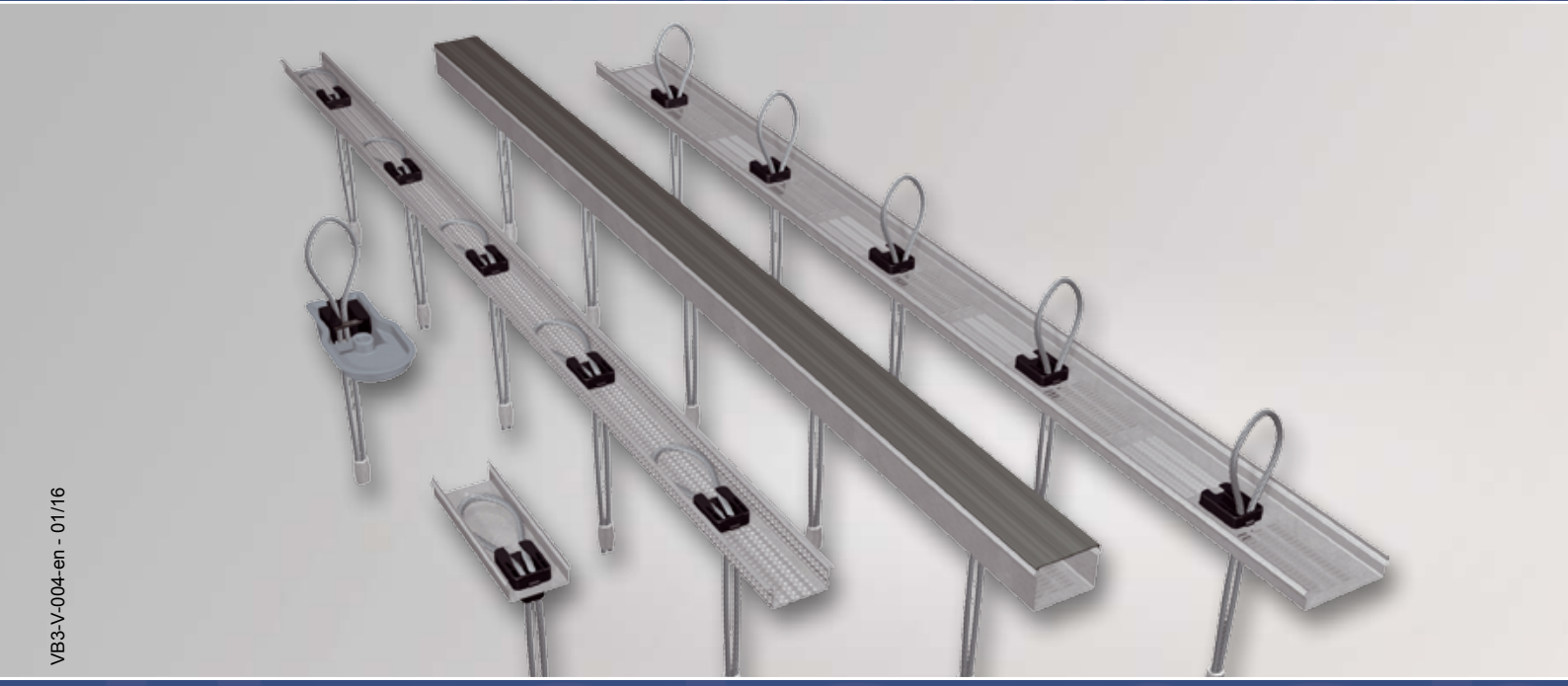
PHILIPPGROUP

PHILIPP Connecting rails and loops



VB3-V-004-en - 01/16

Installation Instruction

Transport and mounting systems for prefabricated building

Technical department

Our staff will be pleased to support your planning phase with suggestions for the installation and use of our transport and mounting systems for precast concrete construction.

Special designs

Customized to your particular needs.

Practical tests on site

We ensure that our concepts are tailored precisely to your requirements.

Inspection reports

For documentation purposes and your safety.

On-site service

Our engineers will be pleased to instruct your technicians and production personnel at your plant, to advise on the installation of precast concrete parts and to assist you in the optimisation of your production processes.

High safety level when using our products

Close cooperation with federal materials testing institutes (MTIs), and official approvals for the use of our products and solutions whenever necessary.

Software solutions

The latest design software, animated videos and CAD libraries can always be found under www.philipp-gruppe.de.

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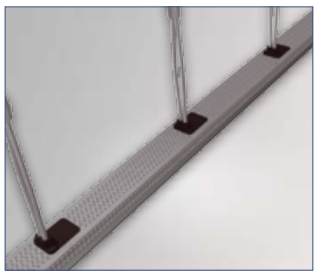
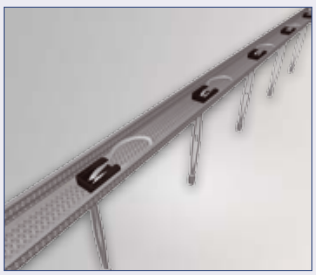
Content



System components

The Connecting loop resp. the Connecting rail is used for constructive connections of prefabricated concrete parts under predominantly static loads. In combination with a suitable mortar they can transfer loads, which do not require a special approval (no high forces).

All PHILIPP connection systems are highly flexible and create a reinforcement splice which functions on the principle of a lapped splice. Herewith, it is possible to realise even complicate connections in an easy way.

