

# Brass

## Chemical Composition

Designation		EN	Chemical composition in % (mm)									
Symbolic	Numerical		Min. Cu	Max. Cu	Max. Al	Max. Fe	Max. Ni	Min. Pb	Max. Pb	Max. Sn	Min. Zn	Others total max.
CuZn10	CW501L	EN 1652	89.0	91.0	0.02	0.05	0.3	-	0.05	0.1	Rest	0.1
CuZn15	CW502L	EN 1654 / EN 1652	84.0	86.0	0.02	0.05	0.3	-	0.05	0.1	Rest	0.1
CuZn30	CW505L	EN 1654 / EN 1652	69.0	71.0	0.02	0.05	0.3	-	0.05	0.1	Rest	0.1
CuZn33	CW506L	EN 1652	66.0	68.0	0.02	0.05	0.3	-	0.05	0.1	Rest	0.1
CuZn37	CW508L	EN 1652	62.0	64.0	0.05	0.1	0.3	-	0.1	0.1	Rest	0.1
CuZn38Pb2	CW608N	EN 1652	60.0	61.0	0.05	0.2	0.3	1.6	2.5	0.2	Rest	0.2
CuZn39Pb2	CW612N	EN 1652	69.0	60.0	0.05	0.3	0.3	1.6	2.5	0.3	Rest	0.2

Designation		EN	Density <sup>1)</sup> g/cm <sup>3</sup>
Symbolic	Numerical		approx.
CuZn10	CW501L	EN 1652	8.8
CuZn15	CW502L	EN 1654 / EN 1652	8.8
CuZn30	CW505L	EN 1654 / EN 1652	8.5
CuZn33	CW506L	EN 1652	8.5
CuZn37	CW508L	EN 1652	8.4
CuZn38Pb2	CW608N	EN 1652	8.4
CuZn39Pb2	CW612N	EN 1652	8.4

1) For information purposes only.

## Equivalents

Symbolic	Numerical	EN	Approximate international equivalents		
			AMERICAN	JAPANESE	CHINESE
			US	JIS	GB
CuZn10	CW501L	EN 1652			
CuZn15	CW502L	EN 1654 / EN 1652			
CuZn30	CW505L	EN 1654 / EN 1652			
CuZn33	CW506L	EN 1652	C26800	C 2680	-
CuZn37	CW508L	EN 1652	C27400	C 2720	H62
CuZn38Pb2	CW608N	EN 1652			
CuZn39Pb2	CW612N	EN 1652			

## Mechanical properties

### MECHANICAL PROPERTIES EN 1652 / EN 1654

Designations		Tensile strength Rm		Conventional yield strength at 0.2% Rp <sub>0.2</sub>		Elongation <sup>1)</sup>		HV hardness		
		N/mm <sup>2</sup>		N/mm <sup>2</sup>		A <sub>50mm</sub> for thicknesses up to 2.5 mm (inclusive) %	A <sub>50mm</sub> for thicknesses above 2.5 mm %			
Material		Metallurgical condition	min.	max.	min.	max.	min.	min.	min.	max.
Symbolic	Numerical		min.	max.	min.	max.	min.	min.	min.	max.
CuZn10	CW501L	R240	240	290	(max. 140)		36	45	-	-
		H050	-	-	-		-	-	50	80
		R280	280	360	(min. 200)		13	20	-	-
		H080	-	-	-		-	-	80	110
		R360	350	-	(min. 290)		4	8	-	-

