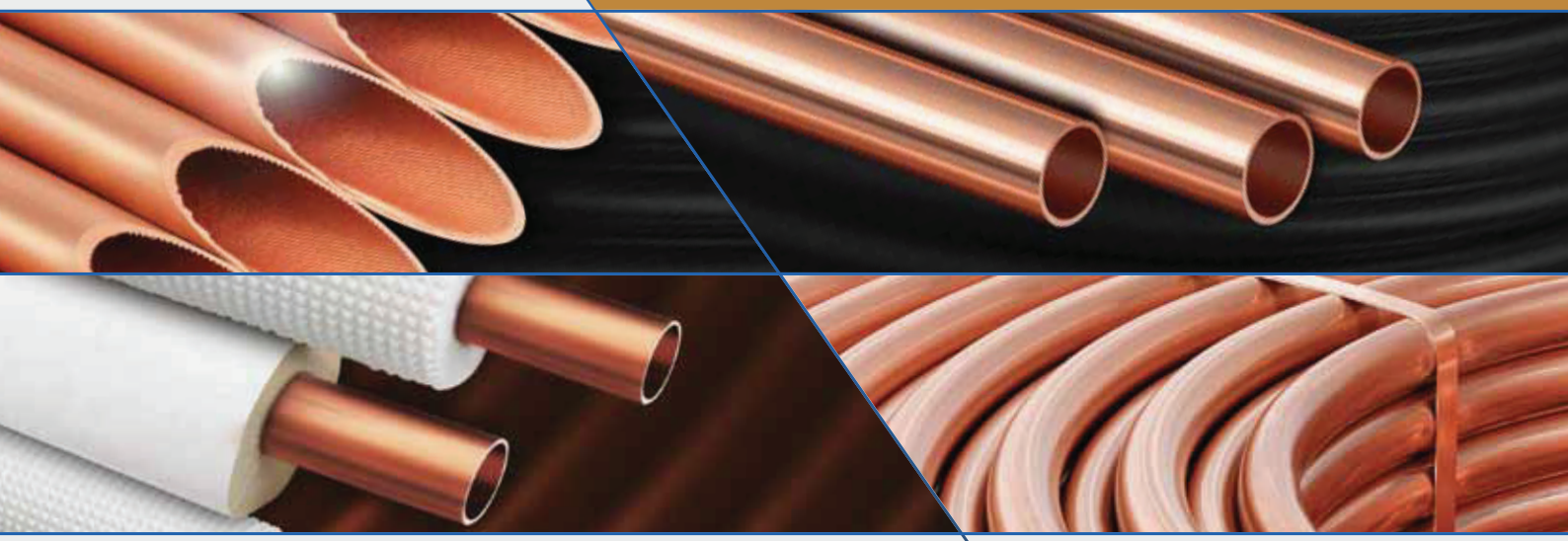
Belaco®

AIR CONDITIONING & REFRIGERATION





Advantages of Belaco® ACR Copper Tubes

The unique properties of high purity copper, make Belaco® ACR copper tubes, indispensable for refrigeration installations.

- High thermal conductivity
- Stable mechanical properties covering an extensive temperature range
- Chemically "inert" against the refrigerants (e.g. R-134A, R-404A, R-407C, R-410A)
- High purity of internal surface
- Smooth internal surface enhancing flow rate
- Excellent weldability
- Excellent "cold formability"

Material

Copper phosphorus deoxidised (Cu-DHP), having minimum copper content 99,90% and P = 0,015% - 0,040%.

Specifications

EN 12735 parts 1 & 2, ASTM B280/B68/B743, JIS H3300
All BELACO® ACR copper tubes produced according to EN 12735 parts 1 & 2 are certified according to the PED 97/23 requirements, as well as, the German regulation AD2000/W6 for pressure vessels.

