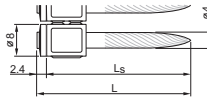
X-U General Purpose Nails for Concrete and Steel

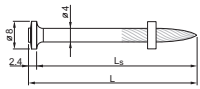
Product data

Dimensions

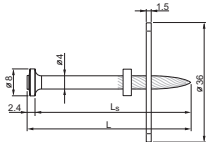
X-U__MX



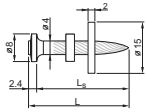
X-U __ P8



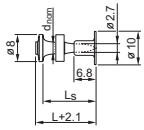
X-U __ P8 S36



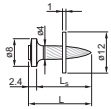
X-U __ P8 S15



X-U 15 P8TH



X-U __ S12



General information

Material specifications

Carbon steel shank:	HRC 58
	HRC 59 (X-U 15)
Zinc coating:	5–13 µm

Fastening tools

See fastener selection

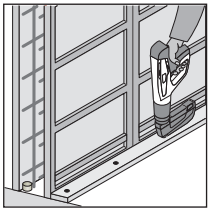
Approvals

ICC ESR-2269 (USA)
DIBt Z-14.4-517 (Germany)

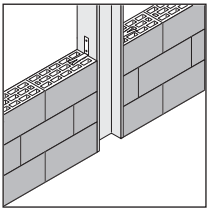
Note: technical data presented in these approvals and design guidelines reflect specific local conditions and may differ from those published in this handbook.

Applications

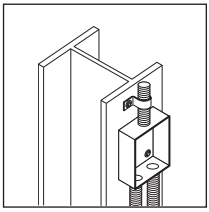
Examples



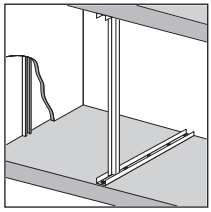
System formwork



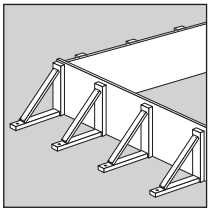
Wall-tie to steel and concrete



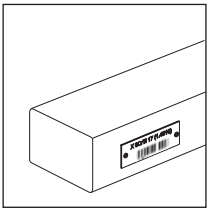
Mechanical and electrical fixtures



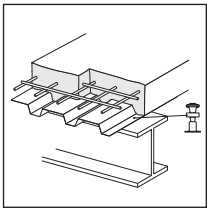
Drywall track to concrete and steel



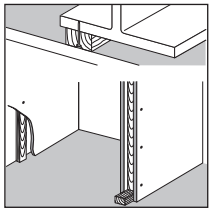
Conventional form-work



Tagging lables



Tacking of metal decks

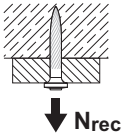


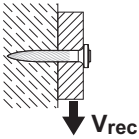
Sill plates / 2x4 wood to concrete and steel

The intended use for safety relevant and permanent applications only comprises fastenings which are not directly exposed to external weather conditions or moist atmospheres.

Fastenings to concrete

Recommended loads





Loads depending on embedment depth h_{ET}:

$N_{rec} = V_{rec} = 0.4$ kN for $h_{ET} \geq 27$ mm
$N_{rec} = V_{rec} = 0.3$ kN for $h_{ET} \geq 22$ mm
$N_{rec} = V_{rec} = 0.2$ kN for $h_{ET} \geq 18$ mm
$N_{rec} = V_{rec} = 0.1$ kN for $h_{ET} \geq 14$ mm

Design conditions:

- For safety relevant fastenings sufficient redundancy of the entire system is required: Minimum 5 fastenings per fastened unit.
- All visible failures must be replaced.
- Valid for concrete with strength of $f_{cc} \leq 45$ N/mm².
- Valid for predominantly static loading.
- Failure of the fastened material is not considered in recommended loads
- To limit penetration of nail and to increase pull-over load, use nails with washers.

Test data (Examples)

Important note: test data are for information only and cannot be used for design. These data are examples and do not represent the whole range of applications and load cases.
Design data for Hilti standard nails in concrete are based on a specific statistical evaluation method taking into consideration high variation coefficients. The evaluation procedure is described in the **Direct Fastening Principles and Technique** section of this manual.
For more detailed information please contact Hilti.

