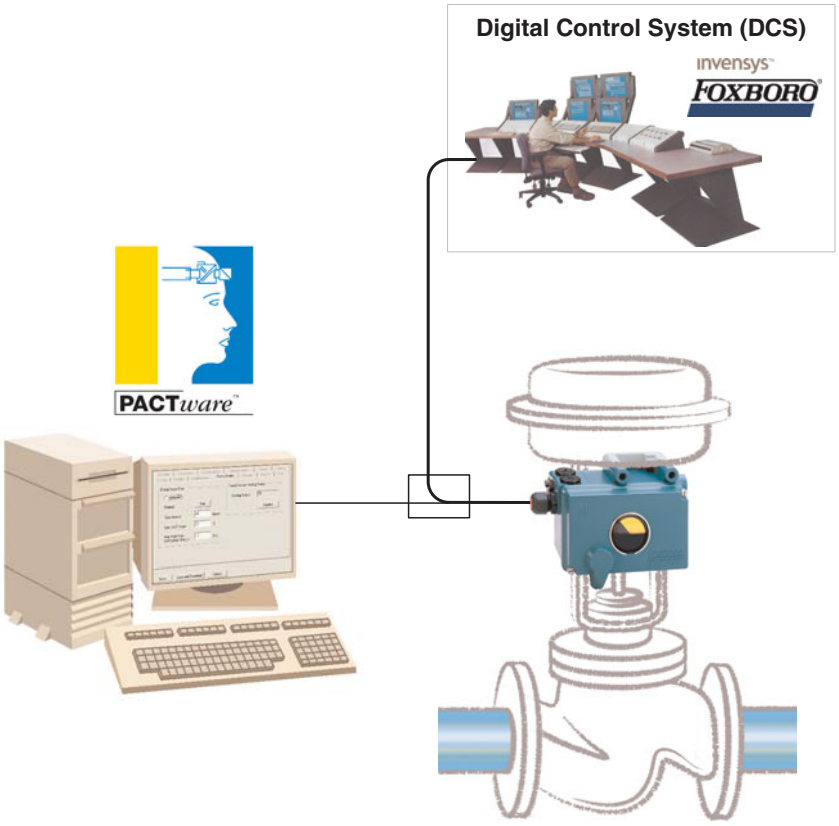
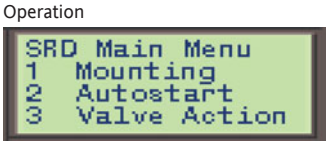
VALcare™ Valve Diagnosis for Positioners SRD960 / SRD991

FOXBORO ECKARDT



Operation



Configuration

Diagnosis for failed PST or stuck valve

Intelligent Valve Diagnostics for Predictive Maintenance

The valve diagnostic software VALcare™ is available as Device Type Manager (DTM) for integration into control systems based on the Field Device Tool (FDT) technology such as the Foxboro I/A™ Series System. It is designed to support methods for evaluation of the valve health, operation and configuration. The DTMs support the communication protocols HART, Profibus PA, FOUNDATION Fieldbus (FF) and FoxCom.

- Predictive Maintenance capabilities
- Intelligent Alarm Management
- Self-surveillance in accordance with NE107
- Service Management
- Histograms for Valve Position- and Response-History
- Data collected up to 60 months
- Data stored inside positioner memory
- Determination of Stem Friction to prevent leakage and stuck stem
- Histogram for Friction-History
- Partial Stroke Test function for ESD applications

invensys

FDT/DTM-Technology

The FDT/DTM concept specifies a “frame application” with a uniform platform for software tools and provides the particular advantage of a simple, standardized and common implementation and engineering environment to integrate field devices into any FDT compliant control system.

It defines interfaces and mechanisms which provide a simple method of running a type of “printer driver” for field devices, the Device Type Manager (DTM).

