

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-22/0224
of 29 January 2024

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

PFEIFER VS-Slim-Box EASYFILL

Product family
to which the construction product belongs

Wire loop system for the connection of precast and in-situ
concrete elements

Manufacturer

Pfeifer Seil- und Hebeteknik GmbH
Dr.-Karl-Lenz-Str. 66
87700 Memmingen
DEUTSCHLAND

Manufacturing plant

Production Plants A/B/C

This European Technical Assessment
contains

20 pages including 3 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 332589-01-0601, Edition 11/2022

This version replaces

ETA-22/0224 issued on 28 June 2022

European Technical Assessment

ETA-22/0224

English translation prepared by DIBt

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Specific Part

1 Technical description of the product

The PFEIFER VS-Slim-Box EASYFILL is a wire loop system for the connection of precast elements. The wire loop system is a load transferring cast-in element, composed by a box and two wire loops made of steel. The union of two of these elements facing each by means of flowable or thixotropic-plastic joint casting grout allows the connection of two prefabricated concrete elements.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the VS-Slim-Box EASYFILL is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the VS-Slim-Box EASYFILL of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Resistance to steel failure under tension loading	See Annex C2 and C3
Resistance to concrete failure under tension loading	
Resistance under shear load 90°	
Resistance under shear load 0°	

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD No. 332589-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 29 January 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Tempel