Designations		Tensile strength Rm		Conventional yield strength at 0.2% Rp0.2		Elongation <sup>1)</sup>		HV hardness				
		N/mm <sup>2</sup>		N/mm <sup>2</sup>		A <sub>50mm</sub> for thicknesses up to 2.5 mm (inclusive) %	A <sub>50mm</sub> for thicknesses above 2.5 mm %					
Material		Metallurgical condition	min.	max.	min.	max.	min.	min.	min.	max.		
Symbolic	Numerical											
		H110	-	-	-	-	-	-	110	-		
CuZn15	CW502L	R260	260	310	(max. 170)		36	45	-	-		
		H055	-	-	-	-	-	-	55	85		
		R300	300	370	(min. 150)		16	25	-	-		
		H085	-	-	-	-	-	-	85	115		
		R350	350	420	(min. 250)		8	12	-	-		
		H105	-	-	-	-	-	-	105	135		
		R410	410	490	(min. 360)		3	4	-	-		
		H125	-	-	-	-	-	-	125	155		
		R480	480	560	-	-	-	-	2	-	-	
		H150	-	-	-	-	-	-	150	180		
		R550	550	-	-	-	-	-	-	-	-	
		H170	-	-	-	-	-	-	-	170	-	
		CuZn30	CW505L	R350	350	430	(min. 170)		21	25	-	-
				H095	-	-	-	-	-	-	95	125
R410	410			490	-	-	9	12	-	-		
H120	-			-	-	-	-	-	120	155		
R480	480			560	-	-	4	6	-	-		

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Designations		Tensile strength Rm		Conventional yield strength at 0.2% Rp0.2		Elongation <sup>1)</sup>		HV hardness			
		N/mm <sup>2</sup>		N/mm <sup>2</sup>		A <sub>50mm</sub> for thicknesses up to 2.5 mm (inclusive) %	A <sub>50mm</sub> for thicknesses above 2.5 mm %				
Material		Metallurgical condition	min.	max.	min.	max.	min.	min.	min.	max.	
Symbolic	Numerical										
		H150	-	-	-	-	-	-	150	180	
		R550	550	640	-	-	-	2	-	-	
		H170	-	-	-	-	-	-	-	170	200
		R630	630	-	-	-	-	-	-	-	-
		H190	-	-	-	-	-	-	-	190	-
		R280	280	380	(max. 170)		40	50	-	-	
		H055	-	-	-	-	-	-	55	90	
CuZn33	CW506L	R350	350	430	(min. 170)		23	31	-	-	
		H095	-	-	-	-	-	-	95	125	
		R420	420	500	(min. 300)		6	13	-	-	
		H125	-	-	-	-	-	-	126	155	
		R500	500	-	(min. 450)		-	-	-	-	
		H155	-	-	-	-	-	-	155	-	
		R300	300	370	(max. 180)		38	46	-	-	
CuZn37	CW508L	H055	-	-	-	-	-	-	55	95	
		R350	350	440	(min. 170)		19	28	-	-	
		H095	-	-	-	-	-	-	95	125	
		R410	410	490	(min. 300)		8	12	-	-	

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Designations		Tensile strength Rm		Conventional yield strength at 0.2% Rp0.2		Elongation <sup>1)</sup>		HV hardness			
		N/mm <sup>2</sup>		N/mm <sup>2</sup>		A <sub>50mm</sub> for thicknesses up to 2.5 mm (inclusive) %	A <sub>50mm</sub> for thicknesses above 2.5 mm %				
Material		Metallurgical condition	min.	max.	min.	max.	min.	min.	min.	max.	
Symbolic	Numerical										
		H120	-	-	-	-	-	-	120	155	
		R480	480	560	(min.430)	-	3	-	-	-	
		H150	-	-	-	-	-	-	-	150	180
		R550	550	-	(min. 500)	-	-	-	-	-	-
		H170	-	-	-	-	-	-	-	170	-
		R340	340	420	(max. 240)	-	33	43	-	-	-
CuZn38Pb2	CW608N	H075	-	-	-	-	-	-	75	110	
		R400	400	480	(min. 200)	-	14	23	-	-	
		H110	-	-	-	-	-	-	-	110	140
		R470	470	550	(min. 390)	-	6	12	-	-	
		H140	-	-	-	-	-	-	-	140	170
		R640	540	-	(min. 490)	-	-	-	-	-	-
CuZn39Pb2	CW612N	H165	-	-	-	-	-	-	165	-	
		R360	360	440	(max. 270)	-	30	40	-	-	
		H090	-	-	-	-	-	-	-	90	120
		R420	420	600	(min. 270)	-	12	20	-	-	
		H120	-	-	-	-	-	-	-	120	150
		R490	490	570	(min. 420)	-	-	9	-	-	-

