PaNELTECH Sandwich Panels Assembly Instruction

1. Preparatory works

Sandwich panels are protective elements, which are assembled to the constructions in accurately determined and prepared points.It makes the building highly aesthetic and prevents the deformation of steel cladding in the assembly points.
Before the beginning of panel assembly, the following has to be checked:

a) building construction precision,
b) compliance of the construction with the design,
c) acceptable maximum support span - the compliance with the load plates offered by the company,
d) tolerance of deviation from flatness and straightness for purlins, rafters and walls,
e) condition of the protective organic coating.

In standard, sandwich panels are delivered to the construction site, packed in cling film on the facade (external) side only. Installing panels covered with foil on the one site, make sure the foil is situated on the facade (external) side.
Optionally, at the client's request (by an additional fee), the foil can be applied on both sides, i.e. on the external and internal facing. Below listed are guidelines for preparatory works aiming to avoid installation errors related to the colour palette of the building.

As standard sandwich panels are delivered to the site packaged in accordance with diagram shown in figures 1 and 2. Figure 1 – applicable to wall sandwich panels and Figure 2 – applicable to roof sandwich panels.



Figure 1. Standard arrangement of wall sandwich panels

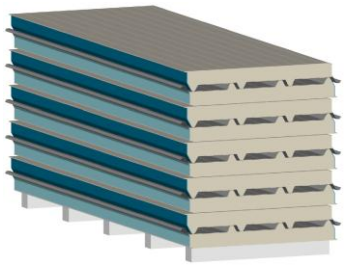


Figure 2. Standard arrangement of roof sandwich panels

Detailed arrangement of panels in stack, according to joint type and sandwich panel core, is given in Table 1.

Table 1. Detailed arrangement of panels in stack.

NAME OF PANEL	Wall panels[1]		Roof panels[1]
	ALL PANELS ARE ARRANGED WITH FAÇADE SIDE FACING UPWARDS	EXCEPT FOR THE FIRST PANEL FROM THE TOP, ALL PANELS ARE ARRANGED WITH FAÇADE SIDE FACING UPWARDS	THE FIRST LOWER PANEL IS ARRANGED WITH TRAPEZOIDAL SIDE FACING UPWARDS, THE NEXT DOWNWARDS AND ALTERNATELY UNTIL THE FINAL UPPER PANEL WHICH IS REVERSED WITH TRAPEZOIDAL SIDE FACING DOWNWARDS
PW PIR-S[2]	x		
PW PIR-S LITE[2]	x		
PW PIR-CH	x		
PW PIR-SU		x	
PW PIR-D			x
PW PIR-D LITE			x
PWW-S	x		
PWW-S LITE	x		
PWW-SU		x	
PWW-D			x
PWS-S	x		
PWS-D			x

[1)] - *optionally, at the customer's request and subject to prior agreement with the manufacturer, sandwich panels, specifically roof sandwich panels, can be packed using non-standard methods; for example, all panels may be oriented with their profiles (ribs) facing either downward or upward, with the exception of the top panel, which is always positioned with its trapezoidal profiles facing downward.*

[2)] - *sandwich panels with polyurethane core PW PIR (with visible joint), on side edges have a protective tape with arrow-shaped marks. Arrowhead indicates the façade (external) side of the panel which has decorative coating. Please note that when installing the panels, the arrows on their edges should face one direction.*

The Manufacturer stipulates that Customer purchases custom-packaged panels on own responsibility and has no right to claim against the Manufacturer.

