

## National technical approval / General construction technique permit

### Zulassungsstelle für Bauprodukte und Bauarten Bautechnisches Prüfamnt

Eine vom Bund und den Ländern  
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Date: 27 Feb 2020      Reference: I 65-1.72.1-4/19

**Number:**  
**Z-72.1-1**

**Validity**  
from: **12 December 2019**  
to: **12 December 2024**

**Applicant:**

**RENOLIT Belgium N.V.**  
Industriepark de Bruwaan 43  
9700 OUDENAARDE  
BELGIUM

**Subject of decision:**

**RENOLIT ALKORSOLAR solar panel fastening system for use on ALKORPLAN F 35176  
waterproof roofing membranes**

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*)/general construction technique permit (*allgemeine Bauartgenehmigung*). This decision contains eleven pages and seven annexes.  
The subject of approval was first granted a national technical approval on 11 December 2014.

Translation authorised by DIBt

DIBt

## I GENERAL PROVISIONS

- 1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.
- 3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Without prejudice to further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer of the subject concerned shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.
- 6 This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.
- 8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

## II SPECIAL PROVISIONS

### 1 Subject concerned and field of use and application

#### 1.1 Subject of approval and field of use

(1) The subject of the national technical approval is the 'RENOLIT ALKORSOLAR fastening system' (hereinafter referred to as the 'fastening system') consisting of:

- aluminium insert profiles (hereinafter referred to as 'aluminium inserts')
- ALKORPLAN extruded plastic profiles (hereinafter referred to as 'extruded profiles') and
- EJOT JT3-2-6.0 self-drilling screws (fastening screw)

(2) The system design is shown in Annex 1.

#### 1.2 Subject of permit and field of application

(1) The subject of the general construction technique permit is the planning, design and execution of the solar panel fastening system.

(2) The fastening system shall exclusively be used on the mechanically fastened ALKORPLAN F 35176 waterproof roofing membrane (hereinafter referred to as the 'waterproof roofing membrane').

(3) For application of the fastening system, the substrate (roof structure) shall meet certain requirements, e.g. regarding roof surface and slope, type and spacing of the waterproof roofing membrane fasteners, type and geometry of the insulation, in accordance with this decision.

(4) The fastening system shall only be used for solar panels installed parallel to the roof surface.

(5) The fastening system transfers wind uplift forces acting vertically on the roof surface into the substrate (roof structure). Transfer of horizontal forces shall be ensured through additional measures.

### 2 Provisions for the construction product

#### 2.1 Properties and composition

##### 2.1.1 General

The characteristic values of the waterproof roofing membrane and the extruded profile were determined in accordance with the 'DIBt test plan for determination of structural characteristic values of waterproof roofing membranes, taking resistance and durability into account' (*DIBt-Prüfplan zur Ermittlung statischer Kennwerte von Dachabdichtungsbahnen unter Berücksichtigung von Beständigkeit und Dauerhaftigkeit*).

##### 2.1.2 Components of the fastening system

###### 2.1.2.1 Aluminium inserts

The aluminium hollow inserts in accordance with EN 12020-2<sup>1</sup> shall consist of the aluminium alloy T6-AlMg0.7Si in accordance with EN-AW 6063<sup>2</sup> and DIN EN 573-3<sup>3</sup>. The geometry and other properties shall correspond to the information provided in Annex 3, Figure 1, and Annex 4.

1	DIN EN 12020-2:2008	Aluminium and aluminium alloys – Extruded precision profiles in alloys EN AW-6060 and EN AW 6063 – Part 2 Tolerances on dimensions and form
2	EN-AW 6063:2011-07	Aluminium material data sheet, EN AW-Al Mg0.7Si
3	DIN EN 573-3:2013	Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition and form of products

#### 2.1.2.2 Extruded profile

The extruded profile shall consist of extruded plasticised polyvinyl chloride (PVC-P) in accordance with the composition deposited with DIBt. The profile shall consist of a square hollow profile with moulded welding flanges. The dimensions and further characteristics shall correspond to the information provided in Annex 3, Figure 2, and Annex 4.

#### 2.1.2.3 Fastening screw

The EJOT JT3-2-6.0 self-drilling screw in accordance with national technical approval no. Z-14.4-426 shall be used for fastening the subframe of the solar system in the aluminium insert in accordance with the provisions of Annex 1 and Annex 4.

### 2.2 Manufacture, transport and storage

(1) The extruded profile shall be manufactured and completed in accordance with the formulation/composition deposited with DIBt in the manufacturing plant of RENOLIT Iberica S.A., Ctra. Del Montnegre s/n, 08470 Sant Celoni, Spain from the starting powder mixture using the extrusion process.

(2) The aluminium insert shall be manufactured in accordance with the provisions of this decision and the requirements of the applicant.

(3) The components of the fastening system (extruded profile, aluminium insert and fastening screw) shall be packed in the manufacturing plant of RENOLIT Belgium N.V., Industriepark de Bruwaan 9700 Oudenaarde, Belgium.

(4) The fastening system shall be delivered in complete form with all its components using a suitable transport vehicle.

(5) Prior to installation, the fastening system shall be stored such that serviceability is not affected. In particular, all components shall be stored in their unopened original packaging and be protected from moisture and frost. Additional instructions from the component manufacturers shall be observed.

