



SLOVENSKI STANDARD
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Industrial thermoprocessing equipment - Part 1: Common safety requirements for industrial thermoprocessing equipment

Industrial thermoprocessing equipment - Part 1: Common safety requirements for industrial thermoprocessing equipment

Industrielle Thermoprozeßanlagen - Teil 1: Allgemeine Sicherheitsanforderungen an industrielle Thermoprozeßanlagen

Equipements thermiques industriels - Partie 1: Prescriptions générales de sécurité pour les équipements thermiques industriels

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EUROPEAN STANDARD

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Industrial thermoprocessing equipment - Part 1: Common safety requirements for industrial thermoprocessing equipment

Equipements thermiques industriels - Partie 1:
Prescriptions générales de sécurité pour les
équipements thermiques industriels

Industrielle Thermoprozeßanlagen - Teil 1:
Allgemeine Sicherheitsanforderungen an
industrielle Thermoprozeßanlagen

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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.

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CEN

European Committee for Standardization
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FOREWORD

This European Standard has been prepared by Technical Committee CEN/TC 186 "Industrial thermoprocessing - Safety", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 1997, and conflicting national standards shall be withdrawn at the latest by September 1997.

The working group that drafted this Part of EN 746 comprised experts from the following countries: France, Germany, Italy, Sweden, United Kingdom.

This standard forms one part of safety standards covering Industrial Thermoprocessing Equipment.

The full list of parts of EN 746 is given below:

EN 746 Industrial Thermoprocessing Equipment

- Part 1: Common Safety Requirements for Industrial Thermoprocessing Equipment
- Part 2: Safety Requirements for Combustion and Fuel Handling Systems
- Part 3: Safety Requirements for the Generation and Use of Atmosphere Gases
- Part 4: Particular Safety Requirements for Hot Dip Galvanising Thermoprocessing Equipment
- Part 5: Particular Safety Requirements for Salt Bath Thermoprocessing Equipment
- Part 6: Particular Safety Requirements for Material Melting, Remelting and Liquid Phase Maintaining Thermoprocessing Equipment
- Part 7: Particular Safety Requirements for Vacuum Thermoprocessing Equipment
- Part 8: Particular Safety Requirements for Quenching Equipment

This European Standard 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).

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

An assessment of the foreseeable risks arising from the use of the equipment was carried out when this standard was prepared.

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.

0 INTRODUCTION

This standard has been prepared to be a harmonised standard to provide one means of conforming with the essential requirements of the Machinery Directive and associated EFTA Regulations.

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery shall comply as appropriate with EN 292 for hazards which are not covered by this standard.

This European Standard is a type C-standard as defined in EN 292.

Where for clarity an example of a preventative measure is given in the text, this should not be considered as the only possible solution. Any other solution leading to the same risk reduction is permissible if an equivalent level of safety is achieved.

This part of EN 746 assumes that the installations are operated and maintained by trained personnel.

1 SCOPE

1.1 This part of EN 746 specifies common safety requirements for industrial thermo-processing equipment (for example industrial furnaces and industrial heating equipment), which meets the definition for machinery given in EN 292-1:1991.

It details the anticipated significant hazards associated with industrial thermoprocessing equipment and specifies the appropriate preventative measures for reduction or elimination of these hazards.

This standard gives general principles and common requirements for the reduction of risks for equipments covered by the scope.

The common requirements apply to all of the subsequent parts of this EN 746 dealing with specific equipment unless an exception is stated in the relevant Part. The general principles (subclauses are pointed out) will be used to establish the specific technical measures in the subsequent Parts(s) dealing with safety requirements for particular equipment.

NOTE: For similar equipment not covered by the particular Parts of this standard, EN 746-1 can be used to assist in the reduction of risk for the Hazards identified in clause 4 (List of Hazards).

1.2 This part of EN 746 is applicable to industrial thermoprocessing equipments for use in fields such as:

- Metallurgical and metal working plant;
- Glass making plant;
- Ceramic manufacturing plant;
- Cement, lime and gypsum manufacturing plant;

- Chemical plant;
- Waste incineration equipment;

and heated by:

- Gaseous fuels;
- Liquid fuels;
- Solid fuels;
- Mixed fuels;
- Electricity.

The thermoprocessing equipment covered by this Part of EN 746 is further specified in clause 3.

A more detailed list of thermoprocessing equipment within these categories is given in Annex A.

In the remainder of this standard the expression "equipment" will be used.

This Part of EN 746 is not applicable to blast furnaces, converters (in steel plants), boilers, welding machines or food processing equipment.

1.3 This Part of EN 746 specifies the requirements to be met by the manufacturer to ensure the safety of persons and property during commissioning, start-up, operation, shut-down, maintenance periods and dismantling, as well as in the event of foreseeable faults or malfunctions which can occur in the equipment.

It specifies the safety requirements at stages in the life of the equipment, and its design, ordering, construction, use and disposal.

