

SLOVENSKI STANDARD
oSIST prEN ISO 13578:2016
01-julij-2016

Industrijske peči in pripadajoča procesna oprema - Varnostne zahteve za stroje in opremo za proizvodnjo jekla z električnimi obločnimi pečmi (ISO/DIS 13578:2016)

Industrial furnaces and associated processing equipment - Safety requirements for machinery and equipment for production of steel by electric arc furnaces (ISO/DIS 13578:2016)

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Fours industriels et équipements associés - Exigences de sécurité pour les machines et les équipements pour la production d'acier par four à arc électrique (ISO/DIS 13578:2016)

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Industrial furnaces and associated processing equipment - Safety requirements for machinery and equipment for production of steel by electric arc furnaces

Fours industriels et équipements associés — Exigences de sécurité pour les machines et les équipements pour la production d'acier par four à arc électrique

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ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.



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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	2
3 Terms and definitions	3
4 Symbols and abbreviated terms	6
5 Safety requirements and/or measures	6
5.1 General.....	6
5.1.1 General design requirements.....	6
5.1.2 Electrical melting power supply.....	7
5.1.3 Electrical low voltage supply and control system.....	7
5.1.4 Bonding and grounding of mechanical furnace parts.....	7
5.1.5 Hydraulic, pneumatic, cooling and lubrication systems.....	7
5.1.6 Molten material.....	7
5.1.7 Linked equipment.....	8
5.1.8 Ergonomic principles.....	8
5.1.9 Leakage from hydraulic system and EAF-Transformer.....	9
5.1.10 Access.....	9
5.1.11 Safety related control system.....	10
5.1.12 Danger zone.....	10
5.1.13 Blocking device for tilting platform.....	10
5.1.14 Gantry movement.....	10
5.1.15 Loss of energy.....	10
5.1.16 Electrode clamp.....	11
5.1.17 EAF control room.....	11
5.1.18 Local control stand.....	11
5.1.19 Portable wireless control box.....	11
5.1.20 Personal protective equipment (PPE).....	11
5.1.21 Warnings.....	12
5.1.22 Surface temperatures and heat radiation.....	12
5.1.23 Noise.....	12
5.1.24 Vibrations.....	13
5.1.25 Special requirements for explosion prevention and protection.....	13
5.1.26 Safety layout.....	14
5.2 List of significant hazards, hazardous situations, safety requirements and/or measures.....	14
6 Verification of the safety requirements and/or measures	18
7 Information for use	19
7.1 General.....	19
7.2 Warning devices and safety signs.....	19
7.3 Minimum marking.....	19
7.4 Accompanying documents.....	19
7.4.1 Instruction handbook.....	19
7.4.2 Maintenance manual.....	22
7.5 Training of personnel.....	22
Annex A (normative) Noise test code	24
Annex B (normative) Equipment covered by this document	28
Annex C (informative) Examples of electric arc furnaces	30
Bibliography	32

ISO/DIS 13578:2016(E)**Foreword**

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13578 was prepared by Technical Committee ISO/TC 244, *Industrial furnaces and associated processing equipment*.

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Introduction

This document is a type C standard as stated in 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 or 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.

Where for clarity an example of a preventive measure is given in this document, 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.

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Industrial furnaces and associated processing equipment - Safety requirements for machinery and equipment for production of steel by electric arc furnaces

1 Scope

This document specifies the general safety requirements for electric arc furnaces (EAF) to melt steel not containing radioactive material.

NOTE Radioactive material is considered to be detected in front of the steel plant entrance

This document deals with significant hazards, hazardous situations and events as listed in [Table 1](#) pertinent to EAF, when used as intended and under conditions foreseen by the manufacturer, but also includes foreseeable faults and malfunctions in case of misuse.

This document specifies also criteria for the plant and equipment integrated in the production process.

This document specifies the requirements to be followed up during design to ensure the safety of persons which are to be met during transport, assembly, commissioning, operation, maintenance and decommissioning of the equipment.

This document assumes that installations are operated and maintained by adequately trained personnel. Manual intervention for setting, adjustment and maintenance is accepted as part of the normal use of the equipment.

This document covers the following equipment (see [Annex B](#)):

- EAF with AC technology (alternating current);
- EAF with DC technology (direct current);
- scrap pre-heating technology;
- associated equipment/devices (e.g., inert gas stirring, carbon and oxygen injection systems).

The following equipment is **not** covered by this document:

- induction furnace;
- resistance-arc furnace (e.g., submerged arc furnace);
- electron beam furnace;
- plasma furnace;
- other electrical furnaces used in secondary steelmaking, e.g., ladle furnace.

