KGP5000 series

Smart valve positioner

HART Communication Operation Manual

For GUI type

Table of Contents

1. Introduction

Please read carefully at first!
This operation manual includes getting information, calibration, maintenance procedures, diagnosis and so on for the KGP5000 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 KGP5000 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.

KGP5003
Electronics Version : 1.0.0 and more
Software Version : 0.6.1 and more

HART DD
Device Revision : 2 and more
DD Revision : 0 and more

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 take into account safety considerations relate to any other installation methods or operation methods except the method provided herein.

1.3. Product summary

KGP5000 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 in order 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 and internal pressure sensors. 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.
- When using the flame proof type, a conductor with a cross-sectional area of at least 1mm^2 shall be used for internal earthing.
- When using the flame proof type, a conductor with a cross-sectional area of at least 4mm^2 shall be used for external bonding.
- Check the specifications of cable glands and blanking elements to make sure to use only suitable Ex certificated cable glands and blanking elements. See Table 1.4a shows the suitable Ex certificated cable glands and blanking elements for each proof type.

Figure of the wiring connections and terminals is shown as below.

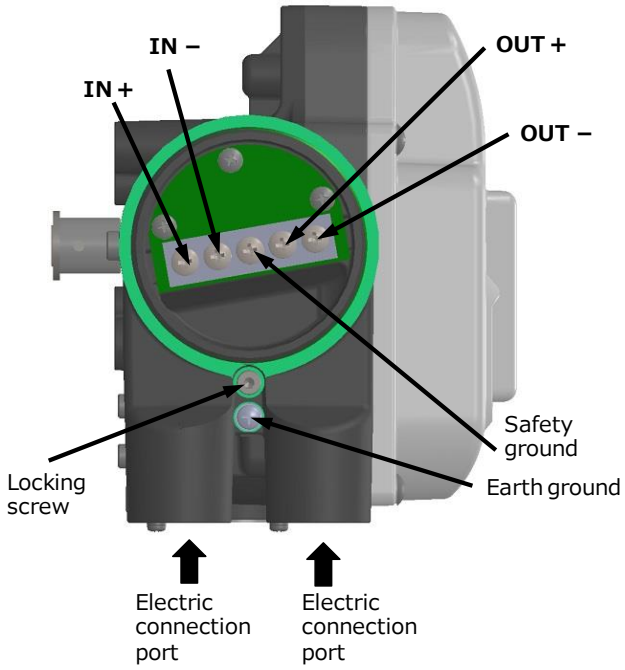

Figure 1.4a Wiring connections and terminals

The positioner uses a 4-20mA loop current and the HART communication is carried out through the digital signal which is superposed on this loop current.

Make wiring connections according to the following procedure.

1. Remove the terminal cover.
2. Then, draw cables of the facilities inside the terminal box. Use cable glands which are rated for the environment of installation and are in accordance with electrical codes which apply to the application. Since screw thread types of electrical connections may vary with specifications, make wiring connections after confirming specifications.
3. Connect cables of loop current, respectively, to IN+ and IN- of the positioner.
4. Connect cables of position transmitter, respectively, to OUT+ and OUT- of the positioner.
5. As illustrated in figure 1.4a, two ground terminals of a safety ground and earth ground are available. The safety ground and earth ground are electrically identical. Make wiring connections according to local electrical codes which apply to the application.
6. Replace the terminal cover.
7. Turn the cover locking screw counterclockwise to fix the terminal cover.

Field wiring diagram is shown in figure 1.4b.

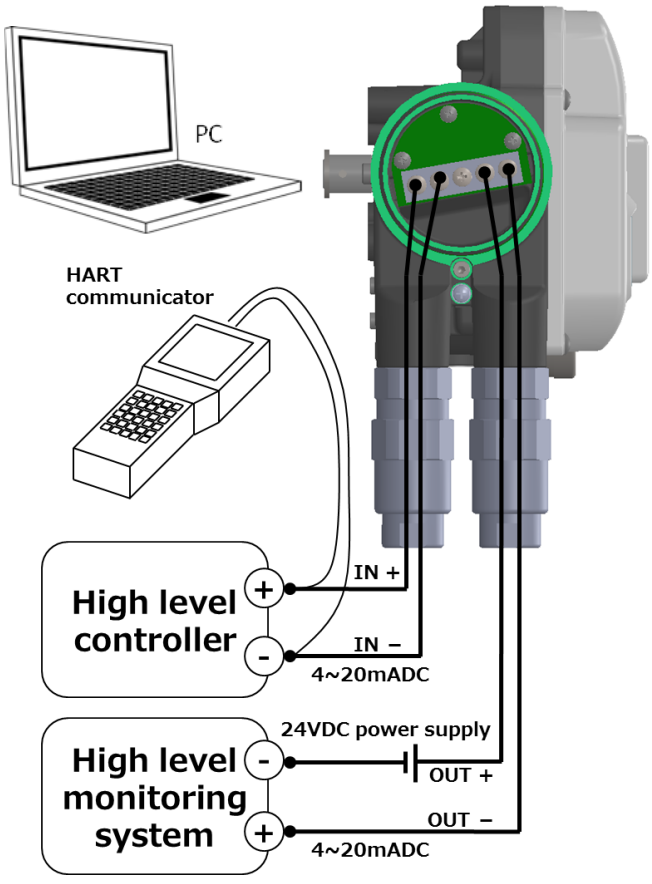

Figure 1.4b Field wiring diagram

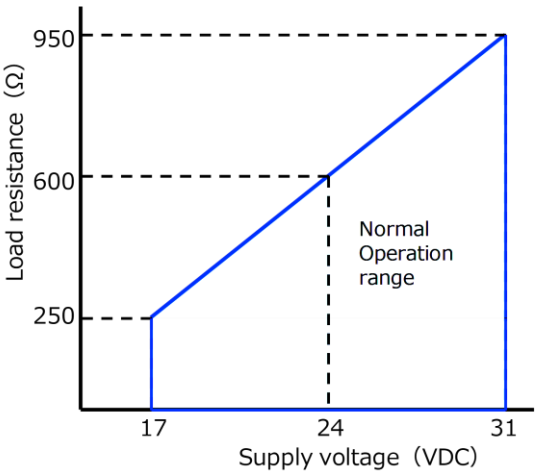

Figure 1.4c Load resistance to supply voltage relationship via the connection of position transmitter

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

Table 1.4a The suitable Ex certificated cable glands and blanking elements for each proof type

Proof type	Thread form of entries	Certification	Rated ambient temperature range	Service temperature range
TIIS	G1/2	Ex d IIC Gb	-20℃～+60℃	-20℃～+63℃
CCC(NEPSI)	1/2NPT	Ex d IIC Gb	-40℃～+70℃	-40℃～+73℃
KOSHA	1/2NPT	Ex d IIC	-20℃～+60℃	-20℃～+63℃
IECEx	1/2NPT or M20X1.5	Ex db IIC Gb	-40℃～+70℃	-40℃～+72℃
ATEX	1/2NPT or M20X1.5	II 2 G Ex db IIC Gb	-40℃～+70℃	-40℃～+72℃

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 the 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 a serious damage.
- Don't use a wireless transceiver near the positioner.

1.5. Preparation for HART communication

A personal computer or communicator and a HART modem are required to acquire the information of this unit via HART communication and perform installation / setting work, maintenance, alarm setting / diagnosis. In addition, the HART modem driver and device description (DD) for KGP5000 communication must be installed on the PC.

※If you want to download and install DD to a communicator, please check with the communicator manufacturer.

※Please check with each manufacturer for the installation of the HART modem driver and management software.

※If the communicator uses the Text type, refer to *OME-KGP5HT-01B_KGP5000 _HART Text type Manual_EN*.

The procedure for connecting to a PC and downloading / installing DD is shown below.

1) Download DD for HART communication.
The DD for HART communication can be downloaded from the following FieldComm Group website.
You can also use the DD from the CD that was included when you purchased this unit.

Download to PC:

① Enter KGP5000 in the Search by Product Name section of the URL:
URL:https://www.fieldcommgroup.org/registered-products Search.

② Select the KGP5000 page and select [2] for DD VERSION.

③ Click EDD Download to start the download and save hart.0000cf.cf83.zip to any location.

④ Unzip the downloaded hart.0000cf.cf83.zip.

2) Installation of DD for HART communication.
The following shows the case where the application SDC625 is used as an example. For others, please check the instruction manual of the management software you are using.

Installation procedure on PC:

① Download to PC Save 0000cf of hart.0000cf.cf83 described in ④ to the folder of C: ¥ HCF ¥ DDL ¥ Library on your PC and complete the installation.

② When SDC625 is started, HART communication with this unit becomes possible.

The data saved in the 0000cf folder is as follows. Software Ver. The data corresponding to this unit is available. (DD in 0083 folder is a HART6 file)

Folder name：**cf83 ※In the case of HART7**
For software up to Ver 0.4.9 DD(Two files)
0103.fm8
0103.sym

For software Ver0.6.1 or later DD(Two files)
0200.fm8Two files
0200.sym

Folder name：0083 **※In the case of HART6**
For software up to Ver 0.4.9 DD(Two files)
0103.fm6
0103.sym

For software Ver0.6.1 or later DD(Two files)
0200.fm6
0200.sym

3) Connection
According to section 1.4, connect the IN+ and IN- of this device to a communication tool. For example HART communicator or a terminal of host controller.

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2. Menu tree on the HART communication

2.1. Menu type

This document describes the GUI (Graphical User Interface) type DD.

- If you are using a Text type communicator, refer to *OME-KGP5HT-01B_KGP5000_HART Text type Manual_EN*.
- The menu types that correspond to GUI type menus and text type menus depend on the management software.
  For details, see the instruction manual of the management software you are using.
- Both GUI-type and text-type menus are available on the PC.

※ Menu ①②③ is a menu of management software set by GUI type.

①Process Variables
②Device
③Diagnosis

※Menu ④ is a menu of management software set by text type.
Please refer to OME-KGP5HT-01B_KGP5000 _HART Text type Manual_EN separately.

④Root menu

Figure 2a menu type

2.2. Menu tree

①Process Variables Root Menu

		【Chapter / Section】
Process Variables Root Menu →	Alarm status	【3.1.】
	<Set point>	
	<Position>	
	<Loop current>	
	<Input>	
	<P-sup.>	
	<P-out1>	
	<P-out2>	
	<Temperature>	
	Trends	【3.2.】

Figure 2b Process Variables Root Menu

②Device Root Menu

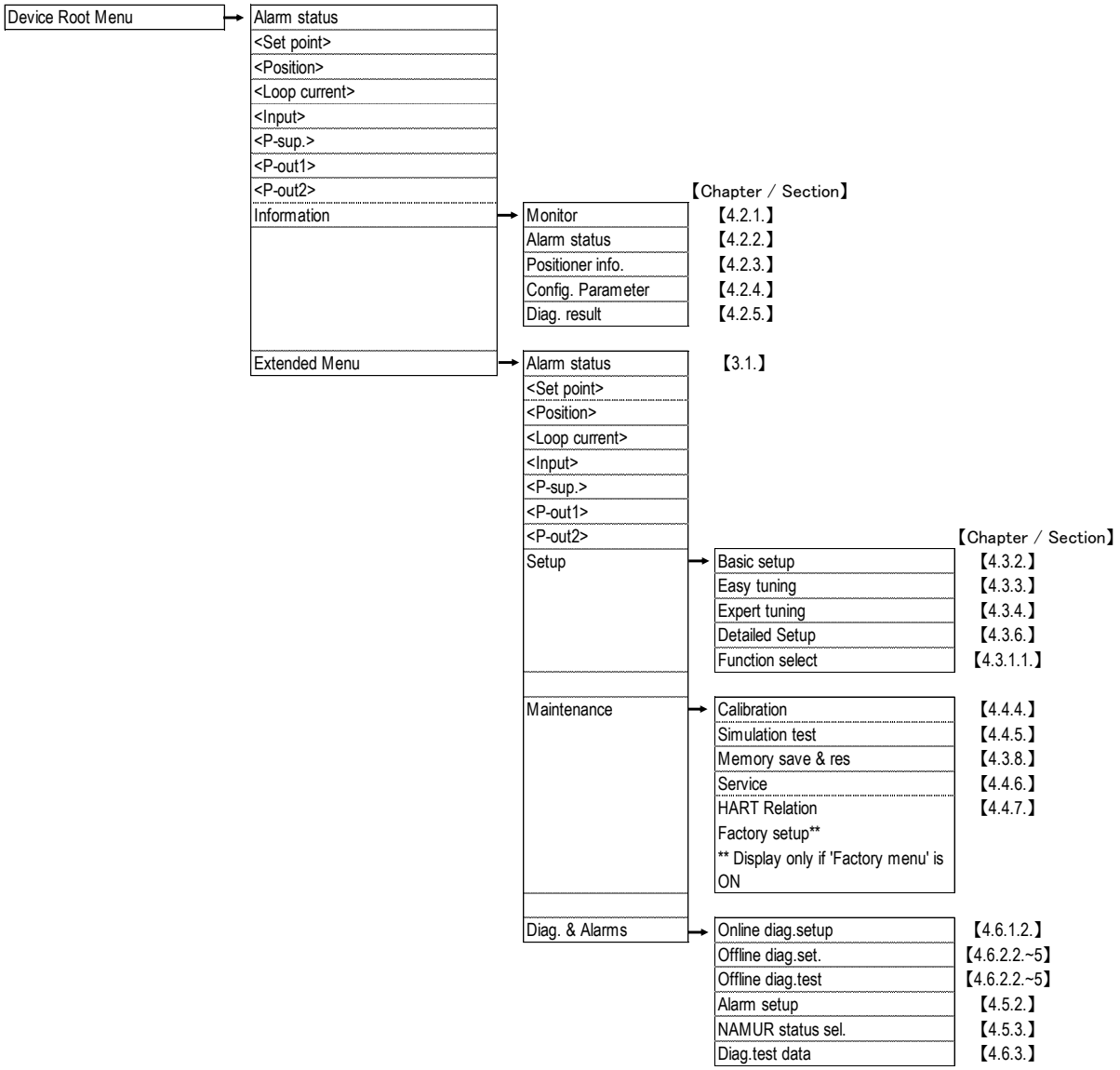


Figure 2c Device Root Menu

③Diagnosis Root Menu

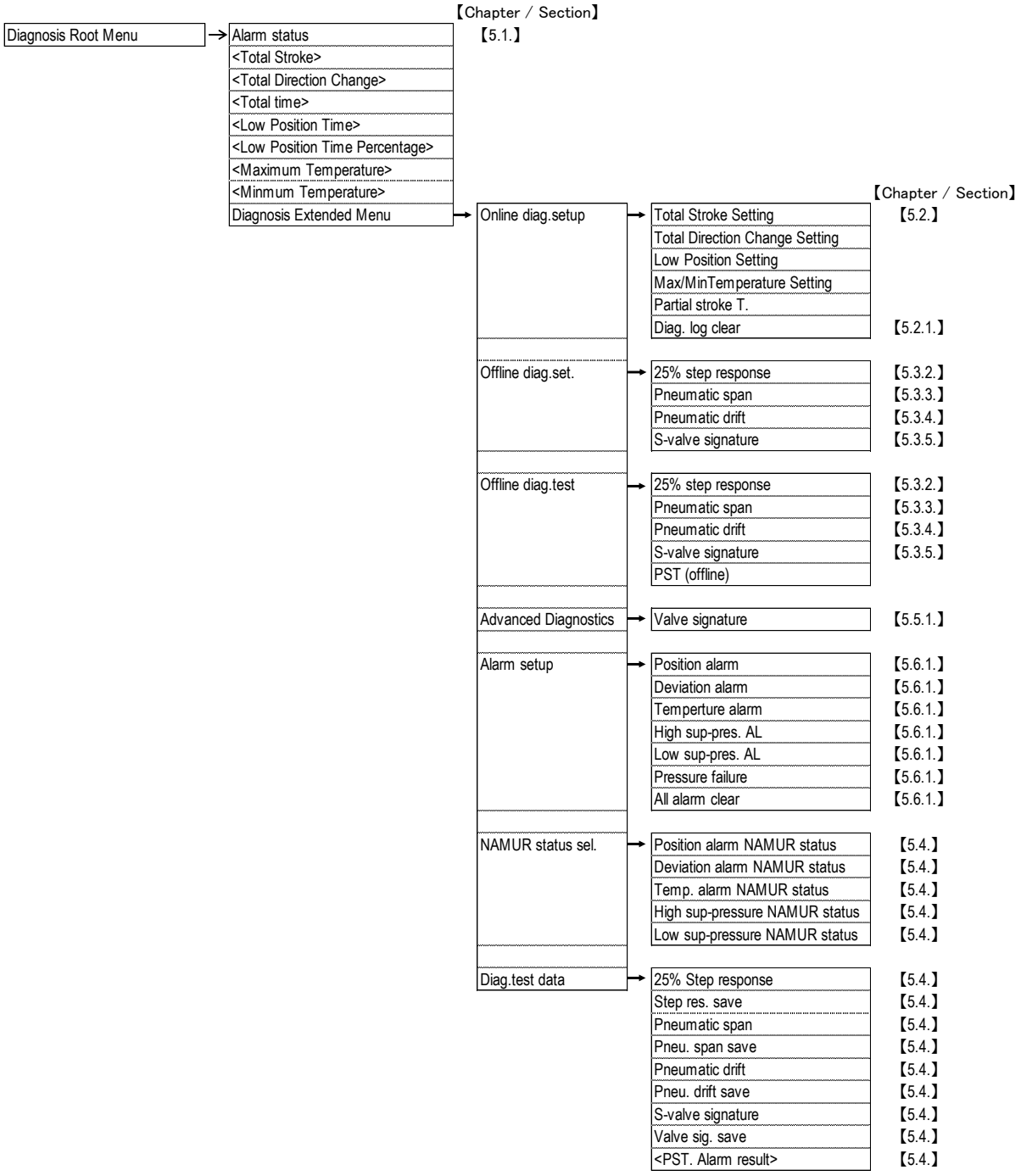


Figure 2c Diagnosis Root menu

3. Process Variables (Root Menu)

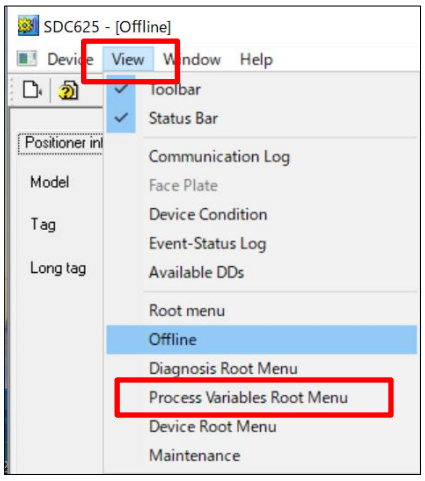
Instructions for information obtaining, setting, maintaining, alerting, and diagnosing are provided with reference to SDC625.

3.1. Alarm status

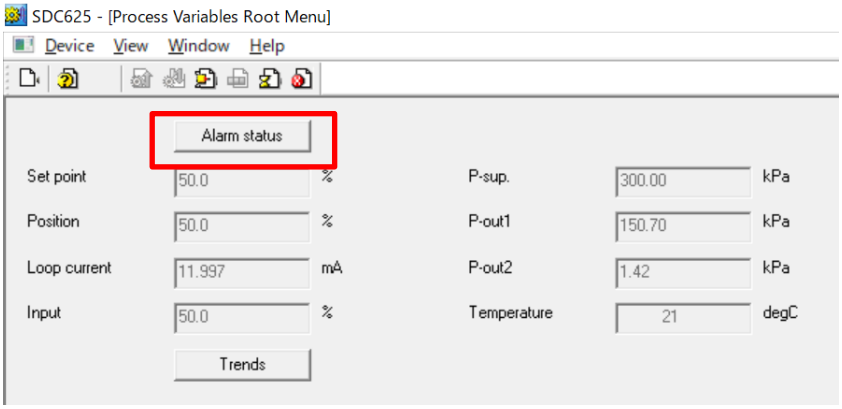
The operator can confirm the alarm status as below.

MENU) *View > Process Variables Root Menu > Alarm status*

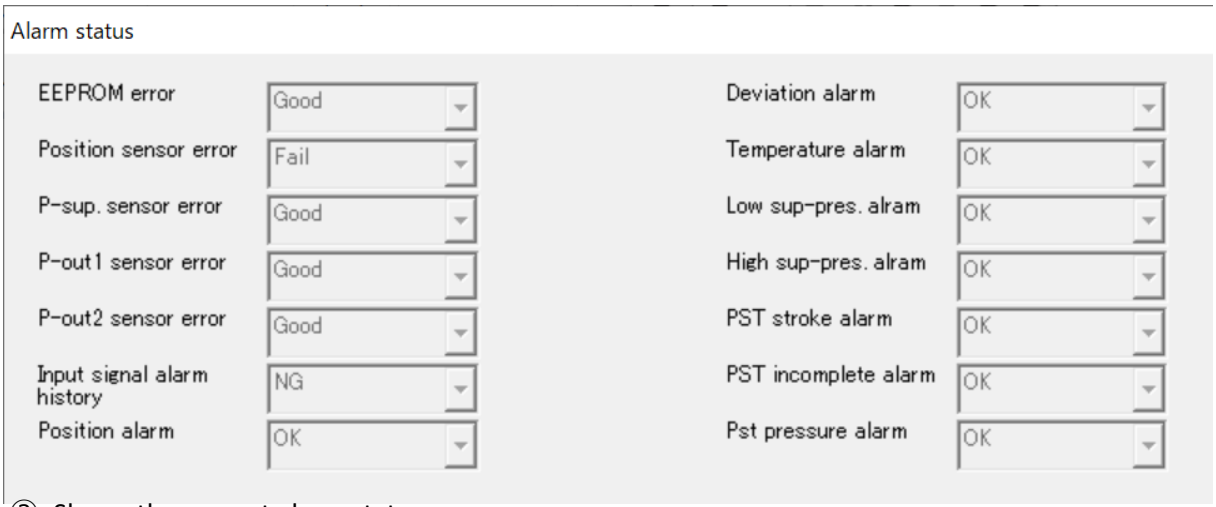
- EEPROM error
- Position sensor error
- P-sup. sensor error
- P-out1. sensor error
- P-out2. sensor error
- Input signal alarm history
- Position alarm
- Deviation alarm
- Temperature alarm
- Low sup-pres. Alarm
- High sup-pres. Alarm
- PST stroke alarm
- PST incomplete alarm
- PST pressure al



① Press the ' View＞ Process Variables Root Menu '



② Press the 'Alarm status'



③ Shows the current alarm status.

3.2. Trends

The operator can confirm operating status of the positioner such as input signal, set point, valve position, Supply pressure, Output pressure, temperature.

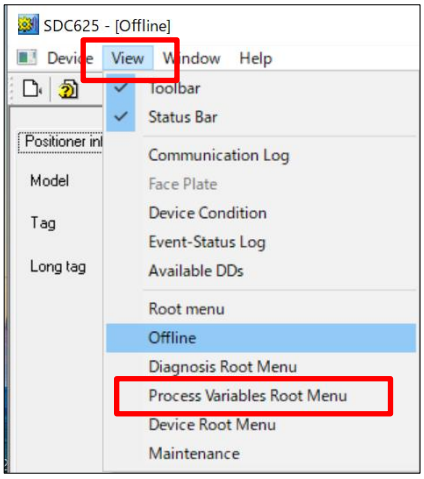
Display items:

- Set point
- Position
- Loop current
- Input※
- P-sup
- P-out1
- P-out2
- Temperature

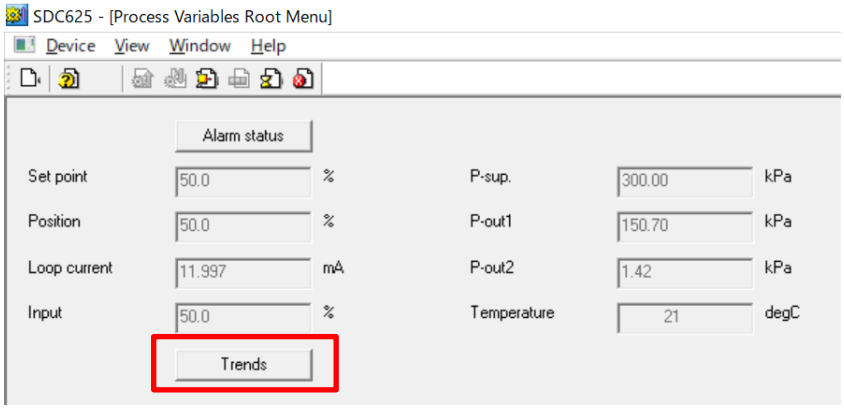
※When you set the split range, the value displayed on the input will differ from the actual valve opening.

For example, check the input signal as follows.

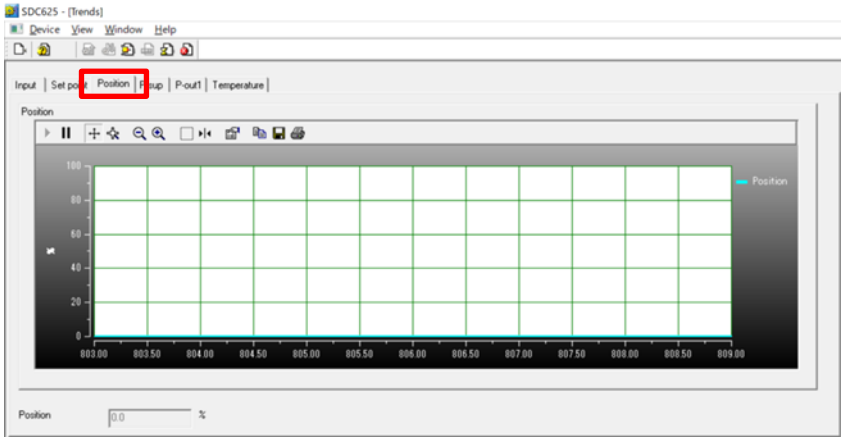
MENU) *View > Process Variables Root Menu > Trends > Input*



① Press the 'View> Process Variables Root Menu'



② Press the 'Trends'



③ When you select the 'position', the valve opening relative to the current input signal is displayed.

4. Device (Root Menu)

Instructions for information obtaining, setting, maintaining, alerting, and diagnosing are provided with reference to SDC625.

4.1. Alarm status

The operator can confirm the alarm status as below.

MENU) *View > Device Root Menu > Alarm status*

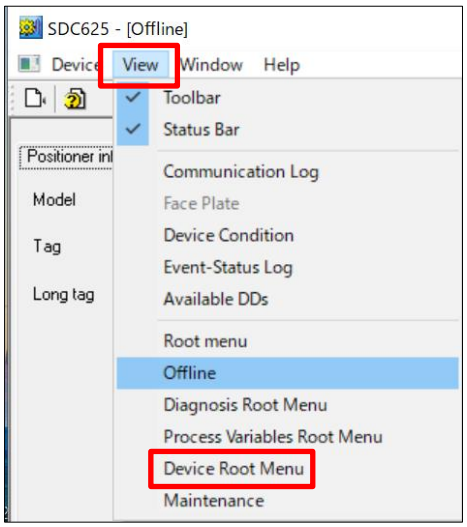
- EEPROM error
- Position sensor error
- P-sup. sensor error
- P-out1. sensor error
- P-out2. sensor error
- Input signal alarm history
- Position alarm
- Deviation alarm
- Temperature alarm
- Low sup-pres. Alarm
- High sup-pres. Alarm
- PST stroke alarm
- PST incomplete alarm
- PST pressure al

4.2. Information

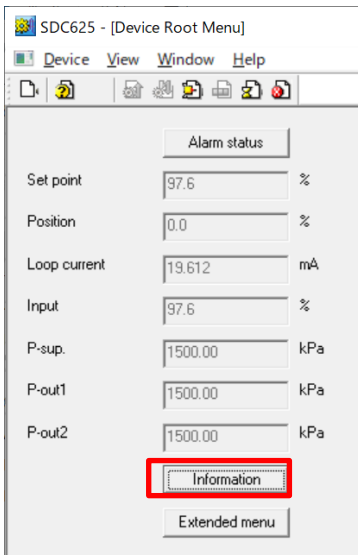
The operator can confirm the information as below.

MENU) *View > Device Root Menu > Information*

- Monitor
- Alarm status
- Positioner info
- Config. parameter
- Diag. result



① Press the 'View> Device Root Menu'

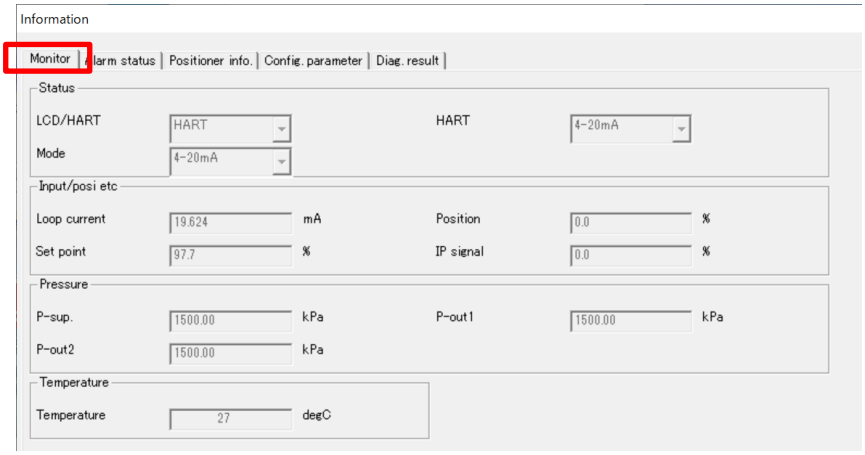


② Press the 'Information'

4.2.1. Monitor

The operator can confirm the current status of the positioner.

MENU) *View > Device Root Menu > Information >Monitor*



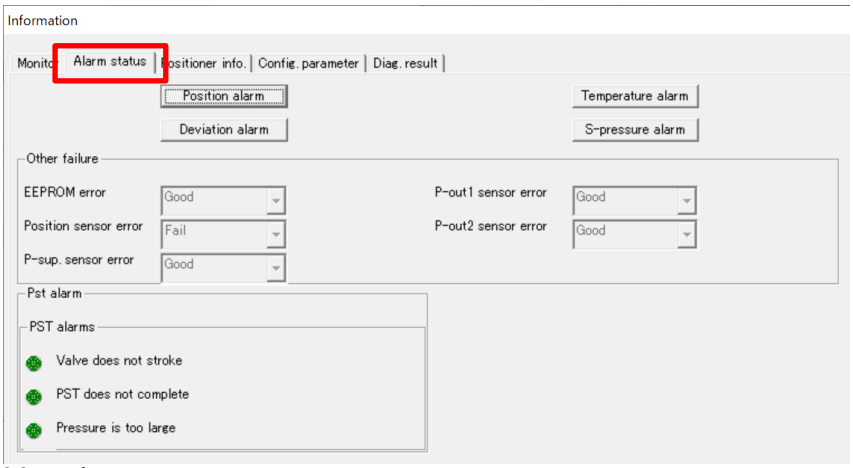
Menu items:

Status	Pressure
Input/posi etc	Temperature

4.2.2. Alarm status

The operator can confirm the alarm status as below.

MENU) *View > Device Root Menu > Information > Alarm status*



Menu items:

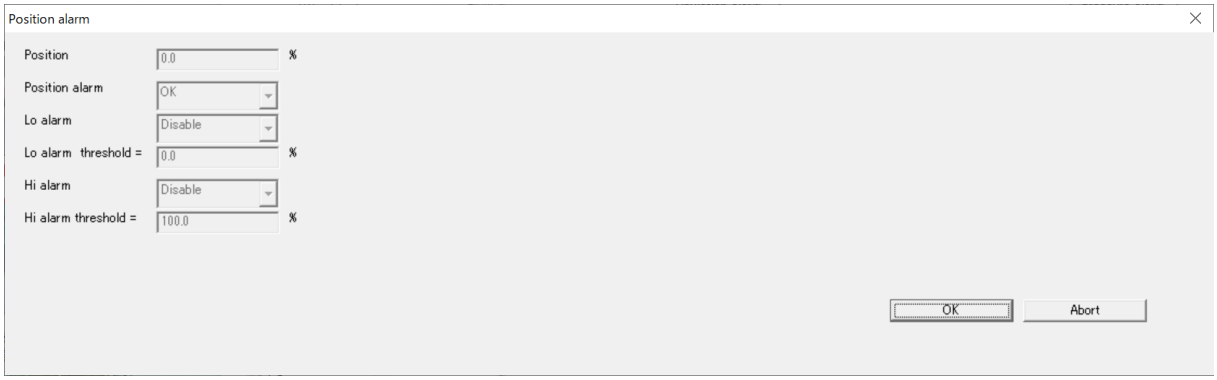
Position alarm	S-pressure alarm
Deviation alarm	Other failure※
Temperature alarm	PST alarm

※For other failures, you can check the alarm status of the memory, angle sensor, and pressure sensor.

4.2.2.1. Position alarm

The operator can confirm the Position alarm status as below.

MENU) *View > Device Root Menu > Information > Alarm status > Position alarm*



Menu items:

Position	: Valve position
Position alarm	: Position alarm
Lo alarm	: Lo position alarm
Lo alarm threshold	: Lo position alarm threshold
High alarm	: High position alarm
High alarm threshold	: High position alarm threshold

4.2.2.2. Deviation alarm

The operator can confirm the Deviation alarm status as below.

