
KME
ENGINEERING
COPPER SOLUTIONS
Connector Strip Materials
Strips of copper and copper alloys

KME Germany GmbH & Co. KG
Overview

slight difference in chem. composition

KME Germany GmbH & Co. KG
1.1. KME in short

KME Germany GmbH & Co. KG with its production sites in Osnabrück, Berlin and Menden manufactures standard products for the building and rolled industry and also in Osnabrück special products for industrial applications.

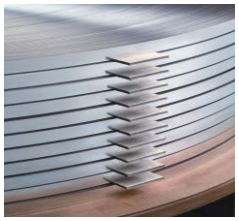
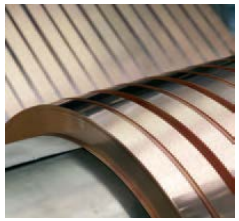
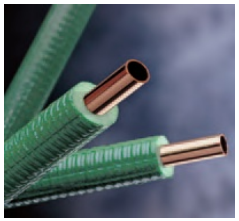
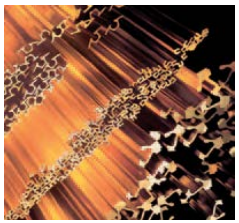
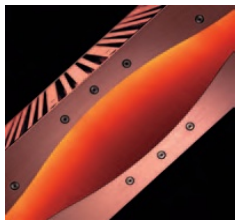
Value adding at KME covers all the stages of processing the basic material copper into semi-finished and finished products.

At KME, copper and copper-alloy rolled material is tailor-made in any quantity/size to customer specifications.

When innovative products are being developed we lend our customers our comprehensive support in the shape of our KME research and development departments and process technology customer assistance.

KME supply their products with the great advantage that they are all from a “one-stop shop”.

KME Germany GmbH & Co. KG
1.2. Product portfolio

Divisions	Products		Main uses
Rolled products			Building and architecture; roof coverings, facades and rainwater draining systems; interior/exterior decorations; electrical and mechanical industry, connectors, boilers, minting, solar collectors, gifts and fancy goods.
Copper tubes			Air conditioning and cooling systems, connectors and pipe fittings, plumbing and heating systems, piping boilers rods systems, gas piping, boilers, electrical applications, solar thermal systems, medical industry.
Brass and copper rods			Tabs, valves and fittings, precision mechanical parts, car components, electrical and electronic equipment, door locks, profiles for architectural use and for window and door fittings.
Special products			Shipbuilding, offshore installations, chemical industry, energy, metallurgy and steel industry.

KME Germany GmbH & Co. KG

1.3. Production and sales location

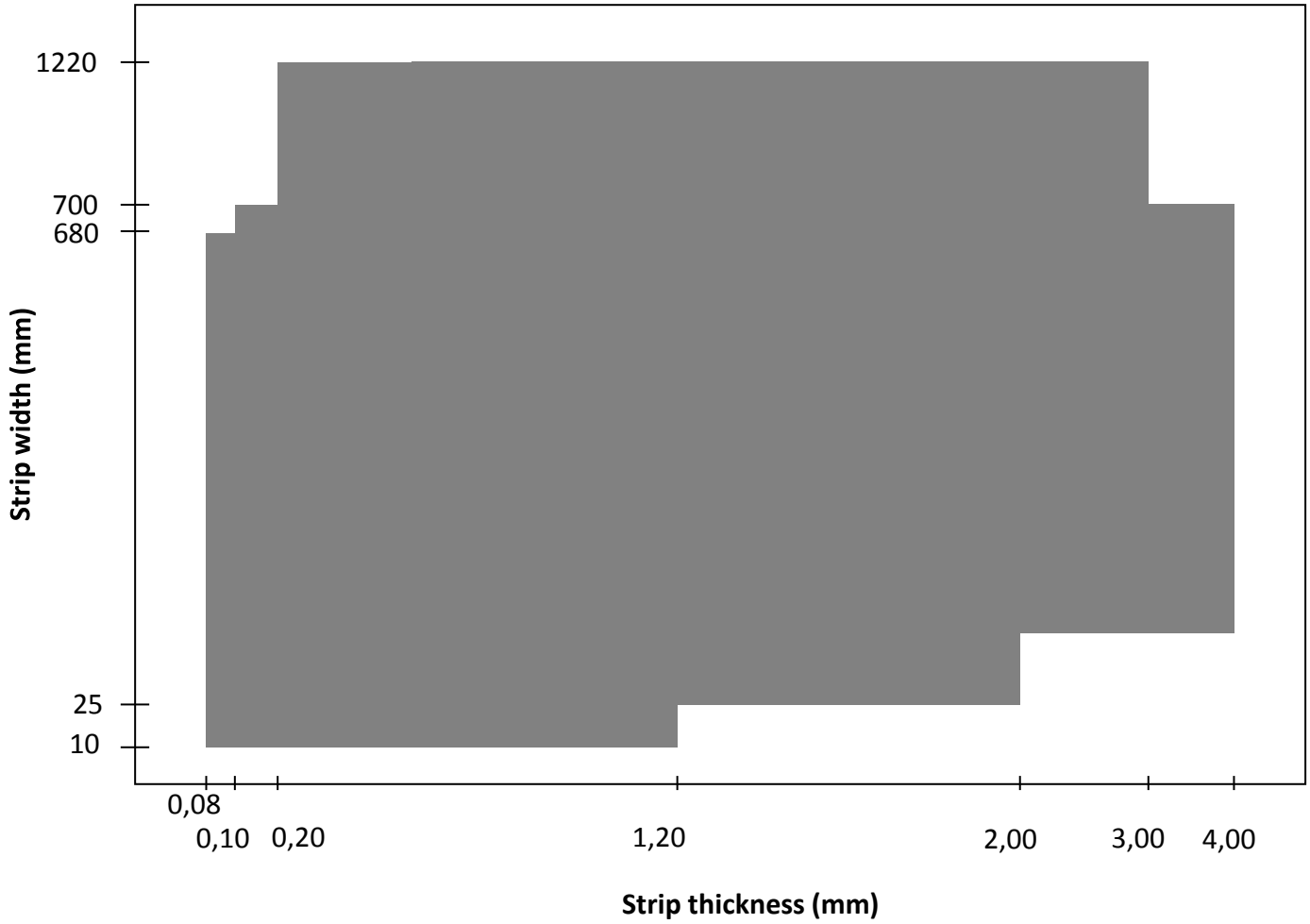
Production and Sales location

- Brass
- Building Products
- Industrial Products
- Special Products
- Research & Development
- Sales location

KME Germany GmbH & Co. KG
2.1.1. Manufacturing programme

- **bare strips**
- **pre tinned strips**
  - hot dip tinned
  - electrolytical tinned
- **special qualities**
  - narrow tolerances
  - stress levelled
  - stress annealed
- **traverse wound strips**
  - drum weights: 300 - 1.500 kg
  - wooden, plastic and metal drums
  - flange less
- **TEC**STRIP®_multicoil
  - thickness: 0,15 - 0,80 mm
  - width: 15 - 50 mm
  - max. pallet weights: 2.500 kg *

  *) higher pallet weights on request
- **pre stamped - and finish parts**



2.1.2. **Manufacturing programme** (tolerances on width and thickness)

thickness mm	width tolerance standard (mm)				
	10 - 50	51 - 100	101 - 200	201 - 350	351 - 600
0,08 - 1,00	+ 0,20	+ 0,30	+ 0,40	+ 0,60	+ 1,00
1,01 - 2,00	+ 0,30	+ 0,40	+ 0,50	+ 1,00	+ 1,50
2,01 - 4,00	+ 0,50	+ 0,60	+ 0,70	+ 1,20	+ 2,00

thickness mm	width tolerance precision (mm)				
	10 - 50	51 - 100	101 - 200	201 - 350	351 - 600
0,08 - 1,00	+ 0,10	+ 0,20	+ 0,30	+ 0,40	+ 0,50
1,01 - 2,00	+ 0,20	+ 0,20	+ 0,40	+ 0,60	+ 0,70
2,01 - 4,00	+ 0,30	+ 0,30	+ 0,50	+ 0,70	+ 0,90

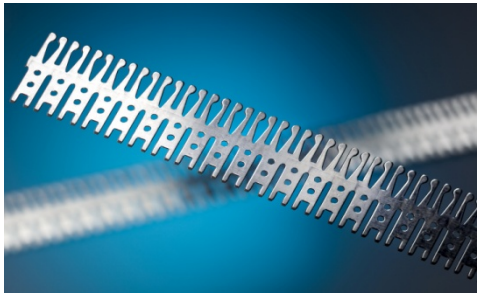
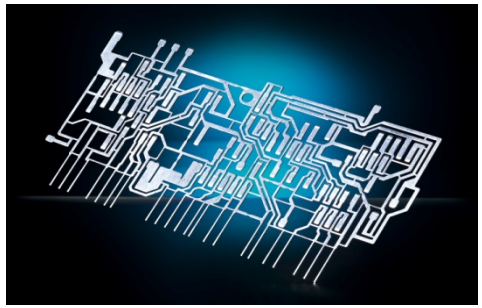
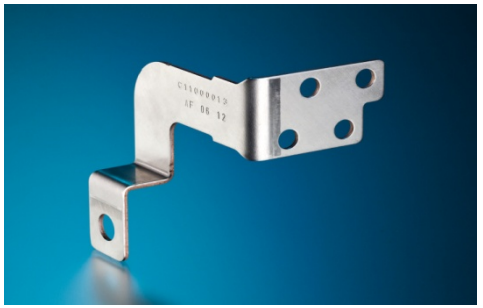
thickness mm	thickness tolerance	
	standard	precision
0,08 - 0,20	± 0,005	± 0,004
0,21 - 0,30	± 0,007	± 0,005
0,31 - 0,40	± 0,015	± 0,006
0,41 - 0,50	± 0,015	± 0,008
0,51 - 0,60	± 0,017	± 0,010
0,61 - 0,70	± 0,020	± 0,010
0,71 - 0,85	± 0,022	± 0,012
0,86 - 1,30	± 0,025	± 0,015
1,31 - 2,00	± 0,030	± 0,020
2,01 - 4,00	± 0,045	± 0,025

other tolerances on request

KME Germany GmbH & Co. KG
2.2.1. Stamping - Center Osnabrück

- When it comes to high-quality stamped and formed parts with maximum precision at a high technical level, we are your partner.

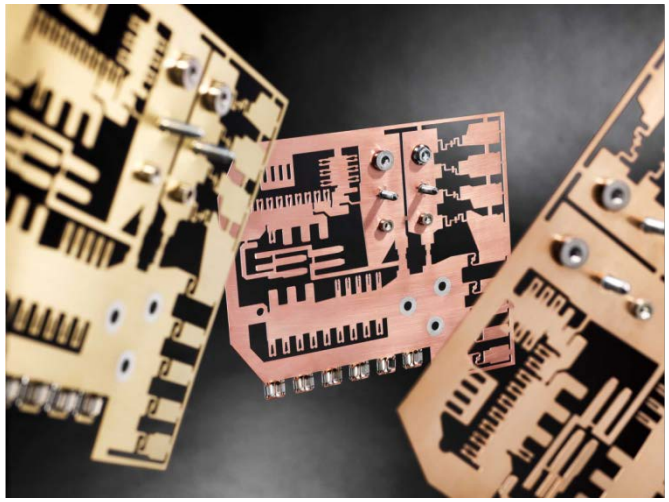
- We offer fully integrated manufacturing chain
  - Advice on materials
  - Strip production
  - Hot-dip tinning, electroplating and coating of stamped strips
  - Manufacturing of stamped parts especially for material-intensive products
  - Recycling of stamping parts
  - Metal management

