Deutsches Institut für Bautechnik

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

Member of EOTA
www.eota.eu

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

European Technical Assessment ETA-24/1250 of 18 July 2025

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	BERNER multicompound system MCS Protect Plus for masonry
Product family to which the construction product belongs	Metal Injection anchors for use in masonry
Manufacturer	Berner Omnichannel Trading Holding SE Bernerstraße 6 74653 Künzelsau GERMANY
Manufacturing plant	Berner Herstellwerk 6 Berner manufacturing plant 6
This European Technical Assessment contains	44 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 330076-01-0604, Edition 10/2022

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Specific Part

1 Technical description of the product

The Berner multicompound system MCS Protect Plus for masonry is a bonded anchor (injection type) consisting of a mortar cartridge with injection mortar MCS Protect Plus, a perforated sleeve and an anchor rod with hexagon nut and washer or an internal threaded rod. The steel elements are made of zinc coated steel, stainless steel or high corrosion resistant steel.

The anchor rod is placed into a drilled hole filled with injection mortar and is anchored via the bond between steel element, injection mortar and masonry and mechanical interlock.

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 fastener 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 fastener 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 resistance for static and quasi-static loading	See Annexes B4 to B7, B14 C1 to C21
Characteristic resistance and displacements for seismic loading	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire under tension and shear loading with and without lever arm. Minimum edge distances and spacing	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with the European Assessment Document EAD 330076-01-0604 the applicable European legal act is: [97/177/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 European Assessment Document

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

Issued in Berlin on 18 July 2025 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

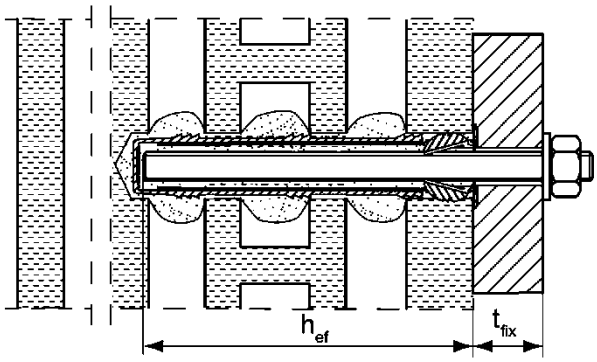
beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

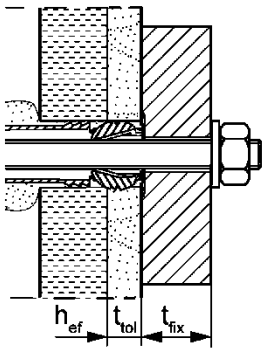
Installation conditions part 1

Anchor rods with perforated sleeve MCS PLUS H; Installation in perforated and solid brick masonry

Pre-positioned installation:

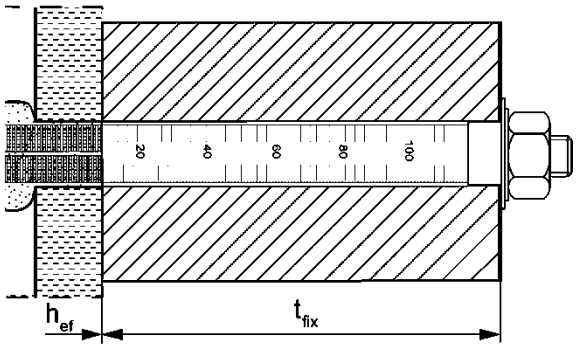


Installation with render bridge

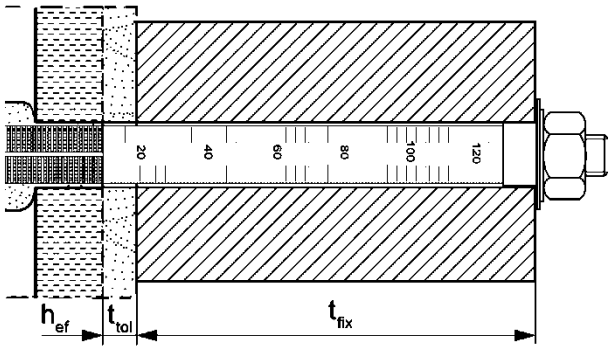


Size of the perforated sleeve: MCS PLUS H 12x50, MCS PLUS H 12x85, MCS PLUS H 16x85, MCS PLUS H 16x130, MCS PLUS H 20x85, MCS PLUS H 20x130

Push through installation:



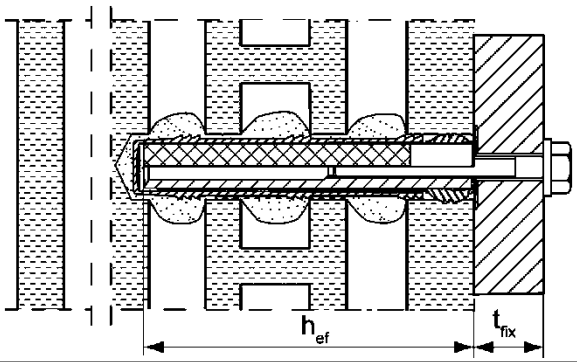
Installation with render bridge



Size of the perforated sleeve: MCS PLUS H 18x130/200, MCS PLUS H 22x130/200

Internal threaded anchor MCS PLUS E with perforated sleeve MCS PLUS H; Installation in perforated and solid brick masonry

Pre-positioned installation:



Figures not to scale

h_{ef} = effective anchorage depth
t_{tol} = thickness of unbearing layer (e.g. plaster)
t_{fix} = thickness of fixture

BERNER multicompound system MCS Protect Plus for masonry

Product description
Installation conditions part 1,
Anchor rods and internal threaded anchor with perforated sleeve MCS PLUS H

Annex A1

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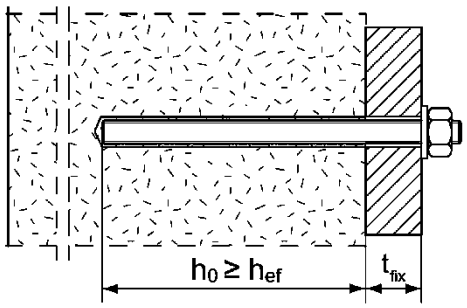
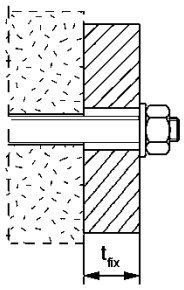
Installation conditions part 2

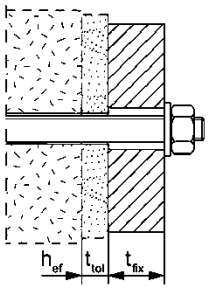
Anchor rods without perforated sleeve MCS PLUS H; installation in solid brick masonry and autoclaved aerated concrete (AAC)

Pre-positioned installation:



Push through installation: Annular gap filled with mortar

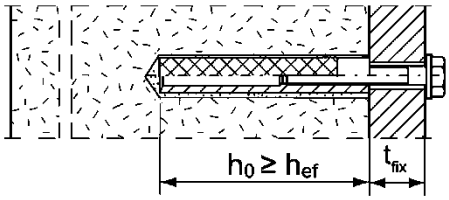




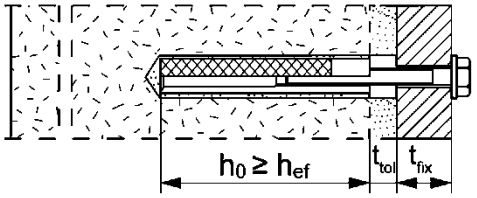
Installation with render bridge

Internal threaded anchors MCS PLUS E without perforated sleeve MCS PLUS H; installation in solid brick masonry

Pre-positioned installation:



Installation with render bridge



Figures not to scale

h_0 = depth of drill hole
h_{ef} = effective anchorage depth
t_{tol} = thickness of unbearing layer (e.g. plaster)
t_{fix} = thickness of fixture

BERNER multicompound system MCS Protect Plus for masonry

Product description
Installation conditions part 2,
Anchor rods and internal threaded anchor without perforated sleeve

Annex A2

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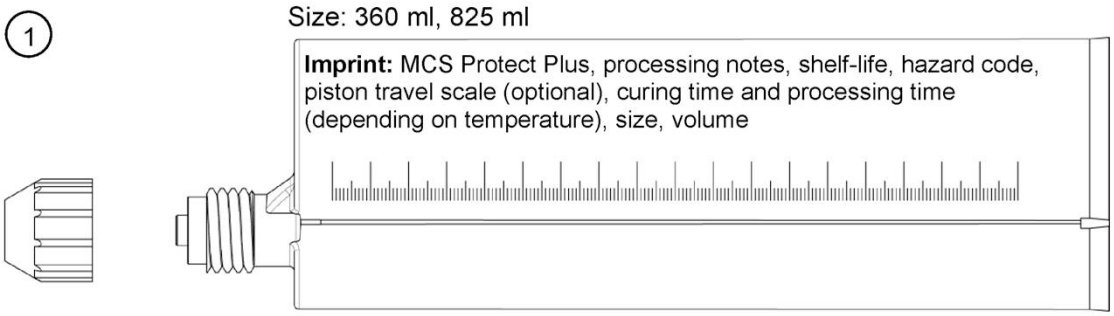
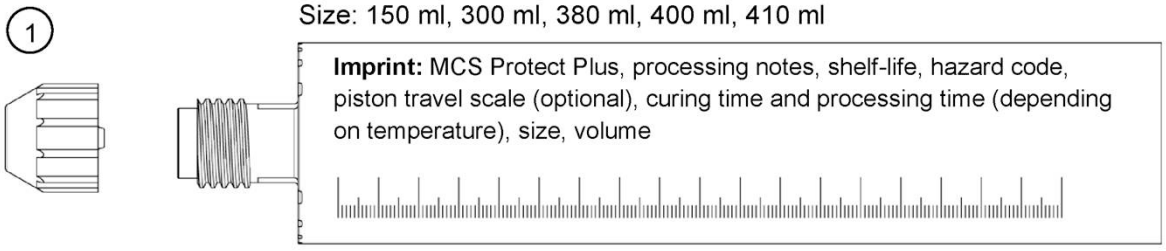
Overview system components part 1

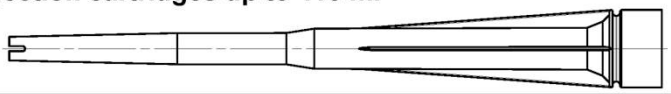
Mortar cartridge (shuttle cartridge) with sealing cap



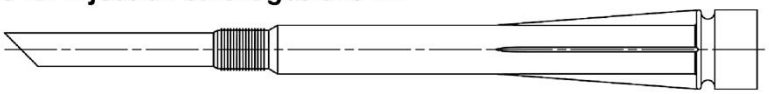
Mortar cartridge (coaxial cartridge) with sealing cap



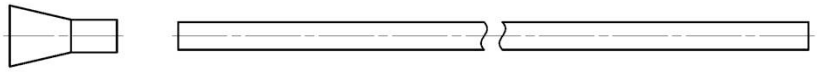
Static mixer MCS Protect Plus for injection cartridges up to 410 ml



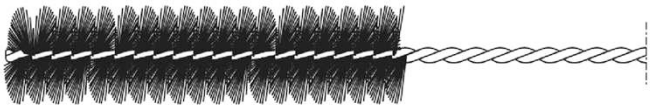
Static mixer MCS Protect Plus for injection cartridges 825 ml



Extension tube Ø 9 for static mixer Static mixer MCS Protect Plus up to 410 ml;
Extension tube Ø 9 or Ø 15 for static mixer MCS Protect Plus 825 ml



Cleaning brush



blow-out pump

compressed-air cleaning tool

Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Product description
Overview system components part 1: cartridge / static mixer / cleaning tools

