fontargen brazing by voestalpine

In-Depth Know-How

PRODUCT CATALOG

voestalpine Böhler Welding
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Fontargen Brazing Product Catalog

In-Depth Know-How

As a leading manufacturer of soldering and brazing consumables, Fontargen Brazing offers proven solutions based on 50 years of industrial experience, tried-and-tested processes and methods. This in-depth know-how has made Fontargen Brazing an internationally preferred partner for every soldering and brazing task.

Content

◆ Surveyr fontargen brazing products

Page

GROUP 1

BRAZING AND SOLDERING ALLOYS 3

GROUP 2

FLUXES 111

GROUP 3

WIRE ELECTRODES 117

GROUP 4

WELDING RODS 139

GROUP 5

TECHNICAL INFORMATION 157

Group 1

BRAZING AND SOLDERING ALLOYS

◆ Content

GROUP 1 3

BRAZING ALLOYS: RODS, WIRE, FOIL 8

BRAZING ALLOYS: PASTES 47

SOLDERING ALLOYS: RODS, WIRE 59

SOLDERING ALLOYS: PASTES 70

HIGH-TEMPERATURE BRAZING ALLOYS: RODS, WIRE, FOIL 75

HIGH-TEMPERATURE BRAZING ALLOYS: PASTES, POWDER 82

BRAZING AND SOLDERING ALLOYS

Brazing alloys: Rods, Wire, Foil					
	DIN 8513	DIN EN 1044	DIN EN ISO 17672	DIN EN ISO 3677	
A 101	L-CuNi10Zn42	CU 305	Cu 773	B-Cu48ZnNi(Si)-890/920	8
A 102				B-Cu48ZnNiAg(-Si)-870/900	9
A 210	L-CuZn40	CU 301	Cu 470a	B-Cu60Zn(Si)-875/895	10
A 210 K	L-CuZn39Sn	CU 306	Cu 671	B-Cu59Zn(Sn)(Ni)(Mn)(Si)-870/890	11
A 211				B-Cu59ZnAg(Sn)(Ni)(Mn)(Si)-870/890	12
A 204	L-CuP8	CP 201	CuP 182	B-Cu92P-710/770	13
A 2003 EASY FORM	L-CuP7	CP 202	CuP 180	B-Cu93P-710/820	14
A 2003 FREE FLOW	L-CuP7	CP 202	CuP 180	B-Cu93P-710/793	15
A 2004	L-CuP6	CP 203	CuP 179	B-Cu94P-710/890	16
A 2005		CP 302	CuP 386	B-Cu86SnP-650/700	17
A 2006			CuP 385	B-Cu87PSnSi-635/675	18
A 3002	L-Ag2P	CP 105	CuP 279	B-Cu92PAg-645/825	19
A 3005 EASY FORM	L-Ag5P		CuP 281	B-Cu89PAg-645/815	20
A 3005 FREE FLOW			CuP 282	B-Cu88PAg-643/771	21
A 3015	L-Ag15P	CP 102	CuP 284	B-Cu80AgP-645/800	22
A 3018			CuP 285	B-Cu76AgP-643/666	23
A 3018 Eutectic		CP 101	CuP 286	B-Cu75AgP-645	24
A 303	L-Ag20	AG 206	AG 220	B-Cu44ZnAg(-Si)-690/810	25
A 308 V	L-Ag72	AG 401	Ag 272	B-Ag72Cu-780	26
A 311	L-Ag44	AG 203	Ag 244	B-Ag44CuZn-675/735	27
A 312 F				B-Ag49CuZnMn-Ni-680/705	28
A 314	L-Ag55Sn	AG 103	Ag 155Si	B-Ag55ZnCuSn(-Si)-630/660	29
A 317		AG 402	Ag 160	B-Ag60CuSn-600/730	30
A 319	L-Ag34Sn	AG 106	Ag 134Si	B-Cu36AgZnSn(-Si)-630/730	31
A 320	L-Ag45Sn	AG 104	Ag 145Si	B-Ag45CuZnSn(-Si)-640/680	32
A 324	L-Ag49	AG 502	Ag 449	B-Ag49ZnCuMn-Ni-680/705	33
A 330	L-Ag30	AG 204	Ag 230	B-Cu38ZnAg-680/765	34
A 331	L-Ag25	AG 205	Ag 225	B-Cu40ZnAg-700/790	35
A 332	L-Ag30Sn	AG 107	Ag 130	B-Cu36ZnAgSn-665/755	36

BRAZING AND SOLDERING ALLOYS

Brazing alloys: Rods, Wire, Foil						
A 333			Ag 230a	B-Cu36ZnAgNi-676/788		37
A 335			Ag 235	B-Ag35ZnCu-685/755		38
A 338 F				B-Ag38CuZnMn-Ni-680/700		39
A 338 FT				B-Ag38CuZnMn-Ni-680/700		40
A 340	L-Ag40Sn	AG 105	Ag 140Si	B-Ag40CuZnSn(-Si)-650/710		41
A 347	L-Ag56Sn	AG 102	Ag 156	B-Ag56CuZnSn-620/655		42
A 350			Ag 450	B-Ag50CuZnNi-660/705		43
A 384				B-Ag72Zn-710/730		44
A 407 L	L-AlSi12	AL 104	Al 112	B-Al88Si-575/585		45
AF 407 LI GEFALZT	L-AlSi12	AL 104	Al 112	B-Al88Si-575/585	1)	46
Brazing alloys: Pastes						
	DIN EN 1044	DIN EN ISO 17672	DIN EN ISO 3677	DIN 8513		
AP 210			B-Cu55Zn(Si)(Mn)-875/890			47
AP 211			B-Cu59ZnAg(Sn)(Ni)(Mn)(Si)-850/870			48
AP 218			B-Cu51Zn(-Si)-870/915			49
AP 2003	CP 202	CuP 180	B-Cu93P-710/820	L-CuP7		50
AP 2004	CP 203	CuP 179	B-Cu94P-710/890	L-CuP6		51
AP 2005	CP 302	CuP 386	B-Cu86S-nP-650/700			52
AP 3018	CP 101	CuP 286	B-Cu75AgP-645			53
AP 308 V	AG 401	Ag 272	B-Ag72Cu-780	L-Ag72		54
AP 314	AG 103	Ag 155	B-Ag55Zn-CuSn-630/660	L-Ag55Sn		55
AP 317	AG 402	Ag 160	B-Ag-60CuSn-600/730			56
AP 350		Ag 450	B-Ag50ZnCu-Ni-660/705			57
AP 356			B-Ag64CuInMn-Ni-730/780			58

1) DIN EN 1045 - FL 20

BRAZING AND SOLDERING ALLOYS

Soldering alloys: Rods, Wire						
	DIN 1707-100	DIN EN ISO 3677	DIN 1707	DIN EN ISO 9453		
A 604	L-SnZn40	S-Sn60Zn40				59
A 604 KA		S-Sn90Zn7Cu3				60
A-AF 611		S-Sn96,5Ag3,5	L-SnAg5	Legierungs-Nr. 703		61
A-AF 612		S-Sn60Pb40E	L-Sn60Pb	Legierungs-Nr. 104		62
AF 618		S-Sn60Pb38Cu2	L-Sn60PbCu2		2)	63
A 630		S-Pb50Sn50	L-Sn50Pb	Legierungs-Nr. 111		64
A 630-60/40		S-Sn60Pb40Sb	L-Sn60Pb(Sb)	Legierungs-Nr. 132		65
A-AF 631	S-Zn98Al2	S-Zn98Al2				66
A 633		S-Zn97Al3				67
A-AF 644		S-Sn97Cu3	L-SnCu3	Legierungs-Nr. 402		68
A 665		S-ZnAl22-420/480				69
Soldering alloys: Pastes						
	DIN EN ISO 3677	DIN 1707	DIN EN ISO 9453			
AP 604/12	S-Sn99,9					70
AP 644/12	S-Sn97Cu3	L-SnCu3	Legierungs-Nr. 402			71
AP 644/21	S-Sn97Cu3	L-SnCu3	Legierungs-Nr. 402			72
AP 653/12	S-Sn97Ag3		Legierungs-Nr. 702			73
AP 654/21	S-Sn97Ag3		Legierungs-Nr. 702			74
High-temperature brazing alloys: Rods, Wire, Foil						
	DIN 8513	DIN EN 1044	DIN EN ISO 17672	DIN EN ISO 3677		
A 200 L	L-SF Cu	CU 104	Cu 141	B-Cu100(P)-1083		75
A 200 L 58	L-Cu	CU 101	Cu 110	B-Cu100-1083	3)	76
A 203/6 L	L-CuSn6	CU 201	Cu 922	B-Cu94Sn(P)-910/1040		77
A 203/12 L	L-CuSn12	CU 202	Cu 925	B-Cu88Sn(P)-825/990		78
A 205				B-Cu86MnNi-970/990		79
A 206				B-Cu87MnCo-980/1030		80
A 842		AU 105	Au 827	B-Au82Ni-950		81

2) DIN EN 29453 - Legierungs-Nr. 25

3) DIN 17933-52 - Cu-ETP

BRAZING AND SOLDERING ALLOYS

High-temperature brazing alloys: Pastes, Powder					
	DIN 8513	DIN EN 1044	DIN EN ISO 17672	DIN EN ISO 3677	
AP 20 AL DB	L-Cu	CU 103	Cu 099	B-Cu99-1083	82
AP 21 AL	L-Cu	CU 103	Cu 099	B-Cu99-1083	83
AP 21 AL C	L-Cu	CU 103	Cu 099	B-Cu99-1083	84
AP 21 CL	L-SFCu	CU 104	Cu 141	B-Cu100(P)-1083	85
AP 21 CL 5	L-SFCu	CU 104	Cu 141	B-Cu100(P)-1083	86
AP 21 CLP (CS)	L-SF Cu	CU104	Cu141	B-Cu100(P)–1083	87
AP 21 DL / DS		CU 105	Cu 186	B-Cu97Ni(B)-1083/1100	88
AP 21 ES-B2*				B-Cu87MnNi-980/1030	89
AP 21 GL / GS				B-Cu96Sn-960/1060	90
AP 21 HL / HS	L-CuSn6	CU 201	Cu 922	B-Cu94Sn(P)-910/1040	91
AP 21 KL	L-CuSn12	CU 202	Cu 925	B-Cu88Sn(P)-825/990	92
HTL 1	L-Ni1	NI 101	Ni 600	B-Ni73CrFe-SiB(C)-980/1060	93
HTL 1A	L-Ni1a	NI 1A1	Ni 610	B-Ni74CrFe-SiB-980/1070	94
HTL 2	L-Ni2	NI 102	Ni 620	B-Ni82CrSiB-Fe-970/1000	95
HTL 3	L-Ni3	Ni 103	Ni 630	B-Ni95SiB-980/1070	96
HTL 5 CR				B-Ni60CrPSi-980/1040	97
HTL 5 M				B-Ni72CrSiP-971/1051	98
HTL 5	L-Ni5	NI 105	Ni 650	B-Ni71CrSi-1080/1135	99
HTL 6	L-Ni6	NI 106	Ni 700	B-Ni89P-875	100
HTL 7	L-Ni7	NI 107	Ni 710	B-Ni76CrP-890	101
HTL 8	L-Ni8	NI 108	Ni 800	B-Ni66MnSi-Cu-980/1010	102
HTL 9				B-Cu52,5MnNi-879/927	103
HTL 10				B-Cu68MnNi-910/932	104
HTL 14		AU 105	Au 827	B-Au82Ni-950	105
HTL 17				B-Cu87MnNi-980/1030	106
HTL 170				B-Ni75CrPFe-SiB-866/881	107
HTL 270				B-Ni71CrCuP-870/890	108
HTL 310				B-Ni42CuMn-SiB-910/1040	109

A 101

High strength brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu48ZnNi(Si)-890/920	Cu 773	CU 305	L-CuNi10Zn42
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0711	RBCuZn-D		

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Ni	Fe	Mn
48	< 0.2	bal.	0.25	9.5	0.2	< 0.2

Mechanical and physical properties

Melting range	890 - 920 °C	Tensile strength	690 N/mm²
Working temperature	910 °C	Elongation (l=5d)	15 - 20 %
Specific gravity	8,7 g/cm^3		

Characteristics and typical fields of application

Nickel-bearing filler metal of high strength and good fluidity. Suitable for brazing of steel, cast iron, malleable cast iron, nickel and nickel alloys. Also suitable for brazing and hardening in one production step. It is very often used in the steel furniture industry.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 100 – Series
Rapidflux - Series

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A 102

High strength German silver brazing alloy

Classifications

DIN EN ISO 3677
B-Cu48ZnNiAg(Si)-870/900

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn	Si	Ni	Mn
48	1	< 0.2	bal.	0.25	9.5	< 0.2

Mechanical and physical properties

Melting range	870 - 900 °C	Tensile strength	785 N/mm²
Working temperature	890 °C	Elongation (l=5d)	17 - 21 %
Specific gravity	8,2 g/cm^3		

Characteristics and typical fields of application

Nickel-bearing filler metal of high strength and good fluidity. Suitable for gap brazing of steel, cast iron, malleable cast iron, nickel and nickel alloys. This alloy is very well suited for butt joints.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 100 – Series
Rapidflux - Series

A 210

Brass brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu60Zn(Si)-875/895	Cu 470a	CU 301	L-CuZn40

Material-No.
B-Cu60Zn(Si)-875/895

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Fe	Mn
60	< 0.2	bal.	0.3	< 0.25	< 0.15

Mechanical and physical properties

Melting range	875 - 895 °C	Tensile strength	350 N/mm²
Working temperature	900 °C	Hardness (Brinell)	110 HB
Electrical conductivity	15 Sm/mm²	Elongation (l=5d)	35 %
Specific gravity	8,4 g/cm^3		

Characteristics and typical fields of application

Brazing alloy with good flowing properties, hardly sensitive to overheating. Suitable for gap brazing and coating of steel, cast iron, malleable cast iron, nickel and nickel alloys as well as copper and copper alloys with a solidus of > 900 °C.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 100 - Series
Rapidflux - Series

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A 210 K

Brass brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu59Zn(Sn)(Ni)(Mn)(Si)-870/890	Cu 671	CU 306	L-CuZn39Sn

Material-No.
2.0533

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Ni	Mn
59	1	bal.	0.3	0.85	0.6

Mechanical and physical properties

Melting range	870 - 890 °C	Tensile strength	380 - 420 N/mm²
Working temperature	900 °C	Hardness (Brinell)	120 HB
Specific gravity	8,4 g/cm^3	Elongation (l=5d)	30 %

Characteristics and typical fields of application

Particularly thin brazing alloy, insensitive to overheating for gap brazing and coating of steel, cast iron, malleable cast iron, nickel and nickel alloys, as well as copper and copper alloys with a solidus of > 900 °C. Also suitable for gap brazing of galvanised steel tubes.

Heat sources

Flame, furnace, induction and resistance heating

Flux

F 100 - Series
Rapidflux – Series

A 211

Thin fluid special brass brazing alloy

Classifications

DIN EN ISO 3677
B-Cu59ZnAg(Sn)(Ni)(Mn)(Si)-870/890

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn	Si	Ni	Mn
59	1	0.3	bal.	0.3	0.6	0.2

Mechanical and physical properties

Melting range	870 - 890 °C	Tensile strength	440 N/mm²
Working temperature	890 °C	Hardness (Brinell)	100 - 125 HB
Specific gravity	8,4 g/cm^3	Elongation (l=5d)	0,3

Characteristics and typical fields of application

Brazing alloy with good flowing and wetting properties. Applications on galvanised steel does not lead to a destruction of the zinc-coating. For gap brazing of copper and copper alloys with a solidus of > 900 °C, steel, cast iron, malleable cast iron, galvanised steel, nickel and nickel alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 100 – Series
Rapidflux - Series

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A 204

Copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu92P-710/770	CuP 182	CP 201	L-CuP8

Material-No.
2.1465

Composition, typical analysis (% w/w)

Cu	P
92.2	7.8

Mechanical and physical properties

Melting range	710 - 770 °C	Specific gravity	8,0 g/cm^3
Working temperature	720 °C	Tensile strength	250 N/mm²
Electrical conductivity	3,5 Sm/mm²	Elongation (l=5d)	5 %

Characteristics and typical fields of application

Filler metal with very good flowing properties and high capillarity. Suitable for gap brazing of copper and copper alloys. Joint-brazing at working temperatures between -20 °C and +150 °C. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

A 2003 EASY FORM

Copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu93P-710/820	CuP 180	CP 202	L-CuP7

Material-No.
2.1463

Composition, typical analysis (% w/w)

Cu	P
bal.	7

Mechanical and physical properties

Melting range	710 - 820 °C	Tensile strength	250 N/mm²
Working temperature	730 °C	Elongation (l=5d)	5 %
Specific gravity	8,1 g/cm^3		

Characteristics and typical fields of application

A 2003 EasyForm is a very homogeneous and capillary active brazing alloy. Despite its good flow characteristics, the alloy gives the operator the possibility to influence and control the flow behaviour by modelling. It is suitable for gab brazing on copper, brass, tin bronze and gunmetal. It suits to brazing joints operated at temperatures between -60 °C and +150 °C (determined by notched flexural impact tests acc. To DIN EN 10045). Do not use in sulphurous environment and on Fe- and Ni- containing base alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

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A 2003 FREE FLOW

Copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu93P-710/793	CuP 180	CP 202	L-CuP7
Material-No.	**AWS A5.8 / SFA-5.8**		
2.1463	BCuP-2		

Composition, typical analysis (% w/w)

Cu	P
bal.	7.25

Mechanical and physical properties

Melting range	710 - 730 °C	Tensile strength	250 N/mm²
Working temperature	730 °C	Elongation (l=5d)	5 %
Specific gravity	8,1 g/cm^3		

Characteristics and typical fields of application

A 2003 FreeFlow is a very homogeneous and capillary active brazing alloy. Its high flow characteristics allows the operator to produce fast reproducible joint assemblies for gap brazing on copper, brass, tin bronze and gunmetal. It suits to brazing joints operated at temperatures between -60 °C and +150 °C (determined by notched flexural impact tests acc. To DIN EN 10045). Do not use in sulphurous environment and on Fe- and Ni- containing base alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

A 2004

Copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu94P-710/890	CuP 179	CP 203	L-CuP6

Material-No.
2.1462

Composition, typical analysis (% w/w)

Cu	P
bal.	6.2

Mechanical and physical properties

Melting range	710 - 890 °C	Tensile strength	250 N/mm²
Working temperature	760 °C	Elongation (l=5d)	5 %
Specific gravity	8,1 g/cm^3		

Characteristics and typical fields of application

Filler metal with good flowing properties and capillarity. Suitable for gap brazing of copper and copper alloys. Joint-brazing at working temperatures between -60 °C and +150 °C, determined by notched flexural impact tests according to DIN EN 10045. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

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A 2005

Copper-phosphorus-tin alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044
B-Cu86SnP-650/700	CuP 386	CP 302

Composition, typical analysis (% w/w)

Cu	Sn	P
86.2	7	6.8

Mechanical and physical properties

Melting range	650 - 700 °C	Specific gravity	8,8 g/cm^3
Working temperature	700 °C	Tensile strength	250 N/mm²

Characteristics and typical fields of application

Filler metal with good flowing properties and capillarity. Suitable for gap brazing of copper and copper alloys. Colour very similar to brass. Soldering seam can be easily electroplated. Jointbrazing at working temperatures between -60 °C and +150 °C, determined by notched flexural impact test according to DIN EN 10045. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, air-gas torch, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

A 2006

Copper-phosphorus-tin alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	AWS A5.8 / SFA-5.8
B-Cu87PSnSi-635/675	CuP 385	BCuP-9

Composition, typical analysis (% w/w)

Cu	Sn	Si	P
88.8	6.5	0.2	6.5

Mechanical and physical properties

Melting range	635 - 675 °C	Specific gravity	8,8 g/cm^3
Working temperature	645 °C		

Characteristics and typical fields of application

Filler metal with good flowing properties and capillarity. Suitable for gap brazing of copper and copper alloys. The seam colour is silver-gray. Joint-brazing at working temperatures between -50 °C and +150 °C, determined by notched flexural impact tests according to DIN EN 10045. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, air-gas torch, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

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A 3002

Silver containing copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu92PAg-645/825	CuP 279	CP 105	L-Ag2P

Material-No.
2.1467

Composition, typical analysis (% w/w)

Cu	Ag	P
91.7	2	6.3

Mechanical and physical properties

Melting range	645 - 825 °C	Specific gravity	8,1 g/cm^3
Working temperature	740 °C	Tensile strength	250 N/mm²
Electrical conductivity	4 Sm/mm²	Elongation (l=5d)	5 %

Characteristics and typical fields of application

Copper-phosphorus alloy with low silver content. This alloy has good gap filling properties and is well suited to bridge wide gaps. Suitable for gap brazing of copper and copper alloys. Suitable by DVGW-worksheet GW 2 for copper pipes. Joint-brazing at working temperatures between -60 °C and +150 °C, determined by notched flexural impact tests according to DIN EN 10045. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

A 3005 EASY FORM

Silver containing copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN 8513	Material-No.
B-Cu89PAg-645/815	CuP 281	L-Ag5P	2.1466

AWS A5.8 / SFA-5.8
BCuP-3

Composition, typical analysis (% w/w)

Cu	Ag	P
bal.	5	6

Mechanical and physical properties

Melting range	645 - 815 °C	Specific gravity	8,2 g/cm^3
Working temperature	710 °C	Tensile strength	250 N/mm²
Electrical conductivity	5 Sm/mm²	Elongation (l=5d)	8 %

Characteristics and typical fields of application

A 3005 EasyForm is a silver containing copper phosphorus brazing alloy with good flow behaviour and high ductility.It is suitable for gap brazing on copper, brass, tin bronze and gunmetal. It suits to brazingjoints-operated at temperatures between -60 °C and +150 °C, (determined by notched flexural impact tests according to DIN EN 10045). Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

fontargen brazing by voestalpine

A 3005 FREE FLOW

Silver containing copper-phosphorus alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	AWS A5.8 / SFA-5.8
B-Cu88PAg-643/771	CuP 282	BCuP-7

Composition, typical analysis (% w/w)

Cu	Ag	P
bal.	5	6.75

Mechanical and physical properties

Melting range	643 - 771 °C	Specific gravity	ca. 8,2 g/cm^3
Working temperature	710 °C		

