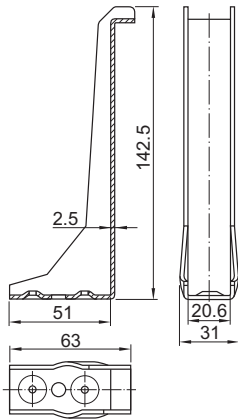


X-HVB shear connectors

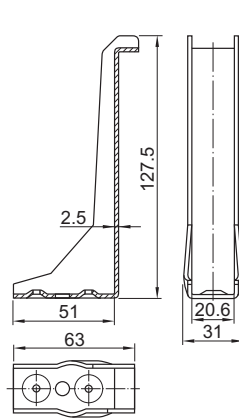
Product data

Dimensions

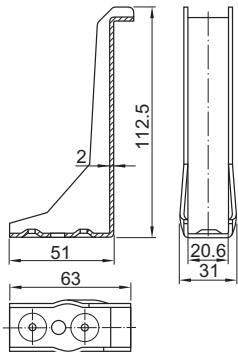
X-HVB 140



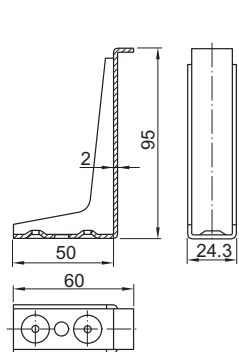
X-HVB 125



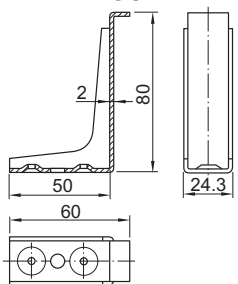
X-HVB 110



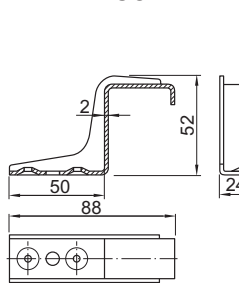
X-HVB 95



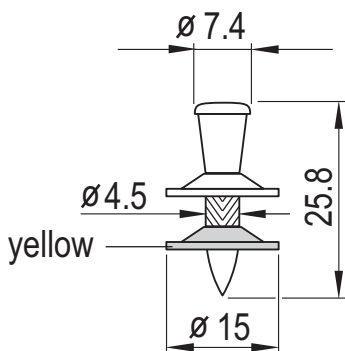
X-HVB 80



X-HVB 50



X-ENP-21 HVB



General information

Material specifications

X-HVB

Carbon steel: $R_m = 295\text{--}350 \text{ N/mm}^2$

Zinc coating: $\geq 3 \mu\text{m}$

X-ENP-21 HVB

Carbon steel shank: HRC58

Zinc coating: 8–16 μm

Fastening tools and equipment

Tool	DX 76 PTR
Fastener Guide	X-76-F-HVB-PTR
Piston	X-76-P-HVB-PTR
Cartridges	6.8/18 M black, red (for details see application limit X-ENP-21 HVB)

See fastener selection for more details.

Approvals and design guidelines

SOCOTEC (France)

