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**Methods of measurement for ferrite con-
tent in austenitic and austenitic-ferritic
stainless steel deposited metals**

ICS 25.160.40

Reference number : JIS Z 3119 : 2006 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard 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 Welding Engineering Society (JWES)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS Z 3119:1988** is replaced with this Standard.

This Standard has been made based on **ISO 8249:2000** *Welding— Determination of Ferrite Number (FN) in austenitic and duplex ferritic-austenitic Cr-Ni stainless steel weld metals* for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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Methods of measurement for ferrite content in austenitic and austenitic-ferritic stainless steel deposited metals

Introduction This Japanese Industrial Standard has been prepared based on the second edition of *ISO 8249 Welding—Determination of Ferrite Number (FN) in austenitic and duplex ferritic-austenitic Cr-Ni stainless steel weld metals* published in 2000 with some modifications of the technical contents.

The portions given continuous sidelines or dotted underlines are the matters not included in the original International Standard. A list of modifications with explanations is given in Annex (informative).

1 Scope This Standard specifies the methods of measuring the ferrite content in the deposited metal of austenitic and austenitic-ferritic stainless steel by means of constitutional diagram, micro structure and magnetic instrument. Further, the method to prepare the test specimen and the method to obtain the measured value of deposited metal applied for the measurement by magnetic instrument are specified.

NOTE : The International Standard corresponding to this Standard is as follows.

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.

ISO 8249 : 2000 *Welding—Determination of Ferrite Number (FN) in austenitic and duplex ferritic-austenitic Cr-Ni stainless steel weld metals* (MOD)

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

JIS G 0320 Standard test methods for heat analysis of steel products

JIS G 0555 Microscopic testing method for the non-metallic inclusions in steel

JIS G 4304 Hot-rolled stainless steel plates, sheet and strip

JIS G 4305 Cold-rolled stainless steel plate, sheet and strip

JIS Z 3001 Welding terms

JIS Z 3184 Method of preparing deposited metal pad and samples for chemical analysis

JIS Z 8401 Guide to the rounding of numbers

3 Terms and definitions For the purpose of this Standard, the definitions given in **JIS Z 3001** and the following definitions shall apply.

- a) **ferrite content** ferrite structure content contained in austenitic and austenitic-ferritic stainless steel deposited metals
- b) **constitutional diagram** the metal constitutional diagram to show the relation of the chemical component of stainless steel deposited metal and the existing region of austenite, ferrite and martensite in microstructure and existing quantity of ferrite
- c) **ferrite content in percentage** ferrite structure content contained in metal structure expressed in percentage

It does not coincide with FN (ferrite number).

- d) **primary standard sample** non-magnetic coating thickness standard sample of carbon steel one side of which is coated with copper of prescribed thickness

It is applied for the preparation of calibration curve of testing instrument by coating meter method and for daily calibration.

- e) **secondary standard sample** deposited metal whose ferrite content is decided by testing instrument by coating thickness gauge calibrated with the primary standard sample or metal sample whose metal structure is similar to the deposit metal

It is applied for the daily calibration of testing instrument by coating thickness gauge method and magnetic induction method.

4 Classification of measuring method Classification of measuring methods shall be in accordance with table 1. Selection of measuring method for the report of test result shall be subject to the agreement between the manufacturer and the purchaser.

Table 1 Classification of measuring method for ferrite content

Measuring method	Classification
Method by microstructure	JIS G 0555 Annex 1 (microscopic test method of non-metallic inclusion by point counting method)
Method by constitutional diagram ⁽¹⁾	Ferrite content calculating diagram A
	Ferrite content calculating diagram B
	Ferrite content calculating diagram C
Method by magnetic instrument	Coating thickness gauge method
	Magnetic induction method

Note ⁽¹⁾ It can not be applied for the deposit metal by welding method which involves a cooling velocity significantly different for that of arc welding.

5 Method by microstructure Decide the ferrite content by the austenite and ferrite existing areas, which appear in the optical microstructure of deposit metal.

Area measuring method by optical microscopic instrument shall be in accordance with **JIS G 0555** Annex 1 or other appropriate method. Sample shall be used as weld. Etching method, measuring point, measuring area, observation magnification and so on shall be subject to the agreement between the manufacturer and the purchaser.