MENU) *View > Device Root Menu > Information > Alarm status > Deviation alarm*

Menu items:

Deviation alarm	: Deviation judgment [OK/NG]
Deviation alarm	: Enable / Disable settings
threshold	: Threshold[%]
Times	: Deviation judgment time[S]

4.2.2.3. Temperature alarm

The operator can confirm the value of the current temperature inside the positioner.

MENU) *View > Device Root Menu > Information > Alarm status > Temperature alarm*

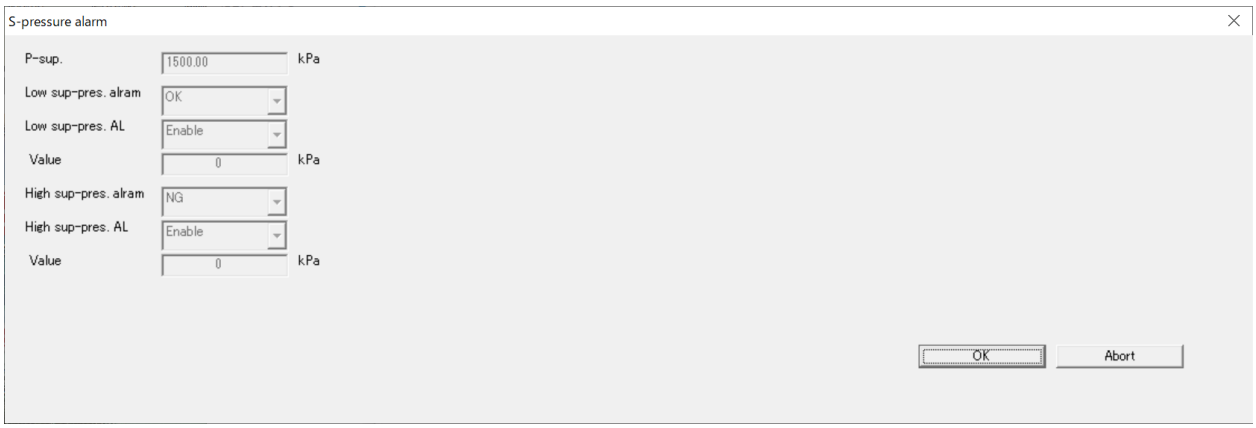
Menu items:

Temperature	: Current temperature
Temperature alarm	: Temperature judgment [OK/NG]
Temperature alarm	: Enable / disable the temperature judgment setting
Low	: Low temperature threshold
High	: High temperature threshold

4.2.2.4. S-pressure alarm

The operator can confirm the supply pressure alarm status as below

MENU) *View > Device Root Menu > Information > Alarm status > S-pressure alarm alarm*



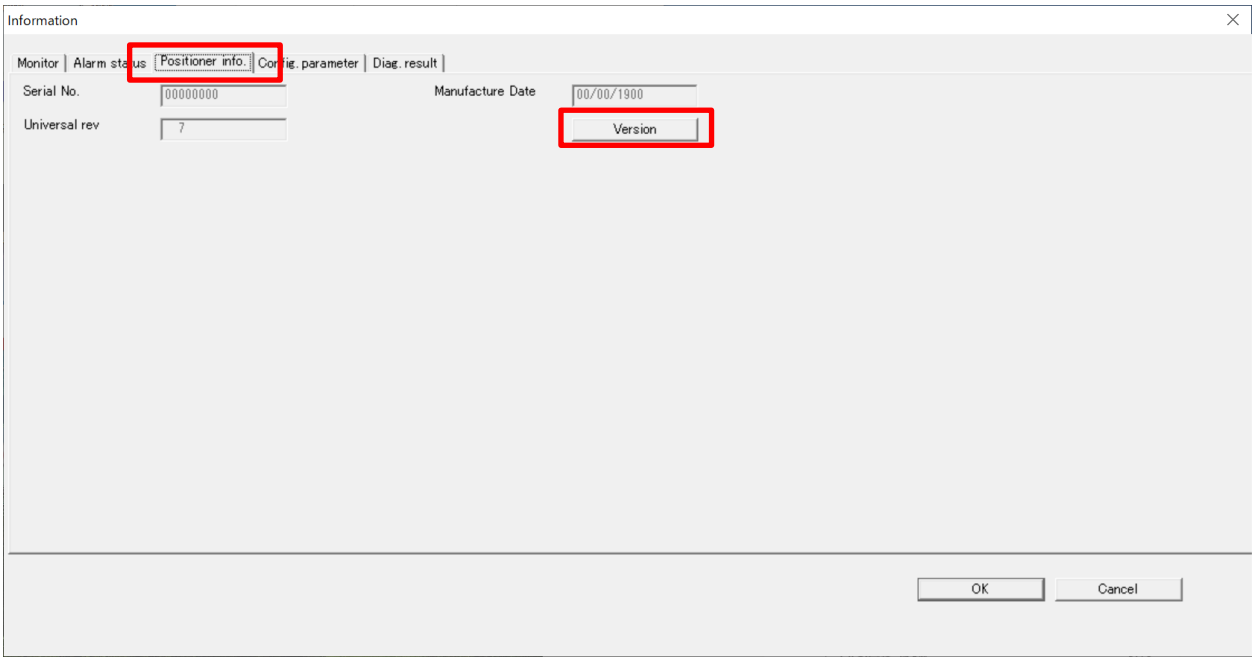
Menu items:

P-sup.	: Supply pressure
Low sup-press.alram	: Low Supply pressure judgment [OK/NG]
Low sup-press.AL	: Enable / disable the Low Supply pressure judgment setting
Value	: Low Pressure threshold
High sup-press.alram	: High Supply pressure judgment [OK/NG]
High sup-press.AL	: Enable / disable the High Supply pressure judgment setting
Value	: High Pressure threshold

4.2.3. Positioner info

The operator can confirm the version of the positioner.

MENU) *View > Device Root Menu > Information > Positioner info*



① Select the ' Positioner info' and press ' Version '

Menu items:

Serial No.
Universal rev(HART version)
Manufacture Date

② The operator can confirm the version information as below

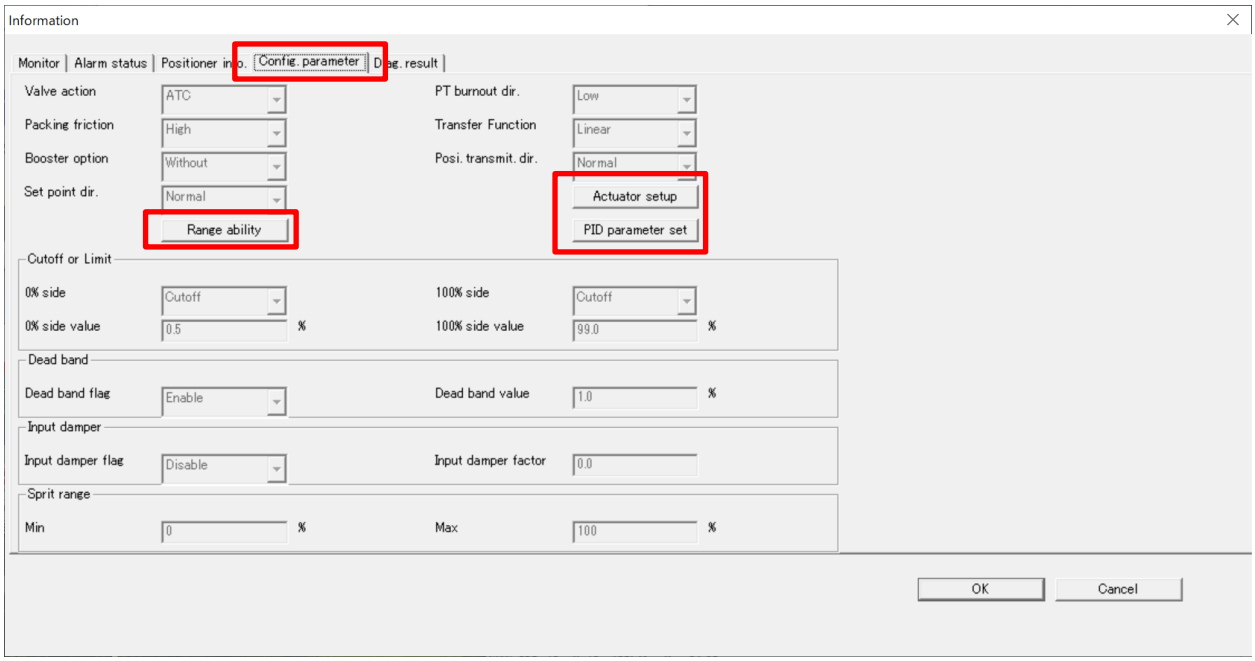
Menu items:

Positioner : Positioner version
Electronics : Electronics version
Software : Software version

4.2.4. Config. parameter

The operator can confirm the configuration parameter information as below.

MENU) *View > Device Root Menu > Information > Config. parameter*



① Select the ' Config. parameter '

Menu items:

Valve action	Transfer Function	Cutoff or Limit
Packing friction	Posi. transmit. Dir	Dead band
Booster option	Range ability	Input damper
Set point dir.	Acutuator setup	Split range
PT burnout dir.	PID parameter set	

4.2.4.1. Range ability

The operator can confirm the Range ability parameter information as below
Only it can be set when Transfer function is Equal percent.

MENU) *View > Device Root Menu > Information > Config. parameter >Range ability*

Press OK to return to the information screen

4.2.4.2. Actuator setup

The operator can confirm the Actuator setup parameter information as below

MENU) *View > Device Root Menu > Information > Config. parameter > Acutuator setup*

Press OK to return to the information screen

4.2.4.3. PID parameter set

The operator can confirm the PID parameter set information as below

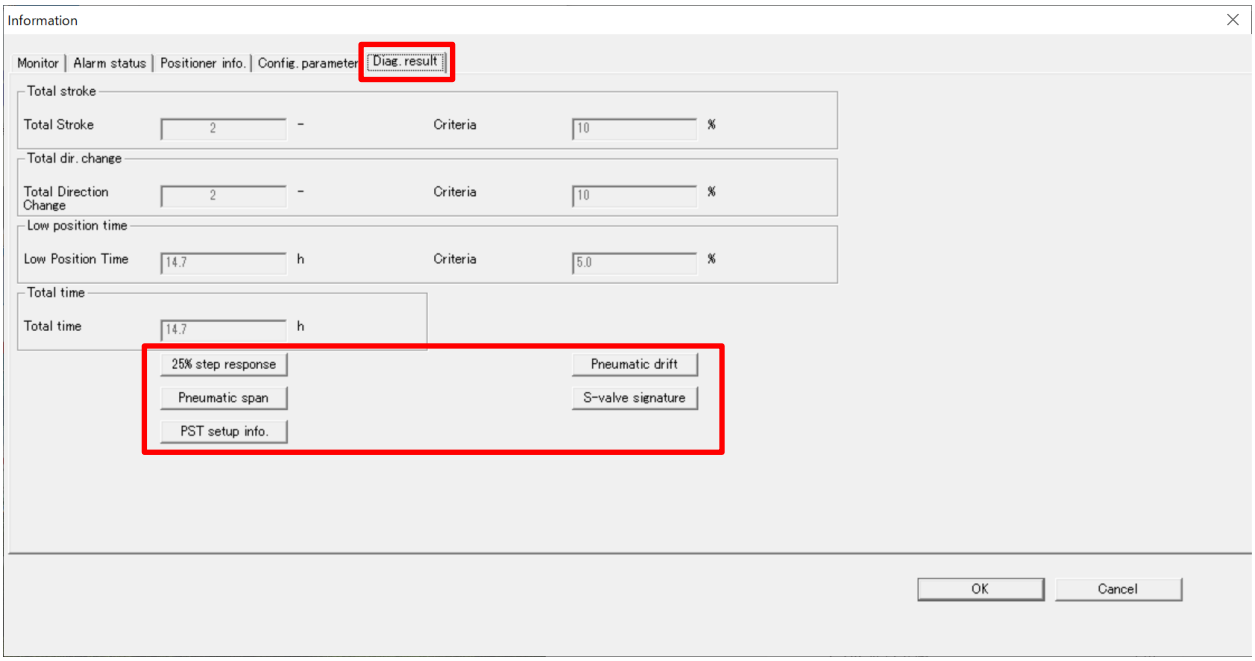
MENU) *View > Device Root Menu > Information > Config. parameter > PID parameter set*

Press OK to return to the information screen

4.2.5. Diag. result

The operator can confirm that the diagnostic result follows:

MENU) *View > Device Root Menu > Information > Diag. result*



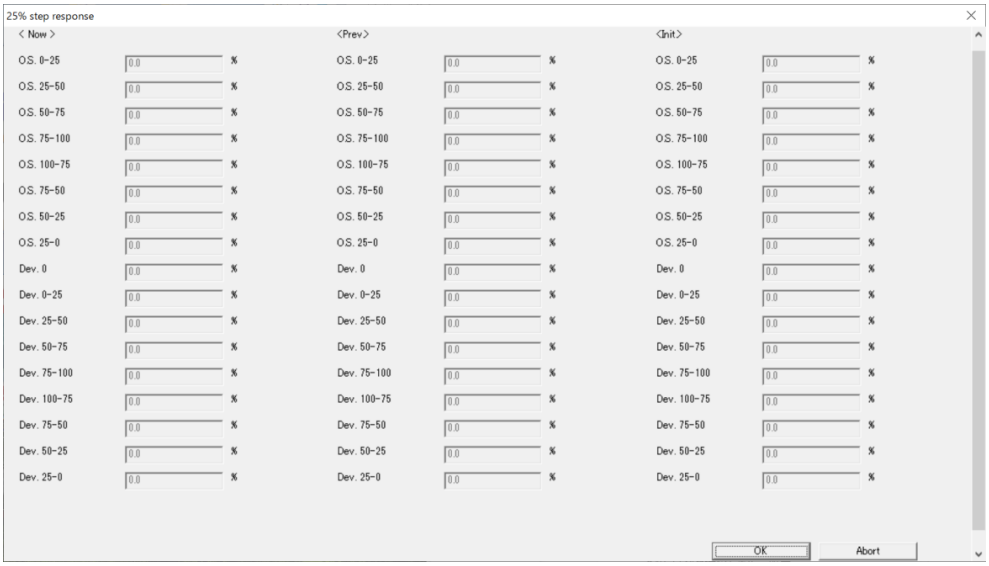
Menu items:

Total stroke	Total time.	PST setup info.
Total dir. change	25%step response.	Pneumatic drift
Low position time	Pneumatic span	S-Valve signature

4.2.5.1. 25%step response

The operator can confirm the 25%step response parameter information as below.

MENU) *View > Device Root Menu > Information > Diag. result >* 25%step response

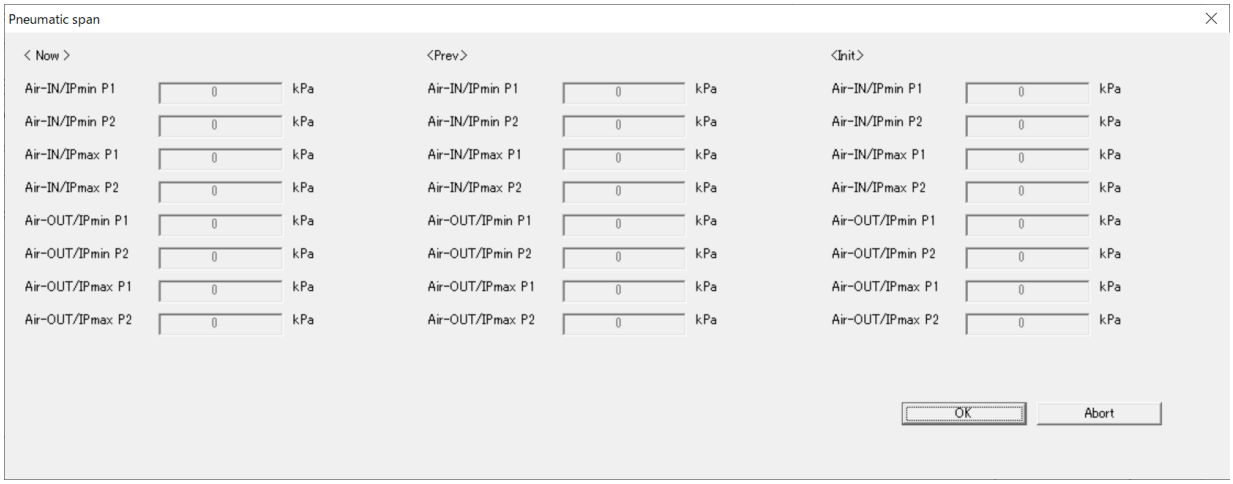


Press OK to return to the information screen

4.2.5.2. Pneumatic span

The operator can confirm the Pneumatic span parameter information as below.

MENU) *View > Device Root Menu > Information > Diag. result > Pneumatic span*



Press OK to return to the information screen

4.2.5.3. PST setup info.

The operator can confirm the PST setup info. parameter information as below.

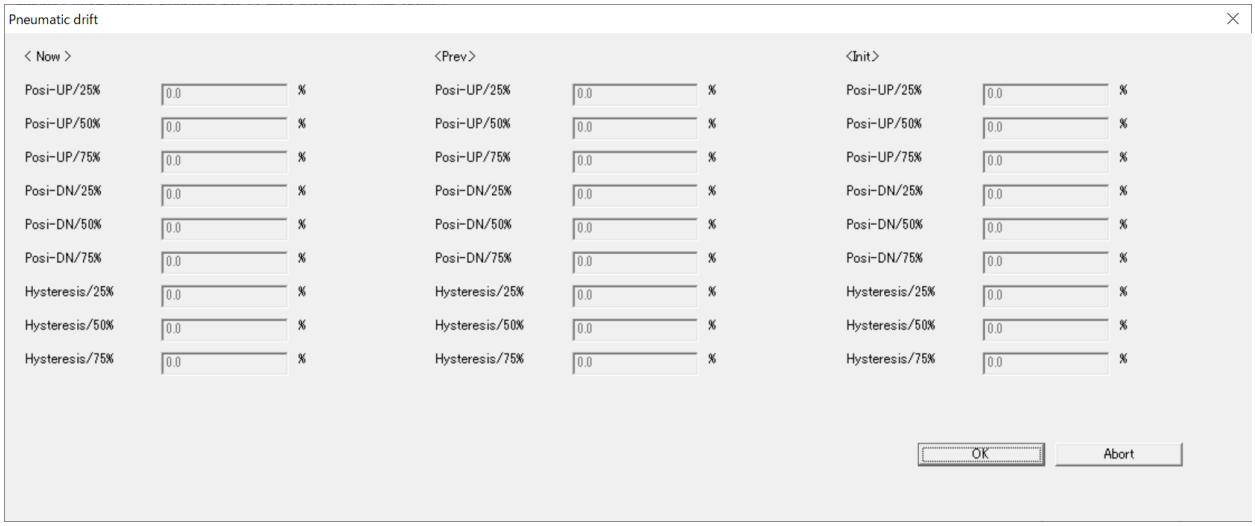
MENU) *View > Device Root Menu > Information > Diag. result > PST setup info.*

Press OK to return to the information screen

4.2.5.4. Pneumatic drift

The operator can confirm the Pneumatic drift parameter information as below.

MENU) *View > Device Root Menu > Information > Diag. result > Pneumatic drift*

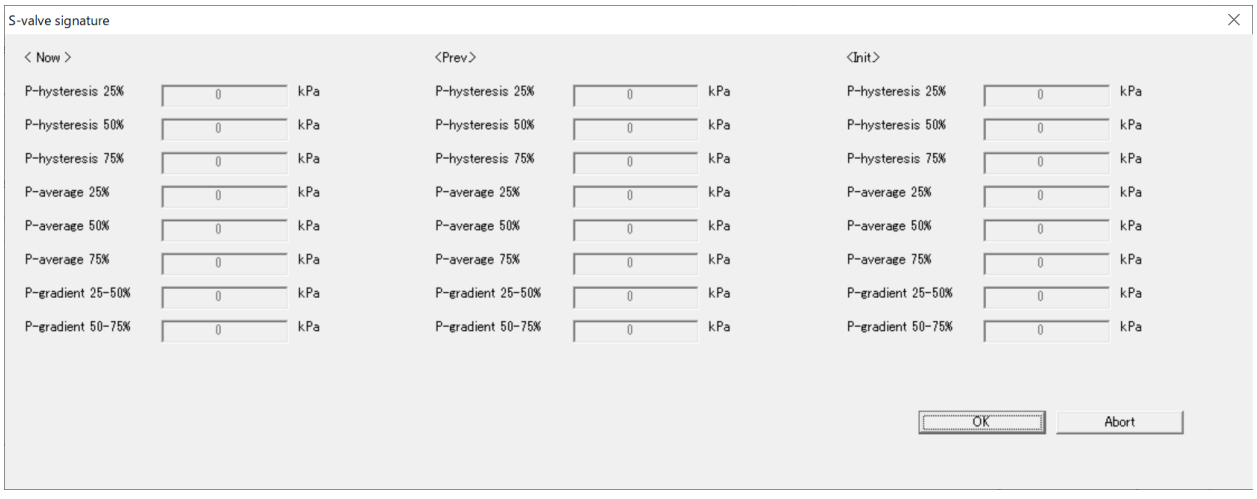


Press OK to return to the information screen

4.2.5.5. S-Valve signature

The operator can confirm the S-Valve signature parameter information as below.

MENU) *View > Device Root Menu > Information > Diag. result > S-Valve signature*



Press OK to return to the information screen

4.3. Setup

4.3.1. Setup and operation authority by HART communication

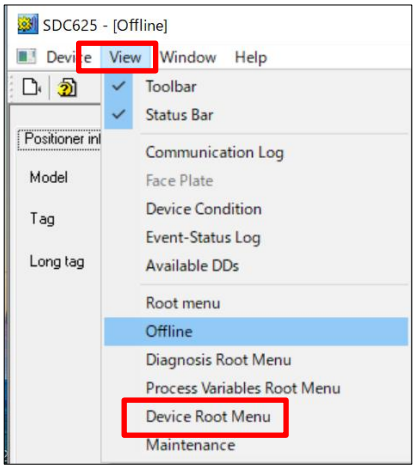
To change the settings via HART communication, the "authority" must be HART.
To operate auto-tuning, calibration, simulation and offline-diagnostics via HART communication, the "Control mode" must be "HART".

4.3.1.1. Authority

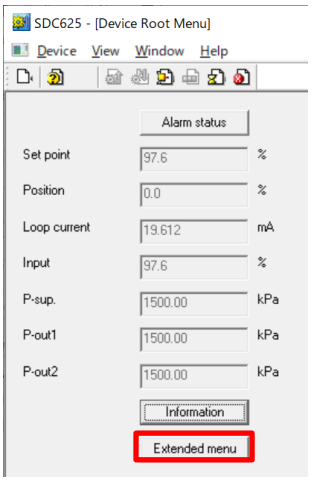
To change permissions to HART, the LUI (LCD) screen must be the top menu, alarm status menu, or info menu.

The procedure for changing is as follows.

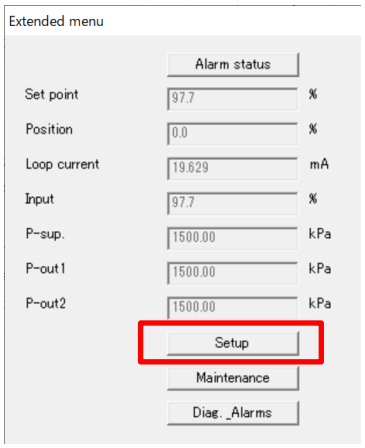
MENU) *View > Device Root Menu >Extended menu > Setup > Function select>Authority>Authority*



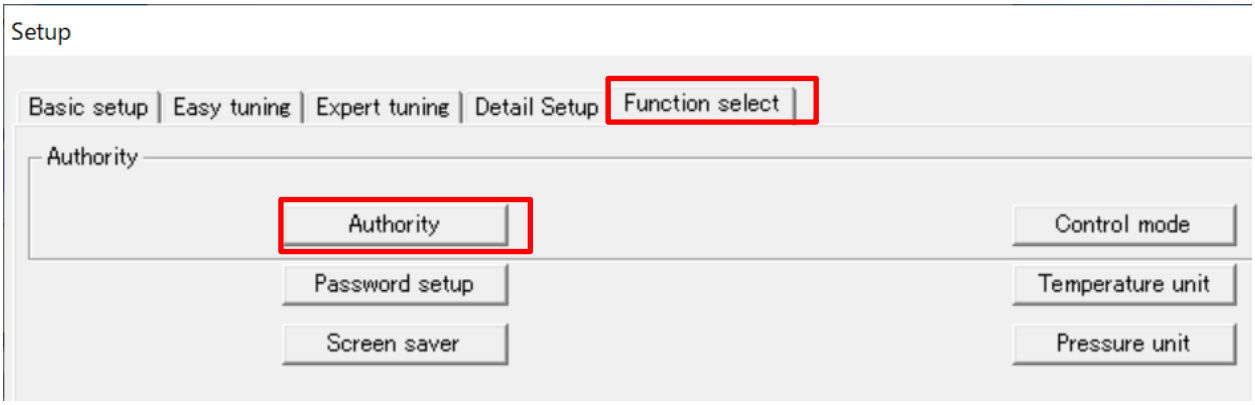
① Press the 'View＞Device Root Menu'



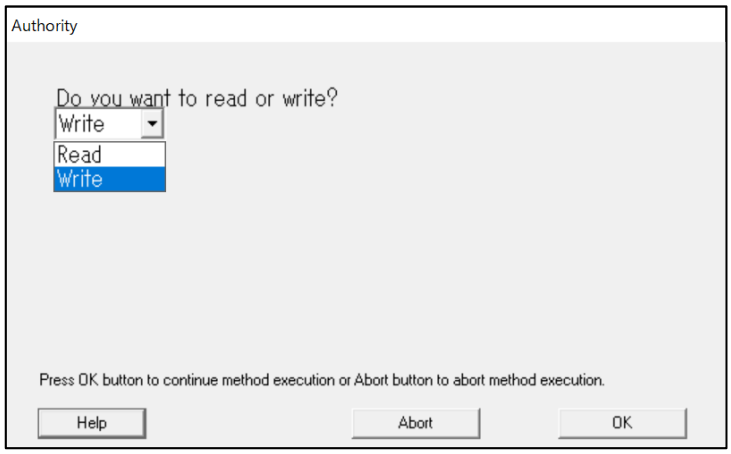
② Press the 'Extended menu'



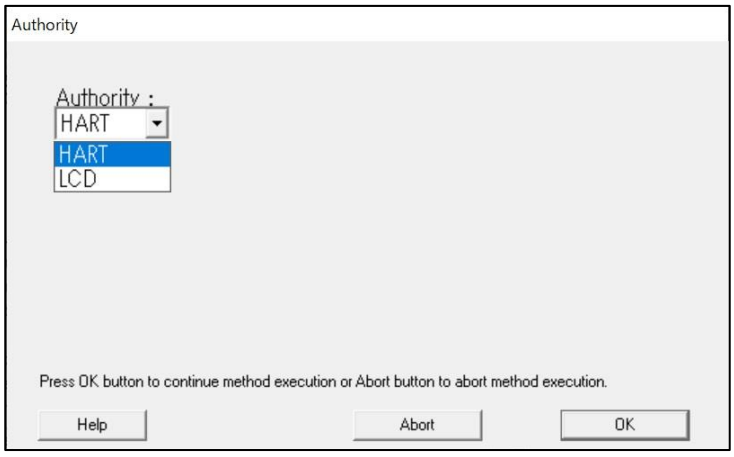
③ Press the 'Setup'



④ Select 'Function select' and press 'Authority'.



⑤ Select 'Write' and press 'OK'.

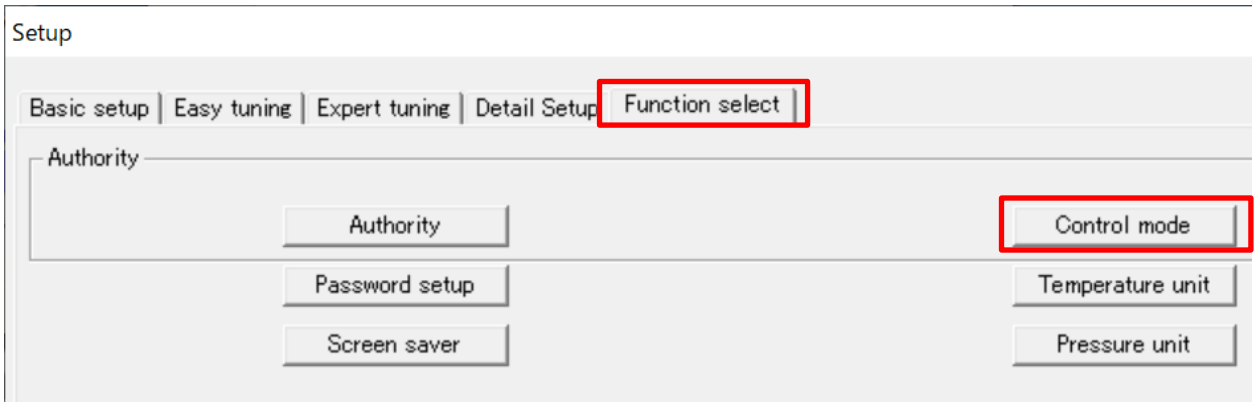


⑥ Select 'HART' and press 'OK' to set.

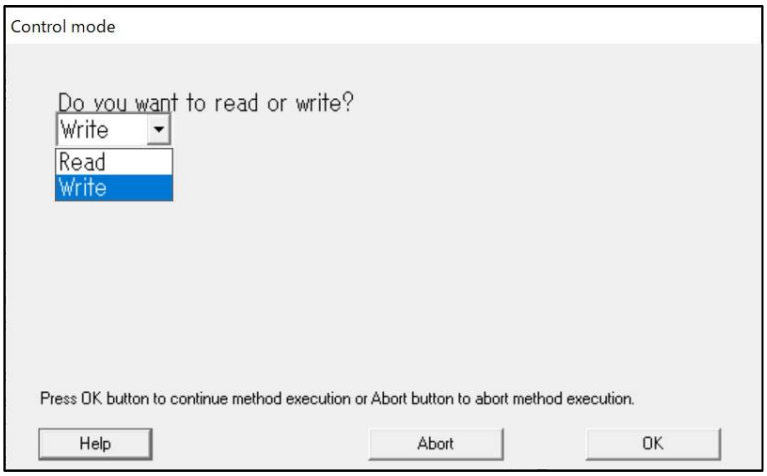
※When 'HART' is selected, only 'Information' in the TOP menu can be accessed from the LUI.

4.3.1.2. Control mode permissions

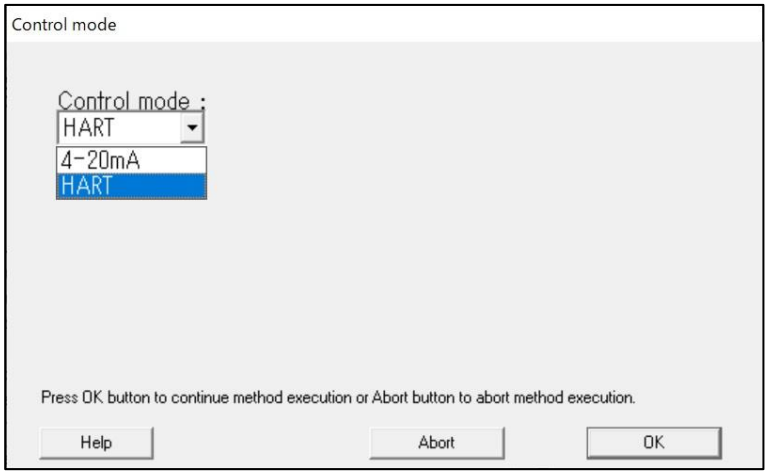
MENU)
View > Device Root Menu > Extended menu > Setup >Function select > Authority > Control mode



① Select 'Function select' and press 'Control mode'.



② Select 'Write' and press 'OK'.



③ Select 'HART' and press 'OK' to set.
.

※When conduct operation with a 4-20mA input signal, select 4-20mA.

4.3.2. Basic setup

Set the basic items required for control with the positioner. Be sure to do this before performing the tasks in the next section.

