Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-22/0877 of 4 September 2023

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	2C Plastic multi-purpose anchor SHARK TWIST
Product family to which the construction product belongs	Plastic anchor for redundant non-structural systems in concrete and masonry
Manufacturer	Adolf Würth GmbH & Co. KG Reinhold Würth Straße 12-17 74650 Künzelsau DEUTSCHLAND
Manufacturing plant	Werk 2
This European Technical Assessment contains	27 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	330284-00-0604 edition 12/2020

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Specific part

1 Technical description of the product

The 2C plastic multi-purpose anchor SHARK TWIST is a plastic anchor consisting of a plastic sleeve made of polyamide and polypropylene and an accompanying specific screw of galvanised steel or of stainless steel.

The plastic sleeve is expanded by screwing in the specific screw which presses the sleeve against the wall of the drilled hole.

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 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 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

3.2 Mechanical resistance and stability (BWR 4)

Essential characteristic	Performance
Resistance to steel failure under tension loading	See Annex C 1 and C 2
Resistance to steel failure under shear loading	See Annex C 1 and C 2
Resistance to pull-out or concrete failure under tension loading (base material group a)	See Annex C 1, C 2 and C 14
Resistance in any load direction without lever arm (base material group b, c)	See Annexes C 6 – C 13
Edge distance and spacing (base material group a)	See Annex B 3
Edge distance and spacing (base material group b, c)	See Annex B 4 and C 6 – C 13
Displacements under short-term and long-term loading	See Annex C 3
Durability	See Annex B 1

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

In accordance with European Assessment Document EAD 330284-00-0604 the applicable European legal act is: 97/463/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 EAD

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

Issued in Berlin on 4 September 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Ziegler

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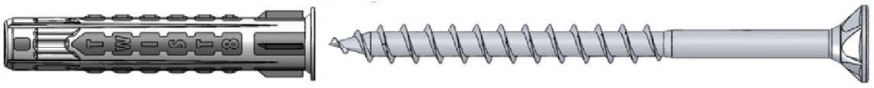
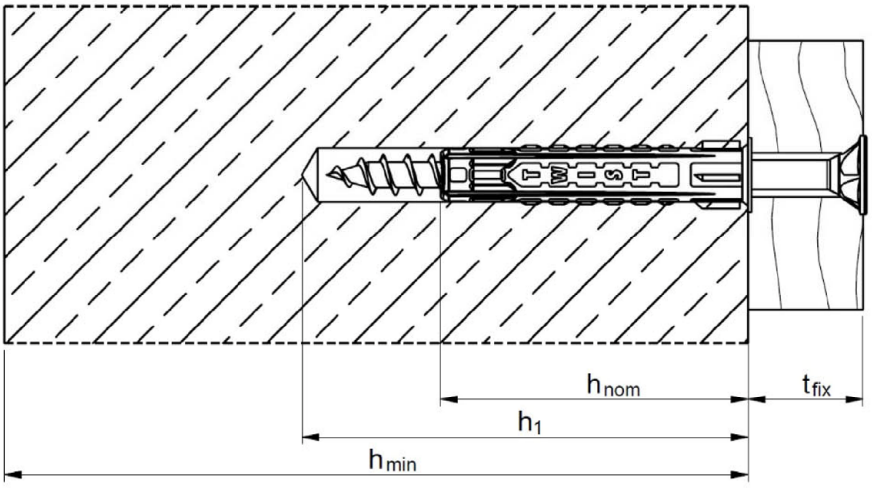
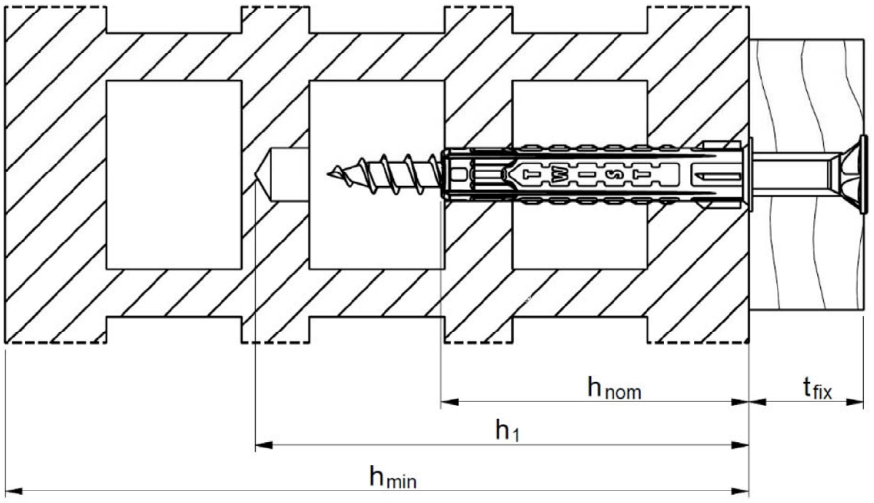
Plastic anchor SHARK TWIST – prepositioned installation concrete and masonry







Legend:

h_{nom}:	Overall plastic anchor embedment depth in the base material
h_1:	Depth of drilled hole to deepest point
h_{min}:	Minimum thickness of member
t_{fix}:	Thickness of fixture

2C Plastic multi-purpose anchor SHARK TWIST	Annex A 1
Product description Product and installed condition prepositioned installation	

