

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-13/0243
of 13 June 2019

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

IHF-Stretch-System

Product family
to which the construction product belongs

IHF Stretchbolt bolting assemblies

Manufacturer

IHF-GmbH
Steinwiese 8
59872 Meschede
DEUTSCHLAND

Manufacturing plant

Werk 1
Werk 2
Plant 1
Plant 2

This European Technical Assessment
contains

9 pages including 5 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 331531-00-0602

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Specific Part

1 Technical description of the product

The construction product is a high-strength structural bolting assembly (IHF Stretchbolt bolting assembly) with metric ISO threads M 27 to M 80.

The high-strength structural bolting assembly consist of an IHF Stretchbolt or an IHF Studbolt and IHF Roundnuts. Due to the geometry of the contact faces of the IHF Stretchbolts and the IHF Roundnuts any washers are not necessary (see Annex B.1). Apart from that, assembling of the following components is also possible:

- hexagon bolts with an extended thread part ($b^* = 3 \times d$) following EN 14399-4 or hexagon bolts of bigger nominal sizes than M39 fulfilling all applicable requirements of EN 14399-4 (HV-bolts, hereinafter referred to as HV Stretchbolts) with a matching washer under the bolt head and a IHF Roundnut,
- IHF Studbolts combined with two IHF Roundnuts,
- IHF Studbolts with a IHF Roundnut and a hexagon nut in accordance with EN 14399-4 or a hexagon nut of bigger nominal sizes than M39 fulfilling all applicable requirements of EN 14399-4 with a matching washer.

Annex B.2 shows the different feasible combinations of HV Stretchbolts, IHF Stretchbolts, IHF Studbolts with IHF Roundnuts or hexagon nuts and washers.

The dimensions, tolerances, materials and the surface protection of the high-strength structural bolting assembly shall correspond to the respective values and information laid down in the technical documentation¹ to this European Technical Assessment.

The required preload will be applied by means of a hydraulic bolt tensioning cylinder. The tensioner preloads the bolt by means of stretching. The hydraulic bolt tensioning cylinder is an integral part of this assessment with regards to its effect on the preloading procedure. A principle sketch of the stretch tightening method is shown in Annex B.3.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The high-strength structural bolting assemblies are intended to be used for the connection of structural metallic components predominantly made of steel in applications where a precise preload is required, e.g. in Towers.

The high-strength structural bolting assemblies provide a precise preload in the bolted joint and guarantee the required preload according to the relevant standards (for instance 70 % of $f_{u,B} \cdot A_s$ in accordance with EN 1993-1-8).

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fastening bolts of at least 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

¹ The technical documentation to this European Technical Assessment is deposited with Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure is handed over to the approved bodies.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Property class	
- IHF Stretchbolts, IHF Studbolts	10.9 (EN ISO 898-1)
- nuts, IHF Roundnuts	10 (EN 20898-2)
Suitability for preloading	see Annex A.1.2
Suitability for an advanced detail category	
- Execution with IHF Stretchbolts: Execution 1 (see Annex B.2)	see Annex A.1.3
- Execution with HV Stretchbolts: Execution 2 (see Annex B.2)	No performance assessed
- Execution with IHF Studbolts: Execution 3 (see Annex B.2)	No performance assessed
- Execution with IHF Studbolts: Execution 4 (see Annex B.2)	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Performance Class A1

3.3 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Property class	See 3.1 - Mechanical resistance and stability (BWR 1)
Suitability for preloading	
Suitability for an advanced detail category	

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 331531-00-0602 the applicable European legal act is: [1998/214/EC].
The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 13 June 2019 by Deutsches Institut für Bautechnik

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Head of Department

beglaubigt:
Schult

Annex A

A.1 Assumptions concerning design

A.1.1 General

Bolted connections in steel structure with IHF Stretchbolt bolting assemblies are designed in accordance with EN 1993-1-8:2005 + AC:2009 as far as no other provisions are made in the following. The high-strength structural bolting assembly and the corresponding connections are subject to tension and/or shear forces.

For the corrosion protection of the IHF Stretchbolt bolting assemblies the rules given in EN 1090-2:2018 are taken into account.

