



SLOVENSKI STANDARD SIST EN ISO 9906:2012

01-september-2012

Nadomešča:

SIST EN ISO 9906:2000

SIST EN ISO 9906:2000/AC:2006

Centrifugalne črpalke - Prezemni preskus za hidravlične lastnosti - Razredi 1, 2 in 3 (ISO 9906:2012)

Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1, 2 and 3 (ISO 9906:2012)

iTeh STANDARD PREVIEW

Kreiselpumpen -Hydraulische Abnahmeprüfung - Klassen 1, 2 und 3 (ISO 9906:2012)

Pompes rotodynamiques - Essais de fonctionnement hydraulique pour la réception - Niveaux 1, 2 et 3 (ISO 9906:2012)

Ta slovenski standard je istoveten z: EN ISO 9906:2012

ICS:

23.080

Črpalke

Pumps

SIST EN ISO 9906:2012

en,fr

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 9906

May 2012

ICS 23.080

Supersedes EN ISO 9906:1999

English Version

Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1, 2 and 3 (ISO 9906:2012)

Pompes rotodynamiques - Essais de fonctionnement
hydraulique pour la réception - Niveaux 1, 2 et 3 (ISO
9906:2012)

Kreiselpumpen -Hydraulische Abnahmeprüfung - Klassen
1, 2 und 3 (ISO 9906:2012)

This European Standard was approved by CEN on 16 March 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....3

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

SIST EN ISO 9906:2012

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

Foreword

This document (EN ISO 9906:2012) has been prepared by Technical Committee ISO/TC 115 "Pumps" in collaboration with Technical Committee CEN/TC 197 "Pumps" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 9906:1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW
Endorsement notice
(standards.iteh.ai)

The text of ISO 9906:2012 has been approved by CEN as a EN ISO 9906:2012 without any modification.

SIST EN ISO 9906:2012

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 9906:2012](#)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

INTERNATIONAL STANDARD

**ISO
9906**

Second edition
2012-05-01

Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1, 2 and 3

*Pompes rotodynamiques — Essais de fonctionnement hydraulique pour
la réception — Niveaux 1, 2 et 3*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>



Reference number
ISO 9906:2012(E)

© ISO 2012

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions, symbols and subscripts	1
3.1 Terms and definitions	1
3.2 Terms relating to quantities	3
3.3 Symbols and subscripts	9
4 Pump measurements and acceptance criteria	10
4.1 General	10
4.2 Guarantees	11
4.3 Measurement uncertainty	11
4.4 Performance test acceptance grades and tolerances	15
4.5 Default test acceptance grades for pump application	21
5 Test procedures	22
5.1 General	22
5.2 Date of testing	22
5.3 Test programme	22
5.4 Testing equipment	22
5.5 Records and reports	22
5.6 Test arrangements	23
5.7 Test conditions	23
5.8 NPSH tests	23
6 Analysis	26
6.1 Translation of the test results to the guarantee conditions	26
6.2 Obtaining specified characteristics	27
Annex A (normative) Test arrangements	28
Annex B (informative) NPSH test arrangements	37
Annex C (informative) Calibration intervals	40
Annex D (informative) Measurement equipment	41
Annex E (informative) Tests performed on the entire equipment set — String test	46
Annex F (informative) Reporting of test results	48
Annex G (informative) Special test methods	52
Annex H (informative) Witnessed pump test	53
Annex I (informative) Conversion to SI units	54
Annex J (informative) Measurement uncertainty for NPSH test	56
Bibliography	57

ISO 9906:2012(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9906 was prepared by Technical Committee ISO/TC 115, *Pumps*, Subcommittee SC 2, *Methods of measurement and testing*.

This second edition cancels and replaces the first edition (ISO 9906:1999), which has been technically revised.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

Introduction

The tests in this International Standard are intended to ascertain the performance of the pump and to compare this with the manufacturer's guarantee.

The nominated guarantee for any quantity is deemed to have been met if, where tested according to this International Standard, the measured performance falls within the tolerance specified for the particular quantity (see 4.4).

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 9906:2012](https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012)

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1, 2 and 3

1 Scope

This International Standard specifies hydraulic performance tests for customers' acceptance of rotodynamic pumps (centrifugal, mixed flow and axial pumps, hereinafter "pumps").

This International Standard is intended to be used for pump acceptance testing at pump test facilities, such as manufacturers' pump test facilities or laboratories.

It can be applied to pumps of any size and to any pumped liquids which behave as clean, cold water.

This International Standard specifies three levels of acceptance:

- grades 1B, 1E and 1U with tighter tolerance;
- grades 2B and 2U with broader tolerance;
- grade 3B with even broader tolerance.

This International Standard applies either to a pump itself without any fittings or to a combination of a pump associated with all or part of its upstream and/or downstream fittings.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 17769-1, *Liquid pumps and installation — General terms, definitions, quantities, letter symbols and units — Part 1: Liquid pumps*

ISO 17769-2, *Liquid pumps and installation — General terms, definitions, quantities, letter symbols and units — Part 2: Pumping system*

3 Terms, definitions, symbols and subscripts

3.1 Terms and definitions

For the purposes of this document, the terms, definitions, quantities and symbols given in ISO 17769-1 and 17769-2 and the following apply.

