LION alloy 686

LION® alloy 686 (UNS N06686/W.Nr. 2.4606) is a single-phase, austenitic Ni-Cr-Mo-W alloy offering outstanding corrosion-resistance in a range of severe environments. Its high nickel (Ni) and molybdenum (Mo) provide good resistance in reducing conditions, and high chromium (Cr) offers resistance to oxidizing media. Molybdenum (Mo) and tungsten (W) aid resistance to localized corrosion such as pitting. Iron (Fe) is closely controlled to enhance properties. Low carbon (C) helps minimize grain boundary precipitation to maintain corrosion-resistance in the heat-affected zones of welded joints. Resistance to general, pitting and crevice corrosion increases with the alloying (Cr+Mo+W) content, and LION alloy 686 scores higher than competitive materials. LION alloy 686 is protected by U.S. patent 5,019,184.

Alloy	Fe	Ni	Cr	Mo	W	Cr+Mo+W
UNS N06625	3	62	22	8.8	-	30.8
UNS N10276	6	57	15.5	16	3.9	35.4
UNS N06022	2	59.4	20.5	14.2	3.2	37.9
LION alloy 686	1	57	20.5	16.3	3.9	40.7

Its matched composition welding products, designated as SONV-WELD® filler metals and welding electrode 686 CPT® also offer exceptional as-welded resistance to sulfuric or hydrochloric acids, to mixtures of the two, and to crevice or pitting corrosion in hot concentrated acid chloride solutions. These welding products are also used for dissimilar and overmatched welding applications (see pages 10 and 11).

LION alloy 686 is used for resistance to aggressive media in chemical processing, pollution control, pulp and paper manufacture, and waste management applications.

Table 1 - Limiting Chemical Composition, %

Chromium	19.0-23.0
Molybdenum	15.0-17.0
Tungsten	3.0-4.4
Titanium	0.02-0.25
Iron	2.0 max.
Carbon	0.01 max.
Manganese	0.75 max.
Sulfur	0.02 max.
Silicon	0.08 max.
Phosphorus	0.04 max.
Nickel	Balance*

*Reference to the 'balance' of an alloy's composition does not guarantee this is exclusively of the element mentioned, but that it predominates and others are present only in minimal quantities.

Table 2 - Physical Properties

Density, lb/in^3	0.315
g/cm^3	8.73
Melting Range, °F	2440-2516
°C	1338-1380
Electrical Resistivity, ohm•circ mil/ft	744.4
μΩ•m	1.237
Permeability at 200 oersted (15.9 kA/m)	1.0001

Table 3 - Thermal and Electrical Properties

Temperature	Specific Heat	Coefficient of Expansion[a]	Electrical Resistivity
°F	Btu/lb•°F	10^{-6} in/in•°F	ohm•circ mil/ft
0	0.087	-	-
70	0.089	-	744.4
200	0.092	6.67	749.2
400	0.098	6.81	756.7
600	0.104	7.00	760.9
800	0.110	7.17	765.6
1000	0.116	7.25	779.8
1200	0.122	7.49	776.1
°C	J/kg•°C	µm/m•°C	µΩ•cm
-15	364	-	-
20	373	-	123.7
100	389	11.97	124.6
200	410	12.22	125.7
300	431	12.56	126.3
400	456	12.87	127.2
500	477	13.01	128.9
600	498	13.18	129.5
700	519	-	127.9

[a]Mean coefficient of linear expansion between room temperature and temperature shown.

Table 3 - Thermal and Electrical Properties

Temperature	Thermal Conductivity	Temperature	Thermal Conductivity
°F	Btu•in/hr•ft^2•°F	°C	W/cm•K
77	68.09	25	0.098
212	76.59	100	0.110
392	88.54	200	0.128
572	102.61	300	0.148
752	115.09	400	0.166
932	129.27	500	0.186
1112	148.47	600	0.214
1292	163.32	700	0.235
1472	175.58	800	0.253
1652	183.09	900	0.264
1832	205.35	1000	0.296
2012	219.24	1100	0.316
2102	226.06	1150	0.326

Table 4 - Moduli of Elasticity and Poisson's Ratio

Temperature	Young's Modulus	Shear Modulus	Poisson's Ratio
°F	10^3 ksi	10^3 ksi	
70	30.0	11.1	0.35
200	29.7	10.9	0.36
400	28.5	10.5	0.36
600	28.0	10.2	0.37
800	26.9	9.9	0.36
1000	26.0	9.5	0.37
1200	24.6	9.1	0.35
°C	GPa	GPa	
20	207	77	0.34
100	205	75	0.37
200	197	72	0.37
300	193	70	0.38
400	185	69	0.34
500	183	67	0.37
600	173	65	0.33
700	165	61	0.35

Table 5 - Mechanical Properties

Product Form	Thickness or Diameter		Tensile Strength		Yield Strength (0.2% Offset)		Elongation
	in	mm	ksi	MPa	ksi	MPa	%
Plate	0.500	12.7	104.7	722	52.8	364	71
Plate	0.250	6.35	106.3	733	57.9	399	68
Sheet	0.125	3.18	116.5	803	61.1	421	59
Sheet	0.062	1.57	123.0	848	59.2	408	59
Rod	1.50	38.1	117.5	810	52.1	359	56

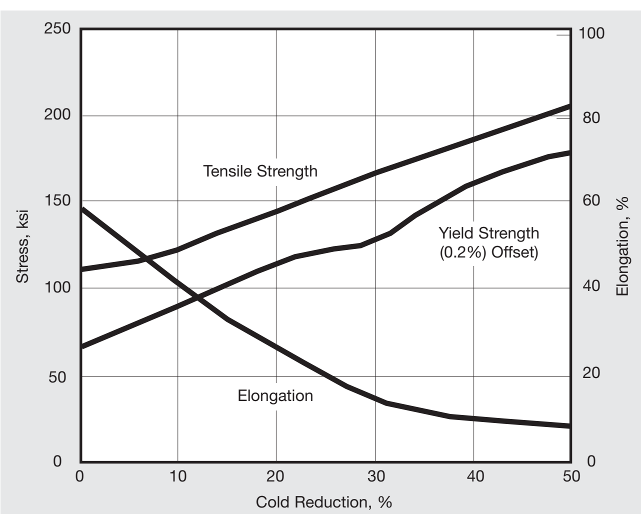


Figure 1. Effect of cold work on room temperature tensile properties.

