

# SVENSK STANDARD

## SS-EN 1012-3:2013



Fastställt/Approved: 2013-11-22  
Publicerad/Published: 2013-11-25  
Utgåva/Edition: 1  
Språk/Language: engelska/English  
ICS: 23.080; 23.140; 23.160

---

### **Kompressorer och vakuumpumpar – Säkerhetskrav – Del 3: Processkompressorer**

### **Compressors and vacuum pumps – Safety requirements – Part 3: Process compressors**

This preview is downloaded from [www.sis.se](http://www.sis.se). Buy the entire standard via <https://www.sis.se/std-100189>

# Standarder får världen att fungera

*SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.*

## Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

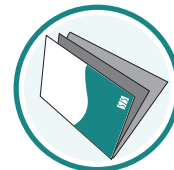
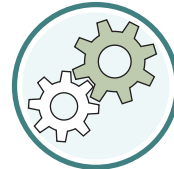
## Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

## Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

**Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på [www.sis.se](http://www.sis.se) eller ta kontakt med oss på tel 08-555 523 00.**



# Standards make the world go round

*SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.*

## Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

## Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

## Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

**If you want to know more about SIS, or how standards can streamline your organisation, please visit [www.sis.se](http://www.sis.se) or contact us on phone +46 (0)8-555 523 00**



Europastandarden EN 1012-3:2013 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 1012-3:2013.

The European Standard EN 1012-3:2013 has the status of a Swedish Standard. This document contains the official version of EN 1012-3:2013.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

*Uppllysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna uppllysningar om svensk och utländsk standard.*

*Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.*

Denna standard är framtagen av kommittén för Kompressorer, SIS/TK 245.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på [www.sis.se](http://www.sis.se) - där hittar du mer information.



EUROPEAN STANDARD

**EN 1012-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2013

---

ICS 23.140; 23.160

English Version

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

Compresseurs et pompes à vide - Prescriptions de sécurité  
- Partie 3: Compresseurs de procédé

Kompressoren und Vakuumpumpen -  
Sicherheitsanforderungen - Teil 3: Prozesskompressoren

This European Standard was approved by CEN on 8 September 2013.

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, Former Yugoslav Republic of Macedonia, 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.



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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

Page

Foreword.....	5
Introduction .....	6
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	10
4 List of significant hazards – Hazard analysis and risk assessment .....	16
5 Safety requirements and/or protective measures .....	22
5.1 General.....	22
5.2 Mechanical safety .....	23
5.2.1 General.....	23
5.2.2 Guards .....	23
5.2.3 Fluid injection.....	24
5.2.4 Loss of stability.....	25
5.2.5 Lifting and transportation of compressor units and parts .....	25
5.2.6 <i>Slip, trip and fall</i> .....	30
5.2.7 Speed .....	30
5.2.8 Loss of main energy supply or short term power interruption.....	31
5.2.9 Reverse running of the compressor .....	31
5.3 Electrical safety.....	32
5.3.1 Generally applicable .....	32
5.3.2 Protection from overload .....	32
5.3.3 Protection from live parts .....	32
5.3.4 Protection from lightning.....	32
5.3.5 <i>Portable and skid-mounted compressor units</i> .....	32
5.4 Control systems.....	33
5.4.1 General.....	33
5.4.2 Failure of safety related control system energy supply .....	33
5.4.3 Start/restart.....	33
5.4.4 Manual suspension of safety functions .....	34
5.4.5 Electrical control systems .....	35
5.4.6 Pneumatic and/or hydraulic control systems .....	36
5.5 Thermal safety.....	36
5.6 Noise .....	37
5.7 Materials and substances processed, used or exhausted .....	37
5.7.1 General.....	37
5.7.2 Reactive gases .....	38
5.7.3 Oxygen compressors .....	38
5.7.4 Acetylene compressors .....	40
5.7.5 Compressors for H <sub>2</sub> S containing gases .....	41
5.7.6 Nitrogen and other inert gases.....	41
5.7.7 Access closures to process gas containing parts.....	41
5.7.8 Compressor shaft seal systems.....	42
5.7.9 Static seals (Gaskets) for piping .....	42
5.7.10 Micro-organisms, biological and microbiological substances .....	43
5.7.11 <i>Compressor units driven by internal combustion engines</i> .....	44
5.8 Fire and explosion .....	44
5.8.1 General.....	44
5.8.2 Electrostatic phenomena .....	45
5.8.3 <i>Oil-flooded rotary compressor units</i> .....	45

