

Fisher™ FIELDVUE™ DVC6200 SIS Digital Valve Controller PST Calibration and Testing using ValveLink™ Software

The test procedure contained in this Instruction Manual Supplement is to be considered as a guideline only and should be modified to address site-specific requirements. Use this procedure in conjunction with the DVC6200 Series quick start guide ([D103556X012](#)) and the DVC6200 SIS instruction manual ([D103557X012](#)). In addition, exercise good engineering practices and abide by specific plant safety guidelines for safe operation.

⚠ WARNING

This document is not intended to be used as a stand-alone document. It *must* be used in conjunction with the following documents:

Safety Manual for FIELDVUE DVC6200 SIS Digital Valve Controller and Position Monitor ([D103601X012](#))

Fisher FIELDVUE DVC6200 SIS Instruction Manual ([D103557X012](#))

Failure to use this instruction manual supplement in conjunction with the above referenced manuals could result in personal injury or property damage. If you have any questions regarding these instructions or need assistance in obtaining any of these documents, contact your [Emerson sales office](#).

For additional information on Partial Stroke Testing and associated parameters refer to Partial Stroke Test Information on page 20.

PST Calibration

This document covers the basic PST calibration, as well as details for making adjustments to the normal end, using Advanced Settings (see figure 11).

Figure 1. Calibration > Partial Stroke

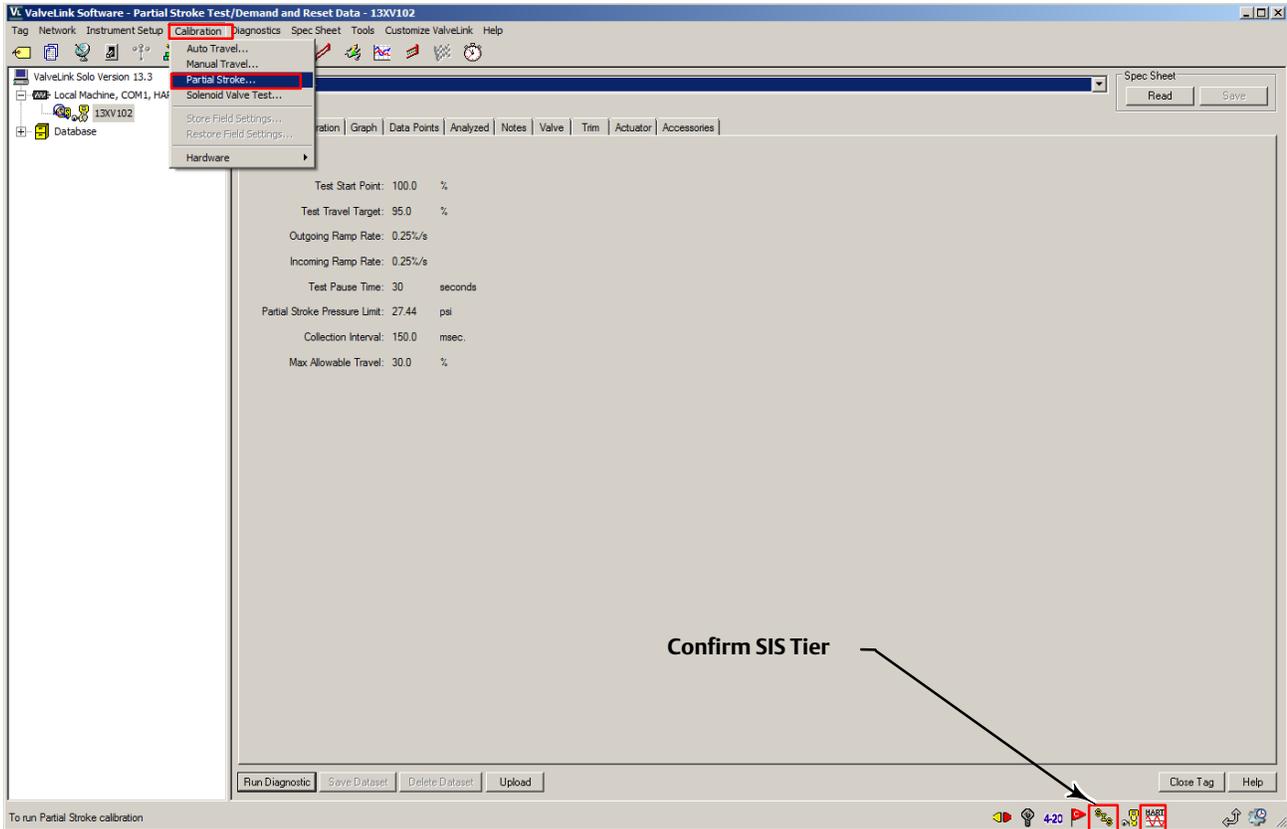
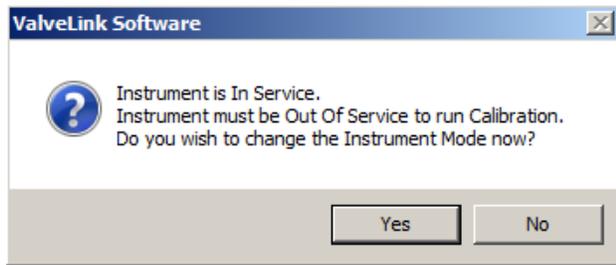


Figure 2. Set Instrument Out of Service and start Partial Stroke Test calibration



Refer to figure 11 for information on Advanced Settings

Figure 3. Enter the Desired Outgoing Ramp Rate

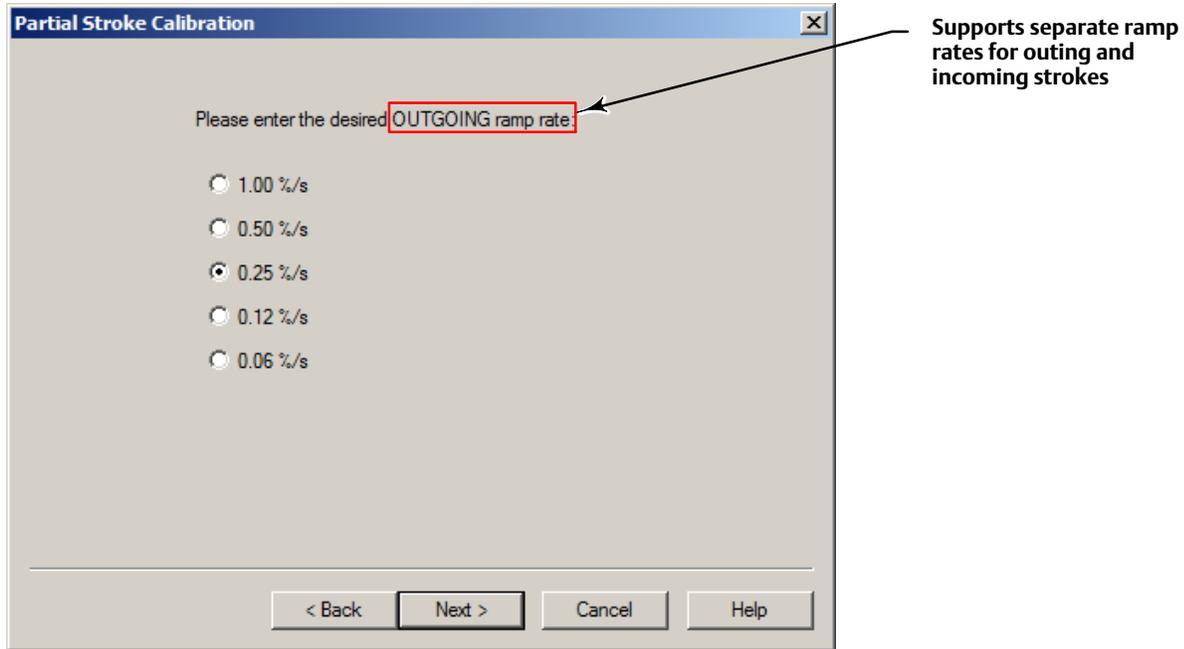


Figure 4. Enter the Desired Incoming Ramp Rate

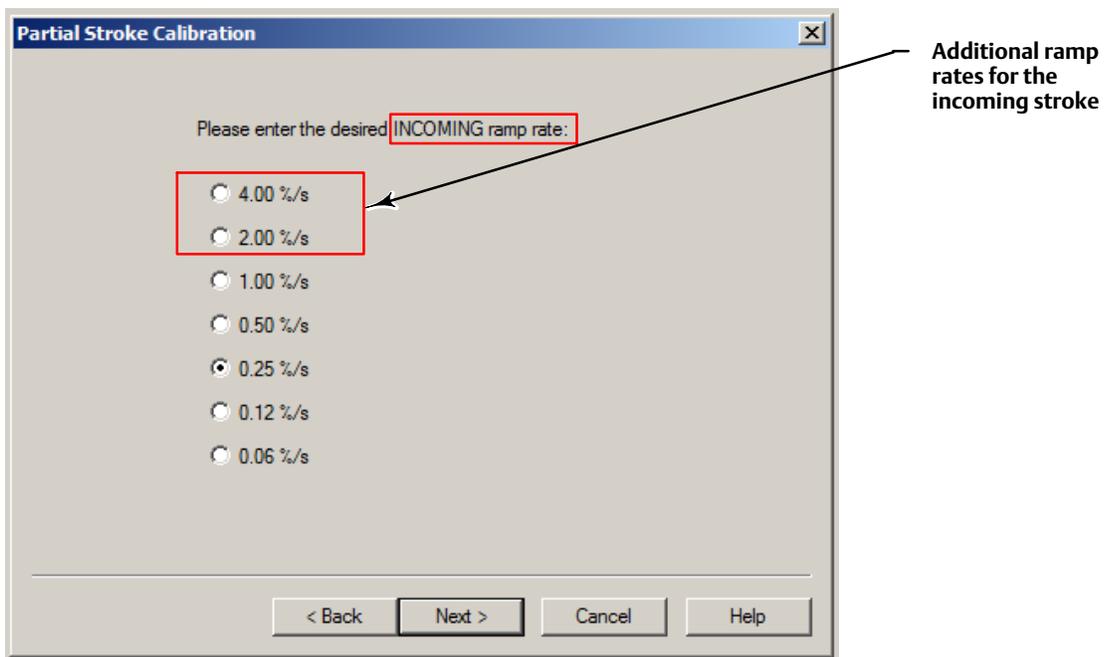
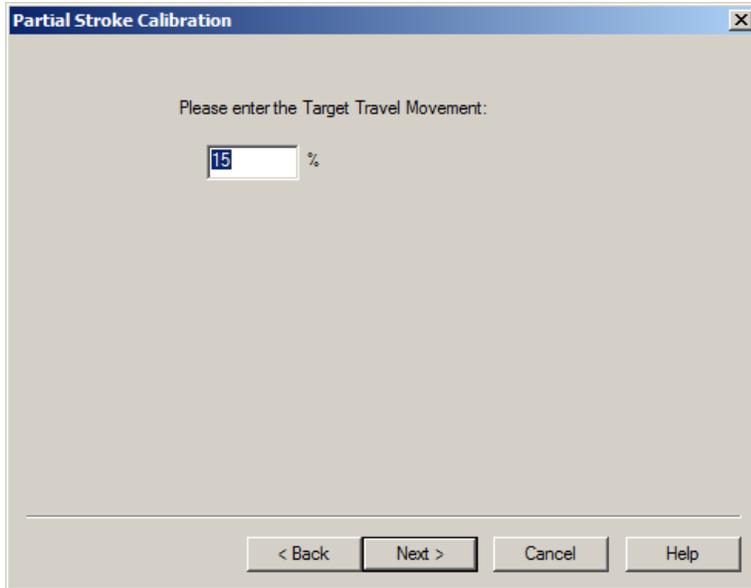


