

September 23, 2002
EWI Project No. 43149GTH

Selection of Materials to Minimize Welding Emissions from Manganese, Nickel, and Chromium

Revision 1

**NSRP ASE Project – Reduction of Worker Exposure and
Environmental Release of Welding Emissions**

Technology Investment Agreement No. 2000922

Submitted to:

**NSRP ASE Program
Advanced Technology Institute
North Charleston, SC**

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Report

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on

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and Chromium**

to

**NSRP ASE Program
Advanced Technology Institute
North Charleston, South Carolina**

September 23, 2002

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1.0 Introduction

The primary goal of this project is to identify and develop ways in which current shipyard practices may be changed in order to reduce worker exposure to welding fumes. This report addresses the substitution of materials as one possible engineering control to reduce worker exposure to welding and cutting fumes containing chromium, nickel, and manganese compounds. Although recommended safe practices for welding and allied processes have been well established over the years¹, regulatory limits on exposure to certain elements have become more restrictive, leading to the necessity of more rigorous controls when materials containing those elements are being welded. The Occupational Safety and Health and Safety Administration² (OSHA) and the American Conference of Governmental Industrial Hygienists³ (ACGIH) have put particular emphasis on reducing worker exposure to fumes that contain oxides of nickel, manganese and/or chromium. This includes OSHA's announced intention of reducing the Permissible Exposure Limit (PEL) for hexavalent chromium from the present ceiling limit of 100 $\mu\text{g}/\text{m}^3$ to an eight-hour time-weighted average (TWA) for hexavalent chromium (Cr VI) of between 0.5 and 5.0 $\mu\text{g}/\text{m}^3$.

Previous work concluded that workers who perform welding and cutting operations may be exposed to fumes containing nickel, manganese, chromium and hexavalent chromium⁴. The level of exposure depends on the process and materials used, the length of exposure, and other factors in the working environment. Fumes from welding and cutting carbon steels, low alloy steels, and stainless steels contain manganese. Those from stainless steels, nickel-chromium alloys, HY-80 steel, and HY-100 steel contain chromium, nickel, and hexavalent chromium.

It has been established that the higher the alloy in the base material and filler material, the more of that element will be present in the welding fume. Approximately 90 percent of the fumes generated during welding come from the filler metal, with the other 10 percent coming from the base material. Manufacturers' Material Safety Data Sheets (MSDS) list the primary elements for each base and filler material. Welding filler materials typically have chemical compositions similar to the base materials being welded in order to provide matching strength, corrosion resistance, and other properties. Therefore, it may be possible to reduce the exposure to hexavalent chromium, for example, by specifying lower chromium base materials which could, in turn, be welded using lower chromium filler materials. Similarly, selection of materials with reduced nickel and manganese can reduce the levels of these elements in fume. However, it is important to keep in mind that alloying elements such as manganese, chromium, and nickel have been added to a material for a reason, typically for strengthening, toughness, improved high-temperature properties, corrosion resistance, or some combination of these properties.

Consequently, due consideration must be given to the intended application of a material prior to changing the specification for that material. On the other hand, if it is possible to specify a material with a lower chromium, nickel, or manganese content for a particular application without any degradation of properties, then efforts should be made to do so.

Another possibility would be to use consumables which undermatch the strength of the base material, i.e., filler materials which do not contain chromium, or contain reduced levels of chromium. Since about 90 percent of the fumes in welding come from the consumable, this could dramatically lower the exposure to hexavalent chromium. Whether or not this is a viable option depends, again, on the specific application for which the material is intended, and careful consideration must be given to mechanical property, high temperature and corrosion property requirements.

Data from a survey of U.S. shipbuilders reveals that over 93 percent of the materials welded during ship construction are steels⁴. Nearly 85 percent of this total is made up of mild steel grades and approximately 8 percent are high strength steels. Stainless steels represent about 2.7 percent of the welded fabrications in ship construction. The remainder of the materials include aluminum, nickel, titanium, and copper alloys. Steels, including high strength steels such as HY-80 and HY-100 are used for hulls, superstructure, and machinery components of ships and submarines. Stainless steels are used primarily in piping systems and valves. Some of the nickel alloys, including alloys 600, 625, and 276 are used in piping systems and for cladding of the HY-80 and HY-100.

2.0 Classification of Alloys

The table in the Appendix was developed to facilitate the classification of materials according to their chromium and nickel contents. Since the majority of these materials contain small percentages of manganese, this element is listed only for those materials that contain relatively high manganese levels. The table includes approximately 2500 alloys which are arranged according to the alloy specification number and type. Specifications include ASTM, SAE-AISI, API, ABS, AMS and military specifications.

2.1 Development of Alloy Classifications

NAVSEA Technical Publication S9074-AQ-GIB-101/248, *Requirements for Welding and Brazing Procedure and Performance Qualifications* (which supersedes MIL-STD-248D) groups base

materials according to chemistry for welding. The “S-numbers” are based on alloy content. Table 1 lists the S-number designations along with the approximate alloy ranges that they represent. Although there are other alloy type designations listed in S9074-AQ-GIB-101/248, including aluminum, copper and titanium alloys, the overwhelming majority of the material welded by the Navy and the shipbuilding industry is iron-based plus a small percentage of nickel-based alloys. Consequently, these are the types of alloys which are covered in Table 1 and the Appendix.

The overwhelming majority of the materials listed in the Appendix have not been classified by the Navy according to S-number. The S-numbers listed are those to which the material would most likely be designated if it were classified. In some cases, there may be more than one group to which a material could belong, due to the fact that a range of chemistries is specified and there may be some overlap with several of the ranges. In those cases, if the fit were clearly better with one group than the other, then that is the group which is listed. In those cases in which there was not a clear disposition, both groups were listed. In other cases, the material did not fit well into any grouping (a good example of such a material might be a maraging steel). For those materials, no group was specified.

One purpose for the Appendix is to separate materials according to their chromium content. Consequently, in addition to listing the S-numbers for the various materials, a second designation is listed according to chromium content. The materials are divided into four categories: low chromium, LCr ($\leq 0.5\%$ Cr); medium low chromium, MLCr ($> 0.5\%$, $\leq 2.5\%$ Cr); medium high chromium, MHCr ($> 2.5\%$, $\leq 10\%$ Cr); and high chromium, HCr ($> 10\%$ Cr). While these classifications are somewhat arbitrary, it is expected that anything listed as low chromium would pose the lowest risk in terms of hexavalent chromium exposure. Those listed as high chromium pose the highest risk of hexavalent chromium exposure. It should be noted that while a material may be listed in the low chromium category, the hazards associated with welding that material may not be low, depending on what other alloying elements it may contain.

Even specifying materials in the low chromium category may not be sufficient to prevent all exposure to hexavalent chromium. Data shows chromium exposure may occasionally exceed $0.5 \mu\text{g}/\text{m}^3$ even for mild steel welding. While chromium would only be present in mild steel base materials and welding consumables as a “tramp” element, it may be necessary to specify lower chromium limits than are currently included in most mild steel specifications. Regardless of what materials are being welded, it is a good idea to perform periodic checks of worker exposure in all areas of welding and cutting.

2.2 Use of Alloy Classification Appendix

The Appendix is intended to be used as a guideline for classifying base materials according to their chromium, nickel, and manganese contents for the purposes of welding. A base material which contains a higher chromium level would be expected to generate a higher level of hexavalent chromium than one that contains less chromium. Consequently, if there are several possible materials available for a given program, this Appendix may be used to differentiate which material may be a better choice in terms of hexavalent chromium exposure. The Appendix also can be used to identify materials that have high nickel and manganese contents that may lead to increased levels of these elements in welding and cutting fumes.

Choosing filler metals with reduced levels of manganese, nickel, and chromium will also be useful in reducing worker exposure to these materials. Table 2 lists “A-Number” designations, by which filler materials may be classified. Other sources of information on filler materials may be found in the AWS or military specifications, and on the manufacturers’ MSDS’s.

3.0 Conclusions

As more information becomes available regarding the hazards of various elements in welding, and as regulations become increasingly restrictive, it becomes imperative to protect workers and minimize exposure. Making an informed choice when specifying base materials may be the first step in reducing worker exposure to some of the potentially hazardous materials that are present in materials which are used in ship and submarine construction. While it may not be possible in many cases to eliminate these materials completely, giving due consideration to the composition prior to specifying a particular material, may help to alleviate the potential for exposure.

4.0 Recommendations

- Consider welding fume exposure issues prior to specifying materials for a given project.
- Include hexavalent chromium and other exposure issues as a design consideration in the development of specifications for future programs.
- Limit chromium, nickel, and manganese whenever possible by choosing materials with the lowest practical levels of these elements.

- Set maximum chromium limits on all materials, including mild steels and other materials in which chromium would not be expected to be an issue.
- Always follow the guidelines set forth in ANSI Z49.1 – Safety in Welding, Cutting, and Allied Processes, and the manufacturers' MSDS to minimize exposure to welding fumes.

5.0 References

1. ANSI A49.1 – Safety in Welding, Cutting, and Allied Processes, American Welding Society, Miami, FL.
2. U. S. Department of Labor Occupational Safety and Health Administration, Washington, D.C., <<http://www.osha.gov>>
3. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, <<http://www.acgih.org>>
4. “Impact of Recent and Anticipated Changes in Airborne Emission Exposure Limits on Shipyard Workers”, National Shipbuilding Research Program (NSRP) Report NSRP 0463, U.S. Department of the Navy, Carderock Division, Naval Surface Warfare Center, March 1996.
5. NAVSEA Technical Publication S9074-AQ-GIB-101/248, *Requirements for Welding and Brazing Procedure and Performance Qualification*, Naval Sea Systems Command, Washington, D.C.

Table 1. Major NAVSEA Base Material Groups

Group	Material Type	% Chromium	% Nickel	Other
S-1	Carbon Steel	0.5% Max.	0.5% Max.	
S-2	Quenched & Tempered Carbon Steel	0.5% Max.	0.5% Max.	
S-3	Carbon Molybdenum Steel	0.25 – 0.45%	—	
S-3A	Alloy Steels	0.75% Max.	—	< 2% Total Alloy
S-4	Alloy Steels	0.75 – 2.0%	—	< 2.75% Total Alloy
S-5	Alloy Steels	—	—	< 10% Total Alloy
S-6, S-6A	High Alloy Steels	11.5 – 14%	—	Martensitic
S-7	High Alloy Steels	12 – 18%	—	Ferritic
S-8	High Alloy Steels	16 – 26%	5 – 16%	Austenitic
S-10H	High Alloy Steels	21 – 27%	4 – 6%	Duplex Stainless
S-11A	Quenched & Tempered Alloy Steels	1 – 1.8%	1 – 3.5%	Includes HY-80/ HY-100
S-11B	Quenched & Tempered Alloy Steels	0.4 – 0.7%	3 – 4%	Includes HY-130
S-11C	Age Hardening Alloy Steel	0.6 – 0.9%	0.7 – 1.5%	Includes HSLA 80
S-11D	Age Hardening Alloy Steel	0.45 – 0.75%	0.7 – 1.5%	Includes HSLA 100
S-43	Nickel/Chromium/Iron Alloys	14 – 23%	60 – 70%	Includes Inconel 625
S-44	Nickel/Molybdenum/Chromium Alloys	14 – 16%	55 – 60%	Includes C-276

Source: NAVSEA S9074-AQ-GIB-010/248

Table 2. Major NAVSEA Filler Material Groups

Group	% Chromium	% Nickel	Filler Materials
A-1A, 1B	--		<p>Containing less than 0.5% Chromium Low and Medium Carbon Steel (covered electrodes wire) Carbon and low alloy steel (covered electrode), E7018 Carbon and low alloy steel (solid wire) ER70S-X Low alloy steel (flux cored wire), E70T-1, E71T-1 Carbon and low alloy steel (covered electrode, solid wire, flux cored wire), E8018-C3, C, C2, ER80S-X and E80T1-Ni1, -Ni2 Low alloy high-yield steel E10018-N1 Aluminum alloy ER5356, ER5554, ER5654</p> <p>Containing between 0.5% and 2.5% Chromium Low alloy, high-yield steel (covered electrode, solid wire, flux cored wire), E10018-M1, E11018-M, E12018-M2, ER100S-1, ER120S-1, E101TM Cr-Mo steel (1.0 to 2.50% Cr, 0.4 to 1.2% Mo) (wire and electrode), E8018-B2L, E9018B3L ER80S-B2L, ER90S-B3L</p> <p>Containing over 2.5% Chromium 5 and 9 Cr-Mo and E410 stainless covered electrode 5 and 9 Cr-Mo and ER410 stainless bare wire 430 stainless electrode and wire, High alloy steel</p> <p>High alloy steel (austenitic) (wire, rod, and insert), 308, 309, 310, 316 Duplex stainless electrodes and bare wire Surfacing alloys RNiCr-B, C Surfacing alloys ECoCr-A, C Surfacing alloys RCoCr-A, C Nickel base alloys (covered electrode), 1N12, 8N12 Nickel base alloys (bare wire), EN62, 82, 625 Nickel-molybdenum-chromium alloys ENiCrMo-4</p>
A-2A	0.15 max	0.4 max	
A-2B, 2C			
A-2D	0.20 max		
A-3A, 3B, 3C,3D	0.15 max	0.8-3.75	
A-4A			
A-22B	0.25 max		
A-5A, 5B, 5C, 5D	0.8 max	1.25-3.8	
A-6A, 6B	1-2.5	0.3 max	
A-7A-1,2	4-12	0.7 max	
A-7B-1,2			
A-7C, D	15-18		
A-8A	14-32	0.6 max	
A-8B	18-32	0.3 max	
A-9A, B	21-23	0.3 max	
		8.5-10.5	
A-38B	8-18		
A-39A	26-32	66-82	
A-39B	26-32	3	
A-43A	13-23	3	
A-43B	14-23	58-70	
A-45A, B	14.5-16.5	58-70	
		50-60	

Source: NAVSEA S9074-AQ-GIB-010/248

Appendix

Classification of Alloys

Classification of Alloys

Designation	Grade or Class	% Cr	% Ni	Group	Cr Group	Comments
ASTM A27	N-1	--	--	S-1	LCr	
ASTM A27	N-2	--	--	S-1	LCr	
ASTM A27	U60-30	--	--	S-1	LCr	
ASTM A27	60-30	--	--	S-1	LCr	
ASTM A27	65-35	--	--	S-1	LCr	
ASTM A27	70-36	--	--	S-1	LCr	
ASTM A27	70-40	--	--	S-1	LCr	
ASTM A29						See applicable ASTM or AISI Specification
ASTM A36		--	--	S-1	LCr	
ASTM A53	Type F	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A53	Type E Gr A	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A53	Type E Gr B	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A53	Type S Gr A	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A53	Type S Gr B	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A82		n.s.	n.s.			
ASTM A105		0.30 Max.	0.40 Max.	S-1	LCr	
ASTM A106	A	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A106	B	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A106	C	0.40 Max.	0.40 Max.	S-1	LCr	
ASTM A108						See applicable AISI Specification
ASTM A120	All	--	--	S-1	LCr	
ASTM A128	A	--	--		LCr	11.0 Min. Mn
ASTM A128	B-1, B-2, B-3, B-4	--	--		LCr	11.5 - 14.0 Mn
ASTM A128	C	1.5 - 2.5	--		MLCr	11.5 - 14.0 Mn
ASTM A128	D	--	3.0 - 4.0		LCr	11.5 - 14.0 Mn
ASTM A128	E-1	--	--		LCr	11.5 - 14.0 Mn, 0.9 - 1.2 Mo
ASTM A128	E-2	--	--		LCr	11.5 - 14.0 Mn, 1.8 - 2.1 Mo
ASTM A128	F	--	--		LCr	11.5 - 14.0 Mn, 0.9 - 1.2 Mo
ASTM A131	A	--	--	S-1	LCr	
ASTM A131	B	--	--	S-1	LCr	
ASTM A131	CS	--	--	S-1	LCr	
ASTM A131	D	--	--	S-1	LCr	
ASTM A131	DS	--	--	S-1	LCr	
ASTM A131	E	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A131	AH32	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	DH32	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	EH32	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	AH36	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	DH36	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	EH36	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	AH40	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	DH40	0.25 Max	0.40 Max	S-1	LCr	
ASTM A131	EH40	0.25 Max	0.40 Max	S-1	LCr	
ASTM A134						see A283, A285, A570, A36
ASTM A135	A	--	--	S-1	LCr	
ASTM A135	B	--	--	S-1	LCr	
ASTM A139	A	--	--	S-1	LCr	
ASTM A139	B	--	--	S-1	LCr	
ASTM A139	C	--	--	S-1	LCr	
ASTM A139	D	--	--	S-1	LCr	
ASTM A139	E	--	--	S-1	LCr	
ASTM A148	All	n.s.	n.s.			As agreed to between supplier and purchaser
ASTM A161	Low C Grade	--	--	S-1	LCr	
ASTM A161	T1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A167	302	17.00 - 19.00	8.00 - 10.00	S-8	HCr	2.00 - 3.00 Si
ASTM A167	308	19.00 - 21.00	10.00 - 12.00	S-8	HCr	
ASTM A167	309	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A167	310	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A167	UNS S33228	26.00 - 28.00	31.00 - 33.00		HCr	0.05 - 0.10 Ce, 0.6 - 1.0 Nb
ASTM A167	UNS S35315	24.00 - 26.00	34.00 - 36.00		HCr	0.03 - 0.08 Ce
ASTM A176	UNS S32803	28.00 - 29.00	3.0 - 4.0		HCr	1.8 - 2.5 Mo, 0.15 - 0.50 Nb
ASTM A176	403	11.50 - 13.00	0.60 Max.	S-6, S-6A	HCr	
ASTM A176	405	11.50 - 14.50	0.60 Max.	S-6, S-6A	HCr	
ASTM A176	409	10.50 - 11.75	0.50 Max.		HCr	
ASTM A176	410	11.50 - 13.50	0.75 Max.	S-6, S-6A	HCr	
ASTM A176	410S	11.50 - 13.50	0.60 Max.	S-6, S-6A	HCr	
ASTM A176	420	12.00 - 14.00	0.75 Max.	S-6, S-6A	HCr	
ASTM A176	422	11.00 - 12.50	0.50 - 1.00	S-6, S-6A	HCr	0.90 - 1.25 Mo, 0.20 - 0.30 V, 0.90 - 1.25 W
ASTM A176	431	15.00 - 17.00	1.25 - 2.50	S-7	HCr	
ASTM A176	442	18.00 - 23.00	0.60 Max.		HCr	
ASTM A176	446	23.00 - 27.00	0.75 Max.		HCr	
ASTM A178	A	--	--	S-1	LCr	
ASTM A178	C	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A179	--	--	--	S-1	LCr	
ASTM A181	60	--	--	S-1	LCr	
ASTM A181	70	--	--	S-1	LCr	
ASTM A182	F1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A182	F2	0.50 - 0.81	--	S-3A	MLCr	Cr may exceed S-3A limit
ASTM A182	F12, CI 1 & 2	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A182	F11, CI 1, 2, 3	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A182	F22, CI 1 & 2	2.00 - 2.50	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A182	F22V	2.00 - 2.50	0.25 Max.	S-5	MLCr	0.9 - 1.1 Mo, 0.25 - 0.35 V
ASTM A182	F21	2.7 - 3.3	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A182	F3V	2.8 - 3.2	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.001 - 0.003 B
ASTM A182	F3VCb	2.7 - 3.3	0.25 Max.	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.070 Nb, 0.0005 - 0.0150 Ca
ASTM A182	F5	4.00 - 6.00	0.50 max	S-5	MHCr	0.44 - 0.65 Mo
ASTM A182	F5a	4.00 - 6.00	0.50 max	S-5	MHCr	0.44 - 0.65 Mo
ASTM A182	F7	6.00 - 8.00	--	S-5	MHCr	0.44 - 0.65 Mo <i>Obsolete</i>
ASTM A182	F9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A182	F91	8.0 - 9.5	0.40 Max.		MHCr	0.85 - 1.05 Mo
ASTM A182	FR	--	1.60 - 2.24	S-5	LCr	0.75 - 1.25 Cu
ASTM A182	F6a	11.50 - 13.50	0.50 max	S-6, S-6A	HCr	
ASTM A182	F6b	11.50 - 13.50	1.00 - 2.00	S-6, S-6A	HCr	0.40 - 0.60 Mo, 0.50 Max. Cu
ASTM A182	F6NM	11.5 - 14.0	3.5 - 4.5	S-6, S-6A	HCr	0.5 - 1.0 Mo
ASTM A182	FXM-27Cb	25.0 - 27.5	0.50 Max.		HCr	0.75 - 1.50 Mo, 0.05 - 0.20 Nb, 0.20 Max. Cu, 0.015 Max. N
ASTM A182	F429	14.0 - 16.0	0.50 Max.		HCr	
ASTM A182	F430	16.0 - 18.0	0.50 Max.	S-7	HCr	
ASTM A182	F304	18.0 - 20.0	8.0 - 11.0	S-8	HCr	
ASTM A182	F304H	18.0 - 20.0	8.0 - 11.0	S-8	HCr	
ASTM A182	F304L	18.0 - 20.0	8.0 - 13.0	S-8	HCr	
ASTM A182	F304N	18.0 - 20.0	8.0 - 10.5	S-8	HCr	
ASTM A182	F304LN	18.0 - 20.0	8.0 - 10.5	S-8	HCr	
ASTM A182	F310	24.0 - 26.0	19.0 - 22.0		HCr	
ASTM A182	F316	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A182	F316H	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A182	F316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A182	F316N	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A182	F316LN	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A182	F317	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.0 - 4.0 Mo
ASTM A182	F317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.0 - 4.0 Mo
ASTM A182	F321	17.0 Min.	9.0 - 12.0	S-8	HCr	Plus Ti
ASTM A182	F321H	17.0 Min.	9.0 - 12.0	S-8	HCr	Plus Ti
ASTM A182	F347	17.0 - 20.0	9.0 - 13.0	S-8	HCr	Plus Cb & Ta

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A182	F347H	17.0 - 20.0	9.0 - 13.0	S-8	HCr	Plus Cb & Ta
ASTM A182	F348	17.0 - 20.0	9.0 - 13.0	S-8	HCr	Plus Cb & Ta
ASTM A182	F348H	17.0 - 20.0	9.0 - 13.0	S-8	HCr	Plus Cb & Ta
ASTM A182	FXM-11	19.0 - 21.5	5.5 - 7.5	S-8	HCr	0.15 - 0.40 N
ASTM A182	FXM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	1.50 - 3.00 Mo, 0.10 - 0.30 Nb, 0.20 - 0.40 N, 0.10 - 0.30 V
ASTM A182	F10	7.0 - 9.0	19.0 - 22.0		MHCr	
ASTM A182	F44	17.5 - 18.5	19.5 - 20.5		HCr	6.0 - 6.5 Mo, 0.50 - 1.00 Cu, 0.18 - 0.22 N
ASTM A182	F45	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A182	F46	17.0 - 18.5	14.0 - 15.5	S-8	HCr	
ASTM A182	F47	18.0 - 20.0	13.0 - 17.5	S-8	HCr	4.0 - 5.0 Mo
ASTM A182	F48	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.0 Mo, 0.10 - 0.20 N
ASTM A182	F49	23.0 - 25.0	16.0 - 18.0		HCr	4.0 - 5.0 Mo, 0.4 - 0.6 N
ASTM A182	F50	24.0 - 26.0	5.5 - 6.5	S-10H	HCr	1.2 - 2.0 Mo, 0.14 - 0.20 N
ASTM A182	F51	21.0 - 23.0	4.5 - 6.5	S-10H	HCr	2.5 - 3.5 Mo, 0.08 - 0.20 N
ASTM A182	F52	26.0 - 29.0	3.5 - 5.2	S-10H	HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A182	F53	24.0 - 26.0	6.0 - 8.0	S-10H	HCr	3.0 - 5.0 Mo, 0.24 - 0.32 N, 0.5 Max. Cu
ASTM A182	F54	24.0 - 26.0	6.0 - 8.0	S-10H	HCr	2.50 - 3.50 Mo, 0.24 - 0.32 N, 0.20 - 0.80 Cu, 1.50 - 2.50 W
ASTM A182	F55	24.00 - 26.00	6.00 - 8.00	S-10H	HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A182	F57	24.0 - 26.0	6.5 - 8.0	S-10H	HCr	3.0 - 4.0 Mo, 1.20 - 2.00 Cu, 0.80 - 1.20 W, 0.23 - 0.33 N
ASTM A184		Not specified	Not specified			
ASTM A185		Not specified	Not specified			
ASTM A192		--	--	S-1	LCr	
ASTM A193	B5	4.0 - 6.0	--	S-5	MHCr	0.40 - 0.65 Mo
ASTM A193	B6, B6X	11.5 - 13.5	--	S-6, S-6A	HCr	
ASTM A193	B7, B7M	0.75 - 1.20	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A193	B16	0.80 - 1.15	--	S-4	MLCr	0.50 - 0.65 Mo, 0.25 - 0.35 V
ASTM A193	B8, B8A	18.0 - 20.0	8.0 - 10.5	S-8	HCr	
ASTM A193	B8C, B8CA	17.0 - 19.0	9.0 - 13.0	S-8	HCr	Nb + Ta
ASTM A193	B8M, B8MA, B8M3, B8M3	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A193	B8P, B8PA	17.0 - 19.0	10.5 - 13.0	S-8	HCr	
ASTM A193	B8N, B8NA	18.0 - 20.0	8.0 - 10.5	S-8	HCr	0.10 - 0.16 N
ASTM A193	B8MN, B8MNA	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A193	B8MLCuN, B8MLCuNA	19.5 - 20.5	17.5 - 18.5		HCr	6.0 - 6.5 Mo, 0.18 - 0.22 N, 0.50 - 1.00 Cu
ASTM A193	B8T, B8TA	17.0 - 19.0	9.0 - 12.0	S-8	HCr	+ Ti

