
ASTERIA
COPPER INDUSTRIES


Crafted for Excellence

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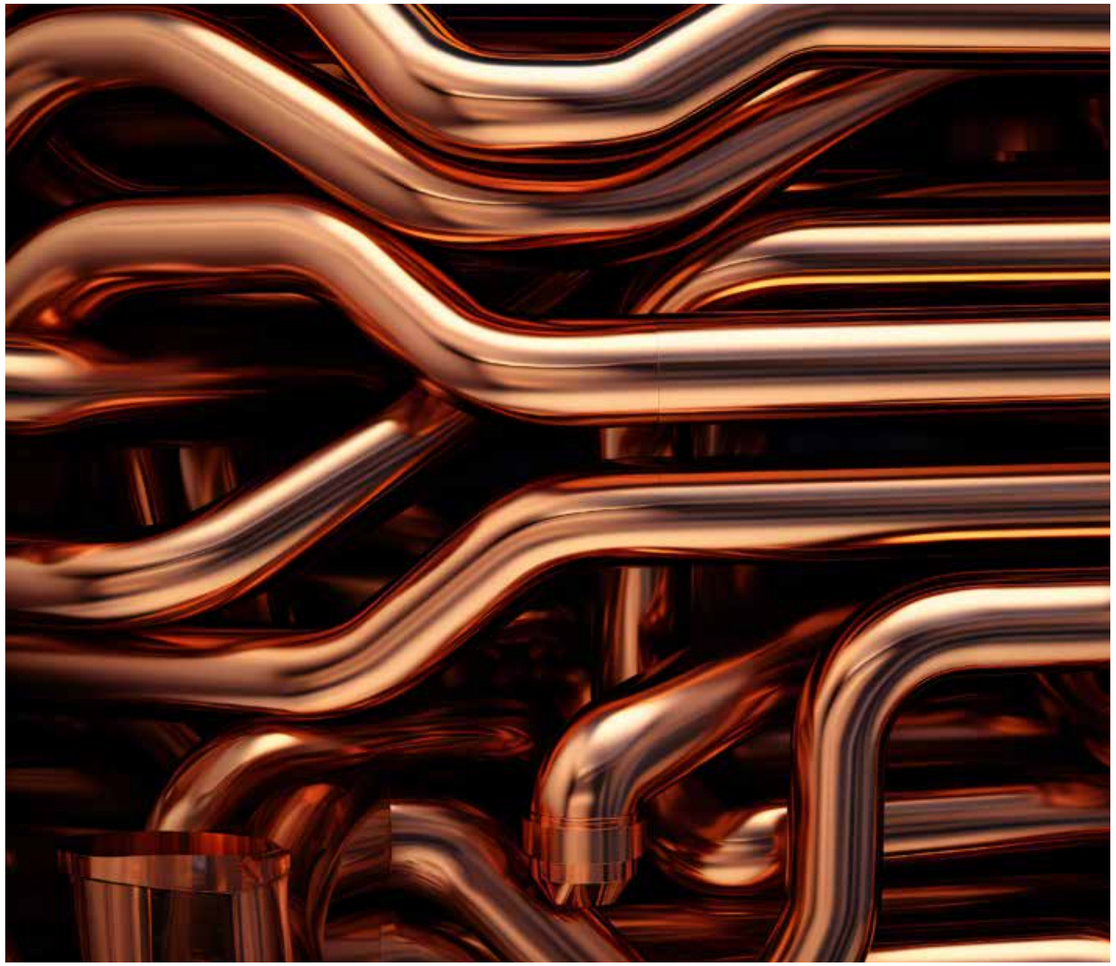
Climate change and consequently ecosystem changes have led to a global policy shift towards decarburization and green energy. In this regard, the increasing demand of using new oil (copper metal) in electric machins, infrastructures of renewable energy production, fast transportation infrastructures, cooling systems of data processing centers, and etc. makes the role of this metal more prominent; So that the European Commission in its raw material program[1] has classified this metal as a strategic raw material. ASTERIA company, in line with its global, national mission and organizational strategy, has started a copper pipe factory to prevent the raw sale of this precious metal.



1 – Critical Raw Materials Act (CRMA)

Why Copper Pipes?

- Copper is recyclable many times without loss of quality and is the third most recycled metal in the world after iron and aluminum.
- The excellent anti-bacterial properties of copper prevent the growth of fungi and bacteria inside the pipe. It reduces the number of harmful microorganisms in drinking water without altering its taste.
- Due to its thermal conductivity, it helps reduce energy consumption in heating and cooling systems.
- High resistance against corrosive agents such as HFOs, HFCs, and natural refrigerants (R- 410A, R- 32, R- 134A, R- 407C, R1234-yf, R1234-ze, R- 600, R- 744) and the hydrogen embrittlement guarantee the lifespan of the structure which leads to decrease the maintenance cost of the building.
- The ability to bend and form at ambient temperature creates a wide range of copper fittings, which facilitates the process of piping. Also, by means of soldering and welding, a strong and leak-proof connection can be achieved.
- Copper pipe is not flammable and does not emit toxic gases in fire. It also prevents the spread of fire, so it is a good choice for plumbing in the ground, walls and ceiling.
- Due to its low thermal expansion coefficient, the safety factor of working with copper pipe is high.
- The smoothness of the inner surface of the plain tube and low friction coefficient ensure the proper flow of fluid, even in low diameters.
- Changes in working temperature do not significantly change the mechanical properties of copper pipes.
- Against direct sunlight and ultraviolet rays, it will not become brittle over time.

