Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-23/0542 of 13 December 2023

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	TOGE concrete screw TSM Multiground
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	TOGE Dübel GmbH & Co. KG
This European Technical Assessment contains	12 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	330747-00-0601, Edition 06/2018

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Specific Part

1 Technical description of the product

The TOGE concrete screw TSM Multiground is an anchor of size of 8, 10 and 12 mm made of galvanized steel or steel with zinc flake coating. 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 in accordance with the applicable European Assessment Document

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 European 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 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C3

3.2 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex C1 and C2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C1 and C2
Durability	See Annex B1

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

In accordance with European Assessment Document EAD No. 330747-00-0601, the applicable European legal act is: [97/161/EC].

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

Issued in Berlin on 13 December 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Tempel

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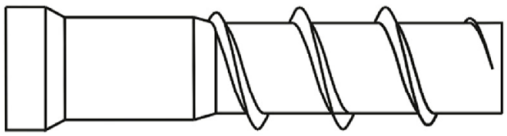
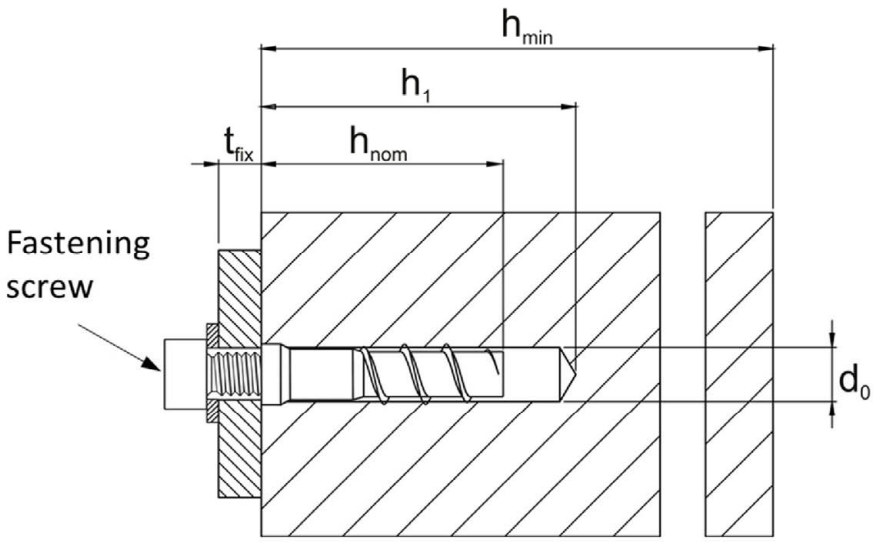
Product in installed condition

TOGE concrete screw TSM Multiground

- Galvanized carbon steel
- Zinc flakes coated carbon steel



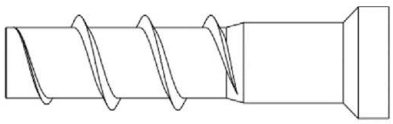
e.g. TOGE concrete screw TSM 8 M and fixture



d_0 = nominal drill hole diameter
t_{fix} = thickness of fixture
h_1 = bore hole depth

h_{min} = minimum thickness of member
h_{nom} = nominal embedment depth

TOGE concrete screw TSM Multiground	Annex A1
Product description Product in installed condition	



Configuration with internal thread and TORX e.g. TSM 8 M

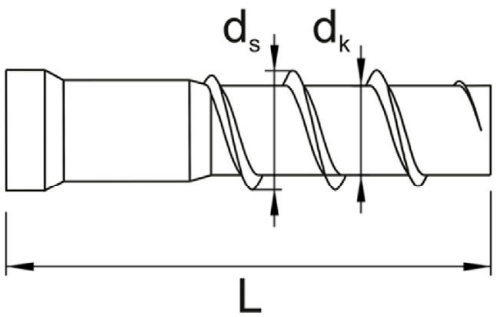
Table 1: Material

Part	Product name	Material
all types	TSM M	- carbon steel galvanized or zinc flake coated

