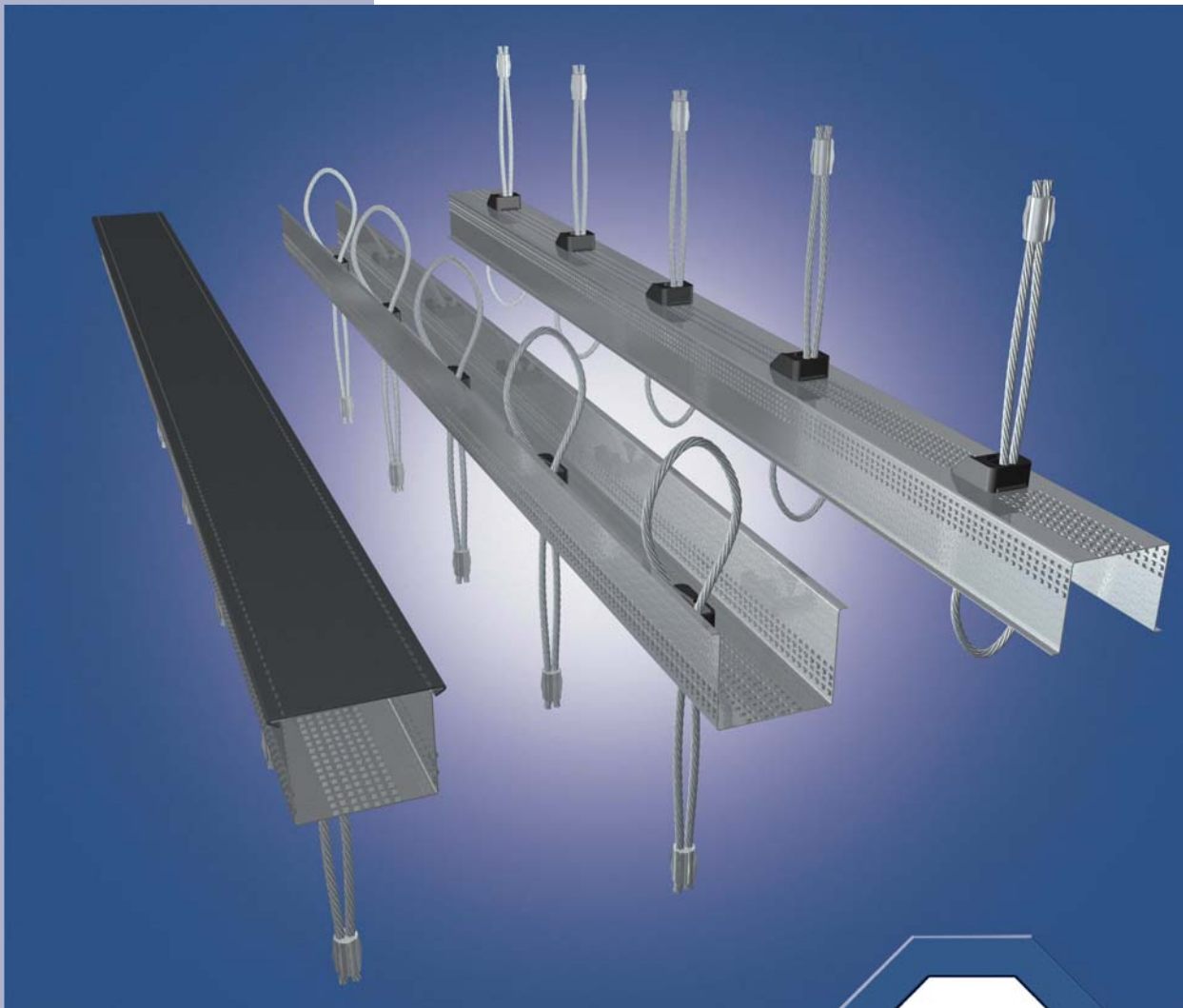




PHILIPP Power Rail Installation Instruction



08/07 - EN



Committed. Competent. Your reliable partner.

www.philipp-group.de

Transport and mounting systems for precast units

- ▲ **Technical department** – our staff would be happy to support you during your design process with suggestions for installation and use of our transport and mounting systems for precast units.
- ▲ **Special constructions** – individual for your special application.
- ▲ **Practical tests in plant** – we ensure that our concepts are customized.
- ▲ **Test reports** – for documentation and your safety.
- ▲ **Service** – our engineers would be happy to train your technicians and staff in plant, consult you during the installation of precast units and help to optimize the production process.
- ▲ **High application safety of our products** – close cooperation with federal institutes for material testing and – where required – German approvals of our products.
- ▲ **Software solutions** – design software for our sandwich anchor system.

