



American National Standard for

Rotodynamic (Centrifugal) Pumps

for Nomenclature and Definitions



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First Floor North
Parsippany, New Jersey
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American National Standard

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Contents

	Page
Foreword	vii
Rotodynamic (centrifugal) pumps	1
1.1 Types and nomenclature	1
1.1.1 Scope	1
1.1.2 Definition of rotodynamic (centrifugal) pumps	1
1.1.3 Types of rotodynamic pumps	1
1.1.4 Impeller designs	7
1.1.5 Construction drawings	9
1.1.6 General information	38
1.1.7 Centrifugal pumps nomenclature	43
1.2 Definitions	61
1.2.1 Rate of flow (Q) [Q]	63
1.2.2 Speed (n)	64
1.2.3 Head (h) [H]	64
1.2.4 Condition points	66
1.2.5 Suction conditions	66
1.2.6 Power	67
1.2.7 Pump pressures	68
1.2.8 Impeller balancing	69
1.2.9 Rotodynamic pump icons	69
Appendix A References	78
Appendix B Standard Dimension for HI – NEMA Type C Face-Mounted Motors	79
Appendix C Index	86
Figures	
Figure 1.1.3a — Rotodynamic pump types - overhung	2
Figure 1.1.3b — Rotodynamic pump types - between bearings	3
Figure 1.1.3c — Rotodynamic pump types - vertically suspended	4
Figure 1.1.3d — Rotodynamic pump types - regenerative turbine	4
Figure 1.1.4.1 — General impeller types	8
Figure 1.1.4.2 — Double suction radial flow pump	9
Figure 1.1.4.3 — Mixed flow impeller	9
Figure 1.1.4.4 — Axial flow impeller	9
Figure 1.1.5a — Overhung impeller – flexibly coupled – single stage – frame mounted	10
Figure 1.1.5b — Overhung impeller – flexibly coupled – single stage – frame mounted – lined pump	11
Figure 1.1.5c — Stock pump – flexibly coupled – single stage – foot mounted	12
Figure 1.1.5d — Overhung impeller – flexibly coupled – single stage – foot mounted – mixed flow	13
Figure 1.1.5e — Overhung impeller – flexibly coupled – single stage – foot mounted – ANSI B73.1	14
Figure 1.1.5f — Overhung impeller – flexibly coupled – single stage – foot mounted – self-priming	15
Figure 1.1.5g — Overhung impeller – flexibly coupled – single stage – centerline mounted – API 610	16
Figure 1.1.5h — Overhung impeller – integral bearing frame – single stage – in-line – flexible coupling	17
Figure 1.1.5i — Vertical end suction OH3A	18
Figure 1.1.5j — Overhung impeller – rigidly coupled – single stage – vertical in-line	19

Figure 1.1.5k — Overhung impeller — close coupled — single stage — in-line (showing seal and packing)	20
Figure 1.1.5l — Vertical end suction OH5A — close coupled — built together.	21
Figure 1.1.5m — High speed — integral gear — close coupled — single stage	22
Figure 1.1.5n — Overhung impeller — close coupled — single stage — end suction	23
Figure 1.1.5o — Overhung impeller — close coupled — single stage — diffuser style — end suction — submersible	24
Figure 1.1.5p — Overhung impeller — close coupled — single stage — volute style — end suction submersible	25
Figure 1.1.5q — Overhung impeller — flexibly coupled — single stage — axial flow — horizontal.	26
Figure 1.1.5r — Lineshaft design sump pump	27
Figure 1.1.5s — Cantilever shaft design sump pump	28
Figure 1.1.5t — Impeller between bearings — flexibly coupled — single stage — axial (horizontal) split case	29
Figure 1.1.5u — Impeller between bearings — flexibly coupled — single stage — radial split case	30
Figure 1.1.5v — Impeller between bearings — flexibly coupled — multistage axial (horizontal) split case	31
Figure 1.1.5w — Impeller between bearings — flexibly coupled — multistage — radial split case	32
Figure 1.1.5x — Impeller between bearings — flexibly coupled — multistage — radial split-double casing	33
Figure 1.1.5y — Regenerative turbine — side channel single stage.	34
Figure 1.1.5z — Regenerative turbine — peripheral single stage	35
Figure 1.1.5aa — Regenerative turbine — impeller between bearings — two stage	36
Figure 1.1.5bb — Pitot pump — flexibly coupled — single stage — frame mounted	37
Figure 1.1.6.5.1.1 — Liquid end (or wet end) assembly	39
Figure 1.1.6.5.1.2 — Power end (or frame assembly)	40
Figure 1.1.6.5.1.3 — Back pull-out assembly	40
Figure 1.1.6.6 — Position of casing and shaft rotation	41
Figure 1.1.6.7a — Horizontal pump — shaft rotation (CW rotation)	42
Figure 1.1.6.7b — Vertical pump — shaft rotation (CW rotation)	42
Figure 1.1.6.8 — Pump with C-frame motor adapter, short coupled	43
Figure 1.1.7.2a — Overhung impeller — flexibly coupled — single stage — frame mounted	55
Figure 1.1.7.2b — Overhung impeller — flexibly coupled — single stage — frame mounted — pump on baseplate	55
Figure 1.1.7.2c — Overhung impeller — flexibly coupled — single stage — centerline mounted	56
Figure 1.1.7.2d — Overhung impeller — flexibly coupled — single stage — centerline mounted — pump on baseplate	56
Figure 1.1.7.2e — Overhung impeller — flexibly coupled — single stage — centerline mounted (top suction).	57
Figure 1.1.7.2f — Overhung impeller — flexibly coupled — single stage — centerline mounted — pump on baseplate (top suction)	57
Figure 1.1.7.2g — Impeller between bearings — flexibly coupled — single stage — axial (horizontal) split case — pump on baseplate	58
Figure 1.1.7.2h — Impeller between bearings — flexibly coupled — single stage — axial (horizontal) split case	58
Figure 1.1.7.2i — Overhung impeller — close coupled — single stage — end suction	59
Figure 1.1.7.2j — Overhung impeller — separately coupled — single stage — frame mounted (vertically mounted)	59
Figure 1.1.7.2k — Overhung impeller — integral bearing frame — single stage — vertical end suction with flexible coupling	60
Figure 1.1.7.2l — Overhung impeller close coupled — single stage — vertical end suction	60
Figure 1.2.3.4 — Datum elevation for various pump designs at eye of first-stage impeller	65
Figure 1.2.9.1.1 — Pump type OH00: Horizontal, flexibly coupled, axial flow, single stage, overhung design.	69
Figure 1.2.9.1.2 — Pump type OH0: Horizontal, frame mounted, flexibly coupled, single stage, overhung design	70
Figure 1.2.9.1.3 — Pump type OH1: Horizontal, foot mounted, single stage, overhung design	70

