



Lasting Connections

# WELDING CONSUMABLES FOR JOINT WELDING



voestalpine Böhler Welding  
[www.voestalpine.com/welding](http://www.voestalpine.com/welding)

voestalpine

ONE STEP AHEAD.



## LASTING CONNECTIONS

As a pioneer in innovative welding consumables, Böhler Welding offers a unique product portfolio for joint welding worldwide. More than 2000 products are adapted continuously to the current industry specifications and customer requirements, certified by well-respected institutes and thus approved for the most demanding welding applications.

Böhler Welding shares its experience and knowledge and co-operates closely with industrial customers and distributors. In doing so, Böhler Welding offers joining solutions that have been developed together with customers and partners and successfully proven in practice.

Böhler Welding has made excellent consulting and support its standard. Employees with high expertise in joint welding provide customers with professional support.

Our clients benefit from a partner with

- » the highest expertise in joining, rendering the best application support globally available
- » specialized and best in class product solutions for their local and global challenges
- » an absolute focus on customer needs and their success
- » a worldwide presence through factories, offices and distributors

# FOR HIGH DEMANDING INDUSTRIES

## Automotive

Welding consumables of Böhler Welding are used in numerous demanding areas of the automobile industry, e.g. in auto body construction, production of axles and in the manufacture of exhaust systems. Our new generation of metal cored wires has already been successfully applied by notable branch leaders and enables the highest process reliability while at the same time minimising scrap rates and rectification costs.

## Chemical and petrochemical processing industry

Top quality high-alloyed welding consumables made by Böhler Welding are available for plant construction. Decades of first-hand experience in development, manufacture and applications provides users with the assurance of the highest metallurgical standards, consistently high product quality and excellent welding characteristics. Reliable resistance to corrosion and ageing ensures safe and enduring operation of the plants.

## Pipeline

The laying of pipelines through varying climatic zones and terrain demands a high level of engineering ingenuity. Böhler Welding faces this task in close collaboration with the leading pipelaying companies and offers a unique product portfolio for the pipeline industry. The toughness of the weld metal, which is decisive for safety, is of primary concern. Over 100,000 km of pipeline successfully laid worldwide with welding consumables made by Böhler Welding confirm the trust placed in our products.

## Steel construction and special designs

For metallurgically demanding structures in bridges and steel construction as well as in the field of fine-grained steels for crane and vehicle manufacture, the proven quality of Böhler Welding is a key to reducing manufacturing costs and ensuring structural safety. The excellent welding characteristics are valued by welders all over the world.

## Thermal power

The demands for higher efficiency with improved economy and a simultaneously reduced environmental impact continually spurs the development of new materials for thermal power plants. Böhler Welding develops these high temperature and creep resistant filler metals working closely with leading steel producers and power station operators worldwide.

## Hydropower

For the construction of Francis, Kaplan and Pelton turbines, Böhler Welding offers high-quality, specialised welding consumables, which are optimally suited for type 316L stainless steel as well as for 13%Cr-4%Ni alloys. For the associated pressure pipelines we also offer a wide product range which meets the strictest safety requirements while also ensuring excellent mechanical properties.

## CONTENT

Selection guide .....	6	TIG rods, high alloyed .....	25
Selection guide Pipeline .....	10	Solid wire, unalloyed and low-alloyed .....	28
Covered electrodes, unalloyed and low-alloyed ...	12	Solid wire, high alloyed .....	31
Covered electrodes, high alloyed .....	14	Wire/flux combination, un- and low-alloyed .....	35
Flux cored wires, unalloyed and low-alloyed .....	18	Wire/flux combination, high alloyed .....	38
Flux cored wires, high alloyed .....	20	SAW-flux for un- and low-alloyed wires .....	41
TIG rods, unalloyed and low-alloyed .....	23	Pipeline .....	43



# BÖHLER PRODUCTS ALPHABETICAL

Avesta 253MA .....	16	BÖHLER FOX alform® 700 .....	13	Thermanit JE 308L Si .....	31
Avesta 253MA .....	26	BÖHLER FOX BVD 85 .....	43	Thermanit MTS 3 .....	14
Avesta 253MA .....	33	BÖHLER FOX BVD 90 .....	43	Thermanit MTS 3 .....	25
Avesta 308L/MVR .....	14	BÖHLER FOX C 9 MV .....	14	Thermanit MTS 3 .....	31
Avesta 316L/SKR .....	15	BÖHLER FOX CEL .....	43	Thermanit MTS 3 PW .....	20
Avesta 347/MVNB .....	15	BÖHLER FOX CEL 75 .....	43	Thermanit MTS 616 .....	14
Avesta 904L .....	15	BÖHLER FOX CEL 80-P .....	43	Thermanit MTS 616 .....	25
Avesta 2507/P100 .....	26	BÖHLER FOX CEL 85 .....	43	Thermanit Nicro 82 .....	17
Avesta 2507/P100 .....	32	BÖHLER FOX CEL 90 .....	43	Thermanit Nicro 82 .....	26
Avesta FCW 2507/P100-PW .....	21	BÖHLER FOX CM 2 Kb .....	13	Thermanit Nicro 82 .....	33
Avesta Flux 801 .....	42	BÖHLER FOX CN 13/4 .....	15	Thermanit Nicro 182 .....	17
Avesta Flux 805 .....	42	BÖHLER FOX CN 22/9 N .....	16	Thermanit NiMo C 24 .....	27
Avesta LDX 2101 .....	32	BÖHLER FOX CN 23/12-A .....	16	Thermanit NiMo C 24 .....	34
BÖHLER 2.5 Ni-IG .....	23	BÖHLER FOX DCMS Kb .....	13	Thermanit TG Nicro 82 .....	22
BÖHLER A 7 CN-IG .....	26	BÖHLER FOX DMO Kb .....	13	Union 37 .....	23
BÖHLER A 7 CN-IG .....	33	BÖHLER FOX EAS 2-A .....	14	Union I 1.2 Ni .....	23
BÖHLER A 7-FD .....	21	BÖHLER FOX EAS 4 M-A .....	14	Union I 52 .....	23
BÖHLER alform® 700-IG .....	29	BÖHLER FOX EV 50 .....	12	Union K 56 .....	28
BÖHLER alform® 900-IG .....	29	BÖHLER FOX EV 60 .....	12	Union MV 70 .....	29
BÖHLER AWS E308L-17 .....	14	BÖHLER FOX EV 60 PIPE .....	44	Union NiMoCr .....	29
BÖHLER AWS E309-L17 .....	16	BÖHLER FOX EV 63 .....	13	Union RV Ni 1 .....	18
BÖHLER AWS E316L-17 .....	15	BÖHLER FOX EV 70 .....	13	Union S 1 CrMo 2 +	
BÖHLER AWS E6013 .....	12	BÖHLER FOX EV 70 PIPE .....	44	UV 420 TTR / UV 420 TTR-W .....	37
BÖHLER AWS E7018-1 .....	12	BÖHLER FOX EV 85 .....	13	Union S 1 CrMo 2 +	
BÖHLER BB 24 .....	41	BÖHLER FOX EV PIPE .....	44	UV 420 TTR / UV 420 TTR-W .....	40
BÖHLER BB 203 .....	42	BÖHLER FOX FFB .....	16	Union S 2 CrMo +	
BÖHLER C 9 MV-IG .....	25	BÖHLER FOX FFB-A .....	16	UV 420 TTR / UV 420 TTR-W .....	37
BÖHLER C 9 MV-IG .....	31	BÖHLER FOX OHV .....	12	Union S 2 CrMo +	
BÖHLER C 9 MV-MC .....	31	BÖHLER FOX SAS 2-A .....	15	UV 420 TTR / UV 420 TTR-W .....	40
BÖHLER C 9 MV Ti-FD .....	20	BÖHLER FOX SAS 4-A .....	15	Union S 2 Mo +	
BÖHLER CAT 430L Cb-IG .....	31	BÖHLER HL 46-MC .....	28	UV 420 TTR / UV 420 TTR-W .....	36
BÖHLER CAT 430L CbTi-IG .....	31	BÖHLER Ni 1-IG .....	23	Union S 2 Mo +	
BÖHLER CM 2-IG .....	24	BÖHLER Ni 2-UP + UV 421 TT .....	35	UV 420 TTR / UV 420 TTR-W .....	39
BÖHLER CM 2-IG .....	30	BÖHLER Ni 2-UP + UV 421 TT .....	38	Union S 2 Ni 2,5 + UV 421 TT .....	35
BÖHLER CM 2 Ti-FD .....	19	BÖHLER NIBAS 70/20-FD .....	22	Union S 2 Ni 2,5 + UV 421 TT .....	38
BÖHLER CN 13/4-IG .....	32	BÖHLER NIBAS 625 PW-FD .....	22	Union S 2 Ni 3,5 + UV 421 TT .....	36
BÖHLER CN 13/4-MC .....	32	BÖHLER NiCu 1-IG .....	29	Union S 2 Ni 3,5 + UV 421 TT .....	38
BÖHLER CN 21/33 Mn-IG .....	33	BÖHLER NiMo 1-IG .....	44	Union S 2 + UV 420 TT .....	35
BÖHLER CN 22/9 N-IG .....	25	BÖHLER Pipeshield 71 T8-FD .....	44	Union S 2 + UV 420 TT .....	38
BÖHLER CN 22/9 N-IG .....	32	BÖHLER Pipeshield 81 T8-FD .....	45	Union S 3 Mo + UV 420 TT .....	37
BÖHLER CN 22/9 PW-FD .....	21	BÖHLER SAS 2-IG .....	25	Union S 3 Mo + UV 420 TT .....	39
BÖHLER CN 23/12-FD .....	21	BÖHLER SAS 2-IG (Si) .....	32	Union S 3 NiMo 1 +	
BÖHLER CN 23/12-IG .....	26	BÖHLER SAS 2 PW-FD .....	20	UV 420 TT .....	36
BÖHLER CN 23/12-MC .....	33	BÖHLER SAS 4-IG .....	25	Union S 3 NiMo 1 + UV 420 TT .....	39
BÖHLER CN 23/12 Mo-FD .....	21	BÖHLER SAS 4-IG (Si) .....	32	Union S 3 NiMoCr +	
BÖHLER CN 23/12 PW-FD .....	21	BÖHLER SAS 4 PW-FD .....	20	UV 421 TT .....	36
BÖHLER DCMS-IG .....	24	BÖHLER SG 2 .....	28	Union S 3 NiMoCr + UV 421 TT .....	39
BÖHLER DCMS-IG .....	30	BÖHLER SG 3-P .....	44	Union S 3 NiMo +	
BÖHLER DCMS Ti-FD .....	19	BÖHLER SG 8-P .....	44	UV 420 TTR / UV 420 TTR-W .....	36
BÖHLER DMO-IG .....	23	BÖHLER Ti 46-FD .....	18	Union S 3 NiMo +	
BÖHLER DMO-IG .....	30	BÖHLER Ti 52-FD .....	18	UV 420 TTR / UV 420 TTR-W .....	39
BÖHLER DMO Ti-FD .....	19	BÖHLER Ti 60-FD .....	18	Union S 3 Si + UV 418 TT .....	35
BÖHLER EAS 2-FD .....	20	BÖHLER Ti 70 PIPE-FD .....	44	Union S 3 Si + UV 418 TT .....	38
BÖHLER EAS 2-IG .....	25	BÖHLER Ti 80 T-FD .....	19	Union S 3 + UV 420 TT .....	35
BÖHLER EAS 2 PW-FD .....	20	BÖHLER X 70-IG .....	29	Union S 3 + UV 420 TT .....	38
BÖHLER EAS 4 M-FD .....	20	Marathon 431 .....	42	Union S P 24 + UV P24 .....	37
BÖHLER EAS 4 M-IG .....	25	Marathon 543 .....	42	Union S P 24 + UV P24 .....	40
BÖHLER EAS 4 PW-FD .....	20	Phoenix Blau .....	12	Union TG 55 M .....	18
BÖHLER EMK 6 .....	28	Phoenix CEL 70 .....	43	Union TG 55 Ni .....	19
BÖHLER EMK 8 .....	28	Phoenix SH CHROMO 2 KS .....	13	Union X 90 .....	29
BÖHLER EML 5 .....	23	Phoenix Spezial D .....	12	UV 305 .....	41
BÖHLER EMS 2 + BB 24 .....	35	Thermanit 25/14 E-309L Si .....	33	UV 306 .....	41
BÖHLER EMS 2 + BB 24 .....	38	Thermanit 35/45 NB .....	26	UV 400 .....	41
BÖHLER EMS 3 + BB 24 .....	35	Thermanit 617 .....	17	UV 418 TT .....	41
BÖHLER EMS 3 + BB 24 .....	38	Thermanit 617 .....	27	UV 420 TT .....	41
BÖHLER FA-IG .....	26	Thermanit 625 .....	17	UV 420 TTRC .....	41
BÖHLER FFB-IG .....	26	Thermanit 625 .....	27	UV 420 TTR /	
BÖHLER FFB-IG .....	33	Thermanit 625 .....	34	UV 420 TTR-W .....	41
BÖHLER FOX 2.5 Ni .....	12	Thermanit CHROMO 9 V .....	14	UV 421 TT .....	42
BÖHLER FOX A7-A .....	16	Thermanit GE 316L Si .....	31		

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# SELECTION GUIDE

	Welding process			
	SMAW	FCAW	GTAW (GW)	
<b>Unalloyed steels</b>				
$R_e \leq 355 \text{ MPa}$	BÖHLER FOX OHV	BÖHLER Ti 46-FD	BÖHLER EML 5	
	BÖHLER AWS E6013	BÖHLER Ti 52-FD	Union I 52	
	BÖHLER FOX EV 50	Union TG 55 M	Union 37	
	BÖHLER AWS E7018-1			
	Phoenix Blau			
	Phoenix Spezial D			
<b>High strength steels</b>				
$R_e \leq 460 \text{ Mpa}$	BÖHLER FOX EV 60	Union RV Ni 1	BÖHLER Ni 1-IG	
	BÖHLER FOX 2.5 Ni		Union I 1.2 Ni	
$R_e \leq 500 \text{ Mpa}$	BÖHLER FOX EV 63		BÖHLER 2.5 Ni-IG	
$R_e \leq 550 \text{ Mpa}$	BÖHLER FOX EV 70	BÖHLER Ti 60-FD		
		Union TG 55 Ni		
$R_e \leq 690 \text{ Mpa}$	BÖHLER FOX alform® 700	BÖHLER Ti 80 T-FD		
	BÖHLER FOX EV 85			
$R_e \leq 890 \text{ Mpa}$				
<b>Creep resistant steels</b>				
0.5 Mo	BÖHLER FOX DMO KB	BÖHLER DMO Ti-FD	BÖHLER DMO-IG (DMO)	
1Cr 0.5Mo	BÖHLER FOX DCMS KB	BÖHLER DCMS Ti-FD	BÖHLER DCMS-IG	
2 1/4Cr 1Mo	BÖHLER FOX CM 2 KB	BÖHLER CM 2 Ti-FD	BÖHLER CM 2-IG	
	Phoenix SH CHROMO 2 KS			
9Cr 1Mo +V(W)	BÖHLER FOX C 9 MV	BÖHLER C 9 MV Ti-FD	BÖHLER C 9 MV-IG	
	Thermanit CHROMO 9 V			
	Thermanit MTS 3	Thermanit MTS 3 PW	Thermanit MTS 3	
	Thermanit MTS 616		Thermanit MTS 616	
<b>Stainless steels</b>				
304L	BÖHLER FOX EAS 2-A	BÖHLER EAS 2-FD	BÖHLER EAS 2-IG	
	Avesta 308L/MVR	BÖHLER EAS 2 PW-FD		
	BÖHLER AWS E308L-17			

	GMAW	SAW
	BÖHLER EMK 6	BÖHLER EMS 2 + BB 24
	BÖHLER EMK 8	BÖHLER EMS 3 + BB 24
	BÖHLER HL 46-MC	Union S 2 + UV 420 TT
	Union K 56	Union S 3 + UV 420 TT
	BÖHLER SG 2	Union S 3 Si + UV 418 TT
	Union MV 70	
		BÖHLER Ni 2-UP + UV 421 TT
		Union S 2 Ni 2,5 + UV 421 TT
	BÖHLER NiCu 1-IG	Union S 2 Ni 3,5 + UV 421 TT
		Union S 3 NiMo + UV 420 TTR
		Union S 3 NiMo 1 + UV 420 TT
	BÖHLER alform® 700-IG	Union S 3 NiMoCr + UV 421 TT
	BÖHLER X 70-IG	
	Union NiMoCr	
	BÖHLER alform® 900-IG	
	Union X 90	
	BÖHLER DMO-IG	Union S 2 Mo + UV 420 TTR
		Union S 3 Mo + UV 420 TT
	BÖHLER DCMS-IG	Union S 1 CrMo 2 + UV 420 TTR
	BÖHLER CM 2-IG	Union S 2 CrMo + UV 420 TTR
		Union S P 24 + UV P24
	BÖHLER C 9 MV-IG	
	BÖHLER C 9 MV-MC	
	Thermanit MTS 3	Thermanit MTS 3 + Marathon 543
		Thermanit MTS 616 + Marathon 543
	BÖHLER CAT 430L CB-IG	
	BÖHLER CAT 430L CbTi-IG	
	Thermanit JE 308L Si	Thermanit JE 308L + Marathon 431

# SELECTION GUIDE

	Welding process			
	SMAW	FCAW	GTAW (GW)	
<b>Stainless steels</b>				
316L	BÖHLER FOX EAS 4 M-A	BÖHLER EAS 4 M-FD	BÖHLER EAS 4 M-IG	
	Avesta 316L/SKR	BÖHLER EAS 4 PW-FD		
	BÖHLER AWS E316L-17			
347	BÖHLER FOX SAS 2-A	BÖHLER SAS 2 PW-FD	BÖHLER SAS 2-IG	
	Avesta 347/MVNB			
316 Ti	BÖHLER FOX SAS 4-A	BÖHLER SAS 4 PW-FD	BÖHLER SAS 4-IG	
13Cr/4Ni	BÖHLER FOX CN 13/4			
904L	Avesta 904L			
Duplex	BÖHLER FOX CN 22/9 N	BÖHLER CN 22/9 PW-FD	BÖHLER CN 22/9 N-IG	
Super Duplex		Avesta FCW 2507/P100-PW	Avesta 2507/P100	
Lean Duplex	Avesta 253MA		Avesta 253MA	
<b>Special application</b>				
	BÖHLER FOX A 7-A	BÖHLER A 7-FD	BÖHLER A 7 CN-IG	
	BÖHLER FOX CN 23/12-A	BÖHLER CN 23/12-FD	BÖHLER CN 23/12-IG	
	BÖHLER AWS E309L-17	BÖHLER CN 23/12 PW-FD		
		BÖHLER CN 23/12 Mo-FD		
<b>Heat resistant steels</b>				
	BÖHLER FOX FFB		BÖHLER FFB-IG	
	BÖHLER FOX FFB-A		BÖHLER FA-IG	
			Thermanit 35/45 Nb	
<b>Nickel base</b>				
	Thermanit Nicro 182			
		BÖHLER NIBAS 70/20-FD		
	Thermanit Nicro 82	Thermanit TG Nicro 82	Thermanit Nicro 82	
	Thermanit 625	BÖHLER NIBAS 625 PW-FD	Thermanit 625	
	Thermanit 617		Thermanit 617	
			Thermanit NiMo C 24	
<b>SAW Flux</b>	<b>For un- and low-alloyed wires</b>			
	BÖHLER BB 24	UV 306	UV 420 TTR	
	UV 400	UV 418 TT	UV 420 TTRC	
	UV 305	UV 420 TT	UV 421 TT	

