Technical Documentation

Sika AnchorFix®-3030

Product Information

Sika Services AG

BUILDING TRUST

TABLE OF CONTENTS

CHEMICAL RESISTANCE

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%	✓
Isoproyl 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

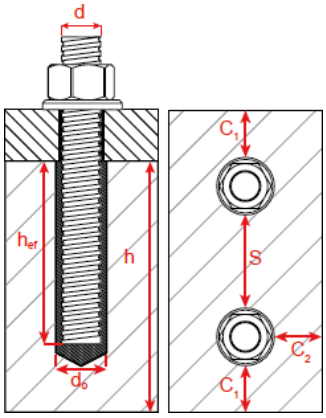
✓ *= Resistant to 75°C with at least 80% of physical properties retained.*

C *= Contact only to a maximum of 25°C.*

✗ *= Not resistant*

INSTALLATION PARAMETERS - THREADED RODS

Property			Anchor Diameter							
			M8	M10	M12	M16	M20	M24	M27	M30
Nominal Drill Hole Diameter	d_0	mm	10	12	14	18	22	26	30	35
Cleaning Brush Diameter	d_b	mm	S11HF	S14HF	S14/15HF	S22HF	S24HF	S31HF	S31HF	S38HF
Torque Moment	T_{inst}	Nm	10	20	40	80	120	160	180	200
Minimum Embedment Depth										
Effective Embedment Depth	h_{ef}	mm	60	60	70	80	90	96	108	120
Minimum Edge Distance	c_{min}	mm	40	40	40	40	50	50	50	50
Minimum Anchor Spacing	s_{min}	mm	40	40	40	40	50	50	50	50
Minimum Member Thickness	h_{min}	mm	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + $2d_0$				
Maximum Embedment Depth										
Effective Embedment Depth	h_{ef}	mm	160	200	240	320	400	480	540	600
Minimum Edge Distance	c_{min}	mm	80	100	120	160	200	240	270	300
Minimum Anchor Spacing	s_{min}	mm	80	100	120	160	200	240	270	300
Minimum Member Thickness	h_{min}	mm	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + $2d_0$				



INSTALLATION PARAMETERS - REBARS

Property			**Anchor Diameter**						
			8mm	**10mm**	**12mm**	**16mm**	**20mm**	**25mm**	**32mm**
Nominal Drill Hole Diameter	d_0	mm	12	14	16	20	25	32	40
Cleaning Brush Diameter	d_b	mm	S12/13HF	S14/15HF	S18HF	S22HF	S27HF	S35HF	S43HF
Torque Moment	T_{inst}	Nm	10	20	40	80	120	180	200
Minimum Embedment Depth									
Effective Embedment Depth	h_{ef}	mm	60	60	70	80	90	100	128
Minimum Edge Distance	c_{min}	mm	40	40	40	40	50	50	50
Minimum Anchor Spacing	s_{min}	mm	40	40	40	40	50	50	50
Minimum Member Thickness	h_{min}	mm	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$		
Maximum Embedment Depth									
Effective Embedment Depth	h_{ef}	mm	160	200	240	320	400	500	640
Minimum Edge Distance	c_{min}	mm	80	100	120	160	200	250	320
Minimum Anchor Spacing	s_{min}	mm	80	100	120	160	200	250	320
Minimum Member Thickness	h_{min}	mm	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$		

STEEL FAILURE IN TENSION - THREADED RODS

Characteristic resistance values under tension loading

Steel Grade			Anchor Diameter							
			M8	M10	M12	M16	M20	M24	M27	M30
Steel Grade 4.6	$N_{Rk,s}$	(kN)	15	23	34	63	98	141	184	224
Partial Safety Factor	γ_{Ms}	(-)	2,00							
Steel Grade 5.8	$N_{Rk,s}$	(kN)	18	29	42	79	123	177	230	281
Partial Safety Factor	γ_{Ms}	(-)	1,50							
Steel Grade 8.8	$N_{Rk,s}$	(kN)	29	46	67	126	196	282	367	449
Partial Safety Factor	γ_{Ms}	(-)	1,50							
Steel Grade 10.9*	$N_{Rk,s}$	(kN)	37	58	84	157	245	353	459	561
Partial Safety Factor	γ_{Ms}	(-)	1,33							
Stainless Steel A2-70, A4-70	$N_{Rk,s}$	(kN)	26	41	59	110	172	247	321	393
Partial Safety Factor	γ_{Ms}	(-)	1,87							
Stainless Steel A4-80	$N_{Rk,s}$	(kN)	29	46	67	126	196	282	367	449
Partial Safety Factor	γ_{Ms}	(-)	1,60							
Stainless Steel 1.4529	$N_{Rk,s}$	(kN)	26	41	59	110	172	247	321	393
Partial Safety Factor	γ_{Ms}	(-)	1,50							
Stainless Steel 1.4565	$N_{Rk,s}$	(kN)	26	41	59	110	172	247	321	393
Partial Safety Factor	γ_{Ms}	(-)	1,87							

