

Technical Documentation

Sika AnchorFix®-3001

Product Information

Sika Services AG



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CHEMICAL RESISTANCE

The chemical mortar has undergone extensive chemical resistance testing. The results are summarised in the table below.

Chemical Environment	Concentration	Result
Aqueous Solution Acetic Acid	10%	C
Acetone	100%	✘
Aqueous Solution Aluminium Chloride	Saturated	✓
Aqueous Solution Aluminium Nitrate	10%	✓
Ammonia Solution	5%	✓
Jet Fuel	100%	C
Benzene	100%	C
Benzoic Acid	Saturated	✓
Benzyl Alcohol	100%	✘
Sodium Hypochlorite Solution	5 - 15%	✓
Butyl Alcohol	100%	C
Calcium Sulphate Aqueous Solution	Saturated	✓
Carbon Monoxide	Gas	✓
Carbon Tetrachloride	100%	C
Chlorine Water	Saturated	✘
Chloro Benzene	100%	✘
Citric Acid Aqueous Solution	Saturated	✓
Cyclohexanol	100%	✓
Diesel Fuel	100%	C
Diethylene Glycol	100%	✓
Ethanol	95%	✘
Ethanol Aqueous Solution	20%	C
Heptane	100%	C
Hexane	100%	C
Hydrochloric Acid	10%	✓
	15%	✓
	25%	C
Hydrogen Sulphide Gas	100%	✓
Isopropyl Alcohol	100%	✘
Linseed Oil	100%	✓
Lubricating Oil	100%	✓
Mineral Oil	100%	✓
Paraffin / Kerosene (Domestic)	100%	C
Phenol Aqueous Solution	1%	C
Phosphoric Acid	50%	✓
Potassium Hydroxide	10% / pH13	✓
Sea Water	100%	C
Styrene	100%	C
Sulphur Dioxide Solution	10%	✓

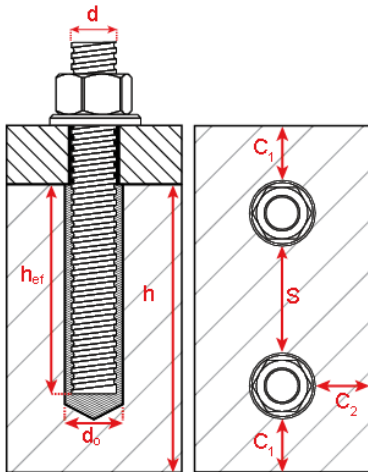
Sulphur Dioxide (40°C)	5%	✓
Sulphuric Acid	10%	✓
	50%	✓
Turpentine	100%	C
White Spirit	100%	✓
Xylene	100%	C

INSTALLATION PARAMETERS THREADED RODS

Size			M10	M12	M16	M20	M24	M30
Nominal drill hole diameter	$\varnothing d_0$	[mm]	12	14	16	22	26	35
Diameter of cleaning brush	d_b	[mm]	S14H/F	S16H/F	S22H/F	S24H/F	S31H/F	S38H/F
Torque moment	T_{inst}	[Nm]	20	40	80	135	200	270
Min. embedment depth								
Depth of drill hole	h_0	[mm]	60	70	80	90	96	120
Effective anchorage depth	h_{ef}	[mm]	60	70	80	90	96	120
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	100	100	115	130	160	200
Max. embedment depth								
Depth of drill hole	h_0	[mm]	200	240	320	400	480	600
Effective anchorage depth	h_{ef}	[mm]	200	240	320	400	480	600
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	224	268	336	444	532	670

REINFORCING BARS

Size			$\varnothing 10$	$\varnothing 12$	$\varnothing 16$	$\varnothing 20$	$\varnothing 25$	$\varnothing 32$
Nominal drill hole diameter	$\varnothing d_0$	[mm]	12	14	16	22	26	35
Diameter of cleaning brush	d_b	[mm]	S14H/F	S16H/F	S22H/F	S24H/F	S31H/F	S38H/F
Torque moment	T_{inst}	[Nm]	20	40	80	135	200	270
Min. embedment depth								
Depth of drill hole	h_0	[mm]	60	70	80	90	100	128
Effective anchorage depth	h_{ef}	[mm]	60	70	80	90	100	128
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	100	100	120	140	164	208
Max. embedment depth								
Depth of drill hole	h_0	[mm]	200	240	320	400	500	640
Effective anchorage depth	h_{ef}	[mm]	200	240	320	400	500	640
Minimum edge distance	c_{min}	[mm]	40	40	45	50	55	65
Minimum spacing	s_{min}	[mm]	40	40	45	50	55	65
Minimum thickness of member	h_{min}	[mm]	228	272	360	450	564	720



STEEL FAILURE INFORMATION THREADED BARS

Characteristic resistance values to tension load

Steel Failure - Characteristic resistance			M10	M12	M16	M20	M24	M30
Size								
Steel grade 5.8	$N_{Rk,s}$	[kN]	29	42	79	123	177	281
Partial safety factor	γ_{Ms}	[-]	1.5					
Steel grade 8.8	$N_{Rk,s}$	[kN]	46	67	126	196	282	449
Partial safety factor	γ_{Ms}	[-]	1.5					
Steel grade 10.9*	$N_{Rk,s}$	[kN]	58	84	157	245	353	561
Partial safety factor	γ_{Ms}	[-]	1.4					
Stainless steel grade A4-70	$N_{Rk,s}$	[kN]	41	59	110	172	247	393
Partial safety factor	γ_{Ms}	[-]	1.9					
Stainless steel grade A4-80	$N_{Rk,s}$	[kN]	46	67	126	196	282	449
Partial safety factor	γ_{Ms}	[-]	1.6					
Stainless steel grade 1,4529	$N_{Rk,s}$	[kN]	41	59	110	172	247	393
Partial safety factor	γ_{Ms}	[-]	1.5					

