Sandwich panel SPA
Product description

Ruukki offers a sandwich panel system that combines an attractive appearance with excellent thermal insulation and fire-resistance. The panels are of a lightweight, prefabricated design, which means that construction is faster and more cost-effective. We can work as a partner in a project from the earliest stages of design through to installation, as required. Our tried and tested structural solutions, coupled with the support of our experts, can speed up design and construction. The panel system is used in façades, partition walls, ceilings, and compartmentalising structures.

Product applications
- Air-conditioning and ventilation structures
- Agricultural buildings
- Construction for the food industry and clean rooms
- Logistics centres
- Power plants
- Office and commercial buildings
- Sports facilities
• **Structure**

The sandwich panel SPA family uses profiled sheet metal with a mineral wool lamella core. The core and the panel facings are joined together with a solid adhesive bond, and the panels are connected to each other with tongue- and groove joints in both the sheets and the core.

In sandwich panels, the fibres of the mineral wool lamellas are oriented edgewise along the length of the panel, so most fibres are perpendicular to the panel facings. The mineral wool lamellas are oriented in a tiered arrangement, with the panel deriving its load-bearing capacity from the composite structure.

• **Thickness classes and panel types**

The panels are available in seven thickness classes: 100, 125, 150, 175, 200, and 230 mm. Four types of panel are available, categorised by application as follows: ‘E’ for external walls, ‘I’ for internal walls, ‘F’ for Fire structures, and ‘S’ for structures requiring special strength. The product codes may also include other designations, at the end, such as ‘ENERGY’ or ‘LIFE’, these refer to airtight energy panels and sustainable life panels, respectively.

Example panel codes:
1. Sandwich panel SPA175E (is an external-wall panel with a thickness of 175 mm),
2. Sandwich panel SPA100I (is a panel for internal walls that has a thickness of 100 mm),
3. Sandwich panel SPA150F (is for structures that require special fire-resistance. It is 50 mm thick)
4. Sandwich panel SPA200S (is a 200-millimetre-thick panel for structures that need special strength - e.g. compartment-structure ceiling or a long span / heavy wind load on external walls)
• **Surface materials**
  The facings of the panels are of galvanised sheet metal with a coloured coating. The external surface is usually Hiarc-coated steel, and the interior-facing surface is of polyester-coated steel.

  Other possible materials are stainless steel, acid-resistant steel, and steel with a food-safe laminate.

  For more information on the materials available, please visit www.ruukki.com/panels.

• **Surface profiling (1/2)**
  Six alternative types of surface profiling are available for the panels. These provide the panels with an attractive finish that matches the structure’s architectural choices.

  The profiles available for outer surfaces are R200, R600, M15, and F (flat). For inner surfaces, R200 and F are suitable profiles. For other purposes, the profiles R150 and L50 are available:
  • R150 is a profile that has shadow grooves with 150 mm spacing. In all, there are seven grooves in the panel surface.
  • The R200 profile has shadow grooves with 200 mm spacing. In total, there are five grooves on the panel surface.
  • R600 has shadow grooves with 600 mm spacing. There is one groove on the panel’s surface.
  • The L50 profile type has grooves with 50 mm spacing. Each of the grooves is 10 mm wide. The grooving is in the central part of the panel, such that the outermost grooves are 150 mm from the edges of the panel.
  • M15 is a profile that has a microprofiled surface. The microprofiling has 15 mm spacing.
  • F is a profile with a flat surface.

  All of the latter types of profiling are available for both surfaces of the panel.

  The panel order must specify the profile type for both the outer and the inner surfaces.