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Designations		Tensile strength Rm		Conventional yield strength at 0.2% Rp0.2		Elongation <sup>1)</sup>		HV hardness		
		N/mm <sup>2</sup>		N/mm <sup>2</sup>		A <sub>50</sub> mm for thicknesses up to 2.5 mm (inclusive) %	A <sub>50</sub> mm for thicknesses above 2.5 mm %			
Material		Metallurgical condition	min.	max.	min.	max.	min.	min.	min.	max.
Symbolic	Numerical		min.	max.	min.	max.	min.	min.	min.	max.
		H150	-	-	-	-	-	-	150	180
		R560	560	-	(min. 510)	-	-	-	-	-
		H175	-	-	-	-	-	-	175	-

NOTE - The numbers in brackets are not standard requirements, they are given for information purposes only.

1) The values shown are for guidance purposes and are based on EN1652 and EN1654. For CuZn15 and CuZn30, the elongation values are in accordance with EN1652, thicknesses range from above 0.25mm to 1mm inclusive.

## Finishes

### BARE MATERIAL

The strips must be clean and free of detrimental defects, which must be specified by agreement between the customer and the supplier when requesting the quote and in the order. Normally, a small residual layer of lubricant is left on cold-rolled products, which is authorised unless otherwise specified.

## ROUGHNESS EN 1654

This must be agreed between the customer and the supplier when requesting the quote and confirming the order.

## SURFACE CONDITION EN 13599

The strips must be clean and free of detrimental defects, which must be specified by agreement between the customer and the supplier in the request for quotes and in the order. Normally, a small residual layer of lubricant is left on cold-drawn products, and this is acceptable unless otherwise specified. Discolouration is acceptable, provided that it is not detrimental to the use of the product .

## TIN COATINGS

Tin coatings for strips and copper strips and copper alloys:

Type of coating	Standard
Electrolytic	EN 14436
Hot dip	EN 13148

## ELECTROLYTIC EN 14436

### ELECTROLYTIC TIN PROCESS TYPES AND TYPES OF TIN COATINGS AND TIN ALLOYS EN 14436

Process	Description
Process for matt electrolytic coatings.	This is the standard finish of a traditional electrolytic bath.
Process for bright electrolytic coatings.	Coatings with a bright appearance are obtained using baths that contain one or more suitable brightening agents (brighteners). Their presence may not be desirable in subsequent melting or soft soldering processes. Furthermore, they may be beneficial for frictional properties (low friction or sliding contacts).
Process for flow-brightened electrolytic coatings.	Flow-brightened electrolytic coatings are obtained by heating a matt electrolytic coating above its melting point for a few seconds and then cooling it. The coatings preserve their sheen after cooling. In practice, flow brightening is not used for coatings with thicknesses above 5 µm (slip risk) or for coatings that are already bright.

NOTE - Tin electrolytic coatings may experience a spontaneous growth of metallic filaments (the combined effect of humidity and mechanical stresses, for example). This phenomenon is highly undesirable for electrotechnical applications (risk of short circuit). The risk of this occurring can be reduced by flow brightening, using tin-lead alloy coatings or inserting a suitable sublayer.



## TYPES OF STEEL ELECTROLYTIC COATINGS AND TIN ALLOYS ACCORDING TO APPLICABLE EN 14436

Coating thickness $\mu\text{m}$		Types of coatings		
min.	max.	Sn bright (Snb)	Sn matt (Snm)	Sn flow-brightened (Snf)
	1	As	N/A	As
0.8	1.2	As	N/A	*
1.5	2.5	B	As	B - R
2	4	B - C	R	B - R
3	6	B - C	R	N/A
5		B - C	R - C	N/A

NOTE 1: Applications:

- N/A: not applicable
- B: improves the suitability for soft soldering
- \*: reduces frictional forces
- C: corrosion resistance
- R: reduction of electrical resistance on a contact
- As: improved appearance

NOTE 2: These typical values are for information purposes and can be replaced by agreement between the customer and the supplier.

