
**Plastics and rubber machines —
Injection moulding machines — Safety
requirements**

*Machines pour les matières plastiques et le caoutchouc — Machines
de moulage par injection — Prescription de sécurité*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 270, *Plastics and rubber machines*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 145, *Plastics and rubber machines*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a type-C standard as stated in ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine distributors, resellers, rebuilders and integrators;
- machine users/employers (small, medium and large enterprises);
- machine operators/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises).

The above-mentioned stakeholder groups have been given the possibility to participate in the drafting process of this document.

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

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

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Plastics and rubber machines — Injection moulding machines — Safety requirements

1 Scope

This document specifies the essential safety requirements for the design and construction of injection moulding machines for the processing of plastics and/or rubber and provides information for their safe use.

This document is applicable only to injection moulding machines with hydraulic and/or electrical drives for platen movement.

This document deals with all significant hazards, hazardous situations and events relevant to injection moulding machines, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see [Annex A](#)) during the life cycle of the machinery (see ISO 12100:2010, 5.4).

The following are not covered:

- machines on which the clamping unit can only be operated by the physical force of the operator;
- machines for which the hydraulic jack can only be manually operated;
- injection blow moulding machines;
- machines for reaction injection moulding;
- compression moulding machines and transfer moulding machines;
- direct-on sole moulding machines, unit sole and footwear component moulding machines, full shoe and boot moulding machines;
- design of an exhaust system;
- design and construction of the mould.

NOTE Moulds and exhaust systems are not part of the machinery.

This document is not applicable to injection moulding machines which are manufactured before the date of its publication.

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.

ISO 1402:2009, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

ISO 3747:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering/survey methods for use in situ in a reverberant environment*

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

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

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 7751:2016, *Rubber and plastics hoses and hose assemblies — Ratios of proof and burst pressure to maximum working pressure*

ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

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 11204:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections*

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

ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13851:2002, *Safety of machinery — Two-hand control devices — Functional aspects and design principles*

ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body*

ISO 13856-1:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors*

ISO 13856-2:2013, *Safety of machinery — Pressure-sensitive protective devices — Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars*

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14118:2017, *Safety of machinery — Prevention of unexpected start-up*

ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 14122-1:2016, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means and general requirements of access*

ISO 14122-2:2016, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways*

ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails*

ISO 14122-4:2016, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders*

IEC 60204-1:2016, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60947-5-3:2013, *Low-voltage switchgear and controlgear — Part 5-3: Control circuit devices and switching elements — Requirements for proximity devices with defined behaviour under fault conditions (PDDDB)*

IEC 61496-1:2012, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

IEC 61496-2:2013, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

IEC 61496-3:2008, *Safety of machinery — Electro-sensitive protective equipment — Part 3: Particular requirements for active opto-electronic protective devices responsive to diffuse Reflection (AOPDDR)*

IEC 61800-5-1:2007, *Adjustable speed electrical power drive systems — Part 5-1: Safety requirements — Electrical, thermal and energy*

IEC 61800-5-2:2016, *Adjustable speed electrical power drive systems — Part 5-2: Safety Requirements — Functional*

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3 Terms, definitions and abbreviated terms

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3.1 Terms and definitions

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For the purposes of this document, the following terms and definitions given in ISO 12100:2010 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1

injection moulding machine

machine for the cyclic production of moulded parts from plastics and/or rubber

Note 1 to entry: The material is injected through a nozzle into a *mould* (3.1.2) containing one or more cavities in which the article is formed.

Note 2 to entry: An injection moulding machine essentially consists of one or more *clamping units* (3.1.6), one or more *injection units* (3.1.8), drive and control systems.

Note 3 to entry: Examples of horizontal and vertical injection moulding machine are shown in [Annex A](#).

3.1.2

mould

exchangeable part consisting of two or more halves clamped on the platens of the machine in which the material is injected

3.1.3

ejector

driven component (e.g. pin with linear movement) inside a *mould* (3.1.2) used for the ejection of the moulded part(s) out of the opened mould

3.1.4

core

driven component inside a *mould* (3.1.2) for carrying out mould functions, e.g. enabling undercuts in the moulded part

3.1.5

mould area

area between the platens where the *mould* (3.1.2) is fixed

3.1.6

clamping unit

part of the machine that holds, opens and closes the *mould* (3.1.2)

3.1.7

clamping mechanism area

area which comprises mechanisms for the movement of the movable platen and/or the application of the clamping force

