Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-11/0288 of 10 September 2016

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-System
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	22 pages including 18 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	European Assessment Document (EAD) 330012-00-0601

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Specific Part

1 Technical description of the product

The PFEIFER-DB-Anchor-System in the size of Rd12, Rd16, Rd20, Rd24 and Rd30 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 Waved Anchor DB 682) or may be straight with a head pressed on one end (PFEIFER Foot-Mounted Anchor DB 682). 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 resistance for static and quasi-static loads and displacements	See Annex C1 to C6

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1

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

In accordance with EAD No. 330012-00-0601, 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.

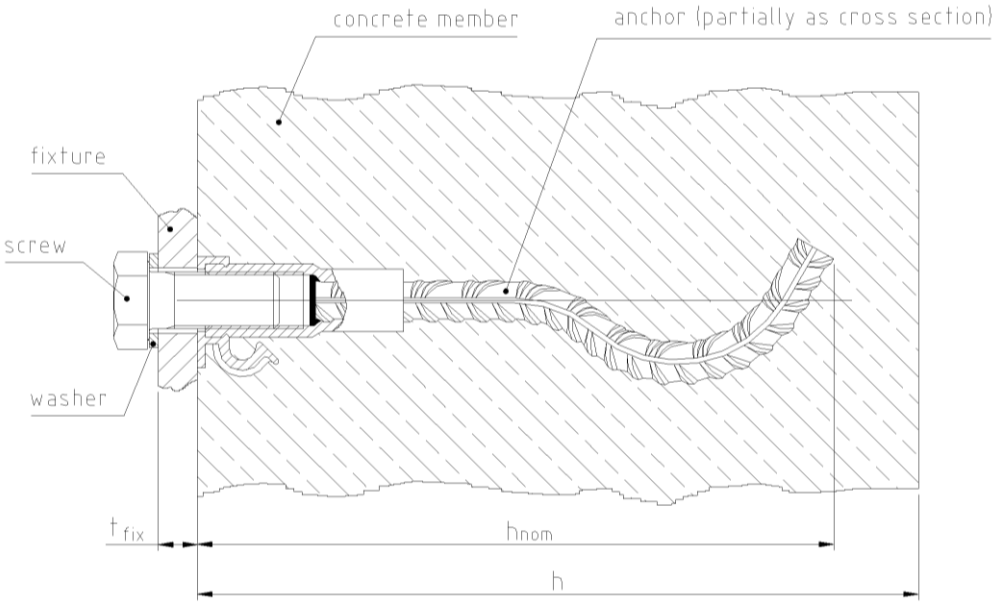
Issued in Berlin on 10 September 2016 by Deutsches Institut für Bautechnik

