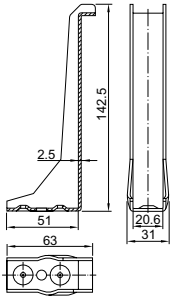
X-HVB shear connectors

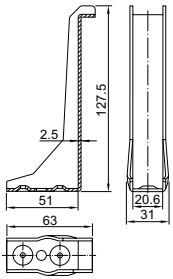
Product data

Dimensions

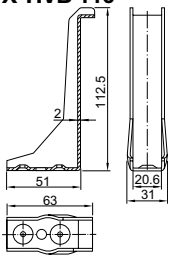
X-HVB 140



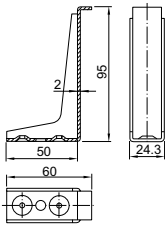
X-HVB 125



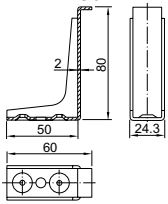
X-HVB 110



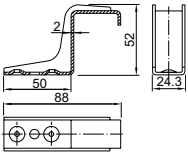
X-HVB 95



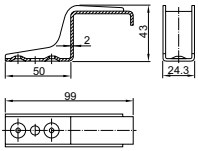
X-HVB 80



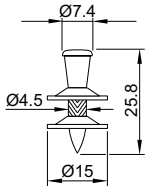
X-HVB 50



X-HVB 40



X-ENP-21 HVB



General information

Material specifications

X-HVB

Carbon steel: R_m = 295–350 N/mm²

Zinc coating: ≥ 3 µm

X-ENP-21 HVB

Carbon steel shank: HRC58

Zinc coating: 8–16 µm

Recommended fastening tools

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

See **Tools and equipment** for more details.

Approvals and design guidelines

SOCOTEC (France)

DIBt (Germany)

MLIT / BCJ (Japan),

Rom. Ministry AT 016-01/214-2010 (Roma),

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.

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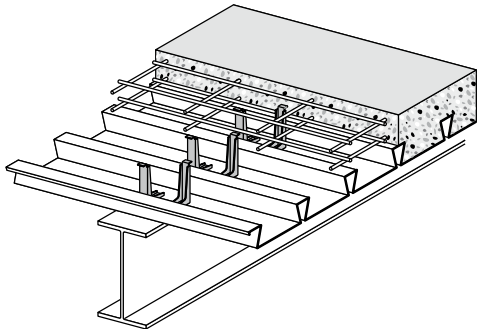
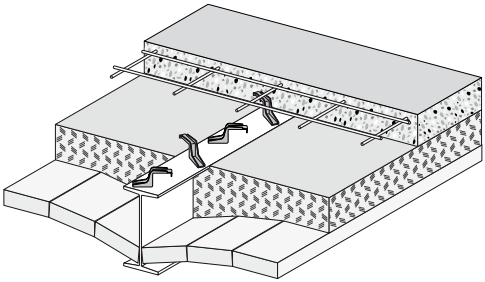
Applications

Examples



Typical application of X-HVB shear connector with steel deck, e.g. new construction.



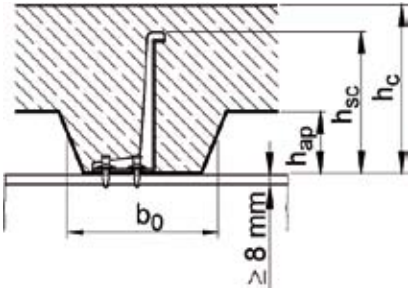
Typical application of X-HVB shear connector with jack arch system (without steel deck), e.g. rehabilitation project.

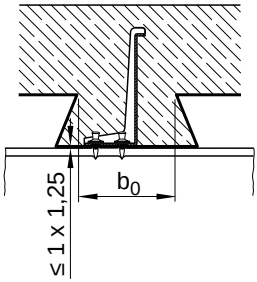
Design data

Designation	LWC [1] / NWC [2]	Characteristic shear resistance, P_{Rk} [3]	Design shear resistance, P_{Rd} [4]	Allowable horizontal shear [5]
X-HVB 40	LWC	25 kN	20 kN	N.A.
X-HVB 50	LWC	25 kN	20 kN	N.A.
X-HVB 40	NWC	28 kN	23 kN	N.A.
X-HVB 50	NWC	28 kN	23 kN	N.A.
X-HVB 80	NWC	28 kN	23 kN	14 kN
X-HVB 95	NWC	35 kN	28 kN	17.5 kN
X-HVB 110	NWC	35 kN	28 kN	17.5 kN
X-HVB 125	NWC	35 kN	28 kN	17.5 kN
X-HVB 140	NWC	35 kN	28 kN	17.5 kN

