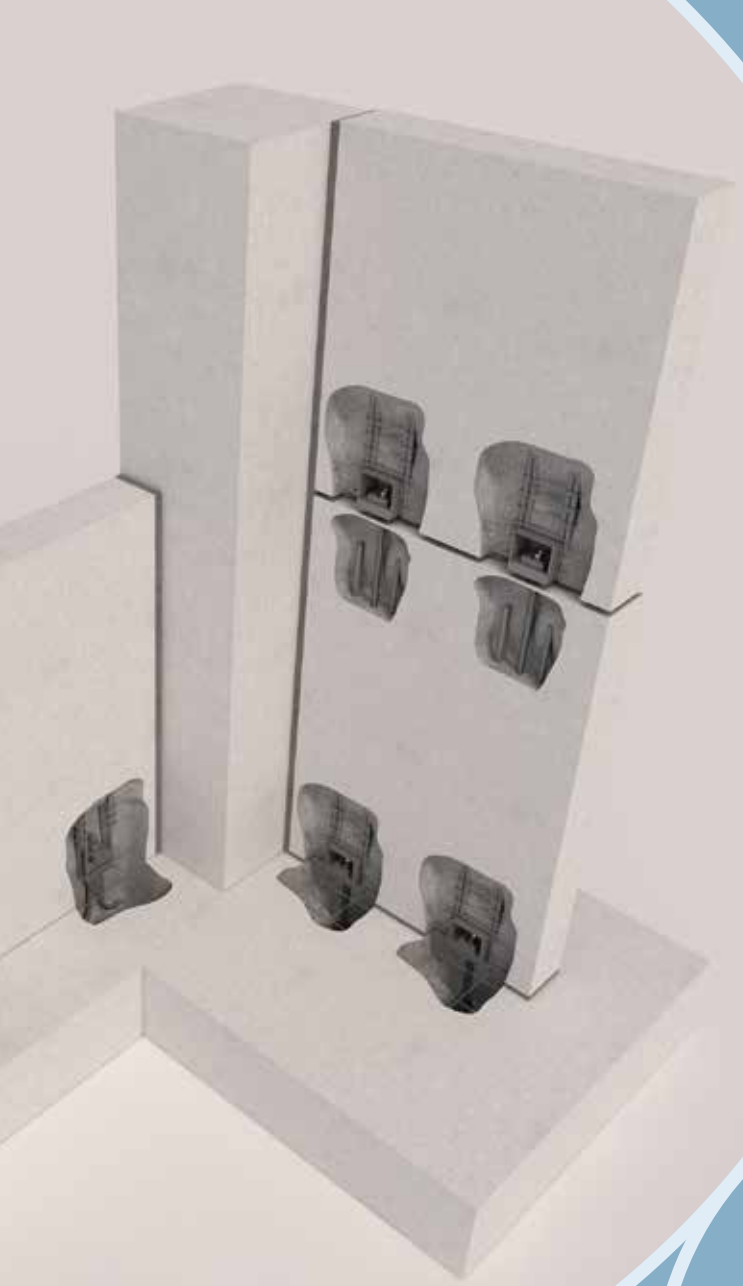
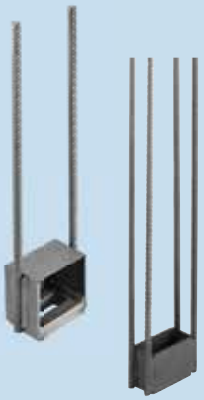


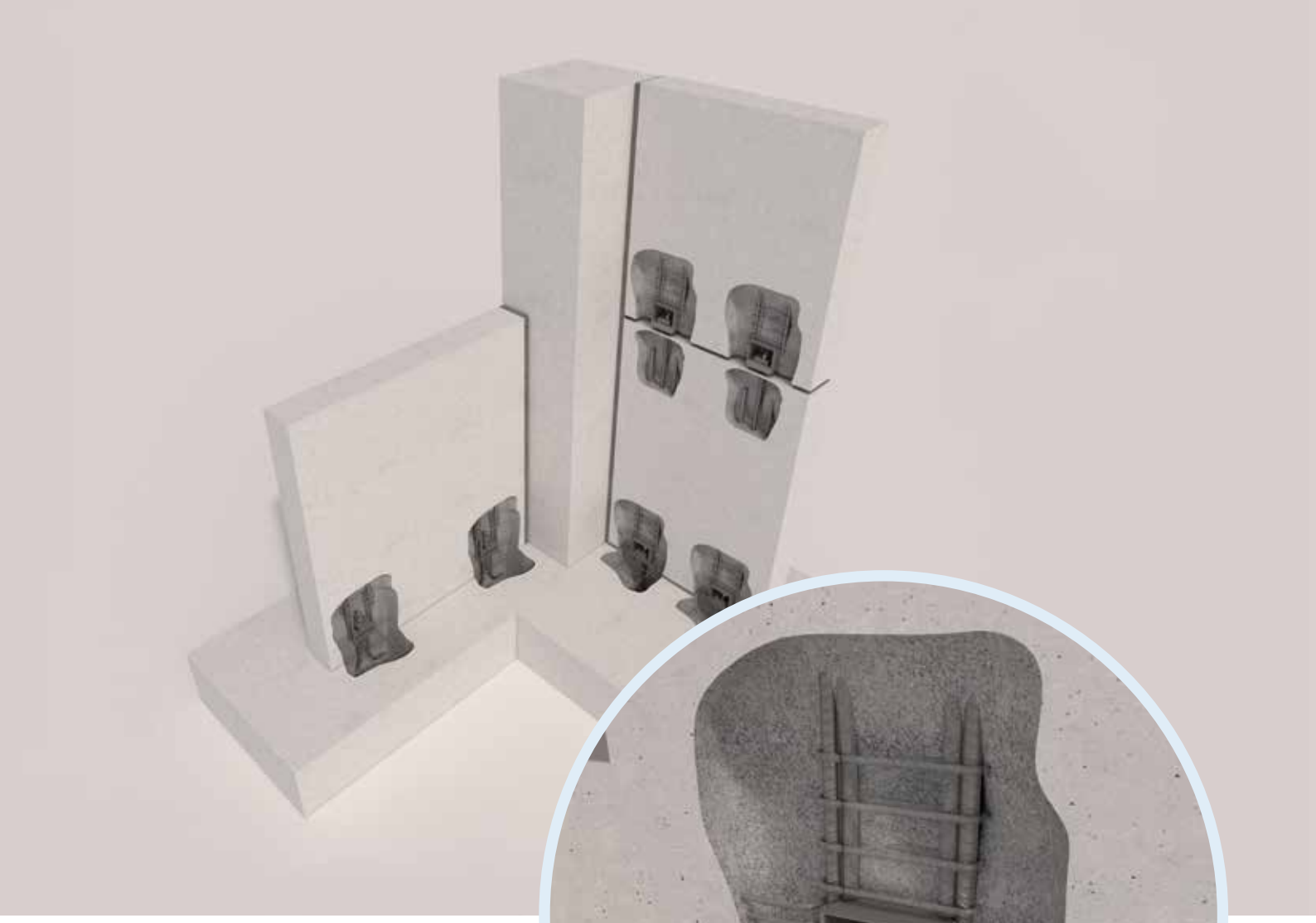
Wall Shoe Systems

Screw connections for wall connections

PFEIFER



planning & installation



More information online:
www.pfeifer.info/wallshoe

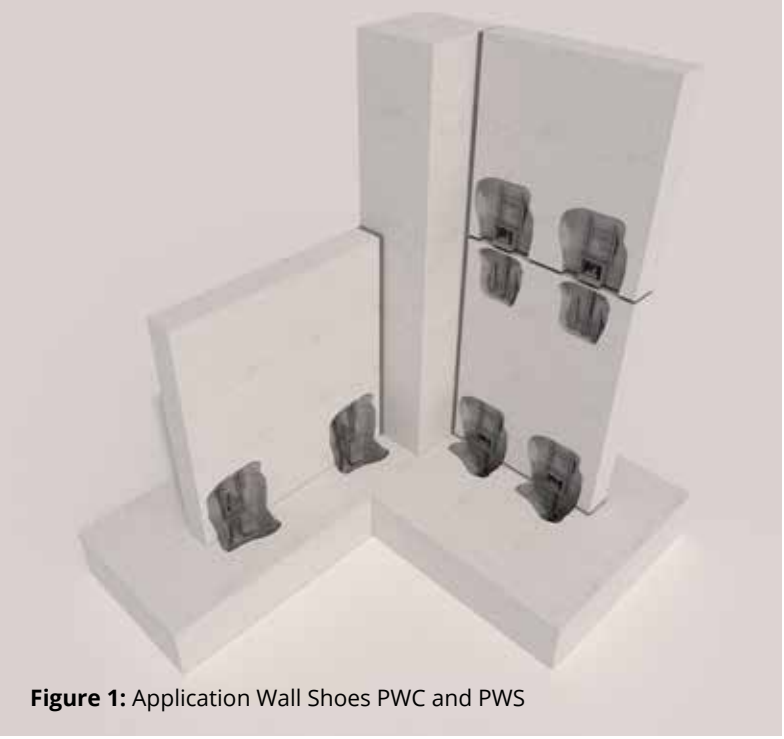


Figure 1: Application Wall Shoes PWC and PWS

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

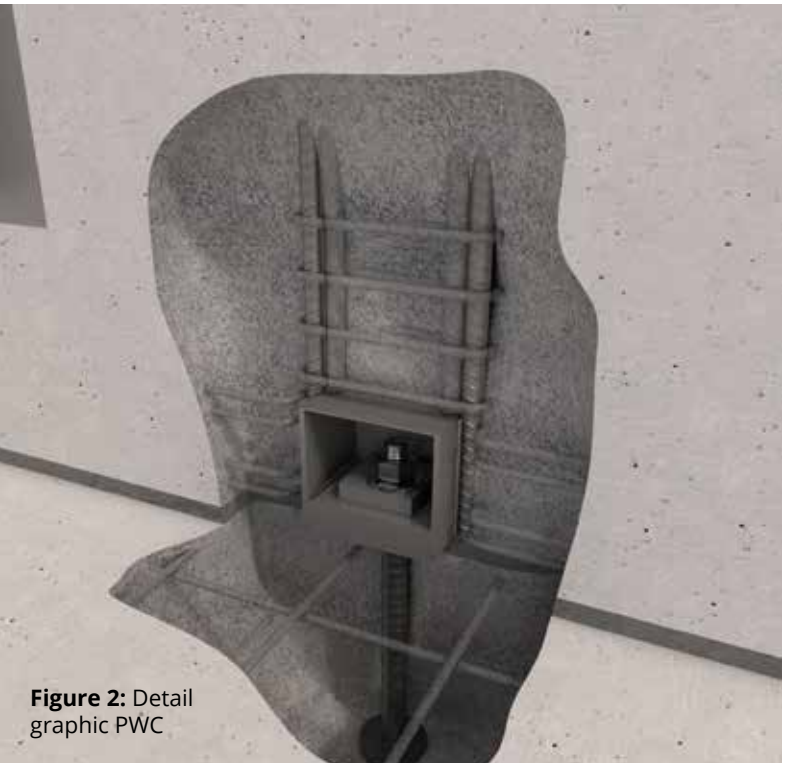


Figure 2: Detail graphic PWC

Figure 3: Wall Shoes PWC and PWS

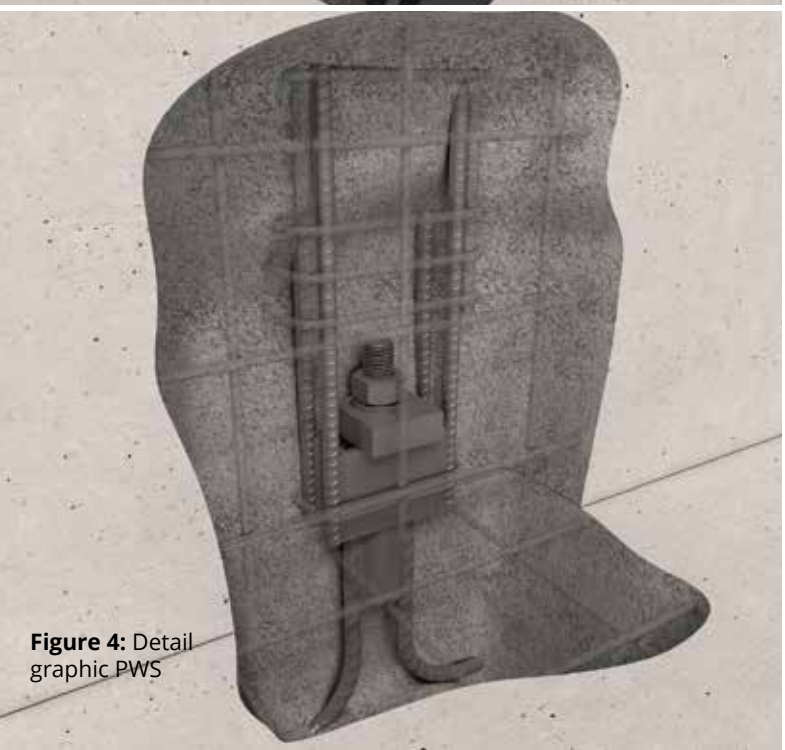


Figure 4: Detail graphic PWS

More information can be found at

www.pfeifer.info/wallshoe

- **Quick, simple assembly of the wall connections**
- **Complete system for the transmission of tensile forces**
- **High assembly tolerances**
- **Detailed instructions for reinforcement routing**
- **Type-approved**

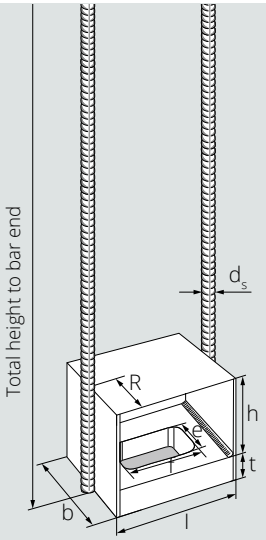
Component recommendation

- Precast wall

CE

Wall Shoe PWC

- For dry screw connection of stiffening wall constructions made of concrete
- Absorption and transmission of tensile forces acting perpendicular to the joint tensile forces
- Wall shoes are installed in the wall element and screwed to the foundation anchors
- The recesses are then grouted
- Requires foundation anchor sets with UP shim plate (sold separately)



