"THE FALCON METALS GROUP"

Falcon Stainless & Alloys Corp.

Falcon Forge

Falcon Metals Worldwide

Reference Manual/
Stock List #36

JUST-A-NOTE

To our customers,

We're pleased to send you our updated Reference Manual/Stock List.

We've tried to include the information our customers have told us they need on a regular basis.

Our strong points are our large and varied inventories, fast deliveries, competitive prices... and probably most important...our experienced sales staff.

Our companies are truly service oriented. No order is too large...or too small...or too complicated for us to handle.

Please contact us on any of your Specialty Metal, Open Die or Rolled Ring needs.

Thank you,

General Sales Manager
FALCON STAINLESS & ALLOYS COMPANY
FALCON FORGE • FALCON METALS WORLDWIDE
MEMBERS OF THE FALCON METALS GROUP

CONTENTS

Falcon Forge

STAINLESS STEEL - SUPER ALLOYS - ALLOY STEELS

"QUALITY OPEN DIE FORGINGS SINCE 1973"

MATERIALS

- STAINLESS STEELS (including PH & Heat treatable grades)
- NICKEL ALLOYS
- HIGH TEMPERATURE ALLOYS
- TITANIUM ALLOYS
- MAGNESIUM ALLOYS
- CARBON STEELS
- ALLOY STEELS (Commercial, Aircraft & Premium Grades)
- COBALT ALLOYS
- COPPER BASED ALLOYS
- REFRACTORY METALS
- LOW EXPANSION ALLOYS
- ALUMINUM

TESTING

DESTRUCTIVE & NON DESTRUCTIVE

SHAPES

- ROUND & SHAPED BARS
- BLOCKS & FLATS
- ROLLED AND FORGED RINGS
- STEPPED & STRAIGHT SHAFTS
- HOLLOW BARS
- MANDRELS
- CYLINDERS & SLEEVES
- DISCS
- HUBS
- FLANGES
- FLANGED SHAFTS
- SPECIAL SHAPES

SECONDARY OPERATIONS

MACHINING - CUTTING - HEAT TREATING

CAPABILITIES CHART

SHAPES		STAINLESS STEELS	CARBON & ALLOY STEELS	LIGHT METALS	OTHER METALS
SHAFTS, SPINDLES MANDRELS	MAX. DIAMETER MAX. WEIGHT MAX. LENGTH	40 INCHES 38,000 LBS 480 INCHES	40 INCHES 40,000 LBS. 480 INCHES	40 INCHES 20,000 LBS 480 INCHES	ON REQUEST ON REQUEST ON REQUEST
FORGED RINGS	MAX. OD	120 INCHES	130 INCHES	80 INCHES	ON REQUEST
ROLLED RINGS (RECTANGULAR OR CONTOURED)	MAX. OD MIN. ID MAX. WEIGHT MAX. LENGTH	180 INCHES 30 INCHES 13,000 LBS 30 INCHES	180 INCHES 30 INCHES 15,000 LBS 30 INCHES	180 INCHES 30 INCHES 3,800 LBS 30 INCHES	ON REQUEST ON REQUEST ON REQUEST ON REQUEST
DISCS	MAX. DIAMETER	150 INCHES	150 INCHES	150 INCHES	ON REQUEST
BLOCKS, FLATS	MAX. SIZE MAX. WEIGHT	40" X 40" 36,000 LBS	40" X 40" 40,000 LBS	40" X 40" 10,000 LBS	ON REQUEST ON REQUEST

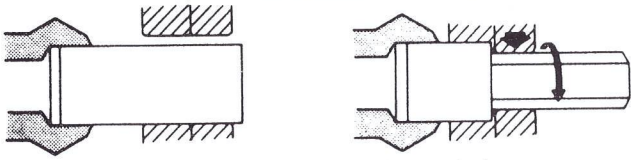
WHEN REQUESTING A QUOTE, PLEASE SUPPLY THE FOLLOWING:

- FINISHED DIMENSIONS
- SPECIFICATIONS (IF REQUIRED)
- HEAT TREATMENT (IF REQUIRED)

>>>>> MORE ON FORGINGS... TURN PAGE <<<<<

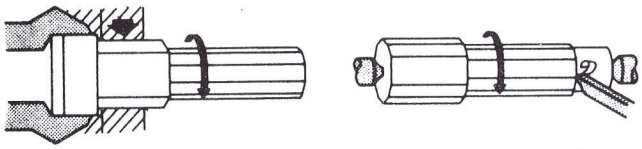
HOW FORGINGS ARE MADE

SHAFTS



1 Starting stock, held by manipulator.

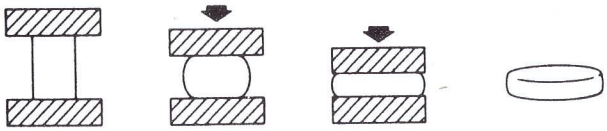
2 Open die forging.



3 Progressive forging.

4 Lathe turning to near net-shape.

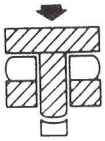
DISCS



1 Starting stock.

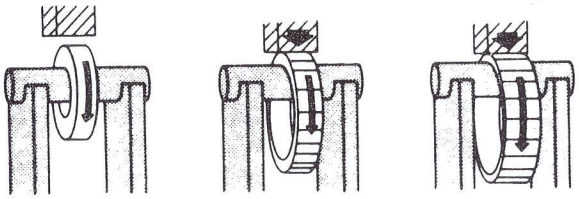
2 Preliminary upsetting.

3 Progressive upsetting/forging to disc dimensions.



4 Pierced for saddle/mandrel ring preform.

SADDLE - MANDREL RINGS



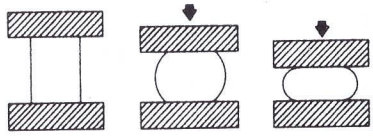
1 Preform mounted on saddle/mandrel.

2 Metal Displacement — reduce preform wall thickness to increase diameter.

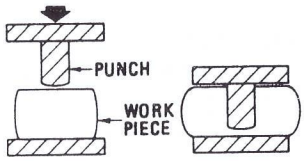
3 Progressive reduction of wall thickness to produce ring dimensions.

4 Machining to near net shape.

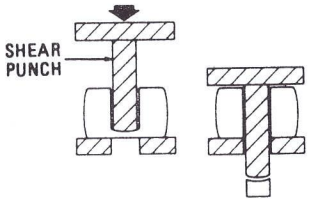
SEAMLESS ROLLED RINGS



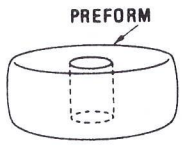
1 This process typically begins with upsetting of the starting stock on flat dies at its plastic deformation temperature — in the case of grade 1020 steel, approximately 2,200 Fahrenheit. The upsetting operation introduces wrought properties to the starting stock and begins the development of a workpiece preform configuration that is conducive to subsequent steps.



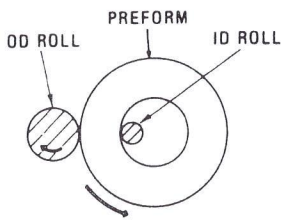
2 Piercing — forcing a punch into the hot upset stock causing metal to be displaced radially, as shown on the right.



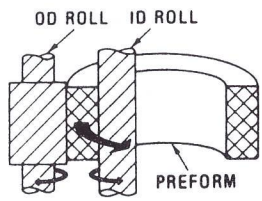
3 Shearing serves to remove the small punchout...



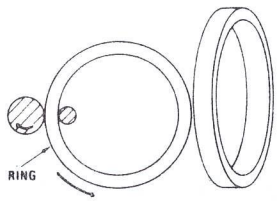
4 producing a completed hole through the stock which is now ready for the ring rolling operation itself. At this point the stock is called a preform.



5 The doughnut-shaped preform is slipped over the ID roll, shown here from an "above" view.



6 A side view of the ring mill and preform workpiece. The free-turning ID roll exerts force against the workpiece, thus squeezing it against the OD roll which imparts a rotary action...



7 resulting in a thinning of the section and a corresponding increase in the diameter of the ring. Once off the ring mill, the ring is then ready for secondary operations such as close tolerance sizing, parting, heat treatment and test/inspection.

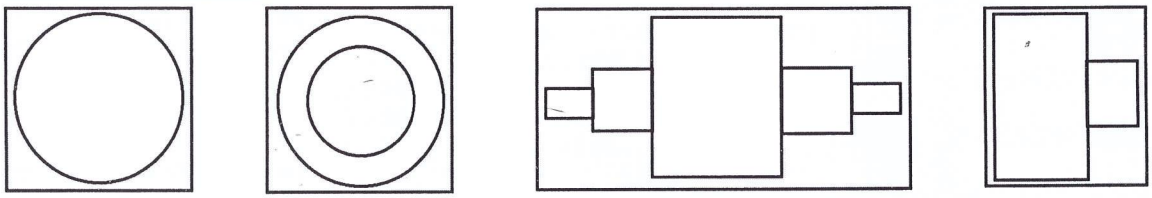
ADVANTAGES OF FORGINGS

Falcon Forge is well equipped to handle all your open die forging needs.

Over the years our customers have found us to be a versatile, innovative supplier of quality open die forgings.

By working with state-of-the-art technology coupled with the craftsmanship of years of experience, we've been able to supply our customers with superior products at very competitive prices and with fast deliveries.

While the experienced forgings buyer is aware of the many advantages of forgings over the more traditional methods of fabrication such as machining from bar or cutting from plate, the following will clearly illustrate for the new or undecided buyer some of the cost saving factors in using a ***Falcon Forge*** product.



DISC CUT FROM PLATE | RING CUT FROM PLATE | STEP DOWN SHAFT MACHINED FROM ROUND BAR | SINGLE HUB MACHINED FROM ROUND BAR

THE GRAY AREA REPRESENTS MATERIAL LOSS

THE SAVINGS MADE BY FORGING CAN BE SIGNIFICANT!!

- .. SAVINGS ON FREIGHT..no excessive weight
- .. LABOR SAVINGS .. your forging is near net size
- .. INCREASED MACHINE LIFE .. less wear & tear
- .. MATERIAL SAVINGS .. see above drawings
- .. INCREASED TOOL LIFE .. we'll forge near net size
- .. IMPROVED PHYSICAL PROPERTIES
- .. ABILITY TO SECURE HARD TO FIND ALLOYS
- .. ABILITY TO SECURE LARGE OR NON-STANDARD SIZES & SHAPES.

IN STOCK.... OVER 180 DIFFERENT ALLOYS FROM 1005 CARBON STEEL, THROUGH THE FULL RANGE OF STAINLESS & NICKEL ALLOYS, TITANIUM & ALUMINUM ALLOYS THROUGH THE MARAGING STEELS AND REFRACTORY METALS.

NEED AN EMERGENCY SHIPMENT!! ... CALL US AND ASK FOR OUR "FLASH" SERVICE

To **INCREASE YOUR SAVINGS**..we can supply your forging **SMOOTH FORGED** or **MACHINED FINISH**

>>>>> *"MACHINABILITY RATINGS"* – 74 METALS See page 27 <<<<<

HOW FORGINGS COMPARE

How FORGINGS compare to Castings	**Forgings are stronger** Casting cannot obtain the strengthening effects of hot and cold working. Forging surpasses casting in predictable strength properties – producing superior strength that is assured, part to part.	**Forging defects are refined in preworking** A casting has neither grain flow nor directional strength and the process cannot prevent formation of certain metallurgical defects. Preworking forge stock produces a grain flow oriented in directions requiring maximum strength. Dendritic structures, alloy segregations and like imperfections are refined in forging.
How FORGINGS compare to Weldments/ Fabrications	**Forgings offer production economies, material savings** Welded fabrications are more costly in high volume production runs. In fact, fabricated parts are a traditional source of forging conversions as production volume increases. Initial tooling costs for forging can be absorbed by production volume and material savings and forging's intrinsic production economics – lower labor costs, scrap and rework reductions and reduced inspection costs.	**Forgings are stronger** Welded structures are not usually free of porosity. Any strength benefit gained from welding or fastening standard rolled products can be lost by poor welding or joining practice. The grain orientation achieved in forging makes stronger parts.
How FORGINGS compare to Machined Bar/Plate	**Forgings offer broader size range of desired material grades** Sizes and shapes of products made from steel bar and plate are limited to the dimensions in which these materials are supplied. Often, forging may be the only metalworking process available with certain grades in desired sizes. Forgings can be economically produced in a wide range of sizes – from parts whose largest dimension is less than 1 in. to parts weighing more than 450,000 lbs.	**Forgings have grain oriented to shape for greater strength** Machined bar and plate may be more susceptible to fatigue and stress corrosion because machining cuts material grain pattern. In most cases, forging yields a grain structure oriented to the part shape, resulting in optimum strength, ductility and resistance to impact and fatigue.
How FORGINGS compare to Powder Metal Parts	**Forgings are stronger** Low standard mechanical properties (e.g. tensile strength) are typical of P/M parts. The grain flow of a forging ensures strength at critical stress points.	**Forgings offer higher integrity** Costly part-density modification or infiltration is required to prevent P/M defects. Both processes add costs. The grain refinement of forged parts assures metal soundness and absence of defects.
How FORGINGS compare to Reinforced Plastics/Composites	**Forgings use less costly materials** High costs are incurred with advanced, composite materials like graphite, aramid, S-glass and less common matrix resins. Forging materials are readily available and comparatively inexpensive.	**Forgings offer greater productivity** New advanced-composite part designs may often require long lead times and substantial development costs. The high production rates possible in forging cannot yet be achieved in reinforced plastics and composites.

CHART COURTESY OF FORGING INDUSTRY ASSOCIATION

NJ: 201-670-8300 OUTSIDE NJ: 800-631-0728 FAX: 201-670-0033 E-MAIL: query@falcon-metals.com

Forgings are more reliable, less costly

Casting defects occur in a variety of forms. Because hot working refines grain pattern and imparts high strength, ductility and resistance properties, forged products are more reliable. And they are manufactured without the added costs for tighter process controls and inspection that are required for casting.

Forgings offer better response to heat treatment

Castings require close control of melting and cooling processes because alloy segregation may occur. This results in non-uniform heat treatment response that can affect straightness of finished parts. Forgings respond more predictably to heat treatment and offer better dimensional stability.

Forgings' flexible, cost-effective production adapts to demand

Some castings, such as special performance castings, require expensive materials and process controls, and longer lead times. Open-die and ring rolling are examples of forging processes that adapt to various production run lengths and enable shortened lead times.

Forgings offer cost-effective designs/inspection

A multiple-component welded assembly cannot match the cost-savings gained form a properly designed, one-piece forging. Such part consolidations can result in considerable cost savings. In addition, weldments require costly inspection procedures, especially for highly stressed components. Forgings do not.

Forgings offer more consistent, better metallurgical properties

Selective heating and non-uniform cooling that occur in welding can yield such undesirable metallurgical properties as inconsistent grain structure. In use, a welded seam may act as a metallurgical notch that can lead to part failure. Forgings have no internal voids that cause unexpected failure under stress or impact.

Forgings offer simplified production

Welding and mechanical fastening require careful selection of joining materials, fastening types and sizes, and close monitoring of tightening practice – both of which increase production costs. Forging simplifies production and ensures better quality and consistency – part after part.

Forgings make better, more economical use of materials

Flame cutting plate is a wasteful process – one of several fabricating steps that consumes more material than needed to make such parts as rings or hubs. Even more is lost in subsequent machining.

Forgings yield lower scrap; greater, more cost-effective production

Forgings, especially near-net shapes, make better use of material and generate little scrap. In high-volume production runs, forgings have the decisive cost advantage.

Forgings require fewer secondary operations

As supplied, some grades of bar and plate require additional operations – such as turning, grinding and polishing – to remove surface irregularities and achieve desired finish, dimensional accuracy, machineability and strength. Often, forgings can be put into service without expensive secondary operations.

Forgings require fewer secondary operations

Special P/M shapes, threads and holes and precision tolerances may require extensive machining. Secondary forging operations can often be reduced to finish machining, hole drilling and other simple steps. The inherent soundness of forgings leads to consistent, excellent machined surface finishes.

Forgings offer greater design flexibility

P/M shapes are limited to those that can be ejected in the pressing direction. Forging allows part designs that are not restricted to shapes in this direction.

Forgings use less costly materials

The starting materials for high-quality P/M parts are usually water atomized, pre-alloyed and annealed powders that cost significantly more per pound than bar steels.

Forgings have established documentation

RP/C physical property data are scarce and data from material suppliers lack consistency. Even advanced aerospace forgings are established products with well-documented physical, mechanical and performance data.

Forgings offer broader service temperature range

RP/C service temperatures are limited and effects of temperature are often complex. Forgings maintain performance over a wider temperature range.

Forgings offer more reliable service performance

Deterioration and unpredictable service performance can result from damage to continuous, reinforcing RP/C fibers. Forging materials out-perform composites in almost all physical and mechanical property areas, especially in impact resistance and compression strength.

...think FORGINGS first!

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
AM-350 AISI-633	AMS-5774 QQ-S-763	AMS-5546				COMMERCIAL SPECIFICATION
AM-355 AISI-634	AMS-5743 5780 QQ-S-763	AMS-5547	AMS-5549			AMS-5743 ASTM-A 565
PH 13-8 MO	AMS-5629 5840 ASTM-A 564					AMS-5629
15-5 PH	AMS-5659 ASTM-A 564					AMS-5659
15-7 MO AISI-632	AMS-5812 ASTM-A 564 A 638 B 639	AMS-5520	AMS-5520 MIL-S-25043			ASTM-A 638 B 637 B 639
17-4 PH AISI-630	AMS-5622 5643 5825 QQ-S-763 ASTM-A 564	AMS-5604 MIL-S-81506	AMS-5604 MIL-S-81506	AMS-5622 5643		AMS-5622 5643
17-7 PH AISI-631 CONDITION "C" AVAILABLE	AMS-5678	AMS-5528 5529 MIL-S-25043	AMS-5528 MIL-S-25043			
CARPENTER 20CB3	ASTM-B 471 B 473	ASTM-B 463	ASTM-B 463	ASTM-B 468	ASTM-B 462 B 464 B 474	ASTM-B 462 B 472
CARPENTER #49		MIL-N-14411	MIL-N-14411			COMMERCIAL SPECIFICATION
21-6-9 (NITRONIC 40)	AMS-5656 ASTM-A 276	AMS-5595	AMS-5595	AMS-5561 ASTM-A 269		AMS 5656
201 AISI 201	ASTM-A 666	ASTM-A 412	ASTM-A 412			
202 AISI 202	ASTM-A 276 A 666	ASTM-A 412				ASTM-A 314 A 473
301 AISI 301	ASTM-A 276 A 313 A 479 A 666	AMS 5901(Ann) 5517 (1/4HD) 5518 (1/2HD) 5902 (3/4HD) 5519(FH) ASTMA 167 177 240	ASTM-A 167 A 240	ASTM-A 511		ASTM-A 314 A 473 A 493
302 AISI 302 BAR STOCK AVAILABLE IN CONDITION "B"	AMS-5636 5637 5688 ASTM-A 276 A 313 A 479 A 493 A 666 MIL-S-7720 QQ-S-763	AMS 5516 5903(1/4HD) 5904(1/2HD) 5905(3/4HD) 5906(FH) ASTMA-167 A-177 A-240 A-666	AMS 5513 5515 ASTM-A 167 A 240	ASTM-A 213 A 249 A 269 A 511	ASTM-A 312	ASTM-A 314 A 473

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
303 AISI 303 BAR STOCK AVAILABLE IN CONDITION "B"	AMS-5640 ASTM-A 320 A 581 A 582 MIL-S-7720 QQ-S-763		ASTMA-895			AMS 5640 ASTM-S 314 A 473
304 AISI 304 BAR STOCK AVAILABLE IN CONDITION "B"	AMS-5639 5697 ASTM-A 193 A 276 A 313 A 320 MIL-S-7720 QQ-S-763	AMS5513 5910(1/4) 5911(1/2HD) 5912(3/4HD) 5913(FH) ASTMA-167 177 240 666	AMS-5513 ASTM-A-240 ASTM-A-666 ASTM-A-167	AMS-5560 5565 5566 5639 ASTM-A 213 A 249 A 269 A 270 MIL-T-6845 T-8504 T-8506	ASTM-A 312 A 376 A 409	AMS-5639 ASTM-A 314 A 336 A 473
304 L AISI 304 L	AMS-5647 ASTM-A 276 A 479 A 581 MIL-S-18170	AMS 5511 ASTM-A-167 ASTM-A-240 ASTM-A-666	AMS 5511 ASTM-A-2407 ASTM-A-666	AMS-5647 ASTM-A 213 A 249 A 269 A 511 MIL-T-8606 T-8973	ASTM-A 312 A 376 A 409	AMS-5647 ASTM-S 314 A 473
309 AISI 309	ASTM-A 276 QQ-S-763	ASTM-A 167	ASTM-A 167	ASTM-A 249 A 511	ASTM-A 312 A 358 A 409	ASTM-A 314 A 473
310 AISI 310	AMS-5651 5694 ASTM-A 276 QQ-S-763	AMS-5521 ASTM-A 167	AMS-5521 ASTM-A 167	AMS-5572 5577 5651 ASTM-A 213 A 249 A 511	ASTM-A 312 A 358 A 409	AMS-5651 ASTM-A 314 A 336 A 473
316 AISI 316 BAR STOCK AVAILABLE IN CONDITION "B"	ASTM-A 276 QQ-S-763	AMS 5524 5907(1/4HD) ASTMA-167 240 262 666	AMS-5524 ASTM-A 167 MIL-S-5059	AMS-5573 5648 ASTM-A 213 A 249 A 269 A 511	ASTM-A 312 A 358 A 376 A 409 A 430	AMS-5648 ASTM-A 314 A 336 A 473
316 L AISI 316 L	AMS-5653 ASTM-A 193 A 276 A 479 MIL-S-7720 QQ-S-763	AMS 5507 5524(ANN) 5907(1/4HD) ASTMA-167 240	AMS-5507 ASTM-A 167 A 240	AMS-5643 ASTM-A 213 A 249 A 269 A 511	ASTM-A 312 A 358 A 376 A 409 A 430	AMS-5643 ASTM-A 314 A 473
317 AISI 317 317 L AISI 317 L	ASTM-A 276 A 580 QQ-S-763	ASTM-S 167 A 240	ASTM-A 167 A 240	ASTM-A 249 A 269 A 511 A 632	ASTM-A 312 A 409	ASTM-A 314 A 472

