

SLOVENSKI STANDARD

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Kompresorji in vakuumske črpalke - Varnostne zahteve - 1. del: Kompresorji

Compressors and vacuum pumps - Safety requirements - Part 1: Compressors

Kompressoren und Vakuumpumpen - Sicherheitsanforderungen - Teil 1: Kompressoren

Compresseurs et pompes à vide - Prescriptions de sécurité - Partie 1: Compresseurs

Ta slovenski standard je istoveten z: EN 1012-1:1996

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EUROPEAN STANDARD

EN 1012-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 1996

ICS 23.140

Descriptors: air compressors, safety requirements, safety of machines, accident prevention, definitions, failure, safety measures, design, construction, installation, utilization, maintenance, verification, name plates

English version

Compressors and vacuum pumps - Safety requirements - Part 1: Compressors

Compresseurs et pompes à vide - Prescriptions de sécurité - Partie 1: Compresseurs

Kompressoren und Vakuumpumpen - Sicherheitsanforderungen - Teil 1: Kompressoren

This European Standard was approved by CEN on 1996-03-13. 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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 232 "Compressors - Safety", the secretariat of which is held by SIS.

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publication of an identical text or by endorsement, at the latest by October 1996, and conflicting standards shall be withdrawn at the latest by October 1996.

This European Standards has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

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

The responsibility of CEN/TC 232 includes coordination of safety standards with CEN/TC 182 "Refrigerating systems, safety and environmental requirements" and CEN/TC 234 "Gas supply".

Annexes A, C and ZA to this European Standard are informative, and Annex B is normative.

The standard is divided in two parts:

- EN 1012-1 Compressors
- EN 1012-2 Vacuum Pumps

1 Scope

This standard is applicable to all types of compressors. The standard lists the significant hazards associated with compressors and specifies safety requirements applicable to the design, installation, operation, maintenance and dismantling of compressors during their foreseeable lifetime and subsequent disposal.

Compressors intended for use in special applications shall also comply with any specific standards relating to those applications.

This standard specifies safety requirements for all compressors and additional requirements for the following specific types:

Compressors for various types of gases

- oil-lubricated air compressors
- oil-flooded air compressors
- oil-free air compressors

- compressors for handling hazardous gases (gas compressors)
- compressors for handling oxygen
- compressors for handling acetylene

Compressors for extreme temperatures and pressures

- high pressure compressors, over 40 bar
- compressors for low inlet temperatures, below 0°C.

Other types of compressors

- large compressors (over 1000 kW, input power)
- portable and skid mounted air compressors
- compressors exposed for potentially explosive atmospheres

Exceptions

The following compressors are excluded from the scope of this standard:

- compressors having an shaft input power of less than 0,5 kW
- compressors for gases other than acetylene, having a maximum allowable working pressure of less than 0,5 bar,
- refrigerant compressors used in refrigerating systems or heat pumps as defined in EN 378.

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 the 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.

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|---------------|--|
| EN 292-1:1991 | Safety of machinery - Basic concepts - General principles for design - Part 1: Basic terminology, methodology |
| EN 292-2:1991 | Safety of machinery - Basic concepts - General principles for design - Part 2: Technical principles and specifications |
| EN 294 | Safety of machinery - Safety distances to prevent danger zones to be reached by the upper limbs. |
| EN 349 | Minimum distances to avoid crushing of parts of the human body |
| EN 378 | Refrigerating systems and heat pumps - Safety and environmental requirements |

