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-13/0401 of 9 February 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	DEMU Bolt anchor
Product family to which the construction product belongs	Cast-in anchor with internal threaded socket
Manufacturer	Leviat GmbH Liebigstraße 14 40764 Langenfeld DEUTSCHLAND
Manufacturing plant	Leviat Herstellwerke
This European Technical Assessment contains	23 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	EAD 330012-01-0601, Edition 12/ 2022
This version replaces	ETA-13/0401 issued on 23 June 2022

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Specific Part

1 Technical description of the product

The DEMU Bolt anchor in the size of M12, M16, M20, M24, M30, M36 and M42 as type 1985, 1988 and DEMU Plate anchor 1980-P in the size of M12, M16, M20, M24 and M30 is an anchor consisting of a bolt and an internal threaded socket screwed and pressed on the thread of the bolt. The socket is made of electroplated steel, hot-dip galvanised steel or stainless steel. The anchor is imbedded surface-flush or sunk in the concrete. The anchorage is characterised by mechanical interlock at the head of the bolt.

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 and displacements	
- Resistance to steel failure for tension loading	See Annex C1
- Resistance to pull-out failure	See Annex C1
- Resistance to concrete cone failure	See Annex C2
- Resistance to splitting and edge distance to prevent splitting and blow-out failure	See Annex C2
- Minimum edge distance and spacing	See Annex B3
- Maximum torque moment	See Annex B5
- Displacements for tension loading	See Annex C2

Essential characteristic	Performance
Characteristic values for shear loading under static and quasi-static actions and displacements	
- Resistance to steel failure for shear loading	See Annex C3 and C4
- Resistance to concrete edge failure without supplementary reinforcement	See Annex C3
- Resistance to concrete edge failure with supplementary reinforcement	No performance assessed
- Resistance to pry-out failure	See Annex C3
- Displacements for shear loading	See Annex C4
Characteristic values for seismic performance categories C1 and C2 and displacements	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C5

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.

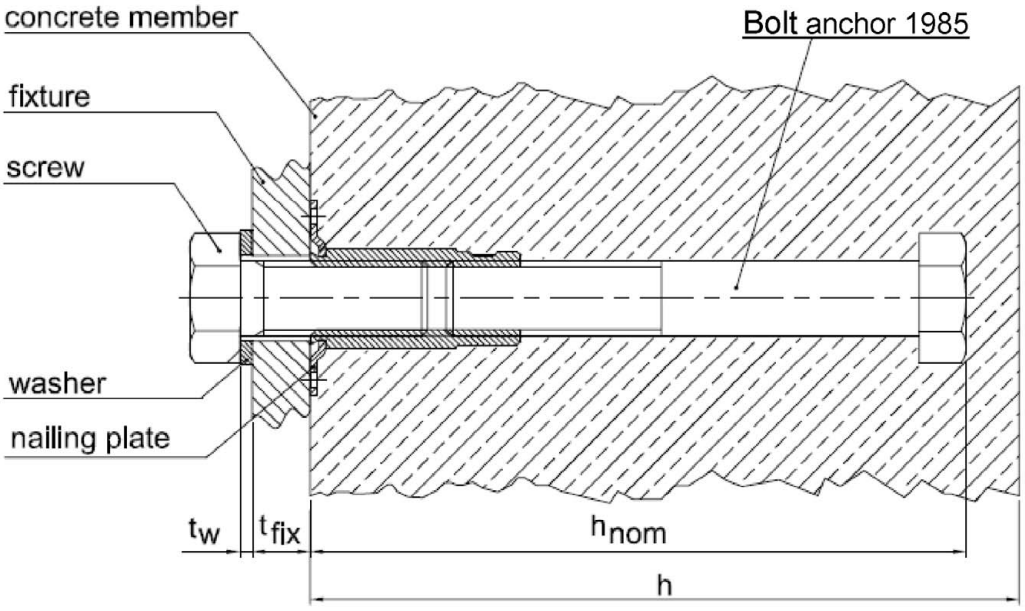
Issued in Berlin on 9 February 2024 by Deutsches Institut für Bautechnik

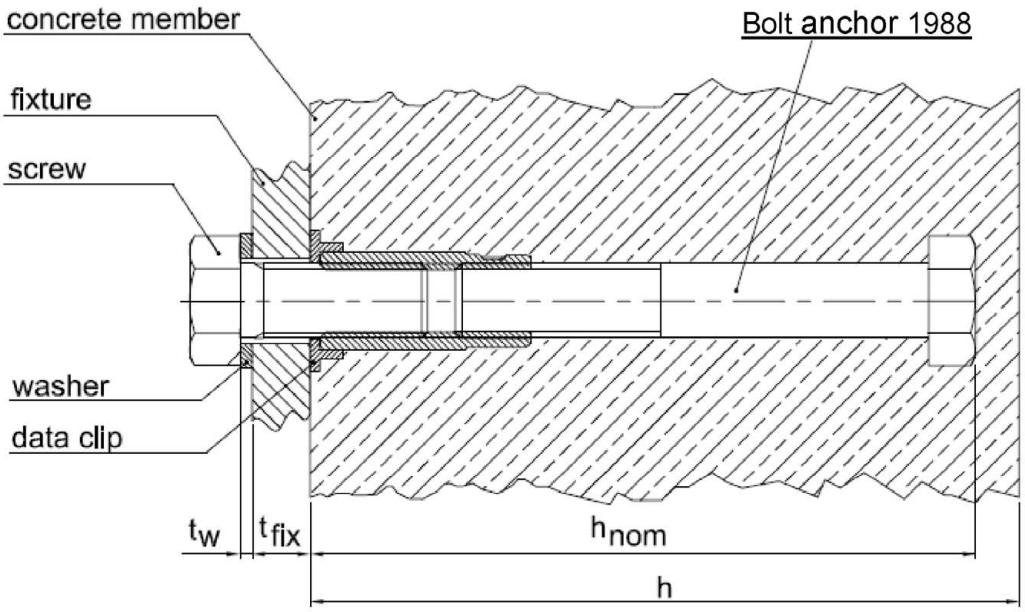
Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Aksünger

Deutsches Institut für Bautechnik DIBt

DEMU Bolt anchor





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

DEMU Bolt anchor and Plate anchor	Annex A1
Product description Installed condition Bolt anchor	