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A193	B8R, B8RA	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.0 - 6.0 Mn, 1.50 - 3.00 Mo, 0.20 - 0.40 N, 0.10 - 0.30 Nb+Ta, 0.10 - 0.30 V
ASTM A193	B8S, B8SA	16.0 - 18.0	8.0 - 9.0	S-8	HCr	7.0 - 9.0 Mn, 3.5 - 4.5 Si, 0.08 - 0.18 N
ASTM A193	B8LN, B8LNA	18.0 - 20.0	8.0 - 10.5	S-8	HCr	0.10 - 0.16 N
ASTM A193	B8MLN, B8MLNA	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A194	1	--	--	S-1	LCr	
ASTM A194	2, 2HM, 2H	--	--	S-1	LCr	
ASTM A194	4	--	--	S-3A	LCr	0.20 - 0.30 Mo
ASTM A194	3	4.0 - 6.0	--	S-5	MHCr	0.40 - 0.65 Mo
ASTM A194	6	11.5 - 13.5	--	S-6, S-6A	HCr	
ASTM A194	6F	12.0 - 14.0	--	S-6, S-6A	HCr	
ASTM A194	7, 7M	0.75 - 1.20	--	S-4	MLCr	
ASTM A194	8, 8A	18.0 - 20.0	8.0 - 10.5	S-8	HCr	
ASTM A194	8C, 8CA	17.0 - 19.0	9.0 - 13.0	S-8	HCr	Nb + Ta
ASTM A194	8M, 8MA	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A194	8T, 8TA	17.0 - 19.0	9.0 - 12.0	S-8	HCr	+ Ti
ASTM A194	8F, 8FA	17.0 - 19.0	8.0 - 10.0	S-8	HCr	+ S or Se
ASTM A194	8P, 8PA	17.0 - 19.0	10.5 - 13.0	S-8	HCr	
ASTM A194	8N, 8NA	18.0 - 20.0	8.0 - 10.5	S-8	HCr	0.10 - 0.16 N
ASTM A194	8LN, 8LNA	18.0 - 20.0	8.0 - 10.5	S-8	HCr	0.10 - 0.16 N
ASTM A194	8MN, 8MNA	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A194	8MLN, 8MLNA	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A194	8R, 8RA	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.0 - 6.0 Mn, 1.50 - 3.00 Mo, 0.20 - 0.40 N, 0.10 - 0.30 Nb+Ta, 0.10 - 0.30 V
ASTM A194	8S, 8SA	16.0 - 18.0	8.0 - 9.0	S-8	HCr	7.0 - 9.0 Mn, 3.5 - 4.5 Si, 0.08 - 0.18 N
ASTM A194	8MLCuN, 8MLCuNA	19.5 - 20.5	17.5 - 18.5		HCr	6.0 - 6.5 Mo, 0.18 - 0.22 N, 0.50 - 1.00 Cu
ASTM A194	16	0.80 - 1.15	--	S-4	MLCr	0.50 - 0.65 Mo, 0.25 - 0.35 V
ASTM A199	T11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A199	T3b	1.65 - 2.35	--	S-5	MLCr	0.44 - 0.65 Mo (total alloy may exceed S-4 limit) <i>obsolete</i>
ASTM A199	T22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A199	T4	2.15 - 2.85	--	S-5	MLCr	0.44 - 0.65 Mo
ASTM A199	T21	2.65 - 3.35	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A199	T5	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A199	T7	6.00 - 8.00	--	S-5	MHCr	0.45 - 0.65 Mo <i>obsolete</i>
ASTM A199	T9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A199	T91	8.00 - 9.50	0.40 Max.		MHCr	0.85 - 1.05 Mo, 0.18 - 0.25V, 0.06 - 0.10 Nb, 0.03 - 0.07N
ASTM A200	T11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A200	T3b	1.65 - 2.35	--	S-5	MLCr	0.44 - 0.65 Mo (total alloy may exceed S-4 limit) <i>obsolete</i>
ASTM A200	T22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A200	T4	2.15 - 2.85	--	S-5	MLCr	0.44 - 0.65 Mo
ASTM A200	T21	2.65 - 3.35	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A200	T5	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A200	T7	6.00 - 8.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A200	T9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A200	T91	8.00 - 9.00	0.40 Max.		MHCr	0.85 - 1.05 Mo, 0.18 - 0.25 V, 0.06 - 0.10 Nb, 0.030 - 0.070 N
ASTM A202	A	0.35 - 0.60	--	S-3A	LCr	
ASTM A202	B	0.35 - 0.60	--	S-3A	LCr	
ASTM A203	A	--	2.10 - 2.50	S-5	LCr	
ASTM A203	B	--	2.10 - 2.50	S-5	LCr	
ASTM A203	D	--	3.25 - 3.75	S-5	LCr	
ASTM A203	E	--	3.25 - 3.75	S-5	LCr	
ASTM A203	F	--	3.25 - 3.75	S-5	LCr	
ASTM A204	A	--	--	S-3A	LCr	0.45 - 0.60 Mo
ASTM A204	B	--	--	S-3A	LCr	0.45 - 0.60 Mo
ASTM A204	C	--	--	S-3A	LCr	0.45 - 0.60 Mo
ASTM A209	T1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A209	T1a	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A209	T1b	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A210	A-1	--	--	S-1	LCr	
ASTM A210	C	--	--	S-1	LCr	
ASTM A213	T2	0.50 - 0.81	--	S-3A	MLCr	0.44 - 0.65 Mo; Cr may exceed S-3A limit, although it is low for S-4
ASTM A213	T12	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A213	T17	0.80 - 1.25	--	S-4	MLCr	0.15 Min. V
ASTM A213	T11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A213	T3b	1.65 - 2.35	--	S-4 (or S-5)	MLCr	0.44 - 0.65 Mo (total alloy may exceed S-4 limit) <i>obsolete</i>
ASTM A213	T22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A213	T21	2.65 - 3.35	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A213	T5	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A213	T5b	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A213	T5c	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo (+ Ti)
ASTM A213	T7	6.00 - 8.00	--	S-5	MHCr	0.45 - 0.65 Mo <i>obsolete</i>
ASTM A213	T9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A213	T91	8.00 - 9.50	0.40 Max.		MHCr	0.85 - 1.05 Mo, 0.18 - 0.25 V, 0.06 - 0.1 Nb, 0.030 - 0.070 N
ASTM A213	18Cr-2Mo	17.5 - 19.5	*		HCr	1.75 - 2.50 Mo; Ni + Cu max. = 1.00; + Ti + Nb
ASTM A213	TP201	16.0 - 18.0	3.50 - 5.50		HCr	
ASTM A213	TP202	17.0 - 19.0	4.00 - 6.00		HCr	
ASTM A213	TP304, TP304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A213	TP304N, TP304LN	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A213	TP304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A213	TP309Cb, TP309HCB	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb + Ta
ASTM A213	TP309H, TP309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A213	TP310Cb, TP310HCB	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb + Ta
ASTM A213	TP310H, TP310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A213	TP310HCbN	24.00 - 26.00	17.00 - 23.00		HCr	0.20 - 0.60 Nb + Ta; 0.15 - 0.35 N
ASTM A213	UNS S31272	14.0 - 16.0	14.0 - 16.0		HCr	1.0 - 1.4 Mo; 0.3 - 0.6 Ti
ASTM A213	TP316, TP316H	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A213	TP316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A213	TP316N, TP316LN	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A213	TP317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A213	TP317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A213	TP321, TP321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A213	TP347, TP347H, TP347HFG	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A213	TP348, TP348H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A213	XM-15	17.0 - 19.0	17.5 - 18.5		HCr	
ASTM A213	UNS S30615	17.0 - 19.5	13.5 - 16.0	S-8	HCr	0.8 - 1.5 Al
ASTM A213	UNS S30815	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A213	UNS S31050	24.0 - 26.0	20.5 - 23.5		HCr	1.6 - 2.6 Mo, 0.09 - 0.15 N
ASTM A213	UNS S21500	14.0 - 16.0	9.00 - 11.0		HCr	0.8 - 1.20 Mo, 0.75 - 1.25 Nb, 0.15 - 0.40 V, 0.003 - 0.009 B
ASTM A213	UNS S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A213	UNS S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A213	UNS S32615	16.5 - 19.5	19.0 - 22.0		HCr	1.5 - 2.5 Cu
ASTM A213	UNS S33228	26.0 - 28.0	31.0 - 33.0		HCr	0.6 - 1.0 Nb + Ta; 0.05 - 0.10 Ce
ASTM A213	XM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A214	--	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A216	WCA	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.50 Max. Cu, 0.03 Max. V, Total Ni + Cr + Mo + Cu = 1.00 Max.
ASTM A216	WCB	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.50 Max. Cu, 0.03 Max. V, Total Ni + Cr + Mo + Cu = 1.00 Max.
ASTM A216	WCC	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.50 Max. Cu, 0.03 Max. V, Total Ni + Cr + Mo + Cu = 1.00 Max.
ASTM A217	WC1	0.35 Max.	0.50 Max.	S-3	LCr	0.45 - 0.65 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Ni + Cr + Cu + W = 1.00 Max.
ASTM A217	WC4	0.50 - 0.80	0.70 - 1.10	S-5 or S-11C	MLCr	0.45 - 0.65 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Cu + W = 0.60 Max.
ASTM A217	WC5	0.50 - 0.90	0.60 - 1.00	S-5 or S-11C	MLCr	0.90 - 1.20 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Cu + W = 0.60 Max.
ASTM A217	WC6	1.00 - 1.50	0.50 Max.	S-4	MLCr	0.45 - 0.65 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Ni + Cu + W = 1.00 Max.
ASTM A217	WC9	2.00 - 2.75	0.50 Max.	S-5	MLCr	0.90 - 1.20 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Ni + Cu + W = 1.00 Max.
ASTM A217	WC11	1.00 - 1.50	0.50 Max.	S-5	MLCr	0.45 - 0.65 Mo, 0.35 Max. Cu, 0.03 Max. V, Total Ni + Cu + W = 1.00 Max.
ASTM A217	C5	4.00 - 6.50	0.50 Max.	S-5	MHCr	0.45 - 0.65 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Ni + Cu + W = 1.00 Max.
ASTM A217	C 12	8.00 - 10.00	0.50 Max.		MHCr	0.90 - 1.20 Mo, 0.50 Max. Cu, 0.10 Max. W, Total Ni + Cu + W = 1.00 Max.
ASTM A217	CA 15	11.5 - 14.0	1.00 Max.	S-6, S-6A	HCr	0.50 Max. Mo
ASTM A225	C	--	0.40 - 0.70	S-3A or S-5	LCr	0.13 - 0.18 V
ASTM A225	D	--	0.40 - 0.70	S-3A or S-5	LCr	0.10 - 0.18 V
ASTM A226	--	--	--	S-1	LCr	
ASTM A234	WPB	--	--	S-1	LCr	
ASTM A234	WPC	--	--	S-1	LCr	
ASTM A234	WPR	--	1.60 - 2.24	S-5	LCr	0.75 - 1.25 Cu
ASTM A234	WP1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A234	WP12	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A234	WP11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A234	WP22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A234	WP5	4.0 - 6.0	--	S-5	MHCr	0.44 - 0.65 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A234	WP7	6.00 - 8.00	--	S-5	MHCr	0.45 - 0.65 Mo <i>obsolete</i>
ASTM A234	WP9	8.0 - 10.0	--		MHCr	0.90 - 1.10 Mo
ASTM A234	WP91	8.0 - 9.5	0.40 Max.		MHCr	0.85 - 1.05 Mo; 0.18 - 0.25 V; 0.06 - 0.10 Nb; 0.03 - 0.07 N
ASTM A240	UNS N08367	20.00 - 22.00	23.50 - 25.50		HCr	6.00 - 7.00 Mo, 0.18 - 0.25 N
ASTM A240	UNS N 08904	19.00 - 23.00	23.00 - 28.00		HCr	4.0 - 5.0 Mo, 1.0 - 2.0 Cu
ASTM A240	201	16.00 - 18.00	3.50 - 5.50		HCr	5.50 - 7.50 Mn
ASTM A240	UNS S20103	16.00 - 18.00	3.50 - 5.50		HCr	5.50 - 7.50 Mn
ASTM A240	UNS S20153	16.00 - 17.50	4.00 - 5.00		HCr	6.40 - 7.50 Mn, 0.10 - 0.25 N, 1.00 Max Cu
ASTM A240	UNS S20161	15.00 - 18.00	4.00 - 6.00		HCr	4.00 - 6.00 Mn, 3.00 - 4.00 Si, 0.08 - 0.20 N
ASTM A240	202	17.00 - 19.00	4.00 - 6.00		HCr	7.50 - 10.0 Mn
ASTM A240	UNS S20400	15.00 - 17.00	1.50 - 3.00		HCr	7.00 - 9.00 Mn, 0.15 - 0.30 N
ASTM A240	XM-19	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A240	XM-31	17.00 - 18.50	1.00 Max.		HCr	14.00 - 16.00 Mn, 0.35 Min. N
ASTM A240	XM-17	17.50 - 22.00	5.00 - 7.00		HCr	7.50 - 9.00 Mn, 2.00 - 3.00 Mo, 0.25 - 0.50 N
ASTM A240	XM-18	17.50 - 22.00	5.00 - 7.00		HCr	7.50 - 9.00 Mn, 2.00 - 3.00 Mo, 0.25 - 0.50 N
ASTM A240	UNS S21800	16.00 - 18.00	8.00 - 9.00		HCr	7.00 - 9.00 Mn, 3.50 - 4.50 Si, 0.08 - 0.18 N
ASTM A240	XM-29	17.00 - 19.00	2.25 - 3.75		HCr	11.50 - 14.50 Mn, 0.20 - 0.40 N
ASTM A240	301	16.00 - 18.00	6.00 - 8.00	S-8	HCr	
ASTM A240	302	17.00 - 19.00	8.00 - 10.00	S-8	HCr	
ASTM A240	304	18.00 - 20.00	8.00 - 10.50	S-8	HCr	
ASTM A240	304L	18.00 - 20.00	8.00 - 12.00	S-8	HCr	
ASTM A240	304H	18.00 - 20.00	8.00 - 10.50	S-8	HCr	
ASTM A240	UNS S30415	18.00 - 19.00	9.00 - 10.00	S-8	HCr	1.00 - 2.00 Si, 0.12 - 0.18 N, 0.03 - 0.08 Ce
ASTM A240	304N	18.00 - 20.00	8.00 - 10.50	S-8	HCr	0.10 - 0.16 N
ASTM A240	XM-21	18.00 - 20.00	8.00 - 10.50	S-8	HCr	0.16 - 0.30 N
ASTM A240	304LN	18.00 - 20.00	8.00 - 12.00	S-8	HCr	0.10 - 0.16 N
ASTM A240	305	17.00 - 19.00	10.50 - 13.00	S-8	HCr	
ASTM A240	UNS S30600	17.0 - 18.5	14.0 - 15.5	S-8	HCr	3.7 - 4.3 Si
ASTM A240	UNS S30601	17.00 - 18.00	17.00 - 18.00		HCr	5.00 - 5.60 Si
ASTM A240	UNS S30615	17.0 - 19.5	13.5 - 16.0	S-8	HCr	3.2 - 4.0 Si, 0.8 - 1.5 Al
ASTM A240	UNS S30815	20.00 - 22.00	10.00 - 12.00	S-8	HCr	1.40 - 2.00 Si, 0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A240	309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A240	309H	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A240	309Cb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb
ASTM A240	309HCb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb
ASTM A240	310S	24.00 - 26.00	19.00 - 22.00		HCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A240	310H	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A240	310Cb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb
ASTM A240	310HCb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb
ASTM A240	310 MoLN	24.00 - 26.00	21.00 - 23.00		HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A240	UNS S31254	19.50 - 20.50	17.50 - 18.50		HCr	6.00 - 6.50 Mo, 0.18 - 0.22 N, 0.50 - 1.00 Cu
ASTM A240	316	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A240	316L	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A240	316H	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A240	316Ti	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.0 - 3.0 Mo, + Ti
ASTM A240	316Cb	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.0 - 3.0 Mo, + Nb
ASTM A240	316N	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A240	316LN	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A240	317	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A240	317L	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A240	UNS S31725	18.00 - 20.00	13.50 - 17.50	S-8	HCr	4.0 - 5.0 Mo
ASTM A240	UNS S31726	17.00 - 20.00	13.50 - 17.50	S-8	HCr	4.0 - 5.0 Mo, 0.10 - 0.20 N
ASTM A240	317LN	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo, 0.10 - 0.22 N
ASTM A240	321	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A240	321H	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A240	UNS S32615	16.5 - 19.5	19.0 - 22.0		HCr	0.30 - 1.5 Mo, 1.5 - 2.5 Cu
ASTM A240	UNS S32654	24.00 - 25.00	21.00 - 23.00		HCr	2.00 - 4.00 Mn; 7.00 - 8.00 Mo; 0.45 - 0.55 V; 0.30 - 0.60 Cu
ASTM A240	UNS S33228	26.0 - 28.0	31.0 - 33.0		HCr	0.05 - 0.10 Ce, 0.6 - 1.0 Nb
ASTM A240	UNS S34565	23.00 - 25.00	16.00 - 18.00		HCr	5.00 - 7.00 Mn, 4.00 - 5.00 Mo, 0.40 - 0.60 Mo
ASTM A240	347	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb
ASTM A240	347H	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb
ASTM A240	348	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A240	348H	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A240	UNS S35315	24.00 - 26.00	34.00 - 36.00		HCr	1.20 - 2.00 Si, 0.03 - 0.08 Ce
ASTM A240	XM-15	17.00 - 19.00	17.50 - 18.50		HCr	1.50 - 2.50 Si
ASTM A240	UNS S31200	24.0 - 26.0	5.5 - 6.5		HCr	1.2 - 2.0, 0.14 - 0.20 N
ASTM A240	UNS S31260	24.0 - 26.0	5.50 - 7.50		HCr	2.50 - 3.50 Mo, 0.10 - 0.30 N, 0.20 - 0.80 Cu, 0.10 - 0.50 W
ASTM A240	UNS S31803	21.0 - 23.0	4.50 - 6.50	S-10H	HCr	2.50 - 3.50 Mo, 0.08 - 0.20 N
ASTM A240	UNS S32304	21.5 - 24.5	3.00 - 5.50		HCr	0.05 - 0.60 Mo, 0.05 - 0.20 N, 0.05 - 0.60 Cu
ASTM A240	UNS S32550	24.0 - 27.0	4.5 - 6.5	S-10H	HCr	2.90 - 3.90 Mo, 0.10 - 0.25 N, 1.5 - 2.5 Cu
ASTM A240	UNS S32750	24.0 - 26.0	6.00 - 8.00		HCr	3.00 - 5.00 Mo, 0.24 - 0.32 N, 0.5 Max. Cu
ASTM A240	UNS S32760	24.00 - 26.00	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A240	329	23.00 - 28.00	2.50 - 5.00		HCr	1.0 - 2.0 Mo
ASTM A240	UNS S32950	26.00 - 29.00	3.50 - 5.20		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A240	UNS S32803	28.00 - 29.00	3.0 - 4.0		HCr	1.8 - 2.5 Mo, + Nb

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A240	405	11.50 - 14.50	0.60 Max.	S-6, S-6A	HCr	0.10 - 0.30 Al
ASTM A240	409	10.50 - 11.75	0.50 Max.	S-7	HCr	+ Ti
ASTM A240	UNS S40945	10.50 - 11.75	0.50 Max.	S-7	HCr	+ Nb + Ti
ASTM A240	410	11.50 - 13.50	0.75 Max.	S-6, S-6A	HCr	
ASTM A240	410S	11.50 - 13.50	0.60 Max.	S-6, S-6A	HCr	
ASTM A240	UNS S41045	12.00 - 13.00	0.50 Max.	S-6, S-6A	HCr	+ Nb
ASTM A240	UNS S41050	10.50 - 12.50	0.60 - 1.10		HCr	
ASTM A240	UNS S41500	11.5 - 14.0	3.5 - 5.5	S-6, S-6A	HCr	0.5 - 1.0 Mo
ASTM A240	429	14.00 - 16.00	0.50 Max.	S-7	HCr	
ASTM A240	430	16.00 - 18.00	0.50 Max.	S-7	HCr	
ASTM A240	439	17.00 - 19.00	0.50 Max.	S-7	HCr	+ Ti
ASTM A240	UNS S44400	17.5 - 19.5	1.00 Max.		HCr	1.75 - 2.50 Mo, + Ti
ASTM A240	UNS S44500	19.00 - 21.00	0.60 Max.		HCr	0.30 - 0.60 Cu, + Nb
ASTM A240	XM-33	25.00 - 27.00	0.50 Max.		HCr	0.75 - 1.50 Mo; + Ti
ASTM A240	XM-27	25.00 - 27.50	0.50 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A240	UNS S44635	24.5 - 26.0	3.5 - 4.5		HCr	3.5 - 4.5 Mo, + Ti + Nb
ASTM A240	UNS S44660	25.0 - 28.0	1.0 - 3.50		HCr	3.00 - 4.00 Mo, + Ti + Nb
ASTM A240	UNS S44700	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A240	UNS S44735	28.00 - 30.00	1.00 Max.		HCr	3.60 - 4.20 Mo, + Ti + Nb
ASTM A240	UNS S44800	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A240	UNS S46800	18.00 - 20.00	0.50 Max.		HCr	+ Nb + Ti
ASTM A242	Type 1	--	--	S-1	LCr	0.20 Cu Min.
ASTM A249	TP201	16.0 - 18.0	3.50 - 5.50		HCr	
ASTM A249	TP202	17.0 - 19.0	4.00 - 6.00		HCr	
ASTM A249	TP304, TP304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A249	TP304N, TP304LN	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A249	TP304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A249	TP305	17.0 - 19.0	10.0 - 13.0	S-8	HCr	
ASTM A249	TP309Cb, TP309HCb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb + Ta
ASTM A249	TP309H, TP309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A249	TP310Cb, TP310HCb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb + Ta
ASTM A249	TP310H, TP310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A249	TP316, TP316H	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A249	TP316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A249	TP316N	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A249	TP316LN	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A249	TP317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A249	TP317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A249	TP321, TP321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A249	TP347, TP347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A249	TP348, TP348H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A249	XM-15	17.0 - 19.0	17.5 - 18.5		HCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A249	TP XM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A249	TP XM-29	17.0 - 19.0	2.25 - 3.75		HCr	11.5 - 14.5 Mn; 0.20 - 0.40 N
ASTM A249	UNS S30615	17.0 - 19.5	13.5 - 16.0	S-8	HCr	0.8 - 1.5 Al
ASTM A249	UNS S30815	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A249	UNS S31050	24.0 - 26.0	20.5 - 23.5		HCr	1.6 - 2.6 Mo, 0.09 - 0.15 N
ASTM A249	UNS S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A249	UNS S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A249	UNS S31254	19.5 - 20.5	17.5 - 18.5		HCr	6.00 - 6.50 Mo; 0.18 - 0.22 V; 0.50 - 1.00Cu
ASTM A249	UNS S24565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N
ASTM A249	UNS S33228	26.0 - 28.0	31.0 - 33.0		HCr	0.6 - 1.0 Nb + Ta; 0.05 - 0.10 Ce
ASTM A249	UNS S30415	18.0 - 19.0	9.00 - 10.00	S-8	HCr	0.12 - 0.18 N; 0.03 - 0.08 Cu
ASTM A249	UNS S32654	24.0 - 25.0	21.0 - 23.0		HCr	2.00 - 4.00 Mn; 7.00 - 8.00 Mo; 0.45 - 0.55 V; 0.30 - 0.60 Cu
ASTM A250	T1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A250	T1a	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A250	T1b	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A250	T2	0.50 - 0.81	--	S-3A	MLCr	0.44 - 0.65 Mo
ASTM A250	T11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A250	T12	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A250	T22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A252	1	Not Specified	Not Specified			
ASTM A252	2	Not Specified	Not Specified			
ASTM A252	3	Not Specified	Not Specified			
ASTM A266	1	--	--	S-1	LCr	
ASTM A266	2	--	--	S-1	LCr	
ASTM A266	3	--	--	S-1	LCr	
ASTM A266	4	--	--	S-1	LCr	
ASTM A268	TP405	11.5 - 13.5	0.50 Max.	S-6, S-6A	HCr	0.10 - 0.30 Al
ASTM A268	TP410	11.5 - 13.5	0.50 Max.	S-6, S-6A	HCr	
ASTM A268	TP429	14.0 - 16.0	0.50 Max.	S-7	HCr	
ASTM A268	TP430	16.0 - 18.0	0.50 Max.	S-7	HCr	
ASTM A268	TP443	18.0 - 23.0	0.50 Max.		HCr	0.90 - 1.25 Cu
ASTM A268	TP446-1	23.0 - 30.0	0.50 Max.		HCr	0.10 - 0.25 N
ASTM A268	TP446-2	23.0 - 30.0	0.50 Max.		HCr	0.10 - 0.25 N
ASTM A268	UNS S40800	11.5 - 13.0	0.80 Max.	S-6, S-6A	HCr	+ Ti
ASTM A268	TP409	10.50 - 11.75	0.50 Max.	S-7	HCr	+ Ti
ASTM A268	TP439	17.00 - 19.00	0.50 Max.	S-7	HCr	+ Ti
ASTM A268	UNS S41500	11.5 - 14.0	3.5 - 5.5		HCr	0.5 - 1.0 Mo
ASTM A268	TP430 Ti	16.00 - 19.50	0.75 Max.	S-7	HCr	+ Ti

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A268	TP XM-27	25.0 - 27.5	0.5 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A268	TP XM-33	25.0 - 27.0	0.50 Max.		HCr	0.75 - 1.50 Mo; + Ti
ASTM A268	18Cr-2Mo	17.5 - 19.5	1.00 Max.		HCr	1.75 - 2.50 Mo; + Ti + Nb
ASTM A268	29-4	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A268	29-4-2	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A268	26-3-3	25.0 - 28.0	1.0 - 3.50		HCr	3.0 - 4.0 Mo; + Ti + Nb
ASTM A268	25-4-4	24.5 - 26.0	3.5 - 4.5		HCr	3.5 - 4.5 Mo; + Ti + Nb
ASTM A268	UNS S44735	28.00 - 30.00	1.00 Max.		HCr	3.60 - 4.20 Mo; + Ti + Nb
ASTM A268	UNS S32803	28.0 - 29.0	3.0 - 4.0		HCr	1.8 - 2.5 Mo; + Nb
ASTM A269	TP 304	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A269	TP 304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A269	TP 304LN	18.0 - 20.0	8.00 - 13.0	S-8	HCr	0.10 - 0.16 N
ASTM A269	TP 316	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A269	TP 316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A269	TP 316LN	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A269	TP 317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A269	TP 321	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A269	TP 347	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A269	TP 348	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A269	TP XM-10	19.0 - 21.5	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A269	TP XM-11	19.0 - 21.5	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A269	TP XM-15	17.0 - 19.0	17.5 - 18.5		HCr	
ASTM A269	TP XM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A269	TP XM-29	17.0 - 19.0	2.25 - 3.75		HCr	11.5 - 14.5 Mn; 0.20 - 0.40 N
ASTM A269	UNS S31254	19.5 - 20.5	17.5 - 18.5		HCr	6.00 - 6.50 Mo; 0.180 - 0.220 V; 0.50 - 1.00 Cu
ASTM A269	UNS S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A269	UNS S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A269	UNS S30600	17.0 - 18.5	14.0 - 15.5	S-8	HCr	
ASTM A269	UNS S24565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N
ASTM A269	UNS S32654	24.0 - 25.0	21.0 - 23.0		HCr	2.00 - 4.00 Mn; 7.00 - 8.00 Mo; 0.45 - 0.55 V; 0.30 - 0.60 Cu
ASTM A270	TP 304	18.00 - 20.00	8.00 - 11.0	S-8	HCr	
ASTM A270	TP 304L	18.00 - 20.00	8.00 - 13.0	S-8	HCr	
ASTM A270	TP 316	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A270	TP 316L	16.00 - 18.00	10.00 - 15.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A271	TP304, TP304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A271	TP316, TP316H	16.0 - 18.0	11.0 - 14.0	S-8	HCr	
ASTM A271	TP321, TP321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A271	TP347, TP347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A276	201	16.00 - 18.00	3.50 - 5.50		HCr	5.50 - 7.50 Mn
ASTM A276	UNS S20161	15.00 - 18.00	4.00 - 6.00		HCr	4.00 - 6.00 Mn, 3.00 - 4.00 Si, 0.08 - 0.20 N
ASTM A276	202	17.00 - 19.00	4.00 - 6.00		HCr	7.50 - 10.0 Mn
ASTM A276	205	16.50 - 18.00	1.00 - 1.70		HCr	14.00 - 15.50 Mn, 0.32 - 0.40 N
ASTM A276	XM-19	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A276	UNS S21800	16.00 - 18.00	8.00 - 9.00		HCr	7.00 - 9.00 Mn, 3.50 - 4.50 Si, 0.08 - 0.18 N
ASTM A276	XM-10	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A276	XM-11	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A276	XM-29	17.00 - 19.00	2.25 - 3.75		HCr	11.50 - 14.50 Mn, 0.20 - 0.40 N
ASTM A276	XM-28	16.50 - 19.00	0.50 - 2.50		HCr	11.00 - 14.00 Mn, 0.20 - 0.45 N
ASTM A276	UNS S24565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N
ASTM A276	UNS S28200	17.00 - 19.00	--		HCr	17.00 - 19.00 Mn, 0.75 - 1.25 Mo, 0.40 - 0.60 N, 0.75 - 1.25 Cu
ASTM A276	302	17.00 - 19.00	8.00 - 10.00	S-8	HCr	
ASTM A276	302B	17.00 - 19.00	8.00 - 10.00	S-8	HCr	2.00 - 3.00 Si
ASTM A276	304	18.00 - 20.00	8.00 - 10.50	S-8	HCr	
ASTM A276	304L	18.00 - 20.00	8.00 - 12.00	S-8	HCr	
ASTM A276	304N	18.00 - 20.00	8.00 - 10.50	S-8	HCr	0.10 - 0.16 N
ASTM A276	XM-21	18.00 - 20.00	8.00 - 10.50	S-8	HCr	0.16 - 0.30 N
ASTM A276	304LN	18.00 - 20.00	8.00 - 12.00	S-8	HCr	0.10 - 0.16 N
ASTM A276	UNS S30454	18.00 - 20.00	8.00 - 10.50	S-8	HCr	0.16 - 0.30 N
ASTM A276	305	17.00 - 19.00	10.50 - 13.00	S-8	HCr	
ASTM A276	308	19.00 - 21.00	10.00 - 12.00	S-8	HCr	
ASTM A276	UNS S30815	20.00 - 22.00	10.00 - 12.00	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A276	309	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A276	309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A276	309Cb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb
ASTM A276	310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A276	310	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A276	310Cb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb
ASTM A276	UNS S31254	19.50 - 20.50	17.50 - 18.50		HCr	6.00 - 6.50 Mo, 0.18 - 0.22 N, 0.50 - 1.00 Cu
ASTM A276	314	23.00 - 26.00	19.00 - 22.00		HCr	1.50 - 3.00 Si
ASTM A276	316	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A276	316L	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A276	316H	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A276	316Ti	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, + Ti
ASTM A276	316Cb	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, + Nb
ASTM A276	316N	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A276	316LN	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A276	UNS S31654	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.16 - 0.30 N
ASTM A276	317	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A276	UNS S31725	18.00 - 20.00	13.50 - 17.50	S-8	HCr	4.0 - 5.0 Mo
ASTM A276	UNS S31726	17.00 - 20.00	13.50 - 17.50	S-8	HCr	4.0 - 5.0 Mo, 0.10 - 0.20 N
ASTM A276	321	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A276	347	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb
ASTM A276	348	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A276	XM-26	25.00 - 27.00	6.00 - 7.00		HCr	
ASTM A276	UNS S31803	21.00 - 23.00	4.50 - 6.50	S-10H	HCr	2.50 - 3.50 Mo, 0.08 - 0.20 N
ASTM A276	UNS S32760	24.00 - 26.00	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A276	405	11.50 - 14.50	--	S-7	HCr	0.10 - 0.30 Al
ASTM A276	429	14.00 - 16.00	0.50 Max.	S-7	HCr	
ASTM A276	430	16.00 - 18.00	0.50 Max.	S-7	HCr	
ASTM A276	UNS S44400	17.5 - 19.5	1.00 Max.		HCr	1.75 - 2.50 Mo, + Ti
ASTM A276	446	23.00 - 27.00	--		HCr	
ASTM A276	XM-27	25.00 - 27.50	0.50 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A276	UNS S44700	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A276	UNS S44800	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A276	403	11.50 - 13.00	--	S-6, S-6A	HCr	
ASTM A276	410	11.50 - 13.50	--	S-6, S-6A	HCr	
ASTM A276	XM-30	11.50 - 13.50	--	S-6, S-6A	HCr	0.05 - 0.30 Nb
ASTM A276	414	11.50 - 13.50	1.25 - 2.50		HCr	
ASTM A276	UNS S41500	11.50 - 14.00	3.50 - 5.50	S-6, S-6A	HCr	0.50 - 1.00 Mo
ASTM A276	420	12.00 - 14.00	0.75 Max.	S-6, S-6A	HCr	□
ASTM A276	UNS S42010	13.50 - 15.00	0.35 - 0.85		HCr	□
ASTM A276	431	15.00 - 17.00	1.25 - 2.50	S-7	HCr	
ASTM A276	440A	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A276	440B	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A276	440C	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A276	9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A283	A	--	--	S-1	LCr	0.20 Min. Cu, when specified
ASTM A283	B	--	--	S-1	LCr	0.20 Min. Cu, when specified
ASTM A283	C	--	--	S-1	LCr	0.20 Min. Cu, when specified
ASTM A283	D	--	--	S-1	LCr	0.20 Min. Cu, when specified
ASTM A284	C	--	--	S-1	LCr	
ASTM A284	D	--	--	S-1	LCr	
ASTM A285	A	--	--	S-1	LCr	0.20 - 0.35 Cu, when specified
ASTM A285	B	--	--	S-1	LCr	0.20 - 0.35 Cu, when specified
ASTM A285	C	--	--	S-1	LCr	0.20 - 0.35 Cu, when specified