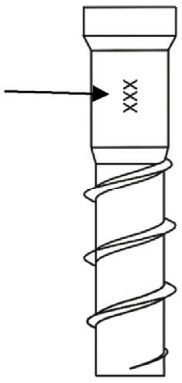
Part	Product name	Nominal characteristic steel		Rupture elongation A_5 [%]
		Yield strength f_{yk} [N/mm²]	Ultimate strength f_{uk} [N/mm²]	
all types	TSM M	540	700	≤ 8

Table 2: Dimensions

Anchor size			TSM 8 M	TSM 10 M	TSM 12 M
Screw length	L	[mm]	40	40	40
Thread outer diameter	d_s	[mm]	10,5	12,5	14,5
Core diameter	d_k	[mm]	7,0	9,0	11,0



Marking:
TSM Multiground
Screw type: TSM 8 M
Screw size: 8



TOGE concrete screw TSM Multiground

Product description
Screw types, material, dimensions and markings

Annex A2

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Specification of Intended use

Anchorages subject to:

- Static or quasi-static loading
- Used only for redundant non-structural systems according to EN 1992-4:2018
- Fire exposure

Base materials:

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

Use conditions (Environmental conditions):

- Concrete structures subject to dry internal conditions

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 for static or quasi-static actions according to EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.
- The design for shear load according to EN 1992-4:2018, Section 6.2.2 applies for all specified diameters df 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. The concrete screw must be screwed in level with the concrete surface. The attachment part is fastened by a fixing screw.

TOGE concrete screw TSM Multiground	**Annex B1**
Intended use Specification continuation	

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Table 3: Installation parameters

Fastening screws or threaded rods of strength classes 4.8, 5.8, 8.8 according to EN ISO 898-1:2013 may be used.

TSM concrete screw size			TSM 8 M	TSM 10 M	TSM 12 M
Nominal embedment depth	h_{nom}	[mm]	40	40	40
Nominal drill hole diameter	d_0	[mm]	8	10	12
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	12,50
Drill hole depth	$h_1 \geq$	[mm]	50	50	50
Clearance hole diameter	d_f	[mm]	7	9	12
Diameter of the metric internal thread		[mm]	6	8	10
Minimum screw-in depth of the fixing screw or threaded rod		[mm]	8	8	8
Installation torque	T_{inst}	[Nm]	4	8	15
Torque impact screw driver		[Nm]	Max. torque according to manufacturer's instructions		
			180		

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

TSM concrete screw size			TSM 8 M	TSM 10 M	TSM 12 M
Nominal embedment depth	h_{nom}	[mm]	40	40	40
Minimum thickness of member	h_{min}	[mm]	80	80	80
Minimum edge distance	c_{min}	[mm]	40	40	40
Minimum spacing	s_{min}	[mm]	30	40	40

TOGE concrete screw TSM Multiground

Intended use
Minimum thickness of member, minimum edge distance and minimum spacing