Pull-out loads

Nails	Mean ultimate pull-out loads $N_{u,m}$ [kN]	Variation coefficient [%]	Embedment depth h_{ET} [mm]	Concrete strength f_{cc} [N/mm²]
X-U 22	3.18	37.8	20.1	54.7
X-U 27	4.04	35.4	24.5	30.9

Application requirements

Thickness of base material

Concrete:

h_{min} = 80 mm

Thickness of fastened material

Wood:

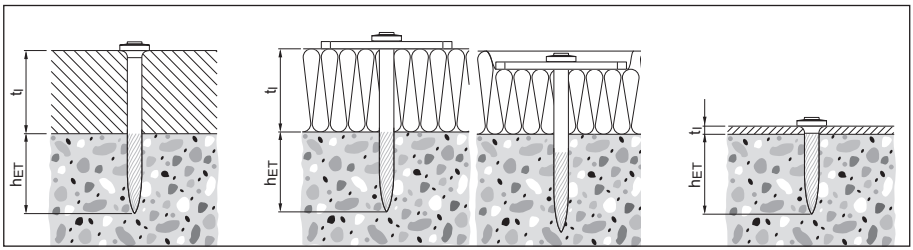
t_I = 15–57 mm

Fastener selection and system recommendation

Fastening to concrete

Required nail shank length: **$L_S = h_{ET} + t_I$** [mm]

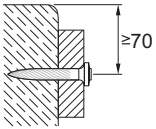
Recommendation: **h_{ET} = 22 mm**



In case flush fastenings are required:

$L_S = h_{ET} + t_I - 5$ [mm]

Edge distance



Edge distance: c ≥ 70 mm

Cartridge recommendation

Tool energy adjustment by setting tests on site

Fastening to concrete:	**6.8/11M yellow cartridge**	on green/ fresh and standard concrete
	6.8/11M red cartridge	on precast, old and hard concrete

Fastenings to steel

Recommended loads

Fastening of steel sheets and other steel parts with X-U 16 and X-U 19

Recommended loads t_I [mm]	X-U _ P8/MX N_{rec} [kN]	X-U _ S12 N_{rec} [kN]	V_{rec} [kN]
0.75	1.0	1.4	1.2
1.00	1.2	1.8	1.8
1.25	1.5	2.2	2.6
≥ 2.00	2.0	2.2	2.6

Tacking of steel sheets with X-U 15

according to ECCS-recommendation N73, "Good Construction Practice for Composite Slabs

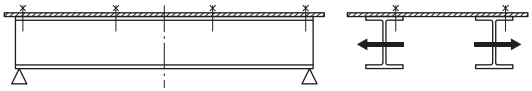
Recommended loads t_I [mm]	N_{rec} [kN]	V_{rec} [kN]
0.75–1.25	0.6	0.8

Design conditions:

- Recommended working loads valid for steel sheet with minimum tensile strength ≥ 360 N/mm².
- For intermediate sheet thicknesses, use recommended load for next smaller thickness.
- In case of a design based on the characteristic resistance, recommended values have to be multiplied by two: => $N_{Rk} = N_{rec} \cdot 2.0$ $V_{Rk} = V_{rec} \cdot 2.0$
- For X-U 16 S12: base material thickness $t_{II,min}$ = 8 mm for $t_I \geq 1.5$ mm and $t_{II,min}$ = 6 mm for $t_I \leq 1.25$ mm
- Other fastened parts: clips, brackets, etc.
- Redundancy (multiple fastening) must be provided.
- Valid for predominantly static loading

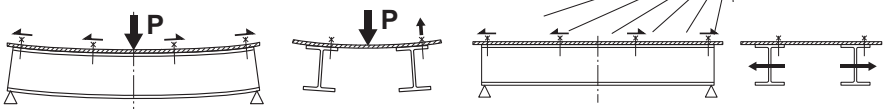
Forces of constraint

When fastening large pieces of steel, the possibility of shear loadings from forces of constraint should be considered. Avoid exceeding V_{rec} for the fastener shank!

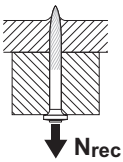


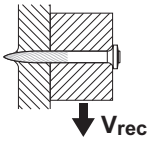
Deflection due to primary loading

Temperature effect



Fastenings of wood to steel





N_{rec} = 0.3 kN

V_{rec} = 0.6 kN

Design conditions:

- For safety-relevant fastenings sufficient redundancy of the entire system is required.
- In case soft material is fastened, its strength determines the loads.
- To limit penetration of nail and to increase pull-over load, use nails with washers.
- Observance of edge distance and fastener spacing in compliance with recognized standards, e.g. DIN 1052.
- With respect to details of fastening wood, chipboard or OSB members to steel base material, it is refered to the German approval DIBt Z-14.4-517.

