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CZŁONEK EOTA i UEAtc

NATIONAL TECHNICAL ASSESSMENT ITB-KOT-2018/0721 version 4

This National Technical Assessment was issued in accordance with the Regulation of the Minister of Infrastructure and Construction of 17 November 2016 on national technical assessments (Dz. U. /Journal of Laws/ of 2016, item 1968) by the Building Research Institute in Warsaw at the request of:

RAWLPLUG S.A.
ul. Kwidzyńska 6, 51-416 Wrocław

The National Technical Assessment ITB-KOT-2018/0721 version 4 is a positive assessment of the performance of the following construction products in relation to their intended use:

MKI and MBA steel fixings for installing thermal insulation

Date of expiry of the National Technical Assessment:

30 September 2025

Warsaw, 30 September 2020

Building Research Institute

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1. TECHNICAL DESCRIPTION OF THE PRODUCT

This National Technical Assessment covers MKI and MBA steel fixings for installing thermal insulation, which are manufactured by RAWLPLUG S.A., ul. Kwidzyńska 6, 51-416 Wrocław in production plants located in Germany.

This National Technical Assessment applies to the types of products specified by the manufacturer and resulting from the performance given in sec. 3 and a combination of materials and components used.

The components of the fixings are an expansion and distance sleeve (body) with a retaining plate 35 mm in diameter (MBA fixings) or with an irregular U-shaped plate (MKI fixings). MKI and MBA fixings may be used with an additional MKC-85 steel washer having an outer diameter of 85 mm.

MKI fixings are made of:

- ordinary, carbon, hot-dip coated steel, grade DX51D+Z140 acc. to the PN-EN 10346:2015 standard (zinc coating with a thickness of at least 7 µm acc. to the PN-EN ISO 4042:2018 or PN-EN ISO 2081:2018 standard), with the offset yield strength $R_{p0.2}$ of ≥ 216 MPa and the ultimate tensile strength $R_m$of ≥ 270 MPa, or
- stainless steel (additionally marked with SS), grade 1.4301 acc. to the PN-EN 10088-1:2014 standard.

MBA fixings are made of:

- ordinary, carbon, hot-dip coated steel, grade DX51D+Z140 acc. to the PN-EN 10346:2015 standard (zinc coating with a thickness of at least 7 µm acc. to the PN-EN ISO 4042:2018 or PN-EN ISO 2081:2018 standard), with the offset yield strength $R_{p0.2}$ of ≥ 216 MPa and the ultimate tensile strength $R_m$of ≥ 270 MPa, or
- stainless steel (additionally marked with SS), grade 1.4016 acc. to the PN-EN 10088-1:2014 standard.

The range of products covered by the National Technical Assessment includes fixings with a nominal diameter of 8 mm and with lengths acc. to Fig. A1 and A2.

The dimensions and shape of MKI and MBA steel fixings are shown in Fig. A1-A3. An example of installation with MKI and MBA fixings is shown in Fig. B1.

2. INTENDED USE OF THE PRODUCT

MKI and MBA fixings are intended for mechanical embedment of thermal insulation made of polystyrene boards (EPS and XPS) or mineral wool boards (stone and glass) in substrates made of:

- normal weight concrete C20/25-C50/60 acc. to the PN-EN 206+A1:2016 standard
- solid brick of the compressive strength of at least 20 N/mm^2 (grade not less than 20) acc. to the PN-EN 771-1+A1:2015 standard,
- solid sand-lime brick of the compressive strength of at least 20 N/mm^2 (grade not less than 20) acc. to the PN-EN 771-2+A1:2015 standard,

- autoclaved aerated concrete of the gross dry density of at least 600 kg/m^3 (density grade of at least 650) and of the average compressive strength of at least 5 N/mm^2 (compressive strength grade not less than 5) acc. to the PN-EN 771-4+A1:2015 standard.

MBA fixings are intended for mechanical embedment of thermal insulation made of polystyrene or mineral wool boards in substrates made of:

- porous clay hollow bricks, acc. to PN-EN 771-1+A1:2015 standard with compressive strength of at least 15 N/mm^2 (compressive strength grade not less than 15) and with a thickness of at least 10mm,
- sand-lime hollow bricks, acc. to the PN-EN 771-2+A1:2015 standard, of the compressive strength of at least 15 N/mm^2 (grade not less than 20) and thickness of at least 21 mm.