▲ **Technical Department:**

Phone: +49 (0) 6021 / 40 27-318
Fax: +49 (0) 6021 / 40 27-329
Email: technik@philipp-gruppe.de

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- The **PHILIPP Power Rail** is now approved for both, shear forces parallel and at right angles to the wall. Therewith the field of application of the **PHILIPP Power Rail** is significantly extended.



Your Advantages in One View:

- Flexible connecting elements
- No complicated „reverse bending“ required
- Simplified design due to shear force data per metre
- Defined grouting channel through rail geometry
- No additional timber board required
- Stable rail covering appropriate for heat-sealing
- Weather resistant rail covering
- Approved by DIBt
- Fire resistance (F90)

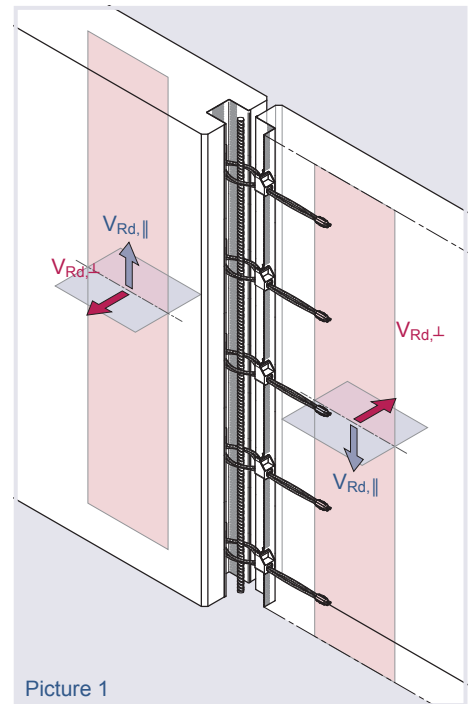
System Components and Dimensions

The **PHILIPP Power Rail System** is used to connect precast concrete units. It is able to transfer shear force parallel and at right angles to the wall into the concrete unit (Picture 1).

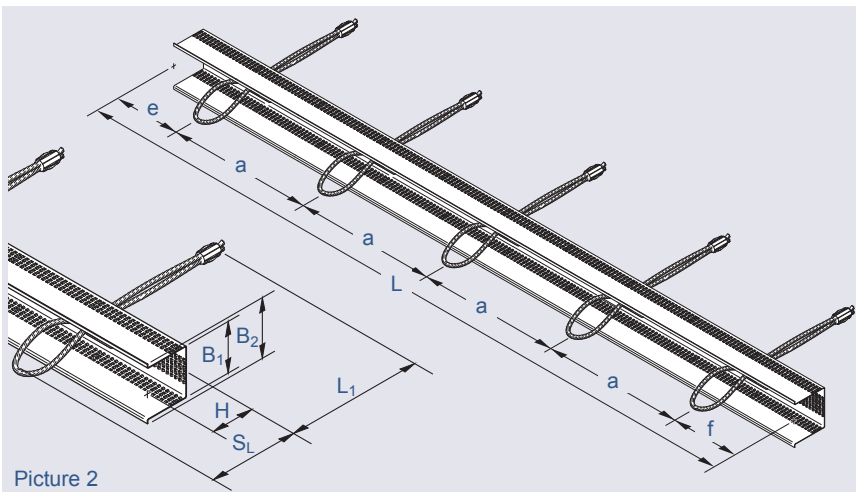
It's simple to install and the predefined joint shape created by the rail guarantees practical application.

The **PHILIPP Power Rail System** is optimally harmonised and consists of:

- The galvanised **PHILIPP Power Rail** including a highly capable steel rope
- High-strength grouting mortar



Picture 1



Picture 2



Picture 3

Table 1: Dimensions

Art.- No.	Dimensions [mm]									Weight per Rail [kg]
	B ₁	B ₂	H	L	L ₁	SL	e	f	a	
84PRS6012005	70	80	60	1250	190	120	107	143	250	2.3

Order proposal:

e.g. **PHILIPP Power Rail** for the **Power Rail System**

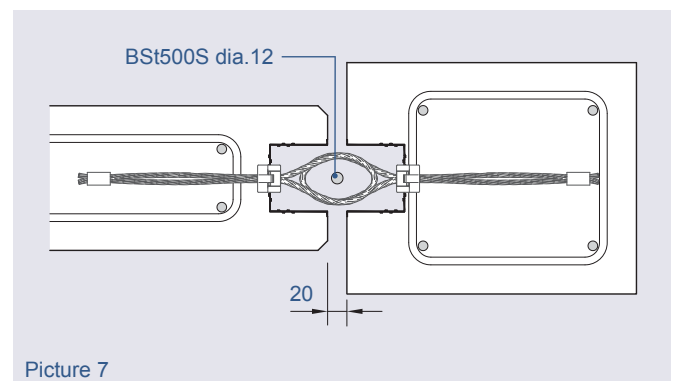
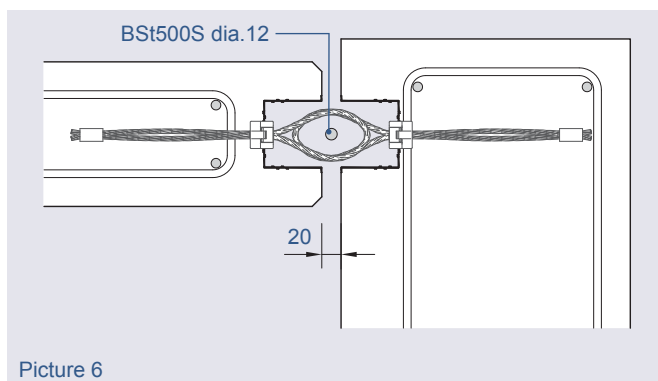
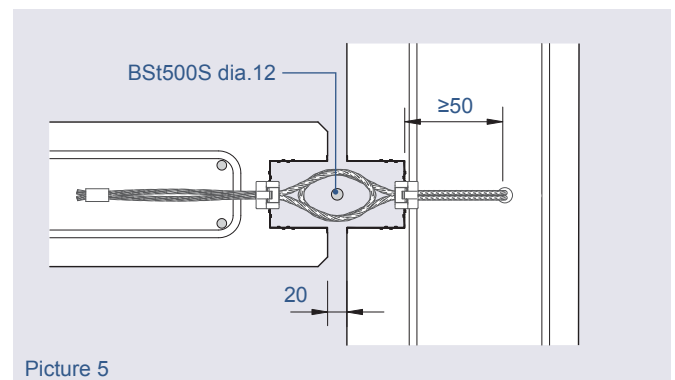
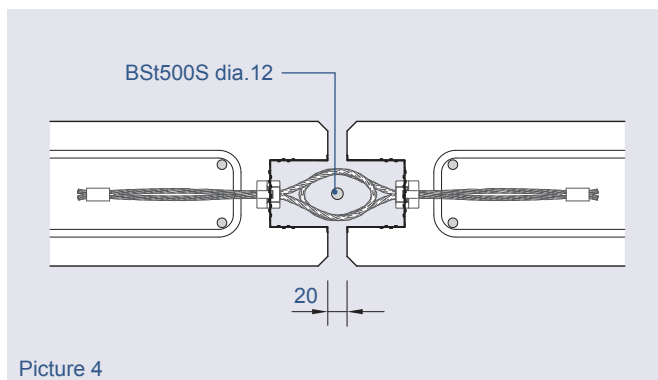
Art. No.: 84PRS6012005

Installation and Use Instructions

The following pictures show only the reinforcement which is required for the PHILIPP Power Rail System!

Fields of Application

The **PHILIPP Power Rail System** can be used for the connection or incorporation of reinforced precast concrete unit walls. It transfers shear forces which act parallel or at right angles to the wall caused by primarily static forces. Planned tensile forces in the joint (along the wall) are excluded or avoided through appropriate design. Direct weathering should be excluded. The requirement can be neglected, if a crack width of 0.3mm or smaller is ensured.

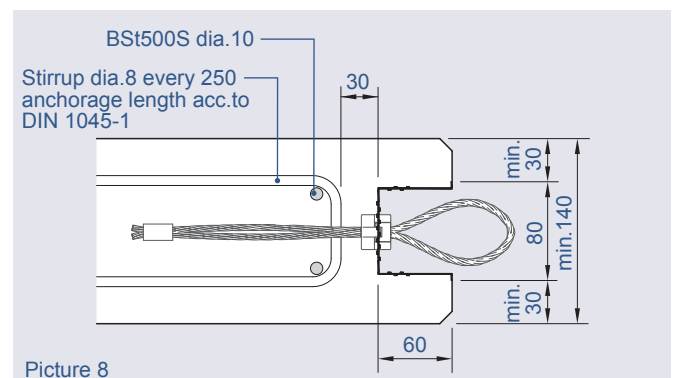


Geometry of Precast Units

Due to the requirements that 30 mm concrete cover must be given when using **PHILIPP Power Rail**, the minimum unit thickness is 140 mm (Picture 8).

In general, three connection rails may be aligned above one another. This results in a maximum joint height of

$$h_{\max} = 3.75\text{m}$$



Higher joints are possible if the subsequent grouting of the joint is undertaken in a batch-bulk processing in combination with a grouting hose.

Dimensioning and Design

The precast concrete units to be connected must correspond to DIN 1045-1:2001-07. The precast units are made of normal concrete with a concrete strength class of at least C30/37 based on German Standard (DIN 1045-2:2001-07).

