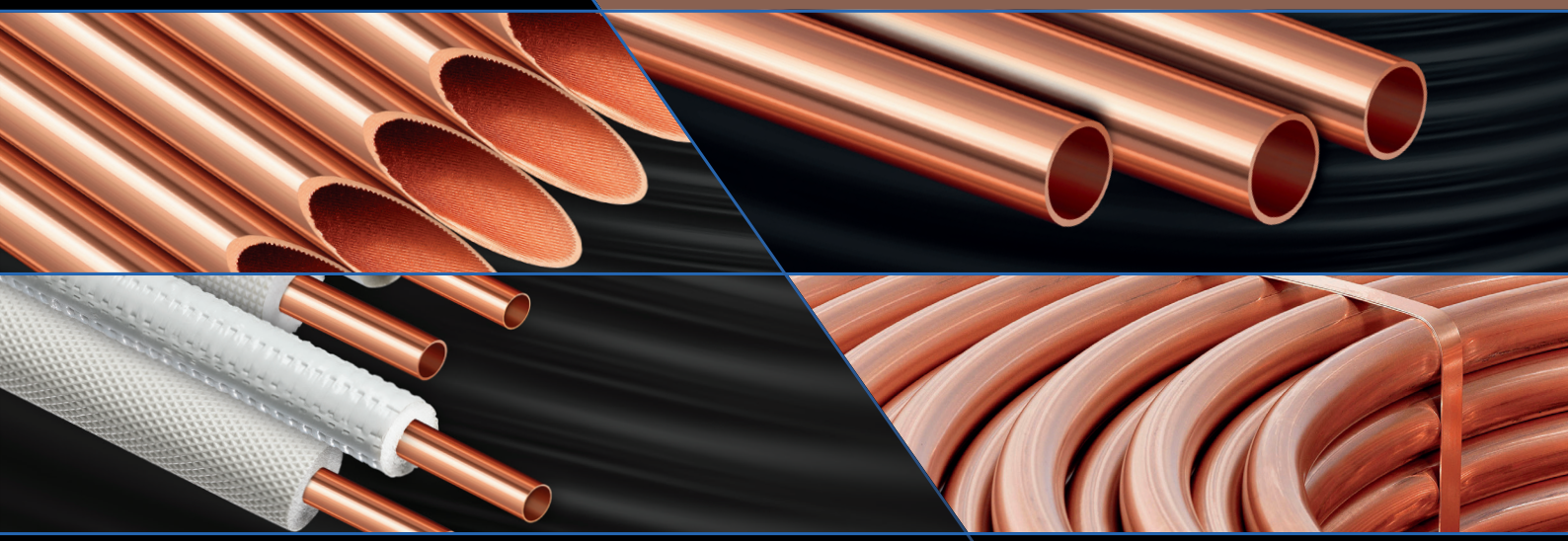
HALCOR

Evolving Beyond Copper

AIR CONDITIONING / REFRIGERATION / HEATING



HALCOR
Evolving Beyond Copper

COPPER & ALLOYS
EXTRUSION DIVISION:
ELVALHALCOR

Member of **Copper Alliance**

Halcor is the largest producer of copper tubes in Europe, implementing long term investments that provide dynamic markets with a wide range of sustainable products and innovative solutions. With more than 80 years of metal processing experience and know-how, Halcor, the copper & alloys extrusion division of ElvalHalcor SA, is a trustful business partner to industrial companies that build equipment and parts, as well as, to wholesalers that distribute products to meet global demands. A dynamic network of owned commercial subsidiaries around Europe and supportive technical services enables Halcor to bring expert solutions to the industry with agility and reliability. Committed to constantly investing in sustainable development, Halcor strategically focuses on R&D&I creating solutions for low carbon and recyclable products, for applications such as energy-efficient equipment, renewable energy sources and electric vehicles, contributing to the global transition to a green economy.

High quality in production is achieved through strict controls applied throughout the production process. With a consistent quality focus, Halcor implements an ISO 9001:2015 Certified Quality Management System and leverages high technologies and expert staff.

TÜV HELLAS ISO 9001 QUALITY SYSTEMS

TÜV AUSTRIA

THE COPPER MARK

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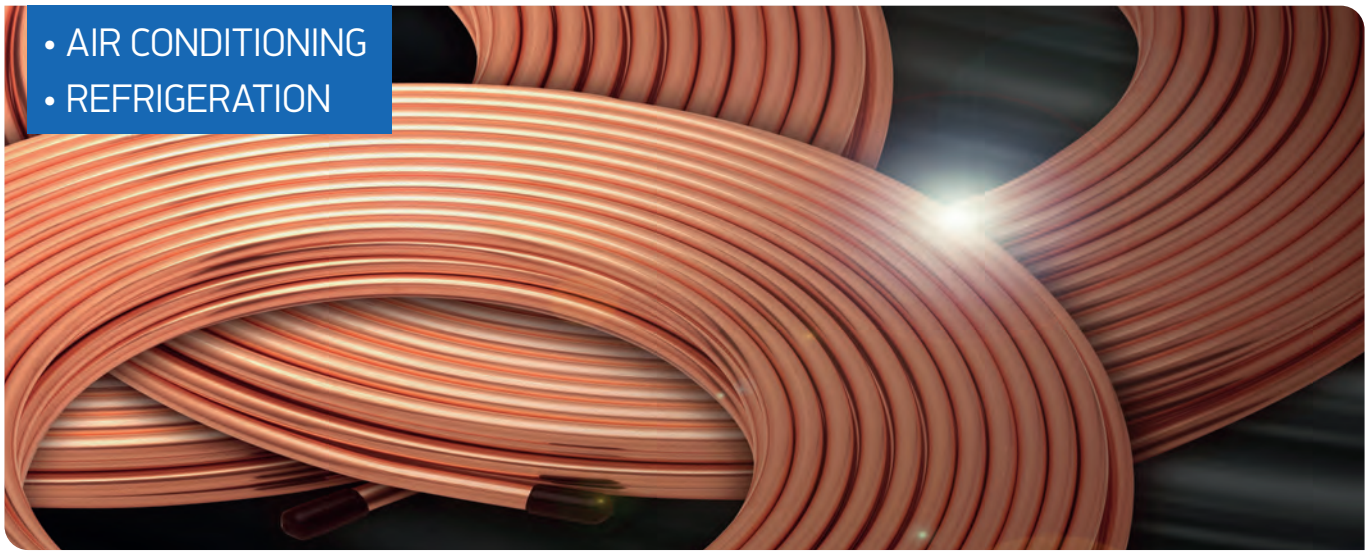
TALOS® ACR



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 purity 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 AD2000/W6 for pressure vessels.

Quality Marks

AENOR, TÜV, GL, VIK

Mechanical Properties EN12735-1

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

* Straight Lengths only

Mechanical Properties EN12735-2

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
Half-Hard (R250)	250	-	30
Hard (R290)	290	-	3

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

PANCAKES (SOFT)									
Copper tube external 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 external 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	Kg/m	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 external 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	225	161	137	112	82	70	57	66

STRAIGHT LENGTHS (HARD TEMPER, 4 OR 5 METERS)														
Copper tube external 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

Customized dimensions are manufactured upon request.

Maximum Allowable Pressure calculation 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.

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® 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 center 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 downtime and increasing production efficiency.

