Deutsches Institut für Bautechnik

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

European Technical Assessment Body for construction products

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

European Technical Assessment

ETA-23/0923 of 19 September 2025

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	TSM concrete screw TSM high performance LT
Product family to which the construction product belongs	Screw anchor for use in masonry
Manufacturer	TOGE Dübel GmbH & Co. KG Illesheimer Straße 10 90431 Nürnberg GERMANY
Manufacturing plant	TOGE Dübel GmbH & Co. KG
This European Technical Assessment contains	36 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	EAD 330460-00-0604, edition 08/2022
This version replaces	ETA-23/0923 issued on 9 July 2025

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Specific Part

1 Technical description of the product

The TOGE concrete screw TSM high performance LT is an anchor in size 6, 8 and 10 mm made 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.

Product and product description are 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 anchors 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)

Essential characteristic	Performance
Characteristic resistance to steel failure of a single screw anchor under tension loading	$N_{Rk,s}$ see Annex C1
Characteristic resistance to steel failure of a single screw anchor under shear loading	$V_{Rk,s}$ [kN], $M^0_{Rk,s}$ see Annex C1
Characteristic resistance to pull-out failure or brick breakout failure of a single screw anchor under tension loading	$N_{Rk,p}$, $N_{Rk,b}$, $N_{Rk,p,c}$, $N_{Rk,b,c}$ see Annex B7, C4, C9, C14, C19 $\alpha_{j,N}$ see Annex C4, C9, C14, C19
Characteristic resistance to local brick failure and brick edge failure of a single screw anchor under shear loading	$V_{Rk,b,II}$, $V_{Rk,b,\perp}$, $V_{Rk,c,II}$, $V_{Rk,c,\perp}$ see Annex B7, C4, C9, C14, C19 $\alpha_{j,VII}$, $\alpha_{j,V\perp}$ see Annex C3, C8, C13, C18
Characteristic resistance to brick breakout failure of a screw anchor group under tension loading	N^g_{Rk} see Annex B7 $\alpha_{g,N}$ see Annex B7, C2, C8, C13, C18
Characteristic resistance to local brick failure and brick edge failure of a screw anchor group under shear loading	$V^g_{Rk,b,II}$, $V^g_{Rk,b,\perp}$, $V^g_{Rk,c,II}$, $V^g_{Rk,c,\perp}$ see Annex B7 $\alpha_{g,VII}$, $\alpha_{g,VII\perp}$ see Annex B7, C2, C8, C13, C18

Essential characteristic	Performance
Edge distances, joint distances, spacing, member thickness	c_{cr}, s_{crII}, $s_{cr\perp}$ see Annex B7, C3, C8, C13, C18 c_{min}, c_{jII}, $c_{j\perp}$, s_{minII}, $s_{min\perp}$ see Annex C3, C8, C13, C18 h_{min} see Annex C3, C7, C12, C17
Resistance to combined tension and shear loading (hollow and perforated bricks)	No performance assessed
Displacements	δ_{N0}, $\delta_{N\infty}$, δ_{V0}, $\delta_{V\infty}$ see Annex C2, C10, C15, C20

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A 1
Resistance to fire	$N_{Rk,s,fi}$, $N_{Rk,p,fi}$, $N_{Rk,b,fi}$, $V_{Rk,s,fi}$, $M^0_{Rk,s,fi}$, $c_{min,fi}$, $c_{j,fi}$ see Annex C6, C11, C16, C21 $N^g_{Rk,fi}$, $s_{min,fi}$, $c_{min,fi}$, $c_{j,fi}$ see Annex C5, C10, C15, C20

3.3 Aspects of durability

Essential characteristic	Performance
Durability	see Annex B1

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

In accordance with the European Assessment Document EAD 330460-00-0604 the applicable European legal act is: 97/177/EC.

The system to be applied is: 1

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 19 September 2025 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Aksünger

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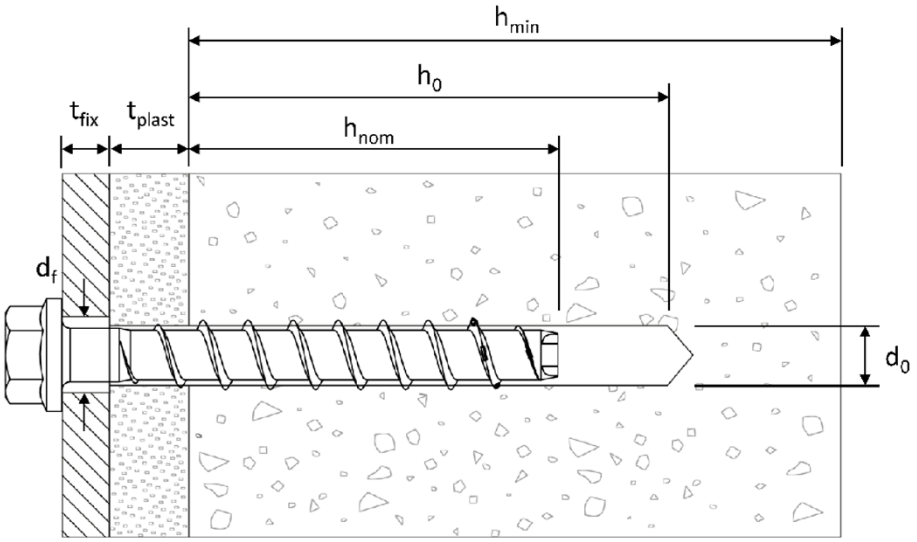
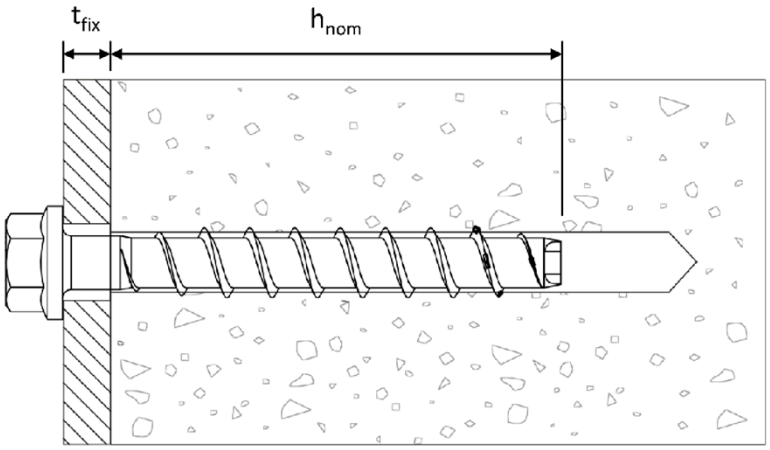
Product in installed condition



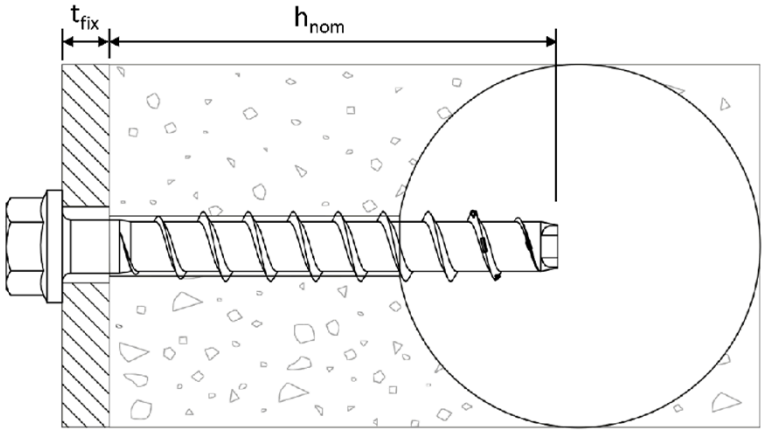
TOGE concrete screw
TSM high performance LT

in solid and perforated brick with non-load-bearing layer



TOGE concrete screw
TSM high performance LT

in solid brick



TOGE concrete screw
TSM high performance LT

in perforated brick

d_0 = nominal drill hole diameter
t_{fix} = thickness of fixture
d_f = clearance hole diameter
t_{plast} = thickness of non-load-bearing layer

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

TOGE concrete screw TSM high performance LT	**Annex A1**
Product description Product in installed condition	

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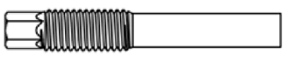
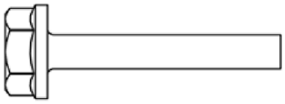
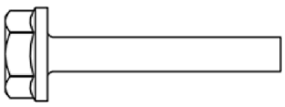


