Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment

ETA-11/0288 of 15 January 2024

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	PFEIFER DB Anchor
Product family to which the construction product belongs	Cast-in anchor with internal threaded socket
Manufacturer	Pfeifer Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str. 66 87700 Memmingen
Manufacturing plant	Pfeifer Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str. 66 87700 Memmingen
This European Technical Assessment contains	26 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	330012-01-0601, Edition 12/2022
This version replaces	ETA-11/0288 issued on 30 November 2020

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Specific Part

1 Technical description of the product

The PFEIFER DB Anchor in the size of 12, 16, 20, 24 and 30 is an anchor consisting of an internal threaded socket pressed on a ribbed reinforcement bar. The socket is made of galvanised steel or stainless steel. The reinforcement bar may be waved (PFEIFER DB Waved Anchor) or may be straight with a head pressed on one end (PFEIFER DB Foot-Mounted Anchor). The anchor is imbedded surface-flush or sunk in the concrete. The anchorage is characterised by bond of the waved reinforcement bar or mechanical interlock at the head.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic values for tension loading under static and quasi-static actions	See Annex B3, B4, C1 and C2
Characteristic values for shear loading under static and quasi-static actions	See Annex C3 to C6
Characteristic values for seismic performance categories C1 and C2	See Annex C7 to C10

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 330012-01-0601, the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

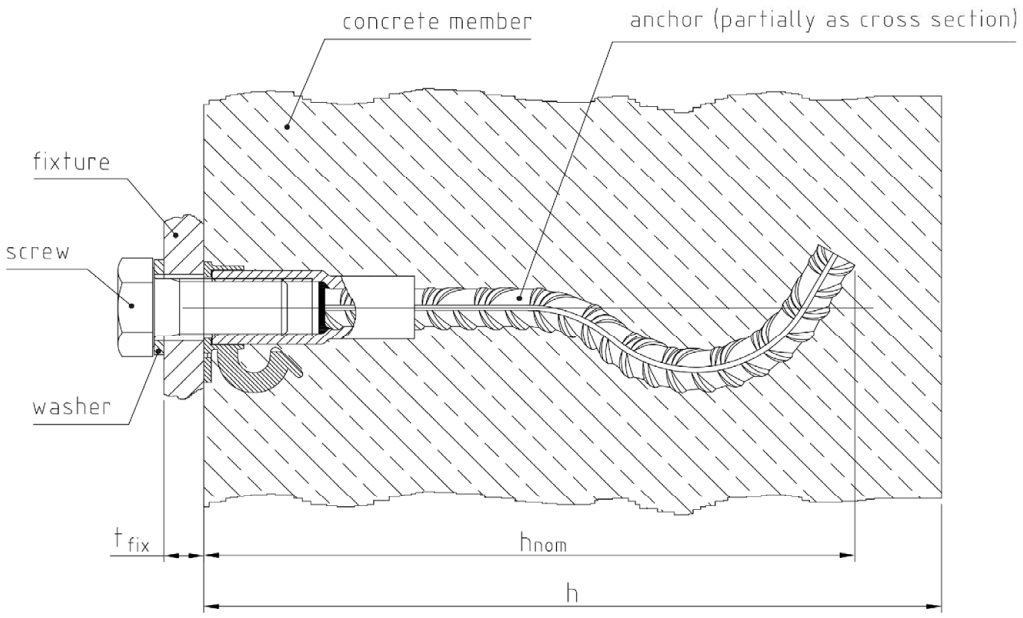
Issued in Berlin on 15 January 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

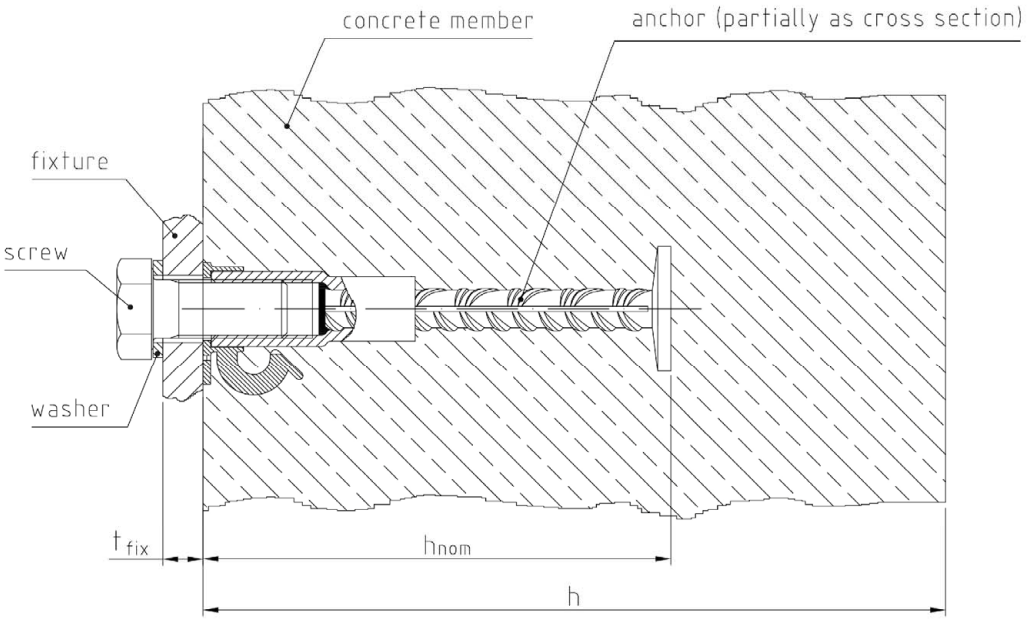
beglaubigt:
Müller

Deutsches Institut für Bautechnik DIBt

PFEIFER DB Waved Anchor

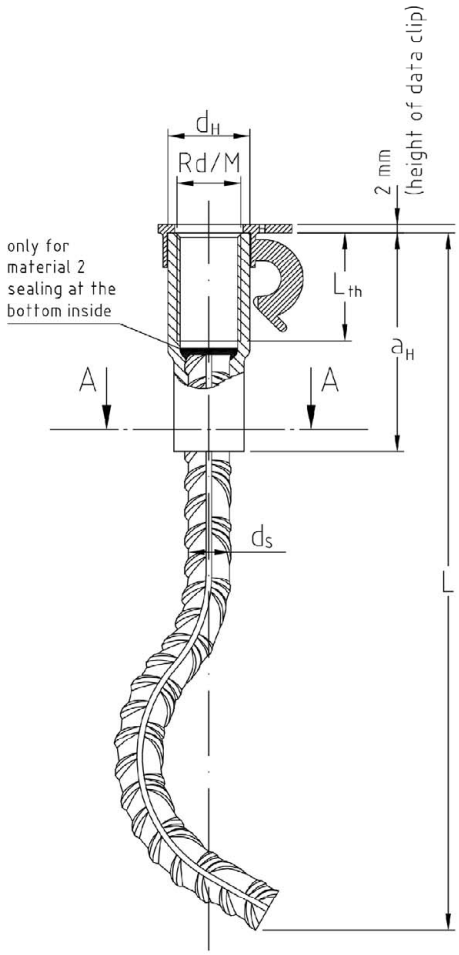


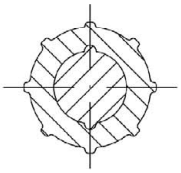
PFEIFER DB Foot-Mounted Anchor



h = thickness of concrete member
t_{fix} = thickness of fixture
h_{nom} = embedment depth

