

**CARBO**  **WELD**®

welding solutions  
worldwide



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**I. Electrodes for welding STAINLESS STEELS**

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation [%] A5
<b>CARBO 4316 AC</b>	E 308L-17 E 19 9 LR 12	C: <0,03 Mn: 0,7 Ni: 10	Si: 0,8 Cr: 19	Rutile-coated electrode for welding corrosion-proof Cr-Ni steels with low carbon content. Operating temperature -120°C up to 350°C. Approvals: TÜV, DB, CE 4316 MPR has a recovery of 160%. YS= 380 TS= 560 IV= >32 at -120°C E= >35	
<b>CARBO 4316 MPR</b> =+/-	E 308 L-26 E 19 9 LR 53				
<b>CARBO 4551 AC</b>	E 347-17 E 19 9 Nb R 12	C: 0,06 Mn: 0,7 Ni: 10 Nb: 8 x %C	Si: 0,9 Cr: 20	Rutile-coated electrode suitable for joining corrosion-proof stabilized or unstabilized Cr-Ni steels. Operating temperature -60°C up to 400°C.  YS=400 TS=600 IV=53 at -60°C E=40 Approvals: TÜV, DB, CE	
=+/-					
<b>CARBO 4430 AC</b>	E 316L-17 E 19 12 3 LR 12	C: <0,03 Mn: 0,6 Ni: 12	Si: 0,8 Cr: 19 Mo: 2,8	Cr-Ni-Mo alloyed electrode with low carbon content. Operating temperature -120°C up to 400°C YS=400 TS=580 IV=37 at -120°C E=>32 Approvals: TÜV, DB, CE	
<b>CARBO 4430 MPR</b>	E 316L-26 E 19 12 3 LR 53			4430 MPR has a recovery of 160%.	
<b>CARBO 4430 FALL</b> =+/-	E 316L-17 E 19 12 3 LR 11			4430 Fall is specially designed for vertical down welding.	
<b>CARBO 4576 AC</b>	E 318-17 E 19 12 3 Nb R 12	C: <0,07 Mn: 0,6 Ni: 11 Nb: 8 x %C	Si: 0,8 Cr: 19 Mo: 2,6	Stabilized Cr-Ni-Mo alloyed electrode for working temperature up to 400°C and down to -60°C for cold tenacions steels.  YS=400 TS=590 IV=57 at -60°C E=36 Approvals: TÜV, DB, CE	
<b>CARBO 4576 MPR</b> =+/-	E 318-26 E 19 12 3 Nb R 53				
<b>CARBO 4576 B</b> =+	E 318-15 E 19 12 3 Nb B 22				

**II. Electrodes for welding HEAT- and SCALE-RESISTANT STEELS**

<b>CARBO 4332 AC</b>	E 309L-17 E 23 12 LR 12	C: <0,04 Cr: 24 Mn: 0,7	Si: 0,9 Ni: 13	Rutile-coated electrode suitable for joining difficult-to-weld steels and for corrosion-proof plating. Scale-resistant up to 1000°C.  YS>400 TS=590 IV=32 at -60°C E=>32 Approvals: TÜV	
=+/-					
<b>CARBO 4829 AC</b>	E 309-17 E 23 12 R 32	C: 0,11 Cr: 23 Mn: 0,7	Si: <0,9 Ni: 13	CARBO 4829 AC is especially suited for difficult-to-weld steels and for use on corrosion-resistant plating. It is an AC-weldable core rod alloy, rutile-coated electrode for joint welding on heat that is scale durable. A CrNi 18 / 10 alloy can be made even when austenitic weld metal is already present in the first layer. The alloy is also suitable for buffer layers on clad sheets. CARBO 4829 AC is heat and scale resistant up to 950°C. Z=700 S=500 D=30 K=>55.	
=+/-					
<b>CARBOTRODE 253</b>	E 309-16 EZ 22 12 R 12	C: 0,08 Mn: 0,6 Ni: 10,5	Si: 1,0 Cr: 23 N: 0,16	CARBOTRODE 253 is an AC-weldable core rod alloy, rutile-coated electrode for joint welding on heat-resistant steels such as 1.4828 as well as nitrogen-alloyed grades like 1.4835. The fully austenitic weld metal is scale-resistant up to 1150°C. Z=730 S=550 D=35 K= at Rt. 60.	
=+/-					
<b>CARBO 4842 AC</b> =+/-	E 310-16 E 25 20 R 12	C: 0,10 Cr: 25	Mn: 3 Ni: 21	Rutile-coated electrode for welding heat-proof steels. Weld deposit scale-resistant up to 1200°C 4842 B is a basic-coated electrode. YS=350 TS=600 IV=80 E=30	
<b>CARBO 4842 B</b> =+	E 310-15 E 25 20B 22				
<b>CARBO 4820 AC</b> <b>CARBO 4820 MPR</b> =+/-	E 25 4 R 12 E 25 4 R 52	C: 0,06 Cr: 25	Mn: 0,7 Ni: 4,7	Electrode for welding heat- and scale-resistant steels. Resistant to oxidizing and sulphuric gases. YS=500 TS=700 E=20	

### III. Electrodes for welding DISSIMILAR, UNKNOWN or PROBLEM STEELS

Type	AWS: / EN:	Typ. analysis [%]	YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO 29/9 AC</b>  <b>CARBO 29/9 MPR</b> =+/~	E 312-17 E 29 9 R 12  E 312-26 E 29 9 R 53	C: <0,10 Cr: 29 Mn: 0,7 Ni: 9,5		Electrode for welding dissimilar steels and for plating. Material No.1.4337 scale-resistant up to 1000°C. Approval: DB, CE YS=580 TS=800 IV=30 E=20 29/9 MPR has a recovery of 160%.
<b>CARBOTRODE 92</b> =+/~	E 312-17 E 29 9 R 12	C: <0,10 Cr: 29 Mn: 0,65 Ni: 9		Electrode for welding dissimilar steels and for plating. Material No.1.4337 scale-resistant up to 1000°C. Possibility for higher current welding. YS=580 TS=800 IV=30 E=20
<b>CARBOTRODE 903</b>   =+/~	E 312-17 /MOD E 29 9 3 R 12	C: <0,10 Mn: 0,7 Ni: 9 Si: 1,1 Cr: 29 Mo: 2,8		CARBOTRODE 903 is an AC weldable stick electrode with a Mo-alloyed core wire resulting in a higher yield point, tensile strength and elongation values with increased crack resistance for joint welds on base materials that are difficult to weld. ~ Material No.: 1.4337 Scale-resistant up to 1000°C For higher current carrying capacity. Z=820 S=600 D=25 K=40 at Rt.
<b>CARBO</b> =+/~ <b>CARBO 4370 MPR</b> =+/~ <b>CARBO 4370 B</b> =+	E 18 8 Mn R 12  E 307-26 E 18 8 Mn R 53  E 18 8 Mn B 22  DIN EN 14700 E Fe 10 -200 CKNPZ	C: 0,10 Cr: 18 Mn: 6 Ni: 8,5		Electrode for welding difficult-to-weld steels, crack-sensitive steel with >0,7% carbon content and for joint welding of austenitic to ferritic steels. CARBO 4370 can be used for welding equalizing buffer layers prior to hardfacing and for repair welding of Mn-steels. Stainless, heat resistant weld metal, non-scaling up to 850°C.  4370 AC approvals: TÜV, DB 4370 B is DB approved YS=>400 TS=600 IV=70 E=>32
<b>CARBO 4431 AC</b>  <b>CARBO 4431 MPR</b> =+/~	E 308MoL-17  E 308MoL-26 E 20 10 3 LR 53	C: <0,04 Ni: 10 Cr: 19 Mo: 3		Electrode for joining austenitic to ferrite steels. Same suitability for joint welding heat treatable steels, manganese steels. 4431 MPR has a recovery of 160%. YS=540 TS=700 IV=50 at -60°C E=30 4431 AC Approvals: TÜV
<b>CARBO 4459 AC</b>   =+/~	E 309MoL-17 E 23 12 2 LR 12	C: <0,04 Ni: 13 Cr: 23 Mo: 2,6		Rutile-coated electrode suitable for joining difficult-to-weld steels and for corrosion-proof claddings. The alloy is also suitable for welding buffer layers on plated metal sheets. YS=450 TS=650 IV=48 at -20°C E=28 Approvals: TÜV, DB, CE

### IV. Electrodes for welding Special Applications

<b>CARBO 4009 MPR</b>  <b>CARBO 4009 B</b> =+/{~}	E 410-17 E 13 R 52  E 410-15 E 13 B 22	C: 0,05 Cr: 13 HB: 190 Mn: 0,6		Rutile-coated electrode with a recovery of 160% for plating and joining equal and similar ferrite Cr-steels and cast steels.  YS=420 TS=680 E=18
<b>CARBO 4015 MPR</b>   =+/~	E 430-16 E 17 R 52	C: 0,11 Cr: 17 Mn: 0,7		Rutile-coated electrode with a recovery of 160% for corrosion- and wear-proof plating on water, steam and gas valves, especially for sulphuric gases.
<b>CARBO 4115 MPR</b>  <b>CARBO 4115 B</b> =+/{~}	EZ 17Mo R 52  EZ 17 Mo B 22	C: 0,2 Cr: 16 Mn: 0,5 Mo: 1,2		Rutile-coated electrode with a recovery of 160% for corrosion- and wear-proof plating on water, steam and gas valves. Hardness: as welded HB: 200 after heat treatment: approx. 38 HRC  YS=500 TS=700 E=15
<b>CARBO 4120 MPR</b>   =+/{~}	EZ 13 1 R 52	C: 0,2 Mo: 1,2 Cr: 14 Ni: 1,0		Rutile-coated electrode with a recovery of 160% for operating temperature up to 500°C. Scale resistant up to 800°C Hardness: as welded HB: 200 after heat treatment: approx. 38 HRC YS=540 TS=730 E=12
<b>CARBO 4351 MPR</b>  <b>CARBO 4351 B</b> =+/{~}	E 410NiMo-16 E 13 4 R 53  E 13 4 B 22 E 410NiMo-15	C: 0,06 Mn: 0,6 Ni: 4,5 Si: 0,7 Cr: 13 Mo: 0,5		Rutile-coated electrode with a recovery of 150% with a cavitation and erosion resistant weld deposit. Applications: Bridge stores, deposition to thick areas of water, steam and gas fittings YS=700 TS=1100 IV=>43 E=15

**IV. Electrodes for welding Special Applications**

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO 4462 AC</b>  =+/-	E 2209-17 E 22 9 3 N LR 12	C <0,03 Ni: 9,0 N: 0,10	Cr: 22,5 Mo: 3,0	Electrode suitable for welding on compound steels of same or similar types. The weld deposit is resistant to pitting, stress corrosion cracking and intercrystalline corrosion at temperatures up to 250°C.  YS=610 TS=780 IV=44 at -40°C E=26 Approvals: TÜV	
<b>CARBO 4462 Cu B</b>  =+	E 25 9 3 Cu N L B 22  DIN 8555: E 9-UM-300-CKR	C: 0,03 Mn: 0,7 Ni: 9 N: 0,2	Si: 0,8 Cr: 25 Mo: 4,0 Cu: 2,5	Basic electrode suitable for welding on compound steels of same or similar type. The weld deposit is resistant to pitting, stress corrosion cracking and intercrystalline corrosion at temperatures up to 250°C. The deposit gives better corrosion results than the Cu free version.  YS=700 TS=850 IV=>32 E=30	
<b>CARBO 4410 AC</b>  =+	E 2594-16 E 25 9 4 N L R 32	C <0,03 Mn: 0,8 Ni: 9,5 N: 0,25	Si: 0,6 Cr: 25,5 Mo: 4,0	For welding onto identical and similar duplex and super duplex steels, CARBO 4410 AC is the choice. AC-weldable core rod alloy electrode. The deposited weld metal is resistant to pitting, stress cracking and intergranular corrosion due to the high CrMo(N) content (PRE effective sum > 40). With added stick material, the weld metal also provides superior strength values and is well suited for use in offshore environments. Z=850 S=700 D=30 K=> 40 at -40°C	
<b>CARBO 4501 B</b>  =+	E 2595-15 E 25 9 4 N L B 22	C <0,04 Mn: 1,2 Ni: 9 N: 0,2 W: 0,6	Si: 0,5 Cr: 25 Mo: 3,8 Cu: 0,7	For best results when weld matching and in situations involving similar duplex and super duplex steels, use the core-rod alloyed electrode CARBO 4501 B. The deposited weld metal is resistant to pitting, stress cracking and intergranular corrosion due to the high CrMo(N) content (PRE effective sum > 40). Due to added nitrogen, the weld metal obtains good strength values and is especially well suited for use in offshore applications. Z=750 S=600 D=25 K=> 50 at -50°C	
<b>CARBO 4440 AC</b>  =+/-	E 317L-17 E 18 16 5 N L R 12	C: <0,03 Mn: 1,0 Ni: 17,5 N: 0,12	Si: 0,8 Cr: 18 Mo: 4,5	Electrode suitable for joining corrosion-resistant CrNiMoN steels as well as for austenitic-ferritic joints. The weld metal is very high corrosion resistant, especially under non oxidizing, halogenious conditions. The high molybdenum content results in extended resistance against pitting intercrystalline corrosion (wet corrosion up to 350°C) YS=400 TS=580 IV=55 at -120°C E=25	
<b>CARBO 4519 HE</b>  =+/-	E 385-17 E 20 25 5 Cu N L R 53	C: 0,02 Ni: 25 Cu: 1,5	Cr: 20 Mo: 4,5	Rutile-coated electrode with a recovery of 160% well suited for joint welding on the same or similar corrosion resistant CrNiMoCu steels. Overlays leave a pierce and tension resistant deposit. YS=380 TS=580 IV=80 at -40°C E=40 Operating temperature: up to 350°C	
<b>CARBO 4850 B</b>  =+	EZ 22 33 Nb B 22 (Alloy 800)	C: 0,15 Mn: 3,0 Ni: 33	Si: 0,6 Cr: 21 Nb: 1,2	Basic-coated electrode for joint welding corrosion- and heat-resistant high alloyed steels and caststeels. The deposit is heat-proof up to 1050°C and resistant to carburising, oxidising and reducing gases.  YS=380 TS=600 IV=45 E=25	
<b>CARBO 4853 B</b>  =+	EZ 25 35 Nb B 22	C: 0,40 Mn: 2,0 Nb: 1,3	Si: 1,0 Cr: 24,5 Ni: 35	Basic-coated electrode for joint welding corrosion- and heat-resistant high alloyed steels and caststeels. The deposit is heat-proof up to 1050°C and resistant to carburising, oxidising and reducing gases. Scale resistant up to 1050°C.	
<b>CARBO 4948 B</b>  =+	E 308H-15 EZ 19 9 B 22	C: 0,05 Mn: 1,5 Ni: 9,5	Si: 0,5 Cr: 18,5	Basic-coated electrode, suitable for welding of austenitic CrNi steels and steel castings with carbon contents higher than 0,4% as well as ACl conform castings. The alloy is high temperature resistant up to 700°C and scale resistant up to 800°C. YS=450 TS=660 IV=60 E=28	
<b>CARBO 4846 B</b>  =+	E 310H-15 E 25 20 H B 22	C: 0,40 Cr: 25,5	Mn: 2,4 Ni: 21,5	High alloyed electrode for centrifugally cast tubes of material HK-40. Used in industrial heating equipment up to 1100°C and for petrochemical applications. Good resistance against fissuring, hot cracking and carburisation.	