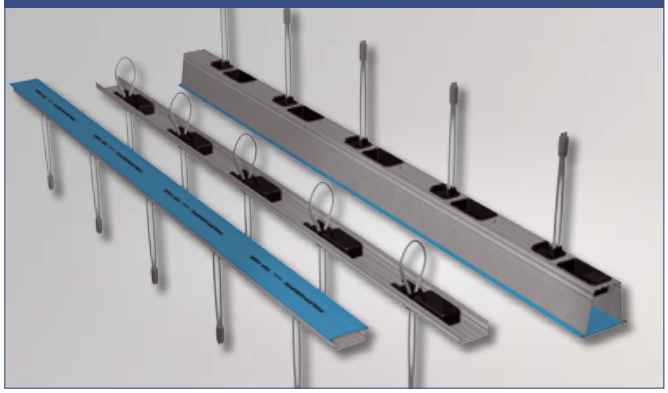
Both, the Connecting loop and rail can be used without any proof in concrete elements which do not have any load-bearing function. The easy handling guarantees a simple installation.

Advantages of the Connecting loop and rail

- Flexible connecting components with small areas of grouting
- No need to bend back any reinforcement
- Less weight than a similar rebend connection with stiff reinforcement bars
- Simple design, as existing reinforcement need not to be changed
- Simple installation due to flexible wire rope ends and pre-cut nail-holes
- Anchoring also possible in thin connection walls
- Version for lightweight concrete with appropriate anchoring available
- Weather-proof cover can be removed easily
- No mix-up due to colour codes and directional marking

For high loads we recommend to use our Power Duo or Power Box system.

PHILIPP Power Duo System



PHILIPP Power Box System

Fire protection expert report F180 for the PHILIPP Connection technology

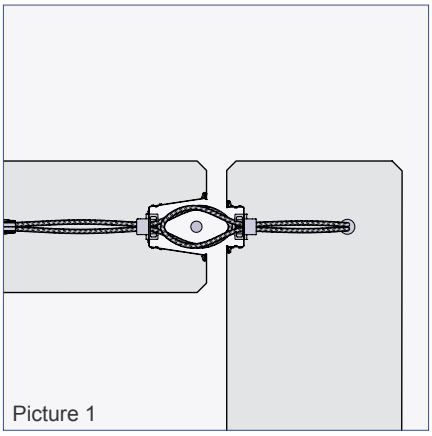
A joint-connection using constructive resp. high load Connecting systems from PHILIPP is tested and approved by an expert report of the Materials Testing Institute (MPA) in Braunschweig, Germany, regarding the fire resistance class F90, F120 and F180 in dependence on DIN 4102-4:1994-03.

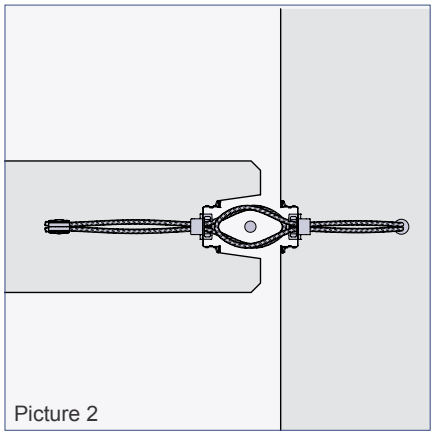
Application

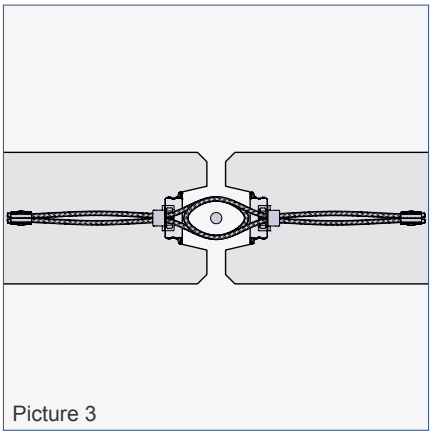
Due to its flexibility the Connecting rails and -loops can be used for many applications such as T-connections, wall/wall and wall/column-connections.

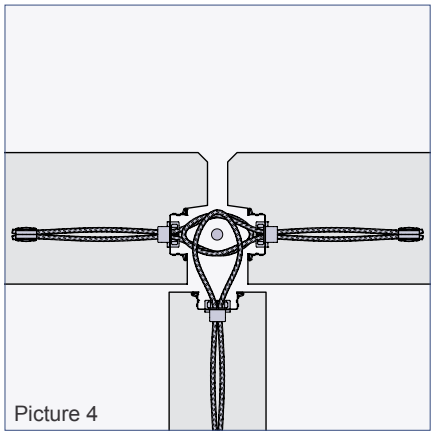
Connecting rails can be supplied in different versions (page 8) and can be fixed to the mould directly or in recessed position using a timber board.

Connecting loops are available with different loop lengths (page 6). Numerous connections can be combined by varying the depth of the timber board and the loop length.


