marbet bausystem®

PRODUCT OF POLAND

Warm mounting beam MARBET

Installation kit for window and door joinery in energy-efficient and passive buildings

PRODUCT INFORMATION

Warm, safe installation

The Marbet Warm Mounting Beam is an innovative set of elements used for provision of permeable and simple installation of windows and doors as part of the building thermal insulation zone. This system enables minimising heat loss resulting from thermal bridges on a window - wall joint.

Beams made of hard polystyrene and sealed-in steel brackets are used for the purpose of extending jambs and the provision of a tight bracket frame . Individual segments are joined similarly to building with bricks . The system is supplemented with under-window beam (BP) and bases for window-sills: inner (PPW), outer (PPZ), and a nib (W).

CBM system was engineered with participation of experts and practitioners in the field – window fitters and manufacturers. Installation of wood joinery based on CBM elements is compliant with ITB guidelines and approved by the National Technical Assessment:

1. ITB-KOT-2018/0199 Issue 1 as of 12.03.2018 "A set of CBM MARBET products for provision of heat-insulating frames to balcony windows and doors"
2. ITB-KOT-2018/0410 Issue 1 as of 26.03.2018 "MARBET Warm Mounting Beams (CBM) including supplementary elements"

Benefits – why is application of CBM MARBET so advantageous?

From 2021 onwards, the requirements for partitions thermal insulation as part of residential buildings will significantly increase. Marbet Warm Mounting Beam is the best possible way to ensure airtight window installation corresponding to the highest demands of clients. The suitable quality of window installation simply limits heat loss and ensures significant savings in relation to a building's maintenance costs.

+ COMPREHENSIVE SOLUTION

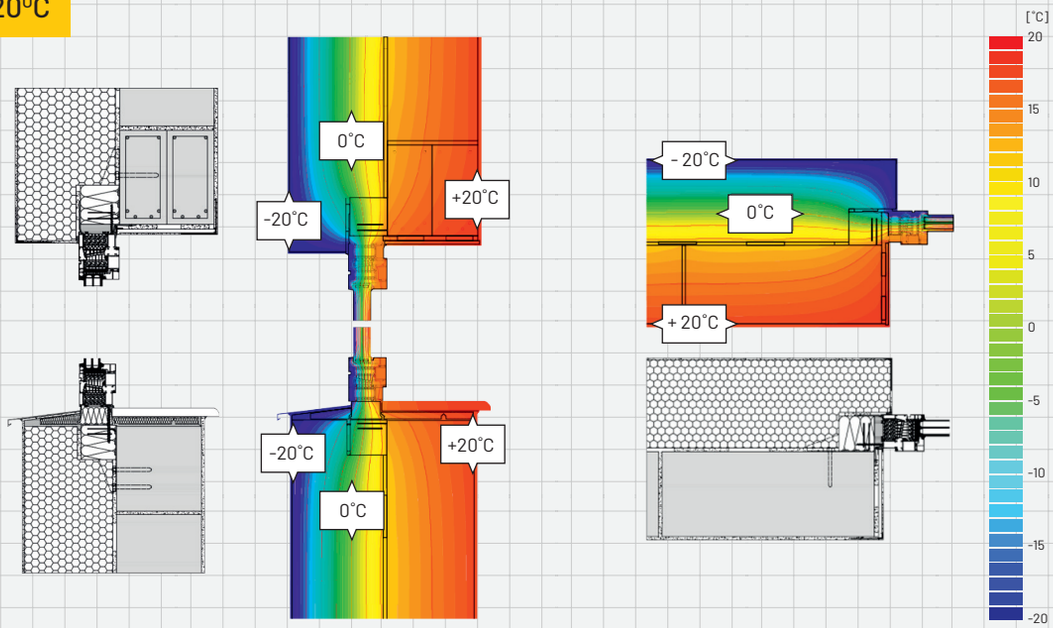
CBM is a thermo-insulating bracket frame that permanently joins a fenestration joinery frame with an existing wall.

CBM minimises linear thermal bridges within window-wall joints to the maximum as part of the warm mounting system:

- In comparison to leading European competitors, CBM features the most favourable distribution of isothermal lines
- the material used for manufacturing CBM elements is marked by low thermal conductivity coefficient, **$\lambda \leq 0{,}032$ W/mK**

DISTRIBUTION OF ISOTHERMS (HEAD, SILL, SIDES - DOOR POSTS) WITHIN TEMPERATURE RANGE

-20°C TO +20°C

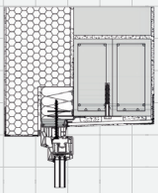


THERMAL BRIDGES – Ψ AND TEMPERATURE COEFFICIENTS – f_{Rsi}

System operational data are specified in the following table:

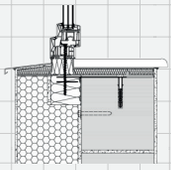
DATA RELATED TO THERMAL BRIDGES – Ψ

CBM enables repeated reduction of thermal bridges within jambs in relation to calculation values accepted as per the PN-EN 12831 standard.



