SLOVENSKI STANDARD
SIST-TP CEN/TR 16748:2015

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Aluminij in aluminijeve zlitine - Mehanska kapaciteta zlitin Al-Si za visokotlačne, nizkotlačne in težnostno kokilno ulite ulitke

Aluminium and aluminium alloys - Mechanical potential of Al-Si alloys for high Pressure, low pressure and gravity die casting

Aluminium und Aluminiumlegierungen - Potential der mechanischen Eigenschaften von AlSi-Legierungen für Druckguss, Niederdruckguss und Schwerkraftkokillenguss

Aluminium et alliages d'aluminium - Potentiel mécanique des alliages Al-Si coulés sous pression et dans des moules permanents pour moulage par gravité et basse pression

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Aluminium and aluminium alloys - Mechanical potential of Al-Si alloys for high pressure, low pressure and gravity die casting

Aluminium et alliages d'aluminium - Potentiel mécanique des alliages Al-Si coulés sous pression et dans des moules permanents pour moulage par gravité et basse pression

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (CEN/TR 16748:2014) has been prepared by Technical Committee CEN/TC 132 “Aluminium and aluminium alloys”, the secretariat of which is held by AFNOR.

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1 Scope

This Technical Report presents the characteristics of reference dies and reference castings, to be used for evaluating the mechanical potential (in terms of Ultimate Tensile Strength, Yield Strength and Elongation) which can be expected by Al-Si based alloys, cast by high pressure, low pressure and gravity (permanent mould) processes. These properties are measured on separately cast test specimens produced with state-of-the-art knowledge on die design, process management and alloy treatments correctly applied to minimize defects and imperfections.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1559-1, *Founding - Technical conditions of delivery - Part 1: General*

EN 1559-4, *Founding - Technical conditions of delivery - Part 4: Additional requirements for aluminium alloy castings*

EN 1676, *Aluminium and aluminium alloys - Alloyed ingots for remelting - Specifications*

EN 1706, *Aluminium and aluminium alloys - Castings - Chemical composition and mechanical properties*

EN 12258-1:2012, *Aluminium and aluminium alloys - Terms and definitions - Part 1: General terms*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12258-1:2012 and the following apply.

3.1
casting process
process in which molten metal is introduced into a mould where it solidifies

[SOURCE: EN 12258-1:2012, 3.1.1]

3.2
die casting process
casting process in which molten metal is injected under substantial pressure, typically above 7 MPa, into a metal die and solidifies under this pressure

Note 1 to entry: Die casting process is also referred to as “pressure die casting (process)” or “high pressure die casting (process)”.

[SOURCE: EN 12258-1:2012, 3.1.10]

3.3
permanent mould casting process
casting process in which molten metal is introduced by gravity or low pressure into a mould constructed of durable material, typically iron or steel

Note 1 to entry: A permanent mould casting process where the metal solidifies in a metal mould under low pressure (typically less than 1 bar above atmospheric pressure) is also referred to as a “low pressure die casting process”.

[SOURCE: EN 12258-1:2012, 3.1.9]

3.4
casting
product at or near finished shape, formed by solidification of the metal in a mould or a die

[SOURCE: EN 12258-1:2012, 2.5.1]

3.5
microstructure
structure of a metal as revealed by microscopic examination of a surface, typically after mechanical and/or chemical preparation, e.g. polishing and micro-etching

[SOURCE: EN 12258-1:2012, 4.5.10]

3.6
defect
quality characteristic is lower with respect to the level or state foreseen (usually specified); it does not allow the product to carry out the function requested

[SOURCE: EN 12258-1:2012, 7.1.2]

3.7
imperfection
quality characteristic is for a some extent lower with respect to the level or state foreseen

Note 1 to entry: This does not mean necessarily that the product is not suitable for use. An imperfection needs to be evaluated by means of a proper scale, based on the related specifications, to decide if the product has a quality level making it suitable for use.