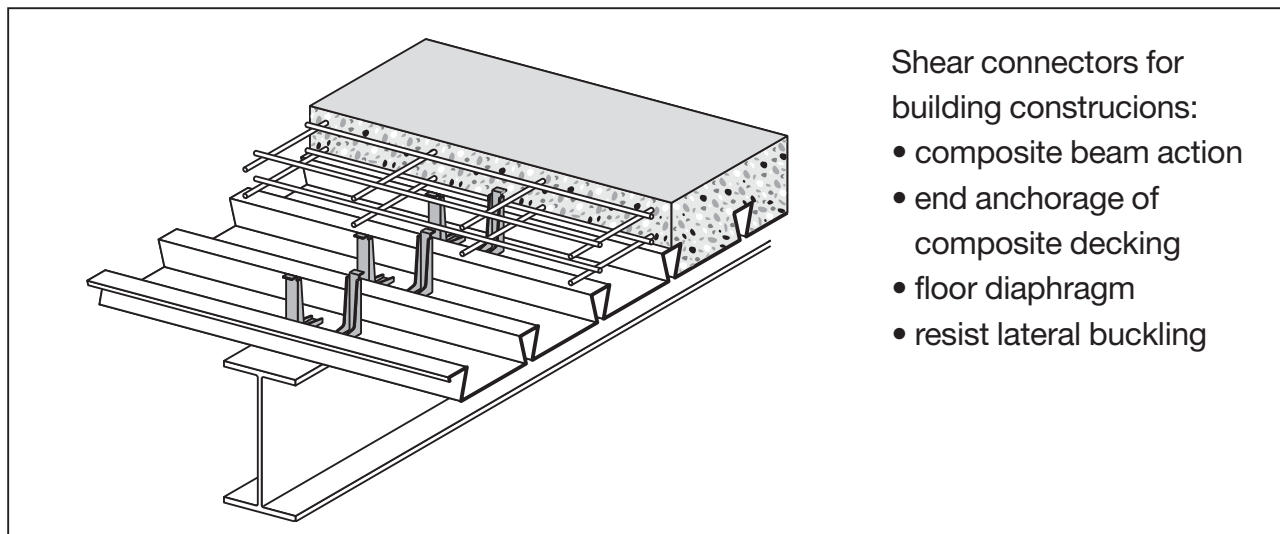
DIBt (Germany)

SCI (UK), TZÚS (Czech)

Note: technical data presented in these approvals and design guidelines reflect specific local conditions and may differ from those published in this handbook. If the fastening is subject to an approval process or where a design guideline must be used, technical data in the approval or design guideline has precedence over data presented here. Approval copies are available from your Hilti technical advisory service.

Applications

Examples



- Shear connectors for building constructions:
- composite beam action
 - end anchorage of composite decking
 - floor diaphragm
 - resist lateral buckling

Design data

Solid slabs

Nominal	Characteristic shear resistance P_{Rk} [kN] ¹⁾	Design shear resistance P_{Rd} [kN] ²⁾	Allowable horizontal shear q [kN] ³⁾	Allowable resistance (working load) R_D [kN] ⁴⁾
X-HVB 50	23	18	N.A	13
X-HVB 80	28	23	14	16
X-HVB 95	35	28	17.5	22
X-HVB 110	35	28	17.5	22
X-HVB 125	35	28	17.5	22
X-HVB 140	35	28	17.5	22

¹⁾ As defined in EN 1994-1-1 (Nominal strength in AISC-LRFD; unfactored shear resistance in CISC, Q_k in BS 5950:3:3.1:1990)

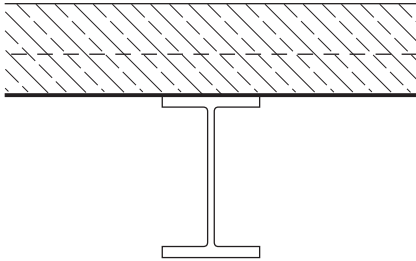
²⁾ As defined in EN 1994-1-1 (Q_p in BS 5950:3:3.1:1990)

³⁾ Allowable shear in AISC-ASD

⁴⁾ Allowable shear for working load design

Reduction factors for profile metal decks

Ribs transverse to beams



Note: $k_t \leq 1.0$

$$k_t = \frac{K}{\sqrt{N_r}} \cdot \frac{b_0}{h_{ap}} \cdot \frac{h_{sc}-h_{ap}}{h_{ap}}$$

EN 1994-1-1 designs:

K = 0.70

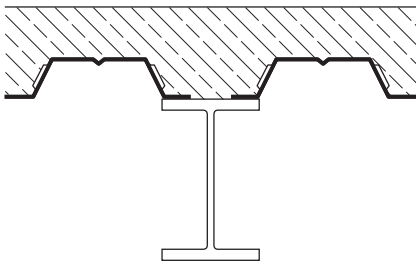
N_r = HVBs / rib (≤ 2 in the calculation even if 3 are placed in a rib)

AISC, CISC, BS 5950, other design codes:

K = 0.85

N_r = HVBs / rib (1, 2 or 3)

Ribs parallel to beams



Note: $k_p \leq 1.0$

for $\frac{b_0}{h_{ap}} \geq 1.8 \Rightarrow k_p = 1.0$

for $\frac{b_0}{h_{ap}} < 1.8 \Rightarrow k_p = 0.6 \times \frac{b_0}{h_{ap}} \times \frac{h_{sc}-h_{ap}}{h_{ap}}$

Engineering advice

Connector placement along the beam

The HVB is a flexible connector and may be uniformly distributed between points where large changes in shear flow occur. These points may be supporting points, points of application of point loads or areas with extreme values of bending moments.