Table 4.3.2 Basic setup parameters

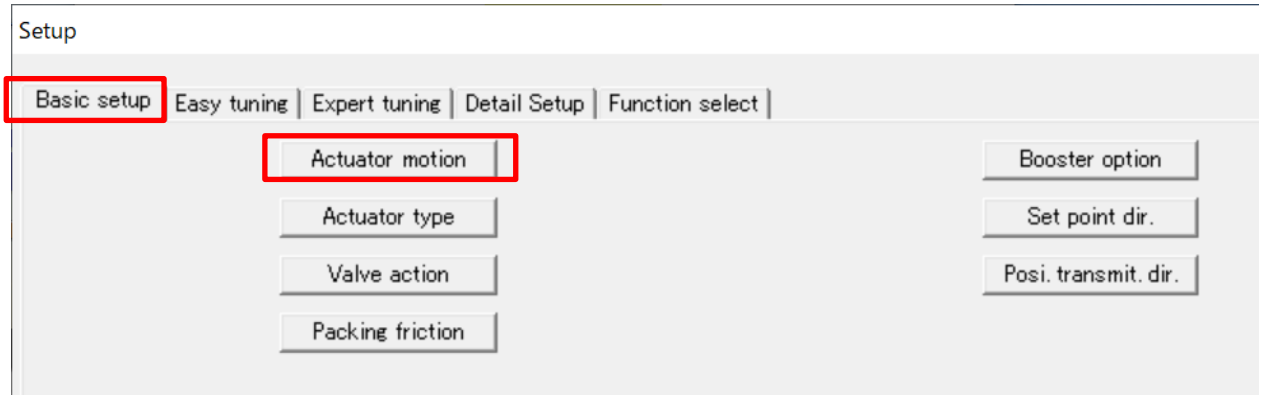
Key menu	Description	Parameters	Default
Actuator motion	Set stem motion type of a actuator	Linear / Rotary	※1
Actuator type	Set acting type of a actuator Single acting actuator : Single Double acting actuator : Double KOSO high power actuator : 5300	Single / Double / 5300	※1
Valve action	Set direction of a valve when Pout1 is output Air to Open : ATO Air to Close : ATC	ATO / ATC	ATO
Packing friction	Set packing material used for valve body Low friction material such as PTFE, etc.：Low High friction material such as GRAFOIL, etc.：High	Low / High	Low ※2
Booster option	Set the presence of booster Absence of booster：Without Presence of booster：With ※Unavailable setup right now on February, 2022	Without / With	Without
Set point dir.	Set the direction to convert 4-20mA input signals to the percentage Normal：4mA=0%，20mA=100% Reverse：4mA=100%，20mA=0%	Normal / Reverse	Normal
Posi. Transmit.dir.	Set the direction to convert input signal to the percentage of the transmitter output signal Normal：0%=4mA，100%=20mA Reverse：0%=20mA，100%=4mA	Normal / Reverse	Normal

※1・・・The parameters setup is carried out according to the specified model code at the factory.

※2・・・When the factory mounts the positioner on the actuator, the parameters setup is carried out.

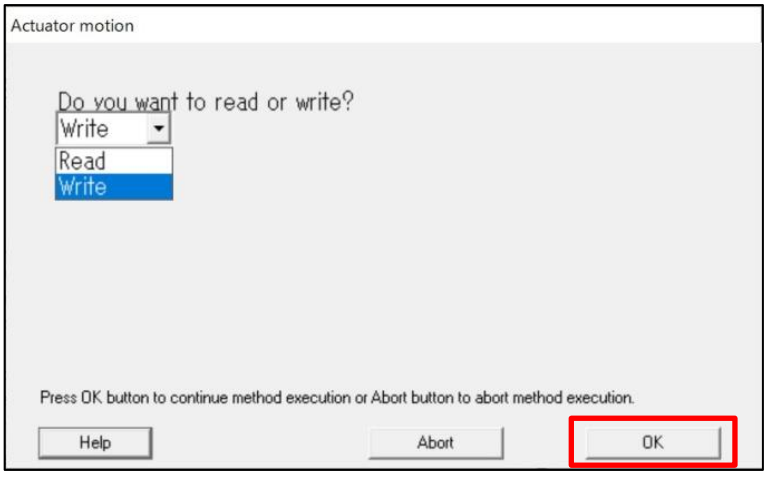
For example, Actuator motion setup procedure is shown as below.

MENU) *View > Device Root Menu > Extended menu> setup > Actuator motion*

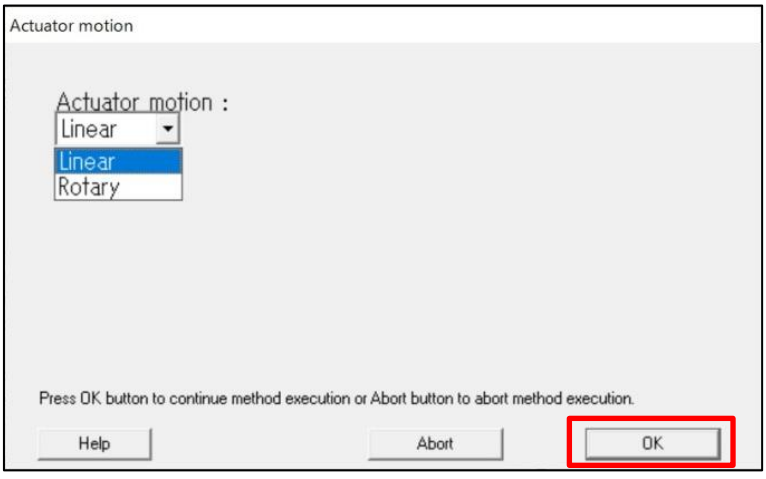


① Select 'Basic Setup'

② Select 'Actuator motion'



③ Select 'Write' and press 'OK'



④ Select 'Linear' or 'Rotary', and press 'OK' to set

4.3.3. Easy tuning

Caution

- HART communication takes more time than the operation using the LUI of this unit, so make sure that the operation is completed.

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 and setting of other parameters necessary to control.

Note

Before performing this operation (easy tuning), all parameters of basic setup described in section4.3.2 must be configured. If wrong parameters were configured, it is possible to choose unsuitable PID parameters.

4.3.3.1. Full auto tuning

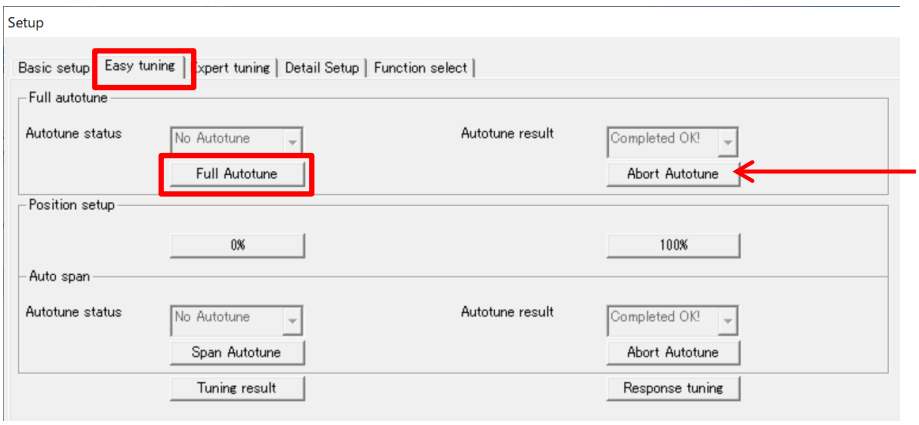
While performing a sequence of operations, it configures automatically settings such as detection and calibration of zero/span, selection of suitable PID parameters to apply the control, detection and calibration of IP signal current bias.

Note

The configuration time varies with actuator size.

1) Execute full autotune

MENU) *View > Device Root Menu > Extended menu> setup > Easy tuning > Full autotune*



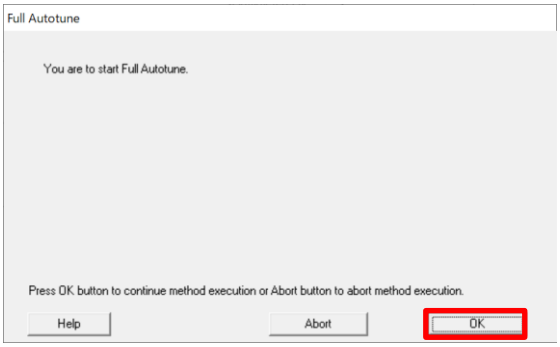
① Select 'Easy tuning' and press 'Full Autotune'.

※ To abort autotune, press 'Abort Autotune'.

The progress are shown as below.

Autotune status: In-progress autotune status.

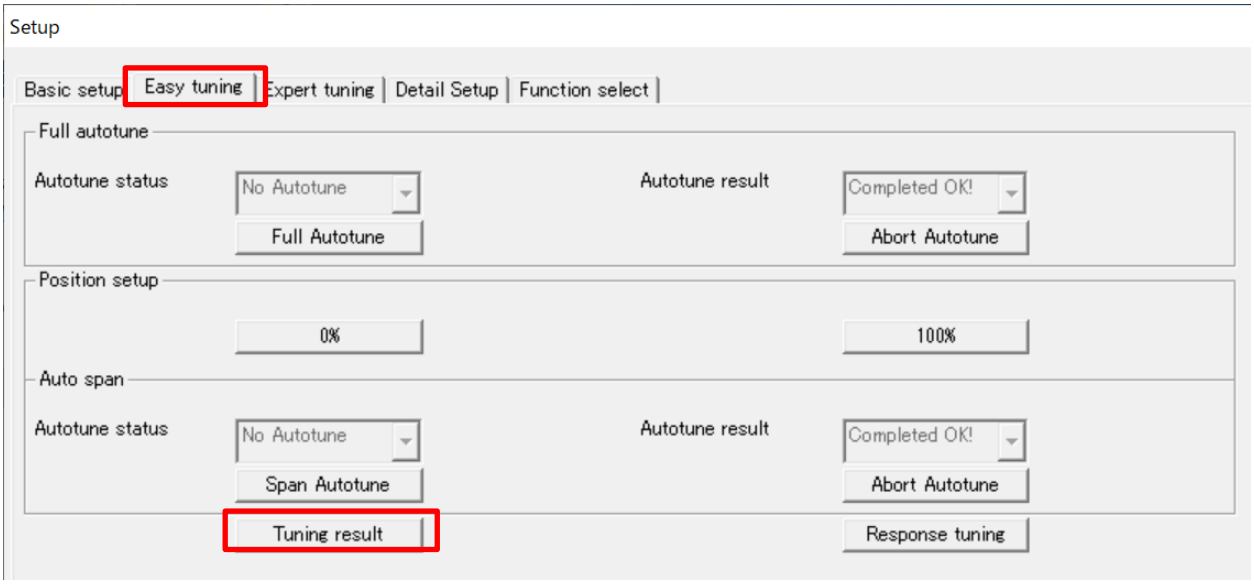
Autotune result: Autotune execution result . (Display error, if there is.)



② Press 'OK' to execute.

2) Confirm the result of the execution (full autotune)

MENU) *View > Device Root Menu > Extended menu> setup > Easy tuning > Full autotune*



① Press 'Tuning result'

① Press 'OK' on confirmation screen.

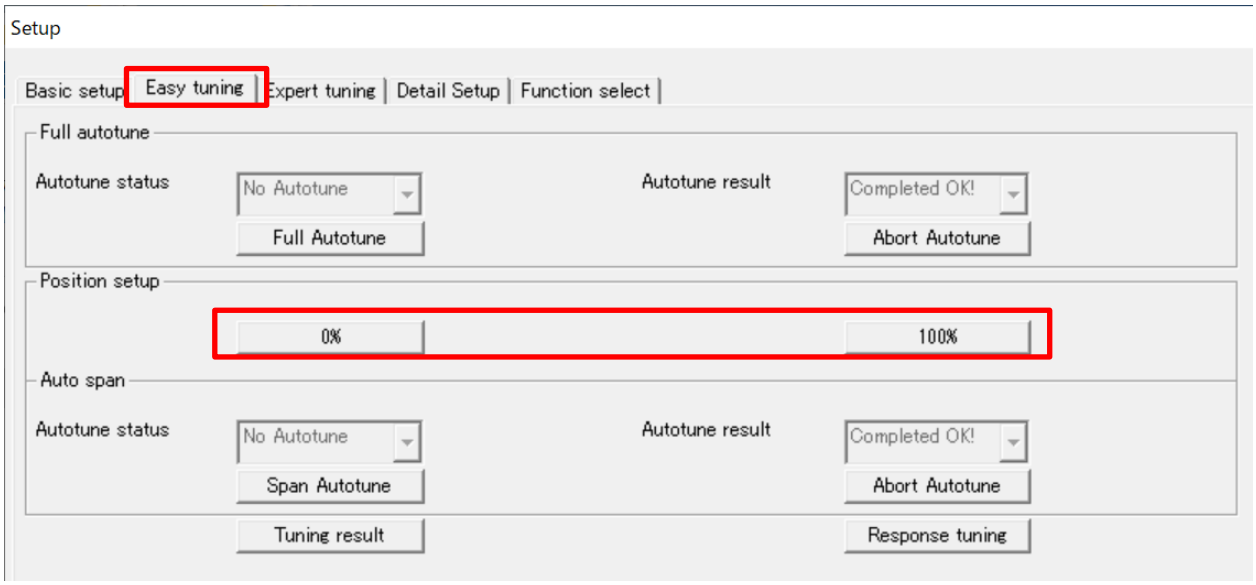
4.3.3.2. Position setup

It is possible to perform Zero/span settings independently, otherwise full autotune. There are two different ways of Zero/span settings whether to specify Zero/span manually or to determine these automatically.

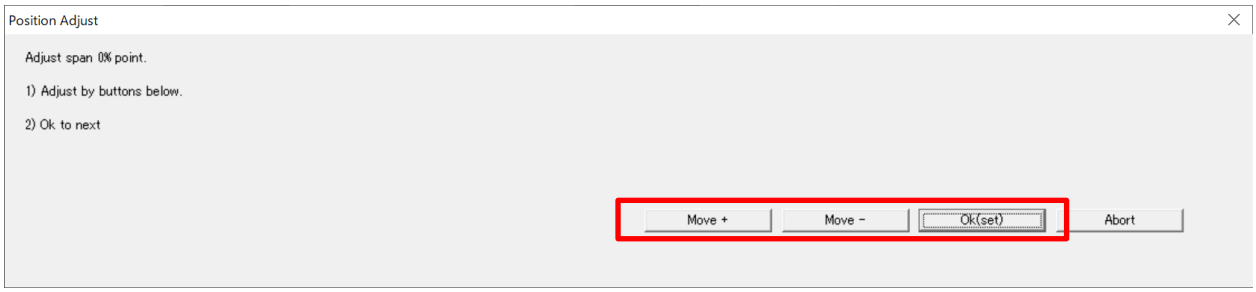
1) Manual calibration

MENU)

View > Device Root Menu > Extended menu> setup > Easy tuning > Position setup > 0% or 100%MENU >



① Select '0%' or '100%'

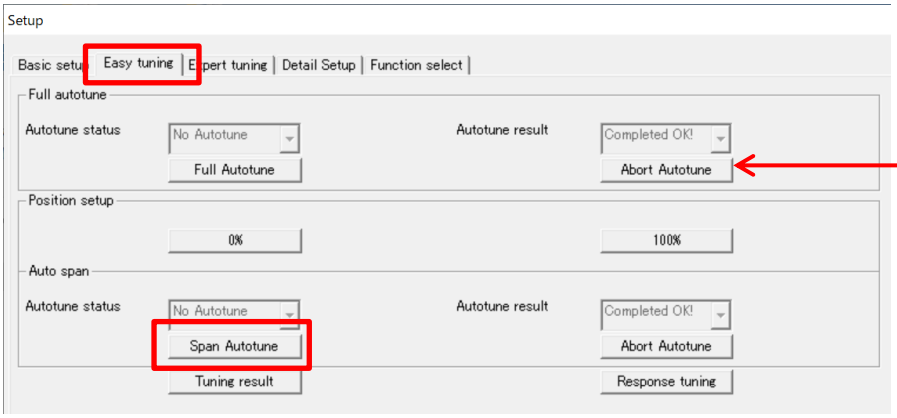


① Press the 'Move-' or 'Move+' to adjust 0% or 100% position of the valve travel.

② Press 'OK(set)', to set the position as 0% or 100% point of the valve travel.

2) Auto span

MENU) *View > Device Root Menu > Extended menu> setup > Easy tuning > Position setup > Auto span*



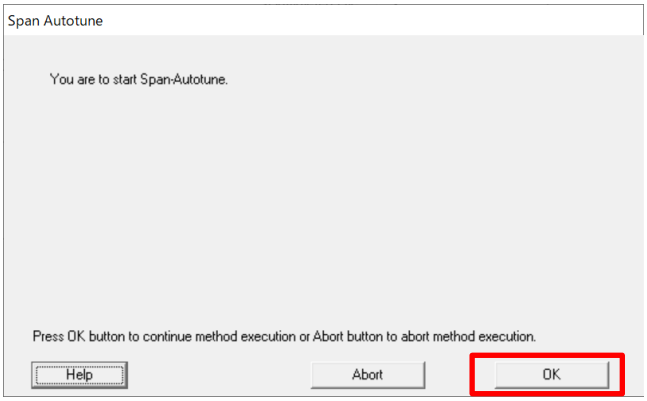
① Select 'Easy tuning' and then 'Span Autotune'.

※To abort autotune, select 'Abort Autotune'.

Progress are shown as below.

Autotune status: In-progress autotune status.

Autotune result: Autotune execution result. (Display error, if there is)



② Press 'OK' to execute.

4.3.3.3. Response tuning

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

MENU) *View > Device Root Menu > Extended menu> setup > Easy tuning > Response tuning*

A. In case the higher response sensitivity is desired,
i.e., you wish to reduce response time by making the response quicker,
Select 'Aggressive' from 'Response tuning' menu 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 'Stable' from 'Response tuning' menu 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 standard settings
Select 'Normal' from 'Response tuning' menu.

4.3.4. Expert tuning

Caution

- HART communication takes more time than the operation using the LUI of this unit, so make sure that the operation is completed.

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.

4.3.4.1. PID parameter set

MENU) *View > Device Root Menu > Extended menu> Setup >Expert tuning > PID parameter set*

Caution

- If you 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.

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

Parameter sets corresponding to maximum seven ranks defined as XS, SS, S, M, L, LL, XL are prepared previously in an ascending order of the proportional gain. Select the parameter set as necessary. If parameters are need to be specified individually through custom setting, select 'custom' menu.

To increase response sensitivity：select PID parameter set with higher proportional gain

To decrease response sensitivity：select PID parameter set with lower proportional gain

Table 4.3.4.1. Correspondence table between rank and each actuator size（※）

Rank	5200LA	6300LA	63D0RC(6300RB)	5300LA
XS	Φ218	Φ150	AT201U	-
SS	Φ270	Φ150	AT251U,AT301U	Φ270S
S	Φ270,Φ350	Φ200	AT351U,AT401U	Φ270S,Φ270L,Φ350S
M	Φ350,Φ450S	Φ300	AT451U,AT501U	Φ350S,Φ350L,Φ450S
L	Φ450S	Φ450	AT551U,AT601U	Φ450S,Φ450M,Φ450L
LL	Φ450L	Φ450,Φ600S	AT651U,AT701U	Φ450M,Φ450L
XL	Φ650	Φ450L,Φ600		-

※・・・Corresponding parameters may change due to differences in actuator stroke and air supply pressure.

4.3.4.2. Custom setting for PID parameter

Caution

- If you change the value of each parameter significantly, unexpected behavior (response is too slow, response is too fast) may occur, so please perform thorough testing in advance to 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.

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

Table 4.3.4.2. Customizable PID parameters

	Category	Type of pressure action	Description and applicable conditions	Value range
P D I	Outside parameter	Air-IN (Increase in output pressure)	When deviation is |e|≥b and Po1 output pressure increases, these parameters will be applied. P: Proportional gain, D: Derivative gain, I: Integral gain	0.1～99.9
rP rD rI		Air-OUT (Decrease in output pressure)	When deviation is |e|≥b and Po1 output pressure decreases, these parameters will be applied. rP: Proportional gain, rD: Derivative gain, rI: Integral gain	
Inside P Inside D Inside I	Inside parameter	Air-IN (Increase in output pressure)	When deviation is |e|≤b and Po1 output pressure increases, these parameters will be applied. Inside P: Maximum proportional gain, then, P(e)=Inside P+(P-Inside P)*e/b Inside D: Maximum derivative gain, then, D(e)=Inside D+(D-Inside D)*e/b Inside I: Integral gain	0.1～99.9
Inside rP Inside rD Inside rI		Air-OUT (Decrease in output pressure)	When deviation is |e|≤b and Po1 output pressure decreases, these parameters will be applied. Inside rP: Maximum proportional gain, then, rP(e)=Inside rP+(rP-Inside rP)*e/b Inside rD: Maximum derivative gain, then, rD(e)=Inside rD+(rD-Inside rD)*e/b Inside rI: Integral gain	
b			Set the deviation to switch between outside parameters and inside parameters, and which will be used to optimize the response. IF b is set to zero (0), the outside parameters are valid only.	0～10%

※Outside parameter means the parameters which are used when deviation is |e|≥b.
※Inside parameter means the parameters which are used when deviation is |e|≤b.

If 'b' parameter is set, Gain P(e) is switched as shown below.

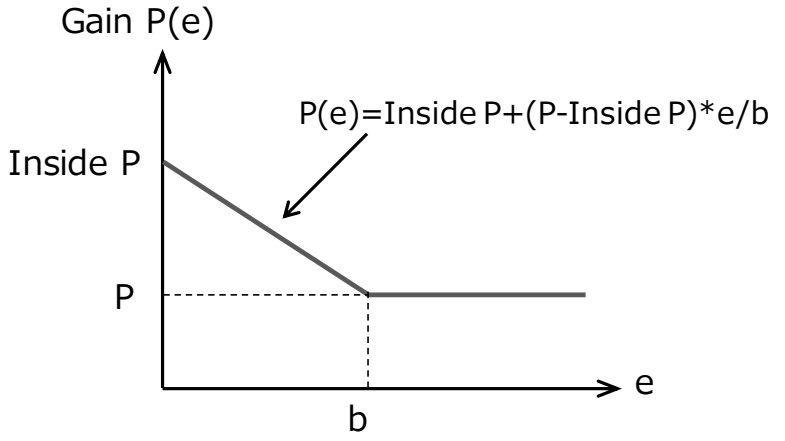
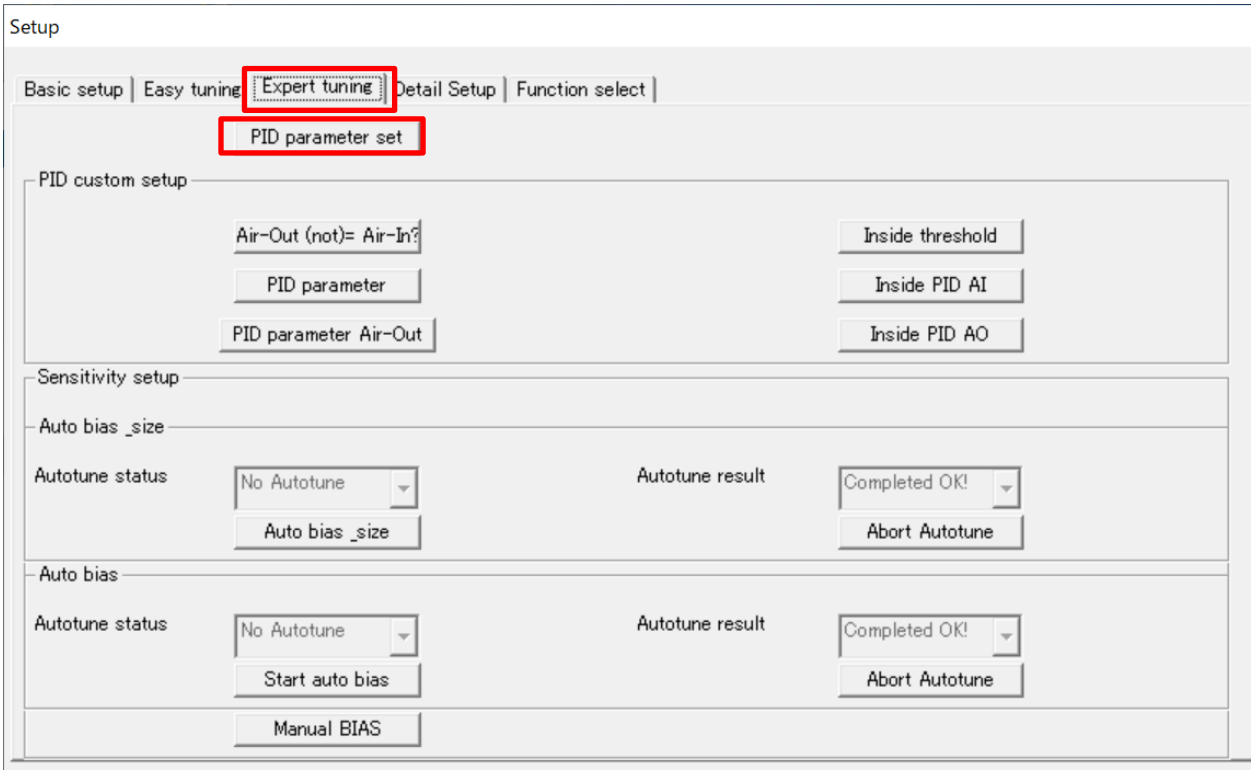


Figure 4.3.4.2. Gain switching (Example of proportional gain)

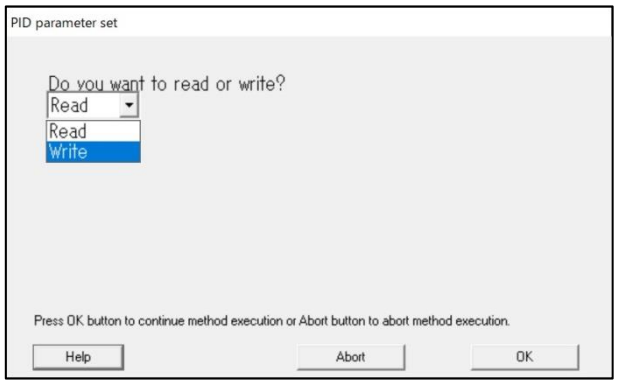
The procedure is shown as followings.

1) Set PID parameter set to 'Custom'

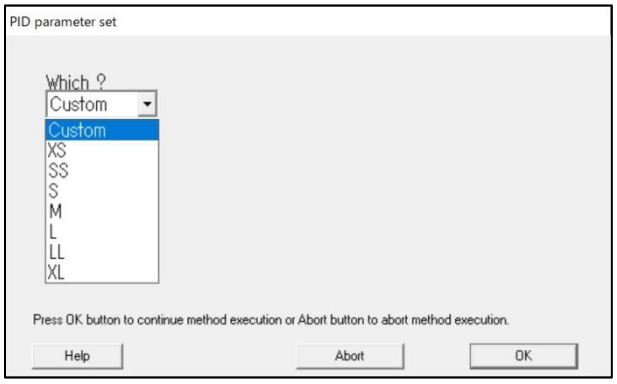
MENU) *View > Device Root Menu > Extended menu> Setup >Expert tuning > PID parameter set*



① Select 'PID parameter set'



② Select 'Write' and press 'OK'

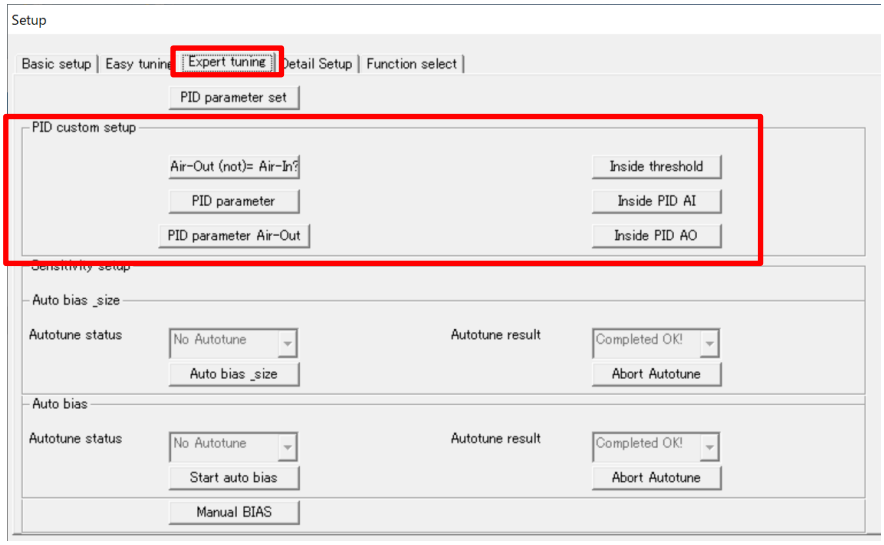


③ Select 'Custom' and press 'OK' to set.

2) Set PID custom setup parameters

※If any other submenu except 'Custom' was selected in PID parameter menu, the value of parameters cannot be changed through the following procedure.

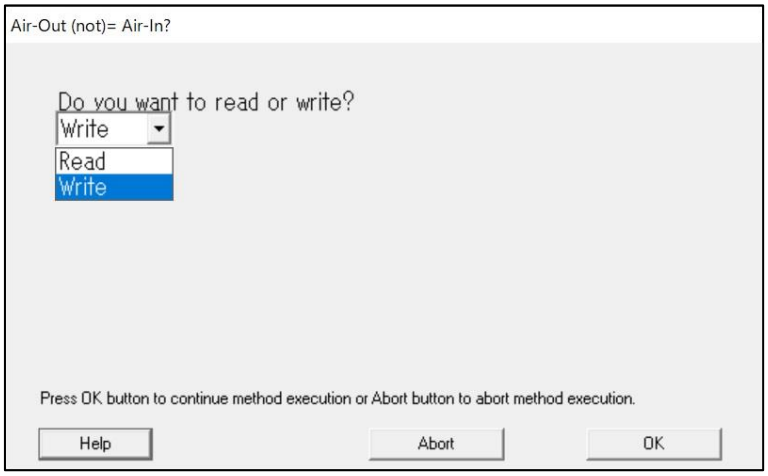
MENU) *View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup*



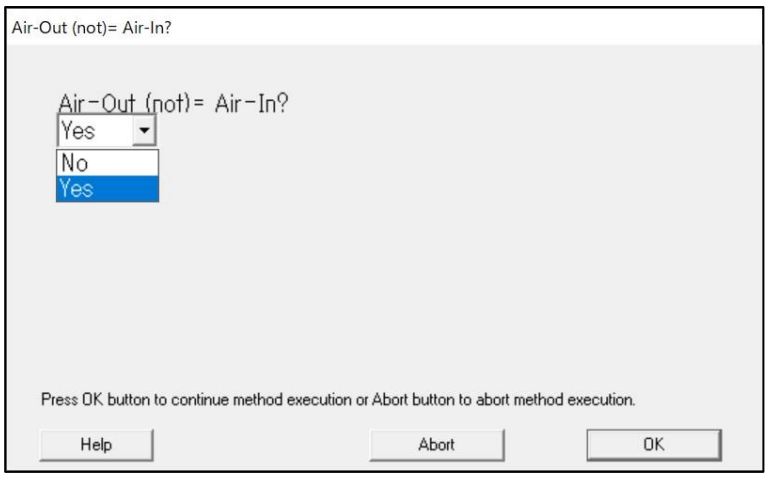
Select 'Expert Tuning' and select the item to be changed in 'PID Custom Settings'.

2-1) Set 'Air-Out (not)= Air-In?'.
Select whether or not Air-Out (decrease in output pressure) is same with Air-In (increase in output pressure).

MENU) *View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup > Air-Out (not)= Air-In?*



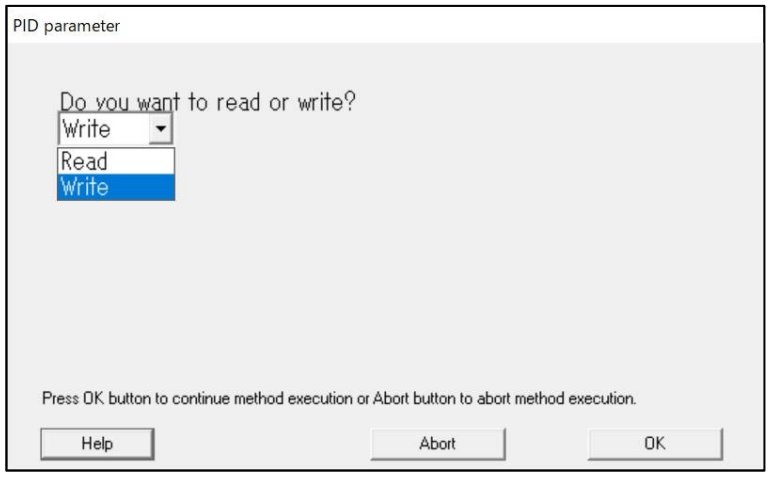
① Select 'Write' and press 'OK'



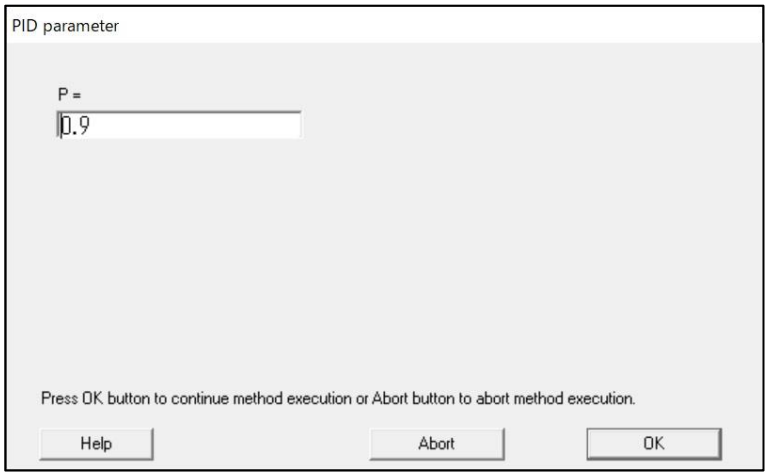
② Select 'Yes' or 'No', and press 'OK' to set.

