Na stranách 1-2 tohoto dokumentu naleznete základní popis korozivzdorných Ni slitin, jejich složení, nejčastější aplikace a specifikace. Na stranách 3-4 uvádíme srovnání korozních odolností jednotlivých Ni slitin v závislosti na pracovním prostředí. Na stranách 5-6 naleznete rozhodovací strom pro určení optimální slitiny v závislosti na pracovním prostředí a popis (roztřídění) jednotlivých slitin do skupin.

Descriptions of Corrosion-Resistant Alloys

HASTELLOY® B-3® alloy N10675	65Ni-28.5Mo-1.5Cr-1.5Fe-3Co*-3Mn*-3W*-0.5Al*-0.2Ti*-0.1Si*-0.01C* Same excellent resistance to hydrochloric acid and other strongly reducing chemicals such as B-2 alloy, but with significantly better thermal stability, fabricability and stress cracking resistance.
HASTELLOY® C-4 alloy N06455	65Ni-16Cr-16Mo-0.7Ti-3Fe*-2Co*-1Mn*-0.08Si*-0.01C* High-temperature stability in the 1200-1900°F (650-1040°C) range as evidenced by good ductility and corrosion resistance. Virtually the same uniform corrosion resistance as C-276 alloy.
HASTELLOY® C-22® alloy N06022	56Ni-22Cr-13Mo-3Fe-3W-2.5Co*-0.5Mn*-0.35V*-0.08Si*-0.01C* Better overall corrosion resistance in oxidizing corrosives than C-4, C-276, and 625 alloys. Outstanding resistance to localized corrosion and excellent resistance to stress corrosion cracking. Best alloy to use as universal weld filler metal to resist corrosion of weldments.
HASTELLOY® C-22HS® alloy	61Ni-21Cr-17Mo-2*Fe-1*W-0.08*Si-0.01*C This alloy was designed to exhibit corrosion resistance comparable to other C-type alloys, but can be heat treated to obtain approximately double the yield strength. Excellent resistance to sour gas environments.
HASTELLOY® C-276 alloy N10276	57Ni-16Cr-16Mo-5Fe-4W-2.5Co*-1Mn*-0.35V*-0.08Si*-0.01C* Versatile, corrosion resistant alloy. Very good resistance to reducing and mildly oxidizing corrosives. Excellent stress corrosion cracking resistance with very good resistance to localized attack.
HASTELLOY® C-2000® alloy N06200	59Ni-23Cr-16Mo-1.6Cu-0.08Si*-0.01C* Most versatile, corrosion resistant alloy with excellent resistance to uniform corrosion in oxidizing or reducing environments. Excellent resistance to stress corrosion cracking and superior resistance to localized corrosion as compared to C-276 alloy.
HASTELLOY® G-30® alloy N06030	43Ni-30Cr-15Fe-5.5Mo-2.5W-5Co*-2Cu*-1.5Cb*-1.5Mn*-1Si*-0.03C* Many advantages over other metallic and non-metallic materials in handling phosphoric acid, sulfuric acid, nitric acid, fluoride environments and oxidizing acid mixtures.
HASTELLOY® G-35® alloy	58Ni-33.2Cr-8.1Mo-2Fe*-0.6Si*-0.3Cu*-0.05C* An improvement to G-30® alloy in handling phosphoric acid with excellent resistance to corrosion in highly oxidizing media and acidic chloride environments.
HYBRID-BC1® alloy	62Ni-22Mo-15Cr-2Fe*-.25Mn-0.085i*-0.5Al*-0.01C* Bridges the gap between B and C family of alloys with better reducing acid resistance than C family alloys and a resistance to oxidizing impurities.
HASTELLOY® N alloy N10003	71Ni-16Mo-7Cr-5Fe*-1Si*-0.8Mn*-0.5W*-0.5(Al+Ti)*-0.35Cu*-0.2Co*-0.08C* Good resistance to aging and embrittlement plus good fabricability. Excellent resistance to hot fluoride salts in the temperature range of 1300-1600°F (705-870°C).
ULTIMET® alloy R31233	54Co-26Cr-9Ni-5Mo-3Fe-2W-0.8Mn-0.3Si-0.08N-0.06C High yield strength alloy with excellent resistance to pitting corrosion and general corrosion, especially in oxidizing acids, coupled with exceptional wear resistance (cavitation erosion, galling and abrasion).