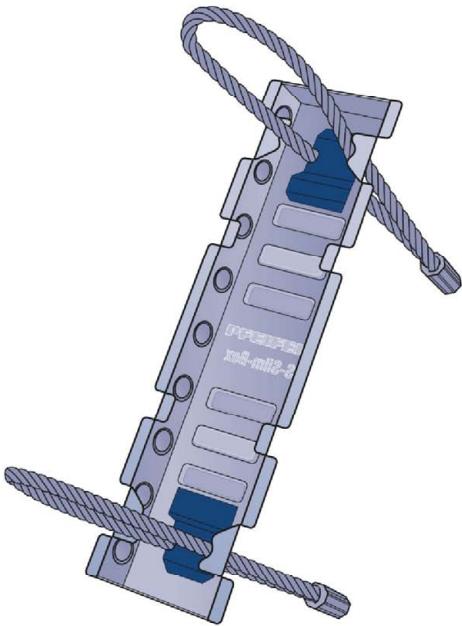


Fig. A.1: VS®-Slim-Box EASYFILL

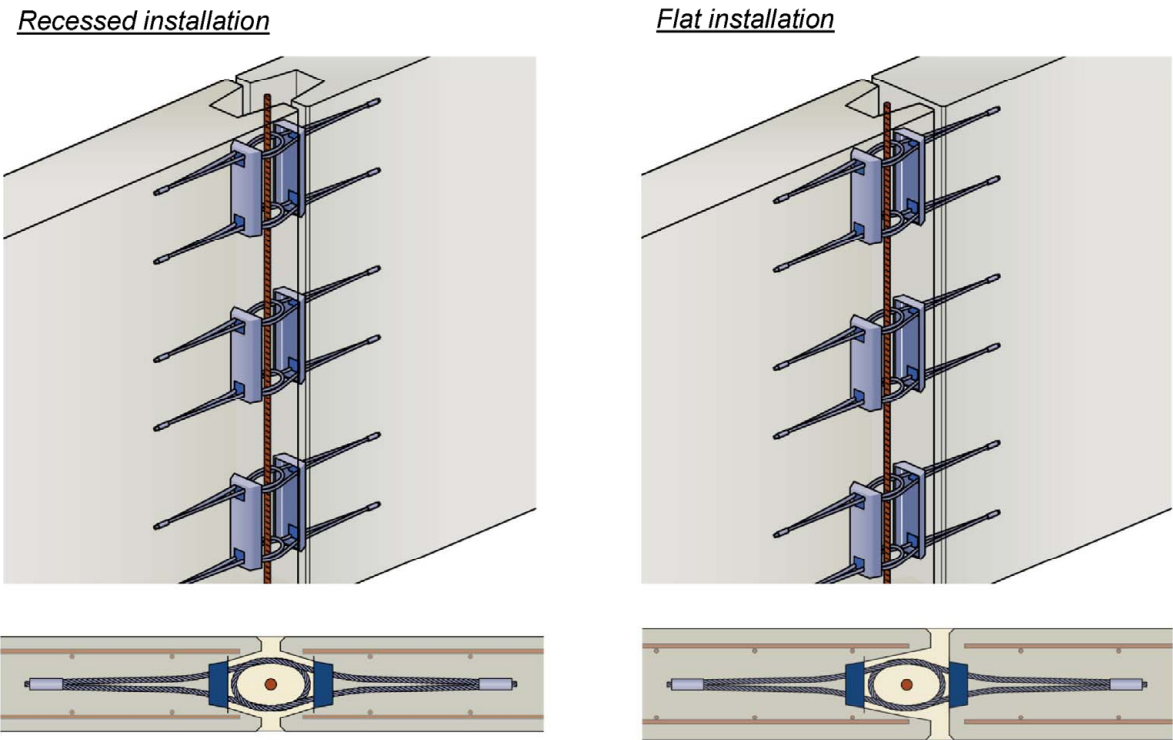


Fig. A.2: VS®-Slim-Box EASYFILL – installation options

VS®-Slim-Box EASYFILL		Annex A1
Product description Product, installation		

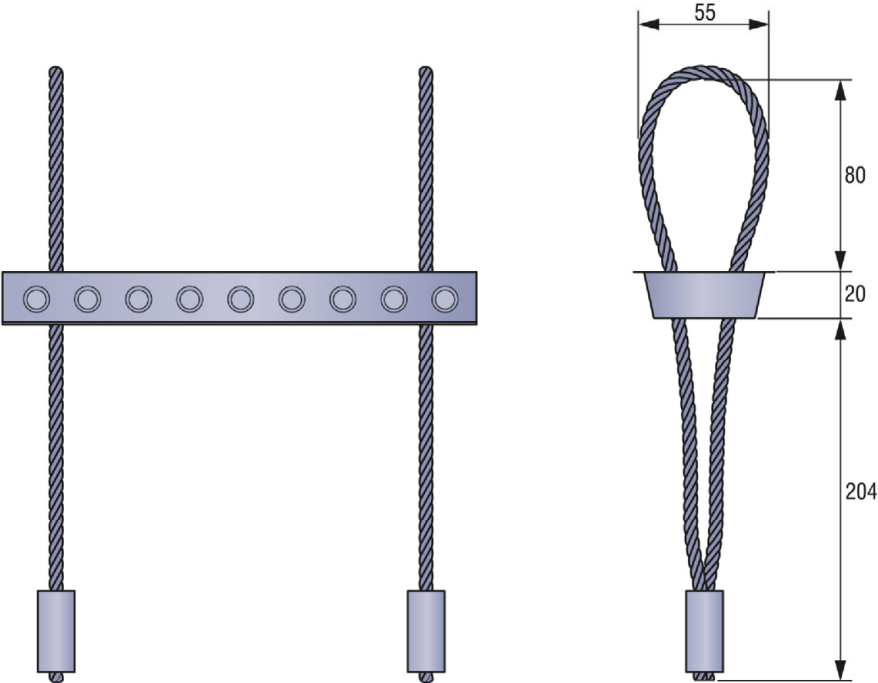


Fig. A.3: Side views VS®-Slim-Box EASYFILL

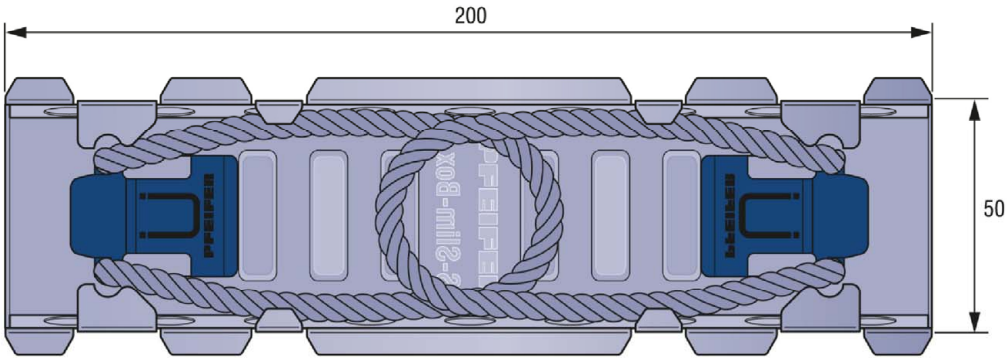


Fig. A.4: Top view on open box and bended wire loops

VS®-Slim-Box EASYFILL	Annex A2
Product description Dimensions	

Specification of intended use

Wire loop system subject to

- Static and quasi-static load

Base materials

- Precast reinforced concrete elements according to EN 1992-1-1:2004+AC:2010 made of compacted concrete without fibres, with a minimum strength class of C30/37 according to EN 206:2013.
- Cracked or uncracked concrete

Minimum reinforcement

- Minimum surface reinforcement 1,88 cm²/m
- Minimum anchoring reinforcement in case of bended wire loops according to Annex B3/B4 and B7/B8

Joint casting grout

- Flowable joint casting grout
EuroGrout® Varix, BETEC® Verguss
- Thixotropic-plastic joint casting grout
EuroGrout® Universalfüller, BETEC® Thixo

Use conditions (Environmental conditions)

- VS®-Slim-Box EASYFILL are to be installed with appropriate concrete covering. The verification of the required concrete cover must be carried out in accordance with EN 1992-1-1:2004 + AC:2010, Section 4. The required exposure class is to be selected according to the environmental requirements.

Design

- The design of anchorage is carried out under the responsibility of an engineer experienced in the field of anchorages and concrete construction.
- Calculations and design drawings must be provided taking into account the loads to be anchored. In the design drawings the position of the anchorages as well as the required anchoring reinforcement are specified.
- The design of anchoring is carried out according to EOTA Technical Report TR 074, Edition April 2022.

Installation

- The installation of the wire loop system and of the casting grout must be carried out according to the manufacturer's instructions (see Annex B11).
- The installation stability (positioning) of the anchoring ends (pressed-on clamps) must be ensured by a suitable fixing to the reinforcement (tying wire).

VS®-Slim-Box EASYFILL	Annex B1
Intended use Specifications	

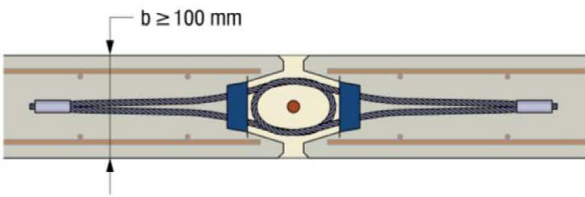


Fig B.1: Wall – Wall connection (*recessed installation*)

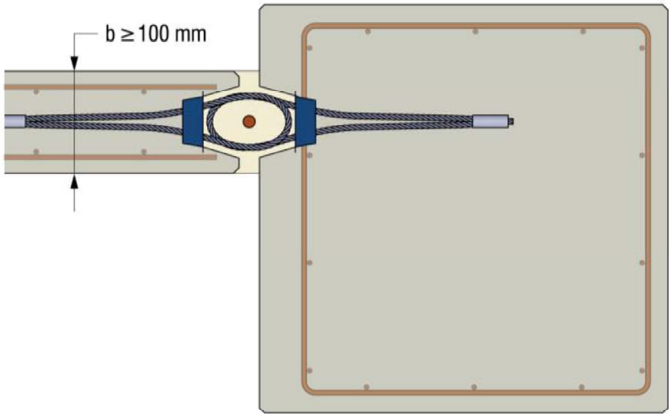


Fig. B.2: Column – Wall connection (*recessed installation*)

Note

Minimum surface reinforcement 1,88 cm²/m.

All reinforcement intended to be used for the transmission of loads within the reinforced concrete component is not shown in the figures above. It has to be defined by the responsible engineer.

VS®-Slim-Box EASYFILL	Annex B2
Intended use Recessed installation	

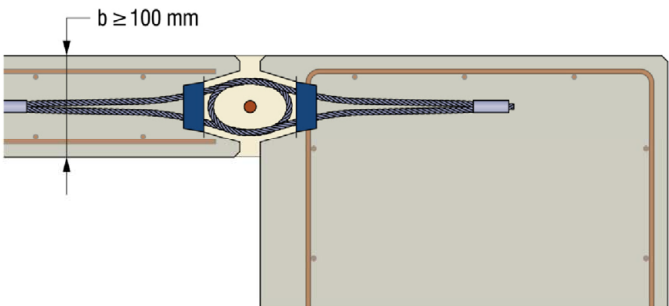


Fig B.3: Wall – Wall – Corner connection - standard detail (recessed installation)