Annex A3

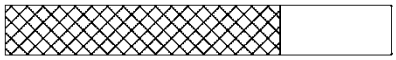
Deutsches Institut für Bautechnik DIBt

Overview system components part 2

BERNER anchor rod

Size: M8, M10, M12, M16

Internal threaded anchor MCS PLUS E



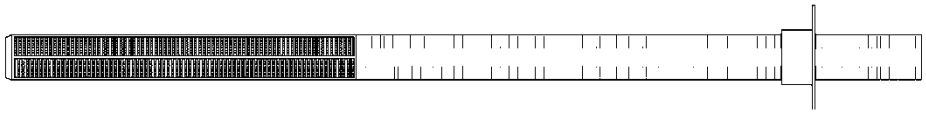
Size: 11x85 M8
15x85 M10 / M12

Perforated sleeve MCS PLUS H

Size: MCS PLUS H 12x50
MCS PLUS H 12x85
MCS PLUS H 16x85
MCS PLUS H 20x85

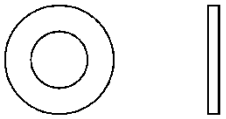
Size: MCS PLUS H 16x130
MCS PLUS H 20x130

Perforated sleeve MCS PLUS H (push through installation)



Size:
MCS PLUS H 18x130/200
MCS PLUS H 22x130/200

Washer



Hexagon nut

Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Product description
Overview system components part 2: Metal parts / perforated sleeves MCS PLUS H

Annex A4

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Table A5.1: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener; filler		
	Steel grade	Steel	Stainless steel R	High corrosion-resistant steel HCR
		zinc plated	acc. to EN 10088-1:2023 Corrosion resistance class CRC III acc. EN 1993-1-4:2006+A1:2015	acc. to EN 10088-1:2023 Corrosion resistance class CRC V acc. EN 1993-1-4:2006+A1:2015
2	Anchor rod	Property class 4.6; 4.8; 5.8 or 8.8; EN ISO 898-1: 2013 zinc plated ≥ 5µm, EN ISO 4042:2022 or hot-dip galvanised EN ISO 10684:2004+AC:2009 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$ fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062; 1.4662; 1.4462; EN 10088-1:2023 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$ fracture elongation	Property class 50 or 80 EN ISO 3506-1:2020 or property class 70 with f_{yk}= 560 N/mm² 1.4565; 1.4529 EN 10088-1:2023 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$ fracture elongation
3	Washer ISO 7089:2000	zinc plated ≥ 5µm, ISO 4042:2022 or hot-dip galvanised EN ISO 10684:2004+AC:2009	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	1.4565;1.4529 EN 10088-1:2023
4	Hexagon nut	Property class 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5µm, EN ISO 4042:2022 or hot-dip galvanised EN ISO 10684:2004+AC:2009	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2023
5	Internal threaded anchor MCS PLUS E	Property class 5.8; EN ISO 898-1:2013 zinc plated ≥ 5µm, EN ISO 4042:2022	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2023
6	Commercial standard screw or threaded rod for internal threaded anchor MCS PLUS E	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5µm, EN ISO 4042:2022	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2023
7	Perforated sleeve MCS PLUS H	PP / PE		

BERNER multicompound system MCS Protect Plus for masonry

Product description
Materials

Annex A5

Deutsches Institut für Bautechnik DIBt

Specifications of intended use part 1

Table B1.1: Overview installation and use

		MCS Protect Plus for masonry		
Hole drilling with hammer drill mode		all bricks		
Hole drilling with rotary drill mode		all bricks		
Static and quasi-static load		all bricks		
Use conditions	dry masonry	all bricks		
Installation	Pre-positioned	Anchor rod or internal threaded anchor (in solid brick masonry and autoclaved aerated concrete)	Perforated sleeve with anchor rod or internal threaded anchor (in perforated and solid brick masonry) Size: MCS PLUS H 12x50 MCS PLUS H 12x85 MCS PLUS H 16x85 MCS PLUS H 16x130 MCS PLUS H 20x85 MCS PLUS H 20x130	
	Push through	Anchor rod (in solid brick masonry and autoclaved aerated concrete)	Perforated sleeve with anchor rod (in perforated and solid brick masonry) Size MCS PLUS H 18x130/200 MCS PLUS H 22x130/200	
Installation and use conditions	condition d/d (dry/dry)	all bricks		
Installation temperature		$T_{i,min}$ = -10 °C to $T_{i,max}$ = +40 °C		
Service temperature	Temperature range Ta	-40 °C to +40 °C	(max. short term temperature +40 °C max. long term temperature +24 °C)	
	Temperature range Tb	-40 °C to +80 °C	(max. short term temperature +80 °C max. long term temperature +50 °C)	
	Temperature range Tc	-40 °C to +120 °C	(max. short term temperature +120 °C; max. long term temperature +72 °C)	

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Specifications part 1

Annex B1

Specifications of intended use part 2

Anchorages subject to:

- Static and quasi-static loads

Base materials:

- Solid brick masonry (base material group b) and AAC masonry (base material groub d), acc. to Annex B12
- Hollow brick masonry (base material group c), according to Annex B12
- Minimum thickness of masonry member is h_{ef}+30mm
- Mortar strength class of the masonry M2,5 at minimum according to EN 998-2:2016
- For other bricks in solid masonry, hollow, perforated masonry or AAC masonry the characteristic resistance of the anchor may be determined by job site tests according to EOTA Technical Report TR 053:2022-07 under consideration of the β-factor according to Annex C20, Table C20.1

  Note (only applies to solid bricks and AAC):
  The characteristic resistance is also valid for larger brick sizes, higher mean compressive strength and higher mean gross dry density of the masonry unit.

Temperature Range:

- **Ta:** from -40°C to +40°C (max. short term temperature +40°C and max. long term temperature +24°C)
- **Tb:** from -40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C)
- **Tc:** from -40°C to +120°C (max. short term temperature +120°C and max. long term temperature +72°C)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc plated steel, stainless steel or high corrosion resistant steel)
- For all other conditions according to EN 1993-1-4:2006+A1:2015 corresponding to corrosion resistance classes to Annex A5, Table A5.1.

BERNER multicompound system MCS Protect Plus for masonry	**Annex B2**
Intended use Specifications part 2	

Specifications of intended use (part 2 continued)

Design:

- The anchorages have to be designed in accordance with EOTA Technical Report TR 054:2023-12, Design method A under the responsibility of an experienced in anchorages and masonry work.
  Applies to all bricks, if no other values are specified:
  $N_{Rk} = N_{Rk,b} = N_{Rk,p} = N_{Rk,b,c} = N_{Rk,p,c}$
  $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$
  For the Calculation of pulling out a brick under tension load $N_{Rk,pb}$ or
  pushing out a brick under shear load $V_{Rk,pb}$ see EOTA Technical Report TR 054:2023-12.
  $N_{Rk,s}$, $V_{Rk,s}$ and $M^0_{Rk,s}$ see annex C1-C3
  Factors for job site tests see Annex C20 and displacements see Annex C21
- Verifiable calculation notes and drawings have to be prepared taking account the relevant masonry in the region of the anchorage, the loads to be transmitted and their transmission to the supports of the structure. The position of the anchor is indicated on the design drawings.

Installation:

- Condition d/d: Installation and use in structures subject to dry, internal conditions
- Hole drilling see Annex B1.1
- In case of aborted hole: The hole shall be filled with mortar
- Bridging of unbearing layer (e.g. plaster) at perforated brick masonry see Annex B6, Table B6.1
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Fastening screws or anchor rods (including nut and washer) must comply with the appropriate material and property class of the internal threaded anchor MCS PLUS E.
- Minimum curing time see Annex B8, Table B8.2
- Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:
  Material dimensions and mechanical properties of the metal parts according to the specifications are given in Annex A5, Table 5.1
  Conformation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents shall be stored
  Marking of the anchor rod with the effective anchorage depth. This may be done by the manufacturer of the rod or by a person on job site

BERNER multicompound system MCS Protect Plus for masonry	**Annex B3**
Intended use Specifications (part 2 continued)	

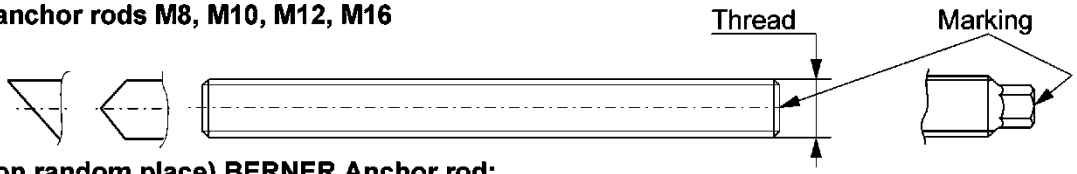
Deutsches Institut für Bautechnik DIBt

Table B4.1: Installation parameters for anchor rods in solid bricks and AAC without perforated sleeves MCS PLUS H

Anchor rod		**Thread**	**M8**	**M10**	**M12**	**M16**
Nominal drill hole diameter		d_0 [mm]	10	12	14	18
Effective anchorage depth h_{ef}[1] in solid brick (cycl. drill hole)		$h_{0,min}=h_{ef,min}$ [mm]	100			
Effective anchorage depth h_{ef}[1] in solid brick (depth of drill hole $h_0 = h_{ef}$)		$h_{ef,min}$ [mm]	50			
		$h_{ef,max}$ [mm]	h-30, ≤200			
Diameter of clearance hole in the fixture	pre-positioned installation	$d_f \leq$ [mm]	9	12	14	18
	push through installation	$d_f \leq$ [mm]	11	14	16	20
Diameter of cleaning brush		$d_b \geq$ [mm]	see Table B8.1			
Maximum installation torque		max T_{inst} [Nm]	see parameters of brick Annex C			

[1] $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ is possible.

BERNER **anchor rods M8, M10, M12, M16**



Marking (on random place) BERNER Anchor rod:

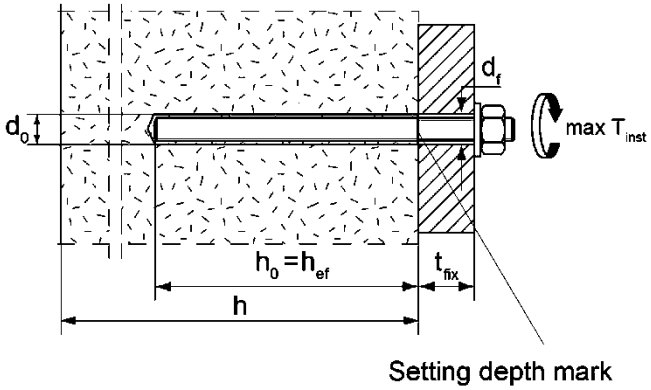
Steel zinc plated PC[1] 8.8	• or +	Steel hot-dip galvanised PC[1] 8.8	•
High corrosion resistant steel HCR PC[1] 50	•	High corrosion resistant steel HCR PC[1] 70	–
High corrosion resistant steel HCR PC[1] 80	(	Stainless steel R property class 50	~
Stainless steel R property class 80	*		

Alternatively: Colour coding according to DIN 976-1: 2016; property class 4.6 marking according to EN ISO 898-1:2013

[1] PC = property class

Installation conditions:

Anchor rod



Setting depth mark

Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Installation parameters for anchor rods without perforated sleeve

Annex B4

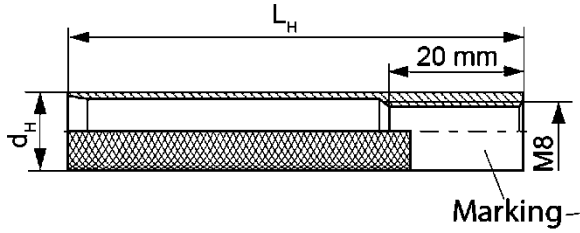
Deutsches Institut für Bautechnik DIBt

Table B5.1: Installation parameters for internal threaded anchors MCS PLUS E in solid bricks without perforated sleeves

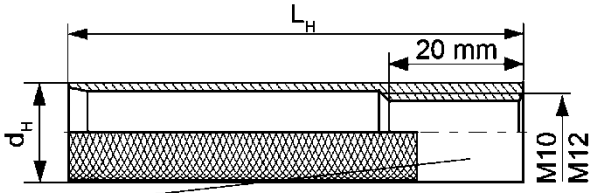
Internal threaded anchor MCS PLUS E		**11x85 M8**	**15x85 M10**	**15x85 M12**
Diameter of anchor	d_H [mm]	11	15	
Nominal drill hole diameter	d_0 [mm]	14	18	
Length of anchor	L_H [mm]	85		
Effective anchorage depth	$h_0 = h_{ef}$ [mm]	85		
Diameter of cleaning brush	$d_b \geq$ [mm]	see Table B8.1		
Maximum installation torque	max T_{inst} [Nm]	see parameters of brick Annex C4-C16		
Diameter of clearance hole in the fixture	d_f [mm]	9	12	14
Screw-in depth	$l_{E,min}$ [mm]	8	10	12
	$l_{E,max}$ [mm]	60		

