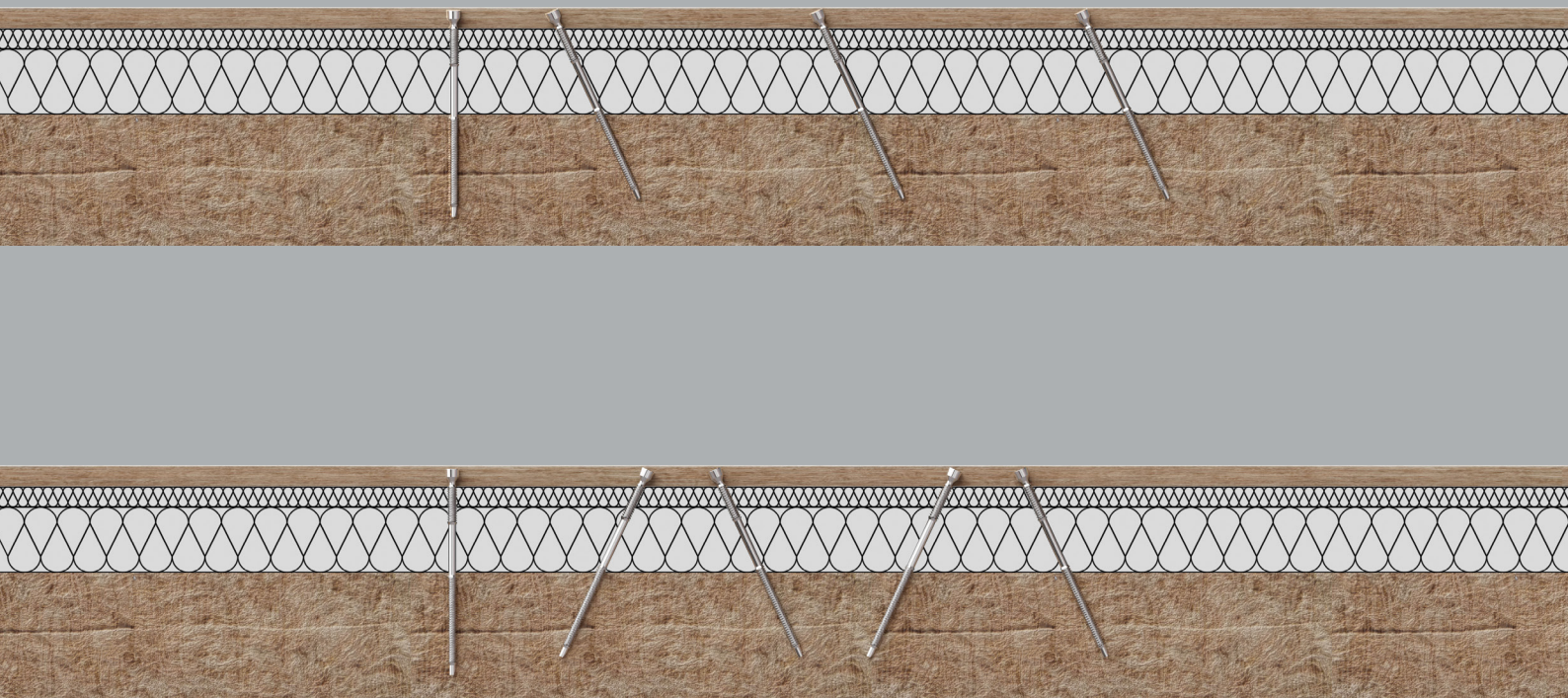


Screws for Insulated Roofs

Recommendation



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1. Introduction

In modern roofing construction, the correct selection of fasteners is essential for ensuring the stability, longevity, and thermal efficiency of insulated roof systems. Above-rafter insulation, commonly known as a „warm roof“ system, is widely used in passive and low-energy buildings to minimize heat loss and enhance energy performance.

However, when installing photovoltaic (PV) systems on pitched roofs with such insulation, special attention must be given to the choice of screws to prevent structural and thermal issues.

The selection of appropriate screws, their length, and their installation angles are crucial to maintaining both the structural integrity of the roof and the long-term performance of the PV system.

This document provides a practical guide for PV installers and roofing professionals on selecting and installing the right screws for insulated roof applications. It covers key aspects such as recommended screw specifications, length calculations, and installation techniques while considering critical factors like wind and snow loads, insulation material properties.

2. Disclaimer

Thermal Bridging Risk for On-Roof Insulation Applications

Mounting photovoltaic systems modules on roofs with on-roof insulation in passive or low-energy buildings may introduce thermal bridging, particularly when using conductive, large screws or other mounting hardware that penetrates the insulation layer.

This may lead to heat loss, reduced energy efficiency, or potential condensation issues within the roof structure. To avoid such risks, please consult a qualified roofing or building envelope specialist prior to installation. Expert guidance is essential to ensure the thermal performance and structural integrity of insulated roof assemblies.

Weather Conditions

It should be noted that local conditions (e.g. snow and wind loads zones) can have a strong influence on the additional requirements for shear screws.

These additional requirements must always be checked prior to installation.

3. Glossary

- **Hard Insulation:** Also called rigid insulation with a high compressive strength. The common products in the market are PIR (Polyisocyanurate), XPS (Extruded polystyrene) and EPS (Expanded Polystyrene).
- **Soft Insulation:** Also called Semi-rigid or flexible insulation. The common products in the market are Rock wool, Fiber Glass, Fiberglass Batts, Cellulose and Spray Foam.