Partial shear connection

Strength:

The minimum connection depends on the design code used:

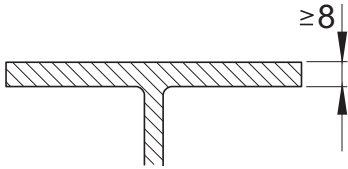
- a) In **EN 1994-1-1 and BS 5950** designs, **N/N_f**, must be at least 0.4. This is increased depending on span length and decking geometry.
- b) In **AISC**, **N/N_f** must be at least 0.25.
- c) In **CISC**, **N/N_f** must be at least 0.50.

Deflection control only:

If the shear connection is needed for deflection control only, there is no minimum degree of connection. However, minimum allowable connector spacing applies and steel beam must have enough strength to carry the self-weight and all imposed loads.

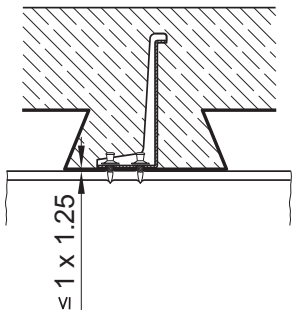
Application requirements

Thickness of base material



Minimum thickness of steel base material $t_{II} = 8 \text{ mm}$

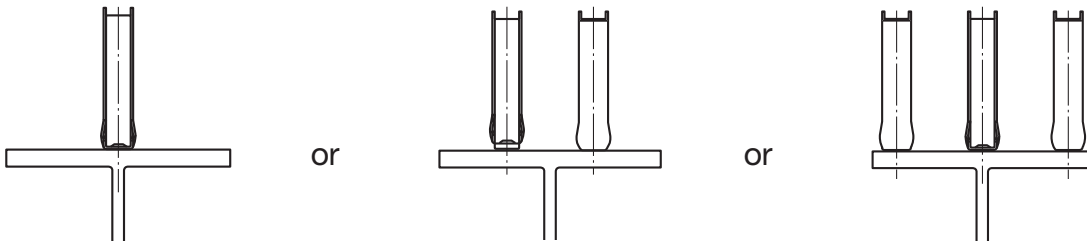
Thickness of fastened material



Maximum thickness of decking $t_I = 1.25 \text{ mm}$

Connector positioning, spacing and edge distances

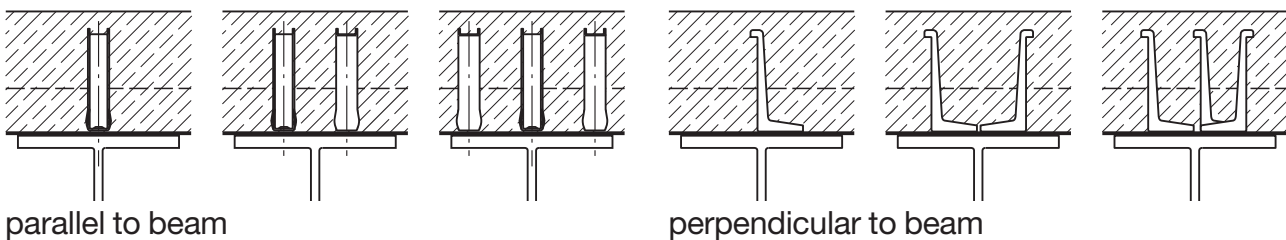
General positioning



Position the HVBs so that the shear force is transferred symmetrically to the beam. The HVB orientation parallel to the axis of the beam is preferred.