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
321 AISI 321	AMS-5645 5689 ASTM-A 193 A 276 A 320 A 479 QQ-S-763	AMS-5510 ASTM-A A 240	AMS-5510 ASTM-A 167 A 240 MIL-S-6721	AMS-5557 5559 5570 5576 5645 ASTM-A 213 A 249 A 269 A 271 A 511 MIL-T-6737 T-8606 T-8808 T-8973	ASTM-A 312 A 358 A 376 A 409 A 430	AMS-5645 ASTM-A 314 A 336 A 473
330 AISI 330	AMS-5716 ASTM-B 511 B 512	AMS-5592 ASTM-B 536	AMS-5592 ASTM-B 536		ASTM-B 312 B-546	AMS-5646
347 AISI 347	AMS-5646 5654 5674 ASTM-A 193 A 276 A 320 QQ-S-763	AMS-5512 ASTM-A 167 A 240 A 409 MIL-S 6721	AMS-5512 ASTM-A 167 A 240 A 409 MIL-S-6721	AMS-5556 5558 5571 5575 5646 5654 ASTM-A 213 A 249 A 269 A 271 A 511 MIL-T-8606 T-8808	ASTM-A 312	AMS-5646 5654 ASTM-A 314
409 AISI 409		ASTMA-240 ASTMA-176	ASTMA-240 ASTMA-176			
410 AISI 410	AMS-5612 5613 5776 5821 ASTM-A 193 A 276 A 493 A 580 MIL-S-861 QQ-S-763	AMS-5504 5505 ASTM-A 176 A 240	AMS-5504 5505 ASTM-A 176 A 240	AMS-5591 5612 5613 ASTM-A 268 A 511	ASTM-A 268	AMS-5612 5613 ASTM-A 182 A 314 A 336 A 473 A 579
416 AISI 416	AMS-5610 5611 ASTM-A 193 A 276 A 581 A 582 MIL-S-861 QQ-S-763		ASTMA-895			AMS-5610 5611 ASTM-A 314 A 473
420 AISI 420	AMS-5621 ASTM-A 276 A 580 QQ-S-763	AMS-5506	AMS-5506 AISI 420 ESR			AMS-5621 ASTM-A 314 A 473

MANUAL UPDATES: http://www.falcon-metals.com

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
420-F AISI 420 F	AMS-5620 ASTM-A 276 QQ-S-764					AMS-5620 ASTM-A 314 A 473
422 AISI 422	AMS-5655					AMS-5655
430 AISI 430	AMS-5627 ASTM-A 276 A 580 QQ-S-763	AMS-5503 ASTM-A 176 A 240	AMS-5503 ASTM-A 176 A 240			AMS-5627 ASTM-A 314 A 473 A 493
430-F AISI 430-F	AMS-5627 ASTM-A 276 A 581 A 582 QQ-S-763					AMS-5627 ASTM-A 314 A 473
431 AISI 431	ASTM-A 276 QQ-S-763					ASTM-A 314 A 473
440 A AISI 440 A	AMS-5631 ASTM-A 276 A 580 QQ-S-763	COMMERCIAL SPECIFICATION				AMS-5631 ASTM-A 314 A 473
440 B AISI 440 B	ASTM-A 276 A 580 QQ-S-763					ASTM-A 314 A 473
440 C AISI 440 C	AMS-5618 5630 ASTM-A 276 A 580 QQ-S-763	COMMERCIAL SPECIFICATION	COMMERCIAL SPECIFICATION			AMS-5618 5630 ASTM-A 314 A 473
440 F Se AISI 440 F Se	AMS-5632 QQ-S-763					AMS-5632
19-9 DL AISI 651		AMS-5526	AMS-5526			
GREEK ASCOLOY AISI 615 (S/S T 418)	AMS-5616					AMS-5616
4130 AISI 4130	AMS 6370 ASTM-A-304 A-322 A 331 MIL-S-6758 MIL-S-16974 QQ-S-624	AMS 6350 6351 ASTM-A 505 MIL-S-18729	AMS 6350 6351 MIL-S-18729	AMS 6361 6362 6371 6373 ASTM-A 519 MIL-T-6736	COMMERCIAL	AMS 6370 ASTM-A 372 A 646
4140 AISI 4140	AMS 6378 AMS 6382 ASTM-A-193 A-304 A-320 A-322 A-331 MIL-S-5626 MIL-S-16974	AMS 6395 ASTM-A-505	AMS 6395	AMS 6381 AMS 6390 ASTM-A-519	COMMERCIAL	AMS 6382 ASTM-A-646

MANUAL UPDATES: http://www.falcon-metals.com

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
4330 MOD	AMS 6411 6427 MIL-S-8699			AMS 6411	COMMERCIAL	AMS 6411 6427 ASTM-A-293
4340 AISI 4340	AMS 6414 AMS 6415 ASTM-A-304 A-320 A-322 A-331 MIL-S-5000 MIL-S-8844	AMS 6359 ASTM-A-505	AMS 6359	AMS 6414 6415 ASTM-A-519	COMMERCIAL	AMS 6414 6415 ASTM-A-646
4620 AISI 4620	AMS 6294 ASTM-A-304 A-322 A-331 MIL-S-7493					AMS 6294
6150 AISI 6150	AMS 6448 AMS 6450 ASTM-A-304 A-322 MIL-S-8503	AMS 6455	AMS 6455			AMS 6448
8620 AISI 8620	AMS 6274 6276 6277 ASTM-A 304 A-322 A-331	COMMERCIAL QUALITY	COMMERCIAL QUALITY	AMS 6274	COMMERCIAL QUALITY	AMS 6274 6276 6277
8740 AISI 8740	AMS 6322 6325 6327 ASTM-A-304 A-322 A-331 MIL-S-6049	AMS 6358	AMS 6358			AMS 6322 6325 6327
9310 AISI 9310	AMS 6260 6265 6267 ASTM-A-304 A-322 A-331 MIL-S-7393			AMS 6260		AMS 6260 6265 6267
D 6 AC	AMS 6431 MIL-S-8949					AMS 6431 MIL-S-8949
H 11 (VASCOJET 1000) AISI 610	AMS 6485 6487 6488 ASTM-A-681	AMS 6437 ASTM-A-681	AMS 6437 ASTM-A-681			AMS 6485 6487 6488 ASTM-A-681
NITRALLOY 135	AMS 6470 6471 6472 ASTM-A-355 MIL-S-6709					AMS 6470 6471 6472
300 M (4340 MOD.)	AMS 6417 6419 MIL-S-8844					AMS 6417 6419
17-22 (A) AISI 601	AMS 6304					AMS 6304

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
ALLOY #25 (L605) AISI 670	AMS 5759	AMS 5537				AMS 5759
ALLOY 188 (HAYNES)	AMS 5772	AMS 5608	AMS 5608			AMS 5772
A 286 AISI 660	AMS 5731 5732 5734 5737 ASTM-A-453 A-638	AMS 5525	AMS 5525			AMS 5731 5732 5734 5737 ASTM-A-638
AL 47-50	AMS 7718	AMS 7717 MIL-N-14411				AMS 7718
COLUMBIUM (NIOBIUM)	AMS 7855 7857	AMS 7850 7851 7852	AMS 7850 7851 7852			
HASTELLOY B2	AMS 5396	ASTM-B-333	ASTM-B-333	ASTM-B-622 B-626	ASTM-B-619 B-622	ASTM-B-335
HASTELLOY C22	**ASTM B-574 ASTMB-564**	**ASTM B-575**	**ASTMB-575**	**ASTM B622 ASTM B626**	**ASTM B-619 ASTM B-622**	**ASTM B-574 ASTM B-575**
HASTELLOY C 276	ASTM-B-574	AMS 5530 ASTM-B-575	AMS 5530 ASTM-B-575	ASTM-B-622 B-625	ASTM-B-619 B-622	ASTM-B-574
HASTELLOY G	ASTM-B-581	ASTM-B-582	ASTM-B-582	ASTM-B-622 B-626	ASTM-B-619 B-622	ASTM-B-581
HASTELLOY W	AMS 5755 5786					AMS 5755
HASTELLOY X	AMS 5754 ASTM-B-572	AMS 5536 ASTM-B-435	AMS 5536 ASTM-B-435	AMS 5587 5588		AMS 5754
HEAVY METAL (TUNGSTEN BASE)	AMS 7725		AMS 7725			
HY MU 80	MIL-N-14411	MIL-N-14411				
INCOLOY 800 (H)	AMS 5766 ASTM-B-408	ASTM-B-409	ASTM-B-409	ASTM-B-163 B-407 B-514	ASTM-B-514	AMS 5766
INCOLOY 801		AMS 5552	AMS 5552			
INCOLOY 825	ASTM-B-425	ASTM-B-424	ASTM-B-424	ASTM-B-163 B-423		ASTM-B-425
INCOLOY 901	AMS 5660 5661					AMS 5660 5661
INCONEL 600	AMS 5665 ASTM-B-166 MIL-N-6710	AMS 5540 ASTM-B-168 MIL-N-6840	AMS 5540 ASTM-B-168 MIL-N-6840	AMS 5580 ASTM-B-163 B-167 MIL-T-7840	ASTM-B-167	AMS 5665 MIL-N-6710
INCONEL 601	COMMERCIAL SPECIFICATION	AMS 5870	AMS 5870		COMMERCIAL SPECIFICATION	COMMERCIAL SPECIFICATION
INCONEL 617	COMMERCIAL SPECIFICATION	COMMERCIAL SPECIFICATION	COMMERCIAL SPECIFICATION			
INCONEL 625	AMS 5666 ASTM-B-446	AMS 5599 ASTM-B-443	AMS 5599 ASTM-B-443	ASTM-B-444	ASTM-B-444	AMS 5666 ASTM-B-446
INCONEL 718	AMS 5662 5663 5664	AMS 5596 5597	AMS 5596 5597	AMS 5589 5590		AMS 5662 5663 5664
INCONEL 722 (W)	AMS 5714	AMS 5541				AMS 5714

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
INCONEL X750	AMS 5667 5668 5669 5670 5671 5698 5699	AMS 5542 5598	AMS 5542 5598	AMS 5582		AMS 5667 5668 5670 5671 ASTM-B-637
INVAR 36 INVAR 36 FM	MIL-I-23011	MIL-I-23011	MIL-I-23011			MIL-I-23011
MAGNESIUM	AZ-31-B ZK-60-AT5 AZ-61A-F AZ-80-A-F	AZ-31-B HM-21A-T8 HK-31A-H24	AZ-31-B HM-21A-T8 HK-31A-H24			
MARAGING "250"	AMS 6512 MIL-S-46850	AMS 6520	AMS 6520			AMS 6512 MIL-S-46850
MARAGING "300"	AMS 6514 MIL-S-46850	AMS 6521	AMS 6521			AMS 6514 MIL-S-46850
MARAGING "350"	COMMERCIAL SPECIFICATION					COMMERCIAL SPECIFICATION
MOLYBDENUM	AMS 7805	AMS 7800 7801 7817	AMS 7800 7801 7817	ASTM-B-386 B-387		
MU METAL	AMS 7705	AMS 7701 7702 MIL-N-14411				
M P 35 N	AMS 5758 5844 5845					AMS 5758 5844 5845
MONEL 400	AMS 4675 4730 4731 ASTM-B-164 MIL-N-894 QQ-N-281	AMS 4544 ASTM-B-127 QQ-N-281	AMS 4544 ASTM-B-127	AMS 4574 ASTM-B-163	ASTM-B-165 QQ-N-281	AMS 4675 QQ-N-281
MONEL R 405	AMS 4674 ASTM-B-164 QQ-N-281					AMS 4674 QQ-N-281
MONEL K 500	AMS 4676 MIL-N-7506 QQ-N-286	COMMERCIAL SPECIFICATION		COMMERCIAL SPECIFICATION		AMS 4676 QQ-N-286
NICKEL 200	ASTM-B-160	ASTM-B-162	ASTM-B-162	ASTM-B-161 B-163	ASTM-B-161	ASTM-B-160
NICKEL 201	ASTM-B-160	ASTM-B-162	ASTM-B-162	ASTM-B-161	ASTM-B-161	ASTM-B-160
42% NI-FE	MIL-I-23011	MIL-I-23011 ASTM-F-30		COMMERCIAL SPECIFICATION		MIL-I-23011
46% NI-FE	MIL-I-23011	MIL-I-23011 ASTM-F-30				MIL-I-23011
49% NI-FE	MIL-I-23011	MIL-I-23011 ASTM-F-30				MIL-I23011
52% NI-FE	MIL-I-23011	MIL-I-23011				MIL-I-23011
RENE 41	AMS 5712 5713 ASTM-A-564 B-637 B-639	AMS 5545	AMS 5545			AMS 5712 5713 ASTM-A-638 B-637 B-639
TANTALUM	AMS 7848	AMS 7847 7849	AMS 7847 7849	ASTM-B-521		AMS 7848

PARTIAL STOCK LIST & CROSS INDEXED SPECIFICATIONS

TYPE	BAR/WIRE	SHEET/STRIP	PLATE	TUBE	PIPE	FORGINGS
TITANIUM (C.P.) GRADES 1-2-3-4	AMS-4921 ASTM-B-348 MIL-T-9047	AMS-4900 4901 4902 ASTM-B-265 MIL-T-9046	AMS-4900 4901 4902 ASTM-B-265	AMS-4941 4942 ASTM-B-338	ASTM-B-337	AMS-4921 ASTM-B-348 MIL-T-9047
TITANIUM 5 AL-2.5 SN	AMS-4924	AMS-4909 4910	AMS-4909 4910			AMS-4924 4966
TITANIUM 6 AL-6V-2 SN	AMS-4936 4971 4978 4979 MIL-T-9047	AMS-4918 MIL-T-9046	AMS-4918 MIL-T-9046			AMS-4971 4978 4979 ASTM-B-381 MIL-T-9047
TITANIUM 6 AL -4V	AMS 4928 4930 4965 4967 MIL-T-9047	AMS 4907 4911 ASTM-B-265 MIL-T-9046	AMS 4907 4911 ASTM-B-265 MIL-T-9046	ASTM-B-338	ASTM-B-338	AMS 4928 4930 4965 4967 MIL-T-9047
TUNGSTEN	AMS-7897	AMS-7898	AMS-7898			AMS-7897
WASPALOY AISI 685	AMS-5706 5707 5708 5709 ASTM-B-637	AMS-5544	AMS-5544	AMS-5586		AMS-5704 5706 5707 5708 5709 ASTM-B-637
ZIRCALLOY NO. 2- NO. 4	ASTM-B-350 B-351	ASTM-B-350 B-352	ASTM-B-350 B-352	ASTM B-353		ASTM-B-350 B-351
ZIRCONIUM	ASTM-B-350 B-351	ASTM-B-350 B-352	ASTM-B-350 B-352	ASTM B-353		ASTM-B-350 B-351

WEIGHT FORMULAS

FOR STAINLESS STEEL

FOR OTHER METALS .... USE CONVERSION CHART PAGE 21

USEFUL FORMULAS

CIRCLE – AREA
SQUARE OF DIAMETER X .7854
CIRCLE – CIRCUMFERNCE
DIAMETER X 3.1416
CONE – CUBIC CONTENTS
AREA OF BASE X (.333 X ALITITUDE)
CYLINDER – AREA
LENGTH X CIRCUMFERENCE OF THE BODY + AREA OF BOTH ENDS
CYLINDER – VOLUME
AREA OF BASE X PERPENDICULAR HEIGHT
ELLIPSE – AREA
PRODUCT OF AXES BY .7854
HEXAGON – AREA
AREA ON THE INSCRIBED CIRCLE X 1.1027
OCTAGON – AREA
DISTANCE ACROSS, SQUARED X .82843
PARALLELOGRAM – AREA
BASE X PERPENDICULAR HEIGHT
RECTANGLE – AREA
LENGTH X WIDTH

SPHERE – AREA
SQUARE OF DIAMETER X 3.1416
or.. DIAMETER X CIRCUMFERENCE
SPHERE – VOLUME
CUBE OF DIAMETER X .5236
SQUARE – CIRCUMFERENCE OF CIRCUMSCRIBING CIRCLE
SIDE X 4.443
SQUARE – DIAMETER OF CIRCUMSCRIBING CIRCLE
SIDE OF SQUARE X 1.4142
SQUARE – SIDE OF INSCRIBED SQUARE
DIAMETER X .7071 ...or
CIRCUMFERENCE X .2251
SQUARE – SIDE OF EQUAL SQUARE
DIAMETER X .8862
TANK – CAPACITY IN GALLONS
(*MEASUREMENTS MUST BE INCHES*)
CYLINDRICAL .. LENGTH X (SQUARE OF DIAMETER) X .0034
RECTANGULAR .. LENGTH X WIDTH X DEPTH = (THIS TOTAL) DIVIDED BY 231.0
ELLIPTICAL .. LENGTH X SHORT DIAMETER X LONG DIAMETER X .0034
TRIANGLE – AREA
HALF HEIGHT X BASE

WEIGHT PER LIN. FT.

FLATS: 3.44 X T X W

HEXAGONS: 2.977 X Dia.sq

OCTAGON: 2.977 X Dia. sq

ROUNDS: 2.70 X Dia. sq

SQUARES: 3.44 X T X W

TUBING: 10.79 X (OD-WL) X WL

WEIGHT PER PIECE

BLANKS: .286 X T X W X L

CIRCLES: .225 X T X Dia. sq

RINGS: .225 X 5 X (ODsq-IDsq)

DISCLAIMER

Falcon has gathered the information contained in this reference manual from many different printed sources. The characteristics, applications and other information contained are given as a guide. The reader must make their own evaluation based on their own research and more specific information than that supplied by Falcon. Falcon Stainless & Alloys Corp and Falcon Forge Div, are resellers and processors of these materials and makes no guarantees or warranties, either expressed or implied, regarding the accuracy of the information supplied or the suitability of any material for any application.

DEFINITIONS OF METAL TERMS

AGING - IN A METAL OR ALLOY, A CHANGE IN PROPERTIES THAT GENERALLY OCCURS SLOWLY AT ROOM TEMPERATURES.

ALCLAD - COMPOSITE SHEET PRODUCED BY BONDING EITHER CORROSION-RESISTANT ALUMINUM ALLOY OR ALUMINUM OF A HIGHER PURITY TO BASE METAL OF STRUCTURALLY STRONGER ALUMINUM ALLOY.

ALLOY STEEL - STEEL CONTAINING SIGNIFICANT QUANTITIES OF ALLOYING ELEMENTS (OTHER THAN CARBON AND THE COMMONLY ACCEPTED AMOUNTS OF MANGANESE, SULFUR AND PHOSPHORUS) ADDED TO EFFECT PHYSICAL OR MECHANICAL CHANGES IN THE STEEL.

ANNEALNG - THE SOFTENING OF A STEEL BY HEATING AND HOLDING AT A SUITABLE TEMPERATURE AND COOLING AT A SUITABLE RATE (DEPENDING ON ALLOY).

ANODIZING - THE PROCESS OF MAKING A PROTECTIVE COATING TO ALUMINUM BY ANODIC OXIDATION.

ARTIFICIAL AGING - AN AGING TREATMENT ABOVE ROOM TEMP.

AUSTENITIC STAINLESS - NORMALLY REFERS TO THE NICKEL BEARING NON-MAGNETIC , NON-HEAT TREATABLE GRADES. THE 300 SERIES.

BEADING - RAISING A RIDGE ON SHEET METAL.

BELLY - A FULLNESS IN CROSS SECTION OF FOIL, EITHER CENTER OR EDGES.

BEND TEST - VARIOUS TESTS USED TO DETERMINE THE TOUGHNESS AND DUCTILITY OF FLAT ROLLED METAL, IN WHICH THE MATERIAL IS BENT AROUND ITS AXIS OR AROUND AN OUTSIDE RADIUS.

BESSEMER PROCESS - A PROCESS FOR MAKING STEEL IN WHICH AIR IS BLOWN THROUGH THE MOLTEN IRON SO THAT THE IMPURITIES ARE REMOVED BY OXIDATION.

BILLET (BLOOM) - A SOLID SEMI-FINISHED ROUND OR SQUARE PRODUCT THAT HAS BEEN HOT WORKED BY FORGING, ROLLING OR EXTRUSION. THIS PRODUCT IS THEN PROCESSED FURTHER.

BOX ANNEALING - ANNEALING A METAL OR ALLOY IN A SEALED CONTAINER UNDER CONDITIONS THAT MINIMIZE OXIDATION.

BLAST FURNACE - A VERTICAL SHAFT TYPE OF SMELTING FURNACE IN WHICH AN AIR BLAST IS IS USED. IT PRODUCES PIG IRON (APPROXIMATELY 92% IRON ,3-1/2% CARBON).

BLISTER - A DEFECT IN THE METAL PRODUCTION WHERE GAS BUBBLES ARE LEFT EITHER ON OR BELOW THE SURFACE OF THE METAL.

BOW - (CAMBER) AN EDGEWISE CURVATURE. MEASURED BY LAYING STRIP OR SHEET NEXT TO A STRAIGHT EDGE. THE DEVIATION IS CAMBER.

BRIGHT ANNEALING - ANNEALING IN A PROTECTIVE MEDIUM TO PREVENT DISCOLORATION OF THE BRIGHT SURFACE.

BRINELL HARDNESS TEST - A TYPE OF HARDNESS TESTING. THE HARDNESS IS DETERMINED BY FORCING A HARD STEEL OR CARBIDE BALL OF SPECIFIED SIZE UNDER SPECIFIC LOAD.

BRITTLE FRACTURE - A FRACTURE WITH LITTLE OR NO PLASTIC DEFORMATION.

BUCKLE - A DEFECT. ALTERNATING BULGES OR HOLLOWS ALONG THE LENGTH OF THE PRODUCT WITH THE EDGES REMAINING RELATIVELY FLAT

BURNING (BURN MARKS) - HEATING A MATERIAL BEYOND ALLOWABLE TEMPERATURE LIMITS. THIS CAUSES MELTING OR INTERGRANULAR OXIDATION. IT MAY APPEAR AS BROWN OR BLUE MARKS ON THE METAL.

BURNISHING - SMOOTHING SURFACES THROUGH FRICTION CONTACT BETWEEN THE WORK AND SOME HARD MATERIAL SUCH AS METAL BALLS.

BURR - A THIN EDGE OR ROUGHNESS LEFT BY A CUTTING OPERATION SUCH AS SHEARING, SHEARING, BLANKING ETC.