2. Panel assembly

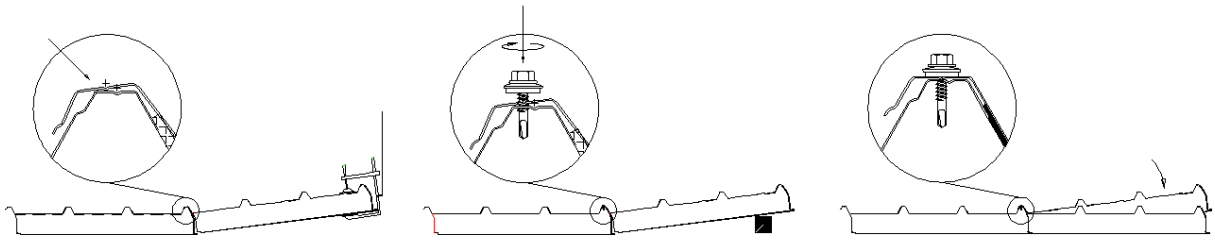
If it is required to use suction cups for transportation of panels, a test for lifting with vacuum device should be performed. Thus, please follow the manufacturer's guidelines, i.e. a previously lifted panel should not be installed on the structure, but placed on a stable ground, a then by releasing the vacuum device the panels should be inspected. If apparent marks are found in points where suction cups were applied, it is unacceptable to continue with installation, and contact with the supplier of suction cups is required. Installation of panels with use of vacuum device is carried out under the sole responsibility of the Buyer.

The insulation panels are formed in the production plant in concrete sizes. If there is a necessity to cut them at the construction site, it can be done using fine-toothed saws. Flashing can be done using hand scissors.
You must not use angle grinders or other tools which produce high temperature during cutting, as they may damage the organic coating protecting metal sheet from corrosion. Sandwich panels have to be assembled to the foundation soil using appropriate connectors or screws, in accordance with Paneltech Technical Catalogues. Connectors should be fitted using specialist power tools.Drill-drivers have to be equipped with appropriate heads to screw the connectors of required lengths, and with a mechanical stop to ensure appropriate fitting depth.

Thanks to this the assembly can be performed correctly, which includes: perpendicular positioning of the connector against the panel, minimum risk of damaging the panel surface and joint sealing. When assembling wall panels, it is recommended to position the panel appropriately in its place of destination, and after fitting panels one next to the other, they have to be assembled using connectors.The correctness of panel positioning is checked with the level and devices used to measure length and dilation.It is necessary to check both vertical and horizontal positioning,In both planes.

The universal tolerance of connector dilation in case of wall panels is assumed to be the basic value $\Delta C = 3$ mm, with tolerance of +2/-2 mm. The mandatory condition is to ensure contact in the insulating core. The above values of connector dilation are determined in accordance with the standard PN-EN 15254-5. In order to meet the above tolerance intervals, laps made of artificial materials are used, or additional self-adhesive flexible seals.Controlling the serviceability limit state ensures correct functioning of sandwich panels under the influence ofoperational loads.Detailed recommendations concerning the assembly of panels with mineral wool or polystyrene foam core were included in the product catalogues.It is important to assemble wall sandwich panels with mineral wool or polystyrene foam core, maintaining appropriate connector dilation tolerance intervals. It is also significant to ensure that the metal cladding does not overlap at the panel-panel joint for less than 10 mm.
When assembling sandwich panels, pay attention to the way insulating cores are connected, to ensure the correct air and water tightness. Screw the first panel to the supports, and then make an overlap on its protuberance, using a second panel. Screw in both using a bolt. Make sure the bolt passes through the overlap protuberance and through the protuberance notch. Only then lower the second panel on the first panel and screw it to the supports. To even out the pressure between the panels, use special webbing straps with buckles, which will be installed on both ends of the panel. Continue the process of gradual installation of panels with overlaps, screwing overlaps to the protuberance, and the lowering the screwing panels to supports for the entire roof.

The graphical illustration of the assembly of PUR/PIR roof panels with a core, was presented in the diagram below.



3. Sealing the connectors

The basic kinds of seals for panels with flashings and connections between the panels are:

a) sealing compounds (butyl or silicone mass) counteracting air infiltration, used to fill the closed joints between click lock claddings,
b) sealing compounds made of plastics (silicone or polyurethane) used to seal the joint at the panel connection from the side of room interiors,
c) sealing compounds made of polyurethane foam used to fill in free spaces,
d) sealing compounds made of silicone mass used to seal flashings.

The above sealing compounds are required depending on the kind of the facility.

4. How to handle protective foil

Metal sheet claddings of sandwich panels are protected against damage and soiling with protective foil.It is recommended to remove the foil from the panel surface and from flashing during the assembly.The foil has to be removed from the sheet after 14 days from the panel reception data the latest, because under the impact of atmospheric conditions it can change its mechanical properties, which will make its future removal difficult.The foil should be removed from the cladding (panel) surface, when its temperature exceeds +5 Cºand does not exceed 60 Cº .