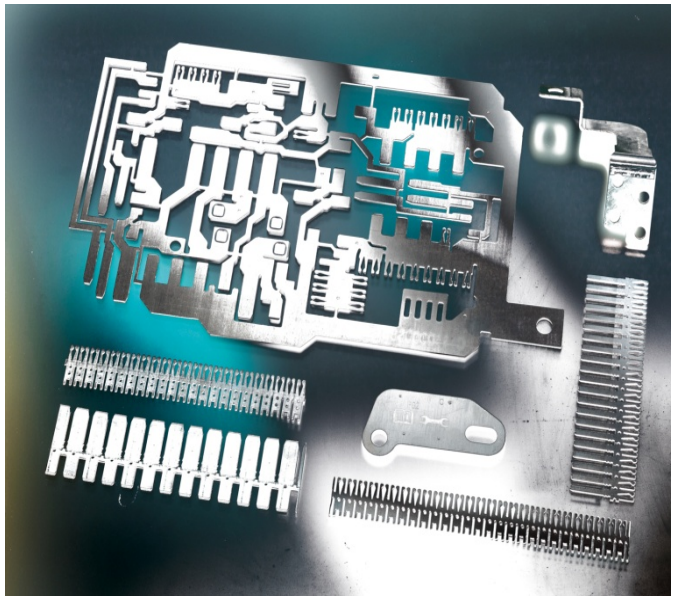





- We will send you an overall concept tailored to your needs

KME Germany GmbH & Co. KG
2.2.2. Stamping - Center Osnabrück

- Stampingmaschines with 50 – 300t press force
- Strip thickness up to 4 mm (according press and base material)
  > 4 mm on request
- Tool size up to 2,5m
- Integrated processes a.e.
  - press in from bolts and nuts
  - joining of components
- Small and large batch production
- Customised packaging
- Tool construction and tool maintenance
- Stamping of all common metals
- Technical and sales support for customers
- Project management
- Quality management system accredited to TS 16949





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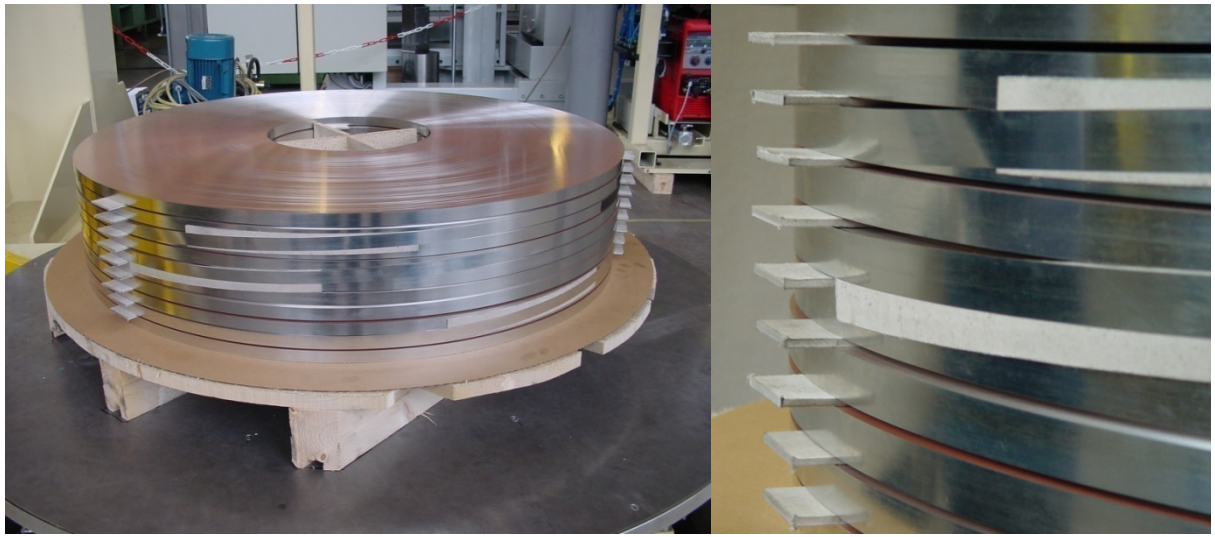
KME Germany GmbH & Co. KG
2.3.1. **TEC**STRIP®_multicoil

The economical coil of Copper, Bronze and High Performance STOL® alloys. **TEC**STRIP®_multicoil is a system where several large pancake coils are joined together by resistance welding and supplied palletized for use on pallet de-coilers.
Your advantage: Increased efficiency = increase of the productivity = cost savings when processing KME alloys.



Standard thickness: 15 - 50 mm
Standard width: 0,15 - 0,80 mm

Warehouse requirements:

- Height of pallet: max. 490 mm
- Circular pallet ø: max. 1.600 mm
- Pallet weight: max. 2.500 kg *)
- Outer diameter ø: max. 1.600 mm

*) higher pallet weights on request

Inner diameter ø 300 mm for thickness:
0,15 - 0,40 mm
Inner diameter ø 400 mm für thickness:
> 0,40 - 0,80 mm

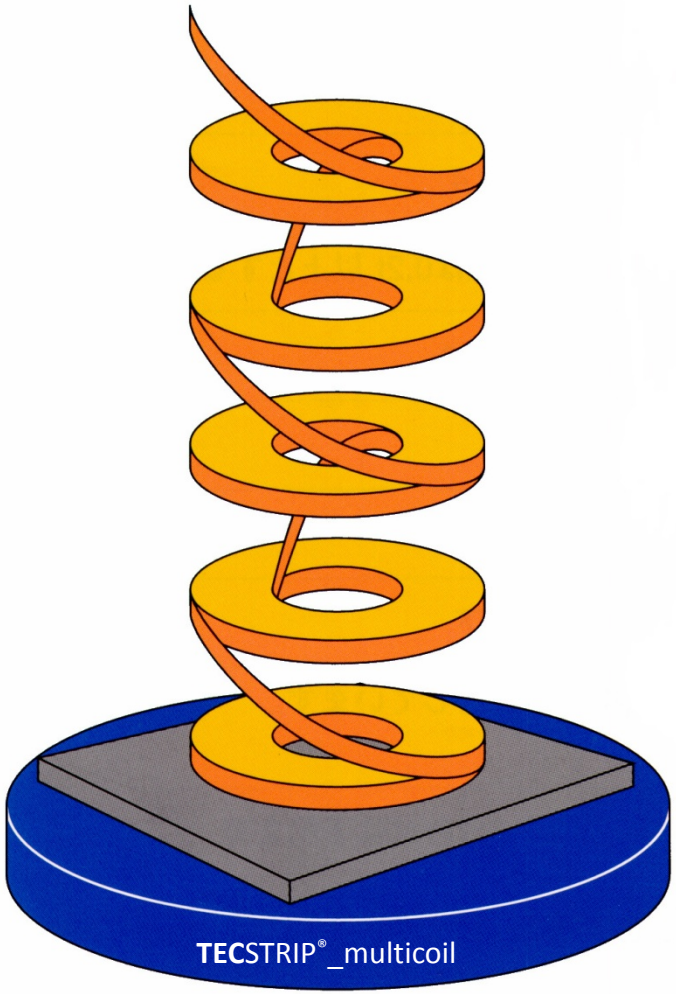
The coils ends are joined by welding the outer to outer and inner to inner ends, forming one continuous length. The **TEC**STRIP®_multicoil is then unreeled in the opposite direction during processing.

2.3.2. **TEC**STRIP®_multicoil

Potential savings using **TEC**STRIP®_multicoil

The use of **TEC**STRIP®_multicoil optimises production, reduces coil changes and labour costs and keeps scrap to the minimum.
(Example for strip dimension: 0,25 x 25 mm = 12 single coils)

- Saving of materials
  - up to 44 m strip material = minimizes scrap.
- Reduction of tooling time
  - up to 165 minutes longer machine running capacity through **TEC**STRIP®_multicoil
  - in comparison to 12 single coils without stamping starts of
  - single coils = productivity increase of approx. 13 %.
- Tooling – capacity
  - up to 25 % less tooling breaks starting single coils.
- De-coiler system of KME own machinery manufacture
  - customer designed conception
  - reduction of investment spending by customer-orientated cost absorptions.



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3.1. Survey standard - alloys

ASTM	DIN EN	CEN	Applications
C11000	Cu-ETP	CW004A	Base material for electrical parts.
C10300	Cu-HCP	CW021A	
C10300	Cu-PHC	CW020A	
C12000	Cu-DLP	CW023A	
C12200	Cu-DHP	CW024A	
C10200	Cu-OF		
C10100	Cu-OFE	CW009A	
C22000	CuZn10	CW501L	Basis elements for electrical parts,
C23000	CuZn15	CW502L	installation parts and fittings for the electrical industry.
C26000	CuZn30	CW505L	Cost reduction by higher zinc content.
C26800	CuZn33	CW506L	
C27000	CuZn36	CW507L	
C27200	CuZn37	CW508L	
C51100	CuSn4	CW450K	Contact springs, connectors,
C51000	CuSn5	CW451K	membranes, spring elements,
C51900	CuSn6	CW452K	switch elements, fixed contacts.
C52100	CuSn8	CW453K	Ultra-high strength spring elements.
C 14415#	CuSn0,15	CW117C	Male connectors, junction boxes.
C15100	CuZr0,1		Connectors, relays, springs, high voltage contacts.
C15500	CuMgAgP		Electrical contacts, electronic components, soldered connection
C19210	CuFe0,1P		Connectors, relays, springs
	CuSn3Zn9	CW454K	Good compromise between alloy properties,
C42500	CuSn2Zn10		low metal price and better price formation.
C50710	CuSn2Fe0,1P		Connectors
C50725	CuSn2Zn2Fe0,1P		Connectors
C70250	CuNi3Si		Connectors, bend parts, relays.
C70600	CuNi10Fe1Mn	CW352H	High corrosion resistance against oil + seawater (seawater spray test), resistance against relaxation.

The KME alloys are conforming to RoHS. # slight difference in chem. composition

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3.2. C11000 - Cu-ETP (E-Cu) - CW004A

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. %	Hardness (reference) HV	Bendability 90° gw [1) 2)] bw	
R220	220 - 260	(max. 140)	33	40 - 65	0	0
R240	240 - 300	180	8	65 - 95	0	0
R290	290 - 360	250	4	90 - 110	0	0,5
R360	min. 360	320	2	min. 110	1	2

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	99,90
O	≤ 0,040

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	394
Electr. conductivity ***	MS/m	58
Electr. conductivity ***	IACS	100
Coefficient of thermal expansion **	10^{-6}/K	17,7
Modulus of elasticity *	GPa	127

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.3. C10300 - Cu-HCP (SE-Cu) - CW021A

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. %	Hardness (reference) HV	Bendability 90° gw [1) 2)] bw	
R220	220 - 260	(max. 140)	33	40 - 65	0	0
R240	240 - 300	180	8	65 - 95	0	0
R290	290 - 360	250	4	90 - 110	0	0
R360	min. 360	320	2	min. 110	0	0,5

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	99,95
P	0,003

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	385
Electr. conductivity ***	MS/m	57
Electr. conductivity ***	IACS	98
Coefficient of thermal expansion **	10^{-6}/K	17,7
Modulus of elasticity *	GPa	132

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.4. C10300 - Cu-PHC (SE-Cu) - CW020A

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. %	Hardness (reference) HV	Bendability 90° gw 1) 2)	bw
R220	220 - 260	(max. 140)	33	40 - 65	0	0
R240	240 - 300	180	8	65 - 95	0	0
R290	290 - 360	250	4	90 - 110	0	0
R360	min. 360	320	2	min. 110	0	0,5

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	99,95
P	0,001 - 0,005

Physical properties		
Density *	g/cm³	8,94
Thermal conductivity *	W/(m·K)	385
Electr. conductivity ***	MS/m	58
Electr. conductivity ***	IACS	100
Coefficient of thermal expansion **	10^{-6}/K	17,7
Modulus of elasticity *	GPa	132

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.5. C12000 - Cu-DLP (SW-Cu) - CW023A

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. %	Hardness (reference) HV	Bendability 90° gw [1) 2)] bw	
R220	220 - 260	(max. 140)	33	40 - 65	0	0
R240	240 - 300	180	8	65 - 95	0	0
R290	290 - 360	250	4	90 - 110	0	0
R360	min. 360	320	2	min. 110	0	0,5

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	99,90
P	0,005 - 0,013

Physical properties		
Density *	g/cm³	8,94
Thermal conductivity *	W/(m·K)	375
Electr. conductivity ***	MS/m	55
Electr. conductivity ***	IACS	95
Coefficient of thermal expansion **	10^{-6}/K	17,3
Modulus of elasticity *	GPa	132

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.6. C12200 - Cu-DHP (SF-Cu) - CW024A

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. %	Hardness (reference) HV	Bendability 90° gw 1) 2)	bw
R220	220 - 260	(max. 140)	33	40 - 65	0	0
R240	240 - 300	180	8	65 - 95	0	0
R290	290 - 360	250	4	90 - 110	0	0
R360	min. 360	320	2	min. 110	0	0,5

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	99,90
P	0,015 - 0,040

Physical properties		
Density *	g/cm³	8,90
Thermal conductivity *	W/(m·K)	330
Electr. conductivity ***	MS/m	47
Electr. conductivity ***	IACS	81
Coefficient of thermal expansion **	10^{-6}/K	17,6
Modulus of elasticity *	GPa	132

