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Kompresorji in vakuumske ļ rpalke - Varnostne zahteve - 3. del: Procesni kompresorji

Compressors and vacuum pumps - Safety requirements - Part 3: Process compressors

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Compressors and vacuum pumps - Safety requirements - Part 3: Process compressors

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Foreword

This document (prEN 1012-3:2008) has been prepared by Technical Committee CEN/TC 232 “Compressors - Safety”, the secretariat of which is held by SIS.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Manchinary Directive.

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

— Part 1: Air compressors

— Part 2: Vacuum pumps

— Part 3: Process compressors

Introduction

This document is a type C standard as stated in EN ISO 12100-1.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A and B standards, the provisions of this type C standard take precedence over the provisions of the other standards for machines that have been designed and built according to the provisions of this type C standard.

When EN 1012-1 was published in 1996, it applied to all types of compressors. Aspects related to process compressors are now moved into this part 3 of the EN 1012 series. It was considered a practical move so that if there were provisions that were laid down for compressors covered by CEN/TC 12 or ISO/TC 67 then any revision or amendments could be done to the process compressor part without affecting the provisions laid down for air compressors covered by this part of EN 1012.

1 Scope

This part of EN 1012 is applicable to compressors having an operating pressure greater than 0,5 bar and designed to utilise all gases other than air, nitrogen or inert gases which are covered in part 1. 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.

This part of EN 1012 includes under the general term compressors, those machines which comprise;

— the compressor itself

— a prime mover

— any component or device supplied which is necessary for safe operation of the compressor.

In addition it applies to partly completed compressors having a compressor in combination with some of these components as well as compressor assemblies operating in combination.

Excluded are refrigerant compressors used in refrigerating systems or heat pumps as defined in EN 378-1.

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.

EN 294 *Safety of machinery; safety distances to prevent danger zones from being reached by the upper limbs*

EN 349 *Safety of machinery; minimum gaps to avoid crushing of parts of the human body*

EN 378-1 *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 1: Basic requirements, definitions, classification and selection criteria*

EN 614-1 *Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles*

EN 626-1 *Safety of machinery - Reduction of risks to health from hazardous substances emitted by machinery - Part 1: Principles and specifications for machinery manufactures*

EN 837-1 *Pressure gauges - Part 1: Bourdon tube pressure gauges; dimensions, metrology, requirements and testing*

EN 953 *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards*

EN 1088 *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection*

EN 1127-1 *Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology*

EN 13309	*Construction machinery - Electromagnetic compatibility of machines with internal electrical power supply*
EN 13861	*Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery*
EN 60079	*Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*
EN 60204-1	*Safety of machinery - Electrical equipment of machines - Part 1: General requirements*
EN 61000-6-2	*Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments*
EN 61000-6-4	*Electromagnetic compatibility (EMC) - Part 6-4: Generic standards; Emission standard for industrial environments*
EN 61310-1	*Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, auditory and tactile signals*
EN 61310-2	*Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking*
EN ISO 2151	*Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)*
EN ISO 4126-1	*Safety devices for protection against excessive pressure - Part 1: Safety valves*
EN ISO 11203	*Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level*
EN ISO 12100-1	*Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology*
EN ISO 12100-2	*Safety of machinery - Basic concepts, general principles for design - Part 2: Technical*
EN ISO 13732-1	*Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces*
EN ISO 13849-1	*Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design principles*
EN ISO 13850	*Safety of machinery - Emergency stop - Principles for desi*
EN ISO 14121-1	*Safety of machinery - Principles for risk assessment*
IEC 60417	*Graphical symbols for use on equipment*
ISO 3457	*Earth-moving machinery - Guards - Definitions and requirements*
ISO 3857-1	*Compressors, pneumatic tools and machines; Vocabulary; Part I: General*
ISO 3857-2	*Compressors, pneumatic tools and machines; Vocabulary; Part II: Compressors*
ISO 4126-1	*Safety devices for protection against excessive pressure - Part 1: Safety valves*
ISO 4871	*Acoustics - Declaration and verification of noise emission values of machinery and equipment*

ISO 15156-1 *Petroleum and natural gas industries - Materials for use in H_2S-containing environments in oil and gas production - Part 1: General principles for selection of cracking-resistant materials*

ISO 80416-2 *Basic principles for graphical symbols for use on equipment - Part 2: Form and use of arrows*

ISO/TR 11688-1 *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning*

ISO/TR 11688-2 *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 2: Introduction to the physics of low-noise design*

prEN 1012-1:2007 *Compressors and vacuum pumps, safety requirements - Part 1: Compressors*

3 Terms and definitions

For the purposes of this standard, the definitions given in EN ISO 12100-1 apply. Definitions specifically needed for compressors are listed below and in the standards ISO 3857-1 and ISO 3857-2.

