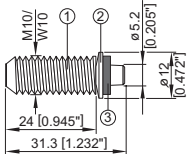


# New Generation X-BT stainless steel threaded studs

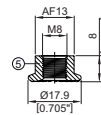
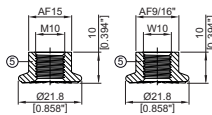
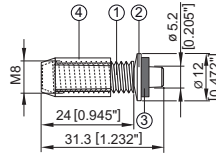
## Product data

### Dimensions

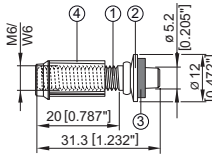
X-BT-MR M10/15 SN 8  
X-BT-MR W10/15 SN 8



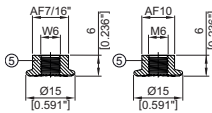
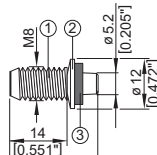
X-BT-MR M8/14 SN 8



X-BT-MR M6/14 SN 8  
X-BT-MR W6/14 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: S31803 (1.4462) equivalent to A4 / AISI grade 316 material
  - ② SN washers: S 31635 (X2CrNiMo 17-12-2, 1.4404)
  - ③ Sealing washers: Elastomer, black, resistant to UV, salt water, water, ozone, oils, etc.
  - ④ Guiding sleeve: Plastic
  - ⑤ Flange nuts: A4 / AISI grade 316 material
- Designation according to Unified Numbering System (UNS)

#### Recommended fastening tools

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-PDA, BV: 54054/A0 BV, ICC-ES ESR-2347 (USA)

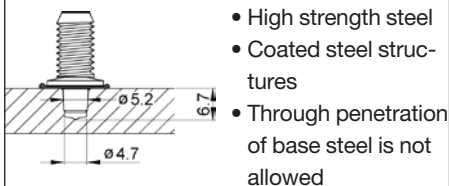
LR, DNV-GL and UL pending



## Applications

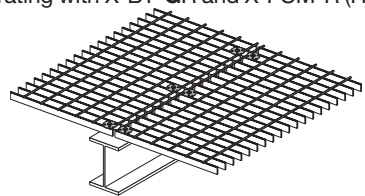
### Examples

Threaded stud applications especially for:



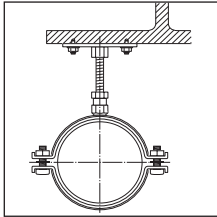
- High strength steel
- Coated steel structures
- Through penetration of base steel is not allowed

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

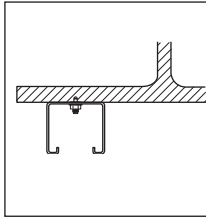


\* Load data, application requirements, corrosion information, fastener selection, system recommendation, material specification and coating refer to section X-FCM-R, X-FCM-R HL or X-FCS-R Grating Fastening System in the Direct Fastening Technology Manual

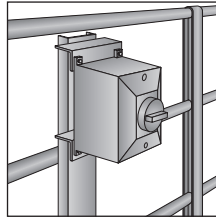
Multi purpose fastening with X-BT-MR



Base plates for pipe rings



Installation rails



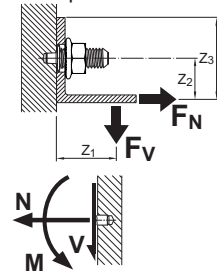
Junction box, etc.

## 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, $V_{rec}$ [kN/lb]	4.3 / 970	5.3 / 1190
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  $t_{ij} = 8$  mm.
- Applicable for steel base materials up to a coating thickness of 500  $\mu$ 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  $M_{Rk}$  of the shank.
- Effects of base metal vibration and stresses are considered.

**Characteristic resistance – steel base material**

Steel grade: Europe, USA	S235, S275, A36	S355 to S960, ≥ Grade 50
Tension <b>N<sub>Rk</sub></b> [kN/lb]	10.0 / 2240	13.0 / 2920
Shear <b>V<sub>Rk</sub></b> [kN/lb]	12.0 / 2700	15.0 / 3360
Moment <b>M<sub>Rk</sub></b> [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 <b>N<sub>Rd</sub></b> [kN/lb]	5.0 / 1120	6.5 / 1460
Shear <b>V<sub>Rd</sub></b> [kN/lb]	6.0 / 1350	7.5 / 1680
Moment <b>M<sub>Rd</sub></b> [Nm/lbft]	28.0 / 20.5	28.0 / 20.5

**Performance data – Cast iron**
**Recommended loads – cast iron \***

Tension, <b>N<sub>rec</sub></b> [kN/lb]	1.0 / 230
Shear, <b>V<sub>rec</sub></b> [kN/lb]	1.5 / 340
Moment, <b>M<sub>rec</sub></b> [Nm/lbft]	16.0 / 11.5

**Design resistance – cast iron \***

Tension <b>N<sub>Rd</sub></b> [kN/lb]	1.6 / 360
Shear <b>V<sub>Rd</sub></b> [kN/lb]	2.4 / 540
Moment <b>M<sub>Rd</sub></b> [Nm/lbft]	26.0 / 19.0

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

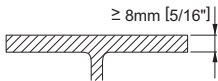
Subject	Requirements
Cast iron	Spheroidal graphite cast iron according to EN 1563
Strength class	EN-GJS-400 to EN-GJS-600 according to EN 1563
Chemical analysis and amount of carbon	3.3 – 4.0 mass percentage
Microstructure	Form IV to VI (spherical) according to EN ISO 945-1:2010 Minimum size 7 according 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**