Andreas Kummerow
p. p. Head of Department

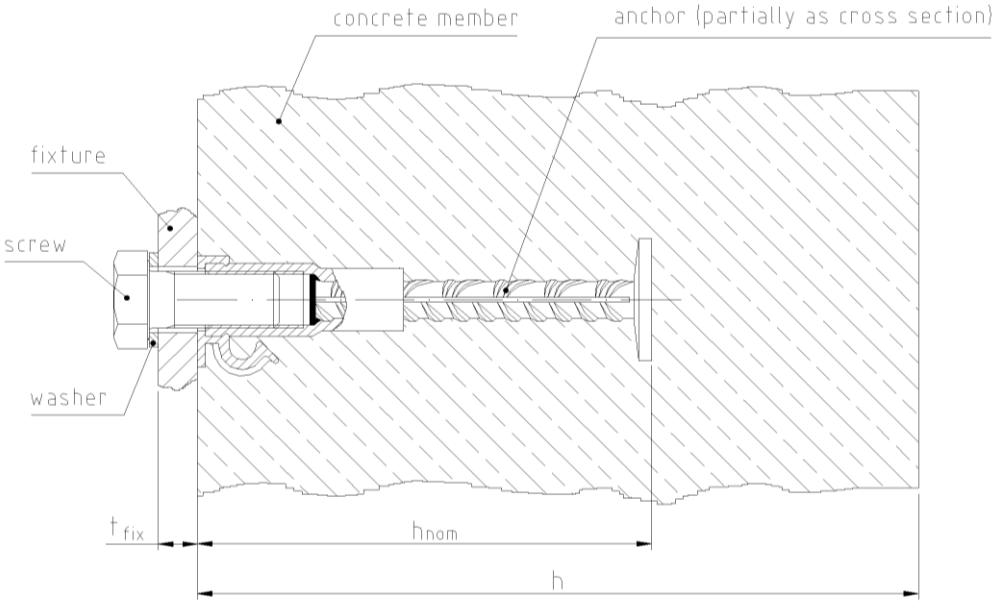
beglaubigt:
Müller

Deutsches Institut für Bautechnik DIBt

PFEIFER Waved Anchor DB 682



PFEIFER Foot-Mounted Anchor DB 682

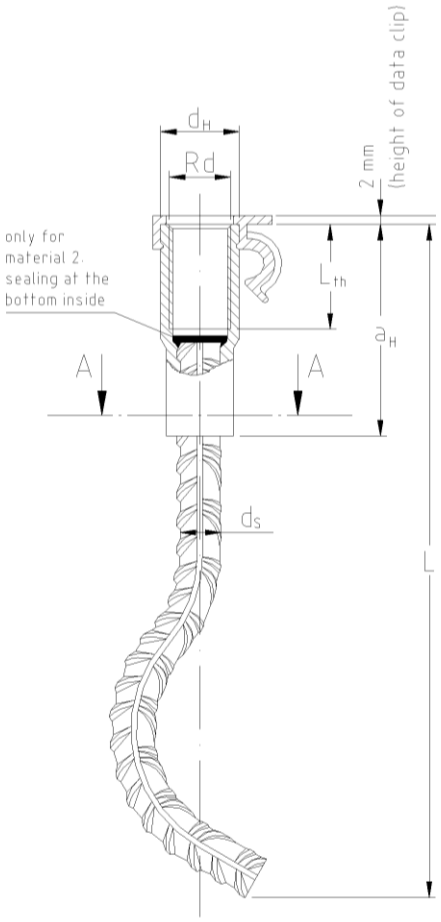


h = thickness of concrete member
t_{fix} = thickness of fixture
h_{nom} = embedment depth

PFEIFER-DB-Anchor-System

Product description
Installed condition

Annex A1



PFEIFER Waved Anchor DB 682 made of two different materials:

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

Material 2: Socket stainless steel (1.4571)

Table A1: **Dimensions of PFEIFER Waved Anchor DB 682**

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]
Rd12	15,0	14,8	42,0	22	8	108
Rd16	21,0	21,6	56,5	27	12	172
Rd20	27,2	27,2	72,0	35	16	192
Rd24	31,0	31,0	82,0	43	16	250
Rd30	39,5	39,5	109,5	56	20	300

PFEIFER-DB-Anchor-System

Product description
Dimensions Waved Anchor DB 682

Annex A2

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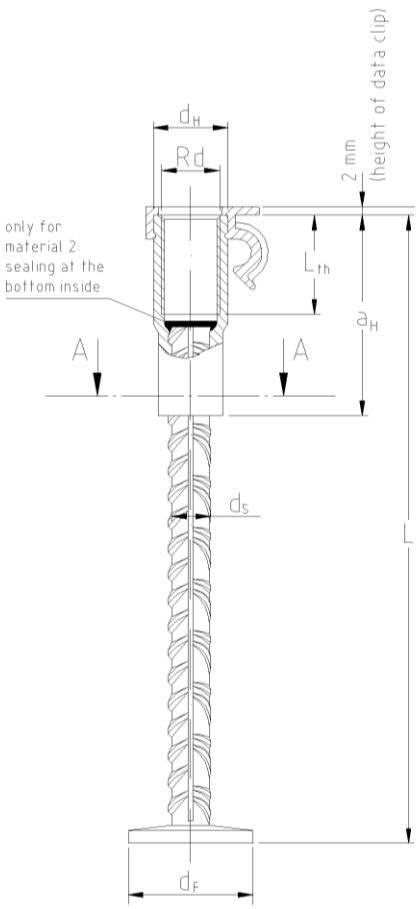


