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Steel sheets and strip for pole core

ICS 29.030

Descriptors : steels, sheet materials, frame yokes, strips, pole shoes, rotating electric machines

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C 2555 : 2000

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS C 2555 : 1992** is replaced with **JIS C 2555 : 2000**.

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Steel sheets and strip for pole core

Introduction This Japanese Industrial Standard has been prepared based on IEC 60404-8-5 *Magnetic materials – Part 8-5 : Specifications for individual materials – Specification for steel sheet and strip with specified mechanical properties and magnetic permeability* published in 1989, in such a manner that the provisions traditionally stated in Japanese Industrial Standard are specified in the text and the said corresponding International Standard is employed as the Annex (normative) without any modification in its technical contents.

1 Scope This Japanese Industrial Standard specifies steel sheets and strip for pole core mainly used for magnetic poles and yokes of rotary electric machinery (hereafter referred to as "steel sheets and strip").

Note : The International Standard corresponding to this Standard is given below.

IEC 60404-8-5:1989 *Magnetic materials – Part 8-5 : Specifications for individual materials – Specification for steel sheet and strip with specified mechanical properties and magnetic permeability*

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards indicated below shall be applied.

JIS C 2550 *Test methods for magnetic steel sheet and strip*

JIS G 0303 *General rules for inspection of steel*

JIS Z 2201 *Test pieces for tensile test for metallic materials*

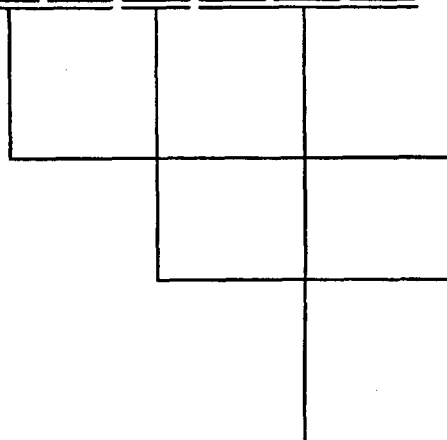
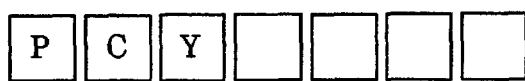
JIS Z 2241 *Method of tensile test for metallic materials*

3 Classification and symbolization The steel sheets and strip are classified according to the rolling procedure and the yield point or proof stress as given in Table 1.

Table 1 Classification

Rolling procedure	Grade symbol
Hot-rolled steel sheets and strip	PCYH 250 PCYH 300 PCYH 350 PCYH 400 PCYH 450 PCYH 500 PCYH 550 PCYH 600 PCYH 650 PCYH 700
Cold- rolled steel sheets and strip	PCYC 250 PCYC 300 PCYC 350 PCYC 400 PCYC 450 PCYC 500

Note: The grade symbol is expressed as follows:



Generic name of steel sheets and strip whose yielding points are guaranteed.

Classification by rolling

H: hot rolling

C: cold rolling

Guaranteed value of yield point or proof stress (N/mm²)

4 Characteristics

4.1 Magnetic flux density The magnetic flux densities of steel sheets and strip shall be as given in Table 2, when the test of 7.1 is carried out.

Table 2 Magnetic flux density

Grade symbol	Density ⁽¹⁾ kg/dm ³	Magnetic flux density ⁽²⁾ T	
		B50	B100
PCYH 250	7.85	1.60 min.	1.69 min.
PCYH 300		1.60 min.	1.69 min.
PCYH 350		1.55 min.	1.66 min.
PCYH 400		1.55 min.	1.66 min.
PCYH 450		1.54 min.	1.65 min.
PCYH 500		1.53 min.	1.64 min.
PCYH 550		1.52 min.	1.63 min.
PCYH 600		1.50 min.	1.62 min.
PCYH 650		1.48 min.	1.60 min.
PCYH 700		1.46 min.	1.60 min.
PCYC 250		1.60 min.	1.69 min.
PCYC 300		1.55 min.	1.69 min.
PCYC 350		1.52 min.	1.68 min.
PCYC 400		1.50 min.	1.66 min.
PCYC 450		1.48 min.	1.65 min.
PCYC 500		1.46 min.	1.64 min.

(¹) The density is used for calculation of the sectional area of test piece.

(²) The magnetic flux density in the column of B50 and that of B100 show the magnetic flux density at a magnetizing force of 5 000 A/m and that of 10 000 A/m respectively.