Quality Marks

AENOR, TÜV, GL, VIK

Mechanical Properties

Temper	Minimum Tensile strength N/mm²	Yield strength 0,2% N/mm² EN 12735 Part 2	Elongation A%
Soft Annealed	200	35-80	> 40%
Light Annealed	220	40-50	> 40%
Half Hard	250	-	> 30%
Hard	290	-	> 3%



Standard Dimensions according to European Standards (EN-12735)

PANCAKES (SOFT)									
Copper tube external diameter	mm	4,76	6,35	7,94	9,52	12,70	15,88	19,05	22,23
Copper tube wall thickness	mm	0,80	0,80	0,80	0,80	0,80	1,00	1,00	1,00
Weight	Kgr/m	0,089	0,124	0,160	0,195	0,266	0,416	0,505	0,594
Permissible working pressure	bar	222	159	123	101	74	74	61	52

STRAIGHT LENGTHS (5 METERS)														
Copper tube external diameter	mm	9,52	12,70	15,88	19,05	22,23	28,58	34,93	41,28	53,98	66,68	79,38	92,08	104,78
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	Kgr/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
Permissible working pressure	bar	94	74	58	48	52	40	41	34	35	34	33	31	31

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	15,88	19,05	22,23
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	Kgr/m	0,085	0,119	0,162	0,198	0,270	0,372	0,451	0,672
Permissible operating pressure	bar	209	150	125	102	75	65	54	59

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	15,88	19,05	22,23	28,58	34,93	41,28	53,98	66,68	79,38	92,08	104,78
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	Kgr/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
Permissible operating pressure	bar	95	83	76	65	59	51	46	42	38	35	33	31	30

Customized dimensions are manufactured upon request.
The values of the permissible operating pressure are calculated with a safety factor 4 according to AD2000-Merkblatt B0/B1 for R220 (soft) condition and temperature up to 100 ^{0}C.

Packaging

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. Customised dimensions are manufactured upon request.

Air Conditioning & Refrigeration

BELACO® ACR copper tubes for refrigeration units are available in the following forms:

Spools (LWC)
BELACO® 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.

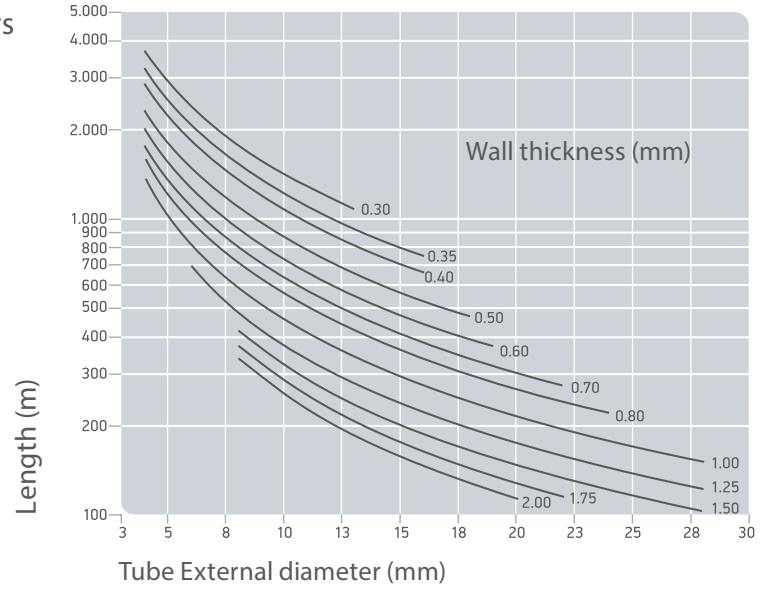
“CD” coils: Spools with a “central” decoiling
Spools with a “central” decoiling are especially prepared so that unwinding from the center of the coil is possible. They provide significant advantages to the user, such as reduction in packaging materials, unwinding directly from the pallet and greater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

