**Ruby® COPPER**

# CONTACT

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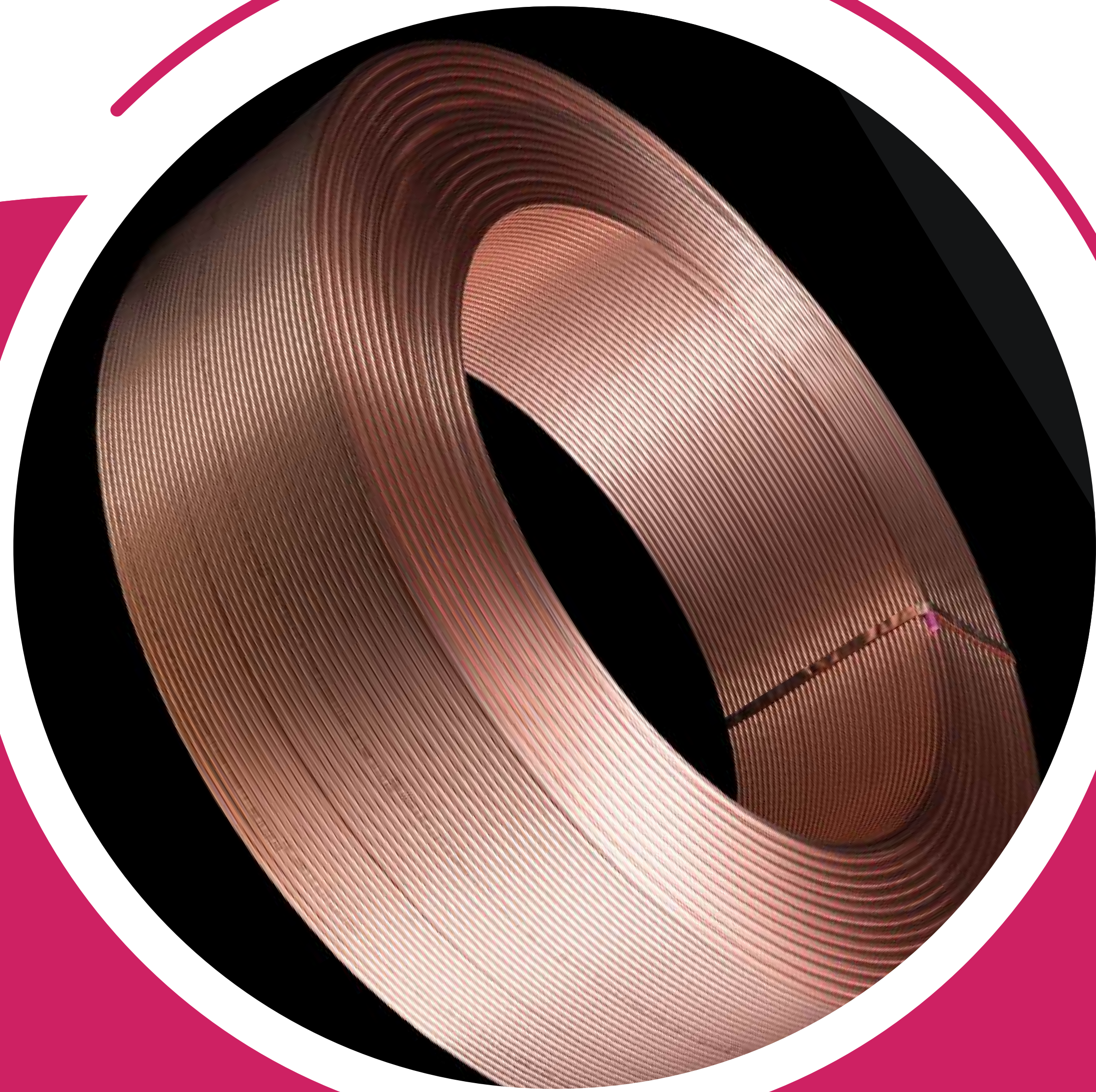
**Ruby® COPPER**



# Product Catalogue

World-class copper tube manufacturer

JIS ASTM STANDARDS Australia UL RoHS

# Product Introduction

Based on surface characteristics, our copper tubes are manufactured in two forms: Traditional, smooth tubes and Inner-grooved tubes. Depending on customer needs, they are then further developed into different categories including Level Wound Coils, Pancake Coils, Straight Tubes, and Insulated Copper Coils, with many different sizes.

Ruby Copper – Locally known as Toan Phat Copper Tube JSC – is a supplier of copper tube products with many applications, such as air conditioning, refrigeration, construction, shipbuilding, electronics, medical, and more.

Our products have a copper content of 99.95% with approved material grades from Japan (C1220T), United States and Australia (C12200), Europe (Cu-DHP/CW024A) and have met stringent quality standards from Japan (JIS), United States (ASTM), Australia (AS/NZS), and Europe (EN).

Copper tubes are the ideal choice for construction projects and fuel systems thanks to its properties of being durable yet also flexible. This makes the installation process simple and requires only basic tools and operations. In comparison, other construction materials like steel or stainless-steel tubes are harder to bend and would require more cutting and welding.

Ruby Copper's products have met exceptional standards in flexibility and durability, along with our advanced annealing technology, as well as our specialist equipment from leading manufacturers of copper tube machinery in the world.

# Customers and Partners

| | | | |
|---|---|---|---|
| SAMSUNG | systemair | NORITZ The Simple Comforts of Life | Johnson Controls |
| Iwatani Iwatani Corporation | SANAKY® Leading innovation | Entalpia | HITACHI Air conditioning solutions |
| THE GLOCAL COMPANY Chuo Bussan Co.,Ltd | Panasonic | ICOOL CANADA | FAWAZ |
| TOTALINE® | DAIKIN | HTC Since 1918 Hosoda Holdings Group | ASCO مركز السيد AL SAYED CENTER |

# Our Vision

## Corporate Vision Statement

We are committed to building a better life for our community, and we aim to do so with the following objectives:

• **Maintain our international standard for manufacturing copper tubes and refrigeration products:**
We always strive to be the leading manufacturer of copper tubes and refrigeration products, but we also aim for an international standard in every aspect, from product quality to manufacturing processes, as well as customer service. We are committed to investing in state-of-the-art technology, increasing our R&D resources to expand our product portfolio, and continuously improving our products to maintain the highest of international standards, and not only satisfy but also exceed expectations from our customers and partners around the world.

• **Grow and develop in a sustainable and environmentally friendly manner:**
Throughout our development, we are always committed to sustainability and our responsibility to the environment. We prioritize more environmentally friendly manufacturing processes and strictly adhere to environmental laws. We were awarded the ISO 14001:2015 certificate in environmental management, which we continue to maintain. Not only does this indicate our concern for our surrounding environment, but also reflects our responsibilities to Vietnam's future generations and heavy industry.

• **Share the pride and values of Vietnam to the rest of the world:**
Not only are we headed towards building a strong brand image, but we also hope to spread the pride and values of Vietnam, with an objective of exporting copper tubes and related products to 50 countries around the world. We believe that through every high-quality product, Ruby Copper is introducing and elevating the image of Vietnam's industry on the international stage, establishing the talent and dedication of Vietnamese workers.

