Fastening of MM channels with Hilti power-actuated fasteners

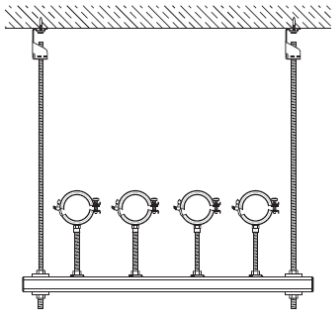
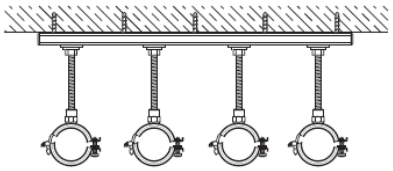
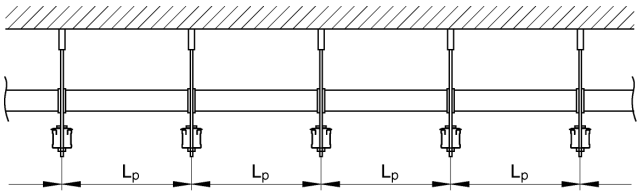
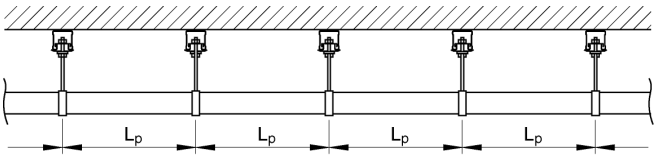
Application Fastener selection
Application tables
Execution Fastening quality

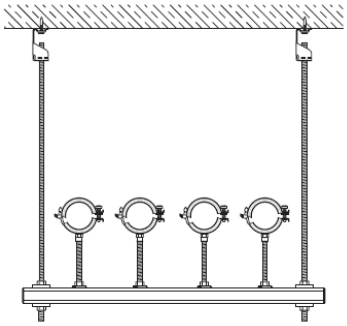
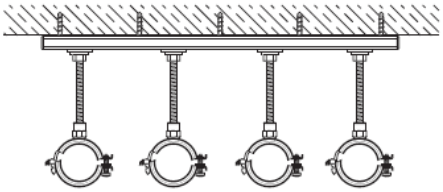
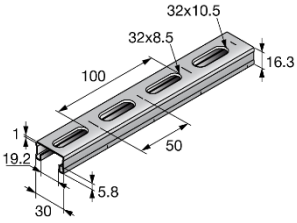
August 2024

Fastening of MM channels for connection of water-filled pipes with power-actuated fasteners

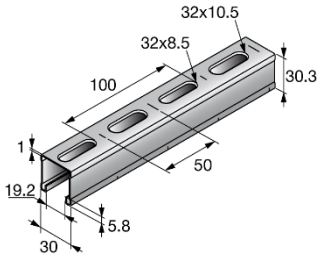
Application and fastener selection

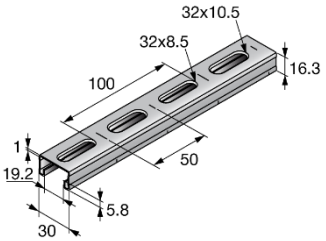
Types of construction and allocation of recommended power-actuated fastener

Trapeze construction	Channel directly fastened to the substrate
	
Static model for pipes  Channel spacing: $L_p \leq 3.0$ m Continuous pipe with at least 5 supports.	Static model for pipes  Channel spacing: $L_p \leq 3.0$ m Continuous pipe with at least 5 supports.
Base material **Concrete** Powder-actuated fasteners without pre-drilling (DX-Standard): • X-HS M8 U32 P8 S15 • X-HS M10 U32 P8 S15 Powder-actuated fasteners with pre-drilling (DX-Kwik): • X-HS M8 DKH 48 P8 S15 • X-HS M10 DKH 48 P8 S15 Battery-actuated fasteners with pre-drilling (BX-Kwik); • X-EHS with X-P 24 B3 MX and X-P 24 B4 MX (maximum grade C50/60)	Base material **Concrete** Power-actuated fasteners without pre-drilling (DX-Standard): • X-P 17 B3 MX (maximum grade C30/37) • X-P 17 B4 MX (maximum grade C30/37) • X-P 17 G3 MX (maximum grade C30/37) • X-U 27 P8 (maximum grade C50/60)
Base material **Steel** • X-HS M8 U19 P8 S15 • X-HS M10 U19 P8 S15	Base material **Steel** • X-U 16 P8 • X-U 15 P8TH

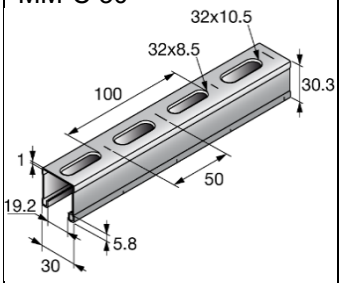
<table>
<tr><th>Trapeze construction</th><th>Channel directly fastened to the substrate</th></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Channel and fastener selection for the base material concrete</td><td>Channel and fastener selection for the base material concrete</td></tr>
<tr><td>MM-C 16
 

