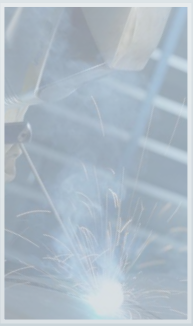
FAGERSTA Stainless

Wire Rod

Welding



Cold Heading

Spring

High Temperature

Duplex

Thanks to a company history starting already 1873, Fagersta Stainless belongs to one of the world leading producers of stainless wire rod and wire. With customized chemistries the products fulfill everything from simple to high demanding applications.

OPTIMUM WIRE ROD FOR COLD HEADING

To get best possible properties for cold heading wire rod, following parameters are important:

- Tight chemistry for identical properties
- Mechanical properties and deformation hardening
- Corrosion properties
- Surfaces
- Dimension tolerances

STANDARD STEEL GRADES FOR COLD HEADING

Our grades have tight chemistries and therefore equal properties from delivery to delivery.
We recommend following of our standard grades:

EN. Nr	TYPE / AWS		FAGERSTA	C %	Si %	Mn %	Cr %	Ni %	Mo %	N %	TS N/mm²	CWH	Md30 Nohara	PRE
1.4512	409 Ti		R 109.11	0.030*	0.50	0.55	11.30	0.50*	0.10*	0.040*	360-460			12
1.4016	430		R 250.11	0.020*	0.30	0.70	16.40	0.30*	0.10*	0.030*	420-520			17
1.4016	430		R 250.30	0.020*	0.30	0.70	16.40	0.30*	0.10*	0.050	430-530			17
1.4301	302		R 320.14	0.050	0.40	0.75	17.80	8.60	0.60*	0.035	580-680	120	-1	19
1.4301	304		R 350.19	0.030	0.40	1.50	18.20	8.20	0.60*	0.050*	550-650	108	9	20
1.4303	305		R 390.21	0.015*	0.40	0.55	17.70	11.20	0.60*	0.030*	490-590	91	-47	19
1.4307	304 L		R 350.20	0.025*	0.45	1.20	18.50	9.75	0.60*	0.030*	500-600	90	-25	20
1.4307	304 L		R 350.43	0.020*	0.50	1.15	18.30	8.50	0.60*	0.060*	530-630	93	2	20
1.4404	316 L		R 425.10	0.020*	0.35	1.55	16.80	11.20	2.10	0.050*	520-620	92	-90	24
1.4436	316 L		R 440.10	0.030*	0.50	1.55	16.80	11.60	2.60	0.050*	520-620	91	-103	26
1.4567	304 Cu	302 HQ	R 575.21	0.015*	0.40	0.55	17.90	9.70	0.40*	0.025*	450-550			19
1.4578	316 Cu		R 545.11	0.030*	0.35	0.55	17.00	10.80	2.20	0.040*	460-560			25
	660	A286 VAR	R 569.60	0.050	0.20	1.00	14.60	24.70	1.20	0.020*	530-630			19

(Other grades from our standard range are displayed on the reverse side)

MECHANICAL PROPERTIES AND DEFORMATION HARDENING

Depending on what shape and wished tensile strength an end product shall have, the wire rod should have a specific ductility (formability) for the cold heading process and that it reaches a specific level of deformation hardening. Following methods of measurement are used regarding deformation hardening:

CWH-factor ”Cold Work Hardening Factor”, a matrix consisting of C, Cr and Ni contents. The factor varies between 80 – 150 and increases with increasing deformation hardening in the steel.

Md30 The temperature (°C) at which 30% true elongation (about 25% area reduction) makes 50% of the austenitic phase transform to deformation martensite. A higher temperature means higher deformation hardening in the steel.

CORROSION

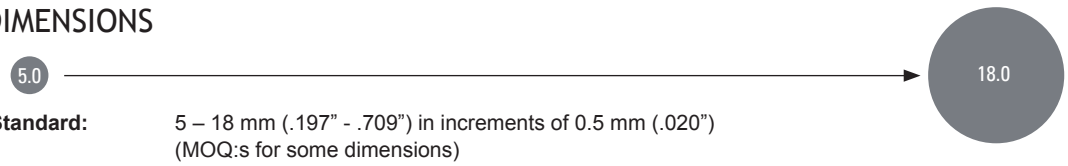
PRE (= Pitting Resistance Equivalent = Cr + 3.1 x Mo + 25 x N) is a factor comparing properties of different chemistries with regards to pitting and crevice corrosion in corrosive environments. A higher value means better resistance. In the table above, PRE is shown for the grades we recommend for cold heading.

