Designated according to The Construction Products (Amendment etc.) (EU Exit) Regulations 2020

UK Technical Assessment	UKTA-0836-22/6496 of 15/11/2022
Technical Assessment Body issuing the UK Technical Assessment:	British Board of Agrément
Trade name of the construction product:	TSM high performance, TSM high performance A4, TSM high performance HCR
Product family to which the construction product belongs:	Fasteners for use in concrete for redundant non-structural systems
Manufacturer:	TOGE Dübel GmbH & Co. KG Illesheimer Straße 10 90431 Nürnberg DEUTSCHLAND
Manufacturing plant(s):	TOGE Dübel GmbH & Co. KG
This UK Technical Assessment contains:	17 pages including 3 annexes which form an integral part of this assessment
This UK Technical Assessment is issued in accordance with The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 on the basis of:	UKAD 330747-00-0601 *Fasteners for use in concrete in redundant for non-structural systems*

1 Technical description of the product

The TOGE concrete screw TSM high performance of sizes 5 and 6 mm is an anchor made of galvanized steel respectively steel with zinc flake coating and of stainless steel. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The product description is given in Annex A.

2 Specification of the intended use(s) in accordance with the applicable UK Assessment Document (hereinafter UKAD)

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this UK Technical Assessment is based lead to the assumption of a working life of the anchor 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

3.1 Mechanical resistance and stability (BWR 1)

Not relevant.

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 3

3.3 Health, hygiene and the environment (BWR 3)

Not relevant.

3.4 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance to tension load (Static and quasi-static loading)	See Annex C 1 and C 2
Characteristic resistance to shear load (Static and quasi-static loading)	See Annex C 1 and C 2

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

No performance assessed.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied

4.1 System of assessment and verification of constancy of performance

According to UKAD No. 330747-00-0601 and Annex V of the Construction Products Regulation (Regulation (EU) 305/2011) as brought into UK law and amended, the system of assessment and verification of constancy of performance (AVCP) 2+ applies.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the British Board of Agrément and made available to the UK Approved Bodies involved in the conformity attestation process.

5.1 UKCA marking for the product/ system must contain the following information:

- Identification number of the Approved Body
- Name/address of the manufacturer of the product/ system
- Marking with intention of clarification of intended use
- Date of marking
- Number of certificate of constancy of performance (where applicable)
- UKTA number.

On behalf of the British Board of Agrément 	
Date of Issue: 15 November 2022	**Hardy Giesler** Chief Executive Officer

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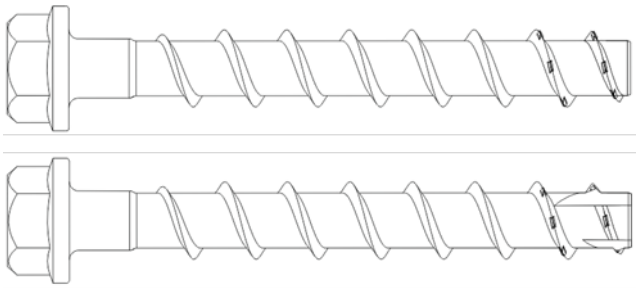
ANNEX A1 Product description, Product in installed condition

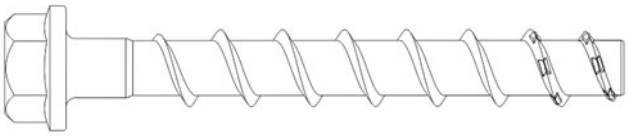
This annex applies to the product described in the main body of the UK Technical Assessment.

TOGE concrete screw TSM high performance (TSM 5 and TSM 6)

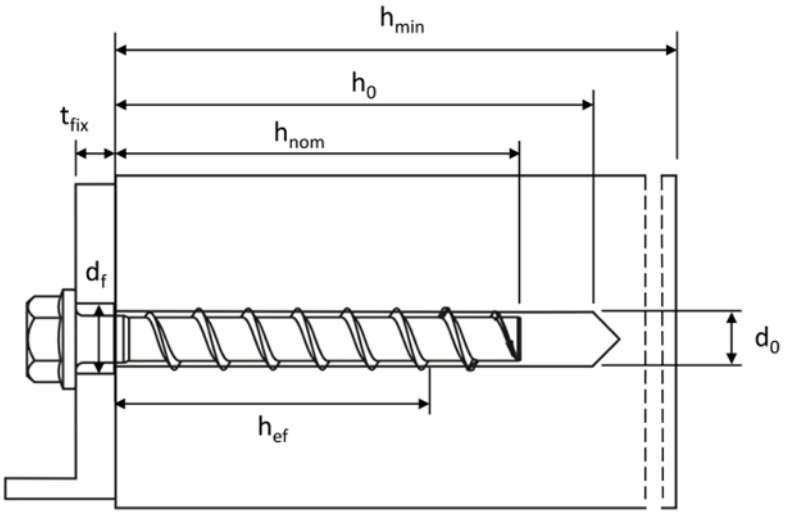
- Galvanized carbon steel
- Zinc flakes coated carbon steel



