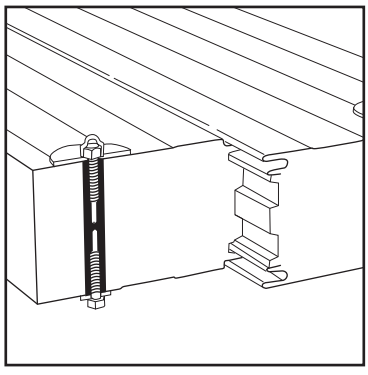
BALEXMETAL

BALEXTHERM-PU-F

SANDWICH COLD STORAGE PANEL WITH POLYURETHANE CORE



TECHNICAL CATALOGUE

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BALEXMETAL

BALEXTHERM-PU-F

Sandwich cold storage panel with polyurethane core

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I. TECHNICAL SPECIFICATION OF THE ENCLOSURE MADE OF SANDWICH PANELS

1. GENERAL INFORMATION – THE CONSTRUCTION OF SANDWICH PANELS

Balex Metal company provides wide range of steel faced sandwich panels with polyurethane core marked with BALEXTHERM-PU trade name. The range of products includes wall and roof sandwich panels for industrial halls, warehouses, sports halls, production facilities, commercial pavilions and facilities, offices, social and public utility buildings. More detailed information concerning sandwich panels for the above mentioned applications is available in the Technical Catalogue of BALEXTHERM-PU-W-PLUS, BALEXTHERM-PU-W-ST and BALEXTHERM-PU-R sandwich panels with a polyurethane core. The thickness of panels ranges from 40 mm to 100 mm.

The panels described in this catalogue supplement the range of products and are modern cold storage panels for cold stores under the BALEXTHERM-PU-F trade name. They are considerably thicker ranging from 120 mm to 200 mm.

BALEXTHERM-PU-F sandwich panels consist of two stainless steel claddings and a structural-insulating core. The core is made of non-freon polyurethane foam foamed with pentane, with density of 40±3 kg/m^3 (environmentally friendly due to the applied foaming agent) with the highest thermal insulation value among all known insulation materials. It is responsible for transmitting shear stress, maintaining fixed distance between the claddings and ensuring high thermal insulation values. The calculation thermal conductivity coefficient equals λ_{obl} = 0.022 W/m^{2}K with average temperature of a division wall of 0°C.

There are two types of polyurethane core used in production of BALEXTHERM-PU sandwich panels: PUR and PIR foams.Polyisocyanurate PIR foams are characterized by improved resistance to high temperature. Flat bonds of PUR foams decompose in approximately 200°C, and carbonization in combustion is only 20%. Isocyanurate structures in PIR foams decompose in temperature approximately 325°C, and carbonization reaches up to 50%. This was confirmed by fire resistance testing. Significant carbonization of PIR foam constitutes a barrier for spreading of fire due to low thermal conductivity of carbonized layers and resistance to oxidation. This way the material from deeper layers of PIR foam is protected from combustion, and the carbonized layer prevents high temperature from passing through sandwich board. As a result, greater fire protection is achieved.

Panel claddings are responsible for transmitting normal stress and securing a particular facility against weather conditions.

BALEXTHERM-PU-F sandwich panel's claddings are made of S220GD, S250GD and S280GD steel metal sheet galvanized on both sides and steel metal sheet S250GD and S280GD according to PN-EN 10346 with aluzinc coating (coating weight ≥ 185 g/m^2), plated with organic coating or made of stainless steel (1.4301) according to EN 10088-1:1998.

Standard steel cladding of sandwich panels is coated with polyester varnishes. Due to often increased anticorrosive requirements and contact with food in the case of warehouses, cold stores and carrying freezers the claddings can be coated with PVDF, PVC(F).

The polyurethane core in the longitudinal joint is milled in the production process to the shape of a double tongue and groove in order to obtain maximum tightness and improved thermal insulation value. The shape of locks of the outside and inside cladding formed as a double metal sheet wrap that contributes to increasing resistance to fire and maintaining the integrity of panels' joint even in severe conditions of fire testing.

Such construction of the panel guarantees fulfilling high requirements concerning thermal insulation, high load-bearing capacity and rigidity with wide range of acceptable temperature differences of outside and inside claddings. It enables application of considerable spans of supports both in the ceiling and on the walls at the same time.

2. TECHNOLOGY OF PRODUCTION

The production of BALEXTHERM sandwich panels is continuous and performed on a fully automated assembly line delivered by one of the leading suppliers in the trade, Hennecke company (Germany). Pentane is used as the foaming agent which makes the production process environmentally friendly i.e. not damaging the ozone layer.

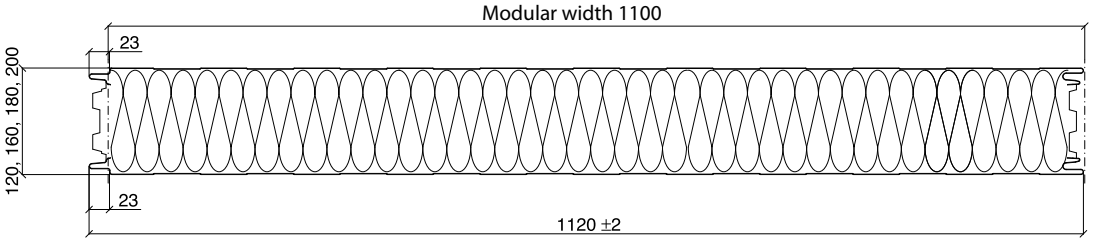
The technological process of producing sandwich panels with polyurethane core consists of injection of mixed components forming rigid polyurethane foam between two continuously moving metal sheet panels of the upper and lower steel cladding (with previously profiled longitudinal joints and the main profile) and using paper tape preventing foamed polyurethane from sticking to side chains forming the core's longitudinal profile at the same time. Panels' sections cut to appropriate dimensions with the use of a saw slide along the so called cooling conveyor in order to undergo the process of double-side milling of the core's longitudinal profile at the final stage. In the course of milling the paper tape is removed and pure polyurethane is exposed. At the final stage of the production process panels are automatically packed in transport packages and wrapped in shrink film.

High quality and fixed repeatability of technical parameters has been achieved due to the application of top class materials and continuous control of production.

3.TYPES OF PANELS

BALEXTHERM-PU-F wall and ceiling cold storage panels are provided in four thicknesses with the modular width (so called covering width) 1100 mm. Profiling outside and inside claddings is performed as standard in two versions as lined and flat, marked with L and G symbols.

Attention!
It is possible to profile one of the claddings as microprofiled marked with M symbol to special orders after consultations with the orderer.



4. BASIC TECHNICAL SPECIFICATION

Table 1. Technical specification

Type of panel	Standard thickness of claddings [mm]		Panel's thickness [mm]	Panel's length [m]		Panel's weight [kg/m²]
	external	internal		min.	max.	
BALEXTHERM-PU-F 120	0,50	0,50	120	2,50	16	13,40
BALEXTHERM-PU-F 160			160			15,00
BALEXTHERM-PU-F 180			180			15,80
BALEXTHERM-PU-F 200			200			16,80

5. DESTINATION, SCOPE OF APPLICATION

BALEXTHERM-PU-F cold storage sandwich panels are to be used as external partitions, ceilings (in this case covered with additional panels like e.g. corrugated sheet) and internal partitions in stationary stores, cold stores and carrying freezers as well as elements of chambers (of the same application) inside other facilities or as wall warming elements or ceilings in existing buildings.

Panels used as external partitions transmit heat and wind load and ceiling panels covered with additional coat, so called tropical, transmit only heat load.

Depending on the thickness of the core and indoor temperature of a room the following scope of application is anticipated:

- the core 120 mm thick - room temperature reaching -15°C
- the core 160 mm thick - room temperature reaching -30°C
- the core 180 mm thick - room temperature reaching -40°C
- the core 200 mm thick - room temperature reaching -50°C

The application of cold storage sandwich panels should be in accordance to the technical design regarding the harmonized European norm PN-EN 14509 concerning BALEXTHERM-PU-F panels as well as the requirements of local standards and building codes.

6. PANEL JOINTS

The whole product line of BALEXTHERM sandwich panels includes a new constructional solution concerning the shape of steel claddings in the longitudinal joint of panels. A unique shape of longitudinal joints with optimal proportion between the thickness of the tongue and the depth of the groove in both claddings, internal and external one, had considerable effect on increasing fire resistance parameters of panels.

In addition in the case of BALEXTHERM-PU-F panels we introduced precise milling of the polyurethane core in the shape of a double tongue joint (it is a novelty in cold storage panels).

In the case of cold storage panels the solution described above guarantees good thermal performance and eliminates linear thermal bridge and satisfies the highest requirements concerning fire resistance, fastness to rain waters, air and steam infiltration.

BALEXTHERM-PU-F panels can be fastened to the load-bearing structure with the use of two different fastener insulation systems eliminating point thermal bridges and with the use of self-drilling and self-tapping eyelet fasteners made of stainless steel. The characteristics of the fastening and the rules of their selection are described in the catalogue further on.

7. LONGITUDINAL PANEL JOINT (ADVANTAGES)

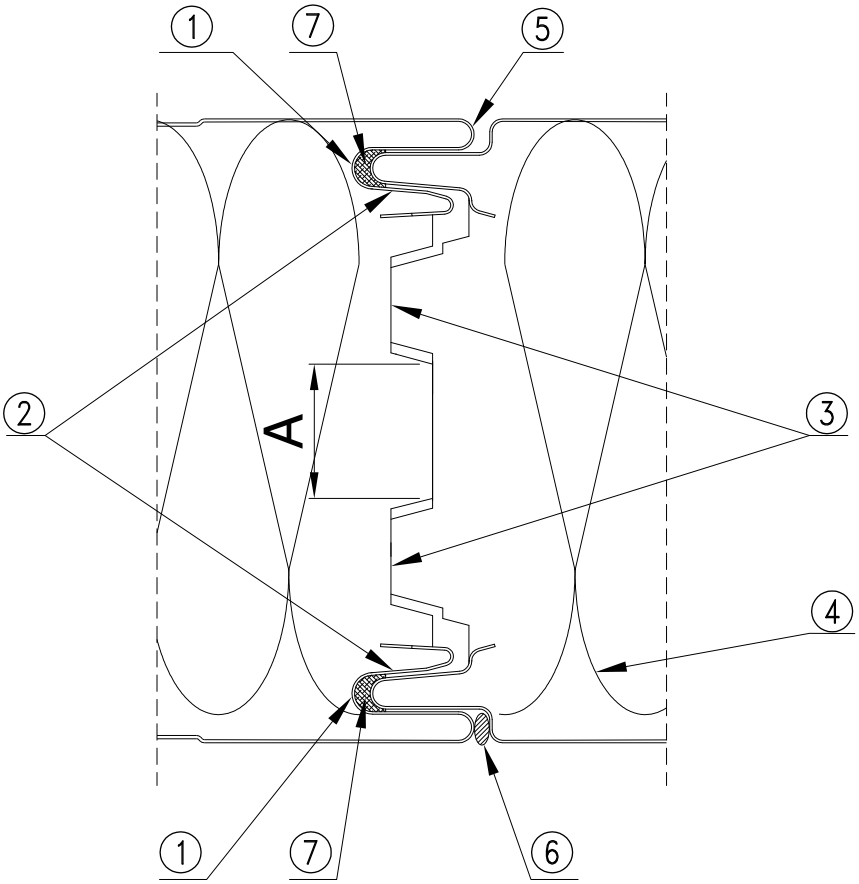


Fig.2 Longitudinal BALEXTHERM-PU-F panel joint

1. Double-sided unique shape of the panel joint in the form of a double lock.
2. Conic inclination of the surface of the internal panel's joint facilitating assembly.
3. A milled joint in the shape of a double tongue joint eliminating linear thermal bridge where A = 26 mm for G = 120 and A = 61,7 mm for G = 160, 180, 200 mm
4. A core made of rigid polyurethane foam
5. Appropriately formed shape of claddings ensuring high resistance of anticorrosive coatings
6. A gap enabling application of permanently plastic sealing compound (e.g. SOUDAFLEX)
7. Sealing compound preventing steam and air infiltration

8. FASTENING BALEXTHERM-PU-F PANELS TO THE LOAD-BEARING STRUCTURE

BALEX METAL provides designers and contractors with four different systems of fastening cold storage panels to the load-bearing structure. Two first systems of fastening eliminate point thermal bridges and are designed mainly for cold stores and carrying freezers.

A designer should decide on selection of an appropriate fastening system taking into consideration appropriate law regulations.

The first version of fastening cold storage sandwich panels with the use of insulating nuts with steel insert consists in fastening panels to the structure with the use of M 10 galvanized steel bars twisted from the side of the structure with a galvanized nut and from the side of the chamber with a special PVC nut with a steel insert placed inside it. A special PVC washer Ø60 mm in diameter enables transmitting heat and wind load to the steel claddings. Plastic PVC elements are provided in basic colours RAL 9002 and 9010.

ATTENTION!
Acceptable load for a single fastener in a critical state of usage (Version I) is 210 daN.

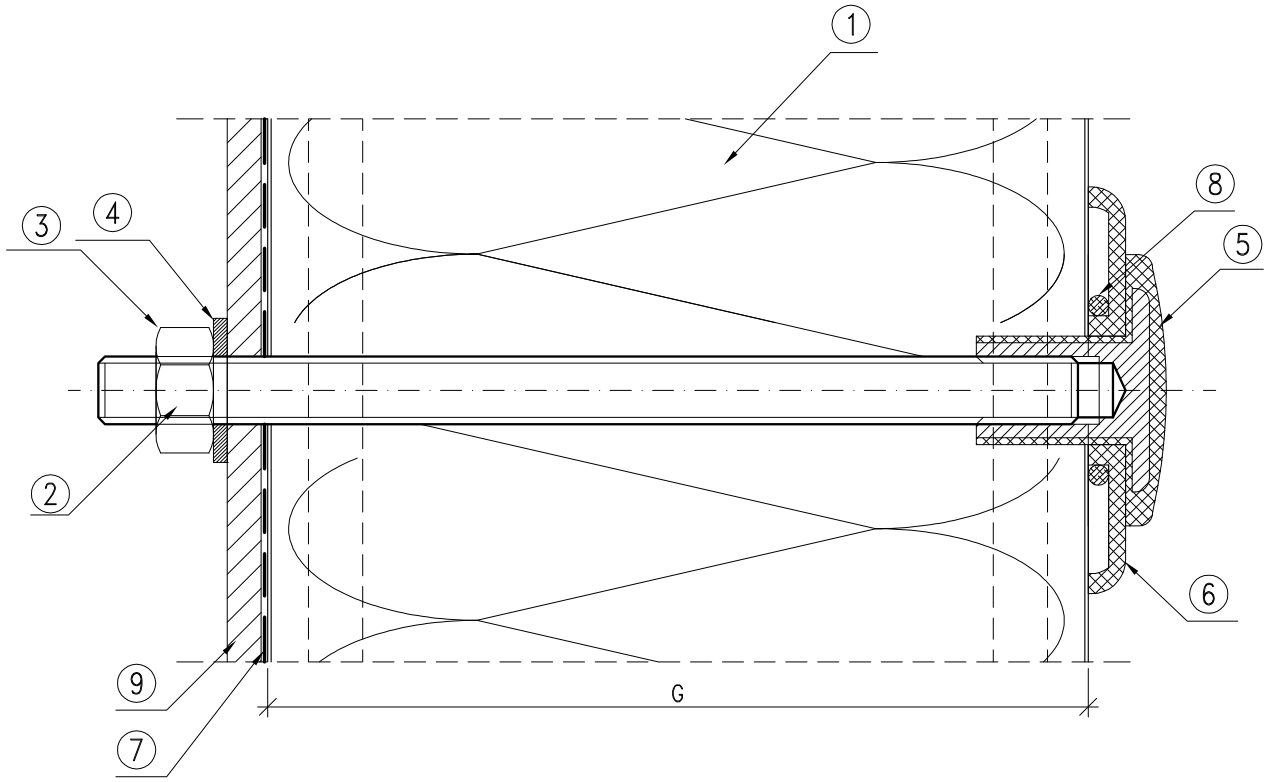


Fig. 3. The fastening system of BALEXTHERM-PU-F cold storage sandwich panels with the use of insulating nuts with a steel insert.

1. BALEXTHERM-PU-F panel
2. M 10XL galvanized bar, where L = G + 25 mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Element of the building's structure

Version II of fastening cold storage sandwich panels consists in fastening panels to the load-bearing structure with the use of a polyamide sleeve screwed on both sides with the help of two M10 screws. A special steel washer Ø70 mm in diameter (galvanized and varnished in the colour of the panel) is responsible for transmitting heat and wind load to steel claddings.

ATTENTION!
Acceptable load for a single fastener in a critical state of usage (Version II) is 250 daN.

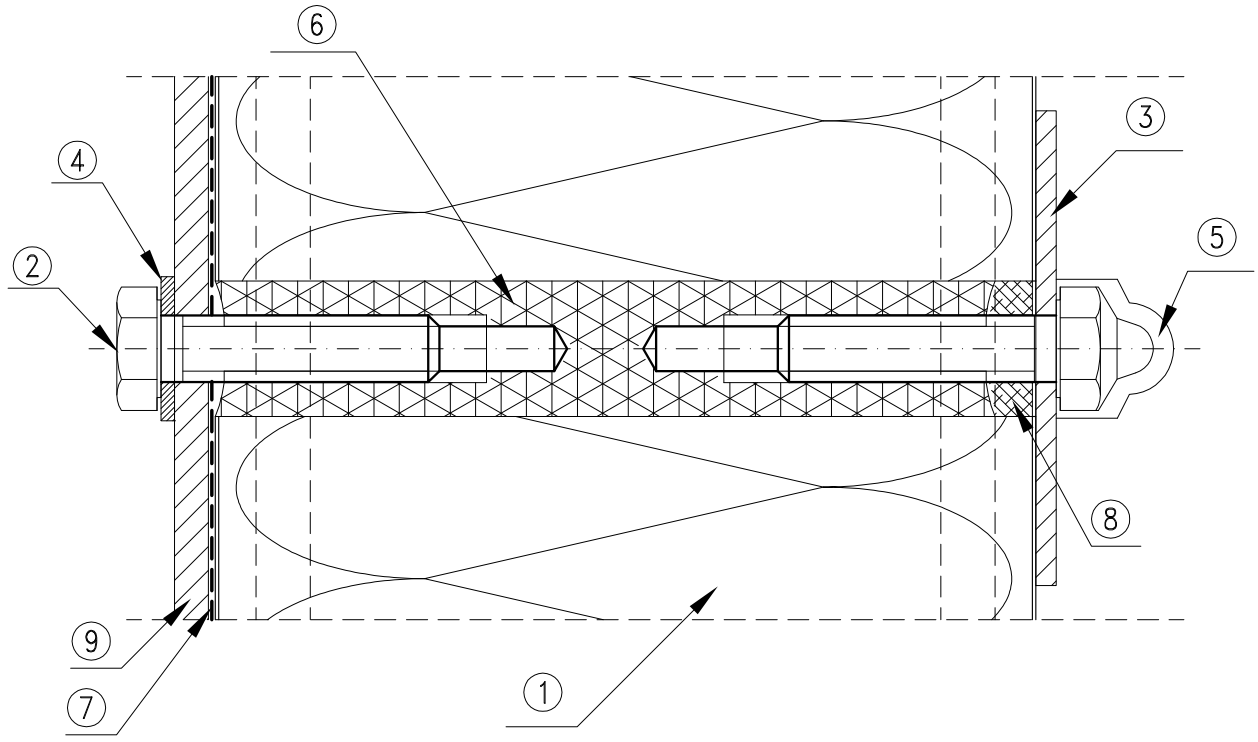


Fig. 4. The fastening system of BALEXTHERM-PU-F cold storage sandwich panels with the use of insulating polyamide sleeves.

1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5 (white as standard)
4. Ø21/Ø10.5 galvanized washer
5. White protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Element of the building's structure

Version III of fastening consists in joining wall panels with the transom back member for buildings with temperatures t ≥ 0°C with the help of self-drilling and self-tapping eyelet fasteners made of stainless steel characterized by 5 times lower heat conductivity than fasteners made of carbon steel.

ATTENTION!
Acceptable load for a single fastener in a critical state of usage (Version III) with a Ø19 mm washer is 100 daN.

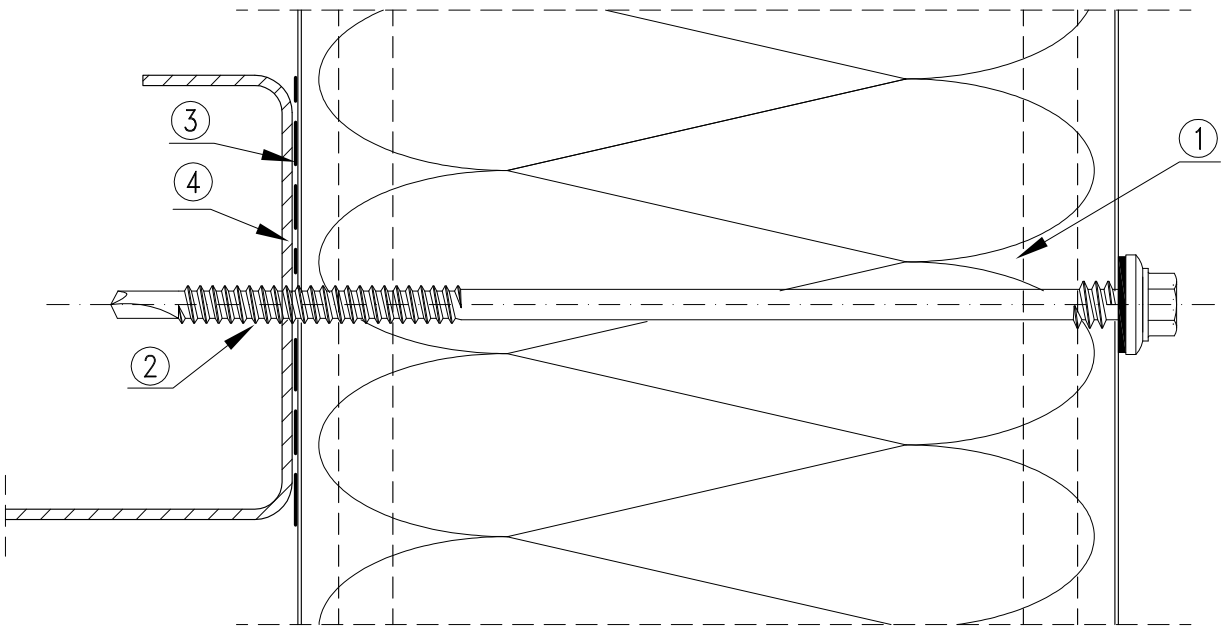


Fig.5 The fastening system of BALEXTHERM-PU-F cold storage sandwich panels with the use of self-drilling screws.

