
**Reciprocating positive displacement
pumps and pump units — Technical
requirements**

*Pompes volumétriques à mouvement alternatif — Prescriptions
techniques*

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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

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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 16330 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 115, *Pumps*, Subcommittee SC 1, *Dimensions and technical specifications of pumps*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

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Foreword

The document (EN ISO 16330:2003) has been prepared by Technical Committee CEN/TC 197 "Pumps", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 115 "Pumps".

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 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

The annexes A, C and D are informative. Annex B is normative.

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

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Introduction

This European Standard is applicable to both direct-acting and power pump types. It is applicable to series production pumps or pump units, limited production pumps or pump units and custom production pumps and pump units. It specifies all the technical requirements for reciprocating positive displacement pumps and reciprocating positive displacement pump units with the exception of safety and testing. Safety and testing of positive displacement pumps and reciprocating positive displacement pump units are specified in the following European Standards:

- EN 809 *Pumps and pump units - Common safety requirements.*
- EN 12162 *Liquid pumps - Procedure for hydrostatic testing.*
- EN 12639 *Liquid pumps and pump units- Noise test code - Grades 2 and 3 of accuracy.*
- prEN 14343 *Positive displacement pumps - Performance tests for acceptance.*

Users of this European Standard should be aware that further or differing requirements may be needed for individual applications. This European Standard is not intended to inhibit a supplier from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier should identify any variations from this European Standard and provide details.

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1 Scope

This European Standard specifies the technical requirements, other than safety and testing, for reciprocating positive displacement pumps and pump units. This standard applies to pumps which utilise reciprocating motion derived from crankshafts and camshafts and also direct-acting fluid driven pumps.

This European Standard does not apply to reciprocating positive displacement pumps, not pumping water, where the whole pump is lubricated with the liquid being pumped.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

- | | |
|----------------|--|
| EN 287-1 | <i>Approval testing of welders - Fusion welding - Part 1: Steels (equivalent to ISO 9606-1).</i> |
| EN 287-2 | <i>Approval testing of welders - Fusion welding - Part 2: Aluminium and aluminium alloys (equivalent to ISO 9606-2).</i> |
| EN 288-1 | <i>Specification and qualification of welding procedures for metallic materials - Part 1: General rules for fusion welding (equivalent to ISO 9956-1).</i> |
| EN 288-2 | <i>Specification and approval of welding procedures for metallic materials - Part 2: Welding procedure specification for arc welding (equivalent to ISO 9956-2).</i> |
| EN 288-3 | <i>Specification and approval of welding procedures for metallic materials - Part 3: Welding procedure tests for the arc welding of steels (equivalent to ISO 9956-3).</i> |
| EN 288-4 | <i>Specification and approval of welding procedures for metallic materials - Part 4: Welding procedure tests for the arc welding of aluminium and its alloys (equivalent to ISO 9956-4).</i> |
| EN 809 | <i>Pumps and pump units for liquids - Common safety requirements.</i> |
| prEN 10226-1 | <i>Pipe threads where pressure tight joints are made on the threads – Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation.</i> |
| EN 12639 | <i>Liquid pumps and pump units - Noise test code - Grade 2 and grade 3 of accuracy.</i> |
| EN 12723:2000 | <i>Liquid pumps - General terms for pumps and installations - Definitions, quantities, letter symbols and units.</i> |
| EN 20898-2 | <i>Mechanical properties of fasteners - Part 2: Nuts with specified proof load values - Coarse thread (ISO 898-2:1992).</i> |
| prEN ISO 228-1 | <i>Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000).</i> |

