

PFEIFER

Win the race against deadlines with PS!



11/2015

**PFEIFER
SEIL- UND HEBETECHNIK
GMBH**

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PFEIFER PS-A steel bearing



PFEIFER Steel Bearings – the new, cost-effective generation of direct supports without bearing ledges



High speed commercial success



Detailed planning of ceiling supports, building regulations approval, manufacturing of the ceiling supports – why not outsource all these steps from the outset to PFEIFER, your industrial supplier?

Our team of engineers has developed the product design in accordance with the latest standards. In our medium-sized production facilities, employees with many years of experience manufacture the steel bearings on automatic production machinery using high-grade materials. The processes are fully compliant with German standards, delivering maximum repeatability within the framework of a certified quality assurance system.

There is hardly a faster or more reliable way to lay floor slabs.

1.



Installation of reinforcement

2.



Installation in precast concrete elements

3.



Series production/stocking

Build from now on with national technical approval!



Fast

- Design time reduced to a minimum allows much earlier use of buildings
- Legal security due to national technical approval **NEW**
- Maximum degree of prefabrication
- Fastest possible installation
- Screeding work is no longer absolutely necessary after concreting the topping slabs



Safe

- Safety due to national technical approval **NEW**
- Highest implementation security
- Detailed planning outsourced to the supplier from the outset
- Introduction of loads with pinpoint accuracy



Cost-effective

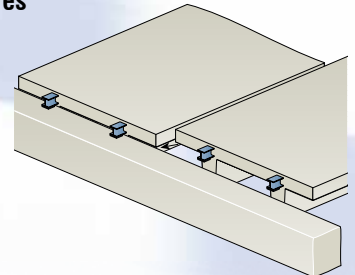
- Cost savings thanks to lower installation costs as a result of the higher speed of installation
- Considerably higher level of prefabrication
- Less planning outlay
- Shorter construction times



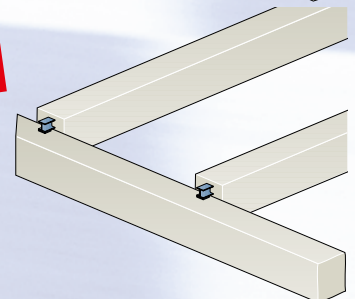
Versatile

Possible floor/ceiling structures with PFEIFER steel bearings:

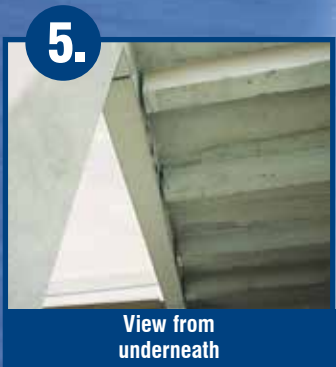
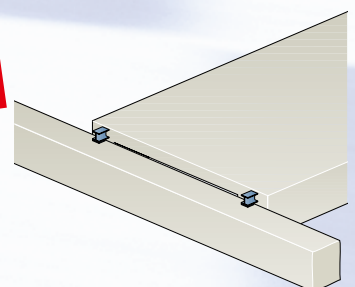
- TT ceilings/floors



- Primary and secondary joists **NEW**



- Trough plates + precast ceilings/floors **NEW**



**Build from now
on with national
technical approval!**

The new generation of PFEIFER steel bearings – the key to success on your building site with PS!



Planning benefits

NEW

- No bearing ledges on beams
- Building regulation security thanks to national technical approval
- Minimal eccentricity on the supporting beam
- Arbitrary installation sequence
- No manual calculation, since dimensioning can be performed with the aid of tables and/or software
- No unwanted constraining moments
- Introduction of loads with pinpoint accuracy
- No elastomer bearings that shift over the course of time



Manufacturing benefits

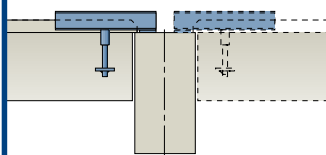
- Extremely straightforward formwork and construction of rectangular
- No dowel measurements
- Less reinforcement in the supporting beam



Installation benefits

- Higher speed of installation
- Flexible installation sequence
- No dowelling
- No neoprene bearings
- Low eccentricity of the supports, thus low torsional loads
- No additional installation supports required
- Safe and reliable installation, since there are no possibilities to make mistakes

Single-sided installation



Client benefits

- Significantly shorter construction times
- Earlier use of the building
- Optimum use of the building height
- Huge cost savings – usually of the order of two-figure percentages
- No bearing ledges on which dirt collects
- Clear bottom view of the ceiling