## V. Electrodes for welding CAST IRON

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO Ni 2</b>  =+/~	E Ni Cl  E Ni-BG 11	C: 0,7 Fe: 2,5 Ni: Rest	Mn: 1,0 Cu: 0,6	For maximum machinability on grey cast iron and malleable iron. A general purpose pure nickel electrode for filling up holes and casting defects, for correcting defects from machining and for building up worn sections. Recommended for use on dirty, aged and burnt cast iron. Use CARBO NUT for weld preparation. Hardness: 160 HB	
<b>CARBOCAST 1</b>  =+/~	E Ni-C1 EN ISO 1071 E C Ni-Cl 3	C: 0,7 Ni: Rest Cu: 0,5	Si: 0,6 Fe: 5,0	When cold welding grey, malleable, cast steel or welding on fatigued castings, use CARBOCAST 1, an electrode with a basic graphitic special coating. When welding on a DC negative pole, it gives a flat seam appearance through clean flowing weld metal. A direct current + results in a curved seam appearance with a calmer flow since the low heat effect on the base material results in a thick application. Hardness approx. 180 HB	
<b>CARBO NiCu</b>  =±	E NiCu-B  E C NiCu 1	C: 0,5 Mn: 1,8 Cu: 30	Si: 0,6 Ni: 64 Fe: 3,0	CARBO NiCu is an electrode with a basic graphitic special coating and a NiCu core wire. It bears a great similarity in color to welding metals with cast iron. CARBO NiCu is therefore particularly suitable for fixed casting bugs and recast machining bugs. Hardness approx. 165 HB	
<b>CARBO NiFe 31</b>  =+/~	E NiFe-Cl  E NiFe-1-BG 11	C: 1,1 Fe: 44 Ni: 54		For high strength & toughness on ductile SG-iron including Meehanite and austenitic Ni-resist type irons. Also used for joining the above irons and cast-iron to steel. Excellent welding characteristics without any risk of overheating. Use CARBO NUT for weld preparation. Hardness: 190 HB	
<b>CARBO NiFe 55</b>  =+/~	E NiFe-Cl  E NiFe-1-BG 11	C: 1,0 Si: 1,0 Fe: Rest	Mn:1,0 Ni: 54	Basic-graphite special coated electrode with a recovery of 160%. Suitable for joining and repairing all types of grey cast iron, but especially for repair of big parts. This electrode excels by very high crack-resistance and high tensile strength of the weld metal.	
<b>CARBO NiFe 60/40</b>  =+/~	E NiFe-Cl  E NiFe-1-BG 11	C: 1,1 Fe: 43 Ni: 54		Basic-graphite special coated electrode with a ferro-nickel corewire. Suitable for joining and repairing all types of grey cast iron with steel, but especially for nodular cast iron. This electrode excels by very high crack-resistance and high tensile-strength of the weld metal.	
<b>CARBO NiFe 60/40K</b>  =+/~	E NiFe-Cl  E NiFe-1-BG 11	C: 1,1 Fe: 43	Ni: 54 Cu: 0,6	Basic-graphite special coated electrode with a copper plated ferro-nickel core. Suitable for joining and repairing all types of grey cast iron with steel, but especially for nodular cast iron. This electrode excels by very high crack-resistance and high tensile-strength of the weld metal.	
<b>CARBO GG</b>  =+/~	Est  E Fe C-2-BG 11	C: 1,7 Mn: 0,9	Si: 1,2 Ti: +	Special basic graphite coated stick electrode for the welding of cast iron. It is used for the repair of difficult to weld steels, heavily contaminated and poor quality cast iron. It is also suitable for wear resistance overlays on cast iron parts. The weld deposit has ca. 340 HB in the first 2 layers.	

## VI. COBALT based Electrodes for HARD SURFACING and CLADDING

<b>CARBO S 1</b>  =+/~	E CoCr-C E Co 3-55-CSTZ  HRc: ca. 55	C: 2,2 Mn: 1,0 W: 12,5 Co: Base	Si: 1,2 Cr: 30 Fe: 3	AC-weldable hardfacing electrode with an alloyed core and a recovery of 160%. The deposit is a cobalt base alloy of austenitic-ledgeburitic structure with embedded CrW carbides. It is the hardest of the standard cobalt base alloys. The weld metal is highly resistant to corrosion, impact, abrasiv wear as well as thermal shocks and heavy mechanical impact. Wear pads, rotary seal rings, pump sleeves, centre less grinder work rests.	
<b>CARBO SK 6</b> <b>CARBO S 6</b> (S 6 has a recovery of 160%) =+/~	E CoCr-A E Co 2-40-CTZ  HRc: ca. 42	C: 1,0 Mn: 1,0 W: 4,5 Co: Base	Si: 0,9 Cr: 28 Fe: 3	AC-weldable hardfacing electrode with a rutile-basic coating and an alloyed core. The deposit is a cobalt base alloy of austenitic-ledgeburitic structure with embedded CrW carbides. The weld metal is highly resistant to corrosion, impact, abrasiv wear as well as thermal shocks and heavy mechanical impact. Good aptitude for polishing and machining. Used on steam valves, hot shear blades, hot pressing dies, etc.	
<b>CARBO S 12</b>  =+/~	E CoCr-B E Co 2-50-CTZ  HRc: ca. 48	C: 1,4 Mn: 1,0 W: 8,5 Co: Base	Si: 0,9 Cr: 28 Fe: 3	AC-weldable hardfacing electrode with an alloyed core and a recovery of 160%. The weld metal is highly resistant to corrosion, impact, abrasiv wear as well as thermal shocks and heavy mechanical impact. Hardfacing of cutting edges, long knives and other tools used in the wood, plastic, paper, carpet and chemical industry.	
<b>CARBO SK 21</b> <b>CARBO S 21</b> (S 21 has a recovery of 160%) =+/~	E Co 2-300-CKTZ  HRc: ca.30	C: 0,3 Mn: 1,0 Mo: 5,5 Fe: 3 Co: Base	Si: 0,9 Cr: 28 Ni: 3	CARBO SK 21 is a rutile-coated electrode which is AC weldable. The deposit is a cobalt base alloy of high tenacity as well extrem corrosion- and heat-resistance. The weld metal is highly resistant to impact and is work-hardening up to 45 HRC. SK 21 is particularly recommended for use on all work pieces which are subjected to corrosion, impact wear as well as high temperatures or termal shocks.	

**VI. COBALT based Electrodes for HARD SURFACING and CLADDING**

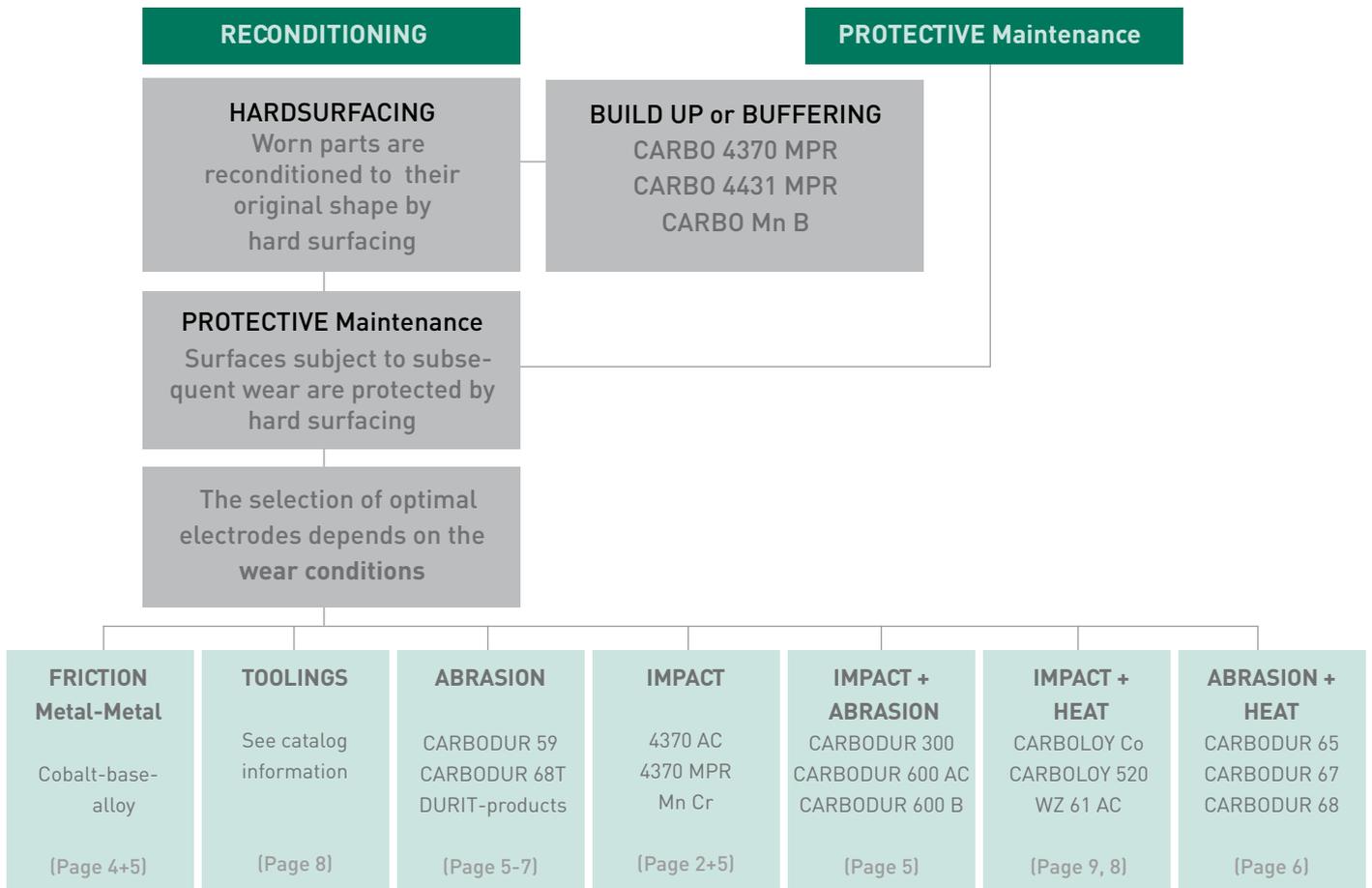
Type	AWS: / EN:	Typ. analysis [%]	YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO TS 1</b>	R CoCr-C S Co 3-55-CSTZ HRc: ca. 55			Bare cobalt base rod for oxy-acetylen and TIG-welding. Applications and alloy see description of CARBO S1.
<b>CARBO TS 6</b>	R CoCr-A S Co 2-40-CTZ HRc: ca. 42			Bare cobalt base rod for oxy-acetylen and TIG-welding. Applications and alloy see description of CARBO S6 / SK6.
<b>CARBO TS 12</b>	R CoCr-B S Co 2-50-CTZ HRc: ca. 48			Bare cobalt base rod for oxy-acetylen and TIG-welding. Applications and alloy see description of CARBO S12.
<b>CARBO TS 21</b>	S Co 2-300-CKTZ HRc: ca. 30			Bare cobalt base rod for oxy-acetylen and TIG-welding. Applications and alloy see description of CARBO S21 / SK21.

