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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Sintered metal materials — Specifications —

Part 3:
Sintered alloyed and sintered stainless steels used for structural parts

Matériaux métalliques frittés — Spécifications —

Partie 3: Aciers alliés et aciers inoxydables frittés destinés à la fabrication de pièces mécaniques

Reference number
ISO 5755-3 : 1987 (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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5755-3 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

Sintered metal materials — Specifications —

Part 3 :
Sintered alloyed and sintered stainless steels used for structural parts

1 Scope and field of application

This part of ISO 5755 specifies the requirements for the chemical composition and physical and mechanical properties of sintered alloyed and sintered stainless steels used for structural parts. The data on the mechanical properties given are obtained on test pieces.

When selecting powder metallurgical materials, it should be taken into account that the properties depend not only on the chemical composition and density, but also on the production methods, especially in the case of stainless steels. The properties of sintered materials giving satisfactory service in particular applications will not necessarily be the same as those of wrought or cast materials that might otherwise be used. Therefore, liaison with prospective suppliers is more than usually necessary, especially when structural parts of complex shape are required in high-density materials.

Any material in this part of ISO 5755 with less than 90 % relative density may be used, whenever oil-impregnated, for structural parts requiring surfaces to have bearing properties.

This document should be read in conjunction with ISO 5755-1 and ISO 5755-2.

2 References

ISO 2738, *Permeable sintered metal materials — Determination of density, oil content, and open porosity.*

ISO 2740, *Sintered metal materials (excluding hardmetal) — Tensile test pieces.*

ISO 4498, *Sintered metal materials, excluding hardmetals — Determination of apparent hardness*

— *Part 1: Materials of essentially uniform section hardness.*

— *Part 2: Case-hardened ferrous materials, surface enriched by carbon or carbon and nitrogen.*

ISO 5755, *Sintered metal materials — Specifications*

— *Part 1: Materials, for bearings, impregnated with liquid lubricant.*

— *Part 2: Sintered iron and sintered steel containing one or both of the elements carbon and copper, used for structural parts.*

ISO 6892, *Metallic materials — Tensile testing.*

3 Sampling

Sampling shall be carried out in accordance with the relevant International Standards.

4 Test methods

4.1 Chemical analysis

Whenever possible, and always in case of dispute, the methods of chemical analysis shall be those specified in the relevant International Standards. If no International Standard is available, the method may be agreed upon and specified at the time of enquiry and order.

4.2 Density

The density shall be determined in accordance with ISO 2738. Whenever possible, the density shall be determined on the whole part.

In cases where the part is so large as to make it impractical to carry out the test on one piece, it may be necessary to reduce its volume by sub-division. All the pieces resulting from the sub-division shall be subjected to the density determination. The density of the part shall be calculated on the basis of the total mass and total volume, regardless of whether the test is carried out on the whole part or on the separate pieces.

Density requirements of specific sub-divisions of the part shall be agreed upon by the customer and supplier.

4.3 Mechanical properties

4.3.1 General

The mandatory values specified in tables 1, 2 and 3 are those obtained on pressed and sintered test pieces, tested in accordance with the appropriate International Standards, at the minimum density and mean chemical composition levels stated in the tables.

The values given in tables 1, 2 and 3 are intended as a guide to initial selection of materials (see also clause 1) and may also be used as a basis for specifying any special tests which may be indicated on the drawing.

NOTE — If materials are heat-treated, it should be noted that the resulting apparent hardness and mechanical properties will vary according to the heat-treatment process used.

The mechanical properties shall neither be calculated from hardness values, nor be determined on tensile test pieces taken from a component, and used for verifying the values given in the tables. If the customer requires that a specified level of mechanical properties shall be obtained by tests on the component, these shall be agreed with the supplier and shall be stated on the drawing and/or any specified technical documents of the customer referred to on the drawing.

4.3.2 Tensile properties

The values for tensile strength, yield strength and elongation given in tables 1, 2 and 3 have been determined in accordance with ISO 6892, using pressed and sintered test pieces made in accordance with ISO 2740.

4.3.3 Apparent hardness

The mandatory values for apparent hardness (Vickers) given in tables 1, 2 and 3 have been determined in accordance with ISO 4498-1, using a force of 49,03 N (HV 5). Where surface hardness is increased as a result of a heat-treatment, it shall be determined in accordance with ISO 4498-2.

The informative Rockwell values are typical and have been determined in accordance with ISO 4498-1 using Rockwell B and Rockwell A scales.

If hardness values are specified in an agreed acceptance test (see 4.3.1), the hardness requirements shall be stated on the drawing of the component, together with the surface or surfaces to be subjected to the test.

5 Specifications

The chemical composition and mechanical and physical properties are given in tables 1, 2 and 3.

For the purpose of specifying a material, the grade designation shall consist of six characters, the sixth (printed in the tables as a dash), being N or Z. N shall be used when the material has not received any after-treatment and Z shall be used to indicate an after-treatment such as heat-treatment, phosphating, or steam treatment.

