



**SLOVENSKI STANDARD**  
**oSIST prEN 764-7:2018**  
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**Tlačna oprema - 7. del: Varnostni sistemi za nekurjeno tlačno opremo**

Pressure equipment - Part 7: Safety systems for unfired pressure equipment

Druckgeräte -Teil 7: Sicherheitseinrichtungen für unbefeuerte Druckgeräte

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**Ta slovenski standard je istoveten z: prEN 764-7**

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## Pressure equipment - Part 7: Safety systems for unfired pressure equipment

Druckgeräte - Teil 7: Sicherheitseinrichtungen für unbefeuerte Druckgeräte

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 54.

If this draft becomes a European Standard, 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.

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## European foreword

This document (prEN 764-7:2018) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 764-7:2002.

This document has been prepared under a mandate given to CEN by the European Commission (EC) and the European Free Trade Association, and supports the essential safety requirements of the Pressure Equipment Directive (PED) 2014/68/EU.

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

This European Standard consists of the following parts, under the general title *Pressure equipment*:

- *Pressure equipment - Part 1: Vocabulary;*
- *Pressure equipment - Part 2: Quantities, symbols and units;*
- *Pressure equipment - Part 4: Establishment of technical delivery conditions for metallic materials;*
- *Pressure equipment - Part 5: Inspection documentation of metallic materials and compliance with the material specification;*
- *Pressure equipment - Part 6: Structure and content of operating instructions [CEN/TR 764-6];*
- *Pressure equipment - Part 7: Safety systems for unfired pressure equipment;*
- *Pressure equipment and assemblies - Part 8: Proof test [CEN/TS 764-8].*

For the preparation of this document, CEN/TC 54 “Unfired pressure vessels” was supported by Technical Committee CEN/TC 267 “Industrial piping and pipelines”.

Annexes A, C, E, F, G and H of this document are informative. Annexes B and D are normative.

The changes compared to the previous edition are the following:

- new Annexes F, G, H related to Fault assessment chart, inspection processes and basics for Risk assessment;
- new Annexe ZA template;
- new rules of presentation taken into account;
- updated normative references.

## Introduction

A safety system can be the ultimate limitation to protect pressure equipment from exceeding its allowable limits or a means to prevent a potentially hazardous situation leading to injury. These limits consist of permissible pressure, temperature, level, flow or a combination of these which were fixed at the design stage. Regular control and/or monitoring devices which are not a necessary part of a safety systems are excluded from this document since they become active in advance of a safety system (see Figure 1).

It is essential to consider not only the pressure relieving device or safety related measurement, control and regulation system (SRMCR) but the whole of the pressure relief system so as not to reduce the relieving capacity or adversely effect the proper operation of the pressure relieving devices. Operating problems frequently occur in pressure relief systems because of incorrect selection of the appropriate device or because a correctly selected device was adversely affected by improper handling, incorrect installation or lack of maintenance.

In some cases it can be necessary to establish the basic details of the safety system before selecting the value of the maximum allowable pressure PS for the equipment to be protected. Some safety systems need a usual margin between the maximum operating pressure and their reseating pressure which it is essential to consider before selecting PS.

This document does not deal explicitly with hazards specifically covered in other European Directives like, for instance, the ATEX-Directive 94/9/EC or the EMC-Directive 2004/108/EC. In cases where such hazards might occur and could become relevant for the design and/or construction of the safety system, it is important that specific standards for these hazards are used or a risk analysis is made.

NOTE The role of harmonized standards in supporting the essential safety requirements of European Directives is described in the "Guide to the implementation of directives based on the New Approach and the Global Approach". It can be necessary for products to meet the requirements of more than one directive and it is the responsibility of the manufacturer to ensure that these requirements are complied with. Annex ZA draws attention to the essential safety requirements of EU Directive 2014/68/EU "Pressure Equipment Directive" addressed by this document. This document also draws attention to subjects which are not covered in detail but are relevant to safety systems.





**prEN 764-7:2018 (E)****1 Scope**

This document specifies the requirements for safety systems which protect a vessel, a system of vessels, piping, accessories or assemblies from exceeding operating conditions.

It is also applicable to safety related indicators and alarms, signals and warning devices when used in safety systems.

Equipment connected together by piping of adequate capacity, free from potential blockages and which does not contain any valve that can isolate any part from the safety system, may be considered as a single pressure system when considering the requirements for overpressure protection.

Safety systems include the interconnections between the equipment to be protected and any discharge location. This location can either be an outlet to atmosphere or the entry into a closed disposal system.

NOTE The scope of this document and its relationship to the safety accessories and other protective devices described in the Pressure Equipment Directive are shown in Annex E.

