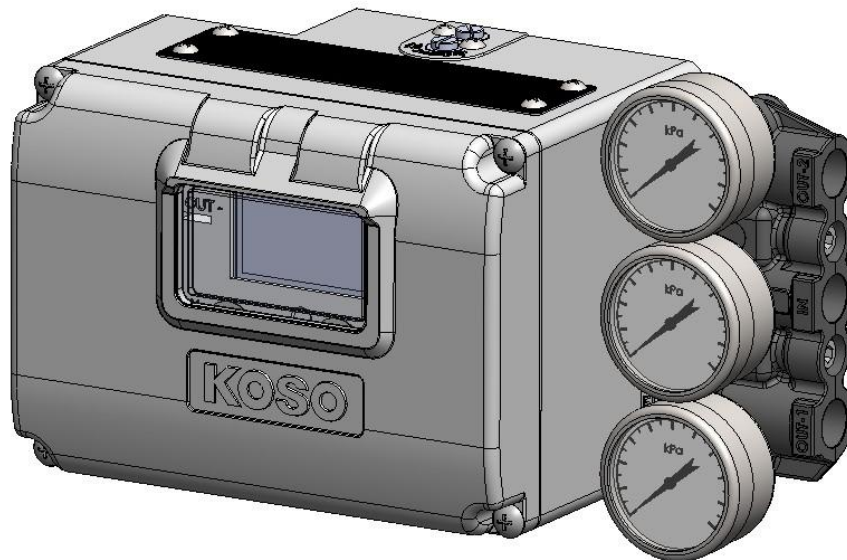


KGP2000 series  
Smart valve positioner

# HART Communication Operation Manual (for FDT DTM)



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# 1. Introduction

## Please read carefully at first!

This operation manual includes getting information, calibration, maintenance steps, diagnosis and so on for the KGP2000 series smart valve positioner by HART communication. Read this operation manual and an instruction manual carefully before using the positioner.

Please read this along with the instruction manual for the KGP2000 you are using.

※Please check the instruction manual (CD) included at the time of delivery.

※If you do not know the instruction manual for your device, check the positioner version / electronics version / software version of your device and order the latest version.

Notes regarding this operation manual.

- The user should read and understand this publication.
- The contents of this publication are subject to change without notice to improve specifications.
- The contents of this publication may not be reproduced or duplicated in whole or in part, without prior consent.
- This publication may not be revised so long as changes in structure and specifications have no effect on the operation of the positioner.
- The contents of this publication are described as correct as possible but if anything is unclear or you have any questions, please contact KOSO sales office.

## 1.1. Scope of this operation manual

This document is compatible with the following versions as below.

KGP2003

Electronics Version : 1.0.0 and more

Software Version : 1.0.0 and more

HART® FDT® DTM (※)

Version : 1 and more

※ HART® is a registered trademark of FieldComm Group.

※ FDT® is a registered trademark of FieldComm Group.

## 1.2. Safety notices

This document describes safety notices by using warnings and cautions as below. The user should thoroughly review safety notices described in this operation manual prior to installation, operation, maintenance for the positioner.



### Warning

Death or severe personal injury can occur if the user fails to keep safety precautions.



### Caution

Minor personal injury or property damage, damages or breakdown of the positioner and the system equipped with the positioner can occur if the user fails to keep safety precautions.

It should be noted that this operation manual includes information for only this smart valve positioner. Therefore, it is the responsibility of the user to consider safety considerations relate to any other installation methods or operation methods except the method provided herein.

## 1.3. Product summary

KGP2000 series smart valve positioner is a control device mounted on the pneumatic actuator for control valve, which positions a control valve according to a 4 to 20mA signal from a higher-level control system or a control device. Position feedback control system which receives feedback signal mapped to the desired valve travel and compares both input signal and feedback signal enables accurate positioning of a control valve.

In addition, it is possible to use this positioner to operate various types of pneumatic actuator such as linear or rotary motion actuators both of single and double acting.

Furthermore, the positioner utilizing digital techniques performs the functions of advanced PID controller, local user interface (LUI) using LCD, diagnosis utilizing sensing techniques with potentiometers. Such features enable an easy installation and calibration, an effective monitoring, and an efficient process management relevant to operations and maintenance.

This device can do the work of setting and adjustment by a communication tool of a HART communicator.

## 1.4. Electrical connections



### Warning

- Disconnect the power supply before wiring connections.
- Wiring connections must be done in accordance with national electrical code requirements.
- Avoid wiring connection on wet weather days or in environments are saturated with water. They are liable to electric leakage or damage to the positioner.



### Caution

- Close the unused entries for flameproof enclosures with blanking elements to avoid the intrusion of humidity, dust, etc.
- The entries shall be sealed with sealants to avoid the intrusion of water or rain
- Earthing and bonding conductor shall be connected by terminal lugs (Tinning copper).
- Earthing or bonding conductor shall be firmly connected by using screws with captive spring lock washer(M4) provided on the positioner in such a way to prevent loosening and twisting.

The figure around the electrical connection is shown below.

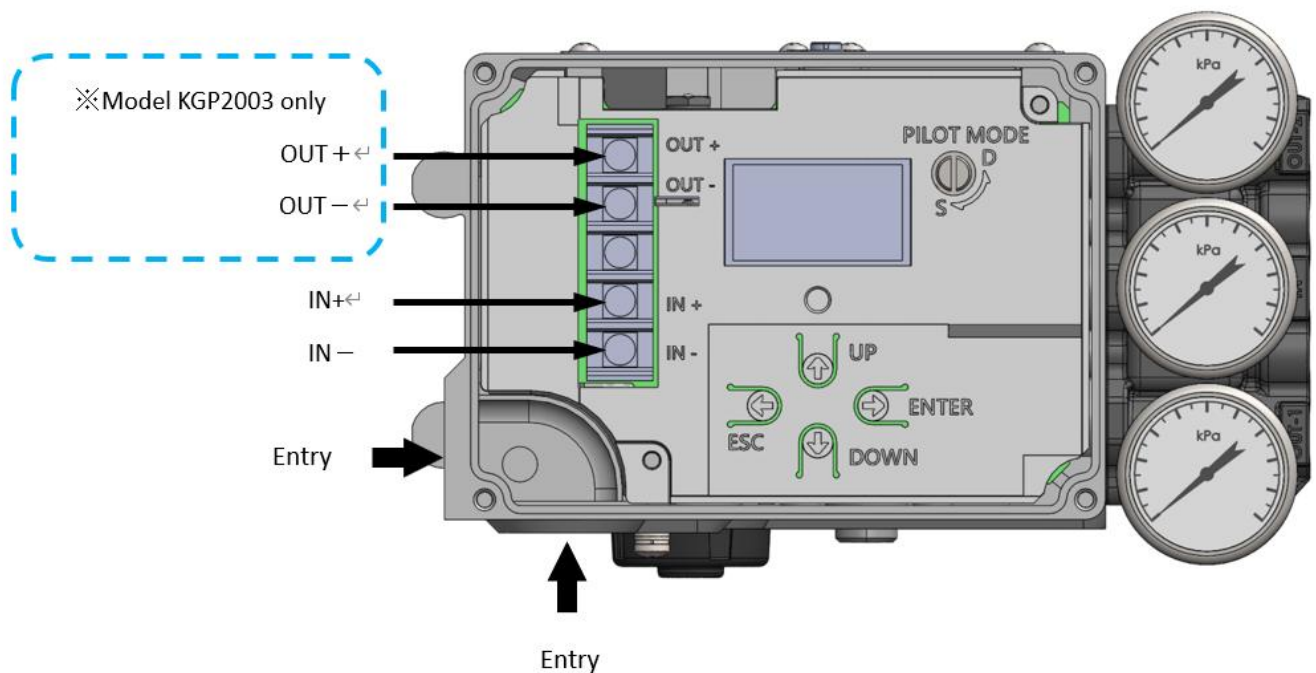


Figure1.4a Entries and Connection facilities

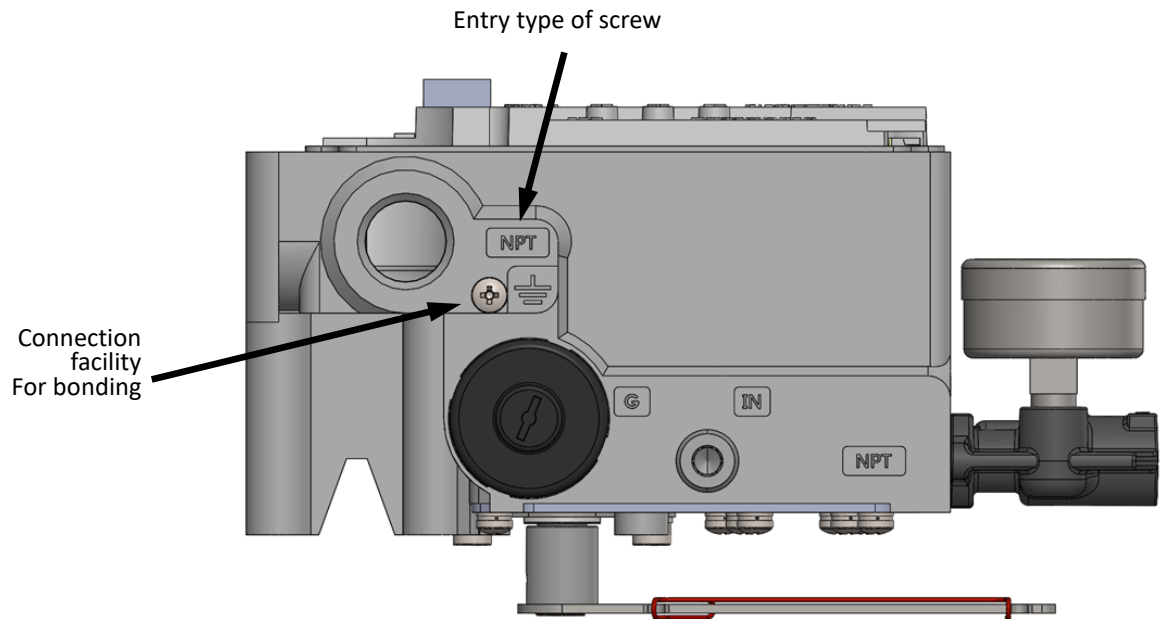


Figure 1.4b Entry type of screw and Connection facilities for bonding

Make wiring connections according to the following procedure.

※ See KGP2000 instruction manual for connection precautions.

1. Remove the front cover.
2. Lead a cable into the terminal from the outside through the entries and the cable gland.
3. Connect wires of loop current, respectively, to IN+ and IN- of the positioner.
4. Connect wires of position transmitter, respectively, to OUT+ and OUT- of the positioner. ※ Model KGP2003 only
5. There is a connection terminal on the outside of the device for the external bonding conductor, as shown in Figures 1.4a and 1.4b Make wiring connections according to the installation environment and applicable laws and regulations.
6. Fix a cable with the cable gland following the instruction manual of the cable gland manufacturer.
7. Replace the front cover.

This positioner uses a 4-20mA loop current as its power source. HART communication is performed using a digital signal superimposed on this loop current.

Field wiring diagram is shown in figure 1.4c and 1.4d

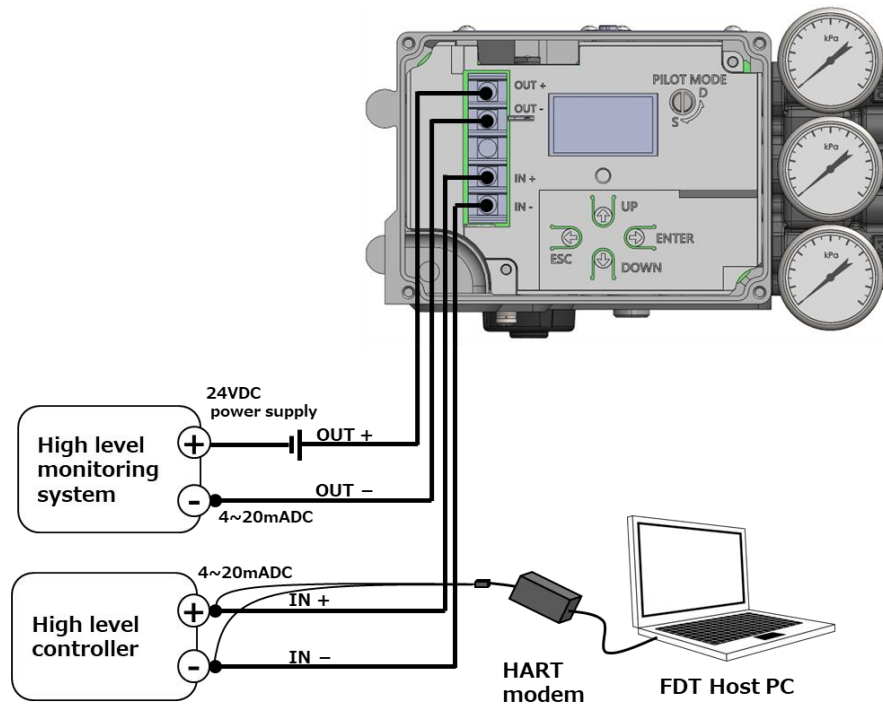


Figure1.4c Field wiring diagram for 1 cable(4-core)

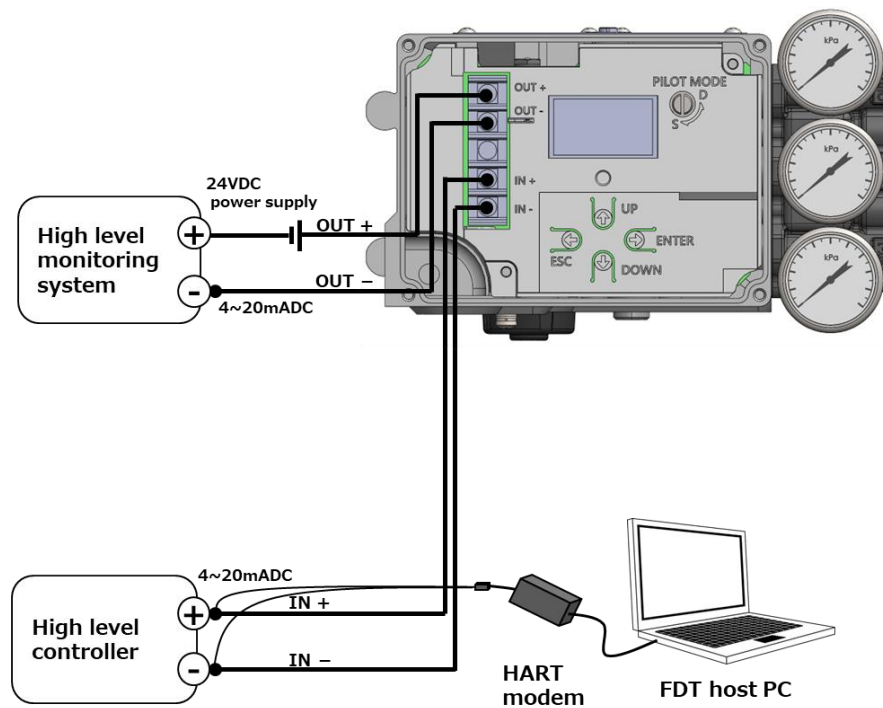


Figure1.4d Field wiring diagram for 2 cable(2-core)



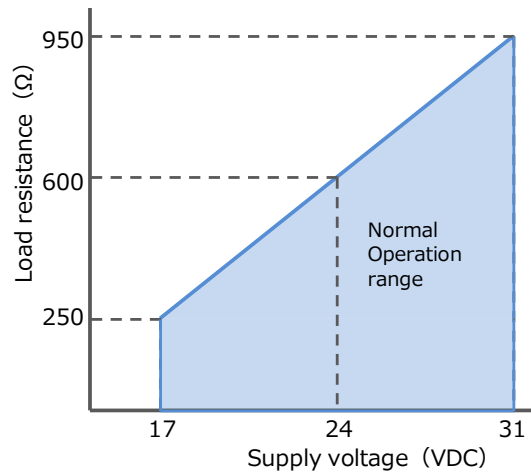


Figure1.4e Load resistance to supply voltage relationship via the connection of position transmitter

Supply power to the positioner according to the load resistance. It should be noted that the supply power must not be exceed 40VDC.

### 1.5. Setup and information



#### Warning

- Changes in parameters and so on owing to setup procedure may cause unexpected movements of the valve. Perform the setup in conditions such as offline state which does not directly affect the process.
- Don't remove the terminal cover of the positioner during or after the passage of electric current. In case the terminal cover must be opened reluctantly, perform that after confirming that flammable, explosive gases are not present, and the environment is not saturated with water or steam.
- Don't touch the moving parts during the setup procedure. It causes personal injury.
- **Keep away from a magnet material or a magnetic-tripped screwdriver.** It unexpectedly moves the control valve so that it may cause serious damage.
- Don't use a wireless transceiver near the positioner.

## 1.6. Preparation for HART communication

A personal computer and a HART modem are required to acquire the information of this device unit via HART communication and perform installation / setting work, maintenance, alarm setting / diagnosis. In addition, the HART modem driver and FDT DTM for KGP2000 communication must be installed on the PC.

Note: Please contact the manufacturer to obtain and install the FDT host management software.

Note: Please check with the manufacturer for the installation of the HART modem driver.

The steps for obtaining FDT DTM and connecting to a PC are shown below.

### 1) Obtain FDT DTM for HART communication.

You can use the FDT DTM from the CD that was included when you purchased this device unit.

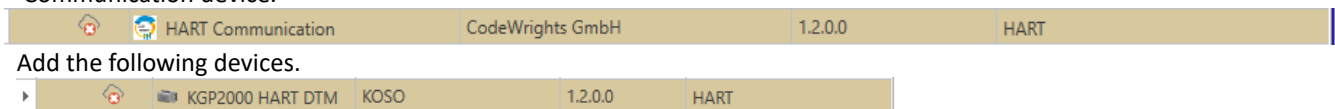
The FDT DTM can be downloaded from KOSO's KGP2000 product site (in preparation).

### 2) Installation of FDT DTM.

Unzip the obtained file KGP2000 HART DTM.zip file in any folder and execute KGP2000 HART DTM.exe in it.

The installation wizard will start, so please follow the instructions on the screen to install.

After installation, update the device catalog of the DTM host, and the KGP2000 DTM will be added to the HART Communication device.



For details, refer to the instruction manual of the FDT host management software you are using.

### 3) Connection

Connect a communication tool (e.g. HART Communication tool or host controller...) to IN+ and IN- of the instrument as described in section 1.4.

## 2. Menu tree of the HART Communication

### 2.1. Menu item

This manual explains how to operate the KGP2000 via FDT DTM. It consists of the following menus:

Menu items	Description
① Process Variables	Process variables and information root menu
② Device Settings	Device settings menu
③ Maintenance	Maintenance root menu
④ Diagnostics	Diagnostics and Alarm root menu
⑤ Offline	Offline root menu

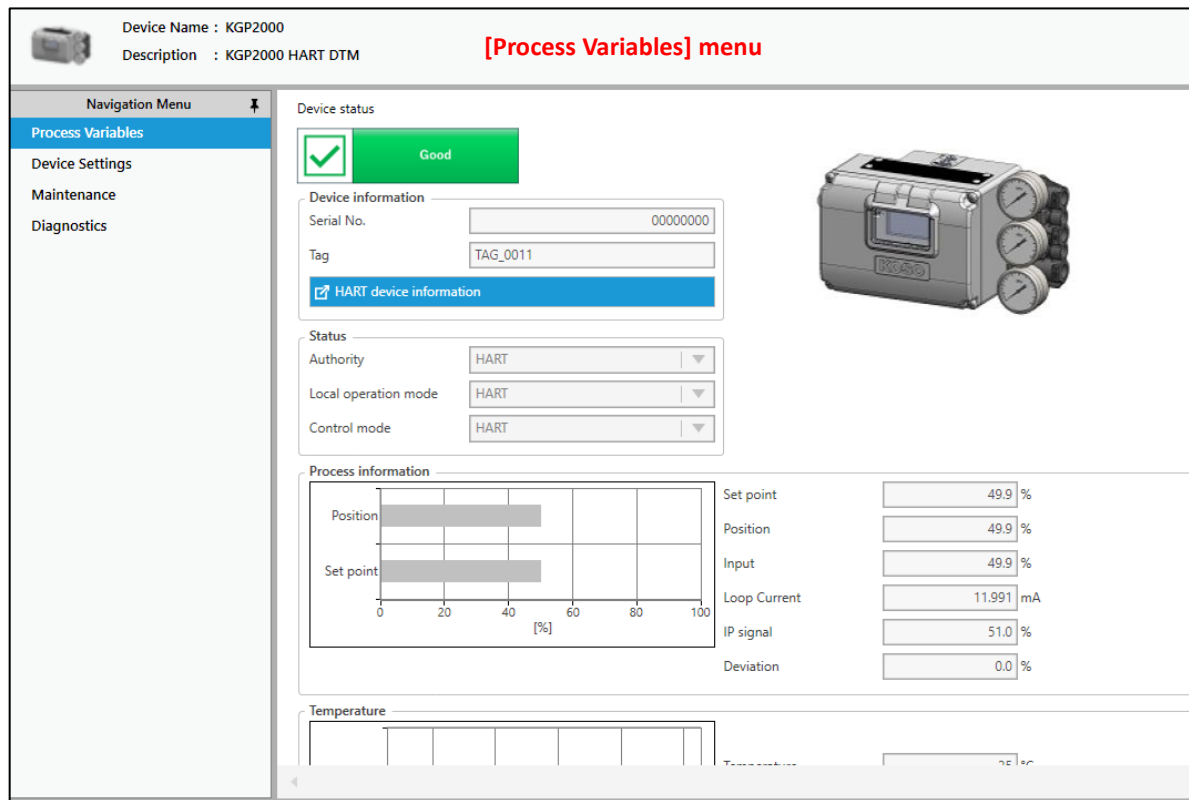
Table 2.1a Menu item

## 2.2. Menu structure

### 2.2.1. Process Variables menu

Select [Process Variables] in the Navigation Menu to open the Process Variables menu.

For details on the Process Variables menu, see [4. Process Variables](#).



Device Name : KGP2000  
Description : KGP2000 HART DTM

**[Process Variables] menu**

Navigation Menu

- Process Variables
- Device Settings
- Maintenance
- Diagnostics

Device status

☒ Good

Device information

Serial No. 00000000

Tag TAG\_0011

☒ HART device information

Status

Authority HART

Local operation mode HART

Control mode HART

Process information

Position 49.9 %

Set point 49.9 %

Input 49.9 %

Loop Current 11.991 mA

IP signal 51.0 %

Deviation 0.0 %

Temperature

Figure 2.2.1a [Process Variables] menu

## 2.2.2. Device Settings menu

Select [Device Settings] in the Navigation Menu to open the Device Settings menu.

For details on the Device settings menu, see [5. Device Settings](#).

This menu consists of the **[Device Settings] top menu** and the **[Extended device settings] menu** as a submenu.

The top menu displays an overview of the current settings. To check details or change settings, open the **[Extended device settings] menu**.

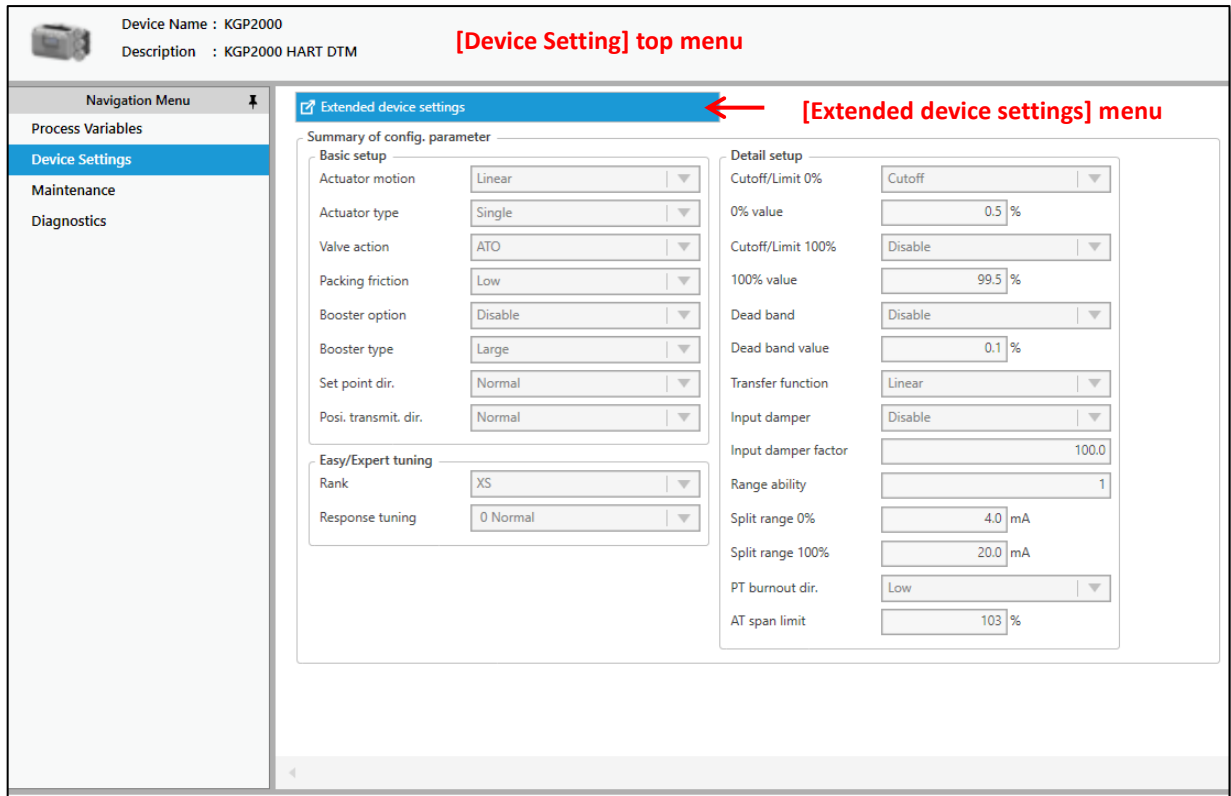


Figure 2.2.2a [Device Settings] top menu

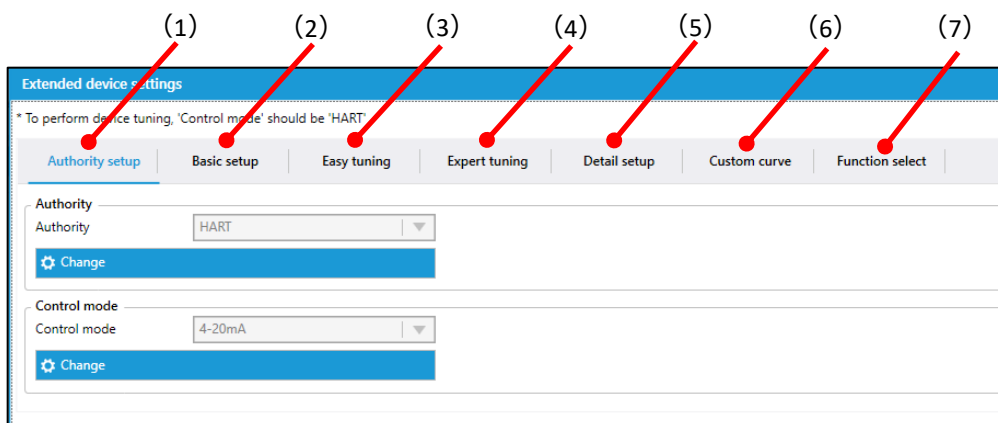


Figure 2.2.2b [Extended device settings] menu

[Extended device settings] menu consists of the following menus:

- |                     |                                          |
|---------------------|------------------------------------------|
| (1) Authority setup | See <a href="#">3. Authority setup</a>   |
| (2) Basic setup     | See <a href="#">5.2. Basic setup</a>     |
| (3) Easy tuning     | See <a href="#">5.3. Easy tuning</a>     |
| (4) Expert tuning   | See <a href="#">5.4. Expert tuning</a>   |
| (5) Detail setup    | See <a href="#">5.5. Detail setup</a>    |
| (6) Custom curve    | See <a href="#">5.6. Custom curve</a>    |
| (7) Function select | See <a href="#">5.7. Function select</a> |

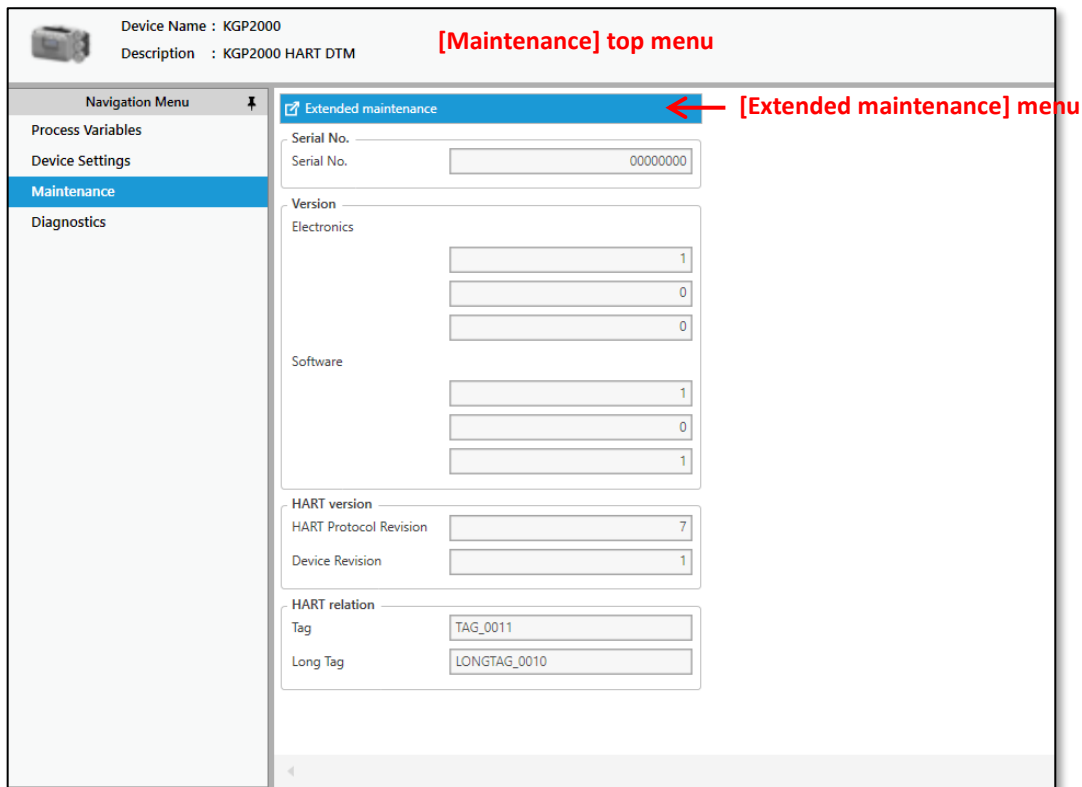
### 2.2.3. Maintenance menu

Select [Maintenance] in the Navigation Menu to open the Maintenance menu.

For details on the Maintenance menu, see [6. Maintenance](#).