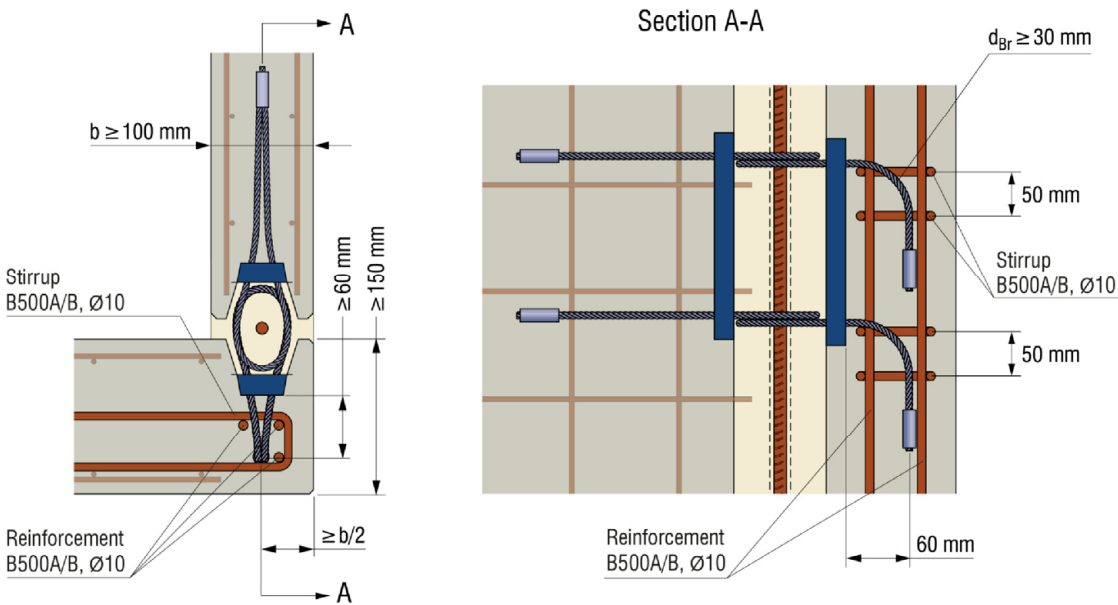


Fig B.4: Wall – Wall – Corner connection - detail with bended wire loops

Note

Minimum surface reinforcement 1,88 cm²/m.

The additional reinforcement required for local load application is shown in the drawings above. This additional reinforcement is used for anchoring the resulting loads of the VS®-Slim-Box EASYFILL-based connection to the precast concrete elements (for detailed description see Annex B5. Corner connection: note additional longitudinal bars).

All reinforcement intended to be used for the transmission of loads within the reinforced concrete component is not shown in the figures above. It has to be defined by the responsible engineer.

VS®-Slim-Box EASYFILL	Annex B3
Intended use Recessed installation	

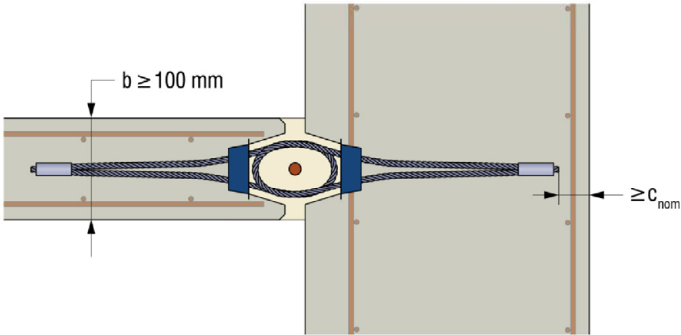


Fig. B.5: Wall – Wall – T-Connection - standard detail (*recessed installation*)

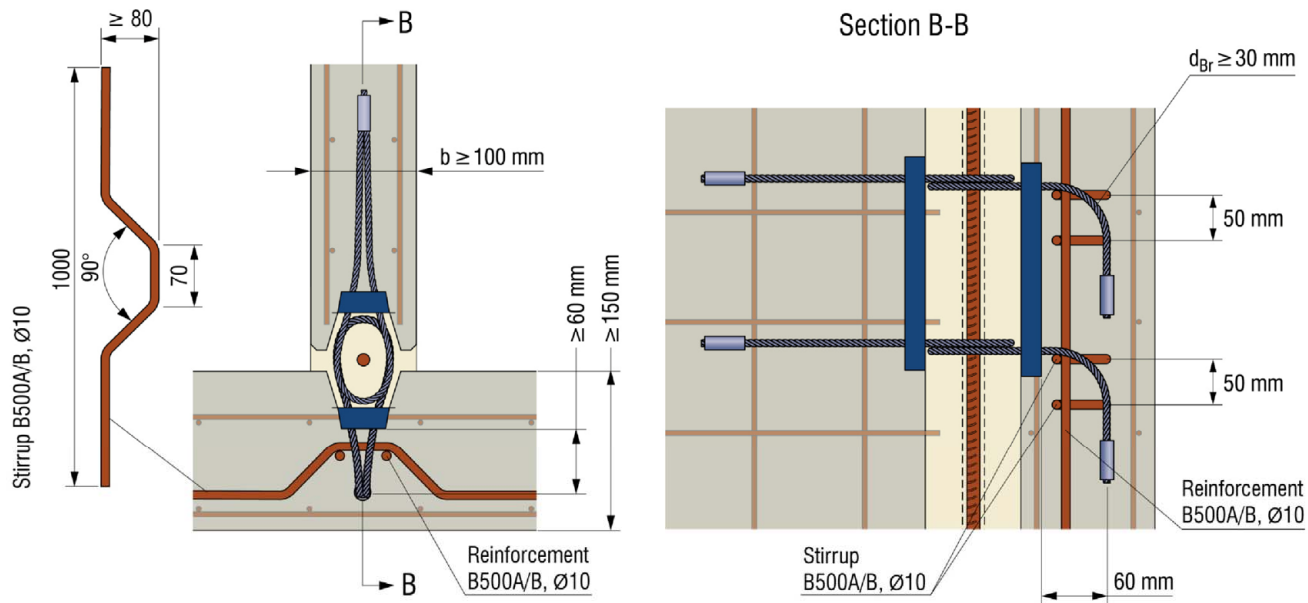


Fig B.6: Wall – Wall – T-Connection - Detail with bended wire loops

Note

Minimum surface reinforcement 1,88 cm²/m.

The additional reinforcement required for local load application is shown in the drawings above. This additional reinforcement is used for anchoring the resulting loads of the VS®-Slim-Box EASYFILL-based connection to the precast concrete elements (for detailed description see Annex B5).

All reinforcement intended to be used for the transmission of loads within the reinforced concrete component is not shown in the figures above. It has to be defined by the responsible engineer.

