# 430F STAINLESS

*UNS Number:*
*S43020*

## Type analysis

*Single figures are nominal except where noted*

| | | | | | |
|---|---|---|---|---|---|
| **Iron** | Balance | **Chromium** | 16.00 to 18.00 % | **Manganese (Maximum)** | 1.25 % |
| **Silicon (Maximum)** | 1.00 % | **Molybdenum (Maximum)** | 0.60 % | **Sulfur (Minimum)** | 0.150 % |
| **Carbon (Maximum)** | 0.120 % | **Phosphorus (Maximum)** | 0.060 % | | |

## Forms manufactured

| | | | |
|---|---|---|---|
| **Bar-Rounds** | **Billet** | **Wire** | Wire-Rod |

## Description

430F Stainless should be considered when making machined articles from a 17% chrome steel. Type 430F does not harden by heat treatement. It has been used in automatic screw machines for parts requiring good corrosion resistance, such as aircraft parts, gears, etc. 430F is not recommended for vessels containing gases or liquids under high pressure.

The safe scaling temperature for continuous service is 1500°F (816°C). The low coefficient of expansion of 430F Stainless makes it useful for moderately high temperature applications.

**Key Properties:**

- Corrosion resistance
- Low coefficient of expansion
- Does not harden by heat treatment

**Markets:**

- Aerospace
- Automotive
- Industrial

**Applications:**

- Aircraft parts
- Gears

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## Corrosion resistance

430F Stainless resists corrosion from the atmosphere, fresh water and steam, foodstuffs, dairy products, nitric acid, and many petroleum products and organic materials. Its resistance to chloride-stress-corrosion crackling at eleated temperatures is superior to that of austenitic Types 304 and 316.

For optimum corrosion resistance, surfaces must be free of scale, lubricants, foreign particles, and coatings applied for drawing and heading. After fabrication of parts, cleaning and/or passivation should be considered.

*IMPORTANT NOTE:*
*The following 4-level rating scale is intended for comparative purposes only. Corrosion testing is recommended; factors that affect corrosion resistance include temperature, concentration, pH, impurities, aeration, velocity, crevices, deposits, metallurgical condition, stress, surface finish, and dissimilar metal contact.*

| | | | |
|---|---|---|---|
| **Nitric Acid** | Good | **Sulfuric Acid** | Restricted |
| **Phosphoric Acid** | Restricted | **Acetic Acid** | Restricted |
| **Sodium Hydroxide** | Moderate | **Salt Spray (NaCl)** | Moderate |
| **Sea Water** | Restricted | **Humidity** | Excellent |

## Physical properties

| PROPERTY | At or From | English Units | Metric Units |
|---|---|---|---|
| **SPECIFIC GRAVITY** | — | 7.70 | 7.70 |
| **DENSITY** | — | 0.2780 lb/in$^3$ | 7695 kg/m$^3$ |
| **MEAN SPECIFIC HEAT** | 32 to 212°F (0 to 100°C) | 0.1100 Btu/lb/°F | 460.5 J/kg·K |
| **MEAN COEFFICIENT OF THERMAL EXPANSION** | 32 to 1200°F (0 to 649°C) | 6.6 x 10$^{-6}$ length/length/°F | 11.88 x 10$^{-6}$ length/length/°C |
| **ELASTIC MODULUS** | — | 29.0 x 10$^3$ ksi | — |
| **ELECTRICAL RESISTIVITY** | 70°F (21°C) | 361.0 ohm-cir-mil/ft | 60 microohm·cm |

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## Typical mechanical properties

**TYPICAL ROOM TEMPERATURE MECHANICAL PROPERTIES**

| 1 IN (25.4 MM) ROUND BAR | | | | | | | |
|---|---|---|---|---|---|---|---|
| HEAT TREATMENT | 0.2% YIELD STRENGTH | | ULTIMATE TENSILE STRENGTH | | ELONGATION IN 2 IN (50.8 MM) | REDUCTION OF AREA | HARDNESS |
| | ksi | MPa | ksi | MPa | % | % | BRINELL |
| Cold-drawn finish | 65 | 448 | 90 | 621 | 15 | 55 | 190 |

## Heat treatment

| | |
|---|---|
| **Annealing** | Heat uniformly to 1250/1400°F (677/760°C), then cool in air. Brinell hardness will be approximately 170. |
| **Hardening** | Does not respond to hardening by heat treatment — hardness moderately increased by cold working. |

## Workability

| | |
|---|---|
| **Forging** | Should be heated uniformly to 1500/1600°F (816/871°C), then taken to the forging temperature of 1950/2100°F (1066/1149°C) as rapidly as possible.<br>Do not soak at the forging temperature, as this may result in excessive grain growth.<br>Hot working operations should not be continued when the temperature has dropped below 1500°F (816°C). Forgings should be air cooled and then annealed. |
| **Cold working** | This alloy will withstand moderate cold work but is not recommended for cold upsetting.<br>The primary application for this material is in magnetic components that are machined to shape. |
| **Machinability** | Cuts very freely in automatic screw machines. In turning operations, it machines like SAE 1030, 1120 or X1340. |

