StoneL®

Valve Communication Solutions

Axiom

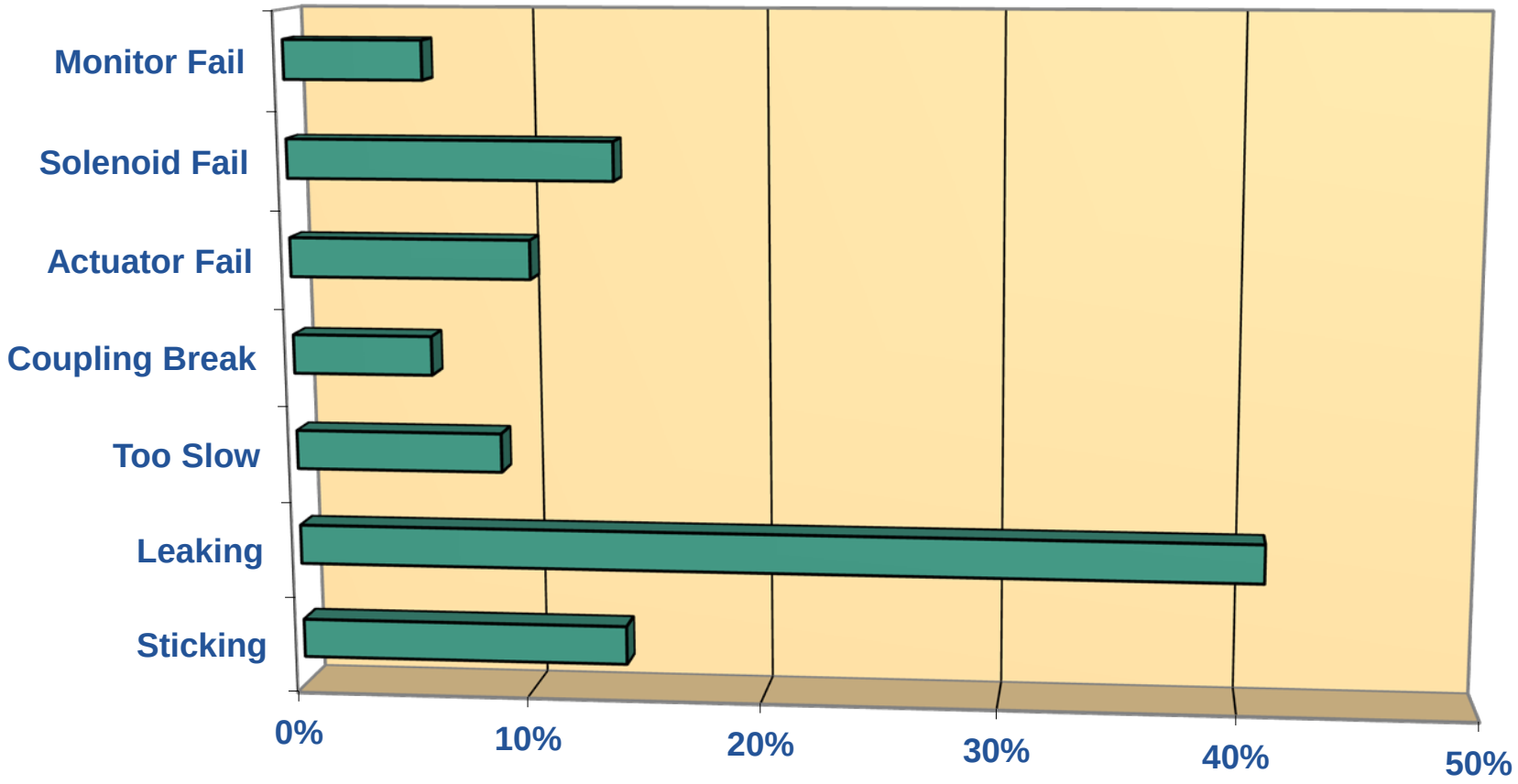
with Diagnostics

Detect automated valve problems

. . . before they shut down your process

HART® COMMUNICATION PROTOCOL

Reasons for Automated On/Off Valve Failures



Diagnostics promise to improve uptime and reduce maintenance cost

- Anticipate valve/actuator failure preventing potential process shut down
- Develop optimal maintenance scheduling
- Determine problem cause faster reducing maintenance time
- Access key information from control room to determine operating health
- Perform remote settings and calibration

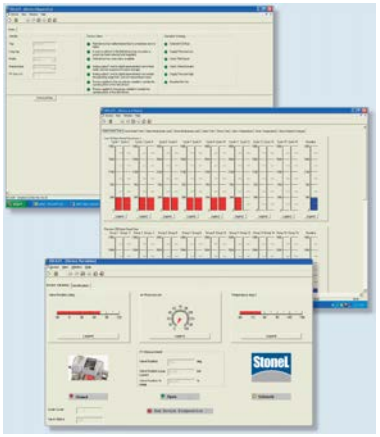
Key Benefits of Axiom Diagnostic Models

1. Remotely calibrate and monitor multiple automated valve conditions.
2. Identify root causes for failures quickly.
3. Detect automated valve problems before they shut down the process!

ication Solutions

StoneL®

HART Diagnostics (AMI71)

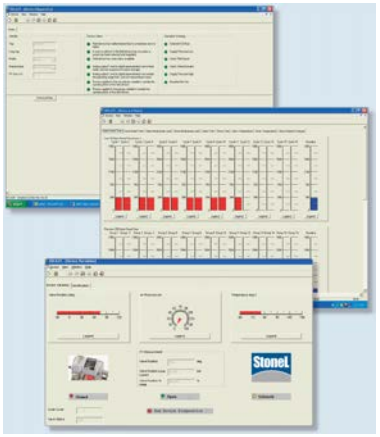


1. Remote calibration and monitoring
   - Open and closed switch settings
   - Identification winking
   - Pneumatic pressure low and high alarm settings
   - Monitor exact position, pressure and electronics temperature

2. Identify root causes quickly
   - Low and high pressure alarms
   - Malfunctioning solenoid
   - Stuck pneumatic spool or pilot valve
   - Stuck process valve/actuator

3. Predictive Diagnostics
   - Pneumatic pressure alarms
   - Open and closed pressure thresholds
   - Critical parameter trending and baseline comparison
   - Historical trending of key parameters

HART Diagnostics (AMI71)

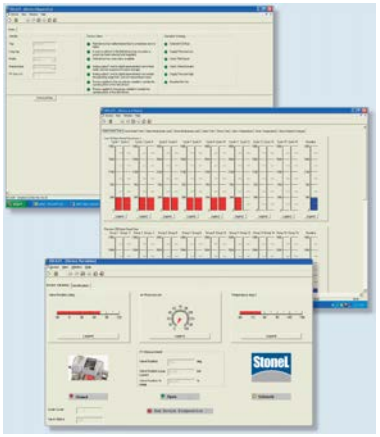


1. Remote calibration and monitoring
   - Open and closed switch settings
   - Identification winking
   - Pneumatic pressure low and high alarm settings
   - Monitor exact position, pressure and electronics temperature

2. Identify root causes quickly
   - Low and high pressure alarms
   - Malfunctioning solenoid
   - Stuck pneumatic spool or pilot valve
   - Stuck process valve/actuator