2-2) Set PID parameter of Air-In.

MENU) *View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup > PID parameter*

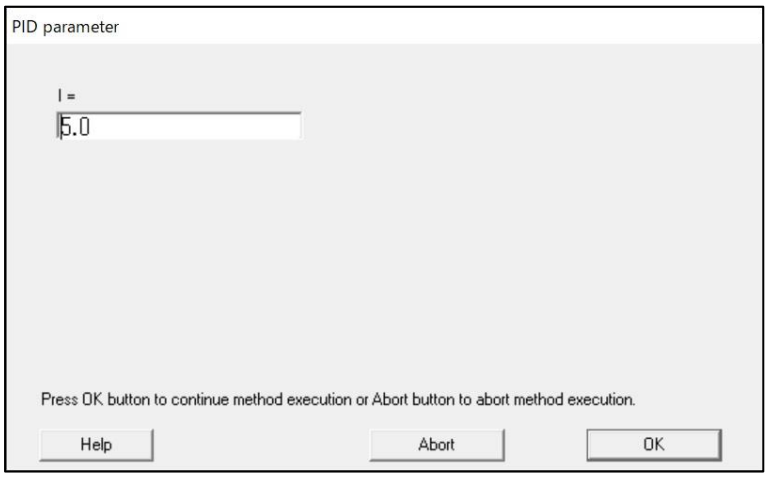


① Select 'Write 'and press 'OK'



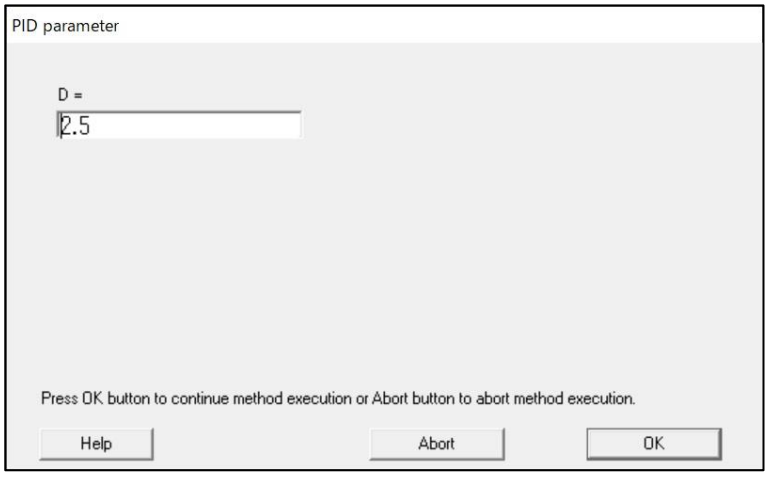
② Input a P value of Air-In.

③ Press 'OK'



④ Input a I value of Air-In.

⑤ Press 'OK

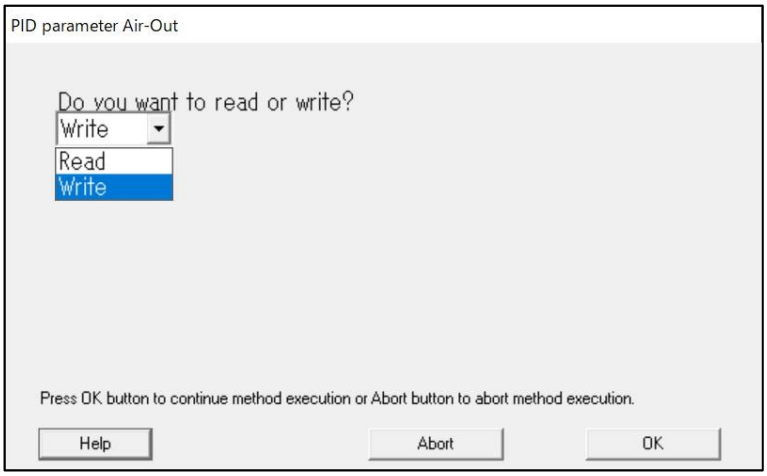


⑥ Input a D value of Air-In.

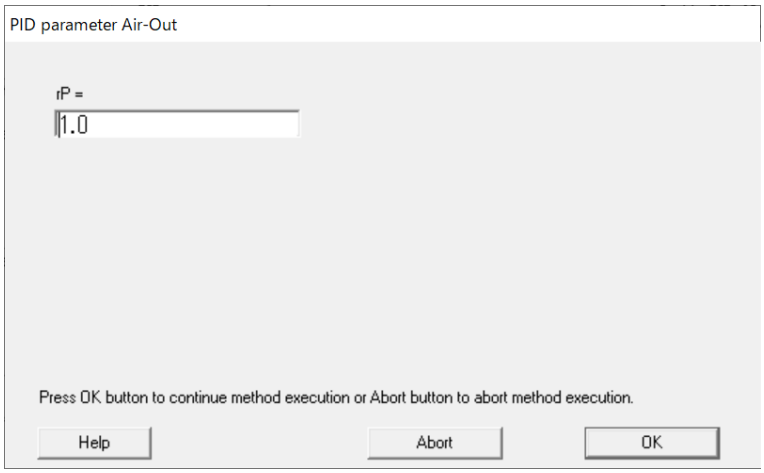
⑦ Press 'OK' to set.

2-3) Set PID parameter Air-Out.

MENU) *View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup > PID parameter Air-Out*

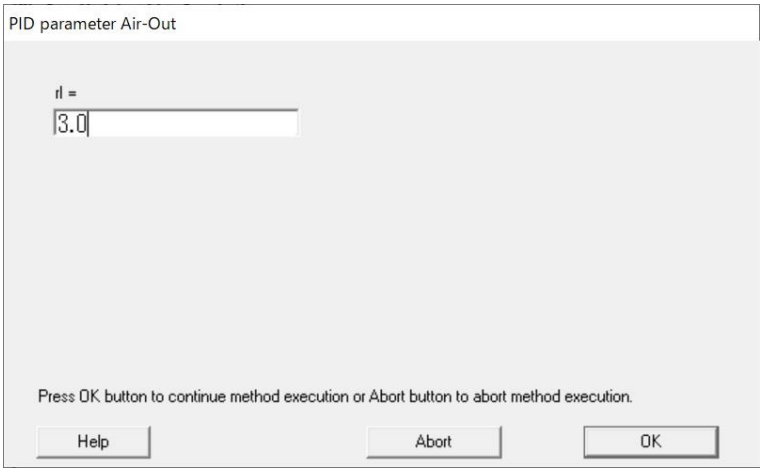


① Select 'Write' and press 'OK'



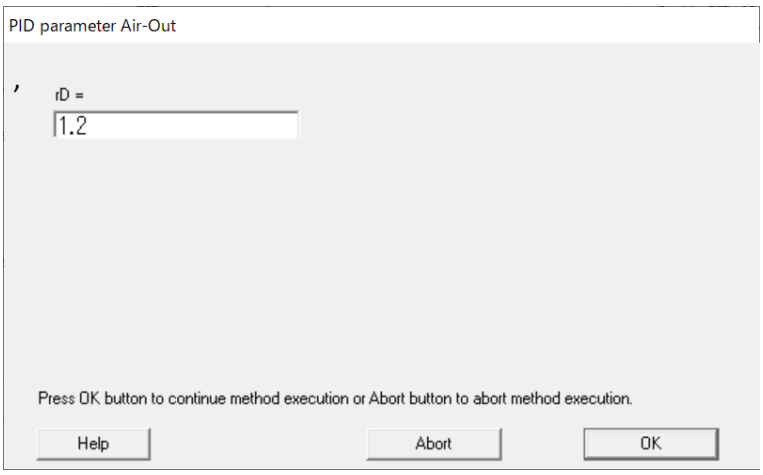
② Input an rP value of Air-Out.

③Press 'OK'



④ Input a rI value of Air-Out.

⑤ Press 'OK'

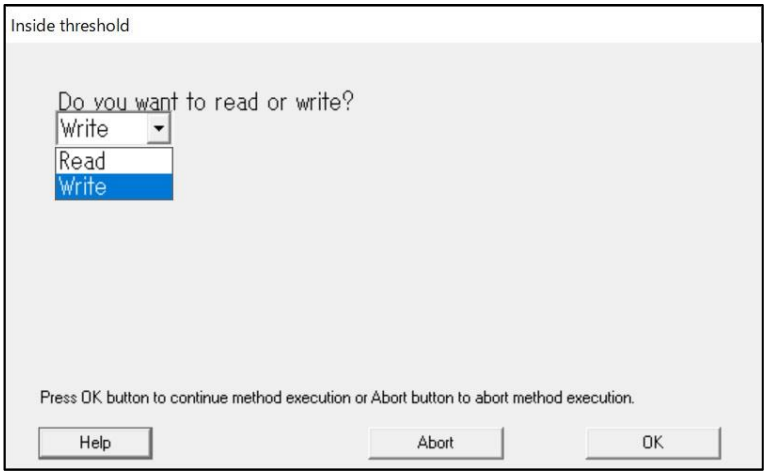


⑥ Input a rD value of Air-Out.

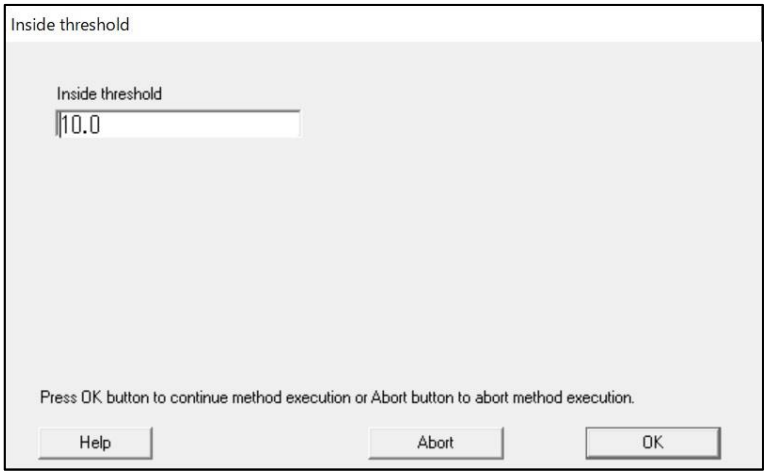
⑦ Press 'OK' to set.

2-4) Set inside threshold value.

MENU)
View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup > Inside threshold



① Select 'Write' and press 'OK'

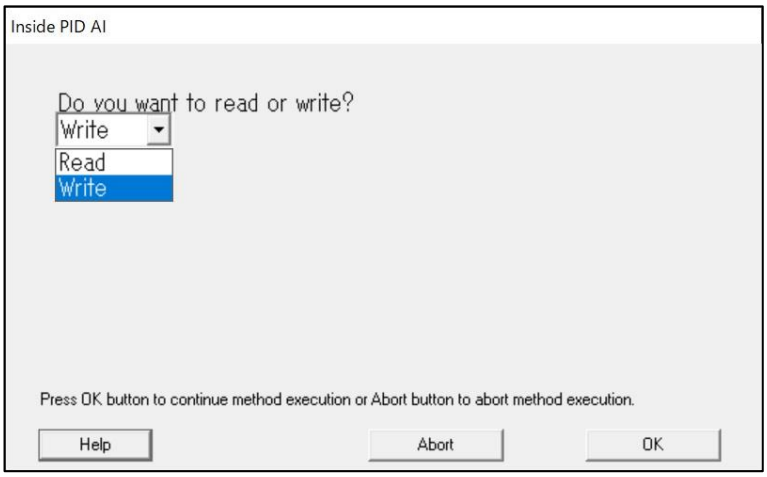


② Input an inside threshold value.

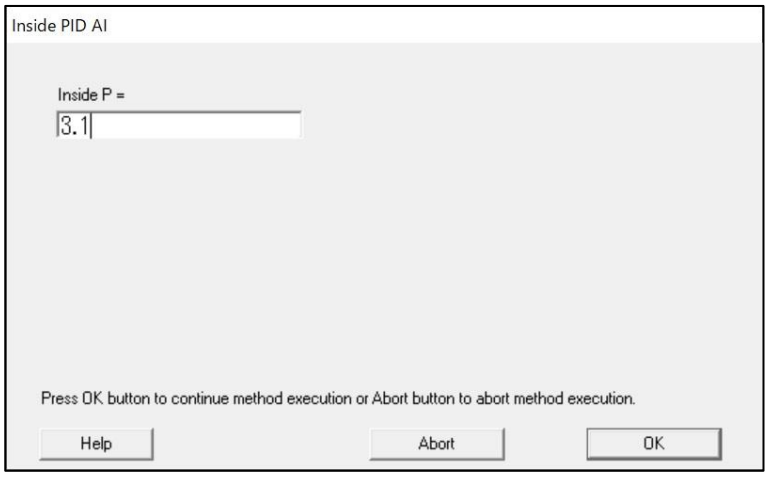
③ Press 'OK' to set.

2-5) Set inside PID Air-In.

MENU)
View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup > Inside PID AI

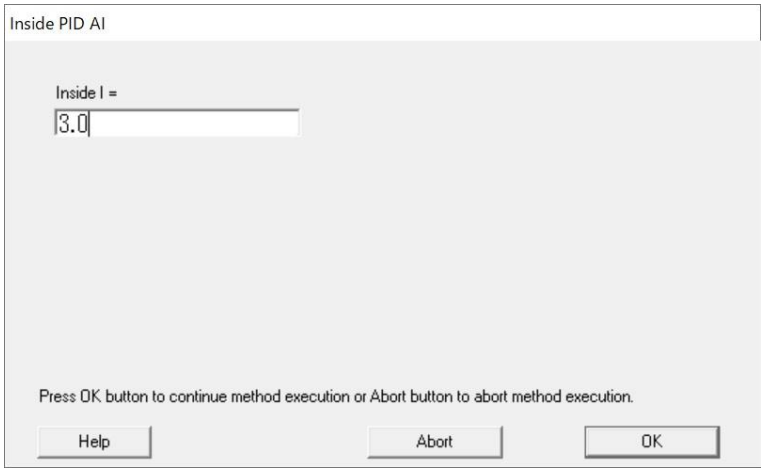


① Select 'Write' and press 'OK'



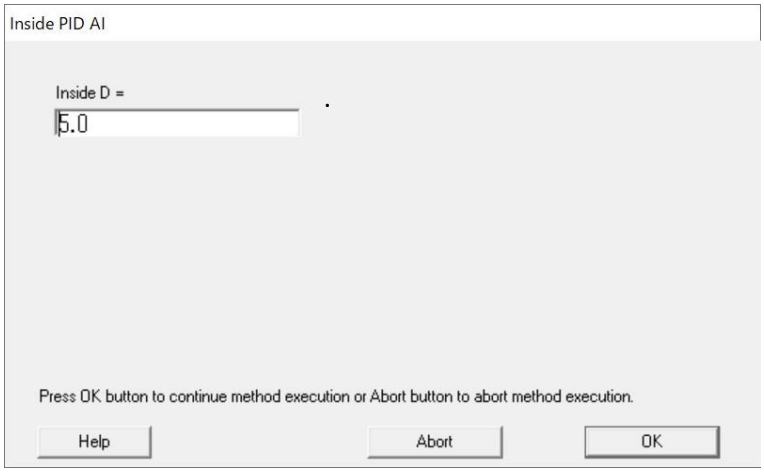
② Input a inside P value of Air-In.

③ Press 'OK'



④ Input a inside I value of Air-In.

⑤ Press 'OK'



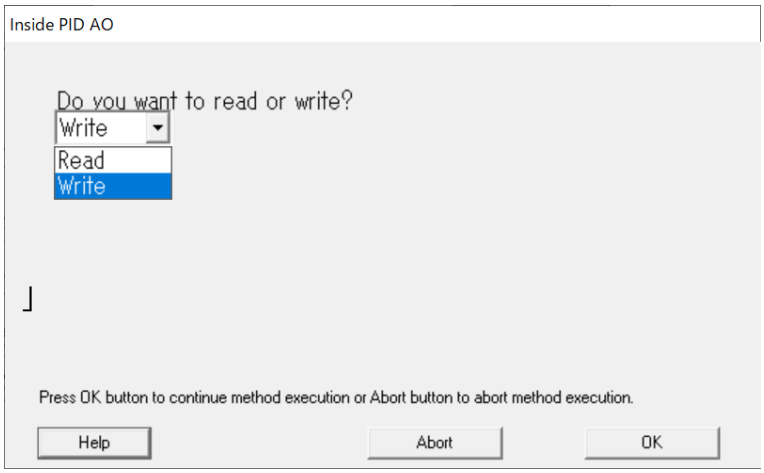
⑥ Input a inside D value of Air-In

⑦ Press 'OK' to set.

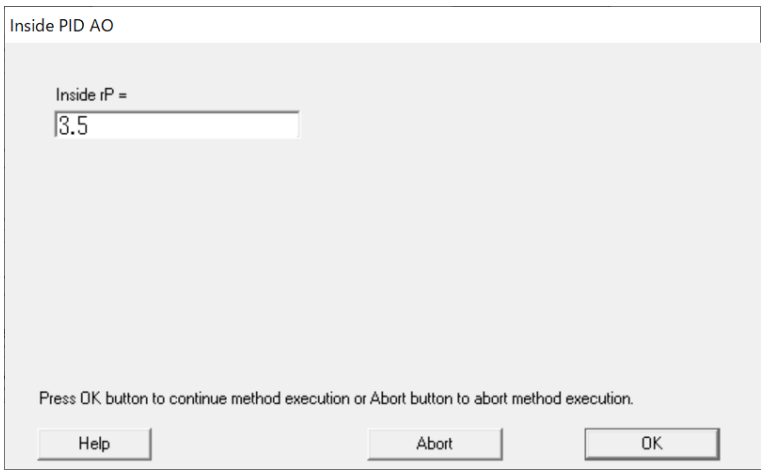
2-6) Set inside PID Air-Out parameters

MENU)

View > Device Root Menu > Extended menu> setup > Expert tuning > PID custom setup > Inside PID AO

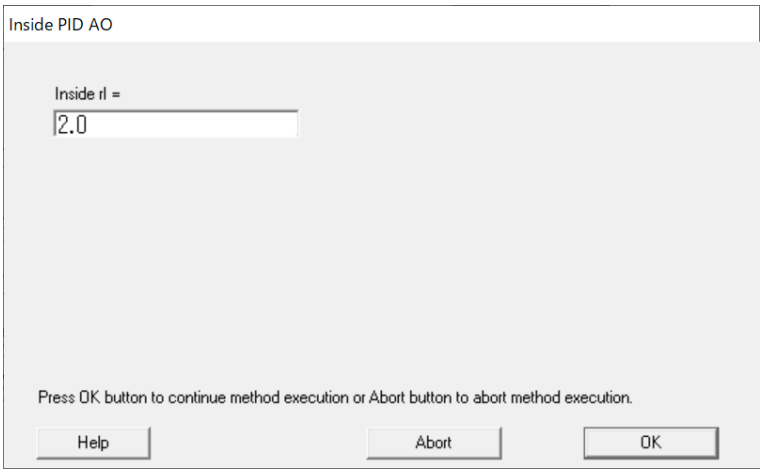


① Select 'Write' and press 'OK'



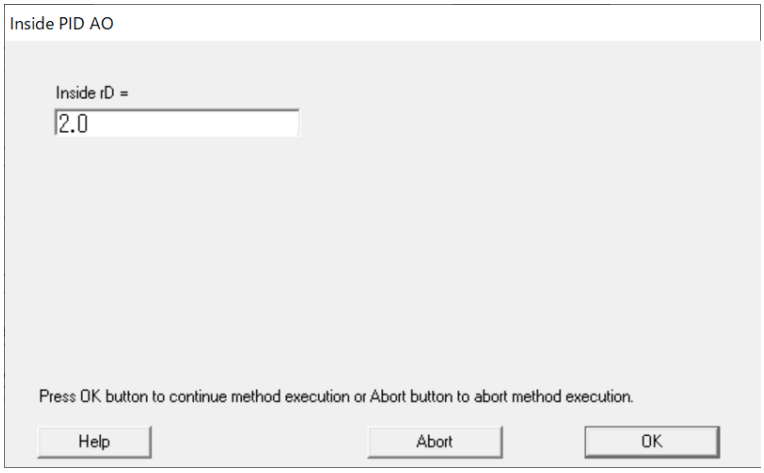
② Input an inside rP value of Air-out.

③ Select press'OK'



④ Input a inside rI value of Air-out.

⑤ Press 'OK'



⑥ Input a inside rD value of Air-out.

⑦ Press 'OK' to set.

4.3.4.3. 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.
There are two different ways whether to determine IP signal current bias automatically or to specify it manually.

1) Auto setup

View > Device Root Menu > Extended menu> setup > Expert tuning > Sensitivity setup

A. Set IP signal current bias and PID parameters together.
Sensitivity setup > Auto bias & size select

B. Set IP signal current bias only.
Sensitivity setup > Auto bias

2) Manual setup

View > Device Root Menu > Extended menu> setup > Expert tuning > Sensitivity setup > Manual Bias

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

4.3.5. Error messages

If the problems cause during the operations such as full auto tune (Section 4.3.3.1), position setup 2) auto setup (Section 4.3.3.2), IP signal bias 1) automatic setting (Section 4.3.4.3), the following error messages will be displayed. and the performance will be stopped.

Table 4.3.5 List of error messages

Code	Error description and solution	
Error at closing	Meaning	**It does not reach the 0% travel position or steady state.**
	Possible causes	Lack in off-balanced pressure
	Solution	Confirm off-balanced pressure
Error at opening	Meaning	**It does not reach 100% travel position or the steady state.**
	Possible causes	Decrease or pulsation in supply pressure
	Solution	Confirm the supply pressure
Error at stopping	Meaning	**It does not reach IP signal bias value (point) or the steady state**
	Possible causes	Limit cycle causes by large packing friction Limit cycle causes by the fall of the tension spring
	Solution	➢ Set dead band or confirm the tension spring ➢ After changing the suitable PID parameters, perform the auto setup of position setup and IP signal bias.
Error at span measurement	Meaning	**It does not reach the span position (point).**
	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.

4.3.6. Detailed setup

Caution

- HART communication takes longer than the operation using the LUI of this unit, so be sure to complete the operation.

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

MENU) *View > Device Root Menu > Extended menu> setup > Detailed setup*

Table 4.3.6 Item list of the detailed setup

Key menu	Description	Parameters	Default
Cutoff	Set the control range which tracks the input signal 0% : If the input signal is lower than this value, IP signal will be cutoff to the low side. The range of values available is 0.1~50.0%. 100% : If the input signal is higher than this value, IP signal will be cutoff to the high side. The range of values available is 50.0~99.9%. ※1 The parameters setup is carried out according to the specified model code at the factory. Linear actuator : 0.5% at the 0% side Disable at the 100% side Rotary actuator : 0.5% at the 0% side 99.5% at the 100% side ※Choose either one Cutoff or Limit as shown below	Value/Disable	※1
	Handling precautions Be sure to use the cutoff setting if you want to control the mechanical hit position as 0% or 100%.		
Limit	Set high and low limit percentage of input signal which the positioner may recognize 0% : This value is a low limit above which the input signal is in effect. The range of values available is 0.1~50.0%. 100% : This value is a high limit below which the input signal is in effect. The range of values available is 50.0~99.9%. ※Choose either one Cutoff as shown above or Limit	Value/Disable	Disable
Dead band	Set the deviation value below which the integral action is disabled.	Value/Disable (0.1~2.0%)	Disable
Transfer function	Set the type of the flow characteristic curve Linear：Linear characteristics Equal percent Low : Low equal percentage characteristics (Rangeability 30:1) Equal percent Mid : Middle equal percentage characteristics (Rangeability 50:1) Equal percent Hig :	As shown on the left	Linear

Key menu	Description	Parameters	Default
	High equal percentage characteristics (Rangeability 100:1) Quick opening : Quick opening characteristics (Rangeability 30:1) Custom curve: Customized characteristics ※In case of using equal percent characteristic besides the rangeability mentioned above, input the value directly to “Range ability”.		
Custom curve set	Set the flow characteristic curve by specifying arbitrary 20 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.	Value/Unused	Unused
Range ability	Specify a rangeability in relevant to the equal percentage characteristic curve. ※This setup is available on condition that the equal percentage characteristics from’ flow characteristic curve’ menu was selected previously. ※If the rangeability is set to 1, it becomes the value of each equal percent characteristics.	Value	1
Input damper	Set the damping coefficient to the input signal. As the value becomes lager, the response becomes slower because the primary delay time constant becomes larger.	Value/Unused (0.1~99.9%)	Unused
Split range	Set the input current value corresponding to 0% and 100% position. Example 1) If 0% is set to 4mA, 4mA becomes 0% input signal. If 100% is set to 12mA, 12mA becomes 100% input signal. Example 2) If 0% is set to 8mA, 4mA becomes 0% input signal . If 100% is set to 16mA, 16mA becomes 100% input signal.	0%/100%	0%=4mA 100%=20mA
PT burnout dir.	Set the burnout direction of output transmitter, when the alarm is activated. Low setting： When the current is lower than 3.6mA, the lower current (burnout signal) will flow	Low/High	Low

Key menu	Description	Parameters	Default
	High setting： When the current bigger than 21mA, the bigger current (burnout signal) will flow ※ If the input signal is zero, the current of Lo setting will flow regardless of above setting.		
AT span limit	Set the full mechanical limit of valve travel over the 100% travel position, when the positioner detects the 100% travel position. ※This value is valid only in condition when 'Linear' from 'actuator motion' menu is selected on the basic setup.	Value (100~150%)	105%
	⚠ Handling precautions When setting the overstroke value to 100%, be sure to enable the setting on the Cutoff 100% side. By setting the value according to the actuator, you can save the time of adjusting the span from the next time onward.		
Integ. stop press	When the supply air pressure falls below the set threshold value, the correction operation by integration is stopped. ※However, regardless of the setting, the integral correction operation stops at 10kPa or less.	Value/Unused (0~999kPa)	Unused

4.3.7. Function select

You can individually set permissions, control modes, password settings, screen savers, temperature units, and pressure units.

MENU) *View > Device Root Menu > Extended menu> setup > Function select*

Table4.3.7 List of selectable functions

Key menu	Description	Parameters	Default
Authority > Authority	Set access permission to HART communication. Select 'HART' in case in which settings should be configured via HART communication. To change authority to 'HART', LUI(LCD) screen should be top menu, alarm status menu or information menu and below. Once HART is selected, only 'Information' from 'TOP' menu will be able to be accessed through LUI(LCD).	LCD / HART	LCD
Authority > Control mode	Set operations permission. Select 'HART' to do operations via HART communication.	4-20mA / HART	4-20mA
Password setup	Set password. Once the password is set, only 'Information' from 'TOP' menu will be able to be accessed unless you	Three-digit integer	Unused

	type the password. If forgetting the password, please inquire to the business office of this manual end.		
Screen saver	Set the time for screen saver during which the LCD screen display will be turned off. It is possible to extend the life span of the LCD with a limited life by using screen saver.	Value/ Unused	Unused
Temperature unit	Set temperature unit displayed on the LCD.	Celsius / Fahrenheit	Celsius
Pressure unit	Set pressure unit displayed on the LCD.	kPa/bar/psi	※

※・・・The parameters setup is carried out according to the specified model code at the factory.

4.3.8. Memory management

4.3.8.1. Memory save

Save setting data to the memory.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Memory save & res > Save*

To save date, select 'OK' on confirmation screen.

4.3.8.2. Restore memory data

Restore setting data from the memory.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Memory save & res. > Restore*

To restore date, select 'OK' on confirmation screen.

4.3.8.3. Restore factory default

Reset the setting data to factory settings.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Memory save & res. > Factory default*

To restore date, select 'OK' on confirmation screen.

4.4. Maintenance

Warning

- If the exhaust port becomes clogged with contaminants, high pressure will be applied to the front cover. Then, removing it on the positioner causes of hazards. Before removing it, confirm that the exhaust port of the housing is surely opened.
- Always wear protective suit, gloves, and eyeglasses before performing any maintenance operation.

Caution

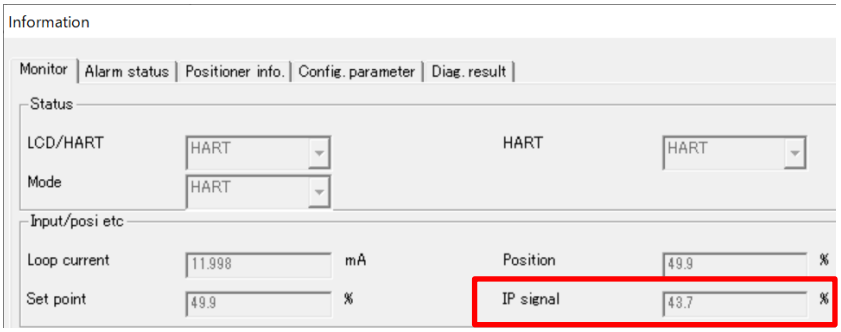
- Don't remove the fall prevention screws from pilot relay, A/M unit.
- HART communication takes longer than the operation using the LUI of this unit, so be sure to complete the operation.

4.4.1. Adjustment · switching

4.4.1.1. Torque motor adjustment

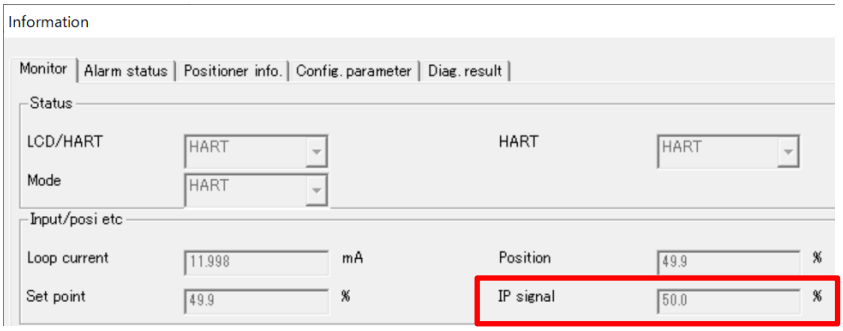
Adjust the gap of nozzle flapper parts, namely, nozzle and nozzle pad.
The procedure is shown as below.

MENU) *View > Device Root Menu > Information >Monitor >Input/posi etc*



① Display 'Input/posi etc' screen.

② Input the signal corresponding to the 50% travel position.



③ While turning the nozzle of the torque motor clockwise or counterclockwise, adjust the value of 'IP signal' to 50±2%. Then, the procedure is now complete.

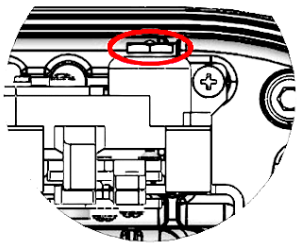


Figure 4.4.1.1 Nozzle adjustment of torque motor

4.4.2. Action switching of pilot relay

The operator can switch the pilot relay between single action mode and double action mode by turning the screw attached to the pilot relay.

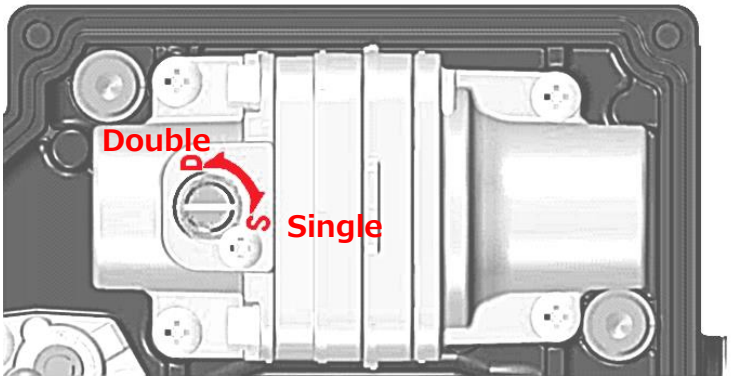


Figure 4.4.2. Action switching of pilot relay

Switching to single action mode;

Turn the switch screw clockwise until it reaches its end position.

Switching to double action mode;

Turn the switch screw counterclockwise until it hits the fall prevention screw.
Since a balance pressure becomes supply pressure at this time, subsequently, the operate need s to perform 「Adjustment of balance pressure」 operation described in next section.

4.4.3. Balanced pressure adjustment of pilot relay

When the pilot relay is used in double action mode, the operator needs to adjust the balanced pressure of the output pressure 1 and 2 by rotating switch screw. When turning the switch screw counterclockwise, the balanced pressure increases. On the other hand when turning the switch screw clockwise, the balanced pressure decreases. Adjust the balanced pressure to 70-80% of the supply pressure.