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.7. C10100 / C10200 - Cu-OFE (OF-Cu) - CW009A

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. %	Hardness (reference) HV	Bendability 90° gw [1) 2)] bw	
R220	220 - 260	(max. 140)	33	40 - 65	0	0
R240	240 - 300	(180)	8	65 - 95	0	0
R290	290 - 360	(250)	4	90 - 110	0	0
R360	min. 360	(320)	2	min. 110	0	0,5

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	99,90
P	0,015 - 0,040
O	0,0005

Physical properties		
Density *	g/cm³	8,94
Thermal conductivity *	W/(m·K)	394
Electr. conductivity ***	MS/m	58,6
Electr. conductivity ***	IACS	101
Coefficient of thermal expansion **	10^{-6}/K	17,7
Modulus of elasticity *	GPa	132

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
3.8. C22000 - CuZn10 - CW501L

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R240	240 - 290	(max. 140)	36	50 - 100	0	0
R280	280 - 360	(200)	13	80 - 130	0	0
R350	350 - 450	(290)	4	110 - 160	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	89,0 - 91,0
Zn	Rest
Ni	max. 0,3
Sn	max. 0,1
Fe	max. 0,05

Physical properties		
Density *	g/cm³	8,8
Thermal conductivity *	W/(m·K)	184
Electr. conductivity ***	MS/m	25
Electr. conductivity ***	IACS	43
Coefficient of thermal expansion **	10^{-6}/K	18,2
Modulus of elasticity *	GPa	124

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.9. C23000 - CuZn15 - CW502L

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R300	300 - 370	(max. 170)	16	85 - 120	0	0
R350	350 - 420	(270)	8	100 - 150	0	0
R410	410 - 490	(360)	3	125 - 155	0	1
R480	480 - 560	(420)	1	150 - 180	1	3
R550	min. 550	(480)	-	min. 170	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	84,0 - 86,0
Zn	Rest
Ni	max. 0,3
Sn	max. 0,1
Fe	max. 0,05

Physical properties		
Density *	g/cm³	8,75
Thermal conductivity *	W/(m·K)	159
Electr. conductivity ***	MS/m	20
Electr. conductivity ***	IACS	34
Coefficient of thermal expansion **	10^{-6}/K	18,5
Modulus of elasticity *	GPa	122

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
3.10. C26000 - CuZn30 - CW505L

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R270	270 - 350	(max. 170)	40	55 - 105	0	0
R350	350 - 430	(270)	21	95 - 155	0	0
R410	410 - 490	(350)	9	120 - 180	0	1
R480	480 - 570	(430)	4	150 - 190	0,5	2
R550	550 - 640	(480)	2	170 - 210	1	3
R630	min. 630	(560)	-	min. 190	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	69,0 - 71,0
Zn	Rest
Ni	max. 0,3
Sn	max. 0,1
Fe	max. 0,05

Physical properties		
Density *	g/cm³	8,5
Thermal conductivity *	W/(m·K)	126
Electr. conductivity ***	MS/m	16
Electr. conductivity ***	IACS	28
Coefficient of thermal expansion **	10^{-6}/K	19,7
Modulus of elasticity *	GPa	115

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
3.11. C26800 - CuZn33 - CW506L

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R280	280 - 380	(max. 170)	44	55 - 95	0	0
R350	350 - 430	(170)	23	95 - 125	0	0
R420	420 - 500	(300)	6	125 - 155	0	0
R500	min. 500	(450)	3	min. 155	0,5	0,5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	66,0 - 68,0
Zn	Rest
Ni	max. 0,3
Sn	max. 0,1
Fe	max. 0,05

Physical properties		
Density *	g/cm³	8,5
Thermal conductivity *	W/(m·K)	121
Electr. conductivity ***	MS/m	15
Electr. conductivity ***	IACS	26
Coefficient of thermal expansion **	10^{-6}/K	19,9
Modulus of elasticity *	GPa	112

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
3.12. C27000 - CuZn36 - CW507L

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R300	300 - 370	(max. 180)	38	55 - 105	0	0
R350	350 - 430	(170)	19	95 - 125	0	0
R410	410 - 490	(300)	8	120 - 155	0	0
R480	480 - 560	(430)	3	150 - 180	0,5	2
R550	min. 550	(500)	-	min. 170	1	3
R630	min. 630	(600)	-	min. 190	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	63,5 - 65,5
Zn	Rest
Ni	max. 0,3
Sn	max. 0,1
Fe	max. 0,05

Physical properties		
Density *	g/cm³	8,45
Thermal conductivity *	W/(m·K)	121
Electr. conductivity ***	MS/m	14
Electr. conductivity ***	IACS	24
Coefficient of thermal expansion **	10^{-6}/K	20,2
Modulus of elasticity *	GPa	110

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
3.13. C27200 - CuZn37 - CW508L

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R300	300 - 370	(max. 180)	38	55 - 105	0	0
R350	350 - 430	(170)	19	95 - 125	0	0
R410	410 - 490	(300)	8	120 - 155	0	0
R480	480 - 560	(430)	3	150 - 180	0,5	2
R550	min. 550	(500)	-	min. 170	1	3
R630	min. 630	(600)	-	min. 190	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	62,0 - 64,0
Zn	Rest
Ni	max. 0,3
Sn	max. 0,1
Fe	max. 0,05

Physical properties		
Density *	g/cm³	8,45
Thermal conductivity *	W/(m·K)	121
Electr. conductivity ***	MS/m	14
Electr. conductivity ***	IACS	24
Coefficient of thermal expansion **	10^{-6}/K	20,2
Modulus of elasticity *	GPa	110

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.14. C51100 - CuSn4 - CW450K

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa		Elongation A50 min. %		Hardness (reference) HV	Bendability 90° gw 1) 2)		Bendability 90° bw 1) 2)	
		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling
R290	290 - 390	max. 190		40		70 - 105	0	0	0	0
R390	390 - 490	320	250	17	20	115 - 155	0	0	0	0
R480	480 - 570	440	400	8	13	150 - 180	0	0	0	0
R540	540 - 630	480	450	6	12	160 - 200	0	0	0,5	0
R600	600 - 660	560	530	5	12	min. 180	0	0	1	0
R660	660 - 720	620	590	-	7	min. 180	-	0	-	0
R700	700 - 800	-	640	-	3	min. 180	-	0	-	0

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	Rest
Sn	3,5 - 4,5
Fe	max. 0,1
Ni	max. 0,2
P	0,01 - 0,4
Zn	max. 0,2
Pb	max. 0,02
Other	max. 0,2

Physical properties		
Density *	g/cm³	8,85
Thermal conductivity *	W/(m·K)	100
Electr. conductivity ***	MS/m	12
Electr. conductivity ***	IACS	21
Coefficient of thermal expansion **	10^{-6}/K	17,8
Modulus of elasticity *	GPa	120

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.15. C51000 - CuSn5 - CW451K

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa		Elongation A50 min. %		Hardness (reference) HV	Bendability 90° gw 1) 2)		Bendability 90° bw 1) 2)	
		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling
R310	310 - 390	max. 250		45		70 - 105	0	0	0	0
R400	400 - 500	340	-	17	-	120 - 160	0	0	0	0
R490	490 - 580	450	440	12	19	160 - 190	0	0	0	0
R550	550 - 640	500	480	5	13	180 - 210	0	0	1	0,5
R630	630 - 720	570	560	3	7	200 - 230	1	0	2	1
R690	min. 690	630	600	2	4	min. 220	2,5	2	3,5	3

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	Rest
Sn	4,5 - 5,5
Fe	max. 0,1
Ni	max. 0,2
P	0,01 - 0,4
Zn	max. 0,2
Pb	max. 0,02
Other	max. 0,2

Physical properties		
Density *	g/cm³	8,85
Thermal conductivity *	W/(m·K)	96
Electr. conductivity ***	MS/m	89
Electr. conductivity ***	IACS	15
Coefficient of thermal expansion **	10^{-6}/K	17,8
Modulus of elasticity *	GPa	120

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.16. C51900 - CuSn6 - CW452K

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa		Elongation A50 min. %		Hardness (reference) HV	Bendability 90° gw 1) 2)		Bendability 90° bw 1) 2)	
		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling
R350	350 - 420	max. 300		45		80 - 120	0	0	0	0
R420	420 - 520	350	340	15	22	120 - 170	0	0	0	0
R500	500 - 590	450	410	15	22	160 - 190	0	0	0	0
R560	560 - 650	520	490	10	15	180 - 210	0	0	0	0
R640	640 - 730	590	570	5	12	200 - 230	0	0	1	0,5
R720	min. 720	650	620	-	4	min. 210	-	1	-	-
R850 3)	min. 850	-	800	-	1,5	min. 240	-	1	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)
3) thicknesses: 0,15 - 0,60 mm

Chemical composition (reference) %	
Cu	Rest
Sn	5,5 - 7,0
Fe	max. 0,1
Ni	max. 0,2
P	0,01 - 0,4
Zn	max. 0,2
Pb	max. 0,02
Other	max. 0,2

Physical properties		
Density *	g/cm³	8,80
Thermal conductivity *	W/(m·K)	75
Electr. conductivity ***	MS/m	8
Electr. conductivity ***	IACS	13
Coefficient of thermal expansion **	10^{-6}/K	18,5
Modulus of elasticity *	GPa	118

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.17. C52100 - CuSn8 - CW453K

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa		Elongation A50 min. %		Hardness (reference) HV	Bendability 90° gw 1) 2)		Bendability 90° bw 1) 2)	
		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling		mech. stress-levelling	thermal stress-levelling	mech. stress-levelling	thermal stress-levelling
R370	370 - 450	max. 300		50		80 - 120	0	0	0	0
R450	450 - 550	370 350	28	35	22	120 - 175	0	0	0	0
R540	540 - 630	460	440	22	27	170 - 200	0	0	0	0
R600	600 - 690	520	480	16	20	180 - 210	0	0	1	0
R660	660 - 750	600	580	10	14	210 - 240	0	0	3	2
R740	740 - 810	680	660	5	8	210 - 260	-	2	-	3
R800 3)	800 - 930	720	700	-	4	230 - 290	-	-	-	-
R850 3)	min. 850	-	800	-	1,5	min. 240	-	-	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)
3) thicknesses: 0,15 - 0,60 mm

Chemical composition (reference) %	
Cu	Rest
Sn	7,5 - 8,5
Fe	max. 0,1
Ni	max. 0,2
P	0,01 - 0,4
Zn	max. 0,2
Pb	max. 0,02
Other	max. 0,2

Physical properties		
Density *	g/cm³	8,80
Thermal conductivity *	W/(m·K)	67
Electr. conductivity ***	MS/m	6,5
Electr. conductivity ***	IACS	11
Coefficient of thermal expansion **	10^{-6}/K	18,5
Modulus of elasticity *	GPa	115

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.18. C70600 - CuNi10Fe1Mn - CW352K

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa (() only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2) 3)	bw
R300	min. 300	(100)	20	min. 70	0	0
R320	min. 320	(180)	12	min. 100	0	0
R420	420 - 510	(370)	3	min. 120	0	0,5
R520	520 - 610	(480)	2	min. 150	1	2
R620	min. 620	(590)	-	min. 170	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	Rest
Ni	9,0 - 11,0
Fe	1,0 - 2,0
Mn	0,5 - 1,0

Physical properties		
Density *	g/cm³	8,80
Thermal conductivity *	W/(m·K)	67
Electr. conductivity ***	MS/m	6,5
Electr. conductivity ***	IACS	11
Coefficient of thermal expansion **	10^{-6}/K	18,5
Modulus of elasticity *	GPa	115

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.19. C70250 - CuNi3Si

Temper class age hardened	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa () only Information	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° gw 1) 2)	 bw
R620	620 - 760	500	10	180 - 240	0	0
R650	650 - 800	585	7	190 - 250	1	1
R690	690 - 820	655	5	210 - 250	1,5	1,5
R760	760 - 840	720	3	220 - 260	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	min. 96,2
Ni	2,2 - 4,2
Si	0,25 - 1,2
Mg	0,05 - 0,30
Other	Rest

Physical properties		
Density *	g/cm³	8,80
Thermal conductivity *	W/(m·K)	190
Electr. conductivity ***	MS/m	23
Electr. conductivity ***	IACS	40
Coefficient of thermal expansion **	10^{-6}/K	17,6
Modulus of elasticity *	GPa	130