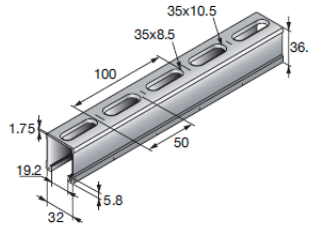
• for DX-Standard, DX-Kwik and BX Kwik

MM-C 30
 

• for DX-Kwik</td><td>MM-C 16
 

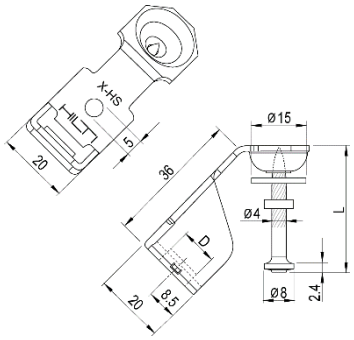
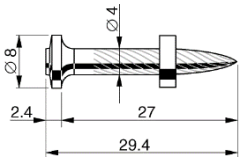
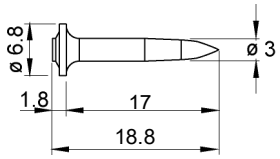
• for X-P 17 B3 MX, X-P 17 B4 MX, X-P 17 G3 MX and X-U 27 P8

MM-C 30
 

• for X-U 27 P8</td></tr>
<tr><td>MM-C 36
 

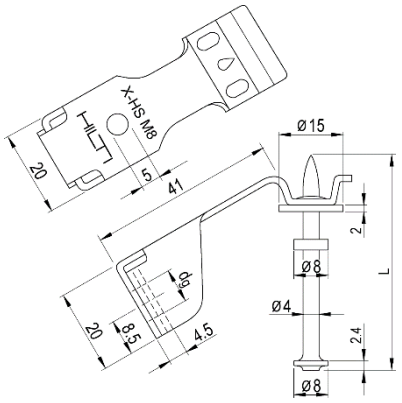
• for DX-Kwik</td><td></td></tr>
<tr><td colspan="2">Pipes filled with water and with 100 % insulation:
• Medium heavy steel pipes according to DIN 2440 and medium type M according to DIN EN 10255, respectively
• Stainless steel pipes according to DIN 17455
• Copper pipes according to DIN 1786, DIN 1754 and EN 1057, respectively
• Geberit Mepla metal composite pipes
Recommended diameter and number of pipes depend on the span of the pipes (= channel spacing) and the selected power-actuated fastener (see the application tables).</td></tr>
</table>

Power-actuated fasteners „DX-Standard“ without pre-drilling for fastenings to concrete

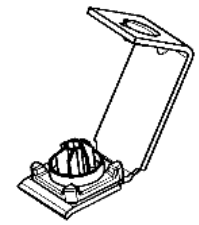
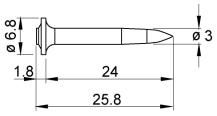
Fastener / Concrete grade		Fastening tool
X-HS M8 U32 P8 S15 Item number: 361789 **X-HS M10 U32 P8 S15** Item number: 361790 Maximum concrete grade: C 30/37 [1]	 L = 34 mm	DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, Yellow, Red or Black DX 351 F8 Fastener guide: X-FG8 ME-351 Piston: X-P 8S-351 Cartridge: 6.8/11M, Yellow or Red
X-U 27 P8 Item number: 237333 Maximum concrete grade: C 50/60	 	DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, Yellow, Red or Black DX 351 F8 Fastener guide: X-FG8 ME-351 Piston: X-P 8S-351 Cartridge: 6.8/11M, Yellow or Red
X-P 17 B3 MX **X-P 17 B4 MX** **X-P 17 G3 MX** Item number: see national product catalogue Maximum concrete grade: C 30/37	 	BX 3-ME BX 4-ME GX 3-ME

[1] The method DX-Standard with X-HS M_ U32 P8 S15 is recommended for concrete strength $f_{cc} \leq 45$ N/mm². With the method DX-Standard, fasteners might fail during the driving process. In case of failure rates exceeding about 10 %, it is recommended to switch to the DX-Kwik method with the X-HS M_ DKH48 P8 S15.