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	GMAW	SAW
	Thermanit GE 316L Si	Thermanit GE 316L + Marathon 431
	BÖHLER SAS 2-IG (Si)	
	BÖHLER SAS 4-IG (Si)	Thermanit H-347 + Marathon 431
	BÖHLER CN 13/4-IG	BÖHLER CN 13/4-UP + BB 203
	BÖHLER CN 13/4-MC	
	BÖHLER CN 22/9 N-IG	Thermanit 22/09 + Marathon 431
	Avesta 2507/P100	Avesta 2507/P100 CU/W + Flux 805
	Avesta LDX 2101	
	Avesta 253MA	
	BÖHLER A 7 CN-IG	BÖHLER A 7 CN-UP + BB 203
	Thermanit 25/14 E-309L Si	
	BÖHLER CN 23/12-MC	
	BÖHLER CN 21/33 Mn-IG	
	BÖHLER FFB-IG	
	Thermanit Nicro 82	Thermanit Nicro 82 + Marathon 444
	Thermanit 625	Thermanit 625 + Marathon 444
	Thermanit NiMo C 24	
	<b>For high alloyed wires</b>	
	BÖHLER BB 203	Marathon 431
	Avesta FLUX 801	Marathon 543
	Avesta FLUX 805	

# SELECTION GUIDE PIPELINE

Steel types API EN	SMAW			
	CEL	BVD	Pipe	
<b>Lower strength pipeline steels</b>				
<b>API</b>				
<b>A, B</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV PIPE	
<b>X42 - X52</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV PIPE	
			BÖHLER FOX EV 60 PIPE	
<b>X56 - X60</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV PIPE	
	Phoenix CEL 70		BÖHLER FOX EV 60 PIPE	
	BÖHLER FOX CEL 75			
	BÖHLER FOX CEL 80-P			
	BÖHLER FOX CEL 85			
<b>EN</b>				
<b>L210</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV PIPE	
<b>L290MB-L360MB</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV PIPE	
			BÖHLER FOX EV 60 PIPE	
<b>L385M-L415MB</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV PIPE	
	Phoenix CEL 70		BÖHLER FOX EV 60 PIPE	
	BÖHLER FOX CEL 75			
	BÖHLER FOX CEL 80-P			
	BÖHLER FOX CEL 85			
<b>High strength pipeline steels</b>				
<b>API</b>				
<b>X65</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV 60 PIPE	
	BÖHLER FOX CEL 80-P			
	BÖHLER FOX CEL 85			
<b>X70</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 90	BÖHLER FOX EV 70 PIPE	
	BÖHLER FOX CEL 80-P			
	BÖHLER FOX CEL 85			
	BÖHLER FOX CEL 90			
<b>X80</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 90	BÖHLER FOX EV 70 PIPE	
	BÖHLER FOX CEL 90			
<b>EN</b>				
<b>L450MB</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 85	BÖHLER FOX EV 60 PIPE	
	BÖHLER FOX CEL 80-P			
	BÖHLER FOX CEL 85			
<b>L485MB</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 90	BÖHLER FOX EV 70 PIPE	
	BÖHLER FOX CEL 80-P			
	BÖHLER FOX CEL 85			
	BÖHLER FOX CEL 90			
<b>L555MB</b>	BÖHLER FOX CEL	BÖHLER FOX BVD 90	BÖHLER FOX EV 70 PIPE	
	BÖHLER FOX CEL 90			

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	GMAW	FCAW
	BÖHLER SG 3-P	BÖHLER Pipeshield 71 T8-FD
	BÖHLER SG 8-P	
	BÖHLER SG 3-P	BÖHLER Pipeshield 71 T8-FD
	BÖHLER SG 8-P	
	BÖHLER SG 3-P	BÖHLER Pipeshield 71 T8-FD
	BÖHLER SG 8-P	
	BÖHLER SG 3-P	BÖHLER Pipeshield 71 T8-FD
	BÖHLER SG 8-P	
	BÖHLER SG 3-P	BÖHLER Ti 70 PIPE-FD
	BÖHLER SG 8-P	BÖHLER Pipeshield 71 T8-FD
	BÖHLER SG 8-P	BÖHLER Ti 70 PIPE-FD
	BÖHLER NiMo 1-IG	BÖHLER Pipeshield 81 T8-FD
	BÖHLER NiMo 1-IG	
	BÖHLER SG 3-P	BÖHLER Pipeshield 71 T8-FD
	BÖHLER SG 8-P	
	BÖHLER SG 8-P	BÖHLER Pipeshield 81 T8-FD
	BÖHLER NiMo 1-IG	
	BÖHLER NiMo 1-IG	

# COVERED ELECTRODES, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER FOX OHV</b> EN ISO 2560-A: E 38 0 RC 11  AWS A5.1: E6013	Heat treatment: untreated, as welded R <sub>e</sub> 460 MPa R <sub>m</sub> 490 MPa A <sub>5</sub> 25 % A <sub>v</sub> 75 J	2.0 2.5 3.2 4.0 5.0	TÜV (5687), DB (10.014.12), ABS, DNV, LR, LTSS, SEPROZ, CE	Rutile-cellulosic covered electrode with very good weldability in all positions, including vertical down.  Universal electrode, especially suitable for small transformers. Flexible coating, very stable arc. Multi-purpose application in steel construction, boiler and tank fabrication, vehicle manufacture and shipbuilding.
<b>BÖHLER AWS E6013</b> EN ISO 2560-A: E 42 0 RC 11  AWS A5.1: E6013	Heat treatment: untreated, as welded R <sub>e</sub> 440 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 22 % A <sub>v</sub> 80 J 55 J...0 °C	2.0 2.5 3.2 4.0 5.0	TÜV (12680.), ABS, DNV, CE	Rutile-cellulosic electrode with good weld ability in all positions including vertical down. Excellent gap-bridging and arc-striking ability.  For tack welding and load fit ups. General purpose for industry and trade, assembly and shop welding
<b>BÖHLER FOX EV 50</b> EN ISO 2560-A: E 42 5 B 42 H5  AWS A5.1: E7018-1H4R	Heat treatment: untreated, as welded R <sub>e</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 27 % A <sub>v</sub> 190 J 70 J...-50 °C	2.0 2.5 3.2 4.0 5.0 6.0	TÜV (0426.), DB (10.014.02), CE, LR, ABS, BV, DNV, GL, RMR, RINA, LTSS, SEPROZ, CRS, NAKS	Basic covered electrode for high-quality welds. Excellent strength and toughness properties down to -50 °C. Weld metal recovery approx. 110 %. Good weldability in all positions except vertical down.  Very low hydrogen content in the weld metal (according AWS conditions HD ≤4 ml/100 g).
<b>BÖHLER AWS E7018-1</b> EN ISO 2560-A: E 42 5 B 42 H5  AWS A5.1: E7018-1H4	Heat treatment: untreated, as welded R <sub>e</sub> 470 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 26% A <sub>v</sub> 160 J 130 J...-20 °C	2.0 2.5 3.2 4.0 5.0	TÜV (12451.), ABS, BV, DNV, GL, CE	Basic coated electrode engineered for high-quality welds. Excellent strength and toughness properties. Also suitable for welding steels with low purity and high carbon content. Metal recovery > 110 %.  Good weldability in out-of-position work except for vertical-down.  Suitable for welding in steel construction, boiler and container fabrication, vehicle construction, shipbuilding, and machine construction as well as for buffer layers when building up on high carbon steels.
<b>Phoenix Blau</b> EN ISO 2560-A: E 42 0 RC 11  AWS A5.1-04: E6013	Heat treatment: untreated, as welded R <sub>e</sub> 420 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 22 % A <sub>v</sub> 50 J	2.0 2.5 3.2 4.0 5.0	TÜV (00425.), DB (10.132.19), ABS, BV, LR, GL (2Y), DNV	Rutile-Cellulose covered electrode. General purpose; useable in all positions; excellent gap-bridging and arc-striking ability; for tack-welding and bad fit-ups.  Well suited for welding rusty and primed plates (roughly 40 µm); excellent vertical down characteristics. Useable on small transformers (42 V, open circuit).
<b>Phoenix Spezial D</b> EN ISO 2560-A: E 42 3 B 12 H10  AWS A5.1: E7016	Heat treatment: untreated, as welded R <sub>e</sub> 440 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 22 % A <sub>v</sub> 80 J 50 J...-30 °C	2.5 3.2 4.0 5.0	TÜV (03282.), DB (10.132.42), ABS, BV, DNV, GL, LR	Double coated basic electrode. Outstanding welding characteristics on AC and DC in all positions except vertical down.  Stable arc, good radiographic soundness.  Useable in handicraft and industry for field and workshop application.
<b>BÖHLER FOX EV 60</b> EN ISO 2560-A: E 46 6 1Ni B 42 H5  AWS A5.5: E8018-C3H4R	Heat treatment: untreated, as welded R <sub>p0.2</sub> 510 MPa R <sub>m</sub> 610 MPa A <sub>5</sub> 27 % A <sub>v</sub> 180 J 110 J...-60 °C	2.5 3.2 4.0 5.0	TÜV (1524.), DNV, RMR, Statoil, LTSS, SEPROZ, CRS, CE, VG 95132	Ni-alloyed, basic covered electrode with excellent Mech. Properties, most notably greater toughness and cracking resistance for high-strength, fine-grained constructional steels.  Suitable for a temperature range of -60 °C to +350 °C.  Very low hydrogen content (according AWS condition HD ≤4 ml/100 g).
<b>BÖHLER FOX 2.5 Ni</b> EN ISO 2560-A: E 46 8 2Ni B 42 H5  AWS A5.5: E8018-C1H4R	Heat treatment: untreated, as welded R <sub>p0.2</sub> 490 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 30 % A <sub>v</sub> 180 J 110 J...-80 °C	2.5 3.2 4.0 5.0	TÜV (00147.), DB (10.014.16), ABS, BV, WIWEB, DNV, GL, LR, RINA, Statoil, SEPROZ, CE	Ni-alloyed, basic covered electrode for unalloyed and Ni-alloyed fine-grained constructional steels. Tough, crack-resistant weld metal.  Low temperature toughness down to -80 °C.  Very low hydrogen content in the weld metal (HD ≤4 ml/100 g).

# COVERED ELECTRODES, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER FOX EV 63</b> EN ISO 2560-A: E 50 4 B 42 H5  AWS A5.5: E8018-GH4R	Heat treatment: untreated, as welded R <sub>p0.2</sub> 580 MPa R <sub>m</sub> 630 MPa A <sub>5</sub> 26 % A <sub>v</sub> 170 J 90 J...-40 °C	2.5 3.2 4.0 5.0	TÜV (0730.), DB (10.014.07 / 81.014.01), RMR, SEPROZ, CE	Basic covered electrode for unalloyed and low-alloy steels of higher strength and a carbon content of up to 0.6 %. Also suitable for rail joint welding. Very low hydrogen content in the weld metal (HD ≤ 4 ml/100 g).
<b>BÖHLER FOX EV 70</b> EN ISO 18275-A: E 55 6 1NiMo B 4 2 H5  AWS A5.5: E9018-GH4R E9018-D1H4R (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 650 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 24 % A <sub>v</sub> 160 J 70 J...-60 °C	2.5 3.2 4.0 5.0	TÜV (0112.), SEPROZ, CE	MoNi-alloyed, basic covered electrode with a high degree of toughness and cracking resistance for high-strength, fine-grained constructional steels. Suitable for the temperature range of -60 °C to +350 °C. Very low hydrogen content in the weld metal (HD ≤ 4 ml/100 g).
<b>BÖHLER FOX alform® 700</b> EN ISO 18275-A: E 69 6 Mn2NiCrMo B 4 2 H5  AWS A5.5: E11018-GH4R E11018MH4R (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 780 MPa R <sub>m</sub> 840 MPa A <sub>5</sub> 20 % A <sub>v</sub> 110 J 60 J...-60 °C	2.5 3.2 4.0 5.0	NAKS	Mn-Ni-Mo-alloyed, basic covered electrode with a high degree of toughness and cracking resistance for high-strength, fine-grained constructional steels. Very low hydrogen content in the weld metal (HD ≤ 4 ml/100 g).
<b>BÖHLER FOX EV 85</b> EN ISO 18275-A: E 69 6 Mn2NiCrMo B 4 2 H5  AWS A5.5: E11018-GH4R E11018MH4R (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 780 MPa R <sub>m</sub> 840 MPa A <sub>5</sub> 20 % A <sub>v</sub> 110 J 60 J...-60 °C	2.5 3.2 4.0 5.0	TÜV (4313.), DB (10.014.22), SEPROZ, CE, BV	Mn-Ni-Mo-alloyed, basic covered electrode with a high degree of toughness and cracking resistance for high-strength, fine-grained constructional steels. Very low hydrogen content in the weld metal (HD ≤ 4 ml/100g).
<b>BÖHLER FOX DMO Kb</b> EN ISO 3580-A: E Mo B 4 2 H5 EN ISO 2560-A: E 46 5 Mo B 4 2 H5  AWS A5.5: E7018-A1H4R	Heat treatment: untreated, as welded R <sub>e</sub> 510 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 24% A <sub>v</sub> 170 J 60 J...-50 °C	2.5 3.2 4.0 5.0	TÜV (0019.), DB (10.014.14), KTA 1408.1, ABS, DNV, GL, Statoil, LTSS, SEPROZ, CRS, CE, NAKS, RS	Basic covered electrodes for high-quality welds on high temperature boiler and pipe steels, preferred for 16Mo3. Approved for long-term use at operating temperatures to +550 °C. Very low hydrogen content (according to AWS conditions, HD ≤ 4 ml/100 g)
<b>BÖHLER FOX DCMS Kb</b> EN ISO 3580-A: E CrMo1 B 4 2 H5  AWS A5.5: E8018-B2H4R	Heat treatment: annealed 680 °C/2 h R <sub>p0.2</sub> 480 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 23% A <sub>v</sub> 160 J	2.5 3.2 4.0 5.0	TÜV (0728.), DB (10.014.32), ABS, DNV, GL, LTSS, SEPROZ, CE, NAKS	Basic covered electrode, core wire alloyed, for high-quality welds on boiler and pipe steels or steels of similar quality. Preferred for 13CrMo4-5. Approved for long-term use at operating temperatures to +570 °C. Suitable for step-cooling applications (Bruscatto ≤ 15 ppm).
<b>BÖHLER FOX CM 2 Kb</b> EN ISO 3580-A: E CrMo2 B 4 2 H5  AWS A5.5: E9018-B3H4R	Heat treatment: annealed 720 °C/2 h R <sub>p0.2</sub> 510 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 20 % A <sub>v</sub> 120 J	2.5 3.2 4.0 5.0	TÜV (0722.), DB (10.014.30), ABS, DNV, GL, SEPROZ, CE, NAKS	Basic covered electrode, core wire alloyed, for components subject to high temperatures in the construction of boilers, apparatus and tube steels, as well as in the petroleum industry, e.g. in cracking plants. Preferred for 10CrMo9-10. Approved for long-term use at operating temperatures to +600 °C.
<b>Phoenix SH CHROMO 2 KS</b> EN ISO 3580-A: E CrMo2 B 4 2 H5  AWS A5.5: E9015-B3	Heat treatment: stress relieved R <sub>p0.2</sub> 440 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 22 % A <sub>v</sub> 130 J 90 J...-30 °C 80 J...-40 °C	2.5 3.2 4.0 5.0	TÜV (01823.)	Basic covered CrMo alloyed electrode. Extra low content of trace elements; step-cooling tested; not sensitive to long term embrittlement. Manufacture of chemical apparatus, hydrocrackers; for welding work on heavy-duty boilers, superheaters, superheater lines; for welding of CrMo and CrMoV alloyed steels for the petrochemical industry.

# COVERED ELECTRODES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER FOX C 9 MV</b> EN ISO 3580-A: E CrMo91 B 4 2 H5  AWS A5.5: E9015-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 580 MPa R <sub>m</sub> 710 MPa A <sub>5</sub> 19 % A <sub>v</sub> 75 J	2.5 3.2 4.0 5.0	TÜV (6762.), SEPROZ, CE	Basic covered electrode, core wire alloyed, for creep-resistant, quenched and tempered 9-12 % chrome steels, especially T91 and P91 steels in turbine and boiler fabrication as well as in the chemical industry.  Approved for long-term use at operating temperatures to +650 °C.
<b>Thermanit CHROMO 9 V</b> EN ISO 3580-A: E CrMo91 B 4 2 H5  AWS A5.5: E9015-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 550 MPa R <sub>m</sub> 680 MPa A <sub>5</sub> 17 % A <sub>v</sub> 47 J	2.5 3.2 4.0 5.0	TÜV (06173.)	Basic covered CrMoVNb alloyed electrode. Good welding characteristics in out of position work; high temperature resistant weld metal.  For quenched and tempered 9% chromium steels, in particular P 91 / T 91 according to ASTM.
<b>Thermanit MTS 3</b> EN ISO 3580-A: E CrMo 9 1 B 4 2 H5  AWS A5.5: E9015-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 550 MPa R <sub>m</sub> 680 MPa A <sub>5</sub> 17 % A <sub>v</sub> 47 J	2.5 3.2 4.0 5.0	TÜV (09168.)	High temperature creep resistant, resistant to scaling up to 600 °C.  Suited for joining and surfacing applications with quenched and tempered 9 % Cr steels, particularly for matching high temperature resistant parent metal T91 / P91 according to ASTM.
<b>Thermanit MTS 616</b> EN ISO 3580-A: E ZCrMoWVNb9 0.5 2 B 4 2 H5  AWS A5.5: E9015-G (E9015 B9 mod.)	Heat treatment: annealed 760 °C/≥2 h R <sub>p0.2</sub> 560 MPa R <sub>m</sub> 720 MPa A <sub>5</sub> 15% A <sub>v</sub> 41 J	2.5 3.2 4.0	TÜV (09289.)	Basic covered CrMoNiWVNb alloyed electrode. Good welding characteristics in out of position work; high temperature resistant matching weld metal.  For the welding of high temperature martensitic steels in particular P 92 according to ASTM A 355.
<b>BÖHLER FOX EAS 2-A</b> EN ISO 3581-A: E 19 9 L R 3 2  AWS A5.4: E308L-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 430 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 40 % A <sub>v</sub> 70 J	1.5 2.0 2.5 3.2 4.0 5.0	TÜV (1095.), DB (30.014.15), ABS, GL, Statoil, VUZ, SEPROZ, CE, CWB, NAKS	Low carbon, core wire alloyed, austenitic, rutile covered electrode. Application in all industry branches where identical steel types are welded, including higher-carbon varieties, as well as ferritic 13 % chrome steels.  The electrode offers particularly excellent welding characteristics. The very good positional weldability and the self-releasing slag are economically significant arguments that favour this electrode.  Intergranular corrosion resistant up to +350 °C.
<b>Avesta 308L/MVR</b> EN ISO 3581-A: E 19 9 L R  AWS A5.4: E308L-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 440 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 37 % A <sub>v</sub> 60 J 40 J...-40 °C	2.5 3.25 4.0 5.0	TÜV (1058.), DB (30.007.01), DNV	Avesta 308L/MVR is a Cr-Ni electrode for all position welding of 1.4301/ASTM 304 type stainless steels.  Corrosion resistance:  Very good under fairly severe conditions, e.g. in oxidising acids and cold or dilute reducing acids.
<b>BÖHLER AWS E308L-17</b> EN ISO 3581-A: E 19 9 L R 3 2  AWS A5.4: E308L-17	Heat treatment: untreated, as welded R <sub>e</sub> 430 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 40 % A <sub>v</sub> 70 J	2.0 3.2 4.0	TÜV (10647.), ABS, GL, CE	Low carbon, core wire alloyed austenitic electrode with rutile-basic coating for use in all industries where similar type steels including higher carbon grades as well as ferritic 13 % chromium steels are welded.  This brand is noted for its outstanding welding characteristics, excellent weld ability on AC, and high hot cracking resistance of the weld metal. The main features of economic interest are excellent out-of-position weld ability, self-detaching slag with no residues, and moisture resistant coating. Resistant to intergranular corrosion up to 350 °C.
<b>BÖHLER FOX EAS 4 M-A</b> EN ISO 3581-A: E 19 12 3 L R 3 2  AWS A5.4: E316L-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 36 % A <sub>v</sub> 70 J	1.5 2.0 2.5 3.2 4.0 5.0	TÜV (0773.), DB (30.014.14), ABS, DNV, GL, LR, Statoil, VUZ, SEPROZ, CE, CWB, NAKS	Low carbon, core wire alloyed, austenitic, rutile covered electrode. Application in all industry branches where identical steel types are welded, including higher-carbon varieties, as well as ferritic 13 % chrome steels.  The electrode offers particularly excellent welding characteristics. The very good positional weldability and the self-releasing slag are economically significant arguments that favour this electrode.  Intergranular corrosion resistant up to +400 °C.