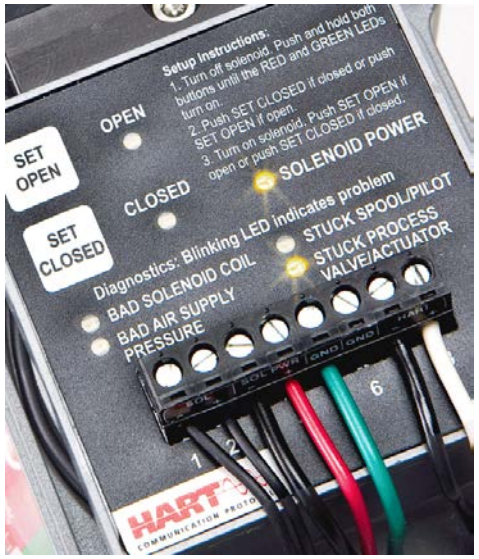
3. Predictive Diagnostics
   - Pneumatic pressure alarms
   - Open and closed pressure thresholds
   - Critical parameter trending and baseline comparison
   - Historical trending of key parameters

HART Diagnostics (AMI71)



1. Remote calibration and monitoring
   - Open and closed switch settings
   - Identification winking
   - Pneumatic pressure low and high alarm settings
   - Monitor exact position, pressure and electronics temperature

2. Identify root causes quickly
   - Low and high pressure alarms
   - Malfunctioning solenoid
   - Stuck pneumatic spool or pilot valve
   - Stuck process valve/actuator



3. Predictive Diagnostics
   - Pneumatic pressure alarms
   - Open and closed pressure thresholds
   - Critical parameter trending and baseline comparison
   - Historical trending of key parameters

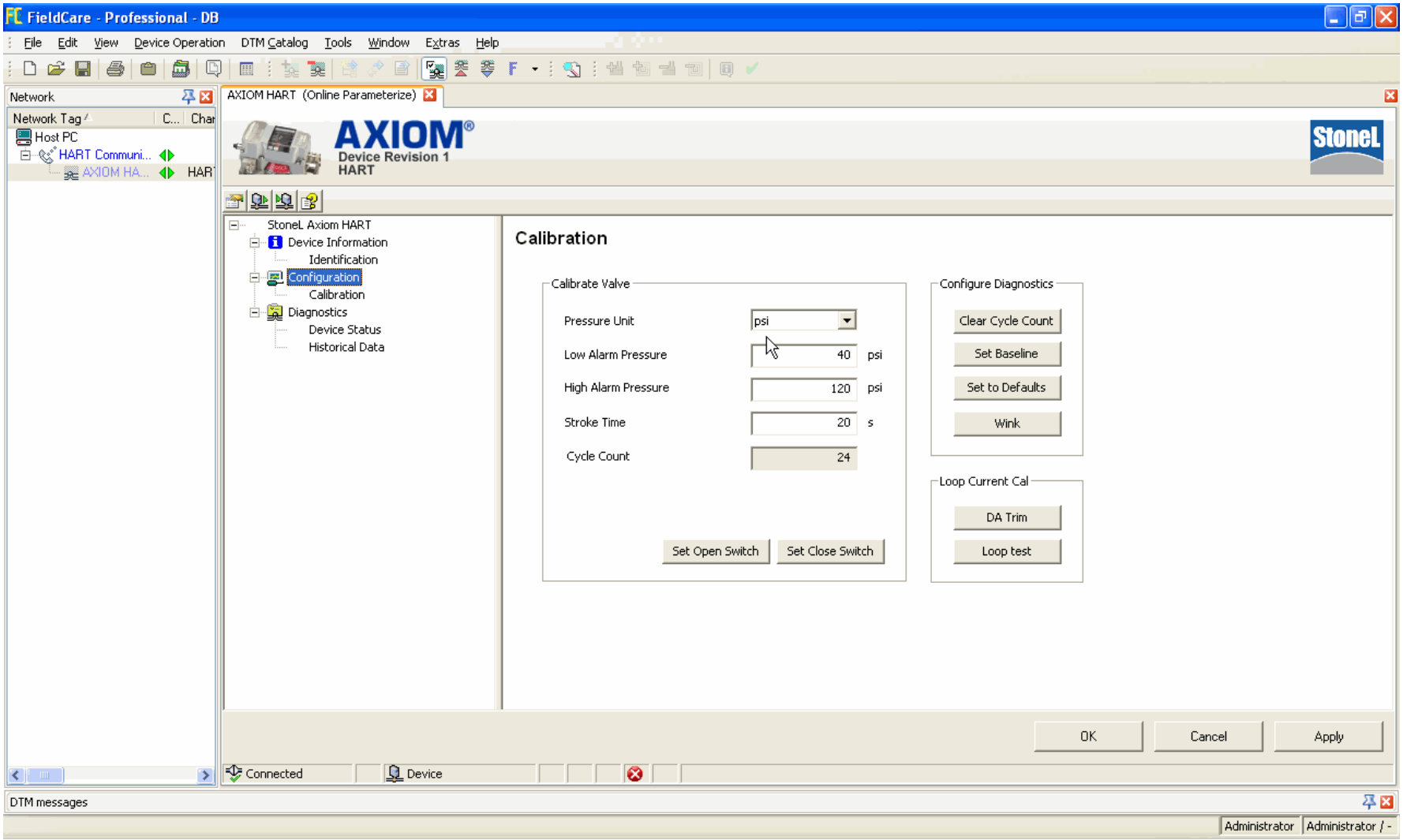
HART Diagnostics (AMI71)

1. Remote calibration and monitoring
   - Open and closed switch settings
   - Identification winking
   - Pneumatic pressure low and high alarm settings
   - Monitor exact position, pressure and electronics temperature

2. Identify root causes quickly
   - Low and high pressure alarms
   - Malfunctioning solenoid
   - Stuck pneumatic spool or pilot valve
   - Stuck process valve/actuator

3. Predictive Diagnostics
   - Pneumatic pressure alarms
   - Open and closed pressure thresholds
   - Critical parameter trending and baseline comparison
   - Historical trending of key parameters