This menu consists of the **[Maintenance] top menu** and the **[Extended maintenance]** menu as a submenu.

The top menu displays device basic information on the device. To check details, change settings, perform calibration or ..., open the **[Extended maintenance]** menu.



Device Name : KGP2000  
Description : KGP2000 HART DTM

**[Maintenance] top menu**

Navigation Menu

- Process Variables
- Device Settings
- Maintenance**
- Diagnostics

**Extended maintenance** ← **[Extended maintenance] menu**

Serial No.  
Serial No. 00000000

Version

Electronics

1  
0  
0

Software

1  
0  
1

HART version

HART Protocol Revision 7

Device Revision 1

HART relation

Tag TAG\_0011

Long Tag LONGTAG\_0010

Figure 2.2.3a [Maintenance] top menu

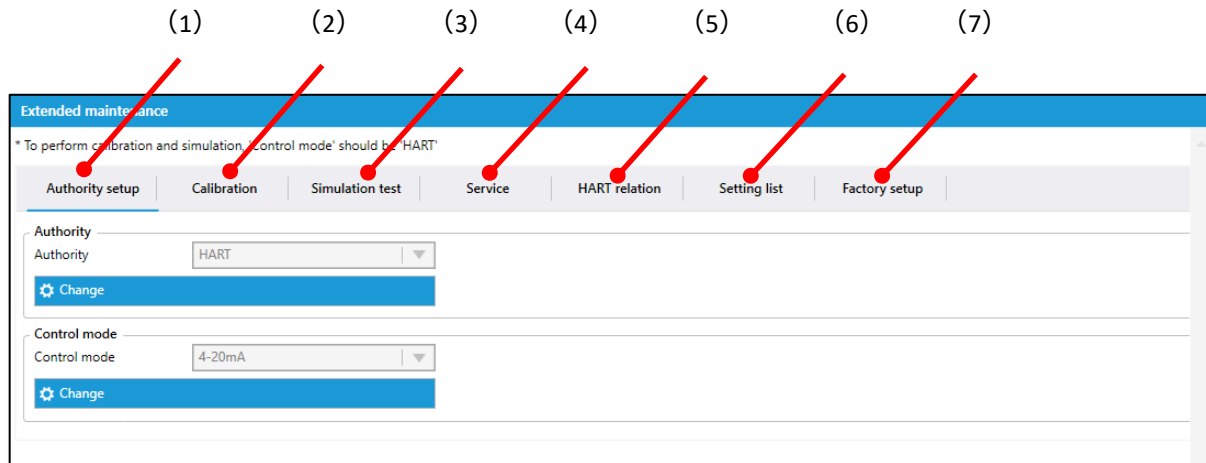


Figure 2.2.3b [Extended maintenance] menu

[Extended maintenance] menu consists of the following menus:

- |                     |                                          |
|---------------------|------------------------------------------|
| (1) Authority setup | See <a href="#">3. Authority setup</a>   |
| (2) Calibration     | See <a href="#">6.2. Calibration</a>     |
| (3) Simulation test | See <a href="#">6.3. Simulation test</a> |
| (4) Service         | See <a href="#">6.4. Service</a>         |
| (5) HART relation   | See <a href="#">6.5. HART relation</a>   |
| (6) Setting list    | See <a href="#">6.6. Setting list</a>    |
| (7) Factory setup ※ | See <a href="#">6.7. Factory setup</a>   |

※ This menu is not displayed by default.

## 2.2.4. Diagnostics menu

Select [Diagnostics] in the Navigation Menu to open the Diagnostics menu.

For details on the Diagnostics menu, see [7. Diagnostics](#).

This menu consists of the **[Diagnostics] top menu** and the **[Extended diagnostics] menu** as a submenu.

The top menu displays diagnostics results. To check details, change settings, perform diagnostics, open the **[Extended diagnostics] menu**.

Figure2.2.4a [Diagnostics] top menu

Figure2.2.4b [Extended diagnostics] menu

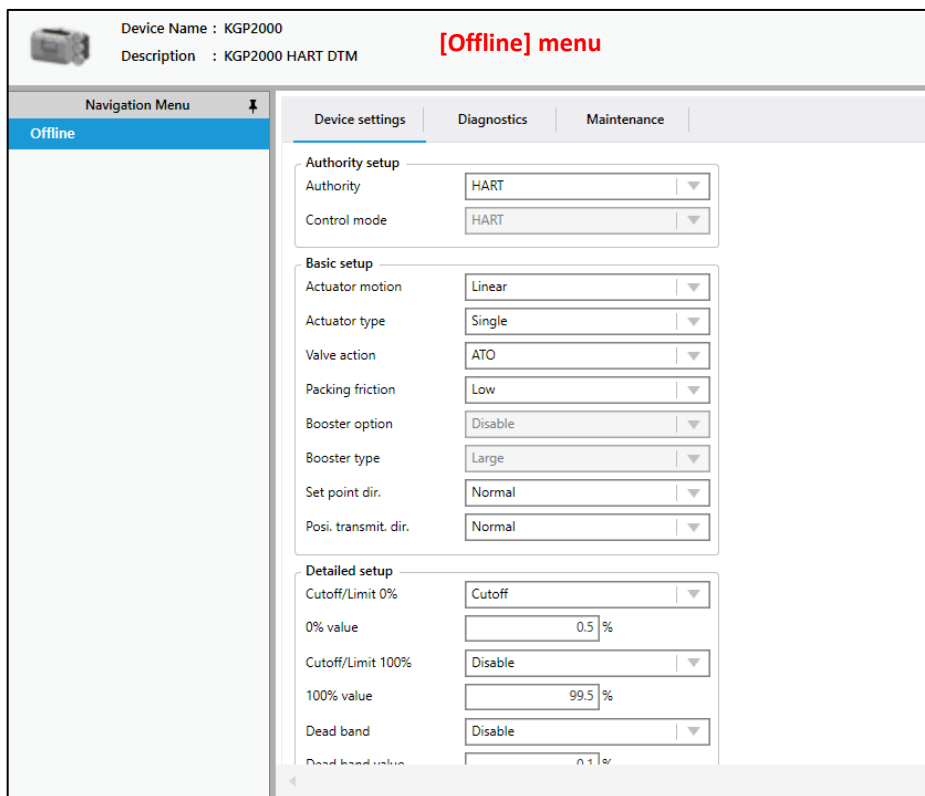


[Extended diagnostics] menu consists of the following menus:

- |                         |                                                    |
|-------------------------|----------------------------------------------------|
| (1) Authority setup     | See <a href="#">3. Authority setup</a>             |
| (2) Online diag. setup  | See <a href="#">7.2. Online diag. setup</a>        |
| (3) 25% step response   | See <a href="#">7.3. 25% step response</a>         |
| (4) One step response   | See <a href="#">7.4. One step response</a>         |
| (5) Partial stroke test | See <a href="#">7.5. Partial stroke test (PST)</a> |
| (6) Alarm setup         | See <a href="#">7.6. Alarm setup</a>               |

### 2.2.5. Offline menu

Select [Offline] in the Navigation Menu in the device disconnect condition to open the Offline menu.  
For details on the Offline menu, see [8. Offline](#).



Device Name : KGP2000  
Description : KGP2000 HART DTM

**[Offline] menu**

Navigation Menu: Offline

Device settings | Diagnostics | Maintenance

**Authority setup**

Authority: HART  
Control mode: HART

**Basic setup**

Actuator motion: Linear  
Actuator type: Single  
Valve action: ATO  
Packing friction: Low  
Booster option: Disable  
Booster type: Large  
Set point dir.: Normal  
Posi. transmit. dir.: Normal

**Detailed setup**

Cutoff/Limit 0%: Cutoff  
0% value: 0.5 %  
Cutoff/Limit 100%: Disable  
100% value: 99.5 %  
Dead band: Disable  
Dead band value: 0.1 %

Figure2.2.5a [Offline] menu

### 3. Authority setup

#### 3.1. Operating and Setting authority from HART host controller

This device uses the “**Authority** (write authority)” parameter to change the authority to rewrite settings. To change the positioner settings from HART host controller, change the “**Authority**” parameter to “HART” to remove the write protection.

Furthermore, to control special operations such as automatic adjustment, calibration, simulation, and offline diagnosis separately from input signals from HART host controller, it is necessary to change the “**Control mode**” (operation authority) parameter to “HART”.

Table 3.1 List of selectable functions

Items	Description	Parameter	Default
Authority	<p>Set write authority to HART communication. Select HART in case in which settings should be configured via not LUI but HART communication only.</p> <p><u>Once HART is selected, only “Information” and “Authority” from “TOP” menu will be able to be accessed through LUI.</u></p> <p>※ If to change the setting back from HART to LUI, please get permission in advance from the person responsible for controlling the device via HART communication.</p>	LCD / HART	LCD
Control mode	<p>Set operational authority. Select “HART” to execute operations from HART host controller. Select “4-20mA” to execute operations from input signal.</p>	4-20 mA/ HART	4-20 mA

Note: To change **Authority** to “HART”, the LUI (LCD) screen must be in the **TOP menu**, **Alarm status menu**, or **Information menu**.

### 3.1.1. Check “Authority” and “Control mode”

MENU) *Device Settings > Extended device settings > Authority setup*

- ① Select [Device Settings] in the Navigation Menu to open the [Device Settings] top menu.
- ② Click [Extended device settings] and open [Extended device settings] menu.

Device Name : KGP2000  
Description : KGP2000 HART DTM

Navigation Menu

- Process Variables
- Device Settings**
- Maintenance
- Diagnostics

**Extended device settings**

Summary of config. parameter

Basic setup

Actuator motion	Linear
Actuator type	Single
Valve action	ATO
Packing friction	Low
Booster option	Disable
Booster type	Large
Set point dir.	Normal
Posi. transmit. dir.	Normal

Easy/Expert tuning

Rank	XS
Response tuning	0 Normal

Detail setup

Cutoff/Limit 0%	Cutoff
0% value	0.5 %
Cutoff/Limit 100%	Disable
100% value	99.5 %
Dead band	Disable
Dead band value	0.1 %
Transfer function	Linear
Input damper	Disable
Input damper factor	100.0
Range ability	1
Split range 0%	4.0 mA
Split range 100%	20.0 mA
PT burnout dir.	Low
AT span limit	103 %

- ③ Select [Authority setup] menu tab.

Extended device settings

\* To perform device tuning, 'Control mode' should be 'HART'

Authority setup | Basic setup | Easy tuning | Expert tuning | Detail setup | Custom curve | Function select

Authority

Authority: HART

Change

Control mode

Control mode: 4-20mA

Change

※ Same menu also exist under the [Extended maintenance] menu and [Extended diagnostics menu].

MENU) *Maintenance > Extended maintenance > Authority setup*

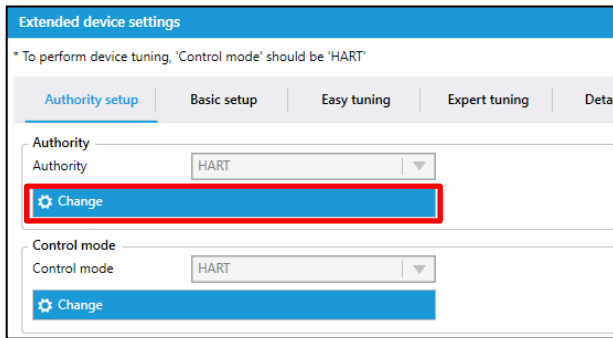
MENU) *Diagnostics > Extended diagnostics > Authority setup*

### 3.1.2. Change “Authority”

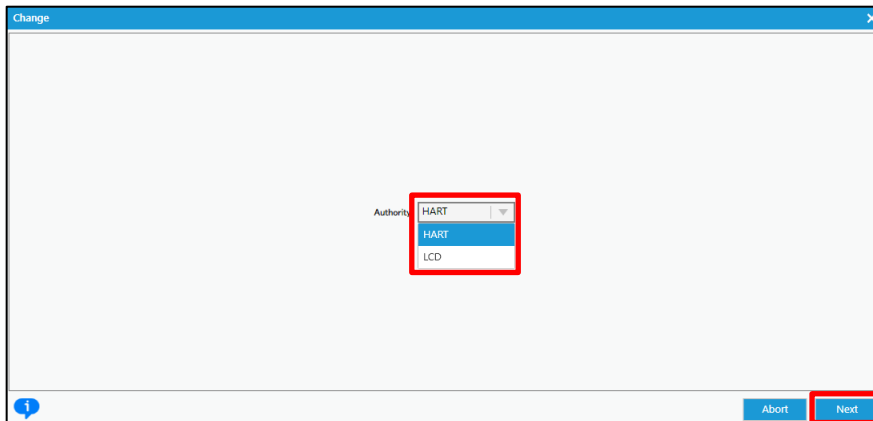
The steps to change “**Authority**” is shown below.

MENU) *Device Settings > Extended device settings > Authority setup > Authority*

- ① Click [Change] in the [Authority] menu group.



- ② If give authority to change configuration to the HART host controller, select "HART".  
If do not give authority to change configuration to the HART host controller, select "LCD". Click [Next] to configure.



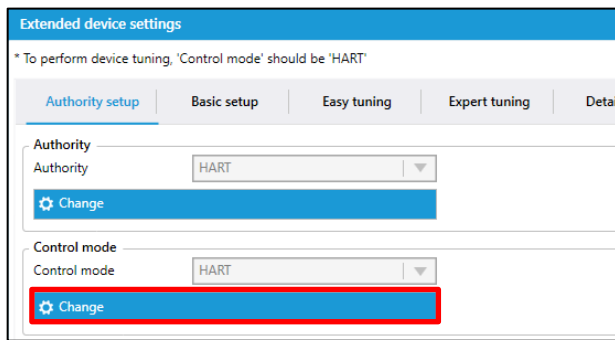
### 3.1.3. Change “Control mode”

To change “**Control mode**” is shown below.

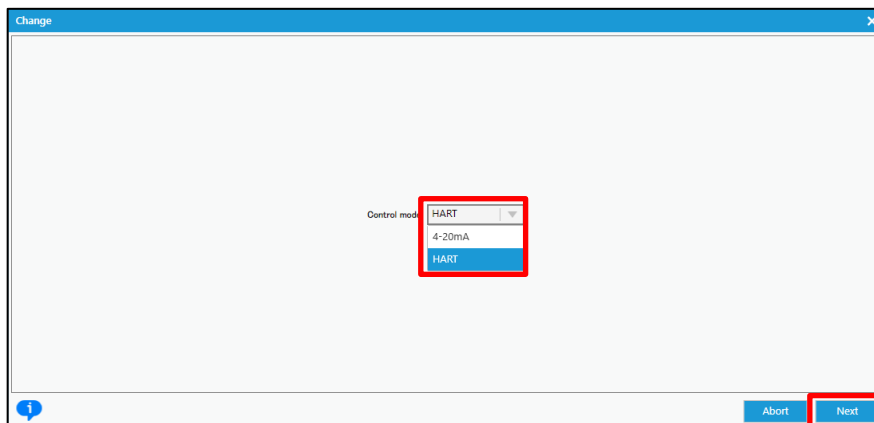
※ In order to change “**Control mode**”, the “**Authority**” setting must be “HART”.

MENU) *Device Settings > Extended device settings > Authority setup > Control mode*

- ① Click [Change] in the [Control mode] menu group.



- ② If give operational authority to the HART host controller, select "HART". If do not give operational authority to the HART host controller, select "4-20mA". Click [Next] to configure.



## 4. Process Variables

This menu offers to display process variables and other basic information, and to control setpoint.

MENU) **Process Variables**

Select [Process Variables] in the Navigation Menu to open the **[Process Variables] menu**.

This menu offers to confirm the following information.

Device status, Device Information, Monitor, Trend, Manual input, and Alarm information.

### 4.1. Device status

This status displays device health status.

### 4.2. Device information

This menu displays device information for the positioner.

Displayed items are as follows:

Serial No.	: Serial number	Tag	: Tag number
------------	-----------------	-----	--------------

To view detailed information, perform the following operations.

- ① Click [HART device information] in the [Device information] menu group.

Device information

Serial No. 00000000

Tag TAG\_0011

**HART device information**

- ② Open the detailed information menu.

**HART device information**

Manufacturer KOSO

Device Type KGP2000

Device Identifier 0

Tag TAG\_0011

Long Tag LONGTAG\_0010

Descriptor DESC0010

Date 2025/04/11

Message MEST0

Final Assembly Number 10

Displayed items are as follows:

Manufacturer	: Manufacturer	Descriptor	: Descriptor
Device Type	: Model	Date	: Date
Device Identifier	: Device Identifier	Message	: Message
Tag	: Tag number	Final Assembly Number	: Final Assembly Number
Long Tag	: Long Tag number		

### 4.3. Status

This menu displays the write authority, operational authority, and special control mode of the positioner.

Status

Authority HART

Local operation mode HART

Control mode HART

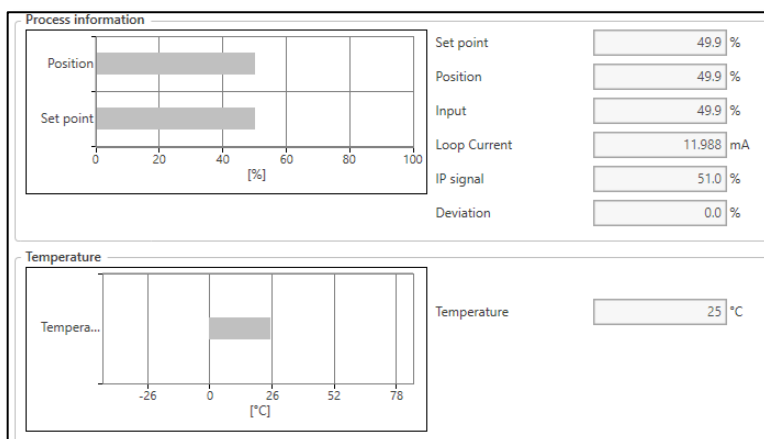
Displayed items are as follows:

[Status]

Authority	: Write authority	Control mode	: Operational authority
Local operation mode	: Special control mode		

#### 4.4. Process information, Temperature

This menu displays the current process information and temperature of the positioner.



Displayed items are as follows:

[Process information]

Set point	: Set point	Loop current	: Input current
Position	: Valve position	IP signal	: IP signal current
Input※	: Percentage of input signal	Deviation	: Deviation

※ When split range is set, the value displayed in “Input” differs from the actual valve opening.

#### 4.5. Trend

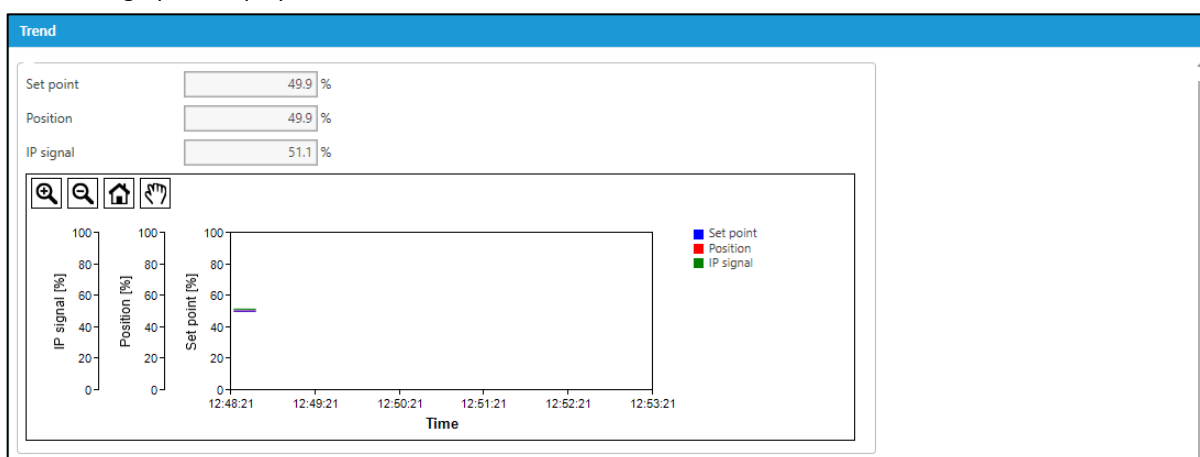
This menu offers to confirm status of positioner such as set point, valve position, IP signal and temperature.

MENU) *Process Variables > Trend*

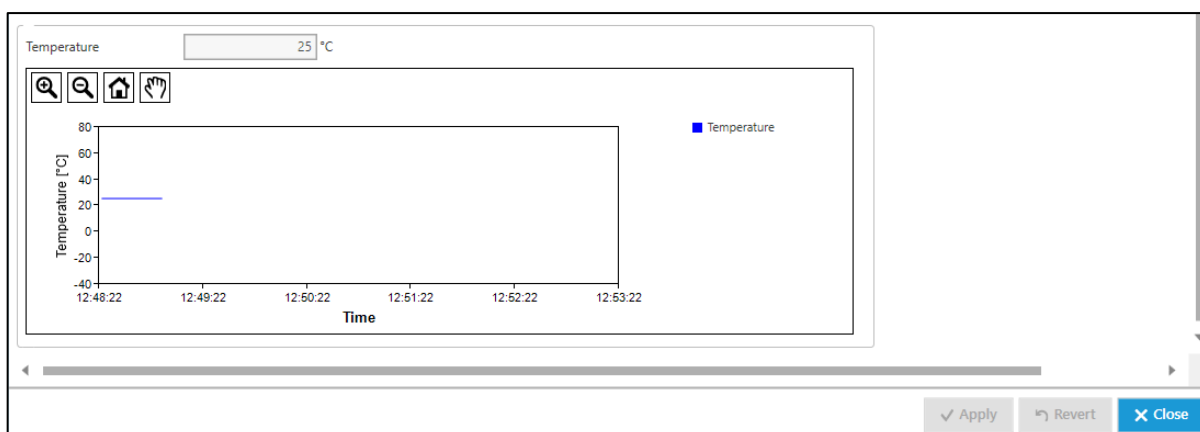
- ① Click [Trend] in the [Trend] menu group.



- ② Trend graph is displayed.







Display items are as follows:

Set point	: Set point	Position	: Valve position
IP signal	: IP signal current	Temperature	: Temperature

## 4.6. Manual setpoint

This menu offers the ability to control setpoint from the FDT host controller.



### Caution

- To activate this function, “**Authority**” must be “HART”.

MENU) *Process Variables > Manual setpoint*

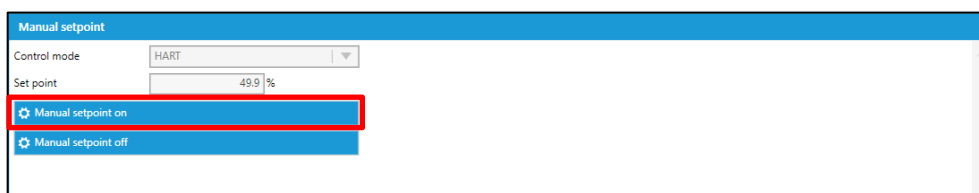
- ① Click [Manual setpoint] in the [Manual setpoint] group menu.



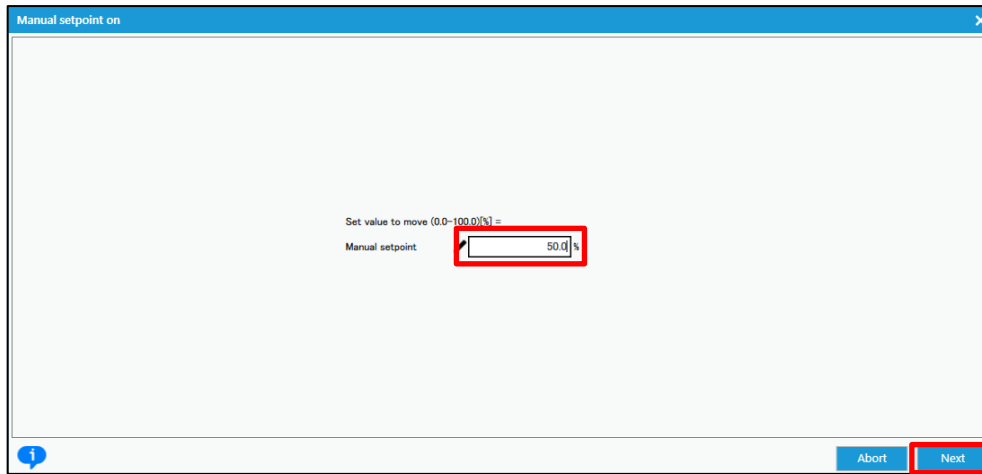
### 1) Enable manual setpoint

The steps for specifying setpoint from the FDT host controller are shown below.

- ① Click [Manual setpoint on].



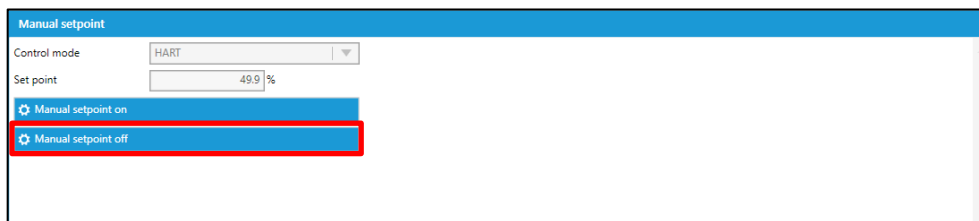
- ② Enter the setpoint value in the “Manual setpoint” field and click [Next].



## 2) Disable manual setpoint

To return device control to “Input signal”, perform the following operations.

- ① Click [Manual setpoint off].



## 4.7. Alarm status, Alarm history and PST alarm

This menu displays alarm status and alarm history of the positioner.

Alarm status		Alarm history	
EEPROM failure	Good	EEPROM failure	Good
Position sensor failure	Good	Position sensor failure	Good
Input signal alarm	OK	Input signal alarm	OK
Position alarm	OK	Position alarm	OK
Deviation alarm	OK	Deviation alarm	OK
Temperature alarm	OK	Temperature alarm	OK
IP deviation alarm	OK	IP deviation alarm	OK
PST alarm			
PST stroke alarm	OK		
PST incomplete alarm	OK		

Displayed items are as follows:

[Alarm status / Alarm history]

EEPROM failure	: Memory failure	Deviation alarm	: Deviation alarm
Position sensor failure	: Position sensor failure	Temperature alarm	: Temperature alarm
Input signal alarm	: Input signal alarm	IP deviation alarm	: IP deviation alarm
Position alarm	: Valve position alarm		

[PST alarm]

PST stroke alarm	: PST stroke alarm	PST incomplete alarm	: PST incomplete alarm
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## 5. Device Settings

This menu offers the setup of the essential items, and the detailed items required for control with the positioner.



### Caution

- To change the settings, “**Authority**” must be “HART”.

MENU) **Device Settings**

- ① Select [Device Settings] in the Navigation Menu to open the **[Device Settings] top menu**.

Displays an overview of the current device settings.

Display items are as follows:

[Summary of config. parameters]

[Basic setup]

Actuator motion	: Stem motion type	Actuator type	: Acting type
Valve action	: Direction of a valve when Pout1 is output	Packing friction	: Packing material
Booster option	: Booster option enable/disable	Booster type	: Booster type
Set point dir.	: Setpoint direction	Posi. transmit. dir.	: Position transmitter direction

[Easy/Expert tuning]

Rank	: Rank of the PID parameter	Response tuning	: Response tuning
------	-----------------------------	-----------------	-------------------

[Detail setup]

Cutoff/Limit 0%	: Cutoff/Limit 0% side enable/disable	0% value	: Cutoff/Limit 0% side value
Cutoff/Limit 100%	: Cutoff/Limit 100% side enable/disable	100% value	: Cutoff/Limit 100% side value
Dead band	: Deadband enable/disable	Dead band value	: Deadband value
Transfer function	: Transfer function	Input damper	: Input dumper enable/disable
Input damper factor	: Input damper factor	Range ability	: Range ability
Split range 0%	: Split range 0% side	Split range 100%	: Split range 100% side
PT burnout dir.	: Burnout direction of the Position transmitter	AT span limit	: Autotune span limit value

## 5.1. Extended device settings

This menu is an extended menu for basic settings, tuning, detailed settings, and function settings for controlling the positioner.

MENU) *Device Settings > Extended device settings*

- ① Click [Extended device settings] in the [Device Settings] top menu.

Device Name : KGP2000  
Description : KGP2000 HART DTM

Navigation Menu

- Process Variables
- Device Settings**
- Maintenance
- Diagnostics

**Extended device settings**

Summary of config. parameter

Basic setup

Actuator motion: Linear

Actuator type: Single

Valve action: ATO

Packing friction: Low

Booster option: Disable

Booster type: Large

Set point dir.: Normal

Posi. transmit. dir.: Normal

Easy/Expert tuning

Rank: XS

Response tuning: 0 Normal

Detail setup

Cutoff/Limit 0%: Cutoff

0% value: 0.5 %

Cutoff/Limit 100%: Disable

100% value: 99.5 %

Dead band: Disable

Dead band value: 0.1 %

Transfer function: Linear

Input damper: Disable

Input damper factor: 100.0

Range ability: 1

Split range 0%: 4.0 mA

Split range 100%: 20.0 mA

PT burnout dir.: Low

AT span limit: 103 %

- ② Open the [Extended device settings] menu.

Menu items are as follows:

- |                     |                                          |
|---------------------|------------------------------------------|
| (1) Authority setup | See <a href="#">3. Authority setup</a>   |
| (2) Basic setup     | See <a href="#">5.2. Basic setup</a>     |
| (3) Easy tuning     | See <a href="#">5.3. Easy tuning</a>     |
| (4) Expert tuning   | See <a href="#">5.4. Expert tuning</a>   |
| (5) Detail setup    | See <a href="#">5.5. Detail setup</a>    |
| (6) Custom curve    | See <a href="#">5.6. Custom curve</a>    |
| (7) Function select | See <a href="#">5.7. Function select</a> |

Click on the tab to open each menu.

## 5.2. Basic setup

Select essential parameters necessary for the control of the positioner.

※ **Perform basic setup surely before performing the following setup (easy tuning) in next section.**



### Caution

➤ To change the settings, “**Authority**” must be “HART”.

Setup items are as follows:

Actuator motion	: Stem motion type	Actuator type	: Acting type
Valve action	: Valve direction	Packing friction	: Packing material
Booster option	: Booster option	Set point dir.	: Setpoint direction
Posi. transmit. dir.	: Direction of Position transmitter		

※ For details on each item, refer to the KGP2000 instruction manual.

MENU) *Device Settings > Extended device settings > Basic setup*

① Select the [Basic setup] tab in the [Extended device settings] menu to open the [Basic setup] menu.

The screenshot shows the 'Extended device settings' window. At the top, there's a note: '\* To perform device tuning, 'Control mode' should be 'HART''. Below this are several tabs: 'Authority setup', 'Basic setup' (highlighted with a red box), 'Easy tuning', 'Expert tuning', 'Detail setup', 'Custom curve', and 'Function select'. The 'Basic setup' tab contains several configuration groups, each with a dropdown menu and a 'Change' button:

- Actuator motion:** Actuator motion (Linear), Change button.
- Actuator type:** Actuator type (Single), Change button.
- Valve action:** Valve action (ATO), Change button.
- Packing friction:** Packing friction (Low), Change button.
- Booster option:** Booster option (Disable), Booster type (Large), Change button.
- Set point dir.:** Set point dir. (Normal), Change button.
- Posi. transmit. dir.:** Posi. transmit. dir. (Normal), Change button.

