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DECLARATION of PERFORMANCE
No 02/CA-H/X/0284/2021

CE

1. *Unique identification code of the product-type*: **CA-H/X**
2. *Intended use:* **Torgue controlled expansion wedge anchor CA-H/X are intended to be used for fastening construction structure to concrete**
3. *Name, registered trade name or registered trade mark and contact address of the manufacturer:* **Marcopol Sp. z o.o. Producer of Bolts str. Oliwska 100, 80-209 Chwaszczyno Poland**
4. *System or systems of assessment and verification of constancy of performance of the construction product:* **System "1" of assessment**
5. *European Technical Assessment:* **ETA 19/0284 issued 21.03.2022**

   Technical Assessment Body: **Instituto de Ciencias de la Construccion Eduardo Torroja**
   Notified Body: **Number: 1219 - Instituto de Ciencias de la Construccion Eduardo Torroja**
   Certificate of Constancy of Performance: **1219-CPR-0223**
6. *Declared performance:*

	Essential characteristic	Performance	Technical Specification
3.1 BWR 1: Mechanical resistance and stability			
3.1.1.	Essential characteristic under static or quasi static loading	see table C3 and C5 below	ETA 19/0284
3.1.2.	Displacements under tension and shear loads	see table C7 and C8 below	ETA 19/0284
3.1.3	Essential characteristic under seismic loading categories C1 and C2	NPD	ETA 19/0284
3.2 BWR 2: Safety in case of fire			
3.2.1.	Reaction to fire	Anchorages satisfy requirements for class A1	EN 13501-1
3.2.2	Resistance to fire	see table C11 below	ETA 19/0284

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Table C3: Essential characteristics under static or quasi-static tension loads according to design method A according to EN 1992-4 for CA-Z/X, CA-H/X, CA-Z/H anchors

Essential characteristics under static or quasi-static tension loads according to design method A				Performances					
				M8	M10	M12	M16	M20	M24
Tension loads: steel failure									
$N_{Rk,s}$	Characteristic resistance:		[kN]	18.1	31.4	40.4	72.7	116.6	179.2
γ_{Ms}	Partial safety factor:		[-]	1.5	1.5	1.5	1.5	1.5	1.5
Tension loads: pull-out failure in concrete									
CA-Z/X anchor									
$N_{Rk,p,ucr}$	Characteristic resistance in C20/25 uncracked concrete:		[kN]	9	16	20	35	50	50
$N_{Rk,p,cr}$	Characteristic resistance in C20/25 cracked concrete:		[kN]	5	9	12	25	30	30
CA-H/X anchor									
$N_{Rk,p,ucr}$	Characteristic resistance in C20/25 uncracked concrete:		[kN]	9	16	30	35	50	--
$N_{Rk,p,cr}$	Characteristic resistance in C20/25 cracked concrete:		[kN]	6	9	16	25	30	--
CA-Z/H anchor									
$N_{Rk,p,ucr}$	Characteristic resistance in C20/25 uncracked concrete:		[kN]	9	16	25	35	50	--
$N_{Rk,p,cr}$	Characteristic resistance in C20/25 cracked concrete:		[kN]	6	9	16	25	30	--
γ_{ins}	Installation safety factor:		[-]	1.2	1.0	1.0	1.0	1.0	1.2
ψ_c	Increasing factor for $N^0_{Rk,p}$:	C30/37	[-]	1.22	1.16	1.22	1.22	1.16	1.22
		C40/50	[-]	1.41	1.31	1.41	1.41	1.31	1.41
		C50/60	[-]	1.55	1.41	1.55	1.55	1.41	1.55
Tension loads: concrete cone and splitting failure									
h_{ef}	Effective embedment depth:		[mm]	48	60	70	85	100	125
$k_{ucr,N}$	Factor for uncracked concrete:		[-]	11.0					
$k_{cr,N}$	Factor for cracked concrete:		[-]	7,7					
γ_{ins}	Installation safety factor:		[-]	1.2	1.0	1.0	1.0	1.0	1.2
$s_{cr,N}$	Concrete cone failure:		[mm]	$3 \times h_{ef}$					
$c_{cr,N}$			[mm]	$1.5 \times h_{ef}$					
$s_{cr,sp}$	Splitting failure:		[mm]	288	300	350	425/510[1)]	500/600[1)]	560
$c_{cr,sp}$			[mm]	144	150	175	213/255[1)]	250/300[1)]	280

