

# Outershield® 81Ni1C-H

## Materials to be welded

Steel grades/Standard	Type
<b>General structural steel</b>	
EN 10025 part 2	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A131	Grade A, B, D, AH32 to EH40
<b>Cast steel</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240NB, L290NB, L360NB, L360QB, L240MB, L290MB, L360MB, L415MB, L415NB
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steel</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steel</b>	
EN 10025 part 3	S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL
EN 10025 part 4	S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

# Outershield® 81Ni1-H

## Low temperature rutile cored wire

### Classification

AWS A5.29/A5.29M : E81T1-Ni1M-JH4 (all diameters)  
 EN ISO 17632-A : T 50 5 1Ni P M 2 H5 (only diameter 1.2 mm)

### General description

All position gas shielded 1% Ni flux cored wire, offshore and similar applications  
 Superior weldability, low spatter, good bead appearance  
 Outstanding operator appeal  
 Exceptional mechanical properties (CVN >47J at -50°C)  
 Very low hydrogen (H<sub>DM</sub> <5 ml/100g)  
 Superior product consistency with optimal alloy control  
 Excellent wire feeding  
 Meet NACE MR-0175 requirements  
 For PWHT, use Outershield 81Ni1-HSR

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	BV	DNV	GL	LR	RINA
M21	SA3,3YMHH	IVYMSH5	4YH10S	4Y40SH5	4YSH5

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	H <sub>DM</sub> ml/100g
M21	0.05	1.4	0.2	0.013	0.010	0.95	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)	
						-40°C	-50°C
Required: AWS A5.29			min. 470	550-690	min. 19	min. 27	
EN ISO 17632-A			min. 500	560-720	min. 18	min. 47	
Typical values	M21	AW	530	600	24	90	60

### Packaging and available sizes

Unit type	Diameter (mm)			
	1.2	1.4	1.6	2.0
4.5kg plastic spool S200	X			
14 kg spool S300 (alu. Bag)	X			
15 kg spool B300	X	X	X	
15 kg spool BS300			X	X
25kg wire reel B435			X	

Outershield® 81Ni1-H: rev. EN 25

# Outershield® 81Ni1-H

## Materials to be welded

Steel grades/Standard	Type
<b>General structural steel</b>	
EN 10025 part 2	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A131	Grade A, B, D, AH32 to EH40
<b>Cast steel</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240NB, L290NB, L360NB, L360QB, L240MB, L290MB, L360MB, L415MB, L415NB
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steel</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steel</b>	
EN 10025 part 3	S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL
EN 10025 part 4	S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20
1.6	20	320	170	21-23	1.9	1.20
		510	235	22-24	3.1	1.20
		635	275	24-25	3.9	1.20
		760	310	25-27	4.7	1.20
		890	350	27-29	5.6	1.20
		1015	385	28-30	6.4	1.20
		1080	400	30-31	6.8	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V
1.6	250-350A	250-350A	230-280A	220-260A	170-240A
	24-32V	24-32V	24-32V	24-28V	22-28V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 81Ni1-HSR

## Low temperature rutile cored wire

### Classification

AWS A5.29/A5.29M : E81T1-Ni1M-JH4  
EN ISO 17632-A : T 50 5 1Ni P M 2 H5 T

### General description

All position gas shielded 1% Ni flux cored wire, offshore and similar applications  
Specific design for stress relieved applications, guaranteed impact properties after PWHT  
Superior weldability, low spatter, good bead appearance  
Outstanding operator appeal  
Exceptional mechanical properties (CVN >47J at -50°C)  
Very low hydrogen (H<sub>DM</sub> <5 ml/100g)  
Superior product consistency with optimal alloy control  
Excellent wire feeding  
Meet NACE MR-0175 requirements

### Welding positions



ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G

### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

Shielding gas	BV	DNV	GL	LR
M21	4YSDH5	IVYMSH5	4YH5S	4YSH5

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	H <sub>DM</sub> ml/100g
M21	0.05	1.4	0.2	0.013	0.010	0.95	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)	
						-40°C	-50°C
Required: AWS A5.29			min. 470	550-690	min. 19	min. 27	
EN ISO 17632-A			min. 500	560-720	min. 18	min. 47	
Typical values	M21	SR	525	590	25	70	
		AW	530	600	24	20	60

SR 1h/600°C, 3G up - V45°

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
4.5kg plastic spool S200	X	
14 kg spool S300 (alu. Bag)	X	X
15 kg spool S300	X	
15 kg spool B300	X	

Outershield® 81Ni1-HSR: rev. EN 24

# Outershield® 81Ni1-HSR

## Materials to be welded

Steel grades/Standard	Type
<b>General structural steel</b>	
EN 10025 part 2	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A131	Grade A, B, C, D, AH32 to DH36
<b>Cast steel</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240NB, L290NB, L360NB, L360QB, L240MB, L290MB, L360MB, L415MB, L415NB
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steel</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steel</b>	
EN 10025 part 3	S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL
EN 10025 part 4	S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20
1.6	20	320	170	21-23	1.9	1.20
		510	235	22-24	3.1	1.20
		635	275	24-25	3.9	1.20
		760	310	25-27	4.7	1.20
		890	350	27-29	5.6	1.20
		1015	385	28-30	6.4	1.20
		1080	400	30-31	6.8	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V
1.6	250-350A	250-350A	230-280A	220-260A	170-240A
	24-32V	24-32V	24-32V	24-28V	22-28V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 81K2-H

## Low temperature rutile cored wire

### Classification

AWS A5.29/A5.29M : E81T1-K2M-JH4 (all diameters)  
 EN ISO 17632-A : T 50 6 1.5Ni P M 2 H5 (only diameter 1.2 mm)

### General description

All position gas shielded 1.5% Ni, Ti and B alloyed flux cored wire  
 Used in off-shore and similar applications  
 Superior weldability, low spatter, good bead appearance  
 Outstanding operator appeal  
 Exceptional mechanical properties (CVN >80J at -60°C)  
 Very low hydrogen ( $H_{DM} < 5$  ml/100g)  
 Superior product consistency with optimal alloy control  
 Excellent wire feeding  
 For PWHT, use Outershield 81K2-HSR

### Welding positions



ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G

### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	LR	RINA	RMRS
M21	IVY46MSH5	4Y40SH5	4YS	4Y50SH5

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	H <sub>DM</sub> ml/100g
M21	0.04	1.4	0.2	0.012	0.010	1.4	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)		
						-40°C	-50°C	-60°C
Required: A5.29			min. 470	550-690	min.19	min. 27		
EN ISO 17632-A			min. 500	560-720	min.18	min. 47		
Typical values	M21	AW	590	630	23	130	100	80