Picture 1

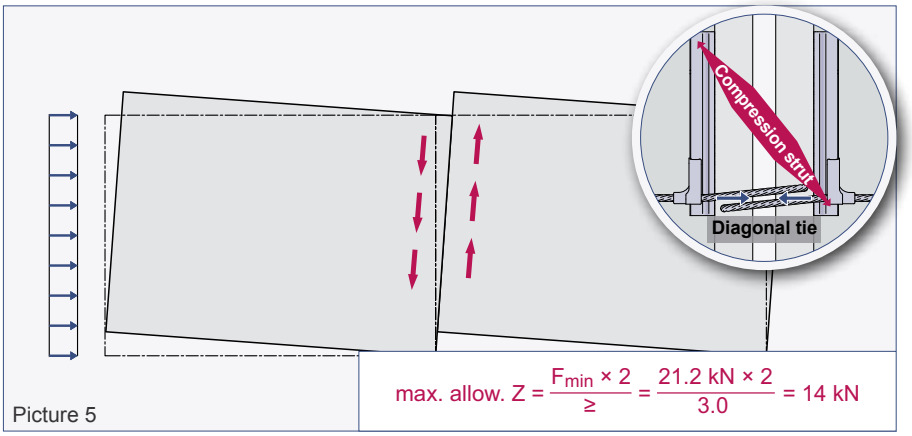

Picture 2


Picture 3


Picture 4

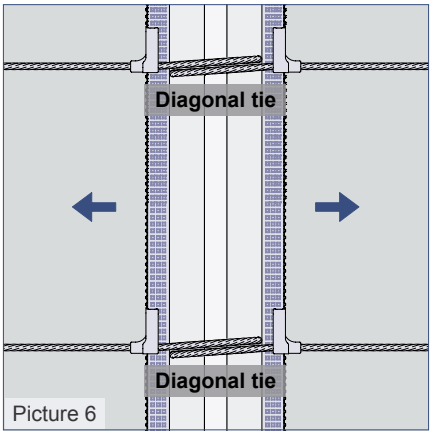
Pay attention to the fact that Connecting loops must not be fixed directly to the formwork without using a timber board, because then no grouting channel is created (page 11).

The Connecting rails and -loops can transfer constructive loads in three directions if a special shear and tension load level is not required (predominantly static loads): Tensile forces (picture 6), shear forces parallel (picture 5) and right-angled (picture 7) to the joint.
All three force directions are subject to a different design model, which bases on the concrete strength of the precast element, the mortar and/or the bearing capacities for tensile forces of the wire rope loop.
The compressive strengths of the precast element as well as the mortar are decided by the user. The tensile force of the wire rope loop is calculated according to the equation in picture 5.

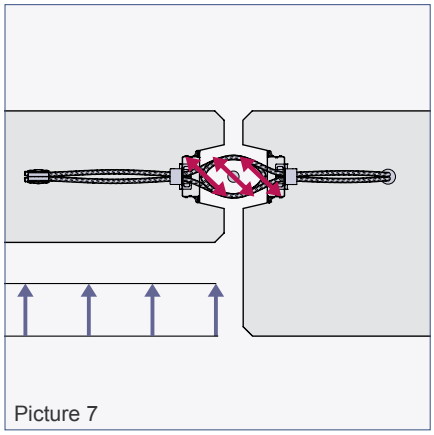


Picture 5

$$\text{max. allow. } Z = \frac{F_{min} \times 2}{\geq} = \frac{21.2\ \text{kN} \times 2}{3.0} = 14\ \text{kN}$$



Picture 6


Picture 7

The state of serviceability (crackings and extensions) were not considered in the equation in picture 5 and the design models (picture 5-7).

Connecting loops

Overview of the Connecting loops

The Connecting loop is a component to create a form-fit connection between precast concrete walls. The advantage is that flexible loops do not require a complicated bending-back and therefore even a connection between columns is not a problem anymore.
Either the Connecting loop is made of a plastic or metal recess former (box) and can be used in normal as well as light-weight concrete.

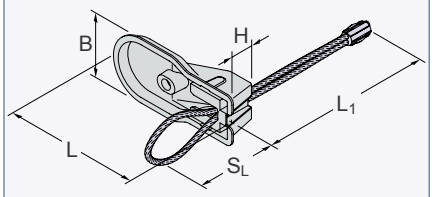
Connecting loop: Plastic version

This version is a combination of a steel wire rope and a plastic recess former (box) in which the ready-for-use wire rope is inserted.

Table 1: Connecting loop (plastic recess box)

Ref.-No.	L [mm]	L_1 [mm]	B [mm]	H [mm]	S_L ① [mm]	Rope Ø [mm]	Weight [kg/100 pcs.]
54VS080	160	210	78	42	80	6	15.0
54VS100	160	210	78	42	100	6	15.6
54VS120	160	210	78	42	120	6	16.3

① Choosing the loop length please note that the required lap length for the loops is met (page 10, picture 26).



Picture 8

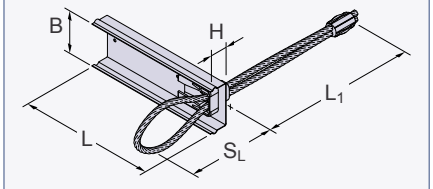
Connecting loop: Metal version

This version is a combination of a steel wire rope and a metal recess former (box) in which the ready-for-use wire rope is inserted.

Table 2: Connecting loop (metal recess box)

Ref.-No.	L [mm]	L_1 [mm]	B [mm]	H [mm]	S_L ① [mm]	Rope Ø [mm]	Weight [kg/100 pcs.]
54VSM080	160	190	50	20	80	6	13.0
54VSM100	160	190	50	20	100	6	14.0
54VSM120	160	190	50	20	120	6	15.0
54VSM140	190	190	50	20	140	6	16.0

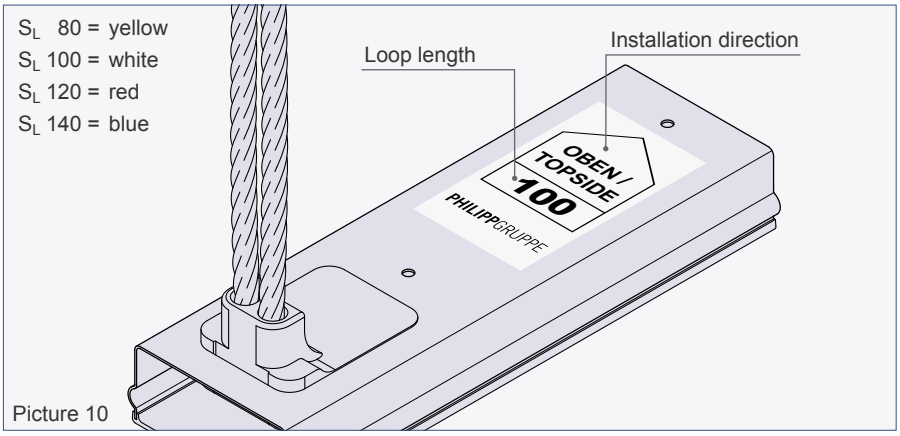
① Choosing the loop length please note that the required lap length for the loops is met (page 10, picture 26).



