PHILIPPGROUP

PHILIPP Noise reduction system

VB3-S-001-en - 01/18

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.

Engineering contact

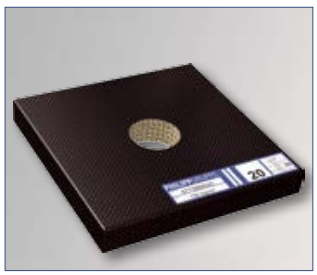
Phone: +49 (0) 6021 / 40 27-318
Fax: +49 (0) 6021 / 40 27-340
E-mail: technik@philipp-gruppe.de

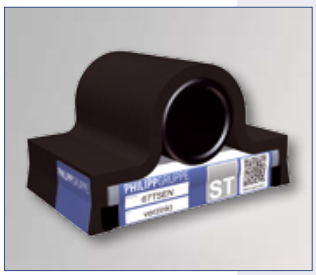
Sales contact

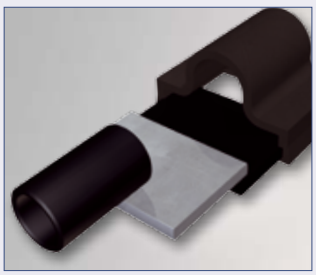
Phone: +49 (0) 6021 / 40 27-300
Fax: +49 (0) 6021 / 40 27-340
E-mail: vertrieb@philipp-gruppe.de




Content



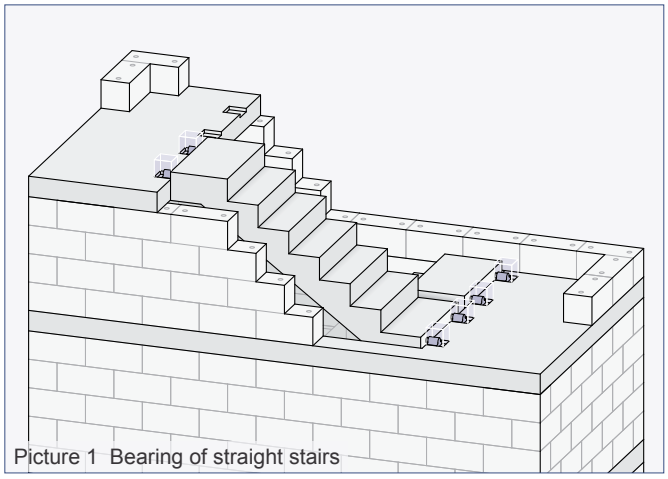


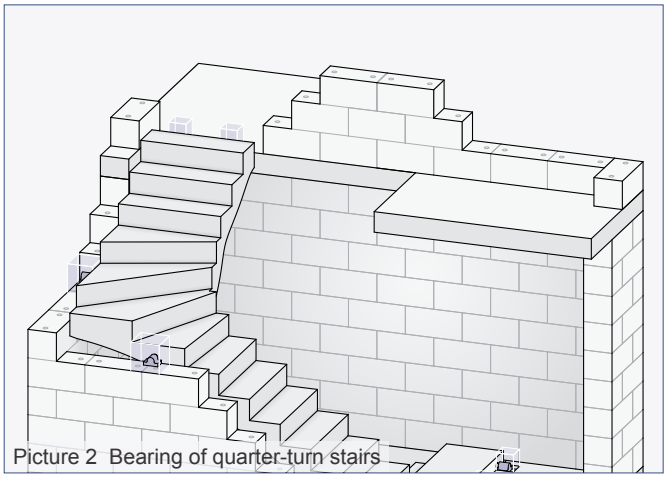


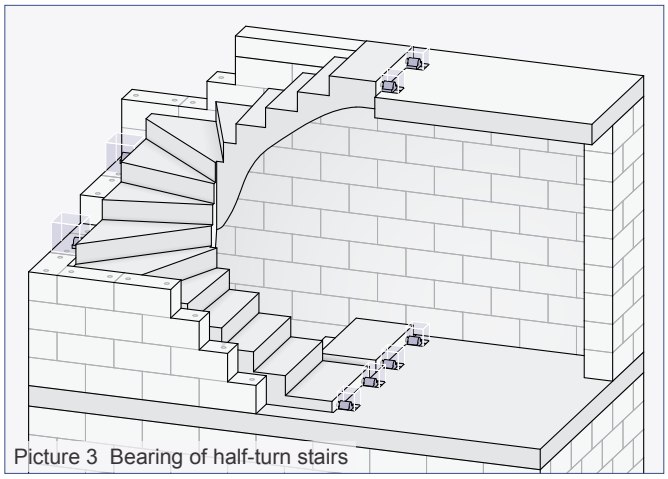
Noise reduction system (TSS-system)

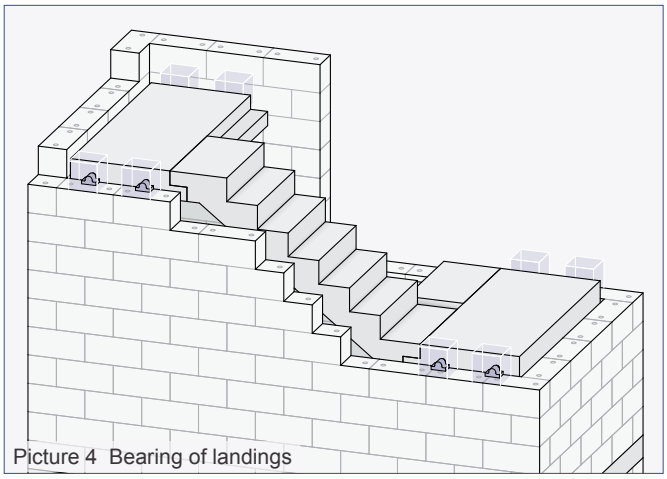
System description

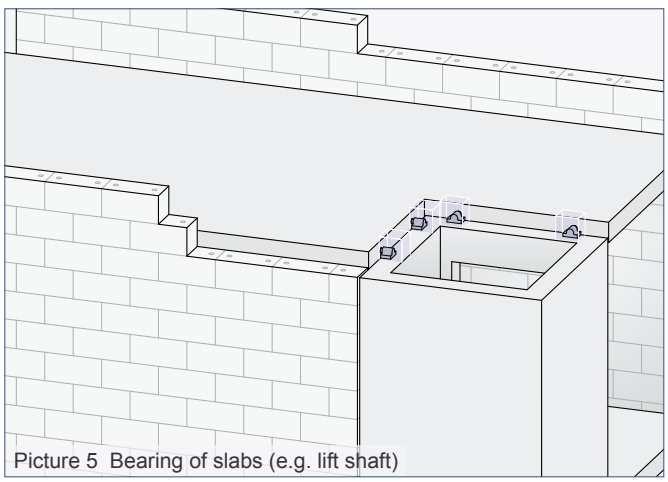
The TSS-system is a type approved system for a sound-decoupled bearing of reinforced concrete elements. It can be used for the bearing of straight stairs (Picture 1), curved stairs (Picture 2 and 3) and landings (Picture 4).
A bearing of slabs (Picture 5), slabs with brackets (for e.g. walls with thermal insulation composite system, picture 6) and beam-shaped units is also possible. The German national type approval considers the use for internal and external concrete elements under predominantly static loads. There are multi-purpose applications for the system because of the different combinations of installation parts and parts set in concrete (Picture 7).

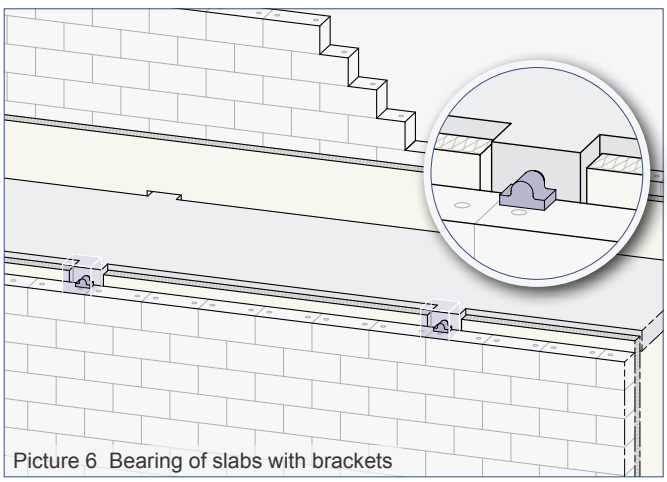

Picture 1 Bearing of straight stairs


Picture 2 Bearing of quarter-turn stairs


Picture 3 Bearing of half-turn stairs


Picture 4 Bearing of landings


Picture 5 Bearing of slabs (e.g. lift shaft)