# COVERED ELECTRODES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Avesta 316L/SKR</b> EN ISO 3581-A: E 19 12 3 LR AWS A5.4: E316L-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 36 % A <sub>v</sub> 60 J 55 J...-40 °C	2.5 3.25 4.0 5.0	TÜV (1073.), DB (30.007.10), DNV	Avesta 316L/SKR is a Cr-Ni-Mo electrode for all position welding of 1.4436/ASTM 316 type stainless steels. Corrosion resistance: Excellent resistance to general, pitting and intergranular corrosion in chloride containing environments. Intended for severe conditions, e.g. in dilute hot acids.
<b>BÖHLER AWS E316L-17</b> EN ISO 3581-A: E 19 12 3 LR 3 2 AWS A5.4: E316L-17	Heat treatment: untreated, as welded R <sub>e</sub> 460 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 36 % A <sub>v</sub> 70 J	2.5 3.2 4.0	TÜV (10648.), ABS, GL, LR, CE	Rutile electrode, core wire alloyed stainless steel. Preferably used for 1.4435 / 316L steel grades. BÖHLER AWS E316L-17 is an acknowledged world leader, noted for its superior welding characteristics and metallurgy. It can be used on AC or DC. Other advantages include high current capacity, minimum spatter formation, self-releasing slag, smooth and clean weld profile, safety against formation of porosity due to moisture resistant coating and packaging into hermetically sealed tins. The fully alloyed core wire ensures the most reliable corrosion resistance. Resistant to intergranular corrosion up to +400 °C.
<b>BÖHLER FOX SAS 2-A</b> EN ISO 3581-A: E 19 9 Nb R 3 2 AWS A5.4: E347-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 70 J	2.0 2.5 3.2 4.0 5.0	TÜV (1105.), DB (30.014.06), ABS, GL, LTSS, VUZ, SEPROZ, CE, NAKS	Stabilised, core wire alloyed, austenitic, rutile covered electrode. Application in all industry branches where identical steel types are welded, as well as ferritic 13 % chrome steels. The electrode offers particularly excellent welding characteristics. The very good positional weldability and the self-releasing slag are economically significant arguments that favour this electrode. Intergranular corrosion resistant up to +400 °C.
<b>Avesta 347/MVNB</b> EN ISO 3581-A: E 19 9 Nb R AWS A5.4: E347-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 60 J 45 J...-40 °C	2.0 2.5 3.2 4.0 5.0	TÜV (1062.), DB (30.007.08), DNV, CWB	Avesta 347/MVNB is a Nb-stabilised Cr-Ni electrode for welding steels that are stabilised with titanium or niobium, such as 1.4541/ASTM 321. A stabilised weldment has improved high temperature properties, e.g. creep resistance, compared to low-carbon non-stabilised grades. Avesta 347/MVNB can also be used for the second layer (first layer 309 type) when cladding mild steel. Corrosion resistance: Avesta 347/MVNB is primarily intended for high temperature service oder applications that should be heat treated. However, the corrosion resistance corresponds to that of 308H, i.e. good resistance to general corrosion.
<b>BÖHLER FOX SAS 4-A</b> EN ISO 3581-A: E 19 12 3 Nb R 3 2 AWS A5.4: E318-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 490 MPa R <sub>m</sub> 640 MPa A <sub>5</sub> 32 % A <sub>v</sub> 60 J	2.0 2.5 3.2 4.0 5.0	TÜV (0777.), DB (30.014.07), LTSS, SEPROZ, CE, NAKS	Stabilised, core wire alloyed, austenitic, rutile covered electrode. Application in all industry branches where identical steel types are welded, as well as ferritic 13 % chrome steels. The electrode offers particularly excellent welding characteristics. The very good positional weldability and the self-releasing slag are economically significant arguments that favour this electrode.
<b>BÖHLER FOX CN 13/4</b> EN ISO 3581-A: E 13 4 B 6 2 AWS A5.4: E410NiMo-15	Heat treatment: untreated, as welded R <sub>p0.2</sub> 890 MPa R <sub>m</sub> 1090 MPa A <sub>5</sub> 12 % A <sub>v</sub> 32 J	2.5 3.2 4.0 5.0	TÜV (3232.), LTSS, SEPROZ, CE	Basic covered electrode for corrosion-resistant, martensitic and martensitic-ferritic rolled, forged and cast steels of identical type. Application in the construction of hydro turbines, compressors and steam power stations. Resistant to water vapour, steam and sea water atmospheres. Low hydrogen content of HD ≤5 ml/100 g in the weld metal.
<b>Avesta 904L</b> EN ISO 3581-A: E 20 25 5 Cu N LR AWS A5.4: E385-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 34 % A <sub>v</sub> 70 J 60 J...-40 °C 50 J...-196 °C	2.5 3.25 4.0 5.0	TÜV (03496.), DB (30.007.09)	Avesta 904L is a high-alloy fully austenitic Cr-Ni-Mo-Cu electrode designed for welding 1.4539/ASTM 904L type steels. It can also be used for welding 1.4404/ASTM 316 components where a ferrite free weld is required, e.g. in cryogenic or non-magnetic applications. The weld metal has a very good impact toughness at low temperatures. Corrosion resistance: Very good resistance to general corrosion in non-oxidising environments such as sulphuric acid and phosphoric acid. Very good resistance to pitting and crevice corrosion in chloride containing solutions. Meets the corrosion test requirements per ASTM G48 Methods A, B and E (40 °C).

# COVERED ELECTRODES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER FOX CN 22/9 N</b> EN ISO 3581-A: E 22 9 3 N L R 3 2  AWS A5.4: E2209-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 650 MPa R <sub>m</sub> 820 MPa A <sub>5</sub> 25 % A <sub>v</sub> 55 J 50 J...-10 °C	2.5 3.2 4.0 5.0	TÜV (3636.), ABS, DNV, GL, LR, RINA, Statoil, SEPROZ, CE	Core wire alloyed, rutile covered electrode for welding of ferritic-austenitic duplex steels, e.g. 1.4462, UNS 31803. Areas of application primarily in offshore technology and the chemical industry.  In addition to increased strength and toughness, the high proportion of ferrite in the weld metal also makes it highly resistant to stress corrosion cracking.
<b>Avesta 253MA</b> EN ISO 3581-A: E 21 10 R	Heat treatment: untreated, as welded R <sub>p0.2</sub> 535 MPa R <sub>m</sub> 725 MPa A <sub>5</sub> 37 % A <sub>v</sub> 60 J	2.0 2.5 3.25 4.0 5.0	-	Avesta 253 MA is primarily designed for welding the high temperature stain- less steel Outokumpu 253 MA, used for furnaces, combustion chambers and burners. Both the steel and filler metal offers excellent resistance to oxidation up to 1,100 °C. The chemical composition of Avesta 253 MA is balanced to give a crack resistant weld metal.  Corrosion resistance: Excellent resistance to high temperature corrosion. Not intended for applications exposed to wet corrosion.
<b>BÖHLER FOX A7-A</b> EN ISO 3851-A: E Z18 9 MnMo R 3 2  AWS A5.4: E307-16 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 520 MPa R <sub>m</sub> 720 MPa A <sub>5</sub> 35% A <sub>v</sub> 75 J ≥32 J...-100°C	2.5 3.2 4.0 5.0	TÜV (09101.), SEPROZ, CE, NAKS	Rutile basic electrode, for joint welding of dissimilar joints and/ or difficult to weld materials. Very popular electrode for numerous applications. The weld metal offers exceptionally high ductility and elongation together with out- standing crack resistance. No embrittlement for service temperatures down to -100 °C or above +500 °C. The scaling resistance goes up to +850 °C. When working at service temperatures above +650 °C please contact Böhler Welding. The weld metal can be post weld heat treated without  any problems. Good resistance against cavitation. BÖHLER FOX A 7-A is suitable for both AC and DC.
<b>BÖHLER FOX CN 23/12-A</b> EN ISO 3581-A: E 23 12 L R 3 2  AWS A5.4: E309L-17	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 40% A <sub>v</sub> 55 J ≥32 J...-60°C	2.5 3.2 4.0 5.0	TÜV (1771.), DB (30.014.08), ABS, BV, DNV, GL, LR, SEPROZ, CE, CWB, NAKS	Core wire alloyed, low carbon, austenitic, rutile covered electrode. Increased ferrite content (FN-17) in the weld deposit for safe and crack resistant dissimilar joints.  Suitable for service temperatures from -60 °C up to +300 °C.
<b>BÖHLER AWS E309-L17</b> EN ISO 3581-A: E 23 12 L R 3 2  AWS A5.4: E309L-17	Heat treatment: untreated, as welded R <sub>e</sub> 440 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 40% A <sub>v</sub> 60 J ≥32 J...-60°C	2.5 3.2 4.0 5.0	ABS	Rutile electrode of type E 23 12 L / 309L providing increased delta ferrite contents (FN -17) in the weld deposit for safe and crack resistant dissimilar joint welds and surfacing.  Operating temperature from -60 °C to +300 °C and for weld claddings up to +400 °C.
<b>BÖHLER FOX FFB</b> EN 3581-A: E 25 20 B 2 2  AWS A5.4: E310-15 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 36 % A <sub>v</sub> 100 J ≥32 J...-196 °C	2.5 3.2 4.0 5.0	TÜV (0143.), Statoil, SEPROZ, CE	Core wire alloyed, basic covered electrode for heat-resistant rolled, forged and cast steels of identical type, e.g. in annealing and hardening shops, in steam boiler construction, in the petroleum and ceramic industries.  Joint welds on heat-resistant CrSiAl steels subject to sulphurous gases must be welded with BÖHLER FOX FA as the final pass.  Scaling resistant up to +1,200 °C.
<b>BÖHLER FOX FFB-A</b> EN ISO 3581-A: E 25 20 R 3 2  AWS A5.4: E310-16	Heat treatment: untreated, as welded R <sub>p0.2</sub> 430 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 75 J	2.0 2.5 3.2 4.0	Statoil, SEPROZ, CE	Core wire alloyed, rutile covered electrode for heat-resistant rolled steels of identical type, e.g. in annealing and hardening shops, in steam boiler construction, in the petroleum and ceramic industries.  Scaling resistant up to +1,200 °C.
<b>Thermanit Nicro 182</b> EN ISO 14172: E Ni 6182 (NiCr15Fe6Mn)  AWS A5.11: ENiCrFe-3	Heat treatment: untreated R <sub>p0.2</sub> 350 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 90 J 70 J...-196 °C	2.5 3.2 4.0 5.0	TÜV (02073.), TÜV (KTA) (08109)	Nickel base electrode, stainless; resistant to scaling up to 950 °C, creep resistant up to 800 °C. Cold toughness down to -196 °C. Well suited for tough joints and surfacing on heat resistant Cr- and CrNi steels/cast steel grades and Ni-base alloys.  Well suited for tough joints and surfacing on heat resistant Cr- and CrNi steels/cast steel grades and Ni-base alloys.  For welding work on cryogenic steels/cast steel grades including Ni steels suitable for quenching and tempering.  For joining applications on steels with a low expansion coefficient (Dilavar, Invar).



# COVERED ELECTRODES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Thermanit Nicro 82</b> EN ISO 14172: E Ni 6082 (NiCr20Mn3Nb)  AWS A5.11: ENiCrFe-3 (mod.)	Heat treatment: untreated R <sub>p0.2</sub> 380 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 90 J 70 J...-196 °C 50 J...-296 °C	2.5 3.2 4.0 5.0	TÜV (01775.), TÜV (KTA), GL	Nickel base electrode, stainless; heat resistant; creep resistant. Cold toughness down to -269°C. Well suited for welding austenitic ferritic joints.  Well suited for tough joints and surfacing on heat resistant Cr and CrNi steels/cast steel grades and Ni-base alloys.  Temperature limits: 500 °C in sulphurous atmospheres, 800 °C max for fully stressed welds. Resistant to scaling up to 1,000 °C.
<b>Thermanit 625</b> EN ISO 14172: E Ni 6625 (NiCr22Mo9Nb)  AWS A5.11: ENiCrMo-3	Heat treatment: untreated R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 760 MPa A <sub>5</sub> 30 % A <sub>v</sub> 75 J 60 J...-196 °C	2.5 3.2 4.0 5.0	TÜV (03463.), ABS, DNV, GL	Nickel base electrode, stainless; high resistance to corrosive environments. Resistant to stress corrosion cracking. Resistant to scaling up to 1,100 °C. Temperature limit: 500 °C max. in sulphurous atmospheres.  Creep resistant up to 1,000 °C. Cold toughness down to -196 °C.  For joining and surfacing work with matching/similar corrosion resistant materials as well as on matching and similar heat resistant, creep resistant steels and alloys. For joining and surfacing work with cryogenic austenitic CrNi(N) steels/cast steel grades and on cryogenic Ni steels suitable for quenching and tempering.
<b>Thermanit 617</b> EN ISO 14172: E Ni 6617 (NiCr22Co12Mo)  AWS A5.11: ENiCrCoMo-1 (mod.)	Heat treatment: untreated R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 30 % A <sub>v</sub> 100 J	2.5 3.2 4.0	TÜV (06844.)	Resistant to scaling up to 1,100 °C, creep resistant up to 1,000 °C. High resistance to hot gases in oxidizing resp. carburizing atmospheres.  Suited for joining and surfacing applications with matching and similar heat resistant steels and alloys.

# FLUX CORED WIRES, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER Ti 46-FD</b> EN ISO 17632-A: T 46 2 P M 1 H10 T 42 2 P C 1 H5  AWS A5.36: E71T1-M21A0-CS1-H8 E71T1-C1A0-CS1-H4	Heat treatment: untreated, as welded Shielding gas: Ar + 15-25 % CO <sub>2</sub> R <sub>e</sub> 500 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 90 J...-20 °C	1.2	TÜV (12522.), DB (42.014.41), ABS, GL, LR, DNV, BV, RINA (3Y S, C1), CE	All position rutile flux-cored wire with fast freezing slag system. User friendly welding characteristics in all positions with one parameter setting. Excellent mechanical properties, easy slag removal, low spatter loss, smooth, finely rippled bead surface, high X-ray safety.  The product performs to the highest productivity with significant savings in time and economical aspects when used for positional welding.
<b>BÖHLER Ti 52-FD</b> EN ISO 17632-A: T 46 4 P M 1 H10 T 42 2 P C 1 H5  AWS A5.36: E71T1-M21A4-CS1-H8 E71T1-C1A2-CS1-H4	Heat treatment: untreated, as welded Shielding gas: Ar + 15-25 % CO <sub>2</sub> R <sub>e</sub> 500 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 26 % A <sub>v</sub> 180 J 130 J...-20 °C 90 J...-40 °C	1.2 1.6	TÜV (11164.), DB (42.014.35), ABS, GL, LR, DNV, BV, CRS, CE	Rutile flux-cored wire with fast-freezing slag system. Excellent welding properties in all positions.  Excellent mechanical properties, easy slag removability and low spatter loss. Highest productivity with significant savings in time and economical aspects when used for positional welding.
<b>Union TG 55 M</b> EN ISO 17632-A: T 46 4 P M 1 H10 T 42 2 P C 1 H5  AWS A5.20: E71T-1MJH8 / E71T-1CH8	Heat treatment: untreated, as welded Shielding gas: M21 Re 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 24 % A <sub>v</sub> 140 J 47 J...-40 °C  Heat treatment: untreated, as welded Shielding gas: C1 R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 520 MPa A <sub>5</sub> 24 % A <sub>v</sub> 130 J	1.0 1.2 1.4 1.6	TÜV (11194.), DB (42.132.47), ABS, DNV, LR, BV, GL	Union TG 55 M is an all position flux cored wire that displays exceptional high impact properties in the as welded as well as in the stress relieved condition with mixed gas M21 acc. to EN ISO 14175. This "welder friendly" wire with its soft, spatterfree arc always operates in the spray arc mode.  It is possible to weld in all positions with one diameter (1.2 mm from 160 A to 250 A), so ideal for fit-up work.  Deposition rates in vertical-up welding can reach 2.2 - 5.5 kg/h, making it one of the most productive consumables available. The slag is easily to detach. Good bead appearance with smooth tie-in.
<b>Union RV Ni 1</b> EN ISO 17632-A: T 50 6 1Ni P M 1 H5/ T 46 5 1Ni P C 1 H5  AWS A5.29: E81T1-Ni1MJH4 E81T1-Ni1CJH4	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 22 % A <sub>v</sub> 120 J 90 J...0 °C 70 J...-20 °C 47 J...-60 °C	1.2 1.4 1.6	TÜV (11079.), DB (42.132.40), GL, LR, ABS, DNV	Union RV Ni 1 is a seamless copper coated rutile basic flux cored wire for the welding of cryogenic steels in all positions with mixed gas M21 and C1 acc. to EN ISO 14175. The wire is characterised by a low spatter affinity, a fine bead appearance, a good slag detachability and x-ray proof joints.  The weld metal furthermore disposes of excellent mechanical properties as welded and annealed. The Ni-alloyed weld metal (acc. to stickelectrode E8018-C3) allows the application at petrochemical constructions and offshore technics.  The fast solidifying slag permits the manual and mechanized position welding with increased welding current. The welding of root passes in all positions with ceramic backing strips is proven.
<b>BÖHLER Ti 60-FD</b> EN ISO 17632-A: T 50 6 1Ni P M 1 H5  AWS A5.36: E81T1-M21A8-Ni1-H4	Heat treatment: untreated, as welded Shielding gas: Ar + 15-25 % CO <sub>2</sub> R <sub>p0.2</sub> 530 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 27 % A <sub>v</sub> 140 J 120 J...-20 °C 100 J...-40 °C 60 J...-60 °C	1.2	TÜV (12544.), DB (42.014.42), GL, ABS, CE, DNV, LR, BV	Rutile flux cored wire with fast freezing slag for welding low-temperature steels. Outstanding welding properties in all positions. Exceptional mechanical strength and good slag detachability, low spatter losses, smooth, finely rippled seam surface, notch-free weld toes. Out-of-position welding can be carried out with increased welding current, and therefore very economically with increased deposition rate.  For high-quality welding in shipbuilding, for offshore applications and steel structures with high strength requirements, as well as for low-temperature applications down to -60 °C. BÖHLER Ti 60-FD is also suitable for sour gas application. Results for HIC-test acc. to NACE TM0248 and SSC test are available.

