

Consistency, Exactitude, Magnitude, Reliability.



Star Copper

“Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives”

– William A. Foster

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ABOUT STAR COPPER

Star Group ('Star') was established in the year 1967. With more than forty years of existence, Star comprises of the following companies -

- Star Copper;
- Star Extrusion;
- Star Redrawers Private Limited; and
- Star Tubing.

Star specializes in the manufacture and export of the following products -

- Copper tubes;
- Copper rods;
- Copper flats;
- Copper bus bars;
- Copper fin tubes / Turbo chill tubes;
- Copper profiles and sections; and
- Copper cable lugs.

With a workforce of 240 employees, having all manufacturing facilities and processes in-house, Star has an annual production capacity of 2,500 Metric Tons. Star is a preferred supplier to the following leading industries -

- Medical Grade
- Air conditioning and refrigeration;
- Water and gas plumbing and fitting (sanitation);
- Heat exchangers;
- Geyser manufacturers;
- Electric lugs; and
- Solar industry.

Star has automatized and semi-automatized machines, an elaborate tool room, an extensive research and development facility and a quality control department.

An ISO 9001: 2008 certified company; Star complies with the following domestic and international standards - American, Australian, British, European, Indian, Japanese and South African.

Star believes in the following 'mantra' -

Superior quality, Competitive pricing and Scheduled delivery of products.



ABOUT STAR COPPER

Star range of products meets the following standards -

ASTM B280	Standard specification for seamless, round copper tubes for air conditioning and refrigeration
ASTM B68M	Standard specification for seamless copper tubes and bright annealing
ASTM B75	Standard specification for seamless copper tubes
ASTM B88	Standard specification for seamless copper water tubes
ASTM B111	Standard specification for copper and copper alloys / seamless condenser tubes and ferrule stock
ASTM B306	Standard specification for seamless copper drainage tubes
ASTM 188	Standard specification for seamless copper bus pipes and tubes
BS-2871/P-II	Standard specification for copper and copper alloy tubes for general purpose
EN-12451	Standard specification for copper and copper alloys / seamless, round tubes for heat exchangers
EN-12449	Standard specification for copper and copper alloys / seamless, round tubes for general purpose
EN-1057	Standard specification for seamless round copper tubes for water and gas used in sanitary and heating applications
IS-2501	Standard specification for seamless copper tubes for general engineering purpose
JIS H3300	Standard specification for seamless copper and copper alloys / seamless pipes and tubes
EN-13348	For Medical Gas Pipeline