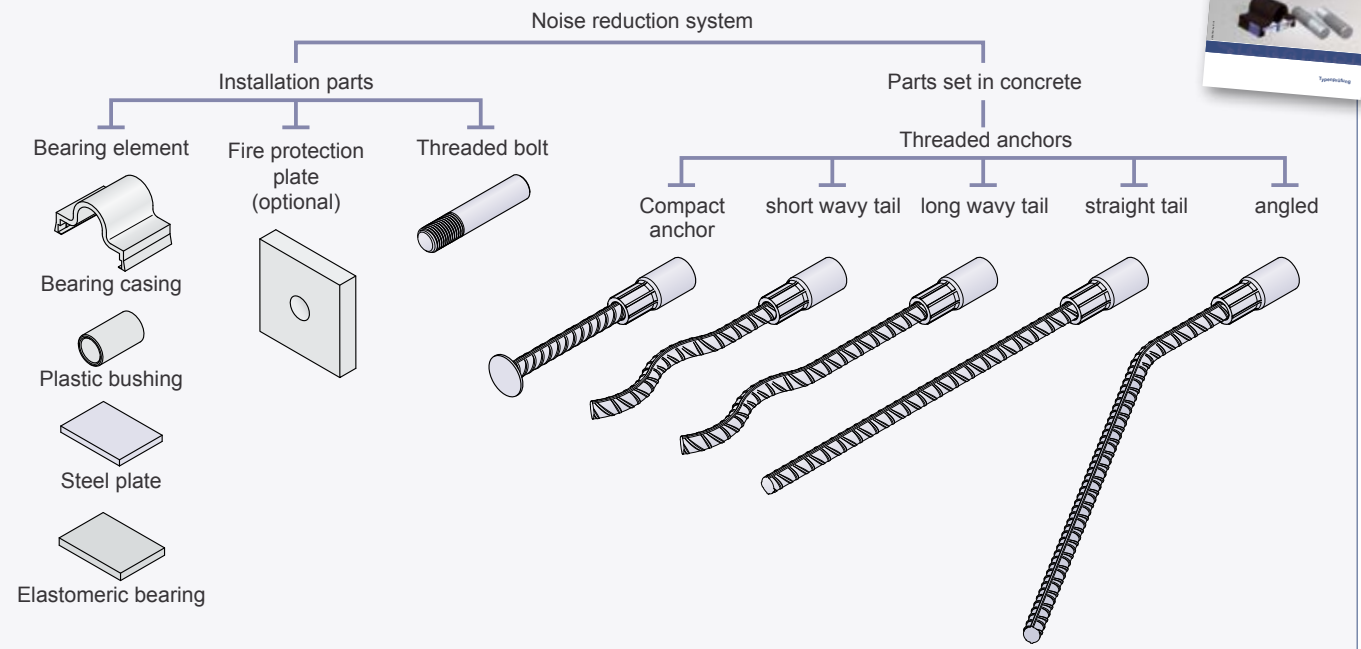

Picture 6 Bearing of slabs with brackets

Noise reduction system (TSS-system)

System overview

The TSS-system consists of several single components (Picture 7) and is suitable for indoor use (galvanised version) as well as outdoor use (stainless steel version) in concrete elements. Each system contains a threaded anchor, a threaded bolt and the actual bearing element as main components. In turn, the bearing element consists also of several components that are delivered pre-assembled.
The load is transferred via the bolt into the steel plate and the elastomeric bearing laying beneath and finally into the load-bearing elements (e.g. masonry or reinforced concrete wall).

Multiple anchor types offer the planner the possibility to use the TSS-system even with difficult precast constructions. Within the scope of this Installation Instruction, the planner has the option of adapting the bending of straight and angled anchors individually to the geometry (page 17).



Picture 7 System overview

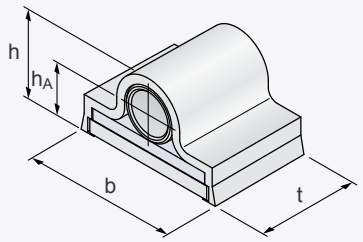
Table 1: System overview

Installation parts			Parts set in concrete
Bearing element	Fire protection plate (optional)	Threaded bolt	Threaded anchors
Indoor (galvanised version)			
67TSEN	67TSBMN020 67TSBMN030	670TSSN___ST; 670TSSN___8	67K360235; 67K360334; 67K360450; 67M36WE; 67M36K; 67M36; 67M361100; 67M360850GE45
Outdoor (stainless steel version)			
67TSENVA	67TSBMN020 67TSBMN030	670TSSN___VA	75K360235VA; 75K360334VA; 75K360450VA; 75M36VAWE; 75M36VAK; 75M36VA; 75M361100VA; 75M360850VAGE45

Installation parts

Table 2: Bearing element

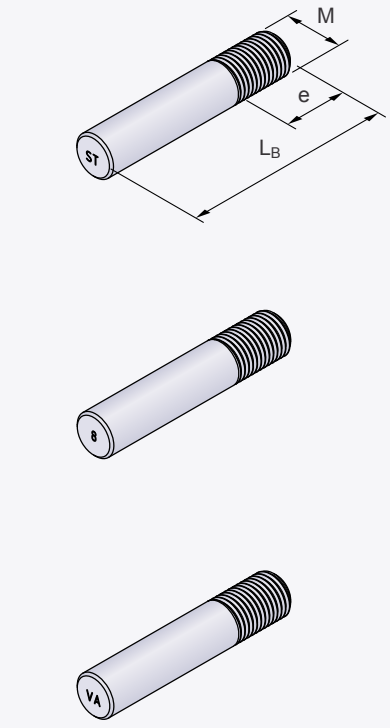
Ref.-No.	b [mm]	t [mm]	h [mm]	h_A [mm]	Steel plate
Galvanised version					
67TSEN	132	88	76	45	bright zinc plated
Stainless steel version					
67TSENVA	132	88	76	45	stainless steel



Picture 8

Table 3: Threaded bolt

Ref.-No.	Thread M	e [mm]	L_B [mm]
S355 galvanised (marking ST)			
670TSSN160ST	M36	56	160
670TSSN180ST			180
670TSSN190ST			190
670TSSN200ST			200
670TSSN210ST			210
670TSSN220ST			220
Tempered steel (marking 8)			
670TSSN1608	M36	56	160
670TSSN1808			180
670TSSN1908			190
670TSSN2008			200
670TSSN2108			210
670TSSN2208			220
Stainless steel S460 (marking VA)			
670TSSN160VA	M36	56	160
670TSSN180VA			180
670TSSN190VA			190
670TSSN200VA			200
670TSSN210VA			210
670TSSN220VA			220

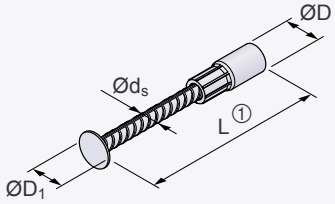


Picture 9

Parts set in concrete

Table 4: Compact anchor

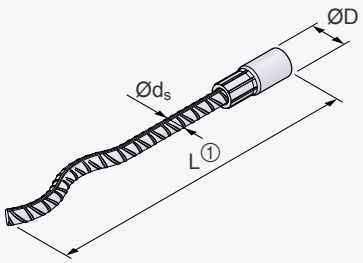
Ref.-No.	Type	ØD [mm]	$ØD_1$ [mm]	L ① [mm]	$Ød_s$ [mm]
Galvanised version					
67K360235	RD 36	47	60	235	25
67K360334	RD 36	47	60	334	25
67K360450	RD 36	47	60	450	25
Stainless steel version					
75K360235VA	RD 36	50	60	235	25
75K360334VA	RD 36	50	60	334	25
75K360450VA	RD 36	50	60	450	25



Picture 10

Table 5: Threaded anchors (short and long wavy tail)

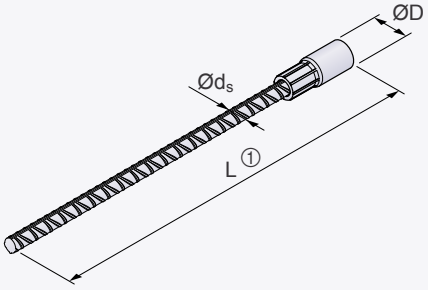
Ref.-No.	Type	ØD [mm]	L ① [mm]	$Ød_s$ [mm]
67M36K	RD 36	47	380	25
67M36WE	RD 36	47	570	25
Stainless steel version				
75M36VAK	RD 36	50	380	25
75M36VAWE	RD 36	50	570	25



Picture 11

Table 6: Threaded anchor (straight tail) ②

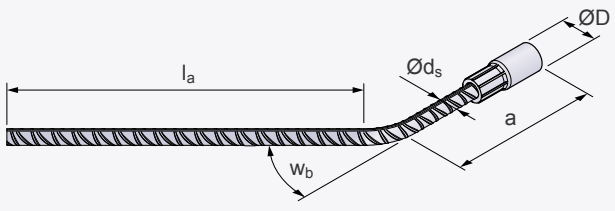
Ref.-No.	Type	ØD [mm]	L ① [mm]	$Ød_s$ [mm]
Galvanised version				
67M36	RD 36	47	690	25
67M361100	RD 36	47	1100	25
Stainless steel version				
75M36VA	RD 36	50	690	25
75M361100VA	RD 36	50	1100	25



Picture 12

Table 7: Threaded anchor (45° angled) ②

Ref.-No.	Type	ØD [mm]	$Ød_s$ [mm]	a [mm]	l_a [mm]	w_b
Galvanised version						
67M360850GE45	RD 36	47	25	165	690	45°
Stainless steel version						
75M360850VAGE45	RD 36	50	25	165	690	45°



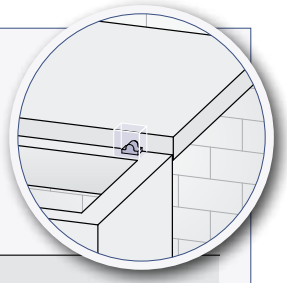
Picture 13

① The shortest anchor length L is sufficient to guarantee the bearing capacity. Longer anchors are possible.
② Anchors are suitable for bending by the user.
(Refer to notes on page 17)

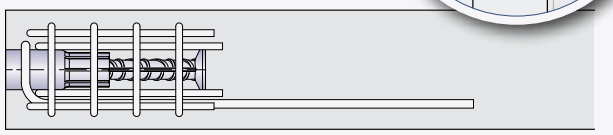
Installation instructions

Installation options

Following installation options are possible for the TSS-system.