- Stainless steel A4
- Stainless steel HCR



e.g. TOGE concrete screw, zinc flakes coated, with hexagon head and fixture

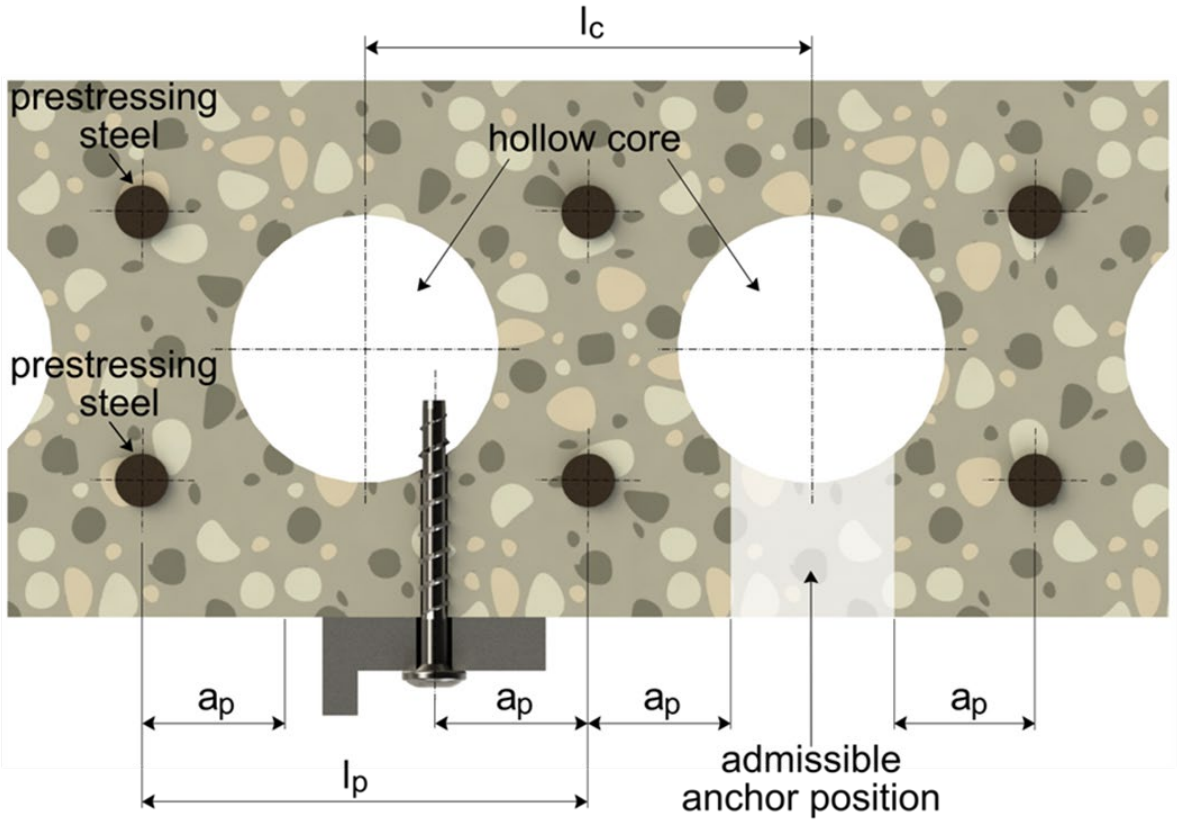


d_0 = nominal drill hole diameter
t_{fix} = thickness of fixture
d_f = clearance hole diameter

h_{min} = minimum thickness of member
h_{nom} = nominal embedment depth
h_0 = drill hole depth
h_{ef} = effective embedment depth

ANNEX A2 Product description, Installed condition in precast prestressed hollow core slabs

This annex applies to the product described in the main body of the UK Technical Assessment.