The structural engineer is responsible to design the units and prove the joint connections according to the German approval.

The design shear forces parallel to the wall on the resistance side is given in Table 2.

Table 2: Design Value of the Shear Force Capacity Parallel to the Wall

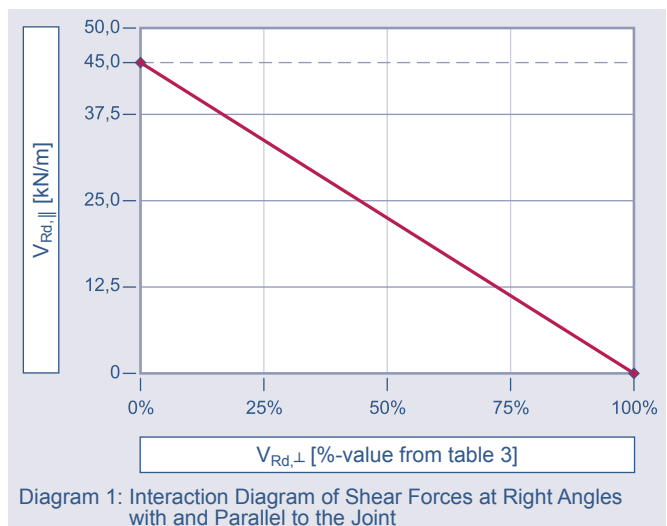
Wall Thickness h [cm]	Design Value of the Shear Force Capacity $V_{Rd, }$ [kN/m]			
	C30/37	C35/45	C40/50	C45/55
≥14	45			

The design shear forces at right to the wall on the resistance can be obtained from Table 3.

Table 3: Design Value of the Shear Force Capacity at Right Angles to the Wall

Wall Thickness h [cm]	Design Value of the Shear Force Capacity $V_{Rd,\perp}$ [kN/m]			
	C30/37	C35/45	C40/50	C45/55
14	7.3	8.4	9.0	9.6
15	8.7	9.9	10.7	11.4
16	10.1	11.6	12.4	13.2
17	11.6	13.3	14.2	15.2
18	13.2	15.0	16.1	17.2
19	14.8	16.8	18.1	19.3
20	16.4	18.7	20.1	21.4
21	18.1	20.7	22.2	23.6
22	19.9	22.6	24.3	25.9
23	21.7	24.7	26.5	28.2
≥ 24	23.5	26.8	28.7	30.6

If shear forces at right angles to the wall are planned, tensile forces (1.5 times the shear force) have to be considered. These tensile forces can be transferred through appropriate reinforcement (e.g. ring beam) or through other measures (columns, friction).

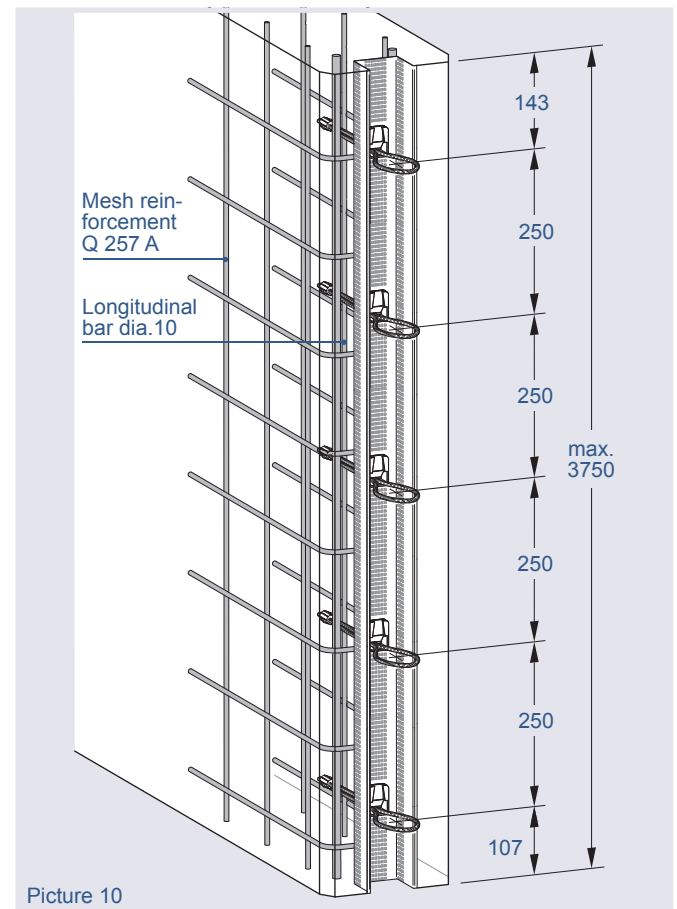
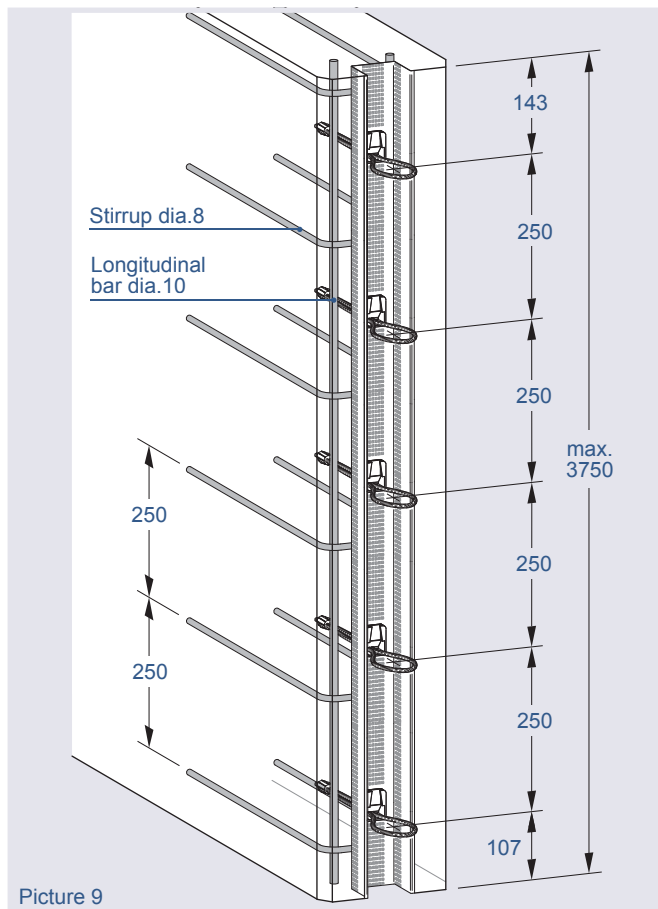