PFEIFER Steel Bearings

Item no. 05.340



**Build from now
on with national
technical approval!**

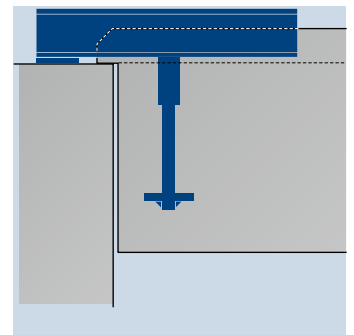
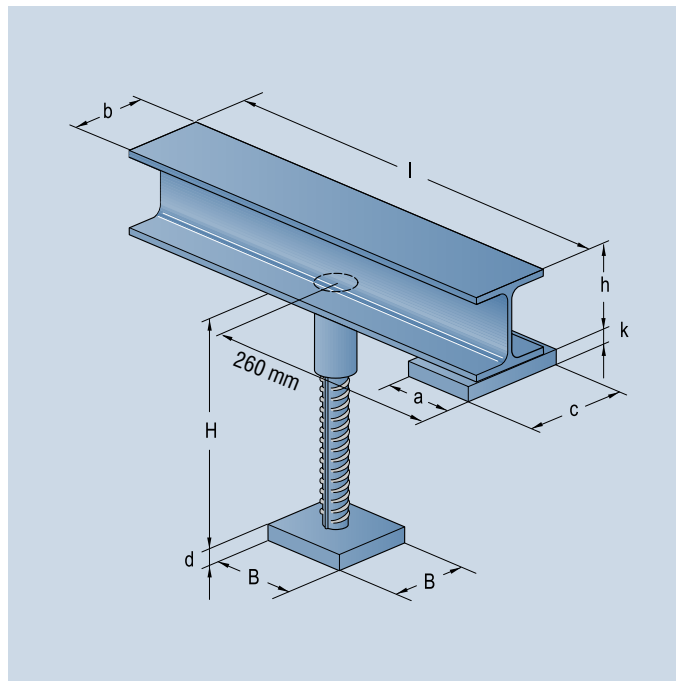
Material:

Rolled steel S 355

Reinforcing steel BSt 500 A/B, forged

Precision steel pipe

Spot-welded support plate



The anchoring bar is supplied unscrewed for transport and storage. The length of the anchoring bar is manufactured per order to match the web.



PFEIFER

Connection systems

Steel bearings

PFEIFER Steel Bearings absorb the dead weight loads during the installation of elements. Together with the inserted reinforcement and the in-situ concrete layer, traffic loads are safely diverted into the ceiling joists. The entire support structure can be planned, dimensioned, manufactured and installed more easily without bracket console strip supporting joists.

The lower installation heights and clean bottom views of the ceilings have a positive effect on the entire building.

Just four types are required to cover TT plates, ceiling joists and trough plates.

Ref. no.	Type	V_{Rd} , installation ^{1), 2), 3)} kN	$l_{Support}$ [mm]	b [mm]	h [mm]	k [mm]	a [mm]	c [mm]	d [mm]	B [mm]	H_{min} [mm]	$\varnothing BSt$ [mm]	Weight ⁴⁾ Kg/unit
05.340.202.520	PS-A 65	65	520	100	91	20	80	120	15	80	225	20	8,1
05.340.252.520	PS-A 80/100	80/100	520	100	96	20	80	120	20	90	225	25	13,5
05.340.282.520	PS-A 130	130	520	100	100	20	80	120	20	100	300	28	15,6
05.340.282.720	PS-A 160	160	720	120	120	20	80	150	20	100	350	28	28,6

Please use the order form on page 15 for all orders or enquiries. Special sizes are available on request

1) Rated resistance of the bearing support force during installation

2) Calculated horizontal force due to constraint: $HRd = 0.20 \times V_{Rd,ges}$ (H_{Rd} is not printed correctly)

3) During construction, the partial safety factor of the influences must **not** be reduced. The dead weight should always be based on $\gamma_G = 1,35!$

4) Minimal for H

Additionally available from www.pfeifer.de:

- Detailed calculation and dimensioning examples
- Dimensioning software
- National technical approval

General installation instructions for PS-A Steel Bearings

1. Application notes

PFEIFER Steel Bearings were developed for the cost-effective support of TT plates and trough plates as well as primary and secondary beams (figs. 1–3). The large eccentricities that usually occur in the installation and end states due to constructions with bearing ledges and the associated increased outlay and costs can be avoided by using steel bearings. Cost-intensive supports using scaffolding towers or the like can also be dispensed with.

The PFEIFER steel bearings are designed to absorb the entire bearing support force during installation, which results from the dead weight of the precast element, the topping layer and the payload when concreting. In the end state the steel bearings work together with the mortised concrete support.

