



**P R E L O A D  
I N D I C A T I N G  
W A S H E R S**

Maximize  
bolted joint  
strength by  
controlling  
clamp force





# **T A B L E   O F C O N T E N T S**

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# GAIN CLAMP FORCE AND WEIGHT ADVANTAGES WITH SPS PRELOAD INDICATING WASHERS

Achieve maximum preload

Maximize joint strength

Decrease weight

## Clamp Force Holds the Joint Together

When a bolt-nut combination is used to fasten a joint, the preload (clamp force) measurement can be determined using various methods. The most commonly used method is to measure the tightening torque using a torque wrench. However, torque is not a direct measurement of the preload in the joint. The relationship between torque and preload must be established to ensure proper joint clamp force.

Even though a torque wrench may be accurate to within  $\pm 2\%$  of the indicated reading, many variables affect the torque-tension relationship. These variables include friction, lubrication, material type, surface texture and others that can cause the clamping force to vary by as much  $\pm 25\%$ .

Many joint designs will specify a torque value that will approximate a clamp force of only 50% of the ultimate tensile strength of the bolt. Using the  $\pm 25\%$  variation potential, the bolt clamp force could be as small as 25% or as great as 75% of the bolt's ultimate tensile strength.

SPS Preload Indicating Washers are designed with a mean indicating load of 72% of ultimate tensile strength (80% of the yield strength of an alloy steel bolt). Therefore, a higher clamp force can be specified due to the greater accuracy of the Preload Load Indicating Washer System.

## Positive Indication of Clamp Force

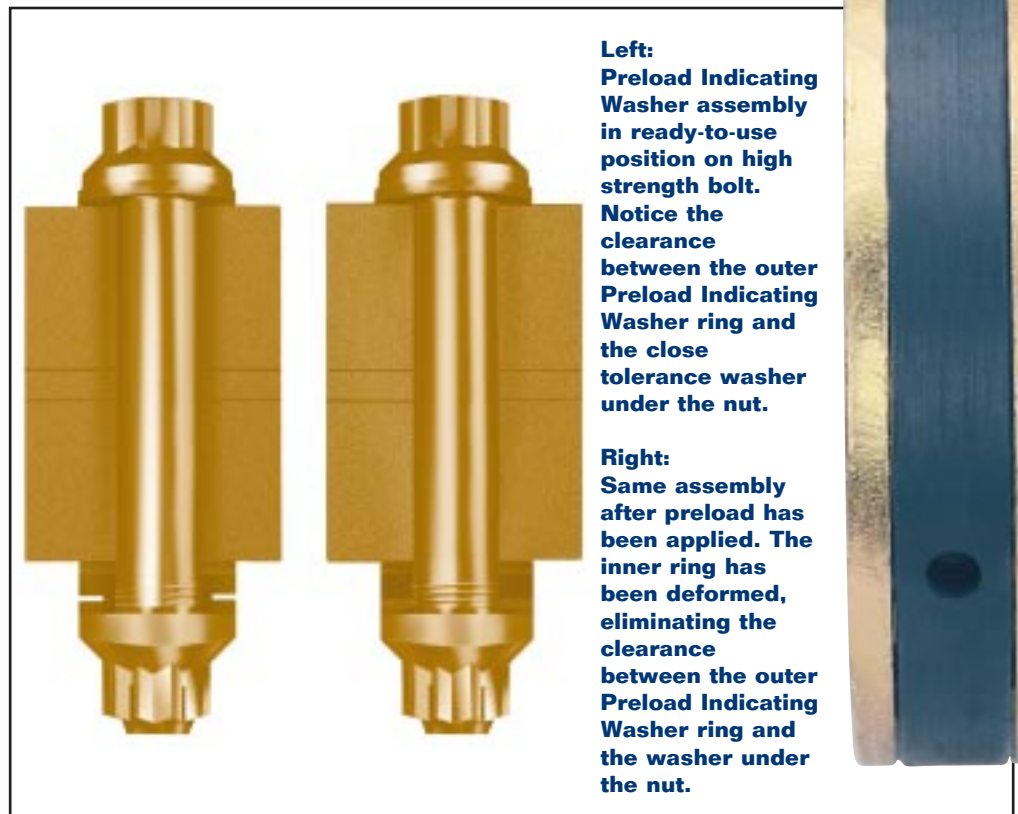
The SPS Preload Indicating Washer offers a simple and accurate means of measuring the clamping forces in a tightened bolt.

The Preload Indicating Washer system consists of two concentric steel rings interleaved between a pair of

plain close tolerance washers. The inner ring is smaller in diameter and taller than the outer ring.

As the assembly is tightened, the inner ring is loaded and compresses elastically. Further tightening actually deforms the inner ring well into the plastic region (see Chart, Figure 1).

A positive indication that the bolt is properly tightened occurs when the loose outer ring is bound between the upper and lower plain washers. The user can verify this by inserting pins in the test (wiggle) holes and rotating the outer ring during the tightening process. When the outer ring no longer moves, the rated load of the washer assembly has been reached.