Due to the aggressive corrosive environment, MKI and MBA fixings made of galvanised steel should be used acc. to PN-EN ISO 12944-2:2018 and PN-EN ISO 9223:2012 standards, while MKI SS and MBA SS stainless steel fixings acc. to the PN-H-86020:1971 standard.

Parameters of installation and arrangement of the fixings in the substrate are given in Appendix B.

The characteristic and design load capacities of MKI and MBA fixings are given in Appendix C. The number of fixings is to be determined on the basis of static calculations, including given in the above-mentioned tables, design load capacity, whereby the number of fixings per 1 m^2 of insulation material must not be less than 4.

The fixing is expanded by manual embedment of the body in a drilled hole (for concrete, clay or lime-sand solid brick or clay or lime-sand hollow brick). Then the fixing is hammered, which results in a permanent anchorage of the fixing in the substrate. For autoclaved aerated concrete substrates, no hole is drilled; the sleeve of the fixing is hammered into the substrate.

Installation of the fixing can be performed either on the surface of the board (standard installation) or in a previously milled cavity with a diameter of 90mm and depth of 20mm (recessed installation). Accessories used for recessed installation are shown in Fig. A4.

MKI and MBA fixings belong to the A1 class of reaction to fire acc. to the PN-EN 13501-1+A1:2010 standard and Commission Decision 96/603/EC as amended acc. to Commission Decision 2000/605/EC.

MKI and MBA steel fixings should be used in accordance with the technical design prepared for a specific work, considering:

- Polish standards and building regulations, in particular the Regulation of the Minister of Infrastructure of 12 April 2002 on the technical requirements to be met by buildings and their location (Dz. U. /Journal of Laws/ of 2019 item 1065),
- the provisions of this National Technical Assessment,
- manufacturer's instructions concerning the conditions of embedment using the above-mentioned fixings, which are provided to customers.

3. PERFORMANCE OF THE PRODUCT AND METHODS USED TO ASSESS THEM

3.1. Performance of the product

3.1.1. Characteristic load capacities of MKI and MBA steel fixings The characteristic pull-out failure load capacity of MKI and MBA steel fixings are given in Appendix C.

3.1.2. Durability of MKI and MBA steel fixings For MKI and MBA fixings made of ordinary carbon steel, the zinc coating with a thickness of at least 7 μm ensures the durability of the fixings in the range resulting from sec. 2.

For MKI SS and MBA SS stainless steel fixings, the grade of steel ensures the durability of the fixings in the range resulting from sec. 2.

3.2. Methods used to assess the performance

3.2.1. Characteristic load capacities of MKI and MBA steel fixings Characteristic load capacities of the fixings are tested when the fixings are embedded in substrates acc. to Appendix C. Loads should be measured using a device having the range appropriate to the expected ultimate load and allowing the load to be increased steadily and slowly until the ultimate load is reached. The measurement error should not exceed 3% in the entire measuring range.

3.2.2. Durability of MKI and MBA steel fixings The thickness of zinc coating is tested acc. to the PN-EN ISO 3497:2004 standard.

4. PACKAGING, TRANSPORT, STORAGE, AND MARKING OF THE PRODUCT

MKI and MBA steel fixings should be delivered in original manufacturer's packaging and stored and transported in such a way as to ensure that their performance remains unchanged.

Marking the products with the construction mark should be consistent with the Regulation of the Minister of Infrastructure and Construction of 17 November 2016 on the methods of declaring the performance of construction products and marking them with the construction mark (Dz. U. /Journal of Laws/ of 2016, item 1966, as amended).

Marking the products with the construction mark should be accompanied by the following information:

- the last two digits of the year in which the construction mark was placed on the construction product for the first time,
- the name and the address of the registered office of the manufacturer or an identification mark allowing the name and the address of the manufacturer to be clearly identified,
- the name and type designation of the construction product,
- number and issuance year of the national technical assessment according to which the performance has been declared (ITB-KOT-2018/0721 version 4),
- the number of the national declaration of performance,
- the level or class of the performance declared,
- the name of the certification body that has participated in the assessment and verification of

constancy of performance of the construction product,

- the address of the manufacturer's website if the national declaration of performance is available on that website.

Apart from the national declaration of performance, the material safety data sheet should be provided or made available as appropriate. The above also applies to information on hazardous substances contained in the construction product referred to in Article 31 or 33 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency.