1. BALEXTHERM-PU-F panel
2. Stainless steel fastener for fastening LB 7 panels
3. Self-adhesive polyethylene tape (recommended)
4. Element of the building's structure

Table 2. Stainless steel fastener adjustment table for Version III.

Fastener type	Support wall thickness [mm]	Panel type and its thickness			
		BALEXTHERM-PU-F			
		120	160	180	200
LB 7	1,50 - 5,00	LB 7A	LB 7B	LB 7C	LB 7D
LB 8	3,00-12,00	LB 8A	LB 8B	LB 8C	LB 8D
LB 9	> 12,00	LB 9A	LB 9B	LB 9C	LB 9D
LB 10	Concrete and brick base	LB 10A	LB 10B	LB 10C	LB 10D
LB 6	Flashing fastener				

Version IV of fastening of cold storage sandwich panels consists in using the LAX set (screw/bushing/cap) for installation.
The LAX anchor is designed especially for installation of sandwich panels in refrigeration plants and freezers with constant operational temperature up to - 40°C. The LAX anchor eliminates occurrence of the thermal bridge phenomenon. In case of use in structures with controlled atmosphere, a silicone for the required temperature must be used in order to seal the LAX anchor. The silicone can be applied directly inside the LAX anchor bushing, as well as under the flange of the bushing.The length and the type of the screw must be selected according to the type of the base and the thickness of the sandwich board. The minimum distance for fastening with LAX anchors:
- 1 cm from the edge of the sandwich panel (measured from external diameter of the LAX anchor),
- min. 10 cm from the other LAX anchor

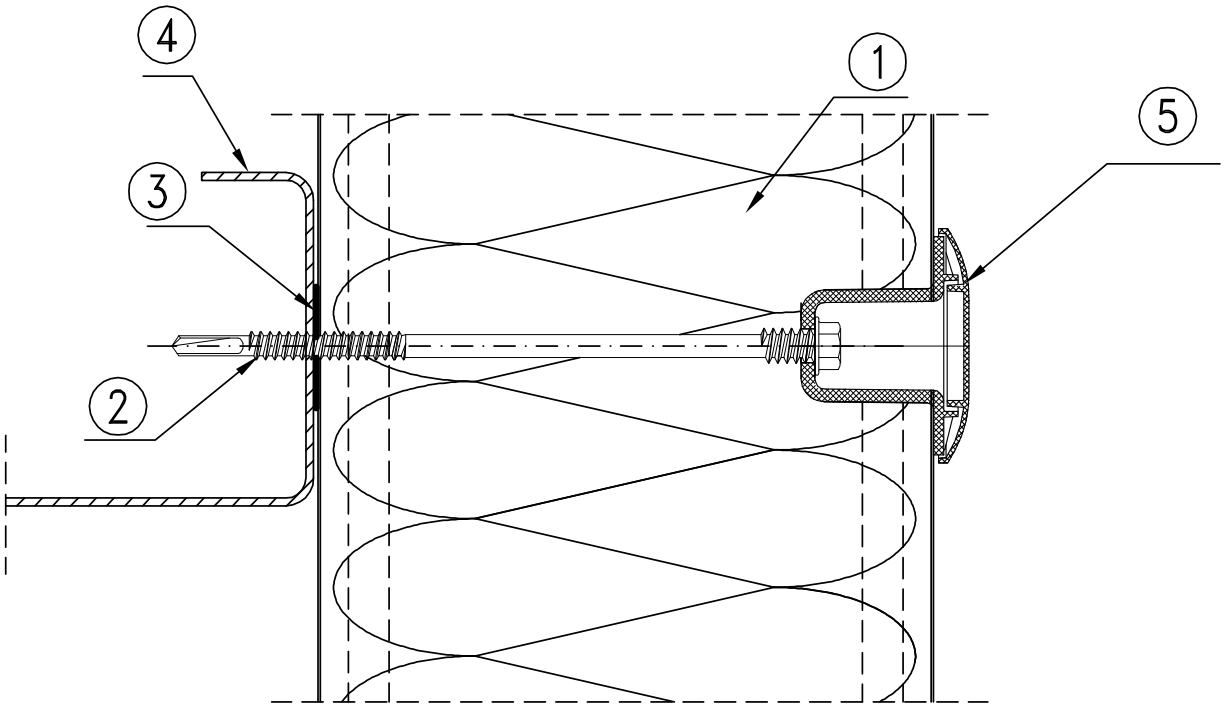


Figure 6. The fastening system for cold storage sandwich panels Balextherm-PU-F with the use of LAX anchors.

1. BALEXTHERM-PU-F panel
2. BALEXTHERM panel fastener
3. Wall spandrel beam according to structure design
4. PES 3x20 polyethylene adhesive tape (recommended)
5. LAX bushing and cap

9. THERMAL PERFORMANCE

BALEXTHERM cold storage panels are distinguished by very good thermal performance parameters. Tests and calculations carried out in the Building Research Institute in the Department of Thermal Physics in Warsaw aimed at determining the heat conductivity coefficient of polyurethane foam forming the panel's insulating core and the partition's heat-transfer coefficient proved high quality as well as high repeatability of BALEXTHERM-PU-F panels' parameters achieved due to the application of top class materials and continuous control of all production stages on one of the most modern assembly lines in Europe. The design thermal conductivity coefficient (used for designing purposes and corresponding to the conditions of material application) reaches the following values depending on the partition's temperature:

Table 3. Design thermal conductivity coefficients

Average temperature of a partition $t_{śr}$ [°C]	Thermal conductivity coefficient λ_{obl} [W/m°C]
10	0,023
5	0,022
0	0,022
-5	0,021

The values of heat-transfer coefficients Uc of partitions made of BALEXTHERM-PU-F sandwich panels taking linear thermal bridges occurring in the panels' contact area into consideration are available in Table 4. Due to the application of special insulating fasteners for fastening BALEXTHERM-PU-F panels the zero value of the point heat-transfer coefficient was assumed in relation to these panels.

Table 4. Internal wall's heat-transfer coefficients

Panel type	Panel's thickness [mm]	Internal wall's heat-transfer coefficient Uc [W/m^{2}K]
BALEXTHERM-PU-F 120	120	0,18
BALEXTHERM-PU-F 160	160	0,14
BALEXTHERM-PU-F 180	180	0,12
BALEXTHERM-PU-F 200	200	0,10

Table 5. Heat flux density

Heat flux density								
Lp.	Temperature difference Δt	Panel type						
		PU-W-ST 60(*)	PU-W-ST 80(*)	PU-W-ST 100(*)	PU-F 120	PU-F 160	PU-F 180	PU-F 200
		Heat-transfer coefficient						
		0,37	0,28	0,23	0,19	0,14	0,12	0,10
	[°C]	[W / m^2]						
	1	3	3	4	5	6	7	8
1	10	3,70	2,80	2,30	1,90	1,40	1,20	1,00
2	15	5,55	4,20	3,45	2,85	2,10	1,80	1,50
3	20	7,40	5,60	4,60	3,80	2,80	2,40	2,00
4	25	9,25	7,00	5,75	4,75	3,50	3,00	2,50
5	30	11,10	8,40	6,90	5,70	4,20	3,60	3,00
6	35	12,95	9,80	8,05	6,65	4,90	4,20	3,50
7	40	14,80	11,20	9,20	7,60	5,60	4,80	4,00
8	45	16,65	12,60	10,35	8,55	6,30	5,40	4,50
9	50	18,50	14,00	11,50	9,50	7,00	6,00	5,00
10	55	20,35	15,40	12,65	10,45	7,70	6,60	5,50
11	60	22,20	16,80	13,80	11,40	8,40	7,20	6,00
12	65	24,05	18,20	14,95	12,35	9,10	7,80	6,50
13	70	25,90	19,60	16,10	13,30	9,80	8,40	7,00
14	75	27,75	21,00	17,25	14,25	10,50	9,00	7,50
15	80	29,60	22,40	18,40	15,20	11,20	9,60	8,00
16	85	31,45	23,80	19,55	16,15	11,90	10,20	8,50
17	90	33,30	25,20	20,70	17,10	12,60	10,80	9,00
18	95	35,15	26,60	21,85	18,05	13,30	11,40	9,50
19	100	37,00	28,00	23,00	19,00	14,00	12,00	10,00
With colour			is marked suggested range of appliance.					
(*) ATTENTION: BALEXTHERM-PU-W-ST sandwich panels are presented in the BALEXTHERM-PU-W-ST, BALEXTHERM-PU-W-PLUS, BALEXTHERM-PU-R catalogue of sandwich panels								

The above table specifies the partition's thermal performance in W/m^2 depending on the panel's thickness and temperature difference Δt [K] between the temperature inside the chamber t_w and the analytical outdoor temperature $t_{z.obl}$ for the building's location area. The outdoor analytical temperature is calculated on the basis of the following formula:

$t_{z.obl} = 0{,}40\ t_{av.m} + 0{,}60\ t_{max}$

where:
$t_{av.m}$ - is the average temperature of the hottest month of the year
t_{max} –is the average maximum temperature of outdoor year in the building's location area.

To make things easier it can be assumed that outdoor temperature equals $t_{z.obl}$ = +35°C.
A designer adjusts required partition's thermal performance whereas the recommended thermal performance should be lower than 10 W/m^2.

An example of adjusting panel's thickness:
Temperature inside the chamber -30°C
Outdoor temperature +35°C

Δt = 65°C

We check in a column with Δt 65 for what panel's thickness the density of the heat flux does not exceed 10 W/m^2. This condition is met by BALEXTHERM-PU-F 160 panels that are at least 160 mm thick and their heat flux value is 9.10 W/m^2.

10. STRENGTH ISSUES

Tables of permissible load and span spread were elaborated on the basis of the following assumptions:

- Cross resilience module value is at least 2.80 MPa for the core of the thickness of 120 and 160 mm and 2.40 MPa for the core of the thickness of 180 and 200 mm
- Wall panels are under uniform load (except for panels with the so-called tropical coat) and under heat load
- Heat load is generated by the difference in temperatures of the inner and outer cladding, for calculating heat loads was made an assumption of temperature's difference $\Delta t=50^{o}C$
- usability limits have been established for two limit conditions
  - o panel's deflection should not exceed 1/200 of span spread
  - o panel's deflection should not exceed 1/100 of span spread
- Conjunction of loads was assumed on the basis on the PN-84/B-03230 Polish standard
- Normal stress in pressed cladding should not exceed critical stress values
- Shear stress in the core should not exceed core's shear resistance value
- Indicated in the tables maximum load values concern pressing the panel to the span
- At a pull-off-load (wind suction) the reaction value on the span should be chcecked, so the permissible load for one fastener would not exceed load set in the certificates of fastener's manufacturer

The tables were based on dependencies and formulas specified in the EN14509:2006 standard

Table 6. Maximum load of BALEXTHERM-PU-F cold storage panels with cladding thickness ext. 0,50 / int. 0,50 mm; max. deflection L/200

Span [m]		3,00	3,30	3,60	3,90	4,20	4,50	4,80	5,10	5,40	5,70	6,00	6,60	6,90	7,20	7,50	7,80	8,10	8,40
Core thickness [mm]	Load due to	Maximum load [kN/m^2]																	
single-span																			
120	load-bearing capacity	2,79	2,30	1,94	1,65	1,42	1,24	1,09	0,97	0,86	0,78	0,70	0,63	0,58	0,53	-	-	-	-
	rigidity	2,62	2,20	1,85	1,57	1,34	1,15	0,99	0,85	0,74	0,64	0,56	0,49	0,43	0,37	-	-	-	-
160	load-bearing capacity	3,74	3,09	2,59	2,21	1,90	1,66	1,46	1,30	1,15	1,03	0,94	0,85	0,77	0,70	0,65	-	-	-
	rigidity	3,96	3,38	2,90	2,51	2,17	1,89	1,65	1,45	1,27	1,12	0,99	0,88	0,78	0,70	0,55	-	-	-
180	load-bearing capacity	4,21	3,48	2,92	2,49	2,14	1,87	1,64	1,46	1,30	1,17	1,06	0,95	0,87	0,79	0,73	0,67	0,62	0,58
	rigidity	4,65	4,00	3,45	3,00	2,61	2,29	2,01	1,77	1,57	1,39	1,23	1,10	0,98	0,88	0,79	0,71	0,64	0,57
200	load-bearing capacity	4,68	3,87	3,25	2,77	2,39	2,08	1,83	1,62	1,45	1,30	1,17	1,06	0,97	0,89	0,82	0,75	0,70	0,64
	rigidity	5,35	4,62	4,01	3,50	3,07	2,70	2,38	2,11	1,87	1,67	1,49	1,33	1,19	1,07	0,97	0,87	0,79	0,71
double-span																			
120	load-bearing capacity	3,74	3,16	2,42	1,90	1,53	1,25	-	-	-	-	-	-	-	-	-	-	-	-
	rigidity	3,16	2,76	2,44	2,16	1,93	1,73	-	-	-	-	-	-	-	-	-	-	-	-
160	load-bearing capacity	4,44	3,99	3,62	2,95	2,35	1,91	1,58	1,33	1,13	-	-	-	-	-	-	-	-	-
	rigidity	4,50	3,96	3,51	3,14	2,82	2,55	2,31	2,10	1,91	-	-	-	-	-	-	-	-	-
180	load-bearing capacity	4,79	4,30	3,91	3,55	2,82	2,28	1,88	1,57	1,33	1,14	-	-	-	-	-	-	-	-
	rigidity	5,18	4,57	4,07	3,64	3,28	2,97	2,70	2,46	2,25	2,06	-	-	-	-	-	-	-	-
200	load-bearing capacity	5,13	4,62	4,19	3,84	3,32	2,68	2,20	1,84	1,55	1,33	1,15	-	-	-	-	-	-	-
	rigidity	5,87	5,19	4,63	4,15	3,74	3,39	3,09	2,82	2,59	2,38	2,19	-	-	-	-	-	-	-

Table 7. Maximum load of BALEXTHERM-PU-F cold storage panels with cladding thickness ext. 0,60 / int. 0,50 mm; max. deflection L/200

Span [m]		3,00	3,30	3,60	3,90	4,20	4,50	4,80	5,10	5,40	5,70	6,00	6,60	6,90	7,20	7,50	7,80	8,10	8,40
Core thickness [mm]	Load due to	Maximum load [kN/m^2]																	
single-span																			
120	load-bearing capacity	3,34	2,77	2,32	1,98	1,70	1,49	1,30	1,16	1,03	0,93	0,84	0,76	0,69	0,63	-	-	-	-
	rigidity	2,68	2,26	1,91	1,63	1,39	1,20	1,03	0,89	0,77	0,67	0,59	0,51	0,45	0,40	-	-	-	-
160	load-bearing capacity	4,48	3,70	3,11	2,65	2,29	1,99	1,75	1,55	1,38	1,24	1,12	1,02	0,93	0,85	0,78	-	-	-
	rigidity	4,04	3,46	2,98	2,58	2,24	1,96	1,71	1,51	1,33	1,17	1,04	0,92	0,82	0,73	0,65	-	-	-
180	load-bearing capacity	5,05	4,17	3,50	2,98	2,58	2,24	1,97	1,74	1,56	1,40	1,26	1,14	1,04	0,95	0,88	0,81	0,74	0,70
	rigidity	4,74	4,08	3,53	3,08	2,69	2,36	2,08	1,84	1,63	1,45	1,29	1,15	1,03	0,92	0,83	0,75	0,67	0,61
200	load-bearing capacity	5,62	4,64	3,90	3,32	2,86	2,50	2,19	1,94	1,74	1,55	1,40	1,27	1,16	1,06	0,98	0,90	0,83	0,77
	rigidity	5,44	4,71	4,10	3,59	3,15	2,78	2,46	2,18	1,94	1,74	1,55	1,39	1,25	1,13	1,02	0,92	0,83	0,75
double-span																			
120	load-bearing capacity	3,76	3,38	3,07	2,50	2,01	1,65	1,38	1,17	1,00	0,87	0,76	-	-	-	-	-	-	-
	rigidity	3,19	2,80	2,47	2,20	1,96	1,76	1,59	1,44	1,31	1,19	1,08	-	-	-	-	-	-	-
160	load-bearing capacity	4,46	4,01	3,64	3,33	3,07	2,51	2,08	1,74	1,49	1,28	1,11	0,98	0,86	-	-	-	-	-
	rigidity	4,54	4,00	3,56	3,18	2,86	2,59	2,35	2,14	1,96	1,79	1,65	1,51	1,40	-	-	-	-	-
180	load-bearing capacity	4,81	4,32	3,93	3,59	3,31	3,00	2,47	2,07	1,76	1,51	1,31	1,14	1,01	0,90	0,80	-	-	-
	rigidity	5,23	4,62	4,11	3,69	3,32	3,01	2,74	2,50	2,29	2,11	1,94	1,79	1,65	1,53	1,42	-	-	-
200	load-bearing capacity	5,16	4,64	4,21	3,85	3,55	3,29	2,89	2,42	2,04	1,75	1,51	1,32	1,17	1,03	0,92	0,83	-	-
	rigidity	5,92	5,24	4,68	4,20	3,79	3,44	3,14	2,87	2,64	2,43	2,24	2,07	1,92	1,78	1,65	1,54	-	-

Table 8. Maximum load of BALEXTHERM-PU-F cold storage panels with cladding thickness ext. 0,70 / int. 0,50 mm; max. deflection L/200

Span [m]		3,00	3,30	3,60	3,90	4,20	4,50	4,80	5,10	5,40	5,70	6,00	6,60	6,90	7,20	7,50	7,80	8,10	8,40
Core thickness [mm]	Load due to	Maximum load [kN/m^2]																	
single-span																			
180	load-bearing capacity	5,89	4,86	4,09	3,48	3,00	2,62	2,30	2,04	1,82	1,63	1,47	1,34	1,22	1,11	1,02	0,94	0,87	0,81
	rigidity	4,80	4,14	3,59	3,14	2,75	2,42	2,13	1,89	1,68	1,49	1,33	1,19	1,07	0,96	0,86	0,78	0,70	0,63
200	load-bearing capacity	6,54	5,41	4,54	3,87	3,34	2,91	2,56	2,26	2,02	1,82	1,64	1,49	1,35	1,24	1,14	1,05	0,97	0,90
	rigidity	5,51	4,77	4,16	3,65	3,21	2,84	2,52	2,24	2,00	1,79	1,60	1,44	1,29	1,17	1,05	0,95	0,86	0,79
double-span																			
180	load-bearing capacity	4,82	4,34	3,94	3,61	3,32	3,08	2,87	2,59	2,20	1,89	1,64	1,43	1,27	1,13	1,01	0,91	0,82	0,75
	rigidity	5,26	4,65	4,15	3,72	3,36	3,05	2,77	2,54	2,32	2,14	1,97	1,82	1,68	1,56	1,45	1,35	1,26	1,17
200	load-bearing capacity	5,18	4,66	4,23	3,87	3,56	3,30	3,07	2,88	2,56	2,19	1,90	1,66	1,46	1,30	1,16	1,04	0,94	0,86
	rigidity	5,96	5,28	4,71	4,23	3,83	3,48	3,17	2,91	2,67	2,46	2,27	2,10	1,95	1,81	1,69	1,57	1,47	1,37

Table 9. Maximum load of BALEXTHERM-PU-F cold storage panels with cladding thickness ext. 0,50 / int. 0,50 mm; max. deflection L/100

Span [m]		3,00	3,30	3,60	3,90	4,20	4,50	4,80	5,10	5,40	5,70	6,00	6,60	6,90	7,20	7,50	7,80	8,10	8,40
Core thickness [mm]	Load due to	Maximum load [kN/m^2]																	
single-span																			
120	load-bearing capacity	2,79	2,30	1,94	1,65	1,42	1,24	1,09	0,97	0,86	0,78	0,70	0,93	0,58	0,53	0,49	-	-	-
	rigidity	5,75	4,88	4,17	3,58	3,09	2,68	2,33	2,04	1,79	1,57	1,39	1,23	1,09	0,98	0,87	-	-	-
160	load-bearing capacity	3,74	3,09	2,59	2,21	1,90	1,66	1,46	1,30	1,15	1,03	0,94	0,85	0,77	0,70	0,65	-	-	-
	rigidity	8,48	7,30	6,31	5,49	4,80	4,21	3,71	3,28	2,91	2,59	2,31	2,07	1,85	1,67	1,50	-	-	-
180	load-bearing capacity	4,21	3,48	2,92	2,49	2,14	1,87	1,64	1,46	1,30	1,17	1,06	0,95	0,87	0,79	0,73	0,67	0,62	0,58
	rigidity	10,00	8,54	7,43	6,49	5,70	5,03	4,45	3,95	3,52	3,14	2,82	2,53	2,28	2,05	1,86	1,68	1,53	1,39
200	load-bearing capacity	4,68	3,87	3,25	2,77	2,39	2,08	1,83	1,62	1,45	1,30	1,17	1,06	0,97	0,89	0,82	0,75	0,70	0,64
	rigidity	10,00	9,80	8,56	7,52	6,63	5,87	5,21	4,65	4,15	3,72	3,35	3,01	2,72	2,46	2,24	2,03	1,85	1,69
double-span																			
120	load-bearing capacity	3,74	3,16	2,42	1,90	1,53	1,25	-	-	-	-	-	-	-	-	-	-	-	-
	rigidity	6,65	5,83	5,16	4,59	4,10	3,68	-	-	-	-	-	-	-	-	-	-	-	-
160	load-bearing capacity	4,44	3,99	3,62	2,95	2,35	1,91	1,58	1,33	1,13	-	-	-	-	-	-	-	-	-
	rigidity	9,38	8,28	7,36	6,58	5,92	5,35	4,86	4,42	4,04	-	-	-	-	-	-	-	-	-
180	load-bearing capacity	4,79	4,30	3,91	3,55	2,82	2,28	1,88	1,57	1,33	1,14	-	-	-	-	-	-	-	-
	rigidity	10,00	9,52	8,48	7,60	6,86	6,21	5,65	5,16	4,72	4,33	-	-	-	-	-	-	-	-
200	load-bearing capacity	5,13	4,62	4,19	3,84	3,32	2,68	2,20	1,84	1,55	1,33	1,15	-	-	-	-	-	-	-
	rigidity	10,00	10,00	9,62	8,64	7,80	7,08	6,45	5,90	5,41	4,98	4,59	-	-	-	-	-	-	-

