X-FCM
DATA SHEET

Grating fastening system

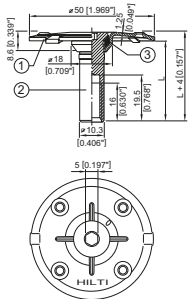
August 2018

X-FCM Grating fastening system

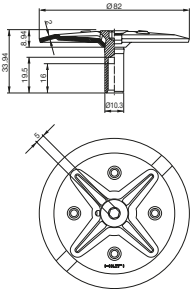
Product data

Dimensions

X-FCM



X-FCM-M_L



General information

Material specifications

See fastener selection for more details.

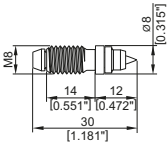
Recommended fastening tools

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

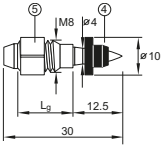
Approvals

DNV GL, BV: X-FCM-M, X-FCM-R
ABS, LR: all types
No approvals for X-FCM-M_L

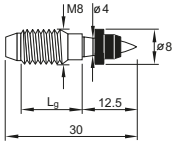
X-ST-GR M8/10 P8



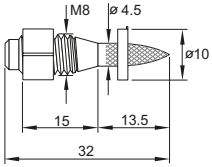
X-CRM8-15-12 FP10



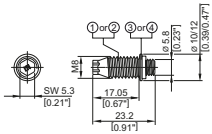
X-CRM8-15-12 P8



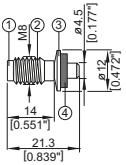
X-EM8H-15-12 FP10



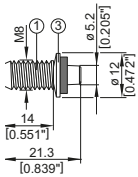
S-BT-GF M8/7 AN 6
S-BT-GR M8/7 SN 6
S-BT-GR M8/7 SN 6 AL



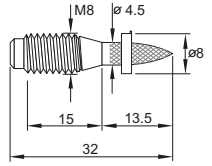
X-BT M8-15-6 SN12-R



X-BT-GR M8/7 SN8

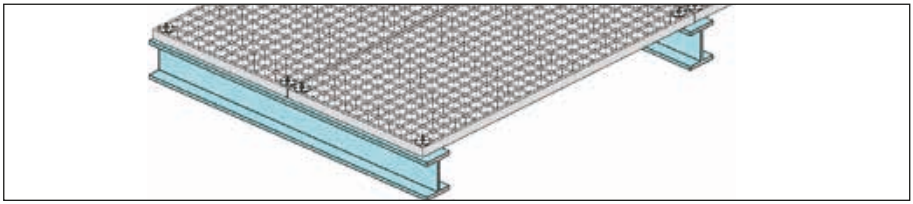


X-EM8H-15-12 P8



Applications

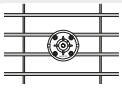
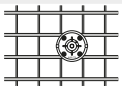
Example

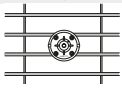
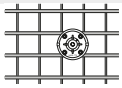


Grating (steel and fibreglass reinforced)

Load data

Recommended tensile loads N_{rec} [kN]

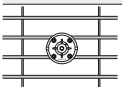
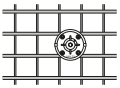
Grating opening type	Rectangular		Square	
				
	Bar spacing [mm]		Bar spacing [mm]	
	18	30	18	30
X-FCM	0.8[2)]	0.8[2)]	2.4[1)3)]	0.8[2)]
X-FCM-M	0.8[2)]	0.8[2)]	1.8[1)3)]	0.8[2)]
X-FCM-R	1.4[2)3)]	1.0[2)]	1.8[1)3)]	1.0[2)]

Grating opening type	Rectangular		Square	
				
	Bar spacing [mm]		Bar spacing [mm]	
	30	57	30	60
X-FCM-M_L	0.8[2)]	0.8[2)]	1.8[1)3)]	0.8[2)]