SURFACES

Direct cooling	(DK)	ASTM 10-13
”In line”-annealing	(DST)	ASTM 5-8
Pit furnace	(SG)	ASTM 3-6

Our standard procedure is to supply the wire rod in pickled condition.

DIMENSIONS



Standard: 5 – 18 mm (.197” - .709”) in increments of 0.5 mm (.020”)
(MOQ:s for some dimensions)

Tolerance:
5.0 – 10.0 +/-0.15
>10.0 – 18.0 +/-0.20

Ovality: Max 60% of the total tolerance span.

Surface classes: Class 3 is the standard class which has a max defect depth of 0.10 mm for dimensions ≤ 10 mm and 1% of the diameter for dimensions > 10 mm. Welding rod has class 2 (max 0.20).

PACKAGING METHODS

Coil weight: Appr. 1000 kg Outer diameter: Max 1250 mm Inner diameter: Max 950 mm

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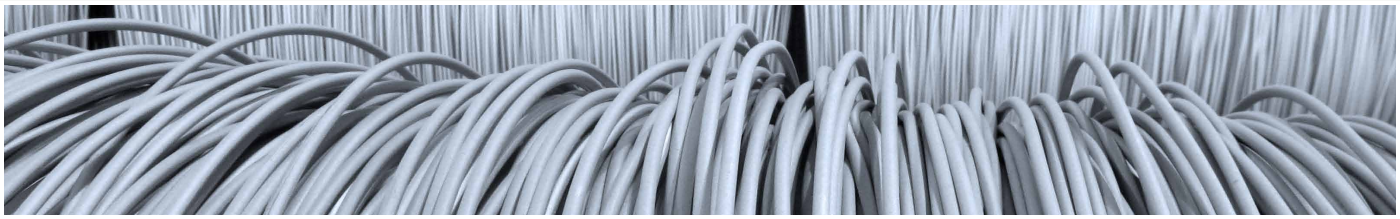