At the bottom right, there are three buttons: 'Apply', 'Revert', and 'Close'.

Click [Change] within each menu group to change the current settings.

### 5.3. Easy tuning

Easy tuning is the setup to ensure that the positioner is operated smoothly relative to the actuator on which the positioner is mounted. It is possible to perform easily zero/span adjustments of a control valve, selection of suitable PID parameters, setting of other parameters necessary to control.



#### Caution

- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- Before performing **Full autotune**, **Position setup**, and **Auto span**, set the “Control mode” to “HART”.

#### Note

Before performing operation of this section, all parameters of basic setup described in **5.2 Basic setup** must be configured. If wrong parameters were configured, it is possible to choose unsuitable PID parameters.

MENU) *Device Settings > Extended device settings > Easy tuning*

- ① Click [Easy tuning] tab in the [Extended device settings] and open the [Easy tuning] menu.

The screenshot displays the 'Extended device settings' window. At the top, a blue header bar contains the title 'Extended device settings'. Below it, a navigation bar has tabs for 'Authority setup', 'Basic setup', 'Easy tuning' (highlighted with a red box), 'Expert tuning', 'Detail setup', 'Custom curve', and 'Function select'. A note states: '\* To perform device tuning, 'Control mode' should be 'HART''. The main area is divided into several sections:

- Autotune status:** Includes 'Autotune status' (set to 'No autotune') and 'Autotune result' (set to 'Completed OK!').
- Full autotune:** Contains buttons for 'Full autotune' and 'Abort autotune'.
- Tuning result:** Includes a checked checkbox for 'Tuning result'.
- Response tuning:** Includes 'Response tuning' (set to '0 Normal') and a 'Change' button.
- Position setup:** Includes 'Manual span' with '0% position adjust' and '100% position adjust' buttons, and 'Auto span' with 'Span autotune' and 'Abort autotune' buttons.
- Position gauge:** A circular gauge labeled 'Position' with a scale from 0 to 100% and a needle pointing to 0.

At the bottom right, there are three buttons: 'Apply' (with a checkmark), 'Revert' (with a circular arrow), and 'Close' (with an X).

### 5.3.1. Full autotune

While performing a sequence of operations, it configures automatically settings such as detection and calibration of zero · span, selection of suitable PID parameters to apply the control, detection and calibration of IP signal current bias.

#### Note

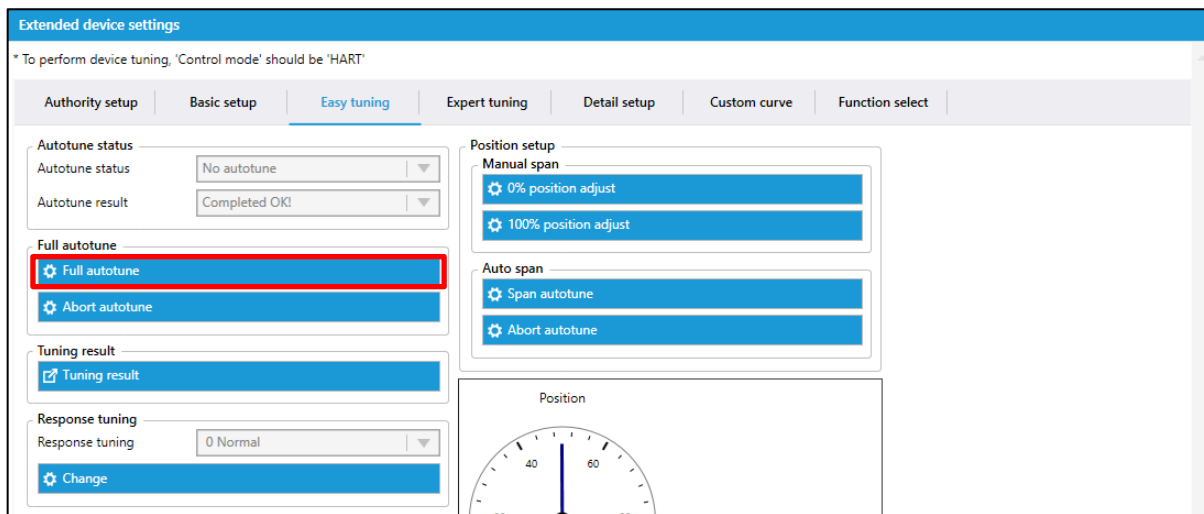
The configuration time varies with actuator size.

#### 5.3.1.1. Execute full autotune

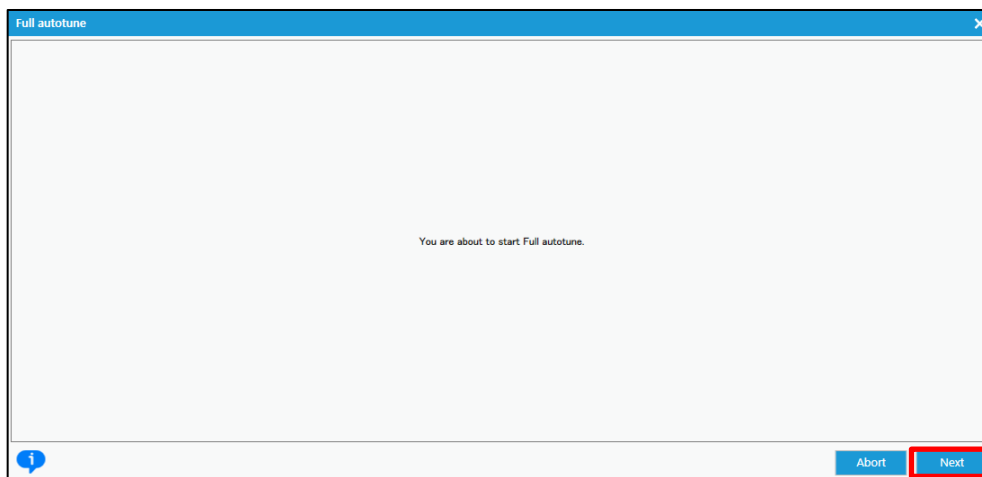
MENU) *Device Settings > Extended device settings > Easy tuning > Full autotune*

① Click [Full autotune] in the [Full autotune] menu group.

※ Click [Abort autotune] to cancel full autotune.



② Confirm the message and click [Next].





- ③ Wait until "Autotune status" field becomes "Complete autotune".

※ If a problem occurs during the operation, an error message will be displayed in the "Autotune result" field and operation will be stopped. For error details, refer to **Appendix B. Error Messages**.

### 5.3.1.2. Display full autotune result

MENU) *Device Settings > Extended device settings > Easy tuning > Tuning result*

- ① Click [Tuning result] in the [Tuning result] menu group and display the autotune result.

- ② Click [Close] to close the menu.

Tuning result	
Rank	XS
Stroke sp. (Air-In)	500 ms
Stroke sp. (Air-Out)	520 ms
Bias value	51.7 %
IP signal	51.0 %

Apply Revert **Close**

### 5.3.2. Position setup

Only zero/span settings can be performed independently, independent of full autotune. There are two different ways of Zero/span settings whether to specify Zero/span manually or to determine these automatically.

#### 5.3.2.1. Manual calibration of Zero/span point

Only the zero point and span point of the control valve are set manually.

MENU) *Device Settings > Extended device settings > Easy tuning > Position setup > Manual span > 0% or 100% position adjust*

- ① Click [0% position adjust] or [100% position adjust] in the [Manual span] menu group.

Extended device settings

\* To perform device tuning, 'Control mode' should be 'HART'

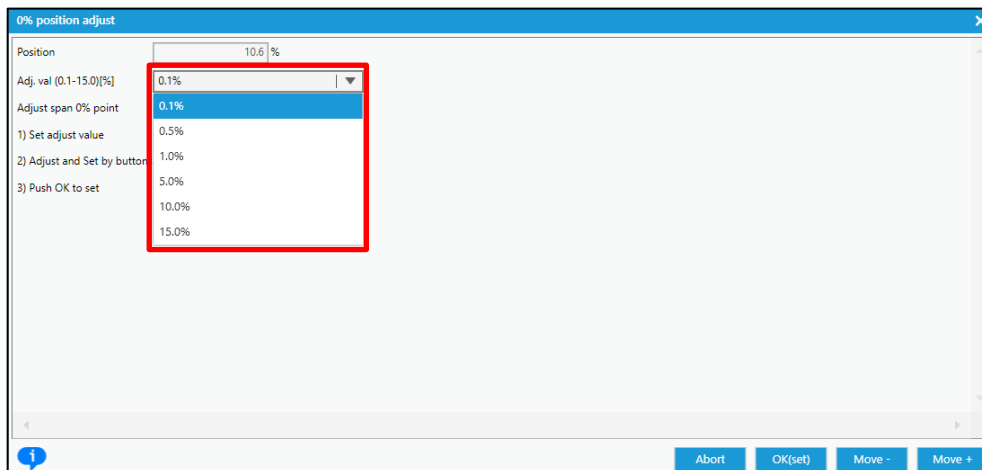
Authority setup Basic setup **Easy tuning** Expert tuning Detail setup Custom curve Function select

Autotune status  
Autotune status Complete autotune  
Autotune result Completed OK!

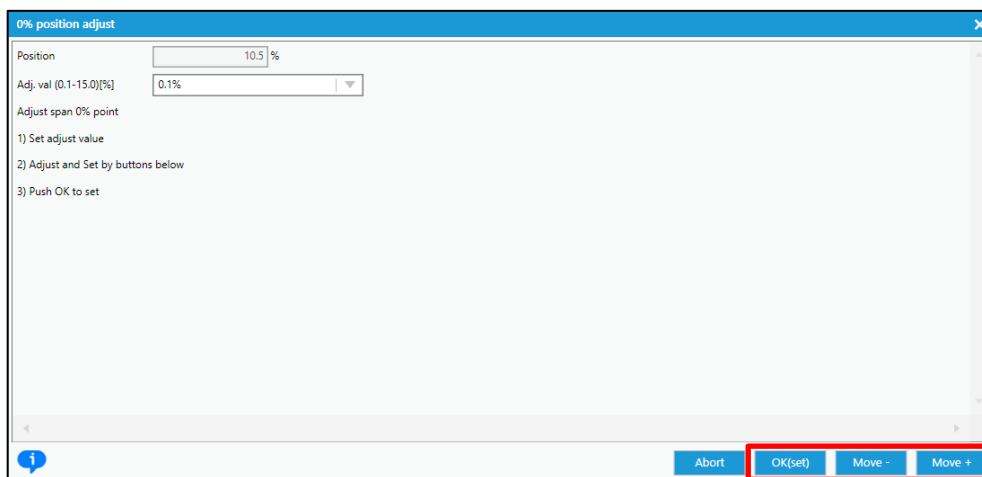
Full autotune

Position setup  
Manual span  
0% position adjust  
100% position adjust

- ② Select the amount of adjustment per button click in the “Adj. val.” field.



- ③ Click [Move-] or [Move +] and adjust individually the value of each position in 0% and 100% of the valve travel.  
 ④ After adjustment, click [OK(set)] to configure the 0% or 100% valve opening position.

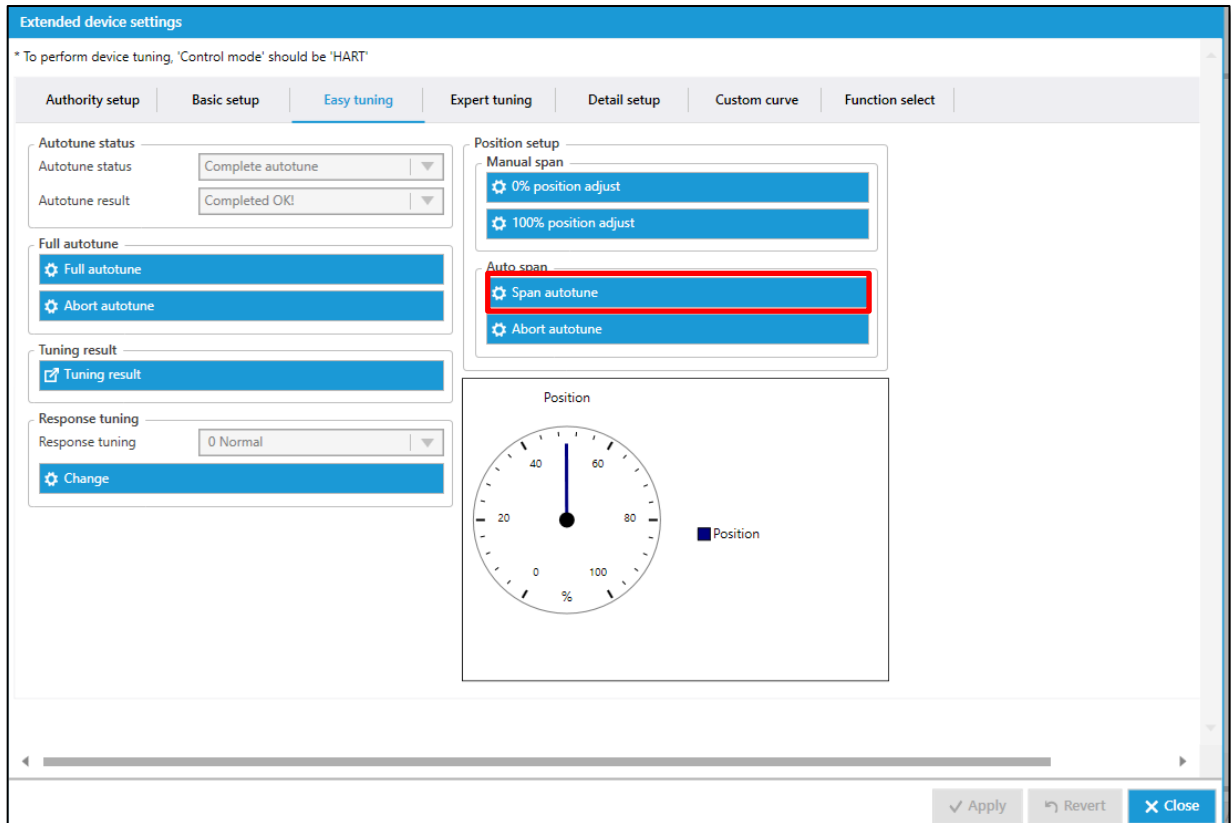


### 5.3.2.2. Auto calibration of Zero/span point

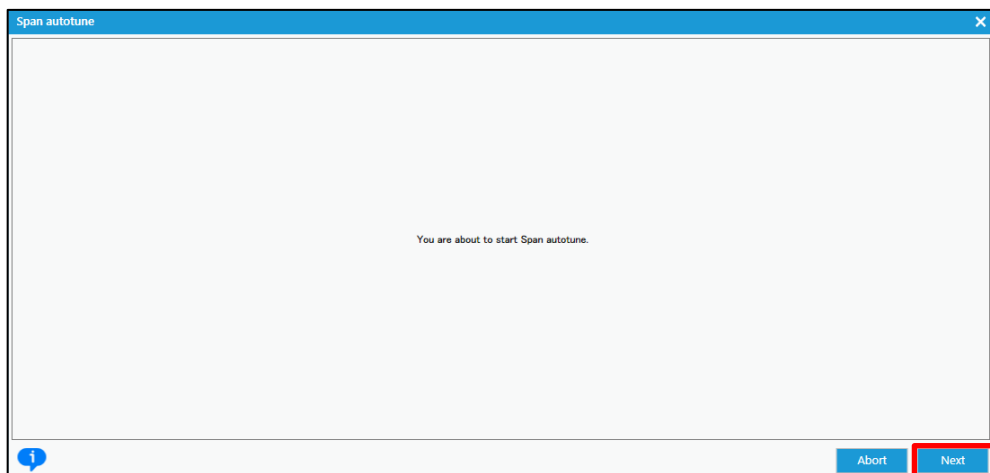
Only the zero point and span point of the control valve are set automatically.

MENU) *Device Settings > Extended device settings > Easy tuning > Position setup > Auto span > Span autotune*

- ① Click [Span autotune] in the [Auto span] menu group.
- ※ Click [Abort autotune] to cancel Span autotune.



- ② Confirm the message and click [Next].



- ③ Wait until "Autotune status" field becomes "Complete autotune".

※ If a problem occurs during the operation, an error message will be displayed in the "Autotune result" field and operation will be stopped. For error details, refer to **Appendix B. Error Messages**.

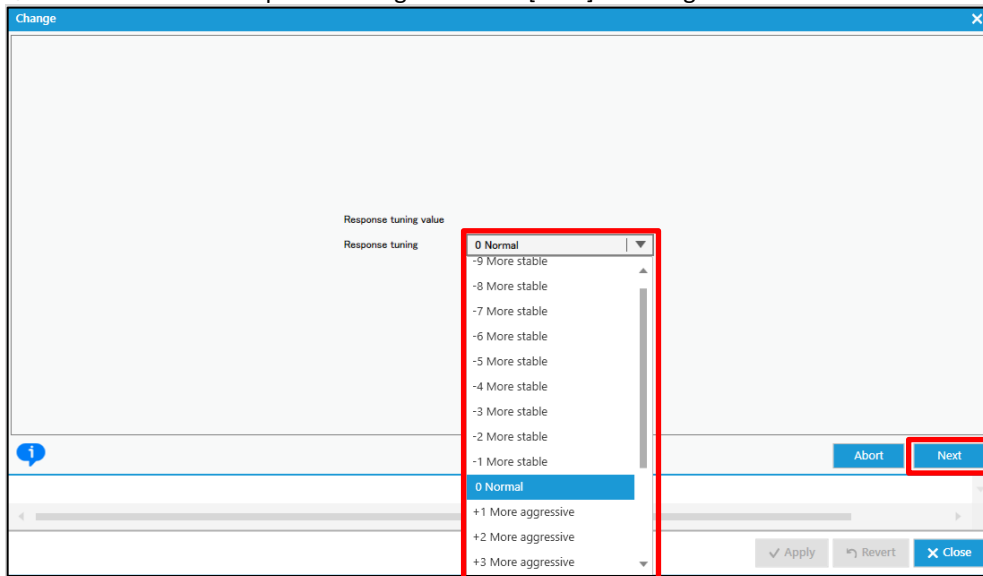
### 5.3.3. Response tuning

This operation is used to perform an additional fine adjustment relevant to the control response after performing PID tuning.

MENU) *Device Settings > Extended device settings > Easy tuning > Response tuning*

- ① Click [Change] int the [Response tuning] menu group.

- ② Select level of “Response tuning” and Click [Next] to configure.



- A. In case the higher response sensitivity is desired,  
i.e., you wish to reduce response time by making the response quicker,  
Select “+ More aggressive” and the most suitable stage among nine stages (+1 ~ +9). The response sensitivity increases in proportion to number of the stage.
- B. In case the lower motion sensitivity is desired,  
i.e., you wish to decrease the overshoot by making the response slower,  
Select “- More stable” and the most suitable stage among nine stages (-1 ~ -9). The response sensitivity decreases in proportion to number of the stage.
- C. In case of restoring the response to original settings,  
Select “0 Normal”.

#### 5.4. Expert tuning

Use this setting in case in which the desired response has not been achieved through easy tuning. More suitable control parameters are configured according to each actuator by tuning individually parameters necessary to control the response.

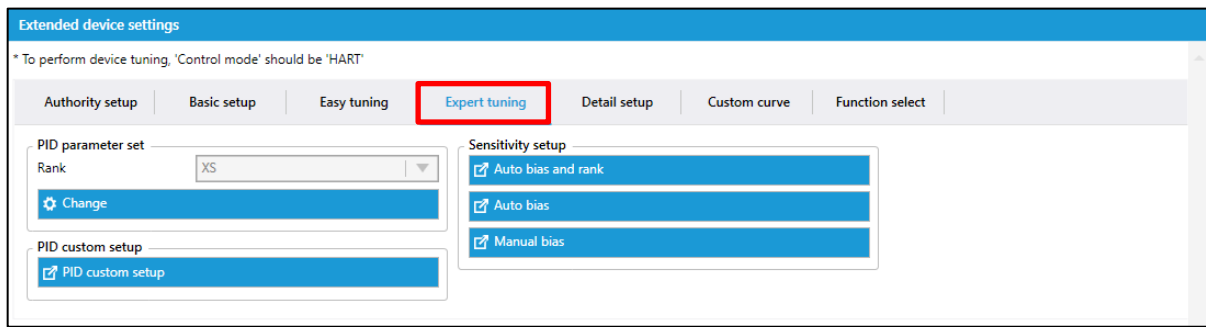


#### Caution

- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- Before performing IP signal current bias (Auto), set the “Control mode” to “HART”.

MENU) *Device Settings > Extended device settings > Expert tuning*

- ① Click [Expert tuning] menu tab in the [Extended device settings] menu and open the [Expert tuning] menu.



#### 5.4.1. Preset setting for PID parameter

It is possible to select preset values prepared previously as PID parameter sets inside the device.



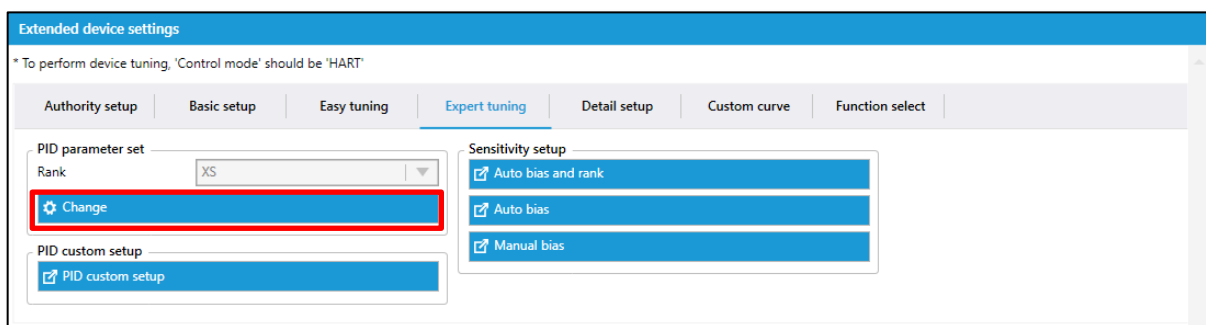
#### Caution

- If change the rank by two or more, unexpected behavior (too slow response, too fast response) may occur, so perform a thorough test operation in advance and confirm that there are no problems.
- In general, lowering the proportional gain takes longer to start moving and delays reaching the target opening. On the other hand, increasing the proportional gain causes instability and hunting.

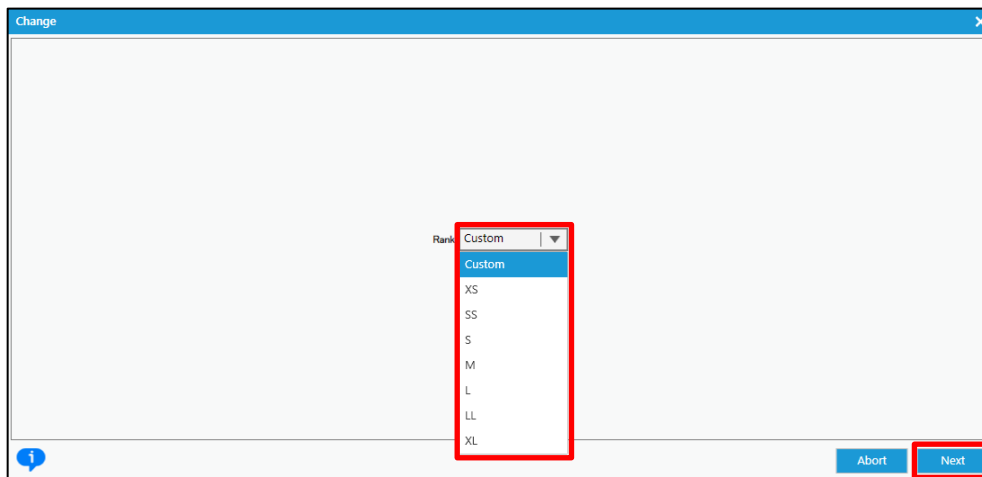
MENU) *Device Settings > Extended device settings > Expert tuning > PID parameter set*

The steps for changing the rank of PID parameter set are as follows.

- ① Click [Change] in the [PID parameter set] menu group.



② Select rank and click [Next] to configure.





### 5.4.2. Custom setting for PID parameter

It is possible to tune individually PID parameters shown as follows.



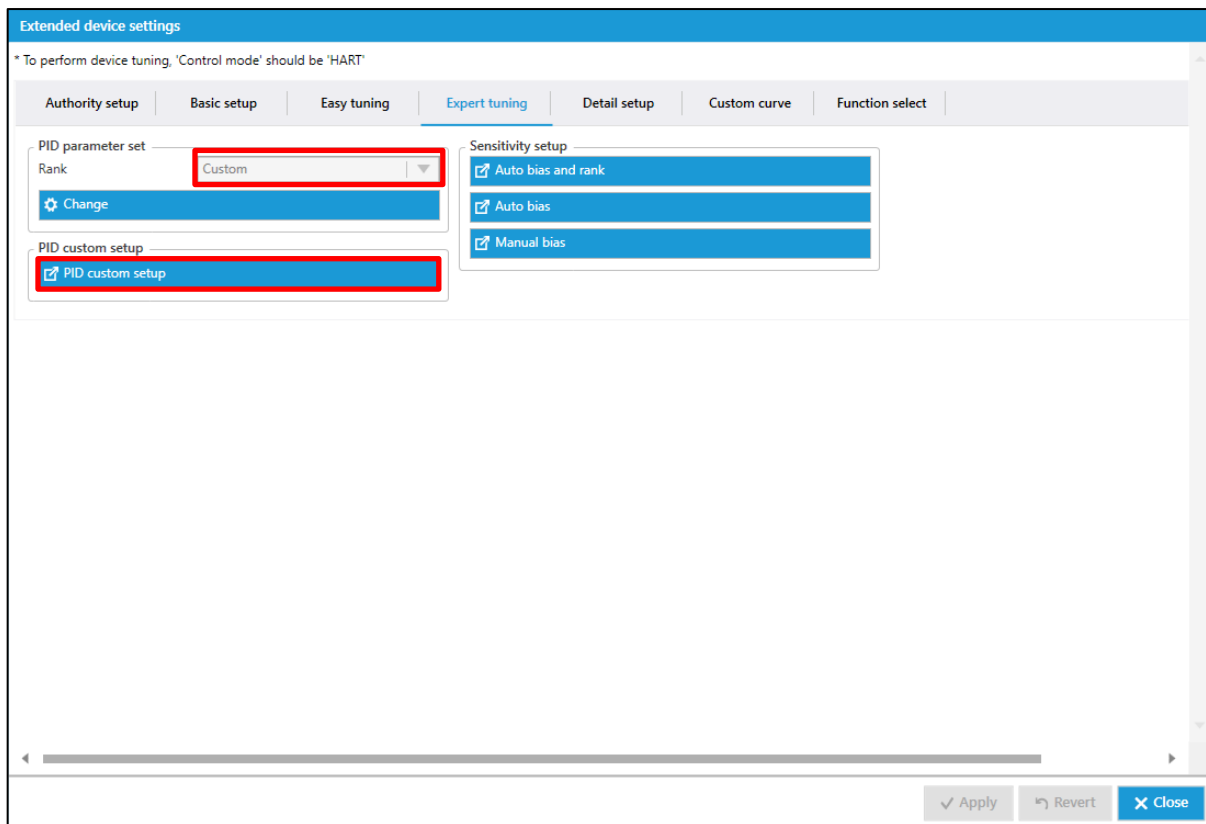
#### Caution

- If the rank setting in the [PID parameter set] menu is other than “**Custom**”, cannot change the parameter value using the following steps.

※ For details and precautions for each parameter, refer to the KGP2000 instruction manual.

MENU) *Device Settings > Extended device settings > Expert tuning > PID custom setup*

- ① Click [PID custom setup] in the [PID custom setup] menu group.



② [PID custom setup] menu opens.

To change the current settings, click [Change] within each menu group.

### 5.4.3. Setup for IP signal current bias

IP signal current bias is the parameter necessary to determine the control output signal (IP signal) corresponding to an input signal inside the positioner.

There are two different ways whether to determine IP signal current bias automatically or to specify it manually.

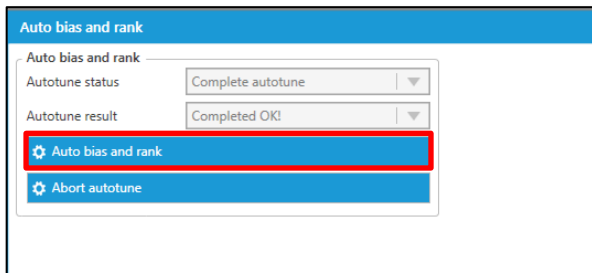
#### 5.4.3.1. Auto setup for IP signal current bias

1) Set IP signal current bias and PID parameters together.

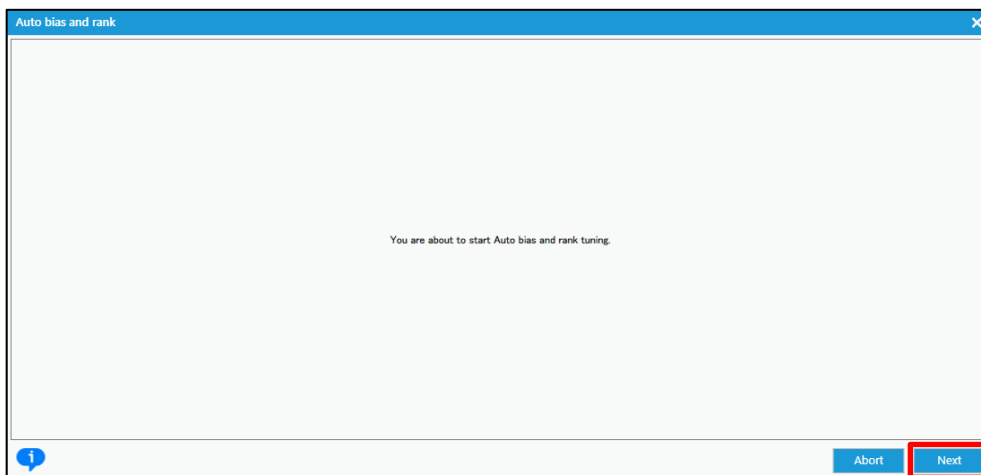
MENU) *Device Settings > Extended device settings > Expert tuning > Sensitivity setup > Auto bias and rank*

① Click [Auto bias and rank] in the [Sensitivity setup] menu group.

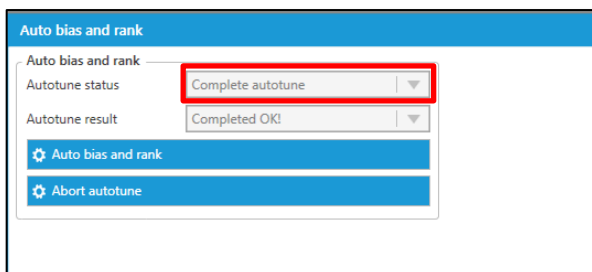
- ② Click [Auto bias and rank] in the [Auto bias and rank] menu group.  
 ※ Click [Abort autotune] to cancel Auto bias and rank.



