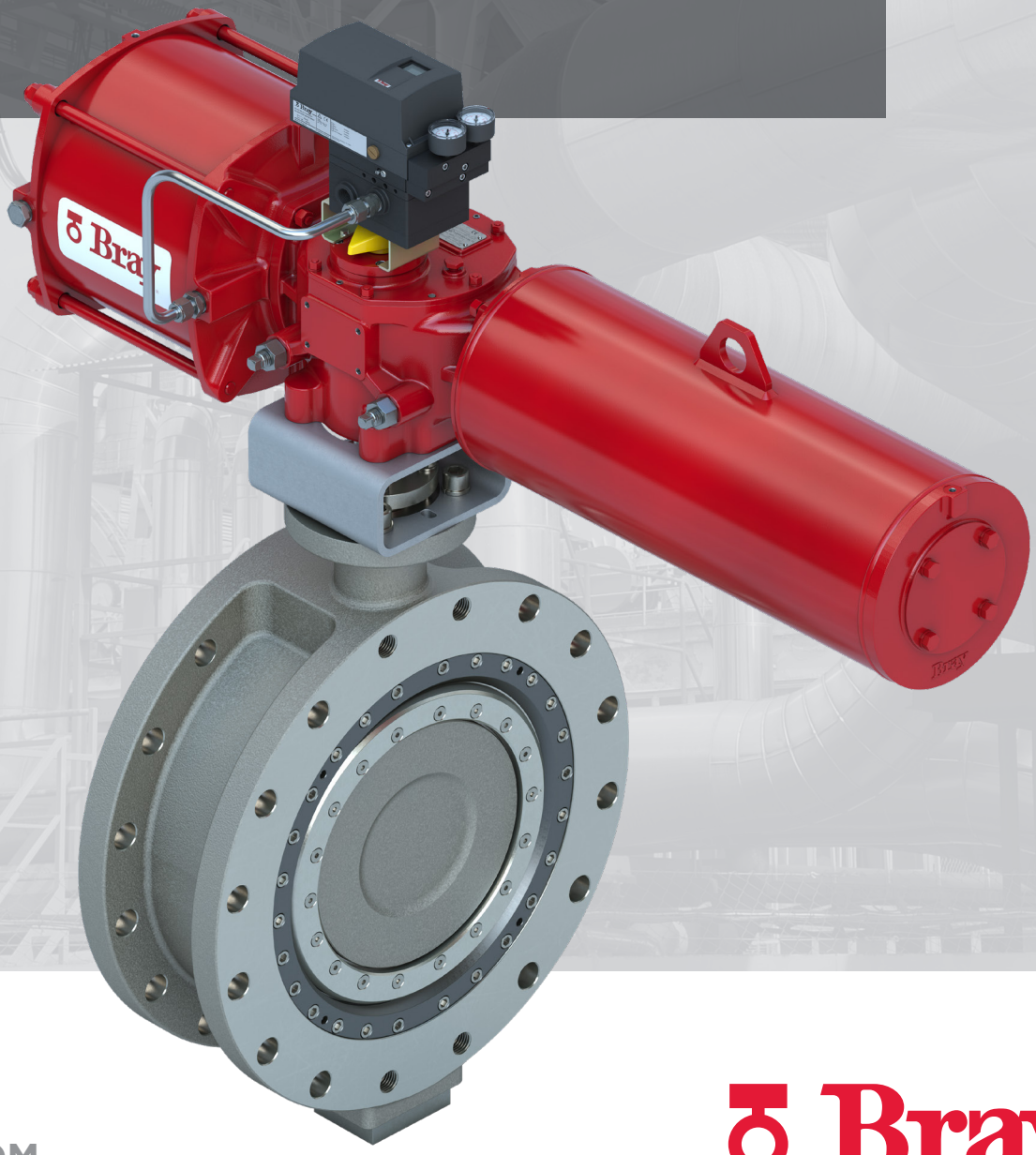
WORLD OF VALVE PERFORMANCE

At Bray we understand Valve Performance plays a crucial role in our customers' ability to maintain their assets. We have developed cost-effective valve testing solutions that can be adapted to many different applications without the challenges of nuisance false alarms.