Wall Shoe PWC

Wall Shoe PWC										
Type designation			**PWC-16**	**PWC-20**	**PWC-24**	**PWC-30**	**PWC-36**	**PWC-39**	**PWC-30-HF**	**PWC-36-HF**
Diameter concrete steel	d_s	mm	14	16	20	25	25	28	28	32
Total height	h	mm	578	978	1078	1328	1890	1970	1590	1955
Plate thickness	t	mm	25	30	35	40	50	50	45	55
Box length	l	mm	125	132	147	156	161	180	161	180
Box width	b	mm	80	90	110	120	130	145	130	150
Box height	h	mm	87	97	102	117	132	132	132	132
Recess width	e	mm	36	40	49	55	61	64	55	61
Recess length	f	mm	76	80	84	90	96	99	90	96
Edge distance	R	mm	40	45	55	60	65	72,5	65	75
Reference no.			**475602**	**475603**	**475604**	**475605**	**475606**	**475607**	**475608**	**475609**
Cover Plate PWS										
Reference no.			**165352**							

- **Complete system for the transmission of tensile and transversal shear forces**
- **Can be used from the thinnest walls from 160 mm**
- **Flexible due to realistic tolerance ranges**
- **Cast with prepared grout mix**
- **Short construction times and thus cost savings**
- **Type-approved**

Component recommendation
- Precast wall

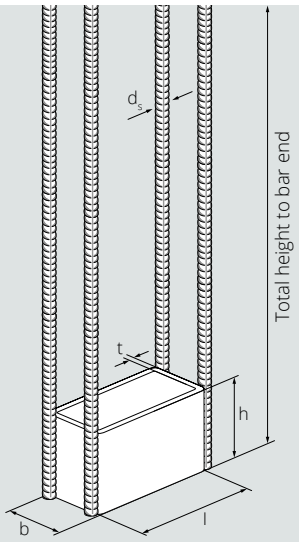
Technical data
- **material:** bright steel

Options on request
- Further lengths

CE

Wall Shoe PWS

- For bolted connection of stiffening concrete wall constructions
- Absorption and transmission of tensile forces acting perpendicular to the joint
- forces acting perpendicular to the joint as well as transverse forces in the longitudinal joint axes.
- Wall Shoes are installed in the wall element and connected to the anchors in the foundation or in an underlaying wall. Alternatively two wall shoes can be connected to each other. Subsequently the recesses are grouted



Wall Shoe PWS

Wall Shoe PWS

Type designation			PWS 120	PWS 200	PWS 330	PWS 400	PWS 650	PWS 900
Total length	L	mm	880	1360	1660	1740	2330	2540
Diameter concrete steel	d_s	mm	14	16	20	25	28	32
Sheet thickness	t	mm	8	8	10	10	14,2	14,2
Protrusion	V	mm	880	1360	1660	1740	2330	2540
Box length	l	mm	148	152	180	190	236	244
Box width	b	mm	60	64	80	100	112	128
Box height	h	mm	80	95	120	140	165	190
Overlap length	L_S	mm	880	1360	1660	1740	2330	2540
Reference no.			**199442**	**199443**	**199444**	**199445**	**199446**	**199447**
Cover Plate PWS								
Reference no.			**165352**	**165352**	**165352**	**165352**	**165352**	**165352**

L_s: Overlap length corresponds to total bar length for concrete grade C30/C37, good bond.

- **Complete set for formwork and site assembly**
- **Eccentric bore in shim plate allows compensation of tolerances**

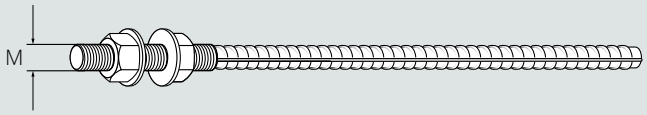
Technical data

- **material:** bright steel

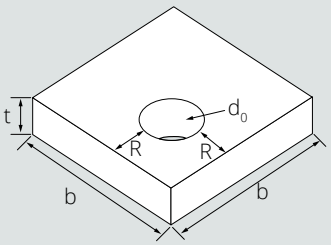
Foundation anchor Set PGS/G1 with UP shim plate for PWC

- Various foundation anchors in a set together with UP shim plates for the assembly of PWC Wall Shoes
- The wall is set down from above with the PWS Wall Shoe installed in the underside over the foundation anchor located in the foundation or the wall below. When doing this, the foundation anchor bolts/connecting bolts are guided through the aperture in the underside of the Wall Shoe. The mounting plate can then be threaded over the bolt through the lateral assembly recess. A washer and a nut are finally fastened to the bolt, thereby fixing the connection.
- Set consisting of one of the selected foundation anchors, an UP shim plate and, in the case of PGS/H2, a PVB connecting bolt

PGS/G1



Foundation anchor (and Connecting Bolt)



UP shim plate

Foundation anchor Set PGS/G1 with UP shim plate for PWC

Type designation			PGS-16/ G1-790 Set	PGS-16/ G1-127 Set	PGS-20/ G1-970 Set	PGS-20/ G1-157 Set	PGS-24/ G1-111 Set	PGS-24/ G1-181 Set
For type/size			**PWC-16**	**PWC-16**	**PWC-20**	**PWC-20**	**PWC-24**	**PWC-24**
Thread type			**M 16**	**M 16**	**M 20**	**M 20**	**M 24**	**M 24**
Plate width	b	mm	60	60	65	65	80	80
Plate thickness	t	mm	12	12	15	15	20	20
Bore diameter	d_0	mm	18	18	22	22	26	26
Edge distance	R	mm	25	25	27,5	27,5	30	30
Reference no.			**478849**	**478850**	**478851**	**478852**	**478853**	**478854**

Foundation anchor Set PGS/G1 with UP shim plate for PWC

Type designation			PGS-30 G1-136 Set	PGS-30 G1-223 Set	PGS-36 G1-174 Set	PGS-36 G1-282 Set	PGS-39 G1-171 Set	PGS-39 G1-276 Set
For type/size			**PWC-30**	**PWC-30**	**PWC-36**	**PWC-36**	**PWC-39**	**PWC-39**
Thread type			**M 30**	**M 30**	**M 36**	**M 36**	**M 39**	**M 39**
Plate width	b	mm	95	95	100	100	115	115
Plate thickness	t	mm	25	25	25	25	30	30
Bore diameter	d_0	mm	33	33	39	39	42	42
Edge distance	R	mm	37,5	37,5	40	40	47,5	47,5
Reference no.			**478855**	**478856**	**478857**	**478858**	**478859**	**478860**

L_s: Overlap length for concrete grade C25/30, good bond (EN 1992-1-1:2004)/overlap length for concrete grade C30/37, moderate bond (DIN EN 1992-1-1/NA:2013-04). The foundation anchor lengths contained in the tables are to be compared with the conditions on site (concrete quality, bonding conditions, bar diameter, etc.), bond conditions, bar diameter, utilisation, bar and edge distances) according to DIN EN 1992-1-1 para. 8.4.3 and para. 8.7.2 including NA.

Special lengths are possible on request. Delivery includes shim plate.

- **Complete set for formwork and building site assembly**
- **Eccentric hole in shim plate allows tolerances compensation**

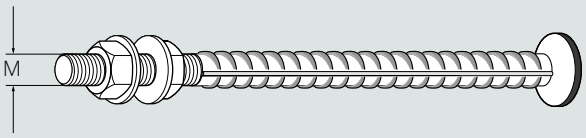
Technical data

- **material:** bright steel

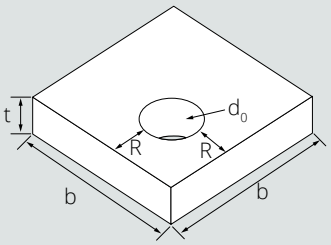
Foundation anchor Set PGS/G1-K with UP shim plate for PWC

- Various foundation anchors in a set together with UP shim plates for the assembly of PWC Wall Shoes
- The wall is set down from above with the PWS Wall Shoe installed in the underside over the foundation anchor located in the foundation or the wall below. When doing this, the foundation anchor bolts/connecting bolts are guided through the aperture in the underside of the Wall Shoe. The mounting plate can then be threaded over the bolt through the lateral assembly recess. A washer and a nut are finally fastened to the bolt, thereby fixing the connection.
- Set consisting of one of the selected foundation anchors, an UP shim plate and, in the case of PGS/H2, a PVB connecting bolt

PGS/G1-K



Foundation anchor (and Connecting Bolt)



UP shim plate

Foundation anchor Set PGS/G1-K with UP shim plate for PWC

Type designation			PGS-16/ G1-K-280 Set	PGS-20/ G1-K-350 Set	PGS-24/ G1-K-430 Set	PGS-30/ G1-K-550 Set	PGS-36/ G1-K-700 Set	PGS-39/ G1-K-750 Set
For type/size			**PWC-16**	**PWC-20**	**PWC-24**	**PWC-30**	**PWC-36**	**PWC-39**
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**
Plate width	b	mm	60	65	80	95	100	115
Plate thickness	t	mm	12	15	20	25	25	30
Bore diameter	d_0	mm	18	22	26	33	39	42
Edge distance	R	mm	25	27,5	30	37,5	40	47,5
Reference no.			**478861**	**478862**	**478863**	**478864**	**478865**	**478866**

Delivery includes shim plate.

- **Complete set for formwork and building site assembly**
- **Eccentric hole in shim plate allows tolerances compensation**

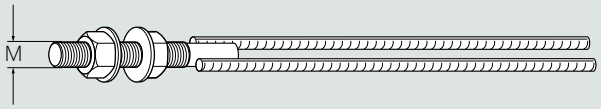
Technical data

- **material:** bright steel

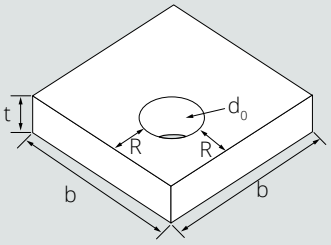
Foundation anchor Set PGS/G2 with UP shim plate for PWC

- Various foundation anchors in a set together with UP shim plates for the assembly of PWC Wall Shoes
- The wall is set down from above with the PWS Wall Shoe installed in the underside over the foundation anchor located in the foundation or the wall below. When doing this, the foundation anchor bolts/connecting bolts are guided through the aperture in the underside of the Wall Shoe. The mounting plate can then be threaded over the bolt through the lateral assembly recess. A washer and a nut are finally fastened to the bolt, thereby fixing the connection.
- Set consisting of one of the selected foundation anchors, an UP shim plate and, in the case of PGS/H2, a PVB connecting bolt

PGS/G2



Foundation anchor (and Connecting Bolt)



UP shim plate

Foundation anchor Set PGS/G2 with UP shim plate for PWC

Type designation			**PGS-30/G2-1025 Set**	**PGS-39/G2-1310 Set**
For type/size			**PWC-30-HF**	**PWC-36-HF**
Thread type			**M 30**	**M 36**
Plate width	b	mm	95	110
Plate thickness	t	mm	25	30
Bore diameter	d_0	mm	33	39
Edge distance	R	mm	37,5	45
Reference no.			**478873**	**478874**

L_s: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.

Special lengths are possible on request. Delivery includes shim plate.

- **Complete set for formwork and building site assembly**
- **Eccentric hole in shim plate allows tolerances compensation**

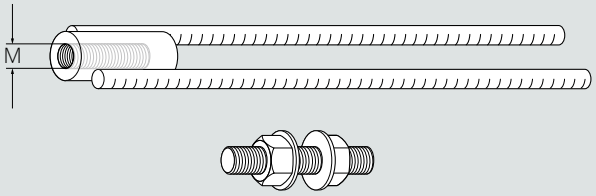
Technical data

- **material:** bright steel

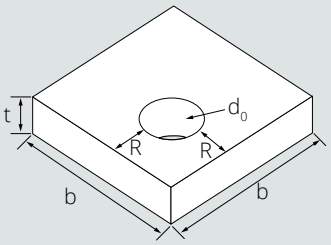
Foundation anchor Set PGS/H2 with UP shim plate for PWC

- Various foundation anchor in a set together with UP shim plates for the assembly of PWC Wall Shoes
- The wall is set down from above with the PWS Wall Shoe installed in the underside over the foundation anchor located in the foundation or the wall below. When doing this, the foundation anchor bolts/connecting bolts are guided through the aperture in the underside of the Wall Shoe. The mounting plate can then be threaded over the bolt through the lateral assembly recess. A washer and a nut are finally fastened to the bolt, thereby fixing the connection.
- Set consisting of one of the selected foundation anchor, an UP shim plate and, in the case of PGS/H2, a PVB connecting bolt

PGS/H2 + PVB



Foundation anchor (and Connecting Bolt)



UP shim plate

Foundation anchor Set PGS/H2 with UP shim plate for PWC

Type designation			PGS-16/H2 Set	PGS-20/H2 Set	PGS-24/H2 Set	PGS-30/H2 Set	PGS-36/H2 Set	PGS-39/H2 Set
For type/size			PWC-16	PWC-20	PWC-24	PWC-30/-HF	PWC-36/-HF	PWC-39
Thread type			M 16	M 20	M 24	M 30	M 36	M 39
Plate width	b	mm	60	65	80	95	110	115
Plate thickness	t	mm	12	15	20	25	30	30
Bore diameter	d_0	mm	18	22	26	33	39	42
Edge distance	R	mm	25	27,5	30	37,5	45	47,5
Reference no.			**478867**	**478868**	**478869**	**478870**	**478871**	**478872**

L_S: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.

Special lengths are possible on request. Delivery includes bolt and shim plate.

