SPIROL®

COMPRESSION LIMITERS

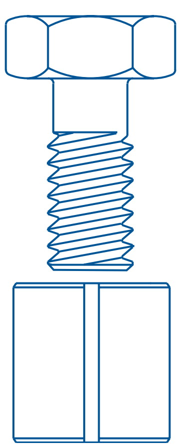
THE SPIROL CONCEPT

Our objective is to provide our customers with the best value; for optimum performance at the lowest installed cost. To achieve this objective, our sales strategy focuses on the application engineering approach.

Starting with an analysis of your needs and objectives, our application engineers determine the best **SPIROL® COMPRESSION LIMITER** for the application. Consideration is not only given to the Compression Limiter but also to the specifications of the components to be assembled and potential assembly problems. Recommendations and samples are provided for your evaluation.

The versatility of the **SPIROL® COMPRESSION LIMITER** makes it the ideal component part to meet the specific engineering and economic objectives of plastic assemblies. Our range of standard Compression Limiters is designed to meet most requirements. If a special diameter, length, duty, material, tolerance or configuration is needed, we are ready to assist you.

Challenge us!



THE FUNCTION OF A COMPRESSION LIMITER

Compression Limiters are designed to protect the plastic components of an assembly from the compressive loads generated by the tightening of bolts.

The objective is to keep the compressive stresses below the elastic limit of the plastic. In practice, as the bolt is tightened the plastic compresses and the stress in the plastic increases until the head of the bolt, or washer if one is used, comes into contact with the Compression Limiter. Thereafter, the Compression Limiter and plastic will compress at the same rate. The Compression Limiter will absorb additional clamping loads without further significant compression and increased stress in the plastic material.

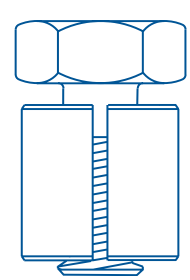
A properly designed bolted joint must meet the following criteria:

- The head of the bolt, or washer if one is used, should always seat against the Compression Limiter under load. This will prevent deterioration of the bolted joint resulting from diminished clamping load due to plastic creep.
- The compression in the plastic component should not exceed its elastic limit, when compressed to seat the bolt against the Compression Limiter in the worst-case tolerance condition of the assembly.
- The proof load of the Compression Limiter should be equal to or greater than the proof load of the bolt to assure that the Compression Limiter will not yield prior to the bolt under excessive clamping loads.
- The clearance between the maximum bolt diameter and the minimum installed inside diameter of the Compression Limiter should be sufficient to compensate for normal misalignment.

Standard **SPIROL® COMPRESSION LIMITERS** meet these criteria.

The clearance between the bolt and the inside diameter of the installed Compression Limiters is adequate to meet normal misalignment. The length and length tolerance is application dependent. The standard tolerance is sufficient to meet most needs, but verification is recommended. **SPIROL** Engineering is available to assist in this process. If it is determined that a special Compression Limiter is required, a documented recommendation will be provided.

The SPIROL range of Compression Limiters includes the molded-in, split seam and solid knurled designs. The molded-in type is produced from low carbon steel and is equipped with radial grooves to provide maximum retention. The split seam type is produced from carbon steel in heat-treated and non-heat-treated versions. The solid knurled type is produced from brass. Since these Compression Limiters are designed to meet specified proof loads, the dimensional specifications are different. The split seam design has a lead to facilitate insertion. The solid design has a pilot, allowing it to stand freely in the hole prior to complete installation.



DETERMINING LENGTH AND TOLERANCE

The recommended maximum length of the compression limiter is the minimum thickness of the plastic component. The compression of the compression limiter at the recommended tightening torque assures that there will always be some compression on the plastic component.

The recommended minimum length of the compression limiter is the maximum thickness of the plastic component, minus the maximum allowable compression of the plastic component, plus the compression of the compression limiter at the proof load. Stated in formula mode:

$$Lc\ min = Lp\ max - d + c$$

Where:

Lc min is the minimum length of the compression limiter

Lp max is the maximum thickness of the plastic component

d is the maximum allowable compression of the plastic component determined as follows:

$$d = \frac{\sigma \times Lp\ max}{Ep}$$

Where:

σ is the allowable compressive stress, and

Ep is the modulus of elasticity, of the plastic specified

c is the compression of the compression limiter at the proof load, as noted in the Spirol specifications

Example:

The plastic component is 14mm +0.1/-0.0 thick, made from ABS 30% glass filled with a maximum allowable compression strength of 140 MPa and a modulus of elasticity of 5,500 MPa.

The bolt used is a M6x1 class 5.8.

The compression limiter is a BUSH M6 x 14 BK CL200, which is a non-heat treated steel split seam compression limiter. The length tolerance is +0.0/-0.15.

$$d = \frac{140\ \text{MPa} \times 14.1\text{mm}}{5{,}500\ \text{Mpa}} = 0.359\ \text{mm}$$

$$c = 14\text{mm} \times .0018 = 0.025\text{mm}$$

$$Lc\ min = 14.1 - 0.359 + 0.025 = 13.77\text{mm}$$

Since the standard length tolerance of +0.0/-0.15mm for a split seam compression limiter is less than the -0.33mm allowable compression, the standard length tolerance meets the requirements of this application.

