



Stainless steel tubes and tube fittings for food processing and hygienic applications

Part 2: Screwed tube couplings



AS 1528.2:2019

This Australian Standard® was prepared by FT-027, Stainless Steel Tubes and Tube Fittings for Food Processing and Hygienic Applications. It was approved on behalf of the Council of Standards Australia on 10 September 2019.

This Standard was published on 24 October 2019.

The following are represented on Committee FT-027:

- Australian Chamber of Commerce and Industry
- Australian Food Engineering Association
- Australian Industry Group
- Australian Stainless Steel Development Association
- Dairy Australia
- Winery Engineering Association

This Standard was issued in draft form for comment as DR AS 1528.2:2018.

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ISBN 978 1 76072 583 9



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Part 2: Screwed tube couplings

Originated as AS N32—1960.
Previous edition AS 1528.2—2001.
Third edition AS 1528.2:2019.

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Preface

This Standard was prepared by the Standards Australia Committee FT-027, Stainless Steel Tubes and Tube Fittings for Food Processing and Hygienic Applications, to supersede AS 1528.2—2001, *Tubes (stainless steel) and tube fittings for the food industry, Part 2: Screwed couplings*.

The objective of this Standard is to specify the materials, dimensions, and surface finish requirements for welded-type and expanded-type screwed tube fittings, comprising male parts, liners, nuts, blank caps, seals and gaskets in screwed couplings for effecting joins in pipelines in food processing and hygienic applications.

This is Part 2 of a series of Standards for stainless steel tubes and tube fittings for food processing and hygienic applications. The Standards in the series are as follows:

AS 1528.1, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 1: Tubes*

AS 1528.2, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 2: Screwed tube couplings* (this Standard)

AS 1528.3, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 3: Butt weld tube fittings*

AS 1528.4, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 4: Clamp tube fittings*

The revision of the AS 1528 series more closely aligns with other national and international Standards applicable to stainless steel tube and tube fittings for hygienic applications, while retaining a number of requirements that were identified in the prefaces to the 2001 editions as lacking in ASTM and ISO Standards.

ISO, European and other national Standards were reviewed and found not suitable for current Australian requirements.

The major changes to this Standard in this revision include the following:

- (a) The title of the Standard was changed to include “hygienic applications” in recognition of a broader application than simply the food processing industry.
- (b) Common internal surface requirements for all parts of the Standard.
- (c) Closer alignment of tolerances with International, European and US-based Standards.
- (d) Expansion of the diameter range and inclusion of wall thicknesses common to various tube diameters.
- (e) Addition of fittings now standard for the intended applications.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

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Australian Standard®

Stainless steel tubes and tube fittings for food processing and hygienic applications

Part 2: Screwed tube couplings

Section 1 Scope and general

1.1 Scope

This Standard specifies requirements for all screwed tube fitting types intended for food processing and hygienic applications. This includes ring-joint types, and trapezoidal thread (ISO type) stainless steel screwed couplings.

The male parts and the liners are intended for use with the stainless steel tubes in accordance with AS 1528.1 and fittings specified in accordance with AS 1528.3 and AS 1528.4.

NOTE Information to be supplied for purchase is given in [Appendix A](#).

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

AS 1528.1, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 1: Tubes*

AS 1528.3, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 3: Butt weld tube fittings*

AS 1528.4, *Stainless steel tubes and tube fittings for food processing and hygienic applications, Part 4: Clamp tube fittings*

AS/NZS 1554.6, *Structural steel welding, Part 6: Welding stainless steels for structural purposes*

ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ASTM A182M, *Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*

ASTM A240M, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*

ASTM A276M, *Standard Specification for Stainless Steel Bars and Shapes*

ASTM A351M, *Standard Specification for Castings, Austenitic, for Pressure-Containing Parts*

AWS D18.1M, *Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications*

EN 10204, *Metallic products — Types of inspection documents*

1.3 Terms and definitions

No terms and definitions are listed in this document.