# FLUX CORED WIRES, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Union TG 55 Ni</b> EN ISO 17632-A: T 50 6 1 Ni P M 1 H5  AWS A5.29: E81T1-Ni1M-JH4	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 20 % A <sub>v</sub> 120 J 47 J...-60 °C	1.2 1.6	LR	Union TG 55 Ni is a rutile basic flux cored wire with fast freezing slag characteristic. It is suitable for GMAW welding with mixed gas M21 acc. to EN ISO 14175 for welding of structural steels with a nominal tensile strength of 560 MPa in all positions. The wire displays exceptional high impact properties in the as welded as well as in the stress relieved condition.  This "welder friendly" wire with its soft, spatter-free arc, always operates in spray arc mode. It is possible to weld in any position with one Diameter (1.2 mm from 160 A to 250 A), so ideal for fit-up work. Single sided root runs are made economically on ceramic backing strips. The nickel alloyed weld metal – corresponding to the stick electrode E8018-C3 – is usable in petrochemical plants and in offshore technology. Areas of application are primarily in the offshore, structural steel and shipbuilding industries.
<b>BÖHLER Ti 80 T-FD</b> EN ISO 18276-A: T69 6 Z P M 1 H5  AWS A5.36: E111T1-M21A8-GH4	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>p0.2</sub> 770 MPa R <sub>m</sub> 800 MPa A <sub>5</sub> 19 % A <sub>v</sub> 75 J 60 J...-60°C	1.0 1.2 1.4 1.6	GL, DNV, ABS, LR, BV, CE	Seamless rutile, Nickel-Molybdenum alloyed, flux cored wire for single- or multilayer welding of high strength steels with Argon-CO <sub>2</sub> shielding gas.  Main features: excellent weldability in all positions, excellent bead appearance, very low spatter losses, fast freezing and easy to remove slag. The good mechanical properties of this wire even at low temperatures (-60 °C) as well as the low content of diffusible Hydrogen make it especially suitable for offshore, pipeline applications and crane applications.
<b>BÖHLER DMO Ti-FD</b> EN ISO 17634-A: T MoL P M 1 H10  AWS A5.36: E81T1-M21PY-A1H8	Heat treatment: untreated, as welded R <sub>p0.2</sub> 540 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 23 % A <sub>v</sub> 120 J	1.2	TÜV (11120), CE	BÖHLER DMO Ti-FD is a flux-cored wire for welding in the construction of boilers, pressure tanks, pipelines and for steel construction, preferably for high temperature steel grades with 0.5 % Mo.  Due to the fast freezing slag, the flux-cored wire is especially suitable for positional welding.
<b>BÖHLER DCMS Ti-FD</b> EN ISO 17634-A: T CrMo1 P M 1 H10  AWS A5.36: E81T1-M21PY-B2H8	Heat treatment: annealed 690 °C/1 h R <sub>p0.2</sub> ≥460 MPa R <sub>m</sub> 550-740 MPa A <sub>5</sub> ≥20 % A <sub>v</sub> ≥47 J	1.2	TÜV (11162), CE	BÖHLER DCMS Ti-FD is a low-alloy, slag-forming flux-cored wire with rutile filling for welding in the construction of boilers, vessels and pipe systems, preferably for creep resistant steels with 1 % chrome- and 0.5 % molybdenum-alloy.  Due to the fast-freezing slag, the flux-cored wire is especially suitable for positional welding.
<b>BÖHLER CM 2 Ti-FD</b> EN ISO 17634-A: T CrMo2 P M 1 H10  AWS A5.36: E91T1-M21PY-B3-H8	Heat treatment: annealed 720 °C/2 h R <sub>p0.2</sub> 600 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 19 % A <sub>v</sub> 70 J	1.2	TÜV (11812), CE	BÖHLER CM 2 Ti-FD filler metal is a low-alloy, slag-forming flux-cored wire with rutile filling for welding in the construction of boilers, vessels and tube steels, preferably for creep resistant steels with 2.25 % chrome- and 1 % molybdenum-alloy (e.g. 10CrMo9 10).  Due to the fast-freezing slag, the flux-cored wire is especially suitable for positional welding.

# FLUX CORED WIRES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER C 9 MV Ti-FD</b> EN ISO 17634-A: T ZCrMo9VNb P M 1  AWS A5.36: E91T1-M21PY-B91	Heat treatment: annealed 760 °C/3 h R <sub>p0.2</sub> 580 MPa R <sub>m</sub> 720 MPa A <sub>5</sub> 17 % A <sub>v</sub> 35 J	1.2	-	BÖHLER C 9 MV Ti-FD is a slag-forming, flux-cored wire with rutile-basic filling for welding creep-resistant, quenched and tempered 9-12 % chrome steels, especially T91 and P91 steels in turbine, boiler and tube steels as well as in foundry engineering. Due to a fast-freezing slag, also suitable for positional welding.
<b>Thermanit MTS 3 PW</b> EN ISO 17634-A: T ZCrMo9VNb P M 1  AWS A5.29-05 E91T1-B9M	Heat treatment: annealed 760 °C/3 h Shielding gas: M21 R <sub>p0.2</sub> 580 MPa R <sub>m</sub> 720 MPa A <sub>5</sub> 17 % A <sub>v</sub> 27 J	1.2	-	Thermanit MTS 3 PW is a rutile- basic flux cored wire for welding creep resistant, tempered 9 – 12 % chromium steels in turbine-, boiler- and pipeline construction as well as in the foundry technology.  The wire is especially designed for the ASTM steels T91 / P91. This flux cored wire is developed for welding with conventional power sources on DC + under mixture gas (Ar + 15 – 25 % CO <sub>2</sub> ). It is also suitable for positional welding.
<b>BÖHLER EAS 2-FD</b> EN ISO 17633-A: T 19 9 L R M21 (C1) 3 T 19 9 L P M21 (C1) 1 (for ø 0.9 mm)  AWS A5.22: E308LT0-4, E308LT0-1 E308LT1-4/-1 (for ø 0.9 mm)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 380 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 40 % A <sub>v</sub> 60 J ≥32 J...-196 °C	0.9 1.2 1.6	TÜV (5348.), DB (43.014.14), CWB, GL, SEPROZ, CE	Strip-alloyed, flux-cored wire with rutile-containing filling for welding of austenitic CrNi steels, primarily in flat and horizontal welding positions. The ease of handling and high deposition rate of BÖHLER EAS 2-FD means greater productivity with excellent welding characteristics, self- releasing slag, low spatter formation and seam oxidation, smooth seam finish with good bead wetting and uniformly reliable penetration.  The weld metal is suitable for temperatures down to -196 °C and intergranular corrosion resistant up to +350 °C.
<b>BÖHLER EAS 2 PW-FD</b> EN ISO 17633-A: T 19 9 L P M21 1 T 19 9 L P C1 1  AWS A5.22: E308LT1-4 / E308LT1-1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 380 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 40 % A <sub>v</sub> 70 J 40 J...-196 °C	1.2 1.6	TÜV (09117), DB (43.014.23), CWB, GL, SEPROZ, CE	BÖHLER EAS 2 PW-FD is optimised especially for positional welding. The fast-freezing slag supports the weld pool and enables particularly economical welding in all positions. The chemical and mechanical properties correspond to those of BÖHLER EAS 2-FD.
<b>BÖHLER EAS 4 M-FD</b> EN ISO 17633-A: T 19 12 3 L R M21 (C1) 3 T 19 12 3 L P M21 (C1) 1 (for ø 0.9 mm)  AWS A5.22: E316LT0-4, E316LT0-1 E316LT1-4/-1 (for ø 0.9 mm)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 38 % A <sub>v</sub> 55 J 35 J...-120 °C	0.9 1.2 1.6	TÜV (5349), DB (43.014.15), CWB, GL, LR, SEPROZ, CE, DNV	Strip-alloyed, flux-cored wire electrode with rutile-containing filling for welding of austenitic CrNiMo steels, primarily in flat and horizontal welding positions. The ease of handling and high deposition rate of BÖHLER EAS 4 M-FD means greater productivity with excellent welding characteristics, self-releasing slag, low spatter formation and seam oxidation, smooth seam finish with good bead wetting and uniformly reliable penetration.  The weld metal is suitable for temperatures down to -120 °C and intergranular corrosion resistant up to +400 °C.
<b>BÖHLER EAS 4 PW-FD</b> EN ISO 17633-A: T 19 12 3 L P M21 1 T 19 12 3 L P C1 1  AWS A5.22: E316LT1-4 / E316LT1-1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 38 % A <sub>v</sub> 65 J 45 J...-120 °C	1.2 1.6	TÜV (09118.), DB (43.014.24), CWB, LR, GL, SEPROZ, CE, DNV, ABS	BÖHLER EAS 4 PW-FD is optimised especially for positional welding. The fast-freezing slag supports the weld pool and enables particularly economical welding in all positions. The chemical and mechanical properties correspond to those of EAS 4 M-FD.  Intergranular corrosion resistant up to +400 °C.
<b>BÖHLER SAS 2 PW-FD</b> EN ISO 17633-A: T 19 9 Nb P M21 1 T 19 9 Nb P C1 1  AWS A5.22: E347T1-4 / E347T1-1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 35 % A <sub>v</sub> 75 J 38 J...-120 °C	1.2	TÜV (10059), SEPROZ, CE	BÖHLER SAS 2 PW-FD is optimised especially for positional welding. The supporting effect of the fast-freezing slag enables positional welding with high amperage at high welding speeds. The areas of application, as well as the chemical and mechanical properties, correspond to those of BÖHLER SAS 2-FD.  For service temperatures down to -120 °C and intergranular corrosion resistant up to +400 °C.
<b>BÖHLER SAS 4 PW-FD</b> EN ISO 17633-A: T 19 12 3 Nb P M21 1 T 19 12 3 Nb P C1 1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 430 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 35 % A <sub>v</sub> 65 J 40 J...-120 °C	1.2	-	The BÖHLER SAS 4 PW-FD is optimised especially for positional welding. The supporting effect of the fast-freezing slag enables positional welding with high amperage at high welding speeds. The areas of application, as well as the chemical and mechanical properties, correspond to those of BÖHLER SAS 4-FD.  Intergranular corrosion resistant up to +400 °C.

# FLUX CORED WIRES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER CN 22/9 PW-FD</b> EN ISO 17633-A: T 22 9 3 N L P M21 1 T 22 9 3 N L P C1 1  AWS A5.22: E2209T1-4 / E2209T1-1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 600 MPa R <sub>m</sub> 800 MPa A <sub>5</sub> 27 % A <sub>v</sub> 80 J 65 J...-20 °C 55 J...-40 °C 45 J...-46 °C	1.2	TÜV (07666.), ABS, CWB, DNV, GL, LR, RINA, SEPROZ, CE	BÖHLER CN 22/9 PW-FD is a strip alloyed, flux-cored wire electrode with a rutile-containing filling for positional welding on duplex steels for chemical apparatus and plant construction, in the chemical industry, for storage tanks as well as for tanker ships for transporting chemicals and in the offshore industry.  Positional welding for this duplex quality also yields excellent deposition rates. The supporting effect of the slag enables positional welding with high amperage at high welding speeds.
<b>Avesta FCW 2507/P100-PW</b> EN ISO 17633-A: T 25 9 4 N L P M21 (C1) 2  AWS A5.22: E2594T1-4/1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 670 MPa R <sub>m</sub> 880 MPa A <sub>5</sub> 27 % A <sub>v</sub> ≥50 J ≥32 J...-40 °C	1.2	-	Avesta FCW 2507-PW is primarily designed for welding the super duplex stainless steel 2507, ASTM S32760, S32550 und S31260 and similar grades. Avesta 2507/P100-PW produces a ferritic-austenitic stainless all weld metal which combines the good characteristics of both types.  Corrosion resistance: Very good resistance to pitting and stress corrosion cracking in nitric acid environments. The critical pitting temperature is higher than 40 °C.
<b>BÖHLER A 7-FD</b> EN ISO 17633-A: T 18 8 Mn R M21 3 T 18 8 Mn R C1 3  AWS A5.22: E307T0-G (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 630 MPa A <sub>5</sub> 39 % A <sub>v</sub> 60 J ≥32 J...-100 °C	1.2 1.6	TÜV (11101.), CE	Flux-cored wire with rutile-containing filling for primarily flat and horizontal welding positions. Very universally applicable flux-cored wire.  Characteristics of weld metal: Cold-work hardening ability, very good resistance to cavity formation, crack resistant, thermal shock resistant, scaling resistant up to 850 °C, impervious to sigma-phase embrittlement above 500 °C, service temperature down to -100 °C.
<b>BÖHLER CN 23/12-FD</b> EN ISO 17633-A: T 23 12 L R M21 (C1) 3 T 23 12 L P M21 (C1) 1 (for Ø 0.9 mm)  AWS A5.22: E309LT0-4(1) E309LT1-4/-1 (for Ø 0.9 mm)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 33 % A <sub>v</sub> 60 J 45 J...-60 °C	0.9 1.2 1.6	TÜV (5350.), DB (43.014.16), CWB, GL, LR, SEPROZ, CE, RINA, DNV	Strip alloyed, flux-cored wire with rutile-containing filling for welding of dissimilar joints between high-alloy Cr and CrNi(Mo) steels with unalloyed or low-alloy steels as well as for weld claddings in primarily flat and horizontal welding positions.  Suitable for service temperatures from -60 °C up to +300 °C.
<b>BÖHLER CN 23/12 PW-FD</b> EN ISO 17633-A: T 23 12 L P M21 1 T 23 12 L P C1 1  AWS A5.22: E309LT1-4 / E309LT1-1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 35 % A <sub>v</sub> 65 J 50 J...-60 °C	1.2 1.6	TÜV (09115.), DB (43.014.22), ABS, LR, GL, CWB, SEPROZ, CE, DNV, RINA	BÖHLER CN 23/12 PW-FD is a strip alloyed, flux-cored wire with rutile slag characteristics for positional welding of dissimilar joints between high-alloy Cr and CrNi(Mo) steels and unalloyed or low-alloy steels.  The supporting effect of the fast-freezing slag enables excellent positional welding characteristics.  Suitable for service temperatures from -60 °C up to +300 °C.
<b>BÖHLER CN 23/12 Mo-FD</b> EN ISO 17633-A: T 23 12 2 L R M21 (C1) 3 T 23 12 2 L P M21 (C1) 1 (for Ø 0.9 mm)  AWS A5.22: E309LMoT0-4/1 E309LMoT1-4/-1 (for Ø 0.9 mm)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 30 % A <sub>v</sub> 55 J 37 J...-60 °C	0.9 1.2 1.6	TÜV (05351.), DB (43.014.17), ABS, DNV, GL, LR, RINA, SE-PROZ, CWB, CE	Rutile flux-cored welding wire of type T 23 12 2 L / E309LMoT0 for GMAW of dissimilar joints of Cr- and CrNi(Mo)-steels and non- or low-alloy steels, as well as weld cladding of un- or low alloyed base metals preferably in flat or horizontal position. The wire offers a high safety against hot cracking even in the case of high dilution. For Mo-alloyed claddings the product is necessary for the 1. layer.  Beside the major savings in time and cost BÖHLER offers a high production quality level together with lowest probabilities for welding errors. Increased travel speeds as well as little demand for cleaning and pickling provide considerable savings in time and money. Wire Ø 0,9 mm is designed for positional welding, wire Ø 1.2 mm and 1.6 mm are recommended mainly for downhand and horizontal welding positions, horizontal/vertical position as well as slightly vertical down position (1 o'clock).

# FLUX CORED WIRES, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER NIBAS 70/20-FD</b> EN ISO 12153: T Ni 6082 R M21 3  AWS A5.34: ENiCr3T0-4	Heat treatment: untreated, as welded $R_{p0.2}$ 400 MPa $R_m$ 650 MPa $A_5$ 39 % $A_v$ 135 J 110 J...-196 °C	1.2 1.6	TÜV (10298.), CE	<p>Nickel base flux-cored wire containing a filling with rutile and basic content for primarily flat and horizontal welding positions. The ease of handling and high deposition rate means greater productivity with excellent welding characteristics, self-releasing slag, low spatter formation and seam oxidation, smooth seam finish with good wetting and safe penetration.</p> <p>Suitable for high-quality joint welding of nickel-based alloys, high temperature and creep-resistant materials, heat- and cold-resistant materials, as well as low-alloy, difficult-to-weld steels and dissimilar joints. Also for ferrite-austenite connections at operating temperatures <math>\geq +300</math> °C or where post weld heat treatments are required.</p> <p>Suitable in pressure tank construction for -196 °C up to +550 °C, otherwise scaling resistant up to +1,200 °C (sulphur-free atmospheres).</p>
<b>Thermanit TG Nicro 82</b> EN ISO 12153: T Ni 6082 R M 3  AWS A5.34: ENiCr3T0-4	Heat treatment: untreated, as welded $R_{p0.2}$ 360 MPa $R_m$ 600 MPa $A_5$ 30 % $A_v$ 110 J 80 J...-196 °C	1.2 1.6	-	<p>Nickel base rutile/basic flux cored wire mainly designed for flat and horizontal welding position. Easy handling and high deposition rate of this wire are leading to high productivity with brilliant welding properties. It produces self detaching slag, almost spatter and weld oxidation-free welding, fine bead appearance with good sidewall wetting and secure penetration.</p> <p>Suitable for high-quality welds of nickel-base alloys, high temperature and creep resistant steels, heat-resistant, cryogenic materials, difficult-to-weld steels and mixed structures. Furthermore it is useable for ferrite austenite joint welding at service temperatures above 300 °C or with post weld heat treatment.</p> <p>This wire is designed for applications in pressure vessel constructions for temperatures from -196 °C up to 550 °C. It is resistant to scaling up to 1,200 °C (sulfur free atmosphere).</p>
<b>BÖHLER NIBAS 625 PW-FD</b> EN ISO 12153: T Ni 6625 P M21 2  AWS A5.34: ENiCrMo3T1-4	Heat treatment: untreated, as welded $R_{p0.2}$ 500 MPa $R_m$ 740 MPa $A_5$ 40 % $A_v$ 90 J 80 J...-196 °C	1.2	TÜV (11223.), CE	<p>Flux-cored wire for high-quality joint welds of high Mo-alloy, nickel-based alloys (e.g. alloy 625 and alloy 825) as well as CrNiMo steels with a high Mo content (e.g. 6 % Mo steels). In addition, this type is also suitable for high temperature and creep-resistant steels, heat- and cold-resistant materials, dissimilar joints and low-alloy, difficult-to-weld steels.</p> <p>Suitable in pressure tank construction for -196 °C up to +550 °C, otherwise scaling resistant up to +1,200 °C (sulphur-free atmosphere).</p>

# TIG RODS, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER EML 5</b> EN ISO 636-A: W 46 5 W2Si  AWS A5.18: ER70S-3	Heat treatment: untreated, as welded R <sub>e</sub> 520 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 26 % A <sub>v</sub> 220 J 200 J...-20 °C 90 J...-50 °C	1.6 2.0 2.4 3.0	TÜV (1096.), DB (42.014.02), Statoil, CE	The GTAW welding rod is suitable for thin-walled plate and pipe as well as root pass welds. The low Si content makes this welding rod especially suitable for joint welds that are subjected to enamelling or galvanising.  BÖHLER EML 5 can be used in sour gas applications (HIC-Test acc. NACE TM-02-84) as well.
<b>Union I 52</b> EN ISO 636-A: W 42 5 W3Si1  AWS A5.18: ER70S-6	Heat treatment: untreated, as welded Shielding gas: I1 R <sub>e</sub> 440 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 25 % A <sub>v</sub> 130 J 50 J...-50 °C	1.6 2.0 2.4 3.0	TÜV (1656.), DB (42.132.11), DNV	GTAW solid rod and wire for the welding with argon. Typical fields of use: boiler, tank and pipeline constructions and apparatus engineering.
<b>Union 37</b> EN 12536: O 1  AWS A5.3: R45	-	1.5 2.0 2.5 3.0 4.0 5.0 6.0 8.0	DB (70.132.01)	Gas welding rod for unalloyed structural steels up to a yield strength of 235 MPa. Liquide weld pool.
<b>BÖHLER Ni 1-IG</b> EN ISO 636-A: W3Ni1 W 46 5 W3Ni1  AWS A5.28: ER80S-Ni1 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 25 % A <sub>v</sub> 150 J ≥47 J...-50 °C	2.0 2.4	-	Ni-alloyed GTAW rod for welding of offshore pipe work and similar high integrity applications. High impact properties down to -50 °C.
<b>Union I 1.2 Ni</b> EN ISO 636-A: W 46 6 W3Ni1  AWS A5.28: ER80S-G	Heat treatment: untreated, as welded Shielding gas: I1 R <sub>e</sub> 470 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 25 % A <sub>v</sub> 150 J 47 J...-60 °C	2.0 2.5 3.0	TÜV (0513.), DB (42.132.49) KTA 1408.1 (8012), DNV	Ni alloyed welding rod / wire. Good flow characteristics in out of position welding. Very good impact toughness of weld metal at low temperatures. Tested according to KTA 1408.
<b>BÖHLER 2.5 Ni-IG</b> EN ISO 636-A: W2Ni2 W 46 8 W2Ni2  AWS A5.28: ER80S-Ni2	Heat treatment: untreated, as welded R <sub>e</sub> 510 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 26 % A <sub>v</sub> 280 J 80 J...-60 °C ≥47 J...-80 °C	2.0 2.4 3.0	TÜV (01081.), BV, GL, Statoil, SEPROZ, CE	A 2.5 % Ni-alloyed GTAW welding rod, copper-coated, for welding of cold-resistant, fine-grained constructional steels and alloyed steels. Low temperature toughness down to -80 °C.
<b>BÖHLER DMO-IG</b> EN ISO 21952-A: W MoSi EN ISO 636-A: W2Mo (for rod)  AWS A5.28: ER70S-A1 (ER80S-G)	Heat treatment: untreated, as welded R <sub>e</sub> 530 MPa R <sub>m</sub> 650 MPa A <sub>5</sub> 26 % A <sub>v</sub> 200 J 80 J...-30 °C	1.6 2.0 2.4 3.0	TÜV (0020.), DB (42.014.09), KTA 1408.1, BV, DNV, CRS, CE, NAKS	GTAW welding rod, copper-coated, for welding in the construction of boilers, pressure tanks, pipelines, cranes and steel construction for steelwork. High-quality, very tough and crack-resistant weld metal, resistant to ageing. Approved for long-term use at operating temperatures from -30 °C to +550 °C.