In addition, the marking of a construction product constituting a hazardous mixture according to REACH should comply with the requirements of Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

5. ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

5.1. National system for assessment and verification of constancy of performance

In accordance with the Regulation of the Minister of Infrastructure and Construction of 17 November 2016 on the methods of declaring the performance of construction products and marking them with the construction mark (Dz. U. /Journal of Laws/ of 2016, item 1966, as amended), the 2+ system of assessment and verification of constancy of performance is applied.

5.2. Type testing

The performance assessed in sec. 3 constitutes the type examination of the product until there are changes to its raw materials, ingredients, production line or plant.

5.3. Factory production control

A factory production control system should be implemented in the manufacturer's production plant. All system components, requirements, and provisions adopted by the manufacturer should be documented in a systematic manner in the form of rules and procedures, including records of the performance of tests. Factory production control should be adapted to production technology and should ensure that the declared performance of the product during series production is maintained.

Factory production control includes the specification and verification of raw materials and ingredients, control and tests in the production process, and control tests (acc. to sec. 5.4) carried out by the manufacturer in accordance with the specified test plan and with the rules and procedures specified in the factory production control documentation.

Production control results should be recorded systematically. The records should confirm that the products meet the criteria for assessment and verification of constancy of performance. Individual products or product batches and related production details should be possible to be identified and retrieved.

5.4. Control tests

5.4.1. Test plan. The test program includes:

a) routine testing,
b) periodic testing.

5.4.2. Routine testing. Routine testing includes checking of:

a) shape and dimensions,
b) thickness of the zinc coating (in the case of fixings made of galvanised steel).

5.4.3. Periodic testing. Periodic testing includes the testing of characteristic load capacities of the fasteners.

5.5. Testing frequency

Routine testing should be carried out according to the agreed test programme, but at least for each product batch. The size of the product batch should be specified in the factory production control documentation.

Periodic testing should be carried out at least once every 3 years.

6. INSTRUCTION

6.1. The National Technical Assessment ITB-KOT-2018/0721 version 4 replaces the National Technical Assessment ITB-KOT-2018/0721 version 3.

6.2. The National Technical Assessment ITB-KOT-2018/0721 version 4 is a positive assessment of the performance of these essential characteristics of MKI and MBA steel fixings that, in accordance with their intended use resulting from the provisions of this Assessment, affect the fulfilment of basic requirements by the construction works in which the product is to be applied.

6.3. The National Technical Assessment ITB-KOT-2018/0721 version 4 does not constitute the authorisation to mark the construction product with the construction mark.

According to the Act of 16 April 2004 on building products (Dz. U. /Journal of Laws/ of 2020, item 215, as amended) products covered by this National Technical Assessment may be placed on the market and made available on the national market if the manufacturer has assessed and verified constancy of their performance, prepared a national declaration of performance in accordance with National Technical Assessment ITB-KOT-2018/0721 version 4 and marked the products with a construction mark according to applicable regulations.

6.4. The National Technical Assessment ITB-KOT-2018/0721 version 4 does not infringe the rights provided for in provisions on the protection of industrial property, in particular the Act of 30 June 2000 – Industrial Property Law (Dz. U. /Journal of Laws/ of 2020, item 286, as amended). The provision of these rights is the responsibility of users of this National Technical Assessment issued by the Building Research Institute.

6.5. By issuing this National Technical Assessment, the Building Research Institute is not liable for any infringement of exclusive or acquired rights.

6.6. The National Technical Assessment does not release the manufacturer of the products from the liability for their proper quality and contractors from the liability for their proper application.

6.7. The validity of the National Technical Assessment may be extended further periods not exceeding 5 years.

7. LIST OF DOCUMENTS USED IN THE PROCEDURE

7.1. Reports, test reports, assessments, classifications

1) RB-05_4_20. Testing report, Rawlplug, 2020
2) LZK02-02328/16/R89NZK, Test report, MBA fixings, Factory of Building Structure Elements and Construction in Mining Areas of the Building Research Institute, Katowice 2016
3) 02068/15/Z00OSK, Technical opinion on MKI steel fixings for installing thermal insulation, Factory of Building Structure Elements and Construction in Mining Areas of the Building Research Institute, Katowice 2015
4) OSK-04549R:03/DD/15, Specialist opinion on MKI steel fixings for installing thermal insulation, Factory of Building Structure Elements and Construction in Mining Areas of the Building Research Institute, Katowice 2016
5) 12/07/2015, 02/02/2016, Periodic testing reports, Rawlplug, 2015-2016
6) LOK-1341/A/09, Test report and technical assessment of MKI-type non-flammable metal fixings for installing thermal insulation, Building Research Institute in Warsaw, Silesian Branch in Katowice, Laboratory of Fasteners and Construction Products LOK, Silesian Branch of the Building Research Institute.
7) Supplementation of technical assessment to the Test Report No. LOK-1341/A/09, Laboratory of Fasteners and Construction Products LOK, Silesian Branch of the Building Research Institute.