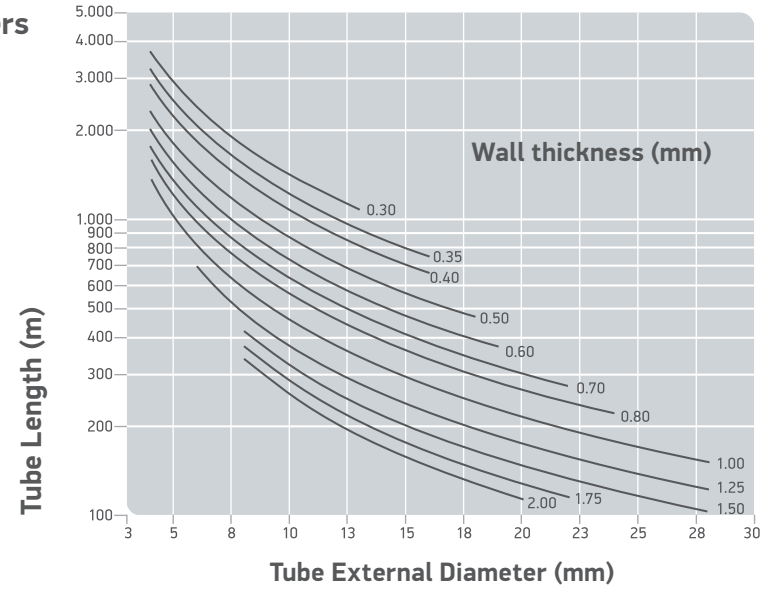
TALOS® ACR

Available Dimensions

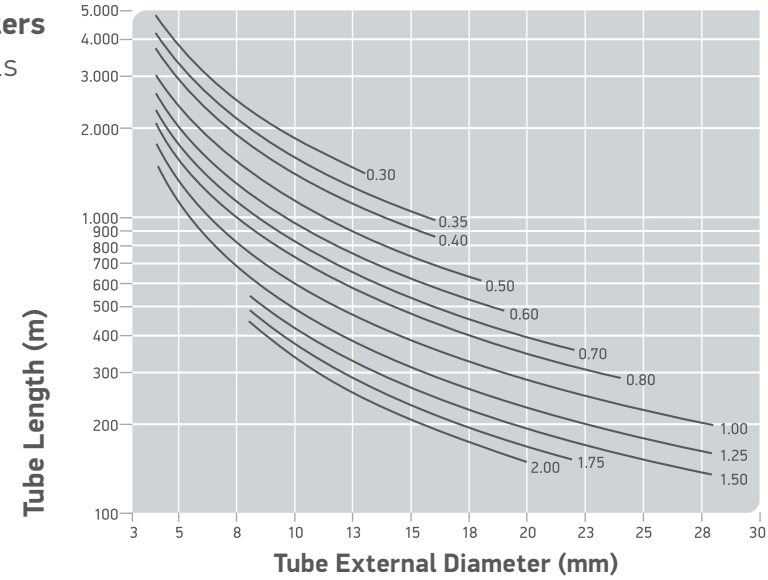
External diameter		Thickness (Inch) (mm)							
(inch)	(mm)	0,011 0,28	0,012 0,30	0,014 0,35	0,016 0,41	0,018 0,45	0,020 0,51	0,025 0,635	0,028 0,71
5/16	7,94	■	■	■	■				
3/8	9,52	■	■	■	■	■	■		■
1/2	12,70			■	■	■	■	■	■
5/8	15,87				■	■	■	■	■

■ Recommended dimensions for LWC spools

Tube Length in meters
for 115kg LWC spools



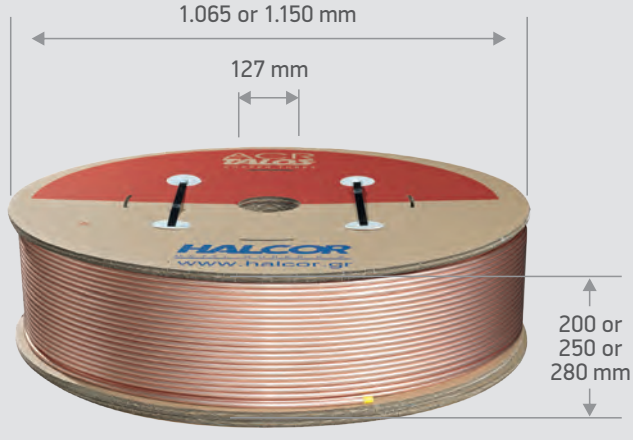
Tube Length in meters
for 150kg LWC spools



Spool (LWC) Dimensions

SPOOL 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 580 kg



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

TALOS®
ACR INNER GROOVED

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 outside diameter down to the new generation microgroove™ tubes with an outside diameter of 5mm or less, 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 ACR 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 optimizing their heat-exchanger design for any of the following:

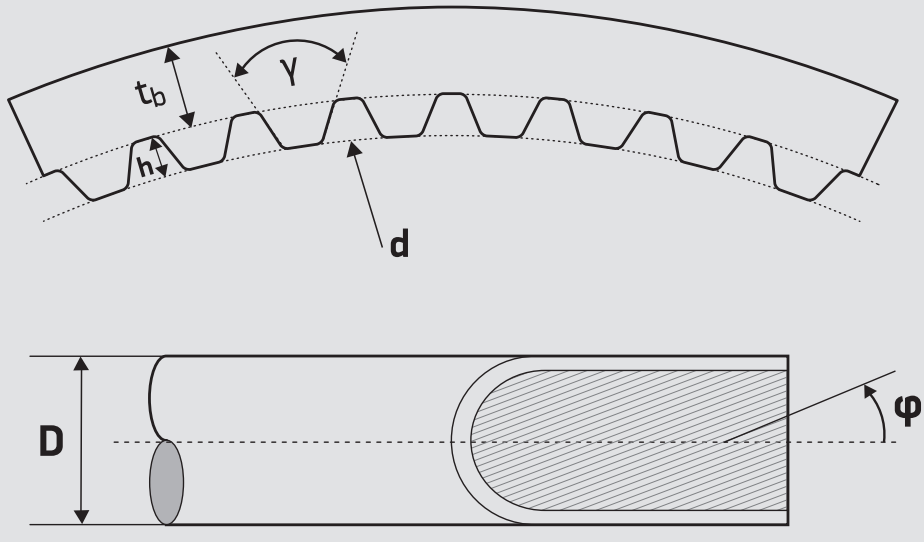
- Improved efficiency
- Higher capacity
- Reduction of raw material
- Compact heat-exchanger size
- Reduction of refrigerant charge

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

TALOS ACR INNER GROOVED

Other configurations and sizes are available upon request.

Outer Diameter D (mm)	Bottom Wall Thickness tb (mm)	Groove Depth h (mm)	Top Apex Angle γ (deg)	Lead Helix Angle φ (deg)	Number of Grooves n	Weight /Meter (gr/m)
5,00	0,20-0,23	0,12-0,15	11-40	18-40	40-58	32-35
6,35	0,23-0,27	0,15-0,16	12-40	18-28	45-54	46-53
7,00	0,21 - 0,27	0,10-0,24	10-53	15-40	50-70	46-60
7.94 - 8.00	0,23 - 0,41	0,12-0,22	12-42	18-43	50-80	57-69
9,52	0,27 - 0,45	0,15-0,25	20-90	15-30	55-85	80-128
11,90 - 12,00	0,32 - 0,40	0,17-0,25	15-55	16-30	70-98	120-145
12,70	0,32 - 0,41	0,23-0,25	30-58	18-30	70-75	135-170
15,00 - 15,90	0,35 - 0,50	0,25-0,35	30-53	18-30	30-75	188-259

