X-FCM
DATA SHEET

Grating fastening system

December 2022

X-FCM Grating fastening system

Product data

Product description

Grating element for securing grating			Special features
X-FCM	X-FCM-F	X-FCM-R	• standard disc • protrusion above the walkway ≤ 4 mm
	X-FCM-F L	X-FCM-R L	• large disc • protrusion above the walkway ≤ 8 mm
		X-FCM-R HL	• high load resistance • high tension resistance for use in wave zones • vibration resistance • protrusion above the walkway ≤ 4 mm
	X-FCM-F NG	X-FCM-R NG	• narrow gratings • protrusion above the walkway ≤ 4 mm
• low corrosion resistance	• medium corrosion resistance	• high corrosion resistance	• Special material characteristics
• zinc plated	• duplex coated	• stainless steel	

- Discs with locking tabs to ensure durable hold and to prevent loosening or spinning.
- Non-slip disc surface to reduce trip hazard.
- Cordless solution.
- Labour-saving due to fewer installation steps compared to grating clamps or welding.
- Grating elements will be assembled on pre-installed fasteners.
- Fastener installation is describe in the corresponding Product Data Sheet(s) for fasteners.

Designation for grating element

Designation		Technology	Product identifier	Corrosion resistance	Feature / characteristic	Minimum grating height	Maximum grating height
Product family	**Grating element**						
Product type	X-FCM	X	FCM				
Product subtype	X-FCM	X	FCM				
Product	X-FCM 28/33	X	FCM			28	33
Product family	**Grating element**						
Product type	X-FCM	X	FCM				
Product subtype	X-FCM-F	X	FCM	F			
Product	X-FCM-F 28/33	X	FCM	F		28	33
Product family	**Grating element**						
Product type	X-FCM	X	FCM				
Product subtype	X-FCM-F L	X	FCM	F	L		
Product	X-FCM-F L 28/33	X	FCM	F	L	28	33
Product family	**Grating element**						
Product type	X-FCM	X	FCM				
Product subtype	X-FCM-R HL	X	FCM	R	HL		
Product	X-FCM-R HL 28/33	X	FCM	R	HL	28	33
Product family	**Grating element**						
Product type	X-FCM	X	FCM				
Product subtype	X-FCM-R NG	X	FCM	R	NG		
Product	X-FCM-R NG 28/33	X	FCM	R	NG	28	33

Designation for stud extension adapter

Designation		Technology	Product identifier	Corrosion resistance	Length	Thread holder size	
Product family	**Stud Extension Adapter**						
Product type	X-SEA	X	SEA				
Product subtype	X-SEA-R	X	SEA	R			
Product	X-SEA-R 30 M8	X	SEA	R	30	M8	

- Information presented in this product data sheet at product family level are valid for all others levels, i.e. product type, product subtype and product. This statement applies also to lower levels.

Grating fastening system for fastening to steel and aluminum

Fastener		X-BT-GR M8/7 SN 8	S-BT-GR M8/7 SN 6	S-BT-GR NG M8/7 SN 6	S-BT-GF M8/7 AN 6	S-BT-MF M8/15 AN 6	S-BT-GF NG M8/7 AN 6	X-ST-GR M8/10 P8	X-EM8H-15-12 P8	X-EM8H-15-12 FP10	S-BT-GR M8/7 SN 6 AL
Optional: stud extension adapter			X-SEA-R 30 M8								X-SEA-R 30 M8
Base material		Steel									Aluminum
Grating element	X-FCM	□	□	□	■	■	■	□	■	■	□
	X-FCM-F	□	□	□	■	■	■	■	–	–	□
	X-FCM-F L	□	□	□	■	■	■	■	–	–	□
	X-FCM-F NG	□	□	□	□	□	■	□	–	–	□
	X-FCM-R	■	■	■	–	–	–	–	–	–	■
	X-FCM-R L	■	■	■	–	–	–	–	–	–	■
	X-FCM-R HL	■	–	–	–	–	–	–	–	–	–
	X-FCM-R NG	□	□	■	–	–	–	–	–	–	□

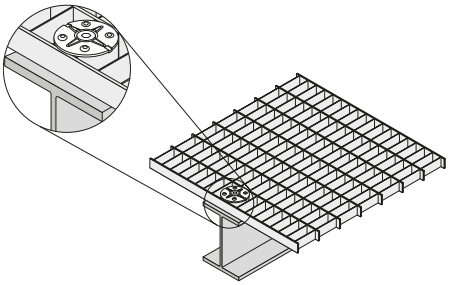
■ = recommended for combination □ = suitable for combination

Approvals and certificates

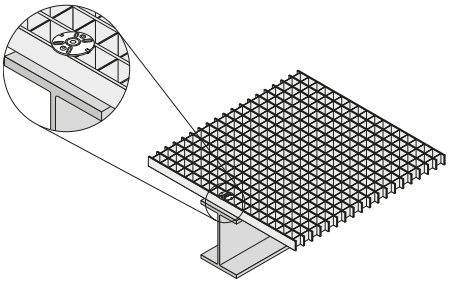
Authority	Approval/certificate no.	Date of issue	Designation	Application area
American Bureau of Shipping ABS	22-2285526-PDA	09/2022	all X-FCM grating elements	Marine industry, offshore industry
Bureau Veritas BV	71291/A0 BV	04/2022	all X-FCM grating elements	Marine industry, offshore industry
Det Norske Veritas DNV	TAS00001UJ Rev-3	08/2022	all X-FCM grating elements	Marine industry, offshore industry
Lloyd's Register LR	LR21394055TA	10/2021	all X-FCM grating elements, except X-FCM-F L and X-FCM-R L	Marine industry, offshore industry
	LR 19-00003-02	07/2020		
RINA	FPE247421CS/001	07/2021	X-FCM-R, X-FCM-R HL	Marine industry, offshore industry

- Information presented in this product data sheet is based on Hilti Technical Data. For the specific application please refer to the corresponding approval/certificate.

Application

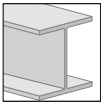


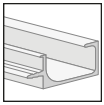
Securing rectangular grating



Securing square grating

Base materials


Steel


Aluminum

Base material properties and fastener positioning in base material

Fastener	X-EM8H-15-12 P8, X-EM8H-15-12 FP10, X-ST-GR M8/10 P8
Base material	Steel
Base material tensile strength R_m	≥ 360 MPa
Base material thickness t_{II}	≥ 6 mm

Fastener	X-BT-GR M8/7 SN 8
Base material	Steel
Base material tensile strength R_m	≥ 360 MPa
Base material thickness t_{II}	≥ 8 mm
Base material coating thickness t_c	≤ 500 µm

Fastener	S-BT-GF M8/7 AN 6, S-BT-MF M8/15 AN 6, S-BT-GF NG M8/7 AN 6 S-BT-GR M8/7 SN 6, S-BT-GR NG M8/7 SN 6
Base material	Steel
Base material tensile strength R_m	360 – 630 MPa
Base material thickness t_{II}	≥ 3 mm
Base material coating thickness t_c	≤ 800 µm
Base material steel grade	S235 Jxx – S355 Jxx acc. to EN 10025-2
	S275N – S355N, S275NL – S355NL acc. to EN 10025-3
	S280 GD – S420 GD acc. to EN 10346

Fastener	S-BT-GR M8/7 SN 6 HL, S-BT-GF M8/7 AN 6 HL
Base material	Steel
Base material tensile strength R_m	360 – 760 MPa
Base material thickness t_{II}	≥ 3 mm
Base material coating thickness t_c	≤ 800 µm
Base material steel grade	S235 Jxx – S500 Jxx acc. to EN 10025-2
	S275N – S460 N S275NL – S460 NL acc. to EN 10025-3
	S280 GD – S550 GD acc. to EN 10346

Fastener	S-BT-GR M8/7 SN 6 HL, S-BT-GF M8/7 AN 6 HL
Base material	Steel
Base material tensile strength R_m	360 – 760 MPa
Base material thickness t_{II}	≥ 3 mm
Base material coating thickness t_c	≤ 800 µm
Base material steel grade	S235 Jxx – S500 Jxx acc. to EN 10025-2
	S275N – S460 N S275NL – S460 NL acc. to EN 10025-3
	S280 GD – S550 GD acc. to EN 10346
	S315MC – S550MC acc- tp EN 10149-2

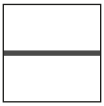
Fastener	S-BT-GR M8/7 SN 6 AL
Base material	Aluminum
Base material tensile strength R_m	≥ 270 MPa
Base material thickness t_{II}	≥ 5 mm
Base material steel grade	acc. to EN 1999-1-1

- Maximum base material tensile strength R_m depending on fastener application limitation, see corresponding Product Data Sheet(s).
- Fastener positioning in base material is describe in the corresponding Product Data Sheet(s) for fasteners.