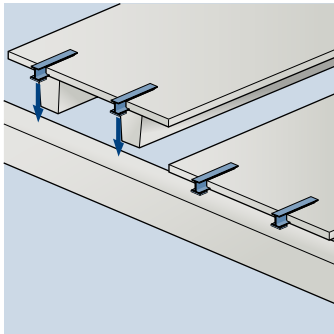


Fig. 1: π -plates

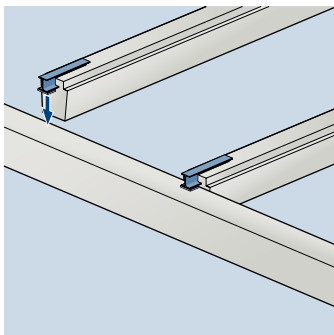


Fig. 2: Secondary beams or ceiling joists

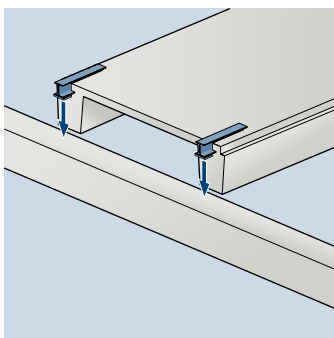


Fig. 3: Trough plates

2. Design resistance

In principle, distinction is made between the installation state and the end state when dimensioning the PFEIFER PS-A steel bearings. These states must be considered separately.

Installation state

The installation state is the period in which the topping layer cross-section of the ceiling is not yet effective. When determining the influences, the dead weight of the precast elements, the topping layer, a man load and influences that may occur during installation must be taken into account.

The applicable design resistances for the installation state can be taken from Table 1. These depend in particular on the height of the web. The minimum concrete quality of the precast element is C35/45.

End state

In the end state the PS-A steel bearing and the in-situ concrete bracket work in combination.

Therefore, the relevant design resistances are different to those that apply during the installation state. The relevant influences are the dead weights of the precast element, topping layer and covering as well as the imposed load. The design resistance decisive for the end state can be simply read off from dimensioning tables, depending on a few boundary conditions. These are to be taken from the current national technical approval. For a fundamental description of the dimensioning procedure, the three necessary steps are briefly described below:

Step 1:

In order to cover as many possible installation situations as possible, two basic modules (figs. 4 and 5) were adopted into the approval. These are distinguished by the geometry of the web. These basic modules are assigned in the design resistance tables. In principle, when defining the module to be employed, it must be determined which module can be fitted into the existing web geometry. The type of precast element – π plate, trough plate, secondary beams or ceiling joist – is thereby irrelevant (figs. 6–8).

Step 2:

Next, the dimensioning table is selected with the bearing required for the installation state and the matching basic module (see step 1).

After that the necessary design resistance can be read off according to the influences, depending on the web height, plate thickness and the quality of the top layer concrete.

Step 3:

With the design resistance that has now been assigned, the necessary reinforcement can be read off from the table and the bearing point can be elaborated in accordance with the “general technical application criteria” from the national technical approval.