Fire Resistance

This construction is approved by MPA Braunschweig regarding the **fire resistance** (F90). It lets no smoke or fire pass prior the 90th minute. Even inadmissible increase of temperature does not occur with this construction so that the stability is not endangered by fire.

Reinforcement

If a flush installation of **PHILIPP Power Rails** is made, all requirements for edge distances (Picture 9) are fulfilled. Additionally please see Section “Manufacture of Reinforced Concrete Precast Units”.



To ensure that the introduced forces of the connecting loop are transferred into the wall, a minimum reinforcement of the precast elements with stirrups dia.8/25 (dia.8 mm every 25 cm) and bars 2 dia.10 mm (see alignment in Picture 9).

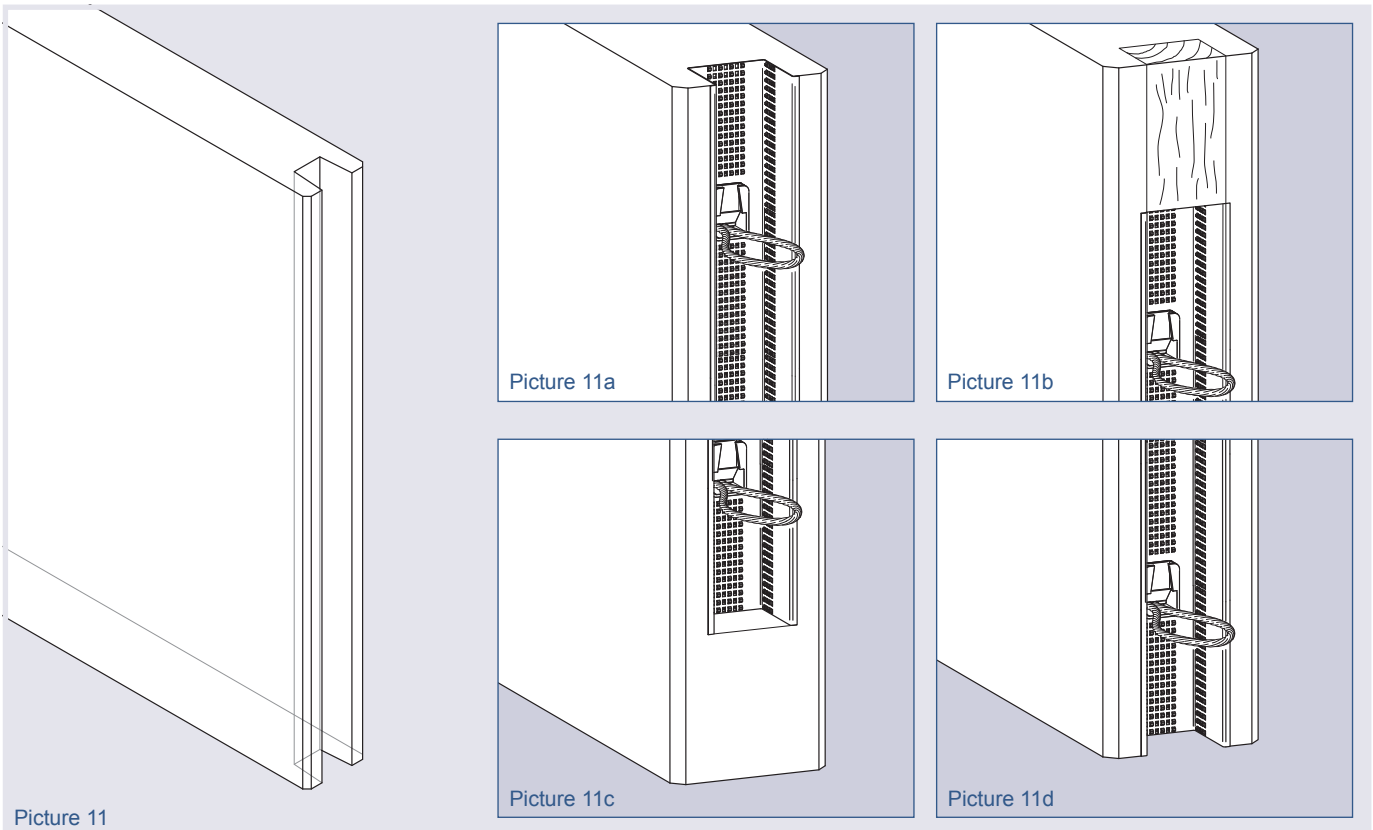


The stirrup may alternatively be replaced through comparable mesh reinforcement (Picture 10).

