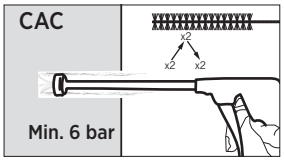
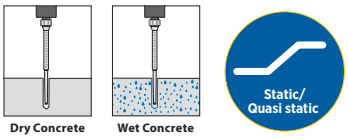
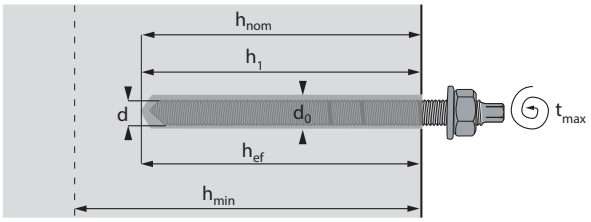
EHI Ultra w/ 8.8 steel threaded rod

Standard Hammer Drill

8.8 steel : M8-M30







Dimension	Installation							Design Resistance [1]					
Threaded Rod	**h_{nom} / h_{ef}**	**d_0**	**h_1**	**h_{min}**	**Volume**	**T_{max} [2]**	**d_f**	**N_{Rd}**		**V_{Rd}**	**N_{Rd}**		**V_{Rd}**
								Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embed-ment/ Effective depth	Drill hole diam-eter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole[4]	Max applied installation torque	Max clearance hole[5]	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Nm	mm	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇
M8 - 60	60	10	60	100	3,3	10	9 (12)	15,2	13,5	8,7	7,0	5,6	8,7
M8 - 80	80	10	80	110	4,4	10	9 (12)	19,3	18,0	12,0	9,4	7,4	12,0
M8 - 100	100	10	100	130	5,6	10	9 (12)	19,3	19,3	12,0	11,7	9,3	12,0
M8 - 150	150	10	150	180	8,3	10	9 (12)	19,3	19,3	12,0	17,6	13,9	12,0
M10 - 60	60	12	60	100	4,3	20	12 (14)	15,2	15,2	18,4	9,4	7,4	18,4
M10 - 90	90	12	90	120	6,5	20	12 (14)	28,0	25,3	18,4	14,1	11,2	18,4
M10 - 110	110	12	110	140	7,9	20	12 (14)	30,6	30,6	18,4	17,2	15,5	18,4
M10 - 150	150	12	150	180	10,8	20	12 (14)	30,6	30,6	18,4	23,6	18,6	18,4
M12 - 70	70	14	70	100	6,3	40	14 (16)	19,2	19,2	27,0	13,4	11,1	27,0
M12 - 90	90	14	90	120	8,1	40	14 (16)	28,0	28,0	27,0	18,1	14,3	27,0
M12 - 110	110	14	110	140	9,9	40	14 (16)	37,8	34,9	27,0	22,1	17,5	27,0
M12 - 150	150	14	150	180	13,6	40	14 (16)	44,7	44,7	27,0	30,1	23,8	27,0
M12 - 200	200	14	200	230	18,1	40	14 (16)	44,7	44,7	27,0	40,2	31,8	27,0
M16 - 80	80	18	80	116	10,0	60	18 (20)	23,5	23,5	46,9	16,4	19,0	32,9
M16 - 110	110	18	110	146	13,8	60	18 (20)	37,8	37,8	50,4	26,5	26,2	50,4
M16 - 125	125	18	125	161	15,7	60	18 (20)	45,8	45,8	50,4	32,1	29,7	50,4
M16 - 160	160	18	160	196	20,0	60	18 (20)	66,4	63,5	50,4	46,5	38,1	50,4
M16 - 210	210	18	210	246	23,6	60	18 (20)	84,0	83,4	50,4	63,3	50,0	50,4
M20 - 100	100	22	100	144	17,1	100	22 (24)	32,8	32,8	65,9	23,0	23,0	46,9
M20 - 170	170	22	170	214	29,1	100	22 (24)	72,7	72,7	78,4	50,9	47,8	78,4
M20 - 250	250	22	250	294	42,9	100	22 (24)	129,6	115,6	78,4	89,0	70,3	78,4
M20 - 350	300	22	350	344	60,0	100	22 (24)	130,7	130,7	78,4	106,8	84,4	78,4
M24 - 96	100	28	100	156	32,3	170	26 (30)	30,8	30,8	61,7	21,6	21,6	43,2
M24 - 140	140	28	140	196	45,2	170	26 (30)	54,3	54,3	108,7	38,0	38,0	76,1
M24 - 210	210	28	190	266	61,3	170	26 (30)	99,8	99,8	112,8	69,9	58,4	112,8
M24 - 290	290	28	290	346	93,5	170	26 (30)	162,0	149,7	112,8	102,0	80,6	112,8
M27 - 140	140	30	140	200	43,0	250	30 (33)	54,7	57,7	108,7	38,0	38,0	76,1
M27 - 240	240	30	240	300	73,6	250	30 (33)	121,9	121,9	147,2	85,4	75,0	147,2
M27 - 340	340	30	340	400	104,3	250	30 (33)	205,6	196,7	147,2	134,6	106,3	147,2
M30 - 120	120	35	120	190	58,4	300	30 (33)	43,1	43,1	86,2	30,2	30,2	60,4
M30 - 230	230	35	230	300	111,9	300	33 (40)	114,4	114,4	179,2	80,1	79,9	160,1
M30 - 270	270	35	270	340	131,4	300	34 (40)	145,5	145,5	179,2	101,8	93,8	179,2
M30 - 380	380	35	380	450	185,0	300	35 (40)	242,9	242,9	179,2	167,1	132,0	179,2