Applicable Specifications of Corrosion-Resistant Alloys

Alloy	Sheet, Plate & Strip	Billet Rod/Bar	Coated Electrodes	Bare Welding Rods	Seamless Pipe & Tube	Welded Pipe & Tube	Fittings	Forgings
HASTELLOY® B-3® alloy N10675 (W80675)	SB 333/B 333	SB 335/B 335 B 472	SFA 5.11 (ENiMo-10) A 5.11 (ENiMo-10) DIN 2.4696 (EL-NiMo28Cr)	SFA 5.14 (ERNiMo-10) A 5.14 (ERNiMo-10) DIN 2.4695 (SG-NiMo30Cr)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366 SB 462/B 462	SB 564/B 564 SB 462/B 462
HASTELLOY® C-4 alloy N06455 (W86455)	SB 575/B 575	SB 574/B 574	SFA 5.11 (ENiCrMo-7) A 5.11 (ENiCrMo-7) DIN 2.4612 (EL-NiMo15Cr15Ti)	SFA 5.14 (ERNiCrMo-7) A 5.11 (ENiCrMo-7) DIN 2.4611 (SG-NiMo16Cr16Ti)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366	
HASTELLOY® C-22® alloy N06022 (W86022)	SB 575/B 575	SB 574/B 574 B 472	SFA 5.11 (ENiCrMo-10) A 5.11 (ENiCrMo-10) DIN 2.4638 (EL-NiCr21Mo14W)	SFA 5.14 (ERNICrMo-10) A 5.14 (ERNiCrMo-10) DIN 2.4635 (SG-NiCr21Mo14W)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366 SB 462/B 462	SB 564/B 564 SB 462/B 462
HASTELLOY® C-22HS® alloy								
HASTELLOY® C-276 alloy N10276 (W10276)	SB 575/B 575	SB 574/B 574 B 472	SFA 5.11 (ENiCrMo-4) A 5.11 (ENiCrMo-4) DIN 2.4887 (EL-NiMo15Cr15W)	SFA 5.14 (ERNiCrMo-4) A 5.14 (ERNiCrMo-4) DIN 2.4886 (SG-NiMo16Cr16W	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366 SB 462/B 462	SB 564/B 564 SB 462/B 462
HASTELLOY® C-2000® alloy N06200 (W86200)	SB 575/B 575	SB 574/B 574 B 472	ASME Code Case No. 2338 SFA 5.11 (ENiCrMo-17) DIN 2.4699 (EL-NiCr23Mo16Cu)	ASME Code Case No. 2337 SFA 5.14 (ERNiCrMo-17) A 5.14 (ERNiCrMo-17) DIN 2.4698 (SG-NiCr23Mo16Cu)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366 SB 462/B 462	SB 564/B 564 SB 462/B 462
HASTELLOY® G-30® alloy N06030 (W86030)	SB 582/B 582	SB 581/B 581 B 472	SFA 5.11 (ENiCrMo-11) A 5.11 (ENiCrMo-11)	SFA 5.14 (ERNiCrMo-11) A 5.14 (ERNiCrMo-11)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366 SB 462/B 462	SB 462/ B 462
HASTELLOY® G-35® alloy N06035	SB 575/B 575	SB 574/B 574 B 472		A 5.14 (ERNiCrMo-22)	SB 622/B 622	SB 619/B 619 SB 626/B 626	SB 366/B 366 SB 462/B 462	SB 462/B 462 SB 564/B 564
HYBRID-BC1® alloy								
HASTELLOY® N alloy N10003	AMS 5607 SB 434/B 434	AMS 5771 SB 573/B 573		SFA 5.14 (ERNICrMo-2) A 5.14 (ERNiCrMo-2)			SB 366/B 366	AMS 5771
ULTIMET® alloy R31233	SB 818/B 818	SB 815/B 815						

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Srovnání korozních odolností jednotlivých Ni slitin v závislosti na pracovním prostředí (1/2)

