

National technical approval / General construction technique permit

Zulassungsstelle für Bauprodukte und Bauarten Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Date:

5 Feb 2020

Reference:

I 28-1.21.8-62/18

Number:

Z-21.8-1837

Applicant:

fischerwerke GmbH & Co. KG

Klaus-Fischer-Straße 1

72178 Waldachtal, Germany

Validity

from: **5 February 2020**

to: **21 April 2022**

Subject of decision:

fischer Thermax to be used for anchoring stand-off constructions in concrete and masonry

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*).

This decision contains ten pages and 13 annexes.

This national technical approval / general construction technique permit replaces national technical approval / general construction technique permit no. Z-21.8-1837 of 30 May 2018. The subject concerned was granted the first national technical approval on 13 June 2007.

Translation authorised by DIBt

DIBt

I GENERAL PROVISIONS

- 1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.
- 3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer of the subject concerned shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.
- 6 This decision may be revoked. The provisions contained therein may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.
- 8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and application

1.1 Subject concerned

The subject of approval is the fischer Thermax.

The fischer Thermax consists of an anti-cold cone (hereinafter called "ACC") in sizes 12-M12 and 16-M12 made of glass-fibre reinforced polyamide, an anchor rod made of galvanised or stainless steel in sizes M12 or M16, the injection anchor sleeve FIS HK and a set screw in size M12 (with corresponding washer and hex nut) made of stainless steel.

On the substrate side, the fischer Thermax is anchored to the structure using the anchor rod and an injection mortar (injection or cartridge) in accordance with Section 1.2. The set screw is used to fasten the fixture on the fixture side.

Optionally, the set screw can also be replaced by a fastening screw (with corresponding washer) or a threaded rod (with corresponding washer and hex nut).

The ACC is a cone-shaped thermal separating element with a toothed surface and milling ribs. At the tapered end (substrate side), the ACC has an M12 (type 12-M12) or M16 (type 16-M12) internal thread to accommodate the anchor rod and on the other end (fixture side) an M12 internal thread to accommodate the set screw, the graduated set screws M12/M10 or M12/M8, the threaded rod or the fastening screw.

The subject of the permit is the planning, design and execution of anchors using fischer Thermax.

1.2 Field of use and application

The fischer Thermax may be used for anchoring stand-off constructions on insulated or non-insulated substrates (e.g. external wall with external thermal insulation composite system) made of concrete or various types of masonry subject to static or quasi-static loads insofar as there are no fire resistance requirements to be met by the entire structure including the fischer Thermax.

The permitted base materials for the fischer Thermax result from the specifications of the following ETAs:

- ETA-02/0024: **FIS V** for use in concrete
- ETA-10/0383: **FIS V** for use in masonry
- ETA-10/0012: **FIS EM** for use in concrete
- ETA-12/0258: **fischer Superbond** for use in concrete
- ETA-14/0408: **FIS GREEN** for use in non-cracked concrete
- ETA-14/0471: **FIS GREEN** for use in masonry
- ETA-17/0979: **FIS EM Plus** for use in concrete
- ETA-17/0350: **FIS AB** for use in concrete
- ETA-17/0352: **FIS AB** for use in masonry

Steel elements substrate side

The anchor rod made of galvanized steel may be used in structures subject to dry internal conditions.

The anchor rod made of stainless steel in accordance with Annex 2 and 3 may be used in accordance with its corrosion resistance class CRC (see Annex 3, Table 3.1) in accordance with DIN EN 1993-1-4:2015-10 in conjunction with DIN EN 1993-1-4/NA:2017-01.

The Thermax with the galvanised steel anchor rod on the substrate side shall only be used in structures of corrosion resistance class CRC III in accordance with DIN EN 1993-1-4:2015-10 in conjunction with DIN EN 1993-1-4/NA:2017-01 if the external thermal insulation composite system applied to the base material consists of one of the following insulation materials, the annular gap between the ACC and the plaster is sealed so it remains permanently elastic using fischer Multi adhesive and sealant KD or fischer DKM construction adhesive sealant and the permitted displacements (see Section 3.2.4.2) are adhered to:

- Mineral wool: Mineral wool batts with apparent density $\geq 80 \text{ kg/m}^3$, $\mu = 1$,
- Polystyrene: White polystyrene (EPS) "040", installed thickness 60 to 300 mm
 $\mu = 20/100$, external thermal insulation composite system panels
WDV/WAP with apparent density 15 kg/m^3

The insulation material may also consist of a building material which has comparable properties from a building physics perspective and which matches the thermal and moisture protection properties of one of the above-mentioned insulation materials.

Steel elements fixture side

The set screw (optionally: the fastening screw or the threaded rod) and the corresponding washer and hex nut with matching steel type and strength properties shall consist of stainless steel in accordance with Annex 3, Table 3.1.

2 Provisions for the construction product

2.1 Properties and composition

The dimensions and the material of the fischer Thermax shall comply with the specifications given in the annexes.

The material characteristics, dimensions and tolerances which are not specified in the annexes shall comply with the specifications deposited with DIBt, the certification body and the external surveillance body.

2.2 Packaging, storage and marking

2.2.1 Packaging and storage

The fischer Thermax shall only be packaged and supplied as a compiled unit (ACC, metal parts and injection anchor sleeve, if required). The injection mortar or the cartridge of the respective ETA is supplied separately.

The ACC shall be stored under normal climate conditions. It shall not be extremely dry or frozen prior to installation.

2.2.2 Marking

The packaging, instruction sheet or delivery note for the fischer Thermax shall be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. In addition, the factory identifying mark, the approval number and the complete fischer Thermax designation shall be specified. The mark shall only be applied if the requirements given in Section 2.3 are met.

The fischer Thermax is designated using the product name and the two internal thread sizes of the ACC, e.g. Thermax 16-M12.

In accordance with Annex 2, each ACC shall be marked with the product name "fischer Thermax" on the face of the fixture side and the size of the substrate-side internal thread on the lateral surface.

2.3 Confirmation of conformity

2.3.1 General

The manufacturer shall confirm for each manufacturing plant that the fischer Thermax complies with the provisions of the national technical approval included in this decision by way of a declaration of conformity based on factory production control and a certificate of conformity issued by a certification body recognised for these purposes as well as on regular external surveillance carried out by a recognised inspection body in accordance with the following provisions. To issue the certificate of conformity and for external surveillance including the associated product testing, the manufacturer of the construction product shall use a certification body and an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction products with the national conformity mark including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control shall be understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products meet the provisions of the national technical approval included in this decision. The factory production control shall at least include the measures laid down in the test plan.

Scope, type and frequency of factory production control shall be in accordance with the test plan deposited with DIBt and the external surveillance body.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material and the components
- type of check or test
- date of manufacture and testing of the construction product or the starting material or the components
- results of the checks and tests and, where applicable, comparison with requirements
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and be submitted to the inspection body used for external surveillance. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately - where technically feasible and necessary to show that the defect has been eliminated.

2.3.3 External surveillance

The factory production control system shall be inspected regularly, i.e. at least once a year, by means of external surveillance at each manufacturing plant.

Initial type-testing of the fischer Thermax shall be carried out within the scope of external surveillance. Samples for random testing shall also be taken. Sampling and testing shall be the responsibility of the recognised inspection body.

Scope, type and frequency of factory production control shall be in accordance with the test plan deposited with DIBt and the external surveillance body.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

3 Provisions for planning, design and execution

3.1 Planning

The anchorages using fischer Thermax shall be planned in line with good engineering practice. Verifiable calculations and design drawings shall be prepared in consideration of the loads to be anchored. The design drawings shall contain the exact positions and number of the anchoring points.

The immediate local transmission of the anchor loads into the base material has been provided.

Regarding the base material, temperature range, dry or wet drill hole, cleaning of drill hole, minimum member dimensions and maximum torque moments, the information in the respective ETA in accordance with Section 1.2 shall be observed.

The installation characteristics for the Thermax are given in Annexes 2, 4, 5 and 6.

3.2 Design

3.2.1 General

The fastenings using fischer Thermax shall be designed in line with good engineering practice. The transfer of the loads to be anchored in the member shall be verified.

Additional loads which may arise in the fischer Thermax, in the attached member or in the member in which the fischer Thermax is installed due to restrained deformations (e.g. due to temperature fluctuations) shall be considered.

Plaster as well as gravel, facing and levelling layers are considered to be non-load-bearing and shall not be taken into account for the embedment depth.

Unless the set screw or optionally the fastening screw or the threaded rod (for fastening the fixture) are supplied by the manufacturer for the respective application case, they shall be specified by the planning engineer regarding the field of application (corrosion resistance factors), the minimum length L_s in accordance with Annex 4 taking into account the thickness of the member to be attached, the required minimum screw-in depth and possible tolerances. Verification of the material and the mechanical properties of the fastening screw or the set screw or the threaded rod shall be provided through an inspection certificate "type 3.1" in accordance with DIN EN 10204:2004. The verifications shall be kept.

3.2.2 Verification of anchoring of anchor rod in the base material

The design of the anchor rod for use in concrete and masonry shall be carried out in accordance with the design methods specified in the ETAs listed in Section 1.2.

The characteristic values of the load-bearing capacity are specified in the respective ETAs.

In case of compression stress, the following verifications shall also be provided, depending on the base material:

a) Base material concrete, solid bricks and aerated concrete

Verification shall be provided mutatis mutandis in accordance with the specifications of the respective ETA listed in Section 1.2. The characteristic load-bearing capacities for axial tension specified in the respective ETA also apply to compression stress.

b) Base material perforated brick

It shall be verified that the following condition is maintained:

$$N_{Ed,compression} \leq N_{Rd,compression} \tag{3.1}$$

where

$$N_{Rd,compression} = \min(N_{Rd,V1}; N_{Rd,V2}) \text{ with } N_{Rd,V1} \text{ and } N_{Rd,V2} \text{ in accordance with Table 1}$$

= Design value of compression load-bearing capacity

$$N_{Ed,compression} = \text{Design value of action due to axial compressive load}$$

Table 1

Number of webs used in the perforated brick	$N_{Rd,V1}$	$N_{Rd,V2}$
n = 1	$0.125 \cdot N_{Rk} / \gamma_M$	0.25 kN
n = 2	$0.420 \cdot N_{Rk} / \gamma_M$	1.00 kN
n = 3	$0.855 \cdot N_{Rk} / \gamma_M$	1.50 kN
n > 3	$1.000 \cdot N_{Rk} / \gamma_M$	n • 1 [kN]

If suitable measures are used to ensure that the compression load is transferred to the base material using suitable mechanical means, $N_{Rd,compression} = N_{Rd,tension}$ can be applied.

$N_{Rk} = N_{Rk,p} = N_{Rk,b}$ Relevant characteristic load-bearing capacity under tension load in accordance with the respective ETA specified in Section 1.2

n = Number of webs in which the anchor is installed

γ_M = Material partial safety factor for masonry ($\gamma_M = 2.5$)

V_1, V_2 = Variant/ selection condition

3.2.3 Verification of the fischer Thermax outside the base material

It shall be verified that the design value for the action does not exceed the design resistance value.

The required verifications for the verification of the load-bearing capacity for tension (compression) and shear load are:

$$N_{Ed} \leq N_{Rd} \quad (3.2)$$

$$V_{Ed} \leq V_{Rd} \quad (3.3)$$

The design resistance values (N_{Rd} or V_{Rd}) for the Thermax are specified in Annex 6, Table 6.2 and Table 6.3.

The design value of the shear resistance V_{Rd} takes into account the bending resistance resulting from the lever arm of the shear load. A separate bending verification under shear load with lever arm is not required.

If a combined tension (compression) and shear load is present, one of the following interaction conditions shall be adhered to:

$$\left(\frac{N_{Ed}}{N_{Rd}} \right) + \left(\frac{V_{Ed}}{V_{Rd}} \right) \leq 1.2 \quad \text{or} \quad \left(\frac{N_{Ed}}{N_{Rd}} \right)^{1.5} + \left(\frac{V_{Ed}}{V_{Rd}} \right)^{1.5} \leq 1.0 \quad (3.4)$$

For N_{Rd} and V_{Rd} , the smallest resistances listed in 3.2.2 and 3.2.3 shall be used.

3.2.4 Displacement behaviour

The displacements of the fischer Thermax under maximum tension and compressive load N (characteristic action) are specified in Annex 6, Table 6.2.

These displacements shall be overlaid with the displacements under tension load in the base material, which are specified in the ETAs listed in Section 1.2 for the respective fischer composite anchor.

The displacements of the fischer Thermax under maximum shear load V (characteristic action) are specified in Annex 7, Table 7.1.

If the tightness of the annular gap between the ACC and the plaster is only ensured through the fischer Multi adhesive and sealant KD or fischer DKM construction adhesive sealant (see Section 1.2), the permitted displacement under shear load is limited to 1 mm. For this application case, the corresponding maximum shear loads for ≤ 1 mm displacement are specified in Annex 8, Table 8.1.

For displacements of > 1 mm, the insulated substrate (e.g. the external thermal insulation composite system) shall additionally be protected against penetrating precipitation by suitable means (e.g. using a sheet metal covering).

The maximum shear loads V for a displacement limited to 2 mm is specified in Annex 9, Table 9.1.

The maximum shear loads V for a displacement limited to 3 mm is specified in Annex 10, Table 10.1.

3.3 Execution

3.3.1 General

The fischer Thermax shall only be used as a compiled unit. Individual parts shall not be exchanged.

The fischer Thermax shall be installed in accordance with the design drawings prepared in accordance with Section 3.1 and the installation instructions of the applicant.

Prior to setting the fischer Thermax, the base material type and the thickness of the non-load-bearing layer shall be identified.

For anchoring the anchor rod of the fischer Thermax in the respective base material (substrate side), the provisions for execution of the corresponding assessments for the respective fischer composite anchor specified in Section 1.2 shall be complied with.

The set screw (optionally the fastening screw or the threaded rod) and the corresponding stainless steel washer and hex nut shall match as regards steel type and strength class.

3.3.2 Drilling of the holes

If the substrate is reinforced, the position of the fischer Thermax shall be coordinated with the position of the reinforcement in such a way that damage to the reinforcement is avoided.

The hole shall be drilled at a right angle to the surface of the base material in accordance with the drilling method specified in the installation instructions. The nominal drill bit diameter and the drill hole depth shall comply with Annex 2, Table 2.1.

Before placing the anchor rod or the injection anchor sleeve, the drill hole shall be cleaned in accordance with the assessments for the respective fischer composite anchor in accordance with Section 1.2.

If a hole is drilled incorrectly, a new hole shall be drilled at a distance of at least 1 x the depth of the incorrect hole, whereby 5 x the outer diameter of the anchor is sufficient as the minimum distance. Tolerances in the base material shall be compensated for in such a way that the installation of the anchor does not cause any undesired loads through multiple fastenings.

3.3.3 Installation of the fischer Thermax

The fischer Thermax shall be set in accordance with the installation instructions given in Annexes 11 to 13.

Each ACC shall only be used once to mill open the thermal insulation. If a milling blade is used to mill open the insulation, it may be reused (Fig. 3 of the installation instructions).

After the insulation material has been milled open using the complete fischer Thermax (anchor rod, ACC, screwed-in threaded rod if applicable), the fixture can optionally be fastened using a set screw, a threaded rod or a fastening screw.

The required mortar amount is given in Annex 5, Tables 5.1, 5.2, 5.3 and Annex 6, Table 6.1.

The installation instructions and processing time of the injection mortar in accordance with the assessments specified in Section 1.2 shall be adhered to.

At a total hole depth $t_d \geq 250$ mm (see Annex 5), the static mixer with extension hose shall be used to inject the mortar (Fig. 5 of the installation instructions). The expansion joint shall be sealed in accordance with the installation instructions (Fig. 8).

3.3.4 Inspection of execution

During installation of the anchors, the contractor commissioned to install the anchors or the site manager assigned by him or her or a competent representative of the site manager shall be present at the construction site. They shall ensure that the work is carried out properly.

**National technical approval /
General construction technique permit
No. Z-21.8-1837**

Page 10 of 10 | 5 February 2020

During installation of anchors, records of the verification of the base material (type of masonry, strength class and mortar group), the temperature of the base material and the proper installation shall be kept by the site manager or the site manager's representative. The records shall be available at the construction site during the construction period and shall be handed over to the construction site supervisor upon request. Like the delivery notes, they shall be kept by the contractor for a minimum of five years after completion of the project.

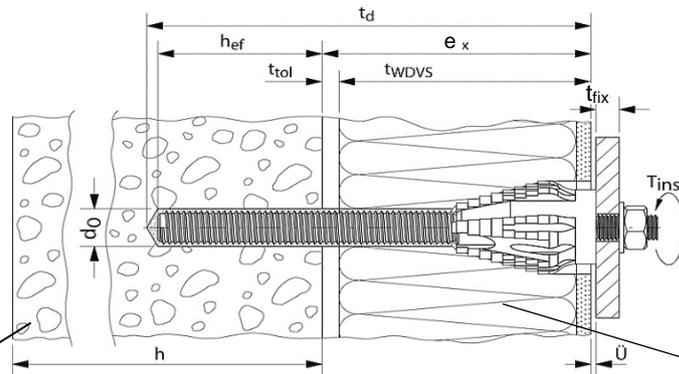
Beatrix Wittstock
Head of Section

Drawn up by

fischer Thermax in installed condition

Exemplary illustration:
1-point fastening, only fastened on base material side

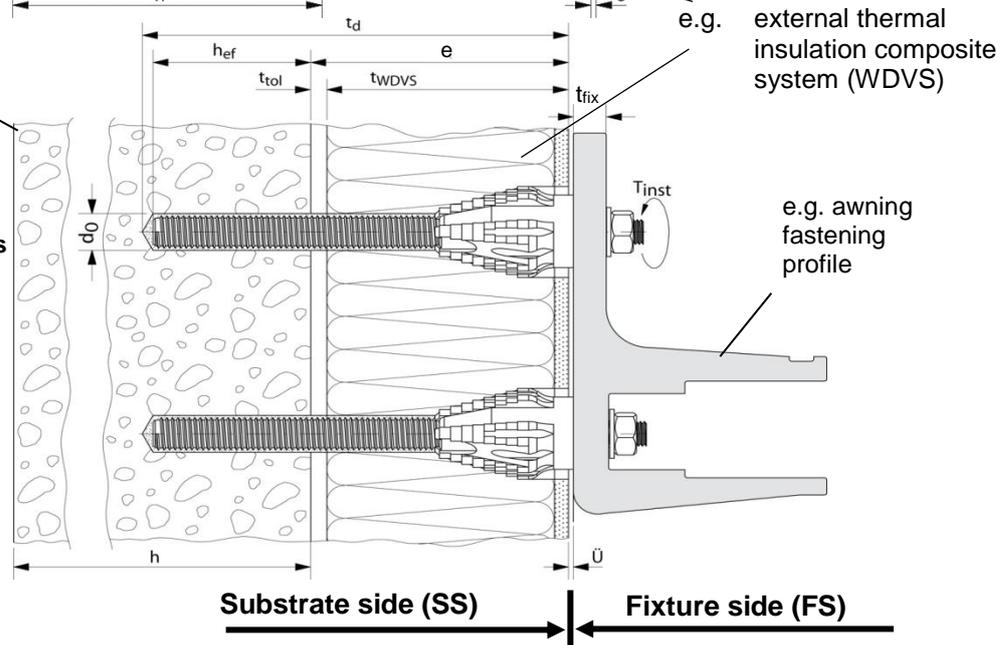
FIG. 1



Base material

Exemplary illustration:
2-point fastening, fastened on both sides (on base material side and fixture side)

FIG. 2



Legend:

- | | |
|---|---|
| h = Member thickness | t_d = Total hole depth |
| h_{ef} = Effective embedment depth | e = Thickness of layer to be bridged ($t_{WDVS} + t_{tol}$) |
| t_{fix} = Fixture thickness | t_{tol} = Thickness of old plaster and/or adhesive |
| \ddot{U} = Overhang $\geq 1\text{mm}$ | t_{WDVS} = Insulation thickness (system) |
| d_0 = Nominal drill bit diameter | T_{inst} = Tightening torque |

Field of application

Thermal bridge reducing element used to connect and transfer loads from the fixture to the substrate. For stand-off constructions on insulated or non-insulated substrates made of concrete or various types of masonry. System can be anchored on the substrate side using:

- **ETA-10/0383: fischer injection system FIS V** for use in masonry
- **ETA-02/0024: fischer injection system FIS V** for use in concrete
- **ETA-10/0012: fischer injection system FIS EM** for use in concrete
- **ETA-14/0471: fischer injection system FIS GREEN** for use in masonry
- **ETA-14/0408: fischer injection system FIS GREEN** for use in non-cracked concrete
- **ETA-12/0258: fischer injection system fischer Superbond** for use in concrete
- **ETA-17/0979: fischer injection system FIS EM Plus** for use in concrete
- **ETA-17/0350: fischer injection system FIS AB** for use in concrete
- **ETA-17/0352: fischer injection system FIS AB** for use in masonry

fischer Thermax

Installed condition

Annex 1

Table 2.1: General installation data

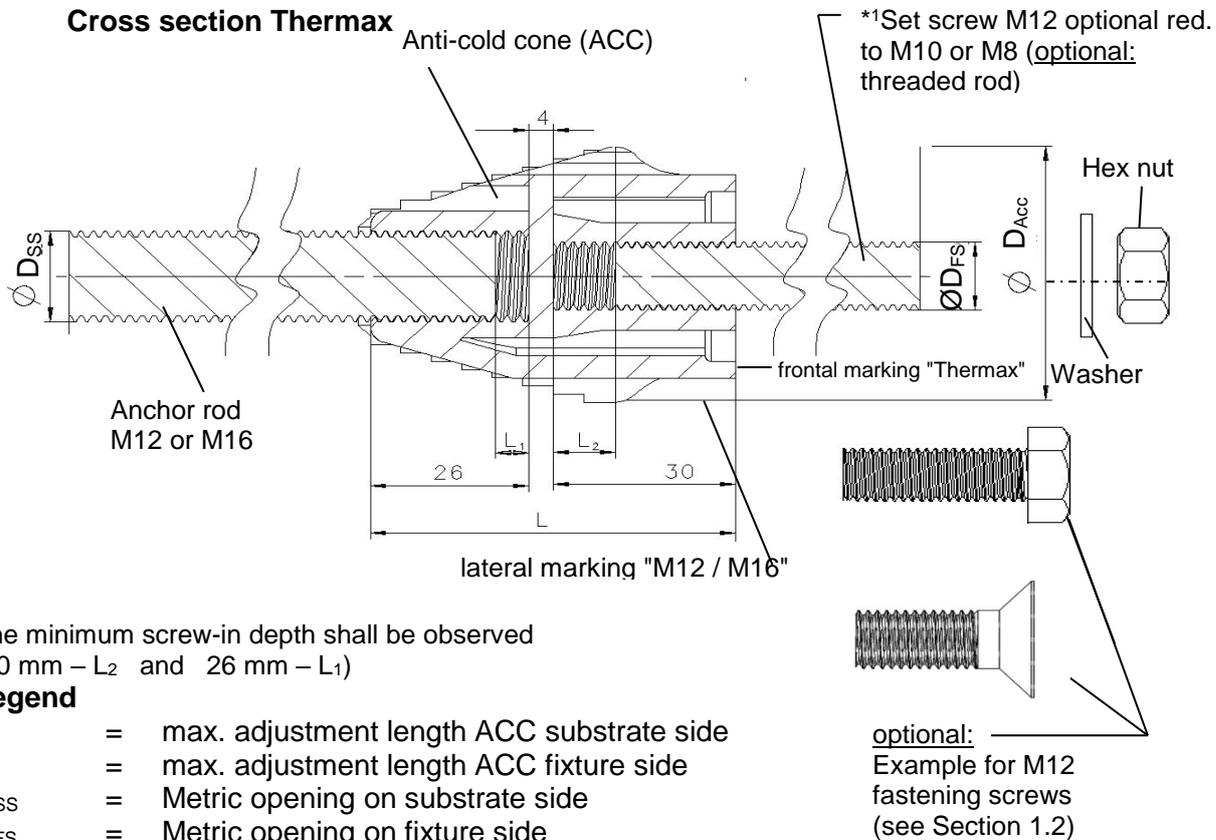
Type	Anchor rod	Building material	e ¹⁾ [mm]	h _{ef} [mm]	d ₀	Drill hole depth t _d [mm]	Injection anchor sleeve	T _{inst,max} [Nm]
Thermax 12	M12	Concrete	62-300	h _{ef} see corresponding assessment (Section 1.2)	14	Table 5.1	not required	20
		Aerated concrete				Table 5.2		
		Solid brick				Table 5.3		
		Perforated brick	62-300		20	Table 6.1	20x85 20x130 20x200	20
Thermax 16	M16	Concrete	62-300		18	Table 5.1	not required	20
		Aerated concrete				Table 5.2		
		Solid brick				Table 5.3		
		Perforated brick	62-300	20	Table 6.1	20x85 20x130 20x200	20	

¹⁾ The following applies in case of pure tensile force: 62 ≤ e ≤ 400 mm

Table 2.2: Dimensions and installation parameters

	D _{SS}	L [mm]	D _{FS}	D _{ACC}	L ₁ [mm]	L ₂ [mm]
Thermax 12	M12	62	M12* ¹⁾	45	≤ 5	≤ 10
Thermax 16	M16	62	M12* ¹⁾	45	≤ 5	≤ 10

Cross section Thermax



fischer Thermax

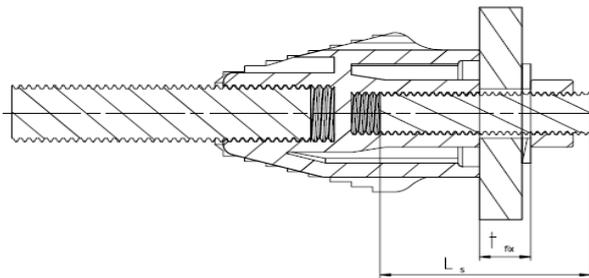
Installation data - dimensions - installation parameters

Annex 2

Table 3.1: Materials		
Designation	Materials	
Anti-cold cone (ACC)	Polyamide PA 6, GF reinforced, colour black	
fischer injection mortar	see information in the assessments listed under Section 1.2	
Injection anchor sleeve FIS H K	PP/PE (in accordance with ETA-10/0383)	
Steel elements substrate side (SS)		
	Steel galvanised ¹⁾ min 5 µm	Stainless steel of corrosion resistance class (CRC) in accordance with DIN EN 1993-1-4:2015-10
Anchor rod (SS) M12 or M16	Material in accordance with DIN EN ISO 898:2012 $f_{uk} \geq 800 \text{ N/mm}^2$ $f_{yk} \geq 640 \text{ N/mm}^2$ Galvanised coating A2G or A2F DIN EN ISO 4042:2018-11	at least CRC III Material in accordance with DIN EN ISO 3506-1:2010-04 $f_{uk} \geq 700 \text{ N/mm}^2$ $f_{yk} \geq 450 \text{ N/mm}^2$
Steel elements fixture side (FS)		
Washer DIN EN ISO 7089:2000-11		CRC III
Set screw (FS) M12 or graduated set screw M12/M10 or M12/M8 in accordance with DIN EN ISO 4026:2004-05 <u>optional:</u> <ul style="list-style-type: none"> Fixing screw FS M12 in accordance with DIN EN ISO 4014:2011-06 Threaded rod (FS) M12 in accordance with DIN EN ISO 898:2012 		CRC III Material in accordance with DIN EN ISO 3506-1:2010-04 $f_{uk} \geq 500 \text{ N/mm}^2$ $f_{yk} \geq 210 \text{ N/mm}^2$
Hex nut DIN EN ISO 4032:2013-04		
¹⁾ Note Section 1.2		
fischer Thermax	Annex 3	
Materials		

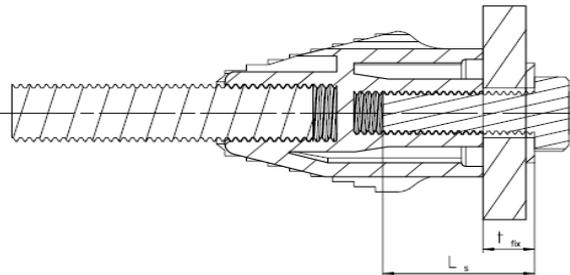
Table 4.1: Determination of set screw length/ optional: length of screw or threaded rod

Fixture thickness t_{fix} [mm]	Minimum length L_s [mm]		
	Set screw M12 or graduated set screw M12/M10 or M12/M8	Threaded rod	Fastening screw M12
2-200	$L_s \geq t_{fix} + 32 \text{ mm}$	$L_s \geq t_{fix} + 32 \text{ mm}$	$L_s \geq t_{fix} + 20 \text{ mm}$ and $L_s \leq t_{fix} + 28 \text{ mm}$

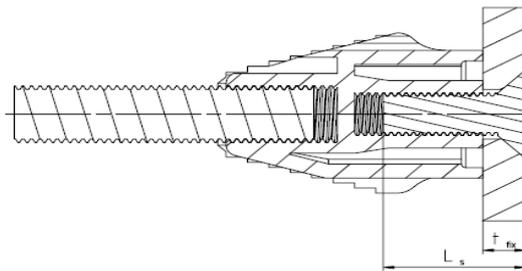


Set screw / threaded rod

optional:



Fastening screw



Fastening screw

Legend

L_s = Length of set screw (optional: threaded rod or fastening screw)
 t_{fix} = fixture thickness with washer, if required

fischer Thermax

Determination of length of set screw, threaded rod or fastening screw

Annex 4

Cutting the Thermax to length

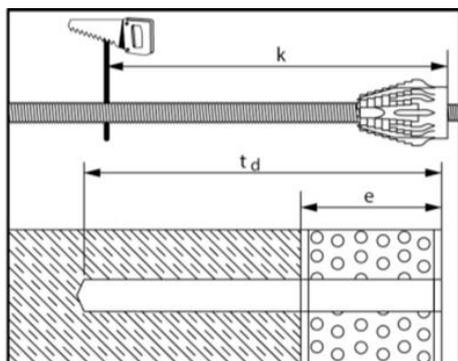


Table 5.1: Concrete

ETA	Thermax 12			Thermax 16		
	Length k [mm]	Length t_d [mm]	Mortar amount [scale divisions]	Length k [mm]	Length t_d [mm]	Mortar amount [scale divisions]
FIS V ETA-02/0024 FIS EM ETA-10/0012 fischer Superbond ETA-12/0258 FIS GREEN ETA-14/0408 FIS EM Plus ETA-17/0979 FIS AB ETA-17/0350	e + 70		5	e + 80		7

Table 5.2: Aerated concrete (with cylindrical drill hole)

Injection system with ETA	Thermax 12			Thermax 16		
	Length k [mm]	Length t_d [mm]	Mortar amount [scale divisions]	Length k [mm]	Length t_d [mm]	Mortar amount [scale divisions]
FIS V ETA-10/0383 FIS GREEN ETA-14/0471 FIS AB ETA-17/0352	e + 100		8	e + 100		9

Table 5.3: Solid bricks

Injection system with ETA	Injection anchor sleeve	Thermax 12			Thermax 16		
		Length k [mm]	Length t_d [mm]	Mortar amount [scale divisions]	Length k [mm]	Length t_d [mm]	Mortar amount [scale divisions]
FIS V ETA-10/0383 FIS GREEN ETA-14/0471 FIS AB ETA-17/0352	without	e + h_{ef}		See mortar installation instructions	e + h_{ef}		See mortar installation instructions

fischer Thermax

Cutting the Thermax to length - general installation data

Annex 5

Table 6.1: Perforated bricks

Injection system with ETA	Injection anchor sleeve	Thermax 12/ Thermax 16		
		Length k [mm]	Length t _d [mm]	Mortar amount [scale divisions]
FIS V ETA-10/0383	20x85	e + 85	e + 95	15
FIS GREEN ETA-14/0471	20x130	e + 130	e + 140	26
FIS AB ETA-17/0352	20x200	e + 200	e + 210	40

Table 6.2: Design values of load-bearing capacity N_{Rd} in case of tension and compressive load per Thermax outside the base material (fixture side) and associated displacements under maximum axial tension load N.

Type	N _{Rd} [kN]	N = N _{Rd} / γ _F ³⁾ [kN]	Displacement	
			Short-term ¹⁾ [mm]	Long-term ²⁾ [mm]
Thermax 12	4.8	3.4	0.5	0.7
Thermax 16	4.8	3.4	0.5	0.7

- 1) Short-term: e.g. wind load
 2) Long-term: e.g. dead load and snow loads
 3) where γ_F = 1.4

Table 6.3: Design values of load-bearing capacity V_{Rd} in case of shear load per Thermax outside the base material (fixture side) depending on the thickness of the layer to be bridged

Type	Material	Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
		Design values V _{Rd} ^{1) 2)} [kN]									
Thermax 12	galv.	1.35	1.05	0.84	0.70	0.60	0.52	0.47	0.42	0.34	0.28
	stainless steel	0.95	0.74	0.59	0.49	0.42	0.37	0.33	0.29	0.24	0.20
Thermax 16	galv. and stainless steel	2.22	1.72	1.38	1.15	0.99	0.86	0.77	0.69	0.55	0.46

- 1) Linear interpolation based on e shall be allowed for values between the given values.
 2) The bending resistance is included in these values
 3) See Table 3.1

Note: The design of the anchor rod for use in the base material (substrate) shall be carried out in accordance with Section 3.2.2

fischer Thermax

General installation data in perforated bricks,
 design values and load-bearing capacity under tension, compression and shear loads, associated displacements

Annex 6

Table 7.1: Maximum shear load V per Thermax outside the base material (fixture side) and associated displacement (without limitation of displacement)

Thermax 12 galvanised		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
V ^{1) 7)} per Thermax [kN]		1.00	0.78	0.62	0.52	0.44	0.39	0.35	0.31	0.25	0.21
only fastened on base material side ⁵⁾											
Displacement²⁾ [mm]	<i>Short-term ³⁾</i>	2.2	2.3	2.4	2.8	3.4	3.9	4.6	5.4	6.7	7.9
	<i>Long-term ⁴⁾</i>	3.3	3.5	3.6	3.9	4.6	5.1	5.6	6.1	7.4	8.7
fastened on both sides ⁶⁾											
Displacement²⁾ [mm]	<i>Short-term ³⁾</i>	1.1	1.2	1.2	1.4	1.7	2.0	2.3	2.7	3.4	4.0
	<i>Long-term ⁴⁾</i>	1.7	1.8	1.8	2.0	2.3	2.6	2.8	3.1	3.7	4.4
Thermax 12 stainless steel		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
V ^{1) 7)} per Thermax [kN]		0.70	0.55	0.44	0.36	0.31	0.27	0.24	0.22	0.17	0.15
only fastened on base material side ⁵⁾											
Displacement²⁾ [mm]	<i>Short-term ³⁾</i>	1.4	1.5	1.5	1.8	2.2	2.5	2.9	3.4	4.3	5.0
	<i>Long-term ⁴⁾</i>	2.1	2.2	2.3	2.5	2.9	3.2	3.6	3.9	4.7	5.5
fastened on both sides ⁶⁾											
Displacement²⁾ [mm]	<i>Short-term ³⁾</i>	0.7	0.8	0.8	0.9	1.1	1.3	1.5	1.7	2.2	2.5
	<i>Long-term ⁴⁾</i>	1.1	1.1	1.1	1.3	1.5	1.7	1.8	2.0	2.4	2.8
Thermax 16 galvanised and stainless steel		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
V ^{1) 7)} per Thermax [kN]		1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.49	0.39	0.33
only fastened on base material side ⁵⁾											
Displacement²⁾ [mm]	<i>Short-term ³⁾</i>	1.5	1.6	1.8	2.1	2.3	2.6	3.0	3.4	5.8	10.1
	<i>Long-term ⁴⁾</i>	2.3	2.4	2.7	2.9	3.1	3.4	3.7	3.8	6.4	11.1
fastened on both sides ⁶⁾											
Displacement²⁾ [mm]	<i>Short-term ³⁾</i>	0.8	0.8	0.9	1.1	1.2	1.3	1.5	1.7	2.9	5.1
	<i>Long-term ⁴⁾</i>	1.2	1.2	1.4	1.5	1.6	1.7	1.9	1.9	3.2	5.6

- 1) $V = V_{Rd} / 1.4$
- 2) Linear interpolation based on e shall be allowed for values between the given values
- 3) Short-term: e.g. wind load
- 4) Long-term: e.g. dead load and snow loads
- 5) Positioning of one or several Thermax in the direction of the shear load, where torsion on the fixture side is not prevented by the fixture (Annex 1 Fig. 1)
- 6) Positioning of one or several Thermax in the direction of the shear load, where fastening in the fixture prevents torsion on the fixture side by means of a fixture / an adjoining structure of sufficient rigidity (Annex 1 Fig. 2). In this case, verification by calculation is not required for fastening in the fixture.
- 7) Linear interpolations based on partial fastenings are permitted.

The shear loads specified in Table 7.1 apply without a limitation of the deflection.
 A torsion of max. 10° can be present with large lever arms.

fischer Thermax

Maximum load-bearing capacity under shear load and associated displacements

Annex 7

Table 8.1: Maximum shear load V per Thermax outside the base material (fixture side) with displacement limited to 1 mm ⁷⁾

Thermax 12		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
only fastened on base material side ⁵⁾											
V ^{1) 2)} [kN]	<i>1 mm short-term ³⁾</i>	0.69	0.53	0.39	0.29	0.21	0.16	0.12	0.09	0.04	0.02
	<i>1 mm long-term ⁴⁾</i>	0.46	0.35	0.26	0.21	0.16	0.12	0.10	0.08	0.04	0.02
fastened on both sides ⁶⁾											
V ^{1) 2)} [kN]	<i>1 mm short-term ³⁾</i>	1.22	0.94	0.75	0.63	0.54	0.40	0.29	0.22	0.10	0.05
	<i>1 mm long-term ⁴⁾</i>	1.15	0.88	0.66	0.52	0.40	0.30	0.24	0.19	0.09	0.04
Thermax 16		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
only fastened on base material side ⁵⁾											
V ^{1) 2)} [kN]	<i>1 mm short-term ³⁾</i>	1.38	1.05	0.78	0.58	0.43	0.32	0.24	0.17	0.08	0.04
	<i>1 mm long-term ⁴⁾</i>	0.92	0.70	0.52	0.41	0.32	0.24	0.19	0.15	0.07	0.04
fastened on both sides ⁶⁾											
V ^{1) 2)} [kN]	<i>1 mm short-term ³⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.46	0.22	0.10
	<i>1 mm long-term ⁴⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.51	0.41	0.20	0.09

- 1) Linear interpolation based on e are allowed for values between the given values
- 2) Linear interpolations based on partial fastenings are permitted
- 3) Short-term: e.g. wind load
- 4) Long-term: e.g. dead load and snow loads
- 5) Positioning of one or several Thermax in the direction of the shear load, where torsion on the fixture side is not prevented by the fixture (Annex 1 Fig. 1)
- 6) Positioning of one or several Thermax in the direction of the shear load, where fastening in the fixture prevents torsion on the fixture side by means of a fixture / an adjoining structure of sufficient rigidity (Annex 1 Fig. 2). In this case, verification by calculation is not required for fastening in the fixture.
- 7) See Section 1.2 and 3.2.4

fischer Thermax

Maximum load-bearing capacity under shear load for given displacement 1 mm

Annex 8

Table 9.1: Maximum shear load V per Thermax outside the base material (fixture side) with displacement limited to 2 mm

Thermax 12		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
only fastened on base material side ⁵⁾											
V ^{1) 2)} [kN]	<i>2 mm short-term ³⁾</i>	1.22	0.94	0.75	0.58	0.43	0.32	0.24	0.17	0.08	0.04
	<i>2 mm long-term ⁴⁾</i>	0.92	0.70	0.52	0.41	0.32	0.24	0.19	0.15	0.07	0.04
fastened on both sides ⁶⁾											
V ^{1) 2)} [kN]	<i>2 mm short-term ³⁾</i>	1.22	0.94	0.75	0.63	0.54	0.47	0.42	0.38	0.21	0.10
	<i>2 mm long-term ⁴⁾</i>	1.22	0.94	0.75	0.63	0.54	0.47	0.42	0.38	0.19	0.09
Thermax 16		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
only fastened on base material side ⁵⁾											
V ^{1) 2)} [kN]	<i>2 mm short-term ³⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.47	0.35	0.16	0.08
	<i>2 mm long-term ⁴⁾</i>	1.59	1.23	0.99	0.82	0.63	0.48	0.39	0.31	0.15	0.07
fastened on both sides ⁶⁾											
V ^{1) 2)} [kN]	<i>2 mm short-term ³⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.49	0.39	0.21
	<i>2 mm long-term ⁴⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.49	0.39	0.19

- 1) Linear interpolation based on e are allowed for values between the given values
- 2) Linear interpolations based on partial fastenings are permitted
- 3) Short-term: e.g. wind load
- 4) Long-term: e.g. dead load and snow loads
- 5) Positioning of one or several Thermax in the direction of the shear load, where torsion on the fixture side is not prevented by the fixture (Annex 1 Fig. 1)
- 6) Positioning of one or several Thermax in the direction of the shear load, where fastening in the fixture prevents torsion on the fixture side by means of a fixture / an adjoining structure of sufficient rigidity (Annex 1 Fig. 2). In this case, verification by calculation is not required for fastening in the fixture.

fischer Thermax

Maximum load-bearing capacity under shear load for given displacement 2 mm

Annex 9

Table 10.1: Maximum shear load V per Thermax outside the base material (fixture side) with displacement limited to 3 mm

Thermax 12		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
only fastened on base material side ⁵⁾											
V ^{1) 2)} [kN]	<i>3 mm short-term ³⁾</i>	1.22	0.94	0.75	0.63	0.54	0.47	0.35	0.26	0.12	0.06
	<i>3 mm long-term ⁴⁾</i>	1.22	0.94	0.75	0.62	0.48	0.36	0.29	0.23	0.11	0.05
fastened on both sides ⁶⁾											
V ^{1) 2)} [kN]	<i>3 mm short-term ³⁾</i>	1.22	0.94	0.75	0.63	0.54	0.47	0.42	0.38	0.30	0.15
	<i>3 mm long-term ⁴⁾</i>	1.22	0.94	0.75	0.63	0.54	0.47	0.42	0.38	0.28	0.13
Thermax 16		Thickness of layer to be bridged e [mm]									
		62	80	100	120	140	160	180	200	250	300
only fastened on base material side ⁵⁾											
V ^{1) 2)} [kN]	<i>3 mm short-term ³⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.49	0.25	0.12
	<i>3 mm long-term ⁴⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.46	0.22	0.11
fastened on both sides ⁶⁾											
V ^{1) 2)} [kN]	<i>3 mm short-term ³⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.49	0.39	0.31
	<i>3 mm long-term ⁴⁾</i>	1.59	1.23	0.99	0.82	0.70	0.62	0.55	0.49	0.39	0.28

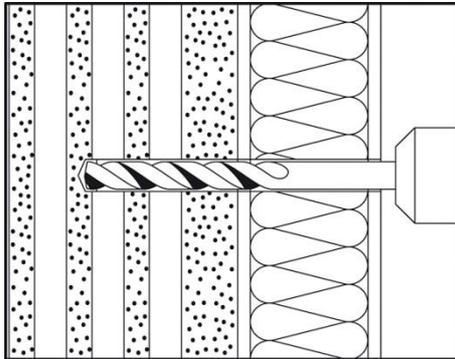
- 1) Linear interpolation based on e are allowed for values between the given values
- 2) Linear interpolations based on partial fastenings are permitted
- 3) Short-term: e.g. wind load
- 4) Long-term: e.g. dead load and snow loads
- 5) Positioning of one or several Thermax in the direction of the shear load, where torsion on the fixture side is not prevented by the fixture (Annex 1 Fig. 1)
- 6) Positioning of one or several Thermax in the direction of the shear load, where fastening in the fixture prevents torsion on the fixture side by means of a fixture / an adjoining structure of sufficient rigidity (Annex 1 Fig. 2). In this case, verification by calculation is not required for fastening in the fixture.

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Maximum load-bearing capacity under shear load for given displacement 3 mm

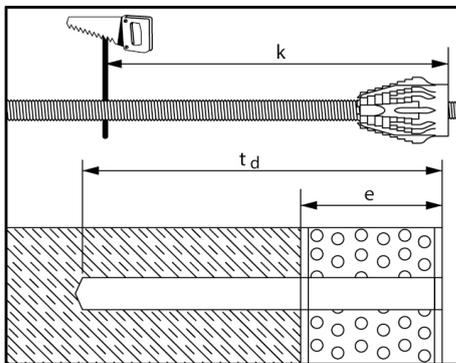
Annex 10

Installation instructions fisher Thermax



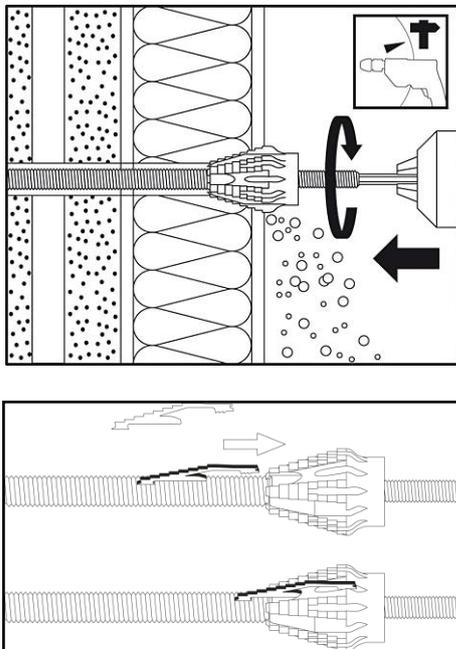
1. Drilling the hole

- Marking the drill holes
- Hole diameter and hole depth: see Table 2.1 "General installation data" or Tables 5.1-5.3 and 6.1
- **Drilling method:**
 - Concrete: hammer drilling
 - Solid brick: hammer drilling
 - Aerated concrete: rotary drilling
 - Perforated brick: drilling method in accordance with assessment/ETA
- Drilling at a right angle to base material surface



2. Cutting the Thermax 12 or Thermax 16 to length

- The anchor rod shall be screwed into the anti-cold cone (ACC) up to the stop.
- Cut length **K** to size in accordance with **Tables 5.1-5.3 and 6.1** (for Thermax 12 and 16).



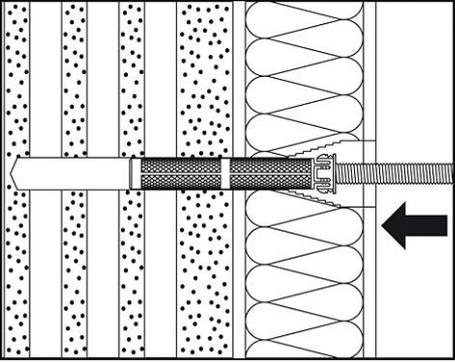
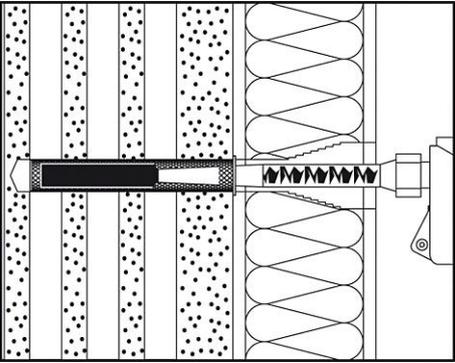
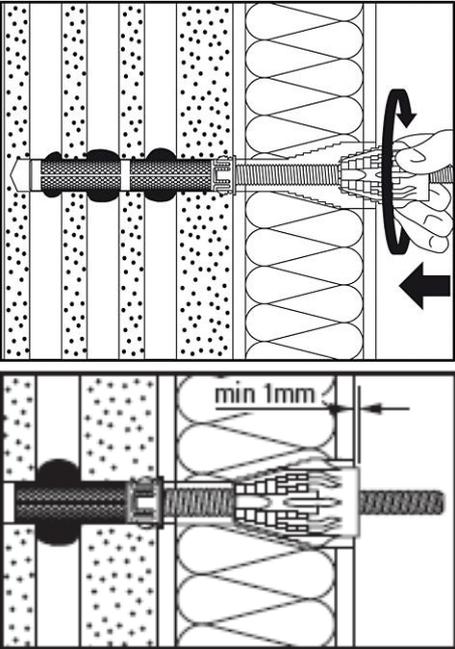
3. Milling open the thermal insulation

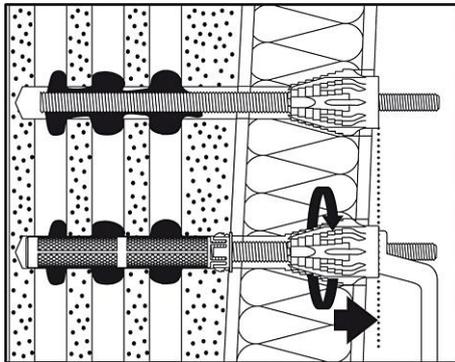
- The plaster and the thermal insulation are milled open with the complete Thermax, using the hex bit or hex nut SW (wrench size) 19. The anchor rod is used as a guide during the milling process.
- **Milling depth:** Upper edge of anti-cold cone (ACC) is flush with the surface of the plaster.
- **Important:** Milling with drill setting "Percussion or hammer drilling"
- **Important:** Cleaning of anchor rod after milling by brushing
- **Important:** Each ACC may only be milled in once.
- **Hint:** With durable plaster, we recommend that the Thermax milling blade is used for milling. Place the milling blade, as illustrated, into one of the three possible indentations of the ACC and remove it again after use.

fischer Thermax

Installation instructions 1 - 3

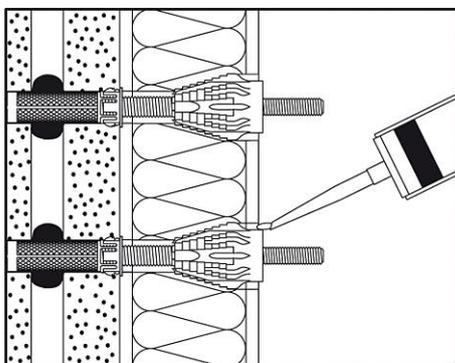
Annex 11

	<p>4. Setting the injection anchor sleeve</p> <ul style="list-style-type: none"> • Important: Before placing the anchor rod or the injection anchor sleeve, the drill hole shall be cleaned in accordance with the assessments for the respective fischer composite anchor listed in Section 1.2. • Base material solid brick/concrete/aerated concrete: Injection anchor sleeve not required • Base material perforated brick: Placement of the injection anchor sleeve into the drill hole using the complete Thermax which has been cut to length, until the anti-cold cone (ACC) is flush with the plaster surface.
	<p>5. Injection</p> <ul style="list-style-type: none"> • Fill the drill hole or injection anchor sleeve with fischer injection mortar without air bubbles (in accordance with Section 1.2), starting from the bottom of the hole. Pull out the static mixer a little further from the drill hole with every stroke. • For the required mortar amount, see Annexes 5 and 6, Tables 5.1-5.3 and 6.1 • At a total hole depth $t_d \geq 250$ mm (see Section 4.3), the static mixer with extension hose shall be used. • Important: The installation instructions and processing time of the injection mortar in accordance with the assessments/ETAs for the fischer injection system used (in accordance with Section 1.2) shall be adhered to.
	<p>6. Insertion of the Thermax (within the processing time of the fischer injection mortar in accordance with Section 1.2)</p> <ul style="list-style-type: none"> • Insert the complete Thermax with a slight rotation. The outer edge of the anti-cold cone (ACC) shall protrude by at least 1 mm from the surface of the plaster. • Leave the fischer injection mortar (in accordance with Section 1.2) to cure in accordance with the curing times (see cartridge label).
<p>fischer Thermax</p>	
<p>Installation instructions 4 - 6</p>	<p>Annex 12</p>



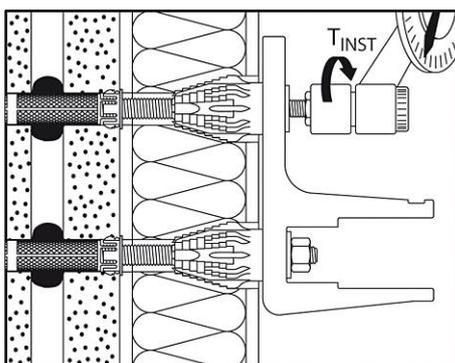
7. Adjustment of the Thermax

- Surface irregularities of the substrate can be compensated for by unscrewing the anti-cold cone (ACC) by a maximum of 2.5 turns (max. 5 mm). The rotation mark "▲" on the face of the ACC shall be observed when doing so. An offset box wrench (wrench size SW 19) shall be used for unscrewing the ACC.
- Unscrew the set screw from the ACC with the hex bit by a max. of 5.5 turns (corresponds to approx. 10 mm). Use an offset box wrench (wrench size SW 19) to fix the ACC in place so it cannot rotate as well.



8. Sealing of expansion joint

- Fill the circular expansion joint between ACC and plaster with fischer Multi adhesive and sealant KD or fischer DKM construction adhesive sealant.



9. Installation of fixture

- Tightening torque $T_{inst} \leq 20 \text{ Nm}$. After the hex nut has been tightened, the fixture may not rest against the substrate.
- For slots in shear load direction (e.g. in an awning fastening profile), the free slot parts shall be completely filled with a fischer injection mortar (in accordance with Section 1.2).

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Installation instructions 7 - 9

Annex 13