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Foundry machinery — Vocabulary —

Part 3: Die casting machines and other equipment related to permanent mold casting process

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Partie 3: Machines à couler sous pression et autres équipements liés au processus de moulage permanent

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword

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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).

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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 306, *Foundry machinery*.

A list of all parts in the ISO 23472 series can be found on the ISO website.

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

Documentation gives rise to numerous international exchanges of both intellectual and material nature. These exchanges often become difficult, either because of the great variety of terms used in various fields or languages to express the same concept, or because of the absence of, or the imprecision of, useful concepts.

To avoid misunderstandings due to this situation and to facilitate such exchanges, it is advisable to select terms to be used in various languages or in various countries to express the same concept, and to establish definitions providing satisfactory equivalents for the various terms in different languages.

The objects involved in the ISO 23472 series are foundry machines used in foundry production.

The purpose of the ISO 23472 series is to provide definitions in English that are rigorous, uncomplicated and which can be understood by all concerned. The scope of each concept defined has been chosen to provide a definition that is suitable for general application within foundry machinery, which includes machines and equipment adapted in each stage of the processes within different casting processes.

As a metal thermoforming method that fills molten metal into the mold to produce machine parts or rough parts after solidification, casting has a long history and various processes, and its technology remains constantly developing and changing. According to the differences in the mold used, or different ways of molten metal filling or solidification, casting processes are usually divided into sand casting, permanent casting and other casting processes. According to different casting processes and different stages of production, casting equipment covered by foundry machinery is divided into the following major categories:

— molding and core-making machines and other equipment related to non-permanent mold casting process;

— die casting machines and other equipment related to permanent mold casting process;

— abrasive blasting machines and other equipment related to cleaning and finishing for casting;

— cupola furnaces and pouring devices and ladles.

This document only involves terms and definitions of die casting machines and other equipment related to permanent mold casting process, including basic concepts specifically concerning structural characteristics and functions, important mechanisms and parts, main technological processes and parameters of various die casting machines, squeeze casting machines, low pressure casting machines, centrifugal casting machines, gravity die casting machines and other related casting machines (see Figure 1).

