
Specification for

Rolled copper and copper alloys : sheet, strip and foil

Spécification du cuivre et des alliages de cuivre laminés : tôle, feuillard et feuille

Spezifikation für Walzkupfer- und Kupferlegierungen : Blech, Band und Folie

Contents

	Page		Page
Foreword	2	Section five. Requirements for brass sheet, strip and foil for the telecommunication industries	
Cooperating organizations	Back cover	33. General	20
Specification		34. Material	20
Section one. Introduction		35. Tolerances on straightness (edgewise curvature)	20
1. Scope	3	36. Temper grades	20
2. References	3	37. Grain size	20
3. Definitions	3	38. Finish	20
Section two. General requirements		Section six. Requirements for copper-beryllium strip and foil for telecommunications, instrument springs and similar applications	
4. General	3	39. General	21
5. Information to be supplied by the purchaser	3	40. Material	21
6. Freedom from defects	3	41. Tolerances	21
7. Chemical composition	3	Section seven. Requirements for copper sheet and strip for roofing, building and decorative purposes	
8. Manufacture	3	42. General	21
9. Condition	4	43. Material	21
10. Dimensions and tolerances	4	44. Tolerances	21
10.1 Thickness, width and length	4	45. Temper grades	22
10.2 Straightness (edgewise curvature)	4	46. Double close bend test (for grade A roofing material only)	22
10.3 Edgewise bending	4	Section eight. Requirements for copper sheets and circles for hot water storage units (domestic cylinders)	
11. Selection of test samples	4	47. General	22
11.1 Mechanical tests	4	48. Material	22
11.2 All materials except CB 101	4	49. Tolerances	22
11.3 Material CB 101	4	50. Hardness test	22
11.4 Hydrogen embrittlement test. Materials C 103 and C 106	4	51. Bend test	22
11.5 Microscopic examination	4	Appendices	
12. Mechanical tests (including preparation of test pieces)	4	A. Alloys not included in this British Standard but available in other product forms	23
12.1 General	4	B. Conversion of stress in N/mm ² to kgf/mm ² , tonf/in ² and lbf/in ²	28
12.2 Hardness test	4		
12.2 Tensile test	5		
12.3 Bend test	5	Tables	
13. Hydrogen embrittlement test	5	Section two. General requirements	
14. Microscopic examination	5	1. Tolerances on thickness of cold rolled sheet, strip and foil	6
15. Retests	5	2. Tolerances on thickness of hot rolled sheet and strip	6
16. Supplier's certificate	5	3. Commercial tolerances on width of rolled sheet, strip and foil (rotary sheared)	7
17. Inspection	5	4. Precision tolerances on width of rolled sheet, strip and foil (rotary sheared)	7
18. Facilities for testing	6	5. Tolerances on length of rolled sheet and strip ordered to exact length cut from rotary sheared coil	7
19. Rounding of numbers rule	6	6. Tolerances on width of rolled sheet and strip (guillotine sheared)	7
Section three. Requirements for leaded brass strip for clocks and watches and for other instruments		7. Tolerances on length of rolled sheet (guillotine sheared) for all thicknesses up to 10 mm	7
20. General	18	8. Chemical composition and mechanical properties of copper sheet, strip and foil	
21. Material	18		
22. Grades	18		
23. Tolerances	18		
24. Tensile properties	18		
25. Stress relieving	18		
26. Microstructure	18		
Section four. Requirements for nickel-silver strip and foil for the telecommunication industries			
27. General	19		
28. Material	19		
29. Tolerances	19		
30. Temper grades	19		
31. Bend test	20		
32. Grain size	20		

Tables

Section two. General requirements (continued)