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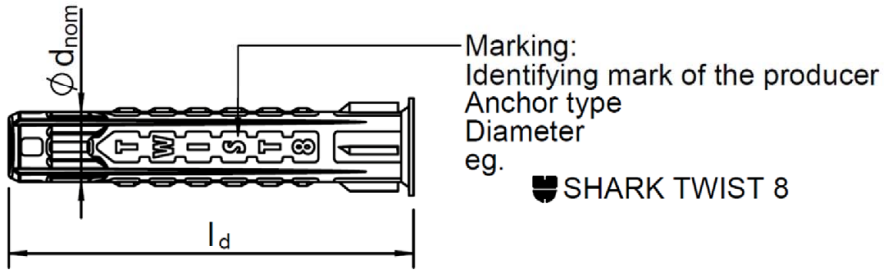
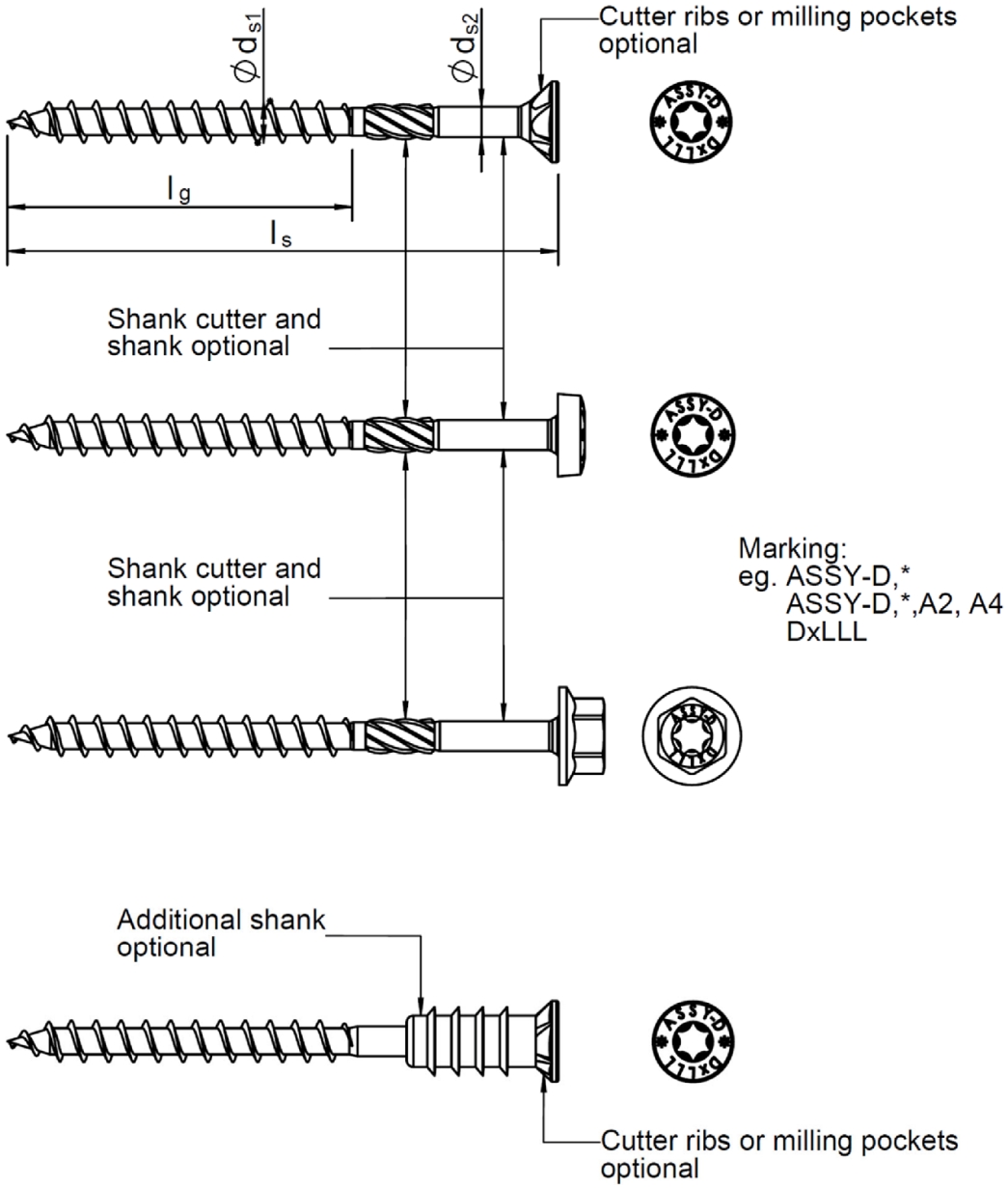
Plastic sleeve SHARK TWIST



Special screw ASSY-D



2C Plastic multi-purpose anchor SHARK TWIST

Annex A 2

Product description
Plastic sleeve, special screw

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Table A 1.1: Anchor dimensions

Anchor type			**SHARK TWIST**				
			6	**8**	**10**	**12**	**14**
Overall plastic anchor embedment depth[1)]	$h_{nom} \geq$	[mm]	35	45	55	65	75
Plastic sleeve							
Plastic sleeve diameter	$\varnothing\ d_{nom} =$	[mm]	6	8	10	12	14
Length of plastic sleeve	$l_d =$	[mm]	36	46	56	66	76
Flat collar diameter	$\varnothing\ d_k =$	[mm]	8	11	13	15	17
Thickness of flat collar	$l_k \geq$	[mm]	0,5	0,5	0,5	0,5	0,5
Special screw ASSY-D							
Screw diameter	$d_{s1} =$	[mm]	5	6	8	10	12
Screw diameter	$d_{s2} =$	[mm]	3,7	4,4	5,8	7,3	8,3
Length of screw	$l_s =$	[mm]	t_{fix} + 40	t_{fix} + 50	t_{fix} + 60	t_{fix} + 70	t_{fix} + 80
Length of thread	$l_g \geq$	[mm]	40	50	60	76	80
Thickness of fixture for screw l_s = 50 mm	t_{fix}	[mm]	1-10	-	-	-	-
Thickness of fixture for screw l_s = 60 mm	t_{fix}	[mm]	1-20	1-10	-	-	-
Thickness of fixture for screw l_s = 70 mm	t_{fix}	[mm]	10-30	1-20	1-10	-	-
Thickness of fixture for screw l_s = 80 mm	t_{fix}	[mm]	20-40	10-30	1-20	1-10	-
Thickness of fixture for screw l_s = 90 mm	t_{fix}	[mm]	30-50	20-40	10-30	1-20	1-10
Thickness of fixture for screw l_s = 100mm	t_{fix}	[mm]	40-60	30-50	20-40	1-30	1-20
Thickness of fixture for screw l_s = 110mm	t_{fix}	[mm]	50-70	40-60	30-50	10-40	1-30
Thickness of fixture for screw l_s = 120mm	t_{fix}	[mm]	60-80	50-70	40-60	20-50	10-40
Thickness of fixture for screw l_s = 130mm	t_{fix}	[mm]	70-90	60-80	50-70	30-60	20-50
Thickness of fixture for screw l_s = 140mm	t_{fix}	[mm]	80-100	70-90	60-80	40-70	30-60
Thickness of fixture for screw l_s = 150mm	t_{fix}	[mm]	90-110	80-100	70-90	50-80	40-70
Thickness of fixture for screw l_s = 160mm	t_{fix}	[mm]	100-120	90-110	80-100	60-90	50-80
Thickness of fixture for screw l_s = 170mm	t_{fix}	[mm]	110-130	100-120	90-110	70-100	60-90
Thickness of fixture for screw l_s = 200mm	t_{fix}	[mm]	140-160	130-150	120-140	100-130	90-120
Thickness of fixture for screw l_s = 220mm	t_{fix}	[mm]	160-180	150-170	140-160	120-150	110-140
Thickness of fixture for screw l_s = 240mm	t_{fix}	[mm]	180-200	170-190	160-180	140-180	130-160