Base material back side coating rework

Base material	Base material thickness	Back side coating rework
Steel	$3 \leq t_{II} < 6$ mm	Rework process based on end use requirements
	$t_{II} \geq 6$ mm	no rework

Load conditions



Static/
quasi static

Environmental conditions

- In general, grating fastening system not to be used in wave zones due to high load impact. For applications in wave zones see X-FCM-R HL.
- For more details, please refer to following technical document(s): Hilti Corrosion Handbook.

Environmental condition		Fastened part	X-FCM combined with S-BT-GF M8/7 AN 6, S-BT-MF M8/15 AN 6, S-BT-GF NG M8/7 AN 6, X-EM8H-15-12 P8, X-EM8H-15-12 FP10	X-FCM-F, X-FCM-F L combined with S-BT-GF M8/7 AN 6, S-BT-MF M8/15 AN 6, S-BT-GF NG M8/7 AN 6, X-ST-GR M8 10P8	X-FCM-R, X-FCM-R L, combined with X-BT-GR M8/7 SN 8, S-BT-GR M8/7 SN 6, S-BT-GR NG M8/7 SN 6, S-BT-GR M8/7 SN 6 AL
					X-FCM-R HL combined with X-BT-GR M8/7 SN 8
				X-FCM-F NG combined with S-BT-GF NG M8/7 AN 6	X-FCM-R NG combined with S-BT-GR NG M8/7 SN 6
	Dry indoor	Steel (zinc-coated, painted), aluminum, stainless steel	■	■	■
	Indoor with temporary condensation	Steel (zinc-coated, painted), aluminum	–	■	■
		Stainless steel		–	
	Outdoor with low pollution	Steel (zinc-coated, painted), aluminum	–	□ 1)	■
		Stainless steel		–	
1-10km	Outdoor with moderate concentration of pollutants	Steel (zinc-coated, painted), aluminum	–	□ 1)	■
		Stainless steel		–	
0-1km	Coastal areas	Steel (zinc-coated, painted), aluminum, stainless steel	–	–	■
	Outdoor, areas with heavy industrial pollution	Steel (zinc-coated, painted), aluminum, stainless steel	–	–	■
	Close proximity to roads	Steel (zinc-coated, painted), aluminum, stainless steel	–	–	■

Notes for next page:

■ = expected lifetime of anchors made from this material is typically satisfactory in the specified environment based on the typically expected lifetime of a building. The assumed service life in European Technical Assessments is 50 years for concrete anchors, 25 years for power-driven fasteners, steel and sandwich panel screws, and 10 years for flat roof insulation screws.

□ = a decrease in the expected lifetime of non-stainless fasteners in these atmospheres must be taken into account (≤ 25 years). Higher expected lifetime needs a specific assessment.

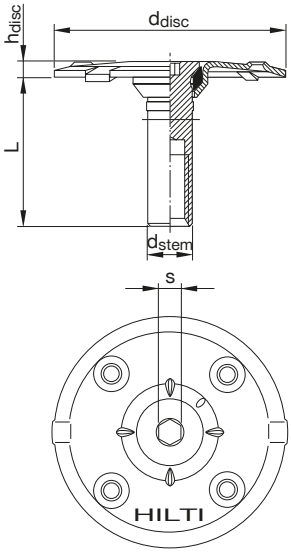
– = fasteners made from this material are not suitable in the specified environment. Exceptions need a specific assessment.

1) From a technical point of view, HDG/duplex coatings and A2/304 material are suitable for outdoor environments with certain application restrictions. This is based on long-term experience with these materials as reflected e.g. in the corrosion rates for Zn given in the ISO 9224:2012 (corrosivity categories, C-classes), the selection guidelines for stainless steel grades provided in Eurocode 3 EN 1993 (final draft 2014) or in the national technical approval issued by the DIBt Z.30.3-6 (April 2014) and the ICC-ES evaluation reports for our products for North America (e.g. ESR-1917, May 2013). The use of those materials in outdoor environments however is currently not covered by the European Technical Assessments (ETA) of anchors, where it is stated that anchors made of galvanized carbon steel or stainless steel grade A2 may only be used in structures subject to dry indoor conditions, based on an assumed working life of the anchor of 50 years.

X-FCM, X-FCM-F, X-FCM-R
Securing grating with standard disc

Dimensions

Technical drawings for grating element with standard disc with medium and high corrosion resistance

Technical drawing	Designation
	X-FCM, X-FCM-F, X-FCM-R

- Threaded stem, Disc, Absorber O-Ring.

Dimensions for grating elements with standard discs

Designation	Grating element length L	Grating element stem diameter d_{stem}	Grating element disc diameter d_{disc}	Grating element disc height h_{disc}	Grating element hex width s
X-FCM 23/28	18 mm	10.3 mm	50 mm	4 mm	5 mm
X-FCM 28/33	23 mm				
X-FCM 32/37	27 mm				
X-FCM 38/43	33 mm				
X-FCM 48/53	43 mm				

Designation		Grating element length L	Grating element stem diameter d_{stem}	Grating element disc diameter d_{disc}	Grating element disc height h_{disc}	Grating element hex width s
X-FCM-F 23/28	X-FCM-R 23/28	18 mm	10.3 mm	50 mm	4 mm	5 mm
X-FCM-F 28/33	X-FCM-R 28/33	23 mm				
X-FCM-F 32/37	X-FCM-R 32/37	27 mm				
X-FCM-F 38/43	X-FCM-R 38/43	33 mm				
X-FCM-F 48/53	X-FCM-R 48/53	43 mm				

Material specification and material properties

Material specification and material properties for carbon steel parts

Designation	Element	Material	Coating	Coating thickness	Category of corrosivity of the atmosphere according to EN ISO 9223
X-FCM	Disc, threaded stem	Carbon steel	Zinc	≥ 20 µm	C1
X-FCM-F	Disc, threaded stem	Carbon steel	Duplex coated	≥ 30 µm	C3

- Duplex coated steel is comparable to HDG steel.
- Duplex coated steel is tested according to EN ISO 9227: NSS, 480 h on salt spray exposure.

Material specification and material properties for stainless steel parts

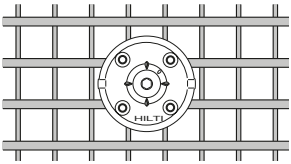
Designation	Element	Material	Coating	Steel grade according to EN 10088	Corrosion resistance class according to EN 1993-1-4
X-FCM-R	Disc, threaded stem	Stainless steel	–	1.4404	CRC III

Material specification and material properties for plastic parts

Designation	Element	Material	Color	Other properties
X-FCM	Absorber O-Ring	Poly-urethane (PUR)	Black	Resistant to UV, water, saltwater, ozone, oil, grease
X-FCM-F				
X-FCM-R				

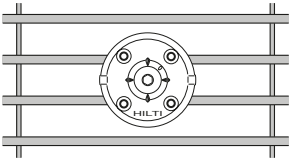
Application recommendation

Grating material and grating material properties for square grating



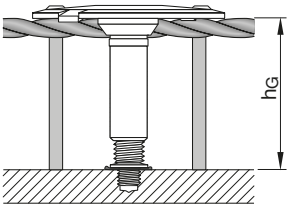
Grating type	Square
Grating material	Carbon steel, stainless steel, reinforced fiberglass
Clear bar spacing $w_{bearing\ bar}$	18 – 30 mm
Clear cross bar spacing $w_{cross\ bar}$	18 – 30 mm
Grating height h_G	23 – 53 mm
Grating height h_G with X-SEA	53 – 83 mm