### Packaging and available sizes

Unit type	Diameter (mm)		
	1.2	1.6	2.0
4.5kg plastic spool S200	X		
14 kg spool S300	X		
15 kg spool B300	X		
25kg wire reel B435		X	X
200kg Accutrak® Drum	X		

Outershield® 81K2-H: rev. EN 24

# Outershield® 81K2-H

## Materials to be welded

Steel grades/Standard	Type
<b>General structural steel</b>	
EN 10025 part 2	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A131	Grade A, B, D, AH32 to EH40
<b>Cast steel</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240NB, L290NB, L360NB, L360QB, L240MB, L290MB, L360MB, L415MB, L415NB
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steel</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steel</b>	
EN 10025 part 3	S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL
EN 10025 part 4	S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML
EN 10025 part 6	S460Q, S460QL, S460QL1, S500S, S500QL, S500QL1

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20
1.6	20	320	170	21-23	1.9	1.20
		510	235	22-24	3.1	1.20
		635	275	24-25	3.9	1.20
		760	310	25-27	4.7	1.20
		890	350	27-29	5.6	1.20
		1015	385	28-30	6.4	1.20
		1080	400	30-31	6.8	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-30V
1.6	250-350A	250-350A	230-280A	220-260A	170-240A
	24-32V	24-32V	24-32V	24-28V	22-28V

# Outershield® 81K2-HSR

## Low temperature rutile cored wire

### Classification

AWS A5.29 : E81T1-K2M-JH4  
EN ISO 17632-A : T 50 6 1.5Ni P M 2 H5 T

### General description

All position gas shielded 1.5% Ni alloyed flux cored wire for offshore and similar applications  
Specific design for stress relieved applications, guaranteed impact properties after PWHT  
Superior weldability, low spatter, good bead appearance and outstanding operators appeal  
Exceptional mechanical properties (CVN >80J at -60°C)  
Very low hydrogen ( $H_{DM} < 5$  ml/100g)  
Superior product consistency with optimal alloy control  
Excellent wire feeding

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	H <sub>DM</sub> ml/100g
M21	0.06	1.3	0.3	0.012	0.010	1.4	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)		
						-40°C	-50°C	-60°C
Required: A5.29			min. 470	550-690	min.19	min. 27		
EN ISO 17632-A			min. 500	560-720	min.18	min. 47		
Typical values	M21	SR	570	620	24			
		AW	590	630	23	140	100	80

SR 1h/600°C, 3G up - V45°

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool B300	X

Outershield® 81K2-HSR: rev. EN 24

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# Outershield® 81K2-HSR

## Materials to be welded

Steel grades/Standard	Type
<b>General structural steel</b>	
EN 10025 part 2	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A131	Grade A, B, D, AH32 to EH40
<b>Cast steel</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240NB, L290NB, L360NB, L360QB, L240MB, L290MB, L360MB, L415MB, L415NB
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steel</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steel</b>	
EN 10025 part 3	S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL
EN 10025 part 4	S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML
EN 10025 part 6	S460Q, S460QL, S460QL1, S500Q, S500QL, S500QL1

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 500CT-H

## Weather resistant rutile cored wire

### Classification

AWS A5.29/A5.29M : E81T1-9G-H4  
EN ISO 17632-A : T 50 5 Z P M 2 H5

### General description

All position gas shielded 0.8% Ni and 0.4% Cu flux cored wire, for welding weather resistant steel (CorTen)

For welding in all positions

Superior weldability, low spatter, good bead appearance

Outstanding operator appeal

Exceptional mechanical properties (CVN >47J at -50°C)

Very low hydrogen (H<sub>DM</sub> <5 ml/100g)

Superior product consistency with optimal alloy control

Excellent wire feeding

For welding applications with higher service temperatures (i.e chimneys), Outershield 555CT-H is recommended.

### Welding positions



ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Cu	H <sub>DM</sub> ml/100g
M21	0.04	1.3	0.2	0.014	0.010	0.84	0.39	4

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J) -50°C
Required: AWS A5.29			min. 470	550-690	min. 19	not required
EN ISO 17632-A			min. 500	560-720	min. 18	min. 47
Typical values	M21	AW	580	610	23	80

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
4.5kg plastic spool S200	X
15 kg spool B300	X

Outershield® 500CT-H: rev. EN 24

# Outershield® 500CT-H

## Materials to be welded

Steel grades/Standard	Type
<b>Weather resisting steels</b>	
EN 10025 part 5	S235 J0W, S235 J2W, S355 J0WP, S355 J2WP, S355 J0W, S355 J2W, S355 42W
ASTM A242	Type 1
ASTM A580	Grade A
ASTM A595	Grade C
ASTM A709	Grade HPS 50W & HPS 70W
ISO 5952	HSA 355W1 & W2

Weather resistant steels like Cor-Ten®, Patinax®-F, Patinax®-37 and similar Ni- and Cu-alloyed steels

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 555CT-H

## Weather resistant rutile cored wire

### Classification

AWS A5.29/A5.29M : E81T1-W2M-JH4  
EN ISO 17632-B : T555T1-1MA-NCC1-UH5

### General description

All position gas shielded 0.6% Ni, 0.5Cr and 0.5% Cu alloyed flux cored wire, for welding weather resistant steel (CorTen)

For welding in all positions

Superior weldability, low spatter, good bead appearance

Outstanding operator appeal

Exceptional mechanical properties (CVN >47J at -50°C)

Very low hydrogen ( $H_{DM} < 5$  ml/100g)

Superior product consistency with optimal alloy control

Excellent wire feeding

### Welding positions



PA/1G



PB/2F



PC/2G



PF/3Gup



PE/4G

ISO/ASME

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Cr	Ni	Cu	H <sub>DM</sub> ml/100g
M21	0.03	1.1	0.4	0.015	0.010	0.55	0.60	0.55	4

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J) -30°C -50°C
Required: AWS A5.29			min. 470	550-690	min. 19	min. 47
EN ISO 17632-B			min. 460	550-740	min. 17	min. 47
Typical values	M21	AW	600	660	20	140 100

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
4.5kg plastic spool S200	X
15 kg spool B300	X

Outershield® 555CT-H: rev. EN 01

# Outershield® 555CT-H

## Materials to be welded

Steel grades/Standard	Type
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### Weather resisting steels

EN 10025 part 5	S235 J0W, S235 J2W, S355 J0WP, S355 J2WP, S355 J0W, S355 J2W, S355 42W
ASTM A242	Type 1
ASTM A580	Grade A
ASTM A595	Grade C
ASTM A709	Grade HPS 50W & HPS 70W
ISO 5952	HSA 355W1 & W2
ISO 5952	HSA 355W1 & W2