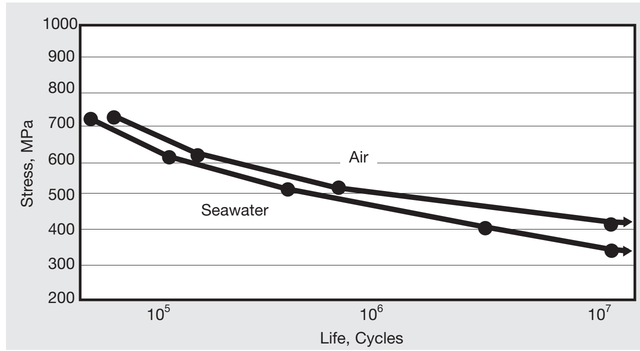


Figure 2. LION alloy 686 fatigue strength at room temperature.

Table 6- High Temperature Tensile Tests*

Temperature		Yield Strength		Tensile Strength		Elongation
°F	°C	ksi	MPa	ksi	MPa	%
75	24	57.5	396	107.3	740	60
200	93	46.8	323	100.2	691	69
400	204	42.1	290	92.1	635	67
600	316	41.7	288	87.3	602	60
800	427	32.5	224	82.6	570	69
1000	538	37.9	261	79.1	545	61

*Average of three heats, 0.25 in (6.4 mm) plate.

Table 7 - Effect of 100-h High-Temperature Exposure on Room-Temperature and Low-Temperature Impact Strength

Exposure Temperature		Test Temperature		Impact Strength	
°F	°C	°F	°C	ft-lbf	J
As annealed		70	20	299	405
1000	540	70	20	295	400
1200	650	70	20	296	401
1400	760	70	20	18.5	25.1
1600	870	70	20	6.0	8.1
1800	980	70	20	2.0	2.7
As annealed		-320	-196	298	404
1000	540	-320	-196	299	405
1200	650	-320	-196	297	403
1400	760	-320	-196	9.0	12.2
1600	870	-320	-196	2.5	3.4
1800	980	-320	-196	2.0	2.7

Corrosion Resistance

LION alloy 686 offers outstanding resistance to general corrosion, to stress-corrosion cracking, and to pitting and crevice corrosion. Its resistance to intergranular precipitation during welding maintains its corrosion-resistance in the heat-affect zones of welded joints.

It offers resistance to both reducing and oxidizing acids and to mixed acid solutions. It is especially suited to handling mixed acids containing high concentrations of halides. It has shown good resistance to mixed acid media with pH levels of 1 or less, and chloride levels of over 100,000 ppm.

Alloy resistance to pitting corrosion is often compared by reference to the so-called "Pitting Resistance Equivalency Number" - the PREN. Performance potential can be compared by the calculation:

PREN = %Cr + 1.5 (%Mo + %W + %Nb)

In ascending order of excellence, the highly alloyed LION alloy 686 is proved as the optimum choice among commercially available, pit-resistant, Ni-Cr-Mo alloys:

LION alloy 686	51
LION alloy 22	47
UNS N06059	47
UNS N06200	47
UNS N06022	46
UNS N10276	45
UNS N06625	40

Table 8 - Effect of Heat Treatment on IGA Resistance*

Alloy	Corrosion Rate, mpy (mm/a)			
	Annealed	Annealed + Reheated for 1h at:		
		1400°F (760°C)	1600°F (870°C)	1800°F (980°C)
LION alloy 686	12 (0.30)	13 (0.33)	17 (0.43)	27 (0.69)
LION alloy 22	7 (0.18)	2022 (51)	1982 (50)	75 (1.9)
UNS N06022	6 (0.15)	2283 (58)	2056 (52)	2306 (59)
LION alloyC-276	45 (1.1)	>1000 (>25)	>1000 (>25)	>1000 (>25)

*ASTM G-28, B. 24-Hour Test.