Important ratio: $\frac{w}{e} \leq 4,2$

w = core width

e = web thickness

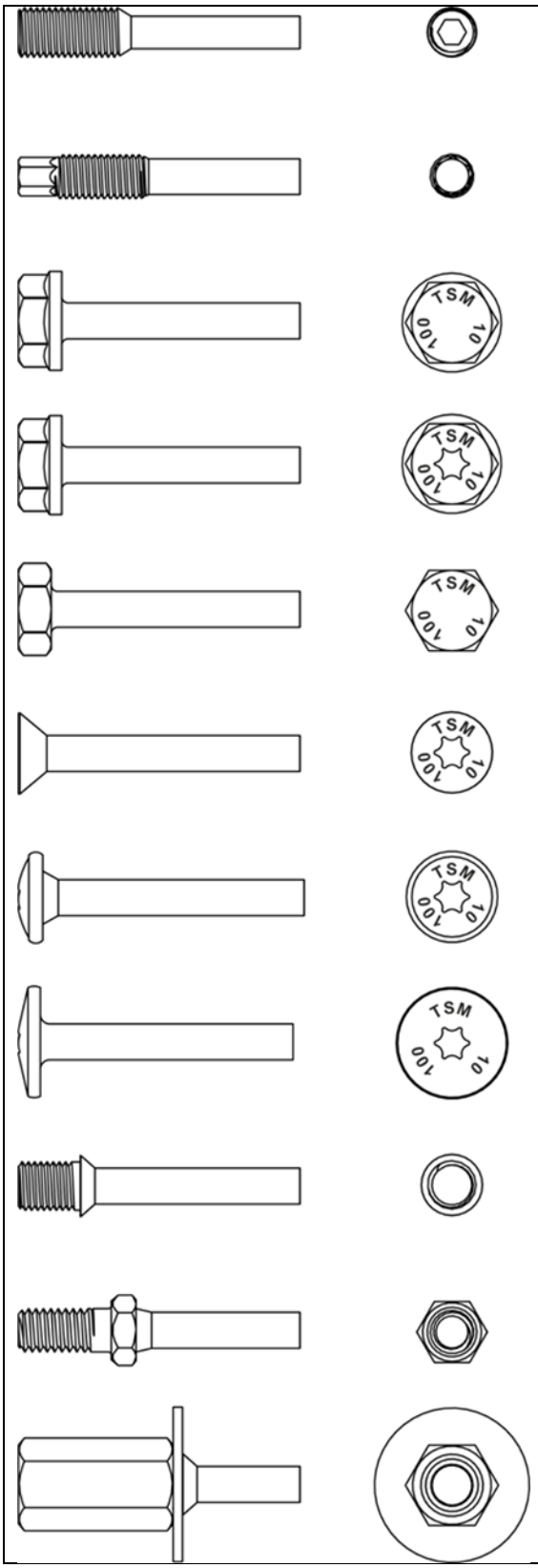
l_c = core distance ≥ 100 mm

l_p = prestressing steel ≥ 100 mm

a_p = distance between anchor position and prestressing steel ≥ 50mm

ANNEX A3 Product description, Screw types

This annex applies to the product described in the main body of the UK Technical Assessment.



1. Configuration with metric connection thread and hexagon socket e.g. TSM 8x105 M10 SW5
2. Configuration with metric connection thread and hexagon drive e.g. TSM 8x105 M10 SW7
3. Configuration with washer and hexagon head e.g. TSM 8x80 SW13 VZ 40
4. Configuration with washer, hexagon head and TORX drive e.g. TSM 8x80 SW13
5. Configuration with hexagon head e.g. TSM 8x80 SW13 OS
6. Configuration with countersunk head and TORX drive e.g. TSM 8x80 C VZ 40
7. Configuration with pan head and TORX drive e.g. TSM 8x80 P VZ 40
8. Configuration with large pan head and TORX drive e.g. TSM 8x80 LP VZ 40
9. Configuration with countersunk head and connection thread e.g. TSM 6x55 AG M8
10. Configuration with hexagon drive and connection thread e.g. TSM 6x55 M8 SW10
11. Configuration with internal thread and hexagon drive e.g. TSM 6x55 IM M8/10

ANNEX A4 Product description, Material Dimensions and markings

This annex applies to the product described in the main body of the UK Technical Assessment.