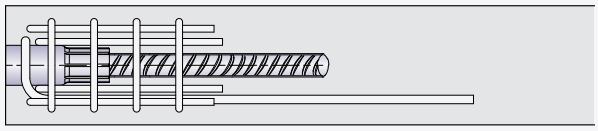


Compact anchor



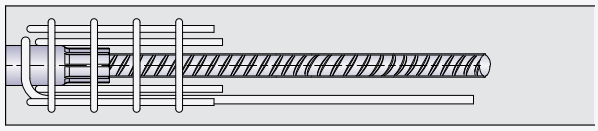
67K360235; 67K360334; 67K360450;
75K360235VA; 75K360334VA; 75K360450VA

Threaded anchor - short wavy tail



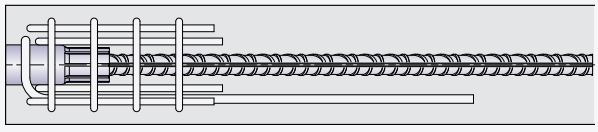
67M36K;
75M36VAK

Threaded anchor - long wavy tail



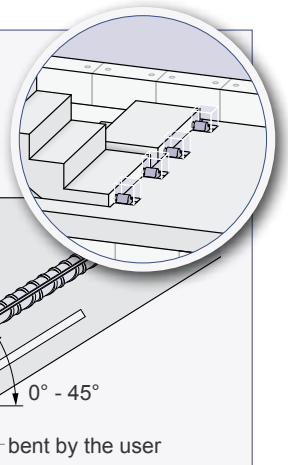
67M36WE;
75M36VAWE

Threaded anchor - straight tail



67M36; 67M361100;
75M36VA; 75M361100VA

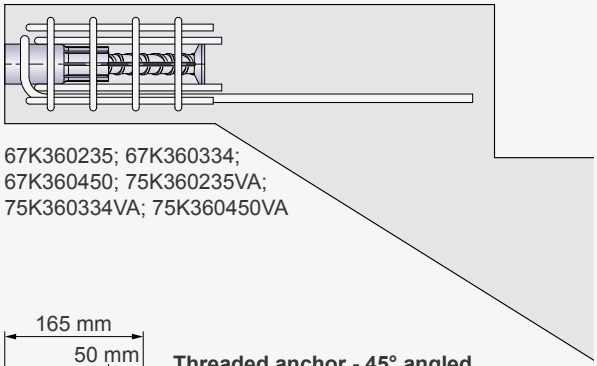
Picture 14



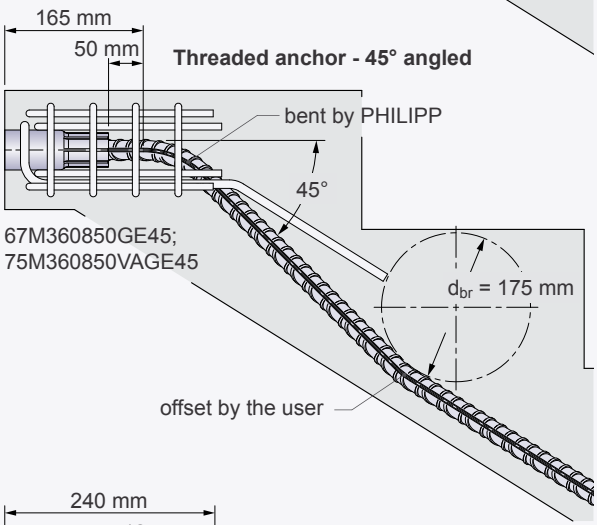
Threaded anchor - angled

67M36; 67M361100;
75M36VA; 75M361100VA

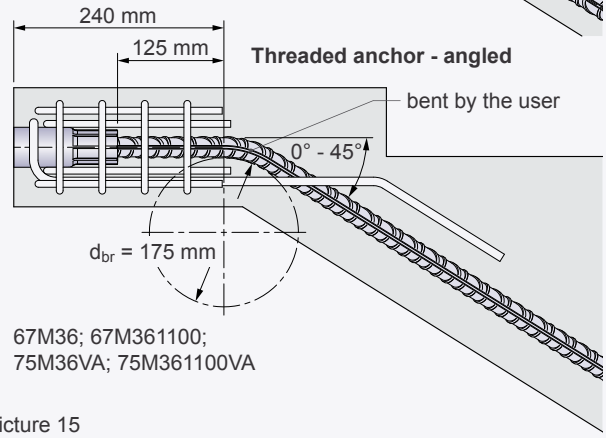
Compact anchor



67K360235; 67K360334;
67K360450; 75K360235VA;
75K360334VA; 75K360450VA



67M360850GE45;
75M360850VAGE45



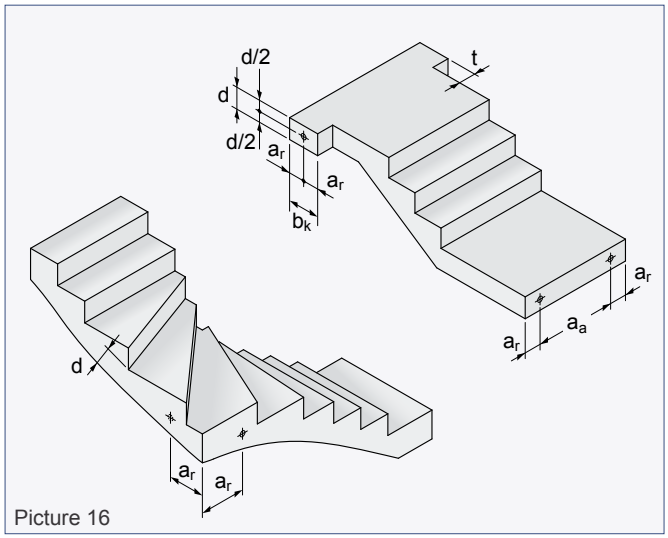
67M36; 67M361100;
75M36VA; 75M361100VA

Picture 15

Installation instructions

Element dimensions

Table 8 specifies element thicknesses, distances, console widths and depths attention have to be paid to. The anchor should be installed centred in the reinforced concrete element relating to the element thickness (d/2). If the anchor is installed in a console, it shall be placed in the centre of the console (b_K/2). The maximum console depth t given in table 8 must be followed, if no separate proof of the local load transfer shall be provided (page 13). If a greater console depth is required, the reinforcement shall be installed acc. to pictures 20 to 22 and a design for the slab resp. the console shall be done.
If a FEM calculation is necessary to calculate the support reactions, the spring stiffnesses have to be considered. For more information about the spring stiffnesses please refer to Picture 19. The structural engineer has to prove the load transfer of the support reactions.



Picture 16

Table 8: Element dimensions

Minimum element thickness d [mm]	Minimum edge distance a_r [mm]	Minimum centre distance a_a [mm]	Minimum bracket width b_k [mm]	Maximum bracket depth t [mm]
Indoor				
≥ 140 ①②	≥100	≥ 200	≥ 200	≤ 150
Outdoor				
≥ 170 ③	≥110	≥ 200	≥ 220	≤ 150

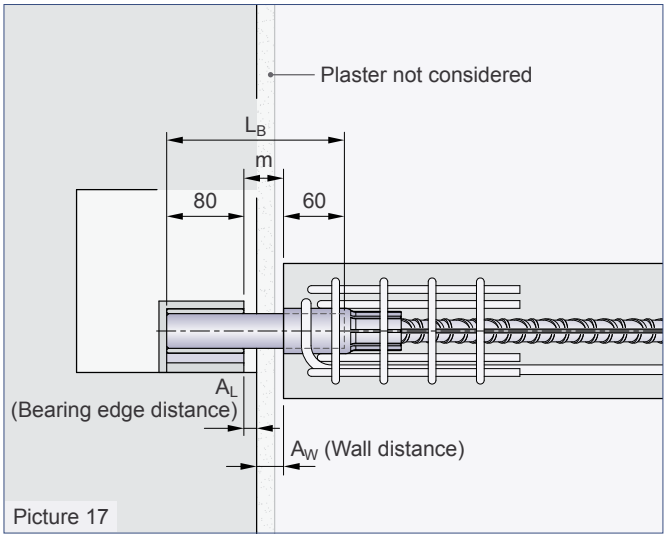
① if fire resistance F90 is required according to DIN 4102-2, d ≥ 150 mm

② with a minimum element thickness of 140 mm the concrete cover is c_{nom} = 15 mm and the minimum concrete strength C20/25. If the exposure class requires a higher concrete cover, the minimum element thickness shall be increased (Picture 25).