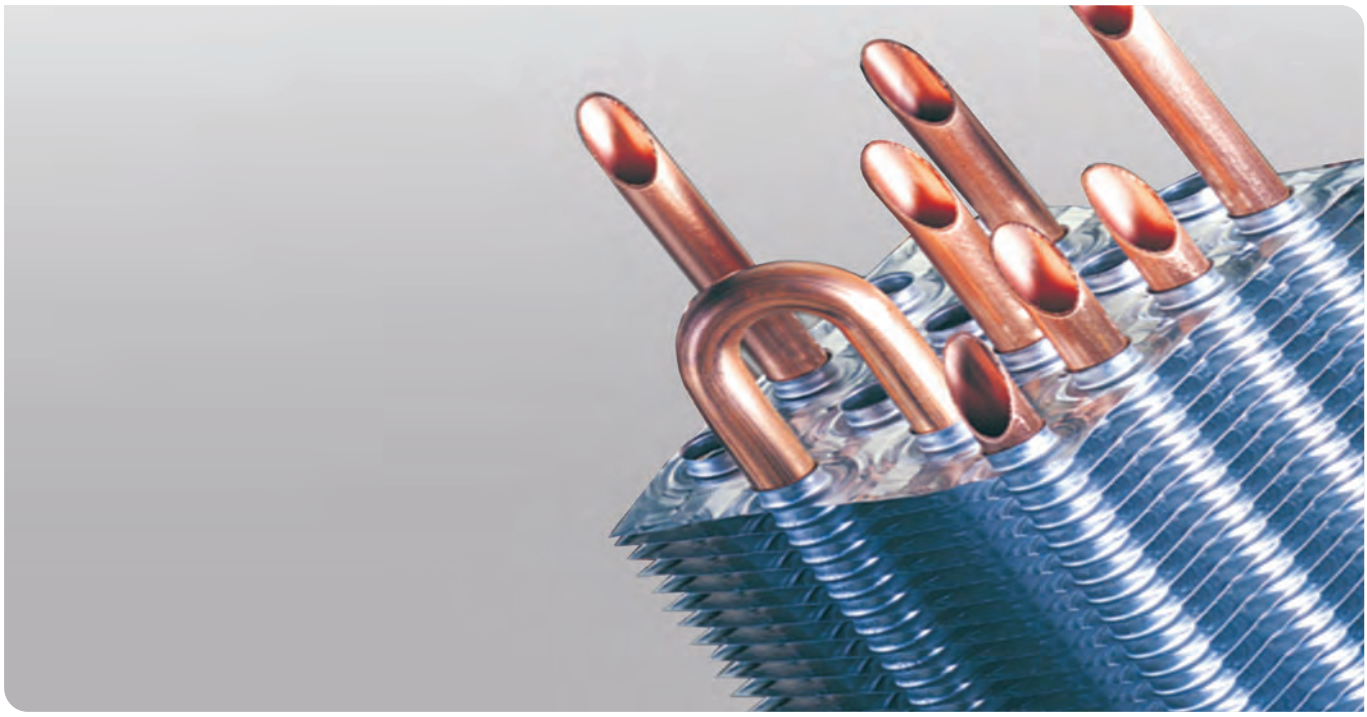


D: Outside Diameter **d:** Inside Diameter **t_b:** Bottom Wall Thickness **h:** Groove Depth **φ:** Lead Angle **γ:** Top Angle

TALOS® ACR INNER GROOVED

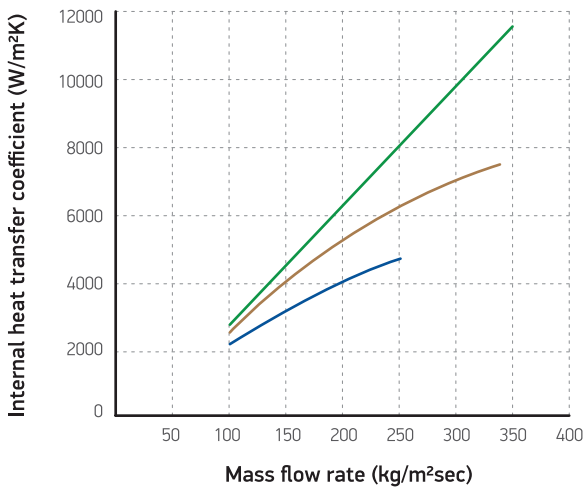
HEAT LAB TUBE HEAT TRANSFER LABORATORY

- Performance measurement and R&D on plain and inner grooved tubes
- Test data derived from the laboratory enable HALCOR to offer specialized technical support to manufacturers of heat-exchangers with the aim of optimizing their heat exchanger design and achieving higher efficiency



TALOS® ACR INNER GROOVED

Tube Heat Transfer Performance: **EVAPORATION**



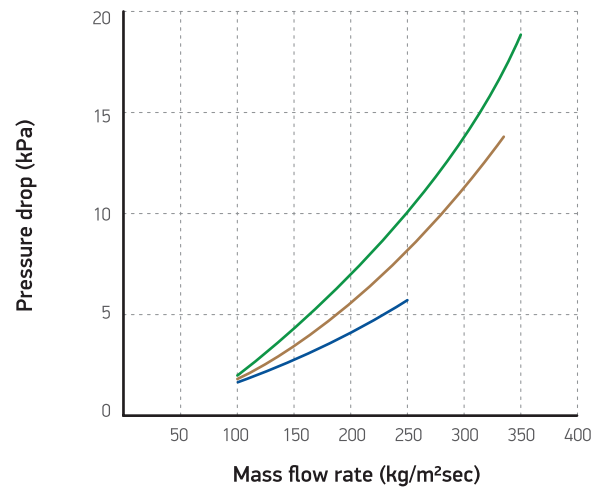
Performance mode:
Evaporation

Refrigerant:
R404A - 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**



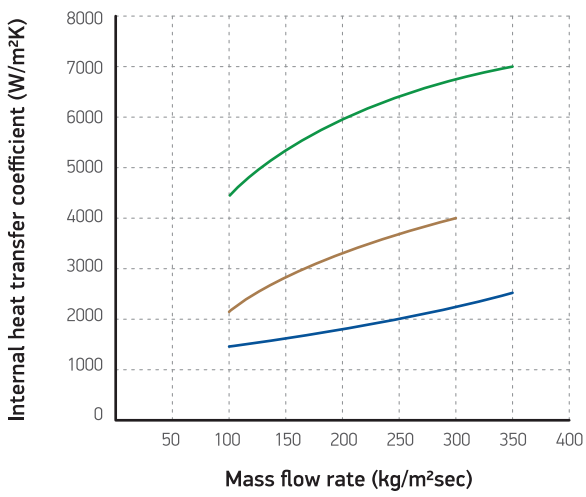
Performance mode:
Evaporation

Refrigerant:
R404A - 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**



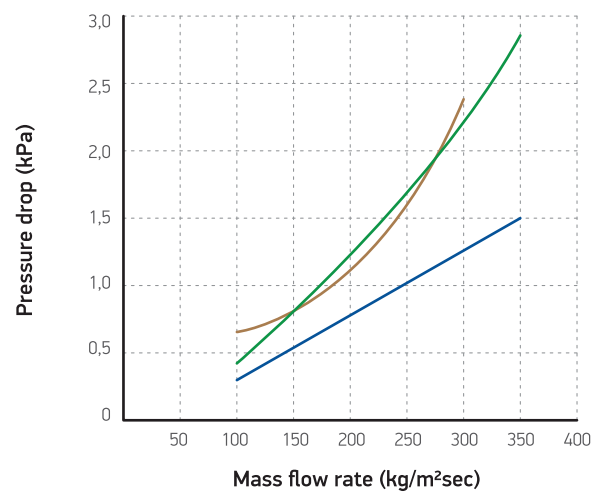
Performance mode:
Condensation

Refrigerant:
R404A - 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**



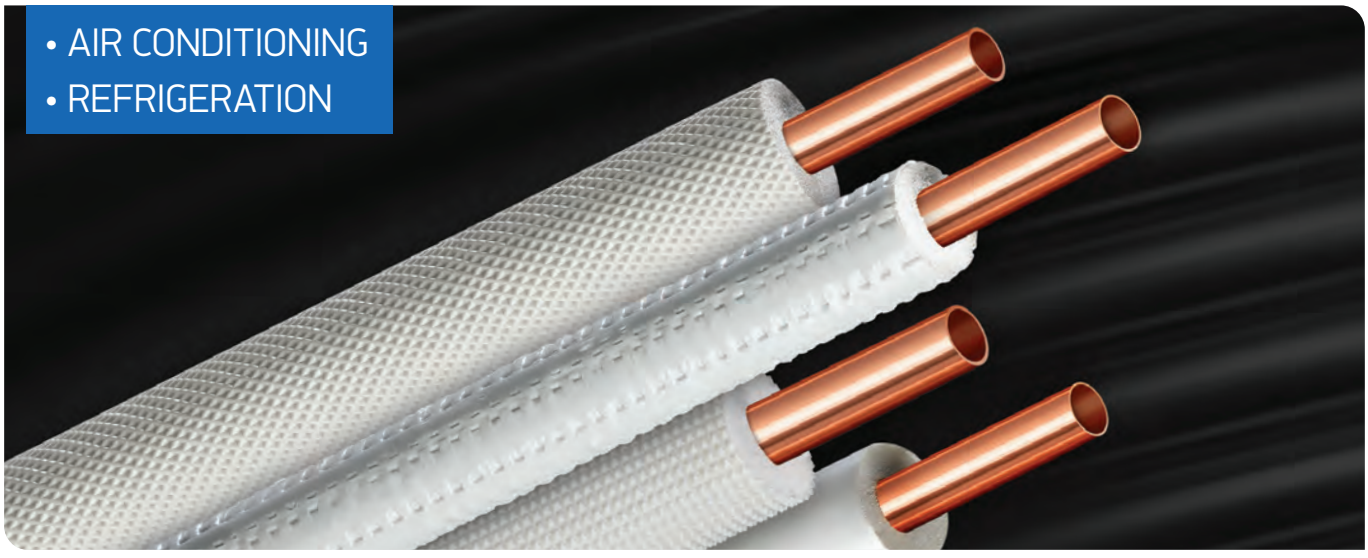
Performance mode:
Condensation

Refrigerant:
R404A - 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

TALOS®
ACR ECUTHERM™



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
- External 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 low installation cost, TALOS® ACR ECUTHERM copper tubes are the ideal 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 FCFC and fibrous substances. A layer of thin polyethylene coating is adhered to the foamy crosslinked substrate, providing a skin of improved operational features and esthetic 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 in most of the European Union countries, as regards insulation properties, chemical characteristics and resistance to fire. They exhibit low ∩ 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 and 13mm, suiting a variety of insulation needs.