**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 764-1, *Pressure equipment – Part 1: Vocabulary*

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

EN 837-3, *Pressure gauges – Part 3: Diaphragm and capsule pressure gauges - Dimensions, metrology, requirements and testing*

EN 13480-3, *Metallic industrial piping – Part 3: Design and calculation*

EN 50156-1, *Electrical equipment for furnaces and ancillary equipment – Part 1: Requirements for application design and installation*

EN 60204-1, *Safety of machinery - Electrical equipment of machines – Part 1: General requirements (IEC 60204 1)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508 series)*

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

EN ISO 4126-2, *Safety devices for protection against excessive pressure – Part 2: Bursting disc safety devices (ISO 4126-2)*

EN ISO 4126-3, *Safety devices for protection against excessive pressure – Part 3: Safety valves and bursting disc safety devices in combination (ISO 4126-3)*

EN ISO 4126-4, *Safety devices for protection against excessive pressure – Part 4: Pilot-operated safety valves (ISO 4126-4)*

EN ISO 4126-5:2013, *Safety devices for protection against excessive pressure – Part 5: Controlled safety pressure relief systems (CSPRS) (ISO 4126-5:2013)*

EN ISO 4126-6, *Safety devices for protection against excessive pressure – Part 6: Application, selection and installation of bursting disc safety devices (ISO 4126-6)*

ISO 4126-9:2018, *Safety devices for protection against excessive pressure - Part 9: Application and installation of safety devices excluding stand-alone bursting disc safety devices*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 764-1 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 <http://www.iso.org/obp>

#### 3.1

##### **safety accessory**

device designed and used to protect pressure equipment against the ultimate limits being exceeded and to prevent allowable limits being exceeded more than momentarily (see Annex E and Figure 1) in reasonably foreseeable conditions

Note 1 to entry: Such devices include:

- devices for direct pressure limitation, such as safety valves, bursting disc safety devices, buckling rods, controlled safety pressure relief systems (CSPRS), and
- limiters, such as pressure switches or temperature switches or fluid level switches and ‘safety related measurement control and regulation (SRMCR)’ devices.

Note 2 to entry: In this document “safety accessory” solely refers to the pressure risk/hazard.

Note 3 to entry: More than one safety accessory may be necessary for these purposes.

Note 4 to entry: Limiters can be classified as safety accessories only when they satisfy essential requirement 2.11 of the Pressure Equipment Directive.

#### 3.2

##### **safety system**

system of safety accessories and other protective devices which prevents the process parameters exceeding the limit values determined by the hazard analysis and ensures that the following risks are eliminated or adequately controlled (injury to personnel, damage to the environment and damage to property)

#### 3.3

##### **monitoring system**

system which periodically checks given parameters and draws attention to those which are outside normal operating range but which are below the allowable values determined by the hazard analysis

Note 1 to entry: Normal operating conditions of the process can be restored either directly by the system or by an operator.

**prEN 764-7:2018 (E)****3.4  
regulating system**

system which adjusts or controls a particular parameter to maintain operation within predetermined range

**3.5  
independence**

ability to function as required without interference from or dependence upon other equipment

**3.6  
fail-safe**

characteristic whereby the failure of any safety system or any energy source will leave the protected equipment in a safe condition

**3.7  
hazard**  
potential source of harm

Note 1 to entry: The term “hazard” can be qualified in order to define its origin (for example, mechanical hazard, electrical hazard) or the nature of the potential harm (for example, electric shock hazard, cutting hazard, toxic hazard, fire hazard).

Note 2 to entry: The hazard envisaged by this definition:

- is either permanently present during the intended use of the pressure equipment (for example, the contained fluid flammability, electric arc during a welding phase, noise emission, high temperature), or
- can appear unexpectedly (for example pressure and/or temperature increase, explosion, ejection as a consequence of breakage).

[SOURCE: EN ISO 12100:2010, 3.6, modified – Note 2 to entry has been adapted to pressure equipment and Note 3 to entry has been removed.]

**3.8  
risk**  
combination of the probability of occurrence of harm and the severity of that harm

[SOURCE: EN ISO 12100:2010, 3.12]

**3.9  
residual risk**  
risk remaining after protective measures have been implemented

Note 1 to entry: See also Figure 2.

[SOURCE: EN ISO 12100:2010, 3.13, modified – Note 1 to entry has been removed.]

**3.10  
risk analysis**  
combination of the specification of the limits of the pressure equipment, hazard identification and risk estimation

[SOURCE: EN ISO 12100:2010, 3.15, modified – “Machine” has been replaced with “pressure equipment”.]