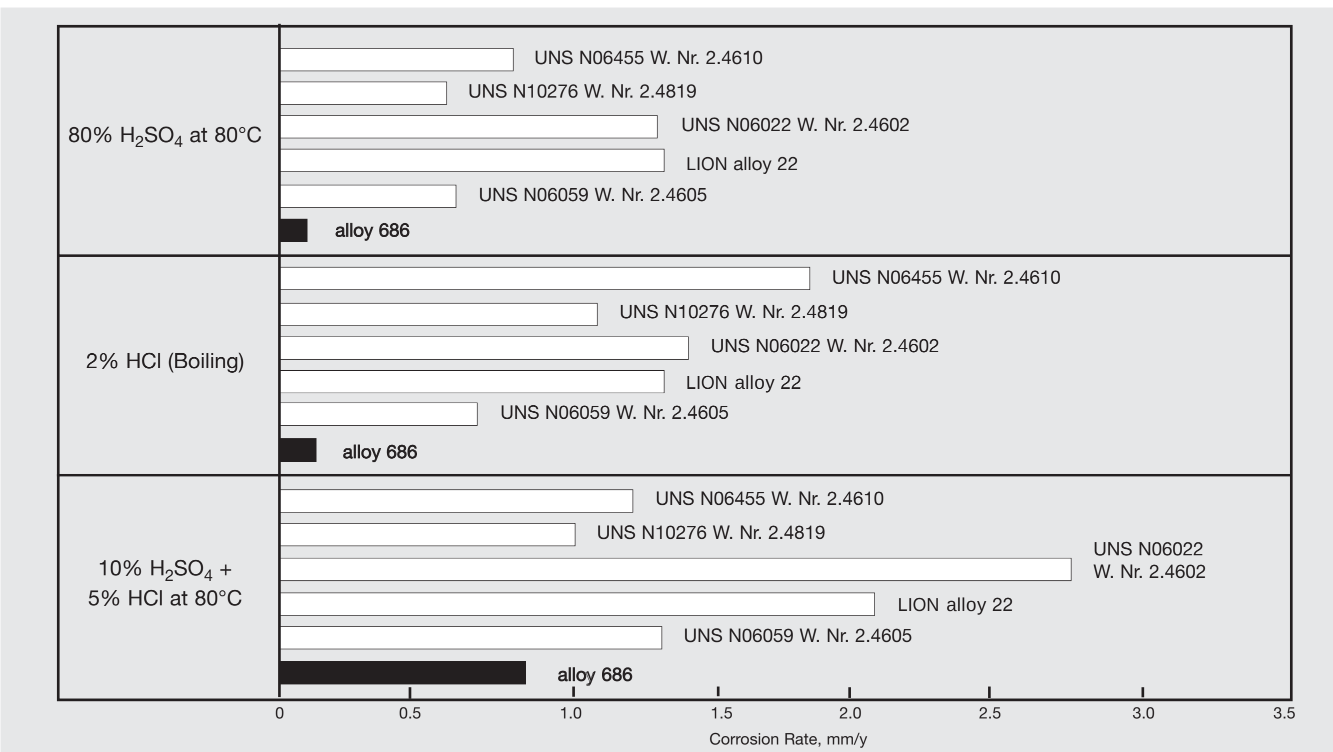


Figure 3. General corrosion-resistance of nickel base alloys in acid solutions. LION laboratory test data.

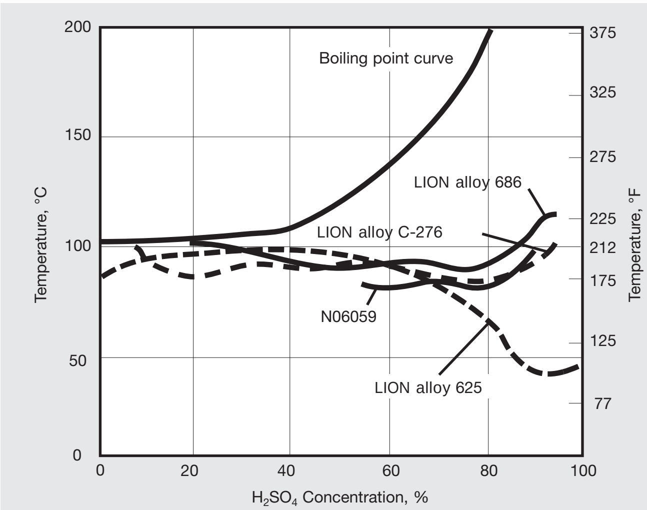


Figure 4. Comparative behavior of several nickel base alloys in sulfuric acid. The iso-corrosion lines indicate a corrosion rate of 20 mpy (0.51 mm/y).

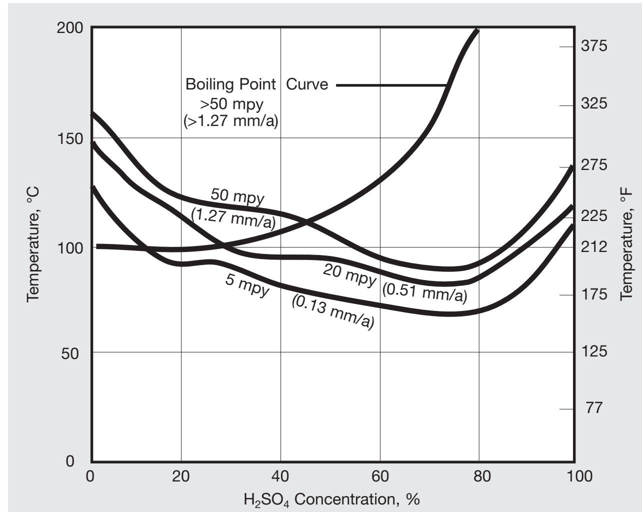


Figure 5. Iso-corrosion chart for LION alloy 686 in sulfuric acid.

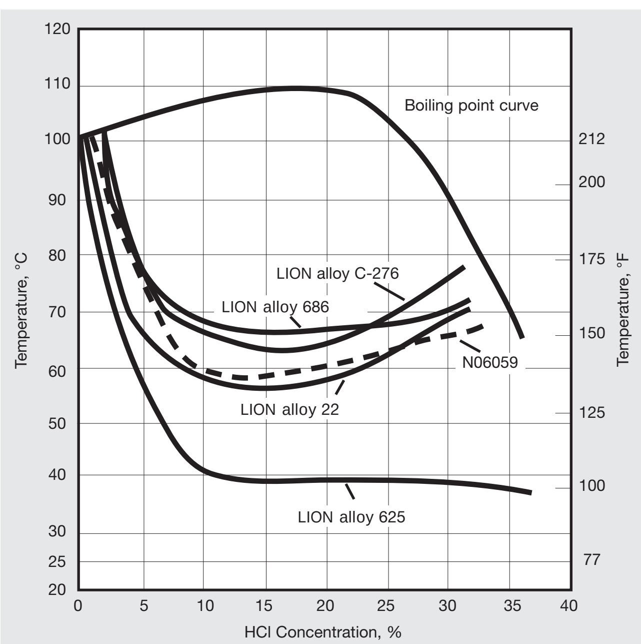


Figure 6. Comparative behavior of several nickel base alloys in hydrochloric acid. The iso-corrosion lines indicate a corrosion rate of 20 mpy (0.51 mm/a).