1.4 Symbols

Symbol	Description
A	= allowance of male part thread
C_1	= spigot diameter of expanded-type male part and liner
C_2	= spigot diameter of welded-type male part and liner
C_3	= inside diameter of hexagon and round nut
C_4	= inside diameter of gasket
C_5	= inside diameter of expanded-type male part and liner and nose diameter of welded male part
C_6	= inside diameter of welded-type male part and liner
C_7	= outside diameter of expanded-type and welded-type liner and blank cap
C_8	= outside diameter of round nut
C_9	= centring inside diameter of nut
C_{10}	= outside neck diameter of welded-type male part and liner
C_{11}	= centre-line diameter of groove for male parts and gasket
C_{12}	= major diameter of taper in liners and blank cap
C_{13}	= inside diameter of recessed liner, cap, and outer diameter of seal
C_{14}	= clearance diameter for C_3
C_{15}	= diameter of thread undercut of nut
d	= major diameter of male part thread
d_1	= minor diameter of male part thread
d_2	= pitch diameter of male part thread
D	= minor diameter of nut thread
D_1	= minor diameter of nut thread
D_2	= pitch diameter of nut thread
E	= inside diameter of gasket lip
F_1	= total length of expanded-type male part
F_2	= total length of welded-type male part and liner
F_3	= total length of liner
F_4	= total length of hexagon and round nut
F_5	= inside depth of blank cap
F_6	= overall length of blank cap
G_1	= length of external thread of expanded-type and welded-type male part
G_2	= length of internal thread of hexagon and round nut
H	= height of fundamental triangle of thread
J	= chamfer diameter of round nut and blank nut
K	= length of spigot of expanded-type and welded-type male part and liner
K_1	= seal ring groove depth
K_2	= length of spigot of weld-type male part
K_3	= depth of recess of expanded-type male part
K_4	= depth of recess of liner and blank nut
L_1	= flange thickness of expanded-type, welded-type liner and blank cap
L_2	= inside flange thickness of hexagon and round nut
L_3	= length of seal lip
L_4	= overall length to the seal lip
L_5	= weld area length

Symbol		Description
L_6	=	back thickness of blind nut
L_7	=	back thickness of machined blank cap
L_8	=	overall length of flat faced modified seal
L_9	=	overall length to outer seal area for Australian crevice free seal
M_2	=	outside diameter of lip of gasket to be used without support ring
N_1	=	width across slots of round nut
N_2	=	width across flats of hexagon nut
O	=	width of slot of round nut
P	=	pitch of thread
T	=	tolerances
U	=	total thickness of gasket
V	=	compression thickness of gasket
V_1	=	depth of an internal step of a gasket
w	=	root width of male part threads on GO side profile
W	=	root width of nut threads on GO side profile
Ra	=	roughness average
$R, R_1, R_2, r, r_1, r_2, r_3, r_4$	=	radii

1.5 Working pressure

Non-shock maximum working pressure for fittings shall be 10 bar at temperatures from $-20\text{ }^{\circ}\text{C}$ up to $100\text{ }^{\circ}\text{C}$, subject to the engineering requirements of the specific application.

1.6 Materials

1.6.1 Male parts, liners, nuts and blank caps

The requirements for the materials shall be as follows:

- (a) Cast, forged or wrought stainless steel from which male parts, liners, nuts, blank nuts and blank caps are made shall be an austenitic stainless steel and shall conform to a raw material specification that applies to the material chosen.
- (b) Components shall be made from one of the high alloy corrosion-resistant steels specified in ASTM A182M, ASTM A240M, ASTM A276M or ASTM A351M.
- (c) The steel used in welded-type components shall be of a weldable grade.
- (d) Filler rods for welding shall be pre-qualified as per AS/NZS 1554.6.

1.6.2 Joint rings, gaskets and seals

Joint rings, gaskets and seals shall be made from elastomeric materials that are non-toxic and suitable for contact under processing conditions with the foodstuffs and cleaning fluids to be used. No odour or taste shall be imparted to the foodstuff. Special joint ring, gasket and seal materials may be required for temperatures above $100\text{ }^{\circ}\text{C}$.

1.7 Surface finish

1.7.1 External surfaces

The external surfaces of the components shall be finished smooth by machining or polishing or both. The fittings, including the threads, shall be free from burrs.

1.7.2 Internal surfaces

The product-contacting surfaces of the components shall be smooth and bright with a finish not inferior to a roughness parameter, Ra , of $0.8\text{ }\mu\text{m}$ as assessed in accordance with the procedure described in ISO 4288. These surfaces shall be free from harmful surface defects and inclusions.

1.8 Hygienic requirements

1.8.1 Accessibility of surface of coupling

All surfaces of the components in contact with the product shall be easily accessible for cleaning, either by cleaning-in-place (CIP) methods or by manual cleaning when the coupling is disassembled. Removable parts shall be readily demountable.

1.8.2 Welded male parts and liners

Welded-type male parts and liners shall be internally clean and smooth. They shall be free from harmful surface defects or inclusions.

1.8.3 Joint rings, gaskets and seals

The joint ring, gasket and seals shall be of an elastomeric material compatible under processing conditions with the foodstuffs and cleaning fluids utilized. It shall not impart an odour or taste to the foodstuff.