Reliability that only TALOS® Copper Tubes can provide

TALOS® ACR copper tubes are manufactured according to the European Standard EN 12735-1 for use in air conditioning and refrigeration installations installations, and have been awarded most major international quality marks. TALOS® ACR copper tubes meet the requirements imposed by new generations of refrigerants (HFCs, HFOs) 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 Euroalloy coding system.

Specifications

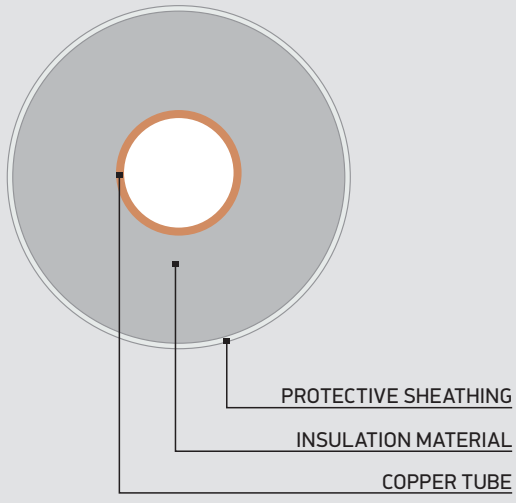
EN 12735-1

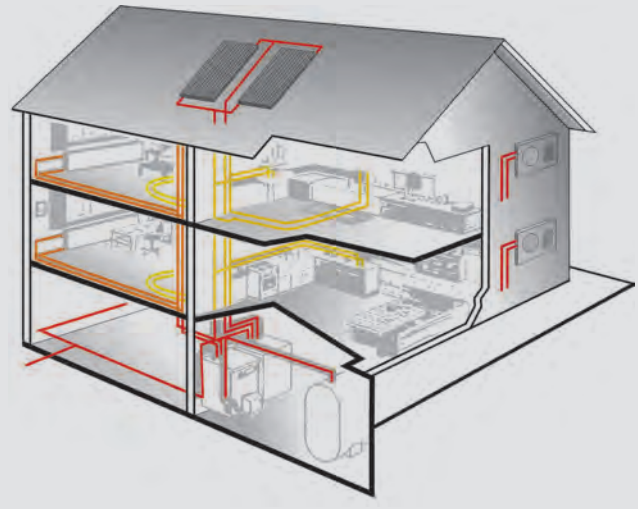
Quality Marks

AENOR, TÜV, GL, VIK

Mechanical Properties

Temper	EN 12735 Designation	Min. Tensile Strength, R_m (MPa)	Min. Elongation, A (%)
Soft	R-220	220	40





TALOS® ACR ECUTHERM™

Insulation Technical Properties

Cross-linked Polyethylene

UV RESISTANCE

MATERIAL	PE-X foam
DENSITY ACCORDING TO DIN 53420 ASTM D 1667	30-33 Kg/m^3
THERMAL CONDUCTIVITY COEFFICIENT (ϑ) ACCORDING TO EN ISO 8497	0.0357 W/mK (0°C) 0.0389 W/mK (40°C)
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO EN 13469	12,500
WORKING TEMPERATURE	-80°C to +110°C
REACTION TO FIRE	EN 13501-1 Class B or Class E, DIN 4102, B2, BS 476, NF P 92 501-M1
RESISTANCE TO CHEMICAL AGENTS ACC. TO ASTM 543-56 T	Very good
DIMENSIONAL STABILITY ACCORDING TO ISO 2796 FOR TEMPERATURES UP TO 100°C	<5%

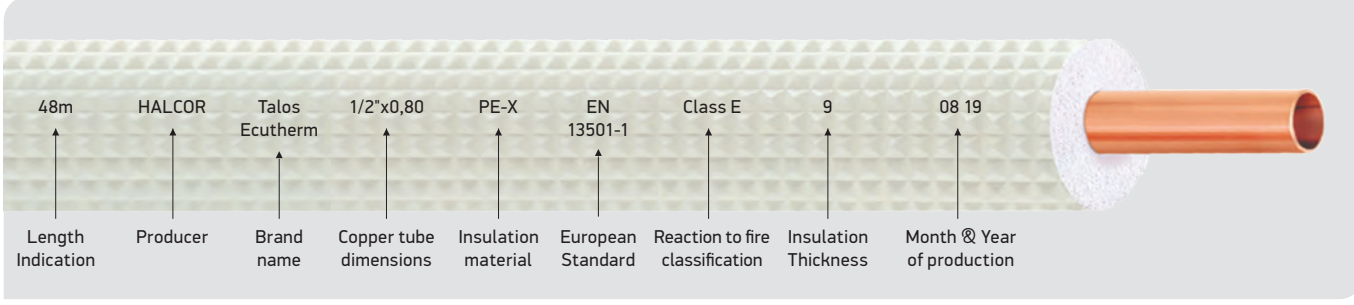
Values are listed, as obtained under standard laboratory conditions and may be amended, without prior notice.

Standard Dimensions according to EN 12735-1

Copper tube external diameter	Inch	3/16	1/4	5/6	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 external 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 calculation according to EN 14276:2020 which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive)

Marking



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 pipes, 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 / 6	6 / 6	6 / 6	6 / 6	9 / 9	6 / 6	6 / 6	9 / 9
+10	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6	9 / 9	6 / 6	6 / 6	9 / 9	6 / 6	6 / 6	9 / 9
+5	6 / 6	6 / 6	9 / 9	6 / 6	6 / 6	9 / 9	6 / 6	6 / 9	9 / 9	6 / 6	9 / 9	9 / 9
0	6 / 6	6 / 6	9 / 9	6 / 6	6 / 6	9 / 9	6 / 6	9 / 9	9 / 9	6 / 6	9 / 9	13 / 13
-5	6 / 6	6 / 9	9 / 9	6 / 6	9 / 9	9 / 13	6 / 6	9 / 9	13 / 13	6 / 6	9 / 9	13 / 13
-10	6 / 6	9 / 9	9 / 13	6 / 6	9 / 9	13 / 13	6 / 9	9 / 9	13 / 13	9 / 9	9 / 9	13 / 13
-20	6 / 9	9 / 9	13 / 13	9 / 9	9 / 9	13 / 13	9 / 9	9 / 13	13 / 13	9 / 9	13 / 13	13 / 13

1/2 inch - 12,7 mm

5/8 inch - 15,88 mm

TALOS® ACR ECUTHERM 2™

Clear Advantage in Refrigeration and Air Conditioning

TALOS® ACR ECUTHERM 2 pre-insulated copper tubes, manufactured by HALCOR are an innovation that ensures significant advantages for refrigeration and air conditioning installers.

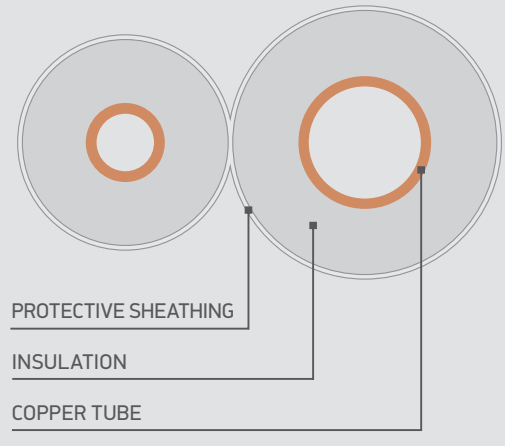
- Simplified installation process and reduction of installation time
- Reduction of overall network installation cost
- Reliable operation of installations and significant energy savings
- Aesthetic result and space saving

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 organization 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.