STEEL FAILURE INFORMATION - REINFORCING BARS

Characteristic resistance values to tension load

Steel Failure - Characteristic resistance			Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
Size								
Rebar BSt 500 S	$N_{Rk,s}$	[kN]	43	62	111	173	270	442
Partial safety factor	γ_{Ms}	[-]	1.4					

USING SIKA ANCHORFIX[®] -3001 WITH THREADED BARS

Combined pullout and concrete cone failure in uncracked concrete C20/25

Size		M10	M12	M16	M20	M24	M30				
Characteristic bond resistance in uncracked concrete											
Characteristic bond resistance dry/wet concrete		τ_{Rk}	[N/mm ²]	12	12	12	12	13	11		
Partial safety factor		γ_{Mc}	[-]	1.8	2.1						
Factor for concrete	C30/37		ψ_c	1.12							
	C40/45							1.23			
	C50/60										

Splitting failure

Size		M10	M12	M16	M20	M24	M30
Edge distance	[mm]	$1.0 * h_{ef} \leq 2.0 * h_{ef} * \left(2.5 - \frac{h}{h_{ef}}\right) \leq 2.4 * h_{ef}$					
Spacing	[mm]	$2 * C_{cr,sp}$					
Partial safety factor	γ_{Msp}	[-]	1.8				

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT VARIOUS EMBEDMENT DEPTHS

using threaded rods in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	96	120
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	22.62	31.67	48.25	67.86	94.10	124.41
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 6d	h_{ef}	mm	60	72	96	120	144	180
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	22.62	32.57	57.91	90.48	141.15	186.61
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	192	240
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	30.16	43.43	77.21	120.64	188.19	248.81
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 10d	h_{ef}	mm	100	120	160	200	240	300
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	37.70	54.29	96.51	150.80	235.24	311.02
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	33.93	49.76	77.21	128.18	205.84	311.02
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	288	360
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	45.24	65.14	115.81	180.96	282.29	373.22
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 14d	h_{ef}	mm	140	168	224	280	336	420
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	52.78	76.00	135.11	211.12	329.34	435.42
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 16d	h_{ef}	mm	160	192	256	320	384	480
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	60.32	86.86	154.42	241.27	376.39	497.63
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 18d	h_{ef}	mm	180	216	288	360	432	540
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	67.86	97.72	173.72	271.43	423.44	559.83
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	480	600
Characteristic Load (Combined concrete cone & pullout failure)	$N_{Rk,p}^0$	kN	75.40	108.57	193.02	301.59	470.48	622.04
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10

¹ Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

² Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

³ Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

⁴ Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

⁵ Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

⁶ The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

⁷ Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT MIN EMBEDMENT DEPTH

USING THREADED RODS IN DRY / WET, UNCRACKED, C20/25 CONCRETE. TEMPERATURE RANGE -40°C TO +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Nominal Anchor Diameter	d	mm	10	12	16	20	24	30
Characteristic Bond Strength	τ_{Rk}	N/mm ²	12.00	12.00	12.00	12.00	13.00	11.00
Effective Embedment Depth	h_{ef}	mm	60	70	80	90	96	120
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	22.62	31.67	48.25	67.86	94.10	124.41
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	120	140	160	180	192	240
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	60	70	80	90	96	120
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	180	210	240	270	288	360
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	90	105	120	135	144	180

¹ Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

² Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

³ Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

⁴ Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

⁵ Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

⁶ Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

⁷ The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

⁸ Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
30	0.53						
35	0.57	0.53					
40	0.60	0.56	0.53				
45	0.64	0.59	0.56	0.53			
50	0.67	0.62	0.58	0.56	0.54		
60	0.75	0.68	0.64	0.60	0.58	0.53	
70	0.83	0.75	0.69	0.65	0.63	0.57	
80	0.91	0.82	0.75	0.70	0.67	0.60	
90	N/R	0.89	0.81	0.75	0.72	0.64	
100		0.96	0.87	0.80	0.77	0.67	
105		N/R	0.90	0.83	0.79	0.69	
110			0.93	0.86	0.82	0.71	
115			0.97	0.88	0.84	0.73	
120			N/R	0.91	0.87	0.75	
125				0.94	0.90	0.77	
130				0.97	0.92	0.79	
135				N/R	0.95	0.81	
140					0.98	0.83	
144					N/R	0.85	
145						0.85	
150						0.87	
160						0.91	
170						0.96	
180						N/R	

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
30	0.59						
35	0.60	0.58					
40	0.62	0.60	0.58				
45	0.63	0.61	0.59	0.58			
50	0.64	0.62	0.60	0.59	0.59		
60	0.67	0.64	0.63	0.61	0.60	0.58	
70	0.70	0.67	0.65	0.63	0.62	0.60	
80	0.73	0.69	0.67	0.65	0.64	0.61	
90	0.75	0.71	0.69	0.67	0.66	0.63	
100	0.78	0.74	0.71	0.69	0.67	0.64	
120	0.84	0.79	0.75	0.72	0.71	0.67	
140	0.89	0.83	0.79	0.76	0.74	0.69	
160	0.95	0.88	0.83	0.80	0.78	0.72	
180	N/R	0.93	0.88	0.83	0.81	0.75	
200		0.98	0.92	0.87	0.85	0.78	
210		N/R	0.94	0.89	0.86	0.79	
225			0.97	0.92	0.89	0.81	
240			N/R	0.94	0.92	0.83	
250				0.96	0.93	0.85	
270				N/R	0.97	0.88	
275					0.98	0.88	
288					N/R	0.90	
300						0.92	
320						0.94	
340						0.97	
360						N/R	

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and " $S_{cr,sp}$ " but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT STD EMBEDMENT DEPTH

using threaded rods in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Nominal Anchor Diameter	d	mm	10	12	16	20	24	30
Characteristic Bond Strength	τ_{Rk}	N/mm ²	12.00	12.00	12.00	12.00	13.00	11.00
Effective Embedment Depth	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	33.93	49.76	77.21	128.18	205.84	311.02
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	180	220	256	340	420	600
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	90	110	128	170	210	300
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	253	304	384	506	630	727
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	126	152	192	253	315	363

