

SHEFFIELD™ MICRO-DUPLEX STAINLESS MDSS



Typical Physical Properties*

Hardness.....	290BHN max.
Tensile Strength.....	94,000 min.
Yield Strength.....	65,000 min.
Elongation in 2".....	30 %
Machinability.....	50

*Based on 1/2" Diameter Specimen

**Single Largest Selection of
its Kind in North America**

North American Steel Company is pleased to introduce the newest addition to our line of special performance maintenance stainless shafts; **Sheffield Micro-Duplex Stainless (MDSS)**.

Sheffield Micro-Duplex Stainless (MDSS) is a **Lean-Duplex** Stainless grade that outperforms most Austenitic grades in a host of critical service applications.

It is offered in two surface finishes from stock; TG&P Precision Finish/Bearing Fit, and, "Stock Finish", for finish machining at your facility. The "Stock Finish" is oversize, so the size will make the size.

Sheffield Micro-Duplex Stainless (MDSS) is stocked here in long length bars to provide many random and cut-to-length options.

In general, Duplex Stainless Steels provide benefits that relate directly to the structure, which displays equal amounts of Austenite and Ferrite.

Austenitic grades like, 304 and 316, are recognized for their excellent resistance to most forms of corrosion. Ferritic stainless steels, (some 400 series grades) are most noted for their elevated strength properties and their excellent resistance to stress corrosion cracking. (SCC).

This Micro-Duplex grade (**Lean-Duplex**) is the result of modifications to existing duplex stainless grades. It has been designed to eliminate problems in machining and warp, ("movement"). Remarkably, even this leaner version maintains many of the duplex stainless characteristics that provide significant advantage over 304 and 316 stainless.

Sheffield Micro-Duplex Stainless (MDSS) combines high chromium, nitrogen, and micro-alloyed molybdenum to enhance the corrosion resistance and toughness.

SHEFFIELD™ MICRO-DUPLEX STAINLESS MDSS

Sheffield Micro-Duplex Stainless (MDSS) will resist fatigue failure & stress corrosion cracking.

When stainless shafts are exposed to a corrosive medium and come under uniform corrosive attack, they are considered to provide "Good" corrosion resistance if their corrosion rate is less than .1 mm/yr. SMD is considered to provide "Excellent" corrosion resistance in many various corrosive media.

Note: The continuous ferritic phase of **Sheffield Micro-Duplex Stainless (MDSS)** renders the product much less sensitive to stress corrosion cracking (SCC). Austenitic stainless grades, such as 304 and 316 are much more susceptible to SCC.

Note: Where sulfide stress cracking and stress corrosion cracking resistance, in sour oilfield environments, are required, materials approved by the NACE MR0175 standard are recommended. For those applications, see the Nass 45 Pump Shaft, on pages 30 and 31, of this catalog. Nass 45 meets the requirements of that standard.

CORROSION FATIGUE

Sheffield Micro-Duplex Stainless (MDSS) resists the detrimental effects of fatigue failure in corrosive environments, because of its unique properties of high strength and resistance to corrosion.

Resistant to attack from oxidizing acids, such as nitric acid.

Excellent machinability

Fatigue resistant

High energy absorption

Weldability

Low thermal expansion

Boxing recommended.



Typical Applications

Agitator Shafts	Pond Pumps
Mixer Shafts	Impellers
Water Pump Shafts	Rotors

Advantages

UP TO 3 TIMES THE STRENGTH OF TYPE 316L

CORROSION RESISTANCE TYPICAL TO TYPE 316L

**EXCELLENT RESISTANCE TO:
STRESS CORROSION CRACKING (SCC).**

CORROSION FATIGUE

PITTING

CREVICE CORROSION CRACKING

INTERCRYSTALLINE CORROSION

EROSION/CORROSION

SHEFFIELD™ MICRO-DUPLEX STAINLESS MDSS

Typical Chemical Analysis (MDSS)

Cr	Ni	Mn	Mo	N
22.0	2.0	5.0	.6 Max	.30
C	Si	Cu	Ph	S
.04 Max	1.0	.1 / .8	.04	.03

Meets the following standard:
UNS S32101, ASTM A276, A479

Chemical Composition of 304

C	N	Cr	Ni	Mo
0.04	-	18.1	8.3	-

Chemical Composition of 316L

C	N	Cr	Ni	Mo
0.02	-	17.2	10.1	-

Available English Sizes

1"	1-15/16"	2-15/16"
1-1/4"	2"	3"
1-7/16"	2-7/16"	3-7/16"
1-1/2"	2-1/2"	3-1/2"
1-3/4"	2-3/4"	

Available Metric Sizes

20 MM	30 MM	50 MM	70 MM	90 MM
25 MM	40 MM	60 MM	80 MM	

Typical Diameter Tolerance

(-.0005" / -.0015") BEARING FIT – TG&P ONLY
Custom Tolerances Available, Please Contact Our Office For Further Details.