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"

TALOS® ACR ECUTHERM 2™

Appropriate also for the New Green Refrigeration Units

According to the European Standard EN12735-1:2010, as well as current market requirements, laid down by the use of new generation of refrigerants, including HFCs and HFOs, adopted by all major manufacturers of refrigeration and air conditioning units the following standardisation is applied to TALOS® ACR ECUTHERM 2 copper tubes:

- For an external diameter of 1/4" to 1/2", the wall thickness is standardised at 0,80 mm
- For an external diameter of 5/8" to 3/4", the wall thickness is standardised at 1,00 mm

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 Euroalloy coding system.

Quality Marks

AENOR, TÜV, GL, VIK

Mechanical Properties

Temper	EN 12735 Designation	Min. Tensile Strength, R_m (MPa)	Min. Elongation, A (%)
Soft	R-220	220	40

Insulation Technical Properties

PE X Cross-linked Polyethylene

UV RESISTANCE

MATERIAL	PE-X foam
DENSITY ACCORDING TO DIN 53420 ASTM D 1667	30-33 Kg/m^3
THERMAL CONDUCTIVITY COEFFICIENT (ƛ) ACCORDING TO EN ISO 8497	0.0357 W/mK (0°C) 0.0389 W/mK (40°C)
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO EN 13469	12,500
WORKING TEMPERATURE	-80°C to +110°C
REACTION TO FIRE	EN 13501-1 Class B or Class E, DIN 4102, B2, BS 476, NF P 92 501-M1
RESISTANCE TO CHEMICAL AGENTS ACC. 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)

Maximum Allowable Pressure calculation according to EN 14276:2020 which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive)

Copper tube external 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 external 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.

TALOS® ACR LINESETS

TALOS® ACR Linesets are designed especially for the split Air Conditioning and Heat Pump Systems products 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 green refrigerants (R -410A, etc.), 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 external 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 standardized 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 Euroalloy coding system.

Specifications

COPPER TUBES: EN 12735-1
FOAM INSULATION: EN 13501-1
FLARE FITTINGS: SAE J513

Quality Marks

COPPER TUBES: AENOR, TÜV, GL

Instructions

Follow the equipment manufacturer’s installation instructions regarding refrigerant tubing, system evacuation and testing for leaks.

- Remove protective shipping plugs
- Properly connect and tighten the flare nut to the approved level of torque
- Take precautions not to crimp tube when bending
- Take precautions not to tear the insulation
- Do not allow contaminants to be introduced inside the network

TALOS ACR LINESETS

Mechanical Properties

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

Standard Dimensions according to EN 12735-1

Copper tube external diameter	Inch	3/16	1/4	5/6	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 external 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 external 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 external 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 calculation according to EN 14276:2020 which complies with the European Directive PED 2014/68/EU (Pressure Equipment Directive)

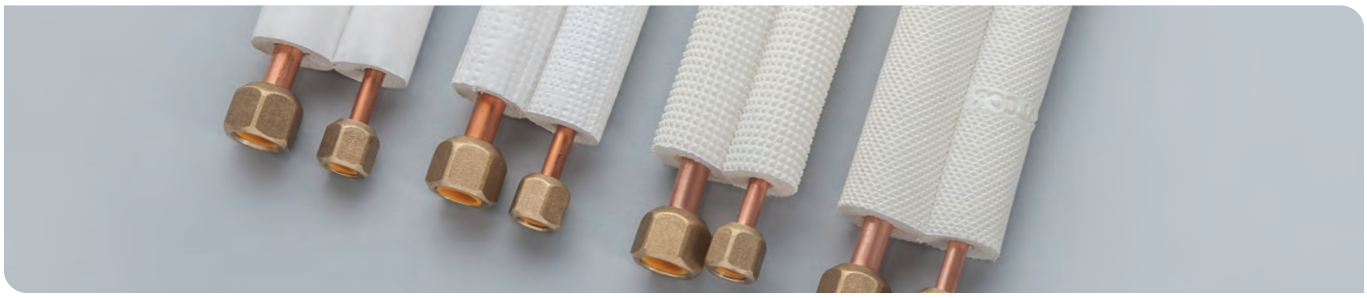
Insulation Technical Properties

MATERIAL	PE-X foam
DENSITY ACCORDING TO DIN 53420 ASTM D 1667	30-33 Kg/m^3
THERMAL CONDUCTIVITY COEFFICIENT (ƛ) ACCORDING TO EN ISO 8497	0.0357 W/mK (0°C) 0.0389 W/mK (40°C)
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO EN 13469	12,500
WORKING TEMPERATURE	-80°C to +110°C
REACTION TO FIRE	EN 13501-1 Class B or Class E, DIN 4102, B2, BS 476, NF P 92 501-M1
RESISTANCE TO CHEMICAL AGENTS ACC. TO ASTM 543-56 T	Very good
DIMENSIONAL STABILITY ACCORDING TO ISO 2796 FOR TEMPERATURES UP TO 100°C	<5%

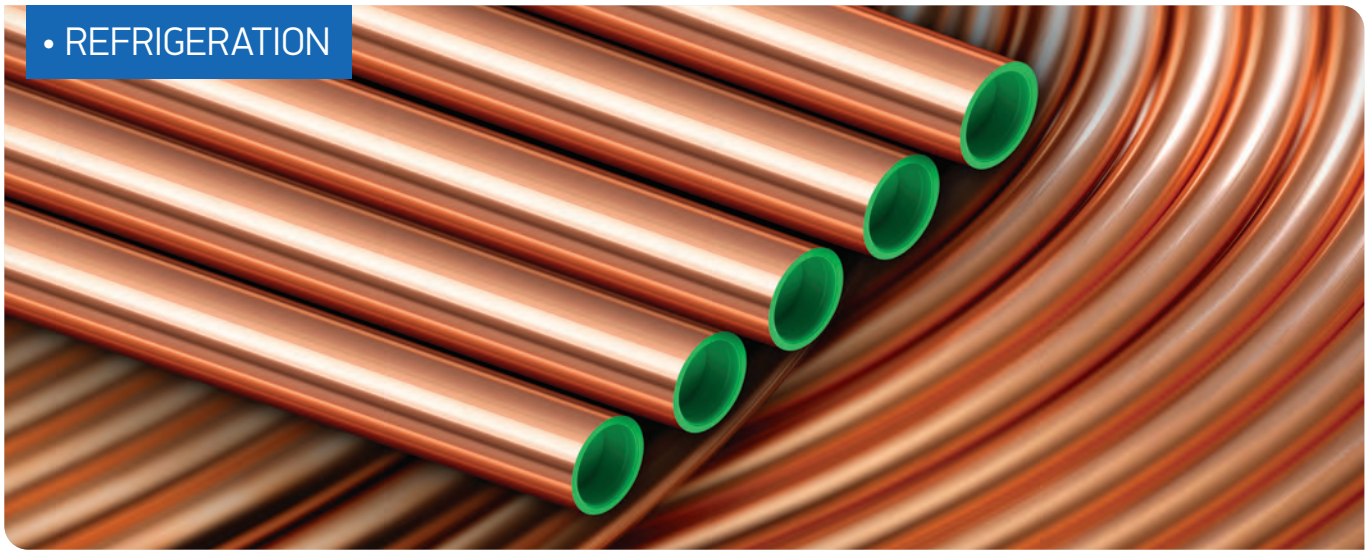
PE X Cross-linked Polyethylene

UV RESISTANCE

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



TALOS® XS



Green Refrigeration

The increasing concern of the environmental impact of hydrofluorocarbon (HFC) refrigerants, as well as the more stringent environmental regulations, have prompted a re-emergence of carbon dioxide (CO_2) based refrigeration systems. CO_2 refrigerant is used as a working fluid in many climate control systems, in applications such as commercial refrigeration, residential air conditioning, hot water pumps, vending machines, etc. The supermarket industry in particular, implemented an ecological and efficient store concept by successfully embracing advanced CO_2 refrigeration technologies developed by refrigeration system manufacturers.

