Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment ETA-18/0267 of 7 November 2022

English translation prepared by DIBt - Original version in German language

**General Part**

| | |
|---|---|
| Technical Assessment Body issuing the European Technical Assessment: | Deutsches Institut für Bautechnik |
| Trade name of the construction product | Austrotherm XPS TOP 30 TB<br>Austrotherm XPS TOP 50 TB<br>Austrotherm XPS TOP 70 TB |
| Product family to which the construction product belongs | Extruded polystyrene foam boards as load bearing layer and/or thermal insulation outside the waterproofing |
| Manufacturer | Austrotherm GmbH<br>Friedrich-Schmid-Straße 165<br>2754 Waldegg/Wopfing<br>ÖSTERREICH |
| Manufacturing plant | Austrotherm GmbH Werk Purbach<br>Industriestraße 1<br>A-7083 Purbach |
| This European Technical Assessment contains | 13 pages including 1 annex which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of | EAD 040650-00-1201 |
| This version replaces | ETA-18/0267 issued on 17 August 2020 |

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## Specific Part

### 1 Technical description of the product

The multilayer extruded polystyrene foam boards are manufactured from up to five layers of extruded polystyrene foam boards (single boards). The single boards with thicknesses of 60 mm to 80 mm are bonded together by full-surface thermal welding. The single boards are made of rigid cellular plastics material extruded from polystyrene or one of its copolymers and which have a closed cell structure. The blowing agent mixture is carbon dioxide ($CO_2$), isobutene and additives.
The multilayer extruded polystyrene foam boards have a foam skin on both surfaces and a special edge treatment (shiplap).
The multilayer extruded polystyrene foam boards do not contain Hexabromocyclododecane (HBCD).
The multilayer extruded polystyrene foam boards have the following designations:

"Austrotherm XPS TOP 30 TB",
"Austrotherm XPS TOP 50 TB" and
"Austrotherm XPS TOP 70 TB"

The multilayer extruded polystyrene foam boards are manufactured with the following dimensions:

Nominal thicknesses:

| | |
|---|---|
| "Austrotherm XPS TOP 30 TB" | 140 mm to 340 mm |
| "Austrotherm XPS TOP 50 TB" | 140 mm to 300 mm |
| "Austrotherm XPS TOP 70 TB" | 140 mm to 300 mm |

Nominal length: 1250 mm

Nominal widths: 600 mm

The European Technical Assessment has been issued for the product on the basis of agreed data/ information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed. The European Technical Assessment applies only to products corresponding to this agreed data/information.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The extruded polystyrene foam boards are intended to be used as load bearing layer and /or thermal insulation outside the waterproofing. The boards are laid uniformly and even on the substrate to which they are applied. In particular the following applications are covered:

- Load bearing layer and thermal insulation underneath foundation slabs up to 300 mm thickness
- External horizontal and vertical thermal insulation of in-ground constructions in non-structural applications (also in case of groundwater)
- Inverted roof insulation (including park deck and green roof applications)

The performance according to section 3 only applies if the thermal insulation boards are installed according to the manufacture's installation instructions and if they are protected from precipitation, wetting or weathering during transport and storage before installation.

Concerning the application of the thermal insulation boards, also the respective national regulations shall be observed.

Where the thermal insulation boards are fixed by using adhesives, only such adhesions shall be used, which are suitable for this purpose. The assessment of these fixings is not subject of this European Technical Assessment.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the extruded polystyrene foam boards of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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

For sampling, conditioning and testing the provisions of the EAD No 040650-00-1201 "Extruded polystyrene foam boards as load bearing layer and / or thermal insulation outside the waterproofing" apply.

