary tightening. The unit is rpm.
Rotation 2 (Rotation speed 2)	Rotation speed setting for full tightening, loosening, and additional tightening. The unit is rpm.
Trq 1 (Torque 1)	Torque setting that is applied when switching from temporary tightening to full tightening. The unit is N.m.
Trq 2 (Torque 2)	Limit torque setting for full tightening. The unit is N.m.
Trq 3 (Torque 3)	Limit torque setting for tightening. The unit is N.m.
Cycle TM (Cycle time)	Time setting for the full set of screw tightening operations. The unit is sec. An error is displayed if the specified time is exceeded.
Hold TM (Holding time)	Holding time setting for screw tightening judgment. The unit is ms. * See Chapter 15 "Holding time".
Torque allowance (Torque judgment range)	Setting range value for when motor torque value judgment is performed in screw tightening judgment. The unit is ±%. Example: When the torque judgment range is ±10% for a torque setting of 1 N.m, the judgment is OK if the torque is from 0.9 N.m to 1.1 N.m. * See Chapter 16.
Counter (Torque judgment counter)	Setting for number of times that normal motor torque value is detected, for screw tightening judgment. The judgment is OK if the number of times that the normal motor torque value is detected is within the range. The judgment is NG if the number of times that the normal motor torque value is detected is outside the range. * See Chapter 16.

■ [Operate] screen

4. [Operate] screen

On the [Operate] screen, start the screw tightening operations using the parameters that have been set.

Fig.4-1 [Operate] screen

4.1 Screen display items

■ Screen display items (buttons)

Screen display button	Description	When button is enabled
	Start the screw tightening operation for the specified channel No. and pattern No.	- In manual mode - Before starting operation - When alarm reset IN (IN 12) is OFF
	Stop the screw tightening operation while it is being performed.	- In manual mode
 	[CW] (Clockwise)/[CCW] (Counterclockwise) Select the rotation direction for screw tightening. This setting cannot be changed while screw tightening operation is being performed.	- In manual mode - Before starting operation
	When an error occurs, the [Error No.] and [Error Reset] buttons are displayed. After removing the cause of the error, touch the [Error Reset] button to clear the error display.	- Always enabled
	Return to the main screen.	- Always enabled
	[Rev] (Reverse) The screwdriver rotates in the screw loosening direction while this button is touched.	- In manual mode - Before starting operation

■ [Operate] screen

■ Screen display items (numeric values, lamps)

Screen display item	Description
	The currently selected channel No. and pattern No. are displayed.
 	The start and finish status of the screw tightening operation is indicated. [Strt] (Start): Lights up while screw tightening operation is being performed. [Fin] (Finish): Lights up for 100 ms after screw tightening operation is complete.
  	The status of the screw tightening operation is indicated. [Tmp] (Temporary tightening): The screw is being temporarily tightened. [Full] (Full tightening): The temporary tightening operation has finished, and the screw is being fully tightened. [Add] (Additional tightening): The full tightening operation has finished, and the screw is being additionally tightened.
 	The direction of the screw tightening operation is indicated. [CW] (Clockwise): Screw tightening direction [CCW] (Counterclockwise): Screw loosening direction
 	The current mode is indicated. [Manl] (Manual): Manual mode [Auto] (Auto): Auto mode
	When an error occurs, the [Error No.] and [Error Reset] buttons are displayed. The error No. of the current error is displayed.
	The status of the screw tightening operation is indicated. [START OUT]: Lights up while screw tightening operation is being performed. [FINISH OUT]: Lights up for 100 ms after screw tightening operation is complete.

■ [Monitor Operate] screen

5. [Monitor Operate] screen

On the [Monitor Operate] screen, start the screw tightening operations using the parameters that have been set.

Various information about the motor can be checked.

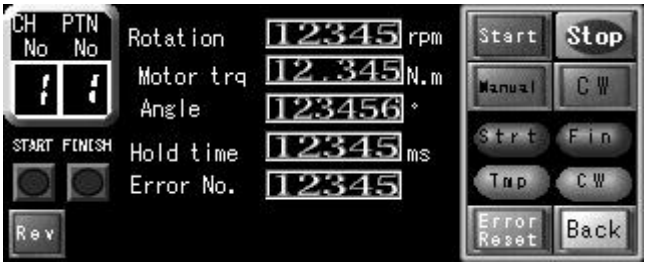


Fig.5-1 [Monitor Operate] screen

5.1 Screen display items

■ Screen display items (buttons)

Screen display button		Description	When button is enabled
		Start the screw tightening operation for the specified channel No. and pattern No.	- In manual mode - Before starting operation - When alarm reset IN (IN 12) is OFF
		Stop the motor while operation is being performed.	- In manual mode
 [Manual]	 [Auto]	Switch between manual mode and auto mode. The mode cannot be changed when auto ON is input from the external I/O. * These buttons can be used to switch the mode only while the [Monitor Operate] screen is open. When you return to the main screen, the mode automatically switches to manual mode.	- Before starting operation
 [Clockwise]	 [Counter-clockwise]	Select the rotation direction for screw tightening. These buttons are enabled only in manual mode. The direction cannot be changed while the screw tightening operation is being performed.	- In manual mode - Before starting operation
		Clear the current error from the error display.	- Always enabled
		Return to the main screen.	- Always enabled
 [Rev] (Reverse)		The screwdriver rotates in the screw loosening direction while this button is touched.	- In manual mode - Before starting operation

■ [Monitor Operate] screen

■ Screen display items (numeric values)

Screen display item	Description
	The currently selected channel No. and pattern No. are displayed.
Rotation (Rotation speed)	The motor rotation speed is displayed in units of rpm.
Motor trq (Motor torque)	The motor torque is displayed in units of N.m.
Angle (Rotation angle)	The current rotation angle is displayed in units of ° (degrees).
Hold time (Holding time)	The holding time for the screw tightening operation is displayed in units of ms. * See Chapter 15 "Holding time".
Error No.	The error No. of the current error is displayed. For details, see the "Error list" sections.

■ Screen display items (lamps)

Screen display item	Description
 	The start and finish status of the screw tightening operation is indicated. [Strt] (Start): Lights up while screw tightening operation is being performed. [Fin] (Finish): Lights up for 100 ms after screw tightening operation is complete.
  	The status of the screw tightening operation is indicated. [Tmp] (Temporary tightening): Temporary tightening is being performed on the screw. [Full] (Full tightening): The temporary tightening operation has finished, and full tightening is being performed. [Add] (Additional tightening): The full tightening operation has finished, and additional tightening is being performed.
 	The direction of the screw tightening operation is indicated. [CW] (Clockwise): Screw tightening direction [CCW] (Counterclockwise): Screw loosening direction
	The status of the screw tightening operation is indicated. [START OUT]: Lights up while screw tightening operation is being performed. [FINISH OUT]: Lights up for 100 ms after screw tightening operation is complete.

■ [Edit] screen

6. [Edit] screen

Configure the various parameter settings that are necessary for the screw tightening operations.

Configured settings can be saved or loaded for each channel No. and pattern No.

Touch a numeric value input field to enter a value using the numeric keys. For details about each numeric value input field and each button, see the screen display item descriptions below.

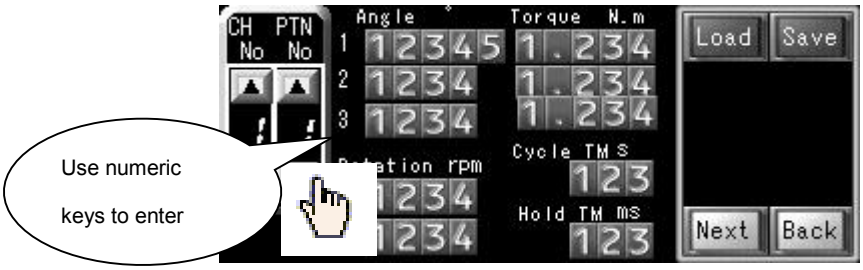


Fig.6-1 [Edit] setting screen (1/2)

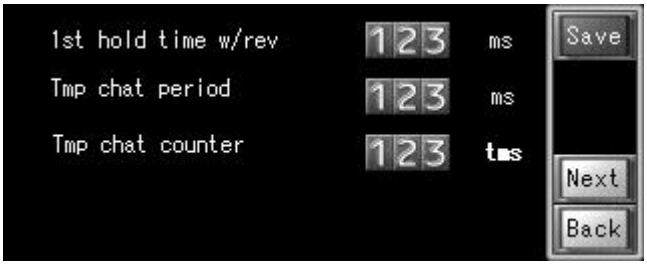


Fig.6-2 [Edit] setting screen (2/2)

6.1 Password input

A password must be entered in order to display the [Edit] screen.

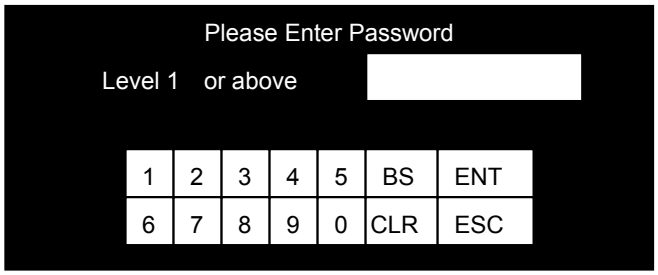
Touch the numeric keys displayed on the screen to enter the password. (The factory default setting is a four-digit password {8104}, and a password of up to eight digits can be set.)

Touch the [BS] button to delete the last digit.

Touch the [CLR] button to delete all digits.

Touch the [ENT] button to log in with the password.

When the correct password is entered, the [Edit] screen is displayed. If the password is not correct, a warning message is displayed. If no password is entered for one minute, the main screen is automatically displayed again.



6.3 Password input screen

■ [Edit] screen

6.2 Screen display items

■ Screen display items (numeric input)

Numeric input item	Description
Angle 1 (Rotation angle 1)	Rotation angle setting for temporary tightening. The unit is ° (degrees).
Angle 2 (Rotation angle 2)	Rotation angle setting for loosening. The unit is ° (degrees).
Angle 3 (Rotation angle 3)	Rotation angle setting for additional tightening. The unit is ° (degrees).
Rotation 1 (Rotation speed 1)	Rotation speed setting for temporary tightening. The unit is rpm.
Rotation 2 (Rotation speed 2)	Rotation speed setting for full tightening, loosening, and additional tightening. The unit is rpm.
Torque 1 (Torque 1)	Torque setting that is applied when switching from temporary tightening to full tightening. The unit is N.m.
Torque 2 (Torque 2)	Limit torque setting for full tightening. The unit is N.m.
Torque 3 (Torque 3)	Limit torque setting for tightening. The unit is N.m.
Cycle TM (Cycle time)	Time setting for the full set of screw tightening operations. The unit is sec. An error is displayed if the specified time is exceeded.
Hold TM (Holding time)	Holding time setting for screw tightening judgment. The unit is ms. * See Chapter 15 "Holding time".
Torque allowance (Torque judgment range)	Setting range value for when motor torque value judgment is performed in screw tightening judgment. The unit is ±%. Example: When the torque judgment range is ±10% for a torque setting of 1 N.m, the judgment is OK if the torque is from 0.9 N.m to 1.1 N.m. * See Chapter 16.
Counter (Torque judgment counter)	Setting for number of times that normal motor torque value is detected, for screw tightening judgment. The judgment is OK if the number of times that the normal motor torque value is detected is within the range. The judgment is NG if the number of times that the normal motor torque value is detected is outside the range. * See Chapter 16.