**3.11****risk assessment**

overall process comprising a risk analysis and a risk evaluation

[SOURCE: EN ISO 12100:2010, 3.17]

**3.12****risk estimation**

defining likely severity of harm and probability of its occurrence

[SOURCE: EN ISO 12100:2010, 3.14]

**3.13****risk evaluation**

judgement, on the basis of risk analysis, of whether the risk reduction objectives have been achieved

[SOURCE: EN ISO 12100:2010, 3.16]

**3.14****reliability**

ability of a system or component to perform a required function under specified conditions and for a given period of time without failing

[SOURCE: EN ISO 12100:2010, 3.2, modified – “A machine or its component or equipment” was replaced with “a system or component”.]

**3.15****shutdown**

automatically or manually initiated action to achieve a safe condition of the pressure equipment

**3.16****lockout**

system feature which preserves the shutdown action until it is released by a manual intervention

**3.17****safety related measurement, control and regulation system**

SRMCR

high integrity pressure protection system

system which by means of automatic control equipment, operating independently from other process control functions, prevents operating parameters from exceeding the ultimate limits and prevents allowable limits being exceeded more than momentarily (see Annex E and Figure 1) in reasonably foreseeable conditions in pressure equipment

**3.18****limiter**

device which either activates the means for correction of a process parameter evolution outside its normal operation prescribed range or provides for shutdown or shutdown and lockout

**3.19****safety**

freedom from risk which is not tolerable

[SOURCE: ISO/IEC Guide 51:2014, 3.14]

**prEN 764-7:2018 (E)****3.20****self-diagnosis**

regular and automatic determination that all chosen components of a safety system are capable of functioning as required

**3.21****maximum allowable pressure****PS**

maximum pressure for which the equipment is designed, as specified by the manufacturer

**3.22****allowable temperatures****TS**

maximum and minimum temperatures for which the equipment is designed, as specified by the manufacturer

**3.23****redundancy**

provision of more than one device or system such that the necessary function will still be provided in case of failure of one or more of these devices

[SOURCE: ISO 4126-9:2018, 3.5]

**3.24****controlled safety pressure relief systems****CSPRS**

system consisting of a main valve in combination with a control unit

[SOURCE: EN ISO 4126-5:2013, 3.1 modified – Notes to entry have been removed.]

**3.25****diversity**

provision of different means to achieve the required function

Note 1 to entry: For example, other physical principles or other ways to resolve the same issue.

**3.26****harm**

injury or damage to the health of people, or damage to property or the environment

[SOURCE: ISO/IEC Guide 51:2014, 3.1]

**3.27****remote scenario****exceptional load case**

highly improbable situation/condition

disturbance condition that is considered not to be reasonably foreseeable, but cannot be ruled out

Note 1 to entry: “Exceptional load case” is used in EN 13445-3:2014, 5.3.3.

**3.28****safety instrumented system**

SIS

instrumented system used to implement one or more safety instrumented functions

Note 1 to entry: A SIS is composed of any combination of sensor (s), logic solver (s), and final elements(s).

[SOURCE: EN 61511-1:2004, 3.2.67, modified – Notes and Figure 1 have been deleted.]

Note 2 to entry: SIS and SRMCR are similar concepts.

**3.29****allowable Limit**

quantitative value of a parameter for which the pressure equipment is designed as determined by the manufacturer through a hazard/risk analysis

Note 1 to entry: In the pressure case, *PS* is the allowable pressure limit.

**3.30****ultimate Limit**

quantitative value of a parameter that shall not be overstepped in reasonably foreseeable conditions as determined by the manufacturer through a hazard/risk analysis

Note 1 to entry: In the pressure case 1.1*PS* is the ultimate pressure limit.

Note 2 to entry: The term “ultimate limit” is sometimes confused with “limits applying to damage limitation” used for instance in remote scenarios, external fire, and other conditions not reasonably foreseeable where the 1.1*PS* limit does not apply.

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**4 Risk consideration**

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**4.1 General**

All service conditions shall be considered to select the most appropriate safety concept to ensure safe operation. This requires a realistic assessment of risk by means of risk analysis and risk evaluation (see Figure 2).

Annex H provides guidance related to the different steps of risk analysis and risk evaluation.

Risk analysis involves:

- determination of the boundaries of the pressure equipment including intended use and reasonably foreseeable misuse (see Annex H);
- identification of potential hazards and characterization of hazardous situations (see 4.2 and Annex H);
- estimation of the risk for each identified hazard (see Annex H).

Risk evaluation (see Annex H) involves the process in which, on the basis of risk analysis, judgement is made to achieve a tolerable risk.

The manufacturer and the user should consider the most onerous conditions which can exist for pressure and temperature within the allowable limits.