

S-IRV – OPTION 1 (cracked concrete)



- *Unique identification code of the product-type:*
SMART S-IRV
- *Type or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):*
See annex 1 to this document
- *Intended uses of the construction product, in accordance with the applicable harmonized technical specification as foreseen by the manufacturer:*

Intended use or uses of the construction product according to ETAG 001 Part 5	
Generic type	Bonded injection type anchor sizes M8, M10, M12, M16, M20, M24, M27, M30 and rebar sizes Ø8mm to Ø32mm.
For use in	<ul style="list-style-type: none"> • Non-cracked concrete. • Cracked and non-cracked concrete for threaded rod size M10, M12, M16, M20, M24 • Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206-1:2000-12
Option / Category	ETAG001 Part 5 Option 1 used as an EAD
Loading	<ul style="list-style-type: none"> • Static, quasi static load • Seismic performance category C1: threaded rod size M10, M12, M16, M20, M24
Use conditions (Environmental conditions)	<ul style="list-style-type: none"> • <u>zinc-plated steel:</u> dry internal conditions only • <u>stainless steel (marking A4):</u> internal and external use without particular aggressive conditions. • <u>highly corrosion resistant steel (marking C):</u> internal and external use with particular aggressive conditions.
Temperature range	Service temperature range: -40°C to +80°C. Maximum short term temperature = +80°C. Maximum long term temperature = +50°C.

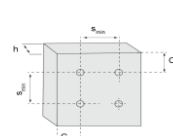
- *Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11 (5):*
pgb-Polska Sp. z o.o. – ul. Fryderyka Wilhelma Redena 3 – 41-807 Zabrze – Polska
- *System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V:*
System 1

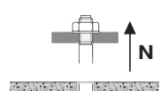
- In case of the declaration of performance concerning a construction product for which European Technical Assessment has been issued:

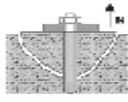
ETA - 17/0141 issued by	TZUS Praha
Body nr	NB 1020
On the basis of	ETAG001 Part 1 and ETAG001 Part 5
Certificate of Conformity issued by	1020-CPR-090-032415
Under System	1

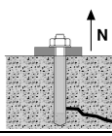
Declared performance – Essential characteristics – Performances



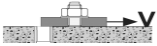
		Installation parameters									
			M8	M10	M12	M16	M20	M24	M27	M30	
	d ₀	Nominal diameter of drill bit	[mm]	10	12	14	18	22	26	30	35
	T _{inst}	Installation torque	[Nm]	10	20	40	80	150	200	240	275
	d _b	Diameter of cleaning brush	[mm]	14	14	20	20	29	29	40	40
	h _{ef,min}	Minimal effective embedment depth	[mm]	64	80	96	128	160	192	216	240
	h ₀	Depth of drilled hole	[mm]	64	80	96	128	160	192	216	240
	s _{min}	Minimum spacing	[mm]	35	40	50	65	80	96	110	120
	c _{min}	Minimum edge distance	[mm]	35	40	50	65	80	96	110	120
	h _{min}	Min. thickness of concrete member	[mm]	h _{ef} + 30 mm ≥ 100 mm				h _{ef} + 2d ₀			
	h _{ef,max}	Maximal effective embedment depth	[mm]	160	200	240	320	400	480	540	600
	h ₀	Depth of drilled hole	[mm]	160	200	240	320	400	480	540	600
	s _{min}	Minimum spacing	[mm]	35	40	50	65	80	96	110	120
	c _{min}	Minimum edge distance	[mm]	35	40	50	65	80	96	110	120
	h _{min}	Min. thickness of concrete member	[mm]	h _{ef} + 30 mm ≥ 100 mm				h _{ef} + 2d ₀			

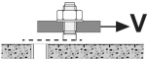
		Tension load: steel failure									
			M8	M10	M12	M16	M20	M24	M27	M30	
	N _{rk,s}	Steel characteristic resistance grade 4.6	[kN]	15	23	34	63	98	141	184	224
	γ _{Ms}	Partial safety factor	[-]	2							
	N _{rk,s}	Steel characteristic resistance grade 5.8	[kN]	18	29	42	79	123	177	230	281
	γ _{Ms}	Partial safety factor	[-]	1,5							
	N _{rk,s}	Steel characteristic resistance grade 8.8	[kN]	29	46	67	126	196	282	367	449
	γ _{Ms}	Partial safety factor	[-]	1,5							
	N _{rk,s}	Steel characteristic resistance grade 10.9	[kN]	37	58	84	157	245	353	459	561
	γ _{Ms}	Partial safety factor	[-]	1,33							
	N _{rk,s}	Steel characteristic resistance A2-70 / A4-70	[kN]	26	41	59	110	172	247	321	393
	γ _{Ms}	Partial safety factor	[-]	1,87							
	N _{rk,s}	Steel characteristic resistance A4-80	[kN]	29	46	67	126	196	282	367	449
	γ _{Ms}	Partial safety factor	[-]	1,6							
	N _{rk,s}	Steel characteristic resistance 1.4529	[kN]	26	41	59	110	172	247	321	393
	γ _{Ms}	Partial safety factor	[-]	1,87							