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SAFETY INSTRUMENTED SYSTEM VALVES (SIS) & AUTOMATED EMERGENCY BLOCK VALVES (EBV)

Safety Instrumented System Valves or EBV's are used to isolate/vent a process stream when unsafe process conditions exist. Actions required can be to open or close based on the process. Due to the critical nature of these valves, frequent testing is needed to ensure proper function during an emergency.

The role of a valve test is to verify the appropriate movement will occur during an event. Since full travel of the valve will interrupt the day to day process, a partial stroke test (PST) can be done as an unobtrusive option. This test will ensure all moving components are in working order by stroking the valve a few degrees. The test can be performed in many ways ranging from mechanical to full automated digital solutions.

Full Stroke Testing (FST) adds the capability of validating the whole stroke of the valve. This test can be done during a plant shut down since it will interrupt the process.

TEST =OPTIONS ARE:

> Manually Operated Mechanical PST
> Digitally Automated PST
> Digitally Automated FST

FEATURES

Manually Operated PST Provides:

- High degree of assurance that a complete valve movement will occur on demand
- Verification that the valve torque is still below actuator operating torque
- Local visual confirmation

Digitally Automated PST Provides:

- Verification that the control signals are operating as designed
- Customizable alarm sensitivity
- Valve condition evaluation and comparison to original PST signature
- Compliance reporting

Digitally Automated FST Provides:

- 100% confirmation of valve travel and confirmation of valve sealing conformance
- Valve condition evaluation and comparison to original FST signature
- Reduction in human error

DETAILED OPERATION AND CUSTOMIZATION

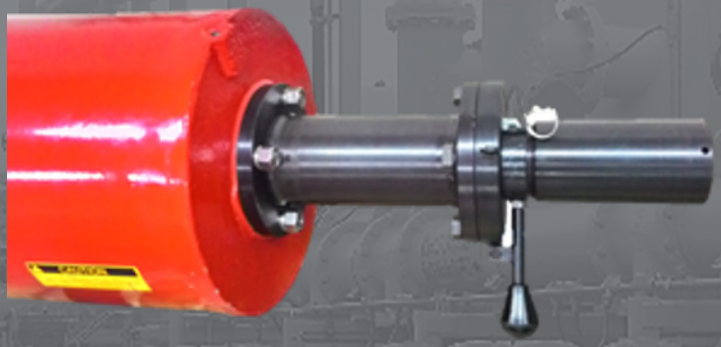
1. MANUALLY OPERATED MECHANICAL PST

S98 PARTIAL STROKE MODULE

The Bray PST module is an all mechanical device that can be added to the S98 scotch yoke actuator. This patented design can serve as a dual function of extended travel stop and partial stroke test.

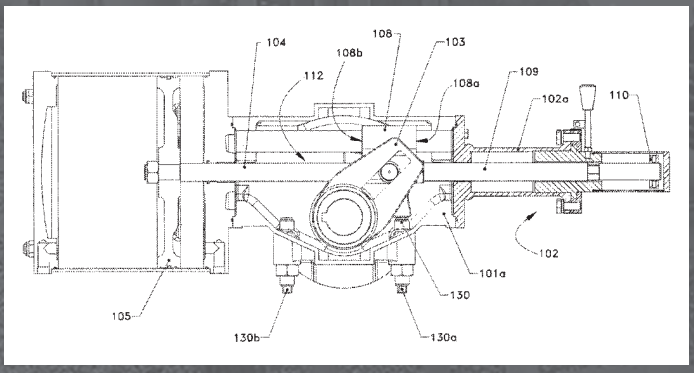
HOW IT WORKS

With the hand lever set in free mode the push rod is free to move through the device allowing full range of travel. When the hand lever is activated the push rod travel is limited. This travel limit can be adjusted anywhere in the valve rotation profile.