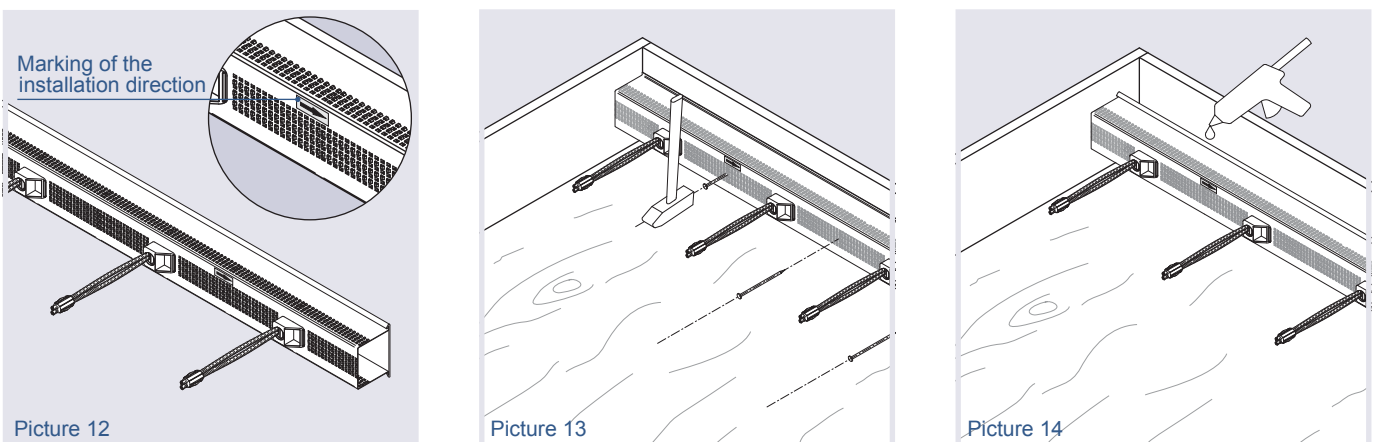
The requirement is e.g. fulfilled by mesh reinforcement Type Q 257 A (dia.7 mm every 15 cm).

Manufacture of Precast Concrete Units

During installation pay attention that the connecting loops are on the same level. For units with the same height it is suggested to begin the installation on the upper edge (Picture 11a). Thereby it is possible to concrete the part where the **PHILIPP Power Rail** ends (Picture 11c). When starting the installation on the bottom edge of the precast unit (Picture 11d) it must be assured that the upper part without the **PHILIPP Power Rail** is recessed by a timber board (Picture 11b) for later grouting.



The **PHILIPP Power Rail** should be installed in the direction of its markings (Picture 12). The **PHILIPP Power Rail** can be fixed to the formwork through nails or hot gluing (Picture 13 and 14).