## LOAD VS. COMPRESSION

Figure 1

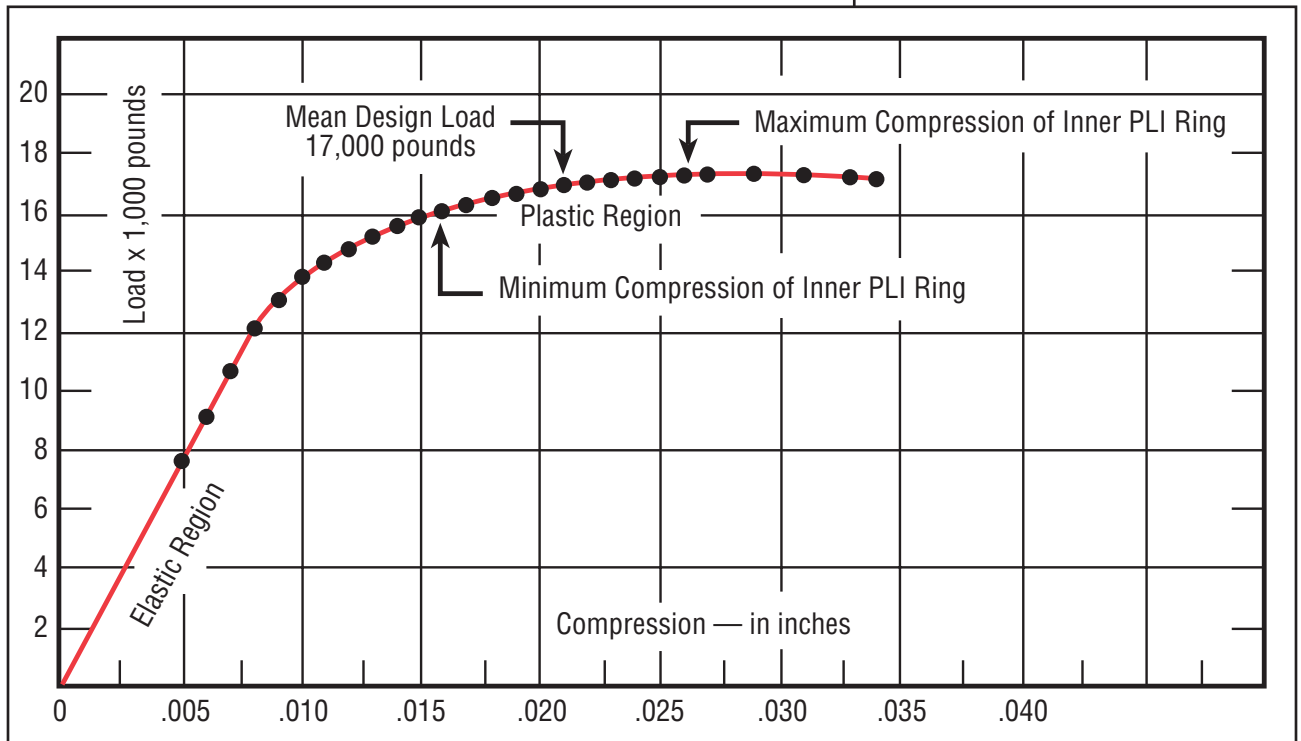


Figure 2

**The inner Preload Indicating Washer ring is designed so that its rated load occurs within the plastic region of its stress-strain diagram. This region exhibits a limited change in load with a significant plastic deformation.**

**Using a 1/2-20 heat treated bolt as an example, the 17,000 lbs. compression necessary to flatten the inner ring results in a 17,000 lb. preload in the bolt—80% of the bolt's yield strength.**