4. Screw Recommendation

4.1 Recommended Screw Specs

Wood Screws: Double-threaded stainless steel or zinc-plated¹ carbon steel

Nominal Screw diameter: 6.0 mm – 8.0 mm

Drive: TX

Screw Head: Cylinder, Flange Button or Countersunk based on the selected Roof Hook hole shape

4.2 Screw Length Calculation

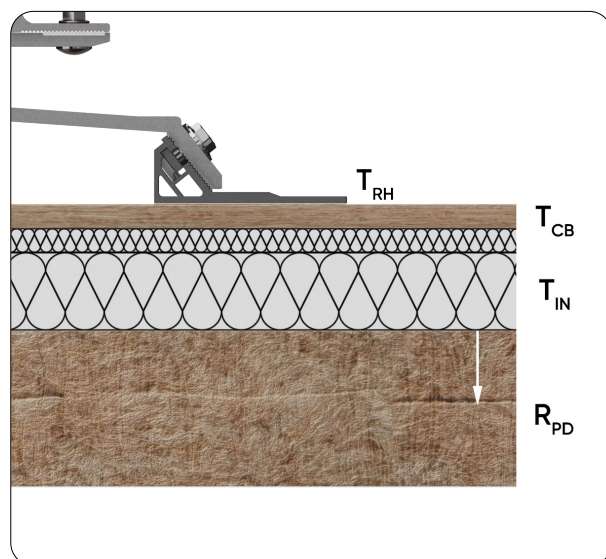
Screw length [mm] = $T_{RH} + T_{CB} + T_{IN} + R_{PD}$, where:

T_{RH} : Base Thickness of the Roof Hook
(depends on the selected roof hook)

T_{CB} : Thickness of the Counter Batten
(to be determined by the project owner)

T_{IN} : Thickness of the Insulation
(to be determined by the project owner)

R_{PD} : Rafter Penetration Depth
(Min. 40 mm, recommended: 60 mm)



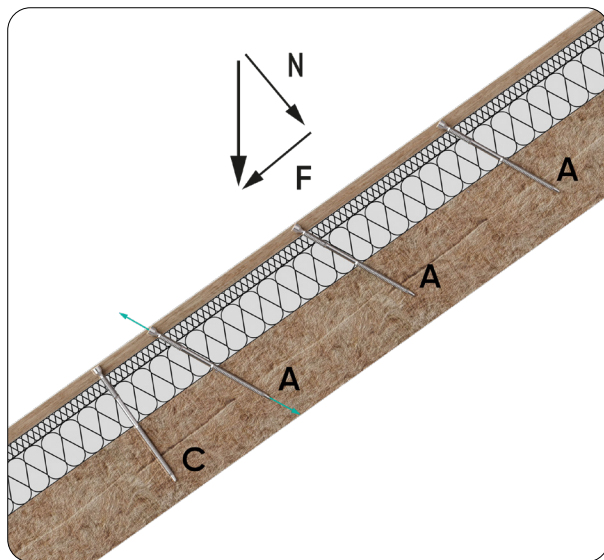
5. Installation Angles and Tips

Shear safety screws should be installed at an angle of $60^\circ - 65^\circ$ to the roof surface².

Suction safety screws should be installed at a 90° angle to the roof surface².

For Hard Insulations with high compression resistance ($10\% \geq 50 \text{ kPa}$ - EN 826) the insulation supports the load component perpendicular to the layer (N).

The screws are subject only to tensile stress (A).
For very high negative wind pressure loads, additional screws are inserted (C).

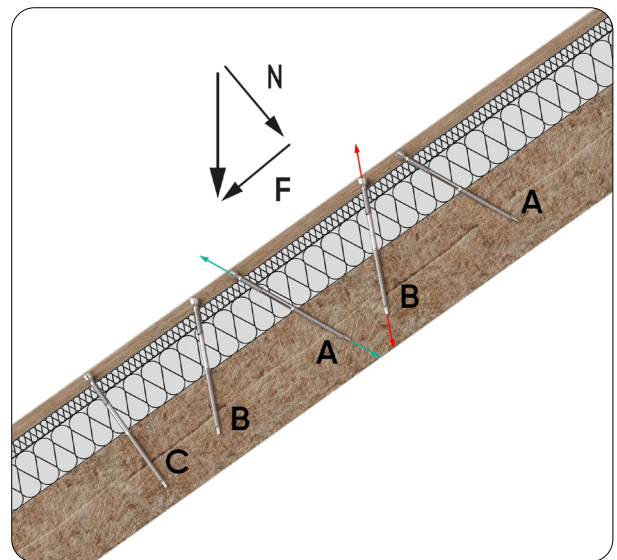


Hard Insulation

For Soft Insulations with Low compression resistance ($10\% < 50 \text{ kPa}$ - EN 826) the insulation does not support the load component perpendicular to the layer (N).

Screws are subject to tensile (A) and compression (B) stresses.

For very high negative wind pressure loads, additional screws are inserted (C).



Soft Insulation

(1) While zinc-coated screws may be allowed in certain low-risk applications, for mounting solar roof hooks on top of over-rafter insulation roofs in Germany, it is generally advisable to use stainless steel screws due to their superior corrosion resistance. Always consult local building regulations, project specifications, and relevant standards to ensure compliance and long-term durability of the installation.

(2) For the right angle please follow the instructions of the insulation material manufacturer.



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