Grating material and grating material properties for rectangular grating

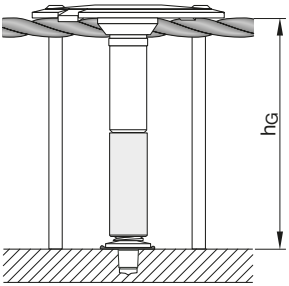


Grating type	Rectangular
Grating material	Carbon steel, stainless steel, reinforced fiberglass
Clear bar spacing $w_{bearing\ bar}$	18 – 30 mm
Clear cross bar spacing $w_{cross\ bar}$	≥ 18 mm
Grating height h_G	23 – 53 mm
Grating height h_G with X-SEA	53 – 83 mm

Grating element recommendation

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM 23/28	Carbon steel, reinforced fiberglass	Square, rectangular	23 – 28 mm
	X-FCM 28/33			28 – 33 mm
	X-FCM 32/37			32 – 37 mm
	X-FCM 38/43			38 – 43 mm
	X-FCM 48/53			48 – 53 mm
	X-FCM-F 23/28	Carbon steel, reinforced fiberglass	Square, rectangular	23 –28 mm
	X-FCM-F 28/33			28 – 33 mm
	X-FCM-F 32/37			32 – 37 mm
	X-FCM-F 38/43			38 – 43 mm
	X-FCM-F 48/53			48 – 53 mm
	X-FCM-R 23/28	Stainless steel, reinforced fiberglass	Square, rectangular	23 – 28 mm
	X-FCM-R 28/33			28 – 33 mm
	X-FCM-R 32/37			32 – 37 mm
	X-FCM-R 38/43			38 – 43 mm
	X-FCM-R 48/53			48 – 53 mm

Grating element recommendation for use with stud extension adapter X-SEA

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM 23/28	Carbon steel, reinforced fiberglass	Square, rectangular	53 – 58 mm
	X-FCM 28/33			58 – 53 mm
	X-FCM 32/37			62 – 67 mm
	X-FCM 38/43			68 – 73 mm
	X-FCM 48/53			78 – 83 mm

- Please contact Hilti for grating element recommendation when the requirements deviate from the standard.

Performance data

Recommended tension load for grating elements

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Tension load N_{rec}
X-FCM	Square grating	18 mm	2.4 kN
		30 mm	0.8 kN
	Rectangular grating	18 mm	0.8 kN
		30 mm	0.8 kN
X-FCM-F	Square grating	18 mm	1.8 kN
		30 mm	0.8 kN
	Rectangular grating	18 mm	0.8 kN
		30 mm	0.8 kN
X-FCM-R	Square grating	18 mm	1.8 kN
		30 mm	1.0 kN
	Rectangular grating	18 mm	1.4 kN
		30 mm	1.0 kN

Recommended tension load for grating fastening system

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Base material tensile strength R_m	Base material thickness t_{II}	Tension load N_{rec}
X-FCM combined with S-BT-GF M8/7 AN 6 S-BT-MF M8/15 AN 6 S-BT-GF NG M8/7 AN 6	Square	18 mm	Steel: 360 – 630 MPa	$3 \leq t_{II} < 5$ mm	1.9 kN
		30 mm			0.8 kN
		18 mm		$t_{II} \geq 5$ mm	2.0 kN
		30 mm			0.8 kN
	Rectangular	18 mm		$3 \leq t_{II} < 5$ mm	0.8 kN
		30 mm			0.8 kN
		18 mm		$t_{II} \geq 5$ mm	0.8 kN
		30 mm			0.8 kN
X-FCM combined with X-EM8H-15-12 P8 X-EM8H-15-12 FP10	Square	18 mm	Steel: ≥ 360 MPa	$t_{II} \geq 6$ mm	1.8 kN
		30 mm			0.8 kN
	Rectangular	18 mm			0.8 kN
		30 mm			0.8 kN
X-FCM-F combined with S-BT-GF M8/7 AN 6 S-BT-MF M8/15 AN 6 S-BT-GF NGM8/7 AN 6	Square	18 mm	Steel: 360 – 630 MPa	$3 \leq t_{II} < 5$ mm	1.8 kN
		30 mm			0.8 kN
		18 mm		$t_{II} \geq 5$ mm	1.8 kN
		30 mm			0.8 kN
	Rectangular	18 mm		$3 \leq t_{II} < 5$ mm	0.8 kN
		30 mm			0.8 kN
		18 mm		$t_{II} \geq 5$ mm	0.8 kN
		30 mm			0.8 kN
X-FCM-F combined with X-ST-GR M8/10 P8	Square	18 mm	Steel: ≥ 360 MPa	$t_{II} \geq 6$ mm	1.8 kN
		30 mm			0.8 kN
	Rectangular	18 mm			0.8 kN
		30 mm			0.8 kN

- Maximum base material tensile strength R_m depending on fastener application limitation, see corresponding Product Data Sheet(s).

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Base material tensile strength R_m	Base material thickness t_{II}	Tension load N_{rec}
X-FCM-R combined with S-BT-GR M8/7 SN 6 S-BT-GR NG M8/7 SN 6	Square	18 mm	Steel: 360 – 630 MPa	$3 \leq t_{II} < 5$ mm	1.8 kN
		30 mm			1.0 kN
		18 mm		$t_{II} \geq 5$ mm	1.8 kN
		30 mm			1.0 kN
	Rectangular	18 mm		$3 \leq t_{II} < 5$ mm	1.4 kN
		30 mm			1.0 kN
		18 mm		$t_{II} \geq 5$ mm	1.4 kN
		30 mm			1.0 kN
X-FCM-R combined with X-BT-GR M8/7 SN 8	Square	18 mm	Steel: ≥ 360 MPa, no upper limit	$t_{II} \geq 8$ mm	1.8 kN
		30 mm			1.0 kN
	Rectangular	18 mm			1.4 kN
		30 mm			1.0 kN
X-FCM-R combined with S-BT-GR M8/7 SN 6 AL	Square	18 mm	Aluminum: ≥ 270 MPa	$t_{II} \geq 5$ mm	1.8 kN
		30 mm			1.0 kN
	Rectangular	18 mm			1.4 kN
		30 mm			1.0 kN

- Data valid for use with stud extension adapter X-SEA.

Recommended shear load for grating fastening system

- Not suitable for explicit shear load design, e. g. diaphragms.
- Shear resistance by friction is depending on surface characteristics.
- Shear loads up to 0.3 kN will not result in permanent deformation.
- Small unexpected shear loads can be accommodated without damage.

Design resistance under tension and shear load for grating fastening system

Load type	Partial factor for actions γ_f	Characteristic resistance
Tension load	1.4	$N_{Rd} = N_{rec} \cdot \gamma_f$
Shear load	1.4	$V_{Rd} = V_{rec} \cdot \gamma_f$

- Design resistance can be calculated.

Characterstic resistance under tension and shear load for grating fastening system

- For characteristic resistance under shear and tension load contact Hilti.

Installation recommendation

Recommended tightening torque for tightening grating element

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM	S-BT-GF M8/7 AN 6 S-BT-MF M8/15 AN 6 S-BT-GF NG M8/7 AN 6	Steel	$3 \leq t_{II} < 5$ mm	5 Nm
			≥ 5 mm	8 Nm
	X-EM8H-15-12 FP10	Steel	$t_{II} \geq 6$ mm	8 Nm
X-FCM-F	S-BT-GF M8/7 AN 6 S-BT-MF M8/15 AN 6 S-BT-GF NGM8/7 AN 6	Steel	$3 \leq t_{II} < 5$ mm	5 Nm
			≥ 5 mm	8 Nm
	X-ST-GR M8/10 P8	Steel	≥ 6 mm	8 Nm

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM-R	S-BT-GR M8/7 SN 6 S-BT-GR NG M8/7 SN 6	Steel	$3 \leq t_{II} < 5$ mm	5 Nm
			≥ 5 mm	8 Nm
	X-BT-GR M8/7 SN 8	Steel	≥ 8 mm	8 Nm
	S-BT-GR M8/7 SN 6 AL	Aluminum	≥ 5 mm	5 Nm

- Data valid for use with stud extension adapter X-SEA.