PFEIFER Foot-Mounted Anchor DB 682 made of two different materials:

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

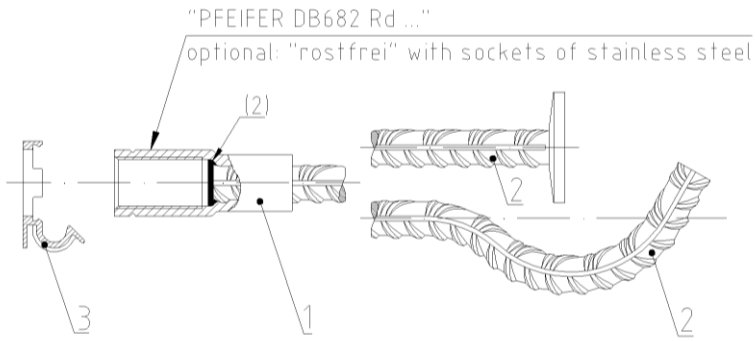
Table A2: **Dimensions of PFEIFER Foot-Mounted Anchor DB 682**

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]
Rd12	15,0	14,8	42,0	22	8	20 - 24	78
Rd16	21,0	21,6	56,5	27	12	30 - 36	118
Rd20	27,2	27,2	72,0	35	16	40 - 48	148
Rd24	31,0	31,0	82,0	43	16	40 - 48	178
Rd30	39,5	39,5	109,5	56	20	50 - 60	218

PFEIFER-DB-Anchor-System

Product description
Dimensions Foot-Mounted Anchor DB 682

Annex A3



Marking
e.g.: PFEIFER DB 682 Rd12

PFEIFER:	Identifying mark of the producer
DB 682:	Name of the anchor
Rd12:	Size

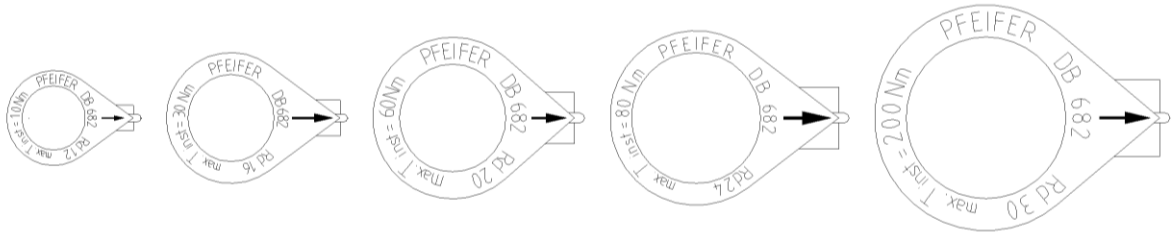
Table A3: **Specification and material of the anchor**

Item	Component	Material 1 galvanized steel	Material 2 stainless steel
1	Socket	Steel E 355 +N (1.0580) acc. to EN 10305-1/2 galvanized [1]	stainless steel 1.4571 acc. to EN 10216-5 with BLUE sealing inside the socket [2]
2	Reinforcement Bar	B500A or B500B	
3	Data Clip	Waved Anchor: Foot-Mounted Anchor:	Hostalen PPN 1060 RAL 7001 / grey Hostalen PPN 1060 RAL 9010 / white

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

Appr. Component	Material associated with anchor of Material 1	Material associated with anchor of Material 2
Washer	Steel acc. to EN 10025, galvanized [1]	Stainless steel 1.4571 acc. to EN 10088
	Geometry acc. to EN ISO 7089/7090	
Screw	Steel acc. to EN ISO 898-1, galvanized [1], strength class 5.6 or 8.8	Stainless steel acc. to EN ISO 3506-1, strength class A4-50 or A4-70
Supplementary Reinforcement	B500A or B500B	Reinforcing steel made of stainless steel
	Geometry acc. to Annex A5 (plane installation) or Annex A6 (front-side installation)	

