IMI STI

SHP – Smart High-Performance Positioner

INSTRUCTION MANUAL 4055
(SOFTWARE & SETTINGS)

Engineering
GREAT Solutions

IMI Critical Engineering

PT

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28/06/2024	*02*	***Added** COM Port Reconnection update and Polling Address Scan feature description* ***Added** Pressure Sensors + Loop Current Calibration Window description* ***Added** OP Trial License description* ***Added** New chapter : Local User Interface* **Updated** *Logger screenshot (new 'On-Time' field)* ***Removed** 'Gr.Panel' explanation (removed in new version)* ***Added** Graph Text File Description* ***Added** Contactless Remote Sensor Description*	*T.S.*	*R.V.*

Contents

ABOUT THIS GUIDE

Introduction

Welcome to the User Guide for **Remote Control**, our dedicated software interface for the **SHP Positioner**. This guide is designed to provide you with a clear overview of the software's features and functionalities, enabling you to get started quickly and efficiently.

Remote Control is a powerful tool designed specifically for controlling and managing the SHP Positioner. It offers a **user-friendly interface** and a range of features that make it **easy to operate** the positioner, whether you're a novice or an experienced user.

The SHP Positioner is equipped with a suite of diagnostic tools. The **online diagnostic tools** include the **Logger**, which records and tracks data over time, the **Events & Counters**, which monitor and count specific occurrences, and the **NE107 status**, which provides standardized status warnings. In addition, the **offline diagnostic tools** comprise the **valve signature** test for assessing valve performance, the **step response** test for system reaction evaluation, and the **frequency response** test for determining system stability.

In this guide, you'll find step-by-step instructions on how to navigate the Remote Control interface, use its main features, and troubleshoot common issues. We've included clear screenshots and concise explanations to make the **learning process as straightforward as possible**.

This guide is divided into seven chapters to help you navigate through the different aspects of the software:

1. **Software Installation** : Walk through the process of installing the Remote Control software on your system.

2. **Getting Started** : Learn about the initial setup, configuration, and basic operations of the software.

3. **Main Tabs** : Understand the functions of the main tabs in the software interface and how to navigate them.

4. **Graph Tool** : Dive into the Graph Tool, its features, and how to effectively use it.

5. **Offline Diagnostic Tools** : Discover the offline diagnostic tools available in the software and how to use them.

6. **Local User Interface (LUI)** : Learn how to interact with the LCD display and touch screen keyboard.

7. **Option Packs** : Explore the additional features available in the Option Packs and how to activate them.

We hope this guide helps you get the most out of our Remote Control software for the SHP Positioner.

Definitions & Abbreviations

- **SHP** : Smart High-Performance positioner
- **Option Pack** : Purchasable group of features that enhance the functionality and control of the SHP positioner.
- **OP1** : Option Pack 1
- **OP2** : Option Pack 2
- **OP3** : Option Pack 3
- **HART** : Highway Addressable Remote Transducer
- **RC** : Remote Control (software)
- **LUI** : Local User Interface

1 SOFTWARE INSTALLATION

1.1 System Requirements

Before installing Remote Control, it's important to ensure that your system meets the necessary requirements for the software to run smoothly and efficiently. Here are the minimum system requirements for Remote Control :

- **Operating System** :
  Remote Control is compatible with **Windows 7**, **Windows 10**, and **Windows 11**. Please ensure that your system is running one of these operating systems.

- **Memory** :
  Your system should have at least **4GB** of **RAM**. This allows the software to perform optimally without causing your system to slow down.

- **.NET Framework** :
  Remote Control requires the latest version of the **.NET Framework**. The .NET Framework is a software development framework from Microsoft that runs primarily on Microsoft Windows. It provides a controlled programming environment where software can be developed, installed, and executed on **Windows-based operating systems**.

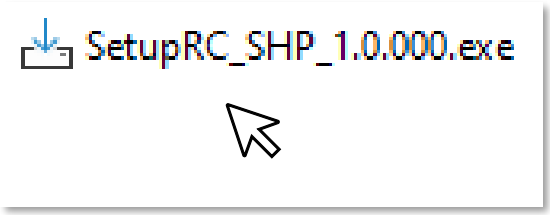
- **Disk Space** :
  Ensure that your system has at least **100 MB** of free disk space available for the software installation. Verify and clear up space if needed before proceeding with the installation.

Please ensure that your system meets these requirements before proceeding with the installation of Remote Control. If your system does not meet these requirements, you may experience performance issues, or the software may not function as intended.

1.2 Installation Wizard

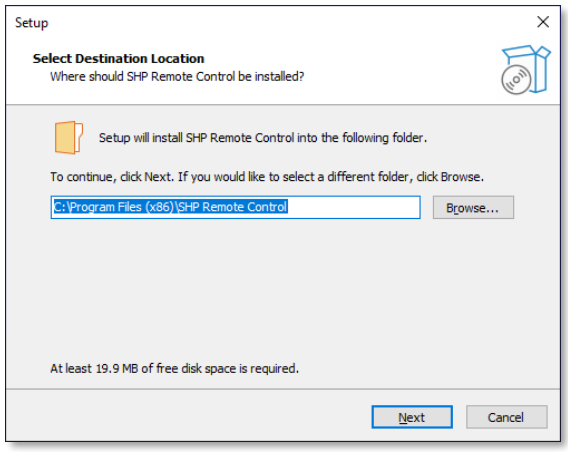
The Installation Wizard is a tool that guides you through the process of installing the Remote Control software. Here are the steps to follow:

Run the Installation File: Locate the installation file on your system and double-click it to run the Installation Wizard.



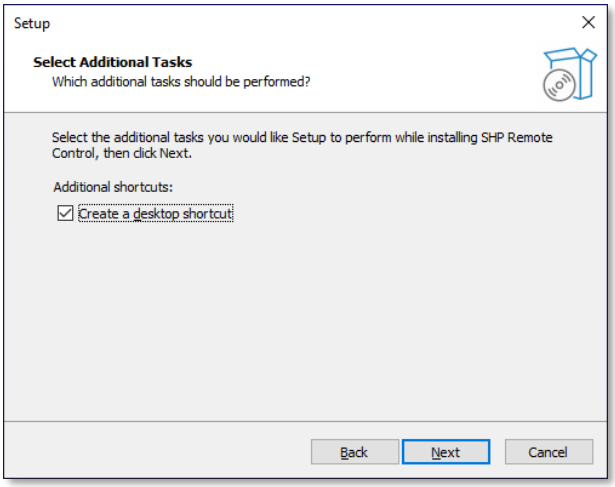
Remote Control Installation File

Select Destination Location: The first screen of the wizard will ask you to select the destination location for the software. Choose the desired location and click "**Next**".



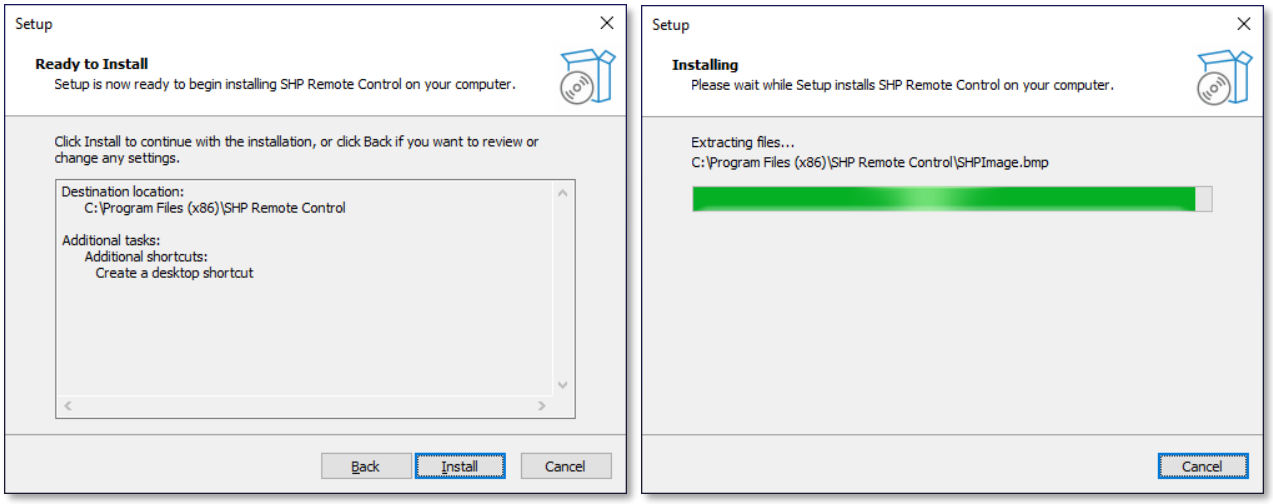
Installation : Step 1

Select Additional Tasks: The next screen will ask if you want to select additional tasks. Here, you can choose to create a desktop shortcut for easy access to the software. Check the box if you wish to create a shortcut, then click "**Next**".



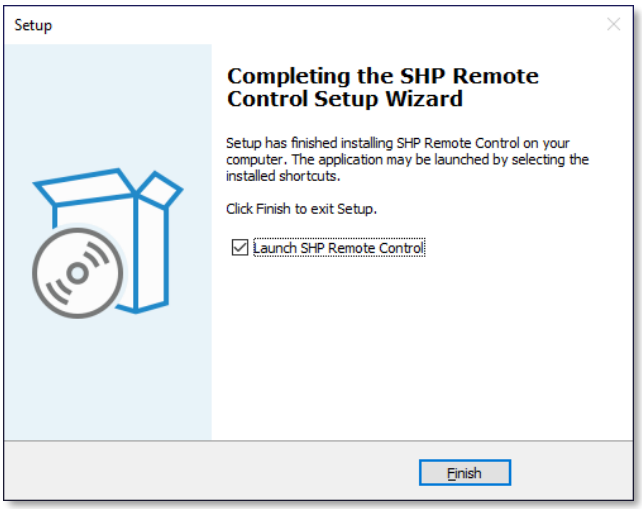
Installation : Step 2

Install: The wizard will now be ready to install the software. Click the "**Install**" button to begin the installation process. Please wait while the software is being installed.



Installation : Step 3 and 4

Finish: Once the installation is complete, click the "**Finish**" button to close the Installation Wizard.



Installation : Step 5

Please refer to the screenshots provided for each step to help guide you through the installation process. If you encounter any issues during installation, please contact IMI STI.

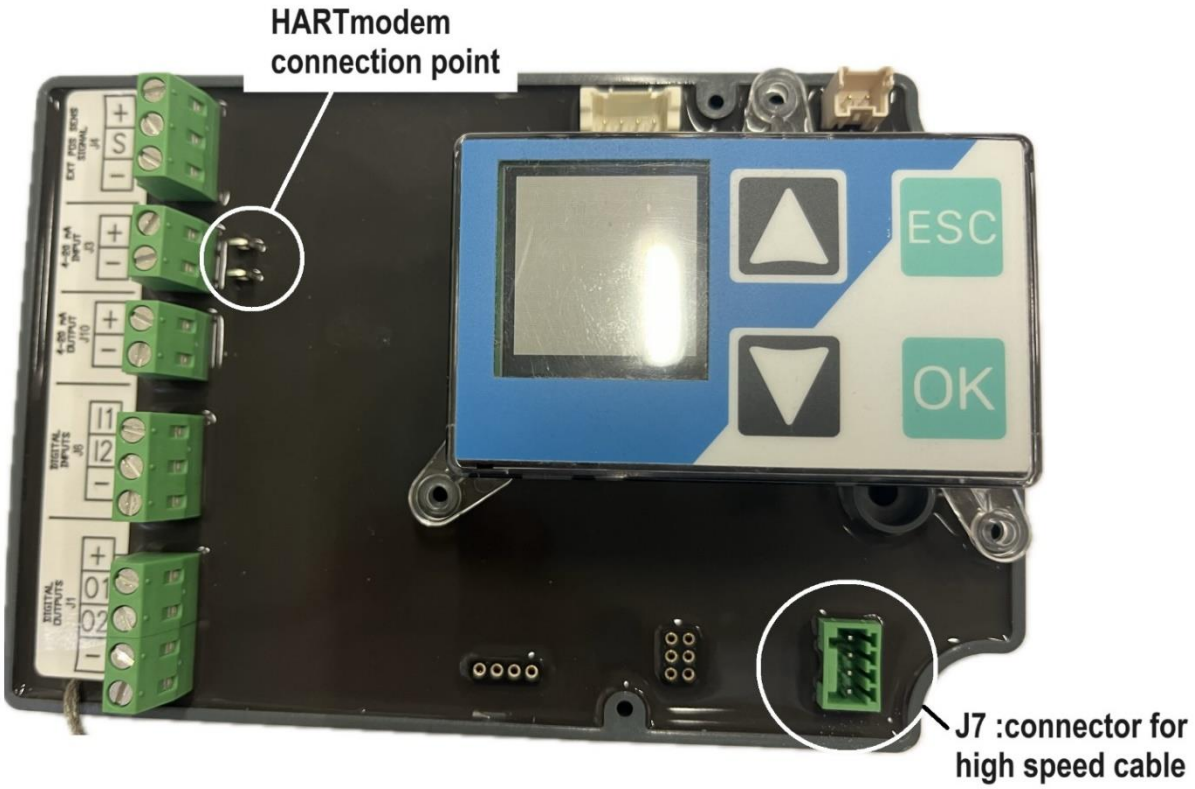
2 GETTING STARTED

2.1 Communication Port

Before you can start using the Remote Control software, it's important to ensure that the SHP Positioner is properly connected to your computer.

Connection can be :

- By the **High Speed Connection Cable** (the use of it is restricted to not hazardous area, see SAFETY MANUAL 9038 for details)
- By **HART Modem**



Always connect the communication cable in the right sequence : **1 = laptop → 2 = positioner**

Always disconnect the communication cable in the right sequence : **1 = positioner → 2 = laptop**

Here are the steps to set up the communication port :

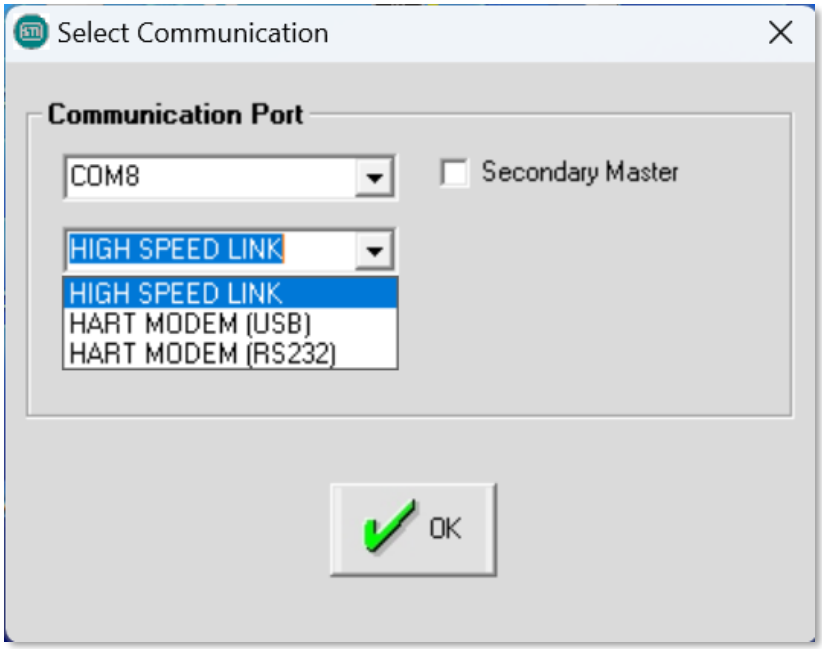
1. **Connect the SHP Positioner**: Before opening the Remote Control software, make sure that the SHP Positioner is connected to your computer using the appropriate cable.

2. **Open the Software**: Once the positioner is connected, you can open the Remote Control software. Upon opening, a window titled "**Select Communication**" will appear.

3. **Select the COM Port**: In the "Select Communication" window, you will need to select the correct COM port that the positioner is connected to. If the COM port is detected but communication with the SHP is not possible, perhaps due to an incorrect COM port selection, the initial COM port selection screen is shown again. This allows the user to reselect the correct COM port. It is suggested to the operator to check that the positioner is not turned off or that the cable is not disconnected.

4. **Select the Communication Mode**: The SHP Positioner can communicate via a **High Speed Cable** or with a **HART modem** (specify whether it's a USB HART modem or an RS232 HART modem). Choose the mode that corresponds to your setup.
   If the connection with the SHP is via HART modem and a wrong polling address is chosen, the operator is then presented with the option to **scan** for field devices in order to find their correct **polling addresses**.

5. **Confirm the Settings**: After all the necessary selections have been made, click "**OK**" to confirm the settings and proceed.



Select Communication

If the "**COMx**" number is not appearing in the list it means that the cable is not recognized : the communication driver is not installed, or you don't have the administrative rights to install it → contact your IT manager.

The "**Secondary Master"** flag allows communication by HART when a DCS is already connected on the same channel to monitor the instrument.

	**Please note that the correct setup of the communication port is crucial for the successful operation of Remote Control with the SHP!**

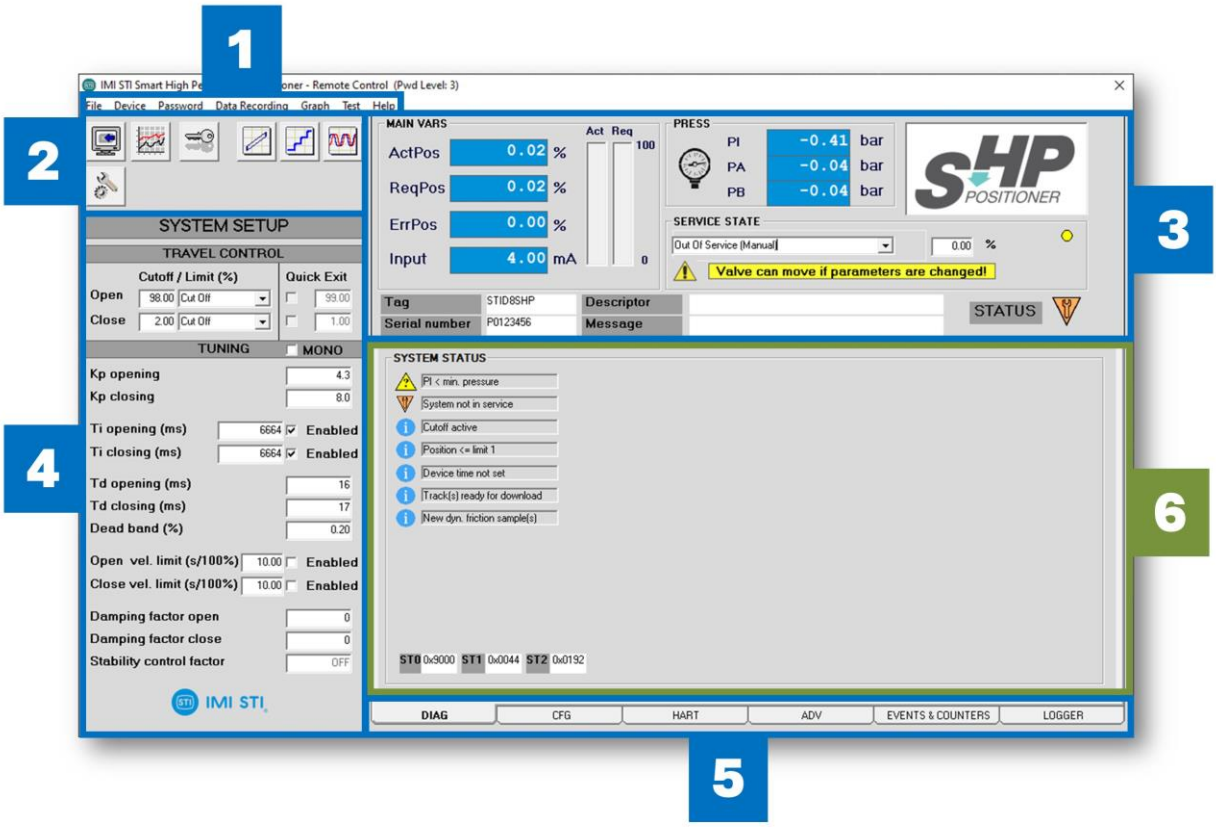
2.2 Main Window

Upon launching the Remote Control software, you will be presented with the main interface window.

	It is necessary to insert the password to get access to different functionalities : **BASIC LEVEL** : Default Password is **12345** **ADVANCED LEVEL** : Default Password is **23456**

This window is divided into two main areas :

- **Permanent Control Section** (**highlighted in blue**): This section contains five essential panels for controlling the positioner. These panels are always visible, regardless of the tab you're currently viewing.
- **Current Tab View** (**highlighted in green**): This area changes based on the tab you select. By default, the Diagnostic tab (DIAG) will be opened when you launch the software.



Remote Control Main Window

Here's a brief overview of the key panels and areas in the main interface window :

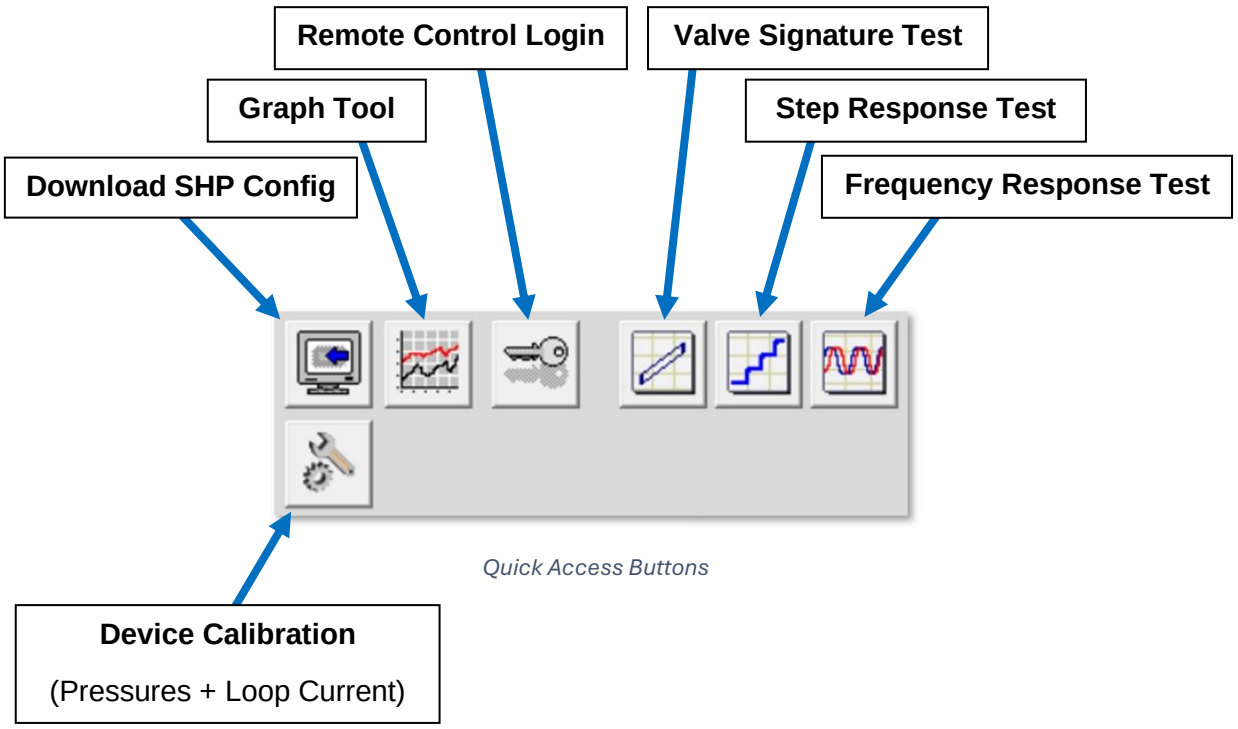
- **[1] Ribbon Bar** : This is where you can access the different tabs of the software. Each tab opens a different set of tools and options in the Current Tab View.
- **[2] Quick Access Buttons** : These buttons provide quick access to commonly used functions and settings.
- **[3] Process Variables and Status Information** : This panel displays important information about the status of the positioner and the current settings.
- **[4] System Setup Panel** : Here you can adjust the settings of the positioner and tune its performance.
- **[5] Access to the Main Menus** : This area provides access to the main menus of the software, where you can find additional settings and options.
- **[6] Currently Opened Menu** : This area displays the menu that is currently opened in the Current Tab View.

Please refer to the screenshot provided for a visual guide to these areas. Each area is marked with a number corresponding to the descriptions above, and the **Permanent Control Section** and **Current Tab View** are highlighted in blue and green, respectively.

2.3 Ribbon Bar & Quick Access Buttons

Quick Access Buttons

The “Quick Access Buttons” section is designed to provide you with immediate access to seven key tools that enhance the functionality and usability of the SHP interface. Each button, when clicked, opens a window that contains the corresponding tool. This allows for a streamlined and efficient user experience, reducing the need for navigating through multiple menus or screens.