Table 1 — Sintered nickel steels and sintered nickel-copper steels

Materials	Grade[1]	Mandatory values								Informative approximate values			
		Chemical composition					Mechanical and physical properties						
		C combined	Ni	Cu	Fe	Total other elements max.	Density ϱ min.	Tensile strength R_m min.	Apparent hardness HV 5 min.	Relative density	Yield strength $R_{p0,2}$	Elongation A	Apparent hardness Rockwell
		%	%	%	%	%	g/cm³	N/mm²		%	N/mm²	%	
Nickel steels[1)2)]	P 3014 —	< 0,2	1 to 3	< 0,8	Balance	2	6,4	200	50	85	140	6	HRB 35
	P 3015 —						6,8	250	60	90	170	8	HRB 40
	P 3025 —	<0,2	3 to 6	< 0,8	Balance	2	6,8	300	80	90	200	6	HRB 60
Nickel copper steels[2)]	P 3034 —	<0,3	1 to 3	1 to 3	Balance	2	6,4	240	70	85	170	3	HRB 35
	P 3035 —						6,8	270	90	90	200	4	HRB 45
	P 3044 —	0,3 to 0,6	1 to 3	1 to 3	Balance	2	6,4	300	100	85	260	1	HRB 55
	P 3045 —						6,8	360	120	90	300	2	HRB 70
	P 3054 —	< 0,3	3 to 6	1 to 3	Balance	2	6,4	250	70	85	190	3	HRB 40
	P 3055 —						6,8	290	90	90	220	4	HRB 55
	P 3064 —	0,3 to 0,6	3 to 6	1 to 3	Balance	2	6,4	320	100	85	280	1	HRB 60
	P 3065 —						6,8	380	130	90	320	2	HRB 75

1) Weldable.

2) Heat treatable (see 4.3.1).

Table 2 — Sintered nickel-copper-molybdenum steels

Materials	Grade	Mandatory values									Informative approximate values			
		Chemical composition						Mechanical and physical properties						
		C combined	Ni	Cu	Mo	Fe	Total other elements max.	Density ϱ min.	Tensile strength R_m min.	Apparent hardness HV 5 min.	Relative density	Yield strength $R_{p0,2}$	Elongation[2)] A	Apparent hardness Rockwell
		%	%	%	%	%	%	g/cm³	N/mm²		%	N/mm²	%	
Nickel copper molybdenum steels[1)]	P 3074 —	< 0,3	1 to 3	1 to 3	0,3 to 0,7	Balance	2	6,4	240	80	85	170	3	HRB 45
	P 3075 —							6,8	270	100	90	200	4	HRB 60
	P 3076 —							7,0	290	110	90	220	5	HRB 70
	P 3084 —	0,3 to 0,6	1 to 3	1 to 3	0,3 to 0,7	Balance	2	6,4	330	120	85	300	2	HRB 70
	P 3085 —							6,8	440	150	90	360	3	HRB 80
	P 3086 —							7,0	480	160	90	390	4	HRB 90
	P 3094 —	0,6 to 0,9	1 to 3	1 to 3	0,3 to 0,7	Balance	2	6,4	350	140	85	330	n m	HRB 75
	P 3095 —							6,8	460	170	90	400	n m	HRB 85
	P 3104 —	0,3 to 0,6	3 to 6	1 to 3	0,3 to 0,7	Balance	2	6,4	410	150	85	350	n m	HRB 80
	P 3105 —							6,8	600	180	90	450	1	HRB 85
	P 3106 —							7,0	680	200	90	520	2	HRB 90

1) Heat treatable (see 4.3.1).

2) n m = non-measurable.

Table 3 — Sintered stainless steels

Material		Mandatory values									Informative approximate values			
		Chemical composition						Mechanical and physical properties						
Stainless steels[1]		C combined	Ni	Cr	Mo	Fe	Total other elements	Density ϱ min.	Tensile strength R_m min.	Apparent hardness HV 5 min.	Relative density	Yield strength $R_{p0,2}$	Elongation A	Apparent hardness Rockwell
Grade	Type	%	%	%	%	%	% max.	g/cm³	N/mm²		%	N/mm²	%	
P 3514 — P 3515 —	304	< 0,08	8 to 11	17 to 19	—	Balance	3	6,4 6,6	320 380	85 90	85 90	190 220	4 5	HRB 45 HRB 50
P 3524 — P 3525 —	316	< 0,08	10 to 14	16 to 18	2 to 3	Balance	3	6,4 6,6	300 380	80 85	85 90	180 210	4 5	HRB 45 HRB 50
P 3534 — P 3535 — [2]	410	< 0,2	—	12 to 14	—	Balance	3	6,4 6,6	320 410	180 200	85 90	290 380	1 1	—
P 3544 — P 3545 — [2]	430	< 0,08	—	16 to 19	—	Balance	3	6,4 6,6	350 430	190 230	85 90	180 260	3 2	—

1) The corrosion properties of sintered stainless steels are not necessarily the same as those of solid stainless steels.

2) Heat treatable (see 4.3.1).

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