



NEW GENERATION X-BT DATA SHEET

Stainless steel threaded stud

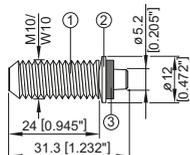


X-BT New Generation stainless steel threaded stud

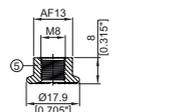
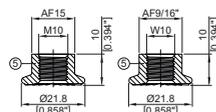
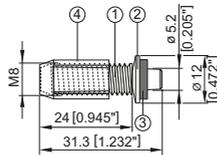
Product data

Dimensions

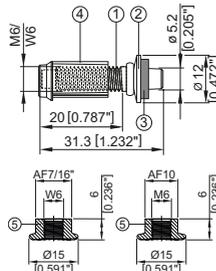
X-BT-MR M10/15 SN 8
X-BT-MR W10/15 SN 8



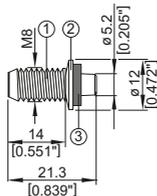
X-BT-MR M8/14 SN 8



X-BT-MR M6/10 SN 8
X-BT-MR W6/10 SN 8



X-BT-GR M8/7 SN 8



Features and benefits

The X-BT system is an approved Fastening on Steel system for grating and multi-purpose fastening applications. Benefits include no-rework to backside of base material, not having application limits and capability to work in C5 corrosive environment. The new generation X-BT system has increased load performance compared with the previous X-BT.

General information

Material specifications

- ① Shank and thread: S31803 (1.4462) equivalent to A4 / AISI grade 316 material
- ② SN washer: S 31635 (X2CrNiMo 17-12-2, 1.4404)
- ③ Sealing washer: Elastomer, black, resistant to UV, salt water, water, ozone, oils, etc.
- ④ Guiding sleeve: Plastic
- ⑤ Flange nut: A4 / AISI grade 316 material
Designation according to Unified Numbering System (UNS)

Recommended fastening tools

BX 3-BT / BTG
DX 351-BT / BTG

See **X-BT fastener program** in the next pages and **Tools and equipment** chapter for more details.

Fasteners approvals

ABS: 18-HS1755518, DNV-GL TAS00001SV, BV 54554, LR 19/0003, ICC-ES ESR-2347 (USA)

Applications

Examples

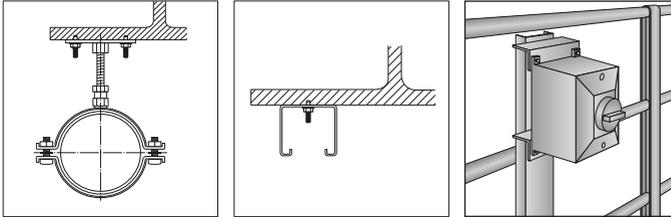
Threaded stud applications especially for:

- High strength steel
- Coated steel structures
- Through penetration of base steel is not allowed

* Grating with X-BT-GR and X-FCM-R (HL)

* Load data, application requirements, corrosion information, fastener selection, system recommendation, material specification and coating refer to section X-FCM-R, X-FCM-R HL or X-FCS-R Grating Fastening System in the Direct Fastening Technology Manual

Multi purpose fastening with X-BT-MR



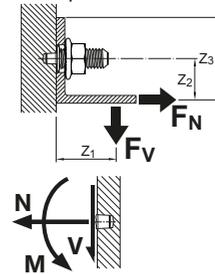
Junction box, etc.

Performance data – Construction steel

Recommended loads – steel base material

Steel grade: Europe, USA	S235, S275 A36	S355 to S960 ≥ Grade 50
Tension, N_{rec} [kN/lb]	3.6 / 810	4.6 / 1030
Shear –		
form lock V_{rec} [kN/lb]	4.3 / 970	5.3 / 1190
friction lock V_{rec} [kN/lb]	0.20 / 45	0.20 / 45
Moment, M_{rec} [Nm/lbft]	20.0 / 14.8	20.0 / 14.8
Torque, T_{rec} [Nm/lbft]	20.0 / 14.8	20.0 / 14.8

Example:



Conditions for recommended loads:

- Application of working load design concept (e.g. ASD)
- For unalloyed construction, off-shore and Shipbuilding steel: e.g. European grades S235, S275, S355 according to EN 10025-2, S355M, S420M, S460M according to EN 10025-4 or EN 10225, S690Q and S960Q according to EN10025-6, US steel grade A36 and Grade 50.
- Minimum base material thickness $t_{pl} = 8$ mm.
- Applicable for steel base materials up to a coating thickness of 500 μ m.
- Edge distance $c \geq 10$ mm [3/8"].
- In case of edge distance 6 mm $\leq c < 10$ mm, N_{rec} , V_{rec} and M_{rec} need to be reduced with the reduction factor $\alpha_c = 0.65$.
- For group fastenings with up to 4 fasteners per group and shear force introduction via the sealing washer, the resistance of all fasteners can be added up, provided the hole in the fastened material is equal or less than 14 mm (e.g. $V_{rec,group} = 17.2$ kN for a group with 4 fasteners fixed to S235 base material). For more details see "New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification".
- Redundancy (multiple fastening) must be provided.