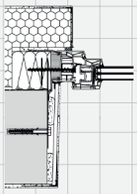
HEAD
Ψ = **0.12** (W/m*K) - as per the standard
Ψ = **0.012** (W/m*K) - obtained as part of CBM

difference - 1000%



SILL
Ψ = **0.12** (W/m*K) - as per the standard
Ψ = **0.021** (W/m*K) - obtained as part of CBM

difference - 571%

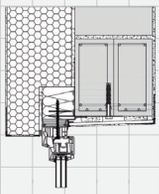


FRAME STAND
Ψ = **0.12** (W/m*K) - as per the standard
Ψ = **0.011** (W/m*K) - obtained as part of CBM

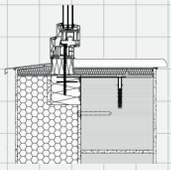
difference - 1091%

TEMPERATURE COEFFICIENTS – f_{Rsi}

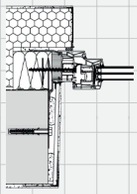
Comparison of temperature coefficients determined as part of CBM testing – f_{Rsi} to the minimum requirements that are specified in the building regulations.
(MIiB Regulation – Technical conditions applicable towards buildings and their locations).



HEAD
f_{Rsi} = **0.72** - required minimum level
f_{Rsi} = **0.87** - level obtained as part of CBM



SILL
f_{Rsi} = **0.72** - required minimum level
f_{Rsi} = **0.91** - level obtained as part of CBM

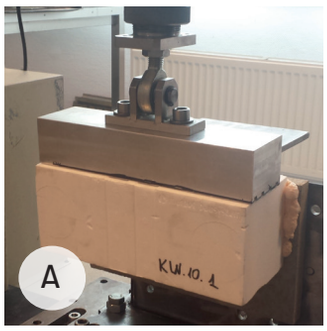


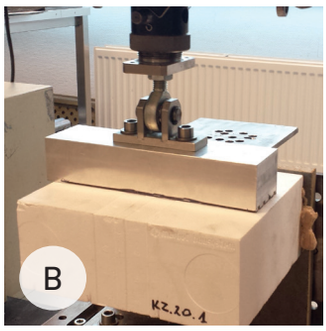
FRAME STAND
f_{Rsi} = **0.72** - required minimum level
f_{Rsi} = **0.87** - level obtained as part of CBM

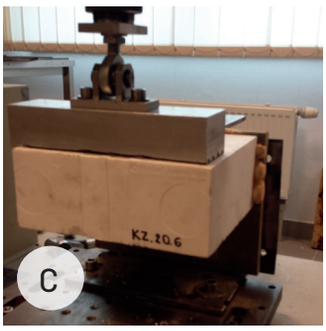
* distribution of isotherms and tables Ψ and f_{Rsi} were developed based on data acquired from report no. NZF-02269/17/Z00NZF as of 10.11.2017 that was carried out in the Research Unit of Thermophysics, Acoustics and Environment ITB, Warszawa, ul. Ksawerów 21.

SAFETY OF APPLICATION – LOAD-CARRYING ABILITY

The value of the load to be carried depends on shift (up to 3 mm) and destructive values for steel brackets (brackets) in a specific type of CBM beam







LOAD-CARRYING ABILITIES FOR CBM BRACKETS (STEEL QUICK RELEASE COUPLING)

Tyoe of CBM beam		Load to be carried expressed in [kN] at shift (deflection) in [mm]			Destruction of a steel bracket at	
		1 mm	2 mm	3 mm	maximum force F_{max} [kN]	shift [mm]
A	**Beams CBM.10.... featuring load protruded up to 60 mm beyond the face of the wall**					
1	CBM.10...W (inner bracket)	1.41	2.58	3.40	12.04	18.3
2	CBM.10...Z (outer bracket)	1.44	2.56	3.34	10.98	14.8
B	**Beams CBM.20.... featuring load in the middle part of a beam, that is the load protruded up to 100 mm beyond the face of the wall**					
3	CBM.20...W (inner bracket)	0.94	2.02	3.23	11.98	21.5
4	CBM.20....Z (outer bracket)	1.02	2.24	3.19	4.04	9.7
C	**Beams CBM.20.... featuring load at the end of a beam, that is the load protruded up to 160 mm beyond the face of the wall**					
5	CBM.20...W (inner bracket)	0.42	0.78	1.27	6.44	20.0
6	CBM.20...Z (outer bracket)	0.37	0.70	1.12	3.02	9.9

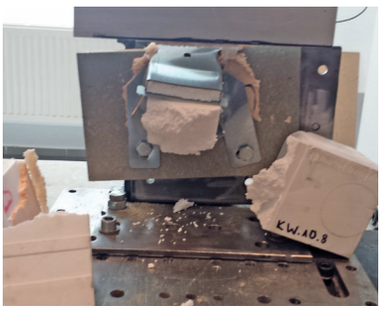
- Averaging values of tested test pieces
- The statement was developed based on the results of the Testing Report no. LZE01-01204/16/Z00NZE as of 06.06.2016 that was carried out by the Unit of Building Element Engineering ITB in Warszawa, ul. Ksawerów 21.