5.8.4	Oil-lubricated reciprocating process compressor units .....	46
5.8.5	Compressor units driven by internal combustion engines .....	46
5.9	Ergonomic principles .....	46
5.9.1	General .....	46
5.9.2	Manual handling of compressor units and parts .....	47
5.9.3	Portable and skid-mounted compressor units .....	47
5.10	Integrity of machinery parts and other functional requirements .....	47
5.10.1	Generally applicable .....	47
5.10.2	Snow, wind and seismic loads .....	47
5.10.3	Break-up during operation .....	48
5.10.4	Low temperature operation .....	48
5.10.5	Liquid shock .....	49
5.10.6	Coolant system .....	49
5.10.7	Process gas temperature rise .....	49
5.10.8	Turbo compressor .....	49
5.11	Pressure limiting devices .....	50
5.11.1	General .....	50
5.11.2	Installation of pressure limiting devices .....	50
5.11.3	Design specifications of pressure relief devices .....	51
5.11.4	Multi stage compressor units .....	51
5.11.5	Single and multi stage turbo compressors .....	51
5.12	Information and warning devices .....	51
6	Verification of safety requirements and/or protective measures .....	52
6.1	Pressure testing .....	52
6.1.1	General .....	52
6.1.2	Acetylene compressors .....	52
6.2	Leak tightness test for hazardous gases .....	53
6.3	Test of electrical loops .....	53
6.4	Test of control systems .....	53
6.5	Noise .....	53
6.5.1	General .....	53
6.5.2	Sound power level of compressors used outdoors .....	54
6.6	Stability of portable compressor units .....	54
6.7	Structure of verification .....	54
7	Information for use .....	59
7.1	General requirements .....	59
7.2	Accompanying documents .....	60
7.2.1	Instruction handbook (Operating Manual) .....	60
7.2.2	Service instructions .....	66
7.2.3	Dismantling .....	68
7.2.4	Qualification .....	68
7.3	Markings, signs and written warnings .....	68
7.3.1	Generally applicable .....	68
7.3.2	Compressor unit enclosures .....	69
7.3.3	Portable and skid-mounted compressor units .....	69
7.3.4	Markings (in particular, data plate) .....	69
Annex A	(informative) Graphical symbols .....	71
Annex B	(informative) Measure to ensure a safety function while testing a safety device (example) .....	78
B.1	Shutdown Override Switches .....	78
B.2	Monitoring .....	78
Annex C	(informative) Guide to the application of current standards to the functional safety on safety related control of process compressors or compressor units .....	79
C.1	Introduction .....	79
C.2	Scope .....	79
C.3	Standard and code references .....	79
C.4	Standard abbreviations .....	80
C.5	Risk reduction process and functional safety .....	81

## SS-EN 1012-3:2013 (E)

C.6	Relationship between EN 1012-3 and the standards for functional safety.....	82
C.7	Process of functional safety.....	84
C.7.1	General.....	84
C.7.2	Risk Assessment.....	85
C.7.3	Allocation of safety function to protection layers.....	90
C.7.4	Safety Requirements Specification.....	91
C.7.5	Design and engineering.....	91
C.7.6	Installation commissioning and validation.....	93
C.7.7	Verification.....	93
C.7.8	Assessment of functional safety.....	93
C.8	Risk assessment of compressor and auxiliary system.....	94
C.9	Responsibilities.....	95
C.9.1	End user and manufacturer.....	95
C.9.2	Compressor or compressor unit manufacturer.....	95
C.9.3	Example 1, using EN 61508, EN 61511.....	97
C.9.4	Example 2, using EN 61508, EN 61511.....	99
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC.....	101
Bibliography.....		102



## Foreword

This document (EN 1012-3:2013) has been prepared by Technical Committee CEN/TC 232 "Compressors, vacuum pumps and their systems", 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 May 2014, and conflicting national standards shall be withdrawn at the latest by May 2014.