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

	X	Anchor Size					
		M10	M12	M16	M20	M24	M30
Close Edge Distance, C (mm)	45	0.55					
	50	0.57					
	55	0.60	0.55				
	60	0.62	0.57				
	65	0.65	0.59	0.54			
	70	0.67	0.61	0.55			
	80	0.73	0.66	0.58			
	85	0.75	0.68	0.60	0.53		
	90	0.78	0.70	0.62	0.55		
	100	0.84	0.74	0.65	0.57		
	105	0.87	0.77	0.67	0.58	0.53	
	120	0.96	0.84	0.72	0.62	0.56	
	126	N/R	0.87	0.74	0.64	0.57	
	130		0.89	0.76	0.65	0.58	
	140		0.94	0.79	0.67	0.60	
	150		0.99	0.83	0.70	0.62	0.58
	152		N/R	0.84	0.70	0.63	0.59
	160			0.87	0.73	0.64	0.60
	170			0.91	0.75	0.66	0.62
	180			0.95	0.78	0.68	0.63
	192			N/R	0.82	0.71	0.66
	200				0.84	0.73	0.67
	225				0.91	0.78	0.72
	253				N/R	0.85	0.77
	275					0.90	0.81
	300					0.96	0.87
	315					N/R	0.90
	325						0.92
	350						0.97
	363						N/R

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

	X	Anchor Size					
		M10	M12	M16	M20	M24	M30
Anchor Spacing Distance, S (mm)	45	0.63					
	50	0.64					
	55	0.65	0.62				
	60	0.66	0.63				
	65	0.67	0.63	0.58			
	70	0.68	0.64	0.59			
	80	0.69	0.66	0.60			
	85	0.70	0.67	0.61	0.58		
	90	0.71	0.67	0.62	0.59		
	100	0.73	0.69	0.63	0.60		
	105	0.74	0.70	0.64	0.60	0.58	
	125	0.77	0.73	0.66	0.62	0.60	
	150	0.82	0.77	0.70	0.65	0.62	0.60
	175	0.86	0.80	0.73	0.67	0.64	0.62
	200	0.91	0.84	0.76	0.70	0.66	0.64
	250	0.99	0.92	0.83	0.75	0.70	0.67
	253	N/R	0.92	0.83	0.75	0.70	0.67
	300		0.99	0.89	0.80	0.74	0.71
	304		N/R	0.90	0.80	0.74	0.71
	350			0.96	0.85	0.78	0.74
	384			N/R	0.88	0.80	0.76
	400				0.90	0.82	0.78
	450				0.94	0.86	0.81
	500				0.99	0.90	0.84
	506				N/R	0.90	0.85
	550					0.94	0.88
	600					0.98	0.91
	630					N/R	0.93
	650						0.95
	727						N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT 20D EMBEDMENT DEPTH

USING THREADED RODS IN DRY / WET, UNCRACKED, C20/25 CONCRETE. TEMPERATURE RANGE -40°C TO +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Nominal Anchor Diameter	d	mm	10	12	16	20	24	30
Characteristic Bond Strength	τ_{Rk}	N/mm ²	12.00	12.00	12.00	12.00	13.00	11.00
Effective Embedment Depth	h_{ef}	mm	200	240	320	400	480	600
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	75.40	108.57	193.02	301.59	470.48	622.04
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	400	480	640	800	960	1200
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	200	240	320	400	480	600
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	253	304	405	506	632	727
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	126	152	202	253	316	363

¹ Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

² Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

³ Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

⁴ Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

⁵ Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

⁶ Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

⁷ The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

⁸ Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
100	0.84						
110	0.90						
120	0.96	0.84					
126	N/R	0.87					
130		0.89					
140		0.94					
150		0.99					
152		N/R					
160			0.84				
170			0.88				
180			0.91				
190			0.95				
200			0.99	0.84			
202			N/R	0.84			
220				0.90			
240				0.96	0.82		
253				N/R	0.85		
260					0.86		
280					0.91		
300					0.96	0.87	
316					N/R	0.90	
320						0.91	
340						0.95	
360						0.99	
363						N/R	

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
100	0.76						
120	0.80	0.76					
140	0.83	0.78					
160	0.86	0.81	0.75				
180	0.89	0.84	0.77				
200	0.92	0.87	0.79	0.74			
220	0.95	0.89	0.81	0.75			
240	0.98	0.92	0.83	0.77	0.71		
253	N/R	0.94	0.84	0.78	0.72		
260		0.94	0.85	0.79	0.72		
280		0.97	0.87	0.81	0.74		
300		N/R	0.89	0.82	0.75	0.73	
304			0.90	0.83	0.76	0.73	
350			0.94	0.87	0.79	0.76	
400			N/R	0.91	0.83	0.79	
405				0.91	0.83	0.80	
450				0.95	0.86	0.83	
500				0.99	0.90	0.86	
506				N/R	0.91	0.86	
550					0.94	0.89	
600					0.98	0.92	
632					N/R	0.94	
650						0.95	
700						0.98	
727						N/R	

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (Cmin) as defined in the ETA.

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.



USING SIKA ANCHORFIX[®] -3001 WITH THREADED BARS

Combined pullout and concrete cone failure in cracked concrete C20/25

Size		M10	M12	M16	M20	M24	M30				
Characteristic bond resistance in cracked concrete											
Characteristic bond resistance dry/wet concrete		τ_{Rk}	[N/mm ²]	9	9	9	6	6	6		
Partial safety factor		γ_{Mc}	[-]	1.8	2.1						
Factor for concrete	C30/37		ψ_c	1.03							
	C40/45							1.06			
	C50/60										

Splitting failure

Size		M10	M12	M16	M20	M24	M30
Edge distance	[mm]	$1.0 * h_{ef} \leq 2.0 * h_{ef} * \left(2.5 - \frac{h}{h_{ef}}\right) \leq 2.4 * h_{ef}$					
Spacing	[mm]	$2 * c_{cr,sp}$					
Partial safety factor	γ_{Msp}	[-]	1.8				

