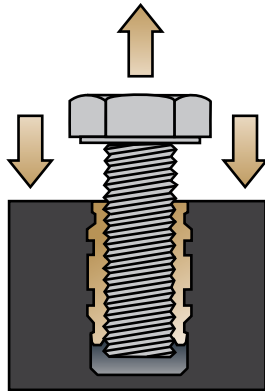
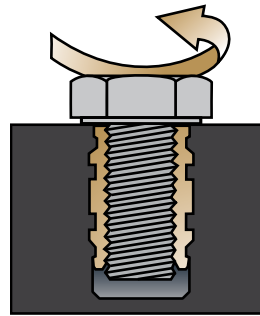


TESTING METHODS AND TERMINOLOGY

SPIROL Inserts are designed to maximize and balance tensile (pull-out) and rotational torque performance. Attention to knurl and thread quality further enhances performance. **Quality Control** assures the consistency of performance.



TENSILE (PULL-OUT) STRENGTH



ROTATIONAL TORQUE

The **axial force** required to pull the Insert out of the plastic material. This test is performed using a qualified tensile testing machine. A load curve is recommended for analysis purposes.

The **rotational force** required to rotate the Insert in the plastic material. In practice, the friction between the screw head and mating component comes into play providing an additional safety factor. A calibrated torque wrench should be used for this test.

PERFORMANCE

The following factors impact Insert performance:

- Insert type, design with type and quality of the Insert features,
- Plastic material and filler composition,
- Design and quality of the plastic components including hole consistency,
- Installation process and resultant quality, and
- Alignment of the mating component and how it supports the installed Insert.

The **correct installation** settings are critical to Heat/Ultrasonic Insert performance. The tapping process for Self-Tapping Inserts has to be set to avoid hole reaming. Improper installation can have devastating effects on performance.

HEAT-ULTRASONIC INSERTS (Straight Holes)

Thread Size		INS 19 Short		INS 19 Long		INS 29 Short		INS 29 Long	
Unified	Metric	Tensile lbs. (N)	Torque in-lbs. (N-m)	Tensile lbs. (N)	Torque in-lbs. (N-m)	Tensile lbs. (N)	Torque in-lbs. (N-m)	Tensile lbs. (N)	Torque in-lbs. (N-m)
2-56	M2	100 (445)	4 (0.4)	150 (665)	5 (0.5)	125 (555)	4 (0.4)	175 (780)	5 (0.5)
4-40	M2.5 M3	175 (780)	14 (1.5)	325 (1,445)	28 (3)	225 (1,000)	14 (1.5)	425 (1,890)	28 (3)
6-32	M3.5	275 (1,220)	30 (3.5)	500 (2,220)	55 (6)	325 (1,445)	30 (3.5)	625 (2,780)	55 (6)
8-32	M4	375 (1,670)	53 (6)	650 (2,900)	80 (9)	446 (2,000)	62 (7)	850 (3,800)	90 (10)
10-24 10-32	M5	550 (2,450)	90 (10)	850 (3,800)	125 (14)	650 (2,900)	100 (11)	1,100 (4,900)	135 (15)
1/4-20	M6	750 (3,350)	140 (16)	1,050 (4,650)	185 (21)	900 (4,000)	150 (17)	1,400 (6,200)	200 (23)
5/16-18	M8	900 (4,000)	250 (28)	1,300 (5,800)	290 (33)	1,200 (5,350)	250 (28)	1,800 (8,000)	310 (35)

The variety of plastic materials and fillers and the complexity of component design makes it impossible to provide Insert performance data which can be applied to specific applications. The data provided herein should only be used as a general comparative guide.

HEAT-ULTRASONIC INSERTS *(Tapered Holes)*

Thread Size		INS 14 Short		INS 14 Long	
Unified	Metric	Tensile lbs. (N)	Torque in-lbs. (N-m)	Tensile lbs. (N)	Torque in-lbs. (N-m)
2-56	M2	50 (220)	3 (0.3)	125 (560)	9 (1)
4-40	M2.5	175 (780)	18 (2)	300 (1,330)	27 (3)
6-32	M3 M3.5	225 (1,000)	27 (3)	450 (2,000)	35 (4)
8-32	M4	300 (1,350)	30 (3.5)	575 (2,550)	45 (5)
10-24 10-32	—	450 (2,000)	45 (5)	750 (3,330)	70 (8)
—	M5	550 (2,450)	88 (10)	950 (4,200)	135 (15)
1/4-20	M6	850 (3,800)	140 (16)	1,300 (5,800)	220 (25)
5/16-18	M8	1,200 (5,350)	265 (30)	2,000 (8,900)	355 (40)

SELF-TAPPING INSERTS

Thread Size		INS 10
Unified	Metric	Tensile lbs. (N)
4-40	M3	600 (2,650)
6-32	M3.5	900 (4,000)
8-32	M4	1,225 (5,500)
10-24 10-32	M5	1,700 (7,500)
1/4-20	M6	2,250 (10,000)
5/16-18	M8	2,800 (12,500)

PRESS-IN INSERTS

Thread Size		INS 50	
Unified	Metric	Tensile lbs. (N)	Torque in-lbs. (N-m)
4-40	M3	75 (330)	18 (2)
6-32	M3.5	90 (400)	27 (3)
8-32	M4	115 (500)	50 (5.5)
10-24 10-32	M5	150 (675)	75 (8.5)
1/4-20	M6	180 (800)	135 (15)
5/16-18	M8	225 (1,000)	230 (26)

MOLDED-IN INSERTS

Thread Size		INS 63	INS 65
Unified	Metric	Tensile lbs. (N)	Tensile lbs. (N)
8-32	M4	1,200 (5,360)	1,420 (6,300)
10-24	M5	1,720 (7,650)	1,990 (8,860)
1/4-20	M6	2,430 (10,830)	2,900 (12,890)
5/16-18	M8	3,030 (13,480)	3,660 (16,290)

The **SPIROL Series 63** and **65** Molded-In Inserts far exceeded the maximum recommended tightening **torque** of a Class 12.9 (Grade 8) bolt.

SPIROL has extensive historic performance data on which to base an initial recommendation. It is, however, SPIROL's preference to test the Insert in your application and determine the installation criteria that will yield the best performance. You will receive a written report. We suggest consultation at the earliest stages in product development.

Performance Test Results:

- Inserts were installed into bosses at least 2 times the Insert diameter.
- The INS 63's and INS 65's were molded into unfilled nylon 6.
- All post-mold installed Inserts were tested in unfilled nylon 6/6 bosses with drilled holes.
- The INS 10's were threaded into the holes, and the INS 50's were pressed into the holes. All other Inserts were heat installed.
- The performance of the headed versions of any Insert will be the same or slightly better than the non-headed version.



**Innovative fastening solutions.
Lower assembly costs.**



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Please refer to www.SPIROL.com for current specifications and standard product offerings.

SPIROL Application Engineers will review your application needs and work with you to recommend the optimum solution. One way to start the process is to visit our **Optimal Application Engineering** portal at **SPIROL.com**.