PFEIFER DB Anchor	**Annex A1**
Product description Installed condition	





A – A
(swaging area)

PFEIFER DB Waved Anchor made of two different materials:

Material 1: Socket galvanized steel (thickness ≥ 5 µm) or
Material 2: Socket stainless steel (1.4571)

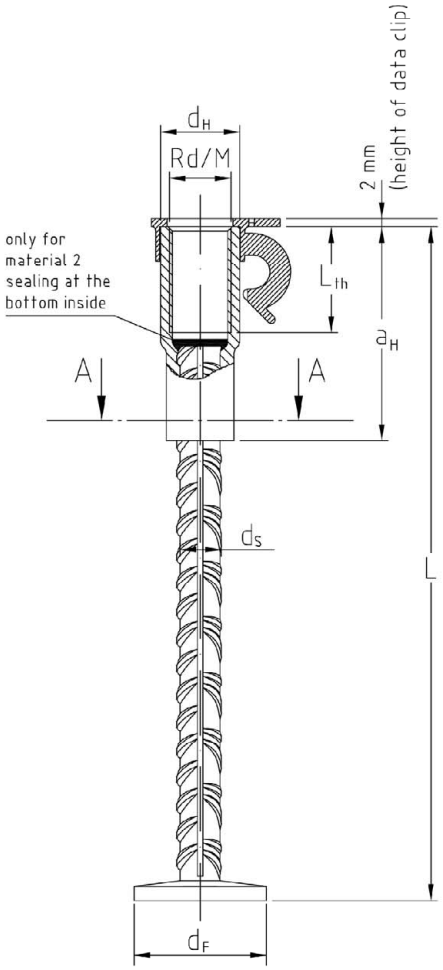
Table A1: **Dimensions PFEIFER DB Waved Anchor**

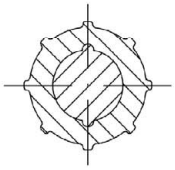
Waved Anchor	d_H		a_H	L_{th}	d_s	L
	Material 1	Material 2	Material 1 and Material 2			
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
Rd/M12	15,0	14,8	42,0	22	8	108
Rd/M16	21,0	21,6	56,5	27	12	172
Rd/M20	27,2	27,2	72,0	35	16	192
Rd/M24	31,0	31,0	82,0	43	16	250
Rd/M30	39,5	39,5	109,5	56	20	300

PFEIFER DB Anchor

Product description
Dimensions DB Waved Anchor

Annex A2





A – A
(swaging area)

PFEIFER DB Foot-Mounted Anchor made of two different materials:

Material 1: Socket galvanized steel (thickness ≥ 5 µm) or

Material 2: Socket stainless steel (1.4571)

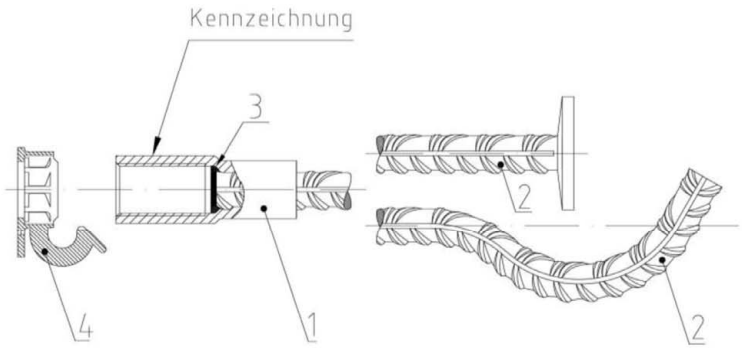
Table A2: **Dimensions PFEIFER DB Foot-Mounted Anchor**

Foot-Mounted Anchor	d_H		a_H	L_{th}	d_s	d_F	L
	Material 1	Material 2	Material 1 and Material 2				
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
Rd/M12	15,0	14,8	42,0	22	8	22 - 24	78
Rd/M16	21,0	21,6	56,5	27	12	30 - 36	118
Rd/M20	27,2	27,2	72,0	35	16	40 - 48	148
Rd/M24	31,0	31,0	82,0	43	16	40 - 48	178
Rd/M30	39,5	39,5	109,5	56	20	50 - 60	218

PFEIFER DB Anchor

Product description
Dimensions DB Foot-Mounted Anchor

Annex A3



Marking

e.g.: **PFEIFER Rd12 VA**

PFEIFER: Identifying mark of producer
alternatively: **P, PFEIFER DB**

Rd12: size

VA: socket of stainless steel
no marking: socket of galvanized steel

The illustration on the left side shows an anchor with Rd thread.
The marking of anchors with M thread is equivalent.

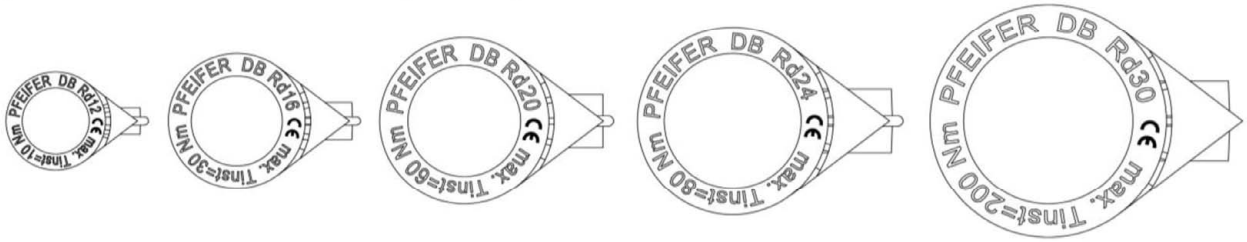
Table A3: **Specification and material of the anchor**

Item	Component	**Material 1** **galvanized steel**	**Material 2** **stainless steel**
1	Socket	steel E 355 +N (1.0580), S355J2+N (1.0577) according to EN 10025:2019, galvanized [1]	stainless steel 1.4571, 1.4401, 1.4404 according to EN 10088:2014 CRC III acc. to EN 1993-1-4:2006+A1:2015, Annex A
2	Reinforcement	B500A or B500B according to EN 1992-1-1:2004+AC:2010, Annex C, uncoated	
3	Sealing	not necessary	2-component-resin [2] / BLUE
4	Data Clip	DB Waved Anchor: Hostalen PPN 1060 RAL 7001 / grey DB Foot-Mounted Anchor: Hostalen PPN 1060 RAL 9010 / white	

Table A4: **Specification and material of appropriate components** (not included in scope of delivery)