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A290	A, B	0.25 Max.	0.30 Max.	S-1	LCr	
ASTM A290	C, D	0.25 Max.	0.30 Max.	S-1	LCr	
ASTM A290	E, F	0.80 - 1.15	0.50 Max.	S-4	MLCr	0.15 - 0.25 Mo
ASTM A290	G, H, I, J, K, L	0.60 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.50 Mo
ASTM A290	M, P	1.40 - 1.80	0.30 Max.	S-4	MLCr	0.30 - 0.45 Mo, 0.85 - 1.30 Al
ASTM A290	T	1.25 - 1.75	3.25 - 4.00	S-5	MLCr	0.30 - 0.70 Mo, 0.05 - 0.15 V
ASTM A291	1	0.25 Max.	0.30 Max.	S-1	LCr	
ASTM A291	2	*	*			Cr, Ni & Mo optional as agreed between manufacturer & purchaser
ASTM A291	3	1.25 Max.	0.50 Max.	S-4	MLCr	0.15 Min. Mo
ASTM A291	3A	1.50 Max.	1.00 - 3.00	S-5	MLCr	0.15 Min. Mo
ASTM A291	4 - 7	0.60 Min.	1.65 Min.	S-5	MLCr	0.20 - 0.60 Mo
ASTM A291	8	1.40 - 1.80	0.30 Max.	S-4	MLCr	0.30 - 0.45 Mo, 0.85 - 1.30 Al
ASTM A291	9	1.25 - 1.75	3.25 - 4.00	S-5	MLCr	0.30 - 0.70 Mo, 0.05 - 0.15 V
ASTM A295	52100	1.30 - 1.60	0.25 Max.	S-4	MLCr	
ASTM A295	51100	0.90 - 1.15	0.25 Max.	S-4	MLCr	
ASTM A295	50100	0.40 - 0.60	0.25 Max.	S-3A	LCr	
ASTM A295	5195	0.70 - 0.90	0.25 Max.	S-4	MLCr	
ASTM A295	UNS K19526	0.40 - 0.60	0.25 Max.	S-3A	LCr	0.08 - 0.15 Mo
ASTM A295	1070M	0.20 Max.	0.25 Max.	S-1	LCr	
ASTM A295	5160	0.70 - 0.90	0.25 Max.	S-4	MLCr	
ASTM A297	HF	18.0 - 23.0	8.0 - 12.0	S-8	HCr	
ASTM A297	HH	24.0 - 28.0	11.0 - 14.0		HCr	
ASTM A297	HI	26.0 - 30.0	14.0 - 18.0		HCr	
ASTM A297	HK	24.0 - 28.0	18.0 - 22.0		HCr	
ASTM A297	HE	26.0 - 30.0	8.0 - 11.0		HCr	
ASTM A297	HT	15.0 - 19.0	33.0 - 37.0		HCr	
ASTM A297	HU	17.0 - 21.0	37.0 - 41.0		HCr	
ASTM A297	HW	10.0 - 14.0	58.0 - 62.0		HCr	
ASTM A297	HX	15.0 - 19.0	64.0 - 68.0	S-43	HCr	
ASTM A297	HC	26.0 - 30.0	4.00 Max.		HCr	
ASTM A297	HD	26.0 - 30.0	4.0 - 7.0		HCr	
ASTM A297	HL	28.0 - 32.0	18.0 - 22.0		HCr	
ASTM A297	HN	19.0 - 23.0	23.0 - 27.0		HCr	
ASTM A297	HP	24 - 28	33 - 37		HCr	
ASTM A299	--	--	--	S-1	LCr	
ASTM A302	A	--	--	S-3A	LCr	0.45 - 0.65 Mo
ASTM A302	B	--	--	S-3A	LCr	0.45 - 0.65 Mo
ASTM A302	C	--	0.40 - 0.70	S-3A	LCr	0.45 - 0.65 Mo
ASTM A302	D	--	0.70 - 1.00	S-3A	LCr	0.45 - 0.65 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A304						See appropriate AISI specification
ASTM A311	A	--	--	S-1	LCr	See appropriate AISI specification
ASTM A311	B	--	--	S-1	LCr	See appropriate AISI specification
ASTM A312	TP304, TP304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A312	TP304N, TP304LN	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A312	TP304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A312	TP309Cb, TP309HCb	22.0 - 24.0	12.0 - 16.0	S-8	HCr	+ Nb + Ta
ASTM A312	TP309H, TP309S	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
ASTM A312	TP310Cb, TP310HCb	24.0 - 26.0	19.0 - 22.0		HCr	+ Nb + Ta
ASTM A312	TP310H, TP310S	24.0 - 26.0	19.0 - 22.0		HCr	
ASTM A312	TP316, TP316H	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A312	TP316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A312	TP316N, TP316LN	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A312	TP317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A312	TP317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A312	TP321, TP321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A312	TP347, TP347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A312	TP348, TP348H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A312	TPXM-10	19.0 - 21.5	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A312	TPXM-11	19.0 - 21.5	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A312	TPXM-15	17.0 - 19.0	17.5 - 18.5		HCr	
ASTM A312	TPXM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A312	TPXM-29	17.0 - 19.0	2.25 - 3.75		HCr	11.5 - 14.5 Mn; 0.20 - 0.40 N
ASTM A312	UNS S31254	19.5 - 20.5	17.5 - 18.5		HCr	6.00 - 6.50 Mo; 0.180 - 0.220 V; 0.50 - 1.00 Cu
ASTM A312	UNS S30615	17.0 - 19.5	13.5 - 16.0	S-8	HCr	0.8 - 1.5 Al
ASTM A312	UNS S30815	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A312	UNS S31050	24.0 - 26.0	20.5 - 23.5		HCr	1.6 - 2.6 Mo, 0.09 - 0.15 N
ASTM A312	UNS S30600	17.0 - 18.5	14.0 - 15.5	S-8	HCr	
ASTM A312	UNS S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A312	UNS S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A312	UNS S32615	16.5 - 19.5	19.0 - 22.0		HCr	0.30 - 1.5 Mo, 1.5 - 2.5 Cu
ASTM A312	UNS S33228	26.0 - 28.0	31.0 - 33.0		HCr	0.6 - 1.0 Nb + Ta; 0.05 - 0.10 Ce
ASTM A312	UNS S24565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N
ASTM A312	UNS S30415	18.0 - 19.0	9.00 - 10.00	S-8	HCr	0.12 - 0.18 N; 0.03 - 0.08 Cu

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A312	UNS S32654	24.0 - 25.0	21.0 - 23.0		HCr	2.00 - 4.00 Mn; 7.00 - 8.00 Mo; 0.45 - 0.55 V; 0.30 - 0.60 Cu
ASTM A314	UNS S20161	15.00 - 18.00	4.00 - 6.00		HCr	4.00 - 6.00 Mn, 3.00 - 4.00 Si, 0.08 - 0.20 N
ASTM A314	202	17.00 - 19.00	4.00 - 6.00		HCr	7.50 - 10.0 Mn
ASTM A314	XM-19	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A314	UNS S21800	16.00 - 18.00	8.00 - 9.00		HCr	7.00 - 9.00 Mn, 3.50 - 4.50 Si, 0.08 - 0.18 N
ASTM A314	XM-10	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A314	XM-11	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A314	XM-29	17.00 - 19.00	2.25 - 3.75		HCr	11.50 - 14.50 Mn, 0.20 - 0.40 N
ASTM A314	XM-28	16.50 - 19.00	0.50 - 2.50		HCr	11.00 - 14.00 Mn, 0.20 - 0.45 N
ASTM A314	UNS S28200	17.00 - 19.00	--		HCr	17.00 - 19.00 Mn, 0.75 - 1.25 Mo, 0.40 - 0.60 N, 0.75 - 1.25 Cu
ASTM A314	302	17.00 - 19.00	8.00 - 10.00	S-8	HCr	
ASTM A314	302B	17.00 - 19.00	8.00 - 10.00	S-8	HCr	2.00 - 3.00 Si
ASTM A314	303	17.00 - 19.00	8.00 - 10.00	S-8	HCr	0.15 Min. S
ASTM A314	303Se	17.00 - 19.00	8.00 - 10.00	S-8	HCr	0.15 Min. Se
ASTM A314	304	18.00 - 20.00	8.00 - 10.50	S-8	HCr	
ASTM A314	304L	18.00 - 20.00	8.00 - 12.00	S-8	HCr	
ASTM A314	305	17.00 - 19.00	10.50 - 13.00	S-8	HCr	
ASTM A314	308	19.00 - 21.00	10.00 - 12.00	S-8	HCr	
ASTM A314	309	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A314	309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A314	309Cb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb + Ta
ASTM A314	310	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A314	310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A314	314	23.00 - 26.00	19.00 - 22.00		HCr	1.50 - 3.00 Si
ASTM A314	316	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A314	316L	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A314	316Ti	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, + Ti
ASTM A314	316Cb	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, + Nb
ASTM A314	317	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A314	321	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A314	UNS S33228	26.00 - 28.00	31.00 - 33.00		HCr	0.6 - 1.0 Nb + Ta; 0.05 - 0.10 Ce
ASTM A314	347	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb
ASTM A314	348	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A314	UNS S38031	26.0 - 28.0	30.0 - 32.0		HCr	6.0 - 7.0 Mo, 1.0 - 1.5 Cu, 0.15 - 0.25 N
ASTM A314	UNS S38926	19.00 - 21.00	24.00 - 26.00		HCr	6.0 - 7.0 Mo, 0.5 - 1.5 Cu, 0.15 - 0.25 N

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A314	UNS S32760	24.00 - 26.00	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A314	UNS S32950	26.00 - 29.00	3.50 - 5.20		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A314	429	14.00 - 16.00	--	S-7	HCr	
ASTM A314	430	16.00 - 18.00	--	S-7	HCr	
ASTM A314	430F	16.00 - 18.00	--	S-7	HCr	0.15 Min. S
ASTM A314	430F Se	16.00 - 18.00	--	S-7	HCr	0.15 Min. Se
ASTM A314	446	23.00 - 27.00	--		HCr	
ASTM A314	XM-27	25.00 - 27.50	0.50 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A314	403	11.50 - 13.00	--	S-6, S-6A	HCr	
ASTM A314	410	11.50 - 13.50	--	S-6, S-6A	HCr	
ASTM A314	414	11.50 - 13.50	1.25 - 2.50	S-6, S-6A	HCr	
ASTM A314	416	12.00 - 14.00	--	S-6, S-6A	HCr	0.15 Min. S
ASTM A314	416Se	12.00 - 14.00	--	S-6, S-6A	HCr	0.15 Min. Se
ASTM A314	420	12.00 - 14.00	--	S-6, S-6A	HCr	
ASTM A314	UNS S42010	13.50 - 15.00	0.35 - 0.85		HCr	0.40 - 0.85 Mo
ASTM A314	431	15.00 - 17.00	1.25 - 2.50	S-7	HCr	
ASTM A314	440A	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A314	440B	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A314	440C	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A314	501	4.00 - 6.00	--	S-5	MHCr	0.40 - 0.65 Mo
ASTM A314	502	4.00 - 6.00	--	S-5	MHCr	0.40 - 0.65 Mo
ASTM A321	--	--	--	S-2	LCr	Pb may be specified (usually 0.15 - 0.35)
ASTM A322						See appropriate AISI specification
ASTM A328	--	--	--	S-1	LCr	0.20 Min. Cu, when specified
ASTM A331						See appropriate AISI specification
ASTM A333	1	--	--	S-1	LCr	
ASTM A333	3	--	3.18 - 3.82	S-5	LCr	
ASTM A333	4	0.44 - 1.01	0.47 - 0.98	S-4	MLCr	0.40 - 0.75 Cu, 0.04 - 0.30 Al
ASTM A333	6	--	--	S-1	LCr	
ASTM A333	7	--	2.03 - 2.57	S-5	LCr	
ASTM A333	8	--	8.40 - 9.60	S-5	LCr	
ASTM A333	9	--	1.60 - 2.24	S-5	LCr	0.75 - 1.25 Cu
ASTM A333	10	0.15 Max.	0.25 Max.	S-1	LCr	
ASTM A333	11	0.50 Max.	35.0 - 37.0		LCr	
ASTM A334	1	--	--	S-1	LCr	
ASTM A334	3	--	3.18 - 3.82	S-5	LCr	
ASTM A334	6	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A334	7	--	2.03 - 2.57	S-5	LCr	
ASTM A334	8	--	8.40 - 9.60	S-5	LCr	
ASTM A334	9	--	1.60 - 2.24	S-5	LCr	0.75 - 1.25 Cu
ASTM A334	11	0.50 Max.	35.0 - 37.0		LCr	
ASTM A335	F1, P1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A335	P15	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A335	P2	0.50 - 0.81	--	S-3A	MLCr	0.44 - 0.65 Mo; Cr may exceed S-3A limit, although it is low for S-4
ASTM A335	P12	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A335	P11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A335	P22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A335	P21	2.65 - 3.35	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A335	P5	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A335	P5b	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A335	P5c	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo; + Ti + Nb
ASTM A335	P9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A335	P91	8.00 - 9.50	0.40 Max.		MHCr	0.85 - 1.05 Mo; 0.18 - 0.25 V; 0.06 - 0.10 Nb; 0.030 - 0.070 N
ASTM A336	F1	--	--	S-3A	LCr	0.40 - 0.60 Mo
ASTM A336	F3V	2.7 - 3.3	--		MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.001 - 0.003 B, 0.015 - 0.035 Ti
ASTM A336	F3VCb	2.7 - 3.3	0.25 Max.	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.070 Nb
ASTM A336	F12	0.80 - 1.10	--	S-4	MLCr	0.45 - 0.65 Mo
ASTM A336	F11, Class 1	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A336	F11, Class 2	1.00 - 1.50	--	S-4	MLCr	0.45 - 0.65 Mo
ASTM A336	F11, Class 3	1.00 - 1.50	--	S-4	MLCr	0.45 - 0.65 Mo
ASTM A336	F22, Class 1	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
ASTM A336	F22, Class 3	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
ASTM A336	F22V	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo, 0.25 - 0.35 V
ASTM A336	F21, Class 1	2.7 - 3.3	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A336	F21, Class 3	2.7 - 3.3	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A336	F5	4.0 - 6.0	0.50 max	S-5	MHCr	0.45 - 0.65 Mo
ASTM A336	F5A	4.0 - 6.0	0.50 max	S-5	MHCr	0.45 - 0.65 Mo
ASTM A336	F9	8.0 - 10.0	--		MHCr	0.90 - 1.10 Mo
ASTM A336	F91	8.0 - 9.5	0.40 Max.		MHCr	0.85 - 1.05 Mo, 0.18 - 0.25 V, 0.06 - 0.10 Nb, 0.03 - 0.07N
ASTM A336	F6	11.5 - 13.5	0.50 Max.	S-6, S-6A	HCr	
ASTM A336	F304	18.0 - 20.0	8.0 - 11.0	S-8	HCr	
ASTM A336	F304H	19.0 - 20.0	8.0 - 12.0	S-8	HCr	
ASTM A336	F304L	18.0 - 20.0	8.0 - 13.0	S-8	HCr	
ASTM A336	F304N, F304LN	18.0 - 20.0	8.0 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A336	F309H	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
ASTM A336	F310	24.0 - 26.0	19.0 - 22.0		HCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A336	F310H	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A336	F316, F316H	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A336	F316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A336	F316N	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A336	F316LN	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A336	F321	17.0 Min.	9.0 Min.	S-8	HCr	+ Ti
ASTM A336	F321H	17.0 Min.	9.0 - 12.0	S-8	HCr	+ Ti
ASTM A336	F347	17.0 - 19.0	9.0 - 12.0	S-8	HCr	+ Nb & Ta
ASTM A336	F347H	17.0 - 19.0	9.0 - 13.0	S-8	HCr	+ Nb & Ta
ASTM A336	F348, F348H	17.0 - 19.0	9.0 - 13.0	S-8	HCr	+ Nb
ASTM A336	FXM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	1.50 - 3.00 Mo, 0.20 - 0.40 N, 0.10 - 0.30 Nb, 0.10 - 0.30 V
ASTM A336	FXM-11	19.0 - 21.5	5.5 - 7.5	S-8	HCr	0.15 - 0.40 N
ASTM A336	F46	17.0 - 18.5	14.0 - 15.5	S-8	HCr	
ASTM A350	LF1	0.30 Max.	0.40 Max.	S-1 or S-2	LCr	
ASTM A350	LF2	0.30 Max.	0.40 Max.	S-1 or S-2	LCr	
ASTM A350	LF3	0.30 Max.	3.3 - 3.7	S-5	LCr	
ASTM A350	LF5	0.30 Max.	1.0 - 2.0	S-4 or S-5	LCr	
ASTM A350	LF6	0.30 Max.	0.40 Max.	S-1 or S-2	LCr	0.04 - 0.11 V; 0.01 - 0.030 N
ASTM A350	LF9	0.30 Max.	1.60 - 2.24	S-5	LCr	0.75 - 1.25 Cu
ASTM A350	LF787	0.60 - 0.90	0.70 - 1.00	S-11C	MLCr	0.15 - 0.25 Mo; 1.00 - 1.30 Cu; 0.02 Min. Nb
ASTM A351	CF3, CF3A	17.0 - 21.0	8.0 - 12.0	S-8	HCr	
ASTM A351	CF8, CF8A	18.0 - 21.0	8.0 - 11.0	S-8	HCr	
ASTM A351	CF3M, CF3MA	17.0 - 21.0	9.0 - 13.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A351	CF8M	18.0 - 21.0	9.0 - 12.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A351	CF3MN	17.0 - 21.0	9.0 - 13.0	S-8	HCr	2.0 - 3.0 Mo, 0.10 - 0.20 N
ASTM A351	CF8C	18.0 - 21.0	9.0 - 12.0	S-8	HCr	+ Nb
ASTM A351	CF10	18.0 - 21.0	8.0 - 11.0	S-8	HCr	
ASTM A351	CF10M	18.0 - 21.0	8.0 - 11.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A351	CH8	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A351	CH10	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A351	CH20	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A351	CK20	23.0 - 27.0	19.0 - 22.0		HCr	
ASTM A351	HK30	23.0 - 27.0	19.0 - 22.0		HCr	
ASTM A351	HK40	23.0 - 27.0	19.0 - 22.0		HCr	
ASTM A351	HT30	13.0 - 17.0	33.0 - 37.0		HCr	
ASTM A351	CP10MC	15.0 - 18.0	13.0 - 16.0	S-8	HCr	1.75 - 2.25 Mo; + Nb
ASTM A351	CN7M	19.0 - 22.0	27.5 - 30.5		HCr	2.0 - 3.0 Mo, 3.0 - 4.0 Cu
ASTM A351	CN3MN	20.0 - 22.0	23.5 - 25.5		HCr	6.0 - 7.0 Mo, 0.18 - 0.26 N, 0.75 Max. Cu
ASTM A351	CD4MCu	24.5 - 26.5	4.75 - 6.00	S-10H	HCr	1.75 - 2.25 Mo, 2.75 - 3.25 Cu
ASTM A351	CE8MN	22.5 - 25.5	8.0 - 11.0	S-8	HCr	3.0 - 4.5 Mo, 0.10 - 0.30 N

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A351	CG6MMN	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo, 0.10 - 0.30 Nb, 0.10 - 0.30 V, 0.20 - 0.40 N
ASTM A351	CG8M	18.0 - 21.0	9.0 - 13.0	S-8	HCr	3.0 - 4.0 Mo
ASTM A351	CF10SMnN	16.0 - 18.0	8.0 - 9.0	S-8	HCr	7.00 - 9.00 Mn, 3.50 - 4.50 Si, 0.08 - 0.18 N
ASTM A351	CT15C	19.0 - 21.0	31.0 - 34.0		HCr	0.50 - 1.50 Nb
ASTM A351	CK3MCuN	19.5 - 20.5	17.5 - 19.5		HCr	6.0 - 7.0 Mo, 0.18 - 0.24 N, 0.50 - 1.00 Cu
ASTM A351	CE20N	23.0 - 26.0	8.0 - 11.0	S-8	HCr	0.08 - 0.20 N
ASTM A351	CG3M	18.0 - 21.0	9.0 - 13.0	S-8	HCr	3.0 - 4.0 Mo
ASTM A351	CD3MWCuN	24.0 - 26.0	6.5 - 8.5	S-8	HCr	3.0 - 4.0 Mo, 0.20 - 0.30 N, 0.5 - 1.0 Cu, 0.5 - 1.0 W
ASTM A352	LCA	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.30 Max. Cu, 0.03 Max. V
ASTM A352	LCB	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.30 Max. Cu, 0.03 Max. V
ASTM A352	LCC	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.30 Max. Cu, 0.03 Max. V
ASTM A352	LC1	--	--	S-3A	LCr	0.45 - 0.65 Mo
ASTM A352	LC2	--	2.00 - 3.00	S-5	LCr	
ASTM A352	LC2-1	1.35 - 1.85	2.50 - 3.50	S-5	MLCr	0.30 - 0.60 Mo
ASTM A352	LC3	--	3.00 - 4.00	S-5	LCr	
ASTM A352	LC4	--	4.00 - 5.00	S-5	LCr	
ASTM A352	LC9	0.50 Max.	8.50 - 10.0		LCr	0.20 Max. Mo, 0.30 Max. Cu, 0.03 Max. V
ASTM A352	CA6NM	11.5 - 14.5	3.5 - 4.5	S-6, S-6A	HCr	0.4 - 1.0 Mo
ASTM A353		--	8.50 - 9.50		LCr	
ASTM A355	A	1.40 - 1.80	--	S-5	MLCr	0.30 - 0.40 Mo, 0.95 - 1.30 Al
ASTM A355	B	1.20 - 1.50	--	S-5	MLCr	0.15 - 0.25 Mo, 0.95 - 1.30 Al, 0.15 - 0.25 Se
ASTM A355	C	1.00 - 1.35	3.25 - 3.75	S-5	MLCr	0.20 - 0.30 Mo, 0.95 - 1.30 Al
ASTM A355	D	1.00 - 1.30	--	S-5	MLCr	0.15 - 0.25 Mo, 0.95 - 1.30 Al
ASTM A356	1	--	--	S-1	LCr	
ASTM A356	2	--	--	S-3A	LCr	0.45 - 0.65 Mo
ASTM A356	3	--	--	S-3A	LCr	0.90 - 1.20 Mo
ASTM A356	4	--	--	S-3A	LCr	0.90 - 1.20 Mo, 0.15 - 0.25 V
ASTM A356	5	0.40 - 0.70	--	S-3A	MLCr	0.40 - 0.60 Mo
ASTM A356	6	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A356	8	1.00 - 1.50	--	S-4	MLCr	0.90 - 1.20 Mo, 0.05 - 0.15 V
ASTM A356	9	1.00 - 1.50	--	S-4	MLCr	0.90 - 1.20 Mo, 0.20 - 0.35 V
ASTM A356	10	2.00 - 2.75	--	S-5	MLCr	0.90 - 1.20 Mo
ASTM A356	CA6NM	11.5 - 14.5	3.5 - 4.5	S-6, S-6A	HCr	0.4 - 1.0 Mo