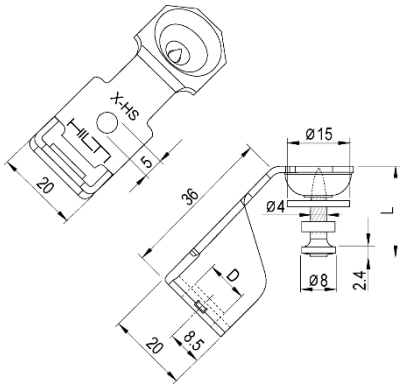
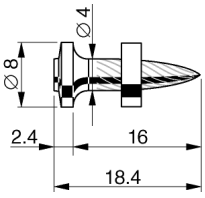
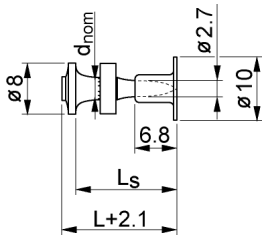
Powder-actuated fasteners „DX-Kwik“ with pre-drilling for fastenings to concrete

Fastener		Fastening tool
X-HS M8 DKH P8 S15 Item number: 299697 **X-HS M10 DKH P8 S15** Item number: 299698 Maximum concrete grade: C 50/60	 L = 50,4 mm	DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, Yellow, Red or Black

Battery-actuated fasteners „BX-Kwik“ with pre-drilling for fastenings to concrete

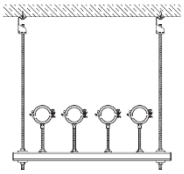
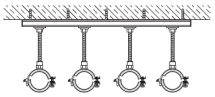
Fastener		Fastening tool
X-EHS M4 MX Item number: 273367 **X-EHS M6 MX** Item number: 272073 **X-EHS M8 MX** Item number: 273368 With: X-P 24 B3 MX nail X-P 24 B4 MX nail Maximum concrete grade: C 50/60	  	BX 3 ME BX 4-ME

Powder-actuated fasteners for fastenings to steel

Fastener		Fastening tool
X-HS M8 U19 P8 S15 Item number: 386214 **X-HS M10 U19 P8 S15** Item number: 386215	 L = 21,4 mm	DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, Yellow, Red or Black DX 351 F8 Fastener guide: X-FG8 ME-351 Piston: X-P 8S-351 Cartridge: 6.8/11M, Yellow or Red
X-U 16 P8 Item number: 237330		DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, Yellow, Red or Black
X-U 15 P8TH Item number: 237328	 L_S = 16 mm	DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, Yellow, Red or Black

Application tables for fastenings to concrete

Medium steel pipes according to DIN 2440 filled with water and with 100 % insulation and steel pipes of medium type M according to DIN EN 10255 filled with water and with 100 % insulation

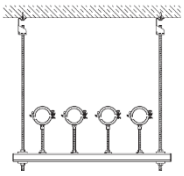
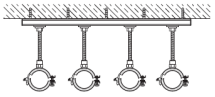
Pipe				Channel selection and channel spacing L_P [m]					Trapeze construction			Channel directly fastened to the substrate	
DN	D_a [mm]	n	L [mm]	1.0	1.5	2.0	2.5	3.0					
									DX-Standard	DX-Kwik	BX-Kwik	DX/GX/BX-Standard [x]	
									X-HS M_ U32	X-HS M_ DKH48	X-EHS MX with X-P 24 B3 X-P 24 B4	X-P 17 B3 X-P 17 B4 X-P 17 G3	X-U27P8
15	21.3	4	500	MM-C16	MM-C16	MM-C16	MM-C16	-	yes	yes	yes	Yes	yes
		6	500	MM-C16	MM-C16	MM-C16	MM-C16	-	yes	yes	yes	yes	yes
		8	600	MM-C16	MM-C16	MM-C16	MM-C16	-	yes	yes	yes	yes	yes
		10	700	MM-C16	MM-C16	MM-C16	MM-C30	-	no	yes	yes	yes	yes
20	26.9	4	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes	yes	yes	yes
		6	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes	yes	yes	yes
		8	700	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	yes	no	yes
		10	800	MM-C16	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes
25	33.7	4	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes	yes	no	yes
		6	600	MM-C16	MM-C16	MM-C16	MM-C30	MM-C30	no	yes	no	no	yes
		8	700	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes
		10	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
32	42.4	4	600	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes
		6	700	MM-C16	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes
		8	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
		10	1000	MM-C30	MM-C30	MM-C36	MM-C36	MM-C36	no	yes	no	no	no
40	48.3	4	600	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
		6	700	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
		8	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C36	no	yes	no	no	no
50	60.3	2	600	MM-C16	MM-C16	MM-C16	MM-C30	MM-C30	no	yes	no	no	no
		4	700	MM-C16	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
		6	800	MM-C30	MM-C30	MM-C30	MM-C36	MM-C36	no	yes	no	no	no
65	76.1	2	600	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
		4	800	MM-C30	MM-C30	MM-C30	MM-C36	MM-C36	no	yes	no	no	no

DN ... Nominal diameter
D_a ... Outer diameter [mm]
n ..... Number of pipes per channel
L ..... Length of channel [mm]

[x] ..... At least 5 fastening points per channel.
Driving sequence: 1. Drive one fastener at each end of the channel. Control of the proper fastening of these 2 end fasteners.
2. Drive 3 more fasteners between the end fasteners.