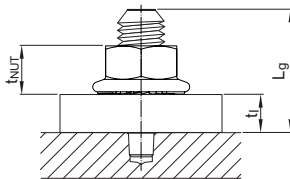
Load combination	Interaction provision
<b>V-N</b> (shear and tension)	$\frac{V_{Sd}}{V_{Rd}} + \frac{N_{Sd}}{N_{Rd}} \leq 1.2$ with $\frac{V_{Sd}}{V_{Rd}} \leq 1.0$ and $\frac{N_{Sd}}{N_{Rd}} \leq 1.0$
<b>V-M</b> (shear and bending)	$\frac{V_{Sd}}{V_{Rd}} + \frac{M_{Sd}}{M_{Rd}} \leq 1.2$ with $\frac{V_{Sd}}{V_{Rd}} \leq 1.0$ and $\frac{M_{Sd}}{M_{Rd}} \leq 1.0$
<b>N-M</b> (tension and bending)	$\frac{N_{Sd}}{N_{Rd}} + \frac{M_{Sd}}{M_{Rd}} \leq 1.0$
<b>V-N-M</b> (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:	$2.0 \leq t_1 \leq 7.0 \text{ mm}$
X-BT-MR M10/W10:	$2.0 \leq t_1 \leq 15.0 \text{ mm}$
X-BT-MR M8:	$2.0 \leq t_1 \leq 14.0 \text{ mm}$
X-BT-MR M6/W6:	$2.0 \leq t_1 \leq 14.0 \text{ mm}^*$

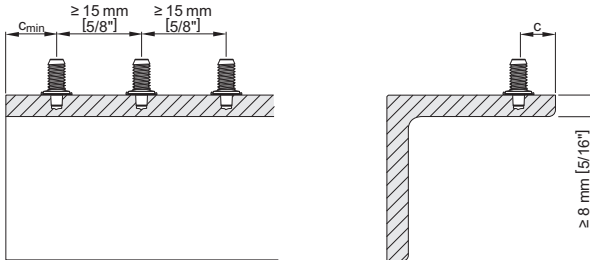
\* if base base material sits on the collar of the stud  $t_{1,\text{min}} = 1.0 \text{ mm}$

### Spacing and edge distances

Spacing:  $\geq 15$  mm

Edge distance:

$c_{\min} = 10$  mm for full tension, shear and moment performance  
 for  $6 \text{ mm} \leq c < 10 \text{ mm}$ , application of load reduction  
 factor  $\alpha_c = 0.65$ .



### 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

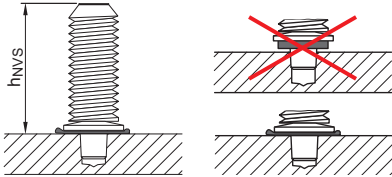
#### Fastener program

Designation	Item no.	Tool Designation
<b>X-BT-GR M8/7 SN 8</b>	<b>2194344</b>	DX 351-BTG
<b>X-BT-MR M6/14 SN 8</b>	<b>2194337</b>	DX 351-BT
<b>X-BT-MR W6/14 SN 8</b>	<b>2194338</b>	DX 351-BT
<b>X-BT-MR M8/14 SN 8</b>	<b>2194339</b>	DX 351-BT
<b>X-BT-MR M10/15 SN 8</b>	<b>2194340</b>	DX 351-BT
<b>X-BT-MR W10/15 SN 8</b>	<b>2194341</b>	DX 351-BT

### Cartridge selection and tool energy setting

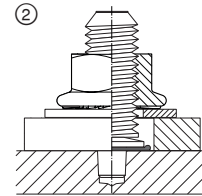
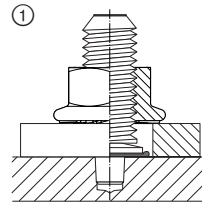
**DX 351-BTG, DX 351-BT: 6.8/11 M high precision brown cartridge**

The recommended tool energy setting = 1 (if required, increase of energy setting based on job site tests).

**Fastening 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**
**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**

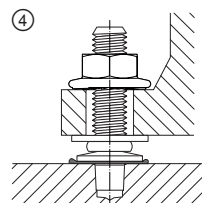
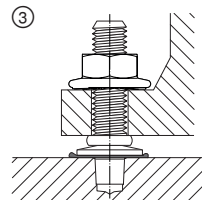
Fastened material:

- 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**

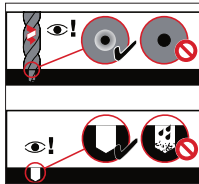
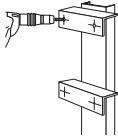
Fastened material:

- 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**

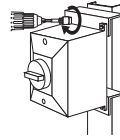
For group fastenings with up to 4 fasteners per group and shear force introduction via the sealing washer, the resistance of all fasteners can be added up, provided the hole in the fastened material is equal or less than 14 mm. For detailed information see “New Generation Hilti X-BT-GR, X-BT-MR and X-BT-ER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

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

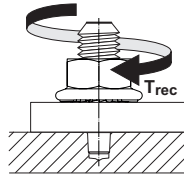


Pre-drill until shoulder grinds a shiny ring.  
The drill hole and the area around drilled hole must be clean and free from liquids and debris.

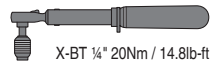
Tighten using a screwdriver with torque clutch



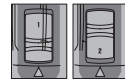
Tightening torque:  
 $T_{rec} \leq 20 \text{ Nm}$  (14.8 ft-lb)!



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



X-BT ¼" 20Nm / 14.8lb-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.