[1)] See Annex A1, A2

2C Plastic multi-purpose anchor SHARK TWIST

Product description
Anchor dimensions

Annex A 3

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Table A 1.1: Materials

Designation	Material
Plastic sleeve	Polyamid, colour: anthracite and Polypropylene, colour: white
Special screw	Galvanized steel in accordance with. to EN ISO 4042:2018 Stainless steel A2 of corrosion resistance class CRC II in accordance with EN 1993-1-4:2006 + A1:2015 Stainless steel A4 of corrosion resistance class CRC III in accordance with EN 1993-1-4:2006 + A1:2015

2C Plastic multi-purpose anchor SHARK TWIST

Annex A 4

Product description
Materials

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads.
- Redundant non-structural systems

Base materials:
- Reinforced or unreinforced compacted normal weight concrete without fibres with strength classes ≥ C12/15 (base material group a), in accordance with EN 206:2013 + A1:2016, Annex C 1 – C 2 and precast prestressed hollow core elements according to Annex C 14.
- Solid brick masonry (base material group b), according to Annex C 6, Annex C 8 – C 9, Annex C 12 – C 13 in accordance with EN 771-1, EN 771-2 or EN 771-3:2011 + A1:2015
  Note: The characteristic resistance is also valid for larger brick sizes and larger compressive strength of the masonry unit.
- Hollow brick masonry (base material group c), according to Annex C 7, Annex C 10 – C 11 in accordance with EN 771-1, EN 771-2 or EN 771-3:2011 + A1:2015
- Mortar strength class of the masonry ≥ M2,5 at minimum in accordance with EN 998-2:2010.
- For other base materials of the base material groups a, b and c the characteristic resistance of the anchor may be determined by job site tests in accordance with TR 051:2018-04.

Temperature range:
- a): -20 °C to +50 °C (max. long temperature +30 °C and max. short temperature +50 °C)

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions (zinc coated steel, stainless steel A2 or A4).
- The specific screw made of zinc coated steel or stainless steel A2 may also be used in structures subject to external atmospheric exposure, if the area of the head of the screw is protected against moisture and driving rain after mounting of the fixing unit in this way, that intrusion of moisture into the anchor shaft is prevented. Therefore there shall be an external cladding or a ventilated rainscreen mounted in front of the head of the screw and the head of the screw itself shall be coated with a soft plastic, permanently elastic bitumen-oil-combination coating (e. g. undercoating or body cavity protection for cars).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel A4 of corrosion resistance class CRC III).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:
- The anchorages are designed in accordance with TR 064:2018-05 under the responsibility of an engineer experienced in anchorages and masonry work.
- Verifiable calculation notes and drawings shall be prepared taking account of the loads to be anchored, the nature and strength of the base materials and the dimensions of the anchorage members as well as of the relevant tolerances. The position of the anchor is indicated on the design drawings.

Installation:
- Hole drilling by the drill modes in accordance with Annex C 6 - C 14 and Annex B 2.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Installation temperature: ≥ -20 °C. Temperature anchor sleeve: ≥ -20 °C.
- Exposure to UV due to solar radiation of the anchor not protected ≤ 6 weeks.
- No ingress of water in the bore hole < 0°C

2C Plastic multi-purpose anchor SHARK TWIST	Annex B 1
Intended use Specifications	

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Table B 1.1: Installation parameters in concrete

Anchor type			**SHARK TWIST**				
			6	**8**	**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	6	8	10	12	14
Overall plastic anchor embedment depth in the base material [1)]	$h_{nom} \geq$	[mm]	35	45	55	65	75
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,4	8,45	10,45	12,5	14,5
Depth of drilled hole to deepest point [1)]	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}				
Drill method		[-]	Hammer drilling				
Diameter of clearance hole in the fixture Pre-positioned installation	$d_f \leq$	[mm]	5,5	6,5	8,5	10,5	12,5

[1)] See Annex A1, A2

2C Plastic multi-purpose anchor SHARK TWIST

Intended use
Installation parameters for use in concrete

Annex B 2

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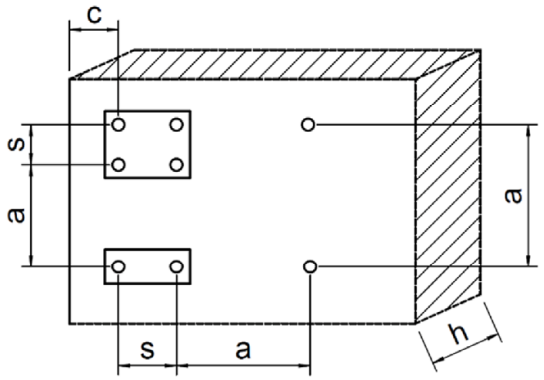
Table B 2.1: Minimum thickness of member, edge distance and spacing in concrete

		h_{nom} [mm]	h_{min} [mm]	c_{cr} [mm]	s_{cr} [mm]	c_{min} [mm]	s_{min} [mm]
SHARK TWIST 6	Concrete ≥ C16/20	35	100	80	80	80	80
	Concrete C12/15	35	100	110	110	110	110
SHARK TWIST 8	Concrete ≥ C16/20	45	100	80	80	80	80
	Concrete C12/15	45	100	110	110	110	110
SHARK TWIST 10	Concrete ≥ C16/20	55	100	80	90	80	80
	Concrete C12/15	55	100	110	130	110	110
SHARK TWIST 12	Concrete ≥ C16/20	65	120	100	100	100	100
	Concrete C12/15	65	120	140	140	140	140
SHARK TWIST 14	Concrete ≥ C16/20	75	120	100	110	100	100
	Concrete C12/15	75	120	140	155	140	140

Fixing points with a spacing $a \leq s_{cr}$ are considered as a group with a max. characteristic resistance $N_{Rk,p}$ according to Table C 1.1, C 2.1. For $a > s_{cr}$, the anchors are considered as single anchors, each with a characteristic resistance $N_{Rk,p}$ according to Table C 1.1, C 2.1.