■ [Edit] screen

■ Screen display items (buttons)

Screen display button	Description
	Select the channel No. Touch the [▲] button to increase the number, and touch the [▼] button to decrease it. A value from 1 to 8 can be selected.
	Select the pattern No. Touch the [▲] button to increase the number, and touch the [▼] button to decrease it. A value from 1 to 4 can be selected.
	Load the saved parameters for the combination of channel No. and pattern No. When loading is complete, the [Data loaded] message window is displayed.
	Save the currently configured parameters for the combination of channel No. and pattern No. If parameters have already been saved for the combination, the data is overwritten. When saving is complete, the [Data saved] message window is displayed.
	Open the screen for configuring special settings that apply to all operation patterns, and settings that are specific to the motor. Since the settings are normally configured by HIOS, a password is required in order to display the screen.
	[Next]/[Prev] Display the next or previous page of the [Edit] screen.
	Return to the main screen.

7. [HIOS] setting screen

Open the screen for configuring special settings that apply to all operation patterns and to settings that are specific to the motor.

Since the settings are normally configured by HIOS, a password is required in order to display the screen.

Touch a numeric value input field to enter a value using the numeric keys. For details about each numeric value input field and each button, see the screen display item descriptions below.

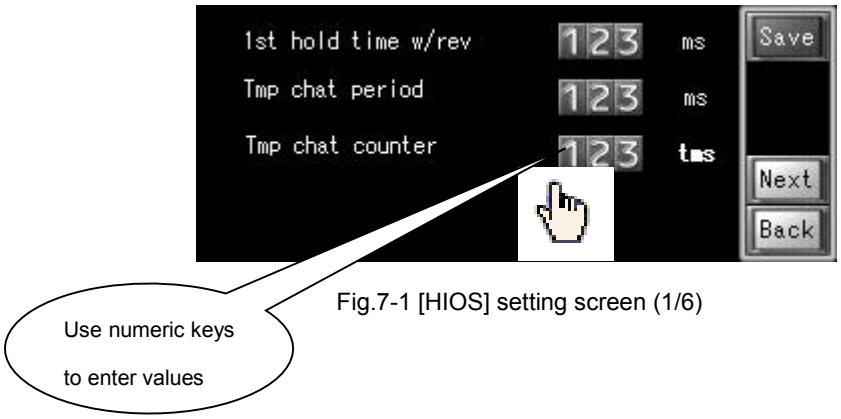


Fig.7-1 [HIOS] setting screen (1/6)

Fig.7-2 [HIOS] setting screen (2/6)

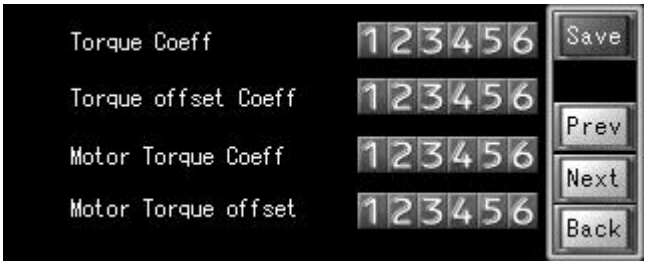


Fig.7-3 [HIOS] setting screen (3/6)

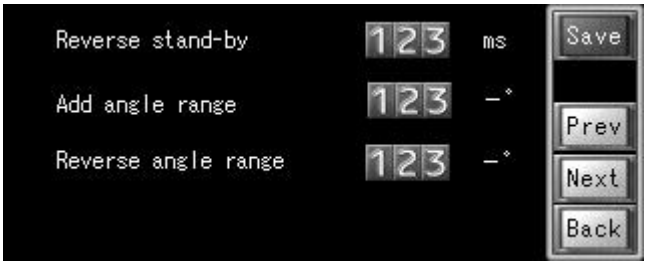


Fig.7-4 [HIOS] setting screen (4/6)

Fig.7-5 [HIOS] setting screen (5/6)

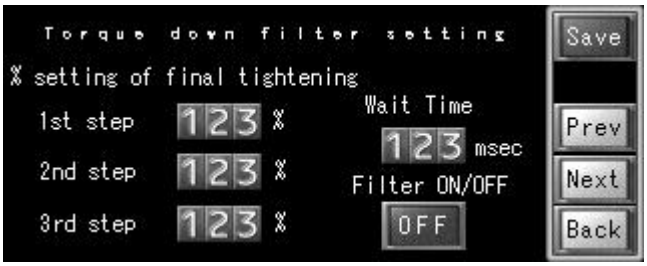


Fig.7-6 [HIOS] setting screen (6/6)

7.1 Password input

A password must be entered in order to display the [HIOS] setting screen.

Touch the numeric keys displayed on the screen to enter the password. (The factory default setting is an eight-digit password {81040000}, and a password of up to eight digits can be set.)

Touch the [BS] button to delete the last digit.

Touch the [CLR] button to delete all digits.

Touch the [ENT] button to log in with the password.

When the correct password is entered, the [HIOS] setting screen is displayed. If the password is not correct, a warning message is displayed. If no password is entered for one minute, the main screen is automatically displayed again.

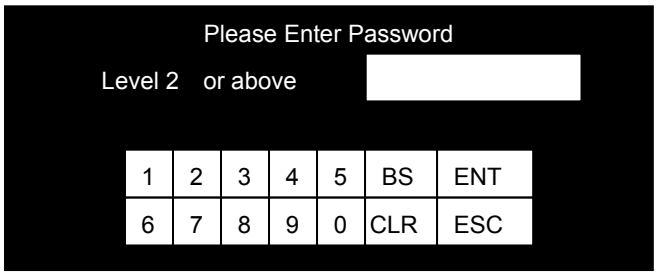


Fig.7-4 Password input screen

7.2 Screen display items

■ Screen display items (numeric input)

Numeric input item	Description
1st hold time w/rev (Holding time for first full tightening in operation patterns that include reverse rotation)	Set the holding time for the first full tightening in operation patterns that include reverse rotation. The unit is ms. * See Chapter 15 "Holding time".
Tmp chat period (Chattering judgment period for temporary tightening)	Set the period of one scan in the current chattering judgment for temporary tightening. The unit is ms. * See Chapter 16.
Tmp chat counter (Chattering judgment count for temporary tightening)	Set the number of scans to perform in the current chattering judgment for temporary tightening. The unit is the number of times. * See Chapter 16.
Full/Add – Specified current (Negative current value used for judgment of whether the specified current is reached in full tightening and additional tightening)	This is the parameter setting to use in the calculation of the current for the torque detection judgment, to speed up torque-up detection for full tightening and additional tightening. The specified percentage amount is subtracted from the full tightening and additional tightening current. The unit is -%.
Reverse Speed (Reverse operation speed)	Set the speed of the reverse operation. The unit is rpm.
Motor KT (spec) (Motor KT value (specification value))	Set the KT value of the motor that is used. (Refer to the motor specifications.) The unit is N.m/A.
Motor KT offset Motor KT high/low (Motor KT value offset + setting torque-down - setting torque-up)	Set the positive and negative offset value to apply to the motor KT value. This corrects for the difference between the motor torque and actual tightening torque. The unit is N.m/A.
Torque Coeff (Torque command correction slope coefficient)	This correction value is applied to the torque command to stabilize it. (Perform calculation using the correction value calculation file.)
Torque offset Coeff (Torque command correction offset value)	This correction value is applied to the torque command to stabilize it. (Perform calculation using the correction value calculation file.)
Motor Torque Coeff (Motor torque correction slope coefficient)	This coefficient corrects for the difference between the motor torque and actual tightening torque.

■ Operation parameters

Motor Torque offset (Wait time for angle judgment in loosening operation)	This setting specifies the required time, based on the angle and speed of the driver's loosening operation. The unit is ms.
Reverse stand-by (Wait time for angle judgment in loosening operation)	This is the setting range of the required time, calculated from the angle and speed of the driver's loosening operation. The unit is ms.
Add angle range (Additional tightening angle judgment range)	This is the range for the angle judgment in additional tightening. The setting range is expressed in negative (-) degrees.
Reverse angle range (Loosening angle judgment range)	This is the range for the angle judgment in loosening. The setting range is expressed in negative (-) degrees.
Pattern 3, Reverse torque – Full (Torque for pattern 3 loosening operation - Negative percentage of full tightening torque)	This setting specifies the torque for the reverse rotation, in terms of negative torque relative to the full tightening torque, to prevent excessive looseness in the screw when the loosening operation in pattern 3 is performed. The unit is -%.
Torque down filter setting 1st step (Torque-down filter setting - Step 1 torque)	Set this parameter to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is %. * See Chapter 16.
Torque down filter setting 2nd step (Torque-down filter setting - Step 2 torque)	Set this parameter to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is %. * See Chapter 16.
Torque down filter setting 3rd step (Torque-down filter setting - Step 3 torque)	Set this parameter to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is %. * See Chapter 16.
Torque down filter setting Wait Time (Torque-down filter setting - Wait time)	Set this parameter to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The wait time specifies the amount of time to wait before applying each change to the torque limit setting. The unit is msec. * See Chapter 16.

■ Operation parameters

■ Screen display items (buttons)

Screen display button		Description
		Save the currently configured parameters. If parameters have already been saved, the data is overwritten. When saving is complete, the [特殊設定データ保存完了] (Finished saving special setting data) message window is displayed.
		[Next]/[Prev] Display the next or previous page of the [HIOS] setting screen.
		Return to the [Edit] screen.
		Set whether or not to use the torque-down filter. Select [ON] to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed before the servo turns OFF upon completion of the pattern operation. The torque limit setting changes based on the parameters specified for steps 1, 2, and 3, in that order. The wait time specifies the amount of time to wait before applying each change to the torque limit setting. * See Chapter 16.

8. Operation parameters

The tables in this chapter describe the parameter settings for each operation pattern, as well as the available setting ranges for the [Edit] screen and [HIOS] screen settings.

