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Hydraulic valve – Pressure rating supplement to NFPA/T2.6.1 R2-2000, Fluid power components – Method for verifying the fatigue and establishing the burst pressure ratings of the pressure containing envelope of a metal fluid power hydraulic valve

(Revision of NFPA/T3.5.26 R1-1996)

A NATIONAL INDUSTRY STANDARD FOR FLUID POWER

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Foreword

This Foreword is not part of National Fluid Power Association Standard *Hydraulic valve – Pressure rating supplement to NFPA/T2.6.1 R2-2000, Fluid power components – Method for verifying the fatigue and establishing the burst pressure ratings of the pressure containing envelope of a metal fluid power hydraulic valve,* NFPA/T3.5.26 R2-2000.

This project was initiated on 11 February 1997. The Technical Board approved the TSP on 10 April 1997. The first draft was an update to coordinate the document with the updated NFPA/T2.6.1 R2. Both were issued for general review on 30 December 1998. Comments were reviewed at the T2.6 committee meeting of 9 February 1999, and proposed changes were reviewed by the T3.21 committee at its meeting of 18 May 1999. The ballot draft was prepared by NFPA headquarters on 2 August 1999. Negative ballots were resolved by the T3.5 committee at its meeting of 22 September 1999 and the Technical Board gave final approval on 18 November 1999.

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Introduction

In fluid power systems, power is transmitted and controlled through a fluid (liquid or gas) under pressure within an enclosed circuit. During operation, hydraulic valve(s) in a system may be loaded from internal pressure, gravity, inertia, thermal variations and external forces. The nature of these loads can vary from a single static application, to continuously varying amplitudes, repetitive loadings and even shock.

It is important to know how well a hydraulic valve(s) can withstand these loads but this standard focuses on the loading due to internal pressure.

There are many ways in which internal loads are imposed upon a hydraulic valve(s). This standard considers a broad range of pressure waveforms within prescribed time limits, temperatures, environmental conditions and only upon certain metals. It is anticipated that these limitations could still provide sufficient common ground for comparing products. This rating method, therefore, provides the system designer with certain information to assist in a selection of hydraulic valve(s) for an application. The designer still has the responsibility to consider the other loading characteristics described above and to determine how they might affect the hydraulic valve(s) ultimate pressure retaining capability.

This standard serves as a universal “verification test” to give credibility to the many in-house and other methods of determining hydraulic valve pressure ranges. The credibility is based upon the fundamental nature of fatigue of metals with its statistical treatment and a mathematical development of the theory is included. Nevertheless, design knowledge of the hydraulic valve population and its representative samples, including consistency in materials, shapes, fabrication techniques, etc. is necessary to maximize accuracy in the verification method.

This standard describes specific methods for testing hydraulic valve(s) verifying their fatigue pressure ratings and establishing burst pressure ratings. It also provides specific means to determine some of the optional parameters.

This standard is a supplement to the basic pressure rating standard, NFPA/T2.6.1 R2. It follows the provisions of that document but is more specific to hydraulic valve(s). Application of this pressure rating method will require use of both documents.

This version of NFPA/T3.5.26 R2 replaces earlier editions and utilizes the same basic theory. Products rated under the first (1976) edition may not be rated to the same values under this edition. See 12.1 for the differences in rating identification.

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1 Scope

1.1 This standard provides:

– test and statistical methods for generating fatigue distribution data;

– test and statistical methods for conducting a verification of the pressure ratings on fluid power hydraulic valves;

– common requirements and an industry-wide philosophy in judging one type of pressure capability for hydraulic valves typically used in fluid power applications;

– uniform methods of product comparison;

– hydraulic valves may contain one or more pressure zones. Each pressure zone may have pressure ratings based on a maximum differential pressure to an adjacent lower pressure zone or atmosphere;

– attachments (see 3.3) can be rated as integral parts of hydraulic valves or as an independent components.

1.2 This standard limits conditions as follows:

– constant amplitude, pressure induced loading of the elements that constitute or maintain the pressure containing envelope;

– product life of at least 100,000 cycles;

– pressure levels and pulse durations as defined in NFPA/T2.6.1 R2-2000;

– temperatures from the charpy impact transition temperature to the threshold of creep sensitivity;.

– environments which are chemically compatible with the materials of the pressure containing envelope;

– materials that are aluminum, magnesium, steel, iron, copper based alloys, cobalt, titanium, stainless steels, nickel steels and monel. Specifically excluded are more creep sensitive materials such as: zinc, plastic, rubber and sealing devices.

1.3 This standard encourages manufacturers to use this common method to enhance the credibility of their pressure ratings.