Table 10. Maximum load of BALEXTHERM-PU-F cold storage panels with cladding thickness ext. 0,60 / int. 0,50 mm; max. deflection L/100

Span [m]		3,00	3,30	3,60	3,90	4,20	4,50	4,80	5,10	5,40	5,70	6,00	6,60	6,90	7,20	7,50	7,80	8,10	8,40
Core thickness [mm]	Load due to	Maximum load [kN/m^2]																	
single-span																			
120	load-bearing capacity	3,34	2,77	2,32	1,98	1,70	1,49	1,30	1,16	1,03	0,93	0,84	0,76	0,69	0,63	0,58	-	-	-
	rigidity	5,89	5,02	4,30	3,70	3,21	2,79	2,43	2,13	1,88	1,65	1,46	1,30	1,16	1,03	0,93	-	-	-
160	load-bearing capacity	4,48	3,70	3,11	2,65	2,29	1,99	1,75	1,55	1,38	1,24	1,12	1,02	0,93	0,85	0,78	-	-	-
	rigidity	8,65	7,46	6,48	5,65	4,96	4,36	3,85	3,42	3,04	2,71	2,42	2,17	1,95	1,76	1,59	-	-	-
180	load-bearing capacity	5,05	4,17	3,50	2,98	2,58	2,24	1,97	1,74	1,56	1,40	1,26	1,14	1,04	0,95	0,88	0,81	0,74	0,70
	rigidity	10,00	8,72	7,61	6,67	5,87	5,19	4,61	4,10	3,66	3,28	2,94	2,65	2,39	2,16	1,96	1,78	1,62	1,47
200	load-bearing capacity	5,62	4,64	3,90	3,32	2,86	2,50	2,19	1,94	1,74	1,55	1,40	1,27	1,16	1,06	0,98	0,90	0,83	0,77
	rigidity	10,00	9,99	8,75	7,70	6,81	6,05	5,39	4,81	4,31	3,87	3,49	3,15	2,85	2,59	2,35	2,14	1,95	1,78
double-span																			
120	load-bearing capacity	3,76	3,38	3,07	2,50	2,01	1,65	1,38	1,17	1,00	0,87	0,76	-	-	-	-	-	-	-
	rigidity	6,74	5,92	5,24	4,67	4,18	3,76	3,40	3,08	2,80	2,55	2,33	-	-	-	-	-	-	-
160	load-bearing capacity	4,46	4,01	3,64	3,33	3,07	2,51	2,08	1,74	1,49	1,28	1,11	0,98	0,86	-	-	-	-	-
	rigidity	9,48	8,37	7,45	6,68	6,02	5,45	4,95	4,52	4,13	3,79	3,49	3,21	2,97	-	-	-	-	-
180	load-bearing capacity	4,81	4,32	3,93	3,59	3,31	3,00	2,47	2,07	1,76	1,51	1,31	1,14	1,01	0,90	0,80	-	-	-
	rigidity	10,00	9,63	8,59	7,71	6,96	6,31	5,75	5,26	4,82	4,43	4,09	3,78	3,50	3,24	3,01	-	-	-
200	load-bearing capacity	5,16	4,64	4,21	3,85	3,55	3,29	2,89	2,42	2,04	1,75	1,51	1,32	1,17	1,03	0,92	0,83	-	-
	rigidity	10,00	10,00	9,73	8,75	7,91	7,19	6,56	6,01	5,52	5,09	4,70	4,35	4,03	3,75	3,49	3,25	-	-

Table 11. Maximum load of BALEXTHERM-PU-F cold storage panels with cladding thickness ext. 0,70 / int. 0,50 mm; max. deflection L/100

Span [m]		3,00	3,30	3,60	3,90	4,20	4,50	4,80	5,10	5,40	5,70	6,00	6,60	6,90	7,20	7,50	7,80	8,10	8,40
Core thickness [mm]	Load due to	Maximum load [kN/m^2]																	
single-span																			
180	load-bearing capacity	5,89	4,86	4,09	3,48	3,00	2,62	2,30	2,04	1,82	1,63	1,47	1,34	1,22	1,11	1,02	0,94	0,87	0,81
	rigidity	10,00	8,85	7,74	6,80	6,00	5,32	4,73	4,22	3,77	3,38	3,04	2,74	2,48	2,24	2,04	1,85	1,69	1,54
200	load-bearing capacity	6,54	5,41	4,54	3,87	3,34	2,91	2,56	2,26	2,02	1,82	1,64	1,49	1,35	1,24	1,14	1,05	0,97	0,90
	rigidity	10,00	10,00	8,89	7,84	6,95	6,18	5,52	4,94	4,43	3,99	3,60	3,26	2,95	2,68	2,44	2,22	2,03	1,86
double-span																			
180	load-bearing capacity	4,82	4,34	3,94	3,61	3,32	3,08	2,87	2,59	2,20	1,89	1,64	1,43	1,27	1,13	1,01	0,91	0,82	0,75
	rigidity	10,00	9,70	8,66	7,79	7,04	6,39	5,83	5,33	4,90	4,51	4,16	3,85	3,57	3,31	3,08	2,87	2,67	2,50
200	load-bearing capacity	5,18	4,66	4,23	3,87	3,56	3,30	3,07	2,88	2,56	2,19	1,90	1,66	1,46	1,30	1,16	1,04	0,94	0,86
	rigidity	10,00	10,00	9,81	8,83	8,00	7,27	6,64	6,09	5,60	5,17	4,78	4,43	4,11	3,82	3,56	3,32	3,11	2,91

Table 12. Permissible span of BALEXTHERM-PU-F cold storage panels under tropical coat

	single-span				double-span			
core thickness [mm]	120	160	180	200	120	160	180	200
temperature inside the room [^{o}C]	maximum span [m]							
+ 5	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
0	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
- 5	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
- 10	6,00	6,00	6,60	7,00	6,00	6,00	6,60	7,00
-15	6,00	6,00	6,60	7,00	5,70	6,00	6,60	7,00
- 20	-	6,00	6,60	7,00	-	5,30	5,60	5,90
- 25	-	6,00	6,60	7,00	-	4,50	4,80	5,00
- 30	-	6,00	6,60	7,00	-	4,00	4,20	4,50
- 40	-	-	6,60	7,00	-	-	3,50	3,70
- 50	-	-	-	7,00	-	-	-	3,30

Important: When analysing the pull-off-load, take into account the permissible load on a single fastener.

11. FIRE SAFETY

As building components of determined fire resistance class, BALEXTHERM-PU-F sandwich panels with polyurethane core must meet the fire safety and suppression requirements set out in the Resolution of the Minister of Infrastructure of 12 April 2002 on required technical conditions of buildings and their location (J. of L. No 75 item 690, 2002, with further amendments).

In accordance with §216 and §272 external walls and roofs of buildings are subject to fire safety classifications in the following fields:
- fire resistance
- fire spreading level

In the field of fire spreading through walls with indoor or outdoor exposure to fire on the basis of tests according to PN-90/B-02867 standard ‚Fire protection of buildings. A method of testing the level of fire spreading through walls', BALEXTHERM-PU-F panels 120 mm, 160 mm, 180 mm and 200 mm thick were classified as ‚not spreading fire' with indoor and outdoor exposure to fire.

In the field of reaction to fire on the basis of tests according to:
1) EN ISO 11925-2 standards 'Inflammability of materials exposed to direct flames. Part 2: Tests with a single flame'
2) EN 13823 'Tests of building products' reaction to fire. Building products, excluding the floor ones, exposed to fire in the form of a single object on fire.'
3) EN 13501-1 standard 'Fire classification of building products and elements of buildings. Part 1: Classification on the basis of tests checking reaction to fire'
BALEXTHERM-PU-F panels 120 mm, 160 mm, 180 mm and 200 mm thick were classified as B-s2, d0 (a so called euroclass).

The B-s2, d0 classification enables application of BALEXTHERM-PU-F panels both for ceilings and screening walls according to technical requirements that should be met by buildings and their location as well as for ‚non-flammable, not dripping and not dropping off when exposed to fire' products and ‚not spreading fire' construction elements according to the Directive of the Minister of Infrastructure of 12th April 2002 (J. of L. no. 75 as of 15th June 2002 item 690).

Classification of fire resistance of non-carrying walls made of BALEXTHERM-PU-F preparwd on the basis of tests led in accordance with EN 13501-2:2007 norm is presented in table 13.

Table 13. Fire resistance classification of walls built of BALEXTHERM-PU-F sandwich panels.

Sandwich panel	Core material	Core thickness [mm]	Fire resistance of wall made of BALEXTHERM-PU-F sandwich panel
BALEXTHERM-PU-F	PUR	120 - 200	E30/EI15
	PIR	120 - 180	E90/EI30
		200	EI60

The applied load-bearing structure should be classified according to BALEXTHERM-PU-F classification as R15, R30, R60 or R90 as far as reaction to fire is concerned.

12. NOISE REDUCTION PERFORMANCE

BALEXTHERM-PU-F cold storage sandwich panels are characterized by the following sound parameters regardless of the thickness of steel claddings and the thickness of the polyurethane core.

Table 14. Noise reduction performance

Weighted index of the R_W specific sound insulation	Weighted assessment index of the specific sound insulation determined in relation to noise in R_{A1} ‚flat' spectrum.	Weighted assessment index of the specific sound insulation determined in relation to noise in R_{A2} low-frequency spectrum.
[dB]	[dB]	[dB]
25	23	21

BALEXTHERM-PU-F cold storage sandwich panels with a polyurethane core can be applied in industrial and commercial facilities and facilities similar to cold stores in case determined individual sound requirements do not exceed appropriate sound parameters of panels specified above.

13. CORROSION RESISTANCE

On the basis of tests carried out in the Building Research Institute in Warsaw in the Department of Durability and Protection of Buildings it has been stated that BALEXTHERM sandwich panels with a polyurethane core meet the requirements of EN ISO 12944-2 in the range of C1 to C4 class.

BALEXTHERM panels with claddings coated with a zinc layer and SP 25 or SP 35, organic coats or PDF 25 or PCV (F) 120 on the front face side can be applied in environments with C1, C2 and C3 corrosion class, in the case of SP 15 coating on the face side in C1 and C2 environments according to the EN ISO 12944-2 standard.

BALEXTHERM panels with claddings protected with AZ185 aluzinc coating can be used in C1, C2 and C3 corrosion class environments according to the EN ISO 12944-2 standard.

BALEXTHERM panels with claddings made of stainless steel can be used in C1, C2, C3 and C4 corrosion class environments according to the EN ISO 12944-2 standard.

Corrosion classes and examples of typical environments according to the EN ISO 12944-2 standard.

C1 corrosion class

- indoors – heated buildings with a clean atmosphere e.g. offices, shops, schools and hotels

C2 corrosion class

- outdoors – slightly polluted atmosphere, mainly countryside
- indoors – not heated buildings with a possibility of condensation e.g. warehouses, sports halls.

C3 corrosion class

- outdoors – urban and industrial atmospheres, medium pollution with sulphur oxide (IV), coastal area with low salinity
- indoors – production rooms with high humidity and certain level of air pollution e.g. food industrial facilities, laundries, breweries, dairies.

C4 corrosion class

- outdoors – industrial areas, coastal area with medium salinity
- indoors – chemical plants, swimming pools, shipyards and yacht yards.

C5 corrosion class

- outdoors - industrial areas with high humidity and aggressive atmosphere
- indoors -buildings or areas with almost permanent condensation and with high pollution

For sandwich panels BALEXTHERM can be used coatings of C$ and C5 corrosion class declared by manufacturer.

14. MATERIAL AND CLADDING COATINGS

14.1. Material

S220GD+ZINC, S250GD+ ZINC, S280GD+ ZINC STEEL (acc. EN 10346)

- carbon steel with increased parameters, galvanized on both sides and permanently secured with anti-corrosion coating
- metal sheet thickness: 0.40 – 0.70 mm
- coated with organic and metallic coatings

STAINLESS STEEL (1.4301) (acc. to EN10088-1:1998)

- high-quality specialist steel with increased corrosion resistance
- metal sheet thickness: 0.50 mm
- material for food processing industry, warehousing and transport of food, cold stores, mushroom-growing cellars, agricultural facilities

14.2. Coatings

PREMIUM offer

CESAR PUR 55® - unequalled durability and vitality

- polyurethane coating with polyamid of overall thickness 55 µm
- extraordinary resistance for corrosion – RC5
- unequalled durability –up to 30 yaers depending on the environment
- very good resistance to intensiveUV radiation – RUV4
- solution for standard, demanding and agressive environments
- high scratch resistance
- aesthetic and colour durability for the whole life cycle
- **NOVELTY** on the polish market **ROOF OF THE 2012**
- used for roof coverings, wall claddings, standard environments, as well as those agressive and demanding: cold, humid, of high UV radiation, industrial and polluted
- colours: 3009, 8017, 7016, 9005, 8004

Standard offer

POLYESTER

- for outdoor applications - coating thickness 25 µm: resistant to changing temperature and weather conditions, good corrosion resistance,
- for indoor applications coating thickness 15 µm: indoor layers of walls and roofs
- colour scheme according to the Balex Metal World of Colours palette

POLYESTER MATT PEARL

- coating thickness 35 µm,
- for outdoor applications: resistant to changing temperature and weather conditions, good corrosion resistance,
- perfectly suitable for roofs of commercial and industrial facilities,
- colour scheme according to the Balex Metal World of Colours palette

Offer to special orders:

PVDF

- coating thickness 25µm,
- good resistance to corrosion and mechanical damage, exceptionally high colour endurance and resistance to fading (at a temperature of up to 110°C), can be formed easily and shows high hardness of surface that prevents dirt accumulation and loss of gloss,

- especially recommended for outdoor applications (building's external wall claddings),
- colour scheme according to the Balex Metal World of Colours palette

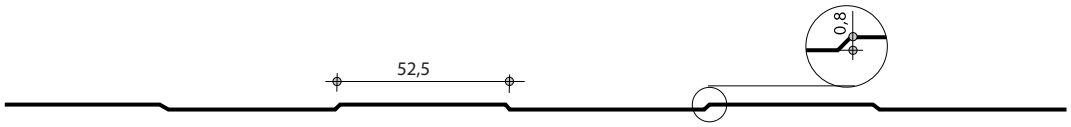
PCV(F) „food safe"

- coating thickness 120µm,
- white foil,
- special coating with increased hardness,
- it can be applied in food processing facilities and cold stores, easily washable and resistant to the majority of cleaning agents.

ALUZINC + Easyfilm®

- metallic coating : 150 and 185 g/m^2 basis weight for each side of the sheet,
- thickness of the coating - 20 µm (for 150 g/m^2), 25 µm (for 185 g/m^2),
- double-sided thermally applied coating in a continuous process, additionally protected with a thin organic coating SPT (Special Protection Treatment), Easyfilm® (environmentally friendly, thin organic layer which protects aluzinc coating against discoloration,
- resistance to higher temperatures, high corrosive resistance, excellent heat and light reflection, good abrasive resistance

15. CLADDING PROFILING SCHEME



L = LINED

G = FLAT

M = MICROPROFILED
Available to special order

16. PROFILE TYPE COMBINATIONS

The table below demonstrates possible combinations of profile types of external BALEXTHERM-PU-F panels' cladding.

Table 15. Profile type combinations

Panel type	External facing			Internal facing	
	L	G	M	L	G
BALEXTHERM-PU-F	●	●	●	●	●

17. SAMPLE MARKING OF BALEXTHERM-PU-F PANELS

Table 16. BALEXTHERM Marking scheme

Name	Core type	Panel type	Joint type
Balextherm	- mineral wool (MW) - polyurethane (PU)	- WALL (W)	- standard with visible joint (ST)
			- with hidden joint(PLUS)
		- ROOF (R)	
		- FREEZING (F)	

Ie. **BALEXTHERM-PU-W-ST** is a panel with polyurethane core Wall type with visible joint

BALEXTHERM-PU-F sandwich cold storage panel:

BALEXTHERM-PU-F 120.1100
zew. 0,50 SP 25 µm 9002 - G / wew. 0,50 SP 25 µm 9010 – L

BALEXTHERM	PU	F	120	•	1100
Panel name	Core type	Panel type	thickness		Modular width

ext.	0.50	SP25 µm	9002	-	G	/	int.	0.50	SP25 µm	9010	-	L
External cladding	Metal sheet thickness	Coating type	colour		profile type		Internal cladding	Metal sheet thickness	Coating type	colour		profile type

18. CLADDING COLOUR SCHEME

Table 17. Colour combinations

Colour scheme			External claddings	Internal claddings
SP - Polyester				
9010		white	●	●
9002		grey-white	●	●

If cold storage panels are used as walls of large sites, where the direction of the wind load impact is towards the support and we do not take into account heat load, other colours can be chosen from the Balex Metal colour palette.

19. GENERAL GUIDELINES ON ASSEMBLY

Before starting assembly it is recommended that one should verify the load-bearing structure in terms of precision of performance and its accordance with the design. Special attention should be paid to the quality of anti-corrosion and varnish coating of the load-bearing structure and additional elements like transoms and purlins as well as the quality of joints.

BALEXTHERM-PU-F panels are secured against dirt and damage with a protective film applied to claddings in the production process.

It is recommended to remove the protective film from claddings which are to form the internal side in a building before fastening them to the structure. In the case of external claddings the protective film should be removed within 1 month from the date of panels' production. It will prevent both the foil from binding permanently with protective varnish of claddings and varnish from getting dirty while removing the foil.

In the case of BALEXTHERM-PU-F sandwich panels which are symmetrical in shape, in order to avoid mistakes in identifying the external and internal side in the production process, a special label is placed under foil. The label indicates the external side of a panel along with the recommended date of removing the protective foil.

For BALEXTHERM-PU-F panels with both claddings in the same colour, it is possible to fix panels depending on the assembler's preference.

In order to prevent varnish coating from being damaged it is recommended to cut panels and flashings on stands covered with soft material e.g. felt.

Panels should be cut with the use of a cutting saw with small tooth blades and flashings with the use of hand scissors.

It is forbidden to use angle grinders and other tools heating up claddings in the process of cutting – it can lead to damaging anti-corrosion coating.

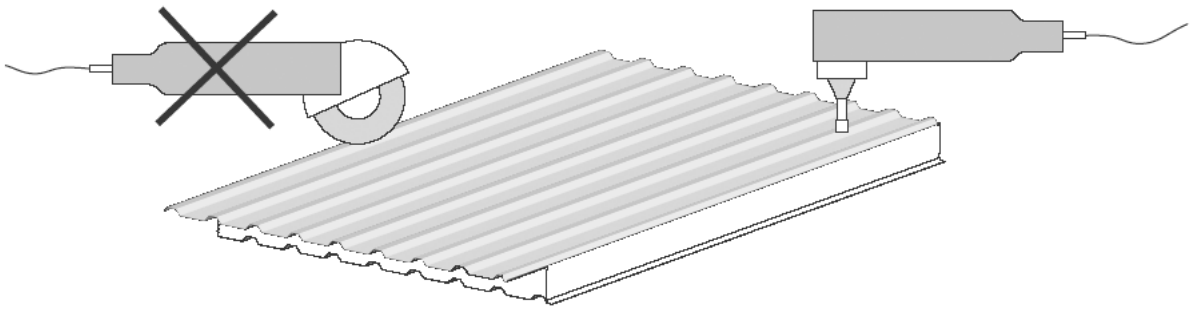


Fig. 7. Tools for cutting sandwich panels

It is recommended to fix BALEXTHERM-PU-F sandwich panels with the use of fastening systems described in this catalogue and the types of fastening elements and their indexes, depending on the thickness of panels are specified in the catalogue of accessories.

For screwing in self-drilling and self–tapping fasteners (application of stainless steel fasteners is recommended) the application of electrical tools is recommended. Screwdrivers should be equipped with an appropriate head for driving long fasteners and a depth limiter fig.7 That guarantees appropriate assembly i.e. maintaining perpendicular location of a particular fastener in relation to a panel, minimised risk of damaging panels' surface and tightness of the fastening.

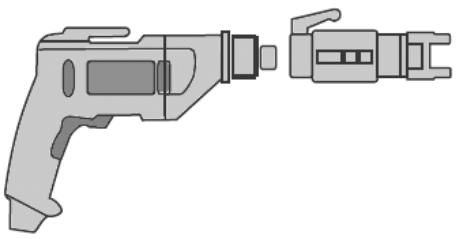


Fig. 8. Screwdriver with a driving head for long bolts.

Optimal parameters of electrical tools for assembling sandwich panels are provided by the information below:

power	600 - 750	W
rotation	1500 - 200	rpm
torque	600 - 700	Ncm

Application of other fastening systems requires consultation with the producer in order to establish appropriate correlation between the load-bearing capacity of panels and fasteners.
After finishing each work cycle you should carefully remove all steel waste and filings that can cause discolouration of the surface of a cladding. The whole enclosure should be sealed with the use of polyurethane foam and appropriate permanently plastic sealers (see figures of construction details). All damages to varnish on cladding sheets caused during assembly should be secured with touch up varnish.

It is recommended that in the case of external walls BALEXTHERM-PU-F panels should be fixed vertically. Before assembly self-adhesive PVC or PE tape should be applied to the surface of the load-bearing structure in the contact area with sandwich panels. Assembly and transport of panels should be performed with due caution to prevent varnish coating from being damaged. While transporting or positioning panels on the building structure you should pay attention not to damage the noses of panels (especially tongues) which can hamper assembly and even lead to damaging the external surface of panels.

20. GUIDELINES ON TRANSPORT

Recommended means of transport and its technical conditions:

Lorries with an open load-carrying body or an open trailer enabling loading long panels (up to 13.60 running metres) from both sides of a car constitute the basic means of transport for sandwich panels.
The following technical conditions are recommended for vehicles for transporting sandwich panels:

- load-carrying body with canvas cover (‚CURTAIN' type)
- load-carrying body longer than transported panels (a package of panels should be placed on the platform in its entire length)
- transport belts holding the load should be placed on a package of panels on each support (belt tension can deform panels)

Way of packing sandwich panels:

The number of sandwich panels in a package depends on the type and the thickness of a single panel (the standard height of a package is ~1100 mm)

Table 18. Packing BALEXTHERM-PU-F panels

Panel thickness [mm]	Package height	Number of pieces per package
	[mm]	[pcs.]
BALEXTHERM-PU-F 120	1160	9
BALEXTHERM-PU-F 160	1200	7
BALEXTHERM-PU-F 180	1160	6
BALEXTHERM-PU-F 200	1080	5

The weight of a package is calculated taking the quantity and the length of individual panels in a package as well as the weight of 1m^2 of the panel acc. to Table 18. into consideration

Unloading, transport:

During loading and unloading extreme caution should be kept, one should avoid point supports as it may lead to damaging the cladding of the lowest panel. In order to avoid this problem you should distribute the load over a greater surface area. You should also pay attention not to drag one panel along another one not to scratch it.