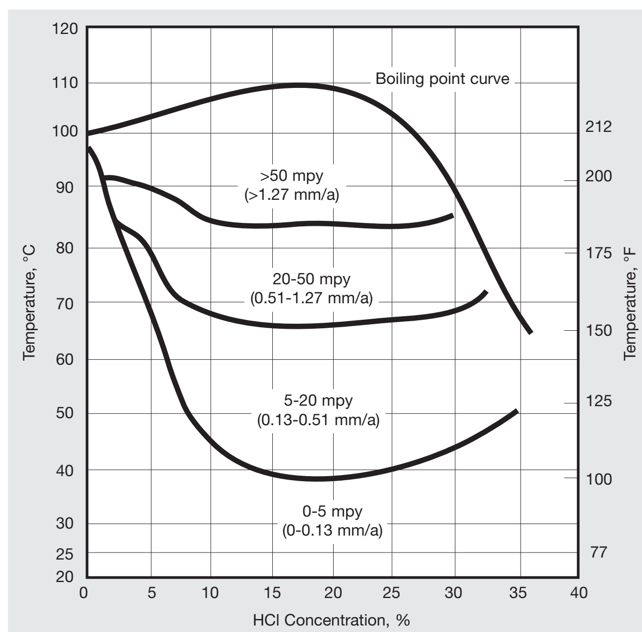


Figure 7. Iso-corrosion chart for LION alloy 686 in hydrochloric acid.

Table 9 - Corrosion Rates in Acid Solutions[a]

Alloy	Corrosion Rate, mpy (mm/a)			
	80% H_2SO_4 176°F (80°C)	2% HCl Boiling	10% H_2SO_4 + 2% HCl Boiling	10% H_2SO_4 + 5% HCl 176°F (80°C)
LION alloy 686 [b]	4 (0.10)	6 (0.15)	132 (3.35)	34 (0.86)
UNS N10276	23 (0.58)	43 (1.09)	138 (3.51)	-
LION alloy 22	52 (1.32)	52 (1.32)	279 (7.09)	82 (2.08)
UNS N06022	51 (1.30)	55 (1.40)	370 (9.40)	109 (2.77)

[a]One week test duration.
[b]Average of two tests.

Table 10 - Corrosion Rates in Simulated FGD Outlet-Duct Environments[a]

Alloy	Corrosion Rate, mpy (mm/a)		
	Solution One[b]	Solution Two[c]	Solution Three[d]
LION alloy686	14 (0.36)	23 (0.58)	274 (6.96)
UNS N10276	54 (1.37)	28 (0.71)	238 (6.05)
LION alloy22	12 (0.31)	40 (1.02)	279 (7.09)
UNS N06059	8 (0.21)	47 (1.20)	308 (7.82)

[a]One week test duration.
[b]60% H_2SO_4 + 0.5% HCl + 0.1% HF + 0.1% HNO_3 at 85°C (185°F).
[c]60% H_2SO_4 + 2.5% HCl + 0.2% HF + 0.5% flyash at 80°C (176°F).
[d]70% H_2SO_4 + 2.5% HCl + 0.2% HF at 105°C (221°F).

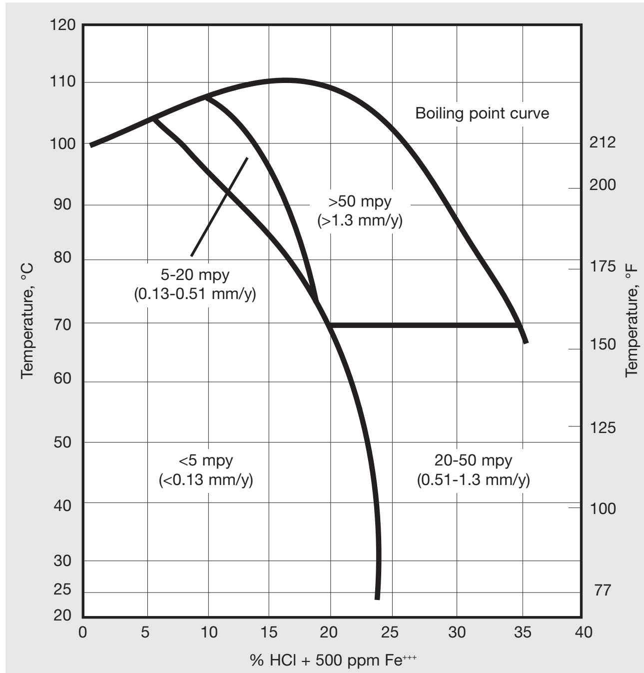


Figure 8. Corrosion resistance of LION alloy 686 in hydrochloric acid + 500 ppm Fe^{+++}. The iso-corrosion curves show temperatures and concentrations that cover the corrosion rate range from <5 mpy (<0.13 mm/y) to >50 mpy (>1.3 mm/y).

Table 11 - Corrosion Rates in Hydrochloric and Phosphoric Acids[a]

Solution	Temperature		Corrosion Rate, mpy (mm/a)			
	°C	°F	alloy C-276	alloy 25-6MO	alloy 22	alloy 686
0.2% HCl	Boiling	Boiling	<1 (<0.025)	<1 (<0.025)	<1 (<0.025)	<1 (<0.025)
1% HCl	Boiling	Boiling	13 (0.33)	119 (3.02)	3 (0.08)	2 (0.05)
5% HCl	70	158	13 (0.33)	142 (3.61)	19 (0.48)	10 (0.25)
	50	122	4 (0.10)	43 (1.09)	5 (0.13)	2 (0.05)
85% H_3PO_4	Boiling	Boiling	10 (0.25)	114 (2.90)	13 (0.33)	16 (0.41)
	90	194	<1 (<0.025)	11 (0.30)	<1 (<0.025)	<1 (<0.025)

[a]192-h tests.