Structure	STEEL GRADES														CWH	Md30	PRE	USAGE						
	EN. Nr	TYPE / AWS		FAGERSTA												Nohara		Welding	Cold heading	Spring	High temperature	Bright forming	Spoke
				Designation	C	Si	Mn	Cr	Ni	Mo	N	Others				°C							
					%	%	%	%	%	%	%	%		%										
Ferritic		409 Cb		R 108.10	0.030	0.60	0.60	11.30	0.35	0.10*	0.040*	Nb	0.50				12	●					
	1.4512	409 Ti		R 109.11	0.030*	0.50	0.55	11.30	0.50*	0.10*	0.040*	Ti	0.75				12		●		●		
	1.4016	430		R 250.11	0.020*	0.30	0.70	16.40	0.30*	0.10*	0.030*						17		●			●	
	1.4016	430		R 250.17	0.050	0.40	0.50	16.80	0.30*	0.50*	0.050*						17						●
	1.4016	430		R 250.30	0.020*	0.30	0.70	16.40	0.30*	0.10*	0.050						17		●			●	
		430 LCb		R 258.10	0.020*	0.40	0.50	18.20	0.30*	0.30*	0.024*	Nb	0.45				20	●					
		439 Ti		R 259.12	0.020*	0.70	0.70	17.50	0.25*	0.10*	0.025*	Ti	0.40				18	●					
		446		R 270.70	0.050	0.50	1.00	23.90	0.50*	0.54*	0.085						27						
Austenitic	1.4301	302		R 320.14	0.050	0.40	0.75	17.80	8.60	0.60*	0.035				120	-1	19		●				
	1.4301	304		R 350.19	0.030	0.40	1.50	18.20	8.20	0.60*	0.050*				108	9	20		●			●	●
	1.4303	305		R 390.21	0.015*	0.40	0.55	17.70	11.20	0.60*	0.030*				91	-47	19		●				
	1.4307	304 L		R 350.20	0.025*	0.45	1.20	18.50	9.75	0.60*	0.030*				90	-25	20		●				
	1.4307	304 L		R 350.43	0.020*	0.50	1.15	18.30	8.50	0.60*	0.060*				93	2	20		●			●	
	1.4310	302		R 300.15	0.100	1.10	1.25	16.80	7.70	0.65	0.045				149	-5	20			●			
	1.4310	302		R 300.20	0.052	0.45	1.20	17.40	8.25	0.60*	0.050				128	4	19			●			●
	1.4310	302		R 300.31	0.100	0.90	1.25	17.30	8.20	0.60*	0.030*				139	-8	19			●			
	1.4310	302		R 320.17	0.070	0.45	1.25	18.35	8.10	0.60	0.040				130	-10	20			●			
	1.4372	201		R 520.12	0.090	0.45	5.90	17.00	5.30	0.60*	0.070						20						●
	1.4401	316		R 420.18	0.050	0.35	1.55	16.80	10.70	2.10	0.060*				102	-85	24			●			
	1.4404	316 L		R 425.10	0.020*	0.35	1.55	16.80	11.20	2.10	0.050*				92	-90	24		●			●	
	1.4436	316 L		R 440.10	0.030*	0.50	1.55	16.80	11.60	2.60	0.050*				91	-103	26		●				
	1.4539	385	904 L	R 840.70	0.015*	0.35	1.75	20.00	25.00	4.50	0.050	Cu	1.50				35	●			●		
	1.4541	321		R 359.10	0.030	0.50	1.15	17.80	9.20	0.60*	0.020*	Ti	0.35		94	5	19			●			
	1.4547		254 SMO	R 847.10	0.018*	0.35	0.45	19.90	17.90	6.10	0.200	Cu	0.70				44				●		
	1.4567	304 Cu	302 HQ	R 575.21	0.015*	0.40	0.55	17.90	9.70	0.40*	0.025*	Cu	3.50				19		●				
	1.4571	316 Ti		R 429.15	0.030*	0.40	1.75	16.60	10.60	2.10	0.030*	Ti	0.20		94	-58	24						
	1.4578	316 Cu		R 545.11	0.030*	0.35	0.55	17.00	10.80	2.20	0.040*	Cu	3.20				25		●				
	1.4828			R 323.10	0.045	1.95	1.20	19.30	11.70	0.60*	0.030				93	-130	21				●		
	1.4835		253 MA	R 327.10	0.075	1.60	0.50	21.00	10.20	0.30*	0.165	Ce	0.055				26				●		
		314		R 823.11	0.030*	2.70	1.75	23.50	19.40	0.60*	0.060*						26				●		
	1.4841	314		R 823.13	0.020*	2.25	1.75	24.30	20.70	0.50*	0.050*						26				●		
	1.4845	310 S		R 820.10	0.045	0.65	1.50	24.70	19.40	0.60*	0.050*						26				●		
	1.4864			R 860.10	0.030*	1.25	1.80	15.30	33.50	0.60*	0.070						18				●		
	1.4886	330		R 860.13	0.030*	1.25	0.75	18.50	34.50	0.50*	0.060*						21				●		