Panel storage:

BALEXTHERM-PU-F sandwich panels should be stored on ground beams, not less than 250 mm over the ground maintaining a slight inclination of the package of panels to enable smooth outflow of potential rain water.

The ground on which ground beams are placed should be levelled and hardened.

The package should be placed on ground beams in the place of lower foamed polystyrene elements of the package. It is recommended to store panels in airy rooms, at normal temperature, far away from acids, lye, salts and other corrosive substances. In case of storing panels in the open packages should be secured from rain, snow and other pollution with the use of breathing canvas covers enabling air circulation. While securing the packages with canvas covers you should pay attention to prevent rain water from penetrating between panels which can cause decolouration of coatings a so called ‚white rust'. Periodically, in order to avoid water vapour condensation on internal surfaces of panels, you should draw the canvas cover slightly aside on the top of a package (with special care in order to prevent it from being blown by the wind).
It is recommended that panels are stored on the construction site in single layers (no floors) which can prevent panels from being dented.

Slight repairs and maintenance:

All damage to coating caused during transport or assembly should be covered with touch up paint. Maintenance of sandwich panels consists in performing regular inspections and securing potential damages. During inspection close attention should be paid to uncovered edges and joints.

Remarks concerning usage:

Wall sandwich panels with dark claddings are characterized by high heat absorption capacity which can cause local deformation of claddings' surface in the period of high air temperatures. As a result allow for panels' thermal motion and apply panels of limited length. This effect does not have any influence on the properties of sandwich panels but the producer warns that clients purchase wall panels in those colours on their own responsibility and do not have rights to claim against the producer due to this fact. The appearance of local deformations in roof panels practically does not appear.

Pursuant to the EN 14509 standard, it is assumed that sheets in dark colours heat to the temperature of 90^{o}C. Therefore, Balex Metal shall not be responsible for any damages caused by high temperature, which may result in changing the position of the cladding in some places. Dark colours are defined in Item E.33 of the EN14509 standard.

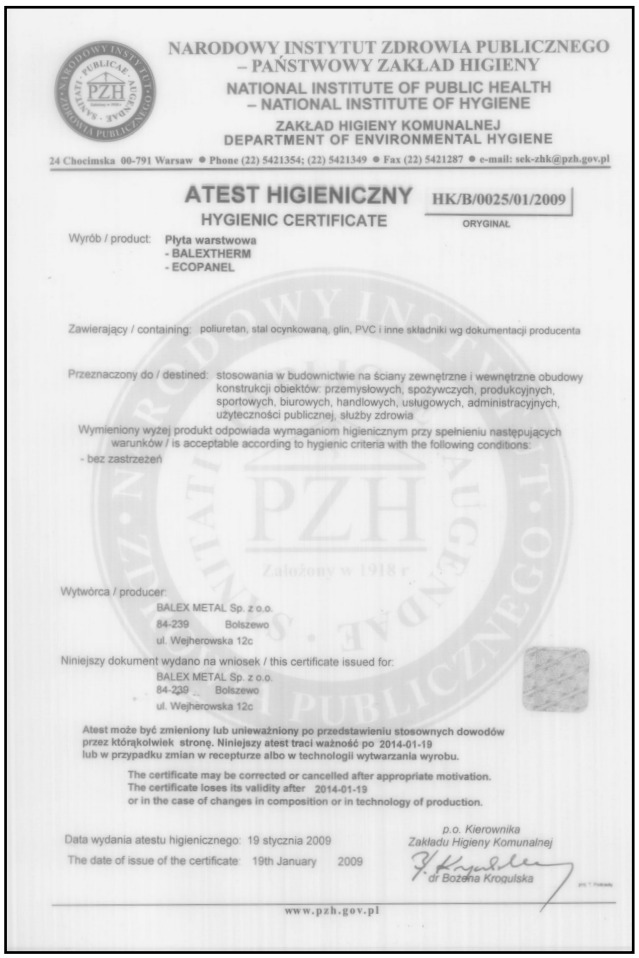
21. CERTIFICATES

Conformity assessment and introduction to sales and application

On the basis of art. 4 and 5 par. 1 item 3 and art. 8 of the act of 16th April 2004 on construction products (J. of L. No 92/2004, item 881) and according to the order The Minister of Infrastructure as of 11th August 2004 on ways of declaring conformity of construction products and ways of marking them with the construction mark (J. of L. No 198/2004, item 2041) BALEX METAL company performed an assessment of cold storage sandwich panels' conformity and issued European Certificate of Conformity no. 18/14509. It was issued on the basis of the following:- company's production controlIn accordance with the Order mentioned above, the European Declaration of Conformity no. 18/14509 issued by BALEXMETAL company as well as marking products with construction mark satisfy requirements concerning introduction of products to sales and application in the construction industry.

Conformity certificates

BALEXTHERM sandwich panels have obtained a Sanitary Certificate No. HK/B/0757/02/2005 issued by the National Institute of Hygiene in Warsaw.



NARODOWY INSTYTUT ZDROWIA PUBLICZNEGO
– PAŃSTWOWY ZAKŁAD HIGIENY
NATIONAL INSTITUTE OF PUBLIC HEALTH
– NATIONAL INSTITUTE OF HYGIENE
ZAKŁAD HIGIENY KOMUNALNEJ
DEPARTMENT OF ENVIRONMENTAL HYGIENE

24 Chocimska 00-791 Warsaw • Phone (22) 5421354; (22) 5421349 • Fax (22) 5421287 • e-mail: sek-zhk@pzh.gov.pl

ATEST HIGIENICZNY HK/B/0025/01/2009
HYGIENIC CERTIFICATE ORYGINAL

Wyrób / product: **Płyta warstwowa**
- BALEXTHERM
- ECOPANEL

Zawierający / containing: poliuretan, stal ocynkowaną, glin, PVC i inne składniki wg dokumentacji producenta

Przeznaczony do / destined: stosowania w budownictwie na ściany zewnętrzne i wewnętrzne obudowy konstrukcji obiektów: przemysłowych, spożywczych, produkcyjnych, sportowych, biurowych, handlowych, usługowych, administracyjnych, użyteczności publicznej, służby zdrowia

Wymieniony wyżej produkt odpowiada wymaganiom higienicznym przy spełnieniu następujących warunków / is acceptable according to hygienic criteria with the following conditions:
- bez zastrzeżeń

Wytwórca / producer:
BALEX METAL Sp. z o.o.
84-239 Bolszewo
ul. Wejherowska 12c

Niniejszy dokument wydano na wniosek / this certificate issued for:
BALEX METAL Sp. z o.o.
84-239 Bolszewo
ul. Wejherowska 12c

Atest może być zmieniony lub unieważniony po przedstawieniu stosownych dowodów przez którąkolwiek stronę. Niniejszy atest traci ważność po 2014-01-19 lub w przypadku zmian w recepturze albo w technologii wytwarzania wyrobu.

The certificate may be corrected or cancelled after appropriate motivation. The certificate loses its validity after 2014-01-19 or in the case of changes in composition or in technology of production.

Data wydania atestu higienicznego: 19 stycznia 2009
The date of issue of the certificate: 19th January 2009

p.o. Kierownika
Zakładu Higieny Komunalnej
dr Bożena Krogulska

www.pzh.gov.pl

Balex Metal Sp. z o.o.
Centrala
ul. Wejherowska 12 C, 84-239 Bolszewo, Polska
tel: + 48 58 778 44 44, fax: + 48 58 778 44 55

BALEXMETAL

CE

EC DECLARATION OF CONFORMITY

NO. 18/14509/1

DOUBLE SKIN METAL FACED INSULATING PANELS **BALEXTHERM** WITH POLYURETHANE CORE

manufactured by:

BALEX METAL SP Z O.O.

ul. Wejherowska 12C

84-239 Bolszewo

produced in the plant:

Balex Metal Sp z o.o.

ul. Wejherowska 12C

84-239 Bolszewo

BALEXTHERM- PU- W- ST with visible joints thickness 40,50,60,80,100

BALEXTHERM- PU- W- PLUS with concealed joints thickness 60,80,100

BALEXTHERM- PU- F thickness 120,160,180,200

BALEXTHERM- PU- R thickness 40,60,80,100,120

Used as: roofs and roof cladding
external walls and wall cladding
walls including partitions

are submitted by the manufacturer to the factory production control. The initial type testing for relevant characteristics of the products were carried out in laboratories of:

Instytut Techniki Budowlanej, ul. Filtrowa1, 00-611 Warszawa, the notified body 1488

FIRES, s.r.o, 059-35 Batizovce, Słowacja, the notified body 1396

This declaration confirm that all provisions concerning attestation of conformity and the performances described in Annex ZA of:

PN-EN 14509:2010

Self- supporting double skin metal faced insulating panels. Factory made products. Specifications.

were applied and products mentioned above fulfill the requirements.

Bolszewo, 10.01.2011

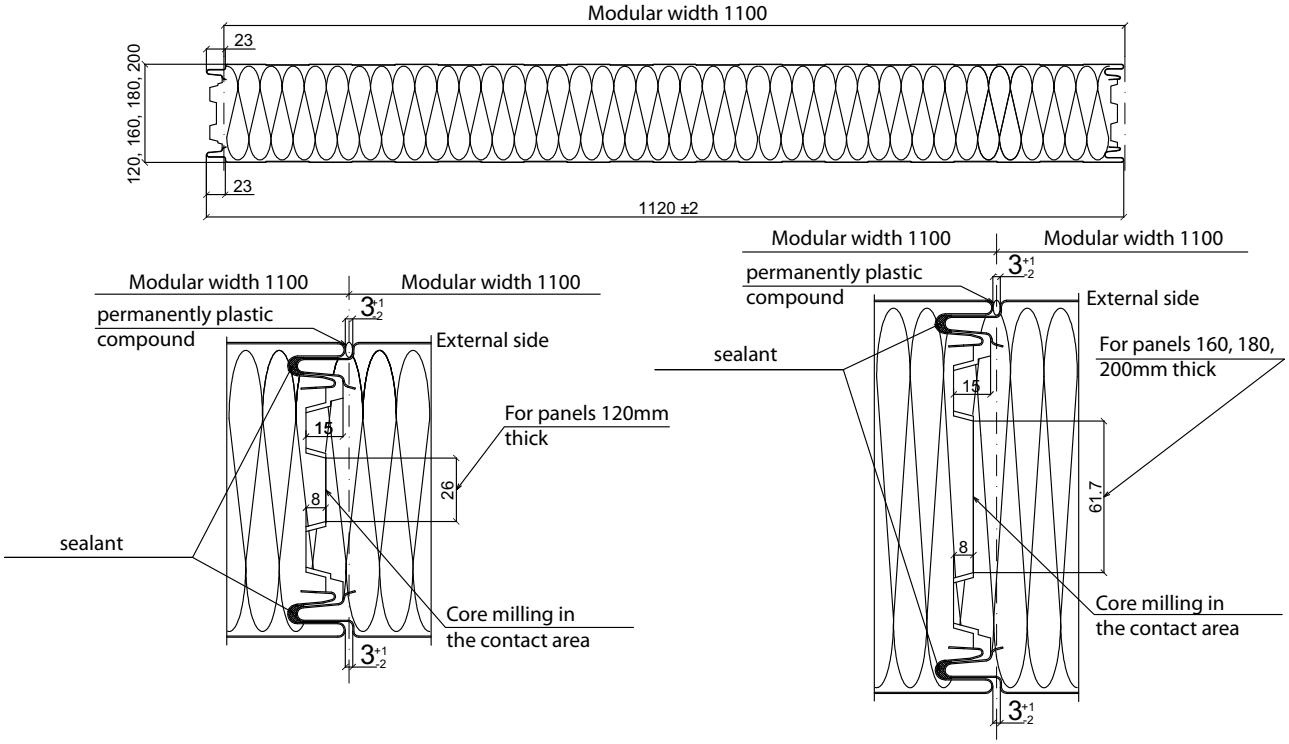
Magdalena Krzos
BALEXMETAL Sp. z o.o.
84-239 Bolszewo, ul. Wejherowska 12C
tel. 58 778-44-44, fax 58 778-44-55
NIP 588-11-30-299
Quality Manager

Tworzymy ze stali www.balex.eu

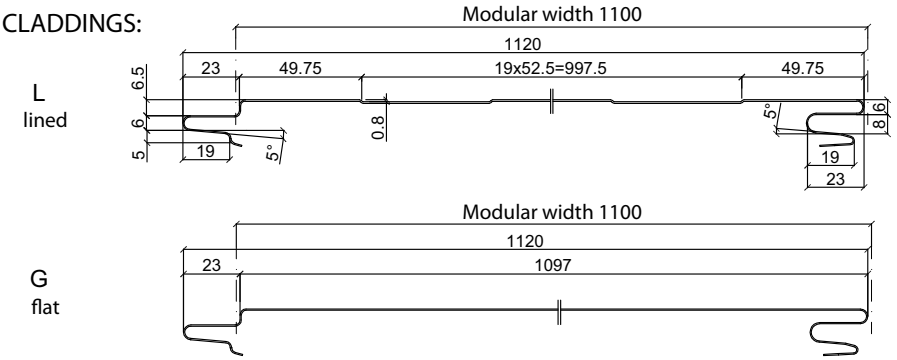
II. DETAILS OF CONSTRUCTION AND ARCHITECTURE ELEMENTS

1. BASIC DRAWNINGS

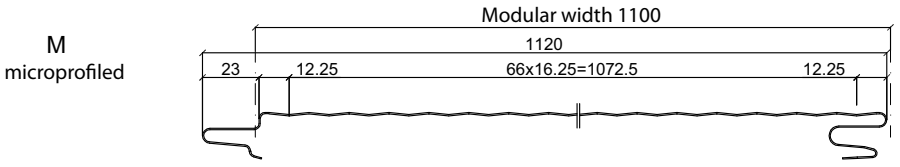
1.1. F01
BALEXTHERM-PU-F panel joint, profile types



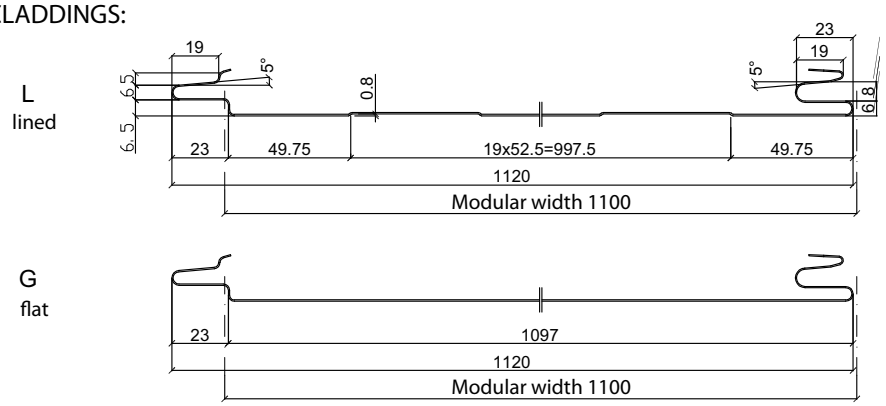
EXTERNAL CLADDINGS:



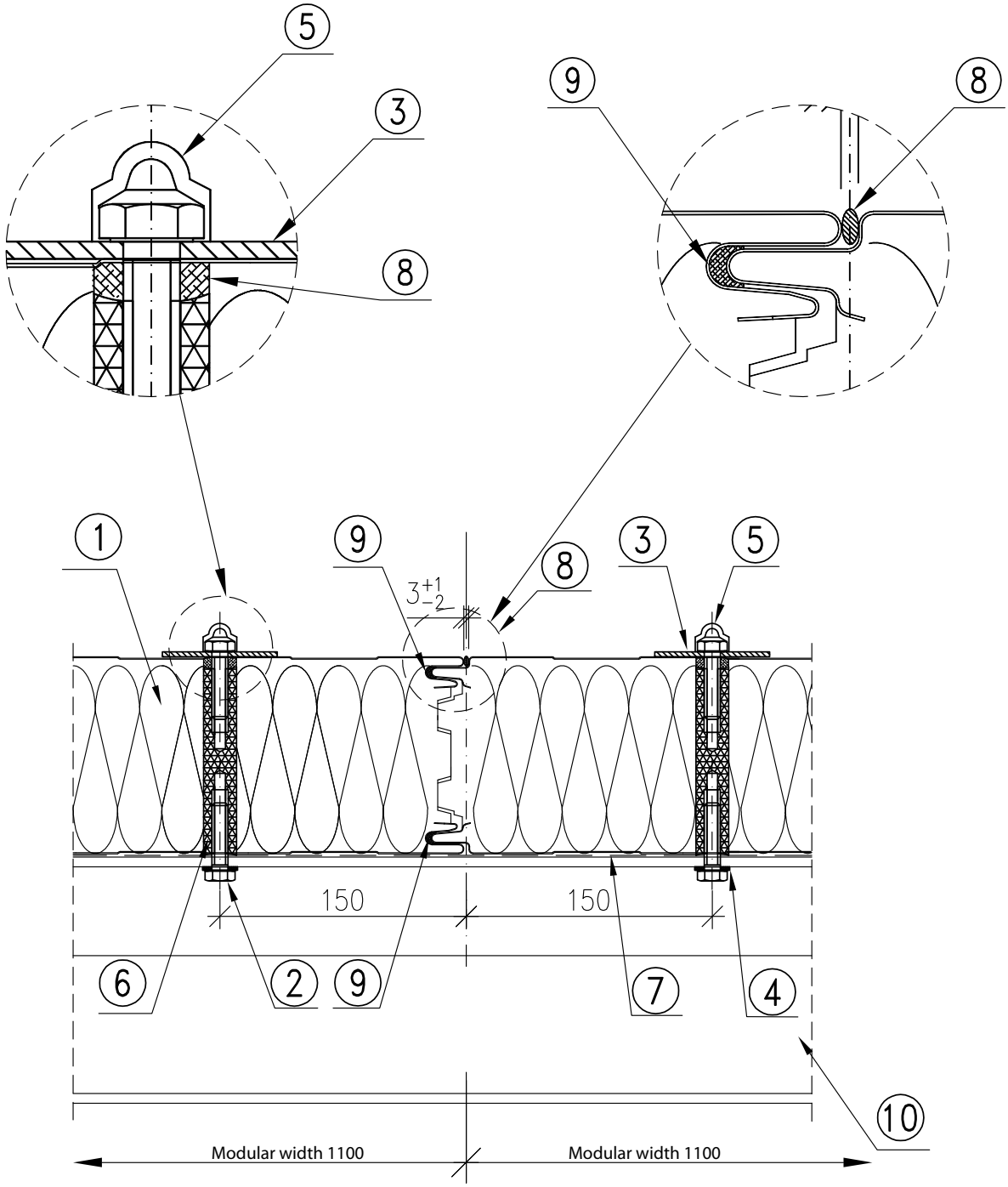
Attention: To special orders after consultations with the orderer.