Application requirements

Thickness of base material

Steel:

t_{II} ≥ 6.0 mm (fastening steel to steel)

t_{II} ≥ 4.0 mm (fastening wood to steel)

Thickness of fastened material

Steel:

t_I ≤ 3 mm (fastened material not pre-drilled)

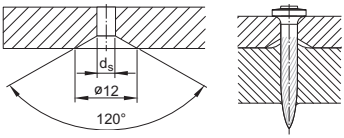
t_I ≤ 6 mm (fastened material pre-drilled)

Wood:

t_I = 15–57 mm

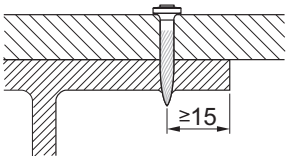
Condition for thick fastened steel parts (t_I > 3 mm)

If a gap between the fastened part and the base material is unacceptable, the fastened part needs to be prepared with drilled holes.



Edge distance

Rolled shapes:

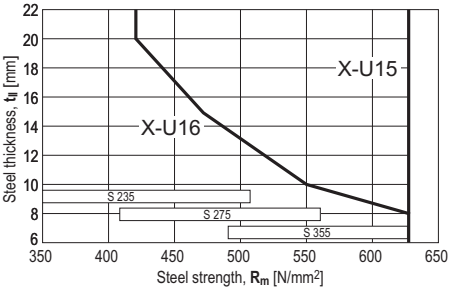


Edge distance: c ≥ 15 mm

Application limits

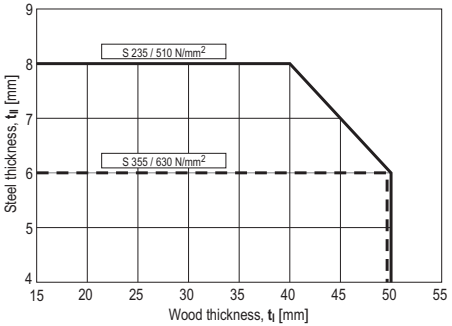
Fastening to steel

Fastening of steel sheets and steel parts to steel



X-U 16 P8, X-U 15 P8TH: For steel sheeting with 0.75 mm ≤ t_I ≤ 1.25 mm sheets

Fastening of wood and soft material to steel



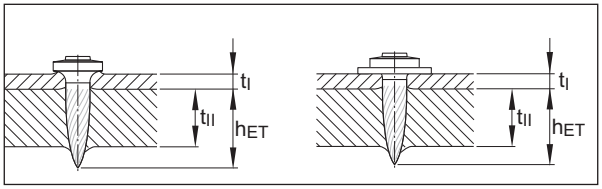
for X-U 22 P8 to X-U 62 P8

Fastener selection and system recommendation

Fastening to steel

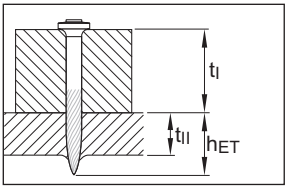
Required nail shank length: $L_S = h_{ET} + t_I$ [mm]

Fastening steel to steel



Recommendation: h_{ET} = 12 ± 2 mm

Fastening wood to steel



h_{ET} ≥ 8 mm

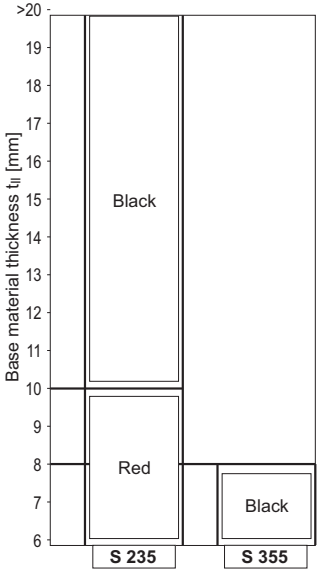
Cartridge recommendation

Tool energy adjustment by setting tests on site

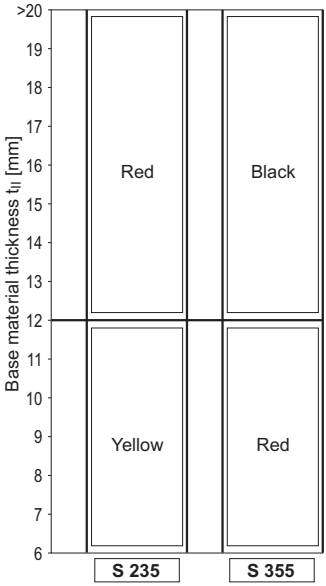
Fastening wood to steel:	**6.8/11M green or yellow cartridge** on steel thickness t_{II} < 6 mm
	6.8/11M yellow, red or black cartridge on steel thickness t_{II} ≥ 6 mm