High loads corresponding with shifts were obtained on steel quick release coupling which eliminates pulling-out of bolts from the wall At the same time the elasticity and safety of operations in the system was confirmed. As part of the CBM system, the range of anticipated loads (0.3 kN to 1.7 kN) per a single beam fixed to the wall considers site realities - standard load-carrying ability of anchor bolts in a specific foundation.

bracket KZ.10.5

Intermediate readings, such as:

- load - 9 654 [N]
- shift - 13.06 [mm]



bracket KW.10.8

Measurement readings:

- failure of a test piece - Fmax =11 732 [N]
- at a shift - 30 [mm]

STATIC DIAGRAMS FOR INSTALLATION OF CBM BEAMS SUBJECT TO TYPE OF BEAM, BRACKET, AND LOCATION OF RESULTANT FORCE APPLICATION RESULTING FROM LOADS

DIAGRAM 1 – CBM.10.25(70).W

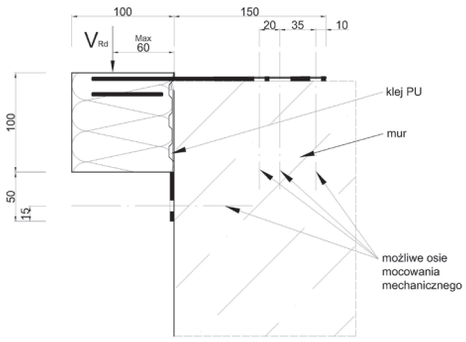


DIAGRAM 2 – CBM.10.25(70).Z

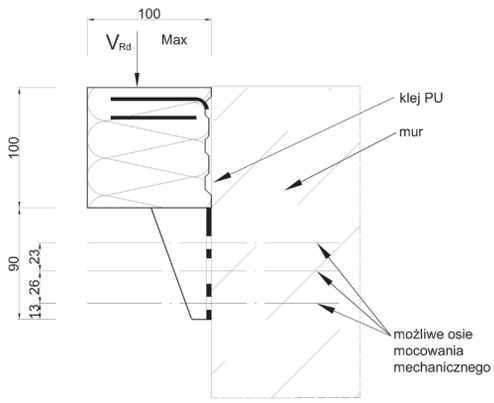


DIAGRAM 3 – CBM.20.25(70).W

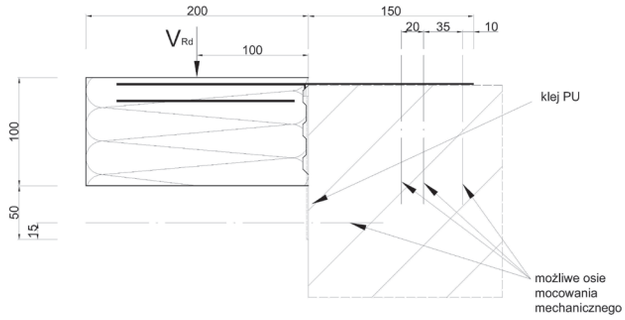


DIAGRAM 4 – CBM.20.25(70).Z

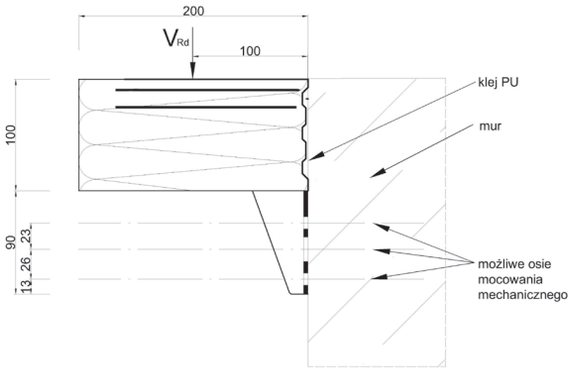


DIAGRAM 5 – CBM.20.25(70).W

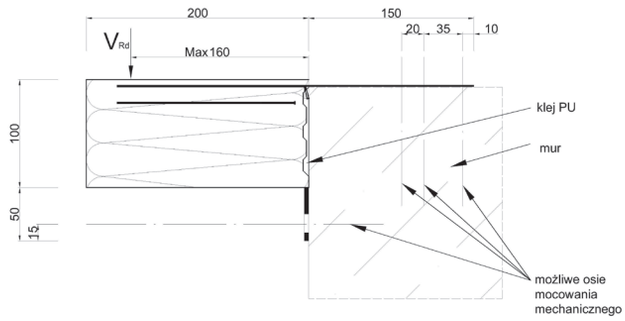
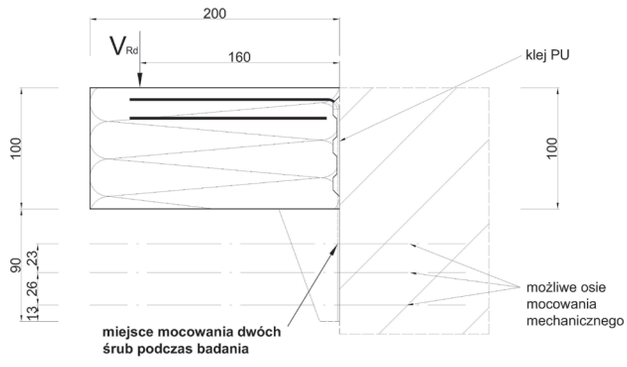


DIAGRAM 6 – CBM.20.25(70).Z



LOAD-CARRYING ABILITY OF CBM BEAMS DEPENDING ON THE TYPE OF FOUNDATION

AND NUMBER OF APPLIED MECHANICAL FASTENERS

Type of CBM beam	Static diagram of installation	Type of brickwork foundation	Analytical load-carrying ability for a single CBM beam stuck with PU adhesive to the foundation including fastening steel bracket with mechanical fasteners type KPR-FAST 10 K Ø 10 mm provided by Wkręt-Met in a number of [kN]		
			1 pc.	2 pcs.	3 pcs.
1	2	3	4	5	6
A	CBM 10 beams.... with inner or outer bracket and a resultant weighting force located up to 6 cm outreach from the face of the wall				
CBM 10.25.W CBM 10.70.W	diagram 1	Concrete foundation, type 1,2	0.80	1.50	1.70
		Foundation made of solid brick, type 3,4,5,6,7	0.80	1.50	1.70
		Structural clay tiles, type 8,9	0.50	0.90	1.20
		Structural perforated clay tiles, type 10	0.60	1.20	1.40
		Cellular concrete, type 13	0.50	0.90	1.20
		Cellular concrete, type 14	0.60	1.20	1.40