GUIDE TO THE SELECTION OF TUBE MATERIAL

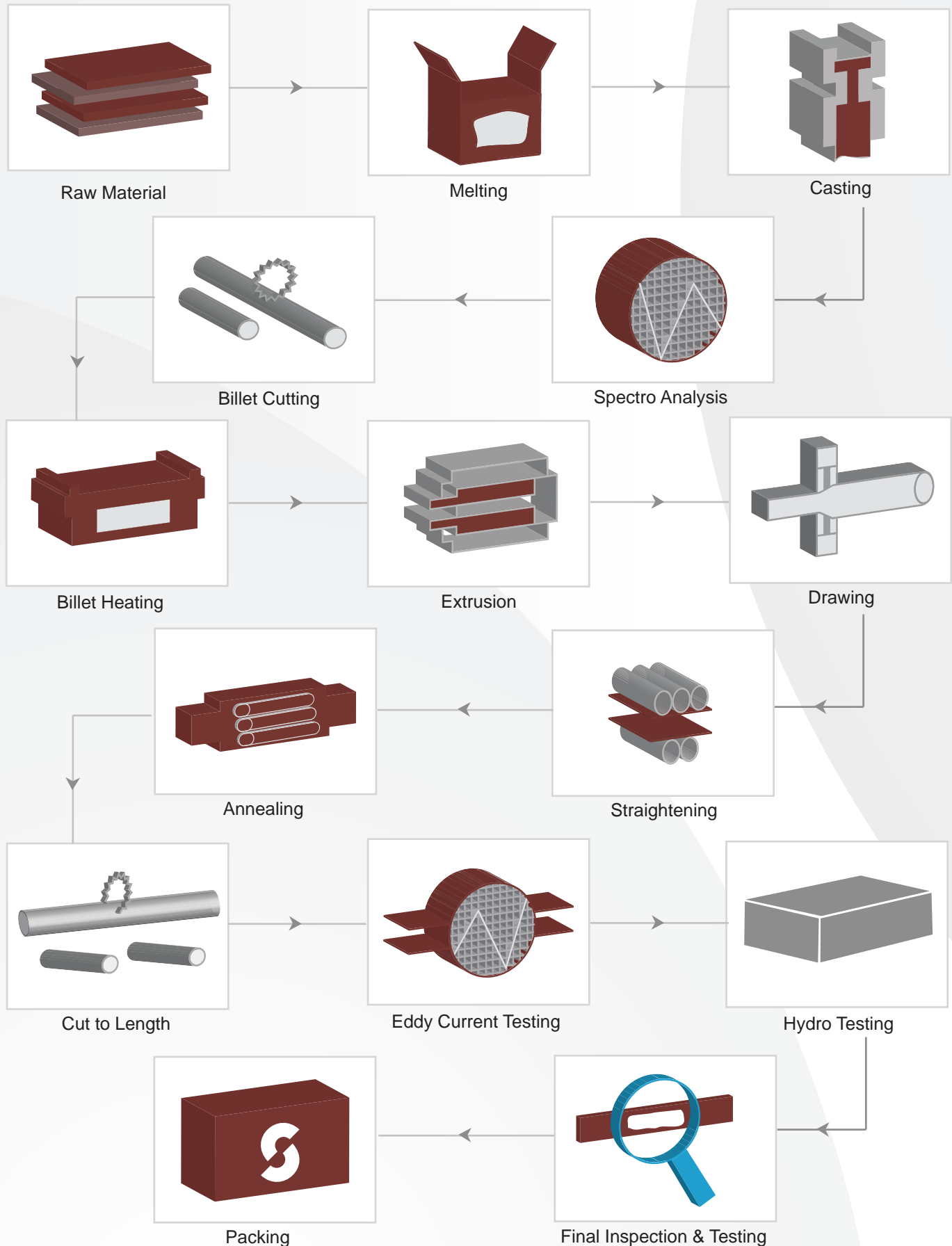
Clear River, Lake or Canal Water

- Dissolved salts less than 500ppm
- Chloride salts less than 10ppm
- H₂S or Ammonia nil
- Organic fats nil
- Suspended solids less than 5ppm

Permissible average velocity of water 0.8-1 meter/sec.

FLOW CHART

Star Extrusion's range of products meets the following standards -



PRODUCT DESCRIPTION

Deoxidized High Residual Phosphorus Copper ('DHP')

Pure copper which has been deoxidized with phosphorus, leaving a high residual of phosphorous content. DHP is not readily susceptible to hydrogen embrittlement.

Electro Touch Pitch Copper ('ETP')

Pure copper having no elements (other than oxygen) present in significant amounts. ETP has good electrical and thermal conductivity, having capacity for being cold worked and hot formed. ETP is suitable for soldering and brazing but not recommended for oxyacetylene welding.

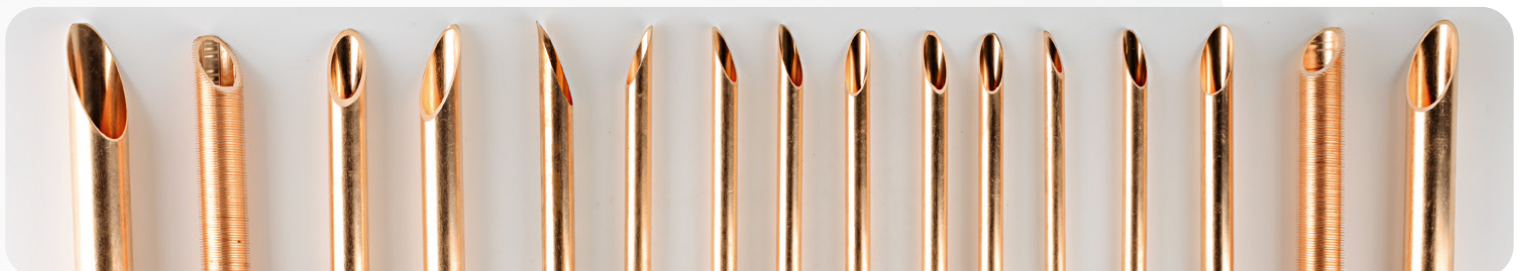
Deoxidized Low Residual Phosphorus Copper ('DLP')

Pure copper which has been deoxidized with phosphorus, leaving only a small residual content. DLP is not readily susceptible to hydrogen embrittlement. The residual phosphorus lowers the conductivity to some extent as compared to ETP copper.



PRODUCT APPLICATION AREAS

- Air conditioning and refrigeration;
- Water and gas plumbing and fitting (sanitation);
- MGPS Gas Pipeline System
- Heat exchangers;
- Solar industry;
- Electric conductors and bus bars;
- Non-flammable medical gas systems;
- Fuel oil, liquid petroleum and natural gas systems;
- Chilled water mains; and
- General engineering applications.



MEDICAL GRADE COPPER TUBE

BS EN 13348:2016 - Copper and copper alloys - Seamless, round copper tubes for medical gases or vacuum.

BS EN 1057:2010 - Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications.

We understand the importance and seriousness of Medical Gas tubing both for patients and hospitals. Through the years; we have successfully developed a culture of safety to ensure that we always deliver the right quality material with the required cleanliness to our esteem clients.