Why ASTERIA Copper Pipes?

ASTERIA has established its copper pipe production line by the CAST & ROLL method, with the namely capacity of 30,000 metric tons per year to meet the needs of the domestic and overseas markets. This company plans to initiate the development phase for production of insulated pipes and various types of copper fittings.
A diverse basket of various products, the quality of the produced products, reduction in production time (especially in the producing of inner-grooved pipes), along with access to cheap and varied transportations and consequently faster delivery time have positioned ASTERIA as an ideal candidate for use in air conditioning industries, cooling-heating industries, construction industry, household appliances, hospital equipment, and other applications.

Copper Pipe Production Factory

The ASTERIA copper pipe factory has been lunched on an area of 9 hectares and 75000 square meters of infrastructure.

The Process of Copper Pipe Production

This plant includes 14 main sections: Melting, Horizontal casting of mother tubes, Surface Milling, Planetary rolling (PSW), Primary and secondary drawing (spinner block), Level winder, Intermediate annealing, Inner grooving, Finishing, Final annealing, Quality control, and packaging.

Melting and Casting

This factory consists of two melting furnaces with a daily melting capacity of 120 tons and a 13-ton holding furnace. In this stage, initially, the cathode grade A, according to the ASTM B115 and EN 1978, is melted where appropriate alloying with phosphorus bronze is carried out, and then transferred to the inductive holding furnace. After controlling the quality parameters of the molten material, 4 lines of the mother tubes are casted simultaneously, horizontally and continuously. Then these tubes with dimensions of OD92 / TH25 / L25000 millimeters transferred to specific baskets.

Surface Milling

Surface milling is performed to a depth of approximately 0.4 to 1 millimeter in order to create a shiny surface, free from oxidation and potential surface solidification defects.

Planetary Rolling (PSW)

The even surface and metallurgical changes in grain size, resulting from the process of hot rolling, suspend the oxidation of the pipe surface and lead to increase resistance to fatigue and surface corrosion. Additionally, this smooth outer surface facilitates placement of pipes for the construction of refrigeration facilities by the operator. The flow of all utilized pipes will be similar while longitudinal expansion. The output of PSW will be pipes with dimensions of OD52 / TH2.5 millimeters.

Primary Drawing

Factors affecting the drawing section include the quality of input pipe, the type of drawing machines, the drawing tools and the process of reducing diameter and thickness to the desired outcome. The diameter and thickness of tubes, produced in the previous stage, are reduced in two stages to dimensions of OD32 / TH1.5 millimeters based on the production process design.

Secondary Drawing (Spinner Block)

In order to make the final sizing, the drawn pipes from the former stage are transferred to 5 spinner block machines. The difference between this machine and the primary drawing machine lies in the ease of the number of drawing steps which enable us to produce tubes with a minimum diameter of 4 and a thickness of 0.30 millimeters.

Double Head Level Winder

After reaching the demanding sizes, the tubes are sent to level winder. In this step the whole surface of all tube passes through the eddy current device for inspection. The inspection is carried out using two devices: Defectomat (point defect detector) and Rotating (line defect detector). Potential areas of surface defects are marked with a color and could be separated by the customer if necessary. The number of faults is controlled in accordance with standards and then tubes are wound in shape of 100 - 300 kg rolls.

Straight and Pancake Production Machine (Finishing)

In finishing, tubes are cut into straights or pancakes with different lengths based on the customer’s order. This machine is capable of producing straights from 3 to 6 meters long and pancakes from 5 to 100 meters. In this, all the pipes are inspected by eddy current as well. If any fault is detected, the defective product will be omitted completely from the production cycle.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Horizontal Annealing Furnace for Straight

This cylindrical furnace with a diameter of 660 mm and a length of 6200 mm has 3 operating zones and capacity of about 150 straights.

In-line Annealing

Since the drawing process has been done in cold temper, some residual tensions are formed in the tubes. In order to release these tensions and modification of metallurgical structure, tubes will be passed through an annealing furnace.

Inner Groove Shaping Machine

The creation of grooves on the inner surface of the tube causes an increase in the effective surface, creating a vortex flow in the cooling fluid, as well as its uniform distribution on the inner surface of tube and as a result, increasing the thermal conductivity of the tubes. This thermal conductivity enhancement is 1.8 to 2 times more than plain pipes. The main advantages of using these products are:

- Increasing system efficiency
- Reducing energy consumption
- Reduction of raw materials used to build facilities
- Reducing the consumption of cooling gas
- Reducing the physical space occupied by the facility

Final Annealing

In this unit coil and pancake tubes are heated up to a suitable temperature in the final annealing furnace to regain their mechanical properties such as cold workability, machinability and also make a shiny surface. Then they will be held at the same temperature for a while and finally cooled down to the room temperature at suitable speed. To avoid the oxidation of the tubes, the oxygen is vacuumed and instead of it, pure nitrogen gas is blown into the furnace.