Component	**Material** **associated with anchor of Material 1**	**Material** **associated with anchor of Material 2**
Washer	steel according to EN ISO 7089/7090:2000 ≥ 200 HV, galvanized [1]	stainless steel 1.4571, 1.4401, 1.4404 according to EN ISO 7089/7090:2000, ≥ 200 HV CRC III acc. to EN 1993-1-4:2006+A1:2015, Annex A
Screw	steel acc. to EN ISO 898-1:2013, galvanized [1], strength class 5.6 or 8.8	stainless steel according to EN ISO 3506-1:2009 strength class A4-50 or A4-70 CRC III acc. to EN 1993-1-4:2006+A1:2015, Annex A
Supplementary Reinforcement	B500A or B500B	reinforcing steel B500NR made of stainless steel
	geometry according to Annex A5 (plane installation) or Annex A6 (front-side installation)	

1) galvanizing with a plate thickness ≥ 5 µm according to EN ISO 2081:2018
2) front side of reinforcement bar covered/protected against corrosion



Front view of Data Clip for anchors with Rd thread. M thread equivalent.
Deviating identifying mark of producer (P) is possible.

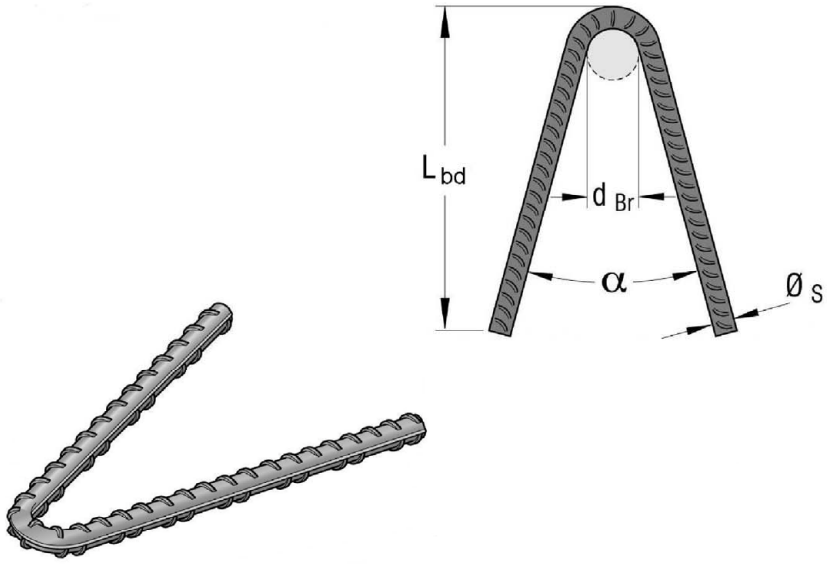
PFEIFER DB Anchor

Product description
Marking and materials

Annex A4

Table A5: **Dimensions of supplementary reinforcement for plane installation**

DB Waved Anchor / DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
reinforcement bar B500A, B500B or B500NR	$ø_S$	[mm]	6	8	10	12	12
anchorage length	L_{bd}	[mm]	330	440	550	660	660
mandrel diameter	d_{Br}	[mm]	24	32	40	48	48
spreading angle	α	[°]	30	30	30	30	30



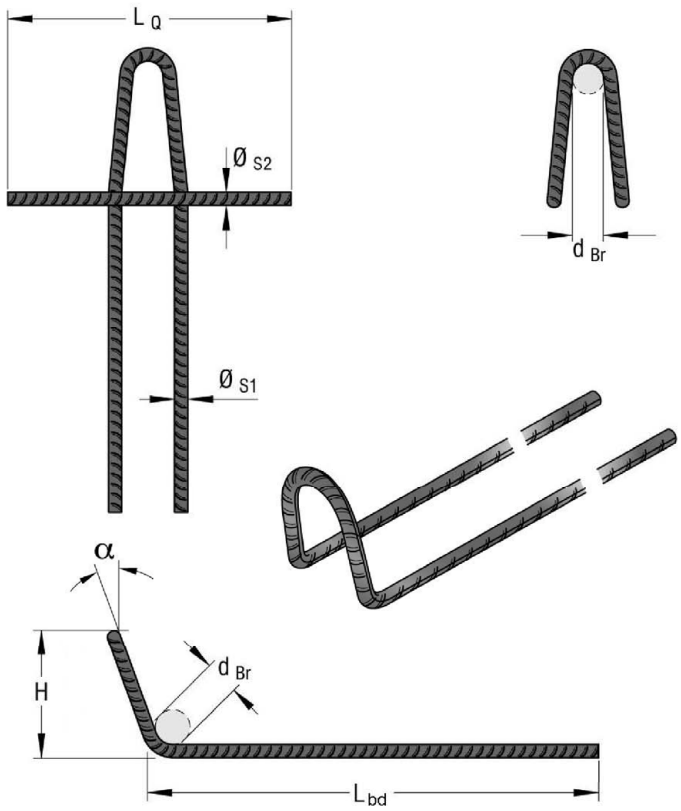
Note

The supplementary reinforcement has to be fixed directly onto the socket by using the data clip. If the anchors are not used under dry conditions (indoor) according to Annex B1, the additional reinforcement has to be made of stainless steel.

PFEIFER DB Anchor	**Annex A5**
Product description Supplementary reinforcement for plane installation with shear load	

Table A6: **Dimensions of supplementary reinforcement for front-side installation**

DB Waved Anchor / DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
reinforcement bar B500A, B500B or B500NR	$ø_{S1}$	[mm]	6	8	10	12	12
crossbar B500A, B500B or B500NR	$ø_{S2}$	[mm]	8	12	14	14	16
anchorage length	L_{bd}	[mm]	270	420	490	520	570
length of crossbar	L_Q	[mm]	280	400	490	550	580
hight	H	[mm]	40	55	70	80	105
mandrel diamater	d_{Br}	[mm]	24	32	40	48	48
spreading angle	α	[°]	15	15	15	15	15



Note

The supplementary reinforcement has to be fixed directly onto the socket by using the data clip. If the anchors are not used under dry conditions (indoor) according to Annex B1, the additional reinforcement has to be made of stainless steel.

PFEIFER DB Anchor	**Annex A6**
Product description Supplementary reinforcement for front-side installation with shear load	

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Specifications of intended use

Anchorages subject to

- Static and quasi-static loads: DB Foot-Mounted Anchor and DB Waved Anchor
- Seismic actions for performance categories C1 and C2: DB Foot-Mounted Anchor only

Base materials

- Reinforced or unreinforced, compacted normal weight concrete without fibres acc. to EN 206:2013+A1:2016
- Strength classes C20/25 to C50/60 acc. to EN 206:2013+A1:2016
- Cracked or uncracked concrete

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions
  (material 1 acc. Annex A4 only if the inner area of the socket is protected against water during installation)
- According to EN 1993-1-4:2006+A1:2015, Annex A relating to corrosion resistance class CRC III
  (material 2 acc. to Annex A4)

Design

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, orientating the data clip)
- Anchorages under static or quasi-static actions are designed in accordance with:
  - EN 1992-4:2018
- Anchorages under seismic actions (cracked concrete) are designed in accordance with:
  - EN 1992-4:2018
- Requirements for the screw:
  - Material in accordance with Annex A4
  - Strength class in accordance with Annex C1 and C3
  - Length in accordance with Annex B3 and required thickness of the fixture
- A supplementary reinforcement is chosen acc. to Annex A5 or A6, if resistances acc. to Annex C4 or C5 are applied.