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT VARIOUS EMBEDMENT DEPTHS

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	96	120
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	16.96	23.75	36.19	33.93	43.43	67.86
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 6d	h_{ef}	mm	60	72	96	120	144	180
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	16.96	24.43	43.43	45.24	65.14	101.79
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	192	240
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	22.62	32.57	57.91	60.32	86.86	135.72
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 10d	h_{ef}	mm	100	120	160	200	240	300
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	28.27	40.72	72.38	75.40	108.57	169.65
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	25.45	37.32	57.91	64.09	95.00	169.65
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	288	360
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	33.93	48.86	86.86	90.48	130.29	203.58
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 14d	h_{ef}	mm	140	168	224	280	336	420
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	39.58	57.00	101.34	105.56	152.00	237.50
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 16d	h_{ef}	mm	160	192	256	320	384	480
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	45.24	65.14	115.81	120.64	173.72	271.43
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 18d	h_{ef}	mm	180	216	288	360	432	540
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	50.89	73.29	130.29	135.72	195.43	305.36
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	480	600
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	56.55	81.43	144.76	150.80	217.15	339.29
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10

¹ Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

² Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

³ Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

⁴ Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

⁵ Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

⁶ The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

⁷ Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT MIN EMBEDMENT DEPTH

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Nominal Anchor Diameter	d	mm	10	12	16	20	24	30
Characteristic Bond Strength	τ_{Rk}	N/mm ²	9	9	9	6	6	6
Effective Embedment Depth	h_{ef}	mm	60	70	80	90	96	120
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	22.62	31.67	48.25	67.86	94.10	124.41
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	120	140	160	180	192	240
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	60	70	80	90	96	120
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	180	210	240	270	288	360
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	90	105	120	135	144	180

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
30	0.53						
35	0.57	0.53					
40	0.60	0.56	0.53				
45	0.64	0.59	0.56	0.53			
50	0.67	0.62	0.58	0.56	0.54		
60	0.75	0.68	0.64	0.60	0.58	0.53	
70	0.83	0.75	0.69	0.65	0.63	0.57	
80	0.91	0.82	0.75	0.70	0.67	0.60	
90	N/R	0.89	0.81	0.75	0.72	0.64	
100		0.96	0.87	0.80	0.77	0.67	
105		N/R	0.90	0.83	0.79	0.69	
110			0.93	0.86	0.82	0.71	
120			N/R	0.91	0.87	0.75	
125				0.94	0.90	0.77	
130				0.97	0.92	0.79	
135				N/R	0.95	0.81	
140					0.98	0.83	
144					N/R	0.85	
145						0.85	
150						0.87	
155						0.89	
160						0.91	
165						0.93	
170						0.96	
175						0.98	
180						N/R	

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
30	0.58						
35	0.60	0.58					
40	0.61	0.60	0.58				
45	0.63	0.61	0.59	0.58			
50	0.64	0.62	0.60	0.59	0.59		
60	0.67	0.64	0.63	0.61	0.60	0.58	
70	0.69	0.67	0.65	0.63	0.62	0.60	
80	0.72	0.69	0.67	0.65	0.64	0.61	
90	0.75	0.71	0.69	0.67	0.66	0.63	
100	0.78	0.74	0.71	0.69	0.67	0.64	
120	0.83	0.79	0.75	0.72	0.71	0.67	
140	0.89	0.83	0.79	0.76	0.74	0.69	
160	0.94	0.88	0.83	0.80	0.78	0.72	
180	N/R	0.93	0.88	0.83	0.81	0.75	
200		0.98	0.92	0.87	0.85	0.78	
210		N/R	0.94	0.89	0.86	0.79	
220			0.96	0.91	0.88	0.81	
240			N/R	0.94	0.92	0.83	
260				0.98	0.95	0.86	
270				N/R	0.97	0.88	
280					0.99	0.89	
288					N/R	0.90	
300						0.92	
320						0.94	
340						0.97	
360						N/R	

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and " $S_{cr,Np}$ " but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT STD EMBEDMENT DEPTH

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Nominal Anchor Diameter	d	mm	10	12	16	20	24	30
Characteristic Bond Strength	τ_{Rk}	N/mm ²	9.00	9.00	9.00	6.00	6.00	6.00
Effective Embedment Depth	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	25.45	37.32	57.91	64.09	95.00	169.65
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	180	220	256	340	420	600
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	90	110	128	170	210	300
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	219	263	351	358	429	537
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	110	131	175	179	215	268

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

	X	Anchor Size					
		M10	M12	M16	M20	M24	M30
Close Edge Distance, C (mm)	45	0.58					
	50	0.61					
	55	0.64	0.59				
	60	0.67	0.61				
	65	0.70	0.63	0.56			
	70	0.73	0.66	0.57			
	80	0.80	0.71	0.61			
	85	0.83	0.74	0.63	0.62		
	90	0.86	0.76	0.65	0.64		
	100	0.93	0.82	0.68	0.68		
	105	0.97	0.85	0.70	0.70	0.63	
	110	N/R	0.87	0.72	0.71	0.65	
	120		0.93	0.76	0.75	0.68	
	130		0.99	0.80	0.79	0.71	
	131		N/R	0.81	0.80	0.71	
	140			0.85	0.83	0.74	0.65
	150			0.89	0.87	0.77	0.68
	160			0.93	0.92	0.81	0.70
	170			0.98	0.96	0.84	0.73
	175			N/R	0.98	0.86	0.74
	179				N/R	0.87	0.75
	180					0.87	0.75
	190					0.91	0.78
	200					0.95	0.81
	215					N/R	0.85
	220						0.86
	240						0.92
	260						0.98
268						N/R	

