

Etchant Selection Guide

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Iron & Carbon Steels (General)

Name	Etchant
General microstructure (unknown grade)	First Picral then 2% Nital
Bainite	Picral
Both ferrite grains and carbides	First Picral then 2% Nital
Carbide networks	Picral
Cold-worked ferrite	2% Nital
Ferrite grains and grain boundaries	2% Nital
General alloy segregation	Picral
Grain-boundary of carbides	Picral
Granular bainite (martensite-austenite constituent)	Picral
Martensite, as-quenched	2% Nital
Martensite, tempered	First Picral then 2% Nital
Pearlite	2% Nital or Picral

Stainless Steels (General)

Name	Etchant
General microstructure (unknown grade)	Vilella's reagent
Austenite grains (austenitic stainless steel)	Electrolytic etching (best) or Marble's (aggressive)
Carbides	Vilella's reagent
Carbides, sensitized	Vilella's reagent
Delta ferrite	Vilella's
Ferrite grains (ferritic stainless steel)	Kalling's
Martensite structure	Vilella's, Fry's, or Kalling's
Sigma phase	Vilella's

Tool Steels

Alloy Name	Etchant
51100	Nital
52100	Nital
A2	Nital
A6	Nital
D2	Nital
D3	Nital
H11	Nital or Vilella's
H12	Nital
H13	Nital
H21	Nital
H46	Vilella's
L6	Nital
M2	Nital
M4	Nital
M42	Nital
M50	Nital
M52	Nital
O2	Nital
T1	Nital
T2	Nital
W1	Nital

Cast Irons

Alloy Name	Etchant
Ductile cast iron (Nodular cast iron)	Nital
Gray cast iron	Nital
Malleable cast iron	Nital
White cast iron	Nital
Wrought iron	Nital

Stainless Steels and Superalloys

Alloy Name	Etchant
301	Fry's
302, 302HQ	Fry's
303	Fry's or Vilella's
303SE	Kalling's 2
304	Fry's or Vilella's
309	Vilella's
310	Vilella's
316	Marble's
317	Marble's
321	Marble's
347	Vilella's
403	Vilella's
405	Vilella's
410	Vilella's
416	Vilella's
418	Vilella's
420	Vilella's
422	Vilella's
430, 430F, 430FR	Vilella's
431	Fry's
440A, 440B, 440C	Vilella's
135 Mod (Nitalloy 135 Mod)	Vilella's
13-8 PH	Fry's
15-5 PH	Fry's
17-22	Vilella's
17-22A	Vilella's
17-4 PH	Fry's
21-6-9 (21Cr-6Ni-9Mn)	Fry's
22-13-5 (22Cr-13Ni-5Mn)	Fry's
300M	Fry's
A182 F51	Superalloy Etch
A286	Fry's
AerMet (All)	Fry's
AISI 664 (V-57)	Kalling's 2
Alloy 20 (20Cb-3 stainless)	Vilella's
Alloy 901 (Nimonic 901, Pyromet 901)	Kalling's 2
Alloy 92	Fry's
Alloy X	Superalloy Etch
AM 355	Vilella's
Chrome Core 12-FM	Kalling's 2
Chrome Core 13-FM	Kalling's 2
Chrome Core 13-XP	Kalling's 2

Chrome Core 18-FM	Kalling's 2
Chromoly	Vilella's
Colmonoy	Superalloy Etch
CK20 (Cast 310)	Marble's
CRES (corrosion-resistant steel)	Fry's
D6AC	Vilella's
Discaloy	Superalloy Etch
ER308	Fry's
FV535	Vilella's
Greek Ascology	Superalloy Etch or Vilella's
GTD222	Fry's
Hastelloy X (Pyromet 680)	Superalloy Etch
Hastelloy HR-120	Fry's
HP 9-4-20	Fry's
HP 9-4-30	Fry's
Hy-Tuf	Fry's
Incoloy 800 HT	Superalloy Etch
Incoloy 903	Superalloy Etch
Incoloy 907	Fry's
Incoloy 909	Superalloy Etch
Incoloy 925	Kalling's 2
Inconel 600	Superalloy Etch
Inconel 706	Kalling's 2
Inconel 713	Superalloy Etch
Inconel 718	Kalling's 2
Inconel 722	Fry's
Inconel 783	Fry's
Inconel 901	Superalloy Etch
Inco X750	Superalloy Etch
Invar 36	Fry's
JBK-75	Fry's
Jethete	Fry's
Kovar	Fry's
Monel	Fry's
Monel 400 (Nickel Copper 400)	Fry's
Monel K-500	Fry's
N155 (Alloy N155)	Fry's
N161	Fry's
NCF 3015	Kalling's 2
Nickel 200/201	Kalling's 2
Nimonic	Fry's
Nimonic C263	Superalloy Etch
Nimonic PE16	Fry's
Nitralloy	Fry's
Nitronic	Superalloy Etch

Pyromet 720	Kalling's 2
Pyromet 860	Kalling's 2
Pyromet V-57	Kalling's 2
Pyrowear 675	Vilella's
T321 stainless	Fry's
Thermo-Span	Fry's or Kalling's 2
TrimRite	Vilella's
Trinamet stainless	Vilella's
UDIMET 720 (U720)	Superalloy Etch
Waspaloy	Superalloy Etch

Aluminum Alloys

Alloy Name	Etchant
206	Keller's
224	Keller's
308	Keller's
356	Keller's
357	Keller's
384	Keller's
390	Keller's
413	Keller's
520	Keller's
1100	Keller's
2219	Keller's
2618	Keller's
3003	Keller's
6061 T6	Keller's
7075	Keller's
2024 T6	Keller's
Cast aluminum (most)	Keller's

Titanium Alloys

Alloy Name	Etchant
Titanium alloys (Unknown grade)	Kroll's
Beta C	Kroll's
CP Ti (Commercially pure titanium, Grade 1-4)	Kroll's
Ti 15-3	Kroll's
Ti 21S (Beta 21S)	Kroll's
Ti 3-2.5 (Ti 3Al-2.5V, Grade 9)	Kroll's
Ti 5-2.5 (Ti 5Al-2.5Sn, Grade 6)	Kroll's
Ti 6-2-4-2 (Ti 6Al-2Sn-4Zr-2Mo)	Kroll's
Ti 6-4 (Ti 6Al-4V, Grade 5)	Kroll's
Ti 6-6-2 (Ti 6Al-6V-2Sn)	Kroll's
Alpha case detection	First Kroll's then 2% HF