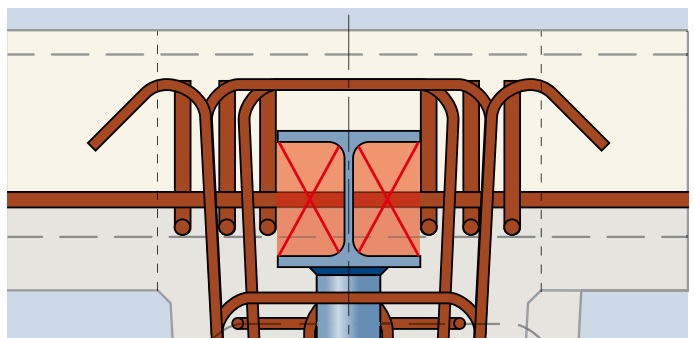
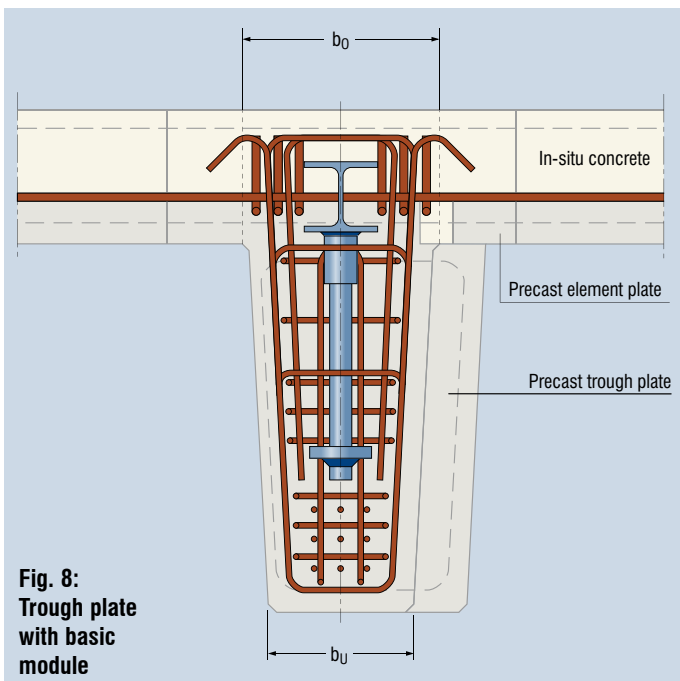
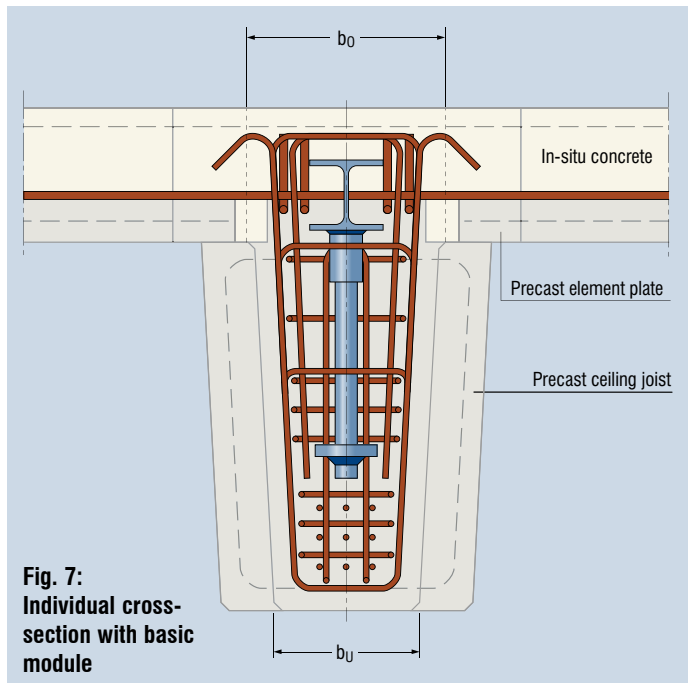
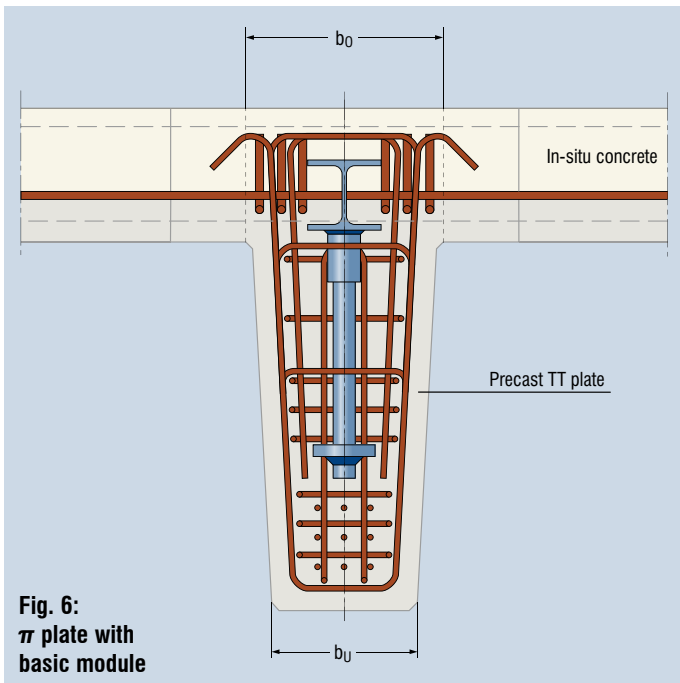
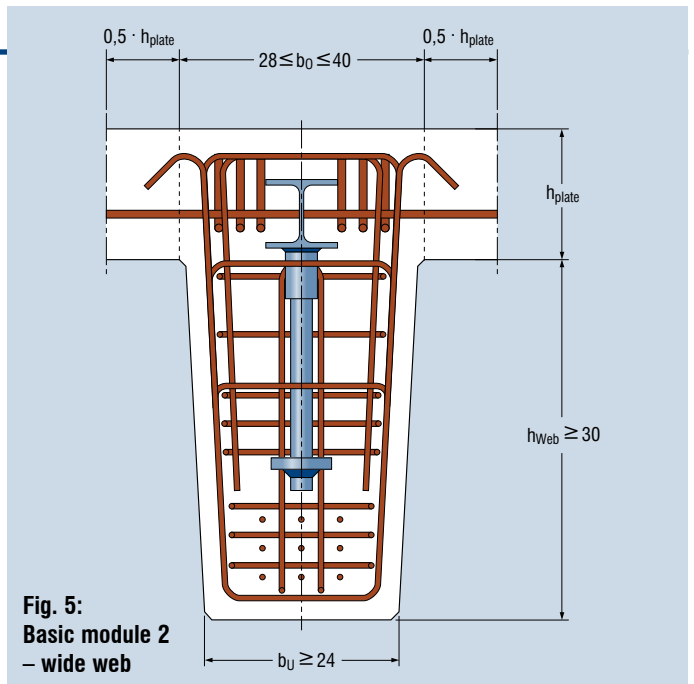
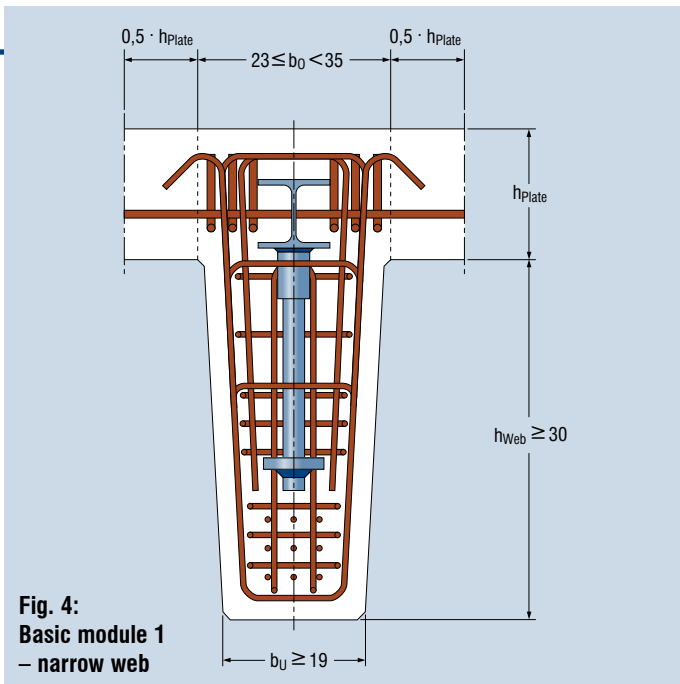
Remark regarding building site operations:

From a minimum strength of the topping layer of 40% of f_{ck} , a maximum traffic load of $q_{ck} = 1 \text{ kN/m}^2$ can be applied without exact verification.

For higher loads these are to be verified by means of an exact calculation.

Table 1:

Web height h [cm]	Load capacities $V_{Rd, installation}$ in the installation state [kN]										
	PS-A 65			PS-A 80/100			PS-A 130			PS-A 160	
$30 \leq h < 40$	65	65	65	80	80	80					
$40 \leq h < 50$	65	65	65	100	100	100					
$50 \leq h < 60$							130	130	130		
$60 \leq h < 70$	65	65	65	100	100	100	130	130	130	160	160
$h \geq 70$							130	130	130	160	160



Indication: The horizontal stirrups must ideally always be outside the steel bearing cross-section.

3. Construction principles

Concrete qualities

The precast concrete elements must be at least quality C35/45 and the supporting elements (e.g. ceiling joists) at least C25/30. The quality of the top layer concrete must be selected according to the dimensioning tables.

Embedding depth of the anchor plate in the web

In order to ensure sufficient anchorage in the precast element, the anchoring bar of the steel bearing must be of the following minimum length (fig. 9).

$$l \geq 0,55 \cdot h_{\text{Web}} \geq 210 \text{ mm [ordering size / anchoring bar length: } H \geq l + 15 \text{ mm]}$$

Minimum anchoring bar lengths:

PS-A 65	: H ≥ 225 mm, \ddot{U}_{pit} 35 mm
PS-A 80/100	: H ≥ 225 mm, \ddot{U}_{pit} 45 mm
PS-A 130	: H ≥ 300 mm, \ddot{U}_{pit} 48 mm
PS-A 160	: H ≥ 350 mm, \ddot{U}_{pit} 48 mm

Reinforcement

The reinforcement required in the bearing area is illustrated qualitatively in fig. 10. The necessary calculated verifications of, for example, anchoring and overlapping lengths as well as all other reinforcement determinations are to be taken from the appendices to the national technical approval (fig. 10).

Cutouts

Cutouts in the level surface are permissible only if they are at least half the ceiling thickness away from the web (fig. 10). Reinforcements must be replaced here if necessary.

