Deutsches Institut für Bautechnik

DIBt

Public-law institution jointly founded by the federal states and the Federation

Technical authority granting approvals and permits for construction products and construction techniques

General construction technique permit

Date:	Reference number:
15 Jan 2024	I 28-1.21.1-4/24

Number:
Z-21.1-1711

Validity
from: **22 January 2024**
to: **22 January 2029**

Applicant:
fischerwerke GmbH & Co. KG
Klaus-Fischer-Strasse 1
72178 Waldachtal, Germany

Subject of decision:
fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs

The subject named above is herewith granted a general construction technique permit (*allgemeine Bauartgenehmigung*).
This decision contains five pages and eight annexes.
The subject concerned was granted the first national technical approval on 26 November 2001.

Translation authorised by DIBt

I GENERAL PROVISIONS

1 The general construction technique permit confirms the fitness for 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 installer of the subject concerned. Furthermore, the installer of the subject concerned shall be made aware of the fact that this decision must be made available at the 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 herein 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 on the subject concerned during the permit procedure. Alterations to the information on which this general construction technique permit was based are not covered by this decision and shall be notified to DIBt without delay.

II SPECIAL PROVISIONS

1 Subject concerned and field of application

This general construction technique permit regulates the planning, design and execution of the anchoring of the fischer hollow-ceiling anchor FHY in accordance with ETA-21/0857 of 30 August 2022 in pre-stressed hollow-core concrete slabs as a single anchor and as an anchor pair.

The fischer hollow-ceiling anchor FHY with torque-controlled expansion is made of galvanised steel or stainless steel. It consists of an expansion sleeve and a cone with internal thread and a hexagon screw with washer or a threaded rod with washer and hexagon nut.

By tightening the screw or nut, the cone is pulled into the expansion sleeve and expands it.

The installed fischer hollow-ceiling anchor FHY (hereinafter referred to as anchor) is shown in Annex 1.

The anchorages may be used under static and quasi-static load in prestressed hollow-core concrete slabs made of normal weight concrete with a minimum strength class of C45/55 in accordance with DIN EN 206-1:2001-07.

Anchoring is only permitted in pre-stressed hollow-core concrete slabs the cavity width of which does not exceed 4.2 times the web width (see sketch in Annex 5).

The resistance to fire is regulated in ETA-21/0857 of 30 August 2022.

The anchor made of galvanised steel may be used in concrete members subject to dry internal conditions.

The stainless steel anchor may be used in accordance with its corrosion resistance class CRC III (see Annex 2 Table 2.1) in accordance with DIN EN 1993-1-4:2015-10 in conjunction with DIN EN 1993-1-4/NA:2017-01.

2 Provisions for planning, design and execution

2.1 Planning

The anchorages shall be planned and designed in line with good engineering practice. Verifiable calculations and design drawings shall be prepared taking into account the loads to be anchored.

It shall be verified that the cavity width of the pre-stressed hollow-core concrete slab does not exceed 4.2 times the web width ($b_H \leq 4.2 \times b_{St}$) cf. Annex 5. The immediate local force transmission into the concrete is verified with the following verifications. Transfer of the loads to be anchored in the member shall be verified separately.

Flexural loading of the anchor may only remain unconsidered if all the following conditions are met:

- The fixture is made of metal and is directly fixed to the concrete over its entire surface in the area of the anchorage without an intermediate layer.
- The entire thickness of the fixture is in contact with the threaded rod or the hexagon screw.
- The clearance hole in the fixture does not exceed the values in Annex 4.

If the clearance hole specifications for the fixture cannot be complied with, special measures shall be taken (e.g. a strengthened washer) because of the danger of pull-through.

Additional loads which may arise in the anchor, in the fixture or in the member in which the anchor is installed due to restrained deformations (e.g. due to temperature fluctuations) shall be taken into account.

2.2 Design

2.2.1 Load-bearing capacity

The design resistances of the anchors used for anchorages in pre-stressed hollow-core concrete slabs apply to the load directions centric tension, shear load and oblique tension at any angle. They are given in Annex 7 as a function of the lower web thickness d_u of the pre-stressed hollow-core concrete slabs.