Stainless pipes according to DIN 17455 filled with water and with 100 % insulation

Wall thickness: For all pipes ≤ 2 mm

Pipe				Channel selection and channel spacing L_P [m]					Trapeze construction			Channel directly fastened to the substrate	
DN	D_a [mm]	n	L [mm]	1.0	1.5	2.0	2.5	3.0					
									DX-Standard	DX-Kwik	BX-Kwik	DX/GX/BX-Standard [x)]	
									X-HS M_ U32	X-HS M_ DKH48	X-EHS MX with X-P 24 B3 X-P 24 B4	X-P 17 B3 X-P 17 B4 X-P 17 G3	X-U27P8
15	21.3	4	500	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		6	500	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		8	600	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		10	700	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
20	26.9	4	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		6	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		8	700	MM-C16	MM-C16	MM-C16	-	-	no	yes	yes	yes	yes
		10	800	MM-C16	MM-C30	MM-C30	-	-	no	yes	no	no	yes
25	33.7	4	600	MM-C16	MM-C16	MM-C16	-	-	no	yes	yes	no	yes
		6	600	MM-C16	MM-C16	MM-C16	-	-	no	yes	yes	no	yes
		8	700	MM-C16	MM-C30	MM-C30	-	-	no	yes	no	no	yes
		10	800	MM-C30	MM-C30	MM-C30	-	-	no	yes	no	no	yes
32	42.4	4	600	MM-C16	MM-C16	MM-C16	MM-C16	-	no	yes	yes	no	yes
		6	700	MM-C16	MM-C30	MM-C30	MM-C30	-	no	yes	no	no	yes
		8	800	MM-C16	MM-C30	MM-C30	MM-C30	-	no	yes	no	no	no
		10	1000	MM-C30	MM-C30	MM-C30	MM-C36	-	no	yes	no	no	no
40	48.3	4	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C30	no	yes	no	no	yes
		6	700	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes
		8	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
50	60.3	2	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes	no	no	yes
		4	700	MM-C16	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes
		6	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
65	76.1	2	600	MM-C16	MM-C16	MM-C16	MM-C30	MM-C30	no	yes	no	no	no
		4	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
80	88.9	2	600	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes	no	no	no
		4	1000	MM-C30	MM-C30	MM-C36	MM-C36	MM-C36	no	yes	no	no	no

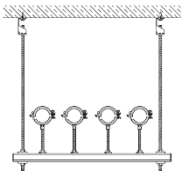
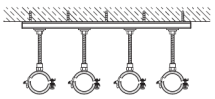
DN ... Nominal diameter
D_a ... Outer diameter [mm]
n ..... Number of pipes per channel
L ..... Length of channel [mm]

[x)] ..... At least 5 fastening points per channel.
Driving sequence: 1. Drive one fastener at each end of the channel. Control of the proper fastening of these 2 end fasteners.
2. Drive 3 more fasteners between the end fasteners.

Copper pipes according to DIN 1786, DIN 1754 or DIN EN 1057 filled with water and with 100 % insulation

Wall thickness:

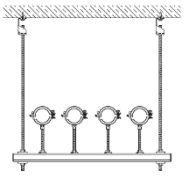
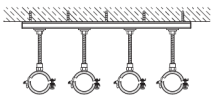
from DN 15 to 20: ≤ 1.0 mm
from DN 25 to 40: ≤ 1.5 mm
from DN 50 to 80: ≤ 2.0 mm

Pipe				Channel selection and channel spacing L_P [m]					Trapeze construction			Channel directly fastened to the substrate	
DN	D_a [mm]	n	L [mm]	1.0	1.5	2.0	2.5	3.0					
									DX-Standard	DX-Kwik	BX-Kwik	DX/GX/BX-Standard [x]	
									X-HS M_ U32	X-HS M_ DKH48	X-EHS MX with X-P 24 B3 X-P 17 B4	X-P 17 B3 X-P 17 B4 X-P 17 G3	X-U27P8
15	18.0	4	500	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		6	500	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		8	600	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		10	700	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
20	22.0	4	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		6	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		8	700	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		10	800	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
25	22.0	4	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		6	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		8	700	MM-C16	MM-C16	MM-C16	-	-	no	yes	yes	no	yes
		10	800	MM-C16	MM-C30	MM-C30	-	-	no	yes		no	yes
32	35.0	4	600	MM-C16	MM-C16	MM-C16	MM-C16	-	no	yes	yes	no	yes
		6	700	MM-C16	MM-C16	MM-C16	MM-C30	-	no	yes	yes	no	yes
		8	800	MM-C16	MM-C30	MM-C30	MM-C30	-	no	yes		no	yes
		10	1000	MM-C30	MM-C30	MM-C30	MM-C30	-	no	yes		no	yes
40	42.0	4	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes	yes	no	yes
		6	700	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes		no	yes
		8	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes		no	yes
50	54.0	2	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes		no	yes
		4	700	MM-C16	MM-C30	MM-C30	MM-C30	MM-C30	no	yes		no	yes
		6	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes		no	no
65	76.1	2	600	MM-C16	MM-C16	MM-C16	MM-C30	MM-C30	no	yes		no	no
		4	800	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes		no	no
80	88.9	2	600	MM-C16	MM-C16	MM-C30	MM-C30	MM-C30	no	yes		no	no
		4	1000	MM-C30	MM-C30	MM-C36	MM-C36	MM-C36	no	yes		no	no

DN ... Nominal diameter
D_a ... Outer diameter [mm]
n ..... Number of pipes per channel
L ..... Length of channel [mm]

[x] ..... At least 5 fastening points per channel.
Driving sequence: 1. Drive one fastener at each end of the channel. Control of the proper fastening of these 2 end fasteners.
2. Drive 3 more fasteners between the end fasteners.