- **Permits**
- **No additional connecting bolt required**
- **Simple screw connection with column shoe/wall shoe via integrated bolt**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Rigid load-bearing connection**
- **Free dimensioning software**
- **General technical approval (abZ)**

Component recommendation

- Column
- Foundation

Technical data

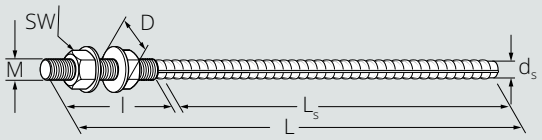
- **material:** bright steel

Options on request

- curved version; further lengths

Foundation anchor PGS/G1

- Anchor with straight bar for anchoring static loads in the concrete base
- Transfer of loads into the component via bond using an end anchorage or overlapping joint according to standard
- Use in combination with column shoes
- Foundation anchor and support foot are each concreted into a component and can be fastened together via the integrated threaded bolt. The recesses are then sealed



Foundation anchor PGS/G1

Foundation anchor PGS/G1

Type designation			PGS-16/G1-790	PGS-16/G1-1270	PGS-20/G1-970	PGS-20/G1-1570	PGS-24/G1-1110	PGS-24/G1-1810
Thread type			**M 16**	**M 16**	**M 20**	**M 20**	**M 24**	**M 24**
Total length	**L**	**mm**	**790**	**1270**	**970**	**1570**	**1110**	**1810**
Diameter concrete steel	d_s	mm	16	16	20	20	25	25
Overlap length	L_s	mm	690	1170	860	1460	990	1690
Thread length	l	mm	100	100	110	110	120	120
Wrench size	SW	mm	24	24	30	30	36	36
Washer diameter	D	mm	45	45	45	45	55	55
Reference no.			**281811**	**282359**	**281813**	**282360**	**281814**	**282361**

Foundation anchor PGS/G1

Type designation			PGS-30/G1-1360	PGS-30/G1-2230	PGS-36/G1-1740	PGS-36/G1-2820	PGS-39/G1-2020	PGS-39/G1-3330
Thread type			**M 30**	**M 30**	**M 36**	**M 36**	**M 39**	**M 39**
Total length	**L**	**mm**	**1360**	**2230**	**1740**	**2820**	**2020**	**3330**
Diameter concrete steel	d_s	mm	32	32	40	40	40	40
Overlap length	L_s	mm	1220	2090	1570	1850	1850	3160
Thread length	l	mm	140	140	170	170	170	170
Wrench size	SW	mm	46	46	55	55	60	60
Washer diameter	D	mm	65	65	75	75	75	75
Reference no.			**281815**	**282362**	**281816**	**282363**	**375783**	**375785**

L_s: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.

Special lengths are possible on request.

- **minimum foundation thicknesses possible**
- **High design resistance values for tensile and compressive forces**
- **No additional connecting bolt required**
- **Simple screw connection with column shoe/wall shoe via integrated bolt**
- **Rigid load-bearing connection**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Free dimensioning software**
- **General technical approval (abZ)**

Component recommendation

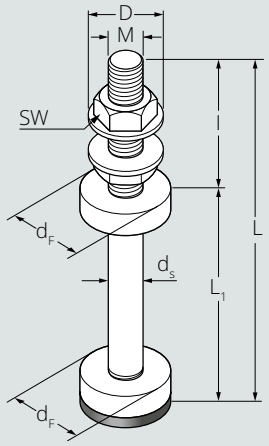
- Foundation

Technical data

- **material:** bright steel

Foundation anchor PGS/G1-DK

- Anchor with two pressure plates for anchoring static loads in the concrete base
- The two pressure plates can be safely transmit the highest tensile and compressive forces
- Use in combination with column shoes
- Foundation anchor and column shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed.



Foundation anchor PGS/G1-DK

Foundation anchor PGS/G1-DK

Type designation			PGS-16/ G1-DK	PGS-20/ G1-DK	PGS-24/ G1-DK	PGS-30/ G1-DK	PGS-36/ G1-DK	PGS-42/ G1-DK	PGS-48/ G1-DK	PGS-56/ G1-DK
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 42**	**M 48**	**M 56**
Total length	**L**	**mm**	**291**	**361**	**433**	**642**	**753**	**884**	**1015**	**1215**
Bar diameter	d_s	mm	16	20	24	30	36	42	48	56
Anchoring length	L_1	mm	180	240	300	490	590	715	825	1005
Wrench size	SW	mm	SW 24	SW 30	SW 36	SW 46	SW 55	SW 65	SW 75	SW 85
Washer diameter	D	mm	45	45	55	65	75	78	92	105
Foot diameter	d_F	mm	40	50	60	85	100	115	130	150
Thread length	l	mm	110	120	130	150	160	170	190	210
Reference no.			**222891**	**222892**	**222894**	**222895**	**222896**	**222897**	**222898**	**222899**

Foundation anchor PGS/G1-K

- Anchor with swaged anchor base for anchoring static loads in the concrete base
- Use in combination with column shoes
- Foundation anchor and column shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed.

- **Low anchor height for less interference in the component**
- **No additional connecting bolt required**
- **Simple screw connection with column shoe/wall shoe via integrated bolt**
- **Rigid load-bearing connection**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Free dimensioning software**
- **General technical approval (abZ)**
- **European Technical Assessment (ETA)**

Component recommendation

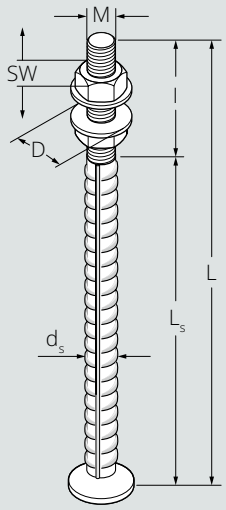
- Foundation

Technical data

- **material:** bright steel

Options on request

- Further lengths



Foundation anchor G1-K

Foundation anchor PGS/G1-K

Type designation			PGS-16/ G1-K-230	PGS-16/ G1-K-280	PGS-20/ G1-K-300	PGS-20/ G1-K-350	PGS-24/ G1-K-370	PGS-24/ G1-K-430	PGS-27/ G1-K-400	PGS-27/ G1-K-480
Thread type			**M16**	**M 16**	**M 20**	**M 20**	**M24**	**M 24**	**M27**	**M27**
Total length	**L**	**mm**	**230**	**280**	**300**	**350**	**370**	**430**	**400**	**480**
Diameter concrete steel	d_s	mm	18	18	22	22	25	25	28	28
Overlap length	L_s	mm	130	180	190	240	250	310	270	350
Thread length	l	mm	100	100	110	110	120	120	130	130
Wrench size	SW	mm	SW 24	24	SW 30	30	SW 36	36	SW 41	SW 41
Washer diameter	D	mm	45	45	45	45	55	55	60	60
Reference no.			**546710**	**281337**	**546711**	**281338**	**546712**	**281339**	**546713**	**546714**

Foundation anchor PGS/G1-K

Type designation			PGS-30/ G1-K-440	PGS-30/ G1-K-500	PGS-30/ G1-K-550	PGS-36/ G1-K-580	PGS-36/ G1-K-700	PGS-39/ G1-K-620	PGS-39/ G1-K-700	PGS-39/ G1-K-750
Thread type			**M30**	**M30**	**M 30**	**M36**	**M 36**	**M39**	**M39**	**M 39**
Total length	**L**	**mm**	**440**	**500**	**550**	**580**	**700**	**620**	**700**	**750**
Diameter concrete steel	d_s	mm	32	32	32	40	40	40	40	40
Overlap length	L_s	mm	300	360	410	410	530	450	530	580
Thread length	l	mm	140	140	140	170	170	100	100	170
Wrench size	SW	mm	SW 46	SW 46	46	SW 55	55	SW 60	SW 60	60
Washer diameter	D	mm	65	65	65	75	75	75	75	75
Reference no.			**546715**	**225926**	**281340**	**546716**	**281341**	**547642**	**546717**	**289222**

- **Thin foundation thicknesses are possible**
- **Low anchor height for less interference in the component**
- **No additional connecting bolt required**
- **Simple screw connection with column shoe via integrated bolt**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Rigid load-bearing connection**
- **Free dimensioning software**
- **General technical approval (abZ)**

Component recommendation

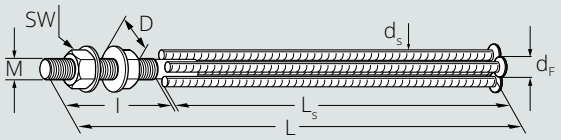
- Foundation

Technical data

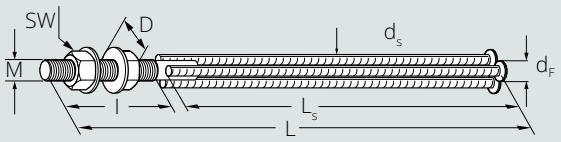
- **material:** bright steel

Foundation anchor PGS/G2-K, G3-K and G4-K

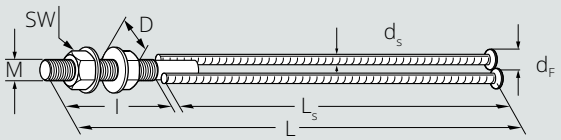
- Anchor with two, three or four swaged anchor bases for the anchoring of static loads in the concrete base
- Load introduction via the anchor bases into the component
- Use in combination with column shoes
- Foundation anchor and column shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed.



PGS/G4-K



PGS/G3-K



PGS/G2-K

Foundation anchor PGS/G2-K, G3-K and G4-K

Type designation			PGS-30/ G2-K	PGS-36/ G4-K	PGS-39/ G3-K	PGS-42/ G4-K	PGS-45/ G4-K	PGS-48/ G3-K	PGS-52/ G4-K	PGS-56/ G4-K	PGS-60/ G4-K
Thread type			**M 30**	**M 36**	**M 39**	**M 42**	**M 45**	**M 48**	**M 52**	**M 56**	**M 60**
Total length	**L**	**mm**	**655**	**740**	**880**	**915**	**980**	**1015**	**1140**	**1265**	**1330**
Diameter concrete steel	d_s	mm	25	20	25	25	25	32	32	32	32
Overlap length	L_S	mm	500	555	675	700	765	800	890	1000	1055
Thread length	l	mm	140	170	190	200	200	200	235	250	260
Wrench size	SW	mm	SW 46	SW 55	SW 60	SW 65	SW 70	SW 75	SW 80	SW 85	SW 90
Washer diameter	D	mm	65	75	75	78	85	92	98	105	110
Reference no.			**506913**	**506914**	**506915**	**506916**	**506917**	**506918**	**506919**	**506920**	**506921**

- **Permits thinner foundations**
- **No additional connecting bolt required**
- **Simple screw connection with column shoe/wall shoe via integrated bolt**
- **Rigid load-bearing connection**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Free dimensioning software**
- **General technical approval (abZ)**

Component recommendation

- Column
- Foundation

Technical data

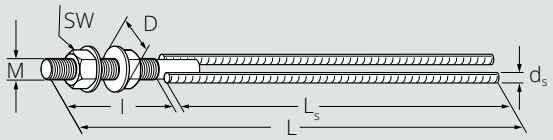
- **material:** bright steel

Options on request

- one-sided or double-sided curved design; further lengths

Foundation anchor PGS/G2

- Anchor with two straight bars for anchoring static loads in the concrete base
- Transfer of loads into the component via bond using an end anchorage or overlapping joint according to standard
- Use in combination with column shoes
- Foundation anchor and column shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed.



Foundation anchor PGS/G2

Foundation anchor PGS/G2

Type designation			PGS-24/G2	PGS-30/G2	PGS-36/G2	PGS-39/G2	PGS-42/G2	PGS-48/G2	PGS-56/G2
Thread type			**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	**L**	**mm**	**770**	**1025**	**1310**	**1520**	**1485**	**1735**	**2005**
Diameter concrete steel	d_s	mm	16	25	28	28	32	40	40
Overlap length	L_s	mm	635	870	1125	1335	1290	1530	1780
Thread length	l	mm	120	140	170	170	180	190	210
Protrusion	V	mm	635	870	1125	1335	1290	1530	1780
Wrench size	SW	mm	36	46	55	60	65	75	85
Washer diameter	D	mm	55	65	75	75	78	92	105
Reference no.			**176066**	**176067**	**176068**	**448465**	**176069**	**176070**	**176071**

L_s: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.

Special lengths are possible on request.

- **Permits thinner foundations**
- **No additional connecting bolt required**
- **Simple screw connection with column shoe/wall shoe via integrated bolt**
- **Rigid load-bearing connection**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Free dimensioning software**
- **General technical approval (abZ)**

Component recommendation

- Column
- Foundation

Technical data

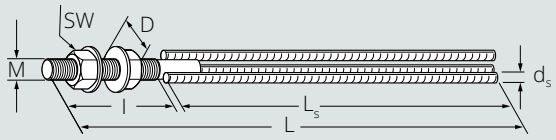
- **material:** bright steel

Options on request

- Further lengths

Foundation anchor PGS/G3

- Anchor with three straight bars for anchoring static loads in the concrete base
- Transfer of loads into the component via bond using an end anchorage of overlapping joint according to standard
- Use in combination with column shoes
- Foundation anchor and column shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed.



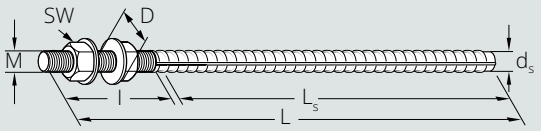
Foundation anchor PGS/G3

Foundation anchor PGS/G3

Type designation			PGS-24/G3	PGS-30/G3	PGS-36/G3	PGS-39/G3	PGS-42/G3	PGS-48/G3	PGS-56/G3
Thread type			**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	**L**	**mm**	**700**	**890**	**1040**	**1195**	**1150**	**1245**	**1605**
Diameter concrete steel	d_s	mm	12	20	25	25	28	32	32
Overlap length	L_S	mm	565	735	855	1010	955	1040	1380
Thread length	l	mm	120	140	170	170	180	190	210
Wrench size	SW	mm	36	46	55	60	65	75	85
Washer diameter	D	mm	55	65	75	25	78	92	105
Reference no.			**176060**	**176061**	**176062**	**448569**	**176063**	**176064**	**176065**

L_s: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.
Special lengths are possible on request.