1) Loading is limited by recommended load for threaded stud.
2) Loading is limited by elastic limit of the **X-FCM** disk. Exceeding recommended loads can result in plastic deformation of disk.
3) N_{rec} = 1.0 kN
   For S-BT-GR M8/7 SN 6 AL in aluminum base material.
   For S-BT-GR M8/7 SN 6 and S-BT-GF M8/7 AN 6 in steel base material 3 mm ≤ t_{II} < 5 mm (drill through hole)
   N_{rec} = 1.8 kN
   For S-BT-GR M8/7 SN 6 and S-BT-GF M8/7 AN 6 in steel base material t_{II} ≥ 5 mm.

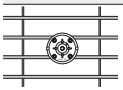
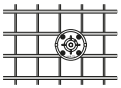
Notes:
X-FCM, X-FCM-M, X-FCM-R, X-FCM-M_L resist shear by friction and are not suitable for explicit shear load designs, e.g. diaphragms. Depending on surface characteristics, shear loads of up to about 0.3 kN will not result in permanent deformation. Therefore small unexpected shear loads can generally be accommodated without damage.

Characteristic tensile loads N_{Rk}:

Type	Grating – bar spacing	**X-FCM-R** with **X-BT (X-BT-GR M8/7 SN 6 for t_{II} ≥ 6 mm)** S235 / A36 steel	S355 / Grade 50 steel	**X-CRM / X-ST-GR**
	Rectangle 18 mm	4.2 kN / 945 lb*	4.2 kN / 945 lb*	4.2 kN / 945 lb*
	Rectangle 30 mm	3.0 kN / 675 lb*	3.0 kN / 675 lb*	3.0 kN / 675 lb*
	Square 18 mm	5.4 kN / 1215 lb	6.9 kN / 1550 lb	5.4 kN / 1215 lb
	Square 30 mm	3.0 kN / 675 lb*	3.0 kN / 675 lb*	3.0 kN / 675 lb*

* Loading is limited by elastic limit of the **X-FCM-R** disc.

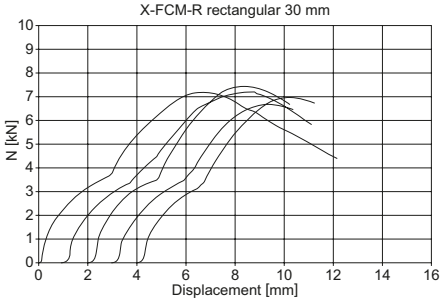
Characteristic tensile loads N_{Rk}:

Type	Grating – bar spacing	**X-FCM-R** with **S-BT-GR M8/7 SN 6,** pilot hole, $t_{II} \geq 6$ mm S235 / A36 steel	S355 / Grade 50 steel	Aluminum $R_m \geq 270$ N/mm²
	Rectangle 18 mm	4.2 kN / 945 lb*	4.2 kN / 945 lb*	3.0 kN / 675 lb
	Rectangle 30 mm	3.0 kN / 675 lb*	3.0 kN / 675 lb*	3.0 kN / 675 lb
	Square 18 mm	5.4 kN / 1215 lb	6.9 kN / 1550 lb	3.0 kN / 675 lb
	Square 30 mm	3.0 kN / 675 lb*	3.0 kN / 675 lb*	3.0 kN / 675 lb

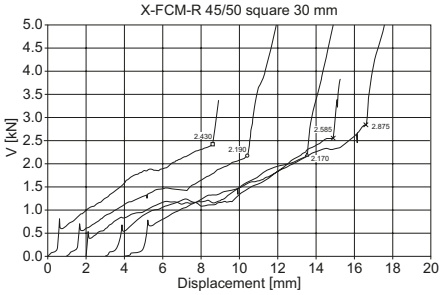
* Loading is limited by elastic limit of the **X-FCM-R** disc.