This document **does not** specify safety requirements for the following equipment, which can be an integral or complementary part of the equipment covered by the Scope:

- a) cranes;
- b) shell lifting cross beam;
- c) scrap basket, steel ladle and slag pot;
- d) transport cars for scrap baskets, steel ladles and slag pots;

ISO/DIS 13578:2016(E)

- e) dedusting system;
- f) “dog house” and “elephant house” (furnace enclosures for environmental reasons);
- g) alloying system;
- h) separate scrap drying equipment;
- i) furnace transformer and high voltage system;
- j) robots/manipulators (e.g., for temperature measurement and sampling).

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.

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 3864-3, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 4871, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals*

ISO 11064-1, *Ergonomic design of control centres — Part 1: Principles for the design of control centres*

ISO 11202:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying approximate environmental corrections*

ISO 11428, *Ergonomics — Visual danger signals — General requirements, design and testing*

ISO 11429, *Ergonomics — System of auditory and visual danger and information signals*

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

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13574, *Industrial furnaces and associated processing equipment — Vocabulary*

ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13849-1/A1:2013, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

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

ISO 14120, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

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

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

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

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

ISO 16069, *Graphical symbols — Safety signs — Safety way guidance systems (SWGS)*

IEC 60204-1 Edition 5.1:2009, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60519-4, *Safety in electroheat installations — Part 4: Particular requirements for arc furnace installations*

IEC 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

IEC 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking*

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

IEC 62061 Edition 1.2:2015, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

EN 13463-1:2009, *Non-electrical equipment for use in potentially explosive atmospheres — Part 1: Basic method and requirements*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 12100, ISO 13574 and the following apply.

NOTE 1 to entry Definition used in ISO standards referred to in this document are also valid for this document.

3.1

charge material

material which is charged into the furnace

Note 1 to entry: to entry: e.g., steel scrap, DRI, HBI, hot metal, FeCr, alloys

3.2

heat cycle

tap-to-tap time period between two consecutive tappings with defined power-on and power-off time

3.3

hydraulic fluid

fluid used to transmit force via hydraulic pressure

Note 1 to entry: to entry: see ISO 6743-4

ISO/DIS 13578:2016(E)**3.4****fire-resistant hydraulic fluid**

hydraulic fluid that is difficult to ignite and shows little tendency to propagate flame

[SOURCE: ISO 5598, 3.2.271]

3.5**ladle**

vessel to collect, transport and charge/discharge hot metal/steel

3.6**work station**

predefined locations for personnel conducting control, production or maintenance activities, the main work stations are:

3.6.1**EAF control room**

main control room in which the control consoles and monitoring facilities for an EAF are located

Note 1 to entry: to entry: It is a location where operating personnel is required permanently during the production process

3.6.2**local control stands**

control units usually situated adjacent to the equipment

Note 1 to entry: to entry: It is a location where operating personnel is required temporarily during the production process, e.g., during tapping

3.6.3**portable wireless control box**

mobile control units connected to the control system

Note 1 to entry: to entry: e.g., to position equipment more precisely

3.6.4**maintenance points**

locations where personnel are required during maintenance

Note 1 to entry: to entry: All above mentioned stations could also be used for maintenance

3.7**tilting**

movement of the furnace to discharge molten steel or slag from foreseen openings

3.8**blocking device**

device to block the equipment in the desired position

3.9**gantry**

structure used for lifting and swinging roof and columns/electrode arms

3.10**high voltage switch gear**

furnace breaker to connect and disconnect the EAF to/from electrical high voltage supply

3.11**reactor**

device to increase the reactance of the EAF system

3.12**furnace transformer**

device for the transformation of the high voltage electrical supply to arc voltage

3.13**alloying system**

device to store and feed any metallic and non-metallic materials to/into the EAF

3.14**electrode nipling system**

device, in which electrode strands can be stored or new electrode sections are added

3.15**dog house**

furnace enclosure inside the EAF building close to the EAF

Note 1 to entry: to entry: It is serving as indirect fume extraction system and minimising noise propagation. It is not covered by the scope.

3.16**elephant house**

furnace enclosure as part of the EAF building

Note 1 to entry: to entry: It is serving as indirect fume extraction system and minimising noise propagation. It is not covered by the scope.

3.17**gas cleaning system**

equipment for the collection and processing of created off-gas

3.18**high current system**

high current connection-line between transformer and electrode

3.19**trained personnel**

persons with the knowledge of systems, background, experience and ability to operate and/or maintain the equipment in the intended use and proper operation of the machinery/equipment

3.20**authorized personnel**

trained persons who are nominated by the user to perform a specific task on a specific equipment

3.21**maintenance**

all activities carried out outside the production process:

3.21.1**inspection**

basic checks (e.g., visual) of equipment;

3.21.2**service**

periodic exchange of lances, cleaning (e.g., lance, slag door area), lubrication, adjustment of limit switches;

3.21.3**repair**

repair or exchange of damaged components accompanied with complete shutdown (i.e. isolation of energy);