A further determination needs to be made to verify that at the recommended clamping load, the head of the bolt, or washer if one is used, will seat itself against the compression limiter at the maximum tolerance condition. Stated in formula mode:

$$Lc\ min = Lp\ max - \frac{Pclamp \times Lp\ max}{Ap \times Ep}$$

Where:

Lc min is the minimum length of the compression limiter

Lp max is the maximum thickness of the plastic component

Pclamp is the recommended clamping load

Ap is the stress area of the plastic component calculated as follows:

$$Ap = \frac{\pi}{4} \times (D_2^2 - D_1^2)$$

Where:

D_1 is the minimum hole in the plastic component

D_2 is the maximum bearing surface diameter of the bolt head, compression limiter head, or washer

Ep is the elastic modulus of the plastic

Example:

The plastic component is 14mm + 0.1/-0.0 thick made of ABS 30% glass filled with a maximum allowable compression strength of 140 MPa and a modulus of elasticity of 5,500 MPa.

The bolt used is a M6x1 class 5.8 with a head diameter of 12mm. The recommended clamping load for this bolt is 5.73 kN which is 75% of the proof load.

The compression limiter is a BUSH M6 x 14 BK CL200, which is a non-heat treated steel split seam compression limiter. The minimum recommended hole for this compression limiter is 9.0mm. The length tolerance is +0.0/-0.15.

$$Ap = \frac{\pi}{4} \times (0.012\text{m}^2 - 0.009\text{m}^2) = 0.00004948\text{m}^2$$

$$Lc\ min = 0.0141\text{m} - \frac{5730\ \text{N} \times 0.0141\text{m}}{0.00004948\ \text{m}^2 \times 5{,}500{,}000{,}000\ (\text{N/m}^2)} = 13.80\ \text{mm}$$

The assembly will require a compression limiter with a length tolerance ≤ +0.0/-0.2 to assure seating of the bolt against the compression limiter. A standard 14mm +0.0/-0.15 compression limiter will meet the needs of this application.

VERIFICATION OF BOLT SEATING AT RECOMMENDED CLAMPING LOAD

Verification of the seating of the bolt head or washer against the compression limiter at the recommended clamping load is the final assurance that the minimum length tolerance for the compression limiter will meet the recommended bolted joint requirements.

Stated in formula mode:

$$Pc = \frac{Tmax \times Ap \times Ep}{Lp\ max}$$

Where:

Pc is the load required to assure contact between the bolt head or washer and the compression limiter

Tmax is the maximum tolerance condition of the assembly, calculated as the maximum thickness of the plastic component (Lp max) minus the minimum length of the compression limiter (Lc min)

Ap is the stress area of the plastic component as calculated in the previous element

Ep is the elastic modulus of the plastic

Lp max is the maximum thickness of the plastic component

Example:

The same plastic component and bolt of the previous example.

Tmax = 14.1mm - 13.85mm = 0.25mm

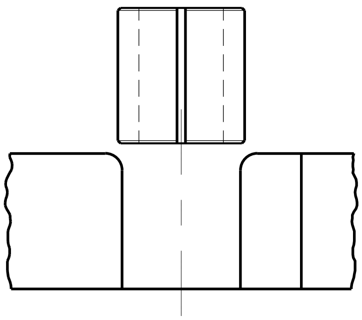
$$Pc = \frac{0.00025m \times 0.\ 00004948\ m^2 \times 5{,}500{,}000{,}000\ (N/m^2)}{0.0141m} = 4825\ N$$

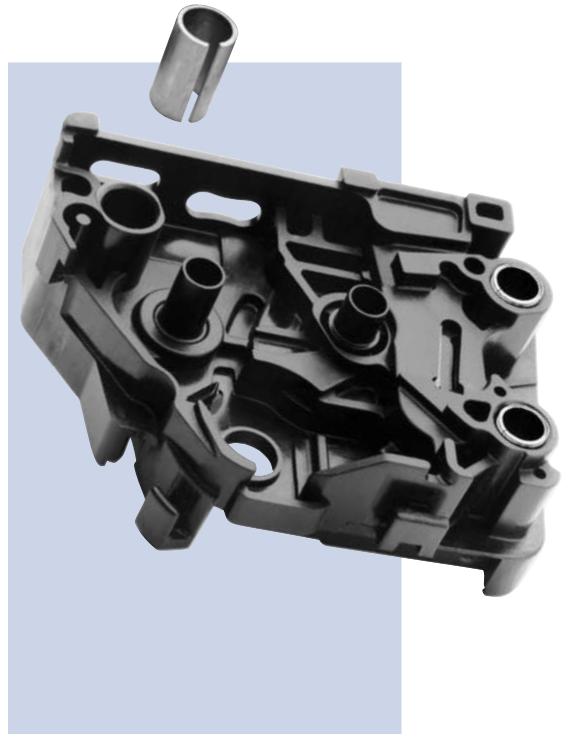
Since the recommended clamping load for the M6x1 class 5.8 bolt of 5.73 kN is greater than the 4.83 kN calculated for Pc, proper seating of the bolt is verified.