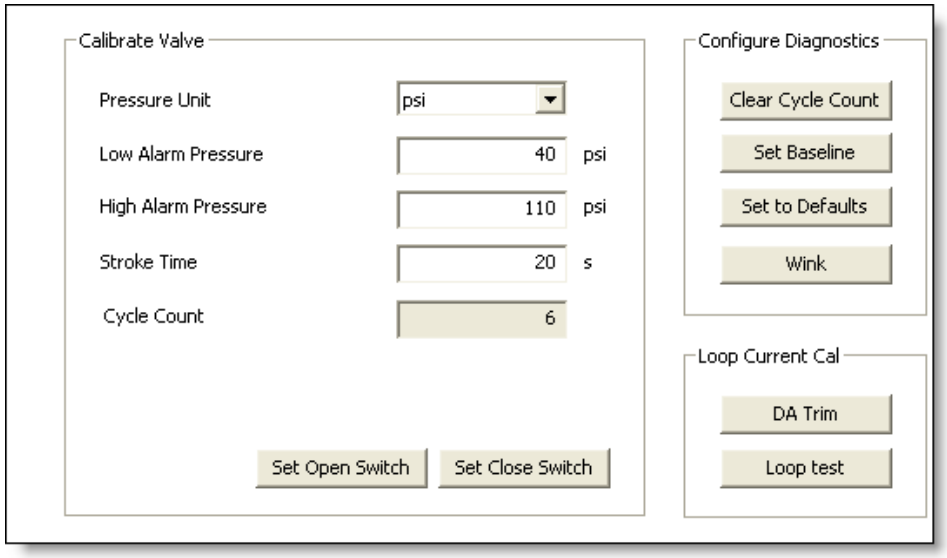
AMI71 Online DTM



Valve Communication Solutions

StoneL®

AMI71 Device Calibration



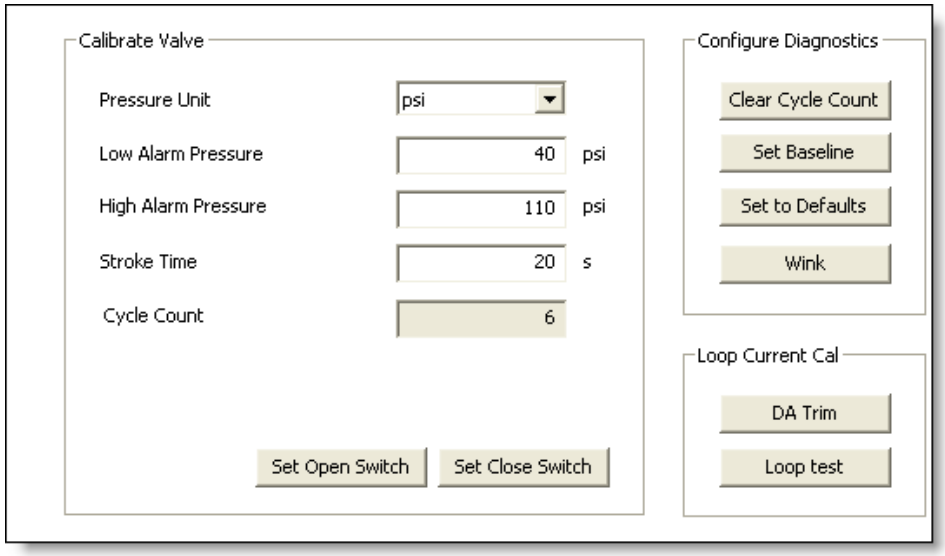
Calibrate Valve

Pressure Unit: Enables you to toggle pressure units between PSI and BAR. Important Note: Pressing this will also clear the cycle count and clear all historical and baseline data.

Low Alarm Pressure: Enter the desired low pressure alarm threshold (40 to 95 psi). When pressure applied falls below this level, the Bad Supply Pressure LED on the Axiom unit will flash red and the HART Low Supply Pressure alert will be activated.

High Alarm Pressure: Enter the desired high pressure alarm threshold (100 to 120 psi). When pressure applied rises above this level, the Bad Supply Pressure LED on the Axiom unit will flash red and the HART High Supply Pressure alert will be activated.

AMI71 Device Calibration



Calibrate Valve

Stroke Time: Enter the desired stroke time alarm threshold (2 to 650 seconds). This determines the normal maximum stroke time for the valve/actuator. When stroke time exceeds this value the Stuck Process Valve /Actuator LED will flash red and the HART diagnostic Stuck Valve / Actuator alert will be activated.

Set Open Switch: Remotely set the open switch limit point (Sets current to 20ma). Determination of Fail Open, Fail Close, Clockwise or Counter-Clockwise operation is made automatically during set up.

Set Closed Switch: Remotely set the closed switch limit point (Sets current to 4ma).

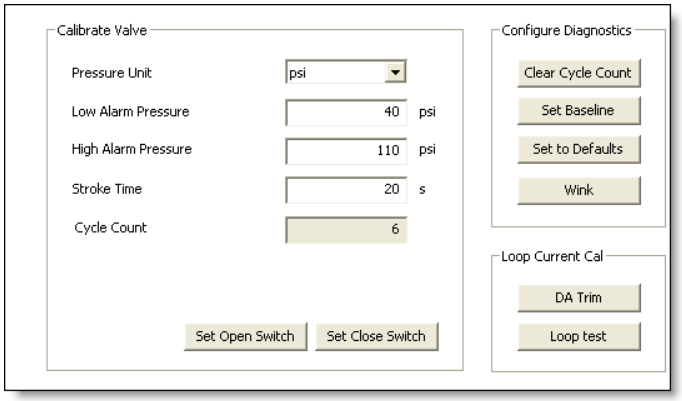
AMI71 Device Calibration

Configure diagnostics:

Clear Cycle Count: Clear the cycle count and all historical and baseline data.

Set Baseline: Set the last cycle as baseline. Otherwise the 50th cycle will be chosen.

Set to Defaults: Return pressure alarms, pressure unit, and stroke time to factory defaults.



Loop Current Calibration

D/A trim: This method allows the user to trim the loop current to zero and span to match the input device or current meter. The procedure first trims the 4mA output to match his local meter and then the 20mA output again to match the local meter.

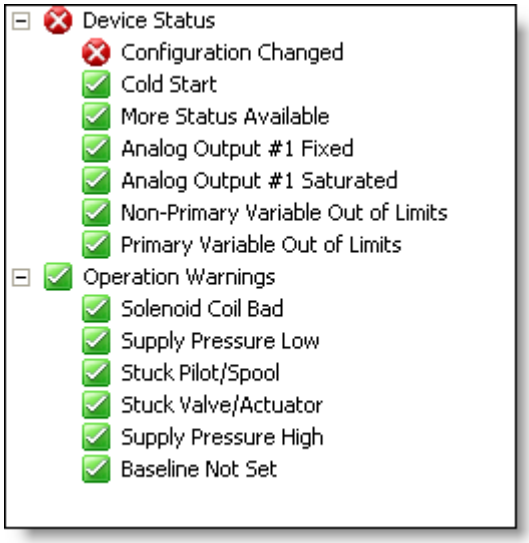
Loop Current: This method allows the user to set the loop current to a fixed value. This allows the user to check out other devices in series with the loop such as current monitors, etc. The method provides fixed choices of 4, 12 and 20mA as well as allowing the user to input a value between 4 and 20mA of his choosing.

AMI71 Diagnostics / Status

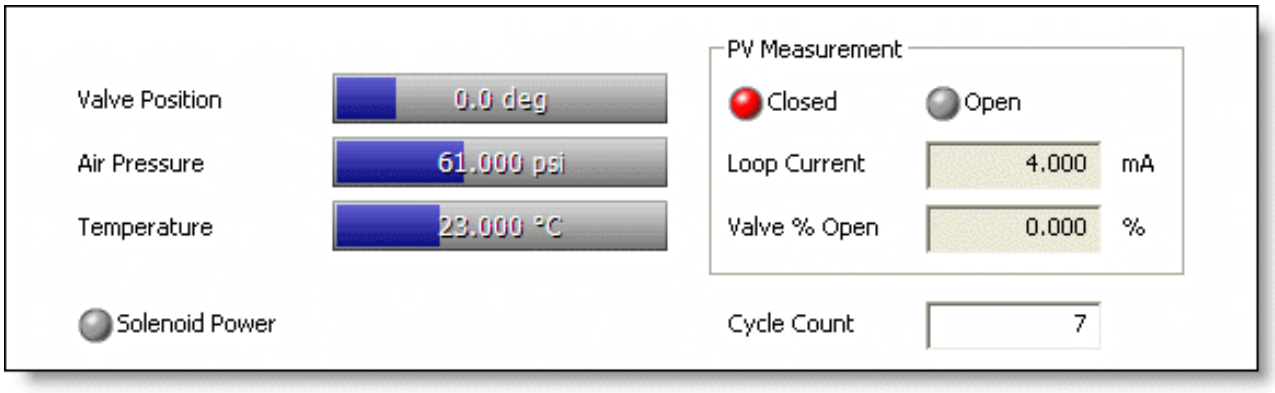
Device Status has status/warning flags for HART related communications.

Operation Warning will give warning indications about the function of the device.