Available Dimensions

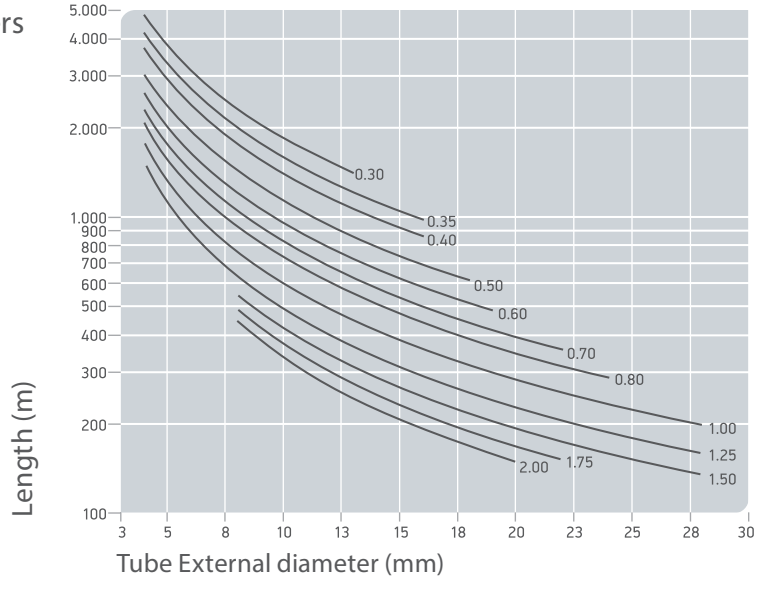
External diameter		Thickness (Inch) (mm)							
(inch)	(mm)	0,011 0,28	0,012 0,30	0,014 0,35	0,016 0,41	0,018 0,45	0,020 0,51	0,025 0,635	0,028 0,71
5/16	7,94	■	■	■	■				
3/8	9,52	■	■	■	■	■	■		■
1/2	12,70			■	■	■	■	■	■
5/8	15,87				■	■	■	■	■

■ Recommended dimensions for LWC spools

Tube Length in meters (based on LWC spools of 115 kgs)



Tube Length in meters (based on LWC spools of 150 kgs)



Spool (LWC) Dimensions

SPOOL WEIGHT (kg)	FORM OF SUPPLY
75	With 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)



Belaco®



Inner Grooved Tubes

Belaco® has developed its own standard with regard to the design of new high thermal efficiency tubes with inner grooves. With these tubes, the thermal efficiency of refrigeration units is improved, enabling the reduction of the size of these units, whilst reducing the quantity of the required amount of refrigerant.

Temper: Light or Soft Annealed

Material

Copper phosphorus deoxidised (Cu-DHP), having minimum copper content 99,90% and P=0,015% - 0,040%.