■ Parameter settings for each operation pattern

Operation No.	Pattern 1	Pattern 2	Pattern 3	Pattern 4
Angle 1 (Rotation angle 1: °)	Specified rotation angle for temporary tightening			
Angle 2 (Rotation angle 2: °)	Not used		Specified rotation angle for loosening	
Angle 3 (Rotation angle 3: °)	Not used	Specified rotation angle for additional tightening	Not used	Specified rotation angle for additional tightening
Rotation 1 (Rotation speed 1: rpm)	Speed for temporary tightening			

■ Operation parameters

Rotation 2 (Rotation speed 2: rpm)	Speed for full tightening	Speed for full tightening and additional tightening	Speed for full tightening and loosening	Speed for full tightening, loosening, and additional tightening
Trq 1 (Torque 1: N.m)	Torque for temporary tightening			
Trq 2 (Torque 2: N.m)	Torque for full tightening			
Trq 3 (Torque 3: N.m)	Not used	Torque for additional tightening	Not used	Torque for additional tightening
Cycle TM (Cycle time: s)	Specified time for full set of operations of each pattern			
Hold TM (Holding time: ms)	Holding time after torque-up for full tightening and additional tightening * See Chapter 15 "Holding time"			
Torque allowance (Torque judgment range: ±%)	Motor torque judgment range for full tightening and additional tightening * See Chapter 16			
Counter (Torque judgment counter)	Number of times to count full tightening and additional tightening torque judgment * See Chapter 16			

■ Parameter setting range for operation patterns

Parameter name	Description	Default value	Min. value	Max. value
Angle 1 (Rotation angle 1: °)	Specified rotation angle for temporary tightening	7200	1	59999
Angle 2 (Rotation angle 2: °)	Specified rotation angle for loosening	Pattern 3: 3 Pattern 4: 10	1	9999
Angle 3 (Rotation angle 3: °)	Specified rotation angle for additional tightening	60	30	9999
Rotation 1 (Rotation speed 1: rpm)	Speed for temporary tightening	800	10	2800
Rotation 2 (Rotation speed 2: rpm)	Speed for full tightening, loosening, and additional tightening	100	10	2800
Trq 1 (Torque 1: N.m)	Torque for temporary tightening	0.300	0.300	1.300
Trq 2 (Torque 2: N.m)	Torque for full tightening	0.300	0.300	1.300

■ Operation parameters

Trq 3 (Torque 3: N.m)	Torque for additional tightening	3.000	0.300	1.300
Cycle TM (Cycle time: s)	Specified time for full set of operations of each pattern	30	5	100
Hold TM (Holding time: ms)	Holding time after torque-up for full tightening and additional tightening * See Chapter 15 "Holding time"	150	50	500
Torque allowance (Torque judgment range: ±%)	Motor torque judgment range for full tightening and additional tightening	5	1	99
Counter	Setting for number of times that normal motor torque value is detected, for screw tightening judgment.	10	1	100

* The minimum value is 30° because the torque-down causes the bit to spring back when the servo turns OFF after full tightening is complete.

■ Operation parameters

■ Parameter setting range for special settings

Parameter name	Description	Default value	Min. value	Max.value
1st hold time w/rev (Holding time for first full tightening in operation patterns that include reverse rotation: ms)	Holding time setting for the first full tightening in operation patterns that include reverse rotation * See Chapter 15 "Holding time"	100	50	500
Tmp chat period (Chattering judgment period for temporary tightening: ms)	Period setting of one scan in the current chattering judgment for temporary tightening * See Chapter 16	1	1	50
Tmp chat counter (Chattering judgment count for temporary tightening: number of times)	Setting for number of scans to perform in the current chattering judgment for temporary tightening * See Chapter 16	5	0	100
Full/Add – Specified current (Negative current value used for judgment of whether the specified current is reached in full tightening and additional tightening: -%)	Parameter setting used in the calculation of the current for judgment to increase the torque-up detection speed for full tightening and additional tightening	10	0	50
Reverse Speed (Reverse operation speed: rpm)	Speed setting for reverse operation	200	1	999
Motor KT (spec) (Motor KT value: N.m/A)	KT value setting of the motor that is used (Refer to the motor specifications)	0.42	0.001	1.000
Motor KT offset Motor KT high/low (Motor KT value offset + setting torque-down - setting torque-up)	Set the positive and negative offset value to apply to the motor KT value. This corrects for the difference between the motor torque and actual tightening torque. The unit is N.m/A.	0	-1.000	1.000
Torque Coeff (Torque command correction slope coefficient)	This correction value is applied to the torque command to stabilize it. (Perform calculation using the correction value calculation file.)	Factory setting	-32768	32767
Torque offset Coeff (Torque command correction offset value)	This correction value is applied to the torque command to stabilize it. (Perform calculation using the correction value calculation file.)	Factory setting	-32768	32767
Motor Torque Coeff (Motor torque correction slope coefficient)	This coefficient corrects for the difference between the motor torque and actual tightening torque.	Factory setting	-32768	32767
Motor Torque offset (Motor torque correction offset value)	This offset value corrects for the difference between the motor torque and actual tightening torque.	Factory setting	-32768	32767

■ Operation parameters

Reverse stand-by (Wait time for angle judgment in loosening operation)	This is the setting range of the required time, calculated from the angle and speed of the driver's loosening operation. The unit is ms.	100	0	999
Add angle range (Additional tightening angle judgment range)	This is the range for the angle judgment in additional tightening. The setting range is expressed in negative (-) degrees.	10	0	999
Reverse angle range (Loosening angle judgment range)	This is the range for the angle judgment in loosening. The setting range is expressed in negative (-) degrees.	10	0	999
Pattern 3, Reverse torque – Full (Torque for pattern 3 loosening operation - Negative percentage of full tightening torque)	This setting specifies the torque for the reverse rotation, as negative torque relative to the full tightening torque, to prevent excessive looseness in the screw when the loosening operation in pattern 3 is performed. The unit is -%.	0	0	100
Torque down filter setting 1st step (Torque-down filter setting - Step 1 torque)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is N.m. * See Chapter 16.	0.000	0.000	5.500
Torque down filter setting 2nd step (Torque-down filter setting - Step 2 torque)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is N.m. * See Chapter 16.	0.000	0.000	5.500
Torque down filter setting 3rd step (Torque-down filter setting - Step 3 torque)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is N.m. * See Chapter 16.	0.000	0.000	5.500
Torque down filter setting Wait Time (Torque-down filter setting - Wait time)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The wait time specifies the amount of time to wait before applying each change to the torque limit setting. The unit is msec. * See Chapter 16.	0	0	999

■ Operation parameters

Pattern 3, Reverse torque – Full (Torque for pattern 3 loosening operation - Negative percentage of full tightening torque)	This setting specifies the torque for the reverse rotation, as negative torque relative to the full tightening torque, to prevent excessive looseness in the screw when the loosening operation in pattern 3 is performed. The unit is -%.	0	0	100
Torque down filter setting 1st step (Torque-down filter setting - Step 1 torque)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is N.m. * See Chapter 16.	0.000	0.000	5.500
Torque down filter setting 2nd step (Torque-down filter setting - Step 2 torque)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is N.m. * See Chapter 16.	0.000	0.000	5.500
Torque down filter setting 3rd step (Torque-down filter setting - Step 3 torque)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The torque limit setting is changed based on the parameters specified for steps 1, 2, and 3, in that order. The unit is N.m. * See Chapter 16.	0.000	0.000	5.500
Torque down filter setting Wait Time (Torque-down filter setting - Wait time)	This parameter is set to reduce the spring-back of the bit that occurs when the servo is turned OFF after the pattern is complete. The wait time specifies the amount of time to wait before applying each change to the torque limit setting. The unit is msec. * See Chapter 16.	0	0	999

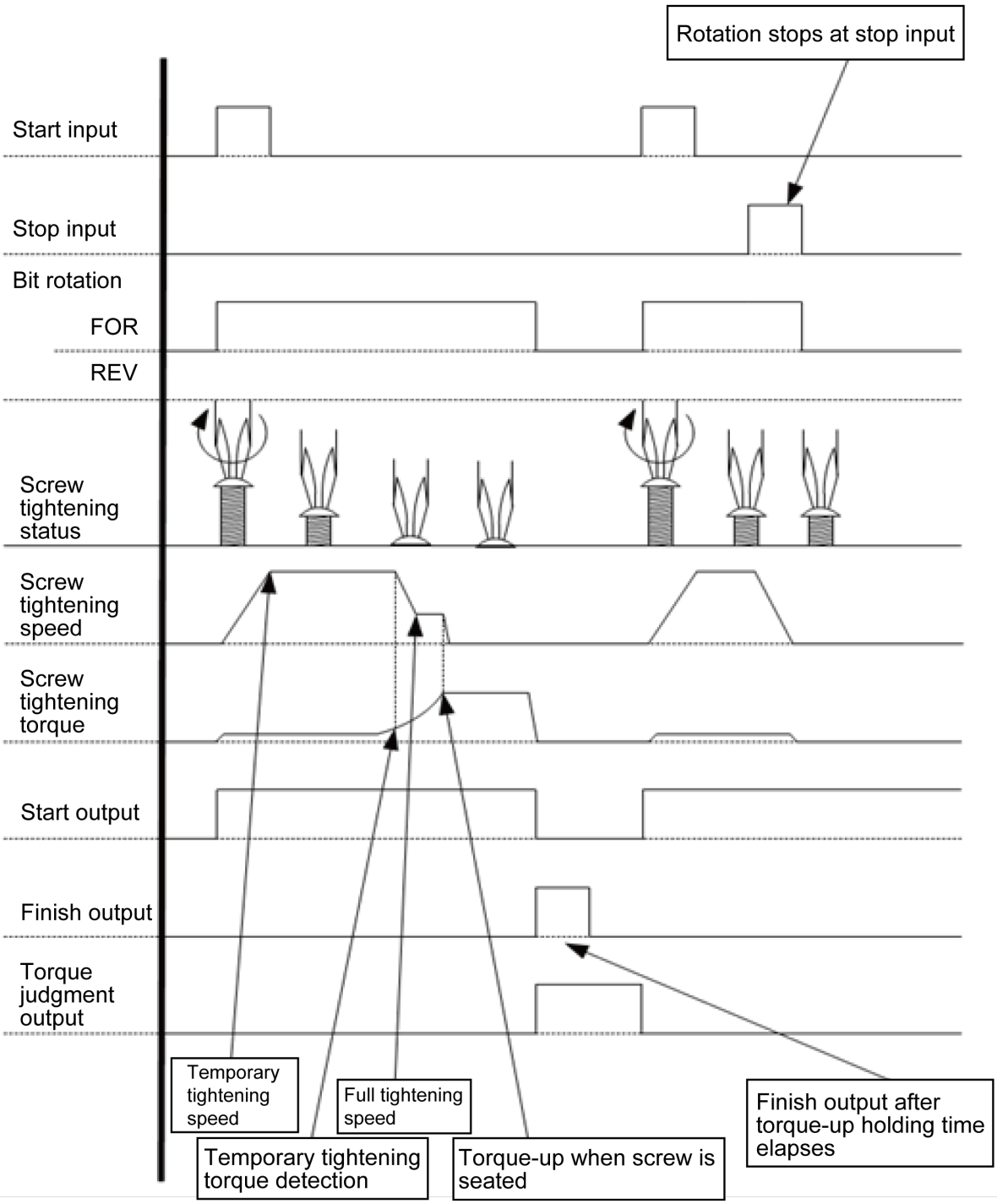
■ Operation timing charts

9. Operation pattern timing charts

This chapter describes the timing charts for each operation pattern.