## COMPOSITION OF THE TIN AND TIN ALLOYS EN 14436

Type of coating	Designation of the material	Composition in % (mass fraction)	
		Min. Sn	Others, total
Sn bright (Snb)	Sn99	99	Remainder
Sn matt (Snm) or Sn flow-brightened (Snf)	Sn99.50	99.5	Remainder

## HOT DIP EN 13148

### APPEARANCE EN 13148. HOT DIP TINNING

Thicknesses (average values) and preferred thickness ranges for coatings:

Thickness	Thickness range		Application
µm	µm		
average value	from	up to & including	
1.45	0.7	2.2	Preventing surface oxidation, decorative appearance, reducing frictional forces.
2	1	3	Preventing surface oxidation, decorative appearance, reducing frictional forces.
3.5	2	5	Preventing corrosion
5	3	7	Extending the useful life
7.5	5	10	To aid soft soldering
10	7	13	To aid soft soldering

The appearance depends on the type of liquid film cooling, the type of coating and the technique used to remove excess molten metal. The surface may have a bright or matt appearance, or a combination of both. The appearance of the coating does not affect its suitability. If there are special requirements for the appearance of the coating, these requirements must be agreed at the time of the quote and/or order.

## Tolerances

### THICKNESS TOLERANCES EN 13599 / EN 1652

Nominal thickness		Thickness tolerance for nominal widths according to EN 13599/ EN 1652					
>	≤	10 < and ≤ 200		200 < and ≤ 350	350 < and ≤ 700	700 < and ≤ 1000	1000 < and ≤ 1250
		normal (Class A)	special (Class B)				
0.05 <sup>1)</sup>	0.1	± 10% <sup>2)</sup>		-	-	-	-
0.1	0.2	± 0.010	± 0.007	± 0.015	-	-	-
0.2	0.3	± 0.015	± 0.010	± 0.020	± 0.03	± 0.04	-
0.3	0.4	± 0.018	± 0.012	± 0.022	± 0.04	± 0.05	± 0.07
0.4	0.5	± 0.020	± 0.015	± 0.025	± 0.05	± 0.06	± 0.08
0.5	0.8	± 0.025	± 0.018	± 0.030	± 0.06	± 0.07	± 0.09
0.8	1.2	± 0.030	± 0.022	± 0.040	± 0.07	± 0.09	± 0.10
1.2	1.8	± 0.035	± 0.028	± 0.06	± 0.08	± 0.10	± 0.11
1.8	2.5	± 0.045	± 0.035	± 0.07	± 0.09	± 0.11	± 0.13
2.5	3.2	± 0.055	± 0.040	± 0.08	± 0.10	± 0.13	± 0.17
3.2	4.0	-	-	± 0.10	± 0.12	± 0.15	± 0.20
4.0	5.0	-	-	± 0.12	± 0.14	± 0.17	± 0.23
5.0	6.0	-	-	± 0.14	± 0.16	± 0.20	± 0.26

Measurements in mm.

1) Including the value 0.05.

2) ± 10% of the nominal thickness

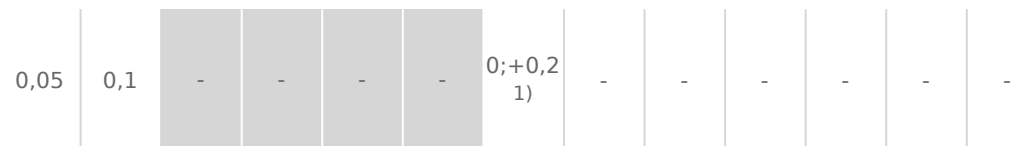
## THICKNESS TOLERANCE FOR COATED MATERIAL

EN 13148. The thickness of the tinned strip must meet the required combination of tolerances for the thickness of the strip (table above) and the range of thicknesses of the coatings ordered, for both sides.

EN 14436. The thickness of the strip prior to tinning must be in accordance with the approximate tolerances given in the table above. The thickness tolerance of the tinned strip must take into account the minimum and maximum thicknesses of the coating.