- ③ Confirm the message and click [Next].



- ④ Wait until "Autotune status" field becomes "Complete autotune".

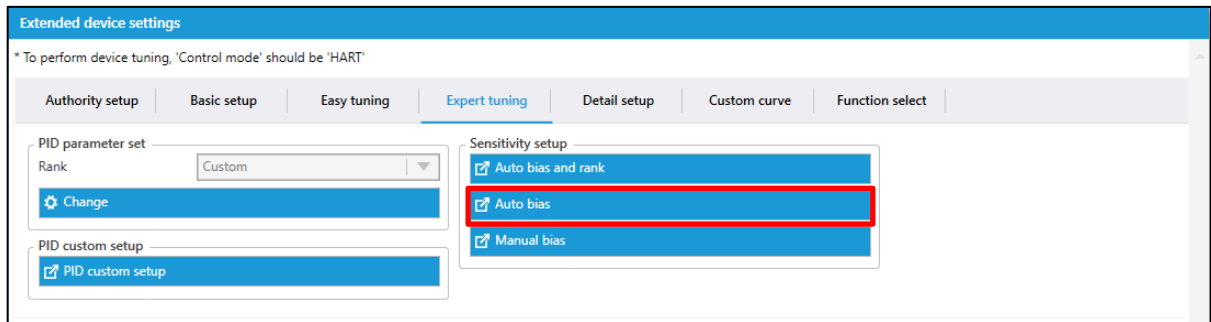


- ※ If a problem occurs during the operation, an error message will be displayed in the "Autotune result" field and operation will be stopped. For error details, refer to **Appendix B. Error Messages**.

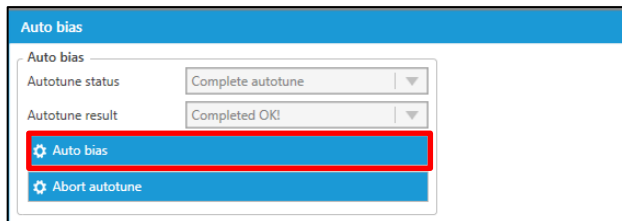
## 2) Set IP signal current bias only

MENU) *Device Settings > Extended device settings > Expert tuning > Sensitivity setup > Auto bias*

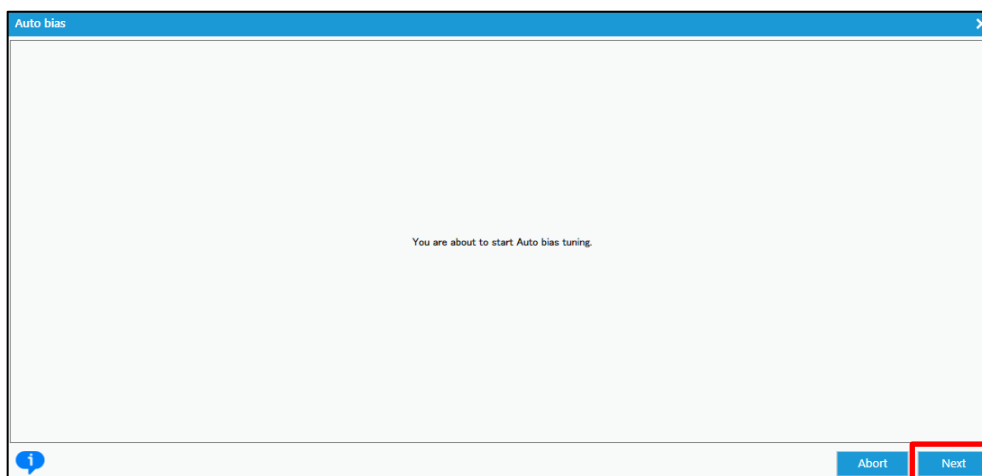
- ① Click [Auto bias] in the [Sensitivity setup] menu group.



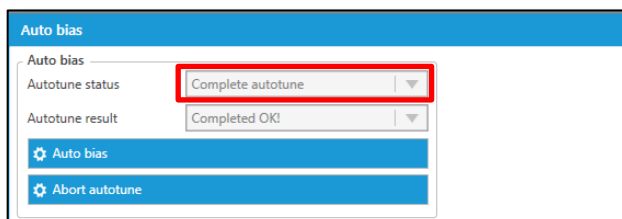
- ② Click [Auto bias] in the [Auto bias] menu group.  
 ※ Click [Abort autotune] to cancel **Auto bias**.



- ③ Confirm the message and click [Next].



- ④ Wait until "Autotune status" field become "Complete autotune".



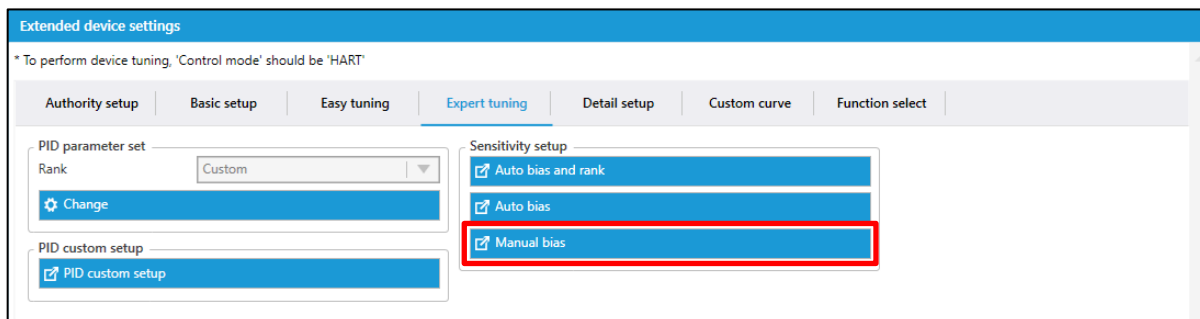
※ If a problem occurs during the operation, an error message will be displayed in the "Autotune result" field and operation will be stopped. For error details, refer to **Appendix B. Error Messages**.

### 5.4.3.2. Manual setup for IP signal current bias

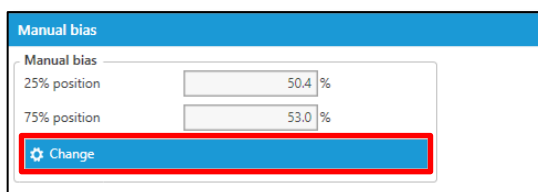
Specify individually IP signal current bias of each position in 25% and 75% of the valve travel.

MENU) *Device Settings > Extended device settings > Expert tuning > Sensitivity setup > Manual bias*

- ① Click [Manual bias] in the [Sensitivity setup] menu group.



- ② Click [Manual bias] in the [Manual bias] menu group and enter setting value.



## 5.5. Detail setup

Set values which need to be changed to achieve the desired response.



### Caution

- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- To change the settings, "Authority" must be "HART" (See 3. Authority setup).

Setup items are as follows:

Cutoff/Limit	: Cutoff/Limit
Dead band	: Deviation value below which the integral action is disabled.
Transfer function	: Type of the flow characteristic curve
Range ability	: Rangeability in relevant to the equal percentage characteristic curve
Damper setting	: Damping coefficient to the input signal.
Split range	: Split range
PT burnout dir.	: Burnout direction of position transmitter
AT span limit	: Full mechanical limit of valve travel over the 100% travel position

※ Refer to the KGP2000 instruction manual for details and precautions for each parameter.

MENU) *Device Settings > Extended device settings > Detail setup*

- ① Click [Detail setup] tab menu in the [Extended device settings] menu. [Detail setup] menu opens.

**Extended device settings**

\* To perform device tuning, 'Control mode' should be 'HART'

Authority setup | Basic setup | Easy tuning | Expert tuning | **Detail setup** | Custom curve | Function select

**Cutoff or Limit**

Cutoff/Limit 0% Cutoff

0% value 0.5 %

Cutoff/Limit 100% Disable

100% value 99.5 %

[Change](#)

**Dead band**

Dead band Disable

Dead band value 0.1 %

[Change](#)

**Transfer function**

Transfer function Linear

[Change](#)

**Range ability**

Range ability 1

[Change](#)

**Damper setting**

Input damper Disable

Input damper factor 100.0

[Change](#)

**Split range**

Split range 0% 4.0 mA

Split range 100% 20.0 mA

[Change](#)

**PT burnout dir.**

PT burnout dir. Low

[Change](#)

**AT span limit**

AT span limit 103 %

[Change](#)

[✓ Apply](#) [↶ Revert](#) [✕ Close](#)

To change the current settings, click [Change] within each menu group.

## 5.6. Custom curve

Set the flow characteristic curve by specifying arbitrary 19 points.

※ Since the 0% valve travel corresponds to the 0% input and the 100% valve travel corresponds to the 100% input, set points of the intervals between them.

※ Define the relationship in such a way that the valve travel monotonically increases as the input increases.

MENU) *Device Settings > Extended device settings > Custom curve*

① Click [Custom curve] tab menu. [Custom curve] menu opens.

Extended device settings

\* To perform device tuning, 'Control mode' should be 'HART'

Authority setup | Basic setup | Easy tuning | Expert tuning | Detail setup | **Custom curve** | Function select

**Change custom curve**

Custom curve

X1 value	100.0 %	Y1 value	100.0 %
X2 value	100.0 %	Y2 value	100.0 %
X3 value	100.0 %	Y3 value	100.0 %
X4 value	100.0 %	Y4 value	100.0 %
X5 value	100.0 %	Y5 value	100.0 %
X6 value	100.0 %	Y6 value	100.0 %
X7 value	100.0 %	Y7 value	100.0 %
X8 value	100.0 %	Y8 value	100.0 %
X9 value	100.0 %	Y9 value	100.0 %
X10 value	100.0 %	Y10 value	100.0 %
X11 value	100.0 %	Y11 value	100.0 %
X12 value	100.0 %	Y12 value	100.0 %
X13 value	100.0 %	Y13 value	100.0 %
X14 value	100.0 %	Y14 value	100.0 %
X15 value	100.0 %	Y15 value	100.0 %
X16 value	100.0 %	Y16 value	100.0 %

✓ Apply    ↶ Revert    ✕ Close

To enter the setting value, click [Change custom curve] and enter the setting value.

## 5.7. Function select

The following functions can be set individually.

Password setup	: Password setup
Screen saver	: Screen saver
Temperature unit	: Temperature unit
LCD display mode	: LCD display mode of valve position

※ See KGP2000 instruction manual for details and precautions for each parameter.

MENU) *Device Settings > Extended device settings > Function select*

① Click [Function select] menu tab in the [Extended device settings] menu. [Function select] menu opens.

The screenshot shows the 'Extended device settings' window. At the top, there is a navigation bar with tabs: Authority setup, Basic setup, Easy tuning, Expert tuning, Detail setup, Custom curve, and Function select. The 'Function select' tab is highlighted with a red rectangle. Below the tabs, there is a note: '\* To perform device tuning, 'Control mode' should be 'HART''. The main content area contains four settings groups, each with a 'Change' button: Password setup (Password status: Disable), Screen saver (Screen saver: Disable, Waiting time: 0 minutes), Temperature unit (Temperature unit: °C), and LCD display mode (LCD posi. disp. mode: Normal). At the bottom right, there are three buttons: Apply, Revert, and Close.

To change the current settings, click [Change] within each menu group.

※ For password settings, refer to **Appendix D. Password setup**.



## 6. Maintenance

This menu offers maintenance, adjustment, and HART-related settings for the positioner.



### Caution

- To change the settings, “**Authority**” must be “HART”.

MENU) **Maintenance**

- ① Click [Maintenance] menu in the Navigation Menu to open the Maintenance menu. Displays an overview of the current settings.

Display items are as follows:

[Serial No.]

Serial No.	: Serial number
------------	-----------------

[Version]

Electronics	: Hardware revision	Software	: Software revision
-------------	---------------------	----------	---------------------

[HART version]

HART Protocol Revision	: HART protocol version	Device rev	: Field device revision
------------------------	-------------------------	------------	-------------------------

[HART relation]

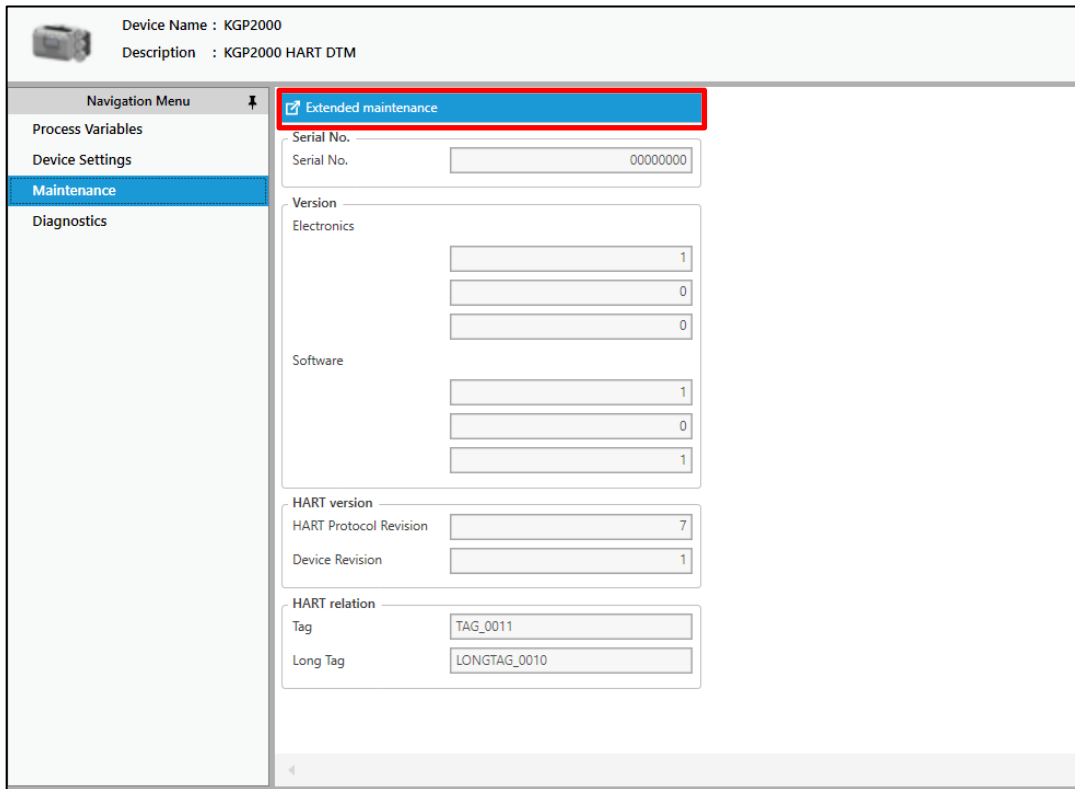
Tag	: Tag number	Long Tag	: Long Tag number
-----	--------------	----------	-------------------

## 6.1. Extended maintenance

This menu offers maintenance, adjustment, and HART-related settings for the positioner.

MENU) *Maintenance > Extended maintenance*

- ① Click [Extended maintenance] in the [Maintenance] top menu.



Device Name : KGP2000  
Description : KGP2000 HART DTM

Navigation Menu

- Process Variables
- Device Settings
- Maintenance**
- Diagnostics

**Extended maintenance**

Serial No.  
Serial No. 00000000

Version

Electronics

1  
0  
0

Software

1  
0  
1

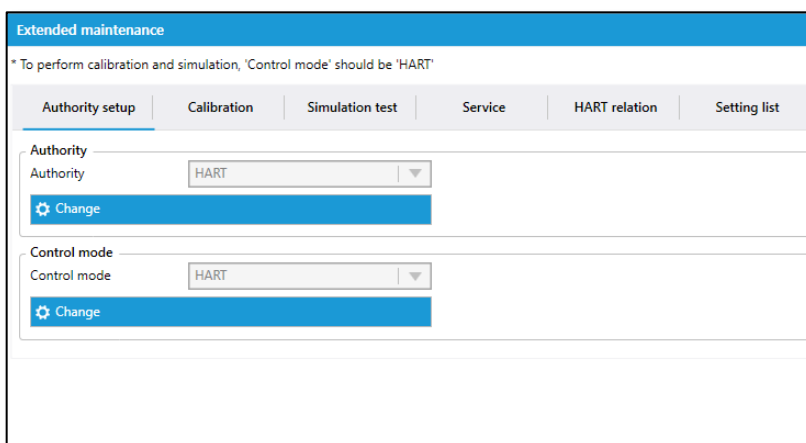
HART version

HART Protocol Revision 7  
Device Revision 1

HART relation

Tag TAG\_0011  
Long Tag LONGTAG\_0010

- ② [Extended maintenance] menu opens.



**Extended maintenance**

\* To perform calibration and simulation, 'Control mode' should be 'HART'

Authority setup | Calibration | Simulation test | Service | HART relation | Setting list

Authority

Authority HART

Change

Control mode

Control mode HART

Change

Menu items are as follows:

- |                     |                                         |
|---------------------|-----------------------------------------|
| (1) Authority setup | See <a href="#">3. Authority setup</a>  |
| (2) Calibration     | See <a href="#">6.2 Calibration</a>     |
| (3) Simulation test | See <a href="#">6.3 Simulation test</a> |
| (4) Service         | See <a href="#">6.4. Service</a>        |
| (5) HART relation   | See <a href="#">6.5. HART relation</a>  |
| (6) Setting list    | See <a href="#">6.6. Setting list</a>   |
| (7) Factory setup ※ | See <a href="#">6.7. Factory setup</a>  |

※ This menu is displayed only when the “Factory setup” field is “ON” in the [Maintenance] > [Service] > [Factory menu].

Click on the tab to open each menu.

## 6.2. Calibration

Since the operation described in this section is preset from the factory, generally, it is not necessary to repeat this. However, since there is a case in which a deviation is produced from long-term operation and so on, if necessary, perform this operation.

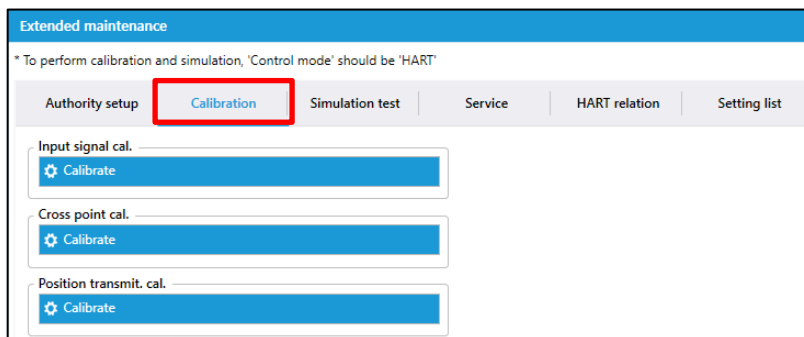


### Caution

- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- Before performing calibration, set “**Control mode**” to “HART”.

MENU) Maintenance > Extended maintenance > Calibration

- ① Click [Calibration] menu tab in the [Extended maintenance] menu. [Calibration] menu opens.



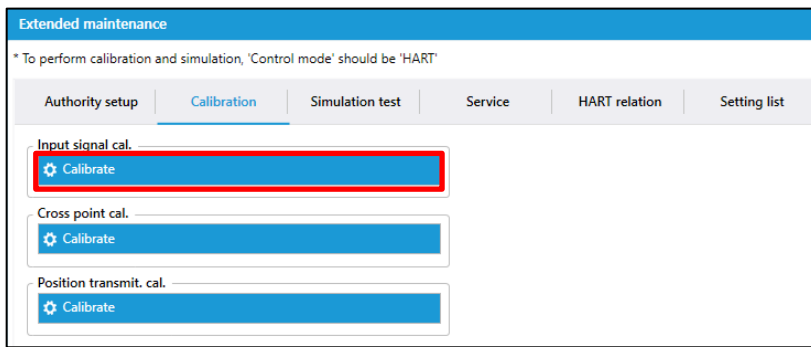
### 6.2.1. Input signal calibration.

Calibrate the value of input signal which the positioner can receive.

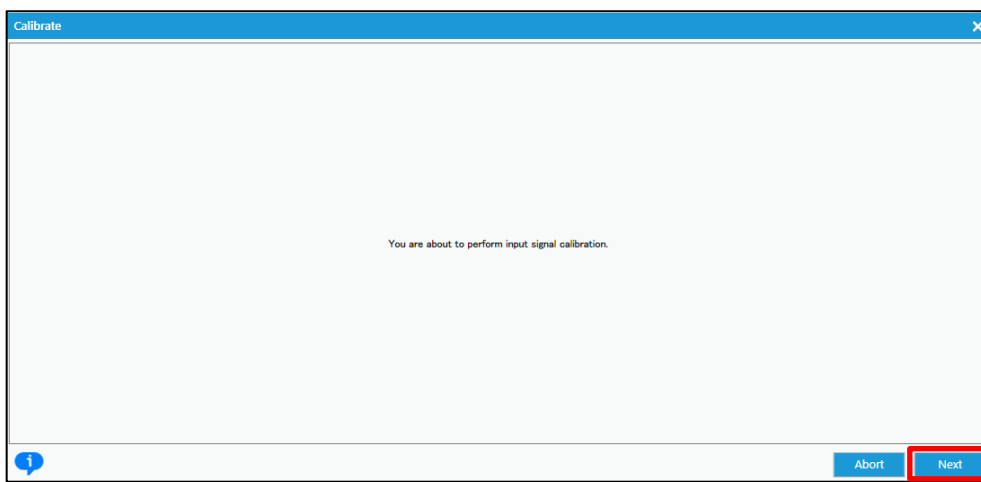
The steps to calibration each value of 4mA and 20mA is shown as below.

MENU) Maintenance > Extended maintenance > Calibration > Input signal cal.

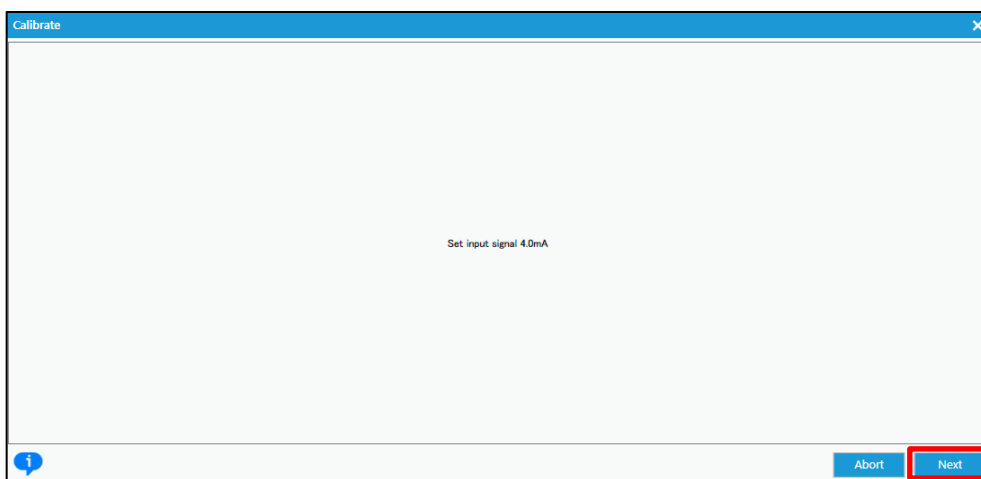
- ① Click [Calibrate] in the [Input signal cal.] menu group.



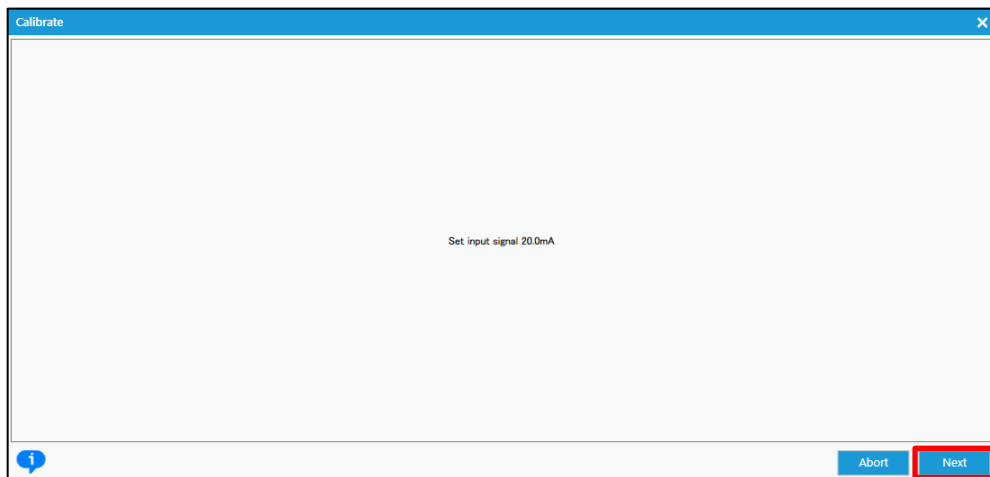
- ② Confirm the message and click [Next].



- ③ Set the input signal to 4mA and click [Next].



- ④ Set the input signal to 20mA and click [Next].



- ⑤ Calibration is complete when the message “Input signal calibration has completed” is displayed.

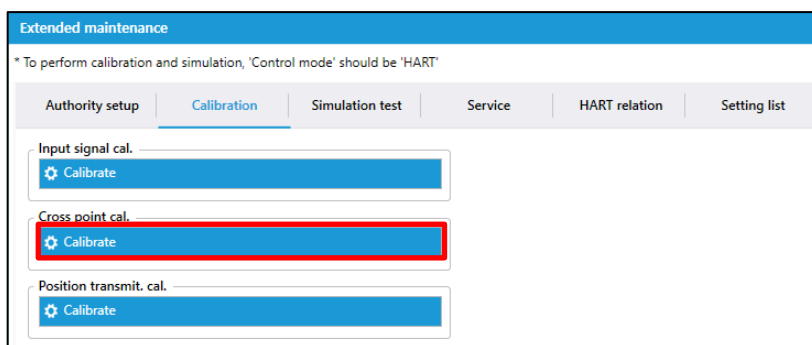
### 6.2.2. Cross point calibration.

Calibrate the position which of the feedback lever becomes in the horizontal position. It is necessary to perform it to precisely control the travel position. When a feedback lever is not installed horizontally in the 50% position, this calibration will be required.

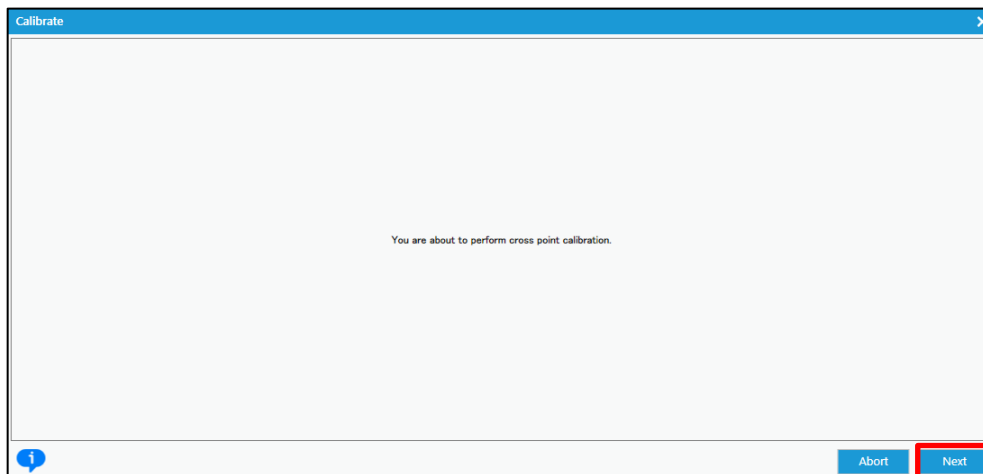
The steps are shown below.

MENU) *Maintenance > Extended maintenance > Calibration > Cross point cal.*

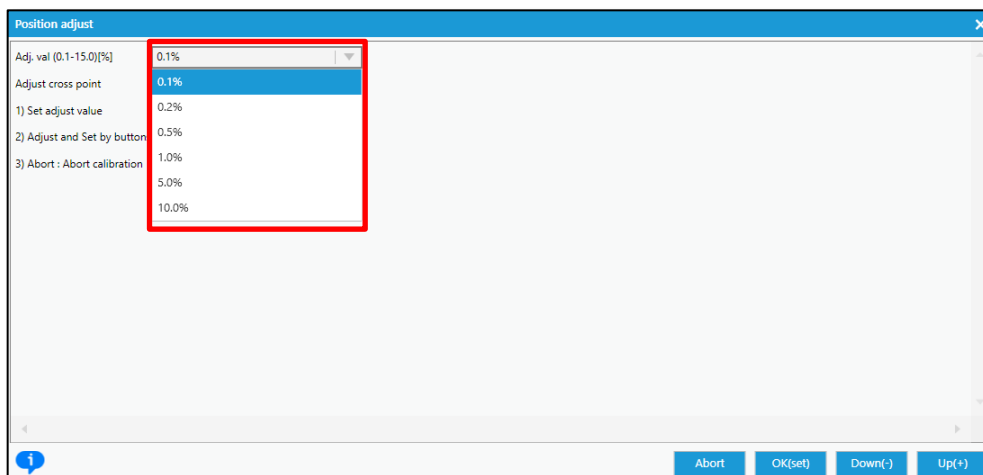
- ① Click [Calibrate] menu tab in the [Cross point cal.] menu group.



- ② Confirm the message and click [Next].

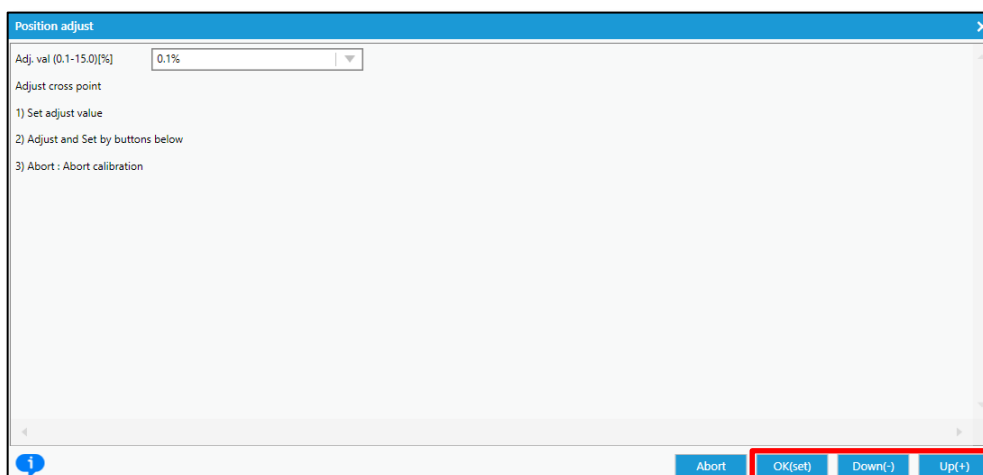


- ③ Select the amount of adjustment with one button click in the “Adj. val.” field.