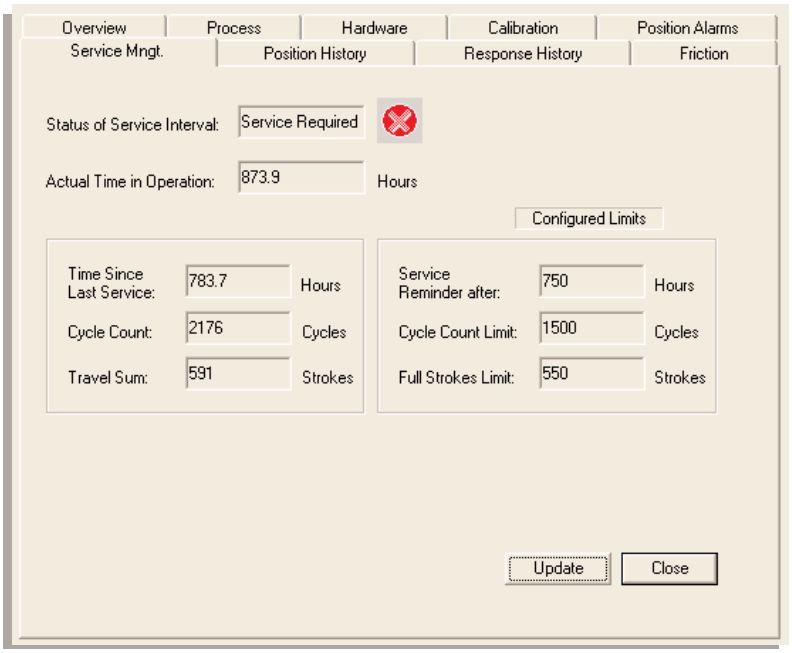
DTM describe the field device specific software component.

VALcare™ is such a “driver” and supports the communication protocols HART, Profibus PA, FOUNDATION Fieldbus and FoxCom. FDT supplements the DDL-technology and offers much more, a unified architecture for all devices in a plant. Benefit, the “driver” can be integrated into any FDT compliant control system.

Predictive Maintenance

VALcare™ is not only software to display the setpoint or measured values, it offers enhanced applications and methods to analyse data. The onboard functionality and memory automatically retrieves and stores all important valve data collected by the positioner during the operation. This feature enables the software to run on demand. As a result it mustn’t run continuously on the control system and therefore can reduce unnecessary traffic on the communication signal.

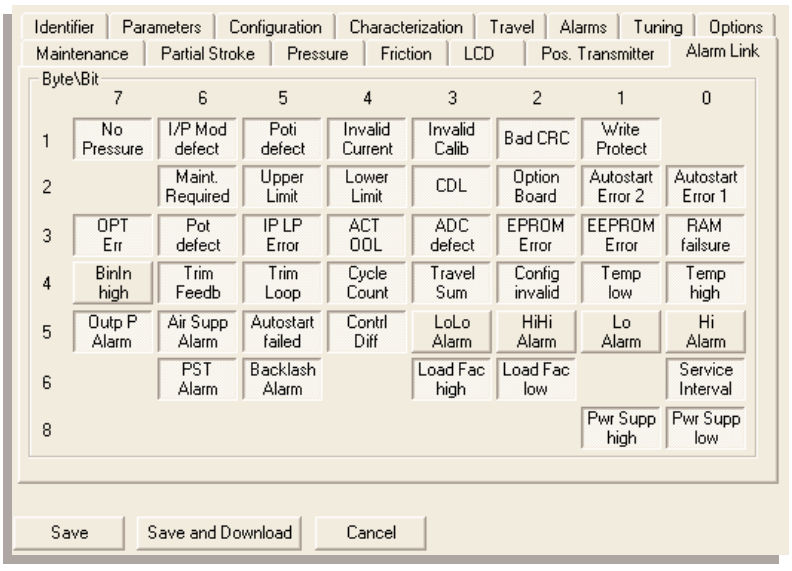
The internal diagnostic-routines continuously evaluate the state of the valve and inform the operator of any irregularities by executing a status- and/or diagnostic-message by using the self surveillance methods following the NAMUR Recommendation NE107. The total operating hours of the device can be displayed. Service Intervals can be timed, using the Service Management. Histograms show the Valve Position History or Valve Response History. The Stem Friction can be measured to identify possible problems caused by a reduced or increased friction on the stem packing. The measured values are then displayed in the Histogram for the Friction History.