CO_2 as a refrigerant

CO_2 (R-744) refrigerant is termed a "natural" refrigerant because it exists in the natural environment. Released from refrigeration systems into the atmosphere has a negligible effect to global warming, thus CO_2 has no regulatory liability, as is the case of CFC, HCFC and HFC refrigerants. In addition to its environmental-friendly character, CO_2 is currently viewed as a viable solution for low-temperature refrigeration applications because it is non-ozone depleting, non-toxic, non-flammable and has a high volumetric cooling capacity. However due to its physical properties, CO_2 based refrigeration systems request much higher pressure, compared to conventional systems. The operating pressure of such systems can reach up to 120/130 bar in the transcritical cycle. CO_2 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 were specifically developed from a high strength copper-alloy (CuFe2P) to satisfy the demands of today's high-pressure CO_2 systems in refrigeration, as well as, other high-pressure HVAC&R applications. TALOS® XS tubes possess the extra strength to withstand operating pressures of up to 130bar. At the same time, TALOS® XS tubes are ma-nufactured with comparatively thinner walls and thus achieve an economical advantage that meets the pressure equipment design. The well-known installation practices of refrigeration copper tubes are followed also for the installation of TALOS® XS tubes in systems and in the field (see also EN378 for guidelines). Since the processing methodology remains essentially the same, existing tooling and handling equipment is made of use. This includes brazing with standardized silver braze alloy (min. silver content of 2%), bending with traditional tools and joining with standardized fittings made from copper or copper-alloy (CuFe2P).

TALOS® XS Product Features

- Ideally suited for CO_2 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: Internal production specifications, EN 12735-1
Internal Cleanliness: EN 12735-1
Mechanical Properties: R300 acc. to EN 12735-1 and VdTÜV WB567, R420 acc. to EN12735-1 upon request
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/1885psi EN 12735-1

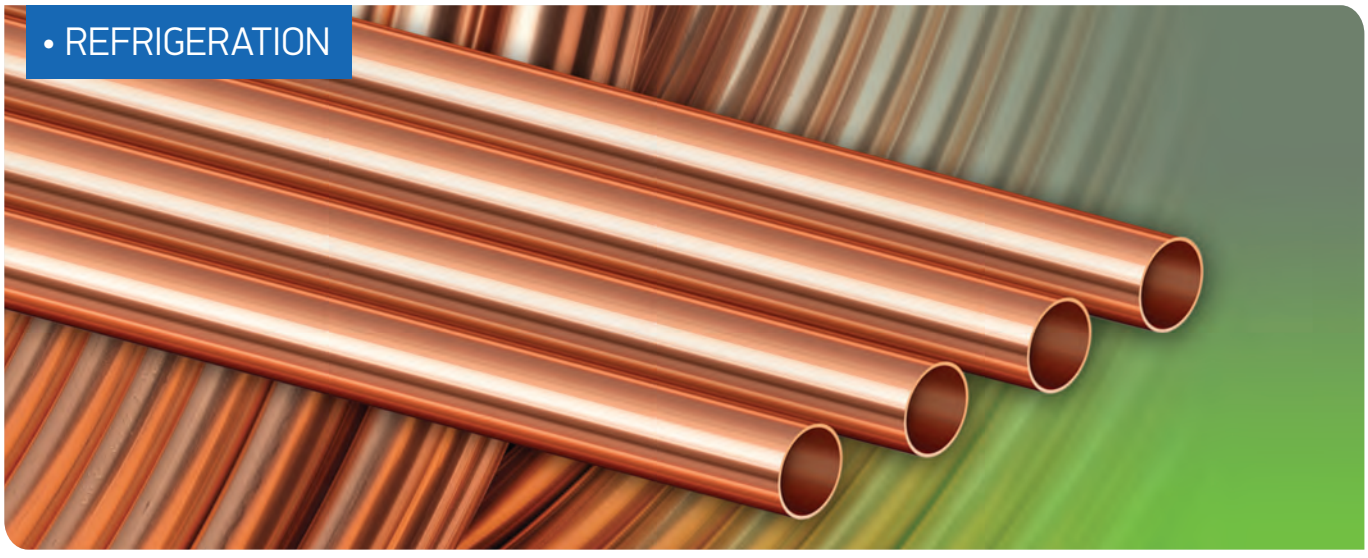
TALOS® XS for 120 & 130 bar

Outside Diameter		Wall Thickness				Temper	Length[2]	
		120bar[1]		130bar[1]				
(mm)	(inch)	(mm)	(inch)	(mm)	(inch)		(meters)	(feet)
9.52	3 / 8"	0.56	0.022	0.65	0.026	R300	5	16.4
12.7	1 / 2"	0.75	0.030	0.85	0.033	R300	5	16.4
15.87	5 / 8"	0.93	0.037	1.05	0.041	R300	5	16.4
19.05	3 / 4"	1.19	0.046	1.30	0.051	R300	5	16.4
22.23	7 / 8"	1.38	0.054	1.50	0.059	R300	5	16.4
28.57	1 1 / 8"	1.78	0.070	1.90	0.075	R300	5	16.4
34.92	1 3 / 8"	2.17	0.085	2.30	0.091	R300	5	16.4
41.27	1 5 / 8"	2.56	0.100	2.70	0.106	R300	5	16.4
53.97	2 1 / 8"	3.35	0.131	3.55	0.140	R300	5	16.4
66,67	2 5/8	4,14	0,163	4,45	0,175	R300	5	16.4

[1] Maximum Allowable Pressure of 120bar (1740psi) and 130bar (1885psi) up to 150°C (302°F) and down to -196°C (-320°F) calculated acc. to EN14276:2020.
[2] Additional lengths are available upon request.

TALOS® S80

• REFRIGERATION



CO_2 Subcritical Systems

Carbon dioxide (CO_2) is a naturally occurring substance in the atmosphere and it has been used as refrigerant since the early days of refrigeration. CO_2 has zero ODP and a GWP of 1, making it one of the best choices from an environmental perspective. Due to thermodynamic properties, CO_2 systems require high operating pressures in order to operate efficiently. CO_2 has a low critical temperature and high pressure 31°C and 73.8bar respectively.

CO_2 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 CO_2 systems depends on the corresponding component refrigerant state. A design pressure of 80bar is sufficient for components in contact with non-transcritical CO_2 at working and standstill conditions.

TALOS® S80

TALOS® S80 tubes are specifically designed for an operation pressure of up to 80bar. In order to meet the high-pressure CO_2 requirements TALOS® S80 tubes are manufactured with reinforced wall thicknesses in comparison with TALOS® ACR.

TALOS® S80 can be used where the system's design pressure does not exceed 80bar, i.e. where the CO_2 is not supercritical. In practice, this occurs at both high and low pressure sides in subcritical cycles and at 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 relative EN378 standard for guidelines).

TALOS® S80 Product Features

- Tailored to meet subcritical CO_2 systems requirements
- Suitable for ACR systems with a design pressure up to 80bar
- 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 standardized 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

