

**TYPE APPROVAL CERTIFICATE****This is to certify:****That the Structural Connecting Elements**

with type designation(s)

**HILTI S-BT FASTENING SYSTEM SCREW-IN THREADED STUDS**

Issued to

**Hilti AG****Schaan, Liechtenstein**

is found to comply with

**IMO Resolution MSC.307(88) International code for application of fire test procedures, 2010 (2010 FTP Code)****EN 1993-1-4:2006 Eurocode 3: Design of steel structures – Part 1-4: General rules – Supplementary rules for stainless steels****EN 1993-1-9:2005 Eurocode 3: Design of steel structures – Part 1-9: Fatigue****ISO/TR 14345:2012 Fatigue – Fatigue testing of welded components – Guidance****ISO 16701:2015 Corrosion of metals and alloys – Corrosion in artificial atmosphere –****Accelerated corrosion test involving exposure under controlled conditions of humidity cycling and intermittent spraying of a salt solution****ISO 9227:2017 Corrosion tests in artificial atmospheres – Salt spray tests****IEC 62561-1:2017 Lightning protection system components (LPSC) – Part 1: Requirements for connection components****IEC 60947-7-1:2009 Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors****IEC 60947-7-2:2009 Low-voltage switchgear and controlgear – Part 7-2: Ancillary equipment – Protective conductor terminal blocks for copper conductors****Application :**Issued at **Hamburg** on **2018-11-15**for **DNV GL**This Certificate is valid until **2023-11-14**.DNV GL local station: **Augsburg**Approval Engineer: **Christian Kaemmer**.....  
**Olaf Drews**  
**Head of Section**

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.



Job Id: **262.1-023658-3**  
 Certificate No: **TAS00000N6**  
 Revision No: **2**

## PRODUCT DESCRIPTION

The S-BT fasteners are threaded studs manufactured from hardened carbon steel and austenitic-ferritic (Duplex) stainless steel 1.4462 acc. DIN-EN 10088-1 (AISI 316 SS equivalent). The S-BT threaded studs are fasteners with male threads (metric or inch) for attachment on one end and a threaded tip on the other end. All studs are supplied with a sealing washer. The S-BT fastener will be screwed in into a pre-drilled hole. The screw is tapping its own internal mating threads when installed into steel material. For drilling the hole into the base material, a special stepped drill bit is needed to guarantee an accurately defined hole in terms of borehole depth and diameter.

The metallic sealing washer with a sealing ring made of chloroprene rubber CR 3.1107 offers weather resistant fastenings against moisture or condensation. The washer seals the hole to prevent moisture from dripping into the fastener threads. The sealing washer also prevents the base material from corrosion around the drilled hole.

Designation	Item Description	Application
S-BT-MR M10/15 SN 6	Stainless steel threaded stud M10 with sealing washer	Multipurpose
S-BT-MR M10/15 SN 6 AL	Stainless steel threaded stud M10 with sealing washer, for base material aluminum	Multipurpose
S-BT-MR W10/15 SN 6	Stainless steel threaded stud W10 with sealing washer	Multipurpose
S-BT-MR W10/15 SN 6 AL	Stainless steel threaded stud W10 with sealing washer, for base material aluminum	Multipurpose
S-BT-MF M10/15 AN 6	Carbon steel threaded stud M10 with sealing washer	Multipurpose
S-BT-MF W10/15 AN 6	Carbon steel threaded stud W10 with sealing washer	Multipurpose
S-BT-MR M10/15 SN 5	Stainless steel threaded stud M10 with sealing washer	Multipurpose
S-BT-MR W10/15 SN 5	Stainless steel threaded stud W10 with sealing washer	Multipurpose
S-BT-MR M8/15 SN 6	Stainless steel threaded stud M8 with sealing washer	Multipurpose
S-BT-MR M8/15 SN 6 AL	Stainless steel threaded stud M8 with sealing washer, for base material aluminum	Multipurpose
S-BT-MR M8/7 SN 6	Stainless steel threaded stud M8 with sealing washer	Multipurpose
S-BT-MR M8/7 SN 6 AL	Stainless steel threaded stud M8 with sealing washer, for base material aluminum	Multipurpose
S-BT-GR M8/7 SN 6	Stainless steel threaded stud M8 with sealing washer	Grating
S-BT-GR M8/7 SN 6 AL	Stainless steel threaded stud M8 with sealing washer, for base material aluminum	Grating
S-BT-MF M8/15 AN 6	Carbon steel threaded stud M8 with sealing washer	Multipurpose
S-BT-MF M8/7 AN 6	Carbon steel threaded stud M8 with sealing washer	Multipurpose
S-BT-GF M8/7 AN 6	Carbon steel threaded stud M8 with sealing washer	Grating
S-BT-MR M8/15 SN 5	Stainless steel threaded stud M8 with sealing washer	Multipurpose
S-BT-MR M8/7 SN 5	Stainless steel threaded stud M8 with sealing washer	Multipurpose
S-BT-GR M8/7 SN 5	Stainless steel threaded stud M8 with sealing washer	Grating
X-FCM-M	Grating fastener, carbon steel, duplex coated	Grating
X-FCM-R	Grating fastener, stainless steel	Grating