VS®-Slim-Box EASYFILL	Annex B4
Intended use Recessed installation	

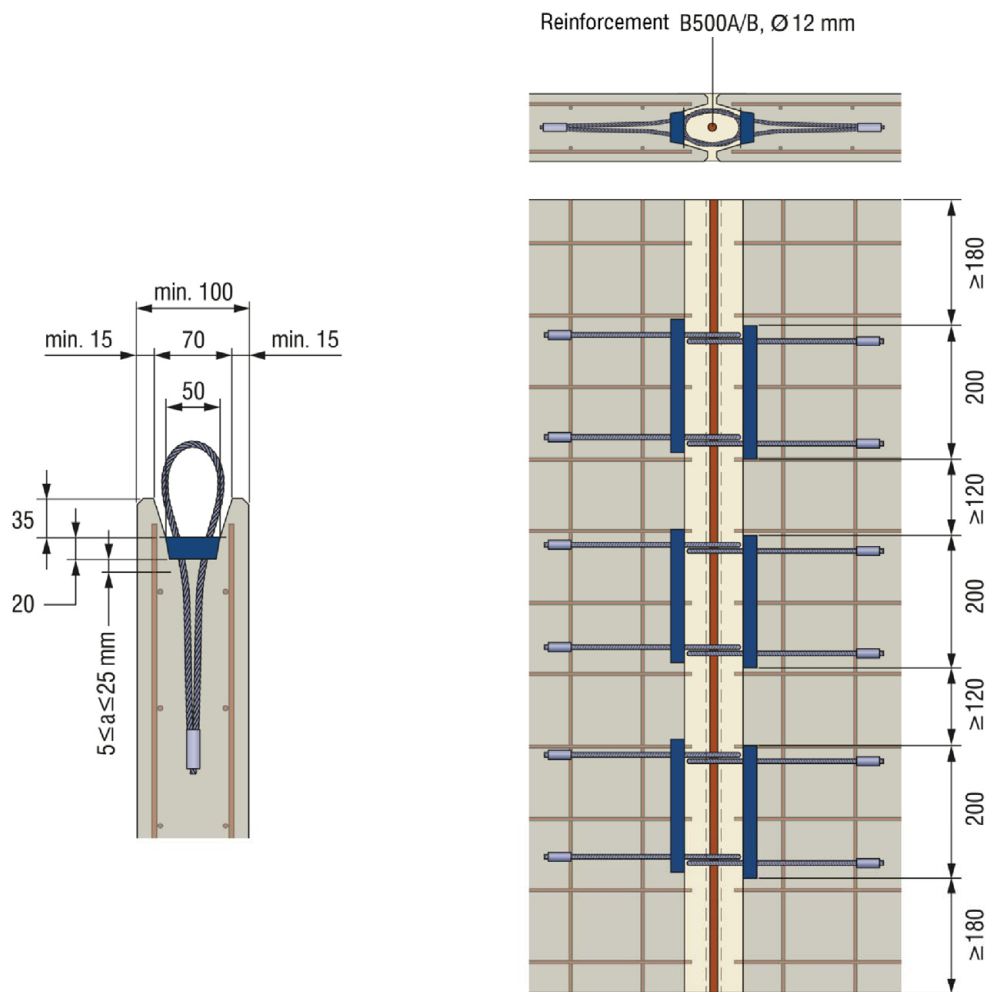


Fig. B.7: Geometry, reinforcement (Detail precast element A and B)

Note

1. Minimum surface reinforcement $1,88 \text{ cm}^2/\text{m}$.
2. The resistance under shear load $v_{Rk,x}$ of walls with thickness $d < 14 \text{ cm}$ can be taken into account only for joints lengths $\geq 100 \text{ cm}$.

VS®-Slim-Box EASYFILL	Annex B5
Intended use Recessed installation	

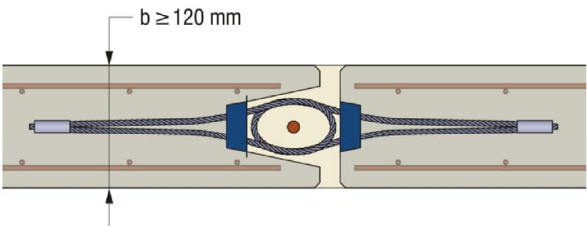


Fig. B.8: Wall – Wall connection (*flat installation*)

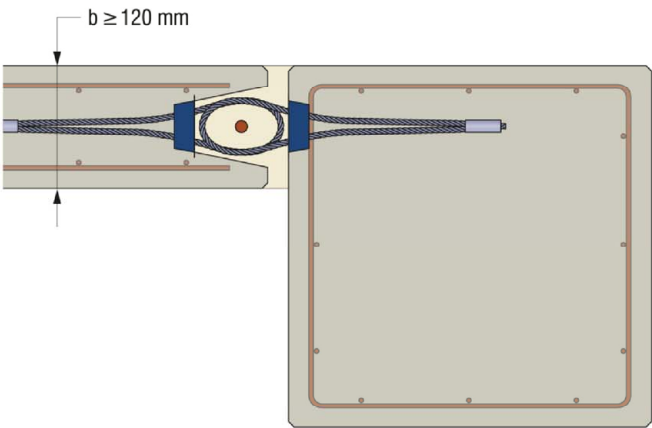


Fig. B.9: Column – Wall connection (*flat installation*)

Note

Minimum surface reinforcement 1,88 cm²/m.

All reinforcement intended to be used for the transmission of loads within the reinforced concrete component is not shown in the figures above. It has to be defined by the responsible engineer.

VS®-Slim-Box EASYFILL	Annex B6
Intended use Flat installation	

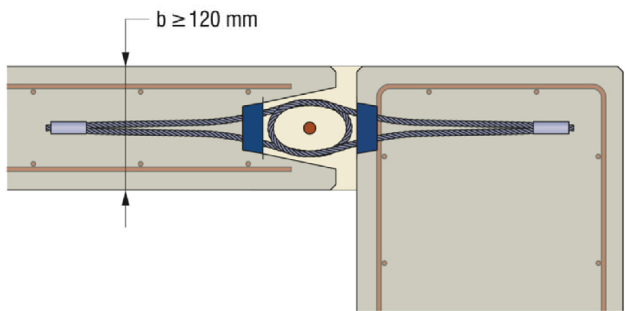


Fig. B.10: Wall – Wall – Corner connection - Standard detail (flat installation)

