ANSI/HI 14.6-2022

American National Standard for

Rotodynamic Pumps

for Hydraulic Performance Acceptance Tests

HYDRAULIC INSTITUTE™

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Rotodynamic Pumps

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American National Standard

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Foreword [Not part of American National Standard (ANSI)]

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Hydraulic Institute are to drive all Pump System stakeholders towards a sustainable future by:

a) Advancing Solutions for Pump System Performance and Efficiency

b) Developing Standards and Technical Resources

c) Educating the Global Marketplace

d) Advocating for the Industry

Purpose of Document:

Hydraulic Institute Standards and Guidelines may be published as American National Standards, and are adopted in the public interest to help eliminate misunderstandings between the manufacturer, the purchaser, and/or the user and to assist the purchaser in selecting and obtaining the proper product for a particular need. Use is completely voluntary and does not in any respect preclude a member from manufacturing or selling products which are not conforming.

Definition of Hydraulic Institute Standard

Quoting from Article XV, Standards, of the By-Laws of the Institute, Section B:

> "An Institute Standard defines the product, material, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, quality, rating, testing and service for which designed."

Definition of Hydraulic Institute Guideline

A Hydraulic Institute Guideline is not normative. The guideline is tutorial in nature, to help the reader better understand the subject matter.

Comments from Users

Comments from users of this standard will be appreciated, to help the Hydraulic Institute prepare even more useful future editions. Questions arising from the content of this standard may be directed to the Technical Director of the Hydraulic Institute. If appropriate, the inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

Revisions

American National Standards of the Hydraulic Institute are subject to constant review, and revisions are undertaken whenever it is found necessary because of new developments and progress in the art. Errata or addenda may be issued to address limited changes. If no revisions are made for five years, the standards are reaffirmed using the ANSI canvass procedure.

Disclaimer

This document was prepared by a committee of the Hydraulic Institute and approved by following ANSI essential requirements. Neither the Hydraulic Institute, Hydraulic Institute committees, nor any person acting on behalf of the Hydraulic Institute: 1) makes any warranty, expressed or implied, with respect to the use of any information, apparatus, method, or process disclosed in this document or guarantees that such may not infringe privately owned rights; 2) assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this guideline. The Hydraulic Institute is in no way responsible for any consequences to an owner, operator, user, or anyone else resulting from reference to the content of this document, its application, or use.

This document does not contain a complete statement of all requirements, analyses, and procedures necessary to ensure safe or appropriate selection, installation, testing, inspection, and operation of any pump or associated products. Each application, service, and selection is unique with process requirements that shall be determined by the owner, operator, or its designated representative.

Units of measurement

Metric units of measurement are used, and corresponding US customary units appear in parentheses. Charts, graphs, and sample calculations are also shown in both metric and US customary units. Because values given in metric units are not exact equivalents to values given in US customary units, it is important that the selected units of measure to be applied be stated in reference to this standard. If no such statement is provided, metric units shall govern.

Consensus

Consensus for this American National Standard was achieved by use of the canvass method. The following organizations, recognized as having an interest in the standardization of pumps, were contacted prior to the approval of this revision of the standard. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

4B Engineering & Consulting, LLC
AECOM
ASME
Brown and Caldwell
Carollo Engineers
Crane Pump & Systems
DuPont
Ekwestrel LLC
Flowserve
Lincus, Incorporated
Hydraulic, Measurement, and Inspection Consulting, LLC
Irving Oil
Leistritz
Meier Consulting
MWI Pumps
Patterson Pump Company
Peerless Pump Company
Pentair
Petrofac
Servicios Procure
Sulzer
Summit Pump, Inc.
Suncor
Swiss Flow Solutions GmbH
Taco Comfort, Inc.
Tarrant Regional Water District
Trillium Flow Technologies
Vibration Institute
WC Livoti Consulting
Westinghouse
Xylem, Inc.

Committee list

Although this standard was processed and approved for submittal to ANSI by the canvass method, a working committee met many times to facilitate its development. At the time it was developed, the committee had the following members:

Chair - Michael Coussens, Peerless Pump Company
Vice-chair - Mark Heiser, Xylem Inc. - Applied Water Systems

Committee members	Company
Charlie Allaben	HDR, Inc.
Rex Beach	PSG, a Dover Company
Karen Bettencourt	AECOM
Gary Brooks	National Pump Company
Jorge Cortes	Patterson Pump Company
Sunil Deshpande	SPP Pumps, Inc.
Camden DiMicco	Hayward Tyler, Inc.
Frank Ennenbach	Sulzer Pumps Ltd.
Eric Eylat	Flowserve Corporation
Steven Fehniger	CDM Smith - Water Services Group