**Galvanised rod of high strength are sensitive to hydrogen embrittlement*

STEEL FAILURE IN TENSION - REINFORCING BARS

Characteristic resistance values under tension loading

Steel Grade			Anchor Diameter						
			8mm	10mm	12mm	16mm	20mm	25mm	32mm
Rebar BSt 500	$N_{Rk,s}$	(kN)	28	43	62	111	173	270	442
Partial Safety Factor	γ_{Ms}	(-)	1,40						

CHARACTERISTIC RESISTANCE - COMBINED PULLOUT & CONCRETE CONE FAILURE USING THREADED RODS

Dry / Wet Concrete | Temperature Range: -40°C to +70°C

Property				Anchor Diameter							
				M8	M10	M12	M16	M20	M24	M27	M30
Characteristic Bond Strength in Uncracked Concrete		τ_{Rk}	N/mm²	17,0	15,0	15,0	12,0	12,0	12,0	11,0	9,5
Factor for Uncracked Concrete Strength	C25/30	ψ_c	-	1,02							
	C30/37			1,04							
	C35/45			1,06							
	C40/50			1,07							
	C45/55			1,08							
	C50/60			1,09							
Partial Safety Factor		γ_{Mp}	-	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Characteristic Bond Strength in Cracked Concrete		τ_{Rk}	N/mm²	10,0	10,0	10,0	9,5	9,0	9,0	6,0	6,0
Factor for Cracked Concrete Strength	C25/30	ψ_c	-	1,02							
	C30/37			1,04							
	C35/45			1,06							
	C40/50			1,07							
	C45/55			1,08							
	C50/60			1,09							
Partial Safety Factor		γ_{Mp}	-	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5

SPLITTING FAILURE

Property			Anchor Diameter							
			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic Edge Distance	$c_{cr,sp}$	mm	$2h_{ef}$							
Characteristic Anchor Spacing	$s_{cr,sp}$	mm	$2c_{cr,sp}$							
Partial Safety Factor	γ_{Msp}	-	1,8							

RESISTANCE VALUES FOR THREADED RODS IN UNCRACKED CONCRETE

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter							
			M8	M10	M12	M16	M20	M24	M27	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	96	108	120
Characteristic Resistance	N_{Rk}	kN	23,47	23,47	29,58	36,13	43,12	47,50	56,68	66,38
Design Resistance	N_{Rd}	kN	15,65	15,65	19,72	24,09	28,75	31,67	37,79	44,26
Controlling Resistance			Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	216	240
Characteristic Resistance	N_{Rk}	kN	25,86	36,13	47,50	73,13	102,20	134,35	160,31	187,76
Design Resistance	N_{Rd}	kN	17,24	24,09	31,67	48,75	68,14	89,57	106,88	125,17
Controlling Resistance			Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	240	270	300
Characteristic Resistance	N_{Rk}	kN	34,18	42,41	58,26	73,13	111,93	187,76	224,05	262,41
Design Resistance	N_{Rd}	kN	22,79	28,27	38,84	48,75	74,62	125,17	149,36	174,94
Controlling Resistance			Pullout	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	324	360
Characteristic Resistance	N_{Rk}	kN	41,02	56,55	81,43	115,81	180,96	246,82	294,52	322,33
Design Resistance	N_{Rd}	kN	27,34	37,70	54,29	77,21	120,64	164,55	196,34	214,88
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Pullout	Concrete Cone	Concrete Cone	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	480	540	600
Characteristic Resistance	N_{Rk}	kN	68,36	94,25	135,72	193,02	301,59	434,29	503,85	537,21
Design Resistance	N_{Rd}	kN	45,57	62,83	90,48	128,68	201,06	289,53	335,90	358,14
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Pullout	Pullout	Pullout	Pullout

1. *Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR029. Resistance for steel failure must also be considered - the lowest value controls.*
2. *Resistance values are for single anchors without close edges or eccentric loading considerations.*
3. *Tabulated values correspond to the above stated temperature range and installation conditions only.*
4. *Long term temperatures are these that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.*
5. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm².*
6. *Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

