



**NFPA Recommended Standard  
NFPA/T2.24.2 R1-2007 (R2017)**

Second edition  
14 November 2007

---

**AN INDUSTRY STANDARD FOR FLUID POWER**

**Hydraulic fluid power systems —  
Methods for preventing external leakage**

**(Revision of ANSI/(NFPA)T2.24.2-1997)**

**Descriptors:** component temperature, external leakage, fluid power, fluid contaminant, fluid temperature, hydraulic systems, industrial hydraulic systems, mobile hydraulic systems, sealing reliability

---

published by

**NATIONAL FLUID POWER ASSOCIATION, INC.**

6737 W. Washington St. Ste. 2350 / Milwaukee, WI 53214 USA  
PHONE: +1 414 778 3344 / FAX: +1 414 778 3361 / E-mail: [nfpa@nfpa.com](mailto:nfpa@nfpa.com)

Copyright 2007 by the  
**NATIONAL FLUID POWER ASSOCIATION**  
Printed in the USA

All standards, recommended practices, information reports, and bibliographies (collectively, "NFPA Documents") are advisory only. Use thereof by anyone for any purpose is entirely voluntary and in any event without risk of any nature to the National Fluid Power Association (NFPA), its officers, directors or authors of such work. There is no agreement by or between anyone to adhere to any NFPA Document. In formulating and approving NFPA Documents, NFPA and/or its councils and committees will not investigate or consider citations, references or patents which may or may not apply to such subject matter since prospective users of such NFPA Documents alone are responsible for establishing necessary safeguards in connection with utilization of such matters, including technical data, proprietary rights or patentable materials.

The information and data contained in NFPA Documents has been obtained from sources believed to be reliable. However, it should not be assumed that all acceptable or applicable sources of information, procedures, methods or techniques are contained in NFPA Documents, or that additional measures may not be required under certain circumstances or conditions.

NFPA Documents and/or policies and procedures are subject to periodic review and may be changed without notice. NFPA Documents are only current as of their publication date. NFPA Documents, after publication, may be revised or withdrawn at any time and current information on all NFPA Documents may be received by calling or writing NFPA. Additionally, the various codes and regulations referenced in NFPA Documents may be amended from time to time and it should not be assumed that the versions referenced therein are the most current versions of such codes and regulations. Please consult the appropriate regulatory authorities for the most up-to-date versions.

NFPA Documents imply a consensus of those substantially concerned with their scope and provisions and are intended as a guide to aid the manufacturer, the consumer and the general public. The publication of NFPA Documents does not in any respect preclude anyone, whether they have participated in the development of or approved such NFPA Documents or not, from manufacturing, marketing, purchasing, or using of products, processes or procedures not conforming to the NFPA Documents. NFPA Documents do not constitute or indicate a warranty of any sort, express or implied, including but not limited to a warranty or representation as to quality, merchantability or fitness for a particular use or purpose.

Participation by federal agency representative(s) or person(s) affiliated with the industry is not to be interpreted as government or industry endorsement of an NFPA Document(s).

#### **NOTICE**

NFPA Documents do not express or imply any judgment, certification or endorsement of or with respect to, the safety, design or performance of any product, component, or its use.

NFPA does not examine, investigate, test, recommend, or certify the design, use or safety of any product or component, even those which may incorporate one or more NFPA Documents. NFPA Documents therefore have no application to and do not express or imply any recommendation, representation or warranty, with respect to the safety, design, use, performance, or functional interchangeability of components or products which incorporate NFPA Documents.

This publication may not, in whole or in part, be reproduced, copied or disseminated, entered into or stored in a computer database or retrieval system, or otherwise utilized without the prior written permission of NFPA.

## Foreword

This Foreword is not part of NFPA Recommended Standard *Hydraulic fluid power systems – Methods for preventing external leakage*, NFPA/T2.24.2 R1-2007.

The NFPA Technical Board endorsed the recommendation to revise NFPA/T2.24.2-1997 on 6 January 2004. The Hydraulic Systems Technology Committee NFPA/T2.24 approved a TSP on 17 February 2004, and the NFPA Technical Board approved a TSP on 1 April 2004.

Preliminary Draft 1 was reviewed and revised by NFPA/T2.24 at its 17 February 2004 meeting, resulting in a Draft 2. Additional comments and communications resulted in Draft 3, dated 30 April 2004, for discussion at the 20 May 2004 meeting.