Characteristics and typical fields of application

A 3005 EasyForm is a very homogeneous brazing alloy.It is high flow characteristic allows the operator to produce fast reproducible joint assemblies for gap brazing on copper, brass, tin bronze and gunmetal.This alloy has a high ductility.It suits to brazingjoints-operated at temperatures between -60 °C and +150 °C, (determined by notched flexural impact tests according to DIN EN 10045). Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

A 3015

Copper-phosphorus alloy with high silver content

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu80AgP-645/800	CuP 284	CP 102	L-Ag15P
Material-No.	**AWS A5.8 / SFA-5.8**		
2.1210	BCuP-5		

Composition, typical analysis (% w/w)

Cu	Ag	P
80	15	5

Mechanical and physical properties

Melting range	645 - 800 °C	Specific gravity	8,4 g/cm^3
Working temperature	700 °C	Tensile strength	250 N/mm²
Electrical conductivity	7 Sm/mm²	Elongation (l=5d)	10 %

Characteristics and typical fields of application

Thin fluid copper-phosphorus alloy with high silver content and high ductility, even at low temperatures. Suitable for gap brazing of copper and copper alloys. Recommended for joints with strong thermal load and vibrations. Joint-brazing at working temperatures between -70 °C and +150 °C. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

fontargen brazing by voestalpine

A 3018

Copper-phosphorus alloy with high silver content

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	AWS A5.8 / SFA-5.8
B-Cu76AgP-643/666	CuP 285	BCuP-8

Composition, typical analysis (% w/w)

Cu	Ag	P
75	18	6.5

Mechanical and physical properties

Melting range	643 - 666 °C	Tensile strength	250 N/mm²
Working temperature	670 °C	Elongation (l=5d)	> 10 %
Specific gravity	8,7 g/cm^3		

Characteristics and typical fields of application

Thin fluid copper-phosphorus alloy with high silver content and high ductility, even at low temperatures. Suitable for gap brazing of copper and copper alloys. Recommended for joints with strong thermal load and vibrations. Joint-brazing at working temperatures between -70 °C and +150 °C. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, air-gas torch, furnace, induction and resistance heating, TIG-torch

Flux

Only copper alloys require the use of flux

F 300 - Series

A 3018 Eutectic

Copper-phosphorus alloy with high silver content

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044
B-Cu75AgP-645	CuP 286	CP 101

Composition, typical analysis (% w/w)

Cu	Ag	P
75	18	7

Mechanical and physical properties

Melting range	645 °C	Specific gravity	8,7 g/cm^3
Working temperature	650 °C		

Characteristics and typical fields of application

A 3018 Eutectic is very fluid, high silver containing copper-phosphorus grazing alloy. The alloy shows good flow characteristics and high ductility, even at low temperatures. It is suitable for gap brazing of copper, brass, tin bronze and gunmetal. Also it is suitable for brazing joints that are subject to strong alternating thermal load and vibrations. It suits to brazing joint-operated at temperatures between -70 °C and +150 °C. Do not use in sulphurous environment and on Fe- and Ni-alloys.

fontargen brazing by voestalpine

A 303

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu44ZnAg(Si)-690/810	AG 220	AG 206	L-Ag20

Material-No.
2.1213

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Si
44	20	36	0.15

Mechanical and physical properties

Melting range	690 - 810 °C	Tensile strength	380 - 450 N/mm²
Working temperature	810 °C	Hardness (Brinell)	125 HB
Electrical conductivity	10,6 Sm/mm²	Elongation (l=5d)	25 %
Specific gravity	8,7 g/cm^3		

Characteristics and typical fields of application

Silver-bearing, cadmium-free brazing alloy insensitive to overheating for gap and joint brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys and carbides. Perfect colour match with brass. The silicon contained in the brazing filler metal can reduce the mechanical property values of welded carbon steels. For brazing joints at working temperatures of max. 300 °C.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

A 308 V

Silver-Copper-Eutectic

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag72Cu-780	Ag 272	AG 401	L-Ag72
Material-No.	**AWS A5.8 / SFA-5.8**		
2.5151	BAg-8		

Composition, typical analysis (% w/w)

Cu	Ag
28	72

Mechanical and physical properties

Melting range	779 °C (Eutektikum)	Specific gravity	10 g/cm^3
Working temperature	780 °C	Tensile strength	340 - 390 N/mm²
Electrical conductivity	46,1 Sm/mm²	Elongation (l=5d)	17 %

Characteristics and typical fields of application

Zinc- and cadmium free alloy with good flowing properties for gap brazing in vacuum and for vacuum-sealed joints of alloyed and unalloyed steel, nickel and nickel alloys. Very good vacuum durability even at high temperatures. Also suitable for joints of copper and copper alloys. The brazing alloy is coalesced in vacuum with a minimum purity of 99.9 %.

Heat sources

Vacuum furnace, inert gas furnace, flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

fontargen brazing by voestalpine

A 311

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag44CuZn-675/735	Ag 244	AG 203	L-Ag44

Material-No.
2.5147

Composition, typical analysis (% w/w)

Cu	Ag	Zn
30	44	26

Mechanical and physical properties

Melting range	675 - 735 °C	Specific gravity	9,1 g/cm^3
Working temperature	730 °C	Tensile strength	400 - 480 N/mm²
Electrical conductivity	11,2 Sm/mm²	Elongation (l=5d)	25 %

Characteristics and typical fields of application

Cadmium free brazing alloy with good fluidity and capillary flow characteristics. For gap and joint brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys and carbides. The lot is suitable for use in seawater by marine standard VG 81245, part 3 and for copper pipe installations according to DVGW worksheet GW 2. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels as well as up until +300 °C.

The temperature resistance of solder joints is further dependent from design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

A 312 F

Classifications

DIN EN ISO 3677
B-Ag49CuZnMnNi-680/705

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Ni	Mn
27.5	49	20.5	0.5	2.5

Mechanical and physical properties

Melting range	680 - 705 °C	Specific gravity	9,0 g/cm^3
Working temperature	690 °C	Elongation (l=5d)	35 %

Characteristics and typical fields of application

Copper foil coated with silver brazing filler metal on both sides for the joining of hard metals and carrier steel. The foil is build-up with a ratio 1:2:1. The copper which does not melt during the brazing process relieves the stress that occurs during brazing due to the difference in coefficients of expansion of the hard metal layer and the carrier steel. Compared to A 324, A 312 F has a lower manganese- and nickel content.

Heat sources

Flame, induction and resistance heating, TIG-torch

fontargen brazing by voestalpine

A 314

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag55ZnCuSn(Si)-630/660	Ag 155Si	AG 103	L-Ag55Sn

Material-No.
2.5159

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn	Si
21	55	2	22	0.1

Mechanical and physical properties

Melting range	630 - 660 °C	Tensile strength	330 - 430 N/mm²
Working temperature	650 °C	Hardness (Brinell)	110 HB
Electrical conductivity	7 Sm/mm²	Elongation (l=5d)	25 %
Specific gravity	9,4 g/cm³		

Characteristics and typical fields of application

Silver-bearing, cadmium-free low melting brazing alloy, insensitive to overheating for gap and joint brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys and carbides. Brazing stainless steel provides the best possible colour match. The silicon contained in the brazing alloy can reduce the mechanical property values of welded carbon steels. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels as well as up until + 200 °C. The temperature resistance of solder joints is further dependent from design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

A 317

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	AWS A5.8 / SFA-5.8
B-Ag60CuSn-600/730	Ag 160	AG 402	BAg-18

AMS
4773 G

Composition, typical analysis (% w/w)

Cu	Ag	Sn
30	60	10

Mechanical and physical properties

Melting range	600 - 730 °C	Specific gravity	9,8 g/cm^3
Working temperature	730 °C	Tensile strength	390 - 460 N/mm²
Electrical conductivity	8,7 Sm/mm²	Elongation (l=5d)	35 %

Characteristics and typical fields of application

Zinc- and cadmium free silver brazing alloy, low vacuum-resistant for gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys. Excellent in reducing atmospheres since no contamination of the furnace can occur through the evaporation of the contents of the alloy. Particularly well suited for brazing on supply circuits in aircraft constructions.

Heat sources

Flame, induction and resistance heating, inert-gas furnace, vacuum furnace

fontargen brazing by voestalpine

A 319

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu36AgZnSn(Si)-630/730	Ag 134Si	AG 106	L-Ag34Sn

Material-No.
2.5157

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn	Si
36	34	2.5	27.5	0.1

Mechanical and physical properties

Melting range	630 - 730 °C	Specific gravity	9 g/cm^3
Working temperature	710 °C	Tensile strength	360 - 480 N/mm²
Electrical conductivity	14 Sm/mm²	Elongation (l=5d)	12 %

Characteristics and typical fields of application

Cadmium free brazing alloy for gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys. Suitable for the copper pipe installation according to DVGW work certificate GW 2. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels as well as up until + 200 °C.

The temperature resistance of solder joints is further dependent from design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

A 320

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag45CuZnSn(Si)-640/680	Ag 145Si	AG 104	L-Ag45Sn
Material-No.	**AWS A5.8 / SFA-5.8**		
2.5158	BAg-36		

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn	Si
27	45	2.5	25.5	0.1

Mechanical and physical properties

Melting range	640 - 680 °C	Specific gravity	9,2 g/cm^3
Working temperature	670 °C	Tensile strength	350 - 430 N/mm²
Electrical conductivity	13 Sm/mm²	Elongation (l=5d)	12 %

Characteristics and typical fields of application

Cadmium free brazing alloy for gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys. The lot is suitable for use in seawater by marine standard VG 81245, part 3 and for copper pipe installations according to DVGW worksheet GW 2. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels as well as up until + 200 °C.

The temperature resistance of solder joints is further dependent from design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

fontargen brazing by voestalpine

A 324

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag49ZnCuMnNi-680/705	Ag 449	AG 502	L-Ag49
Material-No.	**AWS A5.8 / SFA-5.8**		
2.5156	BAg-22		

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Ni	Mn
15	49	23	4.5	7.5

Mechanical and physical properties

Melting range	680 - 705 °C	Electrical conductivity	4 Sm/mm²
Working temperature	690 °C	Specific gravity	8,9 g/cm³

Characteristics and typical fields of application

Nickel- and manganese-bearing silver brazing alloy with very good wetting properties on steel and hard metals, therefore ensuring very tough joints. Gap brazing of hard metals in combination with steel, tungsten, tantalum and molybdenum materials.

Heat sources

Flame, induction and resistance heating, TIG-torch

A 330

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu38ZnAg-680/765	Ag 230	AG 204	L-Ag30
Material-No.	**AWS A5.8 / SFA-5.8**		
2.5167	BAg-20		

Composition, typical analysis (% w/w)

Cu	Ag	Zn
38	30	32

Mechanical and physical properties

Melting range	680 - 765 °C	Tensile strength	380 - 430 N/mm²
Working temperature	750 °C	Elongation (l=5d)	25 %
Specific gravity	8,9 g/cm^3		

Characteristics and typical fields of application

Silver alloy, cadmium free, insensitive to overheating. Gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys. Good colour match with brass. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels as well as up until + 300 °C. The temperature resistance of solder joints is further dependentfrom design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

fontargen brazing by voestalpine

A 331

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu40ZnAg-700/790	Ag 225	AG 205	L-Ag25

Material-No.
2.1216

Composition, typical analysis (% w/w)

Cu	Ag	Zn
40	25	35

Mechanical and physical properties

Melting range	700 - 790 °C	Tensile strength	380 - 430 N/mm²
Working temperature	780 °C	Elongation (l=5d)	25 %
Specific gravity	8,8 g/cm^3		

Characteristics and typical fields of application

Silver alloy, cadmium free, insensitive to overheating. Gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys. Good colour match with brass. Joint-brazing at working temperatures of max. 300 °C.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

A 332

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu36ZnAgSn-665/755	Ag 130	AG 107	L-Ag30Sn

Material-No.
2.5166

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn
36	30	2	32

Mechanical and physical properties

Melting range	665 - 755 °C	Tensile strength	360 - 480 N/mm²
Working temperature	740 °C	Hardness (Brinell)	140 HB
Specific gravity	8,8 g/cm^3		

Characteristics and typical fields of application

Silver alloy, cadmium free, insensitive to overheating. Gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys. Joint-brazing at working temperatures from – 50 °C to 200 °C.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

fontargen brazing by voestalpine

A 333

Cadmium free silver brazing alloy

Classifications

DIN EN ISO 3677
B-Cu36ZnAgNi-676/788

DIN EN ISO 17672
Ag 230a

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Ni
36	30	bal.	2

Mechanical and physical properties

Melting range	676 – 788 °C	Impact energy	138 J (-75°C - +100°C)
Specific gravity	9,17 g/cm^3	Bruchdehnung	36%
Tensile strength	488 N/mm²		

Characteristics and typical fields of application

Cadmium free, intermediate temperature brazing alloy with good wetting and mechanical properties. Suitable for ferrous and nonferrous base materials. Can be used for the brazing of carbide tools. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels. The temperature resistance of solder joints is further dependentfrom design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

A 335

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	AWS A5.8 / SFA-5.8
B-Ag35ZnCu-685/755	Ag 235	BAg-35

Composition, typical analysis (% w/w)

Cu	Ag	Zn
32	35	33

Mechanical and physical properties

Melting range	685 - 755 °C	Specific gravity	9,0 g/cm^3
Working temperature	730 °C	Tensile strength	430 N/mm²

Characteristics and typical fields of application

Nickel- and manganese-bearing silver brazing alloy with very good wetting properties on steel and hard metals, therefore ensuring very tough joints. Gap brazing of hard metals in combination with steel, tungsten, tantalum and molybdenum materials.

Heat sources

Flame, induction and resistance heating, TIG-torch

fontargen brazing by voestalpine

A 338 F

Silver brazing alloy, cadmium free

Classifications

DIN EN ISO 3677
B-Ag38CuZnMnNi-680/700

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Ni	Mn
26	38	bal.	3.5	7

Mechanical and physical properties

Melting range	680 - 700 °C	Specific gravity	8,8 g/cm^3
Working temperature	700 °C		

Characteristics and typical fields of application

Nickel- and manganese-bearing silver brazing alloy with very good wetting properties on steel and hard metals, therefore ensuring very tough joints. Gap brazing of hard metals in combination with steel, tungsten, tantalum and molybdenum materials.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

A 338 FT

3-layer-silver brazing foil, cadmium-free

Classifications

DIN EN ISO 3677
B-Ag38CuZnMnNi-680/700

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Ni	Mn
26	38	bal.	3.5	7

Mechanical and physical properties

Melting range	680 - 700 °C	Specific gravity	8,8 g/cm^3
Working temperature	700 °C	Plattierungsverhältnis	1: 2: 1 / 1: 6: 1

Characteristics and typical fields of application

Copper foil coated with silver brazing filler metal on both sides for the joining of hard metals and carrier steel. The foil is build-up with a ratio 1:2:1 / 1:6:1. The copper which does not melt during the brazing process relieves the stress that occurs during brazing due to the difference in coefficients of expansion of the hard metal layer and the carrier steel. Compared to A 312 F has a lower silver content.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

FONTARGEN A 340

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag40CuZnSn(Si)-650/710	Ag 140Si	AG 105	L-Ag40Sn
Material-No.	**AWS A5.8 / SFA-5.8**		
2.5165	B-Ag-28		

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn
30	40	2	28

Mechanical and physical properties

Melting range	650 - 710 °C	Tensile strength	350 - 430 N/mm²
Working temperature	690 °C	Hardness (Brinell)	130 HB
Electrical conductivity	11 Sm/mm²	Elongation (l=5d)	20 %
Specific gravity	9,1 g/cm^3		

Characteristics and typical fields of application

Silver alloy, cadmium free, insensitive to overheating. Gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys and carbides. Seawater resistant, according to marine standard VG 82145, part 3. Joint-brazing at working temperatures of -200 °C on austenitic and -70 °C on ferritic steels as well as up until + 200 °C. The temperature resistance of solder joints is further dependentfrom design (gap geometry) and the base materials to be soldered and possibly demonstrate, through an examination process.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

A 347

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag56CuZnSn-620/655	Ag 156	AG 102	L-Ag56Sn

AWS A5.8 / SFA-5.8
BAg-7

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn
22	56	5	17

Mechanical and physical properties

Melting range	620 - 655 °C	Specific gravity	9,5 g/cm^3
Working temperature	650 °C	Tensile strength	330 - 430 N/mm²
Electrical conductivity	7 Sm/mm²	Elongation (l=5d)	12 %

Characteristics and typical fields of application

Silver-bearing, cadmium-free low melting brazing alloy, insensitive to overheating for gap and joint brazing of alloyed and unalloyed steel, nickel, nickel alloys and malleable iron as well as the corresponding metals amongst each other. Brazing stainless steel provides the best possible colour match. For applications with service temperatures until 200°C suitable.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

fontargen brazing by voestalpine

A 350

Silver brazing alloy, cadmium free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	AWS A5.8 / SFA-5.8	AMS
B-Ag50CuZnNi-660/705	Ag 450	BAg-24	4788 B

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn
22	56	5	17

Mechanical and physical properties

Melting range	620 - 655 °C	Specific gravity	9,5 g/cm^3
Working temperature	650 °C	Tensile strength	330 - 430 N/mm²
Electrical conductivity	7 Sm/mm²	Elongation (l=5d)	12 %

Characteristics and typical fields of application

Nickel bearing silver brazing alloy with very good wetting properties on steel and hard metals, therefore ensuring very tough joints. Gap brazing of hard metals in combination with steel, tungsten, tantalum and molybdenum materials.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

A 384

Copper-free silver brazing alloy

Classifications

DIN EN ISO 3677
B-Ag72Zn-710/730

Composition, typical analysis (% w/w)

Ag	Zn
72	28

Mechanical and physical properties

Melting range	710 - 730 °C	Specific gravity	9,8 g/cm^3
Working temperature	730 °C		

Characteristics and typical fields of application

Corrosion-resistant, copper free silver brazing alloy for joints of alloyed and unalloyed steel. The brazing seam is suited for ammonia in liquid or vapour form. This brazing alloy is mostly used in the heating and cooling industry.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

F 300 – Series

fontargen brazing by voestalpine

A 407 L

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Al88Si-575/585	Al 112	AL 104	L-AlSi12
Material-No.	**AWS A5.8 / SFA-5.8**		
3.2285	BAlSi-4		

Composition, typical analysis (% w/w)

Al	Si
88	12

Mechanical and physical properties

Melting range	575 - 585 °C	Specific gravity	2.7 g/cm^3
Working temperature	590 °C	Tensile strength	100 N/mm²

Characteristics and typical fields of application

Capillary active brazing alloy for structure matching and tonal joints of aluminium and rolled / cast aluminium alloys. The Mg-content must be < 3 %. The solidus temperature should be > 630 °C.

Not suitable for joints that are to be anodized. This brazing alloy is also suited for joints of aluminium with Cr-Ni-steel.

Heat sources

Inert gas- and vacuum furnace, induction and resistance heating, Flame

AF 407 LI SEAMED

Flux-cored aluminium brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Al88Si-575/585	Al 112	AL 104	L-AlSi12
Material-No.	**AWS A5.8 / SFA-5.8**	**DIN EN 1045**	
3.2285	BAlSi-4	FL 20	

Composition, typical analysis (% w/w)

Al	Si
88	12

Mechanical and physical properties

Melting range	575 - 585 °C	Specific gravity	2.7 g/cm^3
Working temperature	590 °C	Tensile strength	100 N/mm²

Characteristics and typical fields of application

Capillary active flux cored brazing alloy for structure matching and tonal joints of aluminium and rolled / cast aluminium alloys. The Mg-content must be ≤ 1 %. The solidus temperature should be > 630 °C. Not suitable for joints that are to be anodized. This brazing alloy is also suited for joints of aluminium with Cr-Ni-steel. The flux residues can remain on the assembly. The brazing joint must be kept dry.

Heat sources

Induction, flame

Flux

FL 20 - Non corrosive

AP 210

Brass brazing paste

Classifications

DIN EN ISO 3677
B-Cu55Zn(Si)(Mn)-875/890

Composition, typical analysis (% w/w)

Cu	Zn	Si	Mn
55	bal.	0.2	0.2

Mechanical and physical properties

Melting range	875 - 890 °C	Working temperature	900 °C

Characteristics and typical fields of application

Dispensable brass brazing paste. The Si-content improves the wetting and flowing properties. AP 210 is a low cost product for brazing of steel under a normal atmosphere. AP 210 can also be used for the brazing of hard metals. Typical applications are the tooling (drills) and electro-industry as well as car manufacturing.

Heat sources

Flame and induction

Flux

Type FH 21 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms.

Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges

3 months in cartridges >40 ccm content

6 weeks in catridges <40 ccm content

AP 211

Fluid brass brazing paste

Classifications

DIN EN ISO 3677
B-Cu59ZnAg(Sn)(Ni)(Mn)(Si)-850/870

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn	Si	Ni	Mn
59	1	0.3	bal.	0.3	0.85	0.6

Mechanical and physical properties

Melting range	850 - 870 °C	Specific gravity	8,4 g/cm^3 (Metal content)
Working temperature	890 °C		

Characteristics and typical fields of application

Dispensable brass brazing paste with very good flowing and wetting properties. Suitable for the brazing of hard metal with steel. Gap and joint brazing of copper and copper alloys with a solidus of > 900 °C, nickel and nickel alloys, steel, cast iron, malleable iron, zinc coated steel (no destruction of the zinc layer).

Heat sources

Flame, induction and resistance heating

Flux

Type FH 21 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms.

Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges
3 months in cartridges > 40 ccm content
6 weeks in catridges < 40 ccm content

fontargen brazing by voestalpine

AP 218

Brass brazing paste

Classifications

DIN EN ISO 3677
B-Cu51Zn(Si)-870/915

Composition, typical analysis (% w/w)

Cu	Sn	Zn
51.8	0.2	bal.

Mechanical and physical properties

Melting range	870 - 915 °C	Working temperature	925 °C

Characteristics and typical fields of application

Dispensable brass brazing paste with good flowing and wetting properties. Gap and joint brazing of copper and copper alloys with solidus > 900 °C, steel and hard metal.

Heat sources

Flame, induction and resistance heating

Flux

Type FH 21 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms.

Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges
3 months in cartridges > 40 ccm content
6 weeks in catridges < 40 ccm content

AP 2003

Copper-phosphorus brazing paste alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu93P-710/820	CuP 180	CP 202	L-CuP7

Material-No.
2.1463

Composition, typical analysis (% w/w)

Cu	P
93	7

Mechanical and physical properties

Melting range	710 - 820 °C	Specific gravity	8,1 g/cm^3 (Metal content)
Working temperature	730 °C		

Characteristics and typical fields of application

Filler metal with good flowing properties and capillarity. The AP 2003 is suitable for gap brazing of copper and copper alloys. For joints with a working temperature between -60 °C and +150 °C, determined by notched flexural impact according to DIN EN 10045. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, furnace, induction and resistance heating.

Flux

None - For copper applications there is no need of flux

Storage

Keep sealed, under stable temperatures in dry rooms.

Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges
3 months in cartridges > 40 ccm content
6 weeks in catridges < 40 ccm content.

fontargen brazing by voestalpine

AP 2004

Flux free copper-phosphorus brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu94P-710/890	CuP 179	CP 203	L-CuP6

Material-No.
2.1462

Composition, typical analysis (% w/w)

Cu	P
93.8	6.2

Mechanical and physical properties

Melting range	710 - 890 °C	Specific gravity	8,1 g/cm^3 (Metal content)
Working temperature	760 °C		

Characteristics and typical fields of application

Capillary brazing on copper, brass, bronze and red brass. For joints with operating temperatures between -60 °C up to +150 °C, determined by notched flexural impact tests according to DIN EN 10045. Do not use on assemblies that come in contact with sulphide substances and on Fe and/or Ni based alloys.

Heat sources

Flame, furnace, induction, resistance.

Flux

None - For copper applications there is no need of flux

Storage

Keep sealed, under stable temperatures in dry rooms.

Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges
3 months in cartridges > 40 ccm content
6 weeks in catridges < 40 ccm content.

AP 2005

Copper-phosphorus-tin brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044
B-Cu86SnP-650/700	CuP 386	CP 302

Composition, typical analysis (% w/w)

Cu	Sn	P
86.2	7	6.8

Mechanical and physical properties

Melting range	650 - 700 °C	Specific gravity	8,8 g/cm^3 (Metal content)
Working temperature	700 °C		

Characteristics and typical fields of application

Dispensable Cu-P-Sn brazing paste. Filler metal with good flowing properties and capillarity. Suitable for gap brazing of copper and copper alloys. Easy electroplating of the soldering seam. For brazing joints with working temperatures between -60 °C and +150 °C, determined by notched flexured impact tests according to DIN EN 10045. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, furnace, induction and resistance heating

Flux

None - For copper applications there is no need of flux

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges

3 months in cartridges > 40 ccm content

6 weeks in catridges<40ccm content.

fontargen brazing by voestalpine

AP 3018

Copper-phosphorus paste with high silver content

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044
B-Cu75AgP-645	CuP 286	CP 101

Composition, typical analysis (% w/w)

Cu	Ag	P
75	18	7

Mechanical and physical properties

Melting range	645 °C (Eutektikum)	Specific gravity	8,7 g/cm^3 (Metal content)
Working temperature	650 °C		

Characteristics and typical fields of application

AP 3018 is a thin fluid copper-phosphorus alloy with high silver content and high ductility, even at low temperatures. It is suitable for gap brazing of copper and copper alloys. It is recommended for joints with strong thermal load and vibrations and for brazing joints with working temperatures between -70 °C and +150 °C. Do not use in sulphurous environment and on Fe- and Ni-alloys.

Heat sources

Flame, furnace, induction and resistance heating

Flux

None - For copper applications there is no need of flux.

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges

3 months in cartridges > 40 ccm content

6 weeks in catridges<40ccm content

AP 308 V

Dispenseble brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag72Cu-780	Ag 272	AG 401	L-Ag72
Material-No.	**AWS A5.8 / SFA-5.8**		
2.5151	BAg-8		

Composition, typical analysis (% w/w)

Cu	Ag
28	72

Mechanical and physical properties

Melting range	779 °C (Eutektikum)	Electrical conductivity	46,1 Sm/mm²
Working temperature	780 °C	Specific gravity	10 g/cm³ (Metal content)

Characteristics and typical fields of application

Dispensable brazing paste for brazing in vacuum atmospheres. Zinc- and cadmium free alloy with good flowing properties for gap brazing in vacuum and for vacuum-sealed joints of alloyed and unalloyed steel, nickel and nickel alloys. Very good vacuum durability even at high temperatures. Also suitable for joints of copper and copper alloys. The brazing alloy is coalesced in vacuum with a minimum purity of 99.9 %.

Heat sources

Vacuum furnace

Flux

none

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40ccm content.

fontargen brazing by voestalpine

AP 314

Silver brazing alloy, cadmium-free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ag55ZnCuSn-630/660	Ag 155	AG 103	L-Ag55Sn

Material-No.
2.5159

Composition, typical analysis (% w/w)

Cu	Ag	Sn	Zn
21	55	2	22

Mechanical and physical properties

Melting range	630 - 660 °C	Electrical conductivity	7 Sm/mm²
Working temperature	650 °C	Specific gravity	9,4 g/cm³ (Metal content)

Characteristics and typical fields of application

Cadmium-free low melting silver brazing alloy for gap and joint brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys and carbides. For brazing joints with a working temperature of max. 200 °C.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Type FH 10 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40ccm content.

AP 317

Silver brazing alloy, cadmium free

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	AWS A5.8 / SFA-5.8
B-Ag60CuSn-600/730	Ag 160	AG 402	BAg-18

AMS
4773 F

Composition, typical analysis (% w/w)

Cu	Ag	Sn
30	60	10

Mechanical and physical properties

Melting range	600 - 730 °C	Electrical conductivity	8,7 Sm/mm²
Working temperature	730 °C	Specific gravity	9,8 g/cm³ (Metal content)

Characteristics and typical fields of application

Zinc- and cadmium-free silver brazing alloy, low vacuum-resistant. For gap brazing of alloyed and unalloyed steel, nickel and nickel alloys, malleable cast iron, copper and copper alloys.

Heat sources

Flame, induction, furnace, vacuum.

Flux

Type FH 10 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms.

Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges

3 months in cartridges > 40 ccm content

6 weeks in catridges < 40 ccm content.

fontargen brazing by voestalpine

AP 350

Cadminum-free silver brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	AWS A5.8 / SFA-5.8
B-Ag50ZnCuNi-660/705	Ag 450	BAg-24

Composition, typical analysis (% w/w)

Cu	Ag	Zn	Ni
20	50	28	2

Mechanical and physical properties

Melting range	660 - 705 °C	Specific gravity	9,17 g/cm^3 (Metal content)
Working temperature	670 °C		

Characteristics and typical fields of application

Low melting cadmium free silver brazing paste with good wetting and excellent mechanical properties. Suitable for the brazing of hard metals with steel, tungsten, tantalum and molybdenum materials. The alloy is used in the tooling industry and on stainless steel food handling equipment with close joint clearance. For brazing joints operating at temperatures up to 200 °C, respectively up to 150 °C continuous operating temperature.

Heat sources

Flame, induction and resistance heating, TIG-torch

Flux

Type FH 10 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40ccm content

AP 356

Zinc-free silver brazing alloy

Classifications

DIN EN ISO 3677
B-Ag64CuInMnNi-730/780

Composition, typical analysis (% w/w)

Cu	Ag	Ni	Mn	In
26	64	2	2	6

Mechanical and physical properties

Melting range	730 - 780 °C	Betriebstemperatur	max. 200 °C (Ohne Festigkeitsabfall)
Working temperature	770 °C	Specific gravity	9,6 g/cm^3

Characteristics and typical fields of application

Low melting and high silver containing brazing alloy with good flowing characteristics. The alloy is suitable for the brazing of nickel and nickel based alloys, cemented carbides and materials that are difficult to wet such as tungsten, tantalum, chromium and molybdenum. The strength of the joint depends mainly on the base metals characteristics. Typical applications can be found in the tooling industry. TiN-coating is possible.

Heat sources

Induction, flame

Flux

Type FH 10 acc. to DIN EN 1045

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges< 40 ccm content

fontargen brazing by voestalpine

A 604

Friction solder

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707-100
S-Sn60Zn40	2.3830	L-SnZn40

Composition, typical analysis (% w/w)

Sn	Zn
60	bal.

Mechanical and physical properties

Melting range	200 - 340 °C	Tensile strength	(Kupfer)100 N/mm², (Messing)90 N/mm², (Stahl)90 N/mm²
Electrical conductivity	22,2 Sm/mm²	Hardness (Brinell)	19 HB
Specific gravity	7,1 g/cm³		

Characteristics and typical fields of application

Lead-free friction solder, on aluminium without flux. Build-up possible. Step-by-step solder (first solder). Sealing of blowholes and cracks on cast iron and cast aluminium, repairs on zinc injection moulded parts, filling-up of dents in aluminium plates.

Heat sources

Oxyacetylene torch (excess of fuel gas), air-gas torch, soldering iron, soldering lamp

A 604 KA

Classifications

DIN EN ISO 3677
S-Sn90Zn7Cu3

Composition, typical analysis (% w/w)

Cu	Sn	Zn
3	Rest	7

Mechanical and physical properties

Working temperature	200 - 250 °C	Specific gravity	7,3 g/cm^3
Electrical conductivity	22,6 Sm/mm²	Hardness (Brinell)	16 HB

Characteristics and typical fields of application

Step-by-step solder (first solder). Sealing of blowholes and cracks on cast iron and cast aluminium, repairs on zinc injection moulded parts, filling-up of dents in aluminium plates. Car body workshops, aluminium foundries, repair shops, etc.

In application to steel car bodies like the correction of detriments and cracks, AP 644/12 must be applied.

Friction solder, on aluminium without flux. Build-up possible. A 604 KA is an enhancement of A 604.

Heat sources

Air-gas torch, soldering lamp, soldering Iron

fontargen brazing by voestalpine

A-AF 611

Silver-bearing, lead-free solder with and without flux core

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Sn96,5Ag3,5	2.3690	L-SnAg5	Legierungs-Nr. 703

Type	Flux DIN EN 29454.1
A 611 solid wire	
AF 611 F-SW 12 Soft solder with flux core	3.1.1. (corrosive flux)
AF 611 F-SW 26 Soft solder with flux core	1.1.2. (non corrosive flux, colophony base)

Composition, typical analysis (% w/w)

Ag	Sn
3.5	Rest

Mechanical and physical properties

Melting range	221 °C	Tensile strength	44 N/mm² (Lot) 53 N/mm² (an Ms 58)
Electrical conductivity	7,5 Sm/mm²	Hardness (Brinell)	15 HB
Specific gravity	7,3 g/cm^3		

Characteristics and typical fields of application

Solders on steel, stainless steel, copper and copper alloys. Foodstuffs industry, electrical industry and general apparatus engineering, refrigerating industry, copper pipe installations, hot and cold water installations, heating installations up to 100 °C. Lead- and cadmium-free eutectic solder with very good flowing properties. The solder remains brilliant even after a long period of using the soldered objects. Cold-resistant up to -200 °C.

Heat sources

Acetylene torch (fuel gas excess), air-gas torch, soldering lamp, soldering iron, dip bath.

Flux

F 600 – Series

A-AF 612

Antimony-free soft solder alloy with and without flux core

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Sn60Pb40E	2.3660	L-Sn60Pb	Legierungs-Nr. 104

Type	Flux DIN EN 29454.1
A 612 Solid wire	
AF 612 F SW 21 Soft solder with flux core	3.1.1. (limited corrosive flux)
AF 612 F SW 26 Soft solder with flux core	1.1.2. (non corrosive flux)
AF 612 F SW 31 Soft solder with flux core	1.1.1. (non corrosive flux)
AF 612 F SW 32 Soft solder with flux core	1.1.3. (non corrosive flux)

Composition, typical analysis (% w/w)

Sn	Pb	Sb
60	bal.	0.05

Mechanical and physical properties

Melting range	183 - 190 °C	Tensile strength	29 N/mm² (Lot) 78 N/mm² (An Ms 58)
Electrical conductivity	7 Sm/mm²	Hardness (Brinell)	13 HB
Specific gravity	8,5 g/cm³		

Characteristics and typical fields of application

General soldering work on iron and copper based metals without flux. Electrical industry and construction of electrical and general apparatuses. Tin plating. Lead-bearing soft solder with very narrow melting interval. Very fluid with good wetting properties on copper and ferrous metals.

AF 612 enables good bonds with cuprous base metals without additional flux.

Heat sources

Acetylene torch (fuel gas excess), air-gas torch, soldering lamp, soldering iron.

Flux

F 600 – Series (only for solid wire)

fontargen brazing by voestalpine

AF 618

Antimony-free soft solder with flux core

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN 29453
S-Sn60Pb38Cu2	2.3662	L-Sn60PbCu2	Legierungs-Nr. 25

Type	Flux DIN EN 29454.1
AF 618 F SW 26 Soft solder with flux core	1.1.3. (non corrosive flux, colophony based)

Composition, typical analysis (% w/w)

Cu	Sn	Pb	Sb
1.75	60	bal.	0.1

Mechanical and physical properties

Melting range	183 - 190 °C	Tensile strength	38 N/mm²
Electrical conductivity	6,6 Sm/mm²	Hardness (Brinell)	18 HB
Specific gravity	8,5 g/cm^3		

Characteristics and typical fields of application

Leaded solder with narrow melting interval. Good wetting properties on copper.

Heat sources

Soldering iron

A 630

Soft solder

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Pb50Sn50	2.3650	L-Sn50Pb	Legierungs-Nr. 111

Composition, typical analysis (% w/w)

Sn	Pb	Sb
50	bal.	0.12

Mechanical and physical properties

Melting range	183 - 215 °C	Tensile strength	(Lot)39 N/mm², (Ms 58)81 N/mm²
Electrical conductivity	6,7 Sm/mm²	Hardness (Brinell)	12 HB
Specific gravity	8,9 g/cm^3		

Characteristics and typical fields of application

Soft solder with very narrow melting interval and good gap-bridging properties. Good wetting properties on copper and copper alloys.

Heat sources

Acetylene torch (fuel gas excess), air-gas torch, soldering lamp, soldering iron and dip bath

Flux

F 600: 3.1.1.A (corrosive fluid, for low alloyed and alloyed steel and heavy metals) F 600 CW: 3.1.1.C (solder oil, high quality flux for soldering of pipe installation e.g. copper pipes, non corrosive) F 600 CC: 1.1.2.C (paste-like, colophony based)

fontargen brazing by voestalpine

A 630-60/40

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Sn60Pb40Sb	2.3665	L-Sn60Pb(Sb)	Legierungs-Nr. 132

Composition, typical analysis (% w/w)

Sn	Pb	Sb
60	bal.	0.3

Mechanical and physical properties

Melting range	183 - 190 °C	Tensile strength	29,5 N/mm²
Electrical conductivity	7,1 Sm/mm²	Hardness (Brinell)	13 HB
Specific gravity	8,5 g/cm^3		

Characteristics and typical fields of application

Soft solder with very narrow melting interval and good gap-bridging properties. Good wetting properties on copper and copper alloys.

Heat sources

Acetylene torch (fuel gas excess), air-gas torch, soldering lamp, soldering iron and dip bath

A-AF 631

Zinc-bearing aluminium soft solder with and without flux core

Classifications

DIN EN ISO 3677	DIN 1707-100
S-Zn98Al2	S-Zn98Al2

Type

A 631 Solid wire
A 631 NH Soft solder with flux core — non corrosive flux, Cs containing

Composition, typical analysis (% w/w)

Zn	Al
98	2

Mechanical and physical properties

Melting range	382 - 407 °C	Specific gravity	6,91 g/cm^3

Characteristics and typical fields of application

Soft solder for joints on aluminium and aluminium alloys. Suitable for aluminium/copper-joints in the heating and cooling industry. Aluminium solder with low melting point.

Heat sources

Induction, flame

Flux

F 600 ZA Highly active special flux for the soldering of aluminium. For a quality ensured soldering process, only a small amount is needed. Removal of brazing flux residues: Brazing flux residues can be removed by brushing in hot water.

fontargen brazing by voestalpine

A 633

Zinc-bearing aluminium soft solder

Classifications

DIN EN ISO 3677
S-Zn97Al3

Composition, typical analysis (% w/w)

Zn	Al
97	3

Mechanical and physical properties

Melting range	430 - 450 °C	Specific gravity	7,1 g/cm^3

Characteristics and typical fields of application

Soft solder for joints on aluminium and aluminium alloys. Suitable for aluminium/copper-joints in the heating and cooling industry. Aluminium solder with low melting point.

Heat sources

Induction, flame

Flux

F 600 ZA, highly active special flux for the soldering of aluminium. For a quality ensured soldering process, only a small amount is needed. Removal of brazing flux residues: Brazing flux residues can be removed by brushing in hot water.

A-AF 644

Copper-bearing, lead-free soft solder alloy with and without flux core

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Sn97Cu3	2.3691	L-SnCu3	Legierungs-Nr. 402

Type	Flux DIN EN 29454.1
A 644 Solid wire	
AF 644 F SW 21 Soft solder with flux core	3.1.1. (limited corrosive flux)
AF 644 F SW 26 Soft solder with flux core	1.1.2. (non corrosive flux)

Composition, typical analysis (% w/w)

Cu	Sn
3	Rest

Mechanical and physical properties

Melting range	227 - 310 °C	Tensile strength	44 N/mm² (Lot) 53 N/mm² (an Ms 58)
Electrical conductivity	8,5 Sm/m²	Hardness (Brinell)	15 HB
Specific gravity	7,3 g/cm^3		

Characteristics and typical fields of application

Fitting solder for copper pipe installations and plumbing works. Work on metal goods. Suited for the use in the foodstuffs industry. In terms of DVGW sheet GW 2 this solder is suited for copper pipe installations. Lead- and cadmium-free solder. The copper content ensures that the tin does not alloy with the copper of the soldering rod. The flux residues have to be removed after brazing.

Heat sources

Acetylene torch (fuel gas excess), air-gas torch, soldering lamp, soldering iron, induction, resistance heating, dip bath

Flux

F 600 – Series (only for solid wire)

fontargen brazing by voestalpine

A 665

Zinc-bearing aluminium soft solder

Classifications

DIN EN ISO 3677
S-ZnAl22-420/480

Composition, typical analysis (% w/w)

Zn	Al
78	22

Mechanical and physical properties

Melting range	420 - 480 °C	Specific gravity	5,4 g/cm^3

Characteristics and typical fields of application

Soft solder for joints on aluminium and aluminium alloys. Suitable for aluminium/copper-joints in the heating and cooling industry. Aluminium solder with low melting point.

Heat sources

Induction, flame

Flux

F 600 ZA highly active special flux for the soldering of aluminium. For a quality ensured soldering process, only a small amount is needed. Flux activity range: 400 – 500°C Removal of brazing flux residues: Brazing flux residues can be removed by brushin

AP 604/12

Tinning soldering paste, pure tin

Classifications

DIN EN ISO 3677
S-Sn99,9

Composition, typical analysis (% w/w)

Sn
99.9

Mechanical and physical properties

Melting range	232 °C	Specific gravity	7,3 g/cm^3 (Metal content)
Working temperature	235 °C		

Characteristics and typical fields of application

AP 604/12 contains pure tin powder (lead free) and flux containing binder. Flux residues are corrosive. The coated surfaces remain brilliant and have a good corrosion resistance. Used for tin coating and soldering of copper, brass, steel, stainless steel.

Heat sources

Oxyacetylene torch (excess of fuel gas), air-gas torch, soldering iron, soldering lamp

Flux

3.1.1 acc. DIN EN 29454.1
Flux residues can be removed with hot water.

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40ccm content

fontargen brazing by voestalpine

AP 644/12

Lead free highly activating tin copper solder paste

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Sn97Cu3	2.3691	L-SnCu3	Legierungs-Nr. 402

Composition, typical analysis (% w/w)

Cu	Sn
3	Rest

Mechanical and physical properties

Melting range	227 - 310 °C	Specific gravity	7,3 g/cm^3 (Metal content)
Electrical conductivity	8,5 Sm/mm²		

Characteristics and typical fields of application

The lead and cadmium free solder paste AP 644/12 contains a highly activating and corrosive flux. The flux residues are corrosive and must be removed after brazing. Used for tin coating and soldering of metal products. The paste is suitable for products used in the food industry. The paste must be well stirred before use.

Heat sources

Oxyacetylene torch (excess of fuel gas), air-gas torch, soldering iron, soldering lamp

Flux

3.1.1 acc. DIN EN 29454.1
Flux residues can be removed with hot water.

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40 ccm content

AP 644/21

Lead free tin copper solder paste

Classifications

DIN EN ISO 3677	Material-No.	DIN 1707	DIN EN ISO 9453
S-Sn97Cu3	2.3691	L-SnCu3	Legierungs-Nr. 402

Composition, typical analysis (% w/w)

Cu	Sn
3	Rest

Mechanical and physical properties

Melting range	227 - 310 °C	Specific gravity	7,3 g/cm^3 (Metal content)
Electrical conductivity	8,5 Sm/mm²		

Characteristics and typical fields of application

For soldering with copper tube installations for hot and cold water supplies, including drinking water. The paste is suitable for applications in the food industry, sanitary (plumbing works - hot water up to 110 °C) and miscellaneous metal products. If used in copper tube installations, additional solid wire of solder A 644 (S-Sn97Cu3) needs to be added to guarantee maximum penetration.

Heat sources

Oxyacetylene torch (excess of fuel gas), air-gas torch, soldering iron, soldering lamp

Flux

3.1.1 acc. DIN EN 29454.1
Removal of flux residues: Wash with warm water.

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40 ccm content

fontargen brazing by voestalpine

AP 653/12

Lead free highly activating solder paste

Classifications

DIN EN ISO 3677	Material-No.	DIN EN ISO 9453
S-Sn97Ag3	2.3690	Legierungs-Nr. 702

Composition, typical analysis (% w/w)

Ag	Sn
3.0	Rest

Mechanical and physical properties

Melting range	221 - 224 °C	Specific gravity	7,3 g/cm^3 (Metal content)
Electrical conductivity	8,1 Sm/mm²		

Characteristics and typical fields of application

AP 653/12 contains a highly activating and corrosive flux. The alloy remains brilliant. The flux residues are corrosive and must be removed. Tin coating and soldering of copper, brass, steel, stainless steel, food industry, air conditioning. The paste must be well stirred before use.