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 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 document.

EN 1012, *Compressors and vacuum pumps*, is composed of the following parts:

- *Part 1: Air compressors*;
- *Part 2: Vacuum pumps*;
- *Part 3: Process compressors* (the present document).

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 infrastructure.

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, Former Yugoslav Republic of Macedonia, 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.

## Introduction

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

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 published in 1996, Part 1 of EN 1012 applied to all types of compressor. The standard is now divided into 3 parts with Part 1 addressing compressors for compressed air, nitrogen and inert gases and Part 3 addressing compressors for process gases. Part 2 continues to address vacuum pumps.

Separating requirements for process gas compressors from those for compressors for air, nitrogen and other inert gases was considered a practical move so that the requirements for one type of compressor could be changed without affecting the complete standard.

Where texts parts of EN 1012-3 are identical with EN 1012-1:2010, these are identified and formatted in italics.

If common requirements for functional safety would be applied to all process compressors, the variety in the application of process compressors may cause significantly different levels of residual risk. Therefore, in addition to the requirements of this standard, the application of risk assessment may be required for safety related control systems in the case of particular applications to specify performance levels and/or safety integrity levels for related aspects of functional safety.

Informative Annex C has been included to provide guidance on risk assessment for related aspects of functional safety, including the determination of safety integrity levels and/or performance levels. The manufacturer of the compressor is responsible for carrying out such a risk assessment and applying appropriate preventive measures. These tasks are outside the scope of this standard.

## 1 Scope

This European Standard is applicable to process gas compressors and process gas compressor units having an operating pressure greater than 0,5 bar (gauge), an input shaft power greater than 0,5 kW and designed to compress all gases other than air, nitrogen or inert gases which are covered in Part 1. This document deals with all significant hazards, hazardous situations and events relevant to the design, installation, operation, maintenance, dismantling and disposal of process gas compressors and process gas compressor units, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This part of EN 1012 includes under the general term compressor units those machines which comprise:

- the compressor;
- a drive system including the prime mover;
- any component or device supplied which is necessary for operation.

This part of EN 1012 is not applicable to compressors which are manufactured before the date of publication of this document by CEN.

The requirements of this European Standard do not take into account the interaction between the compressor/compressor unit and other processes carried out on site.

Excluded are:

- refrigerant compressors used in refrigerating systems or heat pumps for which the safety requirements are given in EN 60335-2-34 or EN 12693;
- the specification of performance levels and/or safety integrity levels for safety related parts of control systems.

Performance levels and/or safety integrity levels are an important aspect of compressor design and should be determined by the manufacturer and the user based on a risk assessment (see Introduction).

This European Standard does not cover those safety aspects of road transport dealt with by EC legislation for trailers.

## 2 Normative references

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

EN 626-1:1994+A1:2008, *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers*

EN 764-7:2002, *Pressure equipment — Part 7: Safety systems for unfired pressure equipment*

EN 837-2, *Pressure gauges — Part 2: Selection and installation recommendations for pressure gauges*

EN 953:1997+A1:2009, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

## SS-EN 1012-3:2013 (E)

EN 1005-2, *Safety of machinery — Human physical performance — Part 2: Manual handling of machinery and component parts of machinery*

EN 1005-3, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

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

EN 12021, *Respiratory protective devices — Compressed air for breathing apparatus*

EN 12195-1, *Load restraining on road vehicles — Safety — Part 1: Calculation of securing forces*

EN 13001-2, *Crane safety — General design — Part 2: Load actions*

EN 13155, *Cranes — Safety — Non-fixed load lifting attachments*

EN 13309, *Construction machinery — Electromagnetic compatibility of machines with internal power supply*

EN 13445-5:2009, *Unfired pressure vessels — Part 5: Inspection and testing*

EN 13445-6, *Unfired pressure vessels — Part 6: Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron*