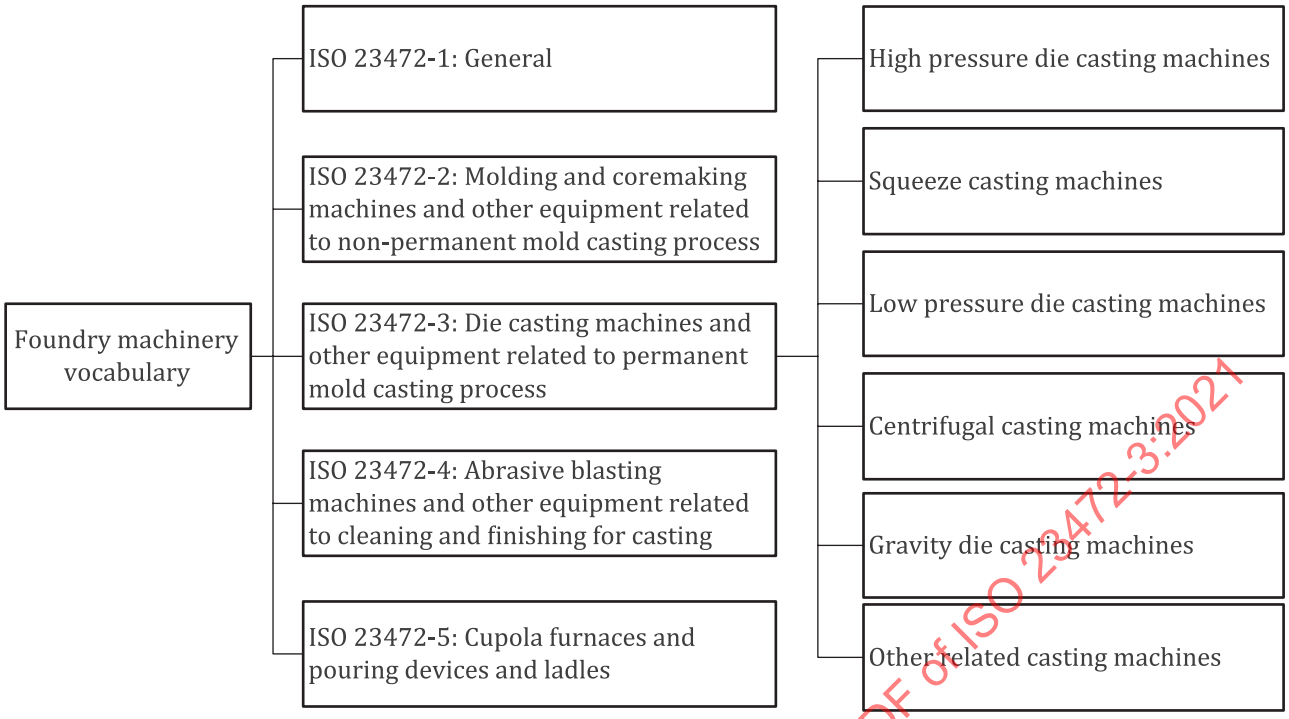

Figure 1 — Structure of vocabulary on die casting machines and other equipment related to permanent mold casting process

It is expected to be used in the field of die casting machines and other equipment related to permanent mold casting process, technical documentation, related scientific and technical publications.

Foundry machinery — Vocabulary —

Part 3: Die casting machines and other equipment related to permanent mold casting process

1 Scope

This document defines a set of terms and definitions of die casting machines and other equipment related to permanent mold casting process.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
acceleration of fast injection
time required to achieve the maximum injection velocity from the *fast injection* (3.41) start during the injection process

3.2
access door
doors of the distance guards of a *die casting cell* (3.16)

3.3
auxiliary equipment
devices which carry out additional process functions within a *die casting cell* (3.16)

3.4
biscuit
slug
metal surplus which solidifies in the cold-chamber *shot sleeve* (3.92) and is ejected with the casting

3.5
cantilever type horizontal centrifugal casting machine
horizontal centrifugal casting machine (3.53) whose *pipe die* (3.81) in cantilever shaped to be fixed on one end or both ends of main axle of the machine, or the flange disc(s) which to be connected with one or both ends of main axle of the machine

3.6
casting area
maximum projected area of the *die casting machine* (3.17) that allows the casting (including the gating system, venting system and overflow system) on the parting surface of the die

3.7
casting volume
<theoretical>maximum amount of volume that can be cast for a single casting

3.8
centrifugal casting machine
machine that uses centrifugal casting process to produce castings

3.9
clamping type horizontal centrifugal casting machine
horizontal centrifugal casting machine (3.53) whose *pipe die* (3.81) spins with its both ends to be clamped

3.10
clean-up device for die
device which clean away coating or other residues

3.11
cold-chamber die casting machine
die casting machine (3.17) with a horizontal *die closing system* (3.22), where molten metal is delivered to the *shot sleeve* (3.92) in measured amounts from a separate furnace

3.12
core puller
assembly which controls movements of cores

3.13
counter pressure casting machine
machines that is similar to low pressure casting machine but using differential pressure between die and furnace to allow molten metal to fill into the die cavity to produce castings.

Note 1 to entry: The working pressure levels are usually higher than ones in low pressure casting machine.

3.14
cylinder platen
thrust platen
reaction platen
link housing
rear platen
platen to which the die closing mechanism and the closing cylinder are connected

3.15
die area
area between *fixed platen* (3.44) and *moving platen* (3.79)

3.16
die casting cell
die casting machine (3.17), together with auxiliary and ancillary equipment, which form a complete production unit

3.17
die casting machine
machine with the purpose to inject molten metal under pressure into a parted die which is connected to the platens of the machine

3.18
die clamping device
device for clamping the die to the platens of the machine (automatically or manually)

3.19
die closing cylinder
die clamping cylinder
hydraulic cylinder that provides force for the *die closing system* (3.22)

3.20
die closing mechanism area
area between *moving platen* (3.79) and *cylinder platen* (3.14)

3.21
die closing safety device
device, actuated by the movable guard, which prevents the die from closing if a failure occurs in the control system area where the drives are located for driving the mechanism of the *moving platen* (3.79)

3.22
die closing system
assembly which opens and closes the die and holds the die against the force exerted on the molten metal during injection and solidification

3.23
die locking force
die clamping force
force which acts on the parting surface of the die by *die closing system* (3.22) to hold the die against the force exerted on the molten metal during injection and solidification after the die closing