Heat sources

Oxyacetylene torch (excess of fuel gas), air-gas torch, soldering iron, soldering lamp

Flux

3.1.1 acc. DIN EN 29454.1

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40 ccm content

AP 654/21

Classifications

DIN EN ISO 3677	Material-No.	DIN EN ISO 9453
S-Sn97Ag3	2.3690	Legierungs-Nr. 702

Composition, typical analysis (% w/w)

Ag	Sn
3.0	Rest

Mechanical and physical properties

Melting range	221 - 224 °C	Specific gravity	7,3 g/cm^3 (Metal content)
Electrical conductivity	8,1 Sm/mm²		

Characteristics and typical fields of application

The lead and cadmium free solder paste AP 654/21 contains a mildly activated, highly active flux. The tinned surface remain smooth and brilliant and offer good against corrosion. Tin coating and soldering of copper, brass, steel, stainless steel, food industry, air conditioning. The paste must be well stirred before use.

Heat sources

Oxyacetylene torch (excess of fuel gas), air-gas torch, soldering iron, soldering lamp

Flux

3.1.1 acc. DIN EN 29454.1

Storage

Keep sealed, under stable temperatures in dry rooms. Optimum temperature range is between 5 and 20 °C. Stir well before use.

Shelf life

6 months in all pots except cartridges 3 months in cartridges > 40 ccm content 6 weeks in catridges<40 ccm content

fontargen brazing by voestalpine

A 200 L

Copper brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu100(P)-1083	Cu 141	CU 104	L-SF Cu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0091	BCu-1/BVCu-1x		

Composition, typical analysis (% w/w)

Cu	P
> 99.90 (oxygen free)	0.025

Mechanical and physical properties

Melting range	1083 °C	Electrical conductivity	56 - 58 Sm/mm²
Working temperature	1100 °C	Specific gravity	8,9 g/cm³

Characteristics and typical fields of application

Alloy suitable for gap brazing subjected to tough conditions.

High-temperature brazing of alloyed and unalloyed steel.

Heat sources

Inert-gas and vacuum furnace, induction

A 200 L 58

Copper brazing alloy

Classifications

DIN EN ISO 3677 B-Cu100-1083	**DIN EN ISO 17672** Cu 110	**DIN EN 1044** CU 101	**DIN 8513** L-Cu
Material-No. 2.0065	**AWS A5.8 / SFA-5.8** BCu-1b	**DIN 17933-52** Cu-ETP	

Composition, typical analysis (% w/w)

Cu
> 99.9 (contains oxygen)

Mechanical and physical properties

Melting range	1083 °C	Electrical conductivity	56 - 58 Sm/mm²
Working temperature	1100 °C	Specific gravity	8,9 g/cm³

Characteristics and typical fields of application

Alloy suitable for gap brazing subjected to tough conditions.

High-temperature brazing of alloyed and unalloyed steel.

Heat sources

Inert-gas and vacuum furnace, induction

fontargen brazing by voestalpine

A 203/6 L

Copper-based high-temperature brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu94Sn(P)-910/1040	Cu 922	CU 201	L-CuSn6

Material-No.
2.1021

Composition, typical analysis (% w/w)

Cu	Sn	P
93.55	6.25	0.2

Mechanical and physical properties

Melting range	910 - 1040 °C	Heat conductivity	35 W/m • K
Working temperature	1040 °C	Hardness (Brinell)	> 80 HB
Electrical conductivity	9 Sm/mm²	Elongation (l=5d)	> 30 %
Specific gravity	8,9 g/cm^3		

Characteristics and typical fields of application

High-temperature brazing alloy for copper, iron and nickel.

Heat sources

Inert-gas furnace, induction

A 203/12 L

Copper-based high-temperature brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu88Sn(P)-825/990	Cu 925	CU 202	L-CuSn12

Material-No.
2.1055

Composition, typical analysis (% w/w)

Cu	Sn	P
87.8	12	0.2

Mechanical and physical properties

Melting range	825 - 990 °C	Heat conductivity	61 W/m • K
Working temperature	1000 °C	Hardness (Brinell)	95 - 105 HB
Electrical conductivity	6 Sm/mm²	Elongation (l=5d)	25 - 28 %
Specific gravity	8,9 g/cm³		

Characteristics and typical fields of application

High-temperature brazing alloy for brazing of copper, iron and nickel.

Heat sources

Inert-gas furnace, induction

fontargen brazing by voestalpine

A 205

Copper-based high-temperature brazing alloy

Classifications

DIN EN ISO 3677	Material-No.
B-Cu86MnNi-970/990	2.1362

Composition, typical analysis (% w/w)

Cu	Ni	Mn
86	2	12

Mechanical and physical properties

Melting range	970 - 990 °C	Specific gravity	8,4 g/cm^3
Working temperature	990 °C	Tensile strength	390 N/mm²

Characteristics and typical fields of application

Manganese bearing copper based alloy for capillary brazing of alloyed and unalloyed steel. Well suited for hard metal / steel joints.

Heat sources

Inert-gas furnace, induction, resistance-heating

A 206

Copper-based high-temperature brazing alloy

Classifications

DIN EN ISO 3677
B-Cu87MnCo-980/1030

Composition, typical analysis (% w/w)

Cu	Mn	Co
87	10	3

Mechanical and physical properties

Melting range	980°C -1030°C	Specific gravity	8,8 g/cm^3
Working temperature	1020 °C		

Characteristics and typical fields of application

High temperature filler metal for the joining of hard metals and carrier steel.

Heat sources

Furnaces with gas atmosphere, induction

fontargen brazing by voestalpine

A 842

High temperature gold based brazing alloy

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	AWS A5.8 / SFA-5.8
B-Au82Ni-950	Au 827	AU 105	BAu-4

AMS
4787 F

Composition, typical analysis (% w/w)

Ni	Au
18	82

Mechanical and physical properties

Melting range	950 °C (Eutektikum)	Gap width	0,04 - 0,08 mm
Working temperature	1000 °C	Oxidationresistant	815 °C
Specific gravity	9,8 g/cm^3		

Characteristics and typical fields of application

The main application area of this alloy is the beam engine construction. It is used for joints of alloyed steel and nickel alloys where high strength as well as high temperature corrosion resistance is demanded. Suitable for the following materials: Fe/Cr, Mo/W, Ni, Ni/Cu, Ni/Fe, Fe/Co, steel.

Heat sources

Oxygen (dew point: -51 °C), Argon (dew point: -63 °C), Vacuum 0.15 Pa (1 • 10-3 Torr)

AP 20 AL DB

Copper brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu99-1083	Cu 099	CU 103	L-Cu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0081	BCu-1a		

Composition, typical analysis (% w/w)

Cu
99

Mechanical and physical properties

Melting range	1083°C	Metal content	≈ 90,0 wt.-%
Working temperature	1100 - 1150 °C	Viscosity	190.000 - 220.000 mPas
Gap width	≤ 0,15 mm		

Characteristics and typical fields of application

Flux-free copper brazing paste with high metal content. The brazing paste has a high viscosity and dries slowly on air. Suited for workpieces made of unalloyed, high-alloyed as well as low-carbon steel.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

AP 21 AL

Copper brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu99-1083	Cu 099	CU 103	L-Cu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0081	BCu-1a		

Composition, typical analysis (% w/w)

Cu
99

Mechanical and physical properties

Melting range	1083 °C	Metal content	≈ 89,0 wt.-%
Working temperature	1100 - 1150 °C	Viscosity	120.000 - 145.000 mPas
Gap width	≤ 0,15 mm		

Characteristics and typical fields of application

Flux-free copper brazing paste with high metal content. The paste has a medium viscosity and dries very slowly on air. Suited for unalloyed, low-alloyed and high-alloyed steel as well as nickel and nickel alloys. Easy to dispense and good adherence on the workpiece. Suitable for thin and thick workpieces.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

AP 21 AL C

Copper brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu99-1083	Cu 099	CU 103	L-Cu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0081	BCu-1a		

Composition, typical analysis (% w/w)

Cu
99

Mechanical and physical properties

Melting range	1083 °C	Metal content	≈ 89,0 wt.-%
Working temperature	1100 - 1150 °C	Viscosity	145.000 - 170.000 mPas
Gap width	≤ 0,15 mm		

Characteristics and typical fields of application

Copper brazing paste with high metal content. The paste has a medium viscosity and dries slowly on air. Suitable for workpieces made of unalloyed, low-alloyed and high-alloyed steel. Easy to dispense and good adherence on the workpiece.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

AP 21 CL

Copper brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu100(P)-1083	Cu 141	CU 104	L-SFCu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0091	BCu-1		

Composition, typical analysis (% w/w)

Cu
99.9

Mechanical and physical properties

Melting range	1083 °C	Metal content	≈ 87 wt.-%
Working temperature	1100 - 1150 °C	Viscosity	150.000 - 165.000 mPas
Gap width	≤ 0,1 mm		

Characteristics and typical fields of application

Flux-free copper brazing paste with high metal content. The paste has a high viscosity and dries slowly on air. Suitable for workpieces made of unalloyed, low-alloyed and high-alloyed steel.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

AP 21 CL 5

Copper brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu100(P)-1083	Cu 141	CU 104	L-SFCu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0091	BCu-1		

Composition, typical analysis (% w/w)

Cu
99.9

Mechanical and physical properties

Melting range	1083 °C	Metal content	≈ 85 wt.-%
Working temperature	1100 - 1150 °C	Viscosity	150.000 - 165.000 mPas
Gap width	≤ 0,1 mm		

Characteristics and typical fields of application

Flux-free brazing paste with high metal content. The paste has a high viscosity and dries slowly on air. Suitable for workpieces made of unalloyed and alloyed steel.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

AP 21 CLP (CS)

Copper brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu100(P)–1083	Cu141	CU104	L-SF Cu
Material-No.	**AWS A5.8 / SFA-5.8**		
2.0091	BCu-1		

Composition, typical analysis (% w/w)

Cu
99.9

Mechanical and physical properties

Melting range	1083°C	Metal content	≈ 87 wt.-%
Working temperature	1100 – 1150°C	Viscosity	≈ 175.000 – 185.000 mPas
Gap width	≤ 0,15 mm		

Characteristics and typical fields of application

Flux-free copper brazing paste with high metal content. The paste has a high viscosity and dries slowly on air. Suitable for workpieces made of unalloyed, alloyed and high-alloyed steel.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

AP 21 DL_DS

Copper- nickel- brazing paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044
B-Cu97Ni(B)-1083/1100	Cu 186	CU 105

Composition, typical analysis (% w/w)

Cu	Ni	B
97	2.5	0.035

Mechanical and physical properties

Melting range	1083 - 1100 °C	Metal content	≈ 88 wt.-%
Working temperature	1120 °C	Viscosity	105.000 - 120.000 mPas
Gap width	0,05 - 0,2 mm		

Characteristics and typical fields of application

Flux-free copper- nickel- brazing paste with high metal content. The paste has a high viscosity and dries slowly on air. The alloy is particularly well suited for bridging wide gaps (max. 0.2 mm). Suitable for workpieces made of alloyed and unalloyed steel, wolfram, molybdenum, tantalum and hard metals (e.g. drill bits exposed to high mechanical stress). The contained nickel facilitates the wetting on hard metals.

Heat sources

Inert-gas continuous furnace H_2/N_2, Cracked ammonia atmosphere, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Producttypes

AP 21 **DL**: Slow drying paste

AP 21 **DS**: Quick drying paste

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

AP 21 ES-B2*

Copper- manganese- nickel- brazingpaste

Classifications

DIN EN ISO 3677
B-Cu87MnNi-980/1030

Composition, typical analysis (% w/w)

Cu	Ni	Mn
87	3	10

Mechanical and physical properties

Melting range	980 - 1030 °C	Metal content	≈ 88 wt.-%
Working temperature	1090 °C	Viscosity	105.000 - 115.000 mPas
Gap width	0,05 - 0,2 mm		

Characteristics and typical fields of application

Flux-free copper- manganese- nickel- brazing paste with high metal content. This paste has a medium viscosity and dries slowly on air. Suitable for workpieces made of steel, hard metal, wolfram, molybdenum and tantalum. The paste has good wetting, flowing and gap bridging properties.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Inert-gas continuous furnace Cracked ammonia atmosphere

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

AP 21 GL_GS

Copper- tin- brazingpaste

Classifications

DIN EN ISO 3677
B-Cu96Sn-960/1060

Composition, typical analysis (% w/w)

Cu	Sn
96	4

Mechanical and physical properties

Melting range	960 - 1060 °C	Metal content	≈ 87 wt.-%
Working temperature	1060 - 1100 °C	Viscosity	90.000 - 110.000 mPas (GL), 45.000 - 55.000 mPas (GS)
Gap width	0,05 - 0,2 mm		

Characteristics and typical fields of application

Flux-free copper- tin- brazing paste with high metal content. The paste is easy to dispense and available in two different drying rates. Suitable for brazing of low-alloyed, medium-alloyed and highalloyed steel. Good wetting and flowing properties.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Vacuum furnace (Watch vapour pressure curve!)

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Producttypes

AP 21 **GL**: Slow drying paste

AP 21 **GS**: Quick drying paste

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

AP 21 HL_HS

Copper- tin- brazingpaste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu94Sn(P)-910/1040	Cu 922	CU 201	L-CuSn6

Material-No.
2.1021

Composition, typical analysis (% w/w)

Cu	Sn
94	6

Mechanical and physical properties

Melting range	910 - 1040 °C	Metal content	≈ 88 wt.-%
Working temperature	1040 °C	Viscosity	90.000 - 120.000 mPas
Gap width	0,1 - 0,2 mm		

Characteristics and typical fields of application

Flux-free copper- tin- brazing paste with high metal content. The paste is easy to dispense and available in two different drying rates. The brazing temperature range is a little lower compared to AP 21 GL (L-CuSn4). Suitable for brazing of unalloyed and alloyed steel.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Vacuum furnace (Watch vapour pressure curve!)

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Producttypes

AP 21 **HL**: Slow drying paste

AP 21 **HS**: Quick drying paste

Shelf life

See information on page 170 Storage Information

AP 21 KL

Copper- tin- brazingpaste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Cu88Sn(P)-825/990	Cu 925	CU 202	L-CuSn12

Material-No.
2.1055

Composition, typical analysis (% w/w)

Cu	Sn
88	12

Mechanical and physical properties

Melting range	825 - 990 °C	Metal content	88,0 wt.-%
Working temperature	990 °C	Viscosity	100.000 - 110.000 mPas
Gap width	≤ 0,15 mm		

Characteristics and typical fields of application

Flux-free copper- tin- brazing paste with high metal content. The paste has a high viscosity and dries slowly on air. Due to the low melting range the paste is particularly well suited for brazing of unalloyed and alloyed steel, copper and copper-plated workpieces as well as copper- nickel- alloys. Interesting for workpieces that have to be processed at low temperatures.

Heat sources

Inert-gas continuous furnace Exogas, Inert-gas continuous furnace H_2/N_2, Vacuum furnace (Watch vapour pressure curve!)

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 1

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni73CrFeSiB(C)-980/1060	Ni 600	NI 101	L-Ni1
Material-No.	**AWS A5.8 / SFA-5.8**	**AMS**	
2.4140	BNi-1	4775 J	

Composition, typical analysis (% w/w)

Si	Ni	Cr	Fe	B	P	C
4.5	bal.	14	4.5	3.2	< 0.02	0.75

Mechanical and physical properties

Melting range	980 - 1060 °C	Metal content	≈ 90 wt.-%
Working temperature	1066 - 1204 °C	Viscosity	55.000 - 65.000 mPas
Gap width	0,05 - 0,15 mm		

Characteristics and typical fields of application

This brazing alloy achieves good stability, is heat- and oxidationresistant and offers good diffusibility. Suitable for joints which aThis brazing alloy achieves good stability, is heat- and oxidationresistant and offers good diffusibility. Suitable for joints which are exposed to high thermal and dynamic stress, e.g. turbine blades as well as assemblies in the hot area of steel engines. Steel-, nickel-, cobalt and special materials. Suitable for workpieces with thicker cross sections. Re exposed to high thermal and dynamic stress, e.g. turbine blades as well as assemblies in the hot area of steel engines

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 1A

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni74CrFeSiB-980/1070	Ni 610	Nl 1A1	L-Ni1a
Material-No.	**AWS A5.8 / SFA-5.8**	**AMS**	
2.4141	BNi-1A	4776 H	

Composition, typical analysis (% w/w)

Si	Ni	Cr	Fe	B	P	C
4.5	bal.	14	4.5	3.2	< 0.02	< 0.06

Mechanical and physical properties

Melting range	980 - 1070 °C	Metal content	≈ 90 wt.-%
Working temperature	1077 - 1204 °C	Viscosity	55.000 - 65.000 mPas
Gap width	0,0 5 - 0,1 mm	Oxidationresistant	1200 °C

Characteristics and typical fields of application

HTL1A is an alloy whose composition is identical to HTL 1, however, with a max. C-content of 0.06 %. This brazing alloy is utilised for parts which are used in the high-temperature range as well as in the cooling technology. This brazing alloy shows good gap bridging properties. Suitable for slowly heated assemblies made of steel, nickel, cobalt and special metals. This brazing alloy achieves good stability, is heat- and oxidationresistant and offers good diffusibility. Better flowing properties compared to HTL 1.

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 2

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni82CrSiBFe-970/1000	Ni 620	Nl 102	L-Ni2
Material-No.	**AWS A5.8 / SFA-5.8**	**AMS**	
2.4142	BNi-2	4777 H	

Composition, typical analysis (% w/w)

Si	Ni	Cr	Fe	B	P	C
4.5	bal.	7	3	3.1	< 0.02	< 0.06

Mechanical and physical properties

Melting range	970 - 1000 °C	Gap width	0,02 - 0,20 mm
Working temperature	1010 – 1170°C	Metal content	≈ 90 wt.-%
Recommended soldering temperature	1080°C	Viscosity	55.000 - 65.000 mPas

Characteristics and typical fields of application

This brazing alloy has good flowing properties and offers good diffusibility and is easy to dispense. Suitable for joints which are exposed to high thermal and dynamic stress. The brazing alloy allows optimal processing on e.g. turbine blades as well as on assemblies for the hot area in steel engines. Iron-, nickel-, cobalt and special materials.

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 3

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni95SiB-980/1070	Ni 630	Ni 103	L-Ni3
Material-No.	**AWS A5.8 / SFA-5.8**	**AMS**	
2.4143	BNi-3	4778K	

Composition, typical analysis (% w/w)

Si	Ni	Fe	B	P	C
4.5	bal.	< 0.5	3.1	< 0.02	< 0.06

Mechanical and physical properties

Melting range	1010- 1177 °C	Metal content	≈ 90 wt.-%
Working temperature	1040°C	Viscosity	60.000 -70 000mPas
Gap width	up to 0,05mm		

Characteristics and typical fields of application

This solder has a good flow behavior and shows a good diffusion. It is well dosed and very suitable for highly stressed connections, application for Iron, nickel, cobalt, and special materials.

Heat sources

Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 5 CR

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677
B-Ni60CrPSi-980/1040

Composition, typical analysis (% w/w)

Si	Ni	Cr	P
4	bal.	29	6

Mechanical and physical properties

Melting range	980 - 1040°C	Metal content	≈ 89 % w/w
Working temperature	1090°C	Viscosity	90000 - 115000 mPas
Gap width	0,02 - 0,35 mm		

Characteristics and typical fields of application

HTL 5 CR is a brazing alloy suited for corrosion resistant joints. It has excellent wetting properties and high tec. strength. HTL 5 CR is also used for wide gap brazing. The corrosion and oxidation resistance is better than B-Ni 5 but the brazing temperature is lower.

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 5 M

Nickel-based high-temperature brazing paste

Classifications

DIN EN ISO 3677
B-Ni72CrSiP-971/1051

Composition, typical analysis (% w/w)

Si	Ni	Cr	P
8	bal.	18	2

Mechanical and physical properties

Melting range	971 - 1051 °C	Gap width	0,02 - 0,10 mm
Working temperature	1060°C	Metal content	≈ 89 wt.-%

Characteristics and typical fields of application

HTL 5 M is a brazing alloy suited for corrosion resistant joints.

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 5

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni71CrSi-1080/1135	Ni 650	Nl 105	L-Ni5
Material-No.	**AWS A5.8 / SFA-5.8**	**AMS**	
2.4148	BNi-5	4782 B	

Composition, typical analysis (% w/w)

Si	Ni	Cr	B	P	C
10.1	bal.	19	< 0.03	< 0.02	< 0.06

Mechanical and physical properties

Melting range	1080 - 1135 °C	Gap width	0,02 - 0,10 mm
Working temperature	1149 -1204°C	Metal content	≈ 90 wt.-%
Recommended soldering temperature	1190°C	Viscosity	55.000 - 65.000 mPas

Characteristics and typical fields of application

HTL 5 is a well suited brazing alloy for joints exposed to high stress. It has a good oxidation resistance. The absence of boron allows its use in the nuclear power area. Suited for joints made of iron-, nickel-, cobalt and special materials.

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 6

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni89P-875	Ni 700	NI 106	L-Ni6
Material-No.	**AWS A5.8 / SFA-5.8**		
2.4149	BNi-6		

Composition, typical analysis (% w/w)

Ni	P	C
bal.	11	< 0.06

Mechanical and physical properties

Melting range	875 °C	Gap width	up to 0,05 mm
Working temperature	927 - 1093 °C	Metal content	≈ 90 wt.-%
Recommended soldering temperature	980 °C	Viscosity	60.000 - 80.000 mPas

Characteristics and typical fields of application

The brazing alloy HTL 6 has outstanding wetting properties. No erosion occurs while brazing on Fe- or Ni-based materials. The brazing alloy is applicable on currentlessNiP-coated assemblies. Iron-, nickel-, cobalt- and special materials. Suited for workpieces which come in contact with food. Good flowing properties at low diffusibility.

