

Corrosion Resistance

Because of their superior anti-corrosion properties under all kinds of corrosive conditions, JFE stainless steels are widely used in the chemical, paper, dyeing, oil-refinery, rolling stock and food-processing industries, as well as for kitchen utensils, home appliances, architectural metal fittings, etc.

In selecting a stainless steel, it is essential to determine the type of steel best suited to the given corrosive conditions and type of fabrication. The wrong selection may reduce the actual performance of these products, in spite of their intrinsic corrosion resistance.

The following table shows data for various solutions and atmospheric gases measured in the laboratory.

Solution	Conditions		Type of Steel			
	Concentration %	Temperature °C	Type 430	Type 444	Type 304	Type 316
Hydrochloric Acid	≤ 0.2	R.T.	△ *	△ *	○ *	○ *
	> 0.2	R.T.	△ *	△ *	△ *	△ *
Nitric Acid	1~20	R.T.	◎	◎	◎	◎
		B.P.	○	○	◎	◎
	40~60	R.T.	◎	◎	◎	◎
		B.P.	○ *1	○ *1	○ *1	○ *1
Sulfuric Acid	≤ 0.25	R.T.		◎	◎	◎
		B.P.			△	○
	30~60	R.T.			○	○
		B.P.			△	△
	95~100	R.T.			◎	◎
		100			△	△
Sulfurous Acid	10	R.T.	△		○	○
		B.P.			○	○
Phosphoric Acid	10	R.T.	◎	◎	◎	◎
		B.P.	○	○	◎	◎
	80	R.T.	○	◎	○	◎
		B.P.			△	○
Fluoric Acid		R.T.	△	△	△	△
Boric Acid	sat	B.P.	◎ *		◎ *	◎ *
Chromic Acid	10	R.T.	◎	◎	◎	◎
		B.P.	○	◎	○	○
Chlorine		R.T.	○		○	◎
		100	△		△	△
Carbonic Acid Gas		R.T.	◎	◎	◎	◎
Sulfurous Acid Gas	wet	R.T.	△	◎ *2	◎-○ *2	◎ *2
Acetic Acid	0~100	R.T.	◎	◎	◎	◎

Solution	Conditions		Type of Steel			
	Concentration %	Temperature °C	Type 430	Type 444	Type 304	Type 316
Oxalic Acid	10	R.T.	○	◎	◎	◎
Citric Acid	15	B.P.	○	◎	◎	◎
Tartaric Acid	50	R.T.	○	◎	◎	◎
Lactic Acid	5	R.T.	○	◎	◎	◎
Butyric Acid	5	R.T.	◎		◎	◎
Stearic Acid	sat	100	○		◎	◎
Fruit & Vegetable		Hot			◎	◎
Butter & Milk		Hot			◎	◎
Milk		60			◎	◎
Sodium Carbonate	50	B.P.	◎	◎	◎	◎
Hydrogen Peroxide	30	R.T.	◎-○ ^{*3}		◎ ^{*3}	◎
Potassium Bichromate	25	B.P.		○	◎	◎
Potassium Permanganate	10	B.P.		◎	◎	◎
Sodium Chloride	10	B.P.	◎ [*]	◎ [*]	◎ [*]	◎ [*]
Ferric Chloride	1	R.T.	◎ [*]	◎ [*]	◎ [*]	◎ [*]
Ammonium Sulfate	5	R.T.	◎	◎	◎	◎
Sodium Sulfate	5	R.T.	◎		◎	◎
Silver Nitrate	5	R.T.	◎	◎	◎	◎
Methyl Alcohol		R.T.	◎ ^{*4}	◎	◎ ^{*4}	◎ ^{*4}
Ethyl Alcohol		R.T.	◎	◎	◎	◎
Acetone		R.T.	○		◎	◎
Ether		R.T.	◎	◎	◎	◎
Benzol		R.T.	○		◎	○
Crude Oil		R.T.	◎ ^{*5}	◎ ^{*5}	◎ ^{*5}	◎ ^{*5}
Gasoline		R.T.	◎	◎	◎	◎
Vegetable Oil		R.T.	○		○	○
Mineral Oil		R.T.	◎	◎	◎	◎
Sugar Syrup	conc	100	◎	◎	◎	◎
Carbon Tetrachloride	pure	R.T.	◎	◎	◎	◎

Notes: 1. ◎ : 0.1mm/year, unaffected.
○ : 0.1 to 1.0mm/year, slightly affected.
△ : 1.0 mm/year, affected.
P : Pitting corrosion is possible

2. sat : Saturated solution
conc : Concentrated solution
R.T. : Room Temperature
B.P. : Boiling Point

Remarks: * P
*1 △ Under high pressure
*2 Use care when H₂SO₄ coexists.
*3 △ When involving H₂SO₄
*4 P at high temperature
*5 Affected by impurities during refining.