Once set the following menu shown below, then, you can adjust it while confirming the values of the output pressure 1 and 2.
It should be noted that the larger the actuator, the more it takes time to adjust the pressure.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Calibration > Pilot relay adju.*

Balanced air lower limit: Low limit of balanced pressure.
(70% of the supply pressure)
Balanced air upper limit: High limit of balanced pressure.
(80% of the supply pressure)

P-out1 : The current value of Pout1
P-out2 The current value of Pout2

4.4.4. Calibration

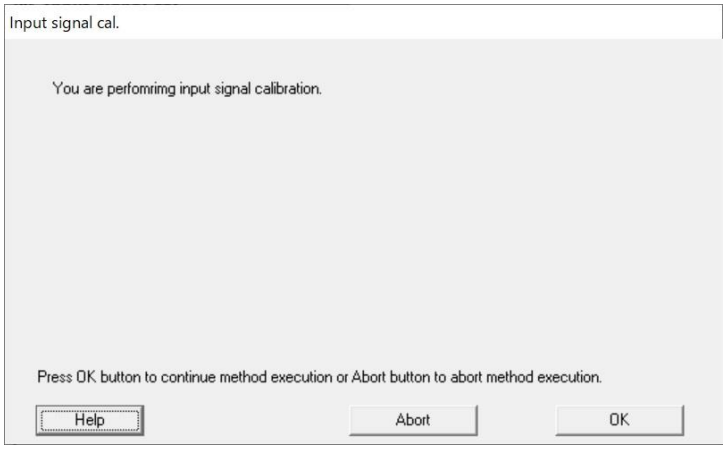
Since the operation described in this section is preset at the factory, generally, it is not necessary to repeat this. However, since there is a case in which a deviation is produced from long-term operation and so on, if necessary, perform this operation.

4.4.4.1. Input signal calibration

Calibrate the value of input signal which the positioner is received.

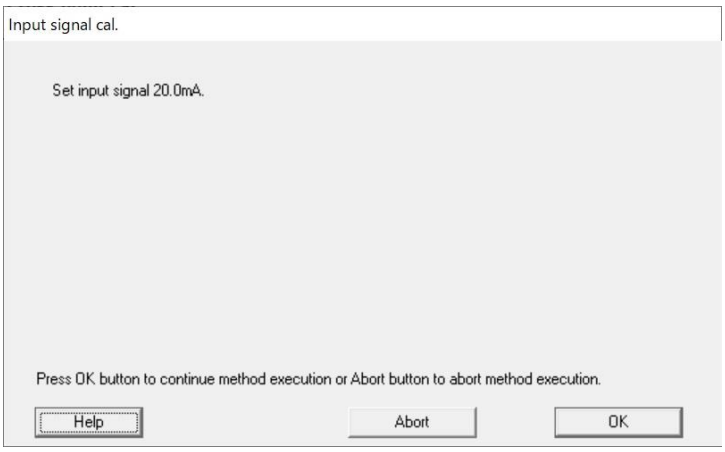
The procedure to calibration each value of 4mA and20mA is shown as below.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Calibration > Input signal cal.*



① Confirm the message and press 'OK'

② Set input signal 4.0mA and press 'OK'



③ Set input signal 20.0mA and press 'OK'

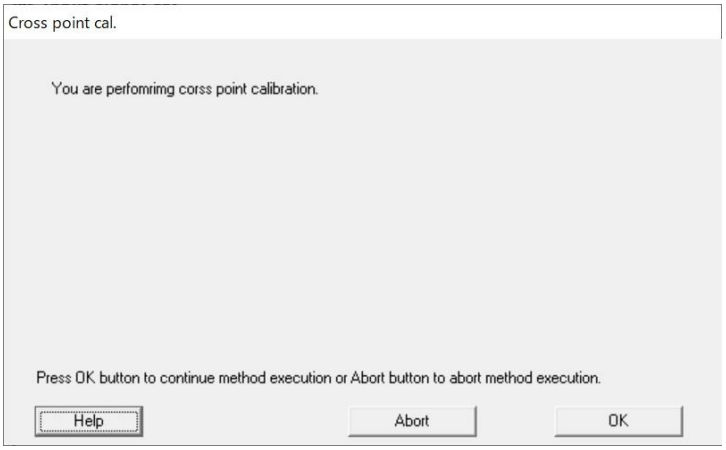
④ If the completion message is displayed, the calibration is completed.

4.4.4.2. Cross point calibration

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

The procedure is shown below.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Calibration > Cross point cal.*



① Confirm the message and press 'OK'

② Press the 'Down' or 'Up' to adjust position.

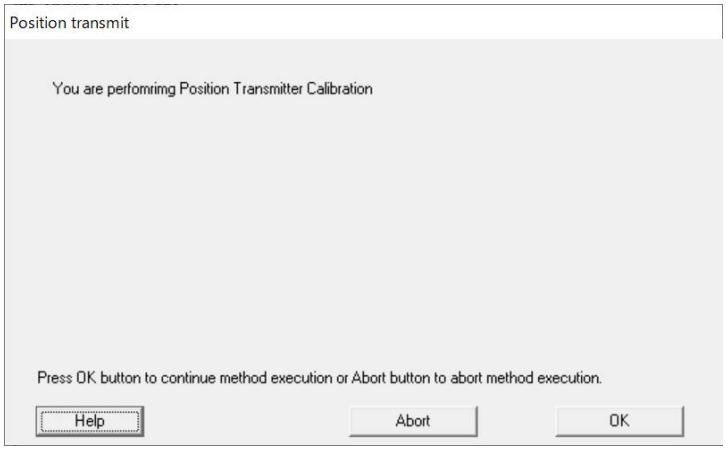
③ Press 'Ok(set)', to set the position as the crospoint.

4.4.4.3. Position transmitter calibration

Calibrate the position transmitter signal which the positioner send.

The procedure to calibrate individually the position transmitter signal of each position in 0% and 100% is shown below.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Calibration > Position transmit cal.*



① Confirm the message and press 'OK'

② Select '0%-side' or '100%-side'.

③ Adjust position transmitter signal by 'Up' or 'Down'.

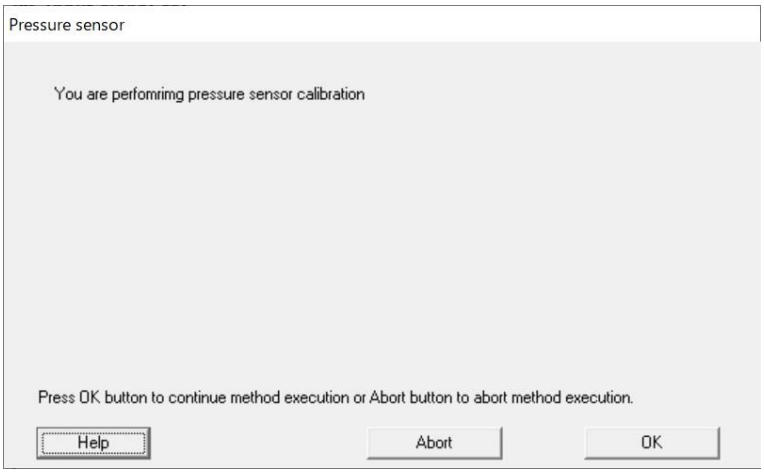
④ Press 'OK' to set.

4.4.4.4. Pressure sensor calibration

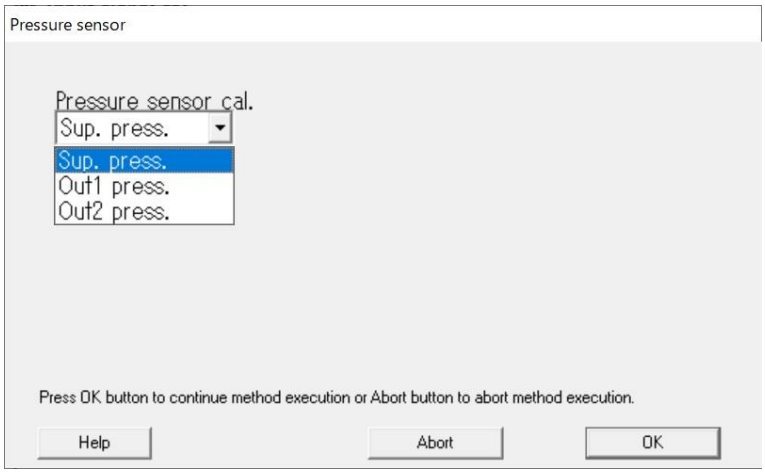
Calibrate three pressure sensors in the positioner. It is necessary to connect the positioner to a pressure measuring device of gauge pressure type which is used for pressure reference. It is required to calibrate both of the first order pressure (lower side) and the second order pressure (upper side) for each sensors.

The procedure to calibrate the supply pressure sensor is showed as below.

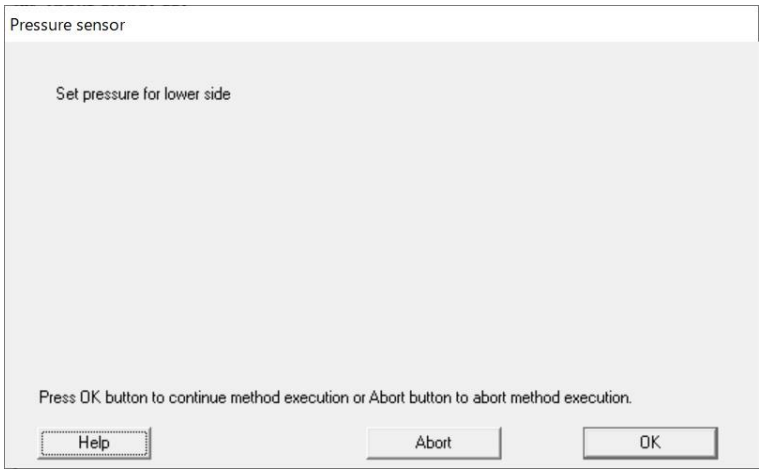
MENU) *View > Device Root Menu > Extended menu> Maintenance > Calibration > Pressure sensor*



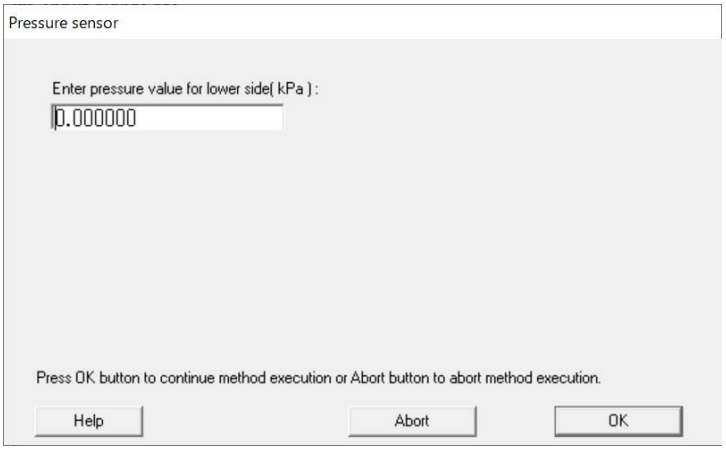
① Confirm the message and press 'OK'



② Select 'Sup. press.' and press 'OK'

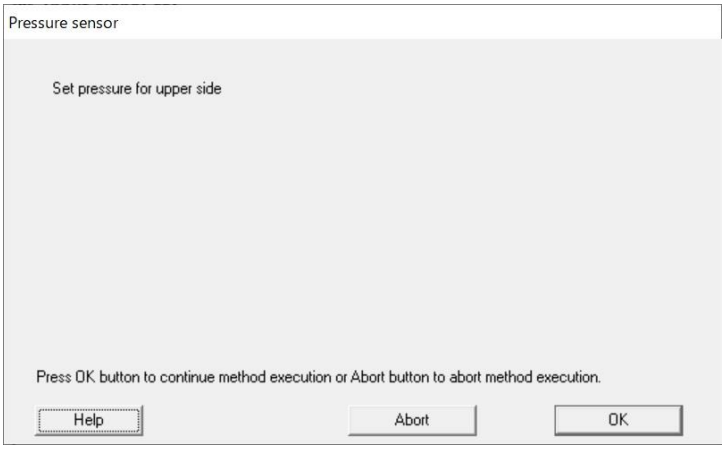


③ Set pressure for lower side and press 'OK'

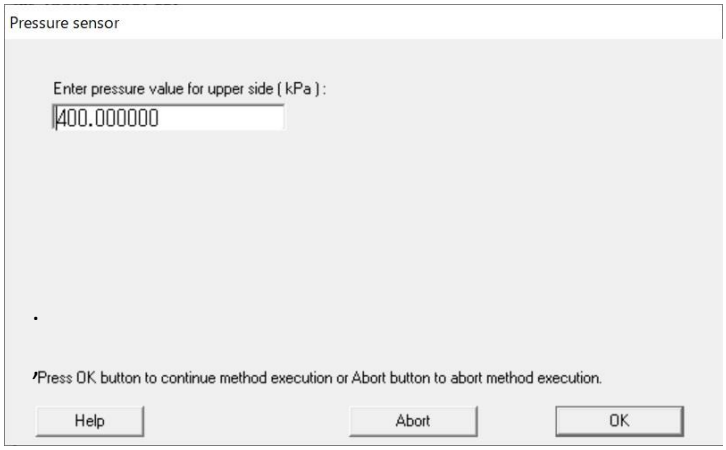


④Enter pressure value for lower side.

⑤ Press 'OK'



⑥ Set pressure for upper side and Press 'OK'



⑦ Enter pressure value for upper side

⑧ Press 'OK' to set.

4.4.5. Simulation test

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 longer than the operation using the LUI of this unit, so be sure to complete the operation.

It is possible to simulate input signal, IP signal current and position transmitter output. And it is also possible to check the response by simulating ramp and step input signal internally .

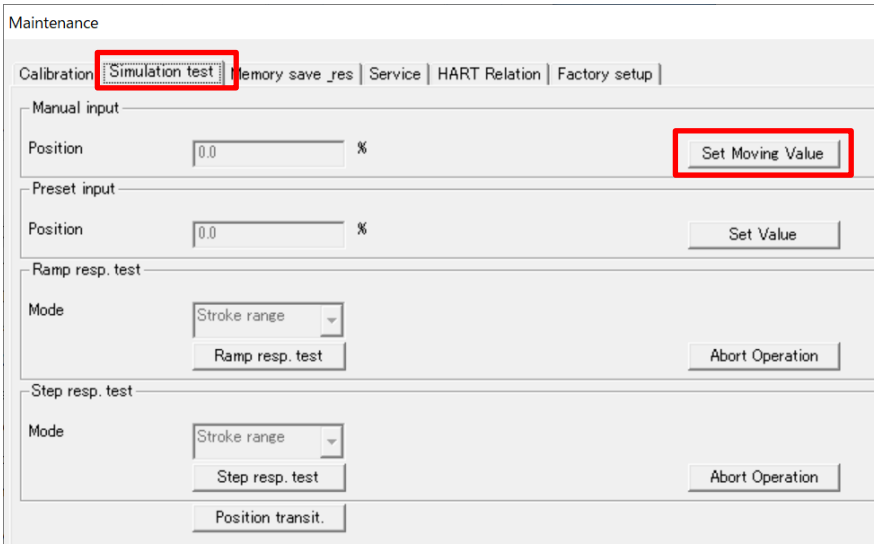
4.4.5.1. Input signal simulation

It is possible to move the control valve by providing the input signal which is similar to the desired signal.

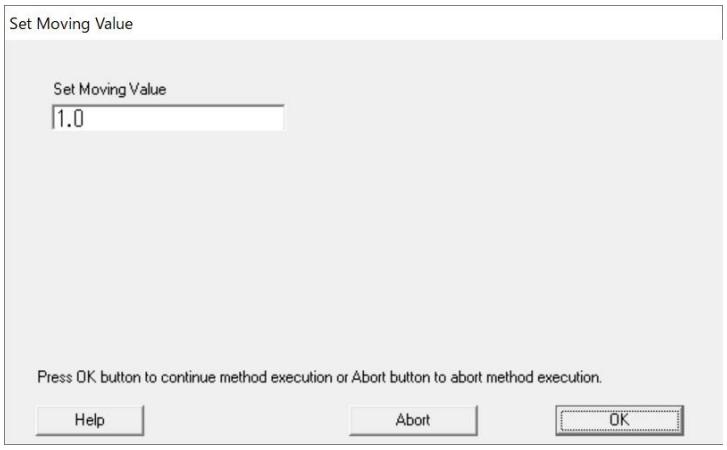
There are two modes in the simulation; manual mode or preset mode. The manual mode makes the positioner to detect continuously all the values among the process that the current value goes to the displayed (input) value. But the preset mode makes the positioner to detect only the displayed (input) value. The simulation of the ramp response and so on is suitable to use the manual mode and the simulation of the step response and so on is suitable to use the preset mode.

1) Manual mode

MENU) *View > Device Root Menu > Extended menu> Maintenance > Simulation test > Manual input*



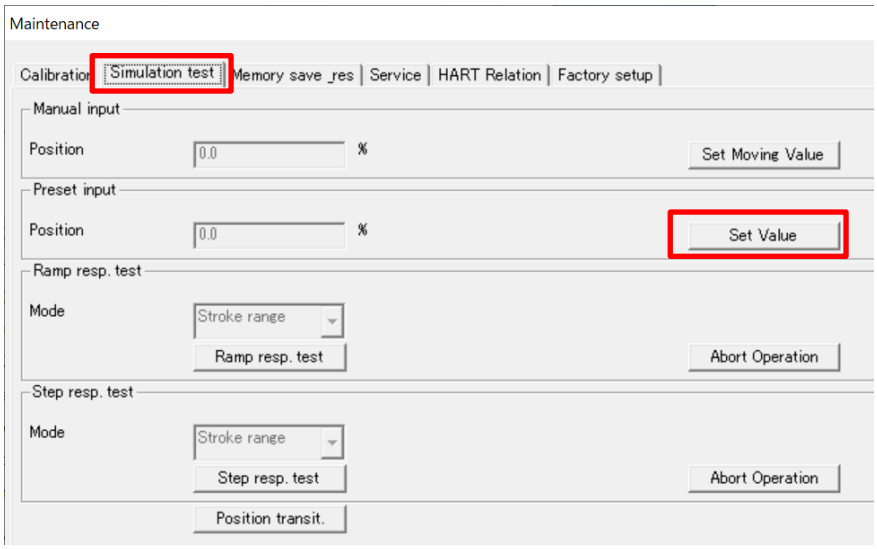
① Select 'Set Moving Value'.



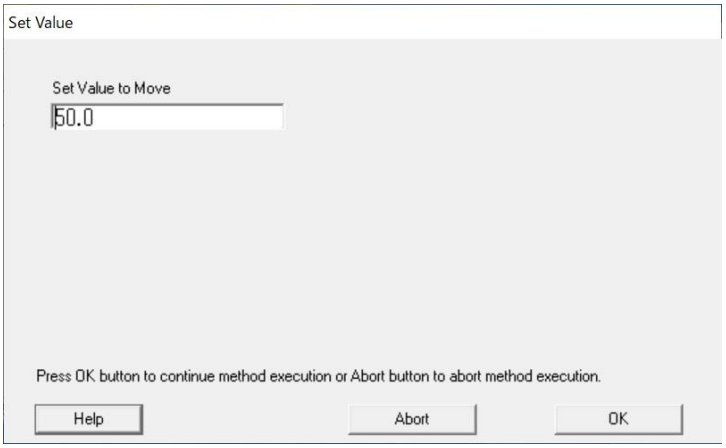
② Input a Moving value.
(Value range: -10.0% - +10.0%)
③ Press 'OK' to execute.

2) Preset mode

MENU) *View > Device Root Menu > Extended menu> Maintenance > Simulation test > Preset input*



① Select 'Set Value'.



② Input a value.
(Value range: 0.0% - 100.0%)
③ Press 'OK' to execute.

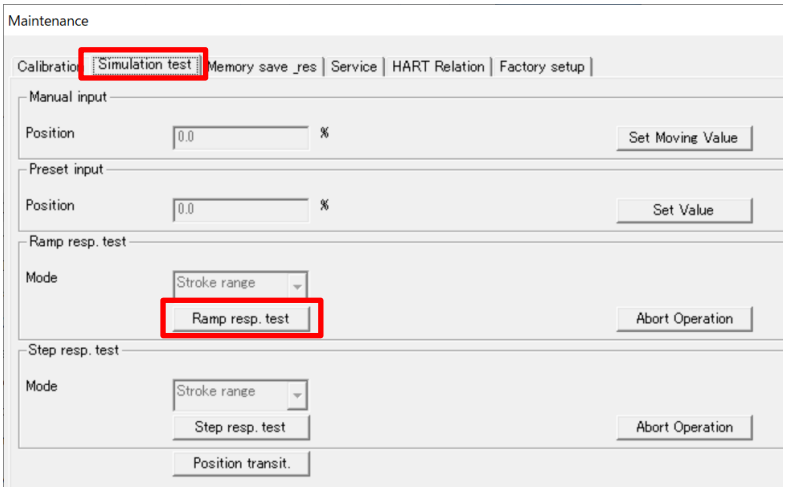
4.4.5.2. Ramp response simulation

It is possible to move the control valve by providing the ramp signal internally.

Parameter	Description	Unit
Start Position	Set the start position of the valve travel	*[%]*
Stop Position	Set the end position of the valve travel	*[%]*
Ramp time	Set the one-way travel time of the ramp response	*[s]*
Wait time	Set the delay time required for the start of the ramp response	*[s]*
Repeat	Set the motion type whether or not to repeat the ramp response	*One time only /Repeat*

MENU) *View > Device Root Menu > Extended menu> Maintenance > Simulation test > Ramp resp. test*

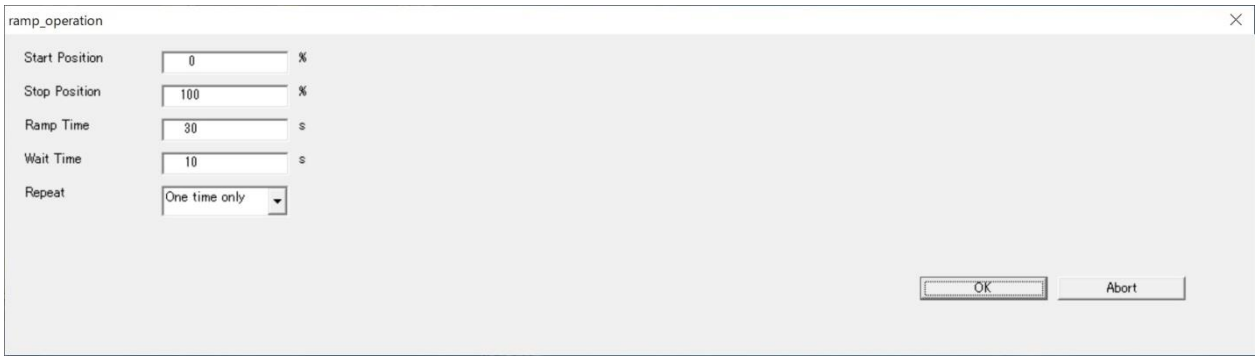
1) Start ramp resp. test.;



① Confirm the mode is ‘ HART’.

② Select ‘Ramp resp. test’.

③ To escape from this screen, press ‘OK’ or ‘Abort’



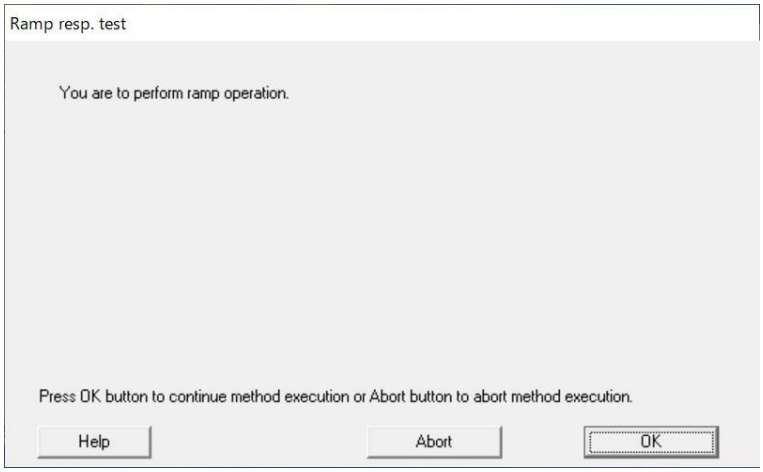
① To modify the parameter, select each item.

② Confirm all parameters are correct.

③ Press ‘OK’

④ Press ‘OK’ on confirmation screen to execute.

2) Abort ramp resp. test.;



① Select 'Abort Operation'.

② Select 'OK' on confirmation screen to abort the ramp resp test..

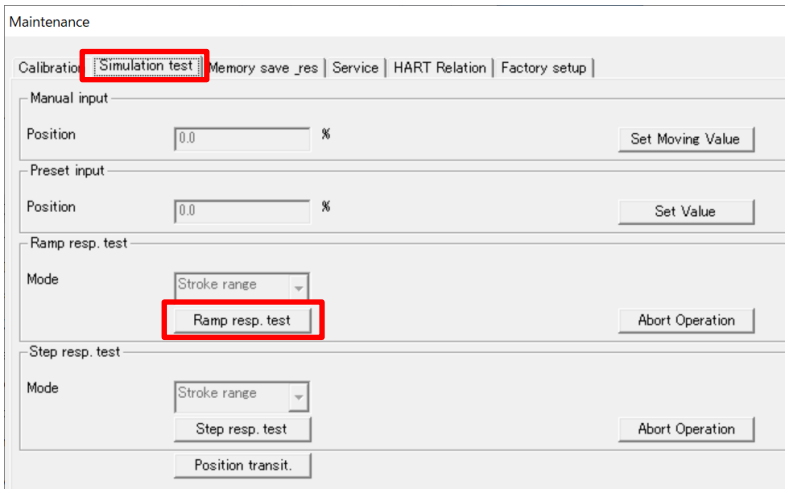
4.4.5.3. Step response simulation

It is possible to move the control valve by providing the step signal internally.

Parameter	Description	Unit
Step	Set the interval of the step response	*[%]*
Start	Set the start position of the valve travel	*[%]*
End	Set the end position of the valve travel	*[%]*
Time	Set the delay time required for the start of the step response	*[s]*
Repeat	Set the motion type whether or not to repeat the step response	*One time only /Repeat*

MENU) *View > Device Root Menu > Extended menu> Maintenance > Simulation test > Step resp. test*

1) Start step resp. test.



① Confirm the mode is ' HART'.

② Select 'Step resp. test'.

③ To escape from this screen, select 'OK' or 'Abort'

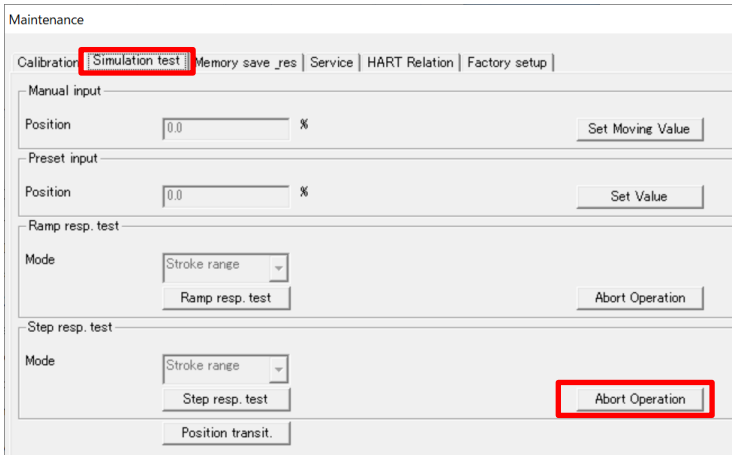
④ To modify the parameter, select each item.

⑤ Confirm all parameters are correct.

⑥ Press 'OK'

⑦ Press 'OK' on confirmation screen to execution.

2) Abort step resp. test.



① Select 'Abort Operation'.

② Press 'OK' on confirmation screen to abort the step resp test.

4.4.6. Service

4.4.6.1. Identification of internal parameters

While entering the following menu as below, the operator can identify A/D converted values, value of potentiometer angle, set value of cross point, time stamp of software, current values of PID parameters.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Service*

4.4.6.2. Switching of 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.

MENU) *View > Device Root Menu > Extended menu> Maintenance > Service Factory menu*

4.4.7. HART relation

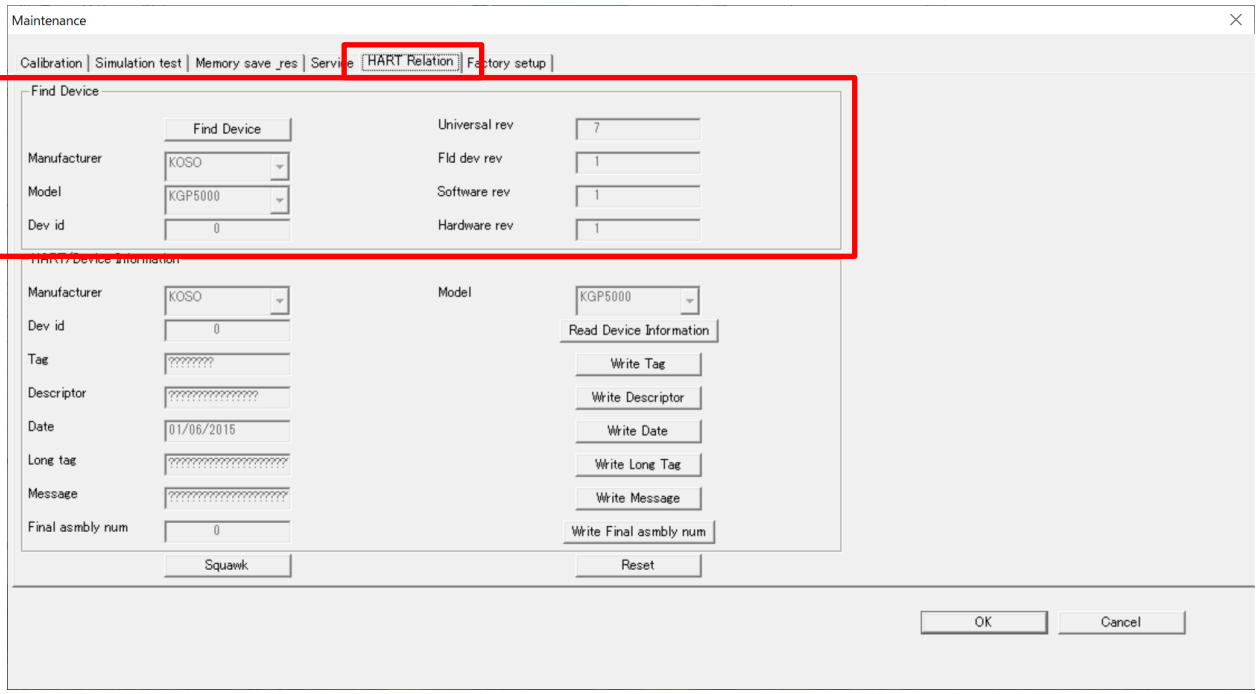
Functions related with HART communication.

4.4.7.1. Find device

By using this command, you can read device information from the armed device.

※ If no armed devices are found, communication may be disconnected.

MENU) *View > Device Root Menu > Extended menu> Maintenance > HART relation > Find device*



Commands:
Find Device

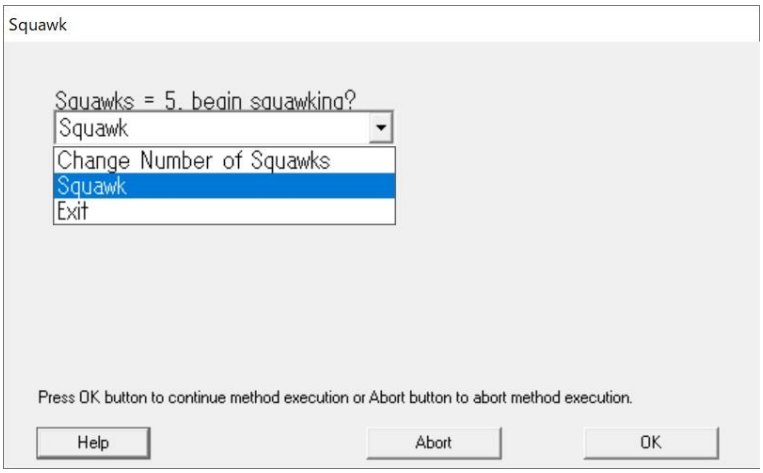
Device information:

Manufactur	Universal revision (HART)
Model	Field device revision
Dev id	Software revision
	Hardware revision

4.4.7.2. Squawk

By using this command, the "Squawk ON !!" or " Squawk ONCE ON " is indicated(blinked) on a LCD screen of the device. To indicate the sign, screen on the LCD should be top menu or 'HART relation > Squawk' menu.

MENU) *View > Device Root Menu > Extended menu> Maintenance > HART relation > Squawk> Squawk*



① If you want to change number of squawking, Select 'Change Number of Squawks' and 'ENTER'. Then input the number.