Tightening tool recommendation for tightening with screwdriver

Designation	Clutch type (stop detection)	Tightening torque T_{rec} = 5 Nm		T_{rec} = 8 Nm	
		Tool power level adjustment			
		Gear	Clutch	Gear	Clutch
SF 2-A12	TRC	1	15	1	15
SF 2H-A12	TRC	1	15	1	15
SF 4-A22	TRC	1	4	1	8
SF 6-A22	ESC (SJ)	1	5	1	7
SF 6H-A22	ESC (SJ)	1	5	1	7
SF 18-A	TRC	1	4	1	5
SFC 18-A	TRC	1	4	1	5
SF 22-A	TRC	1	4	1	5
SFC 22-A	TRC	1	4	1	5
SBT 4-A22	TRC	1	5	1	7

- Data valid for use with stud extension adapter X-SEA.
- Hilti recommends using a calibrated torque wrench or the Hilti Torque tool to apply the recommended tightening torque.
- Tool power level adjustement is a guiding value which applies to new Hilti screwdriver.
- Tightening torque may vary depending on the user and the application.
- Torque release coupling (TRC): Achievable torque can change over time due to clutch wear.
- Electronic slip clutch (ESC): ESC has 2 stop detections, Soft Joint (SJ) and Hard Joint (HJ). Hard joint detection is activated due to drop in speed (fast stop) and can lead to a torque spike.

Tightening tool recommendation for tightening with Hilti torque tool

Designation	Tightening torque T_{rec}
S-BT 1/4" – 5 Nm	5 Nm
X-BT 1/4" – 8 Nm	8 Nm

- Data valid for use with stud extension adapter X-SEA.

Fastener program

Item no. and description for grating elements

Designation	Item no.	Description
X-FCM 23/28	2349077, 2349147	Zinc plated grating element for securing grating with standard disc
X-FCM 28/33	2349078, 2349148	
X-FCM 32/37	2349149	
X-FCM 38/43	2349120, 2349150	
X-FCM 48/53	2349151	
X-FCM-F 23/28	2349122, 2349152	Duplex coated grating element for securing grating with standard disc
X-FCM-F 28/33	2349123, 2349153	
X-FCM-F 32/37	2349154	
X-FCM-F 38/43	2349125, 2349155	
X-FCM-F 48/53	2349126, 2349156	
X-FCM-R 23/28	2349157	Stainless steel grating element for securing grating with standard disc
X-FCM-R 28/33	2349133, 2349158	
X-FCM-R 32/37	2349134, 2349159	
X-FCM-R 38/43	2349135, 2349160	
X-FCM-R 48/53	2349136, 2349161	

Item no. and description for fastener

Designation	Item no.	Description
S-BT-GF M8/7 AN 6	2140527	Screw-in carbon steel threaded stud
S-BT-MF M8/15 AN 6	2148618	Screw-in carbon steel threaded stud
S-BT-GF NG M8/7 AN 6	2302143	Screw-in carbon steel threaded stud
X-EM8H-15-12 P8	271981	Sharp-tip zinc plated carbon steel threaded stud
X-EM8H-15-12 FP10	271982	Sharp-tip zinc plated carbon steel threaded stud
X-ST-GR M8/10 P8	2122460	Sharp-tip stainless steel threaded stud
X-BT-GR M8/7 SN 8	2194344	Blunt-tip stainless steel threaded stud
S-BT-GR M8/7 SN 6	2140529	Screw-in stainless steel threaded stud
S-BT-GR NG M8/7 SN 6	2302142	Screw-in stainless steel threaded stud
S-BT-GR M8/7 SN 6 AL	2140742	Screw-in stainless steel threaded stud

Item no. and description for tools

Designation	Item no.	Description
BX 3-BTG		Battery-actuated fastening tool
DX 351-BTG		Powder-actuated fastening tool
SF 2-A12		Screwdriver
SF 2H-A12		Screwdriver
SF 4-A22		Screwdriver
SF 6-A22		Screwdriver
SF 6H-A22		Screwdriver
SF 18-A		Screwdriver
SFC 18-A		Screwdriver
SF 22-A		Screwdriver
SFC 22-A		Screwdriver
SBT 4-A22		Screwdriver
S-BT 1/4" – 5 Nm	2143271	Hilti torque tool (5 Nm)
X-BT 1/4" – 8 Nm	2119272	Hilti torque tool (8 Nm)

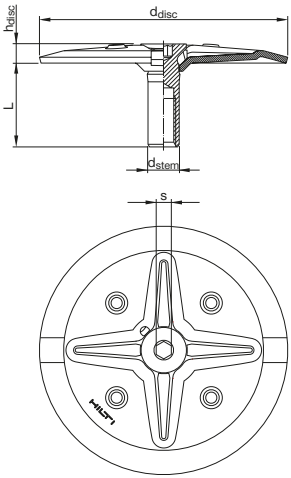
Item no. and description for accessories

Designation	Item no.	Description
X-SEA-R 30 M8	432274	Stainless steel stud extension adapter
TX-BT 4.7/7-80	2197930	Stepped drill bit
TX-BT 4.7/7-110	2197931	Stepped drill bit
TS-BT 5.5-74 S	2143137	Stepped drill bit
TS-BT 5.5-74 AL	2143138	Stepped drill bit
Allen key – Size 5 mm		Adapter

X-FCM-F L, X-FCM-R L
Securing grating with large disc with medium and high corrosion resistance

Dimensions

Technical drawings for grating element

Technical drawing	Designation
	X-FCM-F L, X-FCM-R L

- Threaded stem, Disc, Absorber O-Ring.

Dimensions for grating elements with large discs

Designation		Grating element length L	Grating element stem diameter d_{stud}	Grating element disc diameter d_{disc}	Grating element disc height h_{disc}	Grating element hex width s
X-FCM-F L 28/33	X-FCM-R L 28/33	23 mm	10.3 mm	82 mm	4 mm	5.0 mm
X-FCM-F L 32/37	X-FCM-R L 32/37	27 mm				
X-FCM-F L 38/43	X-FCM-R L 38/43	33 mm				
X-FCM-F L 48/53	X-FCM-R L 48/53	43 mm				

Material specification

Material specification and material properties for carbon steel parts

Designation	Element	Material	Coating	Coating thickness	Category of corrosivity of the atmosphere according to EN ISO 9223
X-FCM-F L	Disc, threaded stem	Carbon steel	Duplex coated	≥ 30 µm	C3

- Duplex coated steel is comparable to HDG steel.
- Duplex coated steel is tested according to EN ISO 9227: NSS/AASS/CASS, 480 h on salt spray exposure.

Material specification and material properties for stainless steel parts

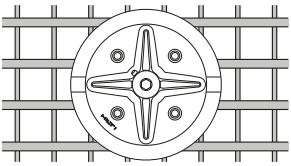
Designation	Element	Material	Coating	Steel grade according to EN 10088	Corrosion resistance class according to EN 1993-1-4
X-FCM-R L	Disc, threaded stem	Stainless steel	–	1.4404	CRC III

Material specification and material properties for plastic parts

Designation	Element	Material	Color	Other properties
X-FCM-F L	Absorber O-Ring	Polyurethane (PUR)	Black	Resistant to UV, saltwater, ozone, oil, grease
X-FCM-R L				

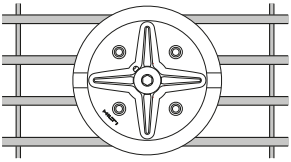
Application recommendation for securing grating

Grating material and grating material properties for square grating



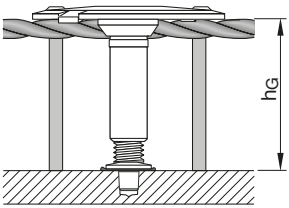
Grating type	Square grating
Grating material	Carbon steel bar grating Stainless steel bar grating Reinforced fiberglass grating
Clear bar spacing $w_{bearing\ bar}$	30 – 60 mm
Clear cross bar spacing $w_{cross\ bar}$	≥ 30 mm
Grating height h_G	28 – 53 mm
Grating height h_G with X-SEA	58 – 83 mm

Grating material and grating material properties for rectangular grating

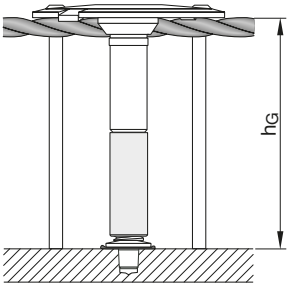


Grating type	Rectangular grating
Grating material	Carbon steel bar grating Stainless steel bar grating Reinforced fiberglass grating
Clear bar spacing $w_{bearing\ bar}$	30 – 60 mm
Clear cross bar spacing $w_{cross\ bar}$	≥ 30 mm
Grating height h_G	28 – 53 mm
Grating height h_G with X-SEA	58 – 83 mm