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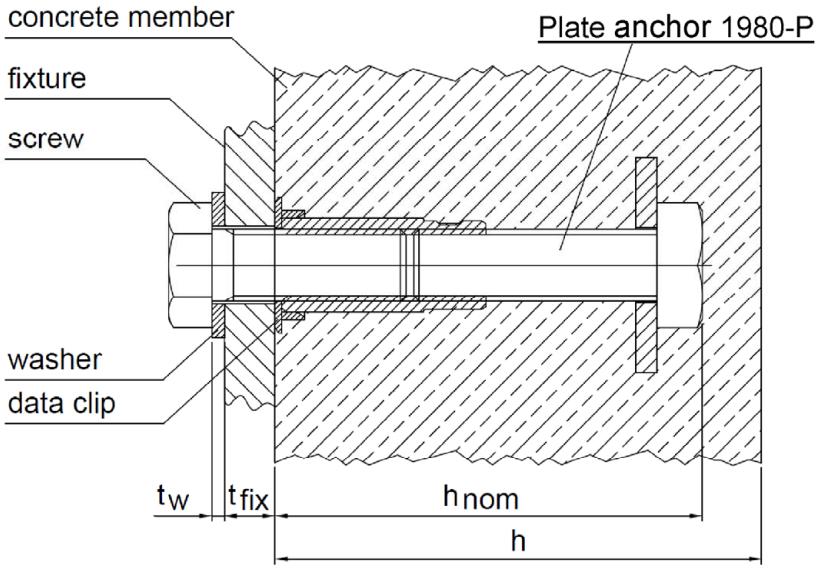
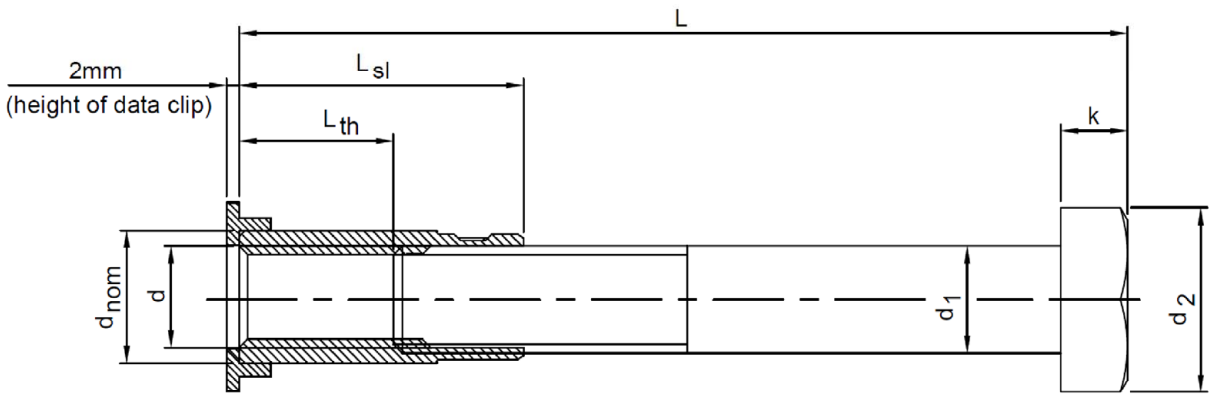
DEMU Plate anchor



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

DEMU Bolt anchor and Plate anchor	Annex A2
Product description Installed condition Plate anchor	



There are 5 different materials available for the DEMU Bolt anchor 1988:

Material 1: Sleeve electroplated
Material 2: Sleeve hot dip galvanised
Material 3: Sleeve in stainless steel A4-50
Material 4: Sleeve in stainless steel A4-70
Material 5: Sleeve in stainless steel A4-80

Table A1: **Dimensions of DEMU Bolt anchor 1988** with sleeves made of material 1 or 2

d	d_{nom}	L_{sl} [3]	L_{th} [3]	d_1	d_2	k	L [3]
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M12	15,5	35,0	23,0 - 25,4	12,0	18,0	8,0	55 / 100 / 150
M16	21,0	45,0	29,0 - 32,2	16,0	24,0	10,0	75 / 140 / 220
M20	26,0	55,0	35,0 - 39,0	20,0	30,0	13,0	90 / 150 / 180 / 270
M24	32,0	70,0	46,0 - 50,8	24,0	36,0	15,0	110 / 200 / 320
M30	40,0	90,0	60,0 - 66,0	30,0	46,0	19,0	160 / 240 / 380
M36	47,5	110,0	74,0 - 81,2	36,0	55,0	23,0	300 [1] / 420
M42	54,0	110,0	68,0 - 76,4	42,0	65,0	26,0	300 [1] / 460 [1]

[1] only available with sleeve made of material 1
[3] if not listed, $L_{sl} - L_{th} \geq \alpha \cdot d_1$ [mm] (α = 0,8 ÷ 1,0) and $L_{th} \geq 1{,}9 \cdot d_1$ [mm]

Table A2: **Dimensions of DEMU Bolt anchor 1988** with sleeves made of material 3 or 4 or 5

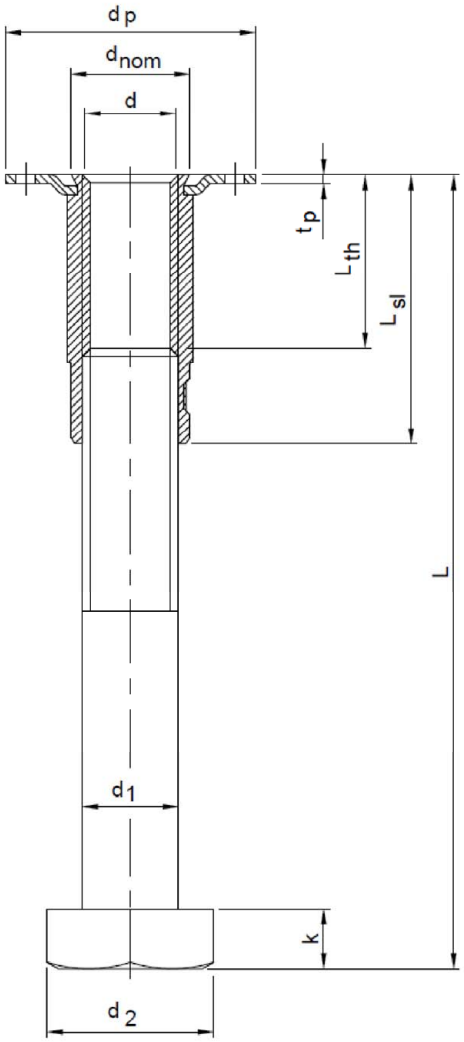
d	d_{nom}	L_{sl} [3]	L_{th} [3]	d_1	d_2	k	L [3]
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M12	15,5	35,0	23,0 - 25,4	12,0	18,0	8,0	100 / 150
M16	21,0	45,0	29,0 - 32,2	16,0	24,0	10,0	140 / 220
M20	26,0	55,0	35,0 - 39,0	20,0	30,0	13,0	150 / 180 / 270
M24	32,0	70,0	46,0 - 50,8	24,0	36,0	15,0	200 [2]
M30	40,0	90,0	60,0 - 66,0	30,0	46,0	19,0	240 [2]

[2] only available with sleeve made of material 4 and 5
[3] if not listed, $L_{sl} - L_{th} \geq \alpha \cdot d_1$ [mm] (α = 0,8 ÷ 1,0) and $L_{th} \geq 1{,}9 \cdot d_1$ [mm]

DEMU Bolt anchor and Plate anchor

Product description
Dimensions Bolt anchor type 1988

Annex A3



There are 4 different materials available for the DEMU Bolt anchor 1985:

Material 1: Sleeve electroplated
Material 2: Sleeve hot dip galvanised
Material 4: Sleeve in stainless steel A4-70
Material 5: Sleeve in stainless steel A4-80

Table A3: **Dimensions of DEMU Bolt anchor 1985** with sleeve / nailing plate made of material 1 or 2 or 4 or 5