The internal cleanliness of the medical gas tubes in an oxygen application is critical in order to prevent gas contamination and potential explosions. Oxygen under pressure may cause spontaneous combustion of residual organic drawing oils if they remain inside the tube after manufacturing. Contamination may cause patients serious respiratory problem if not removed prior to dispatch of the tubes to the hospital.

At STAR, we are fully equipped with qualified personals and the required in house testing facilities to ensure that we consistently deliver the best quality Medical Grade Tubes with internal residue not exceeding 0.20mg/dm² as per Standard EN 13348:2016 /ASRTM B819-00.



MATERIAL ANALYSIS

Material Grade: Phosphorus de-oxidised copper DHP or CW024A Minimum Copper Content 99.90 Including Silver), Phosphorus 0.015-0.040%

Copper Melting Point: 1083°C

Copper Density: 8.9 gm/cc

Temper Condition: Half Hard (R250)

Tensile Strength: 250 MPa minimum.

Elongation: 30% minimum.

Hardness (Inductive) at HV 5 scale: 75 to 100

Cleanliness: Maximum total carbon content 0.20 mg/dm². The determination of lubricant residue as total carbon is carried out with the help of Carbon Determinator using reference method described in EN 723. (Combustion Method)

Freedom From Defect Test: 100% Tubes are subjected to an Eddy Current Test for detection of local defects in accordance with EN:1971

Packaging: Each tube individually end capped, polythene wrapped in bundles and sealed. Marking: Sizes 12 - 108 mm Star Copper Tubes are marked with: (Both Durable and Permanent Marking)



- Tube Size
- Lloyds (As Per Order)
- EN 13348
- Temper (Half Hard R250)
- Manufacturer
- Date & Batch Code 12 mm to 108 mm sizes are also inkjet marked with additional data to enable traceability

Dimensions and Tolerances

Outside Diameter				Wall Thickness			WT/MTR
ODxWT	Tolerance	Minimum	Maximum	Tolerance	Minimum	Maximum	KG
12.00 x 1.00	+/-0.04	11.960	12.040	+/-0.100	0.900	1.100	0.309
15.00 x 0.70	+/-0.04	14.960	15.040	+/-0.070	0.630	0.770	0.281
15.00 x 0.90	+/-0.04	14.960	15.040	+/-0.090	0.810	0.990	0.357
15.00 x 1.00	+/-0.04	14.960	15.040	+/-0.100	0.900	1.100	0.393
22.00 x 0.90	+/-0.05	21.950	22.050	+/-0.090	0.810	0.990	0.534
22.00 x 1.00	+/-0.05	21.950	22.050	+/-0.100	0.900	1.100	0.590
28.00 x 0.90	+/-0.05	27.950	28.050	+/-0.090	0.810	0.990	0.685
28.00 x 1.00	+/-0.05	27.950	28.050	+/-0.100	0.900	1.100	0.759
35.00 x 1.20	+/-0.06	34.940	35.060	+/-0.120	1.080	1.320	1.140
42.00 x 1.20	+/-0.06	41.940	42.060	+/-0.120	1.080	1.320	1.376
54.00 x 1.20	+/-0.06	53.940	54.060	+/-0.120	1.080	1.320	1.780
76.10 x 1.50	+/-0.07	76.030	76.170	+/-0.225	1.275	1.725	3.144
108.00 x 1.50	+/-0.07	107.930	108.070	+/-0.225	1.275	1.725	4.489
133.00 x 1.50	+/-0.20	132.800	133.200	+/-0.225	1.275	1.725	5.543

CERTIFICATE



Certificate no: **PRJ1110003946/1**
Page 1 of 2

Project: **STK002/18-19, dtd. 10/03/2019**

Client: **Star Copper, Umbergaon**

Office: **IFI, Mumbai**

Client's Order Number: **Signed Request for Services, dated 24 April 2019**

Date: **30 April 2019**

Order Status: **Complete**

Inspection Dates

First: **25 April 2019**

Final: **30 April 2019**

This certificate is issued to **M/S Star Copper, Umbergaon** to certify that the undersigned Surveyor did, at their request, attend their works at Umbergaon on 25.04.2019 and subsequently for the purpose of inspecting the undernoted material against their stock purchase Order No STK002/18-19, dated 10.03.2019 and to the following scope of inspection.

Seamless DHP Copper Tubes, chemical and physical properties generally in accordance with BS EN 13348: 2016 and as per client requirement in half hard (R250) condition.

