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AN INDUSTRY STANDARD FOR FLUID POWER

Hydraulic fluid power – Electrical connectors for use with industrial hydraulic integrated proportional valves – Dimensions and requirements

Descriptors: electronics specification interconnection industrial integrated amplifier hydraulic proportional valves integrated directional control hydraulic onboard spool magnetic shield connector seven pin intermateable intermountable

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Foreword

This Foreword is not part of National Fluid Power Association (NFPA) *Hydraulic fluid power – Electrical connectors for use with industrial hydraulic integrated proportional valves – Dimensions and requirements*, NFPA/T2.30.6-2002.

This project was initiated at the 21 September 1995 NFPA/T2.30 meeting. The TSP was approved at the 6 December 1995 Technical Board meeting. Draft no. 1 was dated 23 January 1998 and draft no. 2 was dated 2 April 1998. Headquarters received a new draft, draft no. 3, on 24 September 1998. This document was distributed at the 1 October 1998 NFPA/T2.30 meeting for review.

At the 1 October 1998 meeting, Mr. Cameron distributed a supplement to revision C. Mr. Walrad reported that Mr. Cameron continues to research the possibility of Bosch Automation Technology or Mannesmann Rexroth Corporation participating on the NFPA/T2.30 committee, as well as Scheffer Corporation. Ms. McNamara distributed copies of a 1993 CENELEC connector standard from Germany, developed through the VDMA group. It appears this draft was on hold and further research was completed before the next meeting. Additional items were discussed and action items were assigned.

At the 11 February 1999 NFPA/T2.30 meeting, the document, along with a rough draft of the introduction and scope, were reviewed. The majority of the discussion was a group rewrite of these sections. Action items were assigned to members. It was suggested that three-pins of the twelve-pin configuration be omitted from the document, since it is not specified, and to go back to a nine-pin configuration. It was believed that this connector would not be suitable for use in CAN applications because the protocols could be different, defeating a definition of pin function for safety. Mr. Walrad suggested leaving the twelve-pin configuration in the document for the first distribution and request uses for these pins before omitting them.

At the 20 May 1999 meeting, project group members reviewed draft no. 5. A motion was made to circulate NFPA/T2.30.6-200x for general review with the changes discussed. The general review letter included the following sentence: “The introduction in NFPA/T2.30.6-200x outlines the NFPA Electronics technology committee’s purpose for developing this standard. Please comment on the continuation of this project.” The general review was circulated to members of NFPA Hydraulic systems technology committee (NFPA/T2.24), Electronics technology committee (NFPA/T2.30), Hydraulic valve section (NFPA/T3.5), Pneumatic valve and conditioning section (NFPA/T3.21), U.S. TAG to ISO/TC 131/SC 5/WG 2 (Hydraulic control products) and U.S. TAG to ISO/TC 131/SC 5/Pneumatic (Pneumatic control products); representatives from Ford, General Motors and Delphi also received a copy of the document.

At the 23 September 1999 meeting, responses to the six comments received from the general review were discussed. After responses had been made to these comments and corrections made, the specification was sent out for final ballot. Changes included minor editing, combining the sections on moisture resistance, water immersion and humidity to one section, and verifying that metric units are used. One major revision was to specify the hydraulic phasing in 4.5.8 to agree with the unwritten industry standard.

At the 10 February 2000 project group meeting, members discussed wire sizing and other related concerns, reviewed draft no. 6, made changes to the document and approved a recommendation for final ballot.

At the 18 May 2000 project group meeting, members reviewed draft no. 7 in preparation for the final ballot circulation and made changes to the document. Ms. McNamara agreed to be the representative at the 10 August 2000 Technical Board meeting to answer questions and requested final ballot approval of NFPA/T2.30.6-200x.

At the 8 February 2001 project group meeting, members reviewed the second final ballot draft and made changes to the document. On 15 March 2001, the second final ballot was circulated.

At the 18 May 2001 project group meeting, members reviewed the second final ballot tally and comments received and made changes to the document. On 12 July 2001, members participated in a conference call and reviewed a draft copy of the document prior to the first edition being published.

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Introduction

Since the introduction of the first fully integrated proportional directional control valve, hydraulic valve manufacturers have expanded their lines of valves to include those with onboard electronics. Valves with onboard electronics have proven to be easier to install and set up. The conduit box containing the electronics is part of the overall system and acts as a magnetic shield, decreasing sensitivity to electrical noise. The spool position feedback signal, when used, is also less sensitive to the electrical noise and signal loss associated with long cables between valve and driver cards. Valves with integral electronics also decrease the wiring between valve and driver card, which is time consuming to install and costly. Manufacturers and users of these valves tend to agree that standardizing the connector typically used for input and output (I/O) on these valves is a necessity.

The intention of this specification is to make improvements over the performance, function and reliability of the current seven-pin connector without significant effect on cost. The connector specified in this document would replace the connector that is currently used. It would be intermountable with existing conduit boxes, but not be intermateable with existing systems. End users applying the connector specified in this document would be assured that the pins have identical I/O functions to those of the connector currently in use and would have the required environmental protection equal to or better than the existing connector.

The document is intended to address the following issues that appear to be common to all manufacturers and end users:

- Safety

Pin assignments and the resulting flow direction have been standardized so that valves from different manufacturers can be interchanged without rewiring. Electromagnetic interference has been addressed.

- Expansion

To allow for currently-existing signals and for future expansion, the committee is proposing a connector with 11 pins plus chassis ground. The extra pins would allow for separate power common and signal common, which is desirable with valves with higher frequency response or higher wattage. The power pins would be larger to accommodate up to 1.3 mm^2 (16 AWG) wire for longer cable lengths. The low current signal pins would accommodate wire sizes of 0.5 mm^2 – 0.2 mm^2 (20-24 AWG).

- Applied cost and availability

Total applied cost reflects the overall costs associated with the connector, including installation time, assembly time, component cost, repair cost and cost to harness. The proposed connector style is readily available. This connector, with the proposed insert arrangement and required installation tools, is currently available through multiple suppliers.

- Performance Requirements

The proposed connector was designed to meet the requirements of the international marketplace. It has been designed so that when installed correctly, it can meet current requirements regarding safety and performance.

The proposed connector is intended for new applications. While the new connector is not compatible with the seven-pin connector on existing products, it could be phased in. This document is intended to serve as an aid to enable end users to safely interface with different manufacturers' valves.

Hydraulic fluid power – Electrical connectors for use with industrial hydraulic integrated proportional valves – Dimensions and requirements

1 Scope

1.1 This standard defines:

a) the overall structure of the connector system;

b) the physical dimensions of the connector receptacle;

c) the insert configuration specifying contact assignment and resulting flow direction;

d) the performance requirements of the connector system.

1.2 This design standard encourages end users of integrated electronic hydraulic proportional directional valves to use a connector that will safely enable interfacing and interchangeability. This standard does not influence the hydromechanical design of the valve other than the implied relationship of the command input, sense and magnitude to the direction of resultant flow.

1.3 Two classes of performance requirements are provided (see clause 5):

a) compatibility in environments that encounter the commonly used industrial hydraulic fluids;

b) compatibility in environments that encounter more aggressive hydraulic fluids.

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).**

ASTM D-471 *(latest edition), Standard Test Method for Rubber Property-Effect of Liquids.*

International Electrotechnical Commission (IEC) Publication 60529 *(latest edition), Degrees of Protection Provided by Enclosures* (IP Code).

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

ISO 11158 *(latest edition)*, *Lubricants, industrial oils and related products (class L) – Family H (hydraulic systems) – Specifications for categories HH, HL, HM, HR, HV and HG.*