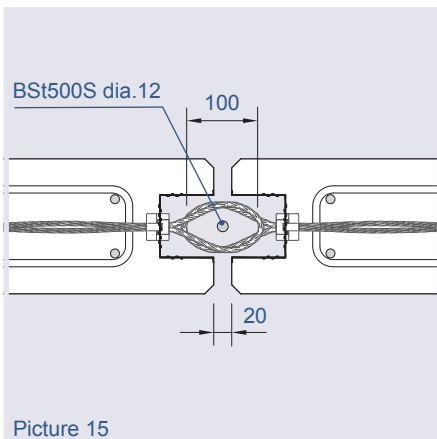


The anchorage of the connecting loops should be aligned rectangular to the **PHILIPP Power Rail** in the precast unit. If an installation in the vertical formwork is preferred, the alignment of the wire loop ends in the precast unit should be guaranteed by tying wire to the reinforcement.

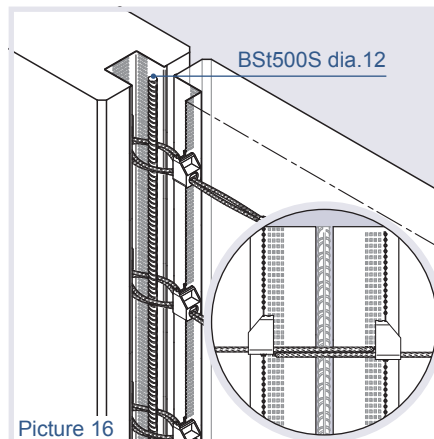
Installation and Grouting

For preparation of grouting, the seal cover is removed and the connecting loops are folded so that they are rectangular to the **PHILIPP Power Rails**.

When properly aligned, the connecting loops will overlap horizontally within the nominal dimension of 100 mm (Picture 15) and will lie directly above one another (Picture 16). T-connections have to be designed in way that the anchorage length is equal or larger than 50mm (Picture 17).



Picture 15



Picture 16

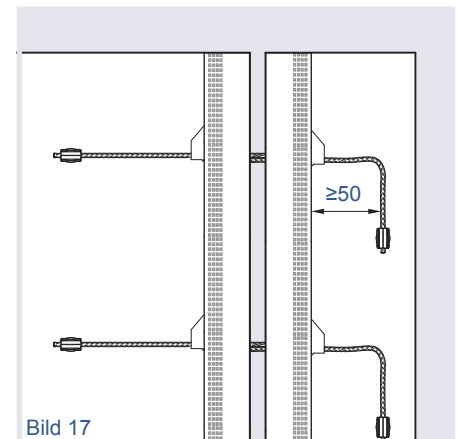
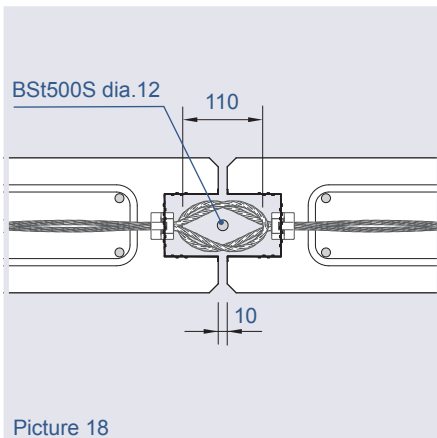
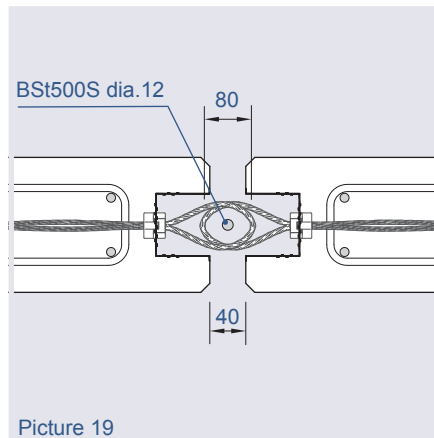


Bild 17

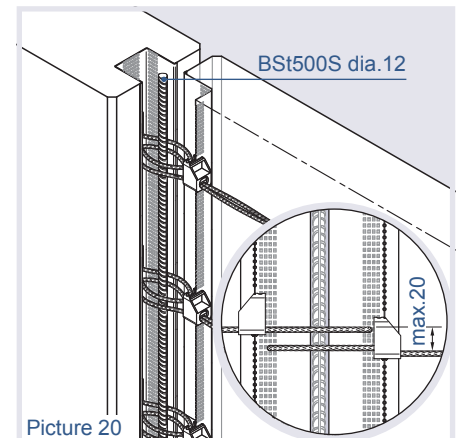
The approval of the **PHILIPP Power Rail System** already takes the horizontal and vertical mounting tolerances into account. The maximum allowable deviations are shown in Picture 18, 19 and 20. To assure the right position of the connecting loops, these should be fastened with wire or otherwise connected to one another.