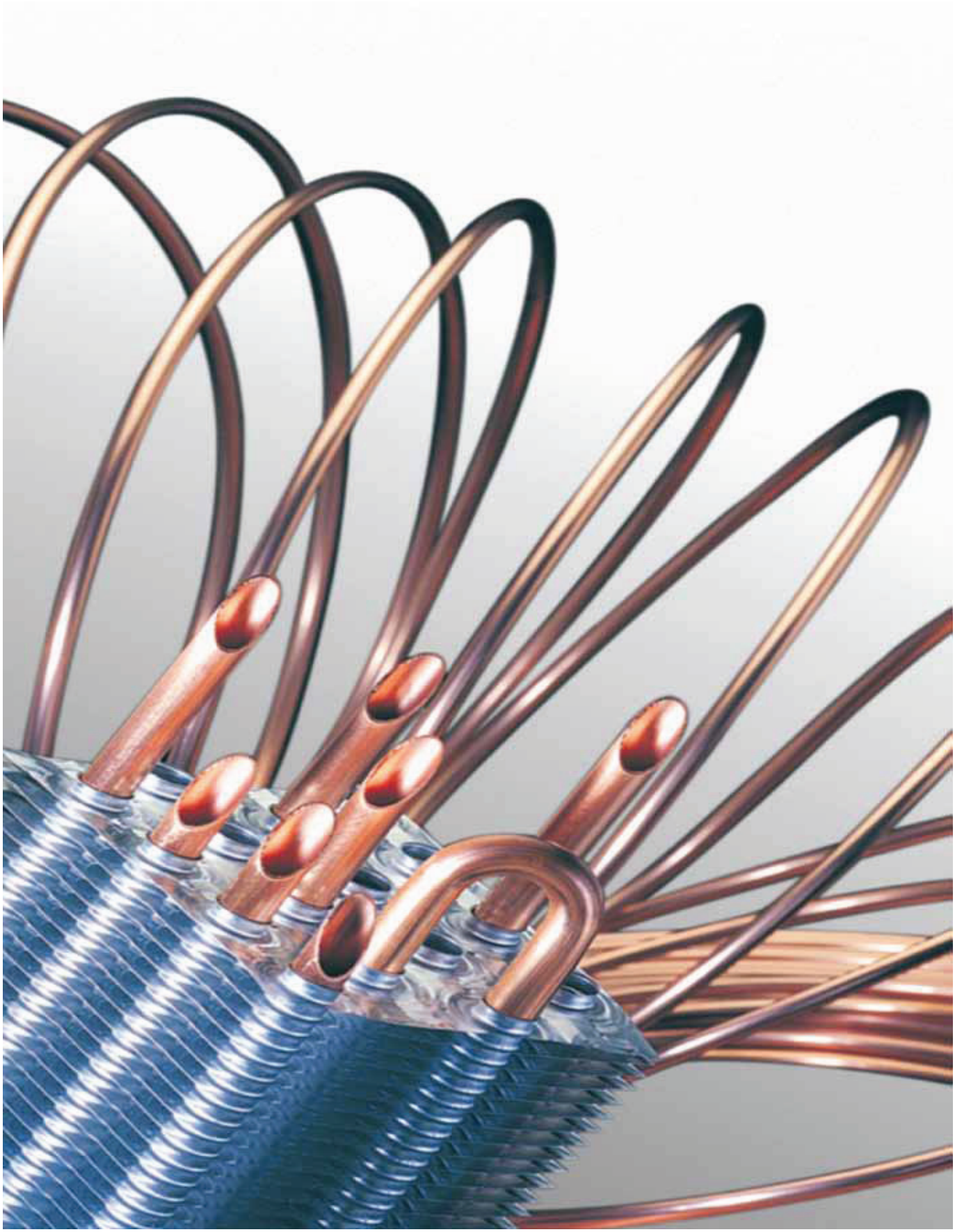
Material Specifications

CW024A, EN 12735, part 2
C12200, ASTM B 743
C1220, JIS H 3300

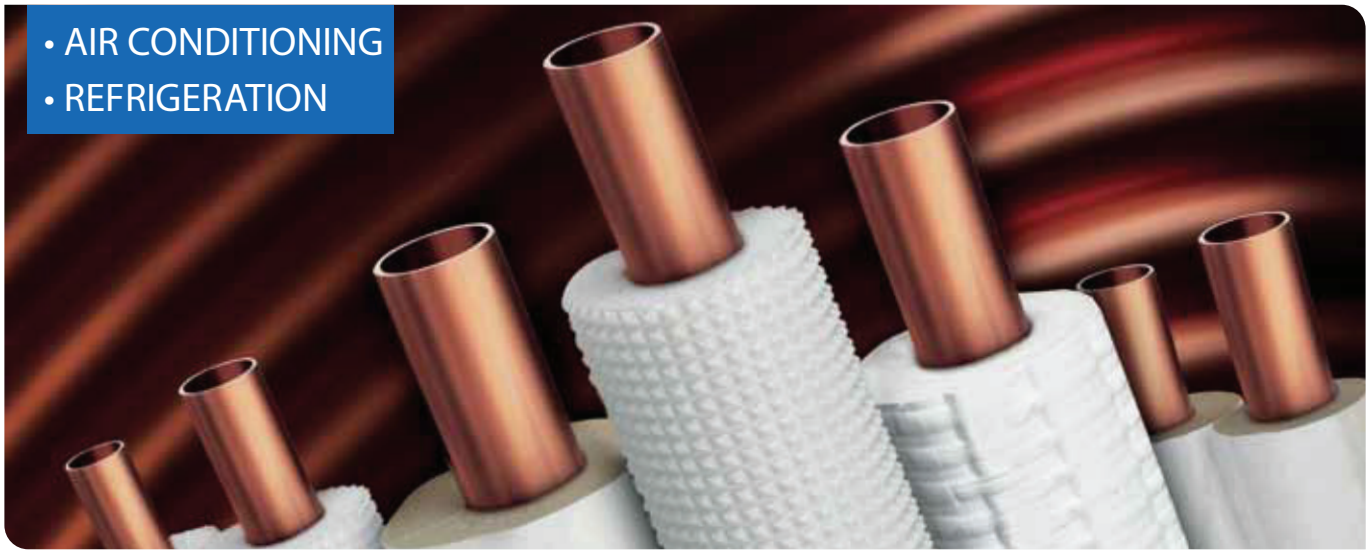
Groove Type/ HALCOR Code	Nominal size	External diameter (mm)	Internal diameter (mm)	Bottom wall (mm)	Groove depth (mm)	Total wall thickness (mm)	Number of grooves	Lead angle (degrees)	Top angle (degrees)	Linear weight (gr/m)
A-1	9,52 x 0,35	9,52	8,66	0,28	0,15	0,43	65	25	90	94
A-2	9,52 x 0,41	9,52	8,54	0,34	0,15	0,49	65	25	85	104
B-2	7,94 x 0,30	7,94	7,06	0,26	0,18	0,44	50	18	40	64
B-3	8,00 x 0,30	8,00	7,12	0,26	0,18	0,44	50	18	40	65
B-6	9,52 x 0,36	9,52	8,52	0,30	0,20	0,50	60	18	53	93
B-10	9,52 x 0,35	9,52	8,66	0,28	0,15	0,43	60	18	53	89
B-15	7,00 x 0,30	7,00	6,14	0,25	0,18	0,43	50	18	40	57
B-21	12,70 x 0,45	12,70	11,48	0,36	0,25	0,61	70	18	58	155
B-22	12,70 x 0,45	12,70	11,48	0,36	0,25	0,61	75	18	58	155
B-25	12,00 x 0,45	12,00	10,80	0,35	0,25	0,60	70	18	55	145
C-1	9,52 x 0,33	9,52	8,62	0,27	0,18	0,45	70	25	25	84
C-2	9,52 x 0,39	9,52	8,40	0,31	0,25	0,56	65	25	25	99

