ANSI/HI 14.6-2016

American National Standard for

Rotodynamic Pumps

for Hydraulic Performance Acceptance Tests

ANSI/HI 14.6-2016

Hydraulic INSTITUTE

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First Floor North
Parsippany, New Jersey
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www.Pumps.org

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American National Standard

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Foreword (Not part of Standard)

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Hydraulic Institute are to promote the advancement of the pump manufacturing industry and further the interests of the public and to this end, among other things:

a) Develop and publish standards.

b) Address pump systems.

c) Expand knowledge and resources.

d) Educate the marketplace.

e) Advocate for the industry.

Purpose of Standards and Guidelines

a) Hydraulic Institute Standards and Guidelines are adopted in the public interest and are designed 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.

b) Use of Hydraulic Institute Standards and Guidelines is completely voluntary. Existence of Hydraulic Institute Standards does not in any respect preclude a member from manufacturing or selling products not conforming to the standards.

Definition of a Standard of the Hydraulic Institute

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 a 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. 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.

Brown and Caldwell
Chevron U.S.A., Inc.
DuPont
Flowserve Corporation
Healy Engineering, Inc.
Hidrostal AG
Hydraulic, Measurement, and Inspection Consulting
ITT
Kemet Inc.
Las Vegas Valley Water District
Leistritz ATC
MWI Pumps
Parametrix
Patterson Pumps
Peerless Pump
Pentair - Berkeley
Pumps Positive
Rotating Equipment Repair, Inc.
Sulzer
Syncrude Canada
WEG Electric
Weir Minerals North America
WorleyParsons Canada
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 - Al Iseppon, Pentair - Berkeley
Vice-chair - Michael Coussens, Peerless Pump Company

Committee members	Company
Timothy R. Albers	Nidec Motor Corporation
Lech Bobowski	Flowserve Corporation
Lucian Dobrot	ITT - Industrial Process
Steven M. Fehniger	CDM Smith
Lane Larsen	Weir Specialty Pumps
Gabor Lechner	Armstrong Fluid Technology
Roy D. Moore	DriveConnect, LLC
Paul W. Moulton	AECOM
Rodney S. Mrkvicka	Smith & Loveless, Inc.
Joseph Orlins	Alden Research Laboratory, Inc.
Ed Pascua	MWH Americas, Inc.
Craig S. Redmond	Gorman-Rupp, Mansfield Division

Paul J. Ruzicka	Xylem Inc. - Applied Water Systems
Arnold R. Sdano	Pentair - Fairbanks Nijhuis
Jason Sexton	Grundfos USA
Albert B. Ticknor, III	National Pump Company
James J. Volk	Franklin Electric Company, Inc.
Jared R. Wageman	Sundyne LLC
Simon Walsh	ClydeUnion Pumps, an SPX Brand
Kristel Zaman	Xylem Inc. - Water Solutions
Troy G. Zellers	A.R. Wilfley & Sons, Inc.

Alternate members	**Company**
Christopher Felix	Xylem Inc. - Applied Water Systems
Mark Heiser	Xylem Inc. - Applied Water Systems
Scott C. Judge	Flowserve Corporation
Patricia D. McCarthy	Xylem Inc. - Water Solutions
Jennifer McGrath	Pentair - Berkeley
James E. McKee	Pentair - Berkeley
Michael L. Mueller	Flowserve Corporation
Robert Ramirez	A.R. Wilfley & Sons, Inc.
James R. Roberts	Xylem Inc. - Applied Water System

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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*. These three standards now have identical pump acceptance grades. 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, and hydrostatic pressure testing, and 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.

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 they are more appropriate for the products being considered for testing.