PFEIFER DB Anchor	**Annex B1**
Intended Use Specifications	

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Installation

- Installation of anchors is carried out by appropriately qualified workers under supervision of the person responsible for technical matters on site
- Usage of anchors only as supplied by the manufacturer without any manipulation or exchanging of components
- Installation of anchors in accordance with manufacturer's specifications given in Annex B5 and Annex B6
- Anchors have to be fixed on the formwork so that no movement of the anchors will occur during the time of laying the reinforcement and of placing and compacting the concrete
- Concrete around anchors and especially under the heads of DB foot-mounted anchors has to be compacted properly
- Inner area of socket has to be protected against penetration of concrete
- Inner area of socket made of galvanised steel has to be protected against water
- Inner area of socket made of stainless steel has to be protected against oil
- Maximum installation torques and the minimum and maximum screw-in depth given in Annex B3 must not be exceeded
- Anchors may only be loaded in the direction shown by the data clip (arrow) if a supplementary reinforcement is used

PFEIFER DB Anchor	**Annex B2**
Intended Use Specifications	

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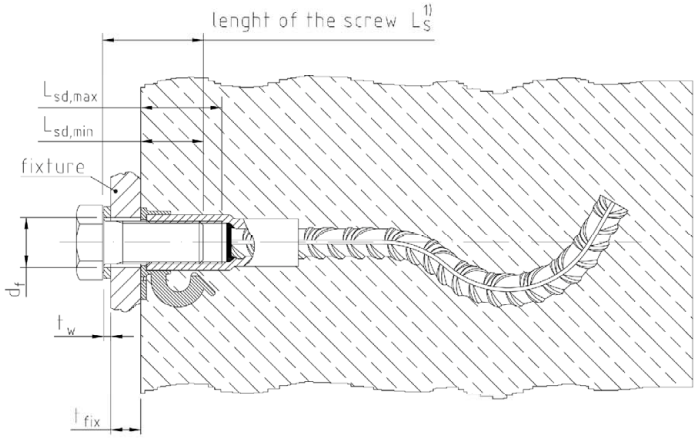
PFEIFER DB Foot-Mounted Anchor may be used analogue

Steel-to-data clip contact

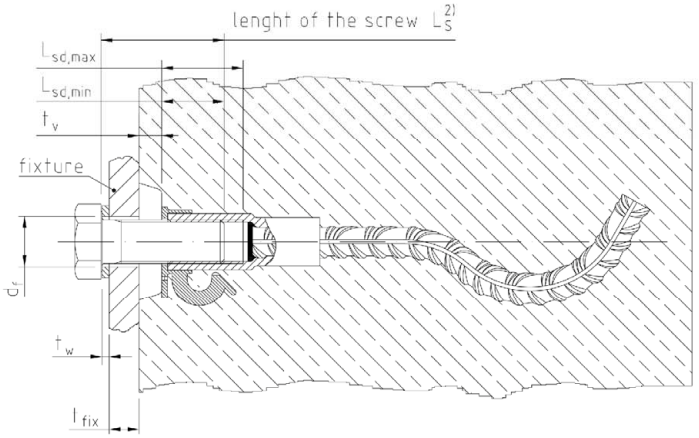
The fixture is braced directly to the anchor, eventually by using a suitable washer.



1) $t_w + t_{fix} + L_{sd,min} \leq L_s \leq t_w + t_{fix} + L_{sd,max}$

General application

The fixture is braced directly to the concrete while the anchor is either braced to the surface flush or sunk into to the concrete.



2) $t_w + t_{fix} + t_v + L_{sd,min} \leq L_s \leq t_w + t_{fix} + t_v + L_{sd,max}$

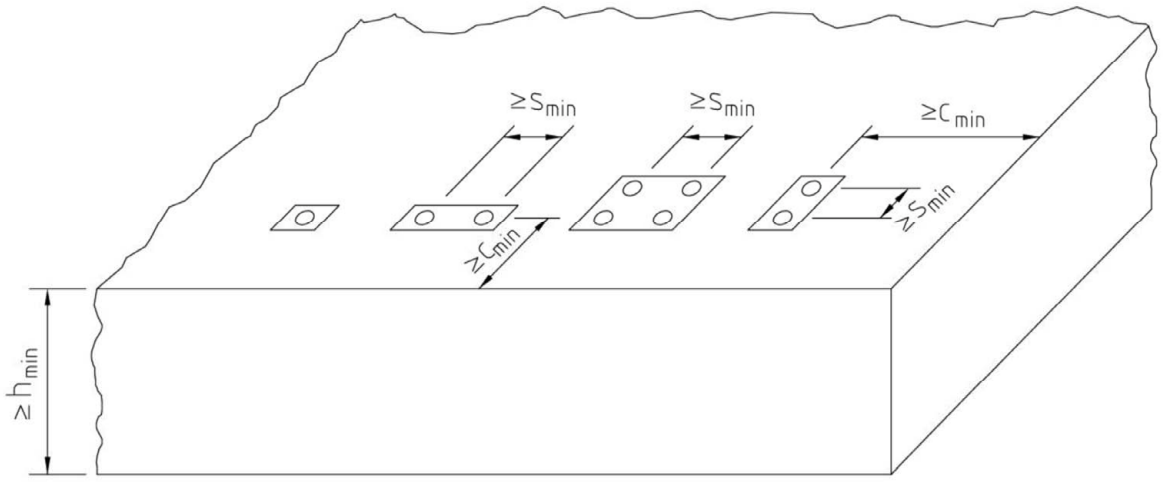
Table B1: **Installation parameters**

DB Waved Anchor / DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
appropriate size of screw		[mm]	M 12	M 16	M 20	M 24	M 30
maximum installation torque	max. T_{inst}	[Nm]	≤ 10	≤ 30	≤ 60	≤ 80	≤ 200
minimum screw-in depth	$L_{sd,min}$	[mm]	15	20	25	30	35
maximum screw-in depth	$L_{sd,max}$	[mm]	24	29	37	45	58
diameter of clearance hole in the fixture	d_f	[mm]	14	18	22	26	33

PFEIFER DB Anchor

Intended Use
Installation parameters

Annex B3



Spacing, edge distance and minimum thickness of concrete member apply also for anchors in front-side installation.

