MIT-Hybrid Plus Mortar for highest performance in concrete

Injection anchors for use in concrete

The anchor is placed into a drilled hole filled with injection mortar. The steel element is anchored via the bond between metal part, injection mortar and concrete. The steel consist of a threaded rod, reinforcing bar or internal threaded rod

1 SPECIFICATIONS OF INTENDED USE

Anchorages subject to:
-Static and quasi-static loads: M8 to M30, Rebar ø8 to ø32 or internal threaded rod (MIG-M) diameter M6 to M20 (see ETA-17/0128 of 7 June 2019) and tension Anchor M12 to M24 (see ETA-17/0130 of 7 June 2019)

Base materials:
-Reinforced or unreinforced cracked or non-cracked normal weight concrete strength classes C20/25 to C50/60 according to EN 206:2013 (see ETA-17/0128 of 7 June 2019)
-Dry or wet concrete and flooded bore holes (see ETA-17/0128 of 7 June 2019)

Approvals:
-European Assessment Document for concrete connections (EAD 330499-01-0601)
-European Assessment Document, for post-installed rebar connections (EAD 330087-00-0601)
-Seismic action for Performance Category C1 and C2 is part of assessment document

Reaction to fire:
-Anchorages with threaded rod or Rebar satisfy requirements for Class A1

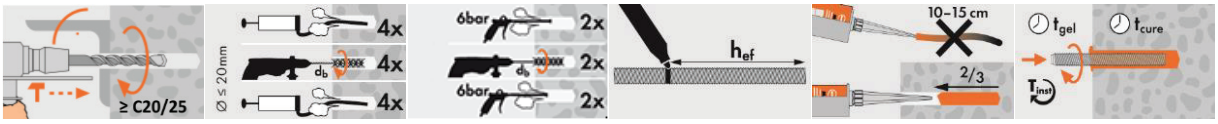
Resistance to fire:
-Assessment of resistance under fire exposure F120 (acc. to DIN EN 1363-1:2012 and Technical Report 020) for use in concrete
-Fire resistance test certification for Rebar connections up to 360°C (ETA-17/0130 of 7 June 2019)

Installation:
-Dry or wet concrete and flooded holes (not sea water)
-Hole drilling by hammer, hollow or compressed air drill mode
-Anchor Installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site

2 CURING TIME AND INSTALLATION INSTRUCTIONS

MAXIMUM WORKING TIME AND MINIMUM CURING TIME							
	-5 ÷ -1°C	0 ÷ 4°C	5 ÷ 9°C	10 ÷ 14°C	15 ÷ 19°C	20 ÷ 29°C	30 ÷ 40°C
max. working time t_{gel}	50 min	25 min	15 min	10 min	6 min	3 min	2 min
min. curing time in dry concrete t_{cure}	5 h	3.5 h	2 h	1 h	40 min	30 min	30 min
min. curing time in wet concrete t_{cure}	10 h	7 h	4 h	2 h	80 min	60 min	60 min
Cartridge temperature	5 ÷ 40°C						

Graphic installation guide for MIT-Hybrid Plus Injection system



1. 2.1. 2.2. 3. 4. 5.

1. Drilling the hole with hammer, compressed air drill mode or hollow drill bit system acc. to ETA-17/0128 of 7 June 2019 (for the hollow drill bit system, no additional cleaning procedure given in point 2.1 and 2.2 is needed).
2.1. **Dry and wet uncracked concrete:** Manual cleaning acc. ETA 17/0128 (diameter of bore hole ≤ 20 mm and bore hole depth h_0 ≤ 10ds).
2.2. **Cracked or uncracked concrete:** Compressed air cleaning acc. to ETA-17/0128 (≥ 6 bar) can be used for all sizes.
3. Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor.
4. Inject mixture into the hole only when an even color is flowing. Start filling from the bottom of the hole to avoid air pockets.
5. Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Tightening with the torque wrench and predetermined value of Tinst.

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3 INSTALLATION DATA IN CONCRETE

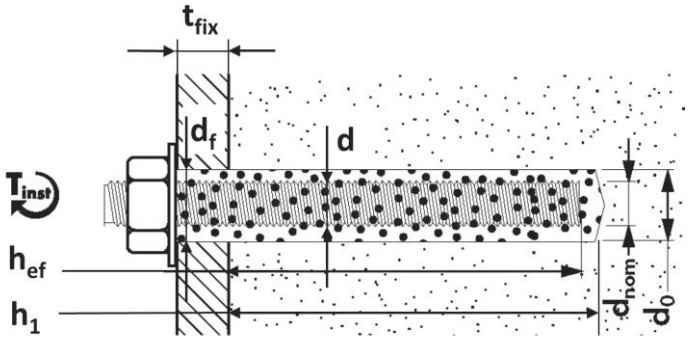
Installation parameters for Mungo Injection system MIT-Hybrid Plus in concrete based on ETA-17/0128 of 7 June 2019

