



Over 100 Years of Experience

# General Fastener Technical Data

## Carbon Steel Physical Properties

### Corrosion Resistance:

Early fasteners relied on applying a thin layer of .00015 inch to .0005 inch of Electro-deposited zinc plating with .0003 being the norm. This was done in order to prolong the fastener life and to improve the appearance. A considerable number of years ago, Atlas pioneered the introduction and use of the Mechanical-Zinc plating process, which eliminates Hydrogen-embrittlement in the manufacturing process. One more advantage is the increased thickness range of deposited zinc ranging from .0003 inch to .001 inch, with .0005 being the norm.

Prior to plating, all carbon steel fasteners are case-hardened to create a hard surface for drilling and tapping while maintaining a softer core for ductility. Parts can also have added corrosion protection, by optionally coating fasteners with Oxyseal long life coating, either alone or in conjunction with a conventional paint finish that substantially increases the life of the fastener.

### Metal Composition:

- C .20-.25
- Mn .80-1.10
- P .040
- S .050

<b>Specific Gravity</b>	<b>7.75</b>
<b>Density</b>	
lb/in <sup>3</sup>	0.280
kg/m <sup>3</sup>	7,750
<b>Mean Specific Heat</b>	
Btu/lb °F (32/212°F)	0.11
J/kg K (0/100°C)	460
<b>Electrical Resistivity (RT)</b>	
ohm-cir mil/ft	343
microhm-mm	570
<b>Mean Coefficient of Thermal Expansion</b>	
10-6/°F (32/1200°F)	6.5
10-6/K (0/649°C)	11.7
<b>Thermal Conductivity</b>	
Btu in/ft <sup>2</sup> h °F(212V)	173
Wm K (100°C)	25.0
<b>Modulus of Elasticity (E)</b>	
ksi	29.0 x 103
MPa	200 x 103



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## 410 SS Physical Properties

### Corrosion Resistance:

Early fasteners relied on applying a thin layer of Stainless Type 410, in both annealed and heat-treated conditions, provides good corrosion resistance to mild atmospheres. It resists corrosion in many light industrial and domestic environments as well as potable and mine waters.

The alloy has acceptable resistance to sulfide stress cracking at Rockwell C 22 maximum hardness per NACE MR-01-75, "Sulfide-Stress-Cracking-Resistant Metallic Materials for Oil Field Equipment." Refer to the current document for details on acceptable conditions.

For optimum corrosion resistance, surfaces must be free of scale and foreign particles and finished parts should be passivated.

### Metal Composition:

- C .15
- Mn 1.00
- P .040
- S .030
- Si 1.00
- Cr 11.5 - 13.5

<b>Specific Gravity</b>	<b>7.75</b>
<b>Density</b>	
lb/in <sup>3</sup>	0.280
kg/m <sup>3</sup>	7,750
<b>Mean Specific Heat</b>	
Btu/lb °F (32/212°F)	0.11
J/kg K (0/100°C)	460
<b>Electrical Resistivity (RT)</b>	
ohm-cir mil/ft	343
microhm-mm	570
<b>Mean Coefficient of Thermal Expansion</b>	
10-6/°F (32/1200°F)	6.5
10-6/K (0/649°C)	11.7
<b>Thermal Conductivity</b>	
Btu in/ft <sup>2</sup> h °F(212V)	173
Wm K (100°C)	25.0
<b>Modulus of Elasticity (E)</b>	
ksi	29.0 x 103
MPa	200 x 103



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## 304 SS Physical Properties

### Corrosion Resistance:

Annealed Project 70 stainless Type 304 is resistant to atmospheric corrosion, foodstuffs, sterilizing solutions, many organic chemicals and dyestuffs, and a wide variety of inorganic chemicals.

Intergranular corrosion may be a problem if the material is heated between 800°F (427°C) and 1650°F and (899°C) or cooled slowly through that range.

For optimum corrosion resistance, surfaces must be free of scale and foreign particles and finished parts should be passivated.

### Metal Composition:

- C .08
- Mn 2.00
- P .045
- S .030
- Si 1.00
- Cr 18.0 - 20.0
- Ni 8.0 - 10.5

<b>Specific Gravity</b>	<b>7.90</b>
<b>Density</b>	
lb/in <sup>3</sup>	0.285
kg/m <sup>3</sup>	7,900
<b>Mean Specific Heat</b>	
Btu/lb °F (32/212°F)	0.12
J/kg K (0/100°C)	500
<b>Electrical Resistivity (RT)</b>	
ohm-cir mil/ft	433
microhm-mm	720
<b>Mean Coefficient of Thermal Expansion</b>	
10-6/°F (32/1200°F)	10.4
10-6/K (0/649°C)	18.7
<b>Thermal Conductivity</b>	
Btu in/ft <sup>2</sup> h °F(212V)	113
Wm K (100°C)	16.3
<b>Modulus of Elasticity (E)</b>	
ksi	28.0 x 103
MPa	193 x 103



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**CARBON & 410 STAINLESS STEEL**

