

# PWC and PWS wall shoe systems

Screw connections

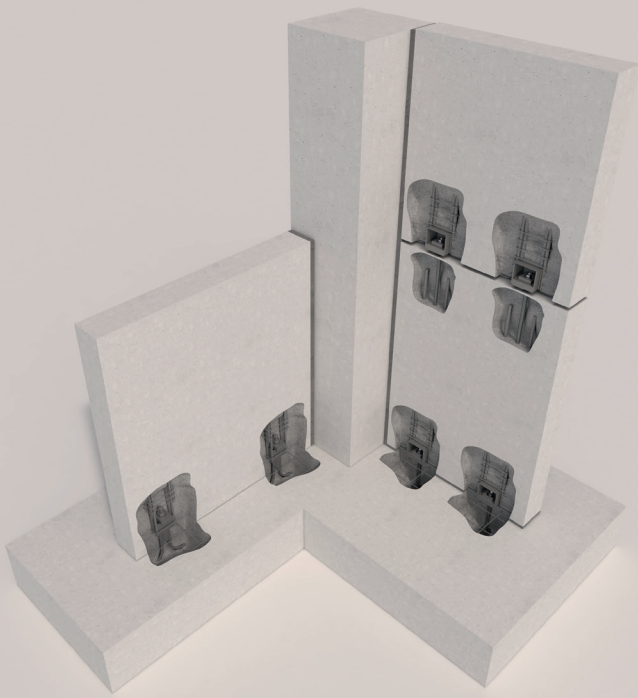


**PFEIFER**

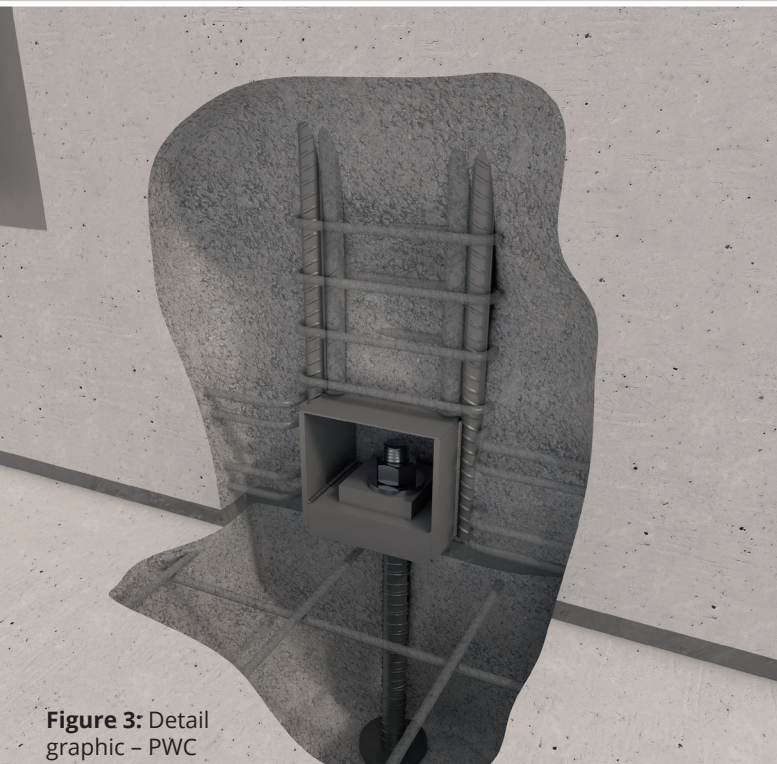


# Your advantages at a glance:

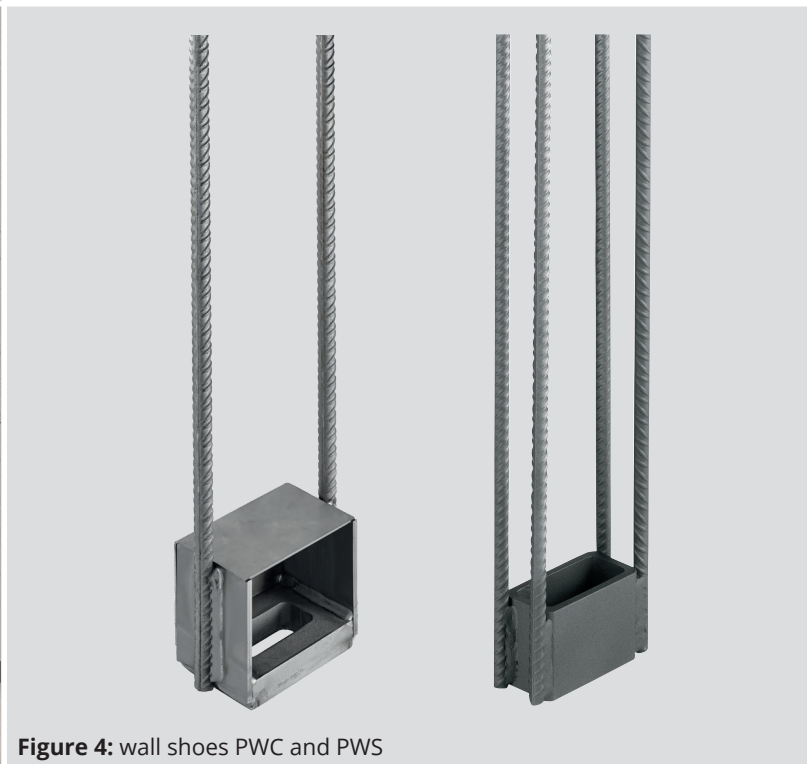
- Complete system for the transmission of tensile and transversal shear forces
- Dry screw connection
- Highest possible tolerances and adjustment options
- Fast simple installation of the wall connections
- Immediate functionality of the connection



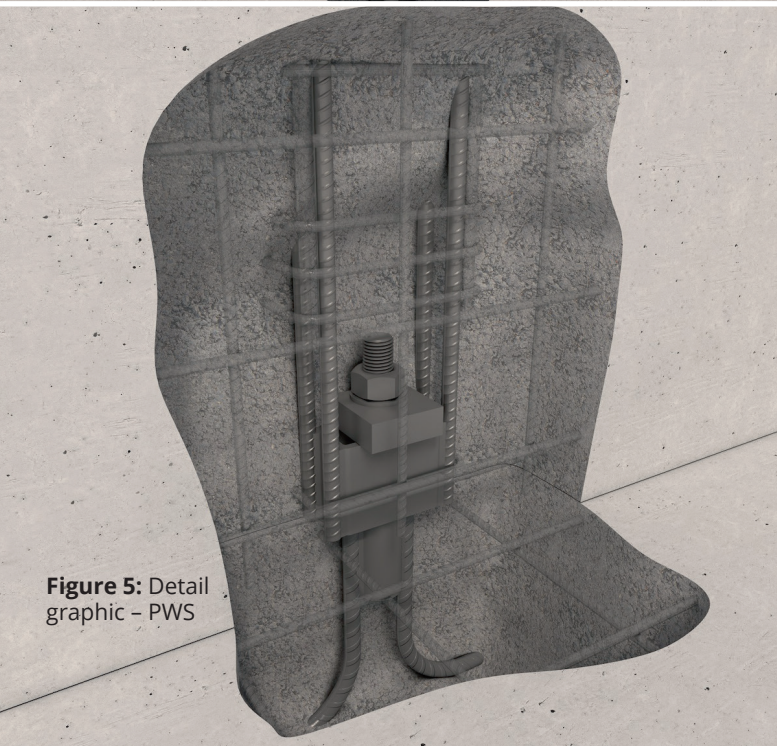
**Figure 2:** Application wall shoes PWC and PWS