1) Galvanizing with a plate thickness ≥ 5 µm incl. chromate coating (yellow) acc. to EN ISO 4042
2) Front side of reinforcement bar covered/protected against corrosion



Front view of Data Clip

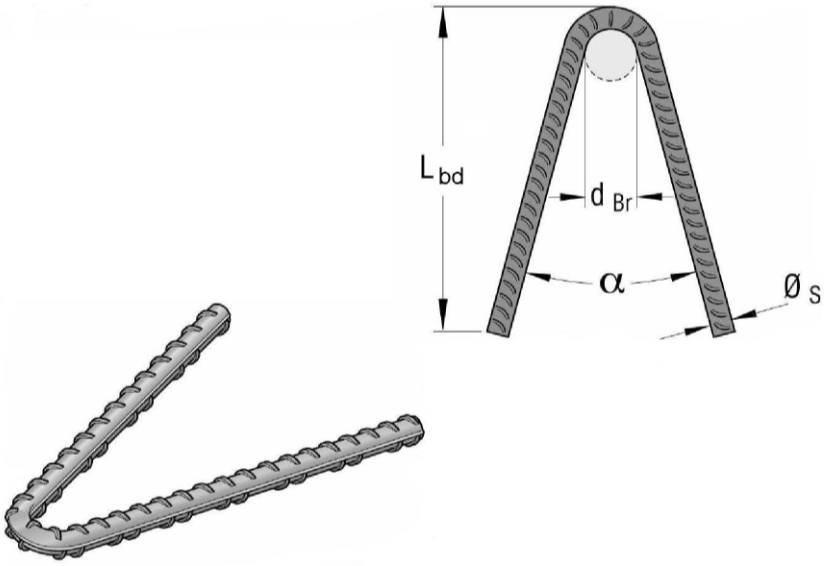
PFEIFER-DB-Anchor-System

Product description
Marking and materials

Annex A4

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

Waved Anchor / Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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.

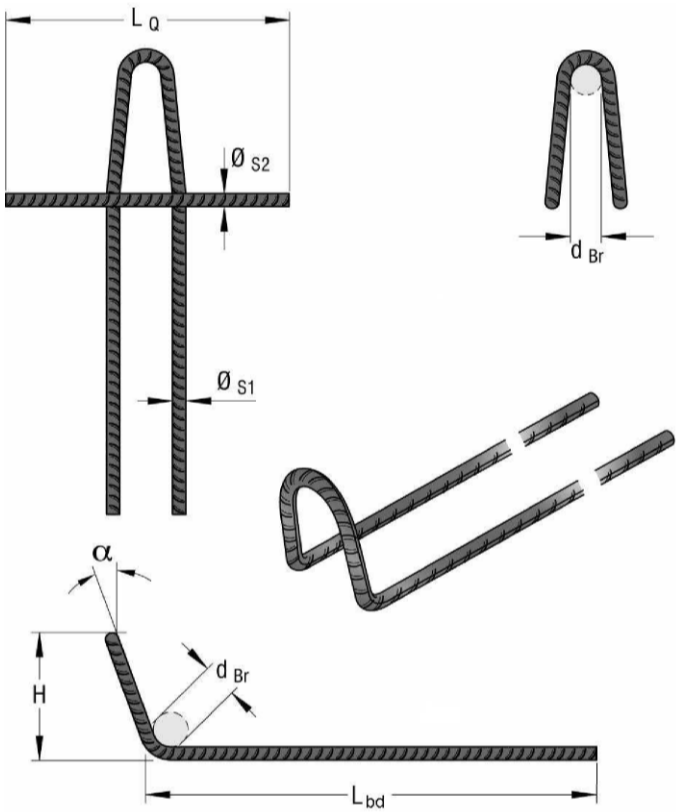
PFEIFER-DB-Anchor-System

Product description
Supplementary reinforcement for plane installation with shear load

Annex A5

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

Waved Anchor / Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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-System

Product description
Supplementary reinforcement for front-side installation with shear load

Annex A6

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Specifications of intended use

