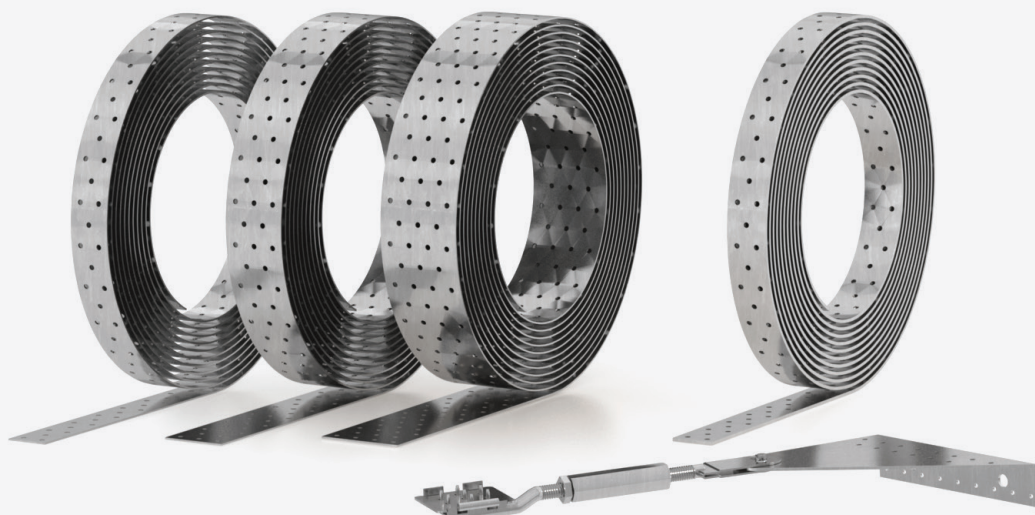


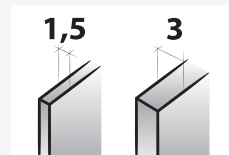
Perforated tape

Bright zinc plated carbon steel coiled straps



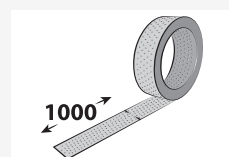
TWO THICKNESSES

Simple and effective system to realize floor bracings; available in thicknesses of 1,5 mm and 3,0 mm



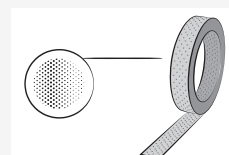
METRIC MARKING

Presence of indentations along all the strap length to facilitate dimensioning and cut according to the design needs



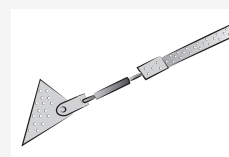
SPECIAL STEEL

S350 GD high strength steel 1,5 mm thick to provide extreme resistance within a small thickness



CLIPSET

Set for securing the strap ends, to realize all kind of floor and roof bracings effortlessly



FIELD OF USE

Timber to timber joints

- solid timber
- glulam timber
- XLAM (Cross Laminated Timber)
- LVL
- wood-based panels



BRACINGS

Ideal system to realize floor bracings quickly, safely and effectively. High quality steel; the reduced thickness does not jeopardize the high tensile strength. CE mark for suitability of use



TENSILE LOADS

Optimal to solve situations requiring the transfer of tensile loads among timber elements far from each other: bracings, walls connections, cantilevered joints

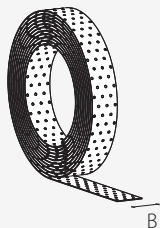


STABILITY

The end of the perforated strap in the 60 mm version, can be incorporated into the CLIPSET to obtain a stable and safe fixing on any structure of any size

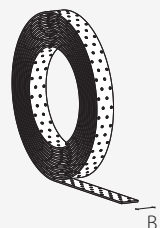
CODES AND DIMENSIONS

LBB 1,5 mm



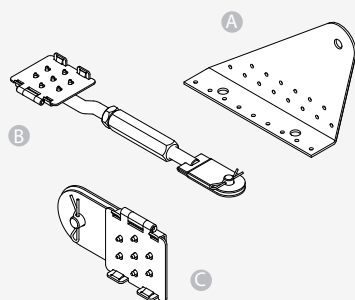
code	type	B [mm]	L [m]	n Ø5 [pcs]	s [mm]		pcs/box
PF900040	LBB4015	40	50	75 / m	1,5	•	1
PF900060	LBB6015	60	50	125 / m	1,5	•	1
PF400080	LBB8015	80	25	175 / m	1,5	•	1

