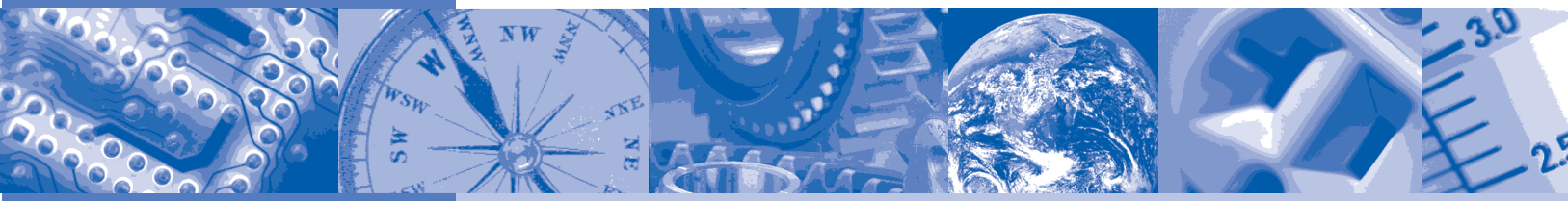
ANSI/ISA–TR75.25.02–2000



Control Valve Response Measurement from Step Inputs

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ISA–The Instrumentation, Systems, and Automation Society

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Control Valve Response Measurement from Step Inputs

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Contents

1 Purpose

This technical report describes the characteristic response of a control valve to step input signal changes. It considers 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 supports standard ANSI/ISA-75.25.01-2000, "Test Procedure for Control Valve Response Measurement from Step Inputs." See the standard for the test procedures.

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 applies to throttling control valves in closed loop control applications. The concept has some application to open loop control applications. It does not address control valves used in on-off control service. The “control valve” in the context of this document includes the following components:

Valve: A valve is a device used for the control of fluid flow. It consists of a fluid containing valve body assembly, one or more ports between connection openings and a moveable closure member, which opens, restricts or closes the port(s) (see ANSI/ISA-75.05.01-2000, "Control Valve Terminology").

Actuator: An actuator is a device that supplies the force and causes the movement of the valve closure member. Commonly these are fluid or electrically powered (see ANSI/ISA-75.05.01-2000). Actuators often use air but other types use electric, hydraulic and electro-hydraulic power.

Motion conversion mechanism: A mechanism installed between the valve and the power unit of the actuator to convert between linear and rotary motion where required. The conversion may be from linear actuator action to rotary valve operation or from rotary actuator action to linear valve operation.

Accessories: Additional devices used in the operation of the control valve. As described in ANSI/ISA-75.05.01-2000, typical examples include a positioner, transducer, signal booster relay, air set, snubber, etc.

3 Definitions

This document and ANSI/ISA-75.25.01-2000 make use of terms as defined in ANSI/ISA-51.1-1979 (R1993) "Process Instrumentation Terminology", and some of the essential terms are repeated here for convenience. In the specific area of nonlinear dynamics, it was determined that some terms defined in ANSI/ISA-51.1-1979 (R1993) lacked the precision desired for these documents. Others were inconsistent with the terminology used in the nonlinear control literature. A common set of definitions is used in ANSI/ISA-75.25.01-2000 and this document. Those used only in this document are marked with an asterisk (*).

3.1 backlash:*

in process instrumentation, a relative movement between connected mechanical parts, resulting from looseness when motion is reversed [ANSI/ISA-51.1-1979 (R1993)]. Sometimes also referred to as slop, lost motion, or free play.