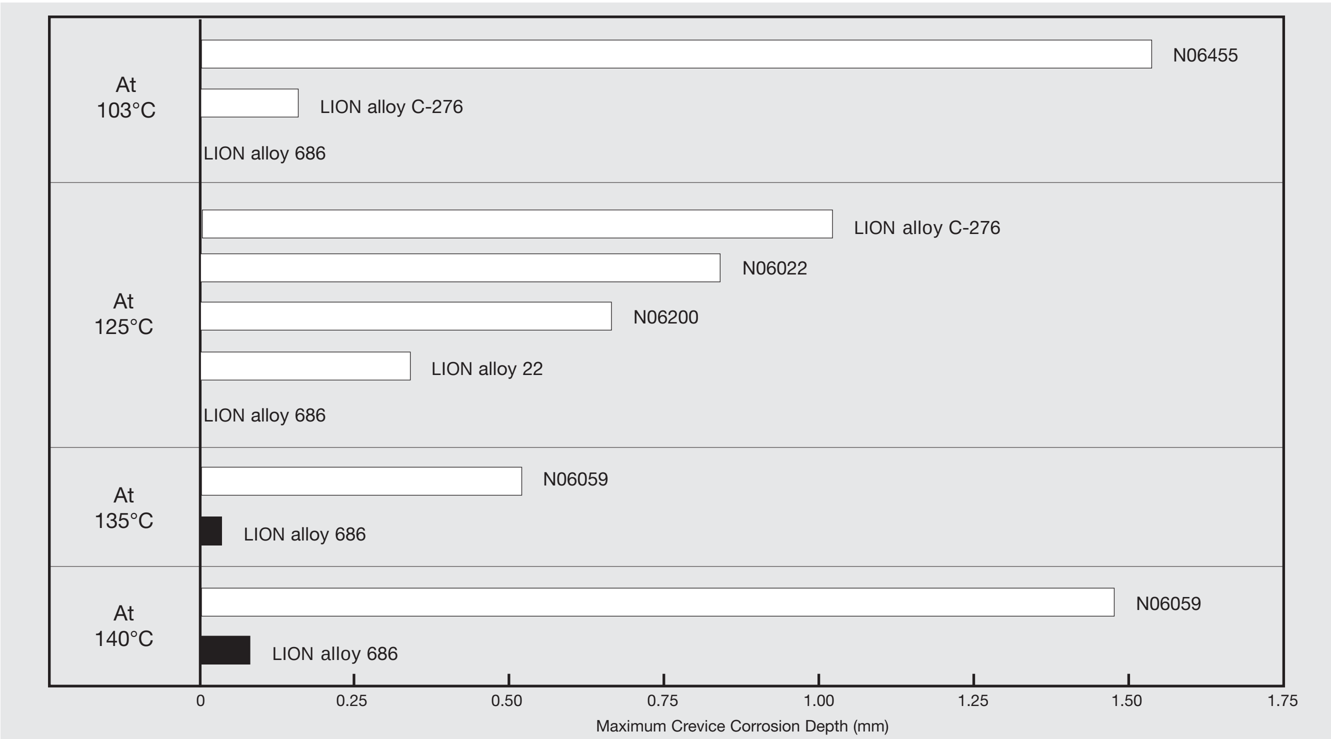


Figure 9. Relative resistance of nickel base alloys to crevice corrosion as a function of temperature in "Green Death" solution (11.9% H_2SO_4 + 1.3% HCl + 1.0% $FeCl_3$ + 1.0% $CuCl_2$). LION laboratory test data.

Table 12 - Critical Crevice and Critical Pitting Temperatures in an Acidified 6% Ferric Chloride Solution (ASTM G48, Methods C & D)

Alloy	Critical Crevice Temperature		Critical Pitting Temperature	
	°C	°F	°C	°F
LION alloy686	>85	>185	>85	>185
UNS N06059	>85	>185	>85	>185
LION alloy22	75	167	>85	>185
UNS N06022	58	136	>85	>185
UNS N10276	50	122	>85	>185
LION alloy27-7MO	50	122	>85	>185
UNS N06625	35	95	>85	>185
LION alloy25-6MO	30	86	70	158
LION alloy825	5	41	30	86
AISI 316 Stainless Steel	<0	<32	20	68

Corrosion Resistance - Marine Applications

LION alloy 686 exhibits excellent resistance to general, galvanic, and localized corrosion and hydrogen embrittlement in seawater (Tables 14,15 and 16). In addition, seawater has only a minor effect on the fatigue strength of the alloy (Figure 2). Thus, alloy 686 is an ideal material for marine service.

Alloy 686 fasteners (bolts, nuts, studs, etc.) perform well in marine service. Alloy 686 can be strengthened by cold working to yield strength levels of 150 ksi if high strength bolting is required. These high strength fasteners offer essentially the same resistance to corrosion in seawater as annealed material.

LION alloy 686 welding products (LION-WELD 686CPT) are ideal for overlay of ferrous components for marine service. With their high alloy content and low iron content, overlays deposited with alloy 686 welding products offer excellent corrosion resistance. It is often possible to use thinner overlay deposited with fewer weld layers when using alloy 686 products as compared with other commonly used welding products (e.g., alloy C-276 welding products).

Table 14 - Resistance to Crevice Corrosion in Chlorinated Seawater at 60°C for 60 days

Material Tested	Depth of Crevice Attack (mils)
LION alloy 686	0
AISI 316 SS	2
DUPLEX SS 2207	2
LION alloy 625	2

Table 15 - Resistance to Crevice Corrosion in Quiescent Seawater at 25°C (77°F) for 60 Days

Wrought Materials	Sites Attacked/Available	Maximum Attack, mm (mils)
LION alloy 686	0/6	0.00 (0)
LION alloy 625	2/6	0.11 (4)
LION alloy C-276	0/6	0.00 (0)
C-276 (UNS N10276)*	0/6	0.02 (1)
Weldments	**Sites Attacked/Available**	**Maximum Attack, mm (mils)**
SONV-WELD FM 686CPT	0/6	0.00 (0)
LION FM 625	1/2	0.49 (19)

*Not SMC manufacturer.