### 2.3 Marking

(1) The delivery note for the fastening system shall be marked by the applicant with the national conformity mark (*Ü-Zeichen*) in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The national conformity mark shall only be applied if the requirements in accordance with Section 2.4 are met.

(2) The extruded profiles shall be marked by the manufacturer with:

- the factory identifying mark,
- the manufacturing date (month + year) and
- 'Component of the RENOLIT ALKORSOLAR fastening system in accordance with Z-72.1-1',

e.g.: '*Factory identifying mark ...*' Component of the RENOLIT ALKORSOLAR fastening system in accordance with Z-72.1-1.

(3) The delivery note for the fastening system shall contain the following information:

- full designations of the individual components
- 'RENOLIT ALKORSOLAR solar panel fastening system in accordance with national technical approval no. Z-72.1-1'
- name and factory identifying mark of the applicant
- date of manufacture.

## 2.4 Confirmation of conformity

### 2.4.1 General

(1) The manufacturer shall confirm for each manufacturing plant that the fastening system complies with the provisions of the national technical approval included in this decision by way of a declaration of conformity based on factory production control and a certificate of conformity issued by a certification body recognised for these purposes as well as on regular external surveillance carried out by a recognised inspection body in accordance with the following provisions.

(2) To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer shall use a certification body and an inspection body recognised for these purposes.

(3) The declaration of conformity shall be submitted by the manufacturer through marking of the construction product with the national conformity mark including statement of the intended use.

(4) The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

(5) A copy of the initial type-testing report shall also be sent to DIBt.

### 2.4.2 Factory production control

(1) A factory production control system shall be set up and implemented in the manufacturing plant of the fastening system. Factory production control shall be understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products satisfy the provisions of the national technical approval included in this decision.

(2) The factory production control shall at least include the measures listed in Annex 6.

(3) The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material or the components,
- type of check or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- results of check and tests and, where applicable, comparison with the requirements as well as
- signature of the person responsible for factory production control.

(4) The records shall be kept for at least five years and submitted to the inspection body used for external surveillance. They shall be submitted to DIBt and the competent supreme building authority upon request.

(5) If the test result is not satisfactory, the person responsible for factory production control shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately - where technically feasible and necessary to show that the defect has been eliminated.

### 2.4.3 External surveillance

(1) At the manufacturing plant, the plant and the factory production control system shall be inspected regularly, at least twice a year, by means of external surveillance. If at least two subsequent external surveillance inspections demonstrate that the factory production control system meets the requirements of this decision, the frequency of the external surveillance by the external surveillance body can be reduced to once yearly. If the inspection results are found to be unsatisfactory during the annual surveillance tests, the sampling and testing interval shall revert back to every six months.

(2) Initial type-testing of the fastening system shall be carried out within the scope of external surveillance. Samples for random testing may also be taken. Sampling and testing shall be the responsibility of a recognised inspection body.

(3) During initial type-testing of the fastening system, the properties and characteristic values shall be determined through carrying out individual tests in accordance with the information provided in Annex 6.

(4) These tests may be omitted if the verification of the fitness for use carried out for this decision was conducted on samples officially taken from ongoing production.

(5) The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

## 3 Provisions for planning, design and execution

### 3.1 Substrate/waterproof roofing membrane

(1) The fastening system shall only be fastened on the ALKORPLAN F 35176 waterproof roofing membrane with the declaration of performance in accordance with DIN EN 13956<sup>4</sup>.

(2) The waterproof roofing membrane shall consist of plasticised polyvinyl chloride (PVC-P) with synthetic fibre reinforcement with the composition deposited with DIBt.

(3) The declared performance characteristics and further properties shall correspond to the specifications provided in Annex 2.

(4) The waterproof roofing membrane shall meet the requirements of DIN SPEC 20000-2015<sup>5</sup>, Clause 5.3.3.3, Table 17.

### 3.2 Planning

(1) The design of the solar panel fastening system shall be planned and verified taking into account the relevant technical rules and legal requirements.

(2) The fastening of the solar panels on the mechanically fastened waterproof roofing membrane shall only be planned by expert designers. Verifiable design and layout drawings for the fastening of the solar panels shall be prepared, taking into account the expected installation conditions.

(3) The fastening system shall only be planned for the designated mechanically fastened waterproof roofing membrane, designed and processed in accordance with DIN 18531<sup>6</sup>, with the components specified in this decision.

4	DIN EN 13956:2013-03	Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing
5	DIN SPEC 20000-201:2018-08	Application of construction products in structures – Part 201: Application standard for flexible sheets for waterproofing according to European product standards for the use as waterproofing of roofs
6	DIN 18531:2010 05	Waterproofing of roofs - Seals for non-utilised roofs -

(4) For the function of the waterproof roofing membrane, the planning principles in accordance with DIN 18531, in particular regarding roof slope, unimpeded water drainage and accessibility for waterproofing maintenance, shall be considered. In particular, a minimum compressive strength of the thermal insulation shall be specified by the expert designer so that any locally increased compressive stresses resulting from elevation can be transmitted to the substrate without causing any damage.

(5) An ultimate limit state verification shall be provided for each solar system fastening on the mechanically fastened waterproof roofing membrane.

(6) The provisions of the national technical approval no. Z-14.4-426 for the EJOT self-drilling screw (fastening screw) shall be complied with.

