TYPE APPROVAL CERTIFICATE
No. **FPE035023CS/001**

This is to certify that the product identified below is in compliance with the regulations herewith specified

Description	**Fixing System with Screw-in Threaded Stud**
Type	**Hilti S-BT HL**
Applicant	**Hilti Italia S.p.A.** **Piazza Indro Montanelli, 20** **20099 Sesto San Giovanni (MI)** **ITALY**
Manufacturer *Place of manufacture*	**HILTI AKTIENGESELLSCHAFT** **FELDKIRCHERSTRASSE 100** **9494 Schaan** **LIECHTENSTEIN**
Reference standards	**Chap. II-2 of SOLAS 74 Convention, as amended; IMO 2010 FTP CODE Annex 1 Part 3; RINA Rules for Type Approval products, equipment and machinery; EN 1993-1-9:2005 Eurocode 3: Design of steel structures - Part 1-9: Fatigue; ISO 9227:2017 Corrosion tests in artificial atmospheres - Salt spray tests; 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; 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; IEC 62561-1:2017 Lightning protection system components (LPSC) - Part 1: Requirements for connection components; EAD 333037-00-0602: European Assessment Document (EAD): Threaded studs for connection of materials to structural steel and aluminium members**
Reference documents	**RINA Type Approval System**

Issued in **Genoa** on **March 31, 2023**. *This Certificate is valid until* **March 30, 2028**

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TYPE APPROVAL CERTIFICATE
No. **FPE035023CS/001**

Hilti S-BT HL

Technical Characteristics and Description

S-BT HL fastening system alternative to welding, using threaded studs screwed-in into a ore-drilled hole.

Materials		
Stud	Hardened Carbon Steel 1038	
	Stainless Steel 1.4462 DIN-EN 10088-1 (AISI 316 SS equivalent)	
Sealing (ship's structure side)	Carbon Steel studs	D. 10 mm or D. 12 mm Aluminum washer with Chloroprene rubber CR 3.1102 sealing ring
	Stainless Steel studs	D. 12 mm Stainless Steel washer with Chloroprene rubber CR 3.1102 sealing ring
Couplings		
Type	***Side of stud***	***Size***
Threaded (male)	Embedment to ship's structure	D. 5.8 mm
	Side for fastening	M8, M10 (male)
		W10 (male)
Application		
Hull/Structure material	***Thickness (t_{II}) mm [inches]***	***Treatment***
Steel	3 [0.12] ≤ $\mathbf{t}_{II}$ < 6 [0.24]	Re-coating on back side [(1)]
Aluminum	5 [0.20] ≤ $\mathbf{t}_{II}$ < 6 [0.24]	
All materials	$\mathbf{t}_{II}$ > 6 [0.24]	none
Grating fastener	***Grating height (HG) mm [inches]***	***Material***
X-FCM	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Carbon steel zinc coated
X-FCM-R	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Stainless steel
X-FCM-R (+ extension adapter)	53 [2.09] ≤ **HG** ≤ 83 [3.27]	Stainless steel
X-FCM-F	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Carbon steel duplex coated
X-FCM-R L	28 [1.10] ≤ **HG** ≤ 53 [2.09]	Stainless steel
X-FCM-R L (+ extension adapter)	58 [2.28] ≤ **HG** ≤ 83 [3.27]	Stainless steel
X-FCM-F L	28 [1.10] ≤ **HG** ≤ 53 [2.09]	Carbon steel duplex coated
X-FCM-R NG	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Stainless steel
X-FCM-R NG (+ extension adapter)	53 [2.09] ≤ **HG** ≤ 83 [3.27]	Stainless steel
X-FCM-F NG	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Carbon steel duplex coated
X-FCM-R HL	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Stainless steel
X-FCM-R HL (+ extension adapter)	53 [2.09] ≤ **HG** ≤ 83 [3.27]	Stainless steel
X-FCM-F HL	23 [0.91] ≤ **HG** ≤ 53 [2.09]	Carbon steel duplex coated
X-FCS-R	31 [1.22] ≤ **HG** ≤ 41 [1.61]	Stainless steel