■ Pattern 1

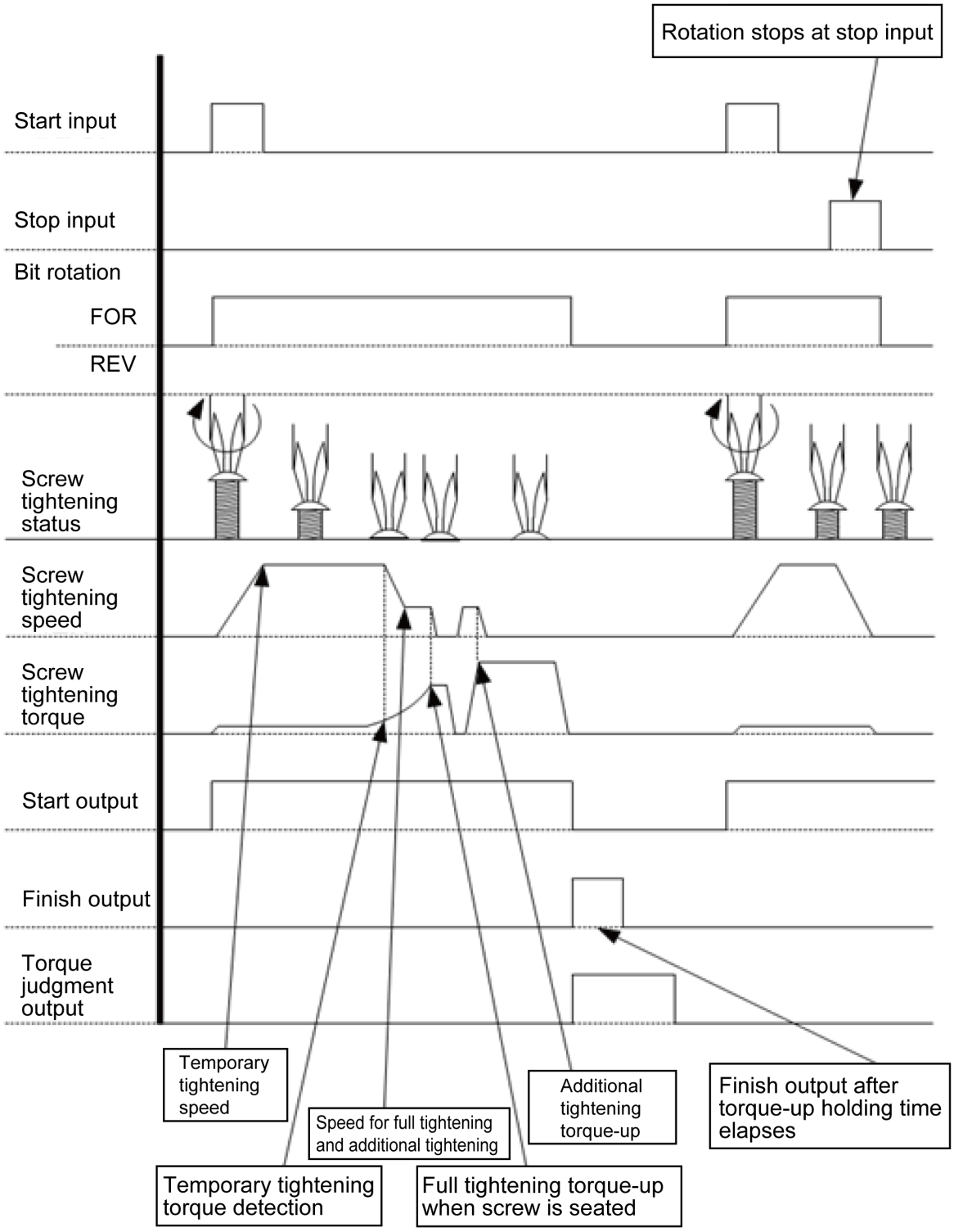
Pattern 1 operation timing chart



■ Operation timing charts

■ Pattern 2

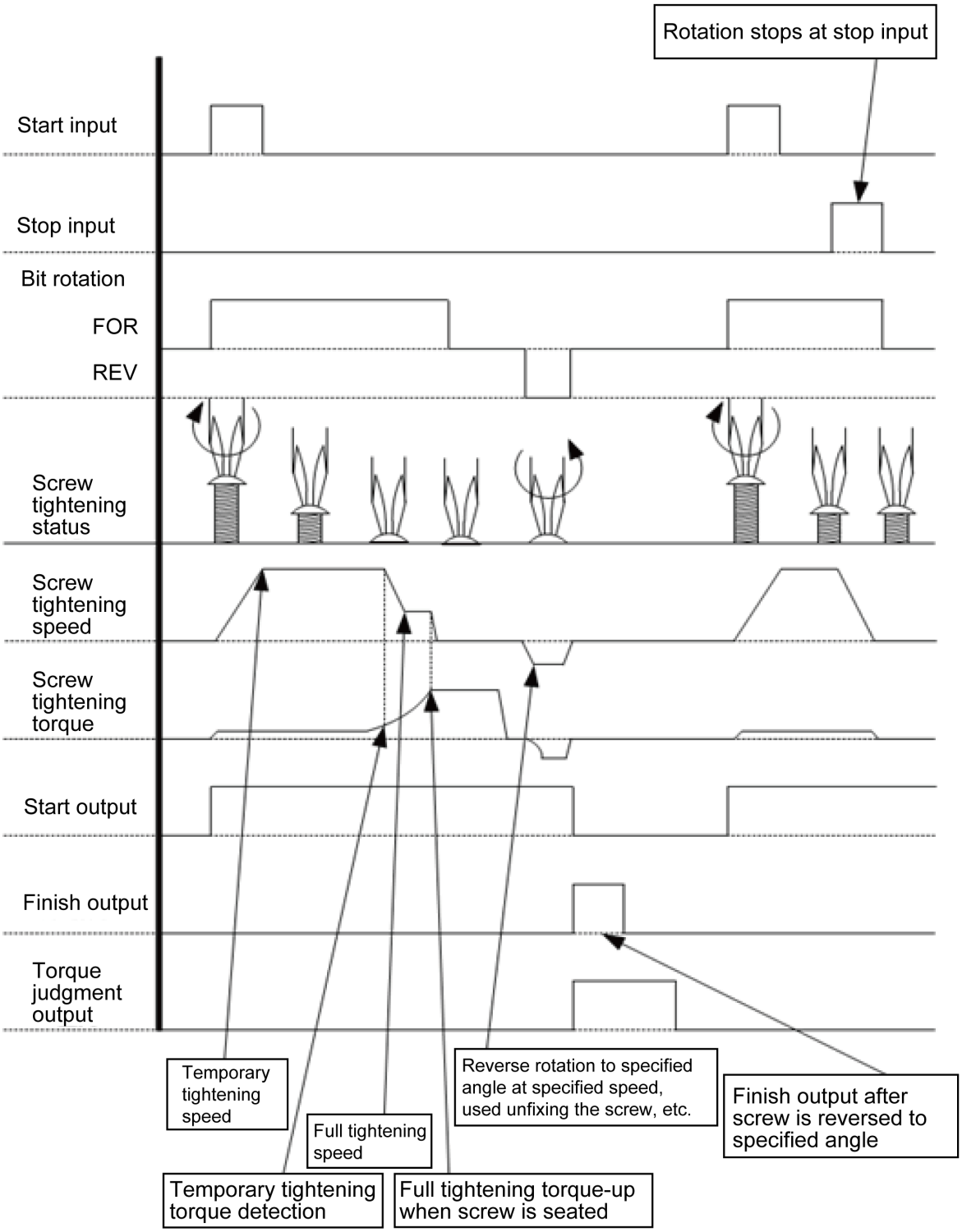
Pattern 2 operation timing chart



■ Operation timing charts

■ Pattern 3

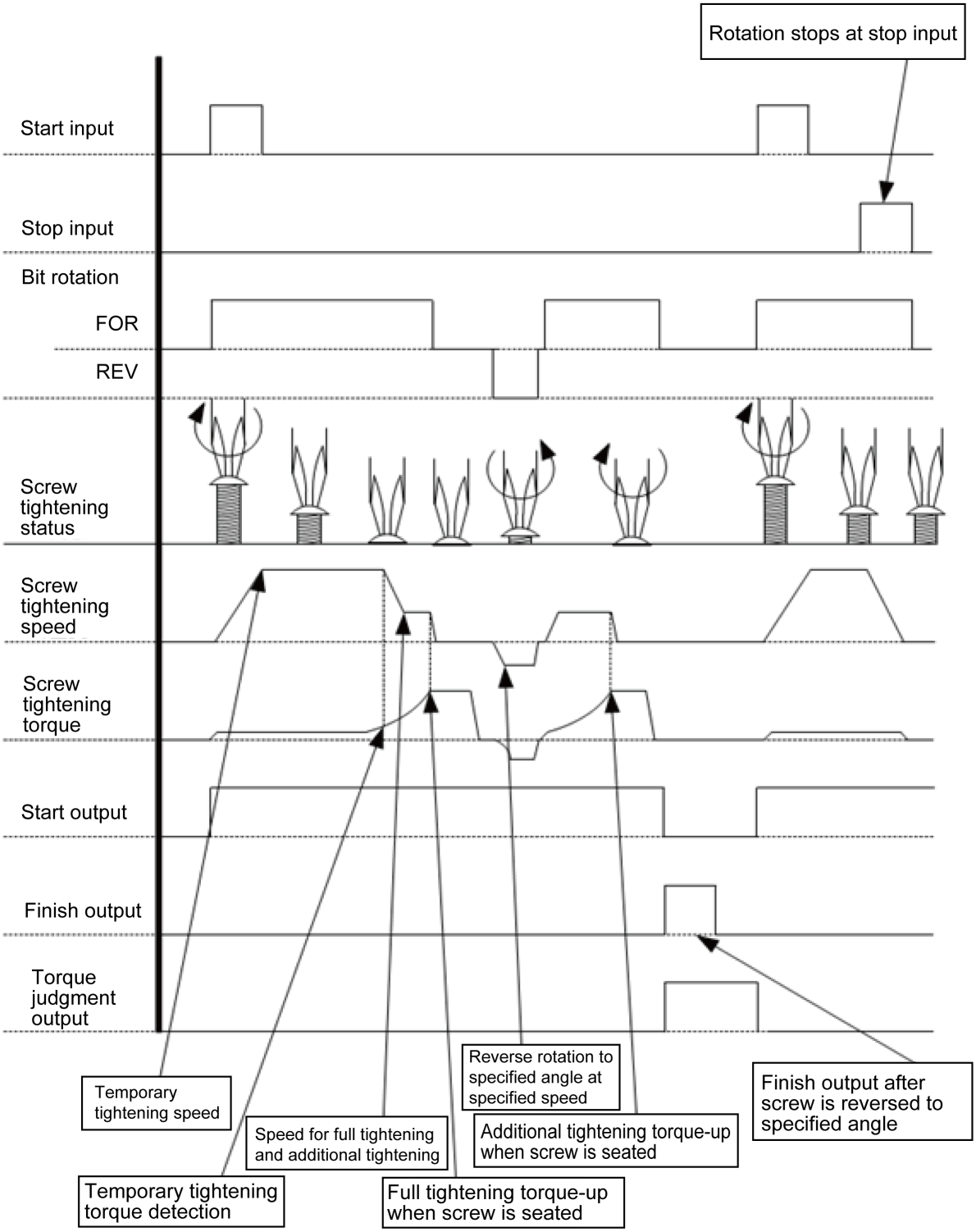
Pattern 3 operation timing chart



■ Operation timing charts

■ Pattern 4

Pattern 4 operation timing chart



10. Manual/auto mode

In manual mode, the screw tightening operation starts when the [Start] button is touched, after selecting the rotation direction ([CW]/[CCW] (Clockwise)/(Counterclockwise)) for the channel No. and pattern No. on the [Program Preview] screen.