Picture 9

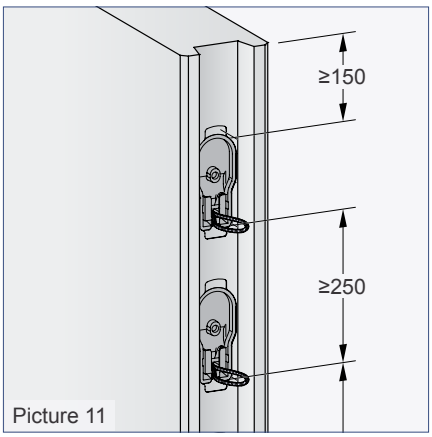
Connecting loops

In order to identify the installation direction and the length of the loops a colour-coded marking is provided on the backside of the box. Attention must be paid that the directional arrow of an installed Connecting loop points to the top of the wall.

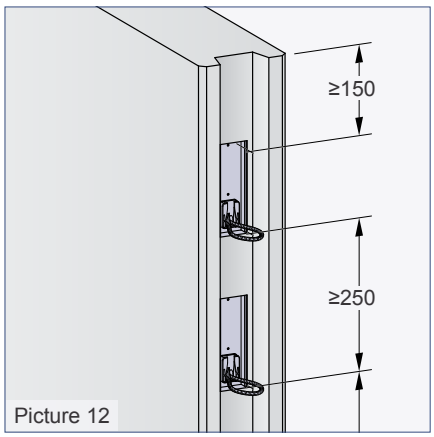


Picture 10

With the Connecting loop attention must be paid to given edge and centre distances. The minimum edge distance is 150 mm and the minimum centre distance is 250 mm.

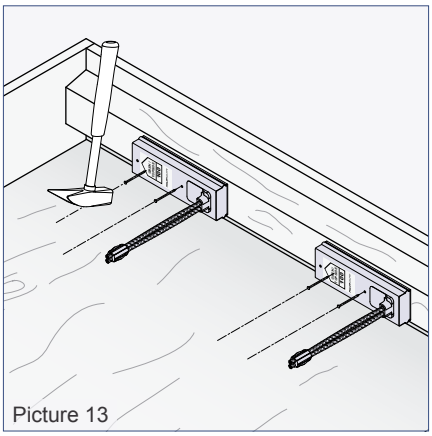


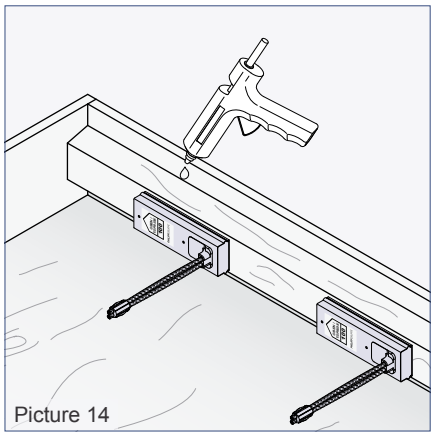
Picture 11



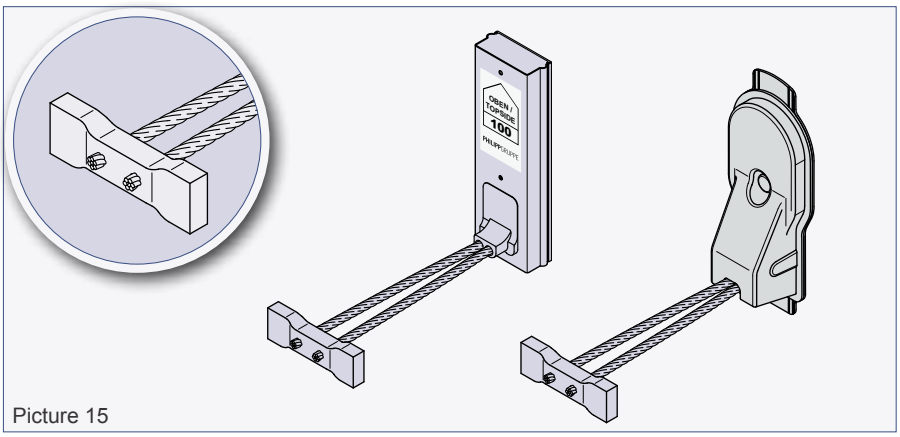
Picture 12

Its fixation to the timber board is done either by nailing or hot bonding.


Picture 13


Picture 14

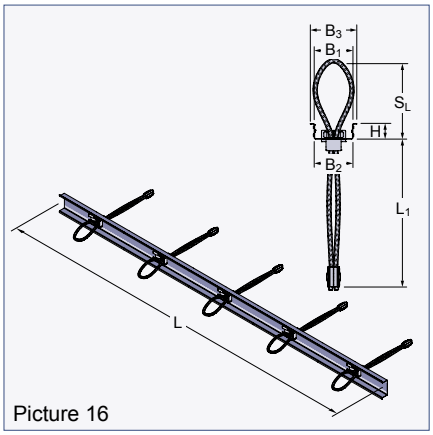
As the bonding effect of lightweight concrete is different to normal concrete, we recommend the use of our special Connecting loop version (e.g. 54VSM120LB) for lightweight aggregate concrete with open structure (LAC).
For a standard lightweight concrete (LC) the normal version can be used also.