3.1 General terms

3.1.1
compressor
a device which compresses air, gases or vapours to a pressure higher than the inlet.

3.1.2
compressor unit
comprises the compressor, drive system and ancillary equipment integrated for a specific application.

3.1.3
hazard
a potential source of injury or damage to health.

3.1.4
inert gases
a chemically inactive gas which retains this characteristic even at elevated pressures.

3.1.5
pressure
pressure in this standard means effective (gauge) pressure unless otherwise stated.

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

3.1.6
liquid shock
the excessive force resulting from an attempt to compress incompressible media.

3.1.7
maximum allowable working pressure
the maximum pressure for which the compressor(s) or compressor assembly is designed, as specified by the manufacturer.

3.1.8
maximum allowable working temperature
the maximum operating temperature, as specified by the manufacturer.

3.1.9
nominal discharge pressure
the pressure at the outlet of the compressor, as specified by the manufacturer.

3.1.10
normal operating conditions
is considered to be when the compressor is properly maintained and operated within admissible limits in particular ambient temperature, as specified by the manufacturer compressing the specified media.

3.1.11
tripping
automatic stopping of a compressor to avoid a hazardous situation.

3.2 Specific terms

3.2.1
air compressor
a compressor intended for compression of air, nitrogen or inert gases

3.2.2
compressor assembly
an assembly of compressor unit(s) and ancillary equipment integrated for a specific application. The limits of the assembly are as defined by the manufacturer.

3.2.3
oil-free air compressor
a compressor design in which the compressed air does not come in contact with oil

3.2.4
oil-lubricated air compressor
a compressor design in which the compressed air may come in contact with oil but excluding oil-flooded air compressors

3.2.5
oil-flooded air compressor
a compressor design in which the compressed air and the oil are mixed.

3.2.6
high pressure compressor
a compressor for maximum allowable working pressures above 50 bar.

3.2.7
portable compressor
a compressor which is wheel mounted and can be towed

3.2.7.2
gross mass
is the maximum specified mass of the portable compressor including tools, equipment and fuel

3.2.8
skid-mounted compressor
a compressor which is mounted on skids and which can be towed short distances or transported.

3.2.9
water-injected compressor
a compressor design in which the compressed gas and the water are mixed.

3.2.10
main energy supply
energy which forces the prime driver of the compressor to turn.

3.2.11
auxiliary energy supply
energy which forces auxiliary systems (e.g. oil systems, cooling system or valves) to operate.

3.2.12
control energy supply
energy supply for the control system (e.g. control voltage).

4 Summary of safety requirements and measures

4.1 Hazard analysis and risk assessment

To provide the suitable level of safety taking into consideration the design, guarding and the provision of information the appropriate risk assessment procedure shall be adopted in accordance with the principles identified in EN ISO 12100-1, EN ISO 12100-2 and EN ISO 14121-1.

Hazards listed in Table 1 are related to all compressors within the scope of this standard. Indication of the type of verification adopted to establish that the identified hazard has been reduced to the lowest acceptable risk is given in the Table 1.

The table shows the references to EN1012-1 which covers identical requirements and measures applicable for process and air compressors.

Table 1 – Hazard listing

Safety integration principle	Safety requirement	Visual check	Function check	Measurement	Reference to clauses of this standard covering safety integration			Reference to other standards
					Design	Guard	Warn	
Safety integration	Ergonomics	X	X				7.2.3,	EN 1012-1 5.6 7.2.4 EN 614-1 EN 13861
Controls	Safety system					5.5.2	5.5.1.1,. 7.3 8th indent	EN 1012-1 5.6 6.2.2, 6.2.1 EN 953 EN ISO 13850 EN ISO 13849-1 IEC 60417
	Emergency stop	X	X		5.5.7			EN ISO 13850 EN 61310-1
Mechanical hazards	Cutting, severing, drawing in, trapping, entanglement, friction and abrasion	x	X	x		5.4.3	7.2.8.1 b), c)	EN 1012-1 5.1.1 6.2.1 EN 294 EN 349 EN 953 EN 1088
	Ejection of parts	X	X		8.1			EN 1012-1 5.1.3 5.1.3.1
	Stability		X	x			7.2.7.1 d)	EN 1012-1 5.1.4. EN ISO 12100-2
	Guards	X	X		5.5.2			EN 953