*"Enhancing Quality*
*Looking towards the future*
*Sustainable Environment"*

# Present in
## 40 countries worldwide


- Vietnam
- Singapore
- Malaysia
- Taiwan
- Korea
- Japan
- Bangladesh
- Iraq
- Thailand
- Indonesia
- Australia
- Russia
- India
- Sri Lanka
- Hong Kong
- Jordan
- Maldives
- UAE
- Qatar
- Kuwait
- Saudi Arabia
- Egypt
- Brunei
- Oman
- Greece
- Italia
- Spain
- UK
- Germany
- Poland
- Cambodia
- Lebanon
- Belarus
- Turkey
- Canada
- United States
- Honduras
- Denmark
- Bahrain
- Myanmar

# *Ruby*® COPPER

# Inner-Grooved Tube

## Enhancing work efficiency and saving resources

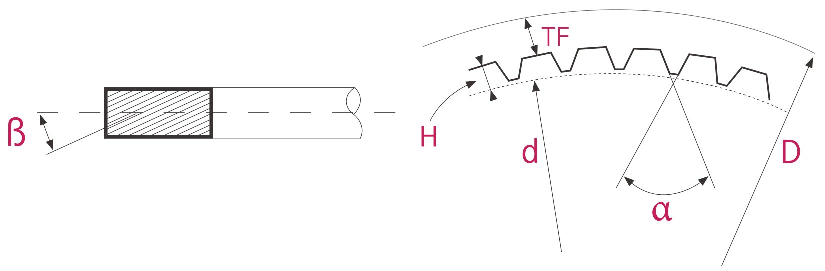
Inner - grooved tubes have internal grooves that enhance the amount of heat transferred through the refrigerant, thereby improving the energy efficiency of air conditioning systems.

***Technical Features:*** High precision dimensions. High thermal efficiency provides higher effectiveness in cooling systems. Lightweight with minimal internal residue.

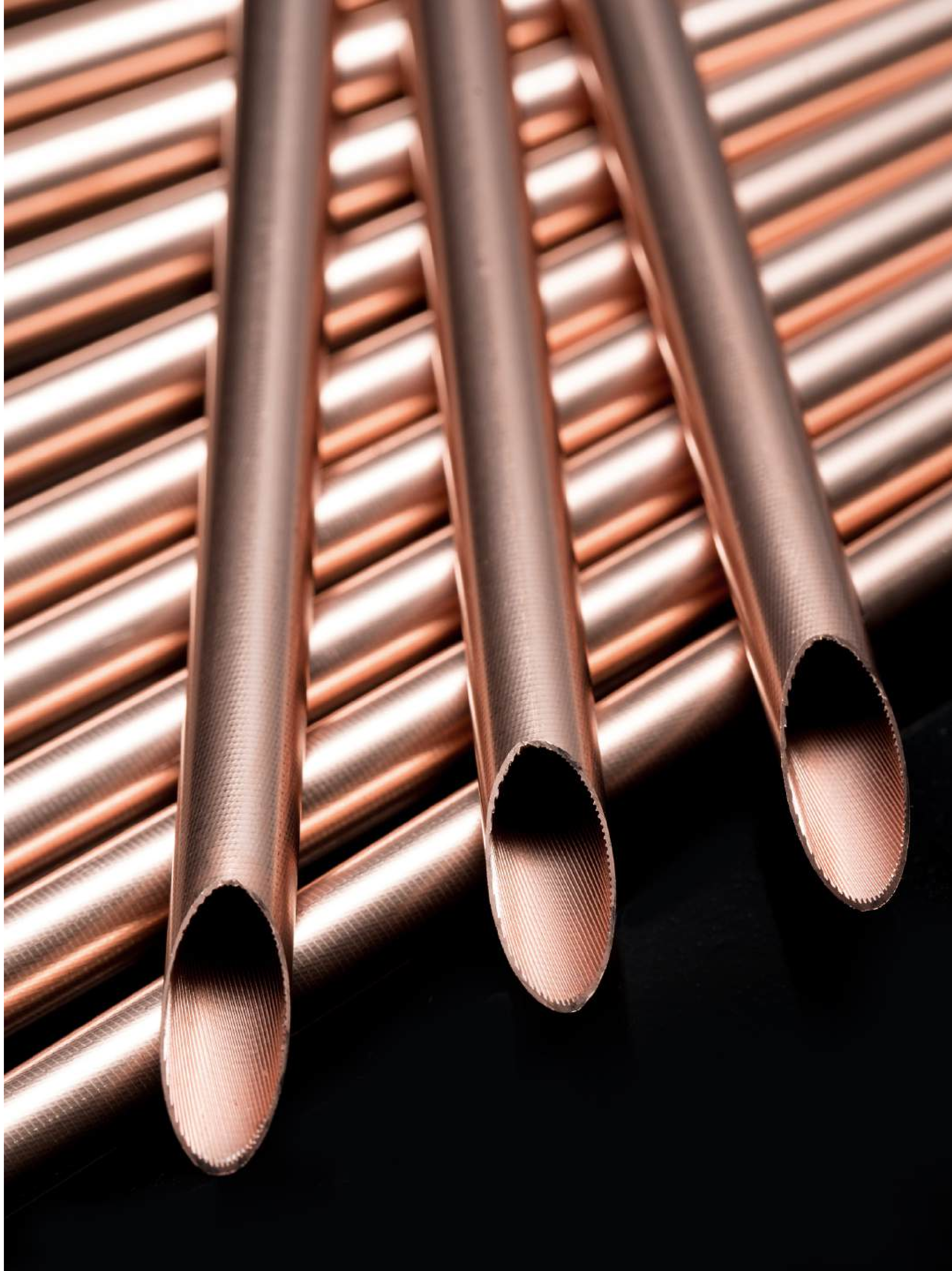
### Specifications for reference

| Outer Diameter (D) | Bottom Wall Thickness (TF) | Groove Depth (H) | Groove Angle (α) | Helix Angle (β) | Number of Grooves | Unit Weight (g/m) |
|---|---|---|---|---|---|---|
| 5.00 | 0.19-0.23 | 0.12-0.16 | 35-45 | 16-20 | 40 | 32~36 |
| 7.00 | 0.21-0.27 | 0.10~0.15 | 20~56 | 15~18 | 60~65 | 46.5~60 |
| 9.52 | 0.28-0.30 | 0.14~0.20 | 18~53 | 15~21 | 60-72 | 78.5~92 |
| 12.7 | 0.33~0.39 | 0.17~0.23 | 45~58 | 16~20 | 65 | 139~143 |

***IGT with different specification & sizes is workable in accordance with the customer's request*




**D** : Outer Diameter
**TF** : Thickness of the Bottom Wall
**H** : Groove Depth
**α** : Groove Angle
**β** : Helix Angle
**d** : Inner Diameter at Groove Tip



Ruby® COPPER

# Level Wound **Coil**

Premium Copper Tubes manufactured by high-tech production equipment and experienced engineers. The copper tubes are of high purity, used in air conditioning systems and heat exchangers with outstanding features:

- ***Material:*** Copper content (Cu):minimum of 99.95%, Phosphorus concentation (P): 0.015% - 0.04%.