Picture 15

Connecting rails

Overview of the Connecting rails

Connecting rails are designed for connections of concrete elements with no need to transfer high forces (only constructive connections). This version is a combination of steel wire ropes and a metal channel (rail) in which the ready-for-use wire ropes inserted. A high adhesion to the concrete is guaranteed by the profiled rail surface.
Available dimensions of the rails are: widths of 50, 60 and 85 mm and heights of 20, 40 and 70 mm. With a rail length of 1.25 m, it is possible to choose between 2, 3 or 5 loops, with different loop lengths each. Other rail dimensions, also without loops, are available on request.



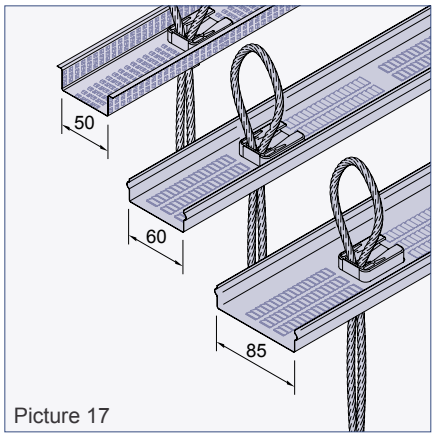
Picture 16

Table 3: Connecting rails

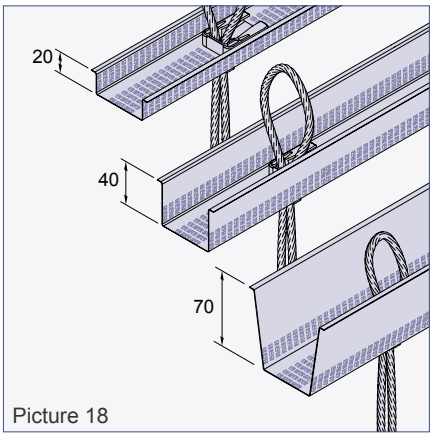
Ref.-No. ②	No. of loops	S_L ①	H	L	Rail width 50			Rail width 60	Rail width 85	L_1
					B_1	B_2	B_3	B_1 / B_2 / B_3	B_1 / B_2 / B_3	
	[pcs.]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
84VS200802	2	80	20	1250	50	50	60	60	85	190
84VS200803	3	80	20	1250	50	50	60	60	85	190
84VS200805	5	80	20	1250	50	50	60	60	85	190
84VS201002	2	100	20	1250	50	50	60	60	85	190
84VS201003	3	100	20	1250	50	50	60	60	85	190
84VS201005	5	100	20	1250	50	50	60	60	85	190
84VS201202	2	120	20	1250	50	50	60	60	85	190
84VS201203	3	120	20	1250	50	50	60	60	85	190
84VS201205	5	120	20	1250	50	50	60	60	85	190
84VS400802	2	80	40	1250	50	50	60	60	85	190
84VS400803	3	80	40	1250	50	50	60	60	85	190
84VS400805	5	80	40	1250	50	50	60	60	85	190
84VS401002	2	100	40	1250	50	50	60	60	85	190
84VS401003	3	100	40	1250	50	50	60	60	85	190
84VS401005	5	100	40	1250	50	50	60	60	85	190
84VS401202	2	120	40	1250	50	50	60	60	85	190
84VS401203	3	120	40	1250	50	50	60	60	85	190
84VS401205	5	120	40	1250	50	50	60	60	85	190
					Rail width 70/50 [mm]					
					B_1		B_2		B_3	
84VS701005	5	100	70	1250	70		50		80	190

① When choosing the loop length (measured from the rail bottom) please note that the required lap length for the loops is met (page 10, picture 26).

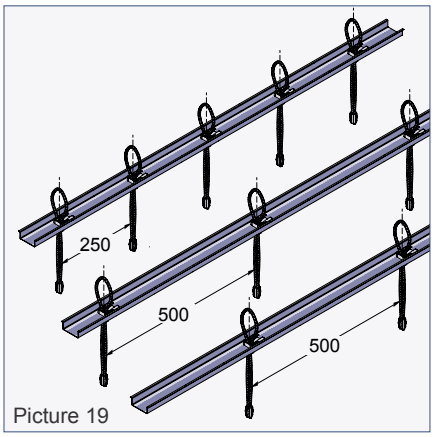
② Given reference numbers are for the rail width 50 mm. For the width 60 mm or 85 mm please add at the end of the reference number 60 or 85.