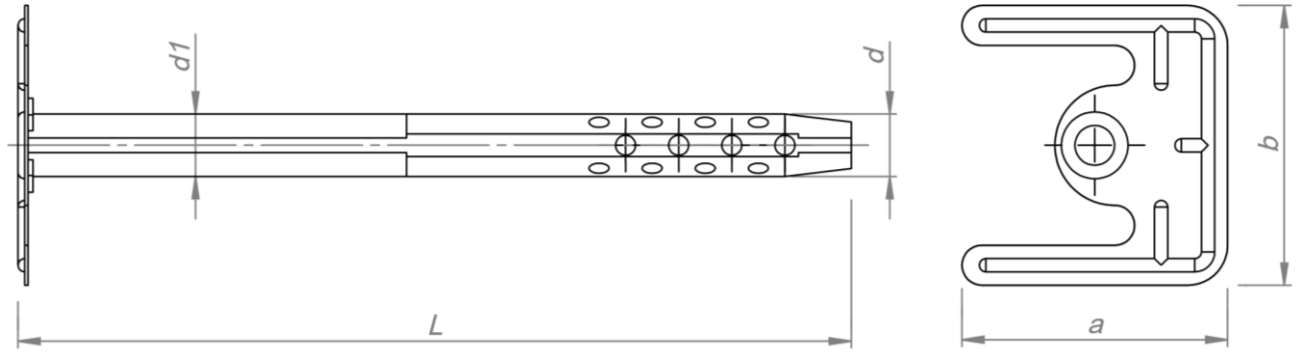
7.2. Related standards and documents

PN-EN 206+A1:2016	*Concrete – Specification, performance, production and conformity*
PN-EN 771-1+A1:2015	*Specification for masonry units – Part 1: Clay masonry units*
PN-EN 771-2+A1:2015	*Specification for masonry units – Part 2: Calcium silicate masonry units*
PN-EN 771-4+A1:2015	*Specification for masonry units – Part 4: Autoclaved aerated concrete masonry units*
PN-EN ISO 2081:2018	*Metallic and other inorganic coatings – Electroplated coatings of zinc with supplementary treatments on iron or steel*
PN-EN ISO 3497:2004	*Metallic coatings – Measurement of coating thickness – X-ray spectrometric methods*
PN-EN ISO 4042:2018	*Fasteners — Electroplated coating systems*

PN-EN ISO 9223:2012	*Corrosion of metals and alloys – Corrosivity of atmospheres – Classification, determination and estimation*
PN-EN 10088-1:2014	*Stainless steels – Part 1: List of stainless steels*
PN-EN 10346:2015	*Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions*
PN-EN ISO 12944-2:2018	*Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 2: Classification of environments*
PN-EN 13501-1+A1:2010	*Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*
PN-H-86020:1971	*Corrosion-resistant steel (stainless and acid-resistant) - Grades*
ITB-KOT-2018/0721 version 3	*MKI and MBA steel fixings for installing thermal insulation*

