



# CERTIFICATE

of factory production control

**No. 0035 – CPD – C921**

In compliance with the Directive 89/106/EEC of the Council of European Communities of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive - CPD), amended by the Directive 93/68/EEC of the Council of European Communities of 22 July 1993, it has been stated that the construction product welding consumable

Filler material	SE	DE / SS / SD		FDE
	EN ISO 2560-A,	EN ISO 14341-A	EN ISO 18273	EN ISO 17632-A,
	EN ISO 3580-A,	EN ISO 14343-A	EN ISO 21952-A	EN ISO 17633-A
	EN ISO 3581-A	EN ISO 16834-A	EN ISO 636-A	EN ISO 14700
	EN ISO 14700			

SE = filler rod / DE = filler wire / SS = filler rod / SD = filler wire /  
FDE = tubular cored electrode

**Distribution of Welding consumables brand**  
**EWM Hightec Welding GmbH Vertriebs- und Logistikzentrum**

**by the company**  
**EWM Hightec Welding GmbH Vertriebs- und Logistikzentrum**  
**Sälzerstrasse 20 (Industriegebiet Rohr)**  
**D-56235 Ransbach-Baumbach, Germany**

is submitted by the manufacturer to the initial type-testing of the product and a factory production control and that the approved body – TÜV Rheinland Industrie Service GmbH - has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control. This certificate attests that all provisions concerning the attestation of factory production control described in the standard

**EN 13479 and Annex ZA**

were applied. This certificate was first issued on August 15, 2012 and remains valid as long as the conditions laid down in the harmonised technical specification in reference or the manufacturing conditions in the factory or the FPC itself are not modified significantly and

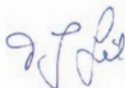
**Valid until July 2015**

Cologne, August 15, 2012  
Revision 00





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Certification Body for Welding Consumables  
Notified Body No. 0035

Dipl.-Ing. F. J. Steinborn

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Detailed information on individual equipment and accessories can be found on the Internet at: [www.ewm-group.com](http://www.ewm-group.com)

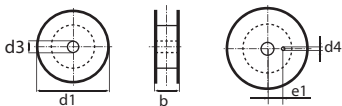
Please note that no liability is assumed for this information.



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### D 200

DIN 8559 D 200  
EN 759 S 200  
DIN EN ISO 544 S 200



EWM (DIN 8559)	d1	d3	b	Tapped hole	
				d4	e1
<b>D 200</b>	200	50.5	55	10	44.5
<b>D 300</b>	300	51.5	103	10	44.5

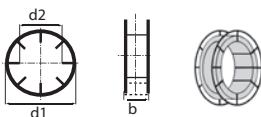
### D 300

DIN 8559 D 300  
EN 759 S 300  
DIN EN ISO 544



### K 300

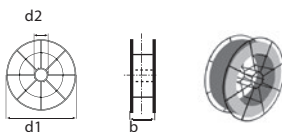
DIN 8559 K 300  
EN 759 B 300  
DIN EN ISO 544 B 300



EWM (DIN 8559)	d1	d2	b
<b>K 300</b>	300	180	103

### BS 300

DIN 8559 K 300 adapter-less  
EN 759 BS 300  
DIN EN ISO 544 300



EWM (DIN EN ISO 544)	d1	d2	b
<b>BS 300</b>	300	50.5	103

### Drum



	d1	H
<b>Drum 250</b>	520	780



Alloy type	AWS		DIN EN ISO		Material no.	EWN name
Unalloyed	A-5.18	ER 70S-2	DIN EN ISO 14341-A	G 42 2 C/M G3Si1+Ti		SW 70S G3Ti
	A-5.18	ER 70S-6	DIN EN ISO 14341-A	G 42 4 M/C G3Si1	1.5125	SW 70S G3
	A-5.18	ER 70S-6	DIN EN ISO 14341-A	G 42 4 M/C G3Si1	1.5125	SW 70S G3 BRONZE
	A-5.18	ER 70S-6	DIN EN ISO 14341-A	G42 2 C / G 42 4 M G3 Si1	1.5125	SW 70S G3 Brilliance
	A-5.18	ER 70S-6	DIN EN ISO 14341-A	G 42 2 C G4Si1 G 46 4 C G4Si1	1.5130	SW 70S G4
	A-5.18	ER 70S-6	DIN EN ISO 14341-A	G 42 2 C G4Si1 G 46 4 C G4Si1	1.5130	SW 70S G4 BRONZE
	A-5.18	ER 70S-6	DIN EN ISO 14341-A	G 46 2 C G4Si1/ G 46 4 M G4Si1	1.5130	SW 70S G4 Brilliance
Low-alloy, high tensile	A-5.28	ER 100S-G	DIN EN ISO 16834-A	G 62 5 Z Mn3Ni1Mo		SW 100S NiMo
	A-5.28	ER 100S-G	DIN EN ISO 16834-A	G 69 5 M Mn3Ni1CrMo		SW 100S NiMoCr
	A-5.28	ER 120S-G	DIN EN ISO 16834-A	G 89 6 M Mn4Ni2CrMo		SW 120S NiMoCr
Low-alloy, low-temperature tough	A-5.28	ER 80S-Ni1	DIN EN ISO 14341-A	G 42 6 Z 3Ni1		SW 80S Ni1
	A-5.28	ER 80S-Ni2	DIN EN ISO 14341-A	G 42 6 Z 2Ni2		SW 80S Ni2
Low-alloy, weather-resistant	A-5.28	ER 80S-G	DIN EN ISO 16834-A	G Z Mn3Ni1Cu		SW 80S NiCu
Low-alloy, creep-resistant	A-5.28	ER 80S-G	DIN EN ISO 21952-A	G CrMo1Si	1.7339	SW 80S CrMo1
	A-5.28	ER 80S-G	DIN EN ISO 21952-A	G MoSi	1.5424	SW 80S Mo
	A-5.28	ER 90S-G	DIN EN ISO 21952-A	G CrMo2Si	1.7384	SW 90S CrMo2
High-alloy	A-5.9	ER 307L	DIN EN ISO 14343-A	G 18 8 Mn	1.4370	SW 307 Si
	A-5.9	ER 308LSi	DIN EN ISO 14343-A	G 19 9 L Si	1.4316	SW 308 LSi
	A-5.9	ER 309LSi	DIN EN ISO 14343-A	G 23 12 L Si	1.4332	SW 309 LSi
	A-5.9	ER 410 NiMo	DIN EN ISO 14343-A	G 13 4	1.4351	SW 410NiMo
	A-5.9	(ER 385)	DIN EN ISO 14343-A	G 20 25 5 Cu L	1.4519	SW 904 L



Alloy type	AWS		DIN EN ISO		Material no.	EWM name
High-alloy, heat-resistant	A-5.9	ER 310	DIN EN ISO 14343-A	G 25 20	1.4842	SW 310
High-alloy, creep-resistant	A-5.9	ER 312	DIN EN ISO 14343-A	G 29 9	1.4337	SW 312
	A-5.9	ER 316LSi	DIN EN ISO 14343-A	G 19 12 3 L Si	1.4430	SW 316 LSi
	A-5.9	ER 318 Si	DIN EN ISO 14343-A	G 19 12 3 Nb Si	1.4576	SW 318 Si
	A-5.9	ER 347 Si	DIN EN ISO 14343-A	G 19 9 Nb Si	1.4551	SW 347
High-alloy, duplex	A-5.9	ER 2209	DIN EN ISO 14343-A	G 22 9 3 LN	1.4462	SW 2209 Duplex
Nickel-base	A-5.14	ER NiCr-Mo3	DIN EN ISO 18274	S Ni 6625 (NiCr22Mo9Nb)	2.4831	SW 625
	A-5.14	ER Ni-1	DIN EN ISO 18274	S Ni 2061 (NiTi3)	2.4155	SW NiTi
	A-5.14	ER NiCr3	DIN EN ISO 18274	S Ni 6082 (NiCr20Mn3Nb)	2.4806	SW NiCr82
						SW NiFe55
Hardfacing			DIN EN 14700	S Fe8	1.4718	SW Hard 600
Aluminium	A-5.10	ER 1450	DIN EN ISO 18273	S Al 1450 (Al99,5Ti)	3.0805	SW 1450 99,5 Ti
	A-5.10	ER 3103	DIN EN ISO 18273	S Al 3103 (AlMn1)		SW 3103 Mn1
	A-5.10	ER 4043	DIN EN ISO 18273	S Al 4034A (AlSi5(A))	3.2245	SW 4043 Si5
	A-5.10	ER 4047	DIN EN ISO 18273	S Al 4047A (AlSi12(A))	3.2585	SW 4047 Si12
	A-5.10	ER 5087	DIN EN ISO 18273	S Al 5087 (AlMg4,5MnZr)	3.3546	SW 5087 MG4,5 MnZr
	A-5.10	ER 5183	DIN EN ISO 18273	S Al 5183 (AlMg4,5Mn0,7)	3.3548	SW 5183 Mg4,5 Mn
	A-5.10	ER 5356	DIN EN ISO 18273	S Al 5356 (AlMg5Cr)	3.3556	SW 5356 Mg5
	A-5.10	ER 5754	DIN EN ISO 18273	S Al 5754 (AlMg3)	3.3536	SW 5754 Mg3





Alloy type	AWS		DIN EN ISO		Material no.	EWM name
Copper/ aluminium	A-5.7	ER CuAl-A1	DIN EN ISO 24373	S Cu 6100 (CuAl7)	2.0921	SW CuAl8
	A-5.7	ER CuAl-A2	DIN EN ISO 24373	S Cu 6180 (CuAl10Fe)	2.0937	SW CuAlBz9Fe
	A-5.7	ER CuNiAl	DIN EN ISO 24373	S Cu 6328 (CuAl9Ni- 5Fe3Mn2)	2.0923	SW CuAl9Ni5
Copper/ silicon	A-5.7	ER CuSi-A	DIN EN ISO 24373	S Cu 6511 (CuSiMn1)		SW CuSi2
	A-5.7	ER CuSi-A	DIN EN ISO 24373	S Cu 6560 (CuSi3Mn)	2.1461	SW CuSi3
Copper/tin	A-5.7	ER Cu	DIN EN ISO 24373	S Cu 1898 (CuSn1)	2.1006	SW CuSn1
	A-5.7	ER CuSn-A	DIN EN ISO 24373	S Cu 5180A (CuSn6P)	2.1022	SW CuSn6
Copper						SW OF Cu



Alloy type	AWS		DIN EN ISO		Material no.	EWM name
Unalloyed	A-5.18	E 70C-6M/-6C	DIN EN ISO 17632-A	T 42 2 M M/C 1 H5		FCW 70TC Metal
	A-5.20	E 71T-5M-J	DIN EN ISO 17632-A	T 42 2 B M 1 H5		FCW 71T Basic
	A-5.20	E 71T-1M	DIN EN ISO 17632-A	T 42 2 P M 1 H5		FCW 71T Rutile
	A-5.20	E 71T-1M/-1C	DIN EN ISO 17632-A	T 42 2 P M/C H5		FCW 71T Rutile CO2
	A-5.20	E 71T-11				FCW 71T Selfshield
	A-5.29	E 81T1-Ni1M-J	DIN EN ISO 17632-A	T 46 6 1Ni P M 2 H5		FCW 81T Rutile Ni1
	A-5.18	E 70C-6M-H4	DIN EN ISO 17632-A	T 46 4 MM 1 H5		FCW T 70C Metal
Low-alloy, creep-resistant	A-5.29	E 81 T1-A1M H4	DIN EN ISO 17634	T Mo P M 1 H5		FCW 81T Rutile Mo
Low-alloy, high tensile	A-5.29	E 111 T1-K3M-J H4	DIN EN ISO 18276-A	T 69 9 Z P M 1 H5		FCW 111T NiMoCr
High-alloy	A-5.22	E 307LT0-1/4	DIN EN ISO 17633-A	T 18 8 Mn R M 3	1.4370	FCW 307 Rutile
	A-5.22	E 308LT0-1/4	DIN EN ISO 17633-A	T 19 9 L R C/M 3	1.4316	FCW 308 Rutile
	A-5.22	E 309LT0-1/4	DIN EN ISO 17633-A	T 23 12 L R C/M 3	1.4332	FCW 309 Rutile
	A-5.22	E 309LT1-1/4	DIN EN ISO 17633-A	T 23 12 L P C/M 1	1.4332	FCW 309 LP Rutile
			DIN EN 14700	T Co2		FCW Cobalt 2
High-alloy, creep-resistant	A-5.22	E 316LT0-1/4	DIN EN ISO 17633-A	T 19 12 3 L R C/M 3	1.4430	FCW 316 Rutile
	A-5.22	E 316LT1-1/4	DIN EN ISO 17633-A	T 19 12 3 L P C/M 1	1.4430	FCW 316 LP Rutile
	A-5.9	E C316L	DIN EN ISO 17633-A	T 19 12 3 L M M 1		FCW 316 METAL
Nickel-base	A-5.34	E NiCr3T0-4	DIN EN ISO 14172	T Ni 6082 (NiCr20M-n3Nb)		FCW NiCr82



Alloy type	AWS		DIN EN ISO		Material no.	EWM name
Unalloyed	A-5.1	E 6010	DIN EN ISO 2560-A	E 38 2 C 21		SE 6010 CEL
	A-5.1	E 6012	DIN EN ISO 2560-A	E 38 0 RC 11		SE 6013 RC
	A-5.1	E 6013	DIN EN ISO 2560-A	E 42 0 RC 11		SE 6013 RC blau
	A-5.1	E 6013	DIN EN ISO 2560-A	E 42 0 RR 12		SE 6013 RR
	A-5.1	E 6013	DIN EN ISO 2560-A	E 35 2 RB 12		SE 6013 RRB
	A-5.1	E 6013	DIN EN ISO 2560-A	E 42 0 RC 11		SE 6013 RRC
	A-5.1	E 7016	DIN EN ISO 2560-A	E 42 2 B 12 H10		SE 7016 BR
	A-5.1	E 7018	DIN EN ISO 2560-A	E 42 4 B 32 H5		SE 7018 BH5
Low-alloy, creep-resistant	A-5.5	E 7018-A1	DIN EN ISO 3580-A	E Mo B 42 H5	1.5424	SE 7018 Mo
	A-5.5	E 8018-B2	DIN EN ISO 3580-A	E CrMo1 B 42 H5	1.7346	SE 8018 CrMo1
	A-5.5	E 9018-B3	DIN EN ISO 3580-A	E CrMo2 B 42 H5	1.7384	SE 9018 CrMo2
High-alloy	A-5.4	E 307-16	DIN EN ISO 3581-A	E 18 8 Mn R 12	1.4370	SE 307
	A-5.4	E 308 L-16	DIN EN ISO 3581-A	E 19 9 LR 12	1.4316	SE 308 L
		E 309 L-26	DIN EN ISO 3581-A	E 23 12 LR 32	1.4332	SE 309 L
	A-5.4	E 309 Mo-26	DIN EN ISO 3581-A	E 23 12 2 LR 32	1.4459	SE 309 MoL
High-alloy, heat-resistant	A-5.4	E 310-16	DIN EN ISO 3581-A	E 25 20 L R 12	1.4842	SE 310
High-alloy, creep-resistant	A-5.4	E 312-16	DIN EN ISO 3581-A	E 29 9 R 12	1.4337	SE 312
	A-5.4	E 316 L-16	DIN EN ISO 3581-A	E 19 12 3 L R 12	1.4430	SE 316 L
	A-5.4	E 318-16	DIN EN ISO 3581-A	E 19 12 3 Nb R 12	1.4576	SE 318 L
	A-5.4	E 347-16	DIN EN ISO 3581-A	E 19 9 Nb R 12	1.4551	SE 347
High-alloy, duplex	A-5.4	E 2209 L-16	DIN EN ISO 3581-A	E 22 9 3 R 32	1.4462	SE 2209 Duplex
Nickel-base	A-5.15	E Ni-CI	DIN EN ISO 1071	E C Ni-CI 1		SE Ni
	A-5.15	E NiFe-CI	DIN EN ISO 1071	E C NiFe 1 1		SE NiFe
	A-5.11	E NiCr-Fe-3	DIN EN ISO 14172	E Ni 6082 (NiCr20Mn3Nb)	2.4648	SE NiCr82
	A-5.11	E NiCr-Mo3	DIN EN ISO 14172	E Ni 6625	2.4621	SE 625
Hardfacing			DIN EN 14700	E Fe 3		SE Fe3 350 GP
			DIN EN 14700	E Fe 8	1.4718	SE HARD 600



Alloy type	AWS		DIN EN ISO		Material no.	EWM name
	A-5.18	ER 70S-3	DIN EN ISO 636-A	W 2Si		
Unalloyed	A-5.18	ER 70S-3	DIN EN ISO 636-A	W 2Si	1.5112	TR 70S G2
	A-5.18	ER 70S-6	DIN EN ISO 636-A	W 42 5 / W 3 Si1	1.5125	TR 70S G3
	A-5.18	ER 70S-6	DIN EN ISO 636-A	W 46 4 / W 4Si1	1.5130	TR 70S G4
Low-alloy	A-5.28	ER 80S-G	DIN EN ISO 16834-A	W Mn3Ni1Cu		TR 80S NiCu
	A-5.28	ER 80S-Ni1	DIN EN ISO 636-A	W 3Ni1		TR 80S Ni1
Low-alloy, creep-resistant	A-5.28	ER 80S-G	DIN EN ISO 21952-A	W CrMo1Si	1.7339	TR 80S CrMo1
	A-5.28	ER 80S-G	DIN EN ISO 21952-A	W MoSi	1.5424	TR 80S Mo
	A-5.28	ER 90S-G	DIN EN ISO 21952-A	W CrMo2Si	1.7384	TR 90S CrMo2
	A-5.28	ER 90S-G	DIN EN ISO 21952-A	W CrMo2VNb		TR 90S CrMo2 VTi
	A-5.28	ER 90S-B9	DIN EN ISO 21952-A	W CrMo91	1.4903	TR 90S CrMo91
	A-5.28	ER 80S B6	DIN EN ISO 21952-A	W CrMo5Si	1.7373	TR CrMo5
High-alloy	A-5.9	ER 307Si	DIN EN ISO 14343-A	W 18 8 Mn Si	1.4370	TR 307 Si
	A-5.9	ER 308LSi	DIN EN ISO 14343-A	W 19 9 L Si	1.4316	TR 308 LSi
	A-5.9	ER 309LSi	DIN EN ISO 14343-A	W 23 12 L Si	1.4332	TR 309 LSi
	A-5.9	ER 410 NiMo	DIN EN ISO 14343-A	W 13 4	1.4351	TR 410 NiMo
			DIN EN 14700	W Co1		TR Cobalt 1
			DIN EN 14700	W Co2		TR Cobalt 2
High-alloy, heat-resistant	A-5.9	ER 310	DIN EN ISO 14343-A	W 25 20	1.4842	TR 310
High-alloy, creep-resistant	A-5.9	ER 312	DIN EN ISO 14343-A	W 29 9	1.4337	TR 312
	A-5.9	ER 316LSi	DIN EN ISO 14343-A	W 19 12 3 L Si	1.4430	TR 316 LSi
	A-5.9	ER 318Si	DIN EN ISO 14343-A	W 19 12 3 Nb Si	1.4576	TR 318 Si
	A-5.9	ER 347 Si	DIN EN ISO 14343-A	W 19 9 Nb Si	1.4551	TR 347
	A-5.9	(ER 385)	DIN EN ISO 14343-A	W 20 25 5 Cu L	1.4519	TR 904L
High-alloy, duplex	A-5.9	ER 2209	DIN EN ISO 14343-A	W 22 9 3 LN	1.4462	TR 2209 Duplex
	A-5.9	ER 2594	DIN EN ISO 14343-A	W 25 9 4 N L	1.4501	TR 2594 SUPER Duplex



Alloy type	AWS		DIN EN ISO		Material no.	EWM name
Copper tin	A-5.7	ER Cu	DIN EN ISO 24373	S Cu 1898 (CuSn1)	2.1006	TR CuSn1
	A-5.7	ER CuSn-A	DIN EN ISO 24373	S Cu 5180A (CuSn6P)	2.1022	TR CuSn6
	A-5.7	ER CuNi	DIN EN ISO 24373	S Cu 7158 (Cu-Ni30Mn1FeTi)	2.0837	TR CuNi30
	A-5.7	ER CuSi-A	DIN EN ISO 24373	S Cu 6560 (CuSi3Mn)	2.1461	TR CuSi3
Aluminium	A-5.10	ER 1450	DIN EN ISO 18273	S AL 1450 (Al99,5Ti)	3.0805	TR 1450 99,5 Ti
	A-5.10	ER 3103	DIN EN ISO 18273	S AL 3103 (AlMn1)		TR 3103 Mn1
	A-5.10	ER 4043	DIN EN ISO 18273	S AL 4043A (AlSi5(A))	3.2245	TR 4043 Si5
	A-5.10	ER 4047	DIN EN ISO 18273	S AL 4047A (AlSi12(A))	3.2585	TR 4047 Si12
	A-5.10	ER 5087	DIN EN ISO 18273	S AL 5087 (AlMg4,5MnZr)	3.3546	TR 5087 MG4,5 MnZr
	A-5.10	ER 5183	DIN EN ISO 18273	S AL 5183 (AlMg4,5Mn0,7)	3.3548	TR 5183 Mg4,5 Mn
	A-5.10	ER 5356	DIN EN ISO 18273	S AL 5356 (AlMg5Cr)	3.3556	TR 5356 Mg5
	A-5.10	ER 5754	DIN EN ISO 18273	S AL 5754 (AlMg3)	3.3536	TR 5754 Mg3

### Brazing

Brazing filler	A-5.2	R60	EN 12536	O III	1.6215	GFR R60
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EN	EWM name	Page
E 38 2 C 21	SE 6010 CEL	150
E 38 0 RC 11	SE 6013 RC	151
E 42 0 RC 11	SE 6013 RC blau	152
E 42 0 RR 12	SE 6013 RR	153
E 35 2 RB 12	SE 6013 RRB	154
E 42 0 RC 11	SE 6013 RRC	155
E 42 4 B 12 H10	SE 7016 BR	156
E 42 4 B 32 H5	SE 7018 BH5	157
E Mo B 42 H5	SE 7018 Mo	158
E CrMo1 B 42 H5	SE 8018 CrMo1	159
E CrMo2 B 42 H5	SE 9018 CrMo2	160
E 22 9 3 R 32	SE 2209 Duplex	174
E 18 8 Mn R 12	SE 307	164
E 19 9 L R 12	SE 308 L	165
E 23 12 LR 32	SE 309 L	166
E 23 12 2 L R 32	SE 309 MoL	167
E 25 20 LR 12	SE 310	168
E 29 9 R 12	SE 312	169
E 19 12 3 L R 12	SE 316 L	170
E 19 12 3 Nb R 12	SE 318	171
E 19 9 Nb R 12	SE 347	172
E Ni 6625 (NiCr22Mo9Nb)	SE 625	173
E Fe 3	SE Fe3 350 GP	176
E Fe 8	SE HARD 600	175
E C Ni-CI 1	SE Ni	161
E Ni 6082 (NiCr20Mn3Nb)	SE NiCr82	163
E C NiFe 1 1	SE NiFe	162
G 42 2 C/M G3Si1+Ti	SW 70S G3 Ti	41
G 42 4 M/C G3Si1	SW 70S G3	40
G 42 4 M/C G3Si1	SW 70S G3 BRONZE	42
G 42 4 M/C G3Si1	SW 70S G3 Brillance	43
G 46 4 M/C G4Si1	SW 70S G4	44
G 46 4 M/C G4Si1	SW 70S G4 BRONZE	45



EN	EWM name	Page
G 46 4 M/C G4Si1	SW 70S G4 Brillance	46
G 62 5 Z Mn3Ni1Mo	SW 100S NiMo	50
G 69 5 M Mn3Ni1CrMo	SW 100S NiMoCr	51
G 89 6 M Mn4Ni2CrMo	SW 120S NiMoCr	52
G 42 6 Z 3Ni1	SW 80S Ni1	48
G 2 Ni2	SW 80S Ni2	49
G ZMn3Ni1Cu	SW 80S NiCu	47
G CrMo1Si	SW 80S CrMo1	54
G MoSi	SW 80S Mo	53
G CrMo2Si	SW 90S CrMo2	55
S Fe8	SW Hard 600	70
G 22 9 3 LN	SW 2209 Duplex	68
G 18 8 Mn	SW 307 Si	56
G 19 9 L Si	SW 308 LSi	57
G 23 12 L Si	SW 309 LSi	58
G 25 20	SW 310	59
G 29 9	SW 312	60
G 19 12 3 L Si	SW 316 LSi	61
G 19 12 3 Nb Si	SW 318 Si	62
G 19 9 Nb Si	SW 347 Si	63
G 13 4	SW 410 NiMo	64
S Ni 6625 (NiCr22Mo9Nb)	SW 625	65
G 20 25 5 Cu L	SW 904 L	66
S Ni 6082 (NiCr20Nb)	SW NiCr82	67
S AL 1450 (Al99,5Ti)	SW 1450 99,5Ti	71
S AL 3103 (AlMn1)	SW 3103 Mn1	72
S AL 4043A (AlSi5(A))	SW 4043 Si5	73
S AL 4047A (AlSi12(A))	SW 4047 Si12	74
S AL 5087 (AlMg4,5MnZr)	SW 5087 Mg4,5MnZr	75
S AL 5183 (AlMg4,5Mn0,7)	SW 5183 Mg4,5Mn	76
S AL 5356 (AlMg5Cr)	SW 5356 Mg5	78
S AL 5754 (AlMg3)	SW 5754 Mg3	79
S Cu 6100 (CuAl7)	SW CuAl8	83



EN	EWM name	Page
S Cu 6328 (CuAl9Ni5Fe3Mn2)	SW CuAl9Ni5	86
S Cu 6180 (CuAl10Fe)	SW CuAlBz9Fe	87
S Cu 6511 (CuSi2Mn1)	SW CuSi2	81
S Cu 6560 (CuSi3Mn)	SW CuSi3	83
S Cu 1898 (CuSn1)	SW CuSn1	84
S Cu 5180A (CuSn6P)	SW CuSn6	85
T 42 2 M M/C 1 H5	FCW 70TC Metal	88
T 42 2 B M 1 H5	FCW 71T Basic	89
T 42 2 P M 1 H5	FCW 71T Rutile	91
T 42 2 P M/C H5	FCW 71T Rutile CO2	92
T 46 6 1Ni P M 2 H5	FCW 81T Rutile Ni1	94
T 46 4 MM 1 H5	FCWT 70C Metal	90
T 69 6 Z P M 1 H5	FCW 111T NiMoCr	96
T Mo P M 1 H5	FCW 81T Rutile Mo	95
T 18 8 Mn R M 3	FCW 307 Rutile	97
T 19 9 L R C/M 3	FCW 308 Rutile	98
T 23 12 L P C/M 1	FCW 309 LP Rutile	100
T 23 12 L R C/M 3	FCW 309 Rutile	99
T 19 12 3 L P C/M 1	FCW 316 LP Rutile	102
T 19 12 3 L R C/M 3	FCW 316 Rutile	101
T Ni 6082 (NiCr20Mn3Nb)	FCW NiCr82	103
T Co2	FCW COBALT 2	105
T 19 12 3 L M M 1	FCW 316 METAL	104
W 2Si	TR 70S G2	108
W 3Si1	TR 70S G3	109
W 4Si1	TR 70S G4	110
W 3Ni1	TR 80S Ni1	111
W Mn3Ni1Cu	TR 80 S NiCu	112
W CrMo1Si	TR 80S CrMo1	115
W MoSi	TR 80S Mo	114
W CrMo2Si	TR 90S CrMo2	116
W CrMo2VNb	TR 90S CrMo2 VTi	118
W CrMo91	TR 90S CrMo91	117