Heat sources

Vacuum furnace, Inert-gas continuous furnace EXO-Gas / ENDO-Gas H_2/N_2, Induction

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 7

Nickel-based high-temperature solderpaste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni76CrP-890	Ni 710	NI 107	L-Ni7
Material-No.	**AWS A5.8 / SFA-5.8**		
2.4150	BNi-7		

Composition, typical analysis (% w/w)

Si	Ni	Cr	Fe	B	P	C
< 0.1	bal.	14	< 0.2	< 0.01	10.1	< 0.06

Mechanical and physical properties

Melting range	890°C	Gap width	up to 0,05 mm
Working temperature	927 - 1093°C	Metal content	≈ 90 wt.-%
Recommended soldering temperature	980°C	Viscosity	60.000 - 80.000 mPas

Characteristics and typical fields of application

The brazing alloy HTL 7 is used for thin-walled tubes, honeycomb-structures as well as assemblies for the nuclear technology. It is easy to dispense and dries slowly on air. It is very well suited for high-tensile, vacuum-sealed, high-temperature- and corrosion resistant joints. Suited for parts which come in contact with food. The ductility of the brazing joint can be enhanced by an extension of the exposure time. Iron-, nickel-, cobalt and special materials are applicable. Good flowing properties at low diffusibility.

Heat sources

Inert-gas continuous furnace cracked NH_3, Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 8

Nickel-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	DIN 8513
B-Ni66MnSiCu-980/1010	Ni 800	Nl 108	L-Ni8
Material-No.	**AWS A5.8 / SFA-5.8**		
2.4152	BNi-8		

Composition, typical analysis (% w/w)

Cu	Si	Ni	Mn	P	C
4.5	7	bal.	23	< 0.02	< 0.06

Mechanical and physical properties

Melting range	980 - 1010 °C	Recommended soldering temperature	1065°C
Working temperature	1010 -1093°C	Gap width	up to 0,05 mm

Characteristics and typical fields of application

The flux-free brazing alloy HTL 8 is used for brazing of heat exchangers, honeycomb-structures as well as temperable or stainless steel. The operation of this brazing alloy requires a very good furnace atmosphere. Iron-, nickel-, cobalt- and special materials are to be brazed with this alloy. Good flowing properties at low diffusibility.

Heat sources

Inert-gas continuous furnace H_2

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 9

Copper-based high-temperature solder paste

Classifications

DIN EN ISO 3677
B-Cu52,5MnNi-879/927

AMS
4764 E

Composition, typical analysis (% w/w)

Cu	Ni	Mn
52.5	9.5	bal.

Mechanical and physical properties

Melting range	879 - 927 °C	Gap width	up to 0,02 - 0,08 mm
Working temperature	1010 -1093°C	Oxidationresistant	538 °C
Recommended soldering temperature	1065°C		

Characteristics and typical fields of application

The flux-free brazing alloy HTL 9 is used for joints on Cu-, Fe- and Ni-based alloys as well as on stainless Cr-Ni-steel. This brazing alloy is used especially in the aviation, nuclear technology and the chemical industry. It is easy to dispense and dries slowly on air.

Heat sources

Inert-gas continuous furnace H_2

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 10

Copper-based high-temperature solder paste

Classifications

DIN EN ISO 3677
B-Cu68MnNi-910/932

Composition, typical analysis (% w/w)

Cu	Ni	Mn
67.5	9	bal.

Mechanical and physical properties

Melting range	910 - 932 °C	Gap width	up to 0,02 - 0,08 mm
Working temperature	954 - 1093 °C	Metal content	≈ 90 wt.-%

Characteristics and typical fields of application

The flux-free brazing alloy HTL 10 is used for joints on Cu-, Fe- and Ni-based alloys as well as on stainless Cr-Ni-steels. This brazing alloy is mostly used in aviation, nuclear technology and chemical industry.

Heat sources

Inert-gas continuous furnace H_2

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 14

Gold-based high-temperature solder paste

Classifications

DIN EN ISO 3677	DIN EN ISO 17672	DIN EN 1044	AWS A5.8 / SFA-5.8
B-Au82Ni-950	Au 827	AU 105	BAu-4

AMS
4787 A

Composition, typical analysis (% w/w)

Ni	Au
bal.	82

Mechanical and physical properties

Melting range	950 °C	Gap width	up to 0,04 - 0,08 mm
Working temperature	1000 °C	Metal content	≈ 90 wt.-%

Characteristics and typical fields of application

The flux-free brazing alloy HTL 14 has a wide range of applications in the steel engine construction. This standard Au-Ni brazing alloy is universally used for brazing of alloyed steel and Ni-alloys where high stability and good high-temperature corrosion resistance is demanded.

Heat sources

Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 17

Copper-based high-temperature solder paste

Classifications

DIN EN ISO 3677
B-Cu87MnNi-980/1030

Composition, typical analysis (% w/w)

Cu	Ni	Mn
87	3	10

Mechanical and physical properties

Melting range	980 - 1030 °C	Metal content	≈ 91 wt.-%
Working temperature	982 - 1010 °C	Viscosity	100.000 - 120.000 mPas
Gap width	up to 0,05 - 0,25 mm		

Characteristics and typical fields of application

The flux-free brazing alloy HTL 17 is an easy to dispense brazing paste with high metal content. This brazing alloy is particularly well suited for joints made of hard to wet base materials e.g. hard metals and for joining of workpieces with big brazing gaps. The binder dries slowly on air and combusts, depending on the brazing atmosphere, residue-free. Good wetting and flowing properties. Also suited for resistance-heating processes with inert-gas.

Heat sources

Inert-gas continuous furnace cracked NH_3, Inert-gas continuous furnace H_2

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 170

Nickel-based high temperature brazing paste

Classifications

DIN EN ISO 3677
B-Ni75CrPFeSiB-866/881

Composition, typical analysis (% w/w)

Si	Ni	Cr	Fe	B	P
2	bal.	14	2	1.4	5.6

Mechanical and physical properties

Melting range	866 – 881 °C	Metal content	≈ 90 wt.-%
Working temperature	980 - 1050 °C	Viscosity	90.000 - 110.000 mPas
Gap width	0,02 - 0,2 mm		

Characteristics and typical fields of application

The flux-free brazing alloy HTL 170 is an easy to dispense brazing paste of medium viscosity with a high metal content and good gap bridging properties. The alloy is particularly well suited for brazing of high-alloyed steel. The paste dries slowly on air.

Heat sources

Inert-gas continuous furnace cracked NH_3, Inert-gas continuous furnace H_2, Vacuum furnace

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

HTL 270

Nickel-based high-temperature brazing paste

Classifications

DIN EN ISO 3677
B-Ni71CrCuP-870/890

Composition, typical analysis (% w/w)

Cu	Ni	Cr	P
10	bal.	11.8	8

Mechanical and physical properties

Melting range	870 - 890 °C	Metal content	81 wt.-%
Working temperature	980 - 1050 °C	Viscosity	90.000 - 110.000 mPas
Gap width	up to 0,2 mm		

Characteristics and typical fields of application

The flux-free brazing alloy HTL 270 AP is an easy to dispense brazing paste with medium viscosity and high metal content. It dries slowly on air and has good gap bridging properties. This brazing alloy is particularly well suited for stainless steel processing.

Heat sources

Inert-gas continuous furnace H_2

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

fontargen brazing by voestalpine

HTL 310

Copper- nickel-based high-temperature paste

Classifications

DIN EN ISO 3677
B-Ni42CuMnSiB-910/1040

Composition, typical analysis (% w/w)

Cu	Si	Ni	Mn	B
40.5	1.8	42.2	14.1	1.2

Mechanical and physical properties

Melting range	> 910 °C	Metal content	≈ 90 wt.-%
Working temperature	1100 °C	Viscosity	80.000 - 90.000 mPas
Gap width	up to 0,1 mm		

Characteristics and typical fields of application

The flux-free brazing alloy HTL 310 AP is an easy to dispense brazing paste with medium viscosity and high metal content. It dries slowly on air. It is used for brazing of steel sinter materials.

Heat sources

Inert-gas continuous furnace H_2

Application

Manually or automatically with pneumatical or mechanical dispensing units.

Shelf life

See information on page 170 Storage Information

Notes

Group 2

FLUXES

◆ Content

GROUP 2 111

BRASS AND GERMAN SILVER FLUXES 113

SILVER FLUXES 114

ALUMINIUM-FLUXES 115

SOLDERING-FLUXES 116

FLUXES

Brass and German silver fluxes			
	DIN EN 1045	DIN 8511	
F 100 Serie	x	x	113
Silver fluxes			
	DIN EN 1045	DIN 8511	
F 300 Serie	x	x	114
Aluminium-fluxes			
	DIN EN 1045	DIN 8511	
F 400 Serie	x	x	115
Soldering-fluxes			
	DIN EN 29454	DIN 8511	
F 600 Serie	x	x	116

Brass and German silver fluxes
in accordance with DIN EN 1045 (DIN 8511)

The following fluxes are available as standard brazing fluxes for brass and German silver:

F 100 (FH 21 / F-SH2)

white paste, non-corrosive for brazing of steel, cast iron, malleable cast iron, nickel and nickel alloys.

F 120 (FH 21 / F-SH2)

white powder, non-corrosive for brazing of steel, cast iron, malleable cast iron, nickel and nickel alloys. Mixed with distilled water, the powder becomes an easy to spread flux paste.

Silver brazing fluxes
in accordance with DIN EN 1045 (DIN 8511)

The fluxes featured in the FONTARGEN program are adjusted to match the working temperature of the silver brazing alloy or to suit the base material being brazed.

F 300 (FH 10 / F-SH1)

white powder, corrosive for brazing of copper and copper alloys, nickel and nickel alloys, alloyed and unalloyed steel. Mixed with distilled water, the powder becomes an easy to spread flux paste.

F 300 H Ultra (FH 10 / F-SH1)

white, easy to spread paste, corrosive for brazing of copper and copper alloys, nickel and nickel alloys, alloyed and unalloyed steel. Slightly increased temperature stability in comparison to

F 300 S.

F 300 H Ultra NT (FH 10 / F-SH1)

white, easy to dose flux paste, non toxic and corrosive for brazing of copper and copper alloys, nickel and nickel alloys, alloyed and unalloyed steel. Well suited for mechanical brazing e.g. flame brazing.

F 300 DN (FH 10 / F-SH1)

white, easy to dose flux paste, corrosive for brazing of copper and copper alloys, nickel and nickel alloys, alloyed and unalloyed steel. Well suited for mechanical brazing e.g. flame brazing.

F 300 HF Ultra (FH 12 / F-SH1)

dark, easy to spread paste, corrosive for brazing of copper and copper alloys, nickel and nickel alloys, alloyed and unalloyed steel as well as hard metals. Particularly well suited for higher temperatures of max. 850 °C.

F 300 HM (FH 12 / F-SH1)

Brown creamy, spreadable flux paste suitable for the production of braze joints on a variety of base materials such as copper and copper alloys, nickel and nickel alloys, steel and alloy steel. Particularly suitable for the brazing of carbide steel compounds. The flux has a sufficient working time (lifetime) in the upper soldering temperature range, a short-term temperature of approx. 950 ° C is available. In this case, however, a sufficient amount of flux is to be considered.

F 300 AB (FH 11/F-SH 1a)

Paste; flux for brazing of aluminium bronze or aluminium alloyed brass

F 3400, F3400S

(not standardised), clear sprayable liquid, slightly corrosive for brazing of copper and copper alloys. The flux supports the fluidity of the solder in conjunction with RAPIDFLUX and copper-phosphor-silver alloys.

Aluminium-fluxes
in accordance with DIN EN 1045 (DIN 8511)

The FONTARGEN fluxes for light metals have been developed to suit the characteristic properties of aluminium.

F 400 NH (FL 20 / F-LH2)

white powder, non-corrosive for brazing of aluminium and aluminium alloys with a Mg-content of max. 0.5 %. The powder is non-hygroscopic and mixed with distilled water the powder becomes an easy to spread flux paste. The brazing joints must be protected from wetness.

F 400 M (FL 10 / F-LH1)

white powder, corrosive for brazing of aluminium and aluminium alloys with a Mg-content of max. 3.0 %. The powder is highly hygroscopic. Flux residues are corrosive and must be removed immediately after the work is completed.

F 400 MD (FL 10 / F-LH1)

white, easy to dose paste, corrosive for brazing of aluminium and aluminium alloys with a Mg-content of max. 3.0 %. The paste is highly hygroscopic and should be kept in tight closed containers. Flux residues must be removed immediately after work is completed.

Soft soldering fluxes
in accordance with DIN EN 29454 (DIN 8511)

The following soft soldering fluxes are featured in the FONTARGEN program:

F 600 S15 (3.2.2.A / F-SW11)
liquid, corrosive Brazing of copper and copper alloys, alloyed and unalloyed steel. Suitable for galvanised plate.

F 600 (3.1.1.A / F-SW12)
easy to spread liquid, corrosive Brazing of copper and copper alloys, alloyed and unalloyed steel.

F 600 CW (3.1.1.A / F-SW21)
solder oil, non-corrosive High quality flux for soldering of pipe installation
e.g. copper pipes. DVGW-approved.

F 600 C (3.1.1.C / F-SW21)
solder oil, slightly corrosive Brazing of copper.

F 600 CC (1.1.2.C / F-SW26)
paste, non-corrosive Colophony-based flux, suitable for brazing in the electrical engineering and electronics.

F 600 AL (2.1.2.A / F-LW3)
oil, non-corrosive Brazing of aluminium, copper and copper alloys.

F 600 ZN (not standardised)
paste, non-corrosive Brazing of aluminium, aluminium alloys and aluminium-copper alloys with zinc-aluminium solders at a temperature of approx. 380 - 500 °C.

Group 3

WIRE ELECTRODES

◆ Content

GROUP 3 117

COPPER AND COPPER ALLOYS 119

ALUMINIUM AND ALUMINIUM ALLOYS 131

WIRE ELECTRODES

Copper and copper alloys					
	DIN 1733	DIN EN ISO 24373	AWS A5.7 / SFA-5.7	AWS A5.13 / SFA-5.13	
A 200 M	SG-CuAg	S Cu 1897 (CuAg1)			119
A 200 SM	SG-CuSn	S Cu 1898 (CuSn1)	ERCu		120
A 202 M	SG-CuSi3	S Cu 6560 (CuSi3Mn1)	ERCuSi-A		121
A 202 MS	SG-CuSi3	S Cu 6560 (CuSi3Mn1)	ERCuSi-A		122
A 202 M HS	SG-CuSi3	S Cu 6560 (CuSi3Mn1)	ERCuSi-A		123
A 207 M	SG-CuSi2Mn	S Cu 6511 (CuSi2Mn)			124
A 203/6 M	SG-CuSn6	S Cu 5180 A (CuSn6P)	ERCuSn-A		125
A 203/12 M	SG-CuSn12	S Cu 5410 (CuSn12P)		ERCuSn-D	126
A 2115/5 NI M		S Cu 6061 (CuAl5Ni2Mn)			127
A 2115/8 M	SG-CuAl8	S Cu 6100 (CuAl7)	ERCuAl-A1		128
A 216 M	SG-CuAl8Ni2	S Cu 6327 (CuAl8Ni2Fe2Mn2)			129
A 746 NI M		Cu Z (CuMn12Ni2)			130
Aluminium and aluminium alloys					
	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1		
A 400 TI M	SG-Al99,5Ti	S Al 1450 (Al99,5Ti)			131
A 402 M	SG-AlMg3	S Al 5754 (AlMg3)	ER5754		132
A 404 M	SG-AlMg5	S Al 5356 (AlMg5Cr(A))	ER5356		133
A 404/4,5 M	SG-AlMg4,5Mn	S Al 5183 (AlMg4,5Mn0,7(A))	ER5183		134
A 404/4,5 ZR M	SG-AlMg4,5MnZr	S Al 5087 (AlMg4,5MnZr)	ER5087		135
A 405 M	SG-AlSi5	S Al 4043 (AlSi5)	ER4043		136
A 407 M	SG-AlSi12	S Al 4047 (AlSi12(A))	ER4047		137

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A 200 M

Copper wire electrode for MIG-welding

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733
2.1211	S Cu 1897 (CuAg1)	SG-CuAg

Composition, typical analysis (% w/w)

Cu	Ag	Mn	P
bal.	1	0.1	0.02

Characteristics and typical fields of application

Joint and build-up welding on copper, for example material numbers: 2.0060 (E-Cu 57), 2.0070 (SE-Cu), 2.0090 (SF-Cu), 2.0110 (SD-Cu), 2.0150 (SB-Cu), 2.0170 (SA-Cu), 2.1202 (CuAg), plates, profiles, containers. Very easily processed copper alloy. Semi-fluid. Suited for difficult welding positions. The welding pool is clean and clear. The welding deposit is tough and non-porous. Colour and structure of the welding deposit like copper. For workpieces that must be polished, use in limited fashion, as silver can cause blackening. Preheat large workpieces to 350 - 600 °C; use Ar-He inert-gas mixture if necessary.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1070 - 1080 °C	Hardness (Brinell)	60 HB
Electrical conductivity	44 - 46 Sm/mm²	Elongation (l=5d)	0.3
Specific gravity	8,9 kg/dm³	Impact energy	75 J
Heat conductivity	220 - 315 W/m • K	Elongation limit (0.2 %)	80 N/mm²
Tensile strength	200 N/mm²	Thermal elongation	17,7 • 10 -6 /K

Polarity	DC +
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 200 SM

Copper wire electrode for MIG-welding

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1006	S Cu 1898 (CuSn1)	SG-CuSn	ERCu

Composition, typical analysis (% w/w)

Cu	Sn	Si	Mn
bal.	1	0.3	0.3

Characteristics and typical fields of application

Joint and build-up welding on oxygen-free copper and copper alloys of material numbers: 2.0040, 2.0060, 2.0070, 2.0080, 2.0090, 2.0100, 2.0120, 2.0150, 2.0170, 2.1202, 2.1322, 2.1325, 2.1491. Suitable for out-of position welding. Clean base materials in the welding spheres and preheat if over 3 mm (per mm of plate thickness approx. 100 °C, but not more than 600 °C). Suitable for welding of galvanised steel (MIG-brazing).

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1020 - 1050 °C	Hardness (Brinell)	60 HB
Electrical conductivity	15 - 20 Sm/mm²	Elongation (l=5d)	0.3
Specific gravity	8,9 kg/dm³	Impact energy	75 J
Heat conductivity	120 - 145 W/m • K	Thermal elongation	18,1 • 10 -6 /K
Tensile strength	200 - 240 N/mm²		

Polarity	DC +
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2/1,6
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 202 M

Copper-silicon wire electrode for MIG-brazing

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1461	S Cu 6560 (CuSi3Mn1)	SG-CuSi3	ERCuSi-A

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Fe	Mn
bal.	0.1	0.1	2.9	0.2	1.2

Characteristics and typical fields of application

MIG-brazing of zinc or aluminium plated and uncoated steel plates. Applications: Auto body, air condition and container building. The corrosion resistance of zinc plated surfaces remains unaffected. Little deformation of thin steel sheets.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	965 - 1032 °C	Hardness (Brinell)	80 HB
Electrical conductivity	3 - 4 Sm/mm²	Elongation (l=5d)	0.4
Specific gravity	8,5 kg/dm³	Impact energy	60 J
Heat conductivity	35 W/m • K	Streckgrenze EN	120 N/mm²
Tensile strength	350 N/mm²	Thermal elongation	18,1 • 10 -6 /K

Polarity	DC +
Zulassungsliste EN	TÜV
Shielding gas	I 1 (Argon)M 12 (Argon + 2,5 % CO2),M 13 (Argon + 1 - 3 % O2)
Welding process	MIG/MAGM/Laser
Availability	Diameter (mm): 0,8/1,0/1,2/1,6
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 202 MS

Copper-silicon wire electrode for laser brazing

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1461	S Cu 6560 (CuSi3Mn1)	SG-CuSi3	ERCuSi-A

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Fe	Mn
bal.	0.1	0.1	2.9	0.2	1.2

Characteristics and typical fields of application

Laser-brazing of zinc-galvanised, aluminized and uncoated steel plates. Applications: Auto body and thin sheet brazing in the automotive industry. The corrosion resistance of zinc-galvanised surfaces remains unaffected. Little deformation of thin steel sheets.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	965 - 1032 °C	Hardness (Brinell)	80 HB
Electrical conductivity	3 - 4 Sm/mm²	Elongation (l=5d)	0.4
Specific gravity	8,5 g/cm³	Impact energy	60 J
Heat conductivity	35 W/m • K	Streckgrenze EN	120 N/mm²
Tensile strength	350 N/mm²	Thermal elongation	18,1 • 10 -6 /K

Shielding gas	I 1 (Argon)
Welding process	Laser
Availability	Diameter (mm): 0,8/1,0/1,2/1,6
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 202 M HS

Copper-silicon wire electrode for laser brazing

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1461	S Cu 6560 (CuSi3Mn1)	SG-CuSi3	ERCuSi-A

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Fe	Mn
bal.	0.1	0.1	2.9	0.2	1.2

Characteristics and typical fields of application

- Ultrapure and smooth wire surface, therefore excellent slide and feeding properties.
- Improved behavior at joining of steel sheets with different zinc coatings.
- Exact reproducibility of parameter adjustments.
- Less or no rework.
- No risk of twist of the wire because bigger drum diameter of 650 mm.
- Brazing speed ≥ 4,5 m/min.

Application: Laser brazing in the car body construction.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	965 - 1032 °C	Hardness (Brinell)	80 HB
Electrical conductivity	3 - 4 Sm/mm²	Elongation (l=5d)	0.4
Specific gravity	8,5 g/cm³	Impact energy	60 J
Heat conductivity	35 W/m • K	Streckgrenze EN	120 N/mm²
Tensile strength	350 N/mm²	Thermal elongation	18,1 • 10 -6 /K

Shielding gas	I 1 (Argon)
Welding process	Laser
Availability	Diameter (mm): 0,8/1,0/1,2/1,6
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 207 M

Copper-silicon wire electrode for MIG-Brazing

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733
2.1522	S Cu 6511 (CuSi2Mn)	SG-CuSi2Mn

Composition, typical analysis (% w/w)

Cu	Sn	Si	Mn
bal.	0.2	1.8	1

Characteristics and typical fields of application

Very easy to weld. High temperature- and corrosion resistance as well as good behaviour under compression stress. Good wetting of the base material with lower working temperature compared to copper. Flat seams due to Si content and little pore formation.