## Specifications for reference

| Outer Diameter | | Wall Thickness (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | inch | 0.27 | 0.31 | 0.35 | 0.41 | 0.51 | 0.56 | 0.61 | 0.71 | 0.81 | 0.91 | 1.00 | 1.20 |
| 4.00 | | | | | ● | ● | ● | ● | ● | ● | | | |
| 4.76 | 3/16″ | | | | ● | ● | ● | ● | ● | ● | | | |
| 6.00 | | | | | ● | ● | ● | ● | ● | ● | | | |
| 6.35 | 1/4″ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 7.00 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 7.94 | 5/16″ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 9.52 | 3/8″ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 10.00 | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 12.00 | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 12.70 | 1/2″ | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 15.00 | | | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| 15.88 | 5/8″ | | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| 19.05 | 3/4″ | | | | | | | | | ● | ● | ● | ● |
| 22.22 | 7/8″ | | | | | | | | | | ● | ● | ● |

***LWC with different wall thickness is workable in accordance with the customer's request*

Ruby® COPPER

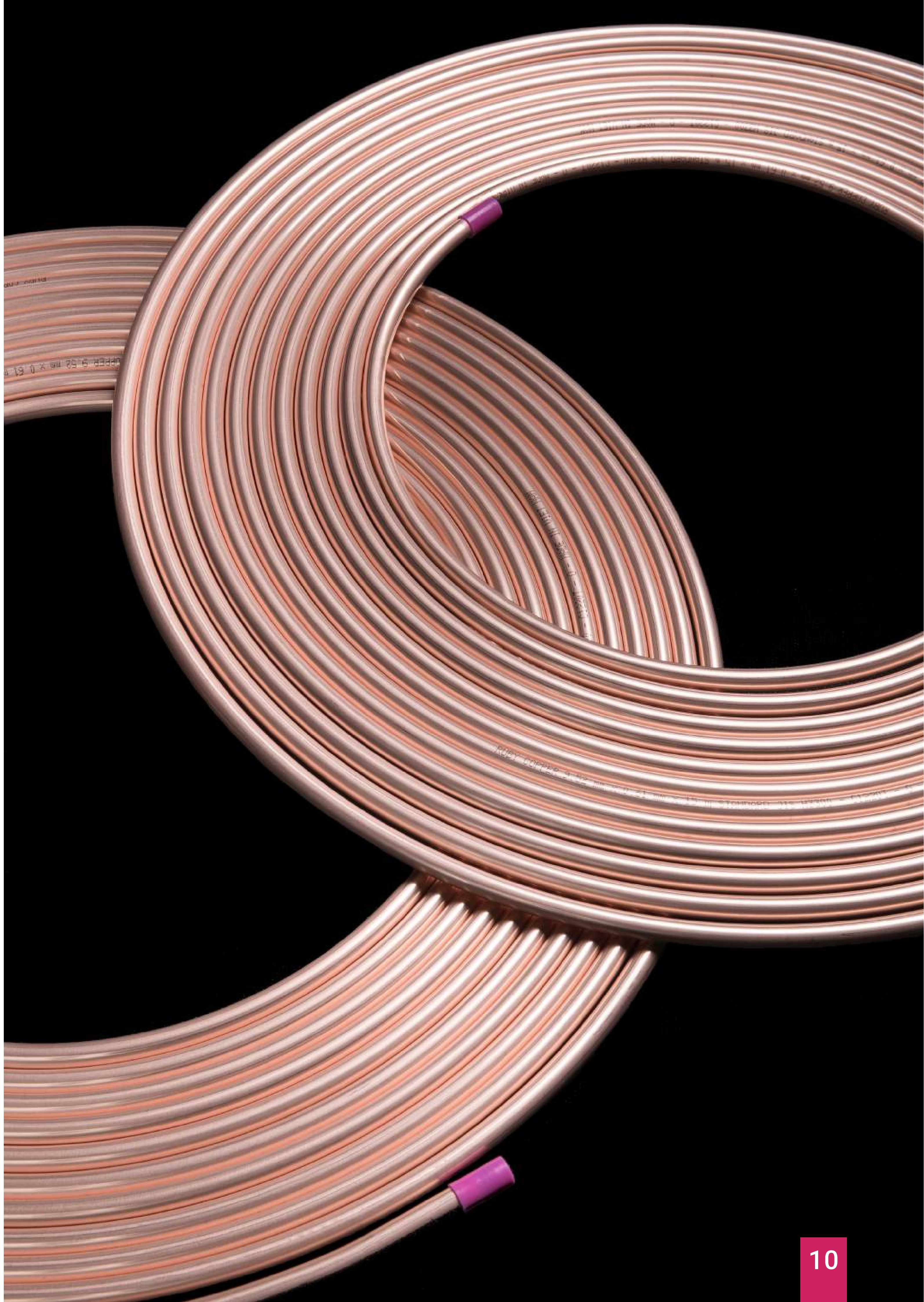
# Pancake **Coil**

- ***Technical Features:*** Bright surface, high precision dimensions. Easy to install. Suitable for use with high-pressure refrigerants R410A, R32.
- ***Common tube lengths:*** 15m, 30m, 45m, 50m.

## Specifications for reference

| Outer Diameter | | Wall Thickness (mm) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | inch | 0.41 | 0.46 | 0.51 | 0.56 | 0.61 | 0.66 | 0.71 | 0.76 | 0.81 | 0.91 | 1.00 | 1.10 | 1.20 |
| 4.76 | 3/16″ | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | |
| 6.35 | 1/4″ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 7.94 | 5/16″ | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 9.52 | 3/8″ | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 12.70 | 1/2″ | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 15.88 | 5/8″ | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 19.05 | 3/4″ | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 22.22 | 7/8″ | | | | | | | | | ● | ● | ● | ● | ● |
| 25.40 | 1″ | | | | | | | | | | ● | ● | ● | ● |
| 28.58 | 1 1/8″ | | | | | | | | | | | ● | ● | ● |