A green indication is a good condition while a red indicates a problem or in the case of Baseline Not Set, signifies that that the baseline has not yet been set. The baseline will be set on the 50th cycle or when set baseline is pressed.



AMI71 Observe / Live Device Variables



Valve position (degrees): Current valve position in degrees

Air pressure (PSI/BAR): Current Inlet air pressure (PSI or BAR)

Temperature (C): Current Temperature of the electronics module (degrees C)

Solenoid Power (Indicator light): Indicates state of solenoid output (On/Off)

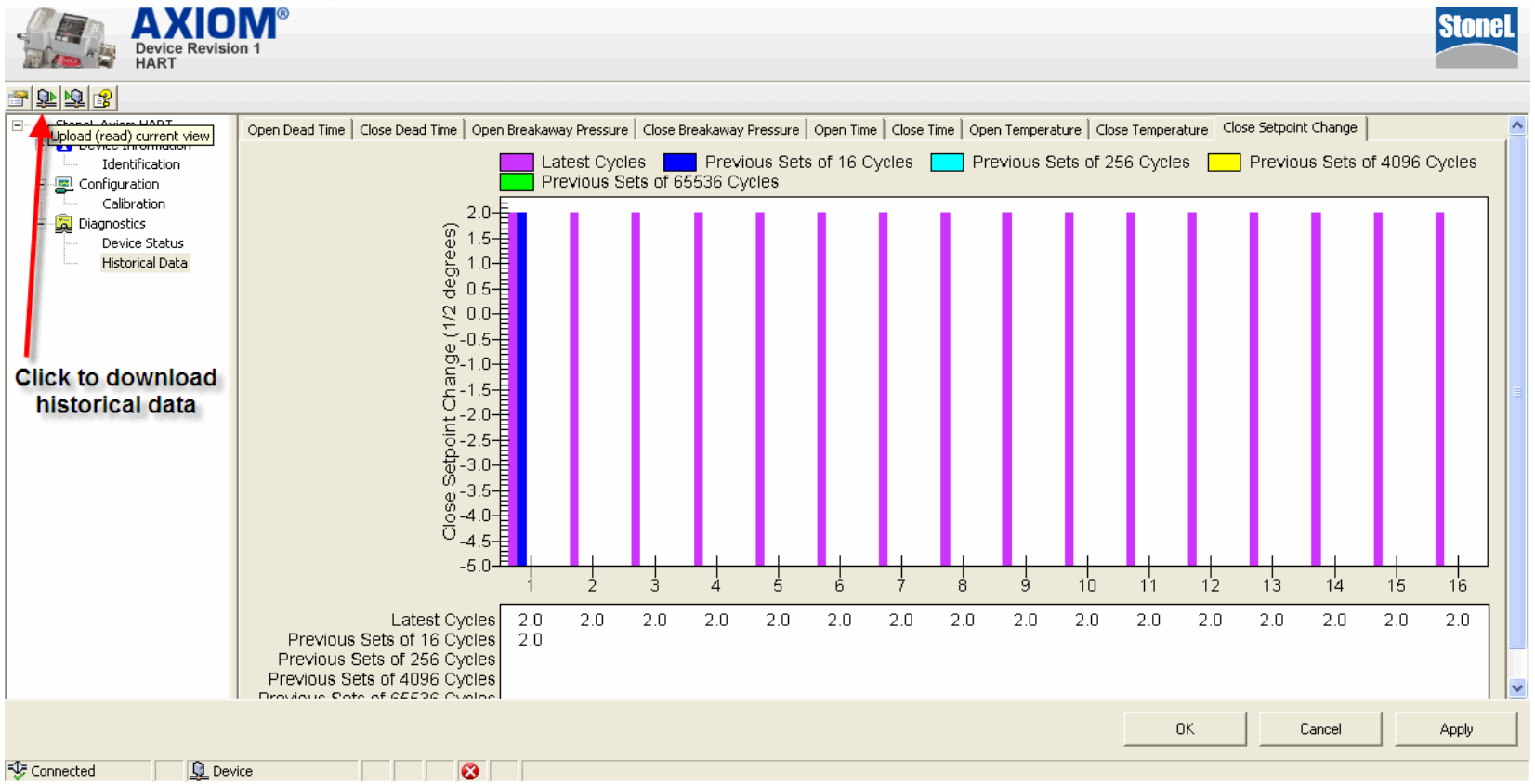
Valve position indication: Open or Closed

Loop Current: Current flow in 4-20mA signal wires

Valve % open: Indicates how far, in degrees, the valve is open.

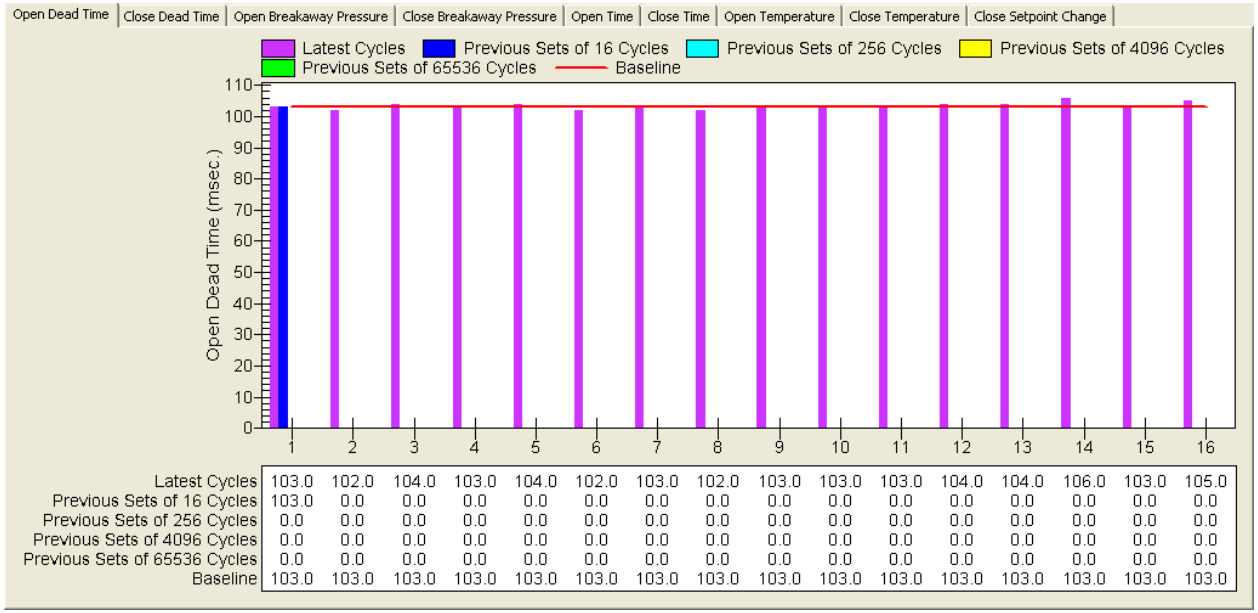
Cycle count: Number of closed–open-closed cycles since last reset

AMI 71 Historical Data (Trends)



Historical Data: These graphs shows the last 16 cycles with the latest cycle on the left. As you accumulate more cycles, the older data is averaged and stored. The red line is the baseline value for this parameter.