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A366		0.15 Max.	0.20 Max.	S-1	LCr	
ASTM A369	FPA	--	--	S-1	LCr	
ASTM A369	FPB	--	--	S-1	LCr	
ASTM A369	FP1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A369	FP2	0.50 - 0.81	--	S-3A	MLCr	0.44 - 0.65 Mo; Cr may exceed S-3A limit, although it is low for S-4
ASTM A369	FP12	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A369	FP11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A369	FP3b	1.65 - 2.35	--	S-4 (or S-5)	MLCr	0.44 - 0.65 Mo (total alloy may exceed S-4 limit) <i>Obsolete</i>
ASTM A369	FP22	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo
ASTM A369	FP21	2.65 - 3.35	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A369	FP5	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A369	FP7	6.00 - 8.00	--	S-5	MHCr	0.44 - 0.65 Mo <i>Obsolete</i>
ASTM A369	FP9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A369	FP91	8.00 - 9.50	0.40 Max.		MHCr	0.85 - 1.05 Mo; 0.18 - 0.25 V; 0.06 - 0.10 Nb; 0.030 - 0.070 N
ASTM A372	Grade A	--	--	S-1	LCr	
ASTM A372	Grade B	--	--	S-1	LCr	
ASTM A372	Grade C	--	--	S-1	LCr	
ASTM A372	Grade D	--	--	S-3A	LCr	0.17 - 0.27 Mo
ASTM A372	Grade E, CI 55, 65, 70	0.80 - 1.15	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A372	Grade F, CI 55, 65, 70	0.80 - 1.15	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A372	Grade G, CI 55, 65, 70	0.40 - 0.65	--	S-3A	MLCr	0.15 - 0.25 Mo
ASTM A372	Grade H, CI 55, 65, 70	0.40 - 0.65	--	S-3A	MLCr	0.15 - 0.25 Mo
ASTM A372	Grade J, CI 55, 65, 70, 110	0.80 - 1.15	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A372	Grade K	1.00 - 1.80	2.0 - 3.3	S-11A	MLCr	0.20 - 0.60 Mo
ASTM A372	Grade L	0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
ASTM A372	Grade M, CI A & B	1.50 - 2.00	2.8 - 3.9	S-5	MLCr	0.40 - 0.60 Mo
ASTM A376	TP304, TP304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A376	TP304N, TP304LN	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A376	TP316, TP316H	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A376	TP316N, TP316LN	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A376	TP321, TP321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A376	TP347, TP347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A376	TP348	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A376	16-8-2H	14.5 - 16.5	7.50 - 9.50		HCr	1.5 - 2.0 Mo
ASTM A376	UNS S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A376	UNS S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A381	Y35, Y42, Y46, Y48, Y50, Y52, Y56, Y60, Y65	--	--			Carbon steel: S-1; HSLA steel composition as agreed to between purchaser and manufacturer.
ASTM A387	2	0.50 - 0.80	--	S-3A	MLCr	0.45 - 0.60 Mo; Cr may exceed S-3A limit, although it is low for S-4
ASTM A387	12	0.80 - 1.15	--	S-4	MLCr	0.45 - 0.60 Mo
ASTM A387	11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A387	22, 22L	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
ASTM A387	21, 21L	2.75 - 3.25	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A387	5	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A387	7	6.00 - 8.00	--	S-5	MHCr	0.45 - 0.65 Mo <i>obsolete</i>
ASTM A387	9	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A387	91	8.00 - 9.50	0.40 Max.		MHCr	0.85 - 1.05 Mo, 0.18 - 0.25 V, 0.06 - 0.11 Nb, 0.30 - 0.070 N
ASTM A389	C24	0.80 - 1.25	--	S-4	MLCr	0.90 - 1.20 Mo; 0.15 - 0.25 V
ASTM A389	C23	1.00 - 1.50	--	S-4	MLCr	0.45 - 0.65 Mo; 0.15 - 0.25 V
ASTM A403	WP 304, WP 304H	18.0 - 20.0	8.0 - 11.0	S-8	HCr	
ASTM A403	WP 304L	18.0 - 20.0	8.0 - 13.0	S-8	HCr	
ASTM A403	WP 304LN	18.0 - 20.0	8.0 - 10.5	S-8	HCr	0.10 - 0.16 N
ASTM A403	WP 304N	18.0 - 20.0	8.0 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A403	WP 309	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
ASTM A403	WP 310	24.0 - 26.0	19.0 - 22.0		HCr	+ Nb + Ta
ASTM A403	WP 316, WP 316H	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A403	WP 316LN	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A403	WP 316L	16.0 - 18.0	10.0 - 16.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A403	WP 316N	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A403	WP 317, WP 317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A403	WP 321, WP 321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A403	WP 347, WP 347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A403	WP 348, WP 348H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A403	WP XM-19	20.5 - 23.5	11.5 - 13.5	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A403	WP S31254	19.5 - 20.5	17.5 - 18.5		HCr	6.00 - 6.50 Mo; 0.180 - 0.220 V; 0.50 - 1.00 Cu
ASTM A403	WP S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A403	WP S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A403	WP S34565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N (should this be S24565?)
ASTM A403	WP S33228	26.0 - 28.0	31.0 - 33.0		HCr	0.6 - 1.0 Nb + Ta; 0.05 - 0.10 Ce
ASTM A405	P24	0.80 - 1.25	--	S-4	MLCr	0.87 - 1.13 Mo; 0.15 - 0.25 V
ASTM A409	TP304	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A409	TP304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A409	TP309Cb	22.0 - 24.0	12.0 - 16.0	S-8	HCr	+ Nb + Ta
ASTM A409	TP309S	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
ASTM A409	TP310Cb	24.0 - 26.0	19.0 - 22.0		HCr	+ Nb + Ta
ASTM A409	TP310S	24.0 - 26.0	19.0 - 22.0		HCr	
ASTM A409	TP316	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A409	TP316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A409	TP317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A409	TP321	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A409	TP347	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A409	TP348	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A409	UNS S30815	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A409	UNS S31725	18.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo
ASTM A409	UNS S31726	17.0 - 20.0	13.5 - 17.5	S-8	HCr	4.0 - 5.00 Mo, 0.10 - 0.20 N
ASTM A409	UNS S24565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N
ASTM A414	All	0.30 Max.	0.40 Max.	S-1	LCr	
ASTM A420	WPL6	--	--	S-1 or S-2	LCr	
ASTM A420	WPL9	--	1.60 - 2.24	S-5	LCr	0.75 - 1.25 Cu
ASTM A420	WPL3	--	3.2 - 3.8	S-5	LCr	
ASTM A420	WPL8	--	8.4 - 9.6	S-5	LCr	
ASTM A423	1	0.24 - 1.31	0.20 - 0.70	S-5	MLCr	0.20 - 0.60 Cu
ASTM A423	2	--	0.40 - 1.10	S-5	LCr	0.10 Min. Mo; 0.30 - 1.00 Cu
ASTM A426	CP1	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A426	CP15	--	--	S-3A	LCr	0.44 - 0.65 Mo
ASTM A426	CP2	0.50 - 0.81	--	S-3A	MLCr	0.44 - 0.65 Mo; Cr may exceed S-3A limit, although it is low for S-4
ASTM A426	CP12	0.80 - 1.25	--	S-4	MLCr	0.44 - 0.65 Mo
ASTM A426	CP11	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A426	CP22	2.00 - 2.75	--	S-5	MLCr	0.90 - 1.20 Mo
ASTM A426	CP21	2.65 - 3.35	--	S-5	MHCr	0.80 - 1.06 Mo
ASTM A426	CP5	4.00 - 6.50	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A426	CP5b	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A426	CP7	6.00 - 8.00	--	S-5	MHCr	0.44 - 0.65 Mo <i>Obsolete</i>
ASTM A426	CP9	8.00 - 10.00	--		MHCr	0.90 - 1.20 Mo
ASTM A426	CPCA 15	11.5 - 14.0	--	S-6, S-6A	HCr	0.50 Max. Mo
ASTM A430	FP304, FP304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A430	FP304N	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A430	FP316, FP316H	16.0 - 18.0	11.00 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A430	FP316N	16.0 - 18.0	11.00 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A430	FP321, FP321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A430	FP347, FP347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A430	FP16-8-2H	14.5 - 16.5	7.50 - 9.50		HCr	1.5 - 2.0 Mo
ASTM A434	BB					See appropriate AISI specification
ASTM A434	BC					See appropriate AISI specification
ASTM A434	BD					See appropriate AISI specification
ASTM A441	--	not specified	not specified			
ASTM A442	55	--	--	S-1	LCr	
ASTM A442	60	--	--	S-1	LCr	
ASTM A447	I, II	23.00 - 28.00	10.00 - 14.00	S-8	HCr	
ASTM A450						See applicable ASTM Specification
ASTM A451	CPF3, CPF3A	17.0 - 21.0	8.0 - 12.0	S-8	HCr	
ASTM A451	CPF8, CPF8A	18.0 - 21.0	8.0 - 11.0	S-8	HCr	
ASTM A451	CPF3M	17.0 - 21.0	9.0 - 13.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A451	CPF8M	18.0 - 21.0	9.0 - 12.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A451	CPF10MC	15.0 - 18.0	13.0 - 16.0	S-8	HCr	1.75 - 2.25 Mo; + Nb
ASTM A451	CPF8C, CPF8C (Ta Max.)	18.0 - 21.0	9.0 - 12.0	S-8	HCr	+ Nb
ASTM A451	CPH8	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A451	CPH20, CPH10	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A451	CPK20	23.0 - 27.0	19.0 - 22.0		HCr	
ASTM A451	CPE20N	23.0 - 26.0	8.0 - 11.0	S-8	HCr	0.08 - 0.20 N
ASTM A452	TP 304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A452	TP 347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A452	TP 316H	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo

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 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A455	--	--	--	S-1	LCr	
ASTM A469	1	--	--	S-2	LCr	0.03 - 0.12 V (optional)
ASTM A469	2	0.50 Max.	2.50 Min.	S-5	LCr	0.20 - 0.50 Mo, 0.03 Min. V
ASTM A469	3	0.50 Max.	2.50 Min.	S-5	LCr	0.20 - 0.50 Mo, 0.03 Min. V
ASTM A469	4	0.50 Max.	3.00 Min.	S-5	LCr	0.20 - 0.60 Mo, 0.03 Min. V
ASTM A469	5	0.50 Max.	3.00 Min.	S-5	LCr	0.20 - 0.70 Mo, 0.05 - 0.15 V
ASTM A469	6, 7, 8	1.25 - 2.00	3.25 - 4.00	S-5	MLCr	0.30 - 0.60 Mo, 0.05 - 0.15 V
ASTM A470	1	--	--	S-1	LCr	0.03 Min. V (optional)
ASTM A470	2	0.75 Max.	2.50 Min.	S-5	LCr	0.25 Min. Mo, 0.03 Min. V
ASTM A470	3, 4	0.75 Max.	2.50 Min.	S-5	LCr	0.25 Min. Mo, 0.03 Min. V
ASTM A470	5, 6, 7	1.25 - 2.00	3.25 - 4.00	S-5	MLCr	0.25 - 0.60 Mo, 0.05 - 0.15 V
ASTM A470	8	1.05 - 1.50	0.75 Max.	S-5	MLCr	1.00 - 1.50 Mo, 0.20 - 0.30 V
ASTM A470	9	0.75 Max.	2.00 Min.	S-5	LCr	0.25 Min. Mo, 0.03 - 0.12 V
ASTM A471	1 to 6	0.75 - 2.00	2.00 - 4.00	S-5	MLCr	0.20 - 0.70 Mo, 0.05 Min. V
ASTM A471	10	0.85 - 1.25	0.50 Max.	S-5	MLCr	1.00 - 1.50 Mo, 0.20 - 0.30 V
ASTM A471	11 to 13	0.80 - 1.10	0.50 Max.	S-5	MLCr	0.15 Min. Mo, 0.06 Max. V
ASTM A471	14	0.50 - 1.25	1.65 - 3.50	S-5	MLCr	0.20 Min. Mo, V optional
ASTM A473	201	16.00 - 18.00	3.50 - 5.50		HCr	5.50 - 7.50 Mn
ASTM A473	202	17.00 - 19.00	4.00 - 6.00		HCr	7.50 - 10.0 Mn
ASTM A473	205	16.50 - 18.00	1.00 - 1.70		HCr	14.00 - 15.50 Mn, 0.32 - 0.40 N
ASTM A473	302	17.00 - 19.00	8.00 - 10.00	S-8	HCr	
ASTM A473	302B	17.00 - 19.00	8.00 - 10.00	S-8	HCr	2.00 - 3.00 Si
ASTM A473	303	17.00 - 19.00	8.00 - 10.00	S-8	HCr	0.15 Min. S
ASTM A473	303B	17.00 - 19.00	8.00 - 10.00	S-8	HCr	0.15 Min. Se
ASTM A473	304	18.00 - 20.00	8.00 - 10.50	S-8	HCr	
ASTM A473	304L	18.00 - 20.00	8.00 - 12.00	S-8	HCr	
ASTM A473	305	17.00 - 19.00	10.50 - 13.00	S-8	HCr	
ASTM A473	308	19.00 - 21.00	10.00 - 12.00	S-8	HCr	
ASTM A473	UNS S30815	20.00 - 22.00	10.00 - 12.00	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A473	309	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A473	309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A473	310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A473	310	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A473	UNS S31254	19.50 - 20.50	17.50 - 18.50		HCr	6.00 - 6.50 Mo, 0.18 - 0.22 N, 0.50 - 1.00 Cu
ASTM A473	314	23.00 - 26.00	19.00 - 22.00		HCr	1.50 - 3.00 Si
ASTM A473	316	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A473	316L	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A473	317	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A473	321	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A473	347	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb
ASTM A473	348	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A473	XM-10	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A473	XM-11	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A473	UNS S28200	17.00 - 19.00	--		HCr	17.00 - 19.00 Mn, 0.75 - 1.25 Mo, 0.40 - 0.60 N, 0.75 - 1.25 Cu
ASTM A473	UNS S32760	24.00 - 26.00	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A473	UNS S32950	26.00 - 29.00	3.50 - 5.20		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A473	405	11.50 - 14.50	0.60 Max.	S-6, S-6A	HCr	0.10 - 0.30 Al
ASTM A473	429	14.00 - 16.00	0.75 Max.	S-7	HCr	
ASTM A473	430	16.00 - 18.00	0.75 Max.	S-7	HCr	
ASTM A473	430F	16.00 - 18.00	0.75 Max.	S-7	HCr	0.15 Min. S
ASTM A473	430F Se	16.00 - 18.00	0.75 Max.	S-7	HCr	0.15 Min. Se
ASTM A473	446	23.00 - 27.00	0.75 Max.		HCr	
ASTM A473	403	11.50 - 13.00	--	S-6, S-6A	HCr	
ASTM A473	410	11.50 - 13.50	0.75 Max.	S-6, S-6A	HCr	
ASTM A473	410S	11.50 - 13.50	0.75 Max.	S-6, S-6A	HCr	
ASTM A473	414	11.50 - 13.50	1.25 - 2.50	S-6, S-6A	HCr	
ASTM A473	UNS S41500	11.50 - 14.00	3.50 - 5.50	S-6, S-6A	HCr	0.40 - 0.80 Mo
ASTM A473	416	12.00 - 14.00	--	S-6, S-6A	HCr	0.15 Min. S
ASTM A473	416Se	12.00 - 14.00	--	S-6, S-6A	HCr	0.15 Min. Se
ASTM A473	420	12.00 - 14.00	0.75 Max.	S-6, S-6A	HCr	
ASTM A473	431	15.00 - 17.00	1.25 - 2.50	S-7	HCr	
ASTM A473	440A	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A473	440B	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A473	440C	16.00 - 18.00	--		HCr	0.75 Max. Mo
ASTM A473	501	4.00 - 6.00	--	S-5	MHCr	0.40 - 0.65 Mo
ASTM A473	501A	6.00 - 8.00	--	S-5	MHCr	0.45 - 0.65 Mo
ASTM A473	501B	8.00 - 10.00	--		MHCr	0.90 - 1.10 Mo
ASTM A473	502	4.00 - 6.00	--	S-5	MHCr	0.40 - 0.65 Mo
ASTM A479	UNS S20161	15.00 - 18.00	4.00 - 6.00		HCr	4.00 - 6.00 Mn, 3.00 - 4.00 Si, 0.08 - 0.20 N
ASTM A479	XM-19	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A479	XM-17	17.50 - 22.00	5.00 - 7.00		HCr	7.50 - 9.00 Mn, 2.00 - 3.00 Mo, 0.25 - 0.50 N
ASTM A479	XM-18	17.50 - 22.00	5.00 - 7.00		HCr	7.50 - 9.00 Mn, 2.00 - 3.00 Mo, 0.25 - 0.50 N
ASTM A479	UNS S21800	16.00 - 18.00	8.00 - 9.00		HCr	7.00 - 9.00 Mn, 3.50 - 4.50 Si, 0.08 - 0.18 N
ASTM A479	XM-11	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A479	XM-29	17.00 - 19.00	2.25 - 3.75		HCr	11.50 - 14.50 Mn, 0.20 - 0.40 N
ASTM A479	UNS S24565	23.0 - 25.0	16.0 - 18.0		HCr	5.0 - 7.0 Mn; 4.0 - 5.0 Mo; 0.4 - 0.6 N
ASTM A479	302	17.00 - 19.00	8.00 - 10.00	S-8	HCr	
ASTM A479	304	18.00 - 20.00	8.00 - 10.50	S-8	HCr	

LCr = Less than 0.5% Cr
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 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A479	304L	18.00 - 20.00	8.00 - 12.00	S-8	HCr	
ASTM A479	304H	18.00 - 20.00	8.00 - 10.50	S-8	HCr	
ASTM A479	304N	18.00 - 20.00	8.00 - 12.00	S-8	HCr	0.10 - 0.16 N
ASTM A479	304LN	18.00 - 20.00	8.00 - 12.00	S-8	HCr	0.10 - 0.16 N
ASTM A479	UNS S30600	17.0 - 18.5	14.0 - 15.5	S-8	HCr	3.7 - 4.3 Si
ASTM A479	UNS S30815	20.00 - 22.00	10.00 - 12.00	S-8	HCr	1.40 - 2.00 Si, 0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A479	309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A479	309H	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A479	309Cb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb
ASTM A479	ER308	19.50 - 22.00	9.00 - 11.00	S-8	HCr	
ASTM A479	310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A479	310H	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A479	310Cb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb
ASTM A479	UNS S31254	19.50 - 20.50	17.50 - 18.50		HCr	6.00 - 6.50 Mo, 0.18 - 0.22 N, 0.50 - 1.00 Cu
ASTM A479	316	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A479	316L	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A479	316H	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A479	316Ti	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, + Ti
ASTM A479	316Cb	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, + Nb
ASTM A479	316N	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A479	316LN	16.00 - 18.00	10.00 - 14.00	S-8	HCr	2.00 - 3.00 Mo, 0.10 - 0.16 N
ASTM A479	317	18.00 - 20.00	11.00 - 15.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A479	UNS S31725	18.00 - 20.00	13.50 - 17.50	S-8	HCr	4.0 - 5.0 Mo
ASTM A479	UNS S31726	17.00 - 20.00	13.50 - 17.50	S-8	HCr	4.0 - 5.0 Mo, 0.10 - 0.20 N
ASTM A479	321, 321H	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A479	UNS S32615	16.50 - 19.50	19.00 - 22.00		HCr	0.30 - 1.50 Mo, 1.50 - 2.50 Cu
ASTM A479	UNS S33228	26.00 - 28.00	31.00 - 33.00		HCr	0.60 - 1.00 Nb + Ta; 0.05 - 0.10 Ce
ASTM A479	347, 347H	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb
ASTM A479	348, 348H	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A479	UNS S31803	21.0 - 23.0	4.50 - 6.50	S-10H	HCr	2.50 - 3.50 Mo, 0.08 - 0.20 N
ASTM A479	UNS S32550	24.0 - 27.0	4.5 - 6.5	S-10H	HCr	2.90 - 3.90 Mo, 0.10 - 0.25 N, 1.5 - 2.5 Cu
ASTM A479	UNS S32750	24.0 - 26.0	6.00 - 8.00		HCr	3.00 - 5.00 Mo, 0.24 - 0.32 N, 0.5 Max. Cu
ASTM A479	UNS S32950	26.00 - 29.00	3.50 - 5.20		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A479	UNS S39277	24.0 - 26.0	6.5 - 8.0		HCr	3.0 - 4.0 Mo, 0.23 - 0.33 N, 1.2 - 2.0 Cu, 0.8 - 1.2 W
ASTM A479	405	11.50 - 14.50	0.60 Max.	S-6, S-6A	HCr	0.10 - 0.30 Al
ASTM A479	430	16.00 - 18.00	0.50 Max.	S-7	HCr	
ASTM A479	439	17.00 - 19.00	0.50 Max.	S-7	HCr	+ Ti
ASTM A479	UNS S44400	17.5 - 19.5	1.00 Max.		HCr	1.75 - 2.50 Mo, + Ti
ASTM A479	XM-27	25.00 - 27.50	0.50 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A479	UNS S44700	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A479	UNS S44800	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo

LCr = Less than 0.5% Cr
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 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A479	403	11.50 - 13.00	--	S-6, S-6A	HCr	
ASTM A479	410	11.50 - 13.50	0.75 Max.	S-6, S-6A	HCr	
ASTM A479	XM-30	11.50 - 13.50	--	S-6, S-6A	HCr	0.05 - 0.30 Nb
ASTM A479	414	11.50 - 13.50	1.25 - 2.50	S-6, S-6A	HCr	
ASTM A479	UNS S41500	11.50 - 14.0	3.5 - 5.5	S-6, S-6A	HCr	0.4 - 1.0 Mo
ASTM A479	431	15.00 - 17.00	1.25 - 2.50	S-7	HCr	
ASTM A486	70	--	--	S-1	LCr	
ASTM A486	90	not specified	not specified			
ASTM A486	120	not specified	not specified			
ASTM A487	Gr. 1, Cl. A, B, C	0.35 Max.	0.50 Max.	S-1	LCr	Mo+W=0.25 max., 0.04-0.12 V, Cu+Ni+Cr+Mo+W=1.00 Max.
ASTM A487	Gr. 2, Cl. A, B, C	0.35 Max.	0.50 Max.	S-3A	LCr	0.10-0.30 Mo, 0.03 max. V, 0.50 max. Cu, 0.10 max. W, Cu+Ni+Cr+W=1.00 Max.
ASTM A487	Gr. 4, Cl. A, B, C, D, E	0.40 - 0.80	0.40 - 0.80	S-3A	MLCr	0.15-0.30 Mo, 0.03 max. V, 0.50 max. Cu, 0.10 max. W, Cu+W=0.60 Max.
ASTM A487	Gr. 6, Cl. A, B	0.40 - 0.80	0.40 - 0.80	S-3A	MLCr	0.30-0.40 Mo, 0.03 max. V, 0.50 max. Cu, 0.10 max. W, Cu+W=0.60 Max.
ASTM A487	Gr. 7, Cl. A	0.40 - 0.80	0.70 - 1.00	S-3A or S-11D	MLCr	0.40-0.60 Mo, 0.03-0.10 V, 0.002-0.006 B, 0.15-0.50 Cu, 0.10 max. W, Cu+W=0.60 Max.
ASTM A487	Gr. 8, Cl. A, B	2.00 - 2.75	--	S-5	MLCr	0.90-1.10 Mo, 0.03 max. V, 0.50 max. Cu, 0.10 max. W, Cu+W=0.60 Max.
ASTM A487	Gr. 9, Cl. A, B, C, D, E	0.75 - 1.10	0.50 Max.	S-5	MLCr	0.15-0.30 Mo, 0.03 max. V, 0.50 max. Cu, 0.10 max. W, Cu+W=1.00 Max.
ASTM A487	Gr. 10, Cl. A, B	0.55 - 0.90	1.40 - 2.00	S-5	MLCr	0.20-0.40 Mo, 0.03 max. V, 0.50 max. Cu, 0.10 max. W, Cu+W=0.60 Max.
ASTM A487	Gr. CA15, Cl. A, B, C, D	11.5 - 14.0	1.00 Max.	S-6, S-6A	HCr	0.50 Max. Mo, 0.50 Max. Cu, 0.10 Max. W, 0.05 Max. V
ASTM A487	Gr. CA15M, Cl. A	11.5 - 14.0	1.0 Max.	S-6, S-6A	HCr	0.15 - 1.00 Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max. V
ASTM A487	Gr. CA6NM, Cl. A, B	11.5 - 14.0	3.5 - 4.5	S-6, S-6A	HCr	0.40 - 1.00 Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max. V
ASTM A487	Gr. 11, Cl. A, B	0.50 - 0.80	0.70 - 1.10	S-5 or S-11D	MLCr	0.45 - 0.65 Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max. V
ASTM A487	Gr. 12, Cl. A, B	0.50 - 0.90	0.60 - 1.00	S-5	MLCr	0.90 - 1.20 Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max. V
ASTM A487	Gr. 13, Cl. A, B	0.40 Max.	1.40 - 1.75	S-3A	LCr	0.20 - 0.30 Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max.

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

						V
ASTM A487	Gr. 14, Cl. A	0.40 Max.	1.40 - 1.75	S-3A	LCr	0.20 - 0.30 Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max. V
ASTM A487	Gr. 16, Cl. A	0.20 Max.	1.00 - 1.40	S-3A	LCr	0.10 Max. Mo, 0.50 Max. Cu, 0.10 Max. W, 0.03 Max. V
ASTM A496		not specified	not specified			
ASTM A497		not specified	not specified			
ASTM A498						See applicable ASTM Specification
ASTM A500	A, B, C & D	--	--	S-1	LCr	
ASTM A501	--	--	--	S-1	LCr	
ASTM A504	All	--	--			
ASTM A506						See appropriate AISI specification
ASTM A507						See appropriate AISI specification
ASTM A508	1	0.25 Max.	0.40 Max.	S-2	LCr	0.10 Max. Mo, 0.05 Max. V
ASTM A508	1A	0.25 Max.	0.40 Max.	S-2	LCr	0.10 Max. Mo, 0.05 Max. V
ASTM A508	2, Cl 1 & 2	0.25 - 0.45	0.50 - 1.00	S-5	LCr	0.55 - 0.70 Mo, 0.05 Max. V
ASTM A508	3, Cl 1 & 2	0.25 Max.	0.40 - 1.00	S-5	LCr	0.45 - 0.60 Mo, 0.05 Max. V
ASTM A508	4N, Cl 1, 2, 3	1.50 - 2.00	2.8 - 3.9	S-5	MLCr	0.40 - 0.60 Mo, 0.03 Max. V
ASTM A508	5, Cl 1 & 2	1.50 - 2.00	2.8 - 3.9	S-5	MLCr	0.40 - 0.60 Mo, 0.08 Max. V
ASTM A508	22, Cl 3	2.00 - 2.50	0.25 Max.	S-5	MLCr	0.90 - 1.10 Mo, 0.02 Max. V
ASTM A508	3V	2.8 - 3.3	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.001 - 0.003 B, 0.015 - 0.035 Ti
ASTM A508	3VCb	2.7 - 3.3	0.25 Max.	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.070 Nb, 0.25 Max. Cu, 0.0005 - 0.0150 Ca, 0.015 Max. Ti
ASTM A511	MT 302	17.0 - 19.0	8.0 - 10.0	S-8	HCr	
ASTM A511	MT 303Se	17.0 - 19.0	8.0 - 11.0	S-8	HCr	0.12 - 0.2 Se
ASTM A511	MT 304	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A511	MT 304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A511	MT 305	17.0 - 19.0	10.0 - 13.0	S-8	HCr	
ASTM A511	MT 309S	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
ASTM A511	MT 310S	24.0 - 26.0	19.0 - 22.0		HCr	
ASTM A511	MT 316	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A511	MT 316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A511	MT 317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A511	MT 321	17.0 - 20.0	9.0 - 13.0	S-8	HCr	+ Ti
ASTM A511	MT 347	17.0 - 20.0	9.0 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A511	MT403	11.5 - 13.0	0.50 Max.	S-6, S-6A	HCr	0.60 Max. Mo
ASTM A511	MT410	11.5 - 13.5	0.50 Max.	S-6, S-6A	HCr	
ASTM A511	MT 414	11.5 - 13.5	1.25 - 2.50	S-6, S-6A	HCr	
ASTM A511	MT 416Se	12.0 - 14.0	0.50 Max.	S-6, S-6A	HCr	0.12 - 0.20 Se
ASTM A511	MT 431	15.0 - 17.0	1.25 - 2.50	S-7	HCr	
ASTM A511	MT 440A	16.0 - 18.0	--	S-7	HCr	0.75 Max. Mo
ASTM A511	MT405	11.5 - 14.5	0.50 Max.	S-6, S-6A	HCr	0.10 - 0.30 Al
ASTM A511	MT 429	14.0 - 16.0	0.50 Max.	S-7	HCr	
ASTM A511	MT 430	16.0 - 18.0	0.50 Max.	S-7	HCr	
ASTM A511	MT 443	18.0 - 23.0	0.50 Max.		HCr	0.90 - 1.25 Cu
ASTM A511	MT 446-1	23.0 - 30.0	0.50 Max.		HCr	0.10 - 0.25 N
ASTM A511	MT 446-2	23.0 - 30.0	0.50 Max.		HCr	0.10 - 0.25 N
ASTM A511	29-4	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A511	29-4-2	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A512				S-1	LCr	See appropriate AISI Specification
ASTM A513						See appropriate AISI Specification
ASTM A514	A	0.50 - 0.80	--	S-5	MLCr	0.18 - 0.28 Mo, 0.05 - 0.15 Zr, 0.0025 Max. B
ASTM A514	B	0.40 - 0.65	--	S-5	MLCr	0.15 - 0.25 Mo, 0.03 - 0.08 V, 0.01 - 0.03 Ti, 0.0005 - 0.005 B
ASTM A514	C	--	--	S-3A	LCr	0.15 - 0.30 Mo, 0.001 - 0.005 B
ASTM A514	D (obs.)	0.85 - 1.20	--	S-4	MLCr	0.15 - 0.25 Mo, 0.04 - 0.10 Ti, 0.001 - 0.005 B
ASTM A514	E	1.40 - 2.00	--	S-4 or S-5	MLCr	0.40 - 0.60 Mo, 0.01 - 0.10 Ti, 0.0015 - 0.005 B
ASTM A514	F	0.40 - 0.65	0.70 - 1.00	S-5 or S-11D	MLCr	0.40 - 0.60 Mo, 0.03 - 0.08 V, 0.15 - 0.50 Cu, 0.0005 - 0.006 B
ASTM A514	G (obs.)	0.50 - 0.90	--	S-5	MLCr	0.40 - 0.60 Mo, 0.05 - 0.15 Zr, 0.0025 Max. B
ASTM A514	H	0.40 - 0.65	0.30 - 0.70	S-5	MLCr	0.20 - 0.30 Mo, 0.03 - 0.08 V, 0.01 - 0.03 Ti, 0.0005 - 0.005 B
ASTM A514	J	--	--	S-3A	LCr	0.50 - 0.65 Mo, 0.001 - 0.005 B
ASTM A514	K	--	--	S-3A	LCr	0.45 - 0.55 Mo, 0.001 - 0.005 B
ASTM A514	L (obs.)	1.15 - 1.65	--	S-4	MLCr	0.25 - 0.40 Mo, 0.04 - 0.10 Ti, 0.0015 - 0.005 B
ASTM A514	M	--	1.20 - 1.50	S-5	LCr	0.45 - 0.60 Mo, 0.001 - 0.005