	Page		Page
9. Chemical composition and mechanical properties of brass sheet, strip and foil: binary alloys of copper and zinc	10	Section four. Requirements for nickel-silver strip and foil for the telecommunication industries	
10. Chemical composition and mechanical properties of brass sheet, strip and foil: special alloys and leaded brasses	11	25. Tolerances on thickness of strip and foil	19
11. Chemical composition and mechanical properties of copper-nickel sheet, strip and foil	12	26. Tolerances on width of strip and foil	19
12. Chemical composition and mechanical properties of phosphor bronze sheet, strip and foil	13	27. Vickers hardness	20
13. Chemical composition and mechanical properties of aluminium bronze sheet, strip and foil	14	28. Bend test	20
14. Chemical composition and mechanical properties of nickel-silver sheet, strip and foil	15	Section five. Requirements for brass sheet, strip and foil for the telecommunication industries	
15. Chemical composition and mechanical properties of copper-chromium sheet, strip and foil	16	29. Mechanical properties	20
16. Chemical composition and mechanical properties of copper-beryllium strip and foil	17	Section six. Requirements for copper-beryllium strip and foil for telecommunications, instrument springs and similar applications	
Section three. Requirements for leaded brass strip for clocks and watches and for other instruments		30. Tolerances on thickness of strip and foil	21
17. Tensile strength	18	31. Tolerances on width of strip and foil	21
18. Tolerances on width (all grades)	18	32. Tolerances on straightness (edgewise curvature)	21
19. Tolerances on thickness	18	Section seven. Requirements for copper sheet and strip for roofing, building and decorative purposes	
20. Tolerances on length	18	33. Tolerances on thickness	21
21. Tolerances on transverse flatness	19	34. Hardness values	22
22. Tolerances on straightness (edgewise curvature)	19	Section eight. Requirements for copper sheets and circles for hot water storage units (domestic cylinders)	
23. Tolerances on straightness (edgewise curvature) grade C	19	35. Tolerances on thickness	22
24. Cross-sectional thickness variation (wedge taper)	19	36. Tolerances on width, length or diameter	22
		37. Bend test	22
		Figures	
		1. Bend test	5
		2. Test piece	5

Foreword

This is the first revision of BS 2870 since it was prepared in metric terms. It is one of the series on copper and copper alloys in wrought forms, the others being:

- BS 2871 Copper and copper alloy tubes (three Parts)
- BS 2872 Copper and copper alloys. Forging stock and forgings
- BS 2873 Copper and copper alloys. Wire
- BS 2874 Copper and copper alloys. Rods and sections (other than forging stock)
- BS 2875 Copper and copper alloys. Plate

Only materials for general engineering purposes are included in this standard. When materials are required with specified electrical properties, reference should be made to BS 1432 or BS 4608 as appropriate.

Certain alloys, now thought to be in sufficient demand to warrant their inclusion, have been added; these are: aluminium bronze CA 104, nickel-silver NS 111 and the chromium-copper alloys CC 101 and CC 102.

Deletions have been made in those cases where the level of demand has diminished to the extent that inclusion

can no longer be justified. The materials affected are C 105, C 107, CN 101, CN 103, CN 106, CA 101, NS 108, NS 109 and CS 101. This standard does not include drawn strip, which is included in BS 2874. Other alloys, not included in this standard, but available in other product forms, are listed in appendix A.

The units used for tensile strength have been changed to N/mm^2 from hbar to be in accordance with current practice.

The references to ISO standards (published by the International Organization for Standardization) have also been updated and the alloys which comply with, or fall within the requirements of an ISO standard are indicated in the tables of composition and mechanical properties. The ISO temper designations are under revision and have not therefore been incorporated.

An appendix in the previous edition listed the cross-references to the individual standards retained during the transition from imperial to metric. These standards have now all been withdrawn and the appendix has therefore been deleted.

British Standard Specification for

Rolled copper and copper alloys : sheet, strip and foil

Section one. Introduction

1. Scope

Section two of this British Standard specifies requirements for rolled copper and copper alloy sheet, strip and foil for general purposes in thicknesses up to and including 10.0 mm.

Sections three to eight give special requirements for particular applications of certain materials included in the standard.

Where copper included in this standard is required with specified electrical properties, the appropriate reference should be made to BS 4608 and BS 1432.

2. References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3. Definitions

For the purposes of this British Standard, the following definitions apply.

3.1 sheet. Flat material of exact length, over 0.15 mm up to and including 10.0 mm thick and over 450 mm in width.

3.2 strip. Material over 0.15 mm up to and including 10.0 mm thick, of any width, and generally not cut to length. Usually in coil, but may be flat or folded.