Geberit Mepla metal composite pipe filled with water

Pipe				Channel selection and channel spacing L_P [m]					Trapeze construction			Channel directly fastened to the substrate	
DN	D_a x s [mm]	n	L [mm]	1.0	1.5	2.0	2.5	3.0					
									DX-Standard	DX-Kwik	BX-Kwik	DX/GX/BX-Standard	
									X-HS M_ U32	X-HS M_ DKH48	X-EHS MX with X-P 24 B3 X-P 24 B4	X-P 17 B3 X-P 17 B4 X-P 17 G3	X-U27P8
15	20x2.5	4	500	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		6	500	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		8	600	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		10	700	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
20	26x3.0	4	600	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		6	600	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		8	700	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
		10	800	MM-C16	MM-C16	-	-	-	yes	yes	yes	yes	yes
25	32x3.0	4	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		6	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		8	700	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		10	800	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
32	40x3.5	4	600	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		6	700	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
		8	800	MM-C16	MM-C16	MM-C16	-	-	yes	yes	yes	yes	yes
40	50x4.0	2	600	MM-C16	MM-C16	MM-C16	MM-C16	-	yes	yes	yes	yes	yes
		4	600	MM-C16	MM-C16	MM-C16	MM-C16	-	yes	yes	yes	yes	yes
		6	700	MM-C16	MM-C16	MM-C16	MM-C16	-	yes	yes	yes	yes	yes
50	63x4.5	2	600	MM-C16	MM-C16	MM-C16	MM-C16	-	no	yes	yes	yes	yes
		4	1000	MM-C30	MM-C30	MM-C30	MM-C30	-	no	yes	yes	yes	yes
		6	1200	MM-C30	MM-C30	MM-C30	MM-C30	-	no	yes	yes	no	yes
65	75x4.7	2	600	MM-C16	MM-C16	MM-C16	MM-C16	MM-C16	no	yes	yes	no	yes
		4	1000	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	yes	no	yes
		6	1200	MM-C30	MM-C30	MM-C30	MM-C30	MM-C30	no	yes	no	no	yes

DN ... Nominal diameter
Da ... Outer diameter [mm]
n ..... Number of pipes per channel
L ..... Length of channel [mm]

x) ..... At least 5 fastening points per channel.
Driving sequence: 1. Drive one fastener at each end of the channel. Control of the proper fastening of these 2 end fasteners.
2. Drive 3 more fasteners between the end fasteners.

Application range for fastenings to steel

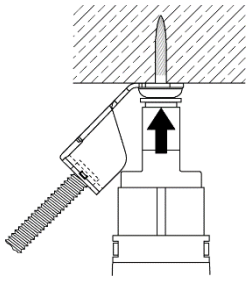
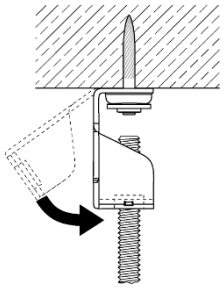
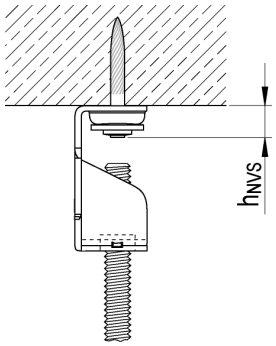
- The application scope from the tables above for concrete is completely covered for the base material steel, when using the powder-actuated fasteners X-HS M8 U19 P8 S15, X-HS M10 U19 P8 S15, X-U 16 P8 or X-U 15 P8TH.
- If the channel is directly fixed to the steel substrate, the number of fasteners per channel may be additionally reduced from 5 to 2. One fastener shall be driven at both ends of the channel. The inner 3 fasteners may be omitted. The application limit of the used fastening system needs to be observed.

Execution and fastening quality: Fastening to concrete

Trapeze construction

DX-Standard: X-HS M8 U32 P8 S15 and X-HS M10 U32 P8 S15

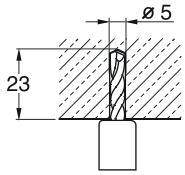
- Cartridge and tool energy setting are to be selected, that the fasteners will be driven flush. It is recommended to start with high energy setting (Red 4 with the DX 460 F8, Red 3 with the DX 351 F8). If the required nail stand-off provisions are met, a reduction of the driving energy is possible. Detailed settings according to trial fastenings on the jobsite.
  The power of the cartridge is indicated with the colour code: Yellow (low/medium power load) → Red (medium high power load) → Black (extra high power load).
- The correct nail stand-off h_{NVS} needs to be observed. h_{NVS} corresponds with the distance between the top of the nail head and the concrete surface.