- | | |
|--|----------------------------------|
| 1). 10.00 mm OD x 0.80 mm WT x 3048 mm Long Batch No. 02SRB-29 | Qty. 2417.06 metres / 793 nos. |
| 2). 12.00 mm OD x 0.80 mm WT x 3048 mm Long Batch No. 01SRB-32 | Qty. 1987.30 metres / 652 nos. |
| 3). 15.00 mm OD x 0.90 mm WT x 3048 mm Long Batch No. 02SRB-29 | Qty. 14002.51 metres / 4594 nos. |
| 4). 22.00 mm OD x 0.90 mm WT x 3048 mm Long Batch No. 02SRB-33 | Qty. 3752.09 metres / 1231 nos. |
| 5). 28.00 mm OD x 0.90 mm WT x 3048 mm Long Batch No. 03SRB-11 | Qty. 2916.94 metres / 957 nos. |

SCOPE OF INSPECTION: (as per approved QAP No.: SC/ITP/18-19/04, Rev.01 dated. 15.04.2019.)

- Identified material against manufacturer's test certificate followed by review of test certificate for compliance with specification/order requirements.
- Witnessed Eddy Current Test on 10% finished tubes selected at random per size.
- Witnessed Mechanical test on samples drawn from finished tubes & verification of test results against specification / order requirements.
- Reviewed Carbon content test on samples drawn from finished tubes per size per batch.
- Verified marking on tubes and carried out visual and dimensional inspection on randomly selected 10% of the finished tubes per size.
- Verified and reviewed calibration status of measuring and test equipments used.

IDENTIFICATION: Each tube electro etched as "VN" and 10% of finished tubes witnessed for visual, dimension and eddy current test electro etched as "VN VN" next to tube manufacturer's markings.

Note: For details of manufacturer's declared chemical analysis and mechanical test witnessed refer manufacturer's test certificate no. SC/QC/19-20/0048 DATED 26/04/2019 duly endorsed.

ONCLUSION: On the basis of the scope of inspection undertaken, tubes were found to comply with the purchase order requirements.

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Form 1123 (2017.07)

Certificate no: **PRJ1110003946/1**
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V T Valavan for Mainak Mukherjee
Surveyor to Lloyd's Register Asia

a member of the Lloyd's Register group.

AIR CONDITIONING AND REFRIGERATION TUBE

Star specializes in the manufacture of copper tubes used in the cooling industry. Catering to a complete range, copper tubes manufactured by Star supports all air conditioning and refrigeration applications.



Specification	JIS H3300 / ASTM B68 / ASTM B75 / ASTM B280 / DIN 1754 EN - 1057
Chemical composition	Copper - 99.90 percent (minimum); and Phosphorus - 0.015 to 0.040 percent.
Size range	1/8" (3.20 mm) OD to 1.00" (25.40 mm) OD in coil form; and 1/8" (3.20 mm) OD to 4 1/8" (104.80 mm) OD in straight length.
Standard length	50 feet and / or 100 feet in coil form; 5.8 meters in straight length; and Customize as per customer's requirement.
Thickness	27 SWG (0.40 mm) to 10 SWG (3.20 mm)
Application	Window air conditioners; Split air conditioners; Packaged air conditioners; Variable flow air conditioners; Chillers; Air handling units; Coolers; Refrigerators; Heat exchangers; Condensers; Evaporators; Oil burner tubing; Chemicals; Thermal power plants; and Petrochemical industries.

- 100 percent eddy current tested as per ASTM E - 243
- Mechanical and chemical properties meet the standards of ASTM / JIS / DIN / EN or as per customer requirement
- Coils are available in soft bright annealed condition as per ASTM / JIS / DIN / EN or as per customer requirement
- Straight length are available in hard, half-hard, quarter-hard, light annealed, soft annealed condition as per ASTM / JIS / IS / DIN / EN or as per customer requirement
- Third party inspection ('TPI') can also be arranged if required

WATER AND GAS PLUMBING AND FITTING (SANITATION)

Star specializes in the manufacture of copper tubes used in the plumbing industry. Catering to a complete range (including *Type K*, *Type L*, *Type M* and *DWV*), copper tubes manufactured by Star support all plumbing and Drain Waste and Vent ('DWV') applications.

Every tube is marked and color coded from inside for easy identification. Manufactured in accordance with applicable standards, Star's ongoing commitment to quality makes our products the preferred choice.

Specification	ASTM B88 / ASTM B306 / EN1057 / BS2871
Chemical composition	Copper - 99.90 percent (minimum); and Phosphorus - 0.015 to 0.040 percent.
Size range	1/8" (3.175 mm) OD to 4 1/8" (104.80 mm) OD in straight length
Standard length	5.8 meters in straight length; and Customize as per customer's requirement.
Thickness	27 SWG (0.40 mm) to 10 SWG (3.20 mm)

- 100 percent eddy current tested as per ASTM E-243
- Mechanical and chemical properties meet the standard of EN1057 as per non-arsenical copper requirement
- Chemical composition meets the standard of EN1057 alloy C-12200, which is DHP grade copper
- Tested for internal bore cleanliness to meet the requirement of carbon film

Tables X, Y and Z provide the calculated burst pressure and maximum working pressure as per the recommended wall thickness of the copper tubes.