**Figure 3:** Detail graphic – PWC



**Figure 4:** wall shoes PWC and PWS



**Figure 5:** Detail graphic – PWS







More information  
can be found at

[www.pfeifer.info/wallshoe](http://www.pfeifer.info/wallshoe)

# Overview and table of contents

## 2 systems – 1 goal:

The optimum solution for every construction project!

 <p>PWC Wall Shoe</p>	<p>S. 4–6</p>  <p>G1-k, G1, G2 and H2 foundation anchors</p>	<p>Tensile forces from 68 to 436 kN</p> <ul style="list-style-type: none"><li>• Largest possible assembly tolerances</li><li>• Various foundation anchors for flexible, cost-effective use</li></ul>
 <p>PWS Wall Shoe</p>	<p>S. 7–10</p>  <p>H2 &amp; H4 foundation anchors</p>	<p>Extra strong</p> <ul style="list-style-type: none"><li>• Tensile forces up to 900 kN</li><li>• Shear forces up to 141.7 kN</li></ul>

# PFEIFER PWC Wall Shoe



**PFEIFER**

**Connection Systems**  
**Wall Shoe Systems**

The type approved system consists of the PWC wall shoe and various foundation anchors and serves as a connecting element for wall connections.

## Advantages

- Cost-effective tensile connection
- Fast assembly
- Highest possible tolerances/adjustment options

## Materials:

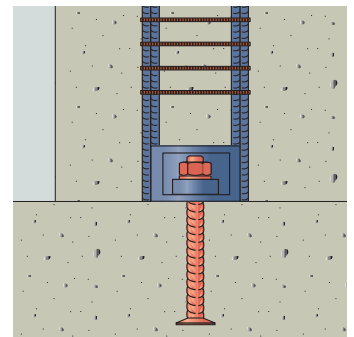
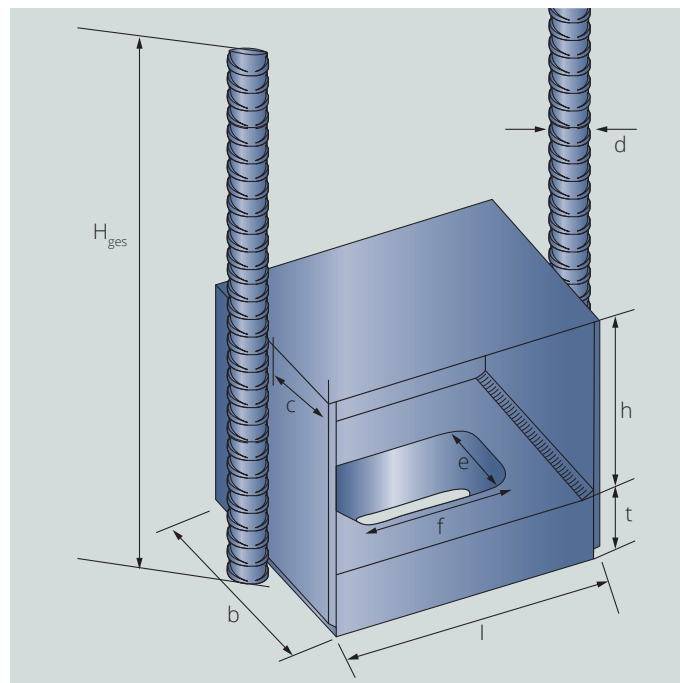
B500B

Steel profiles S355



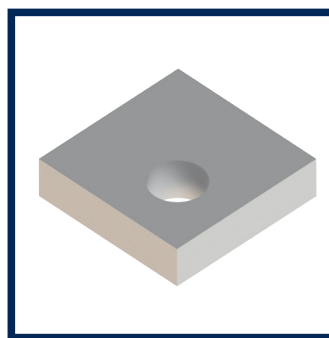
## Notice:

1. In the type designation HF, the wall shoe is used in combination with a foundation anchor with a high-strength bolt (PGS G2 or PGS H2).
2.  $H_{total}$  is the total height for the concrete quality C30/37 under good bonding conditions.



Type	Ref. no.	l [mm]	b [mm]	h [mm]	t [mm]	e [mm]	f [mm]	d [mm]	c <sup>+2mm</sup> [mm]	H <sub>total</sub> [mm]
PWC 16	<b>475602</b>	115	80	87	25	36	76	14	33	578
PWC 20	<b>475603</b>	120	90	97	30	40	80	16	37	978
PWC 24	<b>475604</b>	135	110	102	35	49	84	20	45	1078
PWC 30	<b>475605</b>	140	120	117	40	55	90	25	47,5	1328
PWC 36	<b>475606</b>	145	130	132	50	61	96	25	52,5	1890
PWC 39	<b>475607</b>	160	145	132	50	64	99	28	58,5	1970
PWC 30 HF	<b>475608</b>	145	130	132	45	55	90	28	51	1590
PWC 36 HF	<b>475609</b>	160	150	132	55	61	96	32	64	1955

