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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Sintered metal materials — Specifications —

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

Matériaux métalliques frittés — Spécifications —

Partie 2: Fers frittés et aciers frittés contenant un ou deux des éléments carbone et cuivre, destinés à la fabrication de pièces mécaniques

Reference number
ISO 5755-2: 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 5755-2 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.

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Sintered metal materials — Specifications —

Part 2 : Sintered iron and sintered steel containing one or both of the elements carbon and copper, 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 iron and sintered steel containing one or both of the elements carbon and copper used mainly 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. 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.

Any material in this part of ISO 5755 with less than 85 % relative density may be used, whenever oil-impregnated, for bearings or structural parts requiring surfaces to have bearing properties.

This document should be read in conjunction with ISO 5755-1 and ISO 5755-3.

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 3 : Sintered alloyed and sintered stainless steels 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 the table 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 table.

The values given in the table 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.

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 table. 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 documentation of the customer referred to on the drawing.

4.3.2 Tensile properties

The values for tensile strength, yield strength and elongation given in the table 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 the table have been determined in accordance with ISO 4498-1 using a force of 49,03 N (HV 5). When the surface hardness is increased as a result of 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 H and Rockwell B 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 the table.

For the purpose of specifying a material, the grade designation shall consist of six characters, the sixth (printed in the table as a dash) being N or Z. N shall be used when the material has received no after treatment and Z shall be used to indicate an after treatment such as heat-treatment, phosphating or steam treatment.

Table — Chemical composition, mechanical and physical properties

Materials	Grade[1]	Mandatory values							Informative approximate values				
		Chemical composition				Mechanical and physical properties							
		C combined	Cu	Fe	Total other elements	Density ϱ	Tensile strength R_m	Apparent hardness	Relative density	Yield strength $R_{p0,2}$	Elongation[3] A	Apparent surface hardness after appropriate treatment[4]	Apparent hardness Rockwell
					max.	min.	min.	HV 5 min.				HV 5	
		%	%	%	%	g/cm³	N/mm²		%	N/mm²	%		
Iron	P 1022 –	< 0,3	–	Balance	2	5,6	70	30	75	40	1		30 HRH
	P 1023 –					6,0	100	40	80	60	2		70 HRH
	P 1024 –					6,4	140	50	85	80	3		80 HRH
	P 1025 –					6,8	180	65	90	100	4	400	15 HRB
	P 1026 –					7,2	220	80	94	120	6	500	30 HRB
Carbon steel	P 1033 –	0,3 to 0,6	–	Balance	2	6,0	140	55	80	90	n m		20 HRB
	P 1034 –					6,4	190	75	85	120	1		45 HRB
	P 1035 –					6,8	240	90	90	130	2	400	60 HRB
	P 1042 –	0,6 to 0,9	–	Balance	2	5,6	150	55	75	120	n m		35 HRB
	P 1043 –					6,0	200	80	80	160	n m		50 HRB
	P 1044 –					6,4	250	100	85	210	1		65 HRB
	P 1045 –					6,8	300	120	90	250	1	400	75 HRB
Copper steel	P 2022 –	< 0,3	1 to 4	Balance	2	5,6	120	45	75	90	n m		70 HRH
	P 2023 –					6,0	160	55	80	120	1		80 HRH
	P 2024 –					6,4	200	65	85	140	2	300	15 HRB
	P 2025 –					6,8	240	75	90	170	3	450	25 HRB
	P 2032 –	< 0,3	4 to 8	Balance	2	5,6	160	60	75	120	n m		80 HRH
	P 2033 –					6,0	200	75	80	140	n m		90 HRH
	P 2034 –					6,4	240	85	85	190	1		20 HRB
	P 2035 –					6,8	280	95	90	230	2	400	30 HRB
Copper carbon steel	P 2043 –	0,3 to 0,6	1 to 4	Balance	2	6,0	220	80	80	190	n m		45 HRB
	P 2044 –					6,4	280	100	85	230	n m	350	60 HRB
	P 2045 –					6,8	350	120	90	280	1	450	75 HRB
	P 2053 –	0,6 to 0,9	1 to 4	Balance	2	6,0	270	100	80	210	n m		60 HRB
	P 2054 –					6,4	340	120	85	270	n m	350	70 HRB
	P 2055 –					6,8	420	140	90	330	n m	450	80 HRB
	P 2063 –	0,3 to 0,6	4 to 8	Balance	2	6,0	250	90	80	210	n m		60 HRB
	P 2064 –					6,4	320	110	85	260	n m	350	70 HRB
	P 2073 –	0,6 to 0,9	4 to 8	Balance	2	6,0	300	110	80	240	n m		65 HRB
	P 2074 –					6,4	360	130	85	280	n m	350	75 HRB

1) The grades 1022 and 1023 have the same chemical composition and the same density as the grades 1012 Z and 1013 Z in ISO 5755-1.

2) These materials may be supplied with additives to increase machineability, the properties given remain unchanged.

3) n m = not measurable.

4) These hardness values are obtainable from materials that have undergone a suitable hardening process. The values of all other properties, with the exception of density and copper content, will not then apply.

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