BUTT WELDING - JOINING TWO EDGES OR ENDS BY PLACING ONE AGAINST THE OTHER AND WELDING THEM.

CAMBER - SEE "BOW"

CANNING - SEE "OIL CANNING"

CARBIDE PRECIPITATION - THE FORMATION OF METAL CARBIDES WHEN FERROUS METALS ARE RAISED TO HIGH TEMPERATURES (AS IN WELDING). RESULTS IN INCREASED SUSCEPTIBILITY TO CORROSION.

CARBON STEEL - COMMERCIAL OR ORDINARY STEEL AS OPPOSED TO ALLOYED STEEL. CONTAINS CARBON UP TO 2% .

CARBURIZING - ADDING CARBON TO THE SURFACE OF IRON BASED ALLOYS BY ABSORPTION. THE OLDEST FORM OF CASE HARDENING.

CASE HARDENING - HARDENING A FERROUS STEEL SO THAT THE OUTER PORTION, OR CASE, IS HARDER THAN ITS CORE.

CAST STEEL - OBJECT MADE BY POURING MOLTEN STEEL INTO MOLD.

CHAMFER - BEVELING AN EDGE.

CHARPY TEST - AN IMPACT TEST. THE METAL IS USUALLY NOTCHED, SUPPORTED AT BOTH END, AND BROKEN BY A FALLING PENDULUM.

CHATTER MARKS - A DEFECT. PARALLEL INDENTATIONS OR MARKS APPEARING AT RIGHT ANGLES TO THE EDGE AT CLOSE OR REGULAR INTERVALS. CAUSED BY VIBRATIONS WHEN MATERIAL IS BEING ROLLED.

CHEMICAL MILLING - REMOVAL OF STOCK BY CONTROLLED CHEMICAL ETCH

CHROMIUM-NICKEL STEEL - NORMALLY REFERS TO THE 18% CHROME 8% NICKEL (18-8) STAINLESS STEEL GRADES. -- THE 300 SERIES.

CLADDING - THE PROCESS OF COVERING ONE METAL WITH ANOTHER. DONE BY WELDING, FUSING, ELECTROPLATING ETC.

COIL - FLAT SHEET OR STRIP IN A LONG LENGTH WHICH IS ROLLED INTO COILS.

COIL SET - THE STEEL HOLDS THE CURVATURE OF THE COIL AFTER UNWINDING. REMOVED BY ROLLER OR STRETCHER LEVELING.

COINING - IMPRESSING IMAGES OR CHARACTERS OF THE DIE AND PUNCH ONTO A PLAIN METAL SURFACE.

COIL BREAK - A DEFECT. CREASES OR RIDGES APPEARING ON SHEETS OR COILS AS PARALLEL LINES CROSS THE WIDTH OF SHEET.

COLD FINISH - A SMOOTH FINISH PRODUCED BY COLD WORKING.

COLD ROLLING - SIMILAR TO COLD REDUCTION. ROLLING MATERIAL AT A TEMPERATURE BELOW THE SOFTENING POINT OF THE METAL. THIS REDUCES THICKNESS AND INCREASES HARDNESS (COLD WORK)

COLD WORK - PLASTIC DEFORMATION BY EXTERNAL FORCE SUCH AS HAMMERING, DRAWING, BENDING WHICH PRODUCES HARDENING OF THE MATERIAL.

COMMERCIAL QUALITY STEEL SHEET - STANDARD QUALITY STEEL. WITH A LADLE ANALYSIS OF 0.15 MAX CARBON.

CONCENTRICITY - CONFORMANCE TO A COMMON CENTER. ROUNDNESS.

CORROSION - THE GRADUAL CHEMICAL OR ELECTRO- MECHANICAL ATTACK ON METAL BY ATMOSPHERE, MOISTURE OR OTHER AGENTS.

CORROSION EMBRITTLEMENT - THE SEVERE LOSS OF DUCTILITY OF A METAL RESULTING FROM CORROSIVE ATTACK.

COUPON - A PIECE OF METAL FROM WHICH A TEST SPECIMEN MAY BE PREPARED. USUALLY TAKEN FROM AN INTEGRAL PART OF PRODUCT.

CROP - CUTTING OFF OF THE DEFECTIVE ENDS OF COIL OR FORGING.

CROSS BREAK - DEFECT. TRANSVERSE RIPPLES OR RIBS.

CROWN - THE HEAVY OR RAISED CENTER IN A STRIP OR SHEET.

DECARBURIZATION - LOSS OF CARBON FROM THE SURFACE OF A FERROUS ALLOY BY HEATING IN OXIDIZING /REDUCING ATMOSPHERE.

DEBURRING - BURR REMOVAL BY FILING, ROLLING OR GRINDING.

DISH - A CONCAVE SURFACE.

DRAWING - 1. FORMING RECESSED PARTS BY FORCING THE PLASTIC FLOW OF METALS IN A DIE. 2. REDUCING THE SIZE OR SHAPE OF A WIRE BY PULLING IT THROUGH A SERIES OF SMALLER DIES.

DRAWN PRODUCT - A PRODUCT FORMED BY **DRAWING.**

DRILL ROD - ANNEALED & POLISHED HI-CARBON TOOL STEEL ROD.

DROPPED EDGE - A CONTINUOUS DOWNWARD EDGE DEFLECTION.

DUCTILITY - THE ABILITY OF A METAL TO BE DEFORMED WITHOUT FRACTURING. MEASURED BY ELONGATION & REDUCTION OF AREA.

EARING - WAVY PROJECTIONS FORMED AT THE OPEN END OF A CUP OR SHELL IN THE COURSE OF DEEP DRAWING.

ECCENTRICITY - DEVIATION FROM A COMMON CENTER.

EDGING - THE DRESSING OF A METAL STRIP. I.E. DEBURRING

ELASTIC LIMIT - MAX. STRESS TO WHICH MATERIAL MAY BE SUBJECTED TO WITHOUT PERMANENT STRAIN REMAINING.

ELECTRICAL CONDUCTIVITY - THE CAPACITY OF A MATERIAL TO CONDUCT ELECTRIC CURRENT.

ELECTRICAL RESISTIVITY - THE ELECTRICAL RESISTANCE OF METAL.

ELONGATION - IN TENSILE TESTING, THE INCREASE IN GAGE LENGTH, MEASURED BEFORE FRACTURE OF THE SPECIMEN. GIVEN IN %.

EXFOLIATION - A TYPE OF CORROSION THAT PROGRESSES APPROX. - IMATELY PARALLEL TO THE OUTER SURFACE OF THE METAL, CAUSING LAYERS OF THE METAL TO BE ELEVATED BY THE CORROSION .

EMBOSSING - RAISING OR INDENTING A DESIGN IN METAL BY PASSING THE METAL THROUGH ROLLERS WITH A PATTERN.

EXTRUSION - SHAPING METAL BY PASSING THROUGH SERIES OF DIES.

FATIGUE - THE PHENOMENON LEADING TO THE FRACTURE UNDER REPEATED OR FLUCTUATING STRESS. FATIGUE FRACTURES ARE PROGRESSIVE AND MINUTE. CRACKS GROW UNDER STRESS.

FATIGUE STRENGTH - THE MAXIMUM STRESS THAT CAN BE SUSTAINED FOR A SPECIFIC NUMBER OF CYCLES WITHOUT FAILURE.

FIBER STRESS - LOCAL STRESS THROUGH A SMALL AREA ON A SECTION WHERE THE STRESS IS NOT UNIFORM, ... AS A BEAM UNDER LOAD.

FIN STOCK - COILED SHEET OR FOIL IN SPECIFIC ALLOYS, AND TEMPERS AND THICKNESS SUITABLE TO MAKE FINS FOR HEAT EXCHANGERS.

FERRALLOY - AN ALLOY OF IRON WITH A SUFFICIENT AMOUNT OF SOME ELEMENT OR ELEMENTS SUCH AS MANGANESE, CHROME OR VANADIUM FOR USE AS A MEANS OF ADDING THESE ELEMENTS TO MOLTEN STEEL.

FERROUS - IRON BASED ALLOYS.

FLAKES- "SHATTER CRACKS" OR "SNOWFLAKES". SHORT DISCONTINUOUS INTERNAL FISSURES IN FERROUS METALS .

FLAME ANNEALING - SOFTENING THE MATERIAL BY THE APPLICATION OF HEAT FROM A HIGH TEMPERATURE FLAME.

FLUTING - KINKING OR BREAKAGE DUE TO CURVING OF A METAL STRIP CAUSED BY STRETCHING THE MATERIAL BEYOND ITS ELASTIC LIMIT.

FOIL - COIL OR SHEET BELOW THE THICKNESS OF .006

FORGING - PLASTICALLY DEFORMING METAL, USUALLY HOT, INTO DESIRED SHAPES WITH COMPRESSIVE FORCE, WITH OR WITHOUT DIES.

FRACTURE - SURFACE APPEARANCE WHEN SURFACE IS BROKEN.

FRACTURE TEST - BREAKING OF THE SURFACE FOR EXAMINATION OF COMPOSITION, GRAIN SIZE, CASE DEPTH AND THE PRESENCE OF DEFECTS.

DEFINITIONS OF METAL TERMS

FRACTOGRAPHY - DESCRIPTIVE TREATMENT OF FRACTURE WITH SPECIFIC REFERENCE TO PHOTOGRAPHS OF THE FRACTURED SURFACE

FREE MACHINING - THE MACHINING CHARACTERISTICS OF A METAL TO TO WHICH AN ALLOY HAS BEEN ADDED, TO FACILITATE MACHINING.

FRETTING - ACTION THAT RESULTS IN SURFACE DAMAGE, ESPECIALLY IN A CORROSIVE ENVIRONMENT, WHERE THERE IS RELATIVE MOTION BETWEEN SOLID SURFACES IN CONTACT UNDER PRESSURE.

GAGES - STANDARD NUMBERING SYSTEM FOR DECIMALS OR DIAMETERS.

GALLING - DAMAGE TO ONE OR BOTH METALLIC SURFACES BY REMOVAL OF PARTICLES DUE TO SEIZURE DURING SLIDING MOTION.

GALVANIC CORROSION - CORROSION ASSOCIATED WITH THE CURRENT OF A GALVANIC CELL CONSISTING OF TWO DISSIMILAR CONDUCTORS IN A ELECTROLYTE OR TWO SIMILAR CONDUCTORS IN DISSIMILAR ELECTRO-LYTES.

GRAIN - A MANY SIDED CRYSTAL CONSISTING OF GROUPS OF ATOMS, BOUND TOGETHER IN A REGULAR GEOMETRIC PATTERN. USUALLY THE GRAIN IS REPORTED ONLY ON ONE PLANE. THE GRAIN SIZE IS AN INDICATION OF THE DUCTILITY OF THE METAL.

GRAIN GROWTH - AN INCREASE IN CRYSTAL SIZE AS ANNEALING TEMPERATURE IS INCREASED.

GRANULAR FRACTURE - A TYPE OF IRREGULAR SURFACE PRODUCED WHEN METAL IS BROKEN. IT IS ROUGH AND GRAINY.

GRAPHITIZING - ANNEALING A FERROUS METAL IN A WAY THAT SOME OR ALL OF THE CARBON IS PRECIPITATED AS GRAPHITE.

GRINDING CRACKS - SHALLOW CRACKS CAUSED BY EXCESSIVE HEAT CAUSED IN GRINDING OR THE SENSITIVITY OF THE MATERIAL.

GUN DRILL - A DRILL, USUALLY WITH ONE OR MORE FLUTES AND WITH A COOLANT PASSAGE IN THE DRILL BODY, USED FOR DEEP HOLE DRILLING.

HARD DRAWING - DRAWING METAL WIRE THROUGH A DIE TO REDUCE SIZE AND INCREASE TENSILE STRENGTH. SEE COLD WORK.

HARDNESS - THE DEGREE TO WHICH METAL WILL RESIST CUTTING, BENDING, ABRASION, STRETCHING AND PENETRATION. THERE ARE MANY WAYS OF MEASURING .. I.E. ROCKWELL, VICKERS, BRINELL. TENSILE STRENGTH IS ALSO A WAY OF MEASURING HARDNESS.

HARDENABILITY - THE PROPERTY THAT DETERMINES THE DEPTH AND DISTRIBUTION OF HARDNESS INDUCED BY QUENCHING (FERROUS ONLY)

HARDENING - INCREASING THE HARDNESS USUALLY BY HEATING AND COOLING IN A PRESCRIBED MANNER FOR THE PARTICULAR ALLOY.

HEAT OF STEEL - THE PRODUCT OF A SINGLE MELTING OPERATION AT THE PRODUCING MILL. THE **HEAT NUMBER** IDENTIFIES THE MELT.

HEAT AFFECTED ZONE - THE PORTION OF THE BASE METAL WHICH WAS NOT MELTED IN BRAZING, WELDING OR CUTTING, BUT WHOSE MICRO-STRUCTURE AND PHYSICAL PROPERTIES WAS AFFECTED BY HEAT.

HEAT TREATMENT- CHANGING THE PROPERTIES OF A METAL BY SUBSEQUENT HEATING AND COOLING.

HERRINGBONE STREAKS - ELONGATED ALTERNATE BRIGHT AND DULL MARKINGS AT AN ANGLE TO THE ROLLING DIRECTION AND HAVING THE APPEARANCE OF A HERRINGBONE PATTERN.

HONING - REMOVING STOCK GENERALLY ON THE INTERNAL CYLINDRICAL WORKPIECE WITH AN ABRASIVE STICK MOUNTED IN A HOLDER.

IMPACT - A PART FORMED IN A PRESS FROM A METAL SLUG IN A DIE, USUALLY COLD AND BY RAPID APPLICATION OF FORCE CAUSING THE METAL TO FLOW AROUND THE PUNCH AND/OR THROUGH AN OPENING IN THE DIE.

IMPACT TEST - TEST TO DETERMINE THE RESISTANCE OF METAL TO BREAKAGE BY IMPACT. SEE **CHARPY TEST.**

INCLUSIONS - A DEFECT. PARTICLES OF IMPURITIES IMBEDDED IN STEEL.

INDUCTION HARDENING - QUENCH HARDENING BY ELECTRICAL INDUCTION.

INDENTATION HARDNESS - A TEST OF HARDNESS BY MEASURING THE PENETRATION OF A POINTED OR ROUNDED INDENTER INTO THE METAL.

INTERLEAVING - PLACEMENT OF PAPER BETWEEN LAYERS OF STEEL.

INTERMEDIATE ANNEALING - SOFTENING MATERIAL BETWEEN PERIODS WORK HARDENING. EXAMPLE, BETWEEN VERY DEEP DRAWS.

IRON (FE) - THE BASIC ELEMENT IN FERROUS STEELS.

ISOTHERMAL ANNEALING - PROCESS WHEREBY A FERROUS ALLOY IS HEATED TO PRODUCE A STRUCTURE WHOLLY OR PARTIALLY AUSTENITIC, AND THEN COOLED TO AND HELD AT A TEMPERATURE THAT CAUSES TRANSFORMATION OF THE AUSTENITE TO A RELATIVELY SOFT FERRITE-CARBIDE AGGREGATE.

IZOD TEST - AN IMPACT TEST SIMILAR TO THE CHARPY TEST.

LADLE ANALYSIS - THE ANALYSIS OF A TEST INGOT SAMPLE OBTAINED DURING THE POURING OF THE STEEL FROM A LADLE.

LAMINATIONS - A DEFECT WHICH APPEARS IN SHEETS OR STRIPS AS LAYERS INSTEAD OF A SOLID. CAUSED BY GAS POCKETS IN THE ORIGINAL INGOT. THE LAYERING RUNS THE DIRECTION OF THE ROLLING.

LAP - SURFACE DEFECT, APPEARING AS A SEAM, CAUSED BY FOLDING OVER HOT METAL, FINS OR SHARP CORNERS AND THEN ROLLING OR FORGING THEM INTO THE SURFACE.

LAP WELD - TWO PIECES OF METAL LAPPED, THEN WELDED. NORMALLY THE EDGES ARE BEVELED OR SCARFED FOR BETTER WELDING.

LEVELING - FLATTENING ROLLED METAL BY PASSING IT THROUGH ROLLERS OR BY STRETCHING THE SHEET. (STRETCHER LEVELING)

LIGHT METALS - LOW-DENSITY METALS SUCH AS ALUMINUM, MAGNESIUM, TITANIUM, BERYLLIUM OR OTHER ALLOYS.

LOW CARBON STEELS - STEEL WHICH CONTAINS 0.10 - 0.30 % CARBON, AND LESS THAN 0.60% MANGANESE.

M B GRADE - A STEEL WIRE (.45/.75 C) WIDELY USED FOR SPRINGS.

MACHINABILITY - THE RELATIVE EASE OF MACHINING A METAL.

MACHINABILITY INDEX - STANDARDIZED TEST OF RELATIVE MACHINABILITY.

MACRO-ETCH TEST - EVALUATES THE SOUNDNESS AND HOMOGENEITY OF MATERIAL BY IMMERSING A SAMPLE OF THE STEEL IN HOT ACID AND EXAMINING THE ETCHING.

MACROSCOPIC - VISUAL INSPECTION WITH EITHER THE NAKED EYE OR UNDER LOW MAGNIFICATION.

MAGNETIC-PARTICLE INSPECTION - A NONDESTRUCTIVE METHOD OF INSPECTION TO DETERMINE THE EXISTENCE AND EXTENT OF POSSIBLE DEFECTS IN FERROMAGNETIC MATERIALS.

MALLEABILITY - THE PROPERTY THAT DETERMINES THE EASE OF DE-FORMING A METAL WHEN THE METAL IS SUBJECTED TO ROLLING OR HAMMERING. THE MORE MALLEABLE, THE EASIER TO WORK.

MARTENSITE - A DISTINCTIVE NEEDLE-LIKE STRUCTURE EXISTING IN STEEL AS A TRANSITION STAGE IN THE TRANSFORMATION OF AUSTENITE. IT IS THE HARDEST CONSTITUENT OF STEEL OF EUTECTOID COMPOSIT-ITION. IT IS THE CHIEF COMPOSITION OF HARDENED TOOL STEEL.

MATTE OR MATTE FINISH - NOT AS SMOOTH AS NORMAL MILL FINISH. PRODUCED BY ETCHING OR BY ROLLING WITH ROUGHENED ROLLS.

MECHANICAL PROPERTIES - THE PROPERTIES OF A MATERIAL THAT REVEAL ITS ELASTIC AND INELASTIC BEHAVIOR WHEN FORCE IS APPLIED, THEREBY INDICATING ITS SUITABILITY FOR MECHANICAL APPLICATIONS: FOR EXAMPLE , MODULUS OF ELASTICITY, TENSILE STRENGTH, ELONGATION, HARDNESS AND FATIGUE LIMIT.

MICROSTRUCTURE - THE STRUCTURE OF POLISHED AND ETCHED METALS AS REVEALED BY A MICROSCOPIC MAGNIFICATION OF 10 DIAMETERS OR MORE.

MODULUS OF ELASTICITY - A MEASURE OF THE RIGIDITY OF METAL. ALSO CALLED THE "COEFFICIENT OF ELASTICITY".

METALLOID - IN STEEL IT COVERS ELEMENTS COMMONLY PRESENT IN SIMPLE STEEL.. CARBON, MANGANESE, PHOSPHORUS, SILICON AND SULFUR.

MILL EDGE - EDGE OF SHEET, PLATE OR STRIP WHICH IS UNTRIMMED

MILL FINISH - AS PRODUCED BY MILL. NORMALLY DULL.

MUNTZ METAL - A REFRACTORY METAL. 60 % COPPER AND 40% ZINC. USED FOR CASTINGS AND HOT-WORKED PRODUCTS. HIGH STRENGTH BRASSES ARE DEVELOPED FROM THIS BY ADDING OTHER ELEMENTS.

MUSIC WIRE - THIS IS THE HIGHEST TENSILE (POLISHED) WIRE MADE.

NICKEL SILVER - COPPER BASED ALLOY WITH 20-45% ZINC AND 5-30% NICKEL.

NIOBIUM (NB) - SEE COLUMBIUM

NITRIDING - INTRODUCING NITROGEN TO HARDEN FERROUS STEEL.

NITRIDING STEEL- STEEL WHICH IS PARTICULARLY SUITED GOR THE NIT-RIDING PROCESS. IT FORMS A VERY HARD AND ADHERENT SURFACE UPON PROPER NITRIDING. (.20-.40 C, .90-1.50 CH, .15-1.0 MO, .85-1.20 AL)

NON-FERROUS METALS - METALS WITH NO OR LITTLE IRON.

NORMALIZING - HEATING A FERROUS ALLOY TO A SUITABLE TEMP-ATURE ABOVE THE TRANSFORMATION RANGE AND THEN COOLING IN AIR TO A TEMPERATURE SUBSTANTIALLY BELOW TRANSFORMATION RANGE. IT REFINES THE CRYSTAL STRUCTURE AND RELIEVES STRESS

OIL HARDENING STEEL- STEEL WHICH IS HARDENED BY HEAT TREAT-MENT AND QUENCHED IN OIL.

OLSON TEST - A METHOD OF MEASURING THE DUCTILITY AND DRAWING PROPERTIES OF STRIP OR SHEET METAL. THE METAL IS DRAWN OVER A BALL UNTIL THERE IS A FRACTURE.

OPEN HEARTH FURNACE - A TYPE FURNACE WHERE THE FLAME PASSES OVER THE CHARGE IN THE HEARTH, CAUSING THE CHARGE TO BE HEATED BOTH BY DIRECT FLAME AND RADIATION FROM THE LOW ROOF AND SIDEWALLS OF THE FURNACE.

ORANGE PEEL - THE PEBBLE-GRAINED SURFACE WHICH DEVELOPS IN FORMING OF METALS WITH COURSE GRAINS.

OSCILLATED WOUND - COIL WOUND ON A REEL LIKE THREAD, AS OPPOSED TO RIBBON OR PANCAKE WOUND WHICH IS WOUND SIMILAR TO A ROLL OF TAPE.

ORIENTATION - HAS TO DO WITH THE ARRANGEMENT OF CRYSTAL DIRECTION IN A PLANE. EITHER "PREFERRED " OR "RANDOM".

OXIDATION - THE ADDING OF OXYGEN TO A COMPOUND. EXPOSURE TO ATMOSPHERE SOMETIMES RESULTS IN OXIDATION OF THE EXPOSED SURFACE RESULTING IN A STAINING OR DISCOLORATION. INCREASED TEMPERATURE INCREASES THE OXIDATION.

