

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 2558 : 2021

(JEMA/JSA)

Thin electrical steel strip and sheet for
use at medium frequencies

ICS 29.030

Reference number : JIS C 2558 : 2021 (E)

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Date of Establishment: 2015-03-20

Date of Revision: 2021-08-20

Date of Public Notice in Official Gazette: 2021-08-20

Investigated by: Japanese Industrial Standards Committee
Standards Board for IEC area

JIS C 2558 : 2021, First English edition published in 2022-09

Translated and published by: Japanese Standards Association
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

In the event of any doubts arising as to the contents,
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Printed in Japan

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Electrical Manufacturers' Association (JEMA)/Japanese Standards Association (JSA) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act. This edition replaces the previous edition (**JIS C 2558** : 2015), which has been technically revised.

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Thin electrical steel strip and sheet for use at medium frequencies

Introduction

This Japanese Industrial Standard has been prepared based on **IEC 60404-8-8 : 2017**, Edition 2, with some modifications of the technical contents to correspond to the mainstream technique in Japan.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JC. Annex JA and Annex JB are unique to **JIS** and not given in the corresponding International Standard.

1 Scope

This Standard defines the grades of thin non-oriented electrical steel strip and sheet in nominal thicknesses of 0.05 mm, 0.10 mm, 0.15 mm, 0.20 mm, 0.25 mm, 0.30 mm and 0.35 mm (hereafter referred to as the thin non-oriented electrical steel strips), and of thin grain-oriented electrical steel strip and sheet in nominal thicknesses of 0.05 mm, 0.10 mm, 0.15 mm and 0.18 mm (hereafter referred to as the thin grain-oriented electrical steel strips). It gives general requirements, magnetic properties, geometric characteristics and tolerances, technological characteristics, as well as inspection procedures.

NOTE 1 For the thin non-oriented electrical steel strips, other nominal thicknesses (i.e. 0.12 mm, 0.18 mm, 0.23 mm and 0.27 mm) may be upon the agreement between the manufacturer and the purchaser.

This Standard applies to the thin non-oriented electrical steel strips and the thin grain-oriented electrical steel strips (hereafter simply referred to as the steel strips) supplied in the finally annealed condition in coils and intended for the construction of magnetic circuits used at frequencies in the range from 100 Hz to 10 kHz.

NOTE 2 The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

IEC 60404-8-8 : 2017 Magnetic materials — Part 8-8 : Specifications for individual materials — Thin electrical steel strip and sheet for use at medium frequencies (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

Part or all of the provisions of the following standards, through reference in this text,

constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 2550-1 *Test methods for electrical steel strip and sheet — Part 1 : Methods of measurement of the magnetic properties of electrical steel strip and sheet by means of an Epstein frame*

NOTE Normative reference in the corresponding International Standard : IEC 60404-2 *Magnetic materials — Part 2 : Methods of measurement of the magnetic properties of electrical steel sheet and strip by means of an Epstein frame*

JIS C 2550-2 *Test methods for electrical steel strip and sheet — Part 2 : Methods of determination of the geometrical characteristics of electrical steel strip and sheet*

NOTE 1 Normative reference in the corresponding International Standard : IEC 60404-9 *Magnetic materials — Part 9 : Methods of determination of the geometrical characteristics of magnetic steel sheet and strip*

NOTE 2 The **JIS** cited above is not equivalent to the **IEC** Standard given in NOTE 1 in the technical contents relevant to this Standard.

JIS C 2550-3 *Test methods for electrical steel strip and sheet — Part 3 : Methods of measurement of the magnetic properties of electrical steel strip and sheet at medium frequencies*

NOTE Normative reference in the corresponding International Standard : IEC 60404-10 *Magnetic materials — Part 10 : Methods of measurement of magnetic properties of magnetic steel sheet and strip at medium frequencies*

JIS C 2550-5 *Test methods for electrical steel strip and sheet — Part 5 : Methods of measurement of resistivity, density and stacking factor of electrical steel strip and sheet*

NOTE 1 Normative reference in the corresponding International Standard : IEC 60404-13 *Magnetic materials — Part 13 : Methods of measurement of resistivity, density and stacking factor of electrical steel strip and sheet*

NOTE 2 The **JIS** cited above is not equivalent to the **IEC** Standard given in NOTE 1 in the technical contents relevant to this Standard.

IEC 60050-121 *International Electrotechnical Vocabulary — Part 121 : Electromagnetism* (available at <http://www.electropedia.org/>)

IEC 60050-221 *International Electrotechnical Vocabulary — Chapter 221 : Magnetic materials and components* (available at <http://www.electropedia.org/>)

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions, and those given in **IEC 60050-121** and **IEC 60050-221** apply.