Positioning on metal decks - ribs transverse to beam

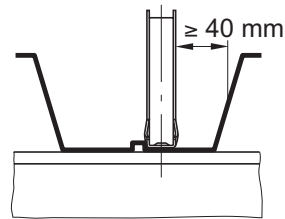
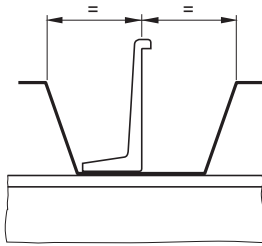
1) One, two or three HVB's per rib



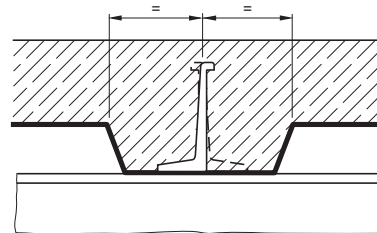
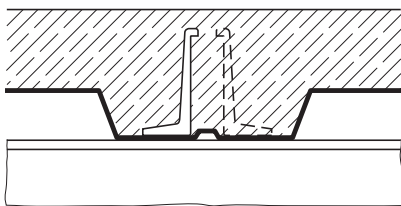
parallel to beam

perpendicular to beam

2a) Position in the rib : 1 HVB per rib – leg centred in the rib or 40 mm clearance

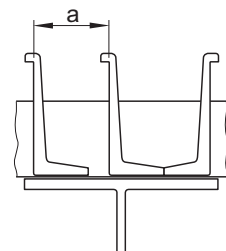
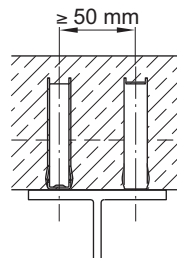


2b) With 2 or 3 HVBs per rib – legs centred in the rib or alternated about the centre



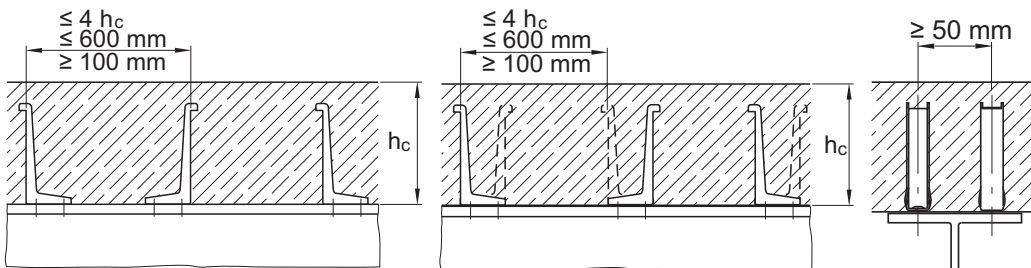
3) Spacing along the ribs

- basic minimum spacing, $a \geq 50$ mm
- $a \geq 100$ mm for:
 - $b_o/m < 0.7$ and $b_o/h_{ap} < 1.8$
 - SDI 3" composite decking (USA)



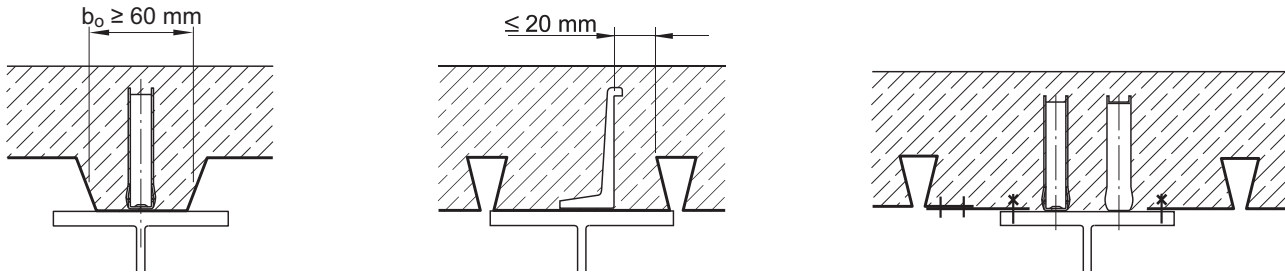
m = rib spacing

Positioning on solid slabs and metal decks – ribs parallel to beam



- With 1 connector per row, alternate direction of connectors from X-HVB to X-HVB.
- With 2 or 3 connectors per row, alternate direction of connectors inside of each row and from row to row.