***PC with wall thickness above 1.20 mm is workable in accordance with customer's request*



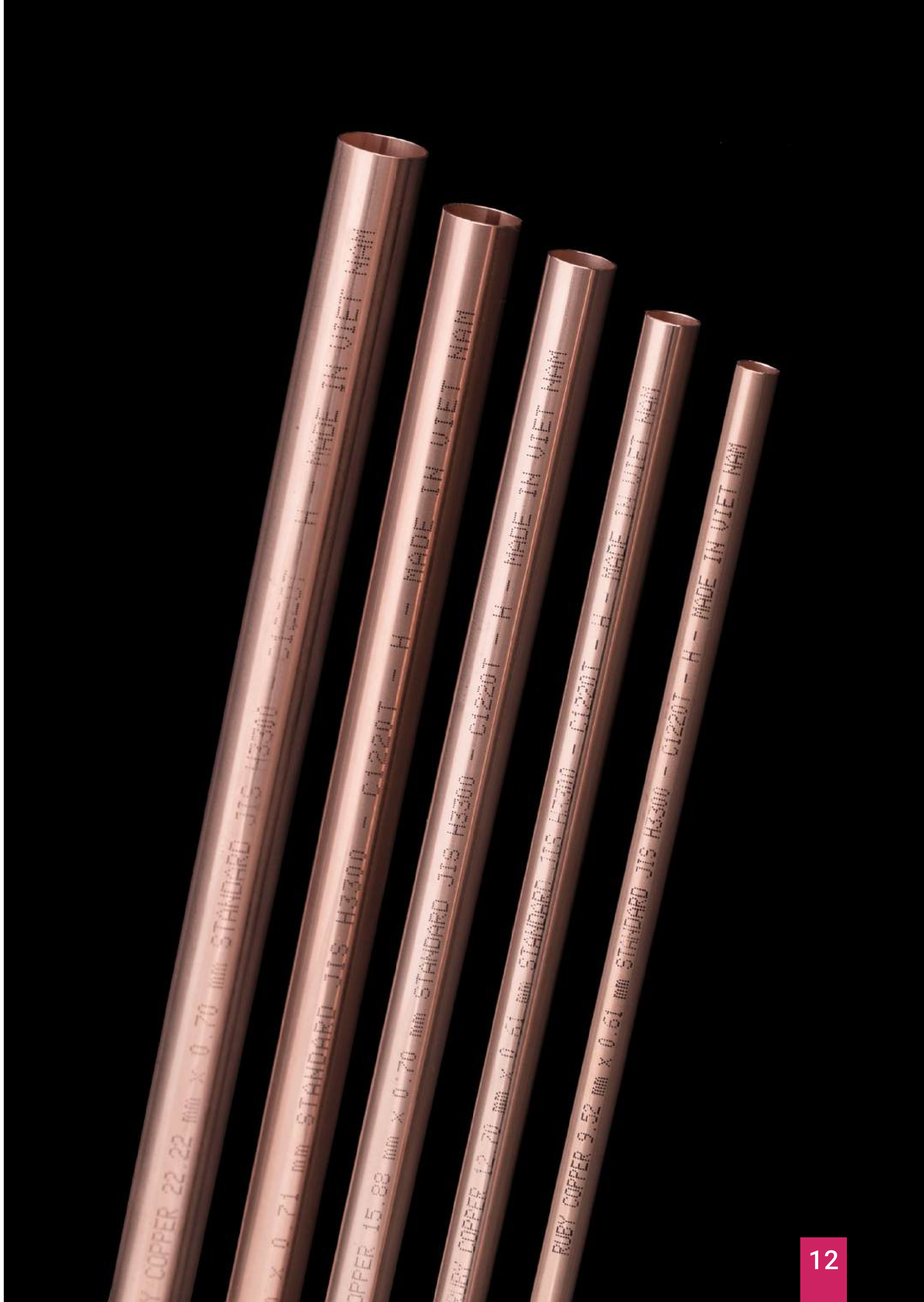
# Straight **Tube**

- ***Technical Features:*** Bright surface, high precision dimensions. Easy to weld and install.

## Specifications for reference

| Outer Diameter | | (H\|O Hard/Soft Annealed) | Wall Thickness (mm) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.41 | 0.51 | 0.56 | 0.61 | 0.71 | 0.81 | 0.91 | 1.00 | 1.10 | 1.14 | 1.2 | 1.27 | 1.4 | 1.43 | 1.5 | 1.8 | 2.0 |
| mm | inch | H \| O | | | | | | | | | | | | | | | | | |
| 4.76 | 3/16″ | H \| O | ● | ● | ● | ● | ● | ● | | | | | | | | | | | |
| 6.35 | 1/4″ | H \| O | | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | |
| 7.94 | 5/16″ | H \| O | | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | |
| 9.52 | 3/8″ | H \| O | | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | |
| 12.70 | 1/2″ | H \| O | | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | |
| 15.88 | 5/8″ | H \| O | | | | ● | ● | ● | ● | ● | ● | ● | ● | | | | | | |
| 19.05 | 3/4″ | H \| O | | | | | ● | ● | ● | ● | ● | ● | ● | | | | | | |
| 22.22 | 7/8″ | H \| O | | | | | ● | ● | ● | ● | ● | ● | ● | | | | | | |
| 25.40 | 1″ | H \| O | | | | | ● | ● | ● | ● | ● | ● | ● | | | | | | |
| 28.58 | 1 1/8″ | H \| O | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| 31.75 | 1 1/4″ | H \| O | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 34.93 | 1 3/8″ | H \| O | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| 38.10 | 1 1/2″ | H \| O | | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 41.28 | 1 5/8″ | H \| O | | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

*** ST with wall thickness from 2.00 mm to 3.50 mm is workable in accordance with customer's request*



Ruby® COPPER

# PE Insulated Copper Coil

## Energy-saving and environmentally friendly with advanced technology

The insulation material used in the production of PE insulated copper coil is high-quality cross-linked polyethylene, expanded appropriately to form a microcellular crystal network with a closed-cell structure. The thin polyethylene layer bonded on the outside helps protect and enhance the efficiency of the insulation layer. The closed-cell microcellular structure and the thin polyethylene outer layer form an essential protective layer against harsh environments, ensuring the performance of the copper tube in outdoor conditions when installed in heating, cooling, and air conditioning systems. The superior features of Ruby Copper, including durable operation, combined with high-performance insulation, significantly save energy for users. The PE insulated copper Coil product is ideal for industrial applications with high performance and competitive market prices.

**Advantages:**

- Energy saving
- Ensures good performance in corrosive and harsh environments
- High mechanical pressure resistance
- Simple and time-saving installation process
- Operating temperature range from -80°C to 110°C

**Material:** Copper content (Cu):minimum of 99.95%, Phosphorus concentation (P): 0.015% - 0.04%.

### Specifications for reference

| Specification | Unit | Inner layer | Outer layer | Standard |
|---|---|---|---|---|
| Apparent density | g/cm³ | 0.033 | 0.035 | JIS K 7222 |
| Tensile Strength | N/cm² | 18.2 | 18.3 | JIS K 6767 |
| Water Absorption | g/100cm² | 0.31 | 0.30 | JIS A 9511 |
| Thermal Conductivity | W/(m.k) | 0.035 | 0.036 | JIS A 1412 |
| Thickness shrinkage:<br>- At 120 +/- 5 ℃<br>- At 70 +/- 5 ℃ | % | 3.8<br>3.4 | 3.5<br>3.2 | JIS A 9511 |
| Moisture permeability coefficient | ng/(m².s.Pa) | 15 | 14 | JIS 7225 |
| Working temperature | ℃ | from -80 ℃ to 110 ℃ | | |

PE X Cross-linked Polyethylene

UV RESISTANCE

Ruby® COPPER

# Ruby Insulation

## The product features advanced technology with superior performance:

- Absolute energy savings
- High pressure resistance
- Safe operating system
- Reduces noise during machine operation
- Durable with good elasticity
- Environmentally friendly with low VOC (Volatile Organic Compounds) levels and high dust resistance
- Low thermal conductivity: ≤ 0.036 at 0°C, ≤ 0.040 at 40°C, demonstrating excellent insulation properties, especially at high temperatures, which is crucial for high-quality insulating foam products

| Key Properties | Value/Assessment | Test method/Standard |
|---|---|---|
| **General** | | |
| Material<br>Basic colour<br>Cell structure<br>Density (kg/m³) | Elastomeric insulation, NBR/PVC Based<br>Black<br>Completely closed cell<br>40 to 60 | ASTM D1667<br>For other color, please contract technical department<br>- |
| **Service temperature** | | |
| Min service temperature<br>Max service temperature | -50 °C<br>+105 °C | Under -50 °C, contact with technical department<br>Above +105 °C, contact with technical department |
| **Thermal conductivity** | | |
| K- value (W/m.K) | 0 °C: 0.033<br>20 °C: 0.035<br>40 °C: 0.037 | ASTM C 177<br>ASTM C 518 |
| **Water vapour behavior** | | |
| Water vapour permeability<br>Water vapour resistance facto<br>water absorption | $\leq 1.9 \times 10^{-11}$ g(m.s.Pa)<br>μ ≥ 10.000<br>≤ 2.8% (by weight)<br>≤ 0.04% (by volume) | ASTM E 96<br>DIN EN 13469<br>ASTM D 1056<br>ASTM C 209 |
| **Fire behavior** | | |
| Fire performance | Class O<br>Class V-0<br>No flamming droplet when burning | BS 476 Part 6 and 7<br>ASTM UL 94 |
| Low oxygen index (LOI) | Very Good | ISO 4589 |
| **Health** | | |
| | Fibre and formaldehyde free<br>Low VOCs | UL 2818 |
| **Enviroment** | | |
| Ozone resistance<br>UV resistance<br>Mold resistance | Very good<br>Very good<br>No growth<br>Zero ODP and GWP | ASTM D 1149<br>ASTM D 1171<br>ASTM C 1338 |
| **Other technical data** | | |
| Sound Reduction (AF)<br>Flexibility<br>Heat stability (% Shrinkage) @220°F (104°C) x 7 days | 33 dB (19 mm)<br>Excellent<br>≤ 10% | ASTM C 534 |