Quality Control and Laboratory

The quality control of ASTERIA operates as an independent unit to control incoming raw materials, intermediate and final products. A quality control strategy based on the PDCA cycle, continuous improvement of production process, and TQM[1] thinking

1- Total Quality Management

prioritize the quality of products with the help of collective participation of employees. Having accurate laboratory equipment, this laboratory examines the products with the highest quality level in accordance with the latest national and international standards (ASTM, EN, DIN, BS, JIS).

Some of the common tests are:

- **Chemical Analysis**: The elemental analysis of the input cathode and the produced tube, especially amount of phosphorus and hydrogen elements, are measured by a quantometer (OBLF) device.

- **EDDY Current test**: In order to eliminate defective products (tube with hole or scratch) from production line and ensure the intact tubes, this test is performed on 100% of products through Defectomat and Rotating devices. Places with possible defects are marked with black ink.
1) Defactomat detects non-uniformities, point defects and voids.
2) Rotating detects non-uniformities, linear and longitudinal defects.

- **Tensile Strength Test**: To determine strength and elongation of products.

- **Hardness Test**: By Vickers and Rockwell devices.

- **Metallographic Test and Determination of Grain Size:** By optical microscope.

- **Dimensional Control:** Dimensional measurement (diameter and thickness of plain pipe, as well as diameter, thickness, angle and depth of groove in inner-grooved tube) are determined by means of micrometers and the microscope.

- **Cleanness Test:** The surface pollution of the pipe (oil and shavings) is checked by an ultrasonic device. Degreasing of hospital equipment and removing of shavings in the air conditioning and cooling-heating system are of particular importance.

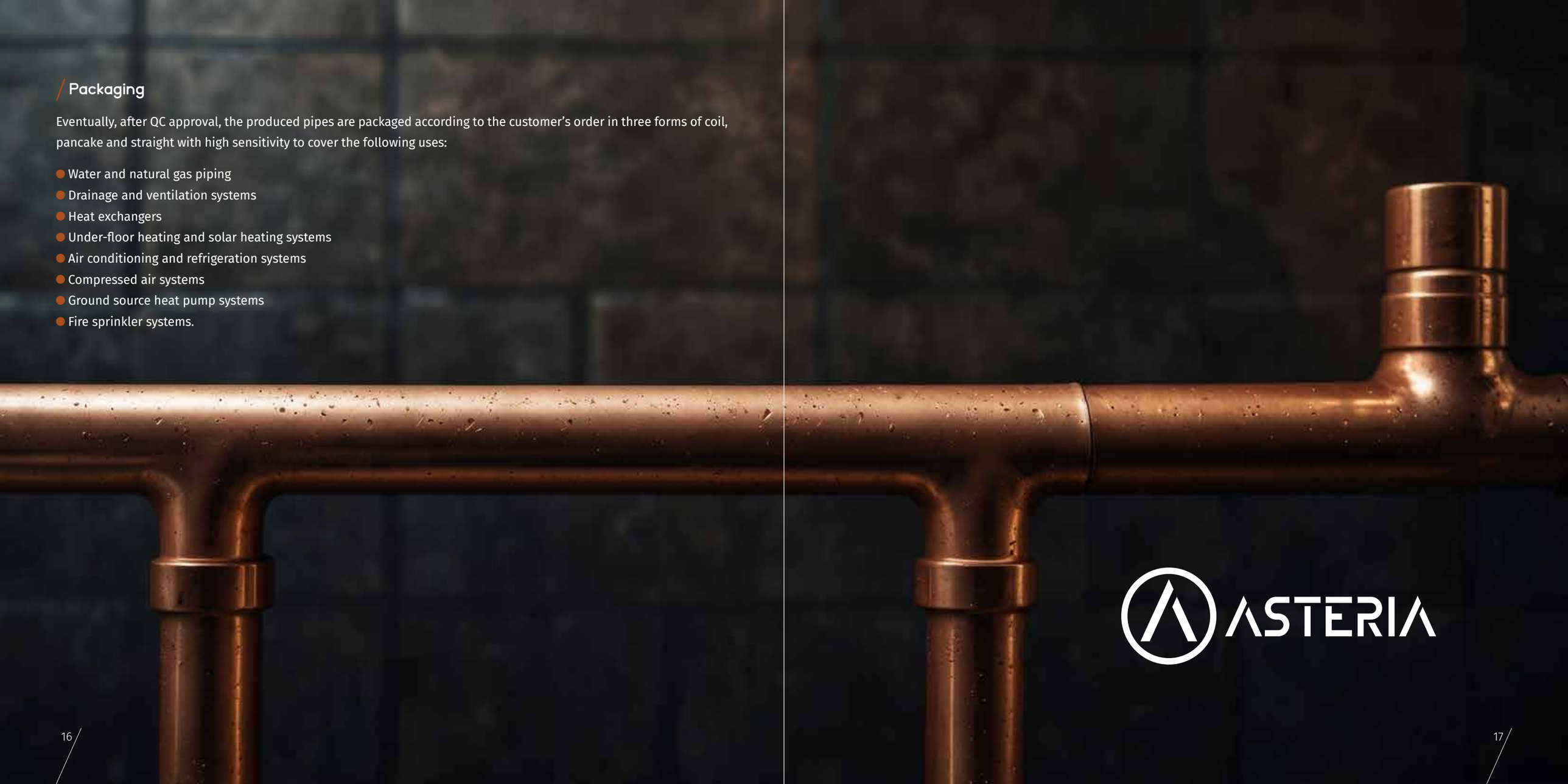
- **Bending, Expanding, Hydrostatic and Pneumatic Pressure Tests:** To examine the ability to bend, expand, and tolerable pressure of tubes to meet the customer's needs for special applications.