5. How to use colourful panels

Sandwich panels are available in the following colour groups:
Group 1 - very pale colours,
Group 2 - pale colours,
Group 3 - dark colours.
It is recommended to choose panels in very pale and pale colours (Groups 1 and 2).

Table 2. Table of colours for sandwich panels surfaces.

COLOUR GROUP / SURFACE SELF-HEATING TEMPERATURE IN THE SUMMER	COLOUR NO. ACC. TO THE RAL SYSTEM	LIGHT REFLECTANCE GRADIENT BY THE PANEL SURFACE RG [%]
1 - very pale colours, temperature up to 55 ºC	1015, 1018, 7035, 9001, 9002, 9010	75 – 90
2 - pale colours, temperature up to 65 ºC	1002, 1007, 1021, 2008, 2011, 5012, 6018, 7040, 9006	40 - 74
3 - dark colours, temperature up to 80 ºC	3000, 3005, 3011, 3016, 5010, 5011, 6003, 6005, 6011, 6029, 7016, 7024, 8004, 8017, 9005, 9007	8 - 39

Colours not included in the above table should be classified to the appropriate category based on the value of radiation reflectance gradient.

It is recommended to use dark panels only in single-span systems, installing them at temperatures above 5°C, in a way that enables thermal expansion. It is important to consider the maximum panel lengths depending on the colour, as shown in the table below. Using dark sandwich panels without observing the above-mentioned recommendations may cause deformations and damage to the panels. The manufacturer reserves that the client purchases the panels in these colours at its own responsibility and does not have the right to any claims against the manufacturer.

Table 3. Table of recommended panel lengths, depending on the color of the facing and the technological possibilities

PANEL TYPE	PANEL THICKNESS [mm]	GROUP I – very bright [m]	GROUP II – bright [m]	GROUP III – dark [m]
PW PIR-S/PW PIR-S lite	40 ÷ 60	2÷10	2÷9	2÷7
PW PIR-S/PW PIR-S lite	80 ÷ 120	2÷15,8	2÷9	2÷7
PW PIR-SU	60	2÷10	2÷9	2÷7
PW PIR-SU	80 ÷ 120	2÷15,8	2÷9	2÷7
PW PIR-CH	120 ÷ 200	2÷15,8	2÷9	2÷7
PW PUR-D/PW PIR-D/ PW PIR-D lite	40 ÷ 160	2÷16	2÷9	2÷7
PWS-S	50 ÷ 200	2÷10	2÷7	2÷7
PWS-D	80 ÷ 200	2÷10	2÷7	2÷7
PWW-S/PWW-S LITE	60 ÷ 160	2÷10	2÷7	2÷7

PWW-S/PWW-S LITE	180 ÷ 200	2÷7	2÷7	2÷7
PWW-SU	60 ÷ 100	2÷10	2÷7	2÷7
PWW-SU	180 ÷ 200	2÷7	2÷7	2÷7
PWW-D	80 ÷ 160	2÷10	2÷7	2÷7
PWW-D	180 ÷ 200	2÷7	2÷7	2÷7

When ordering panels in metallic colours, it is recommended to divide them depending on the type of facade surface.It has been observed that turning an element with metallic cladding by 180 degrees results in significant change of the surface colour.It is recommended to check during the assembly the colour and specular gloss of panels and the condition of the metal sheet surface on the facade, with the following frequency: we check very fifth element from approx. 25 m distance. It can prevent problems with the appearance and colour of the facade.
In case of a special order performance, the customer has to submit the so called reference sample, at least (150x100) mm large, in order to determine the colours of the sandwich panels cladding.
The manufacturer sends the metal sheet sample to the contractor in order to prepare the appropriate colour, similar to the sample submitted by the ordering party.
Once the reference sample is delivered by the manufacturer, the sample is approved by both parties and confirmed with their signatures. The sample becomes an annex to the agreement and contains the following information:

- Name of the manufacturer of the steel band continuously coated with colourful coating material,
- Coating colour - its written description and code,
- Specular gloss unit,
- Coating symbol and thickness in µm.