Historical Data (Open Dead time)

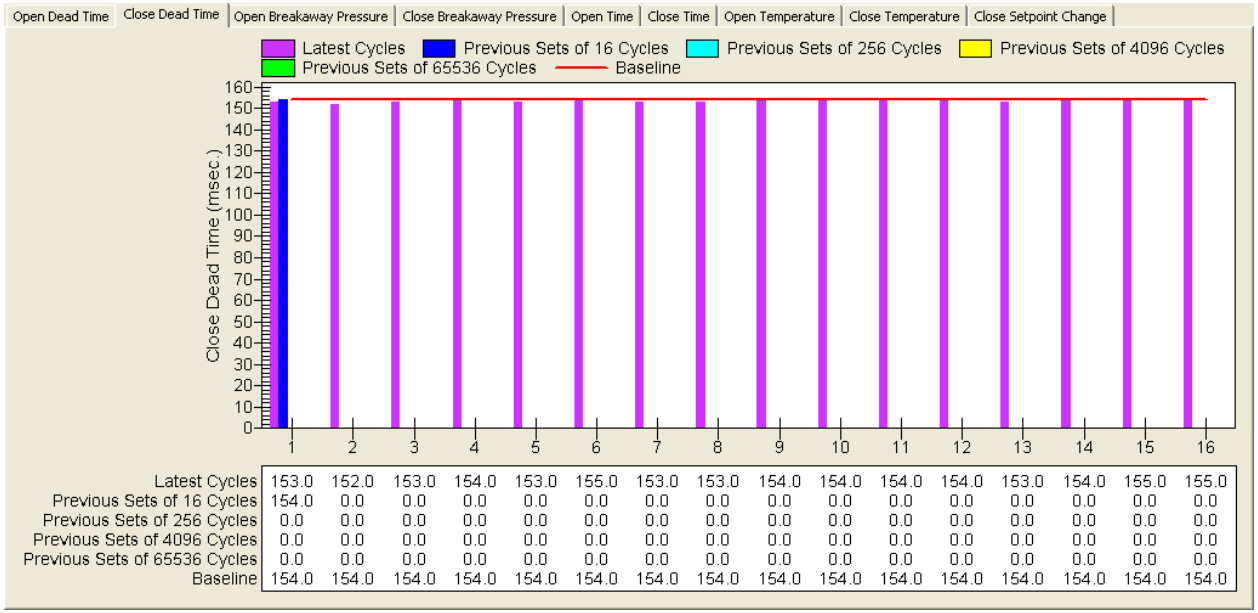


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Latest Cycles	103.0	102.0	104.0	103.0	104.0	102.0	103.0	102.0	103.0	103.0	103.0	104.0	104.0	106.0	103.0	105.0
Previous Sets of 16 Cycles	103.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 256 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 4096 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 65536 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baseline	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0

Open Dead time *is defined as the time delay from toggling the solenoid until the valve begins to open.*

What does this tell me: This value provides a historical look at the time it takes from energizing the coil until the valve starts to move.
What could cause it to change: If the open dead time is increasing, that could be caused by partially clogged air lines or by sluggish but functional solenoid coil or spool valve .
What can I do to address this: Inspect the air lines for blockages or debris. Inspect / rebuild the spool valve. Inspect the Pilot valve screens for debris.

Historical Data (Close Dead time)

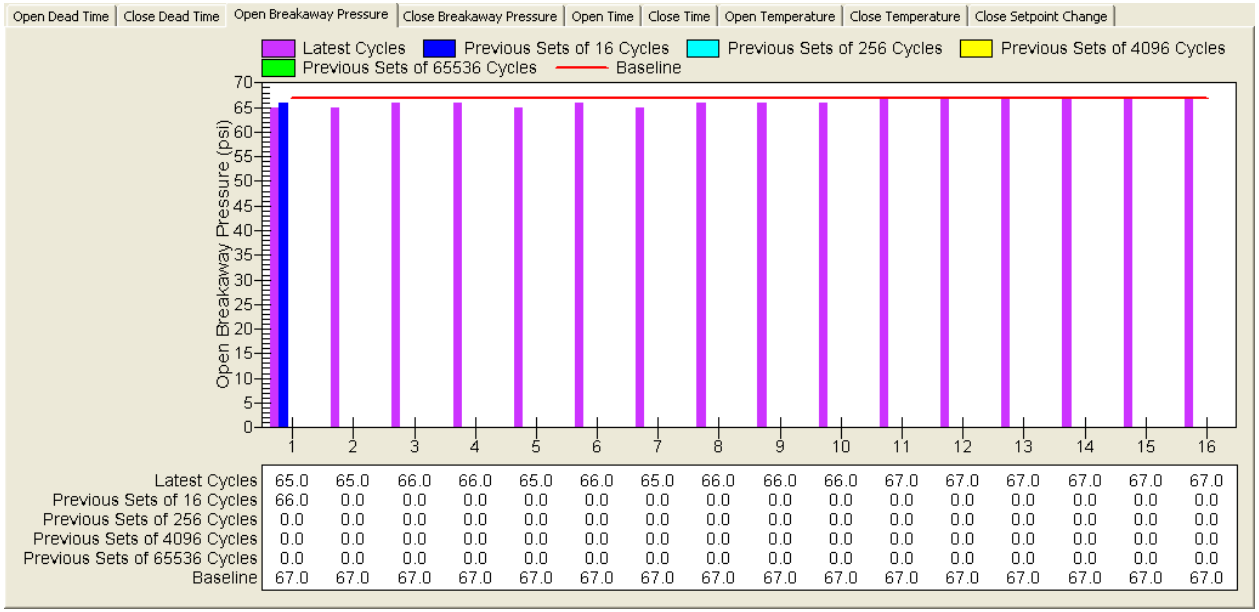


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Latest Cycles	153.0	152.0	153.0	154.0	153.0	155.0	153.0	153.0	154.0	154.0	154.0	154.0	153.0	154.0	155.0	155.0
Previous Sets of 16 Cycles	154.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 256 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 4096 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 65536 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baseline	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0

Close Dead time *is defined as the time delay from toggling the solenoid until the valve begins to close.*

What does this tell me: This value provides a historical look at the time it takes from de-energizing the coil until the valve starts to move.
What could cause it to change: If the close dead time is rising, that could be caused by partially clogged air lines or by sluggish but functional solenoid coil or spool valve .
What can I do to address this: Inspect the air lines for blockages or debris. Inspect / rebuild the spool valve. Inspect the Pilot valve screens for debris.

Historical Data (Open Breakaway pressure)