Annex B2

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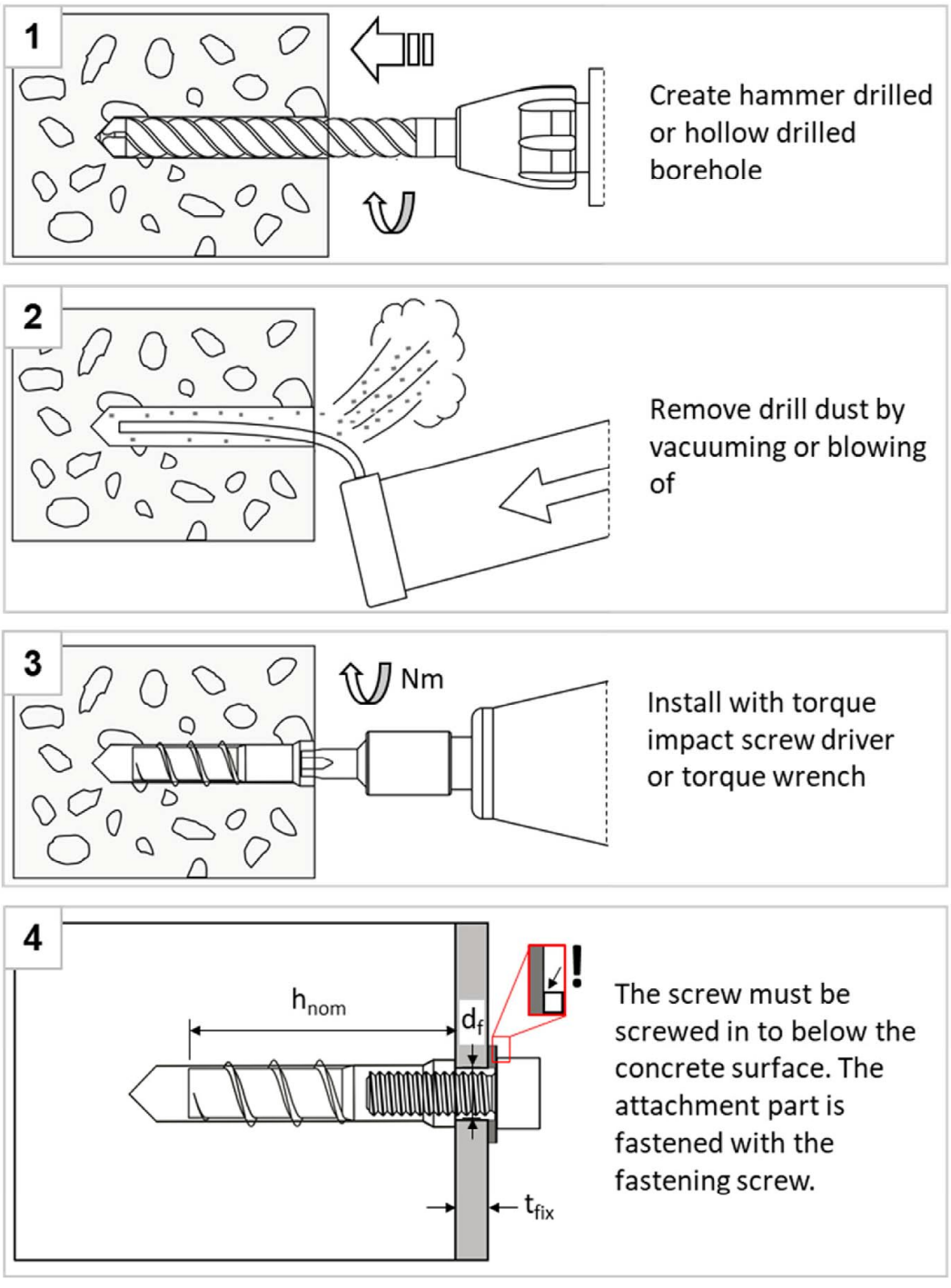
Installation Instructions



Note:
Cleaning of borehole is not necessary when using a hollow drill

TOGE concrete screw TSM Multiground	
Intended use Installation instructions	**Annex B3**

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Table 5: Steel failure for tension and shear loading

TSM concrete screw size			TSM 8 M	TSM 10 M	TSM 12 M
Nominal embedment depth	h_{nom}	[mm]	40	40	40
Characteristic resistance to steel failure, strength class 4.8					
Characteristic resistance	$N_{Rk,s}$	[kN]	8,0	9,5	10,0
Partial factor	$\gamma_{Ms,N}$	[-]		1,5	
Characteristic resistance	$V_{Rk,s}$	[kN]	4,0	7,3	9,0
Partial factor	$\gamma_{Ms,V}$	[-]		1,25	
Ductility factor	k_7	[-]		0,8	
Characteristic bending load	$M^0_{RK,s}$	[Nm]	5,0	12,5	23,9
Characteristic resistance to steel failure, strength class 5.8					
Characteristic resistance	$N_{Rk,s}$	[kN]	8,0	9,5	10,0
Partial factor	$\gamma_{Ms,N}$	[-]		1,5	
Characteristic resistance	$V_{Rk,s}$	[kN]	5,0	7,5	9,0
Partial factor	$\gamma_{Ms,V}$	[-]		1,25	
Ductility factor	k_7	[-]		0,8	
Characteristic bending load	$M^0_{RK,s}$	[Nm]	6,3	15,4	23,9
Characteristic resistance to steel failure, strength class 8.8					
Characteristic resistance	$N_{Rk,s}$	[kN]	8,0	9,5	10,0
Partial factor	$\gamma_{Ms,N}$	[-]		1,5	
Characteristic resistance	$V_{Rk,s}$	[kN]	6,0	7,5	9,0
Partial factor	$\gamma_{Ms,V}$	[-]		1,25	
Ductility factor	k_7	[-]		0,8	
Characteristic bending load	$M^0_{RK,s}$	[Nm]	8,8	15,4	23,9