3.1 Installation parameters for threaded rod

THREADED ROD SIZE			M8	M10	M12	M16	M20	M24	M27	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	27	30
MIT-Hybrid Plus INSTALLATION DATA										
Diameter of clearence hole in the fixture	d_f	[mm]	9	12	14	18	22	26	30	33
Drill hole diameter in substrate	d_0	[mm]	10	12	14	18	22	28	30	35
Depth of drilled hole	h_1	[mm]	h_{ef} + 5 mm							
Effective anchorage depth	$h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600
Installation torque	$T_{inst} \leq$	[Nm]	10	20	40[1)]	60	100	170	250	300
Minimum thickness of concrete memeber	h_{min}	[mm]	h_{ef} + 30 mm (≥ 100 mm)			h_{ef} + $2d_0$				
Minimum spacing	s_{min}	[mm]	40	50	60	75	95	115	125	140
Minimum edge distane	c_{min}	[mm]	35	40	45	50	60	65	75	80

[1)] Maximum Torque moment for M12 with steel Grade 4.6 is 35 Nm

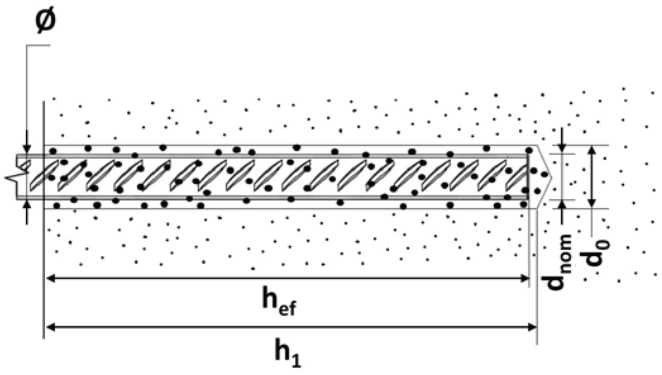
Threaded rods according to ETA-17/0128 of 7 June 2019



3.2 Installation parameters for reinforcing bar (REBAR)

REINFORCING BAR SIZE			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Rebar diameter	Ø	[mm]	8	10	12	14	16	20	24	25	28	32
MIT-Hybrid Plus INSTALLATION DATA												
Drill hole diameter in substrate	d_0	[mm]	12	14	16	18	20	25	32	32	35	40
Depth of drilled hole	h_1	[mm]	h_{ef} + 5 mm									
Effective anchorage depth	$h_{ef,min}$	[mm]	60	60	70	75	80	90	96	100	112	128
	$h_{ef,max}$	[mm]	160	200	240	280	320	400	480	500	560	640
Minimum thickness of concrete memeber	h_{min}	[mm]	h_{ef} + 30 mm (≥ 100 mm)			h_{ef} + $2d_0$						
Minimum spacing	s_{min}	[mm]	40	50	60	70	75	95	120	120	130	150
Minimum edge distane	c_{min}	[mm]	35	40	45	50	50	60	70	70	75	85

Reinforcing bars according to EN 1992-1-1:2004+AC:2010, Annex C



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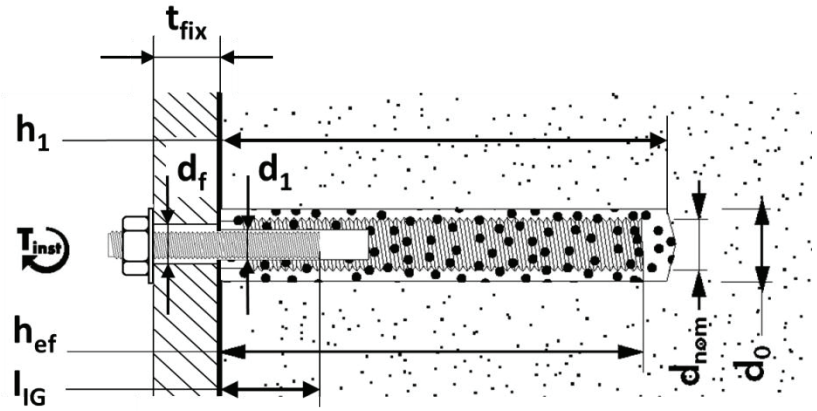
3.3 Installation parameters for internal threaded rod