CBM 10.25.Z CBM 10.70.Z	diagram 2	Concrete foundation, type 1,2	0.80	1.50	1.70
		Foundation made of solid brick, type 3,4,5,6,7	0.80	1.50	1.70
		Structural clay tiles, type 8,9	0.50	0.80	1.00
		Structural perforated clay tiles, type 10	0.60	1.00	1.30
		Cellular concrete, type 13	0.50	0.80	1.00
B		Cellular concrete, type 14	0.60	1.10	1.30
CBM 20 beams.... with inner or outer bracket and a resultant weighting force located up to 10 cm outreach from the face of the wall (in the middle of a beam)					
CBM 20.25.W CBM 20.70.W	diagram 3	Concrete foundation, type 1,2	0.60	1.50	1.70
		Foundation made of solid brick, type 3,4,5,6,7	0.60	1.50	1.70
		Structural clay tiles, type 8,9	0.40	0.70	1.00
		Structural perforated clay tiles, type 10	0.50	1.00	1.20
		Cellular concrete, type 13	0.40	0.70	1.00
		Cellular concrete, type 14	0.50	0.90	1.20
CBM 20.25.Z CBM 20.70.Z	diagram 4	Concrete foundation, type 1,2	0.60	1.00	1.20
		Foundation made of solid brick, type 3,4,5,6,7	0.60	1.00	1.20
		Structural clay tiles, type 8,9	0.40	0.60	0.80
		Structural perforated clay tiles, type 10	0.50	0.80	1.00
		Cellular concrete, type 13	0.40	0.60	0.80
		Cellular concrete, type 14	0.50	0.80	1.00

C	CBM 20 beams... with inner or outer bracket and a resultant weighting force located up to 16 cm outreach from the face of the wall (at the end of a beam)				
CBM 20.25.W CBM 20.70.W	**diagram 5**	Concrete foundation, type 1,2	**0.60**	**1.50**	**1.70**
		Foundation made of solid brick, type 3,4,5,6,7	**0.60**	**1.50**	**1.70**
		Structural clay tiles, type 8,9	**0.40**	**0.70**	**0.90**
		Structural perforated clay tiles, type 10	**0.50**	**0.90**	**1.10**
		Cellular concrete, type 13	**0.40**	**0.70**	**0.90**
		Cellular concrete, type 14	**0.50**	**0.90**	**1.10**
CBM 20.25.Z CBM 20.70.Z	**diagram 6**	Concrete foundation, type 1,2	**0.60**	**1.00**	**1.20**
		Foundation made of solid brick, type 3,4,5,6,7	**0.60**	**1.00**	**1.20**
		Structural clay tiles, type 8,9	**0.30**	**0.50**	**0.70**
		Structural perforated clay tiles, type 10	**0.50**	**0.70**	**0.90**
		Cellular concrete, type 13	**0.30**	**0.50**	**0.70**
		Cellular concrete, type 14	**0.50**	**0.70**	**0.90**