 Load the X-HS into the tool, compress the tool, and drive the pin via pulling the trigger.	 Bend the X-HS down to the vertical position.	 h_{NVS} = 6 – 10 mm

- Proper attachment of each hanger needs to be checked by manual pulling of the threaded rod.
- Fasteners with no holds need to be replaced.

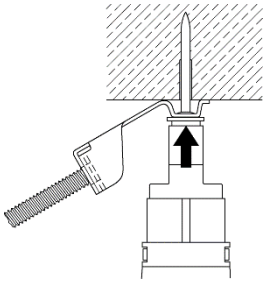
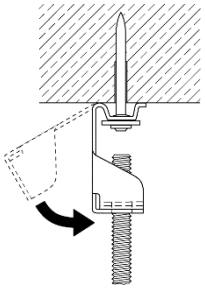
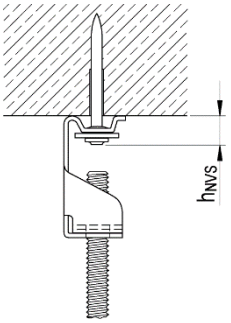
DX-Kwik: X-HS M8 DKH48 P8 S15 and X-HS M10 DKH48 P8 S15

- Pre-drilling of hole using a step shank drill before driving the fastener.



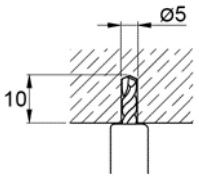
Drilling depth: 23 mm
Step shank drill: TX-C-5/23 (item number: 61787)

- Cartridge and tool energy setting are to be selected, that the fasteners will be driven flush. The yellow cartridge is recommended for lower strength concrete and the red cartridge is recommended for higher strength concrete. Detailed settings according to trial fastenings on the job-site.
- The correct nail stand-off h_{NVS} needs to be observed. h_{NVS} corresponds with the distance between the top of the nail head and the concrete surface.

 Load the X-HS into the tool, compress the tool, and drive the pin via pulling the trigger.	 Bend the X-HS down to the vertical position.	 h_{NVS} = 6 – 10 mm

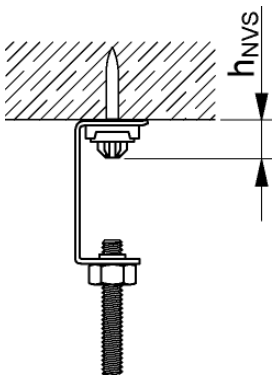
BX-Kwik: X-EHS M4 MX, X-EHS M6 MX and X-EHS M8 MX with X-P 24 B3 and X-P 24 B4 nails

- Pre-drilling of hole using a step shank drill before driving the fastener.



Drilling depth: 10 mm
Step shank drill: TX-C-5/10B (item number: 2178329)

- The correct nail stand-off h_{NVS} needs to be observed. h_{NVS} corresponds with the distance between the top of the nail head and the concrete surface.



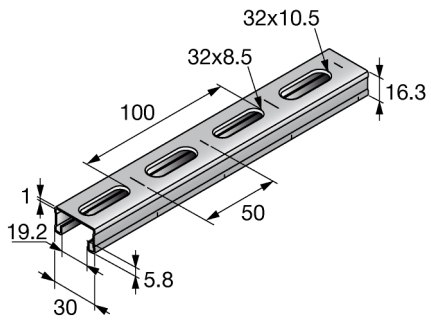
h_{NVS} = 4 – 7 mm

Channels directly fastened to the concrete with BX/GX/DX-Standard X-P 17 B3, X-P 17 B4, X-P 17 G3 or X-U27 P8

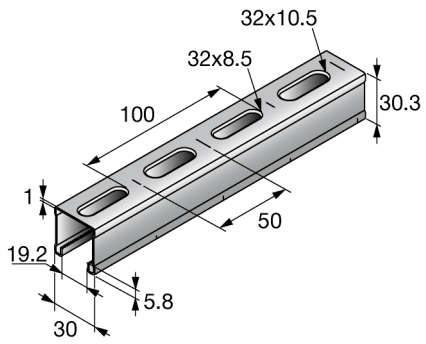
Fastening locations

- Fastening of the channel has to be made directly through the wall of the channel. As the back side of the channels MM-C16 and MM-C30 has slotted holes, possible fastening locations are given between these slotted holes with a distance of 50 mm.