Alarm Link

The newly designed Alarm Link allows the operator to freely define and activate the alarm that he wants to display on his operating station or on his Alarm channel of the Option Board*.

* Option Board: Additional Electronic Board added to the main electronics to enhance the positioner basic functionality

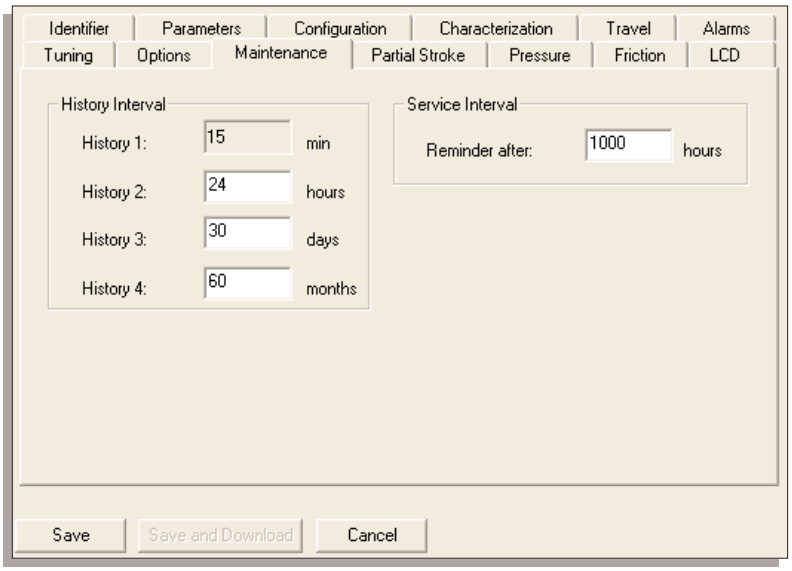


Maintenance Management

This feature allows configuring the Service and History Intervals.

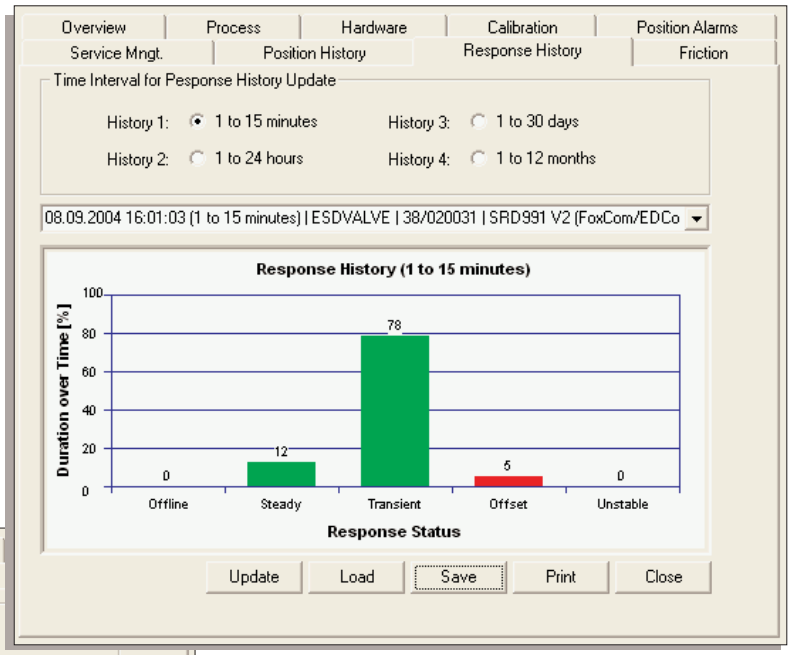
The Service Interval is used to automatically generate an alarm that a service of the device is required. The History Interval can be freely configured, defining the time window of the Histograms for the Response-, Position- and Friction-History, showing the last 15 minutes, 24 hours, 30 days or 60 months.