LBB 3,0 mm



code	type	B [mm]	L [m]	n Ø5 [pcs]	s [mm]		pcs/box
PF400043	LBB4030	40	50	75 / m	3	•	1

CLIPSET

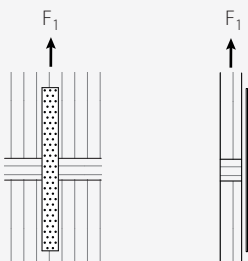


code	LBB type	LBB width	pcs/box
CLIPSET60	perforated strap LBB6015	B = 60 mm	1

The set is comprised of:	B [mm]	H [mm]	L [mm]	n Ø5 [pcs]	n Ø13 [pcs]	s [mm]	pcs/set
A Piastra terminale	254	181	43	9 + 14	2	3	4
B Tenditore Clip-Fix	76	20	334 - 404	-	-	2	2
C Terminale Clip-Fix	76	20	150	-	-	2	2

The set allows to realize two bracing diagonals.

EXTERNAL LOADS



MATERIAL AND DURABILITY

LBB 1,5 mm: Z275 bright zinc plated S350GD carbon steel.

LBB 3,0 mm: Z275 bright zinc plated S250GD carbon steel

CLIPSET: Z275 bright zinc plated DX51D carbon steel.

To be used in Service class 1 and 2 (EN 1995:2008).

FIELD OF USE

Timber to timber joints



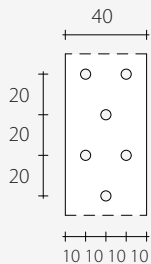
ADDITIONAL PRODUCTS - FASTENERS

type	description		d [mm]	support	p.
LBA	Anker nail		4		364
LBS	screws for plates		5		364

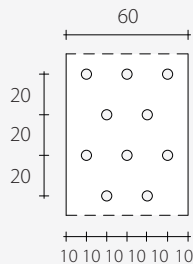
The assembling of the system shall be performed by using the tools described in the chapter 1 of the catalogue "Tools for wooden construction, (p. 20)

GEOMETRY

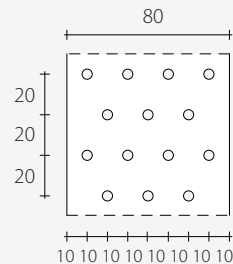
LBB4015 / LBB4030



LBB6015

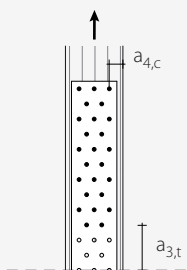


LBB8015



INSTALLATION

LBB ASSEMBLING

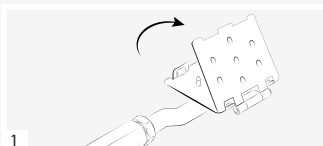


TIMBER - MINIMUM DISTANCES

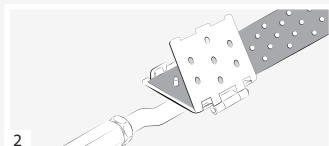
Angle of load to grain $\alpha = 0^\circ$		anker nail LBA Ø4		screw LBS Ø5
Lateral fastener-Unloaded edge	$a_{4,c}$ [mm]	$\geq 5 d$	≥ 20	≥ 25
Fastener-Loaded end	$a_{3,t}$ [mm]	$\geq 15 d$	≥ 60	≥ 75