3.3 foil. A material of 0.15 mm thick and under, of any width, flat or in coil.

Section two. General requirements

4. General

The sheet, strip and foil shall comply with the general requirements given in clauses 5 to 19 and in tables 8 to 16 and, if ordered for a particular application, with the appropriate requirements of one of the sections three to eight.

5. Information to be supplied by the purchaser

The purchaser shall state on his enquiry and order the following information:

- (a) the designation of the material required (selected from tables 8 to 16);
- (b) the condition of the material (selected from tables 8 to 16);

(c) in the case of materials C 104, C 106 and CZ 112, whether a hot rolled or cold rolled finish is to be supplied;

(d) whether mechanical tests are required. In the case of thin strip (e.g. material CB 101 less than 0.45 mm thick) any special requirements for the hardness test procedure;

(e) whether a supplier's certificate is required;

(f) whether it is the purchaser's intention to inspect the material at the supplier's works;

(g) for sheet material, whether guillotined or rotary sheared tolerances are required on width;

(h) for rotary sheared material, whether commercial or precision tolerances on width are required;

(i) when the strip is required for edgewise bending, the degree of bending and any special test requirements agreed with the manufacturer (see 10.3);

(j) when mechanical tests are specified for CB 101, the manner in which the samples are taken (see 11.3);

(k) for materials C 103 and C 106, whether the hydrogen embrittlement test is required;

(l) whether microscopic examination is required;

(m) when material of a controlled grain size is required (see clause 14);

(n) whether the requirements of any clause of sections three to eight of this standard (i.e. for particular applications) are specified.

6. Freedom from defects

The material shall be clean, smooth and free from harmful defects.

7. Chemical composition

The chemical composition shall comply with the requirements of tables 8 to 16.

8. Manufacture

For materials C 101, C 102, C 103, CZ 101, CZ 102, CZ 103, CZ 106, CZ 107, CZ 108, CZ 110, CZ 118, CZ 119, CZ 120, CZ 125, CN 102, CN 104, CN 105, CN 107, PB 101, PB 102, PB 103, NS 103, NS 104, NS 105, NS 106, NS 107, NS 111 and CB 101, the final rolling shall be performed cold.

For materials CZ 123 and CA 104, the final rolling shall normally be performed hot.

For materials C 104, C 106 and CZ 112, the final rolling of the material shall be performed either hot or cold as agreed between the purchaser and the supplier.

9. Condition

The material shall be supplied in one of the following conditions* as specified by the purchaser in accordance with the options given in tables 8 to 16.

O	Material in the annealed condition.
1/4H, 1/2H H EH	The various harder tempers produced by cold rolling. For certain of the materials in this standard, these tempers may be produced by partial annealing.
SH, ESH	Spring hard tempers produced by cold rolling of thinner material.
M	Material in the 'as manufactured' condition.
W	Material that has been solution heat treated and will respond effectively to precipitation treatment.
W (1/4H), W (1/2H), W(H)	Material that has been solution heat treated and subsequently cold worked to various harder tempers.
WP	Material that has been solution heat treated and precipitation treated.
W (1/4H) P W (1/2H) P, W(H) P	Material that has been solution heat treated, cold worked and then precipitation treated.
Wm	Mill-hardened material. Material that has been heat treated by the manufacturer and does not require further heat treatment. Designations for mill-hardened material are not necessarily indicative of the method of manufacture.

10. Dimensions and tolerances

10.1 Thickness, width and length. The thickness, width and length shall be as ordered and within the tolerances specified in tables 1 to 7 as appropriate.

NOTE. Unless otherwise specified by the purchaser, rotary sheared strip will be supplied to the commercial tolerances in table 3 and sheet will be supplied to the tolerances in tables 6 and 7.

If sizes are required for which tolerances are not given in these tables, the tolerances shall be agreed between the supplier and purchaser.

10.2 Straightness (edgewise curvature). When required, tolerances on straightness (edgewise curvature) shall be the subject of agreement between the supplier and the purchaser.