Welding of galvanised auto body steel sheets (MIG brazing), un-alloyed and low-alloyed steels, cast iron as well as copper and copper alloys. With MIG burner: Weld sharp, not dragging.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1030 - 1050 °C	Hardness (Brinell)	62 HB
Electrical conductivity	4,7 - 5,3 Sm/mm²	Elongation (l=5d)	0.45
Specific gravity	8,7 g/cm^3	Impact energy	75 J
Heat conductivity	40 W/m • K	Thermal elongation	18,1 • 10 -6 /K
Tensile strength	285 N/mm²		

Polarity	DC +
Shielding gas	I 1 (Argon)M 12 (Argon + 2,5 % CO 2)
Welding process	MIG, MAGM, Laser
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

fontargen brazing by voestalpine

A 203/6 M

Copper-tin wire electrode for MIG-welding

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1022	S Cu 5180 A (CuSn6P)	SG-CuSn6	ERCuSn-A

Composition, typical analysis (% w/w)

Cu	Sn	P
bal.	6	0.2

Characteristics and typical fields of application

Welding of copper materials, e.g. CuSn-alloys, CuSnZnPb-cast alloys. Particularly well suited for the joint welding of brass on brass or brass on Cu-alloys, Fe-materials and cast iron. Suitable for welding of galvanised steel (MIG-brazing). Further applications include: Building-up of bearing bushes, sliding rails, repairs of phosphor bronze parts. For tin-bronze parts of > 10 mm thickness, we recommend preheating. Suitable for material numbers: 2.1010, 2.1016, 2.1020, 2.1030, 2.1050, 2.1052, 2.1056, 2.1080, 2.1086, 2.1090, 2.1096. Build-up welding on Fe materials should be performed by pulsed arc welding. Corrosion- and overheating-resistant tin-bronze alloy. A 203/6 M is very easily machined and produces a clear weld pool. The welding deposit is tough and nonporous. Keep arc short. To eliminate contraction strains (in materials with high tin content) peen the seam.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	910 - 1040 °C	Tensile strength	260 N/mm²
Electrical conductivity	6 - 7 Sm/mm²	Hardness (Brinell)	80 HB
Specific gravity	8,7 kg/dm³	Elongation (l=5d)	0.2
Heat conductivity	75 W/m • K	Thermal elongation	18,1 • 10 -6 /K

Polarity	DC +
Shielding gas	I 1 (Argon)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2/1,6
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 203/12 M

Copper-tin wire electrode for MIG-welding

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.13 / SFA-5.13
2.1056	S Cu 5410 (CuSn12P)	SG-CuSn12	ERCuSn-D

Composition, typical analysis (% w/w)

Cu	Sn	P
bal.	12	0.2

Characteristics and typical fields of application

Welding of copper materials, e.g. copper and Sn-bronze. Particularly well suited for joint welding of brass on brass or brass on Cu alloys and Fe materials. Building-up of bearing bushes, sliding rails and repairs of phosphor bronze parts. Welding deposit nearly of same colour as welding of red brass Rg 5. Suitable for material numbers: 2.1010, 2.1020, 2.1050, 2.1056, 2.1086, 2.1016, 2.1030, 2.1052, 2.1080. Build-up welding on Fe materials should be performed with pulsed arc welding. Corrosion- and overheating-resistant tin-bronze alloy. A 203/12 M is very easily machined and produces a clear weld pool that is smooth, clear and non-porous.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	825 - 990 °C	Hardness (Brinell)	120 HB
Electrical conductivity	3 - 5 Sm/mm²	Elongation (l=5d)	0.05
Specific gravity	8,6 kg/dm³	Impact energy	8 J
Heat conductivity	40 - 50 W/m • K	Thermal elongation	18,5 • 10 -6 /K
Tensile strength	320 N/mm²		

Polarity	DC +
Shielding gas	I 1 (Argon)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 2115/5 NI M

Copper-aluminium wire electrode for MIG-brazing

Classifications

DIN EN ISO 24373
S Cu 6061 (CuAl5Ni2Mn)

Composition, typical analysis (% w/w)

Cu	Al	Ni	Mn
bal.	5	2	0.2

Characteristics and typical fields of application

Welded joints and deposit welding on aluminium bronze with 5 - 6 % Al, high-strength brass, copper and copper-alloys, ferritic and austentic steel, steel, aluminium-coated steel, gray cast.

MIG-brazing of galvanized stee. Preheating is only necessary for big assemblies. Pulsed arc welding is recommended for the first layer of deposit welding on ferrous materials.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1060 - 1085 °C	Hardness (Brinell)	84 HB
Electrical conductivity	8 - 8,8 Sm/mm²	Elongation (l=5d)	0.45
Specific gravity	8,2 g/cm^3	Impact energy	160 J
Heat conductivity	61 W/m • K	Thermal elongation	17,5 • 10 -6 /K
Tensile strength	350 N/mm		

Polarity	DC +
Shielding gas	I 1 (Argon)
Welding process	MIG
Availability	Diameter (mm): 1.0/1.2/1.6
Spool type	B300, S300, Drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 2115/8 M

Copper-aluminium wire electrode for MIG-brazing

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.0921	S Cu 6100 (CuAl7)	SG-CuAl8	ERCuAl-A1

Composition, typical analysis (% w/w)

Cu	Zn	Al	Si	Ni	Fe	Mn
bal.	0.1	8	0.1	0.5	0.2	0.2

Characteristics and typical fields of application

MIG-brazing of aluminium plated and uncoated steel plates. Applications: Auto body, magnetic solenoids, air conditioning and container building. The corrosion resistance galvanized steel plates remain unaffected. Little deformation of thin steel sheets. Suitable for joining of aluminium-bronze, high-strength brass and steel. Range of applications: Car body, ship building, heating and cooling as well as container building.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1030 - 1040 °C	Hardness (Brinell)	100 HB
Electrical conductivity	8 Sm/mm²	Elongation (l=5d)	0.4
Specific gravity	7,7 g/cm³	Impact energy	100 J
Heat conductivity	65 W/m • K	Thermal elongation	17 • 10 -6 /K
Tensile strength	430 N/mm²		

Polarity	DC +
Shielding gas	I 1 (Argon)
Welding process	MIG
Availability	Diameter (mm): 0,8/1,0/1,2
Spool type	B300 (Korbspule), S300 (Dornspule), Fassspule, weitere Lieferformen auf Anfrage

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 216 M

Copper-aluminium-nickel wire electrode for MIG-brazing

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733
2.0922	S Cu 6327 (CuAl8Ni2Fe2Mn2)	SG-CuAl8Ni2

Composition, typical analysis (% w/w)

Cu	Al	Ni	Fe	Mn
bal.	8	2	1.8	1.8

Characteristics and typical fields of application

Joint and build-up welding on multi-alloyed aluminium-bronze, for example material numbers: 2.0916, 2.0920, 2.0928, 2.0932, 2.0936, 2.0940, 2.0960, 2.0962, 2.0966, 2.0970, 2.0975, 2.0978 and 2.0980. Build-up welding on steel and copper alloys. Fusion welding between steel and aluminium-bronze (also multi-alloys). Suitable for MIG-brazing of aluminium surfaced and galvanised steels. For use in shipbuilding, machine, apparatus and pump construction; for example ship propellers, pump casings, valve control casings and food containers. Preheating necessary only with large workpieces. For the first run of build-up welds on ferrous base material we recommend pulsed-arc welding. The welding deposit is saltwater- and corrosion resistant as well as wear resistant. Well suited if subjected to wear by salt water, cavitation and erosion at the same time.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1030 - 1050 °C	Elongation (l=5d)	0.3
Electrical conductivity	5 Sm/mm²	Impact energy	70 J
Heat conductivity	50 W/m • K	Elongation limit (0.2 %)	290 N/mm²
Tensile strength	530 - 590 N/mm²	Thermal elongation	17 • 10 -6 /K
Hardness (Brinell)	140 HB		

Shielding gas	I 1 (Argon)
Welding process	MIG
Availability	Diameter (mm): 1.0/1.2
Spool type	B300, S300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 746 NI M

Copper-manganese-nickel electrode for MIG-brazing

Classifications

Material-No.	DIN EN ISO 24373
2.1362	Cu Z (CuMn12Ni2)

Composition, typical analysis (% w/w)

Cu	Ni	Mn
bal.	2	12

Characteristics and typical fields of application

High yield strength, ductility and crack resistance. Joining of steel plates and high Mn-alloyed bronzes. Surfacing of rotation-symmetric blanks for solenoids.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	950 - 970 °C	Elongation (l=5d)	> 10 %
Electrical conductivity	2,3 Sm/mm²	Thermal elongation	18,3 • 10-6/K
Tensile strength	350 - 450 N/mm²		

Shielding gas	I 1 (Argon)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,6
Spool type	B300, S300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 400 TI M

Aluminium wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273
3.0805	SG-Al99,5Ti	S Al 1450 (Al99,5Ti)

Composition, typical analysis (% w/w)

Cu	Zn	Al	Si	Fe	Ti
0.05	0.07	bal.	0.2	0.4	0.1

Characteristics and typical fields of application

Aluminium alloy with good fluidity. Weldable in all positions. The Ti-content ensures a grain refinement of the welding deposit. Joint welding of base materials: Al 98; Al 99; Al 99,5; Al 99,8 und Al 99,7. For plates thicker than 15 mm preheat to a min. of 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	647 - 658 °C	Tensile strength	65 N/mm²
Electrical conductivity	34 - 36 Sm/mm²	Elongation (l=5d)	0.35
Specific gravity	2,71 g/cm^3	Elongation limit (0.2 %)	20 N/mm²
Heat conductivity	210 - 230 W/m • K	Thermal elongation	23,5 • 10-6/K

Polarity	DC +
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2/1,6
Spool type	B300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 402 M

Aluminium-magnesium wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1
3.3536	SG-AlMg3	S Al 5754 (AlMg3)	ER5754

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Mg
bal.	0.2	0.1	0.2	0.3	0.1	3

Characteristics and typical fields of application

Corrosion- and saltwater-proof alloy. Suitable for anodising. Welding of rolled and cast aluminium-magnesium alloys such as Al Mg 3, Al Mg Mn, Al Mg 1, Al Mg 2, Al Mg Si 0,5, Al Mg Si 0,8, G - Al Mg 3, G - Al Mg 3 (Cu), G - Al Mg 3 Si. Tank construction, aluminium constructions, constructions of vehicles, shipbuilding, window and door frames construction. Plates thicker than 15 mm must be preheated to approx. 150 °C - 200 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	615 - 642 °C	Tensile strength	200 N/mm²
Electrical conductivity	21 Sm/mm²	Elongation (l=5d)	0.2
Specific gravity	2,66 g/cm³	Elongation limit (0.2 %)	80 N/mm²
Heat conductivity	130 - 170 W/m • K	Thermal elongation	23,7 • 10-6/K

Polarity	DC +
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 404 M

Aluminium-magnesium wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1
3.3556	SG-AlMg5	S Al 5356 (AlMg5Cr(A))	ER5356

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Mg
bal.	0.25	0.1	0.2	0.1	0.1	5

Characteristics and typical fields of application

Corrosion- and saltwater-proof alloy. Suitable for anodising. Welding of rolled and cast aluminiummagnesium alloys according to DIN 1725 Bl. 1 and Bl. 2, like Al Mg 3, Al Mg 5, Al Mg Mn, Al Zn Mg 1, G-Al Mg 3/+Si/+Cu, G-Al Mg 5/+Si, G-Al Mg 10, Al Mg Si 1. Tank construction, construction of vehicles, aluminium constructions, shipbuilding, windows, etc. For plates thicker than 15 mm, preheat to min. 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	575 - 633 °C	Tensile strength	235 N/mm²
Electrical conductivity	15 - 19 Sm/mm²	Elongation (l=5d)	0.08
Specific gravity	2,64 g/cm^3	Elongation limit (0.2 %)	110 N/mm²
Heat conductivity	110 - 150 W/m • K	Thermal elongation	23,7 • 10-6/K

Polarity	DC +
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 404/4,5 M

Aluminium-magnesium wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1
3.3548	SG-AlMg4,5Mn	S Al 5183 (AlMg4,5Mn0,7(A))	ER5183

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Mg
bal.	0.2	0.1	0.2	0.7	0.1	4.5

Characteristics and typical fields of application

Filler metal for joints which demand highest toughness. The welding deposit has a good resistance to atmospheric influences and seawater. Joint welding on rolled and cast aluminium-magnesium alloys, e.g. Al Mg 4,5 Mn, Al Mg 5, Al Zn 4,5 Mg 1, G-Al Mg 3/+Si/+Cu, G-Al Mg 5/+Si, G-Al Mg 10, Al Mg Si 1. If plates are thicker than 15 mm, preheat to a min. of 150 °C.

Filler metal for joints with highest toughness demands. The welding deposit has a good resistance to atmospheric influences and saltwater.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	574 - 638 °C	Tensile strength	280 N/mm²
Electrical conductivity	16 - 19 Sm/mm²	Elongation (l=5d)	0.2
Specific gravity	2,66 g/cm^3	Elongation limit (0.2 %)	140 N/mm²
Heat conductivity	110 - 120 W/m • K	Thermal elongation	23,7 • 10-6/K

Polarity	DC +
Zulassungsliste EN	DB (61.046.02/QS)
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, drum, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 404/4,5 ZR M

Aluminium-magnesium wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1
3.3546	SG-AlMg4,5MnZr	S Al 5087 (AlMg4,5MnZr)	ER5087

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Zr	Mg
bal.	0.1	0.1	0.2	0.9	0.1	0.15	4.7

Characteristics and typical fields of application

Zirconic welding deposit for joints which demand highest toughness. Zirconium increases the heat crack-resistance. The welding filler can be used advantageously for complicated welding constructions involving unfavourable restraint conditions. The welding deposit has a good resistance to atmospheric influences and seawater. Joint welding on rolled and cast aluminiummagnesium alloys, e.g. Al Mg 3, G-Al Mg 3, Al Mg 4,5 Mn, Al Mg 5, G-Al Mg 5, Al-Cu Mg 1, Al Mg Si 1, Al Zn 4,5 Mg 1. If plates are thicker than 10 mm, preheat to 150 °C - 200 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	574 - 638 °C	Tensile strength	300 N/mm²
Electrical conductivity	17 - 19 Sm/mm²	Elongation (l=5d)	0.2
Specific gravity	2,66 g/cm³	Elongation limit (0.2 %)	140 N/mm²
Heat conductivity	110 - 120 W/m • K	Thermal elongation	23,7 • 10-6/K

Polarity	DC +
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): on request
Spool type	B300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 405 M

Aluminium-silicon wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1
3.2245	SG-AlSi5	S Al 4043 (AlSi5)	ER4043

Composition, typical analysis (% w/w)

Cu	Al	Si	Fe	Ti
0.1	bal.	5.2	0.5	0.1

Characteristics and typical fields of application

Welding of Al Si 5, Al Mg Si 0,5, Al Mg Si 0,8, Al Mg Si 1. Al and Al alloys with an alloy content of less than 2 %. Al cast alloy with Si content of max. 7 %. Plates thicker than 15 mm, preheat to approx. 150 °C. When welding heat-treatable alloys, do not put the weld seam in areas subjected to high mechanical stress. Al-Si alloy with good fluidity. Discolouring when anodised.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	573 - 625 °C	Tensile strength	120 N/mm²
Electrical conductivity	24 - 32 Sm/mm²	Elongation (l=5d)	0.08
Specific gravity	2,68 g/cm³	Elongation limit (0.2 %)	40 N/mm²
Heat conductivity	170 W/m • K	Thermal elongation	22,1 • 10-6/K

Polarity	DC +
Zulassungsliste EN	DB (61.046.01/QS)
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 407 M

Aluminium-silicon wire electrode for MIG-welding

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273	AWS A5.1 / SFA-5.1
3.2585	SG-AlSi12	S Al 4047 (AlSi12(A))	ER4047

Composition, typical analysis (% w/w)

Cu	Zn	Al	Si	Fe	Mn	Ti
0.1	0.1	bal.	12	0.5	0.1	0.1

Characteristics and typical fields of application

Al-Si alloy with good fluidity. Structure and colour matching. Not suited for joints that are subsequently anodised. Al-Si cast alloys with more than 7 % weight content of silicon. In special cases also Al and Al alloys with less than 2 % alloying elements. Tank constructions, airconditioning equipment, household appliances, sheets, pipes, profiles. Preheat thick plates and large workpieces to approx. 150 °C - 180 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	573 - 585 °C	Tensile strength	130 N/mm²
Electrical conductivity	17 - 27 Sm/mm²	Elongation (l=5d)	0.05
Specific gravity	2,65 g/cm^3	Elongation limit (0.2 %)	60 N/mm²
Heat conductivity	150 - 170 W/m • K	Thermal elongation	20 • 10-6/K

Polarity	DC +
Zulassungsliste EN	DB (61.046.01/QS)
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	MIG
Availability	Diameter (mm): 1,0/1,2
Spool type	B300, other forms of delivery on request

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

Notes

Group 4

WELDING RODS

◆ Content

GROUP 4 139

COPPER AND COPPER ALLOYS 141

ALUMINIUM AND ALUMINIUM ALLOYS 149

WELDING RODS

Copper and copper alloys			
	DIN 1733	DIN EN ISO 24373	
A 200 S W	SG-CuSn	S Cu 1898 (CuSn1)	141
A 200 W	SG-CuAg	S Cu 1897 (CuAg1)	142
A 202 W	SG-CuSi3	S Cu 6560 (CuSi3Mn1)	143
A 207 W	SG-CuSi2Mn	S Cu 6511 (CuSi2Mn)	144
A 203/6 W	SG-CuSn6	S Cu 5180 A (CuSn6P)	145
A 203/12 W	SG-CuSn12	S Cu 5410 (CuSn12P)	146
A 215/8 W	SG-CuAl8	S Cu 6100 (CuAl7)	147
A 216 W	SG-CuAl8Ni2	S Cu 6327 (CuAl8Ni2Fe2Mn2)	148
Aluminium and aluminium alloys			
	DIN 1732	DIN EN ISO 18273	
A 400 TI W	SG-Al99,5Ti	S Al 1450 (Al99,5Ti)	149
A 400 W	SG-AlMn1	S Al 3103 (AlMn1)	150
A 402 W	SG-AlMg3	S Al 5754 (AlMg3)	151
A 404 W	SG-AlMg5	S Al 5356 (AlMg5Cr(A))	152
A 404/4,5 W	SG-AlMg4,5Mn	S Al 5183 (AlMg4,5Mn0,7(A))	153
A 404/4,5 ZR W	SG-AlMg4,5MnZr	S Al 5087 (AlMg4,5MnZr)	154
A 405 W	SG-AlSi5	S Al 4043 (AlSi5)	155
A 407 W	SG-AlSi12	S Al 4047 (AlSi12(A))	156

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A 200 S W

Copper welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1006	S Cu 1898 (CuSn1)	SG-CuSn	ERCu

Composition, typical analysis (% w/w)

Cu	Sn	Si	Mn	P
bal.	0.8	0.3	0.3	0.01

Characteristics and typical fields of application

Joint and build-up welding on copper and copper alloys of material numbers: 2.0040, 2.0060, 2.0070, 2.0080, 2.0090, 2.0100, 2.0120, 2.0150, 2.0170, 2.1202, 2.1322, 2.1325, 2.1491. Suitable for copper pipe installations according to DVGW work sheet GW 2. The base materials in the welding spheres should be cleaned and preheated if over 3 mm (per mm of plate thickness approx. 100 °C, but not over 600 °C). For preheating temperatures of over 300 °C, flux should be used.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1020 - 1050 °C	Hardness (Brinell)	60 HB
Electrical conductivity	15 - 20 Sm/mm²	Elongation (l=5d)	0.3
Heat conductivity	120 - 145 W/m • K	Impact energy	75 J
Tensile strength	200 N/mm²	Thermal elongation	18 • 10 -6 /K

Polarity	DC –
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG, Gas
Availability	Diameter (mm): 1,6/2,0/2,4/3,2 Lenght (mm): 1000
Flussmittel EN	F 100 (paste) at prheating > 300 °C

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 200 W

Copper welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733
2.1211	S Cu 1897 (CuAg1)	SG-CuAg

Composition, typical analysis (% w/w)

Cu	Ag	Mn	P
bal.	1	0.1	0.02

Characteristics and typical fields of application

Joint and build-up welding on copper, for example material numbers: 2.0040 (OF-Cu), 2.0060 (ECu 57), 2.0070 (SE-Cu), 2.0090 (SF-Cu), 2.0110 (SD-Cu), 2.0150 (SB-Cu), 2.0170 (SA-Cu), 2.1202 (Cu Ag), plates, profiles, containers. Suited for copper pipe installations in accordance with DVGW work sheet GW 2. Preheat large work pieces to 350 °C - 600 °C; use Ar-He inert-gas mixture if necessary.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1070 - 1080 °C	Hardness (Brinell)	60 HB
Electrical conductivity	44 - 46 Sm/mm²	Elongation (l=5d)	0.3
Specific gravity	8,9 kg/dm³	Impact energy	75 J
Heat conductivity	220 - 315 W/m • K	Thermal elongation	17,7 • 10 -6 /K
Tensile strength	200 N/mm²		

Polarity	DC –
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG, Gas
Availability	Diameter (mm):1,6/2,0/2,4/3,2 Lenght (mm):
Flussmittel EN	F 100 (paste) at preheating > 300 °C

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 202 W

Copper-silicon welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1461	S Cu 6560 (CuSi3Mn1)	SG-CuSi3	ERCuSi-A

Composition, typical analysis (% w/w)

Cu	Sn	Zn	Si	Fe	Mn
bal.	0.1	0.1	2.9	0.1	1

Characteristics and typical fields of application

High temperature- and corrosion resistance as well as good behaviour to compression stress. Due to high silicon content, welding deposit seams remain flat.