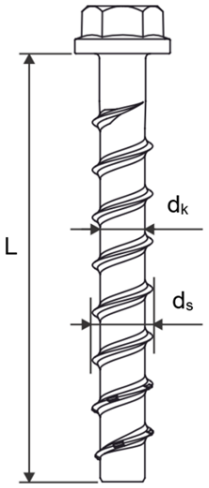
Table 1: Material

Part	Product name	Material
all types	TSM high performance	- Steel BS EN 10263-4:2017 galvanized acc. to BS EN ISO 4042:2018 - Zinc flake coating according to BS EN ISO 10683:2018 (≥5µm)
	TSM high performance A4	1.4401; 1.4404; 1.4571; 1.4578
	TSM high performance HCR	1.4529

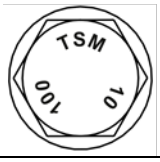
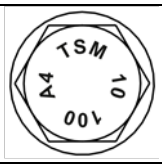
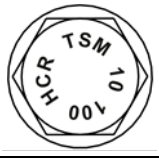
Part	Product name	Nominal characteristic steel		Rupture elongation A_5 [%]
		Yield strength f_{yk} [N.mm^{-2}]	Ultimate strength f_{uk} [N.mm^{-2}]	
all types	TSM high performance	560	700	≤ 8
	TSM high performance A4			
	TSM high performance HCR			

Table 2: Dimensions

Anchor size			TSM 5	TSM 6
Screw length	≤ L	[mm]	200	
Core diameter	d_k	[mm]	4.0	5.1
Thread outer diameter	d_s	[mm]	6.5	7.5



Marking:

TSM high performance	**TSM high performance A4**	**TSM high performance HCR**	**Marking "k" or "x"**
Screw type: TSM Screw size: 10 Screw length: 100	Screw type: TSM Screw size: 10 Screw length: 100 Material: A4	Screw type: TSM Screw size: 10 Screw length: 100 Material: HCR	for anchors with connection thread and h_{nom}= 35mm
			

ANNEX B1 Intended use, Specification

This annex applies to the product described in the main body of the UK Technical Assessment.

Anchorages subject to:

- Static and quasi static loads
- Used only for multiple use for non-structural application according to BS EN 1992-4:2018
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): size 6
- Used for anchorages in prestressed hollow core slabs: size 6

Base materials:

- Compacted reinforced and compacted unreinforced concrete without fibers according to BS EN 206:2013.
- Strength classes C20/25 to C50/60 according to BS EN 206:2013.
- Cracked and uncracked concrete.

Use conditions (Environmental conditions):

- Concrete screws subject to dry internal conditions: all screw types.
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition no particular aggressive conditions exits: screw types made of stainless steel with marking A4.
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition if particular aggressive conditions exits: screw types made of stainless steel with marking HCR.
  Note: Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:

- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed according to BS EN 1992-4:2018.
- The design for shear load according to BS EN 1992-4:2018, Section 6.2.2 applies for all specified diameters d_f of clearance hole in the fixture in Annex B2, Table 3.

Installation:

- Hammer drilling or hollow drilling.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: new drilling must be drilled at a minimum distance of twice the depth of aborted hole or closer if the aborted hole is filled with high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load.
- After installation further turning of the anchor must not be possible. The head of the anchor is supported in the fixture and is not damaged.

ANNEX B2 Intended use, Installation parameters

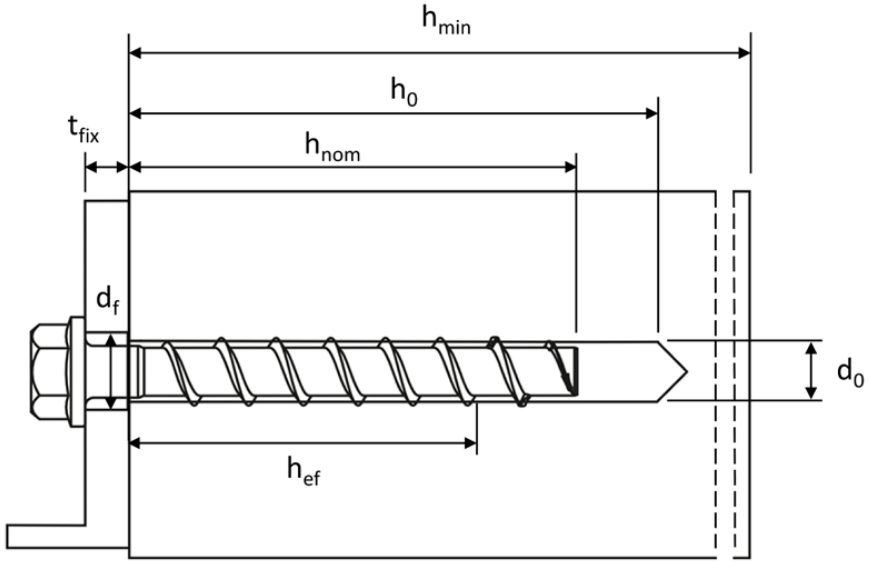
This annex applies to the product described in the main body of the UK Technical Assessment.