Concrete:



2C Plastic multi-purpose anchor SHARK TWIST

Intended use
Minimum thickness, edge distances and spacing for use concrete

Annex B 3

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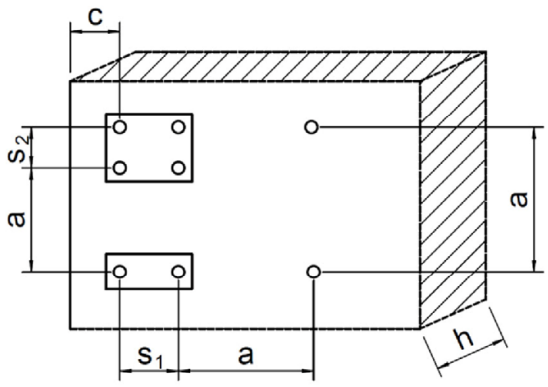
Table B 3.1: Minimum thickness of member, edge distance and anchor spacing in masonry

			Masonry		
Anchor type SHARK TWIST			**10**	**12**	**14**
Minimum thickness of member	h_{min}	[mm]	115[1)]	115[1)]	115[1)]
Single anchor					
Minimum spacing	a_{min}	[mm]	250	250	250
Minimum edge distance	c_{min}	[mm]	100[1)]	100[1)]	100[1)]
Anchor group					
Spacing perpendicular to free edge	$s_{1,min}$	[mm]	70[1)]	70[1)]	70[1)]
Spacing parallel to free edge	$s_{2,min}$	[mm]	140[1)]	140[1)]	140[1)]
Minimum edge distance	c_{min}	[mm]	100[1)]	100[1)]	100[1)]

[1)] Depends on the brick size (see the following Annexes C 6 – C 13)

Masonry



2C Plastic multi-purpose anchor SHARK TWIST

Intended use
Minimum member thickness, edge distances and spacings for use in masonry

Annex B 4

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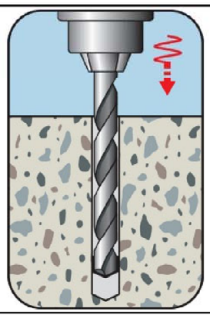
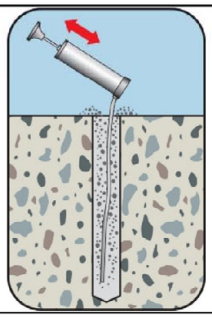
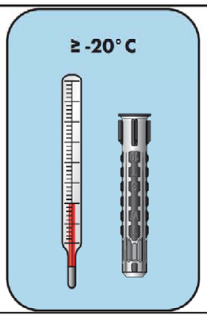
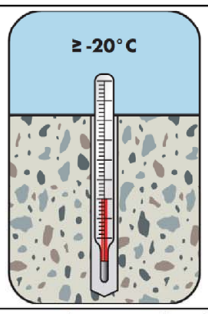
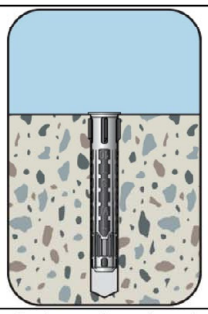
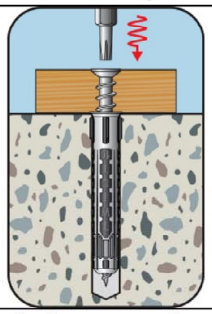
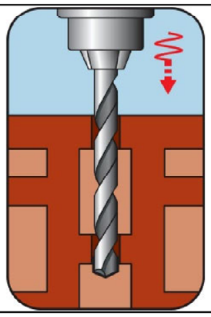
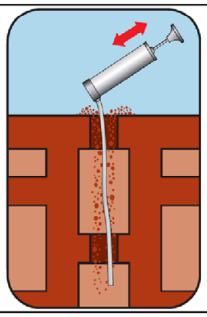
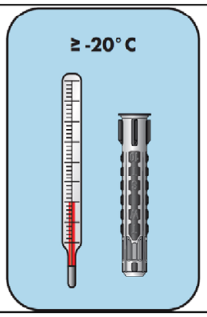
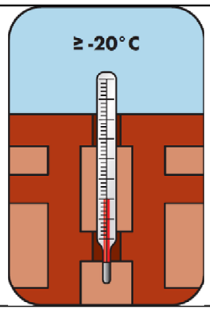
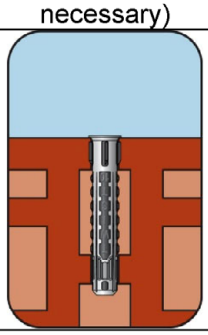
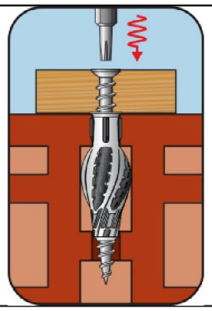
Installation instructions prepositioned installation concrete

		
1) Drill the bore hole	2) Clean the drilled bore hole	3) Temperature anchor sleeve ≥ -20 °C
		
4) Temperature anchoring base ≥ -20 °C	5) Set anchor in place	6) screw in the screw through the fixture until flush

Installation instructions prepositioned installation masonry

		
1) Drill the bore hole	2) Clean the drilled bore hole (not necessary)	3) Temperature anchor sleeve ≥ -20 °C
		
4) Temperature anchoring base ≥ -20 °C	5) Set anchor in place	6) Screw in the screw untilf flush

2C Plastic multi-purpose anchor SHARK TWIST

Annex B 5

Intended use
Installation instructions prepositioned installation

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Table C 1.1: Characteristic resistance of the screw, galvanized steel for use in concrete

Anchor type			**SHARK TWIST,** galvanised steel				
Failure of expansion element (special screw)			**6**	**8**	**10**	**12**	**14**
Overall plastic anchor embedment depth	h_{nom}	[mm]	35	45	55	65	75
Characteristic tension resistance	$N_{Rk,s}$	[kN]	5,65	9,07	16,34	23,76	29,91
Partial safety factor	γ_{Ms} [1)]	[-]	1,5	1,5	1,5	1,5	1,5
Characteristic shear resistance	$V_{Rk,s}$	[kN]	2,83	4,54	8,17	11,88	14,96
Partial safety factor	γ_{Ms} [1)]	[-]	1,25	1,25	1,25	1,25	1,25
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	2,54	5,17	12,50	21,92	30,96
Partial safety factor	γ_{Ms} [1)]	[-]	1,25	1,25	1,25	1,25	1,25
Pull-out failure (plastic sleeve)							
Concrete ≥ C16/20							
Characteristic resistance 30°C[2)] / 50°C[3)]	$N_{Rk,p}$	[kN]	1,5	3,0	5,5	7,0	8,0
Partial safety factor	γ_{Mc} [1)]	[-]	1,8	1,8	1,8	1,8	1,8
Concrete = C12/15							
Characteristic resistance 30°C[2)] / 50°C[3)]	$N_{Rk,p}$	[kN]	1,2	2,0	4,0	5,5	6,0
Partial safety factor	γ_{Mc} [1)]	[-]	1,8	1,8	1,8	1,8	1,8