# UP shim plate



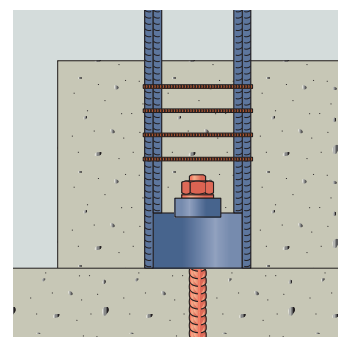
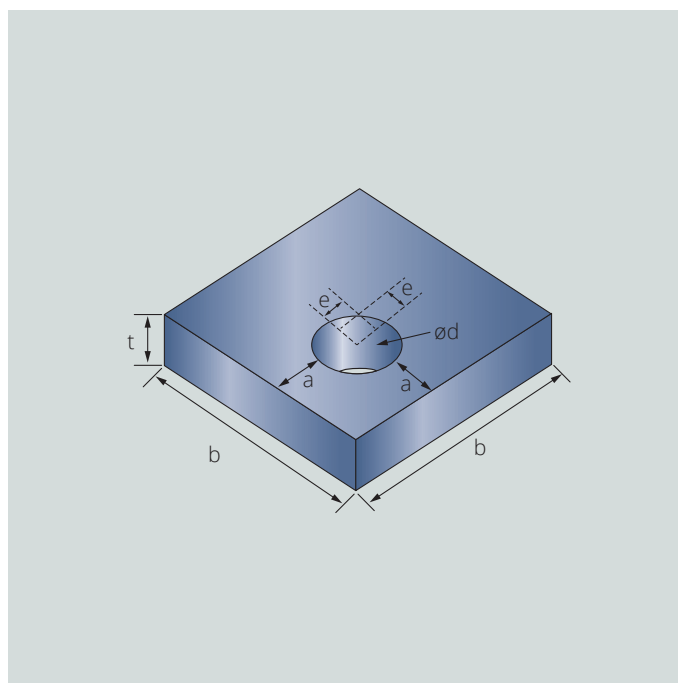
**PFEIFER**

**Connection Systems**  
**Wall Shoe Systems**

The shim plates are delivered as standard in a set with the appropriately selected foundation anchors and do not have to be ordered separately. To make

the wall connection, the shim plate is screwed together with the matching wall shoe.

**Material:**  
Steel profile S355



## Notice:

1. In the type designation HF, the wall shoe is used in combination with a foundation anchor with a high-strength bolt (PGS G2 or PGS H2).

Type	Ref. no.	a [mm]	b [mm]	Ø d [mm]	e [mm]	t [mm]
UP 16	<b>478212</b>	25,0	60,0	18,0	5,0	12,0
UP 20	<b>478216</b>	27,5	65,0	22,0	5,0	15,0
UP 24	<b>478217</b>	30,0	80,0	26,0	10,0	20,0
UP 30/30-HF	<b>478218</b>	37,5	95,0	33,0	10,0	25,0
UP 36	<b>478219</b>	40,0	100,0	29,0	10,0	25,0
UP 39	<b>478220</b>	47,5	115,0	42,0	10,0	30,0
UP 36-HF	<b>478222</b>	45,0	110,0	39,0	10,0	30,0



# Working load limit type PWC

Wall Shoe	Shim plate type	Foundation anchors	Design resistance of the absorbable tensile force
Type	Type	Type PGS	$N_{Rd}$ [kN]
PWC 16	UP 16	G1/G1-K/H2 16	+– 61,7 (bei PGS H2: 68)
PWC 20	UP 20	G1/G1-K/H2 20	+– 97
PWC 24	UP 24	G1/G1-K/H2 24	+– 139
PWC 30	UP 30	G1/G1-K/H2 30	+– 220
PWC 36	UP 36	G1/G1-K/H2 36	+– 320
PWC 39	UP 39	G1/G1-K/H2 39	+– 384
PWC 30 HF	UP 30-HF	G2/H2 30	+– 299
PWC 36 HF	UP 36-HF	G2/H2 36	+– 436

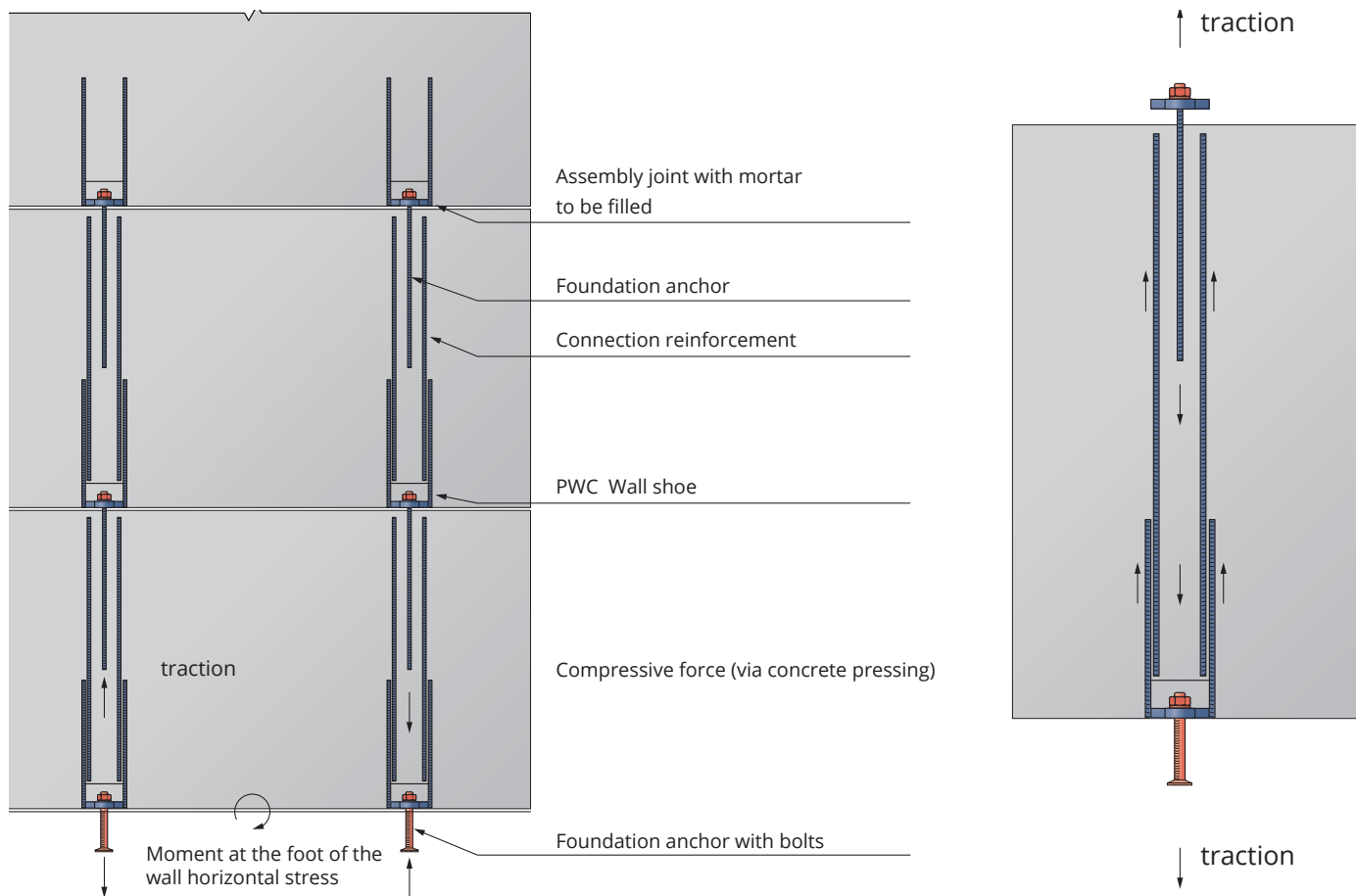
1. In the type designation HF, the wall shoe is used in combination with a foundation anchor with a high-strength bolt (PGS G2 or PGS H2). The use of the PGS H2 foundation anchor brings the advantage of the two-part system of foundation anchor and threaded connection bolt. Thus, nothing protrudes from the foundation on the construction site.
2. Dimensioning values apply to the concrete quality of the wall element C30/37.
3. The **compressive forces** are usually transmitted via the direct contact of the individual structural elements (if necessary, with suitable timber packing or shim plates).