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| EN ISO 898-1 | <i>Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs (ISO 898-1:1999).</i> |
| EN ISO 9934-1 | <i>Non-destructive testing - Magnetic particle testing - Part 1: General principles (ISO 9934-1:2001).</i> |
| ISO 14 | <i>Straight-sided splines for cylindrical shafts with internal centering - Dimensions, tolerances and verification.</i> |
| ISO 1027 | <i>Radiographic image quality indicators for non-destructive testing - Principles and identification.</i> |
| ISO 2491 | <i>Thin parallel keys and their corresponding keyways (Dimensions in millimetres).</i> |
| ISO 2492 | <i>Thin taper keys with or without gib head and their corresponding keyways (Dimensions in millimetres).</i> |
| ISO 3117 | <i>Tangential keys and keyways.</i> |
| ISO 3453 | <i>Non-destructive testing - Liquid penetrant inspection - Means of verification.</i> |
| ISO 3912 | <i>Woodruff keys and keyways.</i> |
| ISO 4156 | <i>Straight cylindrical involute splines - Metric module, side fit - Generalities, dimensions and inspection.</i> |
| ISO 6149-1 | <i>Connections for fluid power and general use - Ports and stud ends with ISO 261 threads and O-ring sealing - Part 1: Ports with O-ring seal in truncated housing.</i> |
| ISO 6149-2 | <i>Connections for fluid power and general use - Ports and stud ends with ISO 261 threads and O-ring sealing - Part 2: Heavy duty (S series) stud ends - Dimensions, design, test methods and requirements.</i> |
| ISO 6149-3 | <i>Connections for fluid power and general use - Ports and stud ends with ISO 261 threads and O-ring sealing - Part 3: Light duty (L series) stud ends - Dimensions, design, test methods and requirements.</i> |
| ISO 6162-1:2002 | <i>Hydraulic fluid power – Flange connectors with split or one-piece flange clamps and metric or inch screws – Part 1: Flange connectors for use at pressures of 3,5 Mpa (35 bar) to 35 Mpa (350 bar), DN 13 to DN 127.</i> |
| ISO 6162-2:2002 | <i>Hydraulic fluid power – Flange connectors with split or one-piece flange clamps and metric or inch screws – Part 2 Flange connectors for use at pressures of 35 Mpa (350 bar) to 40 Mpa (400 bar), DN 13 to DN 51.</i> |
| ISO 6164 | <i>Hydraulic fluid power -- Four-screw, one-piece square-flange connections for use at pressures of 25 MPa and 40 MPa (250 bar and 400 bar)</i> |
| ISO 7005-1 | <i>Metallic flanges - Part 1: Steel flanges.</i> |
| ISO 7005-2 | <i>Metallic flanges - Part 2: Cast iron flanges.</i> |
| ISO 7005-3 | <i>Metallic flanges - Part 3: Copper alloy and composite flanges.</i> |
| ISO 10375 | <i>Non-destructive testing - Ultrasonic inspection - Characterization of search unit and sound field.</i> |

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12723:2000 and the following apply:

3.1

ancillaries

individual components that are mounted on the pump or pump unit including accessories such as pulsation suppression devices. Auxiliary components not used in the primary operation of the pump or pump unit are not included

3.2

auxiliaries

individual components that provide an emergency service to cover breakdown of the primary service, such as an auxiliary generator

3.3

custom production

pumps or pump units that are made specifically to meet a purchaser's requirements. A custom production pump unit may contain a series or limited production pump or components. Overall documentation will be unique to the pump or pump unit

3.4

limited production

pumps or pump units that are made to an established design, in production quantities of less than 10 per batch. A limited production pump unit can contain a series production pump or components

3.5

reciprocating positive displacement power pump

a machine in which liquid is trapped in confined volumes and transported from an inlet connection to an outlet connection by the reciprocating movement of pistons or plungers. The reciprocating motion being derived from a rotating shaft

NOTE According to EN 809, pumps are defined as being terminated by their inlet and outlet connections as well as, in general, by their shaft ends without couplings.

3.6

reciprocating positive displacement direct-acting pump

a machine in which liquid is trapped in confined volumes and transported from an inlet connection to an outlet connection by the reciprocating movement of pistons or plungers. The reciprocating motion being provided by a fluid powered piston

3.7

reciprocating positive displacement pump unit

an assembly of a pump and its driver, with necessary transmission and structural supporting elements terminating at the inlet and outlet connections and at the energy supply to the driver.