1) In absence of other national regulations
2) Maximum long term temperature
3) Maximum short term temperature

2C Plastic multi-purpose anchor SHARK TWIST

Performances
Characteristic resistance of the screw, galvanized steel for use in concrete

Annex C 1

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Table C 2.1: Characteristic resistance, stainless steel for use in concrete

Anchor type			**SHARK TWIST**, stainless steel				
Failure of expansion element (special screw)			**6**	**8**	**10**	**12**	**14**
Overall plastic anchor embedment depth	h_{nom}	[mm]	**35**	**45**	**55**	**65**	**75**
Characteristic tension resistance	$N_{Rk,s}$	[kN]	4,95	7,94	14,30	20,79	26,17
Partial safety factor	γ_{Ms} [1)]	[-]	1,55	1,55	1,55	1,55	1,55
Characteristic shear resistance	$V_{Rk,s}$	[kN]	2,47	3,97	7,15	10,40	13,09
Partial safety factor	γ_{Ms} [1)]	[-]	1,29	1,29	1,29	1,29	1,29
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	2,23	4,53	10,94	19,18	27,09
Partial safety factor	γ_{Ms} [1)]	[mm]	1,29	1,29	1,29	1,29	1,29
Pull-out failure (plastic sleeve)							
Concrete ≥ C16/20							
Characteristic resistance 30°C [2)] / 50°C [3)]	$N_{Rk,p}$	[kN]	1,5	3,0	5,5	7,0	8,0
Partial safety factor	γ_{Mc} [1)]	[-]	1,8	1,8	1,8	1,8	1,8
Concrete = C12/15							
Characteristic resistance 30°C [2)] / 50°C [3)]	$N_{Rk,p}$	[kN]	1,2	2,0	4,0	5,5	6,0
Partial safety factor	γ_{Mc} [1)]	[-]	1,8	1,8	1,8	1,8	1,8

1) In absence of other national regulations
2) Maximum long term temperature
3) Maximum short term temperature

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 2

Performances
Characteristic resistance of the screw, stainless steel for use in concrete

Table C 3.1: **Displacements[1] under tension and shear loading in concrete and masonry**

Anchor type		Tension load			Shear load		
	h_{nom} [mm]	F[2] [kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]	F[2] [kN]	δ_{V0} [mm]	$\delta_{V\infty}$ [mm]
SHARK TWIST 6	35	0,59	0,56	1,16	0,59	1,21	1,82
SHARK TWIST 8	45	1,19	0,53	1,06	1,19	1,10	1,65
SHARK TWIST 10	55	2,18	0,41	0,82	2,18	1,10	1,65
SHARK TWIST 12	65	2,78	0,52	1,04	2,78	1,60	2,40
SHARK TWIST 14	75	3,17	0,61	1,22	3,17	1,60	2,40

1) Valid for all ranges of temperatures
2) Intermediate values by linear interpolation

Footnotes for Annex C 6 – C 13

1) Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading.
The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B 3.1. The specific conditions for the design method have to be considered according to TR 064:2018-05.
2) In absence of other national regulations
3) Maximum long term temperature
4) Maximum short term temperature

Footnotes for Annex C 14

1) Characteristic resistance F_{Rk} for tension, shear or combined tension and shear loading.
The characteristic resistance is valid for single plastic anchor or for a group of two or four plastic anchors with a spacing equal or larger than the minimum spacing s_{min} according to Table B 2.1. The specific conditions for the design method have to be considered according to TR 064:2018-05.
2) In absence of other national regulations
3) Maximum long term temperature
4) Maximum short term temperature

2C Plastic multi-purpose anchor SHARK TWIST	Annex C 3
Performances Displacements under tension and shear loading in concrete and masonry, footnotes for Annexes	

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Table C 5.1: Base material: Concrete and solid masonry

Base material	Format	Measurement [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Annex
Concrete (base material group "a")					
Concrete ≥ C12/15					C 1 C 2
Solid masonry (base material group "b")					
Solid brick Mz according to EN 771-1:2011+A1:2015 e.g. Wienerberger GmbH	≥ NF	≥ 240x115x71	10 12,5 15 20 25 35 45 54,8	≥ 1,8	C 6 771-1-020
Sand-lime solid brick KS according to EN 771-2:2011+A1:2015	≥ NF	≥ 240x115x71	10 12,5 15 20 25 35 45 49,4	≥ 1,8	C 8 771-2-011
Sand-lime solid brick KS according to EN 771-2:2011+A1:2015	≥ 4DF	≥ 248x175x248	10 12,5 15 20 23,4	≥ 1,8	C 9 771-2-048
Lightweight concrete solid bricks and solid blocks V and Vbl according to EN 771-3:2011+A1:2015 e.g. BisoBims, Bisotherm GmbH	≥ NF	≥ 240x115x71	2,5 5 7,3	≥ 1,2	C 12 771-3-007
Lightweight concrete solid bricks and solid blocks V and Vbl according to EN 771-3:2011+A1:2015 e.g. Bisophon, Bisotherm GmbH	≥ NF	≥ 240x115x71	10 12,5 15 20 25 29	≥ 2,0	C 13 771-3-039

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 4

Performances
Concrete (base material group "a") and solid masonry (base material group "b"), format, measurement, mean compressive strength, bulk density, Annex

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Table C 6.1: Base material: Hollow or perforated masonry

Base material	Format	Measurement [mm]	Mean compressive strength [N/mm²]	Bulk density [kg/dm³]	Annex
Hollow or perforated masonry (base material group "c")					
Hollow brick HLz according to EN 771-1:2011+A1:2015 e.g. Wienerberger GmbH	≥ 2DF	≥ 240x115x113	10 12,5 15 20 24,1	≥ 1,2	C 7 771-1-135
Sand-lime perforated brick KS L according to EN 771-2:2011+A1:2015	≥ 2DF	≥ 240x115x113	10 12,5 15 18,8	≥ 1,6	C 10 771-2-054
Sand-lime perforated brick KS L according to EN 771-2:2011+A1:2015 e.g. Xella International GmbH	≥ 8DF	≥ 248x240x238	7,5 10	≥ 1,4	C 11 771-2-013