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

						B
ASTM A514	N (obs.)	0.50 - 0.80	--	S-3A	MLCr	0.25 Max. Mo, 0.05 - 0.15 Zr, 0.0005 - 0.0025 B
ASTM A514	P	0.85 - 1.20	1.20 - 1.50	S-5	MLCr	0.45 - 0.60 Mo, 0.001 - 0.005 B
ASTM A514	Q	1.00 - 1.50	1.20 - 1.50	S-11A	MLCr	0.40 - 0.60 Mo, 0.03 - 0.08 V
ASTM A514	R	0.35 - 0.65	0.90 - 1.10	S-11D or S-5	LCr	0.15 - 0.25 Mo, 0.03 - 0.08 V
ASTM A514	S	--	--	S-3A	LCr	0.10 - 0.60 Mo, 0.06 Max. V, 0.06 Ti, 0.001 - 0.005 B, 0.06 Max. Nb
ASTM A514	T	--	--	S-3A	LCr	0.45 - 0.60 Mo, 0.03 - 0.80 V, 0.001 - 0.005 B
ASTM A515	55	--	--	S-1	LCr	
ASTM A515	60	--	--	S-1	LCr	
ASTM A515	65	--	--	S-1	LCr	
ASTM A515	70	--	--	S-1	LCr	
ASTM A516	55	--	--	S-1	LCr	
ASTM A516	60	--	--	S-1	LCr	
ASTM A516	65	--	--	S-1	LCr	
ASTM A516	70	--	--	S-1	LCr	
ASTM A517	A	0.50 - 0.80	--	S-5	MLCr	0.18 - 0.28 Mo, 0.05 - 0.15 Zr, 0.0025 Max. B
ASTM A517	B	0.40 - 0.65	--	S-5	MLCr	0.15 - 0.25 Mo, 0.03 - 0.08 V, 0.01 - 0.03 Ti, 0.0005 - 0.005 B
ASTM A517	C	--	--	S-3A	LCr	0.20 - 0.30 Mo, 0.001 - 0.005 B
ASTM A517	D (obs.)	0.85 - 1.20	--	S-4	MLCr	0.15 - 0.25 Mo, 0.04 - 0.10 Ti, 0.001 - 0.005 B
ASTM A517	E	1.40 - 2.00	--	S-4 or S-5	MLCr	0.40 - 0.60 Mo, 0.01 - 0.10 Ti (or V), 0.001 - 0.005 B
ASTM A517	F	0.40 - 0.65	0.70 - 1.00	S-5 or S-11D	LCr	0.40 - 0.60 Mo, 0.03 - 0.08 V, 0.15 - 0.50 Cu, 0.0005 - 0.006 B
ASTM A517	G (obs.)	0.50 - 0.90	--	S-5	MLCr	0.40 - 0.60 Mo, 0.05 - 0.15 Zr, 0.0025 Max. B
ASTM A517	H	0.40 - 0.65	0.30 - 0.70	S-5	LCr	0.20 - 0.30 Mo, 0.03 - 0.08 V, 0.0005 Min. B
ASTM A517	J	--	--	S-3A	LCr	0.50 - 0.65 Mo, 0.001 - 0.005 B
ASTM A517	K	--	--	S-3A	LCr	0.45 - 0.55 Mo, 0.001 - 0.005 B
ASTM A517	L (obs.)	1.15 - 1.65	--	S-4	MLCr	0.25 - 0.40 Mo, 0.04 - 0.10 Ti, 0.0015 - 0.005 B
ASTM A517	M	--	1.20 - 1.50	S-5	LCr	0.45 - 0.60 Mo, 0.001 - 0.005 B
ASTM A517	P	0.85 - 1.20	1.20 - 1.50	S-5	MLCr	0.45 - 0.60 Mo, 0.001 - 0.005 B

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A517	Q	1.00 - 1.50	1.20 - 1.50	S-5	MLCr	0.40 - 0.60 Mo, 0.03 - 0.08 V
ASTM A517	R (obs.)	0.60 - 1.00	--	S-4	MLCr	0.20 - 0.60 Mo, 0.06 - 0.12 Zr
ASTM A517	S	--	--	S-3A	LCr	0.10 - 0.35 Mo, 0.06 Max. Ti, 0.06 Max. Nb
ASTM A517	T	--	--	S-3A	LCr	0.45 - 0.60 Mo, 0.03 - 0.08V, 0.001 - 0.005 B
ASTM A519						See appropriate AISI Specification
ASTM A521						As agreed to between supplier and purchaser
ASTM A522	I		8.40 - 9.60		LCr	
ASTM A522	II		7.40 - 8.60	S-5	LCr	
ASTM A523	A	--	--	S-1	LCr	
ASTM A523	B	--	--	S-1	LCr	
ASTM A524	I	--	--	S-1	LCr	
ASTM A524	II	--	--	S-1	LCr	
ASTM A529	42, 50	--	--	S-1	LCr	
ASTM A530						See appropriate ASTM Specification
ASTM A533	A	--	--	S-3A	LCr	0.45 - 0.60 Mo
ASTM A533	B	--	0.40 - 0.70	S-3A	LCr	0.45 - 0.60 Mo
ASTM A533	C	--	0.70 - 1.00	S-3A	LCr	0.45 - 0.60 Mo
ASTM A533	D	--	0.20 - 0.40	S-3A	LCr	0.45 - 0.60 Mo
ASTM A537	1 (Norm.)	0.25 Max.	0.25 Max.	S-1	LCr	
ASTM A537	2 (Q & T)	0.25 Max.	0.25 Max.	S-2	LCr	
ASTM A537	3 (Q & T)	0.25 Max.	0.25 Max.	S-2	LCr	
ASTM A539		--	--	S-1	LCr	
ASTM A541	Grade 1, 1A	0.25 Max.	0.40 Max.	S-2	LCr	
ASTM A541	Grade 1C	0.25 Max.	0.40 - 1.00	S-3A	LCr	
ASTM A541	Grade 2, Cl 1 & 2	0.25 - 0.45	0.50 - 1.00	S-5	LCr	0.55 - 0.70 Mo, 0.05 Max. V
ASTM A541	Grade 3, Cl 1 & 2	0.25 Max.	0.40 - 1.00	S-5	LCr	0.45 - 0.60 Mo, 0.05 Max. V
ASTM A541	Grade 3V	2.8 - 3.3	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.035 Ti, 0.001 - 0.003 B
ASTM A541	Grade 3VCb	2.7 - 3.3	0.25 Max.	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 Max. Ti, 0.25 Max. Cu, 0.015 - 0.070 Nb, 0.0005 - 0.0150 Ca

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A541	Grade 4N, CI 1, 2 & 3	1.25 - 2.00	2.8 - 3.9	S-5	MLCr	0.40 - 0.60 Mo, 0.03 Max. V
ASTM A541	Grade 5, CI 1 & 2	1.25 - 2.00	2.8 - 3.9	S-5	MLCr	0.40 - 0.60 Mo, 0.08 Max. V
ASTM A541	Grade 11, CI 4	1.00 - 1.50	0.50 Max.	S-4	MLCr	0.45 - 0.65 Mo, 0.05 Max. V
ASTM A541	Grade 22, CI 3	2.00 - 2.50	0.25 Max.	S-5	MLCr	0.90 - 1.10 Mo; 0.02 Max V
ASTM A541	Grade 22, CI 4 & 5	2.00 - 2.50	0.50 Max.	S-5	MLCr	0.90 - 1.10 Mo; 0.05 Max V
ASTM A541	Grade 22V	2.00 - 2.50	0.25 Max.	S-5	MLCr	0.90 - 1.10 Mo; 0.25 - 0.35 V, 0.03 Max. Ti, 0.0020 Max. B, 0.20 Max. Cu, 0.07 Max. Nb, 0.015 Max. Ca
ASTM A542	A	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
ASTM A542	B	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
ASTM A542	C	2.75 - 3.25	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.035 Ti, 0.001 - 0.003 B
ASTM A542	D	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo, 0.25 - 0.35 V
ASTM A542	E	2.75 - 3.25	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.070 Nb, 0.0005 - 0.0150 Ca
ASTM A543	B	1.00 - 1.90	2.25 - 4.00	S-5 or S-11A	MLCr	0.20 - 0.65 Mo, 0.03 Max. V
ASTM A543	C	1.00 - 1.90	2.00 - 3.50	S-11A	MLCr	0.20 - 0.65 Mo, 0.03 Max. V
ASTM A553	I	--	8.50 - 9.50	S-5	LCr	
ASTM A553	II	--	7.50 - 8.50	S-5	LCr	
ASTM A554	MT-301	16.0 - 18.0	6.0 - 8.0	S-8	HCr	
ASTM A554	MT-302	17.0 - 19.0	8.0 - 10.0	S-8	HCr	
ASTM A554	MT-304	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A554	MT-304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A554	MT-305	17.0 - 19.0	10.0 - 13.0	S-8	HCr	
ASTM A554	MT-309S	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
ASTM A554	MT-309S-Cb	22.0 - 24.0	12.0 - 15.0	S-8	HCr	+ Nb + Ta
ASTM A554	MT-310S	24.0 - 26.0	19.0 - 22.0		HCr	
ASTM A554	MT-316	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A554	MT-316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A554	MT-317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A554	MT-321	17.0 - 20.0	9.0 - 13.0	S-8	HCr	+ Ti
ASTM A554	MT-330	14.0 - 16.0	33.0 - 36.0		HCr	
ASTM A554	MT-347	17.0 - 20.0	9.0 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A554	MT-429	14.0 - 16.0	0.50 Max.	S-7	HCr	
ASTM A554	MT-430	16.0 - 18.0	0.50 Max.	S-7	HCr	
ASTM A554	MT-430-Ti	16.0 - 19.5	0.075 Max.	S-7	HCr	+ Ti
ASTM A562	--	--	--	S-1	LCr	0.15 Max. Cu, 4 X C Min. Ti

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A565	XM-32	11.00 - 12.50	2.00 - 3.00	S-6, S-6A	HCr	1.50 - 2.00 Mo, 0.25 - 0.40 V, 0.01 - 0.05 N
ASTM A565	UNS S41041	11.50 - 13.00	0.50 Max.	S-6, S-6A	HCr	0.15 - 0.45 Nb
ASTM A565	615	12.00 - 14.00	1.80 - 2.20		HCr	2.50 - 3.50 W
ASTM A565	616	11.00 - 12.50	0.50 - 1.00	S-6, S-6A	HCr	0.90 - 1.25 Mo, 0.20 - 0.30 V, 0.90 - 1.25 W
ASTM A565	619	11.00 - 12.00	0.50 Max.	S-6, S-6A	HCr	2.50 - 3.00 Mo, 0.20 - 0.30 V
ASTM A569		0.15 Max.	0.20 Max.	S-1	LCr	
ASTM A570		0.15 Max.	0.20 Max.	S-1	LCr	
ASTM A572	Type 1	--	--	S-1	LCr	0.20 Min. Cu when specified; 0.005 - 0.05 Nb
ASTM A572	Type 2	--	--	S-1	LCr	0.20 Min. Cu when specified; 0.01 - 0.15 V
ASTM A572	Type 3	--	--	S-1	LCr	0.20 Min. Cu when specified; 0.02 - 0.15 Nb, or 0.01 - 0.16 Nb + V
ASTM A572	Type 4	--	--	S-1	LCr	0.20 Min. Cu when specified; 0.015 Max. N w/ V
ASTM A573	58	--	--	S-1	LCr	
ASTM A573	65	--	--	S-1	LCr	
ASTM A573	70	--	--	S-1	LCr	
ASTM A575						See appropriate AISI Specification
ASTM A576						See appropriate AISI Specification
ASTM A579	11	1.40 - 1.65	2.75 - 3.25	S-11A	MLCr	0.8 - 1.0 Mo, 0.03 - 0.07 Nb
ASTM A579	12	0.40 - 0.70	4.75 - 5.25	S-5	MLCr	0.30 - 0.65 Mo, 0.05 - 0.10 V
ASTM A579	12A	0.40 - 0.70	4.75 - 5.25	S-5	MLCr	0.30 - 0.65 Mo, 0.05 - 0.10 V
ASTM A579	13	0.80 - 1.10	--	S-4	MLCr	0.15 - 0.25 Mo, 0.05 - 0.10 V
ASTM A579	21	0.65 - 0.90	1.65 - 2.00	S-5	MLCr	0.30 - 0.60 Mo, 0.17 - 0.23 V
ASTM A579	22	0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.30 - 0.60 Mo, 0.05 - 0.10 V
ASTM A579	23	0.90 - 1.20	0.40 - 0.70	S-5	MLCr	0.90 - 1.10 Mo, 0.08 - 0.15 V
ASTM A579	31	0.20 - 0.40	1.65 - 2.00	S-5	LCr	0.35 - 0.45 Mo
ASTM A579	32	0.65 - 0.90	1.65 - 2.00	S-5	MLCr	0.30 - 0.45 Mo
ASTM A579	33	1.90 - 2.25	--	S-5	MLCr	0.45 - 0.60 Mo, 0.03 - 0.08 V
ASTM A579	41	4.75 - 5.25	--	S-5	MHCr	1.20 - 1.40 Mo, 0.40 - 0.60 V
ASTM A579	51	11.5 - 13.5	0.75 Max.	S-6, S-6A	HCr	
ASTM A579	52	11.0 - 13.5	0.75 - 1.25	S-6, S-6A	HCr	0.75 - 1.25 Mo, 0.20 - 0.30 V, 0.75 - 1.25 W
ASTM A579	53	15.0 - 17.0	1.25 - 2.50		HCr	
ASTM A579	61	15.5 - 17.5	3.0 - 5.0		HCr	3.0 - 5.0 Cu, 0.15 - 0.45 Nb
ASTM A579	62	16.0 - 18.0	6.5 - 7.75		HCr	0.75 - 1.50 Al

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A579	63	14.0 - 15.25	6.5 - 7.75		HCr	2.0 - 2.75 Mo, 0.75 - 1.25 Al
ASTM A579	64	15.0 - 16.0	4.0 - 5.0		HCr	2.50 - 3.25 Mo, 0.07 - 0.13 N
ASTM A579	71	--	17.0 - 19.0		LCr	3.0 - 3.5 Mo, 0.15 - 0.25 Ti, 8.0 - 9.0 Co, 0.05 - 0.15 Al
ASTM A579	72	--	17.0 - 19.0		LCr	4.6 - 5.2 Mo, 0.30 - 0.50 Ti, 7.0 - 8.5 Co, 0.05 - 0.15 Al
ASTM A579	73	--	18.0 - 19.0		LCr	4.6 - 5.2 Mo, 0.50 - 0.80 Ti, 8.5 - 9.5 Co, 0.05 - 0.15 Al
ASTM A579	74	4.75 - 5.25	11.5 - 12.5		MHCr	2.75 - 3.25 Mo, 0.05 - 0.15 Ti, 0.25 - 0.40 Al
ASTM A579	75	4.75 - 5.25	11.5 - 12.5		MHCr	2.75 - 3.25 Mo, 0.10 - 0.25 Ti, 0.35 - 0.50 Al
ASTM A579	81	0.35 - 0.60	7.0 - 9.0		LCr	0.35 - 0.60 Mo, 0.06 - 0.12 V, 3.5 - 4.5 Co
ASTM A579	82	0.90 - 1.10	7.0 - 8.5		MLCr	0.90 - 1.10 Mo, 0.06 - 0.12 V, 4.0 - 5.0 Co
ASTM A579	83	0.20 - 0.35	7.0 - 8.5		LCr	0.20 - 0.35 Mo, 0.06 - 0.12 V, 3.5 - 4.5 Co
ASTM A587	--	--	--	S-1	LCr	0.02 - 0.10 Al
ASTM A588	A	0.40 - 0.65	0.40 Max.	S-3A	MLCr	0.25 - 0.40 Cu, 0.02 - 0.10 V
ASTM A588	B	0.40 - 0.70	0.50 Max.	S-3A	MLCr	0.20 - 0.40 Cu, 0.01 - 0.10 V
ASTM A588	C	0.30 - 0.50	0.25 - 0.50	S-3A	LCr	0.20 - 0.50 Cu, 0.01 - 0.10 V
ASTM A588	D (obs.)	0.50 - 0.90	--		MLCr	0.30 Max. Cu, 0.05 - 0.15 Zr, 0.04 Max. Nb
ASTM A588	E (obs.)	--	0.75 - 1.25	S-3A	LCr	0.08 Max. Mo, 0.50 - 0.80 Cu, 0.05 Max. V
ASTM A588	F (obs.)	0.30 Max.	0.40 - 1.10	S-3A	LCr	0.10 - 0.20 Mo, 0.30 - 1.00 Cu, 0.01 - 0.10 V
ASTM A588	H (obs.)	0.10 - 0.25	0.30 - 0.60	S-3A	LCr	0.15 Max. Mo, 0.20 - 0.35 Cu, 0.02 - 0.10 V, 0.005 - 0.03 Ti
ASTM A588	J (obs.)	--	0.50 - 0.70	S-3A	LCr	0.30 Min. Cu, 0.03 - 0.05 Ti
ASTM A588	K	0.40 - 0.70	0.40 Max.	S-3A	MLCr	0.30 - 0.50 Cu, 0.005 - 0.05 Nb
ASTM A589	Butt Welded	--	--	S-1	LCr	
ASTM A589	A	--	--	S-1	LCr	
ASTM A589	B	--	--	S-1	LCr	
ASTM A592	A	0.50 - 0.80	--	S-3A	MLCr	0.18 - 0.28 Mo, 0.05 - 0.15 Zr, 0.0025 Max. B
ASTM A592	E	1.40 - 2.00	--	S-4	MLCr	0.40 - 0.60 Mo, 0.04 - 0.10 Ti, 0.20 - 0.40 Cu, 0.0015 - 0.005 B
ASTM A592	F	0.40 - 0.65	0.70 - 1.00	S-5 or S- 11D	MLCr	0.40 - 0.60 Mo, 0.03 - 0.08 V, 0.15 - 0.50 Cu, 0.002 - 0.006 B
ASTM A594	1	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A594	2	--		S-1	LCr	
ASTM A594	3	--		S-1	LCr	
ASTM A594	4	--		S-1	LCr	
ASTM A595	A	--	--	S-1	LCr	
ASTM A595	B	--	--	S-1	LCr	
ASTM A595	C	0.30 - 1.25	0.65 Max.	S-3A or S-4 (depending on Cr content)	MLCr	
ASTM A597	CA-2	4.75 - 5.50	--	S-5	MHCr	0.90 - 1.40 Mo, 0.20 - 0.50 V (optional)
ASTM A597	CD-2	11.00 - 13.00	--	S-6, S-6A	HCr	0.70 - 1.20 Mo, 0.40 - 1.00 V, 0.70 - 1.00 Co (V & Co optional)
ASTM A597	CD-5	11.00 - 13.00	0.40 - 0.60 (optional)	S-6, S-6A	HCr	0.70 - 1.20 Mo, 0.35 - 0.55 V, 2.50 - 3.50 Co
ASTM A597	CS-5	0.35 Max.	--	S-3A	LCr	0.20 - 0.80 Mo, 0.35 Max. V
ASTM A597	CM-2	3.75 - 4.50	0.25 Max.	S-5	MHCr	4.50 - 5.50 Mo, 1.25 - 2.20 V, 0.25 Max. Co, 5.50 - 6.75 W
ASTM A597	CS-7	3.00 - 3.50	--	S-5	MHCr	1.20 - 1.60 Mo
ASTM A597	CH-12	4.75 - 5.75	--	S-5	MHCr	1.25 - 1.75 Mo, 0.20 - 0.50 V, 1.00 - 1.70 W
ASTM A597	CH-13	4.75 - 5.75	--	S-5	MHCr	1.25 - 1.75 Mo, 0.75 - 1.20 V
ASTM A597	CO-1	0.40 - 1.00	--	S-5	MLCr	0.30 Max. V, 0.40 - 0.60 W
ASTM A608	HC30	26 - 30	4.0 Max.		HCr	0.50 Max. Mo
ASTM A608	HD50	26 - 30	4 - 7		HCr	0.50 Max. Mo
ASTM A608	HE35	26 - 30	8 - 11		HCr	0.50 Max. Mo
ASTM A608	HF30	19 - 23	9 - 12	S-8	HCr	0.50 Max. Mo
ASTM A608	HH30	24 - 28	11 - 14		HCr	0.50 Max. Mo
ASTM A608	HH33	24 - 26	12 - 14	S-8	HCr	0.50 Max. Mo
ASTM A608	HI35	26 - 30	14 - 18		HCr	0.50 Max. Mo
ASTM A608	HK30	23 - 27	19 - 22		HCr	0.50 Max. Mo
ASTM A608	HK40	23 - 27	19 - 22		HCr	0.50 Max. Mo
ASTM A608	HL30	28 - 32	18 - 22		HCr	0.50 Max. Mo
ASTM A608	HL40	28 - 32	18 - 22		HCr	0.50 Max. Mo
ASTM A608	HN40	19 - 23	23 - 27		HCr	0.50 Max. Mo
ASTM A608	HT50	15 - 19	33 - 37		HCr	0.50 Max. Mo
ASTM A608	HU50	17 - 21	37 - 41		HCr	0.50 Max. Mo
ASTM A608	HW50	10 - 14	58 - 62		HCr	0.50 Max. Mo
ASTM A608	HX50	15 - 19	64 - 68	S-43	HCr	0.50 Max. Mo
ASTM A612	--	0.25 Max.	0.25 Max.	S-1	LCr	
ASTM A615	40	not specified	not specified			
ASTM A615	60	not specified	not specified			

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A615	75	not specified	not specified			
ASTM A618	Ia	--	--	S-1	LCr	0.20 Min. Cu
ASTM A618	Ib	--	--	S-1	LCr	0.20 Min. Cu
ASTM A618	II	--	--	S-1	LCr	0.20 Min. Cu, 0.02 Min. V
ASTM A618	III	--	--	S-1	LCr	0.02 Min. V or 0.005 Min. Nb, 0.20 Min. Cu, if specified
ASTM A632	TP 304	18.0 - 20.0	8.00 - 11.0	S-8		
ASTM A632	TP 304L	18.0 - 20.0	8.00 - 13.0	S-8		
ASTM A632	TP 310	24.0 - 26.0	19.0 - 22.0			
ASTM A632	TP 316	16.0 - 18.0	11.0 - 14.0	S-8		2.00 - 3.00 Mo
ASTM A632	TP 316L	16.0 - 18.0	10.0 - 15.0	S-8		2.00 - 3.00 Mo
ASTM A632	TP 317	18.0 - 20.0	11.0 - 14.0	S-8		3.00 - 4.00 Mo
ASTM A632	TP 321	17.0 - 20.0	9.00 - 13.0	S-8		+ Ti
ASTM A632	TP 347	17.0 - 20.0	9.00 - 13.0	S-8		+ Nb + Ta
ASTM A632	TP 348	17.0 - 20.0	9.00 - 13.0	S-8		+ Nb + Ta
ASTM A633	A	--	--	S-1	LCr	
ASTM A633	C	--	--	S-1	LCr	0.01 - 0.05 Nb
ASTM A633	D	0.25 Max.	0.25 Max.	S-1	LCr	0.35 Max. Cu
ASTM A633	E	--	--	S-1	LCr	0.04 - 0.11 V, 0.01 - 0.05 Nb, 0.01 - 0.03 N
ASTM A638	660	13.50 - 16.00	24.00 - 27.00		HCr	1.00 - 1.50 Mo, 1.90 - 2.35 Ti, 0.10 - 0.50 V, 0.0010 - 0.010 B
ASTM A638	662	12.00 - 15.00	24.00 - 28.00		HCr	2.50 - 3.50 Mo, 1.55 - 2.00 Ti, 0.0010 - 0.010 B
ASTM A645		--	4.75 - 5.25	S-5	LCr	0.20 - 0.35 Mo, 0.02 - 0.12 Al, 0.020 Max. N
ASTM A646	1 - 7, 11 - 15 (AISI Grades)					See appropriate AISI specification
ASTM A646	8 (300 M)	0.70 - 0.95	1.65 - 2.00	S-5	MLCr	0.35 - 0.45 Mo, 0.05 - 0.10 V
ASTM A646	9 (D6AC)	0.90 - 1.20	0.40 - 0.70	S-5	MLCr	0.90 - 1.10 Mo, 0.08 - 0.15 V
ASTM A646	10 (H-11)	4.75 - 5.25	--	S-5	MHCr	1.20 - 1.40 Mo, 0.40 - 0.60 V
ASTM A646	16 (HP 9-4-20)	0.65 - 0.85	8.5 - 9.5		MLCr	0.90 - 1.10 Mo, 0.06 - 0.12 V, 4.25 - 4.75 Co
ASTM A646	17 (HP 9-4-30)	0.90 - 1.10	7.0 - 8.0		MLCr	0.90 - 1.10 Mo, 0.06 - 0.12 V, 4.25 - 4.75 Co
ASTM A646	18 (Marage 200)	--	17.0 - 19.0		LCr	3.0 - 3.50 Mo, 8.0 - 9.0 Co, 0.10 - 0.25 Ti, 0.05 - 0.15 Al; B, Zr, Ca added
ASTM A646	19 (Marage 250)	--	17.0 - 19.0		LCr	4.6 - 5.2 Mo, 0.30 - 0.50 Ti, 7.0 - 8.5 Co, 0.05 - 0.15 Al; B, Zr, Ca added

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A646	20 (Marage 300)	--	18.0 - 19.0		LCr	4.7 - 5.2 Mo, 0.50 - 0.80 Ti, 8.5 - 9.5 Co, 0.05 - 0.15 Al; B, Zr, Ca added
ASTM A646	21 (Nit. 135)	1.40 - 1.80	--	S-5	MLCr	0.30 - 0.40 Mo, 0.95 - 1.30 Al
ASTM A649	1A	0.80 - 1.15	--	S-4	MLCr	0.15 - 0.50 Mo
ASTM A649	1B	0.65 - 0.93	1.55 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
ASTM A649	2	--	--	S-2	LCr	
ASTM A649	3	0.80 - 1.15	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A649	4	--	--	S-2	LCr	
ASTM A649	5	0.30 Max.	0.60 Max.	S-1 or S-2	LCr	
ASTM A656	Type 3	--	--	S-1	LCr	0.08 Max. V, 0.005 - 0.15 Nb
ASTM A656	Type 7	--	--	S-1	LCr	0.005 - 0.15 V, 0.005 - 0.10 Nb
ASTM A660	WCA	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.50 Max. Cu, 0.03 Max. V, Total Ni + Cr + Mo + Cu = 1.00 Max.
ASTM A660	WCB	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.50 Max. Cu, 0.03 Max. V, Total Ni + Cr + Mo + Cu = 1.00 Max.
ASTM A660	WCC	0.50 Max.	0.50 Max.	S-1	LCr	0.20 Max. Mo, 0.50 Max. Cu, 0.03 Max. V, Total Ni + Cr + Mo + Cu = 1.00 Max.
ASTM A662	A	--	--	S-1	LCr	
ASTM A662	B	--	--	S-1	LCr	
ASTM A662	C	--	--	S-1	LCr	
ASTM A663	45, 50, 55, 60, 65, 70, 75, 80	--	--			Chemistry not specified
ASTM A668	A to E & AH to EH	--	--	S-1	LCr	
ASTM A668	F, FH	--	--	S-2	LCr	
ASTM A668	G to N & GH to NH	not specified	not specified			
ASTM A671						See appropriate ASTM specification
ASTM A672						See appropriate ASTM specification
ASTM A675						See appropriate ASTM, AISI specification
ASTM A678	A	0.25 Max.	0.25 Max.	S-2	LCr	0.20 Min. Cu