**Note also the wide degree of compression (.016 - .026) without any appreciable increase in load.**

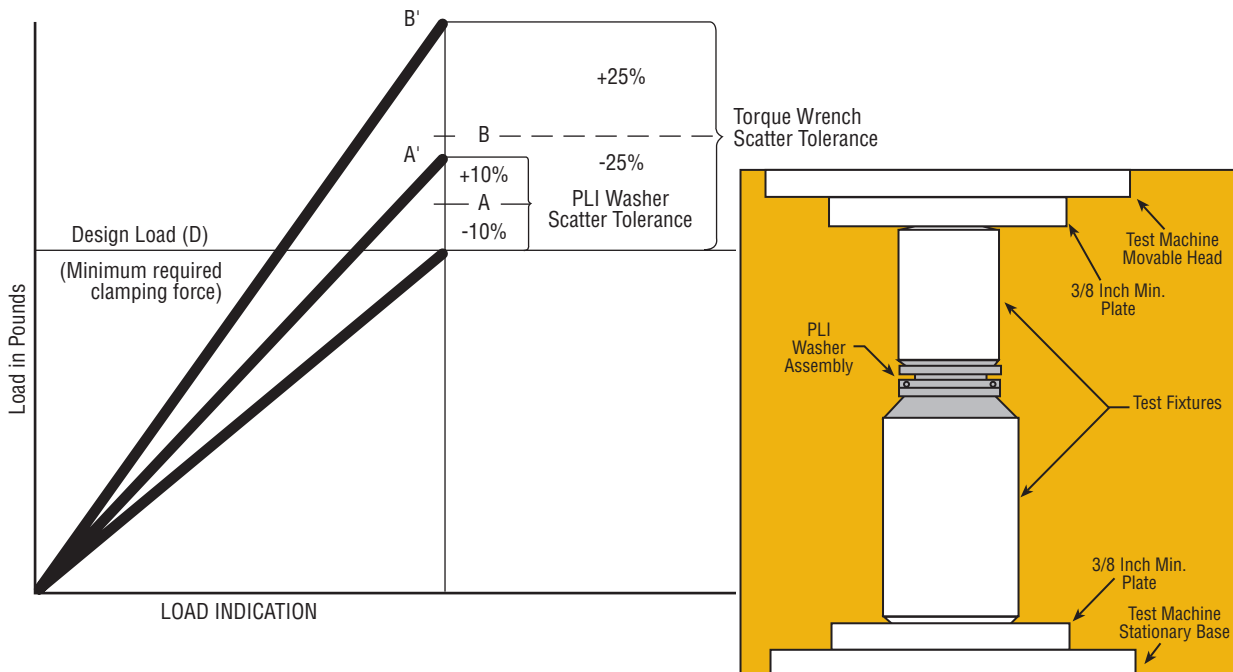
## Preload Indicating Washer Advantages

Using SPS Preload Indicating Washers to achieve maximum preload allows designers to maximize joint strength. By gaining this advantage, smaller diameter fasteners or fewer fasteners can be used, reducing weight without reducing joint reliability.

SPS Preload Indicating Washers are also ideal for use with joints that are inaccessible to torque wrenches. No special tooling is required in the application of Preload Indicating Washers.

Figure 3

ACCURACY OF PRELOAD INDICATING METHODS



**Tolerance in preload measurement must be allowed in addition to the required design load. The bolt preload minimum should equal design load. The torque wrench method with  $\pm 25\%$  tolerance would require a bolt to have a minimum yield strength of B'. The lower 10% tolerance of the Preload Indicating Washer permits the designer to use a bolt that need not exceed yield strength A'...only 72% of the B' (torque wrench) level.**

**Because of the greater accuracy of load measurement of the Preload Indicating Washer, the most economical fasteners can be used...either lower strengths or smaller sizes with weight savings.**

Performance Tests

SPS Preload Indicating Washers undergo a benchmark axial compression test. A universal testing machine applies the load while utilizing fixtures as shown in Figure 3. Pins are inserted into the (wiggle) test holes of the outer ring. The compression load continues until the outer ring can no longer be moved with a firm force from either of two test holes.

Test results conducted at five separate facilities (three within the SPS company) show the correlation, adaptability and viability of this method of testing at different facilities.

Example of test method: Test lot of 5/8" Preload Indicating Washers for 160,000 psi bolts (PLI-10-27.6). The maximum and minimum values ranged from 30,360 to 24,840 lbs. Variations of results between facilities was less than 2%. All results were well within the  $\pm 10\%$  scatter limits of the product.

Availability

Two versions of the Preload Indicating Washers are available. The standard washer is designed for use under the nut. An "under-the-bolt-head" version is also available for use where the washer cannot be installed under the nut. The following tightening strategies will produce less

variation in torque induced preload. When washers are installed under the nut, tightening of the nut is recommended. When washers are installed under the bolt, tightening of the bolt is recommended.

SPS also offers oversize Preload Indicating Washers for use with re-worked joints (see the availability chart on Pages 10-11) and "specials" for loads not listed in this literature (contact the SPS Technologies Product Engineering Dept.

For easy identification and selection, all Preload Indicating Washers are color-coded by stress level. (See page 10).