Table 'X'								
Tube size	Outer dia		Thickness	Inner dia	Calculated burst Pressure		Maximum working pressure	
	Max	Min						
mm	mm	mm	mm	mm	bar	PSI	bar	PSI
15	15.045	14.965	0.7	13.6	240	3480	58	841
22	22.055	21.975	0.9	20.2	215	3117.5	51	739.5
28	28.055	27.975	0.9	26.2	165	2392.5	40	580
35	35.07	34.99	1.2	32.6	175	2537.5	42	609
42	42.07	41.99	1.2	39.6	145	2102.5	35	507.5
54	54.07	53.99	1.2	51.6	110	1595	27	391.5
67	66.75	66.6	1.2	64.6	105	1522.5	20	290
76.1	76.3	76.15	1.5	73.1	100	1450	24	348
108	108.25	108	1.5	105	70	1015	17	246.5

WATER AND GAS PLUMBING AND FITTING (SANITATION)

Table 'Y'

Tube size	Outer dia		Thickness	Inner dia	Calculated burst Pressure		Maximum working pressure	
	Max	Min						
mm	mm	mm	mm	mm	bar	PSI	bar	PSI
15	15.045	14.965	1	13	360	5220	87	1261.5
22	22.055	21.975	1.2	19.6	290	4205	69	1000.5
28	28.055	27.975	1.2	25.6	230	3335	55	797.5
35	35.07	34.99	1.5	32	225	3262.5	54	783
42	42.07	41.99	1.5	39	190	2755	45	652.5
54	54.07	53.99	2	50	195	2827.5	47	681.5
67	66.75	66.6	2	63	157	2276.5	37	536.5
76.1	76.3	76.15	2	72.1	140	2030	33	478.5
108	108.25	108	2.5	103	120	1740	29	420.5

Table 'Z'

Tube size	Outer dia		Thickness	Inner dia	Calculated burst Pressure		Maximum working pressure	
	Max	Min						
mm	mm	mm	mm	mm	bar	PSI	bar	PSI
15	15.045	14.965	0.5	14	260	3770	50	725
22	22.055	21.975	0.6	20.8	215	3117.5	41	594.5
28	28.055	27.975	0.6	26.8	165	2392.5	32	464
35	35.07	34.99	0.7	33.6	155	2247.5	30	435
42	42.07	41.99	0.8	40.6	145	2102.5	28	406
4	54.07	53.99	0.9	52.2	130	1885	25	362.5
67	66.75	66.6	1	65	120	1740	20	290
76.1	76.3	76.15	1.2	73.7	80	1160	19	275.5
108	108.25	108	1.2	105.6	75	1087.5	17	246.5



WATER AND GAS PLUMBING AND FITTING (SANITATION)

The tubes are available in the tempers and lengths as per specifications provided below. Each type (K, L, M and DWV) represents a series of sizes with different wall thickness. The inside diameter depends on tube size and wall-thicknesses. Types K, L, M and DWV tubes are as per ASTM standard, with outside diameter 1/8" larger than the standard size.

Inside dia or standard size (in)		Average outside dia A tolerance (in)		Wall thickness and tolerances (in)								Theoretical weight (lb/ft)		
				Type K		Type L		Type M						
Outside dia (in)		Annealed		Drawn		Wall		Tolerance B		Wall		Tolerance B		
						Thickness		Thickness		Thickness		Thickness		
¼	0.375	0.002	0.001	0.035	0.0035	0.03	0.003	-	-	0.145	0.126	-	-	
⅜	0.5	0.0025	0.001	0.049	0.005	0.035	0.004	0.025	0.002	0.269	0.198	0.145	0.145	
½	0.625	0.0025	0.001	0.049	0.005	0.04	0.004	0.028	0.003	0.344	0.285	0.204	0.204	
⅝	0.75	0.0025	0.001	0.049	0.005	0.042	0.004	-	-	0.418	0.362	-	-	
¾	0.875	0.003	0.001	0.065	0.006	0.045	0.004	0.032	0.003	0.641	0.455	0.328	0.328	
1	1.125	0.0035	0.0015	0.065	0.006	0.05	0.005	0.035	0.004	0.839	0.655	0.465	0.465	
1¼	1.375	0.004	0.0015	0.065	0.006	0.055	0.006	0.042	0.004	1.04	0.884	0.682	0.682	
1½	1.625	0.0045	0.002	0.072	0.007	0.06	0.006	0.049	0.005	1.36	1.14	0.94	0.94	
2	2.125	0.005	0.002	0.083	0.008	0.07	0.007	0.058	0.006	2.06	1.75	1.46	1.46	
2½	2.625	0.005	0.002	0.095	0.01	0.08	0.008	0.065	0.006	2.93	2.48	2.03	2.03	
3	3.125	0.005	0.002	0.109	0.011	0.09	0.009	0.072	0.007	4	3.33	2.68	2.68	
3½	3.625	0.005	0.002	0.12	0.012	0.1	0.01	0.083	0.008	5.12	4.29	3.58	3.58	
4	4.125	0.005	0.002	0.134	0.013	0.11	0.011	0.095	0.01	6.51	5.38	4.66	4.66	

ELECTRIC CONDUCTORS AND BUS BARS

Star sets the standard for quality, consistency and service in the electrical industry and engineering sector. The following table provides the technical specifications of copper tubes used for electric conductors and bus bars.