Table B2: **Minimum thickness of concrete member, minimum edge distance and minimum spacing**

DB Waved Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
minimum spacing	s_{min}	[mm]	100	120	140	160	200
minimum edge distance	c_{min}	[mm]	50	60	70	80	100
minimum thickness of concrete member [1)]	h_{min}	[mm]	130	200	220	290	340

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
minimum spacing	s_{min}	[mm]	120	150	180	200	240
minimum edge distance	c_{min}	[mm]	60	75	90	100	120
minimum thickness of concrete member [1)]	h_{min}	[mm]	100	140	170	210	250

1) $h \geq h_{nom} + c_{nom}$ c_{nom} acc. to EN 1992-1

PFEIFER DB Anchor	**Annex B4**
Intended Use Minimum spacings and edge distances, minimum thickness of concrete member	

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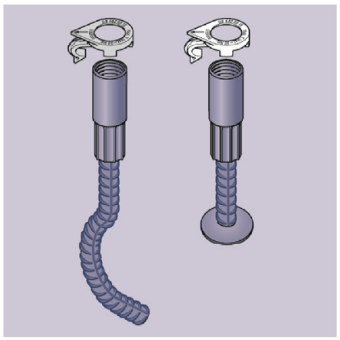
Installation instructions

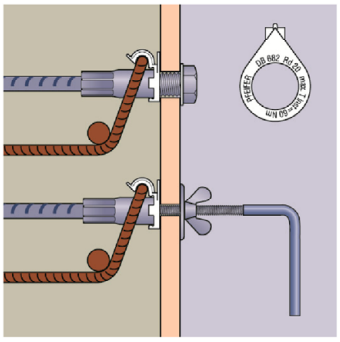
1. Components



1. PFEIFER DB Waved Anchor or PFEIFER DB Foot-Mounted Anchor with pressed on socket made of galvanized steel or stainless steel

2. PFEIFER Data Clip for DB Waved Anchor, colour: grey
   PFEIFER Data Clip for DB Foot-Mounted Anchor, colour: white

2. Fixing of the anchor at the formwork

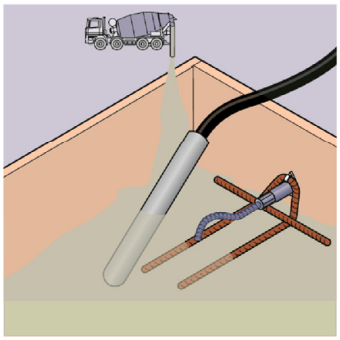


1. Put PFEIFER Data Clip onto the socket.

2. Fix anchor at the formwork by using PFEIFER accessories for shuttering or alternatively by means of a suitable screw.
   → Keep the correct adjustment of the DB anchor!
   → Avoid concrete penetration into the socket!
   → Galvanized socket: Avoid concrete penetration into the socket!

3. If required, fix supplementary reinforcement acc. to Annex A5 or A6 at the socket by PFEIFER Data Clip.
   → Supplementary reinforcement must be fixed close to the socket!

3. Pouring and compacting of concrete



1. Fill in concrete carefully, mind the fixed anchors!

2. Compact concrete properly, avoid contact between vibrating device and DB anchor resp. supplementary reinforcement.
   → Anchor must not be moved or damaged!

PFEIFER DB Anchor	Annex B5
Intended Use Installation instructions	

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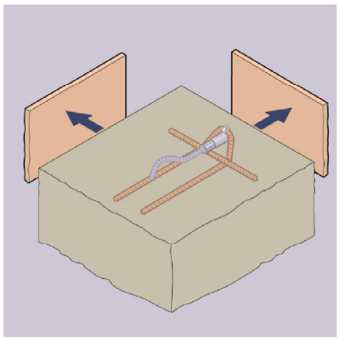
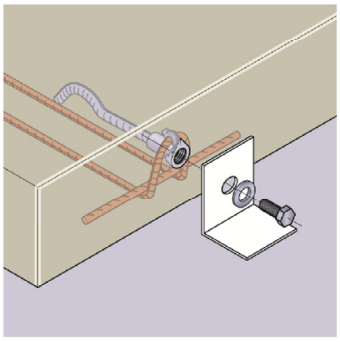
Installation instructions

4. Removal of shuttering



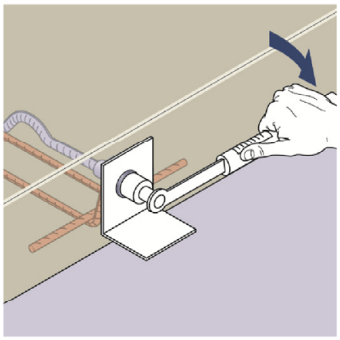
1. Remove accessories for shuttering.
2. Remove shuttering.
3. Check internal thread of DB Anchor. Clean the thread of the socket properly if concrete has been penetrated into.

5. Assembly of the fixture



1. Ensure, that the concrete has reached its designated strength.
2. Ensure, that the length of the screw is correct.
   → Maximum respectively minimum screw-in depth see Annex B3!
3. Assemble the fixture.
   → Use appropriate components acc. to Annex A4, Table A4!
   → Keep the maximum setting torques given below!
   → Note all additional information regarding the fixture!

6. Maximum installation torques



Maximum installation torques max. T_{inst}
for DB Waved Anchor / DB Foot-Mounted Anchor

Rd/M12	Rd/M16	Rd/M20	Rd/M24	Rd/M30
≤ 10 Nm	≤ 30 Nm	≤ 60 Nm	≤ 80 Nm	≤ 200 Nm

Table C1: **Characteristic resistances under tension load for static and quasi-static loads**

