

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS G 3468 : 2021

(JISF)

**Large diameter welded stainless steel
pipes**

ICS 23.040.10 ; 77.140.75

Reference number : JIS G 3468 : 2021 (E)

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Date of Establishment: 1978-12-01

Date of Revision: 2021-04-20

Date of Public Notice in Official Gazette: 2021-04-20

Developed by: The Japan Iron and Steel Federation

Investigated by: The Japan Iron and Steel Federation, Standardization
Center

JIS G 3468 : 2021, First English edition published in 2021-12

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

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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 based on the provision of Article 14, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act in response to a proposal for revision of Japanese Industrial Standard with a draft being attached, submitted by The Japan Iron and Steel Federation (JISF), an accredited standards development organization. This edition replaces the previous edition (**JIS G 3468:2017**), which has been technically revised.

However, **JIS G 3468: 2017** may be applied in the **JIS** mark certification based on the relevant provisions of Article 30, paragraph (1), etc. of the Industrial Standardization Act until 19 April 2022.

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— Address: 1-8-2 Marunouchi, Chiyoda-ku, Tokyo-to

Symbol of grade	Title of invention	Patent number	Registration date of establishment of patent right
SUS821L1TPY	Alloy-saving duplex stainless steel with good corrosion resistance and toughness of weld heat affected zone	5345070	23 August 2013

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Large diameter welded stainless steel pipes

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 9330-6** : 1997, Edition 1, with some modifications of the technical contents.

Annex JA is unique to **JIS** and not given in the corresponding International Standard. 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 JB.

1 Scope

This Standard specifies requirements for large diameter welded stainless steel pipes (hereafter referred to as pipes) used for piping for corrosion resistance, low temperature service, elevated temperature service or the like.

NOTE 1 This Standard generally applies to pipes of outside diameter 165.2 mm (nominal diameter 150A or 6B) to 1 016.0 mm (nominal diameter 1 000A or 40B) (see **9.1**).

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

ISO 9330-6 : 1997 *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 6 : Longitudinally welded austenitic stainless steel tubes* (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 G 0201 *Glossary of terms used in iron and steel (Heat treatment)*

JIS G 0202 *Glossary of terms used in iron and steel (Testing)*

JIS G 0203 *Glossary of terms used in iron and steel (Products and quality)*

JIS G 0320 *Standard test method for heat analysis of steel products*

JIS G 0404 *Steel and steel products — General technical delivery requirements*

JIS G 0415 *Steel and steel products — Inspection documents*

JIS G 0567 *Method of elevated temperature tensile test for steels and heat-resisting*

alloys

JIS G 0571 *Method of oxalic acid etching test for stainless steels*

JIS G 0572 *Method of ferric sulfate-sulfuric acid test for stainless steel*

JIS G 0573 *Method of 65 per cent nitric acid test for stainless steels*

JIS G 0575 *Method of copper sulfate-sulfuric acid test for stainless steels*

JIS Z 2241 *Metallic materials — Tensile testing — Method of test at room temperature*

JIS Z 2343-1 *Non-destructive testing — Penetrant testing — Part 1 : General principles — Method for liquid penetrant testing and classification of the penetrant indication*

JIS Z 3106 *Methods of radiographic examination for welded joints in stainless steel*

JIS Z 3121 *Methods of tensile test for butt welded joints*

JIS Z 3122 *Methods of bend test for butt welded joint*

JIS Z 8401 *Rounding of numbers*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in JIS G 0201, JIS G 0202 and JIS G 0203 apply.

4 Symbols of grade

This Standard covers pipes of 18 steel grades. Their symbols are shown in Table 1.