  All panels with steel sheet surfaces use the same design values for strength, regardless of the surface profiling.
• Surface profilings (2/2)

Picture 5. Surface profiling R600

Picture 6. Surface profiling L50

Picture 7. Surface profiling M15

Picture 8. Surface profiling F

Sandwich panel SPA. Product description
### Product properties

**Table 1. Product properties of Sandwich panel SPA**

<table>
<thead>
<tr>
<th>Primary application</th>
<th>Thickness class (mm)</th>
<th>Panel type</th>
<th>U-value (W/(m²K))</th>
<th>Weight (kg/eff.m²)</th>
<th>Airborne sound insulation Rw (dB)</th>
<th>Nominal thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External walls</strong></td>
<td>100</td>
<td>SPA E</td>
<td>0.40</td>
<td>19.0</td>
<td>29</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>SPA E</td>
<td>0.31</td>
<td>21.3</td>
<td>30</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>SPA E</td>
<td>0.26</td>
<td>23.6</td>
<td>30</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>SPA E LIFE</td>
<td>0.25</td>
<td>19.5</td>
<td>29</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>SPA E</td>
<td>0.22</td>
<td>25.5</td>
<td>31</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>SPA E</td>
<td>0.20</td>
<td>27.5</td>
<td>31</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>SPA E LIFE</td>
<td>0.19</td>
<td>22.2</td>
<td>29</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>230</td>
<td>SPA E</td>
<td>0.17</td>
<td>30.4</td>
<td>31</td>
<td>232</td>
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<tr>
<td></td>
<td>230</td>
<td>SPA E LIFE</td>
<td>0.16</td>
<td>24.2</td>
<td>29</td>
<td>232</td>
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<tr>
<td><strong>Internal walls</strong></td>
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<td>0.40</td>
<td>19.0</td>
<td>29</td>
<td>97</td>
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<tr>
<td></td>
<td>125</td>
<td>SPA I</td>
<td>0.31</td>
<td>21.3</td>
<td>30</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>SPA I</td>
<td>0.26</td>
<td>23.6</td>
<td>30</td>
<td>152</td>
</tr>
<tr>
<td><strong>Fire structures</strong></td>
<td>100</td>
<td>SPA F</td>
<td>0.44</td>
<td>22.3</td>
<td>30</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>SPA F</td>
<td>0.35</td>
<td>25.1</td>
<td>31</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>SPA F</td>
<td>0.29</td>
<td>28.2</td>
<td>31</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>SPA F</td>
<td>0.25</td>
<td>30.7</td>
<td>31</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>SPA F</td>
<td>0.22</td>
<td>33.5</td>
<td>31</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>230</td>
<td>SPA F</td>
<td>0.19</td>
<td>37.4</td>
<td>31</td>
<td>232</td>
</tr>
<tr>
<td><strong>Strong structures</strong>)</td>
<td>100</td>
<td>SPA S</td>
<td>0.44</td>
<td>22.3</td>
<td>30</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>SPA S</td>
<td>0.35</td>
<td>25.7</td>
<td>31</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>SPA S</td>
<td>0.29</td>
<td>28.9</td>
<td>31</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>SPA S</td>
<td>0.25</td>
<td>31.6</td>
<td>31</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>SPA S</td>
<td>0.22</td>
<td>34.5</td>
<td>31</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>230</td>
<td>SPA S</td>
<td>0.19</td>
<td>38.5</td>
<td>31</td>
<td>232</td>
</tr>
</tbody>
</table>
### Fire resistance properties and maximum spans