Foundation anchor PGS/G1 in special length

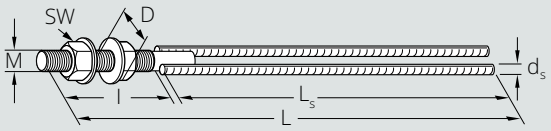


Foundation anchor PGS/G1

Foundation anchor PGS/G1L in special length

Type designation			**PGS-16/G1L**	**PGS-20/G1L**	**PGS-24/G1L**	**PGS-30/G1L**	**PGS-36/G1L**	**PGS-39/G1L**
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**
Total length	L	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Thread length	l	mm	100	110	120	140	170	170
Wrench size	SW	mm	24	30	36	46	55	60
Washer diameter	D	mm	45	45	55	65	75	75
Diameter concrete steel	d_s	mm	16	20	25	32	40	40
Reference no.			**020331**	**020332**	**020333**	**020334**	**020335**	**020424**

Foundation anchor PGS/G2 in special length

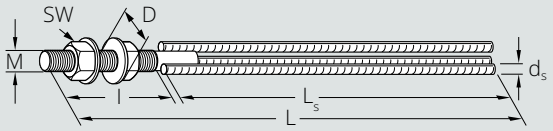


Foundation anchor PGS/G2

Foundation anchor PGS/G2 in special length

Type designation			**PGS-24/G2L**	**PGS-30/G2L**	**PGS-36/G2L**	**PGS-39/G2L**	**PGS-42/G2L**	**PGS-48/G2L**	**PGS-56/G2L**
Thread type			**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	L	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Thread length	l	mm	120	140	170	170	180	190	210
Wrench size	SW	mm	36	46	55	60	65	75	85
Washer diameter	D	mm	55	65	75	75	78	92	105
Diameter concrete steel	d_s	mm	16	25	28	28	32	40	40
Reference no.			**020624**	**020625**	**020626**	**020627**	**020628**	**020629**	**020630**

Foundation anchor PGS/G3 in special length

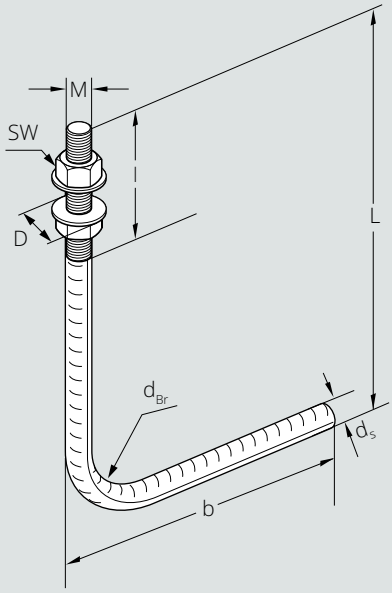


Foundation anchor PGS/G3

Foundation anchor PGS/G3 in special length

Type designation			**PGS-24/G3L**	**PGS-30/G3L**	**PGS-36/G3L**	**PGS-39/G3L**	**PGS-42/G3L**	**PGS-48/G3L**	**PGS-56/G3L**
Thread type			**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	L	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Thread length	l	mm	120	140	170	170	180	190	210
Wrench size	SW	mm	36	46	55	60	65	75	85
Washer diameter	D	mm	55	65	75	75	78	92	105
Diameter concrete steel	d_s	mm	12	20	25	25	28	32	32
Reference no.			**020631**	**020632**	**020633**	**020634**	**020635**	**020636**	**020637**

Foundation anchor PGS/G1-B bent

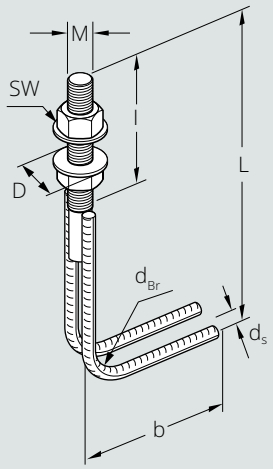


Foundation anchor PGS/G1-B bent

Foundation anchor PGS/G1-B bent

Type designation			**PGS-16/G1-B**	**PGS-20/G1-B**	**PGS-24/G1-B**	**PGS-30/G1-B**	**PGS-36/G1-B**
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**
Thread length	l	mm	100	110	120	140	170
Washer diameter	D	mm	45	45	55	65	75
Diameter concrete steel	d_s	mm	16	20	25	32	40
Bending roller diameter	$d_{Br\ min}$	mm	60	133	165	220	300
	L/b/d_{Br}	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Reference no.			**020337**	**020338**	**020339**	**020340**	**020341**

Foundation anchor PGS/G2-B1 bent on one side

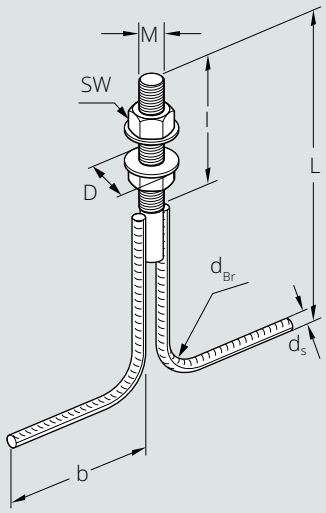


Foundation anchor PGS/G2-B1 bent on one side

Foundation anchor PGS/G2-B1 bent on one side

Type designation			**PGS-24/G2-B1**	**PGS-30/G2-B1**	**PGS-36/G2-B1**	**PGS-42/G2-B1**	**PGS-48/G2-B1**	**PGS-56/G2-B1**
Thread type			**M 24**	**M 30**	**M 36**	**M 42**	**M 48**	**M 56**
Thread length	l	mm	120	140	170	180	190	210
Washer diameter	D	mm	55	65	75	78	92	105
Diameter concrete steel	d_s	mm	16	25	28	32	40	40
Bending roller diameter	d_{Br}	mm	160	250	280	320	400	400
	L/b/ $d_{Br\ min}$	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Dimension 1 minimum	L_{min}	mm	312	430	496	549	645	645
Dimension 2 minimum	b_{min}	mm	176	275	308	352	440	440
Reference no.			**020302**	**020303**	**020304**	**020305**	**020306**	**020307**

Foundation anchor PGS/G2-B2 bent on both sides



Foundation anchor PGS/G2-B2 bent on both sides

Foundation anchor PGS/G2-B2 bent on both sides

Type designation			**PGS-24/G2-B2**	**PGS-30/G2-B2**	**PGS-36/G2-B2**	**PGS-42/G2-B2**	**PGS-48/G2-B2**	**PGS-56/G2-B2**
Thread type			**M 24**	**M 30**	**M 36**	**M 42**	**M 48**	**M 56**
Thread length	l	mm	120	140	170	180	190	210
Washer diameter	D	mm	55	65	75	78	92	105
Diameter concrete steel	d_s	mm	16	25	28	32	40	40
Bending roller diameter	$d_{Br\ min}$	mm	160	250	280	320	400	400
	L/b/d_{Br}	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Dimension 1 minimum	L_{min}	mm	312	430	496	549	645	645
Dimension 2 minimum	b_{min}	mm	176	275	308	352	440	440
Reference no.			**020216**	**020217**	**020218**	**020219**	**020220**	**020221**

- **No obtrusive threaded bolts protruding from the structural element**
- **Permits thinner foundations**
- **Simple screw connection with column shoe/wall shoe via integrated bolt**
- **Free dimensioning software**
- **Rigid load-bearing connection**
- **Complete system for the transmission of tensile and transversal shear forces**
- **Type-approved**

Component recommendation

- Column
- Foundation
- Precast wall

Technical data

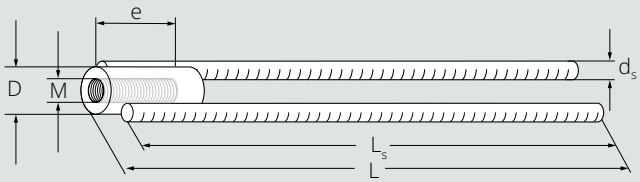
- **material:** bright steel

Options on request

- one-sided or double-sided curved design; further lengths

Foundation anchor PGS/H2

- Anchor with two straight bars for anchoring static loads in the concrete base
- Transfer of loads into the component via bond using an end anchorage or overlapping joint according to standard
- Use in combination with Column Shoes or Wall Shoes and Connecting Bolts
- Foundation anchor and Column Shoe/Wall Shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed



Foundation anchor PGS/H2

Foundation anchor PGS/H2

Type designation			PGS-16/H2	PGS-20/H2	PGS-24/H2	PGS-30/H2	PGS-36/H2	PGS-39/H2	PGS-42/H2	PGS-48/H2	PGS-56/H2
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	**L**	**mm**	**510**	**600**	**645**	**880**	**1135**	**1345**	**1300**	**1540**	**1790**
Diameter concrete steel	d_s	mm	10	12	16	25	28	28	32	40	40
Overlap length	L_s	mm	500	590	635	870	1125	1335	1290	1530	1780
Socket diameter	D	mm	25	30	40	50	60	65	70	80	90
Screw-in depth	e	mm	24	30	36	45	54	59	63	72	84
Reference no.			**200809**	**200811**	**200812**	**200813**	**200814**	**442416**	**200815**	**200816**	**200817**
External plug small											
Reference no.			**118636**	**118642**	**118644**	**118647**	**118649**	**445445**	**135313**	**159041**	**137582**
Connecting bolts PAP, PVB/PGV (see page 28/29)											
Reference no.			**203111**	**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

L_s: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.

Special lengths are possible on request.

Notice:

Foundation anchor PGS/H2 for PWS in combination with Connecting Bolt PAP.

Notice:

Curved versions available on request.

- **No obtrusive threaded bolts protruding from the structural element**
- **Permits thinner foundations**
- **Simple screw connection with Column Shoe/Wall Shoe via Connecting Bolt**
- **Free dimensioning software**
- **Rigid load-bearing connection**
- **Complete system for the transmission of tensile and transversal shear forces**
- **Type-approved**

Component recommendation

- Column
- Precast wall
- Foundation

Technical data

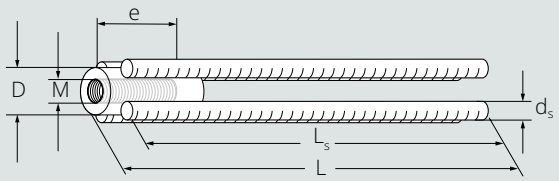
- **material:** bright steel

Options on request

- Further lengths

Foundation anchor PGS/H4

- Anchor with four straight bars for anchoring static loads in the concrete base
- Transfer of loads into the component via bond using an end anchorage or overlapping joint according to standard
- Use in combination with Column Shoes or Wall Shoes and Connecting Bolts
- Foundation anchor and Column Shoe/Wall Shoe are each concreted into one component and can be connected to each other via the integrated threaded bolt. The recesses are then sealed



Foundation anchor PGS/H4

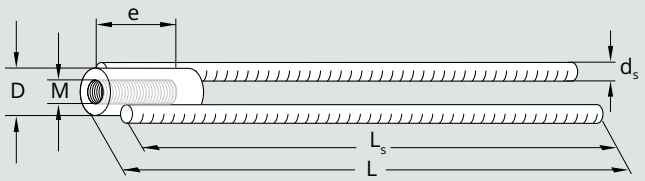
Foundation anchor PGS/H4

Type designation			PGS-20/H4	PGS-24/H4	PGS-30/H4	PGS-20/H4	PGS-39/H4	PGS-42/H4	PGS-48/H4	PGS-56/H4
Thread type			**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	**L**	**mm**	**375**	**445**	**705**	**815**	**960**	**860**	**1160**	**1205**
Diameter concrete steel	d_s	mm	10	12	16	20	20	25	25	28
Overlap length	L_S	mm	365	435	695	805	950	850	1150	1195
Socket diameter	D	mm	35	40	50	60	65	70	80	90
Screw-in depth	e	mm	30	36	45	54	59	63	72	84
Reference no.			**200818**	**200819**	**200820**	**200821**	**442419**	**200822**	**200823**	**200824**
External plug small										
Reference no.			**118642**	**118644**	**118647**	**118649**	**445445**	**135313**	**159041**	**137582**
Connecting bolts PAP, PVB/PGV (see page 28/29)										
Reference no.			**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

L_s: The foundation anchor lengths in the table are to be determined with the on-site conditions (concrete quality, bond conditions, bar diameter, utilization, bar and edge distances) in accordance with EN 1992-1-1 Section 8.4.3 and Section 8.7.2 including National Annexes or National Standards.

Special lengths are possible on request.