OXIDE - A COMPOUND OF OXYGEN WITH ANOTHER ELEMENT.

PACK ROLLING - ROLLING TWO OR MORE PIECES OF STEEL TOGETHER. PACK ROLLING IS OFTEN USED FOR ROLLING SHEET INTO THIN FOIL.

PASSIVATING - THE CLEANING OF METAL OR PART BY IMMERSION IN A ACID BATH. USUALLY DONE AFTER FABRICATION.

DEFINITIONS OF METAL TERMS

PENETRANT INSPECTION - NON-DESTRUCTIVE TEST TO CHECK FOR THE EXISTENCE OR EXTENT OF DISCONTINUITIES THAT ARE OPEN TO THE SURFACE. A PENETRATING DYE IS USED FOR THIS TEST.
PERMALLOY - NICKEL ALLOYS CONTAINING ABOUT 20 -60% FE, USED FOR THEIR HIGH MAGNETIC PERMEABILITY AND ELECTRICAL RESISTIVITY.
PERMANENT SET -THE DEFORMATION OF METAL UNDER STRESS, THAT OCCURS AFTER PASSING ITS ELASTIC LIMIT.
PHYSICAL PROPERTIES - THE PROPERTIES, OTHER THAN MECHANICAL, THAT PERTAIN TO THE PHYSICS OF A MATERIAL. I.E. DENSITY, HEAT AND ELECTRICAL CONDUCTIVITY, THERMAL EXPANSION ETC.
PICKLING - REMOVING SURFACE OXIDES FROM METALS BY CHEMICAL OR ELECTROCHEMICAL REACTION. IN STAINLESS IT TURNS MATERIAL GRAY.
PIN EXPANSION TEST - A TEST FOR DETERMINING THE ABILITY OF TUBES TO BE EXPANDED OR FOR REVEALING THE PRESENCE OF CRACKS OR LONGITUDINAL WEAKNESS.
PIN HOLES - MICROSCOPIC IMPERFECTIONS IN THE SURFACE OR THROUGH A LAYER OR THICKNESS OF METAL.
PIPE- 1) A TUBULAR METAL PRODUCT. 2) **DEFECT.** A CAVITY IN A CASTING BILLET OR INGOT CAUSED BY CONTRACTION OR SHRINKAGE.
PITTING - SMALL SHARP CAVITIES IN A METAL SURFACE.
PLANIMETRIC METHOD - A METHOD OF MEASURING GRAIN SIZE. THE GRAINS WITHIN A SPECIFIC AREA ARE COUNTED.
PLASTIC DEFORMATION - SEE **PERMANENT SET**
PLASTICITY - THE ABILITY OF A METAL TO BE DEFORMED EXTENSIVELY WITHOUT RUPTURE.
PLATING - A THIN COAT OF METAL LAID ON ANOTHER METAL BY ELECTRO-PLATING, GALVANIZING, TINNING, ETC.
POT ANNEALING - SEE **BOX ANNEALING**
POWDER METALLURGY - THE ART OF PRODUCING POWDERED METALS AN UTILIZING METAL POWDERS FOR PRODUCTION OF PARTS.
PRECIPITATION HARDENING - HARDENING CAUSED BY THE PRECIPITATION OF A CONSTITUENT FROM A SUPERSATURATED SOLID SOLUTION.
PRECIPITATION HEAT TREATMENT - RELATES TO NON-FERROUS METAL ANY OF THE VARIOUS AGING TREATMENTS, DONE AT ELEVATED TEMP-ERATURES TO IMPROVE CERTAIN MECHANICAL PROPERTIES.
PRIME - MATERIAL FREE FROM VISIBLE SURFACE DEFECTS.
PROCESS ANNEALING - THE FERROUS ALLOY IS HEATED TO A TEMPER-ATURE JUST BELOW THE LOWER LIMIT OF THE TRANSFORMATION TEMPERATURE AND THEN COOLED. THIS SOFTENS THE MATERIAL.
PROOF STRESS - 1) THE STRESS THAT WILL CAUSE A SPECIFIED SMALL PERMANENT SET IN A MATERIAL. 2) A SPECIFIED STRESS TO BE APPLIED TO A MEMBER OR STRUCTURE TO INDICATE ITS ABILITY TO WITHSTAND SERVICE LOADS.
PULSE-ECHO METHOD - A NON-DESTRUCTIVE TEST IN WHICH PULSES OF ENERGY ARE DIRECTED INTO A PART AND THE TIME FOR THE ECHO TO TO RETURN FROM ONE OR MORE REFLECTING SURFACE IS MEASURED.
PUNCH - MOVABLE PART THAT FORCES METAL INTO A DIE. USED FOR BLANKING, COINING, EMBOSSING, DRAWING, STAMPING, ETC.
QUENCHING - THE STEP OF COOLING METALS QUICKLY. THE QUENCHING CAN BE DONE IN WATER OR OIL.
RADIOGRAPHY - A NON-DESTRUCTIVE METHOD IN INTERNAL EXAMINATION. METAL OBJECTS ARE EXPOSED TO X-RAYS OR GAMMA RADIATION.
RECRYSTALLIZATION - A PROCESS WHERE DISTORTED GRAIN STRUCTURES IN COLD WORKED METAL IS REPLACED BY NEW, STRESS FREE GRAIN STRUCTURES BY CERTAIN ANNEALING PROCESSES.
REFINING TEMPERATURE - A TEMPERATURE USED IN HEAT TREATMENT OF STEEL TO REFINE THE STRUCTURE AND GRAIN SIZE.
REFRACTORY - A HEAT RESISTANT MATERIAL, USUALLY NONMETALLIC, WHICH IS USED FOR FURNACE LINING.
REFRACTORY ALLOY - METAL WITH EXTREMELY HIGH MELTING POINT.
RESIDUAL STRESS - MACROSCOPIC STRESSES THAT ARE SET UP WITHIN A METAL AS A RESULT OF NON-UNIFORM PLASTIC DEFORMATION.
RESIDUALS - THE "TRACE" ELEMENTS NOT NAMED IN SPECIFICATIONS. THEY ARE THE RESULT OF CONTAMINATED SCRAP.
RIBBON WOUND - STRIP WOUND LAYER ON TOP OF LAYER...AS A ROLL OF TAPE. THIS TYPE OF ROLLING IS DONE AROUND A CORE.
RIPPLE - DEFECT. SLIGHT TRAVERSE WAVE OR SHADOW APPEARING AT INTERVALS ALONG THE STRIP OR SHEET.
ROCKWELL HARDNESS - A STANDARD METHOD OF MEASURING HARD-NESS. IT IS A MEASUREMENT OF PENETRATION UNDER SPECIFIC LOAD.
ROLLED EDGE - THE DEBURRING OF AN EDGE BY A SYSTEM OF ROLLERS WHICH SHAPE THE EDGE OF THE MATERIAL.
ROTARY SHEAR - A CUTTING MACHINE WITH SHARPENED CIRCULAR BLADES. A SLITTER.
SALT FOG (SPRAY) TEST - A CORROSION TEST IN WHICH THE METAL IS SUBJECTED TO A FINE MIST OF SALT WATER.
SCAB - A BLEMISH ON A CASTING.
SCALING - 1) LAYERS OF OXIDATION 2) THE REMOVAL OF SCALE FROM METAL.
SCALPING - THE SURFACE MATCHING OF SURFACE LAYERS OF INGOTS, BILLETS AND SLABS BEFORE MACHINING.
SCARFING - CUTTING OR GRINDING OUT DEFECTS FROM INGOTS, BILLETS, OR THE EDGES OF PLATES THAT ARE TO BE BEVELED FOR BUTT WELDING.
SCLEROSCOPE HARDNESS TEST - A HARDNESS TEST IN WHICH A DIAMOND POINTED HAMMER IS DROPPED ONTO METAL AND THE HEIGHT OF THE BOUNCE IS MEASURED.
SCREW STOCK- FREE MACHINING BAR, ROD OR WIRE.
SKELP - A PIECE OR STRIP OF METAL PRODUCED TO A SUITABLE THICKNESS, WIDTH AND EDGE FROM WHICH PIPE OR TUBING IS MADE.
SEAM - DEFECT. A CRACK ON THE SURFACE OF METAL THAT HAS BEEN CLOSED, BUT NOT WELDED. IT IS CAUSED IN CASTING OR WORKING.
SECONDS - A DESIGNATION GIVEN TO MATERIAL THAT HAS SURFACE DEFECTS. MATERIAL OF LESS THAN PRIME QUALITY.
SECONDARY HARDENING - TEMPERING CERTAIN ALLOY STEELS AT CERTAIN TEMPERATURES SO THAT THE RESULTING HARDNESS IS GREATER THAT THAT OBTAINED BY TEMPERING THE SAME STEEL AT SOME LOWER TEMPERATURE FOR THE SAME TIME.
SEGREGATION - NON-UNIFORM DISTRIBUTION OF ALLOYING ELEMENTS, IMPURITIES OR MICROPHASES.
SHEAR - A MACHINE FOR CUTTING STEEL.
SHEAR STRENGTH - THE STRESS REQUIRED TO PRODUCE FRACTURE IN THE PLANE OF A PIECE OF METAL.
SHEAR CRACK - A CRACK OR FRACTURE CAUSED BY SHEAR STRESS.
SHIM - A THIN (HARD) FLAT METAL USED FOR TOOL, DIE AND MACHINE ALIGNMENT PURPOSES.
SHORE HARDNESS TEST - SEE **SCLEROSCOPE HARDNESS TEST**
SHORT - BRITTLE
SHORTNESS - A FORM OF BRITTLENESS IN METAL. IT IS DESIGNATED AS AS "COLD," "HOT," "AND "RED" TO INDICATED THE TEMPERATURE RANGE IN WHICH THE BRITTLENESS OCCURS.
SILKY FRACTURE - A VERY SMOOTH FINE GRAIN SILKY APPEARING FRACTURE.
SILVER SOLDERS - ALLOYS OF SILVER, COPPER, ZINC AND OTHER METALS USED FOR MAKING STRONG YET MODERATELY DUCTILE JOINTS THAT RESIST CORROSION.
SINTERING - CONVERTING METAL POWDER INTO A MASS BY HEATING AFTER COMPRESSING.
SKIN - A THIN SURFACE LAYER THAT IS DIFFERENT FROM THE MAIN MASS OF METAL IN COMPOSITION, STRUCTURE OR OTHER CHARACTERISTICS .
SLAB - SEE **BLOOM**
SLIT EDGE - THE EDGE RESULTING FROM A SLITTING OPERATION.
SLIVER - DEFECT - LOOSE METAL PIECE ROLLED INTO THE SURFACE OF THE METAL DURING THE ROLLING OPERATION.
SLUG - A METAL BLANK FOR FORGING OR IMPACTING.
SOAKING - PROLONGED HEATING OF METAL AT SELECTED TEMPERATURE.
SOLID SOLUTION - A SINGLE SOLID HOMOGENEOUS CRYSTALINE PHASE CONTAINING TWO OR MORE CHEMICAL SPECIES.
SOLUTION HEAT TREATMENT - HEATING AN ALLOY TO A SUITABLE TEMPERATURE, HOLDING AT THAT TEMPERATURE LONG ENOUGH TO ALLOW ONE OR MORE CONSTITUENTS TO ENTER INTO SOLID HEATING SOLUTION.
SORBITE - STRUCTURE OF STEEL, RESULTING FROM THE TEMPERING OF MARTENSITE.
SPALLING - THE CRACKING AND FLAKING OF PARTICLES OF A SURFACE.
SPECIFIC GRAVITY - A NUMERICAL VALUE REPRESENTING THE WEIGHT OF A GIVEN SUBSTANCE AS COMPARED WITH THE WEIGHT OF AN EQUAL VOLUME OF WATER.
SPHERODIZING - HEATING AND COOLING TO PRODUCE A SPHERICAL OR GLOBULAR FORM OF CARBON IN STEEL.
STABILIZING TREATMENT - A THERMAL PROCESS INTENDED TO STABILIZE THE STRUCTURE OF AN ALLOY OR DIMENSIONS OF A PART.
STAINLESS STEEL - CORROSION RESISTANT STEEL IN A WIDE VARIETY OF TYPES, BUT ALWAYS CONTAINING A LARGE AMOUNT OF CHROMIUM.
STAMPING - A TERM USED TO REFER TO VARIOUS PRESS FORMING OPERATIONS IN COINING, EMBOSSING, BLANKING AND PRESSING.
STICKER - THE ADHERING OF STEEL SHEET OR STRIP. USUALLY CAUSED BY OVERHEATING DURING BOX ANNEALING.
STRAIN - DEFORMATION PRODUCED ON A BODY BY AN OUTSIDE FORCE.
STRAIN AGING - AGING INDUCED BY COLD WORKING. SEE AGING.
STRAIN HARDENING - AN INCREASE IN HARDNESS AND STRENGTH CAUSED BY PLASTIC DEFORMATION AT LOWER THAN THE RECRYSTALLIZATION RANGE.
STRESS RELIEVING - HEATING TO A SUITABLE TEMPERATURE, HOLDING LONG ENOUGH TO REDUCE RESIDUAL STRESSES AND THEN COOLING SLOWLY ENOUGH TO MINIMIZE DEVELOPING NEW RESIDUAL STRESSES.
STRETCH FORMING - FORMING PANELS AND COWLS OF LARGE CURVATURE BY STRETCHING SHEET OVER A FORM OF DESIRED SHAPE. THIS IS MORE RAPID THAN HAMMERING AND BEATING.

DEFINITIONS OF METAL TERMS

STRETCH FORMING - FORMING PANALS AND COWLS OF LARGE CURVATURE BY STRETCHING SHEET OVER A FORM OF DESIRED SHAPE.
STRETCHER LEVELING - LEVELING SHEETS OF METAL BY GRIPPED AT BOTH ENDS AND STRETCHED BEYOND ITS YIELD STRENGTH
STRETCHER STRAINS - ELONGATED MARKINGS ON THE SURFACE THAT APPEAR WHEN DEFORMED JUST PAST THE YIELD POINT.
STRUCTURE - THE ARANGEMENT OF PARTS: IN CRYSTALS, ESPECIALLY, THE SHAPE AND DIMENSION OF THE UNIT CELL, AND THE NUMBER, KINDS POSITIONS OF THE ATOMS WITHIN IT.
SUCK-IN - A DEFECT CAUSED WHEN ONE FACE OF A FORGING IS SUCKED IN TO FILL A PROJECTION ON THE OPPOSITE SIDE.
SUPERALLOY - AN ALLOY DEVELOPED FOR VERY HIGH TEMPERATURE SERVICE WHERE RELATIVELY HIGH STRESSES (TENSILE, THERMAL, VIBRATORY AND SHOCK) ARE ENCOUNTERED AND WHERE OXIDATION RESISTANCE IS FREQUENTLY REQUIRED.
TELESCOPING - TRANSVERSE SLIPPING OF SUCCESSIVE LAYERS OF A COIL SO THAT THE ENDS OF THE COIL OR CONICAL VS FLAT.
TEMPER - USED GENERALLY TO MEAN HARDNESS OR TOUGHNESS. TEMPER CAN BE INDUCED BY COLD WORKING (COLD ROLLING), HEAT TREATMENT OR OTHER MEANS OF AGING.
TENSILE STRENGTH - ALSO CALLED **"ULTIMATE STRENGTH"**. THE BREAKING STRENGTH OF A MATERIAL WHEN SUBJECTED TO A TENSILE (STRETCHING) FORCE. EXPRESSED IN LBS OR TONS PER SQUARE INCH
TENSILE TEST- SEE **TENSILE STRENGTH**
TERNARY ALLOY - AN ALLOY THAT CONTAINS 3 PRINCIPLE ELEMENTS.
TERNE PLATE - SHEET STEEL, COATEDWITH LEAD-TINALLOY.
TOLERANCE - PERMISSABLE DEVIATION FROM A SPECIFIED DIMENSION.
TOOLING PLATE - A CAST OR ROLLED PRODUCT OF RECTANGULAR CROSS SECTION OF THICKNESS OF 1/4" OR GREATER, AND WITH EDGES EITHER AS CAST, SHEARED OR SAWED, WITH INTERNAL STRESS LEVELS CONTROLLED TO ACHIEVE MAXIMUM STABILITY FOR MACHINING PURPOSES IN TOOL & JIG APPLICATIONS.
TORSION - A TWISTING ACTION RESULTING IN SHEAR STRESSES & STRAIN.
TOUGHNESS - ABILITY TO RESIST FRACTURING OR DISTORTION.
TRACE - EXTREMELY SMALL QUANTITY OF AN ELEMENT, USUALLY TOO SMALL TO DETERMINE QUANTITATIVELY.
TRANSFORMATION RANGE - TEMPERATURE RANGE OVER WHICH A CHEMICAL OR METALLURGICAL CHANGE TAKES PLACE.
TRANSVERSE - LITERALLY "ACROSS," USUALLY MEANING A DIRECTION PERPENDICULAR TO THE DIRECTION OF WORKING OR ROLLING.
TUMBLING - CLEANING ARTICLES BY ROTAING THEM IN A CYLINDER WITH CLEANING MATERIALS.
ULTIMATE STRENGTH - SEE **"TENSILE STRENGTH."**
UPSETTING - 1) A METAL WORKING OPERATION SIMILAR TO FORGING 2) THE PROCESS OF AXIAL FLOW UNDER AXIAL COMPRESSION OF METAL, AS IN FORMING HEADS ON RIVETS BY FLATTENING THE END OF WIRE.
VACCUM MELTING - MELTING IN A VACUUM TO PREVENT CONTAMIINATION FROM AIR AS WELL AS TO REMOVE GASES ALREADY DISSOVED IN THE METAL: THE SOLIDIFICATION MAY ALSO BE CARRIED OUT IN A VACUUM OR AT LOW PRESSURE.
VENT MARK - A SMALL PROTRUSION ON A FORGING OR CASTING RESULTING FROM THE ENTRANCE OF METAL INTO A DIE OR MOLD VENT HOLES.
VIBRATED WOUND - SEE **"OSCILLATAED WOUND COILS"**
VICKERS HARDNESS (TEST) - A HARDNESS TEST FOR METALS, ESPECIALLY THOSE WITH EXTREMELY HARD SURFACES. IT USES A DIAMOND PENETRATOR.
WASTERS - CARBON STEELS. DEFECTIVE SHEETS.. MAYBE THE ENDS OF LARGE COILS.
WATER HARDENING - HIGH CARBON STEELS THAT ARE WATER QUENCHED AFTER HEAT TREATING
WAVEY - DEFECT. A SLIGHT OR SIGNIFICANT WAVE BEYOND STANDARDS SET FOR FLATNESS.
WEDGE SHAPED - A STRIP WHICH IS THINNER ON ONE SIDE THAN THE OTHER SIDE. ONE OF SEVERAL REASONS FOR CAMBER.
WELDING - A PROCESS OF JOINING TWO PIECES OF STEEL USING HEAT.
WORK HARDENING - SEE **COLD WORKING.**
WROUGHT IRON - IRON CONTAINING ONLY A SMALL AMOUNT OF OTHER ELEMENTS. IT IS MORE RUST RESISTANT FROM STEEL AND FORMS AND WELDS EASIER.
YIELD POINT - THE LOAD PER UNIT OF ORIGINAL CROSS SECTION AT WHICH, IN SOFT STEEL, A MARKED INCREASE IN DEFORMATION OCCURS WITHOUT AN INCREASE IN LOAD. ONLY CERTAIN METALS EXHIBIT A YIELD POINT. IF THERE IS A DECREASE IN STRESS AFTER YIELDING, A DISTINCTION MAY BE MADE BETWEEN UPPER AND LOWER YIELD POINTS.
YIELD STRENGTH - THE STRESS AT WHICH A MATERIAL EXHIBITS A SPECIFIED DEVIATION FROM PROPORTIONALITY OF STRESS AND STRAIN. AN OFFEST OF 2% IS USED FOR MANY METALS.
YOUNG'S MODULUS - THE COEFFICIENT OF ELASTICITY OF STRETCHING.

EFFECTS OF ELEMENTS ON STEEL

THE EFFECTS OF ELEMENTS ALLOYED IN CARBON, ALLOY AND STAINLESS STEELS CAN BE EITHER BENEFICIAL OR DETRIMENTAL DEPENDING ON BOTH THE QUANTITY OF THE ELEMENT OR ITS COMPANION ELEMENTS.

ALUMINUM (Al) : PROMOTES FINE GRAINS IN LOW-CARBON STEELS WHILE RETARDING THE SUSCEPTIBILITY TO AGE HARDENING. CONTRIBUTES TO THE PRECIPITATION HARDENING QUALITIES OF SOME STAINLESS STEELS.

CARBON (C) : THE PRINCIPAL ALLOYING ELEMENT FOR THE STRENGTHENING AND HARDENING OF CARBON AND ALLOY STEELS, USUALLY WITH A SACRIFICE IN DUCTILITY.

CHROMIUM (Ch) : INCREASES HARDENABILITY AND WEAR RESISTANCE OF ALLOY STEELS. IMPROVES RESISTANCE TO CHEMICAL CORROSION AND SCALING IN AIR ATELEVATED TEMPERATURES.

COBALT (C) : INCREASES STRENGTH AND HARDNESS AND PERMITS HIGHER QUENCHING TEMPERATURES. IT ALSO INTENSIFIES THE INDIVIDUAL EFFECTS OF OTHER MAJOR ELEMENTS IN A MORE COMPLEX STEEL.

COLUMBIUM (Cb) + TANTALUM (Ta) : USED IN COMBINATION. STABILIZERS FOR STAINLESS STEELS.

MANGANESE (Mn) : A SULFIDE-FORMER THAT DECREASES THE TENDENCY TO CRACK DURING THE HOT-WORKING OPERATIONS. HARDENS CARBON AND ALLOY STEELS AND PROMOTES WELDABILITY.

MOLYBDENUM (Mo) : INCREASES STRENGTH, HARDNESS, HARDENABILITY, AND TOUGHNESS AS WELL AS CREEP RESISTANCE AND STRENGTH AT ELEVATED TEMPERATURES. IT IMPROVES MACHINABILITY AND RESISTANCE TO CORROSION AND INTENSIFIES THE EFFECT OF OTHER ALLOYING ELEMENTS.