Table 3: Installation parameters

TSM concrete screw size			**TSM 5**	**TSM 6**	
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
Nominal drill hole diameter	d_0	[mm]	5	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	5,40	6.40	
Drill hole depth	$h_0 \geq$	[mm]	40	40	60
Clearance hole diameter	$d_f \leq$	[mm]	7	8	
Installation torque (version with connection thread)	$T_{inst} \leq$	[Nm]	8	10	
Recommended torque impact screwdriver		[Nm]	Max. torque according to manufacturer's instructions		
			110	160	

Table 4: Minimum thickness of member, minimum edge distance and minimum spacing

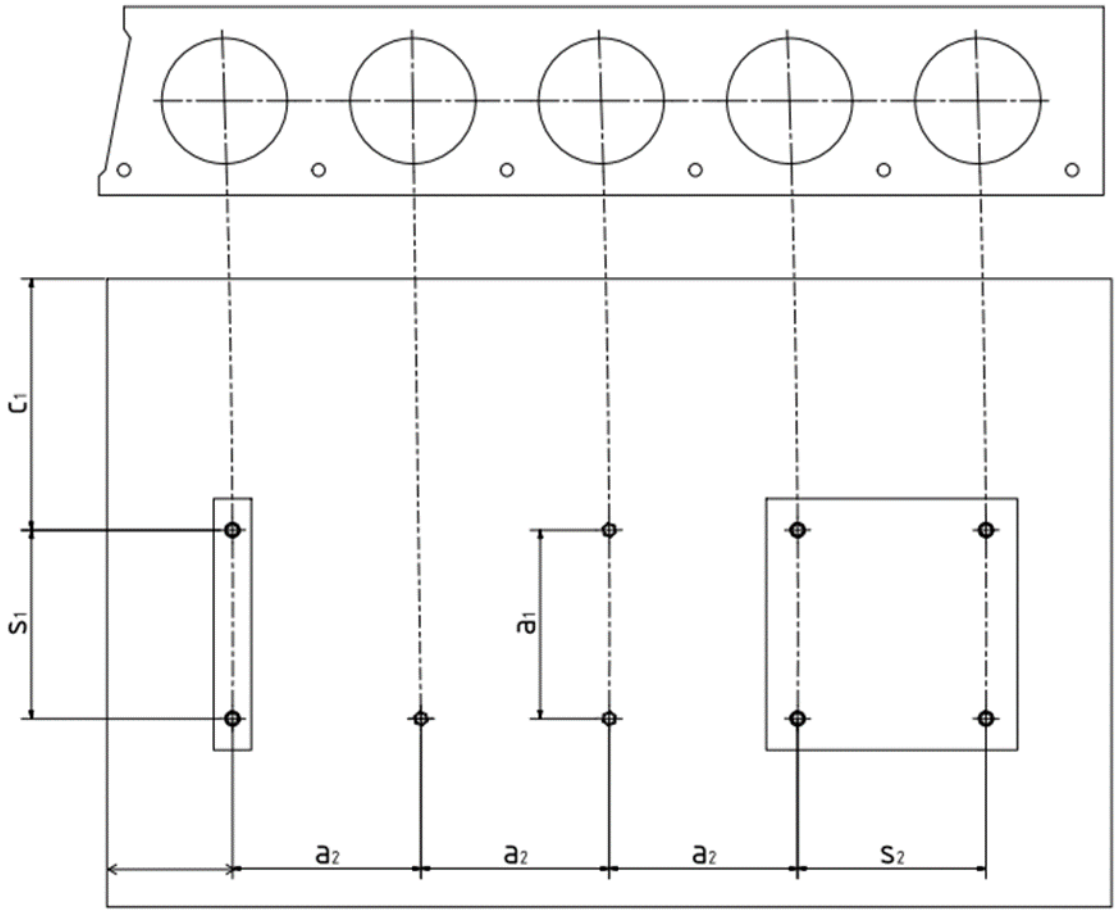
TSM concrete screw size			**TSM 5**	**TSM 6**	
Nominal embedment depth		h_{nom1}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
Minimum thickness of member	h_{min}	[mm]	80	80	100
Minimum edge distance	c_{min}	[mm]	35	35	40
Minimum spacing	s_{min}	[mm]	35	35	40



ANNEX B3 Intended use,
Installation parameters for anchorages in precast prestressed hollow slabs

This annex applies to the product described in the main body of the UK Technical Assessment.