RESISTANCE VALUES FOR THREADED RODS IN CRACKED CONCRETE

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter							
			M8	M10	M12	M16	M20	M24	M27	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	96	108	120
Characteristic Resistance	N_{Rk}	kN	15,08	16,73	21,08	25,76	30,74	33,86	40,41	47,32
Design Resistance	N_{Rd}	kN	10,05	11,15	14,06	17,17	20,49	22,57	26,94	31,55
Controlling Resistance			Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	216	240
Characteristic Resistance	N_{Rk}	kN	16,08	25,13	33,86	52,13	72,86	95,78	109,93	133,85
Design Resistance	N_{Rd}	kN	10,72	16,76	22,57	34,76	48,57	63,85	73,29	89,23
Controlling Resistance			Pullout	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Pullout	Concrete Cone
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	240	270	300
Characteristic Resistance	N_{Rk}	kN	20,11	28,27	41,47	52,13	79,80	133,85	137,41	169,65
Design Resistance	N_{Rd}	kN	13,40	18,85	27,65	34,76	53,20	89,23	91,61	113,10
Controlling Resistance			Pullout	Pullout	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Pullout	Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	324	360
Characteristic Resistance	N_{Rk}	kN	24,13	37,70	54,29	91,68	133,85	175,95	164,90	203,58
Design Resistance	N_{Rd}	kN	16,08	25,13	36,19	61,12	89,23	117,30	109,93	135,72
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Concrete Cone	Concrete Cone	Pullout	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	480	540	600
Characteristic Resistance	N_{Rk}	kN	40,21	62,83	90,48	152,81	226,19	325,72	274,83	339,29
Design Resistance	N_{Rd}	kN	26,81	41,89	60,32	101,87	150,80	217,15	183,22	226,19
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Pullout	Pullout	Pullout	Pullout

1. *Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR029. Resistance for steel failure must also be considered - the lowest value controls.*
2. *Resistance values are for single anchors without close edges or eccentric loading considerations.*
3. *Tabulated values correspond to the above stated temperature range and installation conditions only.*
4. *Long term temperatures are these that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.*
5. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm².*
6. *Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Property			Anchor Diameter		
			M12	M16	M20
Characteristic Bond Strength in Cracked Concrete under Seismic action (Performance Category C1)	τ_{Rk}	N/mm²	5,2	6,6	6,8
Partial Safety Factor	γ_{Mp}	-	1,5	1,5	1,5

RESISTANCE VALUES TO TENSION LOADS FOR THREADED RODS IN CRACKED CONCRETE

Seismic loading category C1

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter		
			M12	M16	M20
Effective Embedment Depth = MIN	h_{ef}	mm	70	80	90
Characteristic Resistance	N_{Rk}	kN	13,72	25,76	30,74
Design Resistance	N_{Rd}	kN	9,15	17,17	20,49
Controlling Resistance			Pullout	Concrete Cone	Concrete Cone
Effective Embedment Depth = 8d	h_{ef}	mm	96	128	160
Characteristic Resistance	N_{Rk}	kN	18,82	42,46	68,36
Design Resistance	N_{Rd}	kN	12,55	28,31	45,57
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = STD	h_{ef}	mm	110	128	170
Characteristic Resistance	N_{Rk}	kN	21,56	42,46	72,63
Design Resistance	N_{Rd}	kN	14,38	28,31	48,42
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	144	192	240
Characteristic Resistance	N_{Rk}	kN	28,23	63,70	102,54
Design Resistance	N_{Rd}	kN	18,82	42,46	68,36
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	240	320	400
Characteristic Resistance	N_{Rk}	kN	47,05	106,16	170,90
Design Resistance	N_{Rd}	kN	31,37	70,77	113,94
Controlling Resistance			Pullout	Pullout	Pullout

1. *Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR029. Resistance for steel failure must also be considered - the lowest value controls.*
2. *Resistance values are for single anchors without close edges or eccentric loading considerations.*
3. *Tabulated values correspond to the above stated temperature range and installation conditions only.*
4. *Long term temperatures are these that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.*
5. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm².*
6. *Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure*

Property			Anchor Diameter		
			M12	M16	M20
Characteristic Bond Strength in Cracked Concrete under Seismic action (Performance Category C2)	τ_{Rk}	N/mm²	3,5	4,0	4,5
Partial Safety Factor	γ_{Mp}	-	1,5	1,5	1,5