Physical Properties

Type of Steel	Density	Electric ^{*1} Resistance	Magnetism	Specific Heat	Thermal Conductivity		Thermal Expansion Coefficient		Young's Modulus ×10 ³
	g /cm ³	10 ⁻⁶ Ω · cm	(Annealed Material)	0~100°C	100°C	500°C	20~100°C	20~650°C	N/mm ²
				J/kg · °C (Cal /g · °C)	W /m · °C (10 ⁻² Cal /cm · sec · °C)		10 ⁻⁶ /°C		
JFE 409L	7.74	59	Magnetic	468 (0.11)	32.9 (7.87)	30.5 (7.29)	11.4	12.3	201
JFE 409SR	7.70	59	Magnetic	502 ^{*1} (0.12)	16.7 ^{*1} (4.00)	—	11.4	11.9 ^{*6}	200
Type 410	7.75	57	Magnetic	460 (0.11)	24.9 (5.95)	25.7 (6.86)	9.9	11.7	200
JFE 429EX	7.70	67	Magnetic	460 (0.11)	26.8 (6.40)	28.8 ^{*3} (6.88)	10.9	12.2	225
JFE MH-1	7.72	61	Magnetic	460 (0.11)	26.4 (6.31)	—	10.3	12.0	216
Type 430	7.70	60	Magnetic	460 (0.11)	26.1 (6.24)	26.3 (6.28)	10.4	11.9	200
JFE 430LN	7.70	60.5	Magnetic	460 (0.11)	23.1 (5.53)	26.3 (6.28)	10.5	12.2	196
JFE 430LNM	7.72	54	Magnetic	460 (0.11)	29.7 (7.10)	—	10.3	11.8	226
JFE 432LTM	7.73	—	Magnetic	433 (0.10)	24.0 (5.74)	—	10.4	11.6	206
JFE 436LT	7.73	48	Magnetic	433 (0.10)	23.6 (5.63)	—	10.4	11.6	212
JFE 443CT	7.74	62	Magnetic	444 (0.11)	22.5 (5.38)	25.1 (6.00)	10.5	11.5	204
JFE 434LN2	7.75	62	Magnetic	460 (0.11)	21.1 (5.04)	25.2 (6.02)	10.1	11.6	206
JFE 445M	7.67	62	Magnetic	470 (0.11)	20.4 (4.87)	24.9 (5.95)	10.1	12.2	211
JFE 20-5USR	7.30	142	Magnetic	419 ^{*1} (0.10) 586 ^{*3} (0.14) 628 ^{*4} (0.15)	11.7 ^{*1} (2.80)	11.7 ^{*3} (2.80) 22.6 ^{*4} (5.40)	11.0	13.0 14.0 ^{*6}	196 ^{*5}
JFE 30-2	7.64	64	Magnetic	502 (0.12)	18.8 ^{*1} (4.50)	—	9.6	11.1	230
Type 301	7.93	72	Non-magnetic	502 (0.12)	16.2 (3.88)	21.4 (5.12)	16.9	18.7	193
Type 304	7.93	72	Non-magnetic	502 (0.12)	16.2 (3.88)	21.5 (5.13)	17.3	18.7	193
Type 316	7.98	74	Non-magnetic	502 (0.12)	16.2 (3.88)	21.5 (5.13)	16.2	18.5	193
SS400 common Steel	7.87	13	Magnetic	460 (0.11)	57.7 (13.80)	41.1 (9.80)	12.6	15.0 ^{*7}	206

Remarks : ^{*1} 20°C, ^{*2} 0~300°C, ^{*3} 600°C, ^{*4} 900°C, ^{*5} Estimated value, ^{*6} RT~700°C, ^{*7} RT~500°C

Note : The density shown in the table is the actually measured value as a physical property.
Calculations of mass for commercial transactions are based on JIS G4310 'Method of calculating mass of stainless steel sheets and heat-resistant steel sheets.'