Ruby® COPPER

# Copper Endfeed Fittings

## $45^0$ Elbow CxC

*OD: Outer Diameter

| OD (inch) | OD (mm) | OD (inch) | OD (mm) | OD (inch) | OD (mm) |
|---|---|---|---|---|---|
| 1/4" | 6.35 | 3/4" | 19.05 | 1 1/4" | 31.75 |
| 3/8" | 9.52 | 7/8" | 22.22 | 1 3/8" | 34.93 |
| 1/2" | 12.70 | 1" | 25.40 | 1 1/2" | 38.10 |
| 5/8" | 15.88 | 1 1/8" | 28.58 | 1 5/8" | 41.28 |

## Coupling-Rolled Stop CxC

*OD: Outer Diameter

| OD (inch) | OD (mm) | OD (inch) | OD (mm) | OD (inch) | OD (mm) |
|---|---|---|---|---|---|
| 1/4" | 6.35 | 3/4" | 19.05 | 1 1/4" | 31.75 |
| 3/8" | 9.52 | 7/8" | 22.22 | 1 3/8" | 34.93 |
| 1/2" | 12.70 | 1" | 25.40 | 1 1/2" | 38.10 |
| 5/8" | 15.88 | 1 1/8" | 28.58 | 1 5/8" | 41.28 |

## $90^0$ Elbow CxC

*OD: Outer Diameter

| OD (inch) | OD (mm) | OD (inch) | OD (mm) | OD (inch) | OD (mm) |
|---|---|---|---|---|---|
| 1/4" | 6.35 | 3/4" | 19.05 | 1 1/4" | 31.75 |
| 3/8" | 9.52 | 7/8" | 22.22 | 1 3/8" | 34.93 |
| 1/2" | 12.70 | 1" | 25.40 | 1 1/2" | 38.10 |
| 5/8" | 15.88 | 1 1/8" | 28.58 | 1 5/8" | 41.28 |

## Equal Tee CxCxC

| OD (inch) | OD (mm) | OD (inch) | OD (mm) | OD (inch) | OD (mm) |
|---|---|---|---|---|---|
| 1/4" | 6.35 | 3/4" | 19.05 | 1 1/4" | 31.75 |
| 3/8" | 9.52 | 7/8" | 22.22 | 1 3/8" | 34.93 |
| 1/2" | 12.70 | 1" | 25.40 | 1 1/2" | 38.10 |
| 5/8" | 15.88 | 1 1/8" | 28.58 | 1 5/8" | 41.28 |

## Coupling Reducing CxC

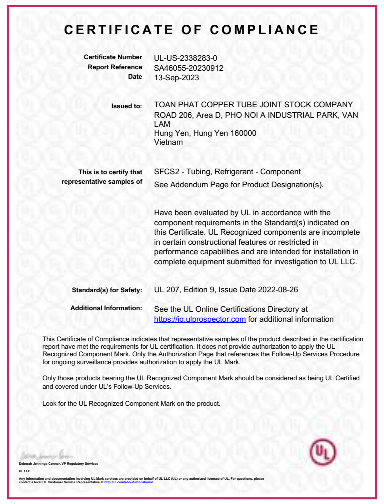
*OD: Outer Diameter

| OD1 x OD2 (inch) | OD1 x OD2 (mm) | OD1 x OD2 (inch) | OD1 x OD2 (mm) | OD1 x OD2 (inch) | OD1 x OD2 (mm) |
|---|---|---|---|---|---|
| 3/8" x 1/4" | 9.52 x 6.35 | 1" x 3/8" | 25.40 x 9.52 | 1 1/2" x 5/8" | 38.10 x 15.88 |
| 1/2" x 1/4" | 12.70 x 6.35 | 1" x 1/2" | 25.40 x 12.70 | 1 1/2" x 3/4" | 38.10 x 19.05 |
| 1/2" x 3/8" | 12.70 x 9.52 | 1" x 5/8" | 25.40 x 15.88 | 1 1/2" x 1" | 38.10 x 25.40 |
| 5/8" x 1/4" | 15.88 x 6.35 | 1" x 3/4" | 25.40 x 19.05 | 1 1/2" x 1 1/4" | 38.10 x 31.75 |
| 5/8" x 3/8" | 15.88 x 9.52 | 1 1/8" x 5/8" | 28.58 x 15.88 | 1 3/8" x 5/8" | 34.93 x 15.88 |
| 5/8" x 1/2" | 15.88 x 12.70 | 1 1/8" x 7/8" | 28.58 x 22.22 | 1 3/8" x 7/8" | 34.93 x 22.22 |
| 3/4" x 1/4" | 19.05 x 6.35 | 1 1/4" x 1/2" | 31.75 x 12.70 | 1 3/8" x 1 1/8" | 34.93 x 28.58 |
| 3/4" x 3/8" | 19.05 x 9.52 | 1 1/4" x 5/8" | 31.75 x 15.88 | 1 5/8" x 5/8" | 41.28 x 15.88 |
| 3/4" x 5/8" | 19.05 x 15.88 | 1 1/4" x 3/4" | 31.75 x 19.05 | 1 5/8" x 7/8" | 41.28 x 22.22 |
| 7/8" x 1/2" | 22.22 x 12.70 | 1 1/4" x 1" | 31.75 x 25.40 | 1 5/8" x 1 1/8" | 41.28 x 28.58 |
| 7/8" x 5/8" | 22.22 x 15.88 | 1 1/2" x 1/2" | 38.10 x 12.70 | 1 5/8" x 1 3/8" | 41.28 x 34.93 |

# Our Certificates

**Through 18 years of continuous innovation,** Ruby Copper has achieved international certificates for copper tube product quality.