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.20. C42500 - CuSn2Zn10 / CuSn3Zn9 - CW454K

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)		Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
						gw	bw	gw	bw
R320	320 - 380	max. 250	25		80 - 110	0	0	0	0
R380	380 - 430	(200)	16	20	110 - 140	0	0	0,5	1
R430	430 - 520	(330)	6	10	140 - 170	0	0	1	1,5
R510	510 - 600	(430)	3	8	160 - 190	0	1	2	2,5
R580	580 - 690	(520)	-		180 - 210	1	2	2,5	4
R660	min. 660	(610)	-		min. 200	-	-	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition % (reference) CuSn3Zn9 - CW454K	
Cu	Rest
Sn	1,5 - 3,5
Zn	7,5 - 10,0

Chemical composition % (reference) CuSn3Zn9 - CW454K	
Cu	87 - 90
Sn	1,5 - 3,0
Zn	Rest

Physical properties		
Density *	g/cm³	8,75
Thermal conductivity *	W/(m·K)	120
Electr. conductivity ***	MS/m	15
Electr. conductivity ***	IACS	25
Coefficient of thermal expansion **	10^{-6}/K	18,4
Modulus of elasticity *	GPa	126

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.21. C15100 - CuZr0,1

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
					gw	bw	gw	bw
R280	280 - 310	190	13	80 - 100	0	0	0	0
R300	300 - 350	280	6	95 - 115	0	0	-	-
R320	320 - 390	310	5	100 - 125	-	-	-	-
R360	360 - 430	350	4	120 - 145	-	-	-	-
R400	400 - 450	390	3	125 - 150	-	-	-	-
R440	440 - 490	430	2	min. 135	-	-	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	≥ 99,80
Zr	0,05 - 0,15
Fe + Al + Mn	≤ 0,01

Physical properties		
Density *	g/cm³	8,94
Thermal conductivity *	W/(m·K)	360
Electr. conductivity ***	MS/m	55
Electr. conductivity ***	IACS	95
Coefficient of thermal expansion **	10^{-6}/K	17,6
Modulus of elasticity *	GPa	121

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
3.22. C19210 - CuFe0,1P

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
					gw	bw	gw	bw
R300	300 - 380	max. 300	10	80 - 110	0	0	0	0
R360	360 - 440	260	3	100 - 130	0	0	-	-
R420	420 - 500	350	2	120 - 150	-	-	-	-

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	Rest
Fe	0,05 - 0,15
P	0,025 - 0,04
Other	max. 0,5

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	350
Electr. conductivity ***	MS/m	50
Electr. conductivity ***	IACS	86
Coefficient of thermal expansion **	10^{-6}/K	17
Modulus of elasticity *	GPa	125

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.23. C50715 - CuSn2Fe0,1P

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
					gw	bw	gw	bw
R390	390 - 500	290	16	min. 130	0	0	0	0
R510	510 - 600	440	6	min. 165	0	0	0	1
R550	550 - 630	490	5	min. 175	0	0,5	1	1,5
R600	600 - 670	550	3	min. 190	1	1,5	2	2,5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	Rest
Sn	1,7 - 2,3
Fe	0,05 - 0,15
P	0,025 - 0,04
Other	max. 0,5

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	140
Electr. conductivity ***	MS/m	22
Electr. conductivity ***	IACS	38
Coefficient of thermal expansion **	10^{-6}/K	17,6
Modulus of elasticity *	GPa	121

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.24. C50725 - CuSn2Zn2Fe0,1P

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
					gw	bw	gw	bw
R390	390 - 500	280	20	min. 130	0	0	0	0
R510	510 - 600	470	6	min. 165	0	0	0	1
R550	550 - 630	510	5	min. 175	0	0,5	1	1,5
R600	600 - 670	575	3	min. 190	1	1,5	2	2,5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	Rest
Sn	1,5 - 2,5
Zn	1,5 - 3,0
Fe	0,05 - 0,20
P	0,02 - 0,06
Other	max. 0,5

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	150
Electr. conductivity ***	MS/m	19
Electr. conductivity ***	IACS	33
Coefficient of thermal expansion **	10^{-6}/K	17,5
Modulus of elasticity *	GPa	113

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

3.25. CW117C - CuSn0,15 - C14415# - STOL®81

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2)	
					gw	bw
R250	250 - 320	200	9	60 - 90	0	0
R300	300 - 370	250	4	85 - 110	0	0
R360	360 - 430	300	3	105 - 130	0	0
R420	420 - 490	350	2	120 - 140	1	1

1) r = x · t thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu	≥ 99,90
Sn	0,10 - 0,15
Other	max. 0,10

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	350
Electr. conductivity ***	MS/m	47
Electr. conductivity ***	IACS	81
Coefficient of thermal expansion **	10^{-6}/K	18
Modulus of elasticity *	GPa	120

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

slight difference in chem. composition

KME Germany GmbH & Co. KG

3.26. C15500 - CuMgAgP

Temper class		Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. %	Bendability 90° 1) 2)	
					gw	bw
R235	O61 annealed	235 - 295	105	30	0	0
R310	H02 ½ hard	310 - 380	260	13	0	0
R385	H04 hard	385 - 440	345	6	0	0,5
R435	H06 extra hard	435 - 495	385	5	0,5	1
R450	H08 spring	450 - 505	415	4	0,5	1
R470	H10 extra spring	470 - 515	435	3	1	2

1) r = x · t (thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (%) (reference)	
Cu (incl. Ag)	99,75
Mg	0,08 - 0,13
P	0,04 - 0,08
Ag	0,027 - 0,10

Main characteristics

Medium performance, automotive and soldered terminals. Maximum conductivity combined with medium strength, high thermal and oxidation stability, junction boxes and terminals.

Physical properties		
Density *	g/cm³	8,91
Thermal conductivity *	W/(m·K)	346
Electr. conductivity ***	MS/m	50
Electr. conductivity ***	IACS	86
Coefficient of thermal expansion **	10^{-6}/K	17,8
Modulus of elasticity *	GPa	115

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG

4.1. STOL® alloys

KME Brand name	CEN	ASTM	Main characteristics
STOL®76	-	C19010	Basic elements for automotive and electrical connectors for high currents and high temperature. Excellent conductivity combined with high strength and good resistance to relaxation; strengthening by age hardening. STOL®76 is the most important alloy in our program.
STOL®76M	-	C19002#	Upgraded STOL®76. High tensile strength with best bendability and electrical conductivity. Good resistance against relaxation; strengthening by age hardening. No peeling at long term-charge up to 130 °C and higher.
STOL®78	-	C18665	Automotive, electrical and electronic connectors; for relays; current carrying springs and junction boxes; excellent formability at medium strength.
STOL®80	-	C14410	Low cost special alloy, highest conductivity, preferred for male connectors, junction boxes, pre-tinned a substitution of brass at nearly the same costs.
STOL®94	-	C70310	Maximum strength combined with good bendability and good electrical conductivity, resistance against relaxation and electro-chemical migration. No peeling at long-term charge up to 130 °C and higher. Partial substitute for beryllium alloys.
STOL®95	-	C18160	Alloy for high current applications e.g. hybrid-cars or photovoltaic. The electrical and thermal conductivity is excellent. Due to the CrZr-precipitations the relaxation properties, even at temperatures up to 200 °C are excellent . As strip (0,2 – 3,0 mm) and round wire (up to 1,0 mm) available.
STOL®194	CW 107 C	C19400	Medium performing alloy, the oldest worldwide available special alloy.

slight difference in chem.composition

KME Germany GmbH & Co. KG

4.2. **STOL® alloys** (Chemical composition)

Alloy	Cu %	Cr %	Fe %	Mg %	Ni %	Sn %	Si %	Zn %	Zr %	Other %
STOL®76	Rest				0,8 – 1,8		0,15 – 0,35			max. 0,8
STOL®76M	Rest				1,4 – 1,7	0,2 – 0,3	0,2 – 0,35	0,35 – 0,5		max. 0,5
STOL®78	min. 99,0			0,4 – 0,9						
STOL®80	min. 99,90 incl. Ag + Sn					0,15 – 0,20				max. 0,1
STOL®94	Rest				2,0 – 3,2	0,1 – 0,7	0,3 – 0,9	0,3 – 1,3		max. 0,5
STOL®95	Rest	0,2 – 1,2	max. 0,10				max. 0,10		0,05 – 0,25	max. 0,3
STOL®194	Rest		2,1 – 2,6					0,05 – 0,20		max. 0,2

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4.3. **STOL® alloys** (Physical properties)

	Density*	Coefficient of thermal conductivity**	Thermal conductivity *	Electrical conductivity***	Electrical conductivity***	Modulus of elasticity *
	kg/cm³	10-6 K	W/ (m K)	MS/m	IACS	GPa
STOL®76	8,9	16,8	260	29 / 35	50 / 60	135
STOL®76M	8,9	16,8	260	27 / 33	47 / 57	135
STOL®78	8,8	17,3	270	36	62	130
STOL®80	8,9	17,3	330	44	76	120
STOL®94	8,85	17	185	23 / 25	40 / 43	132
STOL®95	8,9	18	330	50	86	137
STOL®194	8,9	16,3	260	35	60	125
* Reference values at room temperature		** between 20 and 300 °C	*** Value for the age hardened / lowest cold rolled worked temper class			

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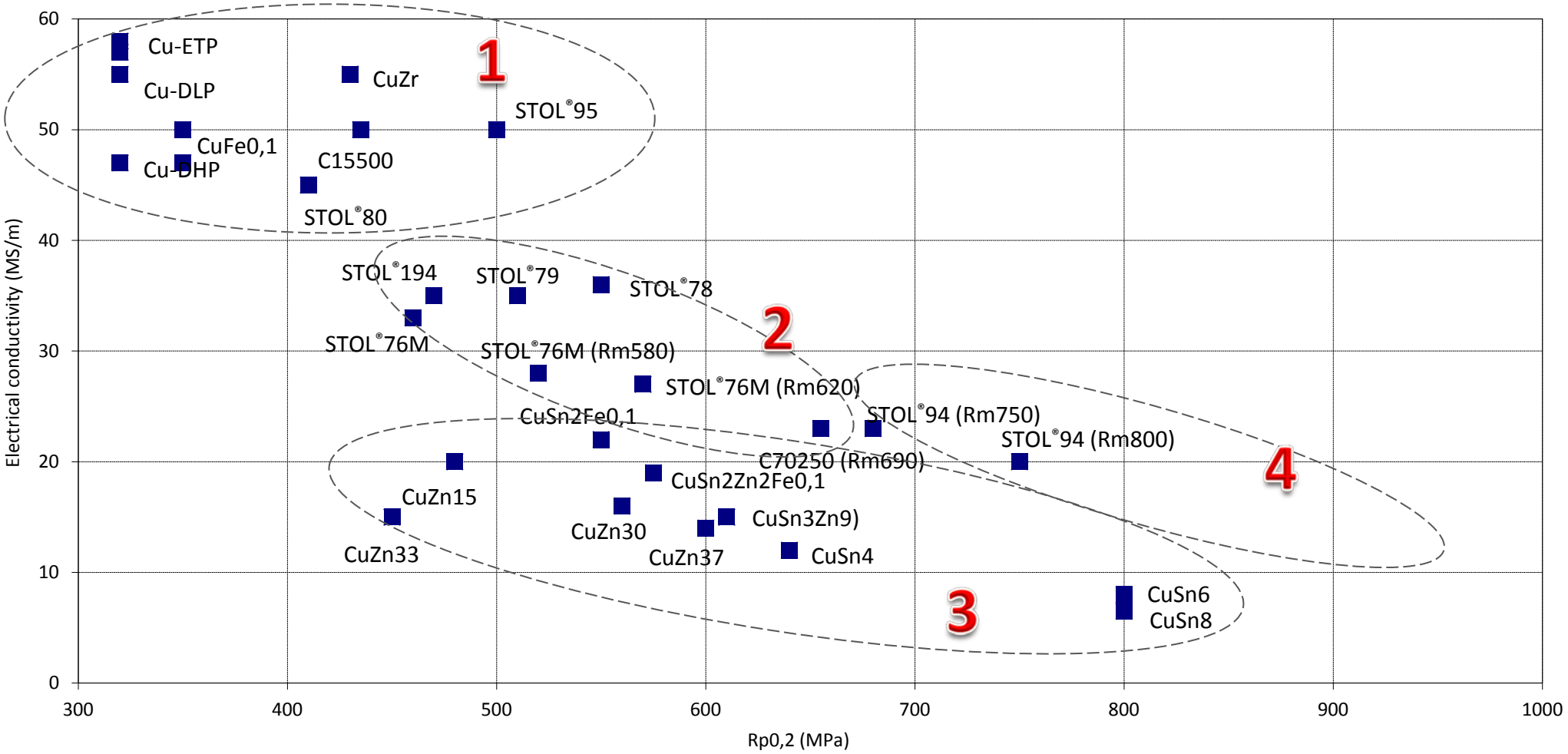
4.4. Segmentation of selected alloys



1. Moderate-low strength, high conductivity
2. Moderate strength, improved conductivity
3. Low conductivity, moderate strength
4. Medium conductivity, high strength

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4.5. STOL®76 - C19010

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)		Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
						gw	bw	gw	bw
cold worked R360	360 - 430	300	12	14	100 - 130	0	0	0	0
R410	410 - 470	360	9	11	125 - 155	0	0	0,5	1
R460	460 - 520	410	7	9	135 - 165	0,5	1	1,5	3
R520	520 - 580	460	5	7	145 - 175	1	2	2,5	4
age hardened R580	580 - 650	520	9		160 - 210	1	1	3	5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition % (reference)	
Cu	Rest
Ni	0,8 - 1,8
Si	0,15 - 0,35
Other	max. 0,8

Main characteristics

Basic elements for automotive and electrical connectors for high current and high temperature. Excellent conductivity combined with high strength and good resistance to relaxation; strengthening by age hardening.