#### Table 2. Fire-resistance properties and maximum spans for fire-resistance of sandwich panel SPA walls

<table>
<thead>
<tr>
<th>Wall panel</th>
<th>Span (m) in installation orientation H / V (H = horizontal installation, V = vertical installation)</th>
<th>Fire resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EI 30</td>
<td>EI 60</td>
</tr>
<tr>
<td>SPA100E</td>
<td>9.3 / 11.9</td>
<td>9.3 / 11.9</td>
</tr>
<tr>
<td>SPA125E</td>
<td>12 / 12</td>
<td>11.1 / 12</td>
</tr>
<tr>
<td>SPA150E</td>
<td>12 / 12</td>
<td>12 / 10.9</td>
</tr>
<tr>
<td>SPA150E LIFE</td>
<td>12 / 4</td>
<td>12 / 4</td>
</tr>
<tr>
<td>SPA175E</td>
<td>12 / 12</td>
<td>12 / 10.9</td>
</tr>
<tr>
<td>SPA200E</td>
<td>12 / 12</td>
<td>12 / 10.9</td>
</tr>
<tr>
<td>SPA200E LIFE</td>
<td>12 / 4</td>
<td>12 / 4</td>
</tr>
<tr>
<td>SPA230E</td>
<td>12 / 12</td>
<td>12 / 10.9</td>
</tr>
<tr>
<td>SPA230E LIFE</td>
<td>12 / 4</td>
<td>12 / 4</td>
</tr>
<tr>
<td>SPA100I</td>
<td>9.3 / 11.9</td>
<td>9.3 / 11.9</td>
</tr>
<tr>
<td>SPA125I</td>
<td>12 / 12</td>
<td>11.1 / 12</td>
</tr>
<tr>
<td>SPA150I</td>
<td>12 / 12</td>
<td>12 / 10.9</td>
</tr>
<tr>
<td>SPA100F</td>
<td>12 / 12</td>
<td>11.9 / 11.5</td>
</tr>
<tr>
<td>SPA125F</td>
<td>12 / 12</td>
<td>12 / 12</td>
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<tr>
<td>SPA150F</td>
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<td>12 / 11.5</td>
</tr>
<tr>
<td>SPA175F</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA200F</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA230F</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA100S</td>
<td>12 / 12</td>
<td>11.9 / 11.5</td>
</tr>
<tr>
<td>SPA125S</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA150S</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA175S</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA200S</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
<tr>
<td>SPA230S</td>
<td>12 / 12</td>
<td>12 / 12</td>
</tr>
</tbody>
</table>

The fire-related technical properties of the panels have been tested in order to ensure appropriate fire-resistance and other properties of the materials. The fire class of the panels is A2-s1, d0 (coatings. Hiarc and polyester).

In compartmentalising structures, the panel and its fastenings need to be dimensioned for at least variable 0.3 kN/m² load. In the event of fire, the panels act as a catenary structure. The fastening and dimensioning are to be done in accordance with the instructions provided. If the applications have specific fire-resistance requirements, the maximum spans allowed shall be no more than those in the table above.

EI-M classified fire walls up to EI-M120 are available. Please contact Ruukki technical support for more detailed information.
Fire-resistance properties of a compartmentalising ceiling
Panel type SPA S (for strong-structure applications) includes a fire-resistant solution for compartment-type ceilings.

Table 3. Sandwich panel SPA S ceiling fire resistance values & maximum span lengths (m)

<table>
<thead>
<tr>
<th>Panel type / Fire resistance</th>
<th>SPA100S</th>
<th>SPA125S</th>
<th>SPA150S</th>
<th>SPA175S</th>
<th>SPA200S</th>
<th>SPA230S</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI60</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>EI90</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>EI120</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Picture 9. Fastening and sealing of the joints between panels in compartmenting ceiling

The fire-related technical properties of the panels have been tested to ensure appropriate fire-resistance and other properties for the materials. The fire class of the panels is A2-s1, d0 (HIARC and polyester coatings and stainless steel).

In the event of fire, the panels act as a catenary structure. Details and fastenings with protection shall be designed such that in fire conditions the fastenings of the upper or lower facing are able to withstand the loads affecting the entire panel structure. The fastening and dimensioning shall be done in accordance with instructions.

Because of structural requirements for vapour- and air-tightness, seals must be used for tongue- and groove-joints on both the upper and lower facings.

For fire-resistance reasons, the joints of the upper facings must be fastened in place with small screws (min. diameter 4.2 mm) at intervals of no more than 500 mm.
• **Dimensioning**

The panel’s location in the building must be taken into account in the panel strength dimensioning, and the required basic data of the construction site must be clarified. Special attention has to be paid to loads in edge zones. The loads borne by the corners, eaves, and areas around openings are usually higher, which makes it particularly important to dimension the panels and their fastenings correctly. In areas where there is a high risk of damage to the surfaces (from traffic, accumulating snow, etc.), a high plinth and a separate support at the edges of the openings should be used.