3.24
die opening force
force that opens the die after the casting is solidified

3.25
die releasing agent tank
device in which the die releasing agent is placed and stirred, and fed into the parts of the spraying mechanism under a certain pressure

3.26
docking
process in *squeeze casting machine* (3.101) which presses the *shot sleeve* (3.92) against the die

3.27
docking device
device in *squeeze casting machine* (3.101) which presses the *shot sleeve* (3.92) against the die

3.28
docking force
force of *docking* (3.26) the *shot sleeve* (3.92) with the die in *squeeze casting machine* (3.101)

3.29
docking stroke
displacement of the *docking device* (3.27) of the *shot sleeve* (3.92) in *squeeze casting machine* (3.101)

3.30
dry cycle time
time required for each dry cycle of the machine in accordance with the sequence of operations

Note 1 to entry: For example, for the *horizontal cold-chamber die casting machine* (3.54), dry cycle time refers to: die closing, injection, die opening, *plunger* (3.82) tracking, injection return, ejection, *ejection return* (3.34) in total time.

3.31
ejection cylinder
hydraulic cylinder that drives the *ejection system* (3.37)

3.32
ejection force
static force which is applied on the ejector plate or rod by the ejector system, when castings are ejected from the die cavity

3.33
ejection plate
part which transmits movement to the ejector device of the die

3.34
ejection return
action of the ejector system returns after the casting is ejected

3.35
ejection rod
part which joins the ejector plate of the machine to the ejector device of the die

3.36
ejection stroke
moving distance of the ejector plate

3.37
ejection system
die casting machine's (3.17) assembly which ejects castings from the die cavity

3.38
ejector coupler
component for automatically coupling the ejector plate of the machine with the ejector system of the die

3.39
entirely vertical cold-chamber die casting machine
cold-chamber die casting machine (3.11) in which the die is installed above the *shot sleeve* (3.92), and both the *plunger* (3.82) and the die move vertically

3.40
extractor
device that is used for taking casting out of the mold

Note 1 to entry: It is able to clamp and take out the castings from the die and release it to a specified position, and then identify the integrity of the castings by product detector.

3.41
fast injection
fast shot
process of filling the molten metal into the cavity after the end of the slow shot

3.42
fast injection speed
velocity of the *plunger* (3.82) in the *fast injection* (3.41) process

Note 1 to entry: Usually mean average velocity.

3.43
fast injection stroke
displacement that the *plunger* (3.82) is generated from the *fast injection* (3.41) start to the end of fast injection during the injection process

3.44
fixed platen
stationary platen
platen to which the fixed die-half and the metal *injection system* (3.66) are connected

3.45
furnace capacity
mass or volume of the rated molten metal that the *holding furnace* (3.52) can contain when in operation

3.46
gooseneck
part of an *injection system* (3.66) (containing the *shot sleeve* (3.92) and metal flow channel) which is submerged in molten metal

Note 1 to entry: Only applies to *hot-chamber die casting machines* (3.56).

3.47
gravity die casting machine with horizontal parting
gravity die casting machine that parting surface of the die is directed horizontally

3.48
gravity die casting machine with vertical parting
gravity die casting machine that parting surface of the die is directed vertically

3.49
heating and cooling device
die temperature controller
thermal regulating unit
device for heating and cooling the die

3.50
heating system of holding furnace
device for providing the heating of a *holding furnace* (3.52)

3.51
height of shot sleeve flange
distance of the flange protruding from the working surface of the *fixed platen* (3.44) after the *shot sleeve* (3.92) is installed on the fixed platen

3.52
holding furnace
container for storing molten metal and keeping it at a certain temperature

3.53
horizontal centrifugal casting machine
centrifugal casting machine (3.8) whose casting mold spins around horizontal axis

3.54
horizontal cold-chamber die casting machine
cold-chamber die casting machine (3.11) with the die closing mechanism and the *shot sleeve* (3.92) mounted horizontally

3.55
horizontal squeeze casting machine
squeeze casting machine (3.101) that motion of the *moving platen* (3.79) is horizontal

3.56
hot-chamber die casting machine
die casting machine (3.17) with an inclined or horizontal *die closing system(3.22)* having the *gooseneck* (3.46) and *plunger* (3.82) submerged in the molten metal of the furnace

3.57
injection drive
system, e. g. hydraulic which moves the *plunger* (3.82) and applies force to it