It specifies safety requirements for:

protection against:

- mechanical hazards, movement of machinery and material, ejection of parts or material or liquids and gases, implosion, structural failure;
- electrical hazards;
- thermal hazards: explosion, fire, scalds, contact with hot parts, gases and flames;
- noise and vibration;
- thermal, optical and ionising and non-ionising radiation;
- harmful by-products and hazardous substances, poisoning, biological and micro-biological contamination, pollution and environmental discomfort;
- other hazards such as listed in clause 4;

maintenance, provision for indicators, and inspection.

This part of EN 746 applies to equipment which is placed on the market after the date of issue of this standard.

2 NORMATIVE REFERENCES

This European standard incorporates by dated and undated references 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 these 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.

2.1 Basic Standards

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 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 204-1:1992, modified)
IEC 364-4-41	Electrical installations of buildings; Part 4: Protection for safety; Chapter 41: Protection against electrical shock
IEC 364-4-43	Electrical installations of buildings; Part 4: Protection for safety; Chapter 43: Protection against overcurrent
IEC 364-4-47	Electrical installations of buildings; Part 4: Protection for safety; Chapter 47: Application of protective measures for safety. Section 470 - General. Section 471 - Measures of protection against electric shock
IEC 364-4-442	Electrical installations of buildings; Part 4: Protection for safety; Chapter 44: Protection against overvoltages; Section 442 - Protection of low-voltage installations against faults between high-voltage systems and earth
IEC 364-4-443	Electrical installations of buildings; Part 4: Protection for safety; Chapter 44: Protection against overvoltages; Section 443 - Protection against overvoltages of atmospheric origin or due to switching

- IEC 364-4-473 Electrical installations of buildings.
Part 4: Protection for safety;
Chapter 47: Application of protective measures for safety.
Section 473 - Measures of protection against overcurrent
- IEC 364-4-45 Electrical installations of buildings.
Part 4: Protection for safety;
Chapter 45: Protection against undervoltage
- IEC 364-4-46 Electrical installations of buildings.
Part 4: Protection for safety;
Chapter 46: Isolation and switching

2.2 Group Safety Standards

- EN 294 Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs
- EN 349 Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
- EN 418 Safety of machinery - Emergency stop equipment, functional aspects - Principles for design
- EN 457 Safety of machinery - Auditory danger signals - General requirements, design and testing
(ISO 7731:1986 modified)
- EN 547-1 Safety of machinery - Human body measurements -
Part 1: Principles for determining the dimensions required for openings for whole body access into machinery
- EN 547-2 Safety of machinery - Human body measurements -
Part 2: Principles for determining the dimensions required for access openings
- EN 563 Safety of machinery - Temperatures of touchable surfaces -
Ergonomics data to establish temperature limit values for hot surfaces
- 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 manufacturers
- EN 811 Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs

EN 842	Safety of machinery; Visual danger signals; General requirements, design and testing
prEN 953	Safety of machinery; General requirements for the design and construction of guards (fixed, movable)
EN 954-1	Safety of machinery; Safety-related parts of control systems - Part 1: General principles for design
EN 981	Safety of machinery - System of auditory and visual danger and information signals
EN 982	Safety of machinery - Safety requirements for fluid power systems and their components - Hydraulics
EN 983	Safety of machinery - Safety requirements for fluid power systems and their components - Pneumatics
EN 1037	Safety of machinery - Prevention of unexpected start-up
EN 1088	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
prEN 1127-1	Safety of machinery - Fire and explosions - Part 1: Explosion prevention and protection
prEN 1299	Vibration isolation of machines - Information for the application of source isolation
EN ISO 11690-2	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 2: Noise control measures (ISO 11690-2:1996)
EN 60825-1	Safety of laser products - Part 1: Equipment classification, requirements and user's guide (IEC 825-1:1993)
EN 61310-1	Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, auditory and tactile signals (IEC 1310- 1:1995)
EN 61310-2	Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking (IEC 1310-2:1995)
IEC 405	Nuclear instruments: Constructional requirements to afford personal protection against ionizing radiations
IEC 417	Graphical symbols for use on equipment - Index, survey and compilation of the single sheets

- ISO 7000 Graphical symbols for use on equipment - Index and synopsis
- ISO 7243 Hot environments - Estimation of the heat stress on working man, based on the *WBGT*-index (wet bulb globe temperature)
- ISO 7933 Hot environments - Analytical determination and interpretation of thermal stress using calculation of required sweat rate