In auto mode, the screw tightening operation starts when the [Start] switch is turned ON, after selecting the rotation direction ([CW]/[CCW] (Clockwise)/(Counterclockwise)) for the channel No. and pattern No. using the external I/O switches.

■ Manual mode

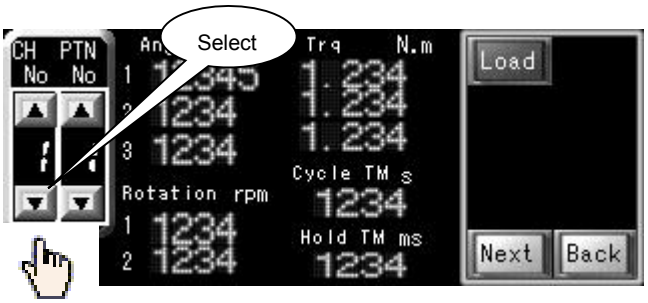


Fig.8-1 [Program Preview] screen (1/2)

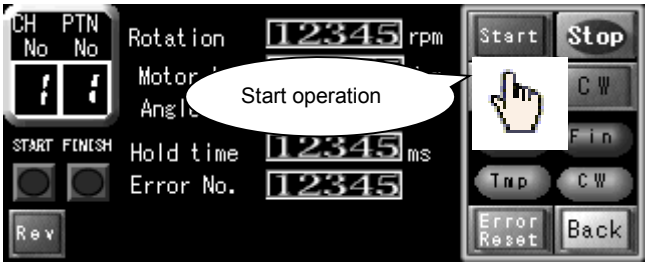


Fig.8-2 [Monitor Operate] screen

■ I/O

■ Auto mode

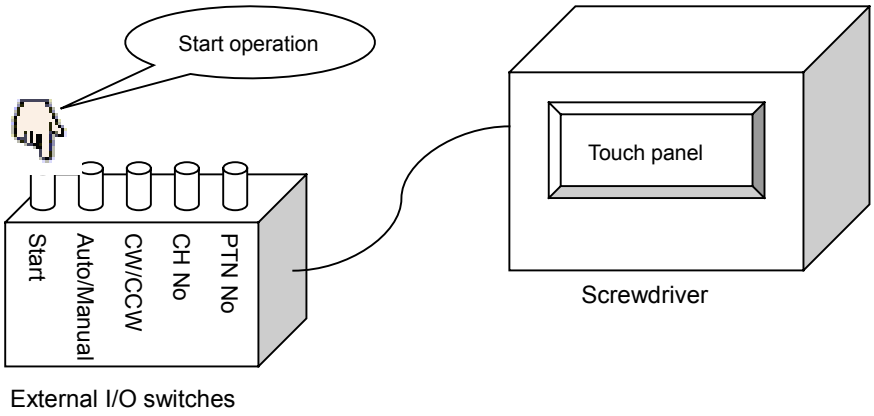


Fig.8-3 Auto mode configuration

11. I/O

11.1 I/O allocation table

■ I/O input signals

Signal	Signal name	Contact	Input signal	Description
IN0	Start IN	A	OFF→ON	ON: Operation starts [Enabled in auto mode]
IN1	FOR/REV switching IN	A	Level	OFF: FOR (clockwise), ON: REV (counterclockwise)
IN2	Auto/Manual switching IN	A	Level	OFF: Manual, ON: Auto
IN3	CH1 IN	A	OFF→ON	CH No. bit 0 [Enabled in auto mode]
IN4	CH2 IN	A	OFF→ON	CH No. bit 1 [Enabled in auto mode]
IN5	CH4 IN	A	OFF→ON	CH No. bit 2 [Enabled in auto mode]
IN6	CH8 IN	A	OFF→ON	CH No. bit 3 [Enabled in auto mode]
IN7	PTN1 IN	A	OFF→ON	PTN No. bit 0 [Enabled in auto mode]
IN8	PTN2 IN	A	OFF→ON	PTN No. bit 1 [Enabled in auto mode]
IN9	PTN4 IN	A	OFF→ON	PTN No. bit 2 [Enabled in auto mode]
IN10	Temporary/Full tightening switching IN	A	OFF→ON	ON: Switch to full tightening operation, when temporary tightening operation is being performed
IN11	-	-	-	-
IN12	Alarm reset IN	A	OFF→ON	ON: Reset alarm when alarm occurs
IN13	Emergency stop IN	A	OFF→ON	ON: Stop shaft rotation and generate an error
IN14	Torque judgment display clear IN	A	OFF→ON	ON: Clear the torque judgment display on the touch panel
IN15	Reverse IN	A	OFF→ON	ON: Start the reverse operation [Enabled in auto mode]

■ I/O

■ I/O output signals

Signal	Signal name	Contact	Output signal	Description
OUT0	Start OUT	A	OFF→ON	ON: Operation has started
OUT1	Finish OUT	A	OFF→ON	ON: Finish operation
OUT2	FOR/REV OUT	A	Level	OFF: FOR (clockwise), ON: REV (counterclockwise)
OUT3	Busy OUT	A	Level	OFF: Not operating, ON: Operating
OUT4	Error 1 OUT	A	OFF→ON	ON: SVD error
OUT5	Error 2 OUT	A	OFF→ON	ON: Operation error
OUT6	Error 3 OUT	A	OFF→ON	ON: SVC error
OUT7	Error 4 OUT	A	OFF→ON	ON: Operation error (only when torque judgment is NG)
OUT8	Reserved			
OUT9	Reserved			
OUT10	Torque judgment OK OUT	A	OFF→ON	ON: Torque judgment is OK
OUT11				
OUT12				
OUT13				
OUT14				
OUT15				

11.2 I/O input signal reception time table

■ I/O input signals

Signal	Signal name	Min. reception time (msec)	Notes
IN0	Start IN	100	Received only while shaft is stopped
IN1	FOR/REV switching IN	100	Received only while shaft is stopped
IN2	Auto/Manual switching IN	100	Received only while shaft is stopped
IN3	CH1 IN		Applied when start I/O is ON
IN4	CH2 IN		Applied when start I/O is ON
IN5	CH4 IN		Applied when start I/O is ON
IN6	CH8 IN		Applied when start I/O is ON
IN7	PTN1 IN		Applied when start I/O is ON
IN8	PTN2 IN		Applied when start I/O is ON
IN9	PTN4 IN		Applied when start I/O is ON
IN10	Temporary/Full tightening switching IN	100	Received only while temporary tightening is performed

IN11	Return to 0 position IN	100	Received only while shaft is stopped
IN12	Alarm reset IN	100	Received only while alarm occurs
IN13	Emergency stop IN	100	Always received
IN14	Torque judgment display clear IN	100	Always received
IN15	Reverse IN	100	Received only while shaft is stopped

11.3 I/O input signal sequence

■ Sequence of each input control signal

IN0 (Start IN)

Start enable conditions: - When in auto mode

- When CH No has been set

- When alarm reset IN (IN 12) is OFF

IN1 (FOR/REV switching IN)

Switch enable condition: When in auto mode

FOR (clockwise): Enables screw tightening direction, REV (counterclockwise): Enables screw loosening direction

IN2 (Auto/Manual switching IN)

Switches between auto mode and manual mode

IN3 (CH1 IN) to IN6 (CH8 IN)

Enable condition: When in auto mode

The channel number is selected based on the specified bit.

IN7 (PTN1 IN) to IN9 (PTN4 IN)

Enable condition: When in auto mode

The pattern number is selected based on the specified bit.

IN10 (Temporary/Full tightening switching IN)

Switches to full tightening operation, when temporary tightening operation is being performed.

IN12 (Alarm reset IN)

Alarm is reset if an alarm has occurred.

IN13 (Emergency stop IN)

If the shaft is in operation, the shaft rotation stops and an error is generated.

IN14 (Torque judgment display clear IN)

The judgment message displayed on the touch panel is cleared.

IN15 (Reverse IN)

Enable condition: When in auto mode

The screwdriver rotates in the screw loosening direction only while the signal is ON.

■ I/O

■ Output status signals

OUT0 (Start OUT)

The status of the screw tightening operation is indicated.

The indicator lights up while the screw tightening operation is being performed.

OUT1 (Finish OUT)

The status of the screw tightening operation is indicated.

The indicator lights up for 100 ms after the screw tightening operation is complete.

OUT2 (FOR/REV OUT)

The current clockwise/counterclockwise setting is output.

OUT3 (Busy OUT)

The current operation status is output.

ON is output when shaft is in operation, and OFF is output when the shaft is stopped.

OUT4 (Error 1 OUT)

Output is performed when an SV-NET driver error occurs.

OUT5 (Error 2 OUT)

Output is performed when an operation error occurs.

OUT6 (Error 4 OUT)

Output is performed when an SV-NET controller error occurs.