## Load-bearing behaviour

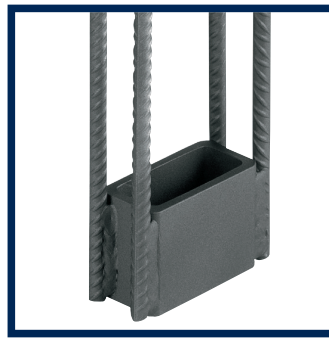
The connection system may be used for the production of articulated as well as rigid connections in order to transmit tensile forces according to plan. The joint between precast wall and foundation or between precast wall and precast wall is grouted after assembly. The compressive forces can thus be transmitted via contact.

In the assembly state (recess not grouted), the wall shoes are positively connected to the foundation anchors by means of nuts and special washers.

The load capacity of the wall shoes is proven for static or quasi-static stresses due to positive normal forces (tensile forces).



# PFEIFER PWS Wall Shoe



**PFEIFER**

**Connection Systems**  
**Wall Shoe Systems**

The type-static tested PFEIFER Wall Shoe serves as a connecting element within stiffening wall constructions. Both the tensile forces acting perpendicularly to the joint and the shear forces in the longitudinal axis of the joint can be absorbed and transmitted. This

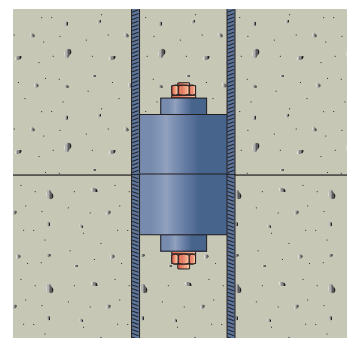
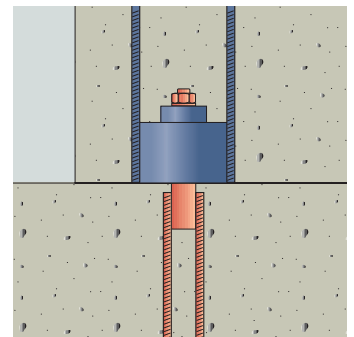
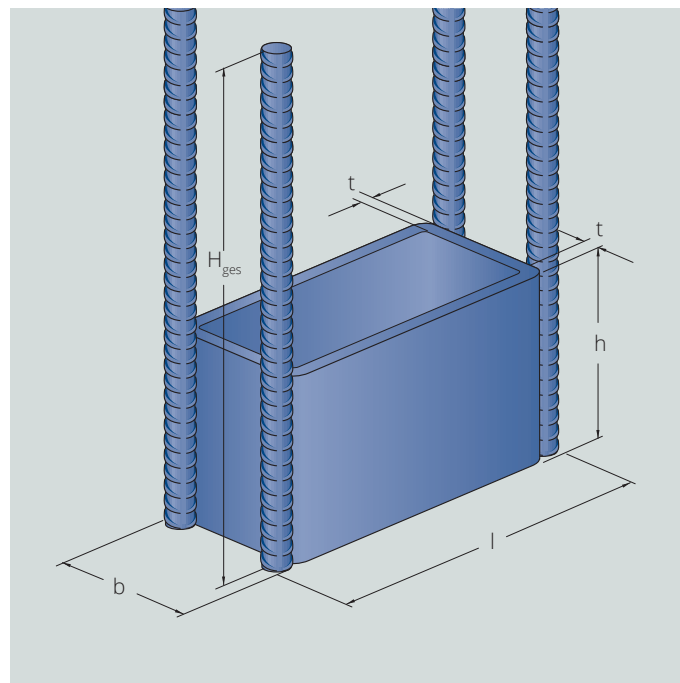
solution offers the advantage of fast, easy and secure connection of concrete components by simple screwing.

**Material:**  
B500B  
steel profile



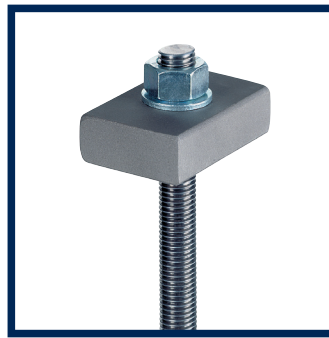
## Notice:

1.  $H_{\text{total}}$  is the total height for the concrete quality C30/37 under good bonding conditions.



Type	Ref. no.	l [mm]	b [mm]	h [mm]	t [mm]	d [mm]	$H_{\text{ges}}$ [mm]	Weight [kg]
PWS 120	<b>199442</b>	148	60	80	8	14	880	5,99
PWS 200	<b>199443</b>	152	64	95	8	16	1360	10,65
PWS 330	<b>199444</b>	180	80	120	10	20	1660	20,14
PWS 400	<b>199445</b>	190	100	140	10	25	1740	31,62
PWS 650	<b>199446</b>	236	112	165	14,2	28	2330	54,86
PWS 900	<b>199447</b>	244	128	190	14,2	32	2540	75,58