Specification	Standard	IS2501	BS2871	ASTM B75	ASTM B188
Chemical composition	Symbol	IS-191 Part-V (ETP)	Part-II C101 (ETP)	C12000 (DLP)	C12000 (DLP)
	Cu+Ag	99.90 min	99.90 min	-	-
	Sn	-	-	-	-
	P	-	-	0.004-0.012	0.004-0.0012
	Pb	0.005 max	0.005 max	-	-
	Ni	-	-	-	-
	Fe	-	-	-	-
	Bi	0.001 max	0.001 max	-	-
	As	-	-	-	-
	S	-	-	-	-
	Total impurities max	0.03 max (Excl Ag and O)	0.03 max (Excl Ag and O)	-	-
Temper condition	Annealed	O	O	O50	60
	Half hard	½ H	-	-	-
	Hard drawn	HD	M	-	H80
Tensile strength	MPa*	205 min	200-250	205 min	255 max
	MPa	235 min	-	-	-
	MPa	280 min	270 min	-	275 min
Yield strength	MPa	-	-	62 min	-
	MPa	-	-	-	-
	MPa	-	-	-	-
Elongation	Percent	40 min	40 min	-	25 min
	Percent	25 min	-	-	-
	Percent	-	-	-	3 min
Hardness	Hv5 and (Rockwell)	-	60 max	55 max	50 max
	Hv5 and (Rockwell)	-	-	-	-
	Hv5 and (Rockwell)	-	100 min	-	80 min
Conductivity	IACS min at 20°C	97 percent min	97 percent min	-	-
Application	Low voltage - Circuits breakers, Switches and Cable lugs High and medium voltage - Transformers and various electrical equipment				

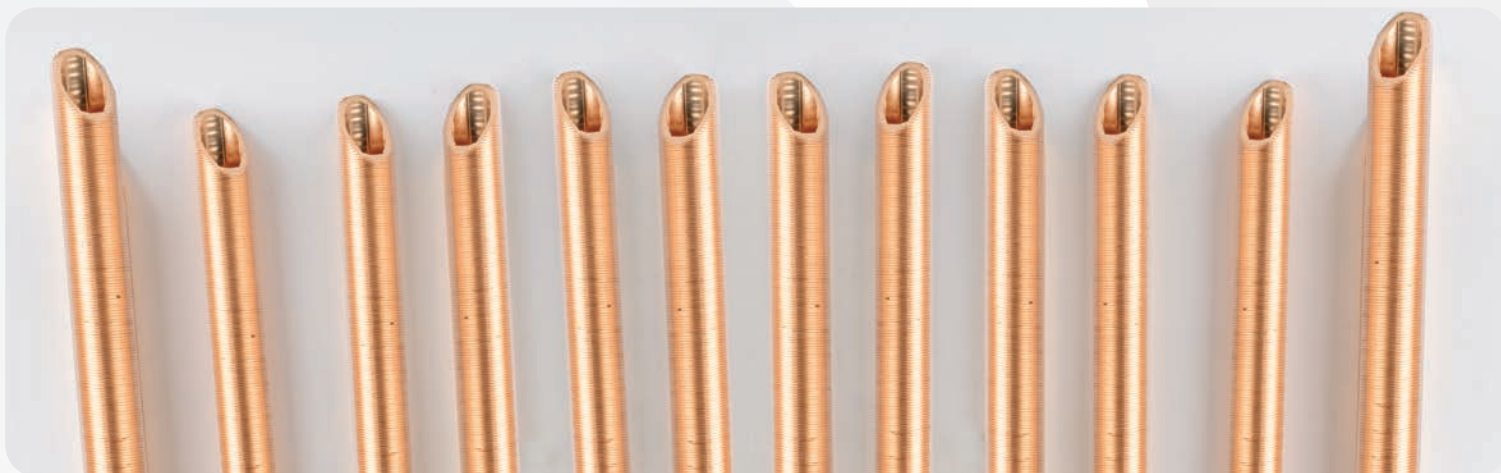
*MPa - Megapascals

COPPER FINNED TUBES / TURBO CHILL TUBES

Star sets the standard for quality finned tubes which are available in straight length with plain end on both sides or with interim skip or as per customer requirement. Finned tubes have a better heat transfer rate over regular tubes. Thus, allowing reduction in size and weight of the heat exchanger and condenser. The following table provides the technical specifications of copper finned tubes / Turbo chill tubes.

