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

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European Technical Assessment

ETA-22/0225 of 18/05/2022

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	TT G Throughbolt
Product family to which the construction product belongs	Torque controlled expansion anchor of sizes M8, M10, M12, M16 and M20 for use in uncracked concrete
Manufacturer	TRUTEK Fasteners Polska Sp. z o.o. Al. Krakowska 38, Janki 05-090 Raszyn Poland e-mail: info@trutek.com.pl www.trutek.com.pl www.trutekfasteners.eu
Manufacturing plant	Plant no. 7
This European Technical Assessment contains	14 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	European Assessment Document EAD 330232-01-0601 "Mechanical fasteners for use in concrete"

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Specific Part

1 Technical description of the product

The TT G Throughbolt anchor in the sizes M8, M10, M12, M16 and M20 is made of hot dip galvanized steel. The anchor is placed into a drill hole and anchored by torque-controlled expansion.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

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

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer or Technical Assessment Body, 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 Performance of the product

3.1.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	Annex C1
Characteristic resistance to shear load (static and quasi-static loading)	Annex C3
Displacements	Annex C2, C3

3.1.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	Annex C4, C5

3.1.3 Aspects of durability

Essential characteristic	Performance
Durability	Annex B1

3.2 Methods used for the assessment

The assessment has been made in accordance with EAD 330232-01-0601.

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

According to Decision 96/582/EC of the European Commission the system 1 of assessment and verification of constancy of performance applies (see Annex V to regulation (EU) No 305/2011).

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited in Instytut Techniki Budowlanej.

For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 18/05/2022 by Instytut Techniki Budowlanej

Anna Panek, MSc
Deputy Director of ITB

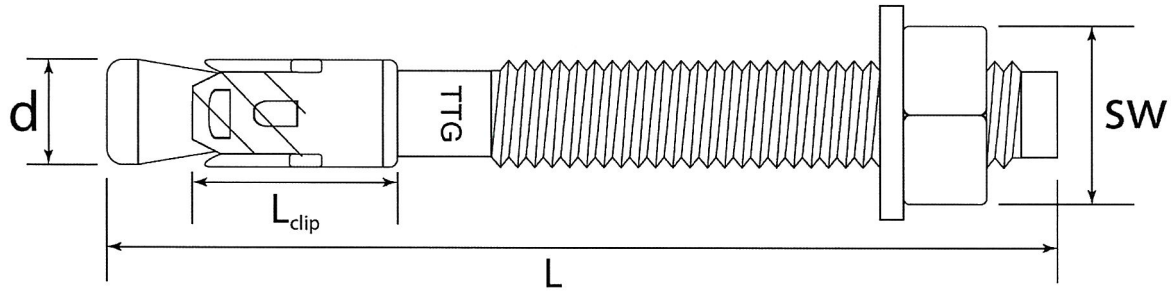


Table A1: TT G Throughbolt anchor dimensions

Type of anchor				d [mm]	L [mm]	L_{clip} [mm]	SW [mm]
Size	Marking	$t_{fix,STD}$ [1] [mm]	$t_{fix,RED}$ [2] [mm]				
M8	TTG08	1 – 135	1 – 145	8	60 – 200	14.90	13
M10	TTG10	1 – 175	1 – 185	10	65 – 250	17.30	17
M12	TTG12	1 – 200	1 – 220	12	80 – 300	21.70	19
M16	TTG16	1 – 280	1 – 300	16	105 – 400	24.10	24
M20	TTG20	1 – 260	1 – 280	20	130 – 400	30.10	30

[1] thickness of the fixed element for standard effective anchorage depth
[2] thickness of the fixed element for reduced effective anchorage depth

Marking:

Marking on the bolt: “TTG”

TT G Throughbolt	**Annex A1**
Product description Dimensions and marking	of European Technical Assessment ETA-22/0225