Al Iseppon	Pentair - Berkeley
Eddie Kreipe	Murraysmith & Associates
Lane Larsen	Trillium Pumps USA
Benjamin Madison	Grundfos USA
Rodney Mrkvicka	Smith & Loveless, Inc.
Maki Onari	Mechanical Solutions, Inc.
Craig Redmond	Gorman-Rupp, Mansfield Division
Maria Elena Rodriguez Hernandez	INDAR Electric
Aleksander Roudnev	Weir Minerals North America
Jan Schyberg	Xylem Inc. - Water Solutions
David Skinner	ITT - Industrial Process
Jerry Szofer	Grundfos Water Utility
Motonobu Tarui	ShinMaywa Industries, Ltd.
George Tey	Stantec
James Volk	Franklin Electric Company, Inc.
Tyler Whitehouse	Carollo Engineers, Inc.

Alternate members	**Company**
Daniel Boldt	Trillium Pumps USA
Robert Domkowski	Xylem Inc. - Water Solutions
John Kelly	Smith & Loveless, Inc.
Fangbiao Lin	Stantec
Jennifer McGrath	Pentair - Berkeley
Paul Moulton	AECOM
Joseph Orlins	AECOM
James Roberts	Xylem Inc. - Applied Water Systems
Paul Ruzicka	Xylem Inc. - Applied Water Systems
Jim Wall	Sulzer Pumps Ltd.
Bryce Wells	Flowserve Corporation
Patrick Wilson	Flowserve Corporation

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14.6 Hydraulic performance acceptance tests

14.6.1 Introduction

This new ANSI/HI 14.6 *Hydraulic Performance Acceptance Tests* standard is revised and updated, superseding the first publication of ANSI/HI 14.6, which replaced ANSI/HI 1.6 *Centrifugal Pump Tests* and ANSI/HI 2.6 *Vertical Pump Tests*. The performance acceptance criteria are in harmony with the revised ISO 9906 *Rotodynamic pumps - Hydraulic performance acceptance test* standard and ANSI/HI 11.6 *Rotodynamic Submersible Pumps for Hydraulic Performance, Hydrostatic Pressure, Mechanical, and Electrical Acceptance Tests*. This standard is normative, meaning the standard must be adhered to in order to comply with the standard. The appendices of this standard are either normative or informative; they are individually marked to clearly show their status. The normative appendices must be adhered to in order to comply with the standard, whereas informative appendices are written to inform and educate the user and do not require compliance.

This standard defines industry-specific default test acceptance grades for cases where the user has not specified an acceptance grade. These default test acceptance grades may not be fully harmonized with ISO 9906.

The standard includes three grades of accuracy of measurement: grade 1 for higher accuracy, and grades 2 and 3 for lower accuracy. These grades include different values for tolerance bands for allowable fluctuations and uncertainties of measurement. It also defines separate tolerances for pumps below 10 kW (13 hp).

References to ANSI/HI 1.6 or ANSI/HI 2.6 in procurement documents and test specifications shall refer to ANSI/HI 14.6 for all applicable parts of the standard.

14.6.1.1 Purpose

This standard provides acceptance criteria and uniform procedures for performance, net positive suction head, hydrostatic pressure testing, data recording, and reporting of test results for rotodynamic pumps. It provides acceptance grades that can be specified for various types of applications. It also defines test procedures that will result in consistent and repeatable results. Final acceptance grade selections will be defined in a contractual agreement between the purchaser and manufacturer.

14.6.1.2 Scope

This standard covers hydraulic performance tests for acceptance of rotodynamic pumps (centrifugal, mixed flow, and axial flow pumps), in this document referred to as *pumps*.

ANSI/HI Standard 14.6 is intended for pump acceptance testing at pump test facilities, such as manufacturers' pump test facilities or laboratories only. Industry experience shows that it is very difficult to perform measurements accurate enough to satisfy the acceptance requirements in this standard when testing is performed in the field.

Information in the standard may be applied to rotodynamic pumps of any size and to any pumped liquids behaving as clear water (see Appendix M.1).

This standard applies to a pump by itself without any fittings. The pump may also be tested with a combination of upstream and/or downstream fittings by prior agreement and agreed on contractually.

There are other pump acceptance test standards for submersible (OH8A and OH8B) and sealless pumps, as defined in their respective documents, that take into account the unique features that those products exhibit. The Hydraulic Institute recommends that the user of this standard consult those respective standards (ANSI/HI 11.6 and ANSI/HI 5.1-5.6 *Sealless Rotodynamic Pumps for Nomenclature, Definitions, Design, Application, Operation, and Test*) to determine if one of these standards are more appropriate for the products being considered for testing.