OTHER DESIGN CONSIDERATIONS

Hole Design

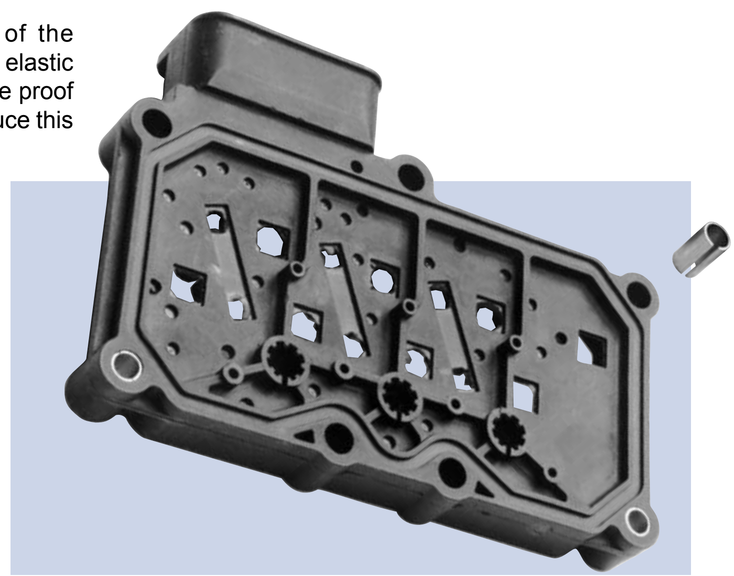
Although the split seam Compression Limiters have a broken edge, this is kept to a minimum in order to maintain the maximum bearing surface area. Accordingly, it is recommended that a radius be molded as a lead-in to the hole in the plastic component to facilitate insertion. This radius is not necessary for solid Compression Limiters, as the pilot is smaller than the hole. When a draft angle is required, the hole should taper within the recommended hole size for the length of the Compression Limiter.

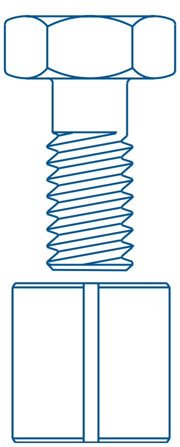




Recommended Tightening Torque

The integrity of the bolted joint requires that none of the components, including the bolt, be stressed beyond the elastic limit. We recommend a clamping load equal to 75% of the proof load of the bolt. The recommended torque values to produce this clamping load are provided in the supplemental data.



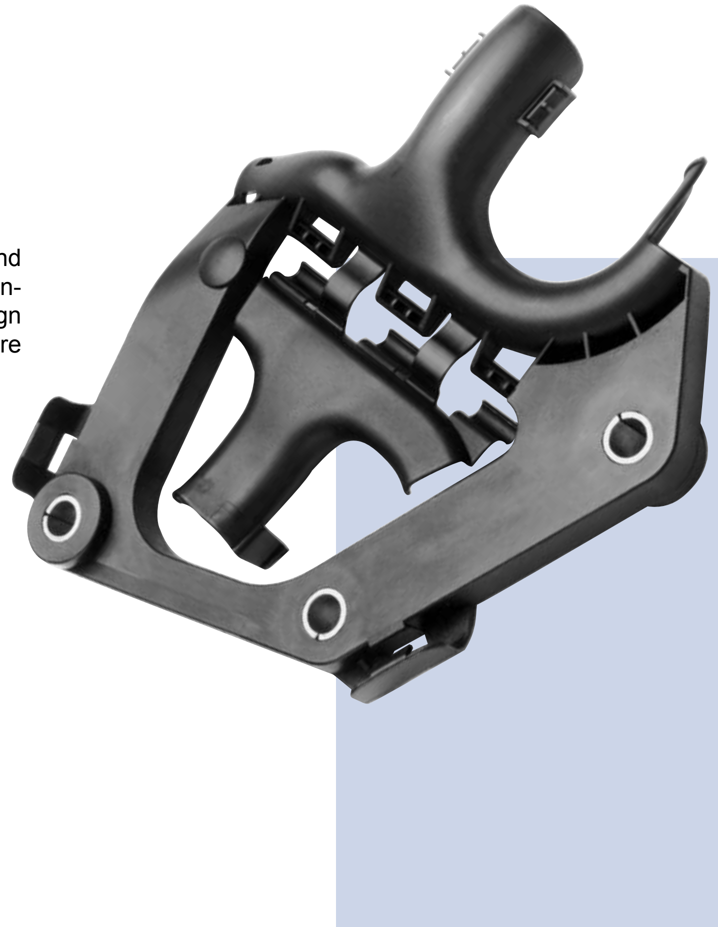


Mating Component Material

The clamping load of the bolt is transferred to the mating component through the Compression Limiter. It must be evaluated whether the material of the mating component is strong enough to withstand the clamping force of the bolt. The stress imparted onto the mating component can be calculated by dividing the clamping load applied to the Compression Limiter by the cross sectional area of the Compression Limiter. If this stress exceeds the yield strength of the mating component material, localized permanent deformation may occur, resulting in a loss in clamping load.