Figure 1.2.9.1.4 — Pump type OH2: Horizontal, centerline mounted, single stage, overhung design	70
Figure 1.2.9.1.5 — Pump type OH3: Vertical, in-line mounted, single stage, with integral bearing bracket	71
Figure 1.2.9.1.6 — Pump type OH4: Vertical, in-line mounted, single stage, rigidly coupled to the driver shaft	71
Figure 1.2.9.1.7 — Pump type OH5: Vertical, in-line mounted, single stage, close coupled to the driver shaft	72
Figure 1.2.9.1.8 — Pump type OH6: High-speed, integral gear driven, single stage, overhung design	72
Figure 1.2.9.1.9 — Pump types OH8A and OH8B	73
Figure 1.2.9.1.10 — Pump types OH9, OH10, OH11, and OH12	73
Figure 1.2.9.2.1 — Pump type BB1: Horizontal, axial split, single and two stage, between-bearings design	73
Figure 1.2.9.2.2 — Pump type BB2: Horizontal, radial split, single and two stage, between-bearings design	74
Figure 1.2.9.2.3 — Pump type BB3: Horizontal, axial split, multistage, between-bearings design	74
Figure 1.2.9.2.4 — Pump type BB4: Horizontal, radially split, multistage, between-bearings design	74
Figure 1.2.9.2.5 — Pump type BB5: Horizontal, radially split, multistage, double casing, between-bearings design	75
Figure 1.2.9.3.1 — Pump type VS4: Vertical, single volute casing, lineshaft, flexibly coupled to the driver	75
Figure 1.2.9.3.2 — Pump type VS5: Vertical, single volute casing, stiff-shaft cantilever, flexibly coupled to the driver	76
Figure 1.2.9.4.1 — Pump type RT1: Overhung, close-coupled, side channel design	76
Figure 1.2.9.4.2 — Pump type RT2: Overhung, close-coupled, peripheral design	76
Figure 1.2.9.4.3 — Pump type RT3: Between-bearing, flexibly coupled, side channel design	77
Figure 1.2.9.4.4 — Pump type RT4: Between-bearing, flexibly coupled, peripheral design	77
Figure 1.2.9.5.1 — Pitot (rotating casing) pumps	77
Figure B.1 — Dimensions for types JM and JP, alternating current, face-mounting, close-coupled pump motors having rolling element contact bearings	81
Figure B.2 — Standard dimensions for HI - NEMA type HP and HPH vertical, solid-shaft motors	85
Tables	
Table 1.1.3.1 — Overhung rotodynamic pump attributes	6
Table 1.1.7.1a — Centrifugal pump nomenclature – alphabetical listing	44
Table 1.1.7.1b — Centrifugal pump nomenclature – numerical listing	52
Table 1.2a — Principal symbols	61
Table 1.2b — Subscripts	63
Table B.1 — Dimensions for type JM, alternating current, face-mounting, close-coupled pump motors (US customary units)	80
Table B.2 — Dimensions for type JP, alternating current, face-mounting, close-coupled pump motors (US customary units)	82
Table B.3 — Open drip-proof frame selections	83
Table B.4 — Standard dimensions for HI - NEMA type HP and HPH vertical solid-shaft motors (US customary units)	84