3.1.8

injection unit

unit for processing (plasticizing and/or homogenizing) and delivering material through a nozzle

3.1.9

carousel machine

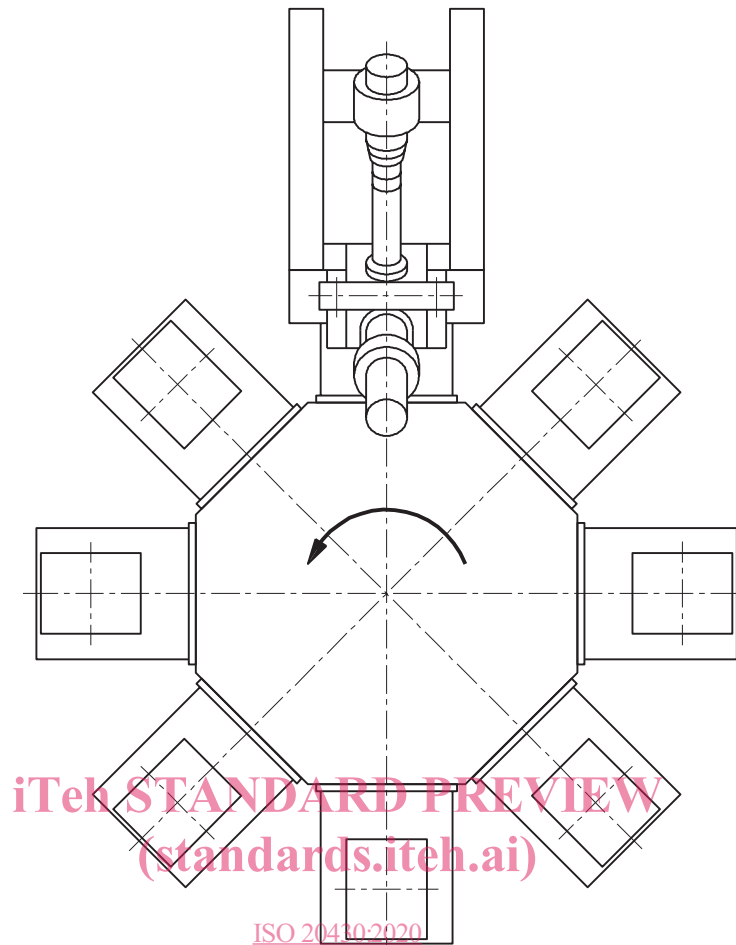
machine consisting of two or more *clamping units* (3.1.6) mounted on a carousel in either a vertical or horizontal configuration to index on one or more fixed *injection units* (3.1.8)

Note 1 to entry: See [Figure 1](#).

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Figure 1 — Example of a carousel machine, shown without guards

3.1.10

shuttle-table machine

machine with a sliding table/platen

machine designed to contain one or more parts of *moulds* (3.1.2) attached to a sliding table/platen

Note 1 to entry: The table/platen indexes the parts of the mould by a sliding movement between the loading/unloading station and the injection position.

Note 2 to entry: See [Figure 2](#).