EN	EWM name	Page
W CrMo5Si	TR CrMo5	113
W 22 9 3 N L	TR 2209 Duplex	133
W 25 9 4 N L	TR 2594 SUPER DUPLEX	134
W 18 8 Mn Si	TR 307 Si	119
W 19 9 L Si	TR 308 LSi	120
W 23 12 L Si	TR 309 LSi	121
W 25 20	TR 310	122
W 29 9	TR 312	123
W 19 12 3 L Si	TR 316 LSi	124
W 19 12 3 Nb Si	TR 318 Si	125
W 19 9 Nb Si	TR 347	126
W 20 25 5 Cu L	TR 904L	128
O III	GFR R60	148
W 13 4	TR 410 NiMo	127
S Ni 6082 (NiCr20Mn3Nb)	TR NiCr82	129
W Ni 6625 (NiCr22Mo9Nb)	TR 625	130
T Co2	TR COBALT2	132
T Co1	TR COBALT1	131
S AL 1450 (Al99,5Ti)	TR 1450 99,5 Ti	135
S AL 3103 (AlMn1)	TR 3103 Mn1	136
S AL 4043A (AlSi5(A))	TR 4043 Si5	137
S AL 4047A (AlSi12(A))	TR 4047 Si12	138
S AL 5356 (AlMg5Cr)	TR 5356 Mg5	141
S AL 5754 (AlMg3)	TR 5754 Mg3	142
S Cu 6100 (CuAl7)	TR CuAl8	147
S Cu 7158 (CuNi30Mn1FeTi)	TR CuNi30	146
S Cu 6560 (CuSi3Mn)	TR CuSi3	143
S Cu 1898 (CuSn1)	TR CuSn1	144
S Cu 5180A (CuSn6P)	TR CuSn6	145
S Cu 6560 (CuSi3Mn)	TR CuSi3	144
S Cu 1898 (CuSn1)	TR CuSn1	145
S Cu 5410 (CuSn12P)	TR CuSn12	146



<b>EN standard/ DIN EN ISO STANDARD</b>	<b>Standard title</b>
EN 1600	Welding consumables – Covered electrodes for manual arc welding of stainless and heat resisting steels – Classification
EN 12536	Welding consumables – Rods for gas welding of non alloy and creep-resisting steels – Classification
DIN EN 14700	Welding consumables – Welding consumables for hard-facing
DIN EN ISO 636	Welding consumables – Rods, wires and deposits for tungsten inert gas welding of non-alloy and fine-grain steels – Classification
DIN EN ISO 1071	Welding consumables – Covered electrodes, wires, rods and tubular cored electrodes for fusion welding of cast iron – Classification
DIN EN ISO 2560	Welding consumables – Covered electrodes for manual metal arc welding of non-alloy and fine-grain steels – Classification
DIN EN ISO 3580	Welding consumables – Covered electrodes for manual metal arc welding of creep-resisting steels – Classification
DIN EN ISO 14172	Welding consumables – Covered electrodes for manual metal arc welding of nickel alloys – Classification
DIN EN ISO 14341	Welding consumables – Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels – Classification
DIN EN ISO 14343	Welding consumables – Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels – Classification
DIN EN ISO 16834	Welding consumables – Wire electrodes, wires, rods and deposits for gas shielded arc welding of high strength steels – Classification
DIN EN ISO 17632	Welding consumables – Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels – Classification
DIN EN ISO 17633	Welding consumables – Tubular cored electrodes and rods for gas shielded and non-gas shielded metal arc welding of stainless and heat-resisting steels – Classification
DIN EN ISO 17634	Welding consumables – Tubular cored electrodes for gas shielded metal arc welding of creep-resisting steels – Classification
DIN EN ISO 18273	Welding consumables – Wire electrodes, wires and rods for welding of aluminium and aluminium alloys – Classification
DIN EN ISO 18274	Welding consumables – Solid wire electrodes, solid strip electrodes, solid wires and solid rods for fusion welding of nickel and nickel alloys – Classification
DIN EN ISO 18276	Welding consumables – Tubular cored electrodes for gas-shielded and non-gas-shielded metal arc welding of high-strength steels – Classification
DIN EN ISO 21952	Welding consumables – Wire electrodes, wires, rods and deposits for gas shielded arc welding of creep-resisting steels – Classification
DIN EN ISO 24373	Welding consumables – Solid wires and rods for fusion welding of copper and copper alloys – Classification



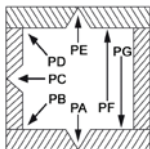
EN standard/ DIN EN ISO STANDARD	Standard title
DIN EN ISO 544	Technical delivery conditions for filler materials and fluxes – Type of product, dimensions, tolerances and markings
DIN EN ISO 14175	Welding consumables – Gases and gas mixtures for fusion welding and allied processes
DIN EN ISO 14174	Welding consumables – Fluxes for submerged arc welding and electroslag welding – Classification
DIN EN ISO 24598	Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of creep-resisting steels
DIN EN ISO 3581	Welding consumables – Covered electrodes for manual metal arc welding of stainless and heat-resisting steels – Classification
DIN EN ISO 26304	Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of high strength steels – Classification
DIN EN ISO 14171	Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels – Classification



### Test certificates in accordance with EN 10204

Type		Certificate content	Certificate confirmation
2.1	Factory certification	Confirmation of agreement with the order	Manufacturer
2.2	Inspection certificate	Confirmation of agreement with the order stating the results of non-specific testing	Manufacturer
3.1	Acceptance test certificate	Confirmation of agreement with the order stating the results of specific testing	The manufacturer's inspectors independent of the production department.
3.2	Acceptance test certificate	Confirmation of agreement with the order stating the results of specific testing	The manufacturer's inspectors independent of the production department and the customer's appointed inspectors or the inspectors named in the official regulations.

### Welding positions



PA (1G, 1F)	Flat position
PB (2F)	Horizontal
PC (2G)	Horizontal to vertical wall
PD (4F)	Horizontal overhead
PE (4G)	Overhead
PF (3G, 3F, 5G up)	Vertical up
PG (3G, 3F, 5g down)	Vertical down



## Approval and acceptance authorities

ABS	American Bureau of Shipping
BV	Bureau Veritas
DB	Deutsche Bahn
DNV	Det Norske Veritas
GL	Germanischer Lloyd
LR	Lloyd's Register of Shipping
TÜV	Technischer Überwachungsverein (Technical Inspection Association)

**!** The current scope of the permit for individual welding consumables should always be requested if necessary. Separate copies may be provided.

## Acceptance authorities

AWS	American Welding Society
BS	British Standard
CE	Conformité Européenne
DIN	Deutsche Industrienorm
EN	European standard

## Power symbols

	Direct current (negatively charged electrode)
	Direct current (positively charged electrode)
	Alternating current

**Gases in accordance with DIN EN ISO 14175**

Main groups		Components in volume percent					
Main group	Sub-group	Oxidising		Inert		Reduced	Slow-responding
I	1			100			
	2				100		
	3			Rest	0,5 < He < 95		
M1	1	0,5 < CO <sub>2</sub> < 5		Rest*		0,5 < H <sub>2</sub> < 5	
	2	0,5 < CO <sub>2</sub> < 5		Rest*			
	3		0,5 < O <sub>2</sub> < 3	Rest*			
	4	0,5 < CO <sub>2</sub> < 5	0,5 < O <sub>2</sub> < 3	Rest*			
M2	0	5 < CO <sub>2</sub> < 15		Rest*			
	1	15 < CO <sub>2</sub> < 25		Rest*			
	2		3 < O <sub>2</sub> < 10	Rest*			
	3	0,5 < CO <sub>2</sub> < 5	3 < O <sub>2</sub> < 10	Rest*			
	4	5 < CO <sub>2</sub> < 15	0,5 < O <sub>2</sub> < 3	Rest*			
	5	5 < CO <sub>2</sub> < 15	3 < O <sub>2</sub> < 10	Rest*			
	6	15 < CO <sub>2</sub> < 25	0,5 < O <sub>2</sub> < 3	Rest*			
	7	15 < CO <sub>2</sub> < 25	3 < O <sub>2</sub> < 10	Rest*			
M3	1	25 < CO <sub>2</sub> < 50		Rest*			
	2		10 < O <sub>2</sub> < 15	Rest*			
	3	25 < CO <sub>2</sub> < 20	2 < O <sub>2</sub> < 10	Rest*			
	4	5 < CO <sub>2</sub> < 25	10 < O <sub>2</sub> < 15	Rest*		0,5 < H <sub>2</sub> < 5	
	5	25 < CO <sub>2</sub> < 50	10 < O <sub>2</sub> < 15	Rest*			
C	1	100					
	2	Rest	0,5 < O <sub>2</sub> < 30				
R	1			Rest*	0,5 < H <sub>2</sub> < 15		
	2			Rest*	15 < H <sub>2</sub> < 50		
N	1						100
	2			Rest*			0,5 < N <sub>2</sub> < 5
	3			Rest*			5 < N <sub>2</sub> < 50
	4			Rest*	0,5 < H <sub>2</sub> < 10		0,5 < N <sub>2</sub> < 5
	5				0,5 < H <sub>2</sub> < 50		Rest
O	1						
Z	Mixed gases not listed in the table or mixed gases with a composition outside the ranges stated **						

\*Argon may be completely replaced by helium for this classification

\*\* Two mixed gases with the same Z classification may not be replaced with each other


**Gases in accordance with DIN EN 439**

Short description		Volume percent (vol. %)					
Group	Code	Oxidising		Inert		Reduced	Slow-re- sponding
		CO <sub>2</sub>	O <sub>2</sub>	Ar	He	H <sub>2</sub>	N <sub>2</sub>
R	1			Rest <sup>2</sup>		> 0 to 15	
	2			Rest <sup>2</sup>		> 15 to 35	
I	1			100			
	2				100		
	3			Rest <sup>2</sup>	> 0 to 95		
M1	1	> 0 to 5		Rest <sup>2</sup>		> 0 to 5	
	2	> 0 to 5		Rest <sup>2</sup>			
	3		> 0 to 3	Rest <sup>2</sup>			
	4	> 0 to 25	> 0 to 3	Rest <sup>2</sup>			
M2	1	> 0 to 25		Rest <sup>2</sup>			
	2		> 3 to 10	Rest <sup>2</sup>			
	3	> 0 to 5	> 3 to 11	Rest <sup>2</sup>			
	4	> 0 to 25	> 0 to 8	Rest <sup>2</sup>			
M3	1	> 25 to 50		Rest <sup>2</sup>			
	2		> 10 to 15	Rest <sup>2</sup>			
	3	>5 to 50	> 8 to 15	Rest <sup>2</sup>			
C	1	100					
	2	Rest	> 0 to 30				
F	1						100
	2					> 0 to 50	Rest

### Classification by yield strength and impact energy of 47J in accordance with DIN EN ISO 14341-A

A weld metal made by GMAW has a minimum yield strength of 420 MPa and an average minimum Charpy impact of 47 J at -40°C; mixed gas (M21) was used.

The designation is as follows:

ISO 14341-A-G 42 4 M21 3Si1

A weld metal produced using a ISO 14341-A-G 42 4 M21 3Si1 electrode has the following mechanical properties:

Yield strength                      420 MPa  
 Minimum Charpy impact:    47J at -40°C  
 M21 gas:                              Mixed gas

ISO 14341-A	Number of this international standard, classification by yield strength and Charpy impact of 47 J
G	Wire electrode
42	Yield strength
4	Charpy impact at -40°C
M21	Shielding gas
3Si1	Chemical composition

### Stick electrode coating type

Abbreviation	Short description	Definition
R	Rutile	Standard electrode for universal use, fine to average globular transfer, good mechanical properties, welding positions PA, PB, PC, PE, PF, (PG limited only)
RB	Basic/rutile	Use as a combination of achievable, high toughness values and universal use with increased demands on the welder and the seam finishing work.
B	Basic	Use for the requirement of high mechanical properties, average to coarse globular transfer, poorly detaching slag, possible in all positions, please allow for baking of the electrodes
RC	Rutile-cellulose	Used as replacement for rutile electrodes, to make welding position PG safer, less slag formation, higher demands on the welder and the finishing work
C	Cellulose	Used mainly for the root pass on pipe connectors (pipeline welding) in position PG, good mechanical properties, average globules, almost no slag





E	19 12 3 L	R	2	3
1	2	3	4	5

1	Code for manual arc welding systems
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2	Abbreviation for chemical composition of the weld metal The components of the alloy are given in the order Cr, Ni and Mo, respectively, without the chemical code. Alloy components such as niobium, manganese and nitrogen are included as chemical codes with no number for the alloy component. The additional L stands for a very low carbon content. The mechanical properties specified in the standard must be met.
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	Code	Coating type
3	R	Rutile
	B	Basic

	Ratio	Metal recovery (%)	Current type
4	1	<105	Direct current, alternating current
	2	<105	Direct current
	3	>105–125	Direct current, alternating current
	4	>105–125	Direct current
	5	>125–160	Direct current, alternating current
	6	>125–160	Direct current
	7	>160	Direct current, alternating current
	8	>160	Direct current

Proof of suitability for alternating current with open circuit voltage of max. 65 V

	Ratio	Welding position
5	1	All positions
	2	All positions except vertical-down weld
	3	Butt weld in flat position
		Fillet weld in flat and horizontal position
	4	Butt weld in horizontal position
Fillet weld in flat position		
5	Vertical-down position and position as per code 3	

E	42	2	-	B	4	2	H10
1	2	3	4	5	6	7	8

1 Code for manual arc welding systems

Code	Minimum yield strength*1 Re (N/mm <sup>2</sup> )	Tensile strength: Rm (N/mm <sup>2</sup> )	Minimum elongation at break A5 (%)
35	355	440 - 570	22
38	380	470 - 600	20
42	420	500 - 640	20
46	460	530 - 680	20
50	500	560 - 720	18

\*1 The yield strength is lower yield strength R. If it is not specified, the 0.2 % elongation limit R should be chosen.

Symbol/number	Minimum Charpy impact 47 J at °C
Z	no requirements
A	20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60

Code	Chemical composition		
	Mn	Mo	Ni
No code	2	-	-
Mo	1,4	0,3 - 0,6	-
Mn Mo	> 1,4 - 2,0	0,3 - 0,6	-
1 Ni	1,4	-	0,6 - 1,2
2 Ni	1,4	-	1,8 - 2,6
3 Ni	1,4	-	2,6 - 3,8
Mn 1 Ni	> 1,4 - 2,0	-	0,6 - 1,2
1 Ni Mo	1,4	0,3 - 0,6	0,6 - 1,2
Z	Any otherwise agreed composition		

\*\*2 if not specified: Mo<0,2, Ni<0,3, Cr<0,2, V<0,08, Nb<0,05, Cu<0,3, are each maximum values



	Code	Coating type
5	A	Acid
	C	Cellulose
	R	Rutile
	RR	Thick rutile *3
	RC	Rutile/cellulose
	RA	Rutile/acid
	RB	Rutile/basic
	B	Basic

\*3 ratio of coating to rod diameter 1.6

	Ratio	Metal recovery (%)	Current type
6	1	<105	Direct current, alternating current
	2	<105	Direct current
	3	>105 - 125	Direct current, alternating current
	4	>105 - 125	Direct current
	5	>125 - 160	Direct current, alternating current
	6	>125 - 160	Direct current
	7	>160	Direct current, alternating current
	8	>160	Direct current

\*3 ratio of coating to rod diameter 1.6

	Ratio	Welding position
7	1	All positions
	2	All positions except vertical-down weld
	3	Butt weld in flat position
		Fillet weld in flat and horizontal position
	4	Butt and fillet welds in flat position
	5	For fillet welds and as per figure 3

	Code	Maximum diffusible hydrogen content (ml/100 g molten weld material)
8	H5	5
	H10	10
	H15	15



**Overview**

	SW 705 G3	SW 705 G3 Ti	SW 705 G3 Bronze	SW 705 G4	SW 705 G4 Bronze	SW 805 NiCu	SW 805 Ni1	SW 805 Ni2	SW 1005 NiMo	SW 1005 NiMoCr	SW 1205 NiMoCr	SW 805 Mo	SW 805 CrMo1	SW 905 CrMo2
10CrSiMoV7														●
10CrMo9-10														●
13CrMo4-5													●	
16Mo3												●		
20MnNb6	●		●	●	●									
9CrNiCuP3-2-4						●								
P235 - P355 T2	●		●	●	●									
L210 - L360NB	●		●	●	●									
L320												●		
L360NB- L415NB												●		
P235G1TH - P255G1TH	●	●	●	●	●							●		
P235GH - P285NH	●		●	●	●			●						
P255NH - P355NH	●		●	●	●			●						
P265GH												●		
P310GH												●		
P355NL1 - P460NL1							●	●						
P420NH							●	●						
P420NH - P500NH									●	●				
GP240GH - GP280GH							●	●						
S185 - S355G1	●	●	●	●	●		●	●						
S185 - S355J0		●												
S235JRW - S355J2G1W						●								
S255N - S355N	●	●	●	●	●		●	●						
S420N - S500N									●	●				
S420NL - S500NL									●	●				
S690QL										●	●			
S690QL1										●	●			
S700MC									●					
S890QL											●			
S960QL											●			
Shipbuilding steels A, B, D, E	●		●	●	●									
Cast steel GS-38-GS-52	●		●											


**Overview**

	SW/ TR CuAl8	SW CuAl9Ni5	SW CuAlBz9Fe	SW CuSi2	SW/ TR CuSi3	SW/ TR CuSn1	SW/ TR CuSn6	SW OF Cu	TR CuNi30
CuAl10Ni5Fe4		●							
CuAl11Ni6Fe5		●							
CuAl5	●								
CuAl8	●								
CuAl8Fe3			●						
CuAl9	●								
CuNi10Fe1Mn									●
CuNi30Mn1Fe									●
CuSi2Mn				●	●				
CuSi3Mn				●	●				
CuSn4							●		
CuSn6							●		
CuSn8							●		
CuZn0,5						●			
CuZn10				●	●				
CuZn15				●	●				
CuZn20Al	●								
CuZn5				●	●				
OF-Cu						●			
SE-Cu						●			
SF-Cu						●			
Connecting of copper components and solder preform parts, suitable for furnace brazing, used in vacuum engineering and the aerospace and astronautics industry								●	



## Unalloyed and low-alloy

### Overview

	FCW70TC Metal	FCW70C Metal	FCW71T Basic	FCW71T Rutile	FCW71T Rutile CO <sub>2</sub>	FCW71T Selfshield	FCW81T Rutile NiTi	FCW81T Rutile Mo	FCW111T NiMoCr
S185 - S355	●	●	●	●	●				
S235 - S460QL1	●	●		●					
S355J0 - S335						●			
S(P)275 - S(P)355			●		●				
S185 - S275JR,						●			
S255 - S460								●	
S255N - S355N						●			
P235GH - P355GH	●	●		●	●		●	●	
P235T1/T2 - P460NL2	●	●		●				●	
L210 - L445MB	●	●		●				●	
L210 - L360			●		●				
P235GH			●		●	●			
P265GH			●		●	●			
P295GH			●		●	●			
P235 - P355			●		●				
P310GH						●			
GP240R			●		●				
S460N						●			
S460M						●			
API X42 - X60	●	●		●					
16Mo3								●	
Low-temperature tough steels to 550Mpa							●		
Shipbuilding steels A, B, D, AH-32 - EH 36		●							
Thermo-mechanically rolled tubular steel up to L690M, high tensile fine-grained steel up to S690QL, S690G1QL1		●							●



### Overview

	TR 70S G2	TR 70S G3	TR 70S G4	TR 80S Ni1	TR 80 S NiCu	TR CrMo5	TR 80S Mo	TR 80S CrMo1	TR 90S CrMo2	TR 90S CrMo91	TR 90S CrMo2 VTi
S185 - S275JR	●	●	●								
S355J0 - S355	●	●	●								
S255N - S355N	●	●	●								
P255NH - P355NH	●	●	●				●				
S235JRW - S355J2G1W					●						●
P355NL1 - P460NL1				●			●				
P235GH	●	●	●				●				
P265GH	●	●	●				●				
P310GH	●	●	●								
S460N			●				●				
S460M			●				●				
9CrNiCu3-2-4					●						●
13CrMo4-5								●			
13CrMoSi5-5								●			
G17CrMo5-5								●			
16Mo 3							●				
10CrMo9-10									●		
10CrSiMoV7									●		
12CrMo9-10									●		
A 213 T91										●	
A 335 P91										●	
X10CrMoVNb9-1										●	
12CrMo19-5						●					
X12CrMo5						●					

Classification	
E 38 2 C 21 SE 6010 CEL	S235J2G3 - S355J2G3, L290MB (X42), L320 (X46), L320M (X52), L385N (X56), StE 210.7, StE 240.7, StE 290.7 TM, StE 320.7 TM, StE 360.7 TM, P235G1TH, P255G1TH,
E 38 0 RC 11 SE 6013 RC	S235J2G3 - S355J2G3, L290MB (X42), L320 (X46), L320M (X52), L385N (X56), StE 210.7, StE 240.7, StE 290.7 TM, StE 320.7 TM, Shipbuilding steels A,B,D, cast steel GS-38-GS-52
E 42 0 RC 11 SE 6013 RC blau	S235J2G3 - S355J2G3, L290MB (X42), L320 (X46), L320M (X52), L385N (X56), StE 210.7, StE 240.7, StE 290.7 TM, StE 320.7 TM, StE 360.7 TM, P235G1TH, P255G1TH, Shipbuilding steels A,B,D, cast steel GS-38-GS-52
E 42 0 RR 12 SE 6013 RR	S185 - S355, P235G1TH, P265G1TH, P295G1TH, L210 - L360, E235 - E355, GP240GH, Shipbuilding steels A,B,D, cast steel GS-38-GS-52
E 35 2 RB 12 SE 6013 RRB	S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R, Shipbuilding steels A,B,D, cast steel GS-38-GS-52
E 42 0 RC 11 SE 6013 RRC	S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R, Shipbuilding steels A,B,D, cast steel GS-38-GS-52
E 42 2 B 12 H10 SE 7016 BR	S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R, Shipbuilding steels A,B,D,E, cast steel GS-38-GS-52
E 42 4 B 32 H5 SE 7018 BH5	S185 - S355, E295, E335, P235GH, P265GH, P295GH, P235 - P460, L210 - L460, S(P)275 - S(P)460, GP240R, Shipbuilding steels A,B,D,E, cast steel GS-38-GS-52
E Mo B 42 H5 SE 7018 Mo	S235JR - S355J2G3, P380NH - P460NH, P235GH - P285NH, P295GH, 20MnNb6, 16 Mo 3, Cast steel GS-22 Mo4
E CrMo1 B 42 H5 SE 8018 CrMo1	13CrMo 4 4 (1.7335), 15CrMo3 (1.3566), 13CrMoV 5 8 (1.7734), 15Cr3 (1.7015), 16MnCr5 (1.7131), 20MnCr5 (1.7147), 15CrMo5 (1.7262), 25CrMo4 (1.7218), Cast steel GS-22CrMo 5, GS-22CrMo 5 4
E CrMo2 B 42 H5 SE 9018 CrMo2	10CrMo9-10 (1.7380), 10CrSiMoV7 (1.8075), 30CrMoV9 (1.7707) Cast steel G17CrMo9-10
E FE 3 SE Fe3 350 GP	Hardfacing, suitable for wear and impacts Heat-treatable, hardfacing, suitable for wear and impacts





Classification	
SE 307 SW 307 Si TR 307 Si FCW 307 Rutile	Dissimilar steels (black/white joints), cladding, buffer layers for hardfacing, high C-content and difficult to weld steels, manganese high carbon steel (example: 1.3401)
SE 308 L SW 308 Lsi TR 308 Lsi FCW 308 Rutile	1.4301, 1.4303, 1.4306, 1.4308, 1.4310, 1.4311, 1.4319, 1.4541, 1.4550, 1.4552
SE 309 L SW 309 Lsi TR 309 Lsi FCW 309 Rutile/ LP Rutile SE 309Mol	Austenite/ferrite joints (black/white), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers
SE 310 SW 310 TR 310	1.4710, 1.4713, 1.4726, 1.4745, 1.4823, 1.4832, 1.4837, 1.4840, 1.4841, 1.4845, 1.4846, 1.4848, 1.4849
SE 312 SW 312 TR 312	Corrosion-resistant analogue steel and cast steel (e.g. 1.4762, 1.4085), difficult to weld steel, manganese high carbon steel, repairs and wear-resistant layers
SE 316 L SW 316 Lsi TR 316 Lsi FCW 316 Rutile/ LP/Metall	1. 4401, 1.4404, 1.4406, 1.4408, 1.4420, 1.4435, 1.4436, 1.4571, 1.4573, 1.4580, 1.4581, 1.4583
SE 318 L SW 318 Si TR 318 Lsi	1.4401, 1.4404, 1.4420, 1.4435, 1.4436, 1.4571, 1.4573, 1.4580, 1.4581, 1.4583
SE 347 SW 347 Si TR 347	1.4541, 1.4550, 1.4552, 1.4301, 1.4312, 1.4546, 1.4311, 1.4306
SE 2209 Duplex SW 2209 Duplex TR 2209 Duplex	1.4462, 1.4417, 1.4460, 1.4362
SW 410 NiMo TR 410 NiMo	Martensitic chrome steels, fine castings and steel castings of type 13% Cr-4% Ni
SW 904L TR 904L	1.4529, 1.4539
TR 2594 Super Duplex	25% Cr super-duplex steels, e.g. 1.4501 X2CrNiMoCuWN 25-7-4 AND S 32750, S 32760
SE 625 SW 625 TR 625	1.4529, 1.4539, 1.4558, 1.4876, 1.5680, 1.5681, 1.5662, 2.4605, 2.4618, 2.4856, 2.4858, 2.4951, 2.4952, Alloy 625, Alloy 800 and similar NiCr alloys
SE Ni	N-GJL-100 - EN-GJL-350, EN-GJMB-350 - EN-GJMB-550, EN-GJMW-350 - EN-GJMW-550
SE NiCr82 SW NiCr82 TR NiCr82 FCW NiCr82	1.4558, 1.4859, 1.4861, 1.4876, 1.4877, 1.4885, 1.4958, 1.4968, 2.4669, 2.4694, 2.4816, 2.4817, 2.4867, 2.4867, 2.4869, 2.4951, 2.4952 Nickel alloys, dissimilar joints (also at temperatures >300 °C), platings, surfacing
SW Ni FE 55 sw hard 600	Ductile case iron, cast irons with spheroidal graphite Hardfacing, suitable for wear and impacts





## Unalloyed and low-alloy steels

### General information

The suitability for welding of unalloyed and low-alloy steels depends largely on their carbon content. Steels with a C-content up to 0.22% can be worked using all welding procedures without limitation.