Tension load: combined pullout and concrete cone failure in concrete												
			M8	M10	M12	M16	M20	M24	M27	M30		
	Characteristic bond resistance in UNCRACKED concrete C20/25											
	Dry and wet concrete											
	TRk	Characteristic bond resistance -40°C to +80°C	[N/mm ²]	10	9,5	9,5	9	8,5	8	6,5	5,5	
	γMc	Partial safety factor	[-]	1,8						2,1		
	Flooded holes											
	TRk	Characteristic bond resistance -40°C to +80°C	[N/mm ²]	8,5	7,5	7	7	6,5	5,5	-	-	
	γMc	Partial safety factor	[-]	2,1								
	ΨC	Increasing factor C30/37	[-]	1								
		Increasing factor C40/50		1								
		Increasing factor C50/60		1								
	Characteristic bond resistance in CRACKED concrete C20/25											
	Dry and wet concrete / flooded holes											
	TRk	Characteristic bond resistance -40°C to +70°C	[N/mm ²]	-	4,5	4,5	4,5	4	4	-	-	
	γMc	Partial safety factor	[-]	1,8								
	Flooded holes											
TRk	Characteristic bond resistance -40°C to +70°C	[N/mm ²]	-	4,5	4,5	4,5	4	4	-	-		
γMc	Partial safety factor	[-]	2,1									
ΨC	Increasing factor C30/37	[-]	1,12									
	Increasing factor C40/50		1,23									
	Increasing factor C50/60		1,3									

Tension load: splitting failure												
			M8	M10	M12	M16	M20	M24	M27	M30		
	C _{cr,sp}	Critical edge distance	[mm]	1,5 · h _{ef}								
	S _{cr,sp}	Critical spacing	[mm]	3 · C _{cr,sp}								
	γ _{Msp}	Partial safety factor	[-]	1,8								

Tension load: displacements											
			M8	M10	M12	M16	M20	M24	M27	M30	
F _{Ucr}	Service tension load in UNCRACKED concrete	[kN]	6,3	7,9	11,9	15,9	23,8	29,8	37,7	45,6	
δ _{N0}	Displacements under short term	[mm]	0,3	0,3	0,3	0,3	0,4	0,5	0,5	0,5	
δ _{N∞}	Displacements under long term	[mm]	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	
F _{cr}	Service tension load in CRACKED concrete	[kN]	-	5,1	7,4	13,1	20,5	24,6	-	-	
δ _{N0}	Displacements under short term	[mm]	-	0,4	0,7	0,7	0,7	0,6	-	-	

		Shear load: steel failure without lever arm									
			M8	M10	M12	M16	M20	M24	M27	M30	
	V _{rk,s}	Steel characteristic resistance grade 4.6	[kN]	7	12	17	31	49	71	92	112
	γ _{Ms}	Partial safety factor	[-]	1,67							
	V _{rk,s}	Steel characteristic resistance grade 5.8	[kN]	9	15	21	39	61	88	115	140
	γ _{Ms}	Partial safety factor	[-]	1,25							
	V _{rk,s}	Steel characteristic resistance grade 8.8	[kN]	15	23	34	63	98	141	184	224
	γ _{Ms}	Partial safety factor	[-]	1,25							
	V _{rk,s}	Steel characteristic resistance grade 10.9	[kN]	18	29	42	79	123	177	230	281
	γ _{Ms}	Partial safety factor	[-]	1,5							
	V _{rk,s}	Steel characteristic resistance A2-70 / A4-70	[kN]	13	20	30	55	86	124	161	196
	γ _{Ms}	Partial safety factor	[-]	1,56							
	V _{rk,s}	Steel characteristic resistance A4-80	[kN]	15	23	34	63	98	141	184	224
	γ _{Ms}	Partial safety factor	[-]	1,33							
	V _{rk,s}	Steel characteristic resistance 1.4529	[kN]	13	20	30	55	86	124	161	196
	γ _{Ms}	Partial safety factor	[-]	1,25							

