

TUBES FOR

AIR CONDITIONING REFRIGERATION HEATING



HALCOR

Evolving Beyond Copper

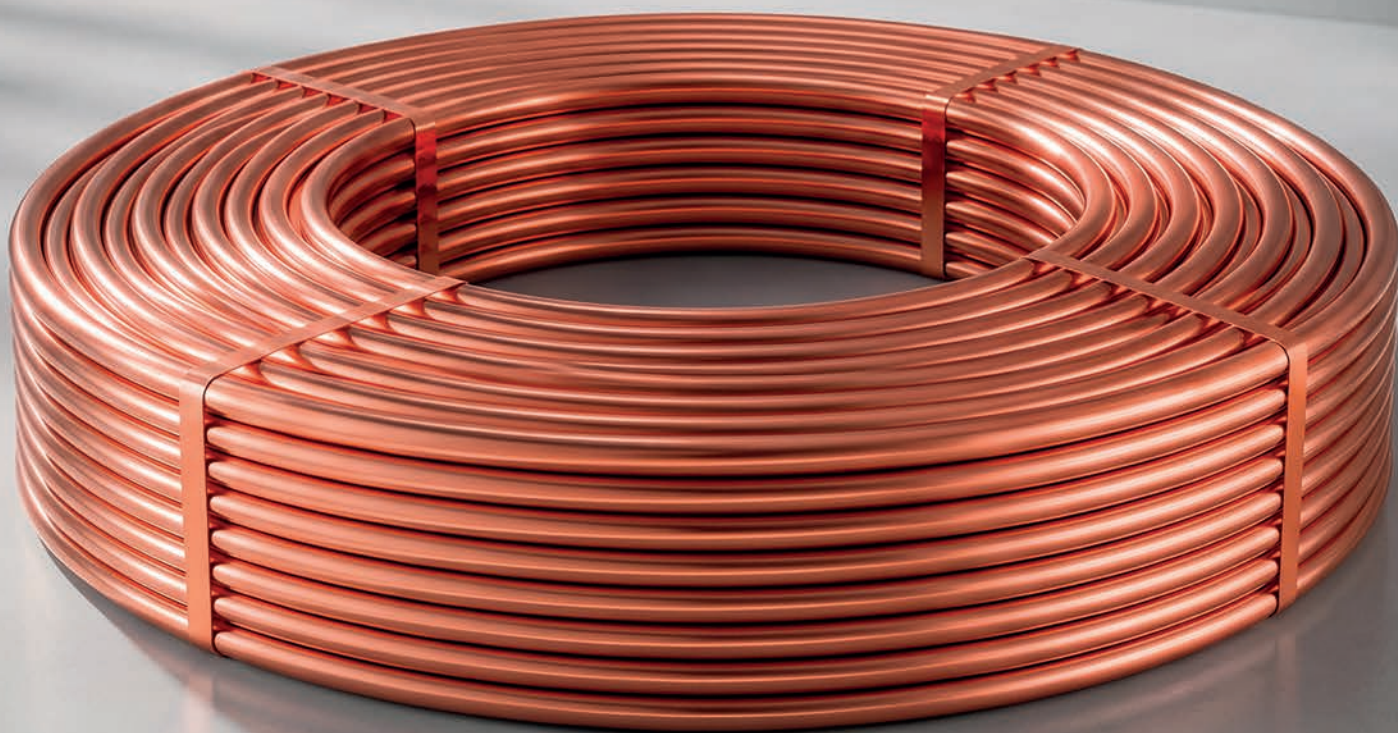
HALCOR

Evolving Beyond Copper

COPPER & ALLOYS
EXTRUSION DIVISION:



ELVALHALCOR



Halcor is the Copper & Alloys Extrusion Division of ElvalHalcor S.A. and the largest* producer of copper tubes in Europe, the Middle East and Africa (EMEA).

By implementing long-term investments, it supplies dynamically developing countries with a broad range of sustainable products and cutting-edge solutions.

With more than 85 years of experience in the metal processing industry, Halcor is a reliable partner for industries that manufacture equipment and fittings, as well as commercial companies that market products to meet the customers' needs all over the world.

A strong network of privately owned commercial subsidiaries across Europe, combined with technical support services, allows Halcor to deliver customised solutions to the industry with flexibility and reliability.

Halcor specialises in developing solutions for a broad spectrum of applications, primarily for HVAC&R, industrial, electrical and construction applications, the automotive industry and for renewable energy sources.

Its commitment to being a leader in innovation is reflected both in its investment in Research & Development and in its advanced production processes.

Halcor has highly automated production lines for manufacturing and packaging products that incorporate state-of-the-art technology for top performance and sustainability.

Halcor's principal message is "Evolving Beyond Copper", which reflects its constant focus on growing all its activity sectors.

*Based on Cu2 Consulting data.

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TALOS FORM

Air Conditioning

Refrigeration

The unique properties of high purity copper, make TALOS ACR copper tubes indispensable for air conditioning and refrigeration applications.

Advantages of TALOS ACR Copper Tubes

- High thermal conductivity.
- Stable mechanical properties covering an extensive temperature range.
- Chemically "inert" against HFCs, HFOs and natural refrigerants (e.g. R-410A, R-32, R-134A, R-407C, R-1234yf, R-1234ze, R-600, R-744, etc.).
- High cleanliness of internal surface.
- Smooth internal surface enhancing flow rate.
- Excellent weldability.
- Excellent "cold formability".

Material

Copper phosphorus deoxidised (minimum copper content 99.90%, phosphorus concentration $P=0.015\% - 0.04\%$, classified as CW024A, or Cu-DHP, according to the European alloy coding system).

Specifications

EN 12735 parts 1 & 2, ASTM B280/B68/B743, JIS H3300. All TALOS ACR copper tubes produced according to EN 12735 parts 1 & 2, are certified according to the requirements of the Pressure Equipment Directive (PED) 2014/68/EU, as well as, the German regulation TN/AD2000-WO/20890/25, for pressure vessels and UL recognised.

Quality Marks

AENOR, TÜV, UL, NSF.



MECHANICAL PROPERTIES EN 12735-1

Material Condition Designation (Temper)	Min. Tensile Strength, R_m (MPa)	Min. Elongation, A (%)
Annealed (R220)	220	40
Half-Hard (R250)*	250	30
Hard (R290)*	290	3

* Straight lengths.

MECHANICAL PROPERTIES EN 12735-2

Material Condition Designation (Temper)	Min. Tensile Strength, R_m (MPa)	Yield Strength, $R_{p0.2}$ (MPa)	Min. Elongation, A (%)
Soft Annealed (Y035)	210	35-80	40
Light Annealed (Y040)	220	40-90	40
Skin Hard* (Y080)	220	80-140	40
Half-Hard* (R250)	250	-	30
Hard* (R290)	290	-	3

*Straight lengths.

Air Conditioning

Refrigeration

Standard Dimensions according to European Standards (EN 12735-1)

PANCAKES (SOFT TEMPER)									
Copper tube outer diameter	mm	4.76	6.35	7.94	9.52	12.70	15.87	19.05	22.22
Copper tube wall thickness	mm	0.80	0.80	0.80	0.80	0.80	1.00	1.00	1.00
Weight	kg/m	0.089	0.124	0.160	0.195	0.266	0.416	0.505	0.594
Maximum Allowable Pressure	bar	238	171	133	109	80	77	62	53

STRAIGHT LENGTHS (5 METERS)														
Copper tube outer diameter	mm	9.52	12.70	15.87	19.05	22.22	28.57	34.92	41.27	53.97	66.67	79.37	92.08	104.77
Copper tube wall thickness	mm	0.75	0.80	0.80	0.80	1.00	1.00	1.25	1.25	1.65	2.00	2.30	2.50	2.85
Weight	kg/m	0.184	0.266	0.337	0.408	0.594	0.771	1.177	1.399	2.414	3.617	4.957	6.262	8.122
Maximum Allowable Pressure	bar	102	80	63	52	53	41	42	35	36	35	34	31	32