Job Id: 262.1-023658-3  
 Certificate No: TAS00000N6  
 Revision No: 2

Designation	Item Description	Application
S-BT-ER M10/15 SN 6	Stainless steel threaded stud M10 with sealing washer and grounding equipment kit	Electrical Connection
S-BT-ER W10/15 SN 6	Stainless steel threaded stud W10 with sealing washer and grounding equipment kit	Electrical Connection
S-BT-EF M10/15 AN 6	Carbon steel threaded stud M10 with sealing washer and grounding equipment kit	Electrical Connection
S-BT-EF W10/15 AN 6	Carbon steel threaded stud W10 with sealing washer and grounding equipment kit	Electrical Connection
S-BT-ER M8/15 SN 6	Stainless steel threaded stud M8 with sealing washer and grounding equipment kit	Electrical Connection
S-BT-EF M8/15 AN 6	Carbon steel threaded stud M8 with sealing washer and grounding equipment kit	Electrical Connection
S-BT-ER M10 HC 35	Stainless steel threaded stud M10 suitable for High Current with sealing washer and grounding equipment kit including conductivity disc for higher contact surface.	Electrical Connection (High Current)
S-BT-ER M10 HC 120		
S-BT-ER W10 HC AWG2	Stainless steel threaded stud W10 suitable for High Current with sealing washer and grounding equipment kit including conductivity disc for higher contact surface.	Electrical Connection (High Current)
S-BT-ER W10 HC AWG4/0		
S-BT-EF M10 HC 35	Carbon steel threaded stud M10 suitable for High Current with sealing washer and grounding equipment kit including conductivity disc for higher contact surface.	Electrical Connection (High Current)
S-BT-EF M10 HC 120		
S-BT-EF W10 HC AWG2	Carbon steel threaded stud W10 suitable for High Current with sealing washer and grounding equipment kit including conductivity disc for higher contact surface.	Electrical Connection (High Current)
S-BT-EF W10 HC AWG4/0		

**Material specification S-BT fasteners:**

**Material specification Shank:**

Upper part: Metric or inch thread with a HEX head 6.35 (1/4") for M10 / W10 and HEX 5.3 (0.21") for M8  
 Lower part: Tapping screw thread  
 Material: S-BT stainless steel: Stainless steel S31803 (1.4462) acc. DIN-EN 10088-1 (AISI 316 SS equivalent), zinc-coated  
 S-BT carbon steel: Carbon steel 1038, duplex-coating ZN-alloy & top coat

**Material specification Washer:**

S-BT stainless steel: Stainless steel S31603 (1.4404) sealing washer Ø12mm (0.47") with a sealing ring.  
 S-BT carbon steel: Aluminum sealing washer Ø10mm (0.39") with a sealing ring.  
 Sealing ring: Chloroprene rubber CR 3.1107, black, resistant to UV, salt water, water, ozone, oils etc.

Job Id: 262.1-023658-3  
Certificate No: TAS00000N6  
Revision No: 2

#### Material specification discs:

Conductivity disc: Ø 22 mm (0.866") (HC 35/AWG2) and  
Ø 32 mm (1.260") (HC120/AWG4/0)  
both from copper alloy CuSn8 (tin-coated) with  
FKM sealing ring resistant to UV, salt water, water, ozone, oils etc.  
Applicable for studs with annex HC - high current.

Grating disc X-FCM-R:  
Disc: Stainless steel X2CrNiMo18-14-3, X2CrNiMo17-12-2  
Threaded stem: Stainless steel X2CrNiMo17-13-2, X5CrNiMo17-12-2, X6CrNiMoTi17-12-2

Grating disc X-FCM-M:  
Disc: Cold rolled carbon steel DC04 to EN 10130  
Threaded stem: Bright (free cutting) steel  
11SMnPb30+C to EN 10277.  
Disc and threaded stem duplex-coated.

## **APPLICATION/LIMITATION**

### **ALUMINUM / CARBON STEEL BASE MATERIAL**

The HILTI S-BT Fastening System is type approved for fastening various materials to base metals of carbon steel and aluminum on board ships and other structures classed by DNV GL as follows:

- Metal and fiberglass gratings to steel and aluminum
- Cable, conduit and tubing connectors to steel and aluminum
- Trays, channels and struts to steel and aluminum for cable, conduit and tubing runs
- Instrumentation, junction boxes, lighting
- Pipe hangers
- Signage
- Door frames
- Mounting cabinets, securing furniture, utensils, etc.
- Grounding and bonding equipment (e.g. for equipment, pipe flanges, storage tanks, junction boxes etc.)