**VII. Electrodes for HARDSURFACING**

<b>CARBODUR Mn</b> =+/~	E FeMn-A E Fe 9-250-KNP	C: 0,8 Mn: 14	Si: 0,5 Ni: 3	CARBODUR Mn is suitable for hardfacing on parts which are subject to extrem impact stress and cavitation. A considerable increase in wear resistance through stain hardening can be achived by cold-hammering.
<b>CARBODUR MnCr</b> =+/~	E FeMn-B E Fe 9-250-KNP 55 HRc workhardened	C: 0,6 Mn: 17	Si: 0,5 Cr: 14	A high-manganes-crome depositing electrode designed for hard facing and buffering layers. Good ductility is obtained where extreme heavy impact conditions apply.CARBODUR Mn/Cr has a recovery of 140%. Railway lines, points, wobblers ends and mill hammers.
<b>CARBODUR 300</b> =+/~	E Fe 1-300-P HB: 275-325	C: 0,1 Cr: 1,2	Mn: 1	For moderat wear and impact. Deposits are machinable. Rolling mills, rails, frogs, points, wheels, tractor rollers and bearing journals. Also for building up layers prior to depositing harder weld metal.
<b>CARBODUR 600 AC</b> =+/~	E Fe 8-60-P HRc: 57-60	C: 0,6 Mn: 1,2	Si: 1,7 Cr: 9	For abrasion and impact with soft running characteristics. Deposits not machinable. Earth moving, steel works and foundry equipment; items such as cast steel cog wheels, brake shoes, rail points and crusher jaws.
<b>CARBODUR 600 B</b> =+	E Fe 8-60-P HRc: 58-60	C: 0,6 Mo: 0,5	Cr: 9 V: 1,4	Same applications as CARBODUR 600 AC. Recommended for cutting edge work because of the special microstructure of the deposit. The electrode is good for welding in constrained positions.
<b>CARBODUR 606 B</b> =+	E Fe 2-60 T HRc: 57-59	C: 0,4 Mn: 0,3 V: 0,5	Si: 0,5 Cr: 7,0	A basic-coated electrode, CARBODUR 606 B is suitable for application on mild steel, cast steel and manganese steel. For welding tough, hard, abrasion-resistant layers. Note: Very crack-sensitive base materials should have an intermediate weld layer of CARBO 4370 or CARBO DUR MnCr for additional toughness.
<b>CARBODUR 42</b> =+/~	E Fe 14-45-CGR HRc: 42-44	C: 1,8 Ni: 3	Cr: 29 Mo: 1	For rebuilding and hardfacing of parts subject to combined wear from corrosion and abrasion. The work hardening condition that comes from machining after the welding process is an added advantage. Extruders in the chemical, foodstuff and meat processing industries.
<b>CARBO SUGARTRODE</b> =+/~	E Fe 14 -55 GR HRc: 50-60	C: 1,8 Ni: 3	Cr: 29 Mo: 1	CARBO SUGARTRODE is a thick-coated AC-suitable, high-performance electrode for welding highly wear-resistant, non-corrosive tender hard armor. The weld metal is austenitic embedded with ten metal carbides. CARBO SUGARTRODE withstands medium impact loads.
<b>CARBODUR 59</b> =+/~	E FeCr-A1 E Fe 14-60-GR HRc: 57-60	C: 3,8 Other: ca. 2%	Cr: 33	For extreme abrasion and light impact with soft running characteristics. The welding deposit is also corrosion resistant. Crusching mills, buckets, dredgers, screw conveyors and mixer parts.

VII. Electrodes for HARDSURFACING

Type	AWS: / EN:	Typ. analysis [%]	YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBODUR 61</b> =+/~	E Fe 15-65-GTRZ HRc: 63-65	C: 5,2 Cr: 29 Si: 2,2 Nb: 6,8 Bor: 1,1 Other: ca 2,5%		For extreme abrasive wear and moderate impact. This soft running heavy coated electrode deposits austenitic carbide weld metal with included special primary, niobium carbides. The electrode has a recovery of 240%.
<b>CARBODUR 63</b> =+/~	E Fe 15-65-GTR HRc: 62-64	C: 5,2 Cr: 34 Other: ca. 2%		Heavy coated high efficiency hardfacing electrode with 170% recovery. Suitable for applications subject to strong abrasive wear by minerals, combined with moderate impact, medium shocks and compression as humidity or wetness.
<b>CARBODUR 65</b> =+/~	E Fe 16-65-GTZ HRc: 63-65 HRc: 45 at 400°C	C: 4,5 Cr: 24 Mo: 6 Nb: 6,2 W: 2 V: 1		Heavy coated high efficiency hardfacing electrode with 240% recovery. The electrode is used for hardfacing of parts subject to strong abrasive wear, friction also at high temperatures. CARBODUR 65 provides extremely high resistance to abrasion also at temperatures up to 600°C.
<b>CARBODUR 67</b> =+/~	E Fe 16-65-GTRZ HRc: 63-66	C: 5 Cr: 23 Si: 1,5 V: 10		Heavy coated high efficiency hardfacing electrode with 170% recovery. The alloy is highly resistant to abrasion combined with impact stress. The special chemical composition of the alloy ensures good wear resistance in various temperature ranges. The fine grained structure of the weld metal provides a solid matrix which retains the vanadium carbides also when subject to strong abrasion and ensures high crack-resistance.
<b>CARBODUR 68</b> =+/~	E FeCr-A1 E Fe 15-70-GTZ HRc: 68-70	C: 5,5 Cr: 36 Other: 3-4%		Heavy coated high efficiency hardfacing electrode with 170% recovery. The alloy is highly resistant to abrasion combined with impact stress. The special chemical composition of the alloy ensures good wear resistance in various temperature ranges. The fine grained structure of the weld metal provides a solid matrix which retains the vanadium carbides also when subject to strong abrasion and ensures high crack-resistance.
<b>CARBODUR 68 T</b> =+/~	E Fe 14-70-GTRZ HRc: 68-70	C: 4,5 Cr: 28 Other: 3-4%		Heavy coated high efficiency hardfacing electrode with 210% recovery. The alloy contains carbide forming elements of different kinds. CARBODUR 68 T is mainly used for applications where parts are subject to strong abrasiv wear. Prior to surfacing on old hardfacing layers a buffer layer with CARBO 4370 MPR is recommended.
<b>CARBODUR 405 T</b> =+/~	E/T Fe 15-65-GTZ HRc: 62-65	C: 5,5 Cr: 40 Mn: 1,5 Other: 2%		Tubular electrode filled with chromium carbide powder, suitable for hardfacings on parts which are mainly subject to abrasiv wear, but also to impact stress. High amount of Cr carbides in a austenitic matrix, very compact. This electrode can be consumed with very low current. High hardness is achieved already in the first layer.



**VIII. Tungsten carbide**

Type	AWS: / EN:	Typ. analysis [%]	YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation [%] A5
<b>CARBO DURIT A</b> <b>CARBO DURIT E</b>  =+/-	T Fe 20-65-GZ E Fe 20-65-GZ  Hardness WSC: >2300 HV	Fe: ca. 40% WSC: ca. 60%		Durit A = tungsten carbide filled Fe base tupe Durit E = Durit A, coated version for electric arc welding The deposits give extended wear protection. For hardfacing and repairing tools and machine parts exposed to wear in: Mining, Road Construction, Ceramic, Excavation and Dredging.
<b>CARBO DURIT Ni A</b> <b>CARBO DURIT Ni E</b>  =+/-	T Ni 20-55-CGTZ E Ni 20-55-CGTZ  Matrix Hardness: ca. 50 HRc Hardness WSC: >2300 HV	NiCrSiB-alloy ca. 37% WSC: ca. 63%		Durit NiA = tungsten carbide filled Ni base tupe Durit NiE = Durit NiA, coated version for electric arc welding The deposit is highly resistant to acids, bases and other corrosive media and excessive wear conditions. Platings of mixer blades, screws & conveyors in Chemical and dye industry and for stabilizer blades in the petroleum industry.
<b>CARBO DURFLEX Ni</b>	T Ni 20-50-CGTZ  Matrix Hardness: ca. 50 HRc Hardness WSC: >2300 HV	NiCrSiB-alloy ca. 37% WSC: ca. 63%		Flexible NiBSi matrix electrode with a high content of WSC. The deposit is highly resistant to acids, bases and other corrosive media and excessive wear conditions. Platings of mixer blades, screws & conveyors in Chemical and dye industry and for stabilizer blades in the petroleum industry.
<b>CARBO DURIT CS 60</b>		Hard metal content: ca. 60 %		Crushed particles of sintered tungsten carbide in a nickel silver matrix. For cutting and wear resistant applications as: milling tools, stabilizers, reamers, coring tools, down hole reamers, openers, fishing tools (spears).

**IX. Electrode for CUTTING and CHAMFERING**

<b>CARBO NUT</b>  =-/~				Electrode for chamfering, grooving and gauging all metals, including all tps of ferritic and austenitic steels as well as Cu-alloys, cast steels and grey cast iron.
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### X: TOOL STEEL

Type	AWS / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO WZ 11 B</b> =+	E Fe 3-60-ST  HRc: 57-59	C: 0,3 Mn: 0,9 Mo: 1,5	Si: 0,5 Cr: 9 W: 9	Basic-coated electrode for high wear resistant hardfacings on hot- and cold-working tools. The deposit has a crack-free martensitic structure. For achieving optimal crack free deposits preheating of the base material to 250°C-300°C is essential.	
<b>CARBO WZ 49 AC</b> =+/~	E Fe 3-55-T  HRc: 56-60	C: 0,25 Mo: 1	Cr: 3,5 V: 0,2	Particularly suitable for the hard facing of tools and components where the carbon content exceeds 0.6%, the full hardness being achieved in a single layer without cracking. Deposits give excellent bonding features. Extended service life when post-weld heat treatment is given.	
<b>CARBO WZ 50 AC</b> <b>CARBO WZ 50 B</b> (Mat. No.: 1.2567) =+/~	E Fe 3-50-T  HRc: ca.47	C: 0,3 W: 4,2	Cr: 2,2 V: 0,6	High-quality electrode with approx. 120% recovery. Used for repairing steels of same type, e.g. on hot working tools, and for overlaying edges or surfaces of tools made of low alloyed high density steels.	
<b>CARBO WZ 54 AC</b> =+/~	E Fe 3-55-T  HRc: 52-57	C: 0,4 Mn: 1,4 Mo: 2,5	Si: 0,45 Cr: 7,5	For repair and build up of hotworking tools such as slab-shears, hot forging dies, crushing equipment of similar or lower alloyed base metal. The preheat and interphase temperature should be held between 250°C and 300°C depending on the base metal and its heat abduction.	
<b>CARBO WZ 59 AC</b> =+/~	E Fe 4-60-ST  HRc: 58-60	C: 0,4 Mo: 3,7	Cr: 4,8 W: 3,5	AC-weldable electrode with a recovery of 150% for repairing hot working tools made of steels of same or similar type. The deposited weld metal is highly resistant to extreme abrasive wear as well as medium shock and impact. The weld metal structure can still be improved by subsequent heat treatment.	
<b>CARBO WZ 60 AC</b> (Mat. No.: 1.3346) =+/~	E Fe 4-60-ST  HRc: 59-62	C: 0,9 Mo: 8,5 V: 1,5	Cr: 4,5 W: 2	For repair and rebuilding of high speed tool steels. Examples are cutting, piercing and shaving tools, hot working punches and dies, extrusion moulds and dies, shear-blades, milling and cutting tools, swaging hammers, wood cutting tools and cutting edges on stamping dies.	
<b>CARBO WZ 61 AC</b> (Mat. No.: 1.3255) =+/~	E Fe 4-65-ST  HRc: 60-63	C: 0,8 Co: 5 V: 1,5	Cr: 4,5 W: 18 Mo: 1	AC-weldable electrode with a recovery of 140%. Designed for hard-facing high-speed steel tools, low alloyed base materials and for reinforcing cutting edges. The weld metal's high tungsten content provides excellent edge-holding quality. It also has good tempering properties and allows heat treatment like other high speed steels.	
<b>CARBO WZ 6356 B</b> (Mat. No.: 1.6356) =+	E Fe 5-350-CKPSTZ  HB 350 as welded HRc: 55 soft annealed	C: 0,03 Ni: 18 Co: 12	Si: 0,3 Mo: 4 Ti: +	For the repair of die steels specifically huge volume pressing tools with particular reference to H13 and mar aging steels. The deposits are easy machinable and heat treatable where improved hardness is required. Facing of dies, stamping tools, metal drawing tools, pressure die, casting tools. The weld metal deposit gives improved edge hardness to cold cutting tools and shears.	