Specification	ASTM B11-C12200 / ASTM B359 / EN12451
Chemical composition	Copper - 99.90 percent (minimum); and Phosphorus - 0.015 to 0.040 percent.
Size range	5/8" (15.875 mm) OD to 3/4" (19.05 mm) OD
Width	19 Fins Per Inch ('FPI') ,23 FPI, 26 FPI, having fin height ranging from 0.889 mm up to 1.40 mm
Thickness	14SWG (2.11mm) to 18SWG (1.24mm)
Application	Heat exchanger, condenser and chiller

- 100 percent eddy current tested as per ASTM E-243
- Mechanical and chemical properties meet the standard of ASTM / EN or as per customer requirement



QUALITY AND TESTING FACILITIES

Star adheres to strict quality control measures. Vigorous tests are conducted on all raw materials, intermediate and finished products to ensure the highest quality as per the Quality Assurance Plan mentioned on the next page. A team of trained supervisors and quality control inspectors ensure that the quality is maintained at all the stages of production.

Star aims to deliver high quality products that conform to different international standards and customer specifications. The process is carefully documented to ascertain consistent and high quality batches of each product lot. At Star, the best available testing facilities for conducting physical, electrical and mechanical tests to assure superior quality products are used. The following table provides a list of testing equipment available at our works.

Make	Machinery
GNR	Spectrometer CPM based optical emission
Tecnofour	Conductivity meter
Test Wall	Universal testing machine capacity
FEI Blue Star	Vickers hardness tester
Tecnofour	Eddy current testing machine
J B Engineers	Hydrostatic test machine



COPPER FITTING - RUNNING SWG

Sr.No	Size	(EL)	(C)	(R)	(U)	(TEE)	(E-CAP)	45'Elbow
1	1/4	12	8		16			
2	5/16	15	9		21	40		
3	3/8	18	9	13	22	40	10	30
4	1/2	21	12	16	32	50	10	40
5	5/8	26	15	27	45	72	10	40
6	3/4	40	25	30	90	112	15	50
7	7/8	48	29	38	125	175	20	80
8	1	70	48	50	200	330	20	
9	1 1/8	80	48	55	200	330	25	150
10	1 3/8	160	90	115	415	500	60	250
11	1 5/8	196	119	160	780	780	80	350
12	1 3/4	300	160	220	800	1100		
13	2	480	250	300	1550	1225		
14	2 1/8	480	250	300	1550	1225	200	500
15	2 5/8	800	410	520		2450	250	1200
16	3 1/8	1000	535	720		3500	500	1500
17	3 5/8	3100	850	1450				
18	4 1/8	4670	1350	1600				
19	5 1/8	8000	3000	5800				

COPPER FITTING

18 SWG

Sr.No.	Size	(EL)	(C)	(R)	(U)
1	1/4	18	12		
2	5/16	20	15		
3	3/8	22	18	18	45
4	1/2	24	21	28	50
5	5/8	48	25	38	75
6	3/4	62	30	46	125
7	7/8	75	38	56	150
8	1	96	52	72	250
9	1 1/8	96	58	72	250
10	1 3/8	160	90	115	500
11	1 5/8	196	119	160	780
12	1 3/4	300	160	220	800
13	2	480	250	300	1550
14	2 1/8	480	250	300	1550
15	2 5/8	800	410	520	
16	3 1/8	1000	535	720	
17	3 5/8	3100	850	1450	
18	4 1/8	4670	1350	1600	
19	5 1/8	8000	3000	5800	

16 SWG

Sr.No.	Size	(EL)	(C)	(R)	(U)	(TEE)
1	1/4	20	15			
2	5/16	25	18			
3	3/8	30	20	30	70	90
4	1/2	38	25	35	75	100
5	5/8	52	35	45	100	120
6	3/4	72	45	58	150	150
7	7/8	90	55	78	200	200
8	1	120	75	120	300	330
9	1 1/8	134	75	120	300	330
10	1 3/8	215	110	130	500	500
11	1 5/8	290	145	200	780	780
12	1 3/4	440	215	250	1000	1100
13	2	480	250	300	1550	1225
14	2 1/8	480	250	300	1550	1225
15	2 5/8	800	410	520		2450
16	3 1/8	1000	535	720		3500
17	3 5/8	3100	850	1450		
18	4 1/8	4670	1350	1600		
19	5 1/8	8000	3000	5800		

STAR COPPER



COPPER FITTING

FOR - VRV / VRF

Sr.No.	Size	(EL)	(C)	(R)	(U)	(TEE)
1	1/4	18	12			60
2	5/16	20	15			80
3	3/8	22	18	18	45	90
4	1/2	24	21	28	50	100
5	5/8	48	25	38	75	120
6	3/4	62	30	46	125	150
7	7/8	75	38	56	150	200
8	1	96	52	72	250	330
9	1 1/8	96	58	72	250	330
10	1 3/8	215	110	130	500	500
11	1 5/8	290	145	200	780	780
12	2 1/8	620	350	400		1225
13	2 5/8	1000	535	600		2450

