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**Flare type and brazing type fittings  
for refrigerants**

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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 Japan Society of Refrigerating and Air Conditioning Engineers (JSRAE)/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 B 8607**:2008), which has been technically revised.

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# Flare type and brazing type fittings for refrigerants

## 1 Scope

This Japanese Industrial Standard specifies requirements for flare type fittings (including flare processing of pipe ends), copper alloy brazing type socket fittings and brazing type fittings (hereafter referred to as fittings) to be used for jointing the copper pipes and copper alloy pipes of the refrigerator using a refrigerant non-corrosive to copper and copper alloys.

When a refrigerant of maximum working pressure exceeding 4.30 MPa is used, this Standard applies to brazing type fittings only.

NOTE The pressure used in this Standard is gauge pressure.

## 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 B 0208 *Unified fine screw threads*

JIS B 0212 *Limits of sizes and tolerances for unified fine screw threads*

JIS B 0405 *General tolerances—Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

JIS H 0321 *General rules for inspection of non-ferrous metal materials*

JIS H 3250 *Copper and copper alloy rods and bars*

JIS H 3300 *Copper and copper alloy seamless pipes and tubes*

ISO 817 *Refrigerants—Designation and safety classification*

ISO 14903 *Refrigerating systems and heat pumps—Qualification of tightness of components and joints*

## 3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

### 3.1

#### toxic refrigerant

refrigerant which is classified into Class B in the safety classification specified in **ISO 817** due to the nature to cause a disease symptom in humans and animals or a hazardous change in organism when organism is exposed to it

The toxicity includes chronic toxicity due to long-term repeated exposures and acute toxicity due to a single, short-term exposure.

### 3.2

#### **flammable refrigerant**

refrigerant having the property in which a flame is capable of self-propagating for a certain distance, which is classified into either Class 2L: lower flammability, Class 2: flammable or Class 3: higher flammability, in the safety classification specified in **ISO 817**

### 3.3

#### **refrigerator**

a set of devices for refrigeration including a motor for driving the compressor and a control device for controlling the refrigerant, in a system constituting a refrigerating cycle with a compressor, condenser, liquid receiver, evaporator, piping, etc.

NOTE A refrigerator also includes a heat pump.

## 4 Classification and class division

### 4.1 Fittings

Classification and class division of fittings, and shape and dimensions of fittings shall be as given in Table 1.

**Table 1 Classification and class division of fittings**

| Classification of fittings                                                                                                         |                                                                                        |                                                                                                                                                                                                                                                             | Class division [maximum working pressure (designed pressure), shape and dimension]        |                                                         |                                                         |                                                          |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------|
|                                                                                                                                    |                                                                                        |                                                                                                                                                                                                                                                             | Class 1<br>3.45 MPa<br>or under                                                           | Class 2<br>Over 3.45 MPa<br>up to and incl.<br>4.30 MPa | Class 3<br>Over 4.30 MPa<br>up to and incl.<br>4.80 MPa | Class 4<br>Over 4.80 MPa<br>up to and incl.<br>15.00 MPa |
| Flare type fittings                                                                                                                | Refrigerant other than toxic refrigerant                                               |                                                                                                                                                                                                                                                             | Table 5<br>Table 6 a)                                                                     | Table 5<br>Table 6 b)                                   | —                                                       | —                                                        |
|                                                                                                                                    | Toxic refrigerant                                                                      | Fittings used for the piping of refrigerators placed in rooms of residents and hotels where people sleep, in places such as hospitals where people’s actions are restricted, in sites accessed by unspecified number of people, or in other similar places. | Not applicable                                                                            | Not applicable                                          | —                                                       | —                                                        |
|                                                                                                                                    |                                                                                        | Sites other than above (e.g. machinery room and outdoors)                                                                                                                                                                                                   | Table 5<br>Table 6 a)                                                                     | Table 5<br>Table 6 b)                                   | —                                                       | —                                                        |
| Copper alloy brazing type socket fittings                                                                                          |                                                                                        |                                                                                                                                                                                                                                                             | Table 7                                                                                   | Table 7                                                 | Table 7                                                 | —                                                        |
| Brazing type fittings                                                                                                              | Joining copper pipes of basic outer diameter 3.17 mm or over up to and incl. 22.22 mm  |                                                                                                                                                                                                                                                             | Table 9<br>Table 10                                                                       | Table 9<br>Table 10                                     | Table 9<br>Table 10                                     | Table 9<br>Table 10                                      |
|                                                                                                                                    | Joining copper pipes of basic outer diameter 25.40 mm or over up to and incl. 44.45 mm |                                                                                                                                                                                                                                                             | Table 9<br>Table 10                                                                       | Table 9<br>Table 10                                     | —                                                       | Table 9<br>Table 10                                      |
|                                                                                                                                    | Joining copper pipes of basic outer diameter 31.75 mm or over up to and incl. 79.38 mm |                                                                                                                                                                                                                                                             | Table 9<br>Table 10                                                                       | —                                                       | —                                                       | Table 9<br>Table 10                                      |
| NOTE 1 The mark “—” in this table shows that it is not specified.                                                                  |                                                                                        |                                                                                                                                                                                                                                                             |                                                                                           |                                                         |                                                         |                                                          |
| NOTE 2 The following table shows examples of applicable refrigerants according to the class division and maximum working pressure. |                                                                                        |                                                                                                                                                                                                                                                             |                                                                                           |                                                         |                                                         |                                                          |
| Class division                                                                                                                     |                                                                                        |                                                                                                                                                                                                                                                             | Example of applicable refrigerant                                                         |                                                         |                                                         |                                                          |
| Class 1                                                                                                                            |                                                                                        |                                                                                                                                                                                                                                                             | R22, R134a, R404A, R407C, R507A, etc. (for application on the high pressure side)         |                                                         |                                                         |                                                          |
| Class 2                                                                                                                            |                                                                                        |                                                                                                                                                                                                                                                             | R410A, R32, etc. (for application on the high pressure side)                              |                                                         |                                                         |                                                          |
| Class 3                                                                                                                            |                                                                                        |                                                                                                                                                                                                                                                             | Those to be used at > 4.30 MPa but ≤ 4.80 MPa (for application on the high pressure side) |                                                         |                                                         |                                                          |
| Class 4                                                                                                                            |                                                                                        |                                                                                                                                                                                                                                                             | R744 (CO <sub>2</sub> ), etc. (for application on the high pressure side)                 |                                                         |                                                         |                                                          |

