PositionMaster EDP300
Extended Diagnostics

Compact, well-proven, and flexible

The benefits of the extended diagnostics feature

The PositionMaster EDP300 is an electronically configurable positioner with communication capabilities, designed for mounting on pneumatic linear or part-turn actuators. It features a compact design, modular construction, and an excellent cost-performance ratio. Fully automatic determination of the control parameters and adaptation to the actuator allow for considerable time savings as well as optimum control behaviour.

The extended diagnostics feature of the PositionMaster EDP300 provides the user the possibility to schedule preventive maintenance for the Control Valve to ensure increased system availability and to minimize unforeseen cost intensive failures. In this document we provide examples of typical offline tests that can be performed by the EDP300 positioner:

— Partial Stroke Test
— Valve Signature
— Speed Over Position Test

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Partial Stroke Test

The Partial Stroke Test is used to check the function of the safe position of ESD (emergency shutdown) valves. For example the partial valve stroke prevents unexpected failure of the safety function by breaking down build up of solids in the valve body or the onset of corrosion that may prevent valve travel when needed for the shutdown. Furthermore, a successfully executed Partial Stroke demonstrates that certain unresolved errors that would otherwise go undetected, such as spring fractures in the spring chamber of the pneumatic actuator are identified. The interval for testing for these undetected errors can be programmed in the positioner or initiated from the host system.

The test can be started both locally on the device in a time-controlled manner, or by using the DTM from the host system. The positioner evacuates Output 1 until the defined position change occurs. If this does not happen within the defined time (timeout value), an alarm is generated as indication of failure.

Additionally, monitoring is performed to establish whether the valve has moved out of its end position within a defined period of time (dead time). If this has not occurred, the test is cancelled as a "failed" test and an alarm is generated. This behavior prevents a blocked valve from suddenly freeing itself from the end position and thereby disrupting the process.

At the end of the test, the EDP300 moves the valve to the last valid position and returns to the most recently active control mode.

As indicated in Fig. 1 there are three separate parameters that need to be set as criteria for valve movement verification: Valve Stroke as a percentage of total valve travel. Dead time as a time duration to verify if valve responds to signal change and timeout as a time duration to ensure that valve can reach the predetermined percentage travel for the PST test cycle. The parameter settings are determined by the user, based on the process and expected performance of the PST valve and actuator assembly.

For documentation purposes, the test result is entered in the event history and saved in the non-volatile memory of the positioner.

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i | **IMPORTANT (NOTE)**
For ESD valves whose safe position is "closed", it is recommended that the following parameter be set to "On":
"Device Setup->END STOP BEHAV.->Control at 100%". This ensures that the depressurizing time and "dead time" are as short as possible during closure.
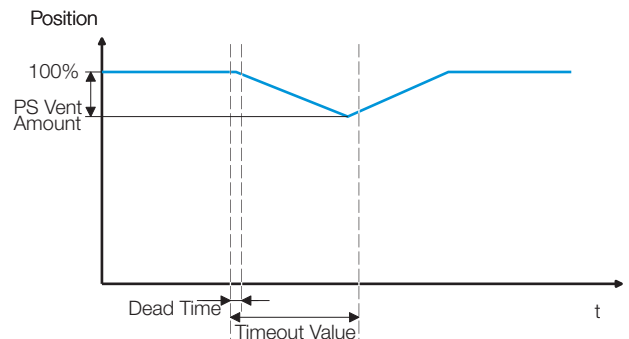
Fig. 1

Speed Over Position Test

This offline test, which is started via the DTM, records the sliding friction of the actuator and valve in the shortest possible time. The graph reliably depicts partial friction as a reduction in valve travel speed.

When the "Speed Over Position Test" is started, the entire valve range for the valve's "open and closed directions" is covered in an uncontrolled manner using a definable degree of openness (Y offset) for the EDP300 pneumatics providing a constant air pressure to the actuator.