[(1)]: pre-drilled through holes

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Products Types and Models

Type of Fasteningy	*Stud Material*	*Code and Size*
Multipurpose	Carbon Steel	S-BT-MF M8/7 AN 6 HL
		S-BT-MF M8/15 AN 6 HL
		S-BT-MF M10/15 AN 6 HL
		S-BT-MF MT M10/15 AN 6 HL
		S-BT-MF W10/15 AN 6 HL
		S-BT-MF MT W10/15 AN 6 HL
	Stainless Steel	S-BT-MR M8/7 SN 6 HL
		S-BT-MR M8/7 SN 6 HL AL
		S-BT-MR M8/15 SN 6
		S-BT-MR M8/15 SN 6 HL AL
		S-BT-MR M10/15 SN 6 HL
		S-BT-MR M10/15 SN 6 HL AL
		S-BT-MR W10/15 SN 6 HL
		S-BT-MR W10/15 SN 6 HL AL
Gratings fastening	Carbon Steel	S-BT-GF M8/7 AN 6 HL
	Stainless Steel	S-BT-GR M8/7 SN 6 HL
		S-BT-GR M8/7 SN 6 HL AL
Electrical connections	Carbon Steel	S-BT-EF M8/15 AN 6 HL
		S-BT-EF M10/15 AN 6 HL
		S-BT-EF W10/15 AN 6 HL
	Stainless Steel	S-BT-ER M8/15 SN 6 HL
		S-BT-ER M10/15 SN 6 HL
		S-BT-ER W10/15 SN 6 HL
Electrical connections (high current)	Carbon Steel	S-BT-EF M10 HC 120 HL
		S-BT-EF W10 HC 4/0 HL
	Stainless Steel	S-BT-EF M10 HC 120 HL
		S-BT-ER W10 HC 4/0 HL

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Reference Documents
1. Drawings (RINA Approval No.)

- No. PSST-29202: HILTI Fixing System S-BT HL - Tech. data sheet Rev.12/2022
- No. PSST-29203: HILTI Fixing System S-BT HL - Grating Fastening System X-FCM
- No. PSST-29204: HILTI Fixing System S-BT HL - Assembly Drawing - 5651472/03/691754
- No. PSST-29205: HILTI Fixing System Type S-BT HL - Threaded Stud S-BT-xF HL - 5651499/03/697424
- No. PSST-29206: HILTI Fixing System Type S-BT HL - Threaded Stud S-BT-xR HL - 5651457/05/697424
- No. PSST-29207: HILTI Fixing System S-BT HL - Washer - 5179764/00/603774
- No. PSST-29208: HILTI Fixing System S-BT HL - Nut A4 - 5249450/01/603918
- No. PSST-29209: HILTI Fixing System S-BT HL - Nut HDG - 5249460/01/603918
- No. PSST-29210: HILTI Fixing System S-BT HL - Tech. data sheet - Threaded studs for electrical connections (HC) - Rev. 12/2022
- No. PSST-29325: HILTI Fixing System S-BT HL - Evaluation Report on Fatigue Classification, Fire Resistance and Water-tightness - 516000423 XSE-01-23
- No. PSST-20309: Application fields in shipbuilding