[SOURCE: EN 12258-1:2012, 7.1.1]

3.8
mechanical potential
tensile properties (in terms of Ultimate Tensile Strength, Yield Strength and Elongation) which can be expected by Al-Si based alloys, separately cast in reference dies with state-of-the-art knowledge on die design, process management and alloy treatments correctly applied to minimize defects and imperfections; the mechanical potential can be higher than the mechanical properties evaluated on test pieces taken from real castings

3.9
reference die
permanent die, designed according state-of-the-art methodologies and made of steel or of cast iron, suitable for the evaluation of mechanical potential of Al-Si cast alloys; the geometry of reference dies varies, in dependence of which process is applied (High Pressure, Low Pressure and Gravity Casting)

3.10
reference casting
casting produced using the reference die

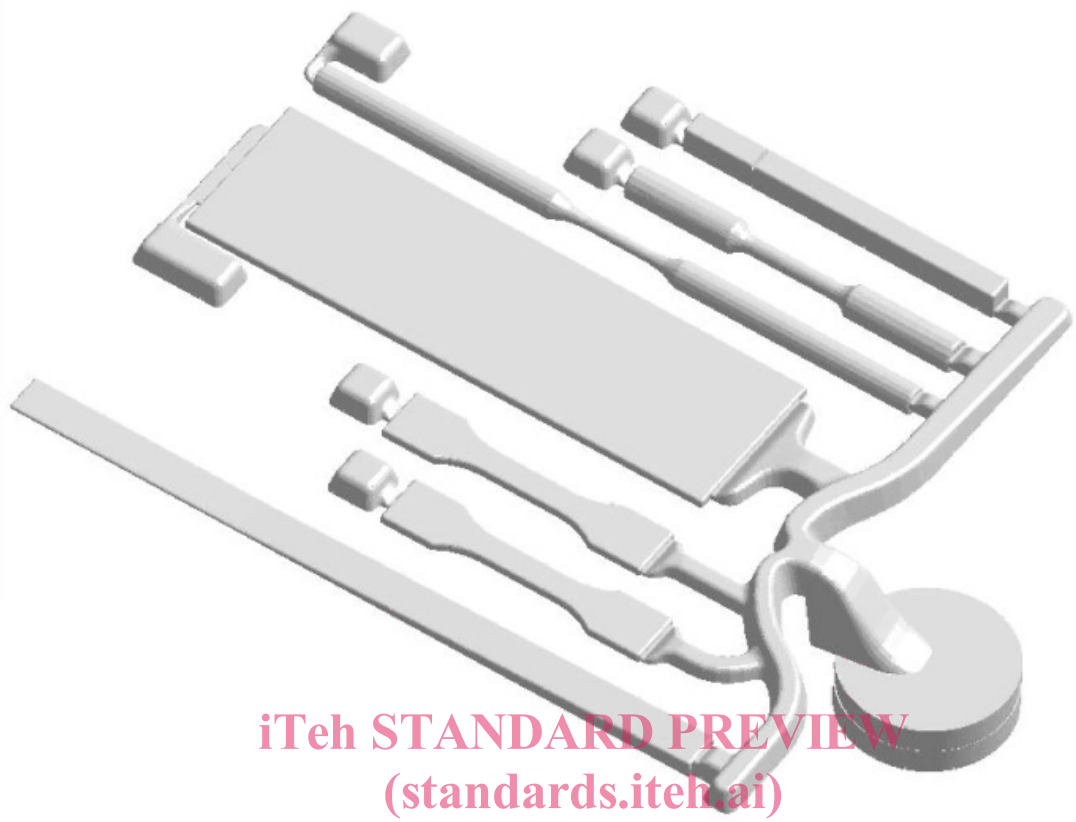
4 Reference dies

4.1 Reference dies for high pressure die cast Al-Si alloys

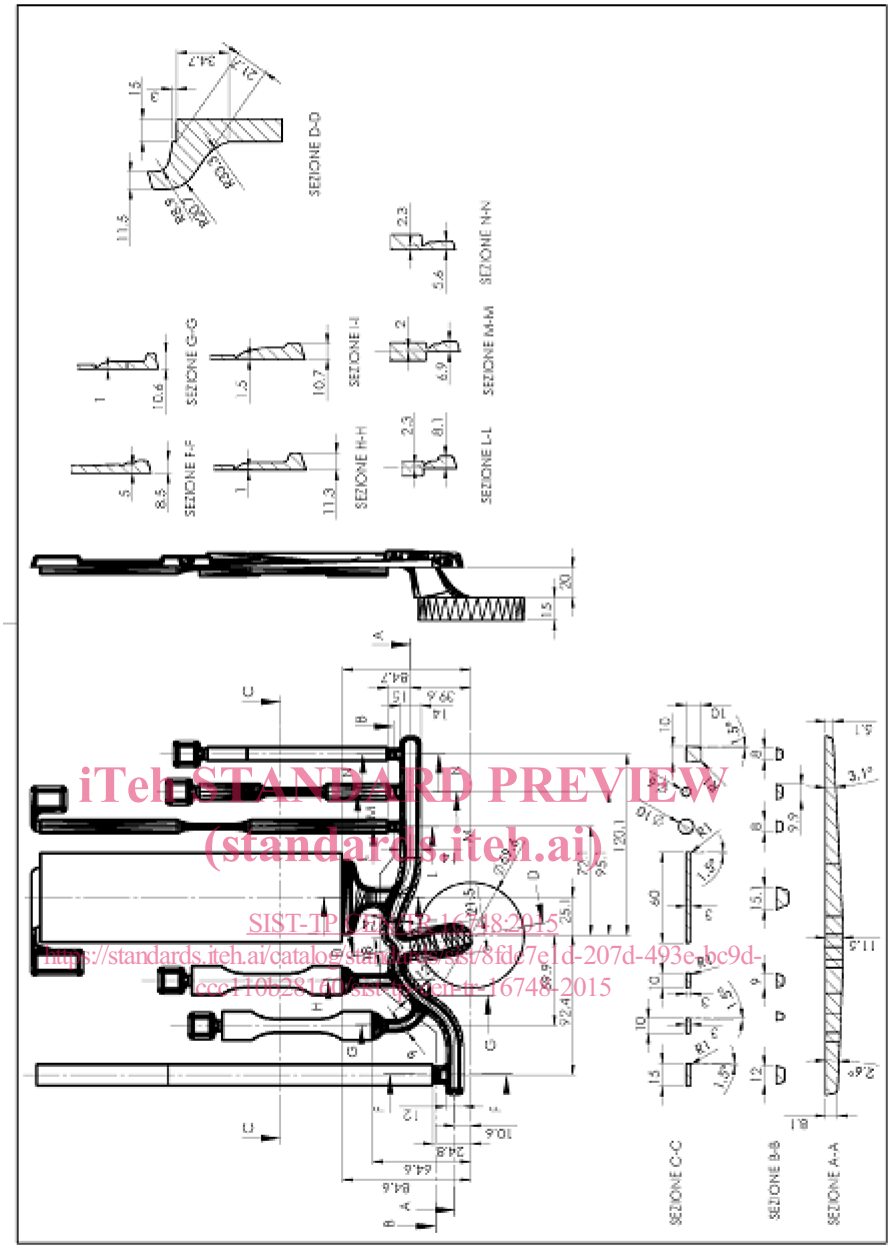
4.1.1 HPDC reference die #1