1) LWC: lightweight concrete with density of 1800kg/m3 and class L20-22
2) NWC: normal weight concrete with density of 2400kg/m3 and class C20-25
3) As defined in EN1994-1-1 (nominal strength in AISC-LRFD)
4) As defined in EN 1994-1-1
5) Allowable shear in AISC-ASD

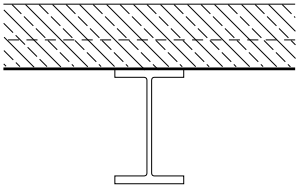
Reduction factors for profile metal decks





C

Ribs transverse to beams



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

EN 1994-1-1 designs:

K = 0.70

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

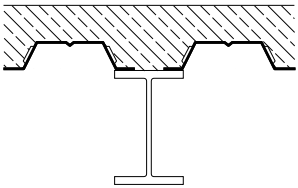
AISC, CISC, BS 5950, other design codes:

K = 0.85

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

Note: $k_t \leq 1.0$

Ribs parallel to beams



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

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

Note: $k_p \leq 1.0$

Engineering advice

Connector placement along the beam

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

Partial shear connection

Strength:

The minimum connection depends on the design code used:

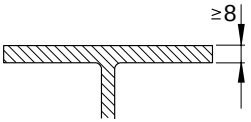
a) In **EN 1994-1-1** design, **N/N_f** must be at least 0.4. This increases depending on span length and decking geometry.
b) In **AISC, N/N_f** must be at least 0.25.
c) In **CISC, N/N_f** must be at least 0.50.

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 the steel beam must have enough strength to carry the self-weight and all imposed loads.

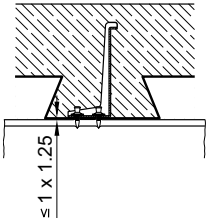
Application requirements

Thickness of base material



Minimum thickness of steel base material t_{II} **= 8 mm**
In rehabilitation projects, application to thin beam flanges of minimum 6 mm is possible in order to take the use of small I-sections (e.g. IAO 100 or IPN 80) into account. Please refer to Socotec approval or contact Hilti for detailed information.

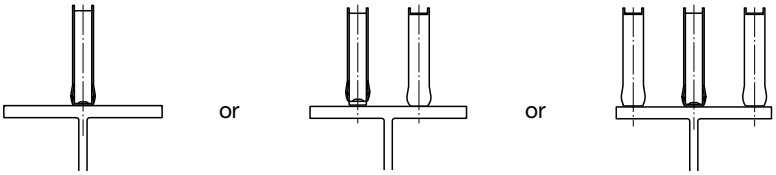
Thickness of fastened material



Maximum thickness of decking t_I **= 1.25 mm**

Connector positioning, spacing and edge distances

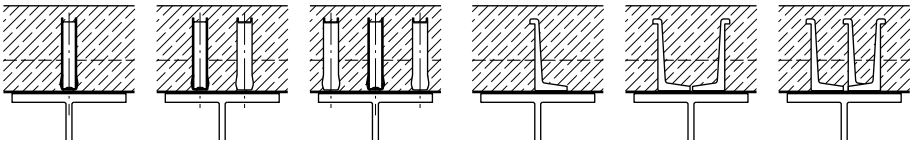
General positioning



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

Positioning on metal decks - ribs transverse to beam

1) One, two or three X-HVBs per rib



Parallel to beam

Perpendicular to beam

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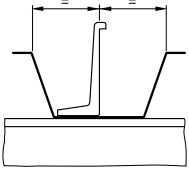
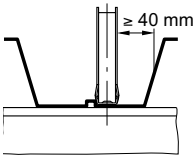
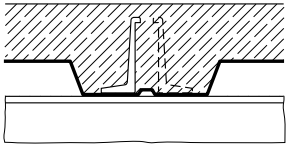
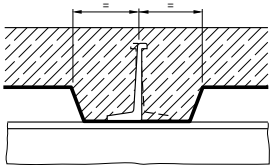
2a) Position in the rib : 1 X-HVB per rib – leg centred in the rib or 40 mm clearance