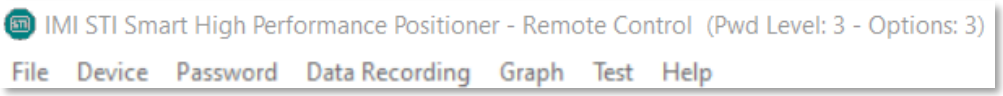


Quick Access Buttons

Please note that the full functionality of offline tests (Valve Signature, Step Response and Frequency Response) is only active if the user has activated the appropriate Option Pack. For more information on how to activate these packs, please refer to the corresponding section in the manual.

Ribbon Bar

The Ribbon Bar provides easy access to various features and functions of the software.



Ribbon Bar options

Here’s an overview of each menu in the Ribbon Bar :

- **File** : This menu allows you to manage your parameters.
  - ***Load*** : This option lets you load a saved set of parameters into the Remote Control interface.

- ***Save*** : This option allows you to save the current set of parameters in a **.shp** file, the proprietary format used for the 'Load' command.
- ***Report*** : This option is used to generate a readable document (.rtf format) to keep trace of the actual configuration.
- ***Exit*** : Close Remote Control.

- **Device** : This menu provides options for managing the connection with the positioner.
  - ***Download from Positioner*** : This performs the same function as the quick button , allowing you to download parameters from the positioner.
  - ***Upload Param*** : This option sends the displayed parameters to the positioner.
  - ***Upload Param + CalibData*** : This performs the same function as "Upload Param" and sends additional calibration information to the positioner.
  - ***Measurement Units*** : This lets you choose between metric and imperial units.

	'CalibData' are related to a specific SHP positioner (like pressure sensor calibration), the command must be used only to restore the configuration of the same positioner where the data comes from. 'Upload Param' can be used from different SHPs to apply the same setting (i.e. when you have similar configuration on multiple devices)

- **Password** : This menu provides options for managing your password and license keys.
  - ***Login***: This performs the same function as the quick button, allowing you to log in.
  - ***Change***: This option is used for changing the password.
  - ***Keys***: This opens the License Code Manager for managing Option Packs.

- **Data Recording** : This menu provides options for recording and managing data.

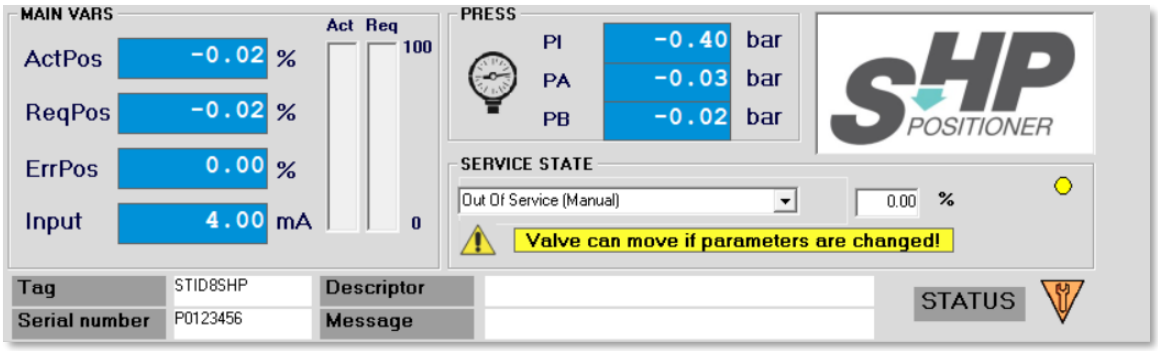
- **Graph Menu** : This performs the same function as the quick button, allowing you to manage graphs.

- **Test Menu** : This menu provides options for running various tests.
  - ***Valve Signature*** : This performs the same function as the quick button, allowing you to run a valve signature test.
  - ***Step Response*** : This performs the same function as the quick button, allowing you to run a step response test.
  - ***Freq. Response*** : This performs the same function as the quick button, allowing you to run a frequency response test.

- **Help Menu** : This menu provides information about the software and device.
  - ***Info*** : This provides information about the software version and the device.

2.4 Process Variables & Status Information

The “Process Variables & Status” panel is a comprehensive dashboard that provides real-time information about the positioner’s process variables and current status. This panel is designed to give you a quick and clear overview of the positioner’s operation, making it easier for you to monitor and control its performance.



Process Variables and Status Panel

Process Variables

Here’s a detailed overview of each variable displayed in this panel :

- **ActPos (Actual Position)**: Displays the current position of the SHP Positioner. It updates in real-time as the positioner moves, providing you with a live view of the positioner’s status.
- **ReqPos (Required Position)** : Shows the target position that the positioner is trying to reach. You can set this value based on your positioning needs.
- **ErrPos (Error Position)** : Indicates the difference between the Actual Position and the Required Position. It helps you monitor the accuracy of the positioning process.
- **Input (4-20mA Signal)** : Shows the current value of the input signal in milliamperes. The SHP Positioner uses this signal to determine the Required Position.
- **PI (Line Pressure)** : Shows the pressure in the supply line that feeds the SHP Positioner.
- **PA (Pressure in Port A)** : Pressure measured at Port A of the positioner.
- **PB (Pressure in Port B)** : Pressure measured at Port B of the positioner. (In case of single acting this info disappear)

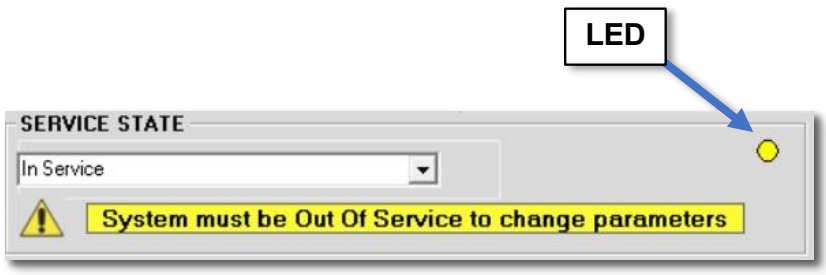
Service State

The “Service State” panel provides information about the current operational state of the SHP Positioner. Here’s a closer look at each service state :

- **In Service**: This state indicates that the positioner is in normal operation mode and uses the 4-20mA information like required position
- **Out of Service**: This state indicates that the positioner is not in operation (Port B is fully pressurized, Port A is exhausted).
- **Out of Service (Manual)**: This state indicates that the positioner is not following the 4-20mA signal and accept ‘manual’ inputs to define the target position.
- **Out of Service (Fixed PWM)**: This state indicates that the positioner is out of service and is operating at a fixed Pulse Width Modulation (PWM) value. This is typically used for testing or calibration purposes.
- **Out of Service (Fixed DP)**: This state indicates that the positioner is out of service and is maintaining a fixed Delta Pressure (DP). DP represents the difference between the pressures at Port A (PA) and Port B (PB) of the positioner (Port A for single acting).

The service state of the SHP Positioner not only indicates its operational status but also determines the availability of certain configuration features in the Remote Control software. Depending on the current service state, some features may be enabled or disabled. This is designed to prevent unintended changes or operations during certain states, ensuring the safe and efficient operation of the positioner.

Next to the Service State option, there is a LED indicator that shows the communication status between the positioner and the software. When the LED is **yellow and blinking**, it means that the **communication is running correctly**. However, if the LED turns **red**, it indicates a **communication problem**.



Service State & Communication LED

Always be sure to check the service state and the LED indicator before attempting to use any configuration features.

Status Information

The “Status Information” panel provides standard details about the positioner.

Status Information fields

It consists of four fields :

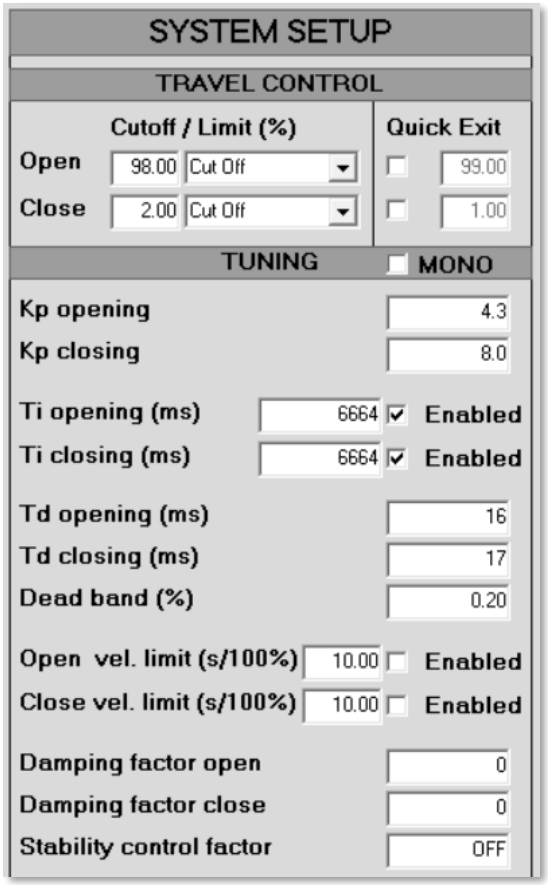
- **Tag** : A unique identifier for the positioner.
- **Descriptor** : A brief description or summary of the positioner.
- **Serial Number** : The SHP assigned serial number.
- **Message** : Any important messages or notifications related to the device.

In addition to these, the panel also includes the **NAMUR NE107 condensed status warning**. This feature provides a quick and clear overview of the positioner’s status, allowing for efficient monitoring and troubleshooting. Only the highest (most important) active warning is displayed. You can view the complete device status in the **Diagnostic Tab**.

2.5 System Setup Panel

The “System Setup” panel is divided into two sub-panels: “**Travel Control**” and “**Tuning**”.

Parameters cannot be changed if the positioner is in ‘IN SERVICE’ mode.



System Setup panel

Travel Control

This panel assists users in configuring the behaviour of the system when close to the travel limits.

Available options are :

OFF : no modification is applied to the signal, the positioner will work to move the valve in the position defined by the 4-20mA signal.

CUTOFF : it means that when the signal falls in the cutoff region, the required position is forced to the hard limit of the region. For example, if CUTOFF is 2% and the signal is < 2% the required position will be forced to 0%, and full pressure will be applied to keep the valve as close as possible. This is the typical setting that must be configured in the close position.

LIMIT : it means that even if the signal falls in the ‘limit region’ the value is limited to the specified number. For example, if LIMIT is 98% and the signal is equivalent to 99%, the required position will be limited to 98%. This is the typical setting that can be configured in open position where there is not the need to fully open the valve and thanks to the limit, it is possible to reduce the stress on the valve bonnet.

SOFTCUTOFF : This is similar to CUTOFF but with an additional feature. When the valve moves in the direction of CUTOFF, the positioner will work in order to reduce the speed when close to the SOFTCUTOFF setting to avoid a big impact on the final position. At the end, the full pressure will be applied but reducing the chance of a strong impact. This is the typical setting used in close position for valves requiring attention to don't damage the seat.

Additionally, there are two "**Quick Exit**" fields **(available with OP3)**.

This special feature allows to come out from cutoff quickly reducing the dead time on seat.

For example, if CUTOFF is at 97% and QuickExit is set at 98,5% we will have the below scenario :

Setpoint if between 98,5% and 100% : Full thrust on seat is applied.

Setpoint if between 97% and 98,5% : Valve is kept closed but without the full thrust.

Setpoint is < 97% : Valve will be moved in the required position.

With a smart control system and the QuickExit option, it is possible to apply a logic to pre-alert the positioner to be ready to go out from cutoff region quickly, reducing consistently the dead time on seat.

Tuning

The "Tuning" panel is designed for **manual adjustment of the control parameters.**

Kp [0,1 .. 25] :

The **proportional gain** is the multiplier of the error (the difference between input signal and actuator actual position) and it is expressed in percent. It is active only for an error which is bigger than the dead band value.

A different gain for each stem direction can be selected.

Ti [OFF – 10 .. 100000 ms] :

The **integral factor is used to** eliminate the residual steady-state error that occurs with a proportional only controller. However, since the integral term is responding to accumulated errors from the past, it can cause the present value to overshoot the setpoint value and cause hunting.

A small 'Ti' value is equal to an aggressive integral effect, when integral is turned off, it is equal to 0.

Td [0..1000] :

The **derivative factor** slows the rate of change of the controller output.

Setting Td equal to '0' disable the derivative factor. Increasing the value increases the derivative action that acts like a brake when the valve is moving to fast in the final position. Make attention because a too high derivative can sometimes cause instability.

Dead Band [0..10] :

The (INTENTIONAL) **dead band** is used to teach the positioner about the accepted error 'tolerance'. Any real system has a 'resolution', a minimum movement that happens when the positioner tries to

move it. This resolution comes mainly from the valve friction and the actuator size. Any time the positioner moves the valve, the minimum movement will be equal or greater of the resolution. Thanks to the (intentional) deadband setting we prevent the positioner to search for an 'impossible' result avoiding a continuous movement up and down around the target position with consequent wearing of mechanical parts.

Velocity Limit [0..655 sec] :

The **velocity limit** is the value expressed in seconds of the stroking time for each direction.

This list is applied to the setpoint change. A Velocity limit of 10 seconds modifies a step 0-100% in a ramp from 0 to 100% in 10 seconds. This parameter is useful in order to reduce the valve speed and consequently stabilize it.

Damping Factor [0..255] :

Applies a **damping** effect at the signal rate of change. Increasing the damping factor causes a smooth effect on the signal rate of change.

A unique feature available is the **Stability Control Factor (available with OP2)**. This feature activates a special algorithm that manages the valve in the event of instability, performing damping action only when instability is detected.

The Stability Control Factor parameter can take several values:

- **0** : This **turns OFF** the functionality.
- **5 - 200** : **Lower values** trigger the stability **control only for high-frequency oscillations**, while **higher values** activate the stability **control for both high and low-frequency oscillations**.

This panel provides users with precise control over the SHP operation, ensuring optimal performance and efficiency. For more detailed information on interpreting these parameters, please refer to the complete user manual.

Mono Option

	Numerous parameters can be configured with distinct settings for both the 'open' and 'close' directions to optimize system performance. If the MONO flag is checked, the first value of each parameter is automatically duplicated to the second one.

3 MAIN TABS

3.1 Overview

The Remote Control interface is organized into six main tabs, each dedicated to a specific aspect of the system's operation. These tabs are: "**Diagnostics**", "**Configuration**", "**HART**", "**Advanced Configuration**", "**Events & Counters**", and "**Logger**".

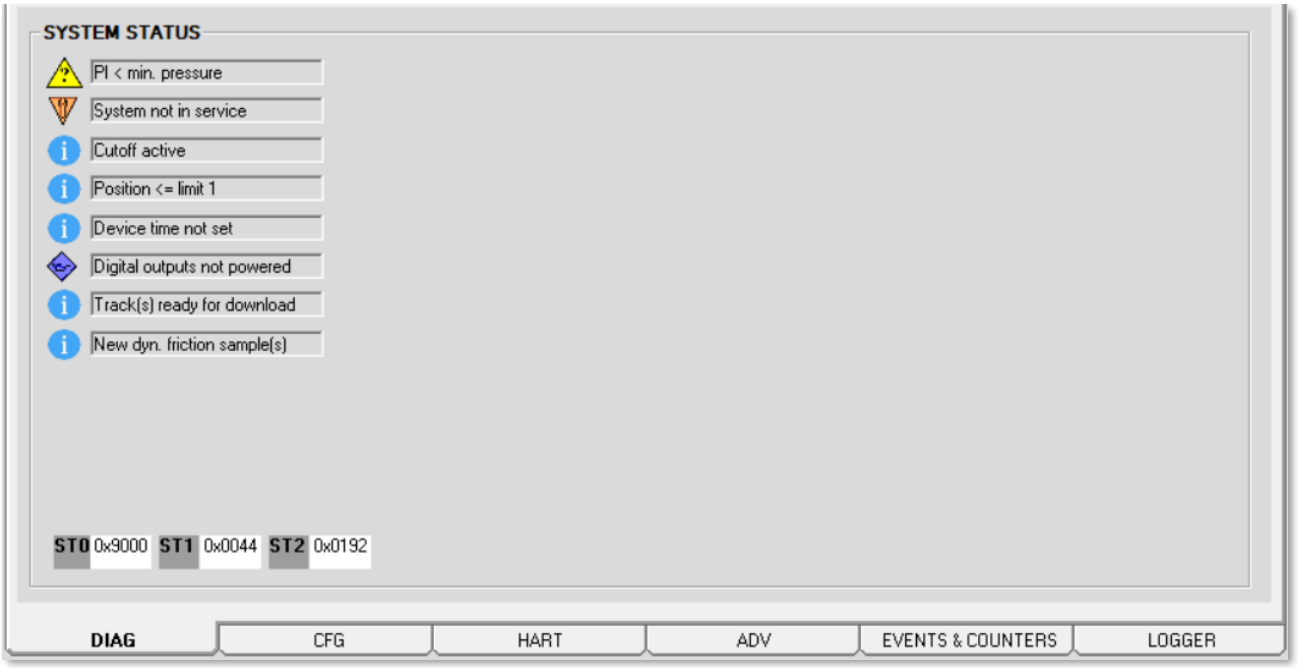
To access all these tabs, users need to **log in** to Remote Control using the Quick Access Button **"Login**". Each tab provides a unique set of features and controls, allowing you to monitor, configure, and manage the positioner effectively.

Please note that the "**Logger**" feature is available only with **Option Pack 3**. Please refer to the corresponding chapter to learn how to enable it.

In this chapter, we'll take a simple look at each tab, helping you get a clear understanding of their functions and how to use them effectively.

3.2 Diagnostic Tab : DIAG

The Diagnostic Tab is your go-to place for real-time system status updates. It displays the system status panel that provides live updates on all active **NAMUR NE107** warnings, along with details about the events that triggered these warnings. This feature is crucial for users to keep an eye on the SHP status and act quickly on any potential issues.
Typically, this is the first tab you'd want to check when you need more information about the displayed **Condensed Status** warning.



Diagnostic Tab

NAMUR NE107 pictograms

	**Failure**	One or more device variables are invalid or inaccurate.
	**Check Function**	Field device is being serviced – device variable(s) may be frozen or invalid.
	**Out of Specification**	Device variable value(s) may be compromised due to past or present ambient or operating conditions deviating from device requirements.
	**Maintenance**	Maintenance required to ensure continued proper operation.
	**Good / Normal**	The device is operating under typical operating conditions such that Maintenance Requirement, Out of Specification, Failure and Function Check are not active.

NAMUR NE107 definitions

The system status also provides additional information using the **info** pictogram (not part of the NE107 standard).

	**Information**	Unlike the other NAMUR NE107 warnings, the “info” pictogram provides non-essential yet useful information about the device’s status.

Remote Control info warning

Device Status Words

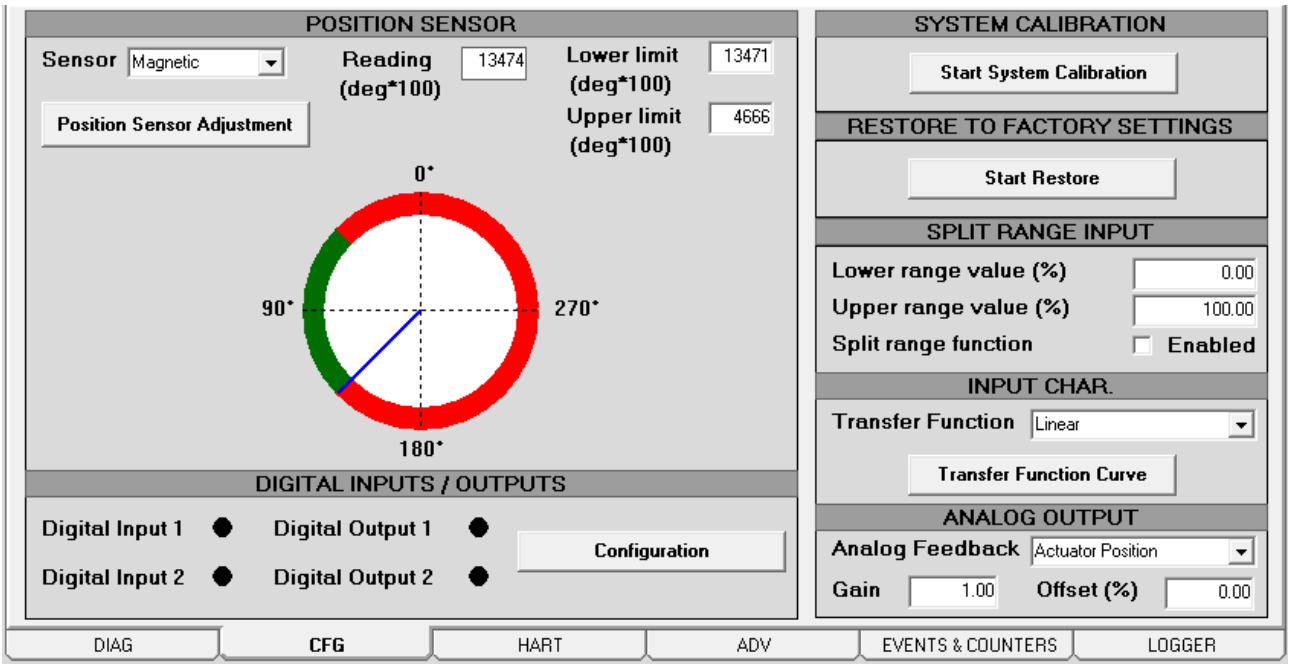
These are the raw information used to get the status of the positioner. The above NE107 status info comes from here.

SHP status words

3.3 Configuration Tab : CFG

The Configuration Tab is the second main menu item in Remote Control. This tab is your central hub for configuring the positioner. It offers a wide range of configuration options, organized into seven distinct panels. Each panel serves a unique purpose, catering to different aspects of the positioner's setup and operation.

From calibrating the system to managing **digital inputs/outputs** and adjusting/selecting the **position sensor**, the Configuration Tab provides you with the tools you need to customize the positioner's settings to your specific requirements. Whether you're **restoring factory settings** or configuring the **analog output**, this tab makes the process straightforward and efficient.



Configuration Tab

Position Sensor

The first section within the Configuration tab is dedicated to the sensor settings. This panel enables you to choose from three compatible sensor options for the SHP positioner :

- **Magnetic Sensor**
- **Potentiometer**
- **Active Remote** (contactless remote position sensor)

The panel contains three fields that provide information about the calibration of the sensor :

Reading :
This field displays the raw value read by the positioner.

- For a **Magnetic Sensor**, it provides an **angle** ranging from **0** to **360 degrees** (expressed as degrees × 100).

- For a **Potentiometer** or ActiveRemote, it provides an **ADC bit value** ranging from **0** to **4095**.

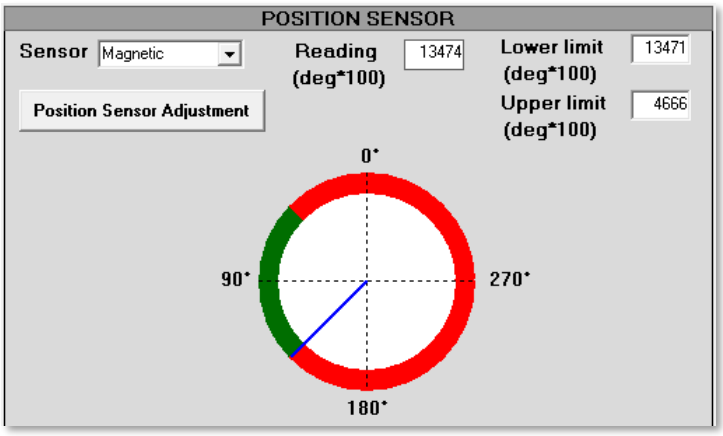
Lower and Upper limits :
These fields display the 'reading' value corresponding to the hard limits. For both the Magnetic Sensor and the Potentiometer, these limits are expressed in their respective units.
Lower and Upper limits are detected automatically by the positioner during self-tune and can be adjusted (double-click on the caption).

The panel also includes a function called "**Position Sensor Adjustment**". This function opens a window that assists the user in moving the actuator at a safe speed in either direction.

