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# COLUMBUS SPECIFICATION

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## I. SCOPE

This publication covers the chemical and mechanical limits for Columbus Stainless grades.

## II. VALIDITY

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## III. ENQUIRIES

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# 1. CHEMICAL COMPOSITION

Group	Grade	C	S	P	Mn	Si	Cr	Ni	Mo	N	Ti	Other
Ferritic Stainless Steel	3CR12	0.030	0.015	0.040	1.50	1.00	10.5 - 12.5	0.30 - 1.50	-	0.030	4x(C+N) - 0.6	-
	3CR12L	0.030	0.015	0.040	1.50	1.00	10.5 - 13.5	0.30 - 1.00	-	0.030	-	-
	3CR12HP400	0.030	0.015	0.040	1.50	1.00	10.5 - 13.5	0.30 - 1.00	-	0.030	-	-
	3CR12TG	0.12	0.030	0.040	1.00	1.60	10.5 - 18.0	1.00	-	0.10	1.00	-
	CS409L	0.030	0.020	0.040	1.00	1.00	10.5 - 11.7	0.5	-	0.03	6x(C+N) - 0.5	Nb≤0.17
	430	0.12	0.030	0.040	1.00	1.00	16.0 - 18.0	0.75	-	-	-	-
	430DDQ	0.08	0.030	0.040	1.00	1.00	16.0 - 18.0	0.40	-	-	-	-
	436T	0.025	0.020	0.040	0.50	0.60	17.0 - 19.0	-	0.75 - 1.5	0.020	-	-
	439L	0.030	0.030	0.040	1.00	1.00	17.0-19.0	0.50	-	0.030	1.10	-
	439Nb	0.030	0.030	0.040	1.00	1.00	17.0 - 19.0	0.50	-	0.30	-	Ti+Nb≥0.20+4*(C+N) Al≤0.15
441	0.030	0.015	0.040	1.00	1.00	17.5 - 18.5	-	-	-	0.10 - 0.60	Nb≤1.00	
HSS441	0.030	0.030	0.040	1.00	1.00	17.5 - 19.5	-	-	0.1	0.10 - 0.60	Nb≤1.00	
Austenitic Stainless Steel	CS20211	0.075	0.010	0.045	7.0 - 9.0	0.60	16.0 - 17.0	4.0 - 5.0	0.56	0.15	-	Cu:1.50 - 2.10
	304DDQ	0.08	0.030	0.045	2.00	1.00	18.0 - 19.0	8.5 - 10.5	-	0.10	-	-
	309Si	0.20	0.015	0.045	2.00	1.50 - 2.50	19.0 - 20.0	11.0 - 13.0	-	0.11	-	-
	314	0.20	0.015	0.045	2.00	1.50 - 2.50	24.0 - 26.0	19.0 - 22.0	-	0.11	-	-
Carbon Steel	CQ-108	0.12	0.040	0.040	1.2	-	1.00	1.00	0.20	-	-	Cu≤0.50
	CQ-135	0.16	0.030	0.035	1.7	0.55	-	0.55	0.20	0.020	-	Nb≤0.05 V≤0.120
	MS200YS	0.10	0.035	0.030	0.50	-	0.40	0.40	0.15	-	-	Cu≤0.40
	S355MHL0Si	0.14	0.030	0.035	1.50	0.15 - 0.25	-	0.30	0.20	0.020	0.05	V≤0.10 Al≥0.20 Cr+Cu+Mo≤0.60 CEV≤0.39
	X42-LoSi	0.26	0.030	0.030	1.50	0.15 - 0.25	0.50	0.50	0.15	-	-	Cu≤0.50 Nb+V+Ti≤0.15
	X52-LoSi	0.26	0.030	0.030	1.50	0.15 - 0.25	0.50	0.50	0.15	-	-	Cu≤0.50 Nb+V+Ti≤0.15