Table C 7.1: Base material: Precast prestressed hollow core slabs

Base material	Format	Measurement [mm]	Compressive strength class	Bulk density [kg/dm³]	Annex
Precast prestressed hollow core slabs in accordance with EN 206:2013+A1:2016	-	-	≥ C30/37	-	C 14

2C Plastic multi-purpose anchor SHARK TWIST	**Annex C 5**
Performances Hollow or perforated masonry (base material group "c"), format, measurement, mean compressive strength, bulk density, Annex	

Base material solid masonry: Solid brick Mz, NF

Table C 5.1.1: Brick data

Description of brick	771-1-020	**Mz**
Type of brick		Solid brick
Bulk density $\rho \geq$	[kg/dm³]	1,8
Standard		EN 771-1:2011+A1:2015
Format (measurement)	[mm]	≥ NF (≥ 240x115x71)
Minimum thickness of member h_{min} =	[mm]	115

Table C 8.1.2: Installation parameters

Anchor size SHARK TWIST		**10**	**12**	**14**
Drill hole diameter d_0 =	[mm]	10	12	14
Cutting diameter of drill bit $d_{cut} \leq$	[mm]	10,45	12,5	14,5
Depth of drill hole to deepest point $h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}		
Drill method	[-]	Hammer drilling		
Overall plastic anchor embedment depth h_{nom} =	[mm]	55	65	75
Diameter of clearance hole in the fixture $d_f \leq$	[mm]	8,5	10,5	12,5
Spacing perpendicular / parallel to free edge $s_{1,min}$ / $s_{2,min} \geq$	[mm]	200 / 250	200 / 250	200 / 250
Minimum edge distance $c_{min} \geq$	[mm]	100	100	100

Table C 8.1.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**10**	**12**	**14**
Mean compressive strength according to EN 771					
Solid brick Mz, ≥ 54,8 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	6,5	7,0	7,5
Solid brick Mz, ≥ 45 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	6,0	6,5	7,0
Solid brick Mz, ≥ 35 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	4,5	5,5	5,5
Solid brick Mz, ≥ 25 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	3,0	4,5	4,0
Solid brick Mz, ≥ 20 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,5	3,5	3,0
Solid brick Mz, ≥ 15 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5	2,5
Solid brick Mz, ≥ 12,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,5	2,0	2,0
Solid brick Mz, ≥ 10 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,2	1,5	1,5
Partial safety factor	γ_{Mm}[2)]	[-]	2,5		

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 6

Performances
Solid masonry: Solid brick Mz, NF
Brick data, installation parameters, characteristic resistance

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Base material hollow masonry: Hollow brick HLz, 2DF

Table C 8.2.1: Brick data

Description of brick	771-1-135	**HLz**
Type of brick		Hollow brick
Bulk density $\rho \geq$	[kg/dm³]	1,2
Standard		EN 771-1:2011+A1:2015
Producer of brick		e.g. Wienerberger GmbH
Format (measurement)	[mm]	≥ 2DF (≥ 240x115x113)
Minimum thickness of member h_{min} =	[mm]	115

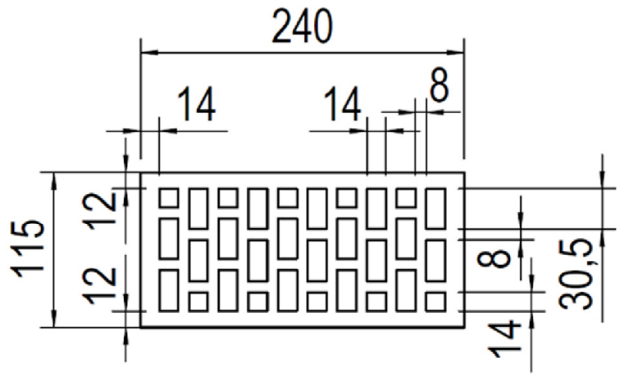

Table C 8.2.2: Installation parameters

Anchor size			**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	10	12	14
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5	14,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}		
Drill method		[-]	Rotary drilling		
Overall plastic anchor embedment depth	h_{nom} =	[mm]	55	65	75
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8,5	10,5	12,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	200 / 250	200 / 250	200 / 250
Minimum edge distance	$c_{min} \geq$	[mm]	100	100	100

Table C 8.2.3: Characteristic resistance F_{Rk}[1)5)8)] in [kN] for single anchor

Anchor size			**10**	**12**	**14**
Mean compressive strength according to EN 771					
Hollow brick HLz, ≥ 24,1 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5	2,5
Hollow brick HLz, ≥ 20 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,5	2,5	2,5
Hollow brick HLz, ≥ 15 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,2	2,0	2,5
Hollow brick HLz, ≥ 12,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	0,9	2,0	2,5
Hollow brick HLz, ≥ 10 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	0,75	1,5	2,0
Partial safety factor	γ_{Mm}[2)]	[-]	2,5		

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 7

Performances
Hollow masonry: Hollow brick HLz, 2DF
Brick data, installation parameters, characteristic resistance

Base material solid masonry: Sand-lime solid brick KS, NF

Table C 8.3.1: Brick data

Description of brick		771-2-011	**KS**
Type of brick			Sand-lime solid brick
Bulk density	$\rho \geq$	[kg/dm³]	1,8
Standard			EN 771-2:2011+A1:2015
Format (measurement)		[mm]	≥ NF (≥ 240x115x71)
Minimum thickness of member	h_{min} =	[mm]	115

Table C 8.3.2: Installation parameters

Anchor size SHARK TWIST			**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	10	12	14
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5	14,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}		
Drill method		[-]	Hammer drilling		
Overall plastic anchor embedment depth	h_{nom} =	[mm]	55	65	75
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8,5	10,5	12,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	200 / 250	200 / 250	200 / 250
Minimum edge distance	$c_{min} \geq$	[mm]	100	100	100

