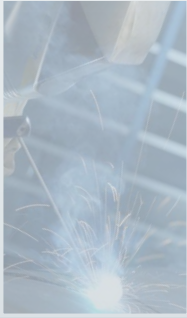




## Wire Rod

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 HIGH TEMPERATURE

To get best possible properties for high temperatures, following parameters are important:

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

## STANDARD STEEL GRADES FOR HIGH TEMPERATURE

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/mm <sup>2</sup>	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*	350-450			12
1.4539	385	904 L	R 840.70	0.015*	0.35	1.75	20.00	25.00	4.50	0.050	540-640			35
1.4547		254 SMO	R 847.10	0.018*	0.35	0.45	19.90	17.90	6.10	0.200	650-750			44
1.4828			R 323.10	0.045	1.95	1.20	19.30	11.70	0.60*	0.030	550-650	93	-130	21
1.4835		253 MA	R 327.10	0.075	1.60	0.50	21.00	10.20	0.30*	0.165	630-750			26
	314		R 823.11	0.030*	2.70	1.75	23.50	19.40	0.60*	0.060*	540-640			26
1.4841	314		R 823.13	0.020*	2.25	1.75	24.30	20.70	0.50*	0.050*	510-610			26
1.4845	310 S		R 820.10	0.045	0.65	1.50	24.70	19.40	0.60*	0.050*	520-620			26
1.4864			R 860.10	0.030*	1.25	1.80	15.30	33.50	0.60*	0.070	520-620			18
1.4886	330		R 860.13	0.030*	1.25	0.75	18.50	34.50	0.50*	0.060*	500-600			21
		Incoloy DS	R 863.13	0.030*	2.30	1.20	18.00	36.50	0.50*	0.070	570-670			21
	330 Cb	35-19 Cb	R 868.11	0.025*	1.85	0.50	19.50	34.50	0.30*	0.060*	530-630			21
	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 high temperatures.

## 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

5.0

18.0

**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.

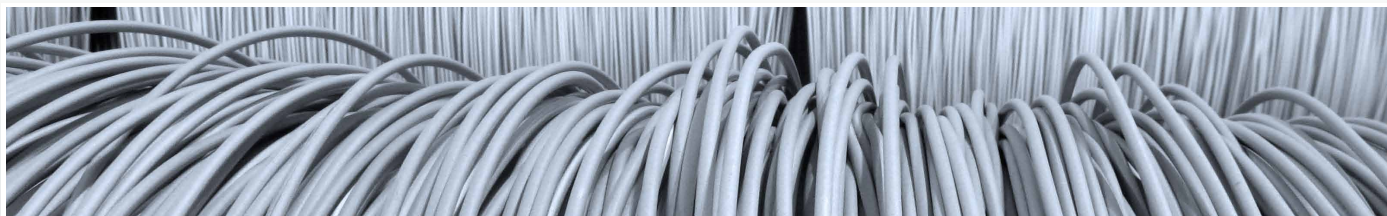
**Surface classes:** Class 3 is the standard class which has a max defect depth of 0.10 mm for dimensions ≤ 10 mm and 1% of the diameter for dimensions > 10 mm. Welding rod has class 2 (max 0.20).

## PACKAGING METHODS

Coil weight: Appr. 1000 kg

Outer diameter: Max 1250 mm

Inner diameter: Max 950 mm



Structure	STEEL GRADES													CWH	Md30	PRE	USAGE							
	EN. Nr	TYPE / AWS	Designation	FAGERSTA													Nohara	°C	Welding	Cold heading	Spring	High temperature	Bright forming	Spoke
				C	Si	Mn	Cr	Ni	Mo	N	Others													
		%	%	%	%	%	%	%	%	%	%	%												
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		19		•			•		
	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		19			•			•	
	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		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		19		•					
	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		19						•	
				R 823.11	0.030*	2.70	1.75	23.50	19.40	0.60*	0.060*				26		19						•	
	1.4841	314		R 823.13	0.020*	2.25	1.75	24.30	20.70	0.50*	0.050*				26		19						•	
	1.4845	310 S		R 820.10	0.045	0.65	1.50	24.70	19.40	0.60*	0.050*				26		19						•	
	1.4864			R 860.10	0.030*	1.25	1.80	15.30	33.50	0.60*	0.070				18		19						•	
	1.4886	330		R 860.13	0.030*	1.25	0.75	18.50	34.50	0.50*	0.060*				21		19						•	
			Incoloy DS	R 863.13	0.030*	2.30	1.20	18.00	36.50	0.50*	0.070				21		19						•	
		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		19						•	
		18 8 SiMn	307	R 526.18	0.070	0.90	6.90	19.10	8.80	0.30*	0.045				21		19		•					
		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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		•					
	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		19		•					
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		19		•						
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		19		•						
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		19		•						
25 20	E 310		R 826.20	0.100	0.45	1.75	25.90	20.80	0.30*	0.060*				27		19		•						
25 20	ER 310		R 826.70	0.120	0.40	1.75	25.90	20.80	0.30*	0.060*				27		19		•						
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		19						•		
	1.4362		2304	R 630.10	0.015	0.45	0.95	22.50	4.70	0.25	0.110	Cu 0.20		26		19								
	1.4362		2304	R 630.21	0.015	0.45	0.95	22.50	4.70	0.25	0.110	Cu 0.20		26		19								
	1.4662		2209	R 646.21	0.013*	0.50	1.60	23.00	8.75	3.15	0.160			37		19								