Fastening steel to steel: **6.8/11M cartridge**

X-U 16



X-U 15 P8TH

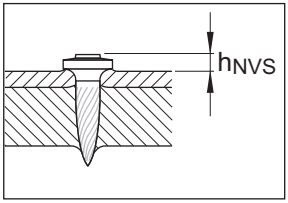


Fastening quality assurance

Fastening inspection

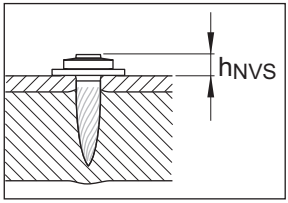
Fastening to steel

X-U __ P8/MX/MXSP



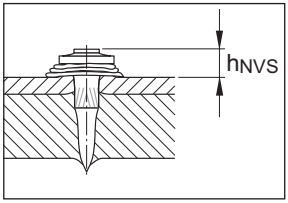
h_{NVS} = 2.5–4.5 mm

X-U __ S12



h_{NVS} = 4.0–5.5 mm

X-U _ P8TH



h_{NVS} = 4.0–6.0 mm

Fastener program

Fastener	Item no.	L_S [mm]	Standard tools: DX 460 MX	DX 460 F8	DX 36	DX E72	DX 351 MX	DX 351 F8	Special tools: DX 35	DX 462 F8	DX 460 F8S12 / DX 462 F8S12	Key applications
X-U 16 MX	237344	16	■				■					Sheet metal on steel
X-U 19 MX	237345	19	■				■					Sheet metal on steel
X-U 22 MX	237346	22	■				■					Sheet metal on concrete
X-U 27 MX	237347	27	■				▪					Sheet metal on concrete
X-U 32 MX	237348	32	■									Wood on concrete/steel
X-U 37 MX	237349	37	■									Wood on concrete/steel
X-U 42 MX	237350	42	■									Wood on concrete/steel
X-U 47 MX	237351	47	■									Wood on concrete/steel
X-U 52 MX	237352	52	■									Wood on concrete/steel
X-U 57 MX	237353	57	■									Wood on concrete/steel
X-U 62 MX	237354	62	■									Wood on concrete/steel
X-U 72 MX	237356	72	■									Wood on concrete/steel
X-U 16 P8	237330	16		■	■	■		■	■	■		Sheet metal on steel
X-U 19 P8	237331	19		■	■	■		■	■	■		Sheet metal on steel
X-U 22 P8	237332	22		■	■	■		■	■	■		Sheet metal on concrete
X-U 27 P8	237333	27		■	■	■		▪	▪	■		Sheet metal on concrete
X-U 32 P8	237334	32		■	■	■		▪	▪	■		Wood on concrete/steel
X-U 37 P8	237335	37		■	■	■		▪	▪	■		Wood on concrete/steel
X-U 42 P8	237336	42		■	■	■		▪		■		Wood on concrete/steel
X-U 47 P8	237337	47		■	■	■		▪		■		Wood on concrete/steel
X-U 52 P8	237338	52		■	■	■				■		Wood on concrete/steel
X-U 57 P8	237339	57		■	■	■				■		Wood on concrete/steel
X-U 62 P8	237340	62		■	■	■						Wood on concrete/steel
X-U 72 P8	237342	72		■	■	■						Wood on concrete/steel
X-U 16 P8TH	237329	16		■	■	■		■	■	■		Sheet metal on steel, *)
X-U 19 P8TH	385781	19		■	■	■		■	■	■		Sheet metal on steel, *)
X-U 27 P8TH	385782	27		■	■	■		▪	▪	■		Sheet metal on concrete, *)
X-U 15 MXSP	383466	16	■				▪					Sheet metal on steel
X-U 15 P8TH	237328	16		■	▪	▪		▪	▪	■		Sheet metal on steel

*) firm hold down

Fastener	Item no.	L_S [mm]	Standard tools						Special tools			Key applications
			DX 460 MX	DX 460 F8	DX 36	DX E72	DX 351 MX	DX 351 F8	DX 35	DX 462 F8	DX 460 F8S12 / DX 462 F8S12	
X-U 27 P8S15	237371	27		■	■	■		▪	▪	■		High pull-over strength
X-U 32 P8S15	237372	32		■	■	■		▪	▪	■		High pull-over strength
X-U 32 P8S36	237374	32		■	■	■		▪	▪	■		Soft material on concr./steel
X-U 52 P8S36	237376	52		■	■	■		▪		■		Soft material on concr./steel
X-U 72 P8S36	237379	72		■	■	■						Soft material on concr./steel
X-U 16 S12	237357	16									■	High pull-over strength
X-U 19 S12	237358	19									■	High pull-over strength
X-U 22 S12	237359	22									■	High pull-over strength
X-U 27 S12	237360	27									■	High pull-over strength
X-U 32 S12	237361	32									■	High pull-over strength

■ = Recommended

▪ = Feasible