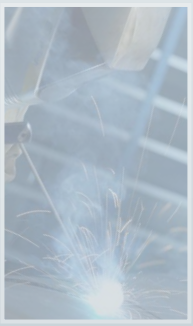
FAGERSTA Stainless

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 SPRINGS

To get best possible properties for spring 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 SPRINGS

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
1.4310	302		R 300.15	0.100	1.10	1.25	16.80	7.70	0.65	0.045	630-730	149	-5	20
1.4310	302		R 300.20	0.052	0.45	1.20	17.40	8.25	0.60*	0.050	590-690	128	4	19
1.4310	302		R 300.31	0.100	0.90	1.25	17.30	8.20	0.60*	0.030*	600-700	139	-8	19
1.4310	302		R 320.17	0.070	0.45	1.25	18.35	8.10	0.60	0.040	590-690	130	-10	20
1.4401	316		R 420.18	0.050	0.35	1.55	16.80	10.70	2.10	0.060*	550-650	102	-85	24
1.4541	321		R 359.10	0.030	0.50	1.15	17.80	9.20	0.60*	0.020*	500-600	94	5	19
1.4568	631	17-7PH	R 560.21	0.078	0.35	0.75	16.50	7.65	0.40*	0.020*	580-820			17

(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

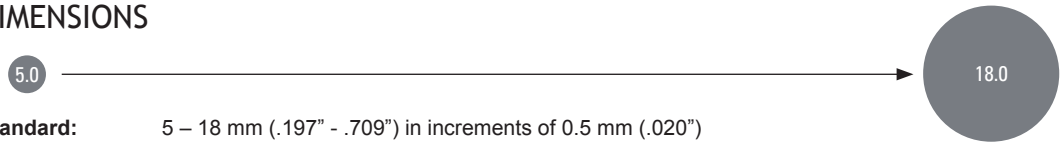
PRE (= Pitting Resistance Equivalent = Cr + 3.1 x Mo + 25 x N) is a factor comparing properties of different chemistries with regards to pitting and crevice corrosion in corrosive environments. A higher value means better resistance. In the table above, PRE is shown for the grades we recommend for springs.

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

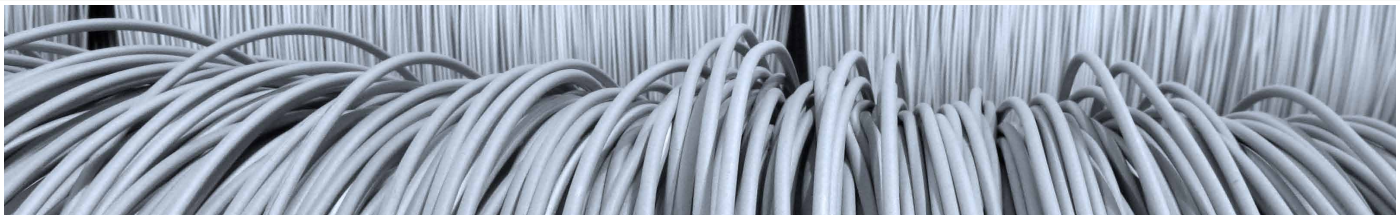
Ovality: Max 60% of the total tolerance span.

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

ENG, 2012, Edition 1



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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