2. Declarations and Test Reports (RINA Filing No.)

- No. PSST-29211: HILTI Fixing System S-BT HL - Stuttgart University Evaluation Report - 2022-55X
- No. PSST-29212: HILTI Fixing System S-BT HL - ETA Test Report Tension, Shear and Bending - 084/22
- No. PSST-29213: HILTI Fixing System S-BT HL - Test report EMPA Constant Amplitude Fatigue Tests - 5214029374/e
- No. PSST-29214: HILTI Fixing System S-BT HL - Test Report DEHN Short-time current - 2276_FRM
- No. PSST-29215: HILTI Fixing System S-BT HL - European Technical Assessment (ETA) - ETA 23/0001
- No. PSST-29216: HILTI Fixing System S-BT HL - SQS ISO 9001:2015 and 14001:2015 Certificate - H12455
- No. PSST-20310 : Hilti Declaration on use in shipbuilding - Hilti S-BT 17_01_2018
- No. PSST-20311 : Hilti Declaration annotations by Shipyard - LR PRJ11074092
- No. PSST-20312 : Test Report FTP Code No.1 - 2016614_en
- No. PSST-20313 : Test Report FTP Code No.2 (Water-tightness) - 20161614-01_en
- No. PSST-20314 : Test Report FTP Code No.3 - 20170384_en
- No. PSST-20315 : Test Report Corrosion - UB_903 0160 000/Bf
- No. PSST-20316 : Test Report Galvan. Corrosion - TM_414-14_2
- No. PSST-20317: Test Report Fatigue Loading - 5214011585/e
- No. PSST-20318: Test Report Fatigue Loading - 5214014601/e
- No. PSST-20319: Test Report Fatigue Loading - 5214013022/e
- No. PSST-20321: Test Report Fatigue loading - 2017-38X

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Fields of Application and Acceptance Conditions

1)
Locations and conditions for use in shipbuilding as per following table:

Aluminum base materials			
Threaded Stud	**Base material characteristics**	**Thickness (t_{II}) mm**	**Recommended loads** [1]
S-BT-MR HL / S-BT-GR HL Stainless Steel	Aluminum Rm ≥ 270 N/mm²	$t_{II} \geq 5$	o Tension: 2.1 kN o Shear: 3.0 kN o Moment: 11.1 Nm
Steel base materials			
Threaded Stud	**Base material characteristics**	**Thickness (t_{II}) mm**	**Recommended loads** [1]
S-BT-MR HL / S-BT-GR HL Stainless Steel	≥ S235 ≥ A36	$t_{II} \geq 5$	o Tension [2]: 3.6 kN / 4.3 kN o Shear: 4.1 kN o Moment: 11.1 Nm
	≥ S235 ≥ A36	$3 \leq t_{II} < 5$	o Tension [2]: 2.3 kN / 2.8 kN o Shear: 4.0 kN o Moment: 11.1 Nm
S-BT-MF HL / S-BT-GF HL Duplex-coated Carbon Steel	≥ S235 ≥ A36	$t_{II} \geq 5$	o Tension [2]: 4.0 kN / 4.8 kN o Shear: 2.8 kN o Moment: 6.7 Nm
	≥ S235 ≥ A36	$3 \leq t_{II} < 5$	o Tension [2]: 2.3 kN / 2.8 kN o Shear: 2.8 kN o Moment: 6.7 Nm
S-BT-MF MT M10/15 AN 6 HL S-BT-MF MT W10/15 AN 6 HL Duplex-coated Carbon Steel	≥ S235 ≥ A36	$t_{II} \geq 5$	o Tension [2]: 4.0 kN / 4.8 kN o Shear: 4.0 kN o Moment: 6.7 Nm
	≥ S235 ≥ A36	$3 \leq t_{II} < 5$	o Tension [2]: 2.3 kN / 2.8 kN o Shear: 4.0 kN o Moment: 6.7 Nm

Conditions:
a. Minimum edge distance: 6 mm, spacing ≥ 18 mm
b. Redundancy (multiple fastening) to be provided

[1] **Design Resistance:** as per indications given in Hilti Product data sheet S-BT HL screw-in Stainless and Carbon Steel threaded stud

[2] **Tension resistance values:** steel strength class S235 and ≥ S355, separated by "/"