BERNER Internal threaded anchor MCS PLUS E

MCS PLUS E 11x85 M8



MCS PLUS E 15x85 M10, MCS PLUS E 15x85 M12

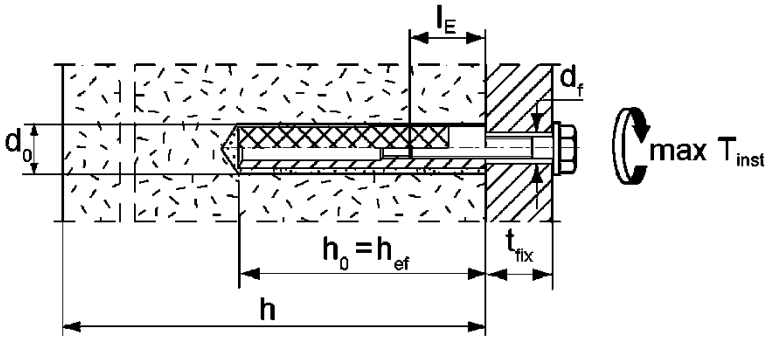


Marking:

Size, e.g. **M8**, Stainless steel: R, e.g. **M8 R**, High corrosion-resistant steel: HCR, e.g. **M8 HCR**

Installation conditions:

Internal threaded anchor



Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Installation parameters for internal threaded rods MCS PLUS E without perforated sleeve

Annex B5

Deutsches Institut für Bautechnik DIBt

Table B6.1: Installation parameters for Anchor rods and internal threaded anchors MCS PLUS E with perforated sleeves MCS PLUS H (pre-positioned installation)

perforated sleeve MCS PLUS H		**12x50**	**12x85[2)]**	**16x85**	**16x130[2)]**	**20x85**	**20x130[2)]**
Nominal drill hole diameter $d_0 = D_{sleeve,nom}$	d_0 [mm]	12		16		20	
Depth of drill hole	h_0 [mm]	55	90	90	135	90	135
Effective anchorage depth	$h_{ef,min}$ [mm]	50	65	85	110	85	110
	$h_{ef,max}$ [mm]	50	85	85	130	85	130
Size of threaded rod	[-]	M8		M8 and M10		M12 and M16	
Size of internal threaded anchor MCS PLUS E		-	-	11x85	-	15x85	-
Diameter of cleaning brush [1)]	$d_b \geq$ [mm]	see Table B8.1					
Maximum installation torque	max T_{inst} [Nm]	see parameters of brick Annex C					

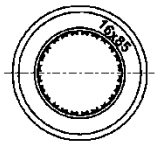
[1)] Only for solid areas in hollow bricks and solid bricks.

[2)] Bridging of unbearing layer (e.g. plaster) is possible. When reducing the effective anchorage depth $h_{ef,min}$, the values of the next shorter perforated sleeve of the same diameter must be used. The smaller value of charastereristic resistance must be taken.

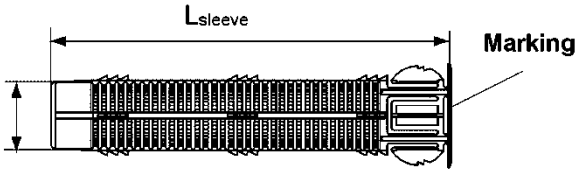
Perforated sleeve

MCS PLUS H 12x50; MCS PLUS H 12x85; MCS PLUS H 16x85; MCS PLUS H 16x130; MCS PLUS H 20x85; MCS PLUS H 20x130

Marking:
Size $D_{sleeve,nom}$ x L_{sleeve}
(e.g.: 16x85)

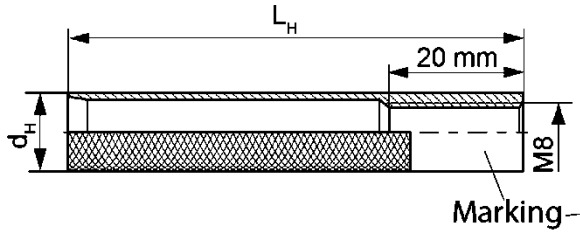


$D_{sleeve,nom}$

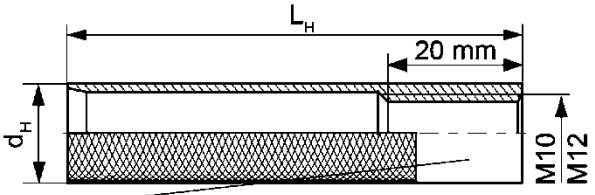


BERNER Internal threaded anchor MCS PLUS E

MCS PLUS E 11x85 M8

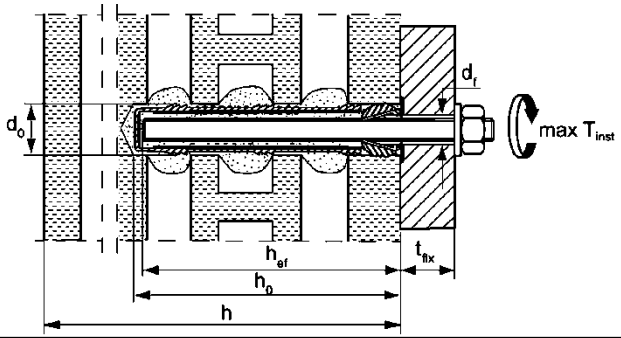


MCS PLUS E 15x85 M10, MCS PLUS E 15x85 M12

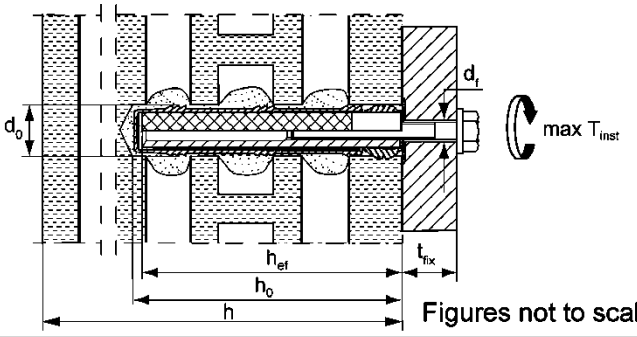


Installation conditions:

Anchor rod with perforated sleeve



Internal threaded anchor with perforated sleeve



Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Installation parameters for anchor rods and internal threaded anchors MCS PLUS E with perforated sleeve MCS PLUS H (pre-positioned installation)

Annex B6

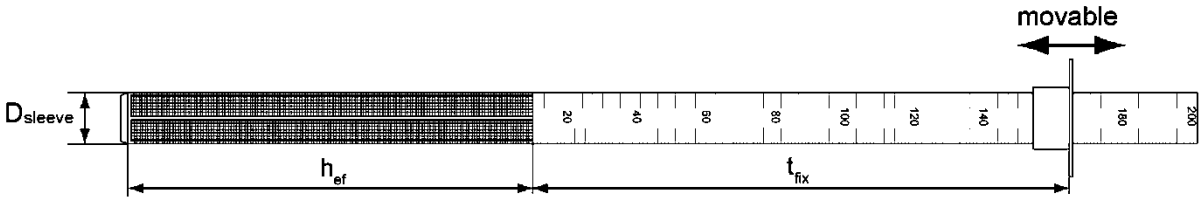
Table B7.1: Installation parameters for anchor rods with perforated push through sleeves (push through installation)

Perforated sleeve MCS PLUS H		**18x130/200**		**22x130/200**
Nominal sleeve diameter	$D_{sleeve,nom}$ [mm]	16		20
Nominal drill hole diameter	d_0 [mm]	18		22
Depth of drill hole	h_0 [mm]	135		
Effective anchorage depth	h_{ef} [mm]	≥130		
Diameter of cleaning brush [1)]	$d_b \geq$ [mm]	see Table B8.1		
Size of threaded rod	[-]	M10	M12	M16
Maximum installation torque	max T_{inst} [Nm]	see parameters of brick Annex C		
Thickness of fixture	$t_{fix,max}$ [mm]	200		

[1)] Only for solid areas in hollow bricks and solid bricks.

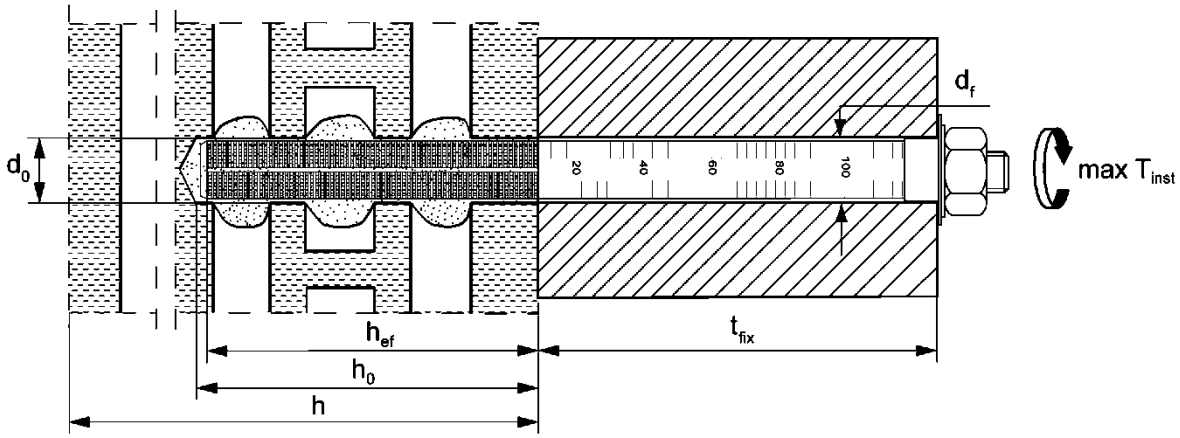
Perforated push through sleeve

MCS PLUS H 18x130/200; MCS PLUS H 22x130/200



Installation conditions:

Anchor rod with perforated sleeve



Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Installation parameters for anchor rods with perforated push through sleeves (push through installation)

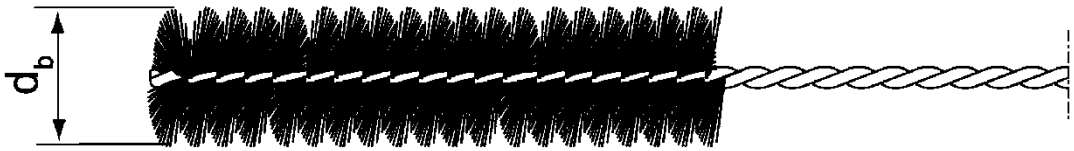
Annex B7

Deutsches Institut für Bautechnik DIBt

Table B8.1: Parameters of the cleaning brush (steel brush with steel bristles)

The size of the cleaning brush refers to the drill hole diameter

Nominal drill hole diameter	d_0 [mm]	10	12	14	16	18	20	22
Steel brush diameter	d_b [mm]	11	14	16	20	20	25	25



Only for solid areas in hollow bricks or solid bricks and autoclaved aerated concrete

Table B8.2: Maximum processing times and minimum curing times (During the curing time of the mortar the temperature of the anchoring base may not fall below the listed minimum temperature)

Temperature at anchoring base [°C]	Maximum processing time t_{work}	Minimum curing time t_{cure}
	MCS Protect Plus	**MCS Protect Plus**
-10 to -5 [1)]	6 h	72 h
> -5 to 0 [1)]	2 h	24 h
> 0 to 5 [1)]	45 min	12 h
> 5 to 10	20 min	6 h
> 10 to 15	8 min	3 h
> 15 to 20	5 min	2 h
> 20 to 25	3 min	1 h
> 25 to 30	2 min	45 min
> 30 to 40	1 min	30 min