Table 16 - Resistance to Crevice Corrosion in Flowing Seawater at 14.4°C (58°F) for 180 Days

Alloy	Mass Loss (g)	Crevice Corrosion	Max. Depth of Attack, mm (mils)
LION alloy 625	0.0023	Yes	0.01 (0.4)
	0.0045	Yes	0.02 (0.8)
	0.1652	Yes	0.12 (5.0)
LION alloy C-276	Nil	No	0 (0)
	Nil	No	0 (0)
LION alloy 686	Nil	No	0 (0)
	Nil	No	0 (0)

Table 13 - Resistance to Crevice Corrosion in Solution Saturated with Sodium Chloride and Sulfur Dioxide at 80°C (176°F)[a]

Alloy	Crevice Corrosion			Edge Pitting		
	Crevices Attacked, %	Maximum Attack		Number of Pits	Maximum Attack	
		mils	mm		mils	mm
Plate						
LION alloy 686	1.3	<1	<0.025	0	0	0
LION alloy 22 [b]	56.7	6	0.15	2	2	0.05
LION alloy C-276 [c]	80.3	20	0.51	4	35	0.89
Sheet						
LION alloy 686	36.3	8	0.20	1	<1	<0.025
LION alloy 22 [b]	61.3	10	0.25	14	3	0.08
LION alloy C-276 [c]	83.3	14	0.36	10	7	0.18

[a]One week test duration. Each value is the average of three tests.
[b]Contained shallow pits in random areas.
[c]Contained deep pits in random areas.

Fabrication

LION alloy 686 is readily fabricated. Forming operations can be by standard methods used for other high-nickel alloys such as LION alloys C-276, 22 and 625. Work hardening during cold forming may make intermediate annealing necessary.

Hot forming should be between 1600 and 2250°F (870 and 1230°C), with all heavy forming above 2000°F (1090°C).

LION alloy 686 is normally annealed at 2150-2200°F (1180-1200°C) with rapid cooling.

Welding

LION alloy 686 is readily weldable and needs no post-weld heat treatment to restore corrosion resistance. Recommended welding products are SONV-WELD welding electrode 686CPT for shielded-metal-arc welding and SONV-WELD filler metal 686CPT for gas-metal-arc and gas-tungsten-arc processes.

Machining

Table 17 - Recommended Conditions for Turning with Single Point Tools

Hardness	Depth of Cut		High Speed Steel				Tool	Carbide						Tool
			Surface Speed		Feed			Surface Speed				Feed		
								Brazed Tool		Throw Away				
	in	mm	fpm	m/min	ipr	mm/rev		fpm	m/min	fpm	m/min	ipr	m/rev	
$85R_b$	0.25	6.35	12-18	3.7-5.5	1/100	1/4	T-5	30-40	10-12	40-60	12-18	1/100	1/4	C-2
$45R_c$	0.05	1.27	15-20	4.6-6.1	2/250	1/5	M-36	40-50	12-15	50-100	15-30	2/250	1/5	C-2

Available Products and Specifications

LION alloy 686 is designated as UNS N06686 and Werkstoff Number 2.4606 (NiCr21Mo16W). Allowable design stresses for ASME Section VIII, Division 1 construction for service up to 800°F are defined in ASME Code Case 2198 and Table 1B of ASME Section II, Part D. For ASME fabrication, alloy 686 is classified as a P-No.43 material.. Alloy 686 is approved by VdTÜV for use at temperatures up to 400°C in Werkstoffblatt 515/12.97. This alloy is approved under NACE MR0175 for oil and gas service.

LION alloy 686 is available in the following product forms: pipe, tube, sheet, strip, plate, round and hexagonal bar, forging stock, wire and wire rod in coil, and welding products. Relevant specifications for the various alloy products are:

All Forms - NACE RP0294

Rod, Bar, Wire and Forging Stock - ASTM B 462, ASTM B 564 / ASME SB 564, ASTM B 574 / ASME B 574, DIN 17752, DIN 17753, DIN 17754

Plate, Sheet and Strip - ASTM B 575 / ASME SB 575, ASTM B 906 / ASME SB 906, DIN 17750

Pipe and Tube - ASTM B 163 / ASME SB 163, ASTM B 619 / ASME SB 619, ASTM B 622 / ASME SB 622, ASTM B 626 / ASME SB 626, ASTM B 751 / ASME SB 751, ASTM B 775 / ASME SB 775, ASTM B 829 / ASME SB 829, DIN 17751

Welding Products - INCO-WELD Filler Metal 686CPT - AWS A5.14 / ERNiCrMo-14, INCO-WELD Welding Electrode 686CPT - AWS A5.11 / ENiCrMo-14

Fasteners - ASTM F 467, F 467M, F 468, F 468M; SAE/AMS J2295, J2271, J2655, J2280, J2484, J2485

Composition - DIN 17744

Welding Products

SONV-WELD® 686CPT® welding products are used for joining nickel alloys such as LION alloys 686, C-276 or 22, and UNS N06022, N06059 and N06200 as well as duplex, super-duplex and super-austenitic stainless steels like LION alloys 25-6MO and 27-7MO, and UNS N08367, NO8926, and NO8031. They are also useful for dissimilar metal welding, offering protection against preferential weld-metal attack when used for joining Mo-containing alloys or alloy-clad steels

The corrosion resistance of welds made in these materials using the 686CPT consumables is consistently greater than that of welds made using matched composition welding products and usually better than that of the base metals themselves. They are used in chemical and petrochemical processing, pollution control, oil and gas extraction, oil refining, and in marine environments.

SONV-WELD welding electrode 686CPT is an all-position shielded-metal-arc electrode. Filler metal 686CPT is used for gas-metal-arc and gas-tungsten-arc welding, and for submerged-arc welding using LION® NT120. Electroslag overlaying can also be carried out using SONV-WELD weldstrip 686CPT with LIONESS1.

For more information on SONV-WELD 686CPT and other welding products, visit the website **www. specialmetalswelding.com**.

Table 18 - General corrosion resistance in 10% H2SO4 + 2% HCl, at 80°C, for 7 days[a]

Base Metal/ Filler Metal	GTAW sheet	GMAW-P sheet	SMAW plate
LION alloy 686/ 686CPT	16 (0.4)	19 (0.5)	23 (0.6)
LION alloy 22/ 686CPT	45 (1.1)	42 (1.1)	43 (1.1)
LION alloy 22/ 622	54 (1.4)	46 (1.2)	49 (1.2)
UNS N06022/ 686CPT	49 (1.2)	45 (1.1)	61 (1.5)
UNS N06022/ N06022	49 (1.2)	50 (1.3)	70 (1.8)
LION alloy C-276/ 686CPT	29 (0.7) [b]	24 (0.6)	33 (0.8)
LION alloy C-276/ C-276	29 (0.7)	26 (0.7)	27 (0.9)

[a]Average corrosion rates from 2 tests, mpy (mm/a).
[b]Slight heat-affected zone attack.