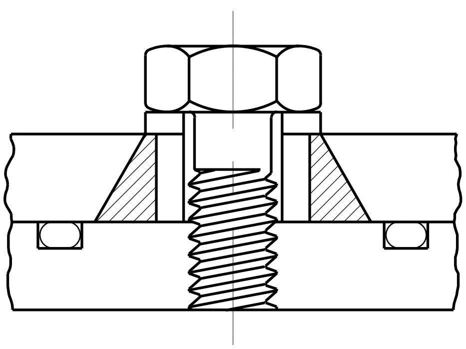
Headed Compression Limiters

In addition to providing a larger contact area, headed Compression Limiters eliminate the need for a washer. The length and length tolerance under the head needs to be determined following these design guidelines for Compression Limiters to avoid the risk of exceeding the elastic limit of the plastic component. Headed Compression Limiters are only available as solid components.



Use of O-Rings

O-rings can be used to provide a sealed joint but the length and length tolerance of the Compression Limiter is still application-dependent and needs to be determined following these design guidelines in order to achieve a properly tensioned and secure bolted joint.



Use of Gaskets

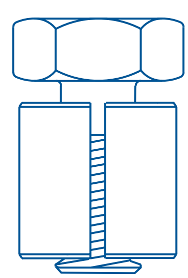
When gaskets are used, the length tolerance of the Compression Limiter is dependent on the minimum and maximum specified gasket compression. Stated in formula mode:

Lc max = Lp min + max gasket thickness - max gasket compression
Lc min = Lp min + min gasket thickness - min gasket compression

Where:

Lc is the length of the Compression Limiter
Lp is the thickness of the plastic component

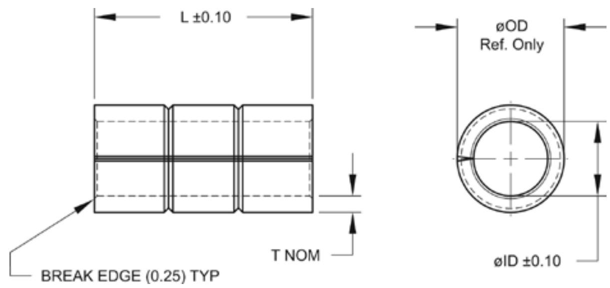
This is based on the assumption that the plastic component is significantly stiffer than the gasket material, having an elastic modulus at least 15 times greater than the gasket material.



SPIROL® COMPRESSION LIMITERS SPECIFICATIONS

STANDARD MOLDED-IN

SERIES CL500



MATERIAL
F Low Carbon Steel

FINISH
T Trivalent (Hexavalent Free) Zinc Plated

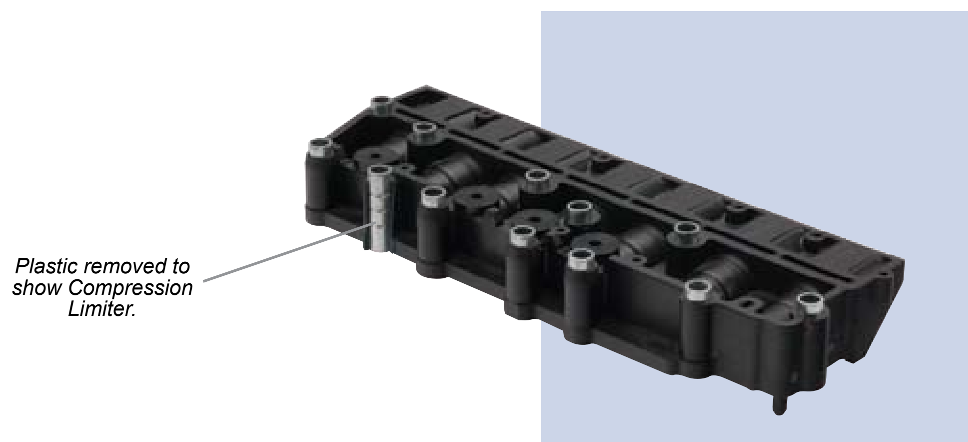
Features and Benefits:

- Single OD vertical groove at the seam offers an anti-rotational feature.
- Lead-in ID chamfer increases feeding and positioning speed as well as efficiency in automated pick-and-place applications.
- Designed around standard, industry-accepted clearances for 6MM and 8MM bolts.

DIMENSIONAL DATA

Metric													
Nominal Bolt Diameter	ID	T	OD	L*									
M6	6.8	1.5	9.8	4	6	8	10	12	15	20	30	40	50
M8	8.8	2	12.8										

* Intermediate lengths, longer lengths, and tight length tolerance products available on request and feasibility review.
Inch sizes available upon special request.