- **Moisture Meter:** To evaluate the moisture content of wooden packaging pallet.

Packaging

Eventually, after QC approval, the produced pipes are packaged according to the customer's order in three forms of coil, pancake and straight with high sensitivity to cover the following uses:

- Water and natural gas piping
- Drainage and ventilation systems
- Heat exchangers
- Under-floor heating and solar heating systems
- Air conditioning and refrigeration systems
- Compressed air systems
- Ground source heat pump systems
- Fire sprinkler systems.



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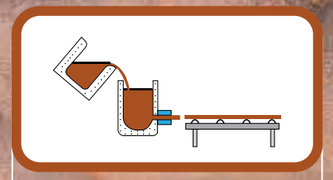
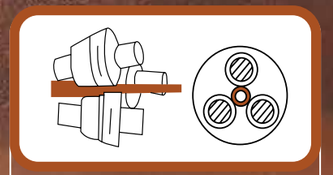
Production Steps of Copper Pipe

Copper Cathode

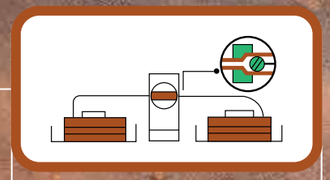


Melting & Casting

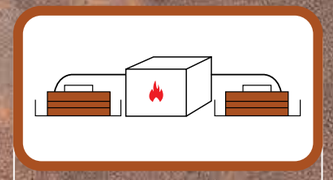
Surface Milling



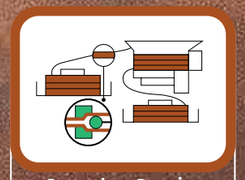
Rolling / PSW



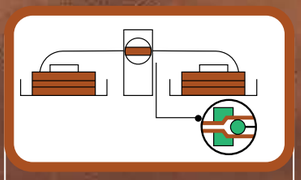
Inner Groove Machine



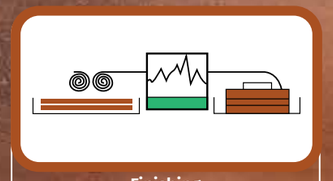
In-line Annealing



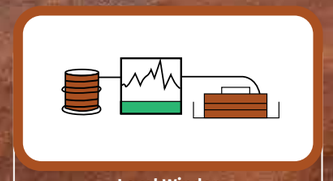
Secondary Drawing
(Spinner Block)



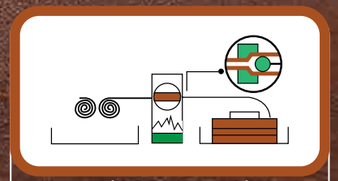
Primary Drawing



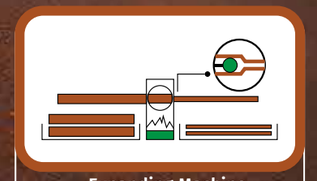
Finishing
(Eddy current for Pancake & Straight)



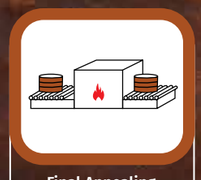
Level Winder
(Eddy current for LWC)



Capillary Tube Machine
(Eddy current for capillary)



Expanding Machine
(Eddy current for straight)



Final Annealing
(Protective atmosphere)

Inspection

Packing

Chemical Composition

DHP alloy contains 150-400ppm (0.015-0.040 weight percent) of phosphorus. Phosphorus is a deoxidant element and increases the fluidity of the melt and, as a result, proper welding.

Alloy	Denomination	ASTM B5	GIS H3300	DIN 1708	BS 2870	EN 12735-1	NF A 51-050
DHP	Deoxidized High Phosphorous	C12200	C1220	SF-Cu (2.0090)	C106	Cu-DHP (CW024A)	Cu-b1

Mechanical Properties

Standard	No.	Temper (Annealing Type)		Yield Strength (MPa)	Minimum Tensile Strength (MPa)	Minimum Relative Elongation (%)	Grain Size (µm)	Vickers (HV5)	Hardness		
									Rockwell		
									Thickness (mm)	Scale	Amount
ASTM	B75 B88 B111 B280	O60	Soft Annealed	62 min	205	40	40 min	–	from 0.381 to 0.889	15T	60 max
									from 0.889 and more	F	50 max
		O50	Light Annealed	62 min	205	40	15-40	–	from 0.381 to 0.889	15T	65 max
									from 0.889 and more	F	55 max
		H58	Drawn	205 min	250	–	–	–	All	30T	30 min
		H80	Hard-drawn	275	310	–	–	–	from 0.508 to 6.35	30T	55 min
EN	12735 - 1 & 2 1057	Y035	Soft Annealed	35-80	210	40	30-60	–	–	–	–
		R220 / Y040	Light Annealed	40-90	220	40	15-40	40-70	–	–	–
		R250	Half Hard	–	250	30a 20b	–	75-100	–	–	–
		R290	Hard	–	290	3	–	100 min	–	–	–
JIS	H3300	O	Soft Annealed	–	205	40	25-60	69 max	0.25<t≤30	15T	60 max
		OL	Light Annealed	–	205	40	40 max	73 max	0.25<t≤30	15T	65 max
		½ H	Half Hard	–	245-325	–	–	70-110	0.25<t≤25	30T	30-60
		H	Hard	–	315	–	–	100 min	0.25<t≤3	30T	55 min