With increased carbon content and thus increased cooling rates, the suitability for welding is reduced as a result of hardening. A coarse-grained structure forms in the heat-affected zone, and the Charpy impact strength decreases considerably.

The hardening tendency of low-alloy structural steels can be estimated from the carbon equivalent value. In the International Institute of Welding carbon equivalent value (CEV), the influence of the key alloy elements is calculated using an empirically determined formula:

$$IIIW C_{ev} = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15}$$

The general limit for the welding suitability of low-alloy steels is  $CEV = 0.45$ . The welding suitability can be increased up to a  $CEV \approx 0.60$  through the suitable choice of an EWM filler material and correct application of heat. However, the CEV is only an estimation of the expected increase in hardness because other process and material dimensions are not taken into account in the calculation.

The welding time, temperature and transformation details (welding ZTU) provide a more accurate idea of the welding suitability of low-alloy steels. This allows the structural transformations in the HAZ to be predicted for each material.

### Welding recommendation

Welding consumables should match the mechanical properties and chemical composition of the parent metal. Basic coated stick electrodes should be used for unalloyed steels and preheated according to the CEV. In the case of rimmed cast steels, basic electrodes should be used for the segregation zones and rutile electrodes for root and final passes.



## Fine-grained steels

### General information

Fine-grained steels are generally suitable for welding. These steels are characterised by a maximum carbon content of 0.22% and use of the main strength-enhancing alloying elements manganese, silicon, chromium, molybdenum, copper and nitrogen.

Other micro-alloying elements such as aluminium, niobium, vanadium and boron are also added. In addition to enhancing strength, these also significantly increase the toughness of the steel by reducing the granularity of the structure. The type of hot forming during steel manufacture also influences its quality and properties.

Fine-grained steels are currently standardised up to a yield strength of 960 MPa and can be welded using all procedures. However components should be preheated before and after welding using the t8/5 method in order to prevent faults.

SEW sheet 088 provides relevant recommendations here. Preheating should generally be used above certain thickness limits. The following recommendations apply, depending on the yield strength:

Yield strength (N/mm) <sup>2</sup>	Thickness limit (mm)
<355	30
>355 to 420	20
>420 to 590	12
>590	8

### Welding recommendation

Welding consumables should match the mechanical properties and chemical composition of the parent metal. EWM can supply solid wire electrodes and flux cored wires for all fine-grained steels.

**Pressure vessel and tubular steels, creep-resistant steels****General information**

Creep-resistant steels are generally well suited to welding. This is mainly a result of their high purity and low carbon content. Creep-resistant steels are used for boiler, tube, container and reactor construction at operating temperatures between 500 °C and 600 °C. Aside from having creep-resistant properties, these steels are very-scale resistant and creep-resistant at high temperatures. The temperature resistance is due mainly to the alloy elements manganese and molybdenum.

**Welding recommendation**

Creep-resistant steels should be preheated to suit their sheet thickness because of the risk of hardening crack formation. The steel manufacturer will make recommendations here. Similar kinds of welding consumables are mainly used in order to guarantee the creep strength of the parent and weld metals.



### ■ **Welding austenitic steels**

Chromium and nickel are among the main alloying elements of austenitic materials. If the correct ratio is achieved (approx. 18% chromium and 8% nickel) the austenitic range is increased so that a stable structure results even at ambient temperature.

Unlike ferritic chromium steel, austenitic material cannot be further hardened and is also non-magnetic. We differentiate between stable and metastable austenites. Whereas stable austenites have no ferritic structure at ambient temperature, metastable austenites can have a ferrite component of up to 10% at ambient temperature. Austenitic steels can be welded without problems using similar welding consumables. It should however be noted that stable austenites are prone to developing heat cracks. In such cases, the heat input should be monitored during the welding process. Welding consumables containing manganese reduce this risk.

### ■ **Welding of austenitic/ferritic steels (duplex steels)**

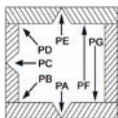
Duplex steels have a wide range of applications, thanks to their exceptional combination of corrosion resistance and superior strength. These properties are achieved by a high chromium content, combined with nitrogen and molybdenum. They are used in contact with corrosive media, chemicals and in offshore environments in the temperature range of -40°C to 250°C. Their ability to be welded is comparable to that of other high-alloy materials where similar filler materials are used.

### ■ **Welding of ferritic chromium steels (chromium/ferrite)**

The ferritic chromium steels include materials with carbon contents below 0.1% and chromium contents between 13% and 30%. Unlike fully austenitic steels, they contain no nickel. Stabilised ferrites should be used for welding purposes. This group is alloyed with strong carbide-forming elements such as titanium and niobium which combine with the carbon during welding. The carbon cannot combine with chromium to form chromium carbide which prevents intercrystalline corrosion. Fully ferritic welding consumables with a slightly increased content of chromium, niobium and titanium should generally be used for welding, because alloying elements can be lost in the welding zone. Austenitic consumables with a slightly increased chromium and molybdenum content can be used with multi-layer welds. Only pure argon a mixture of argon and helium should be used as a shielding gas, because the steels are very given to oxidation when molten due to their high chromium content. The argon/hydrogen mixes normally used with austenitic materials are not recommended. The hydrogen makes the material very brittle.



<b>Welding consumables</b>			<b>Page</b>
Wire electrodes	Unalloyed		<b>40</b>
	Low-alloy	High tensile	<b>48</b>
		Creep resistant	<b>53</b>
	High-alloy		<b>56</b>
		Hardfacing	<b>70</b>
	Aluminium		<b>71</b>
Copper-based		<b>80</b>	
Flux cored wire electrodes	Unalloyed		<b>88</b>
	Low-alloy	Creep resistant	<b>95</b>
	High-alloy		<b>97</b>



## ■ SW 70S G3

- Suitable for EWM forceArc and coldArc
- Unalloyed MAG solid wire electrode
- Copper-plated, layer wound
- Low-spatter thanks to high chemical purity
- For industry, craft and repair businesses

**Standards**

DIN EN 14341-A G 42 4 M/C G3Si1

AWS A-5.18 ER 70S-6

Material number 1.5125

**Chemical analysis**

C	Si	Mn	P	S
0.08	0.9	1.5	0.015	0.012

**Shielding gas**

C1 / M21 / M22 - M33

**Expansion, A5 Yield strength, Rp 0.2%**

≥20 % ≥420 MPa

**Tensile strength, Rm**

500 MPa - 640 MPa

**Impact energy, Av**

≥47 J (-40 °C)

**Approvals**

TÜV / DB / GL / CE / LR

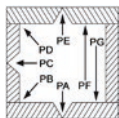
**Materials**

S185 - S355G1, S255N - S355N, P255NH - P355NH, P235GH - P285NH, P 235-P355T2, 20MnNb6, L210 - L360NB

Shipbuilding steels A, B, D, E, Cast steel GS-38–GS-52

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.6	097-003450-20006
		0.8	097-003450-20208
	2.0	0.8	097-003450-20008
		1.0	097-003450-20010
B300	5.0	1.2	097-003450-20012
		0.6	097-003450-30006
		0.8	097-003450-30008
		1.0	097-003450-30010
	15	1.2	097-003450-30012
		1.6	097-003450-30016
		0.8	097-003450-31808
		1.0	097-003450-31810
18	1.2	097-003450-31812	
	1.6	097-003450-31816	
	0.8	097-003450-25008	
	1.0	097-003450-25010	
F250	250	1.2	097-003450-25012
		1.0	097-003450-35010
		1.0	097-003450-50010
F350	350	1.0	097-003450-50010
F500	500	1.0	097-003450-50010
		1.2	097-003450-50012




**■ SW 70S G3 Ti**

- Layer-wound
- Unalloyed MAG solid wire electrode
- Excellent for rusty, primed, contaminated and galvanised surfaces

**EN 440**
**G 42 2 C/M G3Si1+Ti**
**AWS A-5.18**
**ER 70S-2**
**Chemical analysis**

C	Si	Mn	Ti
0.06	0.8	1.5	0.12

**Shielding gas**

C1 / M21

**Expansion, A5    Yield strength, Rp 0.2%**

≥20 %

≥440 MPa

**Tensile strength, Rm**

≥510 MPa

**Impact energy, Av**

≥47 J (-20 °C)

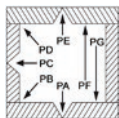
**Approvals**

TÜV / CE

**Materials**

S185 - S355J0, S255N - S355N

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.6	097-003535-20006
		0.8	097-003535-20008
		1.0	097-003535-20010
B300	15	0.8	097-003535-30008
		1.0	097-003535-30010
		1.2	097-003535-30012
		1.6	097-003535-30016

■ **SW 70S G3 Bronze**

- Suitable for EWM forceArc and coldArc
- Unalloyed MAG solid wire electrode
- Bronze plated, layer wound
- Low-spatter thanks to high chemical purity
- For industry, craft and repair businesses

**Standards**

DIN EN 14341-A G 42 4 M/C G3Si1

AWS A-5.18 ER 70S-6

Material number 1.5125

**Chemical analysis**

C	Si	Mn	P	S
0.08	0.9	1.5	0.012	0.011

**Shielding gas**

C1 / M21 / M22 - M33

**Expansion, A5 Yield strength, Rp 0.2%**

≥20 % ≥420 MPa

**Tensile strength, Rm**

500 MPa - 640 MPa

**Impact energy, Av**

≥47 J (-40 °C)

**Approvals**

TÜV / DB / GL / LR

**Materials**

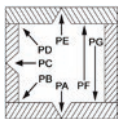
S185 - S355G1, S255N - S355N, P255NH - P355NH, P235GH - P285NH, P 235-P355T2,

20MnNb6, L210 - L360NB

Shipbuilding steels A, B, D, E

Cast steel GS-38-GS-52

Packing drum	kg	Ø/mm	Item no.
B300	15	0.8	097-003562-30008
		1.0	097-003562-30010
		1.2	097-003562-30012
		1.6	097-003562-30016
F250	250	0.8	097-003562-25008
		1.0	097-003562-25010
		1.2	097-003562-25012


**■ SW 70S G3 Brillance**

- Suitable for EWM forceArc and coldArc
- Bright, layer wound
- Very low spatter in all power ranges
- Ideal for automated welding
- Unalloyed MAG solid wire electrode

**DIN EN ISO 14341-A**

G42 2 C / G 42 4 M G3 Si1

**AWS A-5.18**

ER 70S-6

**Material number**

1.5125

**Chemical analysis**

C	Si	Mn
0.07	0.85	1.45

**Shielding gas**

C1 / M21 / M22 - M33

**Expansion, A5 Yield strength, Rp 0.2%**

≥25 %

≥420 MPa

**Tensile strength, Rm**

≥520 MPa

**Impact energy, Av**

≥85 J (20 °C)

**Approvals**

TÜV / DB / CE

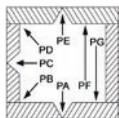
**Materials**

S185 - S355G1, S255N - S355N, P255NH - P355NH, P235GH - P285NH, P235 - P355T2, 20MnNb6, L210 - L360NB

Shipbuilding steels A, B, D, E

Cast steel GS-38–GS-52

Packing drum	kg	Ø/mm	Item no.
F250	250	0.8	097-003689-25008
		1.0	097-003689-25010
		1.2	097-003689-25012
		1.6	097-003689-25016
B300	15	0.8	097-003689-30008
		1.0	097-003689-30010
		1.2	097-003689-30012
		1.6	097-003689-25016



## ■ SW 70S G4

- Suitable for EWM forceArc and coldArc
- Unalloyed MAG solid wire electrode
- Copper-plated, layer wound
- Low-spatter thanks to high chemical purity
- For industry, craft and repair businesses

**Standards**

DIN EN 14341-A	G 42 2C G4Si1, G 46 4M G4Si1
AWS A-5.18	ER 70S-6
Material number	1.5130

**Chemical analysis**

C	Si	Mn	P	S
0.08	1	1.7	0.02	0.015

**Shielding gas**

C1 / M21 / M22 - M33

**Expansion, A5 Yield strength, Rp 0.2%**

≥20 %      ≥460 MPa

**Tensile strength, Rm**

530 J - 680 MPa

**Impact energy, Av**

≥47 J (-40 °C)

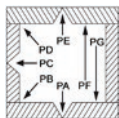
**Approvals**

TÜV / DB / GL / CE

**Materials**

S185 - S355G1, S255N - S355N, P255NH - P355NH, P235GH - P285NH, P235 - P355T2,  
20MnNb6, L210 - L360NB  
Shipbuilding steels A, B, D, E

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.8	097-003451-20008
		1.0	097-003451-20010
B300	15	0.8	097-003451-30008
		1.0	097-003451-30010
		1.2	097-003451-30012
	18	1.6	097-003451-30016
		0.8	097-003451-31808
		1.0	097-003451-31810
F250	250	1.2	097-003451-25012
		1.6	097-003451-25016
		1.0	097-003451-50010
F500	500	1.0	097-003451-50010
		1.2	097-003451-50012


**■ SW 70S G4 Bronze**

- Suitable for EWM forceArc and coldArc
- Unalloyed MAG solid wire electrode
- Bronze plated, layer wound
- Low-spatter thanks to high chemical purity
- For industry, craft and repair businesses

**Standards**

DIN EN 14341-A	G 42 2C G4Si1, G 46 4M G4Si1
AWS A-5.18	ER 70S-6
Material number	1.5130

**Chemical analysis**

C	Si	Mn	P	S
0.08	1	1.7	0.02	0.015

**Shielding gas**

C1 / M21 / M22 - M33

**Expansion, A5 Yield strength, Rp 0.2%**

≥20 %      ≥460 MPa

**Tensile strength, Rm**

530 MPa - 680 MPa

**Impact energy, Av**

&gt;47 J (-40 °C)

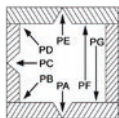
**Approvals**

TÜV / DB / CE

**Materials**

 S185 - S355G1, S255N - S355N, P255NH - P355NH, P235GH - P285NH, P235 - P355T2,  
 20MnNb6, L210 - L360NB  
 Shipbuilding steels A, B, D, E

Packing drum	kg	Ø/mm	Item no.
B300	15	0.8	097-003564-30008
		1.0	097-003564-30010
		1.2	097-003564-30012
		1.6	097-003564-30016
F250	250	1.0	097-003564-25010
		1.2	097-003564-25012
		1.6	097-003564-25016

**■ SW 70S G4 Brilliance**

- Suitable for EWM forceArc and coldArc
- Developed specially for EWM forceArc
- Bright, layer wound
- Very low spatter in all power ranges
- Ideal for automated welding
- Unalloyed MAG solid wire electrode

**DIN EN ISO 14341-A**G 46 2 C G4Si1/ G 46 4 M  
G4 Si1**AWS A-5.18**

ER 70S-6

**Material number**

1.5130

**Chemical analysis**

C	Si	Mn
0.07	0.95	1.75

**Shielding gas**

C1 / M21 / M22 - M33

**Expansion, A5 Yield strength, Rp 0.2%**

≥25 %

≥460 MPa

**Tensile strength, Rm**

520 MPa - 560 MPa

**Impact energy, Av**

≥90 J (20 °C)

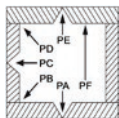
**Approvals**

TÜV / DB / CE

**Materials**

S185 - S355G1, S255N - S355N, P255NH - P355NH, P235GH - P285GH, P235 - P355T2, 20MnNb6, L210 - L360NB  
 Shipbuilding steels A, B, D, E  
 Cast steel GS-38-GS-52

Packing drum	kg	Ø/mm	Item no.
F250	250	0.8	097-003690-25008
		1.0	097-003690-25010
		1.2	097-003690-25012
		1.6	097-003690-25016
B300	15	0.8	097-003690-30008
		1.0	097-003690-30010
		1.2	097-003690-30012
		1.6	097-003690-30016


**■ SW 80S NiCu**

- Unalloyed MAG solid wire electrode
- Copper-plated, layer wound
- For welding weatherproof steels

**Standards**

DIN EN ISO 16834-A      G ZMn3Ni1Cu

AWS A-5.28                ER 80S-G

**Chemical analysis**

C	Si	Mn	Ni	Cu
0.08	0.8	1.4	0.8	0.4

**Shielding gas**

C1 / M2 / M3

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                      ≥450 MPa

**Tensile strength, Rm**

≥550 MPa

**Impact energy, Av**

≥80 J (20 °C) / ≥47 J (-20 °C)

**Approvals**

DB / CE

**Materials**

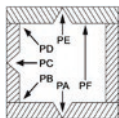
S235JRW - S355J2G1W, 9CrNiCuP3-2-4

Packing drum	kg	Ø/mm	Item no.
B300	15	0.8	097-003524-30008
		1.0	097-003524-30010
		1.2	097-003524-30012



## Wire electrodes

- Low-alloy ● High tensile



### ■ SW 80S Ni1

- Solid wire electrode for welding cold tough fine-grain structural steels
- For operating temperatures up to -60 °C
- Use in offshore technology, e.g. in pipe construction
- Resistant to products containing chloride and acid gases
- Recommended for root welding

### Standards

DIN EN ISO 14341-A G 42 6 Z 3Ni1

AWS A-5.28 ER 80S-Ni1

### Chemical analysis

C	Si	Mn	Ni
0.09	0.5	1.05	0.9

### Shielding gas

C1 / M2 / M3

### Expansion, A5 Yield strength, Rp 0.2%

≥24 %      ≥470 MPa

### Tensile strength, Rm

≥560 MPa

### Impact energy, Av

≥47 J (-60 °C)

### Approvals

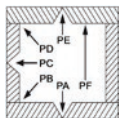
CE

### Materials

P420NH, Gp240GH-GP280GH, S185-S355G1, S255-S355N

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003622-30010
		1.2	097-003622-30012




**■ SW 80S Ni2**

- Solid wire electrode for welding cold tough fine-grain structural steels
- For operating temperatures up to -60 °C
- Use in offshore technology, e.g. in pipe construction
- Resistant to products containing chloride and acid gases
- Recommended for root welding

**Standards**

DIN EN ISO 14341-A	G 2Ni 2
AWS A-5.28	ER 80S-Ni2

**Chemical analysis**

C	Si	Mn	Ni
0.09	0.52	1.1	2.45

**Shielding gas**

C1 / M21

**Yield strength, Rp 0.2%**

≥420 MPa

**Tensile strength, Rm**

≥570 MPa

**Impact energy, Av**

≥47 J (-60 °C) / ≥100 J (20 °C)

**Approvals**

CE

**Materials**

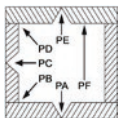
S255N — S380N, S255NL, 14Ni6, 12Ni14

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003640-30010
		1.2	097-003640-30012



## Wire electrodes

- Low-alloy ● High tensile



### ■ SW 100S NiMo

- Suitable for EWM forceArc and coldArc
- Low-alloy MAG solid wire electrode
- Copper-plated, layer wound
- High-tensile welding consumable for vehicle construction
- For welding high-tensile fine-grain structural steels up to 690 MPa yield strength
- For wall thicknesses up to a maximum of 15 mm and fillet welds

### Standards

DIN EN ISO 16834-A G 62 5 Z Mn3Ni1Mo

AWS A-5.28 ER 100S-G

### Chemical analysis

C	Si	Mn	Ni	Mo	Ti
0.08	0.57	1.77	1	0.38	0.15

### Shielding gas

C1 / M21

### Expansion, A5 Yield strength, Rp 0.2%

≥18 %      ≥690 MPa

### Tensile strength, Rm

≥740 MPa

### Impact energy, Av

≥100 J (20 °C) / ≥47 J (-40 °C)

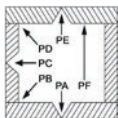
### Approvals

TÜV / DB / CE

### Materials

S690QL, S700MC, S420N - S500N, P420NH - P500NH, S420NL - S500NL

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003525-30010
		1.2	097-003525-30012


**■ SW 100S NiMoCr**

- Low-alloy MAG solid wire electrode
- Copper-plated, layer wound
- For welding high-tensile fine-grain structural steels up to 690 MPa yield strength
- High-strength welding consumables for vehicle and crane construction
- Low-spatter thanks to high chemical purity
- Suitable for EWM forceArc

**Standards**

DIN EN ISO 16834-A      G 69 5 M Mn3Ni1CrMo

AWS A-5.28              ER 110S-G

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	V
0.09	0.52	1.57	0.3	1.4	0.25	0.09

**Shielding gas**

M21

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                      ≥690 MPa

**Tensile strength, Rm**

≥790 MPa

**Impact energy, Av**

≥80 J (20 °C) / ≥47 J (-50 °C)

**Approvals**

TÜV / DB / CE

**Materials**

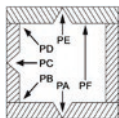
S690QL1, S420N - S500N, P420NH - P500NH, S420NL - S500NL, S690QL

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003548-30010
		1.2	097-003548-30012



## Wire electrodes

- Low-alloy ● High tensile



### ■ SW 120S NiMoCr

- Low-alloy MAG solid wire electrode
- Copper-plated, layer wound
- High-strength welding consumables for vehicle and crane construction
- For welding high-tensile, water-quenched fine-grain structural steels
- Low-spatter thanks to high chemical purity
- Suitable for EWM forceArc

### Standards

DIN EN ISO 16834-A      G 89 6 M Mn4Ni2CrMo

AWS A-5.28              ER 120S-G

### Chemical analysis

C	Si	Mn	Cr	Ni	Mo
0.09	0.8	1.8	0.31	2.2	0.55

### Shielding gas

M21

### Expansion, A5      Yield strength, Rp 0.2%

≥ 14 %                      ≥ 885 MPa

### Tensile strength, Rm

≥ 940 MPa

### Impact energy, Av

≥ 70 J (20 °C) / ≥ 47 J (-60 °C)

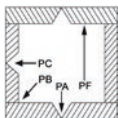
### Approvals

TÜV / DB / CE

### Materials

S890QL, S960QL, S690QL, S690QL1

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003558-30010
		1.2	097-003558-30012


**■ SW 80S Mo**

- Suitable for EWM forceArc and coldArc
- Low-alloy MAG solid wire electrode
- Copper-plated, layer wound
- Creep resistant filler for pipe and container construction
- Low-spatter thanks to high chemical purity
- Maximum operating temperature 500 °C

**Standards**

DIN EN ISO 21952-A	G MoSi
AWS A-5.28	ER 80S-G
Material number	1.5424

**Chemical analysis**

C	Si	Mn	Mo
0.1	0.6	1.15	0.52

**Shielding gas**

M21

**Expansion, A5 Yield strength, Rp 0.2%**

≥22 %      ≥460 MPa

**Tensile strength, Rm**

≥560 MPa

**Impact energy, Av**

≥60 J (20 °C) / ≥47 J (-20 °C)

**Approvals**

TÜV / DB / CE

**Materials**

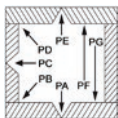
P235G1TH - P255G1TH, P310GH, 16Mo3, L320, L360NB - L415NB, P 265 GH

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003547-30010
		1.2	097-003547-30012
		1.6	097-003547-30016



## Wire electrodes

- Low-alloy ● Creep resistant



### ■ SW 80S CrMo1

- Suitable for EWM forceArc and coldArc
- Low-alloy MAG solid wire electrode
- Copper-plated, layer wound
- Creep resistant filler for pipe and container construction
- Low-spatter thanks to high chemical purity
- Maximum operating temperature 550 °C

### Standards

DIN EN ISO 21952-A G CrMo1Si

AWS A-5.28 ER 80S-G

Material number 1.7339

### Chemical analysis

C	Si	Mn	Cr	Mo
0.1	0.6	1	1.2	0.52

### Shielding gas

M21

### Expansion, A5 Yield strength, Rp 0.2%

≥20 %      ≥305 MPa

### Tensile strength, Rm

≥450 MPa

### Impact energy, Av

≥100 J (20 °C) / ≥47 J (-10 °C)

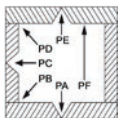
### Approvals

TÜV / DB / CE

### Materials

13CrMo4-5

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003546-30010
		1.2	097-003546-30012


**■ SW 90S CrMo2**

- Low-alloy MAG solid wire electrode
- Copper-plated, layer wound
- Creep resistant filler for pipe and container construction
- Low-spatter thanks to high chemical purity
- Maximum operating temperature 600 °C
- For industry, craft and repair businesses

**Standards**

DIN EN ISO 21952-A	G CrMo2Si
AWS A-5.28	ER 90S-G
Material number	1.7384

**Chemical analysis**

C	Si	Mn	Cr	Mo
0.08	0.6	0.92	2.45	1

**Shielding gas**

M21

**Expansion, A5 Yield strength, Rp 0.2%**

≥22 %      ≥355 MPa

**Tensile strength, Rm**

≥540 MPa

**Impact energy, Av**

≥80 J (20 °C)

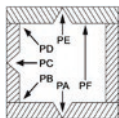
**Approvals**

TÜV / DB / CE

**Materials**

10CrMo9-10, 10CrSiMoV7

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003526-30010
		1.2	097-003526-30012
		1.6	097-003526-30016



## ■ SW 307 Si

- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Excellent welding characteristics thanks to high Si content
- Suitable for dissimilar joints and buffer layers
- Strain-hardening

**Standards**

DIN EN ISO 14343-A G 18 8 Mn

AWS A-5.9 ER 307 L

Material number 1.4370

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.08	0.9	7	18	8

**Shielding gas**

M12 / M13

**Expansion, A5 Yield strength, Rp 0.2%**

≥40 %      ≥400 MPa

**Tensile strength, Rm**

≥650 MPa

**Impact energy, Av**

≥140 J (20 °C) / ≥32 J (-196 °C)

**Approvals**

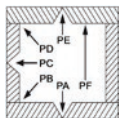
TÜV / CE

**Materials**

Dissimilar joints, cladding, buffer layers for hardfacing, high C-content and difficult to weld steels, manganese steel (example: 1.3401)

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.8	097-003473-20008
		1.0	097-003473-20010
BS300	15	0.8	097-003473-30008
		1.0	097-003473-30010
		1.2	097-003473-30012
		1.6	097-003473-30016
F250	250	1.0	097-003473-25010
		1.2	097-003473-25012




**SW 308 LSi**

- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Excellent welding characteristics thanks to high Si content
- For non-rusting Cr-Ni steels with low C content
- Maximum operating temperature 350 °C
- Can be used for stabilised and non-stabilised Cr-Ni steels
- Cold tough up to -196 °C

