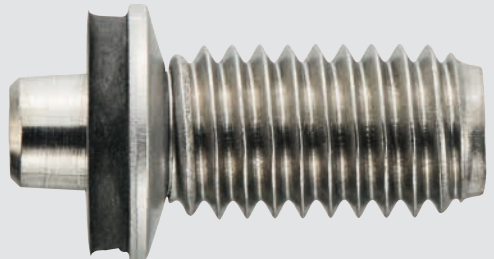




# NEW GENERATION X-BT DATA SHEET

**Stainless steel threaded stud**

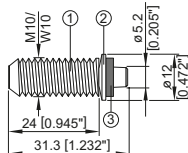


# X-BT New Generation stainless steel threaded stud

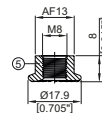
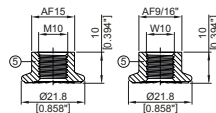
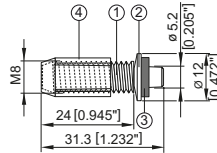
## Product data

### Dimensions

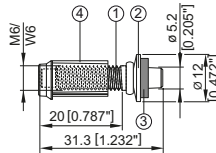
X-BT-MR M10/15 SN 8  
X-BT-MR W10/15 SN 8



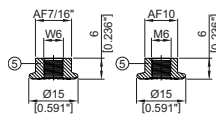
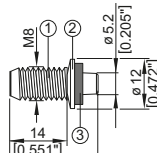
X-BT-MR M8/14 SN 8



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.

### 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

- For more details, please refer to **X-BT-GR/-MR fastener program** and to the chapter **Accessories and consumables compatibility** in the Direct Fastening Technology Manual (DFTM).

### Approvals and certificates

ETA-20/1042, ABS 18-HS1755518, DNV-GL TAS00001SV, BV 54554, LR 19/0003, ICC-ES ESR-2347 (USA)

- Not all information presented in this product data sheet might be subject to approval/certificate content. Please refer to approval/certificate for further information.

## Applications

### Examples

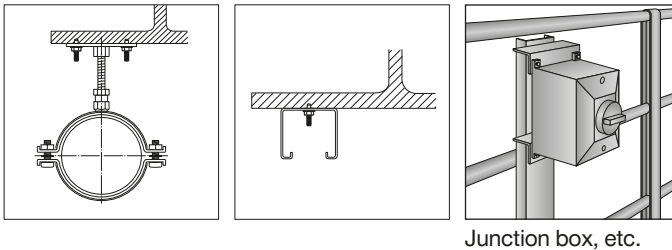
Threaded stud applications especially for:

- 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



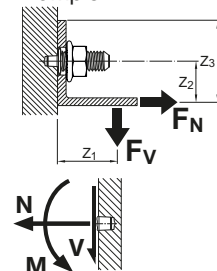
Junction box, etc.

## 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  $t_{II} = 8$  mm.
- Applicable for steel base materials up to a coating thickness of 500  $\mu\text{m}$ .
- Edge distance  $c \geq 10$  mm [ $3/8$ "].
- In case of edge distance  $6 \text{ mm} \leq c < 10$  mm,  $N_{\text{rec}}$ ,  $V_{\text{rec}}$  and  $M_{\text{rec}}$  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.  $V_{\text{rec,group}} = 17.2$  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 $N_{Rk}$ [kN/lb]	10.0 / 2240	13.0 / 2920
Shear –		
form lock $V_{Rk}$ [kN/lb]	12.0 / 2700	15.0 / 3360
friction lock $V_{Rk}$ [kN/lb]	0.56 / 125	0.55 / 125
Moment $M_{Rk}$ [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**

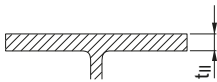
Subject	Requirements
Cast iron	Spheroidal graphite cast iron according to EN 1563
Strength class	EN-GJS-400 to EN-GJS-600 according to EN 1563
Chemical analysis and amount of carbon	3.3 – 4.0 mass percentage
Microstructure	Form IV to VI (spherical) according to EN ISO 945-1:2010 Minimum size 7 according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

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

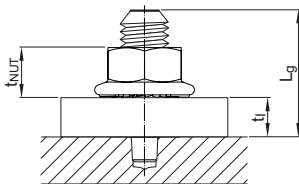
Load combination	Interaction provision
V-N (shear and tension)	$\frac{V_{Sd}}{V_{Rd}} + \frac{N_{Sd}}{N_{Rd}} \leq 1.2$ with $\frac{V_{Sd}}{V_{Rd}} \leq 1.0$ and $\frac{N_{Sd}}{N_{Rd}} \leq 1.0$
V-M (shear and bending)	$\frac{V_{Sd}}{V_{Rd}} + \frac{M_{Sd}}{M_{Rd}} \leq 1.2$ with $\frac{V_{Sd}}{V_{Rd}}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


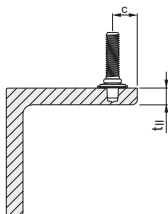
X-BT-GR M8:	$2.0 \leq t_{II} \leq 7.0 \text{ mm}$
X-BT-MR M10/W10:	$2.0 \leq t_{II} \leq 15.0 \text{ mm}$
X-BT-MR M8:	$2.0 \leq t_{II} \leq 14.0 \text{ mm}$
X-BT-MR M6/W6:	$2.0 \leq t_{II} \leq 10.0 \text{ mm}^*$