### XI. NICKEL-BASED ALLOYS

<b>CARBOWELD 135</b> (2.4653) =+/~	EL-NiCr 28 Mo	C: 0,02 Mo: 3,7 Ni: 36	Cr: 28 Cu: 1,8	CARBOWELD 135 was developed to weld materials in conjunction with low alloyed type steels as well as intermediate and top plating layers. The deposited overlay leaves a pierce and tension resistant deposit that is also resistant to intergranular corrosion, specifically from acids and non oxidizing materials. Operating temperature -196°C up to 350°C YS=350 TS=550 IV=50 at -196°C E=30	
<b>CARBO 2.4156 B</b> (2.4156) =+	DIN 1736 EL-NiTi 3  AWS A5.11 E Ni-1 EN ISO 14172 E Ni 2061 (NiTi3)	C: <0,02 Si: 1 Ni: Rest Al: 0,2	Mn: 0,4 Ti: 2 Fe: 0,3	A basic-coated pure-nickel electrode, CARBO 2.4156 B has a content of 1-2% titanium in the weld metal. This is excellent for butt welds and plating on nickel-copper, copper-nickel and on copper-nickel clad steels. It is also suitable for connecting welding of different steels, such as steel with nickel/ copper fer alloys or steel with copper/ copper/ nickel alloys. Z=470 S=310 D=>30 K=>110 at -196°C.	

**XI. NickelBaselegierungen**

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation [%] A5
<b>CARBOWELD 190</b> (2.4366) =+/-	E NiCu-7 EL-NiCu 30 Mn	C: <0,03 Mn: 2 Fe: <2,5 Ti: <0,5 Ni: Base	Si: 0,4 Cu: 31 Al: <0,1	Designated for butt welding and surfacing of nickel-copper, copper-nickel and nickel-copper plated steels. Also recommended for dissimilar joining like steel/nickel-copper or steel/copper/copper/nickel. CARBOWELD 190 is an alloy with strength and excellent resistance to a range of media including sea water, dilute hydrofluoric and sulphuric acids. Operating temperature -196°C up to 350°C YS=300 TS=500 IV=90 (Room temperature) IV=50 at -196°C E=>35	
<b>CARBOWELD A</b> (2.4807) =+/-	E NiCrFe-3 EL-NiCr 15 FeMn	C: 0,04 Mn: 7 Nb: 1,8	Cr: 16 Fe: 8 Ni: Base	Nickel base electrode with a basic coating for joining and cladding stainless-, heat resistant- and cold tenacious steels. Scale-resistant up to 1300°C. Operating temperature -196°C up to 550°C YS=370 TS=650 IV=82 at -196°C E=35	
<b>CARBOWELD 82 B</b> (2.4648) =+	E NiCrFe-2 / mod. EL-NiCr 19 Nb	C: <0,04 Mn: 3,5 Nb: 2 Ni: Base	Cr: 19 Fe: <4 Mo: 1	Basic-coated electrode with an alloyed core wire. Suitable for joining and cladding low alloyed and alloyed steels, welding iron and nickel base alloys and for dissimilar joints. YS=420 TS=700 IV=96 at -196°C Approvals: TÜV	
<b>CARBOLOY 99</b> =+/-	DIN 8555 E 22-UM-60 CGZ DIN EN 14700 E Z Ni 1 Hardness: HRC 58-60	Hartphase 65%  Nickel Matrix 35%		CARBOLOY 99 is a high-performance, nickel-based electrode for parts subject to combined wear and tear from corrosion, abrasion and exposed to erosion and impact. CARBOLOY 99 is a suitable substitute for stellite up to a maximum operating temperature of 200°C - 300°C.	
<b>CARBOWELD 182</b> (2.4620) =+/-	E NiCrFe-2 / mod. EL-NiCr 16 Fe Mn	C: 0,04 Mn: 4 Fe: <6 Ni: Base	Cr: 16 Mo: 1 Nb: 2	Nickel base electrode with a recovery of 140% and excellent weldability on AC, even at low voltages. Suitable for joining and cladding stainless, heat resistant and cold tenacious steels as well as welding dissimilar materials for example low alloyed steels with Ni-base or Cu-base alloys. Free of embrittlement at high and low temperatures, non scaling up to 1000°C, and cold tough down to -269°C.	
<b>CARBOLOY Co</b> (2.4883) =+/-	E NiCrMo-5 E 23-250-CKNPTZ	C: 0,06 Mo: 16 W: 4 Ni: Base	Cr: 16 Co: 2 Fe: 5	The CARBOLOY Co type deposit has outstanding physical characteristics and is resistant to both, oxidating and reduction corrosion. It work hardens under impact and machining to ca. 400HB-even at high temperatures- without deforming the deposit. YS=500 TS=680 E=>10	
<b>CARBOLOY 2.4879</b> =+	DIN 1736 EL-NiCr28W (mod.)	C: 0,45 Mn: 1,2 Ni: 49 Fe: Rest	Si: 1,1 Cr: 30 W: 4,5	CARBOLOY 2.4879 is characterized by a smooth and stable arc out. It has good slag detachability with a finely rippled seam pattern. This weld metal is highly heat-resistant with very good creep resistance. It is excellent for connecting and build-up welding on similar and similar high-alloyed 28/48 CrNi high-temperature casting materials, such as tool material no. 2.4879 G-NiCr28W with operating temperatures up to 1150°C. Z=>650 S=>480 D=> 5	
<b>CARBOLOY C 276 B</b> (2.4887) =+	E NiCrMo-4 EL-NiMo 15 Cr 15 W E 23-250-CKNPTZ	C: <0,02 Mo: 16 V: 0,2 Ni: Base	Cr: 16 W: 4,2 Fe: 5	CARBOLOY C 276 B is a lime coated, high alloyed nickel base electrode for welding NiMoCr-alloys such as C 276. The resulting deposit is resistant to oxidation and reduction corrosion. Overlays are extraordinarily tough and harden with impact stress and high temperatures to about 400 HB without deforming the deposit. YS= 450 TS=720 E= >30	
<b>CARBOWELD 617 B</b> (2.4628) =+	ENiCrCoMo-1 E Ni 6617 (NiCr22Co12Mo)	C: 0,06 Mn: 0,2 Ni: Rest Co: 11 Ti: 0,3	Si: 0,8 Cr: 21 Mo: 9 Al: 0,7 Fe: 1	CARBOWELD 617 B is a basic-coated stick electrode for connecting the same and similar metals, as well as highly heat-resistant austenitic materials and cast alloys. For operating temperatures up to 1100° C can be used e.g. gas turbines and ethylene plants. Materials: 2.4663, 2.4851, 1.4876, 1.4859 Z=700 S=460 D=35 K=> 80 at -196°C	
<b>CARBOWELD 625</b> (2.4621) =+/-	E NiCrMo-3 EL-NiCr20 Mo 9 Nb	C: 0,04 Mo: 9 Nb: 3,5 Ni: Base	Cr: 22 Fe: <6 Si: <0,8	CARBOWELD 625 is a nickel base electrode with a recovery of 140% and excellent weldability on AC even at low voltages. Suitable for joining and cladding stainless, heat resistant and cold tenacious steels as well as welding dissimilar materials for example low alloyed steels with Ni-base or Cu-base alloys. Non-scaling up to 1100°C and cold tough down to -196°C. YS=500 TS=750 IV=40 at -196°C E=35	
<b>CARBOWELD 625 B</b> (2.4621) =+	E NiCrMo-3 EL-NiCr20 Mo 9 Nb	C: <0,03 Mo: 9 Nb: 2,7 Ni: Base	Cr: 22 Fe: <5 Si: 0,4	CARBOWELD 625 B is a lime coated nickel base electrode. Suitable for joining and cladding stainless, heat resistant and cold tenacious steels as well as welding dissimilar materials for example low alloyed steels with Ni-base or Cu-base alloys. Non-scaling up to 1100°C and cold tough down to -196°C. YS=500 TS=750 IV=40 at -196°C E=35	

## XII. Copper- and aluminum alloys

Type	AWS: / EN:	Typ. analysis [%]	YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO ALBRO AC</b> (2.0926)  =+/~	E CuAl-A2 E Cu 1-150 CN EL-CuAl9  HB: ca. 140-160	Al: 8 Mn: 0,5 Fe: <0,5 Cu: Base		CARBO ALBRO AC is a basic-graphite coated electrode for joining aluminium bronzes (up to 10% Al) as well as wear-resisting and corrosion-proof surfacing on steel, cast steel and cast iron, especially on work-pieces which are subject to erosive wear. This electrode can be used on shaped components and wearing parts as well as slide bearings and slide tracks.
<b>CARBO Cu B</b> (2.1363)  =+	EL-CuMn2 ECu  HB: ca. 40	Mn: 2,5 Sn: 0,8 Cu: Base		For joining and surfacing on pure copper, CARBO Cu B is ideal. CARBO Cu B is a pure copper electrode with a basic special cladding. The tail is non-porous, crack-resistant and highly corrosion-resistant. It is widely used in apparatus construction for copper-based alloys, water-cooled oxygen tuyeres in the steel industry and in connection elements for power transmission. Z=200 D=25
<b>CARBO CuNi 30 Fe B</b> (2.0837)  =+	E CuNi  Cu7158 (CuNi30Mn1FeTi)	C: 0,015    Mn: 1,80 Si: 0,4     Fe: 0,60 Ni: 30      Cu:Base		CARBO CuNi 30 Fe B is a seawater and corrosion resistant basic copper-nickel electrode for bond and build-up welding on copper-nickel alloys 10 - 30% Ni.
<b>CARBO CuNi 10 B</b> (2.0877)  =+	E CuNi  Cu7158 (CuNi 10)	C: <0,03    Mn: 1,50 Si: 0,4      Fe: 1,5 Ni: 10       Ti: <0,5 Cu: Base		CARBO CuNi 10 B is a basic-coated copper-nickel stick electrode for connection and build-up welding of same and similar types of Copper alloys with a Ni content up to 10%. CARBO CuNi 10 B is seawater and corrosion resistant to non-oxidizing organic acids.
<b>CARBOTRODE MnS</b> (2.1368)  =+	E CuMnNiAl E Cu 1-200-CN EL-CuMn14Al  HB: ca. 200-230	Mn: 13,5 Ni: 2,2 Fe: 2,5 Al: 7,0 Cu: Base		CARBOTRODE MnS is a lime coated universal electrode to be used for joining, surfacing and building up brass, bronze, copper and normal steels. The deposit is resistant to corrosion, cavitation, erosion, friction and seawater proof. Suitable for surfacing on slide faces, bearings, dies, ship propellers, valves, pump shafts, pipings, evaporators, Francis-turbines and pelion-wheels.
<b>CARBO ZIBRO 6 AC</b> (2.1025)  =+/~	E CuSn-C EL-CuSn7	Sn: 7 Cu: Base		Basic-graphite special coated tin bronze electrode for repairing copper and copper tin bronzes (Cu-Sn 6-8%), brasses and phosphor bronzes. Also for dissimilar joints. Recommended for surfacing on brasses, wrought bronzes (CuSn), mild steel. Good sliding and emergency running properties for bearings and contact surfaces of grey iron, type GG.
<b>CARBO ALSi 5</b> (3.2245)  =+	E ALSi 5 E 4043	Si: 5 Mn: 0,2 Al: Base		Special coated electrode for joining wrought aluminium and cast aluminium alloys. The silicon content of 5% is sufficient for all cast alloys. Because the deposit of higher Si-containing alloys will be increased by base-material alloy. Base materials: G-ALMgSi, G-ALCuMG, G-ALSi, G-ALSi(Cu), G-ALSiMg, G-ALSiMg [Cu], G-ALSi5Cu1                      YS=90 TS=120 E=20
<b>CARBO ALSi 12</b> (3.2585)  =+	E ALSi12 E 4047	Si: 12 Mn: 0,3 Al: Base		This electrode is for joining and building up of aluminium and cast aluminium alloys with a silicon content of up to 12%. Also for applications in the welding of dissimilar aluminium alloys. Base materials: 3.2381 G-ALSi 10 Mg, 3.2383 G-ALSi 10 Mg[Cu], 3.2581 G-ALSi 12, 3.2583 G-ALSi 12[Cu]. YS=80 TS=200 E=14