Grating element recommendation

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM-F L 28/33	Carbon steel and reinforced fiberglass	Square and rectangular grating	28 – 33 mm
	X-FCM-F L 32/37			32 – 37 mm
	X-FCM-F L 38/43			38 – 43 mm
	X-FCM-F L 48/53			48 – 53 mm
	X-FCM-R L 28/33	Stainless steel and reinforced fiberglass	Square and rectangular grating	28 – 33 mm
	X-FCM-R L 32/37			32 – 37 mm
	X-FCM-R L 38/43			38 – 43 mm
	X-FCM-R L 48/53			48 – 53 mm

Grating element recommendation for use with stud extension adapter X-SEA

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM-R L 28/33	Stainless steel and reinforced fiberglass	Square and rectangular grating	58 – 53 mm
	X-FCM-R L 32/37			62 – 67 mm
	X-FCM-R L 38/43			68 – 73 mm
	X-FCM-R L 48/53			78 – 83 mm

Performance data

Recommended tension load for grating elements

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Tension load N_{rec}
X-FCM-F L	Square grating	30 mm	1.8 kN
		60 mm	0.8 kN
	Rectangular grating	30 mm	0.8 kN
		57 mm	0.8 kN
X-FCM-R L	Square grating	30 mm	1.8 kN
		60 mm	0.8 kN
	Rectangular grating	30 mm	0.8 kN
		57 mm	0.8 kN

Recommended tension load for grating fastening system

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Base material tensile strength R_m	Base material thickness t_{II}	Tension load N_{rec}
X-FCM-F L combined with S-BT-GF M8/7 AN 6, S-BT-MF M8/15 AN 6, S-BT-GF NG M8/7 AN 6	Square grating	30 mm	Steel: 360 – 630 MPa	$3 \leq t_{II} < 5$ mm	1.8 kN
		60 mm			0.8 kN
		30 mm		$t_{II} \geq 5$ mm	1.8 kN
		60 mm			0.8 kN
	Rectangular grating	30 mm		$3 \leq t_{II} < 5$ mm	0.8 kN
		57 mm			0.8 kN
		30 mm		$t_{II} \geq 5$ mm	0.8 kN
		57 mm			0.8 kN
X-FCM-F L combined with X-ST-GR M8/10 P8	Square grating	30 mm	Steel: ≥ 360 MPa	$t_{II} \geq 6$ mm	1.8 kN
		60 mm			0.8 kN
	Rectangular grating	30 mm			0.8 kN
		57 mm			0.8 kN

- Maximum base material tensile strength R_m depending on fastener application limitation, see corresponding Product Data Sheet(s).

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Base material tensile strength R_m	Base material thickness t_{II}	Tension load N_{rec}
X-FCM-R-L combined with S-BT-GR M8/7 SN 6, S-BT-GR NG M8/7 SN 6	Square grating	30 mm	Steel: 360 – 630 MPa	$3 \leq t_{II} < 5$ mm	1.8 kN
		60 mm			0.8 kN
		30 mm		$t_{II} \geq 5$ mm	1.8 kN
		60 mm			0.8 kN
	Rectangular grating	30 mm		$3 \leq t_{II} < 5$ mm	0.8 kN
		57 mm			0.8 kN
		30 mm		$t_{II} \geq 5$ mm	0.8 kN
		57 mm			0.8 kN
X-FCM-R-L combined with X-BT-GR M8/7 SN 8	Square grating	30 mm	Steel: ≥ 360 MPa, no upper limit	$t_{II} \geq 8$ mm	1.8 kN
		60 mm			0.8 kN
	Rectangular grating	30 mm			0.8 kN
		57 mm			0.8 kN
X-FCM-R-L combined with S-BT-GR M8/7 SN 6 AL	Square grating	30 mm	Aluminum: ≥ 270 MPa	$t_{II} \geq 5$ mm	1.8 kN
		60 mm			0.8 kN
	Rectangular grating	30 mm		$t_{II} \geq 5$ mm	0.8 kN
		57 mm			0.8 kN

- Data valid for use with stud extension adapter X-SEA.

Design resistance under tension and shear load for grating fastening system

Load type	Partial factor for actions γ_f	Characteristic resistance
Tension load	1.4	$N_{Rd} = N_{rec} \cdot \gamma_f$
Shear load	1.4	$V_{Rd} = V_{rec} \cdot \gamma_f$

- Design resistance can be calculated.

Characterstic resistance under tension and shear load for grating fastening system

- For characteristic resistance under shear and tension load contact Hilti.

Installation recommendation

Recommended tightening torque for tightening grating element

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM-F L	S-BT-GF M8/7 AN 6, S-BT-MF M8/15 AN 6, S-BT-GF NG M8/7 AN 6	Steel	$3 \leq t_{II} < 5$ mm	5 Nm
			≥ 5 mm	8 Nm
	X-ST-GR M8/10 P8		≥ 6 mm	8 Nm

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM-R L	S-BT-GR M8/7 SN 6, S-BT-GR NG M8/7 SN 6	Steel	$3 \leq t_{II} < 5$ mm	5 Nm
			≥ 5 mm	8 Nm
	X-BT-GR M8/7 SN 8	Steel	≥ 8 mm	8 Nm
	S-BT-GR M8/7 SN 6 AL	Aluminum	$t_{II} \geq 5$ mm	5 Nm

- Data valid for use with stud extension adapter X-SEA.

Tightening tool recommendation for tightening with screwdriver

Designation	Clutch type (stop detection)	Tightening torque T_{rec} = 5 Nm		T_{rec} = 8 Nm	
		Tool power level adjustment			
		Gear	Clutch	Gear	Clutch
SF 2-A12	TRC	1	15	1	15
SF 2H-A12	TRC	1	15	1	15
SF 4-A22	TRC	1	4	1	8
SF 6-A22	ESC (SJ)	1	5	1	7
SF 6H-A22	ESC (SJ)	1	5	1	7
SF 18-A	TRC	1	4	1	5
SFC 18-A	TRC	1	4	1	5
SF 22-A	TRC	1	4	1	5
SFC 22-A	TRC	1	4	1	5
SBT 4-A22	TRC	1	5	1	7

- Hilti recommends using a calibrated torque wrench or the Hilti Torque tool to apply the recommended tightening torque.
- Tool power level adjustement is a guiding value which applies to new Hilti screwdriver.
- Tightening torque may vary depending on the user and the application.
- Torque release coupling (TRC): Achievable torque can change over time due to clutch wear.
- Electronic slip clutch (ESC): ESC has 2 stop detections, Soft Joint (SJ) and Hard Joint (HJ). Hard joint detection is activated due to drop in speed (fast stop) and can lead to a torque spike.

Tightening tool recommendation for tightening with Hilti torque tool

Designation	Tightening torque T_{rec}
S-BT 1/4" – 5 Nm	5 Nm
X-BT 1/4" – 8 Nm	8 Nm

- Data valid for use with stud extension adapter X-SEA.