OUT7 (Error 8 OUT)

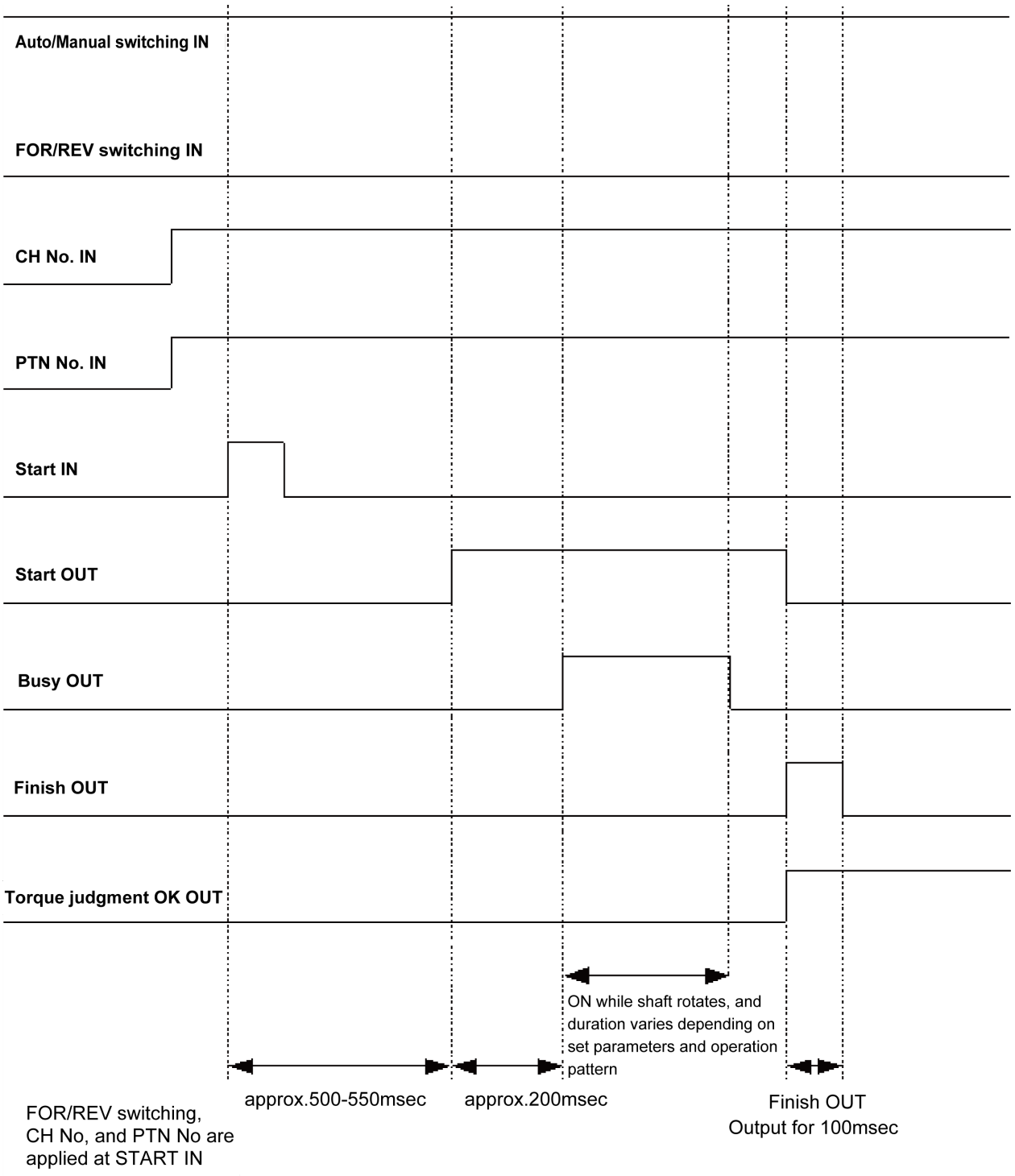
Output is performed only when operation error with NG torque judgment occurs.

OUT10 (Torque judgment OK OUT)

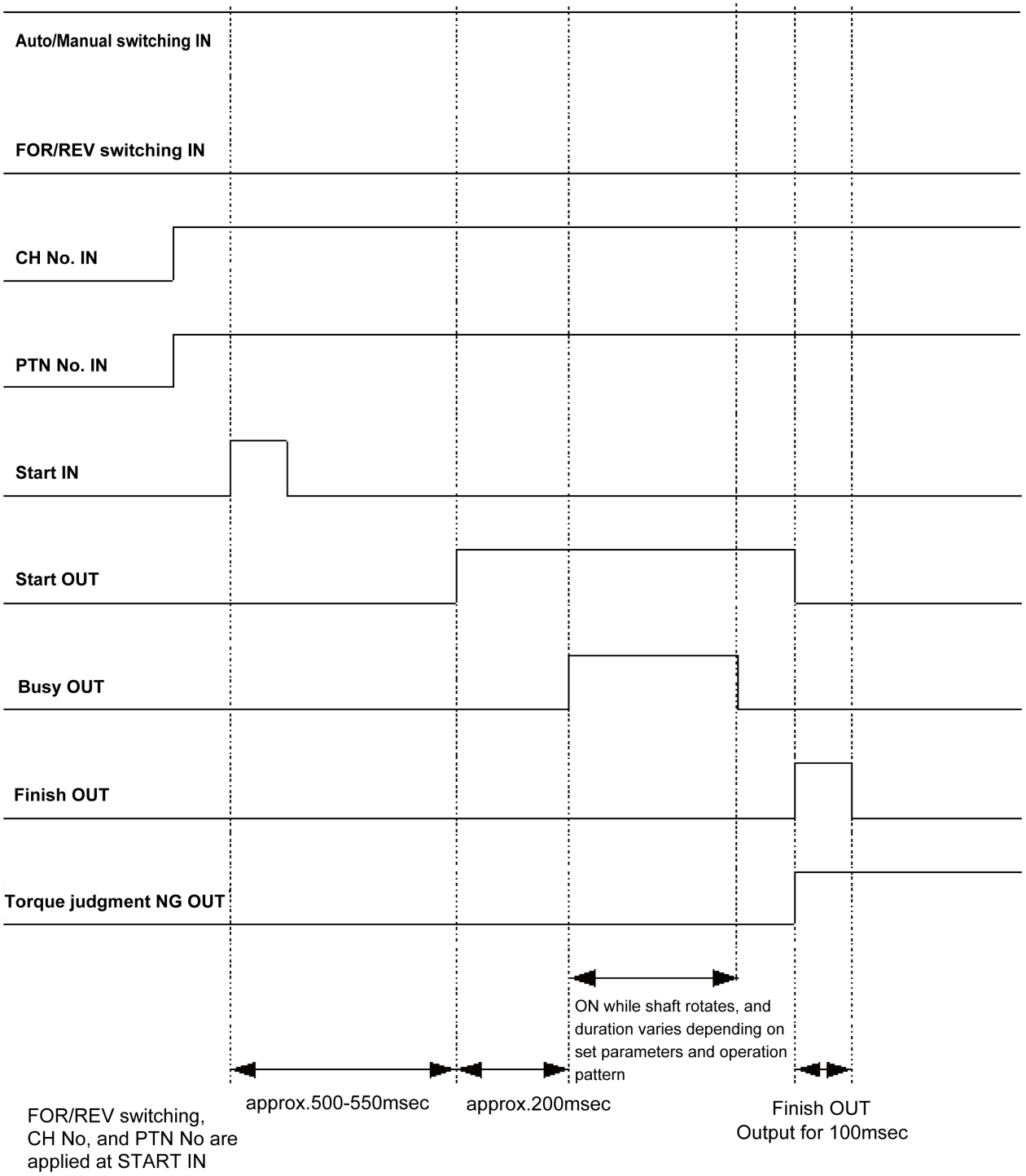
Output is performed only when torque judgment is OK after operation is complete.

11.4 I/O input timing charts

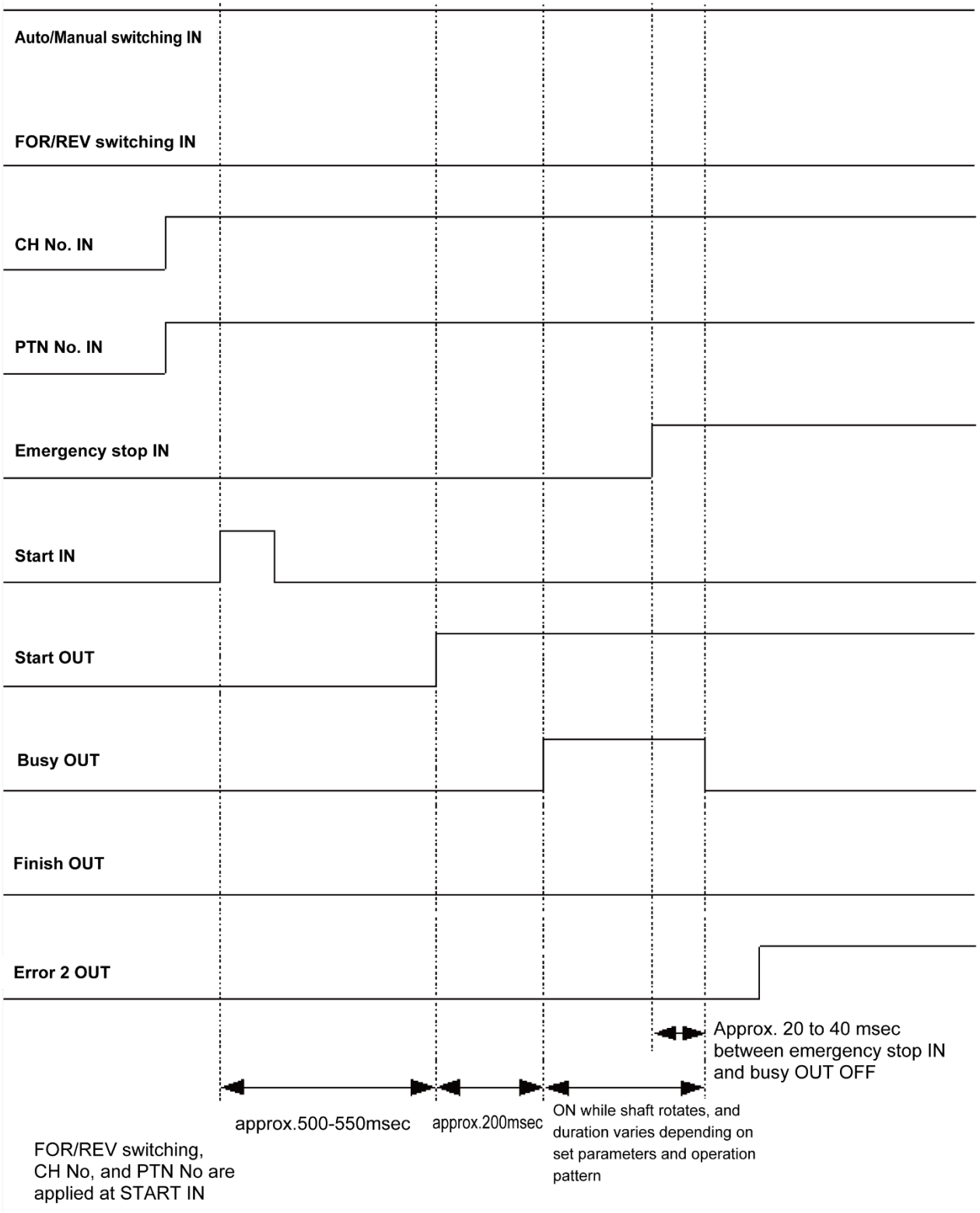
■ Timing chart for normal operations when torque judgment is OK



■ Timing chart for normal operations when torque judgment is NG



■ Timing chart when emergency stop signal is input



■ Message window

12. Message window

The message window is displayed when data loading or saving is complete, and for events such as the torque judgment after screw tightening.

