

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-22/0801
of 19 December 2022

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

TURBO SMART TSM L

Product family
to which the construction product belongs

Fasteners for use in concrete for redundant non-structural
systems

Manufacturer

pgb - Polska Sp. z o.o.
ul. Fryderyka Wilhelma Redena 3
41-807 ZABRZE
POLEN

Manufacturing plant

Manufacturing plant 3

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

EAD 330747-00-0601, Edition 06/2018

European Technical Assessment

ETA-22/0801

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Specific Part**1 Technical description of the product**

The concrete screw TURBO SMART TSM L in size of 6 mm is an anchor made of galvanized steel respectively steel with zinc flake coating, made of stainless or high corrosion resistant 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 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 C2

3.2 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex C1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C1
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 19 December 2022 by Deutsches Institut für Bautechnik

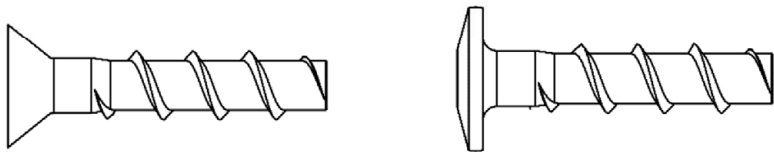
Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Tempel

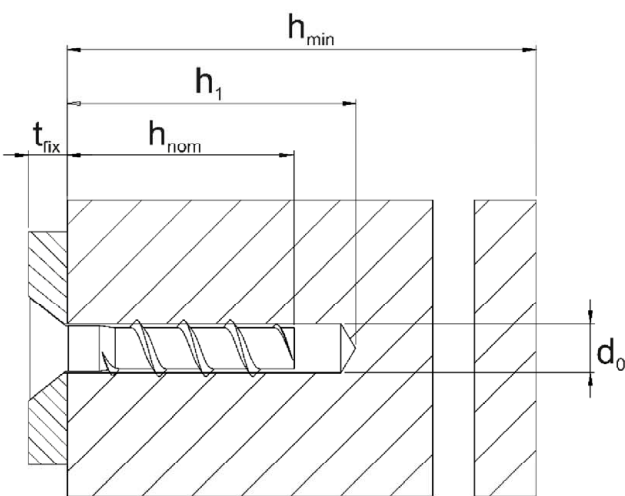
Product in installed condition

TURBO SMART concrete screw TSM L

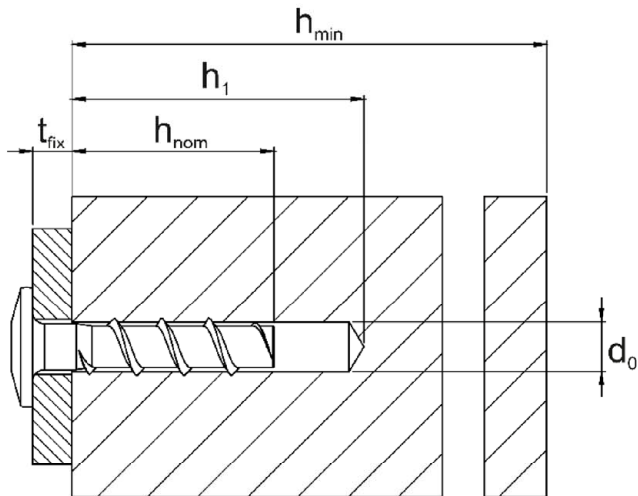
- Galvanized carbon steel
- Zinc flakes coated carbon steel
- Stainless steel A4
- High corrosion resistant steel HCR



e.g. TURBO SMART concrete screw TSM L, configuration with countersunk head and T-drive



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

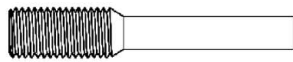


h_{min} = minimum thickness of member
 h_{nom} = nominal embedment depth

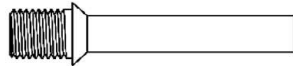
TURBO SMART concrete screw TSM L

Product description
Product in installed condition

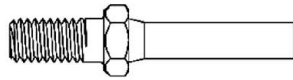
Annex A1



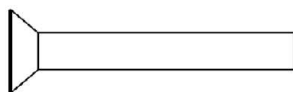
Configuration with metric connection thread and T-drive e.g. TSM L 6x30 M10 SW5



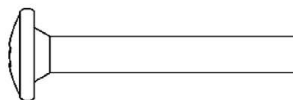
Configuration with countersunk head and metric connection thread e.g. TSM L 6x30 AG M8