Remarks and recommendations:

1) In the under-sill beam of a jamb it is recommended to apply CBM beams and inner brackets fixed with 2 or 3 mechanical fasteners (one of the tap screws must be always stably fixed in a plate from upside - optimally as far as possible from the face of the wall within the plane of the jamb)
- in the case of structural hollow clay tiles for foundations type 8,9,10 (to obtain additional reliability of a fastener anchoring) it is recommended to provide;
a hole with a tap screw and some neighbouring holes (vertical holes in ceramic clay tiles) must be filled with cement mortar, e.g. Ceresit CX-15

2) In upper and side jambs, it is recommended to apply CBM beams with outer brackets fixed with 2 mechanical fasteners

3) CBM load-carrying ability values are restricted up to heights admissible as part of KOT (relevant to site conditions)

4) Prior to sticking (PU foam) CBM beams, it is necessary to check the stability of a foundation and de-dust it or - if necessary - additionally pour the concrete base (cellular concrete always requires pouring concrete base)

5) In weak foundations (cellular concrete and ceramic clay tiles) it is recommended to apply at least 3 mechanical fasteners along the under-sill beam of a jamb

6) Drilling holes in foundations in compliance with table no. ... (punch drilling, standard drilling)

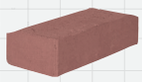
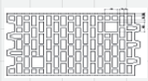
7) Installation may be carried out at temperatures -5°C to +35°C (application limitations must consider admissions related to construction chemicals)

8) At significant loads on windows or in the case of intricate installations, selection of brackets and fasteners must be agreed with the designer or manufacturer of wood joinery

9) Installation must be carried out in compliance with the guidelines submitted by the manufacturer of wood joinery as well as in compliance with requirements specified in ITB-KOT-2018/0410 and ETAG 020

LOAD-CARRYING ABILITY OF FASTENERS

The statement developed basied on the European Technical Assessment ETA-12/0272 as of 29.06.2018 for 10 mm diameter mechanical fasteners type KPR-FAST 10 and KPS-FAST 10 supplied by Klimas Wkręt-Met company

Type of foundation	Description	Volumetric density class [kg/dm^3]	Ultimate compressive strength [N/mm^2]	Foundation diagram	Drilling method	F_{Rk} [11] [kN]	Safety factor	F_{obl}^{*} [12] [kN]
1	Concrete C12/15				percussion drilling	3.0	1.8	1.67
2	Concrete ≥ C16/20				percussion drilling	4.0	1.8	2.22
3	Ceramic solid bricks, made in Poland[1), 5)]	≥ 1.70	≥ 10		percussion drilling	2.5	2.5	1.00
4	Ceramic solid bricks, made in Poland[1), 5)]	≥ 1.70	≥ 20		percussion drilling	3.5	2.5	1.40
5	Ceramic solid bricks, made in Germany[1), 6)]	≥ 2.00	≥ 10		percussion drilling	2.5	2.5	1.00
6	Ceramic solid bricks, made in Germany[1), 6)]	≥ 2.00	≥ 20		percussion drilling	3.5	2.5	1.40
7	Solid calcium-silicate bricks[2), 7)]	≥ 2.00	≥ 20		percussion drilling	3.5	2.5	1.40
8	Porotherm 25P + W[1)]	≥ 0.80	≥ 15		standard drilling	0.9	2.5	0.36
9	MAX 250[1)]	≥ 0.80	≥ 15		standard drilling	0.9	2.5	0.36
10	Ceramic perforated bricks[1), 8)]	≥ 1.20	≥ 12		standard drilling	2.0	2.5	0.80
11	Silicate duct blocks[2), 9)]	≥ 1.60	≥ 12		standard drilling	2.5	2.5	1.00
12	Hole elements made of concrete on lightweight aggregate[3), 10)]	≥ 0.80	2		standard drilling	1.5	2.5	0.60
13	Autoclaved cellular concrete AAC 2[4)]	≥ 0.35	2		standard drilling	0.6	2	0.30
14	Autoclaved cellular concrete AAC 7[4)]	≥ 0.65	≥ 6.5		standard drilling	1.5	2	0.75

[1]) In compliance with EN 771-1 standard
[2]) In compliance with EN 771-2 standard
[3]) In compliance with EN 771-3 standard
[4]) In compliance with EN 771-4
[5]) Solid brick made in Poland
[6]) Solid brick made in Germany MZ Rd 2.0/20
[7]) Kalksandstein KS NF 20-2.0 Vollstein according to DIN 106
[8]) For example HLZ Rd1 1.2/12 according to DIN 105
[9]) For example KSL-R(P)8DF Lochstein according to DIN 106
[10]) For example according to DINV18151-100
[11]) Typical load-carrying ability (including pull-out and shearing)
[12]) Analytical load-carrying ability

+ FIRE SAFETY

- **Fire safety – NRO classification** (a system for non-propagation of fire from inside). It is a first installation of window and door joinery within the zone of additional insulation of double-tier wall, which was fire tested in Poland; it meets the basic requirement that allows for its application within public utility facilities.