Installation parameters for anchorages in precast prestressed hollow core slabs



c_1, c_2 = edge distance

s_1, s_2 = anchor spacing

a_1, a_2 = distance between anchor groups

c_{min} = minimum edge distance ≥ 100 mm

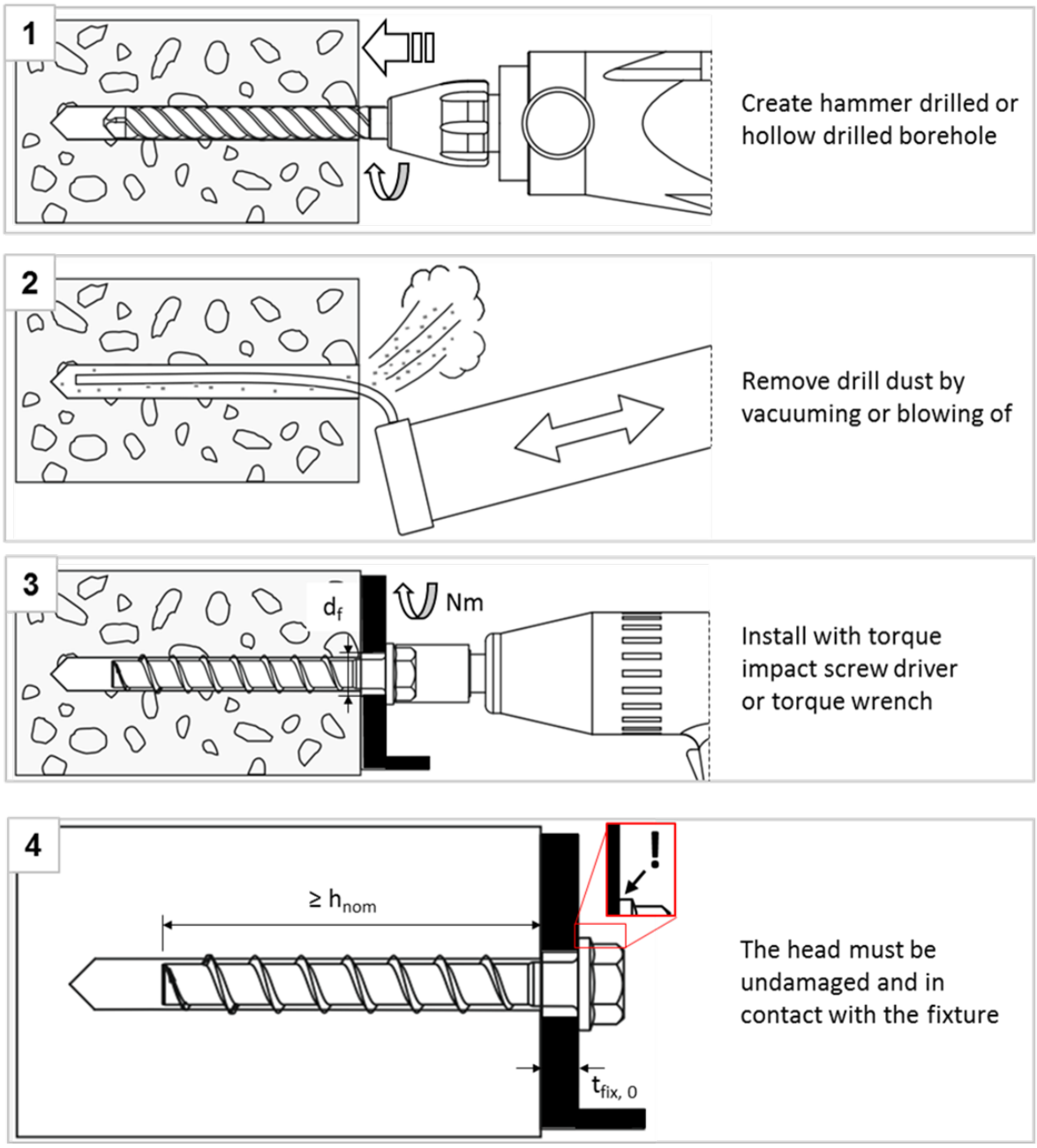
s_{min} = minimum anchor spacing ≥ 100 mm