Weather resistant steels like Cor-Ten®, Patinax®-F, Patinax®-37 and similar Ni, Cr and Cu-alloyed steels

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/ kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 91Ni1-HSR

## Low temperature rutile cored wire

### Classification

AWS A5.29 : E91T1-GM-H4  
 ISO 18276-A : T 55 4 1NiMo P M 2 H5

### General description

All position gas shielded 1% Ni and 0.4%Mo alloyed flux cored wire for offshore, pipeline and similar applications  
 Specific design for stress relieved applications, guaranteed impact properties after PWHT  
 Superior weldability, low spatter, good bead appearance and outstanding operators appeal  
 Exceptional mechanical properties  
 Very low hydrogen ( $H_{DM} < 5$  ml/100g)  
 Superior product consistency with optimal alloy control  
 Excellent wire feeding  
 Specific design to withstand high heat input procedures  
 Meet NACE MR-0175 requirements

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Mo	H <sub>DM</sub> ml/100g
M21	0.05	1.4	0.2	0.013	0.010	0.95	0.4	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)	
						-20°C	-40°C
Required: AWS A5.29			min. 540	620-760	min. 17	min. 27	
ISO 18276-A			min. 550	640-820	min. 18	min. 47	
Typical values	M21	AW	640	700	19	60	

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
4.5kg plastic spool S200	X
15 kg spool B300	X

Outershield® 91Ni1-HSR: rev. EN 04

# Outershield® 91Ni1-HSR

## Materials to be welded

Steel grades/Standard      Type

### General structural steel

EN 10025 part 2      S185, S235, S275, S355

### Ship plates

ASTM A131      Grade A, B, C, D, AH32 to DH36

### Cast steel

EN 10213-2      G P 240R

### Pipe material

EN 10208-1      L210, L240, L290, L360

EN 10208-2      L240NB, L290NB, L360NB, L360QB, L240MB,

L290MB, L360MB, L415MB, L415NB

API 5LX      X42, X46, X52, X60, X65, X70, X80

EN 10216-1/      P235T1, P235T2, P275T1

EN 10217-1      P275T2, P355N

### Boiler & pressure vessel steel

EN 10028-2      P235GH, P265GH, P295GH, P355GH, P420GH, P460GH

### Fine grained steel

EN 10025 part 3      S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL

EN 10025 part 4      S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML

EN 10025 part 6      S460Q, S460QL1, S500Q, S500QL1, S550Q, S550QL1

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/ kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 91K2-HSR

## Low temperature rutile cored wire

### Classification

AWS A5.29 : E91T1-GM-H4  
 ISO 18276-A : T 55 4 1,5NiMo P M 2 H5

### General description

All position gas shielded 1.5% Ni and 0.4%Mo alloyed flux cored wire for offshore, pipeline and similar applications  
 Specific design for stress relieved applications, guaranteed impact properties after PWHT  
 Superior weldability, low spatter, good bead appearance and outstanding operators appeal  
 Exceptional mechanical properties  
 Very low hydrogen ( $H_{DM} < 5 \text{ ml/100g}$ )  
 Superior product consistency with optimal alloy control  
 Excellent wire feeding  
 Specific design to withstand high heat input procedures

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Mo	H <sub>DM</sub> ml/100g
M21	0.05	1.4	0.2	0.013	0.010	1.4	0.4	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V (J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	-20°C	-40°C
Required: AWS A5.29			min. 540	620-760	min. 17	min. 27	
ISO 18276-A			min. 550	640-820	min. 18	min. 47	
Typical values	M21	AW	640	700	19	60	

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
4.5kg plastic spool S200	X
15 kg spool B300	X

Outershield® 91K2-HSR: rev. EN 04



# Outershield® 91K2-HSR

## Materials to be welded

Steel grades/Standard	Type
<b>General structural steel</b>	
EN 10025 part 2	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A131	Grade A, B, D, AH32 to EH40
<b>Cast steel</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240NB, L290NB, L360NB, L360QB, L240MB, L290MB, L360MB, L415MB, L415NB
API 5LX	X42, X46, X52, X60, X65, X70, X80
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steel</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH, P420GH, P460GH
<b>Fine grained steel</b>	
EN 10025 part 3	S275N, S275NL, S355N, S355NL, S420N, S420NL, S460N, S460NL
EN 10025 part 4	S275M, S275ML, S355M, S355ML, S420M, S420ML, S460M, S460ML
EN 10025 part 6	S460Q, S460QL1, S500Q, S500QL1, S550Q, S550QL1

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

# Outershield® 550-H

## High strength rutile cored wire

### Classification

AWS A5.29/A5.29M : E101T1-K3M-JH4  
ISO 18276-A : T 55 4 Z P M 1 H5

### General description

All position gas shielded rutile flux cored wire, for high strength steel grades for welding pipes and plates

Outstanding operator appeal

Excellent mechanical properties (CVN >50J at -40°C)

Very low hydrogen (H<sub>DM</sub> <5 ml/100g)

Superior product consistency with optimal alloy control

Good wire feeding

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Mo	H <sub>DM</sub> ml/100g
M21	0.04	1.4	0.2	0.012	0.010	2.0	0.3	3

### Mechanical properties, typical, all weld metal

Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J) -40°C
Required: AWS A5.29		min. 610	690-800	min.16	min. 27
ISO 18276-A		min. 550	640-820	min.18	min. 47
Typical values	M21 AW	700	730	19	60

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
4.5kg plastic spool S200	X
15 kg spool B300	X

Outershield® 550-H: rev. EN 23

Liability: All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. Fumes: Consult information on Welding Safety Sheet, available upon request

# Outershield® 550-H

## Materials to be welded

Steel grades/Standard	Type
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### Pipe material

API 5LX	X52, X60, X60, X65, X70, X80
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### Fine grained steel

EN 10025 part 6	S460Q, S460QL1, S500Q, S500QL1, S550Q, S550QL1
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## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-30V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 690-H

## High strength rutile cored wire

### Classification

AWS A5.29/A5.29M : E111T1-K3M-JH4  
ISO 18276-A : T 69 4 Z P M 2 H5

### General description

All position gas shielded rutile flux cored wire, for high strength steel grades like grade S690  
Specific design for stress relieved applications, guaranteed impact properties after PWHT  
Outstanding operator appeal  
Excellent mechanical properties (CVN >50J at -40°C)  
Very low hydrogen (H<sub>DM</sub> <5 ml/100g)  
Superior product consistency with optimal alloy control  
Good wire feeding