UL-CA



UL-US

ISO 9001:2015

ISO 14001:2015

JIS H3300

AS 1432 - 2004

ASTM B75/B75M - 11

BS EN 12735-2:2010

BS EN 1057:2006

AS/NZS 1571:1995

ASTM B68/B68M - 11

ASTM B280-16

BS EN 12449:2016

ASTM B88 - 14

ASTM B360 - 15

ASTM B743 - 12

BS EN 12735 - 1:2016

# Quality Management

Ruby Copper's high-tech copper tube production process is closely linked to strict quality control procedures applied continuously throughout the production stages. With a top-notch quality orientation, Ruby Copper has achieved international certifications for copper tube product quality, including the Japanese Industrial Standard JIS H3300:2018, the American Industrial Standard ASTM B280/B68/B88/B743/B75, European standard EN12735/EN1057/EN12449, the Australian Industrial Standard AZ/NZS 1571, the ISO 9001:2015 quality management system, and UL certification.

| Detection Project | Testing Equipments |
|---|---|
| Copper hardness testing | Vicker hardness tester HV5 |
| Tensile strength and elongation properties testing | Pulling Vector |
| Grain size testing | Metallographic Microscope |
| Copper Tube chemical composition testing | Spectrometer SPECTROMAX |
| Inner-tube impurities testing | Inner-tube cleanlines machinery |
| Copper tube defects & oxygen content testing | Eddy current tester |
| Crack-tube testing | Bending flaring tube |
| Durability testing when the tube is put into | Pressure tester |
| Oil content analyzer | OCMA-300 HORIBA |

# Diameter / Wall thickness tolerance comply to ASTM B280

## Soft annealed copper coil

| Outer Diameter | | Diameter Tolerance | Wall thickness | Wall thickness Tolerance |
|---|---|---|---|---|
| mm | inch | +/- mm | mm | +/- mm |
| 6.35 | 1/4" | 0.051 | 0.76 | 0.08 |
| 7.94 | 5/16" | 0.051 | 0.81 | 0.08 |
| 9.52 | 3/8" | 0.051 | 0.81 | 0.08 |
| 12.70 | 1/2" | 0.051 | 0.81 | 0.08 |
| 15.88 | 5/8" | 0.051 | 0.89 | 0.11 |
| 19.05 | 3/4" | 0.064 | 0.89 | 0.11 |

## Straight tube

| Outer Diameter | | Diameter Tolerance | Wall thickness | Wall thickness Tolerance |
|---|---|---|---|---|
| mm | inch | +/- mm | mm | +/- mm |
| 9.52 | 3/8" | 0.025 | 0.76 | 0.08 |
| 12.70 | 1/2" | 0.025 | 0.89 | 0.09 |
| 15.88 | 5/8" | 0.025 | 1.02 | 0.10 |
| 19.05 | 3/4" | 0.025 | 1.07 | 0.11 |
| 22.22 | 7/8" | 0.025 | 1.14 | 0.11 |
| 28.58 | 1 1/8" | 0 038 | 1.27 | 0.13 |
| 34.93 | 1 3/8" | 0.038 | 1.40 | 0.14 |
| 41.28 | 1 5/8" | 0.051 | 1.52 | 0.15 |

# Diameter / Wall thickness tolerance comply to JIS H3300

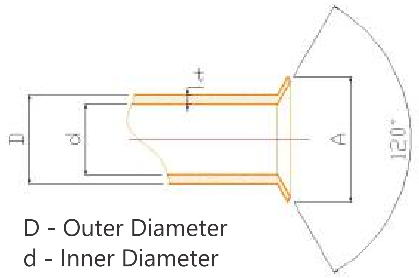
unit: mm

| Diameter | Diameter Tolerance | Wall thickness | | | | |
|---|---|---|---|---|---|---|
| | | From 0.25 to 0.4 | Over 0.4 to 0.6 | Over 0.6 to 0.8 | Over 0.8 to 1.4 | Over 1.4 to 2 |
| From 4 to 15 | 0.08 | 0.06 | 0.07 | 0.10 | 0.13 | 0.15 |
| Over 15 to 25 | 0.09 | 0.07 | 0.08 | 0.10 | 0.13 | 0.18 |
| Over 25 to 50 | 0.12 | | 0.09 | 0.11 | 0.15 | 0.18 |

### Hardness

unit: mm

| Type | Hardness |
|---|---|
| O/OL | 40 - 70 |
| 1/2H | 70 - 100 |
| H | >100 |




D - Outer Diameter
d - Inner Diameter
t = (D-d)/2 - Wall thickness
A = 1.3*D or A = 1.4*D

### Flaring ratio

unit: mm

| Alloy | Outer diameter & wall thickness | |
|---|---|---|
| | Diameter below 20mm with wall thickness over 0.5mm | Diameter from 20mm to 100mm OR thickness below 0.5mm |
| C1220 | 1.4 | 1.3 |

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# Working pressure

unit: bar*

| Outer Diameter x Wall Thickness (mm) | | Soft Annealed / Temperature 40°C | 70°C | 100°C | 120°C | Hard / Temperature From 40°C ~ 120°C |
|---|---|---|---|---|---|---|
| 6.35 | 0.51 | 71 | 60 | 58 | 57 | 122 |
| 6.35 | 0.56 | 79 | 67 | 64 | 63 | 135 |
| 6.35 | 0.61 | 86 | 73 | 70 | 69 | 148 |
| 6.35 | 0.71 | 102 | 86 | 83 | 81 | 174 |
| 6.35 | 0.76 | 110 | 93 | 89 | 88 | 188 |
| 6.35 | 0.81 | 118 | 100 | 96 | 94 | 202 |
| 9.52 | 0.51 | 46 | 39 | 38 | 37 | 79 |
| 9.52 | 0.56 | 51 | 43 | 42 | 41 | 88 |
| 9.52 | 0.61 | 56 | 47 | 46 | 45 | 96 |
| 9.52 | 0.66 | 61 | 52 | 50 | 49 | 104 |
| 9.52 | 0.71 | 66 | 56 | 54 | 52 | 113 |
| 9.52 | 0.76 | 71 | 60 | 58 | 56 | 121 |
| 9.52 | 0.81 | 76 | 64 | 62 | 60 | 130 |
| 9.52 | 1.00 | 95 | 85 | 77 | 76 | 163 |
| 12.7 | 0.51 | 34 | 29 | 28 | 27 | 59 |
| 12.7 | 0.56 | 38 | 32 | 31 | 30 | 65 |
| 12.7 | 0.61 | 41 | 35 | 34 | 33 | 71 |
| 12.7 | 0.66 | 45 | 38 | 37 | 36 | 77 |
| 12.7 | 0.71 | 48 | 41 | 40 | 39 | 83 |
| 12.7 | 0.76 | 52 | 44 | 42 | 42 | 89 |
| 12.7 | 0.81 | 56 | 47 | 45 | 44 | 95 |
| 12.7 | 1.00 | 70 | 59 | 57 | 56 | 119 |
| 15.88 | 0.51 | 27 | 23 | 22 | 22 | 47 |
| 15.88 | 0.56 | 30 | 26 | 25 | 24 | 52 |
| 15.88 | 0.61 | 33 | 28 | 27 | 26 | 56 |
| 15.88 | 0.66 | 36 | 30 | 29 | 28 | 61 |
| 15.88 | 0.71 | 38 | 33 | 31 | 31 | 66 |
| 15.88 | 0.76 | 41 | 35 | 34 | 33 | 71 |
| 15.88 | 0.81 | 44 | 37 | 36 | 35 | 76 |
| 15.88 | 0.91 | 50 | 42 | 41 | 40 | 85 |
| 15.88 | 1.00 | 55 | 47 | 45 | 44 | 94 |
| 19.05 | 0.61 | 27 | 23 | 22 | 22 | 47 |
| 19.05 | 0.66 | 29 | 25 | 24 | 24 | 51 |
| 19.05 | 0.71 | 32 | 27 | 26 | 25 | 55 |
| 19.05 | 0.76 | 34 | 29 | 28 | 27 | 59 |
| 19.05 | 0.81 | 36 | 31 | 30 | 29 | 63 |
| 19.05 | 0.91 | 41 | 35 | 34 | 33 | 71 |
| 19.05 | 1.00 | 45 | 39 | 37 | 36 | 78 |
| 19.05 | 1.10 | 50 | 43 | 41 | 40 | 86 |
| 19.05 | 1.20 | 55 | 47 | 45 | 44 | 94 |
| 19.05 | 1.50 | 70 | 59 | 57 | 56 | 119 |
| 22.22 | 0.71 | 27 | 23 | 22 | 22 | 47 |
| 22.22 | 0.81 | 31 | 26 | 25 | 25 | 53 |
| 22.22 | 0.91 | 35 | 30 | 29 | 28 | 60 |
| 22.22 | 1.00 | 39 | 33 | 32 | 31 | 66 |
| 22.22 | 1.10 | 43 | 36 | 35 | 34 | 73 |
| 22.22 | 1.20 | 47 | 40 | 38 | 37 | 80 |
| 22.22 | 1.50 | 59 | 50 | 48 | 47 | 101 |
| 25.4 | 0.71 | 24 | 20 | 19 | 19 | 41 |
| 25.4 | 0.81 | 27 | 23 | 22 | 22 | 46 |
| 25.4 | 0.91 | 31 | 26 | 25 | 24 | 52 |
| 25.4 | 1.00 | 34 | 29 | 27 | 27 | 58 |
| 25.4 | 1.10 | 37 | 32 | 30 | 30 | 64 |
| 25.4 | 1.20 | 41 | 35 | 33 | 32 | 70 |
| 25.4 | 1.50 | 51 | 44 | 42 | 41 | 88 |
| 28.58 | 0.71 | 21 | 18 | 17 | 17 | 36 |
| 28.58 | 0.81 | 24 | 20 | 20 | 19 | 41 |