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

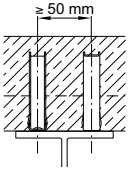


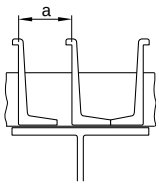


3) Spacing along the ribs

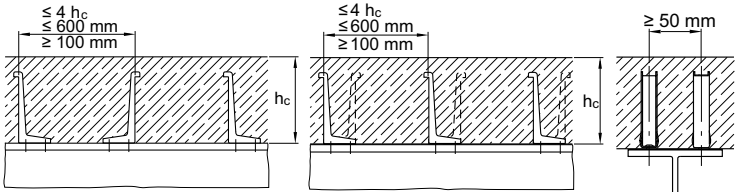
- basic minimum spacing, a ≥ 50 mm
- a ≥ 100 mm for:
  $\mathbf{b_o/m} < 0.7$ and $\mathbf{b_o/h_{ap}} < 1.8$
- SDI 3” composite decking (USA)

m = rib spacing



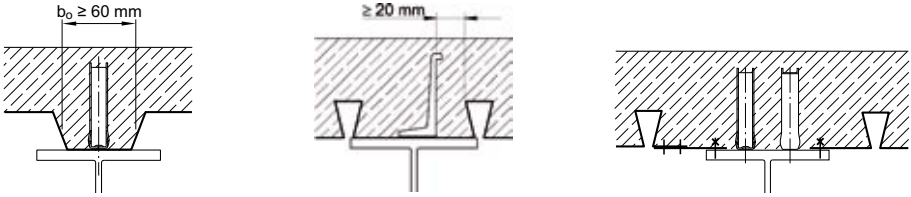


Positioning on solid slabs and metal decks – ribs parallel to beam



- With 1 connector per row, alternate direction of connectors from X-HVB to X-HVB.
- In case of multiple rows (parallel to the beam axis), X-HVBs must be placed with the same direction inside of each row and alternate from row to row.

Clearance to metal decking



Split decking if necessary for spacing / clearance

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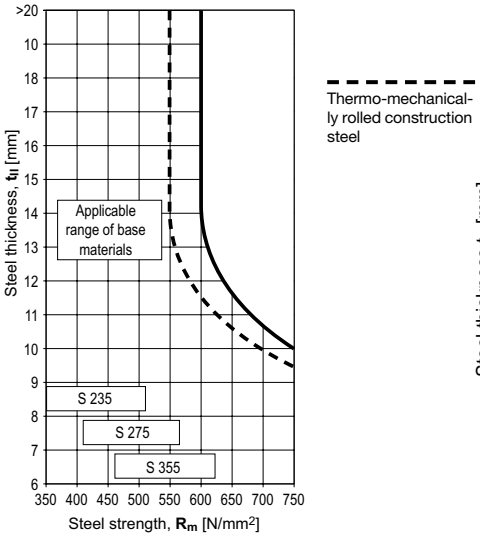
Corrosion information

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

Application limits

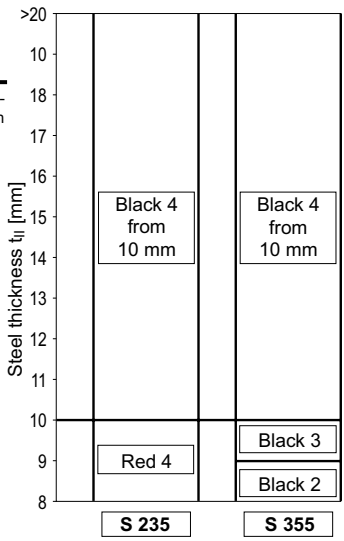
Application limits are valid only if correct cartridge and power setting are used!

Application limits X-ENP-21 HVB



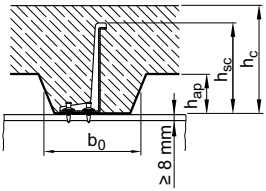
In thermo-mechanically rolled construction steel, e.g. S 355M per EN 10025-4 the application limit is reduced by 50 N/mm²

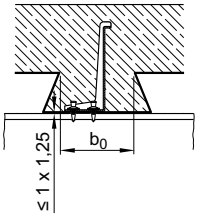
Cartridge preselection and power setting



Fine adjustment by carrying out installation tests on site

Fastener selection



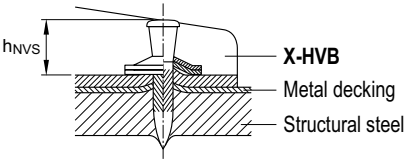


Connector

Designation	Item no.	Maximum decking height h_{ap} [mm] $b_0 / h_{ap} \geq 1.8$	$b_0 / h_{ap} < 1.8$
X-HVB 40	2112256	Not for use with profiled decking	
X-HVB 50	56467	Not for use with profiled decking	
X-HVB 80	239357	45	45
X-HVB 95	348179	60	57
X-HVB 110	348180	75	66
X-HVB 125	348181	80	75
X-HVB 140	348321	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