a_{min} = minimum distance between anchor groups ≥ 100 mm

ANNEX B4 Intended use, Installation instructions

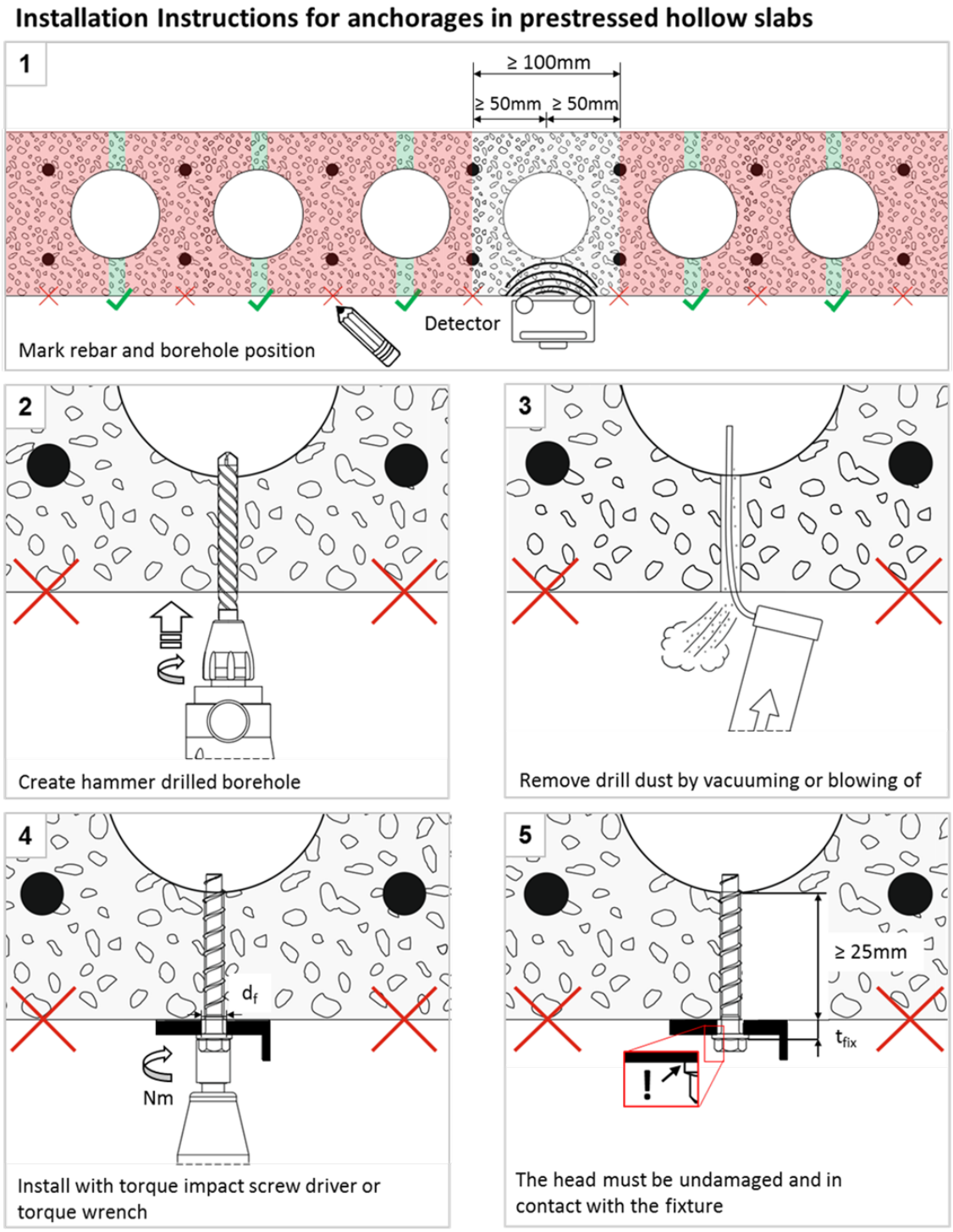
This annex applies to the product described in the main body of the UK Technical Assessment.

Installation Instructions



ANNEX B5 Intended use, Installation instructions for anchorages in prepressed hollow slabs

This annex applies to the product described in the main body of the UK Technical Assessment.



ANNEX C1 Performances, Characteristic values for static and quasi-static loading

This annex applies to the product described in the main body of the UK Technical Assessment.

