



MAINTENANCE-FREE-BOLTING CONCEPT FOR BOLTS UP TO M80 (3 1/8")

Maintenance-Free-Bolting concept by ITH Bolting Technology: IHF bolts, IHF roundnuts, and digital monitoring and application management for ITH Bolt Tensioning Cylinders. (Courtesy: ITH)

ITH Bolting Technology combines digital bolting tool procedures, advanced fastener design, and installation know-how to reduce maintenance costs significantly – proven for onshore and offshore wind-turbine installation projects.

By ITH BOLTING TECHNOLOGY

ITH Bolting Technology is a leading global system supplier in bolting technology providing bolting tools, engineering, fasteners and service. Under their brand, IHF Fastener Systems, ITH has developed innovative fastener systems up to M80 (3 1/8”), which are specifically designed to match the technical demands of onshore and offshore wind turbine joints.

The “Maintenance-Free-Bolting” concept includes the technical coordination of ITH bolting tool systems with digital management software, specifically designed IHF fasteners, and advanced installation process know-how. The technical combination leads to repeatable, fast, and precise bolting procedures, which helps to reduce costly maintenance intervals on onshore and, especially, offshore wind turbines significantly.

BOLTING TOOL METHOD AND DIGITAL MANAGEMENT SOFTWARE

ITH bolt tensioning cylinders work according to the hydraulic, torsion-free, and friction-free bolt tensioning method. The method guarantees reproducible pre-tensioning forces within a close tolerance of ±2.0 percent. For this method, ITH has developed a digital application management system, which offers customizable functions such as data-logging and step-by-step user guidance.

Depending on the demand of the customer, the bolting procedure and functions can be modified. All captured data such as applied pressure, applied preloads, angles of rotation of the nut run-down, bolt-ID, and more application data can be sent to a customer cloud.

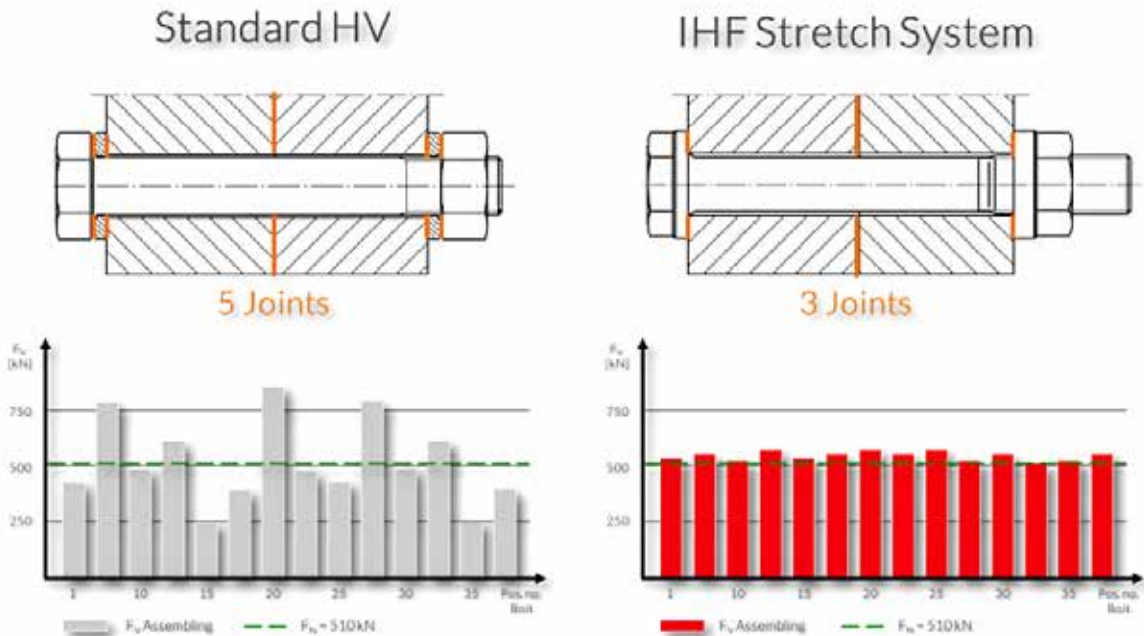
MULTI-CERTIFIED IHF FASTENER DESIGN AND BENEFITS

Bolted joints on steel constructions can be classified according to the HV-standard (HV stands for high-strength) according to DIN EN 14399 and DASt 021. Wind-turbine tower segments are mainly subjected to this standard, which determines that bolts are torqued and fastener sets consist of a bolt, a nut, and two washers. Torqueing is subjected to friction effects, which can affect the implementation of the applied preload forces FM negatively.

