

SmartBolts®

An Industrial Indicators brand

Product Manual



SmartBolts®

SmartBolts are tension indicating fasteners that ensure proper clamp force is achieved at installation and maintained over time. The visual indicator changes color to measure and display tension in real-time.

Tension creates the clamp force that keeps a bolted joint secure. If bolt tension is monitored, we can ensure bolted joints are properly secured and create safer, more efficient, and more reliable bolting processes.



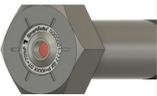
Visual Indication System™

The visual indicator changes color to measure and display tension in real-time. The indicator has no cycle limit and functions continuously for the lifespan of the fastener. The display is bright red when the fastener is loose and gradually transitions to black when the fastener is properly tightened. Design tension can be customized to meet application-specific clamp force requirements.



Product Range

SmartBolts are available in a wide range of fasteners. Available options start with a minimum diameter of 7/16" (M10) and a maximum diameter of 2.5" (M64).

Fastener	Minimum Diameter	Maximum Diameter	Operating Temperature Range
Hex 	7/16" M10	2.5" M64	-4°F to 168°F -20°C to 75°C
Hex Flange 	1/2" M12	2.5" M64	
12-Point Flange 	5/8" M16	2.5" M64	
Socket 	1" M24	2.5" M64	
Stud 	3/4" M20	2.5" M64	



Frequently Asked Questions

General Information

How do SmartBolts® work?

The visual indicator in a SmartBolt gradually changes color according to the amount of tension that is applied to the bolt. The visual indicator is black when Design Tension is reached and red when loose. This color change provides a real-time indication of bolt tension.

Can the Visual Indicator be designed into any type of fastener?

SmartBolts are available in a wide range of fastener types and sizes. Please review the Fastener Size Ranges table for additional information. If you have a requirement that is not listed in the table, please contact us to discuss availability.

What is included with my order of SmartBolts®?

All shipments of SmartBolts will include a Verification Guide, Product Manual, and a Certificate of Compliance. The Certificate of Compliance lists your product specifications (such as dimensions, grade, design tension, and proof load) so that you can verify the product meets your application requirements.

Is there a warranty for SmartBolts®?

Yes! All SmartBolts® products are warranted to the original end user for one year from the date of purchase.

Can I use normal tools with SmartBolts®?

Yes! SmartBolts are designed to be used with the same tools you're already using to install and maintain your bolted joints. In cases where the indicator is covered with a tool during use, we recommend tightening the SmartBolt in stages to check the indicator and prevent overtightening.

Visual Indication System™

Do SmartBolts® indicate tension or torque?

The Visual Indicator measures tension. When a bolt is tightened, it is forced to stretch. This stretching force on a fastener is also called tension. Tension creates the clamp force that holds your bolted joints together.

What is Design Tension and how does it relate to the TIGHT color on the Verification Guide?

Design Tension is the tensile load on the bolt at which SmartBolts are designed to indicate the "Tight" color. "Tight" shows the SmartBolt has been properly installed and preload is established.

What range of Design Tensions are available?

In general, customers can request Design Tensions ranging from 30 – 90% of the fastener proof strength in increments of 5%. Indicating tensions outside of this range are assessed on a case by case basis. All Pre-Engineered SmartBolt have a Design Tension set at 70% of fastener proof strength, which is appropriate for many applications.

Frequently Asked Questions

Does over-tightening damage the indicator?

No, provided the bolt is not tightened beyond its elastic limit (proof load). As with all bolts, if you tighten beyond the proof load you may permanently deform the bolt, and therefore the indicator will no longer operate correctly. An easy way to check if a bolt has been significantly yielded is to loosen the bolt and check that the indicator matches the “loose” red color.

How should I use the Verification Guide?

Hold the Verification Guide up to the Visual Indicator. It's good practice to put the intersection of two colors next to the indicator. This way you can compare the indicator color with the guide and know that it is darker or lighter than the color on the guide. Once you reach the TIGHT color, the bolt is properly tight.

Durability and Environmental Conditions

Are SmartBolts® reusable?

Yes! SmartBolts are designed to operate in the elastic range of the fastener and therefore are reusable for the endurance limit of the bolt.

What is the expected service life of SmartBolts®?

SmartBolts have an operational service life of over twenty years when used as specified, comparable to that of a solid steel fastener.

Do SmartBolts® reduce the strength of the fastener?

In most cases, SmartBolts do not lose any tensile strength. However, when the modification of the indicator protrudes into the threaded or transition regions of the bolt, a reduction in tensile strength will occur. The amount of strength reduction is determined during the engineering analysis and made available to the customer for evaluation prior to ordering.

What are the operating temperature limits for SmartBolts®?

SmartBolts are specified to operate in environments from -4°F to 168°F (-20°C to 75°C). The indicator may not function properly in environments colder than -4°F (-20°C) but will return to normal functionality when temperatures return within the operational limits. Continuous use above 168°F (75°C) may degrade the indicator permanently.