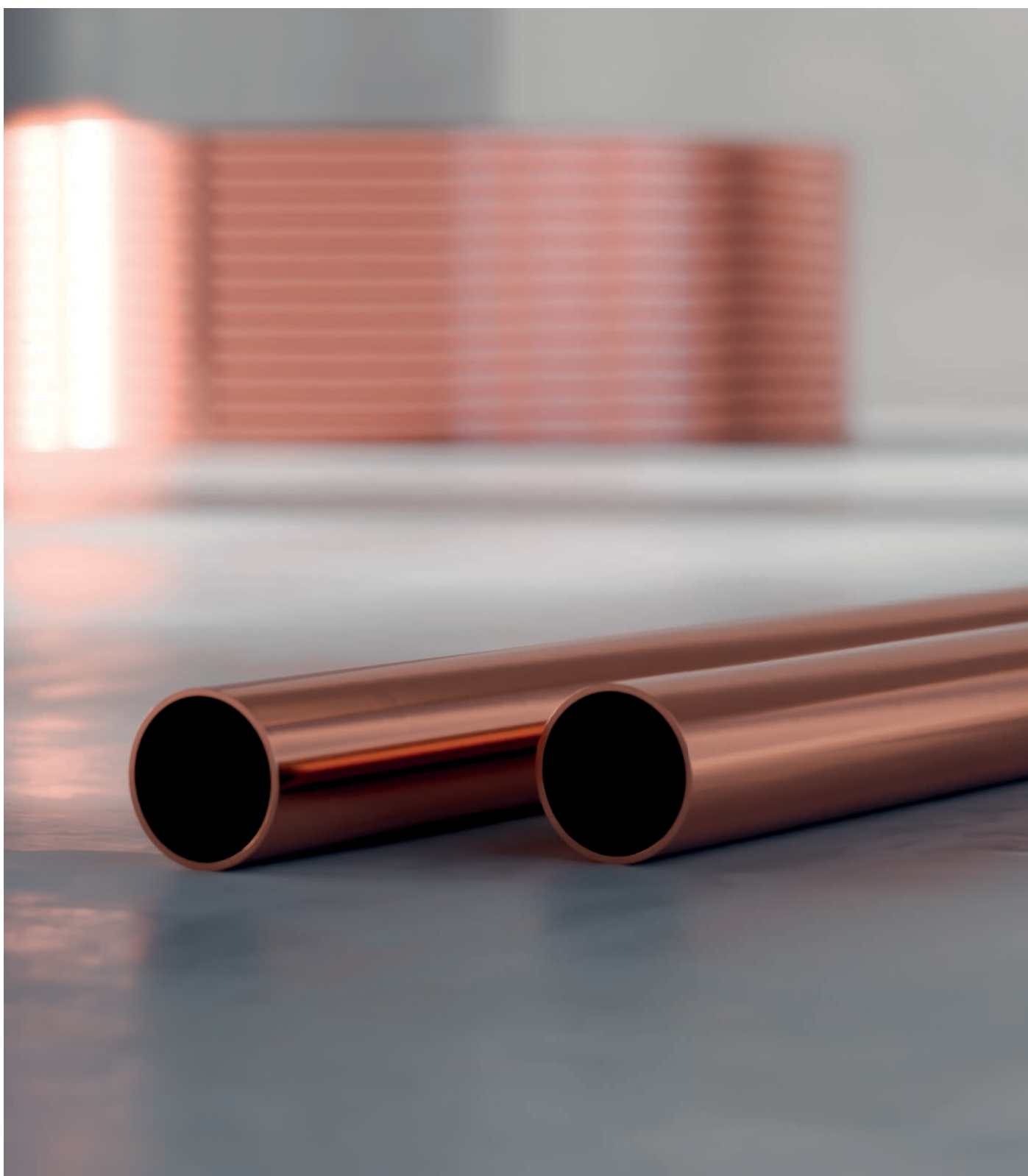
Standard Dimensions according to US Standards (ASTM B-280)

PANCAKES (SOFT TEMPER)									
Copper tube outer diameter	inch	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8
	mm	4.76	6.35	7.94	9.52	12.70	15.87	19.05	22.22
Copper tube wall thickness	inch	0.030	0.030	0.032	0.032	0.032	0.035	0.035	0.045
	mm	0.76	0.76	0.81	0.81	0.81	0.89	0.89	1.14
Weight	kg/m	0.085	0.119	0.162	0.198	0.270	0.372	0.451	0.672
Maximum Allowable Pressure	bar	255	161	137	112	82	70	57	66

STRAIGHT LENGTHS (HARD TEMPER, 4 OR 5 METERS)														
Copper tube outer diameter	inch	3/8	1/2	5/8	3/4	7/8	1 1/8	1 3/8	1 5/8	2 1/8	2 5/8	3 1/8	3 5/8	4 1/8
	mm	9.52	12.70	15.87	19.05	22.22	28.57	34.92	41.27	53.97	66.67	79.37	92.07	104.77
Copper tube wall thickness	inch	0.030	0.035	0.040	0.042	0.045	0.050	0.055	0.060	0.070	0.080	0.090	0.100	0.110
	mm	0.76	0.89	1.02	1.07	1.14	1.27	1.40	1.52	1.78	2.03	2.29	2.54	2.79
Weight	kg/m	0.187	0.294	0.424	0.538	0.672	0.970	1.312	1.690	2.598	3.669	4.936	6.359	7.956
Maximum Allowable Pressure	bar	105	87	81	70	65	56	49	45	40	37	35	33	32

⇒ Customised dimensions are manufactured upon request.

⇒ Maximum Allowable Pressure is calculated according to EN 14276:2020 Standard which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive). The values of the Maximum Allowable Pressure refer to the material condition R200. A safety factor of 3.0 is used. The minus tolerance of the wall thickness is considered. No further processing is taken into account. For temperature up to 100°C.



Air Conditioning

Refrigeration

Form of Supply

Straight lengths, in bundles and in wooden boxes.

Pancakes-PNC in shrink-wrapped individual plastic bags. Depending on market requirements, products can be placed in cardboard boxes and pallets.

TALOS ACR copper tubes for heat exchanger units are available in the following forms:

Spools (LWC)

TALOS ACR copper tubes are available in spools (LWC) with or without central support (hard carton). Spool sides may be delivered, protected by "flanges" of reinforced cardboard.

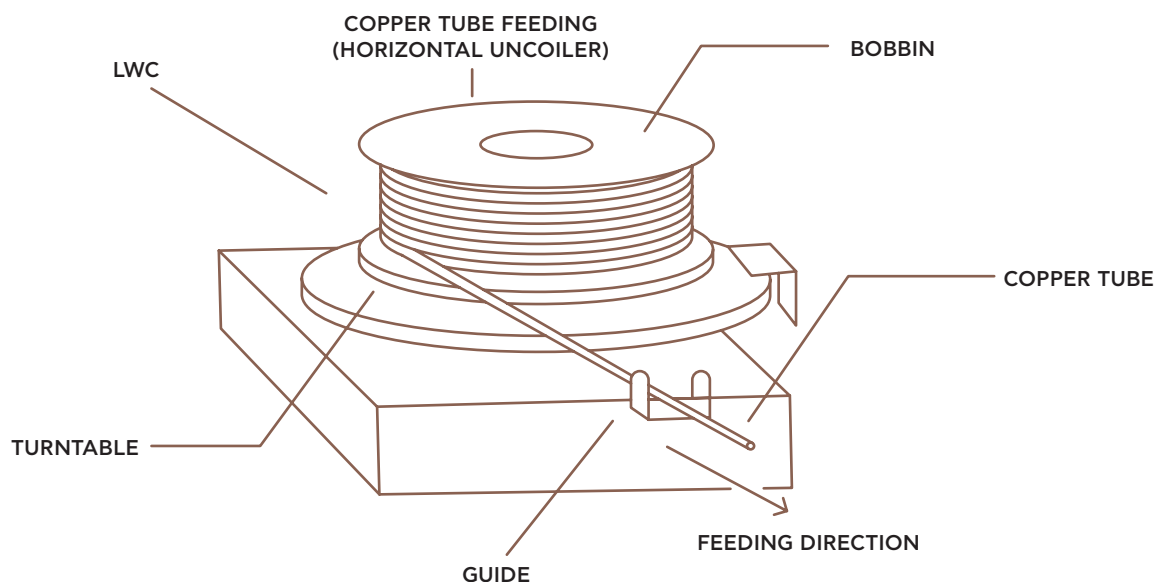
"CD" coils: Spools with a "central" decoiling