### 3.1 Mechanical resistance and stability (BWR 1)

| **Essential characteristic** | **Performance** |
|---|---|
| Compressive stress at 10 % deformation or compressive strength | Level (individual values may fall below this level up to 10 %): |
| test acc. to EN 826:2013 | |
| "Austrotherm XPS TOP 30 TB" | ≥ 300 kPa |
| "Austrotherm XPS TOP 50 TB" | ≥ 500 kPa |
| "Austrotherm XPS TOP 70 TB" | ≥ 700 kPa |
| Slip deformation | No performance assessed |
| Compressive stress or compressive strength in the transverse and longitudinal directions | No performance assessed |
| Characteristic value of compressive stress or compressive strength | |
| 5%-fractile value for a one-sided confidence level of 75 % under unknown or known variance using ISO 12491:1997 | |
| "Austrotherm XPS TOP 30 TB" | |
| thickness 140 mm ≤ d ≤ 300 mm | $\sigma_{0,05}$ = 317 kPa (n = 50; $\sigma_{mean}$ = 356 kPa; $s_\sigma$ = 22 kPa) |
| "Austrotherm XPS TOP 50 TB" | |
| thickness 140 mm ≤ d ≤ 300 mm | $\sigma_{0,05}$ = 502 kPa (n = 24; $\sigma_{mean}$ = 544 kPa; $s_\sigma$ = 23 kPa) |
| "Austrotherm XPS TOP 70 TB" | |
| thickness 140 mm < d ≤ 300 mm | $\sigma_{0,05}$ = 703 kPa (n = 11; $\sigma_{mean}$ = 746 kPa; $s_\sigma$ = 21 kPa) |
| Compressive creep | See Annex A |

| Essential characteristic | Performance |
|---|---|
| Behaviour under shear load (large-sized specimen)<br>test acc. to the EAD and the guidelines in EN 12090:2013 | |
| "Austrotherm XPS TOP 30 TB", thickness 300 mm | $\tau_{large}$ = 105 kPa |
| "Austrotherm XPS TOP 70 TB", thickness 300 mm | $\tau_{large}$ = 162 kPa |
| Creep under shear load | See Annex A |
| Creep under combined compressive and shear load | See Annex A |
| Compressive modulus of elasticity | No performance assessed |
| Adhesion behaviour under compressive and shear load on large-sized samples | No performance assessed |
| Shear strength<br>test acc. to EN 12090:2013 | ≥ 200 kPa |
| Density<br>test acc. to EN 1602:2013 | density range: |
| "Austrotherm XPS TOP 30 TB" | 29 kg/m³ - 33 kg/m³ |
| "Austrotherm XPS TOP 50 TB" | 32 kg/m³ - 36 kg/m³ |
| "Austrotherm XPS TOP 70 TB" | 36 kg/m³ - 41 kg/m³ |

## 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire<br>test acc. to EN ISO 11925-2:2010 | Class E<br>acc. to EN 13501-1:2007 + A1:2009 |

## 3.3 Energy economy and heat retention (BWR 6)

| Essential characteristic | Performance |
|---|---|
| Thermal conductivity<br>at mean reference temperature of 10 °C<br>test acc. to EN 12667:2001 or EN 12939:2001 and aging procedure acc. EN 13164:2012+A1:2015, Annex C with deviating storage time period (sliced specimen) of (90 +2/-2) days prior to testing | |
| "Austrotherm XPS TOP 30 TB" | $\lambda_{D(90d)}$ = 0.035 W/(m·K) |
| "Austrotherm XPS TOP 50 TB" | $\lambda_{D(90d)}$ = 0.035 W/(m·K) |
| "Austrotherm XPS TOP 70 TB" | $\lambda_{D(90d)}$ = 0.035 W/(m·K) |
| Moisture conversion coefficient | No performance assessed |

| Essential characteristic | Performance |
|---|---|
| Water absorption<br>Long term water absorption by total immersion<br>test acc. to EN 12087:2013 (method 2A)<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | WL(T)0,7<br>($W_{lt}$ ≤ 0.7 Vol.%) |
| Long term water absorption by diffusion<br>test acc. to EN 12088:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | WD(V)3<br>($W_{dV}$ ≤ 3.0 Vol.%) |
| Freeze-thaw resistance<br>test acc. to EN 12091:2013<br>using the wet test specimens from having done the water diffusion test in accordance with EN 12088:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | FTCD1<br>($W_V$ ≤ 1.0 Vol.%) |
| Reduction in compressive stress at 10 % deformation or in compressive strength of the re-dried specimens, when tested in accordance with EN 826:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | ≤ 10 % |
| Reduction in shear strength of the re-dried specimens, when tested in accordance with EN 12090:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | ≤ 10 % |
| Water vapour diffusion resistance factor<br>test acc. to EN 12086 and EAD | See Annex A |
| Geometrical properties<br>Thickness<br>test acc. EN 823:2013 (clause 7.2, figure 2, measuring set-up 3)<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | tolerance<br>+4/-2 mm |
| Length, width<br>test acc. EN 822:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | ±8 mm |