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

Shielding gas ABS  
M21 AWS

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Mo	H <sub>DM</sub> ml/100g
M21	0.06	1.5	0.2	0.015	0.010	2.0	0.5	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)		
						-29°C	-40°C	-46°C
Required: A5.29			min. 680	760-900	min.15	min. 27		
ISO 18276-A			min. 690	770-940	min.17	min. 47		
Typical values	M21	AW	800	830	17	75	60	50

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
4.5kg plastic spool S200	X	
14 kg spool S300	X	
15 kg spool B300	X	X
15 kg spool BS300	X	X

Outershield® 690-H: rev. EN 24

# Outershield® 690-H

## Materials to be welded

Steel grades/Standard	Type
<b>Fine grained steel</b>	
EN 10025 part 6	S500Q to S690QL1
API 5L	X100
MIL-S-162164	HY100
ASTM A514	Grade F
ASTM A517	Grade A, B, F, H, D
ASTM A709	Grade 690 type F, grade 100W type F

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20
1.6	20	320	170	21-23	1.9	1.20
		510	235	22-24	3.1	1.20
		635	275	24-25	3.9	1.20
		760	310	25-27	4.7	1.20
		890	350	27-29	5.6	1.20
		1015	385	28-30	6.4	1.20
		1080	400	30-31	6.8	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-30V
1.6	250-350A	250-350A	230-280A	220-260A	170-240A
	24-29V	24-29V	24-28V	24-26V	22-26V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 690-HSR

## High strength rutile cored wire

### Classification

AWS A5.29/A5.29M : E111T1-K3M-JH4  
ISO 18276-A : T 69 4 Z P M 2 H5 T

### General description

All position gas shielded rutile flux cored wire, for high strength steel grades like grade S690

Specific design for stress relieved applications

Outstanding operator appeal

Excellent mechanical properties (CVN >50J at -40°C)

Very low hydrogen ( $H_{DM}$  <5 ml/100g)

Superior product consistency with optimal alloy control

Good wire feeding

### Welding positions



PA/1G



PB/2F



PC/2G



PF/3Gup



PE/4G

ISO/ASME

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Mo	H <sub>DM</sub> ml/100g
M21	0.06	1.5	0.2	0.015	0.010	2.0	0.5	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)		
						-29°C	-30°C	-40°C
Required: AWS A5.29			min. 680	760-900	min.15	min.27		
ISO 18276-A			min. 690	770-970	min.17	min.47		
Typical values	M21	SR	720	770	20	60		
		AW	740	790	19	75	70	

SR: 1h/580°C, 3G up - V60°

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
4.5kg plastic spool S200	X	
15 kg spool B300	X	X

Outershield® 690-HSR: rev. EN 24

# Outershield® 690-HSR

## Materials to be welded

Steel grades/Standard      Type

### Fine grained steel

EN 10025 part 6	S500Q to S690QL1
API 5L	X100
MIL-S-162164	HY100
ASTM A514	Grade F
ASTM A517	Grade A, B, F, H, D
ASTM A709	Grade 690 type F, grade 100W type F

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/ kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20
1.6	20	320	170	21-23	1.9	1.20
		510	235	22-24	3.1	1.20
		635	275	24-25	3.9	1.20
		760	310	25-27	4.7	1.20
		890	350	27-29	5.6	1.20
		1015	385	28-30	6.4	1.20
		1080	400	30-31	6.8	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-30V
1.6	250-350A	250-350A	230-280A	220-260A	170-240A
	24-29V	24-29V	24-28V	24-26V	22-26V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 101Ni1-HSR

## High strength rutile cored wire

### Classification

AWS A5.29/A5.29M : E101T1-G

### General description

Rutile micro alloyed flux-cored wire for welding in all positions, special of high carbon containing low alloy high strength steels such as SAE 4130

Specific design for stress relieved applications

Outstanding operator appeal

Excellent mechanical properties (CVN >50J at -40°C)

Very low hydrogen ( $H_{DM} < 5$  ml/100g)

Superior product consistency with optimal alloy control

Good wire feeding

Meet NACE MR-0175 requirements

### Welding positions



ISO/ASME

PA/1G



PB/2F



PC/2G



PF/3Gup



PE/4G

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

Amount : 15-25 l/min

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Ni	Mo	H <sub>DM</sub> ml/100g
M21	0.06	1.8	0.3	0.013	0.010	0.95	0.4	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J) -50°C
Required: AWS A5.29	M21	AW	610	690-830	16	27
Typical values	M21	AW	730	810	17	43
		SR	660	760	18	46

SR: 4h/645°C

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
4.5kg plastic spool S200	X
15 kg spool B300	X

Outershield® 101Ni1-HSR: rev. EN 02



# Outershield® 101Ni1-HSR

## Materials to be welded

Steel grades/Standard      Type

### Fine grained steel

EN 10025 part 6	S500Q to S620QL1
AISI/SAE	4130-4140
ASTM A1031	Grade 4130
ASTM A519	Grade 4130

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/ kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-30V

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Outershield® 12-H

## Creep resistant rutile cored wire

### Classification

AWS A5.29/A5.29M : E81T1-A1M-H4  
ISO 17634-A : T MoL P M 2 H5

### General description

All position mix gas shielded 0.5% Mo-alloyed rutile cored wire  
Superior weldability, low spatter, good bead appearance  
Outstanding operator appeal  
Very low hydrogen ( $H_{DM} < 5$  ml/100g)  
Superior product consistency with optimal alloy control  
Excellent wire feeding

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

TÜV  
+

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Mo	H <sub>DM</sub> ml/100g
M21	0.065	0.8	0.2	0.014	0.010	0.46	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)	
						+20°C	-20°C
Required: AWS A5.29		SR <sup>1)</sup>	min. 470	550-690	min. 19	not required	
EN 17634-A		SR <sup>2)</sup>	min. 355	min. 510	min.22	47	
Typical values	M21	SR <sup>3)</sup>	540	600	27	160	79

Stress relieving: SR<sup>1)</sup> = 620 ± 15°C/1h, SR<sup>2)</sup> = 570-620°C/1h, SR<sup>3)</sup> = 1h/620°C

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool B300	X

Outershield® 12-H: rev. EN 24

# Outershield® 12-H

## Materials to be welded

Steel grades/Standard	Type
-----------------------	------

### Creep resistant steels

EN 10028-2	P295 G H, P355 G H, 16 Mo 3 & similar alloys
EN 10222-2	17 Mo 3, 14 Mo 6 & similar alloys
ASTM A335	Grade P1
ASTM A209	Grade T1
ASTM A250	Grade T1
ASTM A336	Grade F1
ASTM A204	Grade A, B, C
ASTM A217	Grade WC1
ASTM A352	Grade LC1