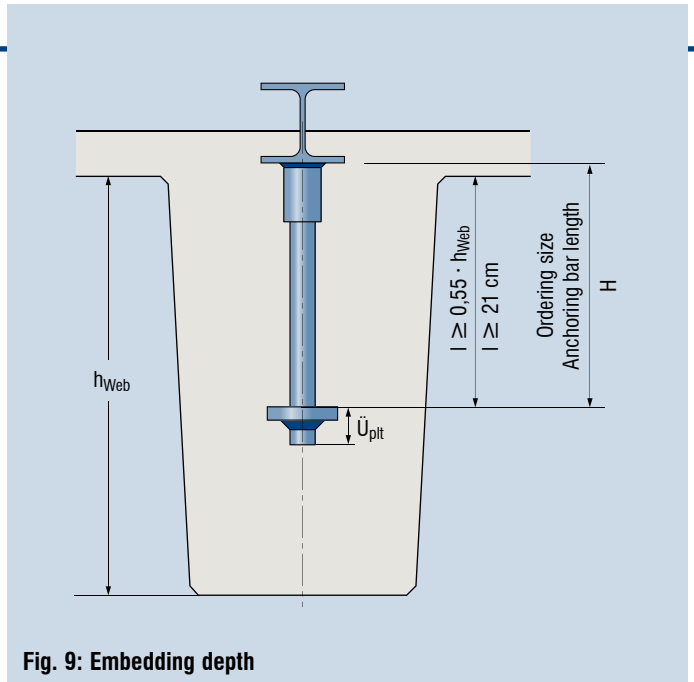


Fig. 9: Embedding depth

Exposure class

With regard to reinforcement corrosion, the exposure classes XC1-XC3 according to DIN1045-1, Table 3 were taken as the basis for the dimensioning of the PS-A steel bearing. More severe cases must be considered and verified separately. In particular, the underside of the steel bearing may have to be provided with an additional layer of anti-corrosion coating. In this case the planned concrete coverage is 15 mm thick.

Fire resistance

The steel bearing structure conforms to fire resistance class F120 in accordance with DIN 4102, part 2, provided the structural element itself complies with this classification in accordance with DIN 4102, part 4. DIN 4102, part 4, section 3.2.4.8 must be observed. The required concrete coverage of the anchor plate must also be taken into account.