The mechanical potential of high pressure die cast Al-Si alloys can be evaluated by the reference die designed, built and tested in the frame of NADIA Project (New Automotive components Designed for and manufactured by Intelligent processing of light Alloys, EU IPs-SMEs, Contract n. 026563-2, 2006-2010). The reference casting is also suitable for other kinds of characterizations.

Figure 1 a) and b) shows the configuration of the HPDC reference casting #1.



a) HPDC Reference casting #1 (general drawing)



b) HPDC Reference casting #1 (detailed drawing)

Figure 1

4.1.2 HPDC reference die #2

The mechanical potential of high pressure die cast Al-Si alloys can be evaluated by the reference die, designed, built and tested by HYDRO in cooperation with NTNU (University of Trondheim).

Figure 2 shows the configuration of the HPDC reference casting #2.

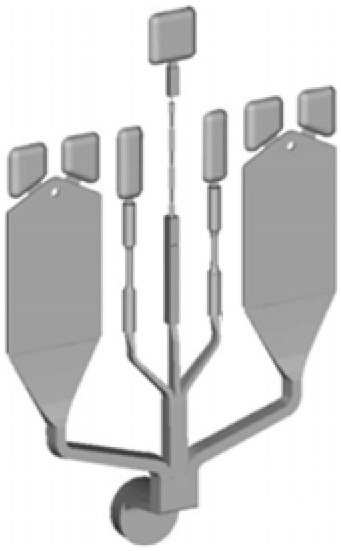


Figure 2 — HPDC Reference casting #2

4.2 Reference dies for low pressure and gravity die cast Al-Si alloys

4.2.1 Gravity casting Reference die #1

The mechanical potential of gravity die cast Al-Si alloys can be evaluated by the Gravity casting Reference die #1, whose details are given in Ref. [1].

Figure 3 shows the configuration of Gravity casting Reference die #1.