3.58
injection drive area
area between *fixed platen* (3.44) and shot cylinder

3.59
injection follow through speed
plunger follow through speed
a kind of slow *injection speed* (3.65) that *plunger* (3.82) is pushed out when the die opening in the process of die opening

3.60
injection follow through stroke
plunger penetration distance
plunger follow through distance
distance between surface of *plunger* (3.82) and *fixed platen* (3.44) when the plunger moves out to the end of tracking position

3.61
injection force
force which is transferred to the *plunger* (3.82) from *injection system* (3.66) in the die casting process

3.62
injection piston velocity in dry run
injection velocity under the condition of no metal

3.63
injection pressure
casting pressure
pressure applied to the molten metal in a *die casting machine* (3.17) when injecting molten metal into the cavity of the die

3.64
injection pressure/displacement-time curve
curve which shows relationship between the *injection pressure* (3.63) and displacement with the *plunger* (3.82) in respect to the time

3.65
injection speed
speed of the *plunger* (3.82) moving during the injection phase

3.66
injection system
assembly which forces molten metal from the *shot sleeve* (3.92) into the die cavity and applies pressure to the molten metal during solidification

3.67
intensification phase
action which the machine has provided a high pressure to push molten metal during solidification by providing a high hydraulic pressure in the injection cylinder higher than that of the system rated pressure, this can be achieved by using piston differential area or higher pressure accumulator or other means

3.68
intensification pressure
increased hydraulic pressure which is supplied by using the piston area difference in the injection cylinder or higher pressure accumulator

3.69
lifting mechanism for holding furnace
mechanism that drives the *holding furnace* (3.52) for lifting or descending

3.70
lower tank
pressure vessel mounted on the *fixed platen* (3.44) for sealing bottom die-half in counter pressure *die casting machine* (3.17)

Note 1 to entry: It is combined with the *upper tank* (3.111) to form a sealed combination.

3.71
maximum die height
maximum distance between the *moving platen* (3.79) and the *fixed platen* (3.44) when the die is closed

3.72
maximum injection stroke
maximum displacement of the *plunger* (3.82) moves from the original position to the end

3.73
maximum loading weight
maximum loading weight of driving rotation body to be borne by *centrifugal casting machine* (3.8)

3.74
maximum stroke of the moving platen
closing stroke
maximum moving distance of the *movable platen* (3.79)

3.75
metal loader
device which can complete quantitative extraction of molten metal from *holding furnace* (3.52), and then convey it to the sprue and pour it into the *shot sleeve* (3.92)

3.76
minimum die height
minimum distance between the *moving platen* (3.79) and the *fixed platen* (3.44) when the die is closed, within the range of allowable adjustment of the equipment

3.77
molten metal level compensation pressure
increment of the forming pressure corresponding to the drop of the molten metal level of a casting is automatically increased by the system before each casting, in order to ensure the repeated reproduction of the process parameters after the beginning of the filling, and not affected by the change of metal level, in the process of low-pressure casting

3.78
moving mechanism for holding furnace
mechanism that drives the *holding furnace* (3.52) for moving in or out

3.79
moving platen
movable platen
platen to which the moving die-half is connected

3.80
nozzle
connection between the *gooseneck* (3.46) and the fixed die-half

3.81
pipe die
tube mold
tubular casting mold used for *horizontal centrifugal casting machine* (3.53)

3.82
plunger
plunger tip
plunger head
piston which forces molten metal from the *shot sleeve* (3.92) or *gooseneck* (3.46) into the die and applies pressure to the molten metal during solidification

3.83
plunger rod
rod which joins the *plunger* (3.82) to the *injection drive* (3.57)

3.84
pressure build-up time
<high pressure die casting machines> time interval between the pressure curve from the first time to reach the required working pressure of the hydraulic system to the end point of the pressure building time, after the movement of the *plunger* (3.82) is stopped in the process of die casting

3.85
pressure build-up time
<low pressure casting> time required for the gas pressure on the molten metal surface in the *holding furnace* (3.52) to rise from the filling pressure to the holding pressure in the process of low pressure casting

3.86
pressurization rate of low pressure casting
ratio of gas pressure increment on the molten metal surface in the holding furnace in respect to time, during rising, filling and pressurizing in the process of low pressure casting

3.87
releasing agent mixer/dilutor
device for proportionally mixing release agent with other liquid media and pressing it into automatic sprayer

3.88
riser tube
tubular passage that molten metal enters into the die cavity from the *holding furnace* (3.52)

3.89
shot position
<high pressure die casting machines> position where the *shot sleeve* (3.92) or *nozzle* (3.80) is located on the *fixed platen* (3.44)

Note 1 to entry: Generally it is determined by distance of the *shot sleeve* (3.92) located at the centre of the *plunger rod* (3.83) of the *die casting machine* (3.17) as well as the position of the central downward.