MM-C16 for X-P 17 B3, X-P 17 B4 MX, X-P 17 G3 or X-U 27 P8



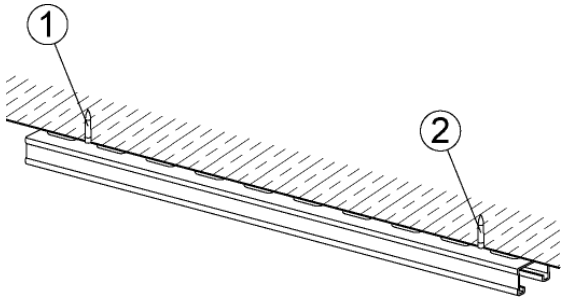
MM-C30 for X-U 27 P8



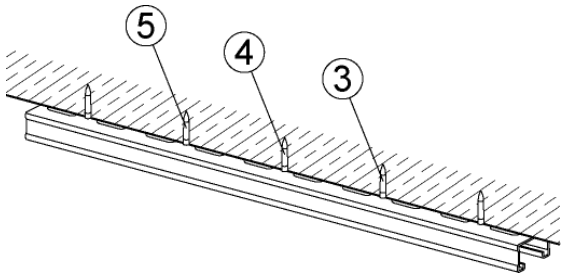
Fastening sequence

When fastening the channels directly to the concrete the following sequence has to be observed.

1. Fasteners #1 and #2 have to be driven first at each end of the channel at the outermost possible fastening location.

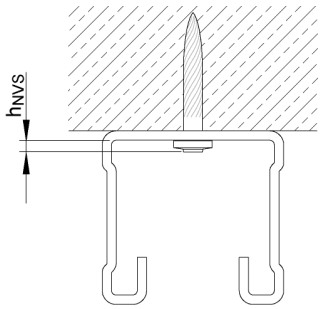
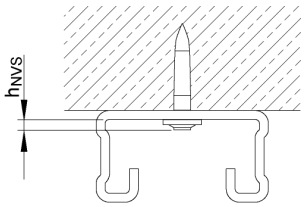


2. Proper attachment of the channel needs to be checked. Loose fasteners must be replaced.
3. Then 3 more inner fasteners (# 3, 4 and 5) are to be driven.



Tool energy setting and nail head stand-off

- Cartridge and tool energy setting are to be selected, that the fasteners will be driven flush.
- In case of the X-U27 P8 the yellow cartridge is recommended for lower strength concrete and the red cartridge is recommended for higher strength concrete. Detailed settings according to trial fastenings on the jobsite.
- In case of X-P 17 G3 MX the nose position of the GX 3 has to be set to position „+“.
- The correct nail stand-off h_{NVS} needs to be observed. h_{NVS} corresponds with the distance between the top of the nail head and the top side of the channel wall.

X-U 27	X-P 17 B3, X-P 17 B4, X-P 17 G3
 h_{NVS} = 2 – 5 mm	 h_{NVS} = 2 – 5 mm

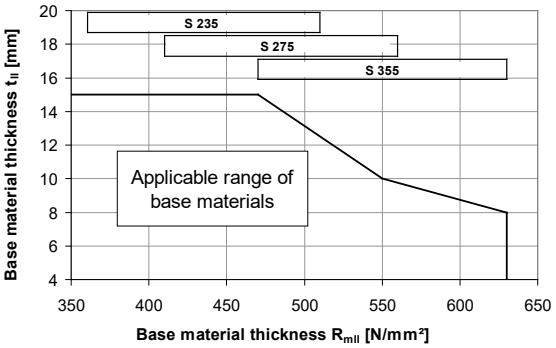
Execution and fastening quality: Fastening to steel

Trapeze construction

- The application limit of the fastening system has to be observed. For the thickness given in the table below the complete strength tolerance range is covered for the listed steel grades.

Fastener	Steel grade	Base metal thickness t_{II}
X-HS M_ U19 P8 S15	S 235	4 to 13 mm
	S 355	4 to 8 mm

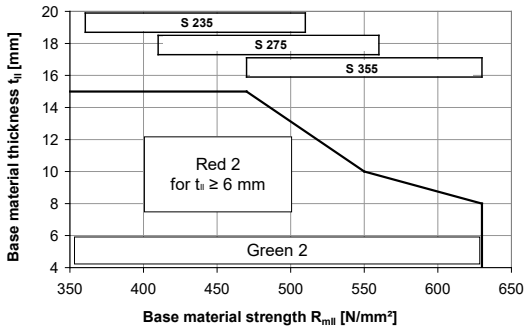
For greater thickness the following application limit has to be observed:



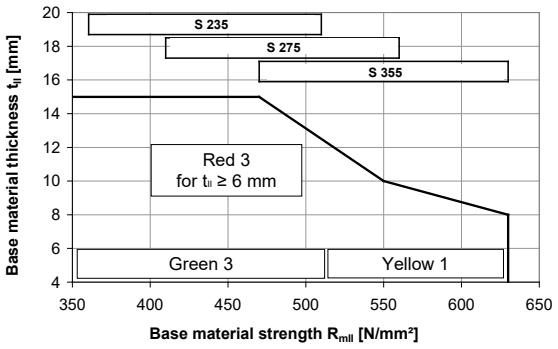
Base material:
Structural steel S235, S275 und S355 in the qualities JR, J0, J2 and K2 according to EN 10025-2:2005

- Procedure for determination of optimum driving energy:
  - Cartridge selection and tool energy setting according to the diagrams for the respective fastening tool DX 460 F8 or DX 351 F8.

