# European Technical Assessment ETA-19/0498 of 2021/08/16

## I General Part

<table>
<thead>
<tr>
<th><strong>Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:</strong></th>
<th>ETA-Danmark A/S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trade name of the construction product:</strong></td>
<td>ThermoPin®</td>
</tr>
<tr>
<td><strong>Product family to which the above construction product belongs:</strong></td>
<td>Glass fibre reinforced plastics connectors</td>
</tr>
</tbody>
</table>
| **Manufacturer:** | B.T. innovation GmbH  
Sudenburger Wuhne 60  
D-39116 Magdeburg  
Tel +49 391 7352 60  
Fax +49 391 7352 52  
Internet [www.bt-innovation.de](http://www.bt-innovation.de) |
| **Manufacturing plant:** | B.T. innovation GmbH  
Production Plant 5 |
| **This European Technical Assessment contains:** | 15 pages including 3 annexes which form an integral part of the document |
| **This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:** | EAD 330387-00-0601– Glass fibre reinforced plastics (GFRP) connectors for use in sandwich and element walls made of concrete |
| **This version replaces:** | The ETA with the same number issued on 2019-11-07 |
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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Technical description of the product

The ThermoPin® tie anchors are made of a glass fibre reinforced plastic bar. Both ends of the anchor tapered. For material and dimensions of the tie anchor, see Annex 2.

Type H and type H_M has a nominal diameter of 7.5 mm and made with a straight plastic sleeve. The operating principle of the anchor is based on utilising the form fit between the conical end of the plastic bar and the concrete.

Type D has a nominal diameter of 7.5 mm and made with an inclined plastic sleeve. The operating principle of the anchor is based on utilising the form fit between the conical end of the plastic bar and the concrete.

The anchors are used to connect the facing shell with the load-bearing layer.

The type H anchor may also be used to retain facing shells which are floor-mounted. The type H anchor must be fitted horizontally. It may only be used to transfer temporary centric tension and pressure loads.

The type D anchor is used inclined installation as a support system for sandwich walls and element walls with freely suspended facing shell, where only the weight of the facing shell and possibly introduced vertical loads with inclined anchors in combination with a sectionally arranged compression-resistant thermal insulation is permanently supported.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

The anchor is used when manufacturing core insulated reinforced concrete wall panels.

The layers consist of a facing shell and load-bearing layer made of standard concrete, and one or more layers of insulation panels. The load-bearing layer consists of a pre-cast part or a precast part and a layer of concrete mixed in-situ.

On the inside of the load-bearing layer, the temperature may not permanently exceed 40 ºC. The anchor permanently used for exposure classes XC, XD and XS under EN 1992-1-1 with DIN EN 1992-1-1/NA:2011-01, section 4.2.

The type D anchors is installed at an angle of 45º (±2.5º) to the horizontal (slab surface). Inclined anchors must have a bonding depth of at least 40 mm in the horizontal direction of the facing shell's concrete ("external side"). At the other end of the rod, on the supporting shell ("internal side"), the inclined anchors must also have a bonding depth of at least 40 mm in the horizontal direction of the concrete.
From this, the minimum bonding length of an inclined anchor is calculated as:

\[ L_{\text{inclined anchor}} = (\text{insulation thickness} + 2 \times 40) \times \sqrt{2} \]

All measurements in mm.

The vertical distance between inclined anchors (with two neighbouring support anchor systems) must be between \(5 \times h_{\text{nom}}\) and max 700 mm. The horizontal distance between inclined anchors must also be at least \(5 \times h_{\text{nom}}\). The vertical distance between horizontal and inclined anchors of the facing and supporting shells must be at least 200 mm.

*Thermal insulation*

With a support anchor system, the compression-resistant thermal insulation must be installed centrally at the inclined anchor's bonding point in the transition area of core insulation and facing shell. For the compression-resistant thermal insulation, a material with a minimum long-term pressure elasticity modulus value of \(E = 2,400\) kPa and a surface of \(500 \times 500\) mm = 250,000 mm\(^2\) must be used.

If a hard foam is used, it must have a short-term compressive strength of 100 kPa for 10% compression according to e.g. EN 13163 for polystyrene. If an EPS hard foam is used, the insulating material's bulk density must be at least 20 kg/m\(^3\). The short-term elasticity modulus with a compressive load must have a minimum value of 3600 kPa.