* Pressure Unit:
1 bar ~ 14.5 Psi    1 bar = 0.1 Mpa
* Pressure basis: based on the physical properties of copper material according to the standards of copper tubes such as JIS H3300 (Japan), ASTM (USA), AS (Australia) and EN (Europe).

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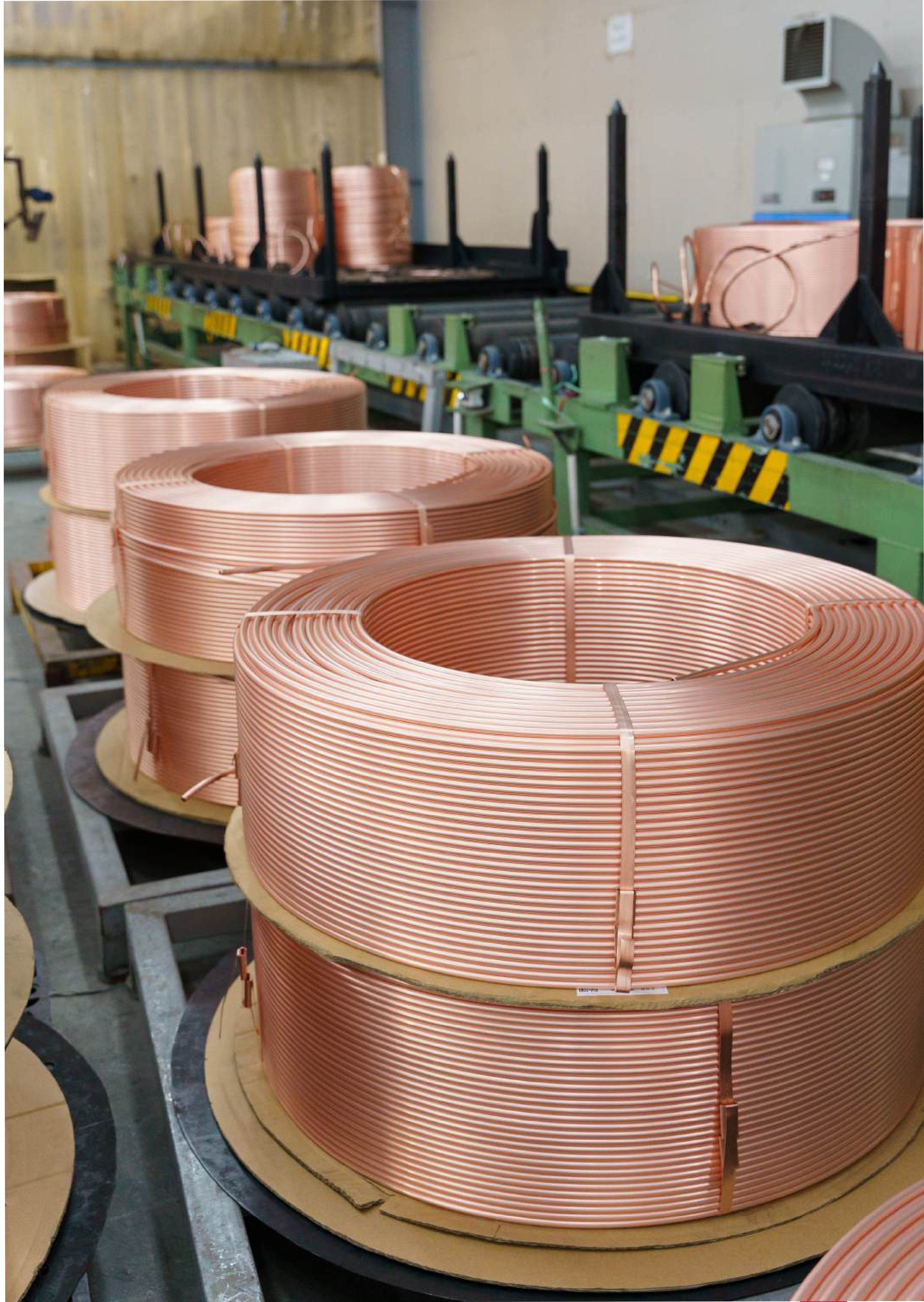
| Outer Diameter x Wall Thickness (mm) | | Soft Annealed / Temperature 40°C | 70°C | 100°C | 120°C | Hard / Temperature From 40°C ~ 120°C |
|---|---|---|---|---|---|---|
| 28.58 | 0.91 | 27 | 23 | 22 | 21 | 46 |
| 28.58 | 1.00 | 30 | 25 | 24 | 23 | 51 |
| 28.58 | 1.10 | 33 | 28 | 27 | 26 | 56 |
| 28.58 | 1.20 | 36 | 31 | 29 | 29 | 62 |
| 28.58 | 1.27 | 38 | 32 | 31 | 30 | 65 |
| 28.58 | 1.50 | 45 | 39 | 37 | 36 | 78 |
| 31.75 | 0.81 | 22 | 18 | 18 | 17 | 37 |
| 31.75 | 0.91 | 24 | 21 | 20 | 19 | 42 |
| 31.75 | 1.00 | 27 | 23 | 22 | 21 | 46 |
| 31.75 | 1.10 | 29 | 25 | 24 | 24 | 51 |
| 31.75 | 1.20 | 32 | 27 | 26 | 26 | 55 |
| 31.75 | 1.50 | 41 | 35 | 33 | 32 | 70 |
| 34.90 | 0.91 | 22 | 19 | 18 | 18 | 38 |
| 34.90 | 1.00 | 24 | 21 | 20 | 19 | 42 |
| 34.90 | 1.10 | 27 | 23 | 22 | 21 | 46 |
| 34.90 | 1.20 | 29 | 25 | 24 | 23 | 50 |
| 34.90 | 1.40 | 34 | 29 | 28 | 27 | 59 |
| 34.90 | 1.50 | 37 | 31 | 30 | 29 | 63 |
| 34.90 | 2.00 | 50 | 42 | 41 | 40 | 85 |
| 41.28 | 0.91 | 19 | 16 | 15 | 15 | 32 |
| 41.28 | 1.00 | 20 | 17 | 17 | 16 | 35 |
| 41.28 | 1.10 | 23 | 19 | 18 | 18 | 39 |
| 41.28 | 1.20 | 25 | 21 | 20 | 20 | 42 |
| 41.28 | 1.43 | 29 | 25 | 24 | 24 | 51 |
| 41.28 | 1.50 | 31 | 26 | 25 | 25 | 53 |
| 41.28 | 2.00 | 42 | 35 | 34 | 33 | 72 |
| 44.50 | 1.20 | 23 | 19 | 19 | 18 | 39 |
| 44.50 | 1.40 | 27 | 23 | 21 | 21 | 46 |
| 44.50 | 1.50 | 29 | 24 | 23 | 23 | 49 |



