

INSTRUCTIONS FOR THE APPLICATION OF FATRAFAST PROFILES TO FLAT ROOFS

FATRAFAST is a complementary product to the FATRAFOL-S waterproofing system that allows various structures and equipment to be placed on roofs. The following text summarizes installation instructions, recommendations, and also several limitations when using the profiles.

Description and use of FATRAFAST profiles

FATRAFAST is intended to be installed on mechanically fastened waterproofing consisting of FATRAFOL 810/V membrane.

FATRAFAST is composed of an extruded PVC-P profile, in which an aluminium reinforcing bar is inserted, sealed with plastic plugs at both ends. The bottom part of the profile allows for a 30 mm wide hot air weld on both sides.

FATRAFAST is applied by welding onto the waterproofing membrane, thereby creating a suitable base for placing and fixing various structures and equipment. Due to its low weight, the profile is a suitable solution for roofs, the composition of which does not allow the installation of structures fixed by weight.

FATRAFAST is designed in such a way that it allows additional structures to be attached to the roof without the need for anchoring elements to perforate the waterproofing layer and the entire roof structure, thereby avoiding the formation of thermal bridges. The profile can be used to install equipment such as photovoltaic panels, solar heaters, air conditioning equipment, air conditioning units, etc. It is also suitable for installing wooden floors on balconies and terraces.

FATRAFAST is available in two lengths, thanks to which an optimal arrangement can be achieved with regard to the size of the installed equipment. If the rules described below in the text are followed, it is possible to shorten the profile as needed.

Dimensions and technical parameters of FATRAFAST profiles (informative values)



Height	33 mm
Base width	95 mm
Length	1.010 mm; 2.020 mm (+ 1,5 %; - 0 %)
Weight	1 235 g; 2 470 g
Colour design	RAL 7035

Follow the instructions described in the following chapters to install the **FATRAFAST** mounting profile:

1. Requirements roofs with FATRAFAST mounting profile and layout design
2. Substrate preparation
3. Testing weld
4. FATRAFAST profile installation
5. Mounting equipment onto the FATRAFAST profile

1 REQUIREMENTS ON ROOFS WITH FATRAFAST MOUNTING PROFILE AND LAYOUT DESIGN

In order to maintain the long-term waterproofing function after various equipment have been mounted on top of the FATRAFAST profile, it is necessary that the roof and its composition meet the basic requirements. These requirements should be taken into account already at the roof design stage.

FATRAFAST is recommended to be installed only on flat roofs, that is, on roofs with a slope not exceeding 5° (8.75%).

Requirements for the waterproofing layer

FATRAFAST can only be applied to mechanically anchored waterproofing membrane FATRAFOL 810/V. The minimum recommended thickness of the FATRAFOL waterproofing membrane is 1.80 mm in case photovoltaic power plants are planned to be installed and 1.50 mm for other structures.

If possible, take into account the direction of the laying and width of the strips of the waterproofing membrane in relation to the location of the structures when designing the waterproofing of the roof. The ideal direction of the laying of the membrane strips is along the slope of the roof, which ensures that the FATRAFAST profiles do not obstruct the drainage of rainwater from the roof. The recommended minimum slope of the substrate is 2%.

The mechanical anchoring of the membrane, regardless of other layers and structures, must be designed and carried out in accordance with the roof wind load calculation according to EN 1991-1-4 and the corresponding national annex. The anchoring elements used for fixing the waterproofing membrane must be provided with the valid ETA assessment.

When fixing the waterproofing membrane, the density and spacing of the anchoring elements determined by the anchoring plan must be observed, as well as the method of their installation in accordance with the generally applied principles described in the construction and technological regulation of the FATRAFOL-S waterproofing system.

For hazardous substrates, the design load on the anchor element must be determined by the results of pull-out tests carried out according to CEN/TS 17659 "Design guideline for mechanically fastened roof waterproofing systems".