TOGE concrete screw TSM Multiground

Performances
Steel failure for tension and shear loading

Annex C1

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Table 6: Characteristic values for static and quasi-static loading

TSM concrete screw size				TSM 8 M	TSM 10 M	TSM 12 M
Nominal embedment depth		h_{nom}	[mm]	40	40	40
Pull-out failure in uncracked concrete						
Characteristic resistance to tension load in C20/25		$N_{Rk,p}$	[kN]	6,5	8,0	5,5
Increasing factor for $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \psi_c$ with $\psi_c = \left(\frac{f_{ck}}{20}\right)^m$	C25/30	m	[-]	0,213	0,146	0,147
	C30/37					
	C40/50					
	C50/60					
Pull-out failure in cracked concrete						
Characteristic resistance to tension load in C20/25		$N_{Rk,p}$	[kN]	5,5	6,5	4,5
Increasing factor for $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \psi_c$ with $\psi_c = \left(\frac{f_{ck}}{20}\right)^m$	C25/30	m	[-]	0,209	0,121	0,281
	C30/37					
	C40/50					
	C50/60					
Concrete failure: splitting failure, concrete cone failure and pry-out failure						
Effective embedment depth		h_{ef}	[mm]	31	31	30
k-Faktor	cracked	k_{cr}	[-]	7,7		
	uncracked	k_{ucr}	[-]	11,0		
Concrete cone failure	spacing	$s_{cr,N}$	[mm]	3,0 x h_{ef}		
	edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}		
Splitting failure	resistance	$N^0_{Rk,sp}$		6,5	8,0	5,5
	spacing	$s_{cr,Sp}$	[mm]	≥ 200 mm und ≥ 4 x h_{ef}		
	edge distance	$c_{cr,Sp}$	[mm]	≥ 100 mm und ≥ 3 x h_{ef}		
Factor for pry-out failure	k_8	[-]		1,0		
Installation factor		γ_{inst}	[-]	1,0	1,0	1,2
Concrete edge failure						
Effective length in concrete		$l_f = h_{nom}$	[mm]	40	40	40
Nominal outer diameter of screw		d_{nom}	[mm]	8	10	12

TOGE concrete screw TSM Multiground

Performances
Characteristic values for static and quasi-static loading

Annex C2

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Table 7: Fire exposure – characteristic values of resistance

TSM concrete screw size				TSM 8 M	TSM 10 M	TSM 12 M
Nominal embedment depth		h_{nom}	[mm]	40	40	40
Steel failure for tension and shear load						
Characteristic Resistance	R30	$N_{Rk,s,fi30}$	[kN]	1,01	2,11	3,92
	R60	$N_{Rk,s,fi60}$	[kN]	0,77	1,58	2,86
	R90	$N_{Rk,s,fi90}$	[kN]	0,54	1,05	1,81
	R120	$N_{Rk,s,fi120}$	[kN]	0,43	0,79	1,28
	R30	$V_{Rk,s,fi30}$	[kN]	1,01	2,11	3,92
	R60	$V_{Rk,s,fi60}$	[kN]	0,77	1,58	2,86
	R90	$V_{Rk,s,fi90}$	[kN]	0,54	1,05	1,81
	R120	$V_{Rk,s,fi120}$	[kN]	0,43	0,79	1,28
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,63	1,81	4,28
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,49	1,36	3,12
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,34	0,91	1,97
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,27	0,68	1,39
Pull-out failure						
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	1,38	1,63	1,13
	R120	$N_{Rk,p,fi}$	[kN]	1,10	1,30	0,90
Concrete cone failure						
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,9	0,9	0,8
	R120	$N^0_{Rk,c,fi}$	[kN]	0,7	0,7	0,7
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]	$4 \times h_{ef}$		
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.						

TOGE concrete screw TSM Multiground

Performances
Fire exposure - characteristic values of resistance

Annex C3