A.1.2 Suitability for preloading

The minimum clamping length ratio is 1 : 3 or 1 : 2.5 if the increased preload force according to Table 1, column 3 shall be applied and the designer has informed the executer in written form about this (e.g. on the shop drawing).

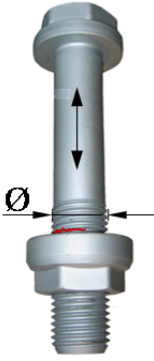
Table A.1 Preload force to be applied to achieve the design preload force

1	2		3	4
Nominal size	Preload force to be applied		Design nominal preload force $F_{p,C,d}$ [kN]	
	Normal preload force [kN]	Increased preload force [kN]		
M 27	410	420	320	
M 30	500	520	390	
M 36	730	750	570	
M 39	870	900	680	
M 42	1000	1030	790	
M 45	1170	1200	910	
M 48	1320	1360	1030	
M 56	1810	1870	1420	
M 64	2390	2470	1880	
M 72	3090	3190	2420	
M 80	3880	4010	3040	

A.1.3 Suitability for an advanced detail category

For the fatigue assessment in accordance with EN 1993-1-9 of bolting assembly with IHF Stretchbolts, Execution 1 (see Annex B.2) for nominal sizes M27 to M72 the detail category given in table A.2 may be used.

Table A.2 Detail category

Detail category	Constructional detail		Description	Requirements
71 (m = 3)	depending on the size $\varnothing > 30 \text{ mm}$ $k_s = (30/\varnothing)^{0,25}$		IHF-stretch-bolt with thread rolling for nominal sizes M27 to M72 (with zinc-lamellar coating) under tension For large diameters, the size effect must be taken into account with k_s	The stress range $\Delta\sigma$ to be calculated using the tensile stress area of the stretch-bolt. Bending and tension resulting from prying effects and bending stresses from other sources must be taken into account. For preloaded bolts, the reduction of the stress range may be taken into account. Hot dip galvanized stretch-bolts are classified as 2 detail categories lower.

A.2 Assumptions concerning Installation

A.2.1 General

Bolted connections in steel structure with IHF Stretchbolt bolting assemblies are executed according to EN 1090-2:2018 as far as no other provisions are made in the following.

A.2.2 Specific

The installation of the IHF Stretchbolt bolting assemblies is only carried out in accordance with the provisions of the manufacturer with the appropriate hydraulic bolt tensioning cylinder. The manufacturer hands over the assembly instruction to the executing company.

The preload force to be applied for every nominal size according to Table A.1 or the corresponding oil pressure at the hydraulic bolt tensioning cylinder is kept.

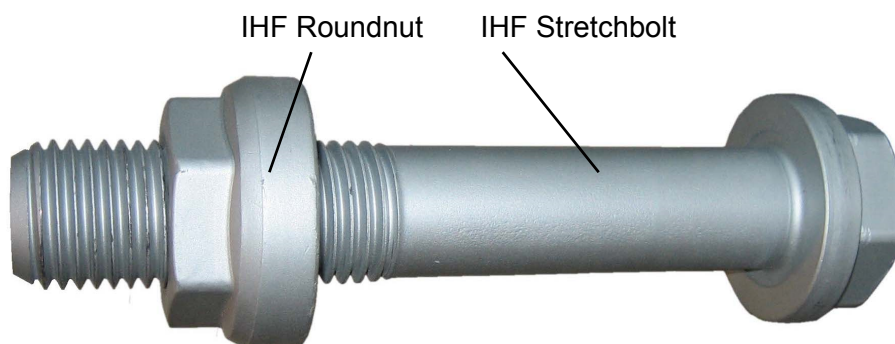
Connections with IHF Stretchbolt bolting assemblies are only executed by companies with the necessary experience unless the instruction of the assembly personnel is arranged by specialists experienced in this field.

The structural parts to be connected are in direct contact. The bolt axis is rectangular to the surface of the structural part. The measures for possible inclination of the faces are agreed with the manufacturer in written form for the single case (e. g. wedge washers).