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

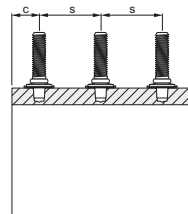
**Spacing and edge distances**
**Edge distance:**

$c \geq 10 \text{ mm}$  (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 program 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

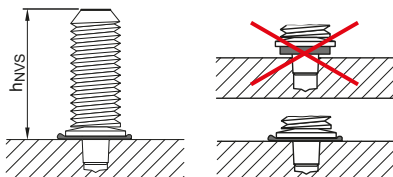
BX 3-BT, BX 3-BTG: 22 V cordless tool battery platform

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).

### Quality assurance

#### Fastening inspection



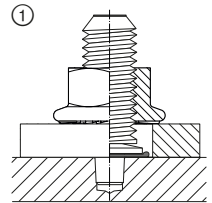
X-BT-GR M8  
 $h_{NVS} = 15.7\text{--}16.8\text{ mm}$

X-BT-MR M6/W6/M8/M10/W10  
 $h_{NVS} = 25.7\text{--}26.8\text{ mm}$

**Installation recommendation**
X-BT-MR M8

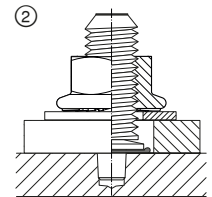
Fastened material:

- 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

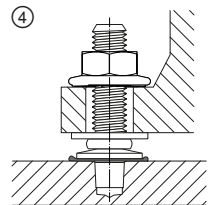
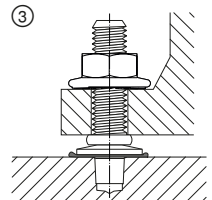
Fastened material:

- 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:

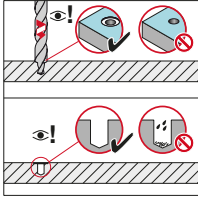
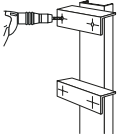
- Hole diameter: 6.5 – 6.7: Fastener sits on collar of stud, use of supplied flange nut ③
- Hole diameter: 6.7 to 11 mm: Use of supplied flange nut with supplement washer sitting on collar ④
- Hole diameter: > 12 mm, fixed part sits on base material, use of flange nut with supplemental washer to cover 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



- 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.

These are abbreviated instructions which may vary by application.

**ALWAYS** review/follow the instructions accompanying the product.

**Tightening torque**

	Fastener: X-BT-GR, X-BT-MR
Element: nut	20 Nm

**Tightening tool recommendation for tightening with cordless screwdriver**

Cordless screwdriver	Clutch type (stop detection)	Gear	Clutch
SF 6-A22	ESC (HJ)	1	5
SF 6H-A22	ESC (HJ)	1	5
SF 10W-A22	TRC	4	11
SF 8M-A22	TRC	4	11
SFC 14-A	TRC	2	11
SFC 22-A	TRC	2	11



• Tool power level adjustment:

Gear:



Clutch:



- The setting of the torque via the Hilti screwdriver with torque release coupling (TRC) can change as the clutch wears over time. The specified torque setting is only a rough guide value and applies to a new Hilti screwdriver. To ensure recommended torque is applied, Hilti recommends the use of a calibrated torque wrench or the Hilti torque tool.
- The specified torque setting for the Hilti screw drivers with electronic slip clutch (ESC) is only a rough guide value as the ESC has 2 stop detections; Soft Joint (SJ) detection and Hard Joint (HJ) detection. The hard joint detection is activated due to drop in speed (fast stop) and can lead to a torque spike. The installation torque may vary depending on the user and the application. To ensure recommended torque is applied, Hilti recommends the use of a calibrated torque wrench or the Hilti torque tool.

**Tightening tool recommendation for tightening with Hilti torque tool**

Hilti torque tool

Torque tool X-BT 1/4" – 20 Nm

## Form and friction lock for shear connection

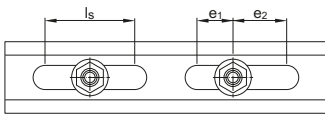
Shear load transfer via friction lock is relevant if non-slip connections are required in the service state

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

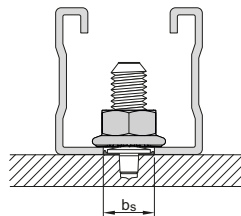
Slotted holes or bigger hole clearance allow easier assembly and geometric adjustment of the fixed component. Consequently form lock mechanism by means of direct contact of the fixed component with the washer of the X-BT-MR cannot be easily ensured with little slip in those cases. The New Generation 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  $e_2$

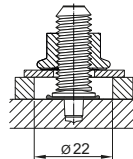
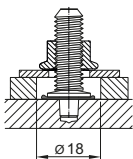


ls ... length of the slot (50 mm)  
bs ... width of the slot (14 mm)



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

X-BT-MR M8/14 SN 8, max. hole  $\varnothing = 18$  mm      X-BT-MR M10/15 SN 8, max. hole  $\varnothing = 22$  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.