In the design of the panel structure, the following requirements, among others, must be considered:

- Loads
- Sufficient frame and support structures
- Air- and vapour-tightness
- Thermal insulation
- Fire-resistance
- Sound-insulation
- Appropriate fastenings and openings

The strength and rigidity of the panels permit rather long spans. The panels are usually dimensioned as single-span structures. For design in basic cases of single-span sandwich panel SPA wall structures, dimensioning curves have been created (see paragraph Dimensioning curves).

Particular attention must be paid to the deflection arising in connection with wind loads and temperature differences and to ensuring that all connections function properly.

**Dimensioning panel fasteners**

The most common fastening method is fixing through panel ends back to frame structure (see picture 10). The correct use of high-quality fasteners in fastening of panels ensures long term performance and corrosion-resistance. The fasteners must be chosen according to the requirements of the service conditions, e.g. loads and aggressiveness of the end use environment. In aggressive or high humidity environments the fasteners of panels shall always be made of stainless steel material. We recommend using stainless steel fasteners in all cases. Over-tightening of fasteners shall be avoided to ensure that the fastening maintains its strength and that the panel is not damaged under the fastener. The fastener may not be punched through the panel surface during installation. For exterior wall structures, we recommend the use of fasteners provided with seals.

Number of fasteners used in fixings through panel is dependent on the load exposed to the panel, on the wind suction load, on the weight and width of the panel, span length and on the possible other loads exposing to the panel. Fixings of panels are to be designed both for wind suction and shear loads. Basis of the design is the design value of support reaction on the support of the panel. Minimum number of fasteners per one end of the panel is two. Fixings shall be placed on a distance of at least 30 mm from edges of panel. Also support width needs to be considered, the minimum support width is 50mm/panel end.

Number of fasteners required for fixing panel is calculated as follows: \[ n \geq \frac{b \cdot F_d}{(F_{Rk} / \gamma_m)} \]

In addition the following must be checked: Resistance of fastener and tensile and shear resistance of fastener from the sub-structure.

In the above sentence

- \( n \) = number of fasteners (pcs / panel end)
- \( b \) = width of panel 1,2 (m)
- \( F_d \) = design value of support reaction (kN/m)
- \( F_{Rk} \) = characteristic (declared) resistance value of fixing according to Table 1 (kN)
- \( \gamma_m \) = material safety factor 1,33

<table>
<thead>
<tr>
<th>Fastener type</th>
<th>Edge distance [mm]</th>
<th>Characteristic pull-through resistance ( F_{RM} ) [kN]</th>
<th>Characteristic shear resistance ( F_{RA} ) [kN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-drilling screw Ø ≥ 5.5mm &amp; spike Ø ≥ 6.3mm, washer diameter 19mm</td>
<td>30</td>
<td>2.5</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>3.0</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>&gt; 100</td>
<td>3.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Self-drilling screw Ø ≥ 5.5mm &amp; spike Ø ≥ 6.3mm, washer diameter 29mm</td>
<td>30</td>
<td>3.2</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>3.9</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>&gt; 100</td>
<td>3.9</td>
<td>2.7</td>
</tr>
<tr>
<td>Self-drilling screw Ø ≥ 5.5mm &amp; spike Ø ≥ 6.3mm, countersink washer (40-9)</td>
<td>35</td>
<td>2.8</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**Sandwich panel SPA. Product description**

07.06.2016
1) 30 mm and 35 mm are the minimum allowed edge distances.
2) Thickness of outer steel facing
3) Thickness of inner steel facing
4) Resistance values for edge distances between 30 and 100 mm may be linearly interpolated. If edge distance is more than 100 mm, the resistance value for 100 mm edge distance is used.

