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**Titanium and titanium alloy tubes
for heat exchangers**

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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 Japan Titanium Society (JTS) 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.

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Titanium and titanium alloy tubes for heat exchangers

1 Scope This Japanese Industrial Standard specifies corrosion-resistive titanium and titanium alloy tubes having a circular section intended for use in appliances where heat is exchanged between the inside and outside of the wall of a tube (hereafter referred to as “tubes”).

2 Normative references The following standards contain provisions which, 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 H 0321 *General rules for inspection of non-ferrous metal materials*
- JIS H 0515 *Eddy current inspection of titanium pipes and tubes*
- JIS H 0516 *Ultrasonic inspection of titanium pipes and tubes*
- JIS H 0517 *Differential pressure testing method of titanium welded tubes*
- JIS H 1610 *Titanium and titanium alloys—Sampling methods*
- JIS H 1612 *Methods for determination of nitrogen in titanium and titanium alloys*
- JIS H 1614 *Methods for determination of iron in titanium and titanium alloys*
- JIS H 1617 *Methods for determination of carbon in titanium and titanium alloys*
- JIS H 1619 *Methods for determination of hydrogen in titanium and titanium alloys*
- JIS H 1620 *Methods for determination of oxygen in titanium and titanium alloys*
- JIS H 1621 *Methods for determination of palladium in titanium alloys*
- JIS H 1622 *Titanium alloys—Method for determination of aluminium*
- JIS H 1630 *Method for atomic emission spectrometric analysis of titanium*
- JIS Z 2201 *Test pieces for tensile test for metallic materials*
- JIS Z 2241 *Method of tensile test for metallic materials*

3 Classification, manufacturing methods, finishing methods and symbols The classification, manufacturing methods, finishing methods and symbols of tubes shall be as given in table 1.

Table 1 Classification, manufacturing methods, finishing methods and symbols

Class	Manufacturing method	Finishing method	Symbol	Informative
				Characteristics and examples of use
Class 1	Seamless tube	Cold working	TTH 270 C	High corrosion resistance, especially high sea-water resistance. Chemical equipment, petroleum refining equipment, pulp paper making industrial equipment, power generating equipment, sea-water desalinization equipment or the like.
	Welded tube	As welded	TTH 270 W	
		Cold working	TTH 270 WC	
Class 2	Seamless tube	Cold working	TTH 340 C	
	Welded tube	As welded	TTH 340 W	
		Cold working	TTH 340 WC	
Class 3	Seamless tube	Cold working	TTH 480 C	
	Welded tube	As welded	TTH 480 W	
		Cold working	TTH 480 WC	
Class 11	Seamless tube	Cold working	TTH 270 Pd C	High corrosion resistance, especially high crevice corrosion resistance. Chemical equipment, petroleum refining equipment, pulp paper making industrial equipment, power generating equipment, sea-water desalinization equipment or the like.
	Welded tube	As welded	TTH 270 Pd W	
		Cold working	TTH 270 Pd WC	
Class 12	Seamless tube	Cold working	TTH 340 Pd C	
	Welded tube	As welded	TTH 340 Pd W	
		Cold working	TTH 340 Pd WC	
Class 13	Seamless tube	Cold working	TTH 480 Pd C	
	Welded tube	As welded	TTH 480 Pd W	
		Cold working	TTH 480 Pd WC	
Class 14	Seamless tube	Cold working	TTH 345 NPRC C	
	Welded tube	As welded	TTH 345 NPRC W	
		Cold working	TTH 345 NPRC WC	
Class 15	Seamless tube	Cold working	TTH 450 NPRC C	
	Welded tube	As welded	TTH 450 NPRC W	
		Cold working	TTH 450 NPRC WC	
Class 16	Seamless tube	Cold working	TTH 343 Ta C	
	Welded tube	As welded	TTH 343 Ta W	
		Cold working	TTH 343 Ta WC	
Class 17	Seamless tube	Cold working	TTH 240 Pd C	
	Welded tube	As welded	TTH 240 Pd W	
		Cold working	TTH 240 Pd WC	
Class 18	Seamless tube	Cold working	TTH 345 Pd C	
	Welded tube	As welded	TTH 345 Pd W	
		Cold working	TTH 345 Pd WC	
Class 19	Seamless tube	Cold working	TTH 345 PCo C	
	Welded tube	As welded	TTH 345 PCo W	
		Cold working	TTH 345 PCo WC	