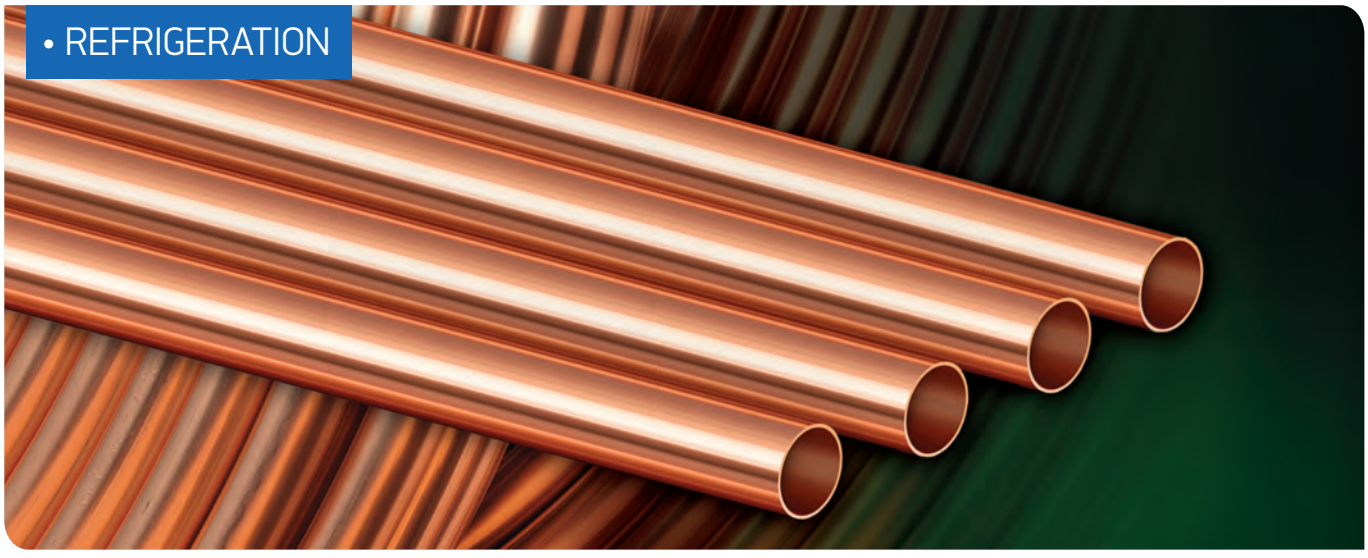
- Straight lengths, in bundles (hard copper tubes) and in wooden boxes (soft copper tubes).
- Pancakes-PNC in shrink-wrapped individual plastic bags. Depending on market requirements, products can be placed in cardboard boxes and pallets.

TALOS® S80 for 80bar[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 acc. to EN 14276:2020. For service temperatures from -196°C up to 100°C.

TALOS® S60

• REFRIGERATION



CO_2 Systems Technology

The rising demand of the international community for a green and safe environment has put pressure on the use of HFC refrigerants for HVAC&R applications. At the same time, the use of Carbon Dioxide (CO_2) as a refrigerant thrives and installations of CO_2 (R-744) refrigeration systems are increasing at a high rate around the world.

CO_2 is a natural refrigerant with zero ODP and a GWP of 1, being one of the best choices from an environmental perspective. CO_2 refrigeration cycles, require high operating pressures in order to operate efficiently. Several technologies that improve the efficiency of CO_2 systems have been established and are under development and optimization (e.g. ejectors, parallel compression, adiabatic cooling, etc.). New technologies lead to new and specialized design conditions that result in different levels of operating and design pressure and temperature.

TALOS® S60

TALOS®S60 tubes are specifically designed for a maximum allowable pressure of 60bar and feature a reinforced wall thickness in comparison with the standardized TALOS®ACR tube range.

Combined with TALOS®XS for 120/130bar and TALOS®S80 for 80bar, TALOS®S60 for 60bar completes HALCOR's copper tube portfolio for CO_2 applications and provides the HVAC&R designer a full range of choices corresponding to the unique design conditions.

The well-known installation practices of refrigeration copper tubes apply both in systems and in the field (see relevant EN378 standard for guidelines).

TALOS® S60 Features

- Suitable for ACR systems with a design pressure up to 60bar
- 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 standardized ACR fittings

Specifications

TALOS®S60 tubes are made from Copper-DHP (CW024A, UNS 12200). They are produced according to EN 12735-1 and internal company specifications and comply with the European Pressure Equipment Directive (PED) 2014/68/EU.

Form of supply

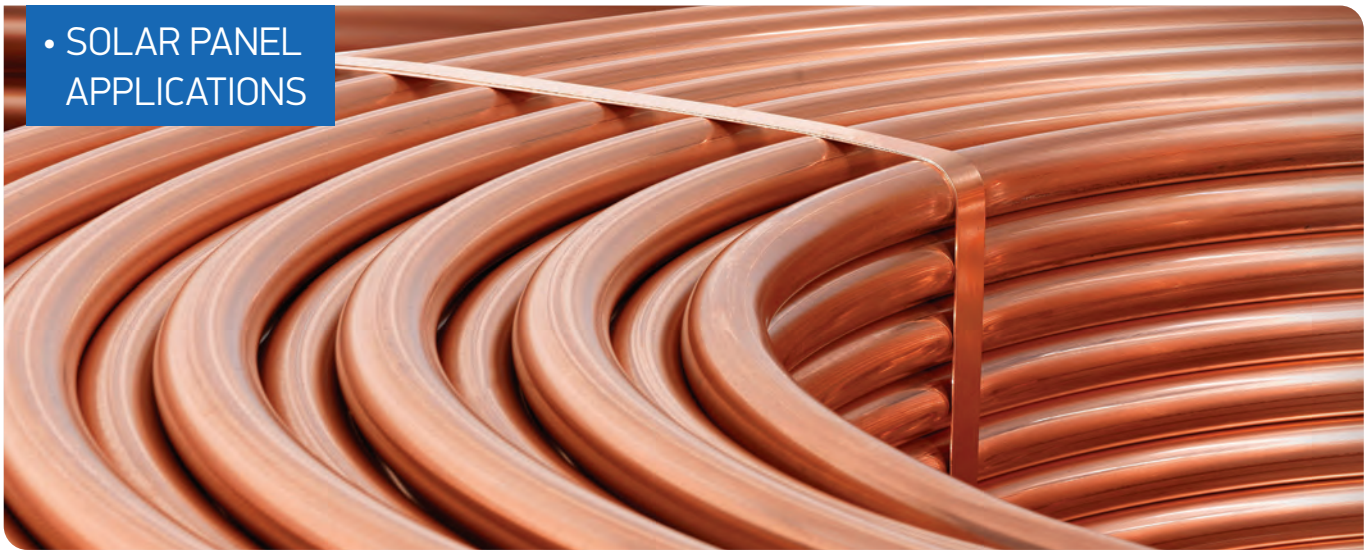
- Straight lengths, in bundles (hard copper tubes) and in wooden boxes (soft copper tubes).
- Pancakes-PNC in shrink-wrapped individual plastic bags. Depending on market requirements, products can be placed in cardboard boxes and pallets.

TALOS® S60 for 60bar[1]			
Outer Diameter		Wall Thickness	
(inch)	(mm)	(mm)	(inch)
5/16''	7,94	0,70	0,028
3/8''	9,53	0,70	0,028
1/2''	12,7	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

[1] Maximum Allowable Pressure calculation acc. to EN 14276:2020. For service temperatures from -196°C up to 100°C.

TALOS SOLAR PLUS

• SOLAR PANEL APPLICATIONS



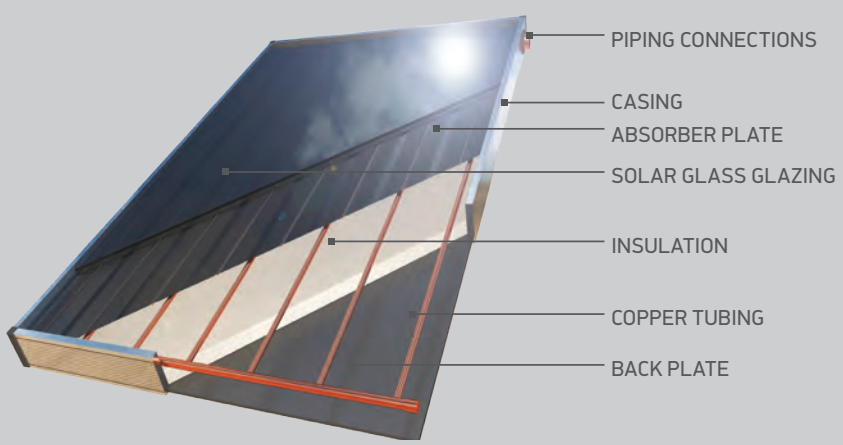
A Pioneer in the Utilization of Solar Power

Utilization of solar energy is a current global challenge on which HALCOR has placed great emphasis. For a number of different devices and applications in that sector, HALCOR has the widest range of rolled and extruded copper products, such as sheets, strips and tubes with or without insulation, that are a reliable solution for solar collectors, water heaters, etc., as well as, hot water plumbing installations in buildings.

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 optimization of the welding process between copper or aluminium absorber sheets when using ultrasonic or laser joining technologies. Increased welding speeds and minimization 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 deoxidized (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 ±0,50mm.