For the ultimate limit state, it shall be verified that the following equations are met:

Tensile, transverse and combined loads $F_{Ed} \leq F_{Rd}$

Bending $M_{Ed} \leq M_{Rd}$

Regarding bending with additional tension, the following equation must be observed for the existing tensile load component:

Bending and tension $$\frac{F_{Ed}}{F_{Rd}} + \frac{M_{Ed}}{M_{Rd}} \leq 1.0$$

F_{Ed} = Design value of the action (tensile, transverse and combined loads)

F_{Rd} = Design resistance, in accordance with Annex 7

M_{Ed} = Design value of the action (bending)

The calculated point of fixation is located at a distance of the nominal diameter of the rod behind the surface of the concrete.

M_{Rd} = Design resistance for bending, in accordance with Annex 4

2.2.2 Displacement behaviour

Under loads amounting to $\frac{F_{Rd}}{1.4}$, displacements of 0.1 mm are to be expected for anchor sizes M6 and M8 and up to 0.4 mm for anchor size M10. An increase in displacement is to be expected under continuous loads.

Under transverse loads amounting to $\frac{F_{Rd}}{1.4}$, displacements of up to 0.9 mm are to be expected for anchor sizes M6 and M8 and up to 1.4 mm for anchor size M10. In addition, the existing hole tolerance between the anchor and the fixture shall be taken into account. The displacements encountered with oblique tension shall be composed of those of the centric tension and shear load components. The displacements are derived from the specified guideline values by linear interpolation.

2.2.3 Fastening with hexagon screw or hexagon nut with threaded rod

The hexagon screw or hexagon nut with threaded rod for the anchor shall be specified by the planning engineer with regard to the length of the screw, taking into account the thickness of the fixture, the required minimum screw-in depth, the thickness of the washer and possible tolerances in accordance with Annex 4, unless it is supplied by the manufacturer for the respective application.

The hexagon screw or the threaded rod with hexagon nut shall comply with the strength class and surface treatment specifications given in Annex 2.

2.3 Execution

2.3.1 General

The executing company shall provide a declaration of conformity in accordance with Section 16a (5) in conjunction with Section 21 (2) of the Model Building Code to confirm the conformity of the construction technique with the general construction technique permit included in this decision.

The anchor shall only be used as a mass-produced fastening unit. A separately supplied hexagon screw or a hexagon nut with threaded rod and associated washer may also be used in accordance with Section 2.2.3.

The anchor shall be installed in accordance with the design drawings prepared in accordance with Section 2.1 and the installation instructions of the company. Before setting the anchor, the exact position of the tensioning strands shall be located using suitable metal detectors and marked on the underside of the slab. If the anchor is not placed centrally into the cavity axis, the distance between the anchor axis and the axis of the tensioning strands shall be at least 50 mm (cf. Annex 8).

2.3.2 Drilling of the holes

The hole shall be drilled perpendicular to the concrete surface using carbide hammer drill bits. The carbide hammer drill bit shall meet the specifications of the DIBt leaflet 'Characteristic values, requirements and tests for masonry drills with carbide drill bits used for drilling holes for anchoring' (*Kennwerte, Anforderungen und Prüfungen von Mauerbohrern mit Schneidköpfen aus Hartmetall, die zur Herstellung der Bohrlöcher von Dübelverankerungen verwendet werden*), version January 2002. Compliance of the drill bit characteristic values shall be verified in accordance with Section 5 of the leaflet.

The nominal diameter of the drill bit and cutting diameter shall correspond to the values given in Annex 4.

2.3.3 Installation of the anchor

The lower web thickness shall be measured before setting the anchor.

The anchor shall be inserted into the drilled hole in such a way that the expansion sleeve is flush with the concrete surface.

The anchor shall be installed with a torque wrench that has been tested. The torques are specified in Annex 4. They shall be applied to the hexagon nut of the threaded rod or the hexagon screw. The anchor shall be properly anchored and may only be loaded if the prescribed torque can be applied.

Installed anchors can be rechecked at any time. It must be possible to apply the prescribed anchoring torque over and over again.

2.3.4 Inspection of execution

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

During the installation of the anchors, records on the verification of the existing concrete strength class and the proper installation of the anchors shall be maintained 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 submitted to the inspection supervisor upon request. Like the delivery notes, they shall be kept by the contractor for a minimum of 5 years after completion of the project.