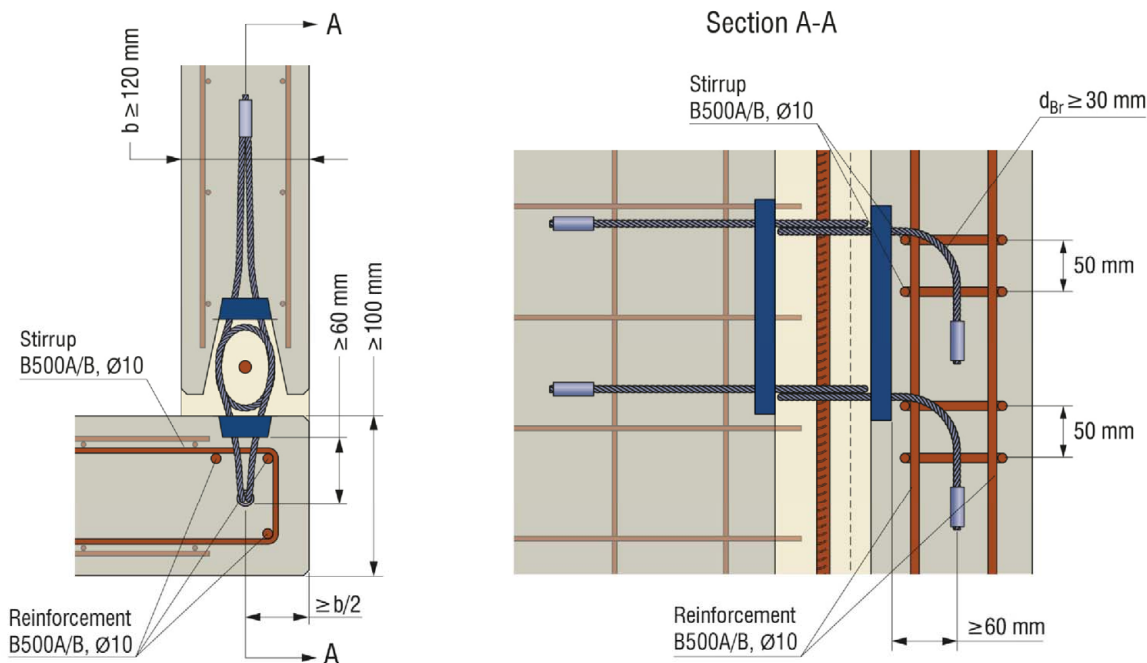


Fig B.11: Wall – Wall – Corner connection - Detail with bended wire loops

Note

Minimum surface reinforcement 1,88 cm²/m.

Only the additional reinforcement required for local load application is shown in the drawings above. This additional reinforcement is used for anchoring the resulting loads of the VS®-Slim-Box EASYFILL-based connection to the precast concrete element (for detailed description see Annex B9. Corner connection: note additional longitudinal bars).

All reinforcement intended to be used for the transmission of loads within the reinforced concrete component is not shown in the figures above. It has to be defined by the responsible engineer.

VS®-Slim-Box EASYFILL		Annex B7
Intended use	Flat installation	

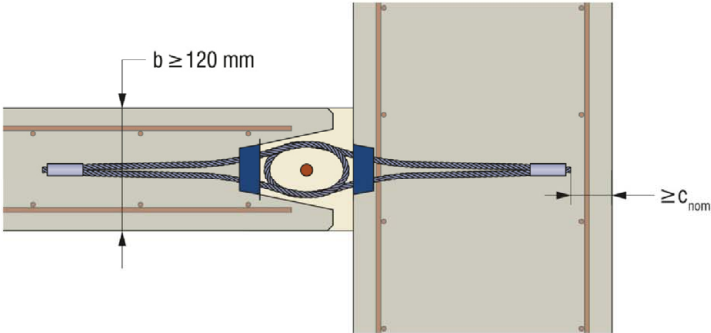


Fig. B.12: Wall – Wall – T-Connection - Standard detail (flat installation)

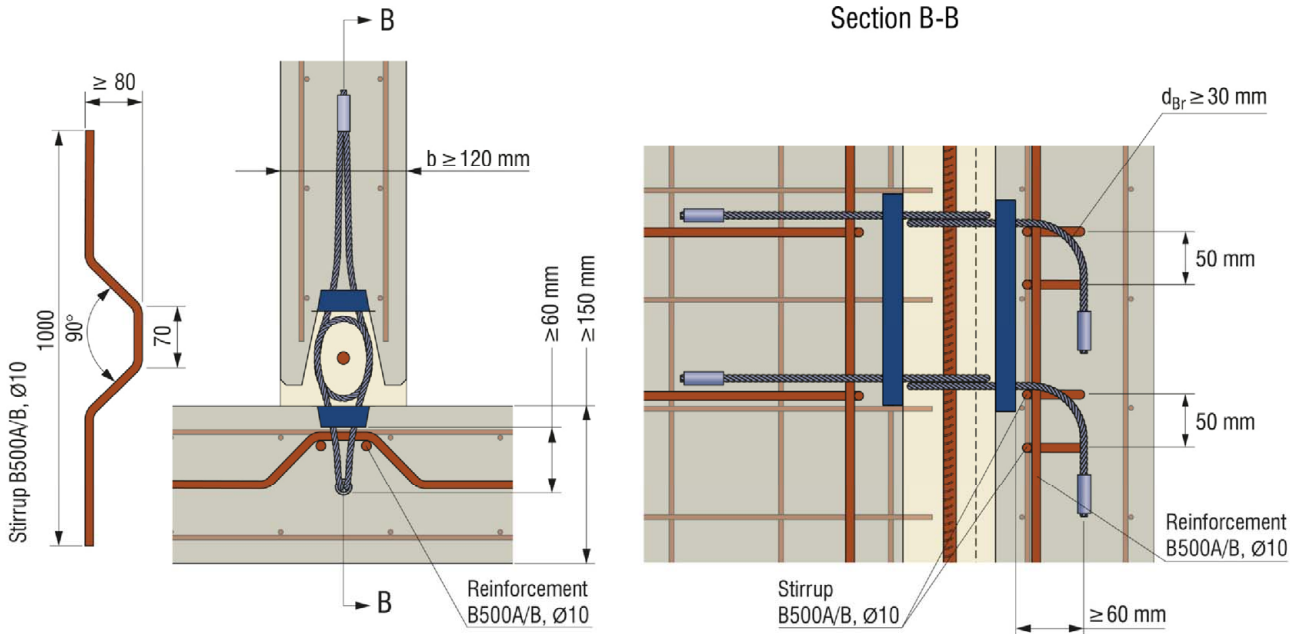


Fig. B.13: Wall – Wall – T-Connection - Detail with bended wire loops

Note

Minimum surface reinforcement 1,88 cm²/m.

Only the additional reinforcement required for local load application is shown in the drawings above. This additional reinforcement is used for anchoring the resulting loads of the VS®-Slim-Box EASYFILL-based connection to the precast concrete element (for detailed description see Annex B9).