Load displacement behaviour – examples:

Tensile load



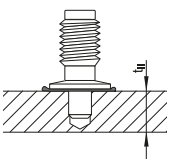
Shear load



Application requirements

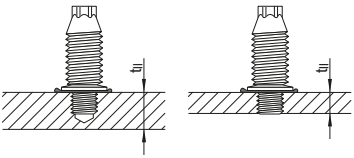
Thickness of base material

X-BT



$t_{II} \geq 8$ mm

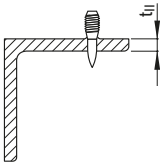
S-BT-GF M8/7 AN 6
S-BT-GR M8/7 SN 6
S-BT-GR M8/7 SN 6 AL*)



$t_{II} \geq 6$ mm pilot hole

steel: 3 mm ≤ t_{II} < 6 mm, aluminum: 5 mm ≤ t_{II} < 6 mm drill through hole

X-ST-GR,
X-CRM and
X-EM8H



$t_{II} \geq 6$ mm

*) for use in aluminum base material

Thickness of fastened material

Grating height: 25–50 mm with standard X-FCM. For other dimensions special X-FCM are available on demand.

Spacing and edge distances

X-ST-GR, X-CRM, X-EM8H

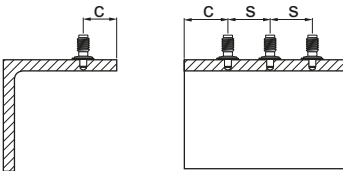
Edge distances: $c \geq 15$ mm

Spacing: $s \geq 15$ mm

X-BT, S-BT

Edge distance: $c \geq 6$ mm

Spacing: $s \geq 15$ mm



Corrosion information

For coastal and offshore applications, X-BT or S-BT-GR stainless steel fasteners have to be used, see fastener selection.

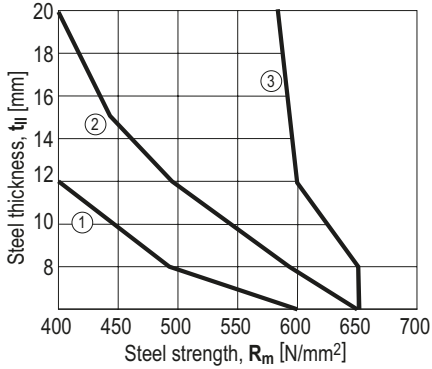
The coating of the carbon steel S-BT fasteners consists of an electroplated Zn-alloy for cathodic protection and a top coat for chemical resistance (Duplex-coating). The thickness of the coating is 35 µm. The use of this coating is limited to the corrosion category C1, C2 and C3 according the standard EN ISO 9223. For higher corrosion categories stainless steel fasteners should be used. In case of a **drill through hole**, rework of the coating on the back side of the plate / profile may be needed.

The intended use of the X-ST-GR and X-CRM fasteners comprises fastenings exposed to outdoor environments in mildly corrosive conditions where HDG coated parts are commonly specified or used. Not for use in atmospheres with chlorides (marine atmospheres) or in heavily polluted environments (e.g. sulphur dioxide).

The intended use of the X-EM8H carbon steel fasteners only comprises fastenings which are not directly exposed to external weather conditions or moist atmospheres.

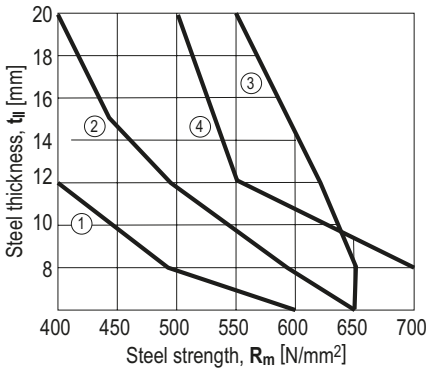
Application limits

DX 460, DX 5



① **X-CRM8-15-12 P8** / DX 460, DX 5 (impact)
② **X-CRM8-15-12 P8** / DX 460, DX 5 (co-acting)
③ **X-EM8H-15-12 P8** / DX 460, DX 5 (impact)