Note: In the column of B100 informative reference values are given. However, B100 may be used as the guaranteed value instead of B50 subject to agreement between the parties concerned with acceptance. In this case B50 is not the guaranteed value.

4.2 Yield point or proof stress and elongation The yield point or proof stress and elongation of steel sheets and strip shall be as given in Table 3 and Table 4, when the tests of 7.2 are carried out.

Table 3 Yield point or proof stress and elongation of hot-rolled steel sheet and strip

Grade symbol	Yield point or proof stress ⁽³⁾ N/mm ²	Elongation %			Tensile strength (Informative reference value) N/mm ²
		Thickness mm			
		1.6≤t<2.0	2.0≤t<2.5	2.5≤t	
PCYH 250	250 min.	23 min.	24 min.	24 min.	350 min.
PCYH 300	300 min.	21 min.	22 min.	22 min.	400 min.
PCYH 350	350 min.	19 min.	20 min.	20 min.	450 min.
PCYH 400	400 min.	17 min.	18 min.	19 min.	500 min.
PCYH 450	450 min.	15 min.	16 min.	17 min.	550 min.
PCYH 500	500 min.	13 min.	14 min.	15 min.	600 min.
PCYH 550	550 min.	12 min.	13 min.	14 min.	650 min.
PCYH 600	600 min.	11 min.	12 min.	13 min.	700 min.
PCYH 650	650 min.	11 min.	12 min.	13 min.	750 min.
PCYH 700	700 min.	11 min.	12 min.	13 min.	800 min.

⁽³⁾ The proof stress of 0.2 % by offset method is used.

Table 4 Yield point or proof stress and elongation of cold-rolled steel sheet and strip

Grade symbol	Yield point or proof stress ⁽³⁾ N/mm ²	Elongation %			Tensile strength (In- formative ref- erence value) N/mm ²
		Thickness mm			
		0.5≤t<1.0	1.0≤t<2.0	2.0≤t	
PCYC 250	250 min.	22 min.	23 min.	24 min.	350 min.
PCYC 300	300 min.	20 min.	21 min.	22 min.	400 min.
PCYC 350	350 min.	16 min.	17 min.	18 min.	450 min.
PCYC 400	400 min.	13 min.	14 min.	15 min.	500 min.
PCYC 450	450 min.	11 min.	12 min.	13 min.	550 min.
PCYC 500	500 min.	9 min.	10 min.	11 min.	600 min.

5 Dimensions and tolerances on dimension and shape

5.1 Dimensions The nominal thickness and the maximum width shall be as follows:

a) Nominal thickness The nominal thickness of steel sheets and strip shall be as given in Table 5.

Table 5 Thickness

Unit: mm

Rolling procedure	Nominal thickness
Hot-rolled steel sheet and strip	1.6, 1.8, 2.0, 2.5, 3.0, 3.2, 4.5
Cold-rolled steel sheet and strip	0.5, 1.0, 1.6, 1.8, 2.0

- b) **Maximum width** The maximum width of steel sheets and strip is subjected to agreement between the parties concerned with acceptance.

5.2 Tolerance on dimension The tolerances on dimension of steel sheets and strip are as given below, when the test of 7.3 is carried out.

- a) The tolerances on thickness of steel sheets and strip shall be as given in Table 6 and Table 7.

Table 6 Tolerance on thickness of hot-rolled steel sheets and strip

Unit: mm

Thickness t	Yield point or proof stress less than 400 N/mm ²		Yield point or proof stress not less than 400 N/mm ²	
	Width		Width	
	Less than 1 200	Not less than 1 200	Less than 1 200	Not less than 1 200
$1.6 \leq t < 2.0$	± 0.16	± 0.17	± 0.16	± 0.19
$2.0 \leq t < 2.5$	± 0.17	± 0.19	± 0.18	± 0.22
$2.5 \leq t < 3.15$	± 0.19	± 0.21	± 0.20	± 0.24
$3.15 \leq t < 4.0$	± 0.21	± 0.23	± 0.23	± 0.26
$4.0 \leq t < 5.0$	± 0.24	± 0.26	± 0.26	± 0.29

Table 7 Tolerance on thickness of cold-rolled steel sheets and strip

Unit: mm

Thickness t	Width	
	Less than 1 200	Not less than 1 200
$0.4 \leq t < 0.6$	± 0.05	± 0.06
$0.6 \leq t < 0.8$	± 0.06	± 0.07
$0.8 \leq t < 1.0$	± 0.07	± 0.08
$1.0 \leq t < 1.2$	± 0.08	± 0.09
$1.2 \leq t < 1.5$	± 0.09	± 0.10
$1.5 \leq t < 2.0$	± 0.12	± 0.13
$2.0 \leq t < 2.5$	± 0.14	± 0.15

- b) **Deviation** ⁽⁴⁾ in thickness in crosswise direction of steel sheets and strip shall be as given in Table 8 and Table 9.