6. Dimensional tolerances

The tolerances have an impact on the resistance of the sandwich panels and safety of their usage.The tolerances presented in the table are the maximum acceptable values.The measurements of: profile pitch, crests, troughs, roofing width, dilation from the flatness, have all to be taken from the distance of 200 mm from the edge of the sandwich panel.
During the measurements, the sandwich panel has to be placed on at least three supports, located on a stiff and flat surface.The tolerances presented below refer to the measurements of sandwich panels in stable state acquired in the temperature of approx. 20°C. In other cases the measurements have to be corrected by the appropriate safety coefficient, taking into consideration: temperature fluctuations from the reference temperature of 20°C, local stresses related to the assembly process, thermal expansion and shrinkage of claddings causing thermal deflections, axial motion at the edges of assembled panels, etc.

Table 4.Tolerances of dimensions and shapes of Paneltech sandwich panels

THICKNESS	For thickness not larger than or equal to 100 mm Tolerance ±2 mm	For thickness larger than 100 mm Tolerance ± 2%	
ROOFING WIDTH	For all profilesTolerance ± 2 mm		
LENGTH	For length not larger than or equal to 3000 mm, Tolerance ± 5 mm	For length larger than 3000 mm, Tolerance ± 10 mm	
DILATION FROM FLATNESS *	For the measurement section 200 mm, Tolerance 0.6 mm	For measurement section 400 mm, Tolerance 1 mm	For measurement section 700 mm, Tolerance 1.5 mm
DILATION FROM RECTANGULARITY	Tolerance, not larger than 0.6% of the nominal roofing width		
DILATION FROM STRAIGHTNESS	Tolerance, not larger than 1 mm/1 m, but not exceeding 5 mm		
METAL PROFILE HEIGHT	For profile height from 5 to 50 mm, tolerance ± 1 mm		
STIFFENING OF LIGHTLY	For depths of stiffening	For depths of stiffening	For depths of stiffening

PROFILED CLADDING HEIGHT	smaller than 1 mm tolerance ±30 %	from 1 to 3 mm tolerance ±0,3 mm	from 3 to 5 mm tolerance ±10 %
CURVE ALONG THE PANEL	Tolerance: not more than 2 mm per one meter of length, but not more than 10 mm for the whole panel		
CURVE ACROSS THE PANEL	Tolerance: not more than 8.5 mm per one meter of width when the profile depth equals h ≤ 10 mm	Tolerance: not more than 10 mm per one meter of width when the profile depth equals h > 10 mm	
PROFILE MODULE	For standard profile tolerance ±2 mm		
WIDTH OF RIB AND TROUGH	Rib tolerance ± 1 mm	Trough tolerance ± 2 mm	

** - See 'Paneltech General Warranty Terms', chapter 'Disclaimers and limitations of Manufacturer's liability', point 8.*

7. Other information

The following additional explanations are hereby introduced:

a) the minimum roof slope equals 5% for roofs made of continuous panels (without any joints at their length),
b) the minimum roof slope equals 9% for roofs made of panels connected with each other,
c) it is recommended to assemble panels at greater roof slopes than indicated above. In case of the minimum slopes, please contact the Manufacturer.
d) The minimum widths of panel supports.

Table 5. Recommended minimum width of panel supports, consistent with tables of load and installation possibilities SU

PANEL TYPE	WIDTH OF THE EDGE SUPPORT [MM]	WIDTH OF THE MIDDLE SUPPORT [MM]
PWW-S, PWW-SU, PWW-S LITE, PWS-S	50	100
PWW-D, PWS-D	60	80
PW PIR-S/S LITE, PW PIR-CH, PW PIR-D/ D LITE, PW PUR-D	40	60
PW PIR-SU	50	60

e) Designer of a civil structure is responsible for application of specific technical solutions for light cladding made from sandwich panels and designing of cladding and its mounting in accordance with current regulations in force,
f) The maximum spacing of the load-bearing structure (supports) of sandwich panels determined on the basis of data from the accredited fire testing laboratories.The load-bearing structure of the minimum R flame resistance class (the minute R value not lower than the fire resistance value of the barrier). Assembly should be performed in compliance with the other fire classification conditions,