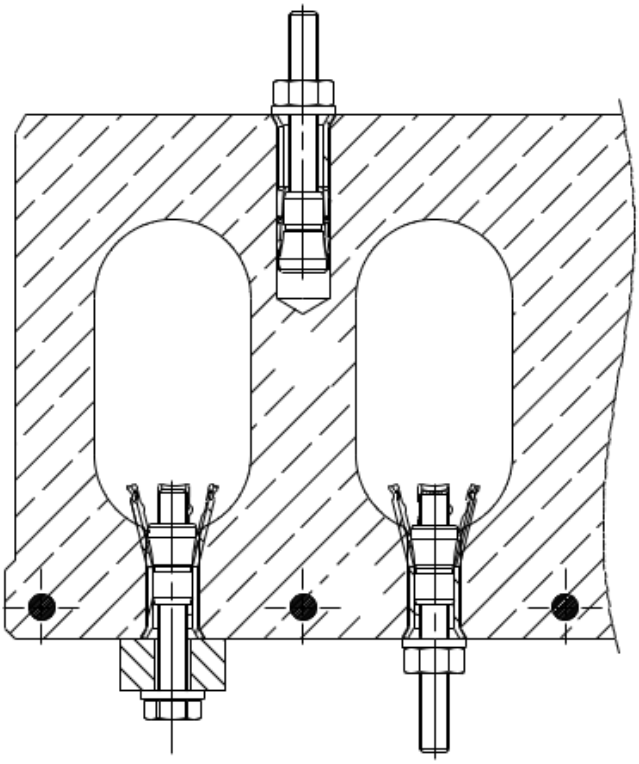
Beatrix Wittstock
Head of Section

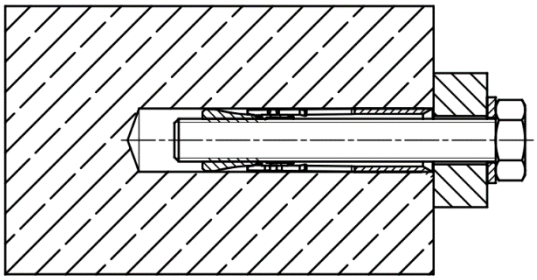
Drawn up by
Aksünger

Deutsches Institut für Bautechnik

DIBt

Installed condition





(Fig. not to scale)

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs	Annex 1
Installed condition	