# PFEIFER PAP Connecting Bolt



**PFEIFER**

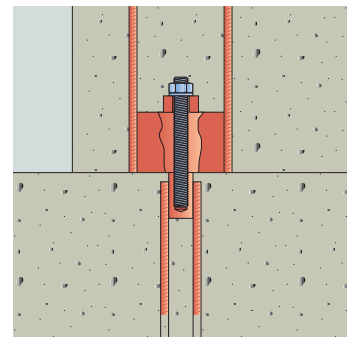
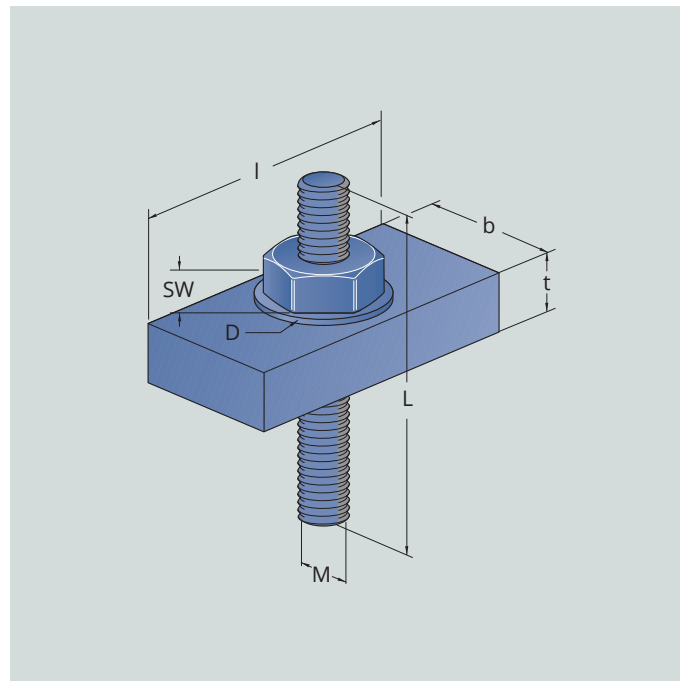
Connection Systems

Connecting bolts  
Anchor plate

The PAP connecting bolt consists of a threaded bolt with nut and washer as well as the matching anchor plate. It is used for the load bearing connection of wall shoes type PWS with associated foundation anchors.

## Materials:

High strength threaded bolt,  
high strength plain nut, black  
washer, black anchor plate,  
black



Type	Ref. no.	Thread [mm]	SW [mm]	L [mm]	D [mm]	l [mm]	b [mm]	t [mm]
PAP 16	<b>199401</b>	M 16	24	180	30	100	50	20
PAP 20	<b>199402</b>	M 20	30	200	37	100	60	25
PAP 24	<b>199403</b>	M 24	36	220	44	100	70	25
PAP 30	<b>199404</b>	M 30	46	270	56	110	80	30
PAP 36	<b>199405</b>	M 36	55	320	66	130	100	35
PAP 42	<b>199406</b>	M 42	65	370	78	150	110	45
PAP 48	<b>199407</b>	M 48	75	410	92	150	130	45
PAP 56	<b>199408</b>	M 56	85	440	105	140	130	50



## Possible combinations of PWS wall shoe with PGS foundation anchors and PAP connecting bolt:

The size of the foundation anchor usually determines the design resistance of the wall shoe connection. With not fully utilised wall shoes, a smaller foundation anchor can be chosen, which is cost-effective.

Due to the dimensions, not all combinations of foundation anchors and wall shoes make sense. The table below is intended to facilitate the meaningful assignments.

Foundation anchors PGS	Connecting bolts PAP	PWS Wall Shoe					
		PWS 120	PWS 200	PWS 330	PWS 400	PWS 650	PWS 900
H2/H4 16	PAP 16	x					
H2/H4 20	PAP 20	x					
H2/H4 24	PAP 24	x	x				
H2/H4 30	PAP 30		x	x			
H2/H4 36	PAP 36			x	x		
H2/H4 42	PAP 42				x	x	
H2/H4 48	PAP 48					x	x
H2/H4 56	PAP 56						x

# Working load limit type PWS

Absorbable tensile forces per PWS wall shoe

Type	PWS 120	PWS 200	PWS 330	PWS 400	PWS 650	PWS 900
$F_{Rd}$ [kN]	120	200	330	400	650	900

Absorbable shear forces with concrete quality **C20/25**

Type	PAP 16	PAP 20	PAP 24	PAP 30	PAP 36	PAP 42	PAP 48	PAP 56
$Q_{Rd}$ [kN]	7,9	12,7	18,7	29,8	43,8	60,5	80,2	110,8

Absorbable shear forces with concrete quality **C25/30**

Type	PAP 16	PAP 20	PAP 24	PAP 30	PAP 36	PAP 42	PAP 48	PAP 56
$Q_{Rd}$ [kN]	9,2	14,7	21,6	34,5	50,7	70,0	92,8	128,0

Absorbable shear forces with concrete quality **C30/37**

Type	PAP 16	PAP 20	PAP 24	PAP 30	PAP 36	PAP 42	PAP 48	PAP 56
$Q_{Rd}$ [kN]	10,4	16,7	24,0	38,4	56,6	77,8	102,4	141,7

## Dimensioning bases

The design resistances for tensile and shear force can easily be read off with the help of the shear force interaction diagrams depending on the grouting concrete quality and the bolt diameter. Decisive for the interaction between normal and shear force is the stress on the threaded bolt. Here, a superposition takes place between normal stresses from the centric forces and the bending stress from shear force load. From the wall shoe itself, the shear forces are transmitted into the concrete directly or via additionally inserted reinforcement.

Decisive for the use of the shear force interaction diagrams is the minimum concrete quality used in conjunction with the wall shoe or foundation anchor. This means that the poorer of the two concrete qualities of the components to be connected, such as wall above/wall below, foundation/precast column or strip foundation/wall, is decisive. Practically, this means: the precast element has the higher concrete quality compared to the in-situ concrete foundation. Thus, the resistance side is reduced to the concrete quality of the foundation.

Ensure that the grouting of the assembly aperture and the recess takes place immediately after the assembly of the components to absorb the stress.



### Notice:

The respective design resistances must be compared for each combination of wall shoe/foundation anchor. The minimum design resistance is decisive in each case.

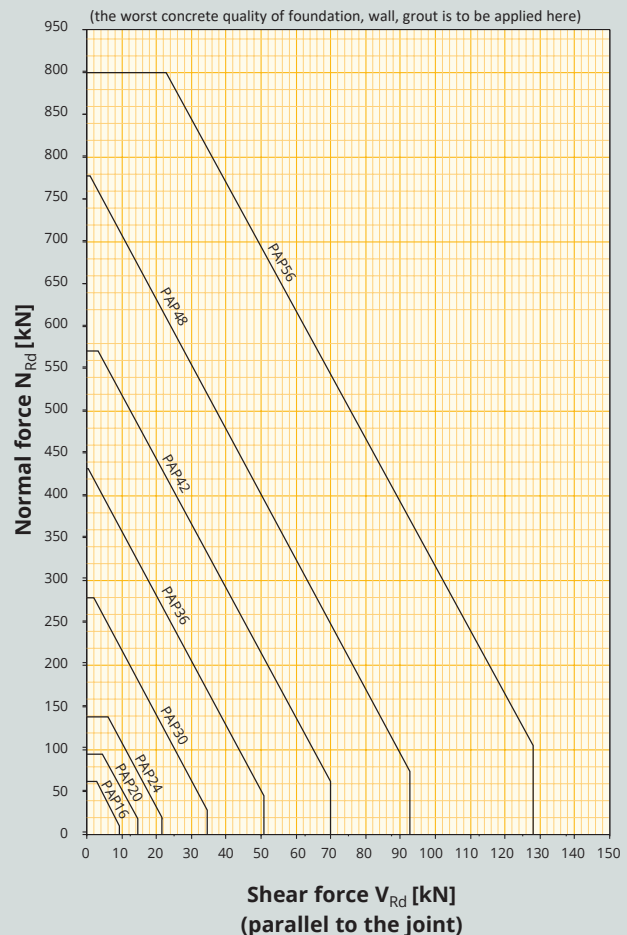


### Joint sealing

If an additional mortar joint between the foundation and the wall panel is planned, the strength of the mortar joint should be taken into account as an additional lever arm, which results in a reduction in the design resistances. In addition, the length of the connecting bolt may have to be adjusted.

