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8 January 2009

AN INDUSTRY STANDARD FOR FLUID POWER

**Hydraulic fluid power –
Two-, three-, and four-port screw-in cartridge valves –
Cavities with UN and UNF threads**

**(Revision of NFPA/T3.5.50-2009)
Reaffirmed 2019**

Descriptors: hydraulic fluid power port screw-in cartridge valve un unf thread cavities

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Foreword

This foreword is not part of National Fluid Power Association (NFPA) Recommended Standard *Hydraulic fluid power – Two-, three-, and four-port screw-in cartridge valves – Cavities with UN and UNF threads*, NFPA/T3.5.50-2009.

This project was initiated on 10 February 1999, and Ron Rueter (Hydraforce, Inc.) agreed to serve as Project Chair.

On 19 May 1999, the project group met, reviewed and updated draft no. 1, and agreed that NFPA/T3.5.50-200x was to be forwarded to the U.S. TAG to ISO/TC 131/SC 5/WG 2 for consideration as an ISO new work item.

The Technical Board approved the Title, Scope and Purpose (TSP) on 18 November 1999.

On 17 May 2000, the project group met, reviewed the latest draft of the document and decided that the document was ready to be circulated for a first general review.

On 20 September 2000, the project group met, discussed the comments received from the first general review circulated on 9 June 2000, and made corrections to the document. The results of the first general review resulted in 15 approvals, one disapproval, four abstentions and 40 no replies. Mr. Rueter attended the Technical Board meeting on 16 November 2000 and recommended that the document be circulated for final ballot.

While there is no record of the Technical Board approving the document for final ballot, the document was circulated for final ballot on 7 January 2001. The results of the final ballot resulted in 12 approvals, one disapproval, five abstentions and 27 no replies.

On 17 May 2001, Mr. Rueter reported to the project group on his review of ISO 11926-1, which uses fractions to express the thread size. Members reviewed the final ballot comment log, and Mr. Rueter agreed to respond to Mr. Carlin's disapproval comments and update the document. Members made a recommendation to NFPA/T3.5 to approve NFPA/T3.5.50-200x for publication, pending resolution of Mr. Carlin's comments.

On 6 July 2001, Eaton Corporation reaffirmed their disapproval, and the Technical Board subsequently removed the document from the agenda during its 20 August 2001 meeting, because of the unresolved disapproval vote.

On 19 September 2001, Mr. Rueter reported that the cavities for screw-in cartridge valves document originated in France. He approached NFPA/T3.5 members to develop a standard for cavities for screw-in cartridge valves with the intention that the NFPA document be deactivated as soon as the ISO document was completed. Both the NFPA and ISO documents were circulated for ballot, at which time Eaton submitted a vote of disapproval based on the added cavities for main system relief cavities; earlier drafts added a single new cavity per cavity size for main system relief cavities, with a change just in the nose sealing diameter. The latest draft carried that even further by referring to ISO 7789 for examples of main system relief cavities.

Project group members agreed that the manufacturers' catalogs should state the information needed by end users (adding the flow requirements to the document would

assist end users), to accept Eaton's comments and to add wording regarding the end users' responsibility to point out specific facts. Project group members also approved a recommendation to the Technical Board for approval of NFPA/T3.5.50-200x to be circulated for second final ballot, pending Mr. Carlin's acceptance of the comment approval letter.

However, at its 19 September 2001 meeting, the NFPA/T3.5.50-200x project group agreed to submit the project for another general review, as the disapproval vote from the final ballot could not be resolved without major changes to the document.

At its 6 February 2002 meeting, the project group agreed to modify the document and asked Mr. Rueter to incorporate the agreed-upon changes and circulate the revised document to those in attendance at the project group meeting for comments.

At its 18 September 2002 meeting, the project group reviewed an advance version of the second general review draft, dated 2 January 2001, made changes and agreed that a second general review draft ballot should be circulated. At the NFPA/T3.5 meeting on the same day, the group approved a motion to circulate an updated document for second general review.

The second general review was circulated on 28 February 2003 and resulted in seven approvals, zero disapprovals, four abstentions and 30 no replies. No comments were submitted with the votes.

At its 14 May 2003 meeting, the project group reviewed the results of the second general review and recommended to NFPA/T3.5 that the document be circulated for second final ballot. NFPA/T3.5 approved this recommendation, which was submitted to and approved by the Technical Board on 26 June 2003, pending an update in accordance with the resolution of comments from the last draft and receipt of a satisfactory technical auditor's report.

Although there is no technical auditor's report on record, the document was submitted for second final ballot on 27 August 2003, and resulted in seven approvals, two disapprovals, two abstentions and 32 no replies.

At its 25 September 2003 teleconference, the project group reviewed the results of the second final ballot, resolved the comments and approved a motion asking NFPA Headquarters to forward the comments on the second final ballot to Mr. Rueter and approving the second final ballot.

At the 18 February 2004 joint meeting of NFPA/T3.5 and U.S. TAG SC 5/WG 2, Mr. Rueter agreed to communicate with commentators to resolve their comments in the document. Since this meeting, NFPA headquarters discovered that many steps in the standard's development process had not been correctly followed.

At the 19 May 2004 joint meeting of NFPA/T3.5 and U.S. TAG SC 5/WG 2, Ms. Wetzel highlighted the steps that were incomplete during the development of this project, particularly with letters not being sent to commentators and not receiving Technical Board approval for various steps. The group approved a motion to repeat document development steps, starting with a general review of the document. The general review draft would be the same draft that will be sent to ISO as a new work item proposal for a Technical Report, once Ms. Boehme, Ms. Wetzel and Mr. Rueter review the draft. Since there was not documentation whether certain ballot comments were responded to, the general review message will indicate that any comments not previously addressed should be resubmitted.

