National Fluid Power Association

ANSI/(NFPA)T3.6.59-1993 (R2007)
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Hydraulic fluid power – Cylinders – Cushion performance

A NATIONAL INDUSTRY STANDARD FOR FLUID POWER

Approved by Committee ASC B93,
accredited by the American National Standards Institute (ANSI)

Descriptors: cushion information cushion performance energy absorption guidelines hydraulic fluid power linear system

Developed and published by

NATIONAL FLUID POWER ASSOCIATION

3333 N. Mayfair Road, Suite 211 • Milwaukee, WI 53222-3219 USA
Phone: +1 414 778-3344 • Fax: +1 414 778 3361 • e-mail: nfpa@nfpa.com

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Foreword

This foreword is not part of American National Standard Hydraulic fluid power — Cylinders — Cushion performance, ANSI/(NFPA)T3.6.59-1993.

At the 16 March 1988 meeting of the Cylinder Section (T3.6) it was recommended that a document be initiated dealing with cushion performance. John Harding (Hydro-Line Mfg.) agreed to serve as project chairman. On 17 May 1989 a TSP was presented to the Cylinder Section for their approval. It was recommended by the section to alter the abbreviated title to "Hydraulic Cylinder Cushion Performance" and the word "performance" in the Purpose section be replaced by "suitability". The Cylinder Section approved the revised TSP and recommended that it be submitted to the NFPA Technical Board for approval. On 15 June 1989 the Technical Board concurred with the Cylinder Section and granted approval of the TSP.

At the 16 August 1989 meeting of the Cylinder Section, John Harding resigned as project chairman. Richard Schink (Hydro-Line Mfg.) agreed to serve as project chairman.

On 15 November 1989 Chairman Schink (Miller Fluid Power Corp., company affiliation has changed) reported that the project was progressing well. A working draft was prepared and discussed by the project group on 21 March 1990. It was recommended that the document be submitted to NFPA headquarters for processing. This draft will be submitted to the Cylinder Section for discussion at their 22 August 1990 meeting. If approved by the Section it will be submitted for general review.

On 22 August 1990 the Cylinder Section concurred with the project group's recommendation to submit the document for general review. NFPA's Technical Staff prepared the document for General Review on 19 October 1990.

The General Review closed with comments from two companies. These editorial changes were incorporated into the document. At the 13 November 1991 meeting, T3.6 agreed to send the document to the Technical Board for approval to ballot.

The Technical Board met on 16 January 1992 and approved T3.6.59 for ballot. NFPA Headquarters prepared the document for ballot and it was sent out 29 January 1992.

The ballot closed 10 March 1992 with two negatives. Project Chairman Schink (Vickers, Inc., company affiliation has changed) discussed the negative comments with both commentators and made minor changes to the document. Both negatives were changed to approvals by 4 June 1992.

The Technical Board granted final approval on 17 September 1992.

Project Group members who developed this standard:

Richard Schink
Project Chairman
Vickers, Inc.

Donald Selke
Section Chairman
The Sheffer Corp.

Paul Gies
Section Vice Chairman
Vickers, Inc./T-J Division

E. Wayne Hays
Section Secretary
Bimba Manufacturing Co.

David Prevallet
Technical Auditor
Dana Corp.

Linda E. Gasso
Technical Coordinator
National Fluid Power Association

Shirley C. Seal
Manager of Standards Development
Industry/National
National Fluid Power Association

Lido Boni
Parker Hannifin Corp.

Eric Johnston*
S-P Manufacturing

Gregory Pesch
Hanna Corp.

*Company affiliation has changed

On 16 October 1992, ANSI/(NFPA)T3.6.59 was submitted to ANSI Committee B93 for Ballot. Balloting closed on 21 December 1992 with no negative comments.

ANSI/(NFPA)T3.6.59 was approved by ANSI's Board of Standards Review on 22 March 1993.

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Hydraulic fluid power — Cylinders — Cushion performance

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit.

Standardization of presentation of cushion information will allow users to better apply cylinders and compare various company's products. This standard would be used by individual manufacturers to establish cushion capabilities if the stated assumptions are taken into account.

1 Scope

1.1 This standard defines maximum energy absorption guidelines for ANSI/B93.15.

1.2 This standard will develop a method of presenting hydraulic cushion suitability.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this ANSI document. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this ANSI document are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. NFPA maintain registers of currently valid NFPA/ANSI standards.

ANSI/B93.2-1986, *Fluid power systems and products - Glossary.*

ANSI/B93.15-1981, *Fluid power systems and products - Square head industrial cylinders - Mounting dimensions.*

3 Terms

For definition of terms used, see ANSI/B93.2.

4 Key assumptions and limitations

These assumptions provide either ideal or arbitrary parameters for determining maximum cushion performance. Actual performance may be different than determined by these methods if assumptions are not maintained. The efficiency factors may also vary with application differences.

4.1 Maximum cushion pressure is 150% of rated pressure.

4.2 The cushion achieves constant deceleration - pressure is constant for the length of the cushion plunger.

4.3 The upper limit of velocity is 18 in/sec.

4.4 If velocity is below 4 in/sec the cushions become ineffective on smaller sizes.

4.5 Friction force is zero.

4.6 The cylinder is used in a linear system - not for rotary applications.

4.7 Fluid viscosity is equivalent to 25 centistokes.

4.8 Drive pressure is equal to the system relief valve setting.

4.9 Cushion adjustment screws may be provided to tune cushion performance within limits.

4.10 Each manufacturer is to adjust the reported energy absorbing potential of his own product with an efficiency factor to reflect characteristics of their cushion design compared to ideal cushion performance.