INTERNAL CLADDINGS:



1.2. F02
Panel's fastening in a contact to the transom

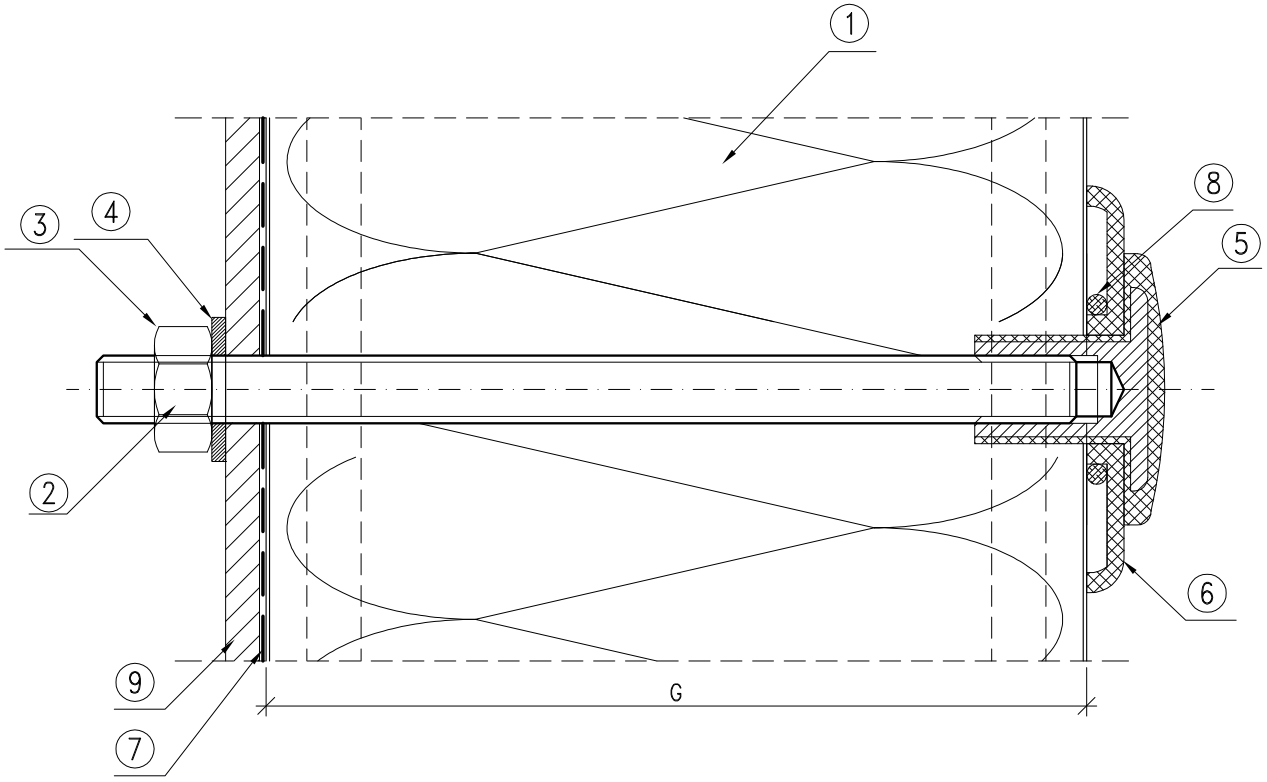


1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5
4. Ø21/Ø10.5 galvanized washer
5. K 1 protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Plastic sealant
10. Wall transom acc to the construction design

2. FASTENING SYSTEM USING INSULATING NUTS WITH STEEL INSERT

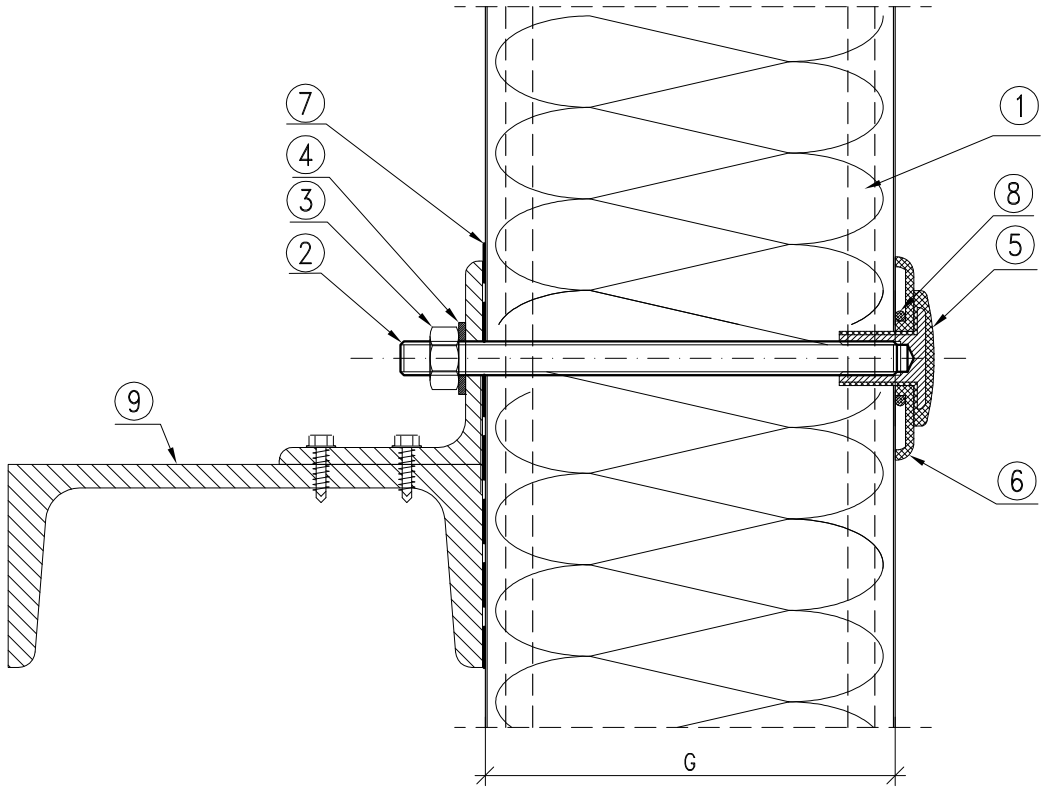
2.1. F03

System of fastening cold storage panels with the use of insulating nuts with steel insert



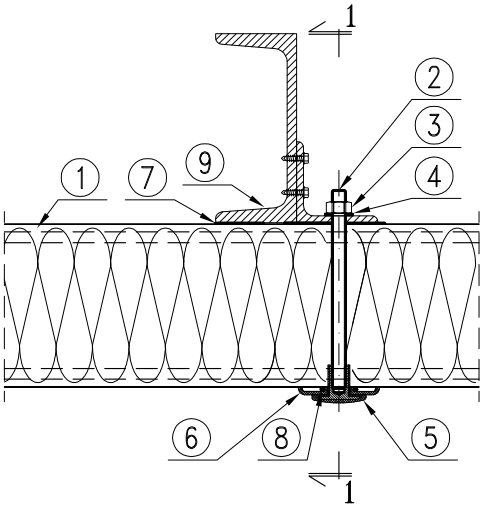
1. BALEXTHERM-PU-F panel
2. Galvanized screwed bar M 10 x L bar where L = G + 25 mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Element of the building's structure

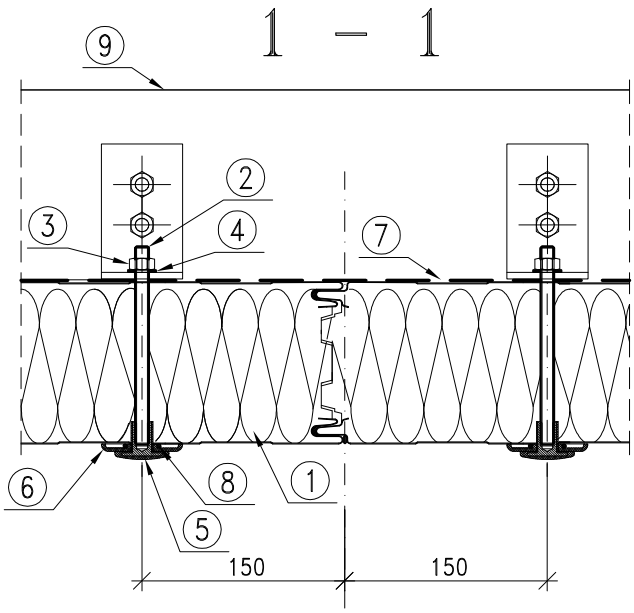
2.2. F04
Fastening panels to hot-rolled transom with the use of insulating nuts with steel insert



1. BALEXTHERM-PU-F panel
2. Galvanized screwed bar M 10 x L bar where L = G + 25 mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Wall transom acc to the construction design

2.3. F05
Suspending panels under the ceiling with the use of insulating nuts with steel insert



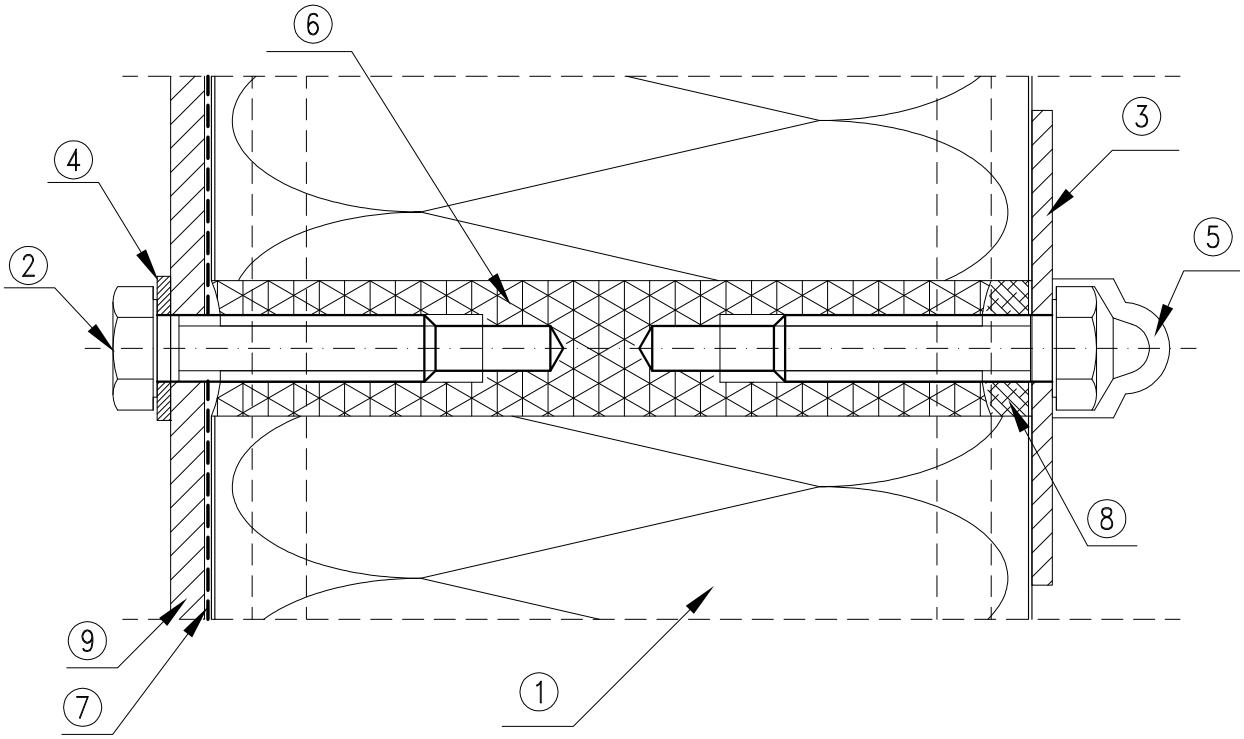


1. BALEXTHERM-PU-F panel
2. Galvanized screwed bar M 10 x L bar where L = G + 25 mm
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. PVC insulating nut with a steel INJ 235 insert
6. PVC INJ 24 washer
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Steel binder acc. to the construction design

3. SYSTEM OF FASTENING COLD STORAGE PANELS WITH THE USE OF POLYAMIDE INSULATING SLEEVES

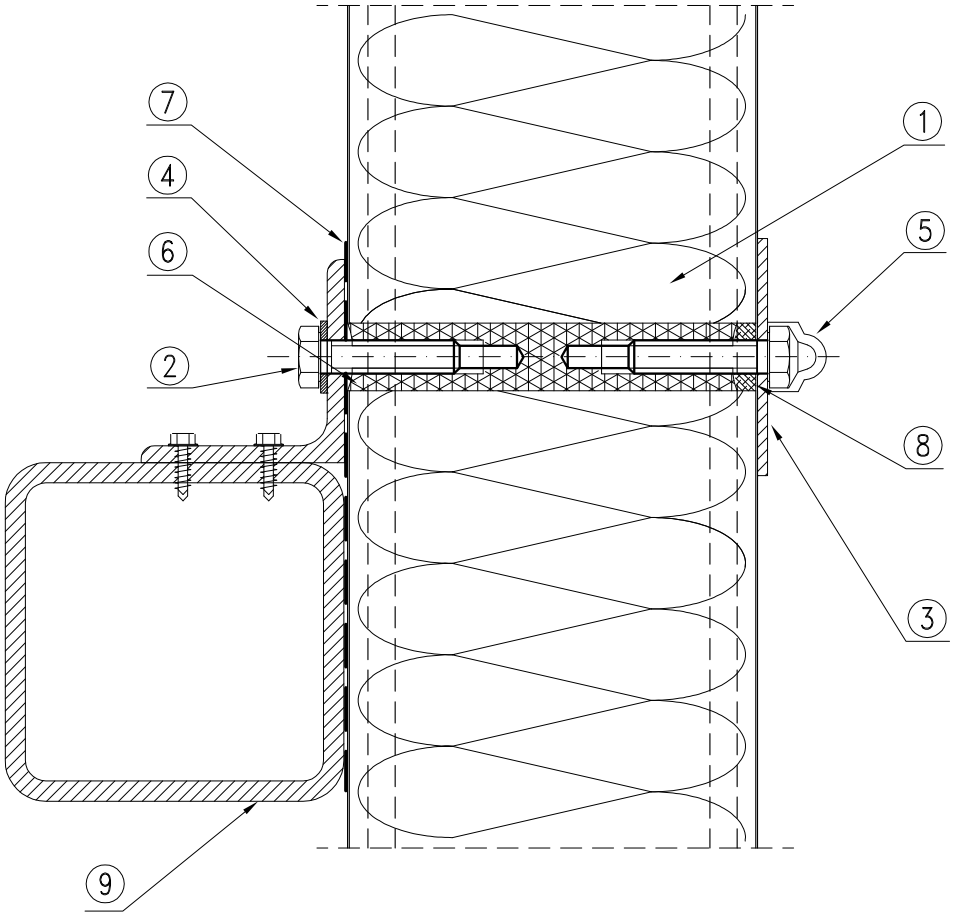
3.1. F06

System of fastening cold storage panels with the use of polyamide insulating sleeves



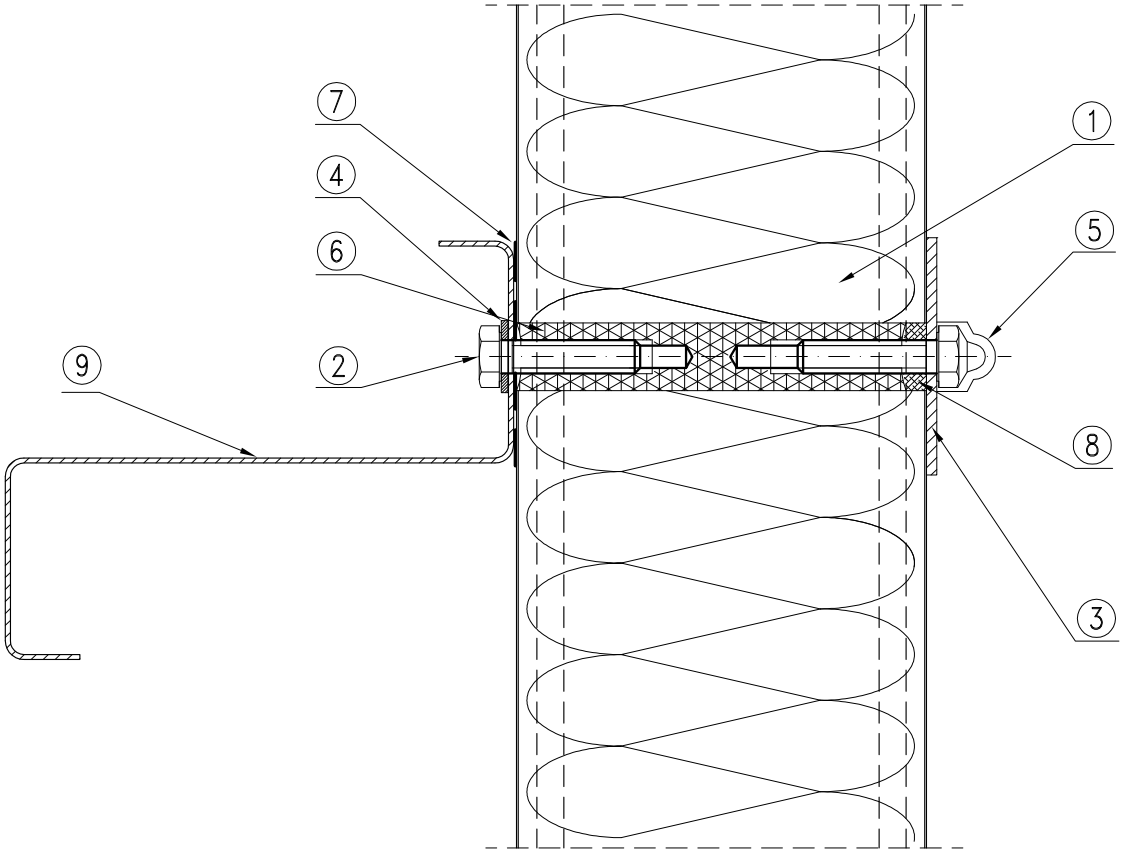
1. BALEXTHERM-PU-F panel
2. M 10x40 galvanized screw
3. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5 (white)
4. Ø21/Ø10.5 galvanized washer
5. Protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Element of the building's structure

3.2. F07
Fastening panels to hot-rolled transom with the use of polyamide insulating sleeves



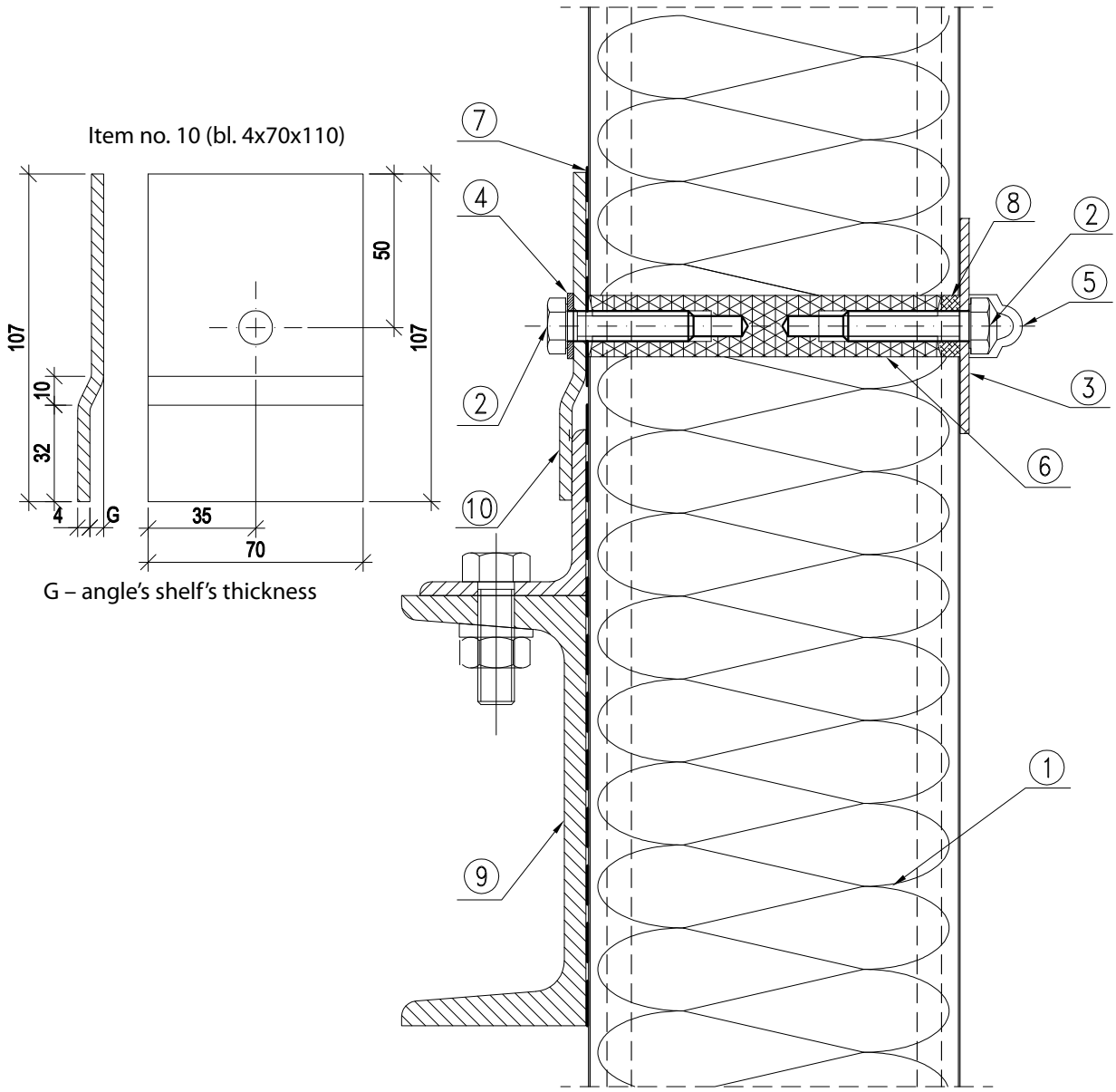
1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5(white)
4. Ø21/Ø10.5 galvanized washer
5. Protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Wall transom acc. to the structural design

3.3. F08
Fastening panels to thin-walled transom with the use of polyamide insulating sleeves



1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB71 load carrying washer Ø70/Ø10.5 (white)
4. Ø21/Ø10.5 galvanized washer
5. Protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Wall transom acc. to the construction design

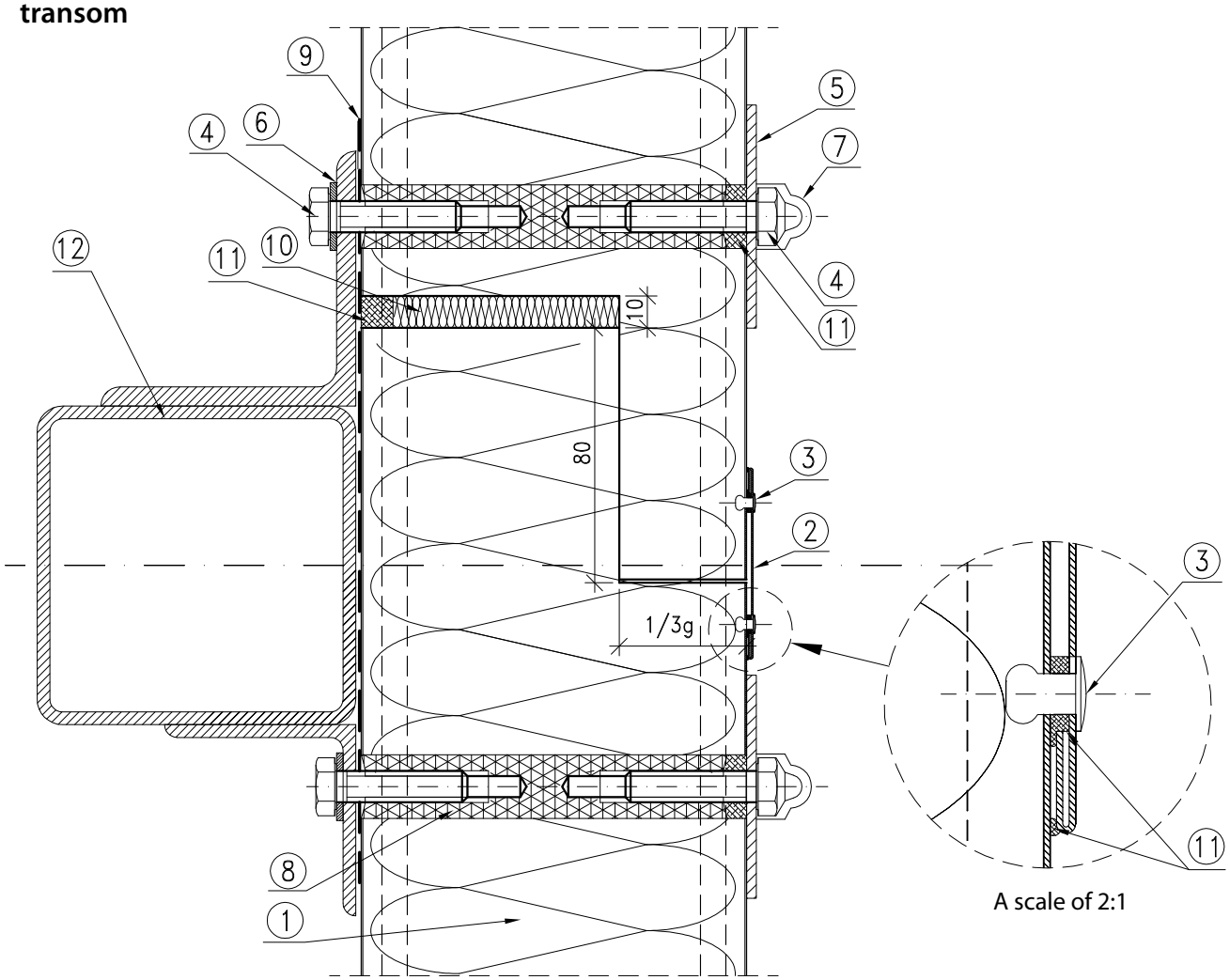
3.4. F09
Slidable panel joint on a wall transom