**Notes**

1. Compositions are maximum values, unless otherwise stated.

## 2. MECHANICAL PROPERTIES

Group	Grade	Gauge [mm]	Rm [MPa]	Rp0.2% [MPa]	A50 [%]	A5/A80 [%]	HRB min. [HRBW]	HV min. [HV]	Bend <sup>2</sup>	Impact min. [J]	Grain Size min.
Ferritic	3CR12	0 - 2.99	460	280	18	-	95	-	180° @ 1T	-	-
		3.00 - 9.50		300					180° @ 2T		
		9.51 - 12.00									
		12.01-50.00									
	3CR12L	0 - 2.99	460	280	18	-	95	-	180° @ 1T	-	-
		3.00 - 9.50		300					180° @ 2T		
		9.51-12.00									
		12.01-50.00									
	3CR12HP400	3.00 - 5.50	460	400	16	-	95	-	180° @ 2T	-	-
	3CR12TG	0-2.00	380	170 - 500	10	-	-	-	-	-	-
		2.01 - 2.50	414	170 - 450							
	CS409L	0 - 9.50	380	170	20	-	88	-	180° @ 1T	-	-
		9.51 - 25.00							180° @ 2T		
		25.01 - 75.00							-		
	430	0 - 12.00	430	205	18	-	89	-	-	-	-
	430DDQ	0 - 15.00	430	205	26	-	88	-	180° @ 1T	-	7.0 - 8.5
436T	0 - 10.00	410	205 - 350	28	-	-	230	-	-	-	
439L	0 - 9.50	415	205	22	-	89	-	180° @ 1T	-	-	
439Nb	0 - 75.00	415	205	22	-	89	-	180° @ 1T	-	-	
441	0 - 8.00	400 - 550	250	23	-	89	-	-	-	-	
HSS441	0 - 1.99	410	245	28	-	-	240	180° @ 2T	-	-	
	2.00 - 6.35			25							
Austenitic	CS20211	0 - 75.00	515	205	40	-	100	-	-	-	-
	304DDQ	0 - 3.50	515	165	40	-	92	-	-	-	-
	309Si	0 - 75.00	550 - 750	230	30	-	95	-	-	-	-

Group	Grade	Gauge [mm]	Rm [MPa]	Rp0.2% [MPa]	A50 [%]	A5/A80 [%]	HRB min. [HRBW]	HV min. [HV]	Bend <sup>2</sup>	Impact min. [J]	Grain Size min.
Carbon Steel	MS200YS	0 - 40.00	300	200	-	20	-	-	-	-	-
	S355MHL0Si	0 - 40.00	450 - 610	355	-	22	-	-	-	40	6
	X42-LoSi	0 - 16.00	290	415	<sup>5</sup>	-	-	-	-	-	-
	X52-LoSi	0 - 16.00	360	460	<sup>5</sup>	-	-	-	-	-	-

**Notes**

1. Limits are minimum values, unless otherwise stated.
2. T value for mandrel diameter corresponds to thickness of material
3. High temper
4. HRC, max individual measurement is 36 HRC
5.  $A_{api}$  minimum calculated based on the minimum tensile strength and specimen cross sectional area

### 3. SUMMARY OF CHANGES

Revision	Paragraph	Detail of Change
0	1	Split out from TCS-IDP-001 Changes to correspond with ASTM and EN limits for multiple certification: - 3CR12: Mn, N - 3CR12L & 3CR12HP: Cr, N
1	1 2	Change CS304DDQ to 304DDQ and removed Cu limit Updates 430DDQ Cr & N Bend parameters added Bend foot notes added Gauge ranges split for different limits
2		System and documentation revision 22 Changed name to only Columbus Specification, as reported on test certificates Include ferritic grades CS409L, 430, 436T, 439Nb, 441 and HSS441 Include austenitic grades RSSA301L, 309Si and 314 Include carbon steel grades
3		System and documentation revision 23 Include ferritic 439L Removed austenitic grade RSS301L Include carbon steel grades X42-LoSi and X52-LoSi

### 4. DOCUMENT APPROVAL

	Job Title	Co No
Prepared by	Engineer: Technical Customers Services	5736
Verified by	Manager: Technical Customers Services	1885
Accepted by	Business Unit Manager: Technical	8412