ANSI/(NFPA)
T3.21.8-1990 (1996)
First edition
30 March 1990

AMERICAN NATIONAL STANDARDS INSTITUTE • A NATIONAL STANDARD FOR FLUID POWER

Pneumatic fluid power – Measurement of response time – Directional control valves

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Descriptors: fluid power; pneumatic; valve, pneumatic; response time; valve, testing; valve, directional control

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Any part of this standard may be quoted. Credit lines should read: Extracted from American National *Standard Pneumatic fluid power — Measurement of response time — Directional control valves***,** ANSI/(NFPA)T3.21.8-1990.

Published by
NATIONAL FLUID POWER ASSOCIATION, INC.

Foreword

This Foreword is not part of American National *Standard Pneumatic fluid power — Measurement of response time — Directional control valves*, ANSI/(NFPA)T3.21.8-1990.

In June 1974, the NFPA Technical Board authorized a project to develop a standard method for the measurement of the response time of pneumatic directional control valves. The project Group met on 3 December 1974 to discuss the type of testing that should be covered by the proposed standard. A first draft was prepared and reviewed at a meeting on 15 April 1975.

Subsequent drafts were then developed, and reviewed at meetings held on 13 April and l7 November 1976.

Draft No. 4 was circulated to the Members of the Project Group, and they submitted their comments to the project Chairman by mail. The project Chairman mailed a letter on 23 February 1977; this letter contained proposed changes to the draft which would resolve the various comments. These proposals were accepted by the Project Group Members and were incorporated in the General Review Draft.

A General Review Draft was prepared by NFPA Headquarters and circulated for general industry review on 2 June 1977.

The Project Group met on 21 February 1979 to review the comments. Several sections of the General Review Draft were rewritten to clarify their meaning.

On 16 November 1979 the Technical Board granted approval to ballot.

Headquarters staff prepared the first ballot draft on 7 May 1980.

The ballot draft was not concluded. Instead, the project group decided to perform a comprehensive round robin test to measure the variability of the procedure among member laboratories. This was done in conjunction with round robin tests for C_v flow rating and the sonic conductance flow rating for ISO.

After two years of tests and additional years of discussions, results were satisfactorily concluded. A Summary is shown in Annex A in generic terms - the actual data is on file with NFPA Headquarters.

A redraft was reviewed at the 22 October 1987 T3.21 Section Meeting and, because of the extensive time lapse from the last document, agreement was reached to proceed with another General Review.

NFPA's Technical Staff prepared the document for Second General Review on 11 December 1987.

Several technical comments were received from the Second General Review Draft, and additional input was received by the chairman from the Automotive Industry Action Group. This was all reviewed at the 16 March 1988 meeting of the project group and extensive revisions proposed.

As a result, a Third General Review Draft was prepared and circulated by NFPA Headquarters on 27 May 1988. Editorial changes resulted from this and Technical Board approval to Ballot was granted on 15 September 1988. NFPA Headquarters distributed the Second Ballot Draft on 23 September 1988.

Only one negative Ballot was received from the Ballot Draft, addressing the issue of I.D. tolerances in the flow tubes. A calculation of pressure loss due to the variation demonstrated this to be negligible and the negative Ballot was withdrawn. The Technical Board approved the standard on 16 March 1989.

Project Group members who developed this standard:

John Berninger
Project Chairman 1987 to present
Parker Hannifin Corp.

Logan Mathis
Section Chairman
Ross Operating Valve Co.

Robert Entwisle
Section Vice Chairman
Automatic Switch

A. Derek Millett
Technical Auditor
Vickers, Inc./TRINOVA Corp.

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Manager of Standards Development - Industry/National
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Clifford Allen
Lexair, Inc.

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Gerald Dalder
Ross Operating Valve Co.

Carlton Ebneth*
Alkon Corp.

Richard Fagerlie
MAC Valves

H. Fleischer
Numatics

Carroll Grigsby*
Schrader-Bellows Div.

Mike Lyons
WABCO Fluid Power Div.

* Company affiliation has changed.

On 27 November 1989, ANSI/(NFPA)T3.21.8 was submitted to Committee B93 for ballot. Balloting closed on 2 February 1990 with unanimous approval.

ANSI/(NFPA)T3.21.8 was approved by ANSI's Board of Standards review on 30 March 1990. The membership roster of Standards Committee B93 at the time of ballot:

Jack C. McPherson
Chairman

Daniel B. Shore
Vice Chairman

Shirley C. Seal
Secretary

American Society of Agricultural Engineers
David L. Newcom

Compressed Air & Gas Institute
David E. Bonn
John Addington (alternate)

Construction Industry Manufacturers
Glenn Stewart

Fluid Controls Institute, Inc.
Jude Pauli
E. C. Rutter (alternate)

Fluid Power Distributors
Thomas Neff

Fluid Power Society
William Adsit
Berry Ferguson
Robert Firth
Tom Frankenfield
Ray Hanley
Verne L. Middleton
Wayland Tenkku
Vincent Torrusio

Fluid Sealing Association
Alex Pilecki

Material Handling Institute
Jack C. McPherson
Jeff Hansell (alternate)

National Fluid Power Association
Richard N. Bailey
Robert Kay
Paul Schacht
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National Machine Tool Builders' Association
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Logan Mathis

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A. O. Roberts
Daniel B. Shore
W. L. Snyder
Jack Walrad
Tom Wanke
James C. White
Frank Yeaple

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Introduction

In pneumatic fluid power systems, power is transmitted and controlled through a gas under pressure within an enclosed circuit. In some circumstances, the time required to charge or vent a volume is of importance to the fluid power system designer.

Standard Pneumatic fluid power — Measurement of response time — Directional control valves

1 Scope and field of application

This Standard is intended:

1.1 To include a standardized procedure for defining, determining and reporting the response time of electrically or pneumatically operated pneumatic directional control valves. The results are applicable only to compressed air at the pressure and temperature at which the test was conducted. Although the method contained can be applied to other gases, pressures or temperatures, these cases are outside the scope of this standard.

1.2 To establish a standard definition of response time.

1.3 To promote improved pneumatic fluid power systems by providing manufacturers and users with a standardized procedure for measurement of the dynamic performance of electrically or pneumatically operated pneumatic directional control valves.

1.4 To establish a standard means of communicating these results.

2 References

ANSI/B93.2, *Fluid power systems and products — Glossary*.

ISO 1219, *Fluid power systems and components — Graphic symbols*.

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*.

ISO 5598, *Fluid power systems and components — Vocabulary*.

NFPA/T2.10.1M, *Metric Units for Fluid Power Applications*.

ISO 2944, *Fluid power systems and components — Nominal pressures*.

3 Terms and definitions

For the purpose of this standard, the following definitions apply. For definitions of other terms, see ANSI/B93.2.

3.1 response time: The time interval in which the pressure in a test chamber connected to an outlet port of a pneumatic directional control valve changes by 90 % between specified pressure levels in response to a change in the control signal to that valve.

3.2 test chamber: A vessel of measured volume capable of statically containing an imposed pressure.

3.3 output volume: The sum of the downstream volumes under test, composed of the test chamber, its connecting conductors, fittings and the pressure transducer.