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## Typical feeds and speeds

### TURNING — SINGLE-POINT AND BOX TOOLS

| DEPTH OF CUT, IN | MICRO-MELT POWDER HIGH-SPEED TOOLS | | | CARBIDE TOOLS (INSERTS) | | | |
|---|---|---|---|---|---|---|---|
| | SPEED, FPM | FEED, IPR | TOOL MATERIAL | SPEED, FPM | | FEED, IPR | TOOL MATERIAL |
| | | | | UNCOATED | COATED | | |
| .150 | 198 | .015 | M-48, T-15 | 600 | 735 | .015 | C-6 |
| .025 | 222 | .007 | M-48, T-15 | 675 | 835 | .007 | C-7 |

### TURNING — CUT-OFF AND FORM TOOLS

| SPEED, FPM | FEED, IPR | | | | | | | TOOL MATERIAL | |
|---|---|---|---|---|---|---|---|---|---|
| | CUT-OFF AND FORM TOOLS WIDTH, IN | | | | | | | MICRO-MELT POWDER HS | CARBIDE TOOLS |
| | *1/16* | *1/8* | *1/4* | *1/2* | *1* | *1-1/2* | *2* | | |
| 180 | .0015 | .002 | .0025 | .0025 | .002 | .0015 | .001 | M-48, T-15 | — |
| 480 | .004 | .0055 | .007 | .005 | .004 | .0035 | .0035 | — | C-6 |

### ROUGH REAMING

| MICRO-MELT POWDER HS | | CARBIDE TOOLS | | FEED, IPR, REAMER DIAMETER, IN | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SPEED, FPM | TOOL MATERIAL | SPEED, FPM | TOOL MATERIAL | *1/8* | *1/4* | *1/2* | *1* | *1-1/2* | *2* |
| 156 | M-48, T-15 | 150 | C-2 | .005 | .008 | .013 | .018 | .022 | .025 |

### DRILLING[1] — HIGH SPEED TOOLS

| SPEED, FPM | FEED, IPR | | | | | | | | TOOL MATERIAL |
|---|---|---|---|---|---|---|---|---|---|
| | NOMINAL HOLE DIAMETER, IN | | | | | | | | |
| | *1/16* | *1/8* | *1/4* | *1/2* | *3/4* | *1* | *1-1/2* | *2* | |
| 100 | .001 | .003 | .006 | .010 | .014 | .017 | .021 | .025 | M-42 |
| 150-200 | .002 | .004 | .008 | .012 | .018 | — | — | — | C-6 uncoated |
| 200-250 | .002 | .004 | .008 | .012 | .018 | — | — | — | C-6 coated |

*Drill should be 130-140 degree included angle and use a split point.*

### DIE THREADING — HIGH-SPEED TOOLS

| SPEED, FPM | | | | TOOL MATERIAL |
|---|---|---|---|---|
| 7 OR LESS, TPI | 8 TO 15, TPI | 16 TO 24, TPI | 25 AND UP, TPI | |
| 15–25 | 30–40 | 40–50 | 50–60 | M-1, M-2, M-7, M-10 |

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**MILLING — END PERIPHERAL**

| DEPTH OF CUT, IN | MICRO-MELT POWDER HIGH-SPEED TOOLS | | | | | | CARBIDE TOOLS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SPEED, FPM | FEED, IPT CUTTER DIAMETER, IN | | | | TOOL MATERIAL | SPEED, FPM | FEED, IPT CUTTER DIAMETER, IN | | | | TOOL MATERIAL |
| | | 1/4 | 1/2 | 3/4 | 1-2 | | | 1/4 | 1/2 | 3/4 | 1-2 | |
| .050 | 168 | .001 | .002 | .004 | .005 | M-48, T-15 | 400 | .001 | .002 | .005 | .007 | C-6 |

**TAPPING — HIGH-SPEED TOOLS**

| SPEED, FPM | TOOL MATERIAL |
|---|---|
| 20-45 | M-1, M-7, M-10 |

**BROACHING — MICRO-MELT POWDER HIGH-SPEED TOOLS**

| SPEED, FPM | CHIP LOAD, IPT | TOOL MATERIAL |
|---|---|---|
| 36 | .0040 | M-48, T-15 |

## Additional machinability notes

Figures used for all metal removal operations covered are average. On certain work, the nature of the part may require adjustment of speeds and feeds. Each job has to be developed for best production results with optimum tool life. Speeds or feeds should be increased or decreased in small steps.

When using carbide tools, surface speed ft/min (SFPM) can be increased between 2 and 3 times over the high speed suggestions. Feeds can be increased between 50 and 100%.

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## Weldability

430F Stainless is usually not recommended for welding. The high sulfur content may cause hot cracking and, when welded to a stainless steel with a lower sulfur content, may cause the weld to shift off center. If the alloy must be welded, the use of a filler metal, along with minimum heat inputs and minimum base metal dilution, will improve the chances of success.

AWS E/ER430 welding consumables should be considered. However, the weldments should be post-weld annealed to restore the ductility in the weld metal and heat-affected zones.

The use of austenitic weld metals like E/ER309 should provide welds of good ductility. However, in this case, the heat-affected zone may have limited ductility unless the weldment is given a post-weld anneal.

## Other information

| | |
|---|---|
| **Applicable specifications** | ASTM A314, ASTM A473, ASTM A581, ASTM A582 , ASTM A838 |

**For additional information, please contact your nearest sales office:**
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