APPLICATION

By manually limiting the rotation of the valve to a small degree of movement the solenoid can be used to activate a partial stroke test. This test can be done locally at the unit by a technician without the use of outside electronics.



2. DIGITALLY AUTOMATED PST

ELECTRONIC APPROACHES

PST can also be done digitally with the use of a smart positioner such as the Bray 6A. By using a digital approach variable such as stiction, speed, dwell time and friction are measured. These variables improve the quality of a partial stroke test and help in predicting valve faults earlier than mechanical solutions. This is done by comparing tested values against user/manufacturer defined limits. A second advantage, is in the data logging capabilities of the Bray 6A. By documenting every test, the Bray 6A provides plant managers a record that all testing processes are being performed in accordance to safety standards.

FULL CONTROLLABILITY

The Bray 6A provides plant managers control over multiple variables in the PST. Variables such as start position, stroke length and ramp rate can be adjusted to meet the needs of the plant.

PARAMETER	FUNCTION	PARAMETER VALUES	UNIT
A. PST	Partial stroke test with the following parameters:		
A1.STPOS	Start Position	0.0 ... 100.0	%
A2. STTOL	Start Intolerance	0.1 ... 2.0 ... 10.0	%
A3.STRKH	Stroke Height	0.1 ... 10.0 ... 100.0	%
A4.STRKD	Stroke Direction	uP / do uP do	
A5.RPMD	Ramp Mode	OFF / On	
A6.RPRT	Ramp Rate	0.1 ... 1.0 ... 100.0	%/s
A7.FLBH	Behavior after failed PST	Auto / Hold / AirIn / AirOu	
A8.INTRV	Test Interval	OFF / 1 ... 365	Days
A9.PDTIN	Reference stroke time for partial stroke test	NOINI / (C)##.# / FdInl /rEAL	s
AA.FACT1	Factor 1	0.1 ... 1.5 ... 100.0	
AB.FACT2	Factor 2	0.1 ... 3.0 ... 100.0	
AC.FACT3	Factor 3	0.1 ... 5.0 ... 100.0	

Fig. 1 Provides an overview of variables that can be adjusted.

INITIATING A TEST CAN BE DONE MULTIPLE WAYS.

1. **Local or remote initiation with Binary input activation**

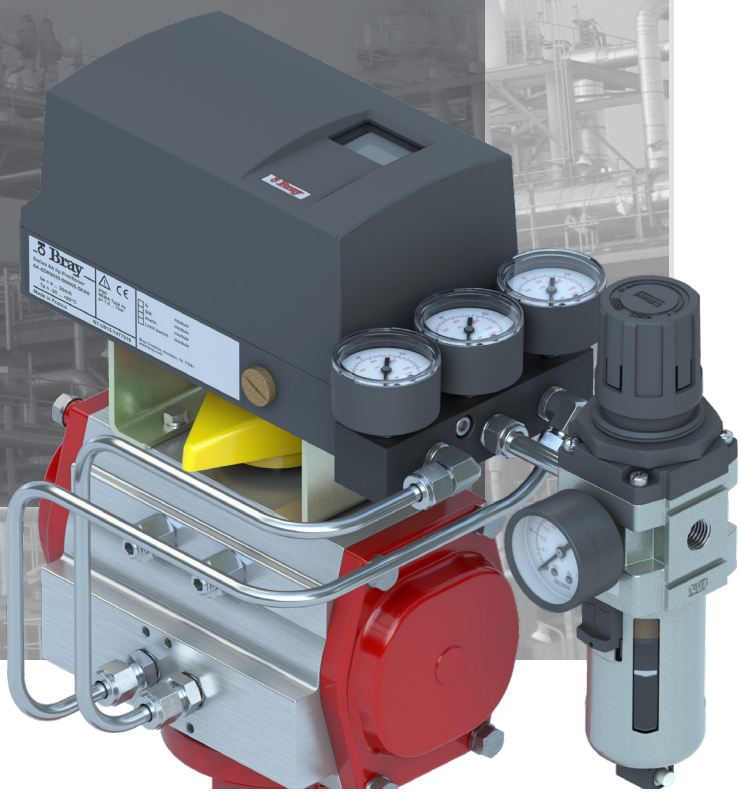
   The 6A smart positioner is equipped with 1 binary input slot as standard. This input can be used to activate the partial stroke test ether remotely with PLC/DCS or by ESD push button