### Fine grained steel

EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

## Remarks/ Application advice

Recommended tempering heat treatment range: 570-630°C  
Time depends on material thickness

# Outershield® 19-H

## Creep resistant rutile cored wire

### Classification

AWS A5.29/A5.29M : E 81T1-B2M-H4  
ISO 17634-A : T CrMo1 P M 2 H5

### General description

All position mix gas shielded 1.25% Cr 0.5% Mo-alloyed rutile cored wire  
Superior weldability, low spatter, good bead appearance  
Outstanding operator appeal  
Very low hydrogen ( $H_{DM} < 5$  ml/100g)  
Superior product consistency with optimal alloy control  
Excellent wire feeding

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

TÜV  
+

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Cr	Mo	H <sub>DM</sub> ml/100g
M21	0.06	0.74	0.24	0.013	0.010	1.24	0.52	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)	
						+20°C	-20°C
Required: AWS A5.29		SR <sup>1)</sup>	min. 470	550-690	min. 19	not required	
EN 17634-A		SR <sup>2)</sup>	min. 355	min. 510	min.20	47	
Typical values	M21	SR <sup>3)</sup>	545	635	21	160	75

Stress relieving: SR<sup>1)</sup> = 690 ± 15°C/1h, SR<sup>2)</sup> = 660-700°C/1h, SR<sup>3)</sup> = 1h/690°C

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool B300	X

Outershield® 19-H: rev. EN 23

# Outershield® 19-H

## Materials to be welded

Steel grades/Standard	Type
<b>Creep resistant steels</b>	
EN 10028-2	13 CrMo 4-5 & similar alloys
EN 10083-1	25 CrMo 4 & similar alloys
EN 10222-2	14 CrMo 4-5 & similar alloys
ASTM A387	Grade 11 & 12
ASTM A182	Grade F1 & F12
ASTM A217	Grade WC6 & WC11
ASTM A234	Grade WP11 & WP12
ASTM A199	Grade T11
ASTM A200	Grade T11
ASTM A213	Grade T11 & T12
ASTM A335	Grade P11 & P12
<b>Tool steel</b>	
DIN 17210	16 MnCr 5 & similar alloys

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

## Remarks/ Application advice

Recommended preheat temperature: 200 - 250°C  
 Recommended tempering heat treatment range: 660-700°C  
 Time depends on material thickness

# Outershield® 20-H

## Creep resistant rutile cored wire

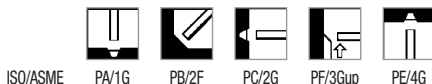
### Classification

AWS A5.29/A5.29M : E 91T1-B3M-H4  
 ISO 17634-A : T CrMo2 P M 2 H5

### General description

All position mix gas shielded 2.25% Cr 1% Mo-alloyed rutile cored wire  
 Superior weldability, low spatter, good bead appearance  
 Outstanding operator appeal  
 Very low hydrogen ( $H_{DM} < 5$  ml/100g)  
 Superior product consistency with optimal alloy control  
 Excellent wire feeding

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

TÜV  
 +

### Chemical composition (w%), typical, all weld metal

Shielding gas	C	Mn	Si	P	S	Cr	Mo	H <sub>DM</sub> ml/100g
M21	0.06	0.75	0.21	0.013	0.008	2.23	1.09	3

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V (J)	
						+20°C	-20°C
Required: AWS A5.29		SR <sup>1)</sup>	min. 540	620-760	min. 17	not required	
EN 17634-A		SR <sup>2)</sup>	min. 400	min. 500	min. 18	47	
Typical values	M21	SR <sup>3)</sup>	570	680	19	160	60

Stress relieving: SR<sup>1)</sup> = 690 ± 15°C/1h, SR<sup>2)</sup> = 690-750°C/1h, SR<sup>3)</sup> = 1h/690°C

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool B300	X

Outershield® 20-H: rev. EN 23

# Outershield® 20-H

## Materials to be welded

Steel grades/Standard      Type

### Creep and hydrogen resistant steels

EN 10028-2	10 CrMo 9-10 & similar alloys
EN 10222-2	12 CrMo 9-10 & similar alloys
ASTM A387	Grade 21 & 22
ASTM A182	Grade F22
ASTM A217	Grade WC9
ASTM A234	Grade WP22
ASTM A199/A200	Grade T21 & T22
ASTM A213	Grade T22
ASTM A335	Grade P22

## Calculation data

Diameter (mm)	Electrical Stick-out (mm)	Wire feed speed (cm/min)	Current (A)	Arc Voltage (V)	Deposition Rate (kg/h)	kg Wire/kg weld metal
1.2	20	445	130	20-22	1.6	1.20
		700	180	23-25	2.5	1.20
		950	220	25-27	3.4	1.20
		1270	265	27-29	4.5	1.20
		1590	305	30-32	5.9	1.20

## Welding parameters, optimum fill passes in shielding gas Ar + (>15 - 25)% CO<sub>2</sub>

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
1.2	230-280A	230-280A	200-240A	200-240A	160-220A
	26-32V	26-32V	25-32V	25-28V	23-28V

## Remarks/ Application advice

Recommended preheat temperature: 200 - 250°C  
 Recommended tempering heat treatment range: 690-750°C  
 Time depends on material thickness

# Cor-A-Rosta 304L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E308LT0-1/-4  
 ISO 17663-A : T 19 9 L R C/M 3

### General description

Gas shielded flux cored stainless steel wire electrode for downhand welding  
 Stable arc, low spatter and good slag removal  
 Excellent wire feeding and operator appeal  
 Bright appearance of weld metal

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 C1 : Active Gas 100% CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	LR	TÜV
M21	308LMS	4550S		+
C1	308LMS		304L	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.7	19.5	10	8

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	+20°C	-110°C
Required: AWS A5.22			not required	min. 520	min. 35		
ISO 17663-A			min. 320	min. 510	min. 30		
Typical values	M21/C1	AW	400	560	42	80	40

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
5 kg plastic spool S200	X	
15 kg spool S300	X	X

Cor-A-Rosta 304L: rev. EN 23

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request



# Cor-A-Rosta 304L

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon (C &lt;0.03%)</b>					
	X2 CrNi 19 11		1.4306	(TP)304L CF-3	S30403 J92500
	X2 CrNiN 18 10		1.4311	(TP)304LN 302,304	S30453 S30400
<b>Medium carbon (C &gt;0.03%)</b>					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
<b>Ti-, Nb stabilized</b>					
	X6 CrNiTi 18 10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6 CrNiNb 18 10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
1.2	100-250A	100-250A	100-200A
1.6	140-300A	140-300A	140-200A