Anchorages subject to

- Static and quasi-static loads

Base materials

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2013
- Strength classes C20/25 to C50/60 according to EN 206-1:2013
- 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)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (material 2 acc. Annex A4)

  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used)

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:
  - CEN/TS 1992-4:2009, part 1 and 2
- The screw is chosen with the corresponding screw-in depth acc. to Annex B3, Table B1 and with the strength class acc. to Annex C1 and C3 subject to the required steel resistance and with the material acc. to Annex A4
- If applicable a supplementary reinforcement is chosen acc. to Annex A5 or A6

PFEIFER-DB-Anchor-System	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 are 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 among anchors and especially under the heads of foot-mounted anchors is compacted properly
- Inner area of socket is to be protected against penetration of concrete
- Inner area of socket made of galvanised steel is to be protected against water
- Inner area of socket made of stainless steel is to be protected against oil
- Maximum setting 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-System	**Annex B2**
Intended Use Specifications	

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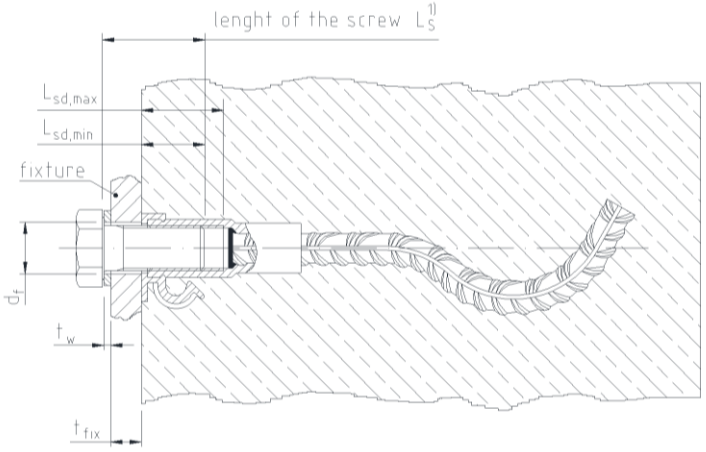
Steel-to-data clip contact

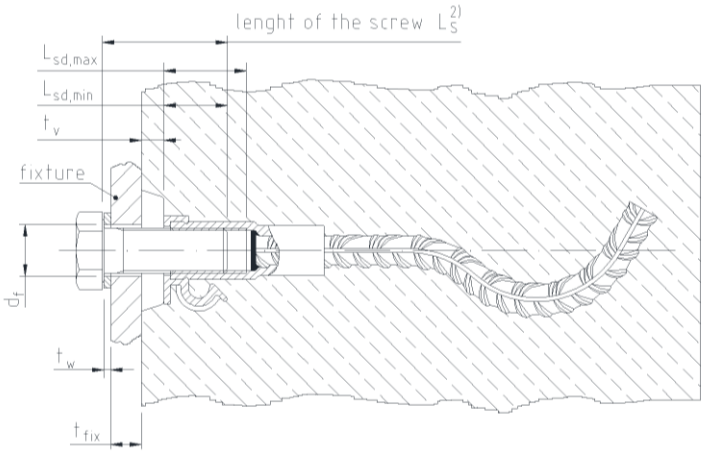
The fixture is braced directly to the anchor, eventually by using a suitable washer.