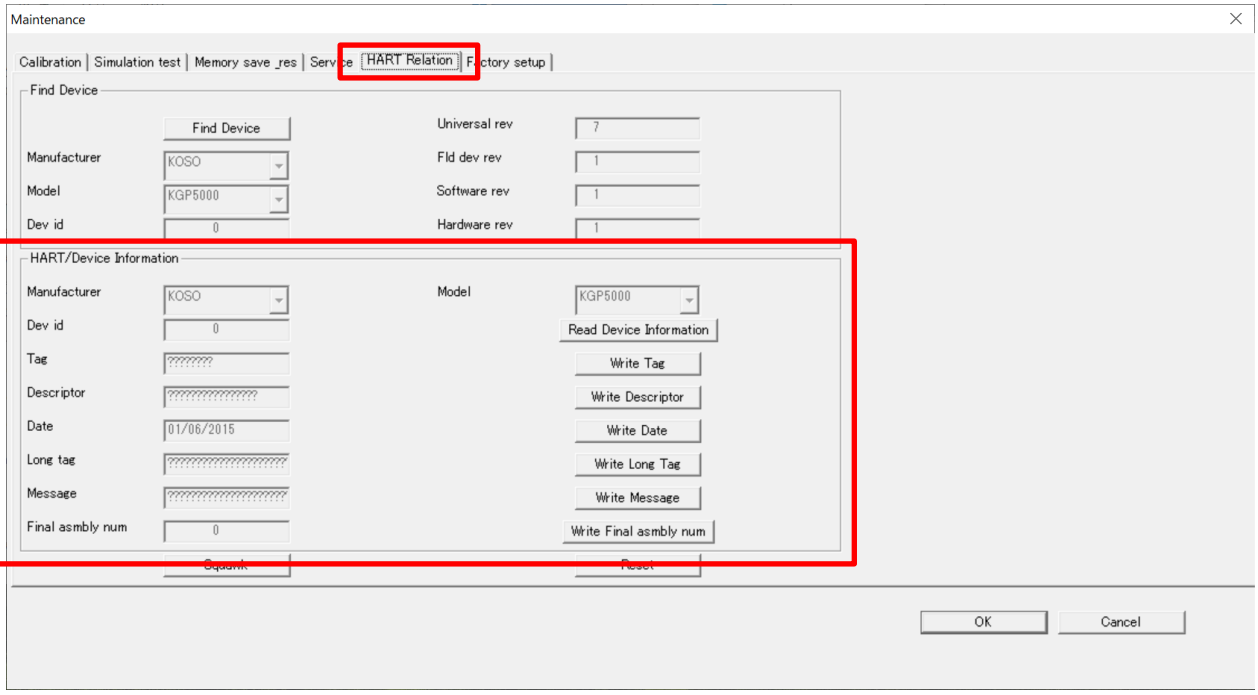
② To do squawking, select 'Squawk'.

③ To exit from this screen, select 'Exit'.

4.4.7.3. HART device information

By using the following commands, the device information on HART communication can be read and written.

MENU)
View > Device Root Menu > Extended menu> Maintenance > HART Relation > HART/Device Information



Device information:

Manufacture*	Long tag
Dev id*	Message
Tag	Final asmbly num
Descriptor	Model*
Date	

*Read only information

Commands:

Read Device information	
Write Tag	Write Descriptor
Write Date	Write Long Tag
Write Message	Write Final assembly num

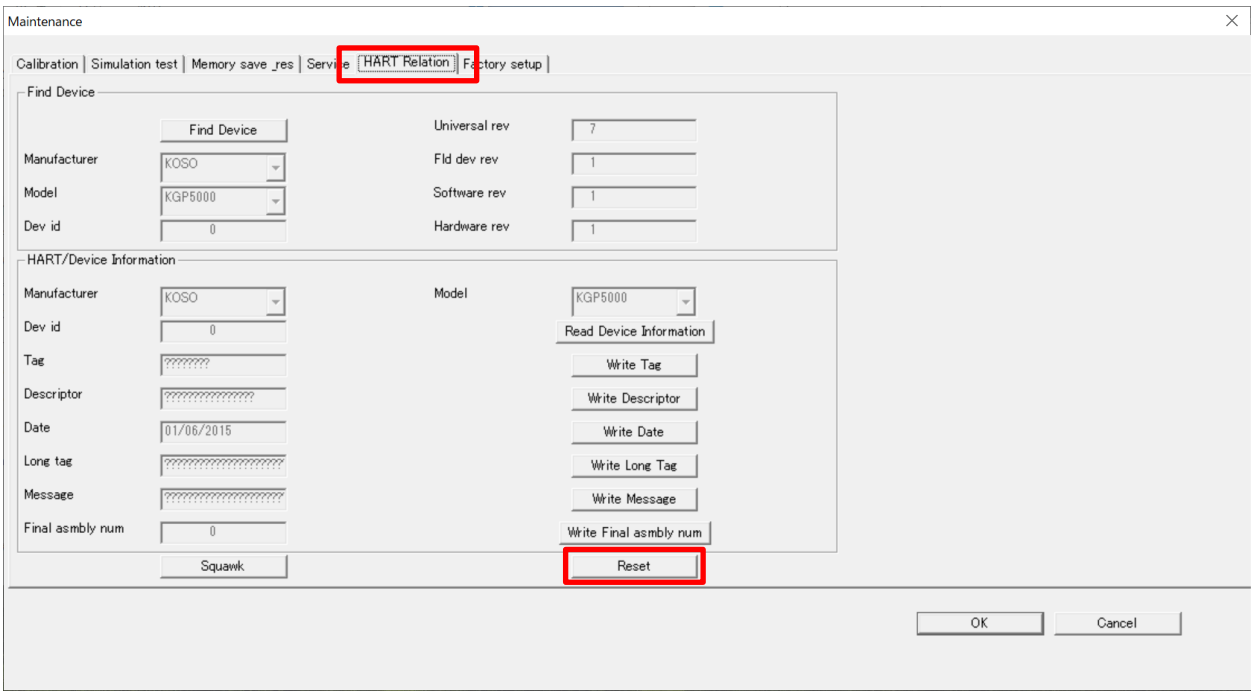
4.4.7.4. Reset

Warning

Reset causes the device shuts down for a few seconds. It may cause communication loss.

This is a function for restarting the device
To reset the device, use the following command.

MENU)
View > Device Root Menu > Extended menu> Maintenance > HART Relation > HART/Device Information



Confirm the message and press 'OK' to execute.

4.5. Alarms

When detecting a breakdown of internal memory and sensors, this positioner announces an alarm by self-diagnostic function as well as shutdown an IP signal current off compulsorily and moves toward fail safe direction.
Additionally, it's possible to set the alarm condition optionally about the valve position, the deviation, the temperature and the pressures. Moreover, it'll be possible to assign the status category defined in NAMUR107 and to make LCD indicate a symbol mark to the respective alarms.

Note
The cause of alarm is taken as well as an alarm has to be released to return when an IP signal current signal blocked off compulsorily by an alarms.

Status symbols defined in NAMUR107 are shown in Table 4.5.

Table 4.5.NAMUR status

Symbol mark	Category	Description / Action to take
	Maintenance required	The problem caused by degradation and wear-out of the device out has occurred. Action) Adjust device or replace parts
	Check function	The problem caused by setting and adjustment of the device out has occurred. Action) Check setting and adjust device
	Out of specification	The problem caused by environment in which the device is used has occurred. Action) Remove environmental condition
	Failure	The problem caused by internal defects of the device has occurred. Action) Replacement of device or parts

4.5.1. Summary of alarms

Alarms unable to change setting;
Alarms caused by a breakdown inside the positioner are shown in Table 4.5.1a.

Table.4.5.1a. Alarms caused by a breakdown (unable to change setting)

Contents	Cause	Action to take
Memory failure	Failure of EEPROM	Replace the device or inquire to our office
Potentiometer failure	Failure of angle sensor	

After detecting these failures, the symbol marks of failure based on NAMUR107 are indicated on LCD. (Refer to right symbol mark)

Alarm of input signal level is shown in Table4.5.1b.

Table 4.5.1b. Alarms caused by a breakdown (unable to change setting)

Contents	Description	Purpose to use
Input signal alarm "4-20 signal"	When the input signal of 4-20mA drops below 3.6mA, an alarm is occurred.	To detect a drop of the input signal level.
	Set-value; None (※Unable to change threshold) Status category; Out of specification (※Unable to change) 	

Alarms able to change setting (User selectable);

The description, the purpose to use, the setting about user selectable alarms are shown in Table.4.5.1c. It's possible to set a threshold of alarm according to the user's conditions for use, and also to assign a symbol mark based on NAMUR107 and to indicate on LCD.

Table.4.5.1.c. Alarms (able to change setting)

Contents	Description	Purpose to use
Position alarm	When the valve position exceeded an upper and lower threshold, an alarm is occurred.	To detect drifts of zero and span caused by wear-out and defect of control valves
	Set-value; 0% side threshold[%], 100% side threshold [%] Status category; Check function(default) 	
Deviation alarm	When the deviation of input signal and valve position exceeded a threshold, an alarm is occurred.	To detect sticking of control valve or actuator and air leakage of piping
	Set-value; Deviation threshold[%], Judgment time of deviation occur[s] Status category; Check function(default) 	
Temperature alarm	When the temperature exceeded an upper and lower threshold, an alarm is occurred.	To detect use by the temperature outside the specification which leads to early degradation of parts
	Set-value; Low temp. threshold [Celsius, Fahrenheit], High temp. threshold [Celsius, Fahrenheit] Status category; Out of specification(default) 	
High supply pressure alarm	When the supply pressure exceeded an upper threshold, an alarm is occurred.	To detect use by high supply pressure which leads to break of actuator diaphragm
	Set-value; High pressure threshold[kPa,bar,psi] Status category; Out of specification(default) 	
Low supply pressure alarm	When the supply pressure exceeded a lower threshold, an alarm is occurred and integral terms accumulation is stopped	To detect use by low supply pressure that leads to lack of actuator output. And, to suppress uncontrollability caused by saturation of the integral term, by

Contents	Description	Purpose to use
	and their correction is held.	stopping integral terms accumulation.
	Set-value; Low pressure threshold[kPa,bar,psi] Default status category; Out of specification 	
Failure of pressure sensors alarm	When the A/D value of pressure sensors exceeded a threshold, an alarm is occurred.	To detect abnormality of pressure sensors.
	Set-value; Disable / Enable (※Unable to change threshold) Status category; Failure (※Unable to change)  ※To disable under failure condition, once, remove the input signal. (Cycle the power.)	

4.5.2. Alarm setting / Check and Clear of result

It's possible to operate setting, check of a result and clear of each alarm by following menu.

1) Setting

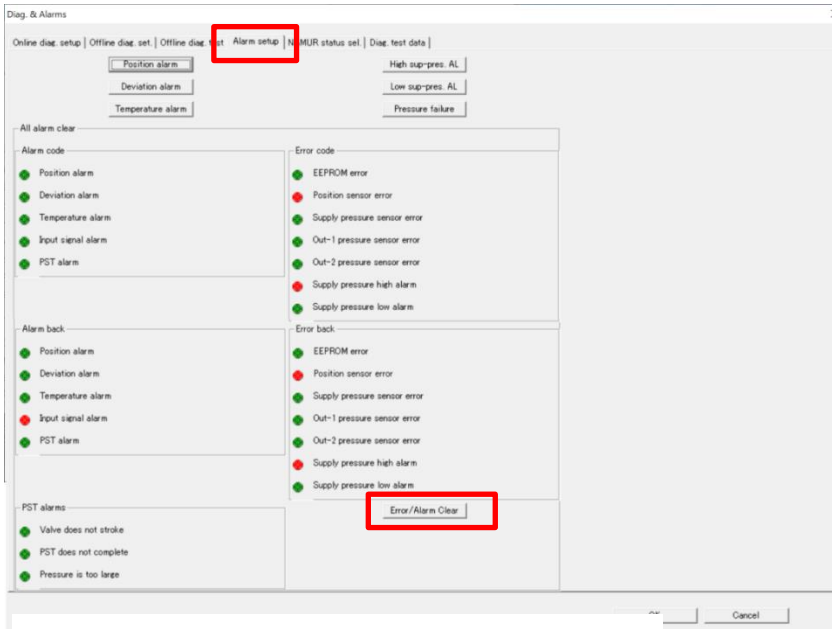
MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Alarm setup*

2) Check of results

MENU) *View > Device Root Menu > Information > Alarm status*

3) Clear of results

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Alarm setup > All alarm clear*



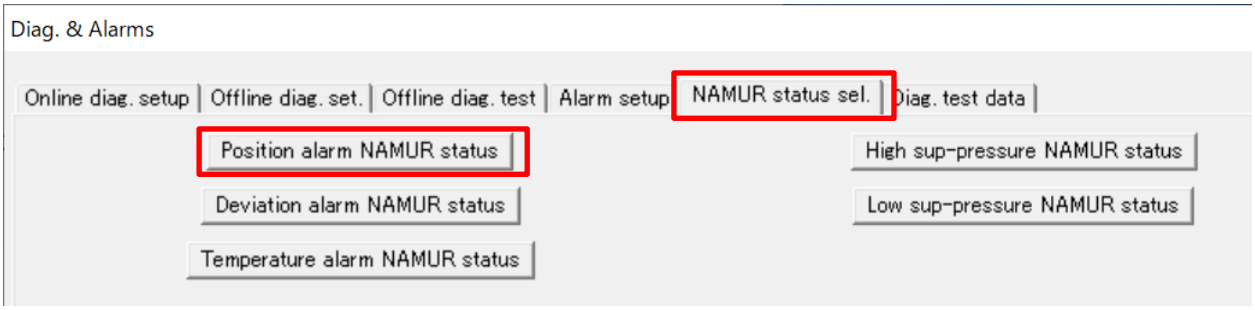
①Press 'Error/Alarm Clear' to execute.

4.5.3. NAMUR status select

The NAMUR status category related to each alarm can be selected voluntarily.

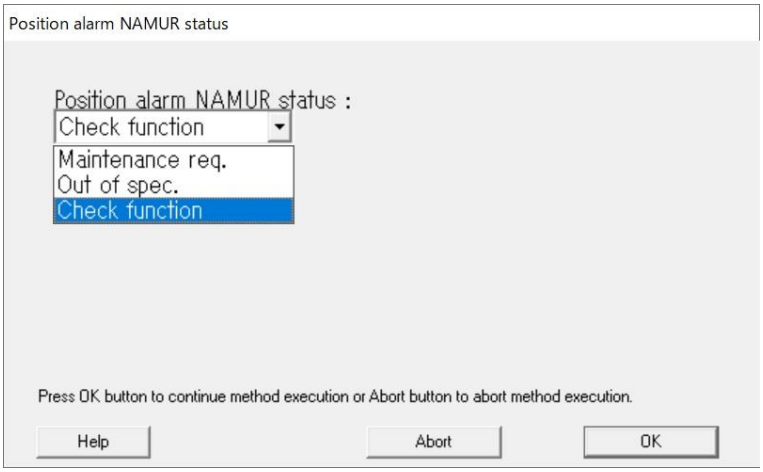
For example, the procedure for setting the position alarm is as follows.

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > NAMUR status sel.*



① Select the 'Position alarm NAMUR status'

② Select 'Write' and press 'OK'



③ Select NAMUR status category and press 'OK' to set.

NAMUR status category:

Maintenance require
Out of specification
Check function

4.6. Diagnosis

Caution

- HART communication takes longer than the operation using the LUI of this unit, so be sure to complete the operation.

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

4.6.1. Online diagnosis

4.6.1.1. Summary of online diagnosis

Summary and set value of online diagnosis is indicated in Table 4.6.1.

Table 4.6.1. Online diagnosis

Items	Summary of online diagnosis
Total stroke	When a valve travel change beyond a threshold has happened, its displacement is accumulated, and it's indicated. It's possible to use it for a prediction of long-term deterioration such as wear of packing and damage of spring.
	Indicated value; The 200% valve position change is counted as 1. Ex) The five times full stroke of 100% equals to the 5 counts. It's indicated until at most about 4,200,000,000 counts, and when this is exceeded, it's reset by a zero. Set value; Criteria [%]: A threshold of the position change to accumulate is set.
Total direction change	When a valve travel direction change beyond a threshold has happened, its number of times is accumulated, and it's indicated. It's possible to use it for a prediction of long-term deterioration such as wear of packing and damage of spring.
	Set value; Criteria [%]: A change width to judge direction change is set.
Low position time	Time when the valve travel was in the range of threshold is accumulated, and it's indicated. It's possible to use it for a prediction of damage of the valve body caused by control by the low position.
	Set value; Criteria [%]: A position to judge low position is set.
Maximum temperature time	Time when the temperature was over threshold is accumulated, and it's indicated. It's possible to use it for a prediction of degradation and damage of a part caused by high temperature environment.
	Set value; Criteria [Celsius / Fahrenheit]: A temperature to judge high temperature is set.
Minimum temperature time	Time when the temperature was under threshold is accumulated, and it's indicated. It's possible to use it for a prediction of degradation and damage of a part caused by low temperature environment.
	Set value; Criteria [Celsius / Fahrenheit] : A temperature to judge low temperature is set.
Partial stroke	Test to move such emergency shutdown valves partially and periodically, and to confirm

Items	Summary of online diagnosis
test	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.

Set value;

Disable / Enable	: Select a periodical execution or not
Stroke size [%]	: Set a position width to move
Completion stroke [%]	: Set a stroke to judge movement completion
Start stroke [%]	: Set a stroke to judge movement start
Abort time limit [s]	: Set a time to judge movement cancellation before movement completion
Start time limit [s]	: Set a time to judge movement cancellation before movement start
Abort pressure [kPa,bar,psi]	: Set a output pressure 1(Pout1) change to judge movement cancellation
Interval day [day]	: Set an interval of periodical execution
Direction	: Set a direction to move

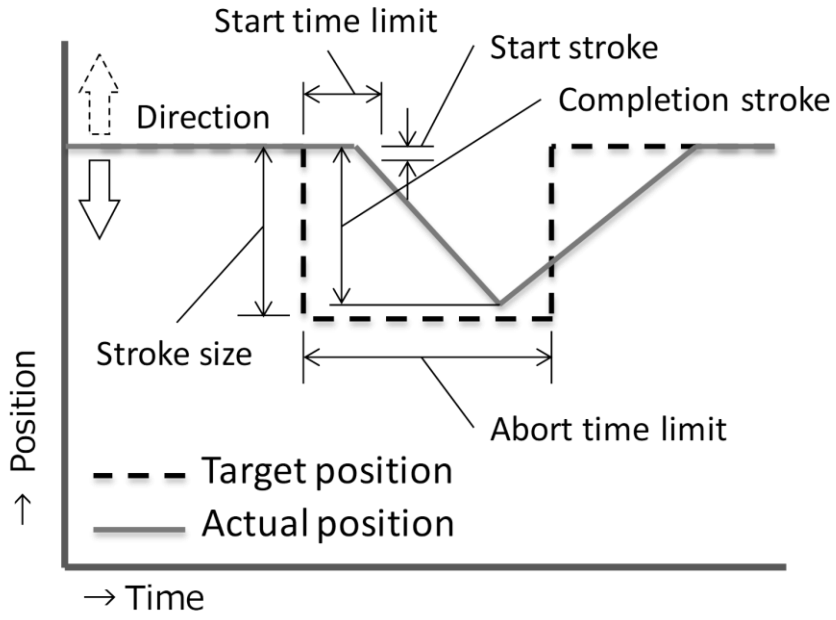


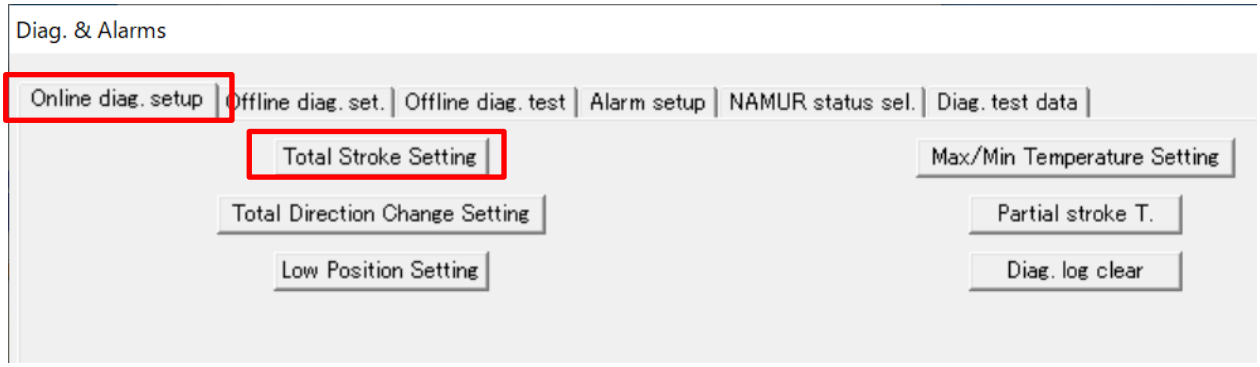
Fig. 4.6.1. Conceptual diagram of each parameters

4.6.1.2. Online diagnosis setup

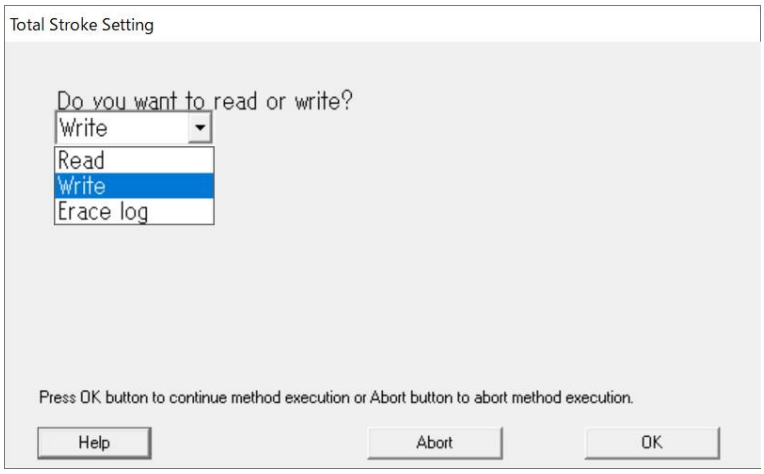
For example, the procedures for setting the total stroke parameter and erasing its log are as follows.

1) Setting the total stroke parameter.

MENU)
View > Device Root Menu > Extended menu> Diag. & Alarms > Online diag. setup> Total Stroke Setting



① Select the 'Total Stroke Setting'



② Select 'Write' and press 'OK'

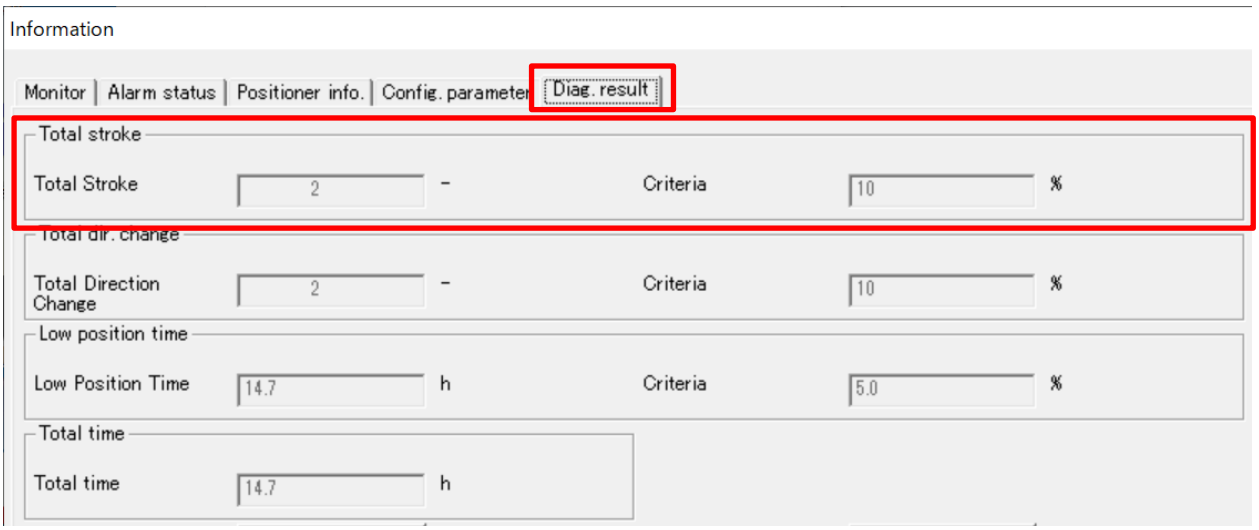
③ Select 'Criteria

④ Input a criteria value. (Value range: 1% - 50%)

⑤ Press 'OK' to set.

2) Check of results.

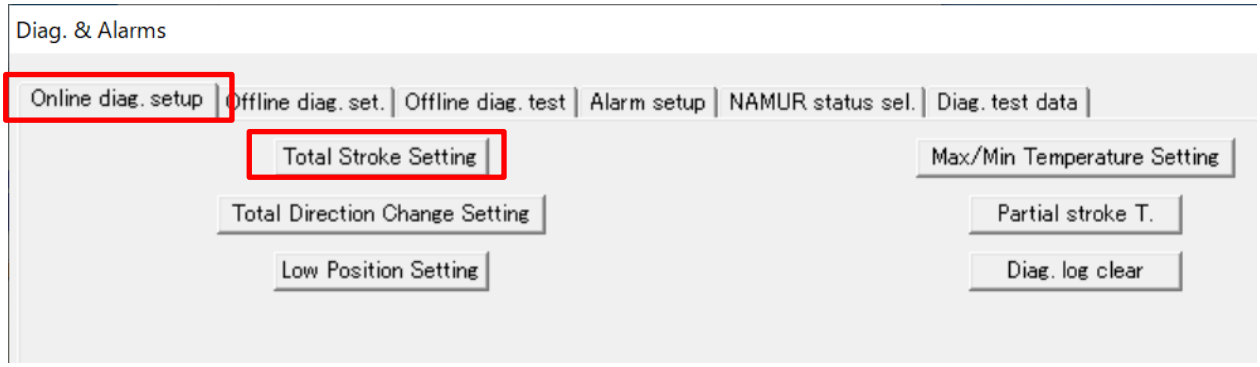
MENU) *View > Device Root Menu > Information > Diag. resutl > Total Stroke*



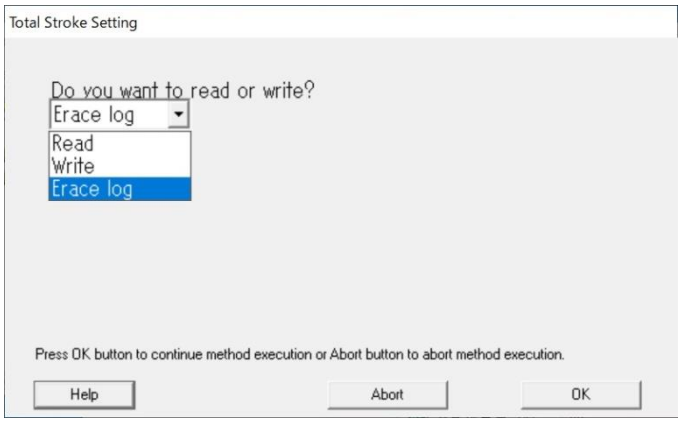
Total Stroke : Present total stroke value
Criteria : Set value

3) Erasing the total stroke log

MENU) *View > Device Root Menu > Extended menu> Diag & Alarms > Online diag. setup*



① Select the 'Total Stroke Setting'



② Select 'Erase log' and press 'OK'

③ Select 'OK' on confirmation to execute.

4.6.1.3. Clear of diagnosis logs

The procedures for clearing diagnosis logs is as follows.

MENU) *View > Device Root Menu > Extended menu> Diag & Alarms > Online diag. setup > Diag. log clear*

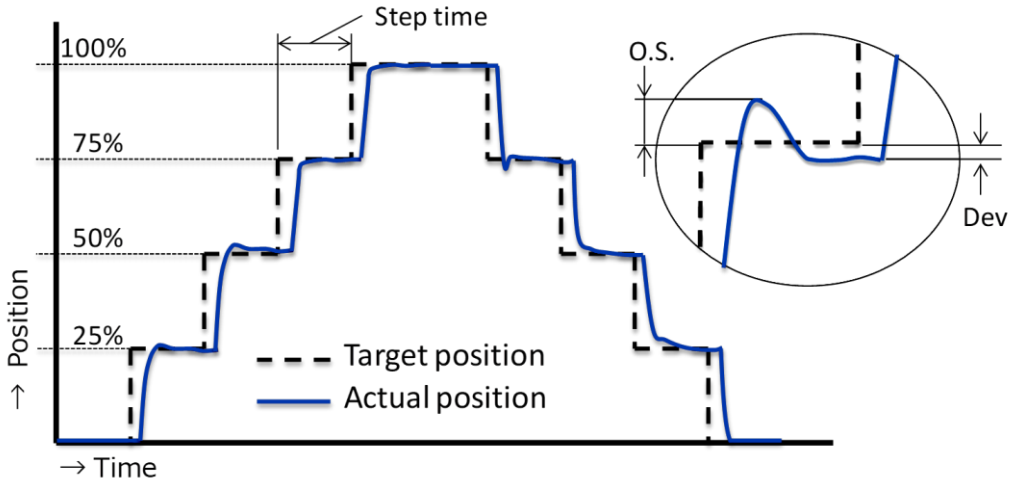
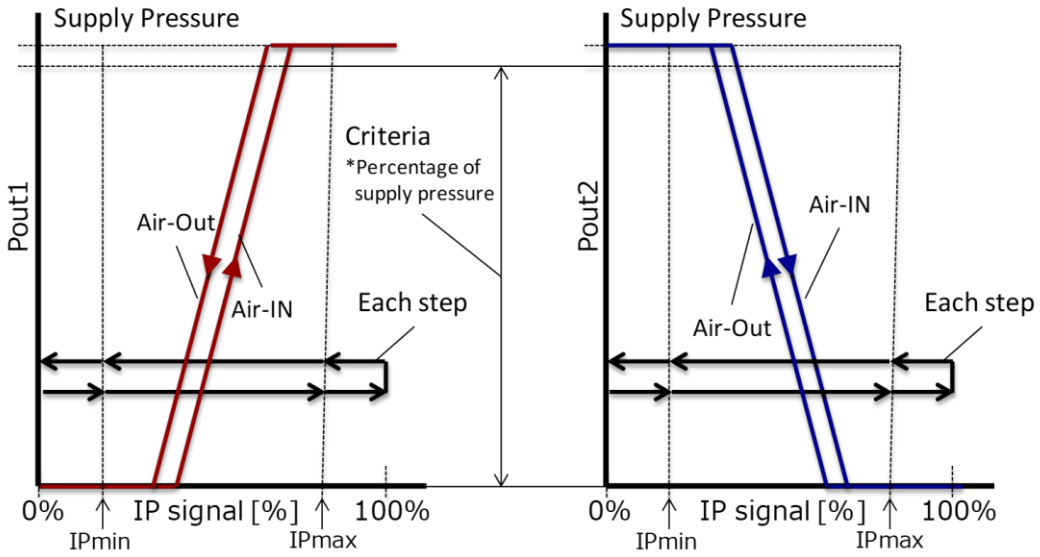
Press 'OK' on confirmation screen to execute.

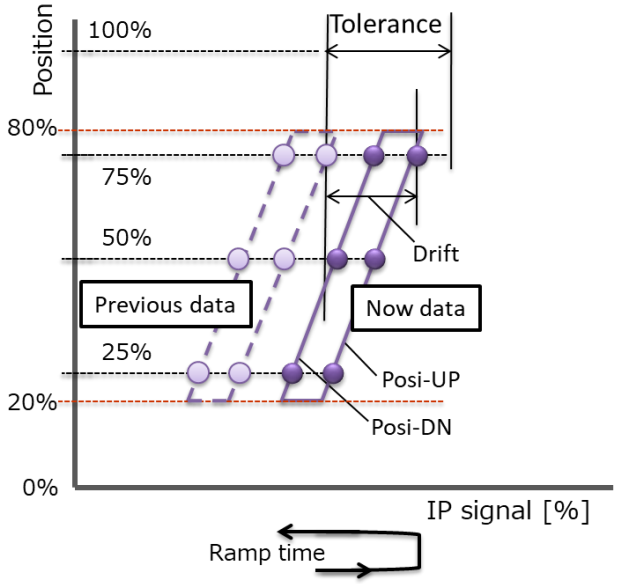
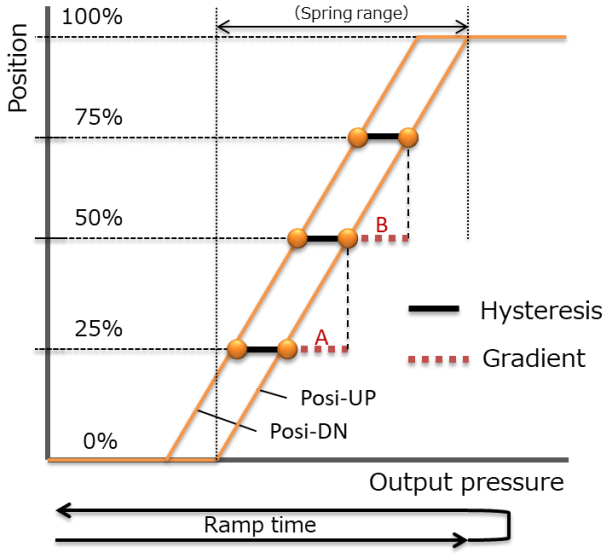
4.6.2. Offline diagnosis

4.6.2.1. Summary of offline diagnosis

Summary and set value of offline diagnosis is indicated in Table 4.6.2.