- ④ Click [Up(+)] or [Down(-)] to make the feedback lever horizontal.

- ⑤ When reach the horizontal position, click [Ok(set)] to complete the crosspoint calibration.

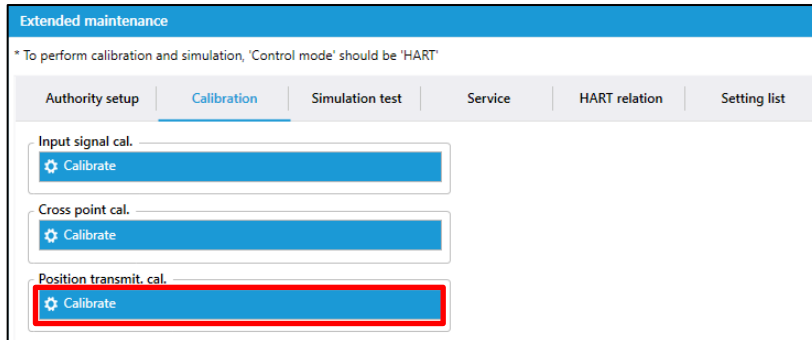


### 6.2.3. Position transmitter calibration.

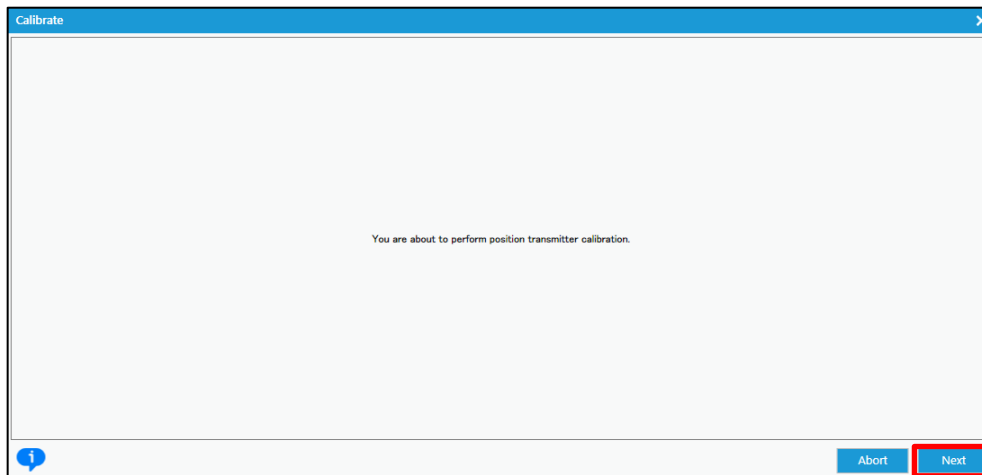
Calibrate the position transmitter signal which the positioner may send.  
The steps to calibrate the position transmitter signal of both position 0% and 100% is shown below.

MENU) *Maintenance > Extended maintenance > Calibration > Position transmit. cal.*

- ① Click [Calibrate] in the [Position transmit. cal.] menu group.

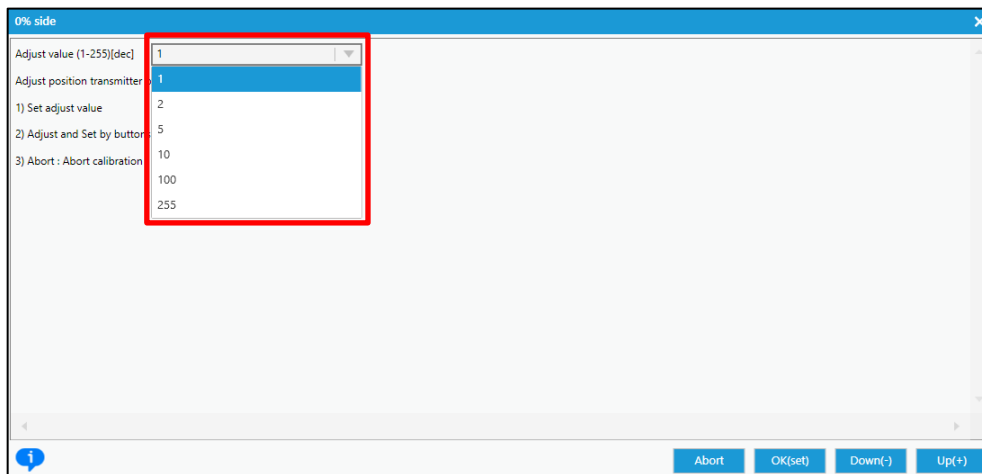


- ② Confirm the message and click [Next].

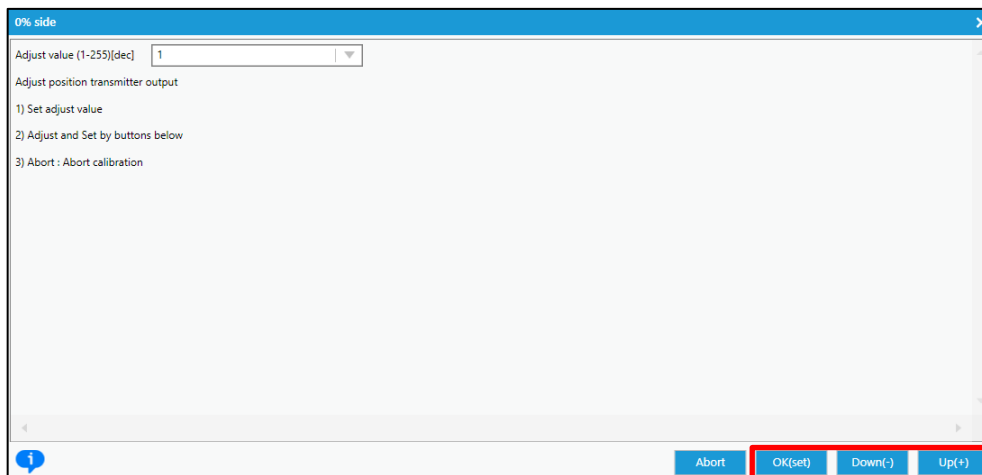


First, perform calibration on the 0% side.

- ③ Select the amount of adjustment with one button click in the “Adjust value” field.

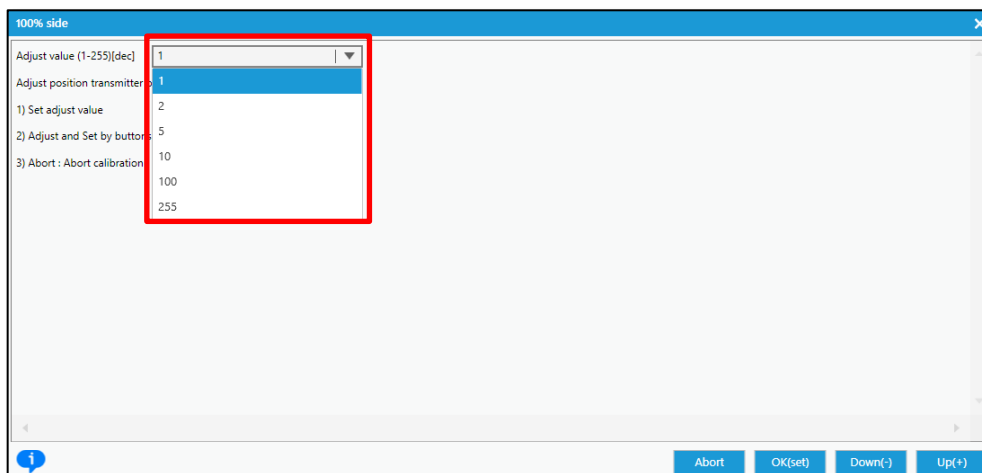


- ④ Click [Up(+)] or [Down(-)] to adjust position transmitter signal. After completing the adjustment, click [OK(set)] to configure.



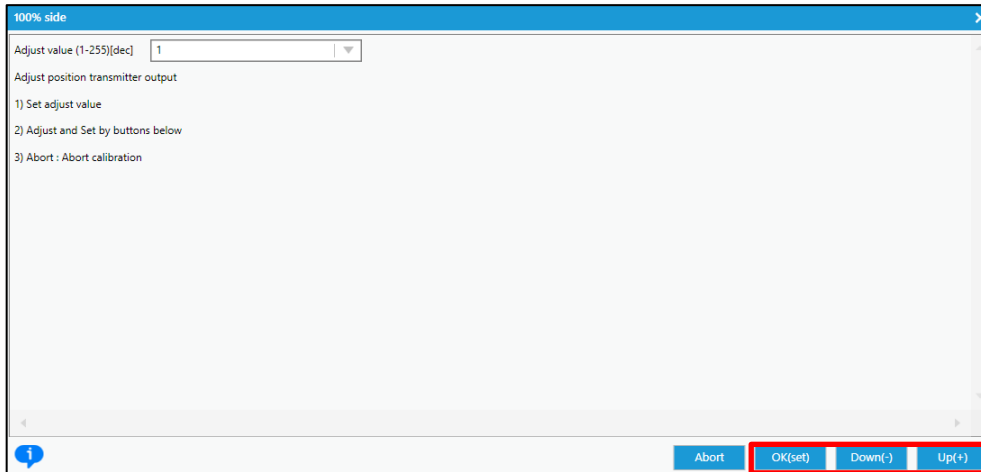
Next, perform calibration on the 100% side.

- ⑤ Select the amount of adjustment with one button click in the “Adjust value” field.





- ⑥ Click [Up(+)] or [Down(-)] to adjust position transmitter signal. After completing the adjustment, click [OK(set)] to complete calibration.



### 6.3. Simulation test

It is possible to generate input signal, IP signal current and position transmitter output in similar manner with the desired control.

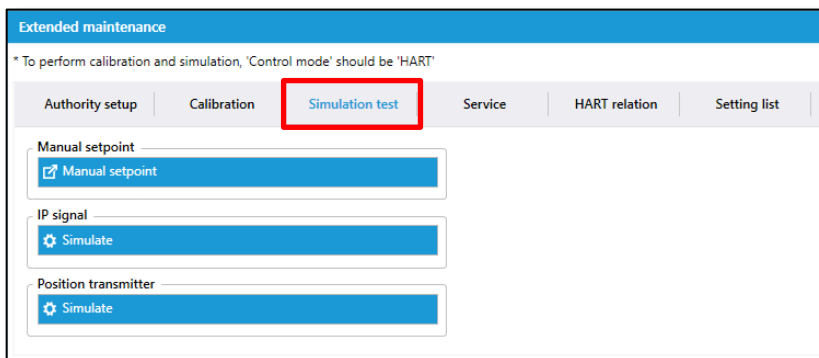


#### Caution

- Simulation test is the function which enables the positioner to be operated regardless of the signal from a higher-level control system connected with the positioner. Prior to operating this function, make sure that the simulation will not affect the process.
- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- Before performing simulation test, set “**Control mode**” to “HART”.

MENU) *Maintenance > Extended maintenance > Simulation test*

- ① Click [Simulation test] menu tab in the [Extended maintenance] menu. [Simulation test] menu opens.

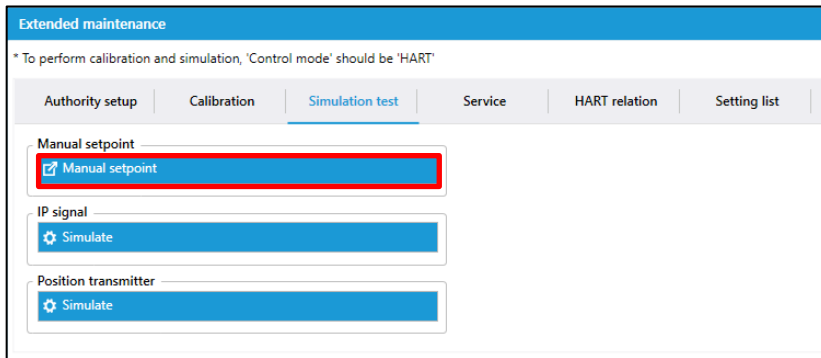


### 6.3.1. Manual setpoint simulation

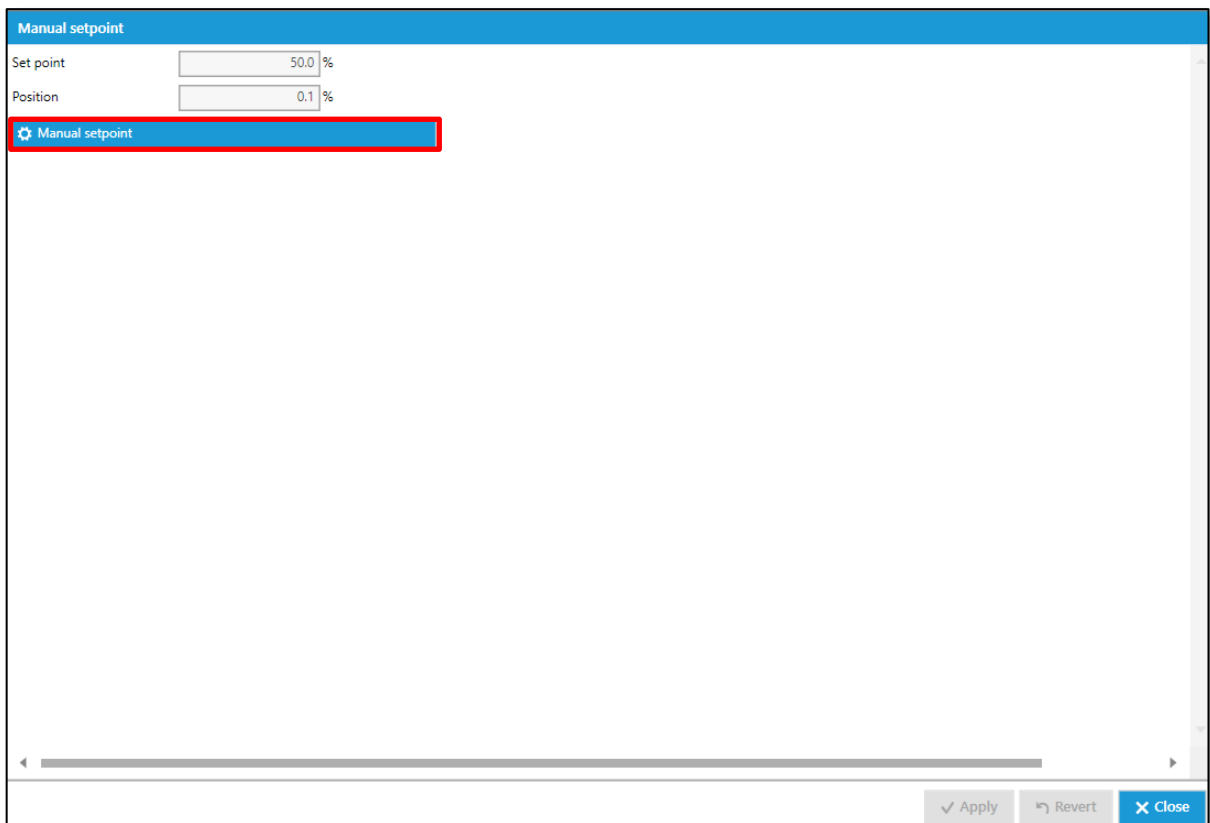
It is possible to operate the control valve by pseudo input signal.

MENU) *Maintenance > Extended maintenance > Simulation test > Manual setpoint*

- ① Click [Manual setpoint] in the [Manual setpoint] menu group. Another menu window opens.



- ② Click [Manual setpoint] in the [Manual setpoint] menu, [Manual setpoint] sub menu opens.



- ③ Enter setpoint value in the “Manual setpoint” field and click [Next]. Perform simulate manual setpoint and return menu of ②.

Manual setpoint

Set value to move (0.0-100.0)(%)

Manual setpoint 50.0 %

Abort Next

- ④ Click [Close], return to the [Simulation test] menu.

Manual setpoint

Set point 50.0 %

Position 0.1 %

Manual setpoint

Apply Revert Close

### 6.3.2. IP signal simulation

It is possible to operate the control valve by providing the IP signal directly to the torque motor unit.

*MENU) Maintenance > Extended maintenance > Simulation test > IP signal*

- ① Click [Simulate] in the [IP signal] menu group.

The screenshot shows the 'Extended maintenance' window with the 'Simulation test' tab active. Under the 'IP signal' section, the 'Simulate' button is highlighted with a red rectangular box. Other sections like 'Manual setpoint' and 'Position transmitter' also have 'Simulate' buttons.

- ② Select whether or not to adjust the temperature. In general, select “Yes” and click [Next].

The screenshot shows the 'Simulate' dialog box. It asks 'Do you want temperature compensation?' with a dropdown menu set to 'Yes', which is highlighted with a red box. At the bottom right, the 'Next' button is also highlighted with a red box. There is an 'Abort' button next to it.

- ③ Enter the IP signal values in the “IP signal value” field and click [Next]. Perform simulation.
- ④ To return to the normal control, click [Abort].

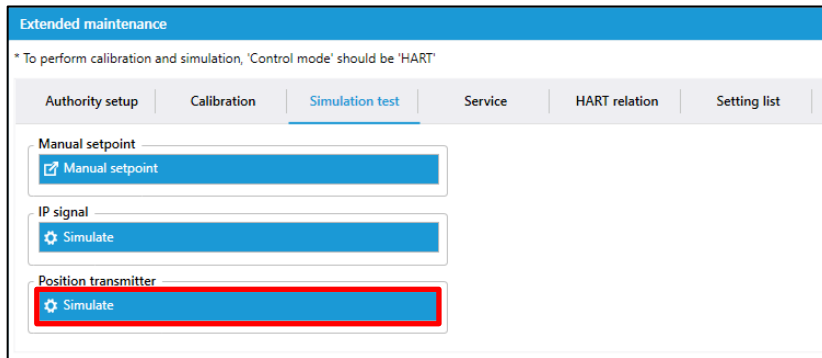
The screenshot shows the 'Simulate' dialog box. It displays 'IP signal simulation (0-100[%])' and 'IP signal value' with a text input field containing '0 %', which is highlighted with a red box. At the bottom right, the 'Next' button is highlighted with a red box. There is an 'Abort' button next to it.

### 6.3.3. Position transmitter simulation

It is possible to output the position transmitter signal with a pseudo-set position transmitter value.

MENU) *Maintenance > Extended maintenance > Simulation test > Position transmitter*

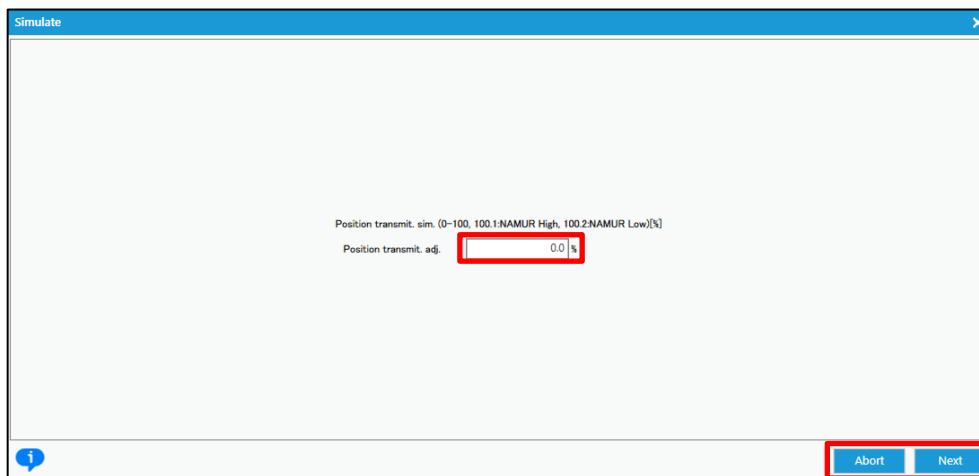
- ① Click [Simulate] in the [Position transmitter] menu group.



- ② Enter position transmitter value in the "Position transmit adj." field and click [Next]. Perform simulation.

Any position transmitter value from 0-100% can be output.  
 If set 100.1%, positioner outputs NAMUR Burnout High signal.  
 If set 100.2%, positioner outputs NAMUR Burnout Low signal.

To return to the normal output, click [Abort].



## 6.4. Service

The operator can identify the current internal control variables as follows.

MENU) *Maintenance > Extended maintenance > Service*

- ① Click [Service] menu tab in the [Extended maintenance] menu and open the [Service] menu.

**Extended maintenance**

\* To perform calibration and simulation, 'Control mode' should be 'HART'

Authority setup | Calibration | Simulation test | **Service** | HART relation | Setting list

**Angle**  
Angle: -10.6550 \*

**Stroke angle**  
Span setting stroke 0: -10.66277 deg  
Cross point: -0.52131 deg  
Span setting stroke 100: 10.21845 deg

**Raw AD values**  
Input(4-20mA): 7B7A  
Position(Sin): 9A64  
Position(Cos): C3AC  
Temperature: 033E

**Time stamp**  
Date: Jan 17 2025  
Time: 13:35:40

**PWM information**  
Posi. transmit.(PWM): 0D8F  
Torque motor(PWM): 3002

**PID values**  
Set point: 50.0 %  
Position: 0.0 %  
P: 25.0  
i: 125.9  
d: -0.1

**Factory menu**  
Factory menu: OFF  
[Change](#)

✓ Apply | ↶ Revert | ✕ Close

Display items are as follows:

[Angle]

Angle	: Angle of potentiometer
-------	--------------------------

[Stroke angle]

Span setting stroke 0	: Angle value at 0% span	Cross point	: Angle of cross point
Span setting stroke 100	: Angle value at 100% span		

[Raw AD Value]

Input(4-20mA)	: AD value of Input signal	Position(Sin)	: AD value of valve
Position(Cos)	: AD value of valve	Temperature	: AD value of temperature

[Time stamp]

Date	: Firmware time stamp - Date	Time	: Firmware time stamp - Time
------	------------------------------	------	------------------------------

[PWM Information]

Posi. transmit. (PWM)	: PWM value of position transmitter	Torque motor (PWM)	: PWM value of IP signal current
-----------------------	-------------------------------------	--------------------	----------------------------------

[PID values]

Set point	: Set point	Position	: Valve position
p	: Proportional gain	i	: Integral coefficient
d	: Differential gain		

### 6.4.1. Switching of Factory setup menu

Enable/Disable the [Factory setup] menu.



#### Caution

- Since the suitable parameters are configured at the factory, in general, do not perform switching of factory setup and the reconfiguration on its menu. The reconfiguration of the values causes the case that the desired response may not be achieved.

MENU) *Maintenance > Extended maintenance > Service > Factory menu*

- ① Click [Change] in the [Factory menu] menu group and select "ON".

Extended maintenance

\* To perform calibration and simulation, 'Control mode' should be 'HART'

Authority setup	Calibration	Simulation test	Service	HART relation	Setting list
<b>Angle</b> Angle: -10.6550 °	<b>Stroke angle</b> Span setting stroke 0: -10.66277 deg Cross point: -0.52131 deg Span setting stroke 100: 10.21845 deg	<b>Raw AD values</b> Input(4-20mA): 787A Position(Sin): 9A64 Position(Cos): C3AC Temperature: 033E	<b>PWM information</b> Posi. transmit(PWM): 0D8F Torque motor(PWM): 3002  <b>PID values</b> Set point: 50.0 % Position: 0.0 % P: 25.0 i: 125.9 d: -0.1  <b>Factory menu</b> Factory menu: OFF <span style="border: 2px solid red; padding: 2px;">Change</span>		

Time stamp  
 Date: Jan 17 2025  
 Time: 13:35:40

- ② [Factory setup] tab menu is added in the [Extended maintenance] menu.

Extended maintenance

\* To perform calibration and simulation, 'Control mode' should be 'HART'

Authority setup	Calibration	Simulation test	Service	HART relation	Setting list	Factory setup
<b>Angle</b> Angle: -10.6556 °	<b>Stroke angle</b> Span setting stroke 0: -10.66277 deg		<b>PWM information</b> Posi. transmit(PWM): 0D8D Torque motor(PWM): 3015  <b>PID values</b>			

## 6.5. HART relation

Display and configure information related to HART communication.

MENU) *Maintenance > Extended maintenance > HART relation*

- ① Click [HART relation] menu tab in the [Extended maintenance].

Display items are as follows:

[HART device information]

Manufacturer	: Manufacturer	Device Type	: Model
Device Identifier	: Device Identifier	HART Protocol Revision	: HART Version
Device Revision	: Field device revision	Tag	: Tag number
Long Tag	: Long Tag number	Descriptor	: Descriptor
Date	: Date	Message	: Message
Final Assembly Number	: Final Assembly Number		

[Dynamic var. assign]

Primary Variable	: Primary Variable	Secondary Variable	: Secondary Variable
Tertiary Variable	: Tertiary Variable	Quaternary Variable	: Quaternary Variable



### 6.5.1. HART/Device Information

Some HART device information can be changed.

The changeable items are as follows:

Tag	: Tag number	Long Tag	: Long Tag number
Descriptor	: Descriptor	Date	: Date
Message	: Message	Final Assembly Number	: Final Assembly Number

The following explains how to change “Tag” as an example.

“Long Tag”, “Descriptor”, “Date”, “Message”, and “Final Assembly Number” can also be changed in the same way.

- ① Click [Change Tag] in the [HART device information] menu group.

The screenshot shows the 'HART device information' menu. It contains several fields: Manufacturer (KOSO), Device Type (KGP2000), Device Identifier (0), HART Protocol Revision (7), Device Revision (1), Tag (TAG\_0011), and Long Tag (LONGTAG\_0010). The 'Change Tag' button, which has a gear icon, is highlighted with a red rectangular box.

- ② Enter any 8-digit alphanumeric character or symbol and click [Next]

The screenshot shows the 'Change Tag' dialog box. It has a title bar 'Change Tag' with a close button. Inside, there are two labels 'Tag' and 'Tag' with corresponding input fields. The first input field contains 'TAG\_0011' and is highlighted with a red rectangular box. At the bottom right, there are two buttons: 'Abort' and 'Next'. The 'Next' button is highlighted with a red rectangular box.

### 6.5.2. Reboot

This is a function to restart the positioner.

## Warning

- After reboot, the device will shut down for a few seconds. Communication may be interrupted.

To reboot the device, do the following:

MENU) *Maintenance > Extended maintenance > HART relation > Reboot*

- ① Click [Reboot] in the [Reboot] menu group.

The screenshot shows the 'Extended maintenance' interface with the 'HART relation' tab selected. On the left, 'HART device information' includes fields for Manufacturer (KOSO), Device Type (KGP2000), Device Identifier (0), HART Protocol Revision (7), Device Revision (1), Tag (TAG\_0011), and Long Tag (LONGTAG\_0010). On the right, 'Dynamic var. assign' shows Primary Variable (Input), Secondary Variable (Position), Tertiary Variable (Set point), and Quaternary Variable (Temperature). Below these, a 'Reboot' button is highlighted with a red rectangle.

- ② A confirmation message will be displayed twice, so click [Next] if execute it.

### 6.5.3. Dynamic Variables assignment

Among dynamic variables, Secondary Variable (SV), Tertiary Variable (TV), and Quaternary Variable (QV) can be assigned to another variable.

MENU) *Maintenance > Extended maintenance > HART relation > Dynamic var. assign*

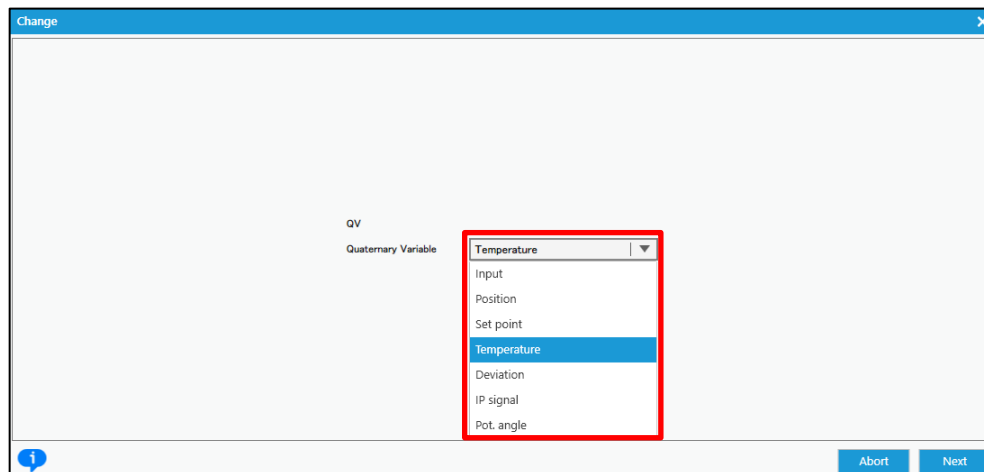
- ① Click [Change] in the [Dynamic var. assign] menu group.

This screenshot is similar to the previous one, but the 'Change' button in the 'Dynamic var. assign' section is highlighted with a red rectangle instead of the 'Reboot' button.

- ② Select the Dynamic Variables to change and click [Next].

The 'Change' dialog box is shown with the title bar 'Change'. It contains a label 'Which variable you want to change:' followed by a dropdown menu. The dropdown menu is open, showing four options: 'SV', 'SV', 'TV', and 'QV'. At the bottom right, the 'Next' button is highlighted with a red rectangle.

- ③ Select variables to assign and click [Next].

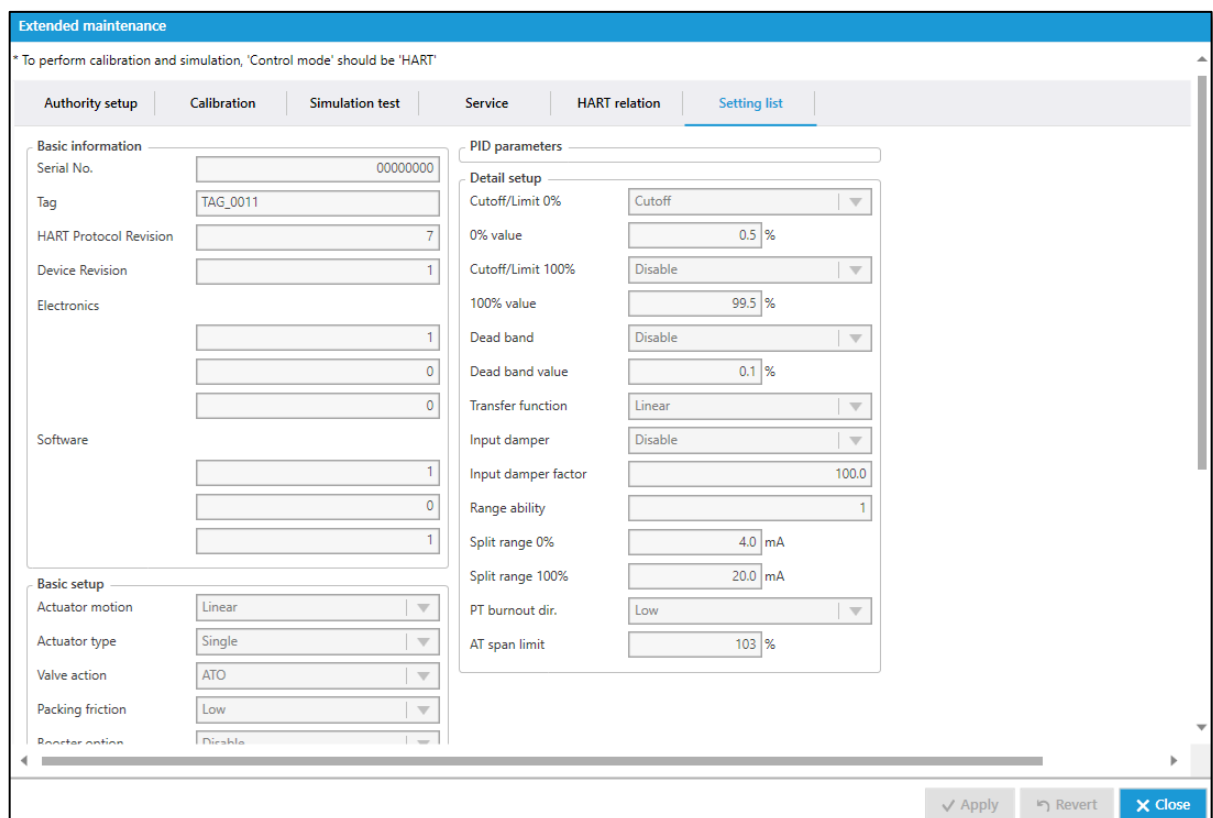


The configurable variables are as follows:

Input	: Percentage of Input signal
Position	: Valve position
Set point	: Set point
Temperature	: Temperature
Deviation	: Deviation
IP signal	: IP signal current
Pot. angle	: Angle of potentiometer

## 6.6. Setting list

Displays the current main settings.