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	260
Electr. conductivity ***	MS/m	35 (cold worked) 29 (age hardened)
Electr. conductivity ***	IACS	60 (cold worked) 50 (age hardened)
Coefficient of thermal expansion **	10^{-6}/K	16,8
Modulus of elasticity *	GPa	135

* Reference values at room temperature ** Between 20 up to 300 °C *** Values for the lowest temper class

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4.6. STOL®76M - C19002#

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)		Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
						gw	bw	gw	bw
cold worked R360	360 - 430	300	12	14	100 - 130	0	0	0	0
R410	410 - 470	360	9	11	125 - 155	0	0	0,5	1
R460	460 - 520	410	7	9	135 - 165	0,5	1	1,5	3
R520	520 - 580	460	5	7	145 - 175	1	2	2,5	4
age hardened R530	530 - 630	430	14		150 - 190	0	0	1	2
R580	580 - 650	540	8		170 - 200	1	1	3	5
R580S	580 - 650	520	9		170 - 200	0,5	0,5	1,5	2
R620S	620 - 700	560	7		180 - 210	1	1,5	3	5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

slight difference in chemical composition

Chemical composition % (reference)	
Cu	Rest
Ni	1,4 - 1,7
Si	0,2 - 0,35
Sn	0,02 - 0,3
Zn	0,35 - 0,5
Other	max. 0,50

Main characteristics

CuNiSi-alloy with high tensile strength, best bendability and electrical conductivity. Good resistance against relaxation; strengthening by age hardening.

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	260
Electr. conductivity ***	MS/m	33 (cold worked) 27 (age hardened)
Electr. conductivity ***	IACS	57 (cold worked) 47 (age hardened)
Coefficient of thermal expansion **	10^{-6}/K	16,8
Modulus of elasticity *	GPa	135

* Reference values at room temperature ** Between 20 up to 300 °C *** Values for the lowest temper class

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4.7. STOL®78 - C18665

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)		Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
						gw	bw	gw	bw
R380	380 - 460	330	14	17	115 - 145	0	0	0	0,5
R460	460 - 520	410	10	12	140 - 165	0,5	1	1,5	3
R520	520 - 570	460	8	10	160 - 180	1	2,5	2	5
R570	570 - 620	500	6	8	175 - 195	2,5	5	3,5	8
R620 4)	min. 620	550	3	4	min. 190	3	6	5	10

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)
4) Thickness max. 0,50 mm

Chemical composition % (reference)	
Cu	min. 99,0
Mg	0,4 - 0,9
P	0,002 - 0,04

Main characteristics

Automotive, electrical and electronic connectors; for relays; current carrying springs and junction boxes; excellent formability at medium strength.

Physical properties		
Density *	g/cm³	8,8
Thermal conductivity *	W/(m·K)	270
Electr. conductivity ***	MS/m	36
Electr. conductivity ***	IACS	62
Coefficient of thermal expansion **	10^{-6}/K	17,3
Modulus of elasticity *	GPa	130

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
4.8. STOL®80 - C14410

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
					gw	bw	gw	bw
R250	min. 250	max. 140	20	60 - 85	0	0	0	0
R300	300 - 370	270	10	80 - 110	0	0	0	0
R360	360 - 430	310	7	110 - 130	0	0	0,5	1
R420	420 - 490	370	5	120 - 150	1	1	2	2,5
R460	min. 460	410	4	min. 135	1	1,5	2,5	3

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition % (reference)	
Cu (incl. Ag + Sn)	99,9
Sn	0,10 - 0,20
Other	max. 0,10

Main characteristics

Low cost special alloy, highest conductivity, prefered for male connectors, junction boxes, and with a pre-tinned surface all scrap materials has a higher value than standard tinned brass. The total cost for finsih products are being equal to brass made one.

Physical properties		
Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	330
Electr. conductivity ***	MS/m	44
Electr. conductivity ***	IACS	76
Coefficient of thermal expansion **	10^{-6}/K	17,3
Modulus of elasticity *	GPa	120

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

KME Germany GmbH & Co. KG
4.9. STOL®94 - C70310

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)		Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
						gw	bw	gw	bw
cold rolled R360	360 - 430	250	14	16	100 - 130	0	0	0	0,5
R410	410 - 470	360	9	12	125 - 155	0	0,5	0,5	1
R460	460 - 520	410	7	10	135 - 165	0,5	1	1,5	3
R520	520 - 580	460	5	8	145 - 175	1	2	2,5	3,5
R580	580 - 650	520	4	6	170 - 200	1	2,5	3	5
age hardened R620	620 - 720	540	16		180 - 240	0	0	1	1,5
R660	660 - 750	590	10		200 - 250	1	1	1,5	2
R750	750 - 830	680	8		210 - 260	2	2	3	4
R800	min. 800	750	5		min. 210	2	3	4	5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition % (reference)	
Cu	Rest
Ni	2,0 - 3,2
Si	0,3 - 0,9
Sn	0,1 - 0,7
Zn	0,3 - 1,3
Other	max. 0,50

Main characteristics

CuNiSi-alloy with highest tensile strength, best bendability and good electrical conductivity. Good resistance against relaxation; strengthening by age hardening.

Physical properties		
Density *	g/cm³	8,85
Thermal conductivity *	W/(m·K)	185
Electr. conductivity ***	MS/m	25 (cold worked) 23 (age hardened)
Electr. conductivity ***	IACS	43 (cold worked) 40 (age hardened)
Coefficient of thermal expansion **	10^{-6}/K	17
Modulus of elasticity *	GPa	132

* Reference values at room temperature ** Between 20 up to 300 °C *** Values for the lowest temper class

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4.10. STOL®95

Temper age hardened	Temper Code	Tensile Strength Rm min. - max. MPa	Yield Strength Rp0,2 min. MPa	Elongation A50 min. %	Hardness (Reference) HV	Bendability 90° 1) 2)		Bendability 180° 1) 2)	
						gw	bw	gw	bw
R480	TM04	480 - 560	450	8	150 - 190	1,5	1,5	2	2
R540	TM08	540 - 630	500	4	160 - 200	2	2	2,5	3
R540S	TR08	540 - 620	500	8	160 - 190	1,5	1,5	2	2,5

1) r = x · t (thickness ≤ 0,50 mm)
2) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition (reference) %	
Cu (1,2)	Rest
Cr	0,2 - 1,2
Zr	0,05 - 0,25
Fe	max. 0,10
Si	max. 0,10

(1) Cu + Sum of Named Elements 99,7 %
(2) includes Ag

Main characteristics

Alloy for high voltage applications, as Hybrid cars or Photovoltaic.
Very high electrical conductivity at excellence relaxation behavior.
As strip (0,2 up to 3,0 mm) and round wire (up to 1,0 mm) available.

Physical properties

Density *	g/cm³	8,9
Thermal conductivity *	W/(m·K)	330
Electr. Conductivity ***	MS/m	50
Electr. Conductivity ***	IACS	86
Coefficient of thermal expansion **	10^{-6}/K	18
Modulus of elasticity *	GPa	137

* Reference values at room temperature
** Between 20 up to 300 °C.
*** Values for the lowest temper class

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4.11. STOL®194 - C19400

Temper class	Tensile strength Rm min. - max. MPa	Yield strength Rp0,2 min. MPa	Elongation A50 min. % 2)	Hardness (reference) HV	Bendability 90° 1) 2) 3)		Bendability 180° 1) 2) 3)	
					gw	bw	gw	bw
R300	300 - 360	max. 240	18	80 - 100	0	0	0	0
R360	360 - 430	270	15	110 - 135	0	0	0	0,5
R420	420 - 480	380	10	130 - 150	0,5	0,5	1	1
R480	480 - 540	430	7	140 - 160	0,5	0,5	1	1,5
R520	520 - 580	470	4	min. 140	2,5	3,5	3	4,5

1) r = x · t thickness ≤ 0,50 mm)
2) values for stress relieved qualities
3) Sample width = 10 mm / Bendability for width of smaller samples on request (scale acc. bending cross reference list)

Chemical composition % (reference)	
Cu	Rest
Fe	2,1 - 2,6
Zn	0,05 - 0,2
Other	max. 0,2

Main characteristics
Alloy for electrical contacts; good electrical conductivity, moderate strength and good resistance against relaxation.

Physical properties		
Density *	g/cm³	8,8
Thermal conductivity *	W/(m·K)	260
Electr. conductivity ***	MS/m	35
Electr. conductivity ***	IACS	60
Coefficient of thermal expansion **	10^{-6}/K	16,3
Modulus of elasticity *	GPa	125

* Reference values at room temperature
** Between 20 up to 300 °C
*** Values for the lowest temper class

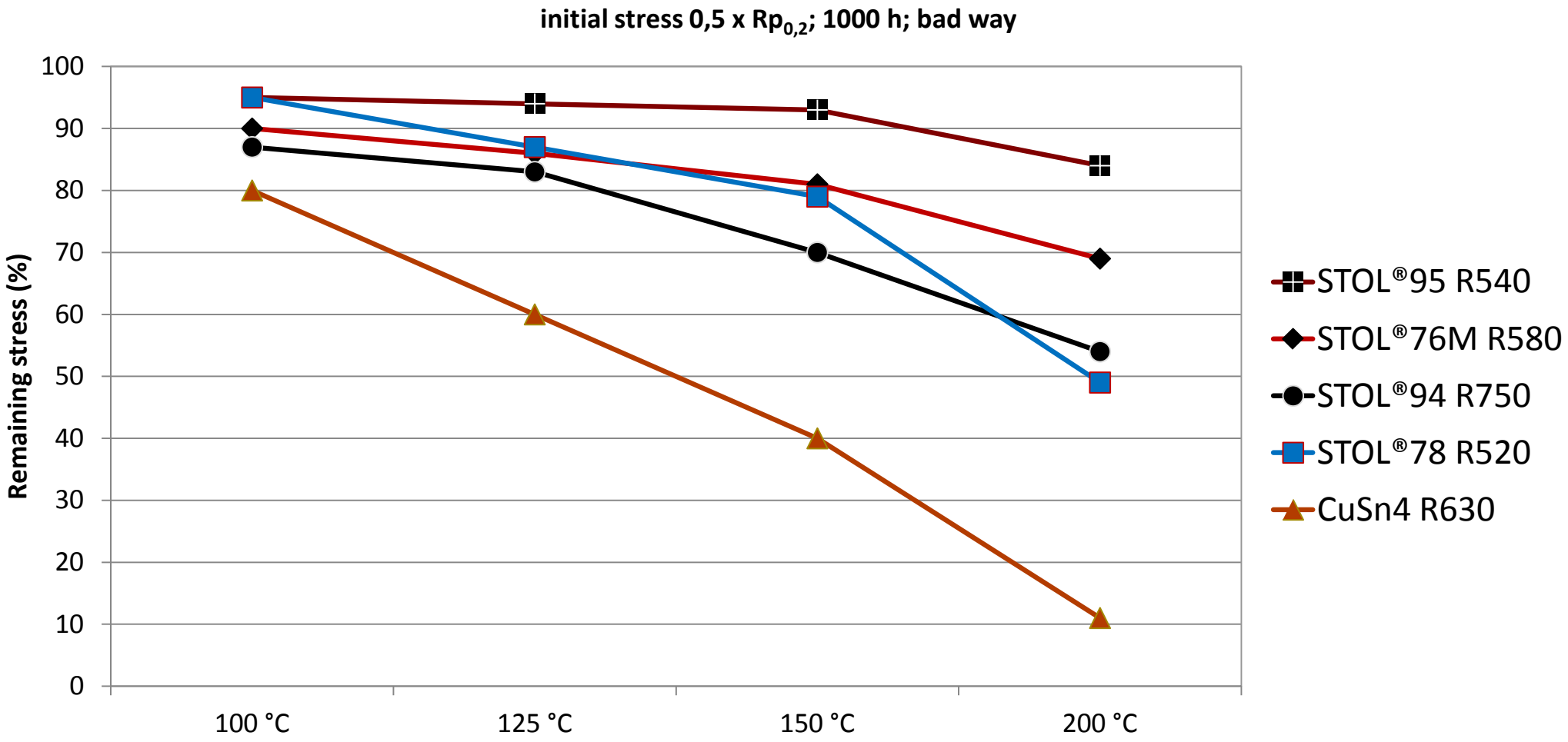
5.1.1. **Relaxation** (test methods and conditions)

- Definition
  - Relaxation sample is deformed elastic (e.g. bended around a tube), causing an initial stress level (of e.g 50 % Rp0.2).
  - After a storage time (e.g. 1,000 h) at elevated temperature (e.g. 150 °C) the remaining stress under this deformation is measured.
  - As the stress/ temperature combination leads to a reduction of the dislocation density, the yield strength of the material drops.
  - Percentage of loss compared to initial yield strength is indicated as relaxation.