When planning to apply FATRAFAST to an existing roof, it is necessary to make sure in advance that the waterproofing membrane installed belongs to the FATRAFOL 810/V series. Waterproofing membranes made by other manufacturers may not be fully compatible with the FATRAFAST system, which can subsequently have a negative impact on the quality of the joint. Before deciding to apply FATRAFAST profiles to an existing roof, also take into consideration the age of the waterproofing, its technical condition and expected service life. Weldability of the membrane with FATRAFAST profiles must be verified at the project stage, as this may be impaired by membrane contamination.

Requirements on the waterproofing base layer

The strength of the base layer under the waterproofing membrane and the solidity of the entire assembly must correspond to the expected total load coming from the installed structures, including all additionally installed devices.

In particular on roofs with soft thermal insulation, it is necessary to make sure that permissible pressure load is not exceeded locally under the profiles - see note below.

In questionable cases, the load capacity of thermal insulation substrates must be verified with the relevant manufacturer.

In case a roof is planned to be reconstructed without removing the original underlying layers, it is necessary to assess the solidity of these layers. With these roofs, the thermal insulation is often partially degraded spots with higher operating stress. In such a case, the damaged thermal insulation boards must be replaced with new ones.

Please note: The compressive strength of thermal insulations specified by the manufacturer at 10% compression and their elastic (reversible) deformation shouldn't be confused. It is always necessary to assess the composition as a whole and, if necessary, take into

account the quality of the bottom layer of thermal insulation, which is often designed with boards with lower compressive strength. For EPS boards, the elastic deformation is usually up to 2% compression, which corresponds to the permissible load. For a specific product, it is necessary to verify the permissible load capacity of the thermal insulation with its manufacturer. The load capacities of EPS substrates at 2% compression are usually stated as follows:

EPS 100 20 kPa = 0,20 kg/cm² → 40 kg/1 m of FATRAFAST profile
 EPS 150 30 kPa = 0,30 kg/cm² → 60 kg/1 m of FATRAFAST profile
 EPS 200 36 kPa = 0,36 kg/cm² → 72 kg/1 m of FATRAFAST profile
 (the area under the AI profile is considered, that is 200 cm²/1 m of the profile)

(Source: www.tzb-info.cz)

A trapezoidal metal sheet, where membranes and profiles must always be installed perpendicularly to the waves can be problematic substrate. In exceptional cases, it is possible to install at an angle. However, an even load on the sheet must always be ensured so that the individual waves are not statically overloaded. It is possible to achieve more even pressure distribution when using a load distribution grate.

FATRAFAST profile location proposal

For the subsequent installation of photovoltaic devices, it is recommended to install FATRAFAST only in the roof area, which means area "H" and "I" according to EN 199114 "Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions". Profiles with structures can only be placed in edge area "G" or corner area "F" in exceptional cases, such as roofs with lower wind load.

For photovoltaic applications, the profiles must always be installed along all the anchoring rows of the waterproofing membrane, that is, along the overlap of the membrane strips (Fig. 1) and along the rows of embedded anchor elements in the surface of the strips (Fig. 2).

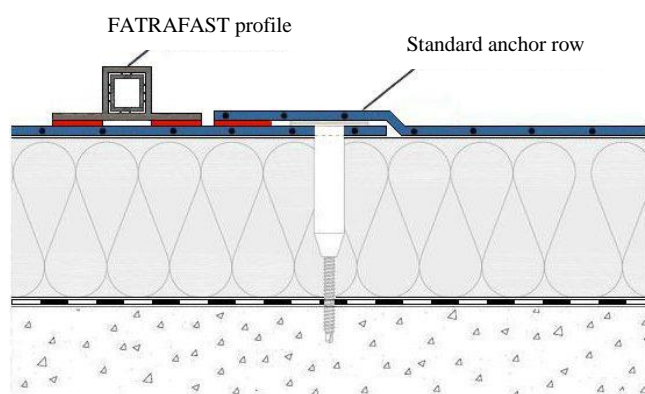


Fig. 1: Installation of the FATRAFAST profile in the overlap of the waterproofing sheets