10.3 Edgewise bending. When the strip is required for edgewise bending, the radius of bending shall be stated in the enquiry and the order, and any special test requirements shall be agreed between the supplier and the purchaser.

11. Selection of test samples

11.1 Mechanical tests. When tests are specifically called for by the purchaser, quantities of sheet or strip of the same width, thickness and temper shall be batched

together. For each batch the number of samples taken shall be as given below. The samples shall be cut off cold and, with the exception of CB 101, which may require heat treatment, shall receive no further treatment (except that they may be cut to the shape of the test piece) before being tested.

11.2 All materials except CB 101

11.2.1 From batches weighing less than 500 kg, one sample shall be taken to provide the necessary test pieces.

11.2.2 From batches weighing 500 kg and not more than 2000 kg, the number of samples taken shall be in the proportion of one per 500 kg of material submitted, any fractional remainder being considered as 500 kg.

Where strip is supplied in coils weighing more than 500 kg, one sample shall be taken from each coil to provide the necessary test pieces. Where sheet or strip is cut from coils weighing more than 500 kg, one sample shall be taken from each original coil to provide the necessary test pieces.

If the purchaser requires more than one sample to be taken from any coil, the method of taking the additional sample or samples shall be agreed between the supplier and the purchaser.

11.2.3 Batches exceeding 2000 kg shall be sub-divided into smaller batches of not less than 500 kg and not more than 2000 kg to which the provisions of 11.2.2 shall then apply.

11.3 Material CB 101. The number of samples taken from material supplied in coil shall be one per 50 kg of material submitted, any fractional remainder being considered as 50 kg.

For sheet and strip cut to length, the test samples shall, at the option of the purchaser, be obtained either (a) by leaving during manufacture extra material of appropriate size upon a sufficient number of sheets or strips in the batch; or (b) by taking them from the body of the sheet or strip at random. In the latter case, the material from which test samples have been taken shall be accepted as good delivery, notwithstanding its consequent non-compliance with the ordered length or width, provided it is otherwise satisfactory.

11.4 Hydrogen embrittlement test. Materials C 103 and C 106. When the hydrogen embrittlement test is required, the selection of test samples and the number of tests to be made shall be agreed between the supplier and the purchaser.

11.5 Microscopic examination. When this test is required, samples shall be selected as specified in 11.2 or 11.3.

12. Mechanical tests (including preparation of test pieces)

12.1 General. Where hardness and tensile properties are specified, they shall be regarded as alternatives, and the hardness shall be taken to be mandatory unless otherwise agreed.

The following tests shall be made on test pieces prepared from test samples selected as specified in clause 11.

12.2 Hardness test. Hardness tests shall be made on test pieces taken from the samples selected as in clause 11

*The equivalent ISO temper designations have not been included in this list because the International Standard, ISO/R 1190/II 'Copper and copper alloys — Code of designation — Part II: Designation of tempers', is under revision.

and shall be made in accordance with the requirements of BS 427 : Part 1.

The values obtained shall comply with the appropriate requirements as given in tables 8, 9, 12, 14 to 16, 27, 29 and 34.

12.3 Tensile test. Wherever practicable, tensile tests shall be made on the full section of the material. Alternatively, a test piece of the full thickness of the material and machined to the dimensions of the 12.5 mm wide rectangular section test piece specified in BS 18 : Part 1 shall be used. The longitudinal axis of symmetry of the test piece shall be in the direction of rolling. The elongation shall be measured on a gauge length of 50 mm.

The tensile test shall not be applied to material 0.50 mm thick and less, with the exception of CB 101, where it may be applied to material down to 0.10 mm thickness.

The elongation test shall not be applied to material thinner than 0.80 mm when less than 12.5 mm wide, with the exception of CB 101, where it may be applied to strip down to 0.25 mm thick.

The values obtained shall comply with the appropriate requirements given in tables 8 to 13, 15 to 17 and 29.

12.4 Bend test. Where possible, the material shall be subjected to a transverse bend test made on test pieces cut with their major axes at right angles to the direction of rolling (see figure 1); where this is not possible, it shall be subjected to a longitudinal bend test, made on test pieces cut with their major axes parallel to the direction of rolling (see figure 1). Both surfaces of the test piece shall be tested.