INTERNAL THREADED ROD SIZE			M6x80	M6x90	M8x80	M8x100	M10x80	M10x100
Internal diameter of sleeve	d_1	[mm]	6	6	8	8	10	10
Outer diameter of sleeve	d_{nom}	[mm]	10	10	12	12	16	16
MIT-Hybrid Plus INSTALLATION DATA								
Diameter of clearence hole in the fixture	d_f	[mm]	7	7	9	9	12	12
Drill hole diameter in substrate	d_0	[mm]	12	12	14	14	18	18
Depth of drilled hole	h_1	[mm]	h_{ef} + 5 mm					
Internal threaded rod effective anchorage depth in concrete	h_{ef}	[mm]	80	90	80	100	80	100
Installation torque	$T_{inst} \leq$	[Nm]	10	10	10	10	20	20
Screw or threaded rod effective anchorage depth	$l_{IG,min}$	[mm]	8	8	8	8	10	10
	$l_{IG,max}$	[mm]	20	20	20	20	25	25
Minimum thickness of concrete memeber	h_{min}	[mm]	h_{ef} + 30 mm (≥ 100 mm)				$h_{ef} + 2d_0$	
Minimum spacing	s_{min}	[mm]	50	50	60	60	75	75
Minimum edge distane	c_{min}	[mm]	40	40	45	45	50	50



4 RECOMMENDED TENSION RESISTANCE

Basic performance data for MIT-Hybrid Plus system in cracked and non-cracked concrete C20/25 without influence of edge distance, spacing and splitting failure due to dimensions of concrete member

REQUIRED PROOFS FOR RECOMMENDED TENSION RESISTANCE:

For design tension resistance with chemical system MIT-Hybrid Plus the minimum value for combined pull-out, concrete cone failure and steel failure needs to be considered:

For use in non-cracked concrete; $N_{rec,ucr} = \min(N_{rec,c,ucr}; N_{rec,s})$

For use in cracked concrete; $N_{rec,cr} = \min(N_{rec,c,cr}; N_{rec,s})$

4.1 Recommended tension resistance ($N_{rec,c}$) for combined pull-out and concrete cone failure (cracked or non-cracked concrete C20/25 with threaded rod)

Metrical Thread Size				[mm]	M8	M10	M12	M16	M20	M24	M27	M30
Setting Depth h_{ef} [mm]	60	Non-Cracked	$N_{rec,c,ucr}$	[kN]	12.17*	12.17*						
		Cracked	$N_{rec,c,cr}$		5.03	6.73						
	70	Non-Cracked	$N_{rec,c,ucr}$	[kN]	14.25	15.34*	15.34*					
		Cracked	$N_{rec,c,cr}$		5.87	7.86	10.06					
	80	Non-Cracked	$N_{rec,c,ucr}$	[kN]	16.28	18.74*	18.74*	18.74*				
		Cracked	$N_{rec,c,cr}$		6.70	8.98	11.49	13.12*				
	90	Non-Cracked	$N_{rec,c,ucr}$	[kN]	18.32	22.36*	22.36*	22.36*	22.36*			
		Cracked	$N_{rec,c,cr}$		7.54	10.10	12.93	15.65*	15.65*			
	100	Non-Cracked	$N_{rec,c,ucr}$	[kN]	20.35	25.44	26.19*	26.19*	26.19*	26.19*		
		Cracked	$N_{rec,c,cr}$		8.38	11.22	14.37	18.33*	18.33*	18.33*		
	125	Non-Cracked	$N_{rec,c,ucr}$	[kN]	25.44	31.80	35.92	36.60*	36.60*	36.60*	36.60*	36.60*
		Cracked	$N_{rec,c,cr}$		10.48	14.03	17.96	25.62*	25.62*	25.62*	25.62*	25.62*
	150	Non-Cracked	$N_{rec,c,ucr}$	[kN]	30.53	38.16	43.10	48.11*	48.11*	48.11*	48.11*	48.11*
		Cracked	$N_{rec,c,cr}$		12.57	16.84	21.55	32.33	33.68*	33.68*	33.68*	33.68*
	175	Non-Cracked	$N_{rec,c,ucr}$	[kN]		44.52	50.29	60.63*	60.63*	60.63*	60.63*	60.63*
		Cracked	$N_{rec,c,cr}$			19.64	25.14	37.71	42.44*	42.44*	42.44*	42.44*
	200	Non-Cracked	$N_{rec,c,ucr}$	[kN]		50.88	57.47	71.84	74.08*	74.08*	74.08*	74.08*
		Cracked	$N_{rec,c,cr}$			22.45	28.73	43.10	50.88	50.29	51.85*	51.85*
	250	Non-Cracked	$N_{rec,c,ucr}$	[kN]				89.80	103.53*	103.53*	103.53*	103.53*
		Cracked	$N_{rec,c,cr}$					53.88	63.61	62.86	70.71	72.47*
	300	Non-Cracked	$N_{rec,c,ucr}$	[kN]				107.76	125.71	136.09*	136.09*	136.09*
		Cracked	$N_{rec,c,cr}$					64.65	76.33	75.43	84.86	94.29
	350	Non-Cracked	$N_{rec,c,ucr}$	[kN]					146.67	163.43	171.49*	171.49*
		Cracked	$N_{rec,c,cr}$						89.05	88.00	99.00	110.00
	400	Non-Cracked	$N_{rec,c,ucr}$	[kN]					167.62	186.78	209.52*	209.52*
		Cracked	$N_{rec,c,cr}$						101.77	100.57	113.14	125.71
	450	Non-Cracked	$N_{rec,c,ucr}$	[kN]						210.12	236.39	250.01*
		Cracked	$N_{rec,c,cr}$							113.14	127.29	141.43
	500	Non-Cracked	$N_{rec,c,ucr}$	[kN]							262.65	291.84
		Cracked	$N_{rec,c,cr}$								141.43	157.14
	550	Non-Cracked	$N_{rec,c,ucr}$	[kN]								321.02
		Cracked	$N_{rec,c,cr}$									172.86
	600	Non-Cracked	$N_{rec,c,ucr}$	[kN]								350.20
		Cracked	$N_{rec,c,cr}$									188.57