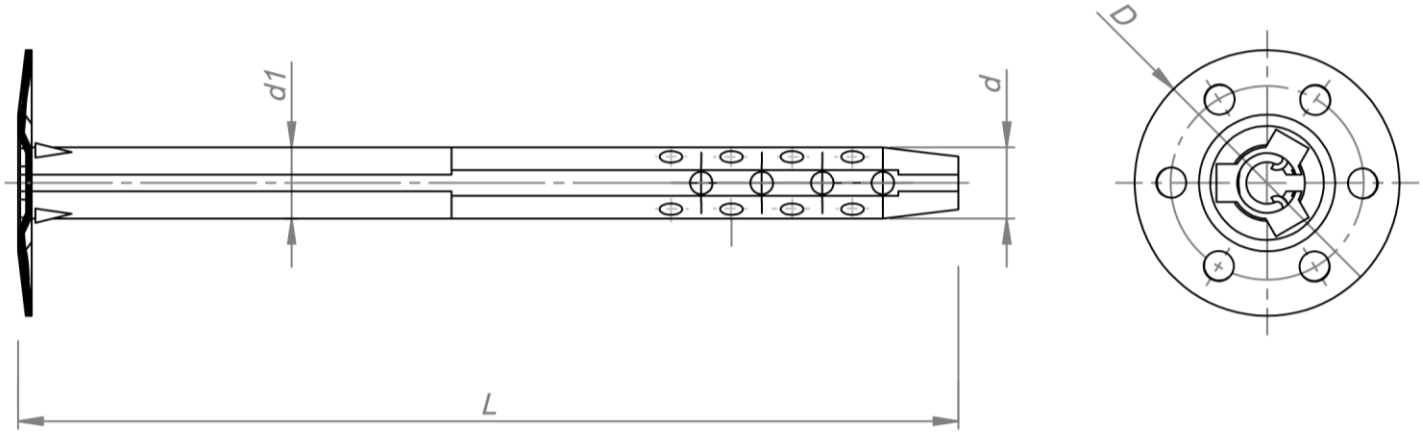
APPENDICES

Appendix A.



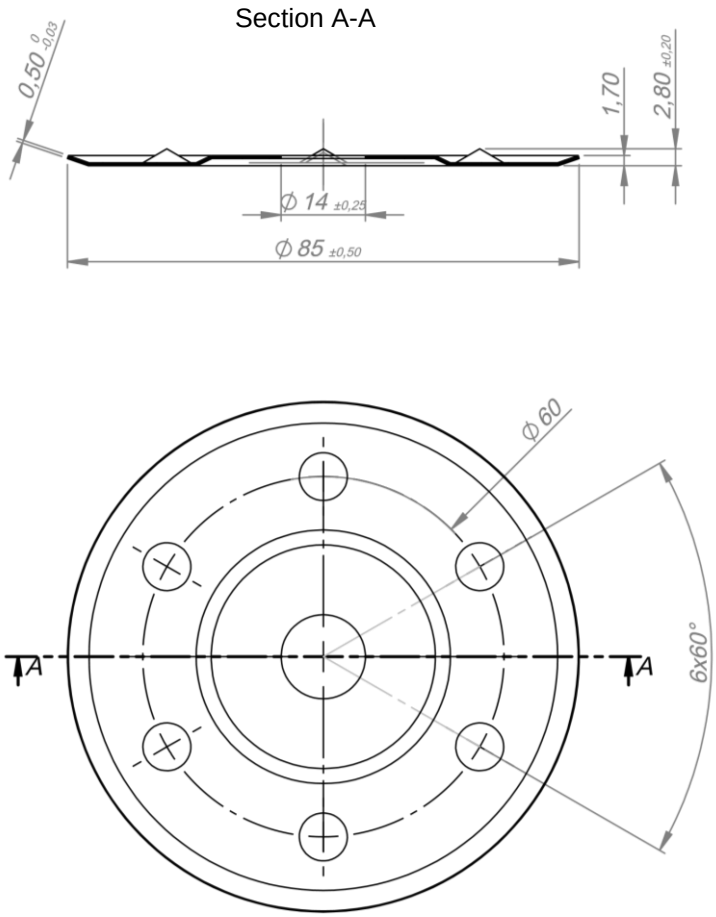
Designation of fixing[1)]	Fixing sleeve			Retaining plate	
	d [mm]	d1 [mm]	L [mm]	a [mm]	b [mm]
MKI-030/8	8 $^{+0.2}$	8.8 $^{+0.5}$	30 $^{\pm 2.0}$	40 $^{\pm 0.3}$	42 $^{\pm 0.3}$
MKI-060/8			60 $^{\pm 2.0}$		
MKI-070/8			70 $^{\pm 2.0}$		
MKI-080/8			80 $^{\pm 2.0}$		
MKI-090/8			90 $^{\pm 2.0}$		
MKI-110/8			110 $^{\pm 2.0}$		
MKI-130/8			130 $^{\pm 2.0}$		
MKI-140/8			140 $^{\pm 2.0}$		
MKI-150/8			150 $^{\pm 2.0}$		
MKI-170/8			170 $^{\pm 2.0}$		
MKI-190/8			190 $^{\pm 2.0}$		
MKI-200/8			200 $^{\pm 2.0}$		
MKI-210/8			210 $^{\pm 2.0}$		
MKI-230/8			230 $^{\pm 2.0}$		
MKI-240/8			240 $^{\pm 2.0}$		
MKI-250/8			250 $^{\pm 2.0}$		
MKI-270/8			270 $^{\pm 2.0}$		
MKI-300/8			300 $^{\pm 2.0}$		
[1)] stainless steel fixings are additionally marked with SS, e.g. MKI-SS-030/8					