Figure 5. Enter the Travel Target Movement



Target Travel Movement is the percentage of travel from the normal end

Figure 6. Partial Stroke Calibration progress

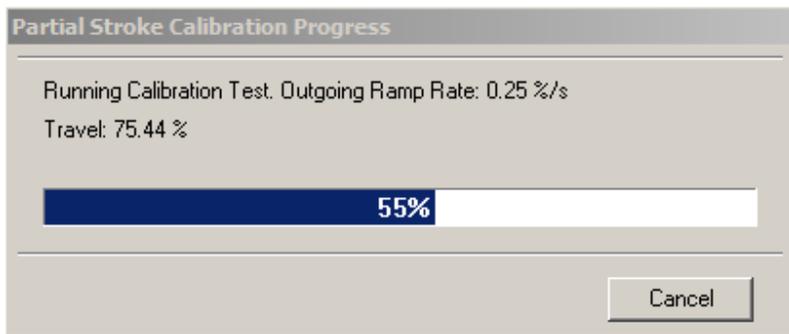
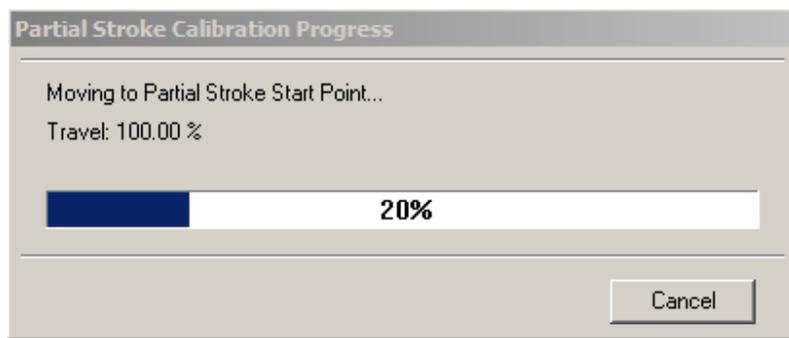


Figure 7. Partial Stroke Calibration progress

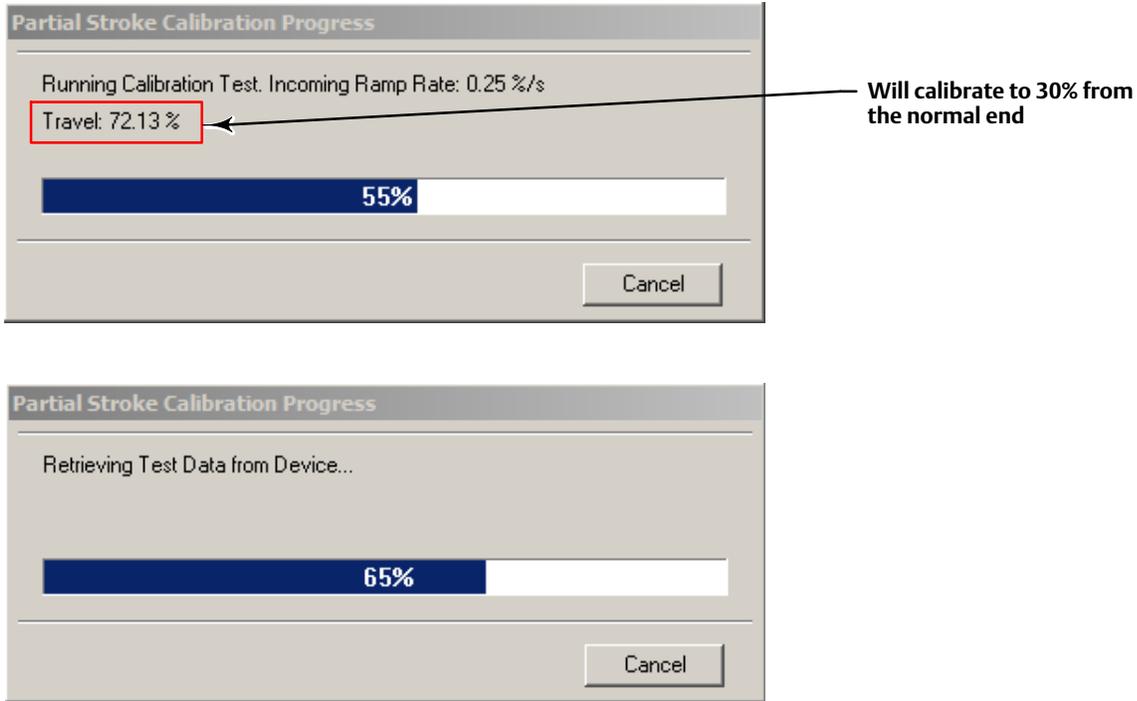


Figure 8. Configuring SIS Triggers

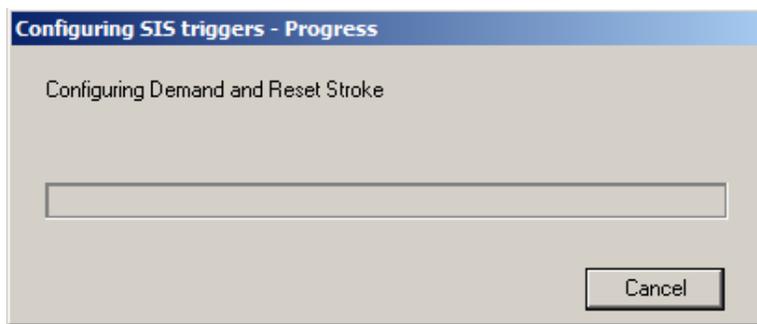


Figure 9. Partial Stroke Calibration Progress

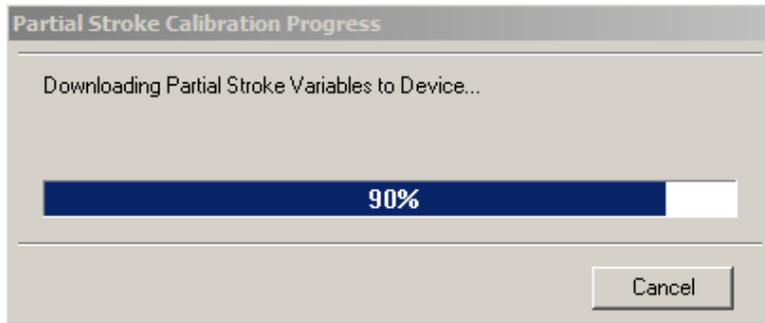
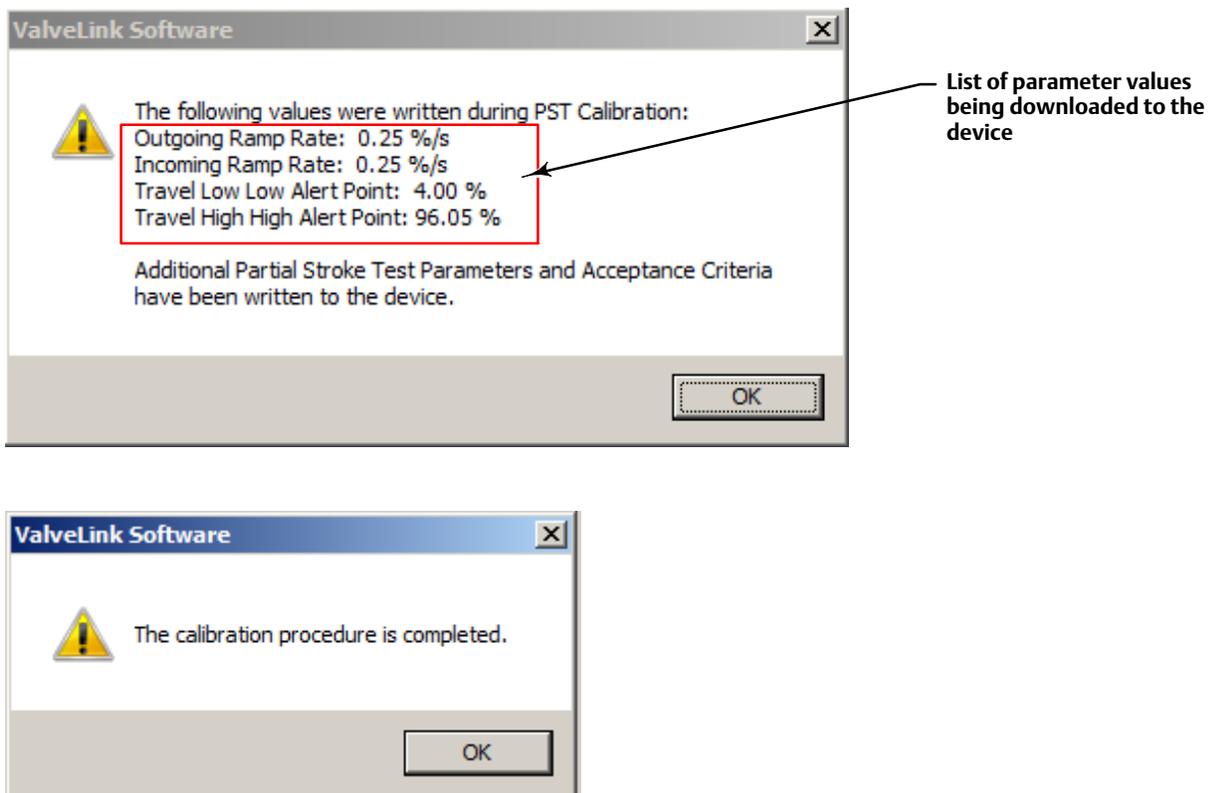


Figure 10. Calibration Procedure Complete



If you need to make adjustments to the normal end default settings, select Advanced Settings, as shown in figure 11, and make the necessary adjustments.