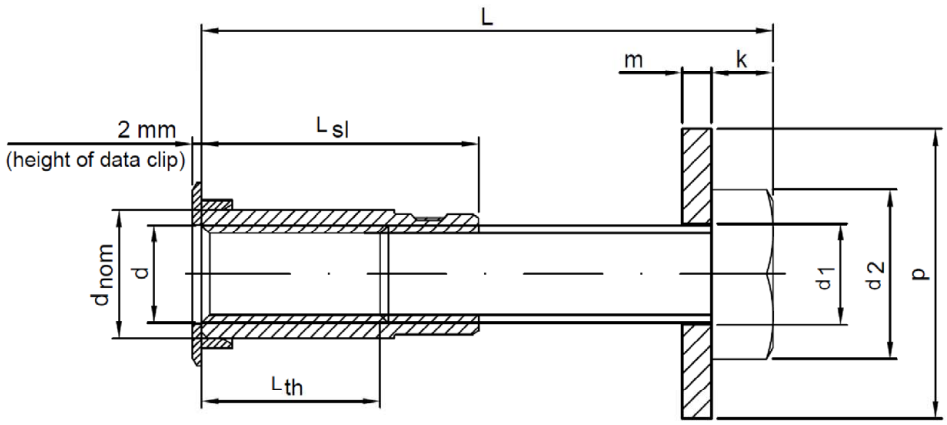
d	d_{nom}	L_{sl} [1)]	L_{th} [1)]	d_1	d_2	k	L [1)]	d_p	t_p
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M12	15,5	35,0	23,0 - 25,4	12,0	18,0	8,0	150	40,0	1,0
M16	21,0	45,0	29,0 - 32,2	16,0	24,0	10,0	140	44,0	1,5
M20	26,0	55,0	35,0 - 39,0	20,0	30,0	13,0	180	48,2	1,5
M24	32,0	70,0	46,0 - 50,8	24,0	36,0	15,0	200	57,0	1,5

[1)] if not listed, $L_{sl} - L_{th} \geq \alpha \cdot d_1$ [mm] (α = 0,8 ÷ 1,0) and $L_{th} \geq 1{,}9 \cdot d_1$ [mm]

DEMU Bolt anchor and Plate anchor

Product description
Dimensions Bolt anchor type 1985

Annex A4



There are 4 different materials available for the DEMU Plate anchor 1980-P:

Material 1: Sleeve electroplated
Material 2: Sleeve hot dip galvanised
Material 4: Sleeve in stainless steel A4-70
Material 5: Sleeve in stainless steel A4-80

Table A4: **Dimensions of DEMU Plate anchor 1980-P** with sleeves made of material 1 or 2 or 4 or 5

d	d_{nom}	L_{sl} [1)]	L_{th} [1)]	d_1	$d_{1,P}$	d_2	k	m	p	L [1)]
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M12	15,5	35,0	23,0 - 25,4	12,0	13,5	18,0	8,0	4,0	40,0	55
M16	21,0	45,0	29,0 - 32,2	16,0	17,5	24,0	10,0	5,0	50,0	75
M20	26,0	55,0	35,0 - 39,0	20,0	22,0	30,0	13,0	5,0	60,0	90
M24	32,0	70,0	46,0 - 50,8	24,0	26,0	36,0	15,0	6,0	80,0	110
M30	40,0	90,0	60,0 - 66,0	30,0	33,0	46,0	19,0	6,0	95,0	140

[1)] if not listed, $L_{sl} - L_{th} \geq \alpha \cdot d_1$ [mm] (α = 0,8 ÷ 1,0) and $L_{th} \geq 1{,}9 \cdot d_1$ [mm]

DEMU Bolt anchor and Plate anchor	
Product description Dimensions Plate anchor 1980-P	Annex A5

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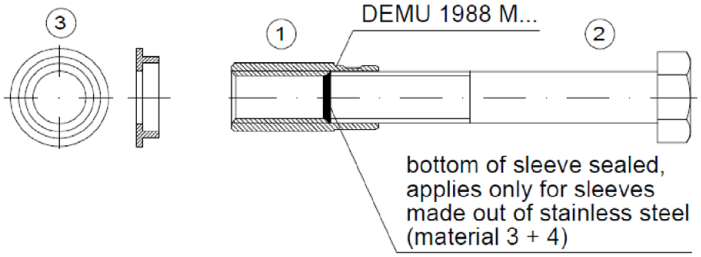
Bolt anchor 1988



Bolt anchor 1985

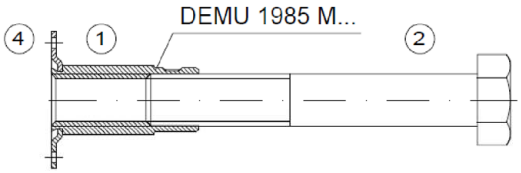
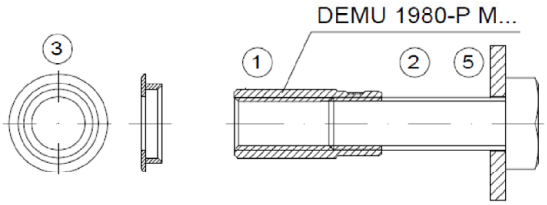


Plate anchor 1980-P



Marking:

e.g.: DEMU 1988 M16x140 GV

DEMU:	identifying mark of the producer
1988:	name of the anchor
M16x140:	size
GV:	material

Material:

GV:	sleeve electroplated
FV:	sleeve hot dip galvanised
A4-50:	sleeve made of stainless steel A4-50
A4-70:	sleeve made of stainless steel A4-70
A4-80:	sleeve made of stainless steel A4-80

DEMU Bolt anchor and Plate anchor	Annex A6
Product description Marking	

Table A5: **Marking/specification and materials of bolt anchor and plate anchor**

Item	Component	Material 1 Sleeve in electroplated steel (GV)	Material 2 Sleeve in hot-dipped galvanised steel (FV)
1	Sleeve	Mecaval 147M +N, E355 +N (1.0580), 20MnV6 +N (1.5217), in accordance with EN 10305-1:2016, electroplated [1)]	Mecaval 147M +N, E355 +N (1.0580), 20MnV6 +N (1.5217), in accordance with EN 10305-1:2016, hot-dipped galvanised [2)]
2	Bolt	Hexagon head bolts in accordance with EN ISO 4014:2011 respect. hexagon head screws with thread up to the head in accordance with EN ISO 4017:2015, strength grade 8.8	
3	Data clip	for sleeve made of material 1+2:	HDPE / RAL 7035 / (light-) grey
4	Nailing plate	Sheet steel DC01 (1.0330), in accordance with EN 10130:2007, electroplated [1)]	---
5	Square washer	S235 in accordance with DIN 436:1994	
Item	Component	Material 3 Sleeve in stainless steel A4-50	Material 4 / Material 5 Sleeve in stainless steel A4-70 / A4-80
1	Sleeve	Stainless steel: CRC III: 1.4401, 1.4404, 1.4571, 1.4362, 1.4578, 1.4062, 1.4162, 1.4662; CRC IV: 1.4439, 1.4462, 1.4539; CRC V: 1.4410, 1.4565, 1.4529, 1.4547, in accordance with EN 10088-3:2009, bottom of sleeve sealed [3)]	Stainless steel: CRC III: 1.4401, 1.4404, 1.4571, 1.4362, 1.4578, 1.4062, 1.4162, 1.4662; CRC IV: 1.4439, 1.4462, 1.4539; CRC V: 1.4410, 1.4565, 1.4529, 1.4547, in accordance with EN 10297-2:2006, bottom of sleeve sealed [3)]
2	Bolt	Hexagon head bolts in accordance with EN ISO 4014:2011 respect. hexagon head screws with thread up to the head in accordance with EN ISO 4017:2015, strength grade 8.8, hot-dipped galvanised [4)] or stainless steel A4-80	
3	Data clip	for sleeve made of material 3: for sleeve made of material 4: for sleeve made of material 5:	HDPE / RAL 9003 / (signal-) white HDPE / RAL 9023 / (pearl-) dark grey HDPE / RAL 9005 / (jet-) black
4	Nailing plate		Stainless steel in accordance with EN 10297-2:2006
5	Square washer	---	S235 in accordance with DIN 436:1994 or stainless steel in accordance with EN 10297-2:2006