[1)] Minimum cartridge temperature +5°C

Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

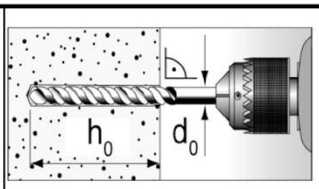
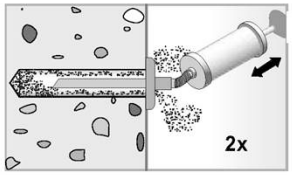
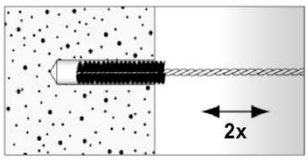
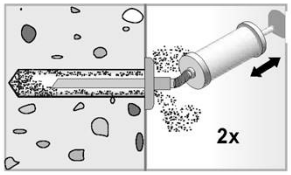
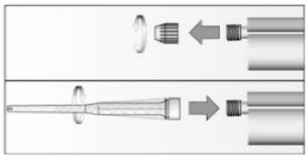
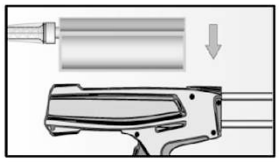
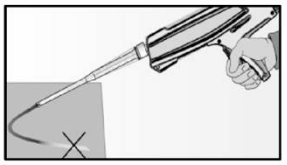
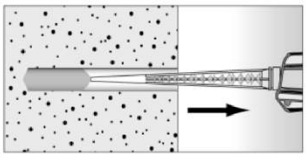
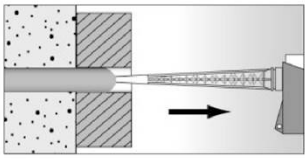
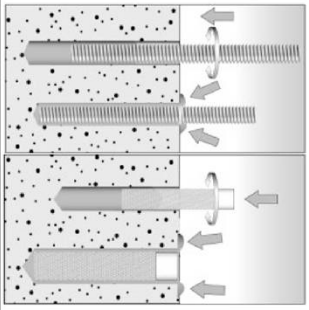
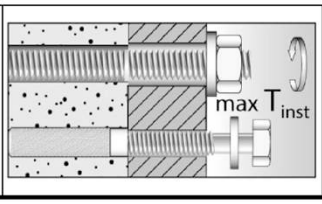
Intended use
Parameters of the cleaning brush (steel brush)
Processing time and curing time

Annex B8

Deutsches Institut für Bautechnik DIBt

Installation instruction part 1

Installation in solid brick and autoclaved aerated concrete without perforated sleeve

1		Drill the hole (drilling method see Annex C of the respective brick) depth of drill hole $\mathbf{h_0}$ and nominal drill hole diameter $\mathbf{d_0}$ see **Table B4.1; B5.1.**		
2				Blow out the drill hole twice. Brush twice and blow out twice again.
3		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)		
4		Place the cartridge into a suitable dispenser		Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.
5		Fill approximetly 2/3 of the drill hole with mortar beginning from the bottom of Avoid bubbles.		For push through installation fill the annular gap with mortar.
6		Only use clean and oil-free metal parts. Mark the setting depth. Insert the anchor rod or internal threaded anchor MCS PLUS E by hand. Recommendation: Rotation back and forth of the anchor rod or internal threaded anchor MCS PLUS E makes pushing easy. When reaching the setting depth mark, excess mortar must emerge from the mouth of the drill hole.		
7		Do not touch. Minimum curing time see Table **B8.2**		Mounting the fixture. max T_{inst} see parameter of brick in Annex C.

[1] Exact volume of mortar see manufacturer´s specifications

BERNER multicompound system MCS Protect Plus for masonry

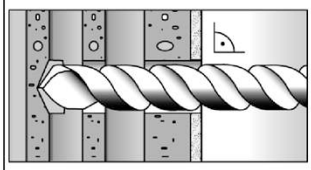
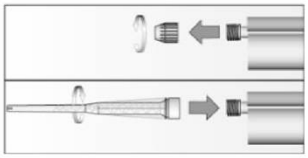
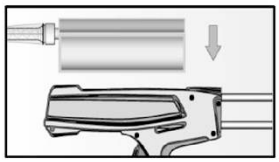
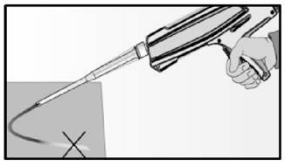
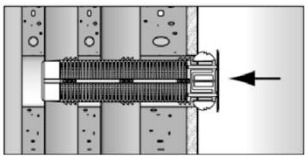
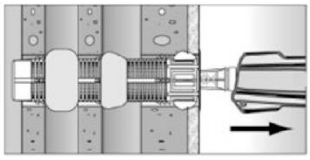
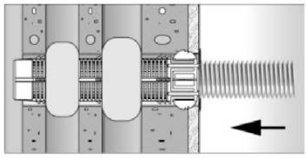
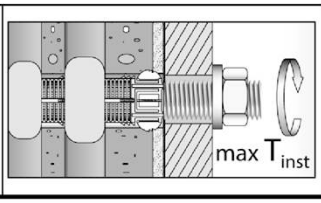
Intended use
Installation instruction part 1
Installation in solid brick without perforated sleeve

Annex B9

Deutsches Institut für Bautechnik DIBt

Installation instruction part 2

Installation in perforated or solid brick with perforated sleeve MCS PLUS H (pre-positioned installation)

1		Drill the hole (drilling method see Annex C of the respective brick). depth of drill hole $\mathbf{h_0}$ and nominal drill hole diameter $\mathbf{d_0}$ see **Table B6.1**.	When install perforated sleeves in solid bricks or solid areas of hollow bricks, also clean the hole by blowing out and brushing.	
2		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)		
3		Place the cartridge into a suitable dispenser.		Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.
4		Insert the perforated sleeve flush with the surface of the masonry or plaster.		Fill the perforated sleeve completely with mortar beginning from the bottom of the hole. [1]
5		Only use clean and oil-free metal parts. Mark the setting depth. Insert the anchor rod or the internal threaded anchor MCS PLUS E by hand. Recommendation: Rotation back and forth of the anchor rod or internal threaded anchor MCS PLUS E makes pushing easy until reaching the setting depth mark (anchor rod) or flush with the surface (internal threaded anchor).		
6		Do not touch. Minimum curing time see Table **B8.2**.		Mounting the fixture. max T_{inst} see parameter of brick in Annex C..

[1] Exact volume of mortar see manufacturer´s specification.

BERNER multicompound system MCS Protect Plus for masonry

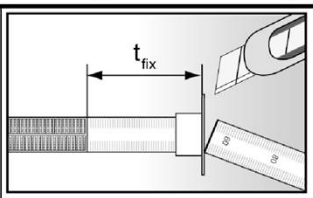
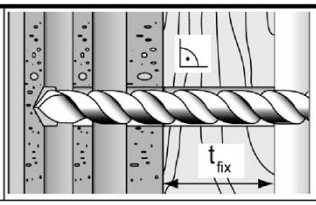
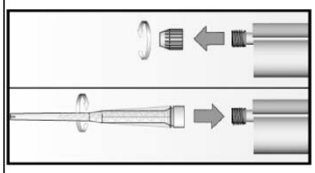
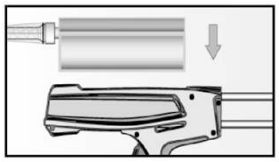
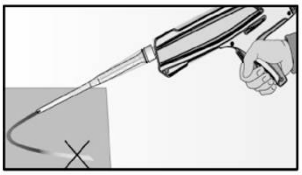
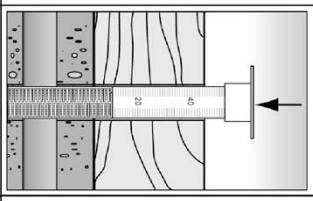
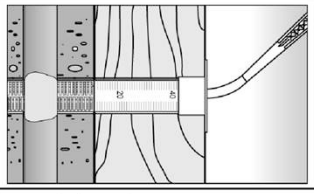
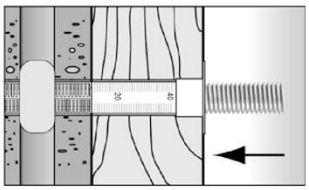
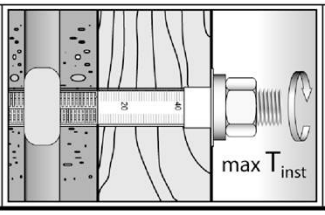
Intended use
Installation instruction part 2
Installation in perforated or solid brick with perforated sleeve (pre-positioned installation)

Annex B10

Deutsches Institut für Bautechnik DIBt

Installation instruction part 3

Installation in perforated or solid brick with perforated sleeve MCS PLUS H (push through installation)

1		Push the movable stop up to the correct thickness of fixture and cut the overlap.		Drill the hole through the fixture. Depth of drill hole **(h_0 + t_{fix})** and nominal drill hole diameter **d_0** see **Table B7.1**
2		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)		
3		Place the cartridge into a suitable dispenser.		Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.
4		Insert the perforated sleeve flush with the surface of the fixture into the drill hole.		Fill the sleeve with mortar beginning from the bottom of the hole. [1] For deep drill holes use an extension tube.
5		Only use clean and oil-free metal parts. Mark the setting depth. Insert the anchor rod by hand. Recommendation: Rotation back and forth of the anchor rod makes pushing easy until reaching the setting depth mark (anchor rod).		
6		Do not touch. Minimum curing time see Table **B8.2**		Mounting the fixture. max T_{inst} see parameter of brick in Annex C..

[1] Exact volume of mortar see manufacturer´s specification.

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Installation instruction part 3
Installation in perforated or solid brick with perforated sleeve (push through installation)

Annex B11

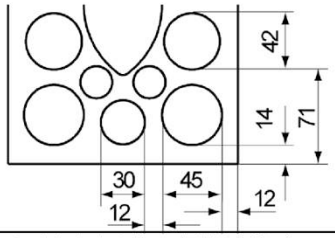
Deutsches Institut für Bautechnik DIBt

Table B12.1: Overview of assessed bricks

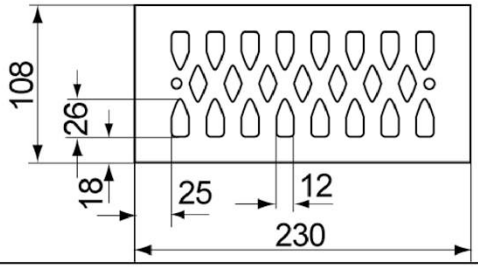
Kind of masonry		Brick format [mm]	Mean compressive strength [N/mm²]	Main country of origin	Mean gross dry density ρ [kg/dm³]	Annex
Solid brick Mz						
Solid brick Mz		≥ 230x108x55	36 / 48	Denmark	≥2,0	C4 / C5
Solid calcium silicate (sand - lime) brick KS / perforated calcium silicate (sand - lime) brick KSL						
Solid calcium silicate brick KS	**NF**	≥240x115x71	12 / 16 / 20	Germany	≥2,0	C6 / C7
Perforated calcium silicate brick KSL	**3DF**	240x175x113	6 / 8 / 10 / 12 / 16	Germany	≥1,6	C8 – C11
Vertical perforated brick HLz						
Vertical perforated brick HLz		230x108x55	8 / 10 / 12 / 16	Denmark	≥1,6	C12/C13
Lightweight aggregate concrete hollow block Hbl						
Lightweight aggregate concrete hollow block Hbl		500x200x200	2,5 / 5	France	≥1,0	C14 / C15
Autoclaved aerated concrete						
AAC	**PP2 / AAC** **PP4 / AAC** **PP6 / AAC**	-	2,5 5 8	Germany	≥0,35 ≥0,50 ≥0,65	C16-C19

Table B12.2: Overview dimensions of perforated and hollow bricks

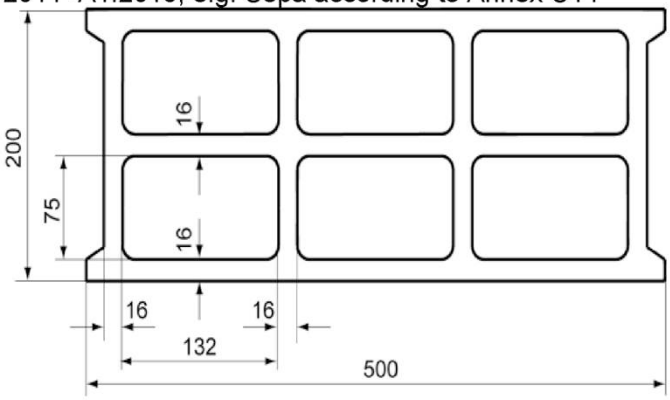
Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2011+A1:2015;; e.g. KS Wemding according to Annex C8