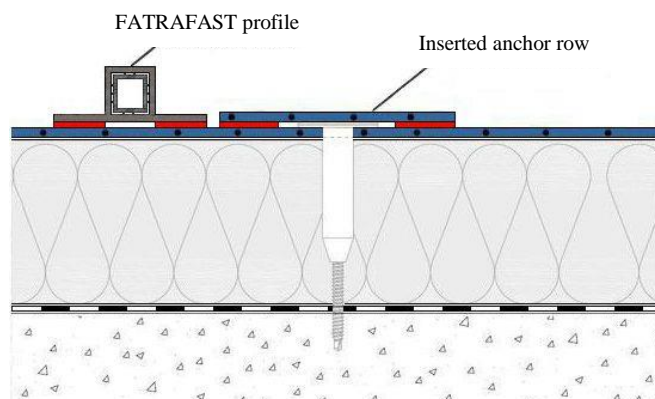


Fig. 2: Installation of the FATRAFAST profile in the centre of the waterproofing sheet

The photovoltaic system supplier should assess the strength and solidity of the roof covering as a part of their project design.

The project design takes into account not only the static load of the profiles resulting from the weight of the installed structure and the equipment mounted on it, but also their load caused by wind action.

The design of the layout of the FATRAFAST profiles on the roof must be based on the actual implementation of the waterproofing of the roof, taking into account the widths of the membranes used, the number and location of the inserted anchor rows. If it is required to place the profiles closer to each other, additional anchor rows must be added.

The load-bearing capacity of the roof and the project design of the location of the SS profiles, including the layout and mounting of the roof structures installed on these profiles, must always be professionally assessed by a structural engineer before proceeding with profile installation.

In places where maintenance personnel will be operating it is recommended to install slip-resistant FATRAFOL WALK 600 walkway tiles in the access routes. These are additionally welded onto the waterproofing layer using hot air once the installation of all structures has been completed (Fig. 3 and 4).

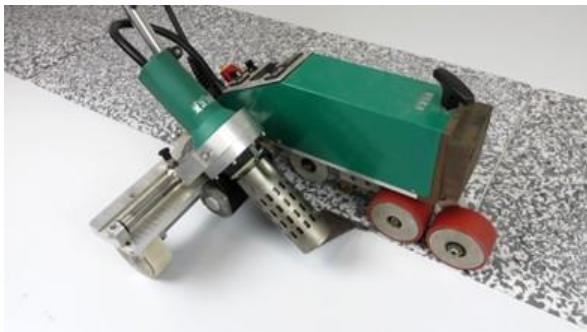


Fig. 3: Welding of FATRAFOL WALK 600 walkway tiles



Fig. 4: Final walkway consisting of the tiles

2 SUBSTRATE PREPARATION

FATRAFAST profiles are applied to the finished roof waterproofing with faultless continuous joints the quality of which has been inspected with a testing needle. For photovoltaic installations, it is recommended to check the mechanical integrity of the entire surface of the waterproofing using one of the other test methods, such as spark or electric impulse test. The surface of the membrane must not be mechanically deteriorated or damaged in any way.

The waterproofing membrane must be free of all mechanical impurities before applying FATRAFAST profiles. Both the membranes and profiles must be dry and clean before welding. It is recommended to wash the joints with clean water with the addition of a small amount of detergent. In case the membrane is soiled with dirt, it is recommended to treat the joints with an acetone cleaner for PVC membrane after washing. The cleaner must be applied only after the membrane has completely dried out (even a small amount of moisture reduces the effectiveness of the cleaner). Before actually welding the FATRAFAST profile, it is necessary to give a good airing to the cleaner, which can take tens of minutes in cold weather.

3 TESTING WELD

To verify the correct parameters have been set on the welding machine, carry out a testing weld and tear-off test before you start the installation of FATRAFAST profiles. For this purpose, use the profile blank without aluminium bar. Insert the aluminium bar into the blank PVC profile. Adjust the welding conditions based on the test results.

Do not start the installation of FATRAFAST profiles if you have not achieved adequate results in the tear-off test on the testing weld!