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

PFEIFER Foot-Mounted Anchors DB 682 may be used analogue

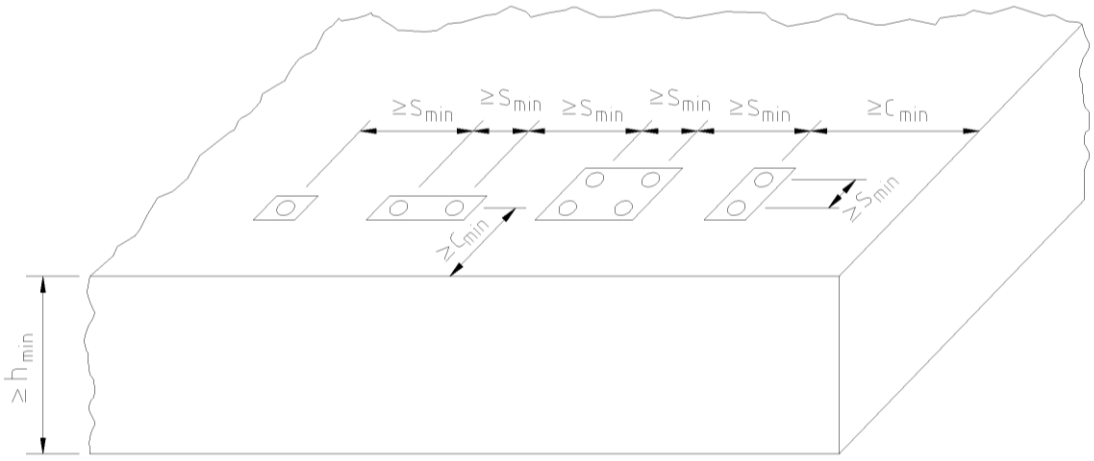
Table B1: **Installation parameters**

Waved Anchor / Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
appropriate size of screw		[mm]	M 12	M 16	M 20	M 24	M 30
maximum setting 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-System

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**

Waved Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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

Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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-System

Intended Use
Minimum spacings and edge distances, minimum thickness of concrete member

Annex B4

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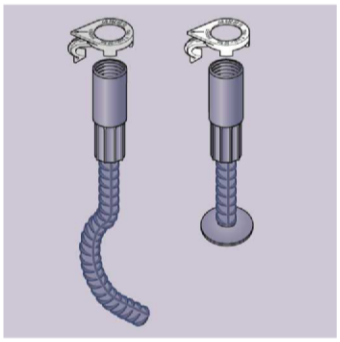
Installation instructions

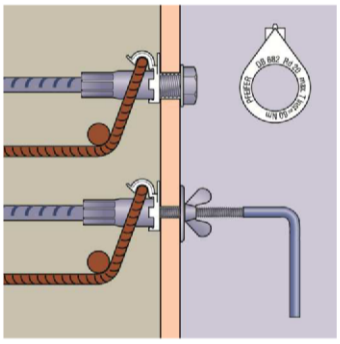
1. Components



1. PFEIFER Waved Anchor or PFEIFER Foot-Mounted Anchor DB 682 with pressed on socket made of galvanized steel or stainless steel

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

2. Fixing of the anchor at the formwork

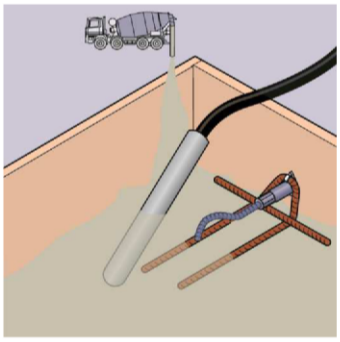


1. Put PFEIFER Data Clip onto the socket.

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-System	**Annex B5**
Intended Use Installation instructions	

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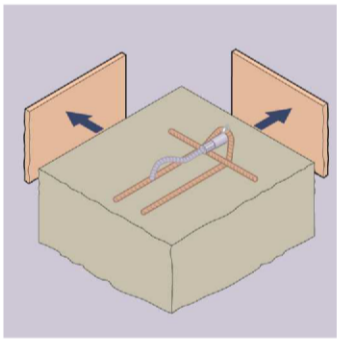
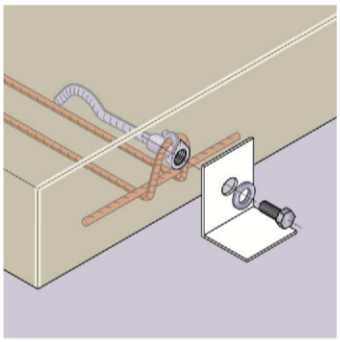
Installation instructions

4. Removal of shuttering



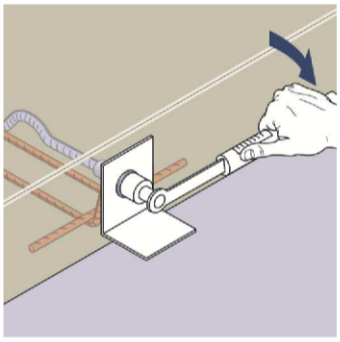
1. Remove accessories for shuttering.
2. Remove shuttering.
3. Check internal thread of DB Anchor. Clean the thread of the socket properly if concrete has been penetrated into.