*Concrete cone failure

Recommended tension resistance for steel failure ($N_{rec,s}$):

Metrical Thread Size			[mm]	M8	M10	M12	M16	M20	M24	M27	M30
Steel property class	Zinc Plated 4.6	$N_{rec,s}$	[kN]	5.23	8.27	12.04	22.42	34.97	50.40	65.51	80.13
	Zinc Plated 5.8	$N_{rec,s}$	[kN]	8.72	13.79	20.06	37.37	58.29	84.00	109.19	133.54
	Zinc Plated 8.8	$N_{rec,s}$	[kN]	13.95	22.07	32.10	59.79	93.27	134.40	174.70	213.67
	Stainless steel A4-70	$N_{rec,s}$	[kN]	9.79	15.49	22.53	41.97	65.46	94.33	–	–
	Stainless steel HCR, class 70	$N_{rec,s}$	[kN]	9.79	15.49	22.53	41.97	65.46	94.33	–	–

Recommended tension resistance for steel failure ($N_{rec,s}$) can be applied for cracked or non-cracked concrete.

4.2 Recommended tension resistance ($N_{rec,c}$) for combined pull-out and concrete cone failure (cracked and non-cracked concrete C20/25 with reinforcing bar (REBAR))

Rebar Size				[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Setting Depth h_{ef} [mm]	60	Non-Cracked	$N_{rec,c,ucr}$	[kN]	10.06	12.17*								
		Cracked	$N_{rec,c,cr}$		3.95	4.94								
	70	Non-Cracked	$N_{rec,c,ucr}$	[kN]	11.73	14.67	15.34*							
		Cracked	$N_{rec,c,cr}$		4.61	5.76	7.54							
	80	Non-Cracked	$N_{rec,c,ucr}$	[kN]	13.41	16.76	18.74*	18.74*	18.74*					
		Cracked	$N_{rec,c,cr}$		5.27	6.59	8.62	10.90	12.45					
	90	Non-Cracked	$N_{rec,c,ucr}$	[kN]	15.09	18.86	22.36*	22.36*	22.36*	22.36*	22.36*			
		Cracked	$N_{rec,c,cr}$		5.93	7.41	9.70	12.26	14.01	15.65*	15.65*			
	100	Non-Cracked	$N_{rec,c,ucr}$	[kN]	16.76	20.95	25.14	26.19*	26.19*	26.19*	26.19*	26.19*		
		Cracked	$N_{rec,c,cr}$		6.59	8.23	10.78	13.62	15.56	18.33*	18.33*	18.33*		
	125	Non-Cracked	$N_{rec,c,ucr}$	[kN]	20.95	26.19	31.43	36.60*	36.60*	36.60*	36.60*	36.60*	36.60*	36.60*
		Cracked	$N_{rec,c,cr}$		8.23	10.29	13.47	17.02	19.46	24.32	25.62*	25.62*	25.62*	25.62*
	150	Non-Cracked	$N_{rec,c,ucr}$	[kN]	25.14	31.43	37.71	44.00	46.69	48.11*	48.11*	48.11*	48.11*	48.11*
		Cracked	$N_{rec,c,cr}$		9.88	12.35	16.16	20.43	23.35	29.18	33.68*	33.68*	33.68*	33.68*
	175	Non-Cracked	$N_{rec,c,ucr}$	[kN]		36.67	44.00	51.33	54.48	60.63*	60.63*	60.63*	60.63*	60.63*
		Cracked	$N_{rec,c,cr}$			14.40	18.86	23.83	27.24	34.05	40.86	42.44*	42.44*	42.44*
	200	Non-Cracked	$N_{rec,c,ucr}$	[kN]		41.90	50.29	58.67	62.26	74.08*	74.08*	74.08*	74.08*	74.08*
		Cracked	$N_{rec,c,cr}$			16.46	21.55	27.24	31.13	38.91	46.69	51.85*	51.85*	51.85*
	250	Non-Cracked	$N_{rec,c,ucr}$	[kN]				73.33	77.82	97.28	103.53*	103.53*	103.53*	103.53*
		Cracked	$N_{rec,c,cr}$					34.05	38.91	48.64	58.37	65.48	72.47*	72.47*
	300	Non-Cracked	$N_{rec,c,ucr}$	[kN]					93.39	116.73	136.09*	136.09*	136.09*	136.09*
		Cracked	$N_{rec,c,cr}$						46.69	58.37	70.04	78.57	88.00	95.26*
	350	Non-Cracked	$N_{rec,c,ucr}$	[kN]						136.19	163.43	170.24	171.49*	171.49*
		Cracked	$N_{rec,c,cr}$							68.10	81.71	91.67	102.67	117.33
	400	Non-Cracked	$N_{rec,c,ucr}$	[kN]						155.65	186.78	194.56	209.52*	209.52*
		Cracked	$N_{rec,c,cr}$							77.82	93.39	104.76	117.33	134.10
	450	Non-Cracked	$N_{rec,c,ucr}$	[kN]						210.12	218.88	218.88	245.14	250.01*
		Cracked	$N_{rec,c,cr}$							105.06	117.86	117.86	132.00	150.86
	500	Non-Cracked	$N_{rec,c,ucr}$	[kN]								243.20	272.38	292.82*
		Cracked	$N_{rec,c,cr}$									130.95	146.67	167.62
	550	Non-Cracked	$N_{rec,c,ucr}$	[kN]									299.62	337.82*
		Cracked	$N_{rec,c,cr}$										161.33	184.38
	600	Non-Cracked	$N_{rec,c,ucr}$	[kN]										373.55
		Cracked	$N_{rec,c,cr}$											201.14