How to perform the testing weld:

- The testing weld is performed on the surface of the installed sheet of waterproofing membrane and must not interfere with the place where the profiles are to be subsequently installed (Fig. 5). If the profiles are installed simultaneously with the installation of a new waterproofing membrane, it is possible to perform a testing weld on the blank of this membrane.
- FATRAFAST profiles are supplied together with a blank profile in length 300-500mm intended to carry out the welding test. Insert the aluminium bar into the blank profile and weld with to the membrane with the help of manual welding device (Fig. 6).

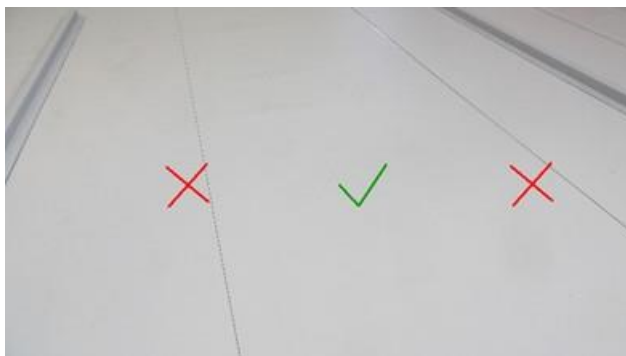


Fig. 5: Choosing the correct place for welding test.



Fig. 6: Spot welding of the test profile to the substrate

- Default welding parameters are set on the welding machine. Due to the fact that the profile is significantly thicker than the waterproofing membrane, the scale of welding conditions is limited in order to achieve a high-quality weld. Higher air temperature and lower welding speed are usually required.

Please note: The following settings have been used for UNIDRIVE 500 welding machine and FATRAFOL 810/V membrane in thickness 1.80 mm under laboratory conditions (Fig. 7):

○ welding air temperature	550 °C
○ moving speed	1,5 m/min
○ fan	90 %

- Welds are made on both sides of the profile (Fig. 8). If a machine for double-sided welding is not used, it is recommended to test different welding parameters on each side, such as two different air temperatures. Detailed instructions for welding are presented in the Application of FATRAFAST profiles section.



Fig. 7: Example of Unidrive 500 machine setting



Fig. 8: Making the joint on both sides of the testing profile

How to perform the tear-off test:

- The welded testing profile is cut out off the surface of the roof (Fig. 9) and the place is subsequently repaired with a membrane patch of the same parameters as was used for waterproofing the roof.



Fig. 9: Cutting out the testing sample from the roof



Fig. 10: Cutting testing specimens for tear-off joint testing

- A minimum of 3 test specimens of 10 mm width are cut from the testing weld (Fig. 10 and 11).
- The tear-off test is carried out by grasping the profile eye and the non-welded lower part of the waterproofing membrane (with the fingers of both hands, alternatively with screwdrivers or another tool of a rounded shape, fig. 12) and developing the force sufficient to separate the joint.
- By doing this, both welded sides of the profile are stressed at the same time, and only the side where the first separation or the tearing of the profile or membrane occurred is assessed.



Fig. 11: Test bodies with in width 10 mm



Fig. 12: Example of performing the tear-off test on a testing specimen

- The weld must be continuous and show damage in one of the materials, either in the waterproofing membrane or in the profile (Fig. 13). In this case, it can be concluded that the welding conditions are set correctly.

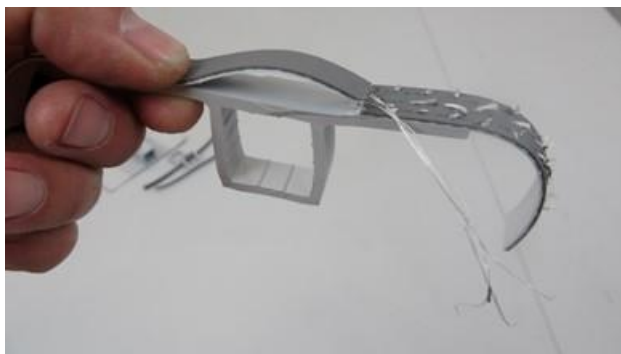


Fig. 13: Correctly performed weld - damage in the foil



Fig. 14: Insufficient weld quality - the weld peels off

- If the weld peels without damaging the joined materials (Fig. 14), it is necessary to adjust the settings of the welding machine and carry out the testing weld again.
- The welding parameters set for a proper weld are used to install the FATRAFAST profiles on the roof.