NICKEL (N) : INCREASES STRENGTH AND HARDNESS WITHOUT SACRIFICING DUCTILITY AND TOUGHNESS. ALSO INCREASES RESISTANCE TO CORROSION AND SCALING AT ELEVATED TEMPERATURES.

PHOSPHORUS (P) : INCREASES STRENGTH AND HARDNESS AND IMPROVES MACHINABILITY. HOWEVER IT ADDS MARKED BRITTLENESS OR COLD-SHORTNESS TO STEEL.

SELENIUM (Se) : IMPROVES MACHINABILITY.

SILICON (Si) : A DEOXIDIZER USED FOR "KILLING" STEELS RESULTING IN FINER GRAINS AND IMPROVED DUCTILITY. IMPROVES SCALING RESISTANCE OF STAINLESS STEELS. IMPARTS SPECIAL MAGNETIC PROPERTIES TO IRON BASE ALLOYS. SILICON ALSO STRENGTHENS LOW ALLOY STEELS.

SULFUR (Su) : FORMS LOCALIZED EMBRITTLED STRIATIONS THAT IMPROVE MACHINABILTY WHILE DECREASING DUCTILITY AND IMPACT STRENGTH, PARTICULARLY IN THE TRANSVERSE DIRECTION. DECREASES WELDABILITY.

TITANIUM (Ti) : A CARBIDE-FORMER, IT STABILIZES STAINLESS STEELS TO PROMOTE WELDABILITY WITHOUT SACRIFICING CORROSION RESISTANCE. REFINES GRAINS IN CARBON AND ALLOY STEELS.

TUNGSTEN (W) : INCREASES STRENGTH, HARDNESS, AND TOUGHNESS. TUNGSTEN STEELS HAVE SUPERIOR HOT-WORKING AND GREATER CUTTING EFFICIENCY AT ELEVATED TEMPERATURES.

VANADIUM (V) : FORMS FINE GRAINS AND CONTRIBUTES TO THE DEEP-HARDENING PROPERTIES OF ALLOY STEELS.

CHARACTERISTICS OF STAINLESS STEEL

STAINLESS STEEL AUSTENITIC GRADES (NOT HEAT TREATABLE)		C	Cr	Ni	OTHER (max)	MAGNETIC YES - NO	AVAILABLE FORMS
201	CHROMIUM-NICKEL-MANGANESE STAINLESS MADE AS AN ALTERNATIVE TO T 301 IN MANY APPLICATIONS.	.15	16.0-18.0	3.5-5.5	Mn 5.5-7.5 N .25 P .06	NO	SHEET STRIP
203	CHROMIUM-NICKEL-MANGANESE-COPPER STAINLESS WITH ADDED SULPHUR GIVING SAME CORROSION RESIST. AS T 303 BUT MACHINE FASTER WITH BETTER FINISHES	.08	16.0-18.0	5.0-6.50	Mn 5.0-6.5 S .18-35 Cu 1.75-2.25 Si.20-.70	NO	ROUND BAR FORGINGS
301	CHROMIUM-NICKEL STEEL CAPABLE OF ATTAINING HIGH TENSILE STRENGTH AND DUCTILITY BY COLD WORKING.	.15	16.0-18.0	6.0-8.0	Mn 2.00 P.045 S .030 Si .75 Max	NO	SHEET STRIP WIRE
302	GENERAL PURPOSE CHROMIUM-NICKEL STEEL. CORROSION RESISTANCE BETTER THAN 301, CAN BE WORK HARDENED TO HIGH TENSILE..LESS DUCTILE THAN 301	.15	17.0-19.0	8.0-10.0	Mn 2.00 P .045 S .030 Si .70	NO	STRIP WIRE BAR
303 303SE	300 GRADE WITH INCREASED SULPHUR FOR GOOD MACHINABILITY. T 303SE IS T 303 WITH 0.15-0.35 SELENIUM ADDED TO INCREASE MACHINABILITY.	.08	17.0-19.0	8.0-10.0	Mn 2.00 S .15 Mo .60	NO	BAR WIRE PLATE FORGINGS
304	LOW CARBON CHROMIUM-NICKEL STAINLESS AND HEAT RESISTING STEEL..SUPERIOR TO 302 IN CORROSION RESISTANCE	.08	18.0-20.0	8.0-10.5	Mn 2.00 P.045 S .030 Si .75	NO	SHEET STRIP PLATE BAR WIRE TUBE/PIPE SHAPES FORGINGS CASTINGS
304L	VERY LOW CARBON CHROMIUM-NICKEL STAINLESS SIMILAR TO 304 BUT WITH SUPERIOR RESISTANCE TO INTERGRANULAR CORROSION AFTER WELDING OR STRESS RELIEVING.	.03	18.0-20.0	8.0-11.0	Mn 2.00 P .045 S .03 Si .75	NO	SHEET STRIP PLATE BAR TUBE/PIPE WIRE FORGINGS CASTINGS
302B 303B 304B 316B	THE BASIC GRADE AS DESCRIBED BUT IN IN A WORK HARDENED CONDITION FOR INCREASED STRENGTH.					SLIGHTLY	ROUND BAR
305	A HIGHLY CORROSION RESISTANT ALLOY WITH LOW RATE OF WORK HARDENING. USED FOR EXTRA DEEP DRAWING AND SPINNING APPLICATIONS.	.12	17.0-19.0	10.0-13.0	Mn 2.0 P .045 S .030 Si 1.00	NO	STRIP WIRE
309	A HIGHLY CORROSIVE RESISTANT STEEL USED IN HIGH TEMPERATURE ENVIRON-MENTS. 309S HAS LOWER CARBON FOR REDUCED CARBIDE PRECIPITATION WHEN WELDING.	.08	22.0-24.0	12.0-15.0	Mn 2.00 P .040 S .030 Si 1.00 Mo .75 Cu .50	NO	SHEET STRIP PLATE BAR TUBE/PIPE WIRE FORGINGS
310	SIMILAR TO 309 WITH EVEN GREATER RESISTANCE TO CORROSION AND OXID-ATION AT ELEVATED TEMPERATURES. 310S HAS LOWER CARBON FOR LESS CARBIDE PRECIPITATION IN WELDING.	.08	24.0-26.0	19.0-22.	Mn 2.0 P .045 Si .30-.80 S .030 Mo .50 Cu .50	NO	SHEET STRIP PLATE BAR TUBE/PIPE WIRE FORGINGS
316	CHROMIUM-NICKEL STAINLESS . GOOD HEAT RESISTANCE AND SUPERIOR CORROSION RESISTANCE TO MANY TYPES OF CHEMICAL CORROSIVES. SUPERIOR CREEP STRENGTH AT ELEVATED TEMPS.	.08	16.0-18.0	10.0-14.0	Mn 2.0 P .045 Mo 2.0-3.0 S .03 Si 1.0 Cu .5	NO	SHEET STRIP PLATE BAR TUBE/PIPE WIRE FORGINGS CASTINGS
316L	SIMILAR CORROSION RESISTANCE AS T 316 BUT WITH SUPERIOR RESISTANCE TO INTERGRANULAR CORROSION AFTER WELDING OR STRESS RELIEVING.	.03	16.0-18.0	10.0-14.0	Mn 1.25-2.0 Mo 2.0-3.0 P .04 Si 1.0 Cu .75	NO	SHEET STRIP PLATE BAR WIRE TUBE/PIPE FORGINGS CASTINGS

MANUAL UPDATES: http://www.falcon-metals.com

CHARACTERISTICS OF STAINLESS STEEL

STAINLESS STEEL AUSTENITIC GRADES (NOT HEAT TREATABLE)		C	Cr	Ni	OTHER (max)	MAGNETIC YES - NO	AVAILABLE FORMS
317L	SIMILAR TO T 316 & 316L WITH THE ADDITION OF MORE MOLYBDENUM TO IMPROVE CORROSION RESISTANCE. 317 HAS .08 CARBON MAX.	.03	18.0-20.0	11.0-15.0	Mn 2.00 P .045 S .03 Si 1.00 Mo 3.0-4.0	NO	SHEET STRIP PLATE BAR TUBE/PIPE WIRE FORGINGS CASTINGS
321	TITANIUM STABILIZED 300 GRADE. FOR WELDMENTS SUBJECT TO INTERGRANULAR CORROSION. GOOD AT HIGH TEMPERATURES	.08	17.0-19.0	9.0-12.0	Ti 5 X C + N MIN - .70 MAX.	NO	SHEET STRIP PLATE BAR TUBE/PIPE WIRE FORGINGS CASTINGS
330	EXCELLENT CARBURIZATION/OXIDATION RESISTANCE. WITHSTANDS THERMAL FATIGUE. GOOD HOT STRENGTH.	.05	19.0	35.0	Fe 43	NO	SHEET PLATE BAR TUBE/PIPE WIRE SHAPES FORGINGS
333	HIGH STRENGTH. EXTREMLY RESISTANT TO CARBURIZATION, OXIDATION AND THERMAL SHOCK. GOOD HOT CORROSION RESISTANCE.	.05	25.0	45.0	Fe 18.0 Mo 3.0 Cb 3.0 W 3.0	NO	SHEET PLATE STRIP BAR
347	COLBALT & TANTALUM STABILIZED. EASILY WELDED. RESISTS INTERGRANULAR CORROSION. SUPERIOR TO T 321.	.08	17.0-19.0	9.0-12.0	(Cb+Ta) 10 X C MIN 1.10 MAX	NO	SHEET STRIP PLATE BAR TUBE/PIPE FORGINGS CASTINGS
NITRONIC * 32	TWICE THE YIELD STRENGTH OF T 304 WITH GOOD CORROSION RESISTANCE	.15	16.5-19.0	1.5-2.5	Mn 11.0-14.0 Mn 0.20-0.45	NO	BAR FORGINGS WIRE
NITRONIC * 40	HIGH STRENGTH WITH GOOD RESISTANCE TO OXIDATION AND TOUGH AT SUB ZERO	.03	19.0-21.5	5.5-7.5	Mn 8.0-10.0 N .15-.40	NO	BAR FORGINGS WIRE
NITRONIC * 50	ABOUT TWICE THE YIELD STRENGTH OF 316 WITH MORE CORROSION RESISTANCE.	.06	20.5-23.5	11.5-13.5	Mn 4.0-6.0 Mo 1.5-3.0	NO	BAR FORGINGS WIRE
NITRONIC * 60	EXCELLENT WEAR AND GALLING QUALITIES TWICE YIELD OF T 304 WITH COMPARABLE CORROSION RESISTANCE.	.10	16.0-18.0	8.0-9.0	Mn 7.0-9.0 Si 3.5-4.5 N .08-.18	NO	BAR FORGINGS WIRE PLATE

MOST AUSTENTIC GRADES CAN BE HARDENED BY COLD WORKING. HARDENED AUSTENTIC GRADES MAY BECOME SLIGHTLY MAGNETIC.

STAINLESS STEEL FERRITIC GRADES (NOT HEAT TREATABLE)		C	Cr	Ni	OTHER (max)	MAGNETIC YES - NO	AVAILABLE FORMS
409	A 11 PERCENT CHROMIUM ALLOY. WITHSTANDS ACID CONDENSATES FORMED IN AUTO EXHAUSTS. REPLACES CARBON AND GALVANIZED STEEL IN SOME USES.	.045	11.0		Ti .5 Fe BAL	YES	SHEET PLATE STRIP
430 430F 430FSe	BASIC GENERAL PURPOSE CORROSION RESISTANT STRAIGHT CHROMIUM SS. USED FOR DECORATIVE AND CORROSION RESISTANCE IN SOME APPLICATIONS. 430F AND 430FSe ADD ELEMENTS FOR MACHINING.	.12	16.0-18.0	0.75	MN 1.0 MAX 430F Su.15 MIN 430FSe + Se .15 MIN	YES	SHEET STRIP PLATE BAR TUBE/PIPE
434 436	BOTH GRADES ARE SIMILAR TO T 430 WITH THE ADDITION OF ELEMENTS TO INCREASE CORROSION RESISTANCE, IMPROVE DRAWABILITY AND IMPROVE THE FINISH FOR DECORATIVE APPLICATIONS.	.12	14.0-18.0		TYPE 434 Mo .75-1.25 TYPE 436 Cb+Ta 0.30-0.60	YES	STRIP
439	CORROSION RESISTANCE SIMILAR TO T304 WITH EXECPTION OF CERTAIN ACIDS. EXCEPTIONAL RESIST TO STRESS CRACKS.	.025	18.0		Fe 82.0 Ti .6 Si .5 N 0.250	YES	SHEET PLATE BAR
446	BEST CORROSION RESISTANCE OF THE STRAIGHT CHROME GRADES. LOW COEFFICIENT OF EXPANSION.	.20	23.0-27.0		Mn 1.5 P .04 N.25 Si 1.0 Fe 73 V .25	YES	SHEET PLATE BAR TUBE/PIPE

CHARACTERISTICS OF SOME NICKEL, HIGH TEMPERATURE & CORROSION RESISTANT ALLOYS

Space prevents our listing all alloys. Falcon Stainless & Falcon Forge can supply the full range of these alloys in available forms (see page 31)

ALLOY	DESCRIPTION	SOME USES
Nickel 200/201	Nickel 200 is a commercially pure nickel used in corrosive environments Though and ductile at both high and low temperatures. 201 is similar to 200 except that the Carbon is restricted to 0.02% Max. Ni 201 is preferred to Ni 200 for applications involving exposure to temperatures above 600F.	Food processing equipment, shipping drums for chemicals, caustic handling equipment, plater bars, aerospace and missile components, magnetostrictive devices.
400/ R-405 Monel	A Nickel-Copper alloy with high strength, excellent corrosion resistance and toughness over a wide temperature range. Highly resistant to corrosion by chlorinated solvents, glass-etching agents, sulfuric acid and most alkalies. Can be useful in oxidizing atmospheres to 1000F. 405 is similar to 400 with Sulphur added to improve machinability.	Valves, pumps, pump and propeller shafts, marine fixtures, electrical and electronic components, process equipment, petroleum refining and production equipment, heat exchangers.
K-500	Age hardened version of alloy 400 for increased strength and hardness.	Pump shafts, impellers, doctor blades, oil well collars, springs.
600/601 Inconel	Ni-Chromium alloys used in severely corrosive environs at elevated temperatures. Resistant to oxidation to 2150F. Excellent mechanical properties.	Chemical processing equipment, furnace muffles, retorts, fixtures, radiant tubes, bellows, electronic components, aircraft parts.
617 Inconel	Optimum high-temperature mechanical stability, oxidation and corrosion resistance. excellent cyclic oxidation and carburization resistance at 2000F. Good stress rupture properties above 1800F.	Aerospace and engine components, after-burners, flame holders, spray bars, combustion liners, turbine seals, heat treating equipment, nitric acid catalyst supports.
625 Inconel	Outstanding resistance to corrosion and oxidation from cryogenic temperatures to 2000F. Non magnetic. Exceptional fatigue strength.	Aerospace ducting systems, combustion systems, after-burners, fuel nozzles, hot brine handling equipment, chemical equipment.
718 Inconel	Excellent oxidation resistance to 1800F. Excellent strength from -425F to +1200F. Age hardenable and weldable in fully aged condition.	Jet engines, pump bodies and parts, nuclear fuel element spaces, rocket motors and thrust reversers. Hot extrusion tooling.
X-750 Inconel	Age hardenable alloy with good corrosion & oxidation resistance. Also good relaxation resistance	Gas turbine parts, steam service and nuclear reactor springs & bolts, vacuum envelopes, extrusion dies, bellows, forming tools.
Alloy G Huntington	Excellent corrosion resistant in many media. Resists pitting, crevice corrosion, and intergranular corrosion.	Manufacture and use of phosphoric and sulfuric acids, flue gas scrubbers, pollution control equip., evaporators, heat exchangers.
800/800H Incoloy	800 is a strong nickel-iron-chromium alloy resistant to oxidation and carburization at elevated temperatures. It resists stress-corrosion cracking, sulfur attack, internal oxidation and scaling in a wide range of industrial atmospheres. 800H is the controlled carbon and solution annealed modification of 800 allowing applications in the higher 1300-1800F heat range.	Heat exchanger tubing, petrochemical flares and process piping, furnace brackets, baskets & trays, chemical and power plant superheater and reheater tubing.
825 Incoloy	For use in aggressively corrosive environments. It is resistant to chloride-ion stress corrosion and immune to attack from oxidizing and some reducing acids. Resists pitting and intergranular attack when heated in the critical sensitization temperature range.	Pickling tank heaters, hooks, etc. Spent fuel element recovery chemical tank trailers, evaporators and other processing equipment, ash pit seals, hydrofluoric and production pollution control and radiation waste systems
B-2 Hastelloy	A nickel-molybdenum alloy with outstanding resistance to hydrochloric and sulfuric acid in the as-welded condition. Excellent hi-temperature strength in inert atmospheres or vacuum.	Suitable for many chemical process applications.
C-276 Hastelloy	The most versatile corrosion-resistant alloy. Excellent resistance to oxidizing and reducing corrosives, acid, and chlorine-contaminated hydrocarbons.	Flue gas desulfurization systems. Usually does not have to be solution heat treated after welding.
Alloy X Hastelloy	Nl-22Cr-19Fe-9Mo the best balance of oxidation resistance, high-temperature strength & fabricatability of any major Nl based hi-temperature alloy.	A standard metal for aircraft, marine, and industrial gas turbine engine combustors.
C-22 Hastelloy	A better corrosion resistant alloy than any Nl-Cr-Mo. Outstanding resistance to localized corrosion, stress corrosion cracking and oxidizing and reducing chemicals. Nl22, Cr13 Mo3w wFe.	Chemical process environments where there is strong oxidizing media. Gas scrubber systems, heat exchangers, incinerators. Nuclear fuel reprocessing, pesticide production equipment.
Alloy 25 Haynes	Co-20Cr-10BNi-15w-3Fe Superior strength and good oxidation resistance at temperatures of 1800F.	Jet engine parts such as turbine blades, combustion chambers, after-burner parts. Industrial furnace muffles and liners.
R-41	A gamma prime alloy with excellent strength in the 1000-1800F heat range.	Parts, aircraft components, gas turbine engines.
188 Haynes	Better at high temperatures than alloy "X". Lanthanum (L) is used to improve oxidation resistance.	Gas turbines and other aircraft engine components. Other engine components.
Multimet	An economical mixed based, high temperature alloy with excellent fabricating characteristics. For applications involving high stress at temp to 1500-1800F.	Aircraft applications such as tail pipes, afterburners, parts, exhaust manifolds, turbine blades, bolts, nozzles, and more.

THE SIMPLIFIED NUMBERING SYSTEM FOR NICKEL ALLOYS

The numbering code for the alloys made by Huntington Alloys Div of Inco, and how it relates to the families is a follows:

	NICKEL System		INCONEL System (Nickel-Iron-Chromium-Iron)
200 series	Solid solution* alloys	600 series	Solid solution* alloys
300 series	Age-hardenable* alloys	700 series	Age-hardenable* alloys
	MONEL System (Nickel-Copper)		INCOLOY System (Nickel-Iron-Chromium)
400 series	Solid solution* alloys	800 series	Solid solution* alloys
500 series	Age-hardenable* alloys	900 series	Age-hardenable* alloys
*Solid solution alloys belong to EVEN numbered series and do not harden by heat treatment. *All alloys hardenable by ageing (heat treatment) begin with ODD number.			