DB Waved Anchor / DB Foot-Mounted Anchor					**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Steel failure with galvanized sockets and screws (strength class 5.6)									
characteristic resistance			$N_{Rk,s}$	[kN]	31,1	78,5	122,5	110,6	172,8
partial factor			γ_{Ms} 1)	[-]	1,66	2,0		1,4	
Steel failure with galvanized sockets and screws (strength class 8.8)									
characteristic resistance			$N_{Rk,s}$	[kN]	31,1	71,2	130,8	110,6	172,8
partial factor			γ_{Ms} 1)	[-]	1,66			1,4	
Steel failure with sockets and screws made of stainless steel (strength class A4-50)									
characteristic resistance			$N_{Rk,s}$	[kN]	29,4	78,5	122,5	151,1	259,2
partial factor			γ_{Ms} 1)	[-]	2,93				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)									
characteristic resistance			$N_{Rk,s}$	[kN]	29,4	82,6	133,4	151,1	259,2
partial factor			γ_{Ms} 1)	[-]	2,93				
Pull-out failure $N_{Rk,p} = \psi_c \cdot N_{Rk,p(C20/25)}$									
cracked concrete	C20/25	Waved Anchor	$N_{Rk,p}$	[kN]	12	25	50	50	95
uncracked concrete	C20/25	Waved Anchor	$N_{Rk,p}$	[kN]	20	40	60	60	95
cracked concrete	C20/25	Foot-Mounted Anchor	$N_{Rk,p}$	[kN]	40	75	140	140	200
uncracked concrete	C20/25	Foot-Mounted Anchor	$N_{Rk,p}$	[kN]	50	115	200	200	300
increasing factor for $N_{Rk,p}$ in cracked or uncracked concrete $N_{Rk,p} = \psi_c \cdot N_{Rk,p(C20/25)}$		C30/37	ψ_c	[-]	1,22				
		C40/50	ψ_c	[-]	1,41				
		C50/60	ψ_c	[-]	1,58				
partial factor			γ_{Mp} 1)	[-]	1,50				
Concrete cone failure									
eff. embedment depth		Waved Anchor	h_{ef}	[mm]	54	95	127	140	194
eff. embedment depth		Foot-Mounted Anchor	h_{ef}	[mm]	78	116	145	175	215
factor to take into account the influence of the load transfer mechanism		Waved Anchor	$k_{cr,N}$	[-]	8,0				
			$k_{ucr,N}$	[-]	11,2				
		Foot-Mounted Anchor	$k_{cr,N}$	[-]	8,9				
			$k_{ucr,N}$	[-]	12,7				
characteristic spacing			$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$				
characteristic edge distance			$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$				
partial factor			γ_{Mc} 1)	[-]	1,50				
Splitting $N^0_{Rk,Sp} = \min. (N^0_{Rk,c}$ 2); $N_{Rk,p})$									
eff. embedment depth		Waved Anchor	h_{ef}	[mm]	54	95	127	140	194
characteristic spacing		Waved Anchor	$s_{cr,sp}$	[mm]	232	354	368	556	706
characteristic edge distance		Waved Anchor	$c_{cr,sp}$	[mm]	116	177	184	278	353
eff. embedment depth		Foot-Mounted Anchor	h_{ef}	[mm]	78	116	145	175	215
characteristic spacing		Foot-Mounted Anchor	$s_{cr,sp}$	[mm]	300	460	480	780	900
characteristic edge distance		Foot-Mounted Anchor	$c_{cr,sp}$	[mm]	150	230	240	390	450
partial factor			γ_{Msp} 1)	[-]	1,50				

1) In absence of other national regulations
2) with $N^0_{Rk,c}$ acc. to EN 1992-4:2018

PFEIFER DB Anchor

Performances
Characteristic resistances under tension load for static and quasi-static loads

Annex C1

Table C2: **Displacements under tension load for static and quasi-static loads**

DB Waved Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Displacements under tension load (material 1 or material 2)							
tension load in cracked concrete	N	[kN]	5,7	11,9	23,8	23,8	45,2
short term displacement	δ_{N0}	[mm]	0,6	1,6	1,4	1,3	1,2
long term displacement	$\delta_{N\infty}$	[mm]	1,0	1,9	1,5	1,2	0,9
tension load in uncracked concrete	N	[kN]	9,5	19,1	28,6	28,6	45,2
short term displacement	δ_{N0}	[mm]	0,8	1,7	1,5	1,4	1,2
long term displacement	$\delta_{N\infty}$	[mm]	1,0	1,9	1,5	1,2	0,9

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Displacements under tension load (material 1 or material 2)							
tension load in cracked concrete	N	[kN]	5,7	11,9	23,8	23,8	45,2
short term displacement	δ_{N0}	[mm]	0,1	0,1	0,2	0,2	0,2
long term displacement	$\delta_{N\infty}$	[mm]	0,2	0,2	0,4	0,4	0,4
tension load in uncracked concrete	N	[kN]	9,5	19,1	28,6	28,6	45,2
short term displacement	δ_{N0}	[mm]	0,1	0,2	0,1	0,2	0,2
long term displacement	$\delta_{N\infty}$	[mm]	0,2	0,4	0,2	0,4	0,4

Table C3: **Characteristic resistances under shear load for static and quasi-static loads**

DB Waved Anchor / DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Shear load without lever arm							
group factor (EN 1992-4, 7.2.2.3.1)	k_7	[-]	1,0				
Steel failure with galvanized sockets and screws (strength class 5.6)							
characteristic resistance	$V_{Rk,s}$	[kN]	15,5	39,2	61,3	88,3	140,3
partial factor	γ_{Ms} 1)	[-]	1,38	1,67			
Steel failure with galvanized sockets and screws (strength class 8.8)							
characteristic resistance	$V_{Rk,s}$	[kN]	15,5	35,6	65,3	74,1	127,0
partial factor	γ_{Ms} 1)	[-]	1,38				
Steel failure with sockets and screws made of stainless steel (strength class A4-50)							
characteristic resistance	$V_{Rk,s}$	[kN]	14,7	39,2	61,3	75,5	129,6
partial factor	γ_{Ms} 1)	[-]	2,44				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)							
characteristic resistance	$V_{Rk,s}$	[kN]	14,7	41,3	66,7	75,5	129,6
partial factor	γ_{Ms} 1)	[-]	2,44				
Shear load with lever arm							
Steel failure with galvanized sockets and screws (strength class 5.6)							
characteristic resistance	$M^0_{Rk,s}$	[Nm]	65	166	324	560	1123
partial factor	γ_{Ms} 1)	[-]	1,67				
Steel failure with galvanized sockets and screws (strength class 8.8)							
characteristic resistance	$M^0_{Rk,s}$	[Nm]	115	266	519	896	1797
partial factor	γ_{Ms} 1)	[-]	1,38	1,25			
Steel failure with sockets and screws made of stainless steel (strength class A4-50)							
characteristic resistance	$M^0_{Rk,s}$	[Nm]	65	166	324	560	1123
partial factor	γ_{Ms} 1)	[-]	2,44				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)							
characteristic resistance	$M^0_{Rk,s}$	[Nm]	108	232	454	1123	2422
partial factor	γ_{Ms} 1)	[-]	2,44	1,56		2,44	
Concrete pry-out Failure							
factor	k_8	[-]	1,0	2,0			
partial factor	γ_{Mcp} 1)	[-]	1,50				
Concrete edge failure (without supplementary reinforcement)							
effective length of anchor	l_f	[mm]	42,0	56,5	72,0	82,0	109,5
outside diameter of anchor	d_{nom}	[mm]	15,0	21,0	25,0	25,0	25,0
partial factor	γ_{Mce} 1)	[-]	1,50				

1) In absence of other national regulations

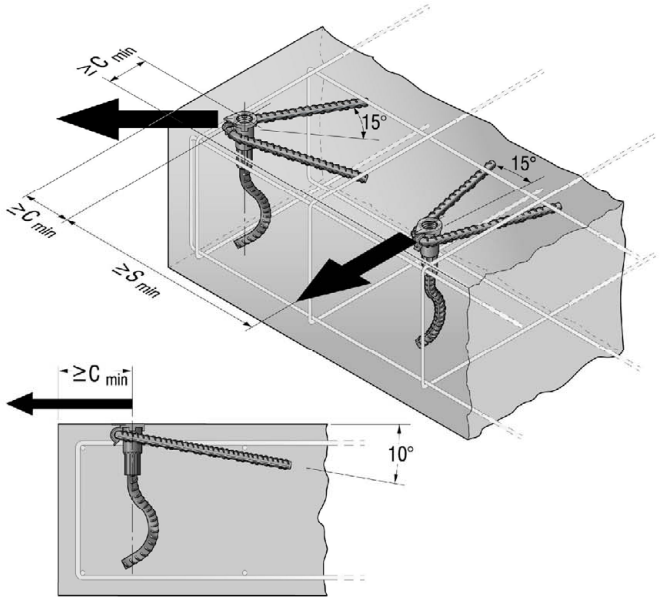
Table C4: **Characteristic resistances under shear load for static and quasi-static loads due to failure of supplementary reinforcement for plane installation**