2. **Data management software communicating through HART protocol**

   Units that are equipped with HART or Profibus will have the capability of activating a PST or FST through software. With the use of asset management software all Bray 6A positioners in a plant are given a unique ID name chosen by the user. Through this system plant managers will have the ability to view all positioners and run PST/FST as needed with real-time data being presented in the control room. PST/FST settings can be adjusted for individual positioners or by valve type/size/features/application. Variables such as test frequency, stroke distance and time can be adjusted to improve performance on the fly.

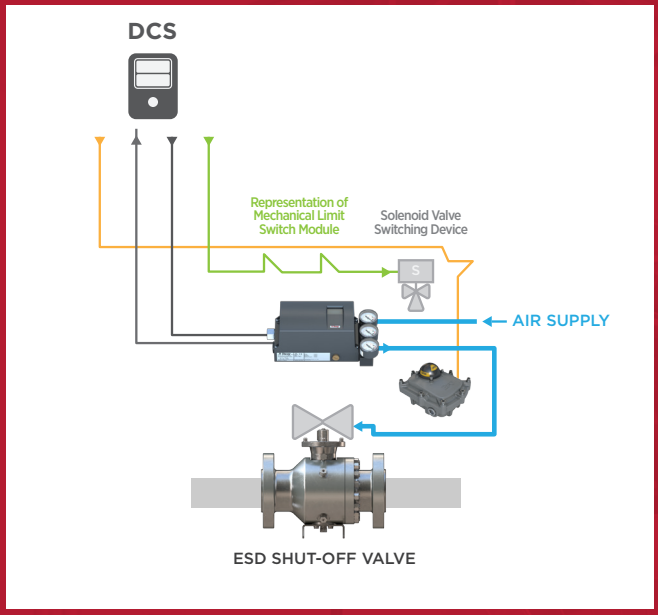
3. **Adjustable Cyclic Test Interval at agreed threshold safe start point**

   The Bray 6A positioner can be programed to automatically run a PST at designated times intervals. Activation of this mode can be done both local to the unit or remotely through the PDM software. Time intervals are done in days allowing for users to meet their minimum availability requirements for automated safe start point.



EXAMPLE 6A CIRCUITS

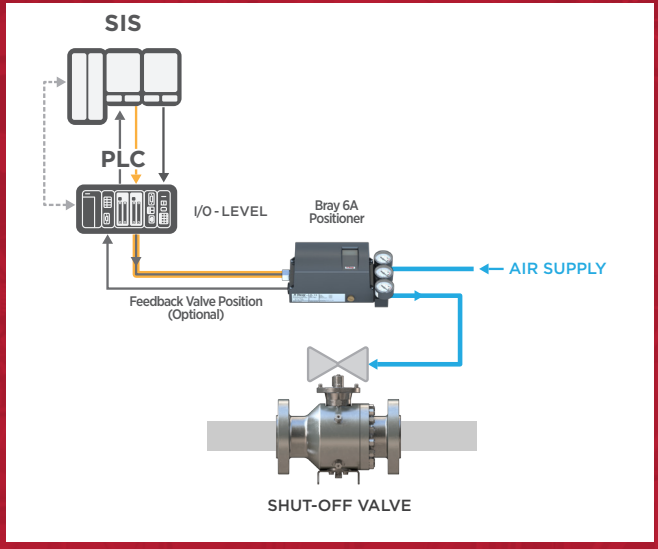
PST WITH SOLENOID



Safety shut down valves that use a solenoid to override the positioner in an emergency add another variable to test. In order to accomplish this a limit switch card is used in conjunction with a solenoid relay.