Vertical perforated brick HLz, EN 771-1: **2011+A1:2015**; e.g. Wienerberger according to Annex C12



Lightweight aggregate concrete hollow block Hbl, EN 771-3: 2011+A1:2015; e.g. Sepa according to Annex C14



Measures in [mm]

Figures not to scale

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Overview of assessed bricks
Overview dimensions of perforated and hollow bricks

Annex B12

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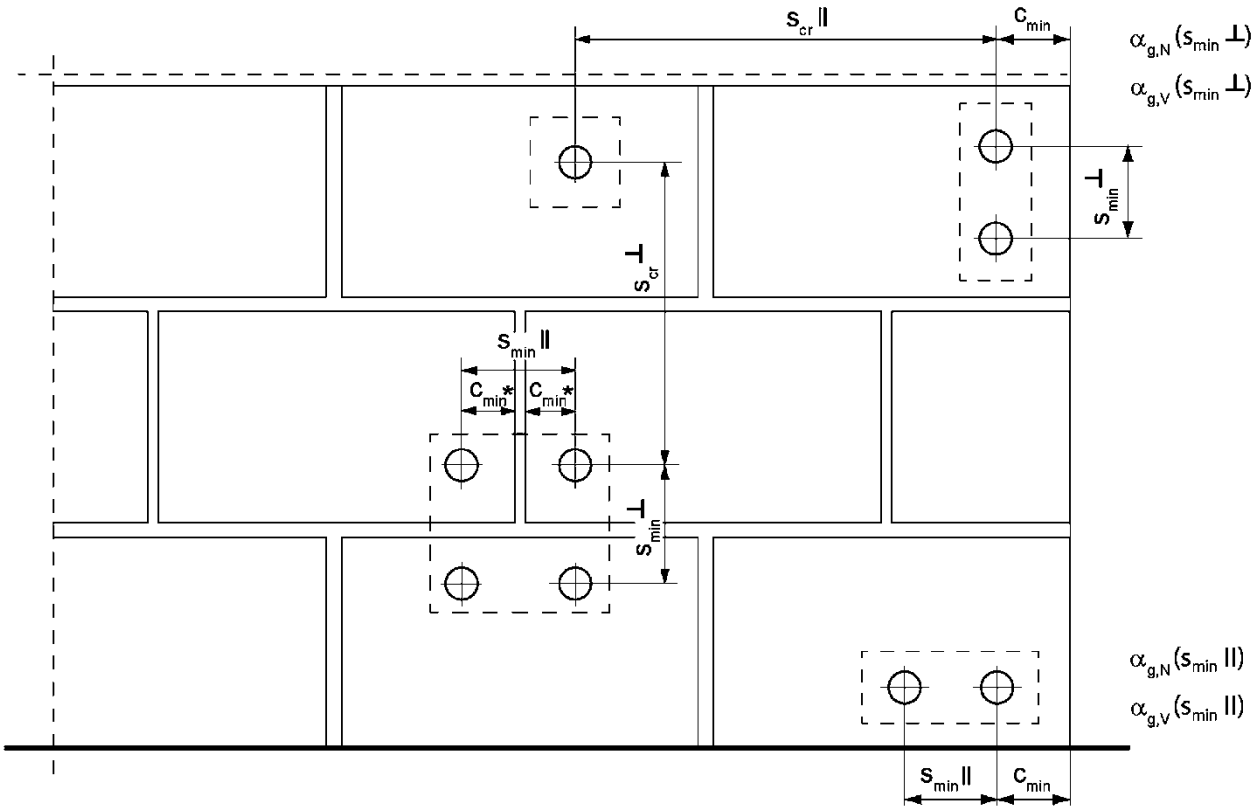
Spacing and edge distance



* Only, if vertical joints are not completely filled with mortar

s_{min} ‖	=	Minimum spacing parallel to horizontal joint
s_{min} ⊥	=	Minimum spacing perpendicular to horizontal joint
s_{cr} ‖	=	Characteristic spacing parallel to horizontal joint
s_{cr} ⊥	=	Characteristic spacing perpendicular to horizontal joint
$c_{cr} = c_{min}$	=	Edge distance
$\alpha_{g,N}$ (s_{min} ‖)	=	Group factor for tension load, anchor group parallel to horizontal joint
$\alpha_{g,V}$ (s_{min} ‖)	=	Group factor for shear load, anchor group parallel to horizontal joint
$\alpha_{g,N}$ (s_{min} ⊥)	=	Group factor for tension load, anchor group vertical to horizontal joint
$\alpha_{g,V}$ (s_{min} ⊥)	=	Group factor for shear load, anchor group vertical to horizontal joint

BERNER multicompound system MCS Protect Plus for masonry

Intended use
Spacing and edge distance

Annex B13

Spacing and edge distance (continuation)

For $s \geq s_{cr}$ $\alpha_g = 2$

For $s_{min} \leq s < s_{cr}$ α_g according to installation parameters of brick Annex C

Group of 2 anchors

$N^g_{Rk} = \alpha_{g,N} \bullet N_{Rk}$; $V^g_{Rk,b} = V^g_{Rk,c,II} = V^g_{Rk,c,\perp} = \alpha_{g,V} \bullet V_{Rk}$

Group of 4 anchors

$N^g_{Rk} = \alpha_{g,N}\ (s_{min}II) \bullet \alpha_{g,N}\ (s_{min}\perp) \bullet N_{Rk}$;

$V^g_{Rk,b} = V^g_{Rk,c,II} = V^g_{Rk,c,\perp} = \alpha_{g,V}\ (s_{min}II) \bullet \alpha_{g,V}\ (s_{min}\perp) \bullet V_{Rk}$

with N_{Rk} and $\alpha_{g,N}$ depending on $s_{min}II$ or $s_{min}\perp$ acc. to Annex C

with V_{Rk} and $\alpha_{g,V}$ depending on $s_{min}II$ or $s_{min}\perp$ acc. to Annex C

BERNER multicompound system MCS Protect Plus for masonry	**Annex B14**
Intended use Spacing and edge distance (continuation)	

Deutsches Institut für Bautechnik DIBt

Table C1.1: Characteristic resistance to **steel failure** of a single anchor under **tension loading** of **BERNER Anchor rods** and **standard threaded rods**

Anchor rod / standard threaded rod				**M8**[3]	**M10**[3]	**M12**	**M16**
Characteristic resistance to steel failure under tension loading							
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	4.6	14,6(13,2)	23,2(21,4)	33,7	62,8
			4.8	14,6(13,2)	23,2(21,4)	33,7	62,8
			5.8	18,3(16,6)	29,0(26,8)	42,1	78,5
			8.8	29,2(26,5)	46,4(42,8)	67,4	125,6
	Stainless steel R and High corrosion resistant steel HCR		50	18,3	29,0	42,1	78,5
			70	25,6	40,6	59,0	109,9
			80	29,2	46,4	67,4	125,6
[kN]							
Partial factors [1]							
Partial factors $\gamma_{Ms,N}$	Steel zinc plated	Property class	4.6	2,00			
			4.8	1,50			
			5.8	1,50			
			8.8	1,50			
	Stainless steel R and High corrosion resistant steel HCR		50	2,86			
			70	1,50[2] / 1,87			
			80	1,60			
[-]							

[1] In absence of other national regulations

[2] Only for BERNER Anchor rod MCS PLUS A made of high corrosion-resistant steel HCR

[3] Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009.

BERNER multicompound system MCS Protect Plus for masonry

Performances
Characteristic resistance to steel failure of a single anchor under tension loading of BERNER anchor rods and standard threaded rods

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2.1: Characteristic resistance to **steel failure** of a single anchor under **shear loading** with and without lever arm of **BERNER Anchor rods** and **standard threaded rods**

Anchor rod / standard Threaded rod				**M8[3)]**	**M10[3)]**	**M12**	**M16**
Characteristic resistance to steel failure under shear loading							
without lever arm							
Characteristic resistance $V^0_{Rk,s}$	Steel zinc plated	Property class	4.6	[kN]	8,7(7,9)	13,9(12,8)	20,2	37,6
			4.8		8,7(7,9)	13,9(12,8)	20,2	37,6
			5.8		10,9(9,9)	17,4(16,0)	25,2	47,1
			8.8		14,6(13,2)	23,2(21,4)	33,7	62,8
	Stainless steel R and High corrosion resistant steel HCR		50		9,1	14,5	21,0	39,2
			70		12,8	20,3	29,5	54,9
			80		14,6	23,2	33,7	62,8
with lever arm							
Characteristic resistance $M^0_{Rk,s}$	Steel zinc plated	Property class	4.6	[Nm]	14,9(12,9)	29,9(26,5)	52,3	132,9
			4.8		14,9(12,9)	29,9(26,5)	52,3	132,9
			5.8		18,7(16,1)	37,3(33,2)	65,4	166,2
			8.8		29,9(25,9)	59,8(53,1)	104,6	265,9
	Stainless steel R and High corrosion resistant steel HCR		50		18,7	37,3	65,4	166,2
			70		26,2	52,3	91,5	232,6
			80		29,9	59,8	104,6	265,9
Partial factors [1)]							
Partial factors $\gamma_{Ms,V}$	Steel zinc plated	Property class	4.6	[-]	1,67			
			4.8		1,25			
			5.8		1,25			
			8.8		1,25			
	Stainless steel R and High corrosion resistant steel HCR		50		2,38			
			70		1,25[2)] / 1,56			
			80		1,33			

[1)] In absence of other national regulations

[2)] Only for BERNER Anchor rod MCS Plus A made of high corrosion-resistant steel HCR

[3)] Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot dip galvanised standard threaded rods (M8 resp. M10) according to EN ISO 10684:2004+AC:2009.

BERNER multicompound system MCS Protect Plus for masonry

Performances
Characteristic resistance to steel failure of a single anchor under shear loading with and without lever arm of BERNER Anchor rods and standard threaded rods

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3.1: Characteristic resistance to **steel failure** of a single anchor under **tension / shear loading** of **internal threaded anchors MCS PLUS E**

BERNER internal threaded anchor MCS PLUS E					**M8**	**M10**	**M12**
Characteristic resistance to steel failure under tension loading							
Characteristic resistance with screw / Anchor	$N_{Rk,s}$	Property class	5.8	[kN]	18,3	29,0	42,1
		Property class 70	R		25,6	40,6	59,0
			HCR		25,6	40,6	59,0
Partial factors [1]							
Partial factors	$\gamma_{Ms,N}$	Property class	5.8	[-]	1,50		
		Property class 70	R		1,87		
			HCR		1,87		
Characteristic resistance to steel failure under shear loading							
without lever arm							
Characteristic resistance with screw / Anchor	$V_{Rk,s}$	Property class	5.8	[kN]	10,9	15,0	21,0
		Property class 70	R		12,8	20,3	29,5
			HCR		12,8	20,3	29,5
with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	Property class	5.8	[Nm]	18,7	37,3	65,4
		Property class 70	R		26,2	52,3	91,5
			HCR		26,2	52,3	91,5
Partial factors [1]							
Partial factors	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25		
		Property class 70	R		1,56		
			HCR		1,56		

[1] In absence of other national regulations

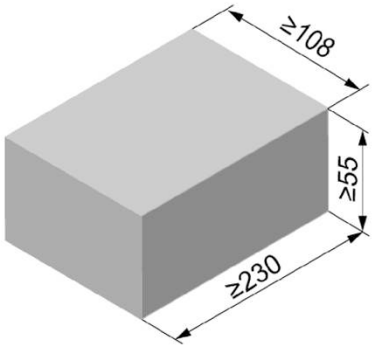
BERNER multicompound system MCS Protect Plus for masonry

Performances
Characteristic resistance to steel failure of a single anchor under tension / shear loading of internal threaded anchors MCS PLUS E