| **Essential characteristic** | **Performance** |
|---|---|
| Geometrical properties<br>Squareness<br>in direction of length and width; in direction of thickness<br>test acc. EN 824:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | tolerance<br><br><br><br>5 mm/m |
| Flatness<br>in direction of length and width<br>test acc. EN 825:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | <br><br><br><br>3 mm |
| Compressive stress at 10 % deformation or compressive strength<br>test acc. to EN 826:2013<br>"Austrotherm XPS TOP 30 TB",<br>thickness 300 mm < d ≤ 340 mm | <br><br><br>≥ 300 kPa |
| Density<br>test acc. to EN 1602:2013<br>"Austrotherm XPS TOP 30 TB"<br>thickness 300 mm < d ≤ 340 mm | <br>density range:<br><br>29 kg/m³ - 33 kg/m³ |
| Deformation under specified compressive load and temperature conditions<br>test acc. to EN 1605:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | <br>load: 40 kPa; temperature: (70 ± 1) °C; time: (168 ± 1) h<br>≤ 5 % |
| Dimensional stability under specified conditions<br>test acc. to EN 1604:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | <br>temperature: 70 °C and 90% R.H.<br>DS(70,90)<br>($\Delta\varepsilon_l \leq 5$ %, $\Delta\varepsilon_b \leq 5$ %, $\Delta\varepsilon_d \leq 5$ %) |
| Tensile strength perpendicular to faces<br>test acc. to EN 1607:2013<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | <br><br>TR150<br>($\sigma_{mt} \geq 150$ kPa) |

| Essential characteristic | Performance |
|---|---|
| Volume percentage of closed cells<br>test acc. to EN ISO 4590:2003 (method 1 with correction)<br>"Austrotherm XPS TOP 30 TB", "Austrotherm XPS TOP 50 TB", "Austrotherm XPS TOP 70 TB" | ≥ 95% |

## 4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 040650-00-1201, the applicable European legal acts are: 1995/467/EC and 1999/91/EC

The system to be applied is:

System 1 for Essential characteristics concerning Mechanical resistance and stability (BWR 1)

System 3 for all other Essential characteristics

## 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 7 November 2022 by Deutsches Institut für Bautechnik

Frank Iffländer
Referatsleiter

*beglaubigt:*
Wendler

Deutsches Institut für Bautechnik DIBt

**Austrotherm XPS TOP 30 TB**
**Austrotherm XPS TOP 50 TB**
**Austrotherm XPS TOP 70 TB**

**Anlage A**

## 1. Compressive creep (single-layer and multi-layer boards)
acc. to EN 1606:2013 and EAD, chapter 2.2.3.1

| **Austrotherm XPS TOP 30 TB (multi-layer boards)** | **thickness 140 mm** | | | **thickness 180 mm** | | |
|---|---|---|---|---|---|---|
| density (kg/m³) | 30.5 | | | 30.5 | | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 443/8 | | | 393/8 | | |
| **load stage (kPa)** | **94** | **141** | **188** | **83** | **125** | **166** |
| $X_0$ (mm) | 0.63 | 0.94 | 1.16 | 0.76 | 1.28 | 1.43 |
| $X_{ct}$ (mm) | 0.53 | 1.01 | 3.37 | 0.87 | 1.33 | 2.15 |
| $X_{ct50}$(mm) | 1.39 | 2.32 | 9.63 | 1.48 | 2.32 | 4.92 |
| **$X_{t50}$(mm)** | **2.02** | **3.26** | **10.79** | **2.56** | **3.60** | **6.35** |