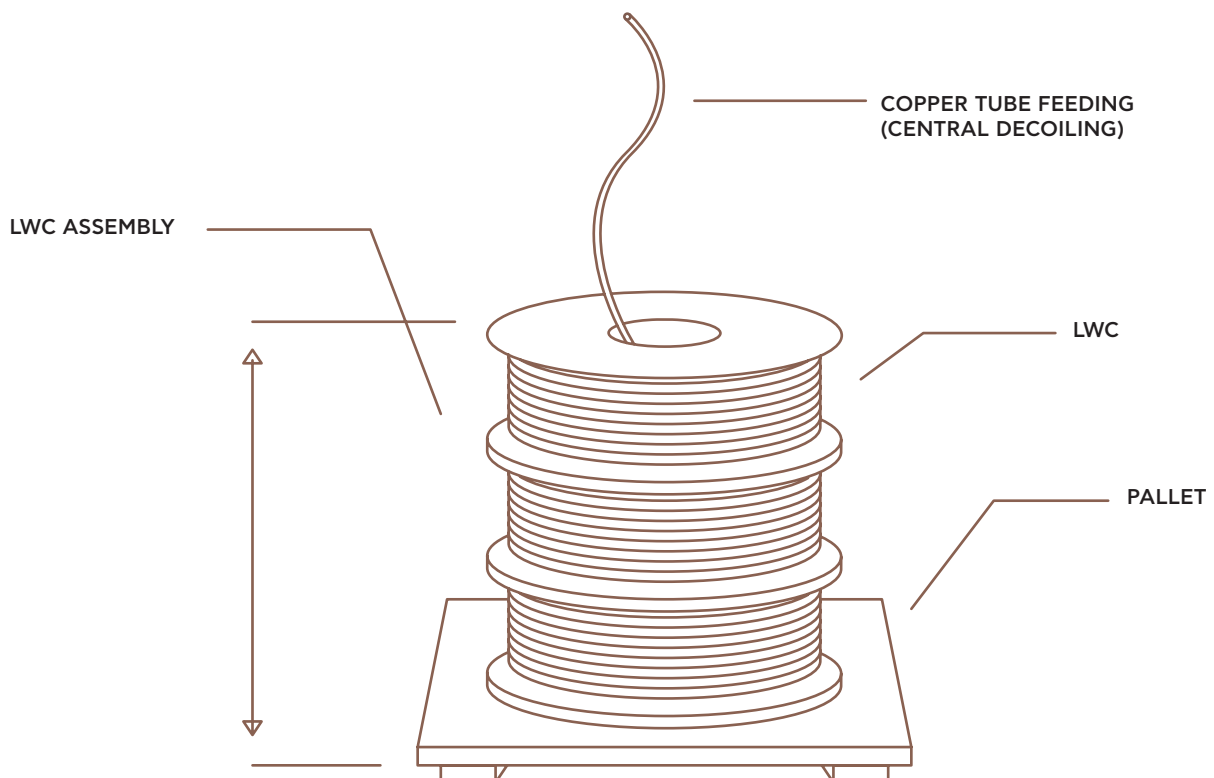
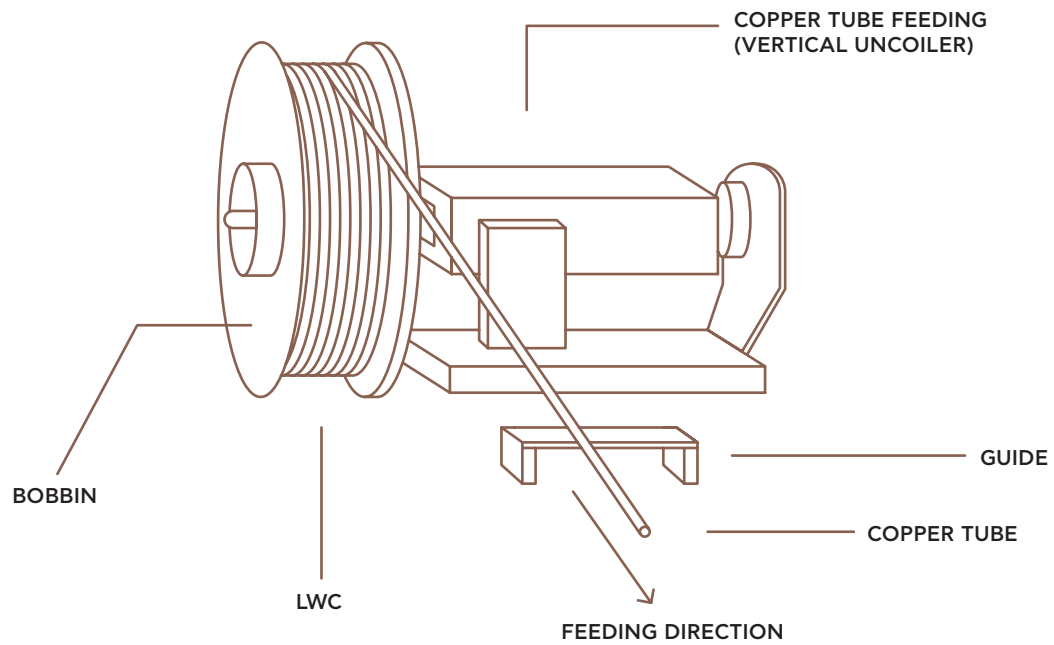
Spools with a "central" decoiling are especially prepared so that unwinding from the centre of the coil is possible. They provide significant advantages to the user, such as reduction in packaging materials, unwinding directly from the pallet and greater weights per spool. "CD" coils of TALOS ACR copper tubes do not require special unwinding equipment; they have lower handling costs, reducing machine down-time and increasing production efficiency.

Available Dimensions

OUTER DIAMETER		THICKNESS (inch) (mm)							
inch	mm	0.011 0.28	0.012 0.30	0.014 0.35	0.016 0.41	0.018 0.45	0.020 0.51	0.025 0.635	0.028 0.71
5/16	7.94								
3/8	9.52								
1/2	12.70								
5/8	15.87								

■ Recommended dimensions for LWC spools.



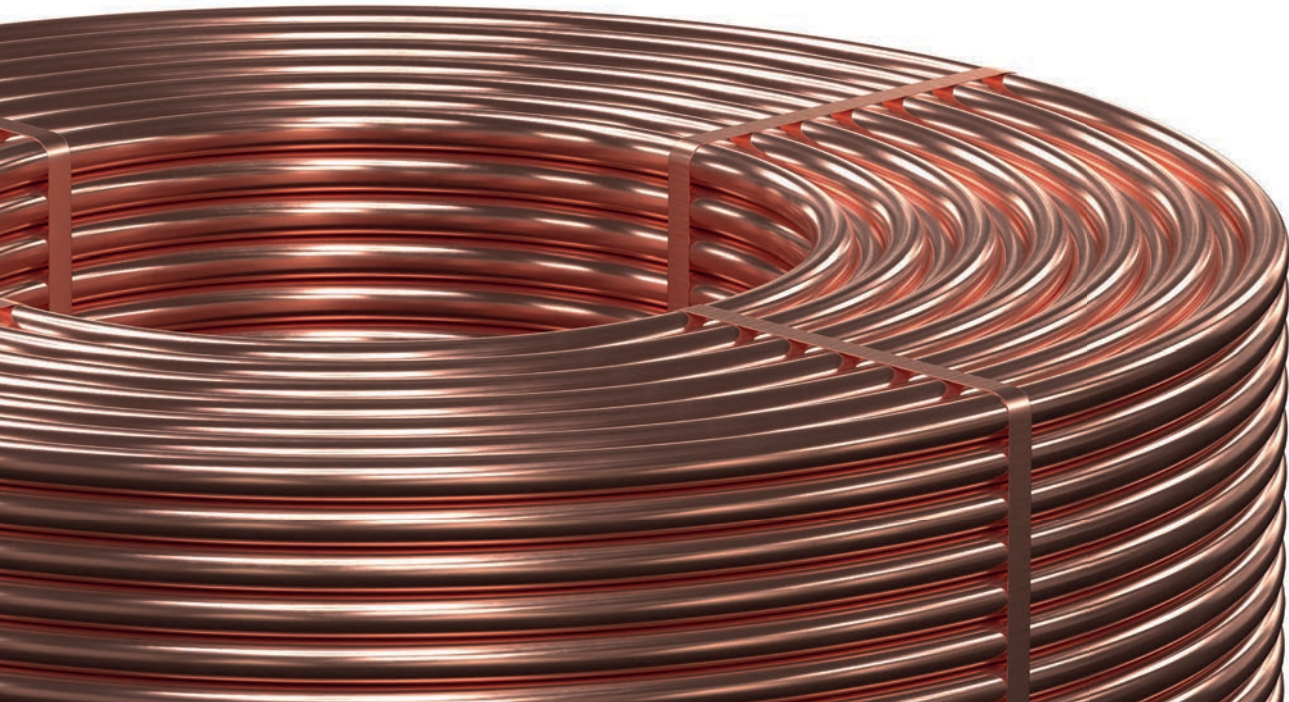


Air Conditioning

Refrigeration

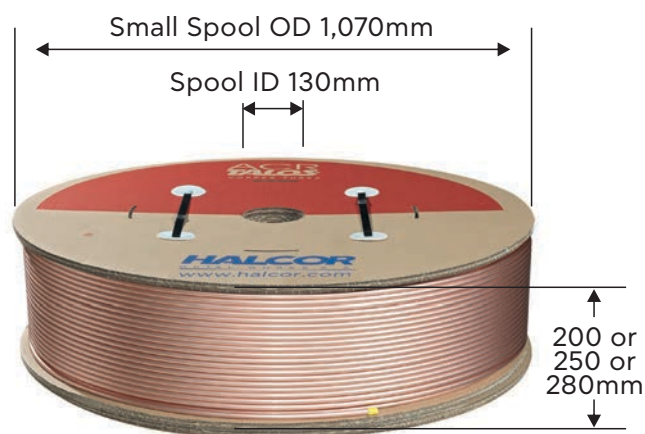
Spool (LWC) Dimensions

SPOOL NOMINAL WEIGHT (kg)	FORM OF SUPPLY
75	With or without carton spool
85	
115	
150	
200	
290	Without carton spool
460	
580	





Without carton spool
Maximum coil weight: 580kg



With carton spool
Spool weight: 75 to 200kg
(Spools of greater weight are available upon request)

Heat Exchangers

Inner Grooved Tubes

TALOS IGT copper tubes feature inner grooves that enhance the heat transferred by the refrigerant and, as a result, increase the energy efficiency of the HVAC&R units. Applications of TALOS IGT include heat exchangers for condensation and/or evaporation in A/C and refrigeration systems, as well as, heat pumps.

Halcor's production technology for TALOS IGT copper tubes enables the manufacture of advanced inner groove designs for a complete range of sizes, starting from 16mm outer diameter down to the new generation microgroove tubes with an outer diameter of 4mm, being one of the few manufacturers worldwide to have this capability.

The ability of Halcor to provide complete solutions to its clients was reinforced by the establishment of a Tube Heat Transfer Laboratory. The equipment of the Tube Heat Transfer Laboratory was specially designed to enable measurements of the heat transfer performance of IGT tubes under fully controlled test conditions. Critical features, such as the heat transfer coefficient and the pressure drop, are measured using a sophisticated system for condensation and evaporation of HFC and

HFO refrigerants. The flow and thermal parameters are programmed to simulate specific operating conditions, such as refrigerant flow rate, saturation temperature, vapor quality, thermal capacity, etc., and thus allow Halcor's engineers to study the influence of the inner-groove design.