Foundation anchor PGS/H2 in special length

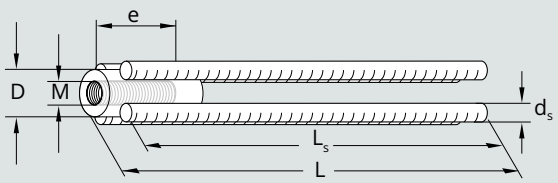


Foundation anchor PGS/H2 in special length

Foundation anchor PGS/H2 in special length

Type designation			**PGS-16/ H2L**	**PGS-20/ H2L**	**PGS-24/ H2L**	**PGS-30/ H2L**	**PGS-36/ H2L**	**PGS-39/ H2L**	**PGS-42/ H2L**	**PGS-48/ H2L**	**PGS-56/ H2L**
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	L	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Screw-in depth	e	mm	24	30	36	45	54	59	63	72	84
Washer diameter	D	mm	25	30	40	50	60	65	70	80	90
Diameter concrete steel	d_s	mm	10	12	16	25	28	28	32	40	40
Reference no.			**020246**	**020247**	**020248**	**020249**	**020250**	**020251**	**020252**	**020253**	**020254**
Connecting bolts PAP, PVB/PGV (see page 28/29)											
Reference no.			**203111**	**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

Foundation anchor PGS/H4 in special length

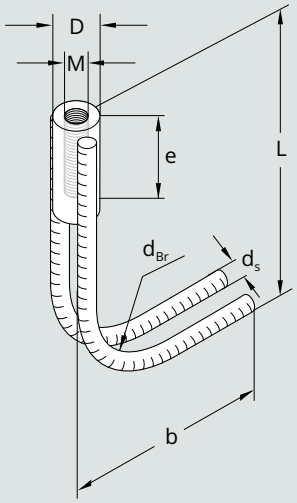


Foundation anchor PGS/H4 in special length

Foundation anchor PGS/H4 in special length

Type designation			**PGS-20/ H4L**	**PGS-24/ H4L**	**PGS-30/ H4L**	**PGS-36/ H4L**	**PGS-39/ H4L**	**PGS-42/ H4L**	**PGS-48/ H4L**	**PGS-56/ H4L**
Thread type			**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Total length	L	mm	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion
Screw-in depth	e	mm	30	36	45	54	59	63	72	84
Washer diameter	D	mm	35	40	50	60	65	70	80	90
Diameter concrete steel	d_s	mm	10	12	16	20	20	25	25	28
Reference no.			**020239**	**020240**	**020241**	**020242**	**–**	**020243**	**020244**	**020245**
Connecting bolts PAP, PVB/PGV (see page 28/29)										
Reference no.			**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

Foundation anchor PGS/H2-B1 bent on one side

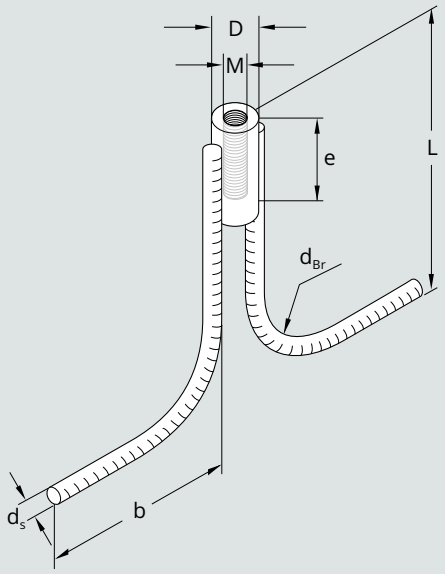


Foundation anchor PGS/H2-B1 bent on one side

Foundation anchor PGS/H2-B1 bent on one side

Type designation			**PGS-16/ H2-B1**	**PGS-20/ H2-B1**	**PGS-24/ H2-B1**	**PGS-30/ H2-B1**	**PGS-36/ H2-B1**	**PGS-39/ H2-B1**	**PGS-42/ H2-B1**	**PGS-48/ H2-B1**	**PGS-56/ H2-B1**
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Dimension 1 minimum	L_{min}	mm	140	159	192	285	321	321	364	450	450
Dimension 2 minimum	b_{min}	mm	110	132	176	275	308	308	352	440	440
Screw-in depth	e	mm	24	30	36	45	54	59	63	72	84
Washer diameter	D	mm	25	30	40	50	60	65	70	80	90
Diameter concrete steel	d_s	mm	10	12	16	25	28	28	32	40	40
Bending roller diameter	d_{Br}	mm	100	120	160	250	280	280	320	400	400
	L/b/d_{Br}	mm	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification	Customer specification
Reference no.			**020262**	**020263**	**020264**	**020265**	**020266**	**020444**	**020267**	**020268**	**020269**
Connecting bolts PAP, PVB/PGV (see page 28/29)											
Reference no.			**203111**	**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

Foundation anchor PGS/H2-B2 bent on both sides



Foundation anchor PGS/H2-B2 bent on both sides

Foundation anchor PGS/H2-B2 bent on both sides

Type designation			**PGS-16/ H2-B2**	**PGS-20/ H2-B2**	**PGS-24/ H2-B2**	**PGS-30/ H2-B2**	**PGS-36/ H2-B2**	**PGS-39/ H2-B2**	**PGS-42/ H2-B2**	**PGS-48/ H2-B2**	**PGS-56/ H2-B2**
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Dimension 1 minimum	L_{min}	mm	140	159	192	285	321	321	364	450	450
Dimension 2 minimum	b_{min}	mm	110	132	176	275	308	308	352	440	440
Screw-in depth	e	mm	24	30	36	45	54	59	63	72	84
Washer diameter	D	mm	25	30	40	50	60	65	70	80	90
Diameter concrete steel	d_s	mm	10	12	16	25	28	28	32	40	40
Bending roller diameter	d_{Br}	mm	100	120	160	250	280	280	320	400	400
	L/b/d_{Br}	mm	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion	Customer specifica-tion
Reference no.			**020254**	**020255**	**020256**	**020257**	**020258**	**020443**	**020259**	**020260**	**020261**
Connecting bolts PAP, PVB/PGV (see page 28/29)											
Reference no.			**203111**	**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

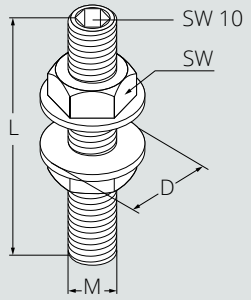
- **No obstrusive threaded bolts protruding from the structural element**
- **Simple screw connection with column shoe via Connecting Bolt**
- **High-tensile material**
- **Subsequent adjustment under load possible with the aid of nuts**
- **Rigid load-bearing connection**
- **Type-approved**

Technical data

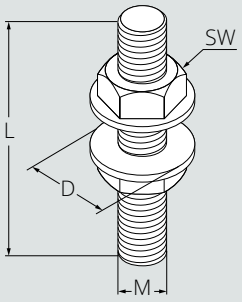
- **material:** bright steel

Connecting Bolt PVB/PGV for PCC and PWC

- For connecting column shoes and foundation anchors, type H/female bar
- Bolt can be fastened into the foundation anchor/ female bar shortly before installation. The column shoe can then be fitted on top and tightened. Nuts and washers allow height adjustment and alignment under load



Connecting bolt PGV



Connecting bolt PVB

Connecting bolts PVB/PGV for PCC and PWC

Type designation			PVB/ PGV-16	PVB/ PGV-20	PVB/ PGV-24	PVB/ PGV-30	PVB/ PGV-36	PVB/ PGV-39	PVB/ PGV-42	PVB/ PGV-48	PVB/ PGV-56
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 39**	**M 42**	**M 48**	**M 56**
Wrench size	SW	mm	SW 24	SW 30	SW 36	SW 46	SW 55	SW 60	SW 65	SW 75	SW 85
Washer diameter	D	mm	45	45	55	65	75	75	78	92	105
Threaded rod length	L	mm	130	145	160	195	230	240	240	270	300
Reference no.			**203111**	**203112**	**203113**	**203114**	**203115**	**445445**	**159040**	**159041**	**159042**

Notice: Shim plate is supplied for Wall Shoe type PWC as a set together with the foundation anchor.

- **Simple screw connection with Wall Shoe via Connecting Bolt**
- **High-tensile material**
- **Complete system for the transmission of tensile and transversal shear forces**
- **Shorter construction times and thus lower costs**
- **Tolerances up to 40 mm in longitudinal direction**
- **Type-approved**

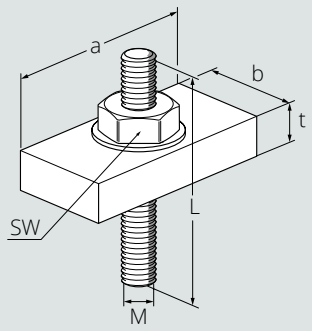
Technical data

- **material:** bright steel

CE

Connecting bolts PAP for PWS

- For connecting Wall Shoe and Foundation anchor type H
- Bolt can be screwed into the foundation anchor easily. The Wall Shoe can then be positioned on it and fastened



Connecting boltsPWS

Connecting bolts PAP for PWS

Type designation			PAP-16	PAP-20	PAP-24	PAP-30	PAP-36	PAP-42	PAP-48	PAP-56
Thread type			**M 16**	**M 20**	**M 24**	**M 30**	**M 36**	**M 42**	**M 48**	**M 56**
Plate width	b	mm	50	60	70	80	100	110	130	130
Plate thickness	t	mm	20	25	25	30	35	45	45	50
Plate length	a	mm	100	100	100	110	130	150	150	140
Wrench size	SW	mm	SW 24	SW 30	SW 36	SW 46	SW 55	SW 65	SW 75	SW 85
Washer diameter	D	mm	30	37	44	56	66	78	92	105
Threaded rod length	L	mm	180	200	220	270	320	370	410	440
Reference no.			**199401**	**199402**	**199403**	**199404**	**199405**	**199406**	**199407**	**199408**

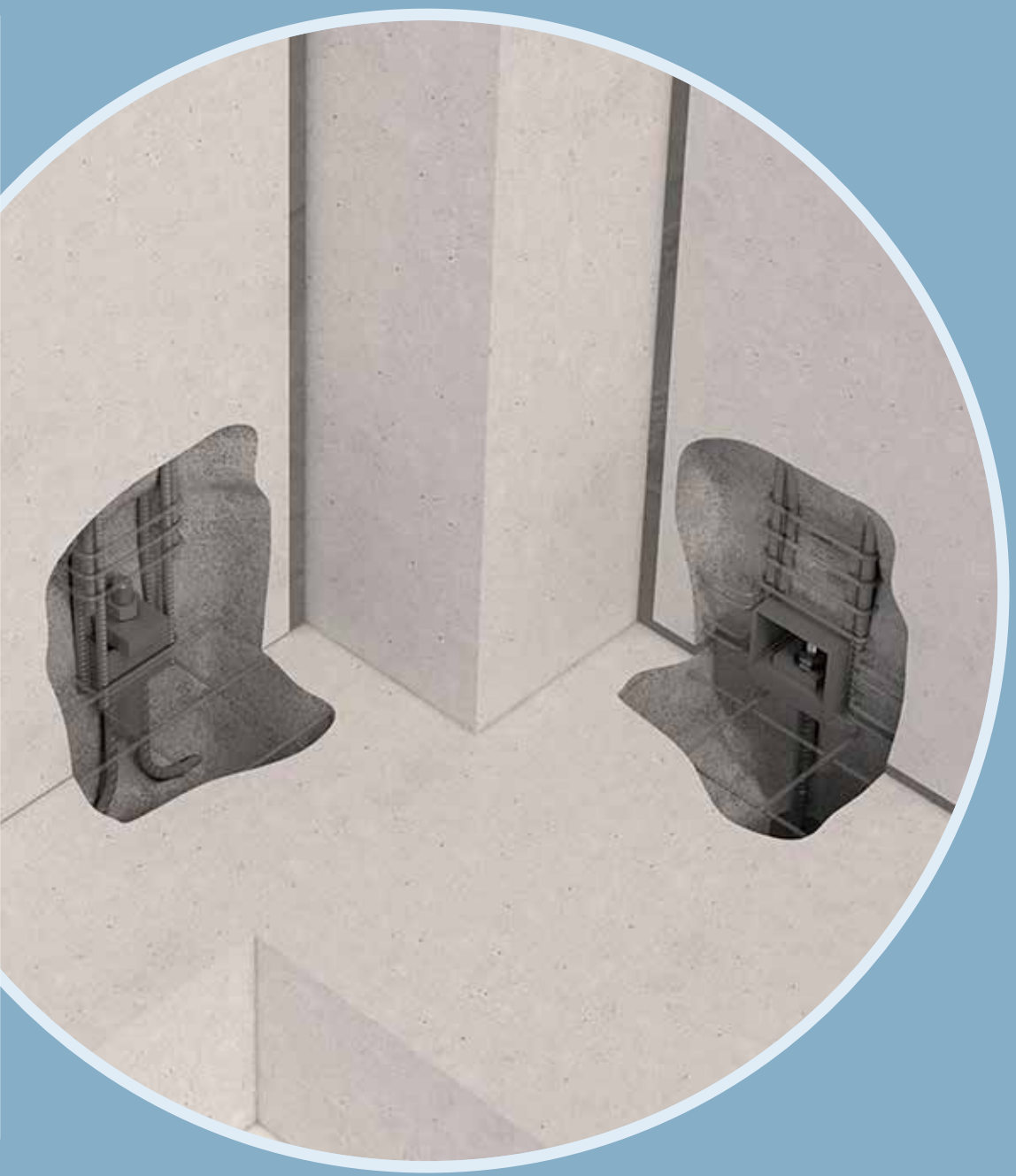
PWC installation

Installation instruction – precast plant

Allocation of the wall shoe to the shim and foundation anchor:

Wall Shoe type	Shim plate type	Foundation anchor type PGS
PWC 16	UP 16	G1 / G1-K / H2 16
PWC 20	UP 20	G1 / G1-K / H2 20
PWC 24	UP 24	G1 / G1-K / H2 24
PWC 30	UP 30	G1 / G1-K / H2 30
PWC 36	UP 36	G1 / G1-K / H2 36
PWC 39	UP 39	G1 / G1-K / H2 39
PWC 30 HF	UP 30 HF	G2 / H2 30
PWC 36 HF	UP 36 HF	G2 / H2 36

Dimensioning



Working load limit type PWC

Wall Shoe	Shim plate	Foundation anchor	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