Fire testing at the ITB Institute in Pionki

+ SAFE SYSTEM OF APPLICATION

CBM is a system of steel brackets – load-carrying brackets and supplemental materials that are elastic; it ensures the most advantageous parameters - class in a range of endurance, airtightness and thermal joints.

Load from the window to the wall is transferred by a set of few or several brackets (steel anchors). Quantity of CBM load-carrying beams depends on the size of wood joinery to be installed, its weight, and the type of foundation, on which it is settled.

- **Operational safety**
  No damages at pressure **3000 Pa** corresponds to a devastating storm blowing at velocity exceeding 250 km/h.

  Resistance to vertical force (racking) - **CLASS 4 (800N)**
  Static torsional strength - **CLASS 4 (350N)**

- **Air permeability 0.03 < a < 0.05m³/(mhdaPa$^{2/3}$)** – it is CBM system air permeability obtained in test cycles simulating multiple-year operation.

- **Water-tightness – 600 Pa, CLASS 9A**
  Standard requirements are met during fatigue cycles (load from wind pressure and suction and load from high temperature).

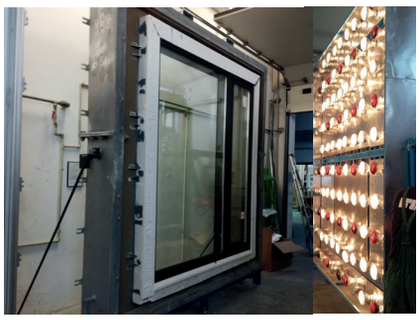
+ SIMPLE INSTALLATION

CBM is a fitter-friendly system that includes multiple improvements that facilitate installation on the basis of "building with bricks":

- CBM system "forgives multiple common mistakes and manufacturing inaccuracies during bricklaying",
- CBM beams can be used for levelling and compensates for part of irregularities of surface on jambs that have been bricked earlier,
- jamb plastering is not required to ensure air-tightness of joints.

+ ECONOMICAL, WARM, AND DURABLE

CBM is a warm and air-tight system that enables limitation of heat loss and generation of significant savings in the upkeep of buildings (this solution is acknowledged with ageing test).



Air-tight and durability testing at ITB Laboratory in Warsaw.

Recommendations from Marbet to the Client:
Upon completion of installation with CBM elements, request your fitter to fill in a specification of installation (available at www.marbetbausystem.com) and store this document a part of the as-built documentation in the site records.

Diagram of window installation **double-tier wall**

λ≤0.032 [W/mK]