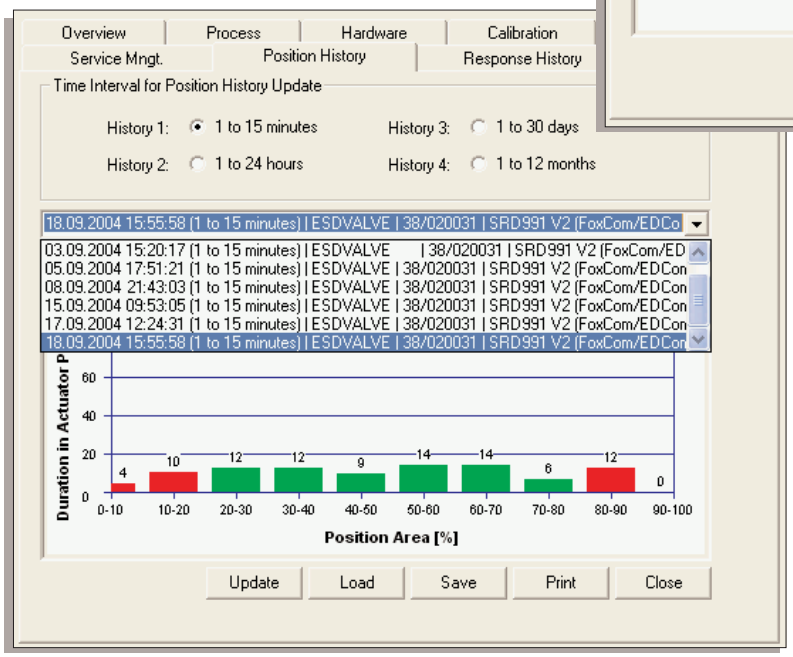
The indicated and illustrated data such as the Valve Position History and the Response History as well as the status and diagnostic messages derived can be ideally utilized for process optimization and predictive maintenance. This results in a more transparent and, at the same time, economic control process thanks to fast localization of possible operational faults. Downtimes can be optimized and service costs can therefore be reduced.



Tools for Predictive Maintenance

The positioner database can be analysed at a later time by loading the data to a Control System or to a PC while the valve is still in the process. Unnecessary down times are optimized, because the valve can be inspected while it's still in operation. The data can be visualized in different freely definable time intervals. This allows the observation of the last 15 minutes, 24 hours, 30 days and up to 60 months. Color coding shows the operator if this is a critical (red) or non-critical (green) operation.





Response History

Shows the control behavior of the valve over time and identifies the state of the valve: offline, steady, transient, offset or unstable.

Position History

Shows the valve position over time and identifies if the valve is operating within or outside the specified range.

Alarm Management

The SRD offers the most enhanced self surveillance and diagnosis monitoring capabilities available on the market.

Unified self-surveillance (NE107)

Self-surveillance and diagnosis monitoring following the Namur Recommendation NE107. This recommendation defines unified status messages for field devices, providing the user with information about the state of the field instrument. The available information indicates clearly what device-alarm was activated, where the alarm initiated from, possible reason for the alarm and what corrective actions need to be initiated to restore a normal operating state. In the illustration below the realization is shown. All alarms are generated in the positioner and can be uploaded at any time. The columns show the displayed status messages, e.g. control difference, air supply pressure alarm, high friction alarm, current or historical message, a full text description explaining the possible reason for the status message, and the actions for maintenance.