(7) The mechanical fastening of the waterproof roofing membrane shall be designed independently of the solar system such that it is stable even without the solar system.

(8) In addition to the provisions in this decision, a structural analysis shall be carried out to verify the increased load on the building caused by the self-weight of the solar panels.

(9) The solar system shall only be fastened on roof superstructures with mechanically fastened waterproof roofing membranes meeting at least the following prerequisites:

- The waterproofing of the roof was carried out in accordance with DIN 18531.
- The time period between the installation of the waterproof roofing membrane and the installation of the solar system is less than one year.
- The roof slope shall be less than 5°.
- The insulation has sufficient compressive strength.
- The fasteners used to fasten the waterproof roofing membrane and their marking shall correspond to the respective verification of fitness for use.
- The requirements regarding spacing and number of fasteners for the waterproof roofing membrane are yielded from the design carried out in accordance with Section 3.3.
- The waterproof roofing membrane shall be free of damage and inadmissible dirt. The surface of the waterproof roofing membrane shall be cleaned as required and pre-treated (if necessary) in accordance with the applicant's specifications.

(10) The extruded profiles shall be arranged directly adjacent to a row of fasteners. If the extruded profile is not arranged next to a welded joint, the waterproof roofing membrane shall be mechanically fastened by means of an additional row of fasteners.

(11) The solar system (module or fastening system) shall be at least 500 mm from the edge of the roof.

### 3.3 Design

#### 3.3.1 General

(1) Unless otherwise specified in the following sections, all required structural verifications shall be provided on the basis of the Technical Building Rules officially introduced in the field of construction.

(2) When designing the solar panel fastening system, the self-weight of the solar panels may be taken into account.

(3) The verification applies exclusively to uplift vertical forces resulting from wind loads. Any occurring horizontal forces shall be absorbed using suitable additional measures.

(4) The stability shall be verified for the ultimate limit state

$$E_d \leq R_d$$

$E_d$ : design value of the action

$R_d$ : design value of the structural resistance for verification of the load capacity

(5) In the planning of the solar system, the possibility of an approx. 2 cm vertical uplift of the profiles at the design wind load shall be taken into account.

(6) The verification shall be provided for the connection of the waterproof roofing membrane to the fastening element as well as the fastener. Verification for the other components of the fastening system (extruded profile, aluminium insert and fastening screw) and the waterproof roofing membrane as well as the interplay between them for fastening the solar system is thus provided.

### 3.3.2 Design values for actions $E_d$

(1) The characteristic values for the actions  $E_k$ , the partial safety factors  $\gamma_F$  and the combination coefficients  $\psi$  shall be taken from the Technical Building Rules officially introduced in the field of construction.

(2) The design value of the action is yielded from the characteristic values of the actions, taking into account the partial safety factors.

(3) When designing the solar panel fastening system, the aerodynamic coefficients of the wind uplift forces in accordance with DIN EN 1991-1-4<sup>7</sup> may be used. However, a net pressure coefficient of at least  $C_{P,net} = -0.7$  shall be applied.

(4) Moreover, the wind uplift forces and wind pressure actions shall be verified in accordance with DIN EN 1991-1-4/NA<sup>8</sup>, Clause 1.5.

(5) For the wind and temperature effects to be considered in the load case "summer", the  $\psi$ -coefficient defined in DIN EN 1990/NA may be applied. In the design situation in which the wind is considered to be the dominant variable action, the  $\psi$  coefficient may be considered in the design value of the structural resistance  $R_d$  (see Section 3.3.3).

### 3.3.3 Design value of structural resistance $R_d$

(1) The design value of structural resistance  $R_d$  is yielded from the characteristic value  $R_k$  in consideration of the material safety factor  $\gamma_M$ , the ageing factor  $K_A$  and the ambient temperature factor  $K_T$  as follows:

$$R_d = \frac{R_k}{\gamma_M * K_A * K_T}$$

$R_k$ : System-specific characteristic value of the structural resistance of the connection between the waterproof roofing membrane and the fastener,  $R_k = 1.0$  kN/fastener

$\gamma_M$	Material safety factor		1.3
$K_A$	Reduction factor for ageing		1.05
$K_T$	Reduction factor for ambient temperature	Summer ( $\psi = 100\%$ )	1.3
		Summer ( $\psi = 60\%$ )	1.18
		Winter	1.0

(2) In the design situation in which the wind is considered to be the dominant variable action, the reduction in structural resistance due to temperature may be reduced by means of the  $\psi$ -coefficient for the summer load case. For this design situation, a reduction factor for the ambient temperature of  $1 + (K-1.0) * \psi$  may be applied.

(3) The verification shall be provided for all design situations:

Summer load case 1:  $K_{t,Sommer (\psi = 100 \%)}$  in combination with 60% wind action

Summer load case 2:  $K_{t,Sommer (\psi = 60 \%)}$  in combination with 100% wind action

Winter load case:  $K_{t,Winter}$  in combination with 100% wind action

7 DIN EN 1991-1-4:2005 + A1:2010 + AC:2010 Eurocode 1: Actions on structures - Parts 1-4: General actions - wind actions  
8 DIN EN 1991-1-4:2010/12 National annex - Nationally determined parameters - Eurocode 1: Actions on structures - Parts 1-4: General actions - Wind actions



(4) The characteristic value of the pull-out force of the fastener and the associated safety factors and reduction values shall be taken from the respective European Technical Assessment.