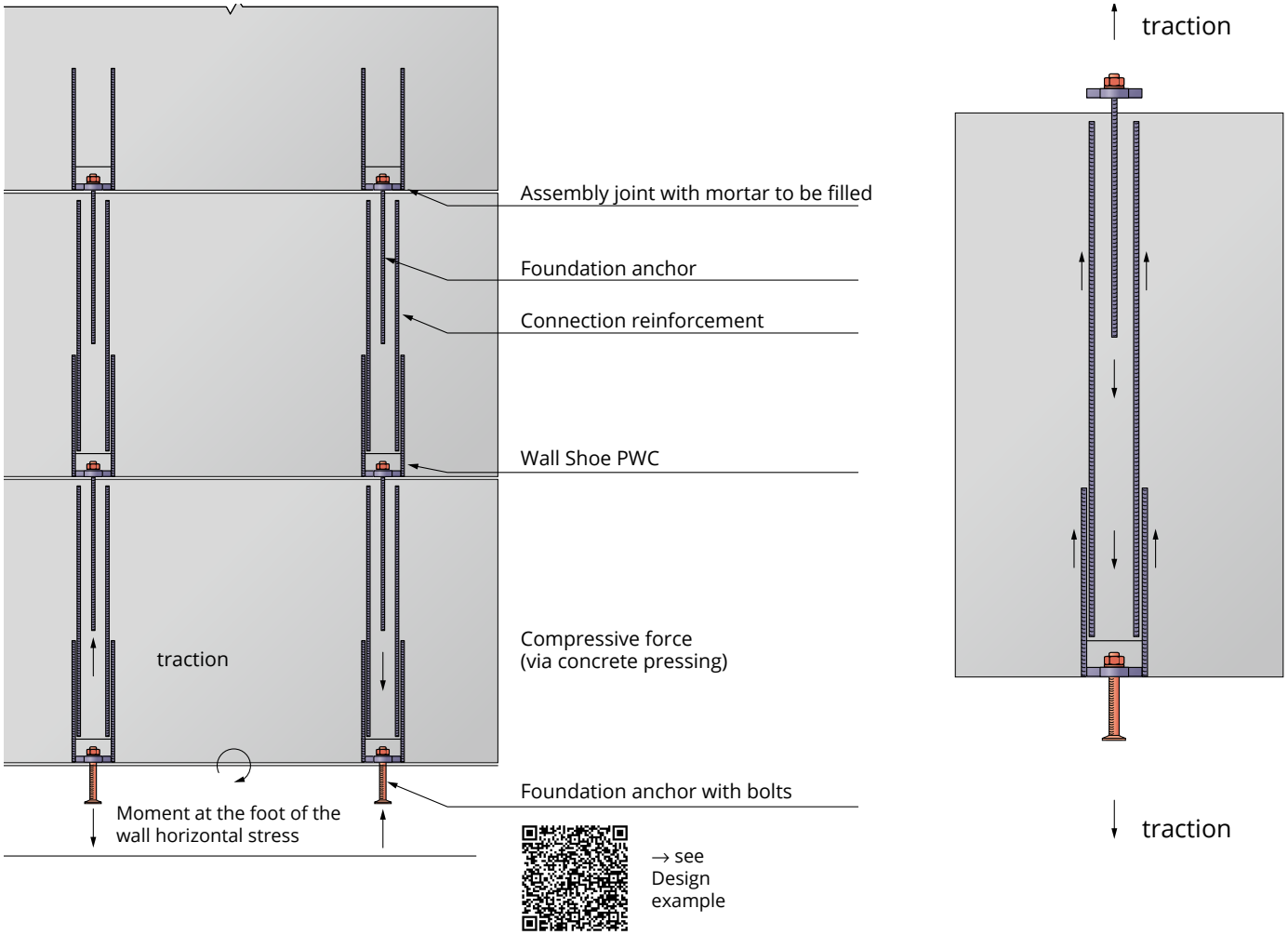
1. In the type designation HF, the wall shoe is used in combination with a foundation anchor with a high-strength bolt (PGS G2 or PGS H2). The use of the PGS H2 foundation anchor brings the advantage of the two-part system of foundation anchor and threaded connection bolt. Thus, nothing protrudes from 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).



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
N_{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
V_{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
V_{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
V_{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.

For walls with thicknesses >> 160mm, it is possible to transfer shear forces perpendicular to the longitudinal direction of the wall if there is sufficient concrete to transfer the shear forces (separate verification via framework model or truss model).

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:

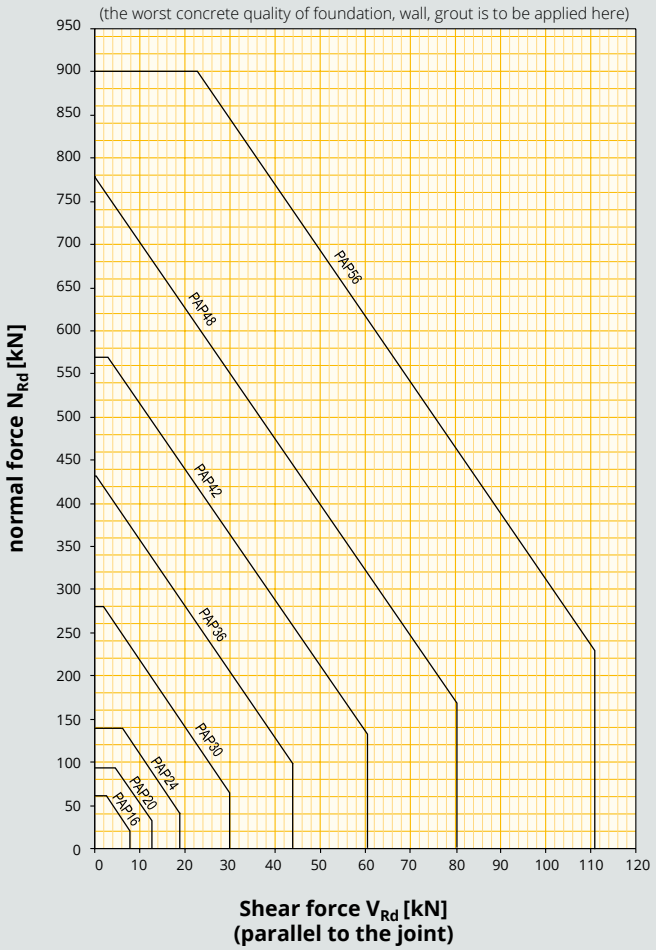
The respective design resistances must be compared for each combination of wall shoe/foundation anchor.
The minimum design resistance is decisive in each case.

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.

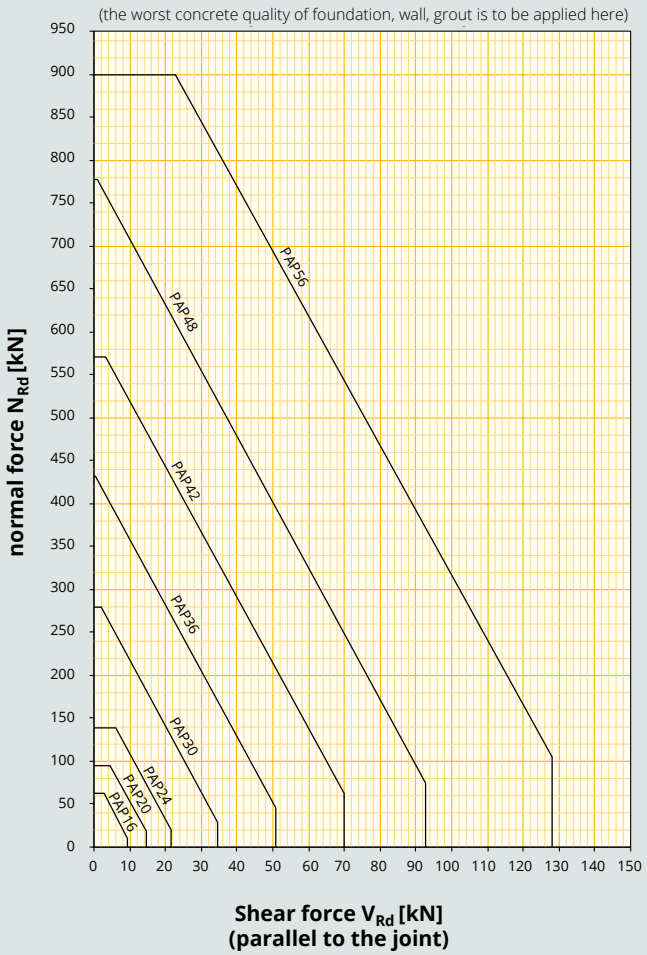
Interaction diagrams for the design resistances of shear force and normal force for common concrete qualities:

Concrete quality C20/25



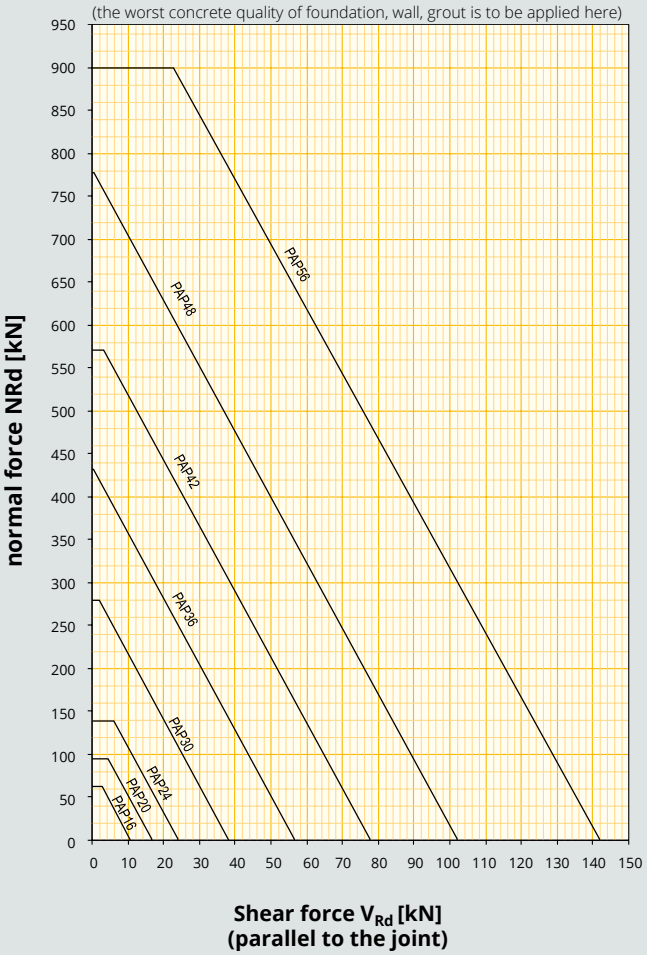
Interaction diagram of the design resistances

Concrete quality C25/30



Interaction diagram of the design resistances

Concrete quality C30/37



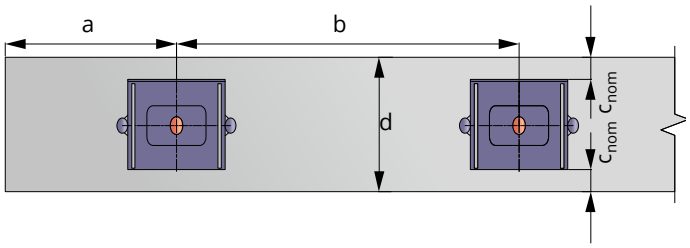
Interaction diagram of the design resistances

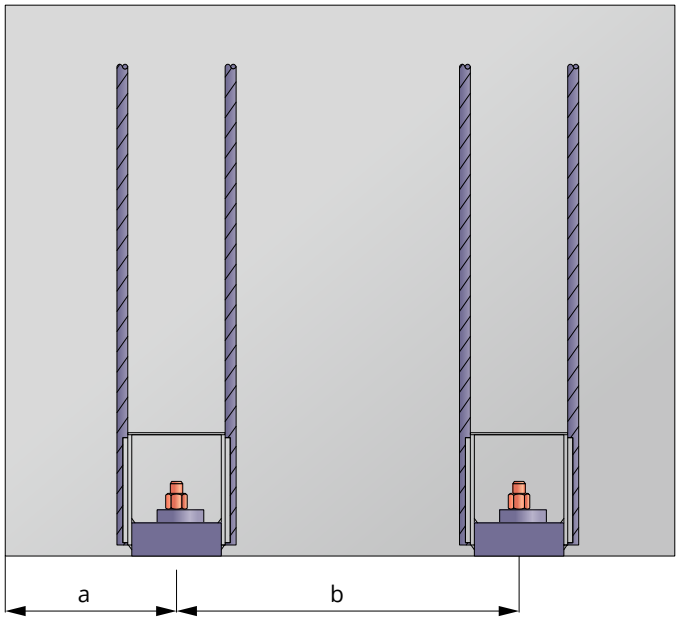
Installation & assembly instruction

PWC installation

Installation instruction – precast plant

Positioning the Wall Shoes





When installing the PFEIFER PWC Wall Shoe, the required concrete cover c_{nom} according to EN 1992-1-1 must be complied with for the edge distances and the minimum wall thickness.

The minimum wall thicknesses arise from the wall shoe width and the concrete cover per wall side to be determined during the planning.

Thanks to the arrangement of the slots in the base plate of the wall shoe, generous tolerances are possible. Inaccuracies can thus be compensated easily when installing in the precast plant and when adjusting on the building site.

Minimum distances and dimensions

The following edge and axis distances as well as the minimum wall thicknesses result from the wall shoe dimensions, the required additional reinforcement and the concrete cover.

Figure 5 + Figure 6

Wall Shoe type	Edge distance **a** [mm]	Axis distance **b** [mm]	Minimum wall thicknesses **d** [mm]
PWC 16	160	320	82 + 2 x c_{nom}
PWC 20	170	340	92 + 2 x c_{nom}
PWC 24	190	380	112 + 2 x c_{nom}
PWC 30	210	420	122 + 2 x c_{nom}
PWC 36	220	440	132 + 2 x c_{nom}
PWC 39	240	480	147 + 2 x c_{nom}
PWC 30 HF	220	440	132 + 2 x c_{nom}
PWC 36 HF	250	500	152 + 2 x c_{nom}

Table 1: Distances and minimum wall thicknesses

PWC installation

Installation instruction – precast plant

Installation of the Wall Shoe

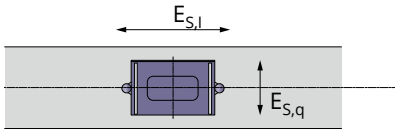


Figure 7

PFEIFER Wall Shoes are fixed as built-in parts to the front side of the formwork of the wall panels. The following tolerances must be adhered to when installing the wall shoes.

Wall Shoe type	Wall Shoe installation tolerance	
	Longitudinal direction $E_{S,l}$ [mm]	Transverse direction $E_{S,q}$ [mm]
PWC 16	± 5	± 2
PWC 20	± 5	± 2
PWC 24	± 5	± 3
PWC 30	± 5	± 3
PWC 36	± 5	± 3
PWC 39	± 5	± 3
PWC 30 HF	± 5	± 3
PWC 36 HF	± 5	± 3

Table 2

Assembly of the foundation anchor

The following tolerances should also be met to when installing the PFEIFER Foundation Anchor.