![Principle drawing of fixing through panel to the frame structure and edge distance e.](image)

**Picture 10. Principle drawing of fixing through panel to the frame structure and edge distance e.**

Also load safety factors must be considered in dimensioning, which are 1.5 and 1.35 for pull-through (wind loads) and shear (weight) resistances accordingly. Fastener dimensioning can easily be done with Ruukki’s panel dimensioning program, Traypan.

**Windows and door openings**

Openings in panels (e.g. for windows and doors) weaken the panel strength pro-rata with the width of the opening compared to module width of the panel. For example, 400 mm high opening within 1200 mm high horizontally installed panel reduces the panel strength by 33% (400 mm/1200 mm). Dimensioning curves (see following pages) or Ruukki’s dimensioning program TrayPan can be used for calculating if the panel with cut-out is strong enough to carry the loads.

If the opening within a panel is bigger than its load bearing capacity, the loads from the penetrated panel will be transferred to adjacent panels over the tongue & groove joints. Therefore the adjacent panels have to be dimensioned against these increased loads. The load distribution factors can be seen from the picture 11. For example, if panels are exposed to wind load of 0.6kN/m², the adjacent panels to penetrated one have to be dimensioned against 1.35 x 0.6kN/m² and 1.15 x 0.6kN/m² loads.

**Partition walls**

The stress on partition wall panels is usually at its highest during construction. The recommended design surface pressure for the panel is at least 0.3 kN/m² (30 kg/m²). Partition wall panels can also be cladded with gypsum board and glass-fibre tissue or tiles. The designer must take into consideration the requirements imposed by the fastening and deflections of the surface structure.

**The dimensioning curves**

- The dimensioning curves have been calculated in accordance with the EN 14509 standard.
- For the wind-suction case, a temperature difference of 45 °C and for the wind-pressure case a temperature difference of 50 °C has been used for the thermal stress between internal and external surfaces.
- The deflection limits allowed are L/100 for external walls and L/150 for internal walls.
- The allowable loads presented presume that the fastenings are handled in accordance with instructions.
- The following widths of supporting surfaces are used in the dimensioning curves: 80 mm for SPA E, SPA E LIFE, SPA F, and SPA S, and 50 mm for SPA I.
- The loads shown in the curves are characteristic loads.
- The curves have been calculated with a load safety factor of 1.5, and material safety factors have been used in compliance with the standard EN 14509.
- If openings are found at the panel or it is exposed to additional loads, the permitted span must be reduced.
- For more detailed design calculations, please use Ruukki’s Traypan software.
- **NOTE:** If the panels in the dimensioning curves do not meet the load/span requirements, please contact Ruukki’s technical support staff for more detailed dimensioning analysis.
• Dimensioning curves for panels SPA E

Sandwich panel SPA E, SPA E ENERGY
WIND PRESSURE
FACINGS 0,60/0,50
SUPPORT WIDTH 80 mm

Sandwich panel SPA E, SPA E ENERGY
WIND SUCTION
FACINGS 0,60/0,50
• Dimensioning curves for panels SPA E LIFE

Sandwich panel SPA E LIFE, SPA E LIFE ENERGY
WIND PRESSURE
FACINGS 0,60/0,50
SUPPORT WIDTH 80 mm

Sandwich panel SPA E LIFE, SPA E LIFE ENERGY
WIND SUCTION
FACINGS 0,60/0,50
• Dimensioning curves for panels SPA I

NOTE: Please use a minimum load of 0.3 kN/m² for inner wall panels even if they are not exposed to wind loads. This ensures that the panels can withstand loads caused by handling and installation.
Dimensioning curves for panels SPA F
• Dimensioning curves for panels SPA S

Sandwich panel SPA S, SPA S ENERGY
WIND PRESSURE
FACINGS 0,60/0,50
SUPPORT WIDTH 80 mm

Sandwich panel SPA S, SPA S ENERGY
WIND SUCTION
FACINGS 0,60/0,50
**Tongue- and groove joint seals**
A tongue- and groove joint seal has been applied to the panel’s groove(s) at the factory. In external wall panels, the seal is used at the joint of the panel’s internal facing in the standard delivery, because the external wall’s inner surface must be vapour-tight. For severe climate conditions, in horizontal installations in high-rise buildings, and in all vertical and diagonal installations, tongue- and groove joint seals must be used on both the inner and outer faces of the panel. The panel order must specify the tongue- and groove joint seal to be applied for the external panel joint.

