DECLARATION OF PERFORMANCE
DoP No. 2873-CPR-401-11 / 01.21-EN

1. Unique identification code of the product-type: **Toge concrete screw TSM high performance LT**
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):

   Annex A 2
   Batch number: see packaging of the product.

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	concrete screw
for use in	Cracked and non-cracked concrete C 20/25-C 50/60 (EN 206) covered sizes: 6, 8,10
option / category	Option 1 Seismic category C1
loading	static or quasi-static
material	stainless steel internal and external use without particular aggressive conditions high corrosion resistant steel internal and external use with particular aggressive conditions covered sizes: 6, 8,10,12,14

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):

   Toge Dübel GmbH & Co. KG, Illesheimer Strasse 10, 90431 Nuernberg

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2): --
6. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V: **System 1**
7. In case of the declaration of performance concerning a construction product covered by a harmonised standard: --
8. In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:

   Deutsches Institut für Bautechnik, Berlin

   has issued the following:

   ETA-21/0425

   on the basis of

   EAD 330232-01-0601, Edition 05/2021

   The notified body **2873-CPR** performed
   i) determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product ;
   ii) factory production control.
   iii) testing of samples taken at the factory in accordance with a prescribed test plan.
   and has issued the following: certificate of conformity 2873-CPR-401-7-11

9. Declared performance:

Essential Characteristics	Design Method	Performance	Harmonized Technical Specification
Characteristic resistance for tension load	CEN/TS 1992-4:2009	Annex C1, C2	EOTA TR 045 EAD 330232-01-0601 EAD 330011-00-0601
Characteristic resistance for shear load	CEN/TS 1992-4:2009	Annex C1, C2	
Minimum thickness of concrete member, Minimum spacing and minimum edge distance	CEN/TS 1992-4:2009	Annex B4	
Displacement for serviceability limit state	CEN/TS 1992-4:2009	Annex C5	
Characteristic resistance for seismic	CEN/TS 1992-4:2009	Annex C3	
Characteristic resistance under fire exposure	CEN/TS 1992-4:2009	Annex C6	

Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies: --

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 9.

Signed for and on behalf of the manufacturer by:

Waldemar Gunkel
Dipl.-Wirtsch.-Ing. (FH).
Application engeeniring and technical documents

Nuernberg, 2022-06-30

Andreas Gerhard
CEO

Nuernberg, 2022-06-30

Table 5: Minimum thickness of member, minimum edge distance and minimum spacing

TSM concrete screw size			6			8			10		
Nominal embedment depth		h_{nom}	h_{nom1} [1)]	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
		[mm]	35	45	55	45	55	65	55	75	85
Minimum thickness of member	h_{min}	[mm]	80	80	100	80	100	120	100	130	130
Minimum edge distance	c_{min}	[mm]	35	35	35	35	35	35	40	40	40
Minimum spacing	s_{min}	[mm]	35	35	35	35	35	35	40	40	40

1) only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

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

TSM concrete screw size			6			8			10		
Nominal embedment depth		h_{nom}	h_{nom1} [1)]	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
		[mm]	35	45	55	45	55	65	55	75	85
Steel failure for tension and shear loading											
Characteristic tension load		$N_{Rk,s}$	[kN]	14,0		27,0			45,0		
Partial factor		$\gamma_{Ms,N}$	[-]	1,5							
Characteristic shear load		$V^0_{Rk,s}$	[kN]	7,0		13,5		17,0	22,5	34,0	
Partial factor		$\gamma_{Ms,V}$	[-]	1,25							
Ductility factor		k_7	[-]	0,8							
Characteristic bending load		$M^0_{Rk,s}$	[Nm]	10,9		26,0			56,0		
Pull-out failure in uncracked concrete											
Characteristic tension load C20/25		$N_{Rk,p}$	[kN]	3,5	4,0	8,5	9,0	12,0	17,0	11,0	19,0	25,0
Increasing factor for $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \Psi_c$	C25/30	Ψ_c	[-]	1,08	1,22	1,17	1,22		1,13	1,22	
	C30/37			1,15	1,36	1,26	1,36		1,20	1,36	
	C40/50			1,27	1,41	1,30	1,41		1,23	1,41	
	C50/60			1,38	1,58	1,42	1,58		1,32	1,58	
Pull-out failure in cracked concrete											
Characteristic tension load C20/25		$N_{Rk,p}$	[kN]	2,5	1,5	3,0	3,0	5,5	8,0	6,0	13,0	17,0
Increasing factor for $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \Psi_c$	C25/30	Ψ_c	[-]	1,09	1,08	1,22	1,22			1,22	1,17	
	C30/37			1,18	1,15	1,36	1,36			1,36	1,27	
	C40/50			1,32	1,27	1,41	1,41			1,41	1,31	
	C50/60			1,45	1,38	1,58	1,58			1,58	1,43	