Table C 8.3.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**10**	**12**	**14**
Mean compressive strength according to EN 771					
Sand-lime solid brick KS, ≥ 49,4 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	6,0	6,5	7,0
Sand-lime solid brick KS, ≥ 45 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	6,0	6,5	7,0
Sand-lime solid brick KS, ≥ 35 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	5,0	5,5	5,5
Sand-lime solid brick KS, ≥ 25 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	3,5	4,5	4,0
Sand-lime solid brick KS, ≥ 20 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,5	3,5	3,0
Sand-lime solid brick KS, ≥ 15 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5	2,5
Sand-lime solid brick KS, ≥ 12,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,5	2,0	2,0
Sand-lime solid brick KS, ≥ 10 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,2	1,5	1,5
Partial safety factor	γ_{Mm}[2)]	[-]	2,5		

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 8

Performances
Solid masonry: Sand-lime solid brick KS, NF
Brick data, installation parameters, characteristic resistance

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Base material solid masonry: Sand-lime solid brick KS, 4DF

Table C 8.4.1: Brick data

Description of brick 771-2-048			**KS**
Type of brick			Sand-lime solid brick
Bulk density	$\rho \geq$	[kg/dm³]	1,8
Standard			EN 771-2:2011+A1:2015
Format (measurement)		[mm]	≥ 4DF (≥ 248x175x248)
Minimum thickness of member	h_{min} =	[mm]	175

Table C 8.4.2: Installation parameters

Anchor size SHARK TWIST			**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	10	12	14
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5	14,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}		
Drill method		[-]	Hammer drilling		
Overall plastic anchor embedment depth	h_{nom} =	[mm]	55	65	75
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8,5	10,5	12,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	120 / 240	120 / 240	120 / 240
Minimum edge distance	$c_{min} \geq$	[mm]	100	100	100

Table C 8.4.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**10**	**12**	**14**
Mean compressive strength according to EN 771					
Sand-lime solid brick KS, ≥ 23,4 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	4,5	5,0	5,0
Sand-lime solid brick KS, ≥ 20 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	4,5	5,0	5,0
Sand-lime solid brick KS, ≥ 15 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	4,0	4,0	4,5
Sand-lime solid brick KS, ≥ 12,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	3,5	4,0	4,0
Sand-lime solid brick KS, ≥ 10 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	3,0	3,5	3,5
Partial safety factor	γ_{Mm}[2)]	[-]	2,5		

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 9

Performances
Solid masonry: Sand-lime solid brick KS, 4DF
Brick data, installation parameters, characteristic resistance

Deutsches Institut für Bautechnik DIBt

Base material hollow masonry: Sand-lime perforated brick KSL, 2DF

Table C 8.5.1: Brick data

Description of brick 771-2-054			**KSL**
Type of brick			Sand-lime perforated brick
Bulk density	$\rho \geq$	[kg/dm³]	1,6
Standard			EN 771-2:2011+A1:2015
Format (measurement)		[mm]	≥ 2DF (≥ 240x115x113)
Minimum thickness of member	h_{min} =	[mm]	115

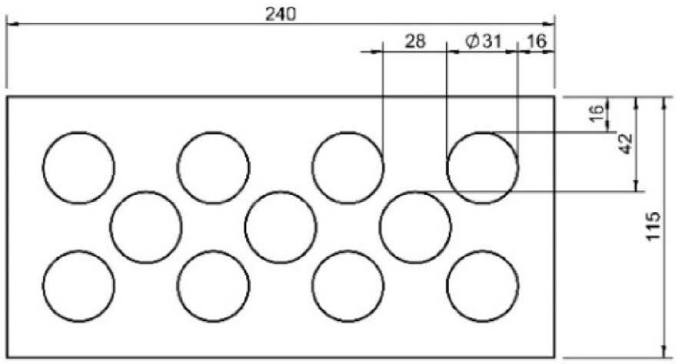

Table C 8.5.2: Installation parameters

Anchor size SHARK TWIST			**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	10	12	14
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5	14,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}		
Drill method		[-]	Rotary drilling		
Overall plastic anchor embedment depth	h_{nom} =	[mm]	55	65	75
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8,5	10,5	12,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	70 / 140	70 / 140	70 / 140
Minimum edge distance	$c_{min} \geq$	[mm]	100	100	100

Table C 8.5.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**10**	**12**	**14**
Mean compressive strength according to EN 771					
Sand-lime perforated brick KSL, ≥ 18,8 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,5	2,5	2,5
Sand-lime perforated brick KSL, ≥ 15 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5	2,5
Sand-lime perforated brick KSL, ≥ 12,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5	2,5
Sand-lime perforated brick KSL, ≥ 10 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,5	2,5	2,5
Partial safety factor	γ_{Mm}[2)]	[-]	2,5		

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST

Annex C 10

Performances
Hollow masonry: Sand-lime perforated brick KSL, 2DF
Brick data, installation parameters, characteristic resistance

Base material hollow masonry: Sand-lime perforated brick KSL, 8DF

Table C 8.6.1: Brick data

Description of brick	771-2-013		**KSL**
Type of brick			Sand-lime perforated brick
Bulk density	$\rho \geq$	[kg/dm³]	1,4
Standard			EN 771-2:2011+A1:2015
Format (measurement)		[mm]	≥ 8DF (≥ 248x240x238)
Minimum thickness of member	h_{min} =	[mm]	240

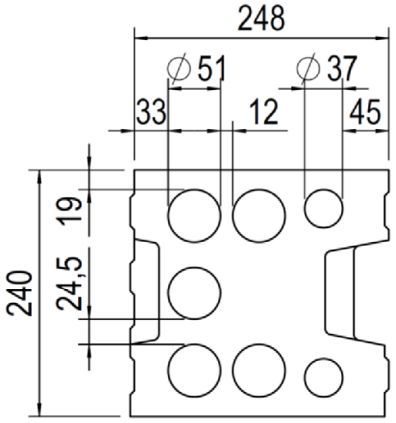

Table C 8.6.2: Installation parameters

Anchor size SHARK TWIST			**12**	**14**
Drill hole diameter	d_0 =	[mm]	12	14
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	14,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}	
Drill method		[-]	Rotary drilling	
Overall plastic anchor embedment depth	h_{nom} =	[mm]	65	75
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	10,5	12,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	130 / 250	130 / 250
Minimum edge distance	$c_{min} \geq$	[mm]	100	100

Table C 8.6.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**12**	**14**
Mean compressive strength according to EN 771				
Sand-lime perforated brick KSL, ≥ 10 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,5	2,5
Sand-lime perforated brick KSL, ≥ 7,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5
Partial safety factor	γ_{Mm}[2)]	[-]	2,5	