**The package**
The panels are usually packed on wooden pallets and wrapped in plastic. If there are panels of different lengths in the package, the shorter ones are packed on top of the longer ones, to prevent transport-related damage. To simplify installation, all panels meant for a certain span are delivered in the same package. If panels of a given span are ordered in different colours, these are packed in separate packages.

The packing solutions available depend on case-specific needs. The packaging solutions are dependent also on delivery area.

In planning of the packages, it is important to consider the type of transport equipment to be used for ensuring that the packages are not too high to fit into the vehicle. The maximum dimensions for a single package are: length 13.55 m x width 1.23 m x height 1.32 m.

*Picture 12. Standard package*
• **Standard accessories**
  Standard and order-specific accessories and tools necessary for the installation are also available with the panel delivery.

  Typical standard accessories:
  - Fasteners (panel fasteners for various frame materials, flashing fasteners, and fastening plates for attachment with threaded sleeves)
  - Sealing materials (plinth seals, sealing strips for frame structures and flashings, sealant mastics, butyl joint seals, insulation, and fire-protection wools)
  - Studs (U-plinth purlins and studs for window and door frames),
  - Flashings (plinth flashings, vertical joint flashings, and corner flashings)

  For more information on accessories, see the “Sandwich panel SPA accessory product description” material.

• **Strip windows**
  Strip windows are available as part of the panel delivery. A well-functioning frame structure is achieved with aluminium profiles joined by an insulation strip. Weather-resistant EPDM rubber and mastic sealant are used as external sealants. The frame is powder painted in the required colour.

  The strip window is rapidly installed as a prefabricated element in conjunction with the panel installation. Installation does not require any special tools or methods.

• **Corner panels**
  Separate corner panels can be manufactured for the external corners of the buildings. These are available for all panel types and thicknesses, with all types of surface profiling. The standard bending angle is 90°.

  Minimum and maximum dimensions:
  SPA100–SPA200: A / B outer dimension min. = 300 mm, max. = 2 400 mm
  SPA230–SPA260: A / B outer dimension min. = 350 mm, max. = 2 400 mm

  Corner panels for internal corners of the buildings and panels bent at different angles must always be agreed upon separately.
• **Handling**
  The panels must be handled properly, to prevent damage, and they must be protected against moisture and impact damage. Cutting and any other machining of the panels must be performed with appropriate tools, for guaranteed work safety and a fault-free result. For example, cutting them with a grinding machine is strictly forbidden, as it would damage the coated surface of the panel.

  For lifting and handling of single panels, a panel-lifting tool hired out by Ruukki must be used (a tongue-joint lifting tool or vacuum lifting tool).

  The protective film of the panel must be removed as soon as possible after installation.

• **Sealing of the structure**
  It is highly important to seal the panel structures thoroughly from both the internal and the external side, in order to ensure proper air- and vapour-tightness and a long service life for the structure. Sealing is typically performed with sealing strips and sealant mastics.

• **Identification**
  Information such as panel type, time of manufacture, and order number is marked on the panel's tongue during manufacture. Panels can also be factory-marked with a code specified by the customer, if necessary. With this code, individual panels can be associated with a specific position in the building.

  Printed material containing package-specific information such as the contents, weight, and handling instructions is attached to the package.

  The panel delivery also contains installation and maintenance instructions for the panels.

• **Installation and maintenance**
  For more information on installation and maintenance, see the document Sandwich panel SPA installation and maintenance instructions. Further information on installation can be found in the material Sandwich panel SPA detail drawings.

• **Conformity with standards and quality control**
  The panels comply with the requirements set in the EN 14509 standard.

  The panels are subjected to external quality control and to Ruukki’s internal quality-control procedures.