## 4.2 Fitting connecting piping

Classification and dimensions of copper pipes for general refrigerant piping to be connected by flaring and brazing are shown in Annex A.

## 5 Performance

### 5.1 Pressure resistance performance

As for pressure resistance performance, when tested in accordance with Clause 10, the fittings shall be free from leakage, abnormal deformation or breakage.

In the case where flammable refrigerants are used, the flare shall be remanufactured if the flare connection is reused in a room.

### 5.2 Airtightness performance

As for airtightness performance, when tested in accordance with Clause 10, the fittings shall be free from leakage.

In the case where flammable refrigerants are used, the flare shall be remanufactured if the flare connection is reused in a room.

## 6 Shape and dimensions

### 6.1 Basic shape and dimensions of flare type fittings and copper alloy brazing type socket fittings

The basic shape and dimensions of flare type fittings and copper alloy brazing type socket fittings shall be as follows.

- a) The shape, dimensions and permissible dimensional deviations of fittings shall be as given in Table 2 to Table 7.
- b) There shall be no abrupt change on any section of fittings. Where a change in the sectional area of fittings is required, suitable rounding or gradient (roundness of about R0.1 or chamfering of about C0.1, unless otherwise specified) shall be provided to avoid abrupt changes in sectional area.
- c) When the permissible dimensional deviations are not indicated, the permissible deviations for the tolerance class of medium grade specified in **JIS B 0405** shall be applied.
- d) As to the fittings given in Table 5 and Table 7, the drilled holes through which refrigerant passes, if they are made linearly from both ends, shall not be deviated from each other's axes by 0.2 mm or more.
- e) The axes of thread and flare seat of fittings shall be free from eccentricity exceeding 0.125 mm. The runout of flared pipe ends shown in Table 4 shall not be exceeding 0.4 mm. The measurement point shall be as shown in Figure 1.
- f) The sectional area of fittings at the intersection of refrigerant passages shall not be less than that of the minor bore passage.
- g) Thicknesses of the fitting body, at any part thereof, shall not be less than the thickness determined from the dimensions and permissible deviations corresponding to the inner and outer diameters and radial runout.
- h) The screw threads used for flare type fittings shall be as follows.
  - 1) Being common to both Class 1 and Class 2, screw threads specified in **JIS B 0208**, which is given in Table 5 and Table 6, shall be used, except that the screw thread

of nominal designation  $1\frac{1}{16}$ –14 UNS shall be in accordance with the requirements of 3).

- 2) Unless otherwise specified, the grades of screw threads shall be, according to **JIS B 0212**, 2A for the external thread and 2B for the internal thread.
- 3) For the screw threads of nominal designation  $1\frac{1}{16}$ –14 UNS, Table 2 gives the basic sizes and Table 3 gives the limits of sizes and tolerances.