Wall Shoe type	Wall Shoe installation tolerance	
	Longitudinal direction $E_{A,l}$ [mm]	Transverse direction $E_{A,q}$ [mm]
PWC 16	± 3	± 3
PWC 20	± 3	± 3
PWC 24	± 3	± 3
PWC 30	± 3	± 3
PWC 36	± 3	± 3
PWC 39	± 3	± 3
PWC 30 HF	± 3	± 3
PWC 36 HF	± 4	± 4

Table 3

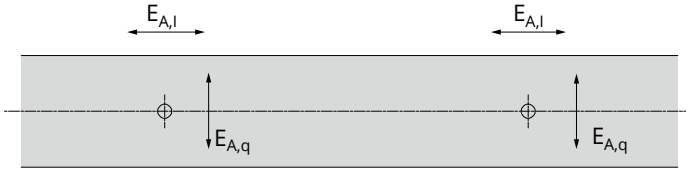


Figure 8

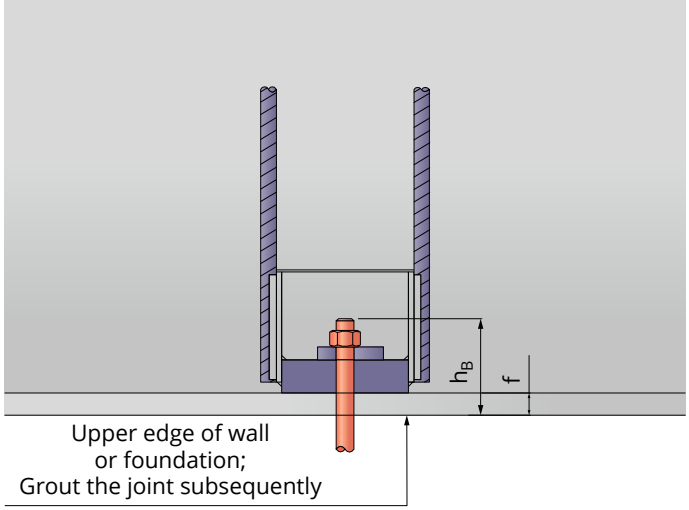


Figure 9

Wall Shoe size	Foundation anchor PGS G1/G1-K/G2			Foundation anchor PGS H2/H4		
	Protruding bolt length h_B	Joint height f		Protruding bolt length h_B	Joint height f	
	[mm]	min [mm]	max [mm]	[mm]	min [mm]	max [mm]
16	100	5	35	106	10	45
20	110	5	35	115	10	40
24	120	5	35	124	10	35
30	140	10	35	150	20	45
36	170	20	50	176	30	55
39	170	25	45	181	35	55
30 HF	140	–	30	150	–	40
36 HF	170	15	40	176	25	45

Table 4

PWC installation

Installation instruction – precast plant

Additional reinforcement

Additional reinforcement must be provided for the introduction and transfer of the loads.

Connection reinforcement (Pos. 1)

Wall Shoe type	Additional connection reinforcement	
	Longitudinal reinforcement [–]	Length of the welded-on longitudinal reinforcement [cm]
PWC 16	2 Ø 14	52
PWC 20	2 Ø 16	90
PWC 24	2 Ø 20	100
PWC 30	2 Ø 25	124
PWC 36	2 Ø 25	180
PWC 39	2 Ø 28	188
PWC 30 HF	2 Ø 28	149
PWC 36 HF	2 Ø 32	186

Table 5: Additional connection reinforcement

The acting tensile forces must be relayed into the components and guided into the foundation by additional reinforcements and corresponding overlapping joints. The required longitudinal reinforcement is illustrated in table 5.

At maximum utilisation, the connecting reinforcement is to be led up to the upper edge of the wall shoe box and butted with the welded-on reinforcement of the wall shoe. The length of the welded-on bars is selected so that the overlap length is maintained at maximum utilisation.

The overlap lengths are calculated with concrete quality C30/37 and assuming a good bond. In case of lower utilisation or higher concrete quality, the overlaping length can be reduced linearly from the specified lengths by the planning engineer.

Shear reinforcement at the overlapping joint (Pos. 2)

Wall Shoe type	Additional shear reinforcement – closed stirrup	
	Quantity and diameter* A_{st} [–]	Joint area $0{,}3 \times l_0$ [cm]
PWC 16	4 Ø 6	16
PWC 20	6 Ø 6	27
PWC 24	6 Ø 6	30
PWC 30	6 Ø 8	37
PWC 36	10 Ø 8	54
PWC 39	10 Ø 8	56
PWC 30 HF	8 Ø 8	45
PWC 36 HF	10 Ø 10	56

* Total number of stirrups per overlapping joint; to be divided in half into joint start and end.

Table 6: Additional shear reinforcement – closed stirrup

According to EN 1992-1-1, paragraph 8.7.4, shear reinforcement is to be provided in the overlap area in order to absorb shear forces. This shear reinforcement is to be installed in the form of closed stirrups and concentrated in the start and end area of the overlap length.

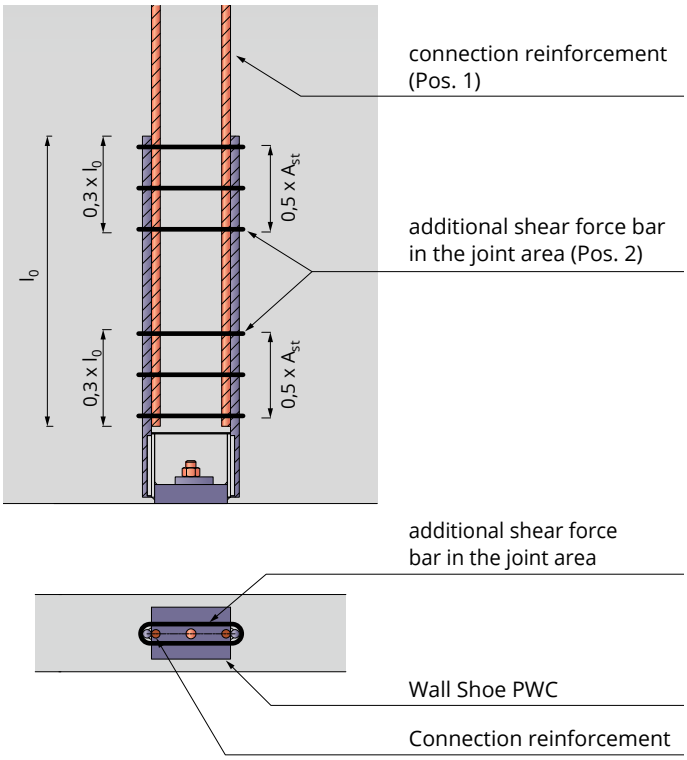
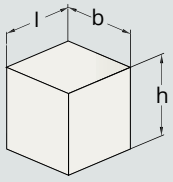


Figure 10: Arrangement of reinforcement PWC 20

PWC installation

Dimensions of recessing block

The required mounting recess in the wall can be formed with the help of a polystyrene recessing block. The dimensions of the recessing block are described below depending on the wall thickness. These apply to the axial installation of a Wall Shoe in a wall with the thickness D.



Polystyrene recessing block

Wall Shoe type [–]	Recessing block dimensions b[1)] [mm]	h [mm]	l [mm]
PWC 16	0,5 x (D + 80)	85	115
PWC 20	0,5 x (D + 90)	95	120
PWC 24	0,5 x (D + 110)	100	135
PWC 30	0,5 x (D + 120)	115	140
PWC 36	0,5 x (D + 130)	130	145
PWC 39	0,5 x (D + 145)	130	160
PWC 30 HF	0,5 x (D + 130)	130	145
PWC 36 HF	0,5 x (D + 150)	130	160

Table 7

[1)] depending on the wall thickness D

PWC assembly instructions – building site

Identification

The Wall Shoes are provided with an identification sticker on the housing. This provides information about the size or type of the Wall Shoe, the parts or reference number and the address of the manufacturer with all relevant data.

Figure 11: Identification Wall Shoe

The following steps are required to assemble the wall element:

- Remove the nuts and washers of the foundation anchor
- Create the appropriate joint with the help of shim plates
- Position the wall element on the shim plates
- Check the correct position of the wall element
- Screw on the nuts and washers and tighten firmly
- Grout the assembly recess and the wall joint
- Connection is finished after curing of the joint filling mortar

Wall assembly

When adjusting the walls on the building site, the tolerances of the system allow a practical alignment of the components.

The following tolerances are available for any inaccuracies that may occur when installing the foundation anchors.

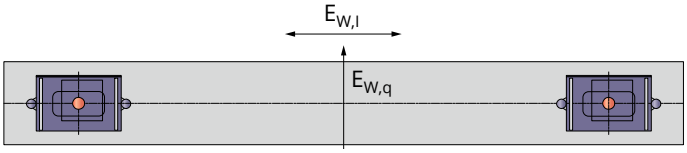


Figure 12

Wall Shoe type	tolerance wall connection	
	Longitudinal direction $E_{w,l}$ [mm]	Transverse direction $E_{w,q}$ [mm]
PWC 16	± 27	± 10
PWC 20	± 25	± 10
PWC 24	± 24	± 12,5
PWC 30	± 23	± 12,5
PWC 36	± 24	± 12,5
PWC 39	± 25	± 12,5
PWC 30 HF	± 24	± 12,5
PWC 36 HF	± 26	± 12,5

Table 8: Assembly tolerances when adjusting

PWS installation

Installation instruction – precast plant

Minimum thicknesses of the wall components

The minimum wall thicknesses for wall components with Wall Shoes specified in Table 9 result from the Wall Shoe dimensions, the surface reinforcement and the concrete cover.

Table 9: Minimum wall thicknesses

PWS 120	PWS 200	PWS 330	PWS 400	PWS 650	PWS 900
160 mm	160 mm	180 mm	200 mm	210 mm	210 mm

Edge and axis distances

The edge and axis distances are to be taken into account to the extent that the required concrete cover cnom according to EN 1992-1-1 is complied with. This protects the built-in parts against corrosion and serves to transmit the acting forces.

When routing the reinforcement, care must be taken that the bar spacing is selected so that the concrete can be placed and sufficiently compacted, and that a sufficient bond is ensured.

The minimum values of the clear bar spacing according to DIN EN 1992-1-1 must therefore be observed.

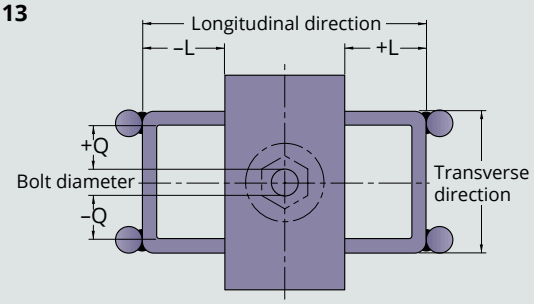
Installation tolerances

PFEIFER Wall Shoes are fixed as built-in parts to the front side of the formwork of the wall panels. The installation tolerances depend on the size of the selected wall shoe and the outer diameter of the anchoring bolt. From the respective combination, a sufficiently large tolerance range according to Table 10/Fig. 13 results so that even larger inaccuracies can be bridged on the building site individually and without additional time expenditure.

Table 10: Horizontal tolerances

PWS 120	PAP 16	PAP 20	PAP 24
long ± L trans ± Q	± 40 mm ± 14 mm	± 35 mm ± 12 mm	± 30 mm ± 10 mm
PWS 200	PAP 24	PAP 30	
long ± L trans ± Q	± 30 mm ± 10 mm	± 20 mm ± 17 mm	
PWS 330	PAP 30	PAP 36	
long ± L trans ± Q	± 30 mm ± 10 mm	± 20 mm ± 17 mm	
PWS 400	PAP 36	PAP 42	
long ± L trans ± Q	± 20 mm ± 12 mm	± 15 mm ± 19 mm	
PWS 650	PAP 42	PAP 48	
long ± L trans ± Q	± 35 mm ± 14 mm	± 25 mm ± 11 mm	
PWS 900	PAP 48	PAP 56	
long ± L trans ± Q	± 25 mm ± 11 mm	± 25 mm ± 17 mm	

Figure 13



PWS installation

Installation instruction – precast plant

Recessing block PWS – dimensioning

The necessary assembly recess in the wall can be manufactured with the aid of a foam polystyrene recessing block (fig. 14). Select the dimensions of the block so that, on the one hand, the concrete cover of at least 1.5 cm according to EN 1992-1-1 is ensured and, on the other, the anchor plate has sufficient clearance to the rear.

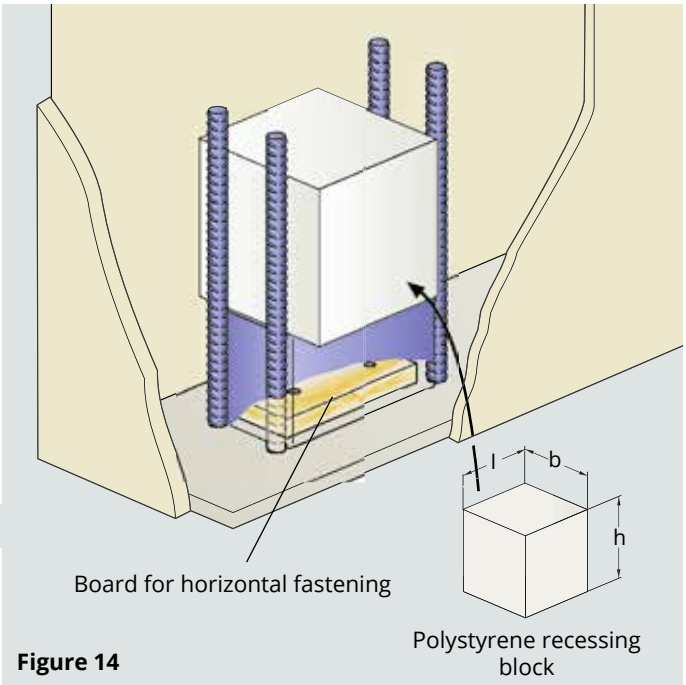


Figure 14

The recessing block is not included in the scope of delivery.