Fastener program

Item no. and description for grating elements

Designation	Item no.	Description
X-FCM-F L 28/33	2354532	Duplex coated grating element for securing grating with large disc
X-FCM-F L 32/37	2354533	
X-FCM-F L 38/43	2354534	
X-FCM-F L 48/53	2354535	
X-FCM-R L 28/33	2354514	Stainless steel grating element for securing grating with large disc
X-FCM-R L 32/37	2354515	
X-FCM-R L 38/43	2354516	
X-FCM-R L 48/53	2354517	

Item no. and description for fastener

Designation	Item no.	Description
S-BT-GF M8/7 AN 6	2140527	Screw-in carbon steel threaded stud
S-BT-MF M8/15 AN 6	2148618	Screw-in carbon steel threaded stud
S-BT-GF NG M8/7 AN 6	2302143	Screw-in carbon steel threaded stud
X-ST-GR M8/10 P8	2122460	Sharp-tip stainless steel threaded stud
X-BT-GR M8/7 SN 8	2194344	Blunt-tip stainless steel threaded stud
S-BT-GR M8/7 SN 6	2140529	Screw-in stainless steel threaded stud
S-BT-GR NG M8/7 SN 6	2302142	Screw-in stainless steel threaded stud
S-BT-GR M8/7 SN 6 AL	2140742	Screw-in stainless steel threaded stud

Item no. and description for tools

Designation	Item no.	Description
BX 3-BTG		Battery-actuated fastening tool
DX 351-BTG		Powder-actuated fastening tool
SF 2-A12		Screwdriver
SF 2H-A12		Screwdriver
SF 4-A22		Screwdriver
SF 6-A22		Screwdriver
SF 6H-A22		Screwdriver
SF 18-A		Screwdriver
SFC 18-A		Screwdriver
SF 22-A		Screwdriver
SFC 22-A		Screwdriver
SBT 4-A22		Screwdriver
S-BT 1/4" – 5 Nm	2143271	Hilti torque tool (5 Nm)
X-BT 1/4" – 8 Nm	2119272	Hilti torque tool (8 Nm)

Item no. and description for accessories

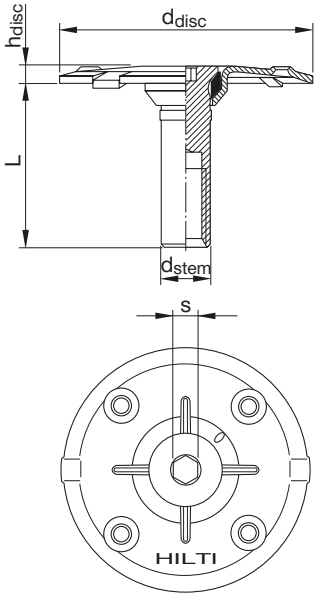
Designation	Item no.	Description
X-SEA-R 30 M8	432274	Stainless steel stud extension adapter
TX-BT 4.7/7-80	2197930	Stepped drill bit
TX-BT 4.7/7-110	2197931	Stepped drill bit
TS-BT 5.5-74 S	2143137	Stepped drill bit
TS-BT 5.5-110 S	2201685	Stepped drill bit
TS-BT 5.5-74 AL	2143138	Stepped drill bit
Allen key – Size 5 mm		Adapter

- Please check delivery times for special item(s) with Hilti Customer Service.

X-FCM-R HL
Securing grating under high load with medium and high corrosion resistance

Dimensions

Technical drawings for grating element

Technical drawing	Designation
	X-FCM-R HL

- Threaded stem, Disc, Absorber O-Ring.

Dimensions for grating elements for narrow gratings

Designation	Grating element length L	Grating element stem diameter d_{stud}	Grating element disc diameter d_{disc}	Grating element disc height h_{disc}	Grating element hex width s
X-FCM-R HL 23/28	18 mm	10.3 mm	50 mm	4 mm	5 mm
X-FCM-R HL 28/33	23 mm				
X-FCM-R HL 32/37	27 mm				
X-FCM-R HL 38/43	33 mm				
X-FCM-R HL 48/53	43 mm				

Material specification

Material specification and material properties for stainless steel parts

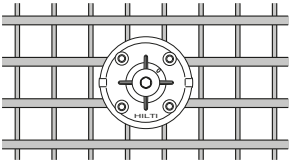
Designation	Element	Material	Coating	Steel grade according to EN 10088	Corrosion resistance class according to EN 1993-1-4
X-FCM-R HL	Disc, threaded stem	Stainless steel	–	1.4404	CRC III

Material specification and material properties for plastic parts

Designation	Element	Material	Color	Other properties
X-FCM-R HL	Absorber O-Ring	Thermoplastic Polyurethane (TPU)	Red	

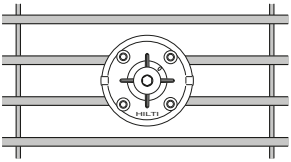
Application recommendation

Grating material and grating material properties for square grating



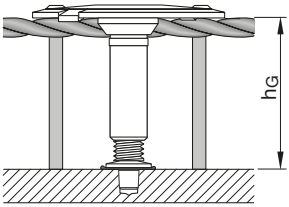
Grating type	Square grating
Grating material	Carbon steel bar grating Stainless steel bar grating Reinforced fiberglass grating
Clear bar spacing $w_{bearing\ bar}$	18 – 44 mm
Clear cross bar spacing $w_{cross\ bar}$	18 – 44 mm
Grating height h_G	23 – 53 mm
Grating height h_G with stud extension adapter X-SEA	53 – 83 mm

Grating material and grating material properties for rectangular grating

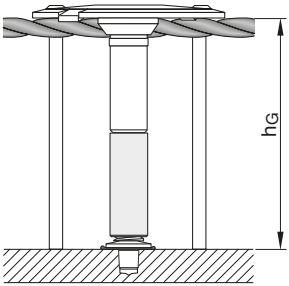


Grating type	Rectangular grating
Grating material	Carbon steel bar grating Stainless steel bar grating Reinforced fiberglass grating
Clear bar spacing $w_{bearing\ bar}$	18 – 44 mm
Clear cross bar spacing $w_{cross\ bar}$	≥ 20 mm
Grating height h_G	23 – 53 mm
Grating height h_G with stud extension adapter X-SEA	53 – 83 mm

Grating element recommendation

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM-R HL 23/28	Stainless steel and reinforced fiberglass	Square and rectangular grating	23 – 28 mm
	X-FCM-R HL 28/33			28 – 33 mm
	X-FCM-R HL 32/37			32 – 37 mm
	X-FCM-R HL 38/43			38 – 43 mm
	X-FCM-R HL 48/53			48 – 53 mm

Grating element recommendation for use with stud extension adapter X-SEA

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM-R HL 23/28	Stainless steel and reinforced fiberglass	Square and rectangular grating	53 – 58 mm
	X-FCM-R HL 28/33			58 – 63 mm
	X-FCM-R HL 32/37			62 – 67 mm
	X-FCM-R HL 38/43			68 – 73 mm
	X-FCM-R HL 48/53			78 – 83 mm

Application areas

- X-FCM-R HL together with X-BT-GR M8/7 SN 8 threaded fasteners forms a high resistance and robust fastening system to fix grating in marine C5 corrosive environment.
- High tension resistance for use in wave zones.

Performance data

Recommended tension and shear load for grating elements

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Tension load N_{rec}	Shear load V_{rec}
X-FCM-R HL	Square grating	$18 \leq w_{bearing\ bar} \leq 38$ mm	3.6 kN	0.6 kN
		$38 < w_{bearing\ bar} \leq 44$ mm	1.2 kN	
	Rectangular grating	$18 \leq w_{bearing\ bar} \leq 24$ mm	2.8 kN	0.4 kN
		$24 < w_{bearing\ bar} \leq 30$ mm	2.1 kN	
		$30 < w_{bearing\ bar} \leq 35$ mm	1.4 kN	
		$35 < w_{bearing\ bar} \leq 44$ mm	0.7 kN	

Recommended tension load for grating fastening system

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Tension load N_{rec}
X-FCM-R-HL combined with X-BT-GR M8/7 SN 8	Square grating	$18 \leq w_{bearing\ bar} \leq 38$ mm	3.6 kN
		$38 < w_{bearing\ bar} \leq 44$ mm	1.2 kN
	Rectangular grating	$18 \leq w_{bearing\ bar} \leq 24$ mm	2.8 kN
		$24 < w_{bearing\ bar} \leq 30$ mm	2.1 kN
		$30 < w_{bearing\ bar} \leq 35$ mm	1.4 kN
		$35 < w_{bearing\ bar} \leq 44$ mm	0.7 kN

- Data valid for use with stud extension adapter X-SEA.

Recommended shear load for grating fastening system

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Grating system extension	Tension load N_{rec}
X-FCM-R HL combined with X-BT-GR M8/7 SN 8	Square grating	$18 \leq w_{bearing\ bar} \leq 44$ mm	–	0.6 kN
			X-SEA-R	0.4 kN
	Rectangular grating	$18 \leq w_{bearing\ bar} \leq 44$ mm	–	0.4 kN
			X-SEA-R	0.4 kN

Design resistance under tension and shear load for grating fastening system

Load type	Partial factor for actions γ_f	Characteristic resistance
Tension load	1.4	$N_{Rd} = N_{rec} \cdot \gamma_f$
Shear load	1.4	$V_{Rd} = V_{rec} \cdot \gamma_f$

- Design resistance can be calculated.