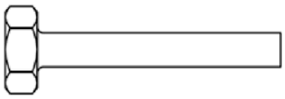

Configuration with metric connection thread and hexagon drive e.g. TSM 8x105 M10 SW7; Type ST



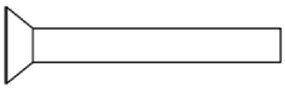

Configuration with washer and hexagon head e.g. TSM 8x80 SW13 VZ 40; Type S



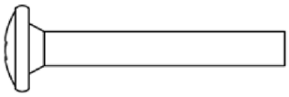

Configuration with washer, hexagon head and TORX drive e.g. TSM 8x80 SW13; Type S



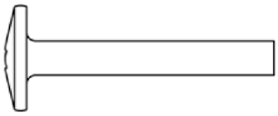

Configuration with hexagon head e.g. TSM 8x80 SW13 OS; Type S



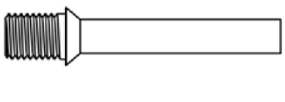

Configuration with countersunk head and TORX drive e.g. TSM 8x80 C VZ 40; Type SK



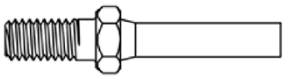

Configuration with pan head and TORX drive e.g. TSM 8x80 P VZ 40; Type P



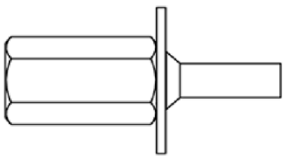

Configuration with large pan head and TORX drive e.g. TSM 8x80 LP VZ 40; Type P



Configuration with countersunk head and connection thread e.g. TSM 6x55 AG M8; Type ST-6




Configuration with hexagon drive and connection thread e.g. TSM 6x55 M8 SW10; Type ST-6




Configuration with internal thread and hexagon drive e.g. TSM 6x55 IM M8/10; Type I

TOGE concrete screw TSM high performance LT	
Product description Screw types	**Annex A2**

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Table 1: Material

Part	Product name	Material
All types	TSM high performance LT A4	1.4401; 1.4404; 1.4571; 1.4578
	TSM high performance LT HCR	1.4529

Part	Product name	Nominal characteristic steel		Elongation A_5 [%]
		Yield strength f_{yk} [N/mm²]	Ultimate strength f_{uk} [N/mm²]	
All types	TSM high performance LT A4	560	700	≤ 8
	TSM high performance LT HCR			

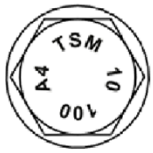
Table 2: Dimensions

TSM LT concrete screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Screw length	≤ L	[mm]	500		
Core diameter	d_K	[mm]	5,1	7,2	9,2
Thread outer diameter	d_s	[mm]	7,6	10,5	12,5

Marking:

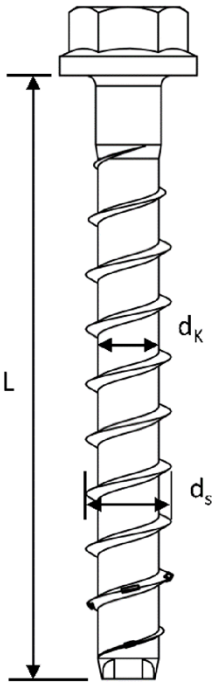
TSM high performance LT A4

Screw type:	TSM
Screw size:	10
Screw length:	100
Material:	A4



TSM high performance LT HCR

Screw type:	TSM
Screw size:	10
Screw length:	100
Material:	HCR



TOGE concrete screw TSM high performance LT

Product description
Material, dimensions and markings

Annex A3

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Specification of Intended use

Anchorages subject to:

- Static or quasi-static actions in tension, shear or combined tension and shear or bending
- Exposure to fire (for dry masonry only)

Base materials:

- Masonry made of solid bricks and perforated bricks see Annex B3
- Minimum thickness of member h_{min} see Annexes C2, C7, C12, C17
- Bearing joints must be completely filled with mortar of at least compressive strength class M5 according to EN 998-2:2016. Butt joints may, but do not have to be filled with mortar.
- In case of fire, all joints must be completely filled with mortar according to EN 998-2:2016 with strength class at minimum M5
- Dry or wet masonry (during installation)

Use conditions (Environmental conditions):

- Concrete screws subject to dry internal conditions: all screw types.
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006 + A1:2015
  - Stainless steel according to Annex A3, screw with marking A4:CRC III
  - High corrosion resistant steel according to Annex A3, screw with marking HCR: CRC V
- Temperature range of the masonry over the period of use: -40°C to +80°C

Design:

- The anchorage is designed in accordance with EOTA Technical Report TR 054:2022-07.
- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and masonry work.
- Screws with nominal embedment depth smaller than 50 mm may only be used for anchoring of statically indeterminate systems, in internal exposure conditions.
- 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 to supports, etc.).
- The screw may be placed in the wall side and in the reveal side of the masonry. The installation parameters for installation in the reveal side must be observed in accordance with Annex B8. In case of Silka XL solid calcium silicate brick KS 12DF, the installation is possible in the wall side only.
- For solid blocks, the characteristic load-bearing capacities also apply to larger block formats, greater compressive strengths and densities of the masonry blocks.
- Installation in the joint and close to the joint is not permitted; the distances to joints according to annexes C3, C8, C13, C18 must be observed.

TOGE concrete screw TSM high performance LT	Annex B1
Intended use Specification	

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Specification of Intended use - continuation

Installation:

- Bridging of non-load-bearing layers (e.g. plaster) is possible. When selecting the screw length L, the thickness of the plaster layer t_{plast} must be considered.
  $L \geq h_{nom} + t_{plast} + t_{fix}$ (see figures in Annex A1)
- During installation, the joint, spacing and edge distances specified by the planner must be considered.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- The borehole is drilled with hammer, percussion, suction or masonry drills in hammer mode or rotary mode. The masonry must not be damaged during hammer drilling. If cracks occur during drilling, the rotary mode must be used. In this case, the drill hole must be discarded.
- Incorrectly drilled holes must be filled with high-strength mortar.

TOGE concrete screw TSM high performance LT	**Annex B2**
Intended use Specification continuation	

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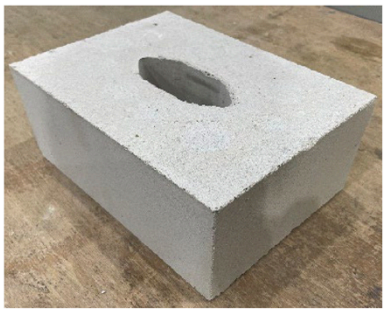
Table 3: Solid and perforated bricks, dimensions and properties

Solid calcium silicate brick KS acc. to EN 771-2:2011+A1:2015				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Annex
KS 20 - 2,0 - NF	L: ≥ 240 B: ≥ 115 H: ≥ 71	≥ 26,0	≥ 2,0	C2 – C6

Silka XL solid calcium silicate brick KS 12DF acc. to EN 771-2:2015-11				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Annex
KS - R (P) 20 - 2,0 - 12DF	L: ≥ 498 B: ≥ 175 H: ≥ 248	≥ 14,0	≥ 1,8	C7 – C11



Perforated calcium silicate brick KSL 3DF acc. to EN 771-2:2015-11				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Annex
SWKV KSL 12 - 1,6 - 3DF	L: ≥ 240 B: ≥ 175 H: ≥ 113	≥ 17,0	≥ 1,5	C12 - C16

Solid clay brick MZ acc. to EN 771-1:2015-11				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Annex
MZ 20 - 2,0 - NF	L: ≥ 240 B: ≥ 115 H: ≥ 71	≥ 21,0	≥ 2,1	C17 – C21