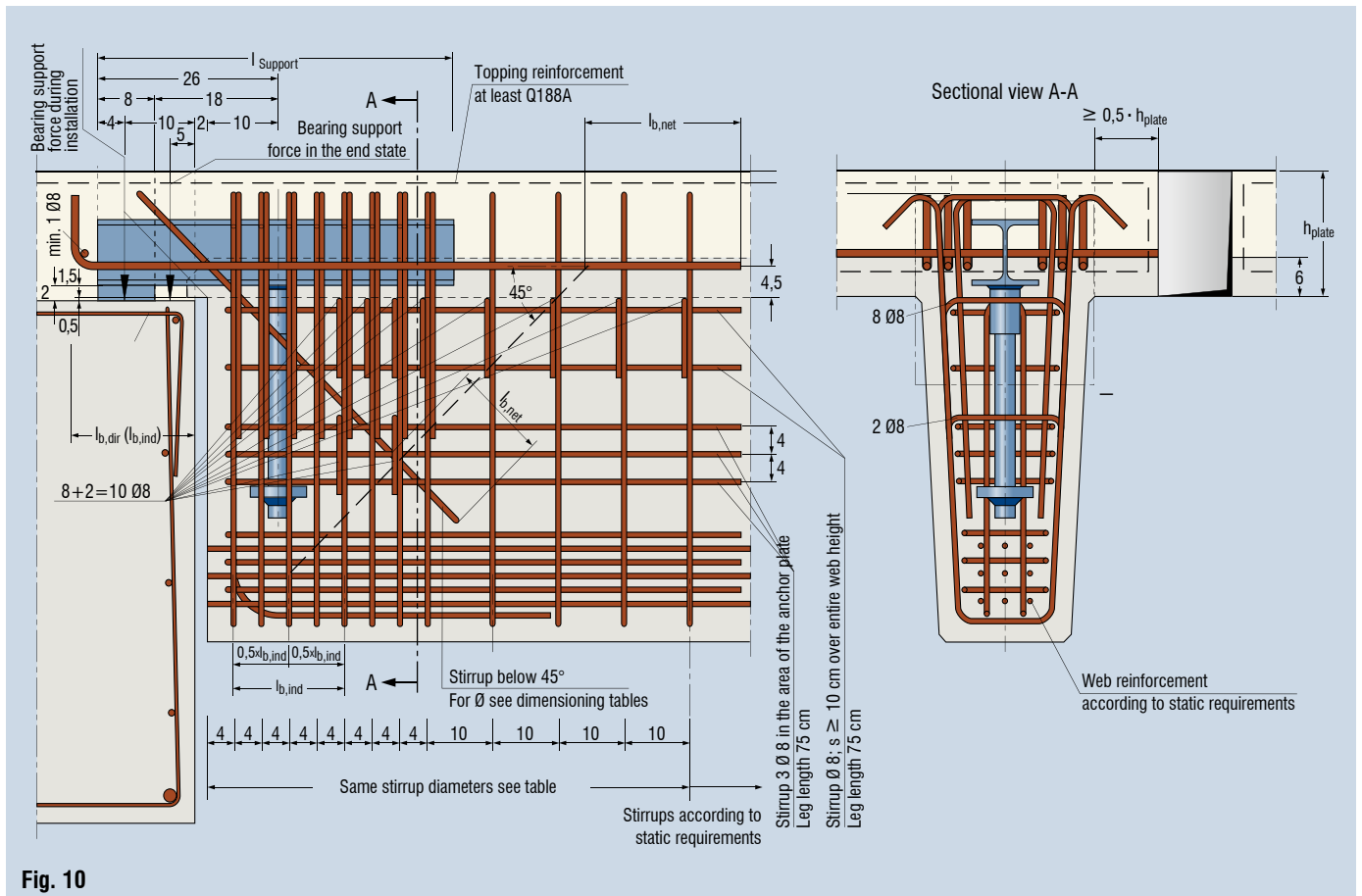


Fig. 10

Installation of the steel bearings

Since the PFEIFER steel bearing and the associated tension rod are supplied loose in order to save transport space, the connecting rod with the plate must be screwed into the socket of the steel support before installation using a torque wrench (e.g. PFEIFER torque wrench) (see fig. 11). The tightening torques given in Table 2 must be observed when doing this.

Table 2: Tightening torques

Steel bearing type	\varnothing_T [mm]	M_T [Nm]
PS-A 65	20	80
PS-A 80/100	25	100
PS-A 130 PS-A 160	28	140

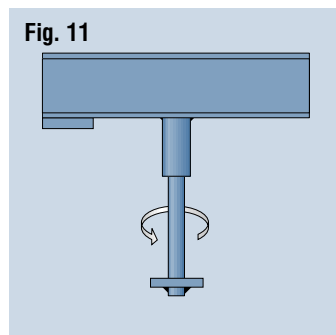
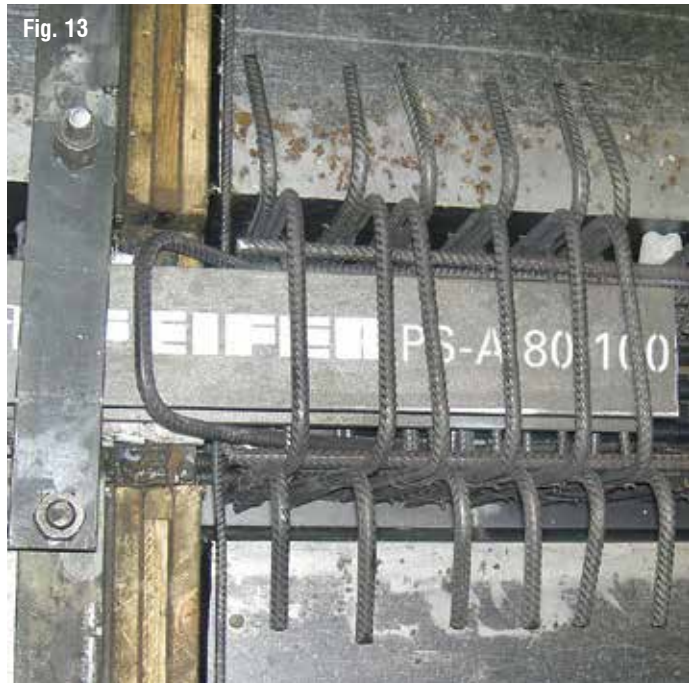
Installation into the formwork

The PFEIFER steel bearing (with screwed-in tension rod) can be fixed with wire in the reinforcement cage which is to be manufactured (fig. 12). In order to allow subsequent adjustments, however, the steel bearing should not be fastened too tightly to the reinforcement cage.

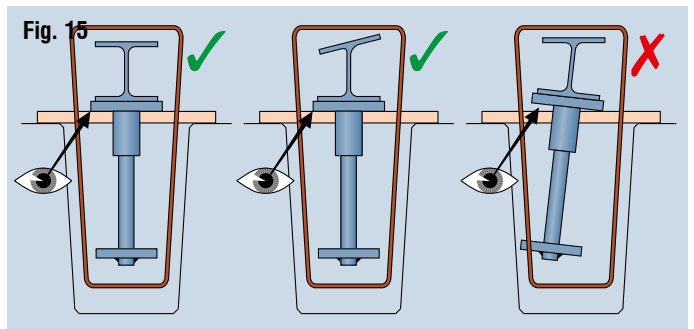
The PFEIFER steel bearing can be supported by means of

- a bearing plate with a clamping device welded to the steel formwork (fig. 13)
- a timber structure on the steel formwork (fig. 14)
- a bearing plate attached to the steel formwork using magnets

The steel bearings which are still movably attached in the reinforcement cage are then aligned horizontally in the longitudinal and transverse directions (fig. 15) and fastened to the bearing structure using a clamping device (figs. 12 to 14).