## 6.7. Factory setup



### Caution

- Since the suitable parameters are configured at the factory, in general, do not perform switching of factory setup and the reconfiguration on its menu. The reconfiguration of the values causes the case that the desired response may not be achieved.

※ The menu is displayed only when the “Factory setup” field is “ON” in the “[Maintenance] > [Service] > [Factory menu]”.

The items that can be set are as follows:

IP signal range	: IP signal range
IP signal factor	: IP signal factor
Cutoff IP signal	: Cutoff IP signal
IP correction	: IP deviation correction
Restore factory default	: Restore factory default setting
Virtual DIP SW	: Setting of Virtual DIP SW

※ For details on each item, see KGP2000 instruction manual.

- ① Click [Factory setup] menu tab in the [Extended maintenance] menu and open the [Factory setup] menu.

The screenshot shows the 'Extended maintenance' window with the following tabs: Authority setup, Calibration, Simulation test, Service, HART relation, Setting list, and **Factory setup** (highlighted with a red box). A note at the top states: '\* To perform calibration and simulation, 'Control mode' should be 'HART''. The 'Factory setup' tab contains several sections:

- IP signal range:** Air-In (100%), Air-Out (100%), with a 'Change' button.
- IP signal factor:** Factor (1.0), with a 'Change' button.
- Cutoff IP signal:** 0% side (25%), 100% side (75%), with a 'Change' button.
- IP correction:** IP correction (Enable), IP deviation threshold (1%), IP deviation time (10 s), with a 'Change' button.
- Restore factory default:** with a 'Restore' button.
- Virtual DIP SW:** Virtual SW1 (bits 0-7) and Virtual SW2 (bits 8-15), each with a 'Change' button.

At the bottom right, there are buttons for 'Apply', 'Revert', and 'Close'.

To change the current settings, check the setting values for each item group and click [Change].

### 6.7.1. Restore factory default

Return to factory default settings.



#### Caution

- All current setting values will be overwritten to the factory settings.

MENU) *Maintenance > Extended maintenance > Factory setup > Restore factory default*

- ① Click [Restore] in the [Restore factory default] menu group.



- ② A confirmation message will be output twice, so click [Next] if execute.  
③ Read the factory default settings and overwrite the current settings.

## 7. Diagnostics

This positioner is equipped with the on-line diagnostics which acquire and estimate data during plant operation and the offline diagnostics performed in maintenance. Through appropriate diagnostic settings based on an operating condition of the installation environment and a process, it's possible to do efficient prevention and forecast preservation.



### Caution

➤ To change the settings, “**Authority**” must be “HART”.

MENU) **Diagnostics**

① Click [Diagnostics] menu in the Navigation Menu to open the [Diagnostics] top menu.

Displays alarm status, alarm history, PST alarm, and online diagnostic status.

The items displayed are as follows:

[Alarm status / Alarm history]

EEPROM failure	: Memory failure	Position sensor failure	: Position sensor failure
Input signal alarm	: Input signal alarm	Position alarm	: Valve position alarm
Deviation alarm	: Deviation alarm	Temperature alarm	: Temperature alarm
IP deviation alarm	: IP deviation alarm		

[PST alarm]

PST stroke alarm	: PST stroke alarm	PST incomplete alarm	: PST incomplete alarm
------------------	--------------------	----------------------	------------------------

## [Online diagnostics]

Total stroke	: Total stroke	Total direction change	: Total direction change
Total time	: Total time	Low position time	: Low position control time
Minimum temperature	: Minimum temperature	Maximum temperature	: Maximum temperature
Low temperature time	: Ambient low temperature time	High temperature time	: Ambient high temperature time

## [PST status]

PST status	: PST status	PST flag	: PST Disable/Enable flag
Remaining days	: Remaining days		

## 7.1. Extended diagnostics

This menu is an extended menu for configuring diagnosis related settings, diagnosis execution, and alarm settings.

MENU) *Diagnostics > Extended diagnostics*

- ① Click [Extended diagnostics] in the [Diagnostics] top menu.

The screenshot displays the 'Extended diagnostics' interface for a KGP2000 HART DTM device. The left sidebar shows a 'Navigation Menu' with options: Process Variables, Device Settings, Maintenance, and Diagnostics (highlighted). The main content area is titled 'Extended diagnostics' and is divided into three sections:

- Alarm status:** A list of six alarms with status dropdowns: EEPROM failure (Good), Position sensor failure (Good), Input signal alarm (OK), Position alarm (OK), Deviation alarm (OK), and Temperature alarm (OK). IP deviation alarm is also listed with an OK status.
- Alarm history:** A list of six alarms with status dropdowns: EEPROM failure (Good), Position sensor failure (Good), Input signal alarm (OK), Position alarm (OK), Deviation alarm (OK), and Temperature alarm (OK). IP deviation alarm is also listed with an OK status.
- PST alarm:** Two alarms with status dropdowns: PST stroke alarm (OK) and PST incomplete alarm (OK).

On the right side, there are two summary panels:

- Online diagnostics:** Displays various diagnostic metrics with numerical values: Total stroke (13), Total direction change (49), Total time (27.9 h), Low position time (9.8 h), Minimum temperature (24 °C), Maximum temperature (26 °C), Low temperature time (0.0 h), and High temperature time (0.0 h).
- PST status:** Displays the current PST status (Waiting(Stop)), PST flag (Disable), and Remaining days (0 day(s)).

② [Extended diagnostics] menu opens.

Menu items are as follows:

- |                         |                                                    |
|-------------------------|----------------------------------------------------|
| (1) Authority setup     | See <a href="#">3. Authority setup</a>             |
| (2) Online diag. setup  | See <a href="#">7.2. Online diag. setup</a>        |
| (3) 25% step response   | See <a href="#">7.3. 25% step response</a>         |
| (4) One step response   | See <a href="#">7.4. One step response</a>         |
| (5) Partial stroke test | See <a href="#">7.5. Partial stroke test (PST)</a> |
| (6) Alarm setup         | See <a href="#">7.6. Alarm setup</a>               |

Click on the tab to open each menu.

## 7.2. Online diag. setup

Configure settings related to online diagnosis.

Setup items are as follows:

Total stroke	: A criteria of the position change to accumulate.
Total direction change	: A criteria of change width to judge direction change.
Low position time	: A criteria of position to judge low position.
High/Low temperature time	: A criteria of temperature to judge high/low temperature.
Partial stroke ※1	: Partial stroke

※1 For settings related to Partial stroke test, see [7.5. Partial stroke test \(PST\)](#).

※ For details on each item, see KGP2000 instruction manual.

MENU) *Diagnostics > Extended diagnostics > Online diag. setup*



- ① Click [Online diag. setup] menu tab in the [Extended diagnostics] menu. [Online diag. setup] menu opens.

The screenshot shows the 'Extended diagnostics' window. At the top, there is a note: '\* To perform diagnostics, 'Control mode' should be 'HART''. Below this is a horizontal tab bar with five tabs: 'Authority setup', 'Online diag. setup' (highlighted with a red box), '25% step response', 'One step response', and 'Alarm setup'. The main content area is divided into four sections, each with a title, a 'Criteria' input field, and two buttons: 'Change' and 'Clear log'. The sections are: 'All diag. log clear' (with a gear icon), 'Total stroke' (Criteria: 10 %), 'Low position time' (Criteria: 5.0 %), and 'High/Low temperature time' (Criteria (Low): 1 °C, Criteria (High): 50 °C). At the bottom right, there are three buttons: 'Apply', 'Revert', and 'Close'.

### 7.2.1. Online diagnostics setting / Confirmation and Clear of results

The following is an explanation using a total stroke as an example.

#### 1) Setting of total stroke criteria

MENU) *Diagnostics > Extended diagnostics > Online diag. setup > Total stroke*

- ① Click [Change] in the [Total stroke] menu group.

This screenshot is similar to the previous one, showing the 'Extended diagnostics' window with the 'Online diag. setup' tab selected. In this view, the 'Change' button for the 'Total stroke' section is highlighted with a red box. The other sections and their values remain the same as in the previous screenshot.

- ② Enter the criteria value in the “Criteria” field and click [Next].

Change

Total stroke setting (1-500%)

Criteria

Abort Next

## 2) Check the results

Diagnostics result can confirm in the [Diagnostics] top menu.

MENU) **Diagnostics**

- ① Click [Diagnostics] menu in the Navigation Menu. [Diagnostics] top menu opens.

Device Name : KGP2000  
Description : KGP2000 HART DTM

Navigation Menu

- Process Variables
- Device Settings
- Maintenance
- Diagnostics**

Extended diagnostics

Alarm status

- EEPROM failure: Good
- Position sensor failure: Good
- Input signal alarm: OK
- Position alarm: OK
- Deviation alarm: OK
- Temperature alarm: OK
- IP deviation alarm: OK

Alarm history

- EEPROM failure: Good
- Position sensor failure: Good
- Input signal alarm: OK
- Position alarm: OK
- Deviation alarm: OK
- Temperature alarm: OK
- IP deviation alarm: OK

PST alarm

- PST stroke alarm: OK
- PST incomplete alarm: OK

Online diagnostics

- Total stroke: 13
- Total direction change: 49
- Total time: 27.9 h
- Low position time: 9.8 h
- Minimum temperature: 24 °C
- Maximum temperature: 26 °C
- Low temperature time: 0.0 h
- High temperature time: 0.0 h

PST status

- PST status: Waiting(Stop)
- PST flag: Disable
- Remaining days: 0 day(s)

Displayed items are as follows:

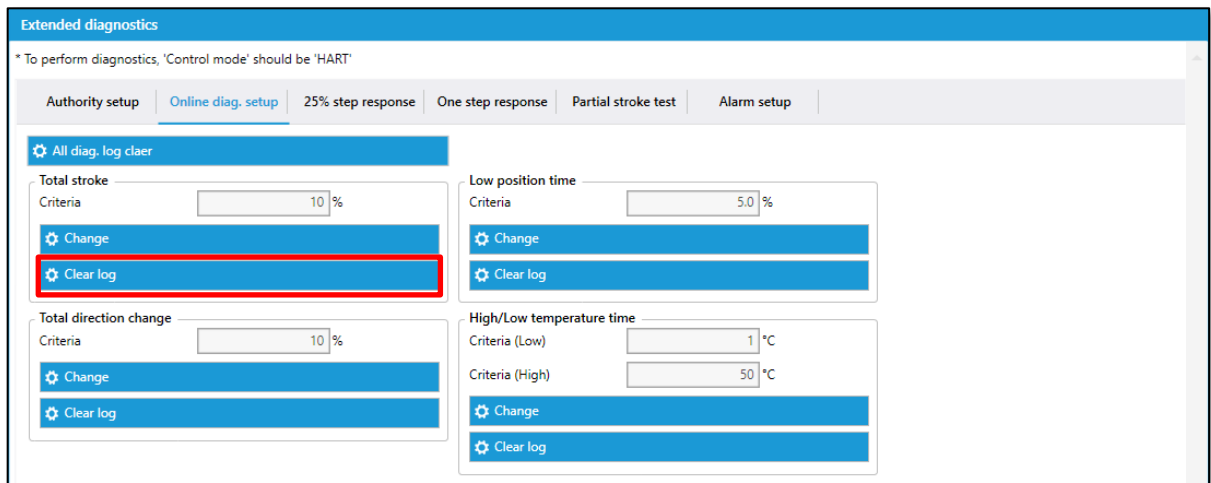
[Online diagnostics]

Total stroke	: Total stroke	Total direction change	: Total direction change
Total time	: Total time	Low position time	: Low position control time
Minimum temperature	: Minimum temperature	Maximum temperature	: Maximum temperature
Low temperature time	: Ambient low temperature time	High temperature time	: Ambient high temperature time

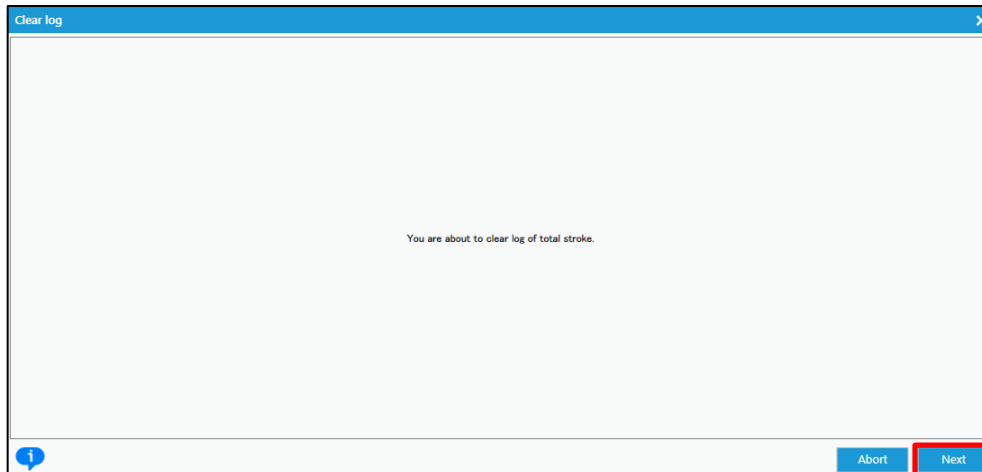
### 3) Clear Total stroke log

MENU) *Diagnostics > Extended diagnostics > Online diag. setup> Total stroke*

- ① Click [Clear log] in the [Total stroke] menu group.



- ② Confirm the message and click [Next] to clear the log of total stroke diagnostics results.



#### 7.2.1.1. All diag. log clear

The steps to clear all diagnostic logs are as follows.

MENU) *Diagnostics > Extended diagnostics > Online diag. setup> All diag. log clear*

- ① Click [All diag. log clear] in the [Online diag. setup] menu.

The screenshot shows the 'Extended diagnostics' window. At the top, there is a note: '\* To perform diagnostics, 'Control mode' should be 'HART''. Below this is a tabbed interface with tabs for 'Authority setup', 'Online diag. setup', '25% step response', 'One step response', 'Partial stroke test', and 'Alarm setup'. The 'Online diag. setup' tab is selected. Within this tab, the 'All diag. log clear' option is highlighted with a red rectangle. Below this, there are four diagnostic criteria sections, each with a 'Criteria' input field, a 'Change' button, and a 'Clear log' button:

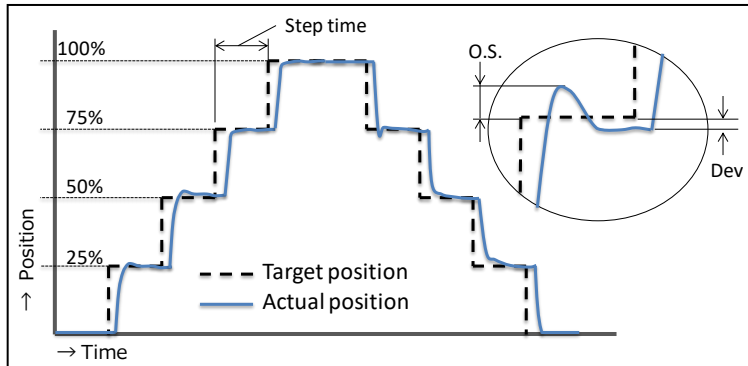
- Total stroke:** Criteria input is '10 %'.
- Low position time:** Criteria input is '5.0 %'.
- Total direction change:** Criteria input is '10 %'.
- High/Low temperature time:** Criteria (Low) input is '1 °C' and Criteria (High) input is '50 °C'.

- ② Confirm the message and click [Next] to clear all logs of diagnostics results.

The screenshot shows a confirmation dialog box titled 'All diag. log clear'. The main area of the dialog contains the text: 'You are about to clear all diagnostics logs.' At the bottom right of the dialog, there are two buttons: 'Abort' and 'Next'. The 'Next' button is highlighted with a red rectangle.

### 7.3. 25% step response

The 25% step response is executed, and the maximum overshoot (O.S.) and the final deviation (Dev.) are recorded. The degradation over time in step response can be checked by comparing initial values, previous values, and present values.



#### Caution

- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- Before performing 25% step response, set “Control mode” to “HART”.

MENU) *Diagnostics > Extended diagnostics > 25% step response*

- ① Click [25% step response] menu tab in the [Extended diagnostics] menu. [25% step response] menu opens.

The steps for setting, executing, displaying the result and saving the 25% step response are shown below.

## 1) Settings of 25% step response

- ① Click [Change] in the [Setting] menu group.

Extended diagnostics

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | **25% step response** | One step response | Partial stroke test | Alarm setup

Status  
Local operation mode: HART

Setting  
Step time: 20 s  
**Change**

Perform  
Start  
Abort operation

Result  
Result

- ② Enter step time value in the "Step time" field and click [Next].

Change

Step time (1-999)[s]  
Step time: 60 s

Abort Next

Setting value is as follows:

Step time [s]	: Set a waiting time per 1 step. Initial value: 60 sec
---------------	--------------------------------------------------------

## 2) Execution of 25% step response

- ① Click [Start] in the [Perform] menu group.  
※ Click [Abort operation] to cancel operation.

Extended diagnostics

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | **25% step response** | One step response | Partial stroke test | Alarm setup

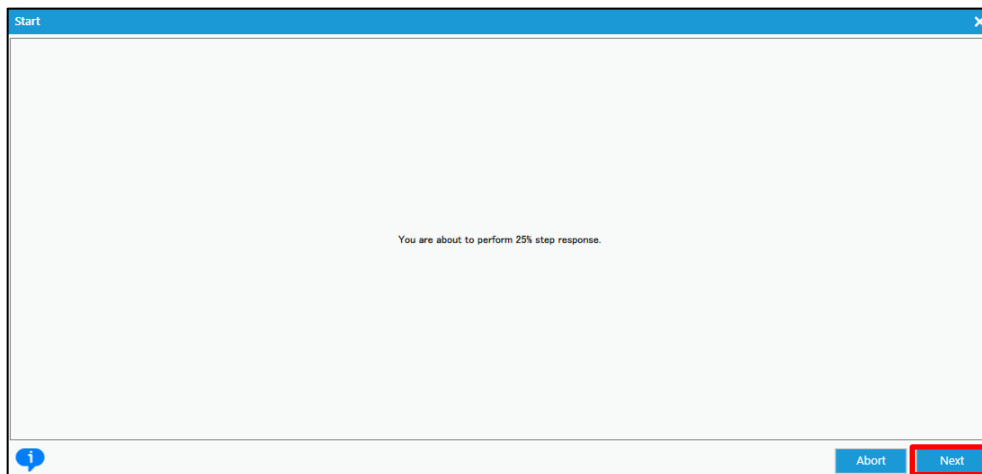
Status  
Local operation mode: HART

Setting  
Step time: 20 s  
Change

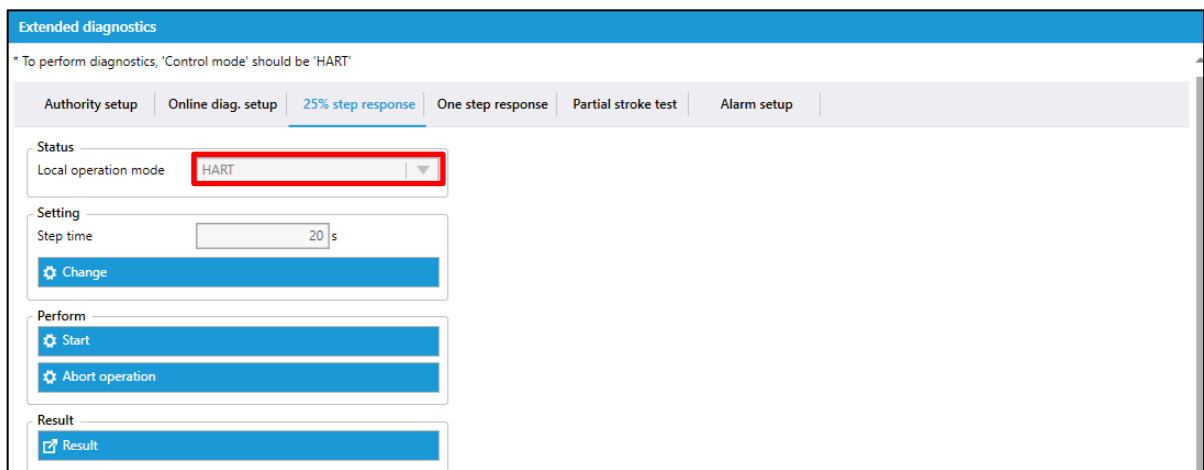
Perform  
**Start**  
Abort operation

Result  
Result

- ② Confirm the message and click [Next].



- ③ Wait until “Local operation mode” field in the [Status] menu group becomes “HART”.



### 3) Check the results of 25% step response

- ① Click [Result] in the [Result] menu.

**Extended diagnostics**

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | **25% step response** | One step response | Partial stroke test | Alarm setup

**Status**  
Local operation mode: HART

**Setting**  
Step time: 20 s  
Change

**Perform**  
Start  
Abort operation

**Result**  
Result

- ② The execution results are read from the positioner, and the display is updated.

**Result**

Save as

< Now >		< Prev. >		< Init. >	
O.S. 0-25	0.0 %	O.S. 0-25	0.0 %	O.S. 0-25	0.0 %
O.S. 25-50	0.4 %	O.S. 25-50	0.3 %	O.S. 25-50	0.4 %
O.S. 50-75	0.3 %	O.S. 50-75	0.2 %	O.S. 50-75	0.3 %
O.S. 75-100	0.3 %	O.S. 75-100	0.3 %	O.S. 75-100	0.4 %
O.S. 100-75	-0.7 %	O.S. 100-75	-0.8 %	O.S. 100-75	-0.8 %
O.S. 75-50	-0.4 %	O.S. 75-50	-0.4 %	O.S. 75-50	-0.4 %
O.S. 50-25	-0.4 %	O.S. 50-25	-0.4 %	O.S. 50-25	-0.4 %
O.S. 25-0	0.0 %	O.S. 25-0	0.0 %	O.S. 25-0	0.0 %
Dev. 0	0.0 %	Dev. 0	0.0 %	Dev. 0	0.0 %
Dev. 0-25	0.0 %	Dev. 0-25	0.0 %	Dev. 0-25	0.0 %
Dev. 25-50	0.0 %	Dev. 25-50	0.0 %	Dev. 25-50	0.0 %
Dev. 50-75	0.0 %	Dev. 50-75	0.0 %	Dev. 50-75	0.0 %
Dev. 75-100	0.0 %	Dev. 75-100	0.0 %	Dev. 75-100	0.0 %
Dev. 100-75	0.0 %	Dev. 100-75	0.0 %	Dev. 100-75	0.0 %
Dev. 75-50	0.0 %	Dev. 75-50	0.0 %	Dev. 75-50	0.0 %
Dev. 50-25	0.0 %	Dev. 50-25	0.0 %	Dev. 50-25	0.0 %
Dev. 25-0	0.0 %	Dev. 25-0	0.0 %	Dev. 25-0	0.0 %

Apply Revert Close

### 4) Save the execution results

To save the results of the 25% step response is as follows:

- ① Click [Save as] in the [Result] menu.

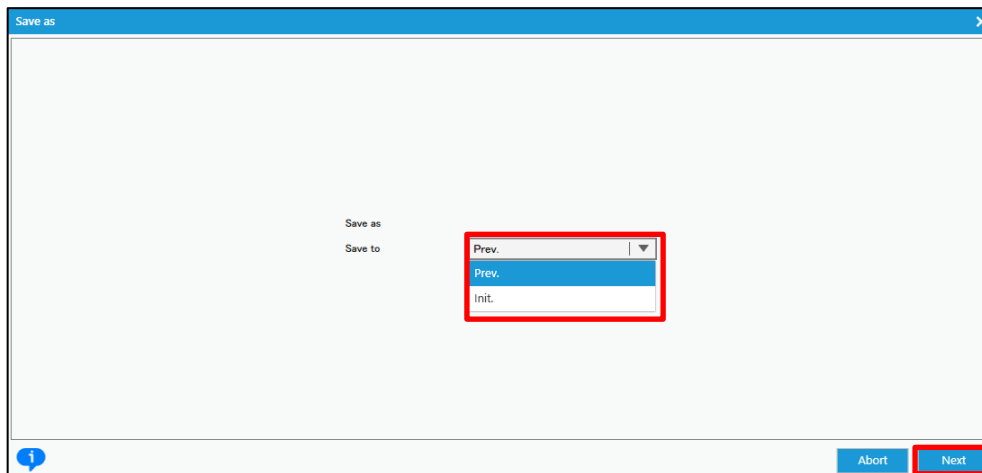
**Result**

Save as

< Now >		< Prev. >		< Init. >	
O.S. 0-25	0.0 %	O.S. 0-25	0.0 %	O.S. 0-25	0.0 %
O.S. 25-50	0.4 %	O.S. 25-50	0.3 %	O.S. 25-50	0.4 %
O.S. 50-75	0.3 %	O.S. 50-75	0.2 %	O.S. 50-75	0.3 %
O.S. 75-100	0.3 %	O.S. 75-100	0.3 %	O.S. 75-100	0.4 %
O.S. 100-75	-0.7 %	O.S. 100-75	-0.8 %	O.S. 100-75	-0.8 %

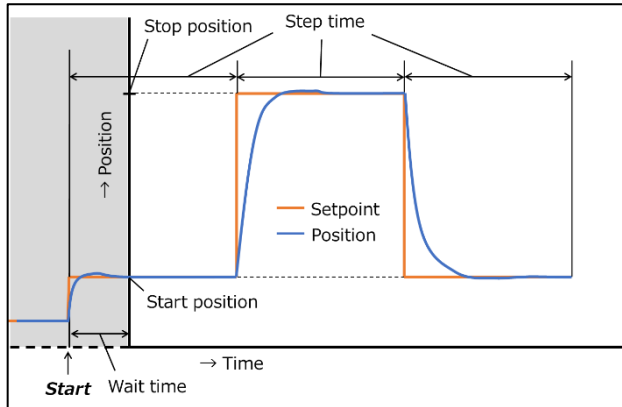


- ② Select the previous data “Prev” or the initial data “Init” as the data save destination. Click [Next] to save the results.



## 7.4. One step response

Performs a step response between the specified starting setpoint and ending setpoint and displays it on a graph.



### Caution

- HART communication takes more time than operating the device's LUI, so be sure to check that the operation is complete.
- Before performing one step response, set **“Control mode”** to **“HART”**.

MENU) *Diagnostics > Extended diagnostics > One step response*

- ① Click [One step response] tab menu in the [Extended diagnostics] menu. [One step response] menu opens.

The steps for setting, executing, displaying, and clearing the results of the one step response are shown below.

## 1) Settings of one step response

- ① Click [Change] in the [Setting] menu group.

Extended diagnostics

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | 25% step response | **One step response** | Partial stroke test | Alarm setup

Status  
Local operation mode: HART

Setting  
Start setpoint: 25 %  
End setpoint: 75 %  
Step time: 20 s  
Wait time: 10 s  
Sample time: 100 ms

**Change** (gear icon)

Perform  
**Start** (gear icon)

- ② Enter setting value into the "Start setpoint" field and click [Next].

Change

Start setpoint (0-100[%])  
Start setpoint: 25 %

Abort Next

- ③ Next, enter the setting values for "End point", "Step time", and "Wait time" and click [Next].

- ④ Enter the setting value in the "Sample time" field and click [Next].

Change

Sample time (40,100,200,400[ms])  
Sample time: 100 ms

Abort Next

Setting values are as follows:

Start setpoint [s]	: Set a start setpoint. Initial value: 25%
End setpoint [s]	: Set an end setpoint. Initial value: 75%
Step time [s]	: Set a waiting time per 1 step. Initial value: 20sec
Wait time [s]	: Set a waiting time from start to data acquisition. Initial value: 0sec
Sample time [s]	: Set a sampling time. Set the interval for acquiring position data. Initial value: 100msec

※ Processing ends when Step time x 3 times have elapsed or data for 600 samplings has been acquired.  
Therefore, set the optimal value according to the operating speed of the connected actuator.  
If Sample time = 100(msec),  $0.1(s) \times 600 = 60(s)$ , and the data acquisition time is 60 seconds.

## 2) Execution of the one step response

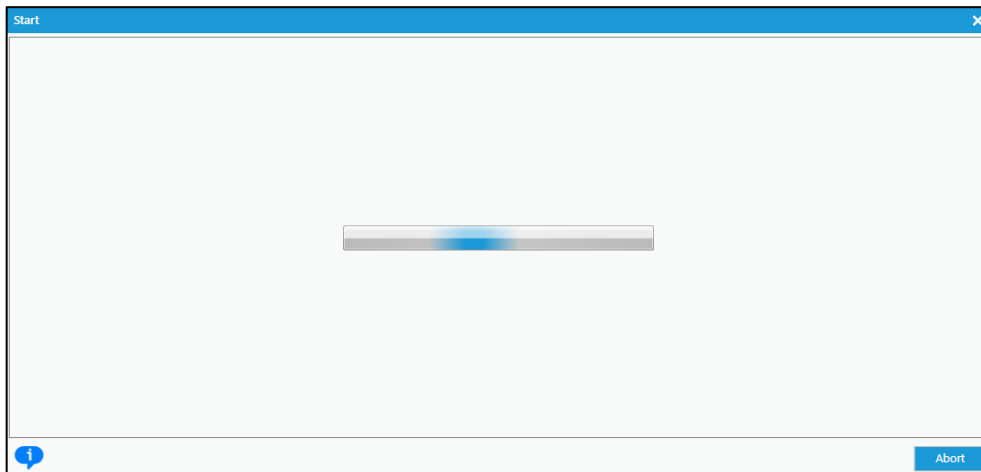
- ① Click [Start] in the [Perform] menu group.