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A678	B	0.25 Max.	0.25 Max.	S-2	LCr	0.20 Min. Cu
ASTM A678	C	0.25 Max.	0.25 Max.	S-2	LCr	0.20 Min. Cu
ASTM A678	D	0.25 Max.	0.25 Max.	S-2	LCr	0.20 Min. Cu, when specified, 0.04 - 0.11 V, 0.01 - 0.03 N, (0.01 - 0.05 Nb)
ASTM A681	H10	3.00 - 3.75	--	S-5	MHCr	2.00 - 3.00 Mo, 0.25 - 0.75 V
ASTM A681	H11	4.75 - 5.50	--	S-5	MHCr	1.10 - 1.60 Mo, 0.30 - 0.60 V
ASTM A681	H12	4.75 - 5.50	--	S-5	MHCr	1.25 - 1.75 Mo, 0.20 - 0.50 V, 1.00 - 1.70 W
ASTM A681	H13	4.75 - 5.50	--	S-5	MHCr	1.10 - 1.75 Mo, 0.80 - 1.20 V
ASTM A681	H14	4.75 - 5.50	--	S-5	MHCr	4.00 - 5.25 W
ASTM A681	H19	4.00 - 4.75	--		MHCr	0.30 - 0.55 Mo, 1.75 - 2.20 V, 3.75 - 4.50 W, 4.00 - 4.50 Co
ASTM A681	H21	3.00 - 3.75	--		MHCr	0.30 - 0.60 V, 8.50 - 10.00 W
ASTM A681	H22	1.75 - 3.75	--		MHCr	0.25 - 0.50 V, 10.00 - 11.75 W
ASTM A681	H23	11.00 - 12.75	--		HCr	0.75 - 1.25 V, 11.00 - 12.75 W
ASTM A681	H24	2.50 - 3.50	--		MHCr	0.40 - 0.60 V, 14.00 - 16.00 W
ASTM A681	H25	3.75 - 4.50	--		MHCr	0.40 - 0.60 V, 14.00 - 16.00 W
ASTM A681	H26	3.75 - 4.50	--		MHCr	0.75 - 1.25 V, 17.25 - 19.00 W
ASTM A681	H41	3.50 - 4.00	--		MHCr	8.20 - 9.20 Mo, 1.00 - 1.30 V, 1.40 - 2.10 W
ASTM A681	H42	3.75 - 4.50	--		MHCr	4.50 - 5.50 Mo, 1.75 - 2.20 V, 5.50 - 6.75 W
ASTM A681	H43	3.75 - 4.50	--		MHCr	7.75 - 8.50 Mo, 1.80 - 2.20 V
ASTM A681	A2	4.75 - 5.50	--	S-5	MHCr	0.90 - 1.40 Mo, 0.15 - 0.50 V
ASTM A681	A3	4.75 - 5.50	--	S-5	MHCr	0.90 - 1.40 Mo, 0.80 - 1.40 V
ASTM A681	A4	0.90 - 2.20	--	S-5	MLCr	0.90 - 1.40 Mo
ASTM A681	A5	0.90 - 1.40	--	S-5	MLCr	0.90 - 1.40 Mo
ASTM A681	A6	0.90 - 1.40	--	S-5	MLCr	0.90 - 1.40 Mo
ASTM A681	A7	5.00 - 5.75	--	S-5	MHCr	0.90 - 1.40 Mo, 3.90 - 5.15 V, 0.50 - 1.50 W
ASTM A681	A8	4.75 - 5.50	--	S-5	MHCr	1.15 - 1.65 Mo, 1.00 - 1.50 W
ASTM A681	A9	4.75 - 5.50	1.25 - 1.75	S-5	MHCr	1.30 - 1.80 Mo, 0.80 - 1.40 V
ASTM A681	A10	--	1.55 - 2.05	S-5	LCr	1.25 - 1.75 Mo
ASTM A681	D2	11.00 - 13.00	--		HCr	0.70 - 1.20 Mo, 0.50 - 1.10 V
ASTM A681	D3	11.00 - 13.50	--		HCr	1.00 Max. V, 1.00 Max. W
ASTM A681	D4	11.00 - 13.00	--		HCr	0.70 - 1.20 Mo, 0.15 - 1.00 V
ASTM A681	D5	11.00 - 13.00	--		HCr	0.70 - 1.20 Mo, 1.00 Max. V, 2.50 - 3.50 Co
ASTM A681	D7	11.50 - 13.50	--		HCr	0.70 - 1.20 Mo, 3.80 - 4.40 V
ASTM A681	O1	0.40 - 0.70	--	S-5	MLCr	0.30 Max. V, 0.40 - 0.60 W
ASTM A681	O2	0.50 Max.	--	S-5	LCr	0.30 Max. Mo, 0.30 Max. V
ASTM A681	O6	0.30 Max.	--	S-5	LCr	0.20 - 0.30 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A681	O7	0.35 - 0.85	--	S-5	MLCr	0.30 Max. Mo, 0.15 - 0.40 V, 1.00 - 2.00 W
ASTM A681	S1	1.00 - 1.80	--	S-5	MLCr	0.50 Max. Mo, 0.15 - 0.30 V, 1.50 - 3.00 W
ASTM A681	S2	--	--	S-5	LCr	0.30 - 0.60 Mo, 0.50 Max. V
ASTM A681	S4	0.10 - 0.50	--	S-5	LCr	0.15 - 0.35 V
ASTM A681	S5	0.10 - 0.50	--	S-5	LCr	0.20 - 1.35 Mo, 0.15 - 0.35 V
ASTM A681	S6	1.20 - 1.50	--	S-5	MLCr	0.30 - 0.50 Mo, 0.20 - 0.40 V
ASTM A681	S7	3.00 - 3.50	--	S-5	MHCr	1.30 - 1.80 Mo, 0.35 Max. V
ASTM A681	L2	0.70 - 1.20	--	S-5	MLCr	0.25 Max. Mo, 0.10 - 0.30 V
ASTM A681	L3	1.30 - 1.70	--	S-5	MLCr	0.10 - 0.30 V
ASTM A681	L6	0.60 - 1.20	1.25 - 2.00	S-5	MLCr	0.50 Max. Mo
ASTM A681	F1	--	--	S-5	LCr	1.00 - 1.75 W
ASTM A681	F2	0.20 - 0.40	--	S-5	LCr	3.00 - 4.50 W
ASTM A681	P2	0.75 - 1.25	0.10 - 0.50	S-5	MLCr	0.15 - 0.40 Mo
ASTM A681	P3	0.40 - 0.75	1.00 - 1.50	S-5	MLCr	
ASTM A681	P4	4.00 - 5.25	--	S-5	MHCr	0.40 - 1.00 Mo
ASTM A681	P5	2.00 - 2.50	0.35 Max.	S-5	MLCr	
ASTM A681	P6	1.25 - 1.75	3.25 - 3.75	S-5	MLCr	
ASTM A681	P20	1.40 - 2.00	--	S-5	MLCr	0.30 - 0.55 Mo
ASTM A681	P21	0.20 - 0.30	3.70 - 4.25	S-5	LCr	0.15 - 0.25 V
ASTM A686	Type W1, Gr. A	0.15 Max.	0.20 Max.		LCr	(water hardening tool steels)
ASTM A686	Type W1, Gr. C	0.30 Max.	0.20 Max.		LCr	(water hardening tool steels)
ASTM A686	Type W2, Gr. A	0.15 Max.	0.20 Max.		LCr	0.15 - 0.35 V (water hardening tool steels)
ASTM A686	Type W2, Gr. C	0.30 Max.	0.20 Max.		LCr	0.15 - 0.35 V (water hardening tool steels)
ASTM A686	Type W5	0.40 - 0.60	0.20 Max.		LCr	(water hardening tool steels)
ASTM A690	--	--	0.40 - 0.75	S-3A	LCr	0.50 Min. Cu, 0.08 - 0.15 P
ASTM A691						See appropriate ASTM specification
ASTM A692		--	--	S-3A	LCr	0.42 - 0.68 Mo
ASTM A693	630	15.00 - 17.50	3.00 - 5.00		HCr	3.00 - 5.00 Cu, + Nb + Ta
ASTM A693	631	16.00 - 18.00	6.50 - 7.75		HCr	0.75 - 1.50 Al
ASTM A693	632	14.00 - 16.00	6.50 - 7.75		HCr	0.75 - 1.50 Al, 2.00 - 3.00 Mo
ASTM A693	633	16.00 - 17.00	4.00 - 5.00		HCr	2.50 - 3.25 Mo, 0.07 - 0.13 N
ASTM A693	634	15.00 - 16.00	4.00 - 5.00		HCr	2.50 - 3.25 Mo, + Nb + Ta
ASTM A693	635	16.00 - 17.50	6.00 - 7.50		HCr	0.40 - 1.20 Ti
ASTM A693	XM-9	14.00 - 14.50	6.25 - 7.00		HCr	0.60 - 0.90 Ti
ASTM A693	XM-12	14.00 - 15.50	3.50 - 5.50		HCr	2.50 - 4.50 Cu
ASTM A693	XM-13	12.25 - 13.25	7.50 - 8.50		HCr	0.90 - 1.35 Al, 2.00 - 2.50 Mo

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

ASTM A693	XM-16	11.00 - 12.50	7.50 - 9.50		HCr	0.80 - 1.40 Ti, 1.50 - 2.50 Cu, + Nb + Ta
ASTM A693	XM-25	14.00 - 16.00	5.00 - 7.00		HCr	0.50 - 1.00 Mo, 1.25 - 1.75 Cu, + Nb
ASTM A694	F42, F46, F48, F50, F52, F56, F60, F65	--	--	S-1	LCr	
ASTM A695	A	--	--	S-1	LCr	
ASTM A695	B	--	--	S-1	LCr	
ASTM A695	C	--	--	S-1	LCr	
ASTM A695	D	--	--	S-1	LCr	0.15 - 0.35 Pb
ASTM A696	B, C	--	--	S-1	LCr	
ASTM A699	1	--	--	S-3A	LCr	0.03 - 0.09 Nb (0.20 - 0.35 Cu when specified)
ASTM A699	2 (Precip. HT)	--	--	S-3A	LCr	0.03 - 0.09 Nb (0.20 - 0.35 Cu when specified)
ASTM A699	3	--	--	S-3A	LCr	0.03 - 0.09 Nb (0.20 - 0.35 Cu when specified)
ASTM A699	4 (Precip. HT)	--	--	S-3A	LCr	0.03 - 0.09 Nb (0.20 - 0.35 Cu when specified)
ASTM A705	630	15.00 - 17.50	3.00 - 5.00		HCr	3.00 - 5.00 Cu, + Nb + Ta
ASTM A705	631	16.00 - 18.00	6.50 - 7.75		HCr	0.75 - 1.50 Al
ASTM A705	632	14.00 - 16.00	6.50 - 7.75		HCr	0.75 - 1.50 Al, 2.00 - 3.00 Mo
ASTM A705	634	15.00 - 16.00	4.00 - 5.00		HCr	2.50 - 3.25 Mo, + Nb + Ta
ASTM A705	635	16.00 - 17.50	6.00 - 7.50		HCr	0.40 - 1.20 Ti
ASTM A705	XM-12	14.00 - 15.50	3.50 - 5.50		HCr	2.50 - 4.50 Cu
ASTM A705	XM-13	12.25 - 13.25	7.50 - 8.50		HCr	0.90 - 1.35 Al, 2.00 - 2.50 Mo
ASTM A705	XM-16	11.00 - 12.50	7.50 - 9.50		HCr	0.90 - 1.40 Ti, 1.50 - 2.50 Cu, + Nb + Ta
ASTM A705	UNS S45503	11.00 - 12.50	7.50 - 9.50		HCr	1.00 - 1.35 Ti, 1.50 - 2.50 Cu, + Nb + Ta
ASTM A705	XM-25	14.00 - 16.00	5.00 - 7.00		HCr	0.50 - 1.00 Mo, 1.25 - 1.75 Cu, + Nb
ASTM A706	--	--	--			CE ≤ 0.55 (CE = C + Mn/6 + Cu/40 + Ni/20 + Cr/10 + Mo/5 + V/10)
ASTM A707	L1	0.30 Max.	0.40 Max.	S-1	LCr	
ASTM A707	L2	0.30 Max.	0.40 Max.	S-1	LCr	
ASTM A707	L3	0.30 Max.	0.40 Max.	S-1	LCr	0.20 Min. Cu, 0.010 - 0.030 N, 0.04 - 0.11 V
ASTM A707	L4	0.30 Max.	1.65 - 2.00	S-5	LCr	0.20 - 0.30 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A707	L5	0.60 - 0.90	0.70 - 1.00	S-11C	MLCr	0.15 - 0.25 Mo, 1.00 - 1.30 Cu, 0.03 Min. Cu
ASTM A707	L6	0.30 Max.	0.40 Max.	S-3A	LCr	0.25 - 0.35 Mo, 0.06 - 0.10 Nb
ASTM A707	L7	0.30 Max.	3.2 - 3.7	S-5	LCr	
ASTM A707	L8	1.50 - 2.00	2.8 - 3.9	S-5	MLCr	0.40 - 0.60 Mo, 0.03 Max. V
ASTM A709	36	--	--	S-1	LCr	0.20 Min. Cu when specified; conforms to ASTM A36
ASTM A709	50	--	--	S-1	LCr	0.20 Min. Cu when specified; conforms to ASTM A572
ASTM A709	50W	*	*	S-3A	MLCr	conforms to ASTM A588, *Types A, B & C are equivalent to A588 A, B & C
ASTM A709	70W	0.40 - 0.70	0.50 Max.		MLCr	conforms to ASTM A852; 0.20 - 0.40 Cu, 0.02 - 0.10 V
ASTM A709	100 & 100W	*	*		MLCr	conforms to ASTM A514; *see types A, B, C, E, F, H, J, M, P & Q of A514
ASTM A710	A	0.60 - 0.90	0.70 - 1.00	S-11C	MLCr	0.15 - 0.25 Mo, 1.00 - 1.30 Cu, 0.02 Min. Nb
ASTM A710	B	--	1.20 - 1.50	S-5	LCr	1.00 - 1.30 Cu, 0.02 Min. Nb
ASTM A710	C	--	0.70 - 1.00	S-5	LCr	0.15 - 0.25 Mo, 1.00 - 1.30 Cu, 0.02 Min. Nb
ASTM A714	Cl 2 Gr I	--	--	S-1	LCr	0.20 Min. Cu
ASTM A714	Cl 2 Gr II	--	--	S-1	LCr	0.20 Min. Cu, 0.02 Min. V
ASTM A714	C 2 Gr III	--	--	S-1	LCr	0.20 Min. Cu, 0.02 Min. V
ASTM A714	Cl 4 Gr IV	0.80 - 1.20	0.20 - 0.50	S-4	MLCr	0.03 - 0.08 P, 0.25 - 0.45 Cu
ASTM A714	Cl 4 Gr V Tp F, E & S	--	1.60 - 2.24	S-5	LCr	0.08 Min. Cu
ASTM A714	Cl 4 Gr VI Tp E & S	0.30 Max.	0.40 - 1.10	S-5	LCr	0.30 - 1.00 Cu
ASTM A714	Cl 4 Gr VII Tp E & S	0.30 - 1.25	0.65 Max.	S-4 or S-5	MLCr	0.25 - 0.55 Cu, 0.07 - 0.15 P
ASTM A714	Cl 4 Gr VIII Tp E & S	0.40 - 0.65	0.40 Max.	S-3A or S-5	MLCr	0.25 - 0.40 Cu, 0.02 - 0.10 V
ASTM A723	1	0.80 - 2.00	1.5 - 2.25	S-11A	MLCr	0.20 - 0.40 Mo
ASTM A723	2	0.80 - 2.00	2.3 - 3.3	S-11A	MLCr	0.30 - 0.50 Mo
ASTM A723	3	0.80 - 2.00	3.3 - 4.5	S-5	MLCr	0.40 - 0.80 Mo
ASTM A724	A	0.25 Max.	0.25 Max.	S-2	LCr	
ASTM A724	B	0.25 Max.	0.25 Max.	S-2	LCr	
ASTM A724	C	0.25 Max.	0.25 Max.	S-2	LCr	
ASTM A727	--	--	--	S-1	LCr	
ASTM A730	A	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A730	B	--	--	S-1	LCr	
ASTM A730	C	--	--	S-1	LCr	
ASTM A730	D	--	--	S-1	LCr	
ASTM A730	E	--	--	S-1	LCr	
ASTM A730	F	--	--	S-1	LCr	
ASTM A730	G	--	--	S-2	LCr	
ASTM A730	H	--	--	S-2	LCr	
ASTM A730	I, J, K, L, M, N	not specified	not specified			
ASTM A731	18Cr-2Mo	17.5 - 19.5	1.00 Max.*		HCr	*Ni + Cu max. = 1.00; 1.75 - 2.50 Mo; + Ti + Nb
ASTM A731	TP XM-27	25.0 - 27.5	0.50 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A731	TP XM-33	25.0 - 27.0	0.50 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; + Ti
ASTM A731	TP 439	17.00 - 19.00	0.50 Max.*		HCr	*Ni + Cu; + Ti
ASTM A731	UNS S41500	11.5 - 14.0	3.5 - 5.5		HCr	0.5 - 1.0 Mo
ASTM A731	29-4	28.0 - 30.0	0.15 Max.*		HCr	*Ni + Cu; 3.5 - 4.2 Mo
ASTM A731	29-4-2	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A731	26-3-3	25.0 - 28.0	1.0 - 3.50		HCr	3.0 - 4.0 Mo; + Ti + Nb
ASTM A732	1A	0.35 Max.	0.50 Max.	S-1	LCr	
ASTM A732	2A, 2Q	0.35 Max.	0.50 Max.	S-1	LCr	
ASTM A732	3A, 3Q	0.35 Max.	0.50 Max.	S-1	LCr	
ASTM A732	4A, 4Q	--	--	S-1	LCr	
ASTM A732	5N	0.35 Max.	0.50 Max.	S-1	LCr	0.05 - 0.15 V
ASTM A732	6N	0.35 Max.	0.50 Max.	S-3A	LCr	0.25 - 0.55 Mo
ASTM A732	7Q	0.80 - 1.10	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A732	8Q	0.80 - 1.10	0.50 Max.	S-4	MLCr	0.15 - 0.25 Mo
ASTM A732	9Q	0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
ASTM A732	10Q	0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
ASTM A732	11Q	0.35 Max.	1.65 - 2.00	S-5	LCr	0.20 - 0.30 Mo
ASTM A732	12Q	0.80 - 1.10	0.50 Max.	S-4	MLCr	0.15 Min. V
ASTM A732	13Q	0.40 - 0.70	0.40 - 0.70	S-3A	MLCr	0.15 - 0.25 Mo
ASTM A732	14Q	0.40 - 0.70	0.40 - 0.70	S-3A	MLCr	0.15 - 0.25 Mo
ASTM A732	15A	1.30 - 1.60	0.50 Max.	S-4	MLCr	--
ASTM A733						See ASTM A312
ASTM A734	A	0.90 - 1.20	0.90 - 1.20	S-5	MLCr	0.25 - 0.40 Mo
ASTM A734	B	0.25 Max.	--	S-2	LCr	
ASTM A735	1	--	--	S-3A	LCr	0.23 - 0.47 Mo; 0.20 - 0.35 Cu, when specified; 0.03 - 0.09 Nb
ASTM A735	2	--	--	S-3A	LCr	0.23 - 0.47 Mo; 0.20 - 0.35 Cu, when specified; 0.03 - 0.09 Nb
ASTM A735	3	--	--	S-3A	LCr	0.23 - 0.47 Mo; 0.20 - 0.35 Cu, when specified; 0.03 -

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

						0.09 Nb
ASTM A735	4	--	--	S-3A	LCr	0.23 - 0.47 Mo; 0.20 - 0.35 Cu, when specified; 0.03 - 0.09 Nb
ASTM A736	Grade A	0.60 - 0.90	0.70 - 1.00	S-11C	MLCr	0.15 - 0.25 Mo; 1.00 - 1.30 Cu; 0.02 Min. Nb
ASTM A736	Grade C	--	0.70 - 1.00	S-5	LCr	0.15 - 0.25 Mo; 1.00 - 1.30 Cu; 0.02 Min. Nb
ASTM A737	B	--	--	S-1 or S-2	LCr	0.05 Max. Nb
ASTM A737	C	--	--	S-1 or S-2	LCr	0.04 - 0.11 V; 0.05 Max. Nb; 0.03 Max. N
ASTM A738	A	0.25 Max.	0.50 Max.	S-1 or S-2	LCr	
ASTM A738	B	0.30 Max.	0.60 Max.	S-2	LCr	
ASTM A738	C	0.25 Max.	0.50 Max.	S-2	LCr	
ASTM A739	B11	1.00 - 1.50	--	S-5	MLCr	0.45 - 0.65 Mo
ASTM A739	B22	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
ASTM A743	CF-8	18.0 - 21.0	8.0 - 11.0	S-8	HCr	
ASTM A743	CG-12	20.0 - 23.0	10.0 - 13.0	S-8	HCr	
ASTM A743	CF-20	18.0 - 21.0	8.0 - 11.0	S-8	HCr	
ASTM A743	CF-8M	18.0 - 21.0	9.0 - 12.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A743	CF-8C	18.0 - 21.0	9.0 - 12.0	S-8	HCr	+ Nb
ASTM A743	CF-16F	18.0 - 21.0	9.0 - 12.0	S-8	HCr	1.50 Max. Mo, 0.20 - 0.35 Se
ASTM A743	CF-16Fa	18.0 - 21.0	9.0 - 12.0	S-8	HCr	0.40 - 0.80 Mo
ASTM A743	CH-10	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A743	CH-20	22.0 - 26.0	12.0 - 15.0	S-8	HCr	
ASTM A743	CK-20	23.0 - 27.0	19.0 - 22.0		HCr	
ASTM A743	CE-30	26.0 - 30.0	8.0 - 11.0		HCr	
ASTM A743	CA 15	11.50 - 14.00	1.00 Max.	S-6, S-6A	HCr	0.50 Max. Mo
ASTM A743	CA 15M	11.50 - 14.00	1.00 Max.	S-6, S-6A	HCr	0.15 - 1.00 Mo
ASTM A743	CB-30	18.0 - 21.0	2.00 Max.		HCr	
ASTM A743	CC-50	26.0 - 30.0	4.00 Max.		HCr	
ASTM A743	CA-40	11.5 - 14.0	1.0 Max.	S-6, S-6A	HCr	0.5 Max. Mo
ASTM A743	CA-40F	11.5 - 14.0	1.0 Max.	S-6, S-6A	HCr	0.5 Max. Mo
ASTM A743	CF-3	17.0 - 21.0	8.0 - 12.0	S-8	HCr	
ASTM A743	CF10SMnN	16.0 - 18.0	8.0 - 9.0	S-8	HCr	7.00 - 9.00 Mn, 3.50 - 4.50 Si, 0.08 - 0.18 N
ASTM A744	CF-8	18.0 - 21.0	8.0 - 11.0	S-8	HCr	
ASTM A744	CF-8M	18.0 - 21.0	9.0 - 12.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A744	CF-8C	18.0 - 21.0	9.0 - 12.0	S-8	HCr	+ Nb
ASTM A744	CF-3	17.0 - 21.0	8.0 - 12.0	S-8	HCr	
ASTM A744	CF-3M	17.0 - 21.0	9.0 - 13.0	S-8	HCr	2.0 - 3.0 Mo
ASTM A744	CG-3M	18.0 - 21.0	9.0 - 13.0	S-8	HCr	3.0 - 4.0 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A744	CG-8M	18.0 - 21.0	9.0 - 13.0	S-8	HCr	3.0 - 4.0 Mo
ASTM A744	CN-7M	19.0 - 22.0	27.5 - 30.5		HCr	2.0 - 3.0 Mo, 3.0 - 4.0 Cu
ASTM A744	CN-7MS	18.0 - 20.0	22.0 - 25.0		HCr	2.5 - 3.0 Mo, 1.5 - 2.0 Cu, 2.50 - 3.50 Si
ASTM A744	CN-3MN	20.0 - 22.0	23.5 - 25.5		HCr	6.0 - 7.0 Mo, 0.18 - 0.26 N, 0.75 Max. Cu
ASTM A744	CD-4MCu	24.5 - 26.5	4.75 - 6.00	S-10H	HCr	1.75 - 2.25 Mo, 2.75 - 3.25 Cu
ASTM A744	CK-3MCuN	19.5 - 20.5	17.5 - 19.5		HCr	6.0 - 7.0 Mo, 0.50 - 1.00 Cu, 0.180 - 0.240 N
ASTM A747	CB7Cu-1	15.50 - 17.70	3.60 - 4.60		HCr	2.50 - 3.20 Cu, 0.15 - 0.35 Nb
ASTM A747	CB7Cu-2	14.0 - 15.50	4.50 - 5.50		HCr	2.50 - 3.20 Cu, 0.15 - 0.35 Nb
ASTM A756	440C	16.00 - 18.00	0.75 Max.		HCr	0.40 - 0.65 Mo
ASTM A756	440C MOD	13.00 - 15.00	0.75 Max.		HCr	3.75 - 4.25 Mo
ASTM A757	A1Q	0.40 Max.	0.50 Max.	S-2	LCr	0.25 Max. Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	A2Q	0.40 Max.	0.50 Max.	S-2	LCr	0.25 Max. Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	B2N, B2Q	0.40 Max.	2.0 - 3.0	S-5	LCr	0.25 Max. Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	B3N, B3Q	0.40 Max.	3.0 - 4.0	S-5	LCr	0.25 Max. Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	B4N, B4Q	0.40 Max.	4.0 - 5.0	S-5	LCr	0.25 Max. Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	C1Q	0.40 Max.	1.5 - 2.0	S-5	LCr	0.15 - 0.30 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	D1N1	2.0 - 2.75	0.50 Max	S-5	MLCr	0.90 - 1.20 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	D1Q1	2.0 - 2.75	0.50 Max	S-5	MLCr	0.90 - 1.20 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	D1N2	2.0 - 2.75	0.50 Max	S-5	MLCr	0.90 - 1.20 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	D1Q2	2.0 - 2.75	0.50 Max	S-5	MLCr	0.90 - 1.20 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	D1N3	2.0 - 2.75	0.50 Max	S-5	MLCr	0.90 - 1.20 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	D1Q3	2.0 - 2.75	0.50 Max	S-5	MLCr	0.90 - 1.20 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	E1Q	1.35 - 1.85	2.5 - 3.5	S-5	MLCr	0.35 - 0.60 Mo; 0.50 Max Cu; 0.03 Max V
ASTM A757	E2N, E2Q	1.50 - 2.0	2.75 - 3.90	S-5	MLCr	0.40 - 0.60 Mo, 0.50 Max. Cu, 0.03 Max. V, 0.10 Max. W
ASTM A757	E3N	11.5 - 14.0	3.5 - 4.5	S-6, S-6A	HCr	0.40 - 1.0 Mo, 0.50 Max. Cu, 0.10 Max. W