At its 20 May 2004 meeting, NFPA/T2.24 reviewed Draft 3 and suggested a number of changes to be made. It was noted that the project leader Jerry Carlin had incorporated information sent by Jack Walrad and comments on connectors from Paul DeWitt of Eaton Corporation. Tom Wanke provided a list of comments on the document, many of which were accepted. Revisions were made to the document, based on changes agreed upon at the meeting. Messrs. Carlin and Wanke agreed to research several issues and provide input for possible changes to the document, for discussion at the 21 September 2004 meeting.

At the 21 September 2004 meeting, NFPA/T2.24 approved a minor rewording of the scope, agreed on added statements noting the normal maximum applicable pressure, and made other corrections and clarifications. These clarifications were reviewed again at an 18 March 2005 meeting, resulting in the preparation of Draft 5 on 25 May 2005.

At its 21 September 2004 meeting, NFPA/T2.24 approved a motion to circulate the document for general review. The general review ballot was circulated on 11 November 2005, and closed on 22 December 2005. All comments were resolved satisfactorily.

On 3 August 2006, NFPA/T2.24 approved a motion via the on-line forums to request approval from the NFPA Technical Board to circulate the document for final ballot. The NFPA Technical Board gave its approval for this ballot at its 10 August 2006 meeting. The document was circulated for final ballot on 22 March 2007, which closed on 7 May 2007.

The NFPA ballot resulted in eight approval votes, zero disapprovals and one abstention. All comments were editorial and were satisfactorily resolved at the joint meeting of NFPA/T2.24 and U.S. TAG SC 9/WG 1 on 16 May 2007, where a motion was approved to ask the NFPA Technical Board for permission to publish the document. At its 9 August 2007 meeting, the NFPA Technical Board gave its approval to publish the document.



NFPA project group members who developed this standard:

**Jerry Carlin**  
Technology Committee Chairman and  
Project Chairman  
Eaton Corp.

**John Berninger**  
Technical Auditor  
Parker Hannifin Corp.

**Fred Biederman**  
Hydraforce, Inc.

**Jim Bolinger**  
Sauer-Danfoss (retired)

**John Kaufman**  
Caterpillar Inc.

**Chuck Meinke**  
Bosch Rexroth Corp.

**John Montague**  
Consultant

**Bryan Nelson**  
Caterpillar Inc.

**Jack Walrad**  
Consultant

**Tom Wanke**  
Milwaukee School of Engineering

**Carrie Tatman Schwartz**  
Industry/National Standards Development  
Manager  
National Fluid Power Association

This is a preview of "NFPA/T2.24.2 R1-2007...". [Click here to purchase the full version from the ANSI store.](#)

## **Introduction**

This recommended standard is intended to promote reliable sealing of hydraulic systems. It identifies common sources and causes of external leakage and recommends preventive measures known to be effective. Use of these practices will help to eliminate external leaks in hydraulic equipment.

# Hydraulic fluid power systems — Methods for preventing external leakage

## 1 Scope

This recommended standard applies to hydraulic fluid power systems for mobile and stationary industrial machinery. It is intended to assist in system design, installation, and maintenance by describing established methods for achieving reliable sealing to prevent external leakage.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this NFPA document are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referenced applies. NFPA maintains registers of currently valid NFPA Standards. Standards development organization contact information and links can be found on the NFPA website ([www.nfpa.com](http://www.nfpa.com)).

NFPA/T3.19.25 R1, *Information report – Fluid power systems – Sealing devices – Storage, handling and installation of elastomeric seals and exclusion devices*

NFPA/T2.24.1 (latest edition), *Hydraulic fluid power – Systems standard for stationary industrial machinery – Supplement to ISO 4413:1998 – Hydraulic fluid power – General rules relating to systems*

IEEE/ASTM SI 10 (latest edition), *Standard for Use of the International System of Units (SI): The Modern Metric System*

ISO 1000 (latest edition), *SI units and recommendations for the use of their multiples and of certain other units*

ISO 3305 (latest edition), *Plain end welded precision steel tubes – Technical conditions for delivery*

ISO 3601-1 (latest edition), *Fluid power systems – O-rings – Part 1: Inside diameters, cross-sections, tolerances and designation codes*

ISO 3601-2 (latest edition), *Fluid power systems – O-rings – Part 2: Housing dimensions for general applications*

ISO 3601-3 (latest edition), *Fluid power systems – O-rings – Part 3: Quality acceptance criteria*

ISO 3601-4 (latest edition), *Fluid power systems – O-rings – Part 4: Anti-extrusion rings (back-up rings)*

ISO 3601-5 (latest edition), *Fluid power systems – O-rings – Part 5: Suitability of elastomeric materials for industrial applications*