	**When the sensor type is changed, the Lower and Upper Limits must be changed !**

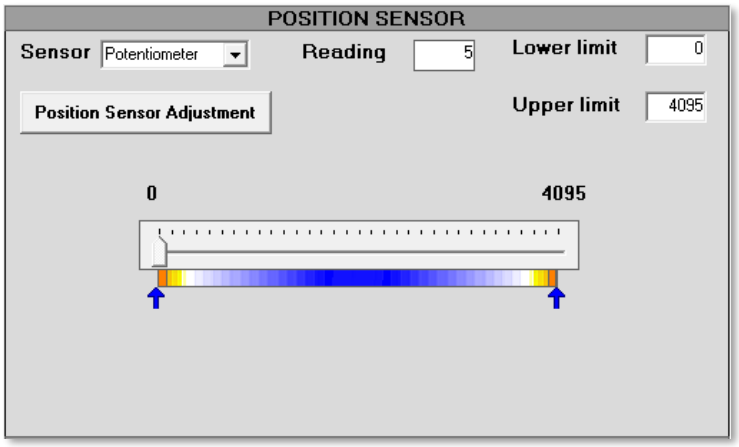
For the **Magnetic Sensor**, there is a dynamic picture showing a trigonometric circle, which represents the full sensor range. The **green portion** of the circle represents the **selected range** of the sensor (e.g., from 45 to 135 degrees), and the **red portion** represents the **unused range**.

A **blue line** indicates the angle towards which the Magnetic Sensor is currently pointing (translating the "**Reading**" value).



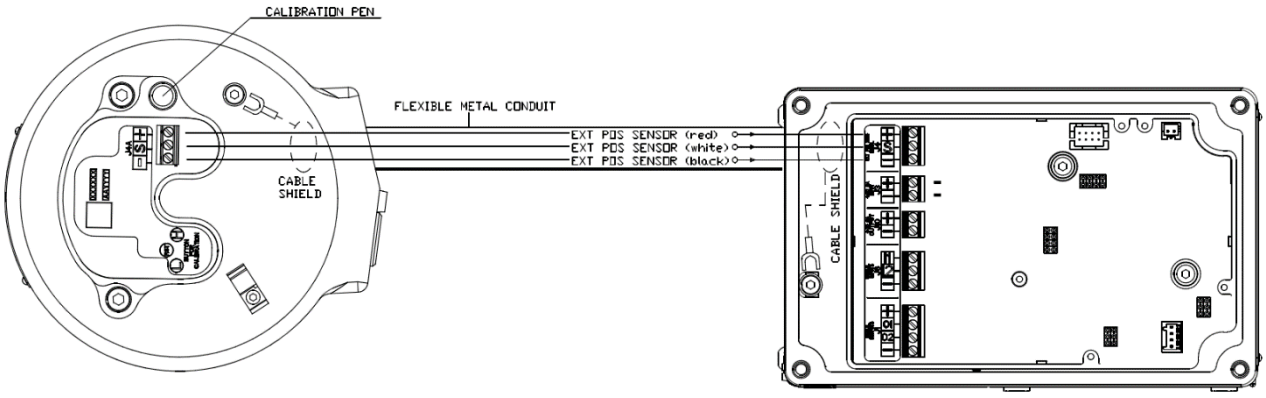
Magnetic Sensor dynamic representation

For the **Potentiometer** and **Active Remote**, the representation is a graduated bar ranging from **0** to **4095** with three cursors. Two **blue arrows** indicate the **upper** and **lower range values**, and a larger **grey arrow** shows the "**Reading**" value. This visual representation helps users understand the current status and range of the Potentiometer (or Active Remote).



Potentiometer / Active Remote dynamic representation

Active Remote Position Sensor Calibration:



Active Remote Position Sensor Wiring

Using **"Position Sensor Adjustment"** tool, the user can calibrate the Active Remote Sensor following the steps below.

Reset Limits Configuration:

- Using the Calibration Pen inside enclosure, place it on the "RST" label for 15 seconds.

Lower Hard Limit Configuration:

- Move the valve to the lower hard limit.
- Using the Calibration Pen inside enclosure, place it on the letter "L" label for 5 seconds.

Higher Hard Limit Configuration:

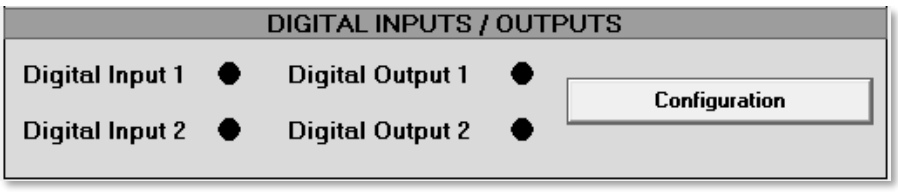
- Move the valve to the higher hard limit.
- Using the Calibration Pen inside enclosure, place it on the letter "H" label for 5 seconds.

Now, Active Remote Position Sensor limits are configured.

Digital Inputs / Outputs

Bellow the Position Sensor configurations, you'll find the "Digital Inputs / Outputs" panel. This panel gives you control over the 2 Digital Inputs and 2 Digital Outputs of the SHP.

One of the features of this panel is the **LED indicator**. It shows you in real-time which of the Digital Inputs / Outputs is currently active, making it easier to monitor and manage these settings.



Digital Inputs / Outputs panel

For more detailed adjustments, a **configuration** window can be accessed directly from this panel. This window facilitates the configuration of the digital inputs and outputs, enabling you to fine-tune the positioner's operation to your specific needs

Digital Inputs / Outputs : Configuration

Digital Outputs
The configuration window offers a range of options for customizing the triggers for the two Digital Outputs. There are 8 different events that can be configured to trigger each output. Four of these triggers can be enabled simply by checking the corresponding flag.
These include:

- **System not in service**
- **Loop Current Failure**
- **Pressure Fallback** (available in OP1)
- **Position sensor error / out of range**

The remaining five triggers offer additional customization options :

- **Position <= limit 1**
- **Position >= limit 2**

Limit1 and Limit2 must be configured in the proper caption.

- **PI < min. pressure**

Pressure limit must be configured in the proper caption.

'Shutdown' option allows to use the 'pressure limit' like a 'pressostatic switch' to move the valve in the safety position when the line pressure is not enough to allow to control it. This is very useful for spring return actuator , if the line pressure is not enough to move the valve, the positioner will put the internal pneumatic in the 'fail safe' position (Port 'A' will be exhausted) and the valve will move in the safety position.

- **Position control error**

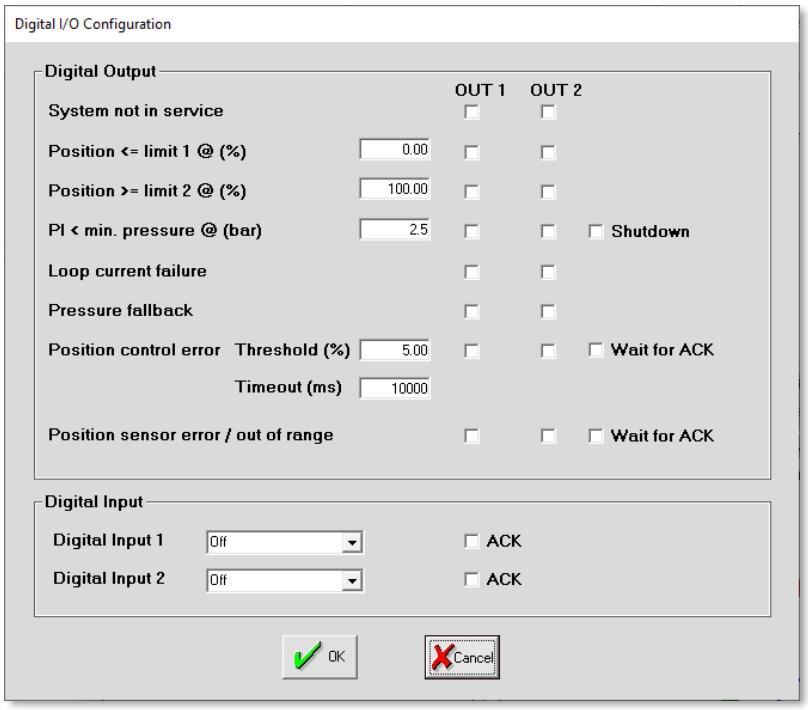
This alarm depends on the setting of the threshold and timeout. With threshold = 5% and Timeout = 10000 ms the digital output will be activated when the position error will be >=5% for 10 seconds.

The flag 'Wait for ack' prevent that the digital output is restored automatically, the digital input must be configured properly to provide the ack.

- **Position sensor error / out of range**

The digital output will report the 'position sensor error' or 'out of range' condition.

The flag 'Wait for ack' prevent that the digital output is restored automatically. The digital input must be configured properly to provide the ack.



Digital Inputs / Outputs Configuration

Digital Inputs :
The second part of the configuration window is dedicated to configuring the **2 Digital Inputs**. In this panel, you can define the actions that the SHP positioner will execute when a Digital Input signal is detected.

There are **3 different actions** you can select from:

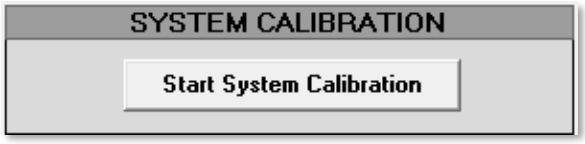
- **Off** : No action is performed when a Digital Input signal is detected.
- **Shut Down** : Upon detection of a Digital Input signal, a shutdown is initiated -> Port B is pressurized, and Port A is exhausted.

- **Pressurize Port A** : Detection of a Digital Input signal triggers the pressurization of Port A (port B is exhausted).

In addition to these actions, the Digital Input signal can also be used to “reset” the “**Wait for Acknowledge**” flag of the concerned Digital Output.

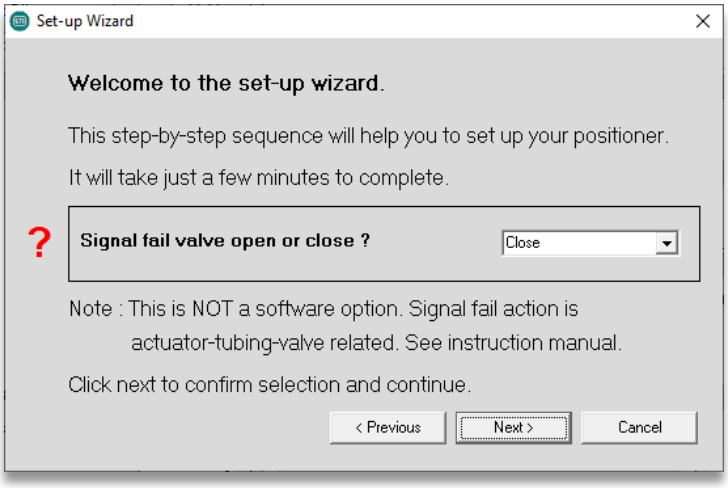
System Calibration

The “System Calibration” panel simplifies the tuning process of your system. It features a single button that, when clicked, initiates a wizard. This wizard is designed to guide you through the auto-tuning process of the system in a step-by-step manner, consisting of five steps in total.



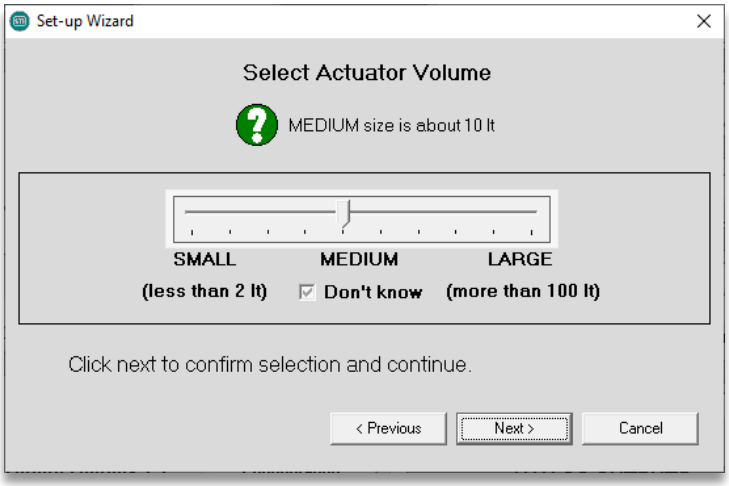
System Calibration panel

Upon completion, for achieving perfect system reactivity, you can manually adjust the parameters of the PID (Proportional-Integral-Derivative) controller. This allows for a higher level of customization and can lead to even better performance.



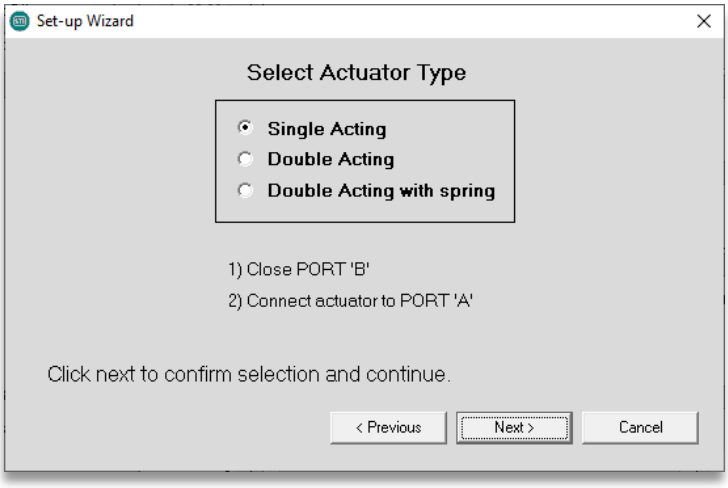
Step 1: Starting Page
In the initial step, you are required to specify the action that occurs when the 4-20mA signal is removed while air is present.

Depending on the pneumatic connection, the actuator will move in one direction or the other. For instance, when the 4-20 mA signal is removed and port B is fully pressurized, the actuator will close the valve.

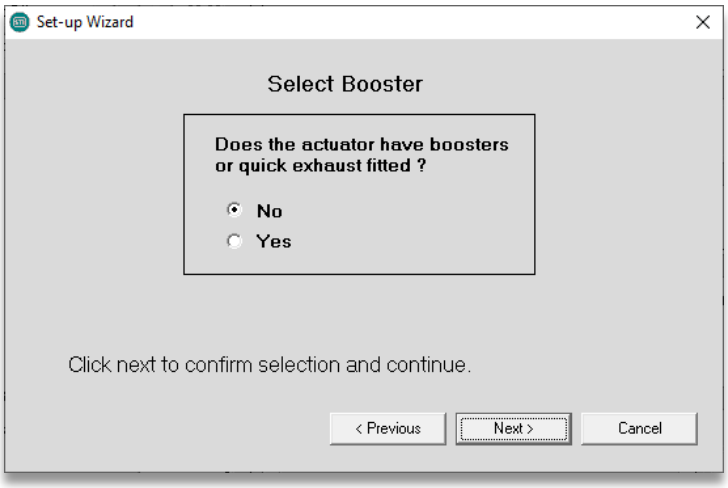


Step 2: Actuator Volume
Select the actuator volume, if known.

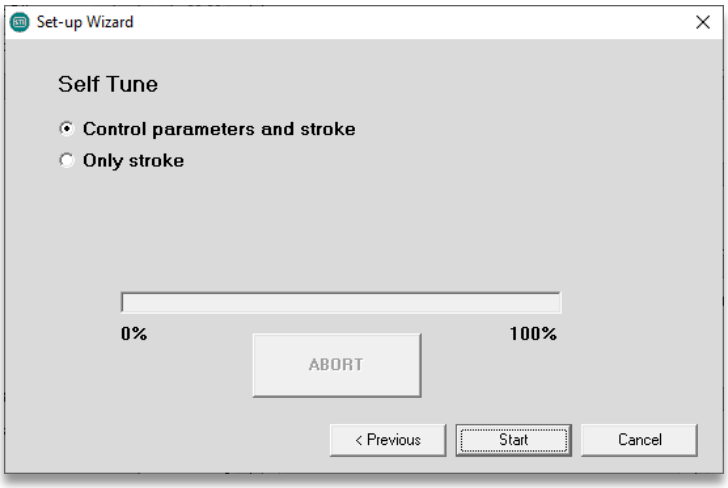
This selection helps the positioner in the tuning.



Step 3 : Actuator Type
Specify the type of actuator.



Step 4 : Presence of boosters
Specify if the actuator has boosters.



Step 5 : Select type of self-tune

Select "**Control parameters and stroke**" if you want to perform a full Self Tune procedure.

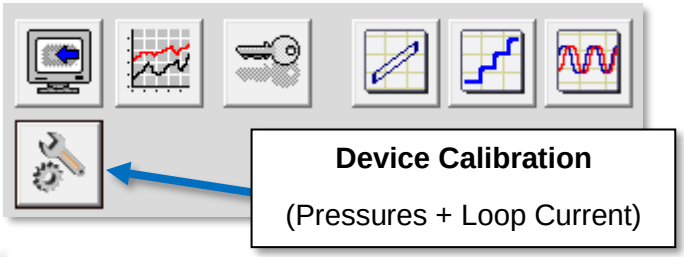
Select "**Only stroke**" if you want only to update the hardware limits of your valve.

Press "**Start**" the perform the Self Tune.

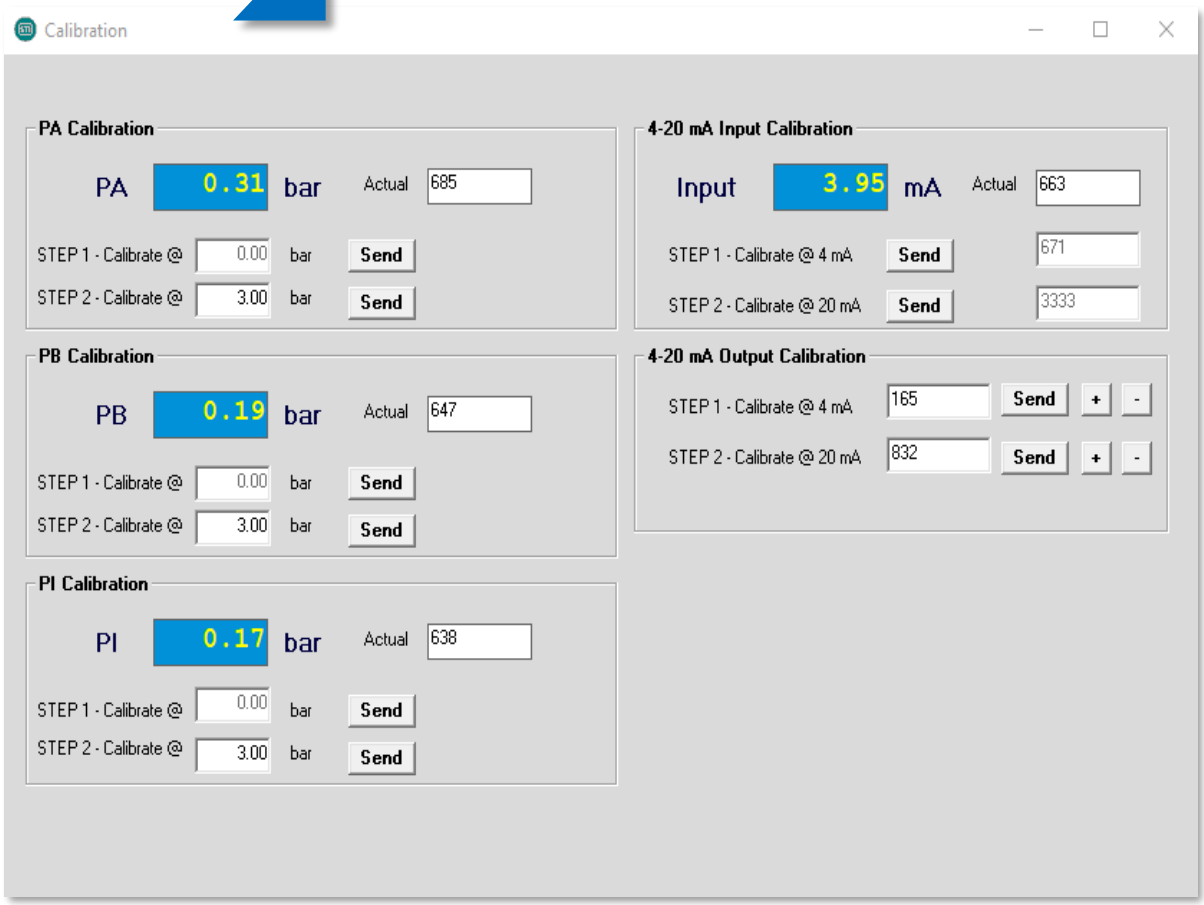
The progress bar informs you about the self-tune status.

Pressure Sensors and Loop Current Calibration

Description and Access :
The SHP positioner allows users to manually calibrate the pressure sensors and the Loop Current if necessary. The Calibration Menu can be accessed by clicking on the "**Calibration**" **Quick Access button**. This action will open a window divided into five sections, each corresponding to a sensor that can be calibrated.



Device Calibration Quick Access Button



Calibration Window

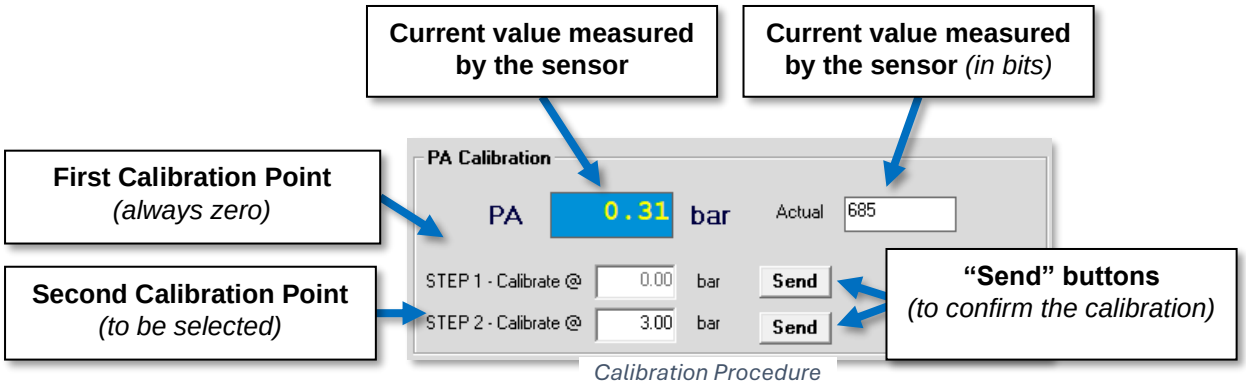
On the **left side** of the window, you will find the **pressure sensors** calibration boxes :

- "**PA Calibration**" for calibrating the pressure sensor in **chamber A**
- "**PB Calibration**" for calibrating the pressure sensor in **chamber B** (*if present*)
- "**PI Calibration**" for calibrating the **Line Pressure** sensor

On the **right side**, there are boxes for calibrating the **loop current** :

- "**4-20 mA Input Calibration**" for calibrating the **input current**
- "**4-20mA Output Calibration**" for calibrating the **output current**

Pressure Sensor Calibration Procedure :
The calibration of the three pressure sensors is identical and can be summarized in **two steps**. Two calibration points are needed: **calibration at 0 bar** (psi) and **calibration at x bar** (psi). For each step, use a manometer to read the exact pressure.



Calibration Procedure

1) **STEP 1 - First Calibration Point**
   Ensure that the pressure is null for the sensor you are calibrating, using the manometer. Press the "**Send**" button to calibrate the pressure sensor at **0 bar** (psi).

2) **STEP 2 - Second Calibration Point**
   Depending on the line pressure supported by your actuator, pressurize the corresponding sensor with a pressure between **1 bar** and **10 bar**. We recommend not choosing a too low pressure value; if possible, choose the line pressure value. Once the pressure is stabilized and confirmed with the manometer, press the "**Send**" button to calibrate the pressure sensor.

Repeat the steps for the remaining pressure sensors.

Loop Current Calibration Procedure :

- **4-20 Input Current Calibration**

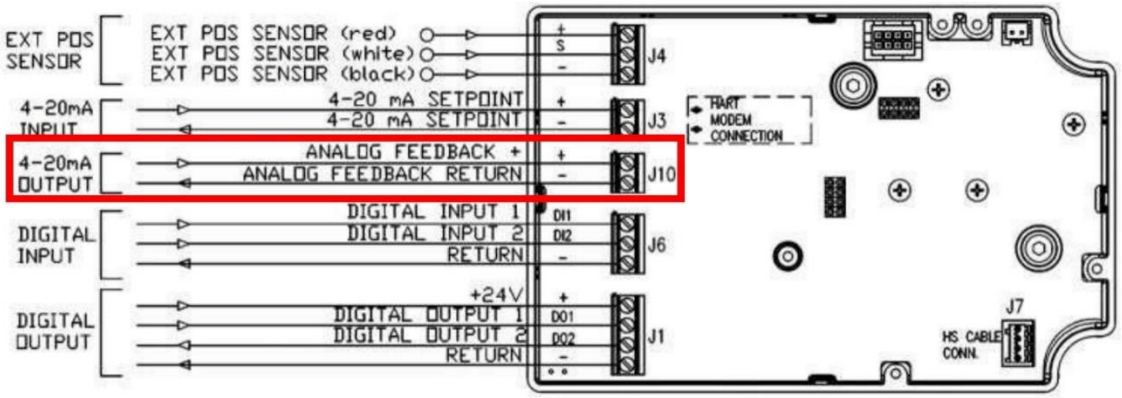
The calibration of the 4-20mA Input Current follows the same steps as the pressure sensors calibration. However, this time a fluke is used to confirm the results. The two calibration points are fixed at 4mA and 20mA.