*Concrete cone failure

Recommended tension resistance for steel failure ($N_{rec,s}$):

Rebar Size		[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Steel property BSt 500 S	$N_{rec,s}$	[kN]	14.10	22.03	31.72	43.18	56.39	88.11	126.88	137.68	172.70	225.57

Recommended tension resistance for steel failure ($N_{rec,s}$) can be applied for cracked or non-cracked concrete.

4.3 Recommended tension resistance ($N_{rec,c}$) for combined pull-out and concrete cone failure (cracked and non-cracked concrete C20/25 with internal threaded anchor rod)

Internal threaded anchor rod				[mm]	MIG-M6	MIG-M8	MIG-M10
Setting Depth hef [mm]	80	Non-Cracked	$N_{rec,c,ucr}$	[kN]	18.74*		
		Cracked	$N_{rec,c,cr}$		8.98		
	90	Non-Cracked	$N_{rec,c,ucr}$	[kN]	22.36*		
		Cracked	$N_{rec,c,cr}$		10.10		
	80	Non-Cracked	$N_{rec,c,ucr}$	[kN]		18.74*	
		Cracked	$N_{rec,c,cr}$			11.49	
	100	Non-Cracked	$N_{rec,c,ucr}$	[kN]		26.19*	
		Cracked	$N_{rec,c,cr}$			14.37	
	80	Non-Cracked	$N_{rec,c,ucr}$	[kN]			18.74*
		Cracked	$N_{rec,c,cr}$				13.12*
	100	Non-Cracked	$N_{rec,c,ucr}$	[kN]			26.19*
		Cracked	$N_{rec,c,cr}$				18.33*

*Concrete cone failure

Recommended tension resistance for steel failure ($N_{rec,s}$):

Internal threaded anchor rod			[mm]	MIG-M6	MIG-M8	MIG-M10
Steel class	Zinc Plated 5.8	$N_{rec,s}$	[kN]	4.76	8.10	13.81
	Stainless steel A4-70	$N_{rec,s}$	[kN]	5.35	9.93	15.66

Recommended tension resistance for steel failure ($N_{rec,s}$) can be applied for cracked or non-cracked concrete.