**XIII. Electrodes for LOW ALLOYED STEELS**

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation [%] A5
<b>CARBO LC</b>  =-/~	E 6013 E 38 A RR 12	C: 0,03 Mn: 0,20	Si: 0,15	CARBO LC is a stick electrode with a thick rutile coating, especially suited for welding Armco and low-carbon thin sheets. Also, CARBO LC is unbeatable for use in repair of liquid zinc tanks. 1.0340 M2 (Armco - Iron) The weld metal offers a high resistance to cracking the effects of liquid zinc. Z=440 S=380 D=25 K=70 at +20°C.	
<b>CARBO CEL 70</b>  =-/ Wurzel =+/ Hotpass, Decklage	E 6010 E 38 3 C 21	C: 0,12 Mn: 0,6	Si: 0,2	CARBO CEL 70 is a cellulose-coated stick electrode for pipe welding, especially in the vertical-down position. CARBO CEL 70 is high efficient against over-riser seams. StE 210.7, StE 240.7, StE 290.7, StE 320.7, StE 360.7, StE 290.7 TM, StE 320.7 TM, StE 360.7 TM, comparable steels according to API Std. 5 LS/LX/ X 42, X 46, X 52 Approvals: TÜV, DB, CE Z=470-580 S=min. 380 D=min. 22K=min. 47 J at -30°C	
<b>CARBO RC 3</b>  =-/~	E 6013 E 38 0 RC 11	C: 0,07 Mn: 0,5	Si: 0,3	Medium-thick rutile-cellulose coated electrode for constrained position welding. It is suitable for universal applications in structural steel engineering, industrial engineering, shipbuilding and vehicle construction. YS=>420 TS=510 IV=>47 at -10°C E=>22 Approvals: TÜV, DB, CE	
<b>CARBO RC 3 BLAU</b>  =-/~	E 6013 E 38 0 RC 11	C: 0,07 Mn: 0,5	Si: 0,3	Medium-thick rutile-cellulose coated electrode for constrained position welding. It is suitable for universal applications in structural steel engineering, industrial engineering, shipbuilding and vehicle construction. YS=>380 TS=500 IV=>47 at -10°C E=>22 Approvals: TÜV, DB, CE	
<b>CARBO RRC 5</b>  =-/~	E 6013 E 42 0 RC 11	C: 0,08 Mn: 0,5	Si: 0,4	Thick rutile-cellulose coated electrode for constrained position welding. It is suitable for universal applications in structural steel engineering, industrial engineering, shipbuilding and vehicle construction. YS=>420 TS=510 IV=>47 at -10°C E=>22 Approvals: TÜV, DB, CE	
<b>CARBO RR 6</b>  =-/~	E 6013 E 42 0 RR 12	C: 0,06 Mn: 0,5	Si: 0,4	Thickly rutile-coated electrode for welding seams with a particularly smooth surface and a selfremoving slag. The field of applications of this electrode is universal. Very easy weldability, excellent restriking, and a stable arc are only some of this outstanding characteristics. The weld-metal is crack-free. YS=>380 TS=490 IV=>47 at -10°C E=>22 Approvals: TÜV, DB, CE	
<b>CARBO RRB 7</b>  =-/~	E 6013 E 38 2 RB 12	C: 0,08 Mn: 0,6	Si: 0,3	Rutile-basic-coated electrode with fast-flowing weld metal, suitable for welding for construction elements made of structural steels up to L385N. Suitable for bridge-, pipeline-, container-, vessel- and shipbuilding. The weld-metal has outstanding mechanical properties and is highly crack-resistant. In constrained welding positions, and also when root welding on pipes. YS=>350 TS=460 IV=>47 at -20°C E=>22 Approvals: TÜV, DB, CE	
<b>CARBO B 10</b>  =+	E 7018 E 42 6 B 42 H 5	C: 0,06 Mn: 1,2	Si: 0,4	CARBO B 10 is a universal basic-coated electrode for welding highly stressed joints with high security. Resistant to cold cracks easy slag removal. Very good welding characteristics - can also be used in constrained welding positions. Fast solidifying weld-metal - allows position welding at high amperage. YS=>420 TS=530 IV=>47 at -40°C E=>22 Approvals: TÜV, DB, CE	
<b>CARBO SPECIAL</b>  =+/~	E 7016-H8 E 38 2 B 12 H10	C: 0,07 Mn: 0,7	Si: 0,4	A basic rutile-coated double-coated electrode with excellent welding properties, CARBO SPECIAL possesses very good mechanical properties and quality values. The electrode can be connected to alternating current (also small transformer) to weld easily. Z=530 S=> 380 D=> 22 K=> 47 at -20°C Approvals: TÜV, DB, CE	
<b>CARBO BR 10 D</b>  =+/~	E 7018 E 42 4 B 32 H10	C: 0,07 Mn: 0,7	Si: 0,4	Double basic-coated electrode of excellent welding characteristics combined with outstanding mechanical properties. Very well suitable for AC welding (also with small transformers). The double coating provides optimal welding characteristics even in constrained welding positions. Smooth weld aspect, free of penetration notches. YS=>420 TS=530 IV=>47 at -40°C E=>22 Approvals: TÜV, DB, CE	

### XIII. Electrodes for LOW ALLOYED STEELS

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation (%) A5
<b>CARBO RR 11</b>  =- (+)	E 7024 E 42 0 RR 73	C: 0,07 Mn: 0,7	Si: 0,4	Thick rutile-coated electrode with a recovery of 160%. It is suitable for universal applications in structural steel engineering, industrial engineering, shipbuilding and vehicle construction.  YS=>420 TS=510 IV=>47 at +0°C E=>22	
<b>CARBO Mn B</b>  =+	E 7018-1 E 42 6 B 42 H5	C: 0,06 Mn: 1,4	Si: 0,4	The weld deposit has high mechanical properties which qualifies this product for constructional jobs with high mechanical load. This field of applications of this electrode is universal but it is typically applied for weldings on rails with high carbon contents (up to 0,6%). YS=>460 TS=600 IV=>47 at -40°C E=>22	Approvals: TÜV, DB
<b>CARBO NiMoCr 90</b>  =+	E 11018-M E 69 4 Mn 2 NiCrMo BT 42 H5	C: 0,05 Mn: 1,7 Cr: 0,4	Si: 0,3 Ni: 2 Mo: 0,4	Basic-coated electrode for welding high-strength tempered low alloy steels, like S500-S690 (StE500-StE690V) ore N-X-TRA55-70. Preheating and intermediate layer temperature acc. to the instructions of the base metal manufacture. YS=>730 TS=830 IV=>47 at -40°C E=>18	
<b>CARBO CORTEN</b>  =+	E 8018-G E 46 5 ZB 32	C: 0,6 Mn: 1,0 Ni: 0,6	Si: 0,4 Cu: 0,4	Basic-coated electrode for weatherproof steels. The weld-deposit is resistance against weather and sea water influences.  YS=>460 TS=580 IV=>47 at -50°C E=>22	
<b>CARBO Mo B</b>  =+	E 7018-A1 E Mo B 42 H5	C: 0,07 Mn: 0,9	Si: 0,6 Mo: 0,5	Basic-coated Mo alloyed electrode for welding piping-, boiler- and fine grain structural steels. Non-ageing weld metal, tough also at low temperature. Hot-crack proof and suitable for service temperature up to 550°C.  YS=490 TS=600 IV=>47 at -20°C IV=>120 at Rt. E=25	Approvals TÜV, DB, CE
<b>CARBO Mo AC</b>  =+/~	E 7013-G E Mo R 12	C: 0,07 Mn: 0,9	Si: 0,8 Mo: 0,5	Rutile-coated Mo alloyed electrode for welding pipe and boiler steels as well as fine grain structural steels. The weld metal is non-ageing and tough also at low temperatures, hot-crack proof and suitable for service temperature up to 550°C.  YS=490 TS=600 IV=>47 E=25	Approvals: TÜV
<b>CARBO CrMo 1 B</b>  =+	E 8018-B2 E CrMo1 B12 H5	C: 0,07 Mn: 0,9 Mo: 0,5	Si: 0,7 Cr: 1,1	Basic-coated CrMo alloyed electrode for welding high-strength joints on low alloy tempered steels up to 880 N/mm <sup>2</sup> . Suitable for welding creep-resistant CrMo steels in boiler and piping system construction. Resistant to high temperatures up to 500°C. Non-ageing welding deposit, resistant to alkaline solutions, heat-treatable and case-hardenable. Annealed 30 min. at 720°C YS=500 TS=640 IV=90 E=24	Approvals: TÜV, DB, CE
<b>CARBO CrMo 1 V B</b>  =+	EN ISO 3580-A E CrMoV1 B 42 H5  AWS A 5.5 E 9018-G	C: 0,08 Mn: 0,9 Mo: 1	Si: 0,4 Cr: 1,1 V: 0,3	A basic-coated CrMoV alloyed stick electrode, CARBO CrMo 1 V B is excellent for welding heat-resistant cast steel with the same composition tongue. 1.7706 G17CrMoV5-10 1.7357 G17CrMo5-5 1.7745 15CrMoV5-10 1.7733 24CrMoV5-5 Z=650 S=440 D=>15 K=50 at Rt	
<b>CARBO CrMo 2 B</b>  =+	E 9018-B3 E CrMo 2 B12 H5	C: 0,05 Mn: 1,0 Mo: 1,0	Si: 0,6 Cr: 2,3	Basic-coated CrMo alloyed electrode for welding high-strength joints on low alloy tempered steels up to 1100 N/mm <sup>2</sup> . Suitable for welding creep-resistant CrMo steels in boiler and piping system construction. Resistant to high temperatures up to 500°C. Non-ageing welding deposit, resistant to alkaline solutions, heat-treatable and case-hardenable. Annealed 30 min. at 760°C YS=510 TS=650 IV=80 E=22	
<b>CARBO CrMo 2 V B</b>  =+	EN ISO 3580-A E ZCrMo2 V B 42 H5 AWS A 5.5 E 9015-G	C: 0,09 Mn: 0,8 Mo: 1	Si: 0,5 Cr: 2,5 V: 0,2	CrMo 2 V B is a basic-coated alloyed stick electrode for joint welding having very good mechanical properties. Note: This electrode should be welded with the shortest possible arc. CrMo 2 V B has a temperature resistance up to 600°C. Base material 1.7378 (7CrMoVTiB10-1)	

**XIII. Electrodes for ALLOYED STEELS**

Type	AWS: / EN:	Typ. analysis [%]		YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation [%] A5
<b>CARBO CrMo 5 B</b>  =+	E 8018-B6 E CrMo 5 B42 H5	C: 0,06 Mn: 1,0 Mo: 0,5	Si: 0,5 Cr: 5,1	Basic-coated CrMo alloyed electrode for welding joints with good mechanical properties to low alloyed quenched and subsequently tempered steels up to 1275 N/mm <sup>2</sup> . Suitable for welding heat treatable, quenched and subsequently tempered steels as well as for tubes, resistance to caustic embrittlement for working temperatures up to 600°C. YS= 490 TS=620 IV>70 E>17	
<b>CARBO CrMo 9 B</b>  =+	E 8018-B8 E CrMo9 B42 H5	C: 0,07 Mn: 0,7 Mo: 1,0	Si: 0,3 Cr: 9,0 Ni: 0,2	Basic-coated CrMo alloyed electrode for welding joints with good mechanical properties to low alloyed quenched and subsequently tempered steels. Suitable for welding heat treatable, quenched and subsequently tempered steels as well as for tubes, resistance to caustic embrittlement for working temperatures up to 600°C. YS= 610 TS=730 IV>70 E>19	
<b>CARBO CrMo 91 B</b>  =+	E 9015-B9 E CrMo91 B42 H5	C: 0,1 Mn: 0,8 Mo: 1,0 V: 0,2 N: 0,04	Si: 0,35 Cr: 9,0 Ni: 0,7 Nb: 0,05	Basic-coated, low hydrogen electrode for welding high temperature martensitic, creep resistant 9-12 % chromium steels such as P91 and T91. The deposits have good toughness properties even under long term stresses and high creep rupture strength. For working temperatures up to 650°C. YS= 650 TS=760 IV>70 E>17	

**XIV. BRAZING and SOLDERING**

<b>CARBOLOT 1</b> <b>CARBOLOT 1 F</b>	RB CuZn-A B-Cu60Zn(Si)(Mn)- 870/900  HB: 110	Cu: ca. 60% Zn: ca. 38%	CARBOLOT 1 + 1F are high purity brazing rods. The application field is very wide like any steel, copper and copper alloys, red brass, cast iron and malleable cast iron as well as for overlays on wear surfaces.
<b>CARBOLOT 2</b> <b>CARBOLOT 2 F</b>	RB CuZn-D B-Cu48ZnNi(Si)- 890/920  HB: 160 - 200	Cu: ca. 50% Ni: ca. 10% Zn: ca. 40%	CARBOLOT 2 + 2F are nickel-silver brazing rods with a high degree of purity. Suitable for a wide range of applications as a universal alloy such as joining steel, bronze, brass, nickel and nickel alloys, cast iron and steels castings as well as for cladding on these metals.
<b>CARBO L-99 F</b>		Al: Base	CARBO L-99 F is a flux cored brazing rod for brazing of aluminium and alloys.