1) **STEP 1 - 4mA Calibration**
   Set the current to 4mA using the fluke. Once the current is set, press the **"Send"** button to calibrate the input current at 4mA.

2) **STEP 2 - 20mA Calibration**
   Set the loop current to 20mA using the fluke. Once the current is set, press the **"Send"** button to calibrate the input current at 20mA.

- **4-20mA Output Current Calibration**

The calibration of the 4-20mA Output Current is slightly different. The user must first power the SHP Analog Output by using another fluke connected to the **J10 port**.

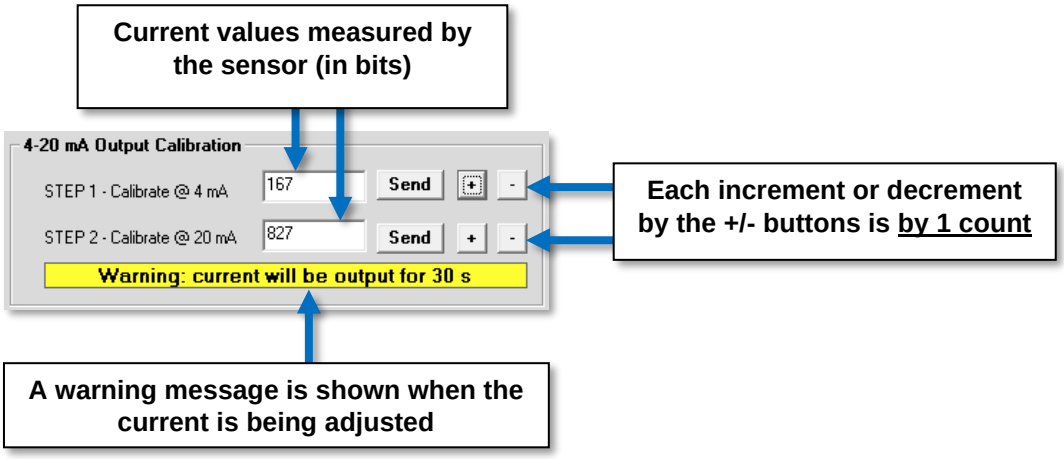


SHP Analog Output : J10 Connector

The procedure is done in two steps:

1) **STEP 1 - 4mA Calibration**
   Press the **"+" or "-" buttons** to output a current for **30 seconds**. During this time, read the current value on the fluke that is connected to the **J10** port. Adjust the output current by pressing the "+" or "-" buttons to get as close as possible to 4mA. Once this is done, press the **"Send"** button to save the calibration.

2) **STEP 2 - 20mA Calibration**
   Repeat the same procedure for the 20mA point.



Analog Output Calibration

Restore to Factory Settings

This panel contains a single, prominently displayed button labelled “Restore Factory Settings”. Upon clicking this button, the system will initiate a process to revert all configurable settings of the SHP positioner back to their original factory defaults.

Restore Factory Settings panel

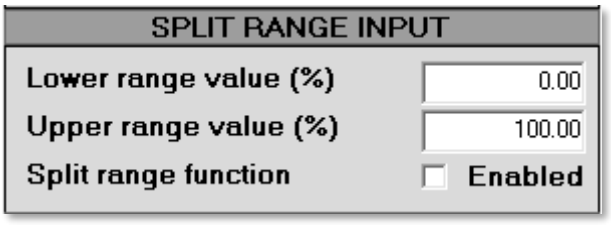
This function is particularly useful in situations where the device’s settings have been extensively modified, or if the device is exhibiting unexpected behaviour that could be attributed to misconfiguration. By restoring the factory settings, users can ensure that the device returns to a known, stable state.

Please note, executing this function will erase any custom settings. Therefore, it is recommended to backup or note down important configurations before proceeding with this operation.

⚠	**Please note, the action you’re about to take is irreversible. It’s highly recommended that you save your SHP configuration prior to executing this function !**

Split Range Input

This panel is dedicated to managing the split range function of the SHP positioner. It provides a set of controls and indicators that allow you to define and visualize how the positioner interprets its 4-20mA input signal.



Split Range Input panel

Here's a breakdown of its components :

- **Lower Range Value (%)**: This field allows you to specify the lower limit of the input range. The value you enter here corresponds to the 4mA point on the input signal.
- **Upper Range Value (%)**: This field allows you to specify the upper limit of the input range. The value you enter here corresponds to the 20mA point on the input signal.
- **Split Range Function**: This control allows you to enable or disable the split range function. When enabled, the positioner will interpret its input signal according to the lower and upper range values you've specified.

Please note that a **minimum distance of 20% is required between the lower and upper range values**. This allows up to five split range areas to be configured in different concatenated positioners.

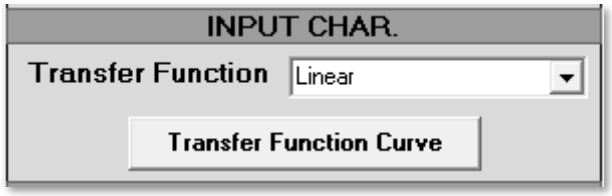
For example, if the **lower range** value is **set to 0%** and the **upper range** value is **set to 100%**, the positioner will interpret **4mA as a 0% position request** and **20mA as a 100% position request**.

If the **upper range value** is instead **set to 50%**, the positioner will interpret **4mA as a 0% position request** and **12mA** (which is 50% of the way between 4mA and 20mA) **as a 100% position request**.

	**Remember to always verify your settings before leaving this panel, as incorrect configurations can lead to unexpected behaviour from the positioner !**

Input Char.

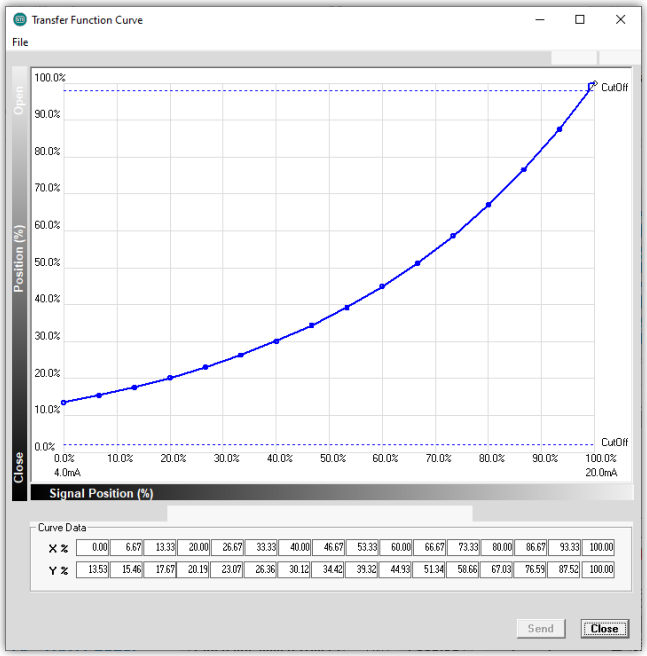
This panel is where you define the **relationship** between the **input signal** and **the requested position** of the SHP positioner. It provides a set of controls for specifying the transfer function, which determines how the positioner interprets its input signal.



Input Char. panel

Here's a breakdown of its components:

- **Transfer Function** : This dropdown menu allows you to select one of several predefined characterizations or a user-defined characterization as follows :
  - ***Linear*** : A straight-line relationship between the input signal and the requested position.
  - ***Standard curve 1-50***: An equi-percentage 1:50 curve.
  - ***Standard curve 50-1***: An inverse equi-percentage 1:50 curve.
  - ***User curve***: A user-defined curve.
  - ***Standard curve 1-25***: An equi-percentage 1:25 curve.
  - ***Standard curve 25-1***: An inverse equi-percentage 1:25 curve.
  - ***Standard curve 1-30***: An equi-percentage 1:30 curve.
  - ***Standard curve 30-1***: An inverse equi-percentage 1:30 curve.
  - ***Feedback Linearization***: A linearization based on feedback from the positioner.
- **Transfer Function Curve Button**: This button opens the Transfer Function Curve window, where you can view a graphical representation of the selected transfer function. This can be helpful for visualizing how different characterizations will affect the positioner's behaviour.



Example of a Transfer Function Curve

This window provides a graphical representation of the transfer function, which shows the relationship between the input signal and the requested position.
Here's an overview of its capabilities:

- **Requested Position Axis**: The "**Close**" and "**Open**" labels on this axis show the effect of the "**Signal Fail Action**" selection.
- **Signal Position Axis**: The "**4.0mA**" and "**20.0mA**" labels on this axis show the effect of the "***Split Range***" setup.
- **Limit and CutOff**: The effects of "**Limit**" and "**CutOff**" are shown on the graph.
- **User Curve Modification**: Only the "**User Curve**" can be modified; the other curves are fixed. If you want to start from a standard curve and generate a user curve, you can follow these steps:

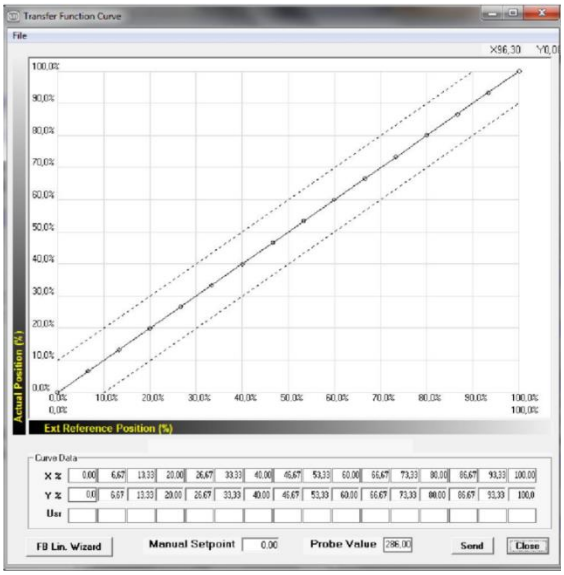
    1. **Select** the starting curve.
    2. **Save** the Table (**File** → **Save Table**).
    3. **Select** "**User Curve**".
    4. **Load** the saved Table.
    5. **Modify** the table.

- **Send Button** : To send a "**User Curve**" to the Positioner, press the "**Send**" button.
- **Signal Position Steps**: These steps are fixed; you can only change the Requested position value.
- **Value Modification**: You can change a value in the table or click & drag the dot in the graph.
- **Linear Interpolation**: If you hold down the shift key and click on two dots, the system will automatically perform a linear interpolation between these two points.

Feedback Linearization

This feature allows you to compensate for position errors that arise from the mechanical linkage and/or the sensor. When you select "**Feedback Linearization**" in the "**Transfer function**" dropdown, all other characterization options will be disabled, as this feature applies to a linear transfer curve.

Upon selecting "**Feedback Linearization**" and pressing the "**Transfer Function Curve**" button, a window with an input panel will appear with the following information :



- **X axis**: This represents the external reference scale, which could be a gauge or meter that provides a secure reference.
- **Y axis**: This shows the actual position as seen by the SHP.
- **FB Lin Wizard button**: This button starts a wizard that helps you align your external reference.
- **Manual Setpoint**: If the "**Service State**" is "**Out Of Service (Manual)**", you can use this tool to manually move the valve.
- **Probe value**: This displays the actual position of the system that is used for linearization. Please note that this value is not affected by the "**Feedback Linearization**" effect.
- **Send button**: This button sends the Feedback curve to the positioner.

Example of Feedback linearization :

1) Apply a gauge or meter on the actuator/valve
in order to have a secure position reference.
2) Be sure to have 'Service State' = 'Out Of Service (Manual) ' and 'Transfer function = Feedback Linearization'.
3) Press 'FB Lin Wizard' and insert the value on the gauge when you are in the 0% position and in the 100% position (for example 120mm and 30mm).
4) The 'Usr' row is filled with the gauge value at different points based on your input.

Curve Data

X %	0,00	6,67	13,33	20,00	26,67	33,33	40,00	46,67	53,33	60,00	66,67	73,33	80,00	86,67	93,33	100,00
Y %	0,0	6,67	13,33	20,00	26,67	33,33	40,00	46,67	53,33	60,00	66,67	73,33	80,00	86,67	93,33	100,0
Usr	120,00	114,00	108,00	102,00	96,00	90,00	84,00	78,00	72,00	66,00	60,00	54,00	48,00	42,00	36,00	30,00

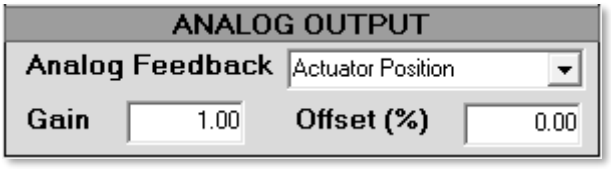
5) Move the 'Manual Setpoint' until you read on the gauge (with reference to the example) 102mm.
6) Copy the value in 'Probe value' in Y%[20] (below X%=20).
7) The point in the graph related to X%[20]is moved in X=20 Y = value and now it appears in 'bold'.
8) Move the 'Manual Setpoint' until you read on the gauge (with reference to the example) 84mm.
9) Copy the value in 'Probe value' in Y%[40] (below X%=40).

10) The point in the graph related to X%[40]is moved in X=40 Y = ‘value’ and now it appears in ‘bold’.
11) Repeat the last 3 steps for a subset (or all) the points in the table.
12) If some points are missing you can linearize them with reference to the ‘known’ ones (keep ‘SHIFT’.
pressed and click of the two [known] points around the one that is ‘missing’)
13) Press ‘Send’ in order to store the linearization curve in the positioner

Remember, the Feedback Linearization feature is designed to help you achieve more accurate positioning by compensating for mechanical and sensor errors. Always verify your settings before leaving this panel, as incorrect configurations can lead to unexpected behaviour from the positioner.

Analog Output

This panel allows you to configure the analog output of the SHP positioner. The **analog output** is a **4-20mA signal** that can be used to **report the position of the actuator**.



Analog Output panel

Here’s a quick overview of each feature :

- **Analog Feedback**: This dropdown menu allows you to select what the analog output will report. You can choose between “**Actuator Position**” and “**Reverse Actuator Position**”. The “**Actuator Position**” option will cause the output to directly reflect the position of the actuator, while the “**Reverse Actuator Position**” option will cause the output to reflect the inverse of the actuator’s position.

- **Gain**: This control allows you to adjust the gain of the analog output. The gain is a multiplier that affects how much the output signal changes in response to changes in the actuator’s position. A higher gain will result in larger changes in the output signal for a given change in position.

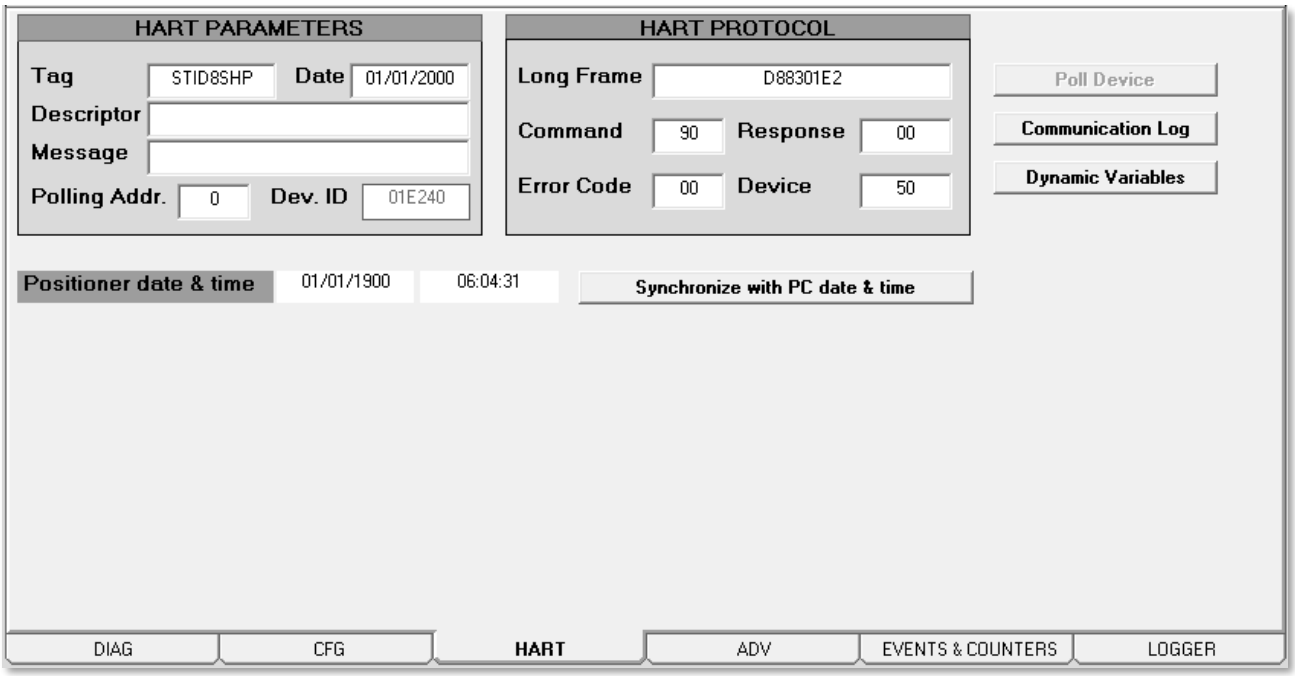
- **Offset**: This control allows you to adjust the offset of the analog output. The offset is a value that is added to the output signal, effectively shifting it up or down. This can be useful for aligning the output signal with an external reference or for compensating for a sensor that doesn’t read exactly zero when the actuator is at its default position.

3.4 HART Tab

The “HART Tab” is a dedicated section within the SHP software interface that provides a suite of tools and parameters for managing and monitoring the HART protocol communication with your device.

This tab is used to interact with various HART parameters, access detailed information about the HART protocol, manage the device’s date and time settings, and utilize functions such as Poll Device, Communication Log, and Dynamic Variables Assignment.

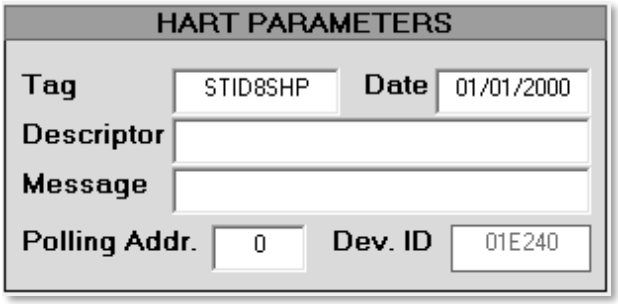
As you navigate through this tab, you’ll find each feature intuitively laid out, making it easier for you to configure and troubleshoot your device effectively.



HART Tab

HART Parameters

This panel provides a set of editable fields that allow you to manage various HART parameters for the positioner.



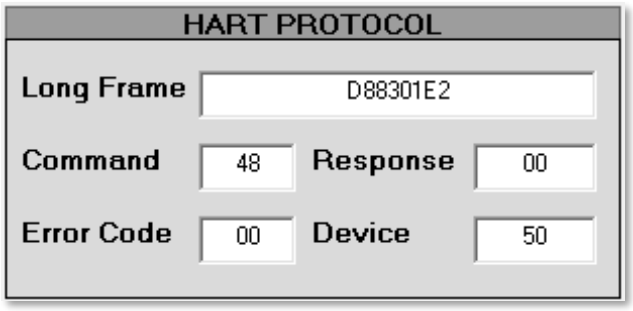
HART Parameters panel

Here's a quick overview of each field :

- **Tag**: This field allows you to assign a unique identifier to the positioner. This can be useful for distinguishing between multiple devices in a system.
- **Date**: This field is used for record keeping. For example, you might use it to keep track of the last calibration date or the next scheduled calibration date for the positioner.
- **Descriptor**: This field allows you to enter a brief description or summary of the positioner. This can be helpful for providing context about the device's role or function in the system.
- **Message**: This field is used to display any important messages or notifications related to the device. These could be system-generated alerts or user-entered notes.
- **Polling Address**: This field is used to specify the polling address for the device. The polling address is a unique identifier that the HART protocol uses to communicate with the device.
- **Device ID**: This field displays the device ID of the positioner. The device ID is a unique identifier assigned by the manufacturer.

HART Protocol

This panel displays a set of communication parameters that can be useful for debugging communication problems.



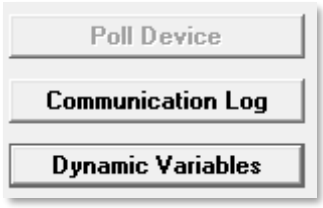
HART Protocol panel

Here's a quick overview of each parameter:

- **Long Frame**: This field displays the long frame data, which is a type of data packet used in HART communication. It can provide insight into the data being transmitted between the positioner and the control system.
- **Command**: This field shows the command code for the last HART command that was sent or received. HART commands are used to perform various actions, such as reading or writing data.
- **Response**: This field displays the response code for the last HART command. The response code can indicate whether the command was successful or if there were any errors.
- **Error Code**: If there was an error with the last HART command, this field will display the error code. The error code can help you identify the cause of the problem.

- **Device**: This field displays information about the device that is communicating with the positioner. This can be useful for identifying the source of any communication issues.

Additional Functions



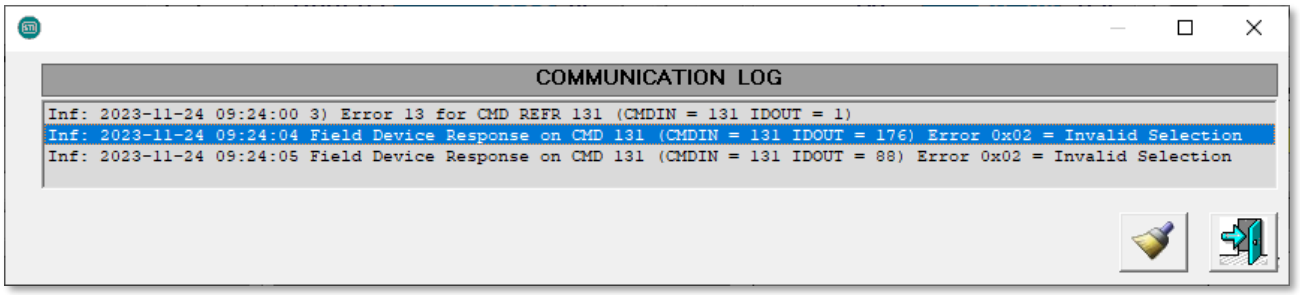
Additional Functions

Poll Device

This function is typically used to request data from the positioner. It sends a signal to the device, prompting it to send back information about its current status. This can be useful for checking the device's connectivity and responsiveness.

Communication Log

This function provides a record of the HART commands that have been sent or received. Each entry in the log includes the date and time of the command, the command code, and any responses or errors.



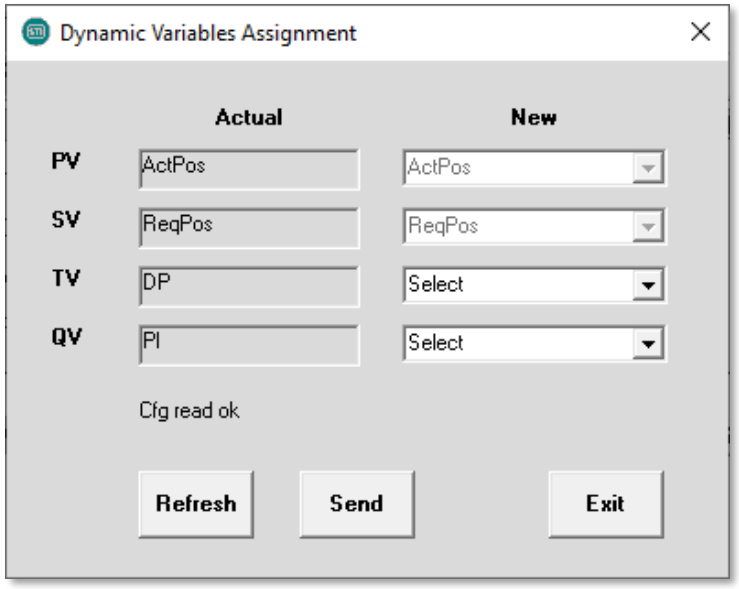
Communication Log

For example, the entry : "**Inf : 2023-11-24 09:24:05 Field Device Response on CMD 131 (CMDIN = 131 IDOUT = 88) Error 0x02 = Invalid Selection**" indicates that a command (CMD 131) was sent at the specified date and time, and the device responded with an error indicating an invalid selection.

Dynamic Variables

This function opens a window displaying the four dynamic variables of the positioner (**Primary, Secondary, Tertiary** and **Quaternary**).

Dynamic variables are parameters that can change during the operation of the actuator, such as its position or pressures. In this case, the **Primary** dynamic variable is always the **Actual Position** of the positioner, and the **Secondary** dynamic variable is always the **Required Position**.