1) only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

Table 7: Characteristic values for static and quasi-static loading continuation

TSM concrete screw size				6			8			10		
Nominal embedment depth		h_{nom}		h_{nom1} [1)]	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
			[mm]	35	45	55	45	55	65	55	75	85
Concrete failure: concrete cone failure and splitting failure												
Effective embedment depth		h_{ef}	[mm]	25	34	42	32	41	49	40	57	65
k-factor	cracked	k_{cr}	[-]	7,7								
	uncracked	k_{ucr}	[-]	11,0								
Concrete cone failure	spacing	$s_{cr,N}$	[mm]	3 x h_{ef}								
	edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}								
Splitting failure case 1	resistance	$N^0_{Rk,sp}$	[kN]	3,5	4,0	8,5	9,0	12,0	17,0	11,0	19,0	25,0
	spacing	$s_{cr,sp}$	[mm]	120	160	240	200	240	290	230	280	320
	edge distance	$c_{cr,sp}$	[mm]	60	80	120	100	120	145	115	140	160
Splitting failure case 2	resistance	$N^0_{Rk,sp}$	[kN]	[2)]	2,5	5,5	5,5	8,0	11,0	7,0	15,0	20,0
	spacing	$s_{cr,sp}$	[mm]	[2)]	116	168	128	164	196	160	224	260
	edge distance	$c_{cr,sp}$	[mm]	[2)]	58	84	64	82	98	80	114	130
Pry-out failure												
Factor for pry-out failure		k_8	[-]	1,0	1,6		2,1	2,8		2,5		
Installation factor		γ_{inst}	[-]	1,0								
Concrete edge failure												
Effective length in concrete		l_f	[mm]	35	45	55	45	55	65	55	75	85
Nominal outer diameter of screw		d_{nom}	[mm]	6			8			10		

1) only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

2) no performance assessed

Table 8: Seismic category C1 – Characteristic load values (only type S, type SK, type ST, type ST-6[1)], type P and type I[1)])

TSM concrete screw size			6		8		10	
Nominal embedment depth	h_{nom}		h_{nom2}	h_{nom3}	h_{nom1}	h_{nom3}	h_{nom1}	h_{nom3}
		[mm]	45	55	45	65	55	85
Steel failure for tension and shear load (version type S, type SK, type ST, type ST-6[1)], type P and type I[1)])								
Characteristic tension load	$N_{Rk,s,C1}$	[kN]	14,0		27,0		45,0	
Partial factor	$\gamma_{Ms,N}$	[-]	1,5					
Characteristic shear load **Type S, Type ST, Type P**	$V_{Rk,s,C1}$	[kN]	3,5	4,0	8,0	10,0	14,0	16,0
Characteristic shear load **Type SK**	$V_{Rk,s,C1}$	[kN]	2,5	[2)]	4,5	7,0	14,0	10,0
Partial factor	$\gamma_{Ms,V}$	[-]	1,25					
Without filling of the annular gap [3)]	α_{gap}	[-]	0,5					
With filling of the annular gap [4)]	α_{gap}	[-]	1,0					
Pull-out failure (version type S, type SK, type ST, type ST-6[1)], type P and type I[1)])								
Characteristic tension load in cracked concrete C20/25	$N_{Rk,p,C1}$	[kN]	1,5	3,0	3,0	8,5	6,0	17,0
Concrete cone failure (version type S, type SK, type ST, type ST-6[1)], type P and type I[1)])								
Effective embedment depth	h_{ef}	[mm]	34	42	32	49	40	65
Edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}					
Spacing	$s_{cr,N}$	[mm]	3 x h_{ef}					
Installation safety factor	γ_{inst}	[-]	1,0					
Concrete pry-out failure (version type S, type SK, type ST and type P)								
Factor for pry-out failure	k_8	[-]	1,6		2,1	2,8	2,5	
Concrete edge failure (version type S, type SK, type ST and type P)								
Effective length in concrete	l_f	[mm]	45	55	45	65	55	85
Nominal outer diameter of screw	d_{nom}	[mm]	6		8		10	