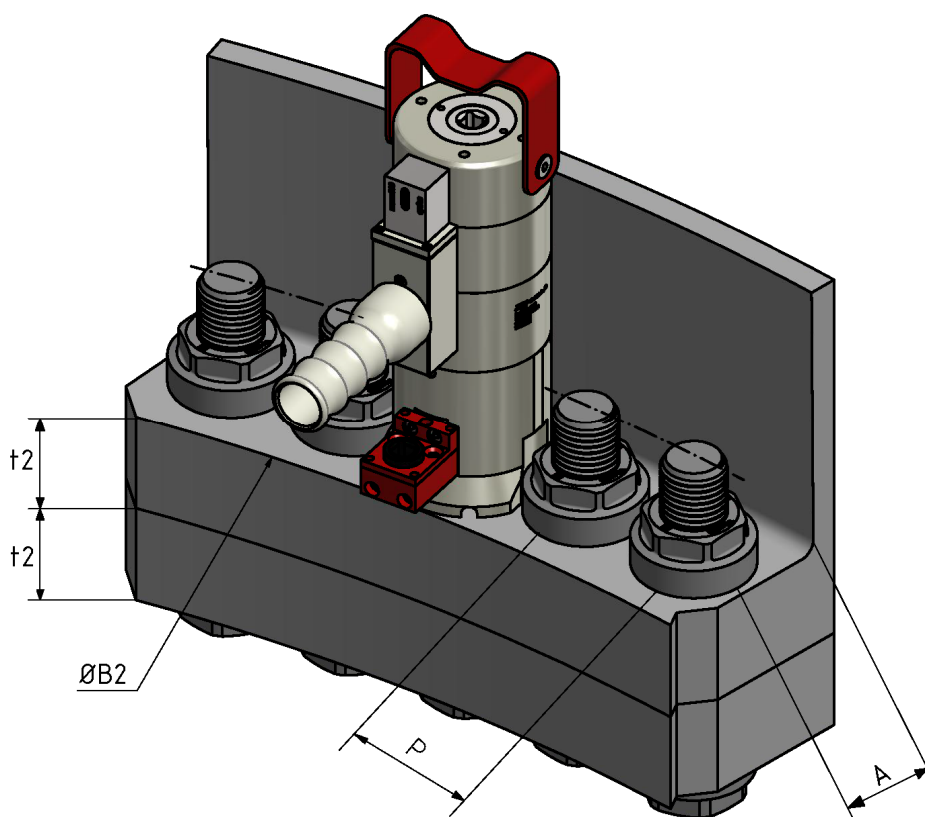
A.3 Indications to the manufacturer

It is in the responsibility of the manufacturer to ensure that the information on the specific conditions is given to those who are concerned. This information may be given by reproduction of the respective parts of the European technical approval.

In addition all installation data (e. g. preload force) shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).



Sample of an IHF-Stretchbolt bolting assembly



Application for a bolted connection in towers

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IHF-Stretch-System

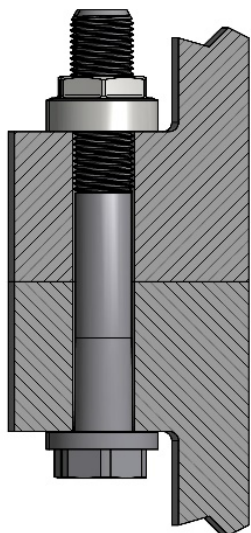
Sample of an IHF - Stretchbolt bolting assembly
Application for a bolted connection in a tower

Annex B.1

Execution with IHF Stretchbolts/ HV Stretchbolts

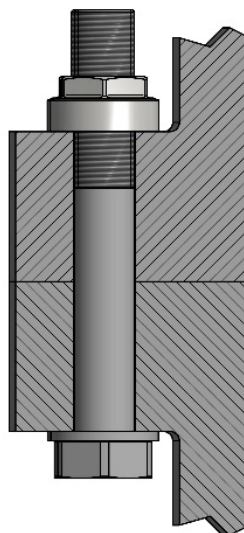
Execution 1:

- 1 x IHF Stretchbolt
- 1 x IHF Roundnut



Execution 2:

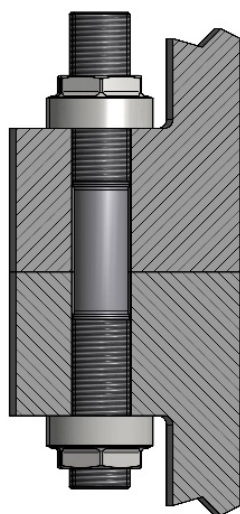
- 1 x HV Stretchbolt
- 1 x HV-washer
- 1 x IHF Roundnut