The fasteners may also be used for applications other than those listed above, subject to special consideration either by the local DNV GL Surveyor.

The base material is limited to steel grade with a maximum ultimate tensile strength  $f_u = 630$  MPa (91ksi). The minimum ultimate tensile strength of steel is  $f_u \geq 340$  MPa (49 ksi). The minimum ultimate tensile strength of aluminum is  $f_u \geq 270$  MPa (39 ksi).

In general, the installation of the fasteners may be carried out in areas where drilling for bolting is permissible. Fasteners are not being installed closer than 6 mm (0.236") from the edge of a flange or cutout and closer than 18 mm (0.709") between fasteners.

Recommended maximal cross section of connected cable according IEC 60947-7-2 and IEC 60947-7-1 depending from used fastener S-BT-ER or S-BT-ER HC and grounding equipment kit including conductivity disc (if applicable) are to find in the report: "Hilti Direct Fastening Technology Manual – S-BT-ER and S-BT-EF screw-in threaded studs for electrical connections" (mentioned under DOCUMENTATION)

Job Id: 262.1-023658-3  
 Certificate No: TAS00000N6  
 Revision No: 2

## FATIGUE DESIGN to CARBON STEEL BASE MATERIAL

The S-BT fasteners are type approved to be used on structural members made from carbon steel that require fatigue verification. Fatigue verification of structural members in ship structures has to be made in compliance with DNVGL RP-C203.

For fatigue verification, the fatigue S-N curve "S-BT", as described in the "Hilti S-BT screw-in threaded studs-Specification binder ", shall be used. This curve applies for base material thickness  $\geq 3$  mm, edge distance  $\geq 15$  mm. This is applicable for structural steel grades with nominal yield strength ranging from 235 MPa to 355 MPa.

Other constructions which require fatigue verification are to be made in compliance with Eurocode 3 (EN 1993-1-9: Eurocode 3: Design of Steel structures – Part 1.9 (Fatigue). For Fatigue verification of normal stresses the detail category 100 (m=5) acc. to EN 1993-1-9 applies.

Description of constructional detail:

Hilti S-BT screw-in stainless and carbon steel threaded studs with pre-drilled hole in structural steel base material.

### Requirement / Limitation

The nominal stress range [N/mm<sup>2</sup>] is to be calculated by the gross cross-section fulfilling the requirements of the nominal stress approach.

Plate thickness:  $t > 3$  [mm]  
 Minimum edge distance: 15 [mm]  
 Minimum spacing of fasteners: 18 [mm]

Structural steel grades: S235 up to S355 grades acc. to EN 10025-2, EN 10025-3 and EN 10225.

The S-BT fastening system is to be observed in view of the project specific static and dynamic load in conjunction with the latest product data sheets.

## COMPONENTS OF S-BT FASTENING SYSTEM

### Drilling tool

Designation	Item Description	Application
SF BT 22-A (B22/2.6 or 5.2Ah)	Drilling tool for Europe, Asia	Drilling
SF BT 18-A (B18/2.6 or 5.2Ah)	Drilling tool for HNA	Drilling
SBT 4-A22 (B22/2.6 or 5.2Ah)	Drilling tool	Drilling, setting, nut fastening

### Stepped drill bit

Designation	Item Description	Application
TS-BT 4.3-74 S	Stepped drill bit	Drilling in steel
TS-BT 5.5-74 S		
TS-BT 5.5-74 AL	Stepped drill bit	Drilling in aluminium
TS-BT HC 35/AWG2	Coating removal drill bit	Removal of the coating from the base material
TS-BT HC 120/AWG4/0		

### Depth gauge

Designation	Item Description	Application
S-DG BT M8/7 Short 6	Depth gauge	Setting of S-BT
S-DG BT M10-W10/15 Long 6	Depth gauge	Setting of S-BT, S-BT-ER/-EF
S-DG BT M8/15 Long 6	Depth gauge	Setting of S-BT, S-BT-ER/-EF
S-DG BT M10-W10/15 HC 6	Depth gauge	Setting of S-BT ER ... HC/ -EF ... HC

Job Id: 262.1-023658-3  
Certificate No: TAS00000N6  
Revision No: 2

**The S-BT fasteners are not to be used for the following locations:**

- For attachment of structural fire protection insulation
- On bulkheads and decks with a thickness less than 5 mm (0.20"), if through penetration of the base material is not accepted. If through penetration is accepted, the base material thickness can be reduced to minimum 3 mm (load reductions according to "Hilti S-BT screw-in threaded studs – Specification binder)
- On the shell plating, sea chests and collision bulkheads

The selection of the HILTI S-BT Fastening System for the corresponding application and the proper assembly are to be in accordance with the instructions of the manufacturer mentioned under DOCUMENTATION.