1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5 (white)
4. Ø21/Ø10.5 galvanized washer
5. Protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Wall transom acc. to the construction design
10. Thrust washer (individual)

3.5. F10/1

Joining wall panels along their length. Their cross-section in the place of fastening to a wall transom

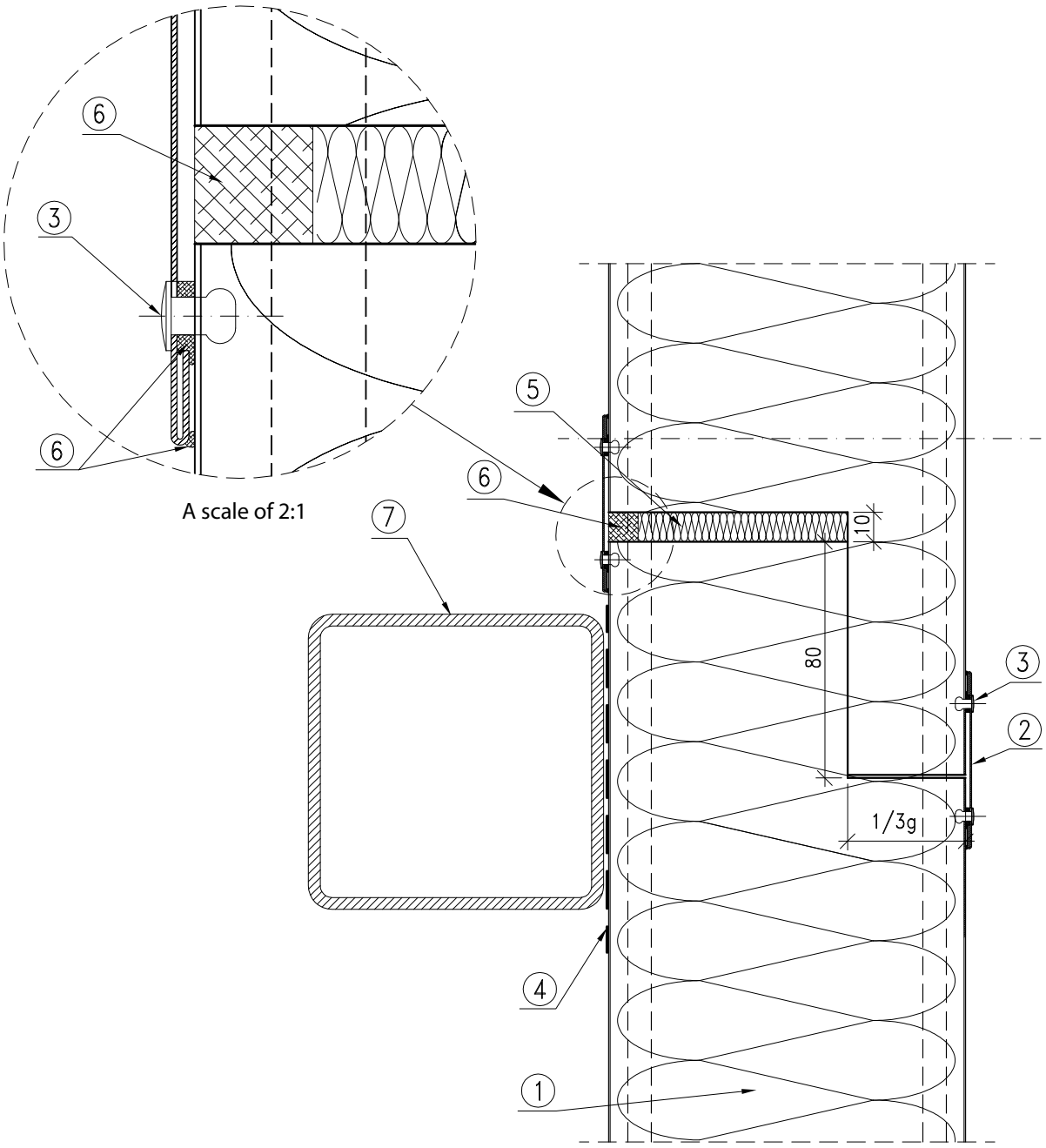


A scale of 2:1

1. BALEXTHERM-PU-F panel
2. OBR 106
3. Ø4x10 Al/Fe tight blind rivet
4. Galvanized M10x40 screw
5. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5 (white)
6. Ø21/Ø10.5 galvanized washer
7. Protective cap
8. LB 70 polyamide sleeve
9. Self-adhesive polyethylene tape (recommended)
10. Polyurethane foam
11. Permanently plastic sealant (recommended SOUDAFLEX)
12. Wall transom acc. to the construction design

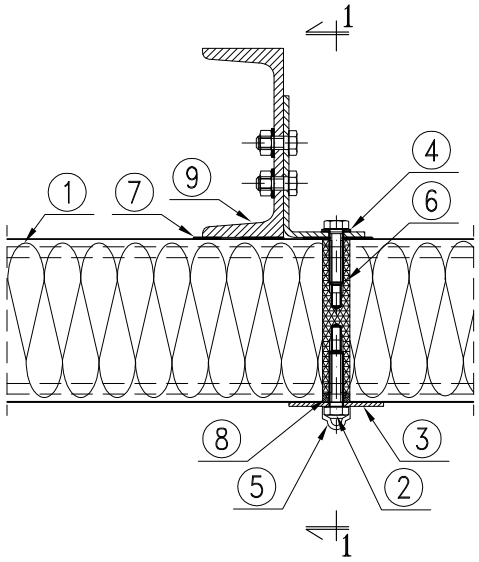
3.6. F10/2

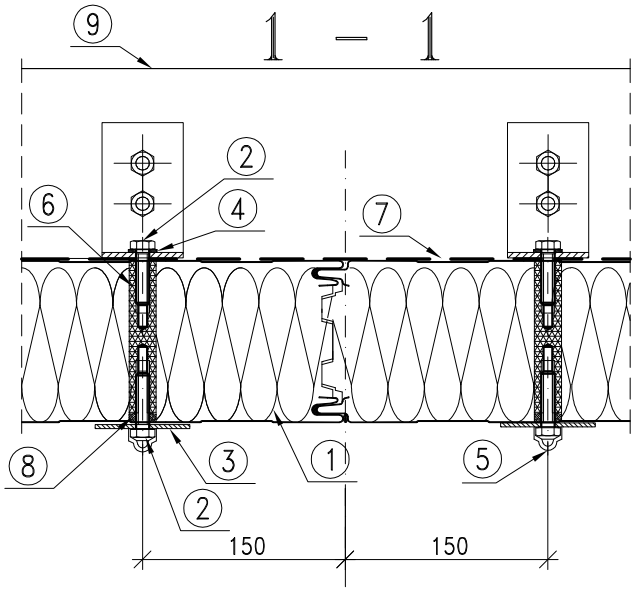
Joining wall panels along their length. Their cross-section outside the place of fastening to a wall transom.



1. BALEXTHERM-PU-F panel
2. OBR 106
3. Ø4x10 Al/Fe tight blind rivet
4. Self-adhesive polyethylene tape (recommended)
5. Polyurethane foam
6. Permanently plastic sealant (recommended SOUDAFLEX)
7. Wall transom acc. to the construction design

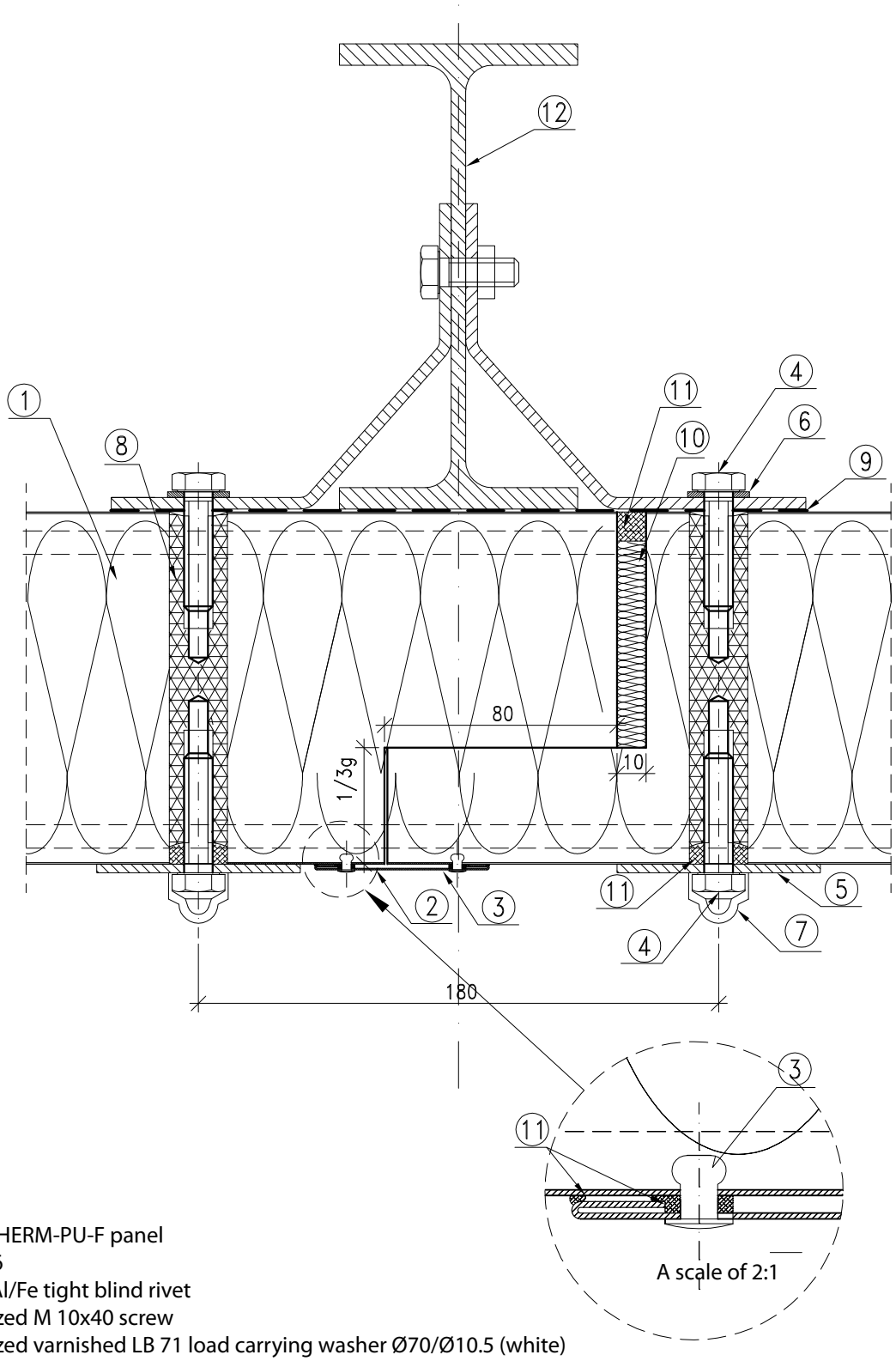
3.7. F11
Suspending panels under the ceiling with the use of polyamide insulating sleeves





1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5 (white)
4. Ø21/Ø10.5 galvanized washer
5. Protective cap
6. LB 70 polyamide sleeve
7. Self-adhesive polyethylene tape (recommended)
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Steel structure acc. to the design

3.8. F12
Fastening panels in the ceiling and joining them along their length

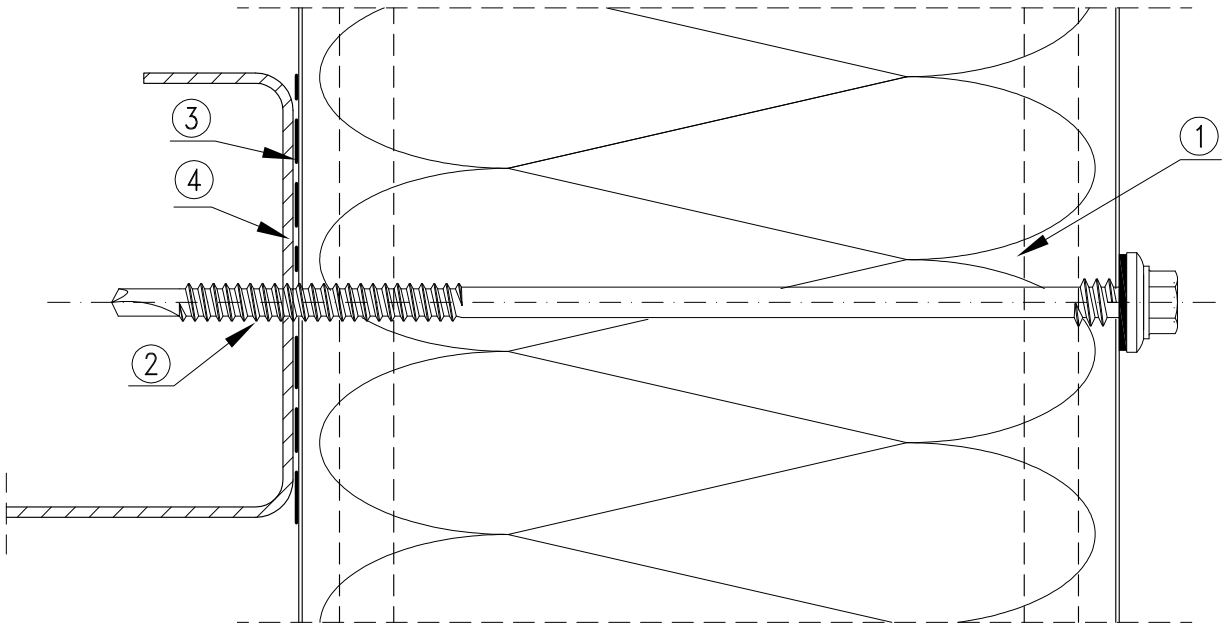


1. BALEXTHERM-PU-F panel
2. OBR 106
3. Ø4x10 Al/Fe tight blind rivet
4. Galvanized M 10x40 screw
5. Galvanized varnished LB 71 load carrying washer Ø70/Ø10.5 (white)
6. Ø21/Ø10.5 galvanized washer
7. Protective cap
8. LB 70 polyamide sleeve
9. Self-adhesive polyethylene tape (recommended)
10. Polyurethane assembly foam
11. Permanently plastic sealant (recommended SOUDAFLEX)
12. Load carrying structure acc. to the design

4. SYSTEM OF FASTENING COLD STORAGE PANELS WITH THE USE OF STAINLESS STEEL FASTENERS

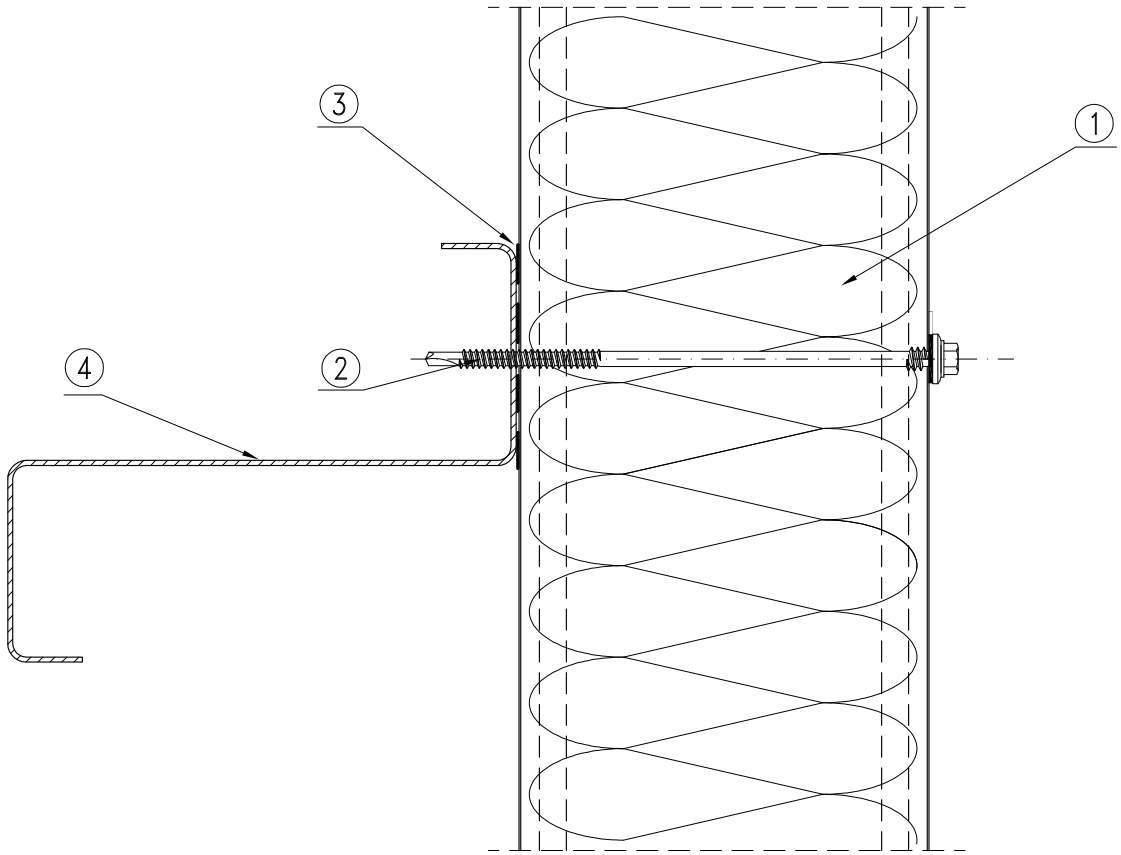
4.1. F13

System of fastening cold storage panels with the use of stainless steel fasteners



1. BALEXTHERM-PU-F panel
2. Stainless steel fastener LB 7 for fastening panels
3. Self-adhesive polyethylene tape (recommended)
4. Element of the building's structure

4.2. F14
Fastening panels to a thin-walled transom with the use of stainless steel fasteners

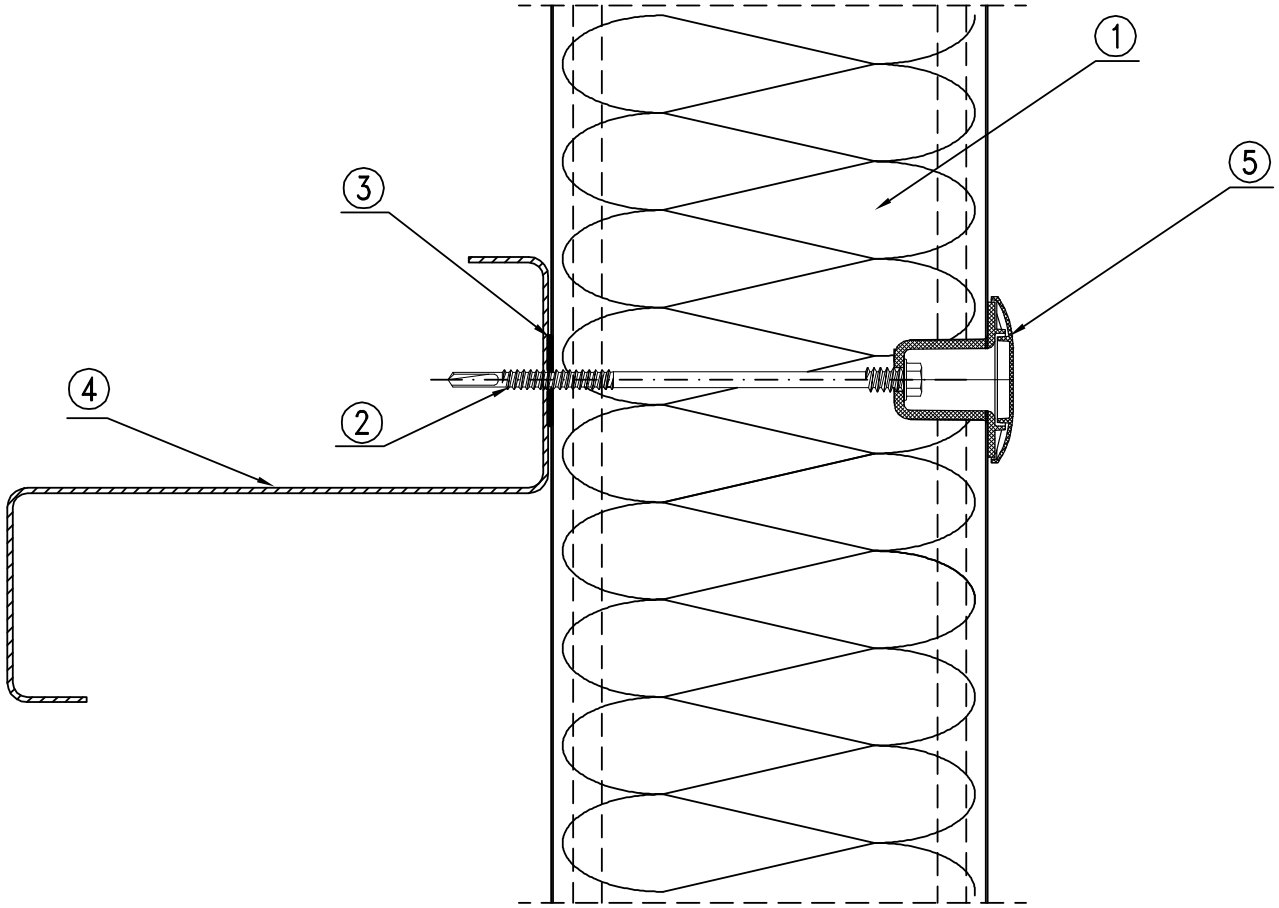


1. BALEXTHERM-PU-F panel
2. Stainless steel fastener for fastening panels LB 7
3. Self-adhesive polyethylene tape (recommended)
4. Wall transom acc. to the construction design