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 setting torques



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

Rd12	Rd16	Rd20	Rd24	Rd30
≤ 10 Nm	≤ 30 Nm	≤ 60 Nm	≤ 80 Nm	≤ 200 Nm

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Table C1: **Characteristic resistances under tension load**

Waved Anchor / Foot-Mounted Anchor					**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 safety 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 safety 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 safety 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 safety factor			γ_{Ms} 1)	[-]	2,93				
Pull-out failure									
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		C30/37	ψ_c	[-]	1,22				
		C40/50	ψ_c	[-]	1,41				
		C50/60	ψ_c	[-]	1,55				
partial safety factor			γ_{Mp} 1)	[-]	1,50				
Concrete cone failure									
effective anchorage depth		Waved Anchor	h_{ef}	[mm]	54	95	127	140	194
effective anchorage depth		Foot-Mounted Anchor	h_{ef}	[mm]	78	116	145	175	215
factor to take into account the influence of the load transfer mechanism			k_{cr}	[-]	7,2				
			k_{ucr}	[-]	10,1				
characteristic spacing			$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$				
characteristic edge distance			$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$				
partial safety factor			γ_{Mc} 1)	[-]	1,50				
Splitting									
effective anchorage 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
effective anchorage 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 safety factor			γ_{Msp} 1)	[-]	1,50				

1) In absence of other national regulations

PFEIFER-DB-Anchor-System

Performances
Characteristic resistances under tension load

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: **Displacements under tension load**

Waved Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 time displacement	δ_{N0}	[mm]	0,6	1,6	1,4	1,3	1,2
long time 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 time displacement	δ_{N0}	[mm]	0,8	1,7	1,5	1,4	1,2
long time displacement	$\delta_{N\infty}$	[mm]	1,0	1,9	1,5	1,2	0,9

Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 time displacement	δ_{N0}	[mm]	0,1	0,1	0,2	0,2	0,2
long time 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 time displacement	δ_{N0}	[mm]	0,1	0,2	0,1	0,2	0,2
long time displacement	$\delta_{N\infty}$	[mm]	0,2	0,4	0,2	0,4	0,4

PFEIFER-DB-Anchor-System

Performances
Displacements under tension load

Annex C2

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Table C3: **Characteristic resistances under shear load**

Waved Anchor / Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
Shear load without lever arm							
groupfactor (CEN/TS 1992-4-2, 6.3.3.1)	k_2	[-]	1,0				
Steel lailure 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 safety 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 safety 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 safety 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 safety 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 safety 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 safety 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 safety 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 safety factor	γ_{Ms} [1)]	[-]	2,44	1,56		2,44	
Concrete pry-out Failure							
factor	k	[-]	1,0	2,0			
partial safety 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 safety factor	γ_{Mce} [1)]	[-]	1,50				