Please note: Peeling resistance of welds, tested according to EN 12316-2 "Flexible sheets for waterproofing - Determination of peel resistance of joints - Part 2: Plastic and rubber sheets for roof waterproofing", reaches at least value of 600 N/50 mm on the properly welded side of the FATRAFAST profile.

The pull-off force of the double-sided welded FATRAFAST profile, perpendicular to the base of the profile, reaches at least 1200N/50mm.

4 FATRAFAST PROFILE INSTALLATION

INSTALLING PROFILES TO ATTACH PHOTOVOLTAIC STRUCTURES

The following instructions and recommendations apply primarily to the application of FATRAFAST profiles on areas intended for the placement of photovoltaic power plants. When using FATRAFAST profiles, it is recommended to prefer photovoltaic systems with panels laid horizontally at an inclination of up to 15°.

The application of the profiles is carried out in conformity with the laying plan prepared for the particular project by the supplier of the photovoltaic power plant.

The project design should also include the location and anchoring of the structure, to which the solar panels are attached afterwards. When installing the profiles perpendicularly to the slope of the roof, the design must also take into account the gaps between the profiles, which are necessary to ensure the drainage of rainwater (Fig. 21).

Welded FATRAFAST profiles must exceed the installed structure by at least 200 mm in the longitudinal direction of the profile in the outer parts of the installation (Fig. 15). Profiles with a length of 2 m are preferably placed on the edges of the installed area. A shorter profile in length 1 m, if it is designed to achieve the required length of the array, is inserted in the middle of a series of connected profiles.

The profiles are always placed close to the row of anchor elements on the bottom membrane, which is mechanically fixed to the substrate (Fig. 1, 16) and further along the same side of the membrane sheet covering the inserted anchor row (Fig. 2).

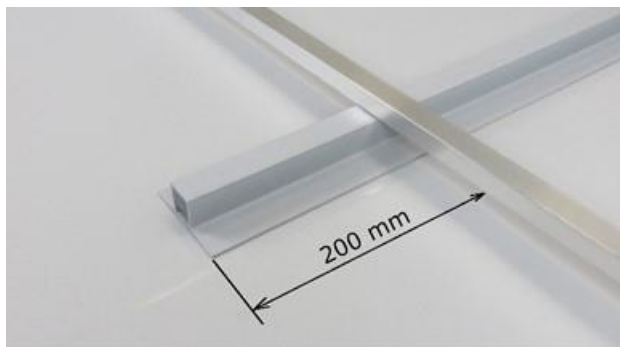


Fig. 15: Minimum overlap of FATRAFAST edge profiles against the installed structure

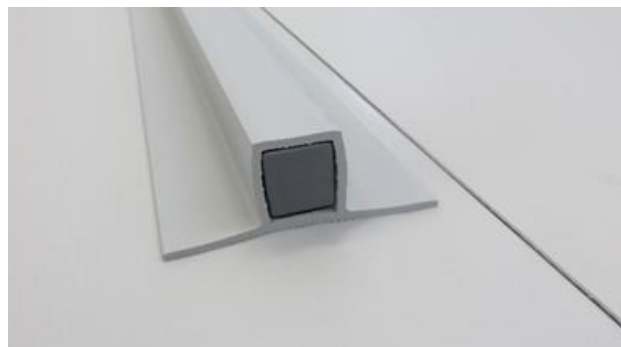


Fig. 16: Correct positioning of the FATRAFAST profile along the weld

The distance between the individual rows of profiles thus depends on the distance between the anchor rows of the waterproofing membrane, designed based on the wind action on the roof, and also on the location of additional anchor rows, created based on specific requirements for individual structures (if such requirements are applied).