Figure 11. Select Advanced Settings to Make Adjustments to the Normal End

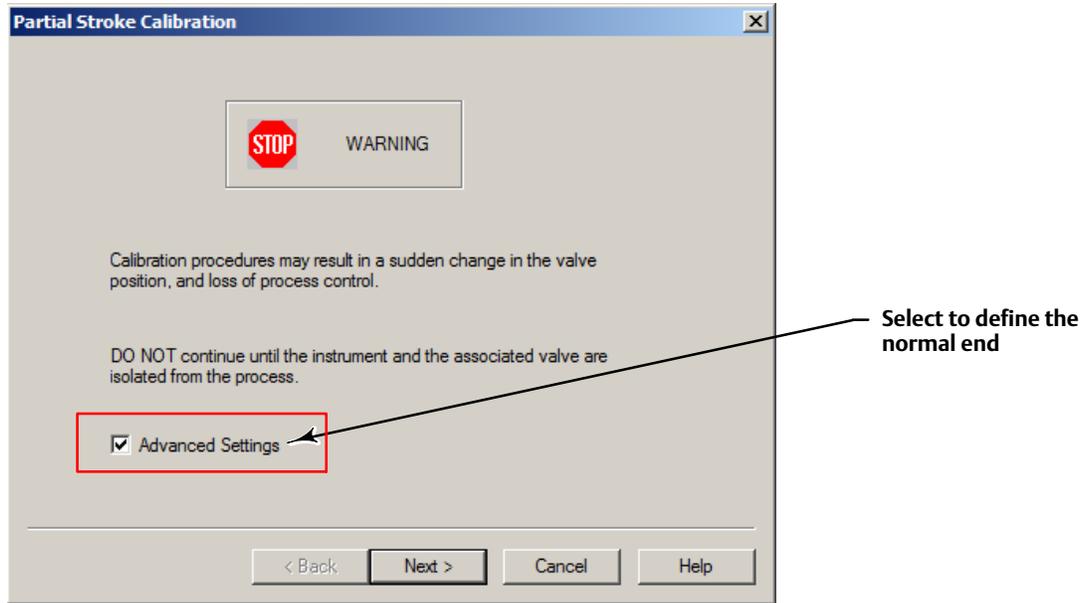


Figure 12. Set Travel High End

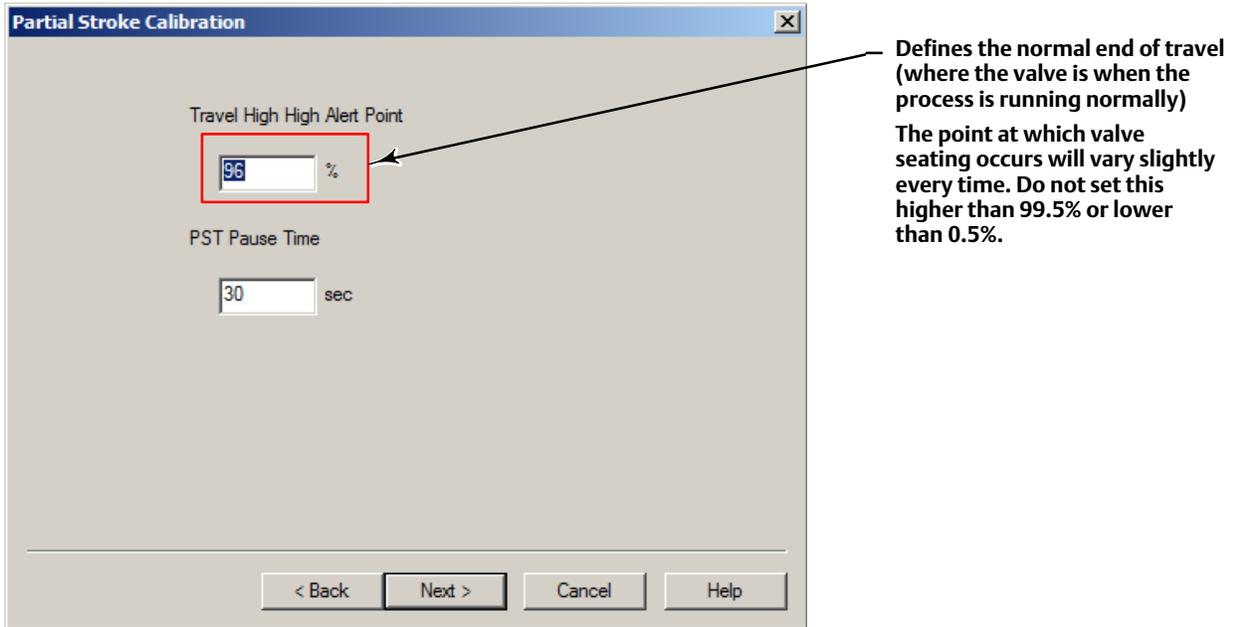


Figure 13. Enter Target Travel Movement

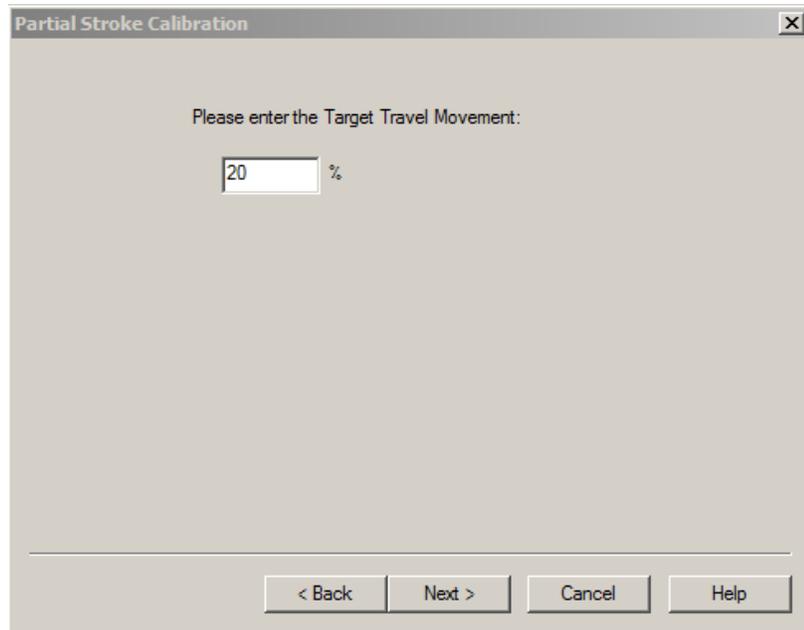
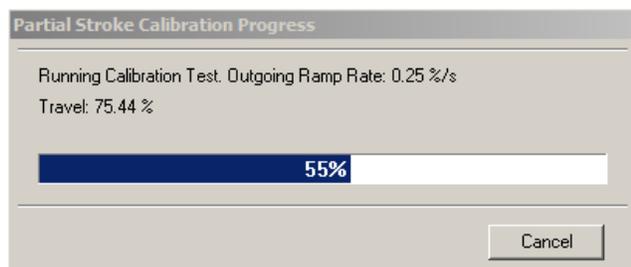


Figure 14. Partial Stroke Calibration Progress



Running a PST calibration will:

- Enable Short Duration PST. Refer to figure 25 for information on disabling Short Duration PST.
- Configure the PST Abort and PST Abnormal Notification parameters as shown in figure 15. The PST Abort and PST Abnormal Notification parameters are configurable in the PST Alert Behavior tab, shown in figure 17.

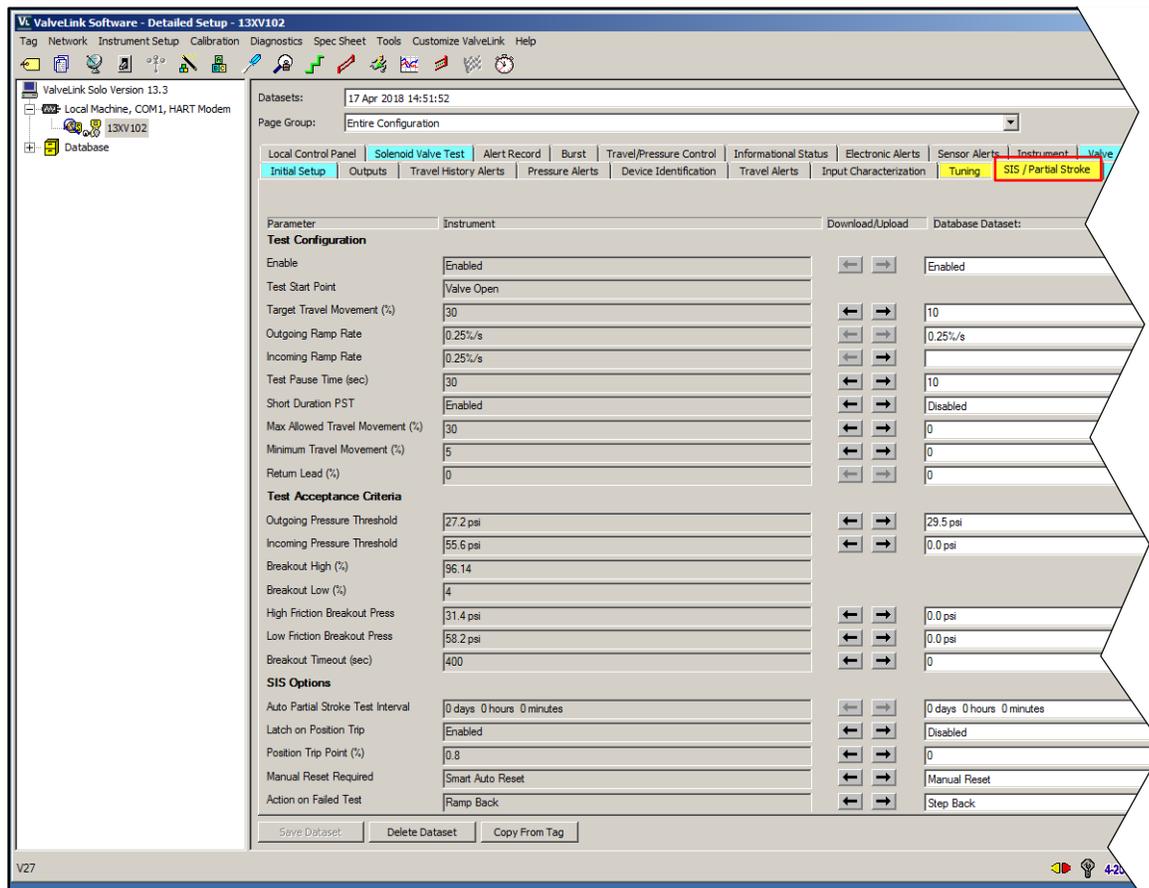
Figure 15. PST Abort and PST Abnormal Notification Parameters at End of PST Calibration