③ with a minimum element thickness of 170 mm the concrete cover is c_{nom} = 30 mm and the minimum concrete strength C35/45. If the exposure class requires a higher concrete cover, the minimum element thickness shall be increased (Picture 25).

Calculation of the bolt length

The installation distance results from the addition of the bearing edge distance and the given wall distance ($m \geq A_L + A_W$). The bolt length is to be selected from table 9. Note that the bolt must be screwed into the anchor completely. Finally, the bearing element is pushed onto the bolt until the back plane touches the end of the bolt.
For the specification of the bearing edge distance A_L the structural engineer is responsible.



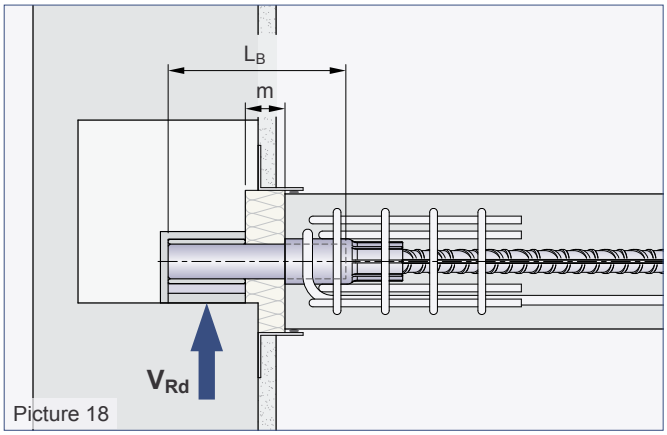
Picture 17

Table 9: Installation distances

Installation distance max. m [mm]	Bolt length min. L_B [mm]
20	160
40	180
50	190
60	200
70	210
80	220

Load-bearing capacities

Predominantly static loads the TSS-system is designed for. The permissible support reactions vary depending on the quality of concrete used (stair or landing), the installation distance (picture 17 and 18) and the material of the threaded bolt (table 10). The installation distance is defined as the distance of the threaded anchor in the concrete element to the front edge of the bearing element (picture 17 and 18).
Depending on the concrete strength of the element to be supported (stair or landing), the bolt material and the installation distance permissible load-bearing capacities result (see table 10).



Picture 18

Table 10: Load-bearing capacities depending on the installation distance

Ref.-No.	Bolt length ① L_B [mm]	Installation distance ① m [mm]	perm. V_{Rd} [kN]	Minimum concrete strength of the element to be supported
Load-bearing capacity for bolts made of S355 bzp				
670TSSGN160ST	160	20	26.0	C20/25
670TSSN180ST	180	40	19.5	C20/25
670TSSN190ST	190	50	17.3	C20/25
670TSSN200ST	200	60	15.6	C20/25
670TSSN210ST	210	70	14.2	C20/25
670TSSN220ST	220	80	13.0	C20/25
Load-bearing capacity for bolts made of tempered steel bzp				
670TSSN1608	160	20	36.6 (39.4)②	C30/37 (C35/45)②
670TSSN1808	180	40	29.8 (29.9)②	C30/37 (C35/45)②
670TSSN1908	190	50	26.6	C30/37
670TSSN2008	200	60	23.9	C30/37
670TSSN2108	210	70	21.7	C30/37
670TSSN2208	220	80	19.9	C30/37
Load-bearing capacity for bolts made of stainless steel S460				
670TSSN160VA	160	20	27.0	C30/37
670TSSN180VA	180	40	20.2	C30/37
670TSSN190VA	190	50	18.0	C30/37
670TSSN200VA	200	60	16.2	C30/37
670TSSN210VA	210	70	14.7	C30/37
670TSSN220VA	220	80	13.5	C30/37

① More information about the bolt length L_B and installation distance m on page 9 (Calculation of the bolt length)
② For values in parentheses refer to tables 13 and 14

Impact sound

Impact sound reduction

The application of the TSS-system ensures the increased impact sound protection recommended by DIN 4109 supplement 2. Compared to conventional bearings the TSS-system achieves a considerable reduction of impact sound.

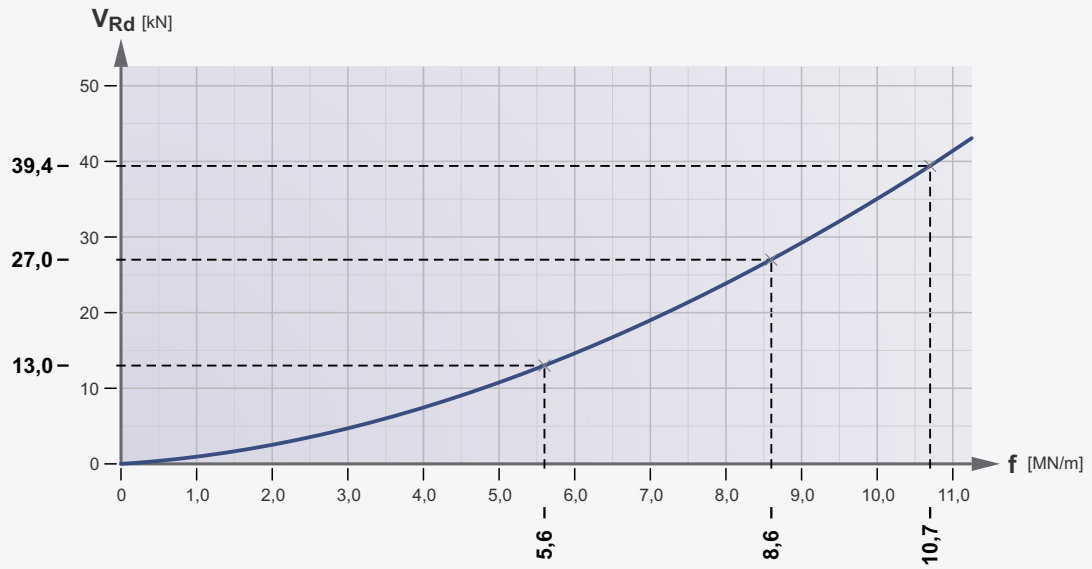
The impact sound reduction determined for the TSS-system is given in table 11 as a function of the support reaction. All values of the impact sound reduction are results from tests done by the notified body ITA (“Ingenieurgesellschaft für Technische Akustik mbH”) in Germany.

Table 11: Impact sound reduction

Impact sound insulation acc. to DIN 4109	Supplement 2 to DIN 4109 Increased impact sound protection	Weighted normalised impact sound pressure level Tab. 20 Sheet 1, DIN 4109	Arithmetically achievable impact sound pressure level	Impact sound reduction
req. $L'_{n,w}$ [dB]	req. $L'_{n,w}$ [dB]	$L_{n,w,eq,R}$ [dB]	$L'_{n,w,R}$ [dB]	$\Delta L_{w,R}$ [dB]
58	46	58	39 - 44	14 - 19

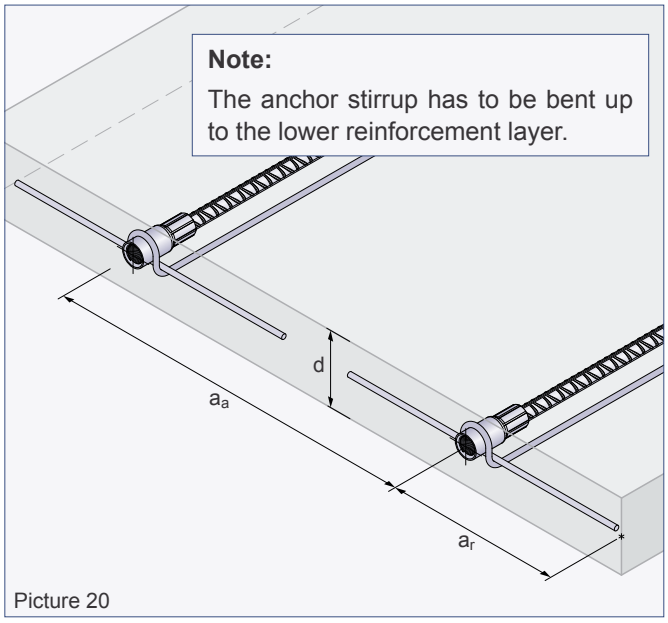
Spring stiffness

If a FEM calculation is required to determine the support reactions the spring stiffness according to picture 19 is to be used for each individual support.