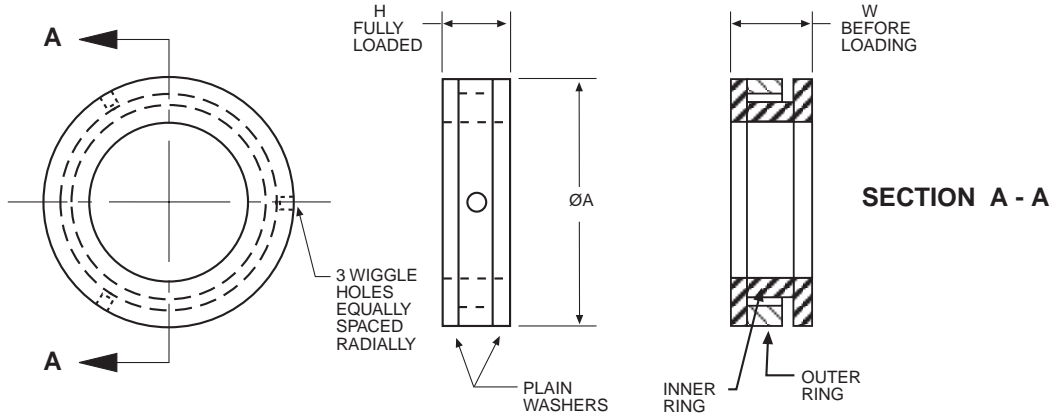


# PRELOAD INDICATING WASHER ASSEMBLY

## APPLICATIONS FOR UNDER THE NUT

### 80 KSI TO 180 KSI STRESS LEVELS

### ALLOY STEEL AND CRES (A286)



NOMINAL BOLT Ø	ØA ±.010	H MIN	W MAX
.190	.468	.188	.228
.250	.531	.198	.240
.312	.593	.208	.252
.375	.687	.247	.296
.437	.781	.258	.309
.500	.875	.268	.321
.562	.968	.279	.333
.625	1.062	.289	.345
.750	1.250	.312	.372
.875	1.437	.333	.396
1.000	1.625	.409	.488
1.125	1.875	.432	.514
1.250	2.125	.456	.542
1.375	2.313	.480	.571
1.500	2.500	.512	.601

- Basic Part Numbers: "PLI" is the basic part number for an alloy steel assembly. "94407" is the basic part number for an A286 assembly. The first dash number = nominal bolt diameter in sixteenths. The second dash number = mean preload in thousands of pounds.  
 Example: PLI-4-2.9 = Alloy steel assembly to be used with ø.2500 bolt (4/16) Preload indicated at 2,900 lbs. (2.9 x 1,000).  
 94407-10-21.7 = A286 assembly to be used with ø.6250 bolt (10/16) Preload indicated at 21,700 lbs. (21.7 x 1,000).

Table I describes the dash numbers and indicated loads offered with the part numbers listed in Note 1.

- Alloy steel assemblies are cadmium plated per QQ-P-416, Type II, Class 3. A286 assemblies are passivated per ASTM A967.
- Alloy steel only: Carbowax .437 and larger inner rings.
- Rings are color coded for load level identification:
  - 80 ksi rings — Red
  - 100 ksi rings — Black
  - 125 ksi rings — Green
  - 160 ksi rings — Plain
  - 180 ksi rings — Blue
- Plain washers are not color coded.
- 160 ksi rings are not color coded — they are plain as plated. The plated parts will appear as a golden color, due to the dichromate treatment.
- Dimensions are in inches.

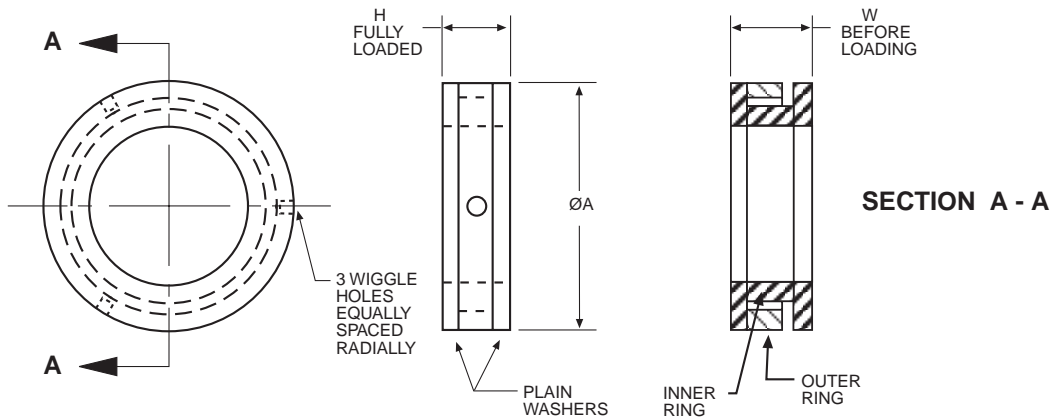
The stress listed in Table I is the minimum ultimate tensile strength of the bolt.  
 The indicated load listed in Table I is 80% of the yield strength of an alloy steel bolt.