CLIPSET ASSEMBLING

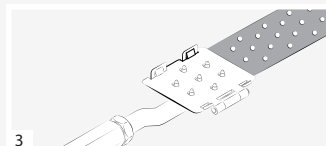
CLIP-FIX TENSIONER



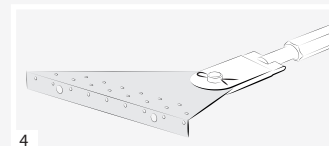
1 Open the Clip-Fix



2 Insert the perforated strap

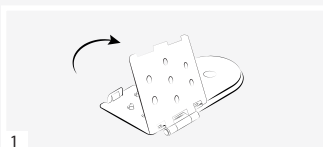


3 Close the Clip-Fix

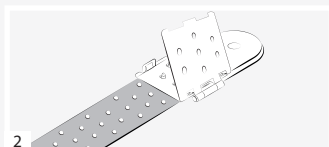


4 Fix it to the plate

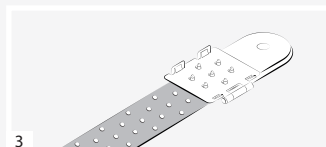
TERMINALE CLIP-FIX



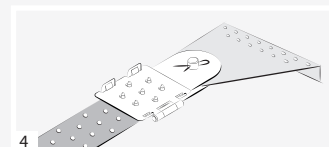
1 Open the Clip-Fix



2 Insert the perforated strap

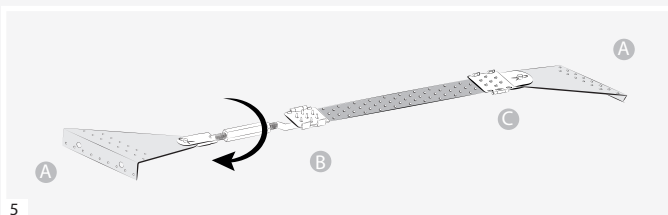


3 Close the Clip-Fix



4 Fix it to plate

ADJUSTING THE SYSTEM



Use the tensioner to regulate the length of the bracing system

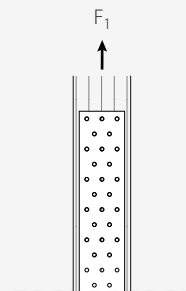
STATIC VALUES - TENSION JOINT - TIMBER-TO-TIMBER

STRENGTH OF THE SYSTEM

The tensile strength of the system $R_{1,d}$ is the minimum between the strap tensile strength $R_{ax,d}$ and the fasteners shear strength $n \cdot R_{v,d}$.

In case of connectors placed in rows, the correction coefficient m_{ef} shall be applied.

$$R_{1,d} = \min \left\{ \begin{array}{l} R_{ax,d} \\ n \cdot m_{ef} \cdot R_{v,d} \end{array} \right.$$



STRAP -TENSILE STRENGTH

				CHARACTERISTIC VALUES	ADMISSIBLE VALUES
TYPE	B [mm]	s [mm]	n. holes net area [pcs]	$R_{ax,k}$ [kN]	N_{amm} [kg]
LBB 1,5 mm	40	1,5	2	17,0	955
	60	1,5	3	25,5	1432
	80	1,5	4	34,0	1909
LBB 3,0 mm	40	3,0	2	26,7	1364

FASTENERS – SHEAR STRENGTH OF STEEL TO TIMBER JOINTS

For the strength $R_{v,k}$ of the LBA anker nails and of the LBS screws see tables at p. 366.

For the correction coefficient m_{ef} see tables at p. 255.

NOTES for seismic design



Particular attention has to be paid to the "capacity design" applied at different scale levels: the global structure and the WHT connection system. The experimental ultimate strength of the LBA nails (and the LBS screws) is higher than the characteristic strength evaluated according to EN 1995.

E.g. LBA nail Ø4 x 60 mm: $R_{v,k} = 1,93$ kN according to EN1995 / $R_{v,k} = 2,8 - 3,6$ kN from experimental tests (it varies depending on the timber properties). Experimental data derive from tests carried out within the X-REV research project and are reported in the scientific report: "Sistemi di connessione per edifici in legno: indagine sperimentale per la valutazione di rigidità, resistenza e duttilità" (DICAM – Department of Civil, Environmental and Mechanical Engineering - UniTN).

GENERAL PRINCIPLES

- Characteristic values according to EN 1993 and EN 1995:2008.
- The strap design values can be obtained from characteristic values as follows:

$$R_{ax,d} = \frac{R_{ax,k}}{\gamma_{m2}}$$

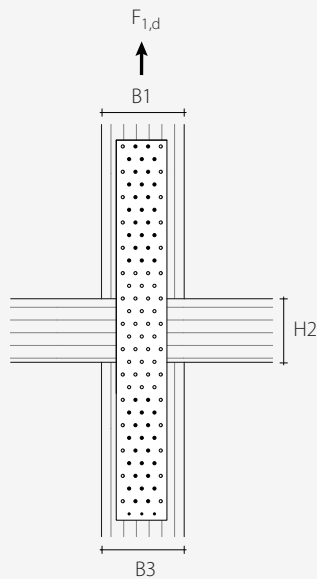
The fasteners design values can be obtained from characteristic values as follows:

$$R_{v,d} = \frac{R_{v,k} \cdot k_{mod}}{\gamma_m}$$

Coefficients γ_{m2} , γ_m and k_{mod} must be taken according to the current Standard adopted for the design.