1) Design Resistance for a single anchor in Concrete C20/25 in Dry or Wet bore hole, without any influence from spacing and/ or edge distance together with threaded rod in 8.8 steel acc. to EN ISO 898-1. Partial safety factor, γm according to EN 1992-4 and γinst according to ETA. Service temperature in base material: Minimum -40 °C. Maximum long term service temperature +50 °C. Maximum short term service temperature + 80 °C.

2) T_{max} is max applied torque on the threaded rod.

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range. In case of combined loads these shall be verified according to EN 1992-4:2018 or ETAG 001: Annex C depending on requirements.

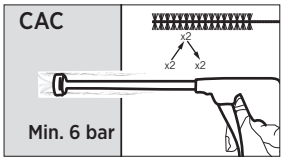
4) Volume correspond to requirement in concrete and do no include needed volume if push-through installation is applied.

5) Diameter in () are max for push-through installation.

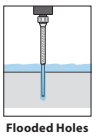
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

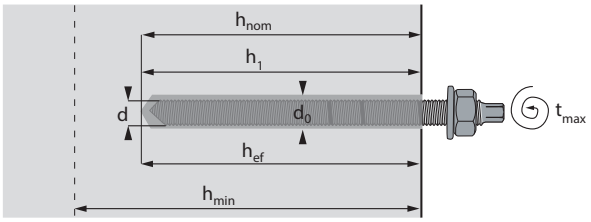
EHI Ultra w/ 8.8 steel threaded rod

Standard Hammer Drill



8.8 steel : M8-M30





Dimension	Installation							Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	Volume	T_{max} [2]	d_f	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
								Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embed-ment/ Effective depth	Drill hole diam-eter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole[4]	Max applied installation torque	Max clearance hole[5]	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Nm	mm	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇
M8 - 60	60	10	60	100	3,3	10	9 (12)	10,9	9,6	11,7	5,0	4,0	11,1
M8 - 80	80	10	80	110	4,4	10	9 (12)	16,3	12,9	11,7	6,7	5,3	11,7
M8 - 100	100	10	100	130	5,6	10	9 (12)	19,5	16,1	11,7	8,4	6,6	11,7
M8 - 150	150	10	150	180	8,3	10	9 (12)	19,5	19,5	11,7	12,6	9,9	11,7
M10 - 60	60	12	60	100	4,3	20	12 (14)	10,9	10,9	18,6	6,7	5,3	14,9
M10 - 90	90	12	90	120	6,5	20	12 (14)	20,0	18,1	18,6	10,1	8,0	18,6
M10 - 110	110	12	110	140	7,9	20	12 (14)	27,0	22,1	18,6	12,3	9,8	18,6