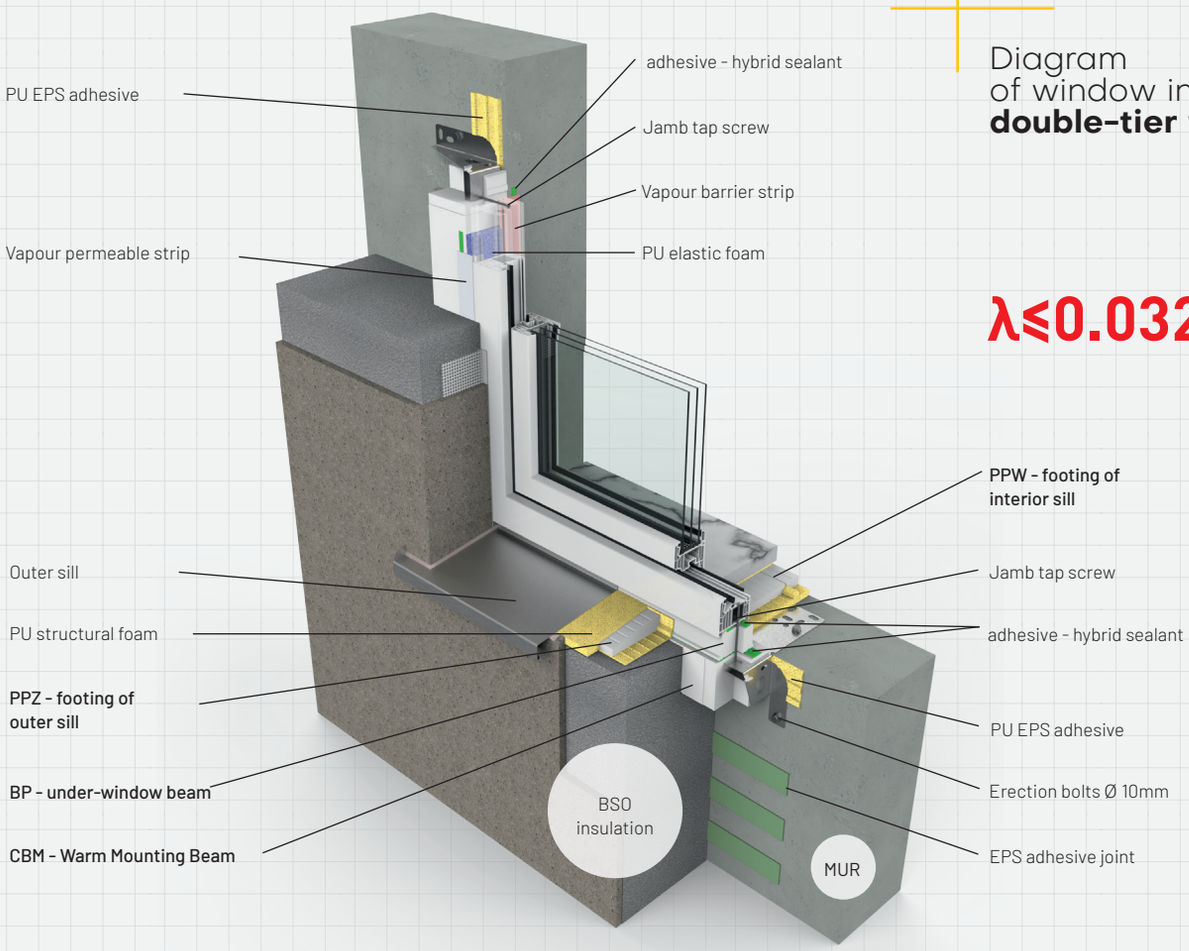
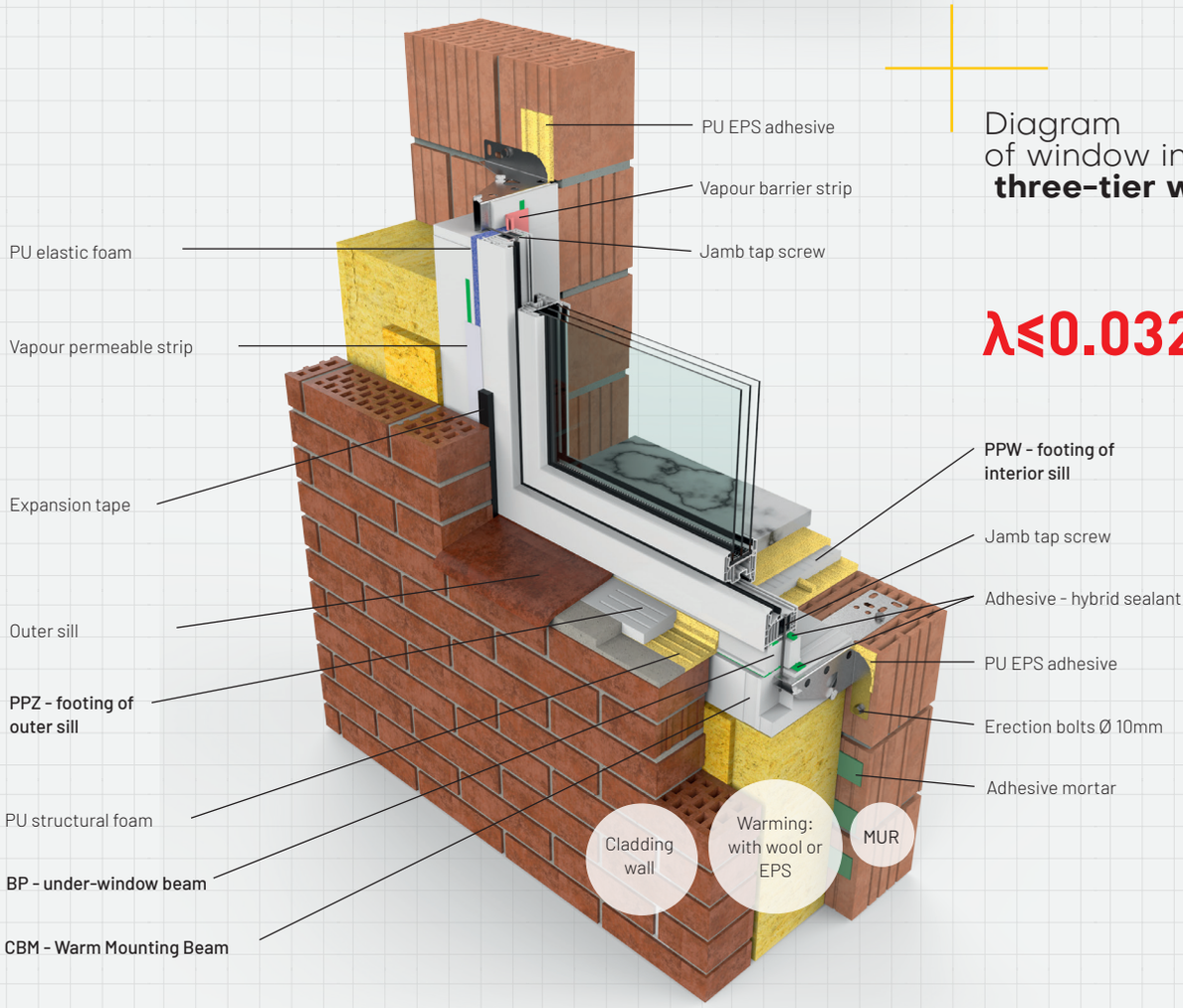