**Standards**

DIN EN ISO 14343-A      G 19 9 L Si

AWS A-5.9                      ER 308 L Si

Material number              1.4316

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.02	0.9	1.8	19	9

**Shielding gas**

M12

**Expansion, A5      Yield strength, Rp 0.2%**

≥42 %                      ≥390 MPa

**Tensile strength, Rm**

≥600 MPa

**Impact energy, Av**

≥50 J (-196 °C) / ≥120 J (20 °C)

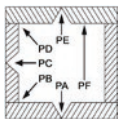
**Approvals**

TÜV / DB / CE

**Materials**

1.4301, 1.4303, 1.4306, 1.4308, 1.4310, 1.4311, 1.4319, 1.4541, 1.4550, 1.4552

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.8	097-003544-20008
		1.0	097-003544-20010
BS300	15	0.8	097-003544-30008
		1.0	097-003544-30010
		1.2	097-003544-30012
		1.6	097-003544-30016
F250	250	1.0	097-003544-25010



## ■ SW 309 LSi

- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Excellent welding characteristics thanks to high Si content
- Suitable for dissimilar joints and buffer layers
- Maximum operating temperature 300 °C

**Standards**

DIN EN ISO 14343-A G 23 12 L Si

AWS A-5.9 ER 309 L Si

Material number 1.4332

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.02	0.8	1.8	23.5	13

**Shielding gas**

M12

**Expansion, A5 Yield strength, Rp 0.2%**

≥35 %

≥450 MPa

**Tensile strength, Rm**

≥650 MPa

**Impact energy, Av**

≥60 J (-120 °C)

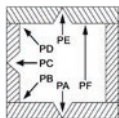
**Approvals**

TÜV / CE

**Materials**

Austenite-ferrite joints (dissimilar), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers

Packing drum	kg	Ø/mm	Item no.
BS300	15	0.8	097-003554-30008
		1.0	097-003554-30010
		1.2	097-003554-30012
		1.6	097-003554-30016


**SW 310**

- High-alloy MAG solid wire electrode
- Weld metal made of fully austenitic chrome nickel steel
- For welding heatproof steels
- Scale resistant up to 1150 °C
- Not resistant in gases containing sulphur

**Standards**

DIN EN ISO 14343-A      G 25 20

AWS A-5.9                      ER 310

Material number            1.4842

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.11	0.4	1.5	25	20

**Shielding gas**

M12 / M13

**Expansion, A5      Yield strength, Rp 0.2%**

≥40 %                      ≥390 MPa

**Tensile strength, Rm**

≥590 MPa

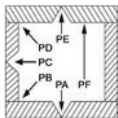
**Impact energy, Av**

≥170 J (20 °C) / ≥60 J (-196 °C)

**Materials**

1.4710, 1.4713, 1.4726, 1.4745, 1.4823, 1.4832, 1.4837, 1.4840, 1.4841, 1.4845, 1.4846, 1.4848, 1.4849

Packing drum	kg	Ø/mm	Item no.
BS300	15	0.8	097-003513-30008
		1.0	097-003513-30010
		1.2	097-003513-30012
		1.6	097-003513-30016

■ **SW 312**

- High-alloy MAG solid wire electrode
- The weld metal features a ferrite-austenite structure
- High strength and wear resistance after welding
- Suitable for dissimilar joints and buffer layers
- Scale resistant up to 1100 °C
- Suitable for transformer

**Standards**

DIN EN ISO 14343-A	G 29 9
AWS A-5.9	ER 312
Material number	1.4337

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.1	0.5	1.9	29	9

**Shielding gas**

M12

**Expansion, A5    Yield strength, Rp 0.2%**

≥25 %                      ≥600 MPa

**Tensile strength, Rm**

≥750 MPa

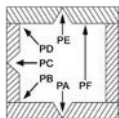
**Impact energy, Av**

≥100 J (20 °C)

**Materials**

Corrosion-resistant similar steel and cast steel (e.g. 1.4762, 1.4085), difficult to weld steel, manganese steel, repairs and wear-resistant layers

Packing drum	kg	Ø/mm	Item no.
B5300	15	0.8	097-003514-30008
		1.0	097-003514-30010
		1.2	097-003514-30012
		1.6	097-003514-30016


**■ SW 316 LSi**

- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Excellent welding characteristics thanks to high Si content
- For non-rusting Cr-Ni steels with low C content
- Maximum operating temperature 400 °C
- Can be used for stabilised and non-stabilised Cr-Ni steels

**Standards**

DIN EN ISO 14343-A	G 19 12 3 L Si
AWS A-5.9	ER 316 L Si
Material number	1.4430

**Chemical analysis**

C	Si	Mn	Mo	Cr	Ni
0.02	0.85	1.85	2.7	19	12

**Shielding gas**

M12

**Expansion, A5 Yield strength, Rp 0.2%**
 $\geq 37\%$        $\geq 400$  MPa

**Tensile strength, Rm**
 $\geq 610$  MPa

**Impact energy, Av**
 $\geq 120$  J (-60 °C)

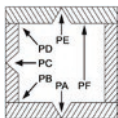
**Approvals**

TÜV / DB / CE

**Materials**

1.4401, 1.4404, 1.4406, 1.4408, 1.4429, 1.4435, 1.4436, 1.4541, 1.4550, 1.4571, 1.4580, 1.4581, 1.4583

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.8	097-003545-20008
		1.0	097-003545-20010
B5300	15	0.8	097-003545-30008
		1.0	097-003545-30010
		1.2	097-003545-30012
		1.6	097-003545-30016

**■ SW 318 Si**

- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Excellent welding characteristics thanks to high Si content
- Can be used for welding stabilised Cr-Ni steels
- Good resistance to corrosion due to greater Nb and Mo content
- Maximum operating temperature 400 °C

**Standards**

DIN EN ISO 14343-A	G 19 12 3 Nb Si
AWS A-5.9	ER 318 Si
Material number	1.4576

**Chemical analysis**

C	Si	Mn	Mo	Nb	Cr	Ni
0.04	0.8	1.8	2.7	0.5	19.5	12.5

**Shielding gas**

M12 / M13

**Expansion, A5 Yield strength, Rp 0.2%**

≥36 %      ≥400 MPa

**Tensile strength, Rm**

≥610 MPa

**Impact energy, Av**

≥100 J (20 °C)

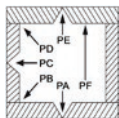
**Approvals**

TÜV / DB / CE

**Materials**

1.4401, 1.4404, 1.4408, 1.4420, 1.4435, 1.4436, 1.4571, 1.4573, 1.4580, 1.4581, 1.4583

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.8	097-003476-20008
		1.0	097-003476-20010
BS300	15	0.8	097-003476-30008
		1.0	097-003476-30010
		1.2	097-003476-30012
		1.6	097-003476-30016
F250	250	1.0	097-003476-25010


**■ SW 347 Si**

- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Excellent welding characteristics thanks to high Si content
- Can be used for welding stabilised Cr-Ni steels
- Suitable for joint welding of stainless and heat-resistant steels
- Very good welding and flow characteristics
- Maximum operating temperature 400 °C
- Scale-resistant up to 800 °C
- Cold tough up to -196 °C

**Standards**

DIN EN ISO 14343-A      G 19 9 Nb Si

AWS A-5.9                ER 347 Si

Material number        1.4551

**Chemical analysis**

C	Si	Mn	Mo	Nb	Cr	Ni	Cu
0.05	0.8	1.2	0.4	0.5	19.5	9.7	0.4

**Shielding gas**

M11 / M12 / M13

**Expansion, A5      Yield strength, Rp 0.2%**

≥35 %                    ≥400 MPa

**Tensile strength, Rm**

≥600 MPa

**Impact energy, Av**

≥100 J (20 °C)

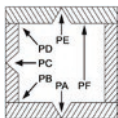
**Approvals**

CE

**Materials**

Martensitic chrome steels, fine castings and steel castings of type 13% Cr-4% Ni.1.4541, 1.4550, 1.4552, 1.4301, 1.4312, 1.4546, 1.4311, 1.4306

Packing drum	kg	Ø/mm	Item no.
B5300	15	0.8	097-003568-30008
		1.0	097-003568-30010
		1.2	097-003568-30012
		1.6	097-003568-30016



## ■ SW 410 NiMo

- High-alloy MAG solid wire electrode
- Suitable for connecting the same type of martensitic-ferrite steels
- Use in water turbine, steam power plant and compressor construction
- Resistant to vapour, water and seawater atmospheres

**Standards**

DIN EN ISO 14343-A	G 13 4
AWS A-5.9	ER 410 NiMo
Material number	1.4351

**Chemical analysis**

C	Si	Mn	Mo	Cu	Ni	Cr	Nb
0.03	0.3	0.4	0.5	0.3	4.5	13	0.5

**Shielding gas**

M13

**Expansion, A5 Yield strength, Rp 0.2%**

≥10 %      ≥750 MPa

**Tensile strength, Rm**

≥950 MPa

**Impact energy, Av**

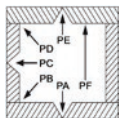
≥35 J (20 °C)

**Materials**

1.4313, 1.4317, 1.4351, 1.4414

Packing drum	kg	Ø/mm	Item no.
B5300	15	0.8	097-003589-30008
		1.0	097-003589-30010
		1.2	097-003589-30012
		1.6	097-003589-30016




**■ SW 625**

- High-alloy MAG solid wire electrode
- Maximum operating temperature of the components 1000 °C
- Cold tough up to -196 °C
- Scale resistant up to 1100 °C
- Weld metal resistant to phosphoric acid, hydrochloric acid, sulphuric acid and nitric acid
- For permanent use in a temperature range from -196 °C to 550 °C

**Standards**
**DIN EN ISO 18274**                      S Ni 6625 (NiCr22Mo9Nb)

**AWS A-5.14**                                ER NiCrMo3

**Material number**                        2.4831

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	Nb
0.01	0.1	0.05	22	64	9	3.6

**Shielding gas**

M12

**Expansion, A5      Yield strength, Rp 0.2%**

≥35 %                                        ≥480 MPa

**Tensile strength, Rm**

≥780 MPa

**Impact energy, Av**

≥60 J (-196 °C)

**Approvals**

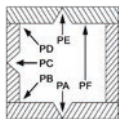
CE / TÜV

**Materials**

Alloy 625, alloy 800 and similar Ni-Cr alloys

1.4529, 1.4539, 1.4558, 1.4876, 1.5680, 1.5681, 1.5662, 2.4605, 2.4618, 2.4856, 2.4858, 2.4951, 2.4952

Packing drum	kg	Ø/mm	Item no.
BS300	15	0.8	097-003515-30008
		1.0	097-003515-30010
		1.2	097-003515-30012



## ■ SW 904 L



- High-alloy MAG solid wire electrode
- Annealed and layer wound
- Suitable for boiler and tube steels
- Resistant to media containing sulphur and chloride
- Maximum operating temperature 400 °C
- Cold tough up to -196 °C

**Standards**

DIN EN ISO 14343-A G 20 25 5 Cu L

AWS A-5.9 ER 385

Material number 1.4519

**Chemical analysis**

C	Si	Mn	Mo	Nb	Cr	Ni	Cu	Co	Al	N	B
0.02	0.3	1.5	4.2	0.05	19.8	25	1.4	0.5	0.5	0.05	0.003

**Shielding gas**

I1 / I3 (20 - 30 % He)

**Expansion, A5 Yield strength, Rp 0.2%**

≥35 %      ≥410 MPa

**Tensile strength, Rm**

≥600 MPa

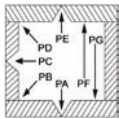
**Impact energy, Av**

≥130 J (-196 °C)

**Materials**

1.4529,1.4539

Packing drum	kg	Ø/mm	Item no.
BS300	15	0.8	097-003634-30008
		1.0	097-003634-30010
		1.2	097-003634-30012
		1.6	097-003634-30016
F250	250	1.2	097-003634-25012


**■ SW NiCr82**

- High-alloy MAG solid wire electrode
- Cold tough up to -196 °C
- Scale-resistant up to 1,200 °C
- For corrosion-resistant alloys with nickel, stainless steels and carbon steels
- Resistant to embrittlement
- High strength and creep strength values
- Dissimilar joints in the petrochemical industry and offshore technology (e.g. furnaces)

**Standards**

DIN EN ISO 18274	S Ni 6082 (NiCr20Nb)
AWS-SFA-5.14	ER NiCr 3
Material number	2.4806

**Chemical analysis**

C	Si	Mn	Cr	Ni	Fe	Nb	Cu	Co	Ti	S	P
0.05	0.5	3.5	22	67	3	3	0.5	0.1	0.75	0.015	0.015

**Shielding gas**

I1 / I3 (40 % He)

**Expansion, A5    Yield strength, Rp 0.2%**

≥35 %                      ≥480 MPa

**Tensile strength, Rm**

≥780 MPa

**Impact energy, Av**

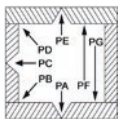
≥60 J (-196 °C)

**Materials**

1.4558, 1.4859, 1.4861, 1.4876, 1.4877, 1.4885, 1.4958, 1.4968, 2.4669, 2.4694, 2.4816, 2.4817, 2.4867, 2.4867, 2.4869, 2.4951, 2.4952

Nickel-based alloys, dissimilar joints (also at temperatures &gt;300 °C), platings, surfacing

Packing drum	kg	Ø/mm	Item no.
BS300	15	0.8	097-003586-30008
		1.0	097-003586-30010
		1.2	097-003586-30012
		1.6	097-003586-30016

**■ SW 2209 Duplex**

- High-alloy MAG solid wire electrode
- Use in a temperature range from -40 °C to 250 °C
- For ferrite-austenitic Cr-Ni-Mo steels
- Resistant to products containing chloride and acid gases
- Use in offshore technology e.g. in pipe construction

**Standards**

DIN EN ISO 14343-A G 22 9 3 LN

AWS A-5.9 ER 2209

Material number 1.4462

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	N
0.015	0.4	1.8	22.5	9	3	0.15

**Shielding gas**

I1 / I3 (20 - 30 % He)

**Expansion, A5 Yield strength, Rp 0.2%**

≥30 %      ≥810 MPa

**Tensile strength, Rm**

≥620 MPa

**Impact energy, Av**

≥65 J (-60 °C) / ≥120 J (20 °C)

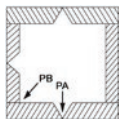
**Approvals**

TÜV / CE / DB

**Materials**

1.4462, 1.4417, 1.4460, 1.4362

Packing drum	kg	Ø/mm	Item no.
BS300	15	0.8	097-003516-30008
		1.0	097-003516-30010
		1.2	097-003516-30012
		1.6	097-003516-30016


**■ SW NiFe55**

- High-alloy MAG solid wire electrode
- Cold welding of grey cast iron, malleable cast iron and spheroidal cast iron
- Highly resistant to cracking and good strength values
- Resistant to embrittlement

**Chemical analysis**

C	Si	Mn	Cu	Co	Ni	Fe
0.03	0.1	0.5	0.04	0.02	55.1	Rest

**Shielding gas**

I1 / M21

**Expansion, A5    Yield strength, Rp 0.2%**

≥40 %

≥580 MPa

**Tensile strength, Rm**

280 MPa

**Hardness**

130

**Materials**

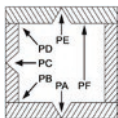
Grey cast iron, malleable cast iron and spheroidal cast iron

Packing drum	kg	Ø/mm	Item no.
S300	15	0.8	097-003572-30008
		1.0	097-003572-30010
		1.2	097-003572-30012
		1.6	097-003572-30016



## Wire electrodes

● High-alloy ● hardfacing



■ SW Hard 600

- High-alloy MAG solid wire electrode
- Copper-plated, layer wound
- For impact loading and mineral abrasion
- High chromium content - good with aggressive media
- Up to 60 HRC



### Standards

EN 14700 S Fe8

Material number 1.4718

### Chemical analysis

C	Si	Cr
0.45	3	9.5

### Shielding gas

M21

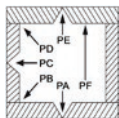
### Hardness

52 - 60 HRC

### Materials

Hardfacing, suitable for wear and impacts

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003549-30010
		1.2	097-003549-30012
		1.6	097-003549-30016


**■ SW 1450 99,5Ti**

- MIG solid wire electrode, aluminium
- Titanium forms fine grains and increases the mechanical qualities
- More resistant to hot cracks than pure aluminium

**Standards**

DIN EN 18273                      S AL 1450 (Al99,5Ti)

AWS A-5.10                         ER 1450

Material number                 3.0805

**Chemical analysis**

Ti	Al
0.15	99.5

**Shielding gas**

I1

**Expansion, A5      Yield strength, Rp 0.2%**

≥35 %                                ≥20 MPa

**Tensile strength, Rm**

≥65 MPa

**Approvals**

TÜV / DB / CE

**Materials**

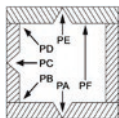
Al99,5Ti, Al99,3, Al99,5, Al99,6, Al99,7, Al99,85,

Packing drum	kg	Ø/mm	Item no.
BS300	7.5	0.8	097-003523-30008
		1.0	097-003523-30010
		1.2	097-003523-30012
		1.6	097-003523-30016



## Wire electrodes

### Aluminium



■ SW 3103 Mn1

- MIG solid wire electrode, aluminium
- Alloy for ship building/marine and offshore technology
- Seawater resistant



#### Standards

DIN EN ISO 18273 S AL 3103 (AlMn1)

AWS A-5.10 ER 3103

#### Chemical analysis

Mn	Si	Mg	Al
1.2	0.3	0.2	Rest

#### Shielding gas

I1

#### Expansion, A5 Yield strength, Rp 0.2%

≥24 %      ≥35 MPa

#### Tensile strength, Rm

≥90 MPa

#### Approvals

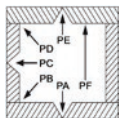
CE

#### Materials

AlMn0,6, AlMn1, AlMn0,2Mg0,1, AlMn1Mg0,5

Packing drum	kg	Ø/mm	Item no.
S300	6.0	0.8	097-003509-30608
		1.0	097-003509-30610
		1.2	097-003509-30612
BS300	7.5	0.8	097-003509-30008
		1.0	097-003509-30010
		1.2	097-003509-30012
		1.6	097-003509-30016
F100	100	0.8	097-003509-10008
		1.0	097-003509-10010
		1.2	097-003509-10012




**■ SW 4043 Si5**

- MIG solid wire electrode, aluminium
- 5% silicon
- Untreated low strength values
- Suitable for subsequent anodisation
- Resistant to hot cracks
- Main areas of use are welds on cast aluminium

**Standards**

DIN EN ISO 18273	S Al 4043A (AlSi5(A))
AWS A-5.10	ER 4043
Material number	3.2245

**Chemical analysis**

Si	Al
5	Rest

**Expansion, A5    Yield strength, Rp 0.2%**

≥8 %                      ≥40 MPa

**Tensile strength, Rm**

≥120 MPa

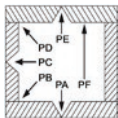
**Approvals**

DB / CE

**Materials**

AlSiMg, AlMgSi

Packing drum	kg	Ø/mm	Item no.
S200	2.0	0.8	097-003553-20008
		1.0	097-003553-20010
BS300	7.5	0.8	097-003553-30008
		1.0	097-003553-30010
		1.2	097-003553-30012
		1.6	097-003553-30016



## ■ SW 4047 Si12

- MIG solid wire electrode, aluminium
- 12% silicon
- Untreated low strength values
- Not suitable for subsequent anodisation
- Main areas of use are welds on cast aluminium

**Standards**

DIN EN ISO 18273 S AL 4047A (AlSi12(A))

AWS A-5.10 ER 4047

Material number 3.2585

**Chemical analysis**

Si	Al
12	Rest

**Shielding gas**

I1

**Expansion, A5 Yield strength, Rp 0.2%**

≥5 % ≥60 MPa

**Tensile strength, Rm**

≥130 MPa

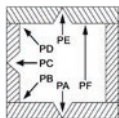
**Approvals**

DB / CE

**Materials**

AlSiMg, AlMgSi

Packing drum	kg	Ø/mm	Item no.
BS300	7	0.8	097-003522-30008
		1.0	097-003522-30010
		1.2	097-003522-30012
		1.6	097-003522-30016


**■ SW 5087 Mg4,5 MnZr**

- MIG solid wire electrode, aluminium
- High strength, extremely resistant to corrosion, resistant to sea water
- Very good mechanical quality values

**Standards**

DIN EN ISO 18273                      S AL 5087 (AlMg4,5MnZr)

AWS A-5.10                              ER 5087

Material number                      3.3546

**Chemical analysis**

Mg	Mn	Cr	Zr	Al
4.5	1	0.15	0.15	Rest

**Shielding gas**

I1

**Expansion, A5      Yield strength, Rp 0.2%**

≥ 17 %                                      ≥ 125 MPa

**Tensile strength, Rm**

≥ 275 MPa

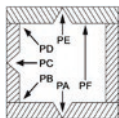
**Approvals**

TÜV / DB / GL / CE / ABS

**Materials**

AlMg3,5, AlMg4,5, AlMg5, AlMg3,5Mn, AlMg3,5Mn0,4, AlMg4,5Mn0,7, AlMg5Mn0,4, AlMg5Mn1, AlMgSi1, G-AlMg3, G-AlMg5

Packing drum	kg	Ø/mm	Item no.
BS300	7	0.8	097-003644-30008
		1.0	097-003644-30010
		1.2	097-003644-30012
		1.6	097-003644-30016



## ■ SW 5183 Mg4,5 Mn

- MIG solid wire electrode, aluminium
- 4.5% magnesium, 0.7% manganese
- High strength, extremely resistant to corrosion, resistant to sea water
- Suitable for subsequent anodisation

**Standards**

DIN EN ISO 18273 S AL 5183 (AlMg4,5Mn0,7)

AWS A-5.10 ER 5183

Material number 3.3548

**Chemical analysis**

Mg	Mn	Cr	Al
4.5	0.7	0.15	Rest

**Shielding gas**

I1

**Expansion, A5 Yield strength, Rp 0.2%**

≥17 %      ≥125 MPa

**Tensile strength, Rm**

≥275 MPa

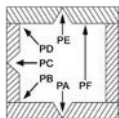
**Approvals**

TÜV / DB / GL / LR / CE / ABS

**Materials**

AlMg3,5, AlMg4,5, AlMg5, AlMg3,5Mn, AlMg3,5Mn0,4, AlMg4,5Mn0,7, AlMg5Mn0,4, AlMg5Mn1, AlMgSi1, G-AlMg3, G-AlMg5

Packing drum	kg	Ø/mm	Item no.
BS300	7	0.8	097-003643-30008
		1.0	097-003643-30010
		1.2	097-003643-30012
		1.6	097-003643-30016


**■ SW 5183 Mg4,5 Mn Premium**

- For weld-critical connections
- Optimised surface
- MIG solid wire electrode, aluminium
- 4.5% magnesium, 0.7% manganese
- High strength, extremely resistant to corrosion, resistant to sea water
- Suitable for subsequent anodisation

**Standards**

DIN EN ISO 18273                      S AL 5183 (AlMg4,5Mn0,7)

AWS A-5.10                              ER 5183

Material number                      3.3548

**Chemical analysis**

Mg	Mn	Cr	Al
4.5	0.7	0.15	Rest

**Shielding gas**

I1

**Expansion, A5      Yield strength, Rp 0.2%**

≥17 %                                      ≥125 MPa

**Tensile strength, Rm**

≥275 MPa

**Approvals**

TÜV / DB / GL / LR / CE / ABS

**Materials**

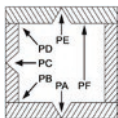
AlMg3,5, AlMg4,5, AlMg5, AlMg3,5Mn, AlMg3,5Mn0,4, AlMg4,5Mn0,7, AlMg5Mn0,4, AlMg5Mn1, AlMgSi1, G-AlMg3, G-AlMg5

Packing drum	kg	Ø/mm	Item no.
B5300	7	1.2	097-003686-30012



## Wire electrodes

### Aluminium



#### ■ SW 5356 Mg5

- MIG solid wire electrode, aluminium
- 5% magnesium
- High strength, extremely resistant to corrosion, resistant to sea water
- Suitable for subsequent anodisation



#### Standards

DIN EN ISO 18273 S AL 5356 (AlMg5Cr)

AWS A-5.10 ER 5356

Material number 3.3556

#### Chemical analysis

Mg	Mn	Cr	Ti	Al
5	0.15	0.1	0.1	Rest

#### Shielding gas

I1

#### Expansion, A5 Yield strength, Rp 0.2%

≥8 %      ≥120 MPa

#### Tensile strength, Rm

≥250 MPa

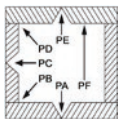
#### Approvals

TÜV / DB / GL / LR / CE

#### Materials

AlMg3, AlMg4,5, AlMg5, AlMgSi1, G-AlMg3, G-AlMg3

Packing drum	kg	Ø/mm	Item no.
S200	2.0	0.8	097-003645-20008
		1.0	097-003645-20010
BS300	7	0.8	097-003645-30008
		1.0	097-003645-30010
		1.2	097-003645-30012
		1.6	097-003645-30016


**■ SW 5754 Mg3**

- MIG solid wire electrode, aluminium
- 3% magnesium
- Medium strength, corrosion resistant
- Suitable for subsequent anodisation

**Standards**

DIN EN ISO 18273                      S Al 5754 (AlMg3)

AWS A-5.10                                ER 5754

Material number                        3.3536

**Chemical analysis**

Mg	Mn	Cr	Al
3	0.3	0.3	Rest

**Shielding gas**

I1

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                                      ≥80 MPa

**Tensile strength, Rm**

≥190 MPa

**Approvals**

TÜV / DB / GL / CE

**Materials**

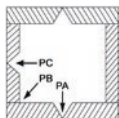
AlMg1, AlMg2, AlMg2,5, AlMg3,5, AlMg0,5Mn, AlMg1Mn0,5, AlMg2Mn0,8, AlMgSi0,5, AlMgSi0,7

Packing drum	kg	Ø/mm	Item no.
S200	2	0.8	097-003646-20008
		1.0	097-003646-20010
BS300	7	0.8	097-003646-30008
		1.0	097-003646-30010
		1.2	097-003646-30012
		1.6	097-003646-30016



## Wire electrodes

### Copper-based



#### ■ SW OF Cu

- Oxygen-free copper-based alloy
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Good resistance to wear and abrasion
- Excellent flow characteristics

#### Chemical analysis

Cu  
99.95

#### Shielding gas

I1

#### Expansion, A5

≥40 %

#### Tensile strength, Rm

≥200 MPa

#### Impact energy, Av

60 J (20 °C)

#### Hardness

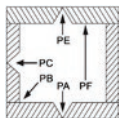
50 HB

#### Materials

Connecting of copper components and solder preform, suitable for furnace soldering, used in vacuum engineering and the aerospace and astronautics industry

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003610-30010
		1.2	097-003610-30012