How do the bolts stand up to outdoor environments, rain, snow, mud, etc.?

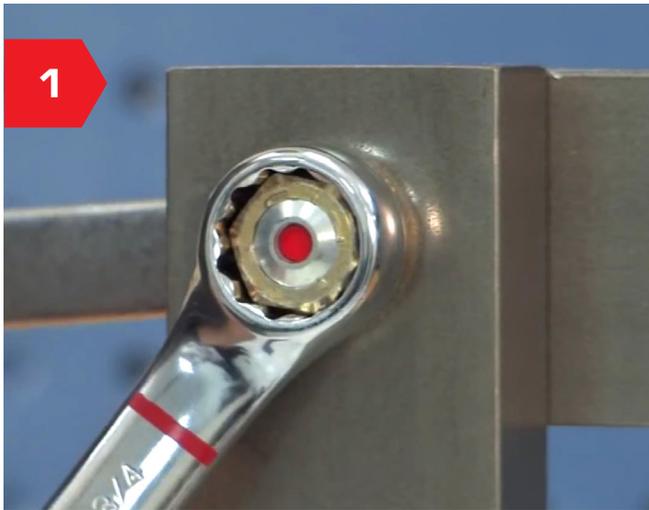
Within the specified temperature range, your SmartBolt may be expected to perform through all normal environmental conditions. SmartBolts operate well in outdoor, wet weather exposure as well as metalworking fluid environments. For full submersion or direct blast exposure, please contact us for options.



Installation

All SmartBolts® are shipped with a Verification Guide

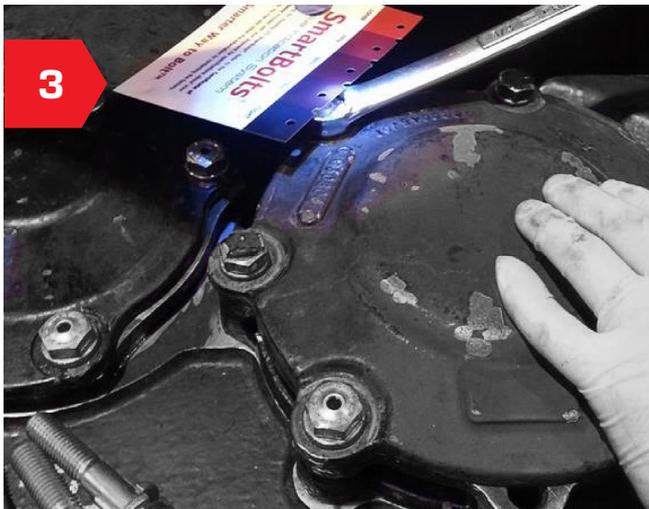
Familiarize yourself with the color blocks and viewing windows on the Verification Guide.



We recommend preloading by visual indication. Tighten the nut while constraining the head and viewing the indicator.



If direct viewing is not possible, apply torque in increasing steps until "Tight."



Compare the color blocks with the indicator. Always confirm tightness by indicator color and adjust torque as necessary.



Once the color of the indicator matches the "Tight" color block, installation is complete.

Monitoring and Maintenance

Monitoring



Monitor for any insufficiently tightened bolts by matching the Verification Guide color blocks to the indicator.



Identify insufficiently tightened bolts. If all bolts are still "Tight", maintenance is unnecessary.

Maintenance



Locate the previously identified bolts in need of necessary maintenance.



Maintain joint by retightening using the appropriate method as described in Installation.



Troubleshooting and Support

Issue	Possible Cause	Solution
The indicator window is a little hazy or dirty, making it difficult to read.	The window has a minor variation in smoothness or is dirty.	Wipe away any grease or debris.
		Apply a thin coating of light oil to the indicator.
It is difficult to read the indicator in my environment.	There is not enough light to see the indicator clearly.	Use an LED flashlight.
	There isn't enough space to clearly view the indicator.	Use an inspection mirror with flashlight.
I have applied my torque value but the bolt is not indicating fully "Tight."	Excess friction in the bolted joint has caused the torque-tension relationship to vary.	Increase applied torque or consider introducing a thread lubricant.
		Use hardened washers to reduce friction.
	The bolt is not able to be properly tensioned due to an error in the bolted joint setup.	Remove the bolt and inspect the bolted joint setup for possible causes or interferences.
A small/medium bubble has formed during tightening, or shortly thereafter.	A bubble was formed in the indicator as the bolt was tightened due to fluid cavitation.	Loosen and re-tighten the bolt slowly.
		Ignore the bubble. Use the area around the bubble which is still accurate. This issue will resolve itself permanently in most cases.



Please contact our support team by phone at **+1 (240) 631-7246** or by email at **support@industrialindicators.com** for additional assistance.



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