EN 13463-1, *Non-electrical equipment for use in potentially explosive atmospheres — Part 1: Basic method and requirements*

EN 15198, *Methodology for the risk assessment of non-electrical equipment and components for intended use in potentially explosive atmospheres*

EN 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0:2011, modified)*

EN 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d" (IEC 60079-1)*

EN 60079-14, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection (IEC 60079-14)*

EN 60204-1:2006<sup>1)</sup>, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60204-11, *Safety of machinery — Electrical equipment of machines — Part 11: Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV (IEC 60204-11)*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2)*

EN 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4)*

EN 61310-2:2008, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:2007)*

---

<sup>1)</sup> EN 60204-1:2006 is impacted by the stand-alone amendment EN 60204-1:2006/A1:2009 (IEC 60204-1:2005/A1:2008).

EN 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements (IEC 61508-1:2010)*

EN 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems (IEC 61508-2:2010)*

EN 61508-3, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 3: Software requirements (IEC 61508-3)*

EN 61508-4, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 4: Definitions and abbreviations (IEC 61508-4)*

EN 61508-5, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 5: Examples of methods for the determination of safety integrity levels (IEC 61508-5)*

EN 61508-6, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3 (IEC 61508-6)*

EN 61508-7, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 7: Overview of techniques and measures (IEC 61508-7)*

EN 61511-1, *Functional safety — Safety instrumented systems for the process industry sector — Part 1: Framework, definitions, system, hardware and software requirements (IEC 61511-1)*

EN 61511-2, *Functional safety — Safety instrumented systems for the process industry sector — Part 2: Guidelines for the application of IEC 61511-1 (IEC 61511-2)*

EN 61511-3, *Functional safety — Safety instrumented systems for the process industry sector — Part 3: Guidance for the determination of the required safety integrity levels (IEC 61511-3)*

EN 62061, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061)*

EN ISO 2151:2008, *Acoustics — Noise test code for compressors and vacuum pumps — Engineering method (Grade 2) (ISO 2151:2004)*

EN ISO 4126-1, *Safety devices for protection against excessive pressure — Part 1: Safety valves (ISO 4126-1)*

EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*

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

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

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

## SS-EN 1012-3:2013 (E)

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

EN ISO 14122-1, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels (ISO 14122-1)*

EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2)*

EN ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails (ISO 14122-3)*

EN ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 14122-4)*

EN ISO 14163, *Acoustics — Guidelines for noise control by silencers (ISO 14163)*

EN ISO 15156-1, *Petroleum and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production — Part 1: General principles for selection of cracking-resistant materials (ISO 15156-1)*

EN ISO 15667, *Acoustics — Guidelines for noise control by enclosures and cabins (ISO 15667)*

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 8573-1, *Compressed air — Part 1: Contaminants and purity classes*

ISO 8573-2, *Compressed air — Part 2: Test methods for oil aerosol content*

ISO 8573-3, *Compressed air — Part 3: Test methods for measurement of humidity*

ISO 8573-4, *Compressed air — Part 4: Test methods for solid particle content*

IEC 60417 (2002-10), *Graphical symbols for use on equipment*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 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**

*part of a compressor unit that compresses a gas or vapour media to a pressure higher than that at the inlet*

##### 3.1.2

##### **compressor unit**

*unit that comprises the compressor, a drive system and any component or device which is necessary for operation*

### 3.1.3

#### **depressurisation**

reduction of the pressure difference between the inside of a pressure containing part and its environment to zero

EXAMPLE Stopping a compressor may lead to higher pressures on the suction side. In such cases, achieving a safe state may include depressurizing.