5 RECOMMENDED SHEAR RESISTANCE

Basic performance data for MIT-Hybrid Plus system in cracked and non-cracked concrete C20/25 without influence of edge distance, spacing and splitting failure due to dimensions of concrete member

REQUIRED PROOFS FOR RECOMMENDED SHEAR RESISTANCE:

For design shear resistance with chemical system MIT Hybrid Plus the minimum value for concrete pry-out failure and steel failure needs to be considered:

For use in non-cracked concrete; $V_{rec,ucr} = \min(V_{rec,cp,ucr}; V_{rec,s})$

For use in cracked concrete; $V_{rec,cr} = \min(V_{rec,cp,cr}; V_{rec,s})$

5.1 Recommended shear resistance for concrete pry-out failure (Vrec,cp) (cracked or non-cracked concrete C20/25 with threaded rod)

Metrical Thread Size				[mm]	M8	M10	M12	M16	M20	M24	M27	M30
Setting Depth h_{ef} [mm]	60	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	24.34	24.34						
		Cracked	$V_{rec,cp,cr}$		10.06	13.47						
	70	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	28.50	30.68	30.68					
		Cracked	$V_{rec,cp,cr}$		11.73	15.71	20.11					
	80	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	32.57	37.48	37.48	37.48				
		Cracked	$V_{rec,cp,cr}$		13.41	17.96	22.99	26.24				
	90	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	36.64	44.72	44.72	44.72	44.72			
		Cracked	$V_{rec,cp,cr}$		15.09	20.20	25.86	31.31	31.31			
	100	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	40.71	50.88	52.38	52.38	52.38	52.38		
		Cracked	$V_{rec,cp,cr}$		16.76	22.45	28.73	36.67	36.67	36.67		
	125	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	50.88	63.61	71.84	73.20	73.20	73.20	73.20	73.20
		Cracked	$V_{rec,cp,cr}$		20.95	28.06	35.92	51.24	51.24	51.24	51.24	51.24
	150	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	61.06	76.33	86.20	96.23	96.23	96.23	96.23	96.23
		Cracked	$V_{rec,cp,cr}$		25.14	33.67	43.10	64.65	67.36	67.36	67.36	67.36
	175	Non-Cracked	$V_{rec,cp,ucr}$	[kN]		89.05	100.57	121.26	121.26	121.26	121.26	121.26
		Cracked	$V_{rec,cp,cr}$			39.29	50.29	75.43	84.88	84.88	84.88	84.88
	200	Non-Cracked	$V_{rec,cp,ucr}$	[kN]		101.77	114.94	143.67	148.16	148.16	148.16	148.16
		Cracked	$V_{rec,cp,cr}$			44.90	57.47	86.20	101.77	100.57	103.71	103.71
	250	Non-Cracked	$V_{rec,cp,ucr}$	[kN]				179.59	207.05	207.05	207.05	207.05
		Cracked	$V_{rec,cp,cr}$					107.76	127.21	125.71	141.43	144.94
	300	Non-Cracked	$V_{rec,cp,ucr}$	[kN]				215.51	251.43	272.18	272.18	272.18
		Cracked	$V_{rec,cp,cr}$					129.31	152.65	150.86	169.71	188.57
	350	Non-Cracked	$V_{rec,cp,ucr}$	[kN]					293.33	326.86	342.99	342.99
		Cracked	$V_{rec,cp,cr}$						178.10	176.00	198.00	220.00
	400	Non-Cracked	$V_{rec,cp,ucr}$	[kN]					335.24	373.55	419.05	419.05
		Cracked	$V_{rec,cp,cr}$						203.54	201.14	226.29	251.43
	450	Non-Cracked	$V_{rec,cp,ucr}$	[kN]						420.24	472.78	500.03
		Cracked	$V_{rec,cp,cr}$							226.29	254.57	282.86
	500	Non-Cracked	$V_{rec,cp,ucr}$	[kN]							525.31	583.67
		Cracked	$V_{rec,cp,cr}$								282.86	314.29
	550	Non-Cracked	$V_{rec,cp,ucr}$	[kN]								642.04
		Cracked	$V_{rec,cp,cr}$									345.71
	600	Non-Cracked	$V_{rec,cp,ucr}$	[kN]								700.41
		Cracked	$V_{rec,cp,cr}$									377.14

Recommended shear resistance for steel failure ($V_{rec,s}$):

Metrical Thread Size			[mm]	M8	M10	M12	M16	M20	M24	M27	M30
Steel property class	Zinc Plated 4.6	$V_{rec,s}$	[kN]	3.76	5.95	8.65	16.11	25.13	36.22	47.07	57.58
	Zinc Plated 5.8	$V_{rec,s}$	[kN]	5.23	8.27	12.04	22.42	34.97	50.40	65.51	80.13
	Zinc Plated 8.8	$V_{rec,s}$	[kN]	8.37	13.24	19.26	35.87	55.96	80.64	104.82	128.20
	Stainless steel A4-70	$V_{rec,s}$	[kN]	5.87	9.28	13.50	25.15	39.23	56.54	–	–
	Stainless steel HCR, class 70	$V_{rec,s}$	[kN]	5.87	9.28	13.50	25.15	39.23	56.54	–	–

Recommended tension resistance for steel failure ($V_{rec,s}$) can be applied for cracked or non-cracked concrete.