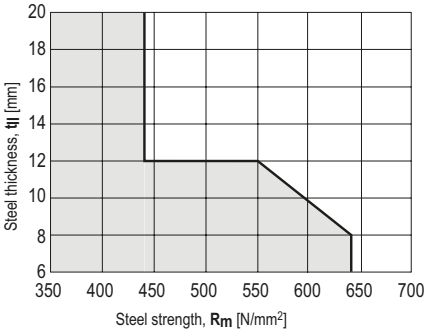
DX 76, DX 76 PTR



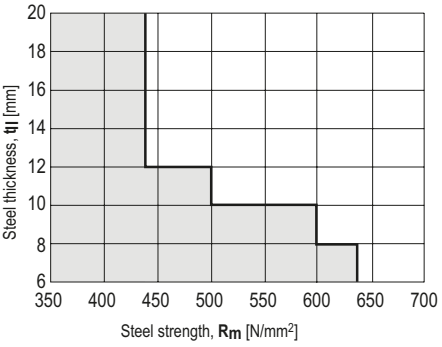
① **X-CRM8-15-12 FP10** / DX 76, DX 76 PTR (impact)
② **X-CRM8-15-12 FP10** / DX 76, DX 76 PTR (co-acting)
③ **X-EM8H-15-12 FP10** / DX 76, DX 76 PTR (impact)
④ **X-EM8H-15-12 P8** / DX 76, DX 76 PTR (impact)

X-ST-GR:

DX 460, DX 5



DX 76 PTR

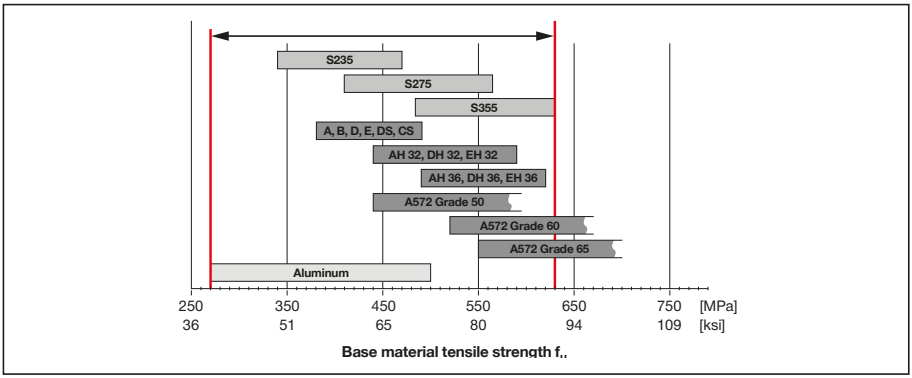


X-BT: No application limits → **using in high strength steel (f_u up to 1000 MPa)**

No through penetration → **$t_{II} \geq 8$ mm [5/16"]**

S-BT:

The base material is limited to steel grade with a maximum tensile strength f_u = 630 MPa (91 ksi). The minimum tensile strength of steel is $f_u \geq 340$ MPa (49 ksi). The minimum tensile strength of aluminum is $f_u \geq 270$ MPa (39 ksi). Minimum thickness of base material t_{II}: refer to section "Thickness of base material" Maximum thickness of base material t_{II}: no limits