## Remarks/ Application advice

Use for positional welding: Cor-A-Rosta P304L

# Cor-A-Rosta P304L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E308LT1-1/-4  
 ISO 17663-A : T 19 9 L P C/M 2

### General description

Gas shielded flux cored stainless steel wire electrode for positional welding  
 Stable arc, low spatter and good slag removal  
 Excellent wire feeding and operator appeal  
 Bright appearance of weld metal

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 C1 : Active Gas 100% CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+
C1			pending

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.7	19.5	10	8

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	+20°C	-110°C
Required: AWS A5.22			not required	min. 520	min. 35		
ISO 17663-A			min. 320	min. 510	min. 30		
Typical values	M21/C1	AW	400	560	42	80	40

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool S300	X

Cor-A-Rosta P304L: rev. EN 23

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Cor-A-Rosta P304L

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon (C &lt;0.03%)</b>					
	X2 CrNi 19 11		1.4306	(TP)304L CF-3	S30403 J92500
	X2 CrNiN 18 10		1.4311	(TP)304LN 302,304	S30453 S30400
<b>Medium carbon (C &gt;0.03%)</b>					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
<b>Ti-, Nb stabilized</b>					
	X6 CrNiTi 18 10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6 CrNiNb 18 10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3G up
1.2	100-250A	100-250A	100-200A	100-180A

## Remarks/ Application advice

Use for downhand welding: Cor-A-Rosta 304L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E347T1-1  
 ISO 17663-A : T 19 9 Nb R M 3

### General description

Rutile gas shielded stainless steel wire electrode for downhand welding  
 For Ti or Nb stabilized 304 or equivalent steels  
 Excellent resistance in oxidizing environments such as nitric acid  
 High resistance to intergranular corrosion  
 Easy slag release and smooth bead appearance

### Welding positions



PA/1G



PB/2F



PC/2G

ISO/ASME

### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 Amount : 15-25 l/min

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
M21/C1	0.05	1.4	0.6	19.5	10	5

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.22			not required	min. 520	min. 30	
ISO 17663-A			min. 350	min. 550	min. 25	
Typical values	M21	AW	435	600	42	90

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool S300	X

Cor-A-Rosta 347: rev. EN 23

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Cor-A-Rosta 347

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Ti-, Nb stabilized</b>					
	X6 CrNiTi 18 10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6 CrNiNb 18 10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710
<b>Non stabilized</b>					
	X4CrNi 18-10		1.4301	302 (TP)304	S30400
	X2CrNi 19-11		1.4306	(TP)304L	S30403
		GX5 CrNi 19-10	1.4308	CF-8	J92600
			1.4312	(TP)304H	S30409

## Welding parameters, optimum fill passes in shielding gas M21

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
1.2	100-250A	100-250A	100-200A

# Cor-A-Rosta 316L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E316LT0-1/ -4  
 ISO 17663-A : T 19 12 3 L R C/M 3

### General description

Gas shielded flux cored stainless steel wire electrode for downhand welding  
 Stable arc, low spatter and good slag removal  
 Excellent wire feeding and operator appeal  
 Bright appearance of weld metal

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 C1 : Active Gas 100% CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	BV	DNV	GL	LR	TÜV
M21		308LMS	4550S		+
C1	316L	316LMS		316L	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.5	19	12	2.7	8

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	+20°C	-110°C
Required: AWS A5.22			not required	min. 485	min. 30		
ISO 17663-A			min. 320	min. 510	min. 25		
Typical values	M21/C1	AW	440	580	38	70	40

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
15 kg spool S300	X	X

Cor-A-Rosta 316L: rev. EN 23

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Cor-A-Rosta 316L

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon (C &lt;0.03%)</b>					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
<b>Medium carbon (C &gt;0.03%)</b>					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions	
	PA/1G	PB/2F
1.2	100-250A	100-250A
1.6	140-300A	140-300A

## Remarks/ Application advice

Use for positional welding: Cor-A-Rosta P316L

# Cor-A-Rosta P316L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E316LT1-1/-4  
 ISO 17663-A : T 19 12 3 L P C/M 2

### General description

Gas shielded flux cored stainless steel wire electrode for positional welding  
 Stable arc, low spatter and good slag removal  
 Excellent wire feeding and operator appeal  
 Bright appearance of weld metal

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 C1 : Active Gas 100% CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+
C1	316LMS		pending

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.5	19	12	2.7	6

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) +20°C -110°C
Required: AWS A5.22			not required	min. 485	min. 30	
ISO 17663-A			min. 320	min. 510	min. 25	
Typical values	M21/C1	AW	440	580	38	70 40

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
5 kg plastic spool S200	X
15 kg spool S300	X

Cor-A-Rosta P316L: rev. EN 23



# Cor-A-Rosta P316L

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon (C &lt;0.03%)</b>					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
<b>Medium carbon (C &gt;0.03%)</b>					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
<b>Ti-, Nb stabilized</b>					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
	GX5 CrNiNb 19-10		1.4552	CF-8C	J92710

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3G up
1.2	100-250A	100-250A	100-200A	100-200A

## Remarks/ Application advice

Use for downhand welding: Cor-A-Rosta 316L

# Cor-A-Rosta 309L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E309LT0-1/-4  
ISO 17663-A : T 23 12 L R C/M 3

### General description

Gas shielded flux cored high CrNi alloyed wire electrode for downhand welding  
For welding stainless to mild steel and buffer layers in clad steel  
Excellent weldability and self releasing slag  
High resistance to embrittlement

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
C1 : Active Gas 100% CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

Shielding gas	BV	DNV	GL	LR	TÜV
M21		308LMS	4550S		+
C1	309L	309LMS		SS/CMn	pending

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
M21/C1	0.03	1.4	0.6	24	12.5	15

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	+20°C	-20°C
Required: AWS A5.22			not required	min. 520	min. 30		
ISO 17663-A			min. 320	min. 510	min. 25		
Typical values	M21/C1	AW	445	560	36	45	40

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
5 kg plastic spool S200	X	
15 kg spool S300	X	X

Cor-A-Rosta 309L: rev. EN 24

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Cor-A-Rosta 309L

## Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
--------------	---------------	---------	----------------------------	-----

## Corrosion resistant cladsteels

X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
X2 CrNi 19-11	1.4306	(TP)304L	S30403
		CF-3	J92500
X4 CrNi 18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloyed steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloyed steel

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
1.2	100-250A	100-250A	100-200A
1.6	140-300A	140-300A	140-200A