**Table 2 Basic sizes of nominal designation  $1\frac{1}{16}$ –14 UNS threads**

Unit: mm

| Nominal thread designation                                                                                                                                                     | Threads per inch (25.4 mm)<br>$n$ | Pitch (reference)<br>$P$ | Thread overlap<br>$H_1$ | Internal thread    |                      |                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------|-------------------------|--------------------|----------------------|----------------------|
|                                                                                                                                                                                |                                   |                          |                         | Major diameter $D$ | Pitch diameter $D_2$ | Minor diameter $D_1$ |
|                                                                                                                                                                                |                                   |                          |                         | External thread    |                      |                      |
|                                                                                                                                                                                |                                   |                          |                         | Major diameter $d$ | Pitch diameter $d_2$ | Minor diameter $d_1$ |
| $1\frac{1}{16}$ –14 UNS                                                                                                                                                        | 14                                | 1.814                    | 0.982                   | 26.987             | 25.809               | 25.024               |
| The definitions of the symbols used in this table are in compliance with Clause 2 of <b>JIS B 0208</b> .<br>The basic size shall be as specified in 2.2 of <b>JIS B 0208</b> . |                                   |                          |                         |                    |                      |                      |

**Table 3 Limits of sizes and tolerances for nominal designation  $1\frac{1}{16}$ –14 UNS threads**

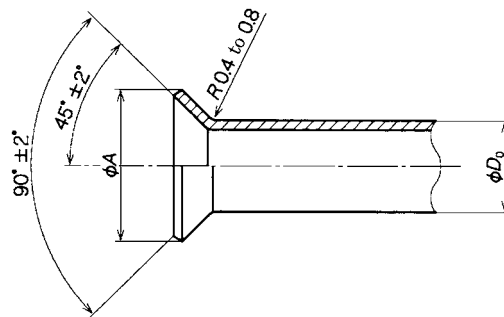
Unit: mm

| Nominal thread designation                                                                                                                                                                                                                                                                                                                                                                                                                                          | External thread |            |       |                |             |          |                |             |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|-------|----------------|-------------|----------|----------------|-------------|----------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Major diameter  |            |       | Pitch diameter |             |          | Minor diameter |             |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | $d_{\max}$      | $d_{\min}$ | $T_d$ | $d_{2\max}$    | $d_{2\min}$ | $T_{d2}$ | $d_{1\max}$    | $d_{1\min}$ |          |
| $1\frac{1}{16}$ –14 UNS                                                                                                                                                                                                                                                                                                                                                                                                                                             | 26.947          | 26.685     | 0.262 | 25.768         | 25.634      | 0.134    | 24.722         | —           |          |
| Nominal thread designation                                                                                                                                                                                                                                                                                                                                                                                                                                          | Internal thread |            |       |                |             |          |                |             |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Major diameter  |            |       | Pitch diameter |             |          | Minor diameter |             |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | $D_{\max}$      | $D_{\min}$ |       | $D_{2\max}$    | $D_{2\min}$ | $T_{D2}$ | $D_{1\max}$    | $D_{1\min}$ | $T_{D1}$ |
| $1\frac{1}{16}$ –14 UNS                                                                                                                                                                                                                                                                                                                                                                                                                                             | —               | —          |       | 25.984         | 25.809      | 0.175    | 25.425         | 25.024      | 0.401    |
| While the minimum limit of the major diameter of internal thread is not specified, some clearance is needed, as a rule, between the major diameter and the basic profile.<br>The definitions of the symbols used in this table are in compliance with Clause 2 of <b>JIS B 0212</b> .<br>NOTE 1 The minimum limit of the minor diameter of external thread is not specified.<br>NOTE 2 The maximum limit of the major diameter of internal thread is not specified. |                 |            |       |                |             |          |                |             |          |

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**Table 4 Shape and dimensions of flared pipe end**

Unit: mm



| Nominal size | Outer diameter of pipe<br>$D_0$ | $A_{-0.4}^0$ |         |
|--------------|---------------------------------|--------------|---------|
|              |                                 | Class 1      | Class 2 |
| 1/4          | 6.35                            | 9.0          | 9.1     |
| 3/8          | 9.52                            | 13.0         | 13.2    |
| 1/2          | 12.70                           | 16.2         | 16.6    |
| 5/8          | 15.88                           | 19.4         | 19.7    |
| 3/4          | 19.05                           | 23.3         | 24.0    |

For the copper pipes to be flared, O or OL type materials shall be used.