Picture 18



Picture 19



Picture 20

Prior to the setting of step ends of the grouting joints, a concrete reinforcing bar (dia.12 mm) should be positioned along the entire length of the joint (when using a joint tape be careful that it does not impede the grouting profile or reduces the required concrete cover for the **PHILIPP Power Rails**). Proper installation should be observed visually. Step ends should thereafter be set on the sides of the joints and filled using **PHILIPP Grouting Mortar**. The use of a grouting hose with a hopper eases the process considerably. To reduce the pouring pressure, it is recommended that **PHILIPP Grouting Mortar** is filled in layers.

PHILIPP Grouting Mortar should be mixed, installed, and condensed based on the following processing notes.

Processing Instructions and Properties of PHILIPP Grouting Mortar

PHILIPP Grouting Mortar is a ready-to-use dry mixture on a cement basis for grouting of precast concrete units. It is free of shrinkage and has a high strength and good flow ability.

Properties

PHILIPP Grouting Mortar is free of chlorides. It has a good bond with steel and concrete and allows no separation of the components. Furthermore it has a good pump ability and a good frost and de-icing salt resistance. **PHILIPP Grouting Mortar** is produced in reliably consistent quality and is easy to process. Due to its flowing consistency, the mortar is self-levelling and fills out all accessible, venting hollow spaces.

PROCESSING

Preparation

The subsurface must be free of dirt such as oils, greases, etc. Cement slurry leavings on the surface shall be removed. A seal formwork should be used. To improve grip, the joint surface should be pre-wetted thoroughly.

Mixing

Approximately 2/3 of the mixing water is put into the mixer; the **PHILIPP Grouting Mortar** is then completely stirred in. Afterwards the remaining water can be used to adjust the consistency. Mixing lasts 4 – 6 minutes depending on the type of mixing.

Note

During grouting, air must be able to escape. Careful compactions can prevent trapped air. The processing time is about 60 minutes at 20° C.

Processing Temperature

DIN 1045-2 and DIN EN 206-1 must be taken into account when working with **PHILIPP Grouting Mortar**. These standards give a processing temperature of at least +5° C.

Post-treatment

It should be prevented that **PHILIPP Grouting Mortar** dries up too fast for at least three days after application. Appropriate procedure includes covering with plastic sheets, wet tissues or irrigation.

Consumption

25 kg dry mortar results in 13 - 14 litres **PHILIPP Grouting Mortar**.

Delivery form

25 kg paper/PE bags

Table 4: Mechanical Strength Properties of PHILIPP Grouting Mortar

Characteristic	1 day	3 days	7 days	28 days
	[N/mm ²]			
Compressive Strength	44	55	70	80
Bending Tensile Strength	5.8	8	10	10

Increase of Volume

Bulking amounts to at least 0.1% after 24 hour

PHILIPP Grouting Mortar can be purchased from:

- **PHILIPP GmbH** Tel.: +49 (0) 6021 / 40 27-300

Table 5: Construction Site Checklist

Step	Procedure	Comment
1	Open rail	Remove cover
2	Inspection of grouting joints	Pay attention on clean surfaces, clean if necessary
3	Fold out the connecting loops	Pay attention to the 90° position
4	Align concrete units	Pay attention to admissible tolerances
5	Install joint reinforcement	Along the entire length of the joint
6	Pre-wetting of grouting joints	Improvement of adhesion
7	Set step ends on sides	Use formwork, timber boards or joint tape
8	Joint grouting	Pay attention to the instructions regarding ambient temperature, compaction and processing time
9	After-treatment of grouting joint	According to processing instructions

Table 6: Grout Consumption

Unit Thickness [mm]	Joint Width [mm]	Grout Consumption per 1 m Joint	
		[l / m]	[kg / m]
140	20	11.2	21.5
160	20	11.6	22.3
180	20	12.0	23.1
200	20	12.4	23.8

Ropes

- ▲ wire rope slings
- ▲ crane and forest ropes
- ▲ wire, hemp and polyamide ropes
- ▲ hoisting and special ropes
- ▲ polypropylene ropes
- ▲ rope connections



Lifting, attachment and lashing equipment

- ▲ load restraint systems
- ▲ RUD sling chains
- ▲ load suspension devices
- ▲ round slings, sling bands and lifting equipment
- ▲ rope and chain accessories
- ▲ lifting beams



Transport and mounting systems for prefabricated units

- ▲ transport anchors
- ▲ spherical-head anchor system
- ▲ fixing sockets
- ▲ connecting technique



Hydraulic, pneumatics and conveyor technique

- ▲ hydraulic units and components
- ▲ pneumatic, connector systems and accessories
- ▲ Hoses, fittings and accessories
- ▲ machines, tools, machinery systems and accessories

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