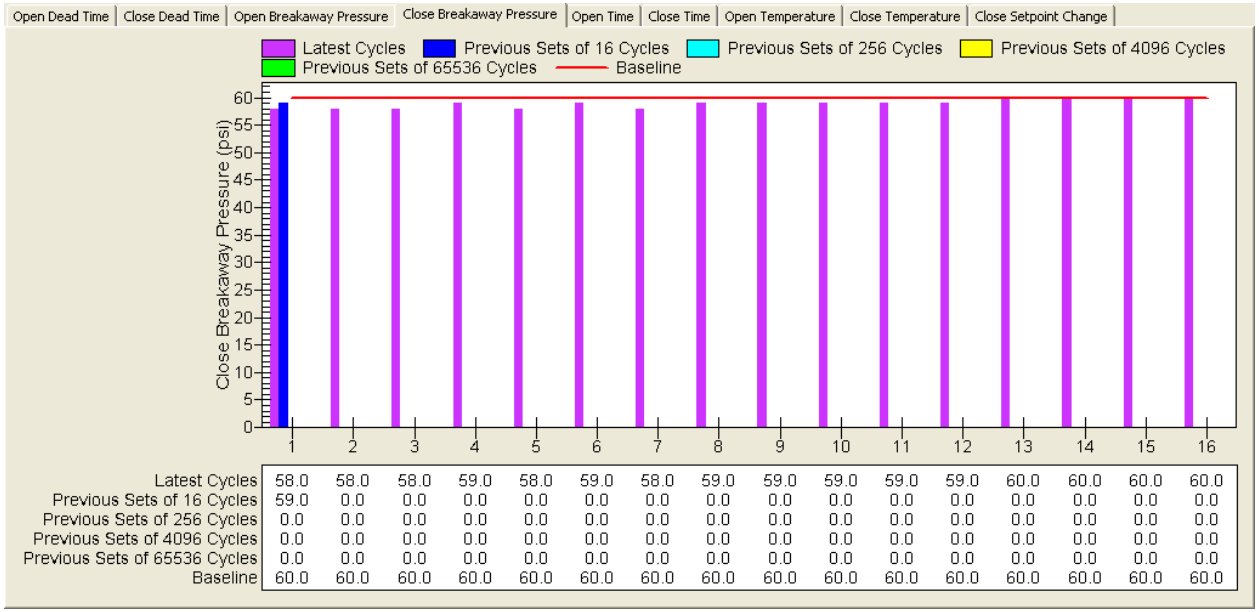


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Latest Cycles	65.0	65.0	66.0	66.0	65.0	66.0	65.0	66.0	66.0	66.0	67.0	67.0	67.0	67.0	67.0	67.0
Previous Sets of 16 Cycles	66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 256 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 4096 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 65536 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baseline	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0

Open Breakaway Pressure *is defined as the pressure differential across the piston at the point where the actuator starts to open the valve. This closely follows breakaway torque and can be used to diagnose problems like sticking valves.*

What does this tell me: This value provides a historical look at how much pressure differential across the piston is required to begin movement of the actuator/valve from the fully closed position.
What could cause it to change: If the Open Breakaway Pressure is rising, breakaway torque is also increasing. This could indicate that a valve is sticking to the seat.
What can I do to address this: Valve service may be needed.

Historical Data (Close Breakaway pressure)



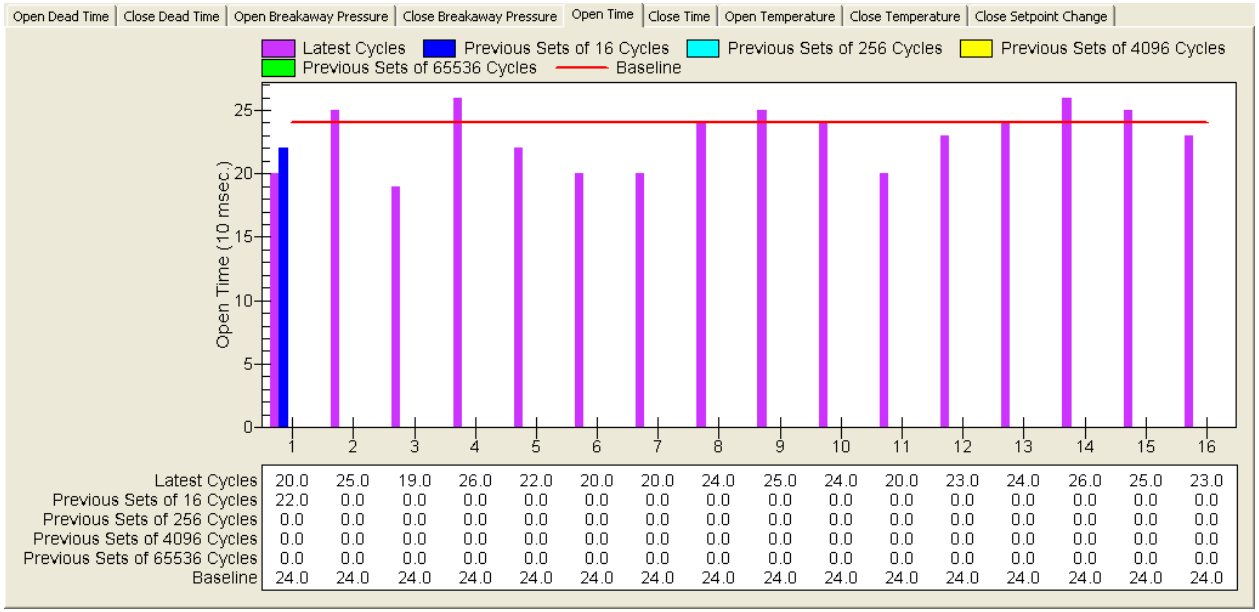
Close Breakaway Pressure *is defined as the pressure differential across the piston at the point where the actuator starts to close the valve. This closely follows breakaway torque and can be used to diagnose problems like sticking valves.*

What does this tell me: This value provides a historical look at how much pressure differential across the piston is required to begin movement of the actuator/valve from the fully open position.

What could cause it to change: If the Close Breakaway Pressure is rising, breakaway torque is also increasing. This could indicate that a valve is sticking to the seat.

What can I do to address this: Valve service may be needed.

Historical Data (Open time)

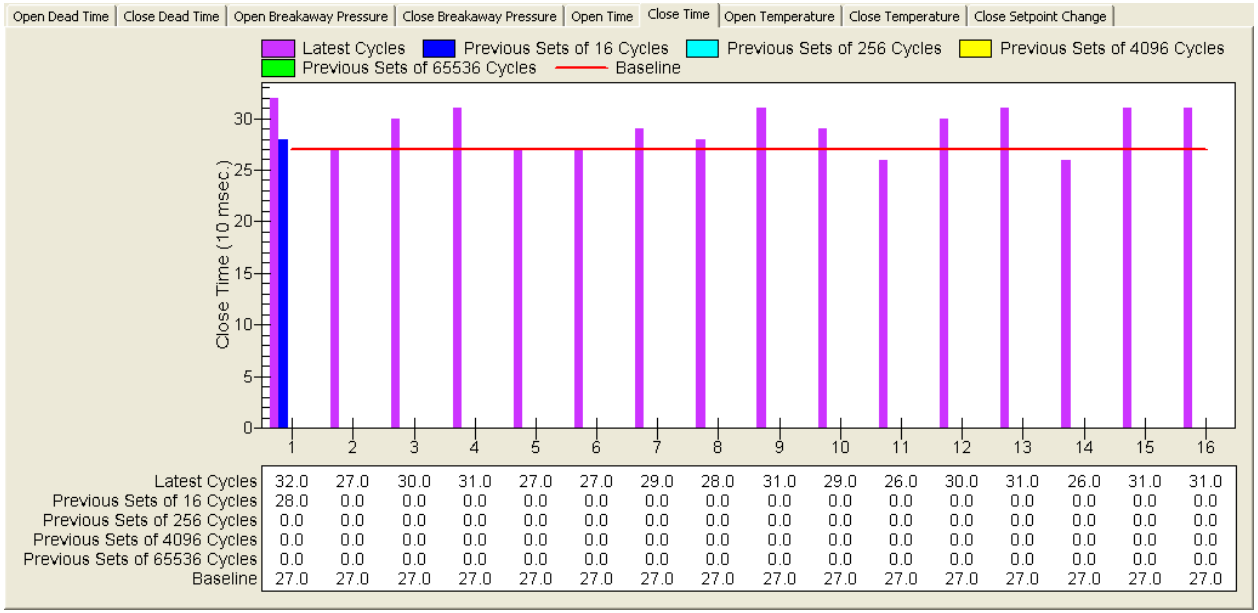


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Latest Cycles	20.0	25.0	19.0	26.0	22.0	20.0	20.0	24.0	25.0	24.0	20.0	23.0	24.0	26.0	25.0	23.0
Previous Sets of 16 Cycles	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 256 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 4096 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Previous Sets of 65536 Cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baseline	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0

***Open Time** is defined as the time it takes for the valve to open.*

What does this tell me: This value provides a historical look at how long it takes the valve to open.
What could cause it to change: If the Open Time is rising, it is simply taking longer for the valve to open. This could indicate that the valve is sticking, or air leakage through the fittings. It could also indicate a sluggish spool valve or pilot valve.
What can I do to address this: Valve or actuator service may be needed. Spool valve service may be needed.