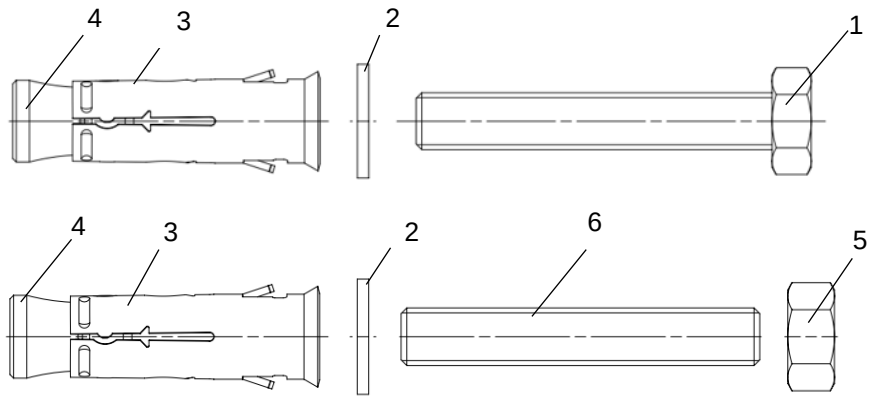


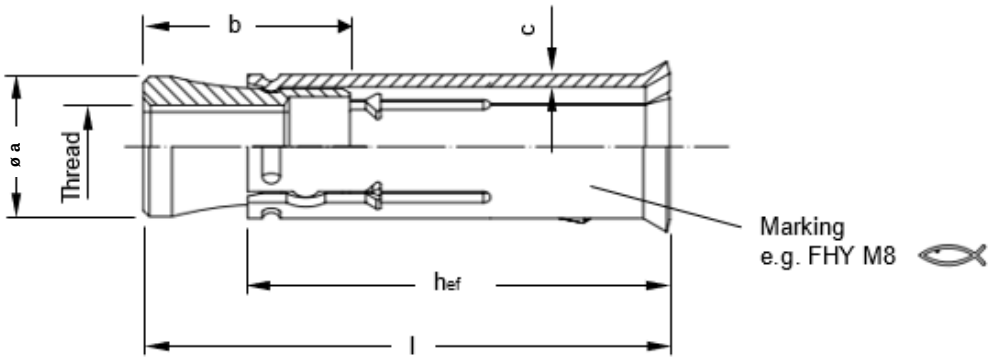
Table 2.1: Designations and materials

Part	Designation	Material	
		FHY	FHY R
		Steel galvanised in accordance with DIN EN ISO 4042:2019-12; ≥ 5 µm,	Stainless steel R 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
1	Hexagon screw [1)]	Steel, DIN EN ISO 898-1:2013-05; property class 8.8 (M6); property class 4.6, 5.8 or 8.8 (M8 and M10)	Stainless steel DIN EN ISO 3506-1:2020-08 property class ≥ 70
2	Washer [1)]	Cold strip, DIN EN 10139:2020-06	Stainless steel DIN EN 10088:2014-12
3	Expansion sleeve		
4	Cone nut	Steel, DIN EN 10277-3:2018-09	
5	Hexagon nut [1)]	Steel, DIN EN ISO 898-2:2012-08; property class 8 (M6); 4, 5 or 8 (M8 and M10)	Stainless steel DIN EN ISO 3506-2:2020-08 property class ≥ 70
6	Threaded rod [1)]	Steel, DIN EN ISO 898-1:2013-05; property class 8.8 (M6); 4.8, 5.8 or 8.8 (M8); 4.6, 5.8 or 8.8 (M10)	Stainless steel DIN EN ISO 3506-1:2020-08 property class ≥ 70

[1)] Commercially available threaded rods, washers, hexagon nuts and hexagon screws may also be used if the requirements of Table 2.1 are met.
The strength of the threaded parts in accordance with DIN EN ISO 898-1:2013-05 shall be determined by the planner in accordance with Annex 4.

(Fig. not to scale)

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs	Annex 2
Anchor types **Designations** **Materials**	



FHY: Steel, galvanised
FHY R: Stainless steel

Table 3.1: Dimensions

Type	h_{ef} [mm]	Thread	ø a [mm]	b [mm]	c [mm]	l [mm]
FHY M6, FHY M6 R	30	M6	9.6	16.0	1.0	37
FHY M8, FHY M8 R	35	M8	11.5	17.0	1.0	43
FHY M10, FHY M10 R	40	M10	15.0	23.5	1.5	52

(Fig. not to scale)

