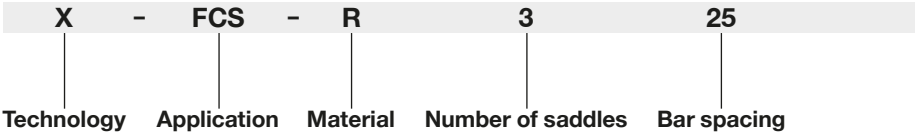
X-FCS-R
DATA SHEET

Grating element

June 2022

X-FCS-R Grating element

X-FCS-R Grating element designation



Technology:

X	DX solution

Application:

FCS	Grating element

Material:

R	Stainless steel

Number of saddles:

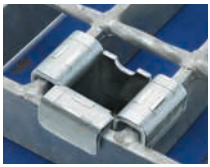
3	Three fastening saddles
4	Four fastening saddles

Bar spacing:

25	Bar spacing

Product data

X-FCS-R-3-25



X-FCS-R-4-25

Product description

- Grating fastening system is an approved system for securing gratings under tension and shear load
- Grating element is available with three saddles for rectangular gratings and four saddles for square gratings
- Grating element X-FCS-R can be combined with various fasteners

Grating fastening system

	Fastener		
Grating element	X-BT M8-15-6 SN 12 R	X-BT-GR M8/7 SN 8	S-BT-GR M8/7 SN 6
X-FCS-R-3-25	●	●	●
X-FCS-R-4-25	●	●	●

Material specification and material properties

Material specification and material properties for stainless steel parts

Grating fastening system		Material	Coating	Steel grade acc. to		Corrosion resistance
				EN 10088	ASTM AISI SAE	acc. to EN 1993-1-4
X-FCS-R-3-25	Saddle	Stainless steel	none	1.4404	316 L	CRC III
X-FCS-R-3-25	Threaded nut	Stainless steel	none	1.4401	316	CRC III
X-FCS-R-4-25	Saddle	Stainless steel	none	1.4404	316 L	CRC III
X-FCS-R-4-25	Threaded nut	Stainless steel	none	1.4401	316	CRC III

Grating fastening system recommendation under various environmental conditions

Environmental condition		Grating fastening system		
		X-FCS-R combined with X-BT M8-15-6 SN 12 R	X-FCS-R combined with X-BT-GR M8/7 SN8	X-FCS-R combined with S-BT-GR M8/7 SN6
	Dry indoor	■	■	■
	Indoor with temporary condensation	■	■	■
	Outdoor with low pollution	■	■	■
	Outdoor with moderate concentration of pollutants	■	■	■
	Coastal areas	■	■	■
	Outdoor, areas with heavy industrial pollution	■	■	■
	Close proximity to roads	■	■	■
	Special application	Please contact our Expert Hilti Engineers to support recommendation		
	Special application			

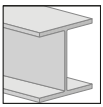
■ = Suitable for corrosion prevention

■ = Feasible for corrosion prevention

Further information can be found in following Hilti brochures:

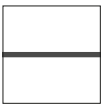
- X-BT Threaded Fastener Specification
- New Generation X-BT-GR, X-BT-MR and X-BT-ER Threaded Fastener Specification
- S-BT Threaded Fastener Specification
- Corrosion handbook

Base material



Steel

Load condition



Static / quasi static

Approval/certificate

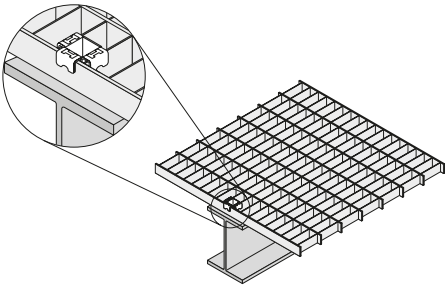
Authority	American Bureau of Shipping	Bureau Veritas	Det Norske Veritas Germanischer Lloyd	Lloyd's Register	RINA

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

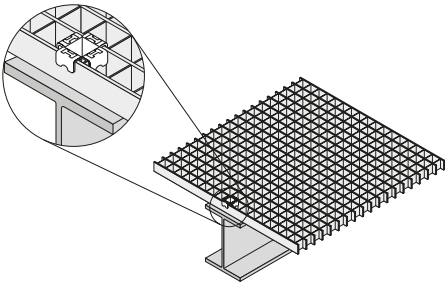
Approvals/certificates available for following grating fastening systems:
X-FCS-R-3-25 (Saddles connected to bearing bar: 3)
X-FCS-R-4-25 (Saddles connected to bearing bar: 4)