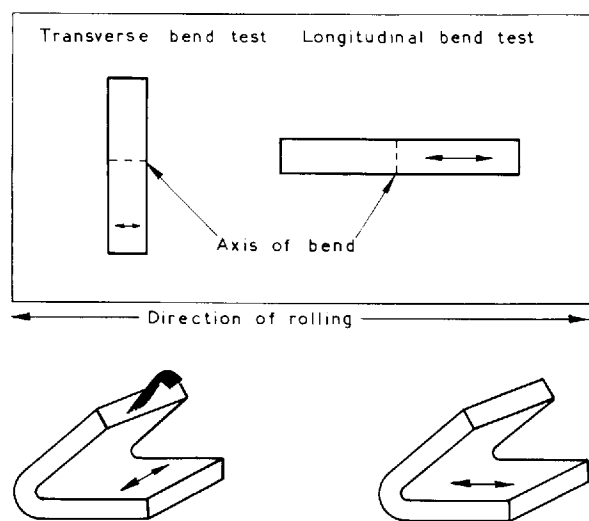


Figure 1. Bend test

The test pieces shall not crack when bent once through the appropriate angle specified in tables 8 to 12, 14 to 16, 28 and 37.

The test pieces shall be of convenient length and the width shall be as follows:

Thickness	Width
Up to and including 6 mm:	12.5 mm where possible, otherwise full width
Over 6 mm:	2t

where t is the thickness of material.

The longer edges shall be carefully rounded and smoothed longitudinally so that, for material up to 3.0 mm thick,

the cross section has approximately semicircular edges; for material over 3 mm thick the edges shall be rounded to a radius of 1.5 mm.

The bend test shall be made in accordance with BS 1639.

13. Hydrogen embrittlement test

The hydrogen embrittlement test as specified in BS 5899 shall be made on test pieces of convenient size selected as specified in clause 11. The longer edges of the test piece shall be carefully rounded and smoothed longitudinally. After being exposed to an atmosphere containing at least 10 % hydrogen for 30 min at 825 °C to 875 °C and subsequently cooled, the test piece shall be subjected to a close bend test as described below and examined for cracking.

The test piece AB is bent by steadily applied pressure or a succession of blows, at right angles to the length AC and flattened close until A assumes the position indicated by D (see figure 2).

The test piece shall not crack when subjected to this test.

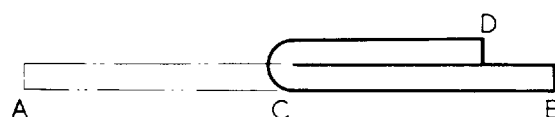


Figure 2. Test piece

14. Microscopic examination

When required, test pieces shall be prepared from the test samples selected as specified in clause 11 and shall be subjected to microscopic examination.

When required, material with a controlled grain size shall be supplied by agreement between the supplier and the purchaser.

NOTE. Because, with some copper base alloys, discrepancies in grain size measurements can result from the presence of fine grained surface layers, the method of determining grain size may also need to be agreed. Attention is drawn to DD 44.

15. Retests

If any of the test pieces first selected fails to pass any of the prescribed tests, two further samples from the same batch shall be selected for testing, one of which shall be from the sheet or strip from which the original test sample was taken, unless that sheet or strip has been withdrawn by the supplier.

If the test pieces from both these additional samples pass the test, the batch represented by the test sample shall be deemed to comply with the requirements of this British Standard. If the test pieces from either of these additional samples fail, the batch represented by the test samples shall be deemed not to comply with the requirements of this standard.

16. Supplier's certificate

The supplier shall, if required, certify that the sheet, strip or foil complies with the requirements of this British Standard appropriate to the material ordered.

17. Inspection

The purchaser shall notify the supplier, when placing the order, if it is his intention to inspect the material at the

supplier's works. The supplier shall afford the purchaser all reasonable facilities to satisfy himself that the material is in accordance with the requirements of this standard. For this purpose the purchaser or his representative may, by prior arrangement, attend to inspect the material, to select and identify the test samples for testing and to witness the tests being made.