Picture 17



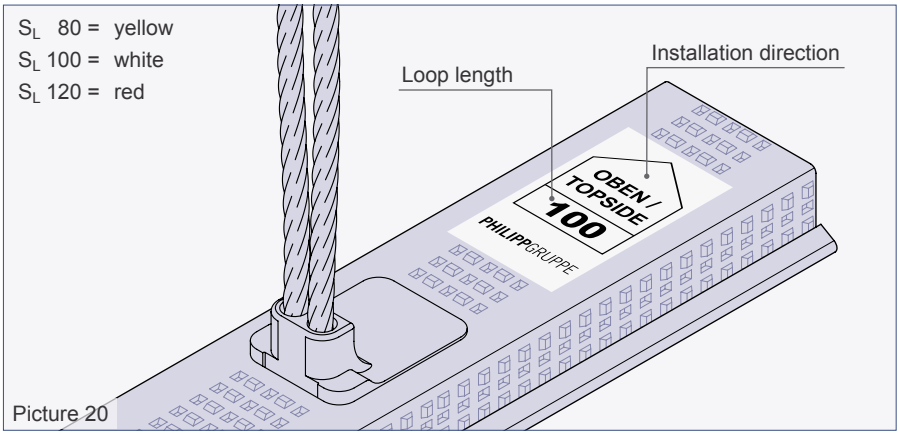
Picture 18



Picture 19

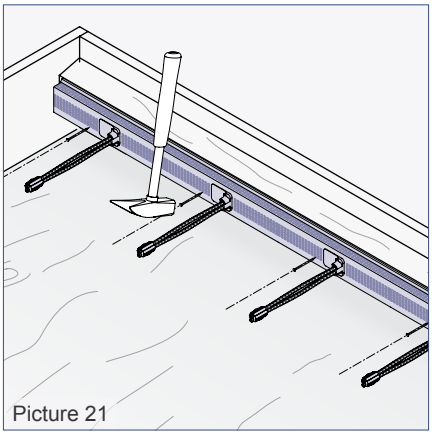
Connecting rails

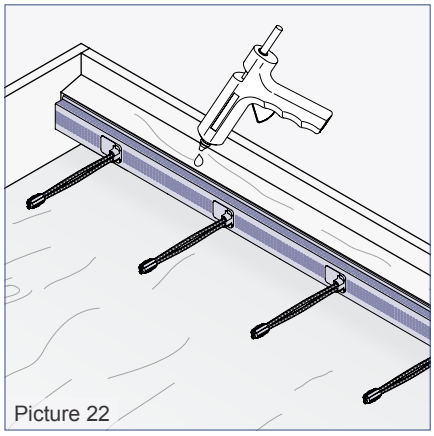
In order to identify the installation direction and the length of the loops a colour-coded marking is provided on the backside of the box. Attention must be paid that the directional arrow of an installed Connecting rail points to the top of the wall.



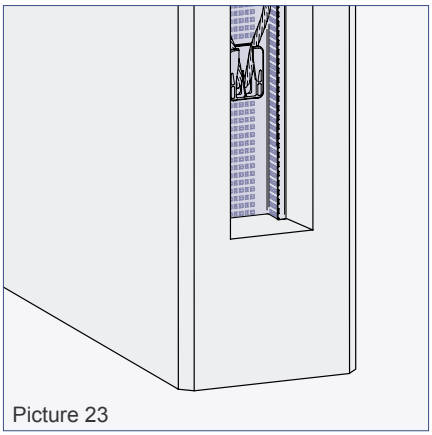
Picture 20

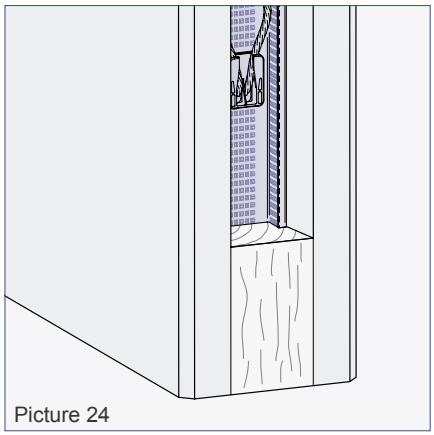
The Connecting rail can be fixed by nailing or hot bonding to the formwork.


Picture 21

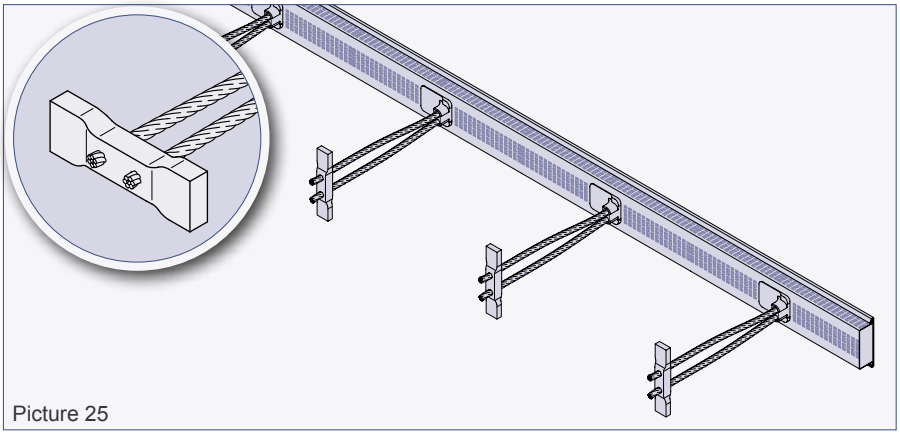

Picture 22

For elements with the same height, it is recommended to start the installation at the upper element edge. This allows a concreting of the rail-free part at the lower element edge.
Alternatively, for the rail-free part a simple timber board can be installed to get a continuous grouting channel.


Picture 23


Picture 24

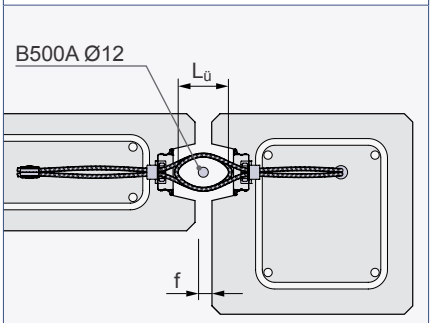
Like the Connecting loops also the Connecting rails can be produced as a special version for lightweight concrete (e.g. 84VS201005LB).
In this case, to the reference number “LB” must be added.


Picture 25

General

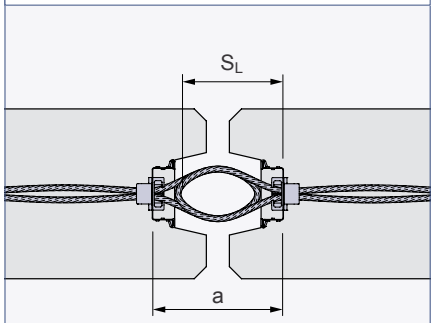
The Connecting loop and -rail functions as a lapped splice and are installed flush or as recessed version in a groove. The depth of the groove has to be chosen according to the loop length and height of the rail. The loops must face each other and create a lapped splice. For the installation of the reinforcement bar Ø12 mm a minimum overlap $L_ü$ of the loops must be ensured (Picture 26).