Table 11 shows the optimal styrofoam recess former dimensions for the axial installation of a wall shoe in a 20 cm thick wall:

Type	**b** [mm]	**h** [mm]	**l** [mm]
PWS 120	170	110	120
PWS 200	170	130	120
PWS 330	170	150	140
PWS 400	170	180	140
PWS 650	170	180	180
PWS 900	170	180	180

Table 11: Recessing block dimensions

PWS installation

Installation instruction – precast plant

Reinforcement layout

Take care that the forces occurring are transmitted into the wall shoe by overlapping joints or a suitable reinforcement layout. The necessary reinforcement must be proven for each individual case and inserted on site. Fig. 15 shows an example of the relaying of forces within wall panels situated above one another.

The shear reinforcement (stirrups) required to absorb the deviation forces and splitting tensile forces occurring in the anchoring area is to be proven with a type-static calculation test according to EN 1992-1-1 and installed (figs. 16 & 17). Furthermore, take the reinforcement guidelines as well as the specifications for the minimum concrete cover according to EN 1992-1-1 into account.

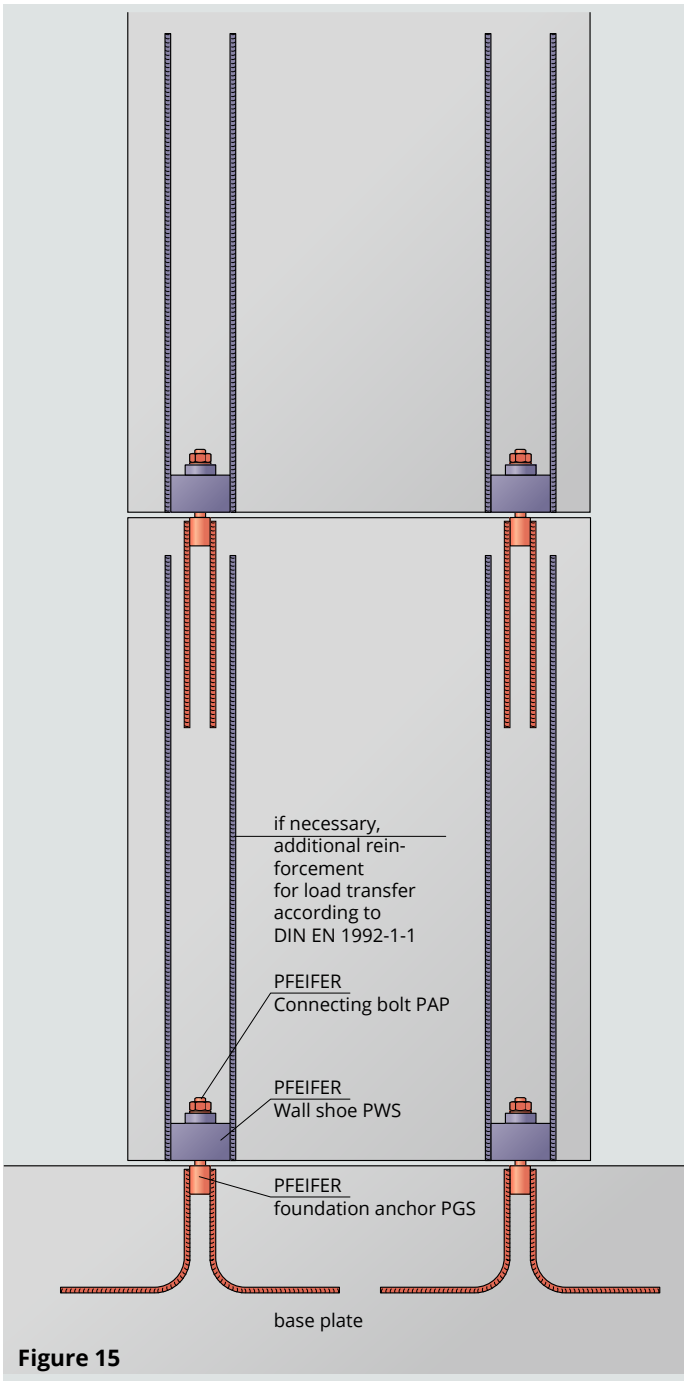


Figure 15

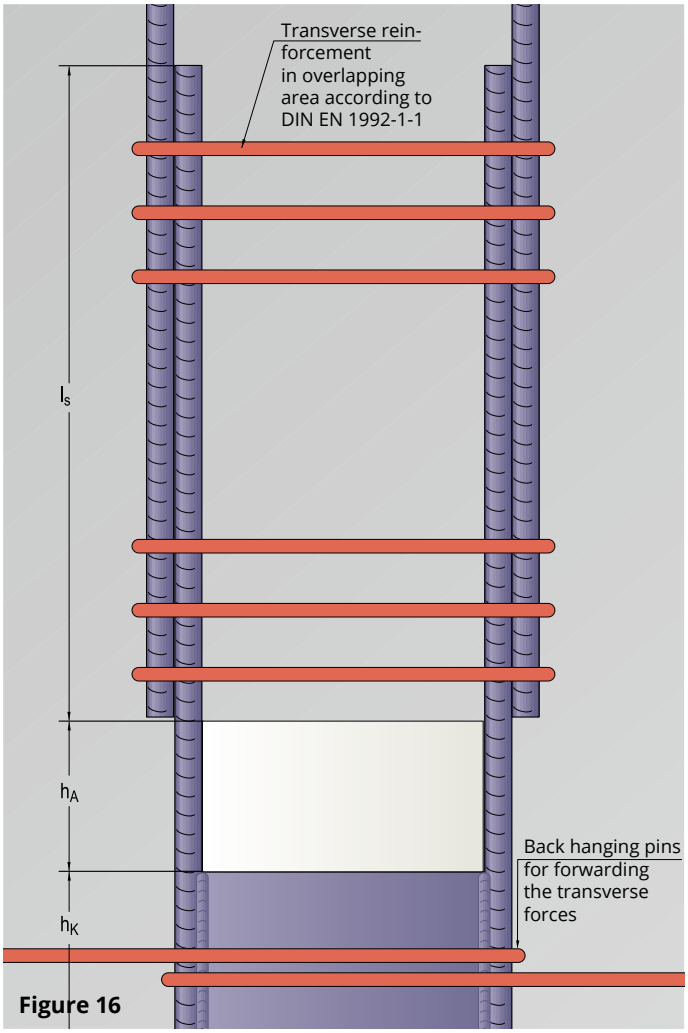


Figure 16

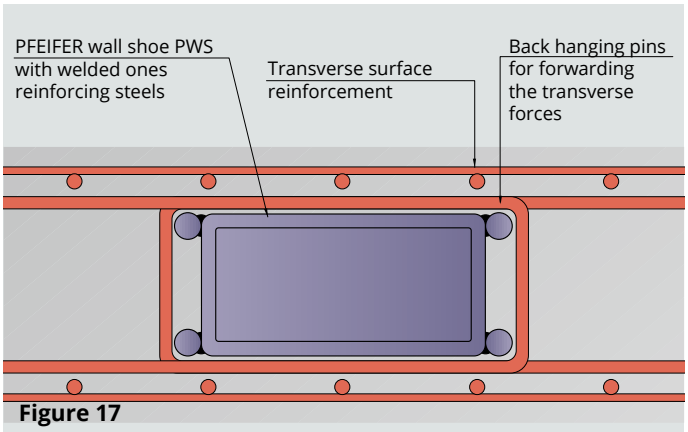


Figure 17

PWS assembly

Installation instructions – building site

The PWS Wall Shoes are provided with a marking band on the welded rebar. This provides information about the size or type of the wall shoe, the parts or reference number and the address of the manufacturer with all relevant data.

Figure 18: Identification of the Wall Shoe PWS

Installation of the wall elements

Shortly before the installation of the wall elements, the plastic caps or bolts inserted for protection are removed from the foundation anchor sleeve. The PFEIFER Connecting Bolt PAP is then screwed in. The screw-in depth in the foundation anchor is 2 x the thread diameter. With the help of shims, the precast wall elements are then positioned and aligned in their final position. After inserting the anchor plate, the nut can be tightened.

To reduce the deformations, the screwed connections should generally be pre-tensioned with 50% of the tightening values according to DIN 18800, Part 7. If necessary, lower or higher pre-tensioning forces can be planned by the engineer for individual applications.

Grouting

Grouting the recess

The additional grouting of the cavity in the wall shoe body with a free-flowing and low-shrinkage grouting concrete ensures the transmission of shear forces longitudinally to the joint. The high-strength, very free-flowing, self-compacting grouting mortar is to be used.

The grouting process must be carried out via the filling funnel as far as possible without interruption.

A reusable cover plate with filling funnel is available for the simple, fast and clean filling of the assembly recess. Lash the cover plate to the threaded bolt using a cable tie. After the hardening of the grout, simply cut the cable tie and re-use the sheet (figs. 19 & 20).

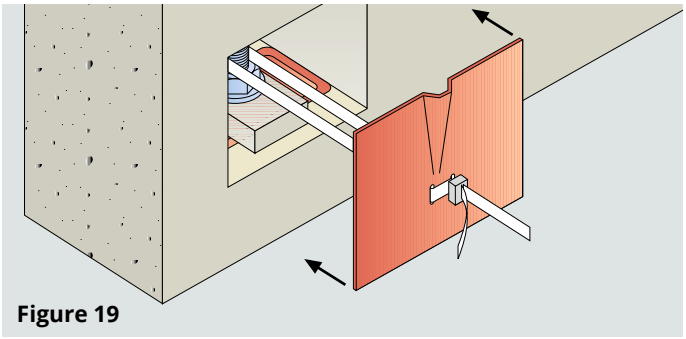


Figure 19

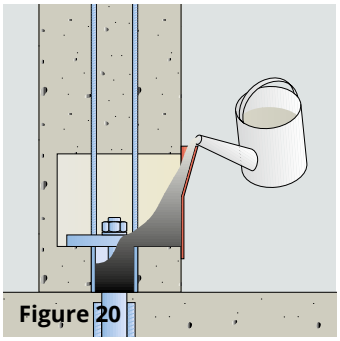
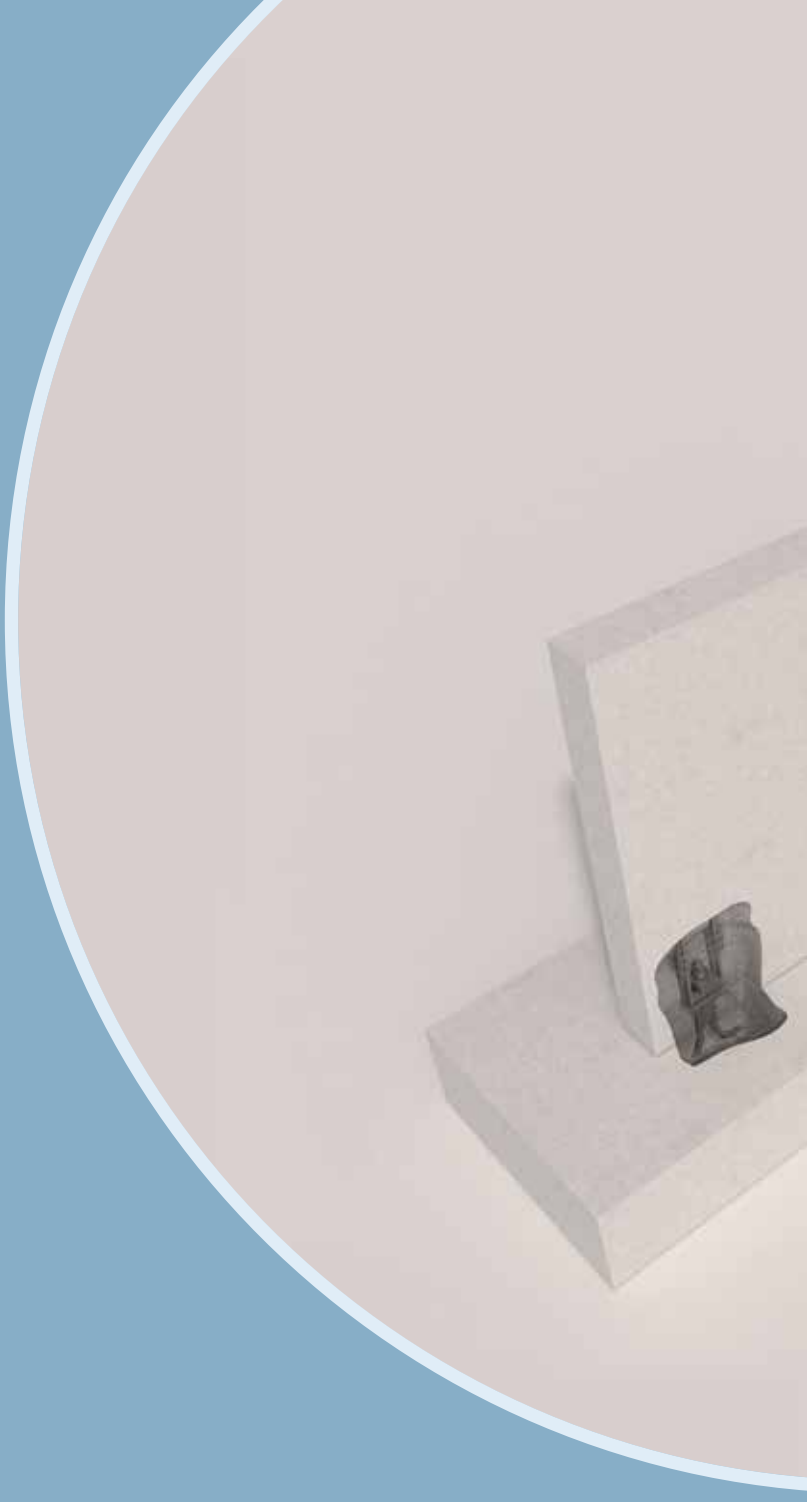


Figure 20



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