Fig. A1. MKI steel fixing



Designation of fixing [1)]	Fixing sleeve			Retaining plate
	d [mm]	d1 [mm]	L [mm]	D [mm]
MBA-08030	8 $^{+0.2}$	9.35 $^{+0.2 / -0.1}$	30 $^{\pm 2.0}$	35 $^{\pm 0.2}$
MBA-08060			60 $^{\pm 2.0}$	
MBA-08070			70 $^{\pm 2.0}$	
MBA-08080			80 $^{\pm 2.0}$	
MBA-08090			90 $^{\pm 2.0}$	
MBA-08110			110 $^{\pm 2.0}$	
MBA-08130			130 $^{\pm 2.0}$	
MBA-08140			140 $^{\pm 2.0}$	
MBA-08150			150 $^{\pm 2.0}$	
MBA-08170			170 $^{\pm 2.0}$	
MBA-08190			190 $^{\pm 2.0}$	
MBA-08200			200 $^{\pm 2.0}$	
MBA-08210			210 $^{\pm 2.0}$	
MBA-08230			230 $^{\pm 2.0}$	
MBA-08240			240 $^{\pm 2.0}$	
MBA-08250			250 $^{\pm 2.0}$	
MBA-08270			270 $^{\pm 2.0}$	
MBA-08300			300 $^{\pm 2.0}$	
[1)] stainless steel fixings are additionally marked with SS, e.g. MBA-SS-08030				

Fig. A2. MBA steel fixing



stainless steel plates are additionally marked with SS, i.e. MKC-SS-85

Fig. A3. MKC-85 retaining plate

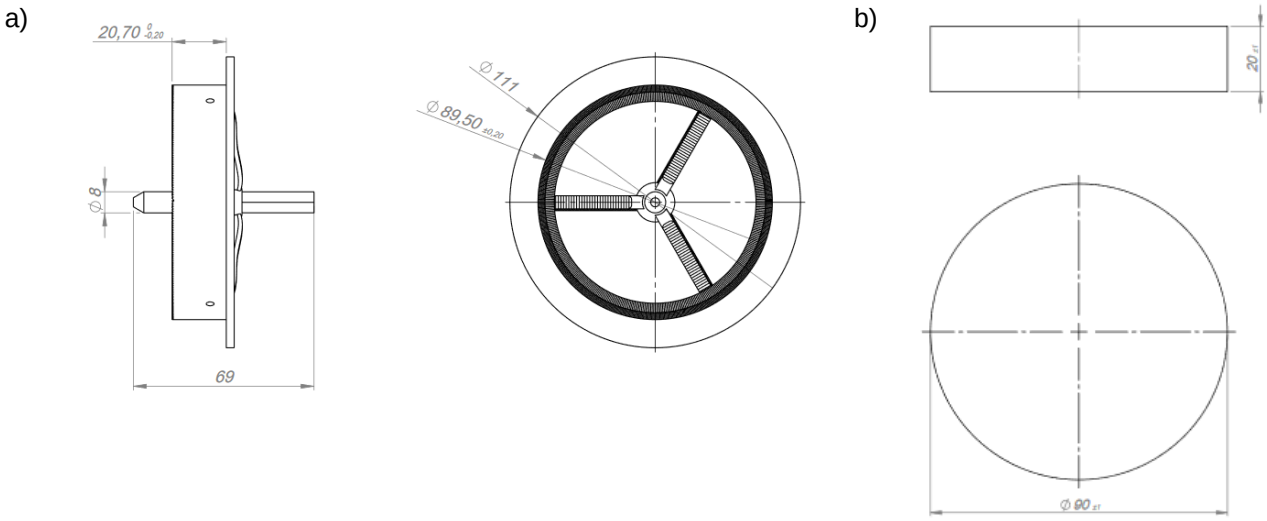
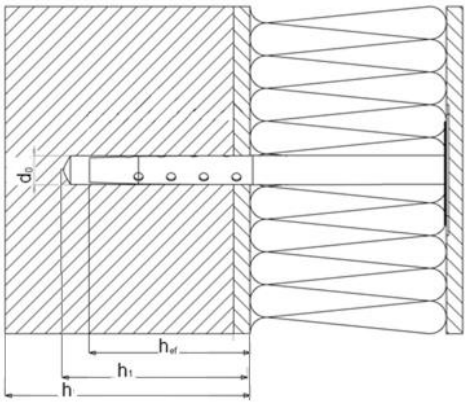