## Remarks/ Application advice

Use for positional welding: Cor-A-Rosta P309L

# Cor-A-Rosta P309L

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E309LT1-1/-4  
 ISO 17663-A : T 23 12 L P C/M 2

### General description

Gas shielded flux cored high CrNi alloyed wire electrode for positional welding  
 For welding stainless to mild steel and buffer layers in clad steel  
 Excellent weldability and self releasing slag  
 High resistance to embrittlement

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 C1 : Active Gas 100% CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+
C1	309LMS		pending

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
M21/C1	0.04	1.3	0.6	24	12.5	15

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	+20°C	-20°C
Required: AWS A5.22			not required	min. 520	min. 30		
ISO 17663-A			min. 320	min. 510	min. 25		
Typical values	M21/C1	AW	445	560	36	65	55

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
5 kg plastic spool S200	X
15 kg spool S300	X

Cor-A-Rosta P309L: rev. EN 24

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Cor-A-Rosta P309L

## Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
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## Corrosion resistant cladsteels

X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
X2 CrNi 19-11	1.4306	(TP)304L	S30403
		CF-3	J92500
X4 CrNi 18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloyed steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloyed steel

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3G up
1.2	100-250A	100-250A	100-200A	100-200A

## Remarks/ Application advice

Use for downhand welding: Cor-A-Rosta 309L

# Cor-A-Rosta 309MoL

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E309LMoT0-1/-4  
ISO 17663-A : T 23 12 2 L R C/M 3

### General description

Gas shielded flux cored high CrNiMo alloyed wire electrode for downhand welding

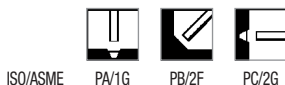
High Corrosion resistant deposit

Specially developed for welding stainless steel to mild steel and buffer layers in cladding

Maximum plate thickness in butt welds ~ 12 mm

Suitable for repair welding in dissimilar joints and steels difficult to weld

### Welding positions



ISO/ASME

PA/1G

PB/2F

PC/2G

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

C1 : Active Gas 100% CO<sub>2</sub>

Amount : 15-25 l/min

### Approvals

Shielding gas	BV	DNV	GL	LR	TÜV
M21		308LMS	4550S		+
C1	UP	309MoLMS		SS/CMn	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.7	23	12.8	2.3	20

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.22			not required	min. 520	min. 25	
ISO 17663-A			min. 350	min. 550	min. 25	
Typical values	M21/C1	AW	550	700	30	50

### Packaging and available sizes

Unit type	Diameter (mm)	
	1.2	1.6
15 kg spool S300	X	X

Cor-A-Rosta 309MoL: rev. EN 24

**Liability:** All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance **Fumes:** Consult information on Welding Safety Sheet, available upon request

# Cor-A-Rosta 309MoL

## Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2 CrNiMo 17-12-2	1.4404	(TP)316L CF-3M	S31603 J92800
	X2 CrNiMo 18-14-3	1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2	1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3	1.4429		
	X4 CrNiMo 17-13-3	1.4436		
	X6 CrNiMoTi 17-12-2	1.4571	316Ti	S31635
	X10 CrNiMoTi 17-3	1.4573		S31635
	X6 CrNiMoNb 17-12-2	1.4580	316Cb	S31640

Welding dissimilar metals: mild steel or low alloyed steel to stainless CrNi or CrNiMo-steel up to max. thickness of 12 mm.  
Build-up welding on mild and low alloyed steel

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
1.2	100-250A	100-250A	100-200A

## Remarks/ Application advice

Use for positional welding Cor-A-Rosta P309MoL

# Cor-A-Rosta P309MoL

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E309LMoT1-1/-4  
 ISO 17663-A : T 23 12 2 L P C/M 2

### General description

Gas shielded flux cored high CrNi alloyed wire electrode for positional welding  
 High corrosion resistant deposit  
 Specially developed for welding stainless steel to mild steel and buffer layers in cladding  
 Maximum plate thickness in butt welds ~ 12 mm  
 Suitable for repair welding in dissimilar joints and steels difficult to weld

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
 M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
 C1 : Active Gas 100% CO<sub>2</sub>  
 Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
M21/C1	0.03	0.8	0.6	22.7	12.5	2.3	20

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.22			not required	min. 520	min. 25	
ISO 17663-A			min. 350	min. 550	min. 25	
Typical values	M21/C1	AW	525	675	34	45

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool S300	X

Cor-A-Rosta P309MoL: rev. EN 23



# Cor-A-Rosta P309MoL

## Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2 CrNiMo 17-12-2	1.4404	(TP)316L CF-3M	S31603 J92800
	X2 CrNiMo 18-14-3	1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2	1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3	1.4429		
	X4 CrNiMo 17-13-3	1.4436		
	X6 CrNiMoTi 17-12-2	1.4571	316Ti	S31635
	X10 CrNiMoTi 17-3	1.4573	316Ti	S31635
	X6 CrNiMoNb 17-12-2	1.4580	316Cb	S31640

Welding dissimilar metals: mild steel or low alloyed steel to stainless CrNi or CrNiMo-steel up to max. thickness of 12 mm.  
Build-up welding on mild and low alloyed steel

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3G up
1.2	100-250A	100-250A	100-200A	100-200A

## Remarks/ Application advice

Use for downhand welding Cor-A-Rosta 309MoL

# Cor-A-Rosta 4462

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E2209T0-1/-4  
 ISO 17663-A : T 22 9 3 N L R M 3

### General description

Gas shielded flux cored wire electrode for duplex stainless steel welding in downhand position

Excellent weldability

Applicable up to a service temperature of 250°C

High resistance to general corrosion, pitting and stress corrosion conditions

High yield strength > 500 N/mm<sup>2</sup>

M21 shielding gas is recommended

### Welding positions



ISO/ASME

PA/1G



PB/2F



PC/2G

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

C1 : Active Gas 100% CO<sub>2</sub>

Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
M21	0.03	1.2	0.7	23	9.2	3.1	0.12	40

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	-20°C	-50°C
Required: AWS A5.22			not required	min. 520	min. 25		
ISO 17663-A			min. 350	min. 550	min. 25		
Typical values	M21	AW	630	800	29	40	30

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool S300	X

Cor-A-Rosta 4462: rev. EN 24

# Cor-A-Rosta 4462

## Materials to be welded

Steel grades	EN 10088-1/-2/-4	Mat. Nr	ASTM / ACI A240	UNS
<b>Duplex stainless steels</b>				
	X2 CrNiMoN 22 -5-3	1.4462		S31803
		1.4417		S31500
	X3 CrNiMoN 27-5-2	1.4460		S31200
	X2 CrNiN 23-4	1.4362		S32304
	X2 CrMnNi21-5-1	1.4162		S32101