PST Abort			
Pressure Threshold	<input type="text"/>	← →	Enabled ▾
High Friction Breakout	<input type="text"/>	← →	Enabled ▾
Low Friction Breakout Press	<input type="text"/>	← →	Disabled ▾
Maximum Travel Exceeded	<input type="text"/>	← →	Enabled ▾
Minimum Travel Not Achieved	<input type="text"/>	← →	Enabled ▾
Not Seated	<input type="text"/>	← →	Enabled ▾
Travel Deviation	<input type="text"/>	← →	Disabled ▾
PST Abnormal Notification			
Pressure Threshold	<input type="text"/>	← →	Yellow ▾
High Friction Breakout	<input type="text"/>	← →	Yellow ▾
Low Friction Breakout Press	<input type="text"/>	← →	Disabled ▾
Maximum Travel Exceeded	<input type="text"/>	← →	Yellow ▾
Minimum Travel Not Achieved	<input type="text"/>	← →	Yellow ▾
Not Seated	<input type="text"/>	← →	Yellow ▾
Solenoid Valve Test Abnormal	<input type="text"/>	← →	Yellow ▾
Travel Deviation	<input type="text"/>	← →	Disabled ▾

Configuration

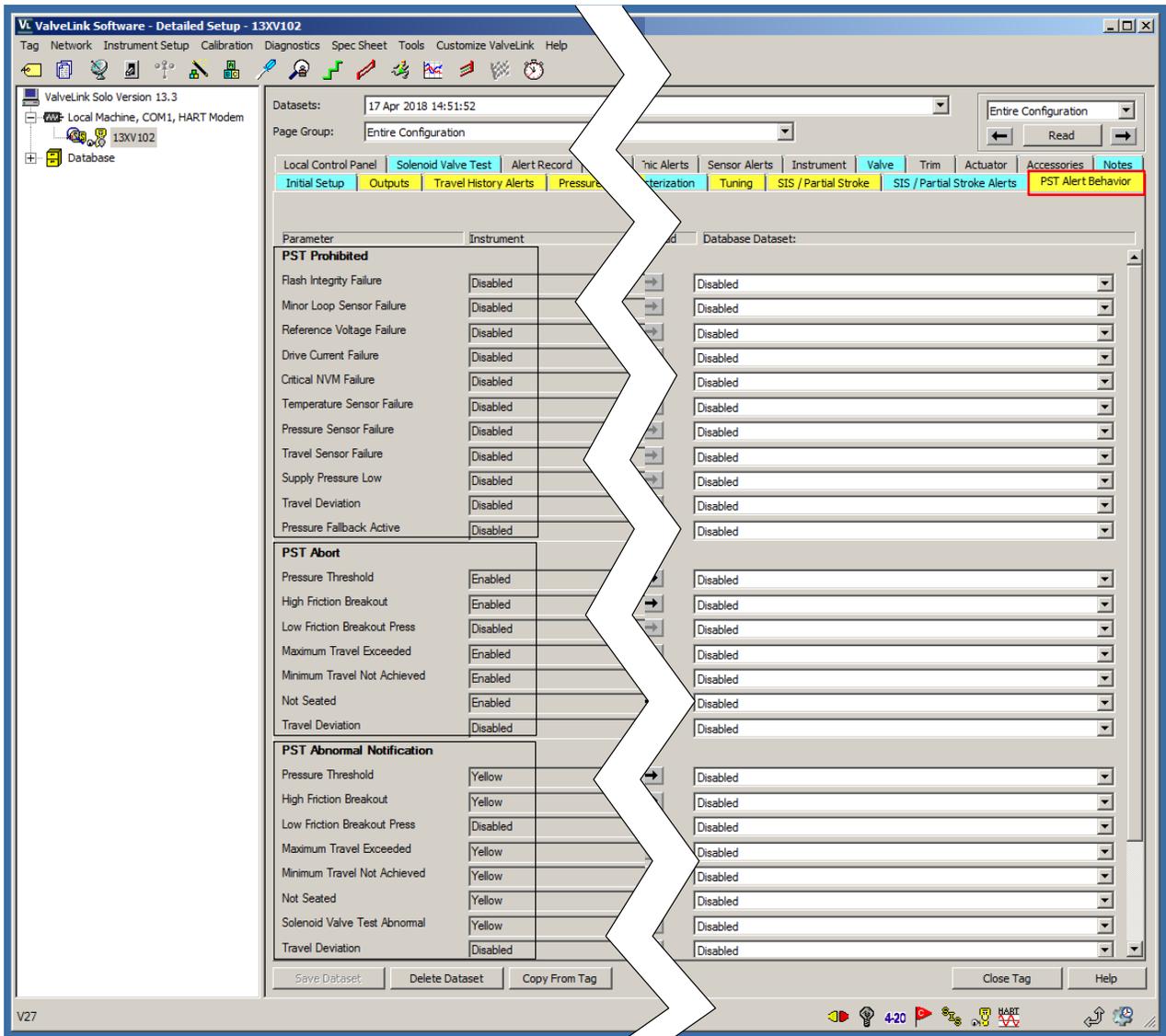
After successfully calibrating the valve for PST go to the Detailed Setup SIS/Partial Stroke tab and verify the values for the parameters in the Test Configuration group box are correct. Then go to the SIS Options group box and enable any of the behaviors required for the PST.

Figure 16. Verify Test Configuration and Test Acceptance Criteria



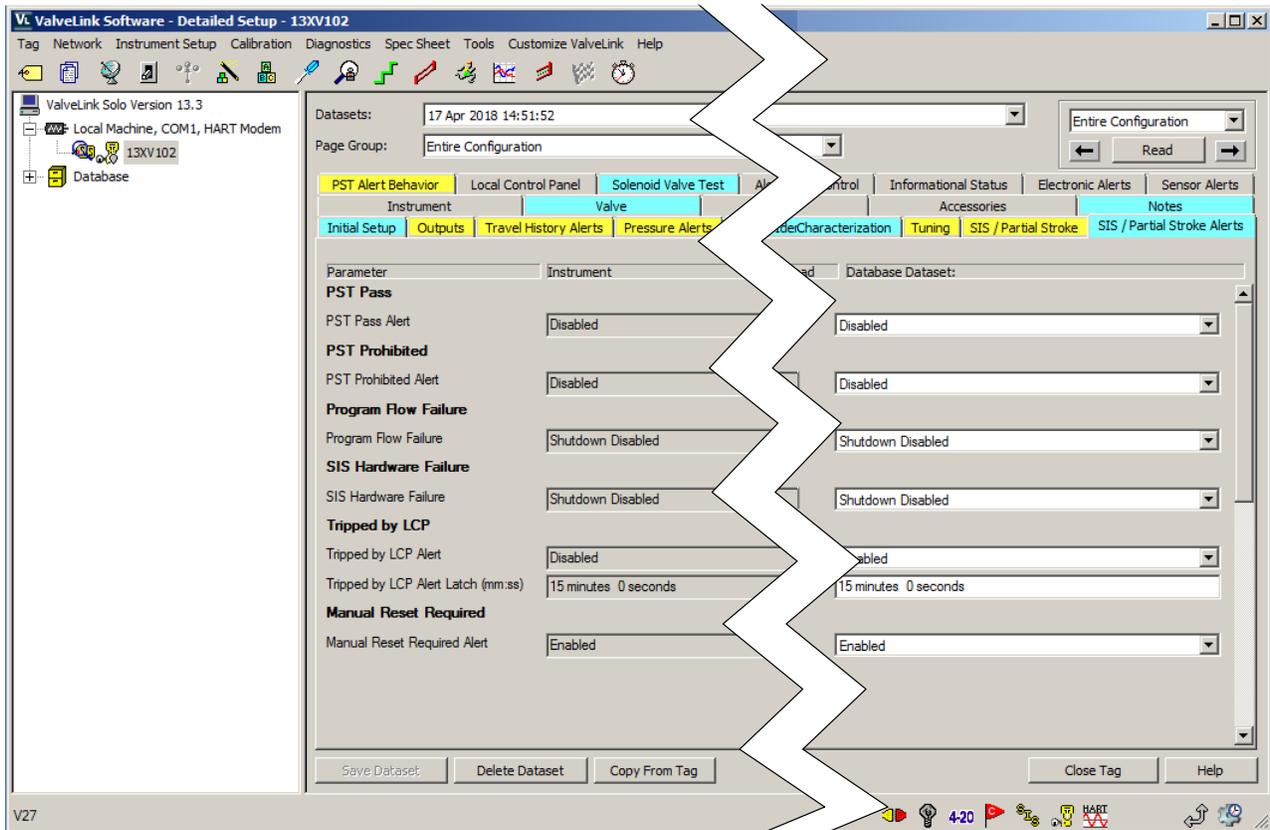
Once the PST has been setup and calibrated go to the PST Alert Behavior tab; select the criteria to be used to evaluate PST after it runs by defining the severity level of each abnormality by categorizing them Red/Yellow/Green under PST Abnormal Notification. Then, select the criteria to be used to abort a PST after initiation, and the criteria to be used to prohibit a PST before initiation.

Figure 17. Select PST Criteria



Enable/Disable the stroke alerts from the SIS/Partial Stroke Alerts tab.

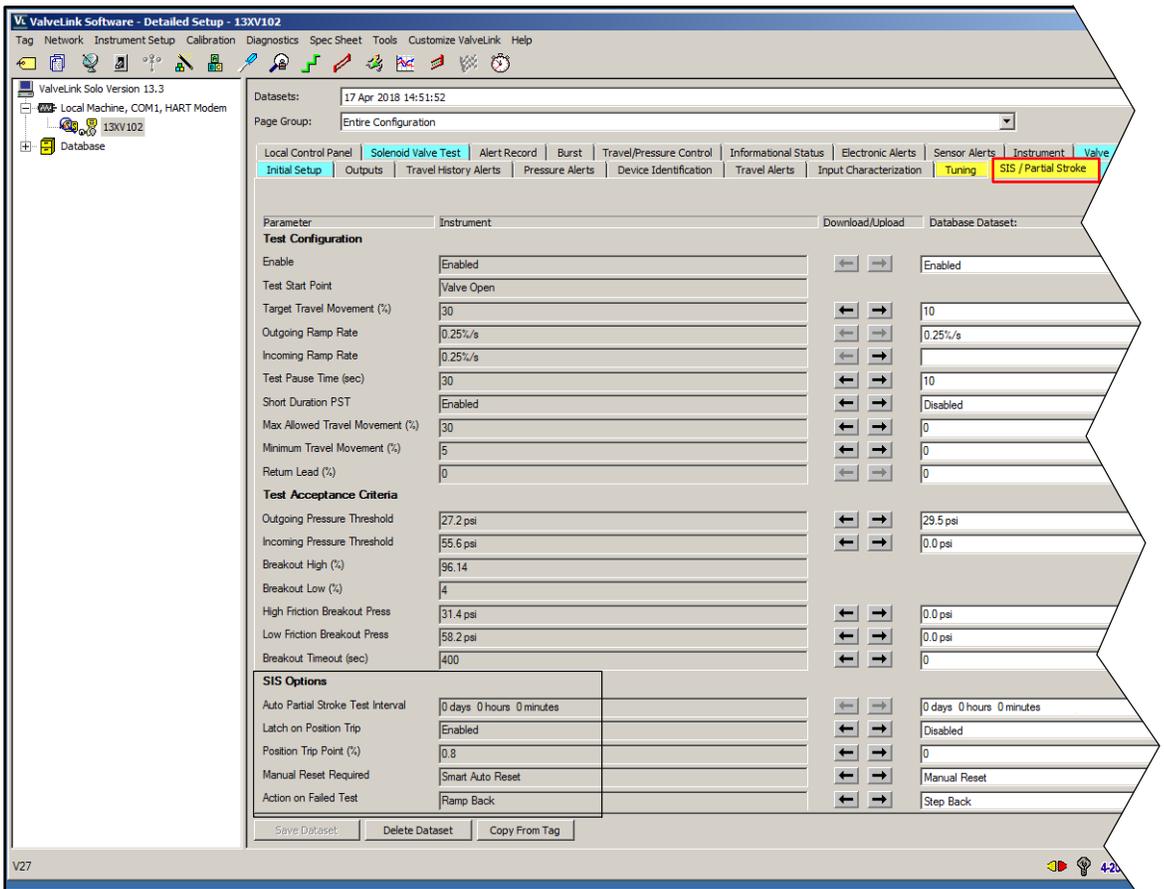
Figure 18. Set SIS / Partial Stroke Alerts