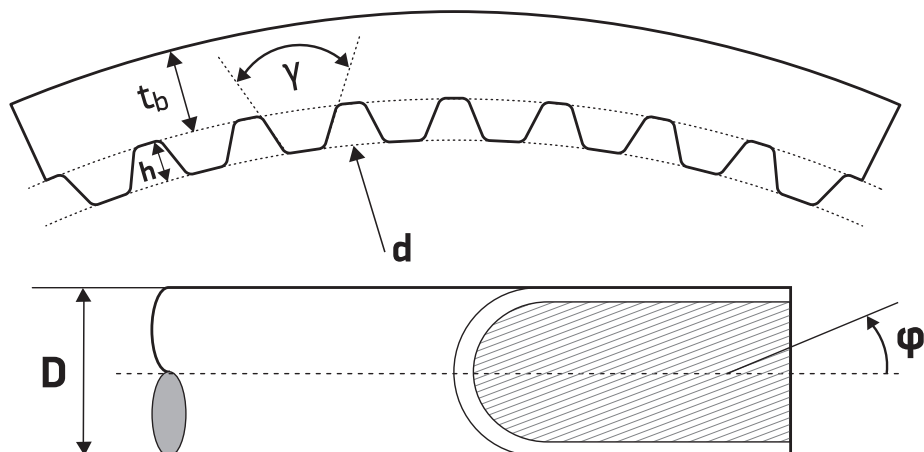
The Tube Heat Transfer Laboratory gives Halcor the capability to incorporate the test results in a complete framework of technical support to manufacturers of heat exchangers, with the purpose of optimising their heat-exchanger design for any of the following:

- ➞ Improved efficiency.
- ➞ Higher capacity.
- ➞ Reduction of raw material.
- ➞ Compact heat-exchanger size.
- ➞ Reduction of refrigerant charge.

The Tube Heat Transfer Laboratory offers a superior advantage to Halcor's clients by giving them the opportunity to establish a mutually beneficial cooperation within an integrated support and product development framework.

IGT Profiles

OUTER DIAMETER (mm)	BOTTOM WALL THICKNESS t_b (mm)	GROOVE DEPTH h (mm)	TOP ANGLE γ (deg)	LEAD ANGLE ϕ (deg)	GROOVE No	TOLERANCE $\pm$ (kg/m)
4,000	0.220	0.12	40.0	12.0	40	0.002
5,000	0.200	0.15	40.0	18.0	40	0.002
7,000	0.250	0.18	40.0	18.0	50	0.002
7,000	0.250	0.12	12.0	27.0	55	0.002
7,000	0.230	0.12	12.0	27.0	55	0.002
7,200	0.250	0.20	23.0	18.0	65	0.002
7,940	0.300	0.20	40.0	18.0	50	0.002
7,940	0.280	0.18	40.0	18.0	50	0.002
7,940	0.280	0.15	40.0	18.0	50	0.002
7,940	0.320	0.20	30.0	18.0	65	0.002
7,940	0.280	0.20	30.0	18.0	65	0.002
9,520	0.300	0.20	53.0	18.0	60	0.002
9,520	0.280	0.15	20.0	18.0	60	0.002
9,520	0.280	0.20	20.0	30.0	85	0.002
9,520	0.280	0.20	25.0	18.0	60	0.002
9,520	0.380	0.20	30.0	18.0	60	0.003
9,520	0.280	0.20	25.0	25.0	65	0.002
12,000	0.320	0.25	15.0	30.0	70	0.003
12,700	0.320	0.25	58.0	18.0	70	0.003
12,700	0.410	0.25	55.0	18.0	75	0.003
12,700	0.330	0.22	15.0	30.0	70	0.003
15,000	0.400	0.23	35.0	16.0	100	0.004
15,870	0.380	0.32	30.0	15.0	75	0.004



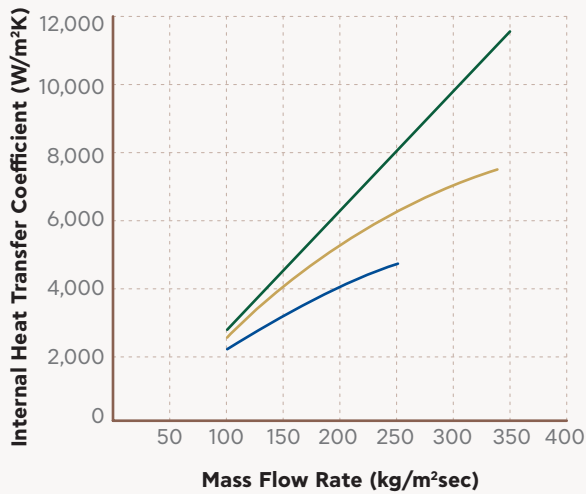
D: Outer Diameter **d:** Inner Diameter **t_b :** Bottom Wall Thickness **h:** Groove Depth **ϕ :** Lead Angle **γ :** Top Angle

Tube Heat Transfer Laboratory



Halcor has gained worldwide distinction as one of the few manufacturers of copper products that operate such specialised laboratories within their operations.

TUBE HEAT TRANSFER PERFORMANCE: EVAPORATION

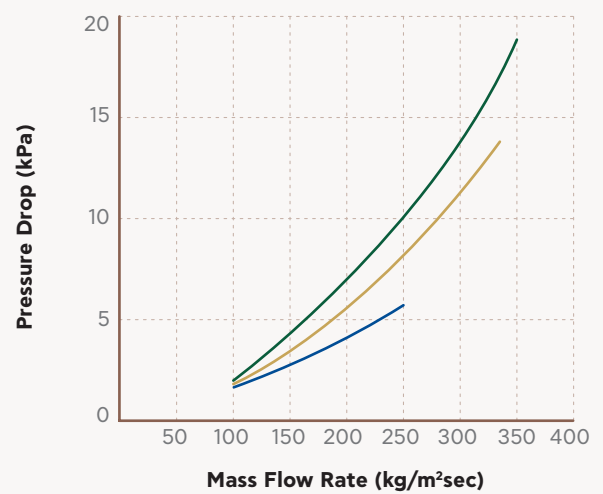


Performance mode: Evaporation
Refrigerant: R40A - no oil

Test conditions:
Dew point: 0°C
Inlet vapor quality: x=20%
Outlet superheat: 5K
Tube length: 2m

PLAIN TUBE
HALCOR IGT ENHANCED TYPE
HALCOR IGT STANDARD TYPE

TUBE HEAT TRANSFER PERFORMANCE: EVAPORATION

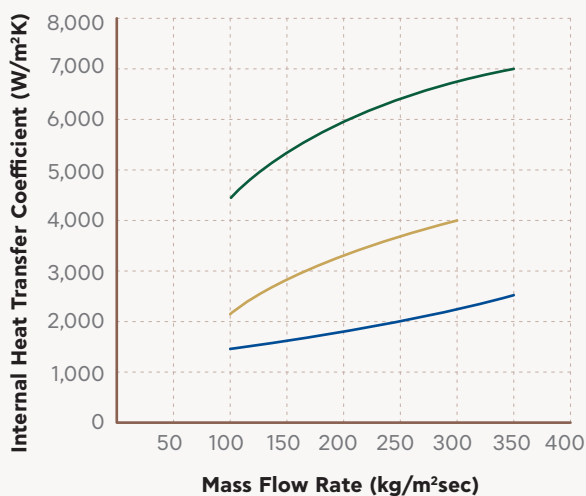


Performance mode: Evaporation
Refrigerant: R40A - no oil

Test conditions:
Dew point: 0°C
Inlet vapor quality: x=20%
Outlet superheat: 5K
Tube length: 2m

PLAIN TUBE
HALCOR IGT ENHANCED TYPE
HALCOR IGT STANDARD TYPE

TUBE HEAT TRANSFER PERFORMANCE: CONDENSATION

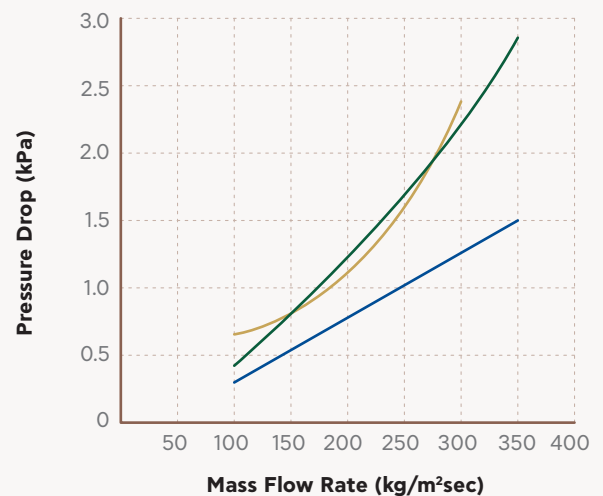


Performance mode: Condensation
Refrigerant: R40A - no oil

Test conditions:
Dew point: 35°C
Inlet superheat: 5K
Outlet subcooling: 2K
Tube length: 2m

PLAIN TUBE
HALCOR IGT ENHANCED TYPE
HALCOR IGT STANDARD TYPE

TUBE HEAT TRANSFER PERFORMANCE: CONDENSATION



Performance mode: Condensation
Refrigerant: R40A - no oil

Test conditions:
Dew point: 35°C
Inlet superheat: 5K
Outlet subcooling: 2K
Tube length: 2m

PLAIN TUBE
HALCOR IGT ENHANCED TYPE
HALCOR IGT STANDARD TYPE

Air Conditioning

Refrigeration

Advanced Technology that saves Energy and protects the Environment.

TALOS ACR ECUTHERM pre-insulated copper tubes are advanced technological products of high added value and significantly superior in effectiveness compared to conventional insulation methods.

- ➞ Significant and continuous energy savings.
- ➞ Safe network operation.
- ➞ Reduction of installation time.
- ➞ High resistance to mechanical stress.
- ➞ Ease of forming.
- ➞ Outer or embedded installations.
- ➞ Resistance to extreme atmospheric conditions.

The unique advantages offered by the TALOS ACR ECUTHERM copper tubes, such as copper resistance and durability, coupled with high performance pre-insulation (Engineering Foams), result in significant energy savings. With a competitive market price and installation cost, TALOS ACR ECUTHERM copper tubes are a reliable choice for every modern application.