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

	X	Anchor Size					
		M10	M12	M16	M20	M24	M30
Anchor Spacing Distance, S (mm)	45	0.64					
	50	0.65					
	55	0.66	0.63				
	60	0.67	0.63				
	65	0.68	0.64	0.59			
	70	0.69	0.65	0.60			
	80	0.71	0.67	0.61			
	85	0.72	0.68	0.62	0.66		
	90	0.73	0.69	0.63	0.66		
	100	0.75	0.71	0.64	0.68		
	105	0.76	0.72	0.65	0.68	0.65	
	125	0.81	0.75	0.68	0.71	0.67	
	150	0.86	0.80	0.71	0.74	0.70	0.66
	175	0.91	0.84	0.75	0.77	0.72	0.68
	200	0.96	0.89	0.79	0.80	0.75	0.70
	219	N/R	0.92	0.81	0.83	0.77	0.72
	225		0.93	0.82	0.83	0.78	0.72
	250		0.98	0.86	0.87	0.81	0.75
	263		N/R	0.88	0.88	0.82	0.76
	275			0.89	0.90	0.83	0.77
	300			0.93	0.93	0.86	0.79
	351			N/R	0.99	0.92	0.84
	358				N/R	0.92	0.84
	400					0.97	0.88
	429					N/R	0.91
	450						0.92
	500						0.97
	537						N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (Cmin) as defined in the ETA.

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT 20D EMBEDMENT DEPTH

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			M10	M12	M16	M20	M24	M30
Nominal Anchor Diameter	d	mm	10	12	16	20	24	30
Characteristic Bond Strength	τ_{Rk}	N/mm ²	9.00	9.00	9.00	6.00	6.00	6.00
Effective Embedment Depth	h_{ef}	mm	200	240	320	400	480	600
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	56.55	81.43	144.76	150.80	217.15	339.29
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	400	480	640	800	960	1200
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	200	240	320	400	480	600
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	219	263	351	358	429	537
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	110	131	175	179	215	268

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
100		0.93					
110		N/R					
120			0.93				
130			0.99				
131			N/R				
140							
150							
160				0.93			
170				0.98			
175				N/R			
179							
180							
190							
200					N/R		
210							
215							
220							
230							
240						N/R	
250							
260							
268							
270							
280							
290							
300							N/R

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size	Anchor Size					
		M10	M12	M16	M20	M24	M30
100		0.79					
120		0.82	0.78				
140		0.86	0.81				
160		0.90	0.84	0.77			
180		0.93	0.87	0.79			
200		0.97	0.90	0.82	0.83		
219		N/R	0.93	0.84	0.85		
220			0.94	0.84	0.85		
240			0.97	0.87	0.87	0.83	
260			N/R	0.89	0.90	0.84	
263				0.90	0.90	0.85	
280				0.92	0.92	0.86	
300				0.94	0.94	0.88	0.82
325				0.97	0.97	0.91	0.84
350				0.99	0.99	0.93	0.86
351				N/R	0.99	0.93	0.86
358					N/R	0.94	0.86
375						0.95	0.88
400						0.97	0.90
425						0.99	0.92
429						N/R	0.92
450							0.93
475							0.95
500							0.97
525							0.99
537							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.

USING SIKA ANCHORFIX®-3001 WITH REINFORCING BARS

Combined pullout and concrete cone failure in uncracked concrete C20/25

Size		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Characteristic bond resistance in uncracked concrete							
Characteristic bond resistance dry/wet concrete		τ_{Rk}	[N/mm ²]	12	12	13	13
Partial safety factor		γ_{Mc}	[-]	1.8	2.1		
Factor for concrete	C30/37		ψ_c	1.06			
	C40/45			1.11			
	C50/60			1.14			

Splitting failure

Size		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Edge distance	[mm]	$1.0 * h_{ef} \leq 2.0 * h_{ef} * \left(2.5 - \frac{h}{h_{ef}}\right) \leq 2.4 * h_{ef}$					
Spacing	[mm]	$2 * C_{cr,sp}$					
Partial safety factor	γ_{Msp}	[-]	1.8				

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT VARIOUS EMBEDMENT DEPTHS

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	100	128
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	22.62	31.67	52.28	73.51	102.10	167.28
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 6d	h_{ef}	mm	60	72	96	120	150	192
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	22.62	32.57	62.73	98.02	153.15	250.93
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	200	256
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	30.16	43.43	83.64	130.69	204.20	334.57
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 10d	h_{ef}	mm	100	120	160	200	250	320
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	37.70	54.29	104.55	163.36	255.25	418.21
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	33.93	49.76	83.64	138.86	214.41	392.07
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	300	384
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	45.24	65.14	125.46	196.04	306.31	501.85
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 14d	h_{ef}	mm	140	168	224	280	350	448
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	52.78	76.00	146.37	228.71	357.36	585.49
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 16d	h_{ef}	mm	160	192	256	320	400	512
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	60.32	86.86	167.28	261.38	408.41	669.13
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 18d	h_{ef}	mm	180	216	288	360	450	576
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	67.86	97.72	188.19	294.05	459.46	752.78
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	500	640
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	75.40	108.57	209.10	326.73	510.51	836.42
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10

1. Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

2. Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

3. Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

4. Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

5. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

6. The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

7. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT MIN EMBEDMENT DEPTH

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm ²	12.00	12.00	13.00	13.00	13.00	13.00
Effective Embedment Depth	h_{ef}	mm	60	70	80	90	100	128
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	22.62	31.67	52.28	73.51	102.10	167.28
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	120	140	160	180	200	256
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	60	70	80	90	100	128
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	180	210	240	270	300	384
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	90	105	120	135	150	192