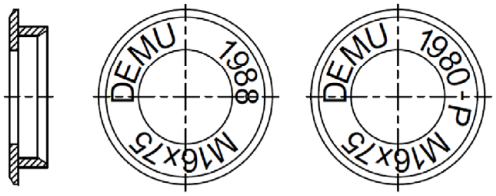
1) thickness of coating ≥ 5µm in accordance with EN ISO 4042:2018
2) thickness of coating ≥ 45µm (M12), ≥ 55µm (≥ M16) in accordance with EN ISO 1461:2009
3) protection of the front end of the screw against corrosion if bolt is not in A4-80.
4) thickness of coating ≥ 40µm acc. EN ISO 10684:2011+AC 2009

DEMU Bolt anchor and Plate anchor	Annex A7
Product description Materials	

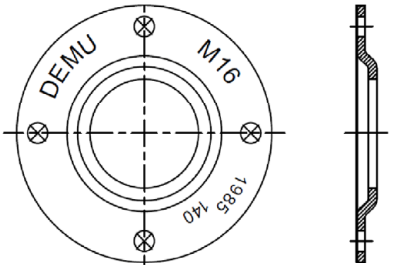
Table A6: **Materials 1 and 2**
(washer, screw and suppl. reinforcement not included with the fixing system

1	Bolt anchor and plate anchor	Bolt / plate anchor in accordance with Table A5, material 1 [1)]	Bolt / plate anchor in accordance with Table A5, material 2 [1)]
2	Washer acc. EN ISO 7089/7093-1:2000	Steel in accordance with EN 10025:2019, galvanised [2)]	Steel in accordance with EN 10025:2019, hot-dipped galvanised [3)]
3	Screw	Steel in accordance with EN ISO 898-1:2013, galv. [2)], strength grade 4.6, 5.6 or 8.8	Steel in accordance with EN ISO 898-1:2013, hot-dipped galv. [3)], strength grade 4.6, 5.6 or 8.8
4	Suppl. Reinforcement	B500A or B500B in accordance with EN 1992-1-1:2004+AC:2010	

[1)] the inner area of the socket has to be protected against ingress of water, e. g. by using DEMU sealing cap or a screw in accordance with line 3
[2)] thickness of coating ≥ 5µm in accordance with EN ISO 4042:2018
[3)] thickness of coating ≥ 40µm in accordance with EN ISO 10684:2004+AC 2009



Data clip: section and top view (with example for marking)



Nailing plate: top view (with example for marking) and section

DEMU Bolt anchor and Plate anchor	Annex A8
Product description Materials 1 and 2 marking	

Table A6 (continued): **Materials 3 and 4 and 5**
(washer, screw and suppl. reinforcement not included with the fixing system)

1	Bolt anchor and plate anchor	Bolt / plate anchor in accordance with Table A5, material 3 and 4 and 5, without sealing of the bottom of the sleeve [1)]	Bolt / plate anchor in accordance with Table A5, material 3 and 4 and 5, with special sealing of the bottom of the sleeve, without sealing for A4-80 bolt	Bolt / plate anchor in accordance with Table A5, material 3 and 4 and 5, with bolt in stainless steel	Bolt / plate anchor in accordance with Table A5, material 3 and 4 and 5, with bolt in stainless steel
2	Washer acc. EN ISO 7089/7093-1:2000	Stainless steel: CRC III: 1.4401, 1.4404, 1.4571, 1.4362, 1.4578, 1.4062, 1.4162, in accordance with EN 10088:2009		Stainless steel: CRC IV: 1.4439, 1.4462, 1.4539, in accordance with EN 10088:2009	Stainless steel: CRC V: 1.4565, 1.4529, 1.4547, in accordance with EN 10088:2009
3	Screw	Stainless steel: CRC III: 1.4401, 1.4404, 1.4571, 1.4362, 1.4578, 1.4062, 1.4162, 1.4662, in accordance with EN ISO 3506-1:2009, strength grade A4-50, A4-70 or A4-80		Stainless steel: CRC IV: 1.4439, 1.4462, 1.4539, in accordance with EN ISO 3506-1:2009, strength grade A4-50, A4-70 or A4-80	Stainless steel: CRC V: 1.4565, 1.4529, 1.4547, in accordance with EN ISO 3506-1:2009, strength grade A4-50, A4-70 or A4-80
4	Suppl. Reinforcement	Stainless reinforcement steel according to appropriate of the Corrosion Resistance Class in accordance to EN 1993-1-4:2015, Tab. A.2 respectively B500A or B500B meeting the requirements for concrete cover c_{nom} in accordance with EN 1992-1-1:2004+AC:2010			

1) the inner area of the socket has to be protected against ingress of water, e. g. by using DEMU sealing cap or a screw in accordance with line 3
2) thickness of coating ≥ 5µm in accordance with EN ISO 4042:2018
3) thickness of coating ≥ 40µm in accordance with EN ISO 10684:2004+AC:2009

DEMU Bolt anchor and Plate anchor	Annex A9
Product description Materials 3 and 4 and 5 marking	

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Specifications of Intended use

Anchorages subject to:

- Static and quasi-static loads.
- Fire exposure: only for concrete C20/25 to C50/60.

Base material:

- Reinforced or unreinforced compacted normal weight concrete without fibers in accordance with EN 206:2013+A1:2016.
- Strength classes C20/25 to C90/105 in accordance with EN 206:2013+A1:2016.
- Cracked and uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (material 1 in accordance with Annex A7)
- Structures subject to internal conditions with usual humidity (e.g. kitchen, bath and laundry in residential buildings, exceptional permanently damp conditions and applications under water. (material 2 in accordance with Annex A7)
- In accordance with EN 1993-1-4:2015 according to the Corrosion Resistance Class – see Annex A7 Table A5 (Material 3 and 4 and 5).

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, etc.).
- Anchorages under static or quasi-static actions are designed in accordance with:
  - EN 1992-4:2019
- Anchorages under fire exposure are designed in accordance with:
  - EN 1992-4:2019, Annex D
    (local spalling of the concrete cover must be avoided)
- Requirements for the screw:
  - Material in accordance with Annex A8/A9, Table A6
  - Strength class in accordance with Annex C1 and C2
  - Length in accordance with Annex B2, Table B1

Installation:

- Anchor installation carried out by appropriately quantified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without any manipulation or exchanging the components.
- The anchors are 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.
- Adequate compaction close to the anchor particularly at head of the bolt, e.g. without significant voids. The cast-in anchor is protected against ingress of concrete into the threaded socket.
- The installation torques given in Annex B2 are not exceeded.
- The inner area of the socket of the anchor made of galvanized steel has to be protected against ingress water.