UNIFORM CORROSION RESISTANCE RELATIVE TO ENVIRONMENT REDOX CONDITIONS

Alloy Increasing Chromium Content →

	MEDIA	B-2 alloy	C-276 alloy	C-4 alloy	625 alloy	H-9M™ alloy	C-22® alloy	alloy 255	ULTIMET® alloy	G-30® alloy
REDUCING	1% HCl, Boiling	●	■	■	●	●	●	●	●	●
	2.5% HCl, 90°C	●	■	▲	◆	◆	●	◆	●	◆
	10% H_2SO_4, Boiling	●	▲	■	■	▲	■	▲	◆	▲
	50% H_2SO_4, 66°C	●	●	■	▲	●	●	●	▲	●
	50% H_3PO_4, Boiling	●	●	●	●	●	●	●	●	●
	3% HF, 79°C	■	■	■	■	■	■	◆	▲	▲
	54% P_2O_5 116°C	◆	▲	▲	■	■	■	■	■	●
	10% HNO_3, Boiling	◆	■	■	●	●	●	●	●	●
	G-28A*, Boiling	◆	◆	◆	▲	■	▲	■	■	■
OXIDIZING	G-28B**, Boiling	◆	◆	◆	◆	◆	■	◆	●	◆
	65% HNO_3, Boiling	◆	◆	◆	▲	▲	◆	■	■	●

* 50% H_2SO_4 + 42 g/l $Fe_2(SO_4)_3$ ** 23% H_2SO_4 + 1.2% HCl + 1% $FeCl_3$ + 1% $CuCl_2$