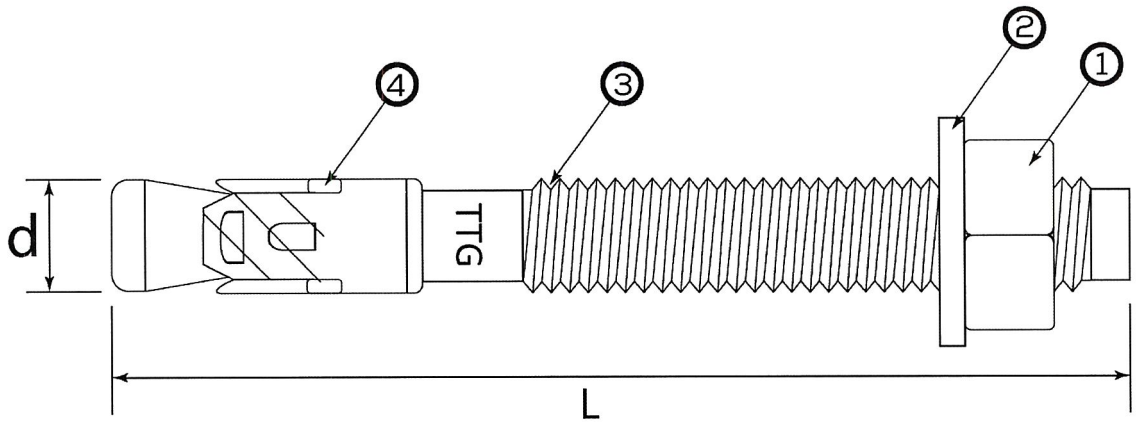


Table A2: Materials

Part	Designation	Material	Coating
1	Hexagon nut	carbon steel, class 5, EN ISO 898-2 DIN 934	hot dip galvanized ≥ 40 µm EN ISO 1461
2	Washer	DIN 125	
3	Bolt	C1008 f_{uk} ≥ 400 MPa, f_{yk} ≥ 320 MPa	
4	Expansion clip	stainless steel 304	-

TT G Throughbolt	**Annex A2** of European Technical Assessment ETA-22/0225
Product description Materials	

Specification of intended use

Anchorages subject to:
- Static and quasi-static loads.
- Anchorages with requirements related to resistance to fire.

Base material:
- Reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at maximum according to EN 206.
- Uncracked concrete.

Use conditions (environmental conditions):
- Structures subject to dry internal conditions.

Design:
- The anchorages under static loads and quasi-static loads are designed in accordance with EN 1992-4:2018 and EOTA Technical Report TR 055, under the responsibility of an engineer experienced in anchorages and concrete work.
- The position of the anchor is indicated on the design drawings.
- Verifiable calculation notes and drawings are taking account of the loads to be transmitted.

Installation:
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging any component of the anchor.
- Anchor installation in accordance with the manufacturer's specification and drawings and using the appropriate tools.
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply.
- Check of concrete being well compacted, e.g. without significant voids.
- Effective anchorage depth, edge distance and spacing not less than the specified values without minus tolerances.
- Positioning of the drill holes without damaging the reinforcement.
- Hole drilling by hammer drill.
- Cleaning of the hole of drilling dust.
- Application of the torque moment using a calibrated torque wrench.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application.

TT G Throughbolt	**Annex B1**
Intended use Specifications	of European Technical Assessment ETA-22/0225