**SW CuSi2**

- Copper-based, MIG/MAG solid wire electrode
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Resistant to high temperatures and corrosion
- Very good welding and flow characteristics
- Pulse arc recommended, approved for coldArc
- Designed for galvanised metal sheets in the automotive industry
- Joint welding of Cu materials and low-alloy steels and cast iron

**Standards**

DIN EN ISO 24373                      S Cu 6511 (CuSi2Mn1)

AWS A-5.7                                ER CuSi-A

**Chemical analysis**

Si	P	Mn	Sn	Cu
1.8	0.01	1	0.22	Rest

**Shielding gas**

I1

**Expansion, A5**

≥45 %

**Tensile strength, Rm**

≥285 MPa

**Impact energy, Av**

≥75 J (20 °C)

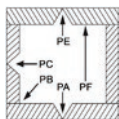
**Hardness**

62 HB

**Materials**

CuSi2Mn, CuSi3Mn, CuZn5, CuZn10, CuZn15

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003565-30010
		1.2	097-003565-30012

**■ SW CuSi3**

- Copper-based, MIG/MAG solid wire electrode
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Resistant to high temperatures and corrosion
- Joint welding of Cu materials and various steel sheets
- GMA-surfacing on steel
- Pulse arc recommended, approved for coldArc

**Standards**

DIN EN ISO 24373 S Cu 6560 (CuSi3Mn)

AWS A-5.7 ER CuSi-A

BS 2901 part 3 C 9

Material number 2.1461

**Chemical analysis**

Si	Mn	Cu
2.8	0.9	Rest

**Shielding gas**

I1

**Expansion, A5**

≥40 %

**Tensile strength, Rm**

≥350 MPa

**Impact energy, Av**

≥60 J (20 °C)

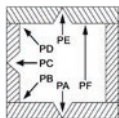
**Hardness**

80 HB

**Materials**

CuSi2Mn, CuSi3Mn, CuZn5, CuZn10, CuZn15

Packing drum	Ø/mm	Item no.
S200	0.8	097-003485-20008
	1.0	097-003485-20010
B300	0.8	097-003485-30008
	1.0	097-003485-30010
	1.2	097-003485-30012
F200	1.0	097-003485-20110


**■ SW CuAl8**

- Copper-based, MIG/MAG solid wire electrode
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Joint welding of Cu materials and various steel sheets
- Wear-resistant GMA-surfacing on steel
- Resistant to high temperatures and corrosion, seawater resistant
- Pulse arc recommended, approved for coldArc

**Standards**

DIN EN ISO 24373                      S Cu 6100 (CuAl7)

AWS A-5.7                                      ER CuAl-A1

BS 2901 part 3                              C 28

Material number                            2.0921

**Chemical analysis**

Al	Mn	Ni	Cu
8	0.2	0.3	Rest

**Shielding gas**

I1

**Expansion, A5**

≥40 %

**Tensile strength, Rm**

≥430 MPa

**Impact energy, Av**

≥100 J (20 °C)

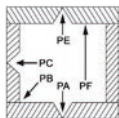
**Hardness**

100 HB

**Materials**

CuAl5, CuAl8, CuAl9, CuZn20Al

Packing drum	kg	Ø/mm	Item no.
S200	5.0	0.8	097-003486-20008
		1.0	097-003486-20010
B300	15	0.8	097-003486-30008
		1.0	097-003486-30010
		1.2	097-003486-30012
		1.6	097-003486-30016
F200	200	1.0	097-003486-20110

■ **SW CuSn1**

- Copper-based, MIG/MAG solid wire electrode
- Joint welding of high-oxygen copper joints and materials
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Resistant to high temperatures and corrosion
- Pulse arc recommended, approved for coldArc

**Standards**

DIN EN ISO 24373	S Cu 1898 (CuSn1)
AWS A-5.7	ER Cu
Material number	2.1006
BS 2901 part 3	C 7

**Chemical analysis**

Sn	Mn	Si	P	Cu
0.85	0.25	0.2	0.01	Rest

**Shielding gas**

I1

**Expansion, A5**

≥30 %

**Tensile strength, Rm**

≥220 MPa

**Impact energy, Av**

≥75 J (20 °C)

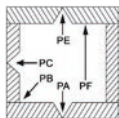
**Hardness**

60 HB

**Materials**

OF-Cu, SE-Cu, SW-Cu, SF-Cu, CuZn0,5

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003559-30010
		1.2	097-003559-30012



### ■ SW CuSn6

- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Resistant to high temperatures and corrosion
- Pulse arc recommended, approved for coldArc
- Joint welding of Cu materials and low-alloy steels and cast iron

### Standards

DIN EN ISO 24373	S Cu 5180A (CuSn6P)
AWS A-5.7	ER CuSn-A
BS 2901 part 3	C 11
Material number	2.1022

### Chemical analysis

Sn	P	Cu
6.3	0.2	Rest

### Shielding gas

I1

### Expansion, A5

≥20 %

### Tensile strength, Rm

≥260 MPa

### Impact energy, Av

≥32 J (20 °C)

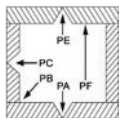
### Hardness

80 HB

### Materials

CuSn4, CuSn6, CuSn8

Packing drum	kg	Ø/mm	Item no.
B300	15	0.8	097-003614-30008
		1.0	097-003614-30010
		1.2	097-003614-30012
		1.6	097-003614-30016

**■ SW CuAl9Ni5**

- Copper-based, MIG/MAG solid wire electrode
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Wear-resistant GMA-surfacing on steel
- Pulse arc recommended, approved for coldArc
- Joint welding of cast and forged nickel-aluminium bronze components
- Surfacing on steel and aluminium bronze, including multialloys
- The weld metal is resistant to corrosion and sea water

**Standards**

DIN EN ISO 24373	S Cu 6328 (CuAl9Ni-5Fe3Mn2)
AWS A-5.7	ER CuNiAl
BS 2901 part 3	C 26 Ni
Material number	2.0923

**Chemical analysis**

Al	Ni	Fe	Mn	Si	Pb	Cu
9	5	4	1.5	0.2	0.02	Rest

**Shielding gas**

I1

**Expansion, A5**

&gt;10 %

**Tensile strength, Rm**

≥560 MPa

**Impact energy, Av**

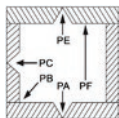
≥60 J (20 °C)

**Materials**

CuAl11Ni6Fe5, CuAl10Ni5Fe4

Copper - Aluminium - Nickel - Alloys

Packing drum	kg	Ø/mm	Item no.
BS300	15	1.2	097-003567-30012


**■ SW CuAlBz9Fe**

- Copper-based, MIG/MAG solid wire electrode
- Low interference due to observation of the smallest dimensional tolerances, layer wound
- Pulse arc recommended, approved for coldArc
- Good resistance to wear and abrasion
- Surfacing on steel and aluminium bronze, including multialloys
- Excellent flow characteristics
- Joint welding of Cu-Al materials

**Standards**

DIN EN ISO 24373	S Cu 6180 (CuAl10Fe)
AWS A-5.7	ER CuAl-A2
BS 2901 part 3	C 13
Material number	2.0937

**Chemical analysis**

Al	Fe	Mn	Ni	Cu
9.5	1.1	1	0.8	Rest

**Shielding gas**

I1

**Expansion, A5**

≥35 %

**Tensile strength, Rm**

≥500 MPa

**Impact energy, Av**

≥95 J (20 °C)

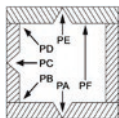
**Hardness**

140 HB

**Materials**

CuAl8Fe3

Packing drum	kg	Ø/mm	Item no.
B300	15	1.0	097-003571-30010
		1.2	097-003571-30012
		1.6	097-003571-30016
F200	200	1.0	097-003571-20110



### ■ FCW 70TC Metal

- Unalloyed metal powder MAG flux cored wire electrode
- Bright, layer wound
- Excellent gap bridging and sidewall fusion
- Notch-free seam transitions
- Very high current carrying capacity and yield
- Even with rusty, primed and galvanised workpieces thanks to the aggressive arc

### Standards

DIN EN ISO 17632-A T 42 2 M M/C 1 H5

AWS A-5.18 E 70C - 6 M/ -6 C

### Chemical analysis

C	Si	Mn
0.09	0.7	1.5

### Shielding gas

C1 / M21

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥400 MPa

### Tensile strength, Rm

≥490 MPa

### Impact energy, Av

≥27 J (-30 °C)

### Approvals

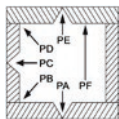
TÜV / DB / LR / CE

### Materials

S185 - S355, P235GH - P355GH, P235T1/T2 - P460NL2, L210 - L445MB, S235 - S460QL1, API X42 - X60

Packing drum	kg	Ø/mm	PU/Pc.	Item no.
S200	5.0	1.2	2	097-003453-20012
BS300	15		1	097-003453-30012
F250	250			097-003453-25012




**FCW 71T Basic**

- Unalloyed basic MAG flux cored wire electrode
- Bright, layer wound
- Very strong and highly resistant to cracking
- Ideal for thick metal sheets and rigidly clamped constructions
- Hydrogen content < 5% in the weld metal

**Standards**

DIN EN ISO 17632-A      T 42 2 B M 1 H5

AWS A-5.20                E 71T-5M-J

**Chemical analysis**

C	Si	Mn
0.09	0.9	1.7

**Shielding gas**

M21

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                    ≥400 MPa

**Tensile strength, Rm**

≥480 MPa

**Impact energy, Av**

≥27 J (-40 °C)

**Approvals**

TÜV / DB / GL / CE

**Materials**

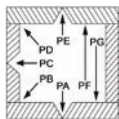
S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R

Packing drum	kg	Ø/mm	Item no.
BS300	15	1.2	097-003452-30012



## Flux cored wire electrodes

Unalloyed



### ■ FCWT 70C Metal

- Unalloyed metal powder MAG flux cored wire electrode
- Bright, layer wound
- Excellent gap bridging and sidewall fusion
- Notch-free seam transitions
- Very high current carrying capacity and yield

### Standards

DIN EN ISO 17632-A T 46 6 M M 1 H5

AWS A-5.18 E 70C-6M H4

### Chemical analysis

C	Si	Mn	P	S
0.05	0.7	1.5	0.015	0.015

### Shielding gas

C1 / M21

### Expansion, A5 Yield strength, Rp 0.2%

≥26 %      ≥460 MPa

### Tensile strength, Rm

530 MPa - 680 MPa

### Impact energy, Av

≥47 J (-60 °C)

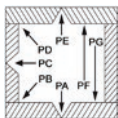
### Approvals

CE

### Materials

S185 - S355, P235GH - P355GH, P235T1/T2 - P460NL2, L210 - L445MB, S235 - S460QL1,  
 API X42 - X60  
 Shipbuilding steels A, B, D, AH-32 - EH 36

kg	Ø/mm	Item no.
16	1.2	097-003616-30012


**FCW 71T Rutile**

- Layer-wound
- Unalloyed rutile MAG flux cored wire electrode
- Quick solidifying slag
- Welding is possible in any position with one machine setting
- Very easy handling and controllability
- Preferred application on pipe and steel constructions, in ship construction, on ceramic

**Standards**

DIN EN ISO 17632-A      T 42 2 P M 1 H5

AWS A-5.20                E 71T-1M

**Chemical analysis**

C	Si	Mn
0.09	0.9	1.7

**Shielding gas**

M21

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                    ≥400 MPa

**Tensile strength, Rm**

≥490 MPa

**Impact energy, Av**

≥27 J (-20 °C)

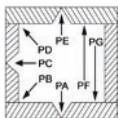
**Approvals**

TÜV / DB / GL / LR / CE

**Materials**

S185 - S355, P235GH - P355GH, P235T1/T2 - P460NL2, L210 - L445MB, S235 - S460QL1, API X42 - X60

Packing drum	kg	Ø/mm	PU/Pc.	Item no.
S200	5.0	1.2	2	097-003454-20012
BS300	15		1.6	1



### ■ FCW 71T Rutile CO<sub>2</sub>

- Unalloyed rutile MAG flux cored wire electrode
- Bright, layer wound
- Quick solidifying slag
- Welding is possible in any position with one machine setting
- Optimised for welding using CO<sub>2</sub>
- Very easy handling and controllability
- Preferred application on pipe and steel constructions, in ship construction, on ceramic

### Standards

DIN EN ISO 17632-A T 42 2 P M/C H5

AWS A-5.20 E 71T-1M/-1C

### Chemical analysis

C	Si	Mn
0.09	0.9	1.7

### Shielding gas

C1 / M21

**Expansion, A5**      **Yield strength, Rp 0.2%**

≥22 %                      ≥400 MPa

**Tensile strength, Rm**

≥490 MPa

**Impact energy, Av**

≥27 J (-20 °C)

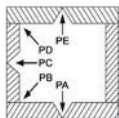
### Approvals

CE

### Materials

S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R

Packing drum	kg	Ø/mm	PU/Pc.	Item no.
S200	5.0	1.2	2	097-003517-20012
BS300	15		1	097-003517-30012


**FCW 71T Selfshield**

- Unalloyed self-shielding flux cored wire electrode
- Bright, layer wound
- Can be welded in any position, including vertically down
- Very easy handling and controllability
- High current carrying capacity and low spatter
- Reduced barium proportion, observe safety instructions

**Standards**

DIN EN ISO 17632-A      T 42 2 P M 1 H5

AWS A-5.20                E 71T-11

**Chemical analysis**

C	Si	Mn	P	S	Al
0.19	0.35	0.6	0.011	0.006	1.2

**Shielding gas**

C1

**Expansion, A5      Yield strength, Rp 0.2%**

≥21 %                    ≥520 MPa

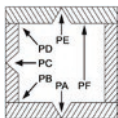
**Tensile strength, Rm**

≥590 MPa

**Materials**

S185 - P275JR, S355J0 - S335, P255N - P355N, P235GH, P265GH, P310GH, P295GH, S460N, S460M

Packing drum	kg	Ø/mm	Item no.
S200	2.0	0.9	097-003455-20209
	5.0		097-003455-20009
B300	15	1.2	097-003455-20012
		1.6	097-003455-30012
			097-003455-30016



### ■ FCW 81T Rutile Ni1

- Unalloyed rutile MAG flux cored wire electrode
- For operating temperatures up to -60 °C
- Suitable for cold tough fine-grain structural steels
- Can be welded in any position except vertical down
- High impact values up to -60 °C



### Standards

DIN EN ISO 17632-A T 46 6 1Ni P M 2 H5

AWS A-5.29 E 81T1-Ni1M-J

### Chemical analysis

C	Si	Mn	P	S	Ni
0.09	0.7	1.4	0.01	0.01	0.95

### Shielding gas

M21

### Expansion, A5 Yield strength, Rp 0.2%

≥19 %      ≥470 MPa

### Tensile strength, Rm

550 J - 690 MPa

### Impact energy, Av

≥27 J (-60 °C)

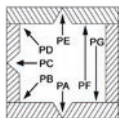
### Approvals

CE

### Materials

P235 GH-P355GH, Kaltzähe Stähle bis 550 Mpa

Packing drum	kg	Ø/mm	Item no.
BS300	15	1.2	097-003518-30012


**FCW 81T Rutile Mo**

- Microalloyed rutile flux cored wire
- Suitable for alloyed, heat-resistant boiler and tube steels
- Low-spatter thanks to high chemical purity
- Excellent modelling capabilities, outstanding for positional welding
- Maximum operating temperature 500 °C
- Particularly suitable for MAG orbital welding

**Standards**

DIN EN ISO 17632-A T 46 A Mo P M 1 H5

AWS A-5.29 E 81T1-A1M H4

**Chemical analysis**

C	Si	Mn	Mo
0.05	0.5	1.1	0.5

**Shielding gas**

M2

**Expansion, A5 Yield strength, Rp 0.2%**

≥22 %      ≥470 MPa

**Tensile strength, Rm**

≥550 MPa - 680 MPa

**Impact energy, Av**

≥60 J (20 °C)

**Approvals**

TÜV

**Materials**

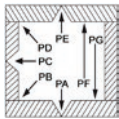
P235GH - P355GH, 16Mo3, P235T1/P235T2 - P460NL2, L210 - L445MB, S255 - S460

Packing drum	kg	Ø/mm	Item no.
B300	16	1.0	097-003603-30010
		1.2	097-003603-30012



## Flux cored wire electrodes

- Low-alloy ● Creep resistant



### ■ FCW 111T NiMoCr

- Microalloyed rutile flux cored wire
- For operating temperatures up to -60 °C
- For welding high-tensile fine-grain structural steels up to 690 MPa yield strength
- Alloy for ship building/marine and offshore technology
- Low-spatter thanks to high chemical purity
- Excellent modelling capabilities, outstanding for positional welding
- Particularly suitable for MAG orbital welding
- CTOD tested welding material

### Standards

DIN EN ISO 18276-A	T 69 6 Z P M 1 H5
AWS A-5.29	E 111 T1-K3M-J H4

### Chemical analysis

C	Si	Mn	Mo	Ni	P	S
0.08	0.5	1.7	0.3	2	0.015	0.015

### Shielding gas

M21

### Expansion, A5 Yield strength, Rp 0.2%

≥17 %      ≥690 MPa

### Tensile strength, Rm

≥770 MPa - 900 MPa

### Impact energy, Av

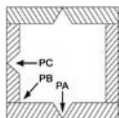
≥47 J (-60 °C)

### Materials

TM tube steels up to L690M, annealed, high-strength fine-grain structural steels up to S690QL, low-temperature tough, high-strength fine-grained construction steels up to S690G1Q11

Packing drum	kg	Ø/mm	Item no.
B300	16	1.2	097-003630-30012




**FCW 307 Rutile**

- High-alloy, rutile MAG flux cored wire electrode
- Excellent weldability, low spatter formation
- Quick solidifying and very easy to remove slag
- For dissimilar joints and buffer layers
- Operating temperature with dissimilar joints 300 °C

**Standards**

DIN EN ISO 17633-A T 18 8 Mn R M 3

AWS A-5.22 E 307LT0-1/4

Material number 1.4370

**Chemical analysis**

C	Si	Mn	P	S	Ni	Cr	Mo	N
0.08	0.6	6.4	0.025	0.01	8	18	0.04	0.03

**Shielding gas**

C1 / M13 / M21

**Expansion, A5 Yield strength, Rp 0.2%**

≥40 %      ≥390 MPa

**Tensile strength, Rm**

≥470 MPa

**Impact energy, Av**

≥47 J (0 °C)

**Approvals**

CE

**Materials**

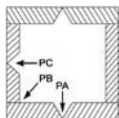
Dissimilar joints, cladding, buffer layers for hardfacing, high C-content and difficult to weld steels, manganese steel (example: 1.3401)

Packing drum	kg	Ø/mm	Item no.
BS300	15	1.2	097-003582-30012
	17	1.6	097-003582-31716



## Flux cored wire electrodes

High-alloy



### ■ FCW 308 Rutile

- High-alloy, rutile MAG flux cored wire electrode
- Excellent weldability, low spatter formation
- Quick solidifying and very easy to remove slag
- For dissimilar joints and buffer layers
- Operating temperature with dissimilar joints 300 °C

### Standards

DIN EN ISO 17633-A T 19 9 L R C/M 3

AWS A-5.22 E 308LT0-1/4

Material number 1.4316

### Chemical analysis

C	Si	Mn	P	S	Ni	Cr	Mo
0.04	0.8	1.5	0.04	0.03	9.5	19.5	0.3

### Shielding gas

C1 / M21

### Expansion, A5 Yield strength, Rp 0.2%

≥41 %

≥370 MPa

### Tensile strength, Rm

≥520 MPa

### Impact energy, Av

≥35 J (0 °C)

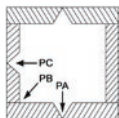
### Approvals

CE

### Materials

1.4301, 1.4303, 1.4306, 1.4308, 1.4310, 1.4311, 1.4319, 1.4541, 1.4550, 1.4552

Packing drum	kg	Ø/mm	Item no.
BS300	15	1.2	097-003561-30012


**FCW 309 Rutile**

- High-alloy, rutile MAG flux cored wire electrode
- Excellent weldability, low spatter formation
- Quick solidifying and very easy to remove slag
- For dissimilar joints and buffer layers
- Very low carbon content
- Operating temperature with dissimilar joints 300 °C

**Standards**

DIN EN ISO 17633-A	T 23 12 L R C/M 3
AWS A-5.22	E 309LT0-1/4
Material number	1.4332

**Chemical analysis**

C	Si	Mn	P	S	Ni	Cr	Mo	Cu
0.04	0.8	2.5	0.04	0.03	13	23	0.5	0.5

**Shielding gas**

C1 / M21

**Expansion, A5 Yield strength, Rp 0.2%**

≥30 %      ≥390 MPa

**Tensile strength, Rm**

≥520 MPa

**Approvals**

TÜV / DB / GL / LR / CE

**Materials**

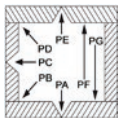
Austenite-ferrite joints (dissimilar), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers

Packing drum	kg	Ø/mm	Item no.
BS300	12.5	0.9	097-003456-30009
	15	1.2	097-003456-30012



## Flux cored wire electrodes

High-alloy



### FCW 309 LP Rutile

- High-alloy, rutile MAG flux cored wire electrode
- Can be welded in any position, including vertically down
- Excellent weldability, low spatter formation
- Quick solidifying and very easy to remove slag
- For dissimilar joints and buffer layers
- Very low carbon content
- Operating temperature with dissimilar joints 300 °C

### Standards

DIN EN ISO 17633-A T 23 12 L P C/M 1

AWS A-5.22 E 309LT1-1/-4

Material number 1.4332

### Chemical analysis

C	Si	Mn	P	S	Ni	Cr	Mo	Cu
0.04	0.8	2.5	0.04	0.03	13	24	0.5	0.5

### Shielding gas

M21

### Expansion, A5 Yield strength, Rp 0.2%

≥30 %

≥390 MPa

### Tensile strength, Rm

≥520 MPa

### Impact energy, Av

≥54 J (0 °C)

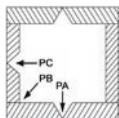
### Approvals

TÜV / DB / CE / LR

### Materials

Austenite-ferrite joints (dissimilar), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers

Packing drum	kg	Ø/mm	Item no.
S200	5.0	1.2	097-003519-20012
BS300	15		097-003519-30012


**FCW 316 Rutile**

- High-alloy, rutile MAG flux cored wire electrode
- Excellent weldability, low spatter formation
- Quick solidifying and very easy to remove slag
- For non-rusting Cr-Ni-Mo steels with low carbon content
- Operating temperature up to 400 °C

**Standards**

AWS A-5.22	E 316LT0-1/4
DIN EN ISO 17633-A	T 19 12 3 L R C/M 3
Material number	1.4330

**Chemical analysis**

C	Si	Mn	P	S	Ni	Cr	Mo	Cu
0.04	0.8	2.5	0.04	0.03	13	19	2.5	0.5

**Shielding gas**

C1 / M21

**Expansion, A5    Yield strength, Rp 0.2%**

≥30 %                      ≥380 MPa

**Tensile strength, Rm**

≥485 MPa

**Impact energy, Av**

≥44 J (0 °C)

**Approvals**

TÜV / DB / GL / LR / CE

**Materials**

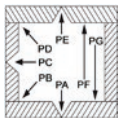
1.4401, 1.4404, 1.4406, 1.4408, 1.4429, 1.4435, 1.4436, 1.4541, 1.4550, 1.4571, 1.4580, 1.4581, 1.4583

Packing drum	kg	Ø/mm	Item no.
BS300	12.5	0.9	097-003457-30009
	15	1.2	097-003457-30012
F150	150		097-003457-15012



## Flux cored wire electrodes

High-alloy



### FCW 316 LP Rutile

- High-alloy, rutile MAG flux cored wire electrode
- Can be welded in any position, including vertically down
- Excellent weldability, low spatter formation
- Quick solidifying and very easy to remove slag
- For non-rusting Cr-Ni-Mo steels with low carbon content
- Very low carbon content
- Operating temperature up to 400 °C

### Standards

AWS A-5.22	E 316LT1-1/-4
DIN EN ISO 17633-A	T 19 12 3 LP C/M 1
Material number	1.4430

### Chemical analysis

C	Si	Mn	P	S	Ni	Cr	Mo
0.04	0.8	2.5	0.04	0.03	13	19	2.5

### Shielding gas

C1 / M21

### Expansion, A5 Yield strength, Rp 0.2%

≥30 %      ≥370 MPa

### Tensile strength, Rm

≥485 MPa

### Impact energy, Av

≥54 J (0 °C)

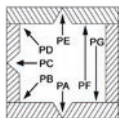
### Approvals

TÜV / CE / GL

### Materials

1.4401, 1.4404, 1.4406, 1.4408, 1.4429, 1.4435, 1.4436, 1.4541, 1.4550, 1.4571, 1.4580, 1.4581, 1.4583

Packing drum	kg	Ø/mm	Item no.
B200	5.0	1.2	097-003520-20012
BS300	15		097-003520-30012


**FCW NiCr82**

- High-alloy, rutile MAG flux cored wire electrode
- Excellent weldability, low spatter formation
- Slag is removed very easily
- Scale-resistant up to 1,200 °C
- Resistant to embrittlement

**Standards**

AWS A-5.34

E NiCr3T0-4

DIN EN ISO 14172

T NI 6082 (NiCr20Mn3Nb)

**Chemical analysis**

C	Si	Mn	P	S	Ni	Cr	Fe	Nb	Cu	Ti
0.08	0.3	3	0.03	0.015	67	21	3	2.5	0.5	0.75

**Shielding gas**

M21

**Expansion, A5 Yield strength, Rp 0.2%**

≥30 %

≥380 MPa

**Tensile strength, Rm**

≥560 MPa

**Impact energy, Av**

≥100 J (0 °C)

**Materials**

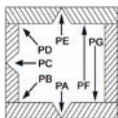
1.4558, 1.4859, 1.4861, 1.4876, 1.4877, 1.4885, 1.4958, 1.4968, 2.4669, 2.4694, 2.4816, 2.4817, 2.4867, 2.4869, 2.4951, 2.4952

Packing drum	kg	Ø/mm	Item no.
BS300	12.5	1.2	097-003577-20212
	15		097-003577-30012



## Flux cored wire electrodes

High-alloy



### ■ FCW 316 METAL

- Can be welded in any position, including vertically down
- Maximum operating temperature 400 °C
- Can be used for stabilised and non-stabilised Cr-Ni steels
- Very homogeneous seam finish
- High-alloy MAG metal-cored wire electrode

### Standards

DIN EN ISO 17633-A T 19 12 3 L M M 1

AWS A-5.9 EC 316L

### Chemical analysis

C	Si	Mn	Cr	Mo	Ni	Cu	P	S
0.015	0.5	1.3	18.5	2.6	11.5	0.13	0.015	0.02

### Shielding gas

M21

### Expansion, A5 Yield strength, Rp 0.2%

≥35 %      ≥450 MPa

### Tensile strength, Rm

≥610 MPa

### Impact energy, Av

≥50 J (-60 °C)