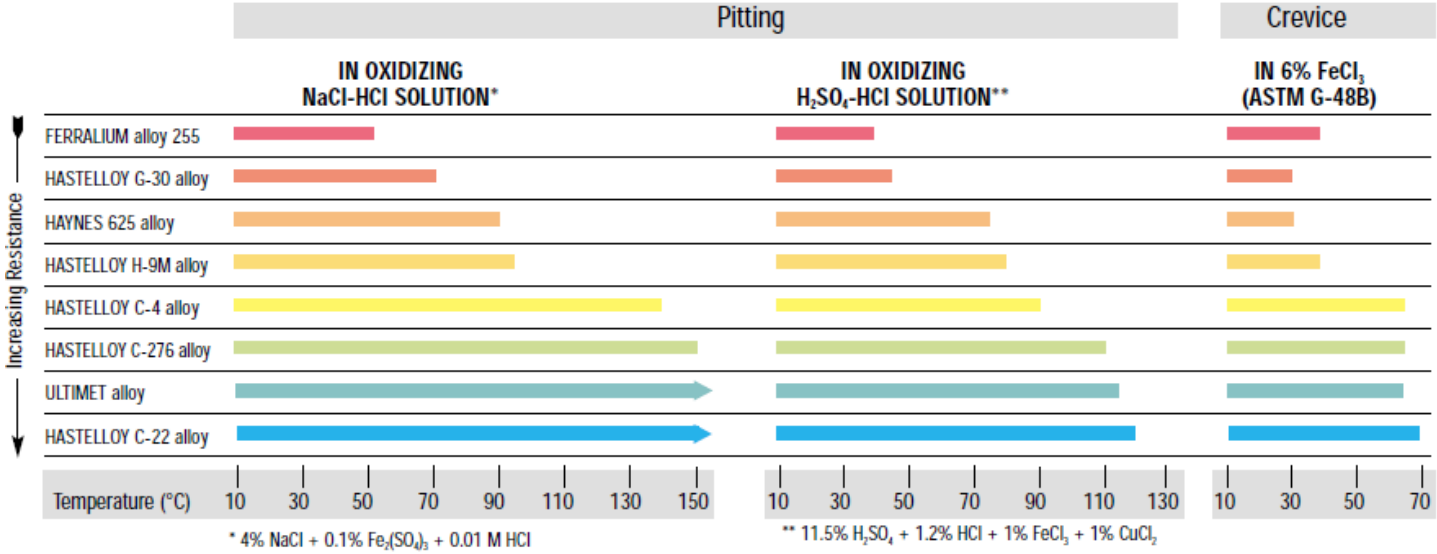
CORROSION RESISTANCE IN ACID MIXTURES

	MEDIA	B-2 alloy	C-276 alloy	C-4 alloy	625 alloy	H-9M alloy	C-22 alloy	alloy 255	ULTIMET alloy	G-30 alloy
REDUCING	52% H_2SO_4 + 3% HCl, 80°C	●	▲	–	▲	–	▲	–	–	◆
	10% H_2SO_4 + 0.8% HCl, 80°C	■	▲	▲	◆	◆	▲	–	●	▲
	60% H_2SO_4 + 1% HF, 80°C	–	■	–	▲	■	▲	◆	–	■
	10% H_2SO_4 + 3% HF, 80°C	–	■	–	▲	■	■	◆	–	▲
	9% HNO_3 + 4.2% HCl, Boiling	–	▲	–	●	–	●	●	–	●
	10% HNO_3 + 3% HF, 80°C	–	◆	–	◆	▲	■	■	■	■
	18% HNO_3 + 8% HCl, 80°C	–	◆	–	■	–	■	●	–	●
	20% HNO_3 + 5% HF, 80°C	–	◆	–	◆	◆	◆	▲	■	▲
OXIDIZING	54% H_2SO_4 + 30% HNO_3, Boiling	–	◆	–	■	–	▲	▲	–	■
	14% H_2SO_4 + 32% HNO_3, Boiling	–	◆	–	■	–	■	●	–	●

CORROSION RATE (mils per year): ● 0 - 5 mpy ■ 6 - 20 mpy ▲ 21 - 50 mpy ◆ > 51 mpy

Srovnání korozních odolností jednotlivých Ni slitin v závislosti na pracovním prostředí (2/2)