Fastener selection and system recommendation

Fastener program

Application areas

Indoors, dry and non corrosive environment		Indoors, mildly corrosive environment, or for limited lifetime use		Marine, offshore, petrochemical, caloric (coal, oil) power plants, etc.				
X-FCM system						**Dimensions**		**Tools**
X-FCM Zinc plated	Item no.	X-FCM-M Duplex coated	Item no.	X-FCM-R Stainless steel	Item no.	L [mm]	Grating height [mm]	
X-FCM 25/30	26582 or 2117353	**X-FCM-M 25/30**	378683 or 2117357	**X-FCM-R 25/30**	247181 or 2117391	**23**	**25–30**	[1])
X-FCM 1″-1¼″	247175 or 2117354	**X-FCM-M 1″-1¼″**	378686 or 2117358	**X-FCM-R 1″-1¼″**	247184 or 2117392	**27**	**29–34**	[1])
X-FCM 35/40	26583 or 2117355	**X-FCM-M 35/40**	378684 or 2117359	**X-FCM-R 35/40**	247182 or 2117393	**33**	**35–40**	[1])
X-FCM 45/50	26584 or 2117356	**X-FCM-M 45/50**	378685 or 2117390	**X-FCM-R 45/50**	247183 or 2117394	**43**	**45–50**	[1])
		X-FCM-M 31/36 L	2042852*			**25**	**31–36**	[1])
		*For use with X-BT M8-15-6 SN12-R S-BT-GR M8 S-BT-GF M8						
		Note: Not for use in marine atmosphere or in heavily polluted environment.		Note: Not for use in automobile tunnels, swimming pools or similar environments				

[1]) SF 100-A, SF 11-A, SF 150-A, SF 121-A, SF 14, SF 14-A, SF 18-A, SFC 18-A, SF 22-A, SFC 22-A, SBT 4-A22, Hilti Torque tool X-BT 1/4”

Threaded studs		Item no.	Tools
X-EM8H-15-12 P8		271981	[2]
X-EM8H-15-12 FP10		271982	[2]
	X-BT M8-15-6 SN12-R	377074	[3]
	X-CR M8-15-12 P8	372033	[2]
	X-CR M8-15-12 FP10	372034	[2]
	S-BT-GF M8/7 AN 6	2140527	[4], [5]
	S-BT-GR M8/7 SN 6	2140529	[4], [5]
	S-BT-GR M8/7 SN 6 AL	2140742	[4], [5]
	X-ST-GR M8/10 P8	2122460	[2]

[2]) DX 76 PTR, DX 460, DX 5
[3]) BX 3-BTG, DX 351-BTG
[4]) SF BT 18-A, SF BT 22-A and SBT 4-A22 for drilling the hole
[5]) SFC 18-A, SFC 22-A and SBT 4-A22 for screw-in the fastener

Cartridge selection and tool energy setting

X-BT: **6.8/11M high precision brown** cartridges

X-CRM: **6.8/11M yellow or red** cartridges with DX 460, DX 5
6.8/18M blue cartridges with DX 76 and DX 76 PTR

X-ST-GR: **6.8/11M black or red** cartridges with DX 460, DX 5
6.8/18M yellow or red cartridges with DX 76 PTR

X-EM8H: **6.8/11M red or black** cartridges with DX 460, DX 5
6.8/18M blue, red or black cartridges with DX 76 and DX 76 PTR

Tool energy adjustment by setting tests on site.

Material specifications and coatings

X-FCM system

	X-FCM-R		X-FCM-M+X-FCM-M_L		X-FCM		All systems
	① Disk	② Threaded stem	① Disk	② Threaded stem	① Disk	② Threaded stem	③ Absorber [1])
Material designation	X2CrNiMo17122	X2CrNiMo17122	DC 04	11SMNPB30+C	DC 04	11SMNPB30+C	Polyurethane Black
Coating	none	none	Duplex *	Duplex *	≥ 20µm Zn	10–20 µm Zn	–

[1]) resistant to: UV, saltwater ozone, oil, grease

*) comparable to 45 µm HDG steel (480 h Salt spray test per DIN 50021)

Threaded studs

	X-BT			X-ST-GR		X-EM8H
	Shank ①	Threaded sleeve ② SN12-R washer ③	Sealing ring of sealing washer[1] ④	Shank	Threaded sleeve	
Material	Stainless steel	X2CrNiMo17132	Elastomer,	P558	(A4 / AISI316)	Carbon steel
designation	CR 500	X5CrNiMo17122+2H	black	(CrMnMo		
	(A4 / AISI316)	(A4 / AISI316)		alloy)		Ck 67 MOD
Coating	none	none		none	none	5–13 µm Zn [2]