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	X	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
30		0.53					
35		0.57	0.53				
40		0.60	0.56	0.53			
45		0.64	0.59	0.56	0.53		
50		0.67	0.62	0.58	0.56	0.53	
60		0.75	0.68	0.64	0.60	0.57	
65		0.79	0.72	0.66	0.63	0.59	0.54
70		0.83	0.75	0.69	0.65	0.62	0.55
80		0.91	0.82	0.75	0.70	0.66	0.58
90		N/R	0.89	0.81	0.75	0.70	0.62
100			0.96	0.87	0.80	0.75	0.65
105				0.90	0.83	0.77	0.67
110				0.93	0.86	0.80	0.69
120				N/R	0.91	0.85	0.72
130					0.97	0.90	0.76
135					N/R	0.92	0.78
140						0.95	0.79
150						N/R	0.83
160							0.87
170							0.91
180							0.95
190							0.99
192							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (Cmin) as defined in the ETA.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	X	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
30		0.59					
35		0.60	0.58				
40		0.62	0.60	0.58			
45		0.63	0.61	0.59	0.58		
50		0.64	0.62	0.60	0.59	0.58	
60		0.67	0.64	0.63	0.61	0.60	
65		0.69	0.65	0.64	0.62	0.61	0.58
70		0.70	0.67	0.65	0.63	0.62	0.59
80		0.73	0.69	0.67	0.65	0.63	0.60
90		0.75	0.71	0.69	0.67	0.65	0.62
100		0.78	0.74	0.71	0.69	0.67	0.63
120		0.84	0.79	0.75	0.72	0.70	0.66
140		0.89	0.83	0.79	0.76	0.73	0.68
160		0.95	0.88	0.83	0.80	0.77	0.71
180		N/R	0.93	0.88	0.83	0.80	0.73
200			0.98	0.92	0.87	0.83	0.76
210			N/R	0.94	0.89	0.85	0.77
220				0.96	0.91	0.87	0.79
240				N/R	0.94	0.90	0.81
260					0.98	0.93	0.84
270					N/R	0.95	0.85
280						0.97	0.86
300						N/R	0.89
320							0.92
340							0.94
360							0.97
380							0.99
384							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT STD EMBEDMENT DEPTH

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm ²	12.00	12.00	13.00	13.00	13.00	13.00
Effective Embedment Depth	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	33.93	49.76	83.64	138.86	214.41	392.07
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	180	220	256	340	420	600
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	90	110	128	170	210	300
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	253	304	384	510	630	843
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	126	152	192	255	315	421

- ^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.
- ^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.
- ^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.
- ^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).
- ^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.
- ^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.
- ^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.
- ^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
45	0.55						
50	0.57						
55	0.60	0.55					
60	0.62	0.57					
65	0.65	0.59	0.54				
70	0.67	0.61	0.55				
80	0.73	0.66	0.58				
85	0.75	0.68	0.60	0.53			
90	0.78	0.70	0.62	0.55			
100	0.84	0.74	0.65	0.57			
105	0.87	0.77	0.67	0.58	0.53		
126	N/R	0.87	0.74	0.63	0.57		
150		0.99	0.83	0.70	0.62	0.55	
152		N/R	0.84	0.70	0.63	0.55	
175			0.93	0.76	0.67	0.58	
192			N/R	0.81	0.71	0.61	
200				0.83	0.73	0.62	
225				0.91	0.78	0.66	
255				N/R	0.85	0.71	
275					0.90	0.74	
300					0.96	0.78	
315					N/R	0.81	
325						0.82	
350						0.87	
375						0.91	
400						0.96	
421						N/R	

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (Cmin) as defined in the ETA.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
45	0.63						
50	0.64						
55	0.65	0.62					
60	0.66	0.63					
65	0.67	0.63	0.58				
70	0.68	0.64	0.59				
80	0.69	0.66	0.60				
85	0.70	0.67	0.61	0.58			
90	0.71	0.67	0.62	0.59			
100	0.73	0.69	0.63	0.60			
105	0.74	0.70	0.64	0.60	0.58		
150	0.82	0.77	0.70	0.65	0.62	0.59	
200	0.91	0.84	0.76	0.70	0.66	0.62	
250	0.99	0.92	0.83	0.75	0.70	0.65	
253	N/R	0.92	0.83	0.75	0.70	0.65	
300		0.99	0.89	0.79	0.74	0.68	
304		N/R	0.90	0.80	0.74	0.68	
350			0.96	0.84	0.78	0.71	
384			N/R	0.88	0.80	0.73	
400				0.89	0.82	0.74	
450				0.94	0.86	0.77	
500				0.99	0.90	0.80	
510				N/R	0.90	0.80	
550					0.94	0.83	
600					0.98	0.86	
630					N/R	0.87	
700						0.92	
750						0.95	
800						0.97	
843						N/R	

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.



TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT 20D EMBEDMENT DEPTH

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm ²	12.00	12.00	13.00	13.00	13.00	13.00
Effective Embedment Depth	h_{ef}	mm	200	240	320	400	500	640
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	75.40	108.57	209.10	326.73	510.51	836.42
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	400	480	640	800	1000	1280
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	200	240	320	400	500	640
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	253	304	421	527	658	843
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	126	152	211	263	329	421

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	X	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
100		0.84					
120		0.96	0.84				
126		N/R	0.87				
140			0.94				
152			N/R				
160				0.82			
180				0.89			
200				0.96	0.82		
211				N/R	0.85		
220					0.87		
240					0.93		
250					0.96	0.82	
263					N/R	0.85	
280						0.88	
300						0.93	
320						0.98	0.82
329						N/R	0.83
340							0.85
360							0.89
380							0.92
400							0.96
421							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	X	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
100		0.76					
120		0.80	0.76				
140		0.83	0.78				
160		0.86	0.81	0.73			
180		0.89	0.84	0.75			
200		0.92	0.87	0.77	0.72		
250		0.99	0.93	0.83	0.76	0.70	
253		N/R	0.94	0.83	0.77	0.71	
300			0.99	0.88	0.81	0.74	
304			N/R	0.88	0.81	0.74	
320				0.90	0.82	0.76	0.69
350				0.93	0.85	0.78	0.71
400				0.98	0.89	0.81	0.74
421				N/R	0.91	0.83	0.75
450					0.94	0.85	0.77
500					0.98	0.89	0.80
527					N/R	0.91	0.81
550						0.92	0.83
600						0.96	0.86
650						0.99	0.89
658						1.00	0.89
700							0.92
750							0.95
800							0.97
843							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.