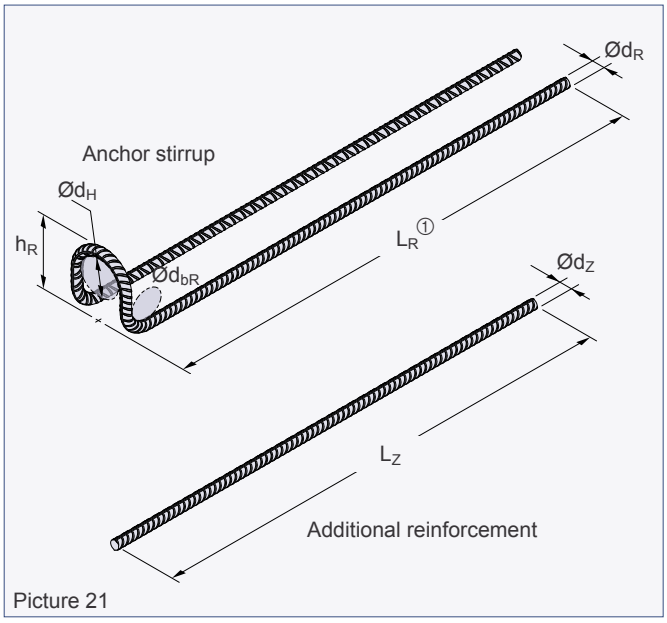


Picture 19

Reinforcement (proof of local load transfer provided)



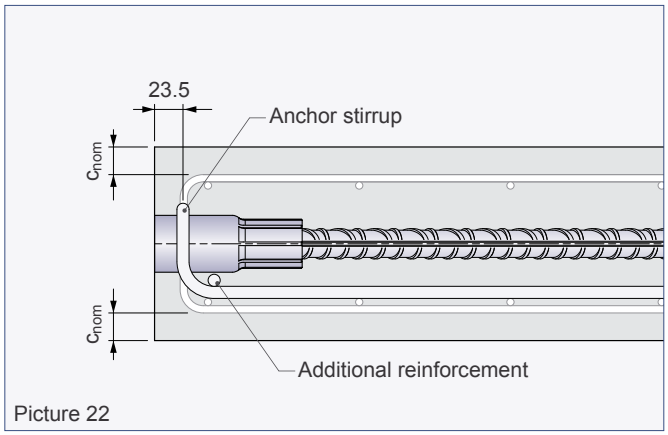
Picture 20



Picture 21

The local load transfer at the anchor socket into the concrete element is guaranteed by the anchor stirrup with cross bar (Table 12). For this purpose, the minimum element thickness must not be less than the specification given in table 8. Both the design of brackets and slabs as well as the transfer of loads into the element has to be provided by the structural engineer.

Mandatorily, the anchor stirrup must have direct pressure contact to the socket in the peak of its bending. The additional reinforcement bar is placed between the anchor socket and the legs of the stirrup. For the transfer of the load please refer to the corresponding standards.



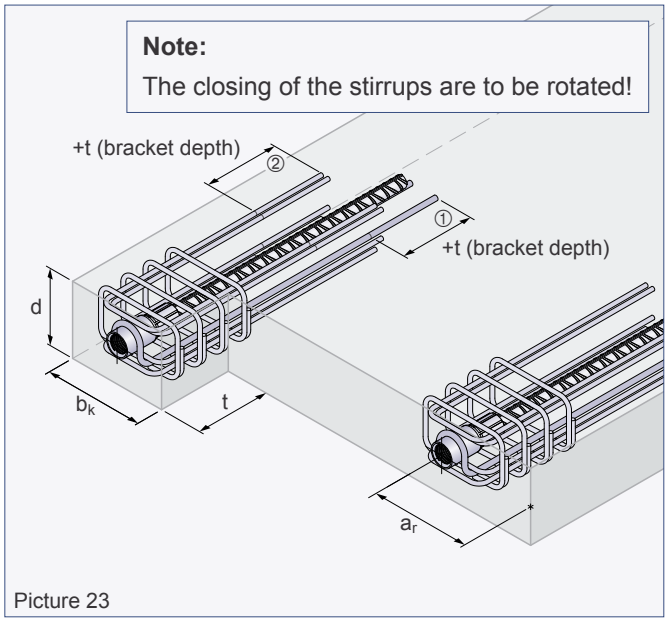
Picture 22

① As an alternative to B500A a hot-dip galvanised reinforcement bar approved acc. to the German Z-1.4-165 or a stainless steel reinforcement bar B500A NR with a general approval can be used for the anchor stirrup in order to guarantee the required concrete cover.

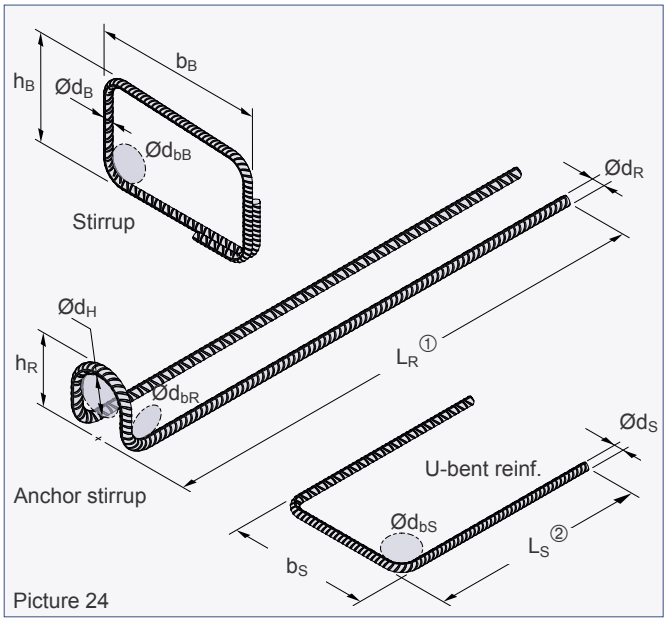
Table 12: Reinforcement

Anchor stirrup (B500A) ①					Additional reinforcement (B500A)	
L_R [mm]	h_R [mm]	Ød$_H$ [mm]	Ød$_R$ [mm]	Ød$_{bR}$ [mm]	L_Z [mm]	Ød$_Z$ [mm]
for version ≥ C20/25						
500	≥ 75	Ø48	Ø10	Ø40	≥ 600	≥ 10
for version ≥ C35/45						
400	≥ 73	Ø50	Ø12	Ø48	≥ 600	≥ 10

Reinforcement (proof of local load transfer provided)

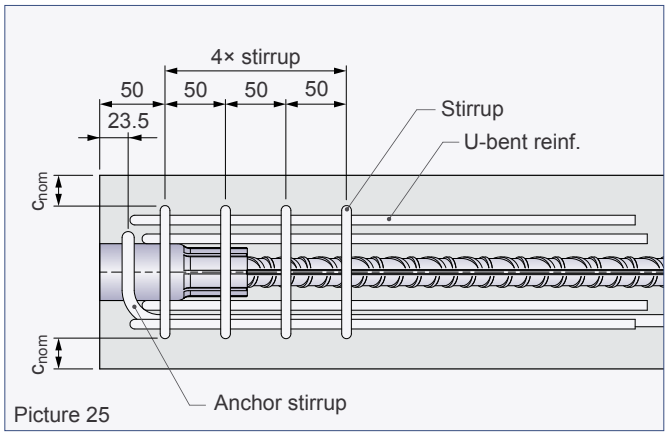


Picture 23



Picture 24

Shown reinforcement in B500A ensures the local load transfer without further calculations and additional reinforcement. The reinforcement can be used in slabs as well as in elements with moulded brackets. In all cases, the minimum element thickness must not fall below the values specified in table 8. The anchorage or the lapping of the U-bent reinforcement and the anchor stirrup are to be considered.



Picture 25

① With brackets the length L_R of the anchor stirrup must be increased by the bracket depth t.

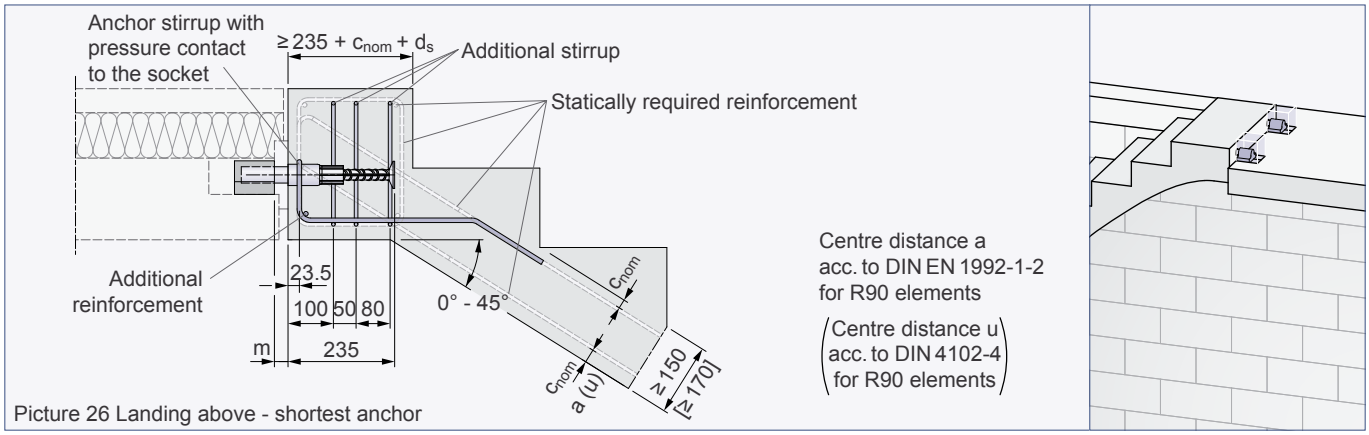
② With brackets the length L_S of the U-bent reinforcement must be increased by the bracket depth t.