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Foreword (Not part of Standard)

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Institute are to promote the continued growth and well-being of pump users and manufacturers and further the interests of the public in such matters as are involved in manufacturing, engineering, distribution, safety, transportation and other problems of the industry, and to this end, among other things:

- a) To develop and publish standards for pumps;
- b) To collect and disseminate information of value to its members and to the public;
- c) To appear for its members before governmental departments and agencies and other bodies in regard to matters affecting the industry;
- d) To increase the amount and to improve the quality of pump service to the public;
- e) To support educational and research activities;
- f) To promote the business interests of its members but not to engage in business of the kind ordinarily carried on for profit or to perform particular services for its members or individual persons as distinguished from activities to improve the business conditions and lawful interests of all of its members.

Purpose of Standards

- 1) Hydraulic Institute Standards 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.
- 2) Use of Hydraulic Institute Standards 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."

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. The inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

If a dispute arises regarding contents of an Institute standard or an answer provided by the Institute to a question such as indicated above, the point in question shall be sent in writing to the Technical Director of the Hydraulic Institute, who shall initiate the appeals process.

Revisions

The 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.

Units of Measurement

Metric units of measurement are used, and corresponding US customary units appear in brackets. 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 for this standard was achieved by use of the Canvass Method

The following organizations, recognized as having an interest in the standardization of centrifugal 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	John Crane Inc.
Baldor Electric Company	Malcolm Pirnie
Bantrel	National Pump Company, LLC
Black & Veatch	Patterson Pump Company
Brown and Caldwell	Peerless Pump Company
Flowserve Pump Division	Pentair Water
GIW Industries, Inc.	Powell Kugler, Inc.
Grundfos Pumps Corporation	Sulzer Pumps (US) Inc.
Healy Engineering	TACO, Inc.
IMO Pump	Tecsumt Inc.
ITT - Industrial Process	The Conservation Fund
ITT - Water & Wastewater	Weir Floway, Inc.
J.A.S. Solutions Ltd.	Weir Minerals North America

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 – Allen J. Hobratchk, National Pump Company, LLC

Vice-chair – Michael S. Cropper, Sulzer Pumps (US) Inc.

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Flowserve Pump Division

Preface

Symbols are used throughout this standard to identify the pump types. When originally introduced, the convention is to define the term in text, followed by the HI symbol in parenthesis (xx) and, when different, the ISO symbol is in brackets [xx].

Standard ANSI/HI 1.3 *Rotodynamic (Centrifugal) Pumps for Design and Applications* complements the nomenclature and definitions content in this document with detailed information about the design and application of rotodynamic (centrifugal) pumps.

Rotodynamic (centrifugal) pumps

1.1 Types and nomenclature

Rotodynamic pumps may be classified by such methods as impeller or casing configuration, end application of the pump, specific speed, or mechanical configuration. The method used in Figure 1.1.3a is based primarily on mechanical configuration.

1.1.1 Scope

This standard covers rotodynamic pumps with centrifugal (radial), mixed flow, and axial flow impellers, as well as regenerative turbine and pitot tube type pumps, of all industrial/commercial types except vertically suspended diffuser turbine pumps. It contains description of types, nomenclature, and definitions.

1.1.2 Definition of rotodynamic (centrifugal) pumps

Rotodynamic pumps are kinetic machines in which energy is continuously imparted to the pumped fluid by means of a rotating impeller, propeller, or rotor. The most common types of rotodynamic pumps are centrifugal (radial), mixed flow, and axial flow pumps.

Centrifugal pumps use bladed impellers with essentially radial outlet to transfer rotational mechanical energy to the fluid primarily by increasing the fluid kinetic energy (angular momentum) and also increasing potential energy (static pressure). Kinetic energy is then converted into usable pressure energy in the discharge collector.

1.1.3 Types of rotodynamic pumps

Rotodynamic pumps are most commonly typed by their general mechanical configuration (see Figures 1.1.3a, b, c, and d). The broadest characteristics, which include virtually all centrifugal pumps, are discussed in the following paragraphs:

1.1.3.1 Overhung impeller type

In this group, the impeller(s) is mounted on the end of a shaft that is cantilevered or “overhung” from its bearing supports.

These pumps are either close coupled, where the impeller is mounted directly on the driver shaft; or separately coupled, where the impeller is mounted on a separate pump shaft supported by its own bearings. One variation of this design is the submersible type, where a close-coupled pump/electric motor unit is designed to operate while submerged in the liquid it is pumping or another liquid.

1.1.3.1.1 Close coupled

Close-coupled pumps are commonly characterized by the following attributes:

The pump and driver share one common shaft; the driver bearings absorb all pump thrust loads (axial and radial). The driver is aligned and assembled directly to the pump unit with machined fits.