2.3 Product Safety Standards

- EN 746-2:1997 Industrial thermoprocessing equipment -
Part 2: Safety requirements for combustion and fuel handling systems
- EN 746-3 Industrial thermoprocessing equipment -
Part 3: Safety Requirements for the generation and use of atmosphere gases
- prEN 746-4 Industrial thermoprocessing equipment -
Part 4: Particular Safety Requirements for Hot Dip Galvanising Equipment
- prEN 746-5 Industrial thermoprocessing equipment -
Part 5: Particular Safety Requirements for Salt Bath Thermoprocessing Equipment
- prEN 746-6 Industrial thermoprocessing equipment -
Part 6: Particular Safety Requirements for Liquid Phase Treatment Equipment
- prEN 746-7 Industrial thermoprocessing equipment -
Part 7: Particular Safety Requirements for Vacuum Thermoprocessing Equipment
- prEN 746-8 Industrial thermoprocessing equipment -
Part 8: Particular Safety Requirements for Quenching Equipment
- prEN 1547 Industrial thermoprocessing equipment -
Noise test code for industrial thermoprocessing equipment including its ancillary handling equipment
- EN 60519-1 Safety in electroheat installations -
Part 1: General requirements
- EN 60519-2 Safety in electroheat installations -
Part 2: Particular requirements for resistance heating equipment

IEC 519-3	Safety in electroheat installations - Part 3: Particular requirements for induction and conduction heating and induction melting installations -
IEC 519-4	Safety in electroheat installations - Part 4: Particular requirements for arc furnace installations
IEC 519-5	Safety in electroheat installations - Part 5: Specifications for safety in plasma installations
IEC 519-6	Safety in electroheat installations - Part 6: Specifications for safety in industrial microwave heating heating equipment
IEC 519-7	Safety in electroheat installations - Part 7: Particular requirements for installations with electron guns
IEC 519-8	Safety in electroheat installations - Part 8: Particular requirements for electro-slag remelting furnaces
IEC 519-9	Safety in electroheat installations - Part 9: Particular requirements for high-frequency dielectric heating installations

3 DEFINITIONS

For the purposes of this standard the following definitions apply:

NOTE: An alphabetic listing of the definitions, as well as their cross-references in German, French and English are given in informative Annex D.

3.1 Metallurgical and metal working plant

Plant and/or equipment which is used for thermal production, melting or remelting of ferrous and non-ferrous metals as well as to enable the molten material to be held, heated, alloyed and restructured before recasting into predetermined shapes.

Equipment used to remelt and re-alloy selected scrap material to produce primary ingots for remelting.

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Equipment used to change the structure of the solid material by heating and cooling through various temperature gradient changes before its return to ambient temperature.

Equipment used to pre-heat metal prior to mechanical working or joining.

3.2 Glass making plant

Plant and/or equipment which is used to heat and melt the constituents which make up glass and to allow for their proper mixing before the molten material is used directly to manufacture glass products.

Plant and/or equipment which is used for heat treatment or forming of glass products.

3.3 Ceramic manufacturing plant

Plant and/or equipment which is used for firing, heating and/or melting ceramic raw material and/or products (e.g. tiles, sanitary ware, table ware, bricks) to process the product to its intermediate or final state.

Plant and/or equipment for the reheating and drying of such products to apply glaze and other decoration to the item.

3.4 Cement, lime and gypsum manufacturing plant

Plant and/or equipment used to calcine and/or fire selected raw materials to produce cement, lime and gypsum.

3.5 Chemical plant

Plant and/or equipment which provides the heat input into chemical plants used in processes such as thermo-chemical reactions, oxygenation, catalysing, reduction, chain reactions and distillation.

3.6 Waste incineration equipment

Equipment used to dispose of by burning, household and industrial waste, sewage sludge, tyres, special and toxic waste, medical and hospital waste but excluding atomic waste.

3.7 Drying equipment

Equipment used to cure or expel moisture or volatiles from a product or material by heating.

3.8 Cooling equipment

Equipment with heating and/or cooling systems used to reduce the temperature of products.

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4 LIST OF HAZARDS

Anticipated significant hazards are listed in broad outline in the scope and are detailed in Table 1.

For ease of reference table 1 also indicates the corresponding preventative measures and should be used in conjunction with clauses 5 and 6.

Table 1:
List of Hazards, Hazardous Situations and Preventative Measures

NOTE: When personal protective equipment is referred to, the manufacturer should recommend it in the information for use manual

1 Clause	2 Hazard	3 Hazardous Situation	4 Preventative Measures	5 References
1	GENERAL		General design concept (Structure, access for operation, maintenance and cleaning, lighting,etc.)	5.1.1 to 5.1.3
2	MECHANICAL			
2.1	General		Design, structural details; Emergency stops; Guards.	5.2.1 EN 418, prEN 953
2.2	Crushing	Moving parts Traps created by auto and manual feeding/take-off mechanisms	Fit guard, fit interlocks, Means of warning (audible, visual), Provision of safety distances, Provision of warning signs,	5.2.2, prEN 953. prEN 1088 EN 457, prEN 842, EN 981, EN 61310-1. EN 294; EN 349; EN 811; EN 547-1 ISO 7000; EN 61310-1
2.3	Shearing	Moving parts, moving of charging doors, feeding/take-off mechanism	Emergency stops, Push button with visual inspection, Maintenance/cleaning, good practice (particularly on guards). Fit guard, Fit interlocks,	EN 418 EN 418 5.2.3; prEN 953 prEN 1088,

(continued)