To close the message window, touch the top part of the window or turn ON the IN14 signal of the external I/O.

■ Displayed messages

Fig.12-1 [Finished loading data] message window

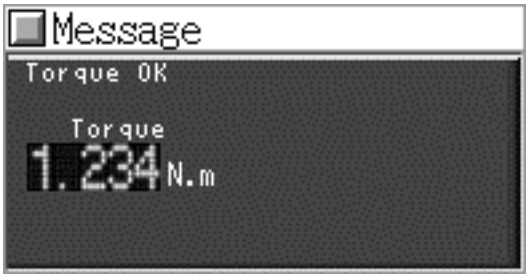


Fig.12-2 [Torque judgment OK] message window (Pattern 1)

Fig.12-3 [Torque no good] (Torque judgment NG) message window (Pattern 1)

[Torque less than set] (Below motor torque setting)

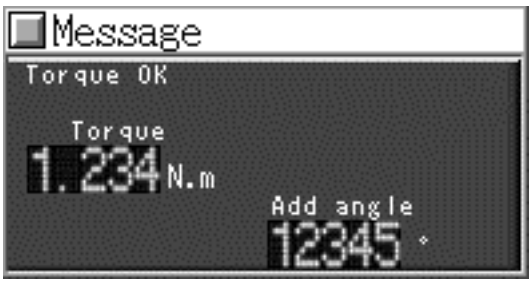


Fig.12-4 [Torque judgment OK, additional tightening angle judgment OK] message window (Pattern 2)

■ Message window

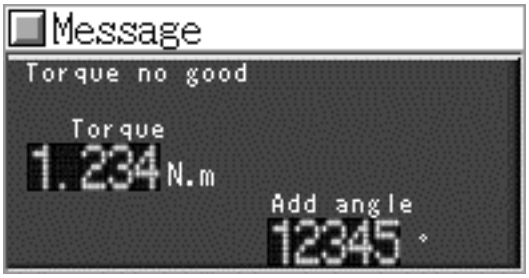


Fig.12-5 [Torque judgment NG, additional tightening angle judgment OK] message window (Pattern 2)

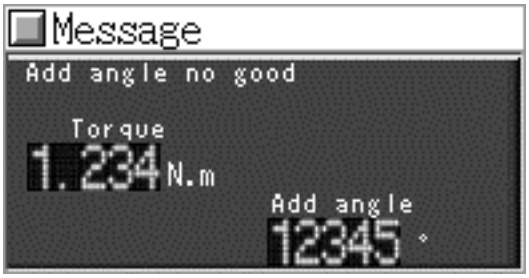


Fig.12-6 [Torque judgment OK, additional tightening angle judgment NG] message window (Pattern 2)

Fig.12-7 [Below additional tightening torque setting, additional tightening angle judgment OK] message window (Pattern 2)

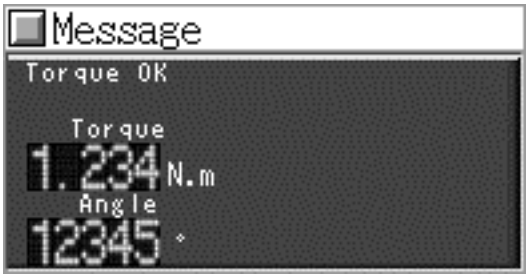


Fig.12-8 [Torque judgment OK, loosening angle judgment OK] message window (Pattern 3)

Fig.12-9 [Torque judgment NG, loosening angle judgment OK] message window (Pattern 3)

■ Message window

Fig.12-10 [Torque judgment OK, loosening angle judgment NG] message window (Pattern 3)

Fig.12-11 [Torque judgment NG, loosening angle judgment OK] message window (Pattern 3)

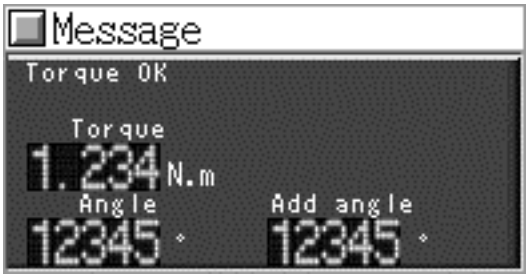


Fig.12-12 [Torque judgment OK, additional tightening angle judgment OK, loosening angle OK] message window (Pattern 4)

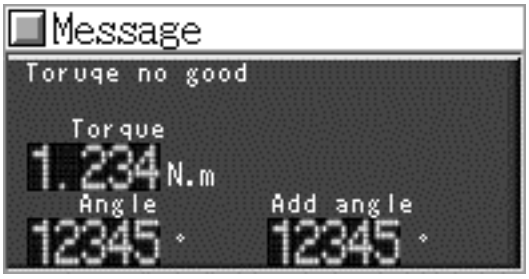


Fig.12-13 [Torque judgment NG, additional tightening angle judgment OK, loosening angle OK] message window (Pattern 4)

■ Message window

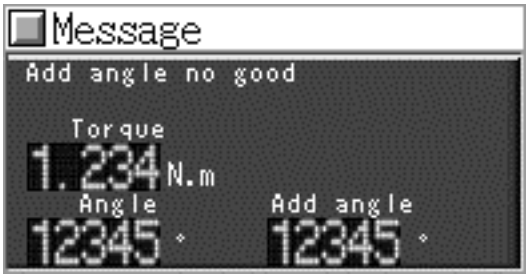


Fig.12-14 [Torque judgment OK, loosening angle judgment OK, additional tightening angle NG] message window (Pattern 4)

Fig.12-15 [Torque judgment NG, additional tightening angle judgment OK, loosening angle OK] message window (Pattern 4)

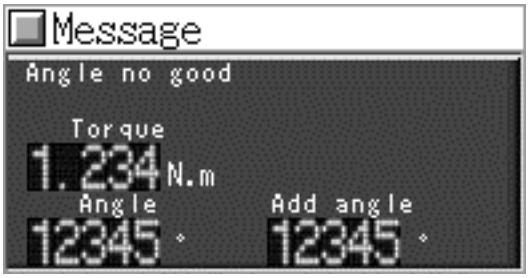


Fig.12-16 [Torque judgment OK, additional tightening angle judgment OK, loosening angle NG] message window (Pattern 4)

Fig.12-17 [特殊設定データ保存完了] (Finished saving special setting data) message window

■ Message window

■ Message list

Message	Description
Data loaded	Finished loading the parameter settings.
Data saved	Finished saving the parameter settings.
特殊設定データ保存完了 (Finished saving special setting data)	Finished saving the parameters of special settings.
Torque OK (Torque judgment OK)	The torque detection value is within the setting range. * The torque is not displayed if the judgment count is set to 0.
Torque no good Torque more than set (Torque judgment NG - Above motor torque setting)	The motor torque detection value is above the upper setting limit.
Torque no good Torque less than set (Torque judgment NG - Below motor torque setting)	The motor torque detection value is below the lower setting limit.
No torque judgment	Displayed when screw is rotated to specified angle before torque-up is detected, when performing additional tightening to specified angle. Only the most recent motor torque value is displayed.
Additional tightening angle	When the additional tightening operation is performed in patterns 2 and 4, the value specified for [Angle 3] (Rotation angle 3) on the touch panel display is used to judge the angle of rotation after the torque-up of additional tightening.
Loosening angle	When the loosening operation is performed in patterns 3 and 4, the value specified for [Angle 2] (Rotation angle 2) on the touch panel display is used to judge the angle of rotation in the loosening operation.

■ System settings

13. System settings

On the touch panel VT3 system settings screen, you can change the password and set whether or not a sound is emitted when buttons are touched.

In addition, the system settings screen can be used to monitor the device, by checking the total number of screw tightening OK judgments.

■ Displaying the system settings screen

To display the system settings screen on the touch panel, first place a finger on the screen where there are no other buttons for at least 3 seconds, then remove your finger for less than 1 second and touch the top right edge of the touch panel screen.

* For more information, refer to Chapter 9 "Special operations screen" in the "VT3_Hardware.pdf".

■ Checking the screw tightening OK judgment count

You can check the total number of screw tightening OK judgments by viewing the MW07FE and MW07FF built-in touch panel devices in [デバイスモニタ] (Device monitor) on the system settings screen.

MW07FE: The count increases by 1 for each 10,000 OK judgments. (Unit: 10,000 times)

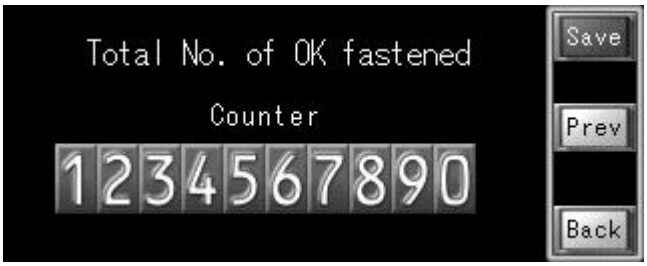
MW07FF: The count increases by 1 for each OK judgment, and the count is reset to 0 when the count reaches 10,000. (Unit: 1 time)

* For more information, refer to Chapter 5 "System modes" in the "VT3_Hardware.pdf".

Note: When TP project data is transferred, all device values are reset (judgment counts are set to 0).

■ Checking the total number of screw tightening OK judgments

[Total No. of fastened Counter] (Total count monitor for screw tightening OK judgments - OK judgment counter)



■ You can check the total number of times that the screw tightening OK judgment has been counted.

■ Button touch operations

14. Button touch operations

The [Rev], [Manual], [Auto], [CW], [CCW], [Torque down filter setting] buttons have an ON delay of 0.5 second.

The buttons do not respond unless they are touched for at least 0.5 second.

The [Load], [Save], [Start], [Stop], [Error Reset], and [HIOS] buttons have an OFF delay of 0.5 second.

When these buttons are pressed, other buttons do not respond for 0.5 second.

■ Holding time

15. Holding time

■ Holding time setting

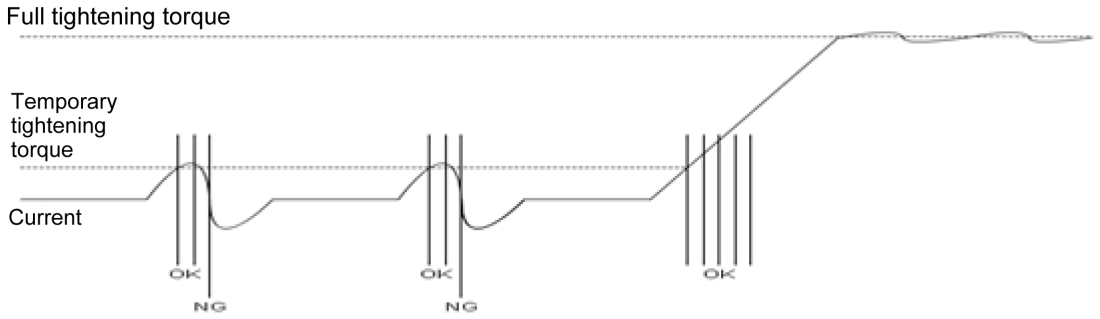
- The holding time setting range is from a minimum of 50 msec to a maximum of 500 msec.
- Each screw tightening judgment takes several msec, so when the number of judgments is increased, the actual torque holding time may become longer than the setting, depending on the holding time value that is specified. When increasing the number of judgments, it is also necessary to specify a longer holding time.
- When using chattering judgment for temporary tightening, a higher temporary tightening speed results in a longer torque holding time.
- When using chattering judgment for temporary tightening, a smaller difference between the temporary tightening torque and full tightening torque results in a longer torque holding time.