If additional profiles are to be installed in the area of the sheets, additional anchoring must be done along each profile with the same density of anchoring elements as in the standard anchoring row.

ATTENTION! The profiles can never be installed perpendicularly to the anchor rows (Fig. 17), in the area of the sheets without an inserted anchor row (Fig. 18) or on the edge of the upper sheet of the waterproofing membrane (Fig. 19), the joint of which would be excessively susceptible to peel off.



Fig. 17: Wrong installation – welded profiles placed perpendicularly to the waterproofing membrane sheet joints



Fig. 18: Wrong installation – welded profiles placed loosely in the middle of the sheets without additionally inserted anchor row



Fig. 19: Wrong installation – welded profile placed on the edge of the upper sheet of the waterproofing membrane above the anchor row

Profiles applied in the direction of the substrate gradient shall be placed in a row with a 10mm expansion gap between each 2m-long profile (20).

Profiles applied perpendicularly to the slope of the roof must have a gap of at least 100 mm between them to ensure smooth drainage of rainwater (Fig. 21).

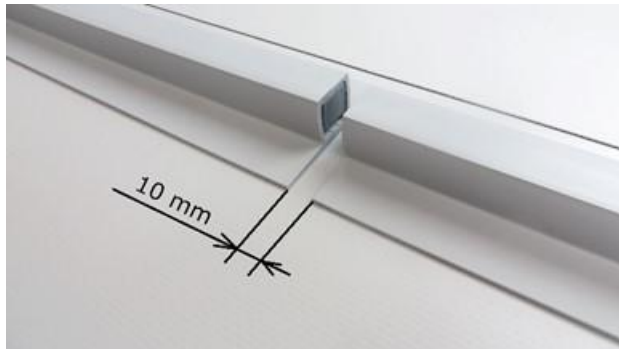


Fig. 20: Expansion gap between profiles oriented along the slope of the roof

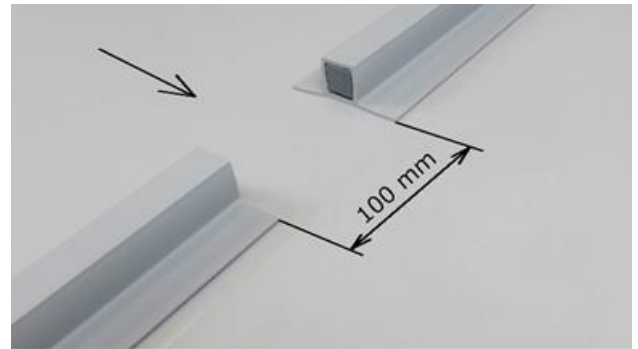


Fig. 21: Gap between profiles oriented perpendicularly to the slope of the roof

Profiles are placed in the same distance from the edge in all rows, which ensures that the gaps for water drainage are continuous.

The FATRAFAST profiles are attached to the FATRAFOL waterproofing membrane exclusively by hot air welding on both sides of the profile. The welds are always made along the entire length of the profile.

The process of welding the FATRAFAST profile to the waterproofing membrane

- On the roof, use chalk or a marker to mark out spots where profiles should be installed according to the agreed implementation documentation of the project.
- We lay out the profiles in the required length on the cleaned surface of the waterproofing along the anchor row (foil edges).
- During installation, make sure the Al bar does not protrude from the PVC profile. If necessary, insert it into the correct position.
- Fix the position of each profile with a spot weld at both ends (Fig. 22, 23). It is advisable to place the spot weld under the central part, i.e., under the aluminium profile, so that the edges of the profile remain free for subsequent welding.



Fig. 22: Fixing the profile with the first spot weld



Fig. 23: Fixing the profile with the second spot weld

- Additional rows of profiles are laid in the same way in the defined area of the roof along all anchor rows (Fig. 24).