High Performance Technological Product

The insulating material used in the manufacturing of TALOS ACR ECUTHERM copper tubes is an extruded high quality cross-linked polyethylene (PE-X), suitably expanded to form a foam with closed microcells, free of CFCs and fibrous substances. A layer of thin polyethylene coating is adhered to the foamy crosslinked substrate, providing a skin of improved operational features and aesthetic appearance.

The closed microcells of the insulating material, combined with the protective outer polyethylene skin, form an integral barrier to aggressive environments, rendering the tube suitable for a variety of applications, such as heating, cooling, and air-conditioning installations.

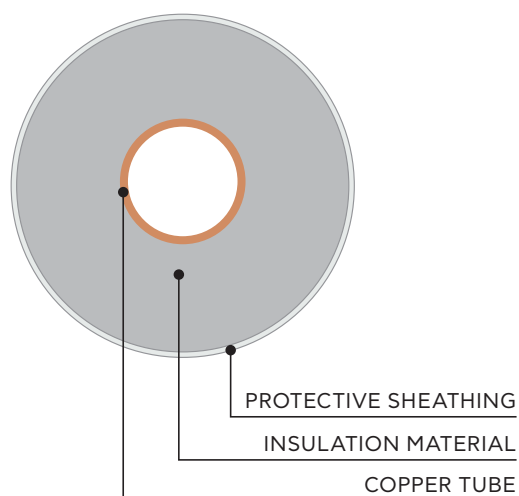
The TALOS ACR ECUTHERM (PE-X) copper tubes are produced in compliance to the requirements of standards that apply, as regards insulation properties, chemical characteristics and reaction to fire. They exhibit low λ coefficient, determining its heat conductivity properties and very good μ coefficient which determines its resistance to penetration of moisture.

The TALOS ACR ECUTHERM (PE-X) copper tubes are available in coils of 25 & 50 meter lengths and insulation thickness of 6, 9, 10, 13 and 19mm, suiting a variety of insulation needs.

Reliability that only TALOS Copper Tubes can provide

TALOS copper tubes are manufactured according to the European Standard EN 12735-1 for use in air conditioning and refrigeration installations, and have been awarded most major international quality marks. TALOS ACR ECUTHERM copper tubes meet the requirements imposed by new generations of refrigerants (HFCs, HFOs and natural refrigerants), which are adopted by major refrigeration and air conditioning unit manufacturers. TALOS copper tubes, with their high quality of manufacture, provide:

- Long lifetime.
- Resistance to pressure, temperature variations and fire.
- Complete network impermeability.
- Quality and reliability of installation.
- Versatile applications.
- Comprehensive range of sizes.



Copper Tube Material

Copper phosphorus deoxidised (minimum copper content 99.90%, phosphorus concentration $P=0.015\% - 0.04\%$, classified as CW024A, or Cu-DHP, according to the European alloy coding system.

Specifications

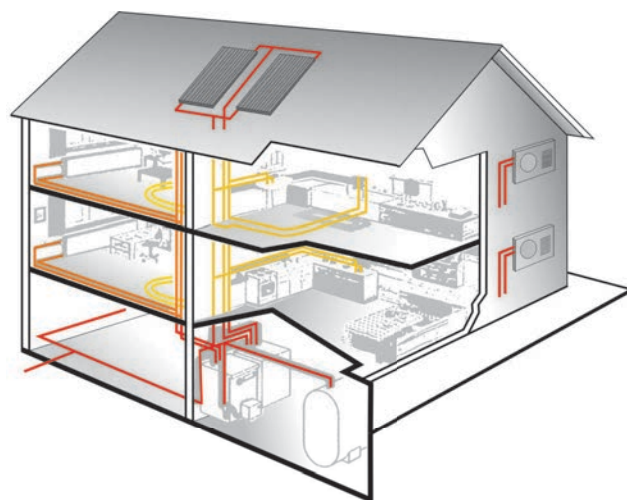
EN 12735-1

Quality Marks

AENOR, TÜV, UL, NSF.

Mechanical Properties

TEMPER	EN 12735 DESIGNATION	MIN. TENSILE STRENGTH, R_m (MPa)	MIN. ELONGATION, A (%)
Soft	R-220	220	40



Air Conditioning

Refrigeration

Insulation Technical Properties



Cross-linked
Polyethylene



RESISTANCE

Material	PE-X or PE foam
Density according to DIN 53420 ASTM D 1667	30-33kg/m ³
Thermal conductivity coefficient (λ) according to EN ISO 8497	0.0357W/mK (0°C) 0.0389W/mK (40°C)
Vapour-water diffusion resistance coefficient (μ) according to EN 13469	12,500
Working temperature	-80°C to +110°C (+90°C for PE foam)
Fire resistance	EN 13501-1 Class B or Class E, DIN 4102, B2, BS 476, NF P 92 501-M1
Resistance to chemical agents according to ASTM 543-56 T	Very good
Dimensional stability according to ISO 2796 for temperatures up to 100°C	<5%

⇒ Values are listed as obtained under standard laboratory conditions and may be amended, without prior notice.

Standard Dimensions according to EN 12735-1

	inch	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8
Copper tube outer diameter	mm	4.76	6.35	7.94	9.52	12.70	15.87	19.05	22.22
Copper tube wall thickness	mm	0.80	0.80	0.80	0.80	0.80	1.00	1.00	1.00
Overall outer diameter with 9mm thick insulation	mm	22.76	24.35	25.94	27.52	30.70	33.87	37.05	40.23
Maximum Allowable Pressure	bar	238	171	146	109	80	77	62	53

⇒ Maximum Working Pressure is calculated according to EN 14276:2020 which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive).

Marking

48m	HALCOR	Talos Ecutherm	1/2"x0.80	EN 13501-1	Class B	9	08 26	PE X	UV RESISTANCE
Length Indication	Producer	Brand name	Copper tube dimensions	European Standard	Reaction to fire classification	Insulation Thickness	Month & Year of production	Insulation material	

TALOS ECUTHERM 1/2" & 5/8"

Indicative Calculation of Insulation Thickness

Air conditioning and refrigeration units operate in temperatures lower than ambient temperature. This temperature difference may lead to unwanted vapour condensation on the insulation outer surface; therefore it must be compensated by the insulation thickness.

The thickness of the insulation (with reference to Mollier's diagram), is calculated taking into consideration the temperature of the fluid (or gas) inside the tubes, ambient temperature and the relative humidity of the air.

TEMPERATURE INSIDE THE TUBE (°C)	INSULATION THICKNESS (mm)											
	AMBIENT TEMPERATURE (°C) AND RELATIVE HUMIDITY (%)											
	25°C			30°C			35°C			40°C		
	50%	60%	70%	50%	60%	70%	50%	60%	70%	50%	60%	70%
+15		6	6	6	6	6	6	6	9	6	6	9
		6	6	6	6	9	6	6	9	6	6	9
+10	6	6	6	6	6	9	6	6	9	6	6	9
	6	6	9	6	6	9	6	6	9	6	9	9
+5	6	6	9	6	6	9	6	6	9	6	9	9
	6	6	9	6	6	9	6	9	9	6	9	13
0	6	6	9	6	6	9	6	9	9	6	9	13
	6	6	9	6	9	13	6	9	13	6	9	13
-5	6	9	9	6	9	13	6	9	13	9	9	13
	6	9	13	6	9	13	6	9	13	9	9	13
-10	6	9	13	9	9	13	9	9	13	9	13	13
	6	9	13	9	9	13	9	13	13	9	13	13
-20	6	9	13	9	9	13	9	13	13	9	13	13



1/2 inch - 12.7mm



5/8 inch - 15.88mm

Air Conditioning

Refrigeration

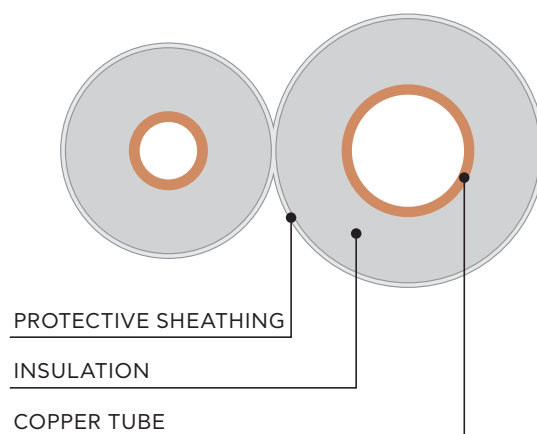
Clear Advantage in Refrigeration and Air Conditioning

TALOS ACR ECUTHERM 2 pre-insulated copper tubes offer significant advantages to refrigeration and air conditioning installers:

- ➞ Simplified installation process and reduction of installation time.
- ➞ Reduction of overall network installation cost.
- ➞ Reliable operation of installations and significant energy savings.
- ➞ Aesthetic result and space saving.

Pair Combinations for any Application

TALOS ACR ECUTHERM 2 copper tubes are manufactured in pairs, firmly connected along their entire length, and in eight standard size combinations which cover sufficiently the usual connectivity requirements of any refrigeration or air conditioning unit. TALOS ACR ECUTHERM 2 copper tube pairs, form a single unit which is installed easily and fast, ensuring professional results.



Certified Quality

TALOS ACR ECUTHERM 2 pre-insulated copper tubes, have been certified by the German quality assurance organisation RWTUV, with regard to trials and manufacturing tests. The quality and reliability of such products is ensured through the implementation of a Quality Assurance System, according to standard ISO 9001:2015, certified by TÜV Hellas.