# TIG RODS, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER DCMS-IG</b> EN ISO 21952-A: W CrMo1Si  AWS A5.28: ER80S-G, ER80S-B2 (mod.)	Heat treatment: annealed 680 °C/2 h R <sub>e</sub> 440 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 25 % A <sub>v</sub> 250 J	1.6 2.0 2.4 3.0	TÜV (0727.), SEPROZ, CE, NAKS	GTAW welding rod, copper-coated, for welding in the construction of boilers, pressure tanks, pipelines, as well as for welding work on quenched and tempered or case-hardened steels.  Preferred for 13CrMo4-5.  Approved for long-term use at operating temperatures to +570 °C. Suitable for step-cooling applications (Bruscato ≤ 15 ppm).
<b>BÖHLER CM 2-IG</b> EN ISO 21952-A: W CrMo2Si  AWS A5.28: ER90S-G, ER90S-B3 (mod.)	Heat treatment: annealed 720 °C/2 h R <sub>e</sub> 470 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 23 % A <sub>v</sub> 190 J	1.6 2.0 2.4 3.0	TÜV (1564.), SEPROZ, CE	GTAW welding rod, copper-coated, for welding in the construction of boiler, vessels and tube steels, as well as in the petroleum processing industry, e.g. in cracking plants. Preferred for 10CrMo9-10.  Approved for long-term use at operating temperatures to +600 °C.



# TIG RODS, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER C 9 MV-IG</b> EN ISO 21952-A: W CrMo91 AWS A5.28: ER90S-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 640 MPa R <sub>m</sub> 760 MPa A <sub>5</sub> 19 % A <sub>v</sub> 150 J	2.0 2.4 3.0	TÜV (07106.), CE, NAKS	GTAW welding rod for creep-resistant, quenched and tempered 9-12 % chrome steels, especially T91 and P91 steels in turbine and boiler fabrication as well as in the chemical industry. Approved for long-term use at operating temperatures to +650 °C.
<b>Thermanit MTS 3</b> EN ISO 21952-A: W CrMo91 AWS A5.28: ER90S-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 530 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 17% A <sub>v</sub> 50 J	1.6 2.0 2.4 3.2	TÜV (6166.)	Creep resistant TIG rod, resistant to scaling up to 600 °C. Suited for applications with quenched and tempered 9 % Cr steels, particularly for matching creep resistant base metal T91 / P91 according to ASTM.
<b>Thermanit MTS 616</b> EN ISO 21952-A: WZ CrMoWVNb 9 0.5 1.5 AWS A5.28: ER90S-G [ER90S-B9(mod.)]	Heat treatment: annealed 760 °C/≥2 h R <sub>p0.2</sub> 560 MPa R <sub>m</sub> 720 MPa A <sub>5</sub> 15 % A <sub>v</sub> 41 J	1.6 2.0 2.4 3.2	TÜV (9290.)	Creep resistant. Suited for joining and surfacing applications with matching creep resistant base metal P92 according to ASTM A 335.
<b>BÖHLER EAS 2-IG</b> EN ISO 14343-A: W 19 9 L AWS A5.9: ER308L	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 38 % A <sub>v</sub> 150 J 75 J... -269 °C	1.6 2.0 2.4 3.0	TÜV (00145), DB (43.014.08), DNV, GL, SEPROZ, CE, NAKS	Application in all industry branches where identical steel types are welded, including higher-carbon varieties, as well as ferritic 13 % chrome steels, e.g. in the construction of chemical apparatus and storage tanks, in the chemical, pharmaceutical and cellulose industries, among many others. Suitable for cryogenic applications down to -269 °C.
<b>BÖHLER EAS 4 M-IG</b> EN ISO 14343-A: W 19 12 3 L AWS A5.9: ER316L	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 610 MPa A <sub>5</sub> 38 % A <sub>v</sub> 140 J ≥32 J...-196 °C	1.6 2.0 2.4 3.0	TÜV (00149), DB (43.014.12), DNV, GL, SEPROZ, CE, NAKS	Application in all industry branches where identical steel types are welded, including higher-carbon varieties, as well as ferritic 13 % chrome steels, e.g. in the construction of chemical apparatus and storage tanks, in the chemical and pharmaceutical industries, for the manufacturing of cellulose, artificial silk and textiles, among many other branches. Low temperature service down to -196 °C.
<b>BÖHLER SAS 2-IG</b> EN ISO 14343-A: W 19 9 Nb AWS A5.9: ER347	Heat treatment: untreated, as welded R <sub>p0.2</sub> 490 MPa R <sub>m</sub> 660 MPa A <sub>5</sub> 35 % A <sub>v</sub> 140 J ≥32 J...-196 °C	1.6 2.0 2.4 3.0	TÜV (00142.), GL, LTSS, SEPROZ, CE, NAKS	Application in all industry branches where identical steel types are welded, as well as ferritic 13 % chrome steels, e.g. in the construction of chemical apparatus and storage tanks, in textile and cellulose manufacturing, dyework factories, among many others. Low temperature service down to -196 °C and intergranular corrosion resistant up to +400 °C.
<b>BÖHLER SAS 4-IG</b> EN ISO 14343-A: W 19 12 3 Nb AWS A5.9: ER318	Heat treatment: untreated, as welded R <sub>p0.2</sub> 520 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 35 % A <sub>v</sub> 120 J ≥32 J...-120 °C	1.0 1.2 1.6 2.0 2.4 3.0	TÜV (00236.), KTA 1408.1, DB (43.014.03), GL, SEPROZ, CE, NAKS	Application in all industry branches where identical steel types are welded, as well as ferritic 13 % chrome steels. Also used in the construction of chemical apparatus and storage tanks, textile and cellulose manufacturing, dyework factories, food and beverage production, synthetic resin plants, among many others.
<b>BÖHLER CN 22/9 N-IG</b> EN ISO 14343-A: W 22 9 3 N L AWS A5.9: ER2209	Heat treatment: untreated, as welded R <sub>p0.2</sub> 600 MPa R <sub>m</sub> 800 MPa A <sub>5</sub> 33 % A <sub>v</sub> 150 J	1.6 2.0 2.4 3.2	TÜV (04484.), ABS, DNV, GL, LR, Statoil, CE	GTAW welding rod for welding ferritic-austenitic duplex steels. In addition to improved strength and toughness characteristics, a purposeful adjustment of the composition also gives the weld metal excellent resistance to stress corrosion cracking and pitting.

# TIG RODS, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Avesta 2507/P100</b> EN ISO 14343: W 25 9 4 N L  AWS A5.9: ER2594	Heat treatment: untreated, as welded R <sub>p0.2</sub> 700 MPa R <sub>m</sub> 900 MPa A <sub>5</sub> 26 % A <sub>v</sub> 80 J 45 J...-46 °C	1.2 1.6 2.0 2.4 3.2	–	Avesta 2507/P100 rutile is designed for welding super duplex steels such as 2507/1.4410.  The weldability of duplex and super duplex steels is excellent but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.  Corrosion resistance: Very good resistance to pitting and stress corrosion cracking in chloride containing environments. PREN >40. Meets the corrosion test requirements per ASTM G48 Methods A, B, E (40 °C).
<b>Avesta 253MA</b> EN ISO 14343-A: G 21 10 N	Heat treatment: untreated, as welded R <sub>p0.2</sub> 535 MPa R <sub>m</sub> 725 MPa A <sub>5</sub> 37 % A <sub>v</sub> 60 J Hardness 210 Brinell	1.2 1.6 2.0 2.4 3.2	–	Avesta 253 MA is primarily designed for welding the high temperature stain- less steel Outokumpu 253 MA, used for furnaces, combustion chambers and burners. Both the steel and filler metal offers excellent resistance to oxidation up to 1,100 °C. The chemical composition of Avesta 253 MA is balanced to give a crack resistant weld metal. The steel often forms a rather thick oxide in welding or hot rolling and oxidized plates and welds must be brushed or ground clean before welding.
<b>BÖHLER A 7 CN-IG</b> EN ISO 14343-A: W 18 8 Mn  AWS A5.9: ER307 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 650 MPa A <sub>5</sub> 38 % A <sub>v</sub> 120 J ≥32 J...-110 °C	1.6 2.0 2.4	TÜV (00023.), DNV, GL, DB (43.014.28), CE, NAKS, VG 95132	GTAW welding rod for welding of dissimilar joints or difficult-to-weld steels and 14 %-Mn steels.  Characteristics of weld metal: Cold-work hardening ability, very good resistance to cavity formation, crack resistant, thermal shock resistant, scaling resistant up to 850 °C, impervious to sigma-phase embrittlement above +500 °C. Service temperatures down to -110 °C.
<b>BÖHLER CN 23/12-IG</b> EN ISO 14343-A: W 23 12 L  AWS A5.9: ER309L	Heat treatment: untreated, as welded R <sub>p0.2</sub> 440 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 34 % A <sub>v</sub> 150 J ≥32 J...-120 °C	1.6 2.0 2.4 3.2	TÜV (4699.), GL, SEPROZ, DB (43.014.29), CE	GTAW welding rod with increased ferrite content (FN~16) in the weld metal. High cracking resistance for difficult-to-weld materials, as well as for welding of dissimilar joints.  Suitable for service temperatures from -120 °C up to +300 °C.
<b>BÖHLER FFB-IG</b> EN ISO 14343-A: W 25 20 Mn  AWS A5.9: ER310 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 630 MPa A <sub>5</sub> 33 % A <sub>v</sub> 85 J ≥32 J...-196 °C	1.6 2.0 2.4	SEPROZ	GTAW welding rod for heat-resistant rolled, forged and cast steels of identical type, e.g. in annealing and hardening shops, in steam boiler construction, in the petroleum and ceramic industries. Fully austenitic weld metal. Preferred in the case of aggressive oxidizing, nitrogen-containing or low-oxygen gases.  Scaling resistant up to +1,200°C.
<b>BÖHLER FA-IG</b> EN ISO 14343-A: W 25 4  –	Heat treatment: untreated, as welded R <sub>p0.2</sub> 540 MPa R <sub>m</sub> 710 MPa A <sub>5</sub> 22 % A <sub>v</sub> 70 J	2.4	–	GTAW rod for gas-shielded welding of heat resisting, analogous or similar steels. Ferritic- austenitic deposit. The low Ni-content renders this filler metal especially recommendable for applications involving the attack of sulphurous oxidizing or reducing combustion gases.  Scaling resistance up to + 1,100 °C.
<b>Thermanit 35/45 NB</b> EN ISO 18274: S Ni Z (NiCr36Fe15Nb0.8)	Heat treatment: untreated R <sub>p0.2</sub> 450 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> – A <sub>v</sub> –	2.0 2.4 3.2	–	Resistant to scaling up to 1,180 °C.  For joining and surfacing work on matching/similar heat resistant cast steel grades
<b>Thermanit Nicro 82</b> EN ISO 18274: S Ni 6082 (NiCr20Mn3Nb)  AWS A5.14: ERNiCr-3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 150 J	1.6 2.0 2.4 3.2	TÜV (1703.), DB (43.132.11)	Nickel base, stainless TIG rod; heat resistant and creep resistant. Cold toughness down to -269 °C. For welding of austenitic-ferritic joints as well as for joining or cladding of heat resistant Cr and CrNi steels and Nickel base alloys.  Temperature limits: 500 °C in sulphurous atmospheres, 800 °C max. for fully stressed welds. Resistant to scaling up to 1,000 °C.

# TIG RODS, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Thermanit 625</b> EN ISO 18274: S Ni 6625 (NiCr22Mo9Nb)  AWS A5.14: ERNiCrMo-3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 740 MPa A <sub>5</sub> 35 % A <sub>v</sub> 120 J 100 J...-196 °C	1.6 2.0 2.4 3.2	TÜV (3464.), DB (43.132.25), DNV	Nickel base, stainless TIG rod; high resistance to corrosive environments. Resistant to stress corrosion cracking. Resistant to scaling up to 1,100 °C. Temperature limit: 500 °C max. in sulphurous atmospheres. High temperature resistant up to 1,000 °C. Cold toughness down to -196 °C.  Suitable for joining or cladding of matching/similar corrosion resistant steels, heat or creep resistant steels and alloys. Also for joining of cryogenic austenitic CrNi(N) steels or cast steels.
<b>Thermanit 617</b> EN ISO 18274: S Ni 6617 (NiCr22Co12Mo9)  AWS A5.14: ERNiCrCoMo-1	Heat treatment: untreated R <sub>p0.2</sub> 450 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 30 % A <sub>v</sub> 60 J	2.0 2.4	TÜV (06845.)	Resistant to scaling up to 1,100 °C, high temperature resistant up to 1,000 °C. High resistance to hot gases in oxidizing resp. carburizing atmospheres.  For joining and surfacing applications with matching and similar heat resistant steels and alloys.
<b>Thermanit NiMo C 24</b> EN ISO 18274: S Ni 6059 (NiCr23Mo16)  AWS A5.14: ERNiCrMo-13	Heat treatment: untreated R <sub>p0.2</sub> 450 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 35 % A <sub>v</sub> 120 J	1.6 2.0 2.4 3.2	TÜV (6462.), GL (NiCr23Mo16)	Nickel based alloy. High corrosion resistance in reducing and, above all, in oxidizing environments. For joining and surfacing with matching and similar alloys and cast alloys.  For welding the cladded side of plates of matching and similar alloys.

# SOLID WIRE, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER EMK 6</b> EN ISO 14341-A: G 42 4 M21 3Si1 G 42 4 C1 3Si1  AWS A5.18: ER70S-6	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>e</sub> 440 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 30 % A <sub>v</sub> 160 J ≥47 J...-40 °C	0.8 1.0 1.2 1.6	TÜV (3036.), DB (42.014.11), ABS, CWB, DNV, GL, LR, LTSS, SEPROZ, CE	Universally applicable copper-coated solid wire with a practically spatter-free metal transfer for either CO <sub>2</sub> or gas mixtures.
<b>BÖHLER EMK 8</b> EN ISO 14341-A: G 46 4 M21 4Si1 G 46 4 C1 4Si1  AWS A5.18: ER70S-6	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>e</sub> 480 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 26 % A <sub>v</sub> 150 J ≥47 J...-40 °C	0.8 1.0 1.2	TÜV (3038.), DB (42.014.05), ABS, DNV, GL, LR, SEPROZ, CE, NAKS	Copper-coated solid wire with universal application in storage tanks, and for boiler and structural work.  Practically spatter-free metal transfer using either gas mixtures or CO <sub>2</sub> .
<b>BÖHLER HL 46-MC</b> EN ISO 17632-A: T 46 2 M M 1 H5  AWS A5.18: E70C-6MH4	Heat treatment: untreated, as welded R <sub>e</sub> 490 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 25 % A <sub>v</sub> 110 J 50 J...-20 °C		TÜV (12542.), DB (42.014.43), DNV, GL, LR, BV, CE	Metal-cored high-efficiency wire for semi-automatic and fully automatic joint welding of unalloyed and fine-grained constructional steels and service temperatures from -20 °C to +450 °C. Very high metal recovery between 93 and 97% and deposition rate up to 9 kg/hr. Steady spray arc-like droplet transfer with minimal spatter formation. Good penetration, high resistance to porosity, good wetting behaviour as well as low hydrogen contents (≤5 ml/100 g deposit) are further quality features of this flux cored wire. Ideal for horizontal and flat fillet welds. Compared to solid wires 20 % higher productivity can be achieved. This wire is designed for minimum oxide residues permit the welding of multi passes without the need for inter-run cleaning.
<b>Union K 56</b> EN ISO 14341-A: G 46 2 C1 4Si1 / G 46 4 M21 4Si1  AWS A5.18: ER70S-6	Heat treatment: untreated, as welded Shielding gas: CO <sub>2</sub> R <sub>e</sub> 450 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 25 % A <sub>v</sub> 90 J 47 J...-20 °C  Shielding gas: M21 R <sub>e</sub> 480 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 24 % A <sub>v</sub> 95 J 65 J...-20 °C 47 J...-40 °C	0.8 1.0 1.2 1.6	TÜV (0376.), DB (42.132.01), ABS, BV, GL, LR, DNV	GMAW solid wire electrode for welding unalloyed and low alloy steels with CO <sub>2</sub> or gas mixture.  Low spatter transfer in short and spray arc range. High arc stability also at high welding current amperage. Large application range; specially suited for steels of higher strength in boiler and pipeline construction, shipbuilding, vehicle manufacturing and structural engineering.
<b>BÖHLER SG 2</b> EN ISO 14341-A: G 38 2 C1 3Si1 / G 42 3 M21 3Si1  AWS A5.18: ER70S-6	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>e</sub> 420 MPa R <sub>m</sub> 500-640 MPa A <sub>5</sub> 20 % A <sub>v</sub> 120 J 47 J...-20 °C  Shielding gas: CO <sub>2</sub> R <sub>e</sub> 380 MPa R <sub>m</sub> 470-600 MPa A <sub>5</sub> 20 % A <sub>v</sub> 47 J	0.8 1.0 1.2 1.6	TÜV (3640.), DB (42.132.15), GL	GMAW solid wire electrode for welding unalloyed and low alloy steels with gas mixtures (M1 – M3).  Low spatter transfer in the short and spray arc range.  Used in boiler construction, shipbuilding, structural engineering and vehicle manufacturing.