An assembly of a direct-acting pump with ancillaries and structural supporting elements terminating at the pump inlet and outlet connections and at the motive fluid inlet and outlet connections on the motive cylinder.

A pump unit can include ancillary equipment, such as relief valves or pulsation suppression devices, when furnished by the supplier and mounted on the pump or pump unit

3.8

series production

pumps or pump units that are regularly made to the same specification and in production batches of not less than 10 at a time. They can be selected and purchased from standard specification sheets supplied by the supplier. In agreement between the purchaser and supplier a series production pump can be used as a custom production pump for a specification not covered in the standard specification sheet

NOTE When the purchaser is familiar with the supplier's limited production or series production pump or pump units he can make his own selection from the specification sheet. Data in the specification sheet should be such that it can be validated on the supplier's test facilities. Water is the test liquid unless otherwise shown on the specification sheet.

4 Information and requirements to be confirmed, agreed and documented

4.1 Purchaser information

When the supplier is required to make the pump selection, the purchaser shall provide the supplier with the information necessary for the proper selection of a pump or pump unit. To facilitate this the data sheet included as annex A may be used. The selection shall consider all received and relevant information on performance requirements, environment and intended operating conditions. When the supplier is required to make the pump selection and considers that information necessary for the pump selection is missing he shall request this from the purchaser. However it is the purchaser's responsibility to notify the supplier of all relevant details that may affect pump performance and longevity.

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4.2 Optional items

The purchaser's information shall include the specification of options and items for special agreement according to this standard and, where applicable, requests for deviations from this standard. Clauses of this standard referring to options and items for special agreement are listed in annex B

4.3 Supplier's Information

The supplier shall provide a general arrangement drawing giving at least the following information:

- overall dimensions;
- mounting dimensions;
- shaft dimensions;
- inlet connection dimensions;
- outlet connection dimensions.

The supplier shall also provide a specification sheet, that allows details of the flow rate and pressure that can be simultaneously obtained at a particular shaft rotational speed together with the power absorbed to determine, by interpolation, that the purchaser's requirements can be met.

5 Fitness for purpose

The design and selection of the pump and pump components shall be compatible with the liquid, motive fluid when appropriate, environment and operating conditions supplied by the purchaser in accordance with 4.1

6 Pump design

6.1 Environmental conditions

Reciprocating positive displacement pumps and pump units shall be capable of operating under the following nominal conditions:

- minimum air temperature 2 °C;
- maximum air temperature 40 °C;
- maximum relative humidity 80 %.

If environmental or operating conditions (see also annex C), such as those listed below, have been specified by the purchaser at the time of enquiry, the pump shall be capable of meeting these requirements subject to agreement between purchaser and supplier:

- ambient temperatures or humidity deviating from the above values;
- exposure to direct sunlight;
- atmospheric pollution including airborne solids;
- biological attack;
- wetting by directed water;
- cleaning by hot water, steam or chemicals;
- external shock or vibration; mechanical or seismic;
- lack of ventilation;
- flooding;
- extended periods of shut-down or storage;
- working out of the horizontal plane;
- marine environment.

6.2 Basic design criteria

6.2.1 Pumps shall be capable of operating either continuously or intermittently with each appropriate set of parameters supplied by the purchaser in accordance with 4.1.

6.2.2 Consideration shall be given during design or selection to the handling of components and assemblies when installing, assembling and maintaining the pump or pump unit. Facilities shall be provided, where necessary, for jacking bolts, extraction screws, locating dowels, spigots and lifting eyes.

6.2.3 Designs shall conform to the safety requirements of EN 809.

6.2.4 A direct-acting pump shall be capable of performing at rated conditions with all the specified motive fluid conditions.

6.2.5 The motive power cylinder and valves for direct-acting pumps shall incorporate an over-speed limiting device to protect the pump in the event of loss of output pressure.