## DOCUMENTATION

- EVALUATION REPORT ON S-BT THREADED STUDS, HTL RANKWEIL, Hilti-Report XSMSse-01-16, dated: 2016-02-12
- EVALUATION REPORT ON S-BT THREADED STUDS, Hilti-Report XSMSse-01-16 S-BT, dated: 2016-02-19
- EVALUATION REPORT ON S-BT THREADED STUDS, Hilti-Report XSMSse-01-17 S-BT, dated: 2017-09-18
- EVALUATION REPORT ON S-BT-ER/-EF HC THREADED STUDS, Hilti-Report XSMSse-02-18 S-BT, dated: 2018-08-10
- Manufacturing Drawing Carbon 01 – Carbon 05, Stainless 01 – 03, Hilti-Report XSMSse-01-16, dated: 2016-02-12
- Investigation Report, MPA Stuttgart, Hilti-Report XSMSse-01-16, dated: 2015-09-14
- ISO 9001:2008, ISO 14001:2004, dated: 2013-07-01
- Hilti Direct Fastening Technology Manual, X-FCM grating fastening system data sheet, dated 2017-12
- Hilti Direct Fastening Technology Manual – S-BT product pages (Edition 06/2018)
- Hilti S-BT screw-in threaded studs – Specification binder (Edition 08/2018)
- Hilti Direct Fastening Technology Manual – S-BT-ER and S-BT-EF screw-in threaded studs for electrical connections (Edition 08/2018)
- Kuhlmann, U., Günther, H.-P.: Fatigue classifications of the constructional detail „Structural steel base material with Hilti S-BT screw-in threaded studs“. Universität Stuttgart, Institut für Konstruktion und Entwurf, June 30<sup>th</sup>, 2017, Nr. 2017-38X
- Pagani, E., Rickenbacher, C.: Report No. 17-IK-0093.S02: Suitability of Hilti S-BT-ER and S-BT-EF threaded studs as connection point in protective grounding and earthing circuits and for lighting protection. Electro Suisse, Fehraltorf (CH), 2017-07-14
- Pagani, E., Rickenbacher, C.: Report No. 17-IK-0021.S04: Eurofins Expert's report HILTI S-BT-EF HC... and S-BT-ER HC... threaded studs + Annex: Testing plan and testing procedure (2018-02-02)  
Eurofins Electrosuisse Product testing AG, Fehraltorf (CH), 2018-08-09
- Pagani, E., Rickenbacher, C.: Report No. 17-IK-0021.S04: Eurofins Expert's report HILTI S-BT-EF HC... and S-BT-ER HC... threaded studs, Eurofins Electrosuisse Product testing AG, Fehraltorf (CH), 2018-08-09
- MPA Dresden: Test Report No. 20170384, MPA Dresden GmbH – IMO Recognized Test Laboratory, Dresden (D), July 20<sup>th</sup>, 2017
- MPA Dresden: Test Report No. 20161614, MPA Dresden GmbH – IMO Recognized Test Laboratory, Dresden (D), July 21<sup>st</sup>, 2017
- MPA Dresden: Test Report No. 20161614/01, MPA Dresden GmbH – IMO Recognized Test Laboratory, Dresden (D), August 3<sup>rd</sup>, 2017
- DEHN Test Report no. 1798\_FRM\_00, DEHN + SÖHNE GmbH + Co. KG, dated 2018-05-24
- DEHN Test Report no. 1795\_FRM\_02, DEHN + SÖHNE GmbH + Co. KG, dated 2018-06-07
- DEHN Test Report no. 1834\_PAM, DEHN + SÖHNE GmbH + Co. KG, dated 2018-07-27

Job Id: 262.1-023658-3  
Certificate No: TAS00000N6  
Revision No: 2

## TESTS CARRIED OUT

- Documentation of tests performed forming the basis for this type approval are referenced in the list above.
- DNV GL Ref.-No. 262.1-023658-2, 15-073637, 15-067232, 15-056411, 12-004312, 11-069328

## MARKING OF PRODUCT

For traceability to this type approval the products are to be marked with:

- Manufacturers name or trade mark
- Type designation

## CERTIFICATE RETENTION SURVEY

Regulations regarding retention of the type approval certificate are to be found in the DNVGL Class Programme CP-0338.

Periodical assessment:

For retention of the type approval certificate, periodical assessments shall be carried out at production places by DNVGL surveyor. The objective of the periodical assessment is to verify the design and production conditions for the type approval.

Renewal assessment:

A renewal assessment will be performed at renewal of the certificate.

Changes in product(s) and/or production side:

Society shall be informed by the certificate owner about any modifications to product(s) or any changes in production side.

END OF CERTIFICATE