

# LDX 2101<sup>®</sup> Bar



## For Excellent Performance at Lower Cost

### General Description

LDX 2101<sup>®</sup> is a low alloyed, general purpose duplex stainless steel. It has high strength, similar to other duplex grades but is much easier to machine. The corrosion resistance of LDX 2101 is better than 304L and 17-4 PH and comparable to 316L in most environments. Its low alloy content, makes it less susceptible to intermetallic phases and its high nitrogen content results in rapid re-formation of austenite in weld thermal cycles. Combined, these characteristics can be utilized to dramatically reduce costs while optimizing performance.

### Features

- High strength
- Good fatigue resistance
- Good corrosion resistance
- High resistance to stress corrosion cracking
- High energy absorption
- Very good machinability

### Applications

- General-purpose applications and environments
- Building and storage construction
- Structural members
- Reinforcement bars
- Rotors, impellers, shafts
- Water treatment
- Pulp and paper equipment
- Fittings
- Fasteners

### Specifications

- ASTM A276, A479
- ASME VIII Section II Code Case 2418-1
- ASME SA479
- UNS S32101

### Corrosion Resistance

The corrosion resistance of LDX 2101 is generally good, and the grade is therefore suitable for use in a wide range of general-purpose applications and environments. The corrosion resistance is in general at least as good as that of Cr-Ni grades such as 304 and in most cases as good as Cr-Ni-Mo grades such as 316L. In alkaline or caustic solutions it is better than Outokumpu 2304 and 2205 up to 90 °C/195 °F. A brief description of the resistance to different types of corrosion is described below.

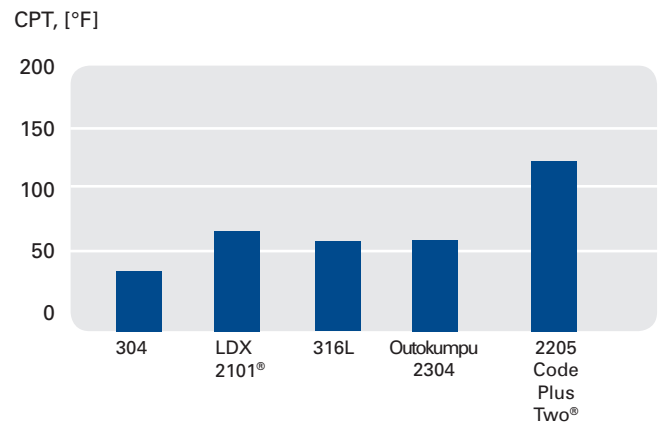


Fig. 1 Typical CPT values in 1M NaCl for tested stainless steels tested in ground conditions according to ASTM G150.

Table 1

Steel Grade	ASTM	Typical composition, %					
		C	N	Cr	Ni	Mo	Others
304	304	0.04	0.04	18.1	8.3	—	—
316L	316L	0.02	0.04	17.2	10.2	2.1	—
Outokumpu 2304	S32304	0.02	0.10	23	4.8	0.3	—
2205 Code Plus Two <sup>®</sup>	S32205*	0.02	0.17	22	5.7	3.1	—
LDX 2101 <sup>®</sup>	S32101	0.03	0.22	21.5	1.5	0.3	5Mn

### Mechanical Properties

Table 2

	UTS	YS	EI% (4d)	Brinell
2101 Peeled	105	68	45	230
2101 CD	124	110	32	269
2101 CDxtra, 20% CD	140	124	22	294
316/316L	85	40	54	163
304/304L	88	40	54	163
17-4 H1150	144	124	21	286
410 Q&T (248-302)	130	106	23	279
410 Q&T (226-264)	115	90	22	247

### Welding

LDX 2101 has a good weldability and can be welded using the same processes used for other duplex steels.