③ As an alternative to B500A a hot-dip galvanised reinforcement bar approved acc. to the German Z-1.4-165 or a stainless steel reinforcement bar B500A NR with a general approval can be used for the anchor stirrup in order to guarantee the required concrete cover.

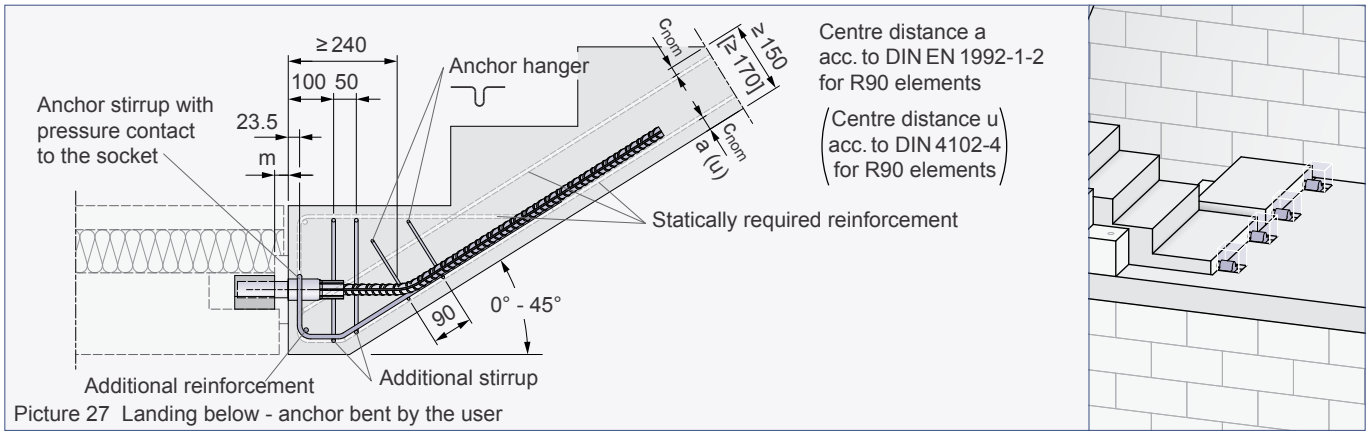
Table 13: Reinforcement

Anchor stirrup (B500A) ③					Stirrup (B500A)				U-bent reinf. (B500A)			
L_R ① [mm]	h_R [mm]	$Ød_H$ [mm]	$Ød_R$ [mm]	$Ød_{bR}$ [mm]	b_B [mm]	h_B [mm]	$Ød_B$ [mm]	$Ød_{bB}$ [mm]	L_S ② [mm]	b_S [mm]	$Ød_S$ [mm]	$Ød_{bS}$ [mm]
for version ≥ C20/25												
≥ 500	≥ 75	Ø48	Ø10	Ø40	≥ 170	≥ 110	Ø8	Ø32	≥400	120	Ø8	Ø32
for version ≥ C35/45												
≥ 400	≥ 79	Ø50	Ø12	Ø48	≥ 170	≥ 110	Ø8	Ø32	≥350	120	Ø10	Ø40

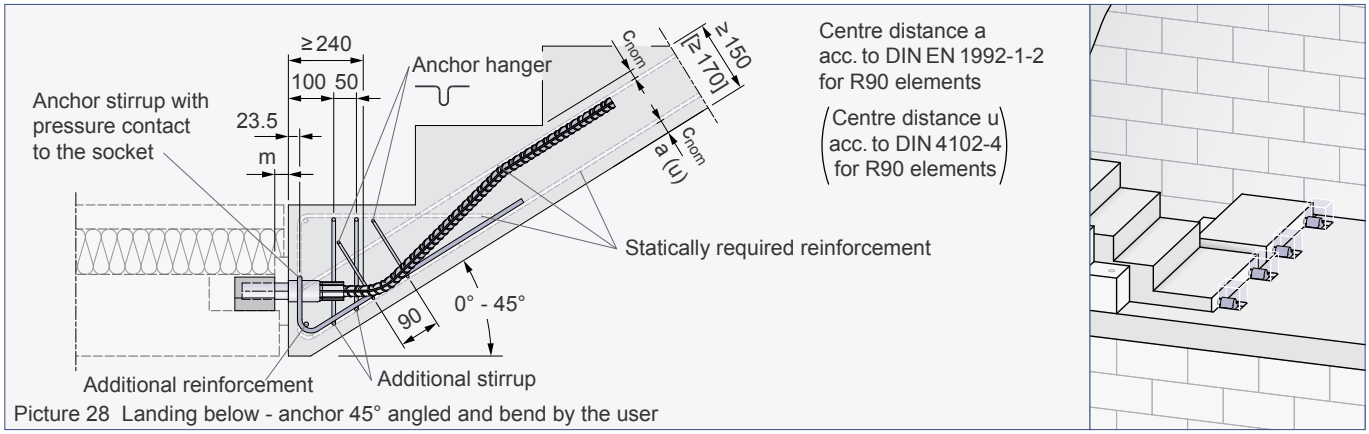
Samples of reinforcement (coordinated with LGA Würzburg, Germany)



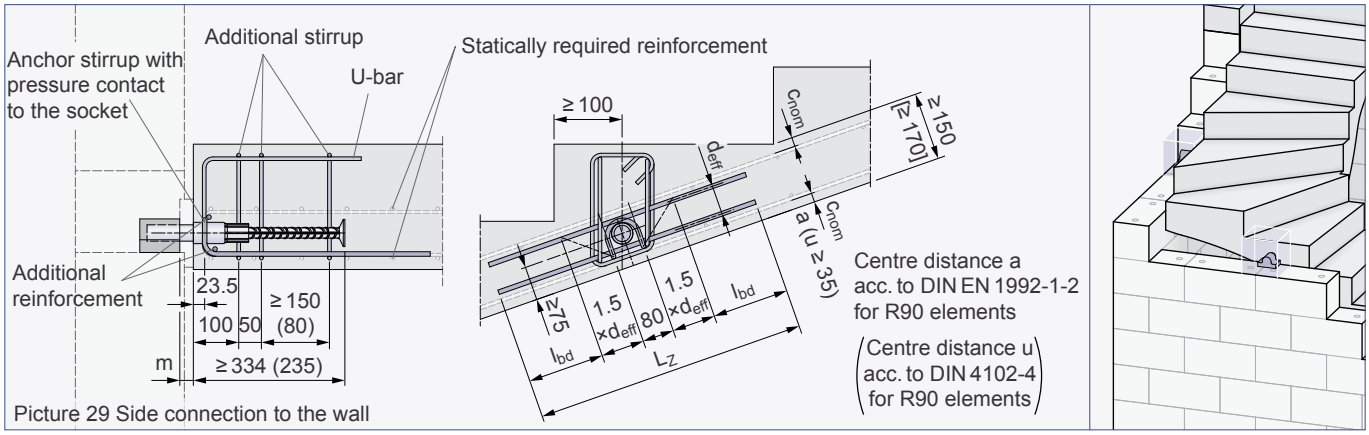
Picture 26 Landing above - shortest anchor



Picture 27 Landing below - anchor bent by the user



Picture 28 Landing below - anchor 45° angled and bend by the user



Picture 29 Side connection to the wall

All proofs for the reinforcement has to be done by the user.