Initiating a PST Diagnostic

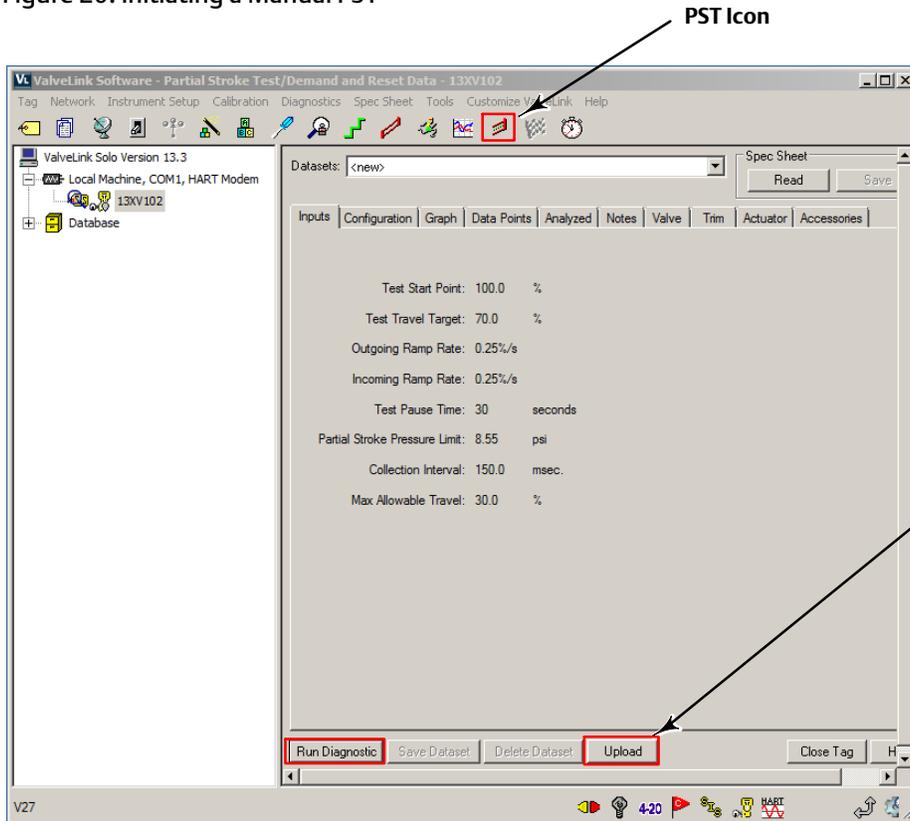
If an Auto PST is desired go to the SIS/Partial Stroke tab and set up the PST schedule in Auto Partial Stroke Test Interval. The instrument will run a PST at the interval defined.

Figure 19. Setting Auto PST



To run a manual PST select the Partial Stroke Test icon as shown in figure 20.

Figure 20. Initiating a Manual PST



Before the manual PST initiates, you can upload and save the instrument diagnostic data to ValveLink software. Select Upload to save the data. Deletion of the data from the instrument is not necessary as new data will overwrite the oldest dataset. Datasets that are not uploaded to ValveLink software will not be accessible in the instrument once they are overwritten by new data.