6 Method by constitutional diagram Calculate the nickel equivalent and chromium equivalent from the chemical analysis value of deposited metal and calculate the ferrite content by applying those values to the constitutional diagram. Express the ferrite content by FN or ferrite percentage according to the constitutional diagram applied.

6.1 Sampling method of the analysis sample The sampling method of the analysis sample shall be in accordance with **JIS Z 3184** or its equivalent methods.

6.2 Analysis method The analysis method shall be in accordance with **JIS G 0320**.

6.3 Obtaining method of measured value Read the value calculated from the ferrite percentage line or FN line specified in constitutional diagram of figure 1, figure 2 or figure 3 according to the results of analysis test, to the first decimal place. Take this value as ferrite content.

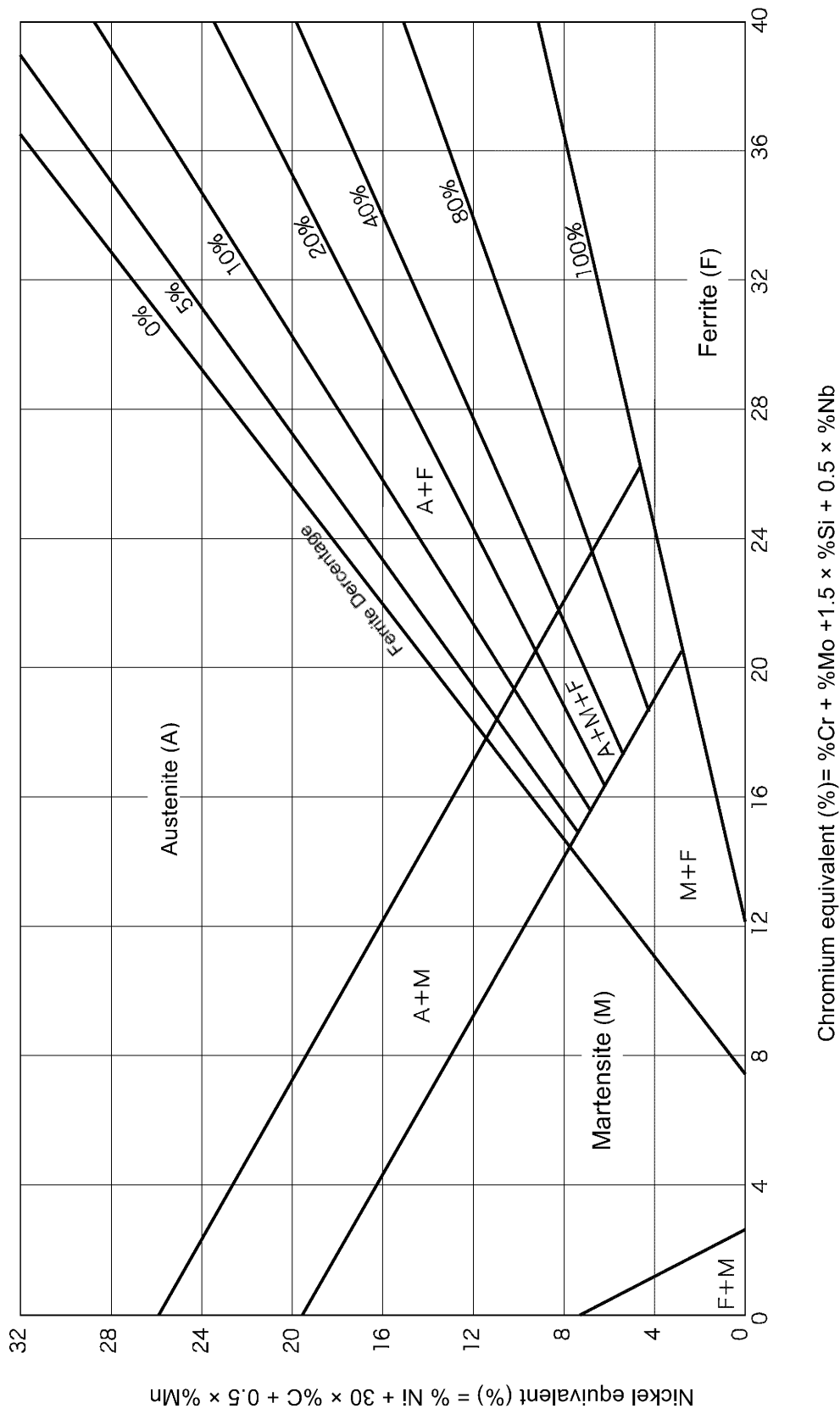


Figure 1 Ferrite content calculating diagram A (Schaeffler diagram)