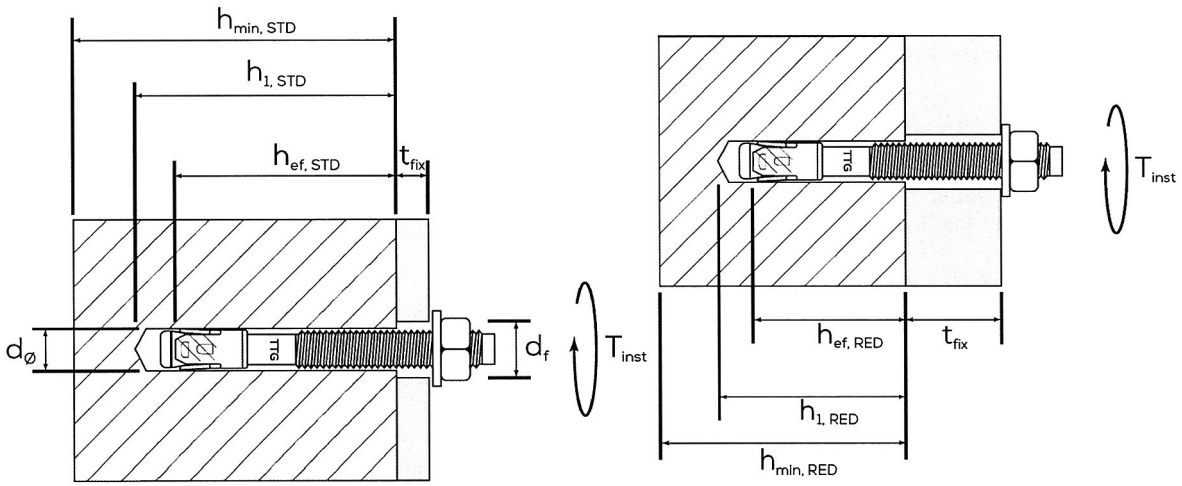
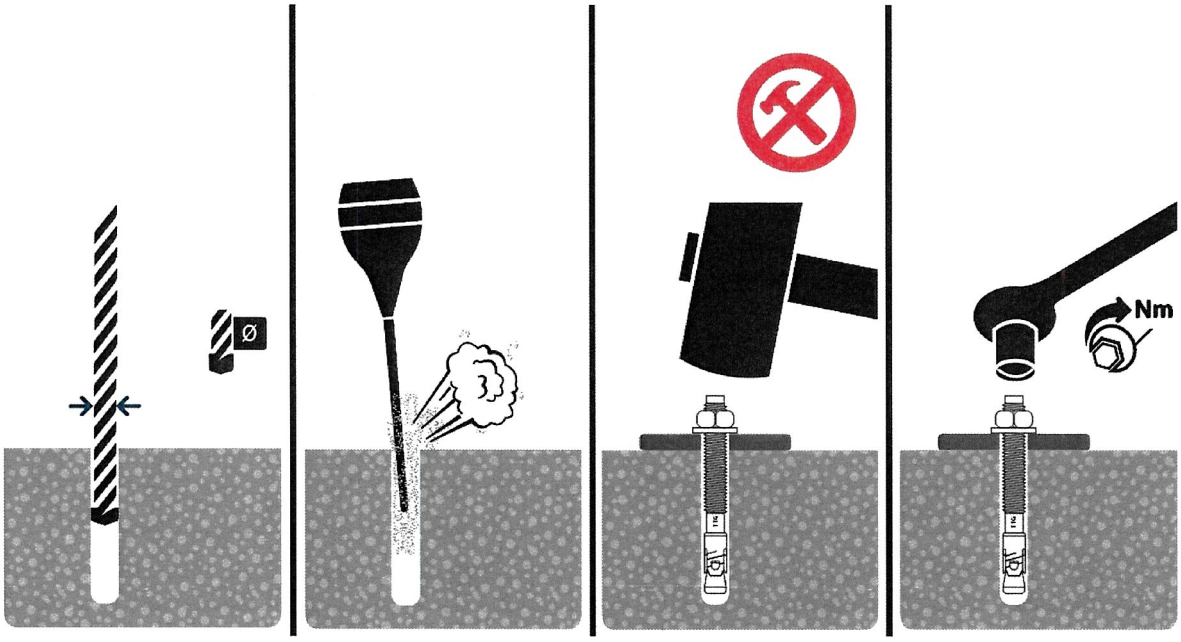


Table B1: Installation parameters

Anchor size		M8	M10	M12	M16	M20
Effective embedment depth (standard)	$h_{ef,STD}$ = [mm]	45	50	70	85	100
Nominal embedment depth (standard)	$h_{nom,STD}$ = [mm]	53	58	80	99	110
Depth of drill hole (standard)	$h_{1,STD} \geq$ [mm]	60	65	90	110	120
Effective embedment depth (reduced)	$h_{ef,RED}$ = [mm]	35	40	50	65	80
Nominal embedment depth (reduced)	$h_{nom,RED}$ = [mm]	43	48	60	79	90
Depth of drill hole (reduced)	$h_{1,RED} \geq$ [mm]	50	55	70	90	100
Nominal drill hole diameter	$d_o = d_{cut}$ = [mm]	8	10	12	16	20
Diameter of clearance hole in the fixture	d_f [mm]	9	12	14	18	22
Installation torque	T_{inst} = [Nm]	25	34	60	120	200
Minimum thickness of member (standard embedment depth)	$h_{min,STD}$ = [mm]	100	100	140	170	200
Minimum thickness of member (reduced embedment depth)	$h_{min,RED}$ = [mm]	100	100	100	130	160
Minimum spacing	s_{min} = [mm]	35	40	50	65	80
Minimum edge distance	c_{min} = [mm]	35	40	50	65	80