5. SYSTEM OF FASTENING COLD STORAGE PANELS WITH THE USE OF LAX FASTENERS

5.1. F25

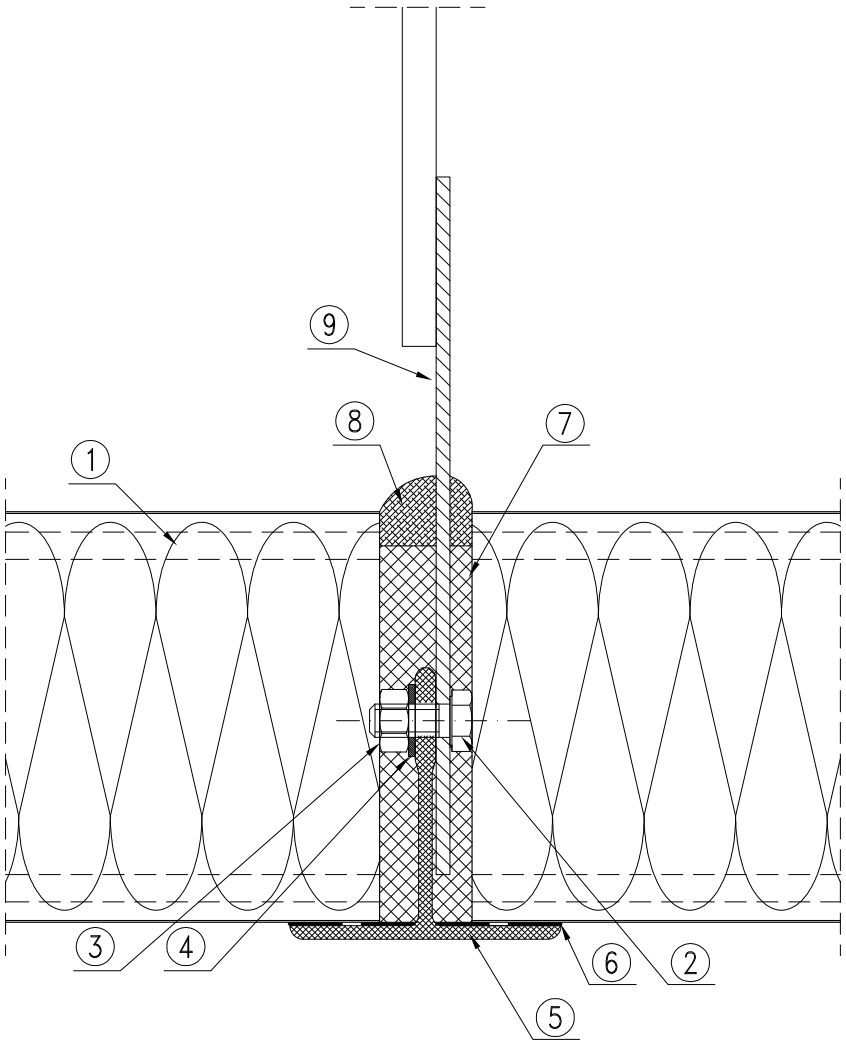
System of fastening cold storage panels with the use of LAX fasteners



1. BALEXTHERM-PU-F panel
2. BALEXTHERM panel fastener
3. PES 3x20 polyethylene adhesive tape (recommended)
4. Wall spandrel beam according to structure design
5. LAX bushing and cap

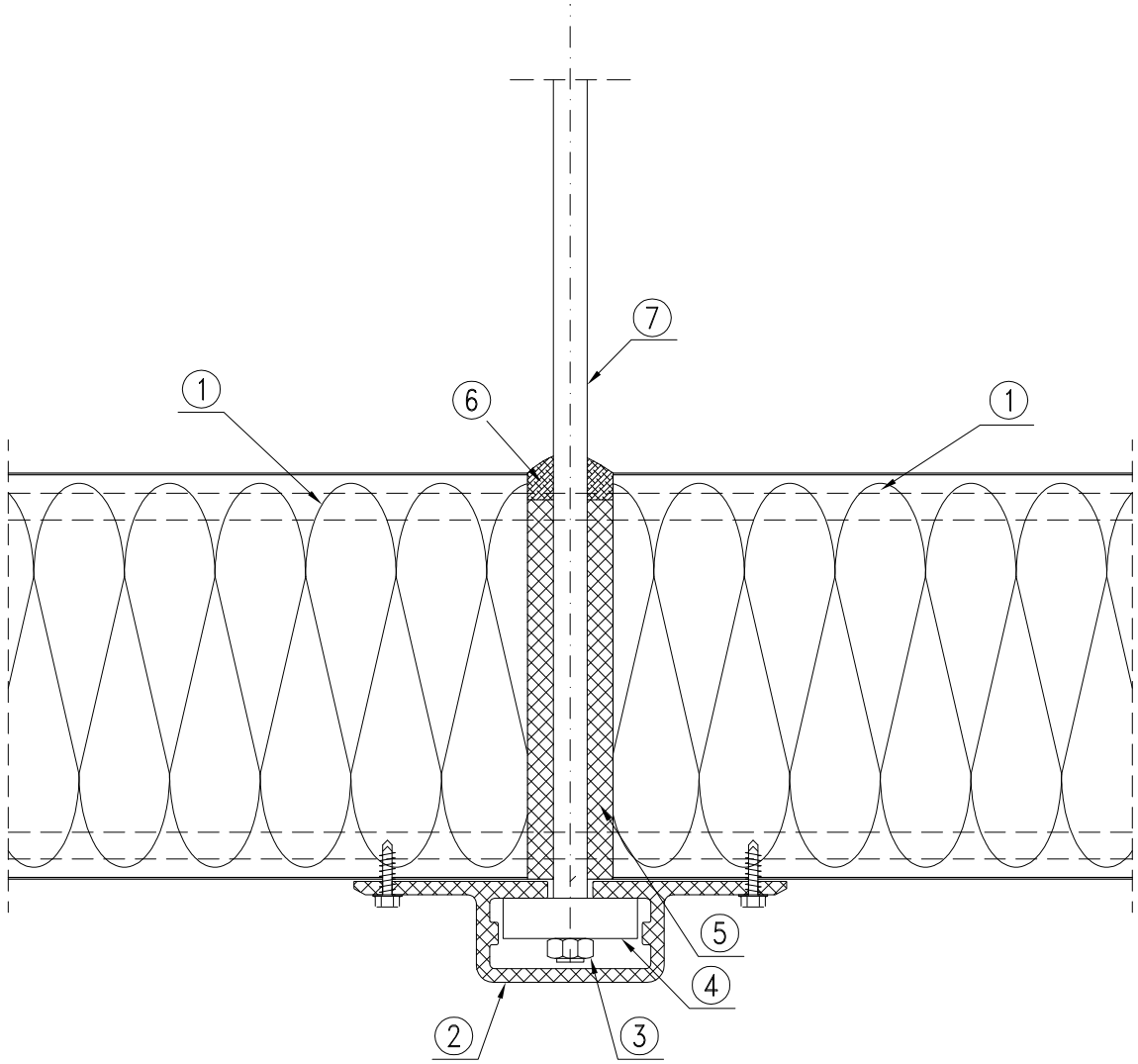
6. SUSPENDING PANELS UNDER THE CEILING WITH THE USE OF PVC PROFILES

6.1. F15
Suspending panels under the ceiling with the use of a T profile

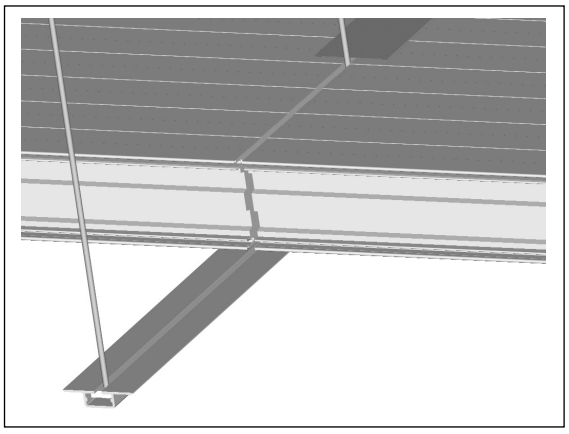


1. BALEXTHERM-PU-F panel
2. Galvanized M 10x40 screw
3. M 10 galvanized nut
4. Ø21/Ø10.5 galvanized washer
5. T profile (aluminium TALU 01 or Polyester PUL 01 or PUL 02)
6. Self-adhesive polyethylene tape (recommended)
7. Polyurethane assembly foam
8. Permanently plastic sealant (recommended SOUDAFLEX)
9. Hanger – tension member

6.2. F16
Suspending panels under the ceiling with the use of an omega profile

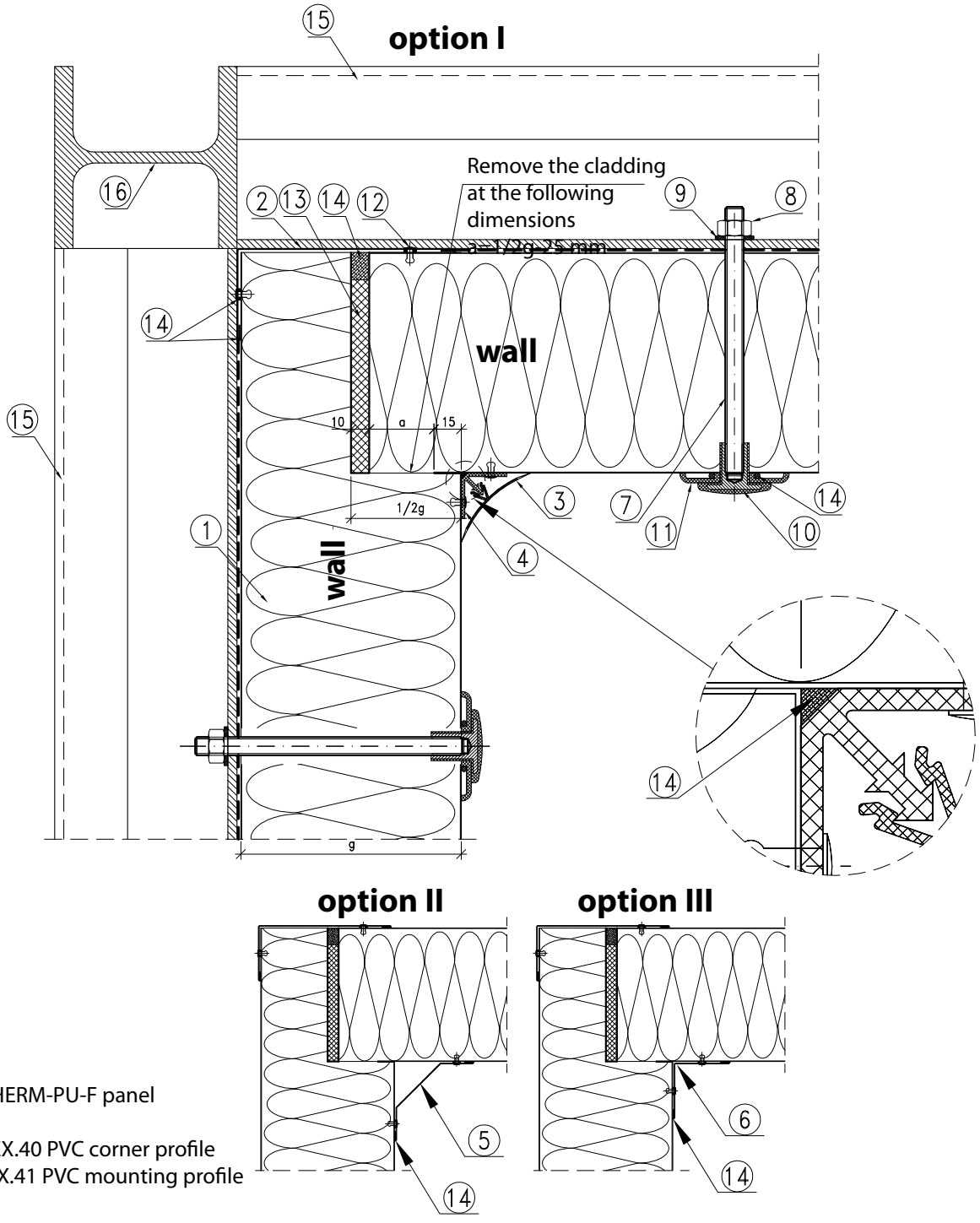


1. BALEXTHERM-PU-F panel
2. PUL.11 OMEGA profile (polyester)
3. M10 galvanized nut
4. M10 nut, square 40x40, galvanized A95G
5. Polyurethane foam
6. Permanently plastic sealant (recommended SOUDAFLEX)
7. Hanger – tension member. In order to bearing capacity of OMEGA profile distance between guys = 1500 mm



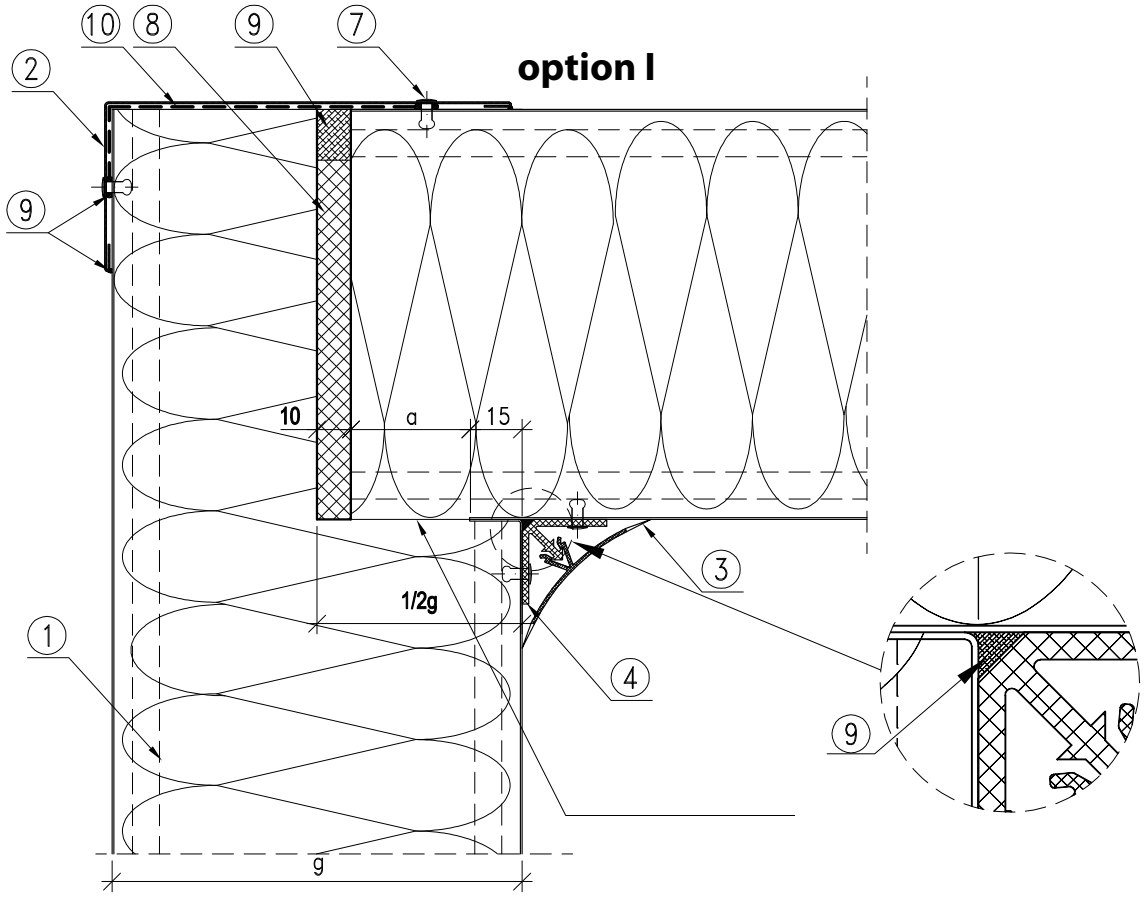
7. COLD STORAGE PANELS' CORNER SOLUTIONS

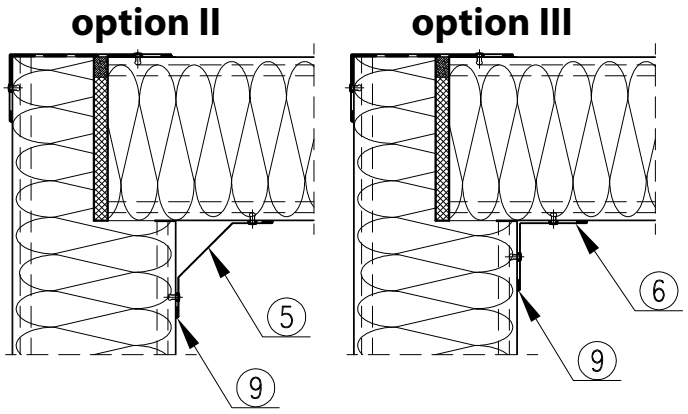
7.1. F17
Fastening wall panels in the corner



1. BALEXTHERM-PU-F panel
2. OBR 301
3. EX.14 v EX.40 PVC corner profile
4. EX28 v EX.41 PVC mounting profile
5. OBR 302
6. OBR303
7. Screwed galvanized bar M10 x L where L = G + 25 mm
8. M10 galvanized nut
9. Ø21/Ø10.5 galvanized washer
10. PVC insulating nut with a steel INJ.235 insert
11. PVC INJ.24 washer12. Ø4x10 Al/Fe tight blind rivet
13. Polyurethane assembly foam
14. Permanently plastic sealant (recommended SOUDAFLEX)
15. Wall transom acc. to the construction design
16. Post acc. to the construction design

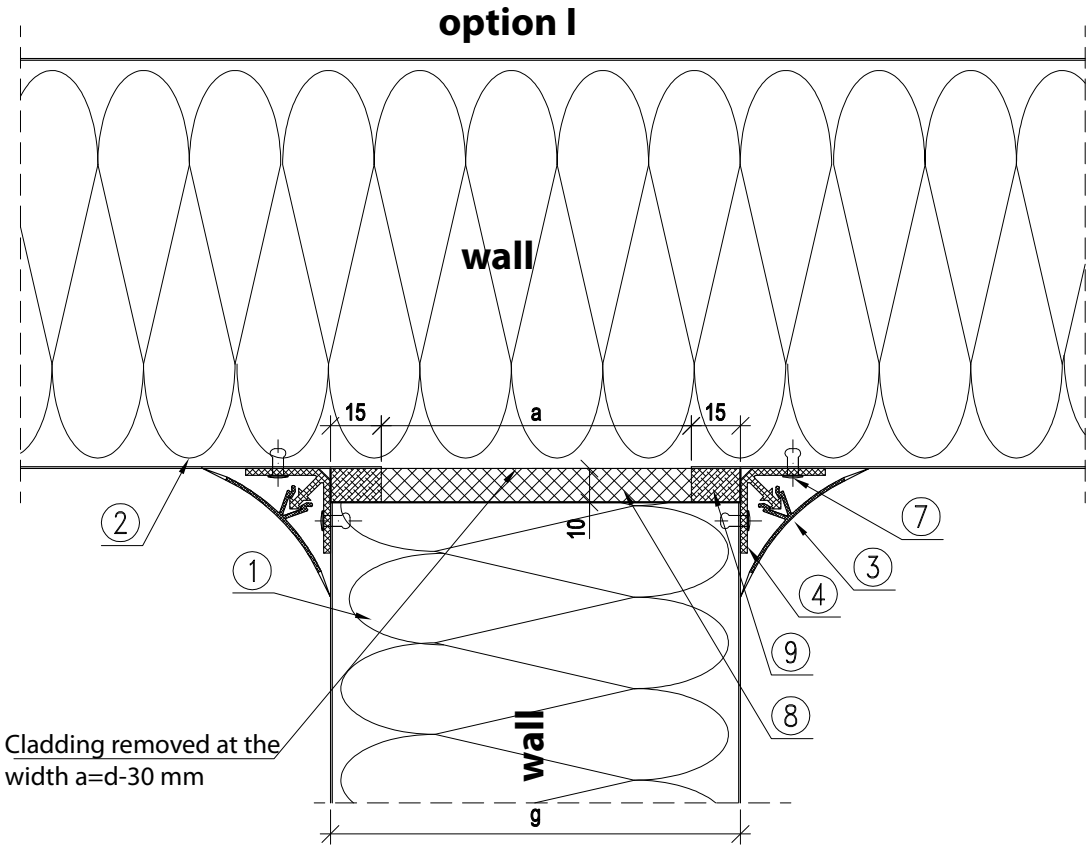
7.2. F18
Joint of wall and ceiling panels in the corner

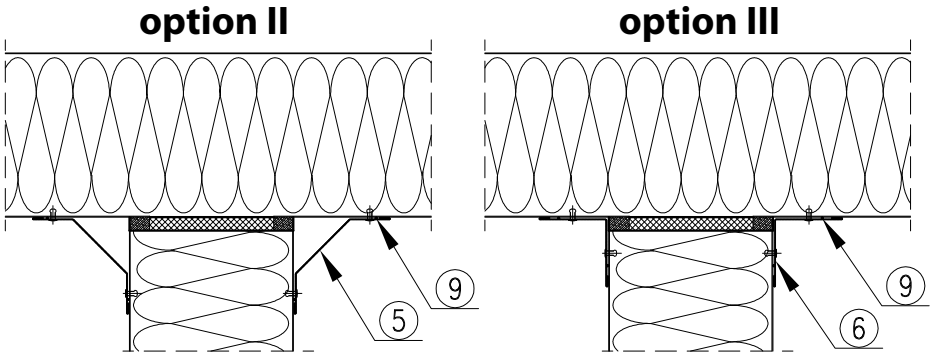




1. BALEXTHERM-PU-F panel
2. OBR 301
3. EX 14 v EX 40 PVC Corner profile
4. EX 28 v EX 41 PVC Mounting profile
5. OBR 302
6. OBR 303
7. Ø4x10 Al/Fe tight blind rivet
8. Polyurethane assembly foam
9. Permanently plastic sealant
   (recommended SOUDAFLEX)
10. Polyethylene foil