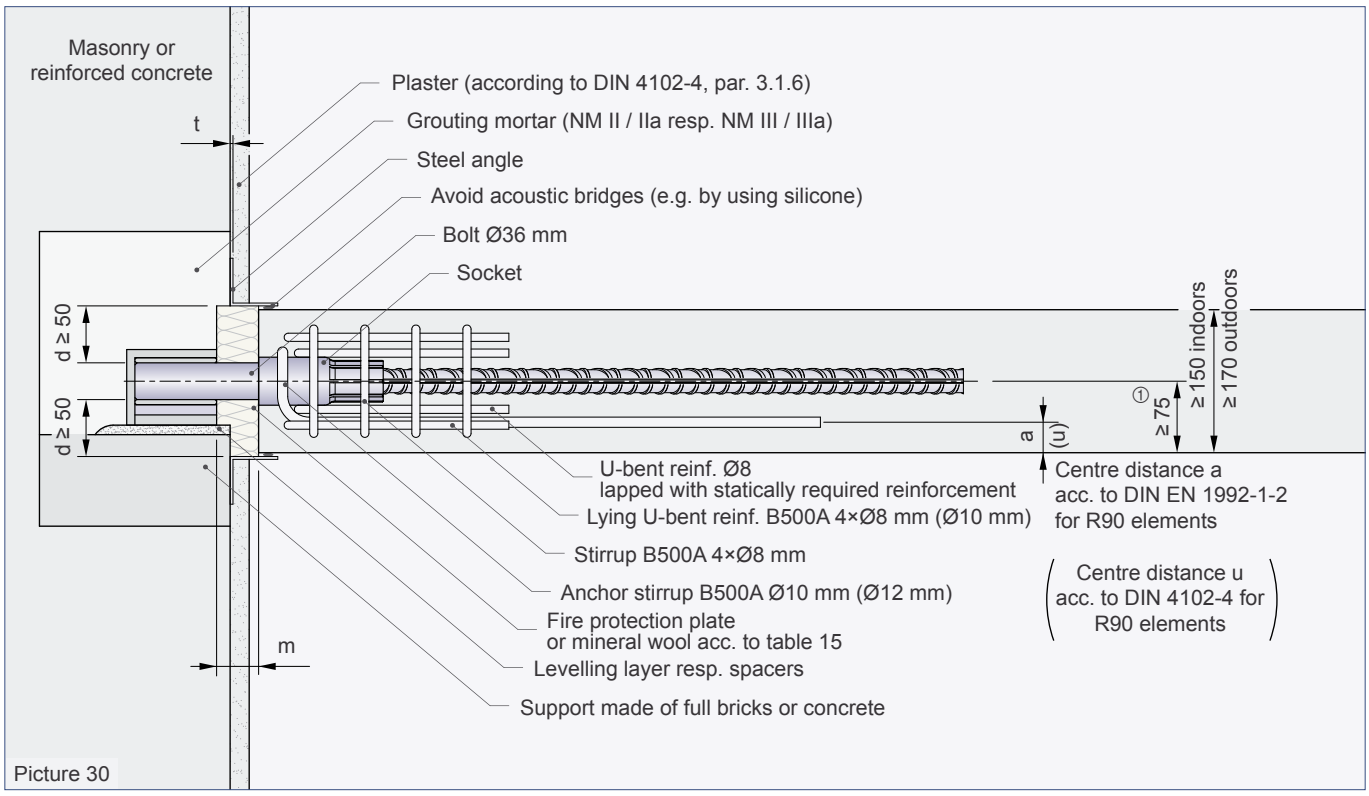
Fire protection

In combination with the fire protection plate (picture 31) the TSS-system is classified by an expert's opinion to the fire resistance class R90 according to DIN 4102-2. Alternatively, the installation distance m can be filled up completely with non-flammable mineral wool according to table 14. This mineral wool must be densely plugged and enclose the bolt at least 50 mm on all sides.
A steel angle from the supporting wall up to the stair or landing shall be installed (table 14 and picture 30). A silicone seal between the angle and the element to be supported shall be provided to avoid acoustic bridges.

The recess area in the wall must be completely filled with mortar (NM II /IIa or NM III / IIIa) after the installation of the bearing element. When grouting, pay attention that no acoustic bridge is generated between bolt and mortar.
The supporting wall (brick, sand-lime brick, aerated concrete or reinforced concrete) must be designed according to DIN 4102-2 for fire resistance class R90. Any interior plaster to be applied must comply with the requirements of DIN 4102-4, par. 3.1.6.

Table 14: Density of mineral wool

Installation distance m [mm]	Steel angle t [mm]	Density of mineral wool (non-flammable) [kg/m³]	Melting point of mineral wool [°C]
≤ 20	1.0	≥ 80	≥ 1000
> 20	1.0	≥ 150	≥ 1000



Picture 30

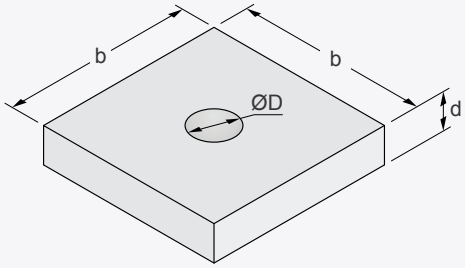
① Without requirements to R90 also 70 mm possible

Fire protection plate

The TSS Fire protection plate meets the requirements of the fire protection expert opinion for non-flammable mineral wool. It guarantees the fire resistance class R90 according to DIN 4102-2 when the edge distances specified in table 8 are observed. The Fire protection plate consists of a jacketed mineral wool core and is available in thicknesses of 20 mm and 30 mm. It must be placed with slight pressure load on both sides to the final installation position close to both elements.

Installation

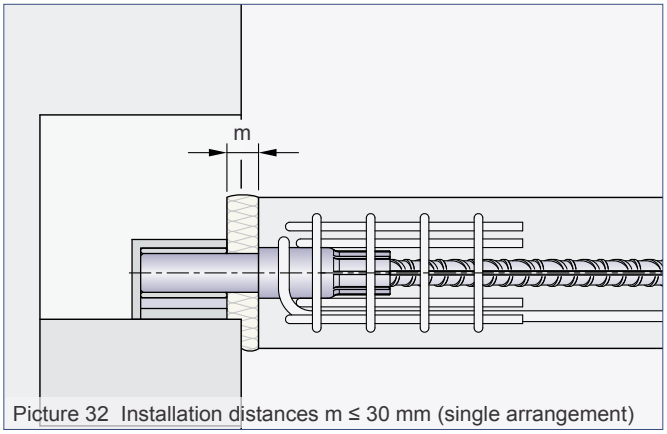
The Fire protection plate is pushed onto the fully screwed-in threaded bolt. In order to cover installation distances from 30 mm up to 80 mm with the plate, it is possible to combine plates of both thicknesses. Pay attention during the actual installation of the TSS that the bearing element is pushed onto the bolt until the back plane touches the end of the bolt. Depending on the dimension of the bearing edge distance it might be necessary to cut the fire protection plate in the bearing area.



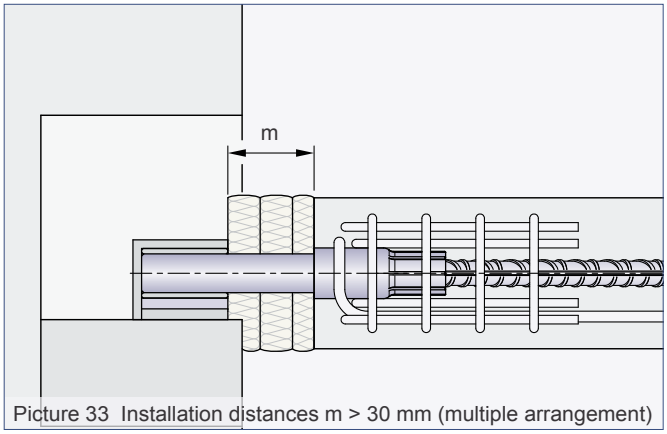
Picture 31

Table 15: Fire protection plate

Ref.-No.	Type [kg/m³]	ØD [mm]	d [mm]	b [mm]
67TSBMN020	150	36	20	150
67TSBMN030	150	36	30	150



Picture 32 Installation distances m ≤ 30 mm (single arrangement)

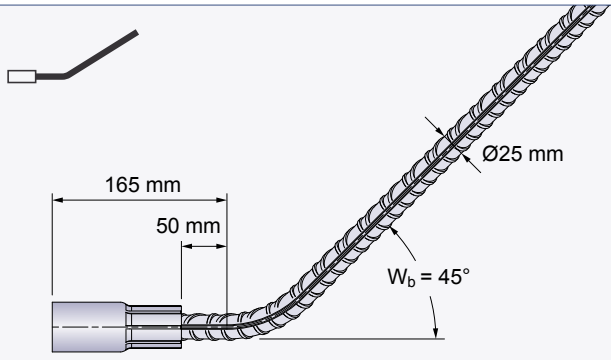


Picture 33 Installation distances m > 30 mm (multiple arrangement)

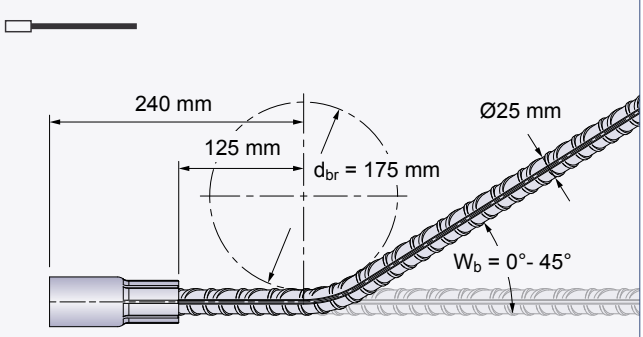
Bending of threaded anchors

Bending of threaded anchors by the user

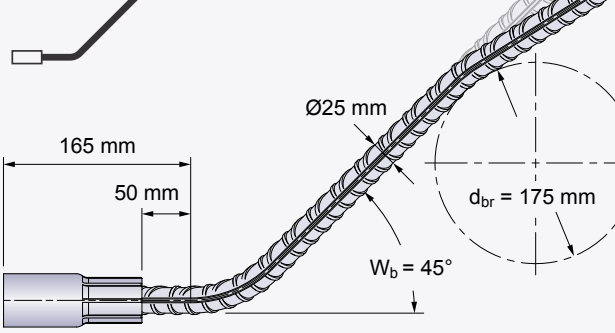
The bending of threaded anchors requires a minimum distance to the socket, at least 5 times of the rebar diameter (125 mm). If the anchor is already bent by PHILIPP, this dimension can be reduced to 2 times of the rebar diameter. The mandrel diameter d_{br} must be at least 7 times of the rebar diameter (175 mm).