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A758	Tp 30, 31, 32 Normalized	0.25 Max.	0.25 Max.	S-1	LCr	
ASTM A758	Tp 40, 41, 42 Norm. & Temp.	0.25 Max.	0.25 Max.	S-1	LCr	
ASTM A758	Tp 50, 51, 52 Q & T	0.25 Max.	0.25 Max.	S-2	LCr	
ASTM A765	I	0.40 Max.	0.50 Max	S-1 or S-2	LCr	
ASTM A765	II	0.40 Max.	0.50 Max	S-1 or S-2	LCr	
ASTM A765	III	0.20 Max.	3.25 - 3.75	S-5	LCr	
ASTM A765	IV	0.40 Max.	0.50 Max	S-1 or S-2	LCr	
ASTM A766	--	--	--	S-1	LCr	0.08 - 0.13 S, 0.15 - 0.35 Pb
ASTM A768	1	11.5 - 13.0	0.40 - 0.75	S-6, S-6A	HCr	
ASTM A768	2	11.0 - 13.0	2.0 - 3.0	S-6, S-6A	HCr	1.5 - 2.0 Mo, 0.25 - 0.40 V
ASTM A768	3	11.0 - 13.0	0.75 Max.	S-6, S-6A	HCr	
ASTM A768	4	11.25 - 12.25	3.5 - 4.25	S-6, S-6A	HCr	0.30 - 0.50 Mo
ASTM A771	TP 316	17.0 - 18.0	13.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A771	UNS S38660	12.5 - 14.5	14.5 - 16.5		HCr	1.50 - 2.50 Mo, 0.10 - 0.40 Ti
ASTM A774	TP 304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A774	TP 316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A774	TP 317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A774	TP 321	17.0 - 19.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A774	TP 347	17.0 - 19.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A778	TP 304L	18.00 - 20.00	8.00 - 13.00	S-8	HCr	
ASTM A778	TP 316L	16.00 - 18.00	10.00 - 15.00	S-8	HCr	2.00 - 3.00 Mo
ASTM A778	TP 317L	18.00 - 20.00	11.00 - 14.00	S-8	HCr	3.00 - 4.00 Mo
ASTM A778	TP 321	17.00 - 19.00	9.00 - 12.00	S-8	HCr	+ Ti
ASTM A778	TP 347	17.00 - 19.00	9.00 - 13.00	S-8	HCr	+ Nb + Ta
ASTM A782	CI 1	0.50 - 1.00	--	S-4	MLCr	0.20 - 0.60 Mo, 0.04 - 0.12 Zr
ASTM A782	CI 2	0.50 - 1.00	--	S-4	MLCr	0.20 - 0.60 Mo, 0.04 - 0.12 Zr
ASTM A782	CI 3	0.50 - 1.00	--	S-4	MLCr	0.20 - 0.60 Mo, 0.04 - 0.12 Zr
ASTM A787	All	--	--	S-1	LCr	
ASTM A788						See applicable ASTM specification
ASTM A789	UNS S31803	21.0 - 23.0	4.50 - 6.50	S-10H	HCr	2.50 - 3.50 Mo, 0.08 - 0.20 N
ASTM A789	UNS S31500	18.0 - 19.0	4.25 - 5.25		HCr	2.50 - 3.00 Mo, 0.05 - 0.1 N
ASTM A789	UNS S32550	24.0 - 27.0	4.50 - 6.50	S-10H	HCr	2.90 - 3.90 Mo, 0.10 - 0.25 N, 1.5 - 2.5 Cu

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A789	UNS S31200	24.0 - 26.0	5.50 - 6.50		HCr	1.20 - 2.00, 0.14 - 0.20 N
ASTM A789	UNS S31260	24.0 - 26.0	5.50 - 7.50		HCr	2.50 - 3.50 Mo, 0.10 - 0.30 N, 0.20 - 0.80 Cu, 0.10 - 0.50 W
ASTM A789	UNS S32304	21.5 - 24.5	3.0 - 5.5		HCr	0.05 - 0.60 Mo, 0.05 - 0.20 N, 0.05 - 0.60 Cu
ASTM A789	UNS S32740	24.0 - 26.0	6.0 - 8.0		HCr	2.50 - 3.50 Mo, 0.24 - 0.32 N, 0.20 - 0.80 Cu, 1.50 - 2.50 W
ASTM A789	UNS S32750	24.0 - 26.0	6.0 - 8.0		HCr	3.0 - 5.0 Mo, 0.24 - 0.32 N, 0.5 Max. Cu
ASTM A789	UNS S32760	24.00 - 26.00	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A789	UNS S32900	23.00 - 28.00	2.50 - 5.00		HCr	1.00 - 2.00 Mo
ASTM A789	UNS S32950	26.00 - 29.00	3.50 - 5.20		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A790	UNS S31803	21.0 - 23.0	4.50 - 6.50	S-10H	HCr	2.50 - 3.50 Mo, 0.08 - 0.20 N
ASTM A790	UNS S31500	18.0 - 19.0	4.25 - 5.25		HCr	2.50 - 3.00 Mo, 0.05 - 0.1 N
ASTM A790	UNS S32550	24.0 - 27.0	4.50 - 6.50	S-10H	HCr	2.90 - 3.90 Mo, 0.10 - 0.25 N, 1.5 - 2.5 Cu
ASTM A790	UNS S31200	24.0 - 26.0	5.50 - 6.50		HCr	1.20 - 2.00, 0.14 - 0.20 N
ASTM A790	UNS S31260	24.0 - 26.0	5.50 - 7.50		HCr	2.50 - 3.50 Mo, 0.10 - 0.30 N, 0.20 - 0.80 Cu, 0.10 - 0.50 W
ASTM A790	UNS S32304	21.5 - 24.5	3.0 - 5.5		HCr	0.05 - 0.60 Mo, 0.05 - 0.20 N, 0.05 - 0.60 Cu
ASTM A790	UNS S32740	24.0 - 26.0	6.0 - 8.0		HCr	2.50 - 3.50 Mo, 0.24 - 0.32 N, 0.20 - 0.80 Cu, 1.50 - 2.50 W
ASTM A790	UNS S32750	24.0 - 26.0	6.0 - 8.0		HCr	3.0 - 5.0 Mo, 0.24 - 0.32 N, 0.5 Max. Cu
ASTM A790	UNS S32760	24.00 - 26.00	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A790	UNS S32900	23.00 - 28.00	2.50 - 5.00		HCr	1.00 - 2.00 Mo
ASTM A790	UNS S32950	26.00 - 29.00	3.50 - 5.20		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A791	TP 409	10.50 - 11.75	0.50 Max.		HCr	
ASTM A791	TP 439	17.00 - 19.00	0.50 Max.		HCr	+ Ti
ASTM A791	TP XM-27	25.0 - 27.5	0.5 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A791	TP XM-33	25.0 - 27.0	0.50 Max.		HCr	0.75 - 1.50 Mo; + Ti
ASTM A791	25-4-4	24.5 - 26.0	3.5 - 4.5		HCr	3.5 - 4.5 Mo; + Ti + Nb
ASTM A791	26-3-3	25.0 - 28.0	1.0 - 3.50		HCr	3.0 - 4.0 Mo; + Ti + Nb
ASTM A791	29-4	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A791	29-4-2	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A791	29-4C	28.00 - 30.00	1.00 Max.		HCr	3.60 - 4.20 Mo; + Ti + Nb
ASTM A791	18-2	17.5 - 19.5	1.00 Max.		HCr	1.75 - 2.50 Mo; + Ti + Nb
ASTM A803	TP 409	10.50 - 11.75	0.50 Max.	S-7	HCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A803	TP 439	17.00 - 19.00	0.50 Max.	S-7	HCr	+ Ti
ASTM A803	TP XM-27	25.0 - 27.5	0.5 Max.*		HCr	*Ni + Cu; 0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A803	TP XM-33	25.0 - 27.0	0.50 Max.		HCr	0.75 - 1.50 Mo; + Ti
ASTM A803	25-4-4	24.5 - 26.0	3.5 - 4.5		HCr	3.5 - 4.5 Mo; + Ti + Nb
ASTM A803	26-3-3	25.0 - 28.0	1.0 - 3.50		HCr	3.0 - 4.0 Mo; + Ti + Nb
ASTM A803	29-4	28.0 - 30.0	0.15 Max.		HCr	3.5 - 4.2 Mo
ASTM A803	29-4-2	28.0 - 30.0	2.0 - 2.5		HCr	3.5 - 4.2 Mo
ASTM A803	29-4C	28.00 - 30.00	1.00 Max.		HCr	3.60 - 4.20 Mo; + Ti + Nb
ASTM A803	18-2	17.5 - 19.5	1.00 Max.		HCr	1.75 - 2.50 Mo; + Ti + Nb
ASTM A808	--	--	--	S-1	LCr	0.02 - 0.10 Nb; 0.10 Max. V; Nb + V = 0.15 Max.
ASTM A813	TP 304, TP 304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A813	TP 304N, TP 304LN	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A813	TP 304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A813	TP 309Cb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb + Ta
ASTM A813	TP 309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A813	TP 310Cb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb + Ta
ASTM A813	TP 310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A813	TP 316, TP 316H	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A813	TP316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A813	TP 316N, TP 316LN	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A813	TP 317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A813	TP 317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A813	TP 321, TP 321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A813	TP 347, TP 347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A813	TP 348, TP 348H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A813	TP XM-10	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A813	TP XM-11	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A813	TP XM-15	17.0 - 19.0	17.50 - 18.50		HCr	
ASTM A813	TP XM-19	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A813	TP XM-29	17.0 - 19.0	2.25 - 3.75		HCr	11.5 - 14.5 Mn; 0.20 - 0.40 N
ASTM A813	UNS S31254	19.50 - 20.50	17.50 - 18.50		HCr	6.00 - 6.50 Mo; 0.180 - 0.220 V; 0.50 - 1.00 Cu
ASTM A813	UNS S30815	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A814	TP 304, TP 304H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A814	TP 304N, TP 304LN	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N
ASTM A814	TP 304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A814	TP 309Cb	22.00 - 24.00	12.00 - 16.00	S-8	HCr	+ Nb + Ta

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A814	TP 309S	22.00 - 24.00	12.00 - 15.00	S-8	HCr	
ASTM A814	TP 310Cb	24.00 - 26.00	19.00 - 22.00		HCr	+ Nb + Ta
ASTM A814	TP 310S	24.00 - 26.00	19.00 - 22.00		HCr	
ASTM A814	TP 316, TP 316H	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A814	TP316L	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A814	TP 316N, TP 316LN	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N
ASTM A814	TP 317	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A814	TP 317L	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo
ASTM A814	TP 321, TP 321H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti
ASTM A814	TP 347, TP 347H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A814	TP 348, TP 348H	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta
ASTM A814	TP XM-10	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A814	TP XM-11	19.00 - 21.50	5.50 - 7.50		HCr	8.00 - 10.00 Mn; 0.15 - 0.40 N
ASTM A814	TP XM-15	17.0 - 19.0	17.50 - 18.50		HCr	
ASTM A814	TP XM-19	20.50 - 23.50	11.50 - 13.50	S-8	HCr	4.00 - 6.00 Mn; 1.50 - 3.00 Mo; 0.10 - 0.30 Nb + Ta; 0.20 - 0.40 N; 0.10 - 0.30 V
ASTM A814	TP XM-29	17.0 - 19.0	2.25 - 3.75		HCr	11.5 - 14.5 Mn; 0.20 - 0.40 N
ASTM A814	UNS S31254	19.50 - 20.50	17.50 - 18.50		HCr	6.00 - 6.50 Mo; 0.180 - 0.220 V; 0.50 - 1.00 Cu
ASTM A814	UNS S30815	20.0 - 22.0	10.0 - 12.0	S-8	HCr	0.14 - 0.20 N, 0.03 - 0.08 Ce
ASTM A815	WP27	25.0 - 27.5	0.50 Max.		HCr	0.75 - 1.50 Mo; 0.05 - 0.20 Nb
ASTM A815	WP33	25.0 - 27.0	0.50 Max.		HCr	0.75 - 1.50 Mo; + Ti
ASTM A815	WP429	14.0 - 16.0	0.50 Max.	S-7	HCr	
ASTM A815	WP430	16.0 - 18.0	0.50 Max.	S-7	HCr	
ASTM A815	WP430Ti	16.0 - 19.5	0.75 Max.	S-7	HCr	+ Ti
ASTM A815	WP446	23.0 - 30.0	0.50 Max.		HCr	0.10 - 0.25 N
ASTM A815	UNS S31803	21.0 - 23.0	4.5 - 6.5	S-10H	HCr	2.50 - 3.50 Mo, 0.08 - 0.20 N
ASTM A815	UNS S32750	24.0 - 26.0	6.0 - 8.0		HCr	3.0 - 5.0 Mo, 0.24 - 0.32 N, 0.5 Max. Cu
ASTM A815	UNS S32950	26.0 - 29.0	3.5 - 5.2		HCr	1.00 - 2.50 Mo, 0.15 - 0.35 N
ASTM A815	UNS S32760	24.0 - 26.0	6.00 - 8.00		HCr	3.00 - 4.00 Mo, 0.20 - 0.30 N, 0.50 - 1.00 Cu, 0.50 - 1.00 W
ASTM A815	UNS S39274	24.0 - 26.0	6.0 - 8.0		HCr	2.50 - 3.50 Mo, 0.24 - 0.32 N, 0.20 - 0.80 Cu, 1.50 - 2.50 W
ASTM A815	WP410	11.5 - 13.5	0.50 Max.	S-6, S-6A	HCr	
ASTM A815	UNS S41500	11.5 - 14.0	3.5 - 5.5		HCr	0.5 - 1.0 Mo
ASTM A822		--	--	S-1	LCr	
ASTM A826	TP 316	17.0 - 18.0	13.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo
ASTM A826	UNS S38660	12.5 - 14.5	14.5 - 16.5		HCr	1.50 - 2.50 Mo, 0.10 - 0.40 Ti

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A826	UNS S42100	11.0 - 12.5	0.30 - 0.80	S-6, S-6A	HCr	0.80 - 1.20 Mo, 0.40 - 0.60 W, 0.25 - 0.35 V
ASTM A826	T91	8.00 - 9.50	0.40 Max.		MHCr	0.85 - 1.05 Mo, 0.06 - 0.10 Nb, 0.030 - 0.070 N, 0.18 - 0.25 V
ASTM A827		--	--	S-1	LCr	See applicable AISI specification
ASTM A829						See applicable AISI specification
ASTM A830						See applicable AISI specification
ASTM A832	21V	2.75 - 3.25	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.035 Ti, 0.001 - 0.003 B
ASTM A832	22V	2.00 - 2.50	0.25 Max.	S-5	MLCr	0.90 - 1.10 Mo, 0.25 - 0.35 V
ASTM A832	23V	2.75 - 3.25	--	S-5	MHCr	0.90 - 1.10 Mo, 0.20 - 0.30 V, 0.015 - 0.070 Nb, 0.0005 - 0.0150 Ca
ASTM A836		--	--	S-1	LCr	
ASTM A837						See applicable AISI specification
ASTM A841	A	0.25 Max.	0.25 Max.	S-1	LCr	(TCMP Steel) 0.020 Min. Al, 0.08 Max. Mo
ASTM A841	B	0.25 Max.	0.60 Max.	S-1	LCr	(TCMP Steel) 0.30 Max. Mo
ASTM A844		--	8.50 - 9.50		LCr	
ASTM A847		not specified	not specified			
ASTM A851	TP304	18.0 - 20.0	8.00 - 11.0	S-8	HCr	
ASTM A851	TP304L	18.0 - 20.0	8.00 - 13.0	S-8	HCr	
ASTM A852		0.40 - 0.70	0.50 Max.	S-3A	MLCr	0.20 - 0.40 Cu, 0.02 - 0.10 V
ASTM A858		0.30 Max.	0.50 Max.	S-2	LCr	
ASTM A859		0.60 - 0.90	0.70 - 1.00	S-11C	MLCr	0.15 - 0.25 Mo, 1.00 - 1.30 Cu, 0.02 Min. Nb
ASTM A860		0.30 Max.	0.50 Max.	S-2	LCr	
ASTM A866						See applicable AISI specification

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A871	Type I	0.40 - 0.70	0.40 Max.		MLCr	0.25 - 0.40 Cu, 0.02 - 0.10 V
ASTM A871	Type II	0.40 - 0.70	0.50 Max.		MLCr	0.25 - 0.40 Cu, 0.01 - 0.10 V
ASTM A871	Type III	0.30 - 0.50	0.25 - 0.50		LCr	0.25 - 0.50 Cu, 0.01 - 0.10 V
ASTM A871	Type IV	0.40 - 0.70	0.40 Max.		MLCr	0.30 - 0.50 Cu, 0.005 - 0.05 Nb
ASTM A872	UNS J93183	20.0 - 23.0	4.00 - 6.00	S-10H	HCr	2.00 - 4.00 Mo, 0.08 - 0.25 N, 1.00 Max. Cu, 0.50 - 1.50 Co
ASTM A872	UNS J93550	23.0 - 26.0	5.00 - 8.00	S-10H	HCr	2.00 - 4.00 Mo, 0.08 - 0.25 N, 1.00 Max. Cu, 0.50 - 1.50 Co
ASTM A890	1A	24.5 - 26.5	4.75 - 6.00	S-10H	HCr	1.75 - 2.25 Mo, 2.75 - 3.25 Cu
ASTM A890	2A	22.5 - 25.5	8.0 - 11.0	S-8	HCr	3.0 - 4.5 Mo, 0.10 - 0.30 N
ASTM A890	3A	24.0 - 27.0	4.00 - 6.00	S-10H	HCr	1.75 - 2.50 Mo, 0.15 - 0.25 N
ASTM A890	4A	21.0 - 23.5	4.5 - 6.5	S-10H	HCr	2.5 - 3.5 Mo, 1.00 Max. Cu, 0.10 - 0.30 N
ASTM A890	5A	24.0 - 26.0	6.0 - 8.0		HCr	4.0 - 5.0 Mo, 0.10 - 0.30 N
ASTM A890	6A	24.0 - 26.0	6.5 - 8.5	S-8	HCr	3.0 - 4.0 Mo, 0.20 - 0.30 N, 0.5 - 1.0 Cu, 0.5 - 1.0 W
ASTM A890	1B	24.5 - 26.5	4.7 - 6.0	S-10H	HCr	1.7 - 2.3 Mo, 2.7 - 3.3 Cu; 0.10 - 0.25 N
ASTM A891		13.50 - 16.00	24.00 - 27.00		HCr	1.00 - 1.50 Mo, 1.90 - 2.35 Ti, 0.003 - 0.010 B, 0.10 - 0.50 V
ASTM A909	All	--	--	S-1	LCr	0.02 - 0.20 V, 0.005 - 0.07 Nb, 0.01 - 0.30 Mo
ASTM A913	50	0.25 Max.	0.25 Max.	S-2	LCr	Quenched and Self-Tempered
ASTM A913	60	0.25 Max.	0.25 Max.	S-2	LCr	Quenched and Self-Tempered
ASTM A913	65	0.25 Max.	0.25 Max.	S-2	LCr	Quenched and Self-Tempered
ASTM A913	70	0.25 Max.	0.25 Max.	S-2	LCr	Quenched and Self-Tempered
ASTM A914						See applicable AISI specification
ASTM A915	SC1020, SC1025, SC1030, SC1040, SC1045	--	--	S-1	LCr	
ASTM A915	SC4130, SC4140	0.80 - 1.10	--	S-4	MLCr	0.15 - 0.25 Mo
ASTM A915	SC4330, SC4340	0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
ASTM A915	SC8620, SC8625, SC8630	0.40 - 0.60	0.40 - 0.70	S-3A	LCr	0.15 - 0.25 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ASTM A920	All	--	--	S-1	LCr	0.01 - 0.30 Mo, 0.02 - 0.20 V, 0.005 - 0.07 Nb
ASTM A921	All	--	--	S-1	LCr	0.01 - 0.30 Mo, 0.02 - 0.20 V, 0.005 - 0.07 Nb
ASTM A928						See ASTM A240
AISI-SAE 10XX	--	--	--	S-1 or S-2	LCr	
AISI-SAE 11XX	--	--	--	S-1 or S-2	LCr	Contain from 0.04 - 0.33 S, depending on grade
AISI-SAE 12XX	--	--	--	S-1 or S-2	LCr	Contain 0.04 - 0.12 P, 0.10 - 0.35 S, depending on grade
AISI-SAE 12LXX	--	--	--	S-1 or S-2	LCr	Contain 0.04 - 0.12 P, 0.24 - 0.35 S, 0.15 - 0.35 Pb, depending on grade
AISI-SAE 13XX	--	--	--	S-1 or S-2	LCr	
AISI-SAE 15XX	--	--	--	S-1 or S-2	LCr	
AISI-SAE 23XX	--	--	3.25 - 3.75	S-5	LCr	
AISI-SAE 25XX	--	--	4.75 - 5.25	S-5	LCr	
AISI-SAE 31XX	A3115, A3120, A3130, 3135, 3140	0.55 - 0.75	1.10 - 1.40	S-5	MLCr	<i>obsolete</i>
AISI-SAE 31XX	A3141, A3145, A3150	0.70 - 0.90	1.10 - 1.40	S-5	MLCr	<i>obsolete</i>
AISI-SAE 32XX	--	0.90 - 1.25	1.50 - 2.00	S-5	MLCr	<i>obsolete</i>
AISI-SAE 33XX	3310, 3312, 3316	1.40 - 1.75	3.25 - 3.75	S-5	MLCr	<i>obsolete</i>
AISI-SAE 33XX	3325, 3335, 3340	1.25 - 1.75	3.25 - 3.75	S-5	MLCr	<i>obsolete</i>
AISI-SAE 34XX	--	0.60 - 0.95	2.75 - 3.25	S-5	MLCr	<i>obsolete</i>
AISI-SAE 40XX	--	--	--	S-3A	LCr	0.20 - 0.30 Mo
AISI-SAE 4118	--	0.40 - 0.60	--	S-3A	LCr	0.08 - 0.15 Mo
AISI-SAE 41XX	4130 - 4150	0.80 - 1.15	--	S-4	MLCr	0.15 - 0.25 Mo
AISI-SAE 4161		0.70 - 0.90	--	S-4	MLCr	0.25 - 0.35 Mo
AISI-SAE 4320		0.40 - 0.60	1.65 - 2.00	S-5	LCr	0.20 - 0.30 Mo
AISI-SAE 4340		0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

AISI-SAE E4340		0.70 - 0.90	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
AISI-SAE 4419		--	--	S-3A	LCr	0.45 - 0.60 Mo <i>obsolete</i>
AISI-SAE 4422 & 4427		--	--	S-3A	LCr	0.35 - 0.45 Mo
AISI-SAE 46XX	4615, 4617, 4620	--	1.65 - 2.00	S-5	LCr	0.20 - 0.30 Mo
AISI-SAE 4626		--	0.70 - 1.00	S-5	LCr	0.15 - 0.25 Mo
AISI-SAE 4718		0.35 - 0.55	0.90 - 1.20	S-5	LCr	0.30 - 0.40 Mo
AISI-SAE 4720		0.35 - 0.55	0.90 - 1.20	S-5	LCr	0.15 - 0.25 Mo
AISI-SAE 48XX		--	3.25 - 3.75	S-5	LCr	0.20 - 0.30 Mo
AISI-SAE 5015		0.30 - 0.50	--	S-3A	LCr	<i>obsolete</i>
SAE 5046		0.20 - 0.35	--	S-3A	LCr	
SAE 5060		0.20 - 0.35	--	S-3A	LCr	
SAE 50100		0.40 - 0.60	--	S-3A	LCr	
AISI-SAE 5115		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE 5117		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE 5120		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE 5130		0.80 - 1.10	--	S-4	MLCr	
AISI-SAE 5132		0.75 - 1.00	--	S-4	MLCr	
AISI-SAE 5135		0.80 - 1.05	--	S-4	MLCr	
AISI-SAE 5140		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE 5145		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level) <i>obsolete</i>
AISI-SAE 5147		0.85 - 1.15	--	S-4	MLCr	
AISI-SAE 5150		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE 5155		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE 5160		0.70 - 0.90	--	S-4	MLCr	(may fall marginally below the S-4 Cr level)
AISI-SAE E51100		0.90 - 1.15	--	S-4	MLCr	
AISI-SAE E52100		1.30 - 1.60	--	S-5	MLCr	
AISI-SAE 6118		0.50 - 0.70	--	S-3A	MLCr	0.10 - 0.15 V
AISI-SAE 6150		0.80 - 1.10	--	S-4	MLCr	0.15 Min. V
AISI-SAE 8115		0.30 - 0.50	0.20 - 0.40	S-3	LCr	0.08 - 0.15 Mo

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

AISI-SAE 86XX		0.40 - 0.60	0.40 - 0.70	S-5	LCr	0.15 - 0.25 Mo
AISI-SAE 87XX		0.40 - 0.60	0.40 - 0.70	S-5	LCr	0.20 - 0.30 Mo
AISI-SAE 88XX		0.40 - 0.60	0.40 - 0.70	S-5	LCr	0.30 - 0.40 Mo
SAE 9254		0.60 - 0.80	--	S-5	MLCr	1.20 - 1.60 Si
AISI-SAE 9260		--	--	S-5	LCr	1.80 - 2.20 Si
AISI-SAE 93XX		1.00 - 1.40	3.00 - 3.50	S-11A	MLCr	0.08 - 0.15 Mo
AISI-SAE 94XX	9437, 9440, 9442, 9445, 9447	0.30 - 0.50	0.30 - 0.60	S-5	LCr	0.08 - 0.15 Mo <i>obsolete</i>
AISI-SAE 97XX		0.10 - 0.25	0.40 - 0.70	S-5	LCr	0.15 - 0.25 Mo <i>obsolete</i>
AISI-SAE 98XX		0.70 - 0.90	0.85 - 1.15	S-5	MLCr	0.20 - 0.30 Mo
AISI-SAE 50B40		0.40 - 0.60	--	S-3A	LCr	0.0005 - 0.003 B
AISI-SAE 50B44		0.40 - 0.60	--	S-3A	LCr	0.0005 - 0.003 B
AISI-SAE 50B46		0.20 - 0.35	--	S-3A	LCr	0.0005 - 0.003 B
AISI-SAE 50B50		0.40 - 0.60	--	S-3A	LCr	0.0005 - 0.003 B
AISI-SAE 50B60		0.40 - 0.60	--	S-3A	LCr	0.0005 - 0.003 B
AISI-SAE 51B60		0.70 - 0.90	--	S-4	MLCr	0.0005 - 0.003 B
AISI-SAE 81B45		0.35 - 0.55	0.20 - 0.40	S-5	LCr	0.08 - 0.15 Mo, 0.0005 - 0.003 B
AISI-SAE 94B17		0.30 - 0.50	0.30 - 0.60	S-5	LCr	0.08 - 0.15 Mo, 0.0005 - 0.003 B
AISI-SAE 94B30		0.30 - 0.50	0.30 - 0.60	S-5	LCr	0.08 - 0.15 Mo, 0.0005 - 0.003 B
AISI 405/SAE-51405		11.50 - 14.50	--	S-6, S-6A	HCr	0.10 - 0.30 Al
AISI 410/SAE-51410		11.50 - 13.50	--	S-6, S-6A	HCr	
AISI 501/SAE-51501		4.00 - 6.00	--	S-5	MHCr	0.44 - 0.65 Mo
AISI 502/SAE-51502		4.00 - 6.00	--	S-5	MHCr	0.44 - 0.65 Mo
SAE J410C		not specified	not specified	S-1	LCr	
ABS	A	--	--	S-1	LCr	
ABS	B	--	--	S-1	LCr	
ABS	CS	--	--	S-1	LCr	

