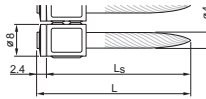


# X-U General Purpose Nails for Concrete and Steel

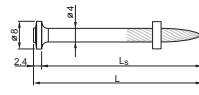
## Product data

### Dimensions

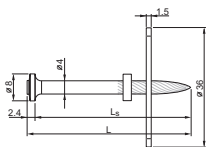
X-U\_MX



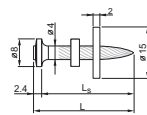
X-U\_P8



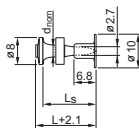
X-U\_P8 S36



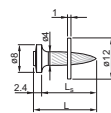
X-U\_P8 S15



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

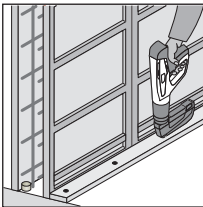
ICC ESR-2269 (USA)

DIBt Z-14.4-517 (Germany)

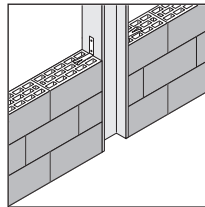
Note: technical data presented in these approvals and design guidelines reflect specific local conditions and may differ from those published in this handbook.

## Applications

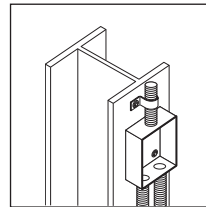
### Examples



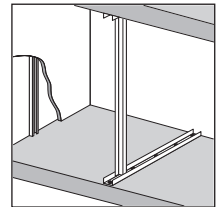
System formwork



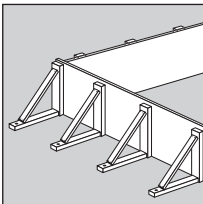
Wall-tie to steel and concrete



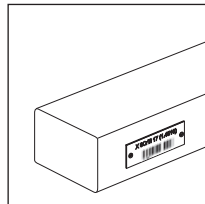
Mechanical and electrical fixtures



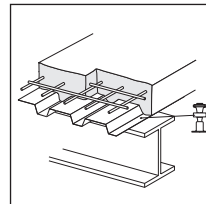
Drywall track to concrete and steel



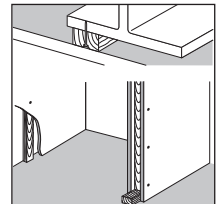
Conventional formwork



Tagging labels



Tacking of metal decks

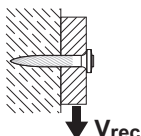


Sill plates / 2x4 wood to concrete and steel

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  $h_{ET}$ :

$$N_{rec} = V_{rec} = 0.4 \text{ kN for } h_{ET} \geq 27 \text{ mm}$$

$$N_{rec} = V_{rec} = 0.3 \text{ kN for } h_{ET} \geq 22 \text{ mm}$$

$$N_{rec} = V_{rec} = 0.2 \text{ kN for } h_{ET} \geq 18 \text{ mm}$$

$$N_{rec} = V_{rec} = 0.1 \text{ kN for } h_{ET} \geq 14 \text{ mm}$$

### 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  $f_{cc} \leq 45 \text{ N/mm}^2$ .
- 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/mm <sup>2</sup> ]
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:

$h_{min} = 80 \text{ mm}$

**Thickness of fastened material**

Wood:

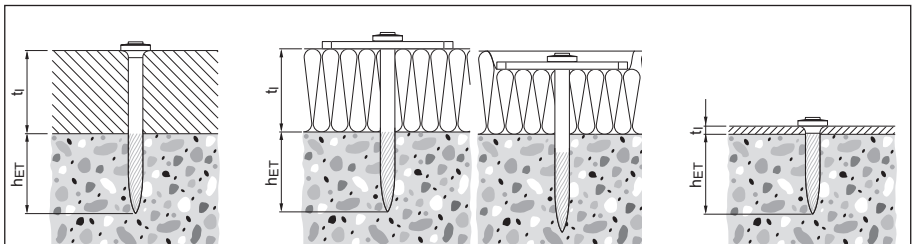
$t_f = 15\text{--}57 \text{ mm}$

**Fastener selection and system recommendation**

**Fastening to concrete**

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

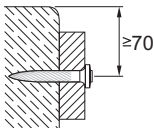
Recommendation:  $h_{ET} = 22 \text{ mm}$



In case flush fastenings are required:

$$L_S = h_{ET} + t_f - 5 \text{ [mm]}$$

**Edge distance**



Edge distance:  $c \geq 70 \text{ mm}$

**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 $t_f$ [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
$\geq 2.00$	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

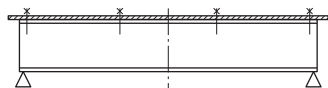
$t_f$ [mm]	$N_{rec}$ [kN]	$V_{rec}$ [kN]
0.75–1.25	0.6	0.8