1.9 Packaging

The components shall be packaged for delivery in a manner that will provide adequate protection against the normal hazards of transport and handling.

1.10 Identification marking

1.10.1 On the container

Each container of couplings or individual components shall be legibly marked with the following information:

- (a) Description of contents.
- (b) Size of coupling or components.
- (c) Material (grade of stainless steel or type of elastomer) of which the coupling or component is made.

1.10.2 On parts

Each stainless steel component shall be legibly and indelibly marked with the following information:

- (a) Manufacturer's batch number.
- (b) Grade of stainless steel material.

- (c) The manufacturer's name, trademark or logo.
- (d) The number of this Standard, i.e. AS 1528.2.
- (e) Nominal size of the component.

EXCEPTION — Where the components are of a size not able to have all of the above marked, the priority is as listed. Where space does not allow for full marking, items may be omitted starting with Item (e) and working up the list.

1.11 Inspection certificates

Inspection certificates in accordance with EN 10204 type 3.1 including test results shall be made available if requested.

NOTE The term “inspection certificate” is consistent with the terminology used in EN 10204; the term “test certificate” is more commonly used in Australia.

1.12 Assembling

1.12.1 Welding

Welded-type male parts and liners shall be attached to the tube ends by means of a full penetration butt weld. The welds shall be structurally sound and product-contacting surfaces shall be free of pits, craters, or any defects which interfere with the hygienic surface. Heat tint in excess of level 3 of AWS D18.1M shall be removed.

1.12.2 Expanding

Expanded-type male parts and liners shall be attached to the tube ends by expanding.

NOTE Recommended methods for carrying out the expansion are provided in [Appendices C](#) and [E](#).

Section 2 Recessed ring joint type

2.1 Scope of section

This Section applies to screwed tube fittings of the compressible ring joint type (RJT) for effecting joins in tube lines for food processing and hygienic applications. It specifies dimensional requirements for the individual components of the tube fittings.

NOTE Information to be supplied for purchase is given in [Appendix A](#).

2.2 Types and assemblies

The screwed fittings covered by this Section are two types, i.e. the expanded type and the welded type.

For each type, the assembly of the component parts is illustrated in [Figure 2.1](#).

NOTE Recommended procedures for fitting the expanded type components to stainless steel tubing are given in [Appendix C](#).