### Approvals

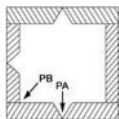
CE

### Materials

1.4401, 1.4404, 1.4406, 1.4408, 1.4420, 1.4435, 1.4436, 1.4571, 1.4573, 1.4580, 1.4581, 1.4583

Packing drum	kg	Ø/mm	Item no.
B300	15	1.2	097-003631-30012




**FCW COBALT2**

- Cobalt-based MAG flux cored wire electrode
- Excellent wear resistance
- Can be used in conditions with high abrasion, hard impacts and extreme temperature fluctuations
- For heavy-duty, corrosion-resistant GMA-surfacing on steel
- Excellent weldability, low spatter formation
- Very good corrosion resistance
- For impact loading and mineral abrasion
- Hardness 40 – 43 HRC
- Machinable with carbide tools

**Standards**

EN 14700

T Co2

**Chemical analysis**

C	Cr	W	Co
1.1	28	4	Rest

**Shielding gas**

M21

**Expansion, A5**

≥30 %

**Approvals**

CE

**Materials**

Heavy-duty, corrosion-resistant surfacing on steel

Can be used in conditions with high abrasion, hard impacts and extreme temperature fluctuations

Packing drum	kg	Ø/mm	Item no.
BS300	15	1.2	097-003624-30012



**Flux cored wire electrodes**  
**High-alloy**



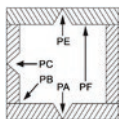


<b>Welding consumables</b>			<b>Page</b>
TIG welding rods	Unalloyed		<b>108</b>
	Low-alloy	Creep resistant	<b>112</b>
	High-alloy		<b>119</b>
	Aluminium		<b>135</b>
	Copper-based		<b>143</b>
	Oxyacetylene welding rods	Unalloyed	<b>148</b>



## TIG welding rods

Unalloyed



■ TR 70S G2

- Unalloyed TIG welding rod
- Copper-plated and stamped
- Suitable for boiler and tube steels
- Semi-fluid molten pool, good controllability

### Standards

DIN EN ISO 636-A	W 2Si1
AWS A-5.18	ER 70S-3
Material number	1.5112

### Chemical analysis

C	Si	Mn
0.09	0.6	1.15

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥360 MPa

### Tensile strength, Rm

≥510 MPa

### Impact energy, Av

≥47 J (-20 °C) / ≥100 J (20 °C)

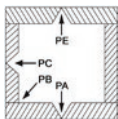
### Length

1000 mm

### Materials

S185 - S275JR, S355J0 - S355, S255N - S355N, P255NH - P355NH, P235GH,  
P265GH, P310GH

kg	Ø/mm	Item no.
5.0	1.0	097-003580-10010
	1.6	097-003580-10016
	2.0	097-003580-10020
	2.4	097-003580-10024
	3.0	097-003580-10030


**■ TR 70S G3**

- Unalloyed TIG welding rod
- Copper-plated and stamped
- Suitable for boiler and tube steels
- Semi-fluid molten pool, good controllability

**Standards**
**DIN EN ISO 636-A**                      W 42 5 | W 3Si1

**AWS A-5.18**                                ER 70S-6

**Material number**                        1.5125

**Chemical analysis**

C	Si	Mn
0.09	0.85	1.45

**Expansion, A5    Yield strength, Rp 0.2%**

≥22 %                                        ≥420 MPa

**Tensile strength, Rm**

≥500 MPa

**Impact energy, Av**

≥47 J (-50 °C) / ≥100 J (20 °C)

**Approvals**

TÜV / DB / CE

**Length**

1000 mm

**Materials**

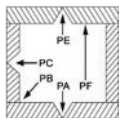
S185 - S275JR, S355JO - S335, S255N - S355N, P235GH, P265GH, P310GH

kg	Ø/mm	Item no.
5.0	1.0	097-003489-10010
	1.6	097-003489-10016
	2.0	097-003489-10020
	2.4	097-003489-10024
	3.0	097-003489-10030
	4.0	097-003489-10040



## TIG welding rods

Unalloyed



### ■ TR 70S G4

- Unalloyed TIG welding rod
- Copper-plated and stamped
- Suitable for boiler and tube steels
- Semi-fluid molten pool, good controllability
- Low-spatter thanks to high chemical purity

### Standards

DIN EN ISO 636-A W 46 4/ W4Si1

AWS A-5.18 ER 70S-6

Material number 1.5130

### Chemical analysis

C	Si	Mn
0.09	0.95	1.65

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥460 MPa

### Tensile strength, Rm

≥530 MPa

### Impact energy, Av

≥47 J (-40 °C) / ≥100 J (20 °C)

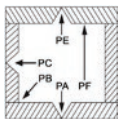
### Length

1000 mm

### Materials

S185 -S275JR, S355JO -S335, S255N - S355N, P235GH, P265GH, P310GH, S460N, S460M

kg	Ø/mm	Item no.
5.0	1.6	097-003574-10016
	2.0	097-003574-10020
	2.4	097-003574-10024
	3.0	097-003574-10030


**■ TR 80S Ni1**

- Unalloyed TIG welding rod
- For operating temperatures up to -60 °C
- Suitable for cold tough fine-grain structural steels
- Copper-plated and stamped
- Semi-fluid molten pool, good controllability

**Standards**
**DIN EN ISO 636-A**
**W 3Ni1**
**AWS A-5.28**
**ER 80S-Ni1**
**Chemical analysis**

C	Si	Mn
0.09	0.5	1.05

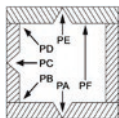
**Expansion, A5    Yield strength, Rp 0.2%**
**≥22 %**
**≥470 MPa**
**Tensile strength, Rm**
**≥560 MPa**
**Impact energy, Av**
**≥47 J (-60 °C)**
**Length**
**1000 mm**
**Materials**
**P355NL1 - P460NL1**

kg	Ø/mm	Item no.
5.0	1.6	097-003618-10016
	2.4	097-003618-10024
	3.0	097-003618-10030



## TIG welding rods

- Low-alloy ● Creep resistant



### ■ TR 80 S NiCu

- Low-alloy TIG welding rod
- Copper-plated and stamped
- For welding weatherproof steels



### Standards

DIN EN ISO 16834-A      W ZMn3N1Cu

AWS A-5.28              ER 80S-G

### Chemical analysis

C	Si	Mn	Ni	Cu
0.08	0.8	1.4	0.8	0.4

### Expansion, A5      Yield strength, Rp 0.2%

≥22 %                      ≥450 MPa

### Tensile strength, Rm

≥550 MPa

### Impact energy, Av

≥47 J (-20 °C) / ≥80 J (20 °C)

### Length

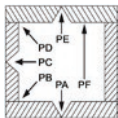
1000 mm

### Materials

S235JRW - S355J2G1W, 9CrNiCu3-2-4

kg	Ø/mm	Item no.
5.0	1.6	097-003555-10016
	2.0	097-003555-10020
	2.4	097-003555-10024
	3.0	097-003555-10030




**■ TR CrMo5**

- Low-alloy TIG welding rod
- Copper-plated and stamped
- Creep resistant filler for pipe and container construction
- Maximum operating temperature 600 °C

**Standards**

DIN EN ISO 21952-A      W CrMo5 Si

AWS A-5.28                ER 80S-B6

Material number        1.7373

**Chemical analysis**

C	Si	Mn	Mo	Cr
0.08	0.35	0.55	0.65	6

**Expansion, A5      Yield strength, Rp 0.2%**

≥18 %                      ≥450 MPa

**Tensile strength, Rm**

≥570 MPa

**Impact energy, Av**

≥100 J (20 °C)

**Length**

1000 mm

**Materials**

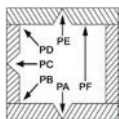
X12CrMo5, 12CrMo-5

kg	Ø/mm	Item no.
5.0	1.6	097-003585-10016
	2.4	097-003585-10024
	3.0	097-003585-10030



## TIG welding rods

- Low-alloy ● Creep resistant



### ■ TR 80S Mo

- Low-alloy TIG welding rod
- Copper-plated and stamped
- Creep resistant filler for pipe and container construction
- Maximum operating temperature 500 °C



DIN EN ISO 21952-A

W Mo Si

AWS A-5.28

ER 70S-A1 (ER 80S-G)

Material number

1.5424

### Chemical analysis

C	Si	Mn	Mo
0.1	0.6	1.15	0.52

### Expansion, A5 Yield strength, Rp 0.2%

>22 %      ≥460 MPa

### Tensile strength, Rm

≥560 MPa

### Impact energy, Av

≥60 J (20 °C) / ≥47 J (-20 °C)

### Approvals

TÜV / DB / CE

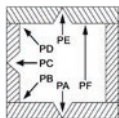
### Length

1000 mm

### Materials

P255NH-P355NH, P355NL1-P460NL1, P236GH, P265GH, P310GH, 16Mo3

kg	Ø/mm	Item no.
5.0	1.6	097-003487-10016
	2.0	097-003487-10020
	2.4	097-003487-10024
	3.0	097-003487-10030


**■ TR 80S CrMo1**

- Low-alloy TIG welding rod
- Copper-plated and stamped
- Suitable for alloyed, heat-resistant boiler and tube steels
- Maximum operating temperature 550 °C
- Bruscato factor max. 12 ppm

**Standards**

DIN EN ISO 21952-A      W CrMo1 Si

AWS A-5.28                ER 80S-G

Material number        1.7339

**Chemical analysis**

C	Si	Mn	Mo	Cr
0.1	0.6	1	0.5	1.2

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                    ≥305 MPa

**Tensile strength, Rm**

≥450 MPa

**Impact energy, Av**

≥100 J (20 °C) / ≥47 J (-10 °C)

**Approvals**

TÜV / DB / CE

**Length**

1000 mm

**Materials**

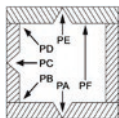
13CrMo4-5, 13CrMoSi5-5, G17CrMo5-5

Ø/mm	Item no.
1.6	097-003500-10016
2.0	097-003500-10020
2.4	097-003500-10024
3.0	097-003500-10030



## TIG welding rods

- Low-alloy ● Creep resistant



### ■ TR 90S CrMo2

- Low-alloy TIG welding rod
- Copper-plated and stamped
- Suitable for alloyed, heat-resistant boiler and tube steels
- Maximum operating temperature 600 °C
- Bruscato factor max. 12 ppm

### Standards

DIN EN ISO 21952-A W CrMo2 Si

AWS A-5.28 ER 90S-G

Material number 1.7384

### Chemical analysis

C	Si	Mn	Mo	Cr
0.08	0.6	0.9	1	2.45

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥355 MPa

### Tensile strength, Rm

≥540 MPa

### Impact energy, Av

≥100 J (20 °C) / ≥47 J (-10 °C)

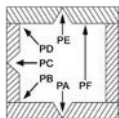
### Length

1000 mm

### Materials

10CrMo9-10, 12 CrMo19-5, 10CrSiMoV7

kg	Ø/mm	Item no.
5.0	2.0	097-003541-10020
	2.4	097-003541-10024
	3.0	097-003541-10030


**■ TR 90S CrMo91**

- Low-alloy TIG welding rod
- For welding highly heat-resistant steel T91/P91

**Standards**

DIN EN ISO 21952-A      W CrMo91

AWS A-5.28                ER 90S-B9

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	V
0.1	0.25	0.5	8.7	0.6	1	0.2

**Expansion, A5      Yield strength, Rp 0.2%**

≥16 %                      ≥520 MPa

**Tensile strength, Rm**

≥620 MPa

**Impact energy, Av**

≥50 J (20 °C)

**Length**

1000 mm

**Materials**

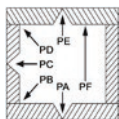
A 213 T91, A 335 P91, X10CrMoVNb9-1

kg	Ø/mm	Item no.
5.0	1.6	097-003629-10016
	2.4	097-003629-10024
	3.2	097-003629-10032



## TIG welding rods

- Low-alloy ● Creep resistant



■ TR 90S CrMo2 VTi

- For welding high-temperature steels T/P24
- Low-alloy TIG welding rod



### Standards

DIN EN ISO 21952-A W CrMo2VNb

AWS A-5.28 ER 90S-G

### Chemical analysis

C	Si	Mn	Cr	Mo	V
0.1	0.25	0.9	2.3	1	0.3

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥550 MPa

### Tensile strength, Rm

≥650 MPa

### Impact energy, Av

≥47 J (20 °C)

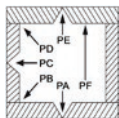
### Length

1000 mm

### Materials

S235JRW - S355J2G1W, 9CrNiCu3-2-4

kg	Ø/mm	Item no.
5.0	1.6	097-003560-10016
	2.0	097-003560-10020
	2.4	097-003560-10024
	3.0	097-003560-10030


**TR 307 Si**

- High-alloy TIG welding rod
- Excellent welding characteristics thanks to high Si content
- Suitable for dissimilar joints and buffer layers
- Strain-hardening
- Stamped

**Standards**

DIN EN ISO 14343-A      W 18 8 Mn Si

AWS A-5.9                      ER 307 Si

Material number            1.4370

**Chemical analysis**

C	Si	Mn	Ni	Cr
0.08	0.85	7	8	18

**Expansion, A5      Yield strength, Rp 0.2%**

≥42 %                      ≥450 MPa

**Tensile strength, Rm**

≥650 MPa

**Impact energy, Av**

≥120 J (20 °C) / ≥60 J (-80 °C)

**Length**

1000 mm

**Materials**

1.3401

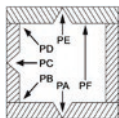
Difficult to weld steel, tool steel, spring steel, manganese steel, case-hardened steel, black/white connections

kg	Ø/mm	Item no.
5.0	1.0	097-003490-10010
	1.2	097-003490-10012
	1.6	097-003490-10016
	2.0	097-003490-10020
	2.4	097-003490-10024
	3.2	097-003490-10032



## TIG welding rods

High-alloy



### ■ TR 308 LSi

- High-alloy TIG welding rod
- Excellent welding characteristics thanks to high Si content
- For non-rusting Cr-Ni steels with low C content
- Maximum operating temperature 350 °C
- Cold tough up to -196 °C
- Stamped

### Standards

DIN EN ISO 14343-A W 19 9 LSi

AWS A-5.9 ER 308 L Si

Material number 1.4316

### Chemical analysis

C	Si	Mn	Cr	Ni
0.02	0.8	1.75	19	9

### Expansion, A5 Yield strength, Rp 0.2%

≥40 %                      ≥400 MPa

### Tensile strength, Rm

≥590 MPa

### Impact energy, Av

≥120 J (20 °C) / ≥60 J (-196 °C)

### Approvals

TÜV / DB / CE

### Length

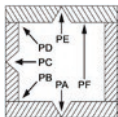
1000 mm

### Materials

1.4301, 1.4303, 1.4306, 1.4308, 1.4310, 1.4311, 1.4319, 1.4541, 1.4550, 1.4552

kg	Ø/mm	Item no.
5.0	1.0	097-003491-10010
	1.2	097-003491-10012
	1.6	097-003491-10016
	2.0	097-003491-10020
	2.4	097-003491-10024
	3.2	097-003491-10032




**■ TR 309 LSi**

- High-alloy TIG welding rod
- Excellent welding characteristics thanks to high Si content
- Suitable for dissimilar joints and buffer layers
- Maximum operating temperature 300 °C
- Stamped

**Standards**
**DIN EN ISO 14343-A**      W 23 12 LSi

**AWS A-5.9**                      ER 309LSi

**Material number**              1.4332

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.02	0.8	1.8	23	13

**Expansion, A5      Yield strength, Rp 0.2%**

≥35 %                      ≥450 MPa

**Tensile strength, Rm**

≥650 MPa

**Impact energy, Av**

≥130 J (20 °C) / ≥65 J (-120 °C)

**Approvals**

TÜV

**Length**

1000 mm

**Materials**

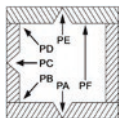
Austenite-ferrite joints (dissimilar), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers

kg	Ø/mm	Item no.
5.0	1.0	097-003539-10010
	1.6	097-003539-10016
	2.0	097-003539-10020
	2.4	097-003539-10024
	3.2	097-003539-10032



## TIG welding rods

High-alloy



### ■ TR 310

- High-alloy TIG welding rod
- Weld metal made of fully austenitic chrome nickel steel
- For welding heatproof steels
- Scale resistant up to 1100 °C
- Not resistant in gases containing sulphur
- Stamped

### Standards

DIN EN ISO 14343-A W 25 20

AWS A-5.9 ER 310

Material number 1.4842

### Chemical analysis

C	Si	Mn	Cr	Ni
0.1	0.4	1.5	25	20

### Expansion, A5 Yield strength, Rp 0.2%

≥40 %      ≥390 MPa

### Tensile strength, Rm

≥590 MPa

### Impact energy, Av

≥170 J (20 °C) / ≥60 J (-196 °C)

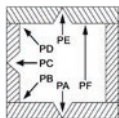
### Length

1000 mm

### Materials

1.4710, 1.4713, 1.4726, 1.4745, 1.4823, 1.4832, 1.4837, 1.4840, 1.4841, 1.4845, 1.4846, 1.4848, 1.4849

kg	Ø/mm	Item no.
5.0	1.0	097-003536-10010
	1.2	097-003536-10012
	1.6	097-003536-10016
	2.0	097-003536-10020
	2.4	097-003536-10024
	3.2	097-003536-10032


**■ TR 312**

- High-alloy TIG welding rod
- For heavy-duty, corrosion-resistant GMA-surfacing on steel
- High strength and wear resistance after welding
- For dissimilar joints and buffer layers
- Strain-hardening
- Stamped

**Standards**

DIN EN ISO 14343-A	W 29 9
AWS A-5.9	ER 312
Material number	1.4337

**Chemical analysis**

C	Si	Mn	Cr	Ni
0.1	0.5	1.9	29	9

**Expansion, A5    Yield strength, Rp 0.2%**

≥25 %                      ≥600 MPa

**Tensile strength, Rm**

≥750 MPa

**Impact energy, Av**

≥50 J (20 °C)

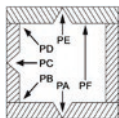
**Length**

1000 mm

**Materials**

Corrosion-resistant similar steel and cast steel (e.g. 1.4762, 1.4085), difficult to weld steel, manganese steel, repairs and wear-resistant layers

kg	Ø/mm	Item no.
5.0	1.0	097-003538-10010
	1.2	097-003538-10012
	1.6	097-003538-10016
	2.0	097-003538-10020
	2.4	097-003538-10024
	3.2	097-003538-10032



### ■ TR 316 LSi

- High-alloy TIG welding rod
- Excellent welding characteristics thanks to high Si content
- For non-rusting Cr-Ni steels with low C content
- Maximum operating temperature 400 °C
- Stamped

### Standards

DIN EN ISO 14343-A W 19 12 3 LSi

AWS A-5.9 ER 316 L Si

Material number 1.4430

### Chemical analysis

C	Si	Mn	Cr	Ni	Mg
0.02	0.85	1.75	19	12	2.7

### Expansion, A5 Yield strength, Rp 0.2%

≥40 %      ≥400 MPa

### Tensile strength, Rm

≥600 MPa

### Impact energy, Av

≥120 J (20 °C) / ≥50 J (-196 °C)

### Approvals

TÜV / DB / CE

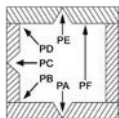
### Length

1000 mm

### Materials

1.4401, 1.4404, 1.4406, 1.4408, 1.4429, 1.4435, 1.4436, 1.4541, 1.4550, 1.4571, 1.4580, 1.4581, 1.4583

kg	Ø/mm	Item no.
5.0	1.0	097-003492-10010
	1.2	097-003492-10012
	1.6	097-003492-10016
	2.0	097-003492-10020
	2.4	097-003492-10024
	3.2	097-003492-10032


**TR 318 Si**

- High-alloy TIG welding rod
- Excellent welding characteristics thanks to high Si content
- Can be used for welding stabilised Cr-Ni steels
- Maximum operating temperature 400 °C
- Stamped

**Standards**

DIN EN ISO 14343-A      W 19 12 3 Nb Si

AWS A-5.9                      ER 318 Si

Material number              1.4576

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	Nb
0.04	0.8	1.8	19	11	2.5	0.5

**Expansion, A5      Yield strength, Rp 0.2%**

≥34 %                              ≥400 MPa

**Tensile strength, Rm**

≥610 MPa

**Impact energy, Av**

≥90 J (20 °C) / ≥40 J (-120 °C)

**Approvals**

TÜV / DB / CE

**Length**

1000 mm

**Materials**

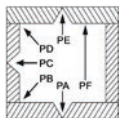
1.4401, 1.4406, 1.4408, 1.4429, 1.4436, 1.4571, 1.4580, 1.4581, 1.4583

kg	Ø/mm	Item no.
5.0	1.0	097-003493-10010
	1.2	097-003493-10012
	1.6	097-003493-10016
	2.0	097-003493-10020
	2.4	097-003493-10024
	3.2	097-003493-10032



## TIG welding rods

High-alloy



■ TR 347

- High-alloy TIG welding rod
- Suitable for joint welding of stainless and heat-resistant steels
- Scale-resistant up to 800 °C
- Cold tough up to -196 °C
- Can be used for welding stabilised Cr-Ni steels
- Stamped

### Standards

DIN EN ISO 14343-A W 19 9 Nb Si

AWS A-5.9 ER 347 Si

Material number 1.4551

### Chemical analysis

C	Si	Mn	Cr	Ni	Mo	Cu	Nb	S	Pb
0.06	0.95	2	20	10	0.4	0.4	0.9	0.015	0.02

### Expansion, A5 Yield strength, Rp 0.2%

≥35 %                      ≥400 MPa

### Tensile strength, Rm

≥620 MPa

### Impact energy, Av

≥130 J (20 °C) / ≥40 J (-196 °C)

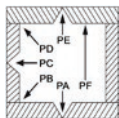
### Length

1000 mm

### Materials

1.4541, 1.4550, 1.4552, 1.4301, 1.4312, 1.4546, 1.4311, 1.4306

kg	Ø/mm	Item no.
5.0	1.0	097-003581-10010
	1.2	097-003581-10012
	1.6	097-003581-10016
	2.0	097-003581-10020
	2.4	097-003581-10024
	3.2	097-003581-10032


**■ TR 410 NiMo**

- High-alloy TIG welding rod
- Suitable for soft martensitic chrome steels
- It is recommended to temper or anneal after welding
- Stamped

**Standards**

DIN EN ISO 14343-A	W 13 4
AWS A-5.9	ER 410 NiMo
Material number	1.4351

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	P	S
0.08	0.45	0.6	12.5	4.5	0.6	0.03	0.03

**Expansion, A5 Yield strength, Rp 0.2%**

≥15 %                      ≥500 MPa

**Tensile strength, Rm**

≥760 MPa

**Impact energy, Av**

≥50 J (20 °C)

**Length**

1000 mm

**Materials**

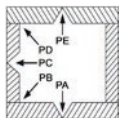
Martensitic chrome steels, fine castings and steel castings of type 13% Cr - 4% Ni

kg	Ø/mm	Item no.
5.0	1.6	097-003590-10016
	2.0	097-003590-10020
	2.4	097-003590-10024
	3.2	097-003590-10032



## TIG welding rods

High-alloy



■ TR 904L

- High-alloy TIG welding rod
- Suitable for boiler and tube steels
- Resistant to media containing sulphur and chloride
- Maximum operating temperature 400 °C
- Cold tough up to -196 °C
- Stamped

### Standards

DIN EN ISO 14343-A W 20 25 5 Cu L

AWS A-5.9 ER 385

Material number 1.4539

### Chemical analysis

C	Si	Mn	Mo	Nb	Cr	Ni	Cu	Co	Al
0.02	0.3	1.5	4.2	0.05	19.8	25	1.4	0.5	0.5

### Expansion, A5 Yield strength, Rp 0.2%

≥35 %                      ≥410 MPa

### Tensile strength, Rm

≥600 MPa

### Impact energy, Av

≥130 J (-196 °C)

### Length

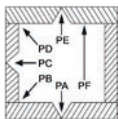
1000 mm

### Materials

1.4529,1.4539

kg	Ø/mm	Item no.
5.0	1,0	097-003635-10010
	1.6	097-003635-10016
	2.0	097-003635-10020
	2.4	097-003635-10024
	3.2	097-003635-10032
	4.0	097-003635-10040




**■ TR NiCr82**

- High-alloy TIG welding rod
- Cold tough up to -196 °C
- Scale-resistant up to 1,200 °C
- For corrosion-resistant alloys with nickel, stainless steels and carbon steels
- Resistant to embrittlement
- High strength and creep strength values
- Dissimilar joints in the petrochemical industry and offshore technology (e.g. furnaces)
- Stamped

**Standards**
**DIN EN ISO 18274**                      S Ni 6082 (NiCr20Mn3Nb)

**AWS A-5.14**                                ER NiCr 3

**Material number**                        2.4806

**Chemical analysis**

C	Si	Mn	Cr	Ni	Fe	Nb	Cu	Co	Ti
0.05	0.5	3.5	22	67	3	3	0.5	0.1	0.75

**Expansion, A5      Yield strength, Rp 0.2%**

≥35 %                                      ≥380 J

**Tensile strength, Rm**

≥620 MPa

**Impact energy, Av**

≥55 J (-196 °C) / ≥100 J (20 °C)

**Length**

1000 mm

**Materials**

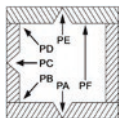
1.4558, 1.4859, 1.4861, 1.4876, 1.4877, 1.4885, 1.4958, 1.4968, 2.4669, 2.4694, 2.4816, 2.4817, 2.4867, 2.4867, 2.4869, 2.4951, 2.4952

kg	Ø/mm	Item no.
5.0	1.6	097-003608-10016
	2.0	097-003608-10020
	2.4	097-003608-10024
	3.2	097-003608-10032



## TIG welding rods

High-alloy



### ■ TR 625

- High-alloy TIG welding rod
- For austenite ferrite joints above 300 °C
- Cold tough up to -196 °C
- Scale resistant up to 1100 °C
- Stamped

### Standards

DIN EN ISO 18274 W Ni 6625 (NiCr22Mo9Nb)

AWS A-5.14 ER NiCrMo3

Material number 2.4831

### Chemical analysis

C	Si	Mn	Cr	Mo	Nb	Ni
0.01	0.12	0.05	22	9	3.5	Rest

### Expansion, A5 Yield strength, Rp 0.2%

≥35 %      ≥480 MPa

### Tensile strength, Rm

≥780 MPa

### Impact energy, Av

>80 J (-196 °C)

### Approvals

CE

### Length

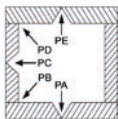
1000 mm

### Materials

1.4529, 1.4539, 1.4558, 1.4876, 1.5680, 1.5681, 1.5662, 2.4605, 2.4618, 2.4856, 2.4858, 2.4951, 2.4952