All reinforcement intended to be used for the transmission of loads within the reinforced concrete component is not shown in the figures above. It has to be defined by the responsible engineer.

VS®-Slim-Box EASYFILL

Intended use
Flat installation

Annex B8

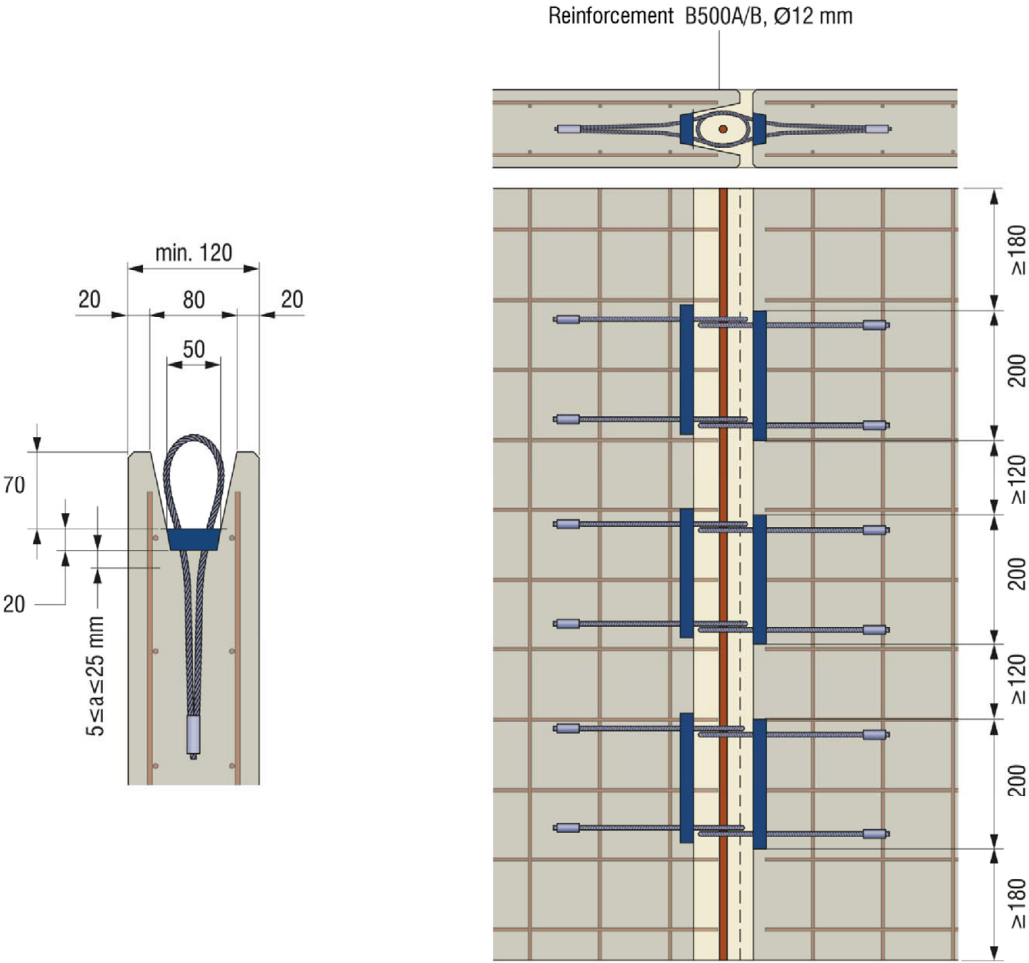


Fig. B.14: Geometry, reinforcement (Detail precast element A and B)

Note

1. Minimum surface reinforcement 1,88 cm²/m.
2. The resistance under shear load $V_{Rk,x}$ of walls with thickness $d < 14$ cm can be taken into account only for joints lengths ≥ 100 cm.

VS®-Slim-Box EASYFILL		Annex B9
Intended use Flat installation		

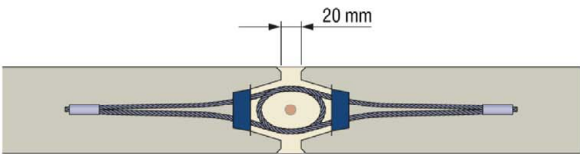


Fig. B.15: Standard joint

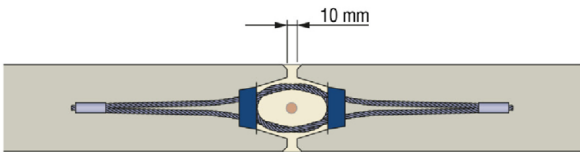


Fig. B.16: Minimal joint

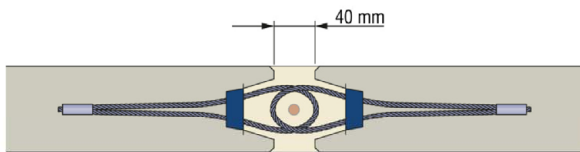


Fig. B.17: Maximal joint

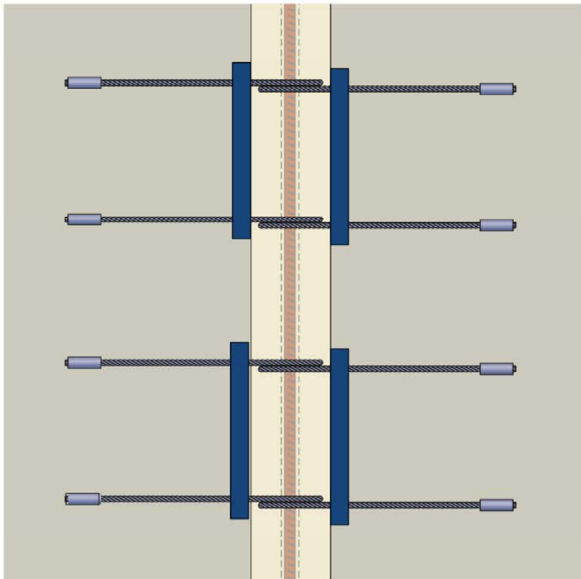


Fig. B.18: Standard wire loop overlap

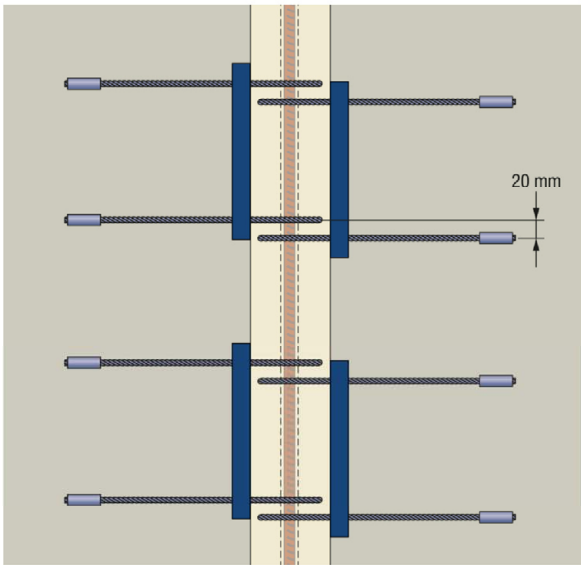


Fig. B.19: Maximal vertical tolerance: 20 mm

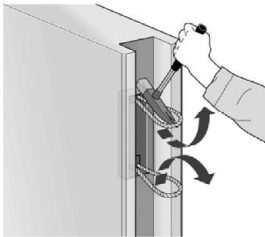
Note

The drawings show the maximal vertical tolerances for the recessed installation.
They apply analogously for flat installation.

