

Foreword

This technical report applies to throttling control valves in closed loop control applications. The concept has some application to open loop control applications but does not address control valves used in on-off control service. In the context of this document, the control valve includes these components: a valve, an actuator, a motion conversion mechanism, and accessories such as a positioner, transducer, signal booster relay, air set, and snubber.

Abstract

This document describes the characteristic response of a control valve to step input signal changes, considering the factors that affect this response, the impact of the response on the quality of process control, and the appropriate control valve specifications. In this document, a control valve is the complete control valve body, with actuator and any accessories required for normal operation assembled and ready for use. This document identifies and defines four regions of control valve response to step input changes of varying sizes and provides guidance that can be used to relate the control valve performance to process control.

Key words

Accessories, actuator, amplitude, backlash, bench test, closed loop, closed loop time constant, control valve, dead band, dead time, dynamic response, flow coefficient, hunting, in-process test, laboratory test, limit cycle, lost motion, motion conversion mechanism, nonlinear, open loop, overshoot, process control, process response, resolution, response, static, steady state, stem position, step change, step input signal changes, step response time, step size, step test, throttling control valve, time constant, valve, velocity limiting.

1 Purpose

This technical report is a reference for ANSI/ISA-75.25 01, *Test Procedure for Control Valve Response Measurement from Step Inputs*. It describes the characteristic response of a control valve to step input signal changes. It discusses the factors that affect this response, the impact of the response on the quality of process control, and the additional control valve specification parameters. This document discusses the impact of step response characteristics on process control performance, so the user can specify valve response metrics to meet process control performance objectives.

This document also supports ISA-75.26.01, *Control Valve Diagnostic Data Acquisition and Reporting*.

Users and manufacturers have developed a better understanding of the effects of control valve response characteristics on process control. This document identifies and defines four regions of control valve response to step input changes of varying sizes. Existing standards do not include the definitions and methods to measure certain valve characteristics now understood to be important. This technical report provides guidance that can be used to relate the control valve performance to process control.

2 Scope

This technical report is intended for use with throttling control valves in closed or open loop control applications. It may apply to other types of final control elements (for example, dampers, variable speed drives). The “control valve” in the context of this document includes the complete, ready-to-use assembly of the control valve body, actuator, and any required accessories. Exceptions should be noted.