Table I

80 ksi			100 ksi			125 ksi			160 ksi			180 ksi		
Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.	
	MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN
-3-1.0	1,100	900	-3-1.3	1,430	1,170	-3-1.6	1,760	1,440	-3-2.1	2,310	1,890	-3-2.3	2,530	2,070
-4-1.9	2,090	1,710	-4-2.4	2,640	2,160	-4-2.9	3,190	2,610	-4-3.6	3,960	3,240	-4-4.3	4,730	3,870
-5-3.1	3,410	2,790	-5-3.8	4,180	3,420	-5-4.7	5,170	4,230	-5-5.9	6,490	5,310	-5-6.9	7,590	6,210
-6-4.7	5,170	4,230	-6-5.9	6,490	5,310	-6-7.3	8,030	6,570	-6-9.2	10,120	8,280	-6-10.7	11,770	9,630
-7-6.4	7,040	5,760	-7-8.0	8,800	7,200	-7-9.9	10,890	8,910	-7-12.4	13,640	11,160	-7-14.4	15,840	12,960
-8-8.7	9,570	7,830	-8-10.9	11,990	9,810	-8-13.5	14,850	12,150	-8-17.0	18,700	15,300	-8-19.6	21,560	17,640
-9-11.1	12,200	10,000	-9-13.9	15,290	12,510	-9-17.1	18,810	15,390	-9-21.6	23,760	19,400	-9-24.9	27,390	22,410
-10-14.1	15,510	12,690	-10-17.6	19,360	15,840	-10-21.7	23,870	19,530	-10-27.6	30,360	24,840	-10-31.7	34,870	28,530
-12-20.6	22,660	18,540	-12-25.8	28,380	23,220	-12-31.8	34,980	28,620	-12-40.3	44,330	36,270	-12-46.5	51,150	41,850
-14-28.2	31,020	25,380	-14-35.3	38,830	31,770	-14-43.5	47,850	39,150	-14-55.2	60,720	49,680	-14-63.5	69,850	57,150
-16-38.0	41,800	34,200	-16-47.5	52,250	42,750	-16-58.6	64,460	52,740	-16-74.3	81,730	66,870	-16-85.5	94,050	76,950
-18-48.2	53,020	43,380	-18-60.2	66,220	54,180	-18-72.9	80,190	65,610	-18-93.4	102,740	84,060	-18-108.4	119,240	97,560
-20-59.4	65,340	53,460	-20-74.2	81,620	66,780	-20-92.8	102,080	83,520	-20-117.8	129,580	106,020	-20-133.6	146,960	120,240
-22-73.1	80,410	65,790	-22-91.4	100,540	82,260	-22-114.2	125,620	102,780	-22-145.1	159,610	130,590	-22-164.5	180,950	148,050
-24-88.2	97,020	79,380	-24-110.3	121,330	99,270	-24-137.9	151,690	124,110	-24-175.3	192,830	157,770	-24-198.5	218,350	178,650

These loads are established by a benchmark axial static test. In applications where preload is torque induced, the actual preload may be less than the indicated load listed on the drawing. Preload scatter using Preload Indicating Washers can be reduced to ±10%.

# PRELOAD INDICATING WASHER ASSEMBLY APPLICATIONS FOR UNDER THE NUT 220 KSI TO 260 KSI STRESS LEVELS ALLOY STEEL



NOMINAL BOLT Ø	ØA ±.010	H MIN	W MAX
.190	.365	.188	.228
.250	.491	.198	.240
.312	.616	.208	.252
.375	.750	.247	.296
.437	.873	.258	.309
.500	1.005	.268	.321
.562	1.139	.279	.333
.625	1.255	.289	.345
.750	1.523	.312	.372
.875	1.780	.389	.464
1.000	2.050	.409	.488
1.125	2.295	.432	.514
Ø1.250	2.565	.456	.542
Ø1.375	2.830	.480	.571
Ø1.500	3.100	.512	.601

Ø Available in 220 ksi Series only

- Basic Part Numbers: PLI22 = Alloy steel, 220 ksi stress level.  
PLI26 = Alloy steel, 260 ksi stress level.  
The first dash number = nominal bolt diameter in sixteenths.  
The second dash number = mean preload in thousands of pounds.  
  
Example: PLI22-6-12.4 = Alloy steel assembly to be used with a ø.3750 bolt (6/16)  
Preload indicated at 12,400 lbs. (12.4 x 1,000).
- Alloy steel assemblies are cadmium plated per QQ-P-416, Type II, Class 3.
- Carbowax .437 and larger inner rings.
- Rings are color coded for load level identification: 220 ksi rings — Olive Drab  
260 ksi rings — Violet
- Plain washers are not color coded.
- Dimensions are in inches.

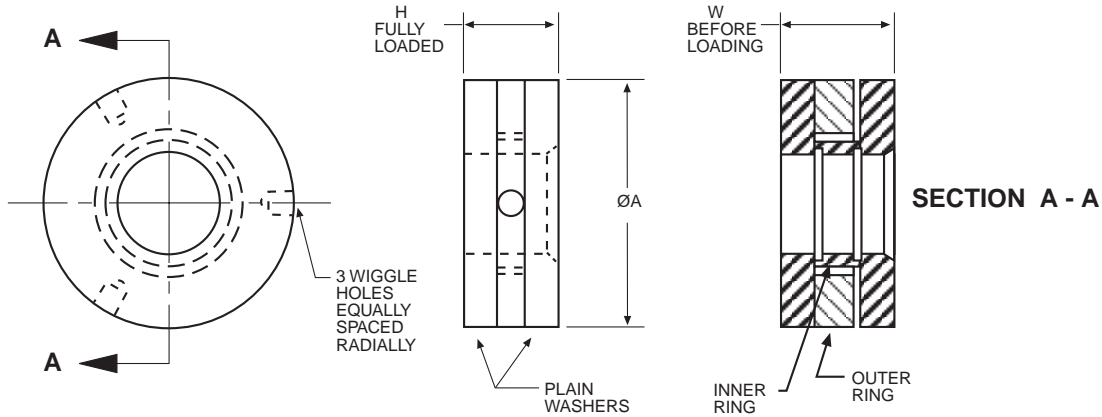
The stress listed in Table I is the minimum ultimate tensile strength of the bolt.  
The indicated load listed in Table I is 80% of the yield strength of an alloy steel bolt.