[1)] Respective values for anchors CA-Z/X / CA-H/X, CA-Z/H

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Table C5: Essential characteristics under static or quasi-static shear loads of design method A according to EN 1992-4 for CA-Z/X, CA-H/X, CA-Z/H anchors

Essential characteristics under static or quasi-static shear loads according to design method A			Performances					
			M8	M10	M12	M16	M20	M24
Shear loads: steel failure without lever arm								
$V_{Rk,s}$	Characteristic resistance:	[kN]	11.0	17.4	25.3	47.1	73.1	84.7
k_7	Ductility factor:	[-]	1.00					
γ_{Ms}	Partial safety factor:	[-]	1.25	1.25	1.25	1.25	1.25	1.25
Shear loads: steel failure with lever arm								
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	22.5	44.8	78.6	199.8	389.4	673.5
γ_{Ms}	Partial safety factor:	[-]	1.25	1.25	1.25	1.25	1.25	1.25
Shear loads: concrete pryout failure								
k_8	Pryout factor:	[-]	1	2	2	2	2	2
γ_{ins}	Installation safety factor:	[-]	1.00					
Shear loads: concrete edge failure								
l_f	Effective length of anchor under shear loads:	[mm]	48	60	70	85	100	125
d_{nom}	Outside anchor diameter:	[mm]	8	10	12	16	20	24
γ_{ins}	Installation safety factor:	[-]	1.00					

Table C7: Displacements under tension loads for CA-Z/X, CA-H/X, CA-Z/H, CA-X/X anchors

Displacements under tension loads			Performances					
			M8	M10	M12	M16	M20	M24
CA-Z/X anchor								
N	Service tension load:	[kN]	2.5	4.3	6.3	10.4	13.9	18.0
δ_{N0}	Short term displacement:	[mm]	1.1	0.7	1.0	0.4	1.6	0.4
$\delta_{N\infty}$	Long term displacement:	[mm]	1.9	1.9	1.9	1.9	1.9	2.0
CA-H/X anchor								
N	Service tension load:	[kN]	2.5	4.3	6.3	10.4	13.9	--
δ_{N0}	Short term displacement:	[mm]	1.0	1.1	0.9	1.5	1.2	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.9	1.9	1.9	1.9	1.9	--
CA-Z/H anchor								
N	Service tension load:	[kN]	2.5	4.3	7.6	11.9	14.3	--
δ_{N0}	Short term displacement:	[mm]	1.0	1.1	0.9	1.5	1.3	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.6	1.6	1.6	1.6	1.6	--
CA-X/X anchor								
N	Service tension load in non cracked concrete:	[kN]	5.7	7.6	8.7	15.3	19.5	--
δ_{N0}	Short term displacement:	[mm]	1.4	1.4	1.4	1.8	1.8	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.9	1.9	1.9	1.9	1.9	--
CA-X/X anchor								
N	Service tension load in cracked cocnrete:	[kN]	4.0	6.7	7.5	10.7	13.7	--
δ_{N0}	Short term displacement:	[mm]	1.2	1.3	1.3	1.3	1.3	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.7	1.7	1.7	1.7	1.7	--

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Table C8: Displacements under shear load for CA-Z/X, CA-H/X, CA-Z/H, CA-X/X anchors