DB Waved Anchor / DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
characteristic resistance of the supplementary reinforcement for plane installation	$V_{Rk,c,re}$	[kN]	13,5	23,9	37,4	53,8	53,8
corresponding partial factor	$\gamma_{Ms,re}$ 1)	[-]	1,15				

DB Waved Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
minimum spacing	s_{min}	[mm]	100	120	140	160	200
minimum edge distance 2)	c_{min}	[mm]	50	60	70	80	100

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
minimum spacing	s_{min}	[mm]	120	150	180	200	240
minimum edge distance 2)	c_{min}	[mm]	60	75	90	100	120

1) In absence of other national regulations
2) The edge distance has to be defined with regard to the concrete cover c_{nom} according to EN 1992-1



Note

Supplementary reinforcement for plane installation may only be used for forces in direction of the arrows given above. The reinforcement has to be arranged symmetrically to the direction of the force.

The supplementary reinforcement has to be fixed directly onto the socket by using the data clip. If the anchors are not used under dry conditions (indoor) according to Annex B1, the additional reinforcement has to be made of stainless steel.

This information also applies for DB Foot-Mounted Anchor.

PFEIFER DB Anchor	**Annex C4**
Performances Characteristic resistances under shear load for static and quasi-static loads with supplementary reinforcement and plane installation	

Table C5: **Characteristic resistances under shear load for static and quasi-static loads due to failure of supplementary reinforcement for front-side installation**

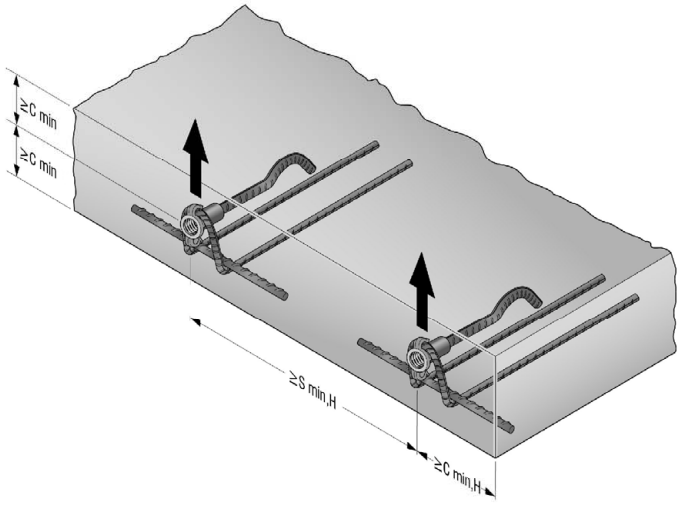
DB Waved Anchor / DB Foot mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
characteristic resistance of the supplementary reinforcement for front-side installation	$V_{Rk,c,re}$	[kN]	5,7	17,6	27,5	39,6	43,0
partial factor	$\gamma_{Ms,re}$ 1)	[-]	1,8				

minimum spacing	$s_{min,H}$	[mm]	280	400	490	550	580
min. edge distance parallel to the plane	$c_{min,H}$	[mm]	= L_Q / 2 + c_{nom} 2)				

DB Waved Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
min edge distance perpendicular to the plane	c_{min}	[mm]	50	60	70	80	100

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
min edge distance perpendicular to the plane	c_{min}	[mm]	60	75	90	100	120

1) In absence of other national regulations
2) Dimensions L_Q according to Annex A6



Note

Supplementary reinforcement for the front-side installation may only be used for forces in direction of the arrows given above. The reinforcement has to be arranged symmetrically to the direction of the force.

The supplementary reinforcement has to be fixed directly onto the socket by using the data clip. If the anchors are not used under dry conditions (indoor) according to Annex B1, the additional reinforcement has to be made of stainless steel.

This information also applies for DB Foot-Mounted Anchor.

Combined tension and shear load	
The exponent k_{11} is for combined tension and shear load acc. to EN 1992-4:2018, section 7.2.3.2:	k_{11} = 2/3

PFEIFER DB Anchor

Performances
Characteristic resistances under shear load for static and quasi-static loads with supplementary reinforcement and front-side installation

Annex C5

Table C6: **Displacements under shear load for static and quasi-static loads**

DB Waved Anchor / DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Displacement under shear load <u>without</u> supplementary reinforcement with galvanized sockets and screws (strength class 5.6)							
shear load in cracked and uncracked concrete	V	[kN]	8,1	16,8	26,2	37,7	60,0
short term displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long term displacement	$\delta_{V\infty}$	[mm]	3,0	3,0	4,5	4,5	6,0
Displacement under shear load <u>without</u> supplementary reinforcement with galvanized sockets and screws (strength class 8.8)							
shear load in cracked and uncracked concrete	V	[kN]	8,1	18,4	33,8	38,3	65,8
short term displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long term displacement	$\delta_{V\infty}$	[mm]	3,0	3,0	4,5	4,5	6,0
Displacement under shear load <u>without</u> supplementary reinforcement with sockets and screws made of stainless steel (strenght class A4-50)							
shear load in cracked and uncracked concrete	V	[kN]	4,3	11,4	17,9	22,1	38,0
short term displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long term displacement	$\delta_{V\infty}$	[mm]	3,0	3,0	4,5	4,5	6,0
Displacement under shear load <u>without</u> supplementary reinforcement with sockets and screws made of stainless steel (strength class A4-70)							
shear load in cracked and uncracked concrete	V	[kN]	4,3	12,1	19,5	22,1	38,0
short term displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long term displacement	$\delta_{V\infty}$	[mm]	3,0	3,0	4,5	4,5	6,0
Displacement under shear load <u>with</u> supplementary reinforcement according to Annex A5 (plane installation)							
shear load in cracked and uncracked concrete	V_S	[kN]	8,4	14,8	23,2	33,4	33,4
short term displacement	δ_{V0}	[mm]	1,5	1,5	2,0	2,0	2,0
long term displacement	$\delta_{V\infty}$	[mm]	2,0	2,3	2,6	2,7	2,7
Displacement under shear load <u>with</u> supplementary reinforcement according to Annex A6 (front-side installation)							
shear load in cracked and uncracked concrete	V_Q	[kN]	2,3	7,0	10,9	15,7	17,1
short term displacement	δ_{V0}	[mm]	1,0	1,4	1,6	1,8	2,0
long term displacement	$\delta_{V\infty}$	[mm]	1,5	2,1	2,4	2,7	3,0