| **Austrotherm XPS TOP 30 TB (multi-layer boards)** | **thickness 300 mm** | | |
|---|---|---|---|
| density (kg/m³) | 31 | | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 412/5 | | |
| **load stage (kPa)** | **87** | **131** | **174** |
| $X_0$ (mm) | 1.04 | 1.53 | 2.14 |
| $X_{ct}$ (mm) | 0.69 | 1.18 | 2.55 |
| $X_{ct50}$(mm) | 1.48 | 2.58 | 6.35 |
| **$X_{t50}$(mm)** | **2.52** | **4.11** | **8.49** |

| **Austrotherm XPS TOP 50 TB (multi-layer boards)** | **thickness 140 mm** | | | **thickness 180 mm** | | |
|---|---|---|---|---|---|---|
| density (kg/m³) | 33.5 | | | 33.5 | | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 635/9 | | | 614/10 | | |
| **load stage (kPa)** | **134** | **202** | **269** | **130** | **195** | **260** |
| $X_0$ (mm) | 0.67 | 0.83 | 1.26 | 0.60 | 1.27 | 1.26 |
| $X_{ct}$ (mm) | 0.45 | 0.55 | 2.91 | 0.51 | 0.85 | 2.97 |
| $X_{ct50}$(mm) | 1.33 | 1.41 | 7.00 | 1.24 | 2.40 | 8.10 |
| **$X_{t50}$(mm)** | **2.00** | **2.24** | **8.26** | **1.84** | **3.67** | **9.36** |

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**Austrotherm XPS TOP 30 TB**
**Austrotherm XPS TOP 50 TB**
**Austrotherm XPS TOP 70 TB**

**Anlage A**

| **Austrotherm XPS TOP 50 TB (multi-layer boards)** | **thickness 300 mm** | | |
|---|---|---|---|
| density (kg/m³) | 33.5 | | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 606/8 | | |
| **load stage (kPa)** | **128** | **192** | **257** |
| $X_0$ (mm) | 1.17 | 1.41 | 1.75 |
| $X_{ct}$ (mm) | 0.71 | 1.29 | 3.18 |
| $X_{ct50}$(mm) | 1.89 | 3.24 | 8.00 |
| **$X_{t50}$(mm)** | **3.06** | **4.65** | **9.75** |

| **Austrotherm XPS TOP 70 TB (multi-layer boards)** | **thickness 140 mm** | | | **thickness 180 mm** | | |
|---|---|---|---|---|---|---|
| density (kg/m³) | 39 | | | 36 | | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 799/5 | | | 761/9 | | |
| **load stage (kPa)** | **169** | **254** | **338** | **161** | **242** | **322** |
| $X_0$ (mm) | 0.55 | 0.75 | 1.11 | 0.78 | 1.06 | 1.42 |
| $X_{ct}$ (mm) | 0.37 | 0.82 | 1.98 | 0.44 | 0.83 | 2.26 |
| $X_{ct50}$(mm) | 1.21 | 2.27 | 5.71 | 1.02 | 2.02 | 6.88 |
| **$X_{t50}$(mm)** | **1.76** | **3.02** | **6.82** | **1.80** | **3.08** | **8.30** |

| **Austrotherm XPS TOP 70 TB (multi-layer boards)** | **thickness 300 mm** | | |
|---|---|---|---|
| density (kg/m³) | 40 | | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 769/5 | | |
| **load stage (kPa)** | **163** | **244** | **326** |
| $X_0$ (mm) | 1.15 | 1.36 | 2.05 |
| $X_{ct}$ (mm) | 0.57 | 0.83 | 2.70 |
| $X_{ct50}$(mm) | 1.49 | 2.12 | 6.71 |
| **$X_{t50}$(mm)** | **2.64** | **3.48** | **8.76** |

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**Austrotherm XPS TOP 30 TB**
**Austrotherm XPS TOP 50 TB**
**Austrotherm XPS TOP 70 TB**

**Annex A**

## 2. Creep under shear load
acc. to EAD, chapter 2.2.5

| **Austrotherm XPS TOP 30 TB (multi-layer boards)** | **thickness 300 mm** |
|---|---|
| density (kg/m$^3$) | 31 |
| shear strength/ deformation acc. EN 12090 (kPa) | 105/2 |
| **load stage (kPa)** | **36.8** |
| $X_{\tau 0}$ (mm) | 2.19 |
| $X_{\tau ct}$ (mm) | 1.07 |
| $X_{\tau ct50}$(mm) | 2.11 |
| **$X_{\tau t50}$(mm)** | **4.30** |

| **Austrotherm XPS TOP 70 TB (multi-layer boards)** | **thickness 300 mm** |
|---|---|
| density (kg/m$^3$) | 41 |
| shear strength/ deformation acc. EN 12090 (kPa) | 162.3/3 |
| **load stage (kPa)** | **56.8** |
| $X_{\tau 0}$ (mm) | 3.38 |
| $X_{\tau ct}$ (mm) | 1.23 |
| $X_{\tau ct50}$(mm) | 2.09 |
| **$X_{\tau t50}$(mm)** | **5.47** |

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**Austrotherm XPS TOP 30 TB** **Annex A**
**Austrotherm XPS TOP 50 TB**
**Austrotherm XPS TOP 70 TB**

## 3. Creep under combined compressive and shear load
acc. to EAD, chapter 2.2.6

| **Austrotherm XPS TOP 30 TB (multi-layer boards)** | | |
|---|---|---|
| **thickness** | **300 mm** | |
| density (kg/m$^3$) | 31 | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 436/- | |
| shear strength/ deformation acc. EN 12090 (kPa) | 105.2/2 | |
| **load stage (kPa)** | **36.8** | **130.8** |
| deformation under | shear load | compressive load |
| $X_{\tau 0}$ /$X_0$ (mm) | 2.34 | 2.88 |
| $X_{\tau ct}$ /$X_{ct}$ (mm) | 2.05 | 2.55 |
| $X_{\tau ct50}$/$X_{ct50}$(mm) | 3.94 | 2.89 |
| **$X_{\tau t50}$/$X_{t50}$(mm)** | **5.99** | **5.77** |

| **Austrotherm XPS TOP 70 TB (multi-layer boards)** | | |
|---|---|---|
| **thickness** | **300 mm** | |
| density (kg/m$^3$) | 41 | |
| compressive stress/ deformation acc. EN 826 (kPa / %) | 813/- | |
| shear strength/ deformation acc. EN 12090 (kPa) | 162.3/3 | |
| **load stage (kPa)** | **56.8** | **244.1** |
| deformation under | shear load | compressive load |
| $X_{\tau 0}$ /$X_0$ (mm) | 3.68 | 3.68 |
| $X_{\tau ct}$ /$X_{ct}$ (mm) | 3.10 | 2.47 |
| $X_{\tau ct50}$/$X_{ct50}$(mm) | 4.76 | 4.29 |
| **$X_{\tau t50}$/$X_{t50}$(mm)** | **8.44** | **7.97** |

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**Austrotherm XPS TOP 30 TB**
**Austrotherm XPS TOP 50 TB**
**Austrotherm XPS TOP 70 TB**

**Annex A**

## 4. Water vapour transmission
in accordance with EN 12086

| **Austrotherm XPS TOP 30 TB** | **thickness 140 mm (60 + 80 mm)** | **thickness 240 mm (3x 80 mm)** | **thickness 400 mm (5x 80 mm)** |
|---|---|---|---|
| density (kg/m³) | 30 | 29 | 30 |
| sliced thickness of the specimens in mm | | | |
| Skin layer | 20 | 29 | 20 |
| Adhesion layer | 30 | 37 | 40 |
| Core layer | 25 | 27 | 40 |
| **water vapour diffusion resistance factor (mean values for the sliced thickness)** | | | |
| $\mu_{skin}$ | 130 | 140 | 160 |
| $\mu_{ad}$ | 130 | 150 | 140 |
| $\mu_{core}$ | 85 | 120 | 105 |

| **Austrotherm XPS TOP 70 TB** | **thickness 180 mm (3x 60 mm)** |
|---|---|
| density (kg/m³) | 36 |
| sliced thickness of the specimens in mm | |
| Skin layer | 20 |
| Adhesion layer | 20 |
| Core layer | 30 |
| **water vapour diffusion resistance factor (mean values for the sliced thickness)** | |
| $\mu_{skin}$ | 115 |
| $\mu_{ad}$ | 120 |
| $\mu_{core}$ | 65 |