Annex C3

Deutsches Institut für Bautechnik DIBt

Solid brick Mz, EN 771-1: 2011+A1:2015



Solid brick Mz, EN 771-1: 2011+A1:2015			
Producer	e.g. Wienerberger		
Nominal dimensions [mm]	length L	width W	height H
	≥ 230	≥ 108	≥ 55
Mean gross dry density ρ [kg/dm³]	≥ 2,0		
Mean compressive strength / Min. compressive strength single brick [1] [N/mm²]	36 / 28 or 48 / 38		
Standard	EN 771-1: 2011+A1:2015		

Table C4.1: Installation parameters

Anchor rod			**M8**		**M10**		**M12**		**M16**		-	-
Internal threaded anchor MCS PLUS E			-		-		-		-		**M8**	**M10** / **M12**
											11x85	**15x85**
Anchor rod and internal threaded anchor MCS PLUS E without perforated sleeve												
Effective anchorage depth	h_{ef}	[mm]	50	80	50	80	50	80	50	80	85	
Max. installation torque	max T_{inst}	[Nm]	10								10	
General installation parameters												
Edge distance	$c_{min} = c_{cr}$	[mm]	100									
Spacing	s_{min} ∥		100									
	s_{cr} ∥		3 x h_{ef}									
	s_{min} ⊥		100									
	s_{cr} ⊥		3 x h_{ef}									
Drilling method												
Hammer drilling with hard metal hammer drill												

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C4.2: Group factors

Anchor rods		**M8**	**M10**	**M12**	**M16**	-	-
Internal threaded anchor MCS PLUS E		-	-	-	-	**M8**	**M10** / **M12**
						11x85	**15x85**
Group factors	$\alpha_{g,N}$ (s_{min} ∥)	[-]	1,81				
	$\alpha_{g,V}$ (s_{min} ∥)		1,49				
	$\alpha_{g,N}$ (s_{min} ⊥)		1,74				
	$\alpha_{g,V}$ (s_{min} ⊥)		1,49				

BERNER multicompound system MCS Protect Plus for masonry

Performances
Solid brick Mz, dimensions, installation parameters

Annex C4

Deutsches Institut für Bautechnik DIBt

Solid brick Mz, EN 771-1:2011+A1:2015

Table C5.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	**M8**		**M10**		**M12**		**M16**		-	-	
Internal threaded anchor MCS PLUS E	-		-		-		-		**M8**	**M10**	**M12**
									11x85	**15x85**	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°C)											
Mean compressive strength / Min. compressive strength single brick [1)]	Effective anchorage depth h_{ef} [mm]										
	50	80	50	80	50	80	50	80	85		
36 / 28 N/mm²	2,5	3,0	3,0	3,0	3,0	3,0	3,0	4,5	2,5		
48 / 38 N/mm²	3,0	3,5	3,5	3,5	3,5	3,5	3,5	5,0	3,0		
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C and 72/120°C)											
Mean compressive strength / Min. compressive strength single brick [1)]	Effective anchorage depth h_{ef} [mm]										
	50	80	50	80	50	80	50	80	85		
36 / 28 N/mm²	1,5	2,0	2,0	2,0	2,0	2,0	2,0	3,5	1,5		
48 / 38 N/mm²	1,5	2,5	2,5	2,5	2,5	2,5	2,5	4,0	1,5		

[1)] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C5.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	**M8**		**M10**		**M12**		**M16**		-	-	
Internal threaded anchor MCS PLUS E	-		-		-		-		**M8**	**M10**	**M12**
									11x85	**15x85**	
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C, 50/80°C and 72/120°C)											
Mean compressive strength / Min. compressive strength single brick [1)]	Effective anchorage depth h_{ef} [mm]										
	50	80	50	80	50	80	50	80	85		
36 / 28 N/mm²	2,5	4,5	2,5	4,5	2,5	4,5	2,5	4,5	2,5	2,5	
48 / 38 N/mm²	3,0	5,0	3,0	5,0	3,0	5,0	3,0	5,0	3,0	3,0	

[1)] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests see Annex C20 and displacements see annex C21

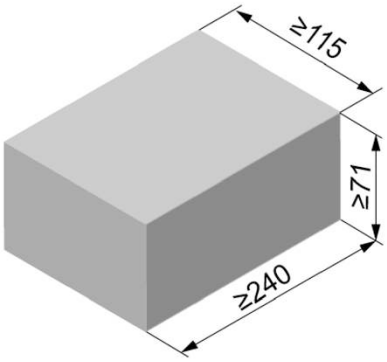
BERNER multicompound system MCS Protect Plus for masonry

Performances
Solid brick Mz, Characteristic resistance under tension and shear loading

Annex C5

Deutsches Institut für Bautechnik DIBt

Solid calcium silicate (sand-lime) brick KS, NF, EN 771-2: 2011+A1:2015



Solid calcium silicate (sand-lime) brick KS, NF, EN 771-2: 2011+A1:2015			
Producer	---		
Nominal dimensions [mm]	length L	width W	height H
	≥ 240	≥ 115	≥ 71
Mean gross dry density [kg/dm³]	≥ 2,0		
Mean compressive strength / Min. compressive strength single brick [1] [N/mm²]	12 / 10 or 16 /12 or 20 / 16		
Standard	EN 771-2: 2011+A1:2015		

Table C6.1: Installation parameters

Anchor rod			**M8**		**M10**		**M12**		**M16**		-	-	
Internal threaded anchor MCS PLUS E			-		-		-		-		**M8**	**M10**	**M12**
											11x85	**15x85**	
Anchor rod and internal threaded anchor MCS PLUS E without perforated sleeve													
Effective anchorage depth	h_{ef}	[mm]	50	80	50	80	50	80	50	80	85	85	
Max. installation torque	max T_{inst}	[Nm]	8		10						8	10	
General installation parameters													
Edge distance	$c_{min} = c_{cr}$	[mm]	100										
Spacing	s_{min} II		100										
	s_{cr} II		3 x h_{ef}										
	s_{min} ⊥		100										
	s_{cr} ⊥		3 x h_{ef}										
Drilling method													
Hammer drilling with hard metal hammer drill													

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C6.2: Group factors

Anchor rod			**M8**	**M10**	**M12**	**M16**	-	-	
Internal threaded anchor MCS PLUS E			-	-	-	-	**M8**	**M10**	**M12**
							11x85	**15x85**	
Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	1,67						
	$\alpha_{g,V}$ (s_{min} II)		1,26						
	$\alpha_{g,N}$ (s_{min} ⊥)		1,67						
	$\alpha_{g,V}$ (s_{min} ⊥)		2,00						

BERNER multicompound system MCS Protect Plus for masonry

Performances
Solid calcium silicate (sand-lime) brick KS, NF, dimensions, installation parameters, Group factors

Annex C6

Deutsches Institut für Bautechnik DIBt

Solid calcium silicate (sand-lime) brick KS, NF, EN 771-2: 2011+A1:2015

Table C7.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	**M8**		**M10**		**M12**		**M16**		-		-	
Internal threaded anchor MCS PLUS E	-		-		-		-		**M8**		**M10**	**M12**
									11x85		**15x85**	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°C)												
Mean compressive strength / Min. compressive strength single brick [1]	Effective anchorage depth h_{ef} [mm]											
	50	80	50	80	50	80	50	80	85		85	
12 / 10 N/mm²	2,0	2,0	2,5	4,5	2,0	4,5	2,0	2,0	2,0			
16 / 12 N/mm²	2,5	2,5	2,5	5,0	2,5	5,0	2,5	2,5	2,5			
20 / 16 N/mm²	2,5	3,0	3,0	6,0	2,5	6,0	2,5	3,0	2,5			
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C and 72/120°C)												
Mean compressive strength / Min. compressive strength single brick [1]	Effective anchorage depth h_{ef} [mm]											
	50	80	50	80	50	80	50	80	85		85	
12 / 10 N/mm²	1,5	1,5	1,5	3,0	1,5	3,0	1,5	1,5	1,5			
16 / 12 N/mm²	1,5	1,5	2,0	3,5	1,5	3,5	1,5	1,5	1,5			
20 / 16 N/mm²	2,0	2,0	2,0	4,0	2,0	4,0	2,0	2,0	2,0			

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C7.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	**M8**		**M10**		**M12**		**M16**		-		-	
Internal threaded anchor MCS PLUS E	-		-		-		-		**M8**		**M10**	**M12**
									11x85		**15x85**	
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C, 50/80°C and 72/120°C)												
Mean compressive strength / Min. compressive strength single brick [1]	Effective anchorage depth h_{ef} [mm]											
	50	80	50	80	50	80	50	80	85		85	
12 / 10 N/mm²	3,5	3,5	4,5	4,5	3,5	4,0	3,5	4,0	3,5		3,5	
16 / 12 N/mm²	4,0	4,0	5,0	5,0	4,0	4,5	4,0	4,5	4,0		4,0	
20 / 16 N/mm²	4,5	4,5	6,0	6,0	4,5	5,0	4,5	5,0	4,5		4,5	

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength. Factor for job site tests see annex C20 and displacements see annex C21

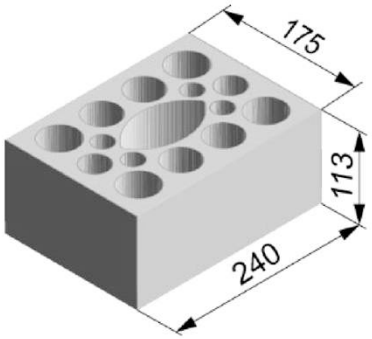
BERNER multicompound system MCS Protect Plus for masonry

Performances
Solid calcium silicate (sand-lime) brick KS, NF, Characteristic resistance under tension and shear loading

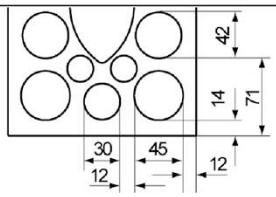
Annex C7

Deutsches Institut für Bautechnik DIBt

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2: 2011+A1:2015



Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2: 2011+A1:2015			
Producer		e.g. KS Wemding	
Nominal dimensions [mm]		length L	width W / height H
		240	175 / 113
Mean gross dry density ρ	[kg/dm³]	≥ 1,4	
Mean compressive strength / Min. compressive strength single brick [1]	[N/mm²]	6 / 5 or 8 / 6 or 10 / 8 or 12 / 10 or 16 / 12	
Standard		EN 771-2: 2011+A1:2015	



Dimensions see also Annex B12

Table C8.1: Installation parameters (Pre-positioned installation with perforated sleeve MCS PLUS H)

Anchor rod			M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor MCS PLUS E			-	-	M8 / 11x85	-		-		M10 / M12 / 15x85		-		-	
Perforated sleeve MCS PLUS H			12x50	12x85	16x85			16x130		20x85				20x130	
Anchor rod and internal threaded anchor MCS PLUS E with perforated sleeve MCS PLUS H															
Max. installation torque	$\max T_{inst}$	[Nm]	8	8	8	8	10	8	10	10					
General installation parameters															
Edge distance	$c_{min} = c_{cr}$	[mm]	100												
Spacing	s_{min} ∥		100												
	s_{cr} ∥		240												
	s_{min} ⊥		100												
	s_{cr} ⊥		115												
Drilling method															
Hammer drilling with hard metal hammer drill															

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C8.2: Group factors

Anchor rod			M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor MCS PLUS E			-	-	M8 / 11x85	-		-		M10 / M12 / 15x85		-		-	
Perforated sleeve MCS PLUS H			12x50	12x85	16x85			16x130		20x85				20x130	
Group factors	$\alpha_{g,N}$ (s_{min} ∥)	[-]	1,14												
	$\alpha_{g,V}$ (s_{min} ∥)		1,51												
	$\alpha_{g,N}$ (s_{min} ⊥)		1,14												
	$\alpha_{g,V}$ (s_{min} ⊥)		1,54												

BERNER multicompound system MCS Protect Plus for masonry

Performances
Perforated calcium silicate (sand-lime) brick KSL, 3DF, dimensions, installation parameters, Group factors

Annex C8

Deutsches Institut für Bautechnik DIBt

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2: 2011+A1:2015

Table C9.1: Installation parameters
(Push through installation with perforated sleeve MCS PLUS H)