RANDOM PHYSICAL PROPERTIES BASED ON 1" ROUND

	TENSILE	YIELD	ELONG	RED. OF AREA	BHN
STAINLESS					
PH13-8					341
15-5 PH					350
15-7					350
17-4 PH					352
17-4 "H-1150"					316
17-7 PH					163
Custom 455					312
AM-355					316
302-304	89,800	43,100	61	77	165
302-304 "B"	116,000	94,000	26	68	262
303 S	90,000	41,500	56	61	177
303 S "B"	123,000	95,600	24	54	277
303 Sel	92,500	63,500	49	69	193
303 Sel "B"	115,000	83,500	31	62	
304-L and 304-L Vac Melt	92,600	61,000	51	75	193
309	86,500	48,500	55	76.5	171
310	95,800	67,700	41	74	194
316	94,800	66,000	45	72.5	200
316 "B"	126,000	97,500	25.5	68	277
316-L	88,900	58,300	48	77	178
317-317 L	97,800	72,500	39	74	198
321	89,300	51,300	48	74.7	177
330	97,000	73,500	39	75	183
347	93,300	50,600	46.5	68	187
410 and 403	90,500	58,100	29	72	180
416	95,800	77,200	21	56.3	203
416 HT	135,000	122,000	14	47	277
418 (Greek Ascoloy)					293
420					210
420 F					205
430	71,500	65,200	29	74	176
430 F	75,300	53,200	30	62	192
431					277
440 A					192
440 C and 440 C Vac Melt					240
440 F Sel					245
446	78,900	51,000	32	60	170
Nitronic 40					192
Nitronic 50	128,000	55,000	45	65	212
Nitronic 60	108,000	60,000	60	71.2	201
Alloy 20	96,000	61,500	35	70	
SUPER ALLOYS • ELECTRICAL STEEL					
A-286 Aged Hard (1650º)	163,200	109,100	24	46	313
A-286 Aged Hard (1800º)	167,700	129,300	22.9	47	339
A-286 Sol Tr	85,900	36,300	43	67.6	150
A-286 15% Cold Red					248
Ni 400					181
Ni 405					192
Ni K-500 Unaged					153
Ni K-500 Aged					274
Ni 600					265
Ni 625					222
718					223
X-750					259
L-605	133,500	63,000	53	58	234
Maraging 300					302
Invar "36"	79,500	58,200	34	65	158
Waspaloy					214
Waspaloy C.R.					337
MP 35N	135,000	60,000	70	70	R/C-8
Alloy X					193
Alloy C (C-276)					171
Kovar	76,000	54,000	38	84	
4750					163
AIRCRAFT ALLOYS • VACUUM & AIR MELT					
E-17-22A					223
E-4130					190
E-4130 Ht	135,000	122,000	21	64	274
E-4140					223
E-4330 Mod N&T and E-4330 Mod V.M.					242
E-4340 and E-4340 V.M.					222
E-4340 Mod Vac Melt N&T "300M"					267
E-4620					207
E-6150					229
E-8740					211
E-9310 N&T and E-9310 V.M.					231
E-52100					223
D6AC Vac Melt					229
H-11 Vac Melt					190
Hy-Tuf					270
Nitriding					282
9-4-30					302
CARBON STEELS					
C-1018	78,000	68,000	22	50	165
C-1215	88,000	75,000	13	40	180
C-12L14	78,000	68,000	15	45	165

FRACTION, DECIMAL & METRIC EQUIVALENTS

Fractional Inch	Dec. Equiv.	Millimeters	Fractional Inch	Dec. Equiv.	Millimeters
1/64	.0156	.397	17/32	.5313	13.494
1/32	.0313	.794	35/64	.5469	13.891
3/64	.0469	1.191	9/16	.5625	14.288
1/16	.0625	1.588	37/64	.5781	14.684
5/64	.0781	1.984	7/12	.5833	14.817
1/12	.0833	2.117	19/32	.5938	15.081
3/32	.0938	2.381	3/5	.6000	15.240
1/10	.1000	2.540	39/64	.6094	15.478
7/64	.1094	2.778	5/8	.6250	15.875
1/8	.1250	3.175	41/64	.6406	16.272
9/64	.1406	3.572	21/32	.6563	16.669
1/6	.1667	4.233	2/3	.6667	16.933
11/64	.1719	4.366	43/64	.6719	17.066
3/16	.1875	4.700	11/16	.6875	17.463
1/5	.2000	5.080	7/10	.7000	17.780
13/64	.2031	5.159	45/64	.7031	17.859
7/32	.2188	5.556	23/32	.7188	18.256
15/64	.2344	5.953	47/64	.7344	18.653
1/4	.2500	6.350	3/4	.7500	19.050
17/64	.2656	6.747	49/64	.7656	19.447
9/32	.2813	7.144	25/32	.7813	19.844
19/64	.2969	7.541	51/64	.7969	20.241
3/10	.3000	7.620	4/5	.8000	20.320
5/16	.3125	7.937	13/16	.8125	20.638
1/3	.3333	8.467	53/64	.8281	21.034
11/32	.3438	8.731	5/6	.8333	21.167
23/64	.3594	9.128	27/32	.8438	21.431
3/8	.3750	9.525	55/64	.8594	21.828
25/64	.3906	9.922	7/8	.8750	22.225
2/5	.4000	10.160	57/64	.8906	22.622
13/32	.4063	10.319	9/10	.9000	22.860
5/12	.4167	10.583	29/32	.9063	23.019
27/64	.4219	10.716	11/12	.9167	23.283
7/16	.4375	11.112	59/64	.9219	23.416
29/64	.4531	11.509	15/16	.9375	23.813
15/32	.4688	11.906	61/64	.9531	24.209
31/64	.4844	12.303	31/32	.9688	24.606
1/2	.5000	12.700	63/64	.9844	25.003
33/64	.5156	13.097	1"	1.0000	25.400

MEASURES OF LENGTH

1 Millimeter (mm) = 0.03937 inch = 0.00328083 feet
1 Meter (m) = 39.37000 inch = 3.28083333 feet
1 Inch = 0.08333333 feet = 25.40005080 millimeters
12 Inches = 1.0 feet = 0.30480061 meter

MEASURES OF WEIGHT

1 Kilogram (kg) = 2.20462234 avoirdupois pounds
1,000 Kilograms or 1 Metric Ton = 2,204.62234141 avoirdupois pounds = 0.98420640 long tons = 1.10231117 short tons
1 Avoirdupois pound = 453.5924277 gram (gm) = 0.45359243 kilogram
1 Long ton—2240 lbs. = 1.0164704 metric tons
1 Short ton—2000 lbs. = 0.90718485 metric ton

HARDNESS GUIDE FOR 300 SERIES. TENSILES ARE APPROX.

TEMPER	ROCKWELL	TENSILE	TEMPER	ROCKWELL	TENSILE
ANNEALED	RB 85 MAX	110 000 PX	3/4 HARD	RC 35-40	175,000 MIN
1/4 HARD	RC 25-30	125,000 MIN	FULL HARD	RC 40 MIN	185,000 MIN
1/2 HARD	RC 30-35	150,000 MIN	EX FULL HD	RC 45-50	200,000min

T316 FULL HARD IS APPROX RC 36

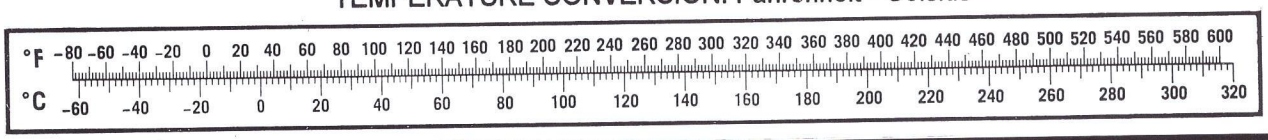
WE HAVE A WIDE RANGE OF TEMPERED STAINLESS COIL & SHEET

HARDNESS CONVERSION TABLE FOR CARBON & ALLOY STEELS

ALL VALUES ARE APPROXIMATE

Brinell Hardness Number (Carbide Ball)	Rockwell Hardness Numbers					Tensile Strength	
	C Scale	A Scale	15N Scale Superficial	B Scale	30T Scale Superficial	1000 Lb./Sq. In.	kgf/mm²
—	66	84.5	92.5	—	—	—	—
722	64	83.4	91.8	—	—	—	—
688	62	82.3	91.1	—	—	—	—
654	60	81.2	90.2	—	—	—	—
615	58	80.1	89.3	—	—	—	—
577	56	79.0	88.3	—	—	313	220
543	54	78.0	87.4	—	—	292	205
512	52	76.8	86.4	—	—	273	192
481	50	75.9	85.5	—	—	255	179
455	48	74.7	84.5	—	—	237	167
443	47	74.1	83.9	—	—	229	161
432	46	73.6	83.5	—	—	222	156
421	45	73.1	83.0	—	—	215	151
409	44	72.5	82.5	—	—	208	146
400	43	72.0	82.0	—	—	201	141
390	42	71.5	81.5	—	—	194	136
381	41	70.9	80.9	—	—	188	132
371	40	70.4	80.4	—	—	181	127
362	39	69.9	79.9	—	—	176	124
353	38	69.4	79.4	—	—	171	120
344	37	68.9	78.8	—	—	167	117
336	36	68.4	78.3	—	—	162	114
327	35	67.9	77.7	—	—	157	110
319	34	67.4	77.2	—	—	153	108
311	33	66.8	76.6	—	—	149	105
301	32	66.3	76.1	—	—	145	102
294	31	65.8	75.6	—	—	142	100
286	30	65.3	75.0	—	—	138	97
279	29	64.7	74.5	—	—	135	95
271	28	64.3	73.9	—	—	132	93
264	27	63.8	73.3	—	—	128	90
258	26	63.3	72.8	—	—	125	88
253	25	62.8	72.2	—	—	122	86
247	24	62.4	71.6	—	—	120	84
243	23	62.0	71.0	—	—	117	82
240	—	—	—	100	82.0	116	82
234	—	—	—	99	81.5	112	79
222	—	—	—	97	80.5	106	75
210	—	—	—	95	79.0	101	71
200	—	—	—	93	78.0	96	67
195	—	—	—	92	77.5	93	65
185	—	—	—	90	76.0	89	63
176	—	—	—	88	75.0	85	60
169	—	—	—	86	74.0	81	57
162	—	—	—	84	73.0	78	55
156	—	—	—	82	71.5	75	53
150	—	—	—	80	70.0	72	51
144	—	—	—	78	69.0	—	—
139	—	—	—	76	67.5	—	—
135	—	—	—	74	66.0	—	—
130	—	—	—	72	65.0	—	—
125	—	—	—	70	63.5	—	—
121	—	—	—	68	62.0	—	—
117	—	—	—	66	60.5	—	—
114	—	—	—	64	59.5	—	—

TEMPERATURE CONVERSION: Fahrenheit - Celsius



MACHINABILITY RATINGS

STAINLESS

GRADE	APPROXIMATE SURF. FT. PER MIN.	% RELATIVE SPEED BASED ON C-1212 as 100%	GRADE	APPROXIMATE SURF. FT. PER MIN.	% RELATIVE SPEED BASED ON C-1212 as 100% (165 SFM)
302	70	40	420	85	50
302/304 "B"	55	28	420 F	125	68
303	150	75	422	85	50
303 High Tensile	80	43	430	110	66
304	70	40	430 F	150	75
304 L	70	40	431	80	48
309	60	36	440 A	65	40
310	60	36	440 C	65	40
316	60	36	440 F Se	80	48
316 "B"	50	22	446	60	36
316 L	60	36	Custom 455 (12-9-2)	55	28
317-317 L	60	36	PH-13-8 MO	60	36
317 LM	60	36	15-5 PH	75	45
321	60	36	15-7	75	45
330	45	20	17-4 PH	75	45
347	60	36	17-4 PH "H1150"	85	50
403	95	54	17-7 PH	75	45
410	95	54	AM 355	72	42
416 Ann	150	75	Nitronic 40	50	22
416 H.T.	85	50	Nitronic 50	50	22
418 (Greek Ascoloy)	96	50	Nitronic 60	50	22
			Alloy 20	70	40

STEEL ALLOYS - ELECTRICAL STEELS

Maraging "300"	60	36	718	20	12
A-286	54	28	718 Cold Red	18	10
4750	60	36	X-750	20	12
L-605	15	9	INVAR 36 "FM"	92	55
Nickel "200"	110	66	Waspaloy	45	20
Nickel "400"	80	48	Waspaloy Cold Red	43	18
Nickel "405"	80	48	MP 35N	45	20
Nickel "K-500"	60	36	MP 159	45	20
Nickel K-500 Aged	40	25	Alloy C	40	18
Nickel "600"	50	22	Alloy X	45	20
Nickel "625"	20	12	Kovar	60	22

ALLOY

E-17-22A	95	57	E-52100	65	40
E-4130	120	72	E-6150	100	60
E-4130 H.T.	65	40	E-8740	110	66
E-4140	110	66	E-9310	80	49
E-4330 Mod	95	57	Nitriding	83	51
E-4340	95	57	H-11	75	45
E-4340			Hy-Tuf	75	45
Mod "300M"	95	57	D6AC	80	49
E-4620	110	66	9-4-30	75	45

ESTIMATED WEIGHT OF STAINLESS (T300) FLAT BARS - LBS PER FT

WIDTH

THICK	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8
1/16	.053	.066	.080	.093	.106	.120	.133	.146	.159	.173	.186	.199	.213	.239	.266	.292	.319	.345	.372	.398
3/32	.080	.100	.120	.140	.159	.179	.199	.219	.239	.259	.279	.299	.319	.359	.398	.438	.478	.518	.558	.598
1/8	.106	.133	.159	.186	.213	.239	.266	.292	.319	.345	.372	.398	.425	.478	.531	.584	.638	.691	.744	.797
5/32	.133	.166	.199	.232	.266	.299	.332	.365	.398	.432	.465	.498	.531	.598	.664	.731	.797	.863	.930	.996
3/16	.159	.199	.239	.279	.319	.359	.398	.438	.478	.518	.558	.598	.638	.717	.797	.877	.956	1.04	1.12	1.20
1/4	.213	.266	.319	.372	.425	.478	.531	.584	.638	.691	.744	.797	.850	.956	1.06	1.17	1.28	1.38	1.49	1.59
5/16	.266	.332	.398	.465	.531	.598	.664	.731	.797	.863	.930	.996	1.06	1.20	1.33	1.46	1.59	1.73	1.86	1.99
3/8	.319	.398	.478	.558	.638	.717	.797	.877	.956	1.04	1.12	1.20	1.28	1.43	1.59	1.75	1.91	2.07	2.23	2.39
7/16	.372	.465	.558	.651	.744	.837	.930	1.02	1.12	1.21	1.30	1.40	1.49	1.67	1.86	2.05	2.31	2.42	2.60	2.79
1/2	.425	.531	.638	.744	.850	.956	1.06	1.17	1.28	1.38	1.49	1.59	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19
9/16	.478	.598	.717	.837	.956	1.08	1.20	1.32	1.43	1.55	1.63	1.79	1.91	2.15	2.39	2.63	2.87	3.11	3.35	3.59
5/8	.531	.664	.797	.930	1.06	1.20	1.33	1.46	1.59	1.73	1.86	1.99	2.13	2.39	2.66	2.92	3.19	3.45	3.72	3.98
11/16	.584	.731	.877	1.02	1.17	1.32	1.46	1.61	1.75	1.90	2.05	2.19	2.34	2.63	2.92	3.21	3.51	3.80	4.09	4.38
3/4	.638	.797	.956	1.12	1.28	1.43	1.59	1.75	1.91	2.07	2.23	2.39	2.55	2.87	3.19	3.51	3.83	4.14	4.46	4.78
13/16	.691	.863	1.04	1.21	1.38	1.55	1.73	1.90	2.07	2.25	2.42	2.59	2.76	3.11	3.45	3.80	4.14	4.49	4.83	5.18
7/8	.744	.930	1.12	1.30	1.49	1.67	1.86	2.05	2.23	2.42	2.60	2.79	2.98	3.35	3.72	4.09	4.46	4.83	5.21	5.58
15/16	.797	.996	1.20	1.40	1.59	1.79	1.99	2.19	2.39	2.59	2.79	2.99	3.19	3.59	3.98	3.38	4.78	5.18	5.58	5.98
1	.850	1.06	1.28	1.49	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19	3.40	3.83	4.25	4.58	5.10	5.53	5.95	6.38
1 1/8	.956	1.20	1.43	1.67	1.91	2.15	2.39	2.63	2.87	3.11	3.35	3.59	3.83	4.30	4.78	5.26	5.74	6.22	6.69	7.17
1 1/4	1.06	1.33	1.59	1.86	2.13	2.39	2.66	2.92	3.19	3.45	3.72	3.98	4.25	4.78	5.31	5.84	6.38	6.91	7.44	7.97
1 3/8	1.17	1.46	1.75	2.05	2.34	2.63	2.92	3.21	3.51	3.80	4.09	4.38	4.68	5.26	5.84	6.43	7.01	7.60	8.18	8.77
1 1/2	1.28	1.59	1.91	2.23	2.55	2.87	3.19	3.51	3.83	4.14	4.46	4.78	5.10	5.74	6.38	7.01	7.65	8.29	8.93	9.56
1 5/8	1.38	1.73	2.07	2.42	2.76	3.11	3.45	3.80	4.14	4.49	4.83	5.18	5.53	6.22	6.91	7.60	8.29	8.98	9.67	10.36
1 3/4	1.49	1.86	2.23	2.60	2.98	3.35	3.72	4.09	4.46	4.83	5.21	5.58	5.95	6.69	7.44	8.18	8.93	9.67	10.41	11.16
1 7/8	1.59	1.99	2.39	2.79	3.19	3.59	3.98	4.38	4.78	5.18	5.58	5.98	6.38	7.17	7.97	8.77	9.56	10.36	11.16	11.95
2	1.70	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38	6.80	7.65	8.50	9.35	10.20	11.05	11.90	12.75
2 1/4	1.91	2.39	2.87	3.35	3.83	4.30	4.78	5.26	5.74	6.21	6.69	7.17	7.65	8.61	9.56	10.52	11.48	12.43	13.39	14.55
2 1/2	2.13	2.66	3.19	3.72	4.25	4.78	5.31	5.84	6.38	6.91	7.44	7.97	8.50	9.56	10.63	11.69	12.75	13.81	14.88	15.94
2 3/4	2.34	2.92	3.51	4.09	4.68	5.26	5.84	6.43	7.01	7.60	8.18	8.77	9.35	10.52	11.69	12.86	14.03	15.19	16.36	17.53
3	2.55	3.19	3.83	4.46	5.10	5.74	6.38	7.01	7.65	8.29	8.93	9.56	10.20	11.58	12.75	14.03	15.30	16.58	17.85	19.13

WIDTH

THICK	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	8	10	12
1/16	.425	.478	.531	.584	.638	.691	.744	.797	.850	.903	.956	1.01	1.06	1.12	1.17	1.22	1.28	1.70	2.13	2.55
3/32	.638	.717	.797	.877	.956	1.04	1.12	1.20	1.28	1.36	1.43	1.51	1.59	1.67	1.75	1.83	1.91	2.55	3.19	3.83
1/8	.850	.956	1.06	1.17	1.28	1.38	1.49	1.59	1.70	1.81	1.91	2.02	2.13	2.23	2.34	2.44	2.55	3.40	4.25	5.10
5/32	1.06	1.20	1.33	1.46	1.59	1.73	1.86	1.99	2.13	2.26	2.39	2.52	2.66	2.79	2.92	3.06	3.19	4.25	5.31	6.38
3/16	1.28	1.43	1.59	1.75	1.91	2.07	2.23	2.39	2.55	2.71	2.87	3.03	3.19	3.35	3.51	3.67	3.83	5.10	6.38	7.65
1/4	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19	3.40	3.61	3.83	4.04	4.25	4.46	4.68	4.89	5.10	6.80	8.50	10.20
5/16	2.13	2.39	2.66	2.92	3.19	3.45	3.72	3.98	4.25	4.52	4.78	5.05	5.31	5.58	5.84	6.11	6.38	8.50	10.63	12.75
3/8	2.55	2.87	3.19	3.51	3.83	4.14	4.46	4.78	5.10	5.42	5.74	6.06	6.38	6.69	7.01	7.33	7.65	10.20	12.75	15.30
7/16	2.98	3.35	3.72	4.09	4.46	4.83	5.21	5.58	5.95	6.32	6.69	7.07	7.44	7.81	8.18	8.55	8.93	11.90	14.88	17.85
1/2	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38	6.80	7.23	7.65	8.08	8.50	8.93	9.35	9.78	10.20	13.60	17.00	20.40
9/16	3.83	4.30	4.78	5.26	5.74	6.22	6.69	7.17	7.65	8.13	8.61	9.08	9.56	10.04	10.52	11.00	11.48	15.30	19.13	22.95
5/8	4.25	4.78	5.31	5.84	6.38	6.91	7.44	7.97	8.50	9.03	9.56	10.09	10.63	11.16	11.69	12.22	12.75	17.00	21.25	25.50
11/16	4.68	5.26	5.84	6.43	7.01	7.60	8.18	8.77	9.35	9.93	10.52	11.10	11.69	12.27	12.86	13.44	14.03	18.70	23.38	28.05
3/4	5.10	5.74	6.38	7.01	7.65	8.29	8.93	9.56	10.20	10.84	11.48	12.11	12.75	13.39	14.03	14.66	15.30	20.40	25.50	30.60
13/16	5.53	6.22	6.91	7.60	8.29	8.98	9.67	10.36	11.05	11.74	12.43	13.12	13.81	14.50	15.19	15.88	16.58	22.10	27.63	33.15
7/8	5.95	6.69	7.44	8.18	8.93	9.67	10.41	11.16	11.90	12.64	13.39	14.13	14.88	15.62	16.36	17.11	17.85	23.80	29.75	35.70
15/16	6.38	7.17	7.97	8.77	9.56	10.36	11.16	11.95	12.75	13.55	14.34	15.14	15.94	16.73	17.53	18.33	19.13	25.50	31.88	38.25
1	6.80	7.65	8.50	9.35	10.20	11.05	11.90	12.75	13.60	14.45	15.30	16.15	17.00	17.85	18.70	19.55	20.40	27.20	34.00	40.80
1 1/8	7.65	8.61	9.56	10.52	11.48	12.43	13.39	14.34	15.30	16.26	17.21	18.17	19.13	20.08	21.04	21.99	22.95	30.60	38.25	45.90
1 1/4	8.50	9.56	10.63	11.69	12.75	13.81	14.88	15.94	17.00	18.06	19.13	20.19	21.25	22.31	23.38	24.44	25.50	34.00	42.50	51.00
1 3/8	9.35	10.52	11.69	12.86	14.03	15.19	16.36	17.53	18.70	19.87	21.04	22.21	23.38	24.54	25.71	26.88	28.05	37.40	46.75	56.10
1 1/2	10.20	11.48	12.75	14.03	15.30	16.58	17.85	19.13	20.40	21.68	22.95	24.33	25.50	26.78	28.05	29.33	30.60	40.80	51.00	61.20
1 5/8	11.05	12.43	13.81	15.19	16.58	17.96	19.34	20.72	22.10	23.48	24.86	26.24	27.63	29.01	30.39	31.77	33.15	44.20	55.25	66.30
1 3/4	11.90	13.39	14.88	16.36	17.85	19.34	20.83	22.31	23.80	25.29	26.78	28.26	29.75	31.24	32.73	34.21	35.70	47.60	59.50	71.40
1 7/8	12.75	14.34	15.94	17.53	19.13	20.72	22.31	23.91	25.50	27.09	28.69	30.28	31.88	33.47	35.06	36.66	38.25	51.00	63.75	76.50
2	13.60	15.30	17.00	18.70	20.40	22.10	23.80	25.50	27.20	28.90	30.60	32.30	34.00	35.70	37.40	39.10	40.80	54.40	68.00	81.60
2 1/4	15.30	17.21	19.13	21.04	22.96	24.86	26.78	28.68	30.60	32.52	34.42	36.34	38.26	40.16	42.08	43.99	45.90	61.20	76.50	91.80
2 1/2	17.00	19.13	21.26	23.38	25.50	27.62	29.76	31.88	34.00	36.12	38.26	40.38	42.50	44.63	46.75	48.88	51.00	68.00	85.00	102.0
2 3/4	18.70	21.04	23.38	25.72	28.06	30.38	32.72	35.06	37.40	39.74	42.08	44.42	46.76	49.09	51.43	53.76	56.10	74.80	93.50	112.02
3	20.40	22.96	25.50	28.06	30.60	33.16	35.70	38.26	40.80	43.36	45.90	48.46	51.00	53.55	56.10	58.65	61.20	81.60	102.0	122.4