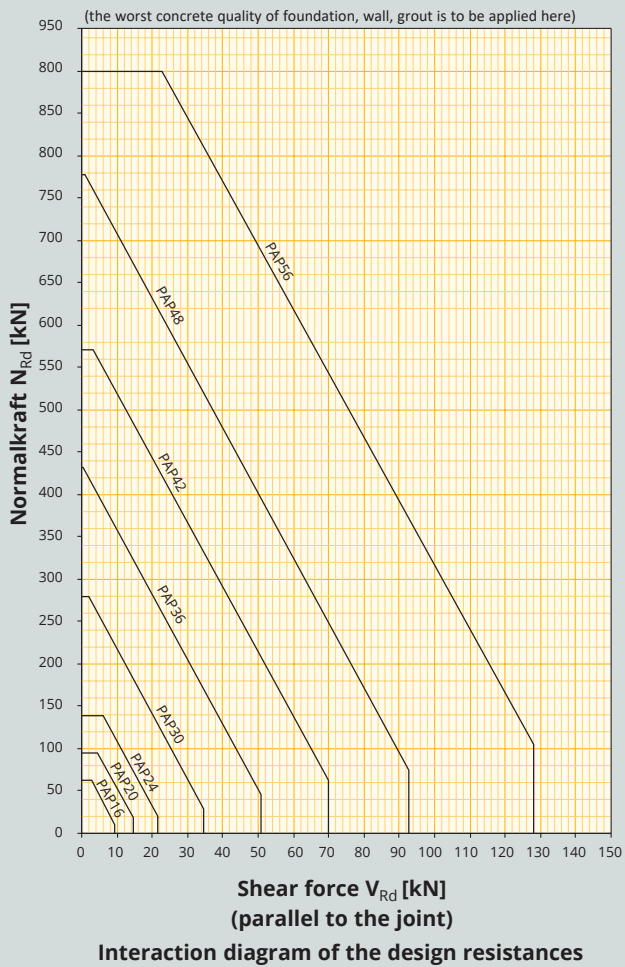
## Interaction diagrams for the design resistances of shear force and normal force for common concrete qualities:

### Concrete quality C20/25

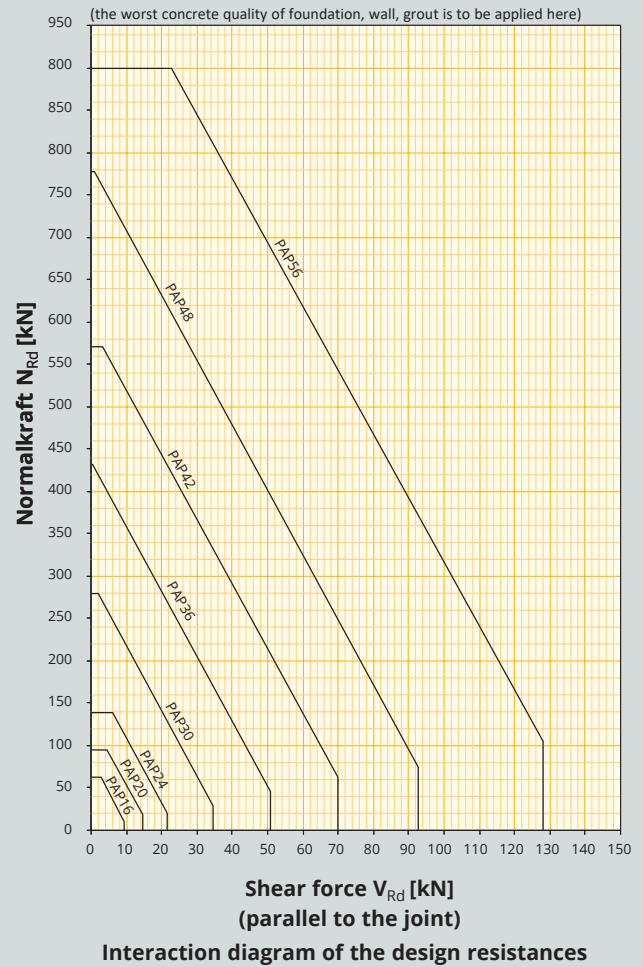


Interaction diagram of the design resistances

## Concrete quality C25/30



## Concrete quality C30/37



# Foundation anchor with bolt

for use with wall shoe type PWC (page 4–6)



PGS/G1-K



PGS/G1



**PFEIFER**

**Connection Systems**  
**Foundation anchors**

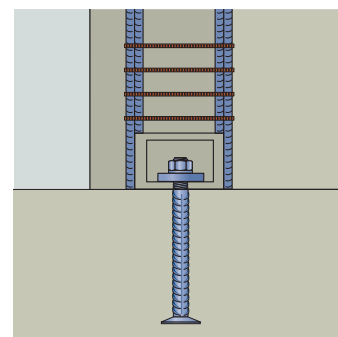
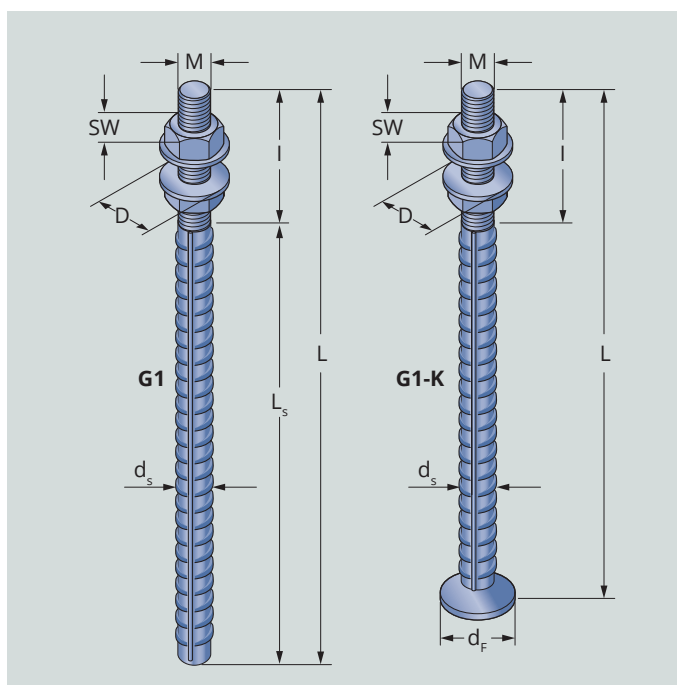
The approved PGS/G1 and G1-K foundation anchors are intended for the rigid connection of precast concrete columns to foundations. They are a component of the wall shoe system.