3.90
shot position
<*horizontal squeeze casting machine* (3.55)> horizontal distance between the *shot sleeve* (3.92) centre and the *fixed platen* (3.44) installation surface

3.91
shot position
<*vertical squeeze casting machine* (3.115)> horizontal distance between the *shot sleeve* (3.92) centre and the tie-bars centre

3.92
shot sleeve
cylindrical container of a *cold-chamber die casting machine* (3.11) or *squeeze casting machine* (3.101), in which pressure is applied to molten or semisolid metal

3.93
shot sleeve tilting angle
tilting angle of *shot sleeve* (3.92) in *squeeze casting machine* (3.101)

3.94
shot sleeve tilting device
device used for tilting the *shot sleeve* (3.92) to some angle for pouring molten (or semisolid) metal into it in *squeeze casting machine* (3.101)

3.95
side core platen
platen to which the side core is connected

3.96
side core stroke
maximum moving distance of the *side core platen* (3.95)

3.97
side cores puller
mechanism that install side cores and drive them to extract cores or insert cores

3.98
space between tie bars
inside dimensions between the *tie bars* (3.103) or square columns

3.99
specific metal pressure
specific injection pressure
pressure which acts on the molten metal by the *plunger* (3.82) in *die casting machine* (3.17) at the end of injection

3.100
spraying device
device which is used to atomize the release agent with compressed air, and then quantificationally and uniformly spray it on designated points and surfaces of the die

3.101
squeeze casting machine
machine that uses squeeze casting process to produce castings

Note 1 to entry: The *plunger* (3.82) move vertically, and its working principle is that molten (or semisolid) metal is slowly, smoothly and laminar filled into the die under the action of high squeezing pressure and solidified directionally under high pressure to obtain low shrinkage porosity castings.

3.102
supporting rollers type horizontal centrifugal casting machine
horizontal centrifugal casting machine (3.53) that casting mold to be propped by four supporting wheels among which one or two wheels drive the casting mold to spin around horizontal axis through the friction force

3.103
tie bar
bars which carry the locking load and guide the *moving platen* (3.79)

3.104
tie bar pulling device
device for pulling *tie bar(s)* (3.103) out of the *die area* (3.15) in order to facilitate die set-up procedure

3.105
tilting force
force that drives the *die closing system* (3.22) to tilt by *tilting mechanism* (3.106)

3.106
tilting mechanism
mechanism that drives the *die closing system* (3.22) in *tilting type gravity die casting machine* (3.109)

3.107
tilting pouring
process of pouring molten metal into mold cavity by the rotation of the mold around its horizontal axis

3.108
tilting speed
speed when the die closing mechanism tilts

Note 1 to entry: *Tilting mechanism* (3.106) can be, for example, found in *tilting type gravity die casting machine* (3.109)

3.109
tilting type gravity die casting machine
gravity die casting machine that die closing mechanism can be tilted

3.110
toggle system
toggle
toggle joint mechanism
toggle link mechanism
mechanism which connects *moving platen* (3.79) and *rear platen* (3.14), which amplifies mechanically the force of the closing cylinder

3.111
upper tank
pressure vessel mounted on a *moving platen* (3.79) for sealing upper die-half in counter pressure *die casting machine* (3.17)

3.112
vacuum casting machine
machine that uses vacuum casting process to produce castings

Note 1 to entry: Vacuum casting is a casting method in which metals are melted, poured and solidified in a vacuum chamber.

3.113
vertical centrifugal casting machine
centrifugal casting machine (3.8) whose casting mold spins around vertical axis

3.114
vertical cold-chamber die casting machine
cold-chamber die casting machine (3.11) with die closing mechanism and *shot sleeve* (3.92) mounted vertically

3.115
vertical squeeze casting machine
squeeze casting machine (3.101) that motion of *moving platen* (3.79) is vertical

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