DX 460 F8 with X-HS M_ U19 P8 S15



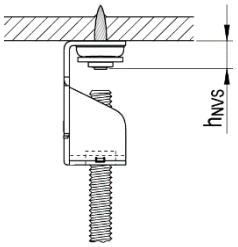
DX 351 F8 with X-HS M_ U19 P8 S15



  - Trial fastenings in order to check the nail head standoff h_{NVS} = 6 to 10 mm. h_{NVS} corresponds with the distance between the top of the nail head and the steel surface.
  - If necessary adjustment of the energy setting or change of cartridge. The power of the cartridge is indicated with the colour code: Green (low power load) → Yellow (low/medium power load) → Red (medium high power load) → Black (extra high power load).

- The correct standoff h_{NVS} has to be observed.

Hanger **X-HS M_ U19 P8 S15**



In case of correct standoff, the washer of the X-HS is bent downwards.

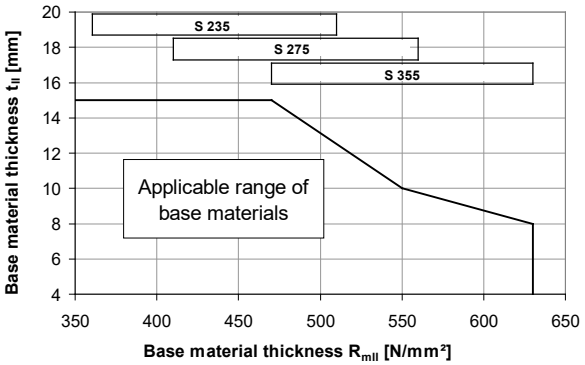
h_{NVS} = 6 – 10 mm

Channels directly fastened to steel with X-U 16 P8 or X-U 15 P8TH

- The application limit of the fastening system has to be observed. For the thickness given in the table below the complete strength tolerance range is covered for the listed steel grades.

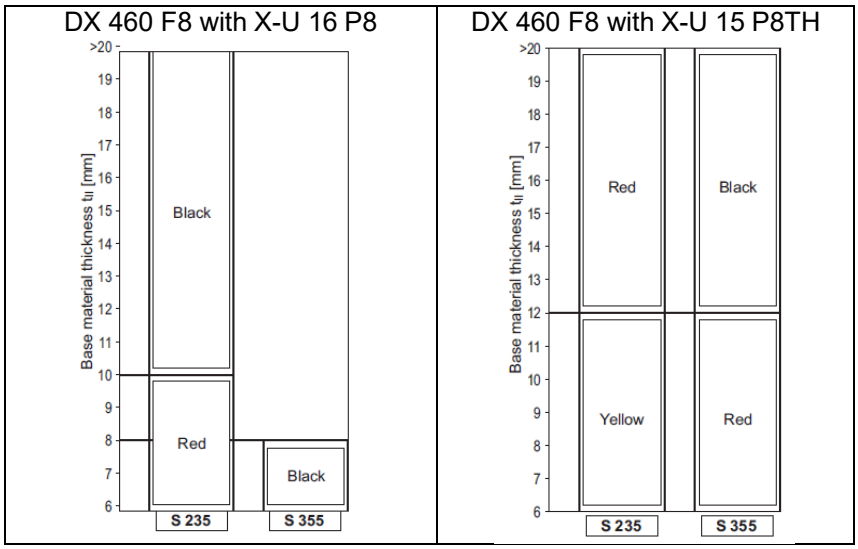
Fastener	Steel grade	Base material thickness t_{II}
X-U 16 P8	S 235	6 to 12 mm
	S 355	6 to 8 mm
X-U 15 P8TH	S 235 bis S 355	≥ 6 mm

In case of the X-U 16 P8 the following application limit has to be observed for greater thickness:



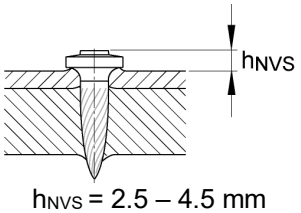
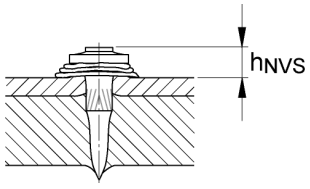
Base material:
Structural steel S235, S275 und S355 in the qualities JR, J0, J2 and K2 according to EN 10025-2:2005

- Procedure for determination of optimum driving energy:
  1. Cartridge selection and tool energy setting according to the diagrams for the fastening tool DX 460 F8.



  2. Trial fastenings in order to check the nail head standoff h_{NVS}. h_{NVS} corresponds with the distance between the top of the nail head and the steel surface.
  3. If necessary adjustment of the energy setting or change of cartridge. The power of the cartridge is indicated with the colour code: Yellow (low/medium power load) → Red (medium high power load) → Black (extra high power load).

- The correct standoff h_{NVS} has to be observed.

X-U 16 P8	X-U 15 P8TH
 h_{NVS} = 2.5 – 4.5 mm	 h_{NVS} = 4 – 6 mm