

American National Standard for

Controlled-Volume Metering Pumps

for Test

Sponsor

Hydraulic Institute, Inc.

www.Pumps.org

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American National Standards Institute, Inc.

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National Standards of the Hydraulic Institute are reviewed on a periodic basis and may be reaffirmed, revised, or withdrawn as appropriate. Errata or addenda may be issued between revisions to address limited changes. Should an errata or addenda occur, details of the changes can be found on the publication's product page at www.pumps.org.

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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.

Flowserve
Las Vegas Valley Water District
Peerless Pump Company

Summit Pump Inc
William Livoti
Worley

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 – Peter Timpanelli, LEWA America, Inc.

Committee Members

Rex Beach
Douglas Purdy

Company

PSG, a Dover Company
Wanner Engineering, Inc.

Committee Alternates

Jorge Guevara (Alternate)
Chris Distaso (Alternate)
James Farley (Alternate)

Company

LEWA America, Inc.
PSG, a Dover Company
PSG, a Dover Company

7.6 Controlled-Volume Metering Pump Tests

7.6.1 Introduction

7.6.1.1 Purpose

This standard provides uniform procedures for hydrodynamic controlled-volume pump performance testing and for recording of the test results of metering pumps.

Vibration and acoustical testing methods are not included in this standard. Refer to ANSI/HI 9.1–9.5 *Pumps – General Guidelines for Types, Definitions, Application, Sound Measurement and Decontamination*, Section 9.2 Measurement of airborne sound, for acoustical testing procedures.

7.6.1.2 Scope

This standard is for the testing of positive displacement reciprocating controlled-volume metering pumps (see ANSI/HI 7.1-7.5 *Controlled-Volume Metering Pumps for Nomenclature, Definitions, Application, and Operation*).

These standards apply to test of the pump only, unless stated otherwise.

Variations in test procedures may exist without violating the intent of this standard. Exceptions may be taken if agreed on by the parties involved without sacrificing the validity of the applicable parts of the standard.

7.6.1.3 Units, symbols, & subscripts

The following terms and symbols in Section 7.6.1.3 are used to designate test parameters used in connection with pump tests.

Table 7.6.1.3 — Symbols

Symbol	Term	Metric Unit	Abbreviation	US Customary Unit	Abbreviation	Conversion Factor ^a
A	Area of piston/plunger	square centimeter	cm ²	square inch	in ²	6.45
β (beta)	Meter or orifice ratio	dimensionless	—	dimensionless	—	1
C	Coefficient for acceleration head	dimensionless	—	dimensionless	—	1
d	Diameter	millimeter	mm	inch	in	25.4
D	Displacement	cubic centimeter	cm ³	cubic inch	in ³	16.39
Δ (delta)	Difference	dimensionless	—	dimensionless	—	1
η (eta)	Efficiency	percent	%	percent	%	1
g	Gravitational acceleration	meter/second squared	m/s ²	foot/second squared	ft/s ²	0.3048
γ (gamma)	Specific weight	newton/cubic meter	N/m ³	pound/cubic foot	lb/ft ³	0.0064
h	Head	meter	m	foot	ft	0.3048
L	Stroke length	millimeter	mm	inch	in	25.4
M	Number of pistons	dimensionless	—	dimensionless	—	1
n	Speed	stroke/minute	spm	stroke/minute	spm	1
NPIPA	Net positive inlet pressure available	bar absolute	bara	pound/square inch absolute	psia	0.0689
NPIPR	Net positive inlet pressure required	bar absolute	bara	pound/square inch absolute	psia	0.0689
NPSHA	Net positive suction head available	meter absolute	m	foot	ft	0.3048
NPSHR	Net positive suction head required	meter	m	foot	ft	0.3048
ν (nu)	Viscosity, kinematic	meter squared/second	m ² /s	centistoke	cSt	10 ⁶
π	pi = 3.1416	dimensionless	—	dimensionless	—	1
p	Pressure	bar	bar	pound/square inch	psi	0.0689
P	Power	kilowatt	kW	horsepower	hp	0.7457
Q	Rate of flow (capacity)	liter/hour	L/h	US gallon/hour	gph	3.7854
ρ (rho)	Density	kilogram/cubic meter	kg/m ³	pound mass/cubic foot	lbm/ft ³	16.02
s	Specific gravity	dimensionless	—	dimensionless	—	1
S	Slip	percent	%	percent	%	1
t	Temperature	degree Celsius	°C	degree Fahrenheit	°F	(°F–32) × 5/9
τ (tau)	Torque	newton-meter	N·m	pound-foot	lb-ft	1.356
μ (mu)	Viscosity, absolute	centipoise	cP	centipoise	cP	1
v	Velocity	meter/second	m/s	foot/second	ft/s	0.3048
V	Specific volume	cubic meter/kilogram	m ³ /kg	cubic foot/pound	ft ³ /lb	0.0624
x	Exponent	none	none	none	none	1
Z	Elevation gauge distance above or below datum	meter	m	foot	ft	0.3048

^a Conversion factor × US customary units = metric units (except temperature).