Table 1 Symbols of grade and solution heat treatment

Unit: °C

Classification	Symbol of grade	Solution heat treatment	Classification	Symbol of grade	Solution heat treatment
Austenitic series	SUS304TPY	1 010 or over, rapid cooling	Austenitic series	SUS317LTPY	1 010 or over, rapid cooling
	SUS304LTPY			SUS321TPY ^{a)}	920 or over, rapid cooling
	SUS309STPY	SUS347TPY ^{a)}		980 or over, rapid cooling	
	SUS310STPY	Austenitic-ferritic series	SUS821L1TPY	940 or over, rapid cooling	
	SUS315J1TPY		SUS323LTPY	950 or over, rapid cooling	
	SUS315J2TPY		SUS329J1TPY		
	SUS316TPY		SUS329J3LTPY		
	SUS316LTPY		SUS329J4LTPY		
	SUS317TPY		SUS327L1TPY	1 025 or over, rapid cooling	
Note ^{b)} For pipes of SUS321TPY and SUS347TPY, the stabilizing heat treatment may be specified. In this case, the temperature of heat treatment shall be 850 °C to 930 °C.					

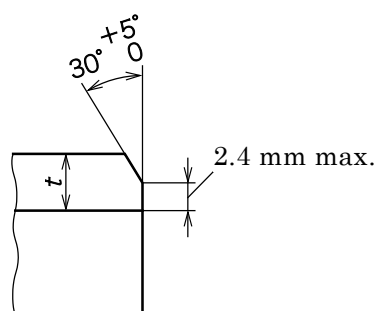
5 Manufacturing method

The manufacturing method shall be as follows.

- a) Pipes shall be manufactured by automatic arc welding or laser welding. The use of filler metal in automatic arc welding shall be left to the discretion of the manufacturer. The symbols of manufacturing method shall be in accordance with 14 b).
- b) Pipes shall be either manufactured from steel sheets or strips given solution heat treatment, or, upon request by the purchaser, given an appropriate heat treatment themselves.
- c) Pipes manufactured from steel strips or sheets given the solution heat treatment specified in Table 1 shall normally be supplied as manufactured. When performing heat treatment on steel sheets or strips, a solution heat treatment where the plates/strips are rapidly cooled after hot-rolling on the rolling line may be performed upon approval by the purchaser. In this case, the hot finishing temperature shall be in accordance with Table 1 and pickling or other similar treatment shall be performed.
- d) If heat treatment on pipes is requested by the purchaser, the solution heat treatment given in Table 1 shall be performed, followed by pickling or similar treatment. Other heat treatment than given in Table 1 may be applied upon agreement between the purchaser and the manufacturer. Pickling or similar treatment may be omitted for pipes that have received a bright heat treatment and have no surface scales. Pipes that have received a solution heat treatment shall be given the symbol S [see 14 c)].

When the solution heat treatment is performed on pipes, the heat treatment on steel sheets or steel strips may be omitted.

- e) Pipes shall be finished with plain ends unless otherwise specified. If the purchaser specifies the bevel end finishing, the shape of the bevel end shall be as agreed between the purchaser and the manufacturer. For pipes with a wall thickness 22 mm or under, however, the bevel end shape shown in Figure 1 shall apply unless otherwise specified.



Key

t : wall thickness (22 mm or under)

Figure 1 Shape of bevel end

6 Chemical composition

The results of heat analysis obtained according to 12.1 shall satisfy the composition given in Table 2.