TOGE concrete screw TSM high performance LT

Intended use
Solid and perforated bricks, dimensions and properties

Annex B3

Deutsches Institut für Bautechnik DIBt

Table 4: General installation parameters

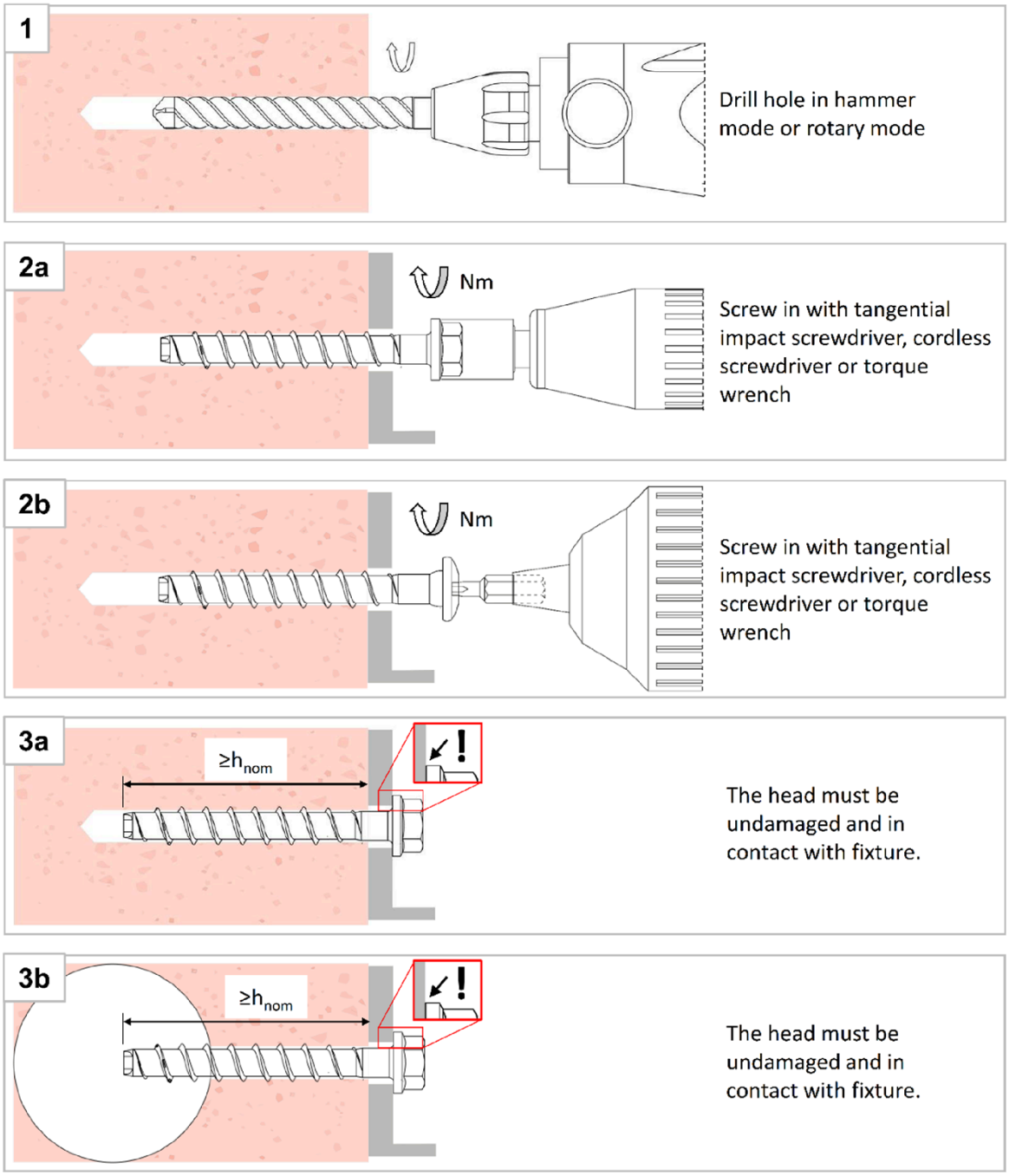
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Nominal drill hole diameter	d_0	[mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	8,45	10,45
Drill hole depth	$h_0 \geq$	[mm]	55	65	85
Clearance hole diameter	$d_f \leq$	[mm]	8	12	14

TOGE concrete screw TSM high performance LT

Intended use
General installation parameters

Annex B4

Installation instructions



Note:

Step 1:	Joint distances, spacing and edge distances must be considered.
Step 2a + 2b:	For further details on screwing in, see brick type related Annex C2 – C21. The tightening torque must not exceed $T_{inst,max}$
Step 3a + 3b:	It must not be possible to turn the screw. $T_{inst,max}$ must not be exceeded during the check.

TOGE concrete screw TSM high performance LT	**Annex B5**
Intended use Installation Instructions	

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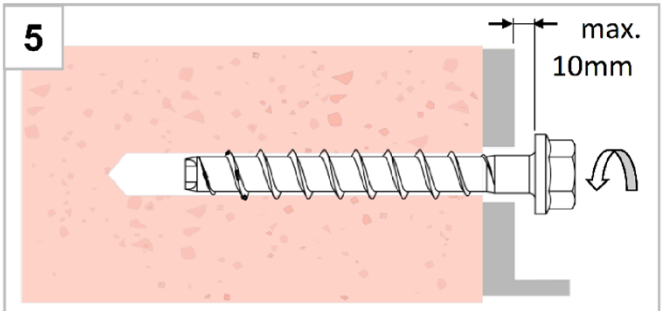
Installation Instructions - Adjustment

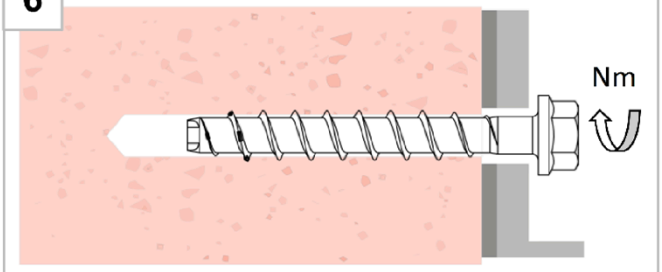
1. Adjustment

5



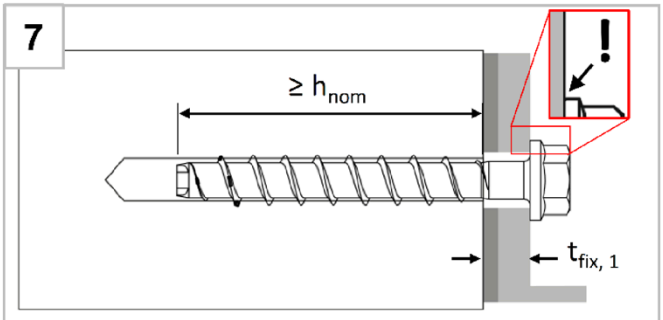
Screw may be untightened maximum 10mm.

6



After adjustment, the screw may be screwed in with a tangential impact screwdriver, cordless screwdriver or torque wrench.

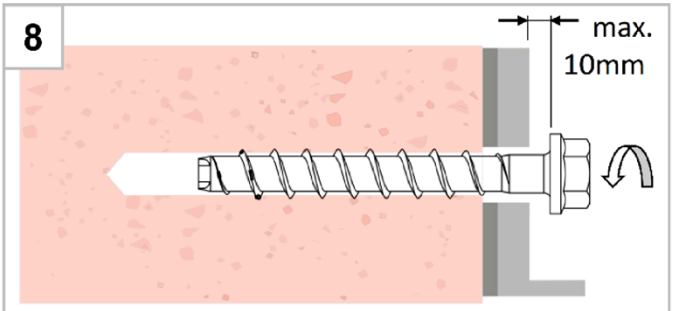
7



The head must be undamaged and in contact with the fixture.

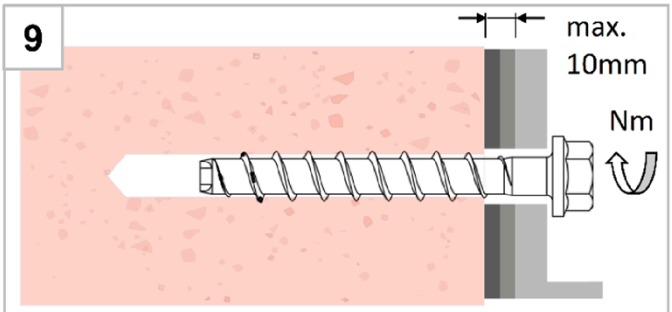
2. Adjustment

8



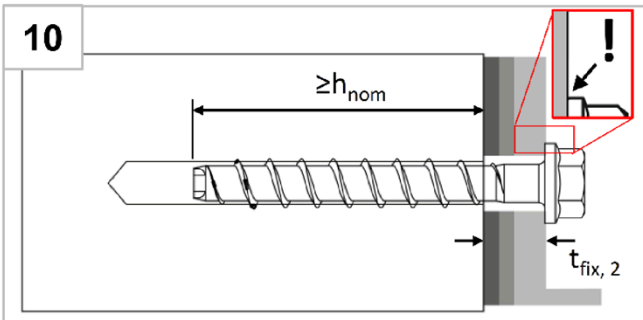
Screw may be untightened maximum 10mm.