Diagram of window installation **three-tier wall**

λ≤0.032 [W/mK]



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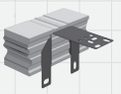
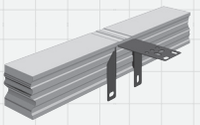
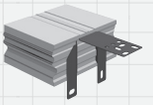
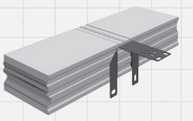
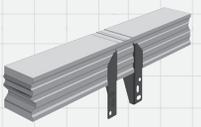
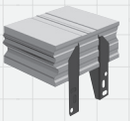
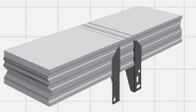
EPS material:
Density: ≥ 40 kg/m³;
CS(10)300: ≥ 300 kPa
$\lambda_D \leq 0.032$W/mK;

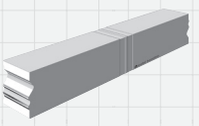
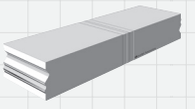
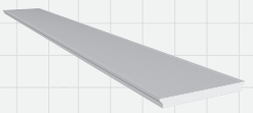
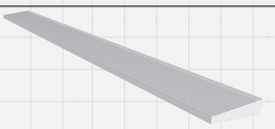
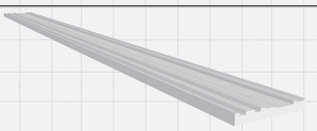
*) - for BP HARD
Density: ≥ 60 kg/m³;
CS(10)600: ≥ 600 kPa
$\lambda_D \leq 0.034$ W/mK;

CBM MARBET PRODUCT PORTFOLIO

element type (jamb width)

	10 cm		20 cm	
CBM beam length	25 cm	70 cm	25 cm	70 cm
with internal bracket	 CBM.10.25.W	 CBM.10.70.W	 CBM.20.25.W	 CBM.20.70.W
with external bracket	 CBM.10.25.Z	 CBM.10.70.Z	 CBM.20.25.Z	 CBM.20.70.Z

supplemental elements for CBM system

without bracket	 CBM.10.25	 CBM.10.70	 CBM.20.25	 CBM.20.70
Under-window beam BP				
Under-window beam BP.HARD*)				
Basis for interior sill PPW				
Basis for outer sill PPZ				
Nib W				

National Technical Assessment – ITB-KOT-2018/0199 as of 12.03.2018
National Technical Assessment – ITB-KOT-2018/0410 as of 26.03.2018

This solution is protected by:
- patent application to UPRP no. P.414259 as of 4.10.2015
- application to EUIPO no. 003047554 as of 30.03.2016

INSTYTUT TECHNIKI BUDOWLANEJ
PL 00-611 WARSZAWA, ul. Filtrowa 1, www.itb.pl

CZŁONEK EOTA I UEAtc

KRAJOWA OCENA TECHNICZNA
ITB-KOT-2018/0410 wydanie 1

Niniejsza Krajowa Ocena Techniczna została wydana zgodnie z Rozporządzeniem Ministra Infrastruktury i Budownictwa z dnia 17 listopada 2016 r. w sprawie krajowych ocen technicznych (Dz. U. z 2016 r., poz. 1968) przez Instytut Techniki Budowlanej w Warszawie, na wniosek firmy:

MARBET Sp. z o.o.
ul. Chochołowska 28, 43-346 Bielsko-Biała

Krajowa Ocena Techniczna ITB-KOT-2018/0410 wydanie 1 stanowi pozytywną ocenę właściwości użytkowych poniższych wyrobów budowlanych do zamierzonego zastosowania:

Ciepłe Belki Montażowe (CBM) MARBET wraz z elementami uzupełniającymi

Data ważności Krajowej Oceny Technicznej:
26 marca 2023 r.

DYREKTOR
Instytutu Techniki Budowlanej
dr inż. Robert Geryło

Warszawa, 26 marca 2018 r.

Dokument Krajowej Oceny Technicznej ITB-KOT-2018/0410 wydanie 1 zawiera 20 stron, w tym 2 załączniki. Tekst tego dokumentu można kopiować tylko w całości. Publikowanie lub upowszechnianie w każdej innej formie fragmentów tekstu Krajowej Oceny Technicznej wymaga pisemnego uzgodnienia z Instytutem Techniki Budowlanej.

MARBET SP. Z O.O.

43-346 Bielsko-Biała, ul. Chochołowska 28
tel. +48 33 812 72 04, +48 600 06 36 42
cbm@marbetbausystem.com.pl
www.marbetbausystem.com

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