The smallest possible Y offset (Y offset=1) is detected during Autoadjust and changed in the adaptive operating mode if necessary. The area between this Y offset and the maximum degree of openness is scaled to 100 %.
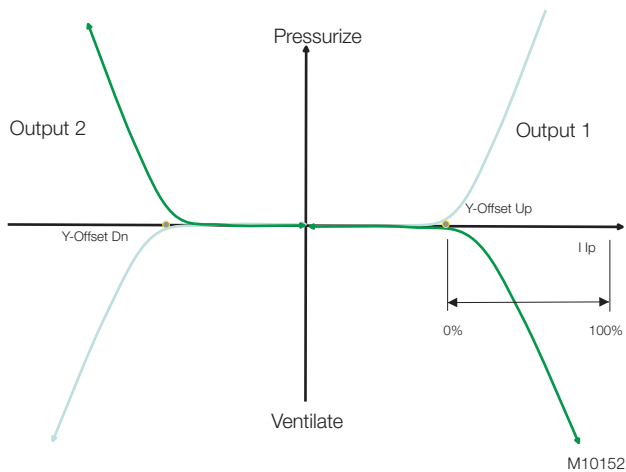
A comparison of several test results only makes sense if the same offset value is used for each test, it is also recommended to switch off the adaptive operating mode of the EDP300 during this test to avoid unintentional changes to the smallest Y offset values.

Fig. 3 below as an example shows the graphical results of a Speed Over Position Test pattern, the graph provides information about friction in the actuator and valve through the entire travel in both directions. The further the trend line moves away from the speed % / sec zero line indicates increase friction in the valve actuator assembly. The speed measurement resolution is approximately 100 points for each travel direction.

The advantage of this test is the fast and easy way to determine if any friction conditions are present that would impact the performance of the positioner to control the actuator during the normal process operation. In addition up to 5 graphs can be archived in the device; these graphs can be compared so that valve diagnostics can be performed for the purpose of preventive maintenance.
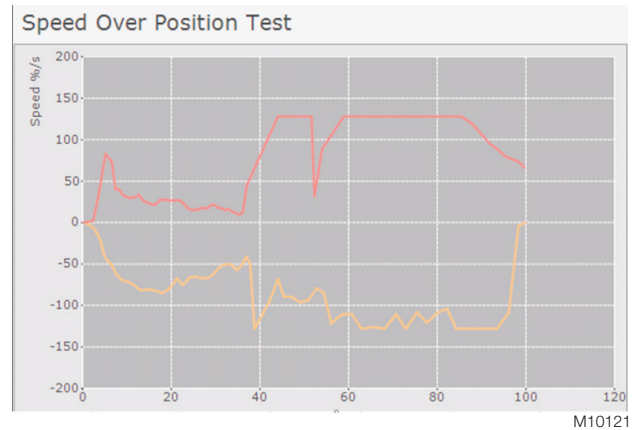

Fig. 2: Pneumatics characteristics

Fig. 3: Example of Speed Over Position Test indicating friction along the travel of the valve.

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Valve Signature

(Note: This test requires the EDP300 Pressure Sensor Module Option)

The Valve Signature, which is displayed via the DTM, is used to detect the static and sliding friction of the valve. The valve hysteresis is also displayed, for this purpose the various positions across the entire valve range are approached in steps.

When the Valve Signature starts, the entire valve operating range for the "open and closed directions" is covered in an uncontrolled manner (open loop test). During this process, the pressure patterns of the diagnostic pressure sensors are recorded using a configurable number of 10 … 100 positions.

For each step, there is a 4-second delay so that the valve can set itself after the required position has been reached.

Once the signature test is complete the parameters selected by the user are loaded from the device and displayed. Consequently, excessively heavy movement of the valve is displayed as a greater hysteresis.

Additionally, the position and signal waveform for the optional Universal Input can also be recorded.

Up to 5 Valve Signatures can be saved in the device; these can be compared so that valve diagnostics can be performed for the purpose of preventive maintenance.

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i   **IMPORTANT (NOTE)**
For double-acting actuators, the pressure difference in both of the chambers should be used for diagnostics.

In the Valve Signature example shown in Fig. 4 below, an increased output pressure is required to move the valve from its seating position.

During closure, greater pressure from the actuator chamber must also be applied to the same position so that the valve can move into its seat.

In this example the Valve Signature shows increased friction at the valve seat and moving out of the end position.
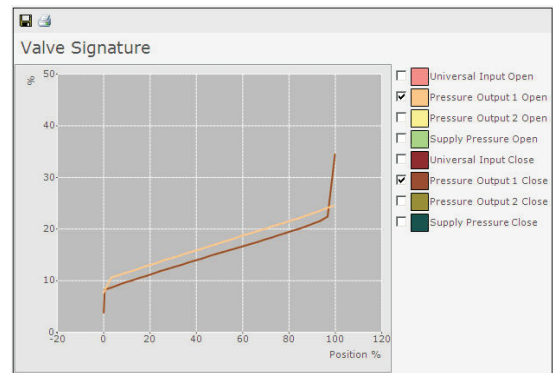
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Fig. 4

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