Anchor rod			**M10**	**M12**	**M16**
Perforated sleeve MCS PLUS H			**18x130/200**		**22x130/200**
Anchor rod with perforated sleeve MCS PLUS H					
Max. installation torque	$\max T_{inst}$	[Nm]	10		
General installation parameters					
Edge distance	$c_{min} = c_{cr}$	[mm]	100		
Spacing	$s_{min} \parallel$	[mm]	100		
	$s_{cr} \parallel$	[mm]	240		
	$s_{min} \perp$	[mm]	100		
	$s_{cr} \perp$	[mm]	115		
Drilling method					
Hammer drilling with hard metal hammer drill					

Table C9.2: Group factors

Anchor rod			**M10**	**M12**	**M16**
Perforated sleeve MCS PLUS H			**18x130/200**		**22x130/200**
Group factors	$\alpha_{g,N}$ ($s_{min} \parallel$)	[-]	1,14		
	$\alpha_{g,V}$ ($s_{min} \parallel$)	[-]	1,51		
	$\alpha_{g,N}$ ($s_{min} \perp$)	[-]	1,14		
	$\alpha_{g,V}$ ($s_{min} \perp$)	[-]	1,54		

BERNER multicompound system MCS Protect Plus for masonry

Performances
Perforated calcium silicate (sand-lime) brick KSL, 3DF, dimensions, installation parameters, Group factors

Annex C9

Deutsches Institut für Bautechnik DIBt

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2: 2011+A1:2015

Table C10.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	**M8**	**M8**	**-**	**M8**	**M10**	**M8**	**M10**	**-**		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	**-**	**-**	**M8 11x85**	**-**		**-**		**M10 M12 15x85**		**-**		**-**	
Perforated sleeve MCS PLUS H	**12x50**	**12x85**	**16x85**			**16x130**		**20x85**				**20x130**	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
6 / 5 N/mm²	1,2		0,9			2,0		0,9				2,0	
8 / 6 N/mm²	1,5		1,2			2,5		1,2				2,5	
10 / 8 N/mm²	1,5		1,5			3,0		1,5				3,0	
12 / 10 N/mm²	2,0		1,5			3,5		1,5				3,5	
16 / 12 N/mm²	2,5		2,0			4,5		2,0				4,5	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C and 72/120°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
6 / 5 N/mm²	0,60		0,75			1,50		0,75				1,50	
8 / 6 N/mm²	0,75		0,90			2,00		0,90				2,00	
10 / 8 N/mm²	0,90		0,90			2,50		0,90				2,50	
12 / 10 N/mm²	0,90		1,20			2,50		1,20				2,50	
16 / 12 N/mm²	1,20		1,50			3,50		1,50				3,50	

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C10.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	**M10**	**M12**	**M16**
Perforated sleeve MCS PLUS H	**18x130/200**		**22x130/200**
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°C)			
Mean compressive strength / Min. compres. strength single brick [1]			
6 / 5 N/mm²	2,0		
8 / 6 N/mm²	2,5		
10 / 8 N/mm²	3,0		
12 / 10 N/mm²	3,5		
16 / 12 N/mm²	4,5		
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C and 72/120°C)			
Mean compressive strength / Min. compres. strength single brick [1]			
6 / 5 N/mm²	1,5		
8 / 6 N/mm²	2,0		
10 / 8 N/mm²	2,5		
12 / 10 N/mm²	2,5		
16 / 12 N/mm²	3,5		

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests see annex C20 and displacements see annex C21

BERNER multicompound system MCS Protect Plus for masonry

Performances
Perforated calcium silicate (sand-lime) brick KSL, 3DF, Characteristic resistance under tension loading

Annex C10

Deutsches Institut für Bautechnik DIBt

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2: 2011+A1:2015

Table C11.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

Anchor rod	**M8**	**M8**	**-**	**M8**	**M10**	**M8**	**M10**	**-**		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	-	-	**M8** **11x85**	-		-		**M10** **15x85**	**M12**	-		-	
Perforated sleeve MCS PLUS H	**12x50**	**12x85**	**16x85**			**16x130**		**20x85**				**20x130**	
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C, 50/80°C and 72/120°C)													
Mean compressive strength / Min. compressive strength single brick [1)]													
6 / 5N/mm²	1,5		2,0					3,0					
8 / 6 N/mm²	2,0		2,5					3,5					
10 / 8 N/mm²	2,5		3,0					4,5					
12 / 10 N/mm²	2,5		3,5					5,0					
16 / 12 N/mm²	3,5		4,0					6,5					

[1)] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C11.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

Anchor rod	**M10**	**M12**	**M16**
Perforated sleeve MCS PLUS H	**18x130/200**		**22x130/200**
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C, 50/80°C and 72/120°C)			
Mean compressive strength / Min. compressive strength single brick [1)]			
6 / 5N/mm²	2,0		3,0
8 / 6 N/mm²	2,5		3,5
10 / 8 N/mm²	3,0		4,5
12 / 10 N/mm²	3,5		5,0
16 / 12 N/mm²	4,0		6,5

[1)] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests see Annex C20 and displacements see Annex C21.

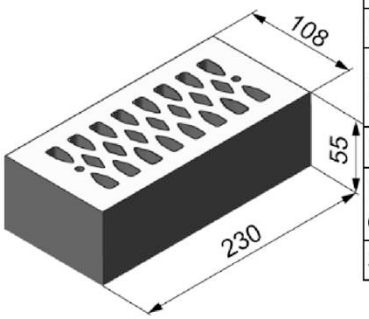
BERNER multicompound system MCS Protect Plus for masonry

Performances
Perforated calcium silicate (sand-lime) brick KSL, 3DF, Characteristic resistance under shear loading

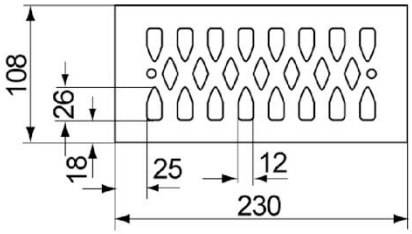
Annex C11

Deutsches Institut für Bautechnik DIBt

Vertical perforated brick HLz, EN 771-1: 2011+A1:2015



Vertical perforated brick HLz, EN 771-1: 2011+A1:2015				
Producer		e.g. Wienerberger.		
Nominal dimensions [mm]		length L	width W	height H
		230	108	55
Mean gross dry density ρ	[kg/dm³]	≥ 1,6		
Mean compressive strength / Min. compressive strength single brick [1]	[N/mm²]	8 / 6 or 10 / 8 or 12 / 10 or 16 / 12		
Standard		EN 771-1: 2011+A1:2015		



Dimensions see also Annex B12

Table C12.1: Installation parameters

Anchor rod	**M8**	**M8**	**-**	**M8**	**M10**	**M8**	**M10**	**-**		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	-	-	**M8** **11x85**	-		-		**M10** **15x85**	**M12**	-		-	
Perforated sleeve MCS PLUS H	**12x50**	**12x85**	**16x85**			**16x130**		**20x85**				**20x130**	
Anchor rod and internal threaded anchor MCS PLUS E with perforated sleeve MCS PLUS H													
Max. installation torque	$\max T_{inst}$	[Nm]	5										
General installation parameters													
Edge distance	$c_{min} = c_{cr}$	[mm]	100										
Spacing	s_{min} ∥		100										
	s_{cr} ∥		230										
	s_{min} ⊥		60										
	s_{cr} ⊥		60										
Drilling method													
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill													

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C12.2: Group factors

Anchor rod	**M8**	**M8**	**-**	**M8**	**M10**	**M8**	**M10**	**-**		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	-	-	**M8** **11x85**	-		-		**M10** **15x85**	**M12**	-		-	
Perforated sleeve MCS PLUS H	**12x50**	**12x85**	**16x85**			**16x130**		**20x85**				**20x130**	
Group factors $\alpha_{g,N}$ (s_{min} ∥)	[-]	1,65											
Group factors $\alpha_{g,V}$ (s_{min} ∥)		1,64											
Group factors $\alpha_{g,N}$ (s_{min} ⊥)		1,65											
Group factors $\alpha_{g,V}$ (s_{min} ⊥)		2,00											

BERNER multicompound system MCS Protect Plus for masonry

Performances
Vertical perforated brick HLz, dimensions, installation parameters, Group factors

Annex C12

Deutsches Institut für Bautechnik DIBt

Vertical perforated brick HLz, EN 771-1: 2011+A1:2015

Table C13.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	**M8**	**M8**	**-**	**M8**	**M10**	**M8**	**M10**	**-**		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	-	-	**M8** / **11x85**	-		-		**M10** / **15x85**	**M12** / **15x85**	-		-	
Perforated sleeve MCS PLUS H	**12x50**	**12x85**	**16x85**			**16x130**		**20x85**				**20x130**	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
8 / 6 N/mm²	1,2	1,5	1,5			2,5		1,5				2,5	
10 / 8 N/mm²	1,2	2,0	2,0			2,5		2,0				2,5	
12 / 10 N/mm²	1,5	2,0	2,0			3,0		2,0				3,0	
16 / 10 N/mm²	1,5	2,5	2,5			3,5		2,5				3,5	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C and 72/120°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
8 / 6 N/mm²	0,60	1,20	1,20			1,50		1,20				1,50	
10 / 8 N/mm²	0,75	1,20	1,20			2,00		1,20				2,00	
12 / 10 N/mm²	0,75	1,50	1,50			2,00		1,50				2,00	
16 / 10 N/mm²	0,90	1,50	1,50			2,50		1,50				2,50	

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C13.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	**M8**	**M8**	**-**	**M8**	**M10**	**M8**	**M10**	**-**		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	-	-	**M8** / **11x85**	-		-		**M10** / **15x85**	**M12** / **15x85**	-		-	
Perforated sleeve MCS PLUS H	**12x50**	**12x85**	**16x85**			**16x130**		**20x85**				**20x130**	
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C, 50/80°C and 72/120°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
8 / 6 N/mm²	2,0	3,5	2,5			3,5		2,5				3,5	
10 / 8 N/mm²	2,0	4,0	3,0			4,0		3,0				4,0	
12 / 10 N/mm²	2,0	4,0	3,0			4,5		3,0				4,5	
16 / 10 N/mm²	2,5	5,0	3,5			5,0		3,5				5,0	

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

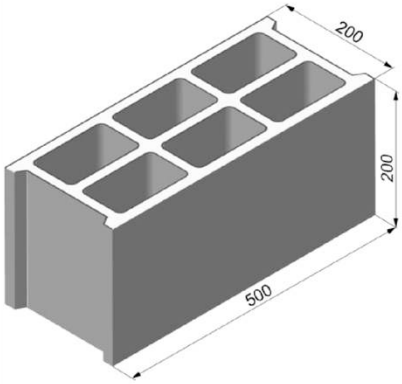
Factor for job site tests see annex C20 and displacements see annex C21

BERNER multicompound system MCS Protect Plus for masonry

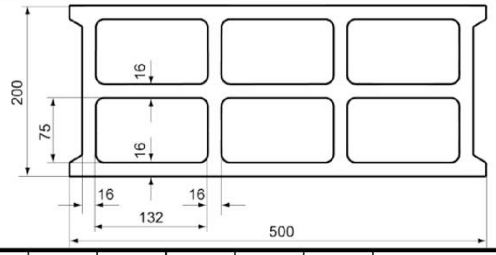
Performances
Vertical perforated brick HLz, Characteristic resistance under tension and shear loading

Annex C13

Lightweight aggregate concrete hollow block Hbl , EN 771-3: 2011+A1:2015



Lightweight aggregate concrete hollow block Hbl, EN 771-3: 2011+A1:2015				
Producer		e.g. Sepa		
Nominal dimensions [mm]		length L	width W	height H
		500	200	200
Mean gross dry density ρ	[kg/dm³]	≥ 1,0		
Mean compressive strength / Min. compres. strength single brick [1)]	[N/mm²]	2,5 / 2 or 5 / 4		
Standard		EN 771-3: 2011+A1:2015		