Table I

Part Numbers	220 ksi		260 ksi		
	Indicated Load in lbs.		Indicated Load in lbs.		
	MAX	MIN	Part Numbers	MAX	MIN
PLI22-3-2.8	3,080	2,520	PLI26-3-3.4	3,740	3,060
PLI22-4-5.0	5,500	4,500	PLI26-4-6.3	6,930	5,670
PLI22-5-8.1	8,910	7,290	PLI26-5-10.1	11,110	9,090
PLI22-6-12.4	13,640	11,160	PLI26-6-15.6	17,160	14,040
PLI22-7-16.7	18,370	15,030	PLI26-7-21.0	23,100	18,900
PLI22-8-22.7	24,970	20,430	PLI26-8-28.5	31,350	25,650
PLI22-9-28.7	31,570	25,830	PLI26-9-36.3	39,930	32,670
PLI22-10-36.4	40,040	32,760	PLI26-10-46.0	50,600	41,400
PLI22-12-53.3	58,630	47,970	PLI26-12-67.3	74,030	60,570
PLI22-14-72.9	80,190	65,610	PLI26-14-92.0	101,200	82,800
PLI22-16-97.9	107,690	88,110	PLI26-16-123.5	135,850	111,150
PLI22-18-122.9	135,190	110,610	PLI26-18-155.2	170,720	139,680
PLI22-20-154.8	170,280	139,320			
PLI22-22-190.3	209,330	171,270			
PLI22-24-229.5	252,450	206,550			

These loads are established by a benchmark axial static test. In applications where preload is torque induced, the actual preload may be less than the indicated load listed on the drawing. Preload scatter using Preload Indicating Washers can be reduced to ±10%.

# PRELOAD INDICATING WASHER ASSEMBLY APPLICATIONS FOR UNDER THE BOLT HEAD 80 KSI TO 180 KSI STRESS LEVELS ALLOY STEEL AND CRES (A286)



NOMINAL BOLT Ø	ØA ±.010	H MIN	W MAX
.190	.468	.188	.228
.250	.531	.198	.240
.312	.593	.208	.252
.375	.687	.247	.296
.437	.781	.258	.309
.500	.875	.268	.321
.562	.968	.279	.333
.625	1.062	.289	.345
.750	1.250	.312	.372
.875	1.437	.333	.396
1.000	1.625	.409	.488
1.125	1.875	.432	.514
1.250	2.125	.456	.542
1.375	2.313	.480	.571
1.500	2.500	.512	.601

1. Basic Part Numbers: 62520 = Alloy Steel, 80 ksi stress level  
 62521 = Alloy Steel, 100 ksi stress level  
 62522 = Alloy Steel, 125 ksi stress level  
 62523 = Alloy Steel, 160 ksi stress level  
 62524 = Alloy Steel, 180 ksi stress level  
 95300 = A286, 80 ksi to 180 ksi stress level

The first dash number = nominal bolt diameter in sixteenths.  
 The second dash number = mean preload in thousands of pounds.

Example: 62520-5-3.8 = Alloy steel assembly to be used with ø.3125 bolt (5/16)  
 Preload indicated at 3,800 lbs. (3.8 x 1,000).  
 95300-8-13.5 = A286 assembly to be used with ø.5000 bolt (8/16)  
 Preload indicated at 13,500 lbs. (13.5 x 1,000).

Table I describes the dash numbers and indicated loads offered with the part numbers listed in Note 1.

- Alloy steel assemblies are cadmium plated per QQ-P-416, Type II, Class 3. A286 assemblies are passivated per ASTM A967.
- Alloy steel only: Carbowax .437 and larger inner rings.
- Rings are color coded for load level identification: 80 ksi rings — Red 160 ksi rings — Plain  
 100 ksi rings — Black 180 ksi rings — Blue  
 125 ksi rings — Green

- Plain washers are not color coded.
- 160 ksi rings are not color coded — they are plain as plated. The plated parts will appear as a golden color due to the dichromate treatment.
- Dimensions are in inches.

The stress listed in Table I is the minimum ultimate tensile strength of the bolt.  
 The indicated load listed in Table I is 80% of the yield strength of an alloy steel bolt.