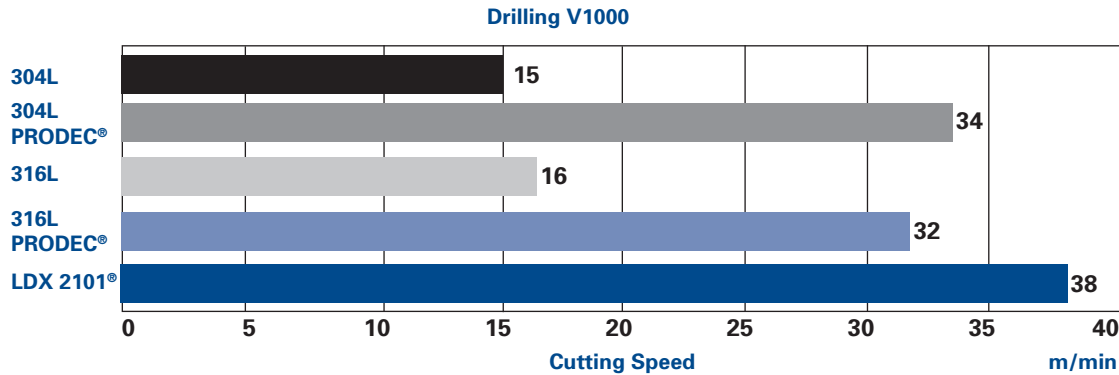
In general the recommendations for welding duplex steels also apply for LDX 2101. However, the restrictions in arc energy are less tight than for conventional duplex steels due to the grade's low alloy content and high nitrogen level. Normally, the special LDX 2101 filler or a filler of type 2209 should be used for optimum properties. Welding without filler is possible, and reasonably good properties can be obtained in the 'as-welded' condition.

Operation	Depth of cut or width (in)	HSS Tooling			Carbide Tooling		
		Cutting Speed (SFM)	Feed (IPR)	Tool Grade	Cutting Speed (SFM)	Feed (IPR)	Tool Grade
Turning	0.04-0.15	45-120	0.001-0.006	T15	80-700	0.0025-0.012	P15-M25
Forming	0.200	45-120	0.0005-0.006	T15	80-813	0.0005-0.010	P15-M25
Cut-off or Grooving	0.04-0.15	Up to 120	0.001-0.005	T15	80-360	0.001-0.008	M25
Drilling	All	40-120	0.003-0.009	M35	80-810	0.0025-0.012	P15-M25
Reaming	All	40-120	0.003-0.025	M35	80-810	0.0025-0.012	P15-M25
Taping	All	Up to 120	N/A	M35	—	—	—
Single Point Threading	—	—	—	—	114-490	Thread Size: 3/4"-10" Passes: 9-11	M20

- Small differences in cutting speed will affect tool lifetime
- Higher feed rate tends to give better surface and chip formation
- TiAlN coated high speed steel tools provide much longer tool lifetime than un-coated
- Results can vary depending upon tooling and machine set-up
- These are actual results obtained from production tests

Drilling with standard method, V1000 for HSS tools

Table 4



V1000 can be explained as the cutting speed that gives a tool lifetime for a drilled length of 1000mm, 40 inch. Tool Wedevag Double X Prodec is a registered Outokumpu trademark for steel grades with improved machinability.

Fatigue

The high tensile strength of duplex steels also implies high fatigue strength. Table 3 shows the result of pulsating tensile fatigue tests (R=0.1) in air at room temperature. The fatigue strength has been evaluated at 2 million cycles and probability of rupture is 50%. Since the test was made using round polished test bars from hot rolled plate, correction factors for surface roughness, notches, welds, etc, are required in accordance with classical theory relating to fatigue failure. As shown by the table, the fatigue strength of the duplex steels corresponds approximately to the yield strength of the material.

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Fatigue, pulsative test

Table 5

Minimum value	LDX 2101®		2205 Code Plus Two®		316L	
	MPa	KSI	MPa	KSI	MPa	KSI
Yield Strength 0.2%	478	69	497	72	280	40
Tensile Strength	696	100	767	111	578	83
Fatigue Strength	500	72	510	73	360	52

Standard deviation of fatigue strength, for the entire population ~ 30 MPa/ 5 KSI



Outokumpu 3043 Crenshaw Parkway Richburg, SC 29729 USA  
Tel. 1-888-458-4600 Fax 803-789-3177