EN 418	Safety of machinery - Emergency stop equipment - Functional aspects
EN 563	Temperatures of touchable surfaces - Ergonomic data to establish temperature limit values for hot surfaces
EN 626	Safety of machinery - Principles for machinery manufacturers on the reduction of risk to health from hazardous substances emitted by machinery
EN 837-1	Pressure gauges - Part :1 Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing
EN 953	Safety of machinery - Guarding of machinery - Fixed and moveable guards
EN 1127-1	Safety of machinery - Fires and explosions - Part 1: Explosion prevention and protection
ENV 1070	Safety of Machinery - Terminology
EN 12076	Acoustics - Noise test code for compressors and vacuum pumps (Grade 2)
EN 50 014	Electrical apparatus for potentially explosive atmospheres - General requirements
EN 50 081-2	Electromagnetic compatibility - Generic emission - Part 2: Industrial environment
EN 50 082-2	Electromagnetic compatibility - Generic immunity - Part 2: Industrial environment
EN 61310 -1	Safety of machinery - Indication, marking and actuation Part 1: Requirements for visual, auditory and tactile signals (IEC 1310-1:1995)
EN 60 204-1	Electrical Equipment of industrial machines - Part 1: General requirements
ISO 3457	Earth-moving machinery - Guards and shields - Definitions and specifications
ISO 3864	Safety colours and safety signs
ISO 3857-1	Compressors, pneumatic tools and machines - Vocabulary - Part 1: General
ISO 3857-2	Compressors, pneumatic tools and machines - Vocabulary - Part 2: Compressors
ISO 4126-1	Safety valves - Part 1: General Requirements

ISO 4871	Acoustics - Declaration and verification of noise emission values of machinery and equipment
ISO 6743-3A	Lubricants, industrial oils and related products (Class L) - Classification Part 3A: Family D (Compressors)
ISO 6743-3B	Lubricants, industrial oils and related products (Class L) - Classification Part 3B: Family D (Gas and refrigeration compressors)
ISO 7000	Graphical symbols for use on equipment - Index and synopsis
ISO/TR 11688-1	Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning
IEC 417	Graphical symbols for use on equipment

3 Definitions

For the purposes of this standard, the definitions given in ENV 1070 apply. Definitions, specifically needed for compressors are listed below and in the standard ISO 3857-1 and ISO 3857-2.

3.1 General definitions

3.1.1 compressor: A machine which compresses air, gases or vapours to a pressure higher than the inlet pressure. A compressor comprises the bare compressor itself, the prime mover and any component or device supplied, which is necessary for safe operation of the compressor.

3.1.2 pressure: Pressure in this standard means effective (gauge) pressure unless otherwise stated.

NOTE: The unit bar for pressure is used. 1 bar = 100 kPa.

3.1.3 nominal discharge pressure: The pressure at the outlet of the compressor, as specified by the manufacturer.

3.1.4 maximum allowable working pressure: The maximum operating pressure as specified by the manufacturer.

3.1.5 maximum allowable working temperature: The maximum operating temperature, as specified by the manufacturer.

3.1.6 hazardous gas or vapour: Gas or vapour with chemical, radioactive or biological properties (such as flammable, explosive, unstable, pyrogenic, corrosive, caustic, toxic, carcinogenic), which generate hazards by reactions inside the compressor or through dispersal or through reactions with the environment. A hazardous gas may be a mixture of gases with these properties.

3.1.7 tripping: Automatic stopping of a compressor initiated by limiting device.

3.2 Definitions of specific compressors

3.2.1 air compressor: A compressor intended for compression of air.

3.2.2 oil free air compressor: A compressor design in which the compressed air does not come in contact with oil.

3.2.3 oil lubricated air compressor: A compressor design in which the compressed air may come in contact with oil but excluding oil-flooded air compressors.

3.2.4 oil flooded air compressor: A compressor design in which the compressed air and the oil are mixed.

3.2.5 gas compressor: A compressor for handling hazardous gases as defined under 3.1.6.

3.2.6 oxygen compressor: A compressor for handling pure oxygen or oxygen rich mixture, of more than 70 mole per cent oxygen.

3.2.7 acetylene compressor: A compressor intended for handling acetylene.

3.2.8 high pressure compressor: A compressor for maximum allowable working pressures above 40 bar.

3.2.9 low temperature compressor: A compressor for continuous handling of media other than air, having an inlet temperature below 0°C.

