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Visual examination of the surface condition of investment castings — Steel, nickel alloys and cobalt alloys

Examen visuel de l'état de surface des pièces moulées par le procédé dit «à la cire perdue» — Acier, alliages de nickel et alliages de cobalt

Reference number
ISO 19959:2005(E)

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Foreword

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ISO 19959 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 11, *Steel castings*.

Visual examination of the surface condition of investment castings — Steel, nickel alloys and cobalt alloys

1 Scope

This International Standard specifies the acceptance criteria for the surface inspection of steel, nickel alloy and cobalt alloy investment castings by visual examination.

NOTE Criteria for special applications such as aerospace are defined in other International Standards.

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 3059:2001, *Non-destructive testing — Penetrant testing and magnetic particle testing — Viewing conditions*

ISO 9712:2005, *Non-destructive testing — Qualification and certification of personnel*

3 Ordering information

The enquiry and order shall specify

— the extent of the surface to be examined,

— the number of castings to be examined,

— the acceptance level required (different acceptance levels may be specified for different surfaces of the same casting; if no acceptance level is specified, level IV applies), and

— any surface conditions that are unacceptable.

4 Terms and definitions

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

4.1
surface pit
depression on the surface of the casting, the length of the depression being less than three times its width

4.2
linear discontinuity
depression on the surface of the casting, the length of the depression being equal to, or greater than, three times its width

4.3
positive metal
raised metal on the casting surface

4.4
surface roughness
measure of the surface condition

NOTE The surface roughness is normally determined by the use of a visual/tactile comparator.

4.5
parting line
surface condition resulting from joints in the tool or die

NOTE Parting lines are not linear discontinuities.

4.6
ejector-pin mark
a surface condition caused by pins used to remove the pattern from the die

4.7
gate stub
positive metal resulting from the removal of the gate used to direct molten metal into the mould

5 Method of inspection

5.1 Qualification of operators

Inspection shall be performed by personnel, qualified in accordance with ISO 9712, or by a certification scheme which is considered to be equivalent. The qualification level of the personnel shall be agreed between the manufacturer and the purchaser at the time of acceptance of the order.

5.2 Conditions of inspection

The inspection shall be carried out with the naked eye or at a maximum magnification of × 3, and the viewing conditions shall be in conformity with ISO 3059.

6 Acceptance criteria

6.1 Levels of acceptance for visual examination are given in Table 1.

6.2 Castings shall not exhibit linear discontinuities. Surface conditions that are less than 0,25 mm are non-relevant.

6.3 Surface roughness and surface pits that will be removed by subsequent machining are acceptable.

6.4 Surface features not addressed in this International Standard shall be agreed between the purchaser and manufacturer at the time of the enquiry and order.

Table 1 — Visual examination acceptance criteria [a]

Surface feature	Level I	Level II	Level III	Level IV
Surface pits [b, c, d]	0,75 mm dia. × 0,40 mm deep with no more than one per 625 mm^2	0,75 mm dia. × 0,40 mm deep with no more than one per 625 mm^2	1,50 mm dia. × 0,75 mm deep with no more than one per 625 mm^2	1,50 mm dia. × 0,75 mm deep with no more than four per 625 mm^2
Linear discontinuities	None permitted	None permitted	None permitted	None permitted
Positive metal [c, d]	1,0 mm dia. × 0,25 mm high with no more than one per 625 mm^2	1,50 mm dia. × 0,40 mm high with no more than one per 625 mm^2	3,00 mm dia. × 0,75 mm high with no more than one per 625 mm^2	3,00 mm dia. × 0,75 mm high with no more than four per 625 mm^2
Parting line and ejector-pin mark height [e]	0,10 mm	0,25 mm	0,50 mm	1,00 mm
Gate stub height	0,25 mm	0,40 mm	0,75 mm	1,15 mm
Apparent surface roughness [d]	1,6 µm	2,5 µm	3,2 µm	6,3 µm

dia.: diameter

[a] Surface conditions in excess of the level specified are not acceptable.

[b] Maximum surface-pit depth shall not violate the required minimum wall thickness.

[c] Surface pits, linear discontinuities or positive metal less than 0,25 mm shall be considered non-relevant.

[d] Determined by visual inspection using a visual/tactile comparator, for example BNIF 359-01, Plate 3/OS1 = Ra 1.6/3.2, Plate 2/OS1 = Ra 6.3.

[e] Applies to positive metal, other surface conditions shall be covered by the requirements of surface pits.

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