The provisions for the anchor must correspond to the details given in the Annexes in its dimensions and material characteristics.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the ThermoPin® tie anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.
3 Performance of the product and references to the methods used for its assessment

<table>
<thead>
<tr>
<th>Essential characteristic</th>
<th>Assessment method</th>
<th>Assessment of characteristic</th>
</tr>
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</table>

### 3.1 Mechanical resistance and stability (BWR1)
In the below characteristics the value \( h_{\text{nom.min}} \) corresponds to the value \( h_{\text{nom}} = 40 \text{ mm} \)

- **Resistance to GFRP failure under compression load**, \( N_{R_{\text{K,GFRP,D}}} \) [kN]
  - \( 2.2.1 \) 4,7 kN

- **Resistance to concrete failure under compression load**, \( N_{R_{\text{K,C,D}}} \) [kN]
  - \( 2.2.2 \) 2,5 kN

- **Resistance to GFRP failure under tension load**, \( N_{R_{\text{K,GFRP}}} \) [kN]
  - \( 2.2.3 \) 6,2 kN

- **Resistance to concrete failure (cracked and uncracked concrete) under tension load**, \( N_{R_{\text{K,C,cr}}, N_{R_{\text{K,C,ucr}}}} \) [kN]
  - \( 2.2.4 \) \( N_{R_{\text{K,C,cr}}}(C20/25): 4,7 \text{ kN} \) \( N_{R_{\text{K,C,ucr}}}(C50/60): 5,9 \text{ kN} \)

- **Resistance to GFRP failure under shear load**, \( V_{R_{\text{K,GFRP}}} \) [kN]
  - \( 2.2.5 \) 0,4 kN

- **Resistance to concrete failure under shear load**, \( V_{R_{\text{K,C}}} \) [kN]
  - \( 2.2.6 \) 0,6 kN

- **Maximum acceptable shear deformation \( w_{\text{max}} \) [mm]**
  - \( 2.2.7 \) 3,7 mm

- **Minimum edge distances and spacing**
  - \( 2.2.8 \) \( c_{\text{min}} \): 105 mm \( s_{\text{min}} \): 210 mm

- **Durability**
  - \( 2.2.9 \) 50 years

- **Modulus of Elasticity**
  - \( 2.2.10 \) \( E_{N}: 60.000 \text{ N/mm}^2 \) \( E_{M}: 30.000-60.000 \text{ N/mm}^2 \)

- **Geometric parameters**
  - \( 2.2.11 \) \( A_{\text{pin}}: 41,9 \text{ mm}^2 \) \( I_{y}: 139,4 \text{ mm}^4 \) \( I_{z}: 139,4 \text{ mm}^4 \)

*) See additional information in section 3.2-3.3"
3.2 Methods of verification
The characteristic values of the anchors are based on the EAD 330387-00-0601.

3.3 General aspects related to the fitness for use of the product

The European Technical Assessment is issued for the product based on agreed data/information, deposited with ETA-Danmark, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to ETA-Danmark before the changes are introduced. ETA-Danmark will decide if such changes affect the ETA and consequently the validity of the CE marking based on the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

ThermoPin® tie anchor are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.
4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system
According to the decision 97/463/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2021-08-16 by

Thomas Bruun
Managing Director, ETA-Danmark
### Annex 1

**Application limits**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol/Unit</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concretes with strength class</td>
<td>$f_{ck}$ / $f_{ck,cube}$ [N/mm²]</td>
<td>C20/25 – C50/60</td>
</tr>
<tr>
<td>Minimum reinforcement of both shells</td>
<td>$a_{s,min}$ [mm²/m]</td>
<td>1.88</td>
</tr>
<tr>
<td>Facing shell thickness</td>
<td>$d_{VS}$ [mm]</td>
<td>50 - 120</td>
</tr>
<tr>
<td>Minimum thickness of supporting layer</td>
<td>$d_{TS}$ [mm]</td>
<td>Element wall: 60 (FT) 140 (on-site concrete + FT) Sandwich wall: 100</td>
</tr>
<tr>
<td>Anchor length of horizontal and inclined anchors in concrete</td>
<td>$h_{nom}$ [mm]</td>
<td>40 - 110</td>
</tr>
<tr>
<td>Spacing of horizontal anchors (min)</td>
<td>$s_{Hx}$, $s_{Hy}$, $s_{H}$ [mm]</td>
<td>210</td>
</tr>
<tr>
<td>Edge distance of horizontal anchors (min/max)</td>
<td>$c_{Hx}$, $c_{Hy}$ [mm]</td>
<td>105/250</td>
</tr>
<tr>
<td>Minimum spacing of inclined anchors of the support anchor system in horizontal and vertical direction (min)</td>
<td>$c_{T.x,min}$, $c_{T.y,min}$ [mm]</td>
<td>5 × $h_{nom}$</td>
</tr>
<tr>
<td>Maximum spacing of inclined anchors of the support anchor system in vertical direction (max)</td>
<td>$c_{T.x,max}$ [mm]</td>
<td>700</td>
</tr>
<tr>
<td>Spacing between inclined anchors of the support anchor system and horizontal anchors</td>
<td>$s_{H,T,x}$, $s_{H,T,y}$, $s_{H,T}$ [mm]</td>
<td>200</td>
</tr>
<tr>
<td>Minimum edge distance of inclined anchors in the support anchor system</td>
<td>$c_{T,x,min}$, $c_{T,y,min}$ [mm]</td>
<td>200</td>
</tr>
<tr>
<td>Installation angle of inclined anchors</td>
<td>$\theta$ [°]</td>
<td>45 ±2.5</td>
</tr>
<tr>
<td>Thickness of insulation</td>
<td>$d_{D}$ [mm]</td>
<td>50 - 200</td>
</tr>
<tr>
<td>Minimum surface of the insulating material as pressure component in the support anchor system</td>
<td>$w \times h$ [mm]</td>
<td>420 x 490</td>
</tr>
</tbody>
</table>