Figure 21. Partial Stroke Test Progress

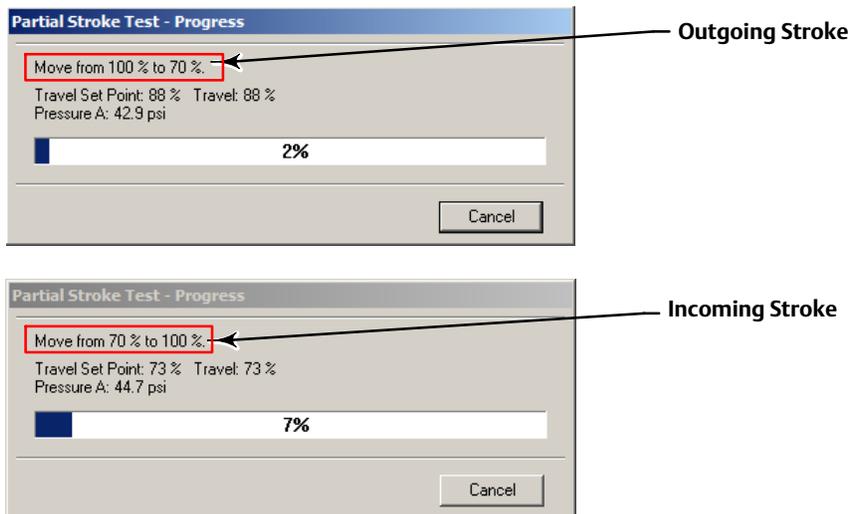


Figure 22. PST Analyzed Data

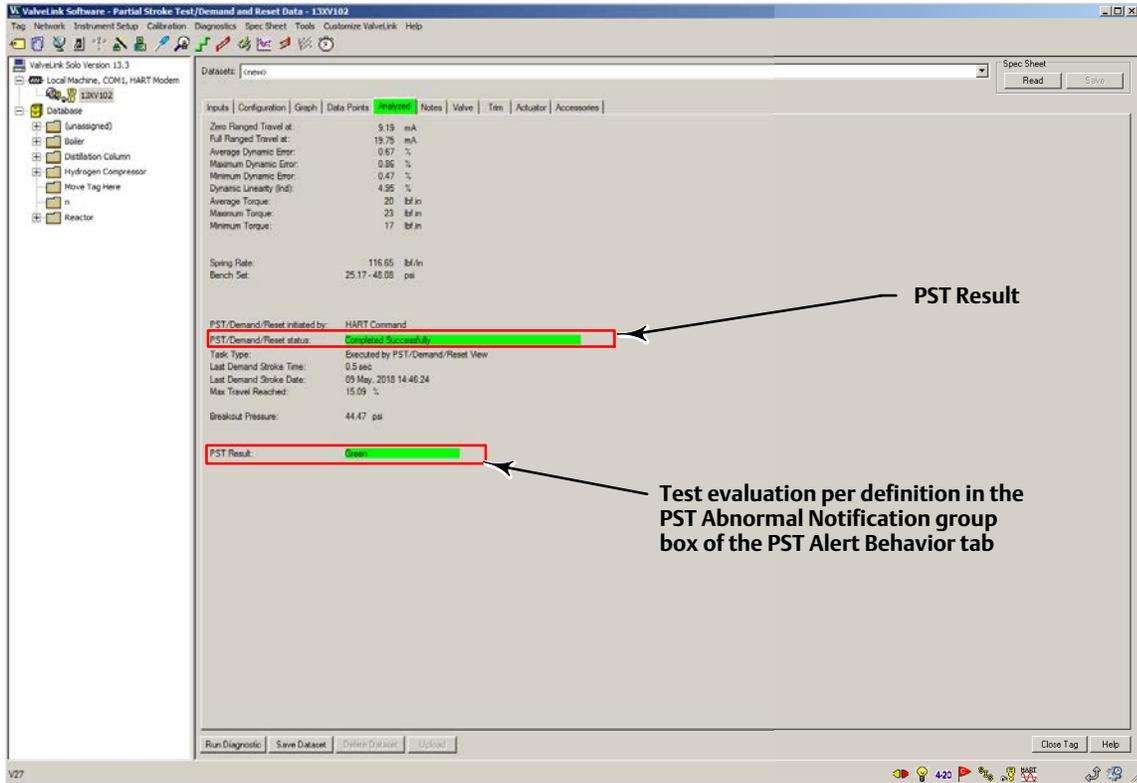


Figure 23. Resulting Press/Tvl Graph Results with Short Duration PST Enabled

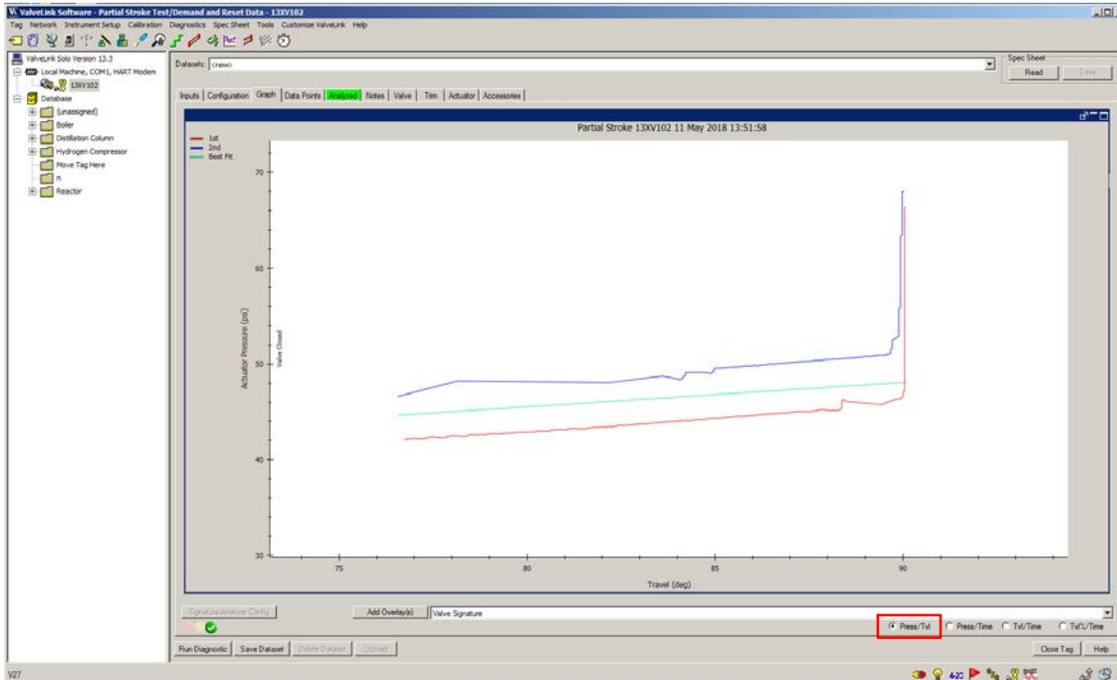
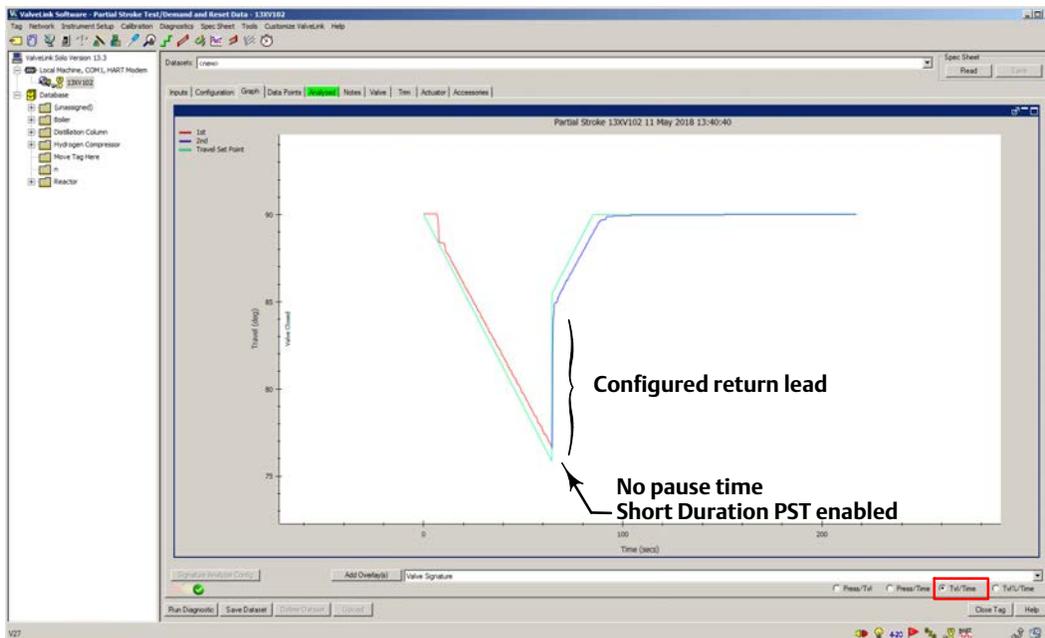


Figure 24. Resulting Tvl/Time Graph Results with Short Duration PST Enabled



A PST Diagnostic can be run with Short Duration PST disabled, as shown in the figure below. When Short Duration PST is disabled the pause time will be in effect once the valve reaches the desired test point, resulting in a slower PST.