9



After adjustment, the screw may be screwed in with a tangential impact screwdriver, cordless screwdriver or torque wrench.

10



The head must be undamaged and in contact with the fixture.

Note:

1. The screw can be adjusted maximum two times. The total allowed thickness of shims added during the adjustment process is 10mm. The final embedment depth after adjustment process must be larger or equal than h_{nom}.
2. For further details on screwing in, see brick type-related annexes C2 – C21

TOGE concrete screw TSM high performance LT	**Annex B6**
Intended use Installation instruction – adjustment	

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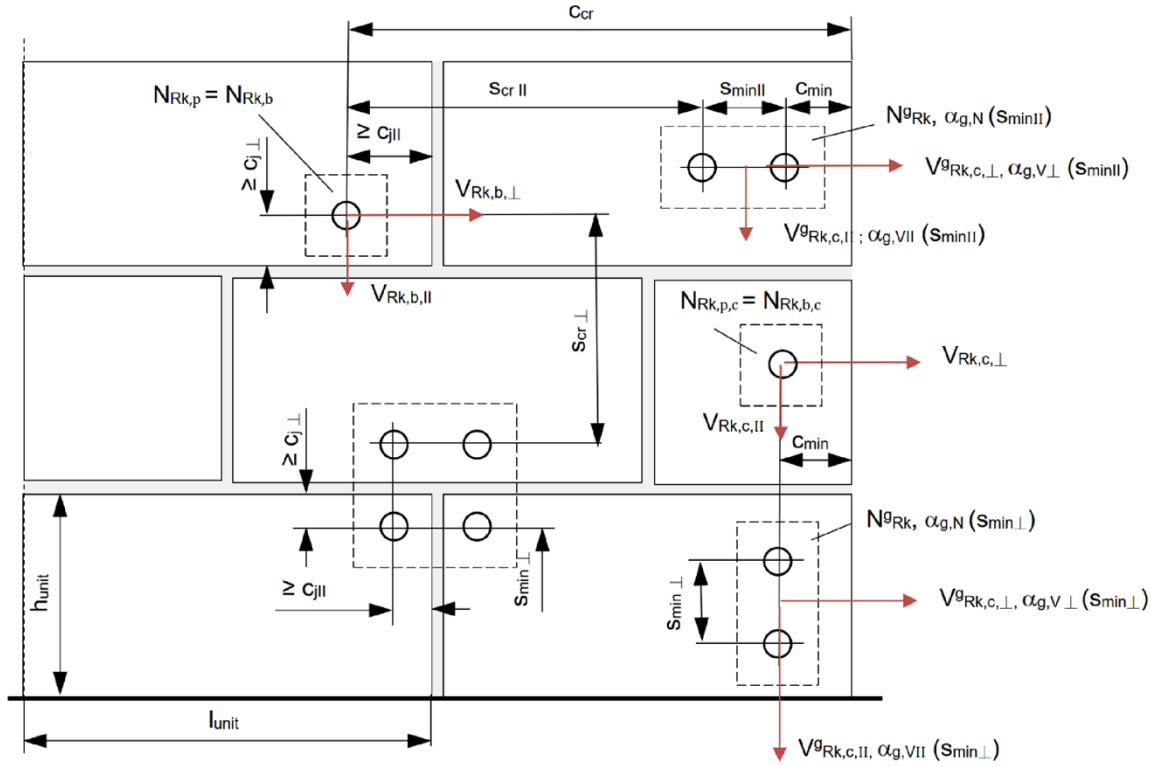
Possible installation positions, the distance c_j must be observed



c_{min} = minimum edge distance to the free edge of the wall
$c_{j\parallel}$ = distance to the vertical joints without influence on resistance of the screw anchor
$c_{j\perp}$ = distance to the horizontal joints without influence on resistance of the screw anchor
$s_{min\parallel}$ = minimum spacing parallel to horizontal joint
$s_{min\perp}$ = minimum spacing perpendicular to the horizontal joint
c_{cr} = edge distance for transmission of the characteristic resistance of single screw anchor = $1{,}5h_{nom}$
$s_{cr\parallel}$ = characteristic spacing parallel to the horizontal joint = $3{,}0h_{nom}$
$s_{cr\perp}$ = characteristic spacing perpendicular to the horizontal joint = $3{,}0h_{nom}$
l_{unit} = length of the masonry unit
h_{unit} = height of the masonry unit
$\alpha_{g,N}(s_{min\parallel})$ = group factor under tension load for minimum spacing parallel to horizontal joint
$\alpha_{g,N}(s_{min\perp})$ = group factor under tension load for minimum spacing perpendicular to the horizontal joint
$\alpha_{g,V\parallel}$ = group factor under shear load parallel to the edge ($\alpha_{g,V\parallel} = \alpha_{g,V\parallel}(s_{min\parallel}) = \alpha_{g,V\parallel}(s_{min\perp})$)
$\alpha_{g,V\perp}$ = group factor under shear load perpendicular to the edge ($\alpha_{g,V\perp} = \alpha_{g,V\perp}(s_{min\parallel}) = \alpha_{g,V\perp}(s_{min\perp})$)

$N_{Rk} = N_{Rk,b} = N_{Rk,p} = N_{Rk,b,c} = N_{Rk,p,c}$
$V_{Rk,\perp} = V_{Rk,,b\perp} = V_{Rk,c\perp}$; $V_{Rk,\perp} = V_{Rk,,b\perp} = V_{Rk,c\perp}$

Für $s \geq s_{cr}$: $\alpha_{g,N}(s_{min\parallel}) = \alpha_{g,N}(s_{min\perp}) = \alpha_{g,V\parallel} = \alpha_{g,V\perp} = 2$
Für $s_{min} \leq s \leq s_{cr}$: $\alpha_{g,N}(s_{min\parallel})$; $\alpha_{g,N}(s_{min\perp})$; $\alpha_{g,V\parallel}$; $\alpha_{g,V\perp}$ according to installation parameters of brick in Annex C
$N^g_{Rk}(s_{min\parallel}) = \alpha_{g,N}(s_{min\parallel}) \times N_{Rk}$ (group of 2 anchors with minimum spacing parallel to horizontal joint)
$N^g_{Rk}(s_{min\perp}) = \alpha_{g,N}(s_{min\perp}) \times N_{Rk}$ (group of 2 anchors with minimum spacing perpendicular to horizontal joint)
$V^g_{Rk\parallel} = \alpha_{g,V\parallel} \times V_{Rk,\parallel}$; $V^g_{Rk,\perp} = \alpha_{g,V\perp} \times V_{Rk,\perp}$ (group of 2 anchors)
$N^g_{Rk} = \alpha_{g,N}(s_{min\parallel}) \times \alpha_{g,N}(s_{min\perp}) \times N_{Rk}$ (group of 4 anchors)
$V^g_{Rk\parallel} = \alpha_{g,V\parallel}^2 \times V_{Rk,\parallel}$; $V^g_{Rk,\perp} = \alpha_{g,V\perp}^2 \times V_{Rk,\perp}$ (group of 4 anchors)

TOGE concrete screw TSM high performance LT

Intended use
Possible installation position

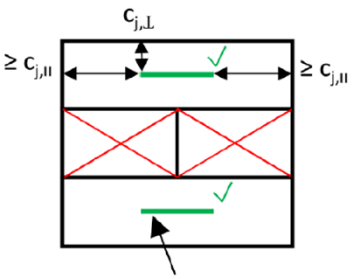
Annex B7

Deutsches Institut für Bautechnik DIBt

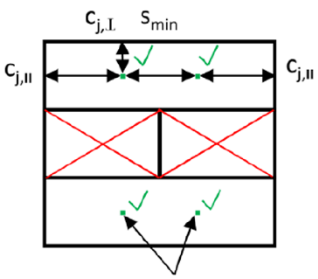
Installations parameter for installation in the reveal site

