CORROSION-RESISTANT

ALLOY AT A GLANCE

HAYNES International

ULTIMET® alloy

ULTIMET® alloy (UNS # R31233) provides a unique blend of properties. From a wear standpoint, it behaves like the low-carbon STELLITE® alloys. From a corrosion standpoint, it possesses many of the attributes of the C-type and G-type HASTELLOY® materials, in particular outstanding resistance to chloride-induced pitting and crevice corrosion. Its mechanical and welding characteristics are much closer to those of the HASTELLOY® alloys than those of the STELLITE® alloys, whose limited ductilities can be problematic.

While ULTIMET® alloy has been used successfully in the form of wrought products, its largest applications have involved weld overlays, made with solid wire consumables and arc-welding processes such as GMAW (MIG) and GTAW (TIG).

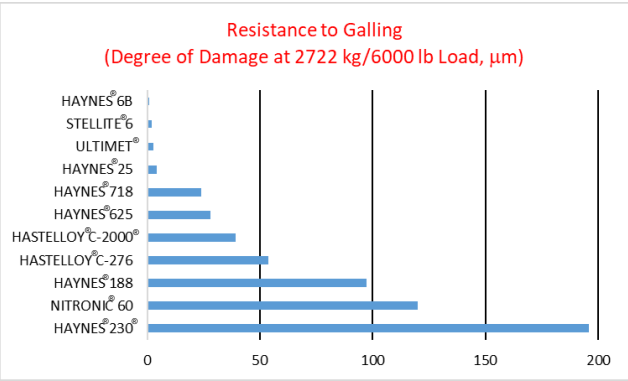
Nominal Composition (wt%):

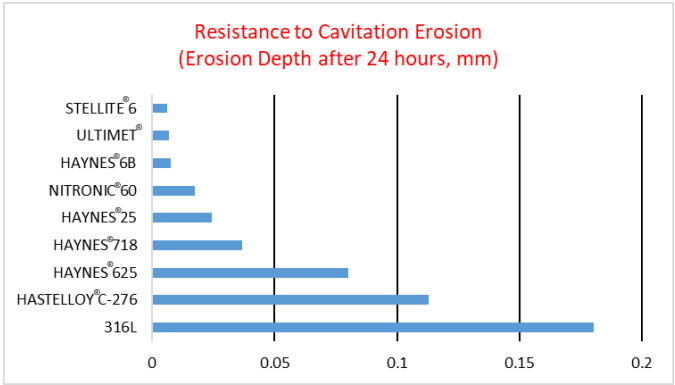
Co	Cr	Ni	Mo	Fe	W	Mn	Si	N	C
Balance	26	9	5	3	2	0.8	0.3	0.08	0.06

*Maximum

Wear Resistance:

ULTIMET® alloy excels under unlubricated, metal-to-metal sliding conditions, at high loads and low speeds (which induce galling) in particular. It also provides outstanding resistance to cavitation erosion, a form of wear associated with turbulent liquids. Regarding abrasion, ULTIMET® alloy excels under high stress conditions at high temperatures.





Corrosion Resistance:

Critical Pitting Temperature in Green Death (11.5% H_2SO_4 + 1.2% HCl + 1% $FeCl_3$ + 1% $CuCl_2$)

Alloy	Critical Pitting Temperature	
	°C	°F
ULTIMET®	**120**	**248**
HASTELLOY® C-22®	120	248
HASTELLOY® C-276	110	230
HAYNES® 625	75	167
HAYNES® 6B	45	113
316L STAINLESS STEEL	25	77

Resistance to Sulfide Stress Cracking:

- Wrought ULTIMET® alloy has been tested according to NACE TM0177, which defines sulfide stress cracking as a room temperature phenomenon, resulting from hydrogen embrittlement.
- The TM0177 tests involved 5% NaCl + 0.5% glacial acetic acid, saturated with H_2S, proof-ring apparatus, and samples coupled to carbon steel and stressed to the point of yield.
- ULTIMET® alloy was able to withstand these conditions, both annealed and cold-reduced (15%), indicating good resistance to hydrogen embrittlement.

Mechanical Properties:

Average Tensile Strengths & Elongations

Form	Test Temperature		Thickness/ Bar Diameter		0.2% Offset Yield Strength		Ultimate Tensile Strength		Elongation
	°C	°F	mm	in	MPa	ksi	MPa	ksi	%
Sheet	Room	Room	1.6	0.063	496	72	951	138	42
Sheet	93	200	1.6	0.063	400	58	931	135	50
Sheet	204	400	1.6	0.063	310	45	924	134	62
Sheet	316	600	1.6	0.063	296	43	896	130	75
Sheet	427	800	1.6	0.063	283	41	827	120	76
Plate	Room	Room	6.4-38.1	0.25-1.5	545	79	1020	148	36
Plate	93	200	6.4-38.1	0.25-1.5	483	70	986	143	40
Plate	204	400	6.4-38.1	0.25-1.5	379	55	986	143	61
Plate	316	600	6.4-38.1	0.25-1.5	331	48	951	138	70
Plate	427	800	6.4-38.1	0.25-1.5	310	45	917	133	70
Plate	538	1000	6.4-38.1	0.25-1.5	262	38	862	125	70
Plate	649	1200	6.4-38.1	0.25-1.5	255	37	683	99	66
Plate	760	1400	6.4-38.1	0.25-1.5	269	39	524	76	70
Plate	871	1600	6.4-38.1	0.25-1.5	193	28	352	51	77
Plate	982	1800	6.4-38.1	0.25-1.5	110	16	214	31	100
Bar	Room	Room	12.7-50.8	0.5-2.0	524	76	1014	147	38
Bar	93	200	12.7-50.8	0.5-2.0	483	70	965	140	49
Bar	204	400	12.7-50.8	0.5-2.0	359	52	965	140	66
Bar	316	600	12.7-50.8	0.5-2.0	303	44	910	132	77
Bar	427	800	12.7-50.8	0.5-2.0	296	43	903	131	84
Bar	538	1000	12.7-50.8	0.5-2.0	276	40	793	115	79

Hardness:

In the annealed condition, ULTIMET® alloy is not very hard. However, it has a high work-hardening rate, and even stretching of sheets and flattening of plates during mill processing can increase its hardness. The hardnesses in this table were measured on mill sheets, and indicate how rapidly the alloy hardens upon cold working.

Condition	Hardness, HRC
Mill Annealed	30
10% Cold Worked	40
20% Cold Worked	43
40% Cold Worked	49

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