Clearance to metal decking



Split decking if necessary for spacing / clearance

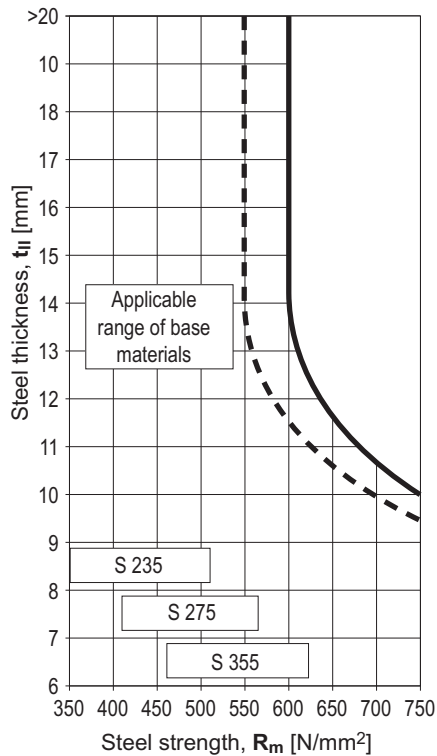
Corrosion information

The intended use only comprises fastenings which are not directly exposed to external weather conditions or moist atmospheres.

Application limits

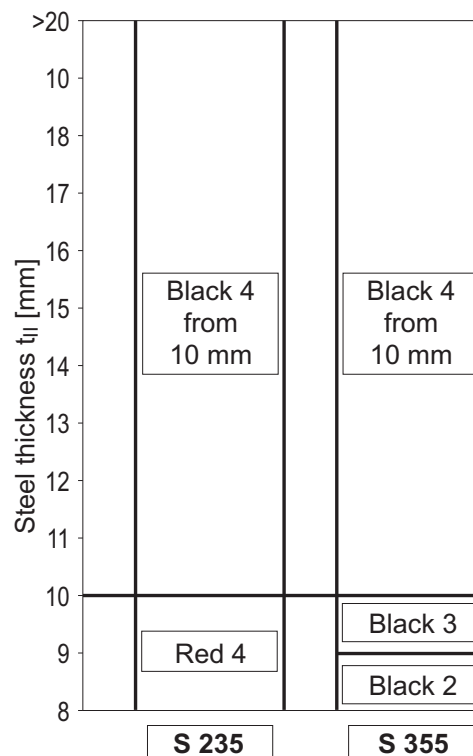
Application limits are valid only if correct cartridge and power setting are used!

Application limits X-ENP-21 HVB



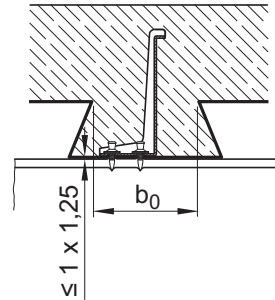
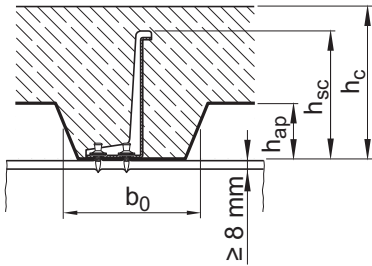
In thermo-mechanically rolled construction steel, e.g. S 355M per EN 10025-4 the application limit is reduced by 50 N/mm²

Cartridge preselection and power setting



Fine adjustment by setting tests on site

Fastener selection

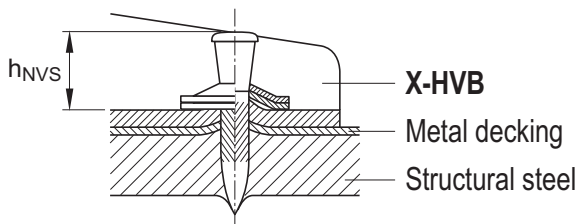


Connector

Designation	Item no.	Maximum decking height h_{ap} [mm]	
		$b_0 / h_{ap} \geq 1.8$	$b_0 / h_{ap} < 1.8$
X-HVB 50	56467	Not for use with profiled decking	
X-HVB 80	239357	45	45
X-HVB 95	239358	60	57
X-HVB 110	239359	75	66
X-HVB 125	239360	80	75
X-HVB 140	239361	80	80
all connectors with two nails			
X-ENP-21 HVB	283512		

Fastening quality assurance

Fastening inspection



X-ENP-21 HVB $h_{NVS} = 8.2-9.8$ mm