Positioning in reveal in brick types KS NF, MZ NF

Single anchor

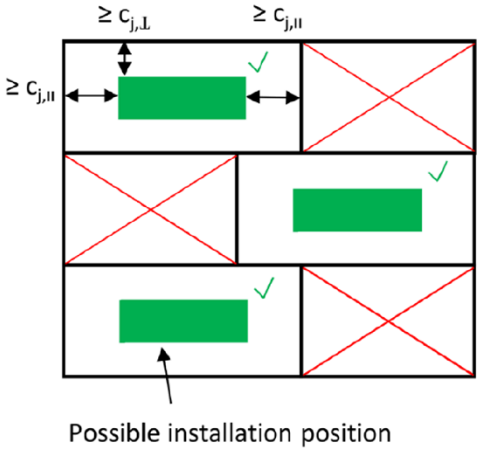


Double anchor group

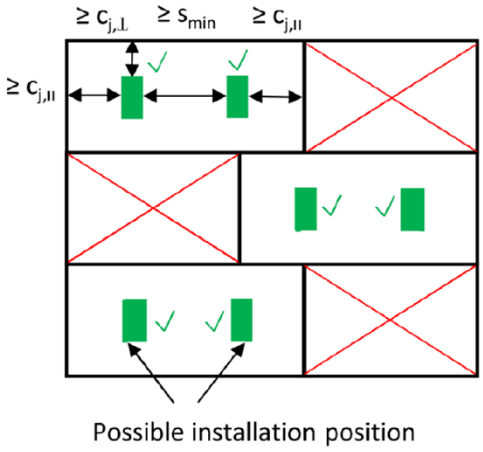


Positioning in reveal in brick type KSL 3DF

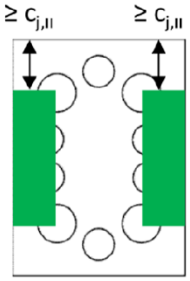
Single anchor



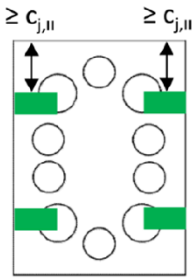
Double anchor group



Top view



Top view



TOGE concrete screw TSM high performance LT	
Intended use Possible installation in reveal	**Annex B8**

Deutsches Institut für Bautechnik DIBt

Table 5: Characteristic resistance to steel failure

TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Steel failure for tension and shear loading					
Characteristic resistance under tension loading	$N_{Rk,s}$	[kN]	14,0	27,0	45,0
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,5		
Characteristic resistance under shear loading	$V_{Rk,s}$	[kN]	7,0	13,5	34,0
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25		
Ductility factor	k_7	[-]	0,8		
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	10,9	26,0	56,0

[1)] In absence of other national regulations

TOGE concrete screw TSM high performance LT

Performance
Characteristic resistance to steel failure

Annex C1

Deutsches Institut für Bautechnik DIBt

Table 6: Material characteristics solid calcium silicate brick KS

Solid calcium silicate brick KS acc. to EN 771-2:2011+A1:2015				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Min. wall thickness h_{min} [mm]
KS 20 - 2,0 - NF	L: ≥ 240 B: ≥ 115 H: ≥ 71	$26,0 \le f_{mean} \le 38,0$	≥ 2,0	240

Table 7: Installation parameters solid calcium silicate brick KS

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Nominal drill hole diameter	d_0	[mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \le$	[mm]	6,40	8,45	10,45
Drill hole depth	$h_0 \ge$	[mm]	55	65	85
Clearance hole diameter	$d_f \le$	[mm]	8	12	14
Torque for manual installation	max. T_{inst}	[Nm]	11	24	41
Impact screw driver	$T_{imp,max}$	[Nm]	Max. torque according to the manufacturer's instructions		
			185	300	

Table 8: Min. edge distance, spacing, group factors

TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Min. edge distance	c_{min}	[mm]	80		
Min. spacing	$s_{min,II} = s_{min,\perp}$	[mm]	80		
Group factors	$\alpha_{g,N}$ ($s_{min\perp}$)	[-]	1,50	1,15	1,65
	$\alpha_{g,N}$ ($s_{min II}$)	[-]	1,80	1,15	1,20
	$\alpha_{g,V,II}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	1,55	1,55	1,05
	$\alpha_{g,V,\perp}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	1,50	1,75	1,75

TOGE concrete screw TSM high performance LT

Performance
Solid calcium silicate brick KS – material characteristics, installation parameters, min. edge distance and spacing, group

Annex C2

Deutsches Institut für Bautechnik DIBt

Table 9: Reduction factors depending on the distance to joints

TSM LT screw size			6	8	10
Distance to joints	$c_{j\perp}$	[mm]	≥35		
	$c_{j\parallel}$		≥80		
Reduction factor	$\alpha_{j,N}$	[-]	1 (full resistance)		
	$\alpha_{j,V\parallel} = \alpha_{j,V\perp}$				
Distance to joints	$c_{j\perp}$	[mm]	<35		
	$c_{j\parallel}$		<80		
Reduction factor	$\alpha_{j,N}$	[-]	Screw must not be used		

TOGE concrete screw TSM high performance LT

Performance
Solid calcium silicate brick KS – installation parameters close to the joints

Annex C3

Deutsches Institut für Bautechnik DIBt

Tabelle 10: Characteristic resistance to pull-out failure or brick breakout failure of a single screw anchor under tension loading and to local brick failure and brick edge failure of a single screw anchor under shear loading

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth	h_{nom}		h_{nom1}	h_{nom1}	h_{nom1}
	[mm]		45	55	75
Compressive strength f_{mean}	[N/mm²]		≥ 26,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	2,5	4,1	4,5
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	5,3		7,7
	$V_{Rk,\perp}$	[kN]	2,8	2,1	
Compressive strength f_{mean}	[N/mm²]		≥ 30,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	2,7	4,4	4,8
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	5,7		8,3
	$V_{Rk,\perp}$	[kN]	3,0	2,3	
Compressive strength f_{mean}	[N/mm²]		≥ 35,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	3,0	4,8	5,2
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	6,1		8,9
	$V_{Rk,\perp}$	[kN]	3,2	2,5	
Compressive strength f_{mean}	[N/mm²]		≥ 38,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	3,1	5,0	5,4
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	6,4		9,3
	$V_{Rk,\perp}$	[kN]	3,4	2,6	

TOGE concrete screw TSM high performance LT

Performance
Solid calcium silicate brick KS – characteristic resistances

Annex C4

Table 11: Displacements

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Tension load	F_N	[kN]	0,6	1,1	1,1
Displacement in tension direction	δ_{N0}	[mm]	0,01		
	$\delta_{N\infty}$	[mm]	0,02		
Shear load parallel to the edge	$F_{V,II}$	[kN]	1,5		2,2
Displacement in shear direction parallel to the edge	$\delta_{V0,II}$	[mm]	0,76		0,37
	$\delta_{V\infty,II}$	[mm]	1,14		0,57
Shear load perpendicular to the edge	$F_{V,\perp}$	[kN]	0,8	0,6	
Displacement in shear direction perpendicular to the edge	$\delta_{V0,\perp}$	[mm]	0,57	0,31	0,01
	$\delta_{V\infty,\perp}$	[mm]	0,85	0,47	0,02

Table 12: Performance under fire exposure for anchor groups- resistance to fire

TSM LT screw size				6	8	10
Nominal embedment depth		h_{nom}	[mm]	45	55	75
Characteristic resistance to local brick failure of groups under fire exposure						
$N^g_{Rk,fi}$ = factor x N^g_{Rk}	[kN]	R30-R90		$0,12 \cdot N^g_{Rk}$	$0,14 \cdot N^g_{Rk}$	$0,24 \cdot N^g_{Rk}$
		R120		$0,10 \cdot N^g_{Rk}$	$0,11 \cdot N^g_{Rk}$	$0,19 \cdot N^g_{Rk}$
Min. edge distance and spacing	[mm]	$c_{min,fi} = c_{j,fi}$		$2 \times h_{nom}$ [1)]		
		$s_{min,fi}$		$4 \times h_{nom}$		

[1)] At least the distances set out in Table 13 shall be observed

TOGE concrete screw TSM high performance LT	**Annex C5**
Performance Solid calcium silicate brick KS – displacements and performance under fire exposure for anchor groups	