Historical Data (Close time)



Close Time *is defined as the time it takes for the valve to close.*

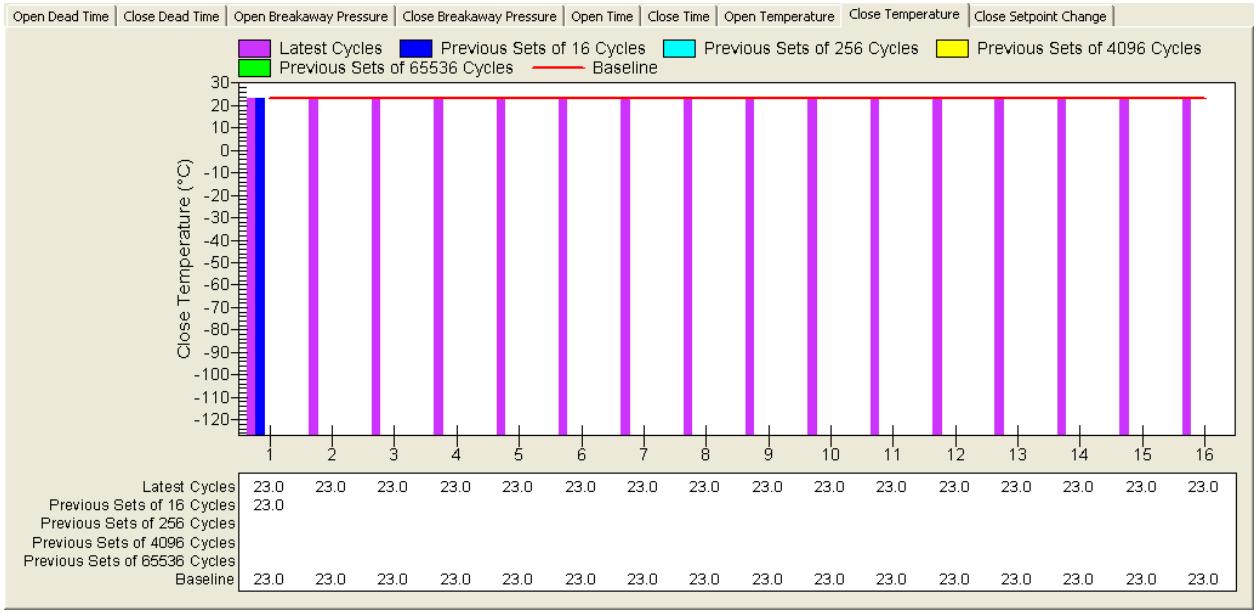
What does this tell me: This value provides a historical look at how long it takes the valve to close.
What could cause it to change: If the Close Time is rising, it is simply taking longer for the valve to close. This could indicate that the valve is sticking, or air leakage through the fittings. It could also indicate a sluggish spool valve or pilot valve.
What can I do to address this: Valve or actuator service may be needed. Spool valve service may be needed.

Historical Data (Open Temperature)

Open Temperature *is defined as the temperature reading from the temperature transducer inside the electronics module measured when the valve reaches open.*

What does this tell me: This value provides a historical look at the temperature seen by the Axiom's C-module (Electronics module) during the open cycle.
What could cause it to change: Ambient temperature fluctuations or internal heat rise.
What can I do to address this: If the temperatures exceed the temperature rating of the device, life of the device could be reduced. Consider heaters / coolers or insulating the surrounding pipes/tanks to protect electronics from exposure to temperatures they are not designed to handle.

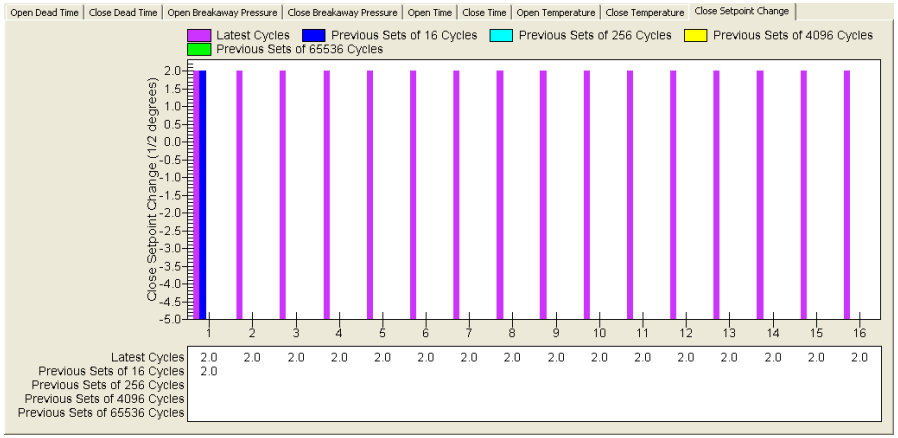
Historical Data (Close Temperature)



Close Temperature *is defined as the temperature reading from the temperature transducer inside the electronics module measured when the valve reaches closed.*

What does this tell me: This value provides a historical look at the temperature seen by the Axiom's C-module (Electronics module) during the closed cycle.
What could cause it to change: Ambient temperature fluctuations or internal heat rise.
What can I do to address this: If the temperatures exceed the temperature rating of the device, life of the device could be reduced. Consider heaters/coolers or insulating the surrounding pipes/tanks to protect electronics from exposure to temperatures they are not designed to handle.

Historical Data (Close Setpoint Change)