According to the European Standard EN 12735-1:2020, as well as current market requirements, laid down by the use of new generation of refrigerants adopted by major manufacturers of refrigeration and air conditioning units the following standardisation is applied to TALOS ACR ECUTHERM 2 copper tubes:

- ➞ For an outer diameter of 1/4" to 1/2", the wall thickness is standardised at 0.80mm.
- ➞ For an outer diameter of 5/8" to 3/4", the wall thickness is standardised at 1.00mm.

PAIR DIAMETERS
1/4" + 3/8"
1/4" + 1/2"
1/4" + 5/8"
1/4" + 3/4"
3/8" + 1/2"
3/8" + 5/8"
3/8" + 3/4"
1/2" + 3/4"

Copper Tube Material

Copper phosphorus deoxidised (minimum copper content 99.90%, phosphorus concentration P=0.015% - 0.04%, classified as CW024A, or Cu-DHP, according to the European alloy coding system).

Quality Marks

AENOR, TÜV, UL, NSF.

Mechanical Properties

TEMPER	EN 12735 DESIGNATION	MIN. TENSILE STRENGTH, R (MPa)	MIN. ELONGATION, A (%)
Soft	R-220	220	40

Insulation Technical Properties



Material	PE-X or PE foam
Density according to DIN 53420 ASTM D 1667	30-33kg/m ³
Thermal conductivity coefficient (λ) according to EN ISO 8497	0.0357W/mK (0°C) 0.0389W/mK (40°C)
Vapour-water diffusion resistance coefficient (μ) according to EN 13469	12,500
Working temperature	-80°C to +110°C (+90°C for PE foam)
Fire resistance	EN 13501-1 Class B or Class E, DIN 4102, B2, BS 476, NF P 92 501-M1
Resistance to chemical agents according to ASTM 543-56 T	Very good
Dimensional stability according to ISO 2796 for temperatures up to 100°C	<5%

⇒ Values are listed as obtained under standard laboratory conditions and may be amended, without prior notice.

Standard Pair Dimensions (Coils 15m, 25m, 30m long)

Copper tube outer diameter	inch	1/4-3/8	1/4-1/2	1/4-5/8	1/4-3/4	3/8-1/2	3/8-5/8	3/8-3/4	1/2-3/4
	mm	6.35-9.52	6.35-12.7	6.35-15.87	6.35-19.05	9.52-12.7	9.52-15.87	9.52-19.05	12.7-19.05
Copper tube wall thickness	mm	0.80-0.80	0.80-0.80	0.80-1.00	0.80-1.00	0.80-0.80	0.80-1.00	0.80-1.00	0.80-1.00
Overall outer diameter with 9mm thick insulation	mm	24.4-27.5	24.4-30.7	24.4-33.9	24.4-37.1	27.5-30.7	27.5-33.9	27.5-37.1	30.7-37.1
Maximum Allowable Pressure	bar	171-109	171-80	171-77	171-62	109-80	109-77	109-62	80-62

⇒ Other sizes and special packaging in pallets or cardboard boxes are available upon request.

⇒ Maximum Allowable Pressure is calculated according to EN 14276:2020, which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive).

Air Conditioning

Heat Pump Systems

TALOS ACR LINESETS are designed especially for split air-conditioning units and heat pumps systems requiring installation with flared connections. The unique advantages offered by TALOS ACR LINESETS, including copper resistance and durability, high performance foam insulation and pre-flared ends with mounted flare nuts, result in significant energy savings and in quick, cost effective field installations.

Advantages of TALOS ACR LINESETS:

- ➞ Significant and continuous energy savings.
- ➞ Quick, safe and cost effective installations.
- ➞ Comprehensive range of sizes.

TALOS ACR LINESETS comprise pre-insulated TALOS copper tubes manufactured according to the European Standard EN 12735-1 for use in air conditioning and refrigeration installations. TALOS ACR LINESETS meet the current requirements imposed by the new refrigerants, adopted by major refrigeration and air conditioning unit manufacturers.

The insulating material used in the manufacturing of TALOS ACR LINESETS is an extruded high quality crosslinked polyethylene (PE-X) foam with closed microcells. The closed microcells of the insulating material, combined with an outer protective skin layer of thin polyethylene

coating, form an integral barrier to aggressive environments. The continuous factory-applied insulation avoids seams or openings that can cause dripping and decrease efficiency.

The ends of TALOS ACR LINESETS are conveniently pre-flared and mounted with forged brass flare nuts manufactured according to the SAE J513 international standard for use with standardised 45° flare joints. The flare nuts are capped with protective plastic plugs for shipment.

TALOS ACR LINESETS are supplied either in single or "twin tube" configurations with a variety of foam thicknesses to meet every insulation requirement. The comprehensive range of sizes reduces waste and time.

Copper Tube Material

Copper phosphorus deoxidised (minimum copper content 99.90%, phosphorus concentration P=0.015% - 0.04%, classified as CW024A, or Cu-DHP, according to the European alloy coding system).

Specifications

Copper tubes: EN 12735-1.
Foam insulation: EN 13501-1.
Flare fittings: SAE J513.

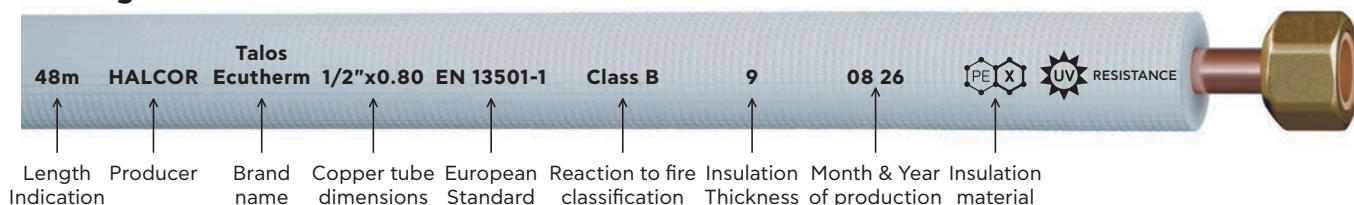
Quality Marks

Copper tubes: AENOR, TÜV, UL, NSF.

MECHANICAL PROPERTIES

Material Condition Designation (Temper)	Min. Tensile Strength, R_m (MPa)	Min. Elongation, A (%)
Soft (R220)	220	40

Marking



Standard Dimensions according to EN 12735-1

Copper tube outer diameter	inch	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8
	mm	4.76	6.35	7.94	9.52	12.70	15.87	19.05	22.22
Copper tube wall thickness	mm	0.80	0.80	0.80	0.80	0.80	1.00	1.00	1.00
Overall outer diameter with 9mm thick insulation	mm	22.76	24.35	25.94	27.52	30.70	33.87	37.05	40.23
Maximum Allowable Pressure	bar	238	171	133	109	80	77	62	53

Standard Pair Dimensions (Coils 2m-15m)

Copper tube outer diameter	inch	1/4-3/8	1/4-1/2	1/4-5/8	1/4-3/4	3/8-1/2	3/8-5/8	3/8-3/4	1/2-3/4
	mm	6.35-9.52	6.35-12.7	6.35-15.87	6.35-19.05	9.52-12.7	9.52-15.87	9.52-19.05	12.7-19.05
Copper tube wall thickness	mm	0.80-0.80	0.80-0.80	0.80-1.00	0.80-1.00	0.80-0.80	0.80-1.00	0.80-1.00	0.80-1.00
Overall outer diameter with 9mm thick insulation	mm	24.4-27.5	24.4-30.7	24.4-33.9	24.4-37.10	27.5-30.7	27.5-33.9	27.5-37.1	30.7-37.1
Maximum Allowable Pressure	bar	171-109	171-80	171-77	171-62	109-80	109-77	109-62	80-62

- ⇒ Other sizes and special packaging in pallets or cardboard boxes are available upon request.
- ⇒ Maximum Allowable Pressure is calculated according to EN 14276:2020 which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive).

Insulation Technical Properties



Material	PE-X or PE foam
Density according to DIN 53420 ASTM D 1667	30-33kg/m ³
Thermal conductivity coefficient (λ) according to EN ISO 8497	0.0357W/mK (0°C) 0.0389W/mK (40°C)
Vapour-water diffusion resistance coefficient (μ) according to EN 13469	12,500
Working temperature	-80°C to +110°C (+90°C for PE foam)
Fire resistance	EN 13501-1 Class B or Class E, DIN 4102, B2, BS 476, NF P 92 501-M1
Resistance to chemical agents according to ASTM 543-56 T	Very good
Dimensional stability according to ISO 2796 for temperatures up to 100°C	<5%

- ⇒ Values are listed as obtained under standard laboratory conditions and may be amended, without prior notice.

Refrigeration

Natural Refrigerants

The increasing concern of the environmental impact of hydro-fluorocarbon (HFC) refrigerants, as well as the more stringent environmental regulations, have prompted a re-emergence of carbon dioxide (CO₂) based refrigeration systems. CO₂ refrigerant is used as a working fluid in many climate control systems, in applications, such as commercial and industrial refrigeration. The supermarket industry in particular, implemented an ecological and efficient store concept by successfully embracing advanced CO₂ refrigeration technologies, developed by refrigeration system manufacturers.

CO₂ as a refrigerant

CO₂ (R-744) stands out as one of the most environmentally friendly refrigerants available today. As a naturally occurring substance, it boasts zero ozone depletion potential (ODP) and an ultra-low global warming potential (GWP) of just 1 -dramatically lower than synthetic refrigerants. It is non-toxic, non-flammable, and free of harmful PFAS chemicals, making it a safe and sustainable option for refrigeration and heat pump systems.