SPIROL®
Standard Molded-In Compression Limiters
can be molded in using industry standard core pins.

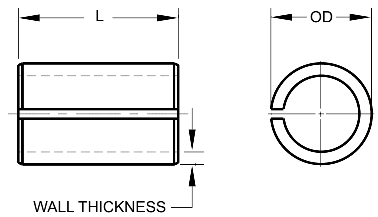
To Order: SPCR, Nominal Bolt Size x Length, Material, Finish, Series
Example: SPCR 6. X 20. FT CL500

COMPRESSION LIMITERS SPECIFICATIONS

STANDARD SPLIT SEAM

SERIES CL200
Not heat treated

SERIES CL250
Heat treated



MATERIAL
B Carbon Steel

HARDNESS
CL200 HV 120 to 245
CL250 HV 420 to 545

FINISH
K Plain, Oiled
T Zinc Plated
R Phosphate Coated

Features and Benefits:

- Flexible diameter accommodates wide hole tolerances.
- Lead-in facilitates insertion.
- Offered in heat treated and non-heat treated versions to suit various bolt grades.

DIMENSIONAL DATA

Unified

Nominal Bolt Size	Installed I.D. Min.	Wall Thickness	OD	Recommended Hole Size	L*	Rated Proof Load (Lbs.) CL200	Rated Proof Load (Lbs.) CL250
#8	ø.193	.033	ø.265/.269	ø.259/.263	.312 to 2, +.000/-.006	810	1,770
#10	ø.221	.039	ø.305/.311	ø.299/.303	.312 to 2, +.000/-.006	1,100	2,400
1/4	ø.281	.044	ø.374/.381	ø.368/.372	.312 to 2, +.000/-.006	2,000	4,350
5/16	ø.344	.059	ø.468/.480	ø.462/.466	.312 to 2, +.000/-.008	3,200	6,950
3/8	ø.406	.073	ø.558/.574	ø.552/.556	.375 to 2, +.000/-.010	4,800	10,500

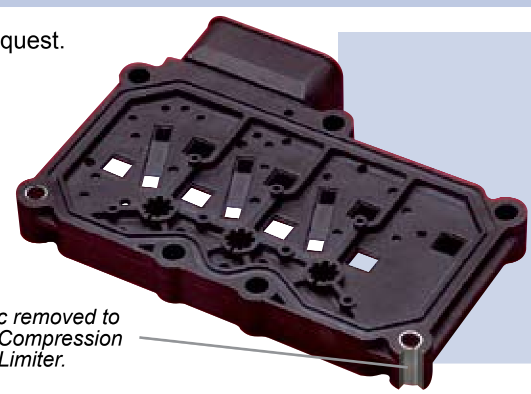
Metric

Nominal Bolt Size	Installed I.D. Min.	Wall Thickness	OD	Recommended Hole Size	L*	Rated Proof Load (kN) CL200	Rated Proof Load (kN) CL250
M4	ø4.8	0.85	ø6.65/6.75	ø6.50/6.60	8 to 50, +0.0/-0.15	3.69	9.66
M5	ø5.8	1.00	ø7.95/8.10	ø7.80/7.90	8 to 50, +0.0/-0.15	5.96	15.6
M6	ø6.8	1.10	ø9.15/9.33	ø9.00/9.10	8 to 50, +0.0/-0.15	8.44	22.1
M8	ø8.8	1.50	ø11.90/12.20	ø11.75/11.85	8 to 50, +0.0/-0.20	15.4	40.3
M10	ø10.8	1.85	ø14.65/15.07	ø14.50/14.60	10 to 50, +0.0/-0.25	24.4	63.8
M12	ø12.8	2.25	ø17.45/18.00	ø17.30/17.40	14 to 50, +0.0/-0.25	35.4	92.7

* Longer and shorter lengths on request.

Compression at Proof Load:
CL200 c = Lc x .0018
CL250 c = Lc x .0047

SPIROL® Standard Split Seam Compression Limiters can be installed with SPIROL Pin Inserters, Pin Driving Chucks, or simply pressed in.



Plastic removed to show Compression Limiter.

To Order: BUSH, Nominal Bolt Diameter, Length, Material, Finish, Series
Example: BUSH 6 X 14 BK CL250

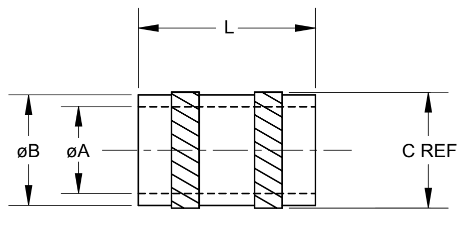
SPIROL COMPRESSION LIMITERS SPECIFICATIONS

STANDARD SOLID KNURLED

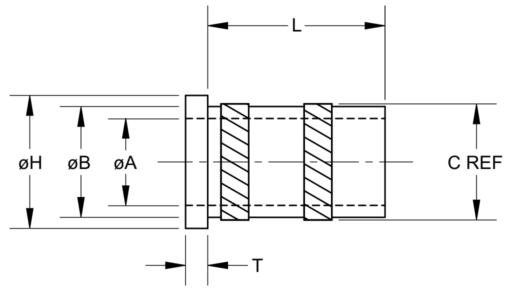
Features and Benefits:

- Square ends - to ensure 100% contact with mating surface
- Series CL111 (Headed) - eliminates the need for a washer
- Knurl - provides excellent retention
- Aluminum is lightweight and contains no lead

SERIES CL101



SERIES CL111
Headed



Parts less than .375” (10 mm) long will have the second knurl band omitted.