$L_ü \geq 50$ mm
$10 \text{ mm} \leq f \leq 40$ mm



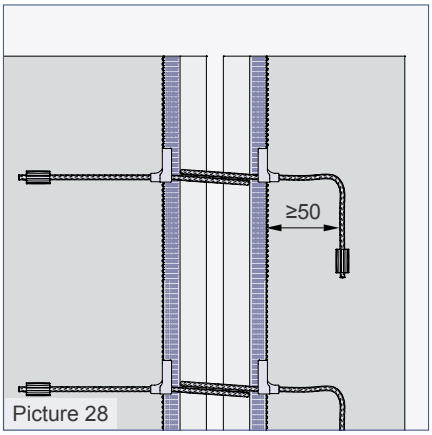
Picture 26

$S_L + 10 \text{ mm} \leq a$
$2 \times S_L - a \geq 50$ mm

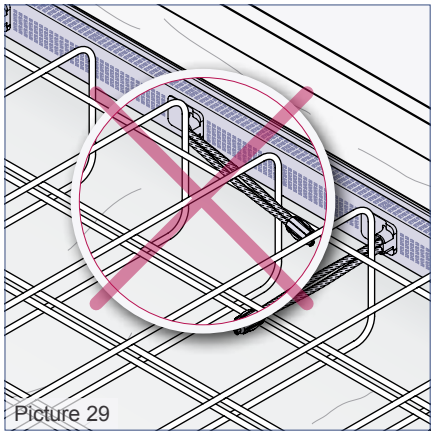


Picture 27

In thin concrete units it is possible to bend the end of the loop under consideration of the bending radius. To simplify the bending of the wire rope a rebar Ø8 mm shall be installed.



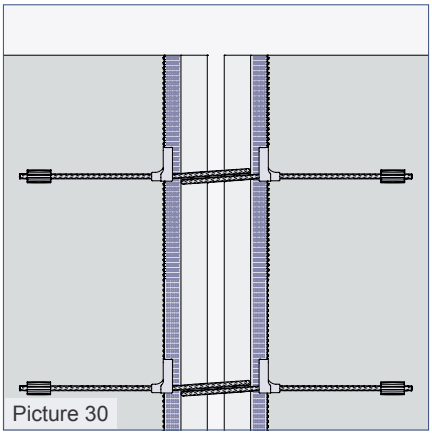
Picture 28



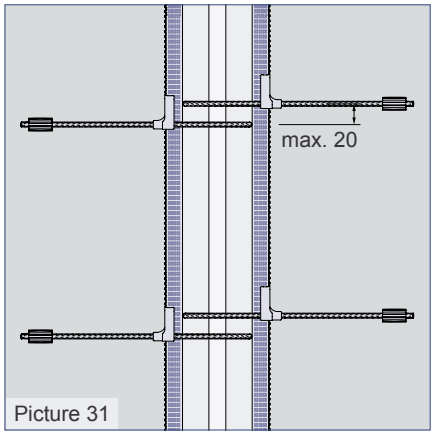
Picture 29

A buckling of the end anchorage by the reinforcement, as shown in picture 29, is not permissible.

The function of a lapped splice can only work if a maximum vertical distance of 20 mm between the loops is not exceeded.

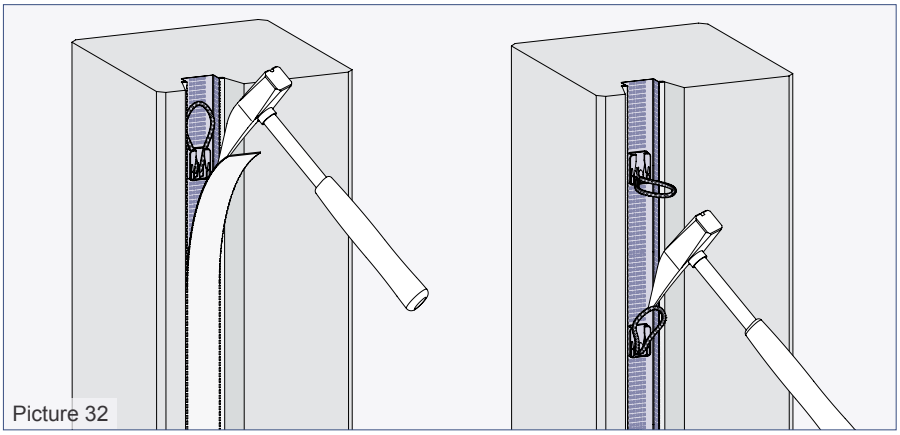


Picture 30



Picture 31

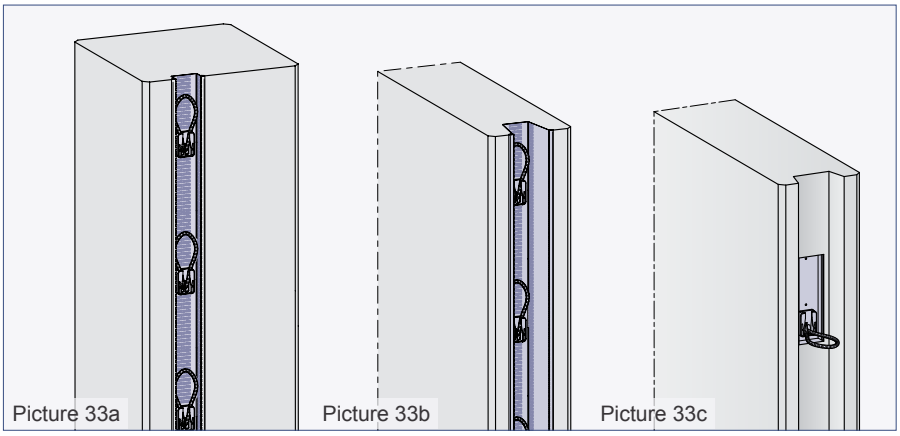
Due to the construction of the Connecting loop and -rail cover it can be removed easily. First, the plastic cover of the installed Connecting loop or -rail must be released at one end. Then the cover can be opened without any effort. The loops are now folded right-angled to the (metal) box or rail.