USING SIKA ANCHORFIX[®] -3001 WITH REINFORCING BARS

Combined pullout and concrete cone failure in cracked concrete C20/25

Size		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Characteristic bond resistance in cracked concrete							
Characteristic bond resistance dry/wet concrete	τ_{Rk}	[N/mm ²]	9	9	7	7	5
Partial safety factor	γ_{Mc}	[-]	1.8	2.1			
Factor for concrete	C30/37	ψ_c	1.04				
	C40/45		1.07				
	C50/60		1.09				

Splitting failure

Size		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Edge distance	[mm]	$1.0 * h_{ef} \leq 2.0 * h_{ef} * \left(2.5 - \frac{h}{h_{ef}}\right) \leq 2.4 * h_{ef}$					
Spacing	[mm]	$2 * C_{cr,sp}$					
Partial safety factor	γ_{Msp}	[-]	1.8				

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT VARIOUS EMBEDMENT DEPTHS

using reinforcing bars in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	100	128
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	16.96	23.75	28.15	39.58	39.27	64.34
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 6d	h_{ef}	mm	60	72	96	120	150	192
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	16.96	24.43	33.78	52.78	58.90	96.51
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	200	256
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	22.62	32.57	45.04	70.37	78.54	128.68
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 10d	h_{ef}	mm	100	120	160	200	250	320
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	28.27	40.72	56.30	87.96	98.17	160.85
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	25.45	37.32	45.04	74.77	82.47	150.80
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	300	384
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	33.93	48.86	67.56	105.56	117.81	193.02
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 14d	h_{ef}	mm	140	168	224	280	350	448
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	39.58	57.00	78.82	123.15	137.44	225.19
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 16d	h_{ef}	mm	160	192	256	320	400	512
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	45.24	65.14	90.08	140.74	157.08	257.36
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 18d	h_{ef}	mm	180	216	288	360	450	576
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	50.89	73.29	101.34	158.34	176.71	289.53
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	500	640
Characteristic Load (Combined concrete cone & pullout failure)	$N_{RK,p}^0$	kN	56.55	81.43	112.59	175.93	196.35	321.70
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10

¹ Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

² Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

³ Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

⁴ Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

⁵ Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

⁶ The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

⁷ Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT MIN EMBEDMENT DEPTH

using reinforcing bars in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm ²	9.00	9.00	7.00	7.00	5.00	5.00
Effective Embedment Depth	h_{ef}	mm	60	70	80	90	100	128
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	16.96	23.75	28.15	39.58	39.27	64.34
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	120	140	160	180	200	256
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	60	70	80	90	100	128
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	180	210	240	270	300	384
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	90	105	120	135	150	192

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	X	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
30		0.53					
35		0.57	0.53				
40		0.60	0.56	0.53			
45		0.64	0.59	0.56	0.53		
50		0.67	0.62	0.58	0.56	0.53	
60		0.75	0.68	0.64	0.60	0.57	
65		0.79	0.72	0.66	0.63	0.59	0.54
70		0.83	0.75	0.69	0.65	0.62	0.55
80		0.91	0.82	0.75	0.70	0.66	0.58
90		N/R	0.89	0.81	0.75	0.70	0.62
100			0.96	0.87	0.80	0.75	0.65
105			N/R	0.90	0.83	0.77	0.67
110				0.93	0.86	0.80	0.69
115				0.97	0.88	0.82	0.70
120				N/R	0.91	0.85	0.72
125					0.94	0.87	0.74
130					0.97	0.90	0.76
135					N/R	0.92	0.78
140						0.95	0.79
145						0.97	0.81
150						N/R	0.83
155							0.85
160							0.87
165							0.89
170							0.91
175							0.93
180							0.95
185							0.97
190							0.99
192							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (Cmin) as defined in the ETA.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	X	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
30		0.58					
35		0.60	0.58				
40		0.61	0.60	0.58			
45		0.63	0.61	0.59	0.58		
50		0.64	0.62	0.60	0.59	0.58	
60		0.67	0.64	0.63	0.61	0.60	
65		0.68	0.65	0.64	0.62	0.61	0.58
70		0.69	0.67	0.65	0.63	0.62	0.59
80		0.72	0.69	0.67	0.65	0.63	0.60
90		0.75	0.71	0.69	0.67	0.65	0.62
100		0.78	0.74	0.71	0.69	0.67	0.63
120		0.83	0.79	0.75	0.72	0.70	0.66
140		0.89	0.83	0.79	0.76	0.73	0.68
160		0.94	0.88	0.83	0.80	0.77	0.71
180		N/R	0.93	0.88	0.83	0.80	0.73
200			0.98	0.92	0.87	0.83	0.76
210			N/R	0.94	0.89	0.85	0.77
220				0.96	0.91	0.87	0.79
240				N/R	0.94	0.90	0.81
260					0.98	0.93	0.84
270					N/R	0.95	0.85
280						0.97	0.86
300						N/R	0.89
320							0.92
340							0.94
360							0.97
380							0.99
384							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT STD EMBEDMENT DEPTH

using reinforcing bars in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm ²	9.00	9.00	7.00	7.00	5.00	5.00
Effective Embedment Depth	h_{ef}	mm	90	110	128	170	210	300
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	25.45	37.32	45.04	74.77	82.47	150.80
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	180	220	256	340	420	600
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	90	110	128	170	210	300
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	219	263	309	386	408	523
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	110	131	155	193	204	261