## Advantages

- No additional connecting bolts required
- Subsequent adjustment under load possible with the aid of nuts
- Easy screw connection with PWC wall shoe via integrated bolt

## Materials:

Reinforcing steel bar B500 A/B.  
Nuts: high-strength, bare metal. Washers: bare metal



Type	Ref. no.	Design resistance <sup>1)</sup>	Thread-size	Dimensions						
		$N_{Rd}$ [kN]		L [mm]	$L_s$ [mm]	I [mm]	SW [mm]	D [mm]	$d_s$ [mm]	$d_F$ [mm]
PGS-16/G1	281811/282359	61,7	M 16	790/1270	690 <sup>2)</sup> /1170 <sup>3)</sup>	100	24	45	16	–
PGS-20/G1	281813/282360	96,2	M 20	970/1570	860 <sup>2)</sup> /1460 <sup>3)</sup>	110	30	45	20	–
PGS-24/G1	281814/282361	138,7	M 24	1110/1810	990 <sup>2)</sup> /1690 <sup>3)</sup>	120	36	55	25	–
PGS-30/G1	281815/282362	220,5	M 30	1360/2230	1220 <sup>2)</sup> /2090 <sup>3)</sup>	140	46	65	32 <sup>2)</sup>	–
PGS-36/G1	281816/282363	320,9	M 36	1740/2820	1570 <sup>2)</sup> /2650 <sup>3)</sup>	170	55	75	40	–
PGS-39/G1	375783/375785	383,4	M 39	1710/2760	1540 <sup>2)</sup> /2590 <sup>3)</sup>	170	60	75	40	–
PGS-16/G1-K	281337	61,7	M 16	280	–	100	24	45	16	38
PGS-20/G1-K	281338	96,2	M 20	350	–	110	30	45	20	46
PGS-24/G1-K	281339	138,7	M 24	430	–	120	36	55	25	55
PGS-30/G1-K	281340	220,5	M 30	550	–	140	46	65	32	70
PGS-36/G1-K	281341	320,9	M 36	700	–	170	55	75	40	80
PGS-39/G1-K	289222	383,4	M 39	750	–	170	60	75	40	80

<sup>1)</sup> for steel failure

PGS/G1-K



## Notice:

<sup>2)</sup> Overlap length: Concrete quality C25/30, good bond (EN 1992-1-1:2004)

<sup>3)</sup> Overlap length: Concrete quality C30/37, poor bond (EN 1992-1-1/NA:2013/14). Different lengths available on request.



# Foundation anchor with bolt

for use with wall shoe type PWC (page 4–6)



**PFEIFER**

**Connection Systems**  
**Foundation anchors**

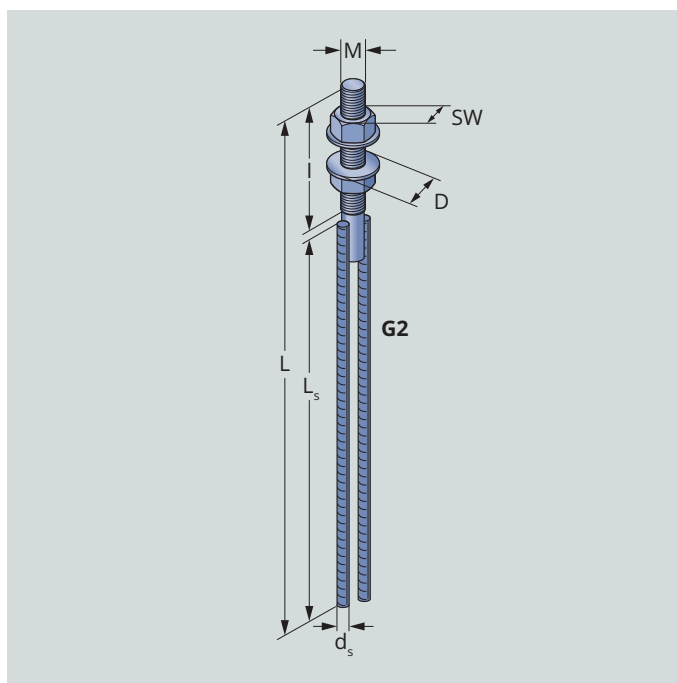
The building authority approved PGS foundation anchor is intended for the rigid connection of precast concrete walls and foundations. They are a component of the wall shoe system.

## Advantages

- No additional connecting bolts required
- Subsequent adjustment under load possible with the aid of nuts
- Easy screw connection with PWC wall shoe via integrated bolt

## Materials:

Reinforcing steel bar B500 A/B. Threaded bolts: high-strength, bare metal. Nuts: high-strength, bare metal. Washers: bare metal



Type	Ref. no.	Design resistance <sup>1)</sup> N <sub>Rd</sub> [kN]	Thread-size	Dimensions					
				L [mm]	L <sub>s</sub> <sup>2)</sup> [mm]	I [mm]	SW [mm]	D [mm]	d <sub>s</sub> [mm]
PGS-24/G2	<b>176066</b>	139	M 24	770	635	120	36	55	16
PGS-30/G2	<b>176067</b>	299	M 30	1025	870	140	46	65	25
PGS-36/G2	<b>176068</b>	436	M 36	1310	1125	170	55	75	28
PGS-39/G2	<b>448465</b>	521	M 39	1520	1335	170	60	75	28

<sup>1)</sup> for steel failure



**Notice:** <sup>2)</sup> Anchorage length: Concrete quality C20/25, good bond. Other lengths on request.

# Foundation anchor with socket

Typee H2 for use with wall shoe type PWC and type PWS

Typee H4 for use with wall shoe type PWS (page 7-10)



**PFEIFER**

Connection Systems

Foundation anchors

The type-static calculation tested PGS/H2 and H4 foundation anchors are intended for anchoring in the case of rigid connection of precast concrete walls and foundations. They are a component of the wall shoe system. Suitable connecting bolts are available separately.