Remarks:

- The recommended loads in the table refer to the resistance of the single fastener and need to be determined by static analysis from the loads F_N and F_V acting on the fastened part. Typical example is the need of consideration of prying forces, see example.
- Moments acting on the shank only need to be considered in case of a gap between the base and the fastened material.
- Global factor of safety for tension and shear load = 2.8 related to the characteristic resistance N_{Rk} and V_{Rk}
- Global factor of safety for bending moment = 1.75 related to the characteristic bending moment $M_{R,k}$ of the shank.
- Effects of base metal vibration and stresses are considered.
- For difference of form and friction lock for shear resistance, refer to explanations at the end of this data sheet.

Characteristic resistance – steel base material

Steel grade: Europe, USA	S235, S275, A36	S355 to S960, ≥ Grade 50
Tension N_{RRk} [kN/lb]	10.0 / 2240	13.0 / 2920
Shear –		
form lock V_{RRk} [kN/lb]	12.0 / 2700	15.0 / 3360
friction lock V_{RRk} [kN/lb]	0.56 / 125	0.55 / 125
Moment M_{RRk} [Nm/lbft]	35.0 / 25.5	35.0 / 25.5

Design resistance – steel base material

Steel grade: Europe, USA	S235, S275, A36	S355 to S960, ≥ Grade 50
Tension N_{Rd} [kN/lb]	5.0 / 1120	6.5 / 1460
Shear –		
form lock V_{Rd} [kN/lb]	6.0 / 1350	7.5 / 1680
friction lock V_{Rd} [kN/lb]	0.28 / 62	0.28 / 62
Moment M_{Rd} [Nm/lbft]	28.0 / 20.5	28.0 / 20.5

Performance data – Cast iron
Recommended loads – cast iron *

Tension, N_{rec} [kN/lb]	1.0 / 230
Shear –	
form lock V_{rec} [kN/lb]	1.5 / 340
friction lock V_{rec} [kN/lb]	0.20 / 45
Moment, M_{rec} [Nm/lbft]	16.0 / 11.5

Design resistance – cast iron *

Tension N_{Rd} [kN/lb]	1.6 / 360
Shear	
form lock V_{Rd} [kN/lb]	2.4 / 540
friction lock V_{Rd} [kN/lb]	0.28 / 62
Moment M_{Rd} [Nm/lbft]	26.0 / 19.0

***Requirements of spheroidal graphite cast iron base material**

Subject	Requirements
Cast iron	Spheroidal graphite cast iron according to EN 1563
Strength class	EN-GJS-400 to EN-GJS-600 according to EN 1563
Chemical analysis and amount of carbon	3.3 – 4.0 mass percentage
Microstructure	Form IV to VI (spherical) according to EN ISO 945-1:2010 Minimum size 7 according to Figure 4 of EN ISO 945-1:2010
Material thickness	t _{II} ≥ 20 mm

Recommended interaction formula for combined loading - steel and cast iron base material

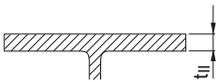
Load combination	Interaction provision
V-N (shear and tension)	$\frac{V_{Sd}}{V_{Rd}} + \frac{N_{Sd}}{N_{Rd}} \leq 1.2$ with $\frac{V_{Sd}}{V_{Rd}} \leq 1.0$ and $\frac{N_{Sd}}{N_{Rd}} \leq 1.0$
V-M (shear and bending)	$\frac{V_{Sd}}{V_{Rd}} + \frac{M_{Sd}}{M_{Rd}} \leq 1.2$ with $\frac{V_{Sd}}{V_{Rd}} \leq 1.0$ and $\frac{M_{Sd}}{M_{Rd}} \leq 1.0$
N-M (tension and bending)	$\frac{N_{Sd}}{N_{Rd}} + \frac{M_{Sd}}{M_{Rd}} \leq 1.0$
V-N-M (shear, tension and bending)	$\frac{V_{Sd}}{V_{Rd}} + \frac{N_{Sd}}{N_{Rd}} + \frac{M_{Sd}}{M_{Rd}} \leq 1.0$

Cyclic loading:

- Anchorage of X-BT threaded stud in steel base material is not affected by cyclic loading.
- Fatigue strength is governed by fracture of the shank. For more details see "New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification".