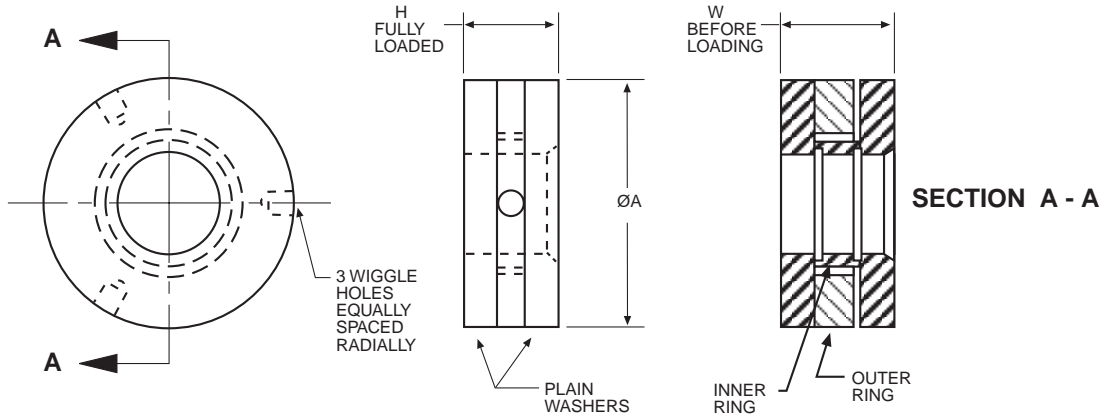
Table I

80 ksi			100 ksi			125 ksi			160 ksi			180 ksi		
Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.		Part Dash Numbers	Indicated Load in lbs.	
	MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN
-3-1.0	1,100	900	-3-1.3	1,430	1,170	-3-1.6	1,760	1,440	-3-2.1	2,310	1,890	-3-2.3	2,530	2,070
-4-1.9	2,090	1,710	-4-2.4	2,640	2,160	-4-2.9	3,190	2,610	-4-3.6	3,960	3,240	-4-4.3	4,730	3,870
-5-3.1	3,410	2,790	-5-3.8	4,180	3,420	-5-4.7	5,170	4,230	-5-5.9	6,490	5,310	-5-6.9	7,590	6,210
-6-4.7	5,170	4,230	-6-5.9	6,490	5,310	-6-7.3	8,030	6,570	-6-9.2	10,120	8,280	-6-10.7	11,770	9,630
-7-6.4	7,040	5,760	-7-8.0	8,800	7,200	-7-9.9	10,890	8,910	-7-12.4	13,640	11,160	-7-14.4	15,840	12,960
-8-8.7	9,570	7,830	-8-10.9	11,990	9,810	-8-13.5	14,850	12,150	-8-17.0	18,700	15,300	-8-19.6	21,560	17,640
-9-11.1	12,200	10,000	-9-13.9	15,290	12,510	-9-17.1	18,810	15,390	-9-21.6	23,760	19,440	-9-24.9	27,390	22,410
-10-14.1	15,510	12,690	-10-17.6	19,360	15,840	-10-21.7	23,870	19,530	-10-27.6	30,360	24,840	-10-31.7	34,870	28,530
-12-20.6	22,660	18,540	-12-25.8	28,380	23,220	-12-31.8	34,980	28,620	-12-40.3	44,330	36,270	-12-46.5	51,150	41,850
-14-28.2	31,020	25,380	-14-35.3	38,830	31,770	-14-43.5	47,850	39,150	-14-55.2	60,720	49,680	-14-63.5	69,850	57,150
-16-38.0	41,800	34,200	-16-47.5	52,250	42,750	-16-58.6	64,460	52,740	-16-74.3	81,730	66,870	-16-85.5	94,050	76,950
-18-48.2	53,020	43,380	-18-60.2	66,220	54,180	-18-72.9	80,190	65,610	-18-93.4	102,740	84,060	-18-108.4	119,240	97,560
-20-59.4	65,340	53,460	-20-74.2	81,620	66,780	-20-92.8	102,080	83,520	-20-117.8	129,580	106,020	-20-133.6	146,960	120,240
-22-73.1	80,410	65,790	-22-91.4	100,540	82,260	-22-114.2	125,620	102,780	-22-145.1	159,610	130,590	-22-164.5	180,950	148,050
-24-88.2	97,020	79,380	-24-110.3	121,330	99,270	-24-137.9	151,690	124,110	-24-175.3	192,830	157,770	-24-198.5	218,350	178,650

These loads are established by a benchmark axial static test. In applications where preload is torque induced, the actual preload may be less than the indicated load listed on the drawing. Preload scatter using Preload Indicating Washers can be reduced to ±10%.



# PRELOAD INDICATING WASHER ASSEMBLY APPLICATIONS FOR UNDER THE BOLT HEAD 220 KSI TO 260 KSI STRESS LEVELS ALLOY STEEL



NOMINAL BOLT Ø	ØA ±.010	H MIN	W MAX
.250	.491	.198	.240
.312	.616	.208	.252
.375	.750	.247	.296
.437	.873	.258	.309
.500	1.005	.268	.321
.562	1.139	.279	.333
.625	1.255	.289	.345
.750	1.523	.312	.372
.875	1.780	.333	.396
1.000	2.050	.409	.488
1.125	2.295	.432	.514
Ø1.250	2.565	.456	.542
Ø1.375	2.830	.480	.571
Ø1.500	3.100	.512	.601

Ø Available in 220 ksi Series only

- Basic Part Numbers: 63126 = Alloy steel, 220 ksi stress level  
62526 = Alloy steel, 260 ksi stress level  
The first dash number = nominal bolt diameter in sixteenths.  
The second dash number = mean preload in thousands of pounds.  
Example: 63126-6-12.4 = Alloy steel assembly to be used with a ø.3750 bolt (6/16)  
Preload indicated at 12,400 lbs. (12.4 x 1,000).
- Alloy steel assemblies are cadmium plated per QQ-P-416, Type II, Class 3.
- Carbowax .437 and larger inner rings.
- Rings are color coded for load level identification: 220 ksi rings — Olive Drab  
260 ksi rings — Violet
- Plain washers are not color coded.
- Dimensions are in inches.