## WIDTH TOLERANCES OF THE STRIPS

Nominal thickness t		Standard slitting tolerances for Metalle Schmidt <sup>2)</sup>				Width tolerances for nominal widths according to EN 13599/ EN 1654						
<	≤	3-15	15-50	50-150	>150	up to & including 50	over 50 and up to 100 inclusive	over 100 and up to 200 inclusive	over 200 and up to 350 inclusive	over 350 and up to 500 inclusive	over 500 and up to 700 inclusive	over 700 and up to 1250 inclusive
0,1	0,2	0;+0,1 5 <sup>3)</sup>	0;+0,1 5 <sup>3)</sup>	0;+0,1 5 <sup>3)</sup>	0;+0,2 3)	0;+0,2	0;+0,3	0;+0,4	0;+0,6	0;+1,0	0;+1,5	0;+2,0
0,2	0,4	0;+0,1 5	0;+0,1 5	0;+0,1 5	0;+0,2	0;+0,2	0;+0,3	0;+0,4	0;+0,6	0;+1,0	0;+1,5	0;+2,0
0,4	1	0;+0,1 7	0;+0,1 8	0;+0,2	0;+0,2 4	0;+0,2	0;+0,3	0;+0,4	0;+0,6	0;+1,0	0;+1,5	0;+2,0
1	1,5	0;+0,2	0;+0,2	0;+0,2	0;+0,3	0;+0,3	0;+0,4	0;+0,5	0;+1,0	0;+1,2	0;+1,5	0;+2,0
1,5	2	on request	0;+0,2 6	0;+0,3	0;+0,3 2	0;+0,3	0;+0,4	0;+0,5	0;+1,0	0;+1,2	0;+1,5	0;+2,0
2	2,5	on request	0;+0,2 6	0;+0,3	0;+0,3 2	0;+0,5	0;+0,6	0;+0,7	0;+1,2	0;+1,5	0;+2,0	0;+2,5



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Nominal thickness t		Standard slitting tolerances for Metalle Schmidt <sup>2)</sup>				Width tolerances for nominal widths according to EN 13599/ EN 1654																				
<	≤	3-15	15-50	50-150	>150	up to & including 50	over 50 and up to 100 inclusive	over 100 and up to 200 inclusive	over 200 and up to 350 inclusive	over 350 and up to 500 inclusive	over 500 and up to 700 inclusive	over 700 and up to 1250 inclusive	2,5	3	on request	on request	0;+0,3 2	0;+0,3 5	0;+1,0	0;+1,1	0;+1,2	0;+1,5	0;+2,0	0;+2,5	0;+3,0	
3	5	on request	on request	0;+0,3 2	0;+0,3 5	0;+2,0	0;+2,3	0;+2,5	0;+3,0	0;+4,0	0;+5,0	0;+6,0														

Measurements in mm.

- 1) Including the value t=0.05
- 2) Other, closer dimensional tolerances are possible under a commercial agreement .
- 3) Including the value t=0,1

### LENGTH TOLERANCES 13599

Length tolerances of thick sheets, thin sheets and strips in cut lengths of up to 5000mm.

Length	Nominal thickness	Length tolerance
Without rolling (M)	up to & including 25	±50
	5 and above	0; +10
Fixed length (F)	over 5 and up to 10 inclusive	0; +15

Measurements in mm.

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## EDGE CAMBER TOLERANCES

Nominal width (W)	Edge curve tolerances under commercial agreement		Edge curve tolerances according to the EN 13599 Standard				
	Maximum deviation 1000 mm Thickness (t)		Maximum deviation 1000 mm Thickness (t)				
	t ≤ 1.20 mm	t > 1.20 mm	t ≤ 0.5 mm	0.5 < t ≤ 1.20 mm	1.20 < t ≤ 2.50 mm	2.50 < t ≤ 3.20 mm	3.20 < t ≤ 5.00 mm
3 ≤ W < 6	2.50	4.00	-	-	-	-	-
6 < W ≤ 10	2.00	3.00	-	-	-	-	-
10 < W ≤ 15	1.00	1.50	7.00 <sup>1)</sup>	10.00	-	-	-
15 < W ≤ 20	1.00	1.50	4.00	6.00	8.00	-	-
20 < W ≤ 30	0.50	1.00	4.00	6.00	8.00	-	-
30 < W ≤ 50	0.50	1.00	3.00	4.00	6.00	7.00	*under a commercial agreement
50 < W ≤ 350	0.50	1.00	2.00	3.00	4.00	5.00	
350 < W ≤ 1250	-	-	2.00	3.00	4.00	5.00	

Measurements in mm.

1) Including nominal width 10mm.