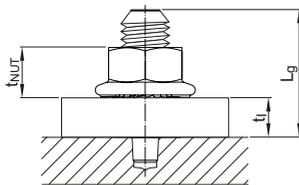
Application requirements

Application limit and thickness of base material



$t_{II} \geq 8 \text{ mm [5/16"]} \rightarrow$ No through-penetration.
No limits with regard to steel strength.

Thickness of fastened material



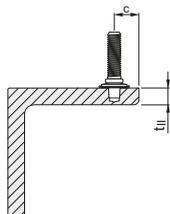
X-BT-GR M8:	$2.0 \leq t \leq 7.0 \text{ mm}$
X-BT-MR M10/W10:	$2.0 \leq t \leq 15.0 \text{ mm}$
X-BT-MR M8:	$2.0 \leq t \leq 14.0 \text{ mm}$
X-BT-MR M6/W6:	$2.0 \leq t \leq 10.0 \text{ mm}^*$

* if base material sits on the collar of the stud $t_{i,min} = 1.0 \text{ mm}$

Spacing and edge distances

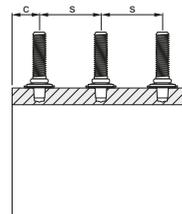
Edge distance:

- $c \geq 10 \text{ mm}$ (load reduction factor $\alpha_c = 1.00$)
- $6 \text{ mm} \leq c < 10 \text{ mm}$ (load reduction factor $\alpha_c = 0.65$)



Spacing:

- $s \geq 15 \text{ mm}$



Corrosion information

The corrosion resistance of S31803 (1.4462) stainless steel material is equivalent to AISI 316 (A4) steel grade. For detailed information see “New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification”.

Fastener selection and system recommendation
Fastener program

Designation	Item no.	Tool Designation
X-BT-GR M8/7 SN 8	2194344	BX 3-BTG, DX 351-BTG
X-BT-MR M6/10 SN 8	2252199	BX 3-BT, DX 351-BT
X-BT-MR M6/14 SN8	2194337	DX 351-BT
X-BT-MR W6/10 SN 8	2252470	BX 3-BT, DX 351-BT
X-BT-MR W6/14 SN 8	2194338	DX 351-BT
X-BT-MR M8/14 SN 8	2194339	BX 3-BT, DX 351-BT
X-BT-MR M10/15 SN 8	2194340	BX 3-BT, DX 351-BT
X-BT-MR W10/15 SN 8	2194341	BX 3-BT, DX 351-BT

Cartridge selection and tool energy setting

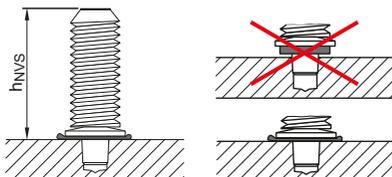
DX 351-BTG, DX 351-BT: 6.8/11 M high precision brown cartridge

Battery selection and fastener guide adjustment

BX 3-BT, BX 3-BTG: 22 V cordless tool battery platform

Battery recommendation: B 22/2.6, also allowed B 22/3.0, B 22/4.0, B 22/5.2

The recommended fastener guide position is “1” (if required, adjust the fastener guide position based on job site tests and IFU).

Fastening quality assurance
Fastening inspection

X-BT-GR M8

$h_{NVS} = 15.7-16.8 \text{ mm}$

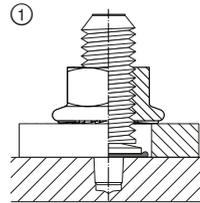
X-BT-MR M6/W6/M8/M10/W10

$h_{NVS} = 25.7-26.8 \text{ mm}$

Installation
X-BT-MR M8

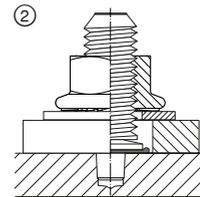
Fastened material:

- Hole diameter: 13 to 14 mm: Use of supplied flange nut ①
- Hole diameter: beyond 14 to 18 mm: Use of supplied flange nut with supplement washer (maximum thickness of fixed component to be reduced with thickness of washer) ②


X-BT-MR M10/W10

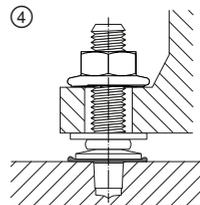
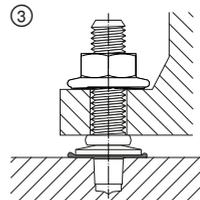
Fastened material:

- Hole diameter: 13 to 18 mm: Use of supplied flange nut ①
- Hole diameter: beyond 18 to 22 mm: Use of supplied flange nut with supplement washer (maximum thickness of fixed component to be reduced with thickness of washer) ②