MATERIAL
A Aluminum
E Brass

FINISH
K Plain

DIMENSIONAL DATA

Inch								
Nominal Bolt Size	A	B	C	H	T	Hole ±.002	L* ±.003	Rated Load** (Lbs.)
#4	ø.145	ø.188	ø.200	ø.238	.050	ø.195	.118-.394	420
#6	ø.168	ø.219	ø.231	ø.269	.050	ø.226	.187-.500	650
#8	ø.196	ø.250	ø.262	ø.300	.050	ø.257	.187-.562	940
#10	ø.223	ø.292	ø.304	ø.342	.050	ø.299	.236-.687	1,275
.250	ø.282	ø.385	ø.397	ø.435	.050	ø.392	.236-.812	2,325
.312	ø.345	ø.479	ø.491	ø.529	.050	ø.486	.236-.812	3,675

Metric								
Nominal Bolt Size	A	B	C	H	T	Hole +0.10/-0.00	L* ±0.075	Rated Load** (kN)
M3	ø3.70	ø4.80	ø5.10	ø6.05	1.30	ø4.90	3.0-10.0	2.20
M3.5	ø4.25	ø5.55	ø5.85	ø6.85	1.30	ø5.70	4.0-12.0	2.96
M4	ø5.00	ø6.35	ø6.65	ø7.60	1.30	ø6.50	5.0-14.0	3.83
M5	ø5.75	ø7.65	ø8.00	ø8.95	1.30	ø7.80	6.0-16.0	6.18
M6	ø6.75	ø9.00	ø9.30	ø10.25	1.30	ø9.10	6.0-20.0	8.72
M8	ø8.75	ø12.15	ø12.45	ø13.45	1.30	ø12.30	6.0-20.0	17.04

* Longer and shorter lengths on request.
** Rated Load is designed for use with SAE Grade 5 and ISO Class 8.8 bolts.

SPIROL® Standard Solid Knurled Compression Limiters can be molded in or simply pressed in.

Plastic removed to show Compression Limiter.

To Order: SPCR, Nominal Bolt Size x Length, Material, Finish, Series
Example: SPCR 6. X 14. EK CL101

SPIROL® SUPPLEMENTAL DATA

BOLT SPECIFICATIONS

Common Inch Bolts per SAE J429						
Thread	Grade 2		Grade 5		Grade 8	
	Proof Load (Lbs.)	**Clamping Load* (Lbs.)**	**Proof Load (Lbs.)**	**Clamping Load* (Lbs.)**	**Proof Load (Lbs.)**	**Clamping Load* (Lbs.)**
#4-40	330	250	510	390	720	540
#4-48	360	270	560	420	790	600
#6-32	490	370	770	580	1,090	820
#6-40	550	420	860	650	1,210	910
#8-32	770	580	1,190	900	1,680	1,260
#8-36	810	610	1,250	940	1,760	1,320
#10-24	960	720	1,480	1,110	2,100	1,580
#10-32	1,100	830	1,700	1,280	2,400	1,800
1/4-20	1,750	1,320	2,700	2,020	3,800	2,860
1/4-28	2,000	1,500	3,100	2,320	4,350	3,260
5/16-18	2,900	2,180	4,450	3,340	6,300	4,720
5/16-24	3,200	2,400	4,900	3,700	6,950	5,220
3/8-16	4,250	3,200	6,600	4,940	9,300	7,000
3/8-24	4,800	3,600	7,450	5,600	10,500	7,900

Common Metric Bolts per ISO 898-1						
Thread	Class 5.8		Class 9.8		Class 10.9	
	Proof Load (kN)	**Clamping Load* (kN)**	**Proof Load (kN)**	**Clamping Load* (kN)**	**Proof Load (kN)**	**Clamping Load* (kN)**
M3 x 0.5	1.91	1.43	3.27	2.45	4.18	3.14
M4 x 0.7	3.34	2.51	5.71	4.28	7.29	5.47
M5 x 0.8	5.40	4.05	9.23	6.92	11.8	8.85
M6 x 1	7.64	5.73	13.1	9.83	16.7	12.5
M8 x 1.25	13.9	10.4	23.8	17.9	30.4	22.8
M10 x 1.5	22.0	16.5	37.7	28.3	48.1	36.1
M12 x 1.75	32.0	24.0	54.8	41.1	70.0	52.5

*Note: The recommended clamping load is 75% of the proof load.