Application

Securing rectangular grating



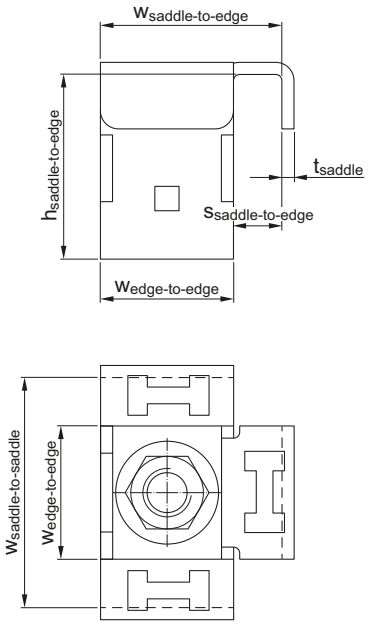
Securing square grating



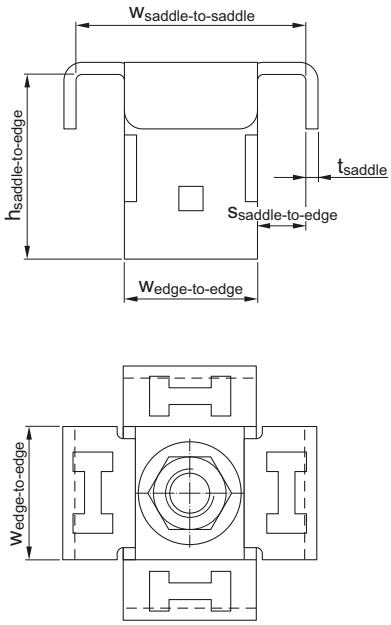
Grating element

Grating element definition

X-FCS-R-3-25



X-FCS-R-4-25



$w_{saddle\text{-}to\text{-}edge}$ = Width between saddle and edge
$w_{saddle\text{-}to\text{-}saddle}$ = Width between saddles
$w_{edge\text{-}to\text{-}edge}$ = Grating element width
$s_{saddle\text{-}to\text{-}edge}$ = Spacing between saddle and grating edge
t_{saddle} = Saddle thickness
$h_{saddle\text{-}to\text{-}edge}$ = Grating element height

Grating element definition

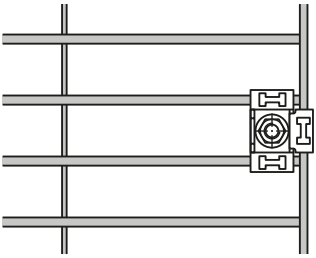
Grating element	Saddle width	Grating element width	Spacing between saddle and grating element	Saddle thickness	Grating element height
	$w_{saddle\text{-}to\text{-}edge}$ $w_{saddle\text{-}to\text{-}saddle}$	$w_{edge\text{-}to\text{-}edge}$	$s_{saddle\text{-}to\text{-}saddle}$	t_{saddle}	$h_{saddle\text{-}to\text{-}edge}$
X-FCS-R-3-25 31/35	30 mm	22 mm	8 mm	2 mm	30.5 mm
X-FCS-R-3-25 37/41	30 mm	22 mm	8 mm	2 mm	36.5 mm
X-FCS-R-4-25 31/35	38 mm	22 mm	8 mm	2 mm	30.5 mm
X-FCS-R-4-25 37/41	38 mm	22 mm	8 mm	2 mm	36.5 mm

Grating fastening

Grating element for rectangular grating fastening

X-FCS-R-3-25 31/35
X-FCS-R-3-25 37/41

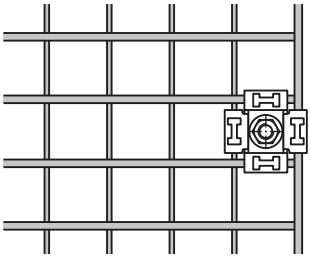
3 saddles
connected to bearing bar



Grating element for square grating fastening

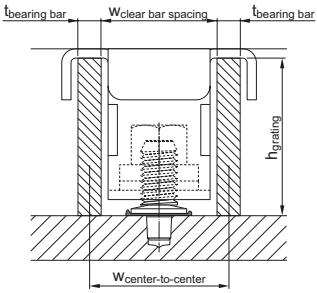
X-FCS-R-4-25 31/35
X-FCS-R-4-25 37/41

4 saddles
connected to bearing bar



Grating definition

Example: Fastening with X-BT



$t_{bearing\ bar}$	Bearing bar thickness
$w_{clear\ bar\ spacing}$	Clear bar spacing
$w_{center\text{-}to\text{-}center}$	Center-to-center bar spacing
$h_{grating}$	Grating height