NOTE 1 Table 1 gives an alphabetical list of the symbols used and Table 2 gives a list of subscripts; see 3.3.

NOTE 2 All formulae are given in coherent SI units. For conversion of other units to SI units, see Annex I.

3.1.1 General terms

NOTE All of the types of test in 3.1.1 apply to guarantee point to fulfil the customer's specification(s).

3.1.1.1

guarantee point

flow/head (Q/H) point, which a tested pump shall meet, within the tolerances of the agreed acceptance class

ISO 9906:2012(E)**3.1.1.2****factory performance test**

pump test performed to verify the initial performance of new pumps as well as checking for repeatability of production units, accuracy of impeller trim calculations, performance with special materials, etc.

NOTE A typical performance test consists of the measurement of flow, head and power input to the pump or pump test motor. Additional measurements, such as NPSH, may be included as agreed upon. A factory test is understood to mean testing at a dedicated test facility, often at a pump manufacturer's plant or at an independent pump test facility.

3.1.1.3**non-witnessed pump test****3.1.1.3.1****factory test**

test performed without the presence of a purchaser's representative, in which the pump manufacturer is responsible for the data collection and judgement of pump acceptance

NOTE The advantage of this test is cost savings and accelerated pump delivery to the pump user. In many cases, if the purchaser is familiar with the performance of the pump (e.g. identical pump model order), a factory non-witnessed test may be acceptable.

3.1.1.3.2**signed factory test**

test performed without the presence of a purchaser's representative, in which the pump manufacturer is responsible for compliance with the parameters of the agreed acceptance class

NOTE The pump manufacturer conducts the test, passes judgement of pump acceptance and produces a signed pump test document. The advantage of this test is the same as seen on the non-witnessed test. Compared to a witnessed test, this test is substantially less expensive and often leads to accelerated pump delivery to the end user.

3.1.1.4**witnessed pump test**

<https://standards.iteh.ai/catalog/standards/sist/f8d4028c-eeb4-4141-98c3-43c2b2036e6a/sist-en-iso-9906-2012>

NOTE The witnessing of a pump test by a representative of the pump purchaser can serve many useful functions. There are various ways of witnessing a test.

3.1.1.4.1**witnessing by the purchaser's representative**

testing physically attended by a representative of the purchaser, who signs off on the raw test data to certify that the test is performed satisfactorily

NOTE It is possible for final acceptance of the pump performance to be determined by the witness. The benefit of witness testing depends largely on the effectiveness and expertise of the witness. A witness cannot only ensure the test is conducted properly, but also observes operation of the pump during testing prior to pump shipment to the job site. A disadvantage of witness testing can be extended delivery times and excessive cost. With just-in-time manufacturing methods, the scheduling of witness testing requires flexibility on the part of the witness and can lead to additional costs if the schedule of the witness causes delays in manufacturing.

3.1.1.4.2**remote witnessing by the purchaser's representative**

pump performance testing witnessed from a distance by the purchaser or his/her representative

NOTE With a remote camera system, the purchaser can monitor the entire testing remotely in real-time. The raw data, as recorded by the data acquisition system, can be viewed and analysed during the test, and the results can be discussed and submitted for approval. The advantages of this type of testing are savings in travel costs and accelerated pump delivery.

3.2 Terms relating to quantities

3.2.1

angular velocity

ω

number of radians of shaft rotation

NOTE 1 It is given by:

$$\omega = 2\pi n \quad (1)$$

NOTE 2 It is expressed in time, e.g. s⁻¹, where n is given in 60 × min⁻¹.

3.2.2

speed of rotation

number of rotations per second

3.2.3

mass flow rate

rate of flow discharged into the pipe from the outlet connection of the pump

NOTE 1 The mass flow rate is given in kilograms per second.

NOTE 2 The following losses or limiting effects are inherent to the pump:

- a) discharge necessary for hydraulic balancing of axial thrust;
- b) cooling of the pump bearings.

NOTE 3 Leakage from the fittings, internal leakage, etc., are not to be reckoned in the rate of flow. On the contrary, all derived flows for other purposes, such as

- a) cooling of the motor bearings, and
- b) cooling of a gear box (bearings, oil cooler)

are to be reckoned in the rate of flow.

NOTE 4 Whether and how these flows should be taken into account depends on the location of their derivation and of the section of flow-measurement respectively.

3.2.4

volume rate of flow

rate of flow at the outlet of the pump, given by:

$$Q = \frac{q}{\rho} \quad (2)$$

NOTE In this International Standard, this symbol may also designate the volume rate of flow in any given section. It is the quotient of the mass rate of flow in this section by the density. (The section may be designated by subscripts.)

3.2.5

mean velocity

mean value of the axial speed of flow, given by:

$$U = \frac{Q}{A} \quad (3)$$

NOTE Attention is drawn to the fact that in this case, Q may vary for different reasons across the circuit.

3.2.6

local velocity

speed of flow at any given point