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# Mechanical Properties

| Standard | Alloy No | % (Cu+Ag) | Chemical Composition P% | Temper | Tensile Strength | Mechanical Properties Elongation (%) | Hardness | Average Grain size |
|---|---|---|---|---|---|---|---|---|
| ASTM B280 | C12200 | 99.9 | 0.015 - 0.04 | H58 | min 250 | / | / | / |
| | | | | O60 | min 205 | min 40 | / | min 0.04 |
| ASTM B68 | C12200 | 99.9 | 0.015 - 0.04 | O50 | min 210 | min 40 | / | 0.015 - 0.04 |
| | | | | O60 | min210 | min 40 | / | min 0.04 |
| ASTM B88 | C12200 | 99.9 | 0.015 - 0.04 | O60 | min 205 | / | max 50 HRF | min 0.04 |
| | | | | O50 | min 205 | / | max 55 HRF | min 0.025 |
| | | | | H58 | min 250 | / | min 30 HR30T | / |
| ASTM B75 | C12200 | 99.9 | 0.015 - 0.04 | H55 | 250-325 | / | 30-60 HRF | / |
| | | | | H58 | min 250 | / | min 30 HRF | / |
| | | | | H80 | min 310 | / | min 55 HRF | / |
| | | | | O60 | min 205 | / | max 60 HRF | min 0.04 |
| | | | | O50 | min 205 | / | max 65 HRF | max 0.04 |
| ASTM B360 | C12200 | 99.9 | 0.015 - 0.04 | H80 | min 310 | / | / | / |
| JIS H3300 | C1220 | 99.9 | 0.015 - 0.04 | H | min 315 | / | min 55HR30T | / |
| | | | | 1/2H | 245 - 325 | / | 30 - 60 HR30T | max 0.04 |
| | | | | OL | min 205 | min 40 | max 55 HRF | max 0.04 |
| | | | | O | min 205 | min 40 | max 50 HRF | 0.025 - 0.06 |
| EN 1057 | Cu-DHP/ CW024A | 99.9 | 0.015 - 0.04 | R220 (O) | min 220 | min 40 | 40 - 70 HV5 | / |
| | | | | R250 (1/2H) | min 250 | min 30 | 70 - 100 HV5 | / |
| | | | | R290 (H) | min 290 | min 3 | min 100 HV5 | / |
| AS 1432 | | 99.9 | 0.015 - 0.04 | Hard drawn | / | / | min 100 HV | / |
| | | | | Bendable | / | / | 80 - 100 HV | / |
| | | | | Annealed | / | / | max 70 HV | / |
| AS NZS 1571 | | 99.9 | 0.015 - 0.04 | H | / | / | min 100 HV | / |
| | | | | 1/2 H | / | / | 75 - 100 HV | / |
| | | | | O | / | / | max 75 HV | max 0.065 |

| Standard | Alloy No | % (Cu+Ag) | Chemical Composition P% | Temper | Tensile Strength | Mechanical Properties Elongation (%) | Hardness | Average Grain size |
|---|---|---|---|---|---|---|---|---|
| EN 12449 | Cu-DHP/ CW024A | 99.9 | 0.015 - 0.04 | R200(O) | Min 200 | Min 40 | / | / |
| | | | | H040(OL) | / | / | 40~65 HV1 | / |
| | | | | R250(1/2H) | Min 250 | 15 ~ 30 | / | / |
| | | | | R290(H) | Min 290 | Min 3 | / | / |
| | | | | H095(H) | / | / | 95~120 HV1 | / |
| EN 12735-1 | Cu-DHP/ CW024A | 99.9 | 0.015 - 0.04 | R220(O) | Min 220 | Min 40 | 40 - 70 HV1 | / |
| | | | | R250(1/2H) | Min 250 | 20 - 30 | 70 - 100 HV1 | / |
| | | | | R290(H) | Min 290 | Min 3 | Min 100 HV1 | / |
| EN 12735-2 | Cu-DHP/ CW024A | 99.9 | 0.015 - 0.04 | R250(1/2H) | Min 250 | Min 30 | 75 - 100 HV1 | / |
| | | | | R290(H) | Min 290 | Min 3 | Min 100 HV1 | / |
| | | | | Y080 | Min 220 | Min 40 | / | 0.015 - 0.04 |
| | | | | Y040(OL) | Min 220 | Min 40 | / | 0.015 - 0.04 |
| | | | | Y035(O) | Min 210 | Min 40 | / | 0.015 - 0.04 |
| ASTM B743 | C12200 | 99.9 | 0.015 - 0.04 | H58 | Min 220 | / | Min 72 HV1 | / |
| | | | | O50 | Min 205 | Min 40 | Max 69 HV1 | Max 0.040 |
| | | | | O60 | Min 205 | Min 40 | Max 60 HV1 | Min 0.040 |

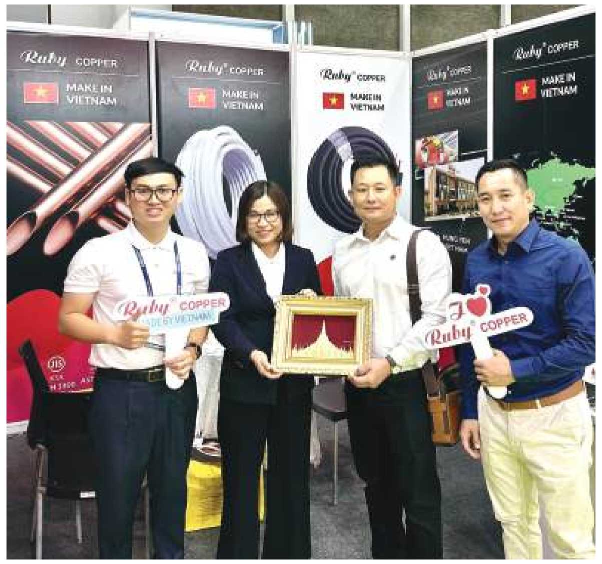
# International exhibitions

## Acrex India


## Chillventa Germany




## RHVAC Indonesia



## Big 5 Dubai

# International exhibitions


## Mostra Convegno Expocomfort Italy


## HVAC-R Egypt