Fig. A4. Accessories for recessed installation

a) milling cutter, b) plug

APPENDIX B.

a)



b)

Designation of fixing [1]		Nominal drill bit diameter [2]	Min. depth of the opening [2]	Min. substrate thickness	Effective embedment depth	Min. spacing	Min. edge distance
		d_0 [mm]	h_1 [mm]	h [mm]	h_{ef} [mm]	s_{min} [mm]	c_{min} [mm]
MKI-030/8	MBA-08030	8.0	60[3] 35[5] 40[6]	80	50[3][4] 30[5]	75	75
MKI-060/8	MBA-08060						
MKI-070/8	MBA-08070						
MKI-080/8	MBA-08080						
MKI-090/8	MBA-08090						
MKI-110/8	MBA-08110						
MKI-130/8	MBA-08130						
MKI-140/8	MBA-08140						
MKI-150/8	MBA-08150						
MKI-170/8	MBA-08170						
MKI-190/8	MBA-08190						
MKI-200/8	MBA-08200						
MKI-210/8	MBA-08210						
MKI-230/8	MBA-08230						
MKI-240/8	MBA-08240						
MKI-250/8	MBA-08250						
MKI-270/8	MBA-08270						
MKI-300/8	MBA-08300						

[1] stainless steel fixings are additionally marked with SS, e.g. MKI-SS-030/8
[2] no hole is drilled for autoclaved aerated concrete substrates
[3] for MKI and MBA fixings embedded in a clay hollow brick substrate
[4] for MBA fixings embedded in an autoclaved aerated concrete substrate
[5] for MBA fixings embedded in a substrate made of normal weight concrete, clay and sand-lime bricks and sand-lime hollow bricks
[6] for MBA fixings embedded in a sand-lime hollow brick substrate

Fig. B1. Installation parameters of MKI and MBA steel fixings

a) standard installation, b) recessed installation

Appendix C.

Tablica C1. Pull-out failure load capacity of MKI steel fixings

item	Type of substrate	Effective embedment depth h_{ef}, mm	Drilled hole diameter d_0, mm	Pull-out failure load capacity of MKI fixings, kN	
				characteristic N_{Rk}	design N_{Sd} [5]
1	*2*	*3*	*4*	*5*	*6*
1	Normal weight concrete [1]	50	8.0	0.88	0.35
2	Solid clay brick [2]			0.66	0.26
3	Solid sand-lime brick [3]			0.94	0.38
4	Autoclaved aerated concrete [4]		–	0.82	0.41

[1] normal weight concrete C20/25-C50/60 acc. to the PN-EN 206+A1:2016 standard
[2] solid clay brick, grade 20 acc. to the PN-EN 771-1+A1:2015 standard
[3] solid sand-lime brick, grade 20 acc. to the PN-EN 771-1+A1:2015 standard
[4] autoclaved aerated concrete, grade 5 (acc. to average compressive strength), density grade of at least 650, acc. to the PN-EN 771-4+A1:2015
[5] the following factors have been assumed to determine design load capacity:
γ_m = 2.52 – for normal weight concrete substrates
γ_m = 2.50 – for solid clay brick and solid sand-lime brick substrates
γ_m = 2.00 – for autoclaved aerated concrete substrates

Tablica C2. Pull-out failure load capacities of MKI SS steel fixings

item	Type of substrate	Effective embedment depth h_{ef}, mm	Drilled hole diameter d_0, mm	Pull-out failure load capacity of MKI SS fixings, kN	
				characteristic N_{Rk}	design N_{Sd} [5]
1	*2*	*3*	*4*	*5*	*6*
1	Normal weight concrete [1]	50	8.0	0.88	0.35
2	Solid clay brick [2]			0.66	0.26
3	Solid sand-lime brick [3]			0.66	0.26
4	Autoclaved aerated concrete [4]		–	0.82	0.41

[1] normal weight concrete C20/25-C50/60 acc. to the PN-EN 206+A1:2016 standard
[2] solid clay brick, grade 20 acc. to the PN-EN 771-1+A1:2015 standard
[3] solid sand-lime brick, grade 20 acc. to the PN-EN 771-1+A1:2015 standard
[4] autoclaved aerated concrete, grade 5 (acc. to average compressive strength), density grade of at least 650, acc. to the PN-EN 771-4+A1:2015
[5] the following factors have been assumed to determine design load capacity:
γ_m = 2.52 – for normal weight concrete substrates
γ_m = 2.50 – for solid clay brick and solid sand-lime brick substrates
γ_m = 2.00 – for autoclaved aerated concrete substrates

