

Chemical Specification Of Commonly Cast Corrosion Resistant Alloys

Closest Equivalent Alloy	UNS	Closest DIN 17445	ASTM - A351/A494/ A743/A890 Gr	C%	Ni %	Cr %	Mo %	Si%	Mn%	others %	Applications
AISI 410	J91150	1.4008	CA15	0.15 max	1.0 max	11.5 - 14.0	0.5 max	1.5 max	1.0 max	-	Valves and valve trim, pump parts for power plant and refining equipments, sliding or wearing parts like wedges for paper mills.
CA40	J91153	-	CA40	0.20 - 0.40	1.0 max	11.5 - 14.0	0.5 max	1.5 max	1.0 max	-	Valves and valve trim, pump parts for power plant and refining equipments, sliding or wearing parts like wedges for paper mills. Has greater

											hardness then CA15
AISI 420	S42000	1.4021	-	0.15 min	1.0 max	12.0 - 14.0	-	1.0 max	1.0 max	-	Used in wear resistant applications such as ROT (run over table) rolls in steel plants.
AISI 416	S41600	1.4005	CA15F	0.08 - 0.15	-	12.0 - 14.0	0.6 max	1.0 max	1.5 max	0.04 P max, 0.15-0.35 S	Similler to CA15 with better machinability.
CA40F	J91154	-	CA40F	0.20 - 0.40	1.0 max	11.5 - 14.0	0.5 max	1.5 max	1.0 max	0.04 P max, 0.20-0.40 S	Similler to CA40 with better machinability.
AISI 440A	S44004	-	-	0.60 - 0.75	-	16.0 - 18.0	0.75 max	1.0 max	1.0 max	-	Cutlery, valve parts, surgical instruments.
AISI 440C	S44003	1.4125	-	0.95 - 1.20	-	16.0 - 18.0	0.75 max	1.0 max	1.0 max	-	Used in applications requiring higher hardness and basic corrosion resistance.
1.4122	-	1.4122	GX 35CrMo17	0.33 - 0.43	1.0 max	15.5 - 17.5	0.9 - 1.3	1.0 max	1.0 max	-	-
F6NM	J91540	1.4313	CA6NM	0.06 max	3.5 - 4.5	11.5 - 14.0	0.4 - 1.0	1.0 max	1.0 max	-	Parts of turbines, compressors, pumps and valves for chemical, pollution control, marine and power industries. Exhibits good cavitation resistance.
-	-	-	ASTM A487 CA6NM Class A & B	0.06 max	3.5 - 4.5	11.5 - 14.0	0.4 - 1.0	1.0 max	1.0 max	-	Valve cages sleeve and parts where higher corrosion resistance is required.

											Usually supplied in 285 BHN max but can also be supplied under 255 BHN max as per NACE standard for applications requiring higher toughness.
AISI 436	S43600	1.4526	-	0.08 max	-	16.0 - 18.0	0.8 - 1.4	1.0 max	1.0 max	0.015 S max, 0.04 N max, 7(C+N)+0.1 ≤ 1.00 - Nb	-
CB30	J91803	-	CB30	0.30 max	2.0 max	18.0 - 21.0	-	1.5 max	1.0 max	-	Non-hardenable grade with excellent resistance to nitric acid, alkaline solutions and many organic chemicals.
1.4418	-	1.4418	-	0.06 max	4.0 - 6.0	15.0 - 17.0	0.8 - 1.5	0.7 max	1.50 max	0.015 S max, N ≥ 0.02	-
28/4	J92615	-	CC50	0.5 max	4.0 max	26.0 - 30.0	-	1.5 max	1.0 max	-	Used in chemical, mining, pulp and paper machinery.
BUME 5	-	1.4138	-	0.90 - 1.30	-	27.0 - 29.0	2.0 - 2.5	2.0 max	1.0 max	-	-
1.4746	-	1.4746	-	0.12 max	-	24.0 - 27.0	-	1.0 max	1.0 max	0.03 S max, TI ≥ 4xC ≤ 0.80	-
15.5 PH	J92100	1.4594	ASTMA 747 Gr CB7Cu-2	0.07 max	4.5 - 5.5	14.0 - 15.5	-	1.0 max	0.7 max	2.5-3.2 Cu, 0.15-0.35 Nb, 0.05 N max	Wearing parts requiring corrosion resistance and high