Stock Lengths For English Bars

Up to 1-3/4" Rd 14 /18 Ft Random Lengths
1-15/16" and Above..... 20 Ft Random Lengths

Stock Lengths For Metric Bars

15 Ft Random Lengths

FATIGUE RESISTANCE

Sheffield Micro-Duplex Stainless (MDSS) shafting has been evaluated (pulsating tensile fatigue) at two million cycles with a probability of rupture listed at 50%.

WELDING

Good response to the following welding methods:

- Gas Tungsten arc TIG (GTAW)
- Shielded metal arc (SMAW)
- Gas metal arc (GMAW)
- Flux-cored arc (FCW)
- Submerged arc (SAW)
- Plasma arc (PAW)

With Sheffield Micro-Duplex Stainless (MDSS), the risk of localized corrosion in welding, at the heat affected zone, is minimized due to the balanced chemical composition.

GENERAL WELDING TIPS

No pre-heat – May heat sufficient to remove residual atmospheric moisture (250°F max.). Cool between passes (below 300°F). Filler metal suggested but not required. Post weld anneal not required. If post-weld annealing is accomplished, follow with a rapid water quench to prohibit re-forming of the intermetallic phase. When GTAW or PAW welding is accomplished, it is suggested that the addition of nitrogen in the shielding / purging gas will ensure optimum pitting resistance.

TEMPERATURE LIMITS IN SERVICE: Less susceptible 885°F embrittlement than 2205 Duplex limit continuous exposure to 750°F

GENERAL FABRICATION

Machining – Excellent machining characteristics when compared to type 304 or 316L stainless. Superior machinability to most Duplex grades.

Thermal Treatment – Solution anneal @ 1870/1975°F (30 min. / 1" of greatest cross section). Rapid cool - (Do not furnace cool).

Cold Forming – Requires more force than Austenitic stainless.

SHEFFIELD™ MICRO-DUPLEX STAINLESS MDSS

Impact Toughness

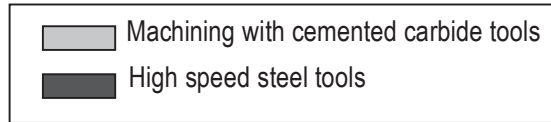
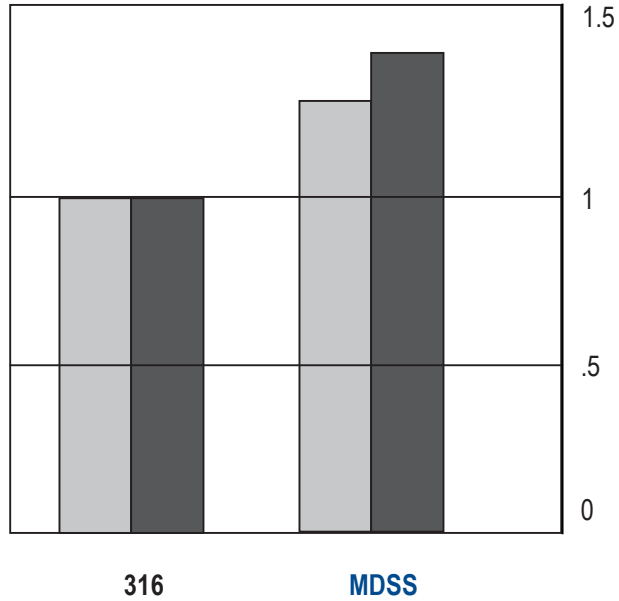
Minimum value¹ based on
30mm, Charpy-V ft-lbs.

68°F	44
-4°F	26
-40°F	20

¹ Mean value of 3 full-size bars.

Characteristic Temp. °F

Hot Forming	2000°F - 1650°F
Quench Annealing	1900°F - 1975°F
Stress Relief Annealing	1900°F - 1975°F



Complete Machining Services Available

- ▶ BROACHING
- ▶ CHAMFERING
- ▶ COUNTER-BORING
- ▶ MILLING
- ▶ POLISHING
- ▶ PLANING
- ▶ TURNING ON CENTERS
- ▶ COUNTER-SINKING
- ▶ DRILLING
- ▶ FACING TO LENGTH
- ▶ SAW CUTTING
- ▶ TAPPING
- ▶ GRINDING
- ▶ HEAT-TREATING