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**ThermoPin®**

**Application limits**

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**Annex 1.0**
Material & Dimensions

ThermoPin®

Annex 1.1

h_D corresponds to the thickness of the insulation
h_V corresponds to the thickness of the facing layer
h_T corresponds to the thickness of the bearing shell
h_{nom} corresponds to the connection depth of the ThermoPin® tie anchors
ThermoPin® tie anchor Type H: GFK anchor with straight plastic sleeve. Dimensions in [mm].

ThermoPin® tie anchor Type H_M: GFK anchor with modified straight plastic sleeve. Dimensions in [mm]

ThermoPin® tie anchor Type D: GFK anchor with inclined plastic sleeve. Dimensions in [mm]

Labelling
Worksidentification: B.T. innovation
Anchor: ThermoPin®

Material
Pin (1): Glass-fibre reinforced plastic
Sleeve (2): Plastic
Caps (3): Plastic

Dimensions
Length L1: Total length freely selectable as a function of application.
Sleeve: Position of sleeve dependent on respective application.
L3: 10 mm or 20 mm

d1: 7.5 ± 0.3 mm; d2: 10.5 ± 0.4 mm
L2: 21.8 ± 0.3 mm; L3: 10 or 20 mm ± 0.3 mm
Example of view of a precast element (element wall or sandwich wall) with vertical facing shell with ThermoPin® tie anchors Type H.

Minimum axis gap between two ThermoPin® Type H: $s_{HH} = 210$ mm
Minimum edge distance of ThermoPin® Type H: $C_H = 105$ mm

Arrangement of ThermoPin® tie anchors in accordance with static calculation.
Example of view of a precast element (element wall or sandwich wall) with ThermoPin® tie anchors Type H and Type D.

Arrangement of ThermoPin® tie anchors in accordance with static calculation.

Minimum axis gap between two ThermoPin® S = 210 mm
Minimum edge distance of ThermoPin® C = 105 mm

ThermoPin®
Installation parameters of ThermoPin® tie anchor Type H and D in concrete

Annex 2.2
Sandwich wall

1. Fill in and compact the concrete of the first shell. Apply the insulation as tightly as possible to the fresh concrete of the first shell. Insert Thermo-Pins through the insulation layer into the fresh concrete of the facing layer.

2. Compact the concrete of the facing layer. Secure the insulation against lateral displacement if possible.

3. Apply the concrete of the second shell.

4. Compact the concrete of the second shell. Observe curing times.

5. Transport the sandwich wall to the construction site.

ThermoPin®
Installation instructions – sandwich wall

Annex 3.1
1. **Element wall**

   ![Diagram of Element wall](image)

   Fill in and compact the concrete of the first shell. Apply the insulation as tightly as possible to the fresh concrete of the first shell. Insert ThermoPins through the insulation into the fresh concrete of the facing layer.

2. ![Diagram of Element wall](image)

   Compact the concrete of the facing layer. Secure the insulation against lateral displacement if possible. Observe curing times.

3. ![Diagram of Element wall](image)

   Fill in the concrete of the second shell.

4. ![Diagram of Element wall](image)

   Turn the first shell with the ThermoPins into the fresh concrete of the second shell.

5. ![Diagram of Element wall](image)

   Compact the fresh concrete of the second shell. Observe curing times.
Element wall

Transport the element wall to the construction site.

Concreting on site, taking into account the concreting speed according to the static calculations.