											strength, such as in valves and in food processing applications, marine environment, petrochemical, pulp and paper industries at temperature upto 315°C.
17.4 PH	J92180	1.4542	ASTM A747 Gr CB7Cu-1	0.07 max	3.6 - 4.6	15.5 - 17.7	-	1.0 max	0.7 max	2.5-3.2 Cu, 0.15-0.35 Nb, 0.05 N max	Wearing parts requiring corrosion resistance and high strength such as in valves and in food processing, marine environment, petrochemical, pulp and paper industries at temperature upto 315°C.
CD4MCu	J93370	-	CD4MCu	0.04 max	4.75 - 6.0	24.5 - 26.5	1.75- 2.25	1.0 max	1.0 max	2.75-3.25 Cu	Used in chemical processing, marine environment, water supply, petroleum refining, pulp & paper, soap manufacturing and textile industries.
CD4MCuN	J93372	-	1B CD4MCuN	0.04 max	4.75 - 6.0	24.5 - 26.5	1.7 - 2.3	1.0 max	1.0 max	2.7-3.3 Cu, 0.1-0.2 N	Used in chemical processing, marine environment, water supply, petroleum refining, pulp & paper, soap manufacturing

Table 1. Chemical composition of duplex stainless steels											and textile industries.	
Grade	UNS	C	N	P	S	Si	Mn	Fe	Cr	Ni	Other elements	Typical applications
AISI 329	S32900	-	-	0.03 max	0.10 max	3.0 - 6.0	25.0 - 30.0	1.0 - 2.0	1.0 max	2.0 max	0.03 S, 0.04 P max	Heat exchangers in pulp mills, nitic acid plants and phosphoric acid plants.
Lean Duplex	S32304	1.4362	-	0.03 max	0.03 max	3.5 - 5.5	22.0 - 24.0	0.1 - 0.6	1.0 max	2.0 max	0.015 S max, 0.1-0.6 Cu, 0.05-0.20 N.	-
Lean Duplex	-	1.4655	-	0.03 max	0.03 max	3.5 - 5.5	22 - 24	0.1 - 0.6	1.0 max	2.0 max	0.015 S max, 1.0-3.0 Cu, 0.05-0.20 Cu.	-
Duplex	S32550 J93373	1.4507	1C CD3MCuN	0.03 max	0.03 max	6.0 - 8.0	24.0 - 26.0	3.0 - 4.0	0.07 max	2.0 max	0.015 S max, 0.2-0.3 N , 1.0-2.5 Cu	Valve cages, sleeves and parts where enhanced corrosion resistance & strength is required
Duplex	J93345	-	2A CE8MN	0.08 max	0.08 max	8.0 - 11.0	22.5 - 25.5	3.0 - 4.5	1.5 max	1.0 max	0.1-0.3 N	Valve cages, sleeves and parts where enhanced corrosion resistance & strength is required.
Duplex	J93371	-	3A CD6MN	0.06 max	0.06 max	4.0 - 6.0	24.0 - 27.0	1.75 - 2.5	1.0 max	1.0 max	0.15-0.25 N	Valve cages, sleeves and parts where enhanced corrosion resistance & strength is required.
2205	J92205 S31803 S32205	1.4462	4A CD3MN	0.03 max	0.03 max	4.5 - 6.5	21.0 - 23.5	2.5 - 3.5	1.0 max	1.5 max	1.0 Cu max, 0.1-0.3 N	Valve cages, sleeves and parts where enhanced corrosion resistance & strength