At the 22 February 2006 joint meeting of NFPA/T3.5 and U.S. TAG SC 5/WG 2, committee members reviewed a draft of the document, and voted to send it out for a third general review. It was circulated for third general review, which closed on 3 April 2006.

At the 17 May 2006 joint meeting of NFPA/T3.5 and U.S. TAG SC 5/WG 2, the group formulated replies to the comments from the third general review, and approved a motion to request approval from the NFPA Technical Board to circulate the document for a third final ballot, pending sign-off from one commentator. At its 10 August 2006 meeting, the NFPA Technical Board approved a motion to circulate the document for a third final ballot. It was circulated for third final ballot on 3 January 2007.

The third final ballot resulted in five approval votes, three disapprovals and four abstentions. During a project group teleconference call on 28 March 2007, the group discussed the ballot results, and the comments were satisfactorily resolved. Consequently, those who initially voted disapproval changed their votes to approval.

The document was updated from the comments from the third final ballot, and this draft was discussed during the 16 May 2007 joint meeting of NFPA/T3.5 and U.S. TAG to ISO/TC 131/SC 5/WG 2. A motion was approved to ask the NFPA Technical Board for permission to circulate the draft for fourth final ballot. The NFPA Technical Board gave such approval at its meeting on 9 August 2007.

The document was circulated for fourth final ballot on 15 August 2007 and closed on 15 September 2007. The voting resulted in nine approval votes, one disapproval, three abstentions and several comments. The comments were satisfactorily resolved and the disapproval vote was changed to approval. Because the comment resolutions resulted in technical changes, the document was rebalotted.

The updated document was circulated for fifth final ballot on 6 August 2008 and closed on 6 September 2008. The voting resulted in nine approval votes, zero disapprovals and two abstentions, and the comments were satisfactorily resolved. At the 17 September 2008 joint meeting of NFPA/T3.5 and U.S. TAG to ISO/TC 131/SC 5/WG 2, a motion was approved to ask the NFPA Technical Board for permission to publish the document. The NFPA Technical Board gave such approval at its meeting on 8 January 2009.

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Introduction

Screw-in cartridge valves are becoming increasingly popular in hydraulic fluid power applications worldwide. The number of manufacturers of these products has grown substantially in recent years. The application of these products requires the use of a valve cavity prepared by machining. The specifications for the machined cavity may come from a source other than the cartridge manufacturer. A recognized standard for these cavities is needed to assure interchangeability.

In recognition of this need, a standard for screw-in cartridge valve cavities with metric threads was developed (ISO 7789:1998). This standard is directed toward a new range of cavities for which a full range of valve functions and sizes do not yet exist.

The purpose of this standard (NFPA/T3.5.50) is to provide a range of cavities with UN and UNF threads and sizes that match the fit requirements of the majority of cartridge valves produced and applied worldwide today.

It is not proposed that this standard will replace ISO 7789. NFPA/T3.5.50 is needed to enhance uniform interchangeability among existing products that are currently used worldwide and continue to be produced in ever-increasing quantities and valve functions. This same need exists in threaded ports for hydraulic valves and is met by having standards for both the metric and UN and UNF threaded ports. The cavity standard proposed will use the port form and thread in ISO 11926-1.

This standard fulfills the following five points, which are the priorities agreed upon by ISO/TC 131:

- 1) the standard is needed to assure functionality in fluid power applications of cartridge style valves. Currently, the user has no assurance that cartridge valves of the same basic size actually fit properly into a cavity of the same basic size if it was made to a different manufacturer's specification;
- 2) the ability of screw-in cartridge valves to fit into customized applications is an important factor in choosing fluid power over other means of motion control;
- 3) a cavity standard for the screw-in cartridge valves currently in use will allow users to make performance comparisons in selecting valves;
- 4) a cavity standard for the screw-in cartridge valves currently in use will simplify selection and application of valves;
- 5) a cavity standard for the screw-in cartridge valves currently in use will result in less variety of non-standard cavities. It will also simplify tooling selection in the manufacture of manifold systems.

Hydraulic fluid power – Two-, three-, and four-port screw-in cartridge valves – Cavities with UN and UNF threads

1 Scope

1.1 This standard specifies the dimensions relating to cavities with UN and UNF threads in which two-, three-, and four-port screw-in cartridge valves are mounted, in order to ensure dimensional interchangeability.

NOTE For size 4, 7 and 12 cavity dimensions, see manufacturers' recommendations. Cavity sizes 4, 7 and 12 may be added in future editions of this document.

1.2 It is applicable to two-, three-, and four-port screw-in cartridge valves generally used in industrial, agricultural, mining and mobile equipment.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this NFPA 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 and ANSI/(NFPA) Standards. Standards development organization contact information and links can be found on the NFPA website (www.nfpa.com).

ISO 1101 (*latest edition*), *Geometrical Product Specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out*.

ISO 1302 (*latest edition*), *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*.

ISO 5598 (*latest edition*), *Fluid power systems and components – Vocabulary*.

ISO 7789 (*latest edition*), *Hydraulic fluid power – Two-, three- and four-port screw-in cartridge valves – Cavities*.

ISO 11926-1 (*latest edition*), *Connections for general use and fluid power – Ports and stud ends with ISO 725 thread and O-ring sealing – Part 1: Ports with O-ring seal in truncated housing*.

ISO 16874 (*latest edition*), *Hydraulic fluid power – Identification of manifold assemblies and their components*.

3 Definitions

For the purposes of this standard, the terms and definitions given in ISO 5598 apply.