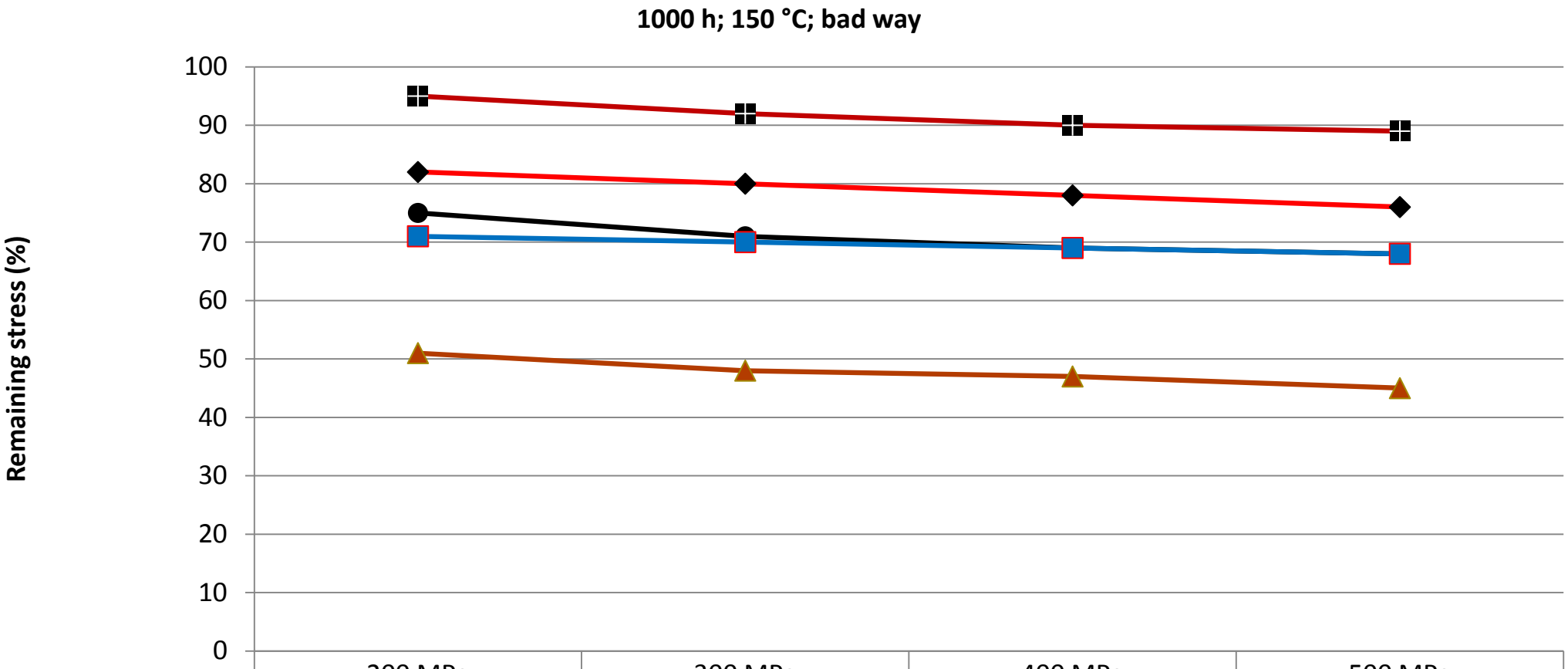
- Methods
  - Three point bending test
  - Four point bending test
  - Tube test
  - Cantilever - bending test (discontinuous / continuous) - KME testing method

- Test conditions (standard practice)
  - Temperatures (100° C. / 125° C. / 150° C. / 200° C.)
  - times (50 h / 100 h / 250 h / 500 h / 1000 h) // Long term view with Larson-Miller Methode
  - Initial stress (50 % oder 80 % of yield strength ($Rp_{0,2}$))

5.1.2. Relaxation (temperatures 100 - 200 °C.)



5.1.3. **Relaxation** (difference initial stress)



	200 MPa	300 MPa	400 MPa	500 MPa
STOL®95 R540	95	92	90	89
STOL®76M R580	82	80	78	76
STOL®94 R750	75	71	69	68
STOL®78 R570	71	70	69	68
CuSn4 R630	51	48	47	45

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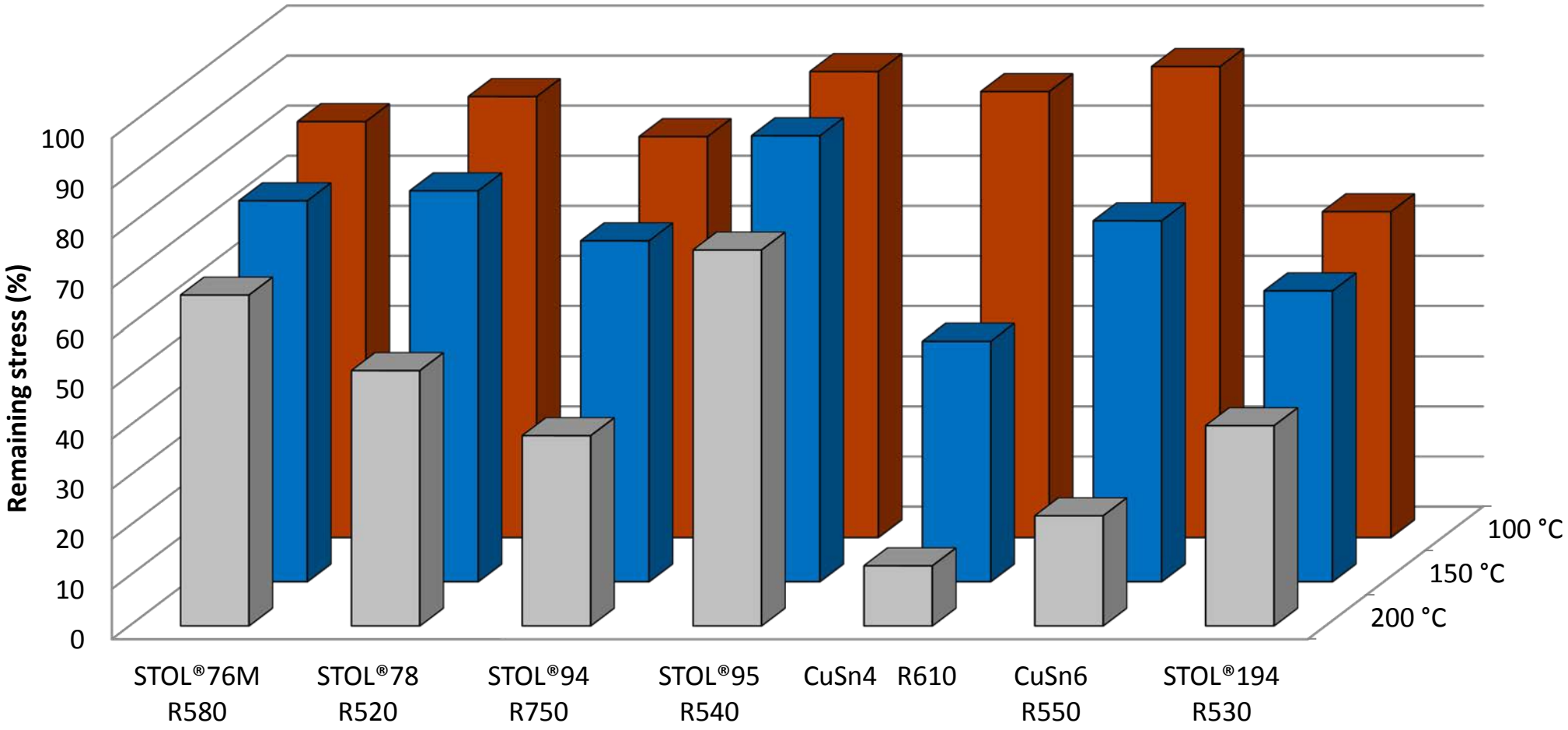
5.1.4. **Relaxation** (comparison at 500 MPa initial stress)



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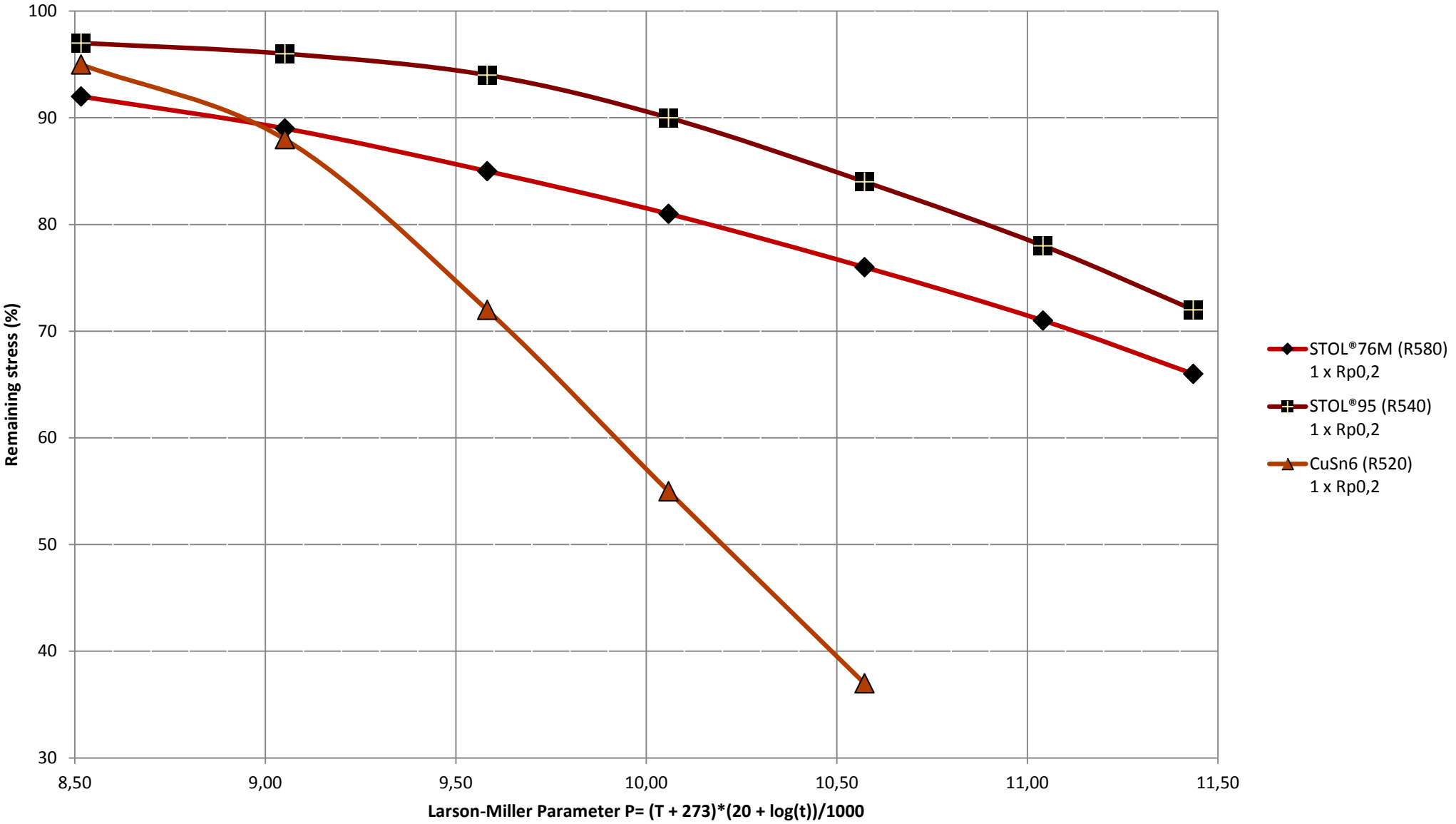
5.1.5. **Relaxation** (comparison in terms of Larson-Miller-Methode)