Table 5: Characteristic values for static and quasi-static loading

TSM concrete screw size				**TSM 5**	**TSM 6**	
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
			[mm]	35	35	55
Steel failure for tension and shear loading						
Characteristic tension load		$N_{Rk,s}$	[kN]	8.7	14.0	
Partial factor		$\gamma_{Ms,N}$	[-]	1.5		
Characteristic shear load		$V_{Rk,s}$	[kN]	4.4	7.0	
Partial factor		$\gamma_{Ms,V}$	[-]	1.25		
Ductility factor		k_7	[-]	0.8		
Characteristic bending load		$M^0_{Rk,s}$	[Nm]	5.3	10.9	
Pull-out failure						
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	1.5	3.0	7.5
	uncracked	$N_{Rk,p}$	[kN]	1.5	3.0	7.5
Increasing factor for $N_{Rk,p}$	C25/30	Ψ_c	[-]	1.12		
	C30/37			1.22		
	C40/50			1.41		
	C50/60			1.58		
Concrete failure: Splitting failure, concrete cone failure and pry-out failure						
Effective embedment depth		h_{ef}	[mm]	27	27	44
k-factor	cracked	$k_1 = k_{cr}$	[-]	7.7		
	uncracked	$k_1 = k_{ucr}$	[-]	11.0		
Concrete cone failure	spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$		
	edge distance	$c_{cr,N}$	[mm]	$1.5 \times h_{ef}$		
Splitting failure	resistance	$N^0_{Rk,Sp}$	[kN]	$\min(N^0_{Rk,c}; N_{Rk,p})$		
	spacing	$s_{cr,Sp}$	[mm]	120	120	160
	edge distance	$c_{cr,Sp}$	[mm]	60	60	80
Factor for pry-out failure		k_8	[-]	1.0		
Installation factor		γ_{inst}	[-]	1.2	1.0	1.0
Concrete edge failure						
Effective length in concrete		$l_f = h_{ef}$	[mm]	27	27	44
Nominal outer diameter of screw		d_{nom}	[mm]	5	6	

ANNEX C2 Performances,
Characteristic values and limiting distances in precast prestressed hollow core slabs

This annex applies to the product described in the main body of the UK Technical Assessment.

Table 6: Characteristic values of resistance in precast prestressed hollow core slabs C30/37 to C50/60

TSM concrete screw size			**TSM 6**		
Bottom flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 35
Characteristic resistance	F^0_{Rk}	[kN]	1	2	3
Installation factor	γ_{inst}	[-]	1.0		

Table 7: Limiting distances for application in precast prestressed hollow core slabs

Distances for application in precast prestressed hollow core slabs			
Minimum edge distance	c_{min}	[mm]	≥ 100
Minimum anchor spacing	s_{min}	[mm]	≥ 100
Minimum distance between anchor groups	a_{min}	[mm]	≥ 100
Distance of core	l_c	[mm]	≥ 100
Distance of prestressing steel	l_p	[mm]	≥ 100
Distance between anchor position and prestressing steel	a_p	[mm]	≥ 50

ANNEX C3 Performances, Characteristic values under fire exposure

This annex applies to the product described in the main body of the UK Technical Assessment.

Table 8: Fire exposure – characteristic values of resistance [1)]

TSM concrete screw size				**TSM 6**			
Material				TSM high performance		TSM high performance A4/HCR	
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
			[mm]	35	55	35	55
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)							
Characteristic Resistance	R30	$F_{Rk,s,fi30}$	[kN]	0.9		1.2	
	R60	$F_{Rk,s,fi60}$	[kN]	0.8		1.2	
	R90	$F_{Rk,s,fi90}$	[kN]	0.6		1.2	
	R120	$F_{Rk,s,fi120}$	[kN]	0.4		0.8	
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0.7		0.9	
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0.6		0.9	
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0.5		0.9	
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0.3		0.6	
Pull-out failure							
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0.75	1.875	0.75	1.875
	R120	$N_{Rk,p,fi}$	[kN]	0.6	1.5	0.6	1.5
Concrete cone failure							
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0.86	2.76	0,.86	2.76
	R120	$N^0_{Rk,c,fi}$	[kN]	0.68	2.21	0.68	2.21
Edge distance							
R30 - R120		$c_{cr,fi}$	[mm]	$2 \times h_{ef}$			
In case of fire attack from more than one side, the minimum edge distance shall be ≥300mm.							
Spacing							
R30 - R120		$s_{cr,fi}$	[mm]	$4 \times h_{ef}$			
Pry-out failure							
R30 - R120		k_8	[-]	1.0			
The anchorage depth must be increased for wet concrete by at least 30 mm compared to the given value.							

1) Not for application in prestressed hollow core slabs

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