# SOLID WIRE, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Union MV 70</b> EN ISO 17632-A: T 46 6 M M 1 H5 / T 42 5 M C 1 H5  AWS A5.18: E70C-6MH4 / E70C-6CH4	Heat treatment: untreated, as welded Shielding gas: M21 R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 24 % A <sub>v</sub> 140 J 80 J...-20 °C 47 J...-60 °C	1.2 1.6	TÜV (11076.), DB (42.132.33), ABS, DNV, GL, LR, BV	Union MV 70 is a high-efficiency seamless copper coated wire, with metal powder filling for all position welding with mixed gas M21, M31 and C1 according to EN ISO 14175.
<b>BÖHLER NiCu 1-IG</b> EN ISO 14341-A: G 42 4 M21 Z3Ni1Cu G 42 4 C1 Z3Ni1Cu  AWS A5.28: ER80S-G	Heat treatment: untreated, as welded R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 26 % A <sub>v</sub> 130 J ≥47 J...-40 °C	1.0 1.2	DB (42.014.08), CE	Ni-Cu alloyed wire, copper-coated, for metal/gas-shielded arc welding on weather-resistant steels, constructional steels and special steels.  Due to the copper alloying, the weld metal features higher resistance to atmospheric corrosion.
<b>BÖHLER alform® 700-IG</b> EN ISO 16834-A: G 79 5 M21 Mn4Ni1.5CrMo  AWS A5.28: ER110S-G	Heat treatment: untreated, as welded R <sub>p0.2</sub> 790 MPa R <sub>m</sub> 880 MPa A <sub>5</sub> ≥16% A <sub>v</sub> ≥90 J ≥47 J...-50 °C	1.0 1.2	NAKS	Medium alloyed solid wire for gas metal arc welding of quenched and tempered fine grained steels. Optimized and proofed welding results can be expected with the appropriate steel alform® 700 M.
<b>BÖHLER X 70-IG</b> EN ISO 16834-A: G Mn3Ni1CrMo G 69 5 M21 Mn3Ni1CrMo  AWS A5.28: ER110S-G	Heat treatment: untreated, as welded R <sub>p0.2</sub> 800 MPa R <sub>m</sub> 900 MPa A <sub>5</sub> 19 % A <sub>v</sub> 190 J ≥47 J...-50 °C	1.0 1.2	TÜV (5547.), DB (42.014.19), GL, SEPROZ, CE, ABS, BV, DNV, LR, RMR	Copper-coated solid wire for welding of high-strength, quenched and tempered fine-grained constructional steels with a minimum yield strength of 690 MPa.  Good low temperature impact strength down to -50 °C.
<b>Union NiMoCr</b> EN ISO 16834-A: G 69 6 M21 Mn4Ni1.5CrMo  AWS A5.28: ER100S-G	Heat treatment: untreated, as welded Shielding gas: CO <sub>2</sub> R <sub>p0.2</sub> 680 MPa R <sub>m</sub> 740 MPa A <sub>5</sub> 18 % A <sub>v</sub> 80 J 47 J...-40 °C  Shielding gas: M21 R <sub>p0.2</sub> 720 MPa R <sub>m</sub> 780 MPa A <sub>5</sub> 16 % A <sub>v</sub> 100 J 47 J...-60 °C	0.8 1.0 1.2	TÜV (2760.), DB (42.132.08), ABS, DNV, BV, GL, LR	Medium alloy solid wire electrode for shielded arc welding of quenched and tempered and thermomechanically treated fine grained structural steels; for joint welding of wear resistant steels.  For use with CO <sub>2</sub> and gas mixture. Outstanding toughness of the weld metal at low temperatures. For use in crane and vehicle manufacturing.
<b>BÖHLER alform® 900-IG</b> EN ISO 16834-A: G 89 6 M21 Mn4Ni2CrMo  AWS A5.28: ER120S-G	Heat treatment: untreated, as welded R <sub>p0.2</sub> 890 MPa R <sub>m</sub> 950 MPa A <sub>5</sub> ≥15 % A <sub>v</sub> ≥47 J...-60 °C	1.0 1.2	-	Medium alloyed solid wire for gas metal arc welding of quenched and tempered fine grained steels. Optimized and proofed welding results can be expected with the appropriate steel alform® 900 M x-treme.
<b>Union X 90</b> EN ISO 16834-A: G 89 6 M21 Mn4Ni2CrMo  AWS A5.28: ER120S-G	Heat treatment: untreated, as welded R <sub>p0.2</sub> 890 MPa R <sub>m</sub> 950 MPa A <sub>5</sub> 15% A <sub>v</sub> 90 J 47 J...-60 °C	1.0 1.2	TÜV (7675.), DB (42.132.12)	Medium alloy solid wire electrode for shielded arc welding of quenched and tempered fine grained structural steels. Outstandingly tough weld metal at low temperatures when deposited with gas mixture.  Good resistance to cold cracking due to high purity of the wire surface. Used in crane and vehicle manufacture.

# SOLID WIRE, UNALLOYED AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER DMO-IG</b> EN ISO 21952-A: G MoSi  AWS A5.28: ER70S-A1 (ER80S-G)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 25 % A <sub>v</sub> 150 J ≥47 J...-40 °C	0.8 1.0 1.2	TÜV (0021.), DB (42.014.09), SEPROZ, CE, NAKS	Solid wire, copper-coated, for welding in the construction of boilers, pressure tanks, pipelines, cranes and steel construction. High-quality, very tough and crack-resistant weld metal, resistant to ageing.  Low temperature toughness down to -40°C. Approved for long-term use at operating temperatures to +550°C.
<b>BÖHLER DCMS-IG</b> EN ISO 21952-A: G CrMo1Si  AWS A5.28: ER80S-G / ER80S-B2 (mod.)	Heat treatment: annealed 680 °C/2 h R <sub>p0.2</sub> 440 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 23 % A <sub>v</sub> 150 J	0.8 1.0 1.2 1.6	TÜV (1091.), DB (42.014.15), SEPROZ, CE	Solid wire, copper-coated, for welding in the construction of boilers, pressure tanks, pipelines, as well as for welding work on quenched and tempered or case-hardened steels.  Preferred for 13CrMo4-5.  Approved for long-term use at operating temperatures to +570°C.
<b>BÖHLER CM 2-IG</b> EN ISO 21952-A: G CrMo2Si  AWS A5.28: ER90S-G / ER90S-B3 (mod.)	Heat treatment: annealed 720 °C/2 h R <sub>p0.2</sub> 440 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 23 % A <sub>v</sub> 170 J	0.8 1.0 1.2	TÜV (1085.), DB (42.014.39), SEPROZ, CE	Solid wire, copper-coated, for welding in the construction of boilers, vessels plates and tube steels, as well as in the petroleum processing industry, e.g. in cracking plants.  Preferred for 10CrMo9-10.  Approved for long-term use at operating temperatures to +600°C.

# SOLID WIRE, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER C 9 MV-IG</b> EN ISO 21952-A: G CrMo91  AWS A5.28: ER90S-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 620 MPa R <sub>m</sub> 760 MPa A <sub>5</sub> 18 % A <sub>v</sub> 80 J	1.0 1.2	-	Solid wire electrode for creep-resistant, quenched and tempered 9-12 % chrome steels, especially T91 and P91 steels in turbine and boiler fabrication as well as in the chemical industry.  Approved for long-term use at operating temperatures to +650 °C.
<b>BÖHLER C 9 MV-MC</b> EN ISO 17634-B: TS 69T15-1G-9C1MV  AWS A5.28: E90C-B9	Heat treatment: annealed 760 °C/3 h R <sub>p0.2</sub> 650 MPa R <sub>m</sub> 760 MPa A <sub>5</sub> 18 % A <sub>v</sub> 55 J	1.2	-	Metal cored wire for creep-resistant, quenched and tempered 9-12% chrome steels, especially T91 and P91 steels in turbine and boiler construction as well as in the chemical industry.
<b>Thermanit MTS 3</b> EN ISO 21952-A: G CrMo91  AWS A5.28: ER90S-B9	Heat treatment: annealed 760 °C/2 h R <sub>p0.2</sub> 520 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 16 % A <sub>v</sub> 50 J	1.0 1.2	-	Creep resistant GMAW wire, resistant to scaling up to 600 °C. Suited for joining and surfacing applications with quenched and tempered 9 % Cr steels, particularly for matching creep resistant base metal T91 / P91 according to ASTM.
<b>BÖHLER CAT 430L Cb-IG</b> EN ISO 14343-A: G Z18 L Nb  AWS A5.9: ER430 (mod.)	Brinell-Hardness HB: untreated, as welded* 150 annealed** 130  *untreated, as welded, shielding gas Ar + 8-10 % CO <sub>2</sub>  ** annealed, 760 °C/2 h, shielding gas Ar + 8-10 % CO <sub>2</sub>	1.0	-	Special GMAW solid wire for catalytic converters as well as exhaust silencers, mufflers, manifolds, and manifold elbows of analogous or similar materials.  Resists scaling up to +900 °C. Outstanding feeding characteristics.  Very good welding and flow characteristics.
<b>BÖHLER CAT 430L CbTi-IG</b> EN ISO 14343-A: G ZCr 18 NbTi L  AWS A5.9: ER430Nb (mod.)	Brinell-Hardness HB: untreated, as welded* 150 annealed** 130  * untreated, as welded, shielding gas Ar + 0.5-5 % CO <sub>2</sub>  ** annealed, 760 °C/2 h, shielding gas Ar + 0.5-5 % CO <sub>2</sub>	1.0 1.2	-	Special GMAW solid wire for joint welding and surfacing of exhaust systems. For analogous or similar materials. Double stabilized (Nb + Ti) with minimum affection to grain growth.  Resists scaling up to +900 °C. Outstanding feeding characteristics.  Very good welding and flow characteristics.
<b>Thermanit JE 308L Si</b> EN ISO 14343-A: G 19 9 L Si  AWS A5.9: ER308LSi	Heat treatment: untreated, as welded R <sub>p0.2</sub> 350 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 35 % A <sub>v</sub> 75 J 35 J...-196 °C	1.0 1.2 1.6	TÜV (0555.), DB(43.132.08), DVN	Stainless; resistant to intercrystalline corrosion and wet corrosion up to 350 °C. Corrosion-resistance similar to matching low-carbon and stabilized austenitic 18/8 CrNi(N) steels/cast steel grades. Cold toughness down to -196 °C. For joining and surfacing applications with matching and similar - stabilized and non-stabilized - austenitic CrNi(N) and CrNiMo(N) steels/cast steel grades. For joining and surfacing work on cryogenic matching/similar austenitic CrNi(N) steels/cast steel grades.
<b>Thermanit GE 316L Si</b> EN ISO 14343-A: G 19 12 3 L Si  AWS A5.9: ER316LSi	Heat treatment: untreated, as welded R <sub>p0.2</sub> 380 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 35 % A <sub>v</sub> 70 J	0.8 1.0 1.2 1.6	TÜV (0489.), DB (43.132.10), LR, CWB, GL, DNV	Stainless; resistant to intercrystalline corrosion and wet corrosion up to 400 °C. Corrosion-resistance similar to matching low-carbon and stabilized austenitic 18/8 CrNiMo steels/cast steel grades.  For joining and surfacing application with matching and similar - non-stabilized - austenitic CrNi(N) and CrNiMo(N) steels and cast steel grades.

# SOLID WIRE, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER SAS 2-IG (Si)</b> EN ISO 14343-A: G 19 9 Nb Si  AWS A5.9: ER347Si	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 630 MPa A <sub>5</sub> 33 % A <sub>v</sub> 110 J ≥32 J...-196 °C	0.8 1.0 1.2	TÜV (00025.), GL, LTSS, SEPROZ, CE, NAKS	Application in all industry branches where identical steel types are welded, including higher-carbon varieties, as well as ferritic 13 % chrome steels, e.g. in the construction of chemical apparatus and storage tanks, in the chemical, pharmaceutical and cellulose industries, among many others. Excellent gliding ability and feed characteristics.  Low temperature service down to -196 °C and intergranular corrosion resistant up to +400 °C.
<b>BÖHLER SAS 4-IG (Si)</b> EN ISO 14343-A: G 19 12 3 Nb Si  AWS A5.9: ER318 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 490 MPa R <sub>m</sub> 670 MPa A <sub>5</sub> 33 % A <sub>v</sub> 100 J ≥32 J...-120 °C	0.8 1.0 1.2	TÜV (03492.), DB (43.014.04), SEPROZ, CE, NAKS	Solid wire for use in all industry branches where identical steel types are welded, including higher-carbon varieties, as well as ferritic 13 % chrome steels.  Areas of application: Construction of chemical apparatus and storage tanks, textile and cellulose manufacturing, dyework factories, food and beverage production, synthetic resin plants, among many others.
<b>BÖHLER CN 13/4-IG</b> EN ISO 14343-A: G 13 4  AWS A5.9: ER410NiMo (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 950 MPa R <sub>m</sub> 1210 MPa A <sub>5</sub> 12 % A <sub>v</sub> 36 J	1.2	TÜV (04110.), SEPROZ, CE	Solid wire for corrosion-resistant, martensitic and martensitic-ferritic rolled, forged and cast steels of identical type.  Application in the construction of hydro turbines, compressors and steam power stations. Resistant to water vapour, steam and sea water atmospheres.
<b>BÖHLER CN 13/4-MC</b> EN ISO 17633-A: T 13 4 M M12 2  AWS A5.9: EC410NiMo (mod.)	Heat treatment: annealed 600 °C/2 h R <sub>p0.2</sub> 760 MPa R <sub>m</sub> 900 MPa A <sub>5</sub> 16 % A <sub>v</sub> 65 J 60 J...-20 °C	1.2 1.6	SEPROZ	Metal cored wire for corrosion-resistant, soft martensitic and martensitic-ferritic rolled, forged and cast steels of identical type. Application in the construction of hydro turbines and compressors.  BÖHLER CN 13/4-MC exhibits very good toughness properties of the heat-treated weld metal, as well as a very low hydrogen content in the weld metal (under AWS conditions HD max. 4 ml/100 g) and excellent feeding characteristics.
<b>BÖHLER CN 22/9 N-IG</b> EN ISO 14343-A: G 2 9 3 N L  AWS A5.9: ER2209	Heat treatment: untreated, as welded R <sub>p0.2</sub> 660 MPa R <sub>m</sub> 830 MPa A <sub>5</sub> 28 % A <sub>v</sub> 85 J ≥32 J...-40 °C	1.0 1.2	TÜV (04483.), DB (43.014.26), DNV, GL, Statoil, SEPROZ, CE	Solid wire for welding ferritic-austenitic duplex steels. In addition to improved strength and toughness characteristics, a purposeful adjustment of the composition also gives the weld metal excellent resistance to stress corrosion cracking and pitting.
<b>Avesta 2507/P100</b> EN ISO 14343-A: G 25 9 4 N L  AWS A5.9: ER2594	Heat treatment: untreated, as welded R <sub>p0.2</sub> 600 MPa R <sub>m</sub> 830 MPa A <sub>5</sub> 27 % A <sub>v</sub> 140 J 100 J...-50 °C	0.8 1.0 1.2 1.6	-	Avesta 2507/P100 is designed for welding super duplex steels such as 2507, ASTM S32760, S32550 und S31260. 2507/P100 GMAW solid wire shows its best characteristics when using impuls arc welding.  Corrosion resistance: Very good resistance to pitting and stress corrosion cracking in chloride containing environments. PREN >40. Meets the corrosion test requirements per ASTM G48 Methods A, B, E (40 °C).
<b>Avesta LDX 2101</b> EN ISO 14343-A: G 23 7 N L	Heat treatment: untreated, as welded R <sub>p0.2</sub> 520 MPa R <sub>m</sub> 710 MPa A <sub>5</sub> 32 % A <sub>v</sub> 150 J 110 J...-40 °C	0.8 1.0 1.2 1.6	-	Avesta LDX 2101 is designed for welding the duplex stainless steel Outokumpu LDX 2101®. LDX 2101 is a "lean duplex" steel with excellent strength and medium corrosion resistance. The steel is used in many various applications such as bridges, process equipment in desalination, pressure vessel in the pulp/paper industry and transport and storage tanks for chemicals. To ensure the right ferrite balance in the weld metal, Avesta LDX 2101 is over-alloyed with respect to nickel. Welding is possible as well under short arc, spray arc or impuls arc. Using impuls arc, welding results both in flat and horizontal as well as in vertical position are good.  Corrosion resistance: Good resistance to general corrosion. Better resistance to pitting, crevice corrosion and stress corrosion cracking than 1.4301/AISI 304.



# SOLID WIRE, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Avesta 253MA</b>	Heat treatment: untreated, as welded R <sub>p0.2</sub> 440 MPa R <sub>m</sub> 680 MPa A <sub>5</sub> 36 % A <sub>v</sub> 130 J Hardness 210 Brinell	0.8 1.0 1.2	-	Avesta 253 MA is primarily designed for welding the high temperature stain- less steel Outokumpu 253 MA, used for furnaces, combustion chambers and burners. Both the steel and filler metal offers excellent resistance to oxidation up to 1100 °C. The chemical composition of Avesta 253 MA is balanced to give a crack resistant weld metal. The steel often forms a rather thick oxide in welding or hot rolling and oxidized plates and welds must be brushed or ground clean before welding.  Corrosion resistance: Excellent resistance to high temperature corrosion. Not intended for applications exposed to wet corrosion.
<b>BÖHLER A 7 CN-IG</b> EN ISO 14343-A: G 18 8 Mn  AWS A5.9: ER307 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 430 MPa R <sub>m</sub> 640 MPa A <sub>5</sub> 36 % A <sub>v</sub> 110 J ≥32 J...-110 °C	0.8 1.0 1.2 1.6	TÜV (00024.), DB (43.017.07), CE, GL, DNV	Special solid wire for welding of dissimilar joints or difficult-to-weld steels and 14 %-Mn steels. All-purpose filler metal with many uses.  Characteristics of weld metal: Cold-work hardening ability, very good resistance to cavity formation, crack resistant, thermal shock resistant, scaling resistant up to 850 °C, impervious to sigma-phase embrittlement above +500 °C. Service temperatures down to -110 °C.
<b>Thermanit 25/14 E-309L Si</b> EN ISO 14343-A: G 23 12 L Si  AWS A5.9: ER309LSi	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 30 % A <sub>v</sub> 55 J	0.8 1.0 1.2	GL, TÜV (12312.)	Stainless; (wet corrosion up to 350 °C. Well suited for depositing intermediate layers when welding clad materials. Favourably high Cr and Ni contents, low C content. For joining unalloyed/low-alloy steels/cast steel grades or stainless heat resistant Cr steels/cast steel grades to austenitic steels/cast steel grades. For depositing intermediate layers when welding the side of plates clad with low-carbon – non stabilized or stabilized – austenitic CrNiMo(N) austenitic metals.
<b>BÖHLER CN 23/12-MC</b> EN ISO 17633-A: T 23 12 L M M12 1  AWS A5.9: EC309L	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 32 % A <sub>v</sub> 90 J 70 J...-120 °C	1.2 1.6	-	Metal cored wire for welding of dissimilar joints between high-alloy Cr and CrNi(Mo) steels and unalloyed or low-alloy steels.  BÖHLER CN 23/12-MC features very good welding, wetting and wire-feed characteristics, as well as high metallurgical reliability after mixing of different materials.  Suitable for service temperatures from -120 °C up to +300 °C.
<b>BÖHLER CN 21/33 Mn-IG</b> EN ISO 14343-A: G Z21 33 MnNb  -	Heat treatment: untreated, as welded R <sub>p0.2</sub> ≥400 MPa R <sub>m</sub> ≥600 MPa A <sub>5</sub> ≥17 % A <sub>v</sub> ≥50 J	1.0 1.2	-	Solid wire for joint welding and cladding of identical or similar type heat-resistant steels and steel casting grades.  Typical alloys for the welding of pyrolysis furnace tubes in the petrochemical industry.
<b>BÖHLER FFB-IG</b> EN ISO 14343-A: G 25 20 Mn  AWS A5.9: ER310 (mod.)	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 38 % A <sub>v</sub> 95 J	0.8 1.0 1.2	SEPROZ	Solid wire for heat-resistant rolled, forged and cast steels of identical type, e.g. in annealing and hardening shops, in steam boiler construction, in the petroleum and ceramic industries. Fully austenitic weld metal.  Preferred in the case of aggressive oxidizing, nitrogen-containing or low-oxygen gases.  Scaling resistant up to +1,200 °C.
<b>Thermanit Nicro 82</b> EN ISO 18274: S Ni 6082 (NiCr20Mn3Nb)  AWS A5.14: ERNiCr-3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 380 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 35 % A <sub>v</sub> 90 J 80 J...-196 °C	0.8 1.0 1.2 1.6	TÜV (3089.), DNV (NV 5 Ni), GL (NiCr20Nb)	Nickel based alloy; heat and creep resistant. Cold toughness down to -269 °C.  Good for welding austenitic-ferritic joints.  For welding of austenitic-ferritic joints as well as for joining or cladding of heat resistant Cr and CrNi steels and Nickel base alloys. Temperature limits: 500 °C in sulphurous atmospheres, 800 °C max. for fully stressed welds.  Resistant to scaling up to 1,000 °C.