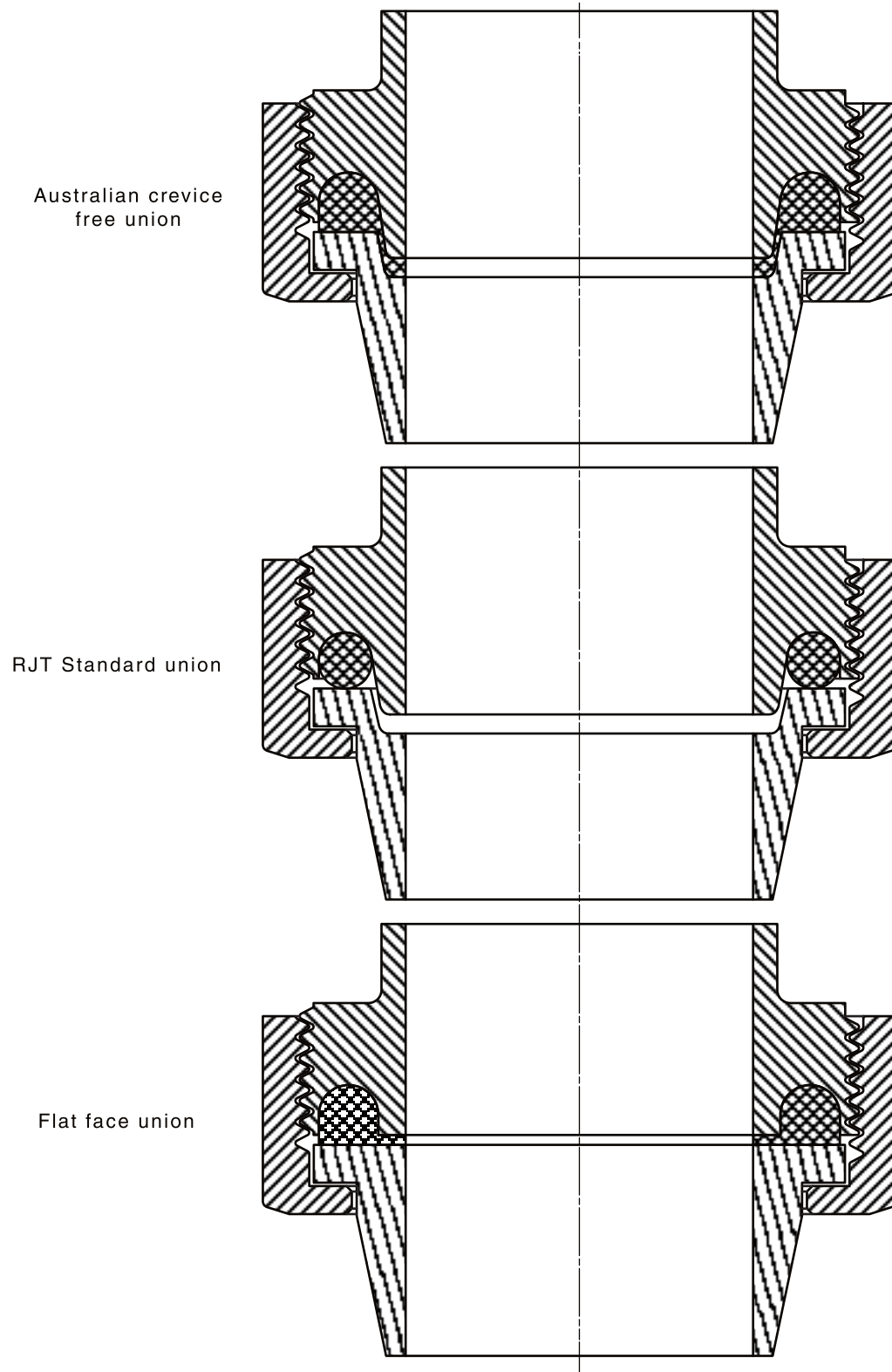


Figure 2.1 — Australian crevice free union, RJT standard union and Flat face union

2.3 Dimensions and tolerances

2.3.1 Male parts, liners, nuts and blank caps

The dimensions of male parts, liners, nuts and blank caps shall be as specified on the relevant [Figures 2.4](#) to [2.13](#). Expanded-type male parts and liners shall be provided with sufficient expansion grooving, as illustrated in [Appendix B Figure B.1](#), to give the required strength to the joint between male part or liner and the tubing.

Unless otherwise stated in this Section, no dimension shall differ by more than 0.25 mm from that specified.

2.3.2 Joint rings

The dimensions and tolerances of joint rings shall be as specified in [Figure 2.14](#).

2.4 Screw threads

The form of the screw thread shall be Whitworth or truncated Whitworth in accordance with [Figures 2.2](#) and [2.3](#). Thread details shall be as given in [Table 2.1](#).

Table 2.1 — Details of Whitworth screw thread for RJT screwed couplings

Dimensions in millimetres

Nominal size	Threads per inch	External thread (tolerance in brackets)				Internal thread (tolerance in brackets)		
		Major diameter (0, -0.3)	Pitch diameter (0, -0.3)	Minor diameter (0, -0.3)	Truncated major diameter (0, -0.3)	Major diameter (+0.3, 0)	Pitch diameter (+0.3, 0)	Minor diameter (+0.3, 0)
25.40	8	45.7	43.7	41.7	45.2	46.3	44.3	42.3
38.10	8	58.4	56.4	54.4	57.9	59.0	57.0	55.0
50.80	6	72.7	69.9	67.3	72.1	73.3	70.6	67.8
63.50	6	85.4	82.6	80.0	84.8	86.0	83.3	80.5
76.20	6	98.1	95.3	92.7	97.5	98.7	96.0	93.2
101.60	6	123.5	120.7	118.1	122.9	124.1	121.4	118.6
127.00	6	148.9	146.1	143.5	148.3	149.5	146.8	144.0
152.40	6	174.3	171.5	168.9	173.7	174.9	172.2	169.4