■ Detailed pattern diagrams

16. Detailed pattern diagrams

■ Chattering judgment

Details of chattering judgment

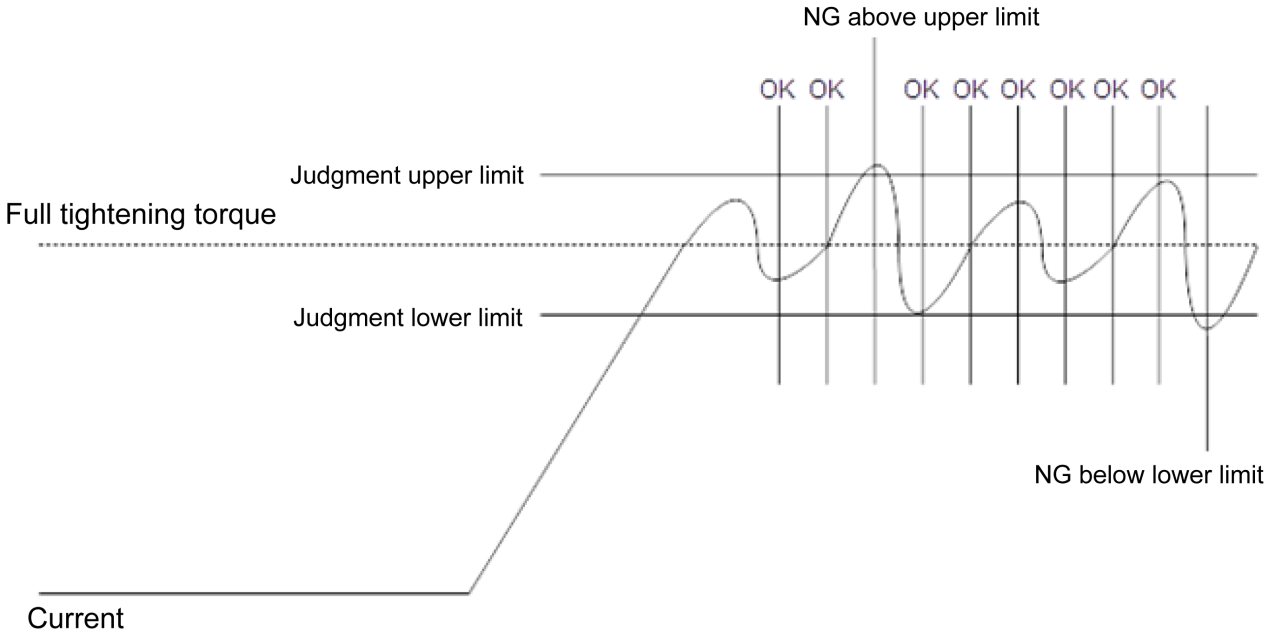


When the torque specified for temporary tightening is exceeded, the current is consecutively scanned the specified number of times during the specified chattering judgment period (msec), and the next operation is performed only if all judgments are OK.
The full tightening operation is not performed if the current falls below the temporary tightening current even one time.
Detection may be prevented if the screw becomes caught or if there are fluctuations in the current.

■ Detailed pattern diagrams

■ Screw tightening judgment

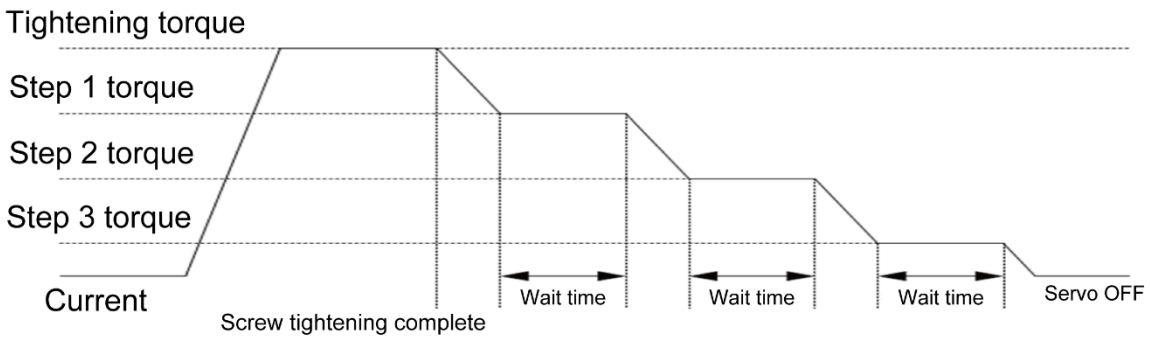
Details of screw tightening judgment



Each judgment determines whether the current is within the specified judgment range, above the upper limit, or below the lower limit, and the counter in the parameter settings is updated with the number of judgments that are counted.

■ Torque-down filter

Details of torque-down filter



Before the servo turns OFF after the screw tightening operation is complete, the driver's torque limit value changes based on the specified torque-down filter settings of steps 1, 2, and 3, in that order. The wait time specifies the amount of time to wait before applying each change to the torque limit value.

■ Alarms

17. Alarms

If a device error occurs or the results of the screw tightening judgment are NG, the error No. is displayed on the [Operate] screen, and the touch panel screen flashes to indicate that an error has occurred.

To cancel the alarm, remove the cause of the error, then touch the [Error Reset] button on the [Operate] screen or [Monitor Operate] screen, or turn ON the IN12 signal of the external I/O. The details for each error No. are shown in the error list below.

17.1 Error list (motor driver errors)

Error No.	Name	Description	Status	Cause	Solution
11	Over Current	Error or excessive current in power drive	Occurs only when power is turned ON	Driver malfunction	Replace driver
			Occurs when servo is turned ON	Short-circuit in motor wiring	Check motor wiring
				Short-circuit in motor winding	Replace motor
				Driver failure	Replace driver
			Occurs when accelerating/decelerating	Poor driver adjustment	Lower the gain
				Driver failure	Replace driver
21	Over Load	Overload alarm	Motor vibrates when servo is turned ON or while in operation	Poor adjustment	Readjust the gain
			Occurs when accelerating/decelerating	Acceleration/deceleration speed is too high	Reduce the acceleration/deceleration speed
			Occurs at a particular rotation speed	The load torque is too high	Check the mechanical parts/ Increase the motor size
			Occurs when servo is turned ON	Motor wiring	Check motor wiring
31	Over Speed	Speed alarm	Occurs while in operation	Speed limit is exceeded	Readjust the gain
41	Counter Overflow	Multi-rotation error	Occurs while motor is rotating	Multi-rotation data of resolver exceeded the specified value	Set the amount of movement from the origin to within 7,000,000 hex count/ Initialize the sensor/ Enable unlimited rotation

42	Excess position deviation	Value of deviation counter exceeded the specified value	Occurs at pulse command input	Pulse was input without turning servo ON	Check the servo ON signal
				The F-LMT and R-LMT signals are not input or configured	Check the wiring and settings
			Occurs when accelerating/decelera ting	Acceleration/deceleration speed is too high	Reduce the acceleration/deceleration speed

Error list (motor driver errors)

Error No.	Name	Description	Status	Cause	Solution
51	Over heat	Abnormal temperature of power drive was detected	Occurs while in operation	Frequent use while overloaded	Relax the operating conditions
				Ambient temperature is high	Install a fan or other device to improve heat dissipation
61	Sensor Error	Sensor error	When power is turned ON	Detected small amplitude of resolver signal	Turn up the sensor excitation voltage one step
62				Detected excessively large amplitude of resolver signal	Turn down the sensor excitation voltage one step
71	Over Voltage	Excess drive voltage	Occurs while in operation	Insufficient regeneration ability	Insufficient power supply capacity: Add regeneration protection circuit to power supply/ Insufficient regeneration protection ability: Reduce the deceleration speed
			Occurs when power is turned ON	If detected when power is turned ON, the voltage specifications are not suitable.	Change the driver
				Driver failure	Replace driver
			Sometimes detected when using	Driver detects voltage of regeneration protection	Increase the value of ID205 "Excess voltage

■ Alarms

			regeneration unit TA8413 with 48 V power supply	operation	error detection voltage" (upper limit: 65 V)
72	Voltage Down	Low drive voltage	During operation	Insufficient power supply capacity	Add regeneration protection circuit to power supply
				Disconnection in drive power supply line	
			When power is turned ON	Disconnection in drive power supply line	Check wiring
91	Flash Memory Error	Non-volatile memory read error	When power is turned ON	Failure of non-volatile memory or CPU in integrated circuit	Replace driver
92		Non-volatile memory write error	When writing the parameters		

Error list (motor driver errors)

Error No.	Name	Description	Status	Cause	Solution
98	Hardware Error	CPU error	Occurs while in operation	Incorrect operation due to noise	Install a noise filter
			When power is turned ON	Driver malfunction	Replace driver
99	Parameters Error	Parameter error	When writing the parameters	Abnormal values when writing the parameters to non-volatile memory (writing is not performed)	Check the values of the parameter settings that were changed

17.2 Error list (operation errors)

Error No.	Name	Description	Status	Cause	Solution
100	Screw tightening operation error	Screw tightening operation error	Emergency stop button was pressed	Emergency stop button was pressed	Check the device status and perform error reset
			Screw tightening time was exceeded	The time of the operation exceeded the time set for the screw tightening cycle	Check the device status and perform error reset
102	Torque judgment NG	Torque judgment NG	Torque judgment result is NG	Detected a value outside the upper or lower limit of the range, in the screw tightening torque judgment	Check the device status and perform error reset
103	I/O input NG	External I/O CH No and external I/O PTN No entry omission	The channel No. and pattern No. from the external I/O have not been selected	Input error	Perform error reset, then enter the external I/O channel No. and pattern No.
104	Angle judgment NG	Screw tightening operation error	Error in additional tightening angle or loosening angle	Occurs if the angle does not reach the angle specified when pattern 2, 3, or 4 is set	Specify the angle again when pattern 2, 3, or 4 is set

17.3 Error list (SVC errors)

Error No.	Name	Description	Status	Cause	Solution
200 + SVC error No.	SVC error	SVC error	Error occurred in SV-NET controller. The error No. is 200 + the SVC error No.	Controller program error, etc.	Refer to the user's manual for the SV-NET controller.