Characterstic resistance under tension and shear load for grating fastening system

- Characteristic tensile loads N_{Rk} can be conservatively calculated by multiplying the recommended load values N_{rec} with the factor 2.8, $N_{Rk} = 2.8 * N_{rec}$.

Installation recommendation

Recommended tightening torque for tightening grating element

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM-R HL	X-BT-GR M8/7 SN 8	Steel	≥ 8 mm	20 Nm

- Data valid for use with stud extension adapter X-SEA.

Tightening tool recommendation for tightening with screwdriver

Designation	Clutch type (stop detection)	Tightening torque T_{rec} = 16 Nm		T_{rec} = 20 Nm	
		Tool power level adjustment			
		Gear	Clutch	Gear	Clutch
SF 6-A22	ESC (SJ)	1	13	1	15
SF 6H-A22	ESC (SJ)	1	13	1	15

- Data valid for use with stud extension adapter X-SEA.
- Hilti recommends using a calibrated torque wrench or the Hilti Torque tool to apply the recommended tightening torque.
- Tool power level adjustement is a guiding value which applies to new Hilti screwdriver.
- Tightening torque may vary depending on the user and the application.
- Electronic slip clutch (ESC): ESC has 2 stop detections, Soft Joint (SJ) and Hard Joint (HJ). Hard joint detection is activated due to drop in speed (fast stop) and can lead to a torque spike.

Tightening tool recommendation for tightening with Hilti torque tool

Designation	Tightening torque T_{rec}
X-BT 1/4" – 20 Nm	20 Nm

- Data valid for use with stud extension adapter X-SEA.

Fastener program

Item no. and description

Designation	Item no.	Description
X-FCM-R HL 23/28	2349142	Stainless steel grating element for securing grating under high load
X-FCM-R HL 28/33	2349143	
X-FCM-R HL 32/37	2349144	
X-FCM-R HL 38/43	2349145	
X-FCM-R HL 48/53	2349146	

Item no. and description for fastener and stud extension adapter

Designation	Item no.	Description
X-BT-GR M8/7 SN 8	2194344	Threaded stud for highly corrosive environment

Item no. and description for tools

Designation	Item no.	Description
BX 3-BTG		Battery-actuated fastening tool
DX 351-BTG		Powder-actuated fastening tool
SF 6-A22		Screwdriver
SF 6H-A22		Screwdriver
X-BT 1/4" – 20 Nm		Hilti torque tool (20 Nm)

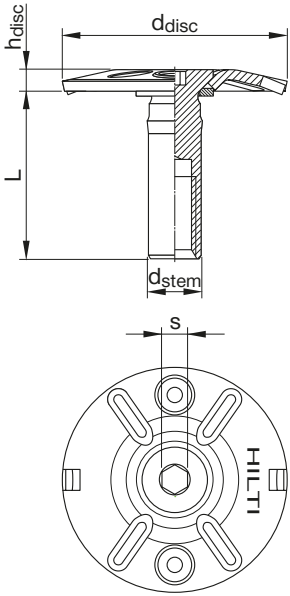
Item no. and description for accessories

Designation	Item no.	Description
X-SEA-R 30 M8	432274	Stainless steel stud extension adapter
TX-BT 4.7/7-80	2197930	Stepped drill bit
TX-BT 4.7/7-110	2197931	Stepped drill bit
Allen key – Size 5mm		Adapter

X-FCM-F NG, X-FCM-R NG
Securing narrow grating with medium and high corrosion resistance

Dimensions

Technical drawings for grating element

Technical drawing	Designation
	X-FCM-F NG, X-FCM-R NG

- Threaded stem, Disc, Absorber O-Ring.

Dimensions for grating elements for narrow gratings

Designation		Grating element length L	Grating element stem diameter d_{stud}	Grating element disc diameter d_{disc}	Grating element disc height h_{disc}	Grating element hex width s
X-FCM-F NG 23/28	X-FCM-R NG 23/28	18 mm	10.3 mm	44 mm	4 mm	5 mm
X-FCM-F NG 28/33	X-FCM-R NG 28/33	23 mm				
X-FCM-F NG 32/37	X-FCM-R NG 32/37	27 mm				
X-FCM-F NG 38/43	X-FCM-R NG 38/43	33 mm				
X-FCM-F NG 48/53	X-FCM-R NG 48/53	43 mm				

Material specification

Material specification and material properties for carbon steel parts

Designation	Element	Material	Coating	Coating thickness	Category of corrosivity of the atmosphere according to EN ISO 9223
X-FCM-F NG	Disc, threaded stem	Carbon steel	Duplex coated	≥ 45 µm	C3

- Duplex coated steel is comparable to HDG steel.
- Duplex coated steel is tested according to EN ISO 9227: NSS/AASS/CASS, 480 h on salt spray exposure.

Material specification and material properties for stainless steel parts

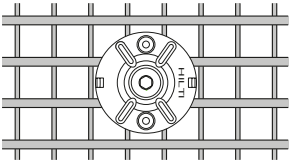
Designation	Element	Material	Coating	Steel grade according to EN 10088	Corrosion resistance class according to EN 1993-1-4
X-FCM-R NG	Disc, threaded stem	Stainless steel	–	1.4404	CRC III

Material specification and material properties for plastic parts

Designation	Element	Material	Color	Other properties
X-FCM-F NG	Absorber	Polyure-thane (PUR)	Black	
X-FCM-R NG	O-Ring			

Application recommendation

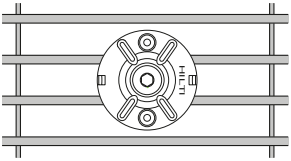
Grating material and grating material properties for square grating



Grating type	Square grating
Grating material	Carbon steel bar grating Stainless steel bar grating Reinforced fiberglass grating
Bearing bar thickness $t_{bearing\ bar}$	5 mm
Clear bar spacing $w_{bearing\ bar}$	18 – 22 mm
Clear cross bar spacing $w_{cross\ bar}$	18 – 22 mm
Grating height h_G	23 – 53 mm
Grating height h_G with stud extension adapter X-SEA	53 – 83 mm

- Deviating bearing bar thickness can be qualified by grating manufacturer.

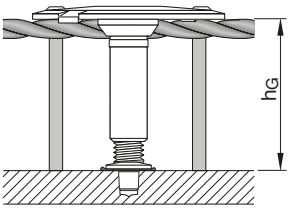
Grating material and grating material properties for rectangular grating



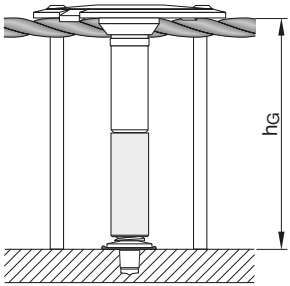
Grating type	Rectangular grating
Grating material	Carbon steel bar grating Stainless steel bar grating Reinforced fiberglass grating
Bearing bar thickness $t_{bearing\ bar}$	5 mm
Clear bar spacing $w_{bearing\ bar}$	13 – 22 mm
Clear cross bar spacing $w_{cross\ bar}$	≥ 18 mm
Grating height h_G	23 – 53 mm
Grating height h_G with stud extension adapter X-SEA	53 – 83 mm

- Deviating bearing bar thickness can be qualified by grating manufacturer.

Grating element recommendation

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM-F NG 23/28	Carbon steel and reinforced fiberglass	Square and rectangular grating	23 – 28 mm
	X-FCM-F NG 28/33			28 – 33 mm
	X-FCM-F NG 32/37			32 – 37 mm
	X-FCM-F NG 38/43			38 – 43 mm
	X-FCM-F NG 48/53			48 – 53 mm
	X-FCM-R NG 23/28	Stainless steel and reinforced fiberglass	Square and rectangular grating	23 – 28 mm
	X-FCM-R NG 28/33			28 – 33 mm
	X-FCM-R NG 32/37			32 – 37 mm
	X-FCM-R NG 38/43			38 – 43 mm
	X-FCM-R NG 48/53			48 – 53 mm

Grating element recommendation for use with stud extension adapter X-SEA

Technical drawing	Designation	Grating material	Grating type	Grating height h_G
	X-FCM-R NG 23/28	Stainless steel and reinforced fiberglass	Square and rectangular grating	53 – 58 mm
	X-FCM-R NG 28/33			58 – 63 mm
	X-FCM-R NG 32/37			62 – 67 mm
	X-FCM-R NG 38/43			68 – 73 mm
	X-FCM-R NG 48/53			78 – 83 mm

- Please contact Hilti for grating element recommendation when the requirements deviate from the standard.

