SULZER

Cast materials

Rely on our material competence for your demanding industrial processes

Our customer-focused R&D and continuous research on new material options enable us to develop equipment with a strong resistance to corrosion and wear.

Proven expertise

- Specialist competence in corrosive and erosive applications, built on leading material technology
- Pump designs consider both materials of construction and hydraulic requirements to optimize performance in the field
- Continuous research into new material options
- One of the largest suppliers of stainless castings for pumps, mixers and agitators in the world

Experience

- Over 100 years of experience in manufacturing process pumps with casted parts
- Over 60 years of experience in duplex steel castings
- 15’000 pumps and agitators manufactured annually with casted parts
- Roughly 75% of deliveries in corrosion resistant duplex and super duplex cast steel grades

Cast materials

	Internal code	USA ASTM [1]	Comparable grades EN10283		Nominal chemical composit				
			Item	Number code	C	Cr	Ni	Mo	Cu
Corrosion-resistant cast steels									
Martensitic cast steels	E2	A743 Grade CA-6NM	G-X 4 CrNi 13 4	1.4317	max. 0.06	11.5-14.0	3.5-4.5	0.40-1.0	
	4E	A747 Grade CB7Cu-2	G-X 5 CrNiCu 16 4	1.4525	max. 0.07	14.0-15.5	4.5-5.5		2.5-3.2
Austenitic cast steels	4C	A743 Grade CF-8	G-X 6 CrNi 19 10	1.4308	max. 0.08	18.0-21.0	8.0-11.0		
	42	A743 Grade CF-8M	G-X 5 CrNiMo 19 11 2	1.4408	max. 0.08	18.0-21.0	9.0-12.0	2.0-3.0	
	43	A743 Grade CN-7M	G-X 4 NiCrCuMo 30 20 4	1.4527	max. 0.07	19.0-22.0	27.5-30.5	2.0-3.0	3.0-4.0
	4U	(UNS S32654)	AVESTA 654SMO [3]		max. 0.025	23.0-25.0	21.0-23.0	7.1-7.5	0.3-0.7
Duplex steels (austenitic-ferritic)	41	A890 Grade 3A	(G-X 2 CrNiMoN 25 6 3)	(1.4468)	max. 0.06	24.0-27.0	4.0-6.0	1.75-2.5	
	4L	A890 Grade 1B	(G-X 2 CrNiMoN 25 6 3 3)	(1.4517)	max. 0.04	24.5-26.5	4.7-6.0	1.7-2.3	2.7-3.3
	4T	A890 Grade 5A	G-X 2 CrNiMo 26 7 4	1.4469	max. 0.03	24.0-26.0	6.0-8.0	4.0-5.0	
Ferritic stainless steel	ER [5]	A743 CC50 (Mod)			0.25-0.35	29.0-30.0	1.50-3.00	1.50-3.00	1.00-1.50
Carbon and low alloy cast steels									
Carbon steels	46	A216 Grade WCB	GP 240 GH	EN 10213-2	max. 0.30	max. 0.50	max. 0.50	max. 0.20	max. 0.30
Cast irons									
Grey cast irons	53	A48 Class No 35 B	EN-GJL-250	EN-JL-1040					
Ductile cast irons	5H	A395 Grade 60-40-18	EN-GJS-400-18	EN-JS-1020	min. 3.00				
Wear-resistant cast irons	5B	A532 Class III Type A	EN-GJN-HV600 (XCr23)	EN-JN-3049	2.0-3.3	23.0-30.0	max. 2.5	max. 3.0	max. 1.2
Cast titanium and nickel alloy									
Titanium	75	B367 C-3		3.7055					
Nickel alloys	4J	A494 Grade CW-6M			max. 0.07	17.0-20.0	balance	17.0-20.0	

[1] Standard corresponding to the internal code is ASTM.
[2] The hardness is an informative value.
[3] Trademark by Outokumpu Oyj.
[4] PRE ≥ 40
[5] Chemical composition modified.

ion		Guaranteed mechanical properties				General properties and examples of applications
N	Others	Tensile strength N/mm²	Yield strength N/mm²	Elonga-tion %	Hardness [2]	
		755	550	15	250	Air-hardening steel with good strength properties. Used e.g. in power industry applications.
	Nb 0.15-0.35	1170	1000	5	400	A precipitation hardening corrosion resistant grade with good strength properties and wear resistance. Used for pump components.
		485	205	35	150	Standard stainless steel grade with good toughness and resistance to nitric acid solutions.
		485	205	30	150	Molybdenum alloyed grade with better resistance to acids and pitting compared to CF-8.
		425	170	35	140	A grade for castings where resistance to sulphuric acid is essential.
0.40-0.55		600	350	35	220	Excellent corrosion resistance. Nitrogen also gives very good resistance to pitting and crevice corrosion. Resistant to hot acids with high chloride content. Used in pulp bleaching plants, sea water applications, and in the handling of liquids containing halides.
0.15-0.25		655	450	25	230	Steel with better tensile and yield strength compared to austenitic steels. Used for various process industry and seawater applications.
0.10-0.25		690	485	16	250	Similar grade to the previous one. The copper content improves corrosion resistance in e.g. weak sulphuric acid solutions. Molybdenum improves general corrosion resistance.
0.10-0.30		690	515	18	250	Used for equipment in the chemical and pulp industries. Good resistance to sea water. [4]
0.10-0.20		380			275	Corrosive WPA with solids in phosphate fertilizer industry. Also metal processing like Lx-Sx-Ew plants and other applications especially when good corrosion and wear resistant material is needed.
	Mn 1.0% max. Si 0.6 max.	485-655	250	22	160	Ductile and strong weldable steel, used e.g. in pump support structures. Also used in hot water pumps.
		241			210	Used in pump casings, casing covers and parts of bearings.
	Si 2.50 max. P 0.08 max.	414	275	18	150	Used in casings and covers in various industries.
	Si 1.5 max.				600	High-chromium white cast iron for wear resistant pumps. Corrosion resistant grade: well suited for wearing applications in alkaline and slightly acidic condition.
		450	380	12	≤235	Excellent corrosion resistance in many severe conditions, particularly ones containing chlorine, and in oxidizing conditions. Used in e.g. chlorine dioxide and hypochlorite containing solutions in the pulp and paper and chemical process industry.
	Fe max. 3.0%	495	275	25	180	High Mo and Cr contents make the alloy suitable for reducing and oxidizing and otherwise severely corroding conditions. Good resistance to sulphuric acid, and also to hydrochloric acid up to concentrations of approx. 10%.

Pitting and crevice corrosion

Pitting and crevice corrosion that occur in metals are of particular interest in stainless steel.

Pitting in pumps refers to small, deep cavities that can form randomly on wetted surfaces. Crevice corrosion, as the name suggests, occurs in narrow crevices into which a solution can penetrate, but where it is not flushed away during the normal course of operation as happens in more open areas of the pump.

By calculating the sum of the most important alloys in a weighed form, it is possible to identify the susceptibility of specific alloys to pitting and crevice corrosion.

This calculated parameter is called the Pitting Resistance Equivalent (PRE), commonly expressed as PRE = Cr % + 3.3 x Mo % + 16 x N %. The values in the graph above have been calculated using this formula, with the higher PRE number representing greater resistance to pitting and crevice corrosion.

PRE figures of various stainless steels
(informative values)

Alloy	PRE
A743 CF-8	19
A743 CF-8M	27
A890 3A	34
A890 1B	35
A890 5A	41
654SMO	56

The higher the PRE figure, the greater the pitting and crevice corrosion resistance of the alloy.

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