- ⁽⁴⁾ The deviation in thickness in crosswise direction means the difference between the maximum thickness and the minimum thickness measured along the lateral direc-

**Table 8 Deviation in thickness of
hot-rolled steel sheet and strip**

Unit: mm

Thickness t	Yield point or proof stress less than 400 N/mm ²		Yield point or proof stress not less than 400 N/mm ²	
	Width		Width	
	Less than 1 200	Not less than 1 200	Less than 1 200	Not less than 1 200
$1.6 \leq t < 2.0$	0.16 max.	0.17 max.	0.16 max.	0.19 max.
$2.0 \leq t < 2.5$	0.17 max.	0.19 max.	0.18 max.	0.22 max.
$2.5 \leq t < 3.15$	0.19 max.	0.21 max.	0.20 max.	0.24 max.
$3.15 \leq t < 4.0$	0.21 max.	0.23 max.	0.23 max.	0.26 max.
$4.0 \leq t < 5.0$	0.24 max.	0.26 max.	0.26 max.	0.29 max.

Table 9 Deviation in thickness of cold-rolled steel sheet and strip

Unit: mm

Thickness t	Width	
	Less than 1 200	Not less than 1 200
$0.4 \leq t < 0.6$	0.05 max.	0.06 max.
$0.6 \leq t < 0.8$	0.06 max.	0.07 max.
$0.8 \leq t < 1.0$	0.07 max.	0.08 max.
$1.0 \leq t < 1.2$	0.08 max.	0.09 max.
$1.2 \leq t < 1.5$	0.09 max.	0.10 max.
$1.5 \leq t < 2.0$	0.12 max.	0.13 max.
$2.0 \leq t < 2.5$	0.14 max.	0.15 max.

c) The tolerances on width of steel sheets and strip are as given in Table 10.

Table 10 Tolerances on width of steel sheet and strip

Unit: mm

Rolling procedure	Width	
	Less than 1 200	Not less than 1 200
Hot-rolled steel sheet and strip	+10 0	+10 0
Cold-rolled steel sheet and strip	+7 0	+10 0

d) The tolerances on length of steel sheets are as given in Table 11.

Table 11 Tolerances on length of steel sheets

Unit: mm

Classification		Tolerance on length
Hot-rolled steel sheet	Length < 6 300	+25
		0
Cold-rolled steel sheet	L < 2 000	+10
		0
	2000 ≤ L < 4 000	+15
		0
	4000 ≤ L < 6 000	+20
		0

5.3 Tolerances on shape The tests of 7.4 and 7.5 shall be carried out for the shape of steel sheets and strip, and the deviations shall be as follows:

(a) The flatness of steel sheets and strip shall be given in Table 12 and Table 13.

- Notes
1. The flatness shall, as a rule, be measured on a surface plate and it means the maximum distortion minus the thickness of steel sheet. This is applied to the upper side surface of specimen.
 2. The values in Table 12 and Table 13 are applicable to a length of 4 000 mm at an optional position, and to the total length if the length is less than 4 000 mm.

Table 12 Flatness of hot-rolled steel sheets and strip

Unit: mm

Thickness t	Yield point or proof stress less than 400 N/mm ²		Yield point or proof stress not less than 400 N/mm ²	
	Width		Width	
	Less than 1 200	Not less than 1 200	Less than 1 200	Not less than 1 200
1.6 ≤ t < 4.0	16 max.	18 max.	20 max.	22 max.
4.0 ≤ t < 5.0	14 max.	16 max.	18 max.	18 max.

Table 13 Flatness of cold-rolled steel sheets and strip

Unit: mm

Width	Kind of distortion		
	Bow or wave	Edge wave	Center buckle
Less than 1 200	15 max.	10 max.	8 max.
Not less than 1 200	15 max.	12 max.	9 max.

b) The edge camber ⁽⁵⁾ of steel sheets and strip shall be as given in Table 14 and Table 15.