

10.4.3. Smart valve positioners and their use in safety instrumented systems

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As part of efforts to reduce life cycle costs of control valves in the process industry, smart electropneumatic positioners play an important role due to their self-adaptive features and their highly developed diagnostic functions. Their use can lead to decisive improvements in availability and reliability. To make full use of this potential, which has often been discussed in theory in the past but hardly been put into practice to date, NAMUR Recommendation 107 and Guideline VDI 2650 provide information on the scope of diagnostics and the generation of alarm states.

Applications in safety instrumented systems are of particular interest as smart positioners are used more and more with on/off valves in place of classic solenoid valves. In the process industry, the use of on/off valves in safety instrumented systems is governed by the IEC 61511 standard. The basic principle behind this standard is the safety management life cycle, which can be effectively supported by the diagnostic functions of positioners.

Modern positioners mounted on control valves in the process industry are smart, microprocessor-based instruments. Besides their main task of controlling the valve position, positioners include extensive diagnostics, which have evolved over the years into a fully developed technology.

Detectable faults and diagnostic methods	
Fault	Reference used by diagnostics
Set point deviation	Directly from the raw data
Valve friction	Step response test, hysteresis test
Valve shut-off impaired (internal leakage)	Zero shift, external ultrasonic sensor
External valve leakage, packing leakage	Packing chamber monitored by external pressure switch, change in valve friction
Packing or bellows wear	Travel counter, cycle counter, change in valve friction
Valve plug wear or damage	Zero shift, change in valve friction around zero point
Actuator spring broken	Pressure/travel characteristic
Unstable control performance	Travel sensor, system deviation histogram
Changed process characteristic	Valve position histogram, cycle counter, cycle counter histogram

Table 10.4.3.-1: Detectable faults and diagnostic methods