Deutsches Institut für Bautechnik DIBt

Table 13: Fire exposure – resistance to fire

TSM LT screw size				6	8	10
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
			[mm]	45	55	75
Steel failure for tension and shear load						
Characteristic resistance	R30	$N_{Rk,s,fi30}$	[kN]	1,30		3,40
	R60	$N_{Rk,s,fi60}$	[kN]	1,00		2,70
	R90	$N_{Rk,s,fi90}$	[kN]	0,60		2,00
	R120	$N_{Rk,s,fi120}$	[kN]	0,50		1,70
	R30	$V_{Rk,s,fi30}$	[kN]	1,30		3,40
	R60	$V_{Rk,s,fi60}$	[kN]	1,00		2,70
	R90	$V_{Rk,s,fi90}$	[kN]	0,60		2,00
	R120	$V_{Rk,s,fi120}$	[kN]	0,50		1,70
	R30	$M^0_{Rk,s,fi30}$	[Nm]	1,10	1,50	4,90
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,80	1,10	4,00
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,50	0,80	3,00
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,40	0,60	2,50
Pull-out failure						
Characteristic resistance	R30	$N_{Rk,p,fi30}$	[kN]	1,30		3,40
	R60	$N_{Rk,p,fi60}$	[kN]	1,00		2,70
	R90	$N_{Rk,p,fi90}$	[kN]	0,60		2,00
	R120	$N_{Rk,p,fi120}$	[kN]	0,50		1,70
Breakout failure						
Characteristic resistance	R30	$N_{Rk,b,fi30}$	[kN]	1,30		3,40
	R60	$N_{Rk,b,fi60}$	[kN]	1,00		2,70
	R90	$N_{Rk,b,fi90}$	[kN]	0,60		2,00
	R120	$N_{Rk,b,fi120}$	[kN]	0,50		1,70
Edge and joint distance						
R30 - R120		$c_{min,fi} = c_{j,fi,II}$	[mm]	120		
		$c_{j,fi,\perp}$	[mm]	35		
Spacing						
R30 - R120		$s_{min,fi}$	[mm]	$4 \times h_{nom}$		

TOGE concrete screw TSM high performance LT

Performance
Solid calcium silicate brick KS – resistance to fire

Annex C6

Deutsches Institut für Bautechnik DIBt

Table 14: Material characteristics Silka XL solid calcium silicate brick KS 12DF

Silka XL solid calcium silicate brick KS 12DF acc. to EN 771-2:2011+A1:2015				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Min. wall thickness h_{min} [mm]
KS - R (P) 20 - 2,0 - 12DF	L: ≥ 498 B: ≥ 175 H: ≥ 248	$14,0 \leq f_{mean} \leq 38,0$	≥ 1,8	175

Table 15: Installation parameters Silka XL solid calcium silicate brick KS 12DF

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Nominal drill hole diameter	d_0	[mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	8,45	10,45
Drill hole depth	$h_0 \geq$	[mm]	55	65	85
Clearance hole diameter	$d_f \leq$	[mm]	8	12	14
Torque for manual installation	max. T_{inst}	[Nm]	11	25	41
Torque for rotary screwdriver installation	$T_{imp,max}$	[Nm]	10	No performance assessed	
Impact screw driver	$T_{imp,max}$	[Nm]	Max. torque according to the manufacturer's instructions		
			185	300	

TOGE concrete screw TSM high performance LT	**Annex C7**
Performance Silka XL solid calcium silicate brick KS 12DF – material characteristics, installation parameters	

Table 16: Min edge distance, spacing, group factors

TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Min. edge distance	c_{min}	[mm]	80		
Min. spacing	$s_{min,II} = s_{min,\perp}$	[mm]	80		
Group factors	$\alpha_{g,N}$ ($s_{min\perp}$)	[-]	1,65	1,55	1,60
	$\alpha_{g,N}$ ($s_{min II}$)	[-]	1,30	1,80	1,40
	$\alpha_{g,V,II}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	2,00		1,90
	$\alpha_{g,V,\perp}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	2,00		1,40

Table 17: Reduction factors depending on the distance to joints

TSM LT screw size			6	8	10
Distance to joints	$c_{j\perp}$	[mm]	≥40		
	$c_{j II}$		≥80		
Reduction factor	$\alpha_{j,N}$	[-]	1 (full resistance)		
	$\alpha_{j,VII} = \alpha_{j,V\perp}$				
Distance to joints	$c_{j\perp}$	[mm]	<40		
	$c_{j II}$		<80		
Reduction factor	$\alpha_{j,N}$	[-]	Screw must not be used		

TOGE concrete screw TSM high performance LT

Performance
Silka XL solid calcium silicate brick KS 12DF – min. edge distance and spacing, group factors group factors and installation parameters close to the joints

Annex C8

Deutsches Institut für Bautechnik DIBt

Table 18: Characteristic resistance to pull-out failure or brick breakout failure of a single screw anchor under tension loading and to local brick failure and brick edge failure of a single screw anchor under shear loading

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Compressive strength f_{mean}	[N/mm²]		≥ 14,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	2,3	7,1	6,4
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	3,2		12,8
	$V_{Rk,\perp}$	[kN]	3,6		5,9
Compressive strength f_{mean}	[N/mm²]		≥ 15,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	2,4	7,4	6,9
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	3,3		13,3
	$V_{Rk,\perp}$	[kN]	3,7		6,1
Compressive strength f_{mean}	[N/mm²]		≥ 20,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	2,8	8,5	8,0
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	3,8		15,3
	$V_{Rk,\perp}$	[kN]	4,3		7,0

TOGE concrete screw TSM high performance LT

Performance
Silka XL solid calcium silicate brick KS 12DF – characteristic resistances

Annex C9

Table 19: Displacements

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Tension load	F_N	[kN]	0,7	2,2	1,8
Displacement in tension direction	δ_{N0}	[mm]	0,01	0,02	0,01
	$\delta_{N\infty}$	[mm]	0,02	0,04	0,02
Shear load parallel to the edge	$F_{V,II}$	[kN]	0,9		3,7
Displacement in shear direction parallel to the edge	$\delta_{V0,II}$	[mm]	0,37		1,70
	$\delta_{V\infty,II}$	[mm]	0,55		2,55
Shear load perpendicular to the edge	$F_{V,\perp}$	[kN]	1,0		1,7
Displacement in shear direction perpendicular to the edge	$\delta_{V0,\perp}$	[mm]	0,40		1,50
	$\delta_{V\infty,\perp}$	[mm]	0,60		2,25

Table 20: Performance under fire exposure for anchor groups - resistance to fire

TSM LT screw size				6
Nominal embedment depth		h_{nom}	[mm]	45
Characteristic resistance to local brick failure of groups under fire exposure				
$N^g_{Rk,fi}$ = factor x N^g_{Rk}	[kN]	R30-R90		$0,12 \cdot N^g_{Rk}$
		R120		$0,10 \cdot N^g_{Rk}$
Min. edge distance and spacing	[mm]	$c_{min,fi} = c_{j,fi}$		$2 \times h_{nom}$ [1)]
		$s_{min,fi}$		$4 \times h_{nom}$

[1)] At least the distances set out in Table 21 shall be observed

TOGE concrete screw TSM high performance LT	**Annex C10**
Performance Silka XL solid calcium silicate brick KS 12DF – displacements and performance under fire exposure for anchor groups	

Deutsches Institut für Bautechnik DIBt

Table 21: Fire exposure – resistance to fire

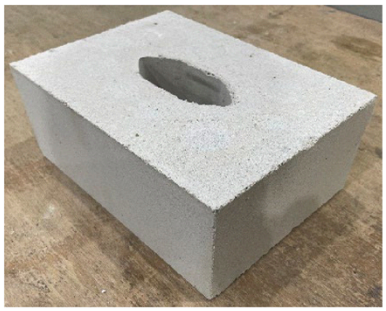
TSM LT screw size				6
Nominal embedment depth		h_{nom}		h_{nom1}
			[mm]	45
Steel failure for tension and shear load				
Characteristic resistance	R30	$N_{Rk,s,fi30}$	[kN]	1,50
	R60	$N_{Rk,s,fi60}$	[kN]	1,10
	R90	$N_{Rk,s,fi90}$	[kN]	0,60
	R120	$N_{Rk,s,fi120}$	[kN]	0,40
	R30	$V_{Rk,s,fi30}$	[kN]	1,50
	R60	$V_{Rk,s,fi60}$	[kN]	1,10
	R90	$V_{Rk,s,fi90}$	[kN]	0,60
	R120	$V_{Rk,s,fi120}$	[kN]	0,40
	R30	$M^0_{Rk,s,fi30}$	[Nm]	1,20
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,90
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,50
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,30
Pull-out failure				
Characteristic resistance	R30	$N_{Rk,p,fi30}$	[kN]	0,40
	R60	$N_{Rk,p,fi60}$	[kN]	0,40
	R90	$N_{Rk,p,fi90}$	[kN]	0,40
	R120	$N_{Rk,p,fi120}$	[kN]	0,32
Breakout failure				
Characteristic resistance	R30	$N_{Rk,b,fi30}$	[kN]	0,28
	R60	$N_{Rk,b,fi60}$	[kN]	0,28
	R90	$N_{Rk,b,fi90}$	[kN]	0,28
	R120	$N_{Rk,b,fi120}$	[kN]	0,23
Edge and joint distance				
R30 - R120		$c_{min,fi} = c_{j,fi,II}$	[mm]	120
		$c_{j,fi,\perp}$	[mm]	35
Spacing				
R30 - R120		$s_{min,fi}$	[mm]	4 x h_{nom}