Joint and build-up welding on copper alloys of material numbers 2.0853, 2.0855, 2.0857, 2.1243, 2.1245, 2.1247, 2.1265, 2.1266, 2.1267, 2.1270, 2.1285, 2.1322, 2.1323, 2.1363, 2.1366, 2.1522, 2.1525, 2.1545, 2.1546, brass as well as build-up MIG-brazing galvanized autobody steel sheets. Unalloyed or low-alloyed steels and cast iron. To avoid hot cracks keep welding pool small and feed fast. Preheat thick workpieces to 350 - 600 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	965 - 1035 °C	Hardness (Brinell)	80 HB
Electrical conductivity	3 - 4 Sm/mm²	Elongation (l=5d)	0.4
Specific gravity	8,5 kg/dm³	Impact energy	60 J
Heat conductivity	35 W/m • K	Thermal elongation	18,1 • 10 -6 /K
Tensile strength	350 N/mm²		

Polarity	DC –
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): 1,6/2,0/2,4/3,2 Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 207 W

Copper-silicon-manganese welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733
2.1522	S Cu 6511 (CuSi2Mn)	SG-CuSi2Mn

Composition, typical analysis (% w/w)

Cu	Sn	Si	Mn
bal.	0.2	1.8	1

Characteristics and typical fields of application

Easy to weld. High temperature- and corrosion resistance as well as good behaviour under compression stress. Good wetting of the base material with low working temperature compared to copper. Flat seams due to silicon content. Little pore formation. Welding deposit has good modelling properties.

MIG-brazing of galvanised autobody steel sheets, other steels as well as copper, copper alloys and cast iron.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1030 - 1050 °C	Hardness (Brinell)	62 HB
Electrical conductivity	4,7 - 5,3 Sm/mm²	Impact energy	75 J
Heat conductivity	40 W/m • K	Elongation limit (0.2 %)	140 N/mm²
Tensile strength	285 N/mm²	Thermal elongation	18 • 10 -6 /K

Polarity	DC –
Shielding gas	I 1 (Argon)
Welding process	TIG
Availability	Diameter (mm): 1,6/2,0 Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 203/6 W

Copper-tin welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.1022	S Cu 5180 A (CuSn6P)	SG-CuSn6	ERCuSn-A

Composition, typical analysis (% w/w)

Cu	Sn	P
bal.	6	0.2

Characteristics and typical fields of application

Welding of copper materials, e.g. copper and Sn bronze. Particularly well suited for joint welding of brass on brass or brass on other Cu alloys, (Rg), Fe materials and cast iron. Other applications include: Building-up of bearing bushes, sliding rails and repairs of tin bronze parts. For tin bronze parts of more than 8 mm thickness we recommend preheating. Suitable for material numbers: 2.1010, 2.1016, 2.1020, 2.1030, 2.1050, 2.1052, 2.1056, 2.1080, 2.1086, 2.1090, 2.1096. Corrosion- and overheating-resistant tin-bronze alloy. A 203/6 W is very easily machined and produces a clear weld pool. The welding deposit is tough and non-porous.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	910 - 1040 °C	Hardness (Brinell)	80 HB
Electrical conductivity	7 - 9 Sm/mm²	Elongation (l=5d)	0.3
Heat conductivity	75 W/m • K	Thermal elongation	18,5 • 10 -6 /K
Tensile strength	330 N/mm²		

Polarity	DC –
Shielding gas	I 1 (Argon)
Welding process	TIG, gas
Availability	Diameter (mm): 1,6/2,0/2,4/3,2/4,0 Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 203/12 W

Copper-tin welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.13 / SFA-5.13
2.1056	S Cu 5410 (CuSn12P)	SG-CuSn12	ERCuSn-D

Composition, typical analysis (% w/w)

Cu	Sn	P
bal.	12	0.2

Characteristics and typical fields of application

Welding of copper materials, e.g. copper and Sn-bronze. Particularly well suited for joint welding of brass or brass on Cu alloys and Fe materials. Building-up of bearing bushes, sliding rails and repairs of phosphor bronze parts. Welding deposit very similar coloured as welding of red brass Rg 5. Suitable for material numbers: 2.1020, 2.1050, 2.1056, 2.1086, 2.1016, 2.1030, 2.1052, 2.1080.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	825 - 990 °C	Tensile strength	320 N/mm²
Electrical conductivity	3 - 5 Sm/mm²	Hardness (Brinell)	120 HB
Specific gravity	8,6 kg/dm³	Elongation (l=5d)	0.05
Heat conductivity	40 - 50 W/m • K	Thermal elongation	18,5 • 10 -6 /K

Polarity	DC –
Shielding gas	I 1 (Argon)
Welding process	TIG, Gas
Availability	Diameter (mm): 1,6/2,0/2,4/3,2 Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 215/8 W

Copper-aluminium welding rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733	AWS A5.7 / SFA-5.7
2.0921	S Cu 6100 (CuAl7)	SG-CuAl8	ERCuAl-A1

Composition, typical analysis (% w/w)

Cu	Al	Ni	Fe	Mn
bal.	8	0.5	0.2	0.2

Characteristics and typical fields of application

Corrosion- and seawater-resistant alloy with very good glide properties (metal-metal). A 215/8 W is very easy to handle and ensures a perfect weld in the root pass and a clean top surface. The seam is smooth and non-porous.

Joint and build-up welding on aluminium-bronze, high-strength brass, steel and cast iron. For use in the machine-, chemical- as well as shipbuilding industries. Joint welding: Corrosion-resistant aluminium-bronze or high-strength brass pipework. Joining of copper conduits with steel. Joining of material numbers 2.0916, 2.0920, 2.0928. Preheat thick workpieces to 200 °C. Build-up welding: Building-up of ship propellers, kid rails, running surfaces, bearings, valves, slide gates, fittings, etc.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1030 - 1040 °C	Hardness (Brinell)	100 HB
Electrical conductivity	8 Sm/mm²	Elongation (l=5d)	0.4
Heat conductivity	65 W/m • K	Impact energy	100 J
Tensile strength	380 N/mm²	Thermal elongation	17 • 10 -6 /K

Polarity	DC –
Shielding gas	I 1 (Argon)
Welding process	TIG
Availability	F 200 (recommended)
Spool type	Diameter (mm): 2,0 Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 216 W

Copper-aluminium-nickel rod

Classifications

Material-No.	DIN EN ISO 24373	DIN 1733
2.0922	S Cu 6327 (CuAl8Ni2Fe2Mn2)	SG-CuAl8Ni2

Composition, typical analysis (% w/w)

Cu	Al	Fe	Mn
bal.	8	1.5	1.5

Characteristics and typical fields of application

Joint and build-up welding on multi-alloyed aluminium-bronze, for example material numbers: 2.0916, 2.0920, 2.0928, 2.0932, 2.0936, 2.0940, 2.0960, 2.0962, 2.0966, 2.0970, 2.0975, 2.0978 and 2.0980. Build-up welding on steel and copper alloys. Fusion welding between steel and aluminium-bronze (also multi-alloys). Suitable for welding (MIG brazing) of aluminium surfaced and galvanised steels. For use in shipbuilding, machine, apparatus and pump construction; for example ship propellers, pump casings, valve control casings and food containers. Preheating necessary only with large workpieces. For the first run of build-up welds on ferrous base material we recommend pulsed-arc welding. The welding deposit is saltwater- and corrosion resistant as well as wear resistant. Well suited if at the same time subjected to wear by salt water, cavitation and erosion.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	1030 - 1050 °C	Hardness (Brinell)	140 HB
Electrical conductivity	5 Sm/mm²	Impact energy	70 J
Heat conductivity	58 W/m • K	Elongation limit (0.2 %)	290 N/mm²
Tensile strength	530 N/mm²	Thermal elongation	17 • 10 -6 /K

Polarity	AC
Shielding gas	I 1 (Argon)
Welding process	TIG
Availability	Diameter (mm): 2,0/2,4/3,2 Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 400 TI W

Aluminium welding rod

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273
3.0805	SG-Al99,5Ti	S Al 1450 (Al99,5Ti)

Composition, typical analysis (% w/w)

Cu	Zn	Al	Si	Fe	Ti
0.05	0.05	bal.	0.2	0.4	0.1

Characteristics and typical fields of application

Aluminium alloy with good fluidity. Weldable in all positions. The Ti-content ensures a grain refinement of the welding deposit. Joint welding of base materials: Al 98; Al 99; Al 99.5; E Al; Al 99.8 und Al 99.7. For plates thicker than 15 mm, preheat to a min. of 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	647 - 658 °C	Tensile strength	65 N/mm²
Electrical conductivity	34 Sm/mm²	Elongation (l=5d)	0.35
Specific gravity	2,71 g/cm³	Elongation limit (0.2 %)	20 N/mm²

Polarity	AC
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): on request, Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 400 W

Aluminium welding rod

Classifications

Material-No.	DIN 1732	DIN EN ISO 18273
3.0516	SG-AlMn1	S Al 3103 (AlMn1)

Composition, typical analysis (% w/w)

Cu	Al	Si	Fe	Mn
<0.05	bal.	<0.2	<0.4	1.2

Characteristics and typical fields of application

Welding rod to connect similar alloy in shipbuilding, marine and offshore technology mostly for repairs and minor compounds, weldable in all positions.

Joint welding of base materials: AlMn0.6; AlMn 1; AlMn0.2Mg0.1; AlMn1Mg0.5 and similar materials. For plates thicker than 6 mm, preheat to a min. of 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	648 - 657 °C	Tensile strength	> 90 N/mm²
Specific gravity	2,73 g/cm^3		

Polarity	AC
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): on request, Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 402 W

Aluminium-magnesium welding rod

Classifications

AWS A5.1 / SFA-5.1	Material-No.	DIN 1732	DIN EN ISO 18273
ER5754	3.3536	SG-AlMg3	S Al 5754 (AlMg3)

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Mg
bal.	0.2	0.1	0.2	0.2	0.1	3

Characteristics and typical fields of application

Corrosion- and saltwater-proof alloy. Easily anodised. Welding of rolled and cast aluminiummagnesium alloys e.g. AlMg3, AlMgMn, AlMg1, AlMg2, AlMgSi0.5, AlMgSi0.8, G-AlMg3, GAlMg3(Cu), G-AlMg3Si. Manufacturing of containers, aluminium constructions, constructions of vehicles, ship building, window and door frames. Plates thicker than 15 mm must be preheated to approx. 150 °C - 200 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	615 - 642 °C	Tensile strength	190 N/mm²
Electrical conductivity	20 - 23 Sm/mm²	Elongation (l=5d)	0.2
Specific gravity	2,66 g/cm^3	Elongation limit (0.2 %)	80 N/mm²

Polarity	AC
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): 1,6/2,0/2,4/3,2, Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 404 W

Aluminium-magnesium welding rod

Classifications

AWS A5.1 / SFA-5.1	Material-No.	DIN 1732	DIN EN ISO 18273
ER5356	3.3556	SG-AlMg5	S Al 5356 (AlMg5Cr(A))

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Mg
bal.	0.2	0.1	0.2	0.1	0.1	5

Characteristics and typical fields of application

Corrosion- and saltwater-proof alloy. Easily anodised. Welding of rolled and cast aluminiummagnesium alloys according to DIN 1725 Bl. 1 and Bl. 2, like AlMg3, AlMg5, AlMgMn, AlZnMg1, G-AlMg3/+Si/+Cu, G-AlMg5/+Si, G-AlMg10, AlMgSi1. Tank constructions, construction of vehicles, aluminium constructions, shipbuilding, windows, etc. For plates thicker than 15 mm preheat, to min. 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	575 - 633 °C	Tensile strength	235 N/mm²
Electrical conductivity	15 - 19 Sm/mm²	Elongation (l=5d)	0.08
Specific gravity	2,64 g/cm^3	Elongation limit (0.2 %)	110 N/mm²

Polarity	AC
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): 1,6/2,0/2,4/3,2, Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 404/4,5 W

Aluminium-magnesium welding rod

Classifications

AWS A5.1 / SFA-5.1	Material-No.	DIN 1732	DIN EN ISO 18273
ER5183	3.3548	SG-AlMg4,5Mn	S Al 5183 (AlMg4,5Mn0,7(A))

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Mg
bal.	0.2	0.1	0.2	0.7	0.1	4.5

Characteristics and typical fields of application

Filler metal for joints that have high demands of toughness. The welding deposit has a good resistance to atmospheric influences and sea water. Joint welding on rolled and cast aluminiummagnesium alloys, e.g. AlMg4,5Mn, AlMg5, AlZn4,5Mg1, G-AlMg3/+Si/+Cu, G-AlMg5/+Si, G-AlMg10, AlMgSi1. For plates thicker than 15 mm, preheat to min. 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	574 - 638 °C	Tensile strength	275 N/mm²
Electrical conductivity	16 - 19 Sm/mm²	Elongation (l=5d)	0.17
Specific gravity	2,66 g/cm^3	Elongation limit (0.2 %)	125 N/mm²

Polarity	AC
Zulassungsliste EN	DB (61.046.02/QS)
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): 1,6/2,0/2,4/3,2, Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 404/4,5 ZR W

Aluminium-magnesium welding rod

Classifications

AWS A5.1 / SFA-5.1	Material-No.	DIN 1732	DIN EN ISO 18273
ER5087	3.3546	SG-AlMg4,5MnZr	S Al 5087 (AlMg4,5MnZr)

Composition, typical analysis (% w/w)

Al	Si	Cr	Fe	Mn	Ti	Zr	Mg
bal.	0.2	0.1	0.2	0.7	0.1	0.15	4.5

Characteristics and typical fields of application

Zirconic welding deposit for joints of very high toughness. The welding deposit has a good resistance to atmospheric influences and sea water. Joint welding on rolled and cast aluminium-magnesium alloys, e.g. AlMg4.5Mn, AlMg5, AlZn4.5Mg1, G-AlMg3/+Si/+Cu, G-AlMg5/+Si, G-AlMg10, AlMgSi1. For plates thicker than 15 mm, preheat to 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	574 - 638 °C	Tensile strength	275 N/mm²
Electrical conductivity	17 - 19 Sm/mm²	Elongation (l=5d)	27 %
Specific gravity	2,66 g/cm^3	Elongation limit (0.2 %)	125 N/mm²

Polarity	AC
Shielding gas	I 1 (Argon), I 3 (Argon/Helium)
Welding process	TIG
Availability	Diameter (mm): On request Length (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

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A 405 W

Aluminium-silicon welding rod

Classifications

AWS A5.1 / SFA-5.1	Material-No.	DIN 1732	DIN EN ISO 18273
ER4043	3.2245	SG-AlSi5	S Al 4043 (AlSi5)

Composition, typical analysis (% w/w)

Cu	Al	Si	Fe	Ti
0.1	bal.	5.2	0.5	0.1

Characteristics and typical fields of application

Al-Si alloy with good fluidity. Welding on pure aluminium without surface-melting the base material is possible. Discolouring when anodised.

Welding of AlSi5, AlMgSi0.5, AlMgSi0.8, AlMgSi1. Al and Al alloys with an alloy content of max. 7 %. For plates thicker than 15 mm, preheat to 150 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	573 - 625 °C	Tensile strength	120 N/mm²
Electrical conductivity	24 - 32 Sm/mm²	Elongation (l=5d)	0.08
Specific gravity	2,68 g/cm³	Elongation limit (0.2 %)	40 N/mm²
Heat conductivity	170 W/m • K	Thermal elongation	22,1 • 10-6/K

Polarity	AC
Zulassungsliste EN	DB (61.046.01/QS)
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG, Gas
Availability	Diameter (mm): 1,6/2,0/2,4/3,2, Lenght (mm): 1000
Flussmittel EN	For gas welding use of flux F 400 M (powder, corrosive, low melting)

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

A 407 W

Aluminium-silicon welding rod

Classifications

AWS A5.1 / SFA-5.1	Material-No.	DIN 1732	DIN EN ISO 18273
ER4047	3.2585	SG-AlSi12	S Al 4047 (AlSi12(A))

Composition, typical analysis (% w/w)

Cu	Zn	Al	Si	Fe	Mn	Ti
0.1	0.1	bal.	12	0.5	0.1	0.1

Characteristics and typical fields of application

Al-Si alloy with good fluidity. Not suitable for joints that are subsequently anodised, since the seam turns grey. Al-Si cast alloys with more than 7 % weight content of silicon. In special cases also Al and Al alloys with less than 2 % alloying elements. Tank construction, air-conditioning equipment, household articles, plates, pipes, profiles. Preheat thick plates and large workpieces to approx. 150 °C - 200 °C.

Mechanical properties of pure welding deposit (Min. values at room temperature)

Melting range	573 - 585 °C	Tensile strength	130 N/mm²
Electrical conductivity	17 - 27 Sm/mm²	Elongation (l=5d)	0.05
Specific gravity	2,65 g/cm^3	Elongation limit (0.2 %)	60 N/mm²

Polarity	AC
Shielding gas	I 1 (Argon) I 3 (Argon/Helium)
Welding process	TIG, Gas
Availability	Diameter (mm): 1,6/2,0/2,4/3,2 , Lenght (mm): 1000

Welding position, according to DIN EN 287

PA	PB	PC	PD	PE	PF	PG
X	X	X	X	X	X	X

Group 5

TECHNICAL INFORMATION

◆ Content

CHAPTER ..... PAGE

GROUP 5 157

BRAZING AND SOLDERING TERMS 158

HARDNESS COMPARISON CONVERSION TABLE IN ACCORDANCE WITH DIN 50150 160

PHYSICAL ELEMENT VALUES 161

PHYSICAL SPECIFICATIONS OF ALLOYS 162

MATERIAL'S BRAZING SUITABILITY 162

PROFESSIONAL COPPER PIPE INSTALLATION 164

HYBRID JOINING IN REFRIGERATION/AIR CONDITIONING 165

CAPILLARY FILLING PRESSURE AS A FUNCTION OF THE GAP WIDTH 166

CADMIUM-FREE SILVER SOLDERS 167

SAFETY PRECAUTIONS WHEN SOLDERING 167

GHS LABELING OF BRAZING FILLER METALS AND FLUXES 168

INDUSTRY SEGMENT APPLICATIONS 169

STORAGE INFORMATION FOR BRAZING PASTES 170

Brazing and soldering terms

Brazing and soldering

A joining process that uses a melted solder whose liquidus temperature is lower than the solidus temperature of the base material(s). The melted solder wets the surface of the material(s) and flows to fill the gap (or remains in the gap if previously placed there) between the parts to be joined, either during or at the end of the heating phase (DIN ISO 857-2:2007-03).

Soldering

Soldering, or soft soldering, is soldering with filler alloys whose liquidus temperature is below 450° C.

Brazing

Brazing, or hard soldering, is soldering with filler alloys whose liquidus temperature is above 450° C.

High-temperature brazing

High-temperature brazing is soldering under hot air with filler alloys whose liquidus temperature is above 900° C.

Solder coating

Solder coating is coating with solder.

Gap soldering

Gap soldering is joining by soldering.

Thin gap soldering

Thin gap soldering is when parts are joined by filling the thin gap between them with solder, preferably using capillary filling pressure.

Joint soldering

Joint soldering is joining parts mainly by using gravity to fill the wide gap (joint) between the parts.

Solder joint

The solder joint is the gap (joint) between the parts that is filled with solder mainly by using gravity.

Solder

Solder is a filler metal suitable for soldering and brazing, either an alloy or pure metal (DIN EN ISO 3677, DIN EN ISO 17672) that comes in the form of e.g. wires, rods, plates, sticks, powders, pastes, or molded parts.

Flux

Flux (DIN EN 1045 – brazing flux) is a nonmetallic material whose main task is to remove oxide from the solder surface and prevent it from reforming.

Solder melting range

The melting range of solder is the temperature range from when melting begins (solidus temperature) to when it is completely liquid (liquidus temperature).

Brazing and soldering terms

Working temperature

The working temperature is the lowest surface temperature at which the solder wets the surface at the soldering point or when interfacial diffusion creates a liquid phase. When a suitable flux is used, the working temperature is a constant that is dependent on the solder.

Soldering temperature

The soldering temperature is the prevailing temperature at the soldering point during soldering. It lies above the working temperature.

Soldering gap

The soldering gap is a thin, mainly parallel gap between the parts that are to be soldered. The soldering gap is preferably filled using capillary filling pressure.

Soldered seam

The soldered seam joins the parts at the solder joint. It is not only determined by the type and form of the solder joint but also by the solder behavior, the base materials, and the filler materials.

Soldered seam width:

The soldered seam width is the distance between the edges of the metallurgically unaffected base materials.

Wetting

In soldering, wetting is the irreversible spreading of melted solder on the material surface.

Flow path

The flow path is the path that the melted solder follows, starting from where the solder was applied.

Capillary filling pressure:

Capillary filling pressure is the pressure that pulls the melted solder into the solder gap even against gravity.

Degree of filling

The degree of filling is the percent of the solder gap volume that is filled with solidified solder.

Binding process

The binding process is the process in which binding takes place due to a metallurgical reaction between the liquid phase and solid material.