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Steel fire resisting A0 to A60 Class boundaries			
Material characteristics	**Thickness (t_{II}) mm**	**Drill hole type**	**Recommended loads** [(1)]
Ultimate tensile strength **Rm** 360 ≤ **Rm** ≤ 630 MPa	$t_{II} \geq 6$	Pilot (no drill trhough)	o Tension R60: 0.50 kN o Shear R60: 0.50 kN
	$5 \leq t_{II} < 6$	Drill through	
	$3 \leq t_{II} < 5$	Drill through	o Tension R60: 0.25 kN o Shear R60: 0.25 kN
Conditions: a. Minimum edge distance: 6 mm, spacing ≥ 18 mm b. Redundancy (multiple fastening) to be provided and studs installed on the unexposed face of the bulkhead c. Insulation turn-up typical for 450 mm and over standard brackets to be applied			

Watertight boundaries and Tanks			
Material characteristics	**Thickness (t_{II}) mm**	**Drill hole type**	**Recommended loads** [(1)]
Standard for tanks	$t_{II} \geq 6$	Pilot (no drill trhough)	---
Conditions: a. On curved surfaces: minimum outer diameter ≥ 150 mm b. Maximum pressure in tanks: 3.0 bar			

Structural members requiring Fatigue design		
Material characteristics	**Thickness (t_{II}) mm**	**Design S-N Cirve and Fatigue Class (EN 1993-1-9)**
Ultimate tensile strength **Rm** 360 ≤ **Rm** < 630 MPa	$t_{II} \geq 3$	Category 100 m = 5
Note: A detailed verification of the fatigue stress is considered not necessary in case of: a. Decks “Micro Openings”: circular openings with D ≤ 250 [mm] (e.g. scuppers, small pipes, etc.) b. Transversal bulkheads “Micro Openings”: inside and outside the Construction Monitoring Area: circular openings D < 250 [mm] may be accepted if isolated (and plasma cut or equivalent when in Construction Monitoring Area only). c. Longitudinal bulkheads “Micro Openings”: inside and outside the Construction Monitoring Area: circular openings D < 250 [mm] may be accepted if isolated (and plasma cut or equivalent). [(1)] **Design Resistance:** as per indications given in Hilti Product data sheet S-BT HL screw-in Stainless and Carbon Steel threaded stud		

2)
For all installation cases the S-BT HL studs must not be positioned in the thickness change areas (e.g. reinforcements in the corners of the holes) or positioned so as to pierce the welding seam.

3)
Adequate corrosion resistance of both the base and fastened materials are to be checked by the installation user for their suitability to the environment in which they are provided.

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4)
Hilti S-BT HL screw-in threaded studs, are approved in shipbuilding for fastening of:

- electrical Systems: fastening of brackets and supports for cables (e.g. cables, cable trays, ladders and baskets, etc.) and fastening of electrical equipment (electrical and junction boxes, lamps, switches, CCTV cameras, telephones, instrumentation, etc.);
- piping Systems: fastening of brackets and support for piping and accessories (drains, scuppers, etc.);
- HVAC Systems: fastening of brackets and support for heating, ventilation and air conditioning systems and relevant accessories (e.g. internal and external grilles, etc.);
- safety and Ship's Equipment: supports and brackets for safety and ship equipment (e.g. portable fire-extinguishers, hydrants, fire boxes, low-location lighting supports and frames, manholes, handrails, etc.) and furniture (e.g. tables, seats, etc.);
- gratings, bulkhead structures, balcony separation panels, C class bulkheads;
- grounding and bonding equipment.

Remarks

The validity of this Certificate refers to the design, rating, and installations parameters of the equipment specimens tested as per Reference Documents section. The manufacturer shall notify RINA of any modification or changes to the equipment in order to request for a valid certificate.

All drawings, test reports and other documents, approved and filed for infromation, mentioned in the approval letters no.:

- PSST/2018/00448/PBR, dated September 4, 2018,
- CSST/2021/00205/PBR, dated June 22, 2021, and
- PSST/2023/128/PBR, dated March 23, 2023

are to be cosnidered part of the present Type Approval Certificate.

On board of RINA Classified ships, the location, system and conditions are to be verified for their compliance with the present Certificate to the satisfaction of the attending surveyor in charge.

Genoa March 31, 2023

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