National Fluid Power Association

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Hydraulic filter/separator housing – 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 filter/separator

(Revision of NFPA/T3.10.5.1 R1-1997)

A NATIONAL INDUSTRY STANDARD FOR FLUID POWER

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Descriptors: hydraulic filter separator housing fluid power RFP verification test constant amplitude pressure ratings pressure containing envelope copper based alloys statistical methods verification fatigue distribution data.

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Foreword

This Foreword is not part of NFPA Recommended Standard *Pump/Motor – 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 pump and motor,* NFPA/T3.10.5.1 R2-2000

The project was initiated on 11 February 1997 and the TSP was approved by the Technical Board on 10 April 1997. The first draft was updated 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. One negative ballot was reviewed at the T2.6 meeting on 22 September 1999. It was resolved 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 filter/separator housing(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 filter/separator housing(s) can withstand these loads, but, this standard addresses only the loading due to internal pressure.

There are many ways in which internal pressure loads are imposed upon a hydraulic filter/separator housing(s). This standard considers a broad range of waveforms but 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 filter/separator housing(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 filter/separator housing(s) ultimate pressure retaining capability.

There are many standards already in existence for pressure rating individual components (e.g. maximum allowable operating pressure) and this standard is not intended to displace them. Instead, a method of fatigue verification is provided.

This standard serves as a universal “verification test” to give credibility to the many in-house and other methods of determining hydraulic filter/separator housing(s) pressure ratings. The credibility is based upon the fundamental nature of fatigue of metals with its statistical treatment and use of the pressure rating verification theory developed in NFPA/T2.6.1 R2. Nevertheless, design knowledge of the hydraulic filter/separator housing(s) 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 filter/separator housing(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 filter/separator housing(s). Application of this pressure rating method will require use of both documents.

This version of NFPA/T3.10.5.1 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 clause 15 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 filter /separator housing(s);

– common requirements and an industry-wide philosophy in judging one type of pressure capability for fluid power hydraulic filter/separator housing(s);

– uniform methods of product comparison.

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;

– defined conditions for pressure levels and pulse durations;

– 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 creep sensitive materials such as: zinc, plastic, rubber and sealing devices;

– to exclude the finite life RFP rating for a hydraulic filter /separator housing (such as spin-on filters) used in finite life applications. See ANSI/(NFPA)T3.10.17.

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