Grating dimension

Grating element	Bearing bar thickness	Clear bar spacing	Center-to-center bar spacing	Minimum grating height	Maximum grating height
	$t_{bearing\ bar}$	$w_{bearing\ bar}$	$w_{center\text{-}to\text{-}center}$	$h_{grating,\ min}$	$h_{grating,\ max}$
X-FCS-R-3-25 31/35	5 mm	25 mm	30 mm	31 mm	35 mm
X-FCS-R-3-25 37/41	5 mm	25 mm	30 mm	37 mm	41 mm
X-FCS-R-4-25 31/35	5 mm	25 mm	30 mm	31 mm	35 mm
X-FCS-R-4-25 37/41	5 mm	25 mm	30 mm	37 mm	41 mm

Load data

Design concept for single fastening points under tension and shear load

Recommended resistance under tension load	Design resistance under tension load
$N_{rec} = \min \{N_{rec,\ grating\ element}; N_{rec,\ fastener}\}$	$N_{Rd} = \min \{N_{Rd,\ grating\ element}; N_{Rd,\ fastener}\}$
Recommended resistance under shear load	**Design resistance under shear load**
$V_{rec} = \min \{V_{rec,\ grating\ element}; V_{rec,\ fastener}\}$	$V_{Rd} = \min \{V_{Rd,\ grating\ element}; V_{Rd,\ fastener}\}$

Design concept for load interaction

Recommended resistance under combined load	Design resistance under combined load
$\frac{N}{N_{rec}} + \frac{V}{V_{rec}} \leq 1.2$	$\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \leq 1.2$

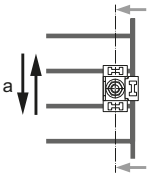
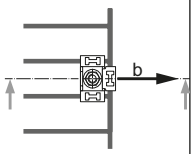
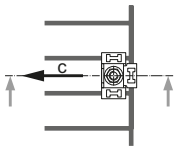
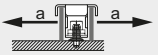
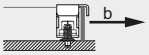
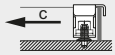
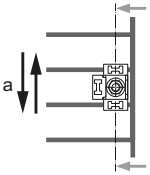
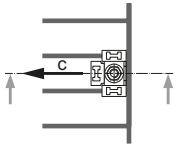
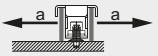
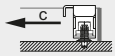
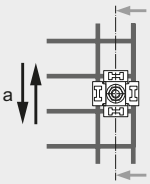
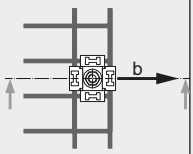
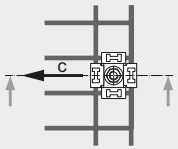
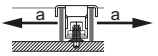
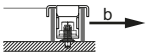
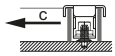
N_{rec} = Recommended resistance under tension load for grating fastening system
$N_{rec,\ grating\ element}$ = Recommended resistance under tension load for grating element
$N_{rec,fastener}$ = Recommended resistance under tension load for fastener

V_{rec} = Recommended resistance under shear load for grating fastening system
$V_{rec,\ grating\ element}$ = Recommended resistance under shear load for grating element
$V_{rec,\ fastener}$ = Recommended resistance under shear load for fastener

N_{Sd} = Design tension load
N_{Rd} = Design resistance under tension load for grating fastening system
$N_{Rd,\ grating\ element}$ = Design resistance under tension load for grating element
$N_{Rd,\ fastener}$ = Design resistance under tension load for fastener

V_{Sd} = Design shear load
V_{Rd} = Design resistance under shear load for grating fastening system
$V_{Rd,\ grating\ element}$ = Design resistance under shear load for grating element
$V_{Rd,\ fastener}$ = Design resistance under shear load for fastener

Shear load direction definition for single fastening points

Grating element	Saddles connected to bearing bar	Shear load direction		
		Load direction a	Load direction b	Load direction c
X-FCS-R-3-25	3			
				
X-FCS-R-3-25	2		Not admissible	
			Not admissible	
				Contact connection of 2 saddles to the bearing bar is required
X-FCS-R-4-25	4			
				