1) In absence of other national regulations

PFEIFER-DB-Anchor-System

Performances
Characteristic resistances under shear load

Annex C3

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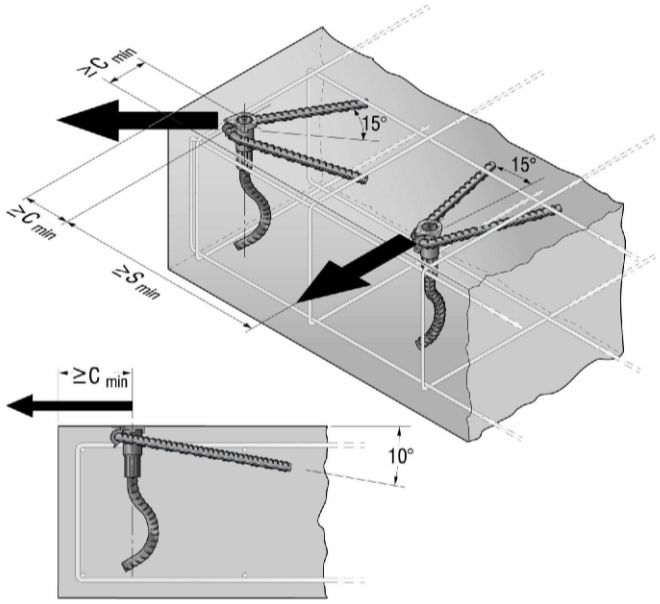
Table C4: **Characteristic resistances under shear load due to failure of supplementary reinforcement for plane installation**

Waved Anchor / Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 safety factor	$\gamma_{Ms,re}$ [1)]	[-]	1,15				

Waved Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
minimum spacing	s_{min}	[mm]	100	120	140	160	200
minimum edge distance [2)]	c_{min}	[mm]	50	60	70	80	100

Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 Foot-Mounted Anchor DB 682.

PFEIFER-DB-Anchor-System

Performances
Characteristic resistances under shear load
with supplementary reinforcement and plane installation

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C4: **Characteristic resistances under shear load due to failure of supplementary reinforcement for front-side installation**

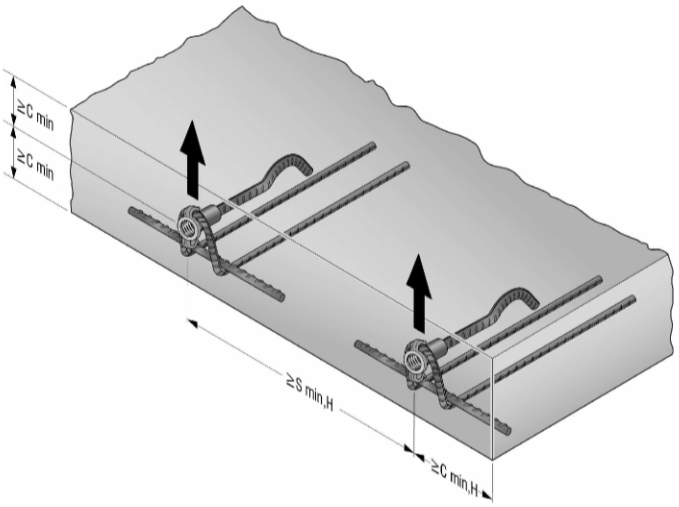
Waved Anchor / Foot mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
characteristic resistance of the supplementary reinforcement for front-side installation	$V_{Rk,c,re}$	[kN]	5,7	17,6	27,5	39,6	43,0
partial safety factor	$\gamma_{Ms,re}$ [1)]	[-]	1,8				

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)]				

Waved Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
min edge distance perpendicular to the plane	c_{min}	[mm]	50	60	70	80	100

Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 Foot-Mounted Anchor DB 682.

Combined tension and shear load	
The factor k_7 is for combined tension and shear load acc. to CEN/TS 1992-4-2:2009, section 6.4.1.3:	$k_7 = 2/3$

PFEIFER-DB-Anchor-System

Performances
Characteristic resistances under shear load
with supplementary reinforcement and front-side installation

Annex C5

Deutsches Institut für Bautechnik DIBt

Table C6: **Displacements under shear load**

Waved Anchor / Foot-Mounted Anchor			**Rd12**	**Rd16**	**Rd20**	**Rd24**	**Rd30**
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 time displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long time 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 time displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long time 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 time displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long time 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 time displacement	δ_{V0}	[mm]	2,0	2,0	3,0	3,0	4,0
long time 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 time displacement	δ_{V0}	[mm]	1,5	1,5	2,0	2,0	2,0
long time 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 time displacement	δ_{V0}	[mm]	1,0	1,4	1,6	1,8	2,0
long time displacement	$\delta_{V\infty}$	[mm]	1,5	2,1	2,4	2,7	3,0

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Performances
Displacements under shear load

Annex C6