In practice, the solenoid is used to override the positioner. Travel is limited by having the second limit switch activate at the desired degrees of motion to disengage the coil. This allows for a PST that includes the emergency valve and the solenoid.

PST NO SOLENOID

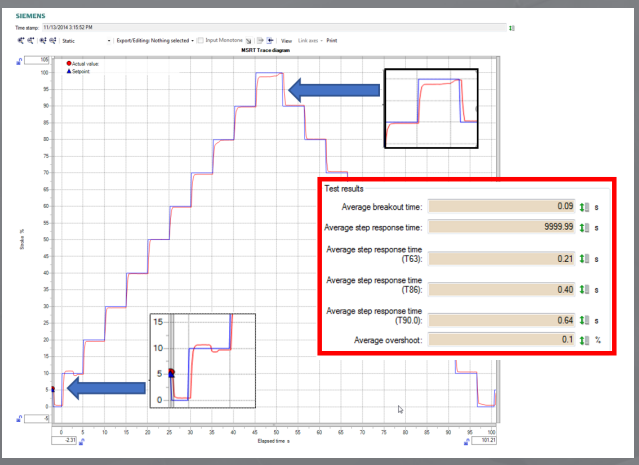


The Bray 6A positioner is certified in accordance with **IEC 61511 to SIL2** for reliably depressurizing. It can therefore replace the solenoid valve with a supply voltage of 24V.

Through the binary input, the 6A will receive a signal to activate in an emergency position state. In this setup, the Bray 6A functions both as a solenoid valve and PST execution device.

3. DIGITALLY AUTOMATED FST

When possible, a full stroke test can be done to validate a full stroke signature and insure valve isolation or unseating capability. Like a PST the FST is logged in the Bray 6A memory. An example of a full stroke baseline test response can be seen in the chart below.



ALARM NOTIFICATIONS

The 6A positioner has the capability of outputting alarm codes based on measured values such as valve torque increase over time, valve movement time and hours of operation. A 3-tiered scale can be used to indicate the severity of variable changes. The below images outlines the visual display of each alarm level found on the Bray 6A screen.

For networked unit this alarm can be sent to a PLC or DCS through a protocol network or binary outputs. Further diagnostics can drill down to the specific alarm reason.

As an example, in the context of a PST the tiered system can be applied to time required to run the PST. The below table outlines the tired alarm program for a 3 second PST.

LEVEL	TRAVEL TIME (sec.)	USER DEFINITION
Alarm 1	3	No Attention Needed
Alarm 2	4	May Need Attention
Alarm 3	5	Maintenance is Required

By giving users the ability to control the sensitivity and relevance of these alarm variables you can create a system that reduces false positives and provide the user full customized valve reliability testing.

BRAY FLOW CONTROL SOLUTIONS ARE AVAILABLE FOR A VARIETY OF INDUSTRIES.

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Oil & Gas
Power / FGD
Nuclear Power

WATER
Water / Wastewater
Ultra Pure Water
Desalination
Irrigation

INDUSTRIAL
Chemical
Pulp & Paper
Textile
Marine

INFRASTRUCTURE
Beverage & Food
Transportation
Heating, Ventilation & Air Conditioning (HVAC)

US HEADQUARTERS
Bray International, Inc.
13333 Westland East Blvd.
Houston, Texas 77041
Tel: 281.894.5454

CHINA HEADQUARTERS
Bray Controls (ZheJiang) Co. Limited
98 GaoXin # 6 Road
XiaoShan Economic & Development Zone
HangZhou, ZheJiang 311231, P.R. China
Tel: 86 571 8285 2200

EUROPE HEADQUARTERS
Bray Armaturen & Antriebe Europa
Halskestraße 25
47877 Willich
Germany
Tel: +49 2154 8875-0

INDIA HEADQUARTERS
Bray Controls India Pvt. Ltd.
Plot No. H-18 & H-19
SIPCOT Industrial Park
Vallam Vadagal, Echoor Post
Sriperumbudur Taluk
Kancheepuram District
Tami Nadu - 631 604
Tel: +91-44-67170100

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