# SOLID WIRE, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Thermanit 625</b> EN ISO 18274: S Ni 6625 (NiCr22Mo9Nb)  AWS A5.14: ERNiCrMo-3	Heat treatment: untreated R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 740 MPa A <sub>5</sub> 30 % A <sub>v</sub> 60 J 40 J...-196 °C	0.8 1.0 1.2 1.6	TÜV (3462.), DB (43.132.25)	Nickel based alloy; high resistance to corrosive environment. Resistant to stress corrosion cracking. Resistant to scaling up to 1,100 °C. Temperature limit: 500 °C max. in sulphurous atmospheres. High temperature resistant up to 1,000 °C. Cold toughness down to -196 °C.  Suitable for joining or cladding of matching/similar corrosion resistant steels, heat or creep resistant steels and alloys. Also for joining of cryogenic austenitic CrNi(N) steels or cast steels.
<b>Thermanit NiMo C 24</b> EN ISO 18274: S Ni 6059 (NiCr23Mo16)  AWS A5.14: ERNiCrMo-13	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 40 % A <sub>v</sub> 60 J	1.0 1.2 1.6	TÜV (6461.)	Nickel based alloy. High corrosion resistance in reducing and, above all, in oxidizing environments. For joining and surfacing with matching and similar alloys and cast alloys.  For welding the cladded side of plates of matching and similar alloys.

# WIRE/FLUX COMBINATION, UN- AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER EMS 2 + BB 24</b> Wire/flux combination: EN ISO 14171-A: S 38 6 FB S2  AWS A 5.17: F7A8-EM12K / F6P6-EM12K	Heat treatment: untreated, as welded Re 440 MPa R <sub>m</sub> 520 MPa A <sub>5</sub> 30 % A <sub>v</sub> 185 J 90 J...-60 °C	2.0 2.5 3.0 4.0	TÜV (7808.) Wire: TÜV (02603.), KTA 1408.1, DB (52.014.03), SEPROZ	The SAW wire BÖHLER EMS 2 is universally applicable in shipbuilding, steel construction as well as for boiler and storage tanks.  It is also suitable for joint welds of standard and fine-grained constructional steels.
<b>BÖHLER EMS 3 + BB 24</b> Wire/flux combination: EN ISO 14171-A: S 42 4 FB S3  AWS A 5.17: F7A4-EH10K / F7P6-EH10K	Heat treatment: untreated, as welded R <sub>p0.2</sub> 455 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 28 % A <sub>v</sub> 180 J 70 J...-40 °C	3.0 4.0	TÜV (7811.) Wire: TÜV (02603.), KTA 1408.1, DB (52.014.04), SEPROZ	The solid SAW wire BÖHLER EMS 3 is universally applicable in shipbuilding, steel construction as well as for boiler and storage tanks.  It is also suitable for joint welds of standard and fine-grained constructional steels.
<b>Union S 2 + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 35 4 FB S2  AWS A 5.17: F7A4-EM12 / F6P6-EM12	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 100 J...-20 °C 47 J...-60 °C	2.0 2.5 3.0 4.0	TÜV (3358.), DB (51.132.02)	General structural steels up to S355JR, boiler plates up to P295GH, shipbuilding steels, pipe steels up to L360 and unalloyed boiler tubes, fine grained structural steels up to P355N, S355N.
<b>Union S 3 + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 38 4 FB S3  AWS A 5.17: F7A4-EH10K	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 100 J...-20 °C 47 J...-60 °C	3.0 4.0 5.0	TÜV (1795.)	General structural steels up to S355JR, boiler plates up to P355GH shipbuilding steels, pipe steels up to L360 and unalloyed boiler tubes, fine grained structural steels up to P355N, S355N.
<b>Union S 3 Si + UV 418 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 6 FB S3Si  AWS A 5.17: F7A8-EH12K	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 120 J...-20 °C 47 J...-60 °C	2.5 3.0 4.0	TÜV (7276.), DB (51.132.05), DNV, GL, LR, BV	General structural steels and fine grained steels up to S460N, P460N. Especially for offshore steels together with flux UV 418TT.
<b>BÖHLER Ni 2-UP + UV 421 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 8 FB S2Ni2  AWS A 5.23: F8A10-ENi2-Ni2	Heat treatment: untreated, as welded R <sub>p0.2</sub> 480 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 22 % A <sub>v</sub> 160 J 47 J...-80 °C	2.5 3.0	TÜV (11914.) Wire: TÜV (2603.), DB (52.014.10), KTA, SEPROZ	Wire/flux combination for joint welding of cryogenic and ageing resistance fine grained and Ni-alloyed steels. The flux react metallurgical neutral.  Excellent slag detachability, smooth beads, good wetting and low hydrogen contents (≤ 5 ml/100 g) are further important features.
<b>Union S 2 Ni 2,5 + UV 421 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 8 FB S2Ni2  AWS A 5.23: F8A10-ENi2-Ni2	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 24 % A <sub>v</sub> 160 J 120 J...-20 °C 60 J...-60 °C	2.5 3.0 4.0	TÜV (2213.), DB (51.132.06) ABS, BV, GL, LR, DNV	Cryogenic fine grained steels up to S460NL, P460NL and special structural steels e.g. 12Ni14G1.

N = normalized, 920 °C/air  
SO = 60h 550 °C + 40h 620 °C/air

SR = stress relieved, 580-620 °C  
SR\* = 750 °C/4 h, SR\*\* = 760 °C/4 h

A = annealed, 580-620 °C/air  
A\* = annealed, 670-720 °C

All values at test temperature +20 °C

# WIRE/FLUX COMBINATION, UN- AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Union S 2 Ni 3,5 + UV 421 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 8 FB S2Ni3  AWS A 5.23: F8A15-ENi3-Ni3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 25 % A <sub>v</sub> 160 J 120 J...-20 °C 47 J...-60 °C	3.0 4.0	-	For welding of cryogenic steels e.g. 10Ni14, SA350G.LF3, SA 203 Gr. D.
<b>Union S 3 NiMo + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 14171-A: S 50 6 FB S3Ni1,5Mo  AWS A 5.23: F9A8-EG-F1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 560 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 22 % A <sub>v</sub> 160 J  Heat treatment: N+A R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 24 % A <sub>v</sub> 120 J	3.0 4.0	TÜV (1797.)	Creep resistant fine grained steels.
<b>Union S 3 NiMo 1 + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 50 6 FB S3Ni1Mo  AWS A 5.23: F9A8-EF3-F3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 560 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 20 % A <sub>v</sub> 160 J  Heat treatment: SO R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 24 % A <sub>v</sub> 150 J	2.0 2.5 3.0 4.0	TÜV (3020.)	For welding of reactor fine grained steels e.g. 22NiMoCr37, 20 MnMo44, 20MnMoNi55, WB 36.
<b>Union S 3 NiMoCr + UV 421 TT</b> Wire/flux combination: EN ISO 26304-A: S 69 6 FB SZ3Ni2,5CrMo  AWS A 5.23: F11A8-EG-F6	Heat treatment: untreated, as welded R <sub>p0.2</sub> 690 MPa R <sub>m</sub> 780 MPa A <sub>5</sub> 17 % A <sub>v</sub> 120 J 60 J...-40 °C 47 J...-60 °C  Heat treatment: SR at 580°C R <sub>p0.2</sub> 690 MPa R <sub>m</sub> 780 MPa A <sub>5</sub> 18 % A <sub>v</sub> 100 J 60 J...-20 °C 47 J...-40 °C	2.0 2.4 3.0 4.0	TÜV (5063.), DB (51.132.06), BV, WIWEB, GL, LR, DNV, ABS	Fine grained steels up to P690Q, S690QL1, S700MC.
<b>Union S 2 Mo + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 14171-A: S 46 4 FB S2Mo AWS A 5.23: F8A4-EA2-A3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 25 % A <sub>v</sub> 140 J  Heat treatment: N+A R <sub>p0.2</sub> 290 MPa R <sub>m</sub> 440 MPa A <sub>5</sub> 26 % A <sub>v</sub> 120 J	2.0 2.5 3.0 4.0	TÜV (3438.)	Mo alloyed steels and boiler plates of 16Mo3, fine grained steels up to S460N, P460N and similar pipeline steels like STE 480 TM.

N = normalized, 920 °C/air  
SO = 60h 550°C + 40h 620 °C/air

SR = stress relieved, 580-620 °C  
SR\* = 750 °C/4 h, SR\*\* = 760 °C/4 h

A = annealed, 580-620 °C/air  
A\* = annealed, 670-720 °C

All values at test temperature +20 °C

# WIRE/FLUX COMBINATION, UN- AND LOW-ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Union S 3 Mo + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 4 FB S3Mo AWS A 5.23: F8A4-EA4-A4	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 24 % A <sub>v</sub> 140 J  Heat treatment: N+A R <sub>p0.2</sub> 320 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 26 % A <sub>v</sub> 130 J	2.4 3.0 4.0	TÜV (1796.)	Mo alloyed steels and boiler plates of 16Mo3, fine grained steels up to S460N, P460N.
<b>Union S 1 CrMo 2 + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 24589-A: S S CrMo2 FB  AWS A 5.23: F9P2-EB3R-B3R	Heat treatment: A* R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 22 % A <sub>v</sub> 140 J	2.0 2.5 3.0 4.0	-	Creep resistant boiler steels e.g. 10CrMo9-10 or 12CrMo9-10
<b>Union S 2 CrMo + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 24589-A: S S CrMo 1 FB  AWS A 5.23: F8P2-EB2R-B2	Heat treatment: A* R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 24 % A <sub>v</sub> 140 J  Heat treatment: N+A R <sub>p0.2</sub> 330 MPa R <sub>m</sub> 480 MPa A <sub>5</sub> 26 % A <sub>v</sub> 120 J	2.0 2.5 3.0 4.0	TÜV (3439.)	CrMo alloyed boiler tubes and plates of 13CrMo4-5 and similar steels.
<b>Union S P 24 + UV P24</b> Wire/flux combination: EN ISO 24598-A: S S Z CrMo2VNb  AWS A5.23: EG	Heat treatment: 740°C/4h R <sub>p0.2</sub> 450 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 15 % A <sub>v</sub> ≥47 J	2.0 2.4	-	7CrMoVTiB10-10, T/P 24, P 23

N = normalized, 920 °C/air  
 SO = 60h 550°C + 40h 620 °C/air  
 SR = stress relieved, 580-620 °C  
 SR\* = 750 °C/4 h, SR\*\* = 760 °C/4 h  
 A = annealed, 580-620 °C/air  
 A\* = annealed, 670-720 °C

**All values at test temperature +20 °C**

# WIRE/FLUX COMBINATION, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER EMS 2 + BB 24</b> Wire/flux combination: EN ISO 14171-A: S 38 6 FB S2  AWS A 5.17: F7A8-EM12K / F6P6-EM12K	Heat treatment: untreated, as welded R <sub>e</sub> 440 MPa R <sub>m</sub> 520 MPa A <sub>5</sub> 30 % A <sub>v</sub> 185 J 90 J...-60 °C	2.0 2.5 3.0 4.0	TÜV (7808.) Wire: TÜV (02603.), KTA 1408.1, DB (52.014.03), SEPROZ	The SAW wire BÖHLER EMS 2 is universally applicable in shipbuilding, steel construction as well as for boiler and storage tanks.  It is also suitable for joint welds of standard and fine-grained constructional steels.
<b>BÖHLER EMS 3 + BB 24</b> Wire/flux combination: EN ISO 14171-A: S 42 4 FB S3  AWS A 5.17: F7A4-EH10K / F7P6-EH10K	Heat treatment: untreated, as welded R <sub>p0.2</sub> 455 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 28 % A <sub>v</sub> 180 J 70 J...-40 °C	3.0 4.0	TÜV (7811.) Wire: TÜV (02603.), KTA 1408.1, DB (52.014.04), SEPROZ	The solid SAW wire BÖHLER EMS 3 is universally applicable in shipbuilding, steel construction as well as for boiler and storage tanks.  It is also suitable for joint welds of standard and fine-grained constructional steels.
<b>Union S 2 + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 35 4 FB S2  AWS A 5.17: F7A4-EM12 / F6P6-EM12	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 100 J...-20 °C 47 J...-60 °C	2.0 2.5 3.0 4.0	TÜV (3358.), DB (51.132.02)	General structural steels up to S355JR, boiler plates up to P295GH, shipbuilding steels, pipe steels up to L360 and unalloyed boiler tubes, fine grained structural steels up to P355N, S355N.
<b>Union S 3 + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 38 4 FB S3  AWS A 5.17: F7A4-EH10K	Heat treatment: untreated, as welded R <sub>p0.2</sub> 400 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 100 J...-20 °C 47 J...-60 °C	3.0 4.0 5.0	TÜV (1795.)	General structural steels up to S355JR, boiler plates up to P355GH shipbuilding steels, pipe steels up to L360 and unalloyed boiler tubes, fine grained structural steels up to P355N, S355N.
<b>Union S 3 Si + UV 418 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 6 FB S3Si  AWS A 5.17: F7A8-EH12K	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 26 % A <sub>v</sub> 160 J 120 J...-20 °C 47 J...-60 °C	2.5 3.0 4.0	TÜV (7276.), DB (51.132.05), DNV, GL, LR, BV	General structural steels and fine grained steels up to S460N, P460N. Especially for offshore steels together with flux UV 418 TT.
<b>BÖHLER Ni 2-UP + UV 421 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 8 FB S2Ni2  AWS A 5.23: F8A10-ENi2-Ni2	Heat treatment: untreated, as welded R <sub>p0.2</sub> 480 MPa R <sub>m</sub> 580 MPa A <sub>5</sub> 22 % A <sub>v</sub> 160 J 47 J...-80 °C	2.5 3.0	TÜV (11914.) Wire: TÜV (2603.), DB (52.014.10), KTA, SEPROZ	Wire/flux combination for joint welding of cryogenic and ageing resistance fine grained and Ni-alloyed steels. The flux react metallurgical neutral.  Excellent slag detachability, smooth beads, good wetting and low hydrogen contents (≤ 5 ml/100 g) are further important features.
<b>Union S 2 Ni 2,5 + UV 421 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 8 FB S2Ni2  AWS A 5.23: F8A10-ENi2-Ni2	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 24 % A <sub>v</sub> 160 J 120 J...-20 °C 60 J...-60 °C	2.5 3.0 4.0	TÜV (2213.), DB (51.132.06) ABS, BV, GL, LR, DNV	Cryogenic fine grained steels up to S460NL, P460NL and special structural steels e.g. 12Ni14G1.
<b>Union S 2 Ni 3,5 + UV 421 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 8 FB S2Ni3  AWS A 5.23: F8A15-ENi3-Ni3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 25 % A <sub>v</sub> 160 J 120 J...-20 °C 47 J...-60 °C	3.0 4.0	-	For welding of cryogenic steels e.g. 10Ni14, SA350G.LF3, SA 203 Gr. D.

# WIRE/FLUX COMBINATION, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Union S 3 NiMo + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 14171-A: S 50 6 FB S3Ni1,5Mo  AWS A 5.23: F9A8-EG-F1	Heat treatment: untreated, as welded R <sub>p0.2</sub> 560 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 22 % A <sub>v</sub> 160 J  Heat treatment: N+A R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 540 MPa A <sub>5</sub> 24 % A <sub>v</sub> 120 J	3.0 4.0	TÜV (1797.)	Creep resistant fine grained steels.
<b>Union S 3 NiMo 1 + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 50 6 FB S3Ni1Mo  AWS A 5.23: F9A8-EF3-F3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 560 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 20 % A <sub>v</sub> 160 J  Heat treatment: SO R <sub>p0.2</sub> 500 MPa R <sub>m</sub> 620 MPa A <sub>5</sub> 24 % A <sub>v</sub> 150 J	2.0 2.5 3.0 4.0	TÜV (3020.)	For welding of reactor fine grained steels e.g. 22NiMoCr37, 20 MnMo44, 20MnMoNi55, WB 36.
<b>Union S 3 NiMoCr + UV 421 TT</b> Wire/flux combination: EN ISO 26304-A: S 69 6 FB SZ3Ni2,5CrMo  AWS A 5.23: F11A8-EG-F6	Heat treatment: untreated, as welded R <sub>p0.2</sub> 690 MPa R <sub>m</sub> 780 MPa A <sub>5</sub> 17 % A <sub>v</sub> 120 J 60 J...-40 °C 47 J...-60 °C  Heat treatment: SR at 580 °C R <sub>p0.2</sub> 690 MPa R <sub>m</sub> 780 MPa A <sub>5</sub> 18 % A <sub>v</sub> 100 J 60 J...-20 °C 47 J...-40 °C	2.0 2.4 3.0 4.0	TÜV (5063.), DB (51.132.06), BV, WIWEB, GL, LR, DNV, ABS	Fine grained steels up to P690Q, S690QL1, S700MC.
<b>Union S 2 Mo + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 14171-A: S 46 4 FB S2Mo  AWS A 5.23: F8A4-EA2-A3	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 25 % A <sub>v</sub> 140 J  Heat treatment: N+A R <sub>p0.2</sub> 290 MPa R <sub>m</sub> 440 MPa A <sub>5</sub> 26 % A <sub>v</sub> 120 J	2.0 2.5 3.0 4.0	TÜV (3438.)	Mo alloyed steels and boiler plates of 16Mo3, fine grained steels up to S460N, P460N and similar pipeline steels like StE 480 TM.
<b>Union S 3 Mo + UV 420 TT</b> Wire/flux combination: EN ISO 14171-A: S 46 4 FB S3Mo  AWS A 5.23: F8A4-EA4-A4	Heat treatment: untreated, as welded R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 24 % A <sub>v</sub> 140 J  Heat treatment: N+A R <sub>p0.2</sub> 320 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 26 % A <sub>v</sub> 130 J	2.4 3.0 4.0	TÜV (1796.)	Mo alloyed steels and boiler plates of 16Mo3, fine grained steels up to S460N, P460N.