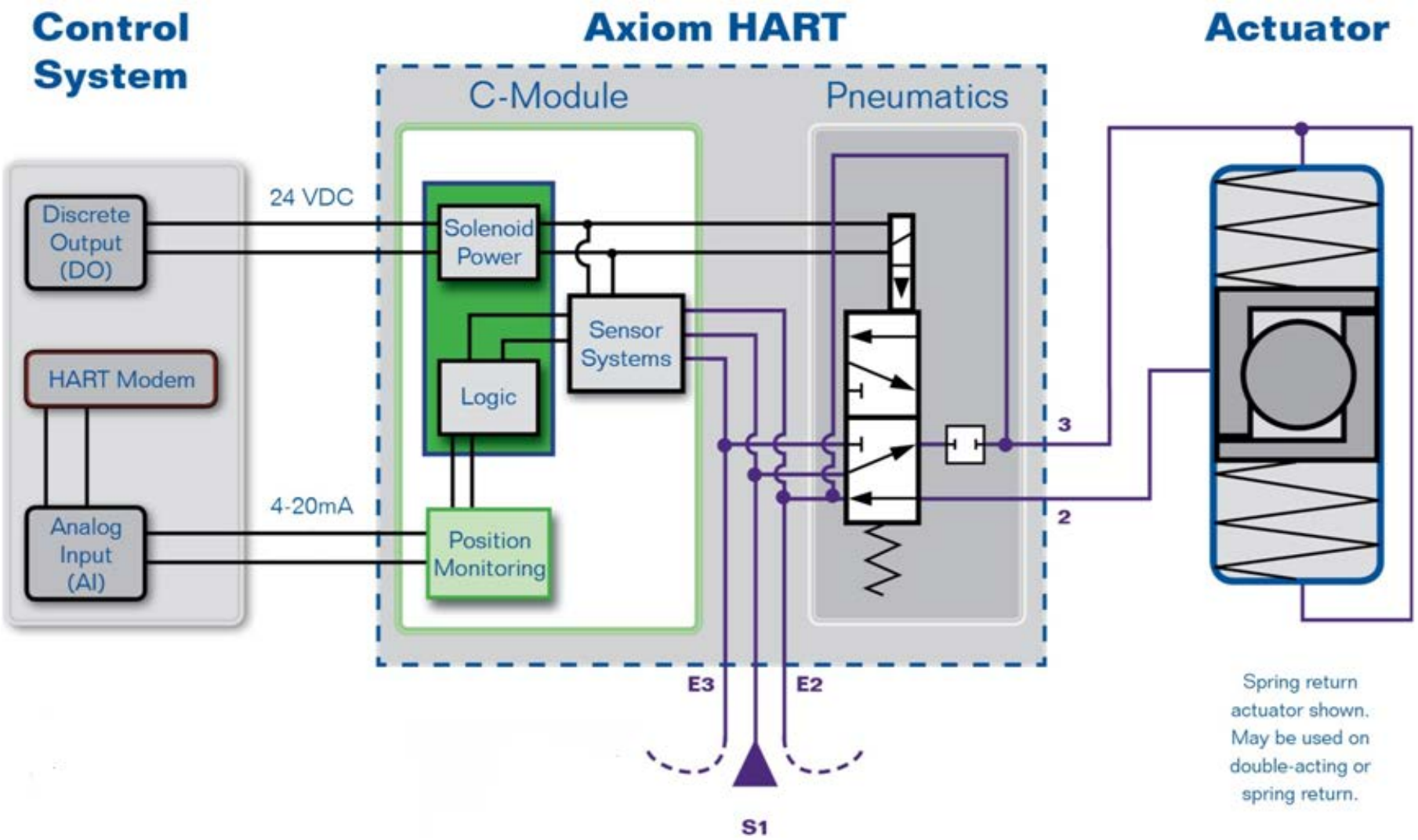
Close Setpoint Change *is defined as the amount the closed setpoint has changed. This parameter can indicate problems such as valve seat wear or buildup.*

What does this tell me: This value provides a historical look at the amount the closed position setpoint has been changed. The setpoint is set by the user. This shows how much it has changed over time.

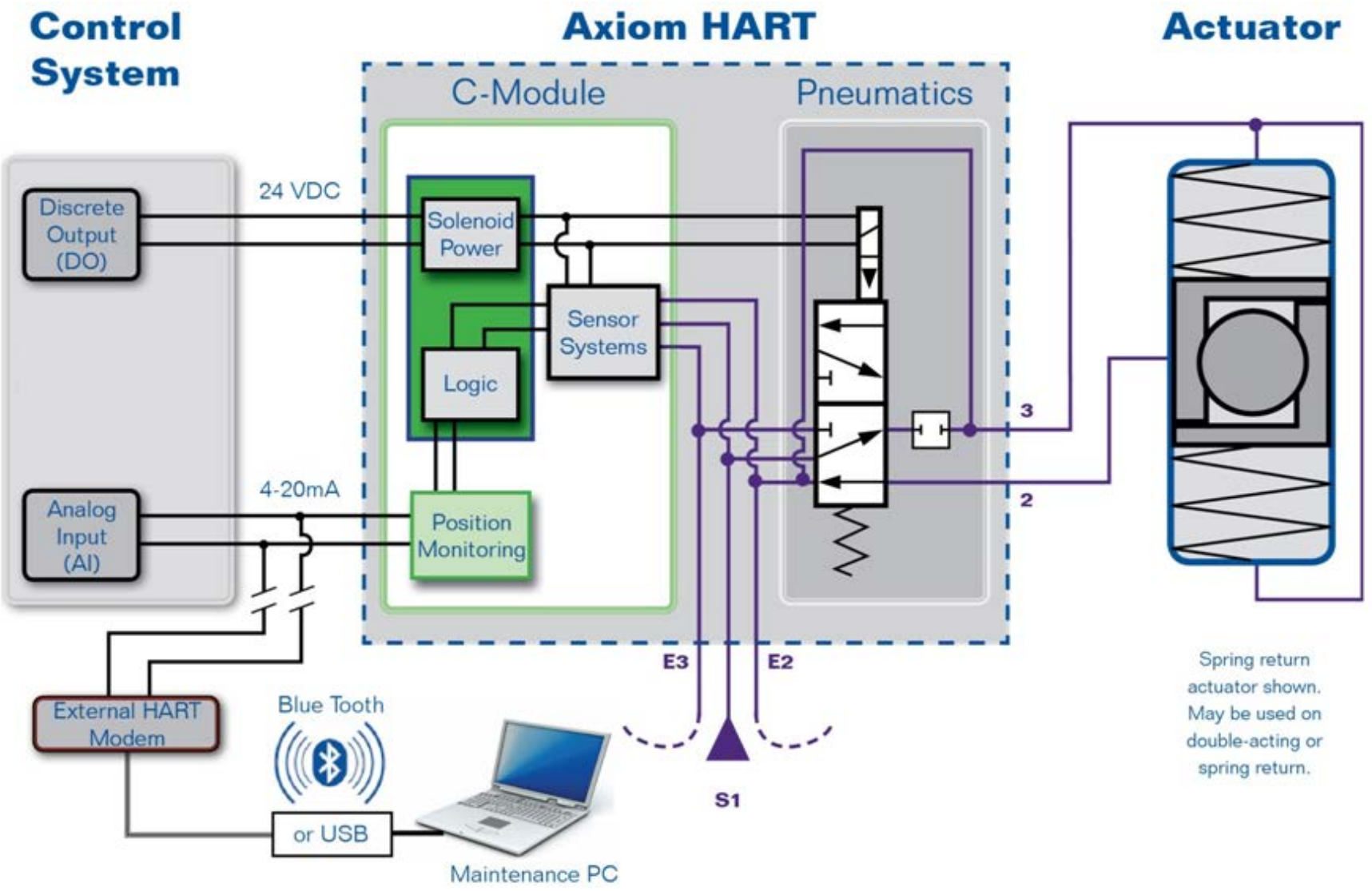
What could cause it to change: Only users can change this, either with the onboard push buttons or in the configuration screen. If the users are changing the setpoint they could be doing so because they are no longer reaching the desired setpoint. (overtravel or undertravel) If the setpoint is not being reached, this could indicate that the actual valve travel has changed.

What can I do to address this: This could be caused by worn seats or buildup in the valve. Valve service may be needed.

AMI 71 Installation



AMI 71 Installation



Asset Management Systems

- Using systems that accept EDDL (Electronic Device Description Language)
  - Download EDD from www.stonel.com
  - Typical EDDL compatible asset management systems include:
    - Emerson AMS
    - Siemens PDM
    - Honeywell FDM
- Using systems that run FDT (Field Device Tool)
  - Download DTM (Device Type Manager) from www.stonel.com
  - DTM is loaded into FDT frame program which is part of DCS or a separate PC
  - Typical FDT compatible systems include
    - Honeywell FDM
    - FieldCare
    - Yokogawa PRM
    - ABB AVM

StoneL®

Valve Communication Solutions

Axiom

with Diagnostics

Detect automated valve problems

. . . before they shut down your process

HART® COMMUNICATION PROTOCOL