The screenshot shows the 'Extended diagnostics' window with the 'One step response' tab selected. The 'Perform' section at the bottom has a 'Start' button highlighted with a red box. The 'Setting' section shows the following values: Start setpoint: 25%, End setpoint: 75%, Step time: 20 s, Wait time: 10 s, Sample time: 100 ms.

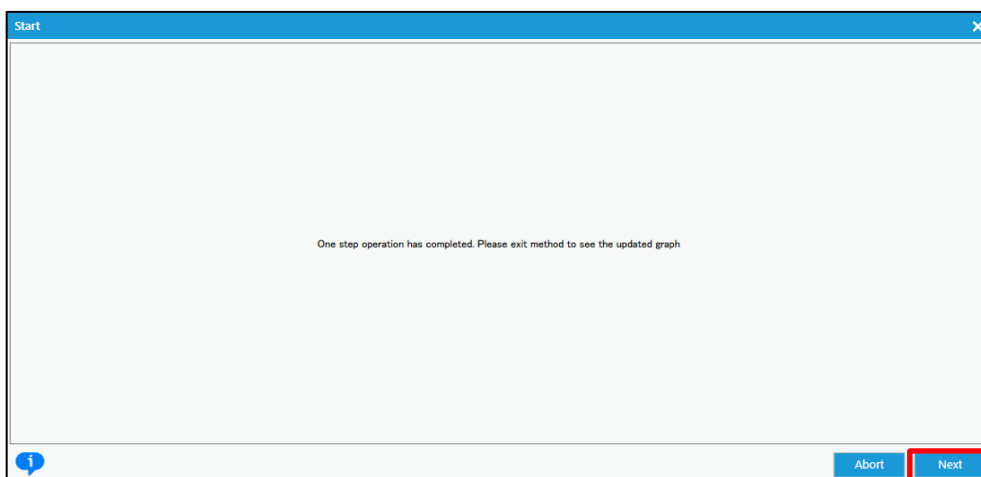
- ② Confirm the message and click [Next]. Start one step response.

The screenshot shows a 'Start' dialog box with the message 'You are about to perform one step response.' and 'Next' button highlighted with a red box. The 'Abort' button is also visible.

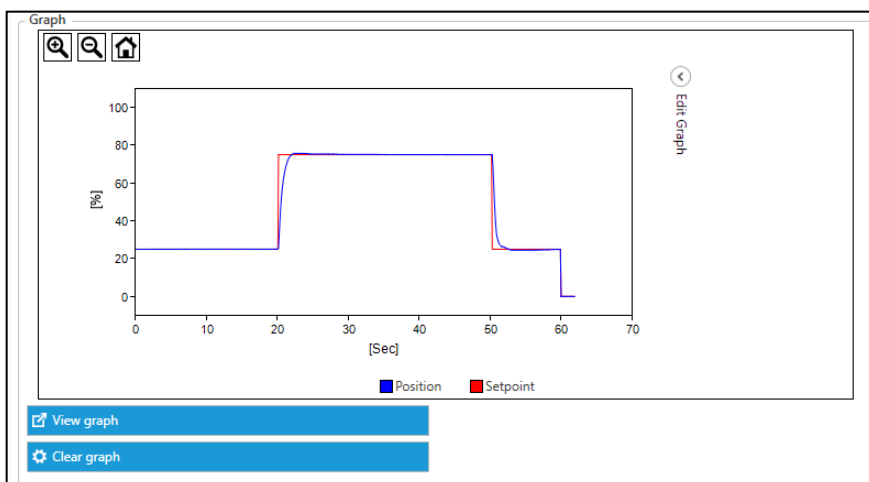
- ③ Wait until the execution completion message is displayed.  
 ※ Click [Abort] to cancel operation.



- ④ Confirm the message and Click [Next] to complete process.



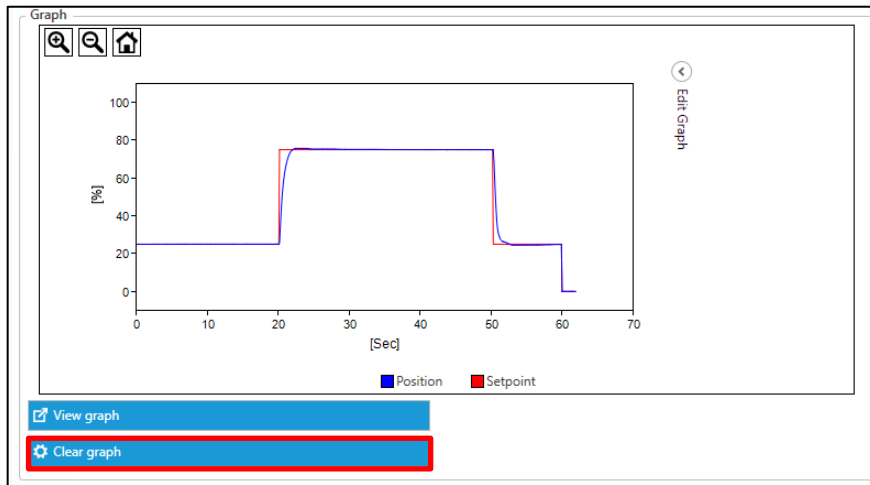
- ⑤ Display the Graph.



- ※ If the graph does not update, click [View graph]. The graph will be displayed in a new window.

### 3) Clear the one step response graph display data

- ① Click [Clear graph] in the [Graph] menu group and initialize the graph data.



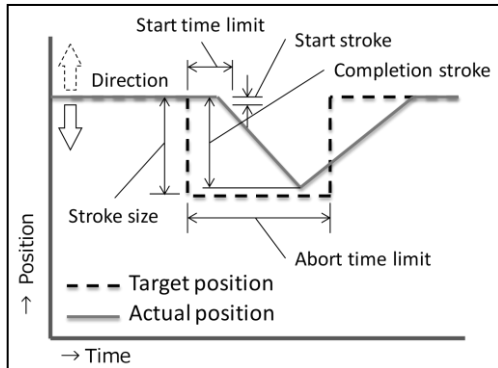
- ② Graph will be cleared to initial condition.

※ As One step response data is not saved, it will be cleared when exit the application.

## 7.5. Partial stroke test (PST)

This function is operated the setting position range at the set time interval (Executed online).

Test to move such emergency shutdown valves partially and periodically, and to confirm its safety functions. It's possible to give a partial valve travel change and to check the defective performance of sticking of a valve periodically.



### Caution

- Before manually running the partial stroke test, set “Control mode” to “HART”.

MENU) *Diagnostics > Extended diagnostics > Partial stroke test*

- ① Click [Partial stroke test] in the [Extended diagnostics] menu tab. [Partial stroke test] menu opens.

The steps for setting, executing at online, and displaying the result for Partial stroke test are shown below.

## 1) Settings of the Partial stroke test

- ① Click [Change] in the [Setting] menu group.

Extended diagnostics

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | 25% step response | One step response | **Partial stroke test** | Alarm setup

PST status  
Local operation mode: HART

Setting  
PST online enable: Disable  
Stroke size: 10 %  
Completion stroke: 9.8 %  
Start stroke: 2.0 %  
Abort time limit: 30 s  
Start time limit: 10 s  
Interval day: 1 day(s)  
Direction: - minus

**Change**

Manual PST  
Start  
Abort operation

- ② Select whether execute PST online or not in the "PST online enable" field and click [Next].  
※ This setting is ignored when execute offline.

Change

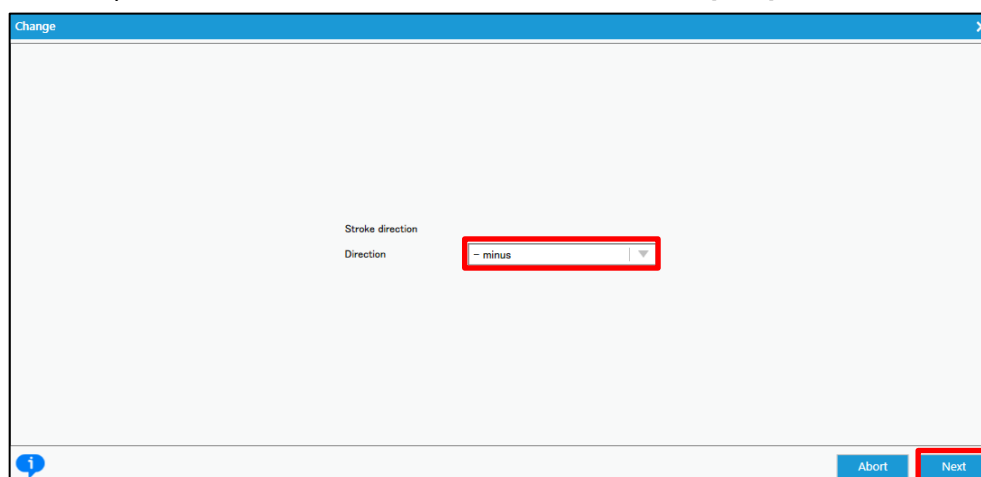
PST online enable  
PST online enable: Disable

Abort Next

- ③ From then on, enter the setting values for "Stroke size", "Completion stroke", "Start stroke", "Abort time limit", "Start time limit", "Interval day" in the same way.  
※ Setting of "Interval day" is ignored when execute online.



- ④ Finally, select the direction in the “Direction” field and click [Next].



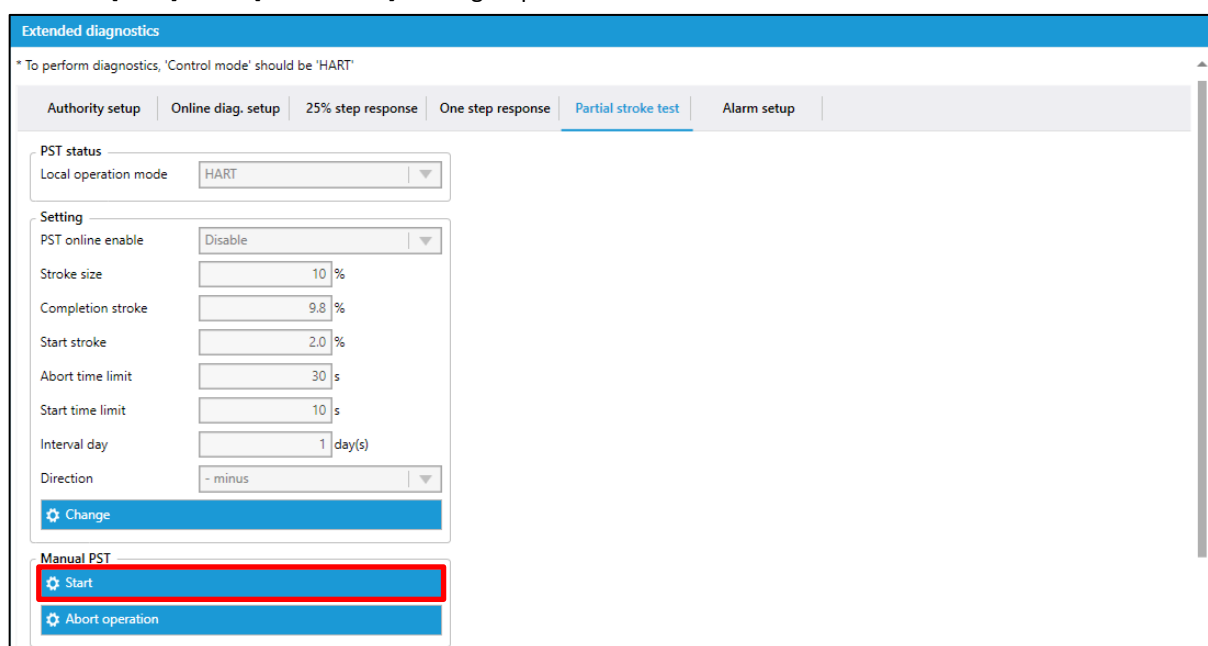
Setting values are as follows:

Disable / Enable	: Select a periodical execution or not. Initial value Disable
Stroke size [%]	: Set a position width to move. Initial value 10%
Completion stroke [%]	: Set a stroke to judge movement completion. Initial value 9.8%
Start stroke [%]	: Set a stroke to judge movement start. Initial value 2.0%
Abort time limit [s]	: Set a time to judge movement cancellation before movement completion. Initial value 30sec
Start time limit [s]	: Set a time to judge movement cancellation before movement start. Initial value 10sec
Interval day [day(s)]	: Set an interval of periodical execution. Initial value 1day
Direction	: Set a direction to move. Initial value -minus

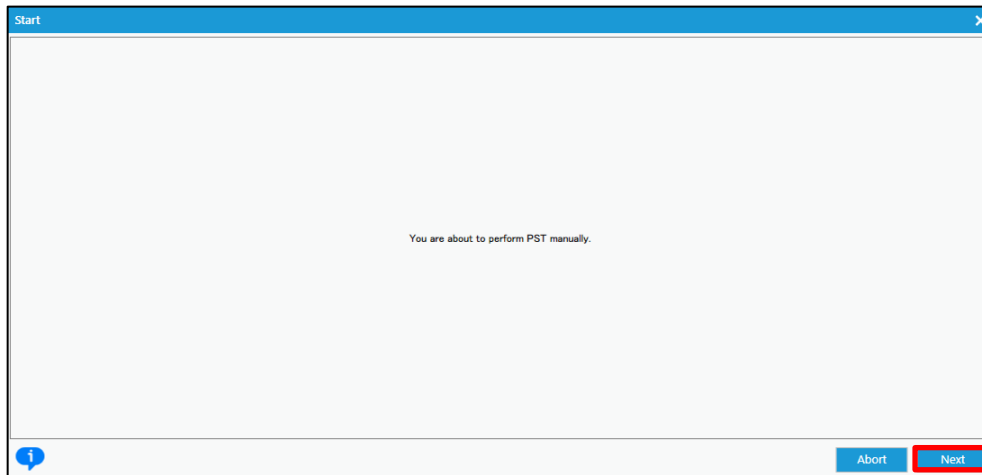
## 2) Execution of Partial stroke test

Partial stroke tests can be performed manually offline. The execution method is as follows.

- ① Click [Start] in the [Manual PST] menu group.



- ② Confirm the message and click [Next].



## 7.6. Alarm setup

This device has a self-diagnosis function that generates an alarm.

Alarm conditions related to valve position, deviation, IP deviation and temperature can be set arbitrarily.

In addition, when a severe failure of memory or sensors is detected, the IP signal is forcibly cut off and the system operates in a fail-safe manner. Additionally, the position transmitter outputs a burnout signal.

The alarm items that can be set are as follows:

Position alarm	: Position alarm
Deviation alarm	: Deviation alarm
Temperature alarm	: Temperature alarm
IP deviation alarm	: IP deviation alarm

MENU) *Diagnostics > Extended diagnostics > Alarm setup*

- ① Click [Alarm setup] menu tab in the [Extended diagnostics] menu. [Alarm setup] menu opens.

Extended diagnostics

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | 25% step response | One step response | Partial stroke test | **Alarm setup**

**Position alarm**

0% side: Disable

Threshold (0%): -26.0 %

100% side: Disable

Threshold (100%): 126.0 %

Change

**NAMUR status**

NAMUR Posi. alarm: Maintenance req.

Change

**Temperature alarm**

Low alarm: Disable

Threshold (Low): -40 °C

High alarm: Disable

Threshold (High): 85 °C

Change

**NAMUR status**

NAMUR Temp. alarm: Maintenance req.

Change

**Deviation alarm**

Deviation alarm: Enable

Threshold: 99 %

Waiting time: 99 s

Change

**NAMUR status**

NAMUR Dev. alarm: Maintenance req.

Change

**IP deviation alarm**

IP deviation alarm: Enable

Threshold: 10 %

Change

**NAMUR status**

NAMUR IP dev. alarm: Check function

Change

Apply Revert Close

Displays the current alarm settings and NAMUR status settings.

※ See KGP2000 instruction manual for details for each alarm item.

### 7.6.1. Alarm setup, check status, and clear

The position alarm is shown below as an example.

## 1) Alarm setup

MENU) *Diagnostics > Extended diagnostics > Alarm setup*

- ① Click [Change] in the [Position alarm] menu group.

Extended diagnostics

\* To perform diagnostics, 'Control mode' should be 'HART'

Authority setup | Online diag. setup | 25% step response | One step response | Partial stroke test | **Alarm setup**

**Position alarm**

0% side: Disable

Threshold (0%): -26.0 %

100% side: Disable

Threshold (100%): 126.0 %

**Change**

**NAMUR status**

NAMUR Posi. alarm: Maintenance req.

**Change**

**Temperature alarm**

Low alarm: Disable

Threshold (Low): -40 °C

High alarm: Disable

Threshold (High): 85 °C

**Change**

**NAMUR status**

NAMUR Temp. alarm: Maintenance req.

**Change**

**Deviation alarm**

Deviation alarm: Enable

Threshold: 99 %

Waiting time: 99 s

**Change**

**NAMUR status**

NAMUR Dev. alarm: Maintenance req.

**Change**

**IP deviation alarm**

IP deviation alarm: Enable

Threshold: 10 %

**Change**

**NAMUR status**

NAMUR IP dev. alarm: Check function

**Change**

Apply Revert Close

- ② Select "Disable" or "Enable" in the "Low alarm (0% side)" field and click [Next]. Here is an example where "Enable" is selected.

※ If "Disable" is selected, move to the "High alarm (100% side)" setting screen in ④.

Change

0% side

0% side

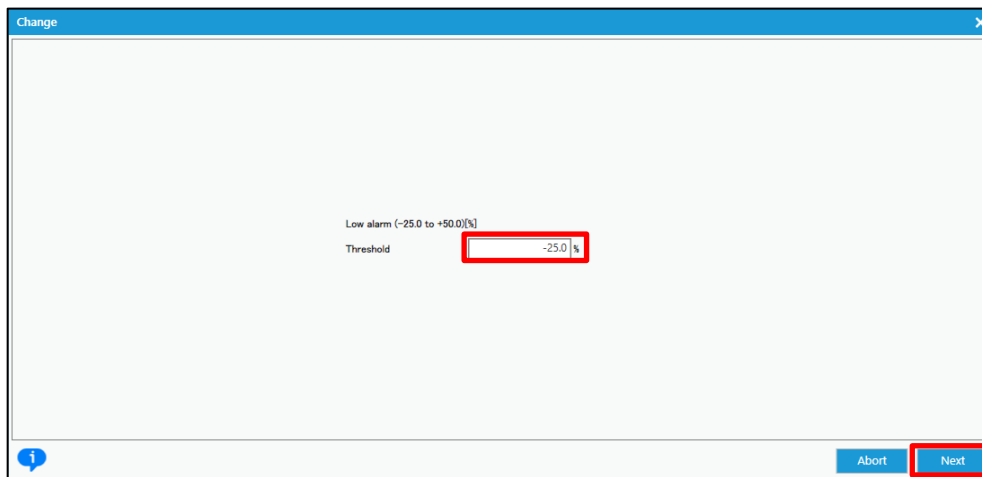
Disable

Disable

Enable

Abort Next

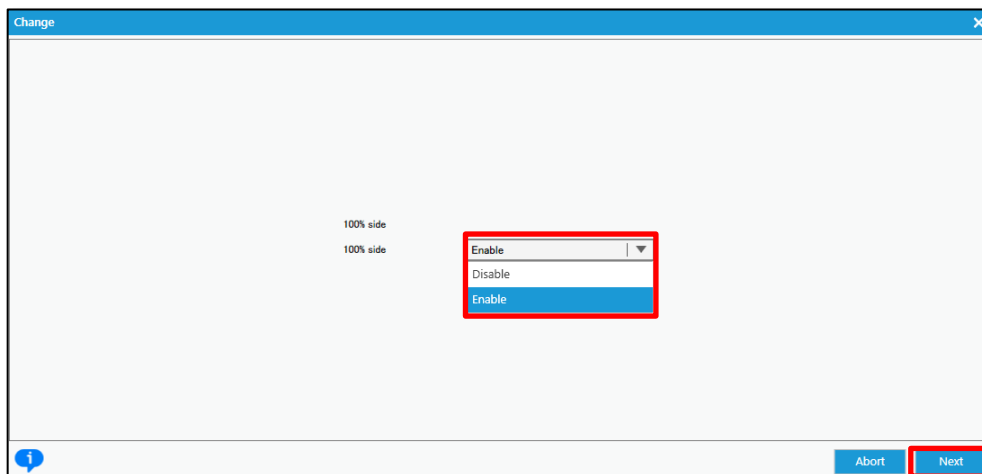
- ③ Enter the threshold value of the position to be set as low position alarm in the “Threshold” field and click [Next].



The screenshot shows a 'Change' dialog box with a title bar. Inside, the text 'Low alarm (-25.0 to +50.0)[%]' is displayed. Below it, the label 'Threshold' is followed by a text input field containing '-25.0%'. At the bottom right, there are two buttons: 'Abort' and 'Next'. The 'Next' button is highlighted with a red border.

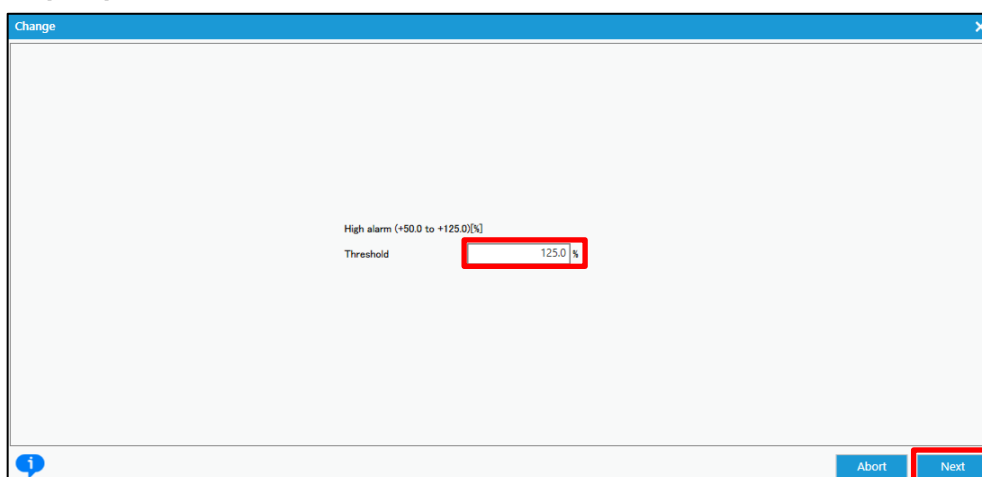
- ④ Select “Disable” or “Enable” in the “High alarm (100% side)” field and click [Next]. Here is an example where “Enable” is selected.

※ If select “Disable”, the entered values up to this point will be set.



The screenshot shows a 'Change' dialog box with a title bar. Inside, the text '100% side' is displayed. Below it, the label '100% side' is followed by a dropdown menu. The dropdown menu is open, showing three options: 'Enable', 'Disable', and 'Enable'. The first 'Enable' option is selected and highlighted with a blue background. At the bottom right, there are two buttons: 'Abort' and 'Next'. The 'Next' button is highlighted with a red border.

- ⑤ Enter the threshold value of the position to be set as high position alarm in the “Threshold” field and click [Next].



The screenshot shows a 'Change' dialog box with a title bar. Inside, the text 'High alarm (+50.0 to +125.0)[%]' is displayed. Below it, the label 'Threshold' is followed by a text input field containing '125.0%'. At the bottom right, there are two buttons: 'Abort' and 'Next'. The 'Next' button is highlighted with a red border.

※ The actual alarm is output based on the OR condition of the “Low alarm” setting and “High alarm” setting.

## 2) Alarm status check

Alarm status can check in the **[Process Variables]** menu or **[Diagnostics]** top menu.

- ① Click [Diagnostics] menu or [Process Variables] menu in the Navigation Menu.

Display items are as follows:

[Alarm status / Alarm history]

EEPROM failure	: Memory failure	Position sensor failure	: Position sensor failure
Input signal alarm	: Input signal alarm	Position alarm	: Position alarm
Deviation alarm	: Deviation alarm	Temperature alarm	: Temperature alarm
IP deviation alarm	: IP deviation alarm		

[PST alarm]

PST stroke alarm	: PST stroke alarm	PST incomplete alarm	: PST incomplete alarm
------------------	--------------------	----------------------	------------------------

## 3) Alarm clear

MENU) **Diagnostics > Alarm clear**

- ① Select [Diagnostics] menu in the Navigation Menu and open [Diagnostics] top menu. Click [Alarm Clear] in the [Diagnostics] top menu. All alarm status is cleared.

Device Name : KGP2000  
Description : KGP2000 HART DTM

**Navigation Menu**

- Process Variables
- Device Settings
- Maintenance
- Diagnostics**

**Alarm Status**

EEPROM failure	Good
Position sensor failure	Good
Input signal alarm	OK
Position alarm	OK
Deviation alarm	OK
Temperature alarm	OK
IP deviation alarm	OK

**Alarm history**

EEPROM failure	Good
Position sensor failure	Good
Input signal alarm	OK
Position alarm	OK
Deviation alarm	OK
Temperature alarm	OK
IP deviation alarm	OK

**PST alarm**

PST stroke alarm	OK
PST incomplete alarm	OK

**System Metrics**

Total stroke	16
Total direction change	69
Total time	29.7 h
Low position time	10.3 h
Minimum temperature	24 °C
Maximum temperature	26 °C
Low temperature time	0.0 h
High temperature time	0.0 h

**PST status**

PST status	Waiting(Stop)
PST flag	Disable
Remaining days	0 day(s)

**Alarm clear**

### 7.6.2. NAMUR status assignment

The NAMUR status classification associated with each alarm can be arbitrarily selected.

The position alarm is shown below as an example.

MENU) *Diagnostics > Extended diagnostics > Alarm setup*

- ① Click [Change] for NAMUR Position alarm in the [Position alarm] menu group.

The screenshot shows the 'Extended diagnostics' window with the 'Alarm setup' tab selected. Under the 'Position alarm' section, the 'NAMUR Posi. alarm' dropdown is set to 'Maintenance req.', and its corresponding 'Change' button is highlighted with a red rectangle. Other sections like 'Temperature alarm', 'Deviation alarm', and 'IP deviation alarm' are also visible.

- ② Select the type of NAMUR status category to be assigned to the Position alarm and click [Next].

The screenshot shows a 'Change' dialog box. The 'NAMUR status' dropdown menu is open, displaying three options: 'Maintenance req.', 'Out of spec.', and 'Check function'. The 'Next' button at the bottom right is highlighted with a red rectangle.

The category of NAMUR status that can be selected are as follows.

Maintenance req.	: Maintenance required
Out of spec.	: Out of specification
Check function	: Check function



## 8. Offline

It is possible to set the settings of the main unit in advance when HART communication is not connected and then change the settings all at once after the connection is established.

※ The names of the menu items for this function vary depending on the FDT host.

Data is updated using the following combinations.

- 1) Transfer parameters from device to offline data set
- 2) Update Offline data set
- 3) Transfer offline data set to device

### 1) Transfer parameters from device to offline data set

When connected to a device, it reads parameter data from the device and updates the offline database.

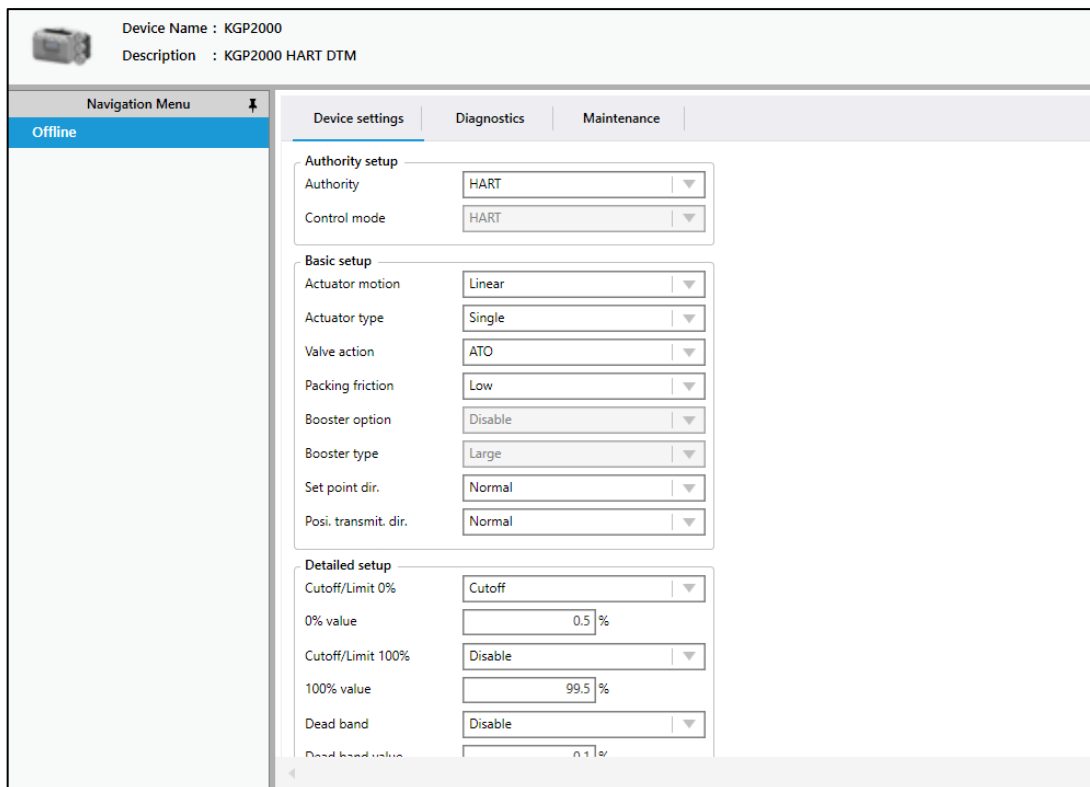
### 2) Update Offline data set

Updates the offline database of parameter data when the device is not connected.