## Advantages

- No obtrusive threaded bolts protruding from the structural element
- Simple screw connection with PWC wall shoe via bolt

## Materials:

Reinforcing steel bar B500 A/B structural steel



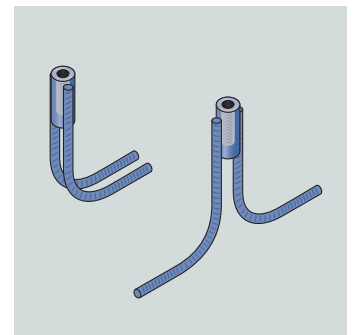
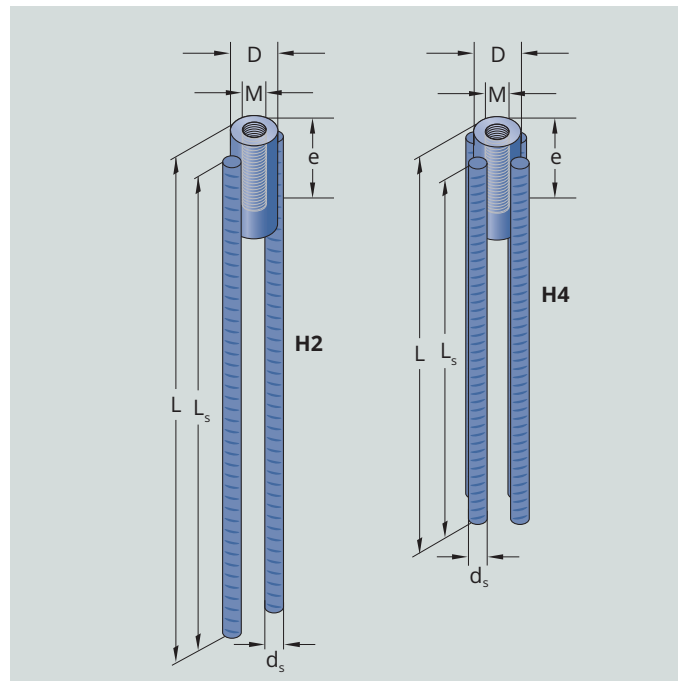
### Notice:

- 2) Development length: Concrete quality C20/25, good bond. Different lengths available on request.



### Notice:

1. The foundation anchors with socket are used in combination with the high-strength PVB connecting bolt (see page 14/ page 8).
2. Curved variants are also available on request. (Illustration above without dimensions)



Type	Ref. no.	Design resistance <sup>1)</sup>	Thread-size	Dimensions				
		$N_{Rd}$ [kN]		L [mm]	$L_s$ <sup>2)</sup> [mm]	D [mm]	e [mm]	$d_s$ [mm]
PGS-16/H2	<b>200809</b>	68	M 16	510	500	25	24	10
PGS-20/H2	<b>200811</b>	97	M 20	600	590	30	30	12
PGS-24/H2	<b>200812</b>	139	M 24	645	635	40	36	16
PGS-30/H2	<b>200813</b>	299	M 30	880	870	50	45	25
PGS-36/H2	<b>200814</b>	436	M 36	1135	1125	60	54	28
PGS-39/H2	<b>442416</b>	521	M 39	1345	1335	65	59	28
PGS-42/H2	<b>200815</b>	570	M 42	1300	1290	70	63	32
PGS-48/H2	<b>200816</b>	778	M 48	1540	1530	80	72	40
PGS-56/H2	<b>200817</b>	910	M 56	1790	1780	90	84	40
PGS-20/H4	<b>200818</b>	97	M 20	375	365	30	30	10
PGS-24/H4	<b>200819</b>	139	M 24	445	435	40	36	12
PGS-30/H4	<b>200820</b>	299	M 30	705	695	50	45	16
PGS-36/H4	<b>200821</b>	436	M 36	815	805	60	54	20
PGS-39/H4	<b>442419</b>	521	M 39	960	950	65	59	20
PGS-42/H4	<b>200822</b>	570	M 42	860	850	70	63	25
PGS-48/H4	<b>200823</b>	778	M 48	1160	1150	80	72	25
PGS-56/H4	<b>200824</b>	910	M 56	1205	1195	90	84	28

<sup>1)</sup> for steel failure



# Connecting bolts

For wall shoe PWC and foundation anchor with sleeve  
(PGS H2, p.14)



**PFEIFER**

Connection Systems

Connecting bolts

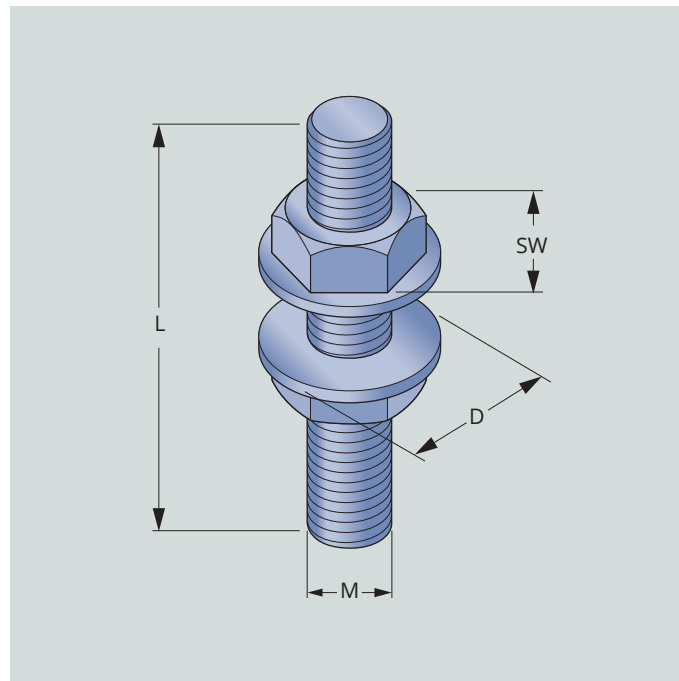
The type-static calculation tested PVB connecting bolts are intended for the rigid connection of precast concrete walls and foundations.

## Advantages

- Subsequent adjustment under load possible with the aid of nuts
- No obtrusive threaded bolts protruding from the structural element
- Simple screw connection with PWC wall shoe via bolt

## Materials:

Threaded bolts: high-strength, bare metal.  
Nuts: high-strength, bare metal.  
Washers: bare metal



Type	Ref. no.	Design resistance <sup>1)</sup> $N_{Rd}$ [kN]	Thread-size	SW [mm]	Dimensions D [mm]	L [mm]
PVB-16	203111	68	M 16	24	45	130
PVB-20	203112	97	M 20	30	45	145
PVB-24	203113	139	M 24	36	55	160
PVB-30	203114	299	M 30	46	65	195
PVB-36	203115	436	M 36	55	75	230
PVB-39	445445	521	M 39	60	75	240

<sup>1)</sup> for steel failure



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