VS®-Slim-Box EASYFILL

Intended use
Horizontal and vertical installation tolerances

Annex B10

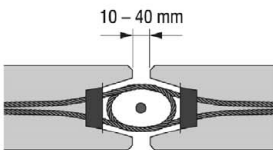


Before the installation of precast elements

Remove masking tape.

Loosen the wire loop from the fixing and fold them out in the desired position.

If necessary, remove any adhesive and/or loose components (dirt, cement slurry, grease) from the joint.



Installation instructions

Follow the processing instructions of the casting grout (see description on the packaging of the mortar).

During assembly of the precast elements ensure a spacing between the elements of 15 - 40 mm.

Check position of the wire loops (for tolerances see Annex B10).

Install longitudinal reinforcing steel bar B500A/B, $\varnothing 12$ mm.

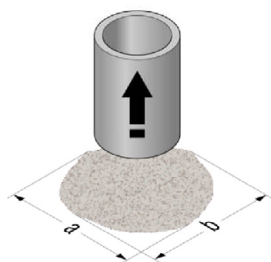


Mixing casting grout

Prepare casting grout according to the mixing instructions given on the packaging.

Use handheld mixer for small consumption rates.

Use automatic mixing system (continuous mixer or mixing and delivery pump) for larger consumption rates.

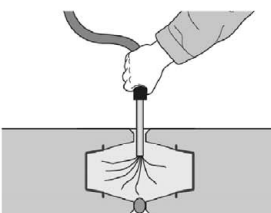


Check of consistency (EuroGrout® Universalfüller / BETEC® Thixo)

The slump diameter $a = b$ must approximately be **170 mm** after mixing (when determined according to EN 13395-1:2002).

Alternatively, the slump can be determined on site by using a tube (int. dia. $d = 70$ mm, height $h = 100$ mm) coated inside with a release agent (without dropping the table).

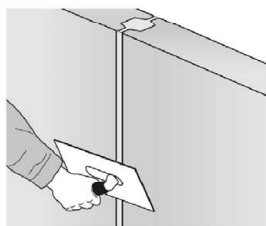
The resulting slump diameter $a = b$ must be in the range between **110 and 160 mm** (EuroGrout® Universalfüller) or between **100 and 150 mm** (BETEC® Thixo). The filling of the tube must be carried out by using the tools provided for filling the joint (see filling nozzle below).



Filling the joint (EuroGrout® Universalfüller / BETEC® Thixo)

Filling the joints by using suitable mixers and pumps.

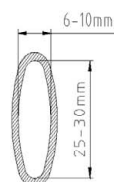
Start with sealing one side of the joint completely by using foam cord, profiled rubber, or alternatively EuroGrout® Universalfüller / BETEC® Thixo. Wait for hardening of the placed mortar. The remaining joint is now closed on one side. After that the joint can be filled evenly and continuously from the other side from the bottom to the top. Poking/picking gently into the grout with the filling nozzle or the filling pipe during filling ensures a proper result.



Finishing

The joint can be planed after the joint-casting procedure.

Cross section of the filling nozzle at it's opening:



VS®-Slim-Box EASYFILL

Intended use

Instructions for the filling of joints

Annex B11

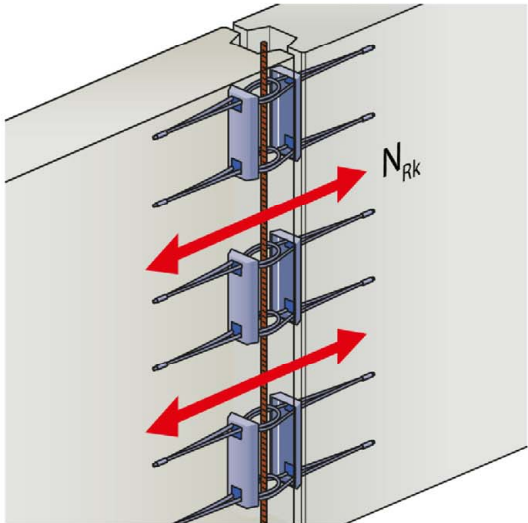


Fig. C.1: Tension load
(in wire loop direction)

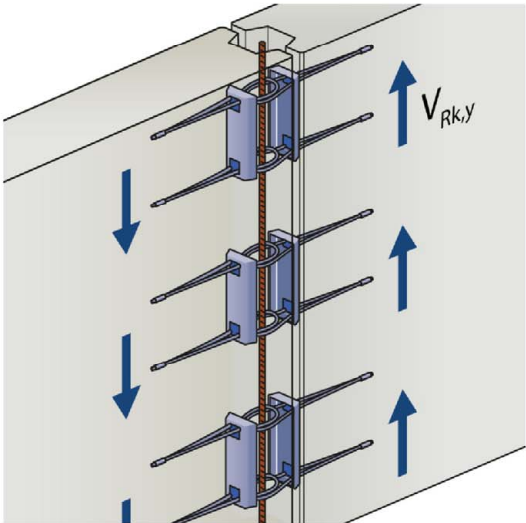


Fig. C.2: Shear load 0°
(in longitudinal axis of box/joint)

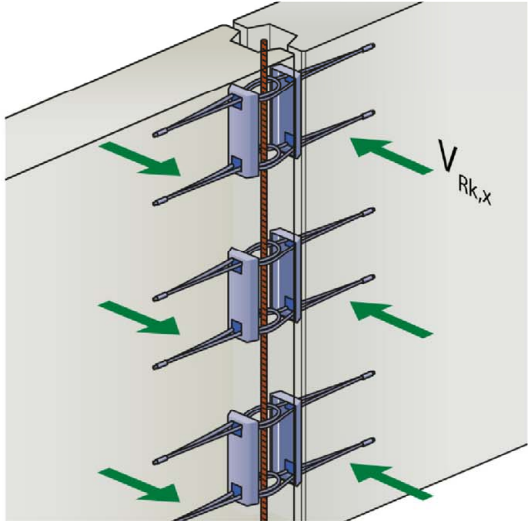


Fig. C.3: Shear load 90°
(perpendicular to longitudinal
axis of the joint)