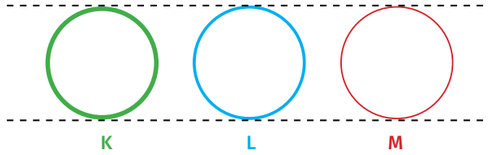
A. When the nominal diameter is less than- equal to 66.7 mm; and either the nominal thickness is less than 1 mm or $24 < \frac{\text{nominal diameter}}{(\text{nominal thickness})^2}$

B. When the nominal diameter is greater than 66.7 mm; or the nominal thickness is greater than - equal to 1 mm and also $24 \gg \frac{\text{nominal diameter}}{(\text{nominal thickness})^2}$

Range of Products

Products and Dimension Range	Form	Outer Diameter			Thickness		Length (m)				
		Unit	from	to	from	to	from			to	
	Pancake	inch	3/16	7/8	0.012	0.059	5	15	30	50	100
		mm	4.76	22.22	0.3	1.5					
	Plain straight /Inner grooved	inch	1/4	3 1/8	0.014	0.108	3			6	
		mm	6.35	79.37	0.35	2.76					
	Plain coil /Inner grooved	inch	3/16	3/4	0.012	0.056	–			–	
		mm	4.76	19.05	0.3	1.42					
	Capillary	inch	0.074	0.12	0.014	0.025	–			–	
		mm	1.9	3	0.35	0.64					

Dimension of K, L and M Types



Nominal O.D (in)	Nominal O.D (mm)	Actual O.D (in)	Actual O.D (mm)	K Type		L Type		M Type	
				Green		Blue		Red	
				Thickness		Thickness		Thickness	
				(in)	(mm)	(in)	(mm)	(in)	(mm)
1/4	6.35	3/8	9.52	0.035	0.9	0.030	0.75	–	–
3/8	9.52	1/2	12.7	0.049	1.24	0.035	0.9	0.025	0.63
1/2	12.7	5/8	15.87	0.049	1.24	0.040	1	0.028	0.7
5/8	15.87	3/4	19.05	0.049	1.24	0.042	1.07	–	–
3/4	19.05	7/8	22.22	0.065	1.65	0.045	1.14	0.032	0.8
1	25.4	1 1/8	28.57	0.065	1.65	0.050	1.27	0.035	0.9
1 1/4	32.54	1 3/8	35	0.065	1.65	0.055	1.42	0.042	1.07
1 1/2	38.1	1 5/8	41.27	0.072	1.83	0.060	1.52	0.049	1.24
2	50.8	2 1/8	54	0.083	2.1	0.070	1.78	0.058	1.5
2 1/2	63.5	2 5/8	66.67	0.095	2.41	0.080	2.03	0.065	1.65
3	76.2	3 1/8	79.37	0.109	2.77	0.090	2.29	0.072	1.83

Dimensional Tolerances (ASTM B251)

O.D (mm)	Average Diameter Tolerance (mm)
O.D≤3	± 0.05
3< O.D ≤16	
16< O.D ≤25	±0.06
25< O.D ≤50	±0.08
50< O.D ≤75	±0.10
75< O.D ≤100	±0.12

Average Thickness Tolerance					
Thickness (mm)	0.8<O.D≤3	3<O.D≤16	16<O.D≤25	25<O.D≤50	50<O.D≤100
W.T≤0.4	±0.05	±0.03	±0.04	±0.05	–
0.4<W.T≤0.6	±0.08	±0.05	±0.05	±0.06	
0.6<W.T≤0.9		±0.06	±0.06	±0.08	±0.10
0.9<W.T≤1.5		±0.08	±0.09	±0.09	±0.12
1.5<W.T≤2	–	±0.09	±0.10	±0.10	±0.15
2<W.T≤3		±0.10	±0.12	±0.12	±0.20

Calculation of Tolerable Pressure for Copper Pipe According to Barlow's Equation (ASTM B31)

P : Hydrostatic pressure

S (Annealed): Allowable stress for annealed material

S (Drawn): Allowable stress for drawn material

T : Minimum thickness

D: Maximum actual outer diameter

$$P = \frac{2st}{D - 0.8\,t}$$

in design of a system, the resistance of the weaker material (pipes, joints or soldering filler) determines the resistance of the entire system.