PHYSICAL PROPERTIES OF COMMON PLASTICS

Plastic Type	Modulus of Elasticity		Compressive Strength	
	MPa	psi	MPa	psi
Nylon 6	2,100	300,000	90	13,000
Nylon 6, 35% glass	9,000	1,300,000	130	19,000
Polycarbonate	2,100	300,000	90	13,000
Polycarbonate, 40% glass	11,000	1,600,000	140	20,000
ABS	2,750	400,000	70	10,000
ABS, 30% glass	5,500	800,000	140	20,000
PEEK, 20% carbon fiber	13,100	1,900,000	140	20,000
PEEK, 40% carbon fiber	25,500	3,700,000	220	32,000

TORQUE SPECIFICATIONS

Typical tightening torque values to achieve recommended clamping loads based on the following formula:

$$T = K \times D \times P$$

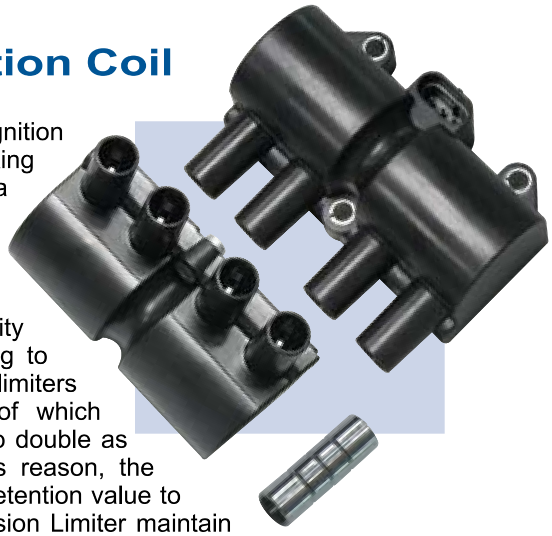
Where:
K = torque-friction coefficient
D = nominal bolt diameter
P = bolt clamping load

Unified						
Thread	Grade 2 Tightening Torque		Grade 5 Tightening Torque		Grade 8 Tightening Torque	
	Dry K=0.20	Lub. K=0.15	Dry K=0.20	Lub. K=0.15	Dry K=0.20	Lub. K=0.15
#4-40	5.6 in•lbs	4.2 in•lbs	8.7 in•lbs	6.6 in•lbs	12.1 in•lbs	9.1 in•lbs
#4-48	6.0 in•lbs	4.5 in•lbs	9.4 in•lbs	7.1 in•lbs	13.4 in•lbs	10.1 in•lbs
#6-32	10.2 in•lbs	7.7 in•lbs	16.0 in•lbs	12.0 in•lbs	22.6 in•lbs	17.0 in•lbs
#6-40	11.6 in•lbs	8.7 in•lbs	17.9 in•lbs	13.5 in•lbs	25.1 in•lbs	18.8 in•lbs
#8-32	19 in•lbs	14 in•lbs	30 in•lbs	22 in•lbs	41 in•lbs	31 in•lbs
#8-36	20 in•lbs	15 in•lbs	31 in•lbs	23 in•lbs	43 in•lbs	32 in•lbs
#10-24	27 in•lbs	21 in•lbs	42 in•lbs	32 in•lbs	60 in•lbs	45 in•lbs
#10-32	32 in•lbs	24 in•lbs	49 in•lbs	36 in•lbs	68 in•lbs	51 in•lbs
1/4-20	66 in•lbs	50 in•lbs	102 in•lbs	77 in•lbs	143 in•lbs	107 in•lbs
1/4-28	75 in•lbs	56 in•lbs	117 in•lbs	88 in•lbs	164 in•lbs	123 in•lbs
5/16-18	11 ft•lbs	9 ft•lbs	17 ft•lbs	13 ft•lbs	25 ft•lbs	19 ft•lbs
5/16-24	13 ft•lbs	9 ft•lbs	19 ft•lbs	14 ft•lbs	27 ft•lbs	20 ft•lbs
3/8-16	20 ft•lbs	15 ft•lbs	31 ft•lbs	23 ft•lbs	44 ft•lbs	33 ft•lbs
3/8-24	23 ft•lbs	17 ft•lbs	35 ft•lbs	26 ft•lbs	49 ft•lbs	37 ft•lbs

Metric						
Thread	Class 5.8 Tightening Torque		Class 9.8 Tightening Torque		Class 10.9 Tightening Torque	
	Dry K=0.20	Lub. K=0.15	Dry K=0.20	Lub. K=0.15	Dry K=0.20	Lub. K=0.15
M3 x 0.5	0.9 N•m	0.6 N•m	1.5 N•m	1.1 N•m	1.9 N•m	1.4 N•m
M4 x 0.7	2.0 N•m	1.5 N•m	3.4 N•m	2.6 N•m	4.4 N•m	3.3 N•m
M5 x 0.8	4.1 N•m	3.0 N•m	6.9 N•m	5.2 N•m	8.9 N•m	6.6 N•m
M6 x 1	6.9 N•m	5.2 N•m	11.8 N•m	8.8 N•m	15.0 N•m	11.3 N•m
M8 x 1.25	16.7 N•m	12.5 N•m	28.6 N•m	21.4 N•m	36.5 N•m	27.4 N•m
M10 x 1.5	33.0 N•m	24.8 N•m	56.6 N•m	42.4 N•m	72.2 N•m	54.1 N•m
M12 x 1.75	57.6 N•m	43.2 N•m	98.6 N•m	74.0 N•m	126.0 N•m	94.5 N•m