High-molybdenum, corrosion-resistant steels, low-temperature tough nickel steels, alloy 625, Alloy 800

kg	Ø/mm	Item no.
5.0	1.6	097-003537-10016
	2.0	097-003537-10020
	2.4	097-003537-10024
	3.2	097-003537-10032


**■ TR COBALT1**

- Cobalt-based, high-alloy TIG welding rod
- Excellent wear resistance
- Can be used in conditions with high abrasion, hard impacts and extreme temperature fluctuations
- For heavy-duty, corrosion-resistant GMA-surfacing on steel
- Very good corrosion resistance
- For impact loading and mineral abrasion
- Machinable with carbide tools
- Hardens up to 45 HRC in use
- Stamped

**Standards**

EN 14700

W Co1

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	Fe	Co
0.25	1	1	27	2.5	5	3	Rest

**Length**

1000 mm

**Materials**

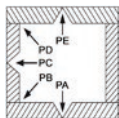
Hot stamping tools, exhaust valves, vapour and acid-proof fittings, valves in combustion engines

kg	Ø/mm	Item no.
5.0	3.2	097-003625-10032



## TIG welding rods

High-alloy



### ■ TR COBALT2

- Cobalt-based, high-alloy TIG welding rod
- Excellent wear resistance
- Can be used in conditions with high abrasion, hard impacts and extreme temperature fluctuations
- For heavy-duty, corrosion-resistant GMA-surfacing on steel
- Very good corrosion resistance
- For impact loading and mineral abrasion
- Hardness 40 – 43 HRC
- Machinable with carbide tools
- Stamped

### Standards

EN 14700

W Co2

### Chemical analysis

C	Si	Mn	Cr	W	Fe	Co
1.1	1	1	28	4.5	3	Rest

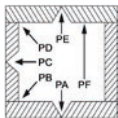
### Length

1000 mm

### Materials

Steam valves, fittings, high-temperature liquid pumps, hot-stamped matrices, valve seats from combustion engines, shears

kg	Ø/mm	Item no.
5.0	3.2	097-003633-10032


**■ TR 2209 Duplex**

- High-alloy TIG welding rod
- Use in a temperature range from -40 °C to 250 °C
- Use in offshore technology, e.g. in pipe construction
- For ferrite-austenitic Cr-Ni-Mo steels
- Resistant to products containing chloride and acid gases
- Stamped

**Standards**

DIN EN ISO 14343-A      W 22 9 3 N L

AWS A-5.9                      ER 2209

Material number            1.4462

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	N
0.02	0.4	1.7	22.5	9	3	0.15

**Expansion, A5      Yield strength, Rp 0.2%**

≥30 %                      ≥620 MPa

**Tensile strength, Rm**

≥800 MPa

**Impact energy, Av**

≥100 J (-46 °C) / ≥85 J (-60 °C)

**Approvals**

TÜV / DB / CE

**Length**

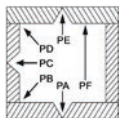
1000 mm

**Materials**

1.4462, 1.4417, 1.4460, 1.4362

Black/white connections

kg	Ø/mm	Item no.
5.0	1.0	097-003499-10010
	1.2	097-003499-10012
	1.6	097-003499-10016
	2.0	097-003499-10020
	2.4	097-003499-10024
	3.2	097-003499-10032



## ■ TR 2594 Super Duplex

- High-alloy TIG welding rod
- Use in offshore technology, e.g. in pipe construction
- Resistant to products containing chloride and acid gases
- Maximum operating temperature of the end product: 250 °C
- For ferrite-austenitic super duplex steels
- Stamped

**Standards**

DIN EN ISO 14343-A W 25 9 4 N L

AWS A-5.9 ER 2594

Material number 1.4501

**Chemical analysis**

C	Si	Mn	Cr	Ni	Mo	N	S	P	Cu
0.03	0.45	0.6	25	9.2	4	0.25	0.01	0.025	0.5

**Expansion, A5 Yield strength, Rp 0.2%**

≥27 %                      ≥695 J

**Tensile strength, Rm**

≥900 MPa

**Impact energy, Av**

≥135 J (-50 °C)

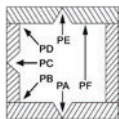
**Length**

1000 mm

**Materials**

25 % Cr super-duplex steels, e.g. 1.4501 X2CrNiMoCuWN 25-7-4 AND S 32750, S 32760  
Black/white connections

kg	Ø/mm	Item no.
5.0	1.2	097-003584-10012
	1.6	097-003584-10016
	2.0	097-003584-10020
	2.4	097-003584-10024
	3.2	097-003584-10032


**■ TR 1450 99,5 Ti**

- TIG welding rod, aluminium
- Titanium forms fine grains and increases the mechanical qualities
- More resistant to hot cracks than pure aluminium


**Standards**

DIN EN ISO 18273                      S AL 1450 (Al99,5Ti)

AWS A-5.10                                ER 1450

Material number                        3.0805

**Chemical analysis**

Ti	Al
0.15	Rest

**Expansion, A5    Yield strength, Rp 0.2%**

>35 %                                        >20 MPa

**Tensile strength, Rm**

>65 MPa

**Approvals**

DB / CE

**Length**

1000 mm

**Materials**

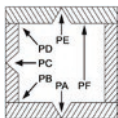
Al99,5Ti, Al99,3, Al99,5, Al99,6, Al99,7, Al99,85,

kg	Ø/mm	Item no.
2.5	1.6	097-003512-10016
	2.0	097-003512-10020
	2.4	097-003512-10024
	3.2	097-003512-10032
	4.0	097-003512-10040



## TIG welding rods

Aluminium



■ TR 3103 Mn1

- TIG welding rod, aluminium
- Alloy for ship building/marine and offshore technology
- Seawater resistant



### Standards

DIN EN ISO 18273 S AL 3103 (AlMn1)

AWS A-5.10 ER 3103

### Chemical analysis

Mn	Si	Mg	Al
1.2	0.3	0.2	Rest

### Expansion, A5 Yield strength, Rp 0.2%

≥24 %      ≥35 MPa

### Tensile strength, Rm

≥90 MPa

### Length

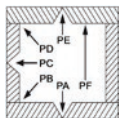
1000 mm

### Materials

AlMn0,6, AlMn1, AlMn0,2Mg0,1, AlMn1Mg0,5

kg	Ø/mm	Item no.
2.5	1.6	097-003575-10016
	2.0	097-003575-10020
	2.4	097-003575-10024
	3.2	097-003575-10032
	4.0	097-003575-10040




**■ TR 4043 Si5**

- TIG welding rod, aluminium
- 5% silicon
- Untreated low strength values
- Not suitable for subsequent anodisation
- Resistant to hot cracks
- Main areas of use are welds on cast aluminium

**Standards**

DIN EN ISO 18273	S Al 4043A (AlSi5(A))
AWS A-5.10	ER 4043
Material number	3.2245

**Chemical analysis**

Si	Al
5	Rest

**Expansion, A5    Yield strength, Rp 0.2%**

≥8 %                      ≥40 MPa

**Tensile strength, Rm**

≥120 MPa

**Approvals**

DB / CE

**Length**

1000 mm

**Materials**

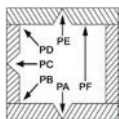
AlSiMg, AlMgSi

kg	Ø/mm	Item no.
2.5	1.6	097-003497-10016
	2.0	097-003497-10020
	2.4	097-003497-10024
	3.2	097-003497-10032
	4.0	097-003497-10040



## TIG welding rods

Aluminium



■ TR 4047 Si12



- TIG welding rod, aluminium
- 12% silicon
- Untreated low strength values
- Not suitable for subsequent anodisation
- Resistant to hot cracks
- Main areas of use are welds on cast aluminium

### Standards

DIN EN ISO 18273	S AL 4047A (AlSi12(A))
AWS A-5.10	ER 4047
Material number	3.2585

### Chemical analysis

Si	Al
12	Rest

### Expansion, A5 Yield strength, Rp 0.2%

≥5 %      ≥60 MPa

### Tensile strength, Rm

≥130 MPa

### Approvals

DB / CE

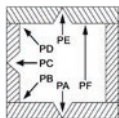
### Length

1000 mm

### Materials

AlSiMg, AlMgSi

kg	Ø/mm	Item no.
2.5	1.6	097-003510-10016
	2.0	097-003510-10020
	2.4	097-003510-10024
	3.2	097-003510-10032
	4.0	097-003510-10040


**■ TR 5087 Mg4,5 MnZr**

- TIG welding rod, aluminium
- High strength, extremely resistant to corrosion, resistant to sea water
- Very good mechanical quality values

**Standards**

DIN EN ISO 18273                      S AL 5087 (AlMg4,5MnZr)

AWS A-5.10                              ER 5087

Material number                      3.3546

**Chemical analysis**

Mg	Mn	Cr	Zr	Al
4.5	1	0.15	0.15	Rest

**Expansion, A5      Yield strength, Rp 0.2%**

≥17 %                                      ≥125 MPa

**Tensile strength, Rm**

≥275 MPa

**Approvals**

DB / GL / CE

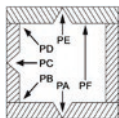
**Length**

1000 mm

**Materials**

AlMg3,5, AlMg4,5, AlMg5, AlMg3,5Mn, AlMg3,5Mn0,4, AlMg4,5Mn0,7, AlMg5Mn0,4, AlMg5Mn1, AlMgSi1, G-AlMg3, G-AlMg5

kg	Ø/mm	Item no.
2.5	1.6	097-003511-10016
	2.4	097-003511-10020
	2.0	097-003511-10024
	3.2	097-003511-10032
	4.0	097-003511-10040



## ■ TR 5183 Mg4,5 Mn

- TIG welding rod, aluminium
- 4.5% magnesium, 0.7% manganese
- High strength, extremely resistant to corrosion, resistant to sea water
- Suitable for subsequent anodisation

**Standards**

DIN EN 18273 S AL 5183 (AlMg4,5Mn0,7)

AWS A-5.10 ER 5183

Material number 3.3548

**Chemical analysis**

Mg	Mn	Cr	Al
4.5	0.7	0.15	Rest

**Expansion, A5 Yield strength, Rp 0.2%**

≥17 %      ≥125 MPa

**Tensile strength, Rm**

≥275 MPa

**Approvals**

TÜV / DB / GL / LR / CE

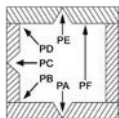
**Length**

1000 mm

**Materials**

AlMg3,5, AlMg4,5, AlMg5, AlMg3,5Mn, AlMg3,5Mn0,4, AlMg4,5Mn0,7, AlMg5Mn0,4, AlMg5Mn1, AlMgSi1, G-AlMg3, G-AlMg5

kg	Ø/mm	Item no.
2.5	1.6	097-003495-10016
	2.0	097-003495-10020
	2.4	097-003495-10024
	3.2	097-003495-10032
	4.0	097-003495-10040


**■ TR 5356 Mg5**

- TIG welding rod, aluminium
- 5% magnesium
- High strength, extremely resistant to corrosion, resistant to sea water
- Suitable for subsequent anodisation

**Standards**

DIN EN 18273 S AL 5356 (AlMg5Cr)

AWS A-5.10 ER 5356

Material number 3.3556

**Chemical analysis**

Mg	Mn	Cr	Ti	Al
5	0.15	0.1	0.1	Rest

**Expansion, A5 Yield strength, Rp 0.2%**

≥8 %                      ≥120 MPa

**Tensile strength, Rm**

≥250 MPa

**Approvals**

TÜV / DB / LR / CE

**Length**

1000 mm

**Materials**

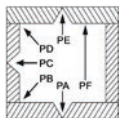
AlMg3, AlMg4,5, AlMg5, AlMgSi1, G-AlMg3, G-AlMg3

kg	Ø/mm	Item no.
2.5	1.6	097-003496-10016
	2.0	097-003496-10020
	2.4	097-003496-10024
	3.2	097-003496-10032
	4.0	097-003496-10040



# TIG welding rods

## Aluminium



### ■ TR 5754 Mg3

- TIG welding rod, aluminium
- 3% magnesium
- Medium strength, corrosion resistant
- Suitable for subsequent anodisation



### Standards

DIN EN 18273 S Al 5754 (AlMg3)

AWS A-5.10 ER 5754

Material number 3.3536

### Chemical analysis

Mg	Mn	Cr	Al
3	0.3	0.3	Rest

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥80 MPa

### Tensile strength, Rm

≥190 MPa

### Approvals

TÜV / DB / CE

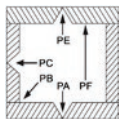
### Length

1000 mm

### Materials

AlMg1, AlMg2, AlMg2,5, AlMg3,5, AlMg0,5Mn, AlMg1Mn0,5, AlMg2Mn0,8, AlMgSi0,5, AlMgSi0,7

kg	Ø/mm	Item no.
2.5	1.6	097-003494-10016
	2.0	097-003494-10020
	2.4	097-003494-10024
	3.2	097-003494-10032
	4.0	097-003494-10040


**■ TR CuSi3**

- TIG welding rod, copper-based
- Resistant to high temperatures and corrosion
- Joint welding of Cu materials and various steel sheets
- GMA-surfacing on steel

**Standards**

DIN EN ISO 24373	S Cu 6560 (CuSi3Mn)
AWS A-5.7	ER CuSi-A
BS 2901 part 3	C 9
Material number	2.1461

**Chemical analysis**

Si	Mn	Cu
2.8	0.9	Rest

**Expansion, A5**

≥40 %

**Tensile strength, Rm**

≥350 MPa

**Impact energy, Av**

≥60 J (20 °C)

**Length**

1000 mm

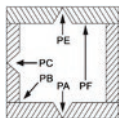
**Hardness**

80 HB

**Materials**

CuZn5, CuZn10, CuZn15, CuSi2Mn, CuSi3Mn

kg	Ø/mm	Item no.
10	1.6	097-003540-11016
	2.0	097-003540-11020
	2.4	097-003540-11024
	3.2	097-003540-11032
	4.0	097-003540-11040



## ■ TR CuSn1

- TIG welding rod, copper-based
- Joint welding of high-oxygen copper joints and materials
- Resistant to high temperatures and corrosion

**Standards**

DIN EN ISO 24373 S Cu 1898 (CuSn1)

AWS A-5.7 ER Cu

Material number 2.1006

BS 2901 part 3 C 7

**Chemical analysis**

Sn	Mn	Si	P	Cu
0.85	0.25	0.2	0.01	Rest

**Expansion, A5**

≥30 %

**Tensile strength, Rm**

≥220 MPa

**Impact energy, Av**

≥75 J (20 °C)

**Length**

1000 mm

**Hardness**

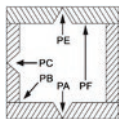
80 - 60 HB

**Materials**

OF-Cu, SE-Cu, SW-Cu, SF-Cu, CuZn0,5

kg	Ø/mm	Item no.
10	2.0	097-003609-10020
	2.4	097-003609-10024
	3.2	097-003609-10032




**■ TR CuSn6**

- TIG welding rod, copper-based
- Resistant to high temperatures and corrosion
- Joint welding of Cu materials and low-alloy steels and cast iron

**Standards**

DIN EN ISO 24373	S Cu 5180A (CuSn6P)
AWS A-5.7	ER CuSn-A
BS 2901 part 3	C 11
Material number	2.1022

**Chemical analysis**

Sn	P	Cu
6.3	0.22	Rest

**Expansion, A5**

≥30 %

**Tensile strength, Rm**

≥260 MPa

**Impact energy, Av**

≥32 J (20 °C)

**Length**

1000 mm

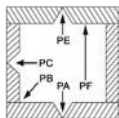
**Hardness**

80 - 60 HB

**Materials**

OF-Cu, SE-Cu, SW-Cu, SF-Cu, CuZn0,5

kg	Ø/mm	Item no.
10	1.6	097-003613-10016
	2.0	097-003613-10020
	2.4	097-003613-10024
	3.2	097-003613-10032
	4.0	097-003613-10040



## ■ TR CuNi30

- TIG welding rod, copper-based
- GMA-surfacing on cast iron, low-alloy steels and copper-zinc alloys
- Joint welding of copper-nickel alloys
- Seawater resistant
- Very good corrosion resistance

**Standards**

DIN EN ISO 24373	S Cu 7158 (CuNi30Mn-1FeTi)
AWS A-5.7	ER CuNi
Material number	2.0837

**Chemical analysis**

Ni	Mn	Fe	Ti	Cu
31	0.8	0.5	0.4	Rest

**Expansion, A5**

≥36 %

**Tensile strength, Rm**

≥420 MPa

**Impact energy, Av**

≥240 J (20 °C)

**Length**

1000 mm

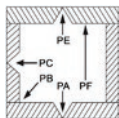
**Hardness**

115 HB

**Materials**

CuNi10Fe1Mn, CuNi30Mn1Fe

kg	Ø/mm	Item no.
10	1.6	097-003501-10016
	2.0	097-003501-10020
	2.4	097-003501-10024
	3.2	097-003501-10032


**■ TR CuAl8**

- TIG welding rod, copper-based
- Considerably temperature-resistant
- Very good corrosion resistance
- Wear-resistant GMA-surfacing on steel
- Seawater resistant

**Standards**
**DIN EN ISO 24373**                      S Cu 6100 (CuAl7)

**AWS A-5.7**                                ER CuAl-A1

**Material number**                      2.0923

**Chemical analysis**

Al	Mn	Ni	Cu
7.7	0.2	0.3	Rest

**Expansion, A5**

≥40 %

**Tensile strength, Rm**

≥430 MPa

**Impact energy, Av**

≥100 J (20 °C)

**Approvals**

CE

**Length**

1000 mm

**Hardness**

100 HB

**Materials**

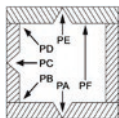
CuAl5, CuAl8, CuAl9, CuZn20Al

kg	Ø/mm	Item no.
10	1.6	097-003682-10016
	2.0	097-003682-10020
	2.4	097-003682-10024
	3.2	097-003682-10032
	4.0	097-003682-10040



## TIG welding rods

● Oxyacetylene welding rods ● unalloyed



■ GFR R60

- Unalloyed oxyacetylene welding rod
- Copper-plated and stamped
- Semi-fluid molten pool, good controllability
- Recommended for seal welds

### Standards

DIN EN 12536	O III
AWS A-5.2	R60
Material number	1.6215

### Chemical analysis

C	Si	Mn	Ni
0.08	0.1	1.1	0.4

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %      ≥310 MPa

### Tensile strength, Rm

≥400 MPa

### Impact energy, Av

≥50 J (20 °C)

### Approvals

TÜV / DB

### Length

1000 mm

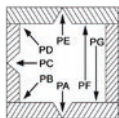
### Materials

S235G2T - S255GT, S235JO - S275JO, P235G1TH, P255G1TH, P235GH, P265GH, P285NH, P295GH

kg	Ø/mm	Item no.
5.0	2.0	097-003488-10020
	2.4	097-003488-10024
	3.0	097-003488-10030
	4.0	097-003488-10040



<b>Welding consumables</b>			<b>Page</b>
Stick electrodes	Unalloyed		<b>149</b>
	Low-alloy	Creep resistant	<b>158</b>
	High-alloy		<b>161</b>
		Hardfacing	<b>175</b>



## ■ SE 6010 CEL

- Cellulose-coated stick electrode
- Can be welded in any position, including vertically down
- Particularly suitable for vertical down welding of root, filler and final passes
- Excellent mechanical quality values

**Standards**

DIN EN ISO 2560-A E 38 2 C 21

AWS A-5.1 E 6010

**Coating type**

Cellulose

**Baking**

not necessary

**Chemical analysis**

C	Si	Mn
0.14	0.2	0.8

**Expansion, A5 Yield strength, Rp 0.2%**

≥22 % ≥390 MPa

**Tensile strength, Rm**

450 MPa - 550 MPa

**Impact energy, Av**

≥47 J (-20 °C)

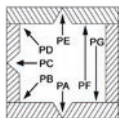
**Approvals**

CE

**Materials**

S235J2G3 - S355J2G3, L290MB (X42), L320 (X46), L320M (X52), L385N (X56), StE 210.7, StE 240.7, StE 290.7 TM, StE 320.7 TM, StE 360.7 TM, P235G1TH, P255G1TH,

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
50 - 65	4.0	2.5	300	304	097-003576-25300
90 - 120	5.0	3.2	350	195	097-003576-32350
110 - 140		4.0		129	097-003576-40350


**SE 6013 RC**

- Rutile/cellulose coated stick electrode
- Can be welded in any position, including vertically down
- Good slag removal characteristics, medium spatter tendency
- Very good ignition and reignition characteristics
- Perfect for roots
- High mechanical quality

**Standards**

DIN EN ISO 2560-A                      E 38 0 RC 11

AWS A-5.1                                      E 6012

**Coating type**

Rutile cellulose

**Baking**

not necessary / (120 °C / 1 h / possible)

**Chemical analysis**

C	Si	Mn
0.06	0.3	0.4

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                                      ≥360 MPa

**Tensile strength, Rm**

450 MPa - 550 MPa

**Impact energy, Av**

≥47 J (20 °C)

**Approvals**

TÜV / DB / LR / CE

**Materials**

S235J2G3 - S355J2G3, L290MB (X42), L320 (X46), L320M (X52), L385N (X56), StE 210.7, StE 240.7, StE 290.7 TM, StE 320.7 TM

Shipbuilding steels A, B, D

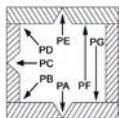
Cast steel GS-38–GS-52

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
55 - 70	4.0	2.0	300	419	097-003461-20300
55 - 85	4.4	2.5	350	250	097-003461-25350
115 - 145	5.0	3.2		169	097-003461-32350
145 - 190	4.4	4.0		98	097-003461-40350
200 - 250	6.0	5.0	450	65	097-003461-50450



## Stick electrodes

Unalloyed



### ■ SE 6013 RC Blau

- Thick rutile/cellulose coated stick electrode
- Can be welded in any position, including vertically down
- Excellent ignition and reignition characteristics
- Even with rusty, primed and galvanised workpieces thanks to the aggressive arc
- Very good mechanical quality values

### Standards

DIN EN ISO 2560-A E 42 0 RC 12

AWS A-5.1 E 6013

### Coating type

Rutile cellulose

### Baking

not necessary / (120 °C / 1 h / possible)

### Chemical analysis

C	Si	Mn
0.06	0.3	0.4

### Expansion, A5 Yield strength, Rp 0.2%

≥22 %

≥420 MPa

### Tensile strength, Rm

510 MPa - 610 MPa

### Impact energy, Av

≥47 J (0 °C)

### Approvals

TÜV / DB / CE

### Materials

S235J2G3 - S355J2G3, L290MB (X42), L320 (X46), L320M (X52), L385N (X56), StE 210.7,

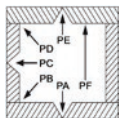
StE 240.7, StE 290.7 TM, StE 320.7 TM, StE 360.7 TM, P235G1TH, P255G1TH,

Shipbuilding steels A, B, D

Cast steel GS-38-GS-52

A (AC)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
50 - 60	4.0	2.0	300	380	097-003530-20300
65 - 80	4.4	2.5	350	230	097-003530-25350
110 - 140		3.2		136	097-003530-32350
125 - 180		4.0		91	097-003530-40350
160 - 230		5.4		5.0	450




**SE 6013 RR**

- Thick rutile-coated stick electrode
- Can be welded in any position except vertical down
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Very homogeneous seam finish
- Excellent mechanical quality values

**Standards**

DIN EN ISO 2560-A      E 42 0 RR 12

AWS A-5.1                E 6013

**Coating type**

Rutile

**Baking**

not necessary / (140 °C / 1 h / possible)

**Chemical analysis**

C	Si	Mn
0.09	0.5	0.7

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                    ≥420 MPa

**Tensile strength, Rm**

510 MPa - 610 MPa

**Impact energy, Av**

≥47 J (0 °C)

**Approvals**

TÜV / DB / CE

**Materials**

S185 - S355, P235G1TH, P265G1TH, P295G1TH, L210 - L360, E235 - E355, GP240GH

Shipbuilding steels A, B, D

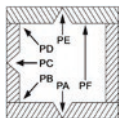
Cast steel GS-38–GS-52

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
50 - 70	4.0	2.0	300	340	097-003459-20300
55 - 85	4.4	2.5	350	205	097-003459-25350
90 - 135		3.2		122	097-003459-32350
130 - 170	5.4	4.0		450	77
175 - 220		5.0	80		097-003459-40450
220 - 270		6.0	50		097-003459-50450
					42



## Stick electrodes

Unalloyed



■ SE 6013 RRB



- Thick rutile/basic coated stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, medium spatter tendency
- Very good ignition and reignition characteristics
- Even with rusty, primed and galvanised workpieces thanks to the aggressive arc
- Satisfactory mechanical quality values

### Standards

DIN EN ISO 2560-A E 35 2 RB 12

AWS A-5.1 E 6013

### Coating type

Rutile/basic

### Baking

not necessary / (140 °C / 1 h / possible)

### Chemical analysis

C	Si	Mn
0.1	0.2	0.55

### Expansion, A5 Yield strength, Rp 0.2%

≥24 %      ≥360 MPa

### Tensile strength, Rm

450 MPa - 540 MPa

### Impact energy, Av

≥47 J (-20 °C)

### Approvals

TÜV / DB / GL / LR / CE

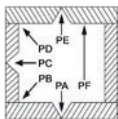
### Materials

S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R

Shipbuilding steels A, B, D, E

Cast steel GS-38-GS-52

A (AC)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
70 - 90	4.0	2.0	300	230	097-003460-20300
		2.5		234	097-003460-25300
115 - 145	4.4	3.2	350	230	097-003460-25350
		4.0		134	097-003460-32350
145 - 190	5.4	4.0	450	90	097-003460-40350
200 - 250		5.0		86	097-003460-40450
				54	097-003460-50450


**SE 6013 RRC**

- Thick rutile/cellulose coated stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, low spatter tendency
- Very good ignition and reignition characteristics
- Even with rusty, primed and galvanised workpieces thanks to the aggressive arc
- Satisfactory mechanical quality values

**Standards**

DIN EN ISO 2560-A                      E 42 0 RC 12

AWS A-5.1                                      E 6013

**Coating type**

Rutile cellulose

**Baking**

not necessary / (140 °C / 1 h / possible)

**Chemical analysis**

C	Si	Mn
0.08	0.4	0.6

**Expansion, A5      Yield strength, Rp 0.2%**

≥22 %                                      ≥420 MPa

**Tensile strength, Rm**

500 MPa - 640 MPa

**Impact energy, Av**

≥47 J (22 °C)

**Approvals**

TÜV / DB / CE

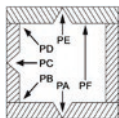
**Materials**

S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R

Shipbuilding steels A, B, D

Cast steel GS-38-GS-52

A (DC-/+)      kg	Ø/mm	l/mm	PU/Pc.	Item no.
40 - 55	2.0	300	370	097-003462-20300
55 - 85	2.5	350	218	097-003462-25350
90 - 135	3.2		118	097-003462-32350
130 - 170	4.0		77	097-003462-40350
175 - 220	5.0	450	55	097-003462-50450