Other configurations and sizes are available upon request.

Belaco®



Belaco®



Advanced Technology that saves Energy and protects the Environment.

- 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

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

The unique advantages offered by the Belaco® 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, Belaco® copper tubes are the ideal choice for every modern application.

High Performance Technological Product

The insulating material used in the manufacturing of TALOS® Belaco® 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 Belaco® (PE-X) copper tubes are 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 λ coefficient, determining its heat conductivity properties and very good μ coefficient which determines its resistance to penetration of moisture.

The Belaco® copper tubes are available in coils of 25 & 50 meter lengths and insulation thickness of 6, 9 and 13mm, suiting a variety of insulation needs.

Reliability that only Belaco® Copper Tubes can provide

Belaco® copper tubes are manufactured according to the Harmonised European Standard EN 12735-1 for use in air con ditioning and refrigeration installations. Belaco® copper tubes meet the current requirements, imposed by the new green refrigerants (R -410A, etc.), adopted by major refrigeration and air conditioning unit manufacturers. Belaco® copper tubes have been awarded most major international quality marks. Belaco® copper tubes, with their high quality of manufacture, provide:

- Increased 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 (Cu-DHP) with min. copper content 99,90% and P=0,015% - 0,040%.

S pecifications

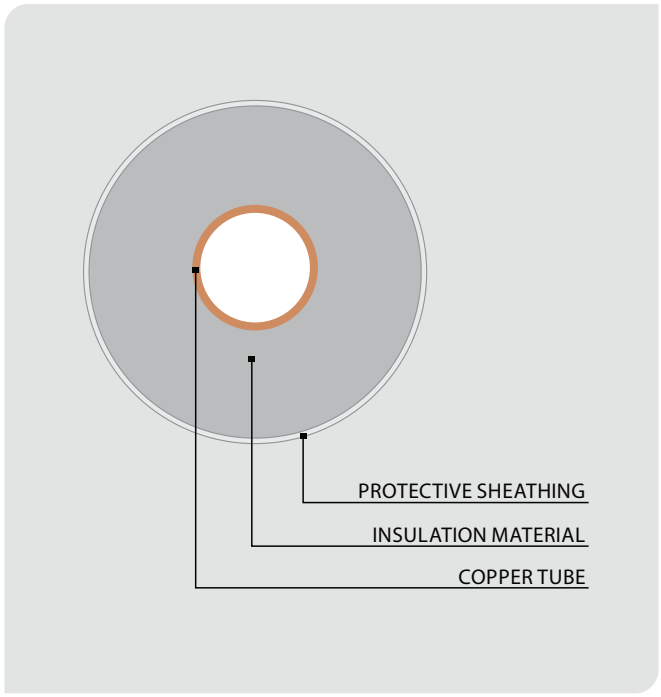
REFRIGERATION PIPES: EN 12735-1

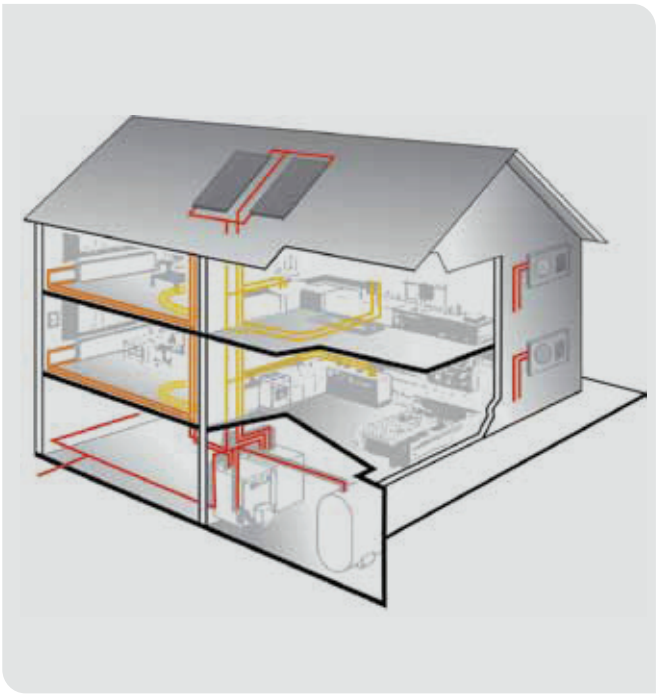
Quality Marks

REFRIGERATION PIPES: AENOR, TÜV, GL, VIK

Mechanical Properties

Temper	EN 12735 Classification	Minimum Tensile strength N/mm^2	Minimum Elongation A%
Soft	R-220	220	40





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 ASTM C 335	0,039 W/m.K
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO ISO 12572	> 9.000
WORKING TEMPERATURE	-80^{0}C to +110^{0}C
FIRE RESISTANCE	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
SOUND ABSORPTION ACC. TO DIN 4109 300-2500Hz	~60%
DIMENSIONAL STABILITY ACCORDING TO ISO 2796 FOR TEMPERATURES UP TO 100^{0}C	<5%

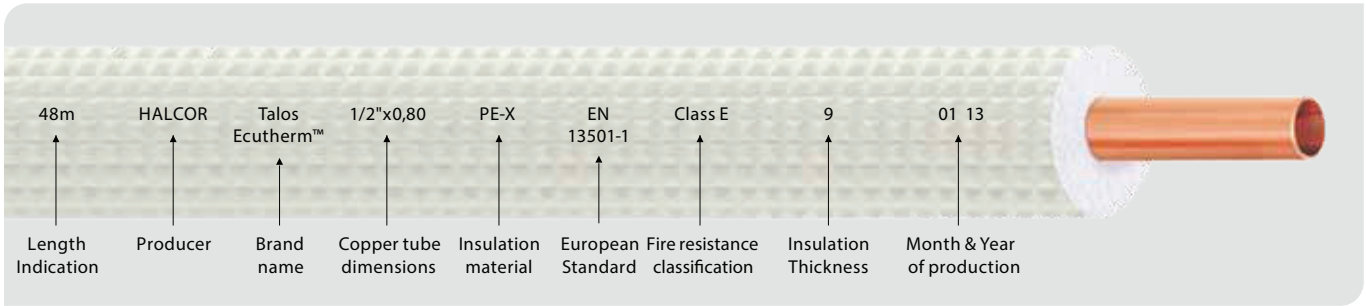
Values are listed, as obtained under standard laboratory conditions and may be amended, without prior notice.

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	22,23
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
Permissible operating pressure (bar)	bar	222	159	123	101	74	74	61	52