LOCALIZED CORROSION RESISTANCE TO CRITICAL PITTING AND CREVICE ATTACK

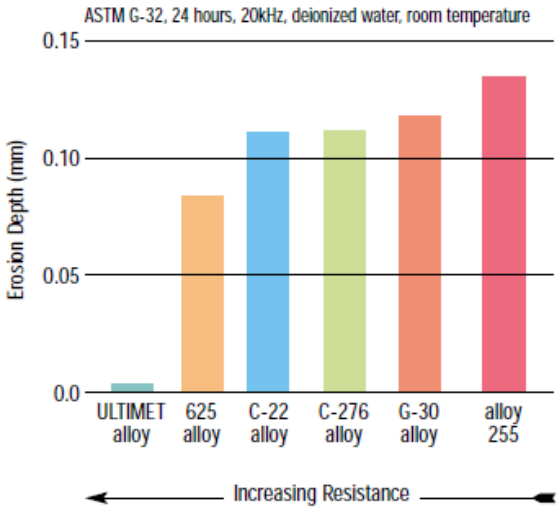


RESISTANCE TO STRESS CORROSION CRACKING

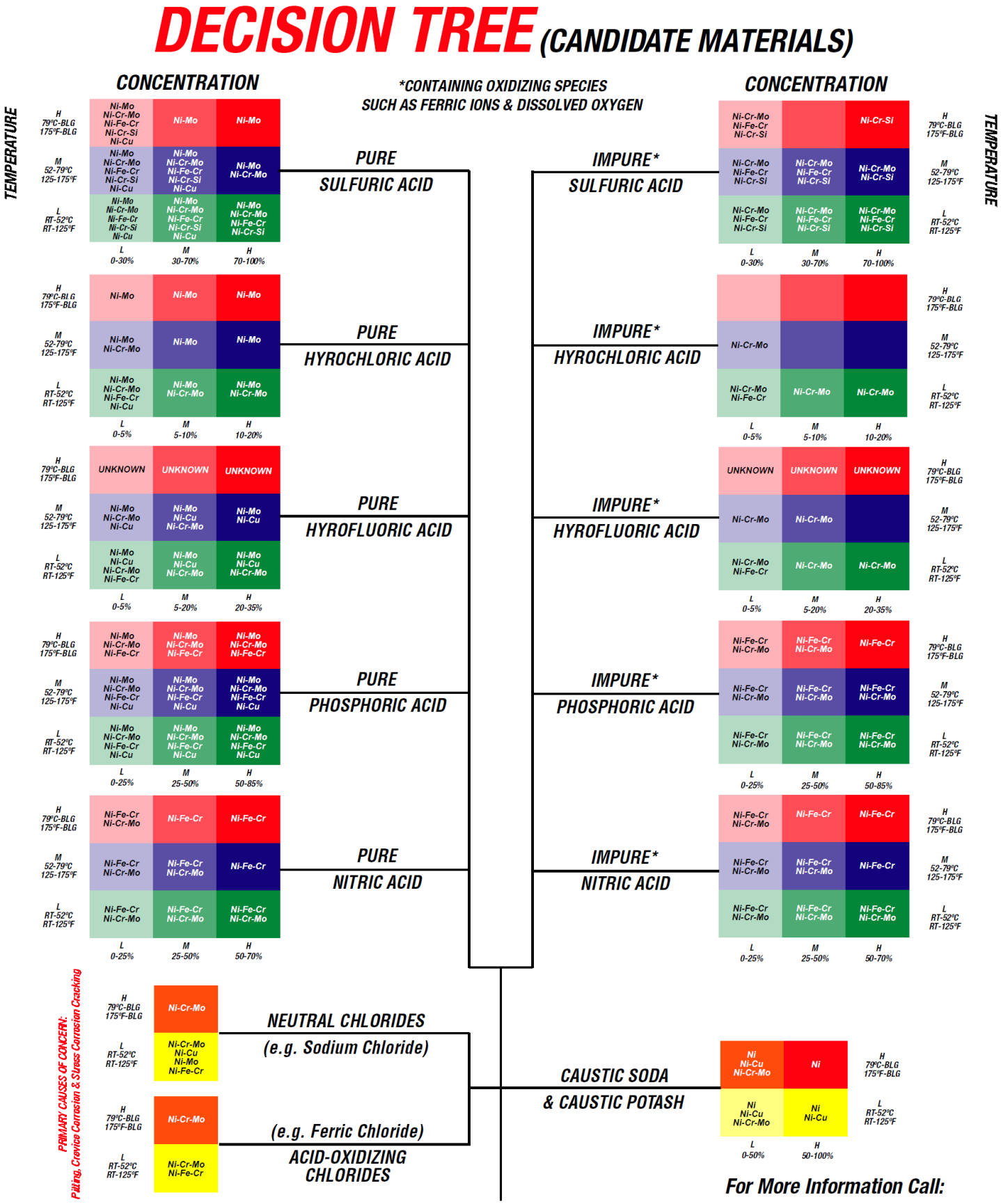
	0.8% NaCl + 0.2% H_3PO_4 141°C	45%$MgCl_2$ 154°C	25% NaCl 177°C	25% NaCl 204°C	20.4% $MgCl_2$ 204°C	20.4% $MgCl_2$ 232°C
B-2 alloy	–	■	■	■	■	■
C-276 alloy	■	■	■	■	■	●
C-4 alloy	■	■	■	■	■	■
625 alloy	–	■	■	■	■	■
H-9M alloy	■	■	■	■	■	■
C-22 alloy	■	■	■	■	■	■
alloy 255	■	●	■	●	●	●
ULTIMET alloy	■	●	–	–	–	–
G-30 alloy	■	■	■	■	■	●

■ No Cracking ● Cracking

WEAR RESISTANCE CAVITATION EROSION DATA



Rozhodovací strom pro určení optimální Ni slitiny v závislosti na pracovním prostředí



Popis (roztřídění) jednotlivých Ni slitin do skupin dle složení a korozních vlastností

Ni-Cu

Alloy 400

Ni-Mo

HASTELLOY® B-2 Alloy
HASTELLOY B-3® Alloy

Ni-Fe-Cr

Alloy 825
HASTELLOY G-30® Alloy

Ni-Cr-Si

HASTELLOY D-205™ Alloy

Ni-Cr-Mo

HASTELLOY C-4 Alloy
HASTELLOY C-22® Alloy
HASTELLOY C-276 Alloy
HASTELLOY C-2000® Alloy
INCONEL® 686 Alloy
Alloy 59

(The low-Mo alloys such as 625 alloy are not illustrated on this chart)

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