3.1

number of bends

number of alternate bends at 90° in opposite direction possible before the appearance of the first crack in the base metal of test specimen, detectable by the naked eye or hearing of the cracking noise

Note 1 to entry The number of bends constitutes an indication of the ductility of steel strip.

3.2**edge camber**

greatest distance between a longitudinal edge of a length of strip and the line joining the two extremities of the measured length of this edge

4 Classification

The grades covered by this Standard are classified according to the maximum value of the specific loss in watts per kilogram (W/kg) and according to the nominal thickness (0.05 mm, 0.10 mm, 0.15 mm, 0.20 mm, 0.25 mm, 0.30 mm and 0.35 mm for thin non-oriented electrical steel strips; 0.05 mm, 0.10 mm, 0.15 mm and 0.18 mm for thin grain-oriented electrical steel strips).

4A Thin non-oriented electrical steel strips (high-resistance material)

For the thin non-oriented electrical steel strip (high-resistance material) in resistivity of 0.75 $\mu\Omega\text{m}$ or over, Annex JB shall apply.

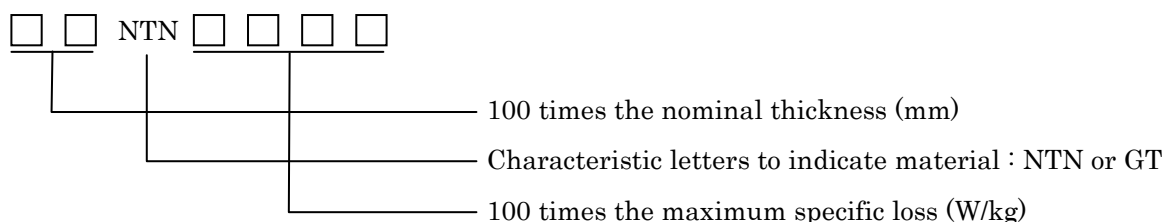
5 Designation

The designation of steel strips shall be as given in Table 1 and Table 2.

The designation method shall be as follows.

- a) one hundred times the nominal thickness of steel strip, in millimetres
- b) characteristic letters to indicate material
 - thin non-oriented electrical steel strip : NTN
 - thin grain-oriented electrical steel strip : GT
- c) one hundred times the maximum value of specific loss in watts per kilogram (W/kg), at frequency and maximum magnetic polarization as given in Table 1 and Table 2

An example of the designation method is shown below.



6 General requirements

6.1 Production process

The production process of steel strip and its chemical composition are left to the discretion of the manufacturer.

6.2 Form of supply

The steel strips are supplied in coils, or in cut or stacked bundles of sheets.

The mass of the coils or the bundles of sheets shall be upon the agreement between the manufacturer and the purchaser at the time of enquiry and order.

The internal diameter of coils shall be approximately 400 mm, or between 500 mm and 520 mm, and the recommended value is 508 mm.

The coils shall be of constant width and wound in such a manner that the edges are superimposed in a regular manner and that the side faces of the coil are substantially flat.

The coils shall be sufficiently tightly wound in order that they do not collapse under their own weight.

The strip may exhibit welds or interleaves resulting from the removal of defective zones, subject to prior agreement between the manufacturer and the purchaser at the time of enquiry and order. The value of the additional thickness due to the weld shall be the subject of an agreement. If necessary, the marking of welds or interleaves may form the subject of a special agreement.

For coils containing repair welds or interleaves, each part of the steel strip shall be of the same grade.

The edges of parts welded together shall not be so much out of alignment as to affect the further processing of steel strip.

Sheets which make up each bundle shall be stacked so that the side faces are substantially flat and approximately perpendicular to the top face.

6.3 Delivery condition

The steel strips are usually delivered with an inorganic or semi-organic insulation coating on both sides. Different types of coating may be provided (see JIS C 2557).

NOTE.....The semi-organic coating refers to a coating that contains inorganic substance and organic substance.

6.4 Surface condition

The surfaces shall be smooth and clean, free from grease and rust ¹⁾. Dispersed defects such as scratches, blisters, cracks, etc. are permitted if they are within the limits of the tolerances on thickness and if they are not detrimental to the correct use of the supplied steel strips.

The insulation coating present on the surface of steel strip shall be sufficiently adherent so that it does not become detached during cutting operations or heat treatment under conditions specified by the manufacturer.