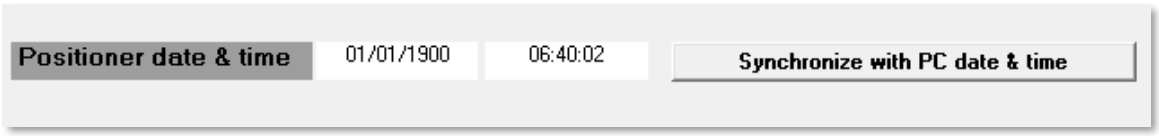


Dynamic Variables Assignment

The Tertiary and Quaternary dynamic variables can be changed as needed.

Synchronize Date & Time

This function allows you to synchronize the SHP's internal clock with the date and time of your PC. When activated, it will automatically update the positioner's date and time settings to match those of your computer.



Synchronize Date & Time

This can be particularly useful in ensuring that the positioner's time-based functions and logs are accurate and aligned with your local time. Remember to use this function whenever there is a significant time difference between your positioner and your PC, such as after daylight saving time changes or when moving the positioner to a different time zone.

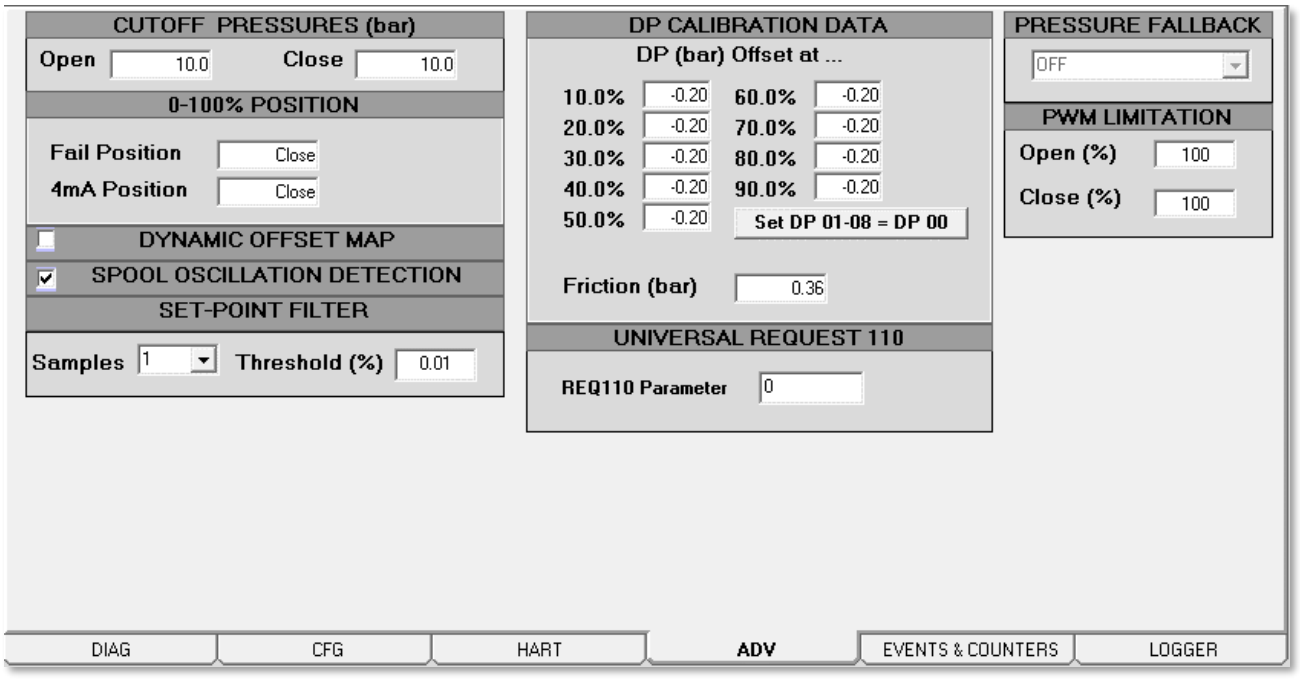
3.5 Advanced Configuration Tab : ADV

The “Advanced Configuration Tab” is a specialized section within the SHP software interface that offers a suite of **advanced tools** and parameters for **fine-tuning** the operation of your positioner. This tab is designed for **advanced users** who have a **deep understanding** of the positioner’s functionality and the technical expertise to adjust its settings in a precise manner.

The tab is organized into **nine panels**, each focusing on a specific aspect of the positioner’s operation. These panels provide controls for a range of advanced features, from spool oscillation detection to friction compensation, and from DP calibration data to PWM limitation.

⚠	**Please note that advanced configurations are intended for <u>advanced users only</u> !**

Adjusting these settings can significantly impact the performance of your positioner, so it’s important to understand what each setting does before making any changes. If you’re not sure about a particular setting, it’s best to leave it at its default value or consult with a qualified professional.



Advanced Configuration Tab

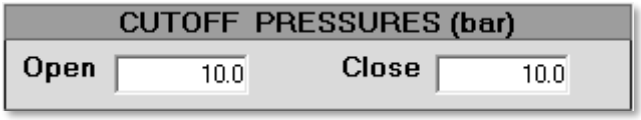
Cutoff pressures

In the context of valve control, the user has two options when it comes to maintaining a closed position. For example :

1. The user can opt to apply the **maximum** available pressure to **keep the valve closed**. This approach ensures a **tight seal**, preventing any **potential leakage**. However, the downside is that it requires **more time to open the valve due to the high pressure**.

2. Alternatively, if the user knows a **certain pressure** (lower than the maximum) is **sufficient to maintain a closed position without leakage**, they can set this as the cutoff pressure. This method has the advantage of allowing the valve to **open faster when required**, as it doesn't have to overcome the maximum pressure.

The "Cutoff Pressure" setting allows the user to define this optimal pressure for both the closed and open positions, providing a balance between secure sealing and operational efficiency.



Cutoff Pressures panel

Here's a quick overview of its features:

- **Cutoff Pressure Limit for Valve Open Position**: This field allows you to set the cutoff pressure limit for when the valve needs to stay in the fully open position.

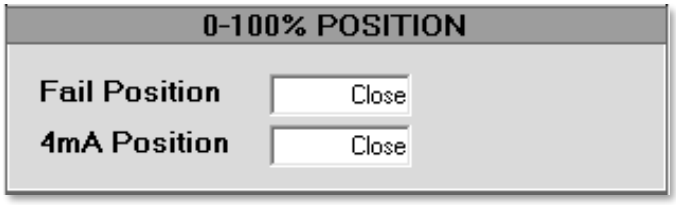
- **Cutoff Pressure Limit for Valve Close Position**: This field allows you to set the cutoff pressure limit for when the valve needs to stay in the fully closed position.

The **default value** for both fields is **10 bars**, which means that **all the available pressure in the line is used**. If you want to speed up the movement of the valve from the fully closed or opened position, you could reduce the used pressure by adjusting these settings.

	**Reducing the pressure may prevent the valve from fully closing, potentially leading to leakage. This could damage the valve!** **Please note, the pressure limitation is only effective when the positioner is operational.** **If the power supply (4-20mA loop) is disconnected, the output from the positioner will match the line pressure. Therefore, the actuator and valve must be capable of handling the full pressure!**

0-100% Position

The “0-100% Position” panel is designed to establish a correlation between the **4mA value** and the **valve’s status**, which can be either “**Close**” or “**Open**”. By default, the SHP positioner is configured such that when power is removed (i.e., when the 4-20mA signal is lost), “**Port A**” is connected to the **atmosphere** and “**Port B**” is **fully pressurized**. The position of the valve when power is removed depends on the pneumatic connection.



0-100% Position panel

An exception to this rule occurs when the “**Fail Freeze**” option device is used. In this case, if the signal is lost, the valve will remain in its last valid position due to a special electronic and 3-way valves.

During the self-tuning phase, the software will ask whether the valve is “**Close**” or “**Open**” when power is removed. This is done to **establish a relationship between the tuning parameter and its effect on the valve**. However, this does not adjust the direction of movement, as that depends on the pneumatic connection.

The “**Fail Position**” field displays the selection made during the self-tuning phase. If necessary, this can be changed. The “**4mA Position**” field allows for adjustment of the “**4mA position**” in relation to the “**Fail Position**”.

	**Setting the “4mA Position” different from the “Fail position” can be dangerous !** **For example, with 4mA, the valve could be fully open.** **When the signal goes below the minimum threshold, the valve moves to the fully closed position.** **If the signal is unstable and close to the minimum value, the valve may continuously move between the closed and open positions.**

Dynamic Offset Map

This function affects the PID controller by “**softening**” the action of the **integral component**.

Dynamic Offset Map option

With the option selected, the integral contribution is reduced step by step if the valve is moving. This is useful if the integral term is causing some slow speed overshoot.

Spool Oscillation Detection

This function **detects DP oscillations** and **adopts safe spool position** to **avoid potential wear**. This feature is to be used primarily when override valves (e.g., fail freeze valves or external solenoid driven 3 way valves) are placed between the positioner outputs and the actuator. In this case the air volume in the pipes can be **very low**, resulting in spool oscillations when trying to control DP.

Spool Oscillation Detection Option

With this option enabled, the positioner is able to detect the oscillation and force the spool to stay in one fixed position. At the same time the positioner continuously monitor the behaviour to come back immediately in control when possible.

Set-Point Filter

The “Set-Point Filter” is a feature **designed to handle a noisy input signal**. It employs a moving average filter to smooth out the signal and reduce high-frequency noise.

The “**Samples**” field allows the user to select the **number of signal samples to be considered** for the filtering process. The available options are **1**, **2**, **4**, **8**, **16**, and **32**.

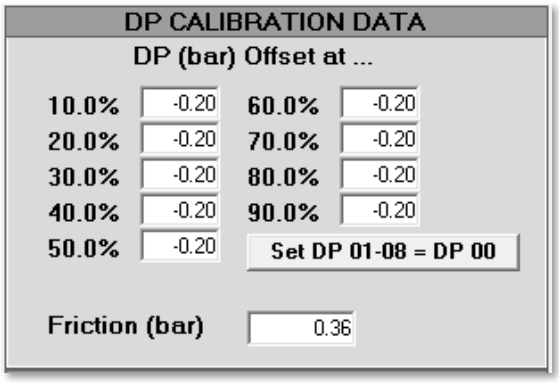
The “**Threshold (%)**” field enables the user to set a percentage value. This value acts as a threshold for the signal change to ignore the filter. This is a way to be very reactive when a big signal change happens and the positioner must move the valve immediately.

Set-Point Filter panel

DP Calibration Data

This tool is designed to adjust the theoretical Delta Pressure (DP) value that is required to maintain the actuator at a specific position, ranging from 10% to 90%. The required DP value can vary depending on the system's architecture.
The table is automatically filled by the positioner during the self-tune process.
In case of spring return actuator, you will be able to recognize the spring thrust in this table.

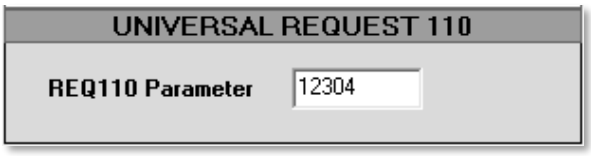
The "**Set DP 01-08 = DP 00**" button copy the value in the 10% field to all the others.
The "Friction" field is an info that is automatically calculated by the software during the self-tune and it is the average measured friction.



DP Calibration Data panel

Universal Request 110

The "Universal Request 110" panel is a specialized feature designed for advanced procedures. It contains a single field, "REQ110 Parameter", where users can input a "Special Request Code". Each code corresponds to a specific action, providing a way to execute special procedures that are **not typically part of the standard operation**.



Universal Request 110 panel

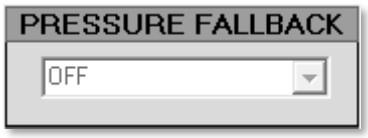
This feature is particularly useful for IMI STI when assisting with customer issues, as it allows them to perform specific actions. However, it should be noted that this feature is intended for use in very specific circumstances and should be used with caution.

The list of possible actions and their corresponding codes can be obtained upon request. Always refer to this list before using the "Universal Request 110" panel to ensure the correct code is being used.

Pressure Fallback

The “Pressure Fallback” option for the SHP positioner is a feature designed to enhance the reliability of the device. This function **automatically switches** from **travel control** to **pressure control** if a **position feedback issue is detected**, thereby ensuring the valve remains operational.

This feature can be used and configured only for spring return actuators.

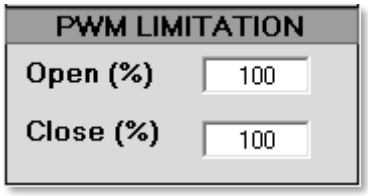


Pressure Fallback panel

Activating or deactivating the “Pressure Fallback” function on the SHP positioner is straightforward. This provides users with the flexibility to use the “Pressure Fallback” function as needed, depending on their specific requirements and operating conditions.

PWM Limitation

The PWM Limitation is a feature that allows users to **control the range of the spool** in the SHP valve positioner, thereby limiting the flow of air circulating within the positioner. This is achieved by applying a Pulse Width Modulation (**PWM**) limitation, which directly influences the position of the spool.



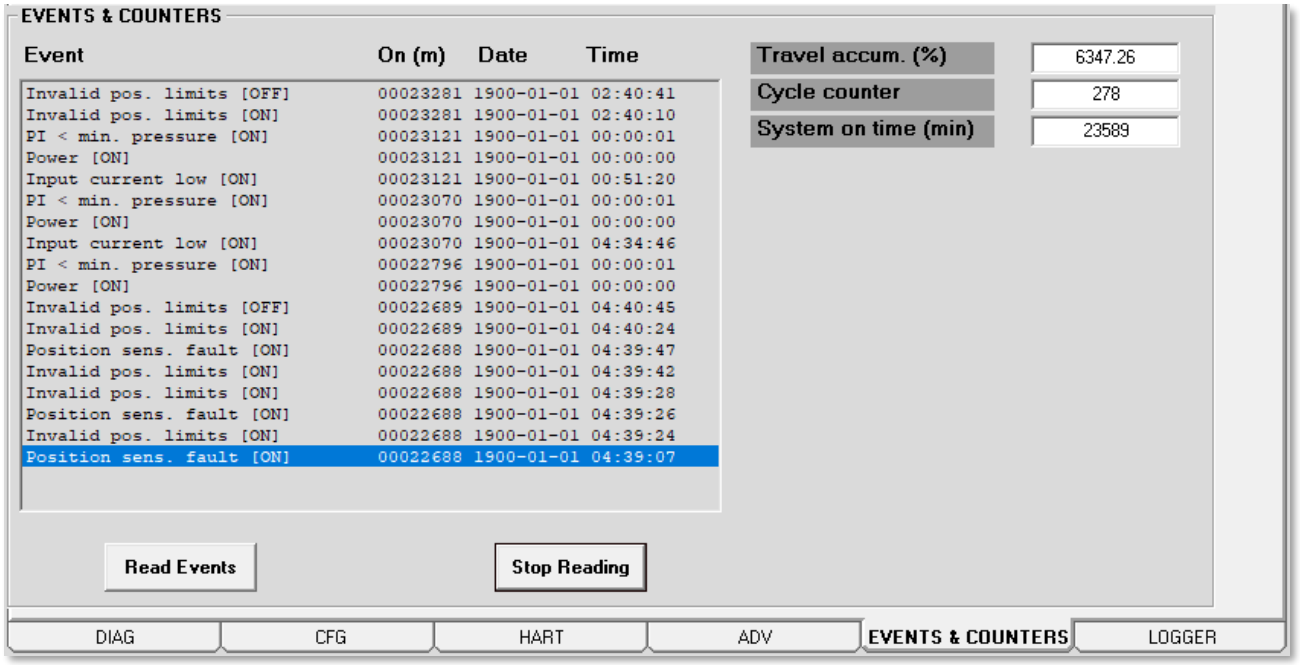
PWM Limitation panel

Users have the flexibility to set a **PWM limitation** for both the valve **closing** and **opening** positions. This ensures precise control over the valve’s operation, enhancing the efficiency and effectiveness of the process. This feature is particularly useful for **small actuators** that cannot handle a high C_v providing them with the necessary control without overwhelming their capabilities.

3.6 Events & Counters Tab

The “Events & Counters” tab serves as an **Online Diagnostic tool** that records and displays significant events that have occurred within the system. This feature provides users with a quick overview of any past abnormal behaviours exhibited by the device, offering valuable insights into its operational history.

In addition to event tracking, this tab also presents key indicators of the system’s life status, including parameters such as **Travel Accumulation**, **Cycle Counter**, and **System On Time**. These metrics offer a comprehensive view of the device’s usage over time.



Events & Counters Tab

Event Logs

This panel displays a list of past events that have occurred within the system. Each event is characterized by its nature, whether it **appeared [ON]** or **disappeared [OFF]**, and its **timestamp**. The timestamp includes the event’s **Date** and **Time**, as well as the “**On Time**”, which represents the duration the positioner has been on since the event occurred.

The events are sorted by time, with the most recent ones appearing at the top of the list. The SHP can store **up to 100 events**. The memory operates on a circular basis, meaning that when it’s full, the oldest event will be replaced by the newest one.

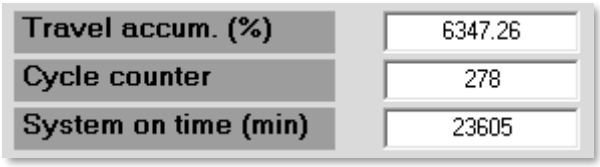
This panel also features two buttons:

- **Read Events Button**: This button retrieves the content of a cycle memory present in the device, allowing you to review past events.
- **Stop Reading Button**: This button halts the memory retrieval process.

Remember, the Event Logs panel is a valuable tool for understanding the device's operational history and identifying any patterns or recurring issues. It provides a comprehensive view of each event, making it easier to monitor the device's performance and troubleshoot any problems.

Counters

This panel provides a set of counters that track key operational metrics of the actuator since commissioning.



SHP Counters panel

Here's a quick overview of each counter:

- **Travel Accumulation (%)**: This counter measures the total "distance" (in %) travelled by the actuator since commissioning. It functions similarly to an odometer (or milometer) in a car, providing a cumulative measure of the actuator's movement.
- **Cycle Counter**: This counter keeps track of the number of valve cycles. One cycle is counted as direction inversion of the stem with minimum amplitude equal to deadband.
- **System On Time (min)**: This counter records the total time (in minutes) during which the device was "ON" since commissioning.

These counters offer essential understanding into the usage and performance of the actuator over time, helping you monitor its condition and plan maintenance activities accordingly.

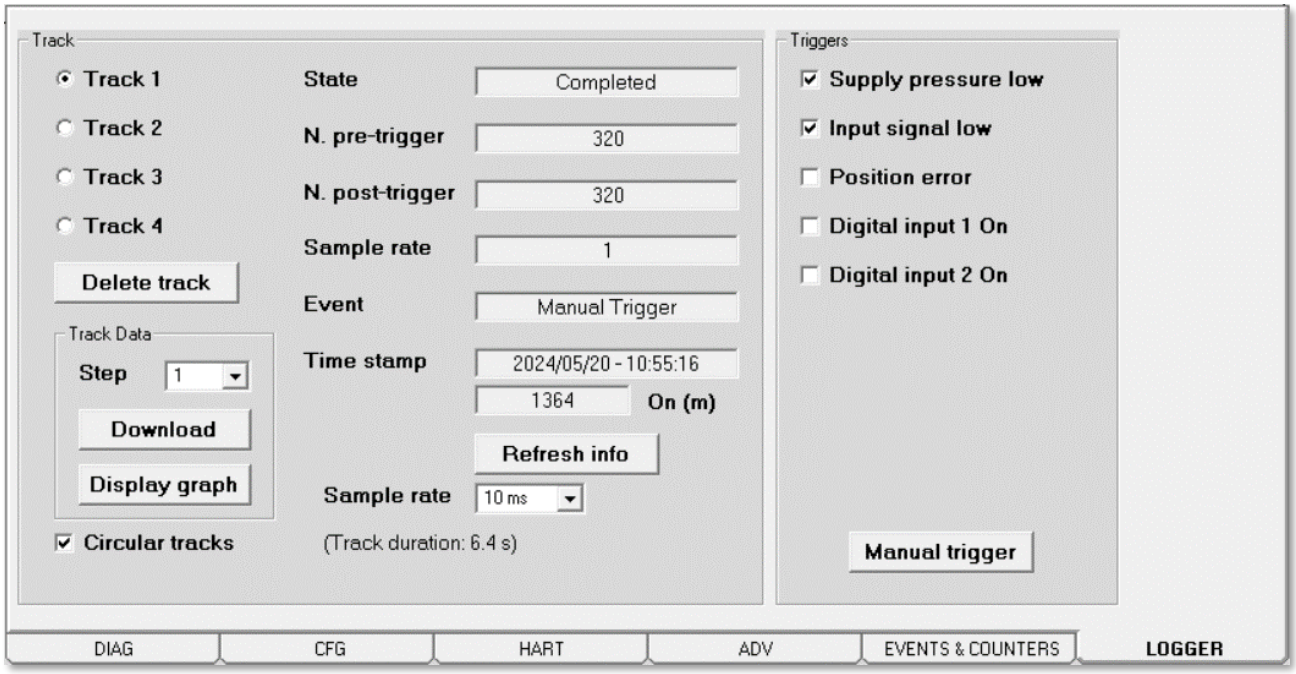
3.7 Logger Tab (OP3)

The “Logger Tab” is part of the **Online Diagnostic** tools in the SHP software. It is specifically designed to capture and record essential data from the device, such as **Actual Position**, **Required Position**, **Pressures**, and more. This data is stored in non-volatile memory areas known as “**Tracks**”.

The Logger tool starts recording when certain events, or “**Triggers**”, occur, capturing both pre-trigger (data before the event) and post-trigger (data after the event) data. Each track consists of a **header** and the **captured data**. The header contains information about the track’s state, the number of samples recorded before and after the trigger, the sampling rate, the event that caused the trigger, and the timestamp of the event.

The **recorded data** can be visualized in a graph for subsequent analysis, and the tool has the capacity to **save up to four tracks**. This feature is invaluable for monitoring **device performance** and **planning maintenance** activities.

Please note that the Logger tool is exclusively available with the **Option Pack 3**.



Logger Tab

Triggers

The first panel of the Logger tab is titled “Triggers”. Here, you have the option to select up to **five different triggers** that will activate the Logger. These triggers include:

- **Supply pressure low**
- **Input Signal Low**
- **Position Error**
- **Digital Input 1 On**

- **Digital Input 2 On**

These triggers are designed to cover a range of potential events that could impact the performance of the device.

In addition to these, there is a special test button called the "**Manual Trigger**". This feature enables you to manually trigger the Logger at any given moment, offering you the flexibility to monitor and record device data as needed.

Track

The second panel of the Logger tab is titled "Track". It is used to parameter the Logger, read the header of each track, visualize, and save the data. Here's a detailed description of its features:

- **Tracks**: Serve as non-volatile memory areas where data is recorded.
- **Delete track**: Allows for the removal of the selected track from the memory.
- **Step**: This parameter allows to minimize the number of samples of a recorded Track during the download. With Step = 1 all the samples are downloaded, with Step = 16 only 1 sample every 16 is downloaded.
- **Download button**: Facilitates the downloading of track data, saving it in a **.txt file**. The saved data can later be read in the Graph tool.
- **Display graph**: Enables quick visualization of the data in the graph.
- **Circular tracks**: This feature enables or disables the circular memory. When the memory is full, the oldest data is replaced by the newest data as time goes on.
- **State**: The Logger operates in the following states:

State	Meaning
IDLE	No samples are inserted in this track.
RUNNING	Samples are inserted in this track at each sampling instant.
TRIGGERED	A trigger event has occurred, and the Logger continues to insert samples until the sum of the pre-trigger and post-trigger samples equals 640 (max number of samples that can be recorded).
COMPLETED	The track is complete, and all samples have been recorded.
PARTIAL	The track is partially filled with data. This state occurs if the SHP is switched off or reset while the track is still in the TRIGGERED state.

Logger's States

Upon startup, if a track is in the RUNNING state, it automatically changes to the IDLE state. If a track is in the TRIGGERED state, it automatically changes to the PARTIAL state. If the header of a track contains out-of-range data, this track is reset and returned to the IDLE state.

- **N. pre-trigger**: The number of samples recorded before the trigger.
- **N. post-trigger**: The number of samples recorded after the trigger. (In total, the Logger can record a maximum of 640 samples.)
- **Sample rate**: This is the time interval between two samples. The user can choose the following sampling rates: 10 ms, 20 ms, 30ms, 40ms, 50 ms, 60 ms, 70ms, 80ms.
- **Event**: The track's trigger.
- **Time stamp**: The date, time and the current 'On-Time' when the trigger occurred.
- **Refresh info button**: This button refreshes the following parameters: State, N. pre/post-trigger, Sample rate, Event, Time stamp.