## ■ SE 7016 BR

- Basic coated, reduced hydrogen stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, low spatter tendency
- Very good ignition characteristics
- Excellent for positional welding
- Very good mechanical quality values
- CTOD tested welding material

**Standards**

DIN EN ISO 2560-A E 42 2 B 12 H10

AWS A-5.1 E 7016

**Coating type**

Basic-coated

**Baking**

380 °C / 1 h)

**Chemical analysis**

C	Si	Mn
0.05	0.65	1

**Expansion, A5 Yield strength, Rp 0.2%**

≥22 %      ≥420 MPa

**Tensile strength, Rm**

500 MPa - 640 MPa

**Impact energy, Av**

≥47 J (-20 °C)

**Approvals**

TÜV / DB / CE

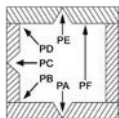
**Materials**

S185 - S355, P235GH, P265GH, P295GH, P235 - P355, L210 - L360, S(P)275 - S(P)355, GP240R

Shipbuilding steels A, B, D, E

Cast steel GS-38-GS-52

A (DC-/±)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	4.0	2.5	350	202	097-003464-25350
90 - 140		3.2		122	097-003464-32350
140 - 190	5.0	4.0	450	75	097-003464-40450
190 - 250		5.0		50	097-003464-50450


**SE 7018 BH5**

- Basic coated, reduced hydrogen stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, low spatter tendency
- Very good ignition characteristics
- Excellent for positional welding
- Very good mechanical quality values
- CTOD tested welding material
- Hydrogen content under 5%

**Standards**

DIN EN ISO 2560-A                      E 42 4B 32 H5

AWS A-5.1                                      E 7018

**Coating type**

Basic

**Baking**

400 °C / 1 h)

**Chemical analysis**

C	Si	Mn
0.07	0.6	1

**Expansion, A5      Yield strength, Rp 0.2%**

≥24 %                                      ≥440 MPa

**Tensile strength, Rm**

510 MPa - 610 MPa

**Impact energy, Av**

≥47 J (-40 °C)

**Approvals**

TÜV / DB / GL / LR / CE

**Materials**

S185 - S355, E295, E335, P235GH, P265GH, P295GH, P235 - P460, L210 - L460, S(P)275 - S(P)460, GP240R

Shipbuilding steels A, B, D, E

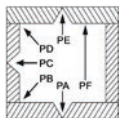
Cast steel GS-38-GS-52

A (DC-/+) / kg	Ø/mm	l/mm	PU/Pc.	Item no.
50 - 70	2.0	300	250	097-003463-20300
65 - 90	2.5	350	171	097-003463-25350
110 - 140	3.2		110	097-003463-32350
140 - 180	4.0		78	097-003463-40350
180 - 230	5.0	450	53	097-003463-50450



## Stick electrodes

- Low-alloy ● Creep resistant



### ■ SE 7018 Mo

- Basic coated, reduced hydrogen stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, low spatter tendency
- Very good ignition characteristics
- Excellent for positional welding
- Excellent mechanical quality values
- Creep resistant and super strength characteristics

DIN EN ISO 3580-A      E Mo B42 H5

AWS A-5.5              E 7018-A1

Material number      1.5424

#### Coating type

Basic

#### Baking

400 °C / 1 h)

#### Chemical analysis

C	Si	Mn	Mo
0.05	0.6	0.95	0.5

#### Expansion, A5      Yield strength, Rp 0.2%

>20 %                  >460 MPa

#### Tensile strength, Rm

530 MPa - 680 MPa

#### Impact energy, Av

>47 J (-20 °C) / >47 J (-40 °C)

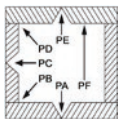
#### Approvals

TÜV / CE

#### Materials

S235JR - S355J2G3, P380NH - P460NH, P235GH - P285NH, P295GH, 20MnNb6, 16 Mo 3  
Cast steel GS-22 Mo4

A (DC-/±)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
65 - 95	4.0	2.5	350	183	097-003472-25350
110 - 140		3.2		110	097-003472-32350
140 - 180	5.4	4.0	450	79	097-003472-40450


**SE 8018 CrMo1**

- Basic coated, reduced hydrogen stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, low spatter tendency
- Very good ignition characteristics
- Excellent for positional welding
- Excellent mechanical quality values
- Creep resistant characteristics
- Maximum operating temperature 550 °C
- Hydrogen content under 5%

**Standards**

DIN EN ISO 3580-A            E CrMo1 B 42 H5

AWS A-5.5                      E 8018-B2

Material number              1.7346

**Coating type**

Basic

**Baking**

400 °C / 1 h)

**Chemical analysis**

C	Si	Mn	Cr	Mo
0.06	0.6	0.95	1.1	0.5

**Expansion, A5    Yield strength, Rp 0.2%**

≥20 %                          ≥470 MPa

**Tensile strength, Rm**

570 MPa - 670 MPa

**Impact energy, Av**

≥95 J (20 °C)

**Approvals**

TÜV / DB / CE

**Materials**

13CrMo 4 4 (1.7335), 15CrMo3 (1.3566), 13CrMoV 5 8 (1.7734), 15Cr3 (1.7015), 16MnCr5 (1.7131), 20MnCr5 (1.7147), 15CrMo5 (1.7262), 25CrMo4 (1.7218)

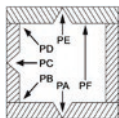
Cast steel GS-22CrMo 5, GS-22CrMo 5 4

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
65 - 95	3.4	2.5	300	171	097-003471-25300
100 - 130	4.0	3.2	350	110	097-003471-32350
140 - 180	5.4	4.0	450	81	097-003471-40450



## Stick electrodes

- Low-alloy ● Creep resistant



### ■ SE 9018 CrMo2

- Basic coated, reduced hydrogen stick electrode
- Can be welded in any position except vertical down
- Good slag removal characteristics, low spatter tendency
- Very good ignition characteristics
- Maximum operating temperature 600 °C
- Excellent mechanical quality values
- Hydrogen content under 5%

### Standards

DIN EN ISO 3580-A E CrMo2 B 42 H5

AWS A-5.5 E 9018-B3

Material number 1.7384

### Coating type

Basic

### Baking

400 °C / 1 h)

### Chemical analysis

C	Si	Mn	Cr	Mo
0.06	0.6	0.9	2.4	1

### Expansion, A5 Yield strength, Rp 0.2%

≥20 %      ≥470 MPa

### Tensile strength, Rm

570 MPa - 670 MPa

### Impact energy, Av

≥95 J (20 °C)

### Approvals

CE

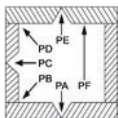
### Materials

10CrMo9-10 (1.7380), 10CrSiMoV7 (1.8075), 30CrMoV9 (1.7707)

Cast steel G17CrMo9-10

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
65 - 95	3.4	2.5	300	171	097-003542-25300
100 - 130	4.0	3.2	350	110	097-003542-32350
140 - 180	5.4	4.0	450	81	097-003542-40450




**SE Ni**

- Basic graphite-coated stick electrode
- Cold welding of grey and malleable cast iron
- Soft, low spatter arc
- Good slag removal characteristics, low spatter tendency
- Graphitic separation of the carbon in the weld metal
- Optimum for the repair and maintenance of cast iron

**Standards**

DIN EN ISO 1071	E C Ni-CI 1
AWS	E Ni-CI

**Coating type**

Basic-graphitic

**Baking**

seldom necessary / (150 °C / 2 h)

**Chemical analysis**

C	Fe	Ni
0.5	2.5	Rest

**Length**

350 mm

**Hardness**

160 HB

**Materials**

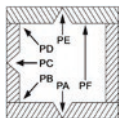
EN-GJL-100 - EN-GJL-350, EN-GJMB-350 - EN-GJMB-550, EN-GJMW-350 - EN-GJMW-550

A (DC-/+) / kg	kg	Ø/mm	PU/Pc.	Item no.
60 - 90	4.5	2.5	230	097-003532-25350
90 - 120		3.2	135	097-003532-32350
110 - 150	5.0	4.0	100	097-003532-40350



## Stick electrodes

High-alloy



■ SE NiFe



- Basic graphite-coated stick electrode
- Cold welding of grey cast iron, malleable cast iron and spheroidal cast iron
- Good slag removal characteristics, low spatter tendency
- Graphitic separation of the carbon in the weld metal
- Optimum for the repair and maintenance of cast iron

### Standards

DIN EN ISO 1071 E C NiFe 1 1

AWS A-5.15 E NiFeCl

### Coating type

Basic-graphitic coated

### Baking

seldom necessary / (150 °C / 2 h)

### Chemical analysis

C	Ni	Fe
1.5	55	Rest

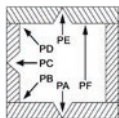
### Hardness

200 HB

### Materials

EN-GJL-100 - EN-GJL-350, EN-GJMB-350 - EN-GJMB-550, EN-GJMW-350 - EN-GJMW-550, EN-GJS-400 - EN-GJS-700

A (DC-/+) / kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	2.5	300	212	097-003533-25300
90 - 120	3.2	350	124	097-003533-32350
110 - 150	4.0		101	097-003533-40350


**SE NiCr82**

- Basic coated, high alloy nickel based stick electrode
- Cold tough up to -196 °C
- Scale-resistant up to 1,000 °C
- Maximum operating temperature 800 °C
- Resistant to embrittlement
- In sulphurous atmospheres up to 500 °C

**Standards**

DIN EN ISO 14172	E Ni 6082 (NiCr20Mn3Nb)
AWS A-5.11	E NiCrFe-3
Material number	2.4648

**Coating type**

Basic-coated

**Baking**

seldom necessary / (300 °C / 2 h)

**Chemical analysis**

C	Cr	Ni	Mn	Nb	Fe
0.05	21	Rest	5	2.4	5

**Expansion, A5    Yield strength, Rp 0.2%**

≥35 %                      ≥380 MPa

**Tensile strength, Rm**

&gt;620 J

**Impact energy, Av**

&gt;70 J (-196 °C)

**Materials**

1.4429, 1.4539, 1.4876, 1.4922, 1.5662, 2.4816, 2.4867, 2.4870

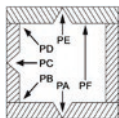
Dissimilar joints at operating temperatures of -196 °C to +650 °C

A (DC+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	3.0	2.5	300	168	097-003579-25300
80 - 120	3.5	3.2	350	98	097-003579-32350
110 - 160	4.5	4.0		81	097-003579-40350



## Stick electrodes

### High-alloy



#### ■ SE 307

- Rutile basic coated, high-alloy stick electrode
- Self-removing slag, very low spatter tendency
- Suitable for dissimilar joints and buffer layers
- Excellent ignition and reignition characteristics
- Maximum operating temperature 300 °C
- Strain-hardening
- Weld metal made of austenitic chrome-nickel-manganese steel

#### Standards

DIN EN ISO 3581-A E 18 8 Mn R12

AWS A-5.4 E 307 L -16

Material number 1.4370

#### Coating type

Rutile/basic

#### Baking

seldom necessary / (300 °C / 2 h)

#### Chemical analysis

C	Cr	Ni	Mn
0.1	19	9	7

#### Expansion, A5 Yield strength, Rp 0.2%

≥40 %      ≥350 MPa

#### Tensile strength, Rm

≥600 MPa

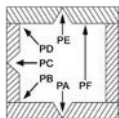
#### Impact energy, Av

≥70 J (20 °C)

#### Materials

Dissimilar joints, cladding, buffer layers for hardfacing, high C-content and difficult to weld steels, manganese steel (example: 1.3401)

A (DC-/±)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	3.0	2.5	300	174	097-003527-25300
80 - 110	3.5	3.2	350	106	097-003527-32350
100 - 150	4.5	4.0		89	097-003527-40350
150 - 200		5.0		57	097-003527-50350


**SE 308 L**

- Rutile-basic coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Can be used for stabilised and non-stabilised Cr-Ni steels
- Very homogeneous seam finish
- Cold tough up to -196 °C

**Standards**

DIN EN ISO 3581-A          E 19 9 LR 12

AWS A-5.4                      E 308 L -16

Material number              1.4316

**Coating type**

Rutile/basic

**Baking**

seldom necessary / (300 °C / 2 h)

**Chemical analysis**

C	Cr	Ni
0.03	20	11

**Expansion, A5      Yield strength, Rp 0.2%**

≥35 %                          ≥320 MPa

**Tensile strength, Rm**

≥550 MPa

**Impact energy, Av**

≥70 J (20 °C)

**Approvals**

TÜV / DB / CE

**Materials**

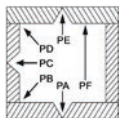
1.4300, 1.4301, 1.4303, 1.4306, 1.4308, 1.4311, 1.4312, 1.4371, 1.4541, 1.4543, 1.4552

A (DC-/±)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
50 - 90	3.0	2.0	300	256	097-003465-20300
		2.5		164	097-003465-25300
80 - 110	3.2	3.2	350	163	097-003465-25350
100 - 150		4.3		4.0	88
150 - 200	5.4	5.0	450	78	097-003465-40350
				49	097-003465-50450



## Stick electrodes

### High-alloy



#### ■ SE 309 L



- Rutile-basic coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Joint welding on heat-resistant CrNi steels
- Self-removing slag, very low spatter tendency
- For dissimilar joints and buffer layers
- Excellent ignition and reignition characteristics
- Maximum operating temperature 300 °C

#### Standards

DIN EN ISO 3581-A E 23 12 LR 32

AWS A-5.4 E 309 L-26

Material number 1.4332

#### Coating type

Rutile/basic

#### Baking

seldom necessary / (300 °C / 2 h)

#### Chemical analysis

C	Cr	Ni
0.03	23	12

#### Expansion, A5 Yield strength, Rp 0.2%

≥30 %      ≥400 MPa

#### Tensile strength, Rm

≥550 MPa

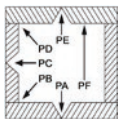
#### Impact energy, Av

≥55 J (20 °C)

#### Materials

Austenite-ferrite joints (dissimilar), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers

A (DC+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
40 - 60	3.0	2.0	300	256	097-003556-20300
60 - 90		2.5		161	097-003556-25300
80 - 110	3.2	3.2	350	88	097-003556-32350
100 - 150	4.3	4.0		79	097-003556-40350


**SE 309 MoL**

- Rutile-basic coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Maximum operating temperature 300 °C
- Very homogeneous seam finish
- Suitable for dissimilar joints

**Standards**

DIN EN ISO 3581-A      E 23 12 2 LR 32

AWS A-5.4                E 309 Mo - 26

Material number        1.4459

**Coating type**

Rutile/basic

**Baking**

seldom necessary / (300 °C / 2 h)

**Chemical analysis**

C	Cr	Ni	Mo
0.03	23	12	3.5

**Expansion, A5    Yield strength, Rp 0.2%**

≥30 %                    ≥460 MPa

**Tensile strength, Rm**

≥650 MPa

**Impact energy, Av**

≥55 J (20 °C)

**Approvals**

TÜV / DB / CE

**Materials**

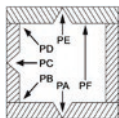
Austenite-ferrite joints (dissimilar), cladding, corrosion-resistant layers on non-alloyed construction steels, buffer layers

A (DC-/+)    kg    Ø/mm    l/mm    PU/Pc.    Item no.
50 - 70    3.0    2.0    rowspan="2">300    rowspan="2">162    097-003466-20300
60 - 90    rowspan="2">3.2    2.5    097-003466-25300
80 - 110    3.2    3.2    rowspan="2">350    rowspan="2">87    097-003466-32350
100 - 150    4.3    4.0    78    097-003466-40350
150 - 200    5.4    5.0    450    49    097-003466-50450



## Stick electrodes

### High-alloy



#### ■ SE 310



- Rutile basic coated, high-alloy stick electrode
- Weld metal made of fully austenitic chrome nickel steel
- For welding heatproof steels
- Self-removing slag, very low spatter tendency
- Scale resistant up to 1150 °C
- Excellent ignition and reignition characteristics
- Not resistant in gases containing sulphur

#### Standards

DIN EN ISO 3581-A E 25 20 LR 12

AWS A-5.4 E 310 - 16

Material number 1.4842

#### Coating type

Rutile/basic

#### Baking

seldom necessary / (300 °C / 2 h)

#### Chemical analysis

C	Cr	Ni	Mn
0.1	25	20	3

#### Expansion, A5 Yield strength, Rp 0.2%

≥35 %      ≥380 MPa

#### Tensile strength, Rm

≥750 MPa

#### Impact energy, Av

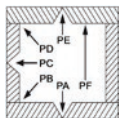
≥70 J (20 °C)

#### Materials

1.4710, 1.4713, 1.4726, 1.4745, 1.4823, 1.4832, 1.4837, 1.4840, 1.4841, 1.4845, 1.4846, 1.4848, 1.4849

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
80 - 110	3.2	2.5	300	181	097-003529-25300
100 - 150	3.5	3.2	350	99	097-003529-32350
150 - 190	4.7	4.0		83	097-003529-40350
160 - 210	4.9	5.0		45	097-003529-50350




**SE 312**

- Rutile coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Self-removing slag, very low spatter tendency
- Suitable for dissimilar joints and buffer layers
- Excellent ignition and reignition characteristics
- Very homogeneous seam finish
- Scale resistant up to 1100 °C

**Standards**

DIN EN ISO 3581-A	E 29 9 R 12
AWS A-5.4	E 312 - 16
Material number	1.4337

**Coating type**

Rutile

**Baking**

seldom necessary / (300 °C / 2 h)

**Chemical analysis**

C	Cr	Ni	Fe
0.1	29	9	Rest

**Expansion, A5 Yield strength, Rp 0.2%**

≥40 %      ≥500 MPa

**Tensile strength, Rm**

≥750 J

**Impact energy, Av**

≥54 J (0 °C)

**Approvals**

DB / CE

**Materials**

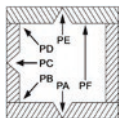
Corrosion-resistant similar steel and cast steel (e.g. 1.4762, 1.4085), difficult to weld steel, manganese steel, repairs and wear-resistant layers

A (DC+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
40 - 60	3.0	2.0	300	249	097-003467-20300
60 - 90		2.5		162	097-003467-25300
80 - 100	3.2	3.2	350	89	097-003467-32350
100 - 150	4.3	4.0		80	097-003467-40350
150 - 200	4.2	5.0		49	097-003467-50350



## Stick electrodes

### High-alloy



#### ■ SE 316 L



- Rutile-basic coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Maximum operating temperature 400 °C
- Can be used for stabilised and non-stabilised Cr-Ni steels
- Very homogeneous seam finish

#### Standards

DIN EN ISO 3581-A E 19 12 3 LR 12

AWS A-5.4 E 316 L - 16

Material number 1.4430

#### Coating type

Rutile-basic coated

#### Baking

seldom necessary / (300 °C / 2 h)

#### Chemical analysis

C	Cr	Ni	Mo
0.03	19	12	3

#### Expansion, A5 Yield strength, Rp 0.2%

≥35 %      ≥320 MPa

#### Tensile strength, Rm

≥550 MPa

#### Impact energy, Av

≥70 J (20 °C)

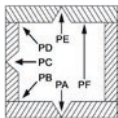
#### Approvals

TÜV / DB / CE

#### Materials

1.4401, 1.4404, 1.4406, 1.4408, 1.4420, 1.4435, 1.4436, 1.4571, 1.4573, 1.4580, 1.4581, 1.4583

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
40 - 60	3.0	2.0	300	260	097-003468-20300
60 - 90		2.5		164	097-003468-25300
				152	097-003468-25350
80 - 110	3.2	3.2	350	89	097-003468-32350
	4.3			80	097-003468-40350
100 - 150	5.4	4.0	450	77	097-003468-40450
150 - 200		5.0		50	097-003468-50450


**SE 318**

- Rutile-basic coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Maximum operating temperature 400 °C
- Very homogeneous seam finish
- Can be used for welding non stabilised Cr-Ni steels

**Standards**

DIN EN ISO 3581-A      E 19 12 3 Nb R 12

AWS A-5.4                E 318 - 16

Material number        1.4576

**Coating type**

Rutile/basic

**Baking**

seldom necessary / (300 °C / 2 h)

**Chemical analysis**

C	Cr	Ni	Mo	Nb
0.03	19	12	3	0.3

**Expansion, A5      Yield strength, Rp 0.2%**

≥30 %                    ≥440 MPa

**Tensile strength, Rm**

≥600 J

**Impact energy, Av**

≥70 J (20 °C)

**Approvals**

TÜV / DB / CE

**Materials**

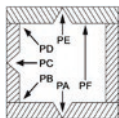
1.4401, 1.4404, 1.4408, 1.4420, 1.4435, 1.4436, 1.4571, 1.4573, 1.4580, 1.4581, 1.4583

A (DC-/+)      kg	Ø/mm	l/mm	PU/Pc.	Item no.	
40 - 60	3.0	2.0	300	249	097-003469-20300
50 - 90		2.5		162	097-003469-25300
80 - 110	3.2	3.2	350	89	097-003469-32350
100 - 150	4.3	4.0		80	097-003469-40350
150 - 200	5.4	5.0		49	097-003469-50450



## Stick electrodes

### High-alloy



#### ■ SE 347



- Rutile basic coated, high-alloy stick electrode
- Can be welded in any position except vertical down
- Can be used for welding stabilised Cr-Ni steels
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Maximum operating temperature 400 °C

#### Standards

DIN EN ISO 3581-A	E 19 9 Nb R 12
AWS A-5.4	E 347-16
Material number	1.4551

#### Coating type

Rutile/basic

#### Baking

seldom necessary / (300 °C / 2 h)

#### Chemical analysis

C	Cr	Ni	Nb
0.03	19	9	0.3

#### Expansion, A5 Yield strength, Rp 0.2%

≥40 %      ≥350 MPa

#### Tensile strength, Rm

≥600 MPa

#### Impact energy, Av

≥65 J (20 °C)

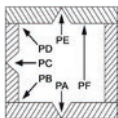
#### Approvals

CE

#### Materials

1.4300, 1.4301, 1.4303, 1.4306, 1.4308, 1.4311, 1.4312, 1.4371, 1.4541, 1.4543, 1.4552

A (DC+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
40 - 60	3.0	2.0	300	250	097-003587-20300
50 - 90		2.5		160	097-003587-25300
80 - 110	3.2	3.2	350	98	097-003587-32350
100 - 150	4.5	4.0		84	097-003587-40350
150 - 200	5.0	5.0		50	097-003587-50450


**SE 625**

- Basic coated, high alloy nickel based stick electrode
- Self-removing slag, very low spatter tendency
- Excellent ignition and reignition characteristics
- Maximum operating temperature of the components 1000 °C
- Cold tough up to -196 °C
- Scale resistant up to 1100 °C
- Suitable for transformer
- Alloy core rod

**Standards**

DIN EN ISO 14172                      E Ni 6625 (NiCr22Mo9Nb)

AWS A-5.11                                E NiCrMo3

Material number                        2.4621

**Coating type**

Rutile/basic

**Baking**

seldom necessary / (300 °C / 2 h)

**Chemical analysis**

C	Cr	Mo	Nb	Ni
0.03	19.5	11	4	Rest

**Expansion, A5    Yield strength, Rp 0.2%**

≥30 %                                        ≥450 MPa

**Tensile strength, Rm**

≥760 MPa

**Impact energy, Av**

≥75 J (20 °C) / ≥60 J (-196 °C)

**Materials**

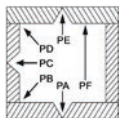
Alloy 625, alloy 800 and similar Ni-Cr alloys

A (DC-/±)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	3.2	2.5	300	170	097-003531-25300
80 - 110	3.5	3.2	350	96	097-003531-32350
100 - 150	4.7	4.0		91	097-003531-40350
150 - 200	4.9	5.0		53	097-003531-50350



## Stick electrodes

### High-alloy



#### ■ SE 2209 Duplex

- Rutile coated, high-alloy stick electrode
- For ferrite-austenitic Cr-Ni-Mo steels
- Resistant to products containing chloride and acid gases
- Self-removing slag, very low spatter tendency
- Use in offshore technology e.g. in pipe construction
- Excellent ignition and reignition characteristics
- Maximum operating temperature of the end product: 250 °C

#### Standards

DIN EN ISO 3581-A E 22 93 R 32

AWS A-5.4 E 2209 L-16

Material number 1.4462

#### Coating type

Rutile/basic

#### Baking

seldom necessary / (300 °C / 2 h)

#### Chemical analysis

C	Cr	Ni	Mo	N
0.03	22	9	3.3	0.15

#### Expansion, A5 Yield strength, Rp 0.2%

≥25 %      ≥480 MPa

#### Tensile strength, Rm

≥690 MPa

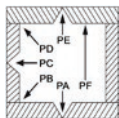
#### Impact energy, Av

≥50 J (20 °C)

#### Materials

1.4462, 1.4417, 1.4460, 1.4362

A (DC-/+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	3.2	2.5	300	181	097-003528-25300
80 - 120	3.5	3.2	350	99	097-003528-32350
110 - 170	4.5	4.0		83	097-003528-40350


**SE Hard 600**

- Basic coated stick electrode
- For very hard GMA welds under grinding-impact wear
- Broad range of applications with problem free processing at the same time
- Weld metal can be processed exclusively by grinding
- Suitable for transformer

**Standards**

EN 14700 E Fe8

Material number 1.4718

**Baking**

300 °C / 2 h

**Chemical analysis**

C	Cr	Mn	Mo	V
0.8	10	0.7	1	1.2

**Hardness**

60 HRC

**Materials**

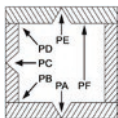
Hardfacing, suitable for wear and impacts

A (DC-/+) / kg	Ø/mm	l/mm	PU/Pc.	Item no.
80 - 120	2.5	350	166	097-003534-25350
100 - 160	3.2		98	097-003534-32350
160 - 220	4.0	450	89	097-003534-40450
190 - 260	5.0		55	097-003534-50450



## Stick electrodes

● High-alloy ● Hardfacing



### ■ SE Fe3 350 GP

- Basic-coated high-performance electrode
- Suitable for repair and production welding on medium-alloy steels
- Also suitable for difficult to weld steels
- Broad range of applications with problem free processing at the same time
- Very strong and highly resistant to cracking
- Wear-resistant GMA-surfacing on steel

### Standards

EN 14700	E Fe3
AWS	E3 UM / 350 GP

### Baking

300 °C / 2 h

### Chemical analysis

C	Si	Mn	Mo	Cr
0.1	0.5	1	2.3	2.5

### Tensile strength, Rm

≥1200 MPa

### Hardness

60 HRC

A (DC+)	kg	Ø/mm	l/mm	PU/Pc.	Item no.
60 - 90	3.5	2.5	350	155	097-003605-25350
95 - 150		3.5		92	097-003605-32350
140 - 190	6.0	4.0	450	80	097-003605-40450



## Notes

A large rectangular area with a dotted border, containing 20 horizontal dotted lines for writing notes.

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