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5.2. **Comparision of alloys** (physical data‘s)

Alloys	Density * g/cm³	Coefficient of thermal expansion** 10^{-6} K	Thermal conductivity* W / (m K)	Electrical conductivity*** MS/m	electrical conductivity*** IACS	Modulus of elasticity * GPa
STOL®76	8,9	16,8	260	35 / 29	60 / 50	135
STOL®76M	8,9	16,8	260	33 / 27	57 / 47	135
STOL®78	8,9	17,3	270	36	62	130
STOL®80	8,9	17,3	330	44	76	120
STOL®94	8,85	17	185	25 / 23	43 / 40	132
STOL®95	8,9	18	330	50	86	137
STOL®194	8,8	16,3	260	35	60	125
C14415 / CuSn0,15	8,9	18	350	47	81	120
C15100 / CuZr	8,94	17,6	360	55	95	121
C15500	8,91	17,8	346	50	86	115
C19210 / CuFe0,1P	8,9	17	350	50	86	125
C42500	8,75	18,4	120	15	25	126
C50715 / CuSn2Fe0,1P	8,9	17,6	140	22	38	121
C50725 / CuSn2Zn2Fe0,1P	8,9	17,5	150	19	33	113
C70250 / CuNi3Si	8,8	17,6	170	23	40	130
C70600 / CuNi10Fe1Mn	8,9	17	46	4	6,9	130
CuSn4	8,85	17,8	100	10	18	120
CuSn5	8,85	18	96	9	15	120
CuSn6	8,8	18,5	75	8	13	118
CuSn8	8,8	18,5	67	6,5	11	115
CuZn10	8,8	18,2	184	25	43	124
CuZn15	8,75	18,5	159	20	34	122
CuZn30	8,5	19,7	126	16	28	115
CuZn33	8,5	19,9	121	15	26	112
CuZn37	8,45	20,2	121	14	24	110
Cu-ETP	8,9	17,7	394	58	100	127
Cu-HCP	8,9	17,7	385	57	98	127
Cu-PHC	8,9	17,7	385	58	100	132
Cu-DLP	8,9	17,7	375	55	95	132
Cu-DHP	8,9	17,6	330	47	81	132
Cu-OFE	8,9	17,7	394	58,6	101	132

* Reference values at room temperature ** between 20 and 300 °C *** Value for the lowest temper / age hardened class

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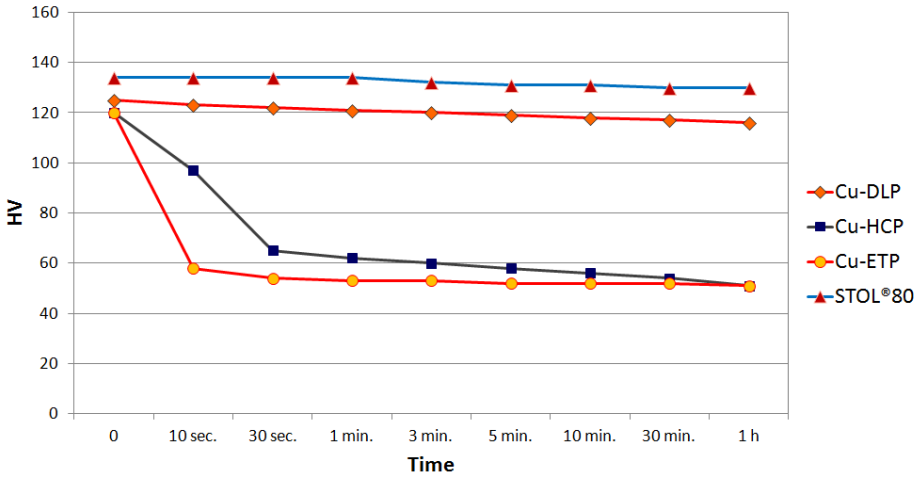
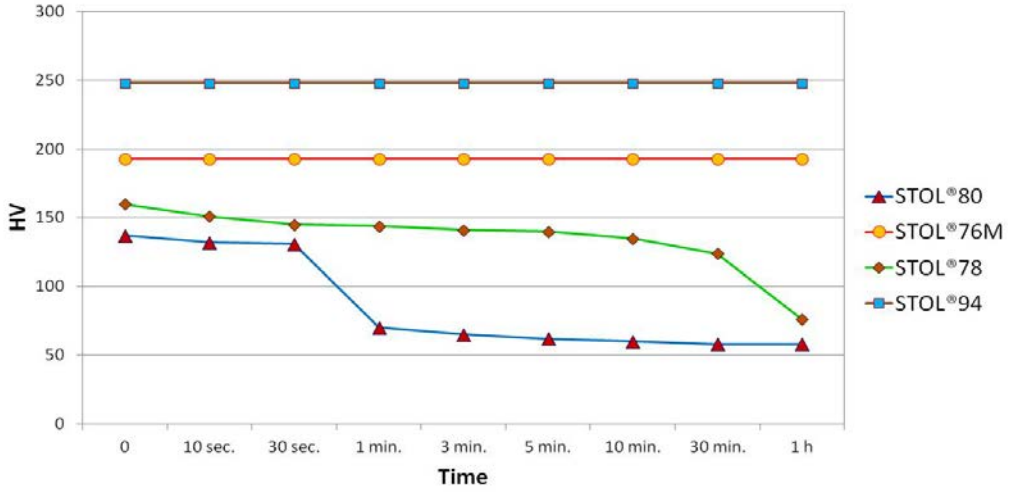
5.3. Softening characteristic