		Shear load: steel failure with lever arm									
			M8	M10	M12	M16	M20	M24	M27	M30	
	M ⁰ _{Rk,s}	Characteristic resistance grade 4.6	[Nm]	7	12	17	31	49	71	92	112
	γ _{Ms}	Partial safety factor	[-]	1,67							
	M ⁰ _{Rk,s}	Characteristic resistance grade 5.8	[Nm]	9	15	21	39	61	88	115	140
	γ _{Ms}	Partial safety factor	[-]	1,25							
	M ⁰ _{Rk,s}	Characteristic resistance grade 8.8	[Nm]	15	23	34	63	98	141	184	224
	γ _{Ms}	Partial safety factor	[-]	1,25							
	M ⁰ _{Rk,s}	Characteristic resistance grade 10.9	[Nm]	18	29	42	79	123	177	230	281
	γ _{Ms}	Partial safety factor	[-]	1,5							
	M ⁰ _{Rk,s}	Characteristic resistance A2-70 / A4-70	[Nm]	13	20	30	55	86	124	161	196
	γ _{Ms}	Partial safety factor	[-]	1,56							
	M ⁰ _{Rk,s}	Characteristic resistance A4-80	[Nm]	15	23	34	63	98	141	184	224
	γ _{Ms}	Partial safety factor	[-]	1,33							
	M ⁰ _{Rk,s}	Characteristic resistance 1.4529	[Nm]	13	20	30	55	86	124	161	196
	γ _{Ms}	Partial safety factor	[-]	1,25							

		Shear load: concrete pryout failure									
			M8	M10	M12	M16	M20	M24	M27	M30	
	k	K factor	[mm]	2							
	γ _{Mpr}	Partial safety factor	[-]	1,5							

		Shear load: concrete edge failure								
			M8	M10	M12	M16	M20	M24	M27	M30
See section 5.2.3.4 of Technical Report TR 029 for the Design of Bonded Anchors										
γ _{Mc}	Partial safety factor	[-]	1,5							

Shear load: displacements										
			M8	M10	M12	M16	M20	M24	M27	M30
V	Service shear load	[kN]	3,1	5,0	7,2	13,5	21,0	30,3	39,4	48,0
δ_{N0}	Displacements under short term	[mm]	1,5	1,5	1,5	1,5	2,0	2,5	2,5	2,5
$\delta_{N\infty}$	Displacements under long term	[mm]	2,3	2,3	2,3	2,3	3,0	3,8	3,8	3,8

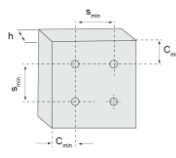
Characteristic values for seismic action



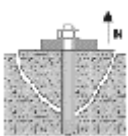
Characteristic bond resistance in under seismic action concrete C20/25										
			M8	M10	M12	M16	M20	M24	M27	M30
Dry and wet concrete / flooded holes										
\overline{f}_{Rk}	Characteristic bond resistance -40°C to +70°C	[N/mm ²]	-	3,5	3,5	3,5	3,5	3,5	-	-
γ_{Mc}	Partial safety factor	[-]	1,8							
Flooded holes										
\overline{f}_{Rk}	Characteristic bond resistance -40°C to +70°C	[N/mm ²]	-	3,5	3,5	3,5	3,5	3,5	-	-
γ_{Mc}	Partial safety factor	[-]	2,1							

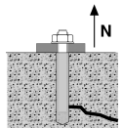
Shear load: steel failure without lever arm										
			M8	M10	M12	M16	M20	M24	M27	M30
$f_{Rk,s}$	Steel characteristic resistance grade 4.6	[kN]	-	7	10	23	30	40	-	-
γ_{Ms}	Partial safety factor	[-]	1,67							
$f_{Rk,s}$	Steel characteristic resistance grade 5.8	[kN]	-	9	13	28	38	51	-	-
γ_{Ms}	Partial safety factor	[-]	1,25							
$f_{Rk,s}$	Steel characteristic resistance grade 8.8	[kN]	-	14	21	45	61	81	-	-
γ_{Ms}	Partial safety factor	[-]	1,25							
$f_{Rk,s}$	Steel characteristic resistance grade 10.9	[kN]	-	18	26	56	76	101	-	-
γ_{Ms}	Partial safety factor	[-]	1,5							
$f_{Rk,s}$	Steel characteristic resistance A2-70 / A4-70	[kN]	-	12	18	39	53	71	-	-
γ_{Ms}	Partial safety factor	[-]	1,56							
$f_{Rk,s}$	Steel characteristic resistance A4-80	[kN]	-	14	21	45	61	81	-	-
γ_{Ms}	Partial safety factor	[-]	1,33							
$f_{Rk,s}$	Steel characteristic resistance 1.4529	[kN]	-	12	18	39	53	71	-	-
γ_{Ms}	Partial safety factor	[-]	1,25							