Dissimilar joints such as un- and low alloyed steel to duplex stainless steel

## Welding parameters, optimum fill passes in shielding gas M21

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
1.2	100-250A	100-250A	100-200A

## Remarks/ Application advice

Use for positional welding Cor-A-Rosta P4462  
Welding with Heat-Input max. 2.5 kJ/mm  
Interpass temperature max. 150°C

# Cor-A-Rosta P4462

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E2209T1-1/-4  
 ISO 17663-A : T 22 9 3 N L P M 2

### General description

Gas shielded flux cored wire electrode for positional welding of duplex stainless steel

Excellent weldability

Applicable up to a service temperature of 250°C

High resistance to general corrosion, pitting and stress corrosion conditions

High yield strength > 500 N/mm<sup>2</sup>

M21 shielding gas is recommended

### Welding positions



ISO/ASME

PA/1G

PB/2F

PC/2G

PF/3Gup

PE/4G

### Current type/Shielding gas (ISO 14175)

DC +

M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>

Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
M21	0.03	1.2	0.7	23	9.2	3.1	0.12	40

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	-20°C	-50°C
Required: AWS A5.22			not required	min. 690	min. 20		
ISO 17663-A			min. 450	min. 550	min. 20		
Typical values	M21	AW	630	800	29	65	55

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool S300	X

Cor-A-Rosta P4462: rev. EN 24

# Cor-A-Rosta P4462

## Materials to be welded

Steel grades	EN 10088-1/-2/-4	Mat. Nr	ASTM / ACI A240	UNS
<b>Duplex stainless steels</b>				
	X2 CrNiMoN 22 -5-3	1.4462		S31803
		1.4417		S31500
	X3 CrNiMoN 27-5-2	1.4460		S31200
	X2 CrNiN 23-4	1.4362		S32304
	X2 CrMnNi21-5-1	1.4162		S32101

Dissimilar joints such as un- and low alloyed steel to duplex stainless steel

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3G up
1.2	100-250A	100-250A	100-200A	130-180A

## Remarks/ Application advice

Use for downhand welding Cor-A-Rosta 4462  
Welding with Heat-Input max. 2.5 kJ/mm  
Interpass temperature max. 150°C

# Cor-A-Rosta 2509

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E2209T0-4  
ISO 17663-A : T 22 9 3 N L R M 3

### General description

Gas shielded flux cored wire electrode for duplex stainless steel welding in downhand position

Excellent weldability

Applicable up to a service temperature of 250°C

High resistance to general corrosion, pitting and stress corrosion conditions

High yield strength > 500 N/mm<sup>2</sup>

### Welding positions



ISO/ASME PA/1G PB/2F PC/2G

### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
C1 : Active Gas 100% CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.6	20	10	3.1	8

### Mechanical properties, typical, all weld metal

Shielding gas	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) -20°C
Required: AWS A5.22		not required	min. 520	min. 25	
ISO 17663-A		min. 350	min. 550	min. 25	
Typical		630	800	29	40

### Packaging and available sizes

Unit type	Diameter (mm)
	1.2
15 kg spool S300	X

Cor-A-Rosta 2509: rev. EN 01

# Cor-A-Rosta 2509

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM / ACI A276/A351/A473	UNS
<b>Regular and super duplex stainless steels</b>					
	X2CrNiMoN 25-7-4		1.4410		
	X4 CrNiMoN 27-5-2		1.4460		
	X2 CrNiMoN 22-5-3		1.4462	2205	S31803
		GX6 CrNiMo 24-8-2	1.4463		
				CD-4MCu	S32550
				Zeron 100	S32760

Super duplex stainless steel grades: chemical composition approximately:  
24-27% Cr, 6-9% Ni, 3-4% Mo, 0.10-0.25% N alloyed also with Cu and/or W

## Welding parameters, optimum fill passes in shielding gas M21

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
1.2	100-250A	100-250A	100-200A

## Remarks/ Application advice

Use for positional welding Cor-A-Rosta P2509  
Welding with Heat-Input max. 2.5 kJ/mm  
Interpass temperature max. 150°C

# Cor-A-Rosta P2509

## Stainless steel rutile cored wire

### Classification

AWS A5.22 : E2209T1-4  
ISO 17663-A : T 22 9 3 N L P C/M 2

### General description

Gas shielded flux cored wire electrode for positional welding of duplex stainless steel

Excellent weldability

Applicable up to a service temperature of 250°C

High resistance to general corrosion, pitting and stress corrosion conditions

High yield strength > 500 N/mm<sup>2</sup>

M21 shielding gas is recommended

### Welding positions



### Current type/Shielding gas (ISO 14175)

DC +  
M21 : Mixed gas Ar+ (>15-25%) CO<sub>2</sub>  
Amount : 15-25 l/min

### Approvals

Shielding gas	DNV	GL	TÜV
M21	308LMS	4550S	+

### Chemical composition (w%) and Ferrite Number (FN), Typical, all weld metal

Shielding gas	C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
M21/C1	0.03	1.3	0.6	20	10	3.1	8

### Mechanical properties, typical, all weld metal

	Shielding gas	Condition	Yield strength	Tensile strength	Elongation	Impact ISO-V(J)	
			(N/mm <sup>2</sup> )	(N/mm <sup>2</sup> )	(%)	-20°C	-50°C
Required: AWS A5.22			not required	min. 690	min. 20		
ISO 17663-A			min. 450	min. 550	min. 20		
Typical values	M21	AW	640	790	29	65	55

### Packaging and available sizes

Unit type	Diameter (mm)
15 kg spool S300	X

Cor-A-Rosta P2509: rev. EN 01



# Cor-A-Rosta P2509

## Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM / ACI A276/A351/A473	UNS
<b>Regular and super duplex stainless steels</b>					
	X2CrNiMoN 25-7-4		1.4410		
	X4 CrNiMoN 27-5-2		1.4460		
	X2 CrNiMoN 22-5-3		1.4462	2205	S31803
		GX6 CrNiMo 24-8-2	1.4463		
				CD-4MCu	S32550
				Zeron 100	S32760

Super duplex stainless steel grades: chemical composition approximately:  
24-27% Cr, 6-9% Ni, 3-4% Mo, 0.10-0.25% N alloyed also with Cu and/or W

## Welding parameters, optimum fill passes in shielding gas M21/C1

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3G up
1.2	100-250A	100-250A	100-200A	130-180A

## Remarks/ Application advice

Use for downhand welding Cor-A-Rosta 2509  
Welding with Heat-Input max. 2.5 kJ/mm  
Interpass temperature max. 150°C