Table4.6.2. Offline diagnosis

Items	Summary of offline diagnosis
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. 
	Set value; Step time [s]: Set a waiting time per 1 step. Initial value: 60s
Pneumatic circuit span	Output pressure in the minimum value (IPmin) and the maximum value (IPmax) of the IP signal current used for control is measured, and it's checked whether the enough air pressure span is obtained or not. The degradation over time in a pneumatic circuit can be checked by comparing initial values, previous values and present values. 
	Set value; Step time [s]: Set a waiting time per 1 step. Initial value:20s Criteria [%]: Set a percentage of output width of output pressure to supply pressure Initial value: 95% ※Please set sufficient time for the position to become stable

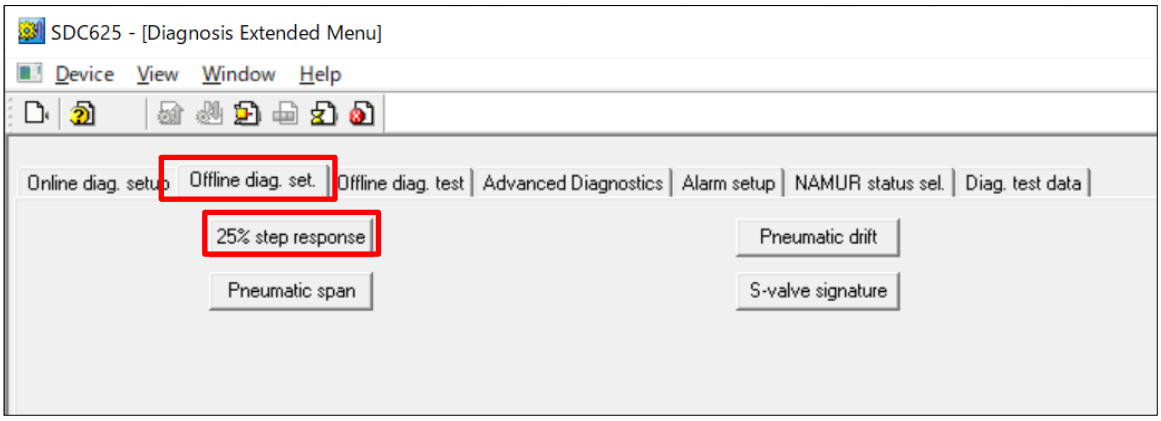
Items	Summary of offline diagnosis
Pneumatic circuit drift	IP signal current to control 25%, 50% and 75% position are measured, and it's checked whether the drift is in tolerance or not. The degradation over time in a pneumatic circuit can be checked by comparing initial values, previous values and present values. 
	Set value; Ramp time [s]: Set a time to fully stroke by ramp input. Initial value: 30s Tolerance [%]: Set a tolerance of drifts of IP current. Initial value: 15%
Simple valve signature	Output pressure at 25%, 50% and 75% position are measured, and a hysteresis and pressure gradient of control valve are calculated, and it's checked whether the values are in tolerance or not. It'll be a simple version of general valve signature. The degradation of packing and spring in control valve can be checked by comparing initial values, previous values and present values.  Reference) The approximate hysteresis of the actuator can be calculated in% by the following formula. Single acting type actuator : $\frac{\text{Hysteresis}}{(\text{GradientA} + \text{GradientB}) \times 2}$ Double acting type actuator : $\frac{\text{Hysteresis}}{\text{Supply air pressure}}$
	Set value; Ramp time [s]: Set a time to fully stroke by ramp input. Initial value: 60s Hysteresis limit [kPa,bar,psi]: Set limit of pressure hysteresis. Initial: 50kPa Gradient limit H [kPa,bar,psi]: Set upper limit of pressure gradient(pressure difference) Initial value: 80kPa

4.6.2.2. 25% step response test

For setting and executing the 25% step response test are as follows.

1) Setting the 25% step response test.

MENU)
View > Device Root Menu > Extended menu> Diag & Alarms > Offline diag. set. > 25% step response



① Select '25% step response'

② Select 'Write' and press 'OK'

③ Input a step time value.

④ Press 'OK' to set.

2) Executing the 25% step response test.

MENU) *View > Device Root Menu > Extended menu> Diag & Alarms > Offline diag. test > 25% step response*

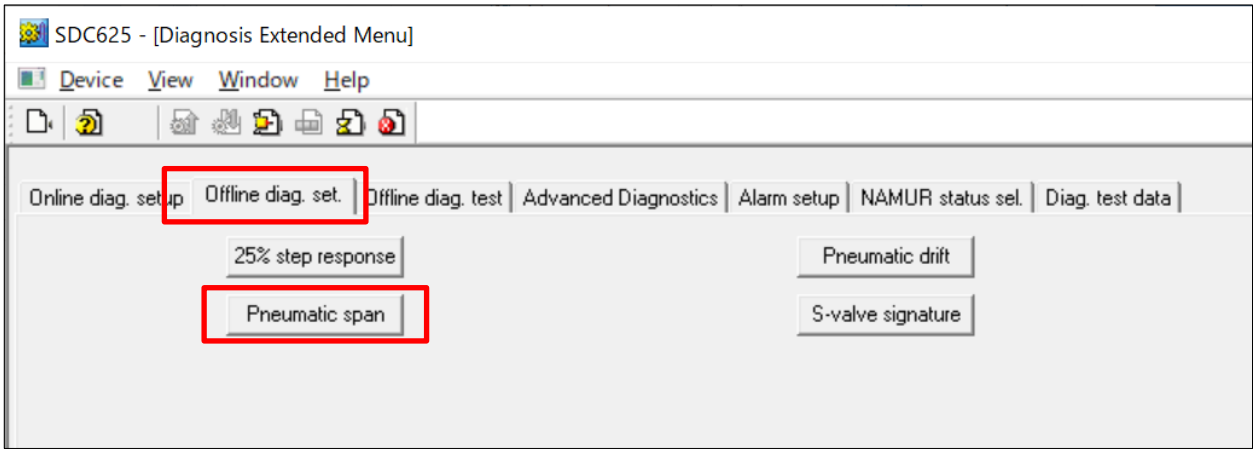
① Press 'OK' on confirmation screen to execute.

4.6.2.3. Pneumatic circuit span

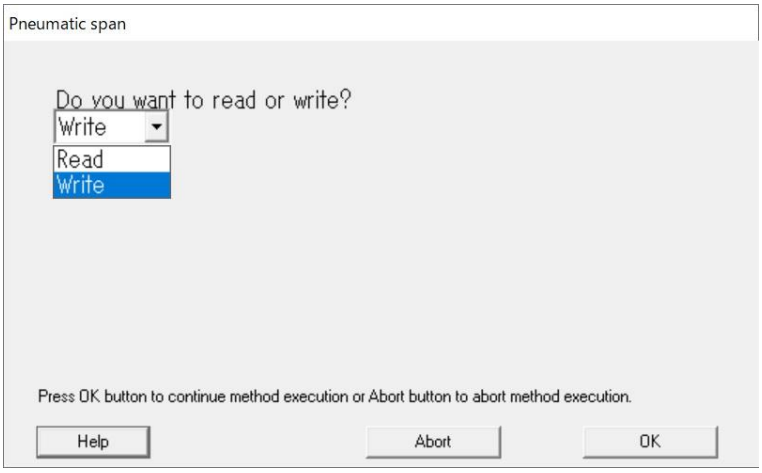
The procedures for setting the Pneumatic circuit span test and executing are as follows.

1) Setting

MENU) *View > Device Root Menu > Extended menu> Diag & Alarms > Offline diag. set > Pneumatic span*



① Select 'Pneumatic span'



② Select 'Write' and press 'OK'

③ Select 'Step time'

④ Input a step time value.

⑤ Select 'Criteria'

⑥ Input a criteria value.

⑦ Press 'OK'

2) Execution

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Offline diag. test > Pneumatic span*

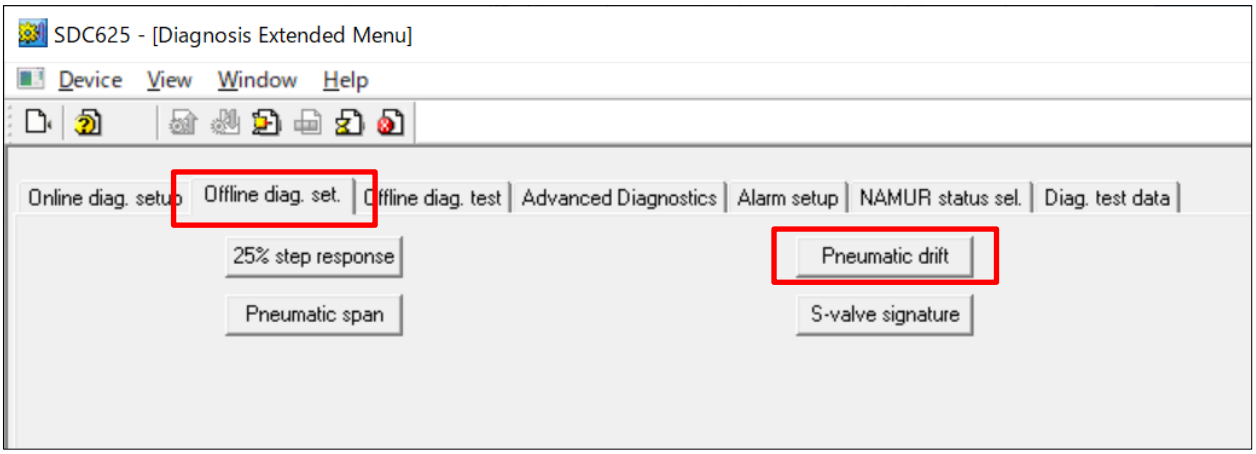
① Press 'OK' on confirmation screen.to execute.

4.6.2.4. Pneumatic circuit drift

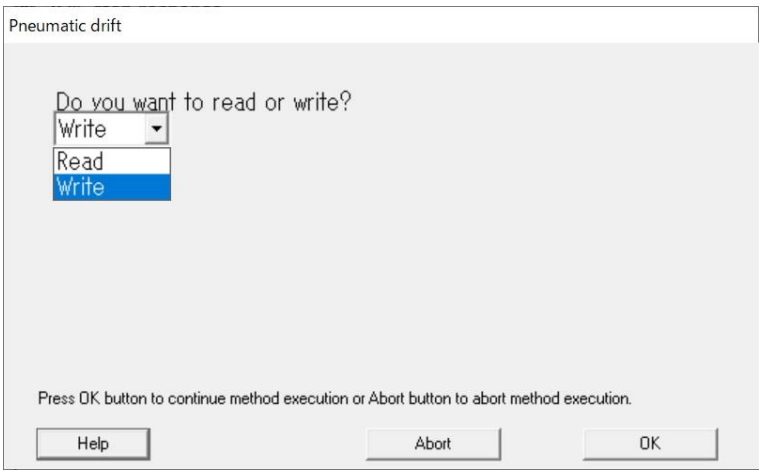
The procedures for setting the Pneumatic circuit drift test and executing are as follows.

1) Setting

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Offline diag. set. > Pneumatic drift*



① Select 'Pneumatic drift'



② Select 'Write' and press 'OK'

③ Select 'Ramp time'

④ Input a ramp time value.

⑤ Select 'Tolerance'

⑥ Input a tolerance value.

⑦ Press 'OK' to set.

2) Execution

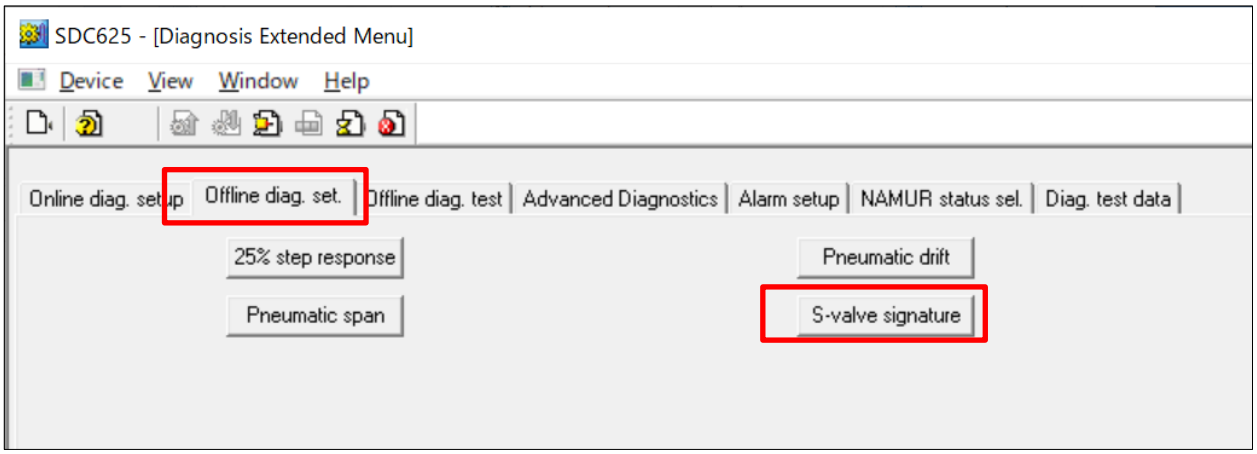
MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Offline diag. test > Pneumatic drift*

① Press 'OK' on confirmation screen.to execute.

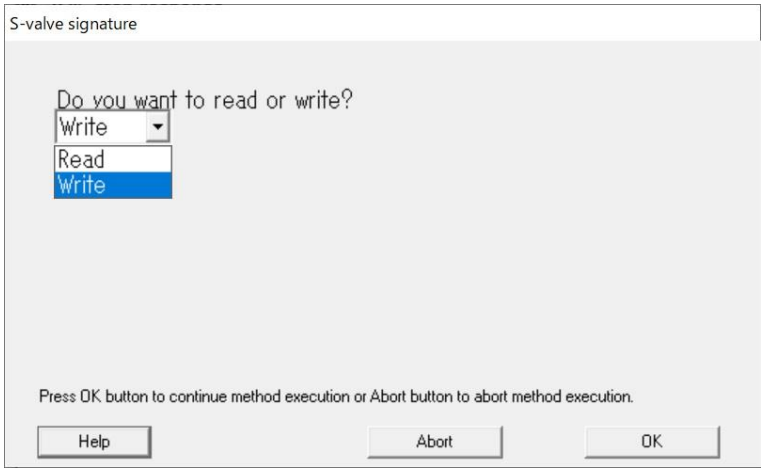
4.6.2.5. Simple valve signature

1) Setting

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Offline diag. set. > S-valve signature*



① Select 'S-valve signature'



② Select 'Write' and press 'OK'

③ Select 'Ramp time'

④ Input a ramp time value to set.

⑤ Select 'Hysteresis limit'

⑥ Input a hysteresis limit value.

Hysteresis limit(kPa)：
Sets the pressure hysteresis tolerance. For details, see Table 4.6.2. Offline diagnosis.

⑦ Select 'Gradient limit H'

⑧ Input a gradient limit high value.

Gradient limit H(kPa)：
Sets the upper limit of the pressure gradient tolerance. See Table 4.6.2. for more information.

⑨ Select 'Gradient limit L'

⑩ Input a gradient limit low value.

⑪ Press 'OK'

Gradient limit L(kPa)：
Sets the upper limit of the pressure gradient tolerance. See Table 4.6.2.for more information.

2) Execution

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Offline diag. test > S-valve signature*

① Press 'OK' on confirmation screen to execute.

4.6.3. Check and Save of online diagnosis results (Diag.test data)

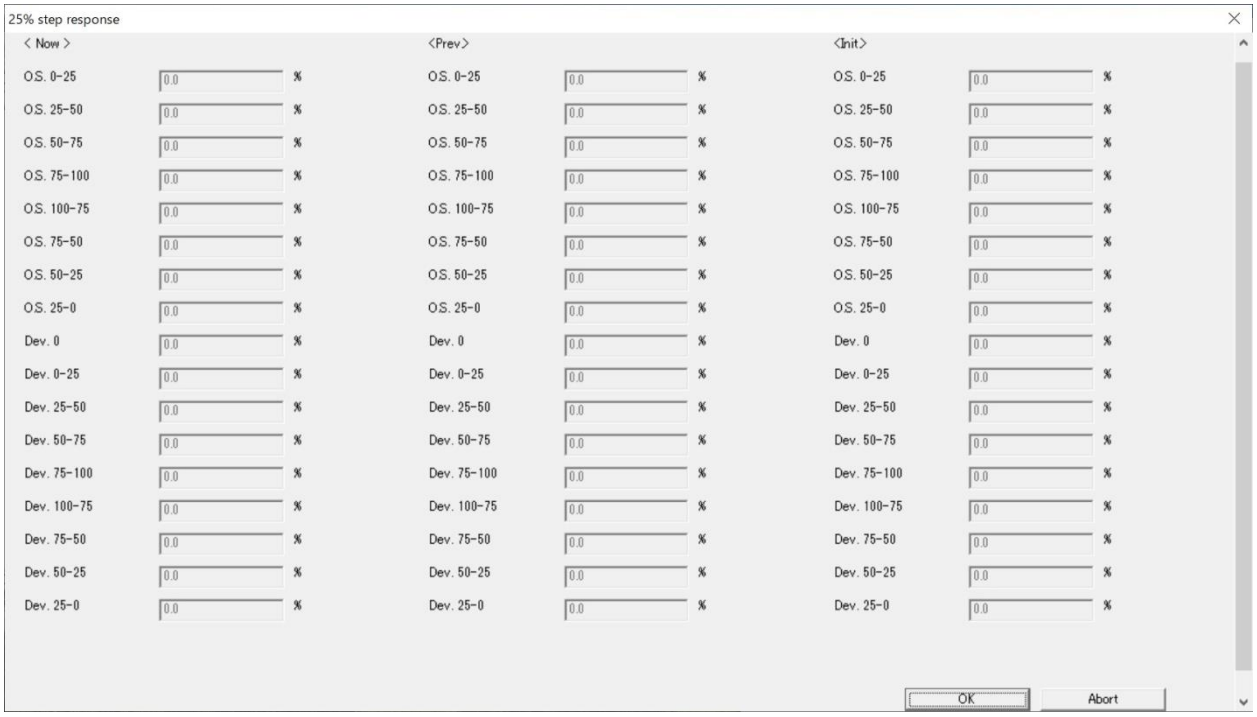
In this section, confirmation and save of diagnosis results are explained. It'll be the same operation with each diagnosis. Therefore, for instance, the 25% step response is explained here.

1) Check of result

It's possible to indicate a result data in following menu.

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Diag.test data > 25% step response*

A list of result is indicated.



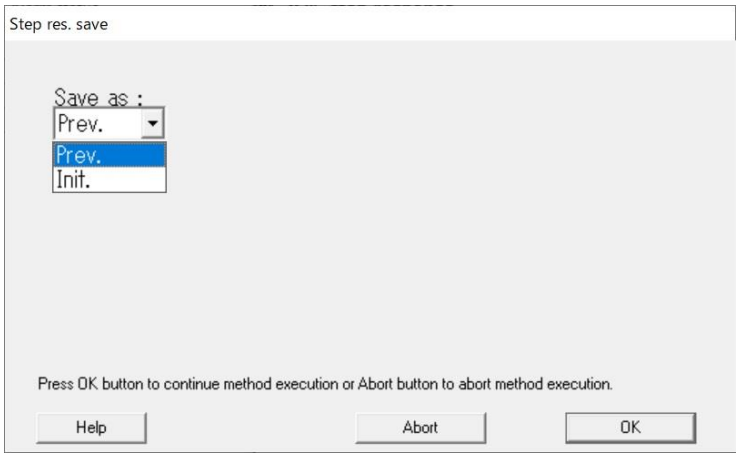
It's possible to indicate a result data from following menu.

MENU) *View > Device Root Menu >> Information > Diag. result > 25% step response*

2) Save of result

You can save a result data as a previous data or an initial data from following menu.

MENU) *View > Device Root Menu > Extended menu> Diag. & Alarms > Diag.test data > Step res. save*



① Select 'Prev.' or 'Init'

② Press 'OK' to save.

5. Diagnosis Root Menu

The operation procedure of the alarm / diagnosis function is explained on the screen of SDC625.

For an overview of online diagnosis, refer to 4.6.1.1 of this instruction manual.

5.1. Alarm status

The operator can confirm the alarm status as below.

- EEPROM error
- Position sensor error
- P-sup. sensor error
- P-out1. sensor error
- P-out2. sensor error
- Input signal alarm history
- Position alarm
- Deviation alarm
- Temperature alarm
- Low sup-pres. Alarm
- High sup-pres. Alarm
- PST stroke alarm
- PST incomplete alarm
- PST pressure al

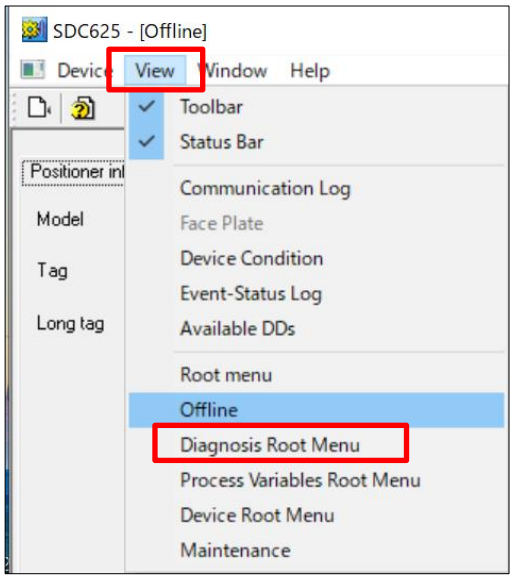
MENU) *View > Diagnosis Root Menu > Alarm status*

5.2. Online diagnosis setup

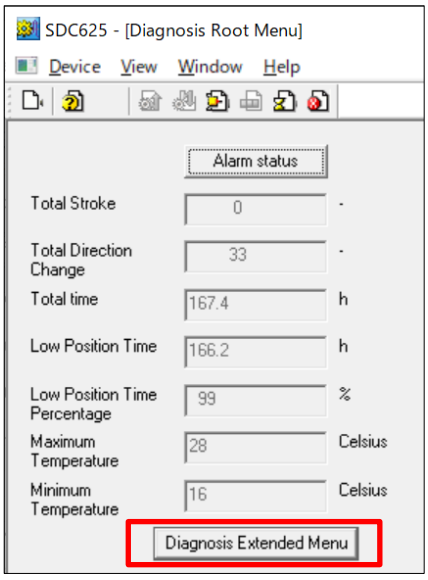
For example, the procedures for setting the total stroke parameter and erasing its log are as follows.

1) Setting the total stroke parameter.

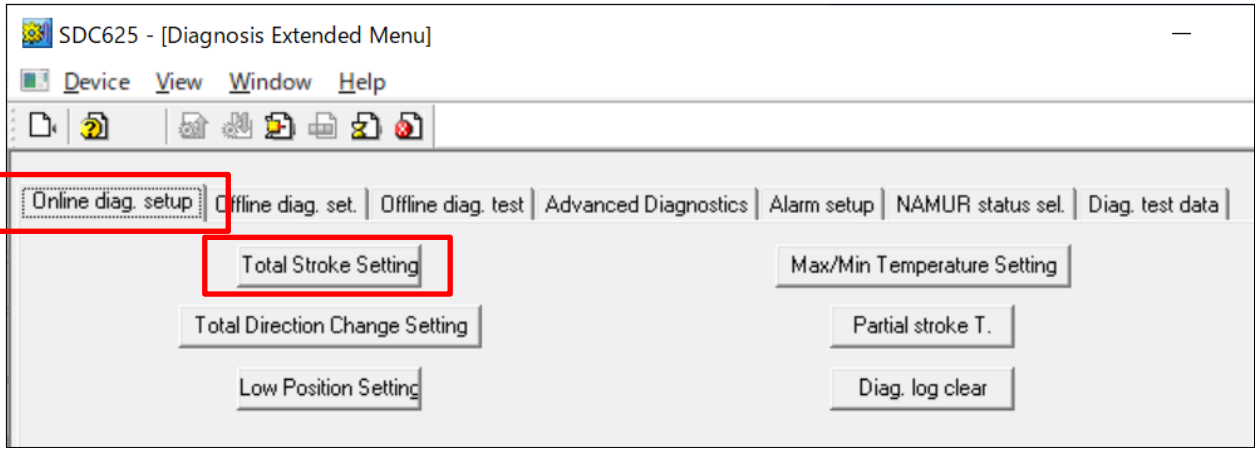
MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Online diag. setup*



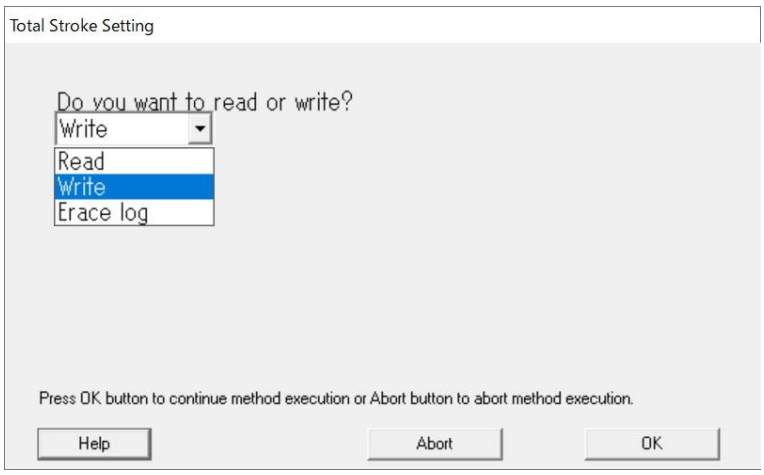
① Press the 'View > Diagnosis Root Menu'



② Press the 'Diagnosis Extended Menu'



③ Select the 'Total Stroke Setting'



④ Select 'Write' and press 'OK'

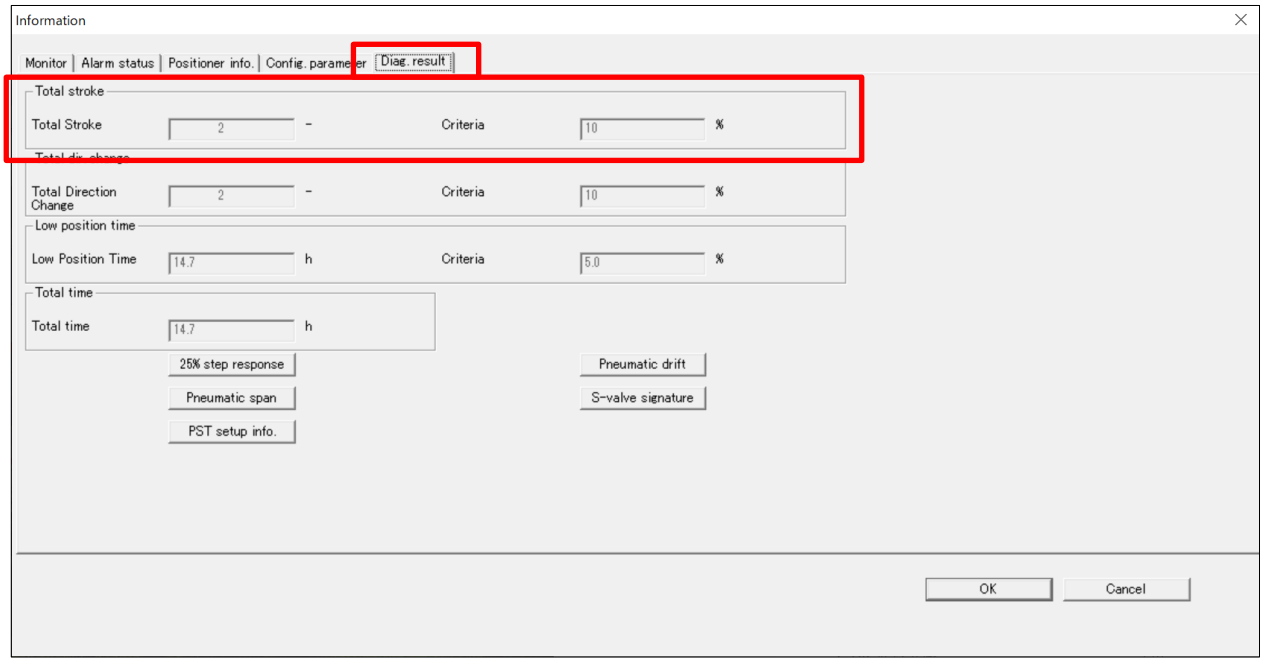
⑤ Select 'Criteria'

⑥ Input a criteria value. (Value range: 1% - 50%)

⑦ Press 'OK' to set.

2) Check of results.

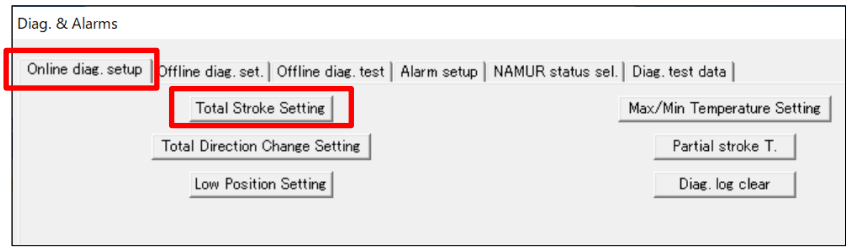
MENU) *View > Device Root Menu > Information>Diag. result>Total Stroke*



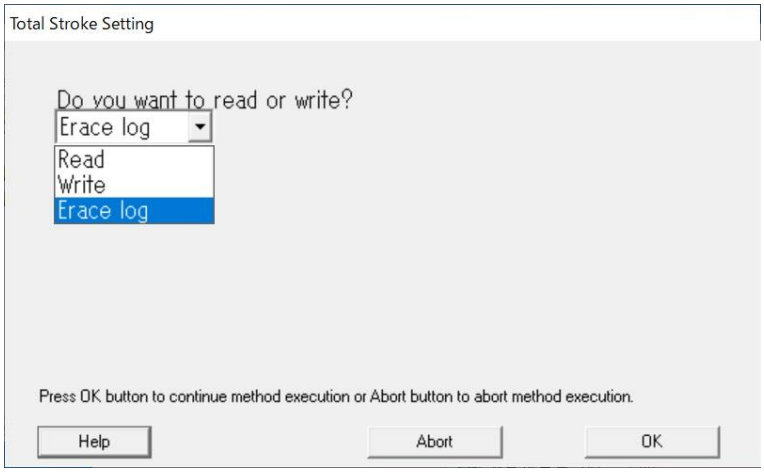
Total Stroke : Present total stroke value Criteria : Set value

3) Erasing the total stroke log

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu >Online Diag. setup >Total Stroke Setting*



① Select the 'Total Stroke Setting'



② Select 'Erase log' and press 'OK'

③ Press 'OK' on confirmation screen.to execute.

5.2.1. Clear of diagnosis logs

The procedures for clearing diagnosis logs is as follows.

MENU) *View > Device Root Menu > Extended Menu > Diag. & Alarms > Online Diag. setup > Diag. log clear*

Select 'OK' on confirmation screen.

5.3. Offline diagnosis setup

5.3.1. Summary of offline diagnosis

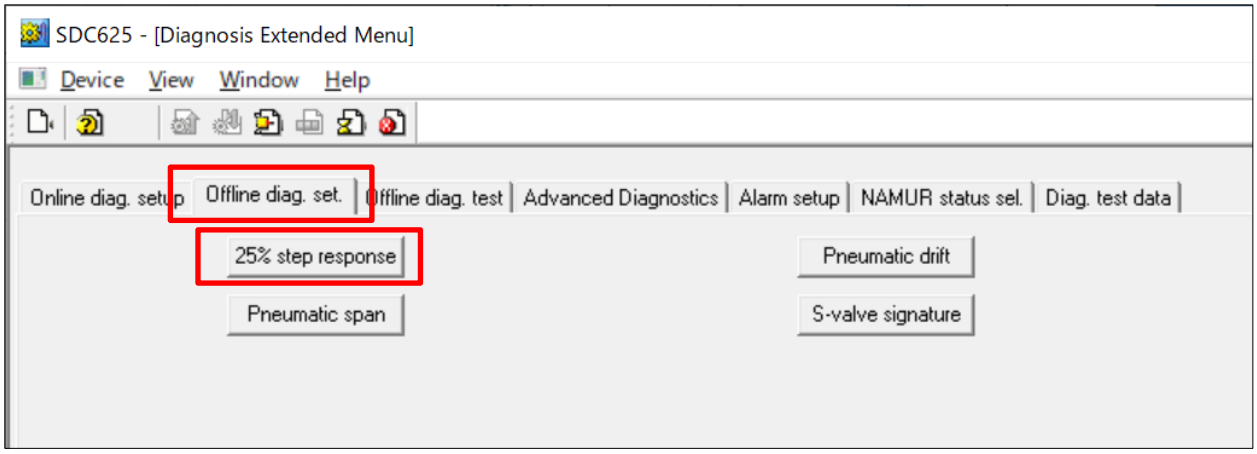
For an overview of offline diagnostics, see 4.6.2.1. in this instruction manual.

5.3.2. 25% step response test

The procedures for setting the 25% step response test and executing are as follows.

1) Setting the 25% step response test.

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. set > 25% step response*



① Select '25% step response'

② Select 'Write' and press 'OK'

③ Input a step time value.

④ Press 'OK' to set.

2) Executing the 25% step response test.