TOGE concrete screw TSM high performance LT

Performance
Perforated calcium silicate brick KSL 3DF - resistance to fire

Annex C11

Table 22: Material characteristics perforated calcium silicate brick KSL 3DF



Perforated calcium silicate brick KSL 3DF acc. to EN 771-2:2011+A1:2015				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Min. wall thickness h_{min} [mm]
SWKV KSL 12 - 1,6 - 3DF	L: ≥ 240 B: ≥ 175 H: ≥ 113	$17,0 \leq f_{mean} \leq 29,0$	≥ 1,5	175

Table 23: Installation parameters perforated calcium silicate brick KSL 3DF

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Nominal drill hole diameter	d_0	[mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	8,45	10,45
Drill hole depth	$h_0 \geq$	[mm]	55	65	85
Clearance hole diameter	$d_f \leq$	[mm]	8	12	14
Torque for manual installation	max. T_{inst}	[Nm]	2	5	7
Torque for rotary screwdriver installation	$T_{imp,max}$	[Nm]	8	9	
Impact screw driver	$T_{imp,max}$	[Nm]	Max. torque according to the manufacturer's instructions		
			no performance assessed	200	

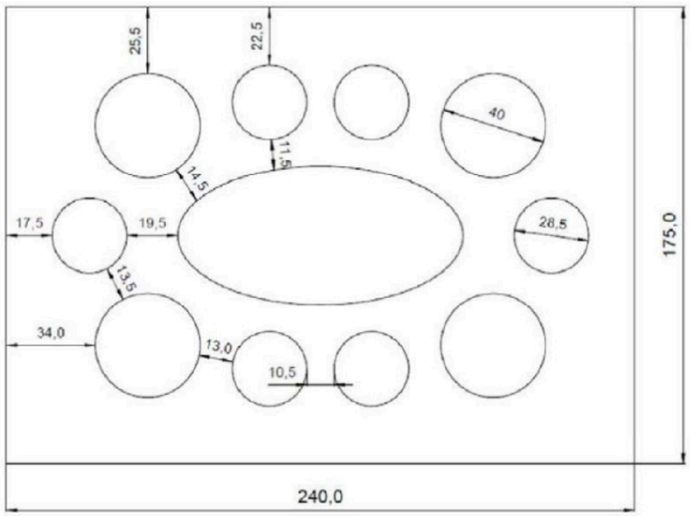
TOGE concrete screw TSM high performance LT	**Annex C12**
Performance Perforated calcium silicate brick KSL 3DF- material characteristics, installation parameters	

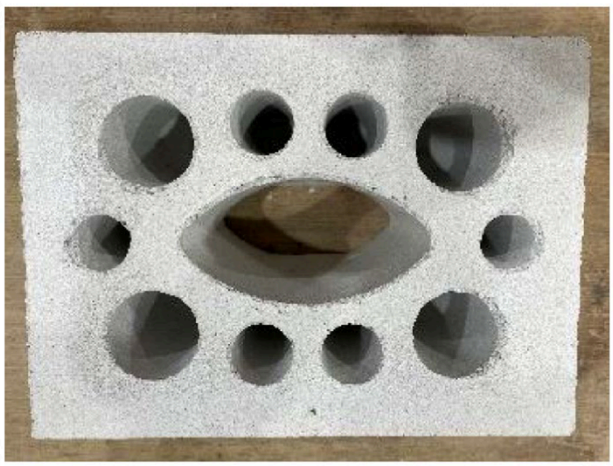
Table 24: Min. edge distance, spacing, group factors

TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Min. edge distance	c_{min}	[mm]	80		
Min. spacing	$s_{min,II} = s_{min,\perp}$	[mm]	80		
Group factors	$\alpha_{g,N}$ ($s_{min\perp}$)	[-]	2,00	1,55	1,95
	$\alpha_{g,N}$ ($s_{min II}$)	[-]	2,00	1,55	1,45
	$\alpha_{g,V,II}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	2,00		
	$\alpha_{g,V,\perp}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	1,80		1,30

Table 25: Reduction factors depending on the distance to joints

TSM LT screw size			6	8	10
Distance to joints	$c_{j\perp}$	[mm]	≥35		
	$c_{j II}$		≥58		
Reduction factor	$\alpha_{j,N}$	[-]	1 (full resistance)		
	$\alpha_{j,VII} = \alpha_{j,V\perp}$				
Distance to joints	$c_{j\perp}$	[mm]	<35		
	$c_{j II}$		<58		
Reduction factor	$\alpha_{j,N}$	[-]	Screw must not be used		





TOGE concrete screw TSM high performance LT	**Annex C13**
Performance Perforated calcium silicate brick KSL 3DF – min. edge distance and spacing, group factors and installation parameters close to the	

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Table 26: Characteristic resistance to pull-out failure or brick breakout failure of a single screw anchor under tension loading and to local brick failure and brick edge failure of a single screw anchor under shear loading

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Compressive strength f_{mean}	[N/mm²]		≥ 17,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	0,9	1,6	2,2
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	3,4		
	$V_{Rk,\perp}$	[kN]	1,6		2,2
Compressive strength f_{mean}	[N/mm²]		≥ 20,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	0,9	1,8	2,5
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	3,8		
	$V_{Rk,\perp}$	[kN]	1,8		2,5
Compressive strength f_{mean}	[N/mm²]		≥ 25,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	1,1	2,2	2,9
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	4,5		4,6
	$V_{Rk,\perp}$	[kN]	2,1		2,9
Interaction	X	[-]	1,0		

TOGE concrete screw TSM high performance LT	**Annex C14**
Performance Perforated calcium silicate brick KSL 3DF – characteristic resistances	

Table 27: Displacements

Use category (Installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Tension load	F_N	[kN]	0,3	0,5	0,6
Displacement in tension direction	δ_{N0}	[mm]	0,01		
	$\delta_{N\infty}$	[mm]	0,02		
Shear load parallel to the edge	$F_{V,II}$	[kN]	1,0		
Displacement in shear direction parallel to the edge	$\delta_{V0,II}$	[mm]	0,68		0,29
	$\delta_{V\infty,II}$	[mm]	1,02		0,43
Shear load perpendicular to the edge	$F_{V,\perp}$	[kN]	0,5		0,6
Displacement in shear direction perpendicular to the edge	$\delta_{V0,\perp}$	[mm]	0,01		
	$\delta_{V\infty,\perp}$	[mm]	0,01		

Table 28: Performance under fire exposure for anchor groups - resistance to fire

TSM LT screw size				6
Nominelle Einschraubtiefe		h_{nom}	[mm]	45
Characteristic resistance to local brick failure of groups under fire exposure				
$N^g_{Rk,fi}$ = factor x N^g_{Rk}	[kN]	R30-R90		$0,12 \cdot N^g_{Rk}$
		R120		$0,10 \cdot N^g_{Rk}$
Min. edge distance and spacing	[mm]	$c_{min,fi} = c_{j,fi}$		$2 \times h_{nom}$ [1)]
		$s_{min,fi}$		$4 \times h_{nom}$

[1)] At least the distances set out in Table 29 shall be observed

TOGE concrete screw TSM high performance LT	**Annex C15**
Performance Perforated calcium silicate brick KSL 3DF – displacements and performance under fire exposure for anchor groups	

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Table 29: Fire exposure – resistance to fire

TSM LT screw size				6
Nominal embedment depth		h_{nom}		h_{nom1}
			[mm]	45
Steel failure for tension and shear load				
Characteristic resistance	R30	$N_{Rk,s,fi30}$	[kN]	1,0
	R60	$N_{Rk,s,fi60}$	[kN]	0,8
	R90	$N_{Rk,s,fi90}$	[kN]	0,5
	R120	$N_{Rk,s,fi120}$	[kN]	0,4
	R30	$V_{Rk,s,fi30}$	[kN]	1,0
	R60	$V_{Rk,s,fi60}$	[kN]	0,8
	R90	$V_{Rk,s,fi90}$	[kN]	0,5
	R120	$V_{Rk,s,fi120}$	[kN]	0,4
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,8
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,6
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,4
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,3
Pull-out failure				
Characteristic resistance	R30	$N_{Rk,p,fi30}$	[kN]	0,60
	R60	$N_{Rk,p,fi60}$	[kN]	0,40
	R90	$N_{Rk,p,fi90}$	[kN]	0,30
	R120	$N_{Rk,p,fi120}$	[kN]	0,20
Breakout failure				
Characteristic resistance	R30	$N_{Rk,b,fi30}$	[kN]	0,60
	R60	$N_{Rk,b,fi60}$	[kN]	0,40
	R90	$N_{Rk,b,fi90}$	[kN]	0,30
	R120	$N_{Rk,b,fi120}$	[kN]	0,20
Edge and joint distance				
R30 - R120		$c_{min,fi} = c_{j,fi,II}$	[mm]	101
		$c_{j,fi,\perp}$	[mm]	56
Spacing				
R30 - R120		$s_{min,fi}$	[mm]	4 x h_{nom}