Installation instruction



TT G Throughbolt	**Annex B3** of European Technical Assessment ETA-22/0225
Intended use Installation instruction	

Table C1: Characteristic values for tension loads, design method A

Anchor size		M8	M10	M12	M16	M20
Steel failure						
Characteristic resistance	$N_{Rk,s}$ [kN]	14.6	23.2	33.7	62.8	98.0
Partial safety factor	γ_{Ms} [1)]	1.5				
Pull-out failure						
Characteristic resistance in uncracked concrete C20/25 (standard depth)	$N_{Rk,p,STD}$ [kN]	9.5	16.0	28.0	28.0	48.0
Characteristic resistance in uncracked concrete C20/25 (reduced depth)	$N_{Rk,p,RED}$ [kN]	9.5	12.0	12.0	24.0	34.0
Installation safety factor	γ_{inst} [2)]	1.0	1.0	1.0	1.0	1.2
Increasing factor for concrete C30/37	ψ_c	1.0	1.0	1.0	1.0	1.0
Increasing factor for concrete C40/50		1.0	1.0	1.0	1.0	1.0
Increasing factor for concrete C50/60		1.0	1.0	1.0	1.0	1.0
Concrete cone failure and splitting failure						
Effective anchorage depth (standard)	$h_{ef,STD}$ = [mm]	45	50	70	85	100
Effective anchorage depth (reduced)	$h_{ef,RED}$ = [mm]	35	40	50	65	80
Factor for uncracked concrete	k_1 [2)] = $k_{ucr,N}$ [2)]	11.0	11.0	11.0	11.0	11.0
Spacing (standard depth)	$s_{cr,N,STD}$ [mm]	135	150	210	255	300
Edge distance (standard depth)	$c_{cr,N,STD}$ [mm]	67.5	75	105	127.5	150
Spacing (reduced depth)	$s_{cr,N,RED}$ [mm]	105	120	150	195	240
Edge distance (reduced depth)	$c_{cr,N,RED}$ [mm]	52.5	60	75	97.5	120
Characteristic resistance for splitting (standard depth)	$N^0_{Rk,sp,STD}$ [2)] [kN]	9.5	16.0	28.0	28.0	48.0
Characteristic resistance for splitting (reduced depth)	$N^0_{Rk,sp,RED}$ [2)] [kN]	9.5	12.0	12.0	24.0	34.0
Spacing (standard depth)	$s_{cr,sp,STD}$ [mm]	135	150	210	255	300
Edge distance (standard depth)	$c_{cr,sp,STD}$ [mm]	67.5	75	105	127.5	150
Spacing (reduced depth)	$s_{cr,sp,RED}$ [mm]	105	120	150	195	240
Edge distance (reduced depth)	$c_{cr,sp,RED}$ [mm]	52.5	60	75	97.5	120
Installation safety factor	γ_{inst} [2)]	1.0	1.0	1.0	1.0	1.2

[1)] in the absence of other national regulations
[2)] parameter for design according to EN 1992-4:2018

Table C2: Displacements under tension loads

Anchor size		M8	M10	M12	M16	M20
Tension load	N [kN]	4.5	7.1	6.0	11.9	17.3
Displacement	δ_{NO} [mm]	1.3	1.3	1.3	1.3	1.4
	$\delta_{N\infty}$ [mm]	1.6	1.6	1.6	1.6	1.6

Table C3: Characteristic values for shear loads, design method A

Anchor size		M8	M10	M12	M16	M20
Steel failure without lever arm						
Characteristic resistance	$V^0_{Rk,s}$ [3] [kN]	7.3	11.6	16.9	31.4	49.0
Ductility factor	k_7 [3]	1.0	1.0	1.0	1.0	1.0
Partial safety factor	γ_{Ms} [2]	1.25	1.25	1.25	1.25	1.25
Steel failure with lever arm						
Characteristic bending resistance	$M^0_{Rk,s}$ [Nm]	15.0	29.9	52.4	133.2	259.6
Partial safety factor	γ_{Ms} [2]	1.25	1.25	1.25	1.25	1.25
Concrete pry-out failure [1]						
Concrete pry-out failure factor	k_8 [3]	1.0	1.0	2.0	2.0	2.0
Partial safety factor	γ_{Mc} [2]	1.5	1.5	1.5	1.5	1.8
Concrete edge failure						
Effective length of anchor under shear loading (standard depth)	$l_{f,STD}$ [mm]	45	50	70	85	100
Effective length of anchor under shear loading (reduced depth)	$l_{f,RED}$ [mm]	35	40	50	65	80
Effective diameter of anchor	d_{nom} [mm]	8	10	12	16	20
Partial safety factor	γ_{Mc} [2]	1.5	1.5	1.5	1.5	1.8

