

KÕRGSURVE VEEJOA MASINAD. OHUTUSNÕUDED. OSA
1: MASINAD

High-pressure water jet machines - Safety
requirements - Part 1: Machines

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 1829-1:2021 sisaldab Euroopa standardi EN 1829-1:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 1829-1:2021 consists of the English text of the European standard EN 1829-1:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 13.01.2021.	Date of Availability of the European standard is 13.01.2021.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 43.180, 97.080

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele. Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD

EN 1829-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2021

ICS 43.180; 97.080

Supersedes EN 1829-1:2010

English Version

High-pressure water jet machines - Safety requirements - Part 1: Machines

Machines à jet d'eau à haute pression - Exigences de
sécurité - Partie 1 : Machines

Hochdruck-Wasserstrahlmaschinen -
Sicherheitsanforderungen - Teil 1: Maschinen

This European Standard was approved by CEN on 9 November 2020.

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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents		Page
European foreword.....		4
Introduction		5
1	Scope.....	6
2	Normative references.....	7
3	Terms and definitions	8
4	Safety requirements and/or measures	11
4.1	General.....	11
4.2	Requirements for high pressure water jet machine with intended exit of water under high pressure.....	12
4.2.1	Replacement inserts	12
4.2.2	Safety devices to prevent excessive pressure.....	12
4.2.3	Pressure indicator	13
4.3	Mechanical requirements	13
4.3.1	Common requirements	13
4.3.2	Spraying devices.....	13
4.3.3	High pressure lines.....	15
4.3.4	Requirements for mobile machines	15
4.4	Requirements for transport.....	15
4.5	Electrical requirements.....	15
4.6	Requirements for emergency stopping.....	15
4.7	Thermal requirements.....	16
4.8	Noise reduction.....	16
4.8.1	Noise reduction at source by design	16
4.8.2	Noise reduction by protective measures.....	17
4.9	Requirements for vibration with hand-held spraying devices.....	17
4.10	Requirements for program controlled water jet machines.....	17
4.11	Marking the control devices.....	17
5	Verification of the safety requirements and/or measures	17
5.1	General.....	17
5.2	Hydrostatic pressure test.....	18
5.2.1	General.....	18
5.2.2	Testing of safety devices for preventing excessive pressure	18
5.2.3	Pressure indicator	18
5.2.4	Hydrostatic pressure test of spraying devices	18
5.3	Mechanical tests and/or visual inspection	18
5.3.1	General.....	18
5.3.2	Testing the stability of the high pressure water jet machine.....	19
5.4	Transport devices	19
5.5	Electrical tests	19
5.6	Testing of emergency stopping.....	19
5.7	Thermal tests.....	19
5.8	Vibration measurement.....	19
5.9	Testing of program controlled high pressure water jet machines.....	19
5.10	Verification of markings.....	19

6	Information for use	20
6.1	General	20
6.2	Marking and Warnings	22
6.2.1	General	22
6.2.2	Marking of the machine unit	22
6.2.3	Marking the safety devices	23
6.2.4	Marking the spraying devices	23
6.2.5	Marking of pipelines	24
6.3	Additional warnings	24
	Annex A (normative) Emission of vibration	26
	Annex B (informative) Vibration report	39
	Annex C (informative) Routine tests	41
	Annex D (informative) List of significant hazards	42
	Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered	44
	Bibliography	46

European foreword

This document (EN 1829-1:2021) has been prepared by 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 July 2021, and conflicting national standards shall be withdrawn at the latest by July 2021.

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

This document supersedes EN 1829-1:2010.

The main changes compared with the previous edition are as follows:

- general revision according to the state of the art;
- revision of the vibration test code requirements;
- deletion of previous normative Annex A on noise test code, which has been replaced by normative annex on emission of vibration;
- addition of informative Annex B on vibration report and informative Annex C on routine testing;
- clarification of hydrostatic pressure testing;
- transfer of Clause 4 on the list of significant hazards to informative Annex D;
- update of Annex ZA in relation to Directive 2006/42/EC.

EN 1829, *High-pressure water jet machines — Safety requirements*, consists of the following parts:

- Part 1: *Machines*
- Part 2: *Hoses, hose lines and connectors*

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Directive 2006/42/EC.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is a type-C standard as stated in EN ISO 12100:2010. This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document. The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the scope of this document. When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

1 Scope

This document contains safety-related requirements for high pressure water jet machines with drives of all kinds (e.g. electric motor, internal combustion engine, air and hydraulic) in which pumps are used to generate pressure. This document deals with all significant hazards, hazardous situations and events arising during assembly, erection, operation and servicing relevant to high pressure water jet machines, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex ZA). All references to high pressure water jet machines within this document includes machines for one or more of the following industrial applications:

- cleaning;
- surface preparation;
- material removal;
- readjustment of concrete;
- cutting.