											is required.
Super Duplex	J93404	-	5A CE3MN	0.03 max	6.0 - 8.0	24.0 - 26.0	4.0 - 5.0	1.0 max	1.5 max	0.1-0.3 N	Valve cages, sleeves and parts where enhanced corrosion resistance & strength is required.
Super Duplex	J93380	-	6A CD3MWCuN	0.03 max	6.5 - 8.5	24.0 - 26.0	3.0 - 4.0	1.0 max	1.0 max	0.5-1 Cu, 0.50-1.0 W, 0.2-0.3 N	Valve cages, sleeves and parts where enhanced corrosion resistance & strength is required.
AISI 304	J92600	1.4308	CF8	0.08 max	8.0 - 11.0	18.0 - 21.0	0.5 max	2.0 max	1.5 max	-	General service, pumps, valves, etc. for chemical processing, oil refining, textile dyeing, food machinery, fuel jets, fuel valves engine supports, etc.
AISI 347	J92710	1.4552	CF8C	0.08 max	9.0 - 12.0	18.0 - 21.0	-	2.0 max	1.5 max	Nb(Cb)=8xC min - upto 1% max.	Used where heat treatment is not possible after welding.
AISI 304L	J92500	1.4311	CF3	0.03 max	8.0 - 12.0	18.0 - 21.0	0.5 max	2.0 max	1.5 max	-	General service, pumps, valves, etc. for chemical processing, oil refining, textile dyeing, food machinery, fuel jets, fuel valves engine supports, etc.
AISI 304LN	-	1.4311	-	0.03	8.0 -	18.0 -	-	1.0	2.0	0.10-0.16 N	Parts for the

Mechanical Properties				Chemical Composition							Applications	
Grade	UNS	EN	CF	C	Mn	P	S	N	Cr	Ni		
				max	10.5	20.0			max	max	construction of apparatus and vessels for refrigerators	
AISI 305	-	1.4303	-	0.06 max	10.5 - 13.0	17.0 - 19.0	-		1.0 max	2.0 max	-	Parts for free spinning deep drawing and severe cold heading operations.
AISI 316	J92900	1.4408	CF8M	0.08 max	9.0 - 12.0	18.0 - 21.0	2.0 - 3.0		1.5 max	1.5 max	-	Pumps, valves, fittings, etc. in reducing acids, paper mill equipments, chemical process industries, sea water service, etc.
AISI 316L	J92800	1.4404	CF3M	0.03 max	9.0 - 13.0	17.0 - 21.0	2.0 - 3.0		1.5 max	1.5 max	-	Pumps, valves, fittings, etc. in reducing acids, paper mill equipments, chemical process industries, sea water service, etc.
AISI 316Ti	S31635	1.4571		0.08 max	10.5 - 13.5	16.5 - 18.5	2.0 - 2.5		0.75 max	2.0 max	Ti = 5xC min upto 0.70 max	Pumps, valves, fittings, etc. in reducing acids, paper mill equipments, chemical process industries, sea water service, etc. Exhibits prolonged endurance at elevated temprature compared to 316

Grade	UNS	C	Alloying Elements	Mn	Si	P	S	Ni	Cr	Mo	Other Elements	Notes
AISI 316LN	J92804	1.4406	CF3MN	0.03 max	10.0 - 12.5	17.0 - 18.0	2.0 - 2.5	1.0 max	1.5 max	0.1-0.2 N		Used for high strength applications.
AISI 316L Ferrite free	S31653	-	CF3M (Low Ferrite)	0.03 max	13.0 - 14.0	16.0 - 18.0	2.0 - 3.0	1.0 max	2.0 max	-		Used in hot zinc bath for galvanizing operations.
AISI 317	J93000	1.4438	CG8M	0.08 max	9.0 - 13.0	18.0 - 21.0	3.0 - 4.0	1.5 max	1.5 max	-		Part for pulp and paper mill equipments and chemical process industries.
6 Mo	J93254	-	CK3M CuN	0.025 max	17.5 - 19.5	19.5 - 20.5	6.0 - 7.0	1.0 max	1.0 max	0.5-1.0 Cu 0.18-0.24 N		-
AISI 317L	J93000	1.4438	CG3M	0.03 max	9.0 - 13.0	18.0 - 21.0	3.0 - 4.0	1.5 max	1.5 max	-		Parts for paper mill, chemical and hot dip galvanizing industries.
AISI 317LN	-	1.4442	CG3MN	0.03 max	11.0 - 15.0	18.0 - 20.0	3.0 - 4.0	0.75 max	2.0 max	0.03 S max, 0.1-0.2 N		Handling of sulphur, pulp liquer dyestuffs, sulphuric acids.
AISI 310 MoLN	-	1.4466	-	0.03	21.0 - 23.0	24.0 - 26.0	2.0 - 2.5	0.7 max	2.0 max	0.025 P max, 0.01 P max, 0.1-0.16 N		-
CN7M (28Ni21Cr2.5Mo)	N08007	-	CN7M	0.07 max	27.5 - 30.5	19.0 - 22.0	2.0 - 3.0	1.5 max	1.5 max	3.0-4.0 Cu		Used in food processing, munitions manufacturing, rayon manufacturing, oil refining, paints, pharmaceuticals, synthetic rubber, soap, textile & dye industries.