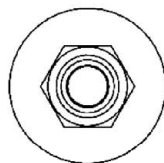
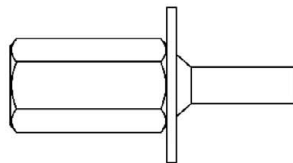
Configuration with hexagon drive and metric connection thread e.g. TSM L 6x30 M8 SW10



Configuration with countersunk head and T-drive e.g. TSM L 6x30 C VZ 40



Configuration with pan head and T-drive e.g. TSM L 6x30 P VZ 40



Configuration with internal thread and hexagon drive e.g. TSM L 6x30 IM M8/10

Table 1: Material

Part	Product name	Material
all types	TSM L	- Steel EN 10263-4:2017 galvanized acc. to EN ISO 4042:2018 - Zinc flake coating according to EN ISO 10683:2018 ($\geq 5\mu\text{m}$)
	TSM L A4	1.4401; 1.4404; 1.4571; 1.4578
	TSM L 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 L	400	600	≤ 8
	TSM L A4			
	TSM L HCR			

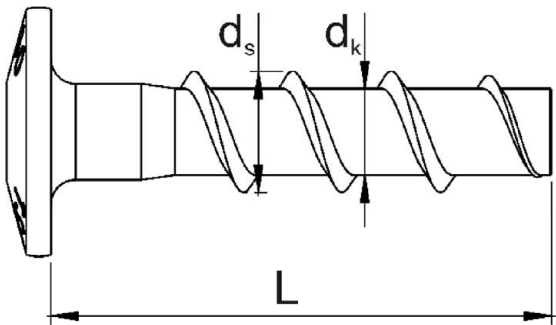
TURBO SMART concrete screw TSM L

Product description
Screw types and material

Annex A2

Table 2: Dimensions

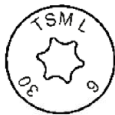
Anchor size			6
Screw length	$L \geq$	[mm]	26
Thread outer diameter	d_s	[mm]	7,0
Core diameter	d_k	[mm]	5,4



Marking:

TSM L

Screw type: TSM L
Screw size: 6
Screw length: 30



TSM L A4

Screw type: TSM L
Screw size: 6
Screw length: 30
Material: A4



TSM L HCR

Screw type: TSM L
Screw size: 6
Screw length: 30
Material: HCR



TURBO SMART concrete screw TSM L

Product description
Dimensions and markings

Annex A3

Specification of Intended use

Anchorage subject to:

- Static and quasi-static loads.
- Used only for anchorages with requirements related to resistance of fire.
- Used only for redundant non-structural systems according to EN 1992-4:2018.

Base materials:

- Compacted reinforced and compacted 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):

- Structures subject to dry, internal conditions: all screw types with h_{nom1} and h_{nom2}
- 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 and only nominal embedment depth h_{nom2} : CRC III
 - High corrosion resistant steel according to Annex A3,
screw with marking HCR and only nominal embedment depth h_{nom2} : CRC V

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 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 d_f of clearance hole in the fixture in Annex B2, Table 3.

Installation:

- Only hammer 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.

TURBO SMART concrete screw TSM L

Intended use
Specification

Annex B1

Table 3: Installation parameters

TURBO SMART concrete screw TSM L			6	
Nominal embedment depth	h_{nom}	[mm]	$h_{nom1}^{1)}$	h_{nom2}
			25	35
Nominal drill hole diameter	d_0	[mm]	6,0	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,35	
Drill hole depth	$h_1 \geq$	[mm]	28	38
Clearance hole diameter	$d_f \leq$	[mm]	8	
Installation torque (version with connection thread)	T_{inst}	[Nm]	10	

¹⁾ only subject to dry internal conditions

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

TURBO SMART concrete screw TSM L			6	
Nominal embedment depth	h_{nom}	[mm]	$h_{nom1}^{1)}$	h_{nom2}
			25	35
Minimum thickness of member	h_{min}	[mm]	80	
Minimum edge distance	c_{min}	[mm]	30	
Minimum spacing	s_{min}	[mm]	30	

¹⁾ only subject to dry internal conditions

TURBO SMART concrete screw TSM L

Intended use

Installation parameters

Minimum thickness of member, minimum edge distance and minimum spacing

Annex B2

Installation Instructions



1. Drilling:

Choose the correct drill diameter (d_0) and drilling depth (h_1). Create a hammer drilled borehole.



