



Maintenance Tools for GE Turbines

Approved
from GE



Maintenance Tools for GE-Turbines

Background

Gas and steam turbine casings are held together with highly loaded bolts and studs. In the past the bolted joints were usually torqued or tightened by the thermal method.

Thermal Method

The thermal method is a time consuming process regarding to heating, cooling and measuring of the bolt elongation. The heating rod requires that the studs have a through hole over their complete length which is very expensive to machine in stainless steel.

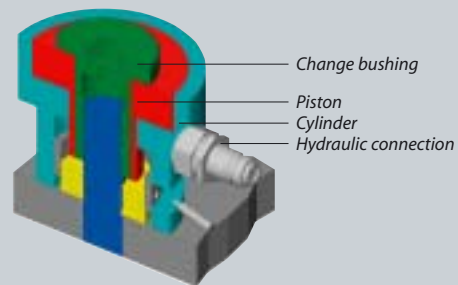
Torque Method

The torque method for casing bolts is mainly used for smaller and medium sized bolt dimensions up to maximum 1.5". The friction coefficient affects the accuracy of the preload. The friction is the reason why it is nearly impossible to get an accurate preload on each stud. To open the bolted joint with the torque method a higher torque (2 - 4 times) is required. The higher opening torque sometimes damages the torque tools and even the hardware. In some cases it is not possible to open the bolted joint with torquing equipment, for this reason most of the bolted hardware has to be cut out with a cutting torch.

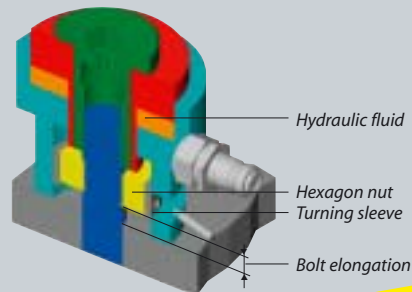
ITH Stretch Method

The ITH-Stretch-Method is a very precise method for tightening high stress level bolted joints. The stress level in the bolt is directly corresponding to the pressure level on the gauge. The bolted elongation is made friction free to the joint. For this reason the precision in the bolt is very high. The tightening process by using the ITH-Stretch-Method consists of two steps:

1. Assembling of bolt tensioning cylinder (BTC)



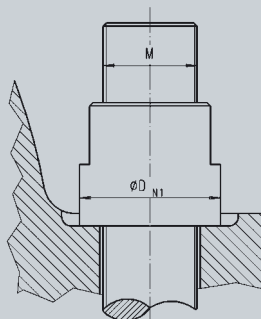
2. Stretching of the bolt and torque controlled tightening of the nut



Patented Design

ITH-Turbine Fasteners

For the gas turbine joints ITH has designed fasteners, packages up to 3" and for steam turbines up to 8". With the patented ITH-Round Nut-Design RMZ it is possible to use the gear drive feature from the bolt-tensioning cylinder.



Fastener sketch with ITH Roundnut RMZ

ITH-BTC for GE

The patented ITH Tensioners are specifically designed for all GE-Gas turbines. There are two different design types used in the field:

- **Type ES**
Single-stage Tensioners
- **Type MS**
Multi-stage Tensioners

Currently there are over 25 tensioners designed specially for GE-Casings.

Thread Size	Type
1,0" – 8 UN	MS 100
1,25" – 8 UN	ES 125
	MS 125
1,5" – 8 UN	SES 150
	ES 150
	MS 150
1,75" – 8 UN	ES 175
	MS 175
2,0" – 8 UN	MS 200
	MS 201
2,25" – 8 UN	MS 225
2,5" – 8 UN	MS 250
2,75" – 8 UN	MS 275
3,0" – 8 UN	MS 300

Some BTC types

Cost reduction

ITH-Bolting-Service

ITH provides a wide range of service activities to meet the customers needs. By using ITH bolting services the power plant owner has the following benefits:

- ✓ Higher profitability of the power plant
- ✓ Time saving
- ✓ Cost saving

ITH Service Tech:



- ✓ Onsite tool training
- ✓ Supervision of tooling operation
- ✓ Tooling Maintenance / support
- ✓ Supervision of bolting procedure

Turn Key Bolting:



- ✓ Complete bolting service
- ✓ Time saving
- ✓ Cost saving
- ✓ Safe work condition

ITH Torque Wrenches for GE Gasturbines:



- ✓ ITH torque wrenches have a compact, lightweight, single acting hose design that lend themselves to the confined areas on the GE casings.

Bolt Tensioning Cylinder Rental:



Toolkit ready for use

- ✓ ITH tools to service the following GE turbines 6C, 6 FA, 7FA, 7FB, 9 E, 9FA, 9FB, 7H, 9H
- ✓ Complete tool kits with all required accessories
- ✓ Certified and tested tools, ready for use

ITH type	max. torque [Nm /ftlbs]	Typical GE Application
DRS 50	5.000/3.670	- compressor casing horiz. bolts outside/inside
DRS 80	8.300/6.125	- exhaust casing vert. /horiz., outside/inside, CDC horiz. bolts
DRS 180	18.300/13.500	- turbine casing to exhaust casing vert. CDC horiz.
DRS 275	27.500/20.285	- turbine casing to CDC vert. - turbine casing horiz.



Products in use

Loosening of CDC-bolts at GE turbine 7 FA + threads 2,0" - 8 UN with Multistage Bolt Tensioning Cylinder (BTC) MS - 200

Tightening of Turbine Shell bolts at GE Gasturbine 9 FA with ITH Torque Wrench DR 18,3

Tightening of CDC bolts at GE Gasturbine 7 FA + with Single Stage BTC ES-125

ITH offers worldwide service at the main service offices:

www.ith.com

Worldwide Network



ITH GmbH · Industrie-Technische Konstruktionen Hohmann
 Postbox 1365 · D-59872 Meschede
 Phone +49 (0) 2 91 / 9 96 20 · Fax +49 (0) 2 91 / 99 62 11
 sales@ith.de · www.ith.de