DEMU Bolt anchor and Plate anchor	Annex B1
Intended use Specifications	

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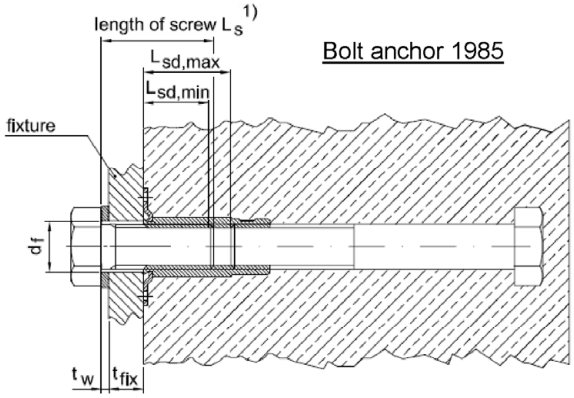
Direct contact between fixture and data clip / nailing plate

The fixture is braced to data clip / nailing plate, if necessary by suitable washer.



Bolt anchor 1985

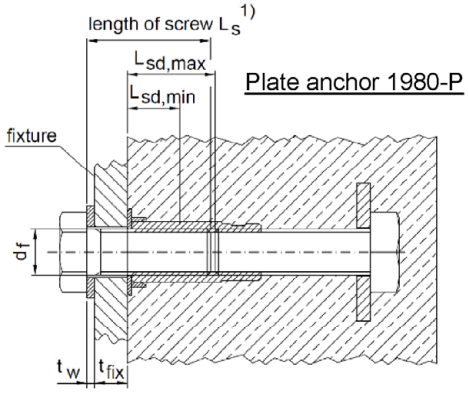
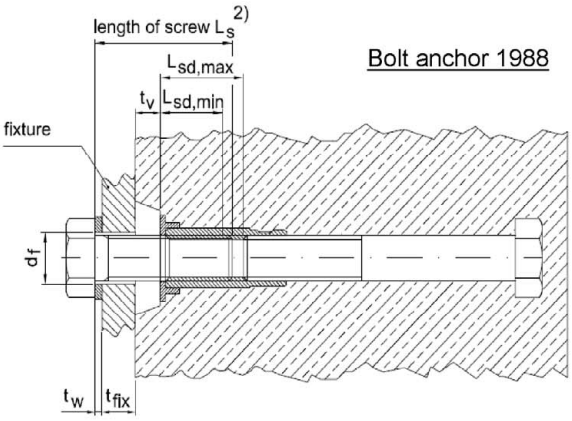


Plate anchor 1980-P

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 to concrete (anchor is embedded sunk in the concrete) resp. braced to concrete and data clip / nailing plate (anchor is embedded flush in the concrete).



Bolt anchor 1988

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

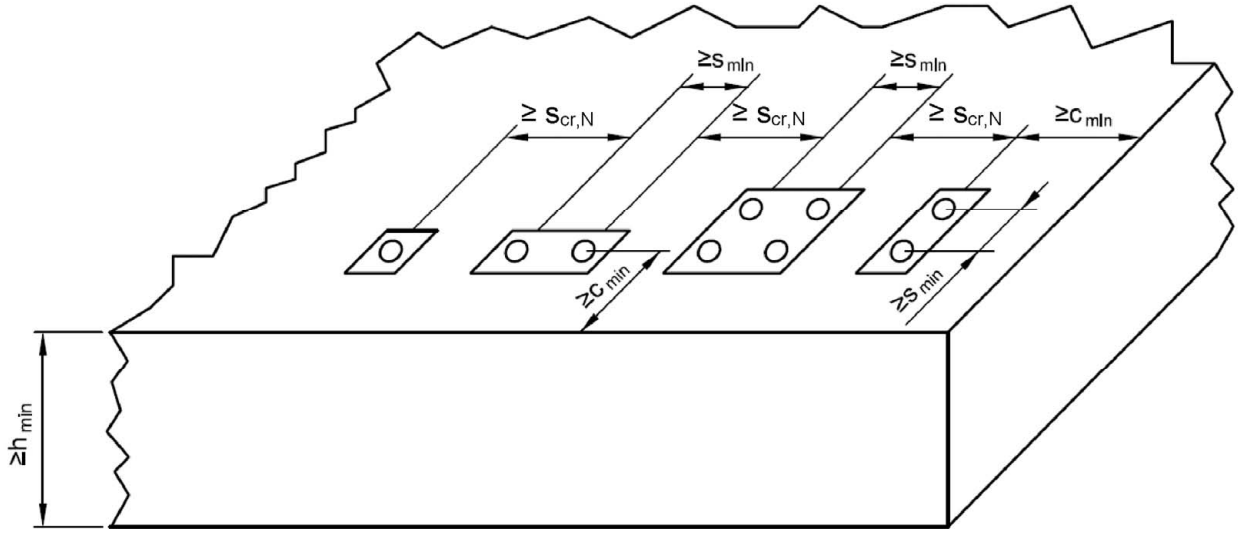
Table B1: **Installation parameters**

Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Maximum torque moment	max. T_{inst}	[Nm]	≤ 10	≤ 30	≤ 50	≤ 90	≤ 180	≤ 250	≤ 300
Minimum screw-in length - **1988**	$L_{sd,min}$	[mm]	16,4	21,2	26,0	30,8	38,0	45,2	52,4
Minimum screw-in length - **1985**	$L_{sd,min}$	[mm]	18,0	24,0	30,0	36,0			
Minimum screw-in length - **1980-P**	$L_{sd,min}$	[mm]	16,4	21,2	26,0	30,8	38,0		
Maximum screw-in length - **1988**	$L_{sd,max}$ 1) 2)	[mm]	25,0	31,0	37,0	48,0	62,0	76,0	70,0
Maximum screw-in length - **1985**	$L_{sd,max}$ 2)	[mm]	23,0	29,0	35,0	46,0			
Maximum screw-in length - **1980-P**	$L_{sd,max}$ 1) 2)	[mm]	25,0	31,0	37,0	48,0	62,0		
Diameter of clearance hole in fixture	d_f	[mm]	14,0	18,0	22,0	26,0	33,0	39,0	45,0

1) for bolt anchors and plate anchors with sealing on bottom of sleeve (material 3 + 4 + 5) and the values have to be decreased by 3,0 mm

2) for other sleeve lengths as defined in Annex A3, A4 and A5, the maximum screw-in length is limited to $L_{sd,max} = 1,85 \cdot d_1$ [mm]

DEMU Bolt anchor and Plate anchor	Annex B3
Intended use Arrangement of anchors and member thickness	



The mentioned spacings, edge distances and member thicknesses apply also for anchors installed in the front edge.