### 3.1.4

#### **drive system**

*system that consists of a prime mover and coupling mechanism*

Note 1 to entry: *Prime mover may be an electric motor, steam engine (turbine), etc.*

Note 2 to entry: *Coupling mechanism may be a drive belt, shaft, gears, etc.*

### 3.1.5

#### **harm**

physical injury or damage to health

[SOURCE: EN ISO 12100:2010, definition 3.5]

### 3.1.6

#### **hazard**

potential source of harm

[SOURCE: EN ISO 12100:2010, definition 3.6]

#### **3.1.6.1**

##### **hazard zone**

danger zone

space within and/or around machinery in which a person can be exposed to a hazard

[SOURCE: EN ISO 12100:2010, definition 3.11]

#### **3.1.6.2**

##### **hazardous event**

event that can cause harm

Note 1 to entry: A hazardous event can occur over a short period of time or over an extended period of time.

#### **3.1.6.3**

##### **hazardous situation**

circumstance in which a person is exposed to at least one hazard

Note 1 to entry: The exposure can result in harm immediately or over a period of time.

[SOURCE: EN ISO 12100:2010, definition 3.10]

#### **3.1.6.4**

##### **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

Note 1 to entry: A hazardous gas may be a mixture of gases with these properties.

## SS-EN 1012-3:2013 (E)

### 3.1.7

#### **inert gases**

*chemically inactive gas which retains this characteristic even at elevated pressures and temperatures*

### 3.1.8

#### **liquid shock**

*excessive force resulting from an attempt to compress incompressible media*

### 3.1.9

#### **maximum allowable pressure**

*maximum allowable working pressure*

*maximum pressure for which the compressor or compressor unit is designed, as specified by the manufacturer*

### 3.1.10

#### **maximum allowable temperature**

*maximum allowable working temperature*

*maximum operating temperature, as specified by the manufacturer*

### 3.1.11

#### **maximum continuous shaft speed**

*highest rotational speed at which the compressor at any of the specified operating conditions is capable of continuous operation*

Note 1 to entry: The maximum continuous speed is specified by the manufacturer.

### 3.1.12

#### **nominal discharge pressure**

*rated discharge pressure*

*pressure at the outlet of the compressor, as specified by the manufacturer*

### 3.1.13

#### **normal operating conditions**

*conditions 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*

### 3.1.14

#### **pressure**

*pressure relative to atmospheric pressure, i.e. gauge pressure*

Note 1 to entry: In many cases, this is referred to as effective pressure.

Note 2 to entry: The unit bar for pressure is used. 1 bar = 100 kPa.

### 3.1.15

#### **rated power**

*maximum permitted power (mechanical or electrical)*

Note 1 to entry: Nominal power is a synonym for rated power.

### 3.1.16

#### **risk**

*combination of the probability of occurrence of harm and the severity of that harm*

[SOURCE: EN ISO 12100:2010, definition 3.12]



### 3.1.17

#### **residual risk**

risk remaining after protective measures have been taken

Note 1 to entry: See EN ISO 12100:2010, Figure 2.

[SOURCE: EN ISO 12100:2010, definition 3.17]

### 3.1.18

#### **safety function**

function of the machine whose failure can result in an immediate increase of the risk(s)

[SOURCE: EN ISO 12100:2010, 3.30; EN ISO 13849-1:2008, 3.1.20]

### 3.1.19

#### **safety related control**

safety instrumented system

SIS

control device that carries out one or more safety function(s)

Note 1 to entry: This definition corresponds to safety instrumented system (SIS) according to EN 61511-1.

### 3.1.20

#### **shutdown**

stopping of all prime movers of a compressor

#### 3.1.20.1

##### **automatic shutdown**

automatically initiated stopping of a compressor initiated by limiting device or safety device

Note 1 to entry: Automatic shutdown is commonly denoted as “tripping”.

Note 2 to entry: This definition describes the way of initiating a normal, safety related controlled or emergency shutdown.

#### 3.1.20.2

##### **normal shutdown**

manually or automatically initiated stopping of a compressor which may include full sequential actuation of auxiliary equipment and drive system

#### 3.1.20.3

##### **safety related controlled shutdown**

manually or automatically initiated stopping of a compressor which includes a reduced (compared to normal shutdown) sequential actuation of auxiliary equipment and drive system

Note 1 to entry: This type of shutdown is initiated by a safety related function.

Note 2 to entry: Reduced sequential actuation means a reduced number and/or duration of steps of the sequence.