### 3.4 Provisions for execution

#### 3.4.1 Installation

(1) The installation of the fastening system shall only be carried out by companies with suitably qualified construction personnel. In addition, these companies (including their specialised staff) shall be trained in and authorised to carry out the aforementioned activities by the approval holder.

(2) The waterproof roofing membrane corresponds to the specifications provided in Section 3.1.

(3) For the proper fastening of a solar system, the applicant shall draw up installation and mounting instructions.

(4) The installation conditions specified in this decision as well as by the applicant shall be adhered to.

(5) The executing company shall receive the complete set of object-specific planning documents in accordance with Sections 3.2 and 3.3 (e.g. design, technical drawings, layout drawings or installation plans) from which the type, number, distribution and spacing of the fasteners as well as of the associated washers and the minimum compressive strength required for insulation can be derived.

(6) For fastening the subframe of the solar system in the aluminium insert, the EJOT JT3-2-6.0 self-drilling screw as set out in national technical approval no. Z-14.4-426 shall be used in accordance with the provisions of Annex 1 and Annex 4, Table 1.

(7) The fastening system shall be installed in accordance with the design documents prepared as set out in Sections 3.1 and 3.2, the ultimate limit state and serviceability limit state verifications and the installation and mounting instructions of the applicant, taking into account the specifications of this decision.

(8) Before installing the fastening system, appropriate measures shall be taken to ensure that the existing roof structure is in a suitable condition for the fastening system. It shall be checked that the compressive strength of the installed insulation layer is suitable. It shall be ensured that the type, distribution, arrangement and number of fasteners for the waterproof roofing membrane correspond to the structural design. Fasteners may be supplemented retroactively where necessary.

(9) The fastening system shall be installed manually. Hot gas welding equipment is used for welding the extruded profiles on to the waterproof roofing membrane. The welding work is carried out based on DVS 2225<sup>9</sup>.

(10) Damaged components of the fastening system shall not be used.

(11) Single components of the fastening system shall be assembled to form a complete system in accordance with this decision, taking into account the installation and mounting instructions of the applicant.

(12) The aluminium insert shall not protrude from the extruded profile and shall be shortened where necessary.

(13) The executing company shall hand over a copy of the decision as well as the installation and mounting instructions of the applicant to the operator of the system.

<sup>9</sup>

DVS 2225-1:1991-02	Joining of lining membranes made from polymeric materials (geomembranes) in geotechnical and hydraulic application; welding, bonding by adhesives, vulcanising
DVS 2225-2:1992-08	Joining of lining membranes made from polymer materials in geotechnical and hydraulic engineering – site testing
DVS 2225-3:1997-07	Joining of sealing sheets made of polymeric materials in earthwork and water engineering – Requirements on welding machines and welding devices

### 3.4.2 Inspection of execution

(1) Check that the declared waterproof roofing membrane performance data at least comply with the requirements given in Annex 2. If the declared performance does not completely cover the values, an inspection certificate shall be demanded and checked.

(2) Check that the correct components of the fastening system, e.g. EJOT self-drilling screw (fastening screw), have been delivered to the site together with the relevant verification of fitness for use. The use of these construction products is subject to the provisions of the relevant verification of fitness for use.

(3) Before and during the installation of the fastening system, the following shall be especially checked:

- The compressive strength of the insulation shall correspond to the planning requirements.
- The roofing membrane shall be laid in accordance with the specifications of DIN 18531. All weld seams shall be watertight over their entire lengths.
- The type, distribution and arrangement of fasteners shall correspond to the structural design data.
- The extruded profile shall be welded on to the waterproof roofing membrane on both sides over the entire length.
- The aluminium insert end shall be flush with the extruded profile end.
- The cross beams of the solar panel subframe shall be anchored with two fastening screws each in the aluminium insert.

(4) During the installation, records of the verification of the correct mounting shall be kept by the site manager or site manager's representative.

(5) The records shall be available at the construction site during the construction period and shall be handed over to the construction site supervisor upon request. Like the delivery notes, they shall be kept by the company for a minimum of five years after completion of the project.

### 3.4.3 Declaration of conformity for the execution on site

(1) The confirmation of conformity of the proper fastening of the solar system with the provisions of this decision shall be provided by the executing company in the form of a declaration of conformity in accordance with Section 16a(5) and Section 21(2) Model Building Code (*Musterbauordnung*) on the basis of the following checks:

- check whether the construction products used comply with the provisions of this national technical approval as well as the marking specifications given in Section 2.3
- inspection of the execution in accordance with Section 3.4.2.

(2) The results of the checks shall be recorded and evaluated as well as documented by at least submitting a production report based on Annex 7 including the reports and checks listed therein.

(3) The records shall be available at the construction site during the construction period. They shall be kept by the company for a minimum of five years after completion of the project. Copies of the records shall be handed over to the client for inclusion in the construction project files and upon request presented to DIBt, the supreme building authority and the inspection body.

(4) If the test results are unsatisfactory, the executing company shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately - where technically feasible and necessary to show that the defect has been eliminated.

#### 4 Provisions for use and maintenance

(1) Unless otherwise specified below, DIN 18531-4<sup>10</sup> shall apply.