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs

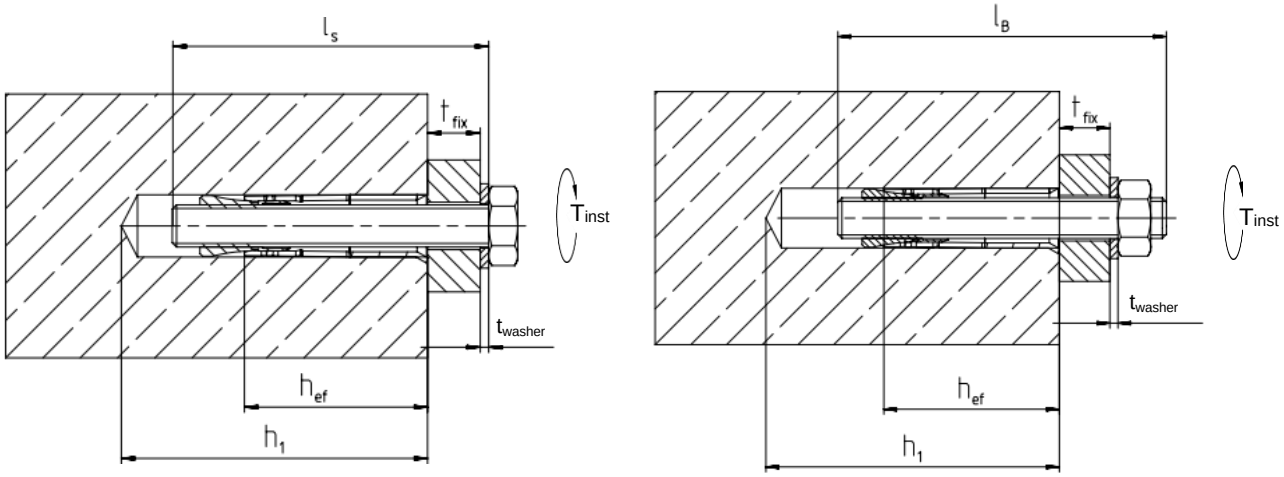
Dimensions and product marking

Annex 3

Table 4.1: Installation parameters / Design resistance for bending

Type				FHY, FHY R		
				M6	M8	M10
Nominal drill diameter			[mm]	10	12	16
Drill bit diameter			≤ [mm]	10.45	12.50	16.50
Drill hole depth			h_1 ≥ [mm]	50	60	65
Effective embedment depth			h_{ef} = [mm]	30	35	40
Length of hexagon screw[1)]			min. l_s ≥ [mm]	37 + t_{washer} + t_{fix}	43 + t_{washer} + t_{fix}	52 + t_{washer} + t_{fix}
Length of threaded bolt			min. l_B ≥ [mm]	42 + t_{washer} + t_{fix}	50 + t_{washer} + t_{fix}	60 + t_{washer} + t_{fix}
Clearance hole in the fixture			d_f ≤ [mm]	7	9	12
Installation torque	FHY		T_{inst}=[Nm]	8	10	20
	FHY R			15	20	40
Design resistance for bending M_{Rd}	property class	4.6	[Nm]	-	9.0	17.9
		4.8		-	12.0	23.9
		5.8		-	15.0	30.0
		8.8		9.8	23.9	47.9
		A4-70		6.8	16.9	33.5

[1)] For hexagon screws with shaft e.g. in accordance with DIN EN ISO 4017:2015-05, the shaft length shall be ≤ t_{fix}



(Fig. not to scale)

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs

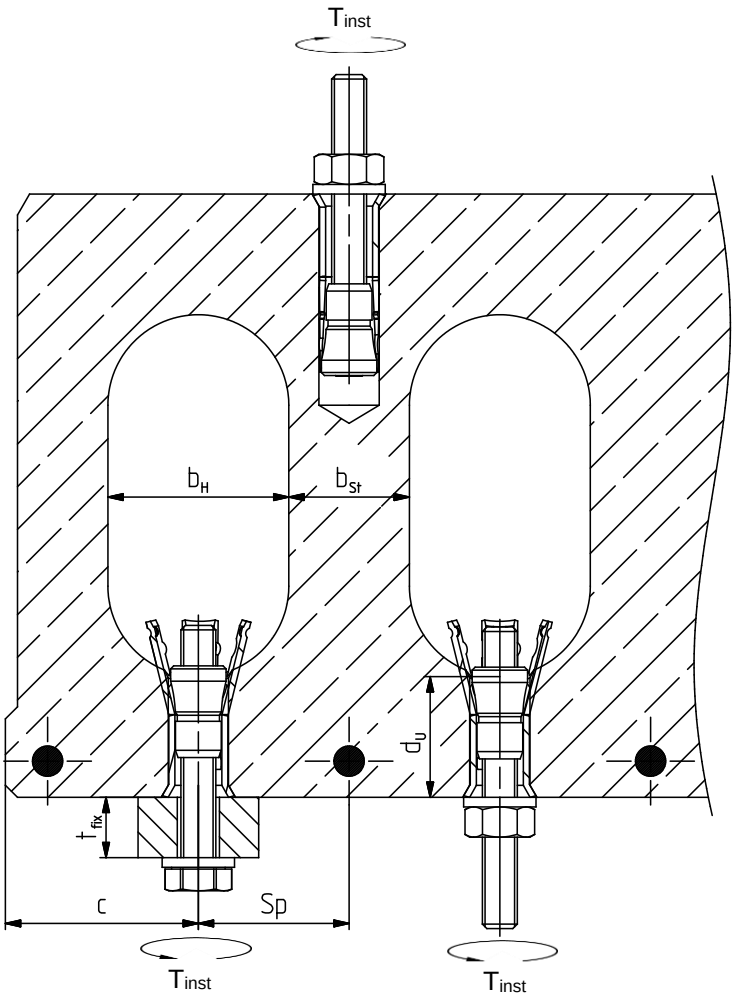
Installation parameters
Design resistance for bending

Annex 4

Deutsches Institut für Bautechnik DIBt

Anchoring in pre-stressed hollow-core concrete slabs

Cavity fixings shall only be permitted in pre-stressed hollow-core concrete slabs if the cavity width does not exceed 4.2 times the web width ($b_H \leq 4.2 * b_{St}$). The anchor may be installed into the concrete member from all sides if the web thickness given in Annex 7 and the distance to the tensioning strands given in Annex 8 are observed (also in the area of solid material).