Table B2: **Min. thickness of concrete member, min. edge distances and spacing**

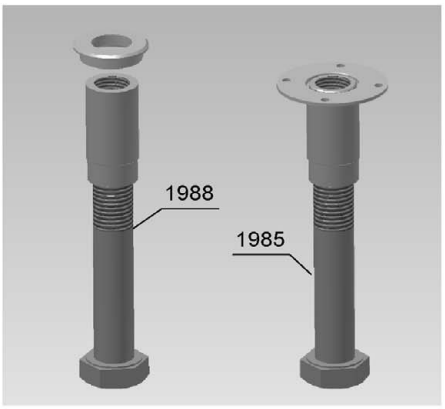
Thread size	d	[mm]	M12	M16	M20	M24	M30	M36	M42
Minimum spacing	s_{min}	[mm]	100	100	120	150	180	220	260
Minimum edge distance	c_{min}	[mm]	50	50	60	75	90	110	130
Minimum thickness of concrete member	h_{min}	[mm]	h_{nom} + c_{nom} [1)]						
[1)] c_{nom} acc. EN 1992-1:2019 with $c_{nom} \geq 20$									

DEMU Bolt anchor and Plate anchor	
Intended use Arrangement of anchors and member thickness	Annex B3

Deutsches Institut für Bautechnik DIBt

Installation instruction - part 1

1. Scope of delivery

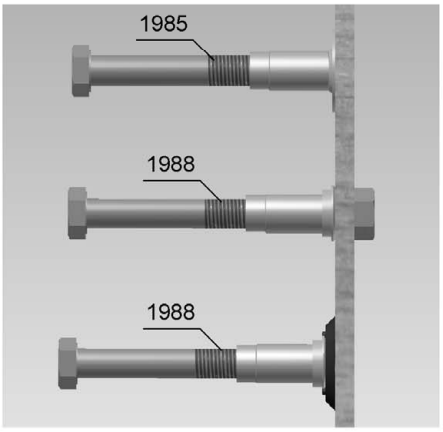


1) Selection of bolt anchor in accordance with the planning documents.

1a) DEMU Bolt anchor 1988 GV / FV / A4-50 / A4-70 / A4-80
or DEMU Bolt anchor 1985 GV
or DEMU Plate anchor 1980-P GV / FV / A4-80

1b) Data clip for bolt anchor 1988 GV / FV
or plate anchor 1980-P GV / FV,
colour: grey;
Data clip for bolt anchor 1988 A4-50,
colour: white;
Data clip for bolt anchor 1988 A4-70,
or plate anchor 1980-P A4-70
colour: dark grey;
Data clip for bolt anchor 1988 A4-80,
or plate anchor 1980-P A4-80,
colour: black.

2. Fixing of the anchor to the formwork



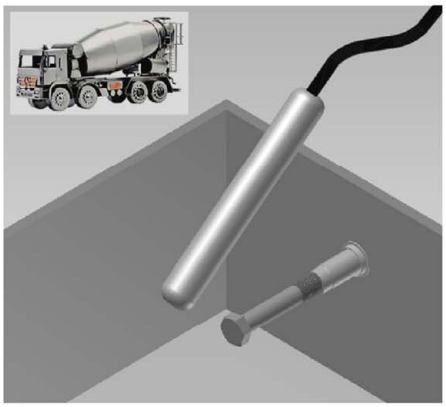
1) Attach data clip to the bolt anchor or plate anchor (this does not apply for type 1985).

2) Fix the anchor to the formwork with the help of DEMU assembly accessories (e. g. nailing plate) or alternatively by hexagon bolts.

→ The inside of the threaded socket must be protected against ingress of dirt and water.

3) If necessary, supplementary reinforcement has to be placed according to the planning documents.

3. Pouring and compacting of concrete



1) Pour concrete carefully, make sure the anchor stays in place!

2) Compact concrete carefully, avoid direct contact between compacting device and bolt anchor.

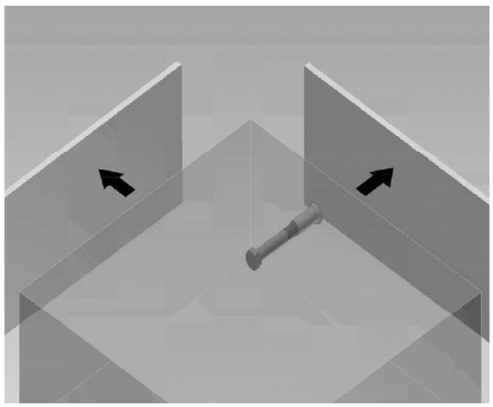
→ The anchor must not be moved by force or damaged!

DEMU Bolt anchor and Plate anchor	Annex B4
Intended use Installation instruction – part 1	

Deutsches Institut für Bautechnik DIBt

Installation instruction - part 2

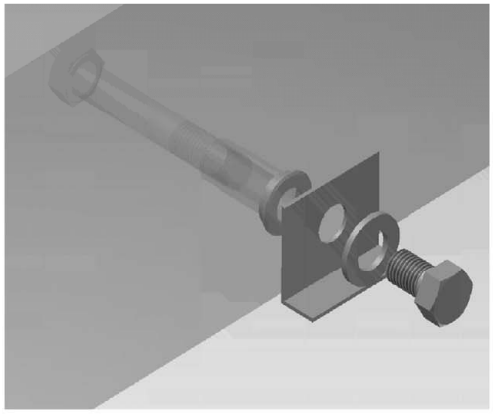
4. Hardening of the concrete, striking the formwork



1) Remove assembly accessories and formwork.

2) Check if the inside of the threaded sleeve is free from dirt, otherwise clean it;
further protection against ingress of water, dirt, etc. until required for use (e. g. by using DEMU-sealing cap).

5. Mounting of fixture

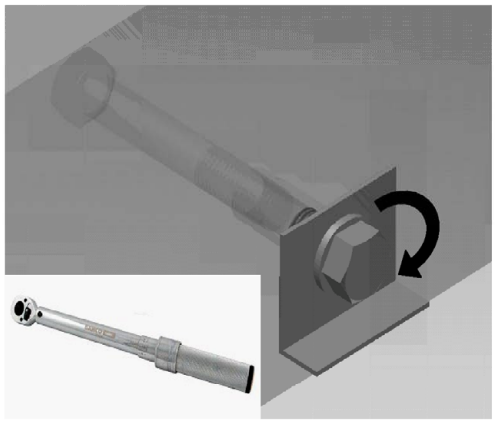


1) Make sure that the concrete has reached its final strength.

2) Check the length of the required bolt.
→ Maximum / minimum screw-in length according to Annex B2!

3) Mounting of the fixture
→ Use fixing components according to Annex A8/A9, Table A6.
→ Maximum torque moments, see table below!
→ Take additionally care of assembly advices for the fixture.

6. Maximum torque moments



Apply installation torque with the help of a torque wrench.
T_{inst} must not be exceeded.