### Design conditions:

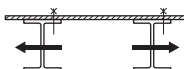
- Recommended working loads valid for steel sheet with minimum tensile strength  $\geq 360 \text{ N/mm}^2$ .
- For intermediate sheet thicknesses, use recommended load for next smaller thickness.
- In case of a design based on the characteristic resistance, recommended values have to be multiplied by two:  $\Rightarrow N_{Rk} = N_{rec} \cdot 2.0$   $V_{Rk} = V_{rec} \cdot 2.0$
- For X-U 16 S12: base material thickness  $t_{II,min} = 8 \text{ mm}$  for  $t_f \geq 1.5 \text{ mm}$  and  $t_{II,min} = 6 \text{ mm}$  for  $t_f \leq 1.25 \text{ mm}$
- Other fastened parts: clips, brackets, etc.
- Redundancy (multiple fastening) must be provided.
- Valid for predominantly static loading

### Forces of constraint

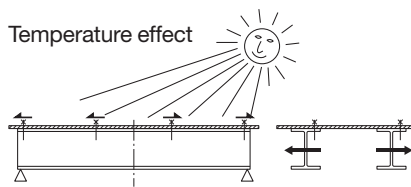
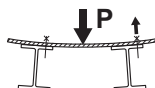
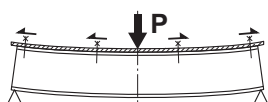
When fastening large pieces of steel, the possibility of shear loadings from forces of constraint should be considered. Avoid exceeding  $V_{rec}$  for the fastener shank!



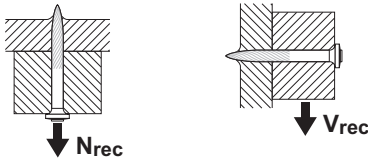
Deflection due to primary loading



Temperature effect



Fastenings of wood to steel



**$N_{rec} = 0.3 \text{ kN}$**

**$V_{rec} = 0.6 \text{ kN}$**

**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 referred to the German approval DIBt Z-14.4-517.

**Application requirements**

**Thickness of base material**

Steel:

**$t_{II} \geq 6.0 \text{ mm}$**  (fastening steel to steel)

**$t_{II} \geq 4.0 \text{ mm}$**  (fastening wood to steel)

**Thickness of fastened material**

Steel:

**$t_1 \leq 3 \text{ mm}$**  (fastened material not pre-drilled)

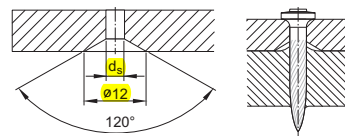
**$t_1 \leq 6 \text{ mm}$**  (fastened material pre-drilled)

Wood:

**$t_1 = 15\text{--}57 \text{ mm}$**

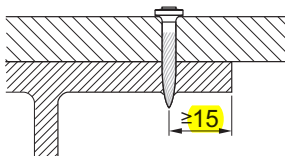
**Condition for thick fastened steel parts ( $t_1 > 3 \text{ mm}$ )**

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:

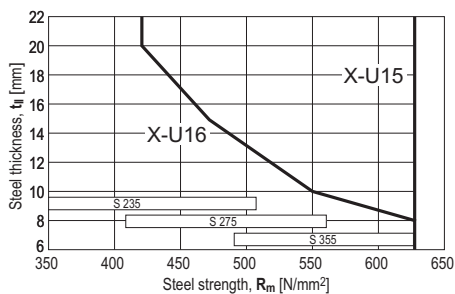


**Edge distance:  $c \geq 15 \text{ mm}$**

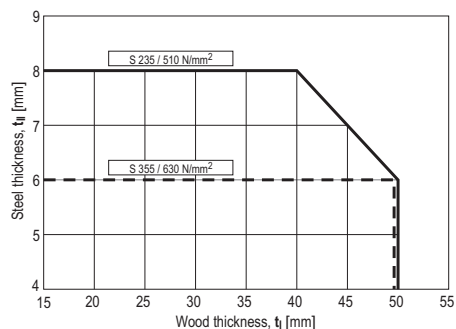
## Application limits

### Fastening to steel

Fastening of steel sheets and steel parts to steel



Fastening of wood and soft material to steel



X-U 16 P8, X-U 15 P8TH: For steel sheeting with  $0.75 \text{ mm} \leq t_1 \leq 1.25 \text{ mm}$  sheets

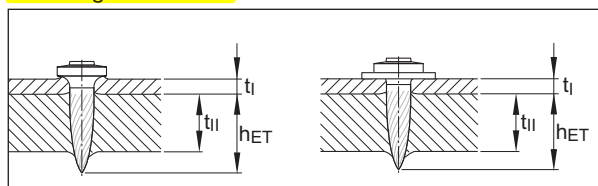
for X-U 22 P8 to X-U 62 P8

## Fastener selection and system recommendation

### Fastening to steel

Required nail shank length:  $L_S = h_{ET} + t_1$  [mm]