X-BT-MR M6/W6

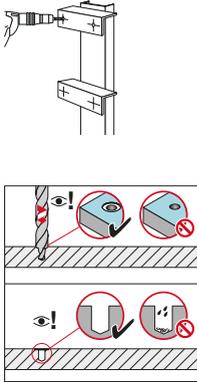
Fastened material:

- Hole diameter: 6.5 – 6.7: Fastener sits on collar of stud, use of supplied flange nut ③
- Hole diameter: 6.7 to 11 mm: Use of supplied flange nut with supplement washer sitting on collar ④
- Hole diameter: > 12 mm, fixed part sits on base material, use of flange nut with supplemental washer to cover hole clearance (maximum thickness of fixed component to be reduced with thickness of washer) ②


Remarks on group fastenings

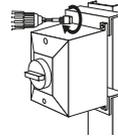
For group fastenings with up to 4 fasteners per group and shear force introduction via the sealing washer, the resistance of all fasteners can be added up, provided the hole in the fastened material is equal or less than 14 mm. For detailed information see “New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification”.

Pre-drill with **TX-BT 4.7/7** step shank drill bit

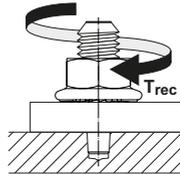


Pre-drill until shoulder grinds a shiny ring.
The drill hole and the area around drilled hole must be clean and free from liquids and debris.

Tighten using a screwdriver with torque clutch



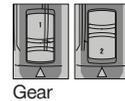
Tightening torque:
T_{rec} ≤ 20 Nm (14.8 ft-lb)!



Hilti Torque tool X-BT 1/4"
– 20 Nm / 14.8 ft-lb
2212510



X-BT 1/4" 20 Nm / 14.8 lb-ft



Gear



Clutch

Hilti cordless screwdriver setting recommendations

Hilti cordless screwdriver	X-BT-MR M6/W6		X-BT-MR M8		X-BT-MR M10/W10	
	Gear	Clutch	Gear	Clutch	Gear	Clutch
SF 14-A	3	15	3	12	3	13
SF 10W-A22	4	15	4	8	4	11
SF 8M-A22	4	15	4	12	4	11
SFC 14-A	2	15	2	13	2	11
SFC 22-A	2	15	2	14	2	11
SF 6-A22	-	-	1	1	1	1

These are abbreviated instructions which may vary by application.
ALWAYS review/follow the instructions accompanying the product.

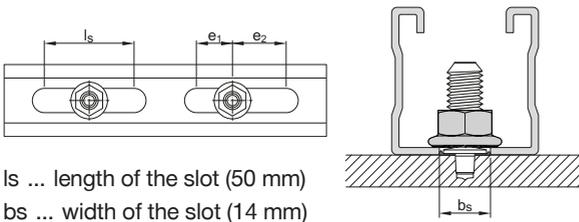
Form and friction lock for shear connection
Shear load transfer via friction lock is relevant if non-slip connections are required in the service state:

- Fixing the position of channel sections with slotted holes and forces in direction of the slots
- Connections with hole clearance beyond 14 mm

Slotted holes or bigger hole clearance allow easier assembly and geometric adjustment of the fixed component. Consequently form lock mechanism by means of direct contact of the fixed component with the washer of the X-BT-MR cannot be easily ensured with little slip in those cases. The New Generation X-BT-MR fasteners allow the use higher torque of 20 Nm resulting in a friction shear connection capacity. That friction lock can be utilized to fix the position of the attached component as well as for shear load transfer if the demand is comparably small. In case of high shear demand, the form lock mechanism has to be activated and can further be optimized for group fastenings (for more details on group fastenings relying on form lock, see „New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification“)

Examples of friction lock:

- MQ-41 channel with X-BT-MR M10/15 SN 8 and varying distances e_1 and e_2



l_s ... length of the slot (50 mm)
 b_s ... width of the slot (14 mm)

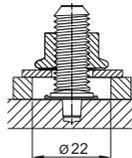
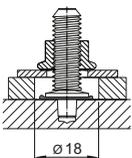
- X-BT-MR connections with maximum hole diameter in fixed material

X-BT-MR M8/14 SN 8,

max. hole diameter = 18 mm

X-BT-MR M10/15 SN 8,

max. hole diameter = 22 mm


Conditions and remarks:

- The use of friction lock connection forces requires the application of an installation torque $T = 20$ Nm.
- Friction lock not suitable in case of base material vibrations.
- The friction lock values are suitable to fix the position of components and in case of lower shear load demand. Full shear load capacity are developed by means of form lock via contact of the fixed component with the sealing washer of the X-BT-MR.