Dimensions see also Annex B12

Table C14.1: Installation parameters

Anchor rod	-	**M8**	**M10**	**M8**	**M10**	**M10**	**M12**	-		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	**M8**	-		-		-		**M10**	**M12**	-		-	
	11x85							**15x85**					
Perforated sleeve MCS PLUS H	**16x85**			**16x130**		**18x130/200**		**20x85**				**20x130**	
Anchor rod and internal threaded anchor MCS PLUS E with perforated sleeve MCS PLUS H													
Max. installation torque	$\max T_{inst}$	[Nm]	2										
General installation parameters													
Edge distance	$c_{min} = c_{cr}$	[mm]	100										
Spacing	s_{min} ∥		100										
	s_{cr} ∥		500										
	s_{min} ⊥		100										
	s_{cr} ⊥		200										
Drilling method													
Hammer drilling with hard metal hammer drill													

[1)] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C14.2: Group factors

Anchor rod	-	**M8**	**M10**	**M8**	**M10**	**M10**	**M12**	-		**M12**	**M16**	**M12**	**M16**
Internal threaded anchor MCS PLUS E	**M8**	-		-		-		**M10**	**M12**	-		-	
	11x85							**15x85**					
Perforated sleeve MCS PLUS H	**16x85**			**16x130**		**18x130/200**		**20x85**				**20x130**	
Group factors	$\alpha_{g,N}$ (s_{min} ∥)	[-]	2,00										
	$\alpha_{g,V}$ (s_{min} ∥)		1,28										
	$\alpha_{g,N}$ (s_{min} ⊥)		1,40										
	$\alpha_{g,V}$ (s_{min} ⊥)		2,00										

BERNER multicompound system MCS Protect Plus for masonry

Performances
Lightweight aggregate concrete hollow block Hbl, dimensions, installation parameters, Group factors

Annex C14

Deutsches Institut für Bautechnik DIBt

Lightweight aggregate concrete hollow block Hbl, EN 771-3: 2011+A1:2015

Table C15.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	-	M8	M10	M8	M10	M10	M12	-		M12	M16	M12	M16
Internal threaded anchor MCS PLUS E	M8	-		-		-		M10	M12	-		-	
	11x85							15x85					
Perforated sleeve MCS PLUS H	16x85			16x130		18x130/200		20x85				20x130	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
2,5 / 2 N/mm²	0,40											0,60	
5 / 4 N/mm²	0,50											0,75	
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C and 72/120°C)													
Mean compressive strength f_b													
2,5 / 2 N/mm²	0,3											0,5	
5 / 4 N/mm²	0,4											0,6	

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Table C15.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	-	M8	M10	M8	M10	M10	M12	-		M12	M16	M12	M16
Internal threaded anchor MCS PLUS E	M8	-		-		-		M10	M12	-		-	
	11x85							15x85					
Perforated sleeve MCS PLUS H	16x85			16x130		18x130/200		20x85				20x130	
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C, 50/80°C and 72/120°C)													
Mean compressive strength / Min. compres. strength single brick [1]													
2,5 / 2 N/mm²	1,5												
5 / 4 N/mm²	2,0												

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests see annex C20 and displacements see annex C21.

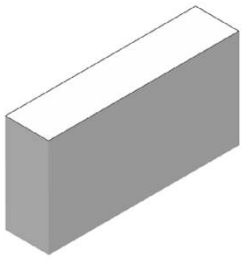
BERNER multicompound system MCS Protect Plus for masonry

Performances
Lightweight aggregate concrete hollow block Hbl
Characteristic resistance under tension and shear loading

Annex C15

Deutsches Institut für Bautechnik DIBt

Autoclaved aerated concrete (cylindrical drill hole), EN 771-4:2011+A1:2015



Producer		e.g. Ytong		
Mean gross dry density ρ	[kg/dm³]	0,35	0,5	0,65
Mean compressive strength / Min. compressive strength single brick [1)]	[N/mm²]	2,5 / 2	5 / 4	8 / 6
Standard or annex		EN 771-4:2011+A1:2015		

Table C16.1: Installation parameters

Anchor rod			**M8**	**M10**	**M12**	**M16**
Effective anchorage depth	h_{ef}	[mm]	100	100	100	100
Max. installation torque	max T_{inst}	[Nm]	2	2	2	2
General installation parameters						
Edge distance	c_{min}	[mm]	100			
	c_{cr}		250			
Spacing	s_{cr} ∥		250			
	s_{min} ∥		100			
	s_{cr} ⊥		250			
	s_{min} ⊥		100			
Drilling method						
Hammer drilling with hard metal hammer drill						

1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.

BERNER multicompound system MCS Protect Plus for masonry

Performance
Autoclaved aerated concrete (cylindrical drill hole), dimensions, installation parameters

Annex C16

Deutsches Institut für Bautechnik DIBt

Table C17.1: Group factors for autoclaved aerated concrete (Compressive strength f_{ck} =2 N/mm²)

Anchor rod			M8	M10	M12	M16
Groupfactors	$\alpha_{g,N}$ II, (s_{min} II)	[-]	1,13			
	$\alpha_{g,N}$ ⊥, (s_{min} ⊥)		1,20			
	$\alpha_{g,V}$, (s_{min} II)		1,39			
	$\alpha_{g,V}$, (s_{min} ⊥)		1,17			

Table C17.2: Group factors for autoclaved aerated concrete (Compressive strength f_{ck} =4 N/mm²)

Anchor rod			M8	M10	M12	M16
Groupfactors	$\alpha_{g,N}$ II, (s_{min} II)	[-]	1,13			
	$\alpha_{g,N}$ ⊥, (s_{min} ⊥)		1,20			
	$\alpha_{g,V}$, (s_{min} II)		1,39			
	$\alpha_{g,V}$, (s_{min} ⊥)		1,17			

Table C17.3: Group factors for autoclaved aerated concrete (Compressive strength f_{ck} =6 N/mm²)

Anchor rod			M8	M10	M12	M16
Groupfactors	$\alpha_{g,N}$ II, (s_{min} II)	[-]	1,13			
	$\alpha_{g,N}$ ⊥, (s_{min} ⊥)		1,20			
	$\alpha_{g,V}$, (s_{min} II)		1,39			
	$\alpha_{g,V}$, (s_{min} ⊥)		1,17			

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Performance
Autoclaved aerated concrete (cylindrical drill hole), Group factors

Annex C17

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Autoclaved aerated concrete (cylindrical drill hole), EN 771-4:2011+A1:2015

Table C18.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod		**M8**	**M10**	**M12**	**M16**
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 24/40°)					
Mean compressive strength / Min. compressive strength single brick [2]	Use conditions	Effective anchorage depth h_{ef} [mm]			
		100	100	100	100
2,5 / 2 N/mm²	d/d	1,2	1,2	1,2	1,5
5 / 4 N/mm²	d/d	1,2	1,2	1,2	1,5
8 / 6 N/mm²	d/d	1,2	1,2	1,2	1,5

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Anchor rod		**M8**	**M10**	**M12**	**M16**
$N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN]; (temperature range 50/80°C)					
Mean compressive strength / Min. compressive strength single brick [2]	Use conditions	Effective anchorage depth h_{ef} [mm]			
		100	100	100	100
2,5 / 2 N/mm²	d/d	0,9	0,9	1,2	1,5
5 / 4 N/mm²	d/d	0,9	0,9	1,2	1,5
8 / 6 N/mm²	d/d	0,9	0,9	1,2	1,5

[1] The minimum compressive strength of the single brick must not be less than 80% of the mean compressive strength.

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Performance
Autoclaved aerated concrete (cylindrical drill hole),
Characteristic resistance under tension loading

Annex C18

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Table C19.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod		**M8**	**M10**	**M12**	**M16**
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C and 50/80°C) $c_{min} \geq 100$mm					
Mean compressive strength / Min. compressive strength single brick [1]	Use conditions	Effective anchorage depth h_{ef} [mm]			
		100	100	100	100
2,5 / 2 N/mm²	d/d	1,2	1,2	1,2	1,2
5 / 4 N/mm²	d/d	1,2	1,2	1,2	1,2
8 / 6 N/mm²	d/d	1,2	1,2	1,2	1,2

1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Anchor rod		**M8**	**M10**	**M12**	**M16**
$V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN]; (temperature range 24/40°C and 50/80°C) $c_{cr} > 250$mm					
Mean compressive strength / Min. compressive strength single brick [1]	Use conditions	Effective anchorage depth h_{ef} [mm]			
		100	100	100	100
2,5 / 2 N/mm²	d/d	2,5	2,5	2,5	2,5
5 / 4 N/mm²	d/d	2,5	2,5	2,5	2,5
8 / 6 N/mm²	d/d	2,5	2,5	2,5	2,5

1) The compressive strength of the single brick must not be less than 80% of the mean compressive strength.

Factor for job site tests see Annex C20, Table C20.2 and displacements see Annex C 21.

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Performance
Autoclaved aerated concrete (cylindrical drill hole),
Characteristic resistance under shear loading

Annex C19

β-factors for job site tests

Table C20.1: β-factors for job site tests

Installation and use conditions	d/d		
temperature range [°C]	24/40	50/80	72/120
M8	0,81	0,47	0,45
M10	0,62	0,49	0,45
M12 / MCS PLUS E 11x85	0,62	0,49	0,52
M16 / MCS PLUS E 15x85	0,56	0,45	0,57

Table C20.2: β-factors for job site tests for AAC

Installation and use conditions	d/d	
temperature range [°C]	24/40	50/80
All sizes	0,58	0,49

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Table C21.1: Displacements

Material	Size	Effective anchorage depth [mm]	N [kN]	δN_0 [mm]	δN_∞ [mm]	V [kN]	δV_0 [mm]	δV_∞ [mm]
Solid brick acc. to C4-C5	M8	50	0,57	0,00	0,00	0,71	0,08	0,12
		80	1,00	0,00	0,00	1,71	0,32	0,48
	M10	50	0,57	0,00	0,00	0,71	0,18	0,27
		80	1,00	0,01	0,02	1,71	0,50	0,75
	M12	50	1,29	0,03	0,06	0,71	0,05	0,08
		80	1,00	0,01	0,02	1,71	0,75	1,13
	M16	50	1,29	0,03	0,06	0,71	0,35	0,53
		80	1,71	0,04	0,08	1,71	0,20	0,30
Solid calcium silicate (sand-lime) brick acc. to C6-C7	M8	50	0,86	0,03	0,06	1,43	0,32	0,48
		80	0,86	0,00	0,00	1,43		
	M10	50	0,86	0,00	0,00	1,43	0,34	0,51
		80	1,71	0,02	0,04	1,43		
	M12	50	0,86	0,03	0,06	1,43	0,12	0,18
		80	1,71	0,04	0,08	1,43	0,32	0,48
	M16	50	0,86	0,03	0,06	1,43	0,57	0,86
		80	1,14	0,02	0,04	1,43	0,20	0,03
Perforated calcium silicate (sand-lime) brick acc. to C8-C11	M8	12x50	0,71	0,01	0,02	1,00	0,16	0,24
		12x85						
	M8 M10	16x85	0,57	0,02	0,04	1,14	0,57	0,86
		16x130	1,29	0,06	0,12	1,14	1,03	1,55
	M12 M16	20x85	0,57	0,03	0,06	1,86	1,15	1,73
		20x130	1,29	0,04	0,08	1,86	1,24	1,86
Perforated brick Hlz acc. to C12-C13	M8	12x50	0,43	0,00	0,00	0,71	0,25	0,38
		12x85	0,71	0,00	0,00	1,43	0,61	0,92
	M8 M10	16x85	0,71	0,03	0,06	1,00	0,36	0,54
		16x130	1,00	0,02	0,04	1,43	0,30	0,45
	M12 M16	20x85	0,71	0,00	0,00	1,00	0,22	0,33
		20x130	1,00	0,04	0,08	1,43	0,17	0,26
Lightweight aggregate concrete hollow block Hbl acc. to C14-C15	M8 M10	16x85	0,14	0,03	0,06	0,57	1,54	2,31
		16x130	0,14	0,02	0,04	0,57	1,01	1,52
	M12 M16	20x85	0,14	0,06	0,12	0,57	1,31	1,97
		20x130	0,21	0,04	0,08	0,57	0,82	1,23
Autoclaved aerated concrete acc. to C16-C19		M8x100 M10x100	0,48	0,08	0,16	0,89	1,49	2,24
		M12x100	0,49	0,09	0,18	0,89	1,49	2,24
		M16x100	0,65	0,12	0,24	0,89	1,49	2,24

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Performances
displacements

Annex C21