904L 25Ni20Cr4Mo	N08904	1.4539	-	0.025 max	24.0 - 26.0	19.0 - 21.0	4.0 - 5.0	1.0 max	2.0 max	1.0-2.0 Cu	Used in food processing, munitions manufacturing, rayon manufacturing, oil refining, paints, pharmaceuticals, synthetic rubber, soap, textile & dye industries.
CG6MMN	J93790	1.3964	CG6MMN	0.06 max	11.5 - 13.5	20.5 - 23.5	1.5 - 3.0	1.0 max	4.0 6.0	0.1 - 0.3 Nb 0.1 - 0.3 Va 0.2 - 0.4 Ni	Similar to Nitronic 50
CF10SMnN	J92972	-	CF10SMnN	0.1 max	8.0 - 9.0	16.0 - 18.0	-	3.5 - 4.5	7.0 - 9.0	0.08 - 0.18 N	Similar to Nitronic 60
Alloy 28	N08028	-	-	0.03 max	26.0 - 28.0	30.0 - 34.0	3.0 - 4.0	1.0 - max	2.5 max	0.06- 1.40 Cu	-
R-55 (58Ni23Cr4Mo)	-	-	-	0.15 max	55.0 - 60.0	22.0 - 24.0	4.0 - 5.0	3.0 - 4.0	1.5 max	4.0-5.0 Cu	Used in pumps, valves and other process equipments for viscose rayon plants operating in severe corrosive conditions.
Alloy 400 M35 (65Ni30Cu)	N24135	-	M35-1	0.35 max	62.0 - 68.0	-	-	2.0 max	1.5 max	26.0-33.0 Cu, 2.5 Fe max	Suitable for sea water applications. Exhibits high resistance to destructive chemical action & mechanical wear.
M30-H	N24030	-	ASTM A494	0.30	Balance	-	-	2.7	1.5	0.02 S max,	Used in rotating parts

			M30H	max				- 3.7	max	0.03 P max, 27.0-33.0 Cu, 3.5 Fe max	because it combines corrosion resistance with high strength and wear resistance.
Alloy 600	N06040	-	ASTM A494 CY40	0.40	Balance	14.0 - 17.0	-	3.0 max	1.5 max	11.0 Fe max	Used to handle hot corrosives under moderately oxidizing conditions due to its high resistance to intergranular attack and stress corrosion cracking. Can be used from cryogenic temperature upto 1093°C.
CW6M	N30107	Chlorimet Alloy 3	ASTM A494 CW6M	0.07	Balance	17.0 - 20.0	17.0 - 20.0	1.0 max	1.0 max	3.0 Fe max	Resists oxidizing agents such as wet chlorine, chlorine gas, hypochlorite, chlorine dioxide solutions, ferric chloride and nitric, hydrochloric and sulphuric acids at moderate temperature. Excellent resistance to corrosion in all concentration of sulphuric acid upto 65C.
Alloy 625	N26625	-	ASTM A494 CW6MC	0.02 max	Bal	20.0 - 23.0	8.0 - 10.0	0.75 max	1.0 max	3.2-4.5 Nb 5.0 Fe max	Can be used from cryogenic temperature up to 1000°C with high

Chemical Process Equipment											corrosion resistance. Used in chemical processing equipment, ship and submarine parts and nuclear reactors.
Alloy 825	N08826	-	ASTM A494 Cu5MCuC	0.05	38.0 - 44.0	19.5 - 23.5	2.5 - 3.5	1.0 max	1.0 max	1.5-3.5 Cu, 0.6-1.2 Nb	Phosphoric acid evaporator, pickling equipment, chemical processing vessels and piping, equipment for recovery of spent nuclear fuel.
Alloy C-276	N30002	-	ASTM A494 CW12MW	0.12 max	50.0 - 55.0	15.5 - 17.5	16.0 - 18.0	1.0 max	1.0 max	3.75-5.25 W, 4.5-7.5 Fe, 0.2-0.4 V.	Exhibits outstanding resistance to highly corrosive chemicals such as wet chlorine, strong hypochloride solutions, hydrochloric acid, sulphuric acid and nitric acid at moderate temperatures or under oxidizing conditions.
Alloy C (Mod)	N26455	-	ASTM A494 CW2M	0.02	Balance	15.0 - 17.5	15.0 - 17.5	0.8 max	1.0 max	2.0 Fe max, 1.0 W max,	Outstanding high temperature stability. Exhibits good ductility and corrosion resistance suitable for most chemical process application in as welded condition. Resistance to stress