Key:

S_p	=	Distance to the tensioning strand
t_{fix}	=	Thickness of the fixture
d_u	=	Web thickness
c	=	Edge distance
T_{inst}	=	Installation torque
b_H	=	Cavity width
b_{st}	=	Web width

(Fig. not to scale)

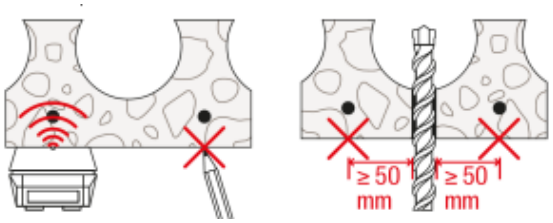
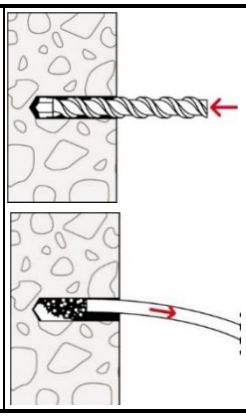
fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs

Installation parameters

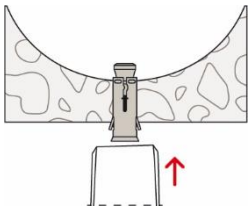
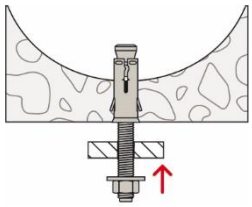
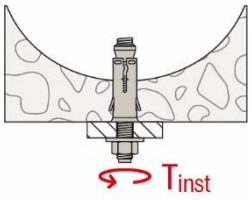
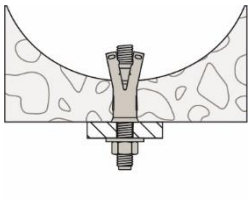
Annex 5

Installation instructions:

- Fastener installation carried out by appropriately qualified personnel and under the supervision of the site manager
- Drill hole created perpendicular +/- 5° to concrete surface, drilling without damaging the reinforcement
- In case of aborted hole in solid material: new drilling at a minimum spacing of twice the depth of the aborted drill hole or smaller spacing if the aborted drill hole is filled with high-strength mortar and if, under shear or oblique tension load, the aborted hole is not in the direction of load application
- In pre-stressed hollow-core concrete slabs, the FHY anchor may be installed from all directions, if the web thicknesses of ≥ 25 mm for M6 and M8, the web thicknesses of ≥ 30 mm for M10 and the distance to the tensioning strand of ≥ 50 mm are observed (also in the area of solid material)

Hammer drill (e.g. fischer Quattric II)		 **Prestressed hollow-core concrete slabs:** Determine and mark the position of the tensioning strands, e.g. with a suitable scanner. Then, drill hole.	 **Solid material/solid areas of pre-stressed hollow-core concrete slabs:** Drill hole and remove bore dust

Installation of the fastener (exemplary application in a pre-stressed hollow-core concrete slab)

			
Set the fastener	Fixation of fixture	Apply T_{inst}	Installed fastener

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs	Annex 6
Installation instructions	

Table 7.1: Design resistance, spacings and edge distances of the anchors for all load directions in pre-stressed hollow-core concrete slabs with a strength class of ≥ B55 res. C45/55

Anchor size		FHY M6, FHY M6 R			FHY M8, FHY M8 R			FHY M10, FHY M10 R	
Web thickness	d_u [mm]	≥ 25 < 30	≥ 30 < 40	≥ 40	≥ 25 < 30	≥ 30 < 40	≥ 40	≥ 30 < 40	≥ 40
Single anchor									
F_{Rd} [1] with s_{cr} and c_{cr}	[kN]	1.0	1.3	2.8	1.0	1.3	2.8	1.7	4.2
Edge distance	c_{cr} ≥ [mm]	150							
F_{Rd} [1] with s_{cr} and c_{min}	[kN]	0.5	1.1	2.5	0.5	1.1	2.5	1.4	3.8
Minimum edge distance	c_{min} = [mm]	100							
Spacing	s_{cr} [mm]	300							
Anchor pairs [2]									
F_{Rd} [1] / anchor pair with s_{min} and c_{cr}	[kN]	1.0	2.0	3.6	1.0	2.0	3.6	2.8	6.7
Minimum spacing	s_{min} = [mm]	70	80	100	70	80	100	80	100
Edge distance	c_{cr} ≥ [mm]	150							
F_{Rd} [1] / anchor pair with s_{min} and c_{min}	[kN]	0.5	1.8	3.3	0.5	1.8	3.3	2.5	6.0
Minimum spacing	s_{min} = [mm]	70	80	100	70	80	100	80	100
Minimum edge distance	c_{min} = [mm]	100							