NOTE Class 1 and Class 2 flared pipe ends shall be used for joining by using Class 1 and Class 2 flare nuts, respectively.

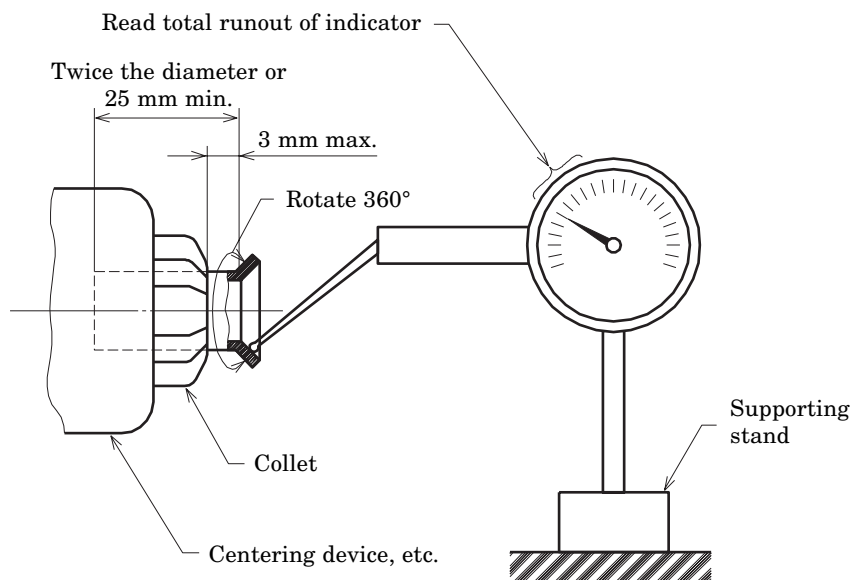
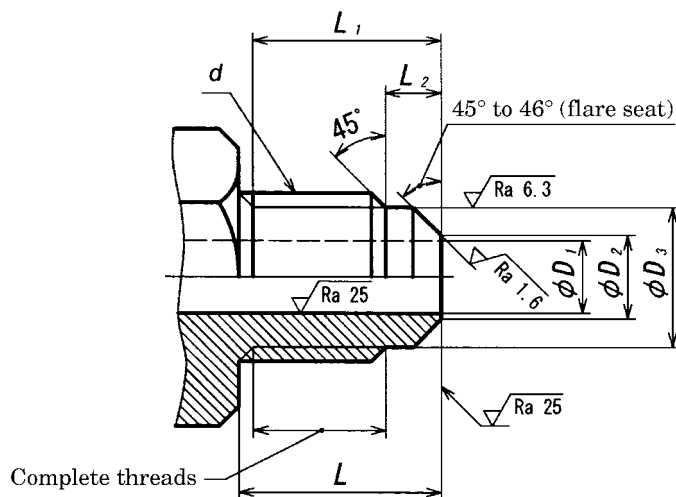


**Figure 1 Measurement point of runout of flared pipe ends**

**Table 5 Shape and dimensions of end of flare type fittings**

Unit: mm



| Nominal size                                                                              | Outer diameter of applicable pipe | Nominal thread designation <sup>a)</sup><br>$d$ | $D_{1-0.15}^0$ | $D_2$ | $D_3$ | $L$  | $L_1$<br>(min.) | $L_2$ |
|-------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------|----------------|-------|-------|------|-----------------|-------|
| 1/4                                                                                       | 6.35                              | $7/16-20$ UNF                                   | 4.8            | 5.5   | 9.2   | 13.5 | 11.3            | 3.7   |
| 3/8                                                                                       | 9.52                              | $5/8-18$ UNF                                    | 7              | 8     | 13.5  | 16.5 | 14              | 4.8   |
| 1/2                                                                                       | 12.70                             | $3/4-16$ UNF                                    | 10             | 11    | 16    | 19.5 | 16.8            | 5.5   |
| 5/8                                                                                       | 15.88                             | $7/8-14$ UNF                                    | 12.5           | 13.5  | 19    | 23   | 19.9            | 6     |
| 3/4                                                                                       | 19.05                             | $1\frac{1}{16}-14$ UNS                          | 16             | 18    | 24    | 26.5 | 23.4            | 6     |
| NOTE Dimensions of the end of flare type fittings are common to both Class 1 and Class 2. |                                   |                                                 |                |       |       |      |                 |       |
| Note <sup>a)</sup> Screw threads shall be in accordance with <b>6.1 h</b> ).              |                                   |                                                 |                |       |       |      |                 |       |