Status	Current	Historical	Category	Description	Action	#
Position High Alarm	(1) INFO	(1) INFO	Position	Position above High Alarm Setpoint.	Monitor situation or correct cause.	256
Position High High Alarm	(1) INFO	(1) INFO	Position	Position above High High Alarm Setpoint.	Monitor situation or correct cause.	1024
Control Diff OOL	(5) Maintenance Required	(5) Maintenance Required	Mechanics	Difference between applied analog or digital setpoint and the corresponding valve position. The values exceed the allowed limit in connection with a specified time limit. The default values are 5% within 60 Seconds.	Check to ensure that there is adequate supply pressure. Verify tuning parameters. Check mechanics of actuator and valve. Refer to troubleshooting sectoin of MI EVE 0105 A.	4096
No Autostart done	(5) Maintenance Required	(5) Maintenance Required	Calibration	No Autostart was done or Autostart was run and did not complete successfully.	Ensure proper mounting of positioner and adequate supply pressure. Refer to online Help for other potential causes. Rerun Autostart Calibration procedure.	8192
Air Supply Pressure Alarm	(5) Maintenance Required	(5) Maintenance Required	Process	The Air Supply Pressure falls below the configured Lower Limit.	Check to ensure that there is adequate supply pressure.	16384
Pneumatic Failure	(6) Failure	(6) Failure	Process	This Alarm indicates a critical state for the operation of the device. The supply pressure has failed and caused a remaining control deviation.	Check if the filters are obstructed. Restore the supply pressure and check the control behavior.	16384
Actuator OOR	(6) Failure	(6) Failure	Mechanics	This Alarm indicates a critical state for the operation of the device. The valve position is not within permissible range of mechanical stops that were determined during the initial start-up. The fingerprint data differ and are outside the allowed range (valve-position: < -5% / > +105%).	Check mechanical connection between the positioner and the actuator / valve. Perform Endpoints Calibration. This can also be a sign of wear on the plug or seat. Check if they are still in tact.	16

Close Print Stop Update

Status indicators are distinguished by messages and color-coding similar to traffic signals:

- Failure
- Maintenance Required
- OK
- INFO
- Out of Specification

Green indicates that no status messages are present; grey that a status message is present but no maintenance is required; yellow that maintenance is required but an operation is still possible; red indicates a device failure that requires an immediate service.

Comparing the historical and current alarm supports the operator if all messages have been eliminated.

Audit Trail

The Audit Trail is designed to record all events from a positioner, listed by date and time. This event monitoring can be used to put a positioner under a special surveillance if there are uncertainties regarding the operation.

Device Parameter | Process Value | Device Status | Function Event | Save To File

Date/Time	Parameter(Key)	Parameter(Description)	Access	New Value
11.07.2005 14:50:17	Function Event:	Test Output	Started	
11.07.2005 14:50:18	SETPNT	Setpoint	read	100.06334686
11.07.2005 14:50:37	Function Event:	Set Analog (4-20mA / Pulse) Output	Done	
11.07.2005 14:53:19	STAT1	Primary Status	read	c8
11.07.2005 14:53:20	DIA_ER	Diagnostic Error	read	0
11.07.2005 14:53:49	STAT1	Primary Status	read	c8
11.07.2005 14:53:49	STAT2	Secondary Status	read	2
11.07.2005 14:53:50	ADSTAT	Additional Status	read	(df004000) Position above High Alarm Setpoint.
tification for a fully shut valve. | Difference between applied digital or analog setpoint and actuator-/valve-position exceeds allowed limit fc				
11.07.2005 14:54:31	STAT1	Primary Status	read	c8
11.07.2005 14:54:32	ADSTAT	Additional Status	read	(df00c000) Position above High Alarm Setpoint.
tification for a fully shut valve. | Difference between applied digital or analog setpoint and actuator-/valve-position exceeds allowed limit fc				
11.07.2005 14:55:08	VLVDIAG	Valve Diagnosis Status	read	1,0,1,1,0,1

Concept of the PST Solution

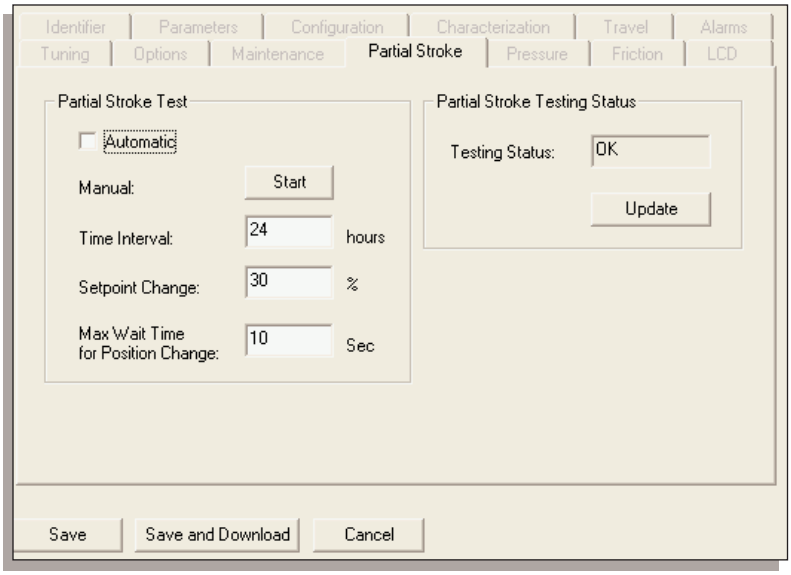
Final control elements in ESD applications such as ON-OFF-, Blow Down- and Venting-Valves remain in one position over a longer time without any mechanical movement.