<b>FASTENER STRENGTH</b>			
<b>(Tensile Values Are For Hex Washer Head &amp; Hex Head Fasteners)</b>			
<b>Fastener Diameter</b>	<b>Minimum Tensile (lbs.)</b>	<b>Minimum Torque (in. lbs.)</b>	<b>Minimum Shear (lbs.)</b>
#6-20	1,125	25	750
#8-18	1,575	42	1,000
#9-16	2,350	65	1,500
#10-16	2,100	61	1,400
#10-24	2,350	65	1,500
#12-14	2,800	92	2,000
#12-24	3,250	100	2,100
1/4-14	3,850	150	2,600
1/4-20	4,275	168	2,700
#17-14	5,200	175	3,125
#18-9	4,550	170	2,575

**304 STAINLESS STEEL**

<b>FASTENER STRENGTH</b>			
<b>(Tensile Values Are For Hex Washer Head &amp; Hex Head Fasteners)</b>			
<b>Fastener Diameter</b>	<b>Minimum Tensile (lbs.)</b>	<b>Minimum Torque (In lbs.)</b>	<b>Minimum Shear (lbs.)</b>
#14-10	2,925	125	1,925
1/4-14	3,600	150	2,600
#17-14	5,200	170	3,125



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Decimal (inch) Equivalents of Thread Diameters		Decimal (inch) Equivalents of Sheet Metal Gauges	
Thread Diameter	Decimal Equivalent	Gauge	Thickness (in.)
#6	.140	26	.018
#7	.150	24	.024
#8	.160	22	.030
#9	.180	20	.036
#10	.190	18	.048
#11	.200	16	.060
#12	.210	14	.075
#13	.230	12	.105
1/4"	.240	10	.134
#14	.250	8	.164
#17	.285	4	.224
#18	.304	1/4	.250
11/32"	.344		

Fastener Size	Washer O.D.
#8 thru #10	1/2"
#12 thru 1/4"	15mm
#18	15mm



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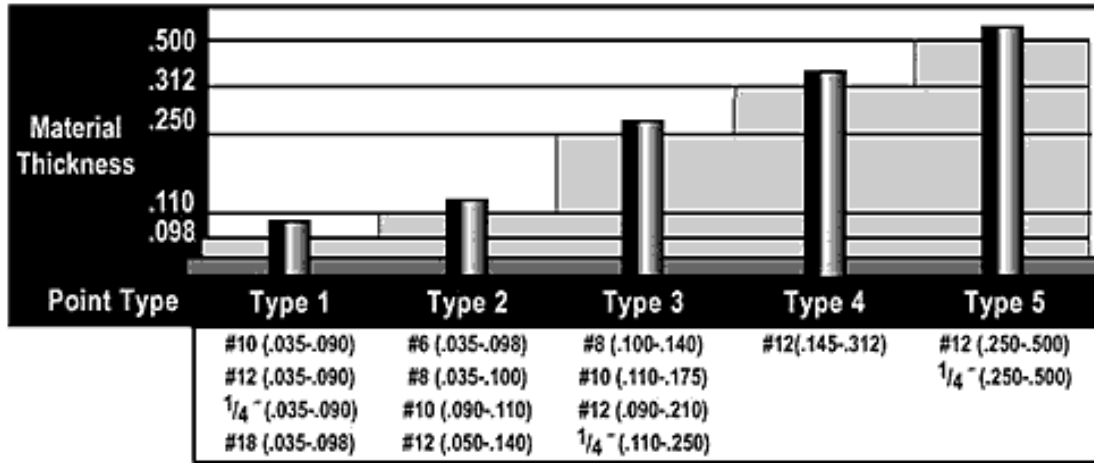
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**Drill Point Capabilities**



Recommended Driving Speed	
Drilling Fasteners	Electric Screw Gun with depth sensing nose piece
#6 thru #10	2,500 RPM max
#12 thru #18 TCP 1,2,3	2,000 RPM max
#12 thru 1/4 TCP 4,5	1,800 RPM max
Self-Tapping Fasteners	
Carbon & 410 Stainless	2,000 RPM max
300 Stainless	800 RPM max



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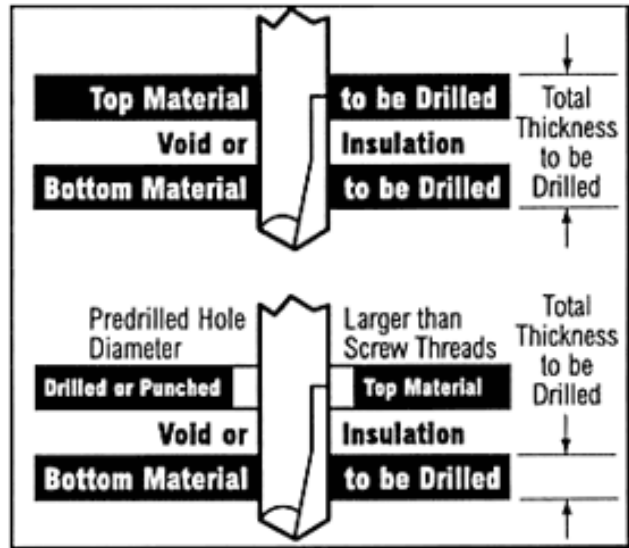
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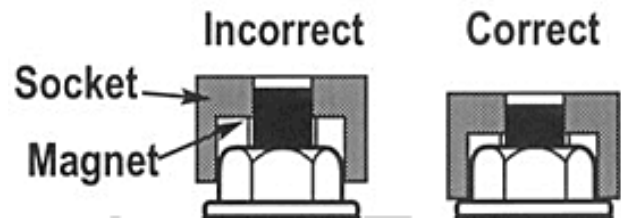
### Metal to Metal Fastening to Determine Drilling Tip Length