Innovative IHF fasteners – head bolts (in general up to M64, 2 1/2”), studs and round nuts (up to M80, 3 1/8”) – are based on an optimized design to meet the technical demands of wind-turbine joints in terms of material, coatings, pre-load distribution, notch categories, and dimensions.

Compared to conventional HV-standard joints, IHF Fasteners offer several advantages:

- Integrated washers: In contrast to an HV-set, the more recent bolt and nut set consists only of two components, the

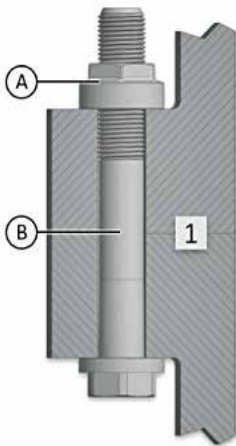


Conventional HV-standard configuration compared to IHF fastener configuration and applied preloads for bolt size M36 (1 3/8”). (Courtesy: ITH)

IHF Fastener set configurations

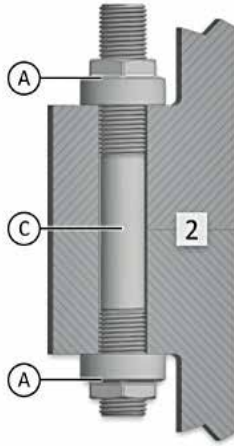
Configuration 1
head bolt
(IHF standard)

- A. 1x IHF Roundnut
- B. 1x IHF Stretchbolt

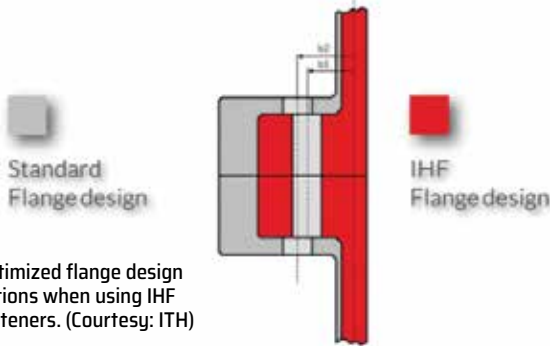


Configuration 2
stud bolt

- A. 2x IHF Roundnut
- C. 1x IHF Studbolt



IHF configuration with IHF roundnuts: No washers required. IHF roundnuts can be used with IHF head bolts, in general, up to M64, 2 1/2" or IHF studs bolts up to M80, 3 1/8". (Courtesy: ITH)



Optimized flange design options when using IHF fasteners. (Courtesy: ITH)



Set of IHF roundnuts and IHF head bolts. (Courtesy: ITH)

▶ ITH hydraulic bolt tensioning cylinders can be equipped with handling systems and automatization components, which enable a semi-automatic nut run-down and an automatic nut alignment. ▶

IHF stretchbolt and roundnut, which simplifies and accelerates the installation process, especially offshore.

▶ Design and optimized load distribution enable higher utilization of the material.

▶ This allows for a use of a) fewer number of IHF fasteners compared to standard fasteners or b) a reduction of the dimensions of the flange.

Due to their proven design, IHF round nuts up to M80 (3 1/8") have received the European Technical Approval (ETA) by the DIBt (German Institute of Construction) to be applied as a substitute for conventional HV-standard fastener configurations.

INSTALLATION KNOW-HOW AND RESULTS

The "Maintenance-Free-Bolting" concept also includes several components that lead to a faster installation process. ITH hydraulic bolt tensioning cylinders can be equipped with handling systems and automatization components, which enable a semi-automatic nut run-down and an automatic nut alignment. Both automatization components are managed by the ITH software. Via an industrial touch-panel PC, users get a visual step-by-step process guidance. Bolt-tightening procedures are often subjected to the risk of possible incorrect operation, which is avoided by the user guide.

This process design not only accelerates installation procedures but also guarantees precise results. Special offshore packaging and the fact that no washers are required also simplifies and accelerates the installation.

WIND TURBINE APPLICATION AND SOLUTIONS

The "Maintenance-Free-Bolting" concept is in use on:

- ▶ Turbine tower bolts.
- ▶ Transition-piece to tower bolts.
- ▶ Monopile-to-transition piece.

Next to the Maintenance-Free-Bolting-Concept, ITH Bolting Technology also provides bolting tools, fasteners, and service for main wind turbine nacelle bolting applications. Comprehensive support in terms of installation supervision, tool maintenance, tool calibration (A2LA-certified up to 60,000 psi), and more is guaranteed by the global ITH network. ↙

ABOUT THE COMPANY

ITH Bolting Technology is a developer, producer, and distributor of hydraulic bolt tensioning tools and torque wrenches for tightening and loosening bolt connections from M 16 (3/8") and up. For more information, go to www.ITH.com.