3.2.10 large compressor: A compressor with an input shaft power above 1000 kW.

3.2.11 portable compressor: A compressor which is wheel mounted and can be towed.

3.2.12 skid mounted compressor: A compressor which is mounted on skids and which can be towed short distances or transported.

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4 List of hazards specific to compressors

4.0 Introduction

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Hazards listed in clause 4 are:

- hazards common to all compressors are listed under heading "Generally applicable"
- hazards which are unique for specific compressors are listed under relevant headings

4.1 Mechanical hazards**4.1.1 Generally applicable**

	Reference to safety requirement
- cutting and severing	5.1.1.1, 5.8.2
- drawing in, trapping or entanglement	5.1.1.1, 6.3.1
- friction or abrasion	5.1.1.1
- high pressure fluid injection	5.1.2.1
- ejection of parts	5.1.3
- loss of stability	5.1.4.1
- slip, trip and fall	5.1.5

4.1.2 Large compressors

- drawing in, trapping or entanglement	5.1.1.2,
7.2.9.4	

4.1.3 Portable and skid-mounted air compressors

- trapping and entanglement	7.2.9.1 b, c
- high pressure injection	7.2.9.1 b, c
- loss of stability	5.1.4.2, 7.2.9.1 b

4.2 Electrical hazards**4.2.1 Generally applicable**

- electrical contact, direct or indirect	5.2.1.1
- electrostatic phenomena	5.2.2
- external influences on electrical equipment	5.2.3

4.2.2 Gas compressors

- sparks	5.2.2
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4.2.3 Portable and skid-mounted air compressors

- electric installation	5.2.1.1
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4.3 Thermal hazards

4.3.1 Generally applicable

- burns or scalds by flames or explosion or possible contact by persons with hot or cold materials or surfaces 5.3

4.4 Noise

4.4.1 Generally applicable

- hearing loss and interference with communication 5.4.1, 7.2.4 h

4.4.2 Construction site compressors

- environmental disturbance 5.4.2

4.5 Hazards generated by used or exhausted materials and substances processed

4.5.1 Generally applicable

- contact with or inhalation of harmful fluids, gases, mists, fumes and dust 5.5.1, 7.2.4
- fire or explosion 5.5.3.1, 7.2.3
- biological and micro-biological substances 5.5.4

4.5.2 Air compressors

- fire and explosion 5.5.3.2, 5.5.3.3, 7.3

4.5.3 Gas compressors

- reaction, explosion or decomposition of the gas inside the compressor 5.5.2.2 a, b
- reactions of the processed gas with the environment due to leakage 5.5.2.2 b
- dispersal of the processed gas into the environment 5.5.2.2 c

4.5.4 Oxygen compressors

- reaction of the oxygen inside the compressor 5.5.2.3 a
- inadequate choice of materials for oxygen service 5.5.2.3 b
- inadequate choice of materials and design of valves for oxygen service 5.5.2.3 c
- lack of maintenance and cleaning 5.5.2.3 d
- emission of oxygen or oxygen enriched atmosphere 5.5.2.3 e

4.5.5 Acetylene compressors

- decomposition of acetylene 5.5.2.4 a, b
- flammability of acetylene in gas mixture 5.5.2.4 c

4.5.6 High pressure compressors

- increased reactivity of gases, lubricants and impurities at high pressure 5.5.2.5

4.5.7 Portable and skid-mounted air compressors

- contact with or inhalation of harmful gases 5.5.2.6
- fire or explosion 5.5.3.4
- refuelling 5.5.3.4

4.6 Hazards generated by neglecting ergonomic principles in machine design

4.6.1 Generally applicable

- neglecting to use personal protection equipment 7.2.4
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- human errors resulting from unsuitable positioning of control devices and instruments 5.6.1, 7.2.3

4.6.2 Portable and skid-mounted air compressors

- tow bars with excessive down load 5.6.2

4.7 Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders