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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

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

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	ThermoPin®
Product family to which the above construction product belongs:	Glass fibre reinforced plastics connectors
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
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

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.

Physical properties		
Density	[kg/m^3]	2000-2050
Water absorption	[%]	≤0.05
Thermal expansion coefficient		
longitudinal	[1/K]	5 x 10^{-6}
transverse	[1/K]	10 x 10^{-6}
Thermal conductivity	[W/ (m x K)]	0.48
Mechanical properties (minimum values)		
Tensile strength	[N/mm^2]	1.500
Compressive strength	[N/mm^2]	1.500
Flexural strength	[N/mm^2]	1.585
Shear strength	[N/mm^2]	165

See Annex 1 for application limits of the ThermoPin® tie anchors.

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.

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.

See annex 3 for installation.

Anchorage is in normal weight concrete of strength classes in the range of C20/25 to C50/60 in accordance with EN 206. Only the temporary or permanent forces from the facing shells working vertically or parallel to the wall in the direction of their own weight may be transferred into the anchor.

The facing shell may also impress temporary forced deformations parallel to the wall into anchors type H. Reinforced concrete wall panels up to size 12 x 6 m can be manufactured with the anchors. The direction of installation of the finished-part walls with freely suspended facing shells must be clearly indicated, for instance by using transport anchors. The anchor can be used for internal and external walls. The temperature on the surface of the concrete cover layer may between +65 °C and -20 °C (max. short term temperature). The maximum long-term temperature is 40 °C.

On the inside of the load-bearing layer, the temperature may not permanently exceed 40 °C. 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 45° (±2.5°) 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:

$L_{inclined\ anchor}$ = (insulation thickness + 2 x 40) x √2

All measurements in mm.

The vertical distance between inclined anchors (with two neighbouring support anchor systems) must be between 5 × h_{nom} and max 700 mm. The horizontal distance between inclined anchors must also be at least 5 × h_{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 x 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

Essential characteristic	Assessment method	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR1)		
In the below characteristics the value $h_{nom,min}$ corresponds to the value h_{nom} = 40 mm		
Resistance to GFRP failure under compression load, $N_{Rk,GFRP,D}$ [kN]	2.2.1	4,7 kN
Resistance to concrete failure under compression load, $N_{Rk,c,D}$ [kN]	2.2.2	2,5 kN
Resistance to GFRP failure under tension load, $N_{Rk,GFRP}$ [kN]	2.2.3	6,2 kN
Resistance to concrete failure (cracked and uncracked concrete) under tension load,	2.2.4	
$N_{Rk,c,cr}$ [kN]		$N_{Rk,c,cr}$ (C20/25): 4,7 kN
$N_{Rk,c,ucr}$ [kN]		$N_{Rk,c,ucr}$(C50/60): 5,9 kN
Resistance to GFRP failure under shear load $V_{Rk,GFRP}$ [kN]	2.2.5	0,4 kN
Resistance to concrete failure under shear load $V_{Rk,c}$ [kN]	2.2.6	0,6 kN
Maximum acceptable shear deformation w_{max} [mm]	2.2.7	3,7 mm
Minimum edge distances and spacing		
c_{min} [mm]	2.2.8	c_{min}: 105 mm
s_{min} [mm]		s_{min}: 210 mm
Durability	2.2.9	50 years
Modulus of Elasticity E_N, E_M [N/mm²]	2.2.10	E_N: 60.000 N/mm² E_M: 30.000- 60.000 N/mm²
Geometric parameters A[mm²], I_y, I_z [mm⁴]	2.2.11	A_{pin}: 41,9 mm², I_y: 139,4 mm⁴, I_z: 139,4 mm⁴

*) 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

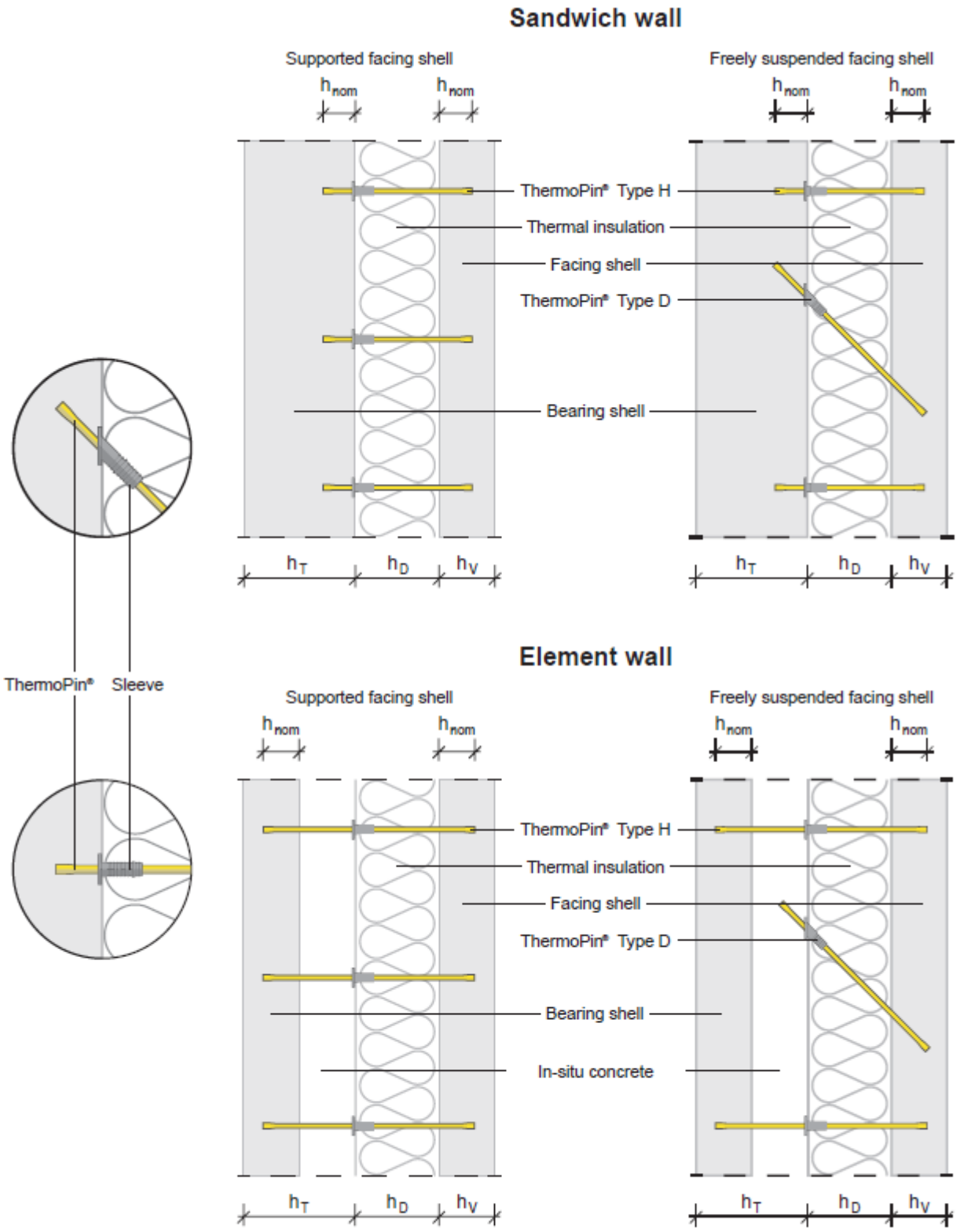
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2021-08-16 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex 1
Application limits

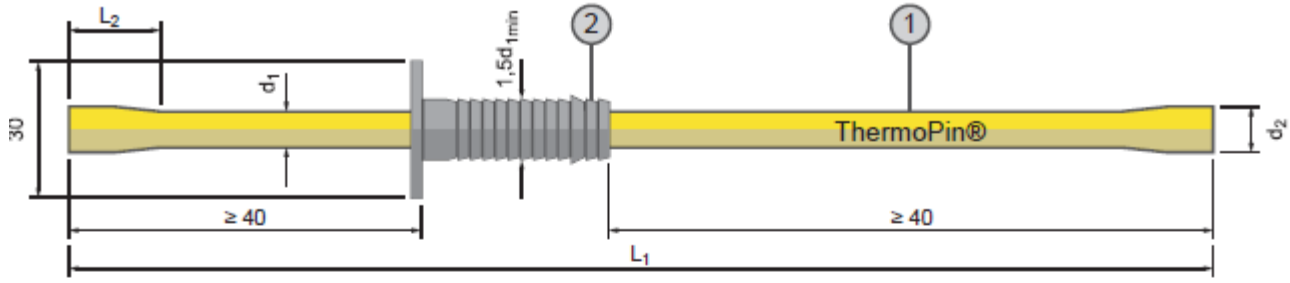
Concretes with strength class	f_{ck} / $f_{ck,cube}$	[N/mm^2]	C20/25 – C50/60
Minimum reinforcement of both shells	$a_{s,min}$	[mm^2/m]	1.88
Facing shell thickness	d_{VS}	[mm]	50 - 120
Minimum thickness of supporting layer	d_{TS}	[mm]	Element wall: 60 (FT) 140 (on-site concrete + FT) Sandwich wall: 100
Anchor length of horizontal and inclined anchors in concrete	h_{nom}	[mm]	40 - 110
Spacing of horizontal anchors (min)	$s_{H-H,x}$ $s_{H-H,y}$ s_{H-H}	[mm]	210
Edge distance of horizontal anchors (min/max)	$c_{H,x}$ $c_{H,y}$	[mm]	105/250
Minimum spacing of inclined anchors of the support anchor system in horizontal and vertical direction (min)	$c_{T-T,x,min}$ $c_{T-T,y,min}$	[mm]	$5 \times h_{nom}$
Maximum spacing of inclined anchors of the support anchor system in vertical direction (max)	$c_{T-T,x,max}$	[mm]	700
Spacing between inclined anchors of the support anchor system and horizontal anchors	$s_{H-T,x}$ $s_{H-T,y}$ s_{H-T}	[mm]	200
Minimum edge distance of inclined anchors in the support anchor system	$c_{T,x,min}$ $c_{T,y,min}$	[mm]	200
Installation angle of inclined anchors		[°]	45 ±2.5
Thickness of insulation	d_D	[mm]	50 - 200
Minimum surface of the insulating material as pressure component in the support anchor system	w x h	[mm]	420 x 490



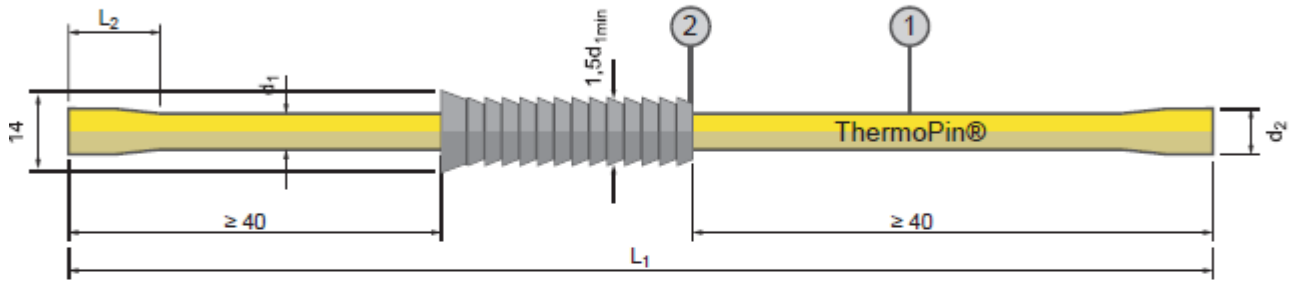
h_D corresponds to the thickness of the insulation
h_T corresponds to the thickness of the bearing shell
h_V corresponds to the thickness of the facing layer
h_{nom} corresponds to the connection depth of the ThermoPin® tie anchors

ThermoPin®	Annex 1.1
Material & Dimensions	

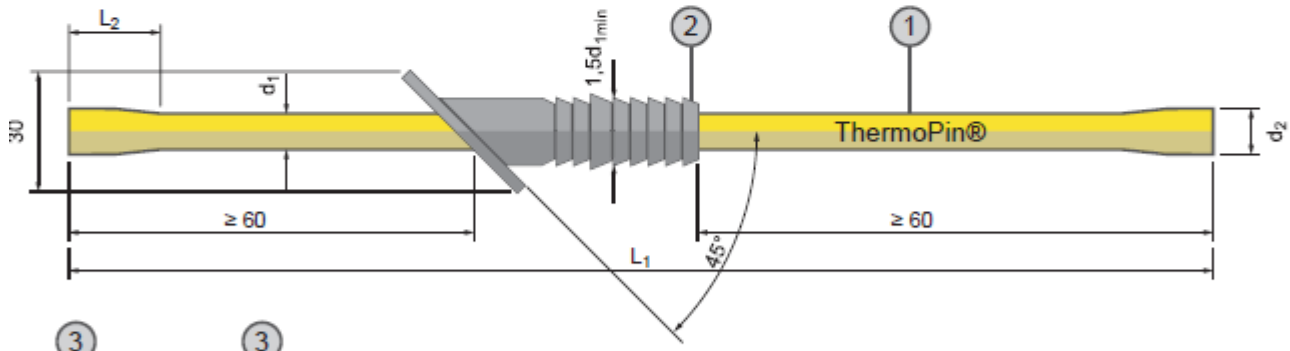
ThermoPin® tie anchor Type H: GFK anchor with straight plastic sleeve. Dimensions in [mm].

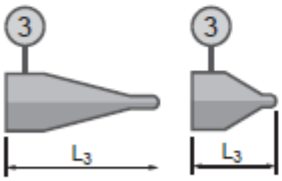


ThermoPin® tie anchor Type H_M: GFK anchor with modified straight plastic sleeve. Dimensions in [mm].



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





d_1: 7,5 ± 0,3 mm; d_2: 10,5 ± 0,4 mm

L_2: 21,8 ± 0,3 mm; L_3: 10 or 20 mm ± 0,3 mm

Labelling

Worksidentification:	B.T. innovation
Anchor:	ThermoPin®

Material

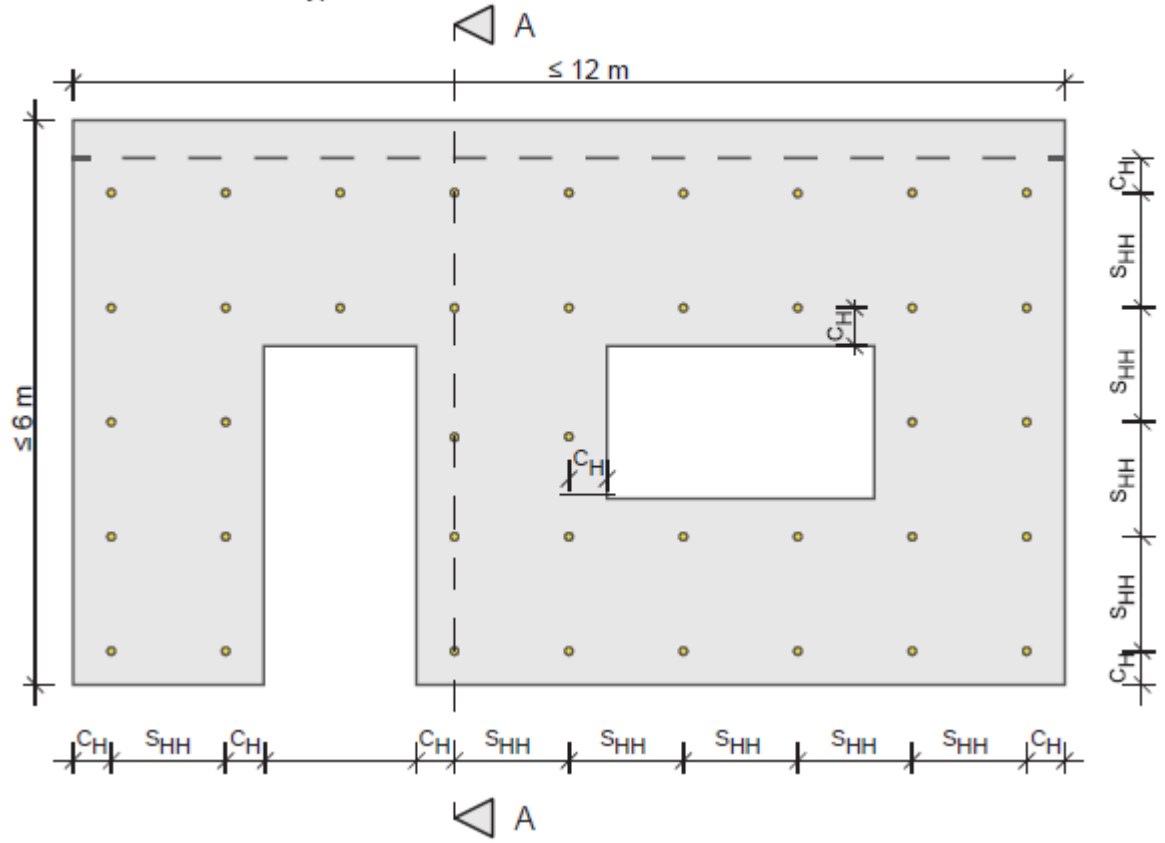
Pin (1):	Glass-fibre reinforced plastic
Sleeve (2):	Plastic
Caps (3):	Plastic

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

ThermoPin®	**Annex 1.2**
Material & Dimensions	

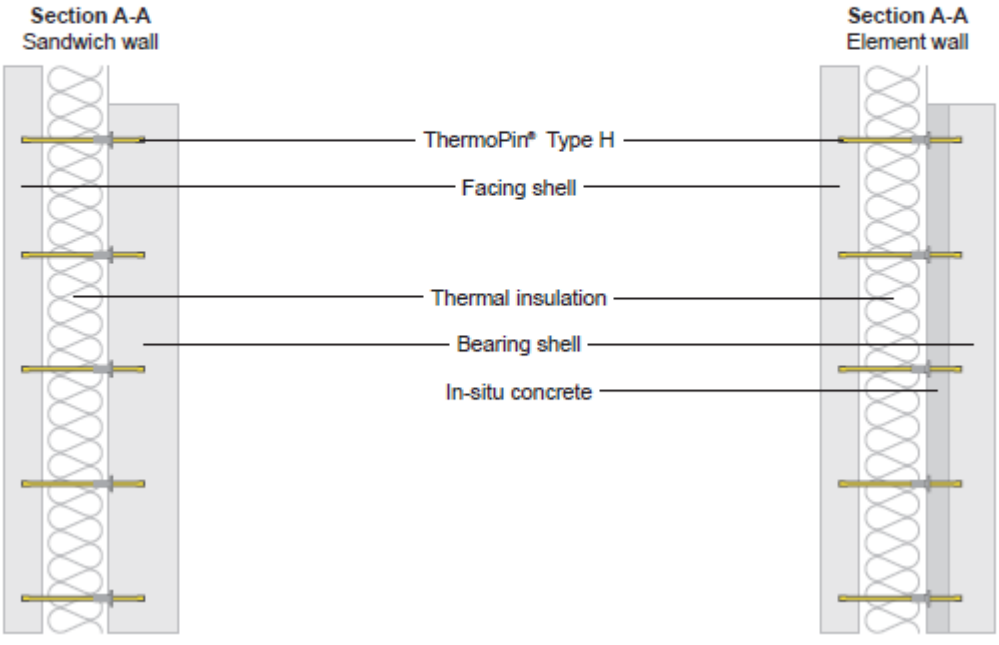
Example of view of a precast element (element wall or sandwich wall) with vertical facing shell with ThermoPin® tie anchors Type H.



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

Minimum axis gap between two ThermoPin® Type H: s_{HH} = 210 mm

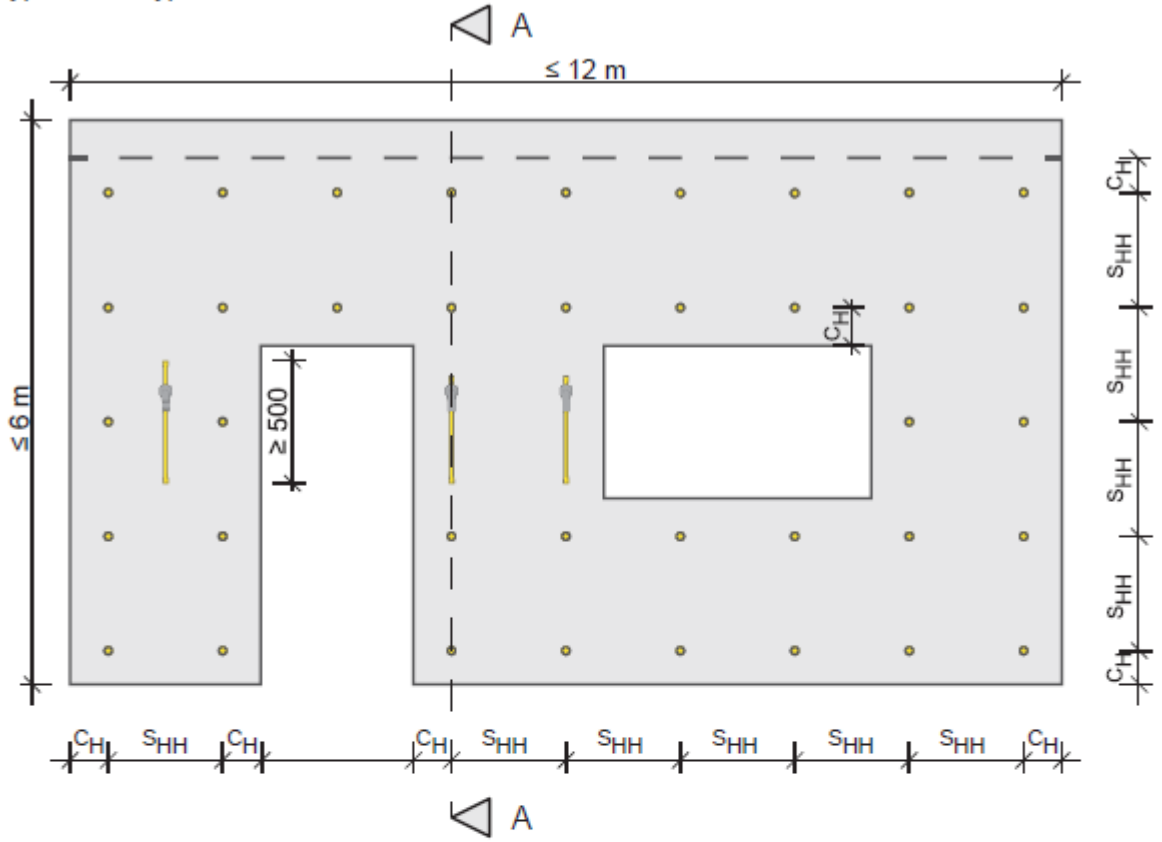
Minimum edge distance of ThermoPin® Type H: c_H = 105 mm



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

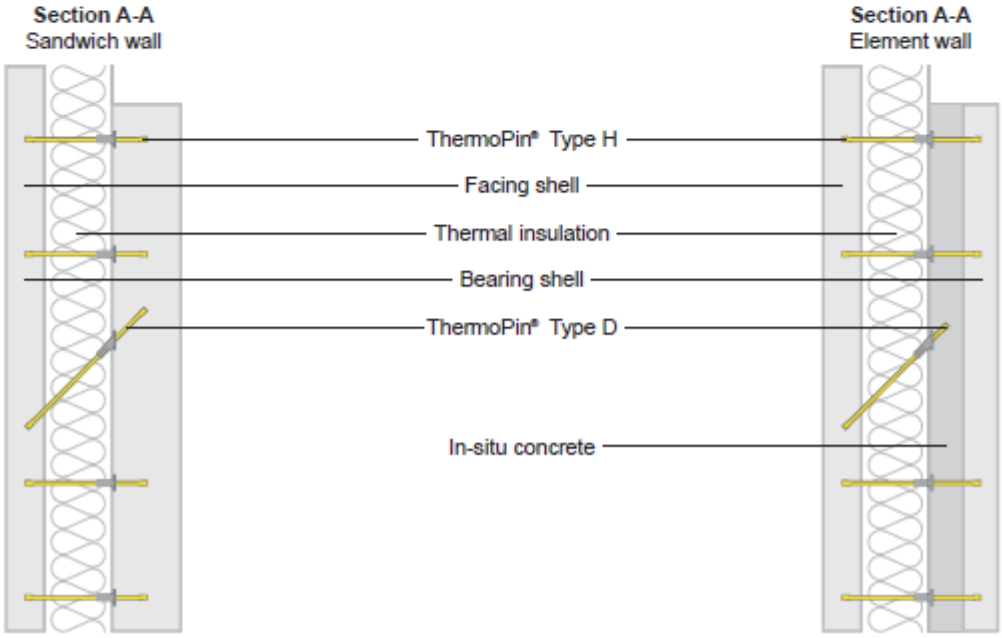
ThermoPin® **Installation parameters of ThermoPin® tie anchor Type H in concrete**	**Annex 2.1**

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

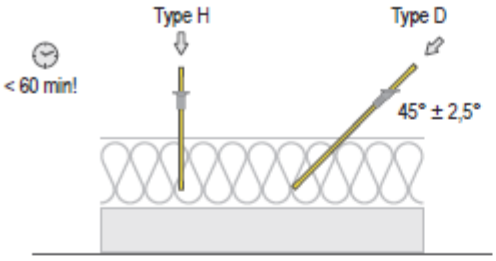


Arrangement of ThermoPin® tie anchors in accordance with static calculation.

ThermoPin®	**Annex 2.2**
Installation parameters of ThermoPin® tie anchor Type H and D in concrete	

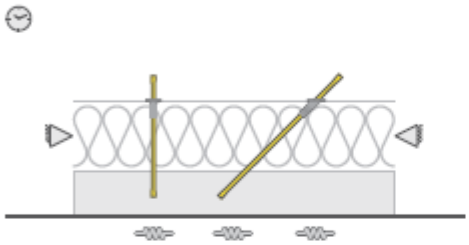
Sandwich wall

1



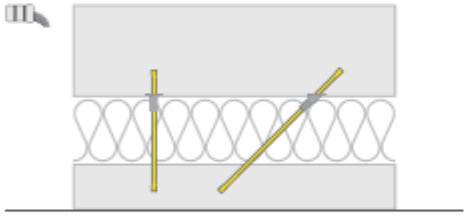
Fill in and compact the concrete of the first shell. Apply the insulation as tightly as possible to the fresh concrete of the first shell. Insert Thermo-Pins through the insulation layer into the fresh concrete of the facing layer.

2



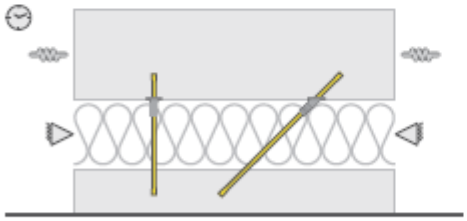
Compact the concrete of the facing layer. Secure the insulation against lateral displacement if possible.

3



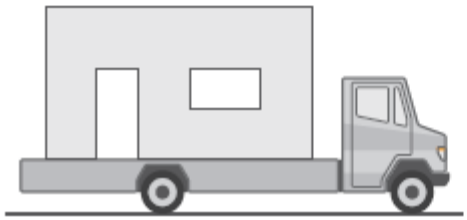
Apply the concrete of the second shell.

4



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

5

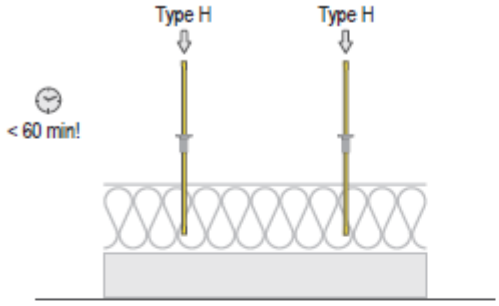


Transport the sandwich wall to the construction site.

ThermoPin®	**Annex 3.1**
Installation instructions – sandwich wall	

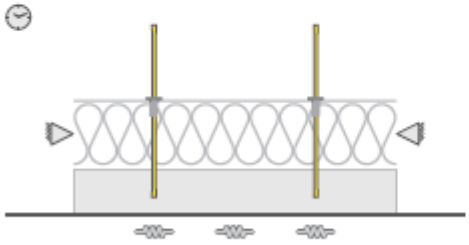
Element wall

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 ThermoPins through the insulation into the fresh concrete of the facing layer.

2

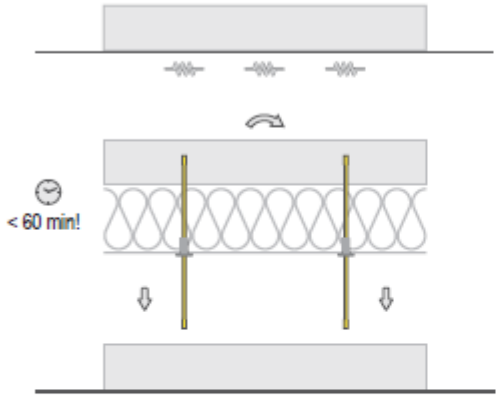


Compact the concrete of the facing layer. Secure the insulation against lateral displacement if possible. Observe curing times.

3

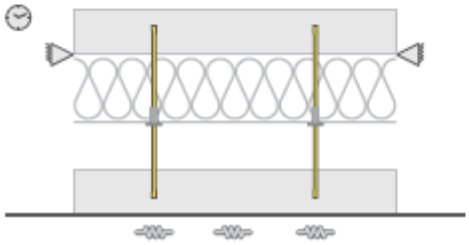
Fill in the concrete of the second shell.

4



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

5

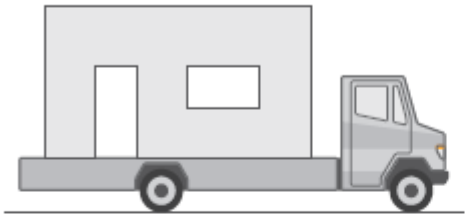


Compact the fresh concrete of the second shell. Observe curing times.

ThermoPin®	**Annex 3.2**
Installation instructions – element wall	

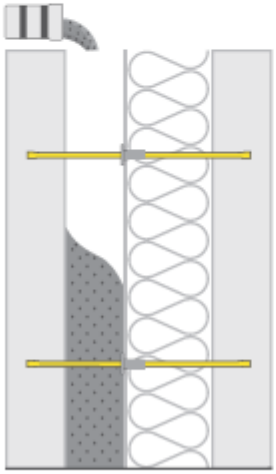
Element wall

6



Transport the element wall to the construction site.

7



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