Recommended resistance under tension and shear load for single fastening points

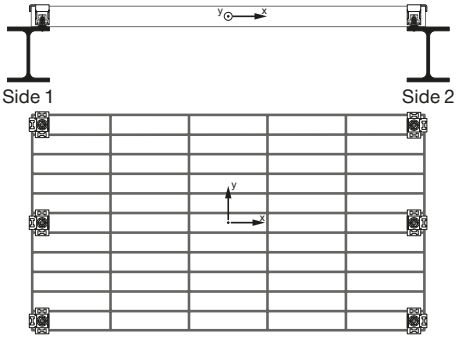
Grating element	Saddles connected to bearing bars	Base material (EN 10025-2)	Base material (ASTM AISI SAE)	Resistance under tension and shear load	Base material thickness		
					$t_{II} \geq 8$ mm	$t_{II} \geq 8$ mm	$t_{II} \geq 6$ mm
					X-BT M8-15-6 SN 12-R	X-BT-GR M8/7 SN 8	S-BT-GR M8/7 SN 6
X-FCS-R-3-25	3	S235	A36	N_{rec}	1.8 kN	2.6 kN	1.8 kN
				$V_{rec,\ direction\ a}$	2.6 kN	4.3 kN	2.6 kN
				$V_{rec,\ direction\ b}$	0.8 kN	0.8 kN	0.8 kN
				$V_{rec,\ direction\ c}$	2.6 kN	4.3 kN	2.6 kN
		S355	Grade 50	N_{rec}	2.3 kN	2.6 kN	2.3 kN
				$V_{rec,\ direction\ a}$	3.2 kN	4.3 kN	3.2 kN
				$V_{rec,\ direction\ b}$	0.8 kN	0.8 kN	0.8 kN
				$V_{rec,\ direction\ c}$	3.2 kN	4.3 kN	3.2 kN
X-FCS-R-3-25	2	S235	A36	N_{rec}	–	1.7 kN	–
				$V_{rec,\ direction\ a}$	–	4.3 kN	–
				$V_{rec,\ direction\ b}$	–	–	–
				$V_{rec,\ direction\ c}$	–	4.3 kN	–
		S355	Grade 50	N_{rec}	–	1.7 kN	–
				$V_{rec,\ direction\ a}$	–	4.3 kN	–
				$V_{rec,\ direction\ b}$	–	–	–
				$V_{rec,\ direction\ c}$	–	4.3 kN	–
X-FCS-R-4-25	4	S235	A36	N_{rec}	1.8 kN	2.6 kN	1.8 kN
				$V_{rec,\ direction\ a}$	2.6 kN	4.3 kN	2.6 kN
				$V_{rec,\ direction\ b}$	2.6 kN	4.3 kN	2.6 kN
				$V_{rec,\ direction\ c}$	2.6 kN	4.3 kN	2.6 kN
		S355	Grade 50	N_{rec}	2.3 kN	2.6 kN	2.3 kN
				$V_{rec,\ direction\ a}$	3.2 kN	4.3 kN	3.2 kN
				$V_{rec,\ direction\ b}$	3.2 kN	4.3 kN	3.2 kN
				$V_{rec,\ direction\ c}$	3.2 kN	4.3 kN	3.2 kN

Design resistance under tension and shear load for single fastening points

Grating element	Saddles connected to bearing bars	Base material (EN 10025-2)	Base material (ASTM AISI SAE)	Resistance under tension and shear load	Base material thickness		
					$t_{II} \geq 8$ mm	$t_{II} \geq 8$ mm	$t_{II} \geq 6$ mm
					X-BT M8-15-6 SN 12-R	X-BT-GR M8/7 SN 8	S-BT-GR M8/7 SN 6
X-FCS-R-3-25	3	S235	A36	N_{Rd}	2.5 kN	3.6 kN	2.5 kN
				$V_{Rd,\ direction\ a}$	3.6 kN	6.0 kN	3.6 kN
				$V_{Rd,\ direction\ b}$	1.1 kN	1.1 kN	1.1 kN
				$V_{Rd,\ direction\ c}$	3.6 kN	6.0 kN	3.6 kN
		S355	Grade 50	N_{Rd}	3.2 kN	3.6 kN	3.2 kN
				$V_{Rd,\ direction\ a}$	4.5 kN	6.0 kN	4.5 kN
				$V_{Rd,\ direction\ b}$	1.1 kN	1.1 kN	1.1 kN
				$V_{Rd,\ direction\ c}$	4.5 kN	6.0 kN	4.5 kN
X-FCS-R-3-25	2	S235	A36	N_{Rd}	–	2.2 kN	–
				$V_{Rd,\ direction\ a}$	–	6.0 kN	–
				$V_{Rd,\ direction\ b}$	–	–	–
				$V_{Rd,\ direction\ c}$	–	6.0 kN	–
		S355	Grade 50	N_{Rd}	–	2.2 kN	–
				$V_{Rd,\ direction\ a}$	–	6.0 kN	–
				$V_{Rd,\ direction\ b}$	–	–	–
				$V_{Rd,\ direction\ c}$	–	6.0 kN	–
X-FCS-R-4-25	4	S235	A36	N_{Rd}	2.5 kN	3.6 kN	2.5 kN
				$V_{Rd,\ direction\ a}$	3.6 kN	6.0 kN	3.6 kN
				$V_{Rd,\ direction\ b}$	3.6 kN	6.0 kN	3.6 kN
				$V_{Rd,\ direction\ c}$	3.6 kN	6.0 kN	3.6 kN
		S355	Grade 50	N_{Rd}	3.2 kN	3.6 kN	3.2 kN
				$V_{Rd,\ direction\ a}$	4.5 kN	6.0 kN	4.5 kN
				$V_{Rd,\ direction\ b}$	4.5 kN	6.0 kN	4.5 kN
				$V_{Rd,\ direction\ c}$	4.5 kN	6.0 kN	4.5 kN