Table 6. Fire resistance and maximum spacing of bearing structure of panels

PANEL TYPE	PANEL THICKNESS [MM]	FIRE RESISTANCE PARAMETER	MAXIMUM SUPPORT SPACING / ARRANGEMENT OF EXTERNAL WALL PANELS
PWW-S	80 ÷ 200	EI 30 (o↔i)	7,5 m / vertical
PWW-S	100 ÷ 200	EI 60 (o↔i)	7,5 m / horizontal and 6,0 m / vertical
PWW-S	120 ÷ 200	EI 180 (o↔i)	4,0 m / vertical
PWW-S	120 ÷ 200	EI 120 (o↔i)	7,5 m / vertical
PWW-S	120 ÷ 200	EI 120 (o↔i)	7,5 m / horizontal
PWW-S	180 ÷ 200	EI 240 (o↔i)	4,0 m / horizontal
PWW-S	180 ÷ 200	EI 180 (o↔i)	7,5 m / horizontal
PWW-S LITE	100 ÷ 200	EI 60 (o↔i)	7,5 m / horizontal

PWW-S LITE	140 ÷ 200	EI 60 (o↔i)	7,5 m / vertical
PWW-SU	100	EI 30 (o↔i)	4,0 m / vertical
PWW-SU	120 ÷ 200	EI 60 (o↔i)	4,0 m / vertical
PWW-D[1]	100 ÷ 200	REI 120	0°÷15°; external facing 0.5 mm/internal facing 0.5 mm
PW PIR-S	80 ÷ 100	EI 15 (o↔i)	4,0 m / horizontal
PW PIR-S	120	EI 30 (o↔i)	4,0 m / horizontal
PW PIR-S	100 ÷ 120	EI 30 (o↔i)	3,0 m / vertical
PW PIR-S LITE	100 ÷ 120	EI 15 (o↔i)	4,0 m / horizontal
PW PIR-CH	120 ÷ 200	EI 30 (o↔i)	4,0 m / horizontal i 4,0 m / vertical
PW PIR-SU	100 ÷ 120	EI 15 (o↔i)	4,0 m / horizontal i 4,0 m / vertical
PW PIR-D[1]	100 ÷ 160	REI 30	0°÷25°
PW PIR-D LITE[1]	100 ÷ 160	REI 15	0°÷15°; external facing 0.5 mm/internal facing 0.4 mm
PW PUR-D[1]	100 ÷ 160	RE 30	0°÷15°; external facing 0.5 mm/internal facing 0.4 mm

[1)] *upper panel joint on ridge must be stitched with self-tapping screws ø 4.8 mm every 300 mm; maximum bending moment and normal force cannot be higher than the ones resulting from fire resistance testing; panels must be installed in two- or multi-span arrangement.*

g) The assembly of colourful panels should be performed in such a way, so that panels of identical colours and specular gloss are used on the given surface / facade area.Due to this it is recommended to determine the colour, colour difference and specular gloss of the panels for different facades before placing an order, and to submit the colour reference sample.
h) The assembly works have to be performed in accordance with the guidelines of the Building Research Institute 'Technical conditions of construction and commissioning'.Earthworks and constructional worksInsulated panel roofing made of sandwich panels.
i) Technical solutions not listed above are acceptable, consistent with good construction practices.
j) For sandwich panels with mineral wool core it is recommended:
- to use 0.6 mm outer facings
- to use external profilation: MICROWAVE (MF) or MICROLINEAR (ML).

If outer facings with external profilation: Linear (L) and Smooth (G) are used, and outer facings with a thickness of less than 0.6 mm are used, light reflections are likely, which are particularly noticeable on lamella joints. This only affects a visual effect of the purchased product being a result of the production technology used, however it has no effect on deterioration of "the declared performance" of the product. It is assumed that slight microwaves on the surface can be classified as non-conforming with surface flatness requirements, if they do not follow dimensional tolerances as specified in EN 14509, Appendix D. When sandwich panels with mineral wool core in combinations of profilation and thickness of facings other than the above, are purchased, the manufacturer will not accept any complaints filed.