RESISTANCE VALUES TO TENSION LOADS FOR THREADED RODS IN CRACKED CONCRETE

Seismic loading category C2

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter		
			M12	M16	M20
Effective Embedment Depth = MIN	h_{ef}	mm	70	80	90
Characteristic Resistance	N_{Rk}	kN	9,24	16,08	25,45
Design Resistance	N_{Rd}	kN	6,16	10,72	16,96
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 8d	h_{ef}	mm	96	128	160
Characteristic Resistance	N_{Rk}	kN	12,67	25,74	45,24
Design Resistance	N_{Rd}	kN	8,44	17,16	30,16
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = STD	h_{ef}	mm	110	128	170
Characteristic Resistance	N_{Rk}	kN	14,51	25,74	48,07
Design Resistance	N_{Rd}	kN	9,68	17,16	32,04
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	144	192	240
Characteristic Resistance	N_{Rk}	kN	19,00	38,60	67,86
Design Resistance	N_{Rd}	kN	12,67	25,74	45,24
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	240	320	400
Characteristic Resistance	N_{Rk}	kN	31,67	64,34	113,10
Design Resistance	N_{Rd}	kN	21,11	42,89	75,40
Controlling Resistance			Pullout	Pullout	Pullout

1. *Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR029. Resistance for steel failure must also be considered - the lowest value controls.*
2. *Resistance values are for single anchors without close edges or eccentric loading considerations.*
3. *Tabulated values correspond to the above stated temperature range and installation conditions only.*
4. *Long term temperatures are these that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.*
5. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm².*
6. *Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure*

CHARACTERISTIC RESISTANCE - COMBINED PULLOUT & CONCRETE CONE FAILURE USING REINFORCING BARS

Dry / Wet Concrete | Temperature Range:-40°C to +70°C

Property				Anchor Diameter						
				8mm	10mm	12mm	16mm	20mm	25mm	32mm
Characteristic Bond Strength in Uncracked Concrete		τ_{Rk}	N/mm²	13,0	13,0	13,0	12,0	12,0	12,0	8,0
Factor for Uncracked Concrete Strength	C25/30	ψ_c	-	1,02						
	C30/37			1,04						
	C35/45			1,06						
	C40/50			1,07						
	C45/55			1,08						
	C50/60			1,09						
Partial Safety Factor		γ_{Mp}	-	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Characteristic Bond Strength in Cracked Concrete		τ_{Rk}	N/mm²	8,0	11,0	10,0	10,0	10,0	8,5	6,5
Factor for Cracked Concrete Strength	C25/30	ψ_c	-	1,02						
	C30/37			1,04						
	C35/45			1,06						
	C40/50			1,07						
	C45/55			1,08						
	C50/60			1,09						
Partial Safety Factor		γ_{Mp}	-	1,5	1,5	1,5	1,5	1,5	1,5	1,5

SPLITTING FAILURE

Property			Anchor Diameter						
			8mm	10mm	12mm	16mm	20mm	25mm	32mm
Characteristic Edge Distance	$c_{cr,sp}$	mm	$2h_{ef}$						
Characteristic Anchor Spacing	$s_{cr,sp}$	mm	$2c_{cr,sp}$						
Partial Safety Factor	γ_{Msp}	-	1,8						

RESISTANCE VALUES FOR REINFORCING BARS IN UNCRACKED CONCRETE

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter						
			8mm	10mm	12mm	16mm	20mm	25mm	32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	100	128
Characteristic Resistance	N_{Rk}	kN	19,60	23,47	29,58	36,13	43,12	50,50	73,13
Design Resistance	N_{Rd}	kN	13,07	15,65	19,72	24,09	28,75	33,67	48,75
Controlling Resistance			Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	200	256
Characteristic Resistance	N_{Rk}	kN	20,91	32,67	47,05	73,13	102,20	142,84	173,72
Design Resistance	N_{Rd}	kN	13,94	21,78	31,37	48,75	68,14	95,22	115,81
Controlling Resistance			Pullout	Pullout	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Pullout
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	250	300
Characteristic Resistance	N_{Rk}	kN	26,14	36,76	53,91	73,13	111,93	199,62	203,58
Design Resistance	N_{Rd}	kN	17,43	24,50	35,94	48,75	74,62	133,08	135,72
Controlling Resistance			Pullout	Pullout	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	300	384
Characteristic Resistance	N_{Rk}	kN	31,37	49,01	70,57	115,81	180,96	262,41	308,83
Design Resistance	N_{Rd}	kN	20,91	32,67	47,05	77,21	120,64	174,94	205,89
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Pullout	Concrete Cone	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	500	640
Characteristic Resistance	N_{Rk}	kN	52,28	81,68	117,62	193,02	301,59	471,24	514,72
Design Resistance	N_{Rd}	kN	34,85	54,45	78,41	128,68	201,06	314,16	343,15
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Pullout	Pullout	Pullout