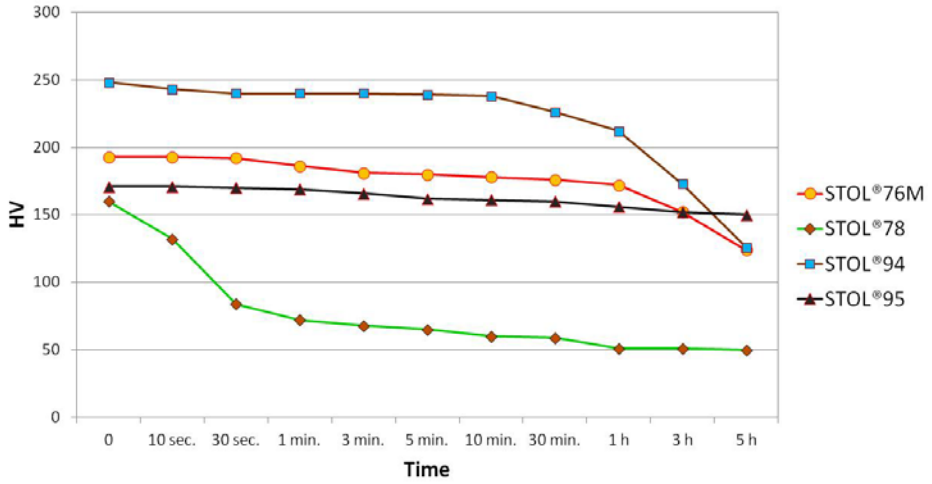
300 °C



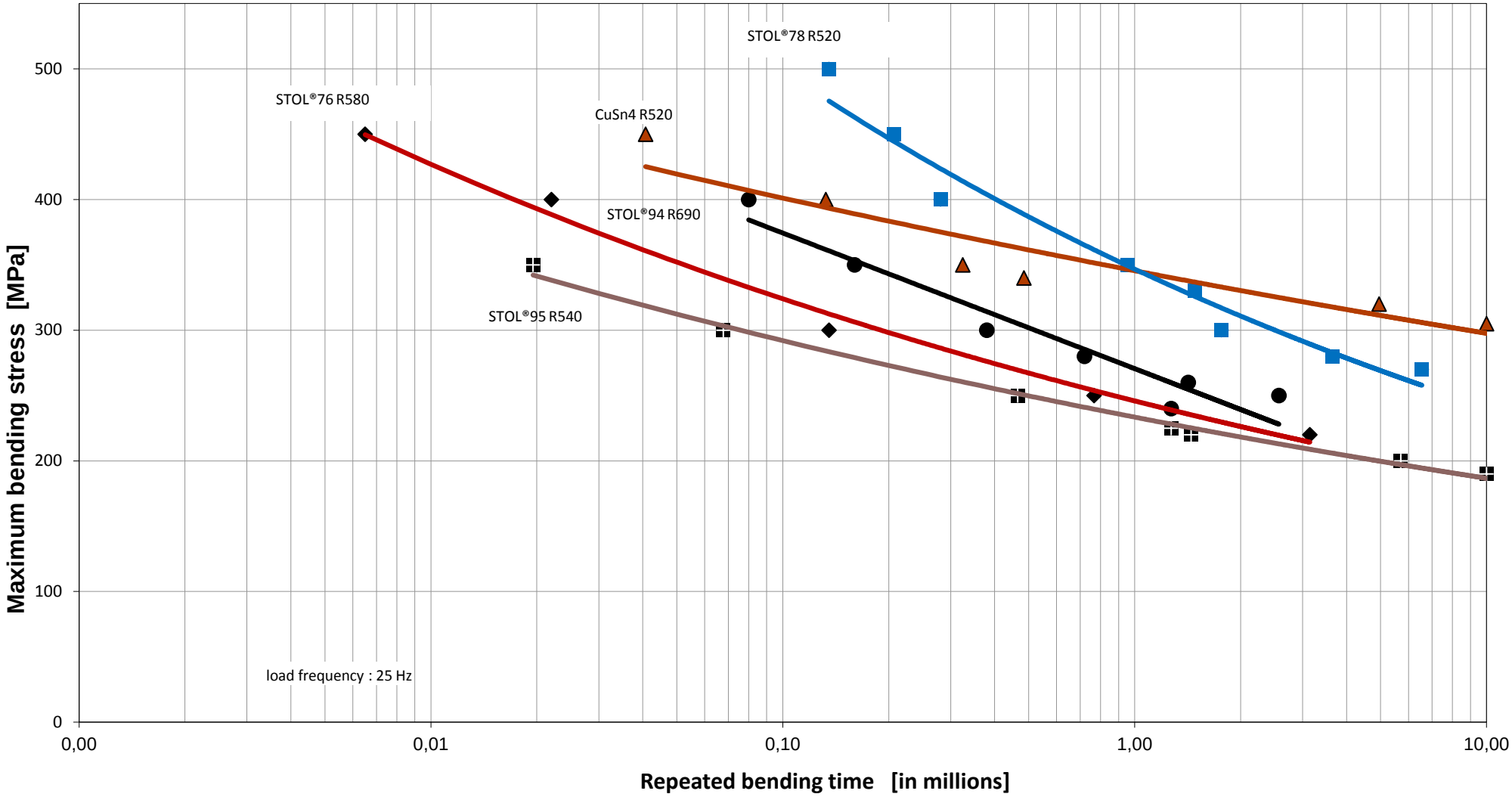
400 °C



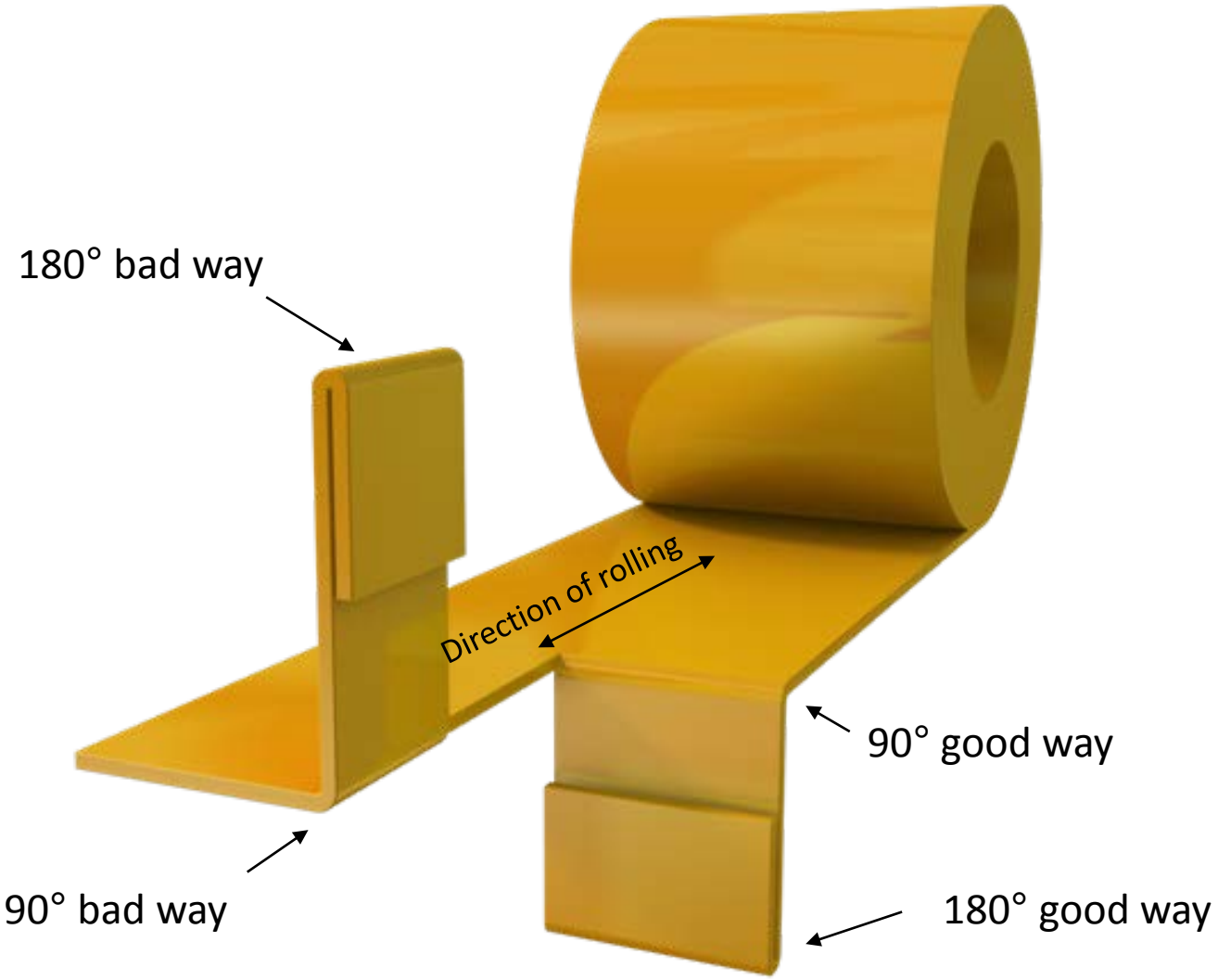
500 °C



5.4. Bend fatigue at room temperature

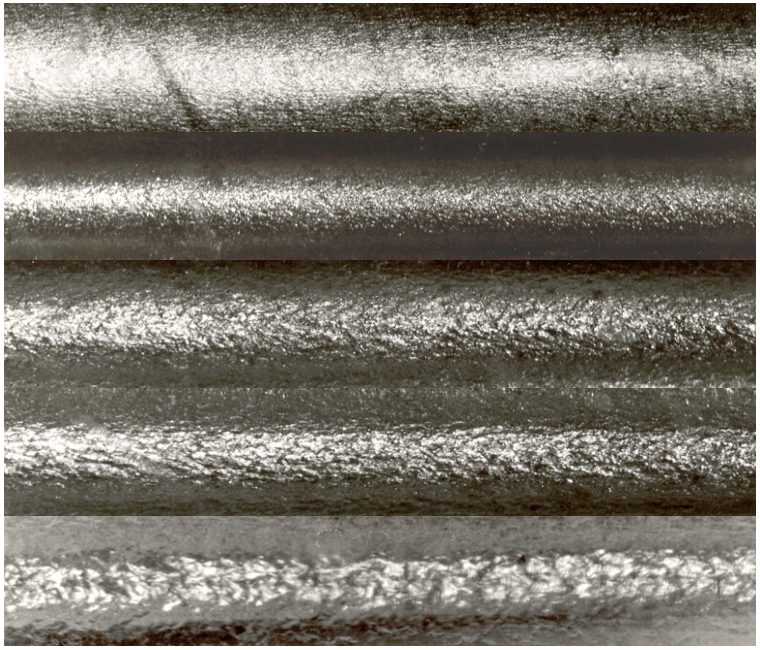


5.5.1. Definition bending axis

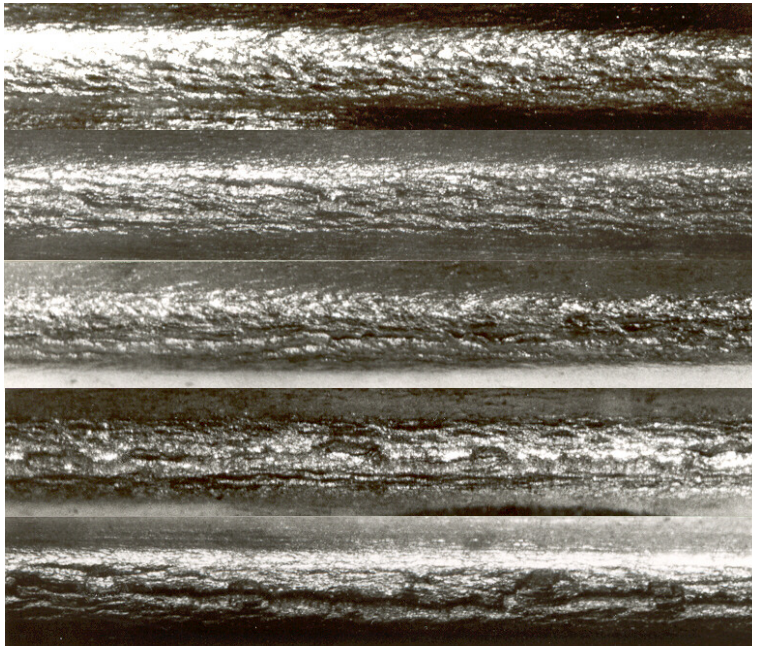


5.5.2. Evaluation of bending (based on bending picture gallery)

Condition 1
Condition 2
Condition 3
Condition 4
Condition 5



Condition 6
Condition 7
Condition 8
Condition 9
Condition 10



Condition 1	smooth, no cracks (no orange skin, no rough grain)
Condition 2	rough, no cracks (no orange skin, no rough grain)
Condition 3	slight orange skin, no cracks
Condition 4	orange skin, no cracks
Condition 5	strong orange skin, no cracks

Condition 6	very sligth cracks
Condition 7	sligth cracks
Condition 8	cracks
Condition 9	strong cracks
Condition 10	very strong cracks, nearly broken

test condition, in accordance with DIN ISO 7438, scale in accordance with DIN EN 1654 plus addititionally valid for 180° bending.
(sample width = 10 mm, 90° test method with V-block and punch, 180 ° test method with 180 ° bend test machine.)

6.1. Coating programme

Hot dip tinning acc. DIN EN 13148 (RoHS conform)

Strip thickness: 0,15 – 1,20 mm (Coating thickness for the strip thickness >1,2 mm on request)

Strip width: up to 330 mm

Coatings: pure tin, tin-silver*, Thermic tin

Coating thickness: 0,5 - 1,2 µm
0,8 - 2,0 µm
1,0 - 3,0 µm
2,0 - 5,0 µm
4,0 - 10,0 µm
10,0 - 20,0 µm

* Coating thickness </= 2,0 µm on request

Electroplating acc. DIN EN 14436 (RoHS conform)

KME

Strip thickness : 0,4 - 2,00 mm

Strip width : up to 170 mm

Coatings : Sn/Cu and Sn/Ni, holohedral, matt, gloss, reflow

external source

Strip width up to 400 mm with and without reflow

Coatings: Sn/Cu or Ni/Ag // Ni/Cu / matt, gloss

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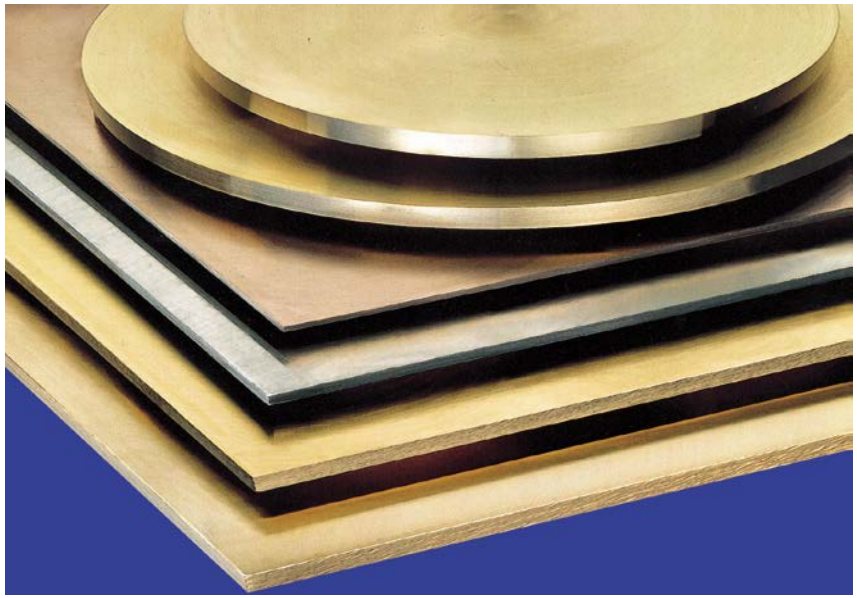
7.1. Sheets, Plates and Discs of Copper and Copper alloys

KME is an industrial group playing a major role in the global copper processing industry. With its headquarters in Florence, approx. 6,500 staff and a manufacturing base strategically located in the five largest European markets and in China, KME is a Group with a strong international vocation spread across all the continents.
With an unique and complete product portfolio, KME is one of the world leading suppliers of copper and copper-alloy industrial rolled products that are used in a wide range of today's modern industries:

- Electrical engineering and electronics
- Mechanics
- Automotive industry
- Minting
- Solar-energy technology
- Telecommunications
- Household consumer products
- Decoration, objects and bathroom accessories.



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7.2. Sheets, Plates and Discs of Copper and Copper alloys

Copper				Brass			
DIN EN	CEN	ASTM	DIN	DIN EN	CEN	ASTM	DIN
Cu-ETP	CW004A	C11000		CuZn10	CW501L	C22000	2.0230
Cu-HCP	CW021A	C10300		CuZn15	CW502L	C23000	2.0240
Cu-DLP	CW023A	C12000		CuZn30	CW505L	C26000	2.0265
Cu-DHP	CW024A	C12200		CuZn37	CW508L	C27200	2.0321
Cu-OFE		C10100		CuZn40	CW509L	C28000	2.0360
Cu-OF	CW008A	C10200		CuZn38Sn1As	CW717R	C46500	2.0530
Cu-Ag0,1	CW016A	C10700*		CuZn38AlFeNiPbSn	CW715R		
Low alloyed Copper				CuZn39Sn1	CW719R	C46400	
CuCrZr	CW106C	C18150	2.1293	CuZn39Pb0,5	CW610N	C36500	2.0372
Bronze				CuZn39Pb2	CW612N	C37700	2.0380
CuSn4	CW450K	C51100	2.1016	**Aluminium-Bronze**			
CuSn6	CW452K	C51900	2.1010	CuAl8Fe3	CA106	C61400	2.0932
CuSn8	CW453K	C52100	2.1030	CuAl10Ni5Fe4	CW307G	C63000	2.0966
Copper-Nickel							
CuNi10Fe1Mn	CW352H	C70600	2.0872				
CuNi30Mn1Fe	CW354H	C71500	2.0882				

* Difference in composition

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