Safe Working Pressure

O.D (mm)	Type	Tolerable Pressure (bar) at 37 °c		Tolerable Pressure (bar) at 65 °c		Tolerable Pressure (bar) at 93 °c		Tolerable Pressure (bar) at 121 °c		Tolerable Pressure (bar) at 148 °c		Tolerable Pressure (bar) at 176 °c		Tolerable Pressure (bar) at 204 °c	
		Annealed	Hard	Annealed	Hard	Annealed	Hard	Annealed	Hard	Annealed	Hard	Annealed	Hard	Annealed	Hard
9.52	K	74	127	63	127	60	127	59	127	58	124	49	120	37	116
	L	63	108	53	108	51	108	50	108	49	105	42	102	31	99
12.7	K	78	134	66	134	64	134	62	134	61	130	52	126	39	122
	L	53	92	45	92	44	92	43	92	42	90	36	87	27	84
	M	39	68	33	68	32	68	31	68	31	65	26	64	19	62
15.87	K	61	105	52	105	50	105	49	105	48	103	41	99	30	97
	L	50	85	42	85	40	85	40	85	39	83	33	80	25	78
	M	34	58	29	58	27	58	27	58	26	57	22	55	17	53
19.05	K	50	87	43	87	41	87	40	87	39	85	34	82	25	80
	L	43	75	37	75	35	75	35	75	34	73	29	70	22	68
22.22	K	58	101	50	101	48	101	47	101	46	98	39	95	29	92
	L	40	69	34	69	33	69	32	69	31	67	27	65	20	63
	M	28	48	24	48	23	48	22	48	22	46	18	45	14	44
28.57	K	45	77	38	77	37	77	36	77	35	75	30	73	22	71
	L	34	58	29	58	28	58	27	58	26	57	23	55	17	53
	M	23	40	20	40	19	40	18	40	18	39	15	37	11	36
35	K	36	63	31	63	30	63	29	63	28	61	24	59	18	57
	L	30	52	25	52	24	52	24	52	24	50	20	49	15	47
	M	23	40	19	40	19	40	18	40	18	39	15	38	11	36
41.27	K	34	58	29	58	28	58	27	58	26	57	23	55	17	53
	L	28	48	24	48	23	48	22	48	22	47	19	45	14	44
	M	23	39	19	39	18	39	18	39	18	38	15	37	11	36
54	K	30	51	25	51	24	51	24	51	23	50	20	48	15	47
	L	25	43	21	43	20	43	20	43	19	42	17	40	12	39
	M	20	35	17	35	17	35	16	35	16	34	14	33	10	32
66.67	K	27	47	23	47	22	47	22	47	21	45	18	44	14	43
	L	23	40	19	40	19	40	18	40	18	38	15	37	11	36
	M	19	32	16	32	15	32	15	32	15	31	12	30	9	29
79.37	K	26	45	22	45	22	45	21	45	20	44	17	43	13	41
	L	22	37	18	37	18	37	17	37	17	36	14	35	11	34
	M	17	30	15	30	14	30	14	30	14	29	11	28	9	27

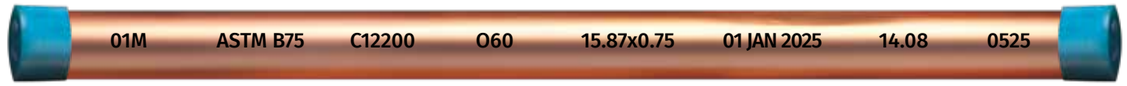
Product Types
Pancake

Seamless copper pipes in the form of pancake are used for purposes such as repairs, fittings in the air conditioning and cooling-heating industries. Asteria will engrave the length, meter by meter on the tube in order to facilitate the use of pancake tube.

Dimension

W.T / O.D	mm	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.63	0.7	0.75	0.8	0.9	1	1.24	1.42	1.5
mm	in	0.012	0.014	0.016	0.018	0.020	0.021	0.023	0.025	0.028	0.030	0.032	0.035	0.039	0.049	0.056	0.059
4.76	3/16								✓								
6.35	1/4		✓		✓	✓			✓	✓	✓	✓		✓			
7.93	5/16								✓					✓			
9.52	3/8	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓
12								✓									
12.7	1/2	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓			
14										✓							
15.87	5/8								✓	✓	✓	✓	✓	✓			
19.05	3/4								✓	✓	✓	✓	✓	✓		✓	
22.22	7/8											✓	✓	✓			

Asteria is capable of producing other sizes according to customer's order.



Meter Counter (Lenght Meter)	Standard	Alloy	Tamper	Dimension	Production date (mfg Date)	Time	Batch NO.

/ Weight Table for Frequently Used Dimentions

O.D		W.T		Length	Weight/m
mm	in	mm	in	m	kg
6.35	1/4	0.63	0.025	5 /15 / 30 / 50 / 100	0.1
9.52	3/8				0.15
12.7	1/2				0.21
15.87	5/8				0.26
19.05	3/4				0.32
6.35	1/4	0.7	0.028		0.111
9.52	3/8				0.17
12.7	1/2				0.23
15.87	5/8				0.29
19.05	3/4				0.36
6.35	1/4	0.75	0.030		0.118
9.52	3/8				0.18
12.7	1/2				0.25
15.87	5/8				0.31
19.05	3/4				0.35

O.D (mm)	Carton Dimension (mm)	Wooden Pallet Dimension (mm)	Chipboard Pallet Demension (mm)
6.35	528x603	1076x623	110x130
7.93	528x603	1076x623	110x130
9.52	588x672	1196x692	110x120
12.7	648x741	1316x761	110x130
15.87	708x810	1436x830	
19.05	778x890	1576x910	
22.22	828x948	1676x968	

LWC (Level Wound Coil)

LWC seamless products are used in the mass production lines of air conditioning systems and heat exchangers.