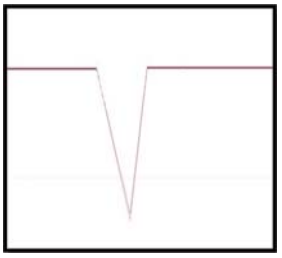
These valves can show a tendency to get stuck; and, as a result, might not operate on demand. This can have a severe impact to the functionality of a Safety System and damaging result to the operating personnel, plant equipment, and environment.

The **Partial Stroke Test** (PST) offers operators a tool to identify the trouble-proof function of such ESD valves. The test can be easily executed via the operation and diagnostic tool VAL*care*™.

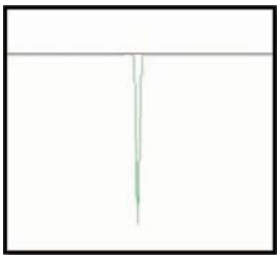
In the **Manual mode** the test can be activated via a Start button and in **Automatic** within a freely defined time interval in hours that allows stroking the valve periodically. In both cases the valve can be stroked within a stroke-ratio of up to 30 %. The maximum wait time allows taking into account that each valve has a different dynamical behaviour e.g. caused by the process media or the valve itself. If the valve has performed the test without any problems, the status for the partial stroke test will go to "OK". In case the valve does not move and could be stuck, the operator will be informed by an alarm indicating an “Error”.

Besides this the device continuously monitors the health of the control valve, among others such as the stem friction, supply- and output-pressure.





PST passed,
Status: OK



PST failed, valve is stuck.
Status: Error

Features of Partial Stroke Test

Activation of Test	Manual
	Automatic
Configuration	Test Interval [Hours]
	Setpoint Change [%]
	Maximum Wait Time [Seconds]
Testing Status	● Not Done ● Running
	● Restricted ● OK
Testing Alarms and Diagnosis	Error (Stuck Valve or Failed Test)
	Service Required (Service Mgmt.)
Alarm Text on Positioner LCD	“Maintenance” (Stuck Valve or Failed Test)
Additional Diagnosis	Stem Friction
	Supply- and Output-Pressure
	Device Temperature
	Hours in Operation
	Valve Position History
	Valve Response History

Stem Friction

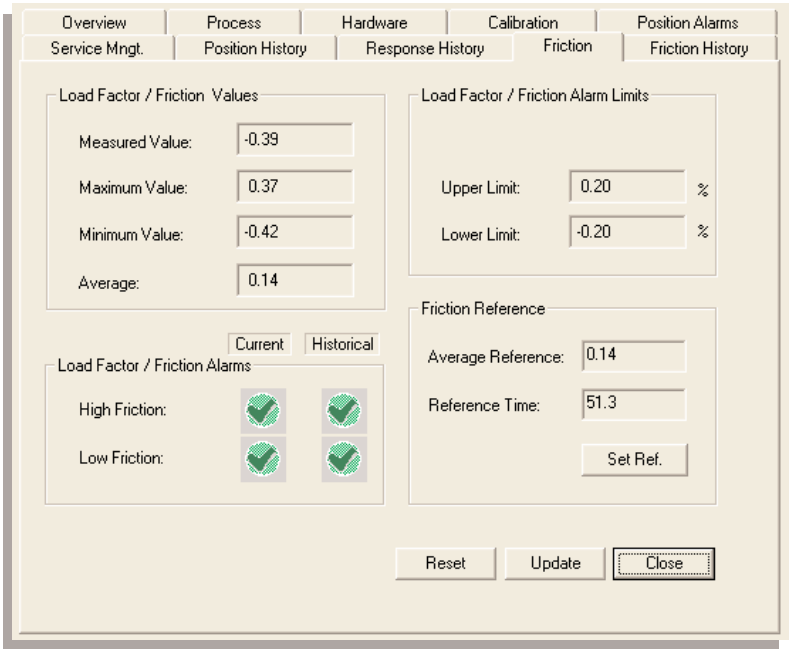
The Stem Friction is an indispensable feature for today's predictive maintenance capabilities of any control valve. This feature allows predicting possible leakages or stuck valves; and, in return, prevents dangerous spills, injuries to personnel, damage to plant equipment and the environment. This also saves expensive downtime of the valve.