Advantages

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

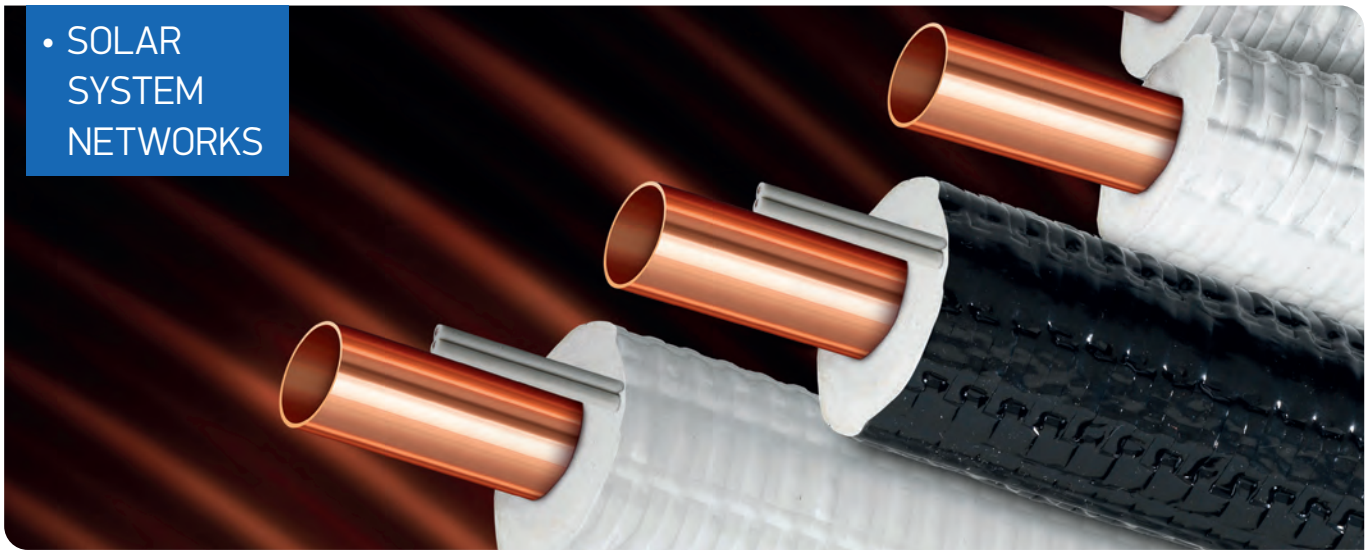
SIZES	
Outside diameter (mm)	6, 8, 9, 10, 11, 12, 18, 22
Wall thickness (mm)	0,30 - 1,20

AVAILABILITY	
LWC coil weight (kg)	75, 85, 115, 150, 200, 290, 460, 580
Straight lengths (m)	0,30 - 6,0

COIL GEOMETRY	
Outer diameter	max. 1350
Inner diameter	610
Height	150-600

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

TALOS®
ECUTHERM™ SOLAR



Modern Technology in Solar Installations

The unique advantages of copper with regards to strength and durability combined with the high efficiency factory insulation make up an integral assembly that is easy and fast to install, ensuring professional results and offering high energy saving. Given this competitive advantage and the low cost of installation, it constitutes the optimum choice for any modern structure.

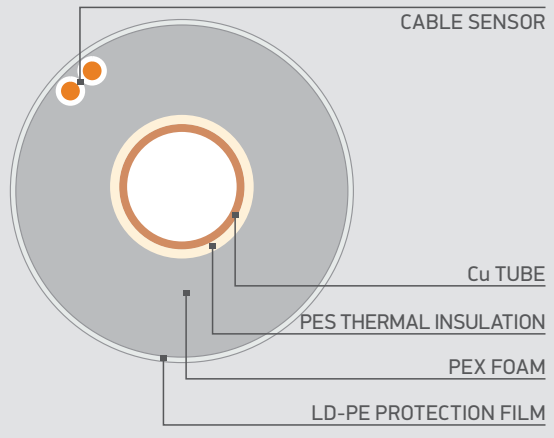
Factory insulated TALOS® ECUTHERM SOLAR copper tubes represent an innovation which guarantees signi- ficant advantages for Solar System installers.

- Simplification of installation process and reduction of working time
- Safe operation of networks with high strength in mechanical strain and weather conditions
- Reduction of total cost of construction for the networks
- Reliable operation of installation and significant energy saving
- 30 year warranty for the copper tube

TALOS® ECUTHERM SOLAR copper tubes are manufactured in pairs (one for supply and one for return), in standardized dimensions which sufficiently cover the usual requirements of solar systems. The two pieces are attached throughout their length, while the tubes also include an incorporated cable for the connection of temperature sensors. For easy connection, separation between the two lines is also possible.

Reliability offered only by TALOS® Copper Tubes.

TALOS® copper tubes are manufactured according to European and U.S. Specifications and have been certified by most international quality organizations (RAL/DVGW, BSI, AFNOR, AENOR, CSTB, NSAI, KIWA / GASTEC-QA, GOST, VIK, SITAC, STF VTT).



High Performance Technological Product

TALOS® ECUTHERM SOLAR copper tubes are coated with a 3-layer system. Firstly, a high temperature resistant PES insulation layer is positioned on the outside of the copper tube. Secondly, an industrial insulation of cross-linked polyethylene (PE-X) foam structured in closed micro-cells provides thermal insulation. Thirdly, an external covering creates an integral resistance barrier against the external environment.

Copper Tube Material

Phosphorus deoxidized copper (DHP-CU) in soft temper (R220), according to EN 1057.

Insulation Technical Properties

PE X Cross-linked Polyethylene

UV RESISTANCE

MATERIAL	PES / PE-X
DENSITY ACCORDING TO DIN 53420 ASTM D 1667	30-33 Kg/m^3
THERMAL CONDUCTIVITY COEFFICIENT (ƛ) ACCORDING TO EN ISO 8497	0,0357 W/mK (0°C) 0,0389 W/mK (40°C)
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO EN13469	12,500
WORKING TEMPERATURE	-80°C to +150°C
REACTION TO FIRE	EN 13501
RESISTANCE TO CHEMICAL AGENTS ACC. TO ASTM 543-56 T	Very good
DIMENSIONAL STABILITY ACCORDING TO ISO 2796 FOR TEMPERATURES UP TO 100°C	<5%

Standardized Dimensions (Roll Lengths 10, 15, 20, 25 meters) TALOS® ECUTHERM SOLAR

The values of the maximum working pressure refer to the material condition R220. A safety factor of 3.5 is used. The minus tolerance of the wall thickness is considered. No further processing is taken into account. For temperature up to 150°C.

Outside diameter of copper tube	mm	10	11	12	15	18	22
Wall thickness	mm	0.50	0.60	0.60	0.70	0.75	0.90
Total diameter with 13mm thick insulation	mm	36	37	38	41	44	48
Working pressure (at 150°C)	bar	52	57	52	48	43	42
Bend radius		4xOD					

Outside diameter of copper tube	mm	10	11	12	15	18	22
Wall thickness	mm	1.0	1.0	1.0	1.0	1.0	1.0
Total diameter with 13mm thick insulation	mm	36	37	38	41	44	48
Working pressure (at 150°C)	bar	104	94	86	68	55	44
Bend radius		4xOD					

Standardized Dimensions TALOS® ECUTHERM SOLAR 2

12/12, 15/15, 18/18, 22/22

CONDUCTOR MATERIAL	COPPER
FLEXIBILITY OF CONDUCTOR	FLEXIBLE, CLASS E
COLOR	WHITE
NO. OF POLE	2
NOMINAL VOLTAGE Vo/V	300/300
NOMINAL CROSS SECTION OF CONDUCTOR	2x0.75mm²

TALOS® FORM™

Exceptional Forming Capability

TALOS® FORM is an advanced copper tube with exceptional forming capability. TALOS® FORM is characterized 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 HVACR 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 standardized test method EN ISO 8493.

TALOS® FORM Product Features

- High degree of forming and ease of processing
- Ideally suited for HVACR 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, EN12449, Internal Company Specification

Form of Supply

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

SIZES	
Outside diameter (mm)	4 - 22
Wall thickness (mm)	0,50 - 1,20

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

COIL GEOMETRY	
Outside diameter (mm)	max. 1350
Inner diameter (mm)	610
Height (mm)	1500 - 600

12/2022

HALCOR
Evolving Beyond Copper

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