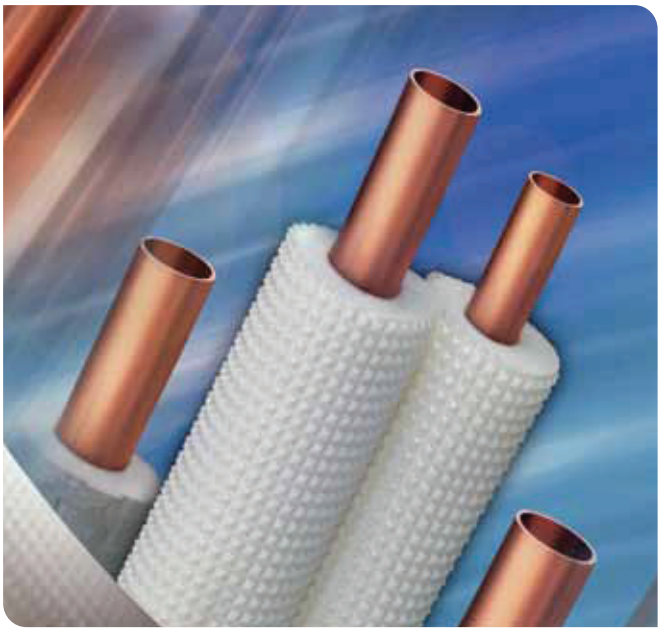
The values of the permissible operating pressure are calculated with a safety factor 4 according to AD2000-Merkblatt B0/B1 for R220 (soft) condition and temperature up to 100 ^{0}C.

Marking



TALOS ECUTHERM ™ 1/2" & 5/8"
Indicative Calculation Of Insulation Thickness

Air conditioning and refrigeration units, operate in temperatures lower than ambient temperature; therefore, this difference must be compensated by the appropriate insulation thickness, to prevent vapour condensation. 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

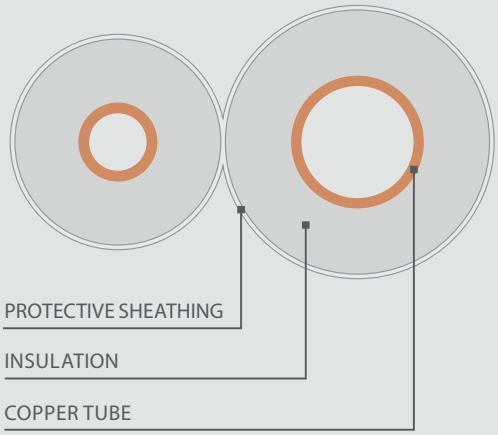
Belaco®



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.

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"

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: 2000, certified by TÜV Hellas.

Appropriate also for the New Green Refrigera - tion Units

According to the European Standard EN12735-1:2010, as well as current market requirements, laid down by the use of new green refrigerants, including R-410A, already 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 (Cu-DHP), having minimum copper content 99,90% and P=0,015% - 0,040%.

Quality Marks

REFRIGERATION PIPES: AENOR, TÜV, GL, VIK

Mechanical Properties

Temper	EN 12735 Classification	Minimum Tensile strength N/mm²	Minimum Elongation A%
Soft	R-220	220	40

Insulation Technical Properties

MATERIAL	PE-X foam
DENSITY ACCORDING TO DIN 53420 ASTM D 1667	30-33 Kg/m³
THERMAL CONDUCTIVITY COEFFICIENT (ñ) ACCORDING TO ASTM C 335	0,039 W/m.K
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO ISO 12572	> 9.000
WORKING TEMPERATURE	-80ºC to +110ºC
FIRE RESISTANCE	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
SOUND ABSORPTION ACC. TO DIN 4109 300-2500Hz	~60%
DIMENSIONAL STABILITY ACCORDING TO ISO 2796 FOR TEMPERATURES UP TO 100ºC	<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 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	6,35-15,88	6,35-19,05	9,52-12,7	9,52-15,88	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
Permissible operating pressure	bar	159-101	159-74	159-74	159-61	101-74	101-74	101-61	74-61

Other sizes and special packaging in pallets or cardboard boxes are available upon request.
The values of the permissible operating pressure are calculated with a safety factor 4 according to AD2000-Merkblatt B0/B1 for R220 (soft) condition and temperature up to 100 ºC.

Belaco®



Belaco® Linesets are designed especially for the split Air-Conditioning and Heat Pump Systems products requiring installation with flared connections. The unique advantages offered by Belaco® Linesets, including, copper resis - tance 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 Belaco® Linesets:

- Significant and continuous energy savings
- Quick, Safe and Cost-effective installations
- Comprehensive range of sizes

Belaco® Linesets comprise pre-insulated Belaco® copper tubes manufactured according to the European Standard EN 12735-1 for use in air conditioning and refrigeration installa tions. Belaco® 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 Belaco® Linesets is an extruded high quality crosslinked poly - ethylene (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 inte gral barrier to aggressive environments. The continuous facto ry-applied insulation avoids seams or openings that can cause dripping and decrease efficiency.