Tablica C3. Pull-out failure load capacities of MBA steel fixings

item	Type of substrate	Effective embedment depth h_{ef}, mm	Drilled hole diameter d_0, mm	Pull-out failure load capacity of MBA fixings, kN	
				characteristic N_{Rk}	design N_{Sd} 7)
1	*2*	*3*	*4*	*5*	*6*
1	Normal weight concrete 1)	30	8.0	0.75	0.30
2	Solid clay brick 2)			0.50	0.20
3	Solid sand-lime brick 3)			0.60	0.24
4	Porous clay hollow brick 4)	50		0.22	0.09
5	Sand-lime hollow brick 5)	30		0.37	0.15
6	Autoclaved aerated concrete 6)	50	–	0.82	0.41

1) normal weight concrete C20/25-C50/60 acc. to the PN-EN 206+A1:2016 standard
2) solid clay brick, grade 20 acc. to the PN-EN 771-1+A1:2015 standard
3) solid sand-lime brick, grade 20 acc. to the PN-EN 771-2+A1:2015 standard
4) porous clay hollow brick, grade 15 acc. to the PN-EN 771-2+A1:2015 standard with a thickness of at least 10 mm,
5) sand-lime hollow brick, grade 15 acc. to the PN-EN 771-2+A1:2015 standard with a thickness of at least 21 mm,
6) autoclaved aerated concrete, grade 5 (acc. to average compressive strength), density grade of at least 650, acc. to the PN-EN 771-4+A1:2015 standard
7) the following factors have been assumed for design load capacity determination:
γ_m = 2.52 – for normal weight concrete substrates
γ_m = 2.50 – for clay and sand-lime brick and hollow brick substrates
γ_m = 2.00 – for autoclaved aerated concrete substrates

Tablica C4. Pull-out failure load capacities of MBA SS steel fixings

item	Type of substrate	Effective embedment depth h_{ef}, mm	Drilled hole diameter d_0, mm	Pull-out failure load capacity of MBA SS fixings, kN	
				characteristic N_{Rk}	design N_{Sd} 7)
1	*2*	*3*	*4*	*5*	*6*
1	Normal weight concrete 1)	30	8.0	0.90	0.36
2	Solid clay brick 2)			0.60	0.24
3	Solid sand-lime brick 3)			0.75	0.30
4	Porous clay hollow brick 4)	50		0.22	0.09
5	Sand-lime hollow brick 5)	30		0.37	0.15
4	Autoclaved aerated concrete 6)	50	–	0.82	0.41

1) normal weight concrete C20/25-C50/60 acc. to the PN-EN 206+A1:2016 standard
2) solid clay brick, grade 20 acc. to the PN-EN 771-1+A1:2015 standard
3) solid sand-lime brick, grade 20 acc. to the PN-EN 771-2+A1:2015 standard
4) porous clay hollow brick, grade 15 acc. to the PN-EN 771-2+A1:2015 standard with a thickness of at least 10 mm,
5) sand-lime hollow brick, grade 15 acc. to the PN-EN 771-2+A1:2015 standard with a thickness of at least 21 mm,
6) autoclaved aerated concrete, grade 5 (acc. to average compressive strength), density grade of at least 650, acc. to the PN-EN 771-4+A1:2015 standard
7) the following factors have been assumed for design load capacity determination:
γ_m = 2.52 – for normal weight concrete substrates
γ_m = 2.50 – for solid clay brick and solid sand-lime brick substrates
γ_m = 2.00 – for autoclaved aerated concrete substrates

Tablica C5. Load capacities of MBA and MBA SS fixings in case of fire

Fire resistance class	Pull-out failure characteristic load capacity $N_{Rk,fi}$ 2), kN	
	MBA	MBA SS
1	2	*3*
R30	0.22	0.22
R60	0.22	0.22
R90	0.22	0.22
R120	0.18	0.18
Effective embedment depth h_{ef}, mm	50	
Spacing $s_{cr,fi}$, mm	4 x h_{ef}	
Edge distance 1) $c_{cr,fi}$, mm	2 x h_{ef}	

1) In case of fire on more than one side, the edge distance should be ≥ 300 mm
2) Partial safety factor $\gamma_{m,fi}$ = 1