NOTE 1 List of significant hazards is given in informative Annex D.

This document applies to mobile and fixed high pressure water jet machines, in which the water pressure is generated by a pressure generator/pump and in which the maximum allowable working pressure is more than the upper limit fixed in the scope of EN 60335-2-79:2012.

NOTE 2 35 MPa is currently the upper limit for machines covered by EN 60335-2-79:2012.

This document does not cover:

- requirements of the Pressure Equipment Directive 2014/68/EU;

NOTE 3 In some cases, specific parts can be in the scope of that directive, but their application is not dealt with in this document.

- high pressure cleaners which are dealt with in EN 60335-2-54:2008, EN 60335-2-54:2008/A11:2012, EN 60335-2-54:2008/A11:2012/AC:2015, EN 60335-2-54:2008/A1:2015 and EN 60335-2-79:2012;

NOTE 4 EN 60335-2-54:2008, EN 60335-2-54:2008/A11:2012, EN 60335-2-54:2008/A11:2012/AC:2015 and EN 60335-2-54:2008/A1:2015 applies to steam cleaners for household use. EN 60335-2-79:2012 applies to high pressure cleaners having a rated pressure not less than 2,5 MPa and not exceeding 35 MPa, as well as steam cleaners and those parts of hot water high pressure cleaners incorporating a steam stage which have a capacity not exceeding 100 l, a rated pressure not exceeding 2,5 MPa and a product of capacity and rated pressure not exceeding 5 MPa.

- additional hazards due to the incorporation of high pressure water jet machines into other process-technology machines;
- specific hazards associated with explosive atmospheres, use on ships or ambient temperatures outside the range 5 °C to 40 °C;
- hazard due to the nature of liquids used for jetting, other than that due to pressure;
- hazards associated with the drives or specific hazards due to any heat generation function. However, the hazards due to high temperatures of touchable surfaces are dealt with;

- high pressure water jet machines which are manufactured before the date of its publication as EN;
- hazards due to noise for what concerns the declaration of noise emission values in the instructions.

NOTE 5 Noise emission measurement and noise declaration will be dealt with in an upcoming amendment to this document.

Tests according to this document are type tests unless they relate to routine (informative) tests to be carried out during series manufacture.

NOTE 6 Routine tests are described in informative Annex C.

Compliance with EN 1829-1 and EN 1829-2 provides the full requirements for high pressure water jet machines.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 614-1:2006+A1:2009, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 809:1998+A1:2009, *Pumps and pump units for liquids — Common safety requirements*

EN 809:1998+A1:2009/AC:2010, *Pumps and pump units for liquids — Common safety requirements*

EN 981:1996+A1:2008, *Safety of machinery — System of auditory and visual danger and information signals*

EN 1829-2:2008, *High-pressure water jet machines — Safety requirements — Part 2: Hoses, hose lines and connectors*

EN 12096:1997, *Mechanical vibration — Declaration and verification of vibration emission values*

EN 12162:2001+A1:2009, *Liquid pumps — Safety requirements — Procedure for hydrostatic testing*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

EN 60335-2-79:2012, *Household and similar electrical appliances — Safety — Part 2-79: Particular requirements for high pressure cleaners and steam cleaners IEC 60335-2-79:2012)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60529:1991/AC:2016-12, *Degrees of protection provided by enclosures (IP code) (IEC 529:1989)*

EN 60529:1991/A1:2000, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/A1:1999)*

EN 60529:1991/A2:2013, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/A2:2013)*

EN 60529:1991/A2:2013/AC:2019-02, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/A2:2013/Cor1:2019)*

EN ISO 5349-1:2001, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements (ISO 5349-1:2001)*

EN ISO 7010:2020, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2019)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13732-1:2008, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

EN ISO 17769-1:2012, *Liquid pumps and installation — General terms, definitions, quantities, letter symbols and units — Part 1: Liquid pumps (ISO 17769-1:2012)*

EN ISO 20643:2008, *Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission (ISO 20643:2005)*

EN ISO 20643:2008/A1:2012, *Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission Amendment 1: Accelerometer positions (ISO 20643:2005/Amd 1:2012)*

IEC 62745:2017, *Safety of machinery — Requirements for cableless control systems of machinery*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010, EN ISO 17769-1:2012 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

high pressure water jet machine

machine with nozzle or other variable opening which allows water at high pressure together with any additive (chemical and/or abrasive) to emerge as a free jet

Note 1 to entry: In general, high pressure water jet machines consist of a drive, a pressure generator, pipelines, hose lines, spraying devices, safety devices, control and measurement devices.