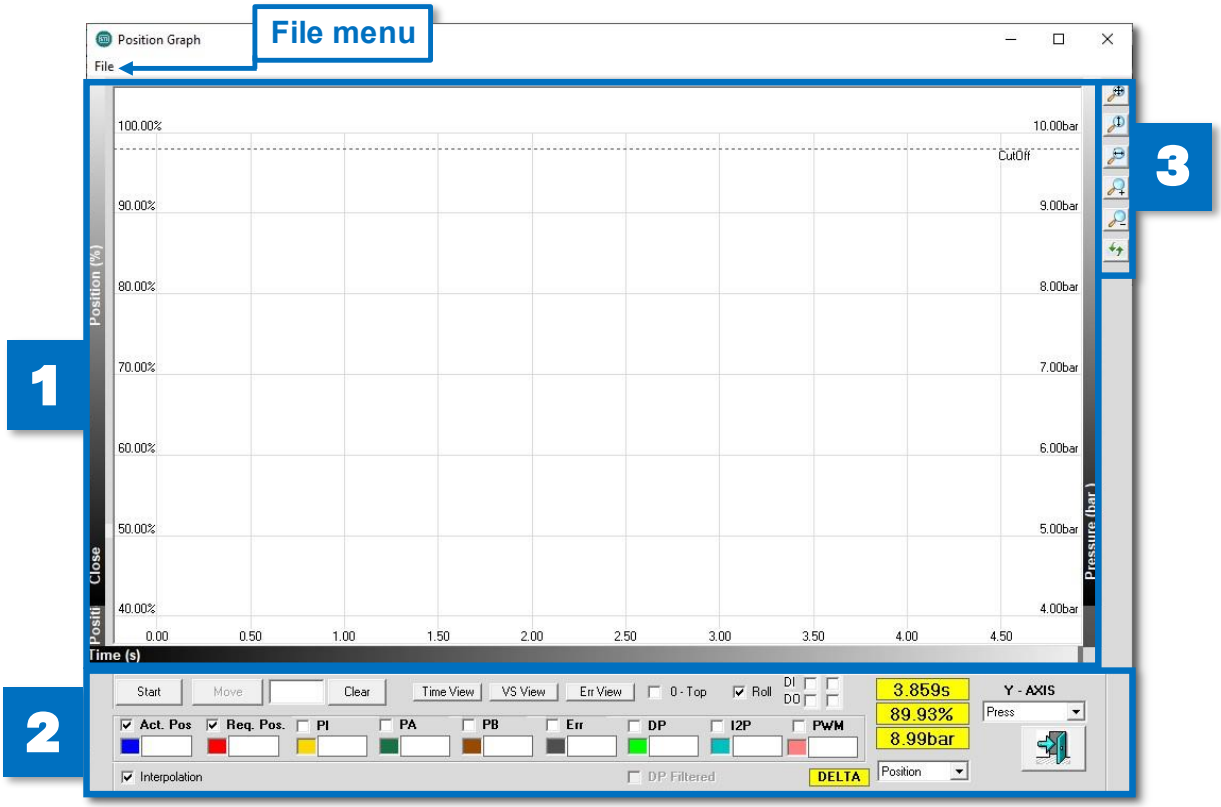
4 GRAPH TOOL

4.1 Overview

The Graph Tool is a central feature of the Remote Control Software, designed to provide **real-time visualization** of all **SHP device variables**, including positions and pressures. This utility not only allows you to monitor these variables in real time, but also offers the capability to **load saved data** for further analysis.

This saved data could be records captured by the **Logger tool** or data saved with **Offline Diagnostic tools** such as **Valve Signature**, **Step Response Test**, and **Frequency Response Test**. By providing a comprehensive view of device performance, the Graph Tool serves as a critical resource for understanding and optimizing the SHP positioner.

In the following sections, we will **explore** the various options that the Graph Tool provides, enabling you to fully **utilize** its capabilities for your specific needs.



Graph Tool window

Here's a brief overview of the key panels and areas in the graph window :

- **[1] Graph**
- **[2] Option Panel**
- **[3] Zoom and Auto-Scale**

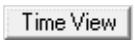
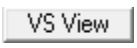
4.2 Features & Usage

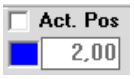
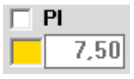
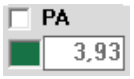
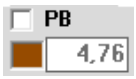
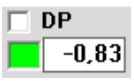
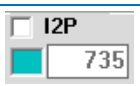
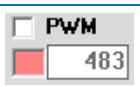
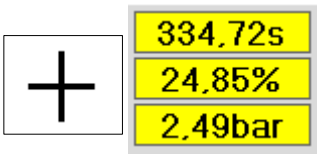
In this section, we will describe the comprehensive functionalities of the Graph Tool. These functionalities include basic operations such as **starting** and **stopping** the **recorder** and **moving** the **actuator** to a **chosen position**.

The Graph Tool also offers advanced features like setting **different views for data analysis**, displaying various curves, and **customizing your data visualization** with checkboxes and option boxes.

Additionally, the Graph Tool provides a **File Menu** for **saving** and **loading graphs**, and even **comparing two graphs**. The Graph Tool also includes a practical feature - the **reticle**. This feature, while common in many graph tools, enhances the user experience by displaying the X,Y values based on where you place the reticle. It's a simple yet effective way to interact with your data.

Whether you're interested in viewing position or pressure over time, analyzing error rates, or comparing graphs, the Graph Tool has a feature to meet your needs.

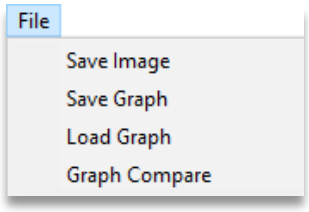
Feature	Icon	Description
Start / Stop		Starts or Stops the recorder
Move		Moves the actuator to a chosen position ("Manual Mode" must be selected)
Clear		Clears the field
Time View		Sets the axis as follows : Y = position (%) / pressure (bar) and X = time (s)
VS View		Sets the axis as follows : Y = DP (bar) and X = actual position (%)
Err View		Sets the axis as follows : Y = Error (%) and X = requested position (%). Also displays the Limit and CutOff position
0-Top		Sets the axis Y = 0 at the top of the screen (with Time View only)
Roll		When the chart line reaches the right edge of the graph, the abscissa values shift to the right, allowing the user to continuously observe the progression of the line
DI/DO		If selected, displays the digital Inputs/Outputs 1 and 2
Y - AXIS		Let the user choose the Y-Axis : Pressure or DP (with Time View only)
DELTA		Let the user select the type of "Delta" (DP) : Delta Position or Delta Pression

Act. Pos.		Displays the Actual Position
Req. Pos.		Displays the Required Position
PI		Displays the Line Pressure
PA		Displays the Pressure in the chamber A
PB		Display the Pressure in the chamber B
Err		Displays the Position Error (difference between the Actual and Required position)
DP		Displays the Delta Pressure (difference between PA and PB)
I2P		Displays the current of the I2P converter
PWM		Displays the PWM
Interpolation		If checked, the graph interpolates values between each sample of the data being visualized
DP Filtered		If checked, the graph applies a filter to the DP values to produce a smoother curve
Reticle and pointed values		Depending on where the user positions the reticle (pointer), the corresponding X,Y values are displayed
Exit		Closes the Graph tool

Graph Tool Options

File menu

The “File” menu in the Graph Tool provides several functionalities that allow you to manage and analyze your data.



Graph Tool File Menu

Here is a description of the different options :

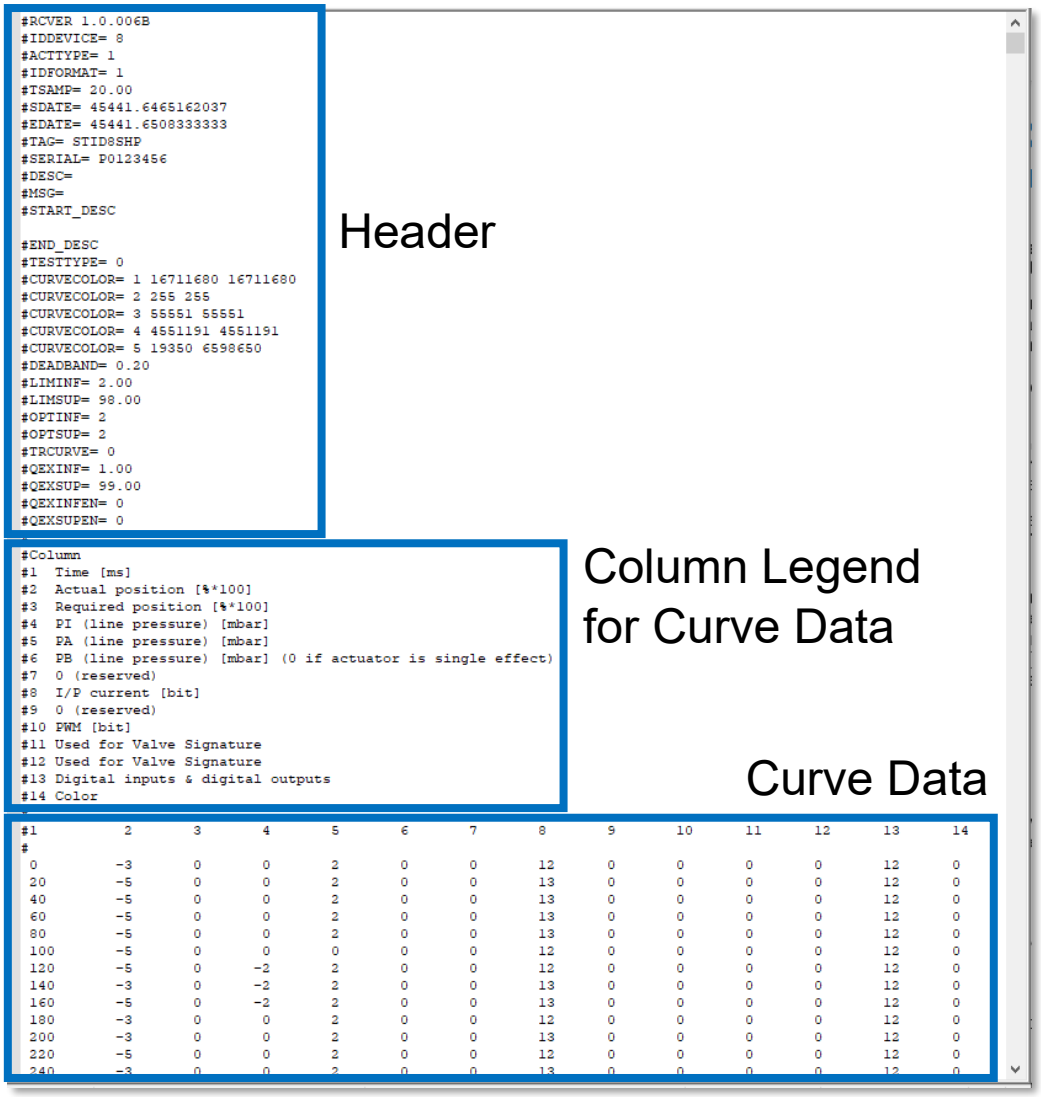
- **Save Image** : This option allows you to save the current graph as an **image**, providing a convenient way to document or share your findings.
- **Save Graph** : This feature enables you to save the entire graph as a **.txt document**. This can be particularly useful for preserving your work or for further analysis.
- **Load Graph** : This function allows you to **load a saved graph or data** from a **.txt document**. This could be data recorded by the **Logger tool** or from one of the offline tests such as **Valve Signature**, **Step Response Test**, or **Frequency Response Test**.
- **Graph Compare** : This powerful feature allows you to compare two graphs. To align the two images, keep the ‘**SHIFT**’ key pressed, hold down the right mouse button, and move in the graph area (left or right).

Graph Text File

When a graph is saved, a text file is generated. This file encapsulates all the essential data required by the software to reconstruct the graph when it is reloaded into the graph tool. The structure of the file is as follows :

- **Header** : The file begins with a header section. This section contains specific information that is utilized exclusively by the software.
- **Column Legend for Curve Data** : The columns are numbered from 1 to 14. The legend provides the correlation between the column number and the corresponding curve data.
- **Curve Data Columns** : Each column corresponds to the data points of a distinct curve on the graph.

This next figure illustrates an example of the structure of a graph text file.



Graph Text File structure

5 OFFLINE DIAGNOSTIC TOOLS

5.1 Introduction to Offline Diagnostic Tools

This chapter will guide you through the use of three specific diagnostic tools. These tools are engineered to operate in an **offline mode**, necessitating the **isolation of the valve** from the **plant process** to facilitate the execution of the tests.

The application of these diagnostic resources is essential in a variety of operational scenarios. This could be during the **commissioning phase**, where the system is being set up for the **first time**. It could also be during the **maintenance phase**, a critical period for ensuring the system's continuous smooth operation. Even in instances where the valve exhibits **unexpected behaviour**, such as not following to the input signal, these offline diagnostic tools prove to be a crucial asset.

The benefits of these tools are significant. They allow you to get a **clear picture** of the **valve's health** before you start fixing any issues. They generate a detailed **test report** that gives you a comprehensive **overview** of the **system's status**. They help you **avoid unnecessary valve disassembly**, saving you both time and effort.

In this chapter, we will delve into three specific tests: the **Valve Signature Test**, the **Step Response Test**, and the **Frequency Response Test**. Each of these tests provides unique insights and contributes to the effective diagnosis and resolution of issues.

All these tests can be **saved**, and their **data loaded** in the **Graph Tool** for further analysis. You can also **compare two tests** done at two different times to check how the valve evolved. At the end of each test, a report is generated with a **summary** of all the **important data** and **screenshots** of the important **curves** (**positions**, **pressures**). Please note that this is a quick guide and won't go into detail about the usage and results interpretation of all these tests.

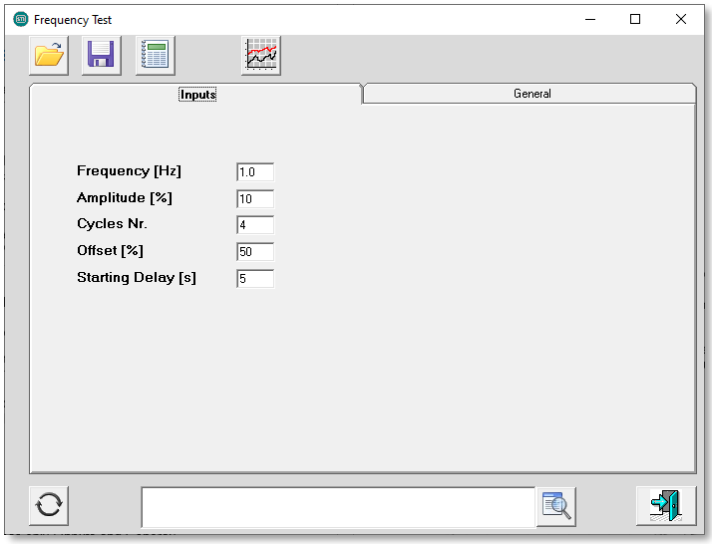
5.2 Common features

Each diagnostic tool is managed from a window that has two or three tabs : **Inputs**, **Analysis**, and **General** (except the Frequency Response Test that has only : Inputs and General).

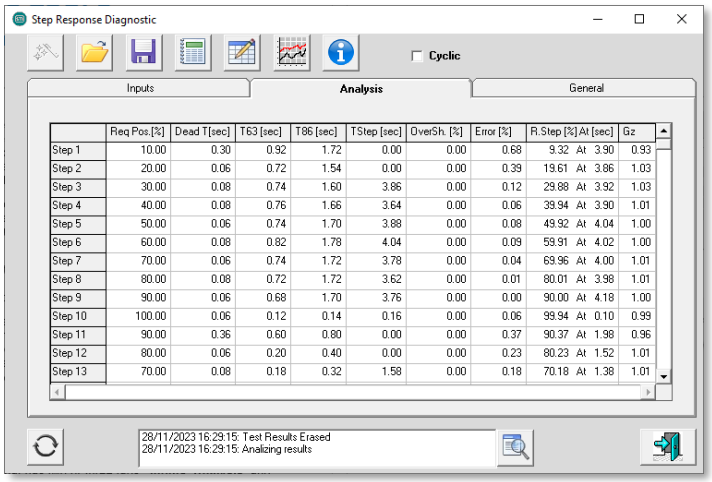
- **Inputs Tab**:
  This tab is used to configure the input data for the test. It allows you to set the parameters necessary for the specific diagnostic tool you are using.

- **Analysis Tab**:
  This tab provides a preview of the analysis results of the offline test. However, to access the full report, the user must download the report.

- **General Tab**:
  This tab retrieves the timestamp of the test, the serial number of the positioner, and other information related to the test. It is used to easily identify a test that was done in the past. The user can also add personal notes/comments in this tab.

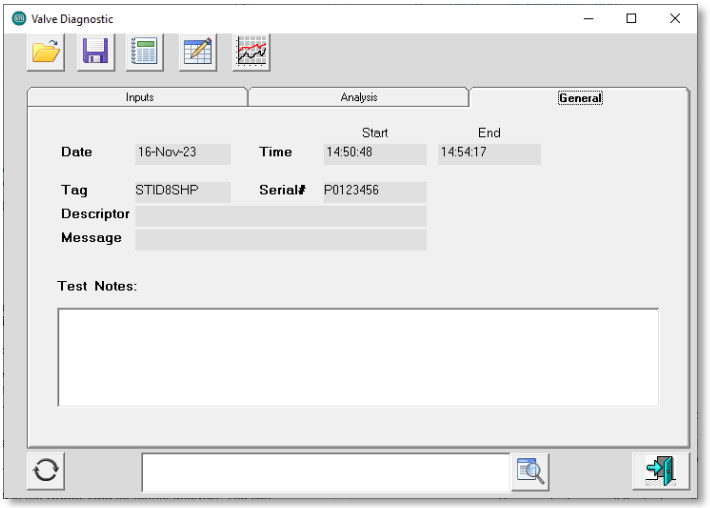


Example : The Inputs Tab of the Frequency Response Test



	Req.Pos.[%]	Dead T[sec]	T63 [sec]	T86 [sec]	TStep [sec]	OverSh. [%]	Error [%]	R.Step [%] At [sec]	Gz
Step 1	10.00	0.30	0.92	1.72	0.00	0.00	0.68	9.32 At 3.90	0.93
Step 2	20.00	0.06	0.72	1.54	0.00	0.00	0.39	19.61 At 3.86	1.03
Step 3	30.00	0.08	0.74	1.60	3.86	0.00	0.12	29.88 At 3.92	1.03
Step 4	40.00	0.08	0.76	1.66	3.64	0.00	0.06	39.94 At 3.90	1.01
Step 5	50.00	0.06	0.74	1.70	3.88	0.00	0.08	49.92 At 4.04	1.00
Step 6	60.00	0.08	0.82	1.78	4.04	0.00	0.09	59.91 At 4.02	1.00
Step 7	70.00	0.06	0.74	1.72	3.78	0.00	0.04	69.96 At 4.00	1.01
Step 8	80.00	0.08	0.72	1.72	3.62	0.00	0.01	80.01 At 3.98	1.01
Step 9	90.00	0.06	0.68	1.70	3.76	0.00	0.00	90.00 At 4.18	1.00
Step 10	100.00	0.06	0.12	0.14	0.16	0.00	0.06	99.94 At 0.10	0.99
Step 11	90.00	0.36	0.60	0.80	0.00	0.00	0.37	90.37 At 1.98	0.96
Step 12	80.00	0.06	0.20	0.40	0.00	0.00	0.23	80.23 At 1.52	1.01
Step 13	70.00	0.08	0.18	0.32	1.58	0.00	0.18	70.18 At 1.38	1.01

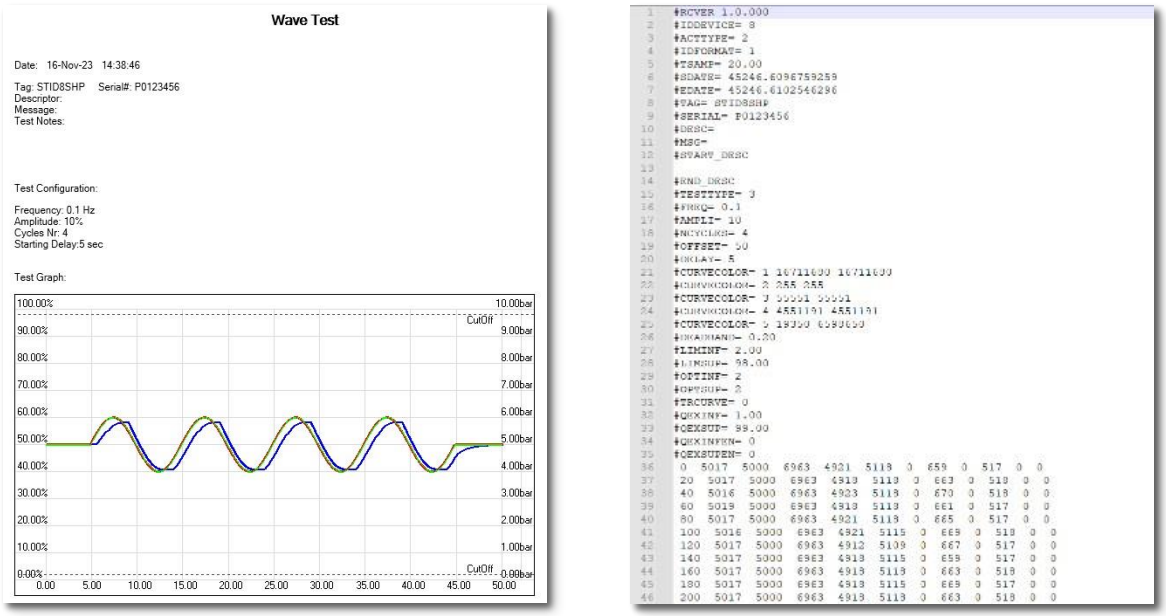
Example : The Analysis Tab of the Step Response Test



Example : The General Tab of the Valve Signature Test

After each test, the user has the option to download two types of files:

- **.txt file**:
  - This file contains the raw data from the test.
  - The data in this file is readable by the Graph Tool.
- .**rtf file**:
  - This file is a test report that can be opened in Word.
  - The report retrieves all the test results, the timestamp, and screenshots of the curves.



Example of Frequency Test Reports

(".rtf file" on the left and the" .txt file" on the right)

5.3 Valve Signature Test (OP1)

Test Insights

The Valve Signature Test is a diagnostic tool designed to assess the **health status of a valve**. It operates by moving the valve within a **specified stroke range**, thereby exploring the **internal friction** of the valve and actuator. This process allows for the **identification** of friction-related issues such as **erosion**, **chamber or membrane damage**, and **actuator misalignment**. The test conducts an evaluation of the actuator's positions and pressures throughout a complete forward and backward stroke.

The operator can use this test to accurately pinpoint areas where friction exceeds the usual level. Data collected during the test is used to **generate a report**, which can be **saved** and **visualized** using the **Graph Tool**. These reports can be generated at various times, allowing for a **comparison** of friction changes over time.

Please be aware that each report consists of a **.txt file** containing **raw data**, which can be loaded into the **Graph Tool**, and a **readily comprehensible** report (**.rtf file**) that can be opened with **Word**.