However, due to its physical properties, CO₂-based applications require special consideration during design stage, as they operate at significantly higher pressures than conventional systems.

The design pressure of such systems can be either 120/130bar in the trans-critical or 80bar in the subcritical applications. CO₂ meets the demand for a low-global warming potential (GWP) refrigerant, but presents challenges in both its application and handling. The higher operating pressure and broad temperature fluctuations require that all the system components, including piping, should be designed accordingly.

Extra-Strong TALOS XS tubes for high-pressure systems

TALOS XS tubes are designed to withstand high operating pressures of up to 130bar.

At the same time, TALOS XS tubes are manufactured with comparatively thinner walls and thus achieve an economic advantage that meets the pressure equipment design. The well-known installation practices of refrigerating copper tubes are followed also for the case of TALOS XS tubes, both in systems and in the field (see relative EN378 standard for guidelines). Since the processing methodology remains essentially the same, existing tooling and handling equipment are utilised. This includes brazing with standardised silver braze alloy (min. silver content of 2%), bending with traditional tools and joining with standardised fittings made from copper alloy (CuFe2P). TALOS XS product features are ideally suitable for CO₂ refrigeration applications, made from extra-strong copper-iron (CuFe2P) alloy, cost-effective and lightweight, manufactured with comparatively thinner walls.

TALOS XS Product Features

- ➞ Ideally suited for CO₂ refrigeration applications.
- ➞ Made from Extra-Strong copper-iron (CuFe2P) alloy.
- ➞ Cost-effective and lightweight, manufactured with comparatively thinner walls.
- ➞ Traditional processing techniques and equipment.
- ➞ Compatible with existing fittings made of the same alloy.
- ➞ Clearly marked and easily identified.

Material

Copper-iron alloy (CuFe2P), with chemical composition according to EN 12735-1 (CW107C) and UNS C19400.

Specifications

Dimensional Tolerances: They are produced according to EN 12735-1 & internal production specifications.

Internal Cleanliness: EN 12735-1.

Mechanical Properties: R300 according to EN 12735-1 and VdTÜV WB567.

Form of Supply: Straight lengths with end-caps, in bundles or wooden cases.

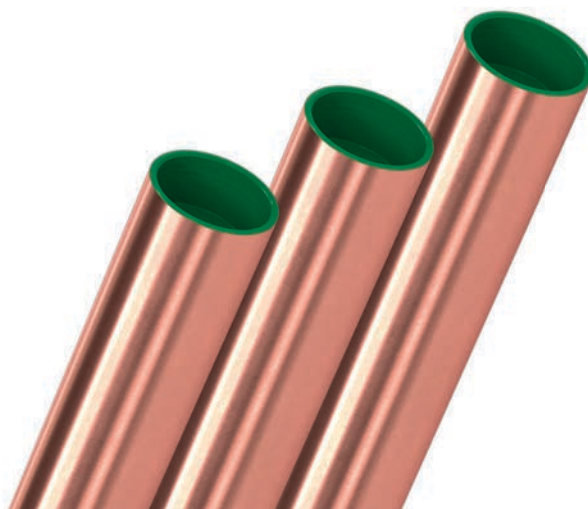
Marking: e.g. Halcor TALOS XS 9.52x0.65 CuFe2P R300 130bar/1885 psi EN 12735-1.

TALOS XS FOR 80, 120 & 130 BAR

Outer Diameter		Wall Thickness						Temper
		80bar ^{1,2}		120bar ¹		130bar ¹		
mm	inch	mm	inch	mm	inch	mm	inch	
9.52	3/8	-	-	0.56	0.022	0.65	0.026	R300
12.7	1/2	0.51	0.020	0.75	0.030	0.85	0.033	R300
15.87	5/8	0.63	0.025	0.93	0.037	1.05	0.041	R300
19.05	3/4	0.76	0.030	1.19	0.046	1.30	0.051	R300
22.23	7/8	0.89	0.035	1.38	0.054	1.50	0.059	R300
28.57	1 1/8	1.20	0.047	1.78	0.070	1.90	0.075	R300
34.92	1 3/8	1.47	0.058	2.17	0.085	2.30	0.091	R300
41.27	1 5/8	1.73	0.068	2.56	0.100	2.70	0.106	R300
53.97	2 1/8	2.27	0.089	3.35	0.131	3.55	0.140	R300
66.67	2 5/8	-	-	4.14	0.163	4.45	0.175	R300

⇒ ¹ Maximum Allowable Pressure up to 150°C (302°F) and down to -196°C (-320°F) calculated according to EN 14276:2020.

⇒ ² Additional lengths are available upon request.



Refrigeration

CO₂ Subcritical Systems

Carbon dioxide (CO₂) is a naturally occurring substance in the atmosphere and it has been used as refrigerant since the early days of refrigeration. CO₂ has zero ODP and a GWP of 1, making it one of the best choices from an environmental perspective. Due to thermodynamic properties, CO₂ systems require high operating pressures in order to operate efficiently. CO₂ has a low critical temperature and high pressure 31°C and 73.8 bar respectively.

CO₂ refrigeration cycles can be transcritical as well as subcritical. Transcritical and subcritical refers to the high-pressure side of the systems, as it operates above or below the critical point, respectively. Transcritical refers to the state of the refrigerant above the critical point.

The design pressure of CO₂ systems depends on the corresponding component refrigerant state. A design pressure of 80 bar is sufficient for components in contact with non-transcritical CO₂ at working and standstill conditions.

TALOS S60 & TALOS S80

TALOS S60 and TALOS S80 tubes are specifically designed to meet the high-pressure requirements of CO₂ refrigeration systems. Featuring reinforced wall thicknesses in comparison with the standardised TALOS ACR tube range, they provide reliable solutions for different CO₂ system design pressures.

TALOS S60 is designed for a Maximum Allowable Pressure of up to 60 bar, while TALOS S80 is designed for operation pressures of up to 80

bar. Together with TALOS XS, they complete Halcor's copper tube portfolio for CO₂ applications and provide HVAC&R designers with a full range of choices corresponding to the unique design conditions of modern CO₂ systems.

TALOS S80 can be used where the system design pressure does not exceed 80 bar, including both high and low pressure sides of subcritical cycles and the low pressure side of transcritical cycles.

The well-known installation practices of refrigeration copper tubes apply both in systems and in the field (see relevant EN 378 standard for guidelines)

TALOS S60 & TALOS S80 Product Features

Tailored to meet subcritical CO₂ systems requirements.

- ➞ Suitable for ACR systems with a design pressure up to 80 bar.
- ➞ Traditional processing techniques and equipment.
- ➞ Excellent "cold formability".
- ➞ Smooth internal surface enhancing flow rate.
- ➞ High purity of internal surface.
- ➞ Stable mechanical properties covering an extensive temperature range.
- ➞ Excellent brazing ability.
- ➞ Compatible with standardised ACR fittings.

Specifications

TALOS S80 tubes are made from Copper-DHP (CW024A, UNS 12200). They are produced according to EN 12735-1 and internal production specifications and are approved according to the European Pressure Equipment Directive (PED) 2014/68/EU.

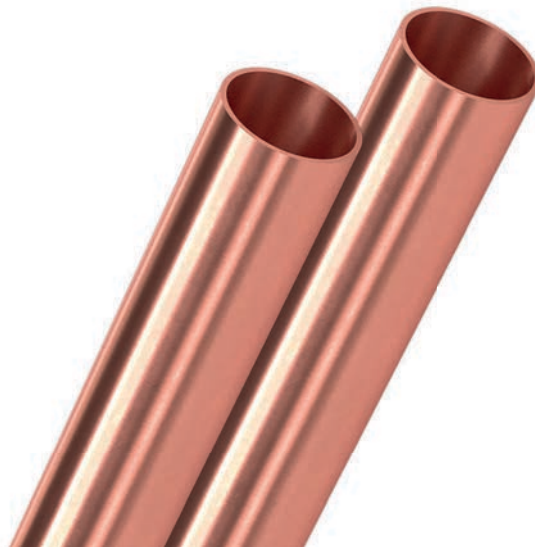
Form of Supply

- Straight lengths, in bundles (hard copper tubes) and in wooden boxes (soft copper tubes).
- Pancakes-PNC in shrink-wrapped individual plastic bags. Depending on market requirements, products can be placed in cardboard boxes and pallets.

TALOS S60 FOR 60 BAR ¹			
Outer Diameter		Wall Thickness	
inch	mm	mm	inch
5/6	7.94	0.70	0.028
3/8	9.53	0.70	0.028
1/2	12.70	0.70	0.028
5/8	15.88	0.80	0.031
3/4	19.05	0.91	0.036
7/8	22.23	1.10	0.043
1 1/8	28.58	1.42	0.056
1 3/8	34.93	1.73	0.068
1 5/8	41.28	2.05	0.081
2 1/8	53.98	2.67	0.105
2 5/8	66.68	3.30	0.130

TALOS S80 FOR 80 BAR ¹			
Outer Diameter		Wall Thickness	
inch	mm	mm	inch
5/16	7.94	0.70	0.028
3/8	9.53	0.80	0.031
1/2	12.70	0.90	0.035
5/8	15.88	1.05	0.041
3/4	19.05	1.30	0.051
7/8	22.23	1.50	0.059
1 1/8	28.58	1.90	0.075
1 3/8	34.93	2.30	0.091
1 5/8	41.28	2.70	0.106
2 1/8	53.98	3.60	0.142
2 5/8	66.68	4.50	0.177

→ ¹ Maximum Allowable Pressure calculation according to EN 14276:2020 for service temperatures from -196°C up to 100°C.