Dimension

W.T / O.D	(mm)	0.3	0.33	0.35	0.4	0.45	0.5	0.55	0.6	0.63	0.7	0.75	0.8	0.9	1	1.14	1.24	1.42
(mm)	in	0.012	0.013	0.014	0.016	0.018	0.020	0.021	0.024	0.025	0.028	0.030	0.032	0.035	0.039	0.045	0.049	0.056
4.76	3/16									✓	✓							
6											✓							
6.35	1/4	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓			
7.93	5/16			✓	✓	✓	✓			✓		✓	✓		✓			
9.52	3/8	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓
10															✓			
12.7	1/2	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
15.87	5/8				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
18											✓	✓	✓	✓				
19													✓					
19/05	3/4						✓			✓	✓	✓	✓	✓	✓	✓	✓	✓

Asteria is capable of producing other sizes according to customer's order.

/ Weight Table for Frequently Used Dimensions

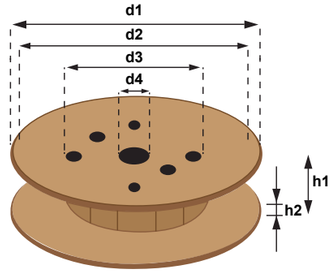
O.D		W.T		Weight/m
mm	in	mm	in	kg
4.76	3/16	0.63	0.025	0.073
		0.7	0.028	0.08
6.35	1/4	0.4	0.016	0.067
		0.5	0.020	0.075
		0.63	0.025	0.101
		0.75	0.030	0.118
7.93	5/16	0.4	0.016	0.084
		0.45	0.018	0.094
		0.5	0.020	0.104
		0.63	0.025	0.129
9.52	3/8	0.35	0.013	0.09
		0.5	0.020	0.126
		0.63	0.025	0.157
		0.75	0.030	0.184
12.7	1/2	0.3	0.012	0.104
		0.35	0.013	0.121
		0.4	0.016	0.138
		0.45	0.018	0.155
		0.5	0.020	0.171
		0.63	0.025	0.213
		0.75	0.030	0.251
15.87	5/8	0.5	0.020	0.215
		0.63	0.025	0.269
		0.75	0.030	0.318
19.05	3/4	0.5	0.020	0.26
		0.63	0.025	0.325
		0.75	0.030	0.385
		0.9	0.035	0.485
		1.24	0.045	0.619
		1.42	0.055	0.702

/ Packaging

Bobbin Dimensions						Bobbin Net Weight
Outer Diameter (d1)	Diameter of the Wounded coil (d2)	Inner Diameter (d3)	Decoiler Diameter (d4)	Height (h1)	Flange Thickness (h2)	
mm						kg
1080	1070	600	130	300	10	100-300

	Lenght (mm)	Width (mm)	Height (mm)	Number of Bobbins on Each Pallet	Pallet Weight (kg)
Chipboard Pallet	1100	1300	150	5-6	500-1000
Wooden Pallet	1130	1130	100	5-6	500-1000

Due to the quality of the outer surface of the pipe, it is possible to use the coil as an eye to the sky. In this case, without the need for special equipment, the costs of moving in the customer's production line and the time of stopping the line to load a new coil are reduced, and as a result, the production efficiency is increased. The volume and time of packaging materials is also reduced for ASTERIA company. It is also possible to produce heavy coils with the weight of about 300 kg. After the final annealing, the inside of the tube is completely cleaned by blowing nitrogen gas and finally, in order to prevent any pollution and surface oxide, both ends of the tube are closed with caps.



1- Eye to The Sky

/ Straight

Seamless copper straight pipes are used in industries such as air conditioning, refrigeration, electrical and sanitary industries.

Dimension

W.T / O.D	(mm)	0.35	0.40	0.45	0.5	0.6	0.63	0.7	0.75	0.8	0.9	1	1.14	1.24	1.42	1.5	1.6	1.65	1.83	2.02	2.1	2.28	2.5	2.76
(mm)	in	0.014	0.016	0.018	0.020	0.024	0.025	0.028	0.030	0.032	0.035	0.039	0.045	0.049	0.056	0.059	0.063	0.065	0.072	0.079	0.082	0.089	0.098	0.1
6.35	1/4						✓																	
7.93	5/16						✓	✓																
9.52	3/8				✓		✓	✓		✓	✓	✓		✓										
10												✓												
12												✓												
12.7	1/2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓										
15												✓												
15.87	5/8						✓	✓		✓	✓	✓	✓	✓										
19					✓																			
19.05	3/4				✓		✓	✓	✓	✓	✓	✓	✓	✓	✓									
22												✓				✓								
22.22	7/8									✓	✓	✓	✓	✓				✓						
23									✓															
28												✓												
28.57	1 1/8											✓		✓				✓						
35	1 3/8											✓	✓	✓	✓			✓	✓					
41.27	1 5/8													✓	✓	✓			✓					
54	2 1/8														✓	✓	✓		✓		✓			
66.67	2 5/8																			✓			✓	
79.37	3 1/8																					✓		✓