Picture 34 Bending of the anchor by PHILIPP



Picture 35 Bending by the user (threaded anchor straight version)



Picture 36 Offset done by the user (threaded anchor 45° angled)

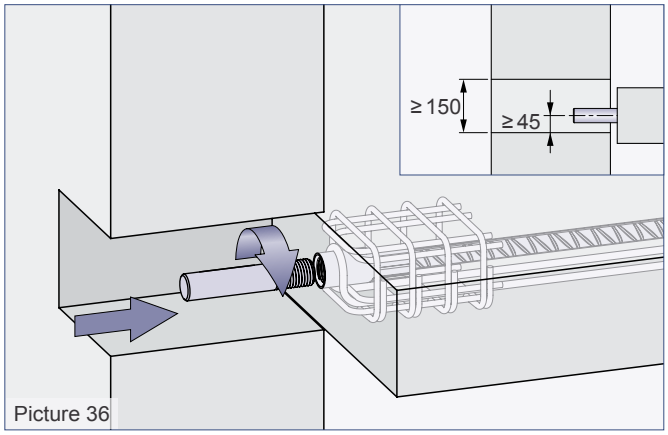
Installation of the bearing element

During installation, the threaded bolt is completely screwed into the threaded socket by hand through a recess in the wall. Naturally, the block-out in the wall has to be adapted to the requirements given at the job-site. Guiding values are given in the following pictures.

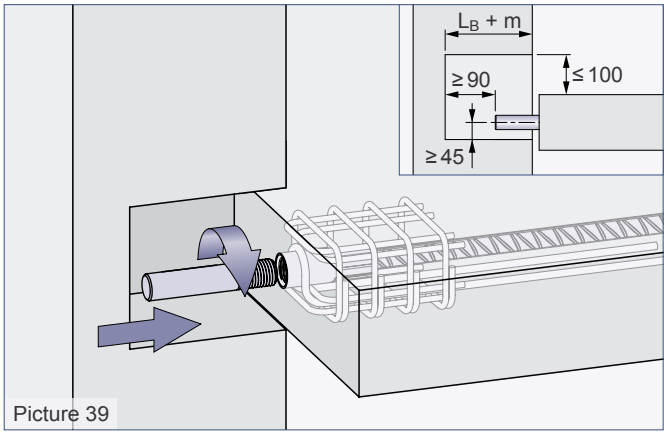
Then, the bearing element is completely pushed onto the bolt screwed-in. A mortar bed, the bearing element is placed on, levels minor irregularities. Also possible is to take steel plates in order to achieve a uniform level of support.

A grouting of the previously created block-out is necessary to ensure a long-lasting bearing. Here, attention has to be paid not to create acoustic bridges during grouting.
If the Fire protection plate is used, it shall be pushed onto the bolt first, then the bearing element follows.

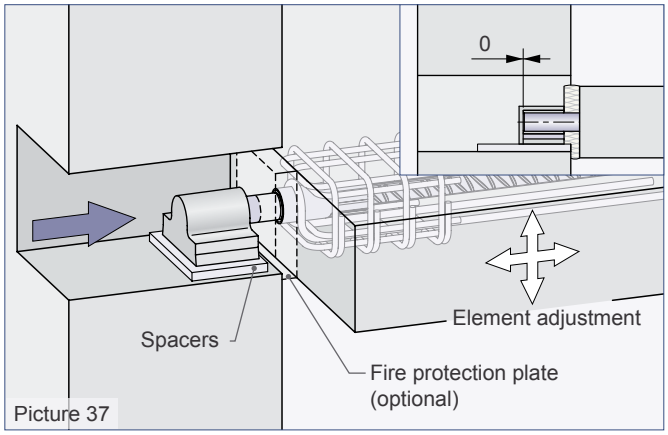
The bearing elements must not be pushed on the screwed-in threaded bolt during transport of the concrete elements.



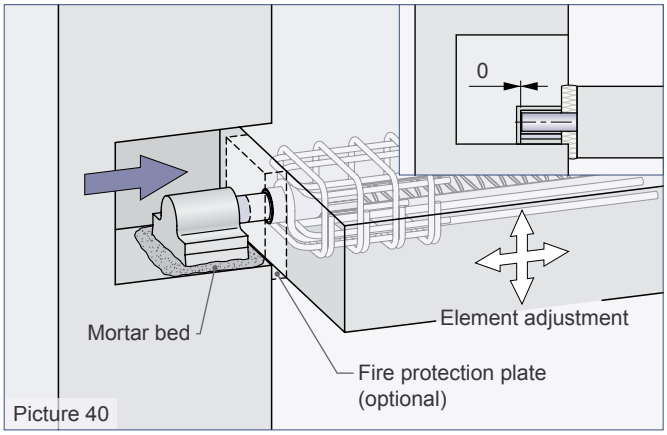
Picture 36



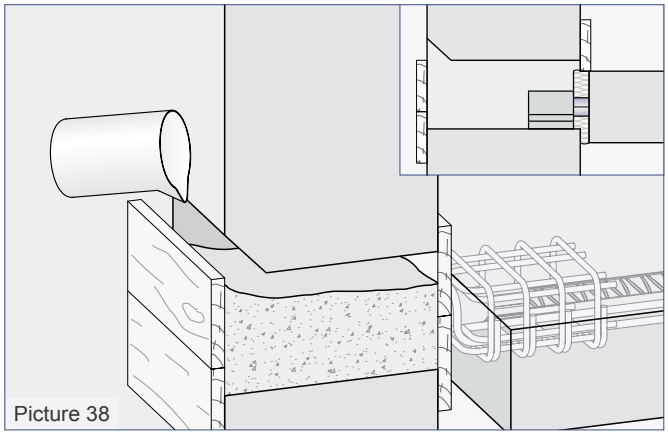
Picture 39

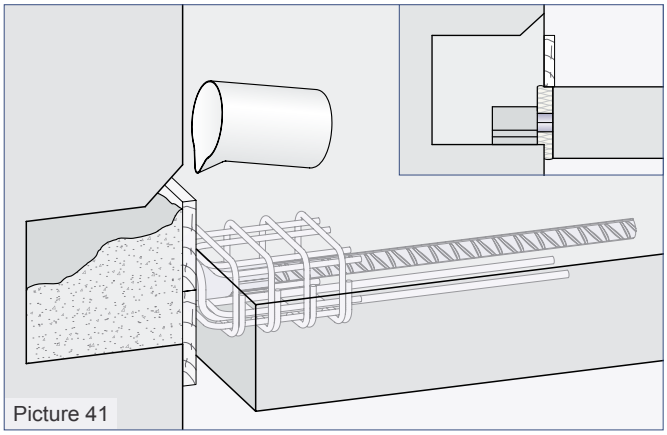


Picture 37



Picture 40


Picture 38


Picture 41

Notes

Our customers trust us to deliver. We do everything in our power to reward their faith and we start each day intending to do better than the last. We provide strength and stability in an ever-changing world.

Welcome to the PHILIPP Group

Sustainable solutions

PHILIPP GROUP

PHILIPP GmbH
Lilienthalstrasse 7-9
D-63741 Aschaffenburg
Phone: +49 (0) 6021/40 27-0
Fax: +49 (0) 6021/40 27-440
info@philipp-gruppe.de

PHILIPP GmbH
Roßlauer Strasse 70
D-06869 Coswig/Anhalt
Phone: +49 (0) 34903/6 94-0
Fax: +49 (0) 34903/6 94-20
info@philipp-gruppe.de

PHILIPP GmbH
Sperberweg 37
D-41468 Neuss
Phone: +49 (0) 2131/59 18-0
Fax: +49 (0) 2131/59 18-10
info@philipp-gruppe.de

PHILIPP Vertriebs GmbH
Leogangerstraße 21
A-5760 Saalfelden / Salzburg
Phone + 43 (0) 6582 / 7 04 01
Fax + 43 (0) 6582 / 7 04 01 20
info@philipp-gruppe.at

01/18

For more information visit our website: www.philipp-group.de