### Fastening steel to steel



Recommendation:  $h_{ET} = 12 \pm 2 \text{ mm}$



### Cartridge recommendation

Tool energy adjustment by setting tests on site

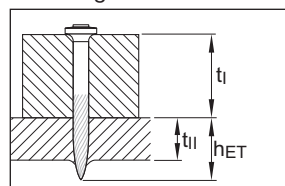
Fastening wood to steel: **6.8/11M green or yellow cartridge**

on steel thickness  $t_{1l} < 6 \text{ mm}$

**6.8/11M yellow, red or black cartridge**

on steel thickness  $t_{1l} \geq 6 \text{ mm}$

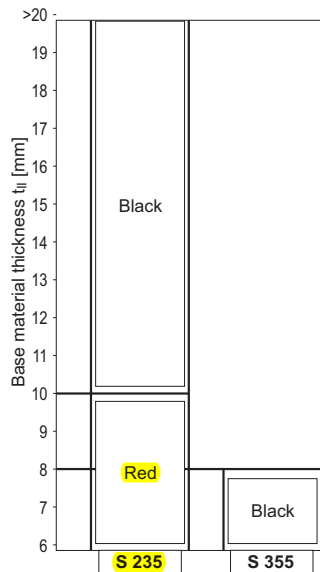
### Fastening wood to steel



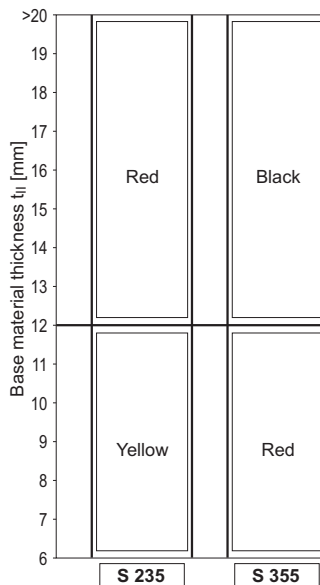
$h_{ET} \geq 8 \text{ mm}$

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

**X-U 16**



**X-U 15 P8TH**

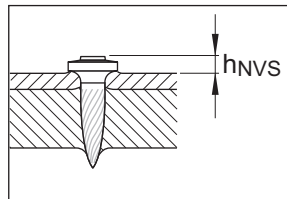


**Fastening quality assurance**

**Fastening inspection**

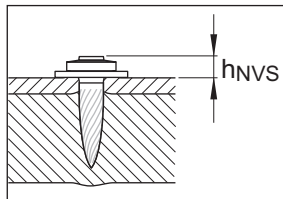
**Fastening to steel**

X-U \_\_ P8/MX/MXSP



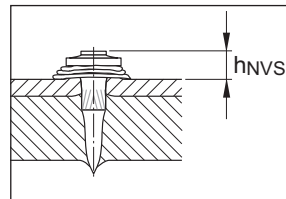
$h_{NVS} = 2.5-4.5 \text{ mm}$

X-U \_\_ S12



$h_{NVS} = 4.0-5.5 \text{ mm}$

X-U \_\_ P8TH



$h_{NVS} = 4.0-6.0 \text{ mm}$

## Fastener program

Fastener	Item no.	L <sub>s</sub> [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	
<b>X-U 16 MX</b>	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
<b>X-U 16 P8</b>	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
<b>X-U 16 P8TH</b>	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, *)
<b>X-U 15 MXSP</b>	383466	16	■				■				Sheet metal on steel
<b>X-U 15 P8TH</b>	237328	16		■	■	■		■	■	■	Sheet metal on steel

\*) firm hold down



Fastener	Item no.	L <sub>s</sub> [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	
<b>X-U 27 P8S15</b>	237371	27	■	■	■		■	■	■		High pull-over strength
<b>X-U 32 P8S15</b>	237372	32	■	■	■		■	■	■		High pull-over strength
<b>X-U 32 P8S36</b>	237374	32	■	■	■		■	■	■		Soft material on concr./steel
<b>X-U 52 P8S36</b>	237376	52	■	■	■		■		■		Soft material on concr./steel
<b>X-U 72 P8S36</b>	237379	72	■	■	■						Soft material on concr./steel
<b>X-U 16 S12</b>	237357	16								■	High pull-over strength
<b>X-U 19 S12</b>	237358	19								■	High pull-over strength
<b>X-U 22 S12</b>	237359	22								■	High pull-over strength
<b>X-U 27 S12</b>	237360	27								■	High pull-over strength
<b>X-U 32 S12</b>	237361	32								■	High pull-over strength

■ = Recommended

■ = Feasible