Maximum installation torque T_{inst}

Thread	d	[mm]	M12	M16	M20	M24
Max. installation torque	max. T_{inst}	[Nm]	≤ 10	≤ 30	≤ 50	≤ 90
Thread	d	[mm]	M30	M36	M42	
Max. installation torque	max. T_{inst}	[Nm]	≤ 180	≤ 250	≤ 300	

DEMU Bolt anchor and Plate anchor

Intended use
Installation instruction – part 2

Annex B5

Table C1a: **Characteristic values for tension loads**

Thread size		d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 4.6) made of electroplated / hot-dipped galvanised steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	33,7	62,8	98,0	141,2	224,4	326,8	448,4 [2]
Partial factor		γ_{Ms} [1]	[-]	2,00						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 5.6) made of electroplated / hot-dipped galvanised steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	42,2	78,5	122,5	176,5	280,5	408,5	560,5 [2]
Partial factor		γ_{Ms} [1]	[-]	2,00						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 8.8) made of electroplated / hot-dipped galvanised steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	45,8	93,1	139,6	219,5	335,0	490,5	588,1 [2]
Partial factor		γ_{Ms} [1]	[-]	1,58						
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-50) made of stainless steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	42,2	81,0	110,3	4)			
Partial factor		γ_{Ms} [1]	[-]	2,86	3,09					
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-70) made of stainless steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	46,4	81,0	110,3	4)			
Partial factor		γ_{Ms} [1]	[-]	3,09						
Steel failure, bolt /plate anchor (material 4: A4-70) and screw (min. steel strength A4-70) made of stainless steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	51,7	105,1	157,6	247,1	392,7	4)	
Partial factor		γ_{Ms} [1]	[-]	1,87						
Steel failure, bolt / plate anchor (material 5: A4-80) and screw (min. steel strength A4-80) made of stainless steel										
Characteristic resistance		$N_{Rk,s}$	[kN]	59,0	125,6	180,1	282,4	448,8	4)	
Partial factor		γ_{Ms} [1]	[-]	1,48	1,60	1,48	1,60			
Pull-out failure										
Characteristic resistance in cracked concrete	C20/25	$N_{Rk,p}$	[kN]	25,1	44,7	69,8	100,5	168,9	240,3	341,0
				218,5 [3]	338,9 [3]	483 [3]	880,4 [3]	1225,5 [3]	4)	
Characteristic resistance in uncracked concrete	C20/25	$N_{Rk,p}$	[kN]	35,2	62,5	97,7	140,7	236,4	336,4	477,4
				305,9 [3]	474,5 [3]	676,2 [3]	1232,5 [3]	1715,6 [3]	4)	
Increasing factors for $N_{Rk,p} = N_{Rk,p(C20/25)} * \Psi c$ in cracked and uncracked concrete	C25/30	Ψ_c	[-]	1,25						
	C30/37	Ψ_c	[-]	1,50						
	C35/45	Ψ_c	[-]	1,75						
	C40/50	Ψ_c	[-]	2,00						
	C45/55	Ψ_c	[-]	2,25						
	C50/60	Ψ_c	[-]	2,50						
Partial factor		γ_{Mp} [1]	[-]	1,50						

[1] in absence of other national regulations; [2] only available in GV (material 1 according to Annex A7); [3] only valid for plate anchor 1980-P; [4] no performance assessed

DEMU Bolt anchor and Plate anchor	Annex C1
Performances Characteristic values for tension loads	

Table C1b: **Characteristic values for tension loads in cracked and uncracked concrete**

Thread size	d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Effective anchorage depth	h_{ef} 1)	[mm]	x55: 49,0	x75: 67,0	x90: 79,0	x110: 97,0	x160: 143,0	x300: 279,0	x300: 276,0
			x100: 94,0	x140: 132,0	x150: 139,0	x200: 187,0	x240: 223,0	x420: 399,0	x460: 436,0
			x150: 144,0	x220: 212,0	x180: 169,0	x320: 307,0	x380: 363,0		
					x270: 259,0				
			x ≥55: h_{ef} 3)	x ≥75: h_{ef} 3)	x ≥90: h_{ef} 3)	x ≥110: h_{ef} 3)	x ≥160: h_{ef} 3)	x ≥300: h_{ef} 3)	x ≥300: h_{ef} 3)
Concrete cone failure									
Factor to take into account the influence of load transfer mechanisms	k_1 (cr)	[-]	8,9						
	k_1 (ucr)	[-]	12,7						
Characteristic spacing	$s_{cr,N}$	[mm]	3,0 • h_{ef}						
Characteristic edge distance	$c_{cr,N}$	[mm]	1,5 • h_{ef}						
Partial factor	γ_{Mc} 2)	[-]	1,50						
Splitting									
Characteristic Resistance	$N^0_{Rk,sp}$	[mm]	$N^0_{Rk,sp} = \min \{N^0_{Rk,c}; N_{Rk,p}\}$ 4)						
Characteristic spacing	$s_{cr,sp}$	[mm]	3,0 • h_{ef}						
Characteristic edge distance	$c_{cr,sp}$	[mm]	1,5 • h_{ef}						
Partial factor	γ_{Msp} 2)	[-]	1,50						

1) for bolt anchor type 1985 the values have to be decreased by 2,0 mm, for plate anchor type 1980-P the values have to be decreased by the plate thickness m
2) in absence of other national regulations
3) h_{ef} = L - k + 2 [mm] for bolt anchor type 1988, h_{ef} = L - k [mm] for bolt anchor type 1985, h_{ef} = L - k - m + 2 [mm] for plate anchor type 1980-P, m in accordance with Annex A5 Table A4
4) $N^0_{Rk,c}$ according to EN 1992-4:2018

Table C2: **Displacements under tension loads in cracked and uncracked concrete**

Thread size	d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Displacements δ_{N0} to 0.7 mm for short term loading under following tension loads 1)	N	[kN]	14,0	20,0	29,0	40,0	63,0	83,0	113,0

1) for long term tension loading the displacements $\delta_{N\infty}$ can be increased to 1,8 mm

DEMU Bolt anchor and Plate anchor

Performances
Characteristic values for tension loads, displacements under tension loads

Annex C2

Table C3a: **Characteristic values for shear loads**

Thread size	d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Shear loads without lever arm									
Group factor (EN 1992-4:2019, 7.2.2.3.1)	k_7	[-]	1,0						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 4.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	16,9	31,4	49,0	70,6	112,2	163,4	224,2 [2]
Partial factor	γ_{Ms} [1]	[-]	1,67						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 5.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	21,1	39,3	61,3	88,3	140,3	204,3	280,3 [2]
Partial factor	γ_{Ms} [1]	[-]	1,67						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 8.8) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	22,9	46,5	69,8	109,7	167,5	245,2	294,1 [2]
Partial factor	γ_{Ms} [1]	[-]	1,32						
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-50) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	21,1	40,5	55,1	3)			
Partial factor	γ_{Ms} [1]	[-]	2,38	2,58					
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-70) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	23,2	40,5	55,1	3)			
Partial factor	γ_{Ms} [1]	[-]	2,58						
Steel failure, bolt / plate anchor (material 4: A4-70) and screw (min. steel str. A4-70) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	25,8	52,5	78,8	123,6	196,4	3)	
Partial factor	γ_{Ms} [1]	[-]	1,56						
Steel failure, bolt / plate anchor (material 5: A4-80) and screw (min. steel str. A4-80) made of stainless steel									
Characteristic resistance	$V_{Rk,s}$	[kN]	29,5	62,8	90,0	141,2	224,4	3)	
Partial factor	γ_{Ms} [1]	[-]	1,25	1,33	1,25	1,33			
Shear loads with lever arm: see Annex C4, Table C3b									
Pry-out failure			**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Factor	k_8	[-]	x55: 1,0 x100: 2,0 x150: 2,0	2,0	2,0	2,0	2,0	2,0	2,0
Partial factor	γ_{Mcp} [1]	[-]	1,50						
Concrete edge failure (without suppl. reinforcement)			**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Effective length of fixing anchor (for shear loads)	l_f [4]	[mm]	x55: 49,0	x75: 67,0	x90: 79,0	x110: 97,0	x160: 143,0	x300: 279,0	x300: 276,0
			x100: 94,0	x140: 132,0	x150: 139,0	x200: 187,0	x240: 223,0	x420: 380,0	x460: 432,0
			x150: 144,0	x220: 212,0	x180: 169,0	x320: 300,0	x380: 320,0		
					x270: 259,0				
			x ≥55: h_{ef}	x ≥75: h_{ef}	x ≥90: h_{ef}	x ≥110: h_{ef}	x ≥160: h_{ef}	x ≥300: h_{ef}	x ≥300: h_{ef}
Effective outside diameter	d_{nom}	[mm]	15,5	21,0	26,0	32,0	40,0	47,5	54,0
Partial factor	γ_{Mce} [1]	[-]	1,50						