14 SWG

Sr.No.	Size	(EL)	(C)	(R)	(TEE)
1	5/8	100	56	100	
2	3/4	125	72	125	
3	7/8	135	90	140	
4	1 1/8	220	155	150	330
5	1 3/8	300	160	200	500
6	1 5/8	425	200	250	780
7	2 1/8	620	350	400	1225
8	2 5/8	1000	535	600	2450
9	3 1/8	1675	800	800	3500
10	3 5/8	3100	1350	1800	
11	4 1/8	4670	1500	2400	

Mfgs. of: AIRCONDITION & REFRIGERATION COPPER TUBES & FITTINGS

“K” TYPE COPPER TUBES

K Type	OD	THK Per Feet	Weight Per Ft.	Weight Mtr.
3/8 x 20 swg	0.375	0.036	0.067	0.22
1/2 x 18 swg	0.5	0.048	0.119	0.391
5/8 x 18 swg	0.625	0.048	0.152	0.499
3/4 x 18 swg	0.75	0.048	0.185	0.607
7/8 x 16 swg	0.875	0.064	0.285	0.935
1 1/8 x 16 swg	1.125	0.064	0.373	1.223
1 3/8 x 16 swg	1.375	0.064	0.46	1.511
1 5/8 x 15 swg	1.625	0.072	0.614	2.013
2 1/8 x 14 swg	2.125	0.08	0.898	2.946
2 5/8 x 13 swg	2.625	0.092	1.279	4.196
3 1/8 x 12 swg	3.125	0.104	1.724	5.657
3 5/8 x 11 swg	3.625	0.116	2.234	7.329
4 1/8 x 10 swg	4.125	0.128	2.808	9.212

“L” TYPE COPPER TUBES

L Type	OD	THK Per Feet	Weight Per Ft.	Weight Mtr.
3/8 x 21 swg	0.375	0.032	0.060	0.198
1/2 x 20 swg	0.5	0.036	0.092	0.301
5/8 x 19 swg	0.625	0.04	0.128	0.421
3/4 x 19 swg	0.75	0.04	0.156	0.511
7/8 x 18 swg	0.875	0.048	0.218	0.715
1 1/8 x 18 swg	1.125	0.048	0.284	1.931
1 3/8 x 17 swg	1.375	0.056	0.405	1.33
1 5/8 x 16 swg	1.625	0.064	0.548	2.799
2 1/8 x 15 swg	2.125	0.072	0.811	2.662
2 5/8 x 14 swg	2.625	0.08	1.117	3.666
3 1/8 x 13 swg	3.125	0.092	1.531	5.024
3 5/8 x 12 swg	3.625	0.104	2.01	6.593
4 1/8 x 11 swg	4.125	0.116	2.552	8.373

STAR COPPER



QUALITY ASSURANCE PLAN

Copper seamless tubes				
Sr no	Process	Characteristics to be checked	Measuring instrument	Quantum to be checked
1	Raw material inspection	Purity	Spectro analyzer	Random sampling
2	Melting and casting	Charge quantity	Weighing scale	Random Sampling
		Temperature	Thermo couple	100 percent
		Chemical composition	Spectro analyzer	100 percent
3	Billet cutting	Appearance	Visual	100 percent
4	Extrusion	Temperature	Pyrometer	Random sampling
		Dimensions	Micro meter	Random sampling
		Appearance	Visual	100 percent
5	Shell inspection	Dimensions	Micro meter	Random sampling
		Appearance	Visual	100 percent
6	Drawing	Dimensions	Micro meter	Random sampling
		Surface	Visual	Random sampling
7	Straightening	Dimensions	Micro meter	Random sampling
		Straightness	Visual and measurement	100 percent
8	Eddy current test (E-243)	Surface and internal defect	Eddy current testing machine	100 percent
9	Finish cutting	Length	Measuring tape	100 percent
10	Hydrostatic test	Pressure test and leakage defect	Hydro test machine	100 percent
11	Pre-inspection	Dimensions, length	Micro meter	100 percent
		Deburring	Deburring tools	100 percent
		Cleaning	Visual	100 percent
12	Annealing	Temperature	Thermo couple	Lot wise
		Speed	Speed controller	Lot wise
13	Dimensional check	Outer diameter, wall thickness, straightness and length	Micrometer and measuring tape	100 percent
14	Visual inspection	Surface	Visual	100 percent
15	Chemical analysis of final product	Chemical composition	Spectro analyzer	Random sampling
16	Mechanical properties test	Tensile test and yield strength	UTM	Random sampling
		Expansion test	UTM	Random sampling
		Flattening test	UTM	Random sampling
		Bend test	UTM	Random sampling
		Hardness	Hardness tester	Random sampling
		Conductivity	Conductivity meter	Random sampling
17	Packing	Marking and packing	As per customer requirement	100 percent





Star Copper

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