

Materials

| ITEM/PROPERTY | BARSTOCK | CASTING | FORGING |
|------------------------------|----------------|----------------|----------------|
| CARBON STEEL | | | |
| ASTM Specifications | A108-1215 | A216-WCB | A105 |
| Unified Numbering System | G12150 | J03002 | K03504 |
| MAJOR ELEMENTS | | | |
| Carbon | 0.09% max. | 0.30% max. | 0.35% max. |
| Manganese | 0.75 - 1.05% | 1.00% max. | 0.60 - 1.05% |
| Phosphorus | 0.04 - 0.09% | 0.04% max. | 0.04% max. |
| Sulfur | 0.26 - 0.35% | 0.045% max. | 0.05% max. |
| Silicon | - | 0.60% max. | 0.35% max. |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 70,000psi min. | 70,000psi min. | 70,000psi min. |
| Yield Strength | 36,000psi min. | 36,000psi min. | 36,000psi min. |
| 316 STAINLESS STEEL | | | |
| ASTM Specifications | A276-316 | A351-CF8M | A182-F316 |
| Unified Numbering System | S31600 | J92900 | S31600 |
| MAJOR ELEMENTS | | | |
| Carbon | 0.08% max. | 0.08% max. | 0.08% max. |
| Chromium | 16.00 - 18.00% | 18.00 - 21.00% | 16.00 - 18.00% |
| Molybdenum | 2.00 - 3.00% | 2.00 - 3.00% | 2.00 - 3.00% |
| Nickel | 10.00 - 14.00% | 9.00 - 13.00% | 10.00 - 14.00% |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 75,000psi min. | 70,000psi min. | 75,000psi min. |
| Yield Strength | 30,000psi min. | 30,000psi min. | 30,000psi min. |
| 316L STAINLESS STEEL | | | |
| ASTM Specifications | A276-316L | A351-CF3M | A182-F316L |
| Unified Numbering System | S31603 | J92800 | S31603 |
| MAJOR ELEMENTS | | | |
| Carbon | 0.03% max. | 0.03% max. | 0.03% max. |
| Chromium | 16.00 - 18.00% | 17.00 - 21.00% | 16.00 - 18.00% |
| Molybdenum | 2.00 - 3.00% | 2.00 - 3.00% | 2.00 - 3.00% |
| Nickel | 10.00 - 14.00% | 9.00 - 13.00% | 10.00 - 15.00% |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 70,000psi min. | 70,000psi min. | 75,000psi min. |
| Yield Strength | 25,000psi min. | 30,000psi min. | 30,000psi min. |
| ALLOY 20 | | | |
| ASTM Specifications | B473-N08020 | A351-CN7M | B462-N08020 |
| Unified Numbering System | N08020 | N08007 | N08020 |
| MAJOR ELEMENTS | | | |
| Chromium | 19.00 - 21.00% | 19.00 - 22.00% | 19.00 - 21.00% |
| Copper | 3.00 - 4.00% | 3.00 - 4.00% | 3.00 - 4.00% |
| Manganese | 2.00% max. | 1.5% max. | 2.00% max. |
| Molybdenum | 2.00 - 3.00% | 2.33 - 3.00% | 2.00% - 3.00% |
| Nickel | 32.00 - 38.00% | 27.50 - 30.50% | 32.00 - 38.00% |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 80,000psi min. | 62,000psi min. | 80,000psi min. |
| Yield Strength | 35,000psi min. | 25,000psi min. | 35,000psi min. |

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|---|----------------|----------------|----------------|
| NICKEL | | | |
| ASTM Specifications | B160-N02200 | A494-CZ100 | B160-N02200 |
| Unified Numbering System | N02200 | N02100 | N02200 |
| MAJOR ELEMENTS | | | |
| Molybdenum | 2.00 - 3.00% | 2.33 - 3.00% | 2.00 - 2.00% |
| Nickel | 99.00% max. | 95.00% min. | 99.00% max. |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 55,000psi min. | 50,000psi min. | 55,000psi min. |
| Yield Strength | 15,000psi min. | 18,000psi min. | 15,000psi min. |
| NICKEL-COPPER ALLOY | | | |
| ASTM Specifications | B164-N04400 | A494-M35-1 | B564-N04400 |
| Unified Numbering System | N04400 | N/A | N04400 |
| MAJOR ELEMENTS | | | |
| Copper | 28.00 - 34.00% | 26.00 - 33.00% | 28.00 - 34.00% |
| Iron | 2.50% max. | 3.50% max. | 2.50% max. |
| Manganese | 2.00% max. | 1.50% max. | 2.00% max. |
| Molybdenum | 2.00 - 3.00% | 2.33 - 3.00% | 2.00 - 3.00% |
| Nickel | 63.00% min. | 60.00% min. | 63.00% min. |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 70,000psi min. | 65,000psi min. | 70,000psi min. |
| Yield Strength | 25,000psi min. | 25,000psi min. | 25,000psi min. |
| LEADED BRASS & BRONZE ALLOYS | | | |
| ASTM Specifications | B16 | B584-C84400 | |
| Unified Numbering System | C36000 | C84400 | |
| MAJOR ELEMENTS | | | |
| Copper | 60.0 - 63.0% | 78.0 - 82.0% | |
| Tin | | 2.3 - 3.5% | |
| Lead | 2.5 - 3.7% | 6.0% - 8.0% | |
| Zinc | 33.00 - 37.5% | 7.0 - 10.0% | |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 25,000psi min. | 29,000psi min. | |
| Yield Strength | 10,000psi min. | 13,000psi min. | |
| 85-5-5-5 BRONZE ALLOYS | | | |
| ASTM Specifications | N/A | B62-C83600 | |
| Unified Numbering System | C83600 | C83600 | |
| MAJOR ELEMENTS | | | |
| Copper | 84.0 - 86.0% | 84.0 - 86.0% | |
| Tin | 4.0 - 6.0% | 4.0 - 6.0% | |
| Lead | 4.0 - 6.0% | 4.0 - 6.0% | |
| Zinc | 4.0 - 6.0% | 4.0 - 6.0% | |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength | 30,000psi min. | 30,000psi min. | |
| Yield Strength | 14,000psi min. | 14,000psi min. | |