### Wire electrodes and rods for welding CORROSION-PROOF STEELS

S= MAG Wire electronics T = WIG rod	AWS / EN / DIN	Typ. analysis [%]		Gases [EN 439]	YS = Yield Strength N/mm <sup>2</sup> TS = Tensile Strength N/mm <sup>2</sup>	IV = Impact Value J E = Elongation [%] A5
<b>CARBO S-4316 Si</b> =+ <b>CARBO T-4316</b> =-	ER 308L Si G 19 9 L Si SG-X 2 CrNi 19 9 W 19 9 L Si	C: 0,02 Mn: 1,7 Ni: 10,0	Si: 0,9 Cr: 20	M11 M12 M13 I1	Wire electrode for joining corrosion-proof CrNi steels with low carbon content. Operating temperature -196°C up to 350°. YS=320 TS=550 IV=70 E=35 Approvals: TÜV, DB, CE	
<b>CARBO S-4430 Si</b> =+ <b>CARBO T-4430</b> =-	ER 316L Si G 19 12 3 L Si SG-X 2 CrNiMo 19 12 W 19 12 3 L Si	C: 0,02 Mn: 1,7 Ni: 12,5	Si: 0,8 Cr: 18,8 Mo: 2,8	M11 M12 I1	CrNiMo alloyed wire electrode with low carbon content. Operating temperature -120°C up to 400°. YS=320 TS=550 IV=70 E=35 Approvals: TÜV, DB, CE	
<b>CARBO S-4576 Si</b> =+ <b>CARBO T-4576</b> =-	~ER 318 Si G 19 12 3 Nb Si SG-X5CrNiMoNb1912 W 19 12 3 Nb Si	C: 0,05 Mn: 1,5 Ni: 12,0 Nb: 12x%C	Si: 0,8 Cr: 19	M11 M12 I1	Stabilized Cr-Ni-Mo alloyed wire electrode for working temperature up to 400°C and down to -60°C for clod tenacions steels. YS=380 TS=550 IV=70 E=30 Approvals: TÜV, DB, CE	
<b>CARBO S-4519</b> =+ <b>CARBO T-4519</b> =-	ER 385 G 20 25 5 Cu L SG-X2CrNiMoCu2025 W 20 25 5 Cu L	C: <0,025 Mn: 2,5 Ni: 25,0 Cu: 1,5	Si: 0,2 Cr: 20,5 Mo: 4,8	M13 I1	Alloy for joint welding on the same or similar corrosion resistant CrNiMoCu steels. Overlays with that electrode leave a pierce and tension resistant deposit. Operating temperature: -60°C up to 350°C. YS=380 TS=580 IV=80 E=40	

### Wire electrodes and rods for austenitic to ferritic joints

<b>CARBO S-4332</b> =+ <b>CARBO T-4332</b> =-	ER 309L Si G 23 12 L Si SG-X 2 CrNi 24 12 W 23 12 L Si	C: 0,03 Mn: 2,0 Ni: 13,0	Si: 0,9 Cr: 24,0	M12 M13 I1	For joining difficult-to-weld steels and for corrosion-proof plating. Austenitic/ferritic joints up to 300°C. Scale resistant up to 1000°C. YS=400 TS=550 IV=55 E=30 Approvals: TÜV
<b>CARBO S-4370 Si</b> =+ <b>CARBO T-4370</b> =-	~ER 307 G 18 8 Mn SG-X 15CrNiMn 188 W 18 8 Mn	C: 0,08 Mn: 7,0 Ni: 9	Si: 0,8 Cr: 19	M12 M13 M21 I1	Suitable for joint welding of austenitic to ferritic steels which are exposed to service temperatures up to 300°C scale resistant up to 850°C. Operating temperature -110°C up to 300°C. YS=320 TS=600 IV=100 E=40 Approvals: TÜV, DB, CE

### Wire electrodes and rods for welding heat proof steels

<b>CARBO S-4842</b> =+ <b>CARBO T-4842</b> =-	~ER 310 G 25 20 SG-X 12 CrNi 25 20 W 25 20	C: 0,13 Mn: 3,2 Ni: 20,5	Si: 1,0 Cr: 25,0	M13 I1	Wire electrode for welding heat-proof steels. Weld deposit scale-resistant up to 1200°C. 4842 B is a basic-coated electrode. YS=350 TS=600 IV=80 E=30
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### Wire electrodes and rods for welding Duplex steels

<b>CARBO S-4462</b> =+ <b>CARBO T-4462</b> =-	ER 2209 G 22 9 3 N L SG-X 2 CrNiMo 2293 W 22 9 3 N L	C: 0,025 Mn: 1,6 Ni: 9,0 N: 0,14	Si: 0,5 Cr: 23,0 Mo: 3,0	M12 M13 I1	Wire Electrode suitable for welding on compound steels of same or similar type. The weld deposit is resistant to pitting, stress corrosion cracking and intercrystalline corrosion at temperatures up to 250°C. YS=610 TS=780 IV=44 E=26 Approvals: TÜV
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### Wire electrodes and rods for welding Nickel alloys

<b>CARBO S-2.4806</b> =+ <b>CARBO T-2.4806</b> =-	ER NiCr-3 SG-NiCr 20 Nb	C: 0,02 Mn: 2,8 Ni: >67 Fe: <2,0	Si: 0,2 Cr: 19,5 Nb: 2,5	I1 I1	Massive nickel chrome wire electrode suitable for welding nickel alloys, (see base materials) and joining austenitic to ferritic steels subjected to working temperatures exceeding 300°C and joining dissimilar materials. Approvals: TÜV the TIG wire has also DB, CE YS=380 TS=620 IV=90 E=35 Scale resistant up to 1000°C. Operating temperature -196°C up to 550°C
<b>CARBO S-2.4831</b> =+ <b>CARBO T-2.4831</b> =-	ER NiCrMo-3 SG-NiCr 21 Mo 9 Nb	C: 0,03 Mn: 0,20 Mo: 9,0 Nb: 3,6	Si: 0,25 Cr: 22,0 Ni: Rest Fe: <1,5	I1 I1	Nickel base wire electrode for welding nickel alloys and cold tough nickel steels, joining dissimilar steels and welding joints between austenitic and ferritic metals. Approvals: TÜV YS=420 TS=760 IV=60 E=30 Scale resistant up to 1100°C. Operating temperature -196°C up to 550°C

Statements on composition and application are just for the applier's information. Statements on mechanical properties always refer to the all-weld-metal according to valid standards. Carbo-Weld may change the characteristics of its products without notice. We recommend the applier to check our products for their special application autonomously.

**WORK HARDENING, AUSTENITIC HARDFACING**

	DIN Hardness	Typ. analysis [%]		Applications
<b>CARBO F-200</b> O, G, S	T Fe 10-200-CKNPZ 180-200 HB workhardened 400 HB	C: 0,1 Mn: 6 Ni: 8,5	Si: 0,4 Cr: 19	The austenitic weld deposit of the high alloyed flux cored wire is corrosion resistant, self hardening, anti-magnetic, heat and thermal shock resistant up to 850°C. Depending on the high elongation of 40% the alloy is suitable for buffer layers on hardfacings and joining dissimilar & difficult weldable steels.
<b>CARBO F-240</b> O, G, S	T Fe 9-200-KNP 200-230 HB workhardened 450 HB	C: 1 Mn: 14 Ni: 0,6	Si: 0,4 Cr: 4	Suitable for welding parts of manganese steel which are exposed to high impact wear and tear. The austenitic deposits are tough, crack-free, non-magnetic and work hardening. Applications are rebuilding of crusher jaws, railroad components and reclaiming worn parts of manganese base materials.
<b>CARBO F-250</b> O, G, S	T Fe 9-250-KNP 220-250 HB workhardened 500 HB	C: 0,4 Mn: 16 Ni: 1,2 V: 0,2	Si: 0,4 Cr: 14 Mo: 0,6	Fully austenitic, high manganese and chromium alloyed wire electrode. The deposit has high plasticity and acts as a buffer, especially on old hardfacings.

**IMPACT RESISTANT APPLICATIONS**

<b>CARBO F-300</b> O, G, S	T Fe 1-300-P 280-325 HB	C: 0,1 Mn: 2	Si: 0,5 Cr: 1,5	Low alloyed tubular wire for building up applications that can be used for multy layer welding, because deposit is ductile and crack free. Weld metal is machinable with carbide tools. Used on tractor wheels, steel shafts, gear and trunion rail links etc.
<b>CARBO F-303</b> G	T Fe 1 ca. 300 HB Gas: CO <sub>2</sub> / M21	C:0,2 Mn: 1,5	Si: 0,6 Cr: 1,3	For a tough weld metal deposit with a hardness of approx. 300 HB. It produces only moderate friction wear but provides stronger impact loading and pressure, and metal-to-metal friction resistance. CARBO F-303 is excellent for applications such as: pulleys, rails, couplings, support rollers from tracked vehicles, wheels, shafts among others.
<b>CARBO F-450</b> O, G, S	T Fe 2-45-PT 42-45 HRc	C: 0,2 Mo: 0,3	Cr: 4,5 V: 0,2	For hardfacings of ca. 450 HB hardness. Weld metal is machinable with carbide tools and can be used for multy layer welding.
<b>CARBO F-600</b> O, G, S	T Fe 8-60-RP 56-57 HRc	C: 0,5 Cr: 9,5	Si: 2,7	Wire electrodes for for impact and abrasion resistant hardfacings of ca. 600 HB. Deposits are hard and tough. For difficult base materials.
<b>CARBO F-602</b> O, G, S	T Fe 8-55-PT 54-56 HRc	C: 0,5 Mn: 3 Mo: 0,8	Si: 1 Cr: 6,5 V: 0,4	Preheating or a buffer layer with F-250 is recommended.
<b>CARBO F-601</b> O, G, S	T Fe 8-60-PT 55-58 HRc	C: 0,5 Mn: 3 Mo: 1,6 W: 1	Si: 1 Cr: 6 V: 0,4	Deposit with excellent properties of resistance to abrasion and impact, with a high hot hardness up to 550°C. Deposit can be heat treated to increase hardness. For hammers, blowbars, bucket teeth and blooming table rolls.
<b>CARBO F-606</b> G	T Fe 2 57-60 HRc Gas: 100% CO <sub>2</sub> / M21	C: 0,5 Mn: 1,5 Mo: 0,5	Si: 0,6 Cr: 5,5	CARBO F-606 is a medium-alloy cored wire. It possesses basic characteristics necessary for semi-automatic and automatic welding. CARBO F-606 is most often utilized with for crusher rollers, crusher jaws, hammer saddles, coal planers, impact crushers and shredders.
<b>CARBO F-700</b> O	T-Fe 8-60-GP 56-58 HRc	C: 1,8 Cr: 7 Ti: 5	Mn: 1,4 Mo: 1,4	For parts which are exposed to high abrasive wear in combination with impact stress. The deposit is martensitic with inserted Titanium-Carbides. Applications are cement crusher rolls, pulveriser rolls and hammers.

**CORROSION and ABRASION RESISTANT APPLICATIONS**

<b>CARBO F-42</b> G, S	T Fe 14-45-CGT 41-44 HRc	C: 1,8 Mn: 1,2 Ni: 3	Si: 0,9 Cr: 28 Mo: 0,8	Cr-, Ni-, Mo-alloyed flux-cored wire electrode for hardfacing on parts that are exposed to abrasive wear in combination with medium impact stress. The weld deposit is corrosion resistant, crack-free and machinable. Typical applications are found in the chemical and food industries.
<b>CARBO F-53</b> O, G, S	T Fe 15-60-GR 56-59 HRc	C: 3,7 Cr: 32	Si: 1,2	The technical properties are similar as F- 59. However, the matrix has a higher corrosion resistance than F- 59.
<b>CARBO F-DURIT Ni</b> O, G	T Ni 20-55-CGTZ Matrix: 47-52 HRc Carbide: >2300 HV	Ni,Si,Cr,B-Matrix with embedded TC (62 %)		The deposite has a NiSiB Matrix, bearing ca. 62% Tungsten Carbide. For very high resistant against abrasion and corrosion.

### Flux-cored wire for ABRASION RESISTANT APPLICATIONS

	DIN Hardness	Typ. analysis [%]		Applications
<b>CARBO F-50</b> O	T Z Fe 16-50-G 50-54 HRc	C: 3 Mn: 1,8	Si: 1,8 Cr: 15	C-, Cr-, Si-, Mn-alloyed flux cored wire on parts with which subjected to abrasive wear and medium impact. Garbage shredder.
<b>CARBO F-55</b> O, S	T Fe 14-60-GR 55-59 HRc	C: 4,8 B: +	Cr: 28	The deposit has a high Cr-, C-alloyed stainless weld metal with excellent resistance to abrasion and medium impact. It can be used whenever high abrasion is expected. Best results are achieved by welding in two layers. Pumps, mixer parts, conveyor screws.
<b>CARBO F-56</b> O	T Fe 14-60-G 57-60 HRc	C: 5 Cr: 27	Si: 1,7 Mo: 1,3	It can be used whenever high abrasion is expected. Compared with CARBO F-55, the weld deposit of this electrode has a higher temperature resistance (up to 450°C). Best results are achieved by welding in two layers. Pumps, mixer parts, conveyor screws.
<b>CARBO F-59</b> O	T Fe 14-60-G 59-61 HRc	C: 5 Cr: 32	Si: 1,5	Tubular wire which deposits a high chrome carbide alloyed weld metal with excellent resistance to abrasion, corrosion and moderate impact. It can be used whenever high abrasion is expected. Best results are achieved by welding in two layers. Pumps, impeller screws, track hopper.
<b>CARBO F-60</b> O	T Fe 15-60-G 61-63 HRc	C: 5,4 Cr: 22	Si: 1,1 Nb: 7	High C-, Cr-, Nb-alloyed flux-cored wire electrode for high abrasive wear. The weld deposit consists of chrome- and niobium-carbides. Weld metal is not machinable. Maximum deposit should be limited on three layers. Steel, coal, cement and mineral industry.
<b>CARBO F-61</b> O	T Fe 15-65-G 62-65 HRc	C: 5,4 Nb: 7	Cr: 22 B: +	High C-, Cr-, Nb-alloyed flux-cored wire electrode with special carbides in extreme hardness. This combination results in high abrasion resistance. Applications are found in the hardfacing of mining equipment, augers, impellers and dredgers.
<b>CARBO F-720</b> O, G	T Z Fe13 Special alloy 65-68 HRc	C: 0,7 Mn: 2 B: 4,5	Si: 1 Ni: 2	CARBO F-720 is a flux-cored wire for build-up welding of highly abrasion-resistant armouring, while simultaneously providing low impact. Often utilized in sand processing plants as well as the ceramics industry.
<b>CARBO F-733</b> O, G	T Z Fe 15 66-68 HRc	C: 2,5 Mn: 1,8 Nb: 5	Si: 0,9 Cr: 13 B: 2	For heavy abrasive wear and tear environments, there is no better solution than by utilizing alloy-cored CARBO F-733 wire. The hard chromium and niobium carbides are in a special embedded matrix. Due to the high degree of hardness in the first layer, no multi-layer welding is necessary.
<b>CARBO F-DURIT</b> G	T Fe 20-65-GZ Matrix: 55-60 HRc Carbide:>2300 HV	Fe-Matrix with Tungsten-Carbide (62%)		The weld metal is composed of fused tungsten carbides which are embedded in a hard matrix alloy. CARBO F-DURIT is easy to use and has little spatter and smoke. It should be welded in max. 2 layers using lowest possible Amp and Volts.