											corrosion cracking and oxidizing atmosphere up to 1040°C
Alloy C-22	N26022	-	ASTM A494 CX2MW	0.02 max	Balance	20.0 - 22.5	12.5 - 14.5	0.8 max	1.0 max	2.0-6.0 Fe, 2.5-3.5 W, 0.35 V max	Used for acetic acid, acetic anhydride production, chlorination systems, complex acid mixtures, electro galvanizing rolls, flue gas scrubber systems, hydrogen fluoride scrubber system and nuclear fuel reprocessing.
CX2M	N26059	-	ASTM A494 CX2M	0.02	Balance	22.0 - 24.0	15.0-16.5	0.5 max	1.0 max	1.5 Fe max	Used for acetic acid, acetic anhydride production, chlorination systems, complex acid mixtures, electro galvanizing rolls, flue gas scrubber systems, hydrogen fluoride scrubber system, incineration scrubber systems, incineration scrubber systems and nuclear fuel reprocessing.
Alloy B	N30012	-	ASTM A494 N12MV	0.12 max	61.0 - 69.0	1.0 max	26.0-30.0	1.0 max	1.0 max	0.2-0.6 Va, 4.0-6.0 Fe.	Excellent resistance to all concentrations of

												<p>sulphuric acid upto 650°C and good resistance upto the boiling point in the concentration range of 10-60%. Highly resistance to acetic acid exposure.</p>
Alloy B (Mod)	J30007	Chlorimet Alloy 2	ASTM A494 N7M	0.07	Balance	1.0 max	30.0-33.0	1.0 max	1.0 max	3.0 Fe max		<p>Suitable for equipment handling hydrochloric acid in all concentration and temperature. Resistant to hydrogen chloride gas and sulfuric, acetic and phosphoric acid. Exposure between 540°C to 815°C should be avoided.</p>
Alloy G	N06007	-	-	0.05 max	Balance	21.0 - 23.5	5.5 - 7.5	1.0 max	1.0 - 2.0	18.0-21.0 Fe, 1.75-2.5 Nb, 1. -2.5 Cu, 0-2.5 C, 1.0 W max.		<p>Used in chemical application, particularly those involving sulphuric and phosphoric acid, pulp digestion operations, dissolver vessel and attendant equipment for spent nuclear fuel elements.</p>
Alloy W	N10004	-	-	0.12 max	Balance	4.0 - 6.0	23.0-26.0	1.0 max	1.0 max	4.0-7.0 Fe, 0.6 V max, 2.5 Co max.		<p>Exceptional strength and oxidation resistance upto</p>

											1200C. Used in many industrial furnace applications due to its resistance to oxidizing, neutral and carburizing atmosphere.
Alloy X	N06002	-	-	0.05 - 0.15	Balance	20.5 - 23.0	8.0 - 10.0	1.0 max	1.0 max	0.5-2.5 Cu, 0.2-1.0 W, 17.0-20.0 Fe.	Exceptional strength and oxidation resistance upto 1200°C. Used in many industrial furnace applications because of its resistance to oxidizing, neutral and carburizing atmosphere.
Ni-Resist AFG 1	-	-	ASTM A436 Type 1	3.0 max	13.5 - 17.5	1.5 - 2.5	-	1.0 - 2.8	0.5 - 1.5	5.5-7.5 Cu	Mechanical seals & their machinery for the production of single superphosphate and related fertilizers.
Ni-Resist AFG 2	-	-	ASTM A436 Type 2	3.0 max	18.0 - 22.0	1.5 - 2.5	-	1.0 - 2.8	0.5 - 1.5	0.5 Cu max	Mechanical seals & their machinery for the production of single superphosphate and related fertilisers