Performance data

Recommended tension load for grating fastening system

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Base material steel grade	Base material thickness t_{II}	Tension load N_{rec}
X-FCM-F NG combined with S-BT-GF NG M8/7 AN 6	Square grating	18 mm	S235 Jxx – S275 Jxx	$3 \leq t_{II} < 5$ mm	1.9 kN
		22 mm			1.7 kN
		18 mm	S280 GD – S350 GD	$t_{II} \geq 5$ mm	2.0 kN
		22 mm			1.7 kN
	Square grating	18 mm	S355 Jxx, S420	$3 \leq t_{II} < 5$ mm	2.3 kN
		22 mm			1.7 kN
		18 mm	S390 GD – S420 GD	$t_{II} \geq 5$ mm	2.4 kN
		22 mm			1.7 kN
X-FCM-F NG combined with S-BT-GF NG M8/7 AN 6	Rectangular grating	13 mm	S235 Jxx – S275 Jxx S280 GD – S350 GD	$3 \leq t_{II} < 5$ mm	1.9 kN
		18 mm			1.9 kN
		22 mm			1.2 kN
		13 mm		$t_{II} \geq 5$ mm	2.0 kN
		18 mm			2.0 kN
		22 mm			1.2 kN
	Rectangular grating	13 mm	S355 Jxx, S420 S390 GD – S420 GD	$3 \leq t_{II} < 5$ mm	2.3 kN
		18 mm			2.1 kN
		22 mm			1.2 kN
		13 mm		$t_{II} \geq 5$ mm	2.4 kN
		18 mm			2.1 kN
		22 mm			1.2 kN

Designation	Grating type	Clear bar spacing $w_{bearing\ bar}$	Base material steel grade	Base material thickness t_{II}	Tension load N_{rec}
X-FCM-R NG combined with S-BT-GR NG M8/7 SN 6	Square grating	18 mm	S235 Jxx – S275 Jxx	$3 \leq t_{II} < 5$ mm	1.8 kN
		22 mm			
		18 mm	S280 GD – S350 GD	$t_{II} \geq 5$ mm	1.9 kN
		22 mm			
	Square grating	18 mm	S355 Jxx, S420 S390 GD – S420 GD	$3 \leq t_{II} < 5$ mm	2.1 kN
		22 mm			
		18 mm		$t_{II} \geq 5$ mm	2.3 kN
		22 mm			
X-FCM-R NG combined with S-BT-GR NG M8/7 SN 6	Rectangular grating	13 mm	S235 Jxx – S275 Jxx S280 GD – S350 GD	$3 \leq t_{II} < 5$ mm	1.9 kN
		18 mm			1.9 kN
		22 mm			1.2 kN
		13 mm		$t_{II} \geq 5$ mm	2.0 kN
		18 mm			2.0 kN
		22 mm			1.2 kN
	Rectangular grating	13 mm	S355 Jxx, S420 S390 GD – S420 GD	$3 \leq t_{II} < 5$ mm	2.1 kN
		18 mm			
		22 mm			
		13 mm		$t_{II} \geq 5$ mm	2.3 kN
		18 mm			2.3 kN
		22 mm		$t_{II} \geq 3$ mm	2.1 kN

- Data valid for use with stud extension adapter X-SEA.

Recommended shear load for grating fastening system

- Not suitable for explicit shear load design, e.g. diaphragms.
- Shear resistance by friction is depending on surface characteristics.
- Shear loads up to 0.3 kN will not result in permanent deformation.
- Small unexpected shear loads can be accommodated without damage.

Design resistance under tension and shear load for grating fastening system

Load type	Partial factor for actions γ_f	Characteristic resistance
Tension load	1.4	$N_{Rd} = N_{rec} \cdot \gamma_f$
Shear load	1.4	$V_{Rd} = V_{rec} \cdot \gamma_f$

- Design resistance can be calculated.

Characterstic resistance under tension and shear load for grating fastening system

- For characteristic resistance under shear and tension load contact Hilti.

Installation recommendation

Recommended tightening torque for tightening grating element

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM-F NG	S-BT-GF NG M8/7 AN 6	Steel	$t_{II} \geq 3$ mm	5 Nm

Designation Grating element combined with fastener		Base material	Base material thickness t_{II}	Tightening torque T_{rec}
X-FCM-R NG	S-BT-GR NG M8/7 SN 6	Steel	$t_{II} \geq 3$ mm	8 Nm

- Data valid for use with stud extension adapter X-SEA.

Tightening tool recommendation for tightening with screwdriver

Designation	Clutch type (stop detection)	Tightening torque			
		T_{rec} = 5 Nm		T_{rec} = 8 Nm	
		Tool power level adjustment			
		Gear	Clutch	Gear	Clutch
SF 2-A12	TRC	1	15	n.a.	n.a.
SF 2H-A12	TRC	1	15	n.a.	n.a.
SF 4-A22	TRC	1	4	1	8
SF 6-A22	ESC (SJ)	1	5	1	7
SF 6H-A22	ESC (SJ)	1	5	1	7
SFC 22-A	TRC	1	4	1	5
SBT 4-A22	TRC	1	5	1	7

- Hilti recommends using a calibrated torque wrench or the Hilti Torque tool to apply the recommended tightening torque.
- Tool power level adjustement is a guiding value which applies to new Hilti screwdriver.
- Tightening torque may vary depending on the user and the application.
- Torque release coupling (TRC): Achievable torque can change over time due to clutch wear.
- Electronic slip clutch (ESC): ESC has 2 stop detections, Soft Joint (SJ) and Hard Joint (HJ). Hard joint detection is activated due to drop in speed (fast stop) and can lead to a torque spike.

Tightening tool recommendation for tightening with Hilti torque tool

Designation	Tightening torque T_{rec}
S-BT 1/4" – 5 Nm	5 Nm
X-BT 1/4" – 8 Nm	8 Nm

- Data valid for use with stud extension adapter X-SEA.

Fastener program

Item no. and description

Designation	Item no.	Description
X-FCM-F NG 23/28	2351686	Duplex coated grating element for securing grating with standard disc
X-FCM-F NG 28/33	2279753	
X-FCM-F NG 32/37	2279754	
X-FCM-F NG 38/43	2279755	
X-FCM-F NG 48/53	2279756	
X-FCM-R NG 23/28	2351685	Stainless steel grating element for securing grating with standard disc
X-FCM-R NG 28/33	2279757	
X-FCM-R NG 32/37	2279758	
X-FCM-R NG 38/43	2279759	
X-FCM-R NG 48/53	2279752	

Item no. and description for fastener and stud extension adapter

Designation	Item no.	Description
S-BT-GF NG M8/7 AN 6	2302143	Screw-in carbon steel threaded stud
S-BT-GR NG M8/7 SN 6	2302142	Screw-in stainless steel threaded stud

Item no. and description for tools

Designation	Item no.	Description
SF 2-A12		Screwdriver
SF 2H-A12		Screwdriver
SF 4-A22		Screwdriver
SF 6-A22		Screwdriver
SF 6H-A22		Screwdriver
SFC 22-A		Screwdriver
SBT 4-A22		Screwdriver
S-BT 1/4" – 5 Nm	2143271	Hilti torque tool (5 Nm)
X-BT 1/4" – 8 Nm	2119272	Hilti torque tool (8 Nm)

Item no. and description for accessories

Designation	Item no.	Description
X-SEA-R 30 M8	432274	Stainless steel stud extension adapter
TS-BT 5.5-110 S	2201685	Stepped drill bit for use with S-CS NG
S-CS NG	2310191	Centering space
S-DG BT M8/7 Short 6	2279735	Depth gauge
Allen key – Size 5 mm		Adapter

- Please check delivery times for special item(s) with Hilti Customer Service.