The stress listed in Table I is the minimum ultimate tensile strength of the bolt.  
The indicated load listed in Table I is 80% of the yield strength of an alloy steel bolt.

Table I

Part Numbers	220 ksi		Part Numbers	260 ksi	
	Indicated Load in lbs.			Indicated Load in lbs.	
	MAX	MIN		MAX	MIN
63126-4-5.0	5,500	4,500	62526-4-6.3	6,930	5,670
63126-5-8.1	8,910	7,290	62526-5-10.1	11,110	9,090
63126-6-12.4	13,640	11,160	62526-6-15.6	17,160	14,040
63126-7-16.7	18,370	15,030	62526-7-21.0	23,100	18,900
63126-8-22.7	24,970	20,430	62526-8-28.5	31,350	25,650
63126-9-28.7	31,570	25,830	62526-9-36.3	39,930	32,670
63126-10-36.4	40,040	32,760	62526-10-46.0	50,600	41,400
63126-12-53.3	58,630	47,970	62526-12-67.3	74,030	60,570
63126-14-72.9	80,190	65,610	62526-14-92.0	101,200	82,800
63126-16-97.9	107,690	88,110	62526-16-123.5	135,850	111,150
63126-18-122.9	135,190	110,610	62526-18-155.2	170,720	139,680
63126-20-154.8	170,280	139,320			
63126-22-190.3	209,330	171,270			
63126-24-229.5	252,450	206,550			

These loads are established by a benchmark axial static test. In applications where preload is torque induced, the actual preload may be less than the indicated load listed on the drawing. Preload scatter using Preload Indicating Washers can be reduced to ±10%.

UNDER THE BOLT HEAD

**OVERSIZE PRELOAD INDICATING WASHERS  
ALLOY STEEL**

<b>Stress Level</b>	<b>Color Code</b>	<b>Application</b>	<b>Size</b>	<b>SPS Basic Part Number</b>
80 ksi	Red	Under Nut	Basic	55950
			.016 Oversize	73960
			.031 Oversize	73961
		Under Bolt Head	Basic	62520
			.016 Oversize	68241
			.031 Oversize	68242
100 ksi	Black	Under Nut	Basic	55950
			.016 Oversize	73962
			.031 Oversize	73963
		Under Bolt Head	Basic	62521
			.016 Oversize	68243
			.031 Oversize	68244
125 ksi	Green	Under Nut	Basic	55950
			.016 Oversize	73964
			.031 Oversize	73965
		Under Bolt Head	Basic	62522
			.016 Oversize	68245
			.031 Oversize	68246
160 ksi	Color as Cadmium Plated	Under Nut	Basic	55950
			.016 Oversize	53256
			.031 Oversize	64045
		Under Bolt Head	Basic	62523
			.016 Oversize	64046
			.031 Oversize	64047
180 ksi	Blue	Under Nut	Basic	55950
			.016 Oversize	62614
			.031 Oversize	62615
		Under Bolt Head	Basic	62524
			.016 Oversize	64043
			.031 Oversize	64044

**OVERSIZE**

**OVERSIZE PRELOAD INDICATING WASHERS  
ALLOY STEEL (CONT.)**

<b>Stress Level</b>	<b>Color Code</b>	<b>Application</b>	<b>Size</b>	<b>SPS Basic Part Number</b>
220 ksi	Olive Drab	Under Nut	Basic	57670
			.016 Oversize	68478
			.031 Oversize	68479
		Under Bolt Head	Basic	63126
			.016 Oversize	68247
			.031 Oversize	68248
260 ksi	Violet	Under Nut	Basic	57670
			.016 Oversize	73966
			.031 Oversize	73967
		Under Bolt Head	Basic	62526
			.016 Oversize	68249
			.031 Oversize	68250

**OVERSIZE PRELOAD INDICATING WASHERS  
A286**

<b>Stress Level</b>	<b>Color Code</b>	<b>Application</b>	<b>SPS Basic Part Number</b>	<b>Oversize Code</b>
80	Red	Under Nut	94407	Add .25 to first dash no. to signify .016 oversize. Add .5 to first dash no. to signify .031 oversize. Ex. 94407-4.25
100	Black			
125	Green			
160	Plain			
180	Blue			
80	Red	Under Bolt Head	95300	Add .25 to first dash no. to signify .016 oversize. Add .5 to first dash no. to signify .031 oversize. Ex. 94661-5.5
100	Black			
125	Green			
160	Plain			
180	Blue			

**OVERSIZE**



## TECHNICAL SUPPORT

SPS Technologies' product engineering group provides support to assist you with the application of Preload Indicating Washers. Contact the Jenkintown group with your questions or a description of your application. The group will provide recommendations for your specific application.

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