(2) The operator of a solar system shall check and maintain the tightness and functionality of the waterproof roofing membranes and the proper fastening of the system. The operator of the solar system shall prepare operating instructions for this purpose. The results of regular checks as well as all incidents that deviate from the operating instructions shall be documented.

(3) Checks and maintenance shall at least include the following measures:

- removal of dirt and unwanted vegetation, particularly in the region of the fastened extruded profile
- checking the roof surface in terms of waterproofing function
- checking the contact areas of the solar system in terms of inadmissible deformations (compressive strain of insulation)
- checking the longitudinal weld seams for detachment between the membrane and the extruded profile
- checking the anchoring of the fastening screws between the cross beams and the aluminium insert.
- initiation of repair works if required

(4) The system shall be checked at least 2 x annually and after special weather events

(5) The operator of a solar system shall be obliged to only commission those companies to repair the solar panel fastening system which were authorised and trained by the applicant to do so.

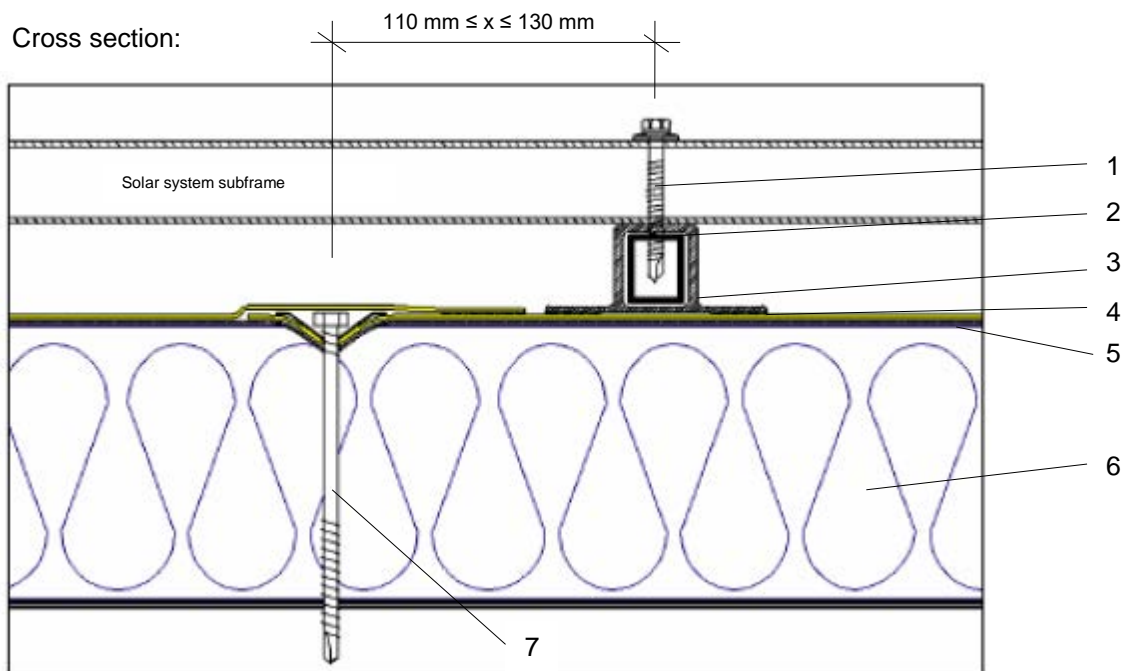
(6) Every 5 years, the fastening construction, the roof surfaces and the connections and terminations shall be verified by a skilled person. The verification shall be documented in writing. The report shall contain information on the identified defects, any necessary further preliminary investigations and the type and urgency of necessary maintenance measures.

Bettina Hemme  
Head of Section

Drawn up by

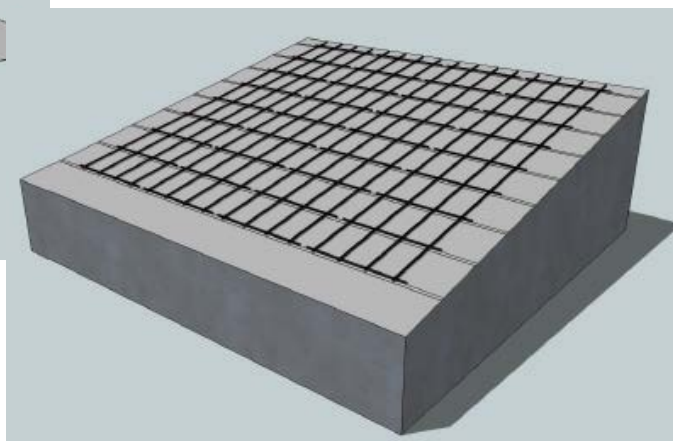
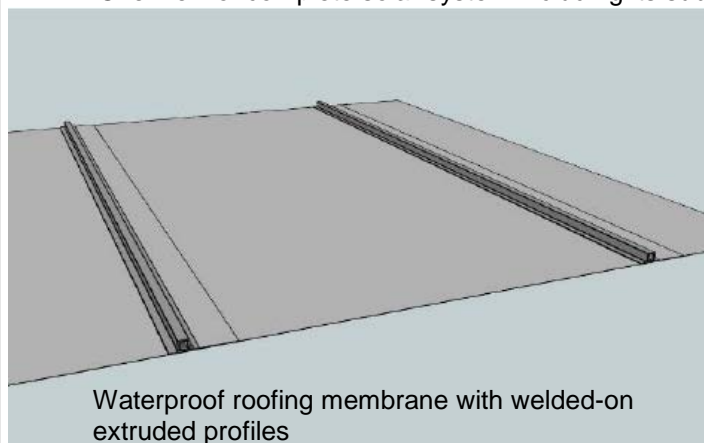
<sup>10</sup> DIN 18531-4:2017-07