Figure 25. Disable Short Duration PST in SIS/Partial Stroke

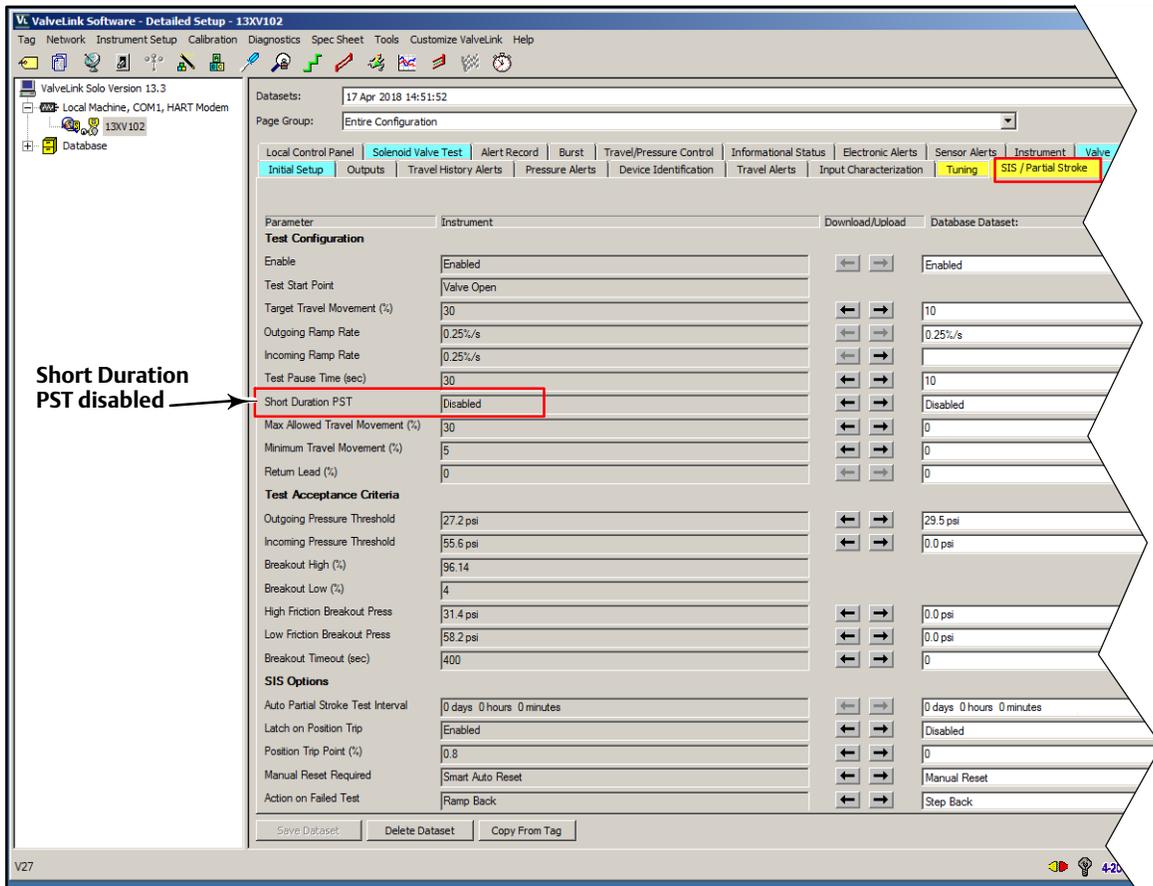


Figure 26. Resulting Press/Tvl Graph Results with Short Duration PST Disabled

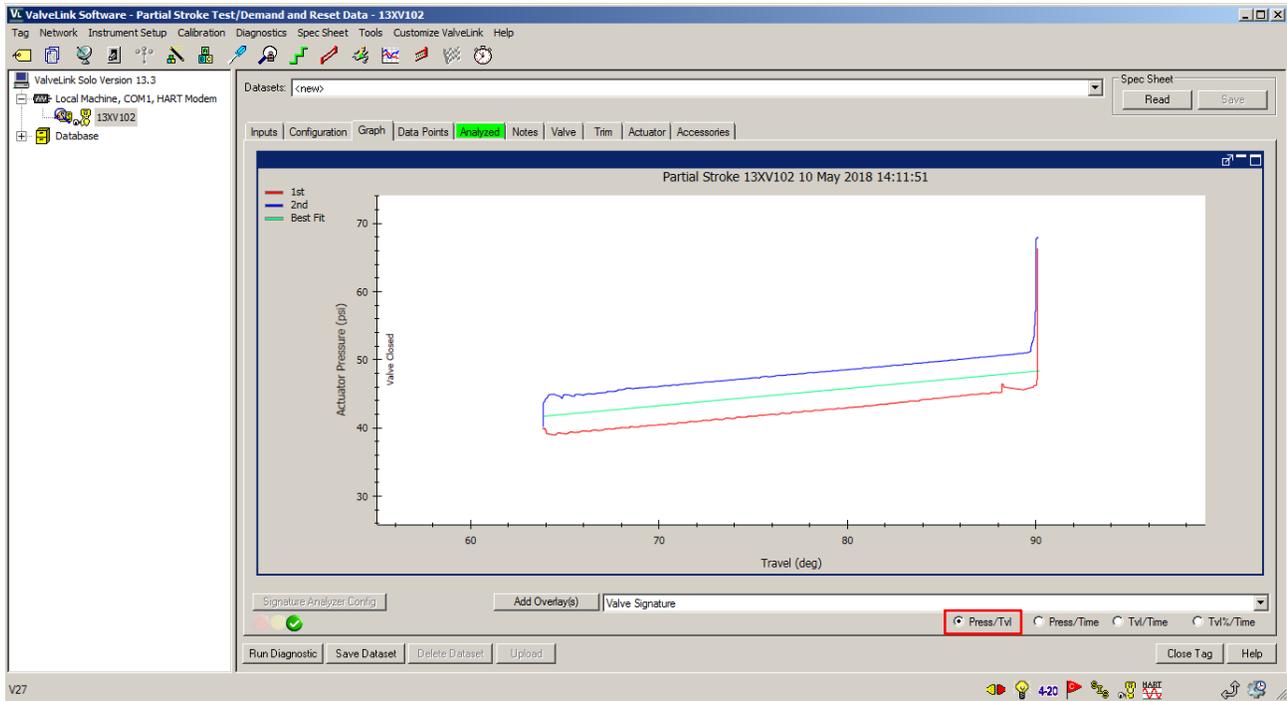


Figure 27. Resulting Tvl/Time Graph Results with Short Duration PST Disabled

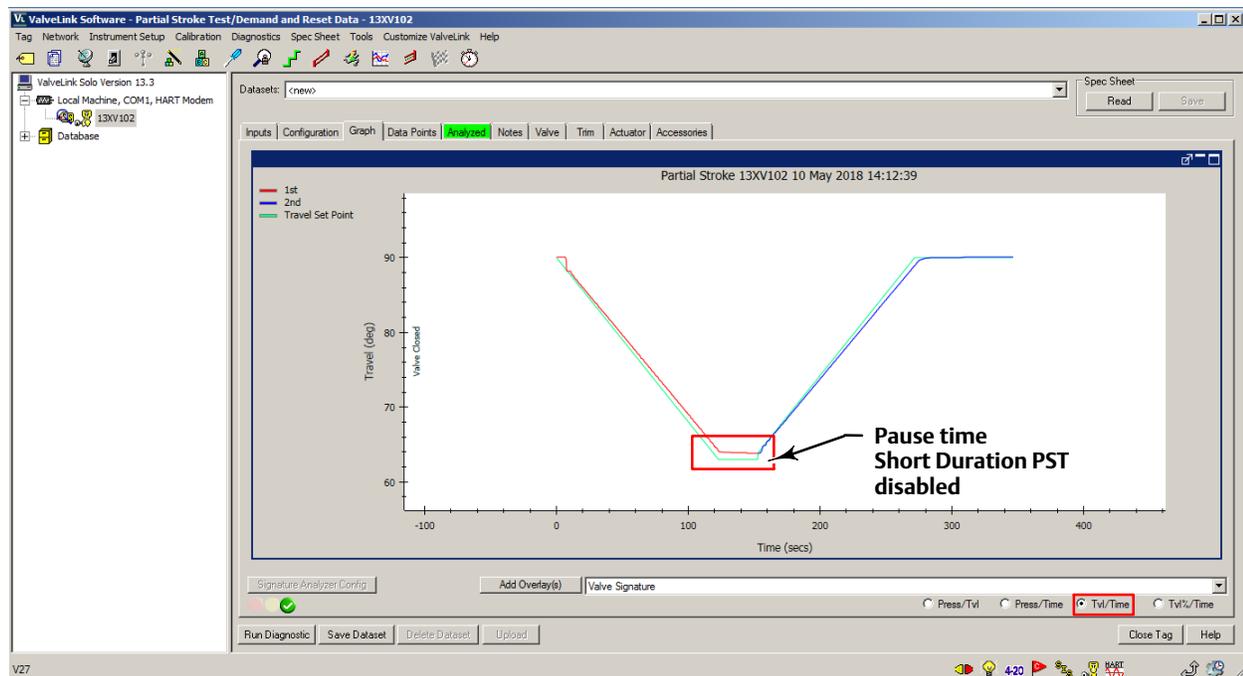
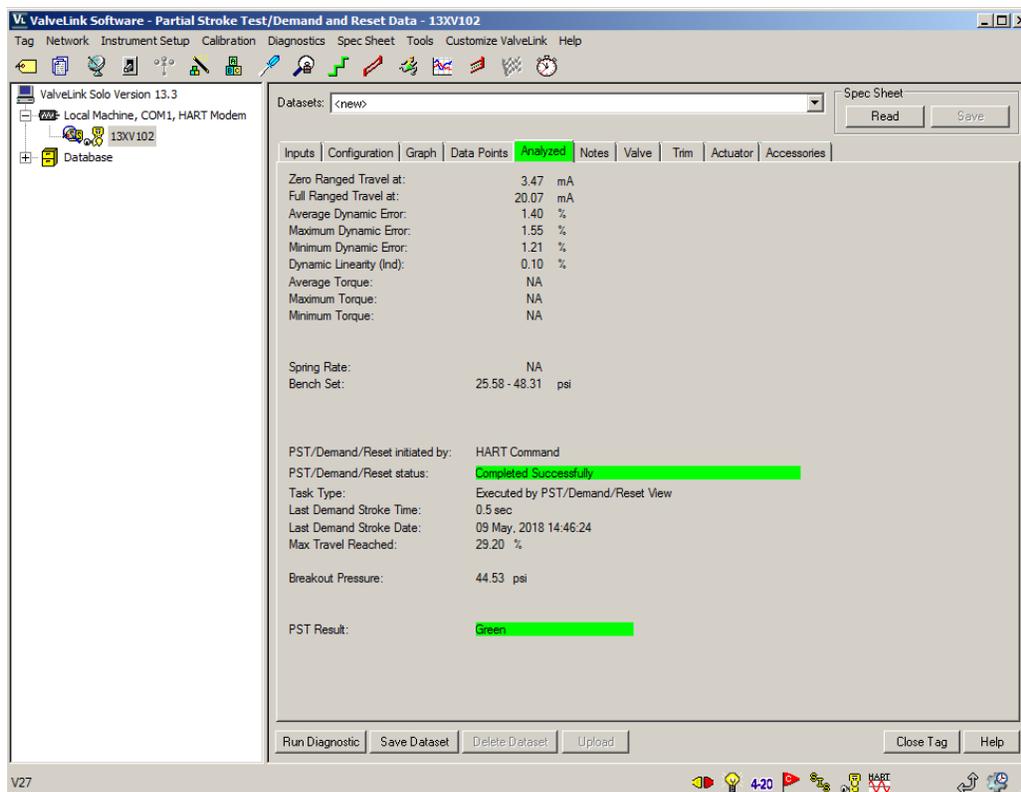


Figure 28. PST Analyzed Data with Short Duration PST Disabled



Select a PST style, either with or without Short Duration PST, and standardize on that style, as the data may be difficult to compare between the two styles. If the desire is to minimize the amount of time the valve is away from the normal end, then enabling Short Duration PST is recommended. If the amount of time away from the normal end is not a concern, then disabling Short Duration PST will cause the set point to pause at the end of the outgoing stroke for the travel to catchup to the set point. The results of the test with the Short Duration PST disabled will be similar to the PST as offered in earlier versions of SIS instruments.

Partial Stroke Test Information

A valve stroke test is the process of taking the valve from the normal end to another target position at a preconfigured ramp rate before returning to the normal end while gathering data. The data is analyzed to evaluate the condition of the valve assembly against a set of user defined thresholds. A valve stroke test is only run if everything is normal in the instrument. A safety demand signal will always take precedence over a valve stroke test.

Test Start Point defines the normal end of the valve. The valve needs to be at this end for a PST to be initiated. When a PST is initiated the valve will be move from this end to the target travel and then back. See figure 29.

Travel Target Movement is the percentage of the calibrated travel span that the valve moves away from its normal operating end of travel towards its tripped end of travel during the test. The default value is 10%. See figure 29.

Outgoing Ramp Rate is the rate at which the valve will move during the outgoing stroke of the Partial Stroke test. The default value is 0.25%/second. The outgoing stroke is from the normal end to the PST target. See figure 30.

Incoming Ramp Rate is the rate at which the valve will move during the incoming stroke of the Partial Stroke test. The default value is 0.25%/second. The incoming stroke is the return stroke to normal end. See figure 30.

Test Pause Time is the time between the outgoing and incoming strokes of the test. The default value is 5 seconds. Pause Time will not be used if Short Duration PST is enabled and the travel reaches the minimum travel movement and. See figure 30.

Short Duration PST, when enabled, the incoming stroke is initiated as soon as the travel reaches the minimum travel movement. Refer to figure 30 for a time series representation of this parameter.

Maximum Allowed Travel Movement defines the percentage of the calibrated travel span that the valve moves away from its normal operating end of travel towards its tripped end of travel during the test (see figure 30). When enabled as an abort criteria the test will terminate and the valve will return to the normal end following the configuration for a failed test behavior.

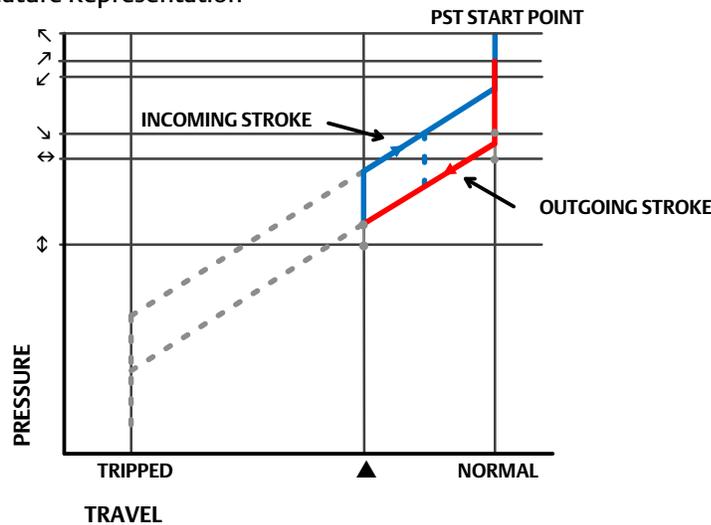
Minimum Travel Movement is the percentage of the calibrated travel span that the valve must move away from its normal operating end of travel towards its tripped end of travel during the test, for the test to be successful. The Incoming stroke will be initiated on reaching the minimum travel movement when short duration PST is enabled The default value is 10%.

Return Lead, defines the percent (%) change in setpoint to overcome the hysteresis in the valve assembly.

Test Acceptance Criteria

- **Outgoing Pressure Threshold** defines the actuator pressure at which a partial stroke test will detect a pressure threshold violation during the outgoing stroke (see figure 29). When enabled as an abort criteria it prevents the DVC6200 SIS from exhausting (or building) excessive pressure from/to the actuator to move a stuck valve. During PST Calibration, the Partial Stroke Outgoing Pressure Threshold will be set automatically.
- **Incoming Pressure Threshold** defines the actuator pressure at which a partial stroke test will detect a pressure threshold violation during the incoming stroke (see figure 29). During PST Calibration, the Partial Stroke Incoming Pressure Threshold will be set automatically.
- **Breakout High**, in percent (%) of calibrated travel, is the point above which the valve is considered to have reached the high end. This value is automatically set during the PST calibration and can be refined by the user using the Travel High High variable in the Travel Alerts tab.
- **Breakout Low**, in percent (%) of calibrated travel, is the point below which the valve is considered to have reached the low end. This value is automatically set during the PST calibration and can be refined by the user using the Travel Low Low variable in the Travel Alerts tab.
- **High Friction Breakout Pressure** indicates the force required to breakout of the normal end of travel is higher than the user configured threshold. The breakout is defined as the pressure at which the travel crosses the user configured breakout travel, either high or low depending on the configured normal end. PST Calibration sets this value automatically for most actuators. The user can refine this pressure threshold based on PST data. Refer to figure 29.
- **Low Friction Breakout Pressure** indicates the force required to breakout of the normal end of travel is lower than the user configured threshold. The breakout is defined as the pressure at which the travel crosses the user configured breakout travel, either high or low depending on the configured normal end. PST Calibration sets this value automatically for most actuators. The user can refine this pressure threshold based on PST data. Refer to figure 29.
- **Breakout Timeout** is the time in seconds before which the travel must have moved beyond the breakout high or breakout low travel thresholds, depending on the test start point.

Figure 29. Valve Signature Representation



- ↖ SUPPLY PRESSURE
- ↗ END POINT PRESSURE CONTROL
- ↘ INCOMING PRESSURE THRESHOLD
- ↙ LOW FRICTION BREAKOUT PRESSURE THRESHOLD
- ⇔ HIGH FRICTION BREAKOUT PRESSURE THRESHOLD
- ⇕ OUTGOING PRESSURE THRESHOLD
- ▲ TARGET TRAVEL MOVEMENT $\leq 30\%$

SIS Options

- **Auto Partial Stroke Test Interval** is the interval of time (in days, hours, and minutes) between partial stroke tests that are automatically run by the digital valve controller, subject to the device being powered up. A value of 0 disables this feature.
- **Start PST on Loop Current Trigger**—When this feature is enabled, the digital valve controller will run a partial stroke test if the loop current is set to within $\pm 0.5\%$ of the PST trip point. The loop current must remain at that point for the duration of the test. To abort the test, the loop current must be returned to the normal or tripped current. This feature is disabled by default. This feature is not available when a loop-powered local control panel is installed.