			Incoloy DS	R 863.13	0.030*	2.30	1.20	18.00	36.50	0.50*	0.070						21				●		
		330 Cb	35-19 Cb	R 868.11	0.025*	1.85	0.50	19.50	34.50	0.30*	0.060*	Nb	0.87				21				●		
	18 8 SiMn	307		R 526.18	0.070	0.90	6.90	19.10	8.80	0.30*	0.045						21	●					
	18 8 SiMn	307		R 526.70	0.080	0.87	7.00	18.20	8.00	0.34*	0.060*	S	0.009				20	●					
	19 12 3 Nb	ER 318		R 448.11	0.040	0.40	1.80	19.30	11.60	2.60	0.040	S	0.011	Nb 0.62			29	●					
	19 12 3 SiNb	ER 318 Si		R 448.12	0.035	0.75	1.35	18.90	11.80	2.70	0.050	S	0.011	Nb 0.65			28	●					
	19 12 3 L	ER 316 L		R 466.10	0.015*	0.40	1.75	18.30	12.20	2.60	0.040	S	0.010				27	●					
	19 12 3 L	E 316 L		R 466.70	0.018*	0.12	1.75	18.40	11.45	2.65	0.040	S	0.011				28	●					
	19 12 3 L	ER 316 L		R 466.71	0.018*	0.40	1.75	18.60	12.30	2.60	0.030	S	0.010				28	●					
	19 12 3 LSi	ER 316 LSi		R 466.72	0.023*	0.90	1.80	18.35	12.25	2.60	0.050	S	0.011				28	●					
	19 13 4 L	ER 317 L		R 476.25	0.020*	0.40	1.50	18.80	13.70	3.60	0.050	S	0.010				31	●					
	19 9 NbSi	ER 347 Si		R 358.16	0.035	0.85	1.30	19.40	9.80	0.30*	0.040	S	0.010	Nb 0.60			21	●					
	19 9 Nb	ER 347		R 358.22	0.050	0.47	1.80	19.60	9.20	0.30*	0.030	S	0.009	Nb 0.60			21	●					
	19 9 H	ER 308		R 326.12	0.050	0.40	1.80	20.25	9.25	0.30*	0.050	S	0.010				23	●					
	19 9 L	ER 308 L		R 366.10	0.015*	0.40	1.80	19.70	10.20	0.20*	0.050	S	0.011				21	●					
	19 9 L	ER 308 L		R 366.19	0.020*	0.20*	1.80	19.90	10.10	0.24*	0.050						21	●					
	19 9 L	E 308 L		R 366.70	0.012*	0.12	1.80	20.00	10.00	0.10*	0.040	S	0.008				21	●					
	19 9 L	ER 308 L		R 366.71	0.023*	0.40	1.80	19.70	10.10	0.30*	0.055	S	0.011				22	●					
	19 9 LSi	ER 308 LSi		R 366.72	0.023*	0.90	1.80	19.85	10.35	0.30*	0.065	S	0.011				22	●					
	23 12 L	ER 309 L		R 806.20	0.018*	0.42	1.80	23.50	13.70	0.30*	0.080	S	0.010				26	●					
	23 12 LSi	ER 309 LSi		R 806.24	0.025*	0.90	1.60	23.30	13.80	0.30*	0.120	S	0.010				27	●					
	23 12 2 L	309 LMo	P5	R 816.10	0.015*	0.37	1.50	21.50	15.00	2.70	0.060						31	●					
	25 20	E 310		R 826.20	0.100	0.45	1.75	25.90	20.80	0.30*	0.060*						27	●					
	25 20	ER 310		R 826.70	0.120	0.40	1.75	25.90	20.80	0.30*	0.060*						27	●					
Duplex	1.4162		2101	R 617.10	0.030	0.70	5.00	21.50	1.50	0.30	0.220	Cu	0.30				28						●
	1.4362		2304	R 630.10	0.015	0.45	0.95	22.50	4.70	0.25	0.110	Cu	0.20				26						
	1.4362		2304	R 630.21	0.015	0.45	0.95	22.50	4.70	0.25	0.110	Cu	0.20				26						
	1.4662		2209	R 646.21	0.013*	0.50	1.60	23.00	8.75	3.15	0.160						37	●					
	1.4462		2205	R 647.70	0.017	0.50	0.85	22.20	5.20	3.20	0.180						37						
		312	29-9	R 656.70	0.100	0.40	1.85	30.35	9.20	0.34*	0.055						32	●					
PH	1.4568	631	17-7 PH	R 560.21	0.078	0.35	0.75	16.50	7.65	0.40*	0.020*	Al	0.95				17			●			
	1.4542	630	17-4 PH	R 565.10	0.025	0.40	0.70	15.90	4.85	0.50*	0.040*	Cu	3.50				18						
		660	A286 VAR	R 569.60	0.050	0.20	1.00	14.60	24.70	1.20	0.020*	V	0.25	Ti 2.10			19		●		●		

Selected steel grades from our standard range. Customized chemistries on demand. (* Max)

FAGERSTA Stainless

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