Internal pressure sensors (optional) measure the output-pressure for each setpoint change. In Milliseconds, the Microprocessor of the positioner calculates the friction of the stem against the packing. The actual friction value is then displayed as Measured- and Average-Value with additional drag-pointers for the Maximum- and Minimum-Value.

Friction Alarms can be configured to inform the operator if the Friction values have exceeded or gone below certain thresholds limits.

Setting a Friction Reference allows the operator to set a fingerpoint showing the initial Average Friction in connection with the Reference Time.

This value will then be highlighted as a vertical line in the Histogram for the Friction History.

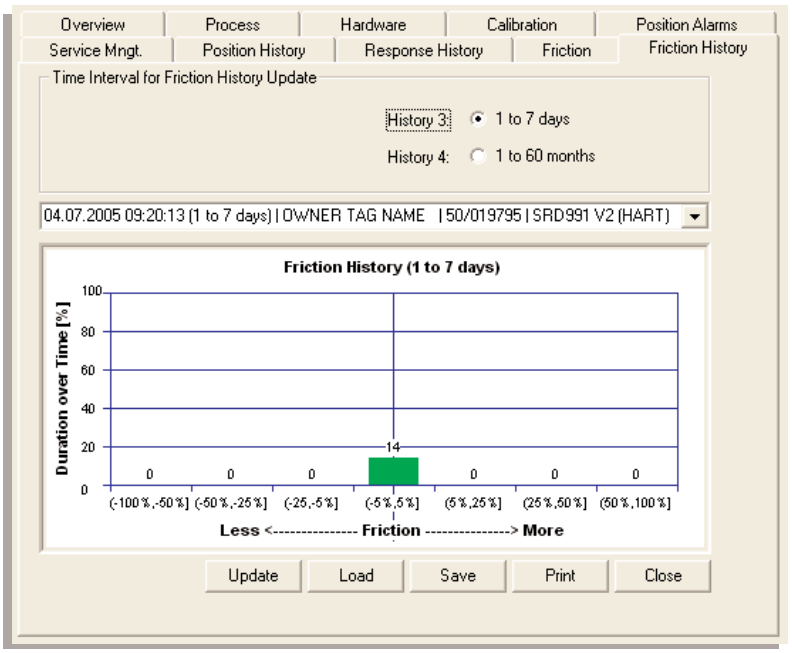


Stem Friction History

The Histogram for the Friction History is an easy tool to show the operator the actual condition of the stem packing over time. The vertical line shows the Reference value defined by the operator after the valve has "broken in". From that moment everything is done automatically by the positioner. If there is Less friction, the histograms will shift to the left, if there is More friction, the histograms will shift to the right.

If Friction Alarms are set, the positioner will automatically execute a Diagnosis Alarm once the values of the configured thresholds are reached.

A comparison can be done between two different historians from 1 to 30 days and 1 to 60 months.



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How to order

The CD-Rom for the VAL*care*™ Software-package can be ordered under the ID.-No.: EW 556 932 011. This package includes PACT*ware*™, Communication-DTMs and the SRD-DTM.

For more information
Please contact us by email: valcare@ips.invensys.com

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