PST Trip Point (ETT) is the point at which the loop current must be set to run a partial stroke test for energize-to-trip applications. This value is not configurable and is preset at 8 mA.

PST Trip Point (DETT) is the point at which the loop current must be set to run a partial stroke test for de-energize-to-trip applications. This value is not configurable and is preset at 16 mA.

- **Latch on Position Trip** defines if the instrument latches on a position trip and waits for a manual reset or will reset when the supply pressure returns.
- **Position trip Point** – If the travel goes below this point in calibrated travel when the set point is at the normal end the instrument will go to the no air position. This protect against conditions where the supply pressure has drooped causing the valve to be partially open and too close to the seat.
- **Manual Reset Required** defines the power up behavior of the DVC6200 SIS. Auto Reset allows the valve to track the command signal when power is applied to the device. Manual Reset will lock the device in its safety position until

the digital valve controller is reset. The digital valve controller when configured to Smart Auto will behave like a manual reset when a trip is initiated at the valve by the local control panel and like auto reset at all other times.

When the digital valve controller is waiting for a manual reset its state can be determined from the status monitor by monitoring the Locked In Safety Position alert.

When Auxiliary Terminal Action is set to SIS Local Control Panel.

The reset signal depends on how the AUX terminals are configured. If configured for SIS Local Control Panel, the digital valve controller can be reset by pressing the button next to the green light on the LCP100. If configured as Push Button Partial Stroke, the digital valve controller can be reset by shorting the AUX terminals for more than 3 seconds but less than 10 seconds. The device cannot be reset from the AUX terminals if they are configured otherwise.

- **Action on Failed Test** displays the action taken by the instrument if a communication timeout occurs. Values are Ramp Back or Step Back.

SIS/ Partial Stroke Alerts

- **PST Pass Alert**, when enabled a PST pass alert is set in command 48 Byte 5 bit 7 on a successful PST and stays active for a user configured period. The time is shared between the LCP Trip Alert time and can be refined by writing to the Tripped by LCP Alert Latch in ValveLink.
- **PST Prohibited Alert**, when enabled a PST deferred alert is set in command 48 Byte 5 bit 6. The faults that contribute to the PST Prohibited are user configurable and can be enabled in the PST Alert Behavior tab of ValveLink.
- **SIS Program Flow Failure** is active if the firmware is not performing the expected series of calculations.
- **SIS Hardware Failure** is active if a demand has occurred, but the electronics hardware failed to take control of the I/P drive.
- **Tripped by the LCP**—The DVC6200 SIS is in the tripped position as a result of the trip button being pressed on the local control panel. This alert will automatically clear only after the valve returns to the normal state.
- **Tripped by LCP Alert Latch** defines the duration for which the alert is active once the valve leaves the tripped end.
- **Manual Reset Required Alert**, when enabled will activate an alert when a manual reset is required. It can be monitored in status monitor or using command 48 data byte 3 bit 3.

PST Alert Behavior

PST Prohibited is a user configurable list of hardware failures that will prohibit a PST from initiating.

- **Flash Integrity Failure** is active if there is a failure associated with flash ROM (read only memory). If this alert is active, restart the instrument. If the alert persists, replace the printed wiring board assembly.
- **Minor Loop Sensor Alert** is active if the pneumatic relay position reading is outside the valid range. If the alert persists, replace the printed wiring board.
- **Reference Voltage Failure** is active if there is a failure associated with the internal voltage reference. If this alert is active, replace the printed wiring board assembly.
- **Drive Current Failure** is active when the drive current to the I/P converter is not flowing as expected. If this alert occurs, check the connection between the I/P converter and the printed wiring board assembly. Try removing

the I/P converter and installing it. If the alert does not clear, replace the I/P converter or the printed wiring board assembly.

- **Critical NVM Failure** is active if there is a failure associated with NVM that is critical for instrument operation. If this alert is active, restart the instrument. If the alert persists, replace the printed wiring board assembly.
- **Temperature Sensor Failure** is active when the instrument temperature sensor fails, or the sensor reading is outside of the range of -60 to 100°C (-76 to 212°F). The temperature reading is used internally for temperature compensation of inputs. If this alert is active, restart the instrument. If the alert persists, replace the printed wiring board assembly.
- **Pressure Sensor Failure** is active if any of the 3 pressure sensor readings are outside the range of -24.0 to 125.0% of the calibrated pressure for more than 60 seconds. If this alert is active, check the instrument supply pressure, ensure the printed wiring board assembly is properly mounted onto the module base assembly, and ensure the pressure sensor O-rings are properly installed. If the alert persists after restarting the instrument, replace the printed wiring board assembly.
- **Travel Sensor Failure** is active if the sensed travel is outside the range of -25.0 to 125.0% of calibrated travel. If this alert is active, check the instrument mounting. Also, check that the electrical connection from the travel sensor is properly plugged into the printed wiring board assembly. After restarting the instrument, if the alert persists, troubleshoot the printed wiring board assembly or travel sensor.
- **Supply Pressure Alert** is active if the supply pressure falls below the supply pressure alert point.
- **Travel Deviation Alert**—If the difference between the Travel Target and the Travel exceeds the Travel Deviation Alert Point for more than the Travel Deviation Time, the Travel Deviation Alert is active. It remains active until the difference between the travel target and the Travel is less than the Travel Deviation Alert Point minus the Travel Alert Deadband.
- **Pressure Fallback Active Alert** is active when the instrument has detected a problem with the travel feedback and is now controlling the output like an I/P transducer.

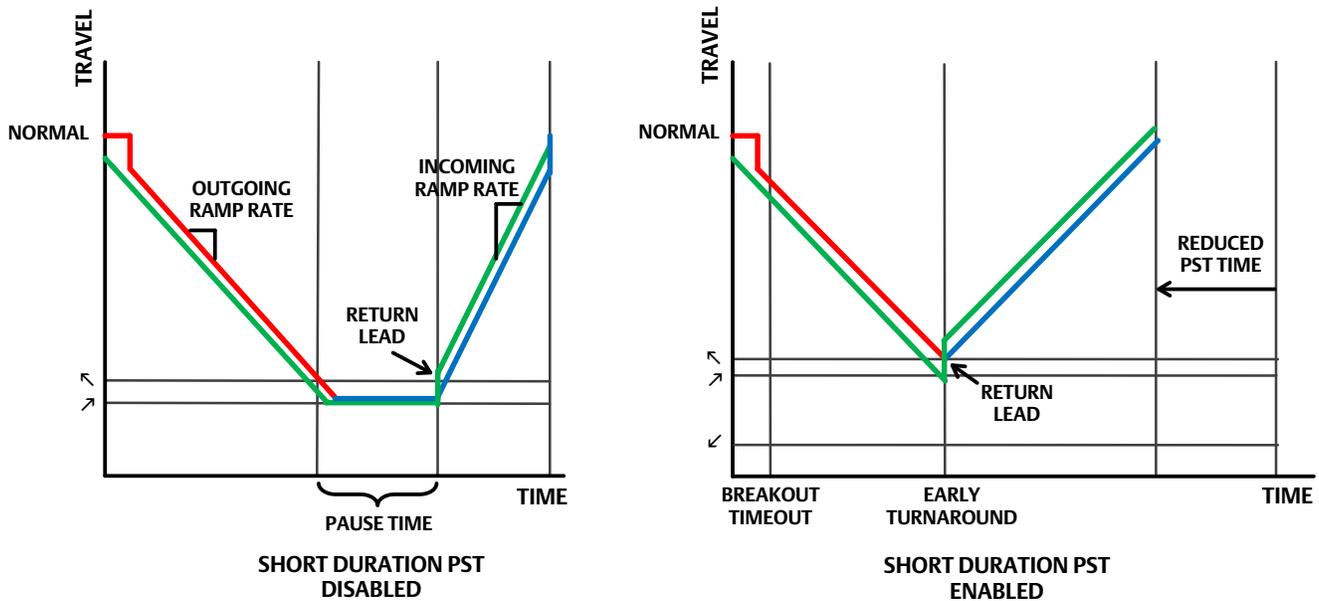
PST Abort is a user configurable list of alerts that will abort a PST when encountered during a PST.

- **Pressure Threshold**, either the outgoing pressure or incoming pressure threshold has been violated.
- **High Friction Breakout Pressure**, the force required to breakout of the normal end of travel is higher than the user configured threshold. The breakout is defined as the pressure at which the travel crosses the user configured breakout travel, either high or low depending on the configured normal end.
- **Low Friction Breakout Pressure**, the force required to breakout of the normal end of travel is lower than the user configured threshold. The breakout is defined as the pressure at which the travel crosses the user configured breakout travel, either high or low depending on the configured normal end.
- **Max Travel Exceeded**, the test actual travel has violated the user configured maximum travel.
- **Minimum Travel not achieved**, the actual travel during the test did not achieve the user configured minimum travel.
- **Not Seated**, the valve did not return to the normal end as defined by the breakout high or breakout low depending on the normal end of travel.
- **Travel Deviation**, the error between the actual valve travel and set point exceeded the user configured value for a user defined period.

PST Abnormal Notification is a user configurable list of alerts that will notify the user of an abnormal PST using command 48 Byte3 bit 6. The user can define if the occurrence of each alert will mark the test as Red or Yellow in the PST evaluation in addition to the ability to disable it.

- Pressure Threshold, either the outgoing pressure or incoming pressure threshold has been violated.
- High Friction Breakout Pressure, the force required to breakout of the normal end of travel is higher than the user configured threshold. The breakout is defined as the pressure at which the travel crosses the user configured breakout travel, either high or low depending on the configured normal end.
- Low Friction Breakout Pressure, the force required to breakout of the normal end of travel is lower than the user configured threshold. The breakout is defined as the pressure at which the travel crosses the user configured breakout travel, either high or low depending on the configured normal end.
- Max Travel Exceeded, the test actual travel has violated the user configured maximum travel.
- Minimum Travel not achieved, the actual travel during the test did not achieve the user configured minimum travel.
- Not Seated, the valve did not return to the normal end as defined by the breakout high or breakout low depending on the normal end of travel.
- Travel Deviation, the error between the actual valve travel and set point exceeded the user configured value for a user defined period.
- Solenoid Valve Test abnormal

Figure 30. Time Series Representation of Short Duration PST



- ↖ MINIMUM TRAVEL MOVEMENT
- ↗ TRAVEL TARGET MOVEMENT
- ↙ MAX. ALLOWABLE TRAVEL

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