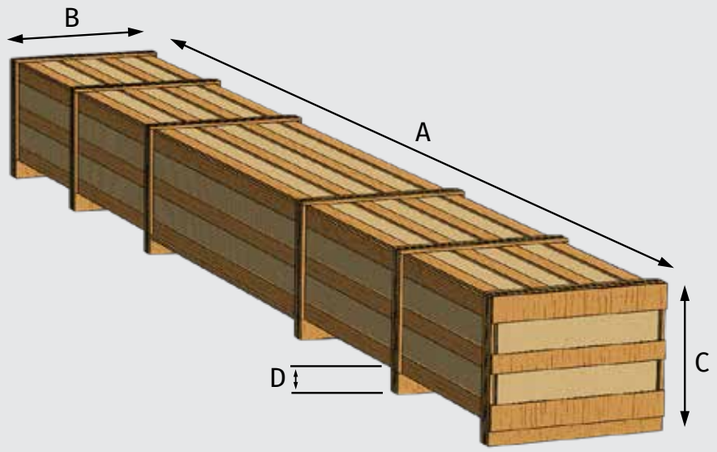
Asteria is capable of producing other sizes within demanding period of time according to customer's orders.
Also, according to the customer's request, hard, semi-hard or soft pipes can also be produced.

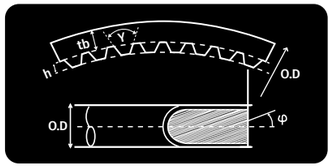
Weight Table for Frequently Used Dimensions

O.D		W.T		Length	Weight/m
mm	in	mm	in	m	kg
9.52	3/8	0.5	0.020	3 to 6	0.126
		0.63	0.025		0.157
		0.75	0.030		0.184
12.7	1/2	0.5	0.020		0.171
		0.63	0.025		0.213
		0.75	0.030		0.251
15.87	5/8	0.5	0.020		0.215
		0.63	0.025		0.269
		0.75	0.030		0.318
		0.8	0.032		0.338
		1	0.039		0.417
19.05	3/4	0.5	0.020		0.26
		0.63	0.025		0.325
		0.75	0.030		0.385
		0.8	0.032		0.409
		1	0.039		0.506
		1.24	0.049		0.619
22.22	7/8	0.8	0.032		0.48
		1	0.039		0.595
		1.24	0.049		0.729
28.57	1 1/8	1	0.039		0.773

/ Packaging

Packaging Type	Pallet dimension				Pallet Weight	
	Length (A)	Width (B)	Height (C)	Wood Lath (D)	Min	Max
	millimeter				kg	
Wooden pallet	6080	440	420	80	80	90
Metal pallet	6080	440	420	80	95	110





Dimension for LWC and Straight

Specification	O.D (mm)	Bottom Wall	Groove Depth, h (mm)	Apex Angle, ϒ (degree)	Helix Angle, φ (degree)	Number of Tooth' n	Unit Weight (gr/m)
5*0.2 + 0.15	5	0.2	0.15	40°	18°	40	34
7*0.22 + 0.1	7	0.22	0.10	40°	15°	65	47
7*0.23 + 0.14	7	0.23	0.14	35°	15°	58	49
7*0.25 + 0.1	7	0.25	0.10	40°	18°	50	52
7*0.25 + 0.15	7	0.25	0.15	40°	18°	65	58
7*0.28 + 0.15	7	0.28	0.15	40°	18°	50	62
7.93*0.28 + 0.15	7.93	0.28	0.15	40°	18°	50	70
9.52*0.27 + 0.16	9.52	0.27	0.16	40°	18°	70	82
9.52*0.28 + 0.12	9.52	0.28	0.12	40°	18°	65	80
9.52*0.28 + 0.15	9.52	0.28	0.15	40°	18°	60	86
9.52*0.28 + 0.20	9.52	0.28	0.20	53°	18°	60	89
9.52*0.30 + 0.20	9.52	0.30	0.20	53°	18°	60	95
9.52*0.34 + 0.15	9.52	0.34	0.15	50°	18°	60	103
9.52*0.45 + 0.20	9.52	0.45	0.20	48°	18°	60	132
12*0.41 + 0.20	12	0.41	0.20	65°	18°	60	156
12.7*0.35 + 0.25	12.7	0.35	0.25	53°	18°	65	155
12.7*0.45 + 0.20	12.7	0.45	0.20	53°	18°	50	180
15.87*0.52 + 0.30	15.87	0.52	0.30	53°	18°	75	239

Asteria is capable of producing other sizes according to customer's order.

/ Capillary Tube

Dimension

O.D (mm)	I.D (mm)	W.T (mm)
1.9	0.64	0.63
1.9	0.66	0.62
1.9	0.71	0.60
2.01	0.79	0.61
2.18	0.91	0.64
2.24	1.07	0.59
2.39	1.27	0.56
2.52	1.4	0.56
2.59	1.52	0.54
2.85	1.78	0.54
3	2.2	0.40
3	2.3	0.35

Asteria is capable of producing other sizes according to customer's order.


Crafted for Excellence

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