Execution with IHF Studbolts

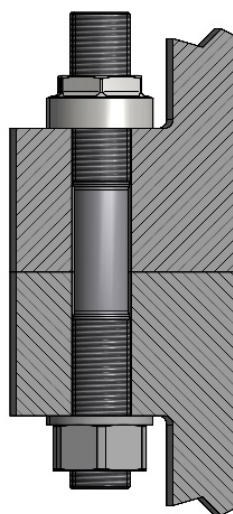
Execution 3:

- 1 x IHF Studbolt
- 2 x IHF Roundnut



Execution 4:

- 1 x IHF Studbolt
- 1 x IHF Roundnut
- 1 x HV washer
- 1 x HV nut

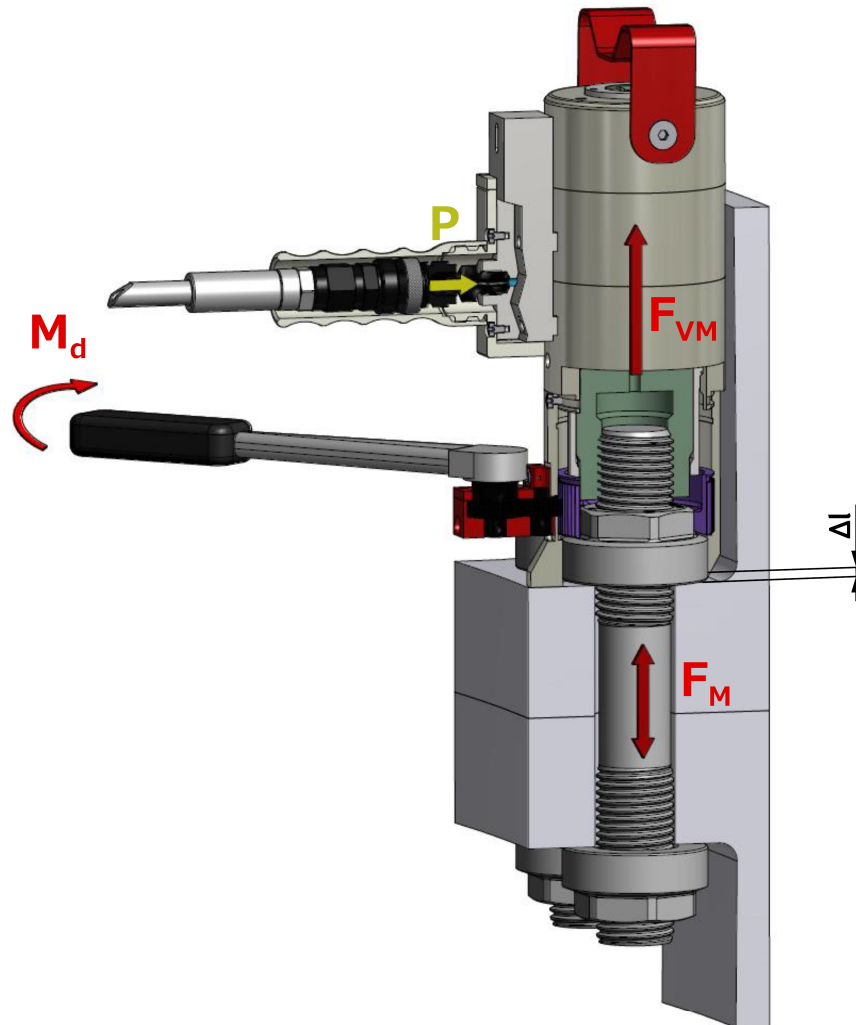


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IHF-Stretch-System

Different feasible combinations

Annex B.2



1. Step: Applying the preload force F_{VM} by means of the hydraulic bolt tensing cylinder and lengthening the bolt by Δl
2. Step: Tightening the nut by means of the hand torque wrench or motor-powered with the relative low torque moment M_d
3. Step: Release the hydraulic bolt tensing cylinder, the preload force F_M will remain

IHF-Stretch-System

Principle sketch of the stretch tightening method

Annex B.3