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST	**Annex C 11**
Performances **Hollow masonry: Sand-lime perforated brick KSL, 8DF** Brick data, installation parameters, characteristic resistance	

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Base material solid masonry: Lightweight concrete solid bricks and solid blocks V and Vbl, NF

Table C 8.7.1: Brick data

Description of brick	771-3-007		**V and Vbl**
Type of brick			Lightweight concrete solid brick and solid block
Bulk density	$\rho \geq$	[kg/dm³]	1,2
Standard			EN 771-3:2011+A1:2015
Producer of brick			e.g. BisoBims, Bisotherm GmbH Eisenbahnstraße 12 D-56218 Mühlheim-Kärlich
Format (measurement)		[mm]	≥ NF (≥ 240x115x71)
Minimum thickness of member	h_{min} =	[mm]	115

Table C 8.7.2: Installation parameters

Anchor size SHARK TWIST			**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	10	12	14
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5	14,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}		
Drill method		[-]	Hammer drilling		
Overall plastic anchor embedment depth	h_{nom} =	[mm]	55	65	75
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8,5	10,5	12,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	200 / 250	200 / 250	200 / 250
Minimum edge distance	$c_{min} \geq$	[mm]	100	100	100

Table C 8.7.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**10**	**12**	**14**
Mean compressive strength according to EN 771					
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 7,3 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	2,0	2,5	2,5
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,5	2,0	2,0
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 2,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	0,75	1,2	1,5
Partial safety factor	γ_{Mm}[2)]	[-]	2,5		

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST	**Annex C 12**
Performances **Solid masonry: Lightweight concrete solid bricks and solid blocks V and Vbl, NF** Brick data, installation parameters, characteristic resistance	

Base material solid masonry: Lightweight concrete solid bricks and solid blocks V and Vbl, NF

Table C 8.8.1: Brick data

Description of brick	771-3-039	**V and Vbl**
Type of brick		Lightweight concrete solid brick and solid block
Bulk density $\rho \geq$	[kg/dm³]	2,0
Standard		EN 771-3:2011+A1:2015
Producer of brick		e.g. Bisophon, Bisotherm GmbH Eisenbahnstraße 12 D-56218 Mühlheim-Kärlich
Format (measurement)	[mm]	≥ NF (≥ 240x115x71)
Minimum thickness of member h_{min} =	[mm]	115

Table C 8.8.2: Installation parameters

Anchor size SHARK TWIST			**10**	**12**
Drill hole diameter	d_0 =	[mm]	10	12
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5
Depth of drill hole to deepest point	$h_1 \geq$	[mm]	l_s + 5 mm - t_{fix}	
Drill method		[-]	Hammer drilling	
Overall plastic anchor embedment depth	h_{nom} =	[mm]	55	65
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8,5	10,5
Spacing perpendicular / parallel to free edge	$s_{1,min}$ / $s_{2,min} \geq$	[mm]	250 / 250	250 / 250
Minimum edge distance	$c_{min} \geq$	[mm]	150	150

Table C 8.8.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**10**	**12**
Mean compressive strength according to EN 771				
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 29,0 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	6,5	7,0
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 25 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	6,0	7,0
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 20 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	4,5	6,5
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 15 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	3,5	5,0
Lightweight concrete solid bricks and solid blocks V and Vbl, ≥ 12,5 N/mm²	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	3,0	4,0
Partial safety factor	γ_{Mm}[2)]	[-]	2,5	

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST	**Annex C 13**
Performances **Solid masonry: Lightweight concrete solid bricks and solid blocks V and Vbl, NF** Brick data, installation parameters, characteristic resistance	

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Base material precast prestressed hollow core elements

Table C 8.9.1: Brick data

Description of brick		**Precast prestressed hollow core elements**
Base material		Precast prestressed hollow core elements ≥ C30/37
Standard		EN 206:2013 + A1:2016

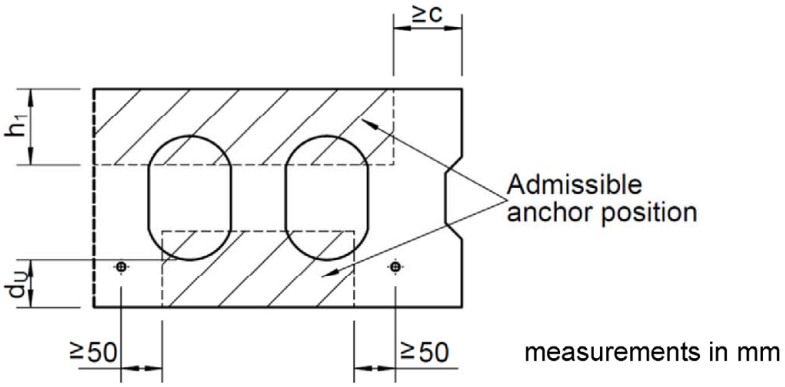

Table C 8.9.2: Installation parameters

Anchor size SHARK TWIST			**6**	**8**	**10**	**12**	**14**
Drill hole diameter	d_0 =	[mm]	6	8	10	12	14
Cutting diameter of drill bit	d_{cut} ≤	[mm]	6,40	8,45	10,45	12,5	14,5
Depth of drill hole to deepest point	h_1 ≥	[mm]	l_s + 5 mm - t_{fix}				
Drill method		[-]	Hammer drilling				
Overall plastic anchor embedment depth	h_{nom} =	[mm]	35	45	55	65	75
Diameter of clearance hole in the fixture	d_f ≤	[mm]	5,5	6,5	8,5	10,5	12,5
Minimum edge distance	c_{min} ≥	[mm]	80	80	80	100	100

Table C 8.9.3: Characteristic resistance F_{Rk}[1)] in [kN] for single anchor

Anchor size SHARK TWIST			**6**	**8**	**10**	**12**	**14**
Precast prestressed hollow core elements, ≥ C30/37 $d_u = h_{nom,red}$ ≥ 25 mm	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	0,75	1,2	1,2	1,2	1,2
Precast prestressed hollow core elements, ≥ C30/37 $d_u = h_{nom,red}$ ≥ 40 mm	F_{Rk}, 30°C[3)] / 50°C[4)]	[kN]	1,5	1,5	1,5	1,5	1,5
Partial safety factor	γ_{Mm}[2)]	[-]	1,8				

Footnotes see Annex C 3

2C Plastic multi-purpose anchor SHARK TWIST	**Annex C 14**
Performances **Precast prestressed hollow core elements** Brick data, installation parameters, characteristic resistance	