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Hardness comparison

Conversion table in accordance with DIN 50150

Tensile strength [N/mm²]	Vickers hardness HV	Brinell hardness HB	Rockwell hardness HRc
320	100	95	-
335	105	99,8	-
350	110	105	-
370	115	109	-
385	120	115	-
400	125	119	-
415	130	124	-
430	135	128	-
450	140	133	-
465	145	138	-
480	150	143	-
495	155	147	-
510	160	152	-
530	165	156	-
545	170	162	-
560	175	166	-
575	180	171	-
595	185	176	-
610	190	181	-
625	195	185	-
640	200	190	-
660	205	195	-
675	210	199	-
690	215	204	-
705	220	209	-
720	225	214	-
740	230	219	-
755	235	223	-
770	240	228	20,3
800	250	238	22,2
820	255	242	23,1
835	260	247	24,0
850	265	252	24,8
865	270	257	25,6
880	275	261	26,4
900	280	266	27,1
915	285	271	27,8
930	290	276	28,5
950	295	280	29,2
965	300	285	29,8
995	310	295	31,0
1030	320	304	32,2
1060	330	314	33,3
1095	340	323	34,4

Tensile strength [N/mm²]	Vickers hardness HV	Brinell hardness HB	Rockwell hardness HRc
1125	350	333	35,5
1155	360	342	36,6
1190	370	352	37,7
1220	380	361	38,8
1255	390	371	39,8
1290	400	380	40,8
1320	410	390	41,8
1350	420	399	42,7
1385	430	409	43,6
1420	440	418	44,5
1455	450	428	45,3
1485	460	437	46,1
1520	470	447	46,9
1555	480	(456)	47,7
1595	490	(466)	48,4
1630	500	(476)	49,1
1700	520	(494)	50,5
1740	530	(504)	51,1
1775	540	(513)	51,7
1810	550	(523)	52,3
1845	560	(532)	53,0
1880	570	(542)	53,6
1920	580	(551)	54,1
1955	590	(561)	54,7
1995	600	(570)	55,2
2030	610	(580)	55,7
2070	620	(589)	56,3
2105	630	(599)	56,8
2145	640	(608)	57,3
2180	650	(618)	57,8
-	660	-	58,3
-	670	-	58,8
-	680	-	59,2
-	690	-	59,7
-	700	-	60,1
-	720	-	61,0
-	740	-	61,8
-	760	-	62,5
-	780	-	63,3
-	800	-	64,0
-	820	-	64,7
-	840	-	65,3

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Physical element values

Element	Symbol	Melting point [°C]	Boiling point at 0,1 MPa [°C]	Density [g/cm³]
Aluminum	AL	660	2060	2,70
Antimony	Sb	630,5	1440	6,62
Beryllium	Be	1280	2770	1,82
Lead	Pb	327,4	1740	11,34
Boron	B	2300	2550	3,30
Chrome	Cr	1890	2500	7,19
Iron	Fe	1539	2740	7,87
Gold	Au	1063	2970	19,32
Indium	In	156	2075	7,30
Iridium	Ir	2454	5300	22,50
Cadmium	Cd	321	765	8,65
Cobalt	Co	1495	2900	8,90
Carbon	C	3500	-	3,51
Copper	Cu	1083	2600	8,96
Lithium	Li	186	1370	0,53
Magnesium	Mg	650	1110	1,74
Manganese	Mn	1245	2150	7,43
Molybdenum	Mo	2625	4800	10,20
Nickel	Ni	1455	2730	8,90
Niobium	Nb	2415 ± 15	330	8,57
Palladium	Pd	1554	4000	12,00
Phosphorus	P	44	282	1,82
Platinum	Pt	1773,5	4410	21,45
Quicksilver	Hg	-38,87	257	13,55
Sulfur	S	112,8	444,6	2,05
Silver	Ag	960,5	2210	10,49
Silicon	Si	1430	2300	2,33
Strontium	Sr	770	1380	2,60
Tantalum	Ta	3000	5300	16,60
Titanium	Ti	1730	-	4,54
Vanadium	V	1735	3400	6,00
Bismuth	Bi	271,3	1420	9,80
Tungsten	W	3410	5930	19,30
Zinc	Zn	419,5	906	7,13
Tin	Sn	231,9	2270	7,29
Zirconium	Zr	1750	2900	6,50

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Physical specifications of alloys

Name	Density [g/cm³]	Melting range [°C]	Tensile strength [N/mm²]
Steel	7,70–7,85	1450–1520	340–1800
Cast iron	7,10–7,30	1150–1250	150–400
Austenitic CrNi steel	7,80–7,90	1440–1460	600–800
Mg alloys	1,80–1,83	590–650	180–300
Al alloys	2,60–2,85	570–655	100–400
Zn alloys	5,70–7,20	380–420	140–300
Brass	8,25	900–950	250–600
Bronze	8,56–8,90	880–1040	200–300

Material's brazing suitability

Materials	Brazing			Soldering		
	Brazing solders	Flux	Soldering process	Soft solders	Flux	Soldering process
Copper	A 3002 A 2004	-	Controlled atmosphere furnace/ Resistance/ Induction/ Flame soldering	A 644 A 611 A 630	F 600 CW	Resistanc/ Hot gas / Iron/ Flame soldering
	A 314 / AF 314 A 311 / AF 311	F 300 H Ultra NT F 300DN				
Copper alloys	A 3002 ; A 3015 A 314 / AF 314 A 311 / AF 311	F 300 H Ultra NT	Controlled atmosphere furnace/ Resistance/ Induction/ Flame soldering	A 644 A 611 A 630	F 600 CW	Resistanc/ Hot gas / Iron/ Flame soldering
Nickel and nickel alloys, various materials, all steels, cobalt	A 314 / AF 314 A 319 / AF 319 A 311 / AF 311 A 320 / AF 320	F 300 F 300 HM	Resistance/ Induction/ Flame/ Furnace soldering (atmosphere)	A 611 A 644	F 600	Resistanc/ Hot gas / Iron/ Flame/ Furnace soldering (atmosphere)
	A 210 / AF 210 A 101 / AF 101	F 120 F 100				
	A 200 L	-	Controlled atmosphere furnace/ Vacuum furnace soldering			
Chrome and chrome-nickel steels	A 314 / AF 314	F 300 F 300 H Ultra NT F 300 HM	Resistance/ Induction/ Flame soldering	A 611	F 600 S15	Resistanc/ Hot gas / Iron/ Flame/ Furnace soldering (atmosphere)
	HTL 5 / HTL 7 / HTL 2 A 308 V / A 200 L	-	Controlled atmosphere furnace/ Vacuum furnace soldering			

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Material's brazing suitability

Materials	Brazing			Soldering		
	Brazing solders	Flux	Soldering process	Soft solders	Flux	Soldering process
Precious metals	A 314 / AF 314 A 308 V / HTL 14 / Goldlot	F 300	Controlled atmosphere furnace/ Resistance/ Induction/ Flame/ Furnace soldering (atmosphere)	A 611	F 600 C	Resistanc/ Hot gas / Iron/ Flame/ Furnace soldering (atmosphere)
Aluminum and aluminum alloys (max. 2% magnesium and/or silicon)	A 407 L	F 400 MD F 400 M	Resistance/ Induction/ Flame/ Furnace soldering (atmosphere)	A 611 A 633	F 600 Al F 600 ZA	Resistanc/ Iron soldering
Hard metals, stellite	A 338 F / FT A 324 F / FT A 312 F	F 300 H Ultra F 300 HM	Controlled atmosphere furnace/ Resistance/ Induction/ Flame/ Furnace soldering (atmosphere)	-	-	-
	A 206 / A 101	F 120 / F 100				
Zinc, antimony	-	-	-	A 630 A 611	F 600	Resistanc/ Hot gas / Iron/ Flame soldering
Lead, bismuth, tin	-	-	-	A 605	F 600	Resistanc/ Hot gas / Iron/ Flame soldering
Titanium	A 308 V AG 58 CuPd (nicht genormt)	-	Controlled atmosphere furnace (argon)/ Vacuum furnace soldering	-	-	-
Zirconium, beryllium	A 308 V	-	Controlled atmosphere furnace (argon)/ Vacuum furnace soldering	-	-	-

Professional copper pipe installation

Brazing

Applications	Filler materials			Flux	
	DIN EN ISO 17672	Fontargen solder	Working temperature [°C]	DIN EN 1045	Fontargen flux
Heating oil, natural gas, district gas, liquid gas, cold water (drinking water) > Ø 28 x 1.5 mm, hot water (drinking water) installation	CuP 179 CuP 279 Ag 134 Ag 244 Ag 145	A 2004 A 3002 A/AF 319 A/AF 311 A/AF 320	730 710 710 730 670	FH10	F 300 H Ultra F 300 H Ultra NT

Remarks:
FONTARGEN-AF solders are flux-coated for simple and practical soldering. Ideal for copper-brass, copper-red brass, copper-steel and red brass-steel compounds. When brass or red brass fittings have to be brazed, flux must be used with solder that contains phosphorus. Since overheating is possible with brass and some red brass alloys, (flux-coated) silver solders A7AF 319 to A 320 are recommended for brass and red brass compounds.

Cold water installation (drinking water) up to Ø 28 x 1.5 mm	-	-	-	-	-

Remarks:
Only soldering (soft soldering) is allowed! It is prohibited to braze drinking water copper pipes up to Ø 28 x 1.5 mm. See DIN 50930, Part 5, Section 6.5.

Soldering

Anwendungs-bereiche	Filler materials			Flux	
	DIN 1707	Fontargen solder	Melting range (°C)	DIN 8511	Fontargen flux
Drinking water, cold and hot water, hot water up to 110° C, refrigeration installation	L- SnAg 5 L- SnCu 3	A 611 A 644	221–240 230–250	F-SW 21 F-SW 22	F 600 C F 600 CR

Bemerkung:
A 611 can be used up to -200° C. Suitable for soldering copper, brass, red brass.

Drinking water, cold and hot water, hot water up to 110° C, refrigeration installation	L-SnAg 5 L-SnAg 3	AP 654/21 AP 644/21	221–240 230–250	F-SW 21 F-SW 21	-

Bemerkung:
Soldering pastes made from flux and solder powder. When using an additional solid solder wire to work with the soldering paste, the same alloy must be added in order to properly fill the soldering gap.

Hybrid joining in refrigeration/air conditioning

The information presented here is especially for users in the field of refrigeration and air conditioning, but also offers a general overview of the possible ways to combine solder and base materials. This information serves as the basis for an initial assessment. We would be happy to discuss your particular application.

Group 1	A 311	A 314	A 319	A 320	A 330	A 340	A 333
Group 2	A 2003	A 2004	A 2005	A 3002	A 3005	A 3015	A 3018

Required flux (FM): Group F 300 or use of flux-coated solder

Base materials to be joined

	Steel/CrNi steel	Copper	Brass	Red brass
Steel/CrNi steel	Group 1 + FM	Group 1 + FM	Group 1 + FM	Group 1 + FM
Copper		Group 2	Group 1 and 2 + FM	Group 1 and 2 + FM
Brass			Group 1 and 2 +FM	Group 1 and 2 + FM
Red brass				Group 1 and 2 + FM

Pressure resistance: Due to solders' dependence on the geometry of the part and the size of the soldering gaps, it is not possible to specify their pressure resistance. The manufacturer of the part is responsible for soldering assemblies.

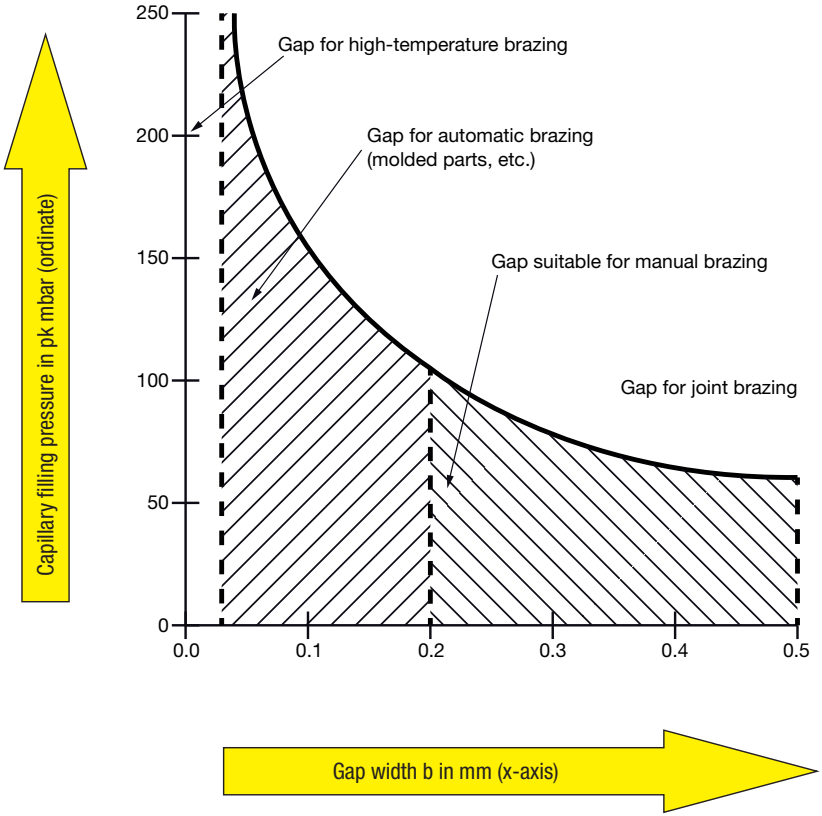
Temperature stability of brazing filler metals

Solders	Richtanalyse						T_A/ [°C]	Melting range [°C]	Temperature stability
Group 1	**Ag**	**Cu**	**Zn**	**Ni**	**Sn**	**Si**			
A 311	44	30	26	-	-	-	730	675–735	-200 °C
A 314	55	22	21	-	2	0,15	650	630–660	-200 °C
A 319	34	36	27,5	-	2,5	0,15	710	630–730	-200 °C
A 320	45	27	25,5	-	2,5	0,15	670	640–680	-200 °C
A 330	30	38	32	-	-	-	750	680–765	-200 °C
A 340	40	30	28	-	2	0,15	690	650–710	-200 °C
A 333	30	36	32	2	-	-	-	676–788	-200 °C
Group	**Ag**	**Cu**		**P**	**Sn**				
A 2003	-	93		7,0	-		730	710–820	-60 °C[1)]
A 2004	-	93,8		6,2	-		760	710–890	-60 °C[1)]
A 2005	-	86,		6,8	7		690	650–700	-60 °C[1)]
A 3002	2	91,7		6,3	-		740	645–825	-60 °C[1)]
A 3005	5	89		6,0	-		710	645–815	-60 °C[1)]
A 3015	15	80		5,0	-		700	645–800	-70 °C
A 3018	18	75		7,0	-		650	645	-70 °C

[1)] After testing the impact strength in accordance with EN 10045

The temperature stability of solder connections also depends on the design (gap geometry) and the base materials that are to be soldered, and may need to be proven in a process qualification test.

Capillary filling pressure as a function of the gap width



Cadmium-free silver solders

Cadmium-free silver solders do not contain elements that readily vaporize and are therefore:

- Environmentally friendly
- Not a health hazard
- Impervious to overheating
- Non-porous

Cadmium-free silver solders are ideal for brazing: steel, stainless steel, copper, brass, bronze, nickel, malleable cast iron, and hard metals.

FONTARGEN Type	Melting range [°C]	Working temperature [°C]	DIN EN ISO 17672	Tensile strength [N/mm²]	Spec. weight [g/cm³]
A/AF 303	690–810	810	Ag 206	350–450	8,70
A/AF 311	675–735	730	Ag 244	400–480	9,10
A/AF 314	620–660	650	Ag 155	330–490	9,50
A/AF 319	630–730	710	Ag 134	360–480	9,00
A/AF 320	640–680	670	Ag 145	350–430	9,20
A/AF 330	680–765	750	Ag 230	380–430	8,90
A/AF340	640–700	690	Ag 140	350–430	9,10

Safety precautions when soldering

The properties and compositions of the flux and metals needed during soldering as well as improper handling can endanger the person who is soldering. It is therefore essential to avoid contact with eyes and skin.

During soldering, flux and metal fumes are inevitable as is fine metal dust when working with solder powders. These can have an adverse health impact. To protect the worker, basic industrial hygiene regulations and UVV-VBG 15 “Welding, Cutting and Related Processes” must be followed. More information about the individual products is available to the user in technical data sheets and safety data sheets in accordance with DIN 52 900. These are continuously updated in accordance with applicable technical rules and regulations.

Is especially important to note the danger of cadmium solders. The Technical Rules for Hazardous Substances TRGS 900 (MAK values) classifies cadmium oxide, the hazardous substance that is produced during soldering, in Group III A 2. This overrules the previous MAC value. When working with cadmium solders, special protection and monitoring measures are required.
In Europe (EU Regulation No. 494/2011), it is now prohibited to use or sell these solders.

Our product portfolio includes suitable cadmium-free filler materials for every application. We provided the support you need in selecting an alternative solder.

GHS labeling of brazing filler metals and fluxes

The labeling applies to substances and mixtures such as:

- Nickel solder rods or wires
- Flux-coated brazing filler metals
- Flux solder pastes
- Flux powders and pastes
- Copper solder pastes
- Nickel solder pastes

NEW	**GHS-Symbol**	01: Explosive	02: Flammable	03: Oxidizing	04: Compressed Gas	05: Corrosive
	Signal Word	Danger/Warning	Danger/Warning	Danger/Warning	Warning	Danger/Warning
OLD	**Symbol acc. to Annex II - 67/548/EWG**					
	Code	Explosive	Extremely Flammable	Oxidizing	No Correspondence	Corrosive
NEW	**GHS-Symbol**	06: Hurtful	07: Harmful	07: Harmful	08: Nausea	09: Environmen-tal Hazard
	Signal Word	Danger	Warning	Warning	Danger/Warning	Warning
OLD	**Symbol acc. to Annex II - 67/548/EWG**					
	Code	Very Toxic / Toxic	Harmful	Irritant	No Correspondence	Dangerous for the environment

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Industry segment applications

1. Car Body – typical products

Product	Application (standardization in acc. with EN ISO 24373)
A 202 M	Standard wire for MIG soldering (CuSi 3 Mn 1)
A 202 MS	Wire for laser soldering (CuSi 3 Mn 1)
A 202 MHS	High-speed wire for laser soldering (CuSi 3 Mn 1)
A 2115/8 M	Wire for MIG soldering (CuAl 7)

2. Car Engine – typical products

Product	Application (standardization in acc. with DIN EN ISO 17672 or ISO 3677)
HTL 2 AP	Corrosion-resistant, high-temperature soldering paste (Ni 102)
HTL 5 AP	Boron-free alternative to HTL 2 AP (Ni 105)
HTL 5 CrAP	Highly corrosion-resistant soldering paste, high chrome content, boron free (B-Ni 60 CrPSi-1050/1070)
AP 21 CLP	Standard copper soldering paste (Cu 141)
AP 21 GS	Copper-tin soldering paste with high metal content (B-Cu 96 Sn-960/1060)
A 200L	Standard copper soldering wire, also suitable for molded parts (Cu 141)

3. HVAC – typical products

Product	Application (standardization in acc. with DIN EN ISO 17672 or ISO 3677)
A 311; A 320	Standard Ag solder alloy, suitable for copper pipe insulation in acc. with DVGW 2 and for sea water (Ag 244; Ag 145)
A 319	Standard Ag solder alloy, suitable for DVGW 2 (Ag 134)
A 314; A 340	Standard Ag solder alloy, suitable for sea water (Ag 155; Ag 140)
A 333	Ag solder alloy with reduced Ag content and good flow properties (Ag 230a)
A 2003; A 2004, A 2005	Standard CuP alloy without Ag, flux-free for Cu/Cu (CuP 180; CuP 179; CuP 386)
A 3002; A 3005 A 3015; A 3018	Standard CuP alloy without Ag, flux-free for Cu/Cu (CuP 279; CuP 281; CuP 284; CuP 286)
A 407	Standard aluminum solder alloy (Al 112)

4. Tooling – typical products

Product	Application (standardization in acc. with DIN EN ISO 17672 or ISO 3677)
A 312 F	Standard tri-film (B-Ag 49 ZnCuMnNi-680/705)
A 338 FT	Alternative to A 312F with reduced Ag content (B-Ag 38 ZnCuMnNi-680/700)
A 324	Rod, film, wire, or molded part, good wetting, high strength (Ag 449)
A 205	Wire or film; carbide/steel compound, good wetting on carbides (B-Cu 86 MnNi-970/990)
A 206	Rod, wire, or molded part, carbide/steel compounds, temperature stable up to 300° C (BCu 87 MnCo-980/1030)
AP 21 ESB2*	Special soldering paste, carbide/steel compound, soldering of drill bits (B-Cu 87 MnNi-980/1030)

5. Power Generation – typical products

Product	Application (standardization in acc. with DIN EN ISO 17672 or ISO 3677)
A 314; A 320; A 330	Joining steel with copper (Ag 155; Ag 145; Ag 230)
A 3005; A 3015	Standard CuP alloy without Ag, without flux for Cu/Cu (CuP 281; CuP 284)

Storage information for brazing pastes

The product portfolio includes flux brazing pastes for brazing in the atmosphere, as well as flux-free brazing pastes for brazing in controlled atmospheres or a vacuum.

Storage requirements:

- Recommended temperature: 20° C +/- 15° C.
- Relative humidity: max. 85%
- The shipping packaging can be used to store the paste until it is used
- Strong temperature deviations or fluctuations should be avoided
- After the brazing paste is removed, the container or cartridge should always be kept closed and it should be stored at the recommended temperature and humidity

Handling:

The material should always be removed according to the first in first out (FIFO) principal.

Brazing paste in buckets or cans should not be stored longer than six months, in cartridges < 40 cm³ not longer than six weeks. Information on the product-specific shelf life can be found on the label.

If the paste is stored for longer, it may settle. In open containers, it is possible to stir the paste to again achieve a homogeneous consistency.

Beyond the main sedimentation aspect, it is the user's responsibility to decide whether to use the paste after the recommended storage period has been exceeded.

Disclaimer

Previous editions of the manual cease to be valid on publication of this edition of Fontargen's manual "Fontargen Brazing Product Catalog".

Particulars regarding the appearance and use of our products serve as information for the user. Details of the mechanical properties always refer to the pure weld metal in accordance with the applicable standards. The parent metal, the welding position and the welding parameters amongst other things affect the weld metal properties in the welded joint.

Express written agreement is required in each individual case as a guarantee of suitability for specific purpose.

The latest version of the product data sheets can be found online:
www.voestalpine.com/welding

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Handbook of voestalpine Böhler Welding Fontargen GmbH

JOIN! voestalpine Böhler Welding

With over 100 years of experience, voestalpine Böhler Welding is the global top address for the daily challenges in the areas of joint welding, repair, hardfacing and cladding as well as brazing. Customer proximity is guaranteed by more than 43 subsidiaries in 25 countries, with the support of 2,300 employees, and through more than 2,000 distribution partners worldwide. With individual consultation by our application technicians and welding engineers, we make sure that our customers master the most demanding welding challenges. voestalpine Böhler Welding offers three specialized and dedicated brands to cater our customers' and partners' requirements.

Lasting Connections – As a pioneer in innovative welding consumables, Böhler Welding offers a unique product portfolio for joint welding worldwide. More than 2000 products are adapted continuously to the current industry specifications and customer requirements, certified by well-respected institutes and thus approved for the most demanding welding applications. As a reliable partner for customers, "lasting connections" are the brand's philosophy in terms of both welding and people.

Tailor-Made Protectivity™ – UTP Maintenance ensures an optimum combination of protection and productivity with innovative and tailor-made solutions. Everything revolves around the customer and their individual requirements. That is expressed in the central performance promise: Tailor-Made Protectivity™.

In-Depth Know-How – As a leading brand of soldering and brazing consumables, Fontargen Brazing offers proven solutions based on 50 years of industrial experience, tried and tested processes and methods. This In-Depth Know-How has made Fontargen Brazing an internationally preferred partner for every soldering and brazing task.

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