PFEIFER DB Anchor

Performances
Displacements under shear load for static and quasi-static loads

Annex C6

Table C7: **Characteristic values of resistance for DB Foot-Mounted Anchor under tension load for seismic performance category C1**

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Steel failure with galvanized sockets and screws (strength class 5.6)							
characteristic resistance	$N_{Rk,s,eq,C1}$	[kN]	31,1	78,5	122,5	110,6	172,8
partial factor	$\gamma_{Ms,eq}$	[-]	1,66	2,0		1,4	
Steel failure with galvanized sockets and screws (strength class 8.8)							
characteristic resistance	$N_{Rk,s,eq,C1}$	[kN]	31,1	71,2	130,8	110,6	172,8
partial factor	$\gamma_{Ms,eq}$	[-]	1,66			1,4	
Steel failure with sockets and screws made of stainless steel (strength class A4-50)							
characteristic resistance	$N_{Rk,s,eq,C1}$	[kN]	29,4	78,5	122,5	151,1	259,2
partial factor	$\gamma_{Ms,eq}$	[-]	2,93				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)							
characteristic resistance	$N_{Rk,s,eq,C1}$	[kN]	29,4	82,6	133,4	151,1	259,2
partial factor	$\gamma_{Ms,eq}$	[-]	2,93				
Pull-out failure							
characteristic resistance in cracked concrete	$N_{Rk,p,eq,C1}$	[kN]	$N_{Rk,c}$ according to Annex C1				
partial factor	$\gamma_{Mp,eq}$	[-]	1,5				

PFEIFER DB Anchor

Performances
Characteristic values of resistance for DB Foot-Mounted Anchor under tension load for seismic performance category C1

Annex C7

Table C8: **Characteristic resistances for DB Foot-Mounted Anchor under shear load for seismic performance category C1**

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Steel failure with galvanized sockets and screws (strength class 5.6)							
characteristic resistance	$V_{Rk,s,eq,C1}$	[kN]	15,5	39,2	61,3	88,3	140,3
partial factor	$\gamma_{Ms,eq}$	[-]	1,38	1,67			
Steel failure with galvanized sockets and screws (strength class 8.8)							
characteristic resistance	$V_{Rk,s,eq,C1}$	[kN]	15,5	35,6	65,3	74,1	127,0
partial factor	$\gamma_{Ms,eq}$	[-]	1,38				
Steel failure with sockets and screws made of stainless steel (strength class A4-50)							
characteristic resistance	$V_{Rk,s,eq,C1}$	[kN]	14,7	39,2	61,3	75,5	129,6
partial factor	$\gamma_{Ms,eq}$	[-]	2,44				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)							
characteristic resistance	$V_{Rk,s,eq,C1}$	[kN]	14,7	41,3	66,7	75,5	129,6
partial factor	$\gamma_{Ms,eq}$	[-]	2,44				

Reduction factor to take into account inertia effects due to an annular gap between fastener and fixture:

Connections with hole clearance acc. to EN 1992-4:2018, Table 6.1: α_{gap} = 0,5 [-]

Connections without hole clearance: α_{gap} = 1,0 [-]

PFEIFER DB Anchor	**Annex C8**
Performances Characteristic resistances for DB Foot-Mounted Anchor under shear load for seismic performance category C1	

Table C9: **Characteristic resistances for DB Foot-Mounted Anchor under tension load for seismic performance category C2**

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Steel failure with galvanized sockets and screws (strength class 5.6)							
characteristic resistance	$N_{Rk,s,eq,C2}$	[kN]	31,1	78,5	122,5	110,6	172,8
partial factor	$\gamma_{Ms,eq}$	[-]	1,66	2,0		1,4	
Steel failure with galvanized sockets and screws (strength class 8.8)							
characteristic resistance	$N_{Rk,s,eq,C2}$	[kN]	31,1	71,2	130,8	110,6	172,8
partial factor	$\gamma_{Ms,eq}$	[-]	1,66			1,4	
Steel failure with sockets and screws made of stainless steel (strength class A4-50)							
characteristic resistance	$N_{Rk,s,eq,C2}$	[kN]	29,4	78,5	122,5	151,1	259,2
partial factor	$\gamma_{Ms,eq}$	[-]	2,93				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)							
characteristic resistance	$N_{Rk,s,eq,C2}$	[kN]	29,4	82,6	133,4	151,1	259,2
partial factor	$\gamma_{Ms,eq}$	[-]	2,93				
Pull-out failure							
characteristic resistance in cracked concrete	$N_{Rk,p,seis}$	[-]	$N_{Rk,c}$ according to Annex C1				
partial factor	$\gamma_{Mp,eq}$	[-]	1,5				

Table C10: **Displacements for DB Foot-Mounted Anchor under tension load for seismic performance category C2**

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Displacements							
displacement for Damage Limitation State (DLS)	$\delta_{N,eq,C2}$	[mm]	1,00	1,34	0,88	1,52	1,22
displacement for Ultimate Limit State (ULS)	$\delta_{N,eq,C2}$	[mm]	2,79	3,73	2,36	4,14	3,20

PFEIFER DB Anchor

Performances
Characteristic resistances and displacements for DB Foot-Mounted Anchor under tension load for seismic performance category C2

Annex C9

Table C11: **Characteristic resistances for DB Foot-Mounted Anchor under shear load for seismic performance category C2**

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Steel failure with galvanized sockets and screws (strength class 5.6)							
characteristic resistance	$V_{Rk,s,eq,C2}$	[kN]	15,5	39,2	61,3	88,3	140,3
partial factor	$\gamma_{Ms,eq}$	[-]	1,38	1,67			
Steel failure with galvanized sockets and screws (strength class 8.8)							
characteristic resistance	$V_{Rk,s,eq,C2}$	[kN]	15,5	35,6	65,3	74,1	127,0
partial factor	$\gamma_{Ms,eq}$	[-]	1,38				
Steel failure with sockets and screws made of stainless steel (strength class A4-50)							
characteristic resistance	$V_{Rk,s,eq,C2}$	[kN]	14,7	39,2	61,3	75,5	129,6
partial factor	$\gamma_{Ms,eq}$	[-]	2,44				
Steel failure with sockets and screws made of stainless steel (strength class A4-70)							
characteristic resistance	$V_{Rk,s,eq,C2}$	[kN]	14,7	41,3	66,7	75,5	129,6
partial factor	$\gamma_{Ms,eq}$	[-]	2,44				

Table C12: **Displacements for DB Foot-Mounted Anchor under shear load for seismic performance category C2**

DB Foot-Mounted Anchor			**Rd/M12**	**Rd/M16**	**Rd/M20**	**Rd/M24**	**Rd/M30**
Displacements							
displacement for Damage Limitation State (DLS)	$\delta_{V,eq,C2}$	[mm]	3,78	4,46	5,33	4,88	5,65
displacement for Ultimate Limit State (ULS)	$\delta_{V,eq,C2}$	[mm]	5,54	6,88	5,58	8,04	9,68