5.2 Recommended shear resistance for concrete pry-out failure ($V_{rec,cp}$) (cracked or non-cracked concrete C20/25 with reinforcing bar (REBAR))

Rebar Size				[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Setting Depth h_{ef} [mm]	60	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	20.11	24.34								
		Cracked	$V_{rec,cp,cr}$		7.90	9.88								
	70	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	23.47	29.33	15.34							
		Cracked	$V_{rec,cp,cr}$		9.22	11.52	15.09							
	80	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	26.82	33.52	18.74	37.48	37.48					
		Cracked	$V_{rec,cp,cr}$		10.54	13.17	17.24	21.79	24.90					
	90	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	30.17	37.71	22.36	44.72	44.72	44.72	44.72			
		Cracked	$V_{rec,cp,cr}$		11.85	14.82	19.40	24.51	28.02	31.31	31.31			
	100	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	33.52	41.90	26.19	52.38	52.38	52.38	52.38	52.38		
		Cracked	$V_{rec,cp,cr}$		13.17	16.46	21.55	27.24	31.13	36.67	36.67	36.67		
	125	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	41.90	52.38	36.60	73.20	73.20	73.20	73.20	73.20	73.20	73.20
		Cracked	$V_{rec,cp,cr}$		16.46	20.58	26.94	34.05	38.91	48.64	51.24	51.24	51.24	51.24
	150	Non-Cracked	$V_{rec,cp,ucr}$	[kN]	50.29	62.86	48.11	88.00	93.39	96.23	96.23	96.23	96.23	96.23
		Cracked	$V_{rec,cp,cr}$		19.76	24.69	32.33	40.86	46.69	58.37	67.36	67.36	67.36	67.36
	175	Non-Cracked	$V_{rec,cp,ucr}$	[kN]		73.33	60.63	102.67	108.95	121.26	121.26	121.26	121.26	121.26
		Cracked	$V_{rec,cp,cr}$			28.81	37.71	47.67	54.48	68.10	81.71	84.88	84.88	84.88
	200	Non-Cracked	$V_{rec,cp,ucr}$	[kN]		83.81	74.08	117.33	124.52	148.16	148.16	148.16	148.16	148.16
		Cracked	$V_{rec,cp,cr}$			32.93	43.10	54.48	62.26	77.82	93.39	103.71	103.71	103.71
	250	Non-Cracked	$V_{rec,cp,ucr}$	[kN]				146.67	155.65	194.56	207.05	207.05	207.05	207.05
		Cracked	$V_{rec,cp,cr}$					68.10	77.82	97.28	116.73	130.95	144.94	144.94
	300	Non-Cracked	$V_{rec,cp,ucr}$	[kN]					186.78	233.47	272.18	272.18	272.18	272.18
		Cracked	$V_{rec,cp,cr}$						93.39	116.73	140.08	157.14	176.00	190.53
	350	Non-Cracked	$V_{rec,cp,ucr}$	[kN]						272.38	326.86	340.48	342.99	342.99
		Cracked	$V_{rec,cp,cr}$							136.19	163.43	183.33	205.33	234.67
	400	Non-Cracked	$V_{rec,cp,ucr}$	[kN]						311.29	373.55	389.12	419.05	419.05
		Cracked	$V_{rec,cp,cr}$							155.65	186.78	209.52	234.67	268.19
	450	Non-Cracked	$V_{rec,cp,ucr}$	[kN]						420.24	437.76	437.76	490.29	500.03
		Cracked	$V_{rec,cp,cr}$							210.12	235.71	235.71	264.00	301.71
	500	Non-Cracked	$V_{rec,cp,ucr}$	[kN]								486.39	544.76	585.64
		Cracked	$V_{rec,cp,cr}$									261.90	293.33	335.24
	550	Non-Cracked	$V_{rec,cp,ucr}$	[kN]									599.24	675.64
		Cracked	$V_{rec,cp,cr}$										322.67	368.76
	600	Non-Cracked	$V_{rec,cp,ucr}$	[kN]										747.10
		Cracked	$V_{rec,cp,cr}$											402.29

Recommended shear resistance for steel failure ($V_{rec,s}$):

Rebar Size		[mm]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Steel property BSt 500 S	$V_{rec,s}$	[kN]	6.58	10.28	14.80	20.15	26.32	41.12	59.21	64.25	80.59	105.26

Recommended tension resistance for steel failure ($V_{rec,s}$) can be applied for cracked or non-cracked concrete.

5.3 Recommended shear resistance for concrete pry-out failure (Vrec,cp) (cracked or non-cracked concrete C20/25 with internal threaded anchor rod)

Internal threaded anchor rod				[mm]	MIG-M6	MIG-M8	MIG-M10
Setting Depth hef [mm]	80	Non-Cracked	Vrec,cp,ucr	[kN]	37.48		
		Cracked	Vrec,cp,cr		17.96		
	90	Non-Cracked	Vrec,cp,ucr	[kN]	44.72		
		Cracked	Vrec,cp,cr		20.20		
	80	Non-Cracked	Vrec,cp,ucr	[kN]		37.48	
		Cracked	Vrec,cp,cr			22.99	
	100	Non-Cracked	Vrec,cp,ucr	[kN]		52.38	
		Cracked	Vrec,cp,cr			28.73	
	80	Non-Cracked	Vrec,cp,ucr	[kN]			28.73
		Cracked	Vrec,cp,cr				26.24
	100	Non-Cracked	Vrec,cp,ucr	[kN]			35.92
		Cracked	Vrec,cp,cr				36.67

Recommended shear resistance for steel failure ($V_{rec,s}$):

Internal threaded anchor rod			[mm]	MIG-M6	MIG-M8	MIG-M10
Steel class	Zinc Plated 5.8	Vrec.s	[kN]	2.86	5.14	8.57
	Stainless steel A4-70	Vrec.s	[kN]	3.21	5.95	9.16

Recommended tension resistance for steel failure ($V_{rec,s}$) can be applied for cracked or non-cracked concrete.

6 MORTAR PROPERTIES

6.1 Mortar properties data for MIT Hybrid Plus system:

Properties	Test Method	Result
UV resistance		Pass
Watertightness	DIN EN 12390-8	0 mm
Temperature stability		≤ 160°C
Density		1.78 kg / dm^3
Compressiv strenght	DIN EN 196-1	122 N / mm^2
Tensile strenght	DIN EN ISO 527-2	14.9 N / mm^2
Flxural strenght	DIN EN 196-1	22.2 N / mm^2
E modulus	DIN EN 527-2 ISO	8300 N / mm^2
Shrinkage	DIN 52450	< 0.2 %
Hardness Shore A	DIN EN ISO 868	97.6
Electrical resistance	DIN IEC 93	7.2 x 10^{13} Ω m
Thermal conductivity	DIN EN 993-15	1.06 W/m·K
Thermal heat capacity	DIN EN 993-15	1.090 J/kg·K

6.2 Chemical resistance data for MIT Hybrid Plus system:

Chemical Agent	Concentration	Resistant	Not Resistant
Acetic acid	10	*	
Acetone	100		*
Ammonia, aqueous solution	5	*	
Benzyl Alcohol	100		*
Chlorinated lime	10	*	
Citric acid	10	*	
Chlorine water, swimming pool	All	*	
Demineralized Water	100	*	
Diesel oil	100	*	
Ethanol	100		*
Ethyl Acetate	100		*
Formic acid	100		*
Fuel Oil	100	*	
Gasoline (premium grade)	100	*	
Glycol (Ethylene glycol)	100		*
Hydraulic fluid	100	*	
Hydrogen peroxide	10		*
Isopropyl alcohol	100		*
Lactic acid	10	*	
Linseed oil	100	*	
Lubricating oil	100	*	
Nitric acid	10		*
Methanol	100		*
Phosphoric acid	10	*	
Potassium Hydroxide ph 13.2	100	*	
Salt (Calcium Chloride)	100	*	
Sea water, salty	100	*	
Sodium carbonate	10	*	
Sulfuric acid	10	*	

Results shown in the table are applicable to brief periods of chemical contact with full cured adhesive (e.g. temporary contact with adhesive during a spill).

7 IMPORTANT NOTICE

For the design the complete technical assessment ETA-17/0128 of 7 June 2019 has to be considered. Values given above are only valid under the assumptions of sufficient cleaning the drill hole with compressed air (≥ 6 bar, ETA-17/0128, Annex B3 and B4) and anchoring in concrete (strength classes C20/25 to C50/60 according to EN 206:2013). Recommended resistance data in this document, do not consider the influence of edge distance, spacing and splitting failure due to limited dimensions of concrete member and in case of such influence, the above values should be reduced. In recommended resistance the partial safety factor as regulated in the ETA and partial safety factor of the load γ_F = 1.4 are considered. For combination of tensile loads, shear loads, bending moments as well as well as reduced edge distances or spacing's (anchor groups) see ETA or Mungo design software. The data above must be checked by the user under the responsibility of an engineer experienced in anchorage and concrete work. This is to ensure there are no errors and all data is complete and accurate and complies with all rules and regulations for the actual conditions and application.