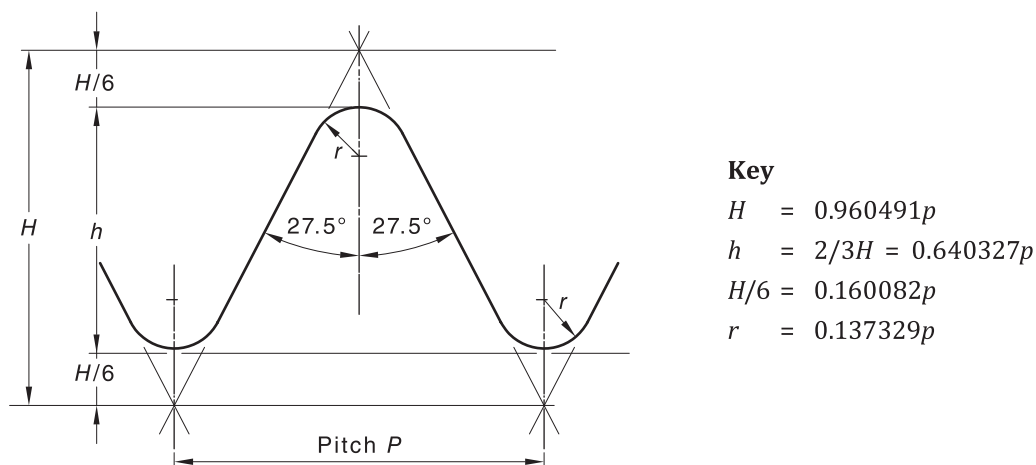


Figure 2.2 — Basic form of Whitworth thread

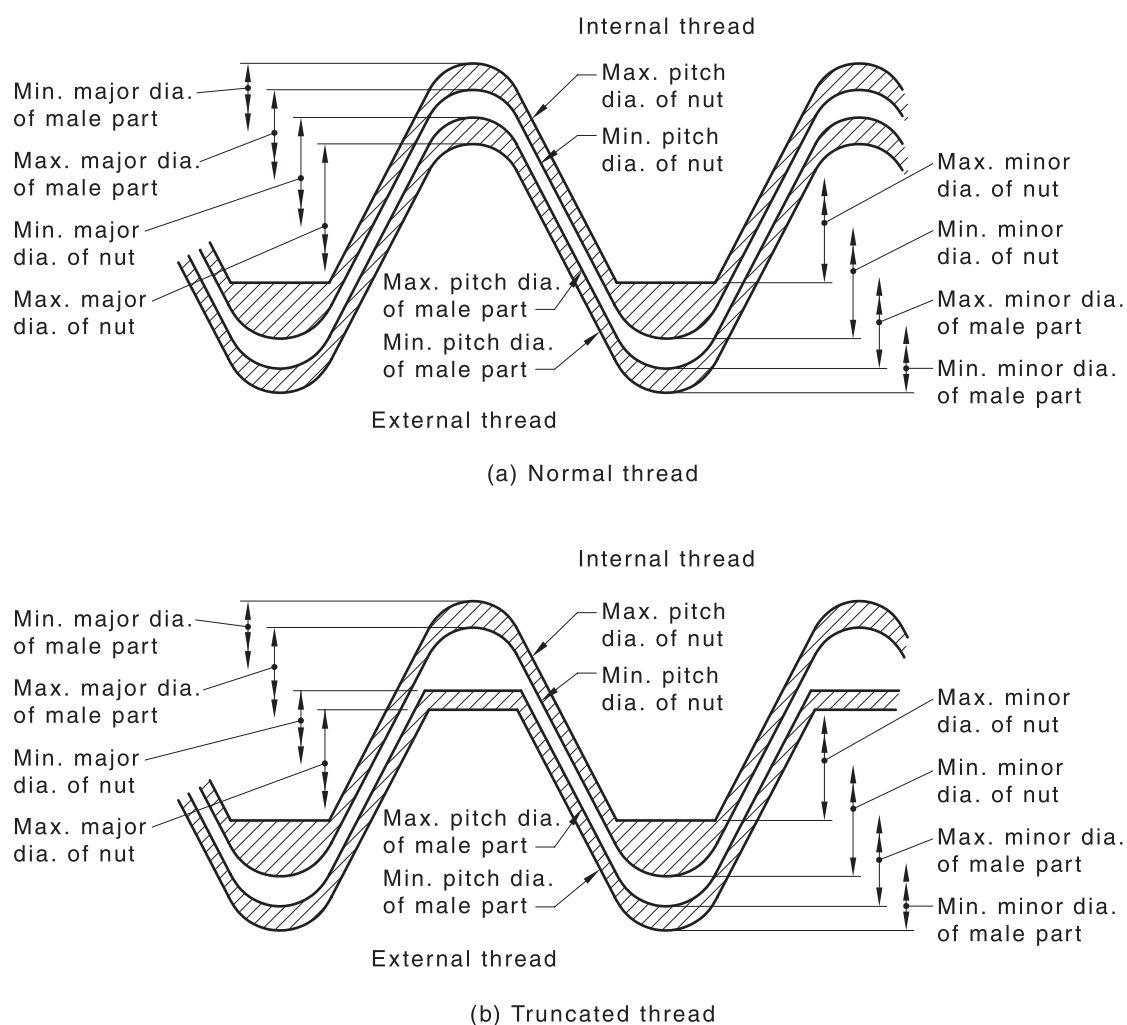


Figure 2.3 — Tolerance zones for screw threads of RJT couplings