Installation parameters			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
	d_o	Nominal diameter of drill bit	[mm]	12	14	16	20	25	32	40
	T_{inst}	Installation torque	[Nm]	10	20	40	80	120	180	200
	$h_{ef,min}$	Minimal effective embedment depth	[mm]	64	80	96	128	160	200	256
	h_o	Depth of drilled hole	[mm]	64	80	96	128	160	200	256
	s_{min}	Minimum spacing	[mm]	35	40	50	65	80	100	130
	c_{min}	Minimum edge distance	[mm]	35	40	50	65	80	100	130
	h_{min}	Min. thickness of concrete member	[mm]	$h_{ef} + 30 \text{ mm} \geq 100 \text{ mm}$			$h_{ef} + 2d_o$			
	$h_{ef,max}$	Maximal effective embedment depth	[mm]	160	200	240	320	400	500	640
	h_o	Depth of drilled hole	[mm]	160	200	240	320	400	500	640
	s_{min}	Minimum spacing	[mm]	80	100	120	160	200	250	320
	c_{min}	Minimum edge distance	[mm]	80	100	120	160	200	250	320
	h_{min}	Min. thickness of concrete member	[mm]	$h_{ef} + 30 \text{ mm} \geq 100 \text{ mm}$			$h_{ef} + 2d_o$			

Tension load: steel failure			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
$N_{rk,s}$	Steel characteristic resistance BSt 500 S	[kN]	28	43	62	111	173	270	442
γ_{Ms}	Partial safety factor	[-]	1,4						

Tension load: combined pullout and concrete cone failure in concrete			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
	Characteristic bond resistance in UNCRACKED concrete C20/25									
	Dry and wet concrete									
	T_{Rk}	Characteristic bond resistance -40°C to +70°C	[N/mm ²]	11	9,5	9,5	9	8,5	8,5	5,5
	γ_{Mc}	Partial safety factor	[-]	1,8						
	Flooded holes									
	T_{Rk}	Characteristic bond resistance -40°C to +70°C	[N/mm ²]	11	9,5	9,5	9	8,5	8,5	5,5
	γ_{Mc}	Partial safety factor	[-]	2,1						
	ψ_C	Increasing factor C30/37	[-]	1						
Increasing factor C40/50		1								
Increasing factor C50/60		1								

Tension load: splitting failure			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
	$C_{cr,sp}$	Critical edge distance	[mm]	$1,5 \cdot h_{ef}$						
	$S_{cr,sp}$	Critical spacing	[mm]	$3 \cdot C_{cr,sp}$						
	γ_{Msp}	Partial safety factor	[-]	1,8						

Tension load: displacements			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
F_{Ucr}	Service tension load in UNCRACKED concrete	[kN]	7,9	9,9	13,9	23,8	29,8	55,6	55,6
$\bar{\delta}_{N0}$	Displacements under short term	[mm]	0,3	0,3	0,3	0,4	0,4	0,5	0,5
$\bar{\delta}_{N\infty}$	Displacements under long term	[mm]	0,5	0,5	0,5	0,5	0,5	0,5	0,5

DECLARATION OF PERFORMANCE



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Shear load: steel failure without lever arm										
			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
V _{rk,s}	Steel characteristic resistance Bst 500S	[kN]	14	22	31	55	86	135	221	
γ _{Ms}	Partial safety factor	[-]	1,5							

Shear load: steel failure with lever arm										
			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
V _{rk,s}	Steel characteristic resistance Bst 500S	[Nm]	33	65	112	265	518	1013	2122	
γ _{Ms}	Partial safety factor	[-]	1,5							

Shear load: concrete pryout failure										
			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
k	K factor	[mm]	2							
γ _{Mpr}	Partial safety factor	[-]	1,5							

Shear load: concrete edge failure										
			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
See section 5.2.3.4 of Technical Report TR 029 for the Design of Bonded Anchors										
γ _{Mc}	Partial safety factor	[-]	1,5							

Shear load: displacements										
			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32	
V	Service shear load	[kN]	5,9	9,3	13,3	23,7	37	57,9	94,8	
δ _{N0}	Displacements under short term	[mm]	0,3	0,4	0,4	0,4	0,4	0,5	0,9	
δ _{N∞}	Displacements under long term	[mm]	0,5	0,6	0,6	0,6	0,6	0,8	1,4	

- The performances of the product identified by the above identification code are in conformity with the declared performance. This declaration of performance is issued under the sole responsibility of pgb-Europe nv. Signed for and behalf of the manufacturer by:

Place and date of issue	Signature
Melle, 24/04/2017	nv pgb-Europe sa Gontrode Heirweg 170 9090 MELLE BE 0425 888 396 Johannes Heye, product manager 

Annex 1 : Product overview



ml	language	pgb code	EAN13	
300	NL-FR-EN-DE	SMOIRV300BE	5902134718941	12
410	NL-FR-EN-DE	SMOIRV410BE	5902134718965	12