Waterproofing of roofs, balconies and walkways - Part 4: Non-utilized and utilized roofs - Maintenance



1. Solar panel fastening screw (part of the fastening system)
2. Aluminium insert (part of the fastening system)
3. Extruded profile (part of the fastening system)
4. Welded joint between extruded profile and waterproof roofing membrane
5. AL KORPLAN F 35176 waterproof roofing membrane
6. Insulation material
7. Fastener of the waterproof roofing membrane

Overview of complete solar system including its subframe:



RENOLIT ALKORSOLAR solar panel fastening system for use on AL KORPLAN F 35176 waterproof roofing membranes

**System design**

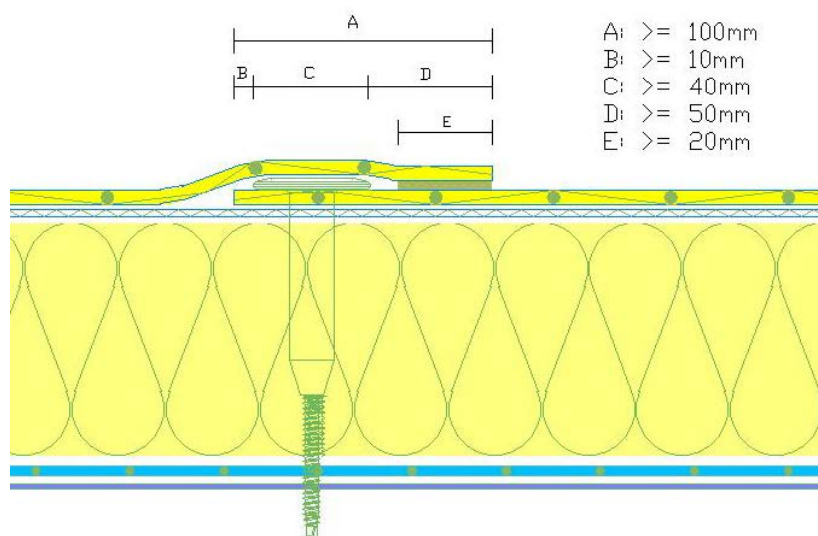
Annex 1

**Special requirements for waterproof roofing membrane used as a component of the substrate (roof structure) for fastening solar panels:**

ALKORPLAN F 35176	Test method	Unit	Value
Thickness	DIN EN 1849-2	mm	1.5 -5 %/+10 % 1.8 -5 %/+10 % 2.0 -5 %/+10 %
Mass per unit area	DIN EN 1849-2	g/m <sup>2</sup>	1850 -5 %/+10 % 2200 -5 %/+10 % 2350 -5 %/+10 %
Characteristic value R <sub>k</sub> of tensile strength	DIN EN 12311-2	N/50 mm	1034
Elongation at break	DIN EN 12311-2 (A)	%	≥ 15
Characteristic value R <sub>k</sub> of peel resistance of joints	DIN EN 12316-2	N/50 mm	364
Joints shear resistance	DIN EN 12317-2	N/50 mm	≥ 800
Resistance to tearing	DIN EN 12310-2	N	≥ 180
UV resistance	DIN EN 1297 5000 h	./.	Pass
Resistance to cold bending	DIN EN 495-5	°C	< -25
Characteristic peel strength value R <sub>k</sub> between the waterproof roofing membrane and the extruded profile	DIN EN 12316-2	N/50 mm	507

Verification of resistance to external fire shall be provided for the respective roof structure with a national technical test certificate (*allgemeines bauaufsichtliches Prüfzeugnis*) in accordance with the Model Administrative Provisions – Technical Building Rules (*Musterverwaltungsvorschrift Technische Baubestimmungen*), Part C, no. C 4.8 or a classification report in accordance with EN 13501-5 with classification B<sub>Roof</sub>(t1).

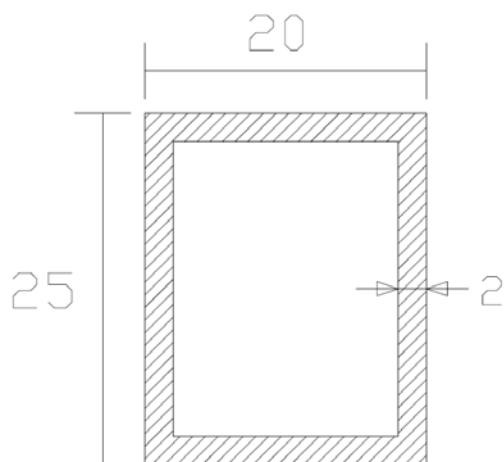
Overlapping joints:



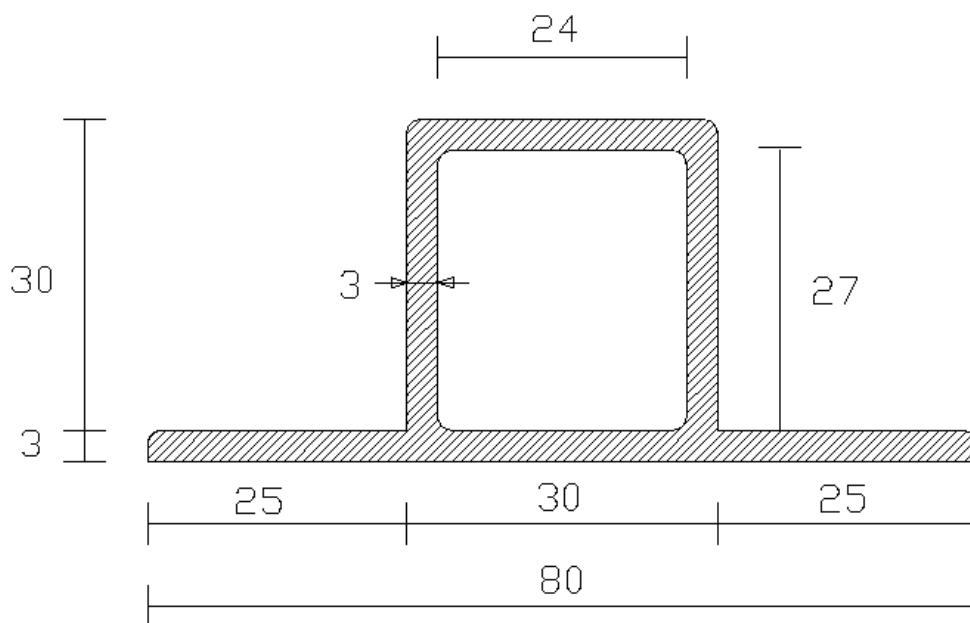
RENOLIT ALKORSOLAR solar panel fastening system for use on ALKORPLAN F 35176 waterproof roofing membranes

ALKORPLAN F 35176 waterproof roofing membrane properties

Annex 2



**Figure 1:** Aluminium insert



**Figure 2:** Alkorplan 81600 extruded profile

RENOLIT ALKORSOLAR solar panel fastening system for use on ALKORPLAN F 35176 waterproof roofing membranes

Dimensions and properties of the components

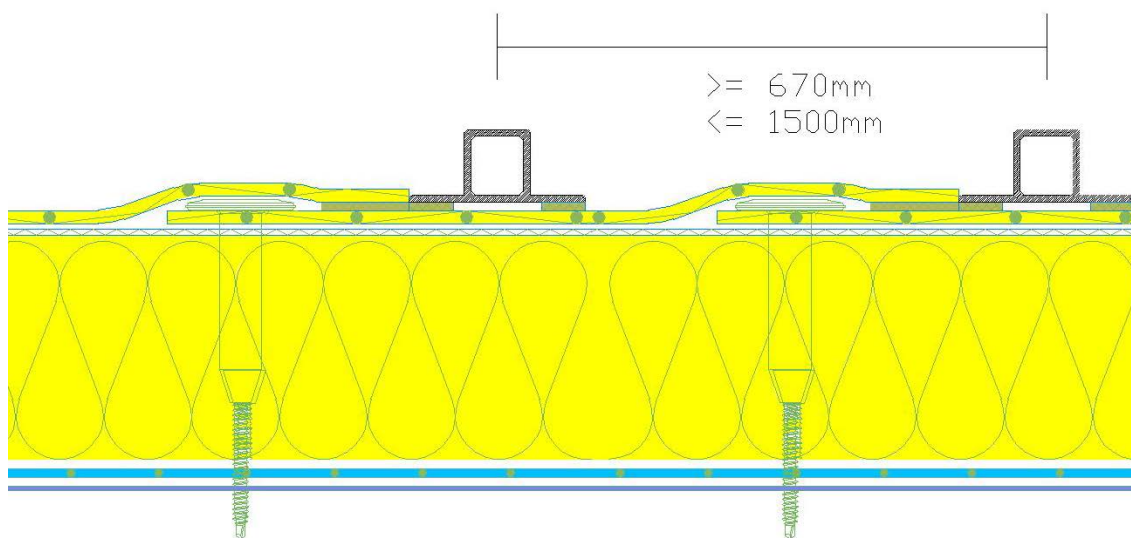
Annex 3

No.	Component	Requirement
1	Fastening screw	EJOT JT3-2-6.0 fastening screw with a national technical approval in accordance with Z-14.4-426 with a diameter of 6.3 mm and a length of 25 mm in accordance with the specifications given in this approval. Moreover, the technical building rules of national technical approval no. Z-30.3-6 shall apply in relation to corrosion protection.
2	Aluminium insert	The requirements of the applicant as well as this decision shall be taken into account.
3	Extruded profile	The characteristic value $R_k$ of the vertical force is 24.4 kN/m.
4	Insulation material	In accordance with the designer's compressive strength requirements
5	Fastener of the waterproof roofing membrane	Fasteners with a national technical approval or European Technical Approval or European Technical Assessment in accordance with the specifications of this decision as well as the requirements of the applicant. The washers shall have the following minimum dimensions: 80 mm x 40 mm
6	Waterproof roofing membrane	ALKORPLAN F 35176 in accordance with DIN EN 13956 with main properties as specified in Annex 2

