

SmartBolts®

SmartBolt DTI Product Manual

SmartBolt DTI

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

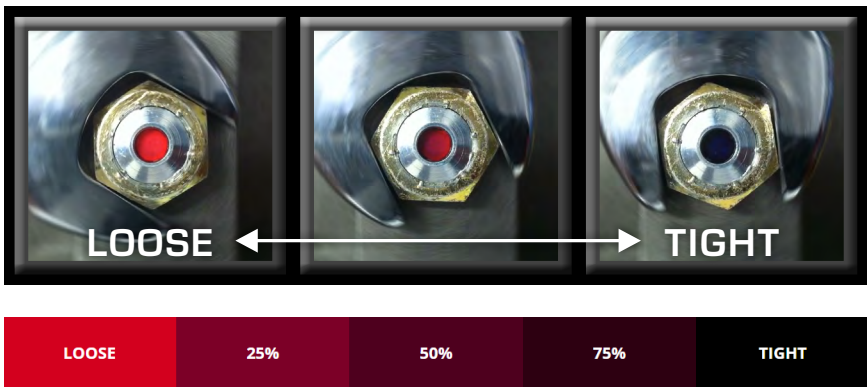
Tension creates the clamp force that keeps a bolted joint secure. If bolt tension is monitored, we can ensure bolted joints are properly secured and create safer, more efficient, and more reliable bolting processes.



DTI Visual Indicator

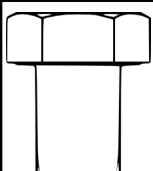
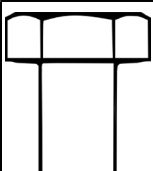
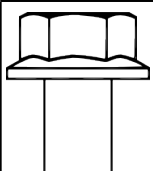
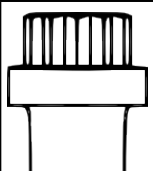
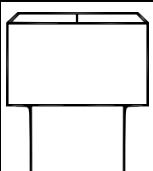
The DTI visual indicator changes color to measure and display tension in real-time. The indicator has no cycle limit and functions continuously for the lifespan of the fastener.

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

SmartBolt DTI 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).

					
	Hex	Heavy Hex	Hex Flange	12-Point Flange	Socket
Minimum Diameter	7/16" M10	1/2" M12	1/2" M12	5/8" M16	1" M24
Maximum Diameter	2.5" M64	2.5" M64	2.5" M64	2.5" M64	2.5" M64

Operating Temperature Range	-4°F to 168°F -20°C to 75°C
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Frequently Asked Questions

General Information

How do SmartBolt DTI work?

The visual indicator in a SmartBolt DTI 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 DTI Visual Indicator be designed into any type of fastener?

SmartBolt DTI 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 SmartBolt DTI?

All shipments of SmartBolt DTI will include a DTI 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 SmartBolt DTI?

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 SmartBolt DTI?

Yes! SmartBolt DTI 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 DTI in stages to check the indicator and prevent overtightening.

Frequently Asked Questions

DTI Visual Indication System

Do SmartBolt DTI indicate tension or torque?

The DTI 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 DTI Verification Guide?

Design Tension is the tensile load on the bolt at which SmartBolt DTI are designed to indicate the "Tight" color. "Tight" shows the SmartBolt DTI 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 DTI have a Design Tension set at 70% of fastener proof strength, which is appropriate for many applications.

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 DTI Verification Guide?

Hold the DTI Verification Guide up to the DTI 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.

Frequently Asked Questions Durability and Environmental Conditions

Are SmartBolt DTI reusable?

Yes! SmartBolt DTI 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 SmartBolt DTI?

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

Do SmartBolt DTI reduce the strength of the fastener?

In most cases, SmartBolt DTI 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 SmartBolt DTI?

SmartBolt DTI 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 DTI may be expected to perform through all normal environmental conditions. SmartBolt DTI 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.

Unpacking and Care

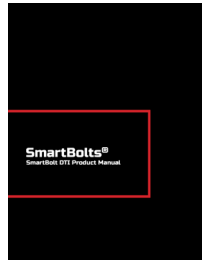
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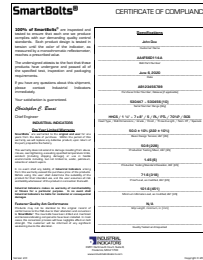
UNPACKING



Verification Guide



Product Manual

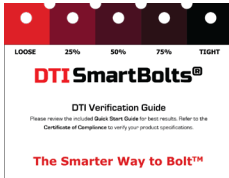


Certificate of Compliance

PROPER CARE

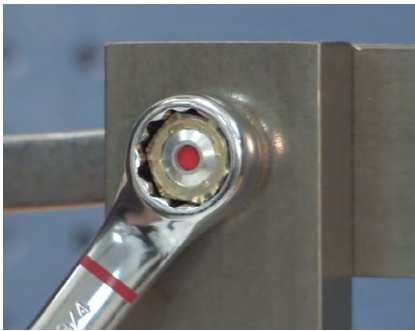
- Avoid direct impacts to the indicator.
- Avoid using harsh solvents to clean the indicator window.

Installation



All SmartBolt DTI are shipped with a DTI 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

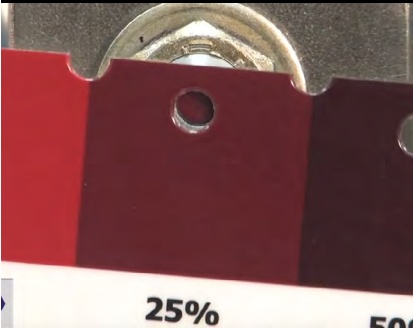


Monitor for any insufficiently tightened bolts by matching the Verification Guide color blocks to the indicator.



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.

SmartBolts are designed and manufactured in the United States by Industrial Indicators.