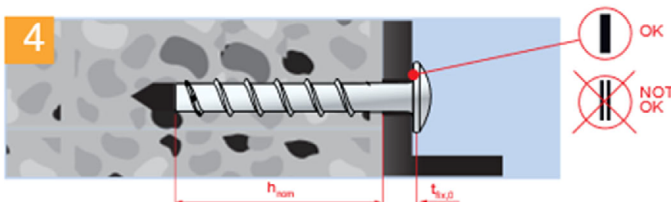
2. Cleaning of the drill hole:

Remove drill dust by vacuuming or blowing.



3. Installation:

Install the anchor by a rotary screwdriver or torque wrench. (NOT with impact screw driver!)



4. Installation:

verify that the head is undamaged and pressed to the fixture.

The use of impact screw driver is not allowed.
The anchor is correctly installed if the head is supported on the fixture.
Further turning of the anchor is not possible.

TURBO SMART concrete screw TSM L

Intended use
Installation instructions

Annex B3

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

TURBO SMART concrete screw TSM L				6	
Nominal embedment depth		h_{nom}		$h_{nom1}^{1)}$	h_{nom2}
		[mm]		25	35
Steel failure for tension and shear loading					
Characteristic tension load	$N_{Rk,s}$	[kN]	13,7		
Partial factor	$\gamma_{Ms,N}$	[-]	1,5		
Characteristic shear load	$V_{Rk,s}$	[kN]	6,9		
Partial factor	$\gamma_{Ms,V}$	[-]	1,25		
Ductility factor	k_7	[-]	0,8		
Characteristic bending load	$M^0_{Rk,s}$	[Nm]	11,1		
Pull-out failure					
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	$0,9^{1)}$	2,0
	uncracked	$N_{Rk,p}$	[kN]	$2,0^{1)}$	4,0
Increasing factor for $N_{Rk,p}$ = $N_{Rk,p (C20/25)} \cdot \Psi_c$	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]	19	27
k-factor	cracked	k_{cr}	[-]	7,7	
	uncracked	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]	0,9	
	spacing	$s_{cr,Sp}$	[mm]	$3 \times h_{ef}$	
	edge distance	$c_{cr,Sp}$	[mm]	$1,5 \times h_{ef}$	
Factor for pry-out failure		k_8	[-]	1,0	
Installation factor		γ_{inst}	[-]	1,0	
Concrete edge failure					
Effective length in concrete		$l_f = h_{ef}$	[mm]	19	27
Nominal outer diameter of screw		d_{nom}	[mm]	6	

¹⁾ only subject to dry internal conditions

TURBO SMART concrete screw TSM L

Performances

Characteristic values for static and quasi-static loading

Annex C1

Table 6: Fire exposure – characteristic values of resistance

TURBO SMART concrete screw TSM L				TSM 6	
Nominal embedment depth		h_{nom}		$h_{nom1}^{1)}$	h_{nom2}
		[mm]		25	35
Steel failure for tension and shear load					
Characteristic Resistance	R30	$N_{Rk,s,fi30}$	[kN]	0,27	
	R60	$N_{Rk,s,fi60}$	[kN]	0,27	
	R90	$N_{Rk,s,fi90}$	[kN]	0,22	
	R120	$N_{Rk,s,fi120}$	[kN]	0,17	
	R30	$V_{Rk,s,fi30}$	[kN]	0,27	
	R60	$V_{Rk,s,fi60}$	[kN]	0,27	
	R90	$V_{Rk,s,fi90}$	[kN]	0,22	
	R120	$V_{Rk,s,fi120}$	[kN]	0,17	
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,22	
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,22	
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,18	
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,14	
Pull-out failure					
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	$0,23^{1)}$	0,50
	R120	$N_{Rk,p,fi}$	[kN]	$0,18^{1)}$	0,40
Concrete cone failure					
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	$0,27^{1)}$	0,65
	R120	$N^0_{Rk,c,fi}$	[kN]	$0,22^{1)}$	0,52
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 $\geq 300\text{mm}$.					
Spacing					
R30 - R120		$S_{cr,fi}$	[mm]	$4 \times h_{ef}$	
Pry-out failure					
R30 - R120		k_8	[-]	1,0	
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.					

¹⁾ only subject to dry internal condition

TURBO SMART concrete screw TSM L

Performances

Fire exposure – characteristic values of resistance

Annex C2