TOGE concrete screw TSM high performance LT

Performance
Perforated calcium silicate brick KSL 3DF – resistance to fire

Annex C16

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Table 30: Material characteristic solid clay brick MZ

Solid clay brick MZ acc. to EN 771-1:2011+A1:2015				
Nomenclature	Dimensions [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Min. wall thickness h_{min} [mm]
MZ 20 - 2,0 - NF	L: ≥ 240 B: ≥ 115 H: ≥ 71	$21,0 \leq f_{mean} \leq 31,0$	≥ 2,1	240

Table 31: Installation parameters solid clay brick MZ

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Nominal drill hole diameter	d_0	[mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	8,45	10,45
Drill hole depth	$h_0 \geq$	[mm]	55	65	85
Clearance hole diameter	$d_f \leq$	[mm]	8	12	14
Torque for manual installation	max. T_{inst}	[Nm]	0,3	12	26
Torque for rotary screwdriver installation	$T_{imp,max}$	[Nm]	6	10	No performance assessed
Impact screw driver	$T_{imp,max}$	[Nm]	Max. torque according to the manufacturer's instructions		
			no performance assessed		155

TOGE concrete screw TSM high performance LT

Performance
Solid clay brick MZ – material characteristic, installation parameters

Annex C17

Table 32: Min. edge distance, spacing, group factors

TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Min. edge distance	c_{min}	[mm]	80		
Min. spacing	$s_{min,II} = s_{min,\perp}$	[mm]	80		
Group factors	$\alpha_{g,N}$ ($s_{min\perp}$)	[-]	1,60	1,00	1,70
	$\alpha_{g,N}$ ($s_{min II}$)	[-]	1,75	1,15	1,45
	$\alpha_{g,V,II}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	1,45		2,00
	$\alpha_{g,V,\perp}$ ($s_{min\perp}$)/($s_{min II}$)	[-]	1,70		1,50

Table 33: Reduction factors depending on the distance to joints

TSM LT screw size			6	8	10
Distance to joints	$c_{j\perp}$	[mm]	≥35		
	$c_{j II}$		≥80		
Reduction factor	$\alpha_{j,N}$	[-]	1 (full resistance)		
	$\alpha_{j,VII} = \alpha_{j,V\perp}$				
Distance to joints	$c_{j\perp}$	[mm]	<35		
	$c_{j II}$		<80		
Reduction factor	$\alpha_{j,N}$	[-]	Screw must not be used		

TOGE concrete screw TSM high performance LT

Performance
Solid clay brick MZ – min. edge distance, spacing, group factors and installation parameters close to the joints

Annex C18

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Table 34: Characteristic resistance to pull-out failure or brick breakout failure of a single screw anchor under tension loading and to local brick failure and brick edge failure of a single screw anchor under shear loading

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Compressive strength f_{mean}	[N/mm²]		≥ 21,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	1,4	2,2	2,8
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	2,5		2,6
	$V_{Rk,\perp}$	[kN]	1,9		2,1
Compressive strength f_{mean}	[N/mm²]		≥ 25,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	1,6	2,4	3,1
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	2,7		2,8
	$V_{Rk,\perp}$	[kN]	2,0		2,3
Compressive strength f_{mean}	[N/mm²]		≥ 30,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	1,7	2,7	3,4
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	2,9		3,1
	$V_{Rk,\perp}$	[kN]	2,2		2,5
Compressive strength f_{mean}	[N/mm²]		≥ 31,0		
Characteristic resistance to tension load	N_{Rk}	[kN]	1,8	2,7	3,4
Characteristic resistance to shear load	$V_{Rk,II}$	[kN]	3,0		3,2
	$V_{Rk,\perp}$	[kN]	2,3		2,6

TOGE concrete screw TSM high performance LT

Performance
Solid clay brick MZ – characteristic resistances

Annex C19

Table 35: Displacements

Use category (installation)			dry or wet		
TSM LT screw size			6	8	10
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
		[mm]	45	55	75
Tension load	F_N	[kN]	0,4	0,6	0,8
Displacement in tension direction	δ_{N0}	[mm]	0,01		
	$\delta_{N\infty}$	[mm]	0,02		
Shear load parallel to the edge	$F_{V,II}$	[kN]	0,7		0,7
Displacement in shear direction parallel to the edge	$\delta_{V0,II}$	[mm]	0,14		0,13
	$\delta_{V\infty,II}$	[mm]	0,22		0,20
Shear load perpendicular to the edge	$F_{V,\perp}$	[kN]	0,5		0,6
Displacement in shear direction perpendicular to the edge	$\delta_{V0,\perp}$	[mm]	0,34		0,33
	$\delta_{V\infty,\perp}$	[mm]	0,5		0,5

Table 36: Performance under fire exposure for anchor groups - resistance to fire

TSM LT screw size				6	8	10
Nominal embedment depth		h_{nom}	[mm]	45	55	75
Characteristic resistance local brick failure of groups under fire exposure						
$N^g_{Rk,fi}$ = factor x N^g_{Rk}	[kN]	R30-R90		$0,12 \cdot N^g_{Rk}$	$0,14 \cdot N^g_{Rk}$	$0,24 \cdot N^g_{Rk}$
		R120		$0,10 \cdot N^g_{Rk}$	$0,11 \cdot N^g_{Rk}$	$0,19 \cdot N^g_{Rk}$
Min. edge distance and spacing	[mm]	$c_{min,fi} = c_{j,fi}$		$2 \times h_{nom}$ [1)]		
		$s_{min,fi}$		$4 \times h_{nom}$		

[1)] At least the distances set out in Table 37 shall be observed

TOGE concrete screw TSM high performance LT	**Annex C20**
Performance Solid clay brick MZ – displacements and performance under fire exposure for anchor groups	

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Table 37: Fire exposure – resistance to fire

TSM LT screw size				6	8	10
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom1}	h_{nom1}
			[mm]	45	55	75
Steel failure for tension and shear load						
Characteristic resistance	R30	$N_{Rk,s,fi30}$	[kN]	1,30		1,70
	R60	$N_{Rk,s,fi60}$	[kN]	1,00		1,60
	R90	$N_{Rk,s,fi90}$	[kN]	0,60		1,60
	R120	$N_{Rk,s,fi120}$	[kN]	0,50		1,50
	R30	$V_{Rk,s,fi30}$	[kN]	1,30		1,70
	R60	$V_{Rk,s,fi60}$	[kN]	1,00		1,60
	R90	$V_{Rk,s,fi90}$	[kN]	0,60		1,60
	R120	$V_{Rk,s,fi120}$	[kN]	0,50		1,50
	R30	$M^0_{Rk,s,fi30}$	[Nm]	1,10	1,50	2,50
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,80	1,10	2,40
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,50	0,80	2,30
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,40	0,60	2,20
Pull-out failure						
Characteristic resistance	R30	$N_{Rk,p,fi30}$	[kN]	1,30		1,70
	R60	$N_{Rk,p,fi60}$	[kN]	1,00		1,60
	R90	$N_{Rk,p,fi90}$	[kN]	0,60		1,60
	R120	$N_{Rk,p,fi120}$	[kN]	0,50		1,50
Breakout failure						
Characteristic resistance	R30	$N_{Rk,b,fi30}$	[kN]	1,30		1,70
	R60	$N_{Rk,b,fi60}$	[kN]	1,00		1,60
	R90	$N_{Rk,b,fi90}$	[kN]	0,60		1,60
	R120	$N_{Rk,b,fi120}$	[kN]	0,50		1,50
Edge and joint distance						
R30 - R120		$c_{min,fi} = c_{j,fi,II}$	[mm]	120		
		$c_{j,fi,\perp}$	[mm]	35		
Spacing						
R30 - R120		$s_{min,fi}$	[mm]	$4 \times h_{nom}$		

TOGE concrete screw TSM high performance LT

Performance
Solid clay brick MZ – resistance to fire

Annex C21