Design concept for multiple fastening points under tension and shear load

Example: Recommended resistance for rectangular grating under symmetrical load in x-axis



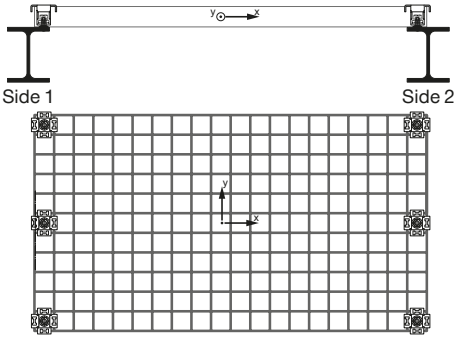
Grating element: X-FCS-R-3-25
Saddles connected to bearing bar: 3
Fastener: X-BT M8-15-6 SN 12 R
Base material: S235
Base material thickness: t_{II} = 8 mm

$N_{rec, GR} = (n_1 + n_2) \cdot N_{rec}$
$= 6 \cdot 1.8 = 10.8$ kN
$V_{rec, GR, y} = 2 \cdot \min\{n_1; n_2\} \cdot V_{rec, a}$
$= 2 \cdot 3 \cdot 2.6 = 15.6$ kN
$V_{rec, GR, x} = n_1 \cdot V_{rec, c}$
$= 3 \cdot 2.6 = 7.8$ kN

X-FCS-R-3-25 per side of rectangular grating:
Number of X-FCS-R side 1: n_1 = 3
Number of X-FCS-R side 2: n_2 = 3

Note: Load resistance in direction b is neglected due to lower stiffness in direction b compared to direction c.

Example: Design resistance for square grating under symmetrical load in x-axis



Grating element: X-FCS-R-4-25
Saddles connected to bearing bar: 4
Fastener: S-BT-GR M8/7 SN 6
Base material: S355
Base material thickness: t_{II} = 6 mm

$N_{Rd, GR} = (n_1 + n_2) \cdot N_{Rd}$
$= 6 \cdot 3.2 = 19.2$ kN
$V_{rec, GR, y} = 2 \cdot \min\{n_1; n_2\} \cdot V_{rec, a}$
$= 2 \cdot 3 \cdot 4.5 = 27.0$ kN
$V_{rec, GR, x} = (n_1 + n_2) \cdot V_{rec, c}$
$= 6 \cdot 4.5 = 27.0$ kN

X-FCS-R-4-25 per side of rectangular grating:
Number of X-FCS-R side 1: n_1 = 3
Number of X-FCS-R side 2: n_2 = 3

Note: Load resistance in direction b is neglected due to lower stiffness in direction b compared to direction c.

System recommendation

System recommendation for tightening grating element

Grating element	Fastener	Torque moment	Tightening tool	Nut setter
X-FCS-R-3-25 X-FCS-R-4-25	X-BT M8-15-6 SN 12-R	8 Nm	SBT 4-A22[1)] SFC 22-A[1)]	S-NS 12 C 95/3 3/4"
	X-BT-GR M8/7 SN 8	20 Nm		
	S-BT-GR M8/7 SN 6	8 Nm		

[1)] Other tightening tools with torque moment control function can be used.

Fastener setting and installation information

Fastener setting information (e.g. base material properties, fastened material properties and setting energy) and installation information (e.g. quality assurance) are part of the corresponding Product Data Sheet for fasteners.

Grating fastening system component

Component	Designation	Item no.
Grating element	X-FCS-R-3-25 31/35	2198296
Grating element	X-FCS-R-3-25 37/41	2198297
Grating element	X-FCS-R-4-25 31/35	2198298
Grating element	X-FCS-R-4-25 37/41	2198299
Fastener	X-BT M8-15-6 SN 12 R	377074
Fastener	X-BT-GR M8/7 SN 8	2194344
Fastener	S-BT-GR M8/7 SN 6	2140529