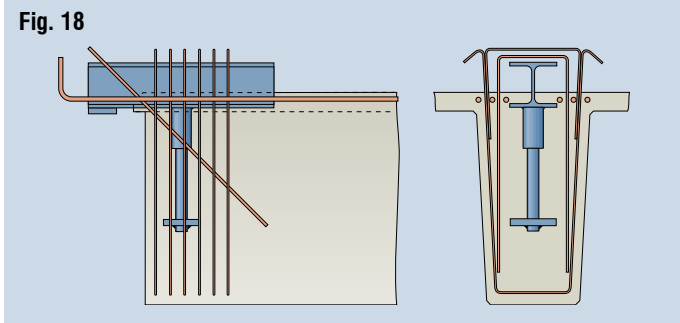
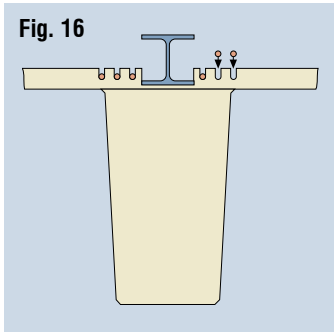


Caution: due to the normal tolerances of the flanges with respect to one another, the steel bearing is to be aligned to the formwork on the support pad (lower flange) during the assembly.



In order to correctly position the horizontal concrete steel reinforcements that lie to the left and right of the PFEIFER steel bearing, corresponding cutouts are provided in the formwork (rake (WHAT DOES THIS MEAN?), figs. 16 and 17). The gaps above the rake can be closed off and sealed with polystyrene (e.g. foam polystyrene). The mounting reinforcement must be installed with great care in accordance with fig. 10. In addition, the regulations contained in DIN 1045-1 must be adhered to during the installation of the reinforcement. The completed reinforcement cages including the PFEIFER steel bearings can then be lifted into the prepared element formwork.

After concreting, the horizontal concrete steel reinforcement outside the pre-cast element and the vertical stirrup above the steel support must be clearly exposed, with no concrete residues in between, in order to ensure a good bond with the subsequently cast in-situ concrete (fig. 18).

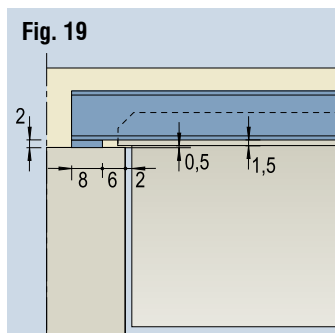


Installation on the building site

During the installation of the prefabricated elements on the building site, care must be taken to ensure that the gap between the level surface of the TT plate (fig. 19) and the ceiling joist is closed, for example with a pre-compressed strip, in order to prevent the escape of the concrete when concreting the in-situ concrete layer.

The dimensions and gaps between the structural elements shown in fig. 19 are obtained when the steel bearing is used.

Wherever the steel bearings come to rest, the stirrups in the ceiling joists must be appropriately arranged in order to enable the TT plates to be laid with the above bearings and the lateral concrete steel reinforcement, as can be seen at the bottom of the picture on page 3 or fig. 20.



Enquiry

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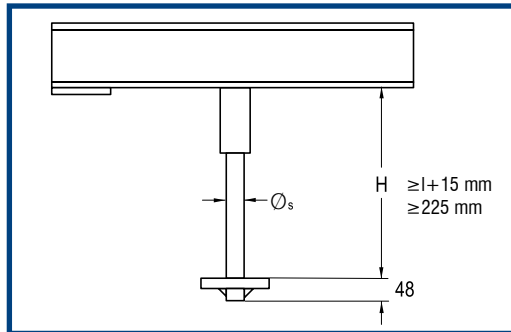
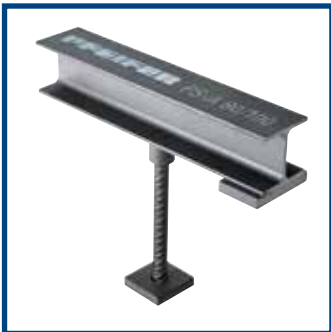
Building project

Sender's details

Company
Street
Town/Postcode
Contact name
Tel.
Fax

PFEIFER Steel Bearing

PFEIFER Steel Bearing



Please always specify dimension H in the table when ordering! Lengths of 225 mm or more with increments of 25 mm are stocked as standard.

Item	Quantity	Type	H [mm]	Net price [EUR]	Preferred delivery date

Delivery address
 (state only if different from the ordering address)

The general terms of business of PFEIFER Seil- und Hebetchnik GmbH apply

Date and signature



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Thread System



Lifting Anchor Systems
BS Anchor System



Lifting Anchor Systems
WK Anchor System



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DB Anchor 682
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Polyamide Sockets



Fixing Systems
HK Assembly Anchor System



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