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

ABS	D	--	--	S-1	LCr	
ABS	DS	--	--	S-1	LCr	
ABS	E	--	--	S-1	LCr	
ABS	AH32, DH32, EH32	0.25 Max.	0.40 Max.	S-1	LCr	
ABS	AH36, DH36, EH36	0.25 Max.	0.40 Max.	S-1	LCr	
API 5L	Grade A	--	--	S-1	LCr	
API 5L	Grade B	--	--	S-1	LCr	
API 5L	Gr. A25, Cl. I	--	--	S-1	LCr	
API 5L	Gr. A25, Cl. II	--	--	S-1	LCr	
API 5L	X42	--	--	S-1	LCr	
API 5L	X46	--	--	S-1	LCr	
API 5L	X52	--	--	S-1	LCr	
API 5L	X56	--	--			0.005 Min. Nb, 0.02 Min. V, 0.03 Min. Ti individually or in comb.
API 5L	X60	--	--			0.005 Min. Nb, 0.02 Min. V, 0.03 Min. Ti individually or in comb.
API 5L	X65 Seamless	--	--			By agreement between supplier and purchaser
API 5L	X65 Welded	--	--			0.005 Min. Nb, 0.02 Min. V, 0.03 Min. Ti individually or in comb.
API 5L	X70 Seamless	--	--			By agreement between supplier and purchaser
API 5L	X70 Welded	--	--			Not specified
API 5A	H-40	--	--			
API 5A	J-55	--	--			
API 5A	K-55	--	--			
API 5A	N-80	--	--			
API 5A	E	--	--			
API 5AC	C-75 Type 1	not specified	not specified	S-1	LCr	0.15 - 0.40 Mo; Ni + Cr + Cu = 0.50 Max.; 0.060 Max. S
API 5AC	C-75 Type 2	not specified	not specified			0.060 Max. S
API 5AC	C-75 Type 3	0.80 - 1.10	not specified		MLCr	
API 5AC	C-90	not specified	1.00 Max.			0.060 Max. S
API 5AC	C-95	not specified	not specified			0.060 Max. S
API 5AC	L-80	not specified	not specified			0.060 Max. S
API 5AX	P-105	not specified	not specified			0.060 Max. S
API 5AX	P-110	not specified	not specified			0.060 Max. S
API 5AX	X-95	not specified	not specified			0.060 Max. S
API 5AX	G-105	not specified	not specified			0.060 Max. S
API 5AX	S-135	not specified	not specified			0.060 Max. S

LCr = Less than 0.5% Cr
 MLCr = 0.5% to 2.5% Cr
 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

AMS (nominal compositions only)						
AMS 50XX	--	--	S-1 (or S-2)	LCr		
AMS 51XX	--	--	S-1 (or S-2)	LCr		
AMS 6250	1.5	3.5	S-11A	MLCr		
AMS 6255	1.45	--	S-5	MLCr	1.0 Mo	
AMS 6256A	1.0	3.0	S-5	MLCr	4.5 Mo, 0.38 V	
AMS 6260K	1.2	3.2	S-11A	MLCr	0.12 Mo	
AMS 6263G	1.2	3.2	S-11A	MLCr	0.12 Mo	
AMS 6264G	1.2	3.2	S-11A	MLCr	0.12 Mo	
AMS 6265F	1.2	3.25	S-11A	MLCr	0.12 Mo	
AMS 6266F	0.50	1.82	S-5	LCr	0.25 Mo, 0.003 B, 0.06 V	
AMS 6267C	1.2	3.25	S-11A	MLCr	0.12 Mo	
AMS 6270L	0.50	0.55	S-3A or S-5	LCr	0.20 Mo	
AMS 6272G	0.50	0.55	S-3A or S-5	LCr	0.20 Mo	
AMS 6274K	0.50	0.55	S-3A or S-5	LCr	0.20 Mo	
AMS 6275E	0.40	0.45	S-3A	LCr	0.12 Mo, 0.002 B	
AMS 6276F	0.50	0.55	S-3A or S-5	LCr	0.2 Mo	
AMS 6277D	0.50	0.55	S-3A or S-5	LCr	0.20 Mo	
AMS 6278	4.1	3.4		MHCr	4.2 Mo, 1.2 V	
AMS 6280G	0.50	0.55	S-3A or S-5	LCr	0.20 Mo	
AMS 6281F	0.5	0.55	S-3A or S-5	LCr	0.20 Mo	
AMS 6282F	0.50	0.55	S-3A or S-5	LCr	0.25 Mo	
AMS 6290F	--	1.8	S-5	LCr	0.25 Mo	
AMS 6292F	--	1.8	S-5	LCr	0.25 Mo	
AMS 6294F	--	1.8	S-5	LCr	0.25 Mo	
AMS 6299	0.50	1.8	S-5	LCr	0.25 Mo	
AMS 6300C	--	--	S-3	LCr	0.25 Mo	
AMS 6302E	1.25	--	S-4	MLCr	0.50 Mo, 0.25 V	
AMS 6303D	1.25	--	S-4	MLCr	0.50 Mo, 0.85 V	
AMS 6304G	0.95	--	S-4	MLCr	0.55 Mo, 0.30 V	
AMS 6305A	0.95	--	S-4	MLCr	0.55 Mo, 0.30 V	
AMS 6308A	1.0	2.0	S-5	MLCr	3.2 Mo, 2.0 Cu, 0.10 V	
AMS 6312E	--	1.8	S-5	LCr	0.25 Mo	
AMS 6317E	--	1.8	S-5	LCr	0.25 Mo	
AMS 6320H	0.50	0.55	S-3A or S-5	LCr	0.25 Mo	
AMS 6321D	0.42	0.30	S-3A	LCr	0.12 Mo, 0.003 B	

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

AMS 6322K		0.50	0.55	S-3A or S-5	LCr	0.25 Mo
AMS 6323G		0.50	0.55	S-3A or S-5	LCr	0.25 Mo
AMS 6324E		0.65	0.70	S-5	MLCr	0.25 Mo
AMS 6325F		0.50	0.55	S-3A or S-5	LCr	0.25 Mo
AMS 6327G		0.50	0.55	S-3A or S-5	LCr	0.25 Mo
AMS 6328H		0.50	0.55	S-3A or S-5	LCr	0.25 Mo
AMS 6330D		0.65	1.25	S-11D	MLCr	
AMS 6342G		0.80	1.0	S-11C	MLCr	0.25 Mo
AMS 6348A		0.95	--	S-4	MLCr	0.20 Mo
AMS 6349A		0.95	--	S-4	MLCr	0.20 Mo
AMS 6350G		0.95	--	S-4	MLCr	0.20 Mo
AMS 6351D		0.95	--	S-4	MLCr	0.20 Mo
AMS 6352E		0.95	--	S-4	MLCr	0.2 Mo
AMS 6354C		0.62	--	S-3A	MLCr	0.2 Mo, 0.10 Zr
AMS 6355K		0.50	0.55	S-3A or S-5	LCr	0.20 Mo
AMS 6356C		0.95	--	S-4	MLCr	0.20 Mo
AMS 6357F		0.50	0.5	S-3A or S-5	LCr	0.25 Mo
AMS 6358F		0.50	0.55	S-3A or S-5	LCr	0.25 Mo
AMS 6359E		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6360H		0.95	--	S-4	MLCr	0.20 Mo
AMS 6361B		0.95	--	S-4	MLCr	0.2 Mo
AMS 6362C		0.95	--	S-4	MLCr	0.2 Mo
AMS 6365G		0.95	--	S-4	MLCr	0.20 Mo
AMS 6370J		0.95	--	S-4	MLCr	0.2 Mo
AMS 6371G		0.95	--	S-4	MLCr	0.20 Mo
AMS 6372G		0.95	--	S-4	MLCr	0.20 Mo
AMS 6373C		0.95	--	S-4	MLCr	0.20 Mo
AMS 6378C		0.95	--	S-4	MLCr	0.20 Mo, 0.015 Te
AMS 6379A		0.95	--	S-4	MLCr	0.20 Mo, 0.015 Te
AMS 6381D		0.95	--	S-4	MLCr	0.20 Mo
AMS 6382J		0.95	--	S-4	MLCr	0.20 Mo
AMS 6385D		1.25	--	S-5	MLCr	0.50 Mo, 0.25 V
AMS 6386B(1)		0.50 - 0.80	--	S-4	MLCr	0.18 - 0.28 Mo, 0.05 - 0.15 Zr
AMS 6386B(2)		0.40 - 0.65	--	S-3A	MLCr	0.15 - 0.25 Mo, 0.01 - 0.03 Ti, 0.03 - 0.08 V, 0.0005 - 0.005 B
AMS 6386B(3)		--	--	S-3	LCr	1.10 - 1.50 Mo, 0.001 - 0.005 B
AMS 6386B(4)		0.85 - 1.20	--	S-4	MLCr	0.15 - 0.25 Mo, 0.04 - 0.10 Ti, 0.0015 - 0.005 B
AMS 6386B(5)		--	--	S-3	LCr	0.45 - 0.70 Mo, 0.001 - 0.005 B
AMS 6390B		0.95	--	S-4	MLCr	0.20 Mo

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

AMS 6395C		0.95	--	S-4	MLCr	0.20 Mo
AMS 6396B		0.80	1.8	S-5	MLCr	0.25 V
AMS 6406C		2.1	--	S-5	MLCr	0.58 Mo, 0.05 V
AMS 6407D		1.2	2.05	S-5	MLCr	0.45 Mo
AMS 6408		5.2	--	S-5	MHCr	1.5 Mo, 1.0 V
AMS 6409		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6411C		0.85	1.8	S-5	MLCr	0.40 Mo
AMS 6412H		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6413G		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6414E		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6415L		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6416B						superseded by AMS 6419
AMS 6417C		0.82	1.8	S-5	MLCr	0.40 Mo, 0.08 V
AMS 6418F		0.30	1.8	S-5	LCr	0.40 Mo
AMS 6419C		0.82	1.8	S-5	MLCr	0.40 Mo, 0.08 V
AMS 6421B		0.80	0.85	S-4	MLCr	0.20 Mo, 0.003 B
AMS 6422E		0.80	0.85	S-4	MLCr	0.20 Mo, 0.003 B
AMS 6423C		0.92	0.75	S-4	MLCr	0.52 Mo, 0.003 B
AMS 6424B		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6426C		1.0	--	S-4	MLCr	0.58 Mo
AMS 6427G		0.85	1.8	S-5	MLCr	0.42 Mo, 0.08 V
AMS 6428D		0.80	1.8	S-5	MLCr	0.35 Mo, 0.20 V
AMS 6429C		0.78	1.8	S-5	MLCr	0.35 Mo, 0.20 V
AMS 6430C		0.78	1.8	S-5	MLCr	0.35 Mo, 0.20 V
AMS 6431G		1.05	0.55	S-5	MLCr	1.0 Mo, 0.11 V
AMS 6432A		1.05	0.55	S-5	MLCr	1.0 Mo, 0.12 V
AMS 6433C		0.80	1.8	S-5	MLCr	0.35 Mo, 0.20 V
AMS 6434C		0.78	1.8	S-5	MLCr	0.35 Mo, 0.20 V
AMS 6435C		0.78	1.8	S-5	MLCr	0.35 Mo, 0.20 V
AMS 6436B		1.25	--	S-4	MLCr	0.50 Mo, 0.85 V
AMS 6437D		5.0	--	S-5	MHCr	1.3 Mo, 0.5 V
AMS 6438C		1.05	0.55	S-5	MLCr	1.0 Mo, 0.11 V
AMS 6439B		1.05	0.55	S-5	MLCr	1.0 Mo, 0.12 V
AMS 6440J		1.45	--	S-5	MLCr	
AMS 6441G						superseded by AMS 6440
AMS 6442E		0.50	--	S-3A	LCr	
AMS 6443E		1.0	--	S-4	MLCr	
AMS 6444G		1.45	--	S-4	MLCr	
AMS 6445E		1.05	--	S-4	MLCr	
AMS 6446C		1.00	--	S-4	MLCr	
AMS 6447C		1.45	--	S-4	MLCr	
AMS 6448F		0.95	--	S-4	MLCr	0.22 V
AMS 6449C		1.0	--	S-4	MLCr	
AMS 6450E		0.95	--	S-4	MLCr	0.22 V
AMS 6451A		0.65	--	S-3A	MLCr	
AMS 6454		0.80	1.8	S-5	MLCr	0.25 Mo
AMS 6455F		0.95	--	S-4	MLCr	0.22 V

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

AMS 6470H		1.6	--	S-5	MLCr	0.35 Mo, 1.1 Al
AMS 6471C		1.6	--	S-5	MLCr	0.35 Mo, 1.2 Al
AMS 6472B		1.6	--	S-5	MLCr	0.35 Mo, 1.1 Al
AMS 6475E		1.1	3.5	S-11A	MLCr	0.25 Mo, 1.25 Al
AMS 6485		5.0	--	S-5	MHCr	1.3 Mo, 0.50 V
AMS 6487		5.0	--	S-5	MHCr	1.3 Mo, 0.50 V
AMS 6488D		5.0	--	S-5	MHCr	1.3 Mo, 0.50 V
AMS 6490D		4.0	--	S-5	MHCr	4.2 Mo, 1.0 V
AMS 6491A		4.1	--	S-5	MHCr	4.2 Mo, 1.0 V
AMS 6512B		--	18		LCr	4.9 Mo, 7.8 Co, 0.40 Ti, 0.10 Al
AMS 6514B		--	18.5		LCr	4.9 Mo, 9.0 Co, 0.65 Ti, 0.10 Al
AMS 6518A		--	19.0		LCr	3.0 Mo, 0.10 Al, 1.4 Ti
AMS 6519A		--	19.0		LCr	3.0 Mo, 0.10 Al, 1.4 Ti
AMS 6520B		--	18		LCr	4.9 Mo, 7.8 Co, 0.40 Ti, 0.10 Al
AMS 6521A		--	18.5		LCr	4.9 Mo, 9.0 Co, 0.65 Ti, 0.10 Al
AMS 6522		2.0	10.0		MLCr	1.0 Mo, 14.0 Co
AMS 6523C		0.75	9.0		MLCr	1.0 Mo, 0.09 V, 4.5 Co
AMS 6524B		1.0	7.5		MLCr	1.0 Mo, 0.09 V, 4.5 Co
AMS 6525A		0.75	9.0		MLCr	1.0 Mo, 0.09 V, 4.5 Co
AMS 6526C		1.0	7.5		MLCr	1.0 Mo, 0.09 V, 4.5 Co
AMS 6527		2.0	10.0		MLCr	1.0 Mo, 14 Co
AMS 6528		0.95	--	S-4	MLCr	0.20 Mo
AMS 6529		0.95	--	S-4	MLCr	0.20 Mo
AMS 6530H		0.55	0.50	S-4	MLCr	0.20 Mo
AMS 6535G		0.50	0.55	S-4	LCr	0.20 Mo
AMS 6543A		2.0	10.0		MLCr	1.0 Mo, 8.0 Co
AMS 6544A		2.0	10.0		MLCr	1.0 Mo, 8.0 Co
AMS 6546C		0.48	8.0		LCr	0.48 Mo, 4.0 Co, 0.09 V
AMS 6550H		0.55	0.50	S-4	MLCr	0.20 Mo
DOD-F-24669/1						See ASTM A29
DOD-F-24669/2	F-11	1.00 - 1.50	--	S-4	MLCr	0.45 - 0.65 Mo
DOD-F-24669/2	F-22	2.00 - 2.50	--	S-5	MLCr	0.90 - 1.10 Mo
DOD-F-24669/6						see ASTM A314
DOD-F-24669/7	Class 403	11.5 - 13.0	0.50 Max.	S-6, S-6A	HCr	0.40 - 0.60 Mo, when permitted
DOD-F-24669/7	Class 410	11.5 - 13.5	--	S-6, S-6A	HCr	

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 HCr = Over 10% Cr

Classification of Alloys

DOD-F-24669/7	Class 405	11.5 - 14.5	--	S-6, S-6A	HCr	0.10 - 0.30 Al
DOD-F-24669/7	Class 422	11.5 - 13.5	0.50 - 1.00	S-6, S-6A	HCr	0.75 - 1.25 Mo, 0.15 - 0.30 V, 0.75 - 1.25 W
MIL-B-15382C	Class A	24.00 - 26.00	19.00 - 22.00		HCr	See ASTM A276, type 310
MIL-B-15382C	Class B					See ASTM B166
MIL-C-24707/1	A1Q, A2Q, C1Q, E1Q, E2N, E2Q					see ASTM A757
MIL-C-24707/1	WCA, WCB, WCC	0.50 Max.	0.50 Max.	S-1	LCr	see ASTM A216
MIL-C-24707/1	4B, 14A			S-3A		see ASTM A487
MIL-C-24707/2	WC1, WC6, WC9					see ASTM A217
MIL-C-24707/2	C23	1.00 - 1.50	--	S-4	MLCr	0.45 - 0.65 Mo; 0.15 - 0.25 V; see ASTM A389
MIL-DTL-23195				S-8	HCr	Restricted access; see UNS S30400, S30403, S31600, S31603, S34700, S34800
MIL-DTL-23196				S-8	HCr	Restricted access; see UNS S30400, S30403, S31600, S34700, S34800
MIL-DTL-23226						Restricted access
MIL-F-20236D(SH)		0.25 Max.	0.25 Max.	S-1	LCr	Cancelled; see ASME B16.9
MIL-F-20670B(SH)		0.25 Max.	0.25 Max.	S-1	LCr	Inactive
MIL-F-23467						Restricted access
MIL-F-24669/8	Grade A	--	--	S-1	LCr	0.03 - 0.12 V, if specified
MIL-F-24669/8	Grade B	0.75 Max.	2.50 Min.	S-5	LCr	0.25 Min. Mo, 0.03 Min. V
MIL-F-24669/8	Grade C	0.75 Max.	2.50 Min.	S-5	LCr	0.25 Min. Mo, 0.03 Min. V
MIL-F-24669/8	Grade D	1.25 - 2.00	3.25 - 4.00	S-5	MLCr	0.30 - 0.60 Mo, 0.05 - 0.15 V
MIL-F-24669/8	Grade E	1.25 - 2.00	3.25 - 4.00	S-5	MLCr	0.30 - 0.60 Mo, 0.05 - 0.15 V
MIL-F-24669/8	Grade F	0.90 - 1.50	0.75 Max.	S-5	MLCr	1.00 - 1.50 Mo, 0.20 - 0.30 V
MIL-F-24669/8	Grade G	11.5 - 13.0	0.50 Max.	S-6, S-6A	HCr	0.50 Max. Mo
MIL-L-24128						Restricted access
MIL-P-1144						Cancelled; superseded by MIL-P-24691/3 (reference ASTM A312)

LCr = Less than 0.5% Cr
MLCr = 0.5% to 2.5% Cr
MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr

Classification of Alloys

MIL-P-24691/1		0.40 Max.	0.40 Max.	S-1	LCr	see ASTM A106
MIL-P-24691/2	C (P11)	1.00 - 1.50	--	S-4	MLCr	0.44 - 0.65 Mo; see ASTM A335
MIL-P-24691/2	D (P22)	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo; see ASTM A335
MIL-P-24691/2	E (P5)	4.00 - 6.00	--	S-5	MHCr	0.45 - 0.65 Mo; see ASTM A335
MIL-P-24691/3	F	18.0 - 20.0	8.00 - 11.0	S-8	HCr	see ASTM A312, TP304
MIL-P-24691/3	G	18.0 - 20.0	8.00 - 13.0	S-8	HCr	see ASTM A312, TP304L
MIL-P-24691/3	H	18.0 - 20.0	8.00 - 11.0	S-8	HCr	0.10 - 0.16 N; see ASTM A312, TP304N
MIL-P-24691/3	J	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; see ASTM A312, TP316
MIL-P-24691/3	K	16.0 - 18.0	10.0 - 15.0	S-8	HCr	2.00 - 3.00 Mo; see ASTM A312, TP316L
MIL-P-24691/3	L	16.0 - 18.0	11.0 - 14.0	S-8	HCr	2.00 - 3.00 Mo; 0.10 - 0.16 N; see ASTM A312, TP316N
MIL-P-24691/3	M	18.0 - 20.0	11.0 - 14.0	S-8	HCr	3.00 - 4.00 Mo; see ASTM A312, TP317
MIL-P-24691/3	N	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.00 - 4.00 Mo; see ASTM A312, TP317L
MIL-P-24691/3	P	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Ti; see ASTM A312, TP321
MIL-P-24691/3	Q	17.0 - 20.0	9.00 - 13.0	S-8	HCr	+ Nb + Ta; see ASTM A312, TP347
MIL-S-860						cancelled, see MIL-F-24669/8
MIL-S-867						cancelled--see MIL-C-24707/3
MIL-S-870						cancelled--see MIL-C-24707/2
MIL-S-8699						Cancelled, see AMS 6411, 6427
MIL-S-15083						cancelled--see MIL-C-24707/1, ASTM A757, A216, A487
MIL-S-15464						Cancelled, see MIL-C-24707/2
MIL-S-16216K(SH)	HY-80, ≤1.25 in.	1.00 - 1.80	2.00 - 3.25	S-11A	MLCr	0.20 - 0.60 Mo
MIL-S-16216K(SH)	HY-100, ≤1.25 in.	1.00 - 1.80	2.25 - 3.50	S-11A	MLCr	0.20 - 0.60 Mo

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 HCr = Over 10% Cr

Classification of Alloys

MIL-S-16216K(SH)	HY-80, >1.25, ≤3.0 in.	1.40 - 1.80	2.50 - 3.50	S-11A	MLCr	0.35 - 0.60 Mo
MIL-S-16216K(SH)	HY-100, >1.25, ≤3.0 in.	1.40 - 1.80	2.75 - 3.50	S-11A	MLCr	0.35 - 0.60 Mo
MIL-S-16216K(SH)	HY-80, >3.0 in.	1.50 - 1.90	3.00 - 3.50	S-11A	MLCr	0.50 - 0.65 Mo
MIL-S-16216K(SH)	HY-100, >3.0 in.	1.50 - 1.90	3.00 - 3.50	S-11A	MLCr	0.50 - 0.65 Mo
MIL-S-16993						<i>Cancelled, see MIL-C-24707/6</i>
MIL-S-17509						<i>cancelled--see MIL-C-24707/3</i>
MIL-S-18728						<i>cancelled--see SAE-AMS 6350, 6351 or 6345</i>
MIL-S-18729						<i>cancelled--see SAE-AMS 6350, 6351 or 6345</i>
MIL-S-21952D(SH)	HY-80	1.35 - 1.80	2.50 - 3.25	S-11A	MLCr	0.30 - 0.60 Mo
MIL-S-21952D(SH)	HY-100	1.35 - 1.80	2.75 - 3.50	S-11A	MLCr	0.30 - 0.60 Mo
MIL-S-22698C(SH)				S-1	LCr	See appropriate ABS specification
MIL-S-23008D(SH)	HY-80	1.35 - 1.80	2.50 - 3.25	S-11A	MLCr	0.30 - 0.60 Mo
MIL-S-23008D(SH)	HY-100	1.35 - 1.80	2.75 - 3.50	S-11A	MLCr	0.30 - 0.60 Mo
MIL-S-23009C(SH)	HY-80	1.35 - 1.80	2.50 - 3.25	S-11A	MLCr	0.30 - 0.60 Mo
MIL-S-23009C(SH)	HY-100	1.35 - 1.80	2.75 - 3.50	S-11A	MLCr	0.30 - 0.60 Mo
MIL-S-23193						<i>Restricted access</i>
MIL-S-23194						<i>Restricted access</i>
MIL-S-23284A(SH)	Class 1	0.50 Max.	2.75 - 3.50	S-5	LCr	0.25 - 0.60 Mo, 0.08 Max.V
MIL-S-23284A(SH)	Class 2	0.50 Max.	2.75 - 3.25	S-5	LCr	0.25 - 0.60 Mo, 0.05 Max.V
MIL-S-23284A(SH)	Class 3	--	--	S-1	LCr	
MIL-S-23284A(SH)	Class 4	--	--	S-1	LCr	
MIL-S-23284A(SH)	Class 5	1.50 - 2.00	2.75 - 3.90	S-5	MLCr	0.40 - 0.60 Mo

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 HCr = Over 10% Cr

Classification of Alloys

MIL-S-23284A(SH)	Class 6	1.50 - 2.00	2.75 - 3.90	S-5	MLCr	0.40 - 0.60 Mo
MIL-S-24093A(SH)	I	0.70 - 0.95	1.65 - 2.00	S-5	MLCr	0.20 - 0.30 Mo
MIL-S-24093A(SH)	II	0.80 - 1.10	--	S-4	MLCr	0.15 - 0.25 Mo
MIL-S-24093A(SH)	III	--	3.25 - 3.75	S-5	LCr	
MIL-S-24093A(SH)	IV	--	--	S-1	LCr	
MIL-S-24093A(SH)	V	--	0.25 Max.	S-1	LCr	
MIL-S-24238						<i>Restricted access</i>
MIL-S-24338						<i>Restricted access</i>
MIL-S-24339						<i>Restricted access</i>
MIL-S-24371	HY-130			S-11B	MLCr	<i>Specification not available for download</i>
MIL-S-24412						<i>Cancelled</i>
MIL-S-24451	HY-80			S-11A	MLCr	<i>Specification not available for download</i>
MIL-S-24451	HY-100			S-11A	MLCr	<i>Specification not available for download</i>
MIL-S-24645	HSLA-80			S-11C	MLCr	<i>Specification not available for download</i>
MIL-S-24645	HSLA-100			S-11D	MLCr	<i>Specification not available for download</i>
MIL-T-6736						<i>Cancelled, use SAE-AMS-T-6736 as possible replacement</i>
MIL-T-8504B		18.00 - 20.00	8.00 - 12.00	S-8	HCr	
MIL-S-8699						<i>Cancelled, see AMS 6411, 6427</i>
MIL-T-16286E(SH)	a	--	--	S-1	LCr	
MIL-T-16286E(SH)	c	17.0 - 20.0	9.0 - 13.0	S-8	HCr	TP-321 is Ti-stabilized, TP-347 is Nb/Ta stabilized
MIL-T-16286E(SH)	d	--	--	S-3A	LCr	0.44 - 0.65 Mo
MIL-T-16286E(SH)	e	1.90 - 2.60	--	S-5	MLCr	0.87 - 1.13 Mo

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 MHCr = 2.5% to 10% Cr
 HCr = Over 10% Cr

Classification of Alloys

MIL-T-16286E(SH)	g	--	--	S-1	LCr	
MIL-T-20155						<i>Cancelled</i>
MIL-T-18165						<i>Cancelled; superseded by MIL-P-24691 (reference ASTM A335)</i>
MIL-T-20157						<i>Cancelled; superseded by MIL-P-24691/1 (reference ASTM A106)</i>
QQ-S-763F	202	17.0 - 19.0	4.0 - 6.0		HCr	
QQ-S-763F	302	17.0 - 19.0	8.0 - 10.0	S-8	HCr	
QQ-S-763F	304	18.0 - 20.0	8.0 - 10.5	S-8	HCr	
QQ-S-763F	304L	18.0 - 20.0	8.0 - 12.0	S-8	HCr	
QQ-S-763F	S30430	17.0 - 19.0	8.0 - 10.0	S-8	HCr	3.0 - 4.0 Cu
QQ-S-763F	305	17.0 - 19.0	10.50 - 13.0	S-8	HCr	
QQ-S-763F	309	22.0 - 24.0	12.0 - 15.0	S-8	HCr	
QQ-S-763F	310	24.0 - 26.0	19.0 - 22.0		HCr	
QQ-S-763F	316	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.0 - 3.0 Mo
QQ-S-763F	316L	16.0 - 18.0	10.0 - 14.0	S-8	HCr	2.0 - 3.0 Mo
QQ-S-763F	317	18.0 - 20.0	11.0 - 15.0	S-8	HCr	3.0 - 4.0 Mo
QQ-S-763F	321	17.0 - 19.0	9.0 - 12.0	S-8	HCr	+ Ti
QQ-S-763F	347	17.0 - 19.0	9.0 - 13.0	S-8	HCr	+ Nb + Ta
QQ-S-763F	384	15.0 - 17.0	17.0 - 19.0		HCr	
QQ-S-763F	403	11.5 - 13.0	--	S-6, S-6A	HCr	
QQ-S-763F	405	11.5 - 14.5	--	S-6, S-6A	HCr	0.10 - 0.30 Al
QQ-S-763F	410	11.5 - 13.5	--	S-6, S-6A	HCr	
QQ-S-763F	414	11.5 - 13.5	1.25 - 2.50	S-6, S-6A	HCr	
QQ-S-763F	420	12.0 - 14.0	--	S-6, S-6A	HCr	
QQ-S-763F	430	16.0 - 18.0	--	S-7	HCr	
QQ-S-763F	440A	16.0 - 18.0	--	S-7	HCr	
QQ-S-763F	440B	16.0 - 18.0	--	S-7	HCr	
QQ-S-763F	440C	16.0 - 18.0	--	S-7	HCr	
QQ-S-763F	446	23.0 - 27.0	--		HCr	
QQ-S-766D						<i>Cancelled - Refer to ASTM A240, A666 or A693</i>

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MHCr = 2.5% to 10% Cr
HCr = Over 10% Cr