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
45		0.58					
50		0.61					
55		0.64	0.59				
60		0.67	0.61				
65		0.70	0.63	0.59			
70		0.73	0.66	0.61			
80		0.80	0.71	0.65			
85		0.83	0.74	0.67	0.60		
90		0.86	0.76	0.69	0.62		
100		0.93	0.82	0.74	0.65		
105		0.97	0.85	0.76	0.67	0.65	
110		N/R	0.87	0.78	0.68	0.66	
120			0.93	0.83	0.72	0.70	
131			N/R	0.88	0.76	0.73	
140				0.93	0.79	0.76	
150				0.98	0.83	0.80	0.69
155				N/R	0.85	0.82	0.70
160					0.87	0.83	0.71
170					0.91	0.87	0.74
180					0.95	0.91	0.77
193					N/R	0.96	0.80
200						0.98	0.82
204						N/R	0.83
210							0.85
220							0.88
230							0.91
240							0.94
250							0.97
260							0.99
261							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
45		0.64					
50		0.65					
55		0.66	0.63				
60		0.67	0.63				
65		0.68	0.64	0.63			
70		0.69	0.65	0.64			
80		0.71	0.67	0.66			
85		0.72	0.68	0.66	0.62		
90		0.73	0.69	0.67	0.63		
100		0.75	0.71	0.69	0.64		
105		0.76	0.72	0.69	0.65	0.67	
125		0.81	0.75	0.72	0.67	0.70	
150		0.86	0.80	0.76	0.70	0.72	0.68
175		0.91	0.84	0.80	0.74	0.75	0.70
200		0.96	0.89	0.84	0.77	0.78	0.72
219		N/R	0.92	0.87	0.79	0.80	0.74
225			0.93	0.87	0.80	0.80	0.74
250			0.98	0.91	0.83	0.83	0.77
263			N/R	0.93	0.85	0.85	0.78
275				0.95	0.86	0.86	0.79
300				0.99	0.89	0.89	0.81
309				N/R	0.90	0.90	0.82
350					0.95	0.94	0.85
386					N/R	0.98	0.88
400						0.99	0.90
408						N/R	0.90
450							0.94
500							0.98
523							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.

TENSION LOAD CALCULATIONS FOR COMBINED CONCRETE CONE & PULLOUT FAILURE AT 20D EMBEDMENT DEPTH

using reinforcing bars in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +40°C.

Property	Symbol	Unit	Anchor Size					
			Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm ²	9.00	9.00	7.00	7.00	5.00	5.00
Effective Embedment Depth	h_{ef}	mm	200	240	320	400	500	640
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N_{Rk,p}^0$	kN	56.55	81.43	112.59	175.93	196.35	321.70
Partial Safety Factor	γ_{Mc}	-	1.80	2.10	2.10	2.10	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	400	480	640	800	1000	1280
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	200	240	320	400	500	640
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	219	263	309	386	408	523
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	110	131	155	193	204	261

^{1.} Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.

^{2.} Characteristic edge distance for splitting failure assumes $h/h_{ef} = 2.0$.

^{3.} Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.

^{4.} Tabulated values are valid for temperature range -40°C to +40°C (Max LTT = +24°C; Max STT = +40°C).

^{5.} Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.

^{6.} Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.

^{7.} The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.

^{8.} Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
100	0.93						
110	N/R						
120		0.93					
131		N/R					
140							
150							
155							
160			N/R				
170							
180							
193							
200				N/R			
204							
210							
220							
230							
240							
250					N/R		
261							
270							
280							
290							
300							
310							
320							
330							
340							
350							
360							
370							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Close edge distances must exceed or be equal to the minimum close edge distance (Cmin) as defined in the ETA.

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size	Anchor Size					
		Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
100	0.79						
120	0.82	0.78					
140	0.86	0.81					
160	0.90	0.84	0.81				
180	0.93	0.87	0.84				
200	0.97	0.90	0.86	0.81			
219	N/R	0.93	0.89	0.83			
225		0.94	0.90	0.83			
250		0.98	0.93	0.86	0.85		
263		N/R	0.94	0.87	0.87		
275			0.96	0.88	0.88		
300			0.99	0.91	0.90		
309			N/R	0.92	0.91		
325				0.94	0.92		
350				0.96	0.95		
370				0.98	0.97	0.89	
375				0.99	0.97	0.89	
386				N/R	0.98	0.90	
400					0.99	0.91	
408					N/R	0.92	
425						0.93	
450						0.95	
475						0.97	
500						0.98	
523							N/R

1. Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.
2. Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "Scr,Np" but without close edge considerations.
3. Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.
4. Interpolation is allowed.
5. Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.
6. Anchor spacing distances must exceed or be equal to the minimum anchor spacing (Smin) as defined in the ETA.

USING SIKA ANCHORFIX[®] -3001 WITH POST-INSTALLED REBAR CONNECTIONS

Installation parameters

Rebar		Drill Hole (mm)	Cleaning Brush* (mm)	Min. Anchorage Length (mm)	Min. Lap/Splice Length (mm)	Max. Embedment Depth (mm)
Diameter (mm)	$f_{y,k}$ (N/mm ²)					
8	500	12	S12/13HF	170	300	400
10	500	14	S14/15HF	212	300	500
12	500	16	S18HF	255	300	600
14	500	18	S22HF	298	315	700
16	500	20	S22HF	340	360	800
20	500	25	S27HF	425	450	1000
25	500	32	S35HF	532	563	1000
28	500	35	S38HF	595	630	1000
32	500	40	S43HF	681	720	1000
40	500	55	S58HF	851	900	1000

DESIGN BOND STRENGTH VALUES

Design values of the ultimate bond resistance f_{bd} in N/mm² for rotary hammer drilling and compressed air drilling for good bond conditions.

Rebar \varnothing (mm)	Concrete Class													
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60					
8	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3					
10														
12														
14														
16														
20										3.7				
25										3.0				
28										2.7				
32										2.3				
40										1.6				

*Tabulated values for f_{bd} are valid for good bond conditions according to EN 1992-1-1. For all other bond conditions multiply the values for f_{bd} by 0.7

Important Notes

Use in Porous Substrates

This bonded anchor is not intended for use as a cosmetic or decorative product. When anchoring into porous or reconstituted stone it is recommended that technical assistance is sought. Due to the nature of the product, migration of the monomer in the resin may cause staining in certain materials. If you are still uncertain, it is advisable to test the resin by applying it in a small, discrete area and testing before using the resin on the project.

Important Note

Whilst all reasonable care is taken in compiling technical data on the Company's products, all recommendations or suggestions regarding the use of such products are made without guarantee, since the conditions of use are beyond the control of the Company. It is the customer's responsibility to satisfy himself that each product is fit for the purpose for which he intends to use it, that the actual conditions of use are suitable and that, in the light of our continual research and development programme the information relating to each product has not been superseded.

Technical Documentation

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