Table 2 Chemical composition

Unit: %

Symbol of grade	C	Si	Mn	P	S	Ni	Cr	Mo	Other elements
SUS304TPY	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	8.00 to 10.50	18.00 to 20.00	—	—
SUS304LTPY	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	9.00 to 13.00	18.00 to 20.00	—	—
SUS309STPY	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	12.00 to 15.00	22.00 to 24.00	—	—
SUS310STPY	0.08 max.	1.50 max.	2.00 max.	0.045 max.	0.030 max.	19.00 to 22.00	24.00 to 26.00	—	—
SUS315J1TPY	0.08 max.	0.50 to 2.50	2.00 max.	0.045 max.	0.030 max.	8.50 to 11.50	17.00 to 20.50	0.50 to 1.50	Cu : 0.50 to 3.50
SUS315J2TPY	0.08 max.	2.50 to 4.00	2.00 max.	0.045 max.	0.030 max.	11.00 to 14.00	17.00 to 20.50	0.50 to 1.50	Cu : 0.50 to 3.50
SUS316TPY	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	10.00 to 14.00	16.00 to 18.00	2.00 to 3.00	—
SUS316LTPY	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	12.00 to 15.00	16.00 to 18.00	2.00 to 3.00	—
SUS317TPY	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	11.00 to 15.00	18.00 to 20.00	3.00 to 4.00	—
SUS317LTPY	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	11.00 to 15.00	18.00 to 20.00	3.00 to 4.00	—
SUS321TPY	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	9.00 to 13.00	17.00 to 19.00	—	Ti : 5 × C % min.
SUS347TPY	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	9.00 to 13.00	17.00 to 19.00	—	Nb : 10 × C % min.
SUS821L1TPY	0.030 max.	0.75 max.	2.00 to 4.00	0.040 max.	0.020 max.	1.50 to 2.50	20.50 to 21.50	0.60 max.	Cu : 0.50 to 1.50 N : 0.15 to 0.20
SUS323LTPY	0.030 max.	1.00 max.	2.50 max.	0.040 max.	0.030 max.	3.00 to 5.50	21.50 to 24.50	0.05 to 0.60	Cu : 0.05 to 0.60 N : 0.05 to 0.20
SUS329J1TPY	0.08 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	3.00 to 6.00	23.00 to 28.00	1.00 to 3.00	—
SUS329J3LTPY	0.030 max.	1.00 max.	2.00 max.	0.040 max.	0.030 max.	4.50 to 6.00	21.00 to 24.00	2.50 to 3.50	N : 0.08 to 0.20
SUS329J4LTPY	0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	5.50 to 7.50	24.00 to 26.00	2.50 to 3.50	N : 0.08 to 0.30
SUS327L1TPY	0.030 max.	0.80 max.	1.20 max.	0.035 max.	0.020 max.	6.00 to 8.00	24.00 to 26.00	3.00 to 5.00	Cu : 0.50 max. N : 0.24 to 0.32

Elements not listed or without limit values (marked as “—”) in this table may be added as necessary, but only to a degree where chemical composition of the grade concerned remains distinguishable from those of other grades.

7 Mechanical properties

7.1 Tensile strength, proof stress and elongation of base metal

Base metal (the pipe body excluding the weld, or the steel strip or sheet used for manufacturing the pipe) shall be tested in accordance with 12.2, and its tensile strength, proof stress and elongation shall conform to Table 3. For a tensile test of pipes under 8 mm in wall thickness using Test piece No. 12 or No. 5, the elongation requirement in Table 4 shall apply.

Table 3 Mechanical properties

Symbol of grade	Tensile strength	Proof stress	Tensile strength of weld	Elongation %		
	N/mm ²	N/mm ²	N/mm ²	Tensile test piece and tensile direction		
				Pipe		Steel sheet or strip
				Test piece No. 12	Test piece No. 5	Test piece No. 13B, No. 14B or No. 5
				Parallel to pipe axis	Perpendicular to pipe axis	a)
SUS304TPY	520 min.	205 min.	520 min.	35 min.	25 min.	40 min.
SUS304LTPY	480 min.	175 min.	480 min.			
SUS309STPY	520 min.	205 min.	520 min.			
SUS310STPY						
SUS315J1TPY						
SUS315J2TPY						
SUS316TPY						
SUS316LTPY	480 min.	175 min.	480 min.			
SUS317TPY	520 min.	205 min.	520 min.			
SUS317LTPY	480 min.	175 min.	480 min.			
SUS321TPY	520 min.	205 min.	520 min.			
SUS347TPY						
SUS821L1TPY	600 min.	400 min.	600 min.	20 min.	14 min.	20 min.
SUS323LTPY						
SUS329J1TPY	590 min.	390 min.	590 min.	18 min.	13 min.	18 min.
SUS329J3LTPY	620 min.	450 min.	620 min.			
SUS329J4LTPY						
SUS327L1TPY	795 min.	550 min.	795 min.	15 min.	10 min.	15 min.
NOTE 1 N/mm ² = 1 MPa						
Note a) Parallel or perpendicular to the rolling direction.						