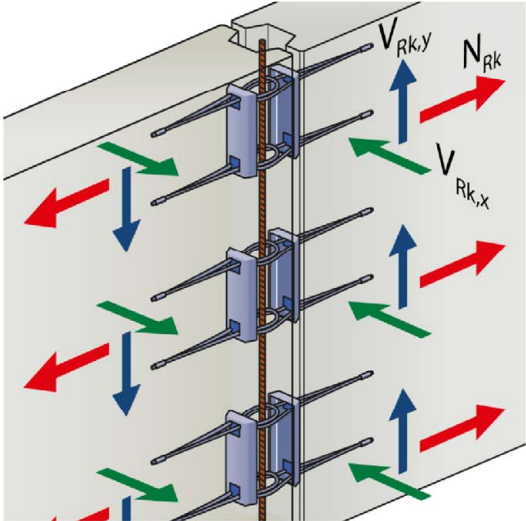


Fig. C.4: Load combination

Note

The drawings show the possible types of loads in the case of recessed installation.
They apply analogously to plan installation.

VS®-Slim-Box EASYFILL

Performance
Load possibilities

Annex C1

Recessed installation

Table C1: **Characteristic resistance N_{Rk} under tension load** [kN/VS®-Slim-Box EASYFILL]

Grout	Wall thickness h_1 [cm]	Characteristic resistance	C30/37	C35/45	C40/50	C45/55
EuroGrout® Varix / Universalfüller BETEC® Verguss / Thixo	≥ 10	$N_{Rk,s}$	18,0			
		$N_{Rk,c,u,5\%}$	27,0			
		$N_{Rk,c,u,min}$	36,0			
		$N_{Rk,c,crack}$	18,0			

Table C2: **Characteristic resistance $V_{Rk,c,y}$ under shear load 0°** [kN/VS®-Slim-Box EASYFILL]

Grout	Wall thickness h_1 [cm]	Characteristic resistance	C30/37	C35/45	C40/50	C45/55
EuroGrout® Varix BETEC® Verguss	≥ 10	$V_{Rk,c,u,y,5\%}$	45,0			
		$V_{Rk,c,u,y,min}$	60,0			
		$V_{Rk,c,y,crack}$	30,0			
EuroGrout® Universalfüller BETEC® Thixo	≥ 10	$V_{Rk,c,u,y,5\%}$	37,5			
		$V_{Rk,c,u,y,min}$	50,0			
		$V_{Rk,c,y,crack}$	25,0			

Tabelle C3: **Characteristic resistance $v_{Rk,x}$ under shear load 90°** [kN/m] ¹⁾

Grout	Wall thickness h_1 [cm]	Characteristic resistance	C30/37	C35/45	C40/50	C45/55
EuroGrout® Varix / Universalfüller BETEC® Verguss / Thixo	10 ²⁾	$v_{Rk,x}$	6,8	7,7	8,3	8,8
	12 ²⁾		10,5	11,9	12,8	13,7
	14		14,6	16,6	17,8	19,0
	16		19,0	21,7	23,3	24,8
	18		23,8	27,1	29,1	31,0
	20		28,9	32,9	35,3	37,7
	22		34,3	39,1	41,9	44,7
	24		39,9	45,5	48,8	52,0
	26		45,8	52,2	56,0	56,3
	28		51,9	56,3	56,3	56,3
	30		56,3	56,3	56,3	56,3

¹⁾ Resistance independent of the number of installed VS®-Slim-Box EASYFILL

²⁾ The resistance under shear load $v_{Rk,x}$ of walls with thickness $d < 14$ cm can be taken into account only for joints lengths ≥ 100 cm !

VS®-Slim-Box EASYFILL

Performance

Recessed installation: characteristic resistances

Annex C2

Flat installation

Table C4: Characteristic resistance N_{Rk} under tension load [kN/VS®-Slim-Box EASYFILL]

Grout	Wall thickness h_1 [cm]	Characteristic resistance	C30/37	C35/45	C40/50	C45/55
EuroGrout® Varix BETEC® Verguss	≥ 12	$N_{Rk,s}$	18,0			
		$N_{Rk,c,u,5\%}$	27,0			
		$N_{Rk,c,u,min}$	36,0			
		$N_{Rk,c,crack}$	18,0			

Table C5: Characteristic resistance $V_{Rk,c,y}$ under shear load 0° [kN/VS®-Slim-Box EASYFILL]

Grout	Wall thickness h_1 [cm]	Characteristic resistance	C30/37	C35/45	C40/50	C45/55
EuroGrout® Varix BETEC® Verguss	≥ 12	$V_{Rk,c,u,y,5\%}$	45,0			
		$V_{Rk,c,u,y,min}$	60,0			
		$V_{Rk,c,y,crack}$	30,0			

Table C6: Characteristic resistance $v_{Rk,x,0}$ under shear load 90° if one VS®-Slim-Box EASYFILL is installed per meter of joint [kN/m]

Grout	Wall thickness h_1 [cm]	Characteristic resistance	C30/37	C35/45	C40/50	C45/55
EuroGrout® Varix BETEC® Verguss	12 ¹⁾	$v_{Rk,x,0}$	3,1	3,6	3,8	4,1
	14		4,4	5,0	5,3	5,7
	16		5,7	6,5	7,0	7,4
	18		7,1	8,1	8,7	9,3
	20		8,7	9,9	10,6	11,5
	22		10,3	11,5	11,5	11,5
	≥ 24		11,5	11,5	11,5	11,5

¹⁾ The resistance under shear load of walls with thickness $d < 14$ cm can be taken into account only for joints lengths ≥ 100 cm !

The characteristic resistances $v_{Rk,x,0}$ given in Table C6 define the load-bearing capacity of the connection under transverse load 90° if one ($n = 1$) VS® Slim Box EASYFILL per meter of joint is installed. Taking into account the minimum edge and axial distances according to Annex B9, a number of n boxes can be installed per meter of joint. The load-bearing capacity of this joint under transverse load 90° can then be determined as follows:

$$v_{Rk,x} = v_{Rk,x,0} \cdot n$$

VS®-Slim-Box EASYFILL

Performance

Flat installation: characteristic resistances

Annex C3