The length of the tip required on a drilling fastener is determined by adding up the thickness of the top material, any insulation or void between the top material and bottom material, and the thickness of the bottom material. If a hole larger than the screw threads has been pre-drilled or punched into the top material, only the thickness of the bottom material need be considered. The threaded portion of the shank must be long enough to extend into and through the bottom material drilled.



### Socket Information

Recommend 5/16" retaining ring socket, which allows good fastener head engagement into socket and keeps fastener perpendicular to the work surface. If magnetic sockets are used, be sure to set magnet depth prior to use.



### Washer Seating Recommendation



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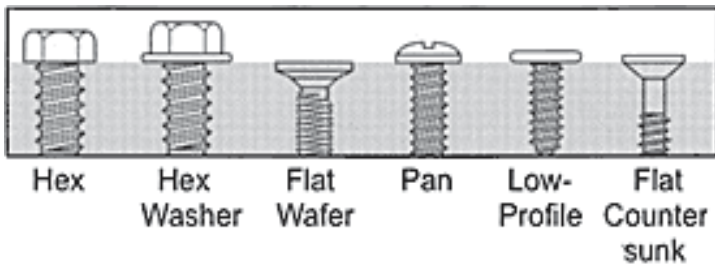
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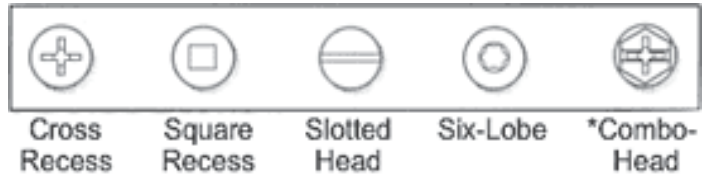
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FASTENER	INSULATION THICKNESS					
	1"	2"	3"	4"	5"	6"
SELF-TAPPING FASTENER LENGTHS	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
SELF-DRILLING FASTENER LENGTHS	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/2"
SEALING WASHER DIAMETERS	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"

### Head Styles Available



### Head Drive Systems



\* Hex washer, Slotted, and Cross recess



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**Fastener Selection**

to Minimize Galvanic Action (Corrosion) Between Fastener and Base Metal

Base Metal	Fastener Metal					
	Zinc & Galvanized Steel	Aluminum & Aluminum Alloys	Steel & Cast Iron	Brasses, Copper, Bronze, Monel	Martensitic Stainless 410	Austenitic Stainless 302/304, 303, 305
Zinc & Galvanized Steel	A	B	B	C	C	C
Aluminum & Aluminum Alloys	A	A	B	C	NR	B
Steel & Cast Iron	AD	A	A	C	C	B
Terne (Lead-Tin) Plated Sheet	ADE	AE	AE	C	C	B
Brass, Copper, Bronze, Monel	ADE	AE	AE	A	A	B
Ferritic Stainless Steel (430)	ADE	AE	AE	A	A	A
Austenitic Stainless Steel(302/304)	ADE	AE	AE	AE	A	A

**KEY**

- A - corrosion of the base metal is not increased by the fastener
- B - corrosion of the base metal is marginally increased by the fastener
- C - corrosion of the base metal may be markedly increased by the fastener
- D - plating on the fastener is rapidly consumed, leaving the bare fastener metal
- E - corrosion of the fastener is increased by the base metal
- NR - not recommended

Note: Surface treatment and environment can change activity.



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Fastener Selection Chart and Suggested Drill Sizes							
#14 Type A		1/4" Type B & BP		1/4" Type AB		#17 Type AB	
Steel Gauge	Hole Size	Steel Gauge	Hole Size	Steel Gauge	Hole Size	Steel Gauge	Hole Size
#26	1/8"	3/16" - 3/8"	#2 Bit	#26	1/8"	#26	3/16"
#24	5/32"	3/8" & over	#1 Bit	#24	5/32"	#24	3/16"
#22	5/32"			#22	5/32"	#22	3/16"
#20	5/32"			#20	5/32"	#20	1/4"
#18	3/16"			#18	3/16"	#18	1/4"
#16	3/16"			#16	3/16"	#16	1/4"
#14	#7 Bit			#14	#7 Bit	#14	1/4"
				#12	#7 Bit	#12	17/64"
				1/8"	#2 Bit	#10	16/64"
				#10	#2 Bit		

All test results and recommendations are based on laboratory tests. Hole sizes for material thicker than 14 gauge are based on 50,000 psi hot rolled structural steel. Specific job site conditions should be taken into consideration when specifying the proper fastener. Because applications vary, we assume no liability for use of this information.



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