Displacements under shear loads			Performances					
			M8	M10	M12	M16	M20	M24
CA-Z/X anchor								
V	Service shear load:	[kN]	4.9	6.8	8.5	15.1	24.6	33.6
δ_{V0}	Short term displacement:	[mm]	1.0	1.5	1.8	1.9	3.1	1.4
$\delta_{V\infty}$	Long term displacement:	[mm]	1.5	2.3	2.7	2.9	4.7	2.1
CA-H/X anchor								
V	Service shear load:	[kN]	4.9	6.8	8.5	15.1	24.6	-
δ_{V0}	Short term displacement:	[mm]	1.0	1.5	1.8	1.9	3.1	--
$\delta_{V\infty}$	Long term displacement:	[mm]	1.5	2.3	2.7	2.9	4.7	--
CA-Z/H anchor								
V	Service shear load:	[kN]	4.9	6.8	8.5	15.1	24.6	--
δ_{V0}	Short term displacement:	[mm]	1.0	1.5	1.8	1.9	3.1	--
$\delta_{V\infty}$	Long term displacement:	[mm]	1.5	2.3	2.7	2.9	4.7	--
CA-X/X anchor								
V	Service shear load:	[kN]	6.8	10.8	15.7	31.4	46.9	--
δ_{V0}	Short term displacement:	[mm]	1.9	1.6	1.6	2.2	2.2	--
$\delta_{V\infty}$	Long term displacement:	[mm]	2.4	2.4	2.4	3.3	3.3	--

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Table C11: Essential characteristics under fire exposure CA-Z/X, CA-H/X, CA-Z/H anchors

Essential characteristics under fire exposure				Performances					
				M8	M10	M12	M16	M20	M24
Steel failure									
$N_{Rk,s,fi}$	Characteristic tension resistance:	R30	[kN]	0,4	0,9	1,7	3,1	4,9	7,1
		R60	[kN]	0,3	0,8	1,3	2,4	3,7	5,3
		R90	[kN]	0,3	0,6	1,1	2,0	3,2	4,6
		R120	[kN]	0,2	0,5	0,8	1,6	2,5	3,5
$V_{Rk,s,fi}$	Characteristic shear resistance:	R30	[kN]	0,4	0,9	1,7	3,1	4,9	7,1
		R60	[kN]	0,3	0,8	1,3	2,4	3,7	5,3
		R90	[kN]	0,3	0,6	1,1	2,0	3,2	4,5
		R120	[kN]	0,2	0,5	0,8	1,6	2,5	3,5
$M^0_{Rk,s,fi}$	Characteristic bending resistance:	R30	[Nm]	0,4	1,1	2,6	6,7	13,0	22,5
		R60	[Nm]	0,3	1,0	2,0	5,0	9,7	16,8
		R90	[Nm]	0,3	0,7	1,7	4,3	8,4	14,6
		R120	[Nm]	0,2	0,6	1,3	3,3	6,5	11,2
Pull out failure									
$N_{Rk,p,fi}$	Characteristic resistance:	R30 R60 R90	[kN]	1,3/1,5[3]	2,3	3,0/4,0[3]	6,3	7,5	7,5
		R120	[kN]	1,0/1,2[3]	1,8	2,4/3,2[3]	5,0	6,0	6,0
Concrete cone failure [2]									
$N_{Rk,c,fi}$	Characteristic resistance:	R30 R60 R90	[kN]	2.9	5,0	7,4	12,0	18,0	31,4
		R120	[kN]	2,3	4,0	5,9	9,6	14,4	25,2
$S_{cr,N,fi}$	Critical spacing:	R30 to R120	[mm]	$4 \times h_{ef}$					
$S_{min,fi}$	Minimum spacing:	R30 to R120	[mm]	50	60	70	85/128[1]	100/150[1]	125
$C_{cr,N,fi}$	Critical edge distance:	R30 to R120	[mm]	$2 \times h_{ef}$					
$C_{min,fi}$	Minimum edge distance:	R30 to R120	[mm]	$c_{min} = 2 \times h_{ef}$; if fire attack comes from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ $2 \times h_{ef}$					
Concrete pry out failure									
k_8	Pryout factor:	R30 to R120	[-]	1	2	2	2	2	2

[1] Respective values for anchors CA-Z/X / CA-H/X, CA-Z/H

[2] As a rule, splitting failure can be neglected since cracked concrete and reinforcement is assumed.
In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{m,fi} = 1,0$ is recommended

7. **The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point *6***

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 3.

Signed by:

Chwaszczyno, 12.04.2022

R&D Director

Janusz Kabała

Dyrektor Działu Rozwoju Produktów

Janusz Kabała