[1] in absence of other national regulations; [2] only available in GV (material 1 according to Annex A7); [3] no performance assessed; [4] for bolt anchor type 1985 the values have to be decreased by 2,0 mm

DEMU Bolt anchor and Plate anchor	Annex C3
Performances Characteristic values for shear loads	

Table C3b: **Characteristic values for shear loads**

Thread size	d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Shear loads with lever arm									
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 4.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	52,4	133,2	259,6	449,0	899,6	1581,0	2541,1 [2]
Partial factor	γ_{Ms} [1]	[-]	1,67						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 5.6) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	65,5	166,5	324,5	561,3	1124,5	1976,3	3176,3 [2]
Partial factor	γ_{Ms} [1]	[-]	1,67						
Steel failure, bolt / plate anchor (material 1 or 2) and screw (min. steel strength 8.8) made of electroplated / hot-dipped galvanised steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	104,8	266,4	519,3	898,0	1799,2	3162,1	5082,1 [2]
Partial factor	γ_{Ms} [1]	[-]	1,25						
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-50) made of stainless steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	65,5	166,5	324,5	3)			
Partial factor	γ_{Ms} [1]	[-]	2,38						
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-70) made of stainless steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	91,7	383,7	659,4	3)			
Partial factor	γ_{Ms} [1]	[-]	1,56	2,58					
Steel failure, bolt anchor (material 3: A4-50) and screw (min. steel strength A4-80) made of stainless steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	161,6	383,7	659,4	3)			
Partial factor	γ_{Ms} [1]	[-]	2,58						
Steel failure, bolt / plate anchor (material 4: A4-70) and screw (min. steel strength A4-70) made of stainless steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	91,7	233,1	454,4	785,8	1574,3	3)	
Partial factor	γ_{Ms} [1]	[-]	1,56						
Steel failure, bolt / plate anchor (material 5: A4-80) and screw (min. steel strength A4-80) made of stainless steel									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	104,8	266,4	519,3	898,0	1799,2	3)	
Partial factor	γ_{Ms} [1]	[-]	1,33						

[1] in absence of other national regulations
[2] only available in GV (material 1 according to Annex A7)
[3] no performance assessed

Table C4: **Displacements under shear loads in cracked and uncracked concrete**

Thread size	d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Displacements δ_{V0} to 1.5 mm for short term loading under following shear loads [1]	V	[kN]	13,0	23,0	36,0	52,0	82,0	120,0	160,0

[1] for long term shear loading the displacements $\delta_{V\infty}$ can be increased to 2,0 mm

DEMU Bolt anchor and Plate anchor

Performances
Characteristic values for shear loads, displacements under shear loads

Annex C4

Table C5: **Characteristic values for resistance to fire**

Thread size		d	[mm]	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**	**M42**
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$), bolt anchor (material 1 or 2) and screw made of electroplated / hot-dipped galvanised steel										
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	1,5	3,0	4,5	7,1	10,8	15,8	19,0
	R60	$F_{Rk,s,fi}$	[kN]	1,1	2,3	3,4	5,3	8,1	11,9	14,2
	R90	$F_{Rk,s,fi}$	[kN]	1,0	2,0	2,9	4,6	7,0	10,3	12,3
	R120	$F_{Rk,s,fi}$	[kN]	0,7	1,5	2,3	3,5	5,4	7,9	9,5
Partial factor		$\gamma_{Ms,fi}$ [1]	[-]	1,00						
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	2,6	6,7	13,0	22,5	45,0	79,1	127,1
	R60	$M^0_{Rk,s,fi}$	[Nm]	2,0	5,0	9,7	16,8	33,7	59,3	95,3
	R90	$M^0_{Rk,s,fi}$	[Nm]	1,7	4,3	8,4	14,6	29,2	51,4	82,6
	R120	$M^0_{Rk,s,fi}$	[Nm]	1,3	3,3	6,5	11,2	22,5	39,5	63,5
Partial factor		$\gamma_{Ms,fi}$ [1]	[-]	1,00						
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$), bolt anchor (material 3 or 4 or 5) and screw made of stainless steel										
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	2,2 / 2,5 [2]	4,5 / 4,6 [2]	6,8	10,6	16,2	3)	3)
	R60	$F_{Rk,s,fi}$	[kN]	1,8 / 2,1 [2]	3,8 / 3,9 [2]	5,6	8,8	13,5		
	R90	$F_{Rk,s,fi}$	[kN]	1,5 / 1,6 [2]	3,0 / 3,1 [2]	4,5	7,1	10,8		
	R120	$F_{Rk,s,fi}$	[kN]	1,2 / 1,3 [2]	2,4 / 2,5 [2]	3,6	5,6	8,6		
Partial factor		$\gamma_{Ms,fi}$ [1]	[-]	1,00						
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,9	10,0	19,5	33,7	67,5	3)	3)
	R60	$M^0_{Rk,s,fi}$	[Nm]	3,3	8,3	16,2	28,1	56,2		
	R90	$M^0_{Rk,s,fi}$	[Nm]	2,6	6,7	13,0	22,5	45,0		
	R120	$M^0_{Rk,s,fi}$	[Nm]	2,1	5,3	10,4	18,0	36,0		
Partial factor		$\gamma_{Ms,fi}$ [1]	[-]	1,00						
Pull-out failure										
Characteristic resistance	R90	$N_{Rk,p,fi}$	[kN]	$N_{Rk,p,fi(90)} = 0,25 \bullet N_{Rk,p}$						
	R120	$N_{Rk,p,fi}$	[kN]	$N_{Rk,p,fi(120)} = 0,20 \bullet N_{Rk,p}$						
Partial factor		$\gamma_{Mp,fi}$ [1]	[-]	1,00						

[1] in absence of other national regulations
[2] higher value applies for material 3 (according to Annex A7)
[3] no performance assessed

DEMU Bolt anchor and Plate anchor	Annex C5
Performances Characteristic values for resistance to fire	