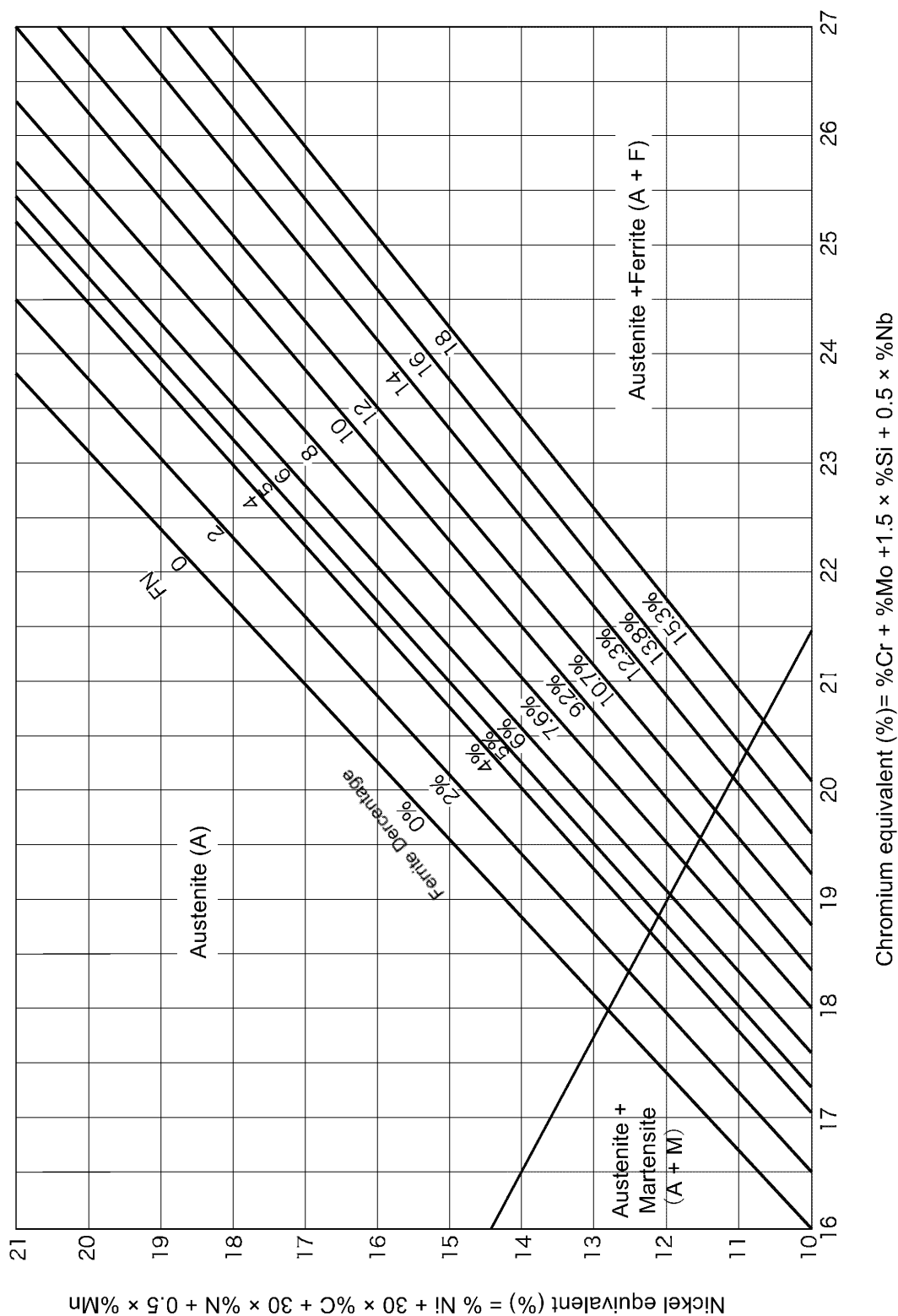


Figure 2 Ferrite content calculating diagram B (DeLong diagram)