[1)] only tension load
[2)] no performance assessed
[3)] without filling of the annular gap according to annex B5
[4)] with filling of the annular gap according to annex B7

TOGE concrete screw TSM high performance LT	**Annex C3**
Performances Seismic category C1 – Characteristic load values	

Table 9: Fire exposure – characteristic values of resistance

TSM concrete screw size				6			8			10		
Nominal embedment depth			h_{nom}	1[1)]	2	3	1	2	3	1	2	3
			[mm]	35	45	55	45	55	65	55	75	85
Steel failure for tension and shear load												
characteristic Resistance	R30	$N_{Rk,s,fi30}$	[kN]	0,9			2,4			4,4		
	R60	$N_{Rk,s,fi60}$	[kN]	0,8			1,7			3,3		
	R90	$N_{Rk,s,fi90}$	[kN]	0,6			1,1			2,3		
	R120	$N_{Rk,s,fi120}$	[kN]	0,4			0,7			1,7		
	R30	$V_{Rk,s,fi30}$	[kN]	0,9			2,4			4,4		
	R60	$V_{Rk,s,fi60}$	[kN]	0,8			1,7			3,3		
	R90	$V_{Rk,s,fi90}$	[kN]	0,6			1,1			2,3		
	R120	$V_{Rk,s,fi120}$	[kN]	0,4			0,7			1,7		
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,7			2,4			5,9		
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,6			1,8			4,5		
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,5			1,2			3,0		
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,3			0,9			2,3		
Pull-out failure												
characteristic Resistance	R30-90	$N_{Rk,p,fi}$	[kN]	0,6	0,4	0,8	0,8	1,4	2,0	1,5	3,3	4,3
	R120	$N_{Rk,p,fi}$	[kN]	0,5	0,3	0,6	0,6	1,1	1,6	1,2	2,6	3,4
Concrete cone failure												
characteristic Resistance	R30-90	$N^0_{Rk,c,fi}$	[kN]	0,5	1,2	2,0	1,0	1,9	2,9	1,7	4,2	5,9
	R120	$N^0_{Rk,c,fi}$	[kN]	0,4	0,9	1,6	0,8	1,5	2,3	1,4	3,4	4,7
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 bis R120		$s_{cr,fi}$	[mm]	$4 \times h_{ef}$								
Pry-out failure												
R30 bis R120		k_8	[-]	1,0	1,6		2,1	2,8		2,5		
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.												

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Table 10: Displacements under static and quasi-static tension load

TSM concrete screw size				6		8			10		
Nominal embedment depth			h_{nom}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
			[mm]	45	55	45	55	65	55	75	85
Cracked concrete	tension load	N	[kN]	0,72	1,45	1,63	2,74	4,06	3,04	6,22	8,46
	displacement	δ_{N0}	[mm]	0,19	0,27	0,27	0,53	0,45	0,26	0,58	0,61
		$\delta_{N\infty}$	[mm]	0,55	0,84	0,49	0,66	0,61	0,69	0,92	1,1
Uncracked concrete	tension load	N	[kN]	2,11	4,07	4,24	5,97	8,03	5,42	9,17	12,28
	displacement	δ_{N0}	[mm]	0,42	0,43	0,33	0,49	0,58	0,84	0,62	0,79
		$\delta_{N\infty}$	[mm]	0,42	0,43	0,58			0,79		

Table 11: Displacements under static and quasi-static shear load

TSM concrete screw size				6		8			10		
Nominal embedment depth			h_{nom}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
			[mm]	45	55	45	55	65	55	75	85
Cracked and uncracked concrete	shear load	V	[kN]	3,3		8,6			16,2		
	displacement	δ_{V0}	[mm]	1,55		2,7			2,7		
		$\delta_{V\infty}$	[mm]	3,1		4,1			4,3		