[1]) resistant to: UV, saltwater ozone, oil, grease

[2]) Zinc applied by electroplating. Intended for corrosion protection during shipment, storage, construction and service in protected environment. It is not adequate for protection against corrosion in outside or otherwise corrosive applications

Threaded studs

	S-BT-_R			S-BT-_F		
	Threaded Shank ①	SN 12-R washer ③	Sealing ring of sealing washer[1] ③	Threaded Shank ②	AN 10-F washer ④	Sealing ring of sealing washer[1] ④
Material	Stainless steel	Stainless steel	Elastomer,	Carbon steel	Aluminum	Elastomer,
designation	1.4462	1.4404	black	1038		black
	(A4 / AISI316)	(A4 / AISI316)				
Coating	Zinc	none	none	Duplex-coating	none	HDG

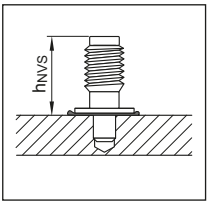
[1]) resistant to: UV, salt water, ozone, oil, grease

[2]) The surface of the S-BT stainless steel fasteners is zinc plated (anti-friction coating) in order to reduce the thread forming torque when the stud is screwed in into the base material.

Fastening quality assurance

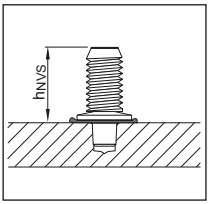
Fastening inspection

X-BT M8-15-6 SN12-R



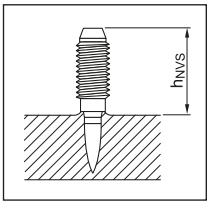
h_{NVS} = 15.7–16.8 mm

X-BT-GR M8/7 SN8



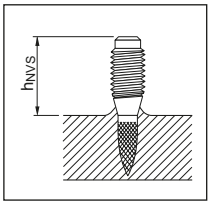
h_{NVS} = 15.7–16.8 mm

X-CRM8-15-12



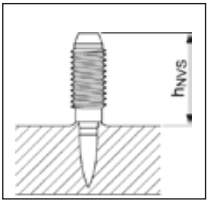
h_{NVS} = 17–20 mm

X-EM8H-15-12

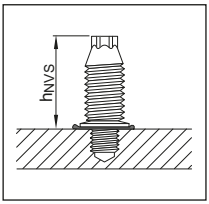


h_{NVS} = 15.5–19.5 mm

X-ST-GR M8/10 P8

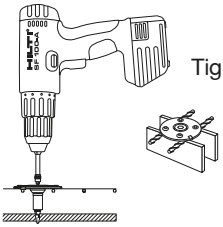


h_{NVS} = 17.0–20.0 mm



S-BT-_____/7_____6

h_{NVS} = 18.6–19.1mm [0.732” - 0.752”]



Tighten the disk

Tightening torque

T_{rec} = max. 8 Nm

T_{rec} = max. 5 Nm [1)]

[1)] For S-BT-GR M8/7 SN 6 AL in aluminum base material
For S-BT-GR M8/7 SN 6 and S-BT-GF M8/7 AN 6 in steel base material
3 mm ≤ t_{II} < 5 mm (drill through hole)

Tightening tool:

- Screwdriver with torque release coupling (TRC)
- 5 mm Allen-type bit
- Hilti Torque tool X-BT 1/4”, which gives 8 Nm

Hilti screwdriver

	T_{rec}	
	5 Nm	8 Nm
	Torque setting	
SF 121-A	5	6
SF 150-A	4	5
SF 14	4	5
SF 14-A	5	6
SF 18-A	4	5
SFC 18-A	4	5
SF 22-A	4	5
SFC 22-A	4	5
SBT 4-A22	4	5