WEIGHTS ROUND, SQUARE, OCTAGON & HEX BAR - PER FOOT - 300 SERIES STAINLESS

Size in Inches	Round	Square	Octa-gon	Hexa-gon	Size in Inches	Round	Square	Octa-gon	Hexa-gon	Size in Inches	Round	Square	Octa-gon	Hexa-gon
1/16	.010	.013	.011	.012	1 1/4	4.172	5.313	4.407	4.601	4 3/4	60.25	76.71	63.62	....
5/64	.017	.022	.018	.019	1 5/16	4.600	5.857	4.858	5.072	4 13/16	61.85	78.75	65.32	....
3/32	.023	.029	.024	.025	1 3/8	5.049	6.428	5.332	5.567	4 7/8	63.46	80.80	67.02	....
7/64	.031	.039	.033	.034	1 7/16	5.518	7.026	5.827	6.085	4 15/16	65.10	82.89	68.75	....
1/8	.042	.053	.044	.046	1 1/2	6.008	7.650	6.345	6.625	5	66.76	85.00	70.50	....
9/64	.053	.067	.056	.058	1 9/16	6.519	8.301	6.885	7.189	5 1/16	68.44	87.14	72.27	....
5/32	.065	.083	.069	.072	1 5/8	7.051	8.978	7.446	7.775	5 1/8	70.14	89.30	74.07	....
11/64	.079	.100	.083	.087	1 11/16	7.604	9.682	8.030	8.385	5 3/16	71.86	91.50	75.89	....
3/16	.094	.120	.099	.104	1 3/4	8.178	10.41	8.634	9.018	5 1/4	73.60	93.71	77.72	....
13/64	.110	.140	.116	.121	1 13/16	8.773	11.17	9.265	9.673	5 5/16	75.36	95.96	79.59	....
7/32	.128	.163	.135	.141	1 7/8	9.388	11.95	9.911	10.35	5 3/8	77.15	98.23	81.47	....
15/64	.147	.187	.155	.162	1 15/16	10.02	12.76	10.58	11.05	5 7/16	78.95	100.5	83.38	....
1/4	.167	.213	.176	.184	2	10.68	13.60	11.28	11.78	5 1/2	80.78	102.9	85.30	....
17/64	.188	.240	.199	.207	2 1/16	11.36	14.46	11.99	12.53	5 9/16	82.62	105.2	87.25	....
9/32	.211	.269	.223	.233	2 1/8	12.06	15.35	12.73	13.30	5 5/8	84.49	107.6	89.23	....
19/64	.235	.300	.248	.259	2 3/16	12.78	16.27	13.49	14.09	5 11/16	86.38	110.0	91.22	....
5/16	.261	.332	.275	.288	2 1/4	13.52	17.21	14.27	14.91	5 3/4	88.29	112.4	93.23	....
21/64	.288	.365	.304	.318	2 5/16	14.28	18.18	15.08	15.75	5 13/16	90.22	114.9	95.27	....
11/32	.316	.402	.334	.348	2 3/8	15.06	19.18	15.91	16.61	5 7/8	92.17	114.7	97.33	....
23/64	.345	.439	.364	.381	2 7/16	15.87	20.20	16.75	17.49	5 15/16	94.14	119.9	99.41	....
3/8	.376	.478	.397	.414	2 1/2	16.69	21.25	17.62	18.40	6	96.13	122.4	101.5	....
25/64	.408	.519	.431	.450	2 9/16	17.53	22.33	18.52	19.34	6 1/16	98.15	125.0	103.6	....
13/32	.441	.561	.466	.486	2 5/8	18.40	23.43	19.43	20.29	6 1/8	100.2	127.6	105.8	....
27/64	.475	.605	.502	.524	2 11/16	19.20	24.56	20.37	21.27	6 3/16	102.2	130.2	108.0	....
7/16	.511	.651	.540	.564	2 3/4	20.19	25.71	21.33	22.27	6 1/4	104.3	132.8	110.2	....
29/64	.548	.698	.579	.604	2 13/16	21.12	26.90	22.31	23.29	6 5/16	106.4	135.5	112.4	....
15/32	.587	.747	.620	.647	2 7/8	22.07	28.10	23.31	24.34	6 3/8	108.5	138.2	114.6	....
31/64	.627	.798	.662	.692	2 15/16	23.04	29.34	24.33	25.41	6 7/16	110.7	140.9	116.9	....
1/2	.668	.850	.705	.736	3	24.03	30.60	25.38	26.50	6 1/2	112.8	143.7	119.1	....
33/64	.710	.904	.750	.783	3 1/16	25.05	31.89	26.45	27.62	6 9/16	115.0	146.4	121.4	....
17/32	.754	.960	.796	.831	3 1/8	26.08	33.20	27.54	....	6 5/8	117.2	149.2	123.8	....
35/64	.799	1.017	.844	.881	3 3/16	27.13	34.55	28.65	....	6 11/16	119.4	152.1	126.1	....
9/16	.845	1.076	.892	.932	3 1/4	28.21	35.91	29.79	....	6 3/4	121.7	154.9	128.5	....
37/64	.893	1.136	.943	.985	3 5/16	29.30	37.21	30.94	....	6 13/16	123.9	157.8	130.9	....
19/32	.941	1.199	.994	1.038	3 3/8	30.42	38.73	32.12	....	6 7/8	126.2	160.7	133.3	....
39/64	.992	1.263	1.048	1.094	3 7/16	31.55	40.18	33.32	....	6 15/16	128.5	163.6	135.7	....
5/8	1.043	1.328	1.102	1.150	3 1/2	32.71	41.65	34.54	....	7	130.9	166.6	138.2	....
41/64	1.096	1.395	1.517	1.209	3 9/16	33.90	43.15	35.79	....	7 1/16	133.2	169.6	140.7	....
21/32	1.150	1.464	1.214	1.268	3 5/8	35.09	44.68	37.07	....	7 1/8	135.6	172.6	143.2	....
43/64	1.205	1.535	1.272	1.329	3 11/16	36.31	46.23	38.34	....	7 3/16	138.0	175.6	145.7	....
11/16	1.262	1.607	1.333	1.392	3 3/4	37.55	47.81	39.65	....	7 1/4	140.4	178.7	148.2	....
45/64	1.320	1.681	1.394	1.456	3 13/16	38.81	49.42	40.99	....	7 5/16	142.8	181.8	150.8	....
23/32	1.380	1.756	1.487	1.521	3 7/8	40.10	51.05	42.34	....	7 3/8	145.2	184.9	153.4	....
47/64	1.440	1.834	1.521	1.588	3 15/16	41.40	52.71	43.72	....	7 7/16	147.7	188.1	156.0	....
3/4	1.502	1.913	1.586	1.656	4	42.73	54.40	45.12	....	7 1/2	150.2	191.3	158.6	....
25/32	1.630	2.075	1.721	1.797	4 1/16	44.07	56.11	46.54	....	7 1/8	155.3	197.7	164.0	....
13/16	1.763	2.245	1.862	1.944	4 1/8	45.44	57.85	47.98	....	7 3/4	160.4	204.2	169.4	....
27/32	1.901	2.421	2.008	2.096	4 3/16	46.83	59.62	49.45	....	7 7/8	165.6	210.9	174.9	....
7/8	2.045	2.603	2.159	2.254	4 1/4	48.23	61.41	50.93	....	8	170.9	217.6	180.5	....
29/32	2.193	2.792	2.316	2.418	4 5/16	49.66	63.23	52.44	....	8 1/4	181.8	230.9	192.0	....
15/16	2.347	2.988	2.479	2.588	4 3/8	51.11	65.08	53.98	....	8 1/2	192.9	245.7	203.8	....
31/32	2.506	3.191	2.646	2.763	4 7/16	52.58	66.95	55.53	....	8 3/4	204.4	259.6	215.8	....
1	2.670	3.400	2.820	2.945	4 1/2	54.08	68.85	57.10	....	9	216.3	275.4	228.4	....
1 1/16	3.015	3.838	3.183	3.324	4 9/16	55.59	70.78	58.70	....	10	267.0	340.0	282.0	....
1 1/8	3.380	4.303	3.569	3.727	4 5/8	57.12	72.73	60.32	....	11	323.1	411.4	341.2	....
1 3/16	3.766	4.795	3.977	4.152	4 11/16	58.68	74.71	61.96	....	12	384.4	489.6	406.1	....

METAL DENSITIES & WEIGHT CONVERSION (Based on 300 Series Stainless)

ALLOY	DENSITY CU. INCH	FACTOR	ALLOY	DENSITY CU. INCH	FACTOR	ALLOY	DENSITY CU. INCH	FACTOR
ALUMINUM 1100	0.098	0.338	HAYNES "188"	0.324	1.117	MULTIMET (N-155)	0.296	1.021
ALUMINUM 2024	0.097	0.334	INCOLOY 800	0.287	0.990	MU-METAL	0.305	1.052
ALLOY 36	0.291	1.003	INCONEL "600/625"	0.306	1.055	NI-SILVER # 752	0.316	1.090
ALLOY 42	0.293	1.01	INCONEL "718"	0.269	0.928	PERMALLOY 80	0.315	1.086
ALLOY 52	0.300	1.034	INCONEL "X-750"	0.299	1.031	RENE "41"	0.298	1.028
COLUMBIUM (NIOBIUM)	0.309	1.066	INVAR	0.291	1.003	STAINLESS "400'S"	0.280	0.965
COPPER	0.323	1.114	KOVAR	0.302	1.041	**STAINLESS "300"**	**0.290**	**1.000**
FERRALIUM "255"	0.282	0.976	MAGNESIUM	0.063	0.217	STEEL	0.284	0.980
HASTELLOY "B"	0.333	1.148	MOLYBDENUM	0.360	1.241	TANTALUM	0.600	2.069
HASTELLOY "C276"	0.321	1.107	MONEL "400"	0.318	1.100	TITANIUM 6AL4V	0.160	0.552
HAYNES "25"	0.330	1.138	MONEL "K500"	0.305	1.052	TUNGSTEN	0.697	2.403
INCOLOY 825	0.294	1.014	NICKEL 200/201	0.321	1.107	ZIRCONIUM	0.234	0.807

TO DETERMINE WEIGHT OF DESIRED METAL, MULTIPLY STAINLESS WEIGHT, USING CHARTS ON PGS 19-21 AND MULTIPLY BY FACTOR SHOWN.
EXAMPLE: STAINLESS IS 10 LBS PER FT. TO FIND WEIGHT PER FOOT OF COPPER, MULTIPLY 10 LBS X 1.114 (THE COPPER FACTOR) COPPER WEIGHT 11.14 LBS FT.

STAINLESS STEEL SHEET WEIGHTS... 300 SERIES

Gauge	Size in Inches	Estimated Pounds per Sq. Ft.	Estimated Pounds per Sheet	Gauge	Size in Inches	Estimated Pounds per Sq. Ft.	Estimated Pounds per Sheet
26(.018)	30 × 96	.756	15.10	14(.075)	36 × 96	3.150	75.60
	30 × 120	.756	18.90		36 × 120	3.150	94.50
	36 × 96	.756	17.40		36 × 144	3.150	113.40
	36 × 120	.756	21.70		48 × 96	3.150	100.80
	48 × 120	.756	30.24		48 × 120	3.150	126.00
24(.024)	36 × 96	1.008	24.19		48 × 144	3.150	151.20
	36 × 120	1.008	30.24		60 × 120	3.150	157.50
	48 × 96	1.008	32.26		60 × 144	3.150	189.00
	48 × 120	1.008	40.32		72 × 120	3.150	189.00
22(.030)	36 × 96	1.260	30.24		72 × 144	3.150	226.80
	36 × 120	1.260	37.80	13(.090)	36 × 96	3.780	90.72
	48 × 96	1.260	40.32		48 × 96	3.780	120.96
	48 × 120	1.260	50.40		48 × 120	3.780	151.20
20(.036)	36 × 96	1.512	36.29	12(.105)	36 × 96	4.410	105.84
	36 × 120	1.512	45.36		36 × 120	4.410	132.30
	36 × 144	1.512	54.43		36 × 144	4.410	158.76
	48 × 96	1.512	48.38		48 × 96	4.410	141.12
	48 × 120	1.512	60.48		48 × 120	4.410	176.40
	48 × 144	1.512	72.58		48 × 144	4.410	211.68
	60 × 120	1.512	75.60		60 × 120	4.410	220.50
18(.048)	30 × 120	2.016	50.40		60 × 144	4.410	264.60
	36 × 96	2.016	48.38	11(.120)	36 × 96	5.040	120.96
	36 × 120	2.016	60.48		36 × 120	5.040	151.20
	48 × 96	2.016	64.51		36 × 144	5.040	181.44
	48 × 120	2.016	80.64		48 × 96	5.040	161.28
	48 × 144	2.016	96.77		48 × 120	5.040	201.60
	60 × 120	2.016	100.80		48 × 144	5.040	241.92
16(.060)	36 × 96	2.520	60.48		60 × 120	5.040	252.00
	36 × 120	2.520	75.60		60 × 144	5.040	302.40
	36 × 144	2.520	90.72		72 × 120	5.040	302.40
	48 × 96	2.520	80.64		72 × 144	5.040	362.88
	48 × 120	2.520	100.80	10(.135)	36 × 96	5.670	136.08
	48 × 144	2.520	120.96		36 × 120	5.670	170.10
	60 × 120	2.520	126.00		48 × 96	5.670	181.44
	60 × 144	2.520	151.20		48 × 120	5.670	226.80
					48 × 144	5.670	272.16
					60 × 120	5.670	283.50
					60 × 144	5.670	340.20
					72 × 120	5.670	340.20
					72 × 144	5.670	408.24

STAINLESS STRIP - 300 SERIES - Lbs/Lin/Ft

THICKNESS		WIDTH IN INCHES					
No. B.W.G.	DECIMAL EQUIVALENT	1	2	3	4	5	6
7	.180″	.6300	1.260	1.890	2.520	3.150	3.780
8	.165″	.5775	1.155	1.733	2.310	2.888	3.465
9	.148″	.5180	1.036	1.554	2.072	2.590	3.108
10	.134″	.4690	0.938	1.407	1.876	2.345	2.814
11	.120″	.4200	0.840	1.260	1.680	2.100	2.520
12	.109″	.3815	0.763	1.145	1.526	1.908	2.289
13	.095″	.3325	0.665	0.998	1.330	1.663	1.995
14	.083″	.2905	0.581	0.872	1.162	1.453	1.743
15	.072″	.2520	0.504	0.750	1.008	1.260	1.512
16	.065″	.2275	0.455	0.683	0.910	1.138	1.365
17	.058″	.2030	0.406	0.609	0.812	1.015	1.218
18	.049″	.1715	0.343	0.515	0.686	0.858	1.029
19	.042″	.1470	0.294	0.441	0.588	0.735	0.882
20	.035″	.1225	0.245	0.368	0.490	0.613	0.735
21	.032″	.1120	0.224	0.336	0.448	0.560	0.672
22	.028″	.0980	0.196	0.294	0.392	0.490	0.588
23	.025″	.0875	0.175	0.263	0.350	0.438	0.525
24	.022″	.0770	.1540	.2310	.3080	.3850	.4620
25	.020″	.0700	.1400	.2100	.2800	.3500	.4200
26	.018″	.0630	.1260	.1890	.2520	.3150	.3780
27	.016″	.0560	.1120	.1680	.2240	.2800	.3360
28	.014″	.0490	.0980	.1470	.1960	.2450	.2940
29	.013″	.0455	.0910	.1365	.1820	.2275	.2730
30	.012″	.0420	.0840	.1260	.1680	.2100	.2520
31	.010″	.0350	.0700	.1050	.1400	.1750	.2100
32	.009″	.0315	.0630	.0945	.1260	.1575	.1890
33	.008″	.0280	.0560	.0840	.1120	.1400	.1680
34	.007″	.0245	.0490	.0735	.0980	.1225	.1470
35	.005″	.0175	.0350	.0525	.0700	.0875	.1050
36	.004″	.0140	.0280	.0420	.0560	.0700	.0840
For Interpolation	.001″	.0035	.0070	.0105	.0140	.0175	.0210

WEIGHT OF FLAT ROLLED STEEL COILS "PER INCH OF WIDTH" (PIW)

OD	24"	25"	26"	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"	39"	40"	41"	42"	43"	44"	45"	46"	47"	4
ID																									
10"	106	114	128	139	152	165	178	191	205	220	225	250	266	282	299	316	333	351	370	389	408	427			
12"	96	107	118	130	142	154	168	182	196	210	225	240	256	272	289	306	324	342	360	379	398	418			
16"	71	82	93	104	116	129	142	155	169	183	198	213	229	245	262	279	296	314	332	351	370	390	410	430	4
18"	55	66	77	88	100	113	126	139	153	167	182	197	213	229	246	263	280	298	316	335	354	374	394	414	4
20"	39	50	61	72	84	97	110	123	137	151	166	181	197	213	230	247	264	282	300	319	338	358	378	398	4
24"		11	22	33	45	57	70	83	97	111	126	141	156	172	188	205	222	239	257	275	294	313	333	353	3

For other sizes: (OD sq – ID sq) x .2223 – weight PIW – For footage in coil: weight PIW divided by wt per lineal foot
Wt per lineal ft: thickness (decimals) x width x 3.4 – Wt Blank: decimal thick x width x .2833 x length (in inches)
To convert weights to stainless: 400 series above weight x 1.01 – 300 series: Above wt x 1.03
Footage per coil: Weight per coil divided by weight per lineal foot.

STAINLESS STEEL COIL, FOIL & STRIP

Specialty: Thin and Tempered Coil

200 ☼ 300 ☼ 400 ☼ PH GRADES ◆ TEMPERED & ANNEALED ◆ COIL: .001 to .250

SLITTING - EDGING - POLISHING - CUT TO LENGTH

FULL SIZE AND CUT-TO-SIZE SHEET & PLATE

TEMPERED AND ANNEALED SHEET ◆ PLATE TO 8" THICK

***PROCESSED FLAT BAR: .125 X .500 to 1" X 18"**

* Processed Flat Bar is Plate Sheared, Straightened & Edged .. "A significant cost savings vs true flat bar"

Shearing, Plasma or Water Jet Plate Cutting ... Machining available on cut-outs.

ALLOY NO.	201	202	301	302	304	304L [6]	305	316	316L [6]	321 [6]	347 [6]	405	409	430	410 [6]	420 [6]	PH17-7
PHYSICAL PROPERTIES																	
Density (lbs. per cu. in.)	.287	.287	.290	.287	.287	.287	.290	.286	.286	.285	.290	.280	.280	.278	.278	.278	.282
Modulus of Elast. ($X10^6$ PSI)	26.6	28.6	28	28	28	28	28	28	28	28	28	29	29	29	29	29	29.5
Electrical Resistivity 1	423	427	432	432	432	432	432	444	444	432	438	360	360	360	342	330	480
Thermal Conductivity 2	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.3	9.3	9.3	9.2	—	—	13.1	14.4	14.4	9.5
Coefficient of Thermal Expansion 3	8.9	9.7	9.4	9.6	9.6	9.6	9.6	8.9	8.9	9.3	9.3	6.0	6.0	5.8	5.5	5.7	8.5
Cost Factor 4	.87	.95	.95	1.00	1.00	1.13	1.39	1.56	1.68	1.35	1.62	.88	—	.73	.76	—	2.18
TENSILE STRENGTH (x 1000 PSI)																	
ANNEALED	115-135	95 Min.	125-145	95-110			90-100	100 Max.		85-110	90-110	65 Nom.	NA	70-80	80-95	95 Nom.	150 Max.
1/8 HARD							100-120	100-120						95-110			
1/4 HARD	125-150		125-150	125-150			120-135	125-150						125 Min.			153 Nom.
1/2 HARD	150-175		150-175	150-175			135-150	150-175									180 Nom.
3/4 HARD	175-195		175-200	175-195													200 Nom.
FULL HARD	185 Min.		185 Min.	185-225			155-170	175-190						135 Min.			220 Nom.
SPRING	200 Min.		200 Min.														
SPL SPRING 5			280 Min. 7												180 Nom.	230 Nom.	240 Nom.
YIELD STRENGTH (x 1000 PSI @0.2% Offset)																	
ANNEALED	45-60	40 Min.	40-60	38-50			35-45	40-55		30-45	40-55	40 Nom.		45-60	40-60	50 Nom.	65 Max.
1/8 HARD							80-95	80-100						90-105			
1/4 Hard	95-125		80-100	100-130			100-120	100-130						120 Nom.			94 Nom.
1/2 HARD	115-150		100-125	130-150			115-130	140-160									115 Nom.
3/4 HARD	140-165		145-160	150-170													148 Nom.
FULL HARD	160-185		160-200	170-210			135-160	160-180						130 Nom.			190 Nom.
SPRING	185 Min.		185 Min.														
SPL SPRING 5			250 Min. 7												140 Nom.	195 Nom.	225 Nom.
ELONGATION (% in 2 inches)																	
ANNEALED	45 Min.	40 Min.	45-75	40-65			50-66	40-65		40-71	46-58	25 Nom.		20-32	22-31	25 Nom.	25 Min.
1/8 HARD							20-40	30-40						3-8			
1/4 Hard	25 Min.		35-60	30 Min.			15-25	12-25						1 Nom.			22 Nom.
1/2 HARD	15 Min.		25-50	7-15			7-15	4-10									10 Nom.
3/4 HARD	7 Min.		15-30	4-10													8 Nom.
FULL HARD	2 Min.		10-25	1-4			2-6	1-5						1 Nom.			5 Nom.
SPRING	1 Min.		1 Min.														
SPL SPRING 5			1 Nom. 7												15 Nom.	8 Nom.	6 Nom.

1. OHMS/CIR. MIL FT 2. BTU PER SQ. FT. PER FT. PER HR.PER F @68F 3. INCHES PER INCH X 10 to the -6 FROM 32F - 212 F 4. DISREGARD 5. TYPICAL HEAT TREATED PROPERTIES OF MARTENSITIC & PH STAINLESS STEELS 6. GENERALLY SOLD IN ANNEALED COND. 7. SPECIAL ROLLED SPRING TEMPER

MANUAL UPDATES: http://www.falcon-metals.com

>>> AVAILABLE GRADES & FORMS ... See pages 34-35 <<<

ALUMINUM AVAILABILITY CHART

ALLOY SERIES	SHEET PLATE	COIL	BAR	PIPE TUBE	STRUCT. SHAPES	WIRE	FORGINGS
1100	X	X	X			X	X
2000*	X	X	X	X	X	X	X
3000	X	X		X		X	X
5000	X	X	X	X	X	X	X
6000*	X	X	X	X	X	X	X
7000*	X	X	X	X	X	X	X

SIZE RANGE	
COIL	.001-.190
SHEET	.008 - 190
PLATE	TO 12"
ROUND	3/16 - 20"
FLAT	4" X 5"
PIPE	12" IPS

* THE 2000, 6000 & 7000 ALLOYS ARE HEAT TREATABLE. NON-HEAT-TREATABLE ALLOYS CAN BE HARDENED BY COLD WORK.