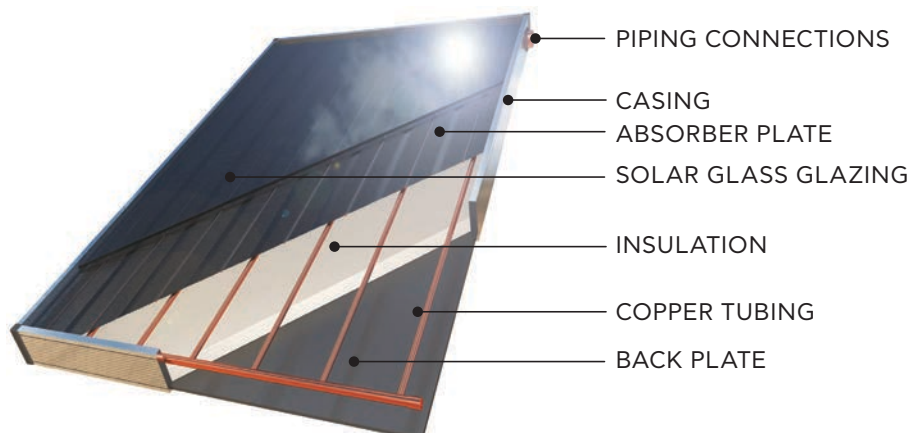
Solar Panel Applications

A Pioneer in the Utilisation of Solar Power

Utilisation of solar energy is a current global challenge. Due to its superior physical and chemical properties, engineers have always relied on copper for thermo-hydraulic systems. The exploration of solar energy has also unveiled this red metal's advantages in solar systems, the most important being its high thermal conductivity and corrosion resistance. These systems are easy to install, efficient (both in energy consumption and maintenance), and reliable (comparably long life cycle).

Advantages of Copper in Solar Systems

- High thermal conductivity, the highest of all industrial materials.
- Stable chemical composition and mechanical behavior through time.
- Inflammable and unaffected to long-term exposure to solar radiation.
- High resistance to environmental conditions.
- Maximum resistance to high operating pressures.
- Flexible and stable material, without memory characteristics.
- Material that can be processed using a number of different methods and techniques.
- Fully recyclable material of fixed value.
- Safe and healthy for drinking water.



TALOS SOLAR PLUS

TALOS SOLAR PLUS tubes are specially engineered for solar panel applications. The extra clean outer surface of TALOS SOLAR PLUS tubes enables the optimisation of the welding process between copper or aluminium absorber sheets when using ultrasonic or laser joining technologies. Increased welding speeds and minimisation of pre-cleaning operation lead to savings of time and money in the manufacturing of solar absorber panels. The high thermal conductivity of copper ensures an improved thermal efficiency of the solar absorber panel.

Material Strength Specifications

Hard (R360 and R290) and Soft (R220) in level wound coils (LWC).

Hard (R360 and R290), Half-Hard (R250) and Soft (R220) in straight lengths.

Material

Copper phosphorus deoxidised (DHP-Cu) with min. copper content 99.90% and P=0.015%-0.040%.

Dimensional Tolerances

According to EN 12449 or ASTM B75.

Upon request length tolerances can be set at $\pm 0.50\text{mm}$.

Advantages

- ➔ Higher welding speeds to copper and aluminium absorber sheets.
- ➔ Improved thermal efficiency due to high conductivity of copper and extra cleanliness.
- ➔ Increased production efficiency due to coil weights up to 580kg.

SIZES	
Outer diameter (mm)	6, 8, 9, 10, 11, 12, 18, 22
Wall thickness (mm)	0.30-1.20

AVAILABILITY	
LWC coil nominal weight (kg)	75, 85, 115, 150, 200, 290, 460, 580
Straight lengths (m)	0.30-6.0

COIL GEOMETRY	
Outer diameter	max. 1,350
Inner diameter	610
Height	150-600

PACKAGING	
Coils	On wooden pallet, with cardboard inserts and corrosion inhibitor (VCI) protective film
Straight lengths	Bundles wrapped in corrosion inhibitor (VCI) protective film in wooden boxes

Advanced Forming Applications

Exceptional Forming Capability

TALOS FORM is an advanced copper tube with exceptional forming capability. TALOS FORM is characterised by the ability to be formed into shapes that require a high degree of elongation. This advanced forming ability finds application in the manufacturing of critical HVAC&R elements, such as connection fittings for boilers, heat exchangers' parts and other intricate-formed components.

The use of TALOS FORM over standard tubing ensures higher productivity, by requiring a smaller number of forming steps to achieve a precise shape. At the same time, components made from TALOS FORM achieve excellent functional quality.

The enhanced properties of TALOS FORM are achieved through a highly controlled production process, specifically designed for the particular purpose. The high level of formability of TALOS FORM is verified through measurement of the tube expansion behavior, following the standardised test method EN ISO 8493.

TALOS FORM Product Features

- High degree of forming and ease of processing.
- Ideally suited for HVAC&R fittings and parts.
- Higher productivity with smaller number of forming steps.
- Made from 100% recyclable DHP Copper.

Material

Copper phosphorus deoxidised (Cu-DHP), having minimum copper content 99.90% and P=0.015% - 0.040%.

Specifications

EN 12735-2, EN 12449, Internal Company Specification.

Form of Supply

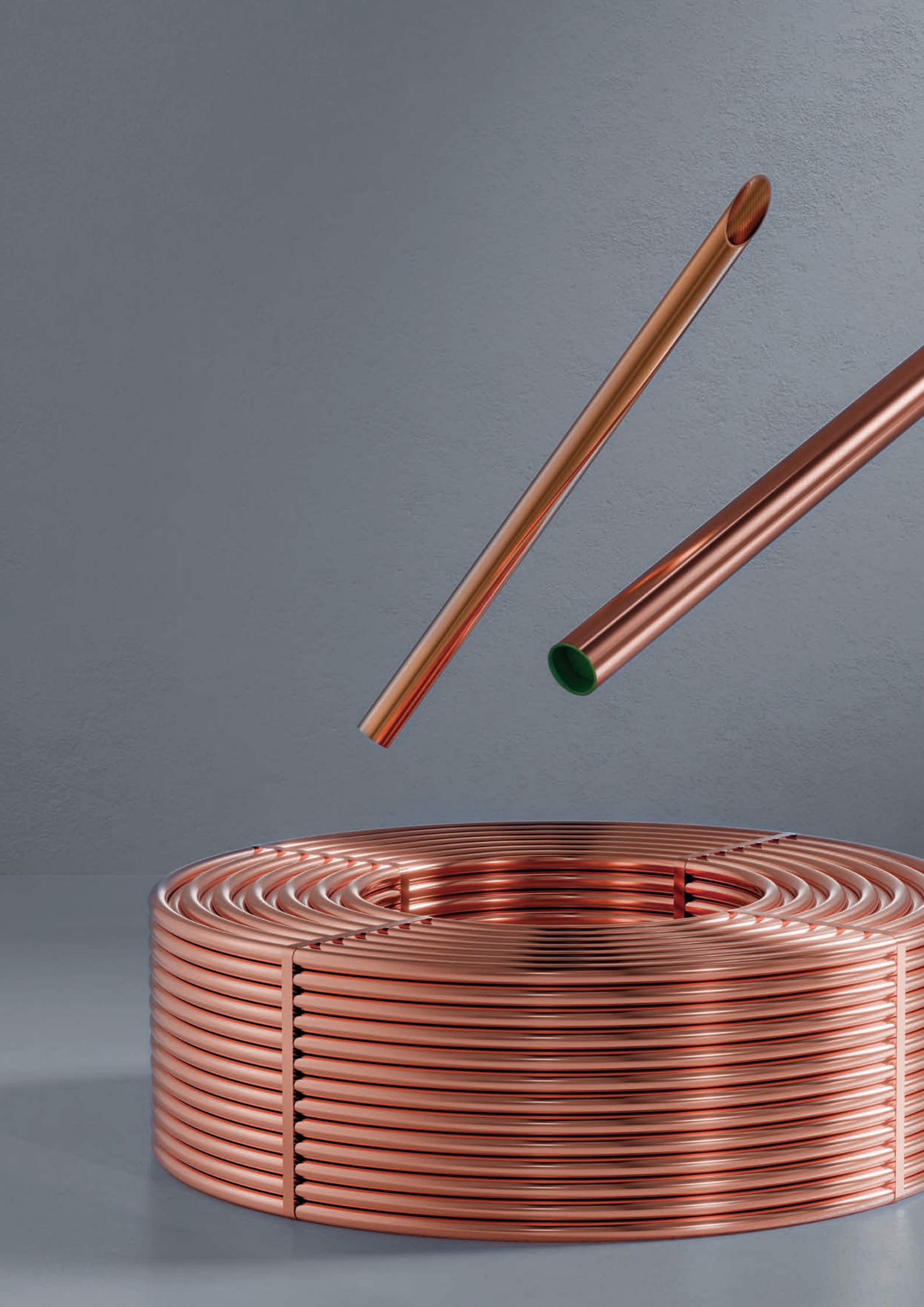
Light Annealed in spools (LWC) with or without central carton support.

SIZES	
Outer diameter (mm)	4-22
Wall thickness (mm)	0.50-1.20

AVAILABILITY	
LWC coil nominal weight (kg)	115, 150, 200, 460

COIL GEOMETRY	
Outer diameter	max. 1,350
Inner diameter	610
Height	150-600





This product is made of material from well-managed FSC®-certified forests, recycled materials, and other controlled sources.

HALCOR

Evolving Beyond Copper

COPPER & ALLOYS
EXTRUSION DIVISION:



ELVALHALCOR



ELVALHALCOR

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