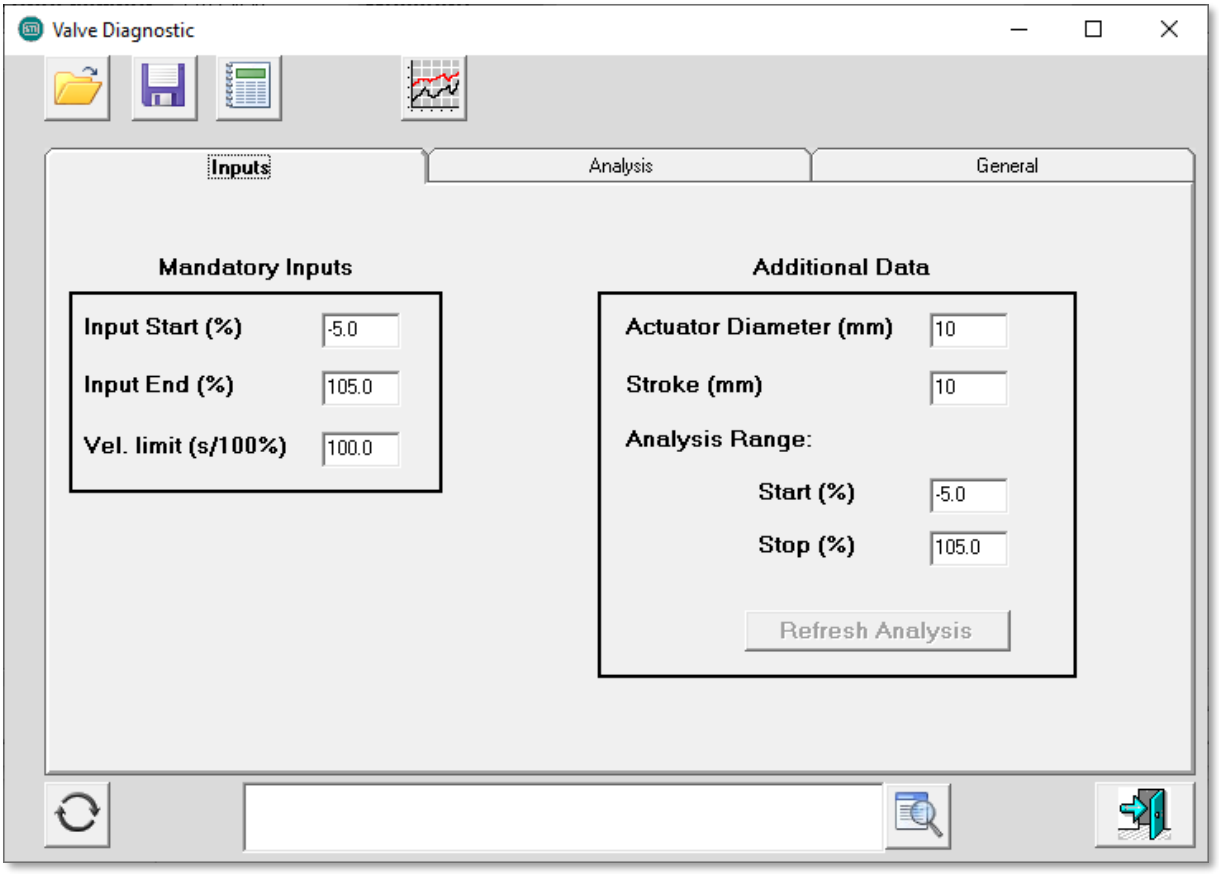
For actuators equipped with a spring, the system also evaluates the **spring range** based on the measured data. The test effectively maps out the **relationship** between **Delta Pressure** (DP) and **position**, offering valuable insights into the functioning and performance of the valve.

Please note that this offline test is only available with the Option Pack 1.

Initiating the Test

⚠	**Ensure all safety requirements are met before starting.** **As the test moves the valve regardless of the 4-20mA setpoint !**

You can initiate the Valve Signature Test by either clicking on the **Quick Access Button** or navigating to: "**Ribbon Bar**" → "**Test**" → "**Valve Signature**". Upon initiation, a configuration window appears with several options :



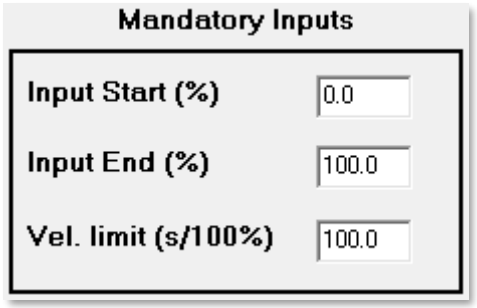
Valve Signature Test window

	***Open button :*** Opens a saved Valve Signature Test.		***Save button :*** Saves the actual Valve Signature Test results.
	***Create button :*** Creates a report with the results.		***Graph button :*** Shows the Valve Signature Test in a graph (works also while the test is running).
	***START button :*** Starts the Valve Signature Test.		***STOP button :*** Stops the Valve Signature Test.
	***Details button :*** Shows the details of the Valve Signature Test process status.		**Exit button :** Exit the window.
		**Refresh Analysis button :** Recalculates the analysis data based on the updated parameters : actuator diameter, stroke, analysis range.	

Mandatory Inputs

This panel contains the key configuration parameters of the Valve Signature Test :

- **Input Start**: The test's starting point (in %).
- **Input End**: The test's final point (in %).
- **Velocity Limit**: The stroke speed for the test (in s/100%).



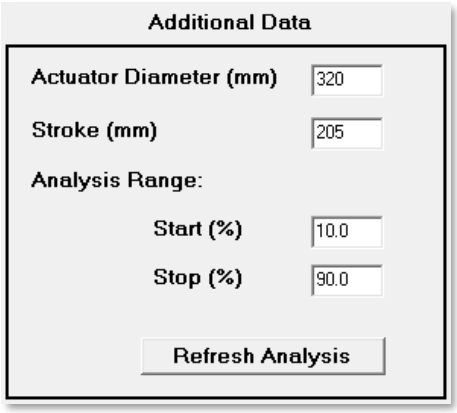
Valve Signature Mandatory Inputs

Additional Data

The "Additional Data" panel needs also to be configured prior to conducting a Valve Signature Test.

Actuator diameter and stroke are used to properly show forces/friction and spring parameters

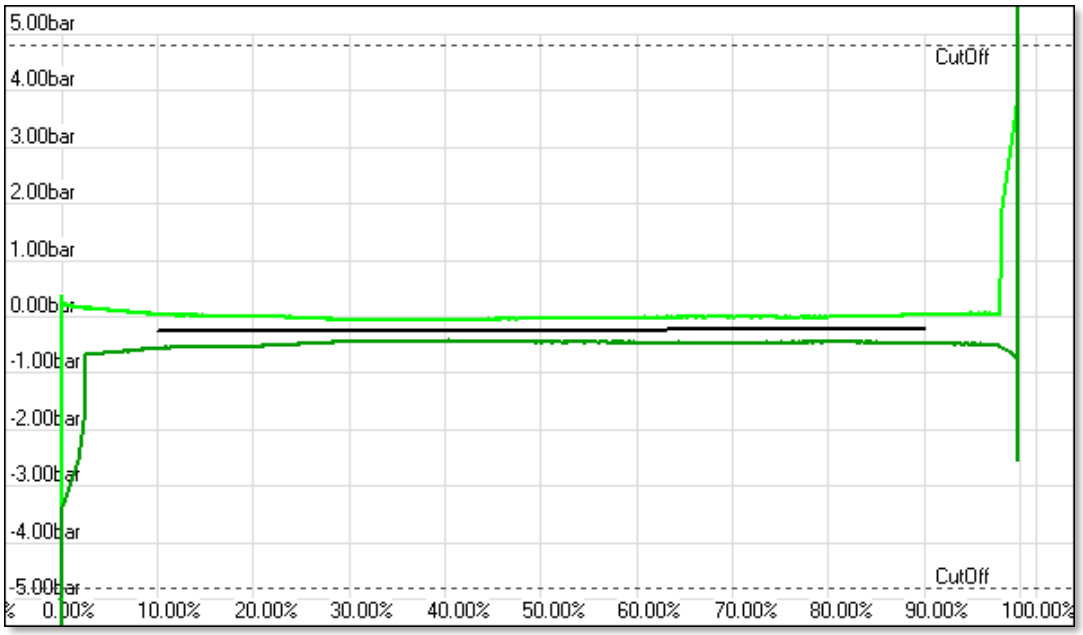
For all actuators, the user must specify the **analysis range** by setting the "**Start**" and "**Stop**" parameters. It's important to note that to obtain accurate results, it's generally recommended to exclude the initial and final parts of the valve signature data. This ensures that the analysis focuses on the most relevant and reliable portion of the data.



Valve Signature Additional Data

The SHP **Service State** must be in "**Manual mode**" to start the test.

During the test, you can observe the Valve Signature's evolution in real time by hitting the "Graph button". Once completed, the Graph displays DP versus position. Use the "**Time view**" or "**VS view**" buttons to change the visualization. The "**Err view**" button shows the dynamic error. You can also **load a saved test** for comparison.



Example of a Valve Signature Graph (DP vs Position) in "VS view"

5.4 Step Response Test (OP1)

Test Insights

The Step Response Test is a diagnostic tool designed to **evaluate** the **performance** of the **PID controller** and assess the **stability of the system**. It operates by moving the valve to different positions based on a list of endpoints.

This process allows for the identification of potential issues with the PID controller's performance and offers an assessment of **how the system responds to changes**. With this test, operators can manually tune the PID controller. It allows them to **observe the effects** of the proportional gain (**Kp**), integral time (**Ti**), and derivative time (**Td**) on the system's **response**.

Data collected during the test is used to generate a report, which can be **saved** and **visualized** using the **Graph Tool**.

Please be aware that each report consists of a **.txt file** containing **raw data**, which can be loaded into the **Graph Tool**, and a **readily comprehensible** report (**.rtf file**) that can be opened with **Word**.

These reports can be **generated** at various times, allowing for a comparison of changes in the system's response over time. The test thus provides a comprehensive **overview** of **each step**, offering valuable insights into the functioning and performance of the system.

Please note that this offline test is only available with the Option Pack 1.

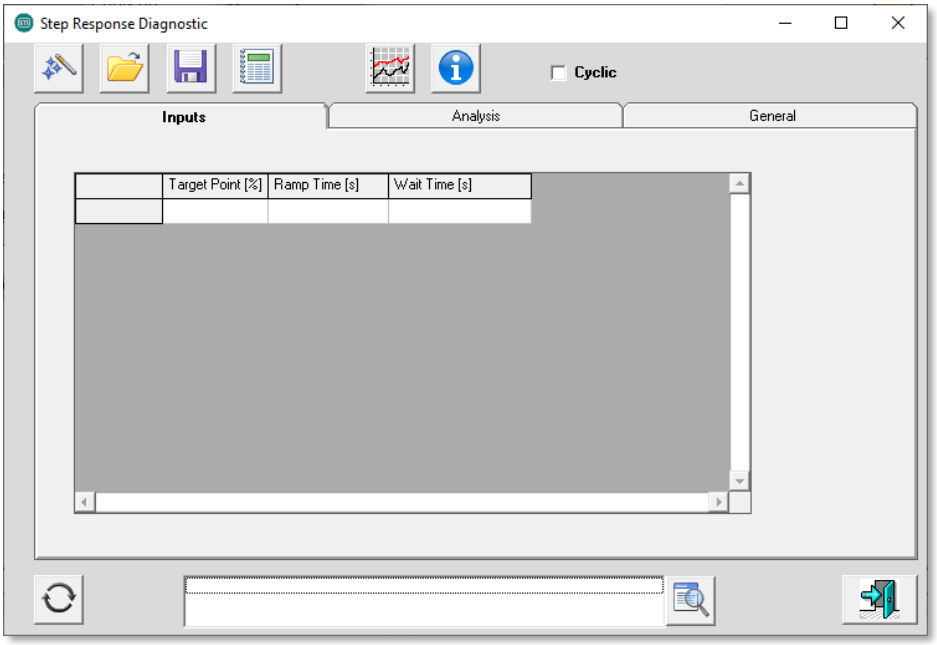
Initiating the Test

	**Ensure all safety requirements are met before starting.** **As the test moves the valve regardless of the 4-20mA setpoint !**

The Step Response Test can be initiated by either clicking on the **Quick Access Button** or navigating to: **"Ribbon Bar"** → "**Test**" → "**Step Response**". Upon initiation, a configuration window appears with several options :

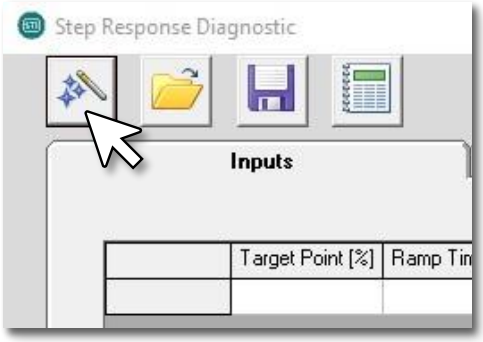
	**Open button** : Opens a saved Step Response Test.		**Save button** : Saves the actual Step Response Test results.
	**Create button :** Creates a report with the results.		**Graph button** : Shows the Step Response Test in a graph (works also while the test is running).
	**START button** : Starts the Step Response Test.		**Step Response Wizard button** : Opens a window with pre-configured parameters for the Step Response Test.

	**Details button** : Shows the details of the Step Response Test process status.		**Exit button** : Exit the window.
	**STOP button** : Stops the Step Response Test.		**Info button** : Opens a window with a blank field where the user can write its own analysis definitions.



Step Response Test window

Step Response Wizard By pressing the "**Step Response Wizard**" button, the "**Automatic Step Generation**" window will appear to assist the user in configuring the Step Response Test parameters.



Hitting the "Step Response Wizard" button

Mandatory Inputs

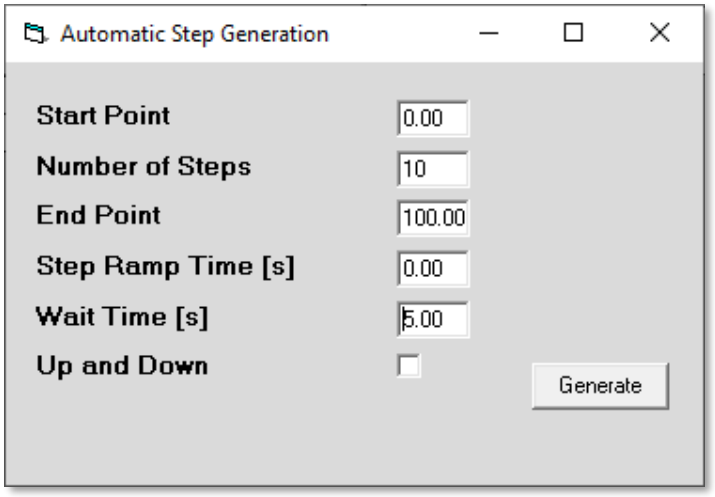
- **Start Point** :
  Refers to the initial position the actuator moves to before the commencement of the actual test. Data recording begins immediately after the actuator reaches this specified point.

- **Number of Steps / End Point** :
  The parameters "**Start Point**" and "**End Point**" are used to automatically generate the desired number of steps between these two points. All generated steps share identical parameters. After automatic generation, parameters of each individual step can be modified. Each step is defined by three parameters: "**Target point**", "**Ramp time**", and "**Wait time**".

- **Wait Time** :
  Defined as the duration after a step input change during which the system waits for the response to stabilize at the new value. If the "Ramp Time" is not zero, the "Wait time" begins following the "Ramp Time".

- **Step Ramp Time** :
  Refers to the ramp time required to reach the step's target position.

- **Up and Down** :
  If selected, the Step Response Test will move the valve back and forth between the "Start Point" and the "End Point", effectively doubling the number of steps.



Step Response Automatic Generation window

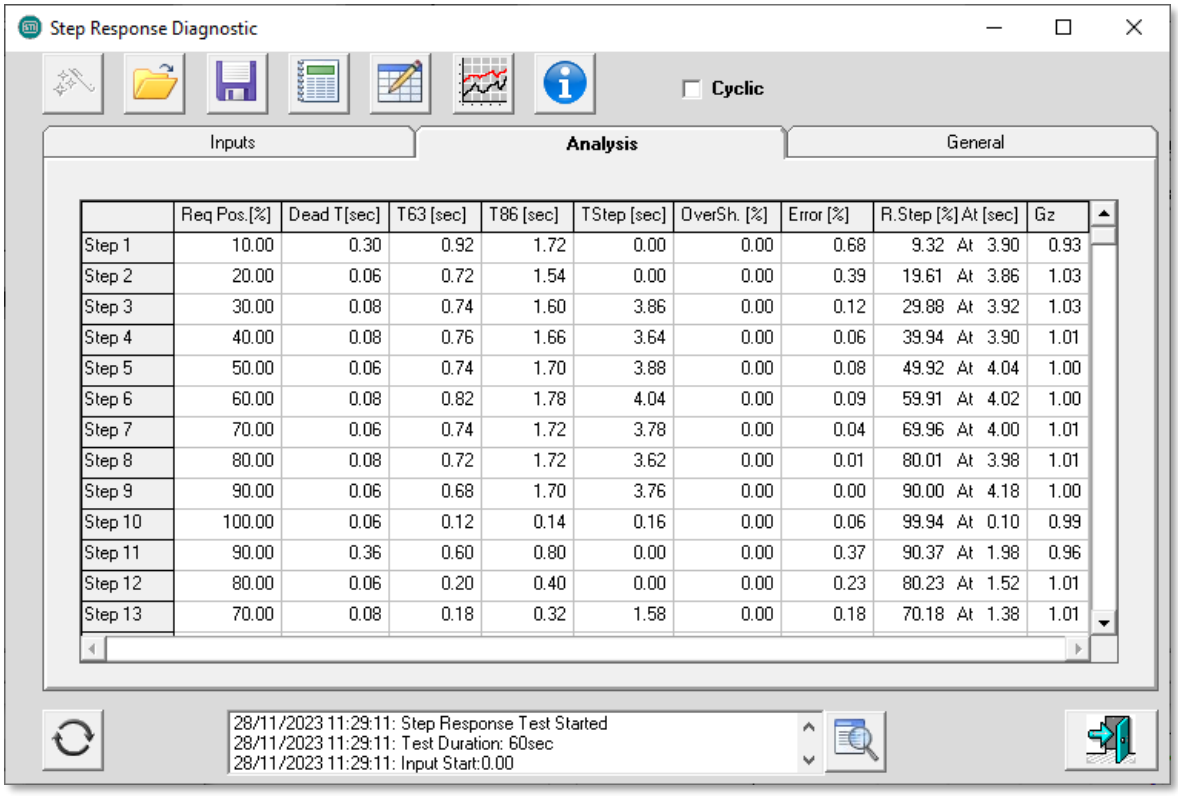
Click on "**Generate**" to configure the steps. A table appears with information about each step. It is possible to change the value of each step.

- Click on "**Start**" to initiate the test.
- To view the graph, click on "**Graph**".
- To generate a detailed report, click on "**Create Report**".

At the end of the test, you can view test details including information about dead time, T63 and T86 for a particular step, and overshoot (with the percentage of overshoot relative to a particular step).

Step Response Test Analysis

To check the test analysis, open the "**Analysis Tab**".



	Req Pos.[%]	Dead T[sec]	T63 [sec]	T86 [sec]	TStep [sec]	OverSh. [%]	Error [%]	R.Step [%] At [sec]	Gz
Step 1	10.00	0.30	0.92	1.72	0.00	0.00	0.68	9.32 At 3.90	0.93
Step 2	20.00	0.06	0.72	1.54	0.00	0.00	0.39	19.61 At 3.86	1.03
Step 3	30.00	0.08	0.74	1.60	3.86	0.00	0.12	29.88 At 3.92	1.03
Step 4	40.00	0.08	0.76	1.66	3.64	0.00	0.06	39.94 At 3.90	1.01
Step 5	50.00	0.06	0.74	1.70	3.88	0.00	0.08	49.92 At 4.04	1.00
Step 6	60.00	0.08	0.82	1.78	4.04	0.00	0.09	59.91 At 4.02	1.00
Step 7	70.00	0.06	0.74	1.72	3.78	0.00	0.04	69.96 At 4.00	1.01
Step 8	80.00	0.08	0.72	1.72	3.62	0.00	0.01	80.01 At 3.98	1.01
Step 9	90.00	0.06	0.68	1.70	3.76	0.00	0.00	90.00 At 4.18	1.00
Step 10	100.00	0.06	0.12	0.14	0.16	0.00	0.06	99.94 At 0.10	0.99
Step 11	90.00	0.36	0.60	0.80	0.00	0.00	0.37	90.37 At 1.98	0.96
Step 12	80.00	0.06	0.20	0.40	0.00	0.00	0.23	80.23 At 1.52	1.01
Step 13	70.00	0.08	0.18	0.32	1.58	0.00	0.18	70.18 At 1.38	1.01

Analysis Tab

Quick overview of each analyzed parameter :

- **Req Pos.** (Requested Position) :
  It indicates the target position requested at each step. This does not represent an actual analysis value.

- **Dead T** (Dead Time) :
  It is the delay between the initiation of an input signal change and the moment when the system begins to respond. During this period, no observable changes occur in the system's output.

- **T63** :
  The time interval between the initiation of an input signal change and the moment when the first order dynamic system reaches 63.2% of the full steady state change.

- **T86** :
  The time interval between the initiation of an input signal change and the moment when the first order dynamic system reaches 86.5% of the full steady state change.

- **TStep** (First Time to Target) :
  The time interval between the initiation of an input signal change and the moment when the system enters in the intentional tolerance band (dead band).

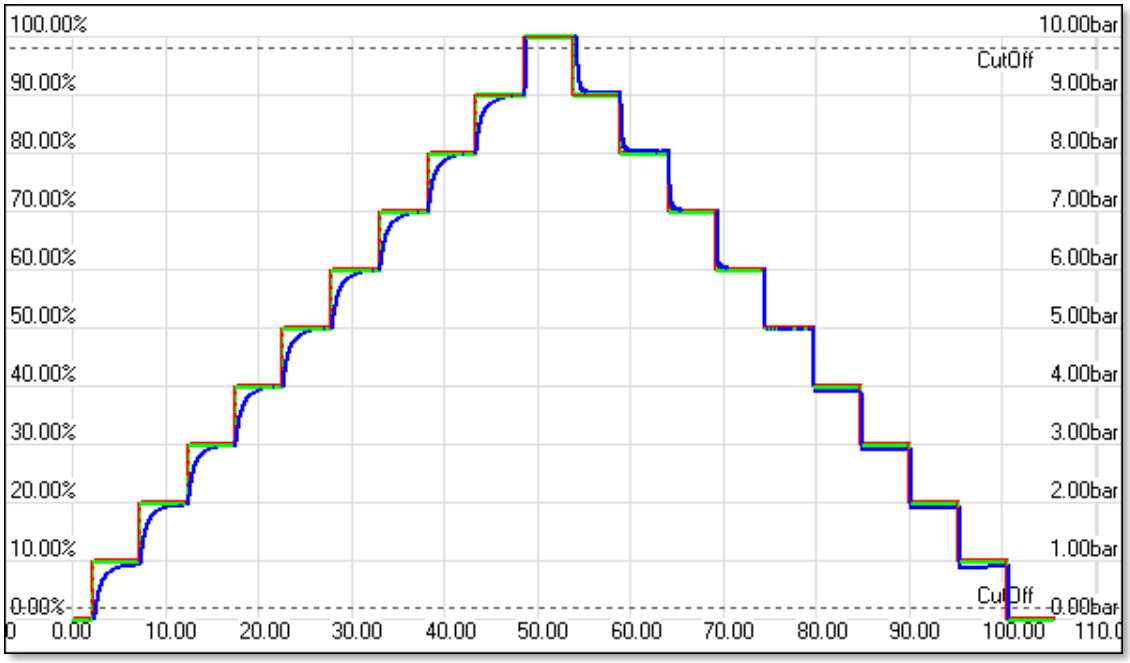
- **OverSh** (Overshoot):
  The overshoot, expressed as a percentage of the full stroke.

- **Error** :
  The Error between the Steady Step Position and the Requested position in % of total stroke.

- **RStepAt** (reached Step) :
  This refers to the steady state position at the settling time. In other words, it's the point where the system has stabilized after a change.

- **Gz** (response gain) :
  The ratio of the steady state magnitude of the process change Δz divided by the requested step Δs that caused the change. Gz = Δz /Δs.

During the test, you can observe the Step Response evolution in real time by hitting the "Graph button".



Example of a Step Response Graph (Actual and Required Position vs Time)

5.5 Frequency Response Test (OP2)

Test Insights

The Frequency Response Test is a specialized diagnostic tool designed to **evaluate** the **performance** and **precision** of the valve by generating a sinusoidal setpoint. This test is particularly useful for testing anti-surge valves, as it provides valuable insights into the system's **speed** and precision. The ability to save multiple configurations in memory for future tests adds to its convenience and efficiency.

The data gathered during the test is utilized to produce a report. This report can be **saved** for future reference and its contents can be **visualized** using the **Graph Tool**. Each report is made up of two components: a **.txt file** and an .**rtf file**. The .txt file contains the **raw data** from the test, which can be imported into the Graph Tool for further analysis. The **.rtf** file, on the other hand, presents the data in a format that is easy to understand and can be opened with Word. (This specific test generates two separated .rtf reports.)