### Flux-cored wire for ABRASION- and HEAT-RESISTANT APPLICATIONS

<b>CARBO F-64</b> O	T Fe 16-65-GZ 62-64 HRc	C: 3,8 V: 1 B: 1	Cr: 22 W: 2	C-, Cr-, B-, W-, V-alloyed flux-cored wire that deposits a very hard martensitic micro structure with carbides. The deposit is resistant against strong mineral abrasion at higher temperatures. The hardness decreases about 15% at 400°C, about 25% at 600°C
<b>CARBO F-65</b> O	T Fe 16-65-GZ 63-64 HRc/ 20°C 40 HRc/ 600°C	C: 5,2 Mo: 7 V: 1	Cr: 21 Nb: 7 W: 2	High C-, Cr-, Mo-, Nb-, V-, W-alloyed flux-cored self shielding wire which forms extremely hard carbides. This is used for hard facings against extremely strong mineral wear. The deposit retains its wear resistance up to 650°C. At 400°C the hardness decrease about 4%, at 650°C about 10%.
<b>CARBO F-68</b> O	T Fe 15-70-GCZ 66-68 HRc	C: 5 Cr: 38	Si: 0,8 B: 2	Very high C-, Cr-, B-alloyed flux-cored wire electrode for extreme hard and non-corrosive hardfacing against high mineral wear also at high temperatures. The weld deposit has a ledeburitic structure, bearing many various hypereutectic carbides.
<b>CARBO F-70</b> O	T Fe 16-65-G 62-64 HRc	C: 5,3 Cr: 24,5	Si: 1 V: 5,5	High C-, Cr-, V-alloyed flux-cored wire electrode for high abrasive wear. The weld deposit consists of chrome- and vanadium-carbides. Weld metal is not machinable.

**Flux-cored wire for TOOL STEELS**

O = Open arc G = Gas shielded S = Submerged arc	DIN/ AWS Hardness	Typ. analysis [%]		Applications
<b>CARBO F-WZ 50</b> (1.2714 / 1.2567) O, G, S	T Fe 3-50-ST  48-50 HRc	C: 0,3 V: 0,6	Cr: 2,5 W: 4,5	This C-, Cr-, V-, W- alloyed flux-cored wire electrode is suitable for repair and build - up applications on hot working steels of similar or lower alloyed hot working tools. The weld deposit is machinable, heat treatment is possible and has a retention of hardness up to 550°C.
<b>CARBO F-WZ 55</b> (1.2567) O, G, S	T Fe 3-55-ST  53-56 HRc	C: 0,3 Co: 2 W: 7	Cr: 2,5 V: 0,3	This C-, Cr-, V-, W- alloyed flux-cored wire electrode is suitable for repair and build - up applications on hot working steels of similar or lower alloyed hot working tools. The weld deposit is machinable, heat treatment is possible and has a retention of hardness up to 550°C.
<b>CARBO F-WZ 59</b>  O, G, S	T Fe 4-55-ST  57-59 HRc	C: 0,6 Mo: 3,5	Cr: 4 W: 3,5	The wear and heat resistant deposit of this flux-cored wire electrode in high speed steel quality is suitable for repair and manufacture of hot and cold working tools, stamps and counter dies. etc. The weld deposit can be heat treated and has a retention of hardness up to 550°C.
<b>CARBO F-495</b> Special alloy  G, S	DIN EN 14700 T Z Fe 3  DIN 8555 MF3-GF-50-CKTZ	C: 0,2 Mn: 1,2 Ni: 1,5 Co: 12,5	Si: 0,7 Cr: 14,5 Mo: 3	Where environments produce high-heat wear, the flux-cored CARBO F-495 wire (containing stainless weld metal based on Fe, Cr, Co, Mo) offers deformation resistance as well as high resistance to sliding wear metallic counterparts. Its performance features are due to stellite alloys (a cobalt substitute alloy).
<b>CARBO F-WZ 6356</b> (1.6356)  G	T Fe 5-350-ST ca. 35 HRc Heat treated (4h 450°C) up to ca. 51 HRc	C: 0,03 Mo: 4 Ti: +	Ni: 18 Co: 12	This flux-cored wire electrode is suitable for surfacing tools that should be machined. The weld deposit is martensitic cured. Through heat treatment the hardness can be increased. Applications include press and drawing dies, extruding dies and forms for the aluminium and plastic industry.

**Flux-cored wire for COBALT BASED ALLOYS**

<b>CARBO F-S 1</b>  G	T Co 2-55-CGTZ A 5.21 ERCCoCr-C  52-55 HRc	C: 2,4 Mn: 0,1 Co: Rest Fe <2,5	Si: 0,7 Cr: 29 W: 11	F-S 1 deposits a cobalt-base alloy with an austenitic-ledeburitic structure. This is the hardest of the standard cobalt-base alloys. It has a high resistance to corrosion, especially to reducing acids, impact, extreme wear and temperature shocks. The alloy is only machinable by grinding. Best used on wear pads, rotary seal rings, pump sleeve sand centerless grinder work rests.
<b>CARBO F-S 6</b> <b>F-S 6 L</b> <b>F-S 6 H</b>  G	T Co 2-45-CTZ A 5.21 ERCCoCr-A 40-43 HRc 36-39 HRc 43-46 HRc	C: 1,1 (0,8) (1,3) Si: 1 Cr: 28 Co: Rest	Mn: 0,6 W: 4,5 Fe < 2,5	Cobalt-base alloys with an austenitic-ledeburitic structure bearing chrome and tungsten carbides. These alloys are resistant against high corrosion and abrasion, high impact stress and extreme temperature shocks. The deposit is machinable by hard metal tools. Best used on steam and chemical valves and on equipment handling hot steel, such as tong bits, shear blades, etc.
<b>CARBO F-S 12</b>  G	T Co 2-50-CTZ A 5.21 ERCCoCr-B  45-48 HRc	C: 1,4 Mn: 0,1 Co: Rest Fe < 2,5	Si: 0,8 Cr: 29 W: 8	Cobalt-base alloy with high resistance against abrasion, temperature shocks and corrosion. This alloy is suitable for hardfacing cutting edges of long knives and other tools used in the wood, plastic, paper, carpet and chemical industry.
<b>CARBO F-S 21</b>  G	T Co 1-350-CKTZ A 5.21 ERCCoCr-E 275-325 HB workhardened: ca. 45 HRc	C: 0,25 Mn: 0,3 Ni: 2,5 Co: Rest	Si: 0,8 Cr: 27 Mo: 5,5 Fe < 2,5	This cobalt base-alloy is the toughest, with highest corrosion and thermal resistance of all cobalt-base alloys. The weld deposit is machinable and is used on components that are exposed to high temperatures, corrosion and impact stress, such as valve seats as well as components in the chemical industry.
<b>CARBO F-S 25</b>  G	T Co 1-300-CKTZ  275-300 HB workhardened: ca. 45 HRc	C: 0,30 Mn: 0,1 Ni: 10,0 Co: Rest	Si: 0,5 Cr: 20,0 W: 15 Fe < 3	CARBO F-S 25 deposits a weld deposit with an austenitic structure. This alloy contains approximately 10% nickel to stabilize the matrix for use at higher temperatures. CARBO F-S 25 is corrosion-resistant, as well as impact, wear and extreme temperature shock resistant. The weld metal can be hardened up to 45 HRc and stays editable with hard metal tools. This alloy is particularly suitable for use in environments where both corrosion and impact stress as well as high temperatures or extreme temperature change are present.

**Flux-cored wire for NICKEL-BASED ALLOYS**

	DIN Hardness	Typ. analysis [%]		Applications
<b>CARBO F-Ni Co</b>  G, S	T Ni 2-250-CKNPTZ  220-260 HB workhardened: ca. 420 HB	C: 0,08 Ni: Rest Co: 2,5 W: 4,5	Cr: 16 Mo: 16 V: 0,35 Fe: <5	High temperature resistance alloy for hot working tools. When first applied to hot forging dies, the overlay is very cohesive. Put under impact, pressure load and high temperature, the resulting overlay increases hardness up to 400 HB without deforming. The deposit is heat and wear resistant and resistant to oxidation, reduction and other corrosive media.
<b>CARBO F-Ni 182 B</b>  G	AWS 5.34 ENiCrFe3T0-4 AWS 5.34M - 2007 T Ni6182-04  EN ISO 12153 T Ni6182 (NiCr15FeMn)	C: 0,01 Mn: 6 Ni: Rest Fe: 6	Si: 0,3 Cr: 17 Nb: 1,7	CARBO F-Ni 182 B is a nickel-based flux-cored wire ideal for connecting and plating of nickel base alloys such as Alloy 600 or similar materials. This austenitic alloy is insensitive to hot cracking and free from embrittlement at both high and low temperatures. S=610 Z=380 D=45 K=90 at -196°C
<b>CARBO F-Ni 520</b>  G	T Ni 2-350-CKPTZ  330-350 HB workhardened: 35-45 HRc	C: 0,05 Ni: Rest Co: 11 W: 5 Al: 1,7	Cr: 19 Mo: 5 V: 0,3 Ti: 3	Carbo F- 520 produces a Cr-, Co-, Mo-, Ti-, Al- and W- alloyed nickel base deposit. The weld metal is a precipitated, easily hardened alloy with an exceptional combination of high temperature mechanical properties, formability and corrosion resistance. The alloy can be used for hot forging dies, hot working steels, hot shear blades, etc.
<b>CARBO F-Ni 625</b> (Mat.-No.: 2.4831)  G	SG NiCr 21 Mo 9 Nb  ER NiCrMo-3	C: 0,05 Cr: 22 Mo: 9 Fe: <5,0	Mn: 0,5 Ni: Rest Nb: 3,5	Alloy for a wide range of applications including joining of dissimilar steels and repairs on cast iron. When used for hardfacing, deposit gives up to 350 HB.

**Flux-cored wire for CORROSION RESISTANT STEELS**

<b>CARBO F-4015</b> (1.4015)  G, S	T Fe 8 200-220 HB AWS 430	C: 0,10 Cr: 17,5		Flux-cored wire for plating and joining equal and similar ferritic Cr-steels and cast steels. Proper weldings are subject to the recommended heat treatment. The electrode is specially suitable for sealing surfaces on water, steam- and gas-valves for working temperatures up to 450°C. Scale resistance up to 950°C.
<b>CARBO F-4115</b> (1.4115)  G, S	T Fe 8  annealed: ca. 43 HRc	C: 0,20 Mo: 1,2	Cr: 17	Flux-cored wire for plating and joining equal and similar ferritic Cr-steels and cast steels. Proper weldings are subject to the recommended heat treatment. The electrode is specially suitable for sealing surfaces on water, steam- and gas-valves for working temperatures up to 450°C. Scale resistance up to 950°C.
<b>CARBO F-4122</b> (1.4122)  O, G, S	T Fe 8  ca.50 HRc	C: 0,35 Mo: 1,0	Cr: 17	Flux-cored wire for plating and joining equal and similar ferritic Cr-steels and cast steels. Proper weldings are subject to the recommended heat treatment. The electrode is specially suitable for sealing surfaces on water, steam- and gas-valves for working temperatures up to 475°C. Scale resistance up to 800°C.
<b>CARBO F-4351 N</b> (1.4351)  O, G, S	ER410NiMo  ca. 41 HRc	C: 0,06 Mn: 0,6 Ni: 4,5 N: 0,20	Si: 0,7 Cr: 13 Mo: 0,5	Flux-cored wire for plating and joining equal and similar ferritic Cr-steels and cast steels. The alloy is highly suitable for welding on tough, corrosion resistant continuous-cast rolls and also wear parts from the steel industry and large machinery. Apart from corrosion resistance, it also has a further capability in protecting against cavitation, erosion and also capable of resisting pitting. Typical applications are: Bridge store; depositions to thick areas of water, steam and gas fittings for operating temperatures to 450°C; rope pouring roles.