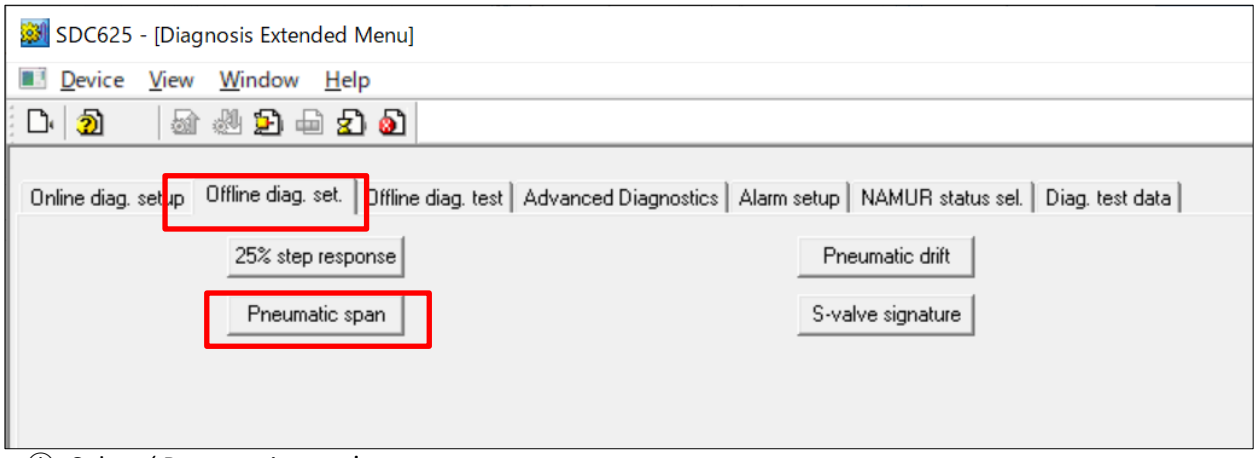
MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. test >25 step response*

Press 'OK' on confirmation screen to execute..

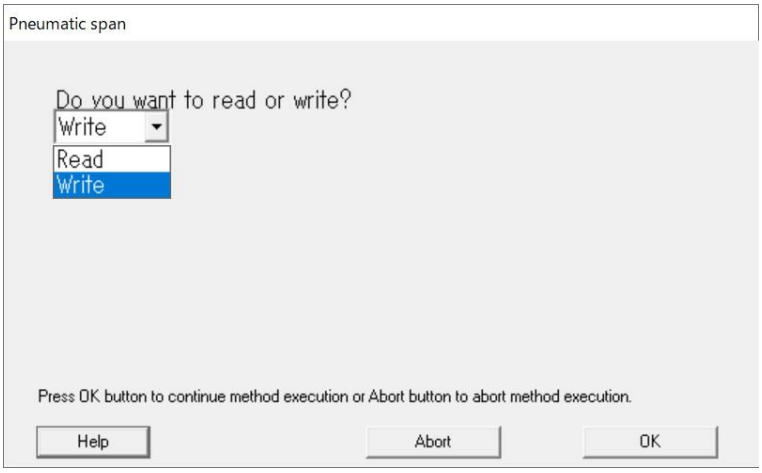
5.3.3. Pneumatic circuit span

1) Setting

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. set > Pneumatic span*



① Select ' Pneumatic span'



① Select 'Write' and press 'OK'

② Select 'Step time'

③ Input a step time value.

④ Select 'Criteria'

⑤ Input a criteria value.

⑥ Select 'OK to set.

2) Execution

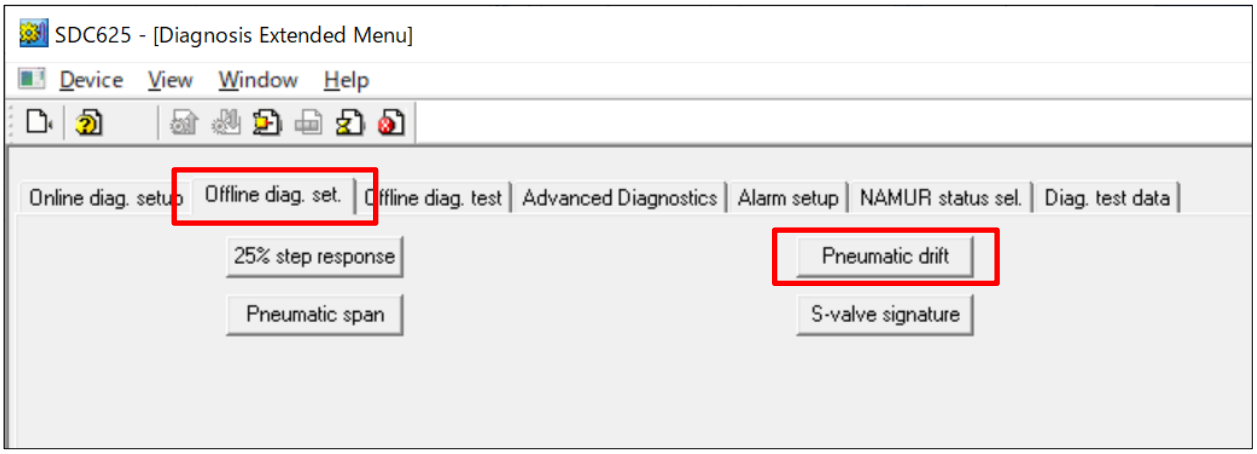
MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. test > Pneumatic span*

Select 'OK' on confirmation screen to execute.

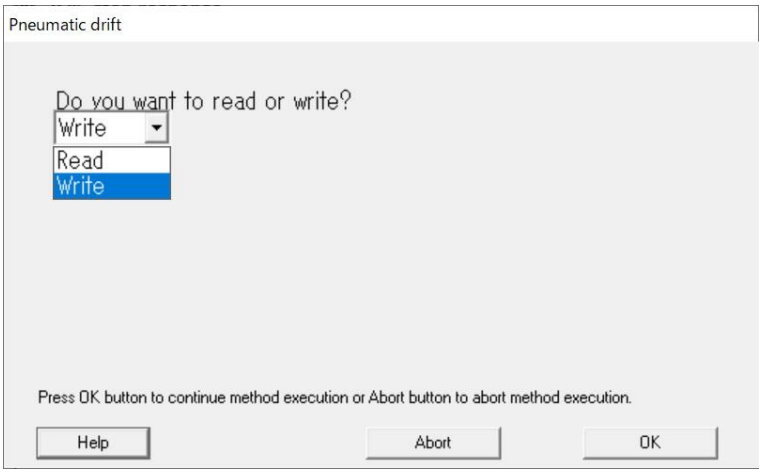
5.3.4. Pneumatic circuit drift

1) Setting

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. set > Pneumatic drift*



① Select ' Pneumatic drift'



② Select 'Write' and press 'OK'

③ Select 'Ramp time'

④ Input a ramp time value

⑤ Select 'Tolerance'

⑥ Input a tolerance value.

⑦ Press 'OK' to set.

2) Execution;

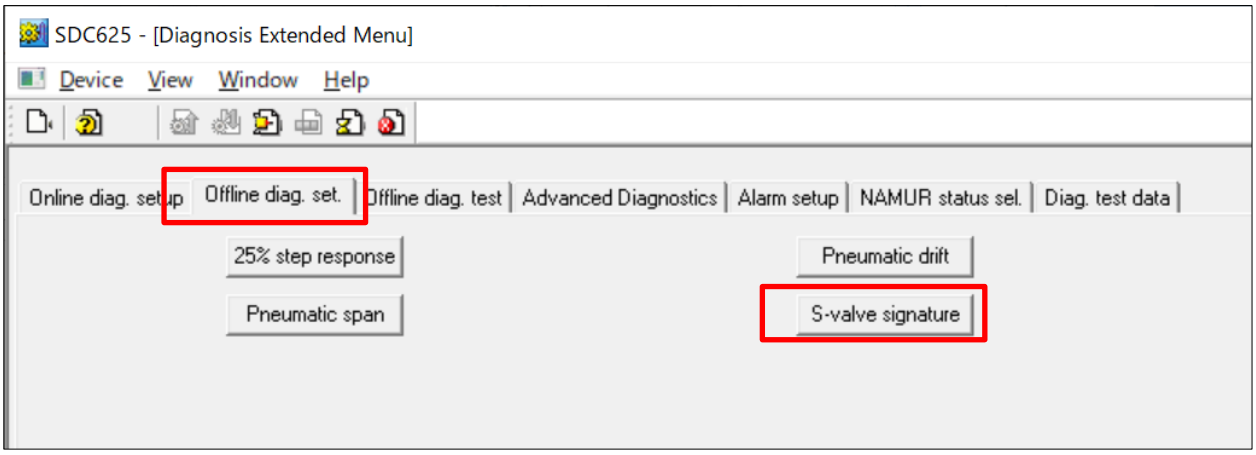
MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. test > Pneumatic drift*

Select 'OK' on confirmation screen to execute.

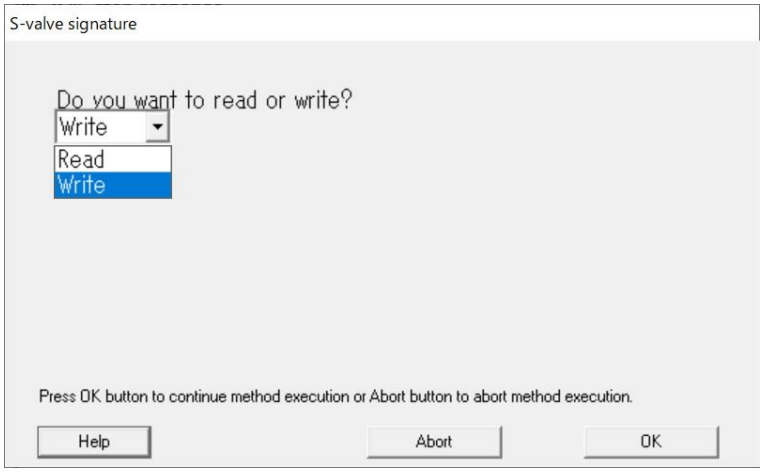
5.3.5. Simple valve signature

1) Setting

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. set > S-valve signature*



① Select 'S-valve signature'



② Select 'Write' and 'OK'

③ Select 'Ramp time'

④ Input a ramp time value.

⑤ Select 'Hysteresis limit'

⑥ Input a hysteresis limit value.

Hysteresis limit(kPa) :
Sets the pressure hysteresis tolerance. For details, see Table 4.6.2. Offline diagnosis.

⑦ Select 'Gradient limit H'

⑧ Input a gradient limit high value.

Gradient limit H(kPa) :
Sets the upper limit of the pressure gradient tolerance. See Table 4.6.2 for more information.

⑨ Select 'Gradient limit L'

⑩ Input a gradient limit low value.

⑪ Press 'OK' to set.

Gradient limit L(kPa) :
Sets the upper limit of the pressure gradient tolerance. See Table 4.6.2 for more information.

2) Execution;

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Offline diag. test > S-valve signature*

Press 'OK' on confirmation screen to execute.

5.4. Check and Save of online diagnosis results (Diag.test data)

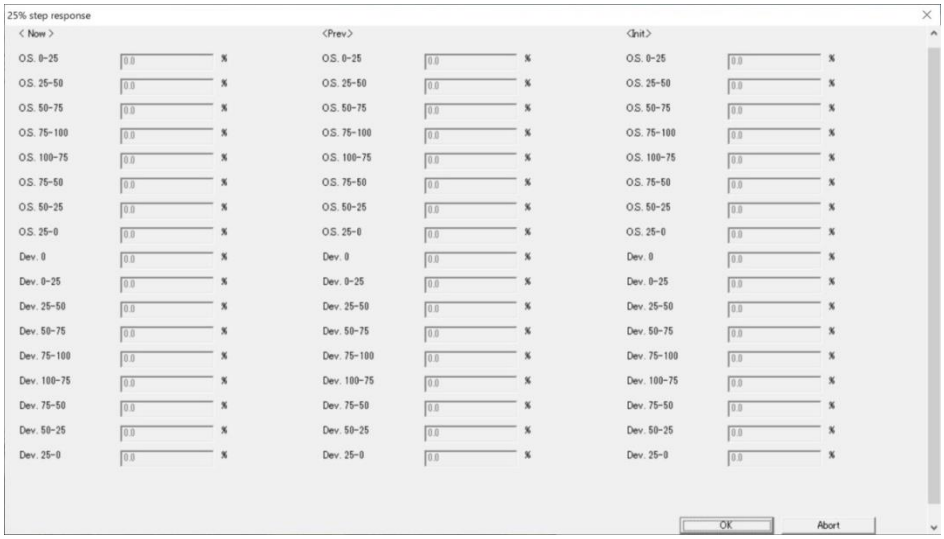
In this section, confirmation and save of diagnosis results are explained. It'll be the same operation with each diagnosis. Therefore, for instance, the 25% step response is explained here.

1) Check of result

It's possible to indicate a result data in following menu.

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Diag test data> 25% step response*

A list of result is indicated.



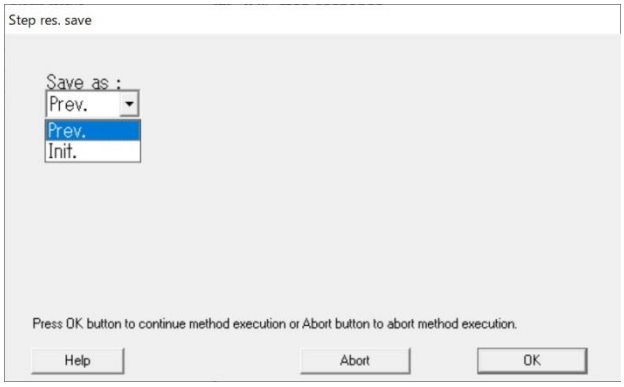
It's possible to indicate a result data from following menu.

MENU)
View > device Root Menu > Diagnosis Extended Menu > Information > Diag. result> 25% step response

2) Save of result

You can save a result data as a previous data or an initial data from following menu.

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Diag. test data > Step res save*



① Select 'Prev.' or 'Init'

② Press 'OK'to save.

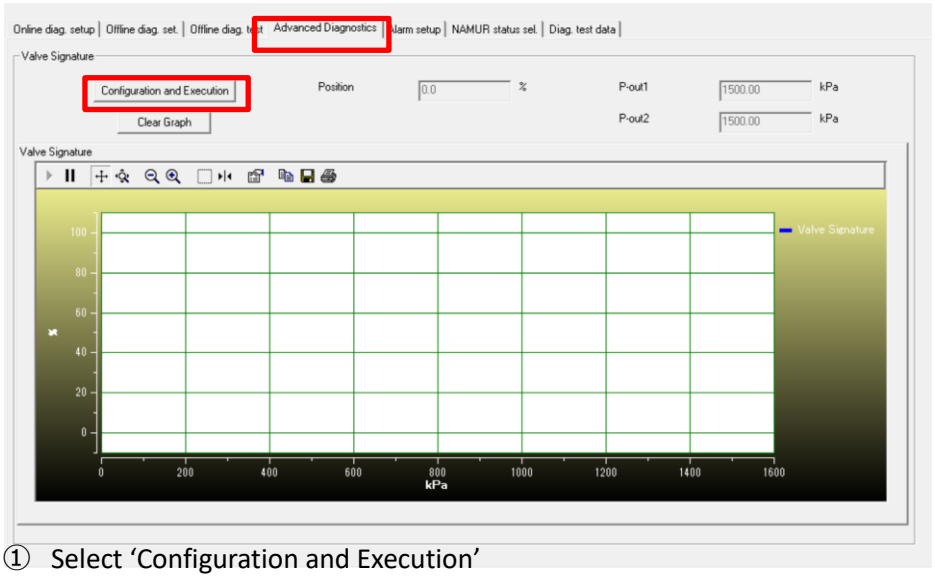
5.5. Advanced Diagnostics

5.5.1. Valve signature

The Valve signature shows the relationship between the operating pressure and the valve position when the valve is moved. And it shows the characteristics of a valve and an actuator.

From the data, various events occurring in the valve, such as irregular frictional force, can be found.

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Advanced Diagnostics*



① Select ‘Configuration and Execution’

② Select ‘Start Position’

③ Input a Start Position value.

④ Select ‘Stop Position’

⑤ Input a Stop Position value.

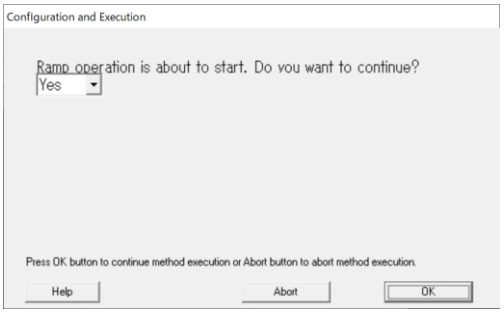
⑥ Select ‘Ramp Time’

⑦ Input a Ramp Time value.

⑧ Select ‘Wait Time’

⑨ Input a Wait Time value.

⑩ Press ‘OK



① Select ‘Yes’ and press‘OK’

②Press ‘OK’ on confirmation screen to execute.

5.6. Alarm setup

For an overview of alarms, refer to 6.4.1of this instruction manual.

5.6.1. Alarm setting / Check and Clear of result

It's possible to operate setting, check of a result and clear of result of each alarm from following menu.

1) Setting

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Alarm setup*

2) Check of results

MENU) *View > Device Root Menu >Information >Alarm status*

3) Clear of results

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > Alarm setup*

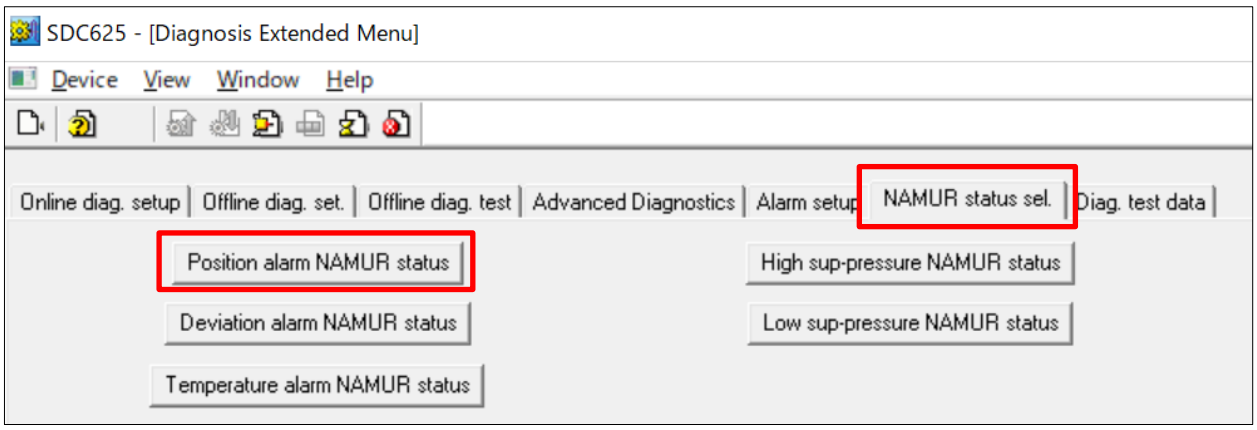
① Press 'Error/Alarm Clear'

5.7. NAMUR status select

The NAMUR status category related to each alarm can be selected voluntarily.

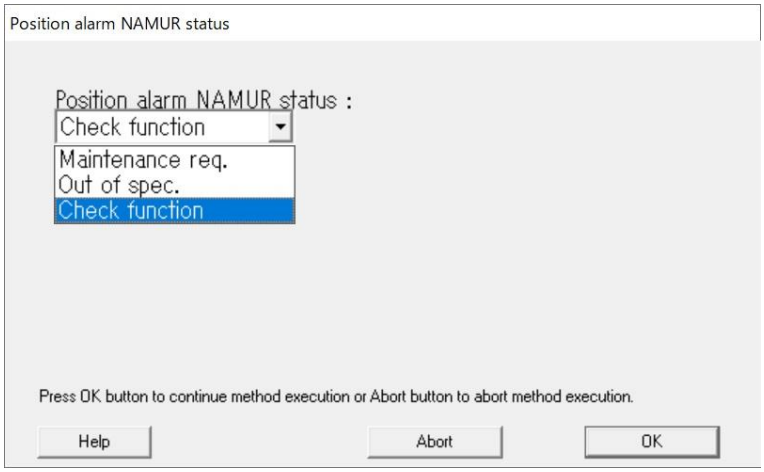
For example, the procedure for setting the position alarm is as follows.

MENU) *View > Diagnosis Root Menu > Diagnosis Extended Menu > NAMUR status sel.*



① Select the 'Position alarm NAMUR status'

② Select 'Write' and press 'OK'



③ Select NAMUR status category and press 'OK' to set

NAMUR status category:

Maintenance require
Out of specification
Check function

6. Troubleshooting

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

Table 6 Trouble shooting

Phenomenon	Assumed cause	Action
Does not move Move too slow Does not move fully	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
	Lack of actuator output	✓ Replace actuator
	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
Hunting Overshoot	Abnormality of positioner	✓ Cleaning of restriction ✓ Cleaning of nozzle flapper
	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

7. Menu item

1st hierarchy	2nd hierarchy	3rd hierarchy	4th hierarchy	5th hierarchy	6th hierarchy	reference (chapter)
Process Variables	Alarm status					
Root Menu	<Set point>					
	<Position>					
	<Loop current>					
	<Input>					3.1.
	<P-sup.>					
	<P-out1>					
	<P-out2>					
	<Temperature>					
	Trends					3.2.

1st hierarchy	2nd hierarchy	3rd hierarchy	4th hierarchy	5th hierarchy	6th hierarchy	reference (chapter)
Device	Alarm status					
Root Menu	<Set point>					
	<Position>					
	<Loop current>					
	<Input>					4.1.
	<P-sup.>					
	<P-out1>					
	<P-out2>					
	Information	Monitor	<Status>			
			<Input/posi etc>			4.2.1.
			<Pressure>			
			<Temperature>			
		Alarm status	Position alarm			
			Deviation alarm			
			Temperature alarm			4.2.2.
			S-pressure alarm			
			<Other failure>			
			<PST alarm>			
		Positioner info.	<Serial No.>			
			<Universal rev>			4.2.3.
			<Manufacture Date >			
			Version			
		Config. parameter	<Valve action>			
			<Packing friction>			
			<Booster option>			
			<Set point dir.>			
			Range ability			
			<PT burnout dir.>			
			<Transfer Function>			
			<Posi.transmit.dir>			4.2.4.
			Actuator setup			
			PID parameter set			
			<Cutoff or Limit>			
			<Dead band>			
			<Input damper>			
			<Sprit range>			
			<Integ.stop press.>			
		Diag. result	<Total stroke >			
			<Total dir. Change >			4.2.5.
			<Low position time >			
			<Total time >			
			25% step response			4.2.5.1.
			Pneumatic span			4.2.5.2.
			Pneumatic drift			4.2.5.4.
			S-valve signature			4.2.5.5.
			PST setup info			4.2.5.3.

Extended Menu	Alarm status				
	<Set point>				
	<Position>				
	<Loop current>				
	<Input>				
	<P-sup.>				
	<P-out1>				
	<P-out2>				
	Setup	Basic setup	Actuator motion	Linear	4.3.2.
				Rotary	
			Actuator type	Single	
				Double	
				5300	
			Valve action	ATO	
				ATC	
			Packing friction	Low	
				High	
			Booster option		
			Set point dir.	Normal	
				Reverse	
			Position transmit. dir	Normal	
				Reverse	
		Easy tuning	Full Autotune	<Autotune status>	4.3.3.1.
				Full autotune	
				<Autotune result>	
				Abort Autotune	
			Position setup	0%	4.3.3.2.
				100%	
				Auto span	
			Tuning result		
			Response tuning	Response tuning value	4.3.3.3.
		Expert tuning	PID parameter set	Custom /XS～XL	4.3.4.1.
			PID custom setup	Air-Out(not)= Air-In?	4.3.4.2.
				PID parameter	
				PID parameter Air-Out	
				Inside threshold	
				Inside PID AI	
				Inside PID AO	
			Sensitivity setup	Auto bias & size	4.3.4.3.
				Auto bias	
				Manual bias	
		Detailed Setup	Cutoff or Limit	Disable	4.3.6.
				Cutoff	
				Limit	
			Dead band	Disable/Enable	
			Transfer function	Linear	
				Equal percent Low	
				Equal percent Mid	
				Equal percent Hig	
				Quick opening	
				Custom Curve	
			Custom curve	Disable/Enable	
			Range ability		
			Input damper	Disable/Enable	
			Split range		
			PT burnout dir.	Low	
				High	
			AT span limit		
			Integ.stop press.		
		Function select	Authority	Authority	4.3.1.1.
				Control mode	4.3.1.2

	Extended Menu	Setup	Function select	Password setup	Disable/Enable	4.3.7.
				Screen saver	Disable/Enable	
				Temperature unit	Celsius	
					Fahrenheit	
				Pressure unit	kPa	
					psi	
					bar	
		Maintenance	Calibration	Input signal cal.		4.4.4.1.
				Cross point cal.		4.4.4.2.
				Position transmit		4.4.4.3.
				Pressure sensor	Sup.press.	4.4.4.4.
					Out1 press.	
					Out2 press.	
				Pilot relay adju.		4.4.3.
			Simulation test	Manual input	<Position>	4.4.5.1.
					Set Moving Value	
				Preset input	<Position>	
					Set Value	
				Ramp resp. test	<Mode>	4.4.5.2.
					Ramp resp. test	
					Abort Operation	
				Step resp. test	<Mode>	4.4.5.3.
					Step resp. test	
					Abort Operation	
			Memory save & res	Save		4.3.8.1.
				Restore		4.3.8.2.
				Factory Default		4.3.8.3.
			Service	<Angle>		4.4.6.1.
				<Cross Point>		
				<A/D values>		
				<Time stamp>		
				<PID values>		
				Factory menu		4.4.6.2.
			HART Relation	Find Device		4.4.7.1.
				HART/Device Information***		
				Squawk		4.4.7.2.
			*** HART only menu	Reset***		4.4.7.4.
			Factory setup**	IP signal range		
			** Display only if 'Factory menu' is ON	IP signal factor		
				Virtual DIP SW		
				Cutoff IP signal		
		Diag. & Alarms	Online diag.setup	Total Stroke Setting		4.6.1.2.
				Total Dir. Change Setting		4.6.1.1.
				Low Position Setting		
				Max/Min Temp. Setting		
				Partial stroke T.		
				Diag. log clear		4.6.1.3.
			Offline diag.set.	25% step response		4.6.2.2.
				Pneumatic span		4.6.2.3.
				Pneumatic drift		4.6.2.4.
				S-valve signature		4.6.2.5.
			Offline diag.test	<Mode>		
				25% step response		4.6.2.2.
				Pneumatic span		4.6.2.3.
				Pneumatic drift		4.6.2.4.
				S-valve signature		4.6.2.5.
				PST (offline)		4.6.1.1.

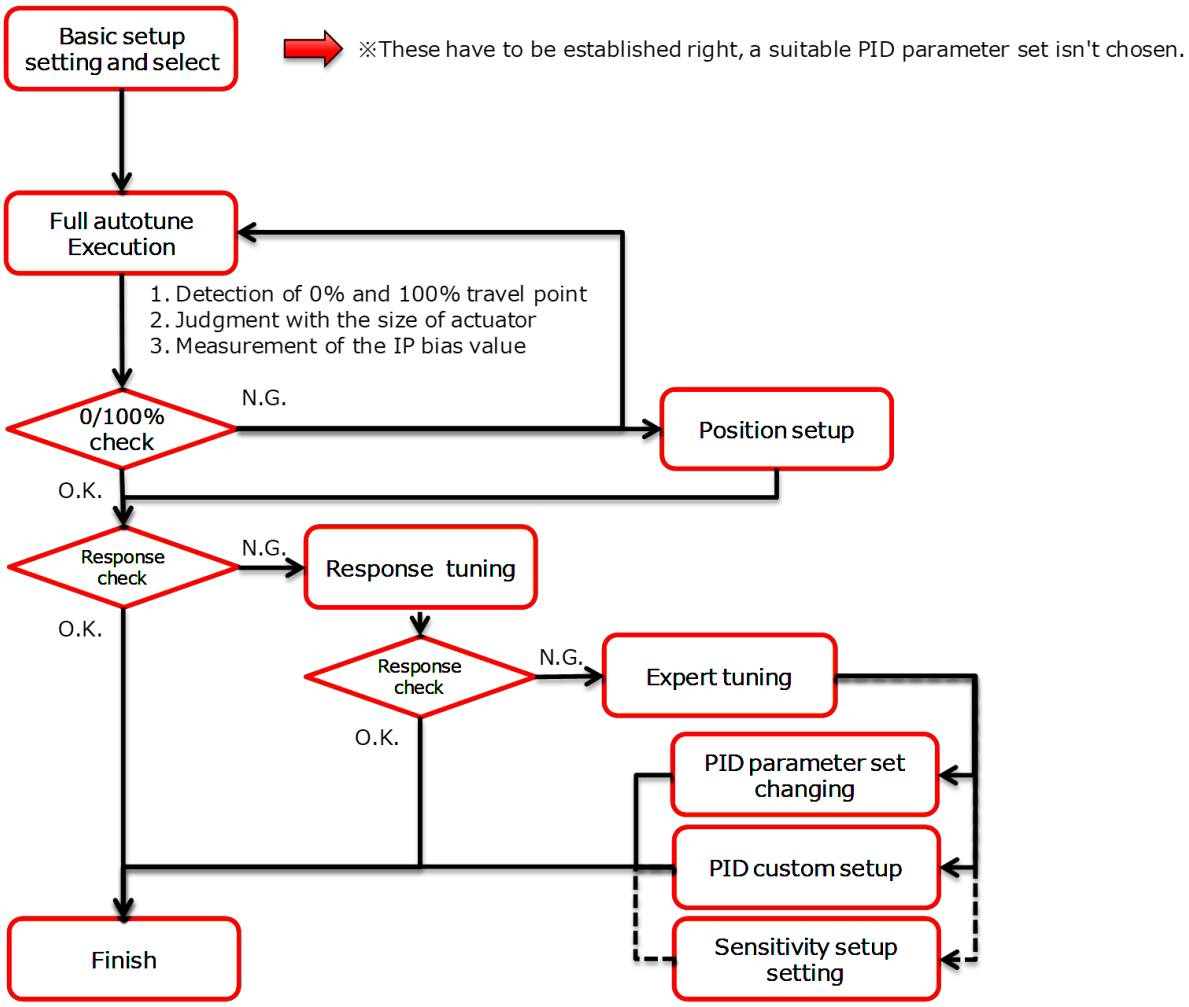
	Extended Menu	Diag. & Alarms	Alarm setup	Position alarm		4.5.2.
				Deviation alarm		
				Temperature alarm		
				High sup-pres. AL		
				Low sup-pres. AL		
				Pressure failure		
				Error/Alarm clear		
			NAMUR status sel.	Position alarm NAMUR status		4.5.3.
				Deviation alarm NAMUR status		
				Temperature alarm NAMUR status		
				High sup-pressure NAMUR status		
				Low sup-pressure NAMUR status		
			Diag.test data	25% step response		4.6.3
				Step res. save		
				Pneumatic span		
				Pneu. span save		
				Pneumatic drift		
				Pneu. drift save		
				S-valve signature		
				S-valve sig. save		
				<PST. Alarm result>		

1st hierarchy	2nd hierarchy	3rd hierarchy	4th hierarchy	5th hierarchy	6th hierarchy	reference (chapter)
Diagnosis	Alarm status					5.1.
Root Menu	<Total Stroke>					
	<Total Direction Change>					
	<Total time>					
	<Low Position Time>					
	<Low Position Time Percentage>					
	<Maximum Tamperature>					
	<Minmum Tamperature>					
	Diagnosis Extended Menu	Online diag.setup	Total Stroke Setting			5.2.
			Total Dir. Change Setting			4.6.1.1.
			Low Position Setting			
			Max/Min Temp. Setting			
			Partial stroke T.			
			Diag. log clear			5.2.1.
		Offline diag.set.	25% step response			5.3.2.
			Pneumatic span			5.3.3.
			Pneumatic drift			5.3.4.
			S-valve signature			5.3.5.
		Offline diag.test	25% step response			5.3.2.
			Pneumatic span			5.3.3.
			Pneumatic drift			5.3.4.
			S-valve signature			5.3.5.
			PST (offline)			4.6.1.1.
		Advanced Diagnostics	Valve signature	Configuration and Exection		5.5.1.
				View Graph		
				Clear Graph Data		
				<Position>		
				<P-out1>		
				<P-out2>		
		Alarm setup	Position alarm			5.6.1.
			Deviation alarm			
			Temperature alarm			
			High sup-pres. AL			
			Low sup-pres. AL			
			Pressure failure			
			Error/Alarm clear			

	Diagnosis Extended	NAMUR status sel.	Position alarm NAMUR status			5.7.
			Deviation alarm NAMUR status			
			Temperature alarm NAMUR status			
			High sup-pressure NAMUR status			
			Low sup-pressure NAMUR status			
		Diag.test data	25% Step response			5.4
			Step res. save			
			Pneumatic span			
			Pneu. span save			
			Pneumatic drift			
			Pneu. drift save			
			S-valve signature			
			S-valve sig. save			
			<PST. Alarm result>			

A) APPENDIX / 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.



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