The ends of Belaco® Linesets are conveniently pre-flared and mounted with forged brass flare nuts manufactured ac cording to the SAE J513 international standard for use with standardized 45° flare joints. The flare nuts are capped with protective plastic plugs for shipment.

Belaco® 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 (DHP-Cu) with min. copper content 99,90% and P=0,015% - 0,040%.

Specifications

REFRIGERATION PIPES: EN 12735-1
FOAM INSULATION: EN 13501-1
FLARE FITTINGS: SAE J513

Quality Marks

REFRIGERATION PIPES: 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

Mechanical Properties

Temper	EN 12735-1 Classification	Minimun Tensile strength N/mm²	Minimum elongation A%
Soft	R-220	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	22,23
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
Permissible operating pressure (bar)	bar	222	159	123	101	74	74	61	52

Standard Pair Dimensions (coils 2m-15m)

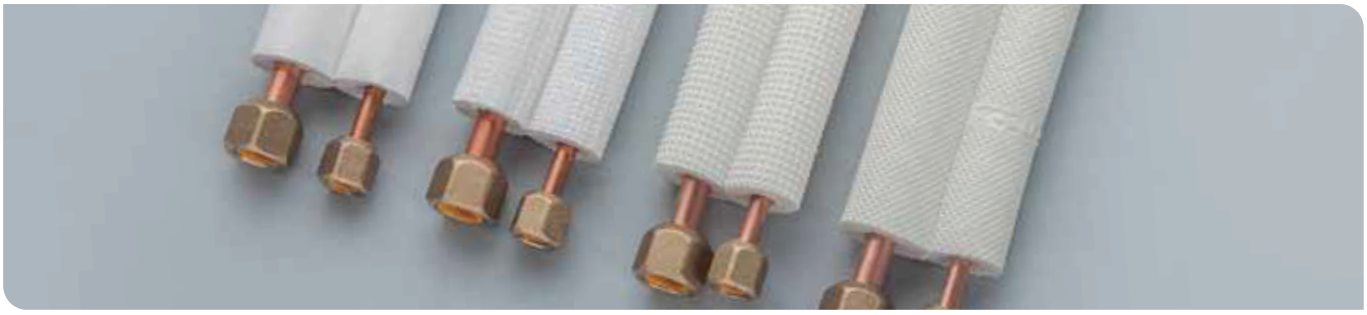
Copper tube external diameter	Inch	1/4-3/8	1/4-1/2	1/4-5/8	1/4-3/4	3/8-1/2	3/8-5/8	3/8-3/4	1/2-3/4
	mm	6,35-9,52	6,35-12,7	6,35-15,88	6,35-19,05	9,52-12,7	9,52-15,88	9,52-19.05	12,7-19,05
Copper tube wall thickness	mm	0,80-0,80	0,80-0,80	0,80-1,00	0,80-1,00	0,80-0,80	0,80-1,00	0,80-1,00	0,80-1,00
Overall 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
Permissible operating pressure	bar	159-101	159-74	159-74	159-61	101-74	101-74	101-61	74-61

Other sizes and special packaging in pallets or cardboard boxes are available upon request.
The values of the permissible operating pressure are calculated with a safety factor 4 according to AD2000-Merkblatt B0/B1 for R220 (soft) condition and temperature up to 100 ^{0}C.

Insulation Technical Properties

MATERIAL	PE-X foam
DENSITY ACCORDING TO DIN 53420 ASTM D 1667	30-33 Kg/m^3
THERMAL CONDUCTIVITY COEFFICIENT (ñ) ACCORDING TO ASTM C 335	0,039 W/m.K
VAPOUR-WATER DIFFUSSION RESISTANCE COEFFICIENT (μ) ACCORDING TO ISO 12572	> 9.000
WORKING TEMPERATURE	-80^{0}C to +110^{0}C
FIRE RESISTANCE	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
SOUND ABSORPTION ACC. TO DIN 4109 300-2500Hz	~60%
DIMENSIONAL STABILITY ACCORDING TO ISO 2796 FOR TEMPERATURES UP TO 100^{0}C	<5%

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





عبد الحافيظ للتجارة والمقاولات ذ.م.م

Abdul Hafiz Trading & Contrating Co. W.L.L.