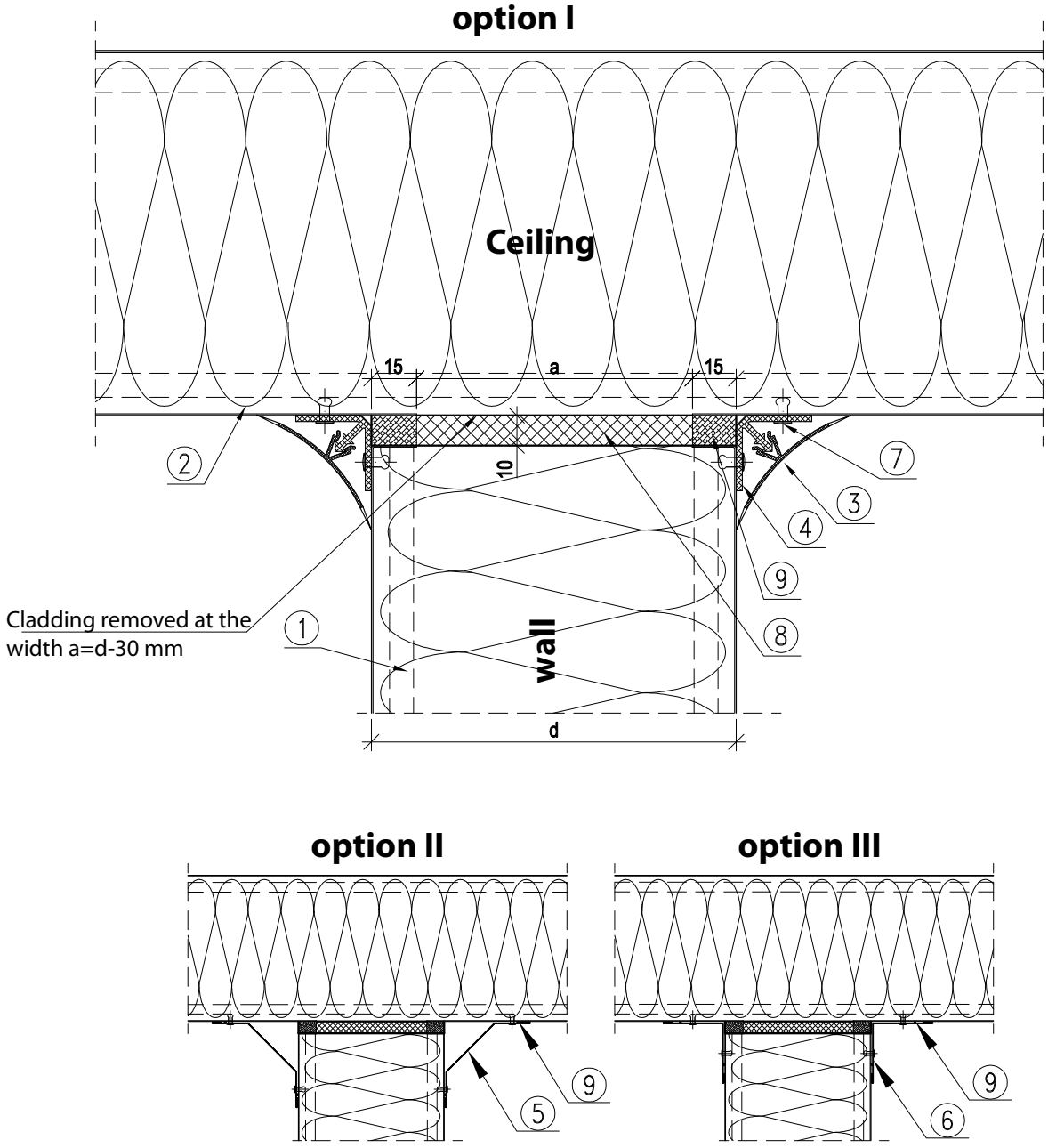
7.3. F19
Joint of partition walls with external walls





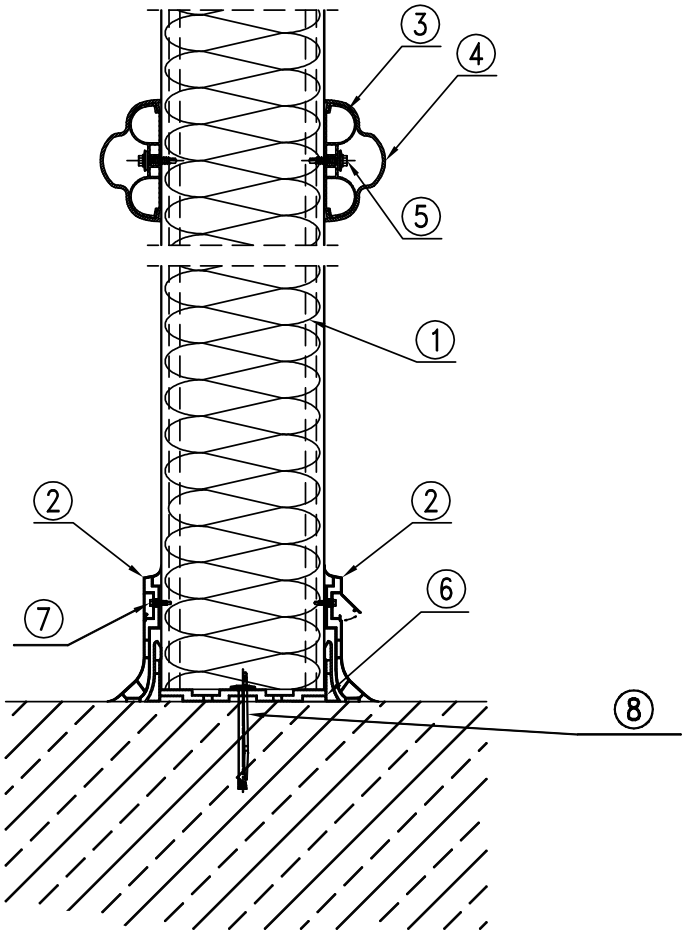
1. BALEXTHERM-PU-F panel
2. BALEXTHERM-PU-F panel
3. EX 14 v EX 40 PVC Corner profile
4. EX 28 v EX 41 PVC Mounting profile
5. OBR 302
6. OBR 303
7. Ø4x10 Al/Fe tight blind rivet
8. Polyurethane assembly foam
9. Permanently plastic sealant (recommended SOUDAFLEX)

7.4. F20/1
Joint of partition walls with the ceiling



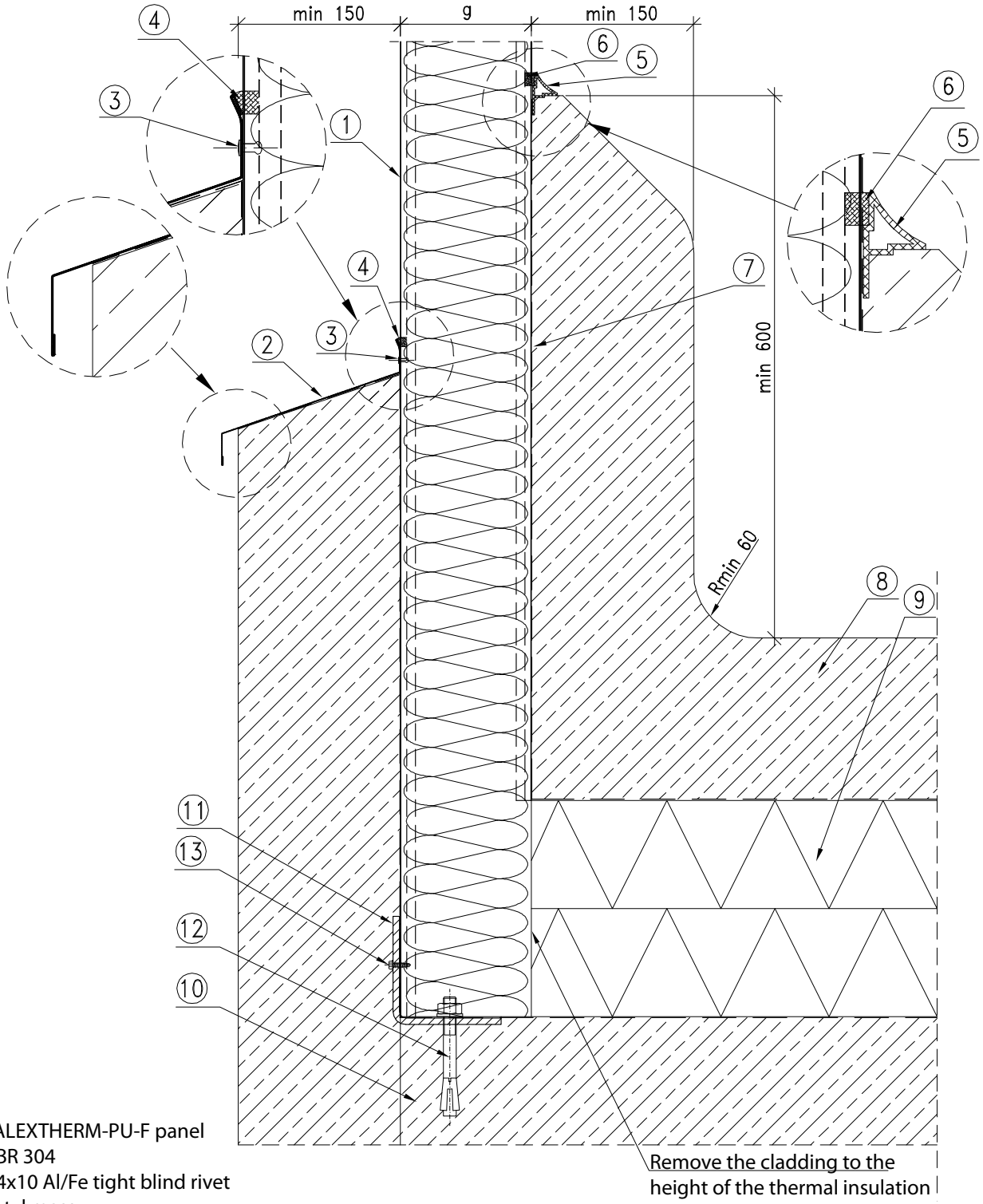
1. BALEXTHERM-PU-F panel
2. BALEXTHERM-PU-F panel
3. EX 14 v EX 40 PVC Corner profile
4. EX 28 v EX 41 PVC Mounting profile
5. OBR 302
6. OBR 303
7. Ø4x10 Al/Fe tight blind rivet
8. Polyurethane assembly foam
9. Permanently plastic sealant (recommended SOUDAFLEX)

7.5. F20/2
Fastening of a partition wall on a groove profile



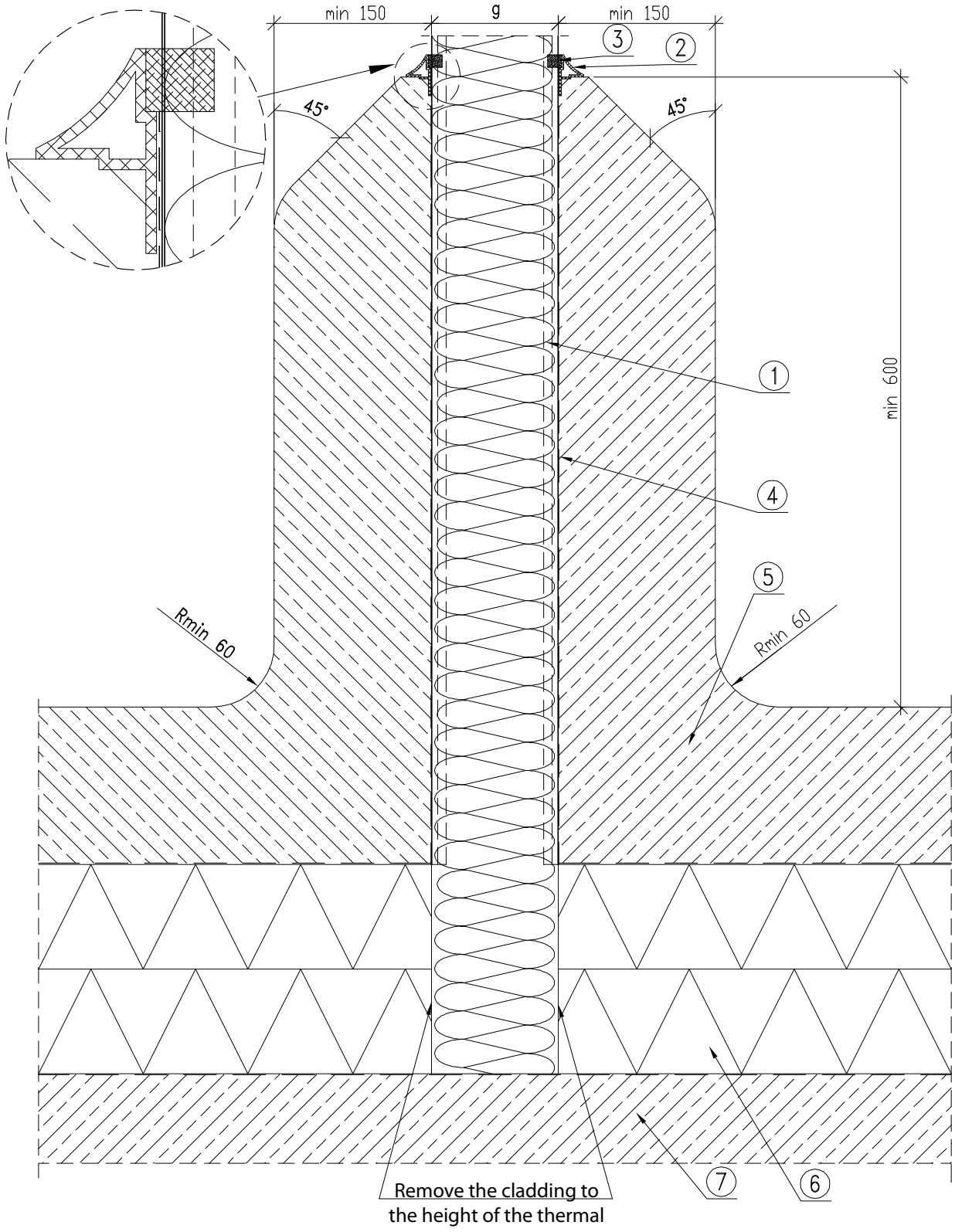
1. BALEXTHERM-PU-F panel
2. EX 15 Base
3. EX 20 Wall support of the fender
4. EX 21 Fender cover
5. Self-drilling screw for fastening of PVC/PE
6. EX 23 Groove profile
7. Self-drilling screw
8. Anchor bolt

7.6. F21
Joint of external wall with the floor and a concrete base



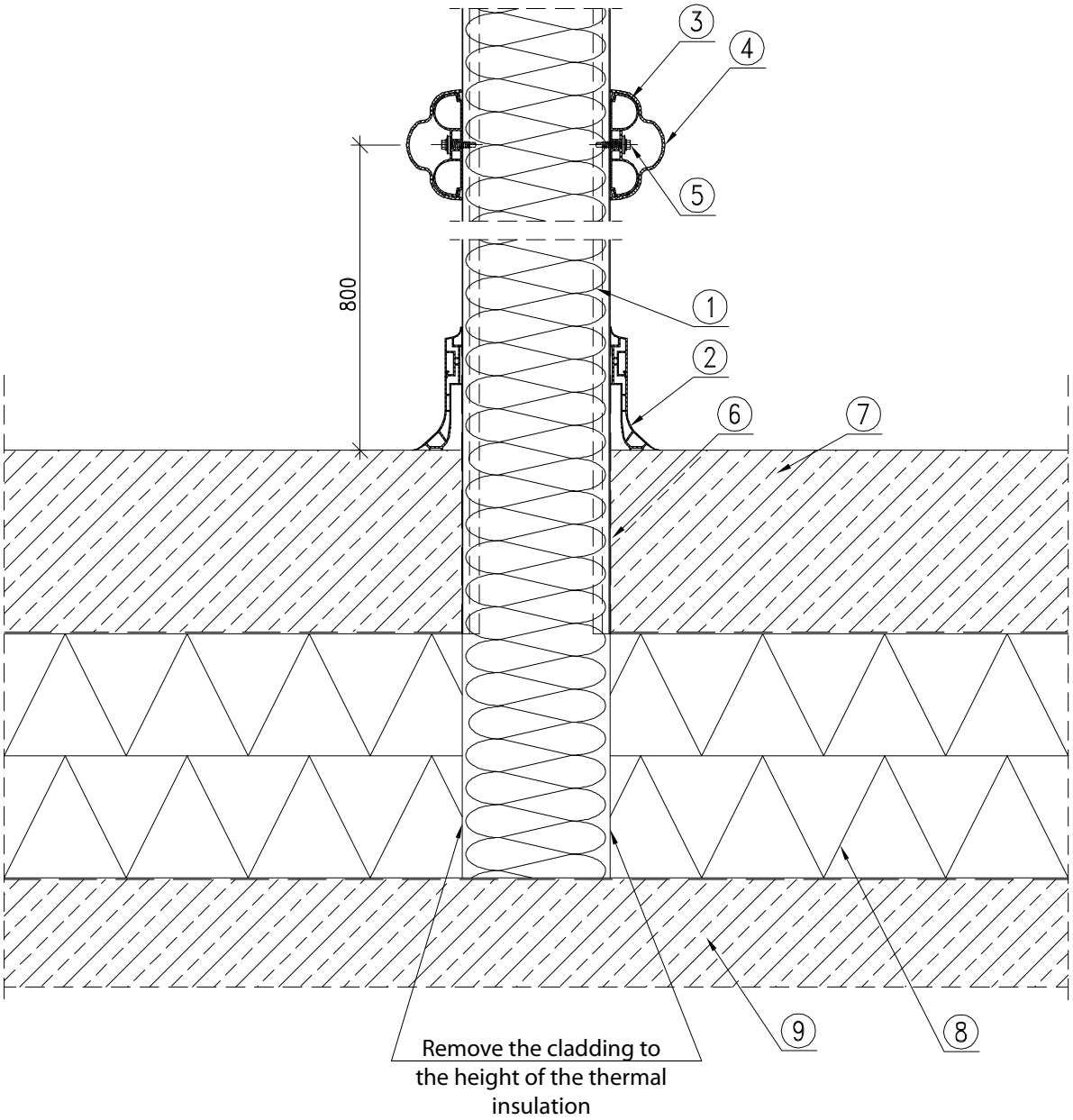
1. BALEXTHERM-PU-F panel
2. OBR 304
3. Ø4x10 Al/Fe tight blind rivet
4. Butyl mass
5. PVC EX 10 corner profile (additional ending of the INJ B229 profile)
6. Permanently plastic sealant (recommended SOUDAFLEX)
7. Vertical and horizontal dampproof course (e.g. PE)
8. Concrete floor acc. to the design
9. Thermal insulation
10. Concrete slab acc. to the construction design
11. Cold-bent angle
12. Concrete anchor bolt
13. LB6 self-drilling fastener

7.7. F22
Joint of internal wall with a concrete base



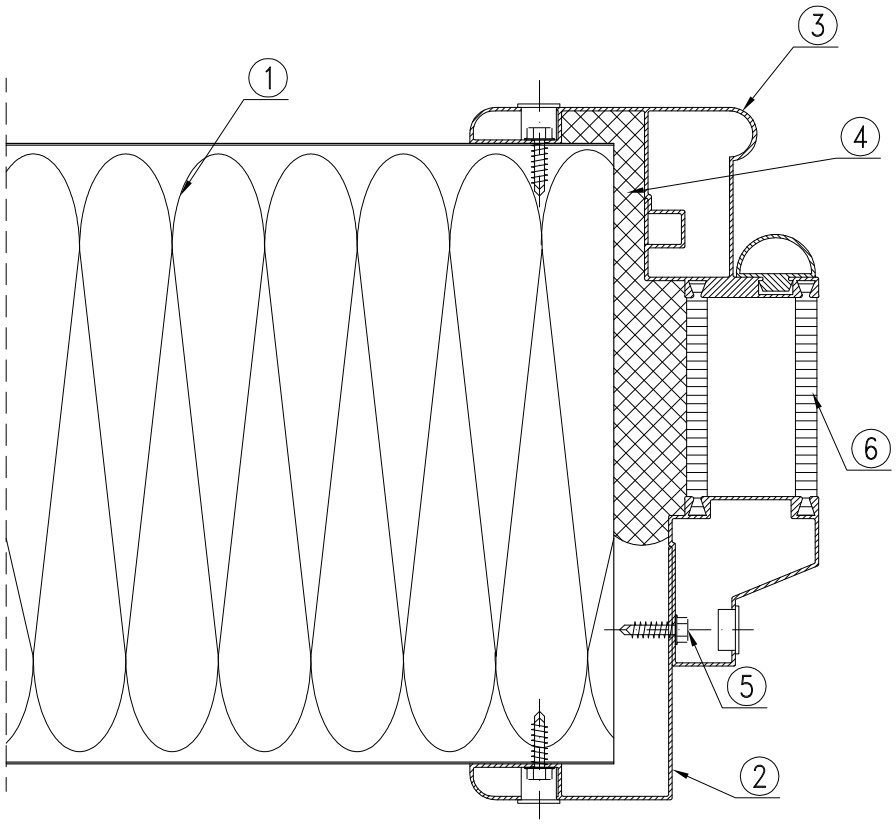
1. BALEXTHERM-PU-F panel
2. PVC EX 10 v. INJ B229 corner profile
3. Permanently plastic sealant (recommended SOUDAFLEX)
4. Vertical and horizontal dampproof course (e.g. PE)
5. Concrete floor acc. to the design
6. Thermal insulation
7. Concrete slab acc. to the construction design

7.8. F23
Joint of internal wall with a PVC base



1. BALEXTHERM-PU-F panel
2. PVC EX 15 base
3. EX 20 wall support of the fender (together with EX 21 in a set)
4. EX 21 fender cover
5. Assembly screw
6. Vertical and horizontal dampproof course (e.g. PE)
7. Concrete floor acc. to the design
8. Thermal insulation
9. Concrete slab acc. to the construction design

7.9. F24
Cold storage door installation



1. BALEXTHERM-PU-F panel
2. External door frame
3. Internal door frame
4. Polyurethane assembly foam
5. Assembly screw
6. Insulating insert

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Balex Metal Sp. z o.o. is a leading manufacturer of construction materials in Poland. The offer of the company includes complete solutions and steel roof and wall systems for residential, commercial and rural constructions. The products gained trust and appreciation in Poland, Belorussia, Russia, Lithuania, Latvia, Estonia, Ukraine, Czech Republic, Slovakia, Sweden, Norway and Finland. Consultancy and sale is being realized by own net of regional branches, cooperating distributors and a team of professional advisers.

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