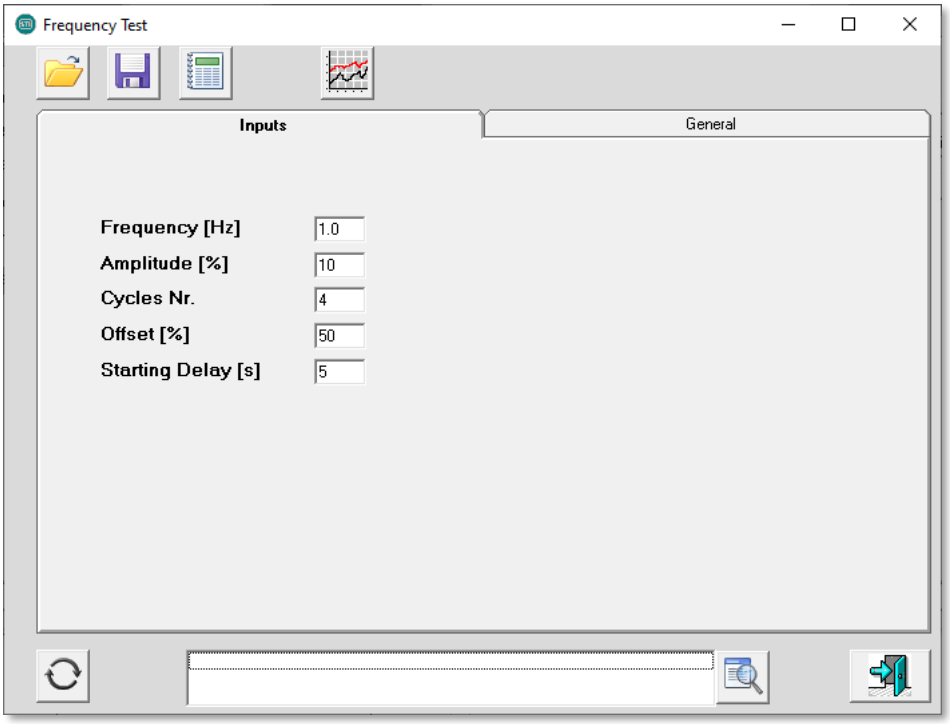
Please note that this offline test is only available with the Option Pack 2.

Initiating the Test

	**Ensure all safety requirements are met before starting.** **As the test moves the valve regardless of the 4-20mA setpoint !**

The Frequency Response Test can be initiated by either clicking on the **Quick Access Button** or navigating to: "**Ribbon Bar**" → "**Test**" → "**Freq. Response**". Upon initiation, a configuration window appears with several options :

	***Open button :*** Opens a saved Frequency Response Test.		***Save button :*** Saves the actual Frequency Response Test results.
	***Create button :*** Creates a report with the results.		***Graph button :*** Shows the Frequency Response Test in a graph (works also while the test is running).
	***START button :*** Starts the Frequency Response Test.		***STOP button :*** Stops the Frequency Response Test.
	***Details button :*** Shows the details of the Frequency Response Test process status.		**Exit button :** Exit the window.



Frequency Response Test window

Mandatory Inputs

- **Frequency** :
  The frequency of the sinusoid.

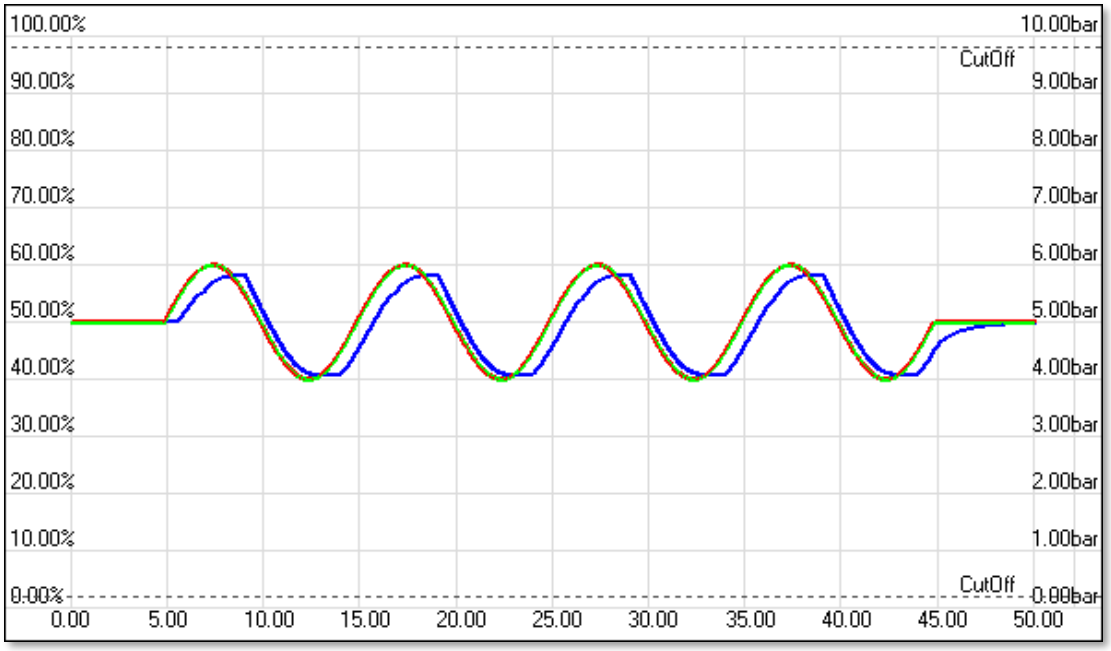
- **Amplitude** :
  The amplitude of the sinusoid.

- **Cycles Nr** :
  The number of sinusoid cycles.

- **Offset** :
  The Offset value of the sinusoid.

- **Starting Delay** :
  The actuator is initially moved to the “Offset” position. The “Starting Delay” parameter defines the waiting period before the Frequency Test Response begins after reaching the “Offset” position.

  To initiate the test, click on “**Start**”. As the test progresses, you can monitor the real-time evolution of the Frequency Response by selecting the “**Graph**” icon. Upon completion of the test, a detailed report can be generated by clicking on “**Create**” icon. This allows for a comprehensive review and analysis of the test results.



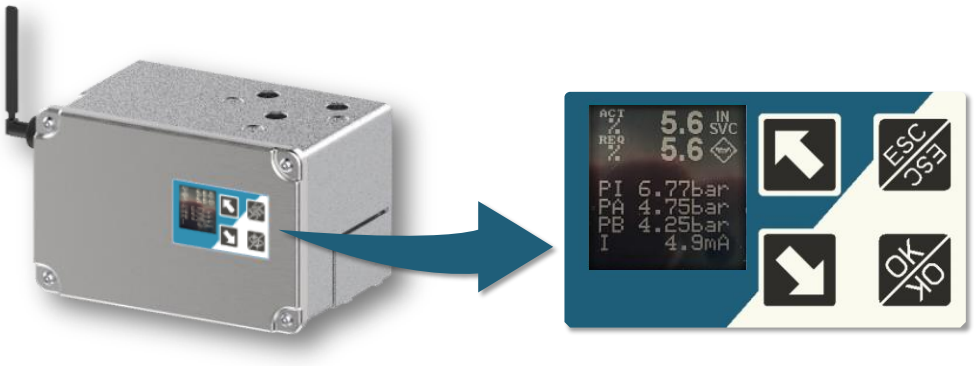
Example of a Frequency Response Graph (Actual and Required Position vs Time)

At the end of the test, you can view test details including information about the phase shift (absolute value) and the gain amplification/attenuation. Using the right button of the mouse, it is possible to measure the results of the test. The feature allows to select any two points on the graph.

6 LOCAL USER INTERFACE (LUI)

6.1 Description

The Local User Interface (LUI) is an optional feature of the SHP positioner, designed to provide users with **quick** and **easy** access to the main information and configurations of the device. The LUI consists of a small **LCD display** and **four buttons**, all housed within a robust enclosure available in both aluminium and **SS 316** options.



Local User Interface panel

One of the standout features of the LUI is its touch screen keyboard, which can be operated **without opening the enclosure**. This ensures the durability and longevity of the device even in challenging environments.

6.2 Controls and LCD display

Buttons

The LUI is equipped with an LCD display and four buttons, serving as the primary means of interaction, the details of which can be found in the table below :

Name	Action	LUI
UP	*Navigate up / Increase*	
DOWN	*Navigate down / Decrease*	
ESC	*Escape*	
OK	*Enter / Validate*	

Display

The main screen displays information about the positioner's process variables and its current status. This includes :

Name	Description
ACT	*Actual Position*
REQ	*Required Position*
PI	Line Pressure
PA	*Pressure in chamber B*
PB	*Pressure in chamber A*
I	*Input current*
IN SVC/ OUT SVC/ MANV	*Service State*
	*Condensed Health Status pictogram*

The main screen also shows the condensed status with its related NE107 pictogram for quick problem identification.

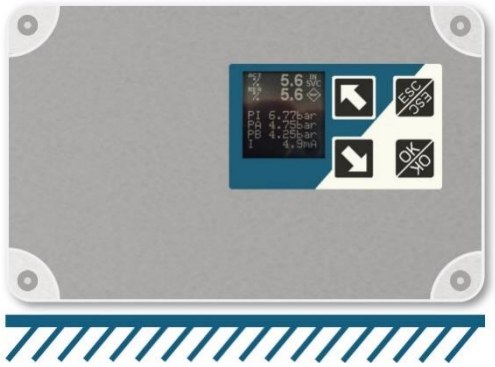
Press "**ESC**" in order to check the details of all the active NE107 alarms. The active alarms will automatically scroll one after the other. Press "**ESC**" again to return to the main screen.

Example of NE 107 active alarms

Display Orientation

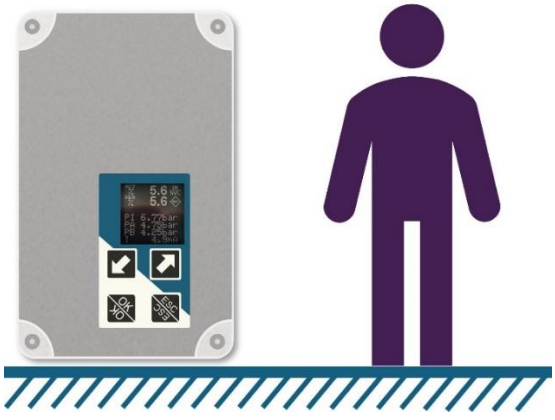
Depending on the actuator, the positioner can be mounted either **vertically** or **horizontally**. This in turn requires the adjustment of the Local User Interface (LUI) orientation to ensure optimal readability and user experience.

For the LUI to correctly interpret which arrow button corresponds to the "**UP**" or "**DOWN**" direction, the display information must always be presented with the correct orientation to the user (**the operator SHOULD NOT need to tilt his/her head to read the information**). If this condition is not met, the LUI may not know what the position of the SHP is, and as a result, the "**UP**" and "**DOWN**" buttons may behave in reverse.



Default Orientation

Here is an example of a positioner mounted vertically. On the left, the LUI orientation is correct. However, on the right, the operator did not adjust the LUI orientation, resulting in the reverse behaviour of the "**UP**" and "**DOWN**" buttons.

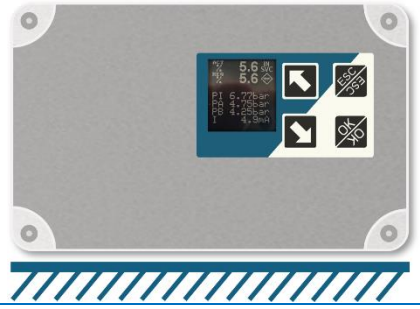
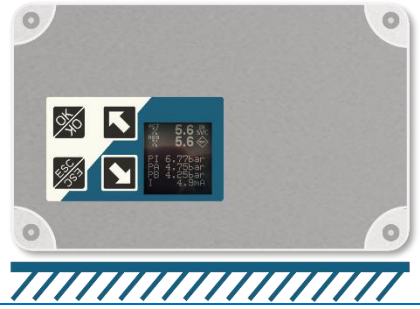


LUI CORRECT orientation	***LUI INCORRECT orientation***

Adjusted Orientation

To adjust the display orientation, follow these steps:

1. Navigate to the **CONFIG** menu.
2. Select **DISP. ROT**..
3. Choose **Disp. Rot**..
4. Select the desired orientation: **0** deg, **90** deg, **180** deg, or **270** deg.

	
0° orientation	**90° orientation**
	
180° orientation	**270° orientation**

Supported Orientations

Password

In order to access the menus, a **5 digit pin code** is requested. To enter the pin code, **press** "**OK**" **and then** type the following sequence :

	PIN CODE : 

6.3 Menu structure

Root menus

The Local User Interface (LUI) is organized into **six root menus**, each providing access to different items of the positioner's configuration and information :

Root Menus	Description
1 CONFIGURATION	Allows changing the main settings of the positioner.
2 SYSTEM INFO	Displays information such as the device firmware version and serial number.
3 CALIBRATION	Provides access to the calibration wizards and factory reset option.
4 SET-UP	Allows changing the tuning and the travel control parameters.
5 COUNTERS	Displays system counters (such as Travel accumulator, Cycles counter and device On Time).
6 RAW DATA	Displays some relevant device variables in their internal representation (e.g. bits, etc.).

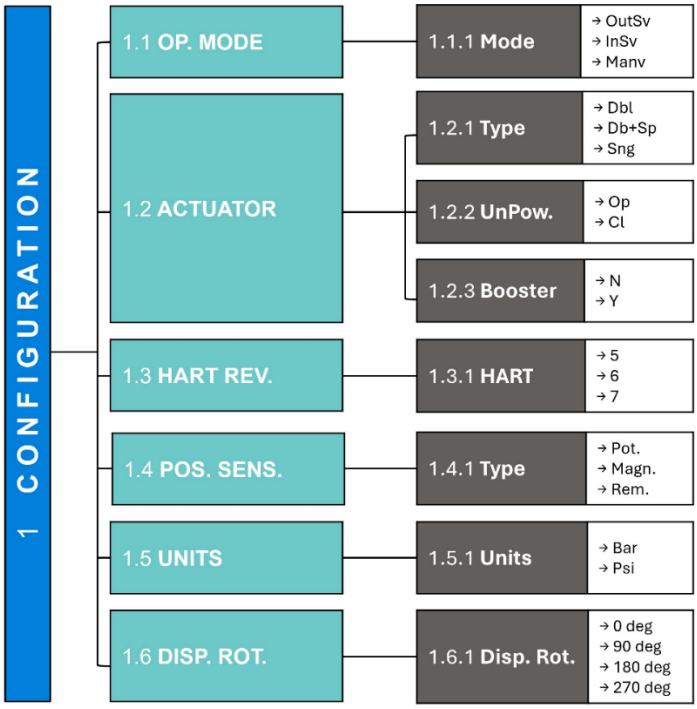
Hierarchical Menu Layout

The LUI's menu structure is organized in a layered manner, with each root menu leading to various options and nested menus. This section provides a visual representation of the menu hierarchy, to show how to navigate through the different levels of menus. The hierarchical structure is shown using a tree diagram, where each box represents a menu, and the connecting lines indicate their relationships.
To make navigation easier, a color-coding scheme is used:

- **Blue** boxes represent the **root menus**, which are the starting point of the navigation.
- **Turquoise** boxes denote the **first-level menus**, which are directly accessible from the root menus.
- **Dark grey** boxes indicate the **second-level menus**, which are accessible from the first-level menus.
- **White** boxes are used for **editable variables or displayed information**, which are the final nodes in the navigation tree.

This color-coding scheme allows for a quick and easy understanding of the menu levels and aids in efficient navigation of the LUI.

1 CONFIGURATION



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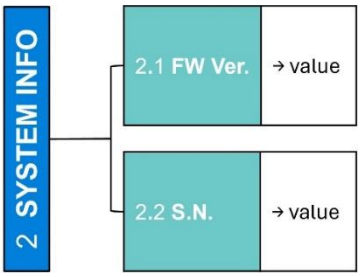
2 SYSTEM INFO



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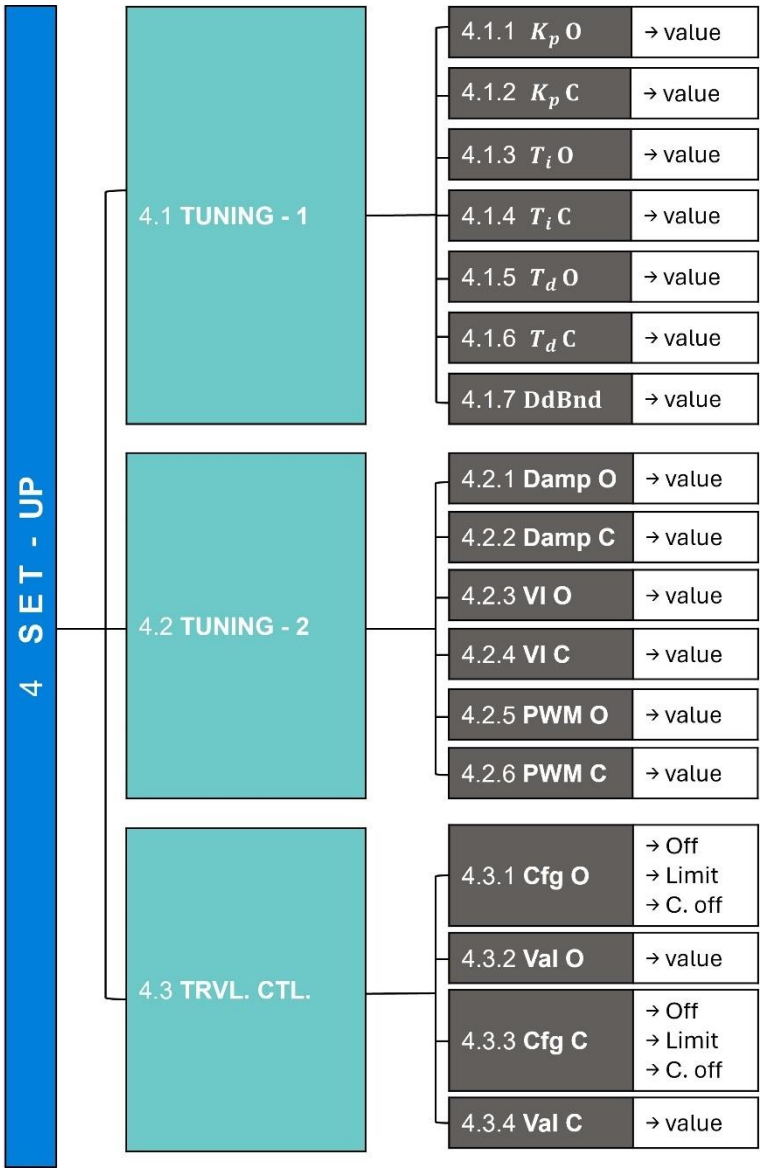
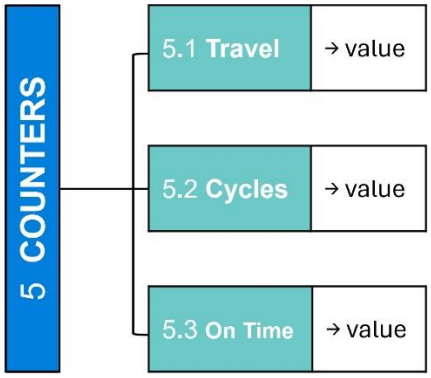
3 CALIBRATION

4 SET-UP


4 SET - UP
4.1 TUNING - 1
4.1.1 K_p O
→ value
4.1.2 K_p C
→ value
4.1.3 T_i O
→ value
4.1.4 T_i C
→ value
4.1.5 T_d O
→ value
4.1.6 T_d C
→ value
4.1.7 DdBnd
→ value
4.2 TUNING - 2
4.2.1 Damp O
→ value
4.2.2 Damp C
→ value
4.2.3 VI O
→ value
4.2.4 VI C
→ value
4.2.5 PWM O
→ value
4.2.6 PWM C
→ value
4.3 TRVL. CTL.
4.3.1 Cfg O
→ Off
→ Limit
→ C. off
4.3.2 Val O
→ value
4.3.3 Cfg C
→ Off
→ Limit
→ C. off
4.3.4 Val C
→ value

5 COUNTERS



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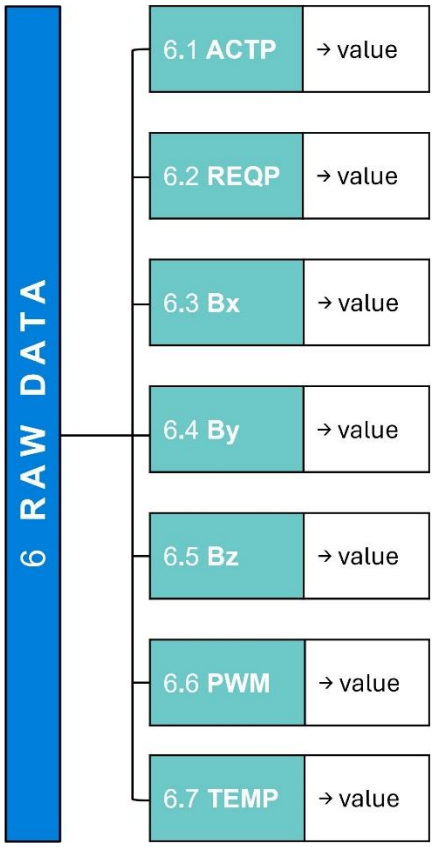
6 RAW DATA



7 OPTION PACKS

The SHP positioner is designed with flexibility in mind, offering a range of features, including **Online and Offline Diagnostic tools** to meet your specific needs. By default, every SHP positioner comes with the "**Standard Pack**", which includes basic instruments such as **Parameter Monitoring**, **Graph Tool**, **Self-tuning**, **System Status**, and **Events & Counters**. However, for those who require additional functionalities, we offer three different Option Packs that can be purchased separately.

Option Pack Details

- **Option Pack 1 (OP1)** :
  This pack includes all the features of the **Standard Pack**, along with the **Step Response Test**, **Valve Signature Test**, and **Pressure Fallback option**.

- **Option Pack 2 (OP2)** :
  Building on **Option Pack 1**, this pack also includes the **Stability Control** option, **Soft Cut-off** option, and **Frequency Response Test**.

- **Option Pack 3 (OP3)** :
  The most comprehensive pack, Option Pack 3 includes all the features of **Option Pack 2**, plus the **Quick Exit from Cut-off** option and the **Logger**.

- **Trial License** :
  This feature provides users with the opportunity to trial all the option packs (1, 2, and 3) for a limited period of time. Each pack is designed to provide additional tools and features to enhance your control and understanding of the SHP positioner.

  The trial license **can be activated only once per device**. Once activated, it enables **all the option packs** for a duration of **24 hours**.

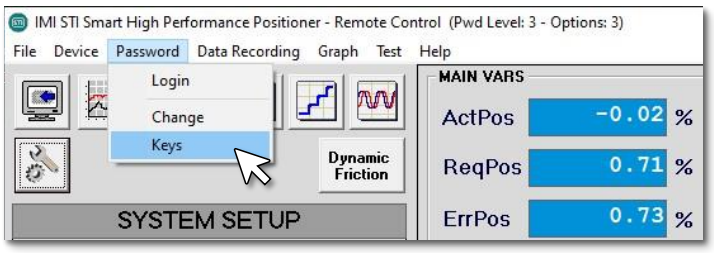
  Please note that each time the positioner is turned **OFF** and then **ON** again while the trial license is active, the remaining time of the trial license is reduced by **6 hours**. This is designed to prevent misuse of the trial license.

  When the trial license expires, only the option packs that had been enabled previously remain active. If a code is sent to enable option packs while the license is active, the code is evaluated only upon the expiration of the license.

Activating Option Packs

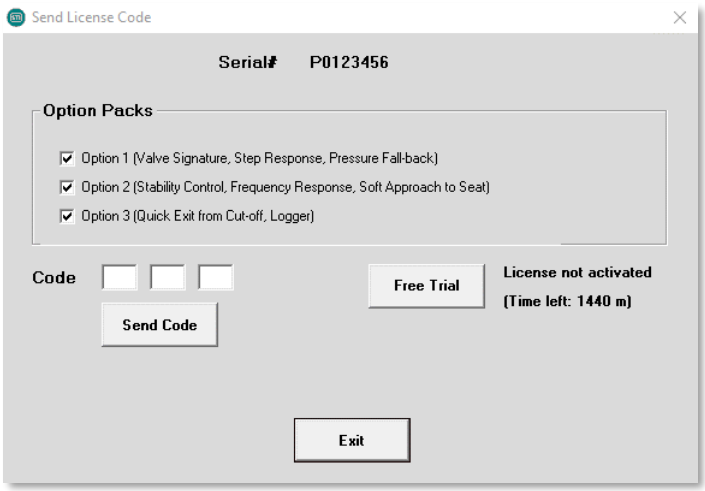
Option Packs are not free of charge, you can get a license (related to your specific positioner identified by the serial number) contacting IMI STI that will provide you with a License **Key**. This Key needs to be entered into the Remote Control Interface.

To do this, navigate to the interface **ribbon bar**, select **Password → Keys**, and enter the **Key**.



Option Pack Activation procedure

The features of the purchased Option Pack will then be automatically unlocked on your specific positioner. Please note that in order to perform this operation, the service state must be "**Out of Service**". This ensures a seamless integration of the new features into your existing system.



Option Pack Activation Window

By clicking the "**OK**" button, you will unlock the features associated with the entered Option Pack.

	**Please note, if you input an incorrect key, any previously enabled option pack will be deactivated !** **In the event of an incorrect key entry leading to the deactivation of a validly licensed option pack, please contact IMI STI.** **Assistance can be provided in retrieving your key if it has been misplaced or forgotten.**

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