**Flux-cored wire for CAST**

<b>CARBO F-NiFe 36</b> (1.3912)  G		C: <1 Mn: 3,0 Fe: Rest	Si: <1,0 Ni: 36,0	Ni-, Fe-alloyed flux-cored wire. The content of 36% Ni is significant, because at this Ni content an iron alloy has the lowest possible thermal extension rate. Steel with this composition does not extend up to 200°C. Used for joining and repairing nearly all types of cast iron.
<b>CARBO F-NiFe 45</b>  O	EN ISO 1071 T C NiFeT3-Cl M	C: 0,7 Mn: 4,0 Fe: Rest	Si: 0,6 Ni: 45	CARBO F-NiFe 45 is a flux-cored wire for semi-automated welding of lamellar and nodular cast iron and connections of cast iron with steel. It is low energy, self-protecting with cored wire delivery.
<b>CARBO F-NiFe 60/40</b>  G	MF NiFe-2	C: <1 Mn: 4,0 Fe: 40,0	Si: <1,0 Ni: Rest Cu: +	CARBO F-NiFe 60/40 is a flux-cored wire, which deposit an alloy of the Ferro-nickel type. Its suitable for joining and repairing all types of grey cast iron, also for joining cast iron with steel, but especially for nodular cast iron. Used for joining and repairing nearly all types of cast iron.

CARBO F-S 1

CARBO F-S 6

CARBO F-S 12

CARBO F-S 21

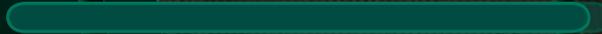
CARBO F-S 25

## F-S

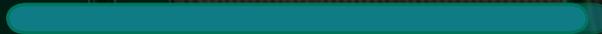
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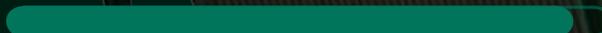
THERMAL SHOCK



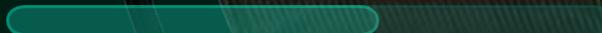
CORROSION



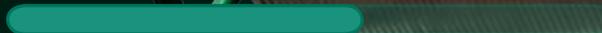
CAVITATION



ABRASION



SLAG



Product	C	Si	Mn	Cr	Ni	Mo	Co	Nb	V	W	Fe other [%]	Hardness	DIN EN 14700: 2005	
CARBO F-200	0,1	0,4	6	19	8,5							180-200 hardened 400 HB	T Fe 10 - 200 - CKNPZ	
CARBO F-240	1	0,4	14	4	0,6							200-230 hardened 450 HB	T Fe 9 - 200 - KNP	
CARBO F-250	0,4	0,4	16	14	1,2	0,6			0,2			220-250 hardened 500 HB	T Fe 9 - 250 - KNP	
CARBO F-300	0,1	0,5	2	1,5								280-325 HB	T Fe 1 - 300 - P	
CARBO F-303	0,2	1	1,5	1,3								ca. 300 HB	T Fe 1 - 300 - GP	
CARBO F-400	0,15			2,5								400 HB	T Fe 2 - 400 - P	
CARBO F-450	0,2			4,5		0,3			0,2			42-45 HRc	T Fe 2 - 450 - P	
CARBO F-495	0,2	0,7	1,2	14,5	1,5	3	12,5					50 HRc hardened 53 HRc	TZ Fe3 - 50 - CKTZ	
CARBO F-600	0,5	2,7		9,5								55-57 HRc	T Fe 8 - 60 - RP	
CARBO F-601	0,5	1	3	6		1,6			0,4	1		55-58 HRc	T Fe 8 - 60 - PT	
CARBO F-602	0,5	1	3	6,5		0,8			0,4			54-56 HRc	T Fe 8 - 55 - PT	
CARBO F-606	0,5	0,6	1,5	5,5		0,5						56-60 HRc	T Fe2 - C1 - 60 - GP	
CARBO F-622	0,6			5	0,6	1		3,3				55-58 HRc	T Fe 8 - 60 - PT	
CARBO F-700	1,8		1,4	7		1,4					Ti: 5	55-56 HRc	T Fe 8 - 60 - GP	
CARBO F-720	0,7	1	2		2						B: 4,5	65-68 HRc	TZ Fe 13 - 65 - G	
CARBO F-733	2,5	0,9	1,8	13				5			B: 2	66-68 HRc	TZ Fe 15 - 65 - G	
CARBO F-WZ 50	0,3			2,5					0,6	4,5		48-50 HRc	T Fe 3 - 50 - ST	
CARBO F-WZ 55	0,3			2,5			2		0,3	7		53-56 HRc	T Fe 3 - 55 - ST	
CARBO F-WZ 59	0,6			4		3,5				3,7		57-59 HRc	T Fe 4 - 55 - ST	
CARBO F-WZ 6356	0,03				18	4	12				Ti: +	ca. 35 (4h 450°C ca. 51 HRc)	T Fe 5 - 350 - ST	
CARBO F-42	1,8	0,9	1,2	28	3	0,8						41-44 HRc	T Fe 14 - 45 - CGT	
CARBO F-50	3	1,8	1,8	15		1						50-54 HRc	TZ Fe 16 - 50 - G	
CARBO F-53	3,7	1,2		32								58 HRc	T Fe 15 - 60 - GR	
CARBO F-55	4,8			28							B: +	55-59 HRc	T Fe 14 - 60 - GR	
CARBO F-56	5	1,7		27		1,3						59 HRc	T Fe 14 - 60 - G	
CARBO F-59	5	1,5		32								59-61 HRc	T Fe 14 - 60 - G	
CARBO F-60	5,4	1,1		22				7				61-63 HRc	T Fe 15 - 60 - G	
CARBO F-61	5,4			22				7			B: +	62-65 HRc	T Fe 15 - 65 - G	
CARBO F-64	3,8			22					1	2	B: 1	62-64 HRc	T Fe 16 - 65 - GZ	
CARBO F-65	5,2	1		21		7		7	1	2		63-65 HRc	T Fe 16 - 65 - GZ	
CARBO F-67	5	1		22					10			64-67 HRc	T Fe 16 - 65 - GZ	
CARBO F-68	5	0,8		38							B: 2	66-68 HRc	T Fe 15 - 70 - GCZ	
CARBO F-69	5,2	0,8		32				5,5			B: 1,5	64-67 HRc	T Fe 15 - 65 - GRZ	
CARBO F-70	5,3	1,1		24,5					5,5			62-64 HRc	T Fe 16 - 65 - G	
CARBO F-78	5,5	1,3		16				6,5	6		B: 1	67 HRc	T Fe 16 - 65 - GZ	
CARBO F-S 1	2,4	0,7	0,1	29			R			11	<2,5	52-55 HRc	T Co 2 -55 - CGTZ	
CARBO F-S 6	1,1	1	0,6	28			R			4,5	<2,5	40-43 HRc	T Co 2 -45 - CTZ	
CARBO F-S 6 L	0,8	1	0,6	28			R			4,5	<2,5	36-39 HRc	T Co 2 -40 - CTZ	
CARBO F-S 6 H	1,3	1	0,6	28			R			4,5	<2,5	43-45 HRc	T Co 2 -45 - CKTZ	
CARBO F-S 12	1,4	0,8	0,1	29			R		8		<2,5	45-48 HRc	T Co 2 -50 - CTZ	
CARBO F-S 21	0,25	0,8	0,3	27	2,5	5,5	R				<2,5	275-325HB hardened 45 HRc	T Co 1 -350 - CKTZ	
CARBO F-S 25	0,3	0,5	0,1	20	10		R			15	<3	275-300HB hardened 45 HRc	T Co 1 -300 - CKTZ	
CARBO F-Ni Co	0,08			16	R	16	2,5		0,4	4,5	<5	220-260HB hardened 420 HB	T Ni 2 - 250 -CKNPTZ	
CARBO F-Ni 182 B	0,01	0,30	6	17	R			1,7		6			ENiCrFe3T0-4	
CARBO F-Ni 520	0,05			19	R	5	11		0,3	5		330-350HB hardened 45 HRc	T Ni 2 - 350 -CKPTZ	
CARBO F-Ni 625	0,05		0,5	22	R	9		3,5			<5		T Ni 2 - 300 -CKNPTZ	
CARBO F-NiFe 36	<1		3		36						R	140-160 HB	1.3912	
CARBO F-NiFe 45	0,7	1	4		45						R	ca. 165 HB		
CARBO F-NiFe 60/40	<1		4		R						40	Cu: +	160-190 HB	
CARBO F-NiCrB 40	0,4	4,5		22	R			1,5			<5	B: 1,7	41-43 HRc	T Ni 1 - 45 -CGZ
CARBO F-DURIT	Tungsten 62%											65 HRc	T Fe 20 - 65 - GZ	
CARBO F-DURIT Ni	Ni, Si, Cr, B-Matrix + 62 % Tungsten (2400 HV)											47 - 50 HRc	T Ni 20 - 55 - CGTZ	
CARBO F-4015	0,1			17,5									200-220 HB	T Fe 8 / AWS 430
CARBO F-4028	0,3			13,5		0,5							47 HRc	T Fe 8 / AWS 420
CARBO F-4115	0,2			17		1,2							43 HRc	T Fe 8 / 1.4115
CARBO F-4122	0,35			17		1							50 HRc	T Fe 8 / 1.4122
CARBO F-4351	0,05	0,9	1,1	14	5	0,75							410 HB	AWS » 410NiMo
CARBO F-4351 N	0,05	0,9	1,1	14	5	0,75					N: 0,20		41 HRc	AWS » 410NiMo
CARBO F-4337	0,1	1,2	0,7	29	9,5								200 HB	T Fe 11 - 200 - CKRTZ

**Range of approvals for high alloyed electrodes**

Similar austenitic and ferritic materials which are included by TÜV

dated: 06.04

Material Group	DIN-name	Material No.:	Classification
21 main material	X 5 CrNi 18 10 G-X 6 CrNi 18 9 X 12 CrNi 18 9 G-X 8 CrNi 18 10 X 6 CrNi 18 10 X 6 CrNi 18 10 X 10 CrNiTi 18 10	1.4301 1.4308 1.6900 1.6901 1.6902 1.6902 1.6903	EN 10028-7, 10222-5, 10272 DIN 17445 VdTÜV-Wbl. 286  SEW 685 VdTÜV-Wbl.411 SEW 685
22 main material	includes: group 21 X 2 CrNi 19 11	1.4306	EN 10028-7, 10088-2, 10272
23 main material	X 2 CrNi 18 10	1.4311	EN 10028-7, 10222-5, 10272
24 main material	includes: groups 21 u. 22 X 5 CrNiMo 17 12 2	1.4401	EN 10088-2, 10222-5, 10272
25 main material	includes: material no. 1.4308 u. 1.4408 X 2 CrNiMo 17 13 2 G-X 6 CrNiMo 18 10	1.4404 1.4408	EN 10028-7, 10088-2, 10272 DIN 17445 VdTÜV-Wbl. 286
26 main material	includes: group 23 X 2 CrNiMoN 17 13 3 X 2 CrNiMo 17 12 2	1.4429 1.4406	EN 10028-7, 10088-2, 10272 EN 10028-7, 10088-2, 10272
27 main material	includes: groups 21, 22, 24 u. 25 X 2 CrNiMo 18 14 3 X 2 CrNiMo 17 12 2	1.4435 1.4404	EN 10028-7, 10088-2, 10272 DIN 17440
28 main material	includes: groups 21 u. 24 X 5 CrNiMo 17 13 3	1.4436	EN 10028-7, 10088-2, 10222-5
29 main material	includes: groups 21 u. 22 X 6 CrNiNb 18 10 X 6 CrNiTi 18 10 G-X 5 CrNiNb 18 9 X 6 CrNi 18 11	1.4550 1.4541 1.4552 1.4948	EN 10028-7, 10088-2, 10222-5 EN 10028-7, 10088-2, 10222-5 DIN 17445 VdTÜV-W.Bl. 313, SEW 640
30 main material	includes: groups 21, 22, 24, 25, 27, 28 u. 29 X 10 CrNiMoNb 18 12 X 6 CrNiMoTi 17 12 2 X 10 CrNiMoNb X 6 CrNiMoNb 17 12 2 G-X 5 CrNiMoNb 18 10	1.4583 1.4571 1.4573 1.4580 1.4581	13CrMo4-5 EN 10028-7, 10088-2, 10272  EN 10028-7, 10088-2, 10272 DIN 17445 VdTÜV-Wbl. 286
31 main material	X 2 CrNiMoN 22 5 3 X 2 CrNiN 23 4 X2 CrNiMoSi 19 5	1.4462 1.4362 1.4417	VdTÜV-W.Bl 418  VdTÜV-W.Bl.385

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