Picture 32

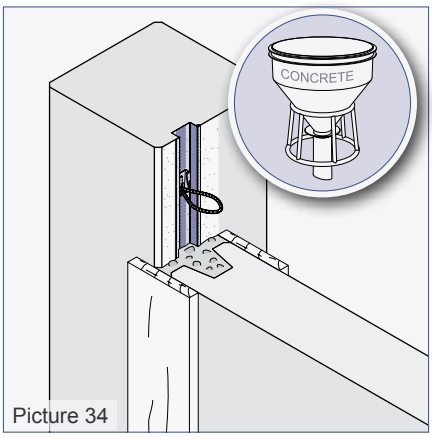
Mortar grouting

Please make sure, if a connection of two concrete elements is created with Connecting loops or -rails a continuous channel for the grouting must be available. With Connecting rails the grouting channel is realised only by their steel sheet shape (Picture 33a+b). Connecting loops have to be installed always on a timber board in order to create the needed grouting channel (Picture 33c).

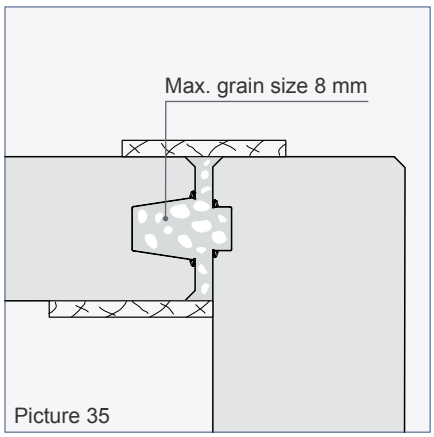

Picture 33a Picture 33b Picture 33c

Concrete

As the Connecting loops and rails can only be used for applications without high forces the grouting material can be chosen freely by the user. If concrete is used, a maximum grain size of 8 mm should not be exceeded, otherwise this aggregate might plug the joint. This may cause some voids which “weaken” the cross section.



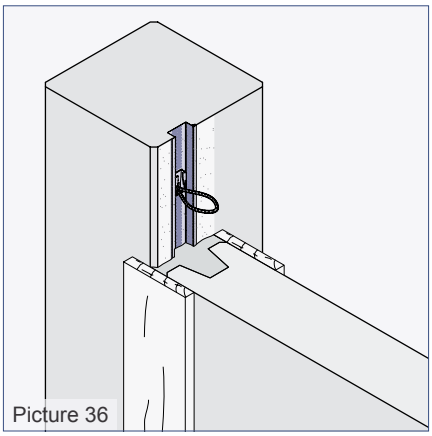
Picture 34

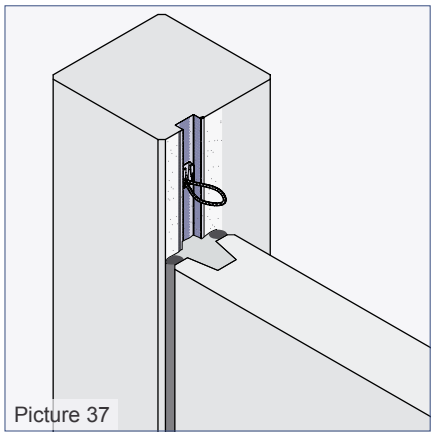


Picture 35

Grouting mortar

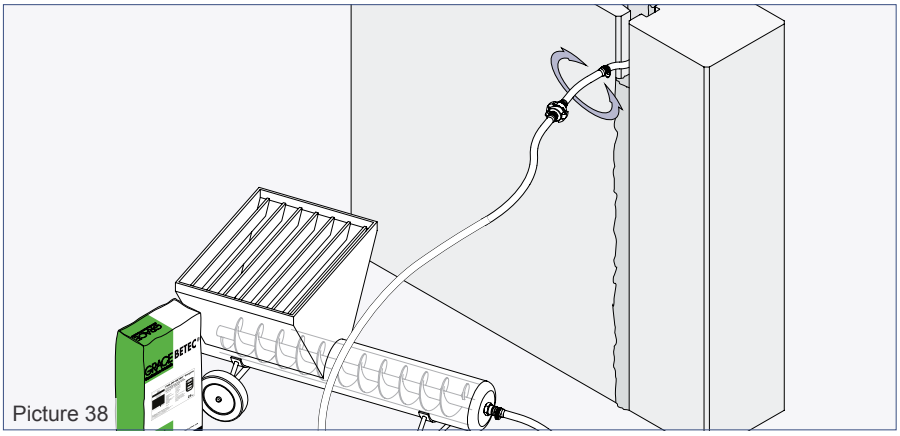
A good alternative to concrete is a grouting mortar. In order to fill in the grouting mortar into the channel it must be sealed just as well if concrete is used. This can be done by using form boards, rope seals or thixotropic mortar. After hardening of the grouting mortar we recommend to do concrete cosmetics or a sealing with a permanently elastic joint tape.


Picture 36


Picture 37

Thixotropic mortar

If thixotropic mortar is used no further sealing of the grouting channel is needed. Either the thixotropic mortar is mixed and pumped with a compulsory mixer or a suitable continuous mixer. First, one side is closed with the mortar or a joint tape is installed. Then the mortar is filled in from the other side - pay attention that the loops resp. rails are filled up completely.


Picture 38

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