SPIROL SOLUTION ENGINEERING

Application: Automotive Ignition Coil



A manufacturer of automotive ignition coils approached **SPIROL** seeking a cost effective alternative to a machined brass Compression Limiter. Preferred method of installation was molded in. Compression Limiters were required to protect the integrity of the plastic case when bolting to the mating component. Three limiters were required per coil, one of which would protrude from the base to double as an alignment feature. For this reason, the end customer specified a high retention value to ensure the protruding Compression Limiter maintain its position.

The elimination of brass offers the most significant cost savings. Steel can provide the necessary strength at a much lower cost. Compression Limiters can be manufactured of low or high carbon steel and delivered soft or hard dependant upon fastener grade. Method of manufacture is the second component of cost that can be reduced. Machining or cutting operations are typically more expensive than forming. The best way to reduce the customer's cost was to convert them from the machined brass component to a roll formed steel Compression Limiter.

SPIROL Engineering designed a rolled steel Compression Limiter to meet the customer's specific requirements. The Compression Limiter was designed with a closed seam to ensure that plastic could not migrate to the ID where it may interfere with bolt installation. Wall thickness was selected to provide columnar strength sufficient to resist the compressive load of a Class 9.8 bolt. A radial groove was added about the part's circumference and centered. The radial groove fills with host material during the molding process that yields high resistance to lateral movement.

SPIROL's roll formed steel Compression Limiter provided a substantial cost reduction while meeting all of the performance requirements. Roll formed Compression Limiters are typically designed to function with Class 9.8 bolts. A variety of finishes can be provided to meet specific requirements. The retention groove provides excellent resistance to lateral movement at significantly less cost than machined components with similar features. Steel complies with current environmental standards/content restrictions. Further, steel reduces the effect of galvanic corrosion when placed in contact with magnesium. Galvanic corrosion is common in assemblies where brass and magnesium are in direct contact due to the electric field generated by the coil packs.

Challenge Us!

SPIROL Application Engineers will review your application needs and work with your design team to recommend the best solution. One way to start the process is to select **Compression Limiters** in our **Optimal Application Engineering** portal at www.**SPIROL**.com.

U.S.A.

Spirol International Corporation
30 Rock Avenue
Danielson, Connecticut 06239
Tel. +1 (1) 860.774.8571
Fax. +1 (1) 860.774.2048

Spirol West Inc.
1950 Compton Avenue, Unit 111
Corona, California 92881-6471
Tel. +1 (1) 951.273.5900
Fax. +1 (1) 951.273.5907

Spirol International Corporation
Shim Division
321 Remington Road
Stow, Ohio 44224
Tel. +1 (1) 330.920.3655
Fax. +1 (1) 330.920.3659

Spirol Distribution
(For Distributor Customers)
30 Rock Avenue
Danielson, Connecticut 06239
Tel. +1 (1) 860.774.8571
Fax. +1 (1) 860.774.0487

Canada

Spirol Industries, Ltd.
3103 St. Etienne Boulevard
Windsor, Ontario
Canada N8W 5B1
Tel. +1 (1) 519.974.3334
Fax. +1 (1) 519.974.6550

Mexico

Spirol México, S.A. de C.V.
Carretera a Laredo KM 16.5 Interior E
Col. Moisés Saenz
Apodaca, N.L. 66613 México
ó Apdo. Postal 151 de Apodaca, N.L.
Tel. +52 (01) 81 8385 4390
Fax. +52 (01) 81 8385 4391

Europe

Spirol Industries, Ltd.
Princewood Road
Corby, Northants
England NN17 4ET
Tel. +44 (0) 1536 444800
Fax. +44 (0) 1536 203415
(UK Distributors: Tel. 0800 3890034)

Spirol SAS
Rue Henri Rol Tanguy
Z.A. Les Naux
51450 Bétheny - Reims
France
Tel. +33 (0) 3 26 36 31 42
Fax. +33 (0) 3 26 09 19 76

Spirol GmbH
Brienner Strasse 9
80333 Munich
Germany
Tel. +49 (0) 931 454 670 74
Fax. +49 (0) 931 454 670 75

Asia Pacific

Spirol International Engineered Fastener Trading Co. Ltd.
No. 11 Xi Ya Rd. North
Section A, 1F, Building 14
Wai Gao Qiao Free Trade Zone
Shanghai, China 200131
Tel. +86 (0) 21 5046-1451/1452
Fax. +86 (0) 21 5046-1540

e-mail: info@spirol.com

ISO/TS 16949:2002 Certified
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SPIROL.com