The purchaser shall be at liberty to take samples from the material selected in accordance with 11.2 or 11.3, and it is his responsibility to have them tested. The results shall be communicated to the supplier if they are not in accordance with the requirements of section two, tables 8 to 16 and, if ordered for a particular application, in accordance with tables 17 to 37, contained in sections three to eight, for the appropriate material.

18. Facilities for testing

For making tests on samples selected in accordance with clause 11, the supplier shall provide and prepare the necessary test pieces, and supply labour and appliances for such testing as may be carried out on his premises in accordance with the requirements of this standard. Unless otherwise agreed, material for testing shall remain the property of the supplier. In the absence of facilities at his own works for making the prescribed tests, the supplier shall make the necessary arrangements for making the tests elsewhere.

19. Rounding of numbers rule

Values between the limits of composition and mechanical properties shown (NOT dimensional tolerances) shall be subject to the application of the 'rounding' rule in accordance with BS 1957. Under this rule the determined values are 'rounded' to the last place of figures stated as limits.

Table 1. Tolerances on thickness of cold rolled sheet, strip and foil

Specified thickness		Tolerance (plus and minus)					
Over	Up to and including	Up to and including 150 mm wide	Over 150 mm up to and including 300 mm wide	Over 300 mm up to and including 450 mm wide	Over 450 mm up to and including 600 mm wide	Over 600 mm up to and including 900 mm wide	Over 900 mm up to and including 1200 mm wide
mm	mm	mm	mm	mm	mm	mm	mm
—	0.15	10 %	12½ %	15 %	—	—	—
0.15	0.3	0.015	0.02	0.025	0.03	0.04	—
0.3	0.6	0.02	0.025	0.03	0.04	0.05	0.06
0.6	0.9	0.025	0.03	0.04	0.05	0.06	0.07
0.9	1.3	0.03	0.04	0.05	0.06	0.07	0.09
1.3	2.0	0.04	0.05	0.06	0.07	0.09	0.11
2.0	2.7	0.05	0.06	0.07	0.09	0.11	0.14
2.7	3.5	0.06	0.07	0.09	0.11	0.14	0.17
3.5	4.5	0.07	0.09	0.11	0.14	0.17	0.20
4.5	6.0	0.09	0.11	0.14	0.17	0.20	0.25
6.0	8.0	0.11	0.14	0.17	0.20	0.25	0.30
8.0	10.0	0.14	0.17	0.20	0.25	0.30	0.35

Table 2. Tolerances on thickness of hot rolled sheet and strip

Specified thickness		Tolerance (plus and minus)	
Over	Up to and including	Up to and including 900 mm wide	Over 900 mm up to and including 1500 mm wide
mm	mm	mm	mm
—	2.5	By agreement	
2.5	5.0	0.25	0.35
5.0	7.0	0.35	0.45
7.5	10.0	0.45	0.55

Table 3. Commercial tolerances on width of rolled sheet, strip and foil (rotary sheared)

Specified width		Tolerance (plus and minus)						
Over	Up to and including	Over 0.1 mm up to and including 0.25 mm thick	Over 0.25 mm up to and including 0.5 mm thick	Over 0.5 mm up to and including 1.0 mm thick	Over 1.0 mm up to and including 2.0 mm thick	Over 2.0 mm up to and including 4.0 mm thick	Over 4.0 mm thick	
mm	mm	mm	mm	mm	mm	mm	Not normally supplied	
—	10	By agreement						
10	50	0.1	0.15	0.2	0.3	—		
50	100	0.15	0.2	0.3	0.5	0.6		
100	200	0.2	0.3	0.5	0.6	0.8		
200	400	0.3	0.5	0.6	0.8	1.0		
400	600	0.5	0.6	0.8	1.0	1.4		
600	800	0.6	0.8	1.0	1.4	1.6		

Table 4. Precision tolerances on width of rolled sheet, strip and foil (rotary sheared)

Specified width		Plus tolerances (minus nil)		
Over	Up to and including	Up to and including 1.0 mm thick	Over 1 mm up to and including 1.5 mm thick	Over 1.5 mm up to and including 2.5 mm thick
mm	mm	mm	mm	mm
—	50	By agreement		
50	100	0.3	0.5	1.0
100	200	0.4	0.6	1.2
200	350	0.6	0.8	1.8
350	500	1.0	1.2	2.0
500	700	1.5	2.0	2.5