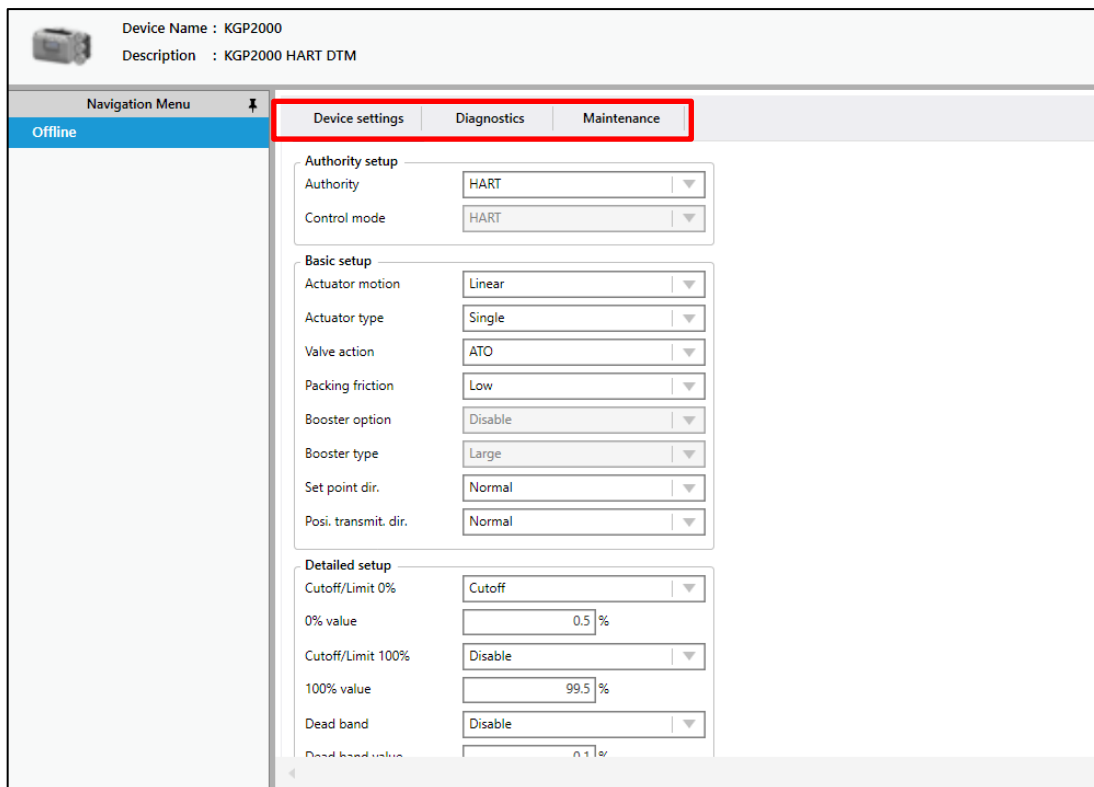
※ This operation does not update the positioner data.

MENU) **Offline**

- ① Click [Offline] menu in the Navigation Menu to open the Offline menu.



The [Device Settings], [Diagnostics], and [Maintenance] tab menus will open as shown below.



Device Name : KGP2000  
Description : KGP2000 HART DTM

Navigation Menu  
Offline

Device settings | Diagnostics | Maintenance

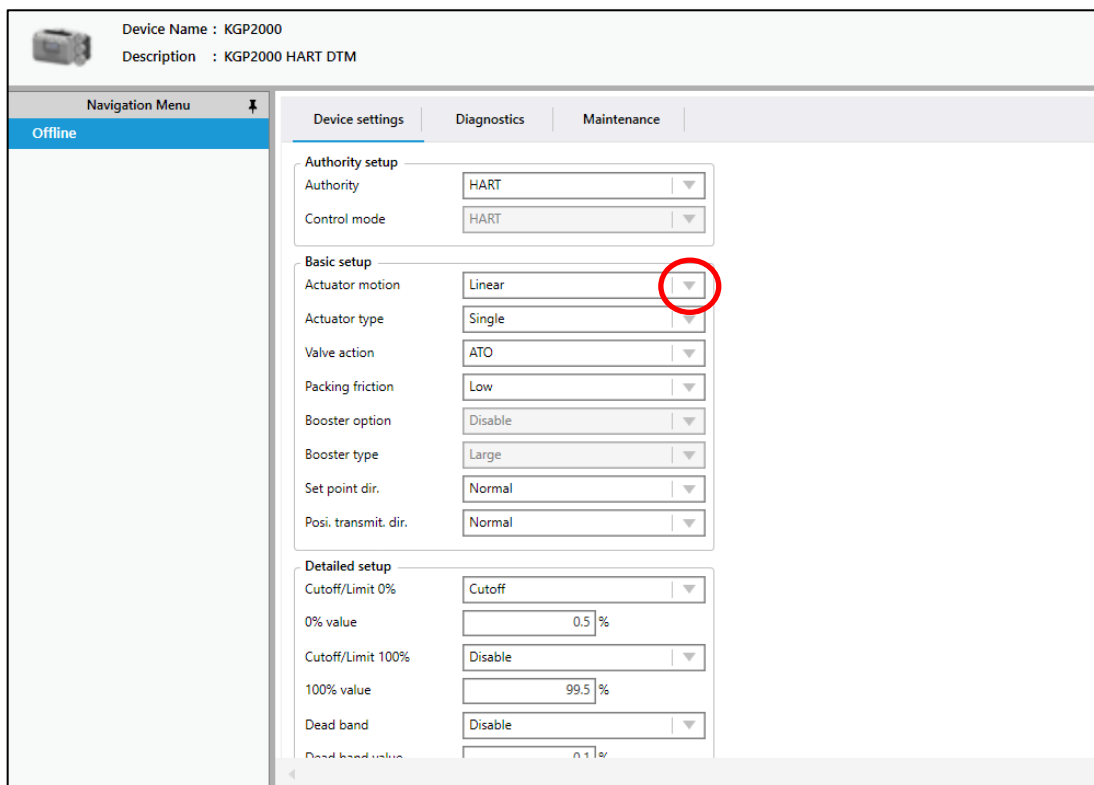
Authority setup  
Authority: HART  
Control mode: HART

Basic setup  
Actuator motion: Linear  
Actuator type: Single  
Valve action: ATO  
Packing friction: Low  
Booster option: Disable  
Booster type: Large  
Set point dir.: Normal  
Posi. transmit. dir.: Normal

Detailed setup  
Cutoff/Limit 0%: Cutoff  
0% value: 0.5 %  
Cutoff/Limit 100%: Disable  
100% value: 99.5 %  
Dead band: Disable  
Dead band value: 0.1 %

The following shows how to change and update setting values using "Actuator motion" in the [Device settings] menu as an example.

- ① Click [Device settings] menu tab and open the [Device settings] menu.
  - ② Click ▼ button of the item "Actuator motion" in the [Basic setup] menu group.
- ※ Buttons cannot be selected for items whose settings cannot be changed.



Device Name : KGP2000  
Description : KGP2000 HART DTM

Navigation Menu  
Offline

Device settings | Diagnostics | Maintenance

Authority setup  
Authority: HART  
Control mode: HART

Basic setup  
Actuator motion: Linear  
Actuator type: Single  
Valve action: ATO  
Packing friction: Low  
Booster option: Disable  
Booster type: Large  
Set point dir.: Normal  
Posi. transmit. dir.: Normal

Detailed setup  
Cutoff/Limit 0%: Cutoff  
0% value: 0.5 %  
Cutoff/Limit 100%: Disable  
100% value: 99.5 %  
Dead band: Disable  
Dead band value: 0.1 %

- ③ Change setting (select “Rotary” here).

- ④ A mark indicating “edited” will be displayed where the settings have been changed.

- ⑤ Also, the [Apply] button and [Revert] button at the bottom right become active.

If click the [Apply] button, the edited values will be reflected in the offline database.

If click the [Revert] button, the offline database will be restored to the settings before editing.

※ Does not affect the device settings yet.

### 3) Transfer offline data set to device

When connected to a device, sends the offline database parameter data to the device and rewrites the device data.



## Caution

- To change the settings, “**Authority**” must be “HART”.

※ To perform this operation, must set “HART” to the value in the “**Authority**” field in the [Offline] > [Device settings] > [Authority setup] menu group.

## 9. Trouble shooting

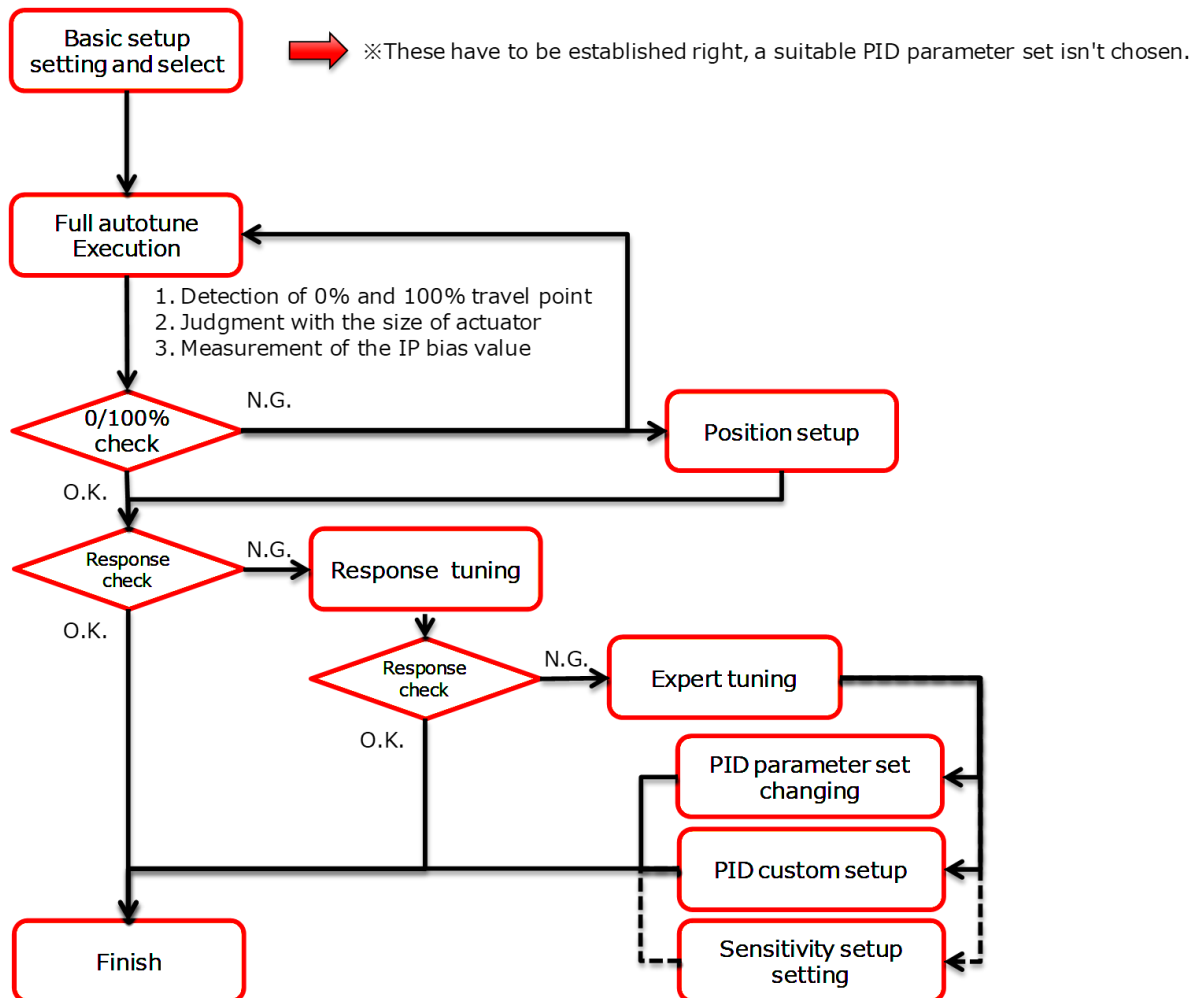
When problems occurred at the operation starting or during operation, please refer to the following table and take an action appropriately.

Table 9. Trouble shooting

Phenomenon	Assumed cause	Action
Does not move	Loss of electrical power, disconnection or miswiring	✓ Check input current ✓ Check wiring
	Drop of supply pressure or loss	✓ Check supply pressure ✓ Check air regulator
	Leak from air piping	✓ Check piping
	Actuator abnormality / Handle is in manual mode	✓ Set handle to auto mode
	Actuator abnormality / Packing sticking or wear out	✓ Replace packing
Move too slow	Lack of actuator output	✓ Replace actuator
Does not move fully	Forced shut down by positioner alarm	✓ Check alarm status
	Mistake of setting	✓ Check setting parameters ✓ Check PID parameter ✓ Check mode of A/M-unit
	Adjustment difference	✓ Cleaning of restriction ✓ Cleaning of nozzle flapper ✓ Adjustment of torque motor
	Breakdown of positioner	Inquire to our office
	Abnormality of positioner	✓ Cleaning of restriction ✓ Cleaning of nozzle flapper
Hunting		
Overshoot	Mismatch of PID parameter	✓ Check PID parameter
Bad accuracy	Abnormal attachment	✓ Check there are no backlashes ✓ Check whether a feedback lever becomes horizontal at 50% position ✓ Readjust cross point
	Abnormal control	✓ Check PID parameter ✓ Check dead band setting
	Actuator abnormality / Packing sticking or wear out	✓ Replace packing
LCD does not work	Loss of electrical power, disconnection or miswiring	✓ Check input current ✓ Check wiring
	Temperature is too low	✓ Check indication in the LCD specification temperature range.
	Breakdown of positioner	Inquire to our office
Position transmitter signal does not output or drifts	Loss of electrical power, disconnection or miswiring	✓ Check input voltage ✓ Check wiring
	Adjustment difference	✓ Implement position transmitter current calibration
Leak from valve seat of CVs	Lack of actuator output	✓ Increase actuator output (Raise actuator size)
	Corrosion, erosion or defect in valve seat	✓ Overhauling of valve

## Appendix A. Flow chart of settings procedure

In case of the purchase of a control valve with the positioner, settings described in this section are completed at the factory. Accordingly, it is not necessary to repeat the settings. However, if the positioner is specified on the order or it is separated from the control valve for maintenance, if necessary, perform the setting according to the following procedure.



## Appendix B. Error message

If the problems cause during the operations such as [5.3.1. Full autotune](#), [5.3.2 Position setup](#), [5.4.3. Setup for IP signal current bias](#), the following error messages will be displayed, and the performance will be stopped.

Table B.1 List of error messages

Error	内容	
Error at closing	Phenomenon	<b>It does not reach the 0% travel position or steady state.</b>
	Possible causes	Lack in off-balanced pressure
	Solution	Confirm off-balanced pressure
Error at opening	Phenomenon	<b>It does not reach the 0% travel position or steady state.</b>
	Possible causes	Lack in off-balanced pressure
	Solution	Confirm off-balanced pressure
Error at stopping	Phenomenon	<b>It does not reach 100% travel position or the steady state.</b>
	Possible causes	<ul style="list-style-type: none"> <li>• Valve friction is large and a limit cycle is occurring.</li> <li>• A limit cycle has occurred due to mechanical backlash such as the tension spring falling off or the screw loosening.</li> <li>• The appropriate PID parameters are not set.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>➤ Set dead band</li> <li>➤ Remove mechanical backlash</li> <li>➤ After changing the suitable PID parameters, perform the setup of position setup and IP signal bias.</li> </ul>
Error at span measurement	Phenomenon	<b>It does not get correct span. Span is too narrow.</b>
	Possible causes	Decrease or pulsation in supply pressure
	Solution	Confirm the supply pressure

※ In addition to the possible causes of each error code, if five minutes is passed while performing the specified operation, the error codes will be displayed.

## Appendix C. How to change the settings of the menu

An example of how to operate and explain how to set it up.

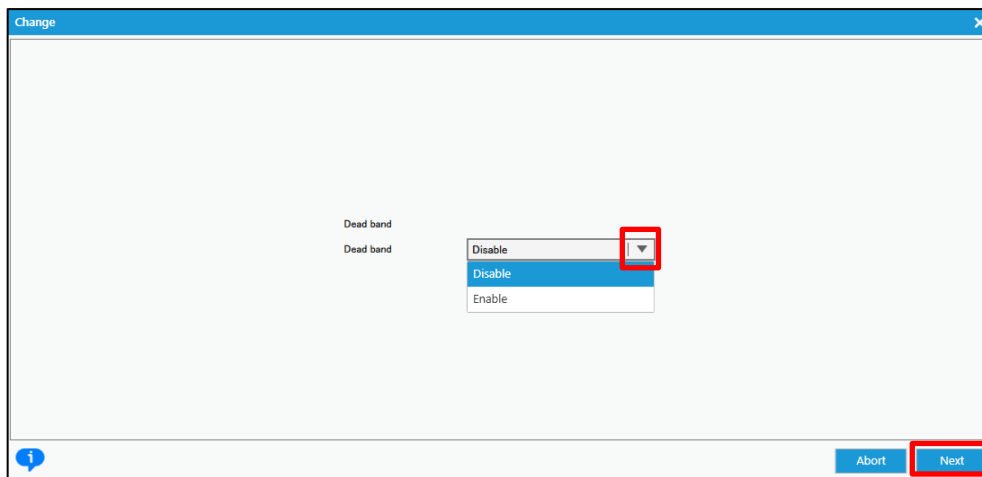
### C-1) Numeric input, list selection type

As an example of how to enter numeric values and select a list, show how to change the "Dead band" and change the list and numeric value from the [Device setting] > [Extended device settings] > [Detail setup] menu.

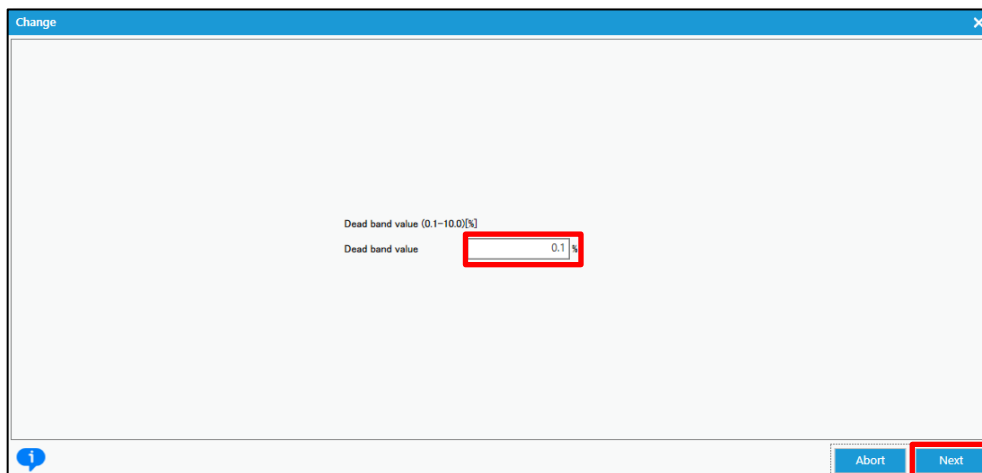
- ① Confirm current setup value in the [Dead band] menu group. If need to make change, click [Change].

The screenshot shows the 'Extended device settings' window with the 'Detail setup' tab selected. The 'Dead band' section is highlighted with a red box. The 'Dead band' dropdown is set to 'Disable' and the 'Dead band value' is 0.1%. The 'Change' button for the 'Dead band' is highlighted with a red box. Other settings visible include 'Cutoff or Limit', 'Damper setting', 'Split range', 'PT burnout dir.', 'Transfer function', 'Range ability', and 'AT span limit'.

- ② The setting value input menu will open.  
 ③ Click ▼, select "Enable" in the list (list selection type).  
 ④ Click [Next] to determine ※  
 ※ If select "Disable", this setting will be determined and the menu will close.



- ⑤ Next, enter the deadband value in the “Dead band value” field (enter a number type).
- ※ Enter a value within the displayed valid range (0.1-10.0[%] in this example).
- ⑥ Click [Next] to determine
- ⑦ The setting change is complete, and the data is set in the positioner.

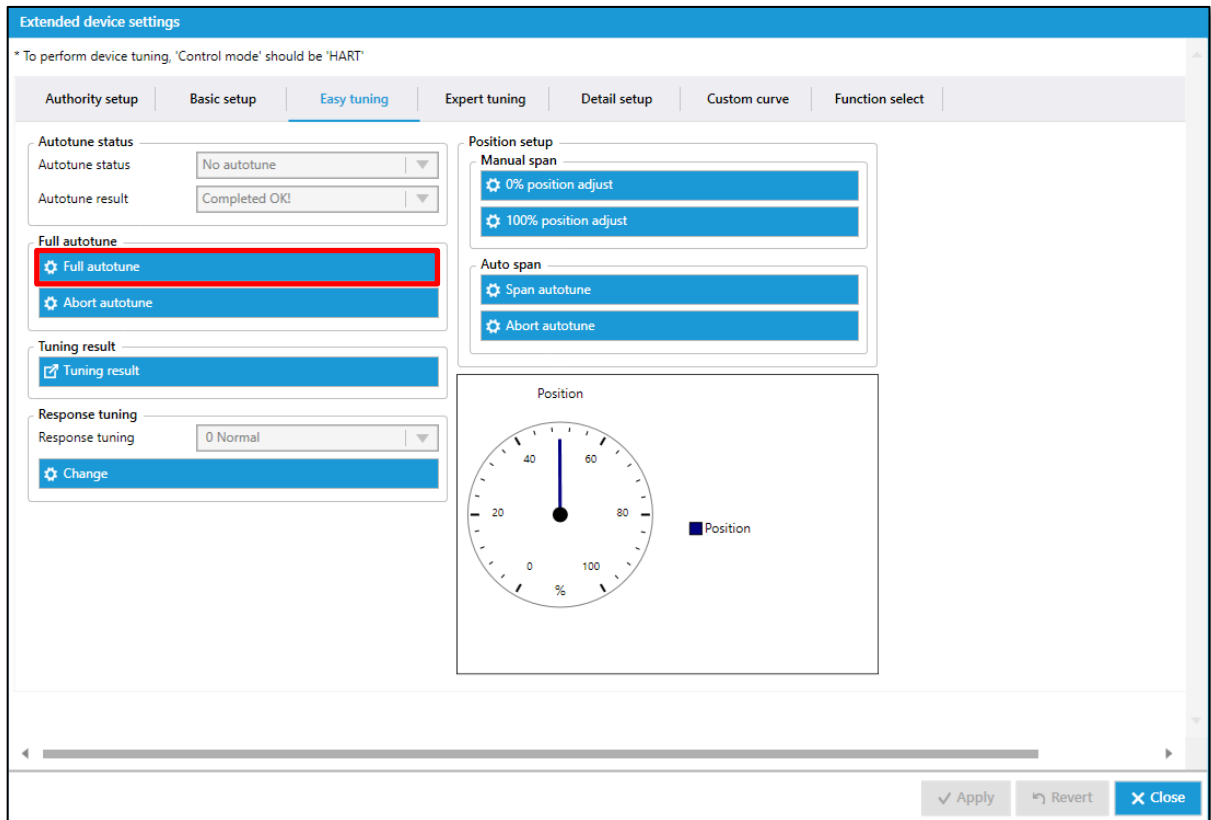




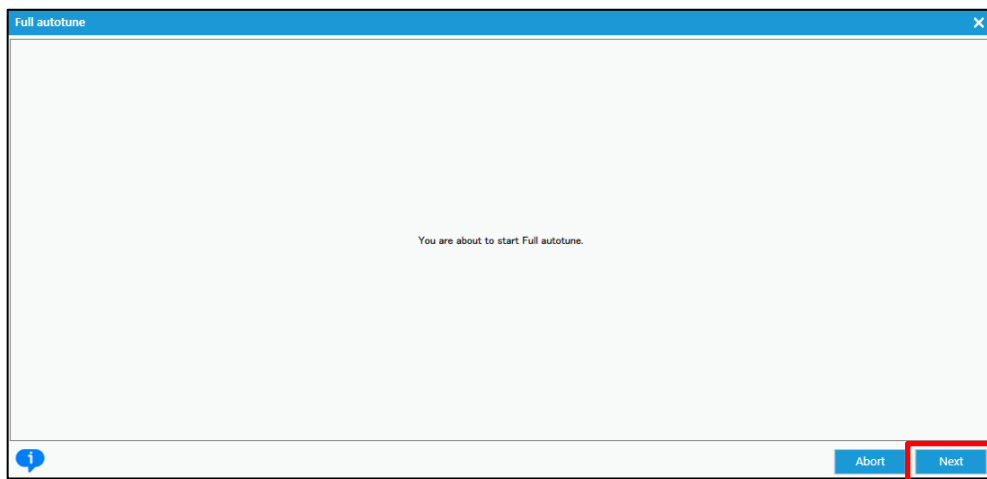
## C-2) Execution type

As an example of the execution type operation, show how to perform full auto tuning from the [Device settings] > [Extended device settings] > [Easy tuning] menu.

- ① Click [Full autotune] in the [Full autotune] menu group.



- ② A confirmation dialog will be displayed, so click [Next].



- ③ Full autotuning will start on the positioner.
- ④ Check the progress during execution in the "Autotune status" field. When it becomes "Complete autotune", full autotune is complete.

Extended device settings

\* To perform device tuning, 'Control mode' should be 'HART'

Authority setup | Basic setup | **Easy tuning** | Expert tuning | Detail setup | Custom curve | Function select

Autotune status

Autotune status: Complete autotune

Autotune result: Completed OK!

Full autotune

Full autotune

Abort autotune

Tuning result

Tuning result

Response tuning

Response tuning: 0 Normal

Change

Position setup

Manual span

0% position adjust

100% position adjust

Auto span

Span autotune

Abort autotune

Position

Position

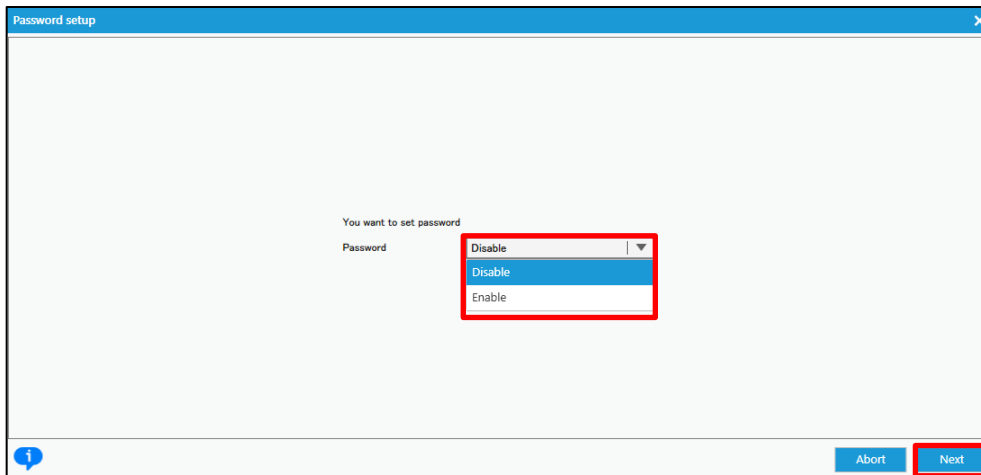
Apply Revert Close

## Appendix D. Password setup

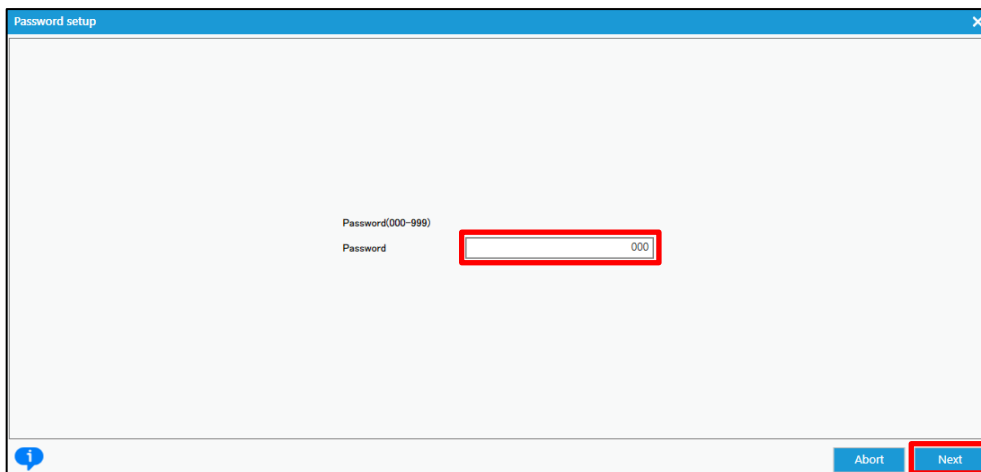
This device allows to set a password with a three-digit integer.

If set a password, only be able to access the information on each top menu without entering the password.

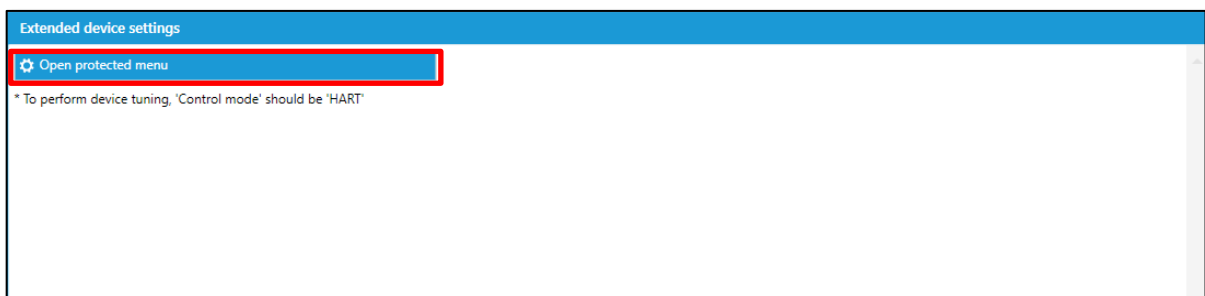
- ① Click [Change] in the [Password setup] menu.
- ② Select "Enable" to enable the password, or "Disable" to disable the password, then click [Next].
- ※ If select "Disable", set this value.



- ③ If select "Enable", enter a three-digit password and click [Next] to set it.



※ When locked with a password, the settings menu will be locked as shown below, and the menu will not be displayed unless enter the correct password in the [Open protected menu] menu.



Or,



※ The [Open force clear password menu] is a rescue menu if you forget the password. A secret code is required to unlock it, so if you have forgotten the password, please contact the sales office listed on the back of this manual.

■ **WORLD-WIDE NETWORK (Sales, Manufacturing, Services)**

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<b>Paris Office</b>	Tel. (33) 1-73-75-23-1	Fax. (33) 1-73-75-23-1
<b>Moscow Office</b>	Tel. (7) 495-775-8531	Fax. (7) 495-787-2758
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<b>KOSO Kent Introl. Ltd., U.K.</b>	Tel. (44) 0-1484-710311	Fax. (44) 0-1484-407407
<b>KOSO Control Engineering (Wuxi) Co., Ltd., China</b>	Tel. (86) 510-85101567	Fax. (86) 510-85122498
<b>Wuxi KOSO Fluid Control Co., Ltd., China</b>	Tel. (86) 510-85585118	Fax. (86) 510-85585119
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<b>Hangzhou Hangyang KOSO P &amp; V Co., Ltd.</b>	Tel. (86) 571-85869508	Fax. (86) 571-85343203
<b>KOSO-AACI (Anshan) Co., Ltd., China</b>	Tel. (86) 412-8812686	Fax. (86) 412-8814582
<b>KOSO Control Instrument (Anshan) Co., Ltd., China</b>	Tel. (86) 412-8829518	Fax. (86) 412-8968860
<b>Korea KOSO Co., Ltd., Seoul, Korea</b>	Tel. (82) 2-539-9011	Fax. (82) 2-566-5119
<b>Korea KOSO Engineering Co., Ltd., Seoul, Korea</b>	Tel. (82) 2-539-9018	Fax. (82) 2-566-5119
<b>KOSO Controls Asia Pte Ltd., Singapore</b>	Tel. (65) 67472722	Fax. (65) 67467677
<b>KOSO India Private Limited</b>	Tel. (91) 253-2383111	Fax. (91) 253-2384413
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<b>KOSO Italy</b>	Tel. (39) 02-93162165	Fax. (39) 02-9306847
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