

# MAINTENANCE-FREE-BOLTING CONCEPT FOR BOLTS UP TO M100 (4")

Maintenance-Free-Bolting concept by ITH Bolting Technology and IHF Fastener Systems: IHF Bolts, IHF Round Nuts, 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 DIPL.-ING. FRANK HOHMANN

With its brand, IHF Fastener Systems, ITH Bolting Technology has developed innovative fastener systems up to M100 (4"), which are specifically designed to match the technical demands of onshore and offshore wind-turbine joints. ITH is a leading global system supplier in bolting technology providing bolting tools, engineering, fasteners, and service.

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 frictionless and torsion-free tightening method. The method guarantees reproducible assembly preload FM within a close tolerance of  $\pm 2.0$  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 as per 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. Torquing is subjected to friction effects, which can affect the implementation of the applied assembly preload FM negatively.

Innovative IHF Fasteners – the IHF Stretch Bolts (head bolt in general up to M64, 2 1/2"), IHF Stud Bolts and IHF Round Nuts (up to M100, 4") – are based on 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

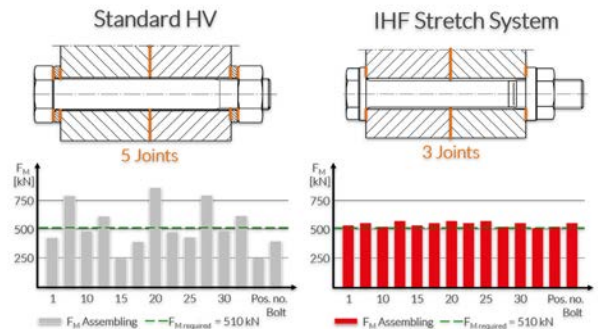


Figure 1: Conventional HV-standard configuration) compared to IHF fastener configuration and applied preloads for bolt size M36 (1 3/8"). (Courtesy: ITH)

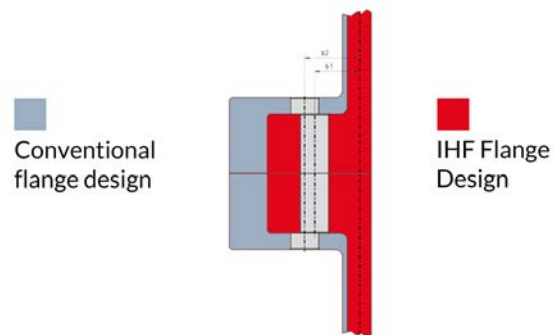


Figure 2: Optimized flange design options when using IHF Fasteners. (Courtesy: ITH)

recent bolt and nut set consists only of two components, the IHF Stretch Bolt/ IHF Stud Bolt and IHF Round Nut, which simplifies and accelerates the installation process, especially offshore.

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

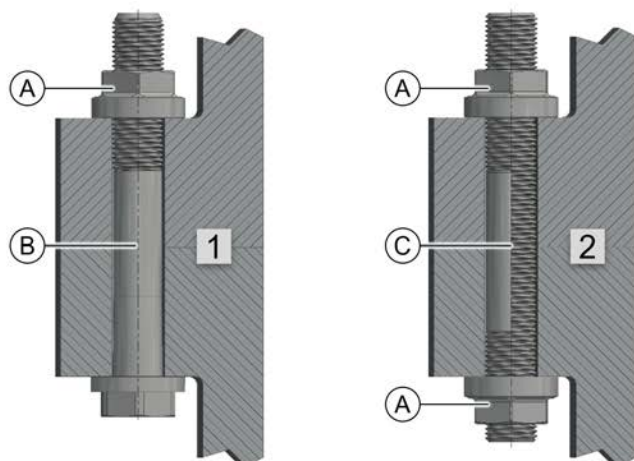
▀ This enables a) to use less IHF Fasteners compared to standard fasteners or b) reduce the dimensions of the flange.

Due to their proven design, IHF Fasteners 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.



**Configuration 1 - IHF bolt assembly:**

A. IHF Round Nut (acc. IHF-09.00100)

B. IHF Stretch Bolt (acc. IHF-09.00100)

**Configuration 2 - IHF stud bolt assembly:**

A. IHF Round Nut (acc. IHF-09.00100)

C. IHF Stud Bolt (acc. IHF-09.00100)

A. IHF Round Nut (acc. IHF-09.00100)

Figure 3: ITH configuration possibilities: IHF Round Nuts can be used with IHF Stretch Bolts in general up to M64, 2 1/2", or IHF Studs Bolts up to M100, 4" — no washers required. (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. 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 proven "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, and further is guaranteed by the global ITH network. ✌

## ABOUT THE AUTHOR

Dipl.-Ing. Frank Hohmann is CEO of ITH GmbH & Co. KG (ITH Bolting Technology). ITH Bolting Technology is the worldwide



Figure 4: ITH bolt assemblies with IHF Stud Bolt and IHF Round Nut. (Courtesy: ITH)

leading system supplier for tension and torque tools to tighten and loosen industrial bolt connections bigger than M16 (5/8"). As a whole system supplier, ITH combines high-quality tool solutions, comprehensive engineering knowledge, innovative fasteners, and qualified services for the best technical and economic solution for business partners. As a private-owned engineering company with a long-term business strategy, the global ITH-network includes 12 ITH-subsidaries and more than 40 global representations. This guarantees fast and qualified tool services as well as customer proximity. With more than 200 international patents, ITH is among the most important drivers of innovation in industrial bolting technology.