Table 5. Tolerances on length of rolled sheet and strip ordered to exact length cut from rotary sheared coil

Specified length		Tolerance (plus and minus)	
Over	Up to and including	Over 0.25 mm up to and including 4.0 mm thick	Over 4.0 mm thick
mm	mm	mm	Not normally supplied
150	1000	3	
1000	2000	6	
2000	4000	9	

Table 6. Tolerances on width of rolled sheet and strip (guillotine sheared)

Specified width		Plus tolerance (minus nil)		
Over	Up to and including	Up to and including 2.0 mm thick	Over 2.0 mm up to and including 5.0 mm thick	Over 5.0 mm up to and including 10.0 mm thick
mm	mm	mm	mm	mm
450	1250	6	8	10
1250	—	By agreement		

Table 7. Tolerances on length of rolled sheet (guillotine sheared) for all thicknesses up to 10 mm

Specified length		Plus tolerance (minus nil)
From	Up to and including	
mm	mm	mm
450	5000	10

Table 8. Chemical composition and mechanical properties of copper sheet, strip and foil

essential alloying elements, limits are in bold type. Unless otherwise stated, figures in total impurities column include those in lighter type. Unless otherwise indicated, all limits are maxima.

Designation	Material	Copper (including silver)	Tin	Lead	Iron	Nickel	Arsenic	Antimony	Bismuth	Phosphorus	Oxygen	Selenium	Tellurium	Total impurities	Condition	Thickness		Tensile strength	
																Over	Up to and incl.	Up to and incl. 450 mm wide (min.)	Over 450 mm wide (min.)
C 101	Electrolytic tough pitch high conductivity copper	99.90 min.	—	0.005	—	—	—	—	0.0010	—	—	—	—	0.03 (excl. oxygen and silver)		mm	mm	N/mm ² *	N/mm ²
C 102	Fire-refined tough pitch high conductivity copper	99.90 min.	—	0.005	—	—	—	—	0.0025	—	—	—	—	0.04 (excl. oxygen and silver)	O	0.5	10.0	210	210
															M	3.0	10.0	210	210
C 103	Oxygen-free high conductivity copper	99.95 min.	—	0.005	—	—	—	—	0.0010	—	—	—	—	0.03 (excl. oxygen and silver)	1/2H	0.5	2.0	240	240
C 104†	Tough pitch non-arsenical copper	99.85 min.	0.01	0.010	0.01	0.05	0.02	0.005	0.0030	—	0.10	0.020	0.010	0.05 (excl. nickel, oxygen and silver)		2.0	10.0	240	240
															H	0.5	2.0	310	280
																2.0	10.0	290	280
C 106†	Phosphorus deoxidized non-arsenical copper	99.85 min.	0.01	0.010	0.030	0.10†	0.05	0.010	0.0030	0.013/0.050	—	Se + Te 0.020	0.010	0.06 (excl. silver, arsenic, nickel and phosphorus)					

NOTE 1. C 101. The limitation of oxygen to 0.06 % for vertically cast shapes may be the subject of agreement between the supplier and the purchaser.

NOTE 2. C 101, C 102 Silver-bearing copper. Silver may be present in specific amounts between 0.03 % and 0.2 %. If silver is to be present as an alloying element, the purchaser should specify, at the time of the enquiry and order, the silver content he requires.

NOTE 3. C 101, C 102. For special requirements, the limitation of other individual impurities or special elements may be the subject of agreement between the supplier and the purchaser.

*N/mm² = MPa; for conversion to kgf/mm², tonf/in² and hbar, see appendix B.

†For special requirements relative to particular applications, see sections seven and eight.

‡Impurity or optional addition.

NOTE 4. C 106. If the copper is required to undergo severe range 400 °C to 700 °C, this fact shall be indicated by the bismuth content shall not exceed 0.0015 %.

NOTE 5. C 103, C 106. Oxygen limitation is defined by (see 11.4).