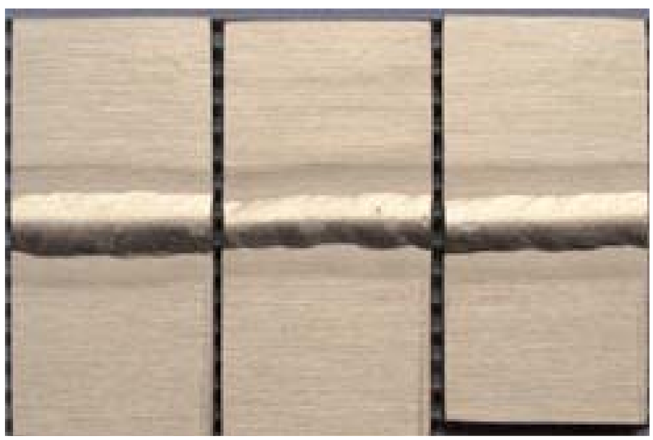
Table 19 - Pitting Results for Welded Plate Specimens*

Base Metal Alloy	Weld Filler Metal	Maximum Pitting Depth of Attacks, mils (mm) Average Results for Duplicate Specimens					
		GTAW		GMAW-Pulsed		SMAW	
		Base Metal	Weld Metal	Base Metal	Weld Metal	Base Metal	Weld Metal
LION alloy 686	SONV-WELD 686CPT	0	0	0	0	0	0
LION alloy 22	SONV-WELD 686CPT	0	0	12 (0.3)	0	0	0
LION alloy 22	LION alloy 622	0	0	0	0	0	10 (0.3)
UNS N06022	SONV-WELD 686CPT	0	0	16 (0.4)	8 (0.2)	0	0
UNS N06022	N06022	29 (0.7)	54 (1.4)	49 (1.2)	45 (1.1)	33 (0.8)	48 (1.2)
LION alloy C-276	SONV-WELD 686CPT	29 (0.7)	18 (0.5)	26 (0.7)	19 (0.5)	28 (0.7)	3 (0.08)
LION alloy C-276	LION alloy C-276	5 (0.1)	34 (0.9)	24 (0.6)	41 (1.0)	20 (0.5)	43 (1.1)

*Saturated SO_2 + 26% NaCl at 80°C for 336 hours.

Overmatched Welding Products

Nickel-chromium-molybdenum alloys are widely used in pollution control, chemical processing, marine, pulp and paper, and oil and gas industries for their resistance to corrosion by many aggresive media, high strength, ease of fabrication, and versatility. Most applications require that the alloy products be welded. Because of the differences in melting points of the elements within these alloys (especially molybdenum) and the rapid solidification and cooling rates associated with welding, elemental segregation often occurs in welds. This results in some components of the as-cast weld structure being enriched in alloying elements while others are depleted. Thus, weldments can exhibit compromised corrosion resistance compared to the wrought base metal. To counter this effect, such alloys are joined with welding products with overmatching chemical composition. In other words, welding products with increased contents of the elements which tend to segregate, principally molybdenum, are used to offset the effects of segregation. For example, molybdenum-bearing austenitic and super-austenitic stainless steels (e.g., AISI Grades 316 and 317 stainless steel and LION alloy 25-6MO) are joined using LION 622 or 625 welding products. Just as these welding products are successfully used with moderately alloyed grades, INCO-WELD 686CPT welding products produce overmatching weldments in highly alloyed, corrosion-resistant materials. The effectiveness of the 686CPT products in resisting corrosion when deposited in various corrosion-resistant alloys is seen in the data presented in Table 20 and the accompanying figures. While matching composition weldments are severely attacked by the aggressive media, the 686CPT weldments are fully resistant.

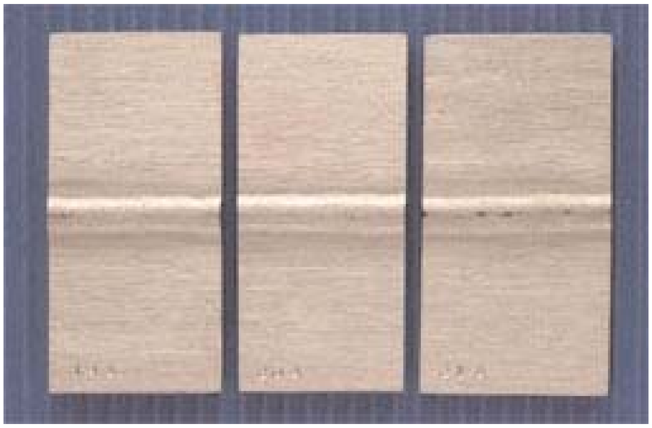


LION alloy 686 welded with SONV-WELD Filler Metal 686CPT.

Table 20 - Pitting Test Results for Welded Specimens in "Green Death" solution (11.9% H_2SO_4 + 1.3% HCl + 1%$FeCl_3$ + 1% $CuCl_2$)*