# WIRE/FLUX COMBINATION, HIGH ALLOYED

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>Union S 1 CrMo 2 + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 24589-A: S S CrMo2 FB  AWS A 5.23: F9P2-EB3R-B3R	Heat treatment: A* R <sub>p0.2</sub> 460 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 22 % A <sub>v</sub> 140 J	2.0 2.5 3.0 4.0	-	Creep resistant boiler steels e.g. 10CrMo9-10 or 12CrMo9-10
<b>Union S 2 CrMo + UV 420 TTR / UV 420 TTR-W</b> Wire/flux combination: EN ISO 24589-A: S S CrMo 1 FB  AWS A 5.23: F8P2-EB2R-B2	Heat treatment: A* R <sub>p0.2</sub> 470 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 24 % A <sub>v</sub> 140 J  Heat treatment: N+A R <sub>p0.2</sub> 330 MPa R <sub>m</sub> 480 MPa A <sub>5</sub> 26 % A <sub>v</sub> 120 J	2.0 2.5 3.0 4.0	TÜV (3439.)	CrMo alloyed boiler tubes and plates of 13CrMo4-5 and similar steels.
<b>Union S P 24 + UV P24</b> Wire/flux combination: EN ISO 24598-A: S S Z CrMo2VNb  AWS A5.23: EG	Heat treatment: 740°C/4h R <sub>p0.2</sub> 450 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 15 % A <sub>v</sub> ≥47 J	2.0 2.4	-	7CrMoVTiB10-10, T/P 24, P 23



# SAW-FLUX FOR UN- AND LOW-ALLOYED WIRES

Brand Standard EN ISO Standard AWS	Main constituent: %	Grain size / density	Characteristics and applications
<b>BÖHLER BB 24</b> EN ISO 14174: SA FB 1 65 DC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 15    CaO+MgO 35    Al <sub>2</sub> O <sub>3</sub> +MnO 21    CaF <sub>2</sub> 26	acc. EN ISO 14174: 3 - 25	BÖHLER BB 24 is agglomerated fluoride-basic welding flux. It is characterised by its neutral metallurgical behaviour. When used in combination with suitable wire electrodes the weld metal displays high toughness properties at low/ subzero temperatures. The flux is designed for joining and surfacing applications on general-purpose structural steels, fine-grained high strength and low temperature steels, and high- temperature steel grades. BÖHLER BB 24 is a hydrogen-controlled welding flux with hydrogen contents of maximum 5 ml/100 g weld deposit.
<b>UV 400</b> EN ISO 14174: SA AB 1 67 AC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 20    CaO+MgO 30    Al <sub>2</sub> O <sub>3</sub> +MnO 28    CaF <sub>2</sub> 16	acc. EN ISO 14174: 3 - 20	UV 400 is an agglomerated aluminate basic flux, designed for joining and surfacing applications with general-purpose structural steels, fine grained structural steels, boiler and pipe steels. The flux is characterized by its low silicon and moderate manganese pickup. It can be used on DC and AC.
<b>UV 305</b> EN ISO 14174: SA AR 1 76 AC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 30    Al <sub>2</sub> O <sub>3</sub> +MnO 55    CaF <sub>2</sub> +CaO+MgO 8	acc. EN ISO 14174: 4 - 14	UV 305 is an agglomerated aluminate-rutile flux for joining and surface welding. Suited for direct and alternating current. The flux is suited for butt welding in two-run technique and for sheet thickness up to 10 mm for fillet welding. It is especially suited for welding tube walls.
<b>UV 306</b> EN ISO 14174: SA AR 1 77 AC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 24    Al <sub>2</sub> O <sub>3</sub> +MnO 50    CaF <sub>2</sub> +CaO+MgO 14	acc. EN ISO 14174: 3 - 16	UV 306 is an agglomerated flux designed for joining applications on general-purpose structural and pipe steels. Suitable for use on DC and AC. For single- and multi-wire welding with high welding speed using the two-run technique as well as for fillet welding. Very good slag removal.
<b>UV 418 TT</b> EN ISO 14174: SA FB 1 55 AC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 15    CaO+MgO 38    Al <sub>2</sub> O <sub>3</sub> +MnO 20    CaF <sub>2</sub> 25	acc. EN ISO 14174: 3 - 20	UV 418 TT is an agglomerated fluoride-basic flux for joining and surfacing and applications with dissimilar steels. Mainly for high strength and cryogenic fine grained structural steels. This chameleonic flux is suited for many SAW wires on AC and DC current. Also suited for Tandem and multi- wire systems.
<b>UV 420 TT</b> EN ISO 14174: SA FB 1 65 DC / SA FB 1 65 DC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 15    CaO+MgO 35    Al <sub>2</sub> O <sub>3</sub> +MnO 21    CaF <sub>2</sub> 26	acc. EN ISO 14174: 3 - 20	UV 420 TT is an agglomerated fluoride-basic flux for joining and surfacing applications with general purpose structural steels, fine grained structural steels and creep resistant steels. It is characterized by its neutral metallurgical behaviour. When used in combination with suitable wire electrodes the weld metal has high toughness properties at subzero temperatures. It is suited for single wire and tandem welding.
<b>UV 420 TTR / UV 420 TTR-W</b> EN ISO 14174: SA FB 1 65 DC / SA FB 1 65 AC	SiO <sub>2</sub> +TiO <sub>2</sub> 15    CaO+MgO 35    Al <sub>2</sub> O <sub>3</sub> +MnO 21    CaF <sub>2</sub> 26	acc. EN ISO 14174: 3 - 20	UV 420 TTR is an agglomerated fluoride-basic flux, mainly for joining and surfacing applications with creep resistant steels. It displays neutral metallurgical behaviour and is characterised by a high degree of purity. It is particularly suitable for welding hydrocrackers because of the low P pick-up of 0.004 % max. UV 420 TTR-W permits sound welding on AC, by this achieving a higher level of toughness when welding with CrMo-alloyed SAW wires.
<b>UV 420 TTRC</b> EN ISO 14174: SA FB 1 65 DC	SiO <sub>2</sub> +TiO <sub>2</sub> 15    CaO+MgO 35    Al <sub>2</sub> O <sub>3</sub> +MnO 21    CaF <sub>2</sub> 26	acc. EN ISO 14174: 3 - 20	This special variant of flux UV 420 TTR supports the C-content of the wire electrode when DC-welding. In comparison with UV 420 TTR the C-content in the all weld metal is about 0.03-0.04 % higher. It is suitable for multipass welding, for single- and tandem-wire systems. UV420 TTRC has prime importance for SAW of the high- temperature resistant steel, for joining and surfacing applications.

# SAW-FLUX FOR UN- AND LOW-ALLOYED WIRES

Brand Standard EN ISO Standard AWS	Main constituent: %	Grain size / density	Characteristics and applications
<b>UV 421 TT</b> EN ISO 14174: SA FB 1 55 AC H5	SiO <sub>2</sub> +TiO <sub>2</sub> 16    CaO+MgO 34    Al <sub>2</sub> O <sub>3</sub> +MnO 21    CaF <sub>2</sub> 26	acc. EN ISO 14174: 3 - 20	UV 421 TT is an agglomerated fluoride-basic flux for welding of high strength and cryogenic fine-grained steels. It has a neutral metalurgical behaviour acc. to burn-off or pickup of Si and Mn.
<b>BÖHLER BB 203</b> EN ISO 14174: SA FB 2 DC	SiO <sub>2</sub> +TiO <sub>2</sub> 20    CaO+MgO 26    Al <sub>2</sub> O <sub>3</sub> +MnO 18    CaF <sub>2</sub> 32	acc. EN ISO 14174: 2 - 12	BÖHLER BB 203 is an agglomerated fluoride-basic flux with high basicity for joint welding of soft martensitic CrNi-steels and austenitic CrNi(Mo)-steels. BÖHLER BB 203 produces well contoured and smooth welding beads. Beside good slag detachability the flux features good fillet weld capabilities. The weld deposits show high purity and good Mech. Properties.
<b>Avesta Flux 801</b> EN ISO 14174: SA CS 2 Cr DC	SiO <sub>2</sub> 30    Al <sub>2</sub> O <sub>3</sub> 15    CaF <sub>2</sub> +MnO 40    Cr 5.6	Density: 0.8 kg/dm <sup>3</sup>	Avesta Flux 801 is a neutral chromium compensated agglomerated flux. It is a general-purpose flux designed for both joint welding stainless steel and for cladding onto unalloyed or low-alloyed steel. Flux 801 can be used in combination with all types of stabilised and non-stabilised Cr-Ni and Cr-Ni-Mo fillers.
<b>Avesta Flux 805</b> EN ISO 14174: SA AF 2 Cr DC	SiO <sub>2</sub> 10    Al <sub>2</sub> O <sub>3</sub> 36    CaF <sub>2</sub> 48    Cr 2.5	Density: 1.0 kg/dm <sup>3</sup>	Avesta Flux 805 is a basic, slightly chromium-compensated agglomerated flux. It is primarily designed for welding with high-alloyed stainless fillers such as Avesta P12, 904L and 2205. Standard Cr-Ni and Cr-Ni-Mo fillers can also be welded with excellent results.
<b>Marathon 431</b> EN ISO 14343: SA FB 2 64 DC	SiO <sub>2</sub> 10    Al <sub>2</sub> O <sub>3</sub> 38    CaF <sub>2</sub> 50	acc. EN ISO 14174: 4 - 14	Marathon 431 is an agglomerated basic welding flux for welding stainless high alloyed CrNi(Mo) steels. The weld seams are smooth and finely rippled without any slag residues. Besides the good slag detachability the flux also provides good fillet weld properties. The weld metals show high degree of purity and good Mech. Properties.
<b>Marathon 543</b> EN ISO 14174: SA FB 2 55 DC H5	SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> 35    CaF <sub>2</sub> + CaO + MgO 60	acc. EN ISO 14174: 3 - 20	Marathon 543 is an agglomerated fluoride-basic flux with a high basicity. For joining and surfacing applications of creep resistant CrMo steels such as e.g. 12CrMo 19-5, P 91/T 91, X10CrMoVNB9-1, X20CrMoWV12-1. In combination with SAW wire Thermanit MTS 616 the flux is suited for welding steels of type P 92 and X11Cr-MoWVNB9-1-1, E 911.

# PIPELINE

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER FOX BVD 85</b> EN ISO 2560-A: E 46 5 1Ni B 4 5  AWS A5.5: E8045-P2 E8018-G	Heat treatment: untreated, as welded R <sub>e</sub> 510 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 27 % A <sub>v</sub> 170 J 65 J...-50 °C	3.2 4.0 4.5	TÜV (03531.), SEPROZ, CE	Basic covered vertical down electrode for high-quality weld joints on large pipelines as well as in structural work. In pipeline construction, suitable for filler and cap welding. Vertical down welding enables an as much as 100 % higher deposition rate as compared to vertical up welding. This applies to all BÖHLER BVD electrodes!
<b>BÖHLER FOX BVD 90</b> EN 757: E 55 5 Z2Ni B 4 5  AWS A5.5: E9018-G E9045-P2 (mod.)	Heat treatment: untreated, as welded R <sub>e</sub> 600 MPa R <sub>m</sub> 650 MPa A <sub>5</sub> 27 % A <sub>v</sub> 170 J 80 J...-50 °C	3.2 4.0 4.5	TÜV (03402.), Statoil, SEPROZ, CE, GAZPROM	Basic covered vertical down electrode for high-quality weld joints on large pipelines as well as in structural work. In pipeline construction, suitable for filler and cap welding. Especially crack-resistant weld metal with excellent toughness.
<b>BÖHLER FOX CEL</b> EN ISO 2560-A: E 38 3 C 2 1  AWS A5.1: E6010	Heat treatment: untreated, as welded R <sub>e</sub> 450 MPa R <sub>m</sub> 520 MPa A <sub>5</sub> 26 % A <sub>v</sub> 100 J ≥47 J...-30 °C	2.5 3.2 4.0 4.5	TÜV (1281.), DNV, Statoil, SEPROZ, CE, NAKS	Cellulosic covered electrode for vertical down welding of the root, hot passes, filler and cap passes on large pipelines. Great economy as compared to vertical up welding, also in combination with basic vertical down electrodes. Particularly suitable for welding of root passes on minus polarity.
<b>BÖHLER FOX CEL 75</b> EN ISO 2560-A: E 42 3 C 2 5  AWS A5.5: E7010-P1	Heat treatment: untreated, as welded R <sub>e</sub> 480 MPa R <sub>m</sub> 550 MPa A <sub>5</sub> 23 % A <sub>v</sub> 100 J 45 J...-40 °C	3.2 4.0 5.0	TÜV-A (533.)	High-strength cellulosic covered electrode for vertical down welding of large pipelines. Great economy as compared to vertical up welding. BÖHLER cellulosic covered electrodes are used first and foremost for hot pass, filler and cap welding.
<b>Phoenix CEL 70</b> EN ISO 2560-A: E 42 2 C 2 5  AWS A5.1: E6010	Heat treatment: untreated, as welded R <sub>p0.2</sub> 420 MPa R <sub>m</sub> 510 MPa A <sub>5</sub> 22 % A <sub>v</sub> 80 J 28 J...-40 °C	2.5 3.2 4.0 5.0	TÜV (00247.), DB (10.132.44), ABS, GL, LR, DNV, VNIIST	Cellulose covered electrode for vertical down circumferential welds in pipeline constructions. Excellent weldability in root pass welding; also in the vertical up position. CTOD, HIC and HSCC tested.
<b>BÖHLER FOX CEL 85</b> EN ISO 2560-A: E 46 4 1Ni C 2 5  AWS A5.5: E8010-P1	Heat treatment: untreated, as welded R <sub>e</sub> 490 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 23 % A <sub>v</sub> 110 J ≥47 J...-40 °C	3.2 4.0 5.0	TÜV (1361.), ABS, SEPROZ, CE	High-strength cellulosic covered electrode for vertical down welding of large pipelines. BÖHLER cellulosic covered electrodes offer excellent economy compared to vertical up welding.
<b>BÖHLER FOX CEL 80-P</b> EN ISO 2560-A: E 46 3 1Ni C 2 5  AWS A5.5: E8010-P1	Heat treatment: untreated, as welded R <sub>e</sub> 490 MPa R <sub>m</sub> 570 MPa A <sub>5</sub> 23 % A <sub>v</sub> 90 J ≥47 J...-30 °C	3.2 4.0 5.0	TÜV (11181.), CE	High-strength cellulosic covered electrode for vertical-down welding of large pipelines. BÖHLER FOX CEL 80-P provides a more intensive arc and a more fluid weld metal compared to BÖHLER FOX CEL 85.
<b>BÖHLER FOX CEL 90</b> EN ISO 2560-A: E 50 3 1Ni C 2 5  AWS A5.5: E9010-P1 E9010-G	Heat treatment: untreated, as welded R <sub>e</sub> 580 MPa R <sub>m</sub> 650 MPa A <sub>5</sub> 21 % A <sub>v</sub> 100 J ≥47 J...-30 °C	4.0 5.0	TÜV (1324.), Statoil, SEPROZ, CE	High-strength cellulosic covered electrode for vertical down welding of large pipelines, especially X70 and X80 steels.
<b>BÖHLER FOX EV PIPE</b> EN ISO 2560-A: E 42 4 B 12 H5  AWS A5.1: E7016-1H4R	Heat treatment: untreated, as welded R <sub>e</sub> 470 MPa R <sub>m</sub> 560 MPa A <sub>5</sub> 29 % A <sub>v</sub> 170 J 55 J...-40 °C	2.0 2.5 3.2 4.0	TÜV (7620.), DB (10.014.77), LTSS, SEPROZ, VNIIGAZ, CE, NAKS	BÖHLER FOX EV PIPE is a basic covered electrode which has excellent welding characteristics for pipe vertical up welds of root passes with negative polarity as well as filler and cap passes with positive polarity, or even AC. BÖHLER FOX EV PIPE offers considerable time savings against AWS E 7018 type electrodes when welding root passes due to increased travel speeds.

# PIPELINE

Brand Standard EN ISO Standard AWS	Mech. Properties Typical values	Ø mm	Approvals	Characteristics and applications
<b>BÖHLER FOX EV 60 PIPE</b> EN ISO 2560-A: E 50 4 1Ni B 12 H5  AWS A5.5: E8016-GH4R	Heat treatment: untreated, as welded R <sub>e</sub> 550 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 29 % A <sub>v</sub> 170 J 110 J...-40 °C	2.5 3.2 4.0 5.0	NAKS, GAZPROM	BÖHLER FOX EV 60 PIPE is a basic covered electrode which has excellent welding characteristics for pipe vertical up welds of root passes with negative polarity as well as filler and cap passes with positive polarity, or even AC.  BÖHLER FOX EV 60 PIPE offers considerable time savings against AWS E 8018 type electrodes when welding root passes due to increased travel speeds.
<b>BÖHLER FOX EV 70 PIPE</b> EN 757: E 55 4 Z Mn2NiMo B 12 H5  AWS A5.5: E9016-GH4R	Heat treatment: untreated, as welded R <sub>e</sub> 620 MPa R <sub>m</sub> 680 MPa A <sub>5</sub> 20 % A <sub>v</sub> 140 J 55 J...-46 °C	2.5 3.2 4.0	-	BÖHLER FOX EV 70 PIPE is a basic covered electrode which has excellent welding characteristics for pipe vertical up welds of root passes with negative polarity as well as filler and cap passes with positive polarity, or even AC.  BÖHLER FOX EV 70 PIPE offers considerable time savings against AWS E 9018 type electrodes when welding root passes due to increased travel speeds.
<b>BÖHLER SG 3-P</b> EN ISO 14341-A: G3Si1 G 46 5 M21 3Si1 G 42 4 C1 3Si1  AWS A5.18: ER70S-G	Heat treatment: untreated, as welded R <sub>e</sub> 510 MPa R <sub>m</sub> 640 MPa A <sub>5</sub> 25 % A <sub>v</sub> 120 J 55 J...-50 °C	0.9 1.0 1.2	TÜV (07682), CE, NAKS, GAZPROM	BÖHLER SG 3-P is a micro-alloyed solid wire designed for the automated gas-shielded arc welding of pipelines.  Due to the precise addition of micro-alloying elements it offers very good low temperature impact strength to -50°C, as well as excellent ductility and cracking resistance.
<b>BÖHLER SG 8-P</b> EN ISO 14341-A: G3Ni1 G 42 5 M21 3Ni  AWS A5.28: ER80S-G	Heat treatment: untreated, as welded R <sub>e</sub> 500 MPa R <sub>m</sub> 590 MPa A <sub>5</sub> 24 % A <sub>v</sub> 150 J 80 J...-50 °C	0.9 1.0 1.2	DNV	BÖHLER SG 8-P is a micro-alloyed wire designed for the automated gas-shielded arc welding of pipelines. The precise addition of micro-alloying elements results in a weld metal with excellent low temperature impact strength to -50°C as well as excellent ductility and cracking resistance.
<b>BÖHLER NiMo 1-IG</b> EN ISO 16834-A: G 55 6 M21 Mn3Ni1Mo G 55 4 C1 Mn3Ni1Mo  AWS A5.28: ER90S-G	Heat treatment: untreated, as welded R <sub>e</sub> 620 MPa R <sub>m</sub> 700 MPa A <sub>5</sub> 23 % A <sub>v</sub> 140 J ≥47 J...-60 °C	1.0 1.2	TÜV (11763), DB (42.014.06), GL, SEPROZ, CE, NAKS, GAZPROM	Copper-coated wire for the gas-shielded arc welding of high-strength, quenched and tempered fine-grained constructional steels.  Due to the precise addition of micro-alloying elements, very good low temperature impact strength to -60°C, as well as excellent ductility and cracking resistance, can also be obtained when using BÖHLER NiMo1-IG.
<b>BÖHLER Ti 70 PIPE-FD</b> EN ISO 18276-A: T 55 4 Mn1Ni P M 1 H5  AWS A5.29: E91T1-M21A4-G	Heat treatment: untreated, as welded R <sub>e</sub> ≥550 MPa R <sub>m</sub> 640-820 MPa A <sub>5</sub> ≥18 % A <sub>v</sub> ≥47 J...-40 °C	1.2	TÜV (12279), GAZPROM, CE	Micro-alloyed rutile flux-cored wire for single- and multi-pass welding of carbon-manganese steels and high-strength steels using Ar-CO <sub>2</sub> shielding gas.
<b>BÖHLER Pipeshield 71 T8-FD</b> AWS A5.29: E71T8-A4-K6	Heat treatment: untreated, as welded R <sub>e</sub> 435 MPa R <sub>m</sub> 535 MPa A <sub>5</sub> 28 % A <sub>v</sub> 200 J 150 J...-30 °C ≥27 J...-40 °C	2.0	NAKS, GAZPROM	Böhler Pipeshield 71 T8-FD is a self shielded flux-cored wire designed for semiautomatic vertical-down welding of pipelines and low-alloyed steel constructions.
<b>BÖHLER Pipeshield 81 T8-FD</b> AWS A5.29: E81T8-A4-Ni2 / E81T8-A4-G	Heat treatment: untreated, as welded R <sub>e</sub> 500 MPa R <sub>m</sub> 600 MPa A <sub>5</sub> 25 % A <sub>v</sub> 170 J 120 J...-30 °C ≥27 J...-40 °C	2.0	NAKS, GAZPROM	Böhler Pipeshield 81 T8-FD is a self shielded flux-cored wire designed for semiautomatic vertical-down welding of pipelines and low-alloyed steel constructions.

The specifications in regard to the type and application of our products are only for the user's information. The data specified for the mechanical properties always refer to the weld metal alone under observance of the applicable standards. In the weld joint, the weld metal properties

are influenced, among other factors, by the parent metal, the welding position and the welding parameters. A guarantee of suitability for a certain type of application requires an explicit written agreement in each individual case. Subject to modifications.



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