Note 3 to entry: After a normal shutdown the energy to the prime movers can be cut off or not (see stop category 1 or 2 of 9.2.2 of EN 60204-1:2006).

Note 4 to entry: Manually initiated stopping of a compressor which includes a reduced (compared to normal shutdown) sequential actuation of auxiliary equipment and drive system is often denoted as emergency stop.

## SS-EN 1012-3:2013 (E)

### 3.1.20.4

#### **emergency shutdown**

manually or automatically initiated stopping of a compressor with immediate cut of the energy to the prime mover

Note 1 to entry: This type of shutdown is initiated by a safety related function.

Note 2 to entry: This shutdown definition is related to the stop category 0 of 9.2.2 of EN 60204-1:2006.

### 3.1.21

#### **unexpected start-up**

unintended start-up

start-up which, because of its unexpected nature, generates a hazard by, for example:

- a start command which is the result of a failure in, or an external influence on, the control system;
- a start command generated by inopportune action on a start control or other parts of the machine as, e.g., a sensor or a power control element;
- restoration of the power supply after an interruption;
- external / internal influences (e.g. gravity, wind, self-ignition in internal combustion engines) on parts of the machine.

Note 1 to entry: Machine start-up during the normal sequence of an automatic cycle is not unintended, but can be considered to be unexpected from the point of view of the operator. Prevention of accidents in this case involves the use of safeguarding measures (see EN ISO 12100-2:2010, Clause 5).

[SOURCE: EN ISO 12100:2010, 3.31]

## 3.2 Specific terms

### 3.2.1

#### **acetylene compressor**

compressor intended for handling technically pure acetylene

Note 1 to entry: For mixtures of acetylene with other gases or liquids the applicability of the relevant acetylene specifications will be decided on a case by case basis.

### 3.2.2

#### **air compressor**

*compressor intended for compression of air, nitrogen or inert gases*

### 3.2.3

#### **auxiliary energy supply**

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

### 3.2.4

#### **compressor assembly**

*assembly of compressor units and ancillary equipment to provide a compression facility that functions as an integrated whole*

Note 1 to entry: *The limits of the assembly are as defined by the manufacturer.*

### 3.2.5

#### **control energy supply**

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

### 3.2.6

#### **high pressure compressor**

compressor for maximum allowable working pressures above 50 bar

### 3.2.7

#### **large compressor**

compressor with an input shaft power above 1 000 kW

### 3.2.8

#### **low temperature compressor**

compressor for continuous handling of media other than air, inert gases or nitrogen, having an inlet temperature below 0 °C

### 3.2.9

#### **main energy supply**

energy which forces the prime mover(s) of the compressor to turn

### 3.2.10

#### **oil-flooded compressor**

compressor design in which the compressed gas or vapour and the oil are mixed

Note 1 to entry: In such compressors, a considerable amount of oil is injected into the gas or vapour in order to reduce the gas discharge temperature.

### 3.2.11

#### **oil-free compressor**

compressor design in which the compressed gas or vapour does not come in contact with oil

### 3.2.12

#### **oil-lubricated compressor**

compressor design in which the compressed gas or vapour may come in contact with oil but excluding oil-flooded compressors

### 3.2.13

#### **oxygen compressor**

compressor for handling pure oxygen or oxygen rich mixture, of more than 70 mole percent oxygen

Note 1 to entry: If ideal gas law is applicable mole fraction is equivalent to volume fraction.

### 3.2.14

#### ***portable and skid-mounted compressor***

#### **3.2.14.1**

##### ***portable compressor unit***

*compressor unit which is wheel-mounted and can be towed on and off-site*

#### **3.2.14.2**

##### **skid-mounted compressor unit**

compressor unit which is mounted on skids and which is intended to be towed short distances on-site or transported on-site

#### **3.2.14.3**

##### **gross mass**

*maximum specified mass of the skid mounted or portable compressor unit (including tools, equipment and fuel)*

Note 1 to entry: Tools and equipment includes for example concrete breakers, picks and hoses likely to be carried for a typical working application.