Fig. 24: Laying profiles on the designated roof area

- Proceed to the welding of the profiles only after the test weld and tear-off test have been performed - see Chapter 3.
- It is possible to use a manual welding device (e.g., Leister, Herz, Fig. 25), a semi-automatic welding device (e.g., Leister Unidrive 500, Fig. 26), or an automatic welding device (e.g., Herz BeltOn).



Fig. 25: Profile welding using a manual welding device



Fig. 26: Profile welding using a semi-automatic welding device

- The quality of welding of the FATRAFAST profiles and the continuity of the joints are checked mechanically with a test needle after the welding is completed. Increased attention should be paid to the beginnings and ends of welds. Correct any deficiencies with a manual welding device.

APPLICATION OF PROFILES FOR OTHER INSTALLATIONS

FATRAFAST can also be used in the roof area for the installation of other, additionally installed equipment than structures for photovoltaic power plants. The layout of the profiles must be designed individually, based on the specific requirements for the given application.

In such cases, similar principles shall apply as for installations of photovoltaic power plants, the difference being that these installations are usually not so demanding. Structures and equipment other than photovoltaic power plants can be placed practically on the entire surface of the roof, unless other requirements or restrictions prevent it.

Heavy equipment should be installed on distribution grating. Devices that do not require fixing to the substrate can be laid loose on the FATRAFAST.

The layout of individual structures and devices with regard to the static load of the roof and the method of their fastening must always be dealt with individually depending on the purpose.

5 ANCHORING OF STRUCTURES INTO THE FATRAFAST PROFILE

FATRAFAST is designed in such a way that it allows additional structures to be attached to roofs without the need to penetrate the waterproofing membrane with anchor elements. For this purpose, the FATRAFAST has an aluminium reinforcing bar inserted inside the plastic profile.

The integrated Al reinforcing element is made of EN AW-6060 alloy (AlMgSi) with the wall thickness of 2,0 mm under EN 755-9 "Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 9: Profiles, tolerances on dimensions and form".

The Al reinforcing bar achieves the maximum strength of $R_{m,min} = 215 \text{ N/mm}^2$ under EN 755-2 "Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties".



Fig. 27: Ejot EJOFast JF3-2-5,5xL stainless steel screw

Suitable anchoring elements must be used to fasten the structures to the aluminium reinforcing bar, preferably without the need to drill or create metal splinters.

The recommended anchoring component is the Ejot EJOFast JF3-2-5,5xL E16 stainless steel screw with a hexagonal head or half-round Torx head and a sealing washer $\varnothing 14 \text{ mm}$, alternatively without a washer (Fig. 27). The characteristic pullout value of the Al reinforcing element with a wall thickness of 1.50 mm is $NR_{II,k} = 2120 \text{ N}$ (see ETA-10/0200, Annex 127).

Please note: For the FATRAFAST profile with the wall thickness of 2.00 mm, the verified axial pullout resistance of the Ejot EJOFast JF3-2-5,5xL screw is min. 2 500 N.

When choosing another fastening element, it must have a valid ETA assessment for use in the given substrate.

The screws are fixed into the top wall of the aluminium reinforcing bar and fixed perpendicularly to the surface. The minimum distance of the screws from the edges of the Al profile is 20 mm. The number of screws for fastening the structure is determined based on its calculated load, while it is recommended to install at least two fastening elements for each individual FATRAFAST profile. The length of the screw must be chosen in such a way that the screwing depth given by the manufacturer is taken into account and the end of the screw does not reach the surface of the bottom wall of the Al profile.

LEGAL SUPPLEMENT

The technical data contained herein is based on our current knowledge and experience and relate to the use of products under normal application conditions. Before using FATRAFAST profiles, the user has to check whether the product is suitable for the intended use. In addition, all users should contact the seller or manufacturer of this product for additional technical information regarding its use. In particular, if they believe that the information available to them requires any explanation, either for the general or specific use of this product. Please always make sure that you have the latest edition of the product's data sheet and application instructions. This data sheet and further information can be obtained from the sales or technical representative of the manufacturer or on the manufacturer's website.

The manufacturer of FATRAFAST profiles is not responsible for any damage caused by faulty design or installation.