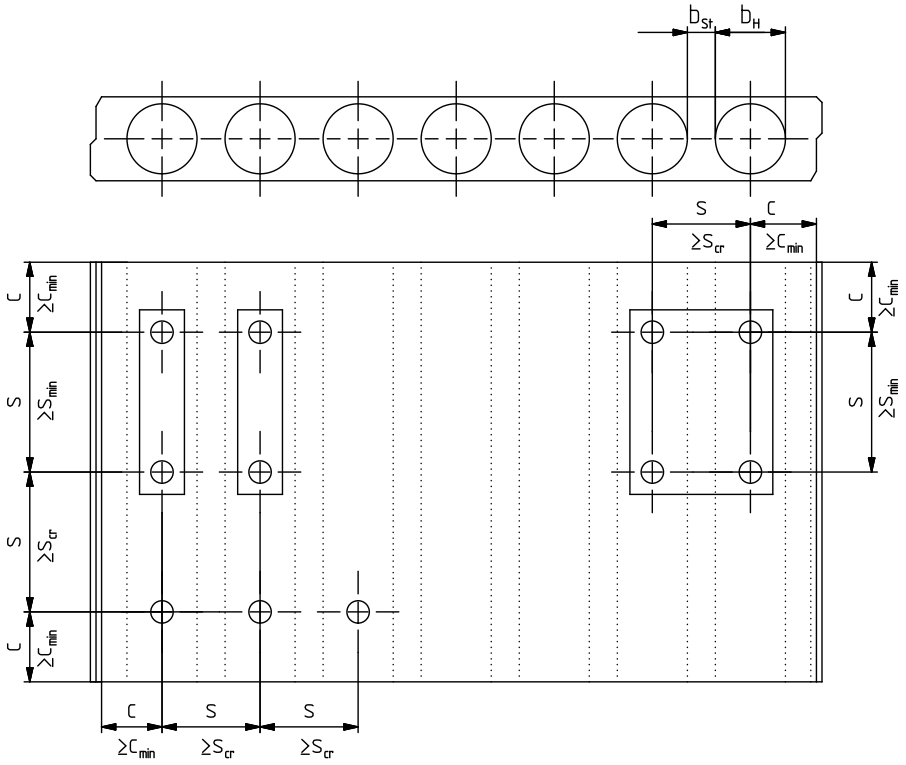
[1] For edge distances $c_{min} < c \leq c_{cr}$, the design resistances may be determined by linear interpolation.
[2] The design resistances apply to the anchor pair. The design resistance for the anchor exposed to the highest stress load shall not exceed the values specified for single anchors. In case of anchor pairs with a spacing of $s_{min} < s \leq s_{cr}$, the design resistance may be determined by linear interpolation, with twice the design resistances for single anchors allowed for the limit s = scr for the anchor pair under centric load introduction.

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs

Design resistances
Spacings and edge distances

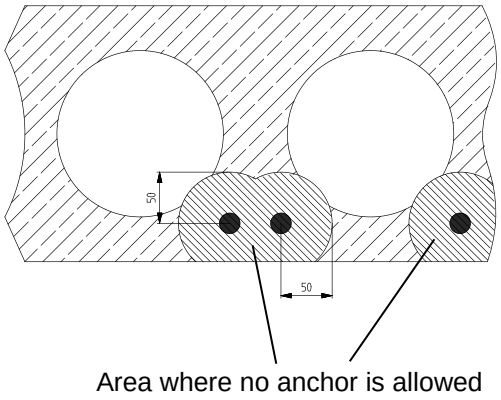
Annex 7

Figure 8.1: Anchor configuration
Condition: $b_H \leq 4.2 * b_{St}$



For s_{min}, c_{min} and s_{cr}, see Annex 7

Figure 8.2: Minimum distance to the tensioning strand



The distance from the anchor axis to the axis of the tensioning strand shall be at least 50 mm.

fischer hollow-ceiling anchor FHY for use in pre-stressed hollow-core concrete slabs	Annex 8
Anchor configuration and minimum distance to tensioning strand	