[1] the pry-out failure is not decisive
[2] in the absence of other national regulations
[3] parameter for design according to EN 1992-4:2018

Table C4: Displacements under shear loads

Anchor size		M8	M10	M12	M16	M20
Shear load	V [kN]	4.1	6.8	11.5	13.8	29.4
Displacement	δ_{V0} [mm]	0.8	1.1	1.1	1.1	2.5
	$\delta_{V\infty}$ [mm]	1.2	1.7	1.7	1.7	3.8

Table C5: Characteristic resistance for tension loads under fire exposure

Anchor size				M8	M10	M12	M16	M20
Steel failure								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0.4	0.9	1.7	3.1	4.9
	R60	$N_{Rk,s,fi}$	[kN]	0.3	0.8	1.3	2.4	3.7
	R90	$N_{Rk,s,fi}$	[kN]	0.3	0.6	1.1	2.0	3.2
	R120	$N_{Rk,s,fi}$	[kN]	0.2	0.5	0.8	1.6	2.5
Pull-out failure								
Characteristic resistance	R30	$N_{Rk,p,fi}$	[kN]	2.4	3.1	3.1	6.2	8.8
	R60	$N_{Rk,p,fi}$	[kN]	2.4	3.1	3.1	6.2	8.8
	R90	$N_{Rk,p,fi}$	[kN]	2.4	3.1	3.1	6.2	8.8
	R120	$N_{Rk,p,fi}$	[kN]	1.9	2.5	2.5	5.0	7.0
Concrete cone failure								
Characteristic resistance	R30	$N_{Rk,c,fi}$	[kN]	1.8	2.6	4.5	8.6	14.5
	R60	$N_{Rk,c,fi}$	[kN]	1.8	2.6	4.5	8.6	14.5
	R90	$N_{Rk,c,fi}$	[kN]	1.8	2.6	4.5	8.6	14.5
	R120	$N_{Rk,c,fi}$	[kN]	1.5	2.0	3.6	6.9	11.6
Edge distance								
	R30	$c_{cr,N,fi}$	[mm]	$2 \times h_{ef}$				
	R60	$c_{cr,N,fi}$	[mm]					
	R90	$c_{cr,N,fi}$	[mm]					
	R120	$c_{cr,N,fi}$	[mm]					
In case of fire attack from more than one side minimum edge distance shall be ≥ 300 mm								
Spacing								
	R30	$s_{cr,N,fi}$	[mm]	$4 \times h_{ef}$				
	R60	$s_{cr,N,fi}$	[mm]					
	R90	$s_{cr,N,fi}$	[mm]					
	R120	$s_{cr,N,fi}$	[mm]					

Table C5: Characteristic resistance for shear loads under fire exposure

Anchor size				M8	M10	M12	M16	M20
Steel failure without lever arm								
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0.4	0.9	1.7	3.1	4.9
	R60	$V_{Rk,s,fi}$	[kN]	0.3	0.8	1.3	2.4	3.7
	R90	$V_{Rk,s,fi}$	[kN]	0.3	0.6	1.1	2.0	3.2
	R120	$V_{Rk,s,fi}$	[kN]	0.2	0.5	0.8	1.6	2.5
Steel failure with lever arm								
Characteristic bending resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0.6	1.7	3.9	9.3	18.3
	R60	$M^0_{Rk,s,fi}$	[Nm]	0.5	1.4	2.9	7.0	13.7
	R90	$M^0_{Rk,s,fi}$	[Nm]	0.4	1.1	2.5	6.0	11.9
	R120	$M^0_{Rk,s,fi}$	[Nm]	0.3	0.9	1.9	4.6	9.1