- For calculations, a timber density $\rho_k = 380$ kg/m³ has been considered.
- Dimensioning and verification of timber elements must be carried out separately.
- The characteristic shear strengths are evaluated for nails/screws inserted without predrilling; in case of nails / screws inserted in predrilled holes it is possible to obtain higher strength values.
- Admissible values are obtained according to DIN 1052:1988.
- It is recommended to place the fasteners symmetrically with respect to the load direction.

CALCULATION EXAMPLE - TIMBER-TO-TIMBER TENSION JOINT



PROJECT DATA

- load $F_{1,d} = 20,3 \text{ kN}$
- service class = 2
- load duration = short time

- Glulam GL24h
- element 1: $B1 = 120 \text{ mm}$
- element 2: $H2 = 100 \text{ mm}$
- element 3: $B3 = 120 \text{ mm}$

The joint can be realized either with perforated straps (LBB) or perforated plates (LBV).

LBB STRAP CHOICE

Perforated strap LBB8015

$B = 80 \text{ mm}$
 $s = 1,5 \text{ mm}$

CONNECTOR CHOICE ⁽¹⁾

anker nail LBA440

$d_1 = 4,0 \text{ mm}$
 $L = 40 \text{ mm}$

LBV PLATE CHOICE

Perforated plate LBV80600

$B = 80 \text{ mm}$
 $s = 1,5 \text{ mm}$
 $H = 600 \text{ mm}$

CONNECTOR CHOICE ⁽¹⁾

anker nail LBA440

$d_1 = 4,0 \text{ mm}$
 $L = 40 \text{ mm}$

EVALUATION OF THE SYSTEM STRENGTH ⁽²⁾

STRAP / PLATE TENSILE STRENGTH

$$R_{ax,d} = \frac{R_{ax,k}}{\gamma_{m2}}$$

LBB8015

$R_{ax,k} = 34,0 \text{ kN}$
 $\gamma_{m2} = 1,25$
 $R_{ax,d} = 27,20 \text{ kN}$

LBV80600

$R_{ax,k} = 26,7 \text{ kN}$
 $\gamma_{m2} = 1,25$
 $R_{ax,d} = 21,36 \text{ kN}$

FASTENER SHEAR STRENGTH

$$R_{V,d} = \frac{R_{V,k} \cdot k_{mod}}{\gamma_m}$$

LBA440

$R_{V,k} = 2,02 \text{ kN}$
 $n = 25 \text{ pcs}$
 number of nailed rows = 10
 $m_{ef} = 0,79$
 $k_{mod} = 0,90$
 $\gamma_m = 1,30$
 $R_{V,d} = 1,40 \text{ kN}$
 $n \cdot m_{ef} \cdot R_{V,d} = 27,62 \text{ kN}$

LBA440

$R_{V,k} = 2,02 \text{ kN}$
 $n = 20 \text{ pcs}$
 number of nailed rows = 10
 $m_{ef} = 0,79$
 $k_{mod} = 0,90$
 $\gamma_m = 1,30$
 $R_{V,d} = 1,40 \text{ kN}$
 $n \cdot m_{ef} \cdot R_{V,d} = 22,10 \text{ kN}$

SYSTEM STRENGTH

$$R_{1,d} = \min \left\{ \begin{array}{l} R_{ax,d} \\ n \cdot m_{ef} \cdot R_{V,d} \end{array} \right.$$

$R_{1,d} = 27,20 \text{ kN}$

$R_{1,d} = 21,36 \text{ kN}$

VERIFICATION

$$R_{1,d} \geq F_{1,d}$$

$27,2 \text{ kN} \geq 20,3 \text{ kN}$ OK ✓

$21,36 \text{ kN} \geq 20,3 \text{ kN}$ OK ✓

GENERAL PRINCIPLES

To optimize the connection system, it is recommended to use a number of fasteners which can provide a shear capacity comparable with the tensile strength of the strap / plate.
 It is recommended to place the fasteners symmetrically with respect to the load direction.

NOTES

- ⁽¹⁾ In the calculation example LBA nails are used. The fixing may also be realized through full-threaded LBS screws (p. 364).
- ⁽²⁾ Coefficients γ_{m2} , γ_m and k_{mod} are in accordance with EN 1993 and EN 1995:2008. In case NTC2008 is adopted as reference standard, a coefficient $\gamma_m = 1,5$ shall be assumed.