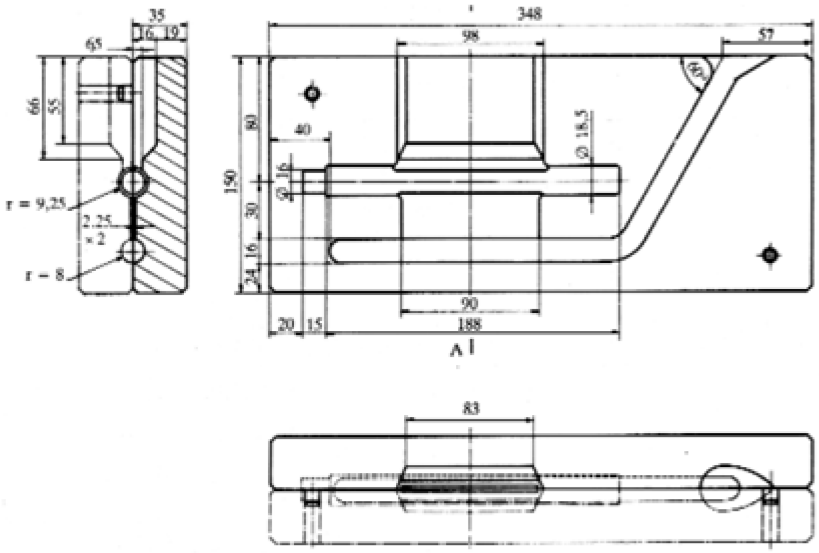


Figure 3 — Gravity casting reference die #1

4.2.2 Gravity casting Reference die #2

The mechanical potential of gravity die cast Al-Si alloys can be evaluated by the Gravity casting Reference die #2, whose details are given in Ref. [1].

Figure 4 shows the configuration of Gravity casting Reference die #2.

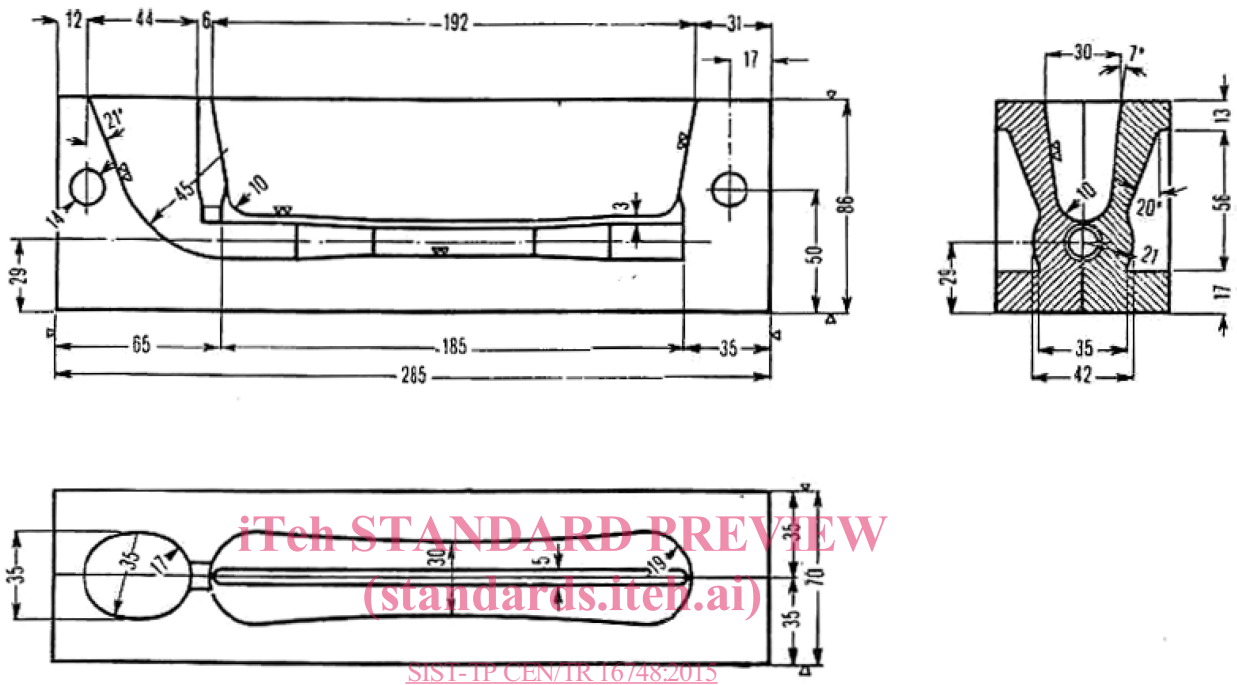


Figure 4 — Gravity casting Reference die #2

4.2.3 Gravity casting Reference die #3

The mechanical potential of gravity die cast Al-Si alloys can be evaluated by the reference die designed, built and tested by NTNU (University of Trondheim) in cooperation with SINTEF (Norway).

Figure 5 shows the configuration of the reference casting obtained Gravity casting Reference die #3.