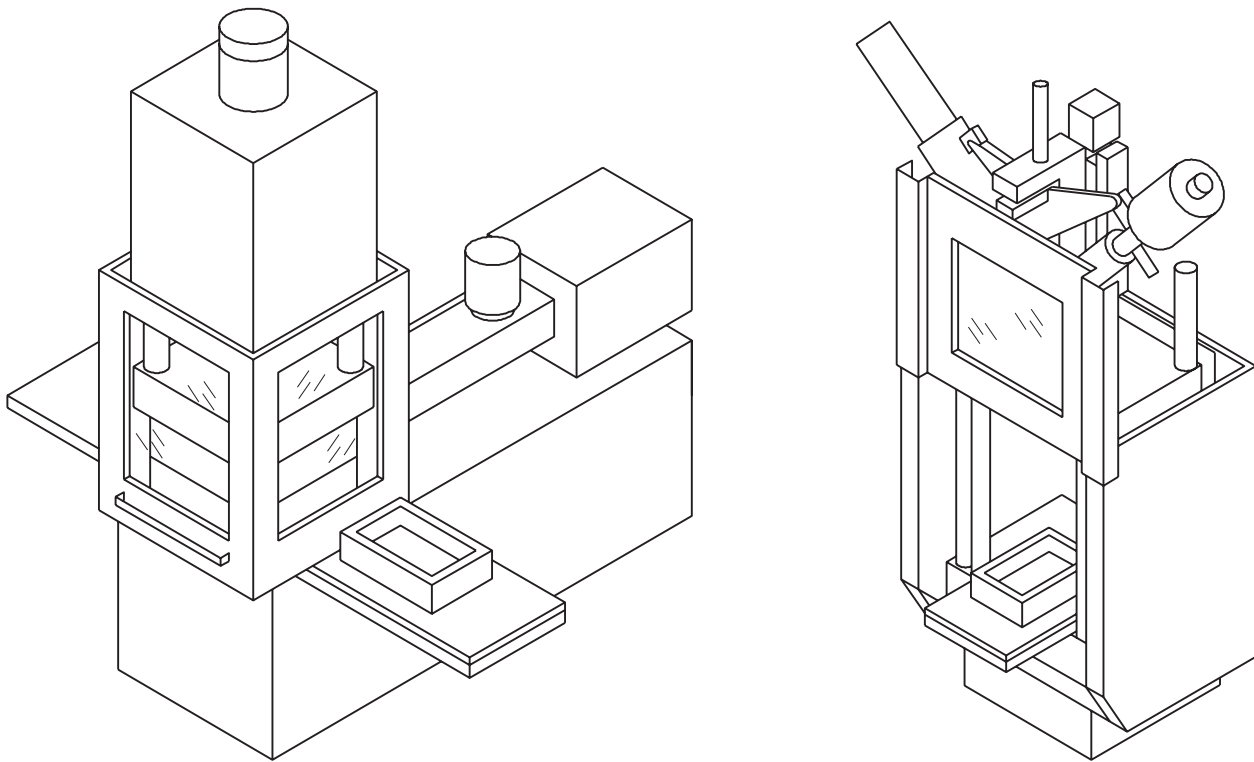


Figure 2 — Examples of shuttle-table machines (two stations left; single station right), shown without guards for the movements of the table

3.1.11

turn-table machine

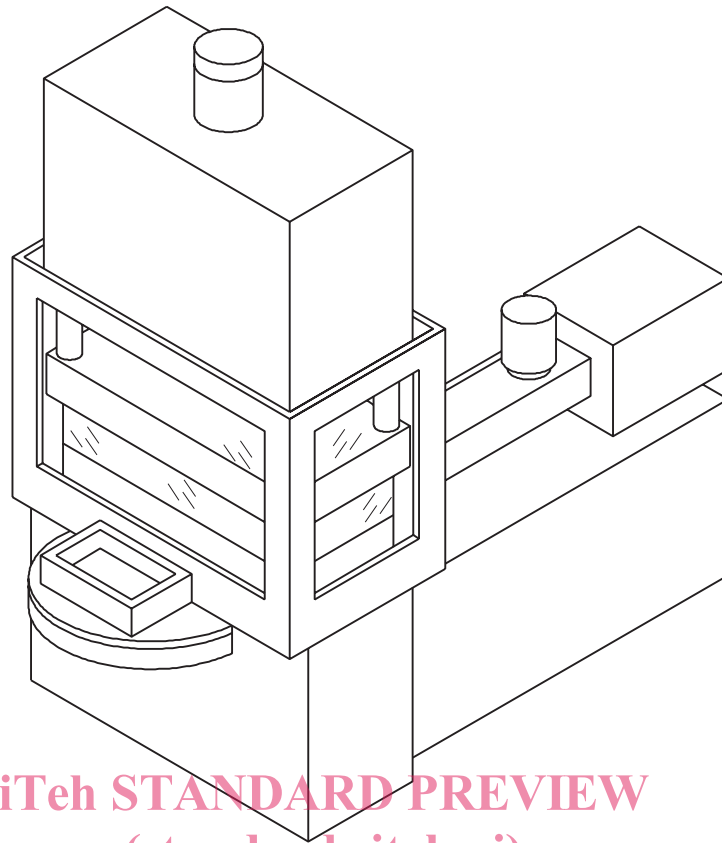
machine designed to contain one or more parts of moulds (3.1.2) attached to a rotating table

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Note 1 to entry: The table indexes the parts of the mould by a rotary movement between the loading/unloading station and the injection position.

Note 2 to entry: See [Figure 3](#).



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Figure 3 — Example of a turn-table machine, shown without guards for the movements of the table

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3.1.12

multi-station machine with mobile injection unit

machine consisting of a mobile *injection unit* (3.1.8) which indexes between two or more stationary *clamping units* (3.1.6)

Note 1 to entry: See [Figures 4](#) and [5](#).