1. *Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR029. Resistance for steel failure must also be considered - the lowest value controls.*
2. *Resistance values are for single anchors without close edges or eccentric loading considerations.*
3. *Tabulated values correspond to the above stated temperature range and installation conditions only.*
4. *Long term temperatures are these that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.*
5. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm².*
6. *Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

RESISTANCE VALUES FOR REINFORCING BARS IN CRACKED CONCRETE

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter						
			8mm	10mm	12mm	16mm	20mm	25mm	32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	100	128
Characteristic Resistance	N_{Rk}	kN	12,06	16,73	21,08	25,76	30,74	36,00	52,13
Design Resistance	N_{Rd}	kN	8,04	11,15	14,06	17,17	20,49	24,00	34,76
Controlling Resistance			Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	200	256
Characteristic Resistance	N_{Rk}	kN	12,87	25,76	33,86	52,13	72,86	101,82	141,15
Design Resistance	N_{Rd}	kN	8,58	17,17	22,57	34,76	48,57	67,88	94,10
Controlling Resistance			Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Concrete Cone	Pullout
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	250	300
Characteristic Resistance	N_{Rk}	kN	16,08	30,74	41,47	52,13	79,80	142,30	165,40
Design Resistance	N_{Rd}	kN	10,72	20,49	27,65	34,76	53,20	94,87	110,27
Controlling Resistance			Pullout	Concrete Cone	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	300	384
Characteristic Resistance	N_{Rk}	kN	19,30	41,47	54,29	95,78	133,85	200,28	250,93
Design Resistance	N_{Rd}	kN	12,87	27,65	36,19	63,85	89,23	133,52	167,28
Controlling Resistance			Pullout	Pullout	Pullout	Concrete Cone	Concrete Cone	Concrete Cone	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	500	640
Characteristic Resistance	N_{Rk}	kN	32,17	69,12	90,48	160,85	251,33	333,79	418,21
Design Resistance	N_{Rd}	kN	21,45	46,08	60,32	107,23	167,55	222,53	278,81
Controlling Resistance			Pullout	Pullout	Pullout	Pullout	Pullout	Pullout	Pullout

1. *Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR029. Resistance for steel failure must also be considered - the lowest value controls.*
2. *Resistance values are for single anchors without close edges or eccentric loading considerations.*
3. *Tabulated values correspond to the above stated temperature range and installation conditions only.*
4. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.*
5. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm².*
   Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

INSTALLATION PARAMETERS FOR POST-INSTALLED REBAR CONNECTIONS

Rebar Diameter[mm]	$f_{y,k}$ [N/mm²]	Drill Hole Diameter [mm]	Cleaning Brush [mm]	Min. Anchorage Length [mm]	Min. Lap/Splice Length [mm]	Max. Embedment Depth [mm]
8	500	12	S12HF S13HF	113	200	400
10	500	14	S14HF S15HF	142	200	500
12	500	16	S18HF	170	200	600
14	500	18	S22HF	198	210	700
16	500	20	S22HF	227	240	800
20	500	25	S27HF	284	300	1000
25	500	32	S35HF	354	375	1000
28	500	35	S38HF	397	420	1000
32	500	40	S43HF	454	480	1000
40	500	55	S58HF	851	900	1000

DESIGN BOND STRENGTH VALUES - HAMMER DRILLED OR COMPRESSED AIR DRILLED HOLES

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 Ø [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	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
12	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
14	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
16	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
20	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
25	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
28	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
32	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7
40	1,5	1,8	2,1	2,1	2,1	2,1	2,1	2,1	2,1

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

DESIGN BOND STRENGTH VALUES - DIAMOND CORE DRILLED HOLES

Design values of the ultimate bond resistance f_{bd} in N/mm² for diamond core drilling for good bond conditions

Rebar Ø [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	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
12	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
14	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
16	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
20	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
25	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
28	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
32	1,6	2,0	2,3	2,7	3,0	3,4	3,4	3,4	3,4
40	1,5	1,8	2,1	2,1	2,1	2,1	2,1	2,1	2,1

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