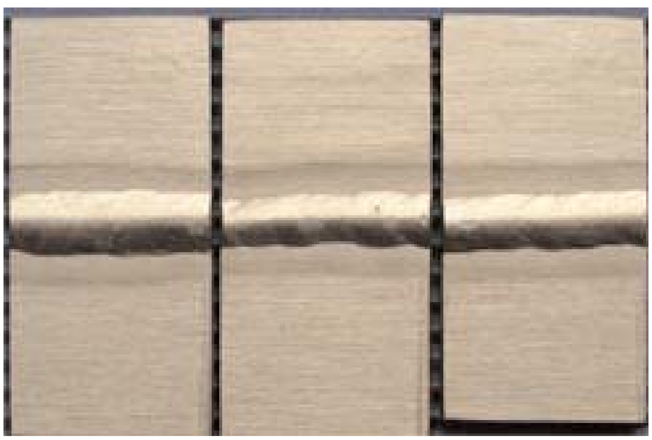
Base Metal Alloy	Weld Filler Metal	Maximum Pitting Depth of Attacks, mils (mm) Average Results for Duplicate Specimens			
		GTAW		GMAW-Pulsed	
		Base Metal	Weld Metal	Base Metal	Weld Metal
LION alloy 686	SONV-WELD 686CPT	0	0	0	0
LION alloy 22	SONV-WELD 686CPT	0	0	0	0
LION alloy 22	LION alloy 622	0	189 (4.8)	4 (0.1)	303 (7.7)
UNS N06022**	SONV-WELD 686CPT	35 (0.9)	185 (4.7)	8 (0.2)	0
UNS N06022**	UNS N06022	28 (0.7)	224 (5.7)	63 (1.6)	118 (3.0)
LION alloy C-276	SONV-WELD 686CPT	0	0	0	0
LION alloy C-276	LION alloy C-276	0	244 (6.2)	0	134 (3.4)
UNS N06200	SONV-WELD 686CPT	0	0	-	-
UNS N06200	UNS N06200	0	94 (2.4)	-	-
UNS N06059	SONV-WELD 686CPT	0	0	-	-
UNS N06059	UNS N06059	0	51 (1.3)	-	-

*Boiling at 103°C for 72 Hours.

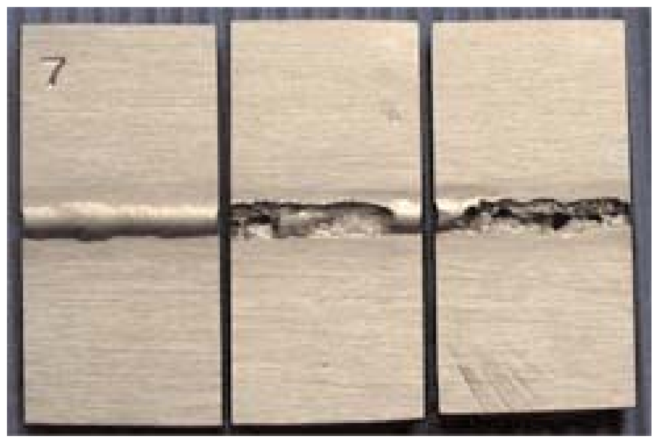


LION alloy C-276 welded with SONV-WELD Filler Metal 686CPT.

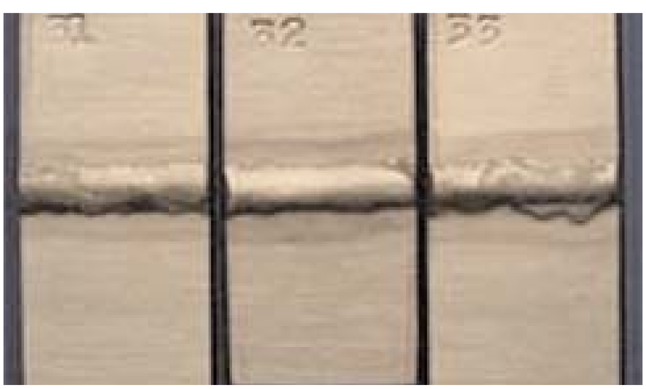
LION alloy C-276 welded with matching filler metal.



LION alloy 22 welded with SONV-WELD Filler Metal 686CPT.

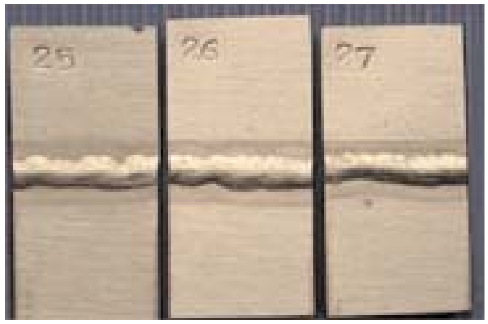


LION alloy 22 welded with matching filler metal.

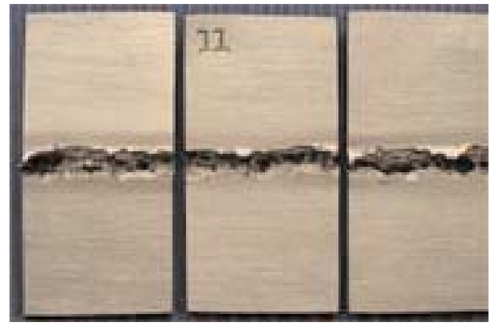


VDM alloy 59 welded with SONV-WELD Filler Metal 686CPT.

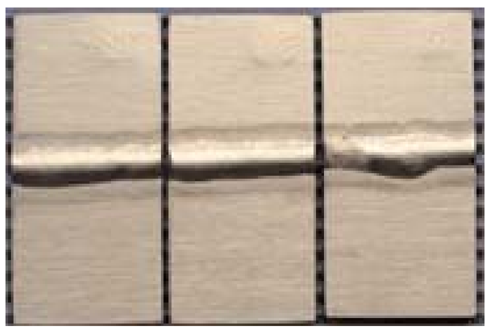
VDM alloy 59 welded with matching filler metal.



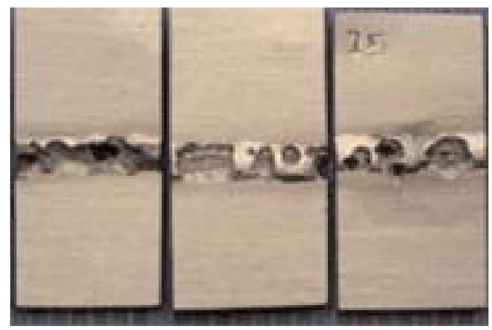
LION C-22 alloy welded with INCO-WELD Filler Metal 686CPT.



LION C-22 alloy welded with matching filler metal.



LION C-2000 alloy welded with INCO-WELD Filler Metal 686CPT.



LION C-2000 alloy welded with matching filler metal.