FORGING: IN ADDITION TO COMMON FORGING GRADES, FALCON FORGE WORKS WITH THE FOLLOWING GRADES:
1060 -2014 - 2025 - 2219 - 5083 - 7005 - 7039 - 7050 - 7079 - 7129 - 7149 - 7174 - 7175 - 7475

CHARACTERISTICS OF SOME ALUMINUM ALLOYS

ALLOY	GENERAL CHARACTERISTICS	SOME USES
1100	99% pure aluminum. Excellent forming qualities weldability, electrical conductivity and resistance to corrosion.	Chemical equipment, tank cars, heat exchangers, storage tanks, sheet metal work, dials and name plates, cooking utensils, reflectors.
2011	Good machining, unexcelled for free cutting qualities with good mechanical properties.	Screw machine products, machine parts, atomizer and hose parts, pipe stems, tube fittings.
2017	Relatively high strength, combined with fair workability and good machinability.	Screw machine products, tube fittings, pulleys, gages, coat hangers, tube & tube fittings.
2024 & ALCLAD	A high strength material of adequate workability Has largely superseded 2017 for structural applications. 2024-0 is not recommended unless subsequently heat treated. ALCLAD combines the high strength of 2024 with excellent resistance to corrosion in the T3 & T4 temper.	Aircraft parts, truck wheels, piano hinges, luggage, scientific instruments ski poles, fasteners, orthopedic braces. In ALCLAD.. aircraft frames and skins, venetian blinds, truck bodies, railroad car roofs.
2219	Excellent combination of cryogenic, room temperature and elevated temperature mechanical properties. Excellent resistance to stress corrosion cracking in standard artificially aged tempers.	Welded tanks for cryogenic liquids, high strength structural weldments, and elevated temperature applications in the 400F -500F range.
3003 & ALCLAD	Similar to 1100 but with slightly higher strength, good workability, weldability, and resistance to corrosion. Low cost. 3003 H112 Plate: ASME Unfired Pressures Vessel Code Approved. ALCLAD improves corrosion resistance.	Ductwork, ice cube trays, garage doors, awing slats, trailer & truck panels refrigerator panels, gas lines, gas tanks, heat exchangers, storage tanks, utensils, drawn & spun parts. A very versatile metal. ALCLAD is used for heat exchanger tubes, chemical equipment, swimming pools, tea kettles.
5005	Similar characteristics to 3003 but with finer grain structure. Good finishing characteristics.	Same uses as 3003. Used where excessive finishing costs are encountered in the use of 3003 alloys due to surface roughness upon drawing.
5052	Very good corrosion resistance, good workability, weldability and strength. Tensile range 31-44Kpsi	Used for aircraft fuel tanks, storm shutters, refrigerator liners, utensils, electronic mounting plates and panels, fan blades.
5083	High strength, high resistance to corrosion, suitable for welding. Tensile 40-59Kpsi.	Welded structures (high strength), pressure vessel, storage tanks, truck and marine applications, armor plate.
5086	Similar to 5083. High strength, high resistance to corrosion, good weldability. Tensile 40-54Kpsi.	Medium strength welded structures.
5456	High strength, high resistance to corrosion very suitable for welding. Tensile 46-38 Kpsi	High strength welded structures, pressure vessels, storage tanks, truck and marine applications, armor plate.
6061	Combines relatively high strength, good workability and high resistance to corrosion. ASME pressure vessel code approved. Tens 20-52Kpsi.	Chemical equipment, boats, truck & bus bodies, scaffolding, transmission towers, marine equipment, fire ladders. 6061T6 is used for tankage, tank fittings and general structural and high pressure applications.
7075 & ALCLAD	Very high strength & hardness. ALCLAD also gives excellent resistance to corrosion (in T6).	Used where higher strengths than 2024 are required. Especially used in aircraft parts.

ALUMINUM ALLOYS GROUPED BY MAJOR ALLOYING ELEMENTS

SERIES	MAJOR ALLOY
1XXX	99% MIN ALUM
2XXX	COPPER
3XXX	MANGANESE
4XXX	SILICON
5XXX	MAGNESIUM
6XXX	MAGNESIUM & SILICON
7XXX	ZINC
8XXX	OTHER ELEMENTS

TUNGSTEN ALLOYS (High-Density) Typical Properties and Characteristics

	90% W *6% Ni 4% Cu	90% W 7% Ni 3% Fe	92.5% W 5.25% Ni 2.25 Fe	93% W Balance Ni Fe Mo	95% W 3.5% Ni 1.5% Cu	95% W 3.5% Ni 1.5% Fe	97% W 2.1% Ni .9% Fe
MIL-T 21014D	Class 1	Class 1	Class 2	★ Chip Resistant	Class 3	Class 3	Class 4
SAE AMS	7725B	7725B					
ASTM-B-777-87	Class 1	Class 1	Class 2		Class 3	Class 3	Class 4
Density Gms/cc	17	17	17.5	17.7	18	18	18.5
Density Lbs/Cu. In	0.614	0.614	0.632	0.639	0.65	0.65	0.688
Hardness Rc	24	25	26	32	27	27	28
UTS (Psi)	110,000	120,000	114,000	125,000	110,000	120,000	123,000
Yield .2% Offset (Psi)	80,000	88,000	84,000	95,000	85,000	90,000	85,000
Elongation -% in 1"	6	10	7	4	7	7	5
Proportional Elastic Limit (Psi)	45,000	52,000	46,000	60,000	45,000	44,000	45,000
Modulus / Elasticty (Psi)	40 x 10_6	45 x 10_6	47 x 10_6	53 x 10_6	45 x 10_6	50 x 10_6	53 x 10_6
Coefficient of Thermal Expansion x 10-6/C (20-400C)	5.4	4.61	4.62	4.5	4.43	4.6	4.5
Thermal Cond (CGS)	0.23	0.18	0.2	0.27	0.33	0.26	0.3
Elec Conductivity (% IACS)	14	10	13	14	16	13	17
Magnetic Properties	Nil	Slightly	Slightly	Slightly	Nil	Slightly	Slightly

These alloys are used where high density, strength and machinability are required.
All Falcon's Tungsten products are produced to ISO 9002 and AS 9000
* Typical composition. Composition can be changed as required. Properties may vary according to size and shape.
If non-magnetic material is required, it must be specified at time of order.

MACHINING & FINISHING HIGH-DENSITY TUNGSTEN BASED METALS

Machining is similar to machining gray cast iron. Coolants are optional, but carbide tools are recommended in most cases.

TURNING & BORING: Roughing–use C-2 Carbide with cutting depth of .030"-to .125" and .008" - .015" feed, at 200 to 300 SFM. Finishing– .010 to .015 cutting depth and .004-.010 feed at 250-400 SFM.

DRILLING: Use high speed steel surface treated drills with plain points. Increased clearance angles and automatic feeds are often used to avoid binding and seizing. Carbide drills will give better tool life. A chlorinated oil is sometimes used as a coolant.

TAPPING: Use High-speed or carbide, two flute plug spiral point taps. Use chlorinated oil or tapping compound is recommended.

GRINDING: Use aluminum oxide or silicon carbide wheels of medium hardness.

SAWING – CUTTING: When sawing, use a bi-metal coarse blade at high speeds, or a high-speed coarse blade at low speed. Coolant can be used. Material can be cut using high-speed cutoff wheels.

MILLING: Use M-2 high-speed steel for light cuts and M-42 high-speed steel for deep cuts. Carbide cutter inserts will extend tool life. We recommend when using carbide, feeds of .007-.015" per tooth at speeds of 200-400 SFM for roughing, and when finished, feeds of .003-.010" per tooth 300-700 SFM. Our high-density tungsten alloys are not heat treatable; however, stress relieving is sometimes done on machined parts. We suggest heating 600F in air for 2 hours and air cool in air or heating in a protective atmosphere at 900F for 30 minutes.

The material's characteristics and its low thermal expansion allow very close tolerances and fine finishes.

★ *New Alloy :* Chip Resistant Tungsten: 93% W Bal. Ni, Fe & Mo.
This alloy replaces Tungsten Carbide in most boring & grinding operations.

Available Forms: *IN STOCK* – Round Bar, Flat Bar, Square Bar, Sheet & Wire

Also Available: Commercially Pure Tungsten, Copper Tungsten & Silver Tungsten

Machining Available for Tungsten Alloys:
"State of the art" machine shop can produce to near net/net, and finished parts as per your drawings.

AVAILABILITY LISTING – *STAINLESS STEEL*

Turn sheet over for Availability of Specialty Metals

GRADE	COIL SHEET	PLATE	BAR	WIRE	TUBE PIPE	STRUCT	FORGE
201	X						
301	X						
302	X		X				
302B			X				
303		X	X	X			X
303(B,Sel,VM)			X				X
304(L)	X	X	X	X	X	X	X
304H		X	X			X	
304B			X				
305	X			X			
308				X			X
309(S)	X	X	X	X	X		X
310(S)	X	X	X	X	X		X
316(L,LVM)	X	X	X	X	X	X	
316B			X				X
317(L,LM)	X	X	X	X	X		X
321	X	X	X	X	X		X
330	X	X	X	X	X	X	X
347	X	X	X	X	X		X
Duplex	X	X	X				X
Alloy 20 (20cb3)	X	X	X	X	X		X
AM350,355			X	X			X
Nitronic 40,50,60	X	X	X				
253MA			X			X	

GRADE	COIL SHEET	PLATE	BAR	WIRE	TUBE PIPE	FORGE
403			X			X
405		X				X
409	X	X				
410(S)	X	X			X	X
410HT			X			X
416	X	X	X	X		X
416(HT)			X			X
418(Greek Ascology)			X			X
420	X	X	X	X		X
420(F)			X			X
422			X			X
430	X	X	X	X		X
430(F)			X			X
431			X			X
439	X					X
440(A,Fse)			X			X
440C	X	X	X	X		X
446		X	X		X	X
ph13-8mo	X	X	X			X
15-5ph	X	X	X	X		X
15-7ph	X	X	X	X		X
17-4ph	X	X	X	X		X
17-4 H1150			X			X
17-7ph	X	X	X	X		X

STAINLESS SPECIALTIES

WAREHOUSE PRODUCTS

Cut-to-Size Sheet & Plate (Billed at the after cutting weight) – 440C Sheet & Plate
Stainless Foil & Tempered Stainless Strip – Processed Bar (from Plate) – Large Diameter Bars (Mill & Forge

FORGINGS & ROLLED RINGS

Open Die Forgings – All Shapes to 50,000 lbs & 440" Long – Rolled Rings to 180" O.D.

STAINLESS STEEL FINISHES

STRIP COIL	SHEET	DESCRIPTION
	HRAP	Rough Gray, Orange Peel Finish
#1	2D	CR Dull, no reflectivity
#2	2B	Smooth cold rolled, some reflectivity
#1 BA	#1 BA	Somewhat bright & silvery, not fully reflective.
#2 BA	#2 BA	Bright, Silvery. In 430,mirror like.
RIP, RSK EZ Blend	RIP, RSK EZ Blend	Rolled in finish at mill. Similar to satin finish. Short scratch lines.
#3	#3	120 grit satin finish
#4	#4	180 grit satin finish
#6	#6	Tampico brush finish.
#7	#7	Semi-mirror..fine grain lines.
#8	#8	Mirror finish.
PVC Coating: a clear or colored vinyl applied to the polished surface to prevent scratching while shipping or processing.		

BILLING WEIGHTS .. STAINLESS STEEL PLATE- We stock to 8"

Weights based on .281 lbs per cubic inch.

FRACTION	DECIMAL	LB/SQ.FT	FRACTION	DECIMAL	LB/SQ.FT
3/16	0.1875	8.579	1-1/8	1.1250	47.833
1/4	0.2500	11.162	1-3/16	1.188	50.396
5/16	.3125	13.746	1-1/4	1.250	53.000
3/8	0.3750	16.496	1-3/8	1.375	58.169
7/16	0.4375	19.08	1-1/2	1.500	63.337
1/2	0.5000	21.663	1-5/8	1.625	68.504
9/16	0.5625	24.274	1-3/4	1.750	73.672
5/8	0.6250	26.831	1-7/8	1.875	78.834
11/16	0.6875	29.415	2.00	2.000	84.008
3/4	0.7500	32.123	2-1/4	2.250	94.777
13/16	0.8125	34.707	2-1/2	2.500	105.113
7/8	0.8750	37.291	2-3/4	2.750	115.427
15/16	0.9375	39.875	3.00	3.000	126.301
1	1.0000	42.665	3-1/2	3.500	149.327
1-1/16	1.0625	45.228	4.00	4.000	168.264

AVAILABLE MATERIALS & FORMS ***

NICKEL & SUPER ALLOYS

METAL	COIL / SHEET	PLATE	BAR	WIRE	TUBE/ PIPE	FORGE
NICKEL 200/201	X	X	X	X	X	X
MONEL 400	X	X	X	X	X	X
MONEL RF95			X	X		X
MONEL K500	X		X	X		X
NICKEL 301	X	X		X		X
INCONEL 600	X	X	X	X	X	X
INCONEL 601	X	X	X	X	X	X
INCONEL 617	X	X	X	X		X
INCONEL 625	X	X	X	X	X	X
INCONEL 718	X	X	X	X		X
INCONEL X-750	X	X	X	X		X
HX	X	X	X	X		X
HASTELLOY G		X	X			
INCOLOY 800/825	X	X	X			X
904L		X	X			X
925			X			X
B2	X	X	X			X
HASTELLOY C4	X	X	X			X
HAST. C22/C276	X	X	X		X	X
HAST GE,30,H,N	X	X	X			X
FERRALIUM 255		X	X			X
WASPALOY		X	X			X
MP35N			X	X		X
MP159			X			X
NI-SILVER	X			X		
PERMANICKEL	X					
254SMO	X	X	X			X
A286	X	X	X	X		X
HAYNES "S"	X	X	X	X		
HAYNES "25"	X	X	X	X	X	X
HAYNES "188"	X	X	X		X	X
HAYNES "R41"	X	X	X			
HASTELLOY X	X	X	X	X	X	X
MULTIMET	X	X	X	X		X
STELLITE	X	X	X			X
HY MU80	X		X			X
L605	X	X	X			X

SEE PAGE 3 FOR FULL INFORMATION ON FALCON FORGE'S CAPABILITIES

CARBON & ALLOY STEELS -- COMMERCIAL & AIRCRAFT

METAL	COIL / SHEET	PLATE	BAR	WIRE	TUBE/ PIPE	FORGE
1000 SERIES		X	X	X	X	X
4000 GRADES	X	X	X		X	X
6000 GRADES			X			X
8000 GRADES	X	X	X		X	X
9000 GRADES		X	X			X
52100			X		X	X
D6AC			X			X
H11			X			X
HYTUF			X			X
NITRIDING			X			X
9-4-30			X			X
HY 80-100		X	X			X

LIGHT METALS

ALUMINUM	X	X	X	X	X	X
TITANIUM	X	X	X	X	X	X
MAGNESIUM	X	X	X			X

REFRACTORY METALS

MOLYBDENUM	X	X	X	X	X	X
RHENIUM	X		X	X		X
TANTALUM	X	X	X	X	X	X
TUNGSTEN	X	X	X			X

GLASS SEALING & ELECTICIAL METALS

INVAR	X	X	X			X
KOVAR	X	X	X	X		X
ALLOY 36	X			X		X
ALLOY 42	X			X		X
ALLOY 48	X			X		X
ALLOY 52	X			X		X
NICHROME	X			X		X

OTHER METALS

MARAGING 200		X	X	X		X
MARAGING 250		X	X	X		X
MARAGING 300		X	X	X		X
MARAGING 350		X	X	X		X
ZIRCONIUM			X	X		X
ZIRCALLOY			X	X		X

SEE PAGE 3 FOR FULL INFORMATION ON FALCON FORGE'S CAPABILITIES

SIZE RANGE

COIL: .0005 - .250 THICK .030 - 60" WIDE
SHEET: .010 - 7 GAGE 24" - 72" WIDE
PLATE: 3/16" - 8" THICK TO 120" WIDE
ROUNDS: .062" - 18" DIAMETER

FLAT BAR: TRUE/PROCESSED 1/8" X 3/16" TO 4" X 6"
SQUARE BAR: 1/8" TO 10" LARGER ON REQUEST
HEX BAR: 1/8" TO 6" LARGER ON REQUEST
ROUND WIRE: .002" - 3/4" ANN THROUGH SPRING
FLAT & SHAPED WIRE: .002 X .006 TO .375 X .500
FORGINGS: 2 to 40,000 LBS. ***SEE PAGES 3 - 5***

WAREHOUSES

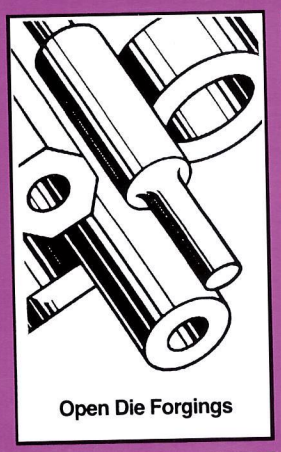
NJ
PA
GA
IL
TX
CA

PROCESSING

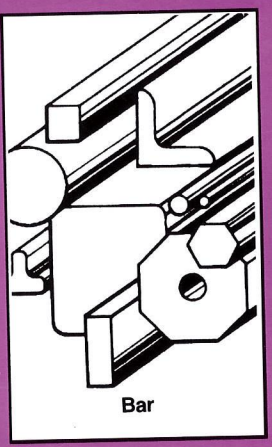
COIL: SLITTING - EDGING - POLISHING - BLANKING LEVELING - TEMPER ROLLING - PERFORATING
SHEET: SHEARING - BLANKING - POLISHING PERFORATING - EXPANDING

PLATE: SAW, PLASMA, MACHINE CUTTING -POLISHING
BAR: CUTTING - POLISHING - GRINDING

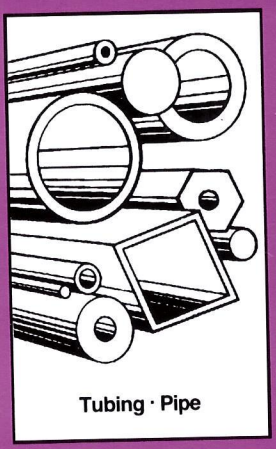
TUBE/PIPE: CUTTING - POLISHING - THREADING
WIRE: STRAIGHTENING - CUT TO LENGTH
FASTENERS: MADE TO ORDER - MOST ALLOYS
FORGINGS: ALL SECONDARY OPERATIONS



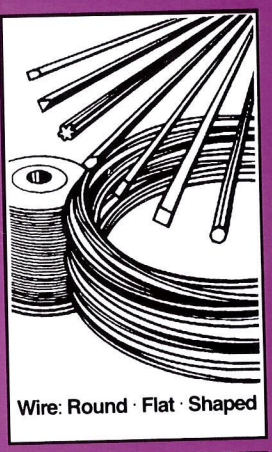
Open Die Forgings



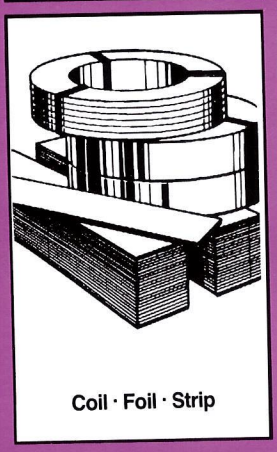
Bar



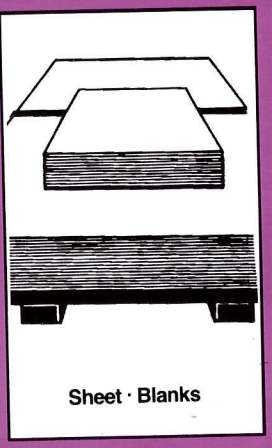
Tubing · Pipe



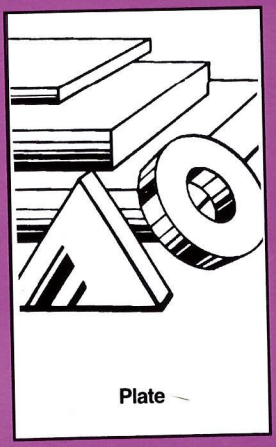
Wire: Round · Flat · Shaped



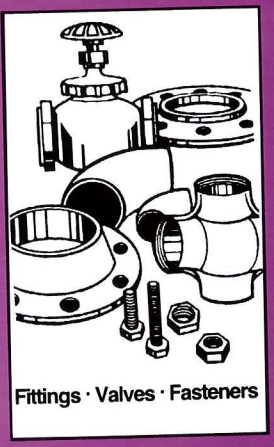
Coil · Foil · Strip



Sheet · Blanks



Plate



Fittings · Valves · Fasteners

Falcon Stainless & Alloys Corp.

Falcon Forge

STAINLESS STEELS - NICKEL & SUPER ALLOYS
ALLOY & HI-CARBON STEELS - MARAGING STEELS
REFRACTORY METALS - NI-IRONS - GLASS SEALING
ALLOYS - TITANIUM - ALUMINUM - OTHER METALS

STEEL WHSES: NJ - CT - PA - OH - NC - IL - TX - CA ✈ *FORGING PLANTS & WHSES*: NJ - CT - PA - IL - CA

CONTENTS:

Specifications - Definitions of Metal Terms - Formulas - Weights - Weight, temperature, metric conversions - Densities - Physical properties - Chemistries - Stock list - Available forms - Hardness conversion scales - Stainless Characteristics & Chemistries - Abbreviations Forging capabilities - Processing capabilities - & more.

(See page 2 for complete index)

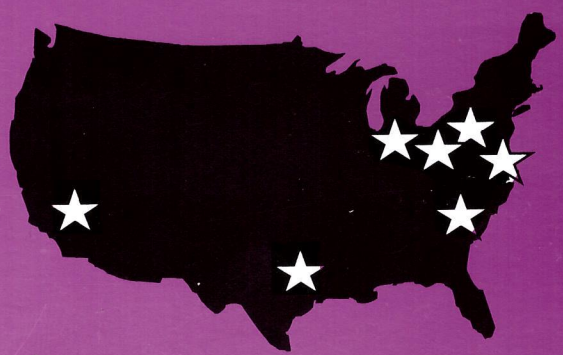
MasterCard VISA®

COMBINED NATIONAL SALES OFFICES:

FALCON STAINLESS
& ALLOYS CORP
Falcon Forge
Falcon Metals Worldwide

39 HEWSON AVE, WALDWICK, NJ 07463

NJ: 201-670-8300
FAX: 201-670-0033
USA: 800-631-0728
CANADA: 800-544-5501
E.Mail: query@falcon-metals.com



We're here "at your service"