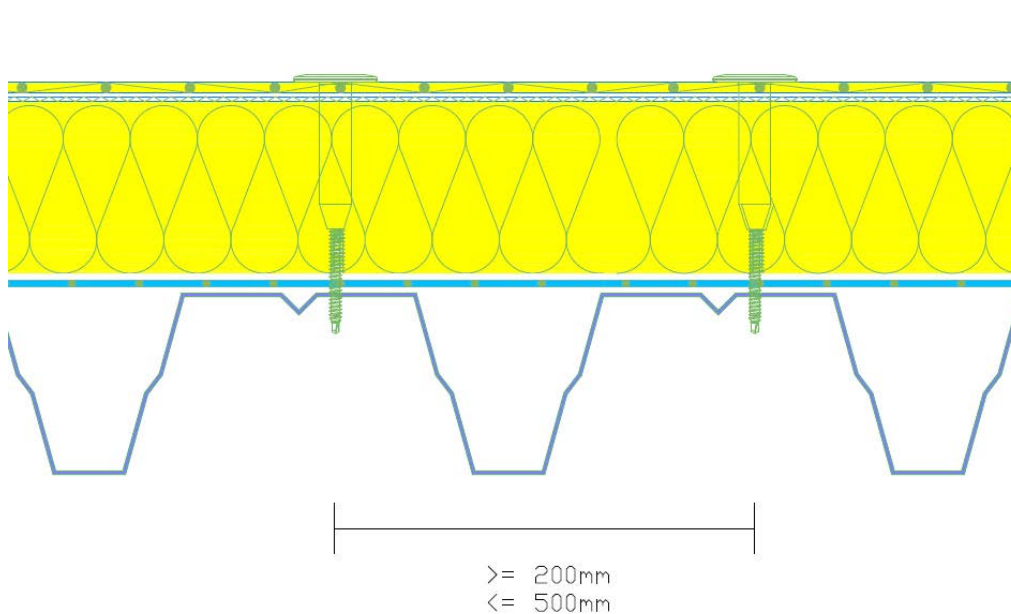
RENOLIT ALKORSOLAR solar panel fastening system for use on ALKORPLAN F 35176 waterproof roofing membranes

Materials, properties, requirements

Annex 4



Minimum and maximum spacing between the extruded profiles



Minimum and maximum spacing between the fasteners (in longitudinal direction of the extruded profile)

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Arrangement of and spacing between the fasteners and the extruded profiles

Annex 5



	Test method	Frequency of		Value / Tolerance
		Factory production control (FPC)	External surveillance (ES)	
<b>Inspection of incoming materials</b>				
Aluminium insert				
Material	DIN EN 10204	Every delivery	2 x annually	Inspection certificate type 3.1
Dimensions	DIN EN 12020-2	Every delivery	2 x annually	Inspection certificate type 3.1, Annex 3, Figure 1
Extruded profile				
Starting materials	DIN EN 10204	Every delivery	2 x annually	Inspection certificate type 3.1
<b>Inspection after production</b>				
Visible defects	DIN EN 1850-2	Every 288 m	2 x annually	None
Mass per unit area	DIN EN 1849-2	Every 288 m	2 x annually	695 g/100 cm <sup>2</sup> -5%/+10%
Dimensions	DIN EN 1848-2	Every 288 m	2 x annually	Annex 3, Figure 2 0/+3 mm
Thickness	DIN EN 1849-2	Every 288 m	2 x annually	3 mm 0/+1 mm
Profile length	DIN EN 1848-2	Every 288 m	2 x annually	3025 mm -10/+15 mm
Dimensional stability of profile	DIN EN 1107-2	Every 288 m	2 x annually	Dimensions +/- 2%
Tensile properties	DIN EN 12311-2	Every 288 m	2 x annually	Longitudinal: ≥15 N/mm <sup>2</sup> ≥ 250 %
Peel strength between the waterproof roofing membrane and the extruded profile	EN 12316-2	2 x annually	2 x annually	Annex 2, Table 2
RENOLIT ALKORSOLAR solar panel fastening system for use on ALKORPLAN F 35176 waterproof roofing membranes				Annex 6
Factory production control and external surveillance				

No.	Confirmation of the executing company	
1.	Project title: Location: ..... Size:.....Building height:.....	
2.	Description of solar system: .....	
3.	Description of substrate, name of insulation product: ..... .....	
4.	Approval: No.:..... of (date) .....	
5.a	Structural analysis and installation plan: ..... (Installer) .....	
5.b	Executing company:: ..... ..... .....	
5.c	Construction period: .....	
		Confirmation
6.	The specialised staff of the executing company have been informed by the approval holder of the proper handling	
7.	Evaluation prior to installation of extruded profiles	
	a)	Waterproof roofing membrane requirements in accordance with the approval
	b)	Compressive strength of insulation material in accordance with the structural design specifications
	c)	Roof slope
	d)	Type and arrangement of fasteners as per structural analysis
8.	Installation check	
	a)	Reports on weather condition
	b)	Reports on the quantities used exist
	c)	Check through visual inspection
	d)	Other
	e)	
Remarks:		
RENOLIT ALKORSOLAR solar panel fastening system for use on ALKORPLAN F 35176 waterproof roofing membranes		Annex 7
Declaration of conformity template		