M10 - 150	150	12	150	180	10,8	20	12 (14)	30,9	30,1	18,6	16,8	13,3	18,6
M12 - 70	70	14	70	100	6,3	40	14 (16)	13,7	13,7	27,0	9,6	7,9	19,2
M12 - 90	90	14	90	120	8,1	40	14 (16)	20,0	20,0	27,0	12,9	10,2	27,0
M12 - 110	110	14	110	140	9,9	40	14 (16)	27,0	25,0	27,0	15,8	12,5	27,0
M12 - 150	150	14	150	180	13,6	40	14 (16)	43,0	34,0	27,0	21,5	17,0	27,0
M12 - 200	200	14	200	230	18,1	40	14 (16)	45,0	45,0	27,0	28,7	22,7	27,0
M16 - 80	80	18	80	116	10,0	60	18 (20)	16,8	16,8	33,5	11,7	11,7	23,5
M16 - 110	110	18	110	146	13,8	60	18 (20)	27,0	27,0	50,2	18,9	18,7	37,8
M16 - 125	125	18	125	161	15,7	60	18 (20)	32,7	32,7	50,2	22,9	21,3	45,8
M16 - 160	160	18	160	196	20,0	60	18 (20)	47,4	45,4	50,2	33,2	27,2	50,2
M16 - 210	210	18	210	246	23,6	60	18 (20)	71,3	59,6	50,2	45,2	35,7	50,2
M20 - 100	100	22	100	144	17,1	100	22 (24)	23,4	23,4	46,9	16,4	16,4	32,8
M20 - 170	170	22	170	214	29,1	100	22 (24)	51,9	51,9	78,4	36,3	34,2	72,7
M20 - 250	250	22	250	294	42,9	100	22 (24)	92,6	82,7	78,4	63,6	50,2	78,4
M20 - 350	300	22	350	344	60,0	100	22 (24)	125,7	99,3	78,4	76,3	60,3	78,4
M24 - 96	100	28	100	156	32,3	170	26 (30)	23,4	23,4	46,9	16,4	16,4	32,8
M24 - 140	140	28	140	196	45,2	170	26 (30)	38,8	38,8	77,6	27,2	27,2	54,3
M24 - 210	210	28	190	266	61,3	170	26 (30)	61,4	61,4	113,0	49,9	41,7	99,8
M24 - 290	290	28	290	346	93,5	170	26 (30)	115,7	106,9	113,0	72,9	57,6	113,0
M27 - 140	140	30	140	200	43,0	250	30 (33)	38,8	38,8	77,6	27,2	27,2	54,3
M27 - 240	240	30	240	300	73,6	250	30 (33)	87,1	87,1	146,9	61,0	53,6	121,9
M27 - 340	340	30	340	400	104,3	250	30 (33)	146,9	141,0	146,9	96,1	75,9	146,9
M30 - 120	120	35	120	190	58,4	300	30 (33)	30,8	30,8	61,6	21,6	21,6	43,1
M30 - 230	230	35	230	300	111,9	300	33 (40)	81,7	81,7	163,4	57,2	57,1	114,4
M30 - 270	270	35	270	340	131,4	300	34 (40)	103,9	103,9	179,5	72,7	67,0	145,5
M30 - 380	380	35	380	450	185,0	300	35 (40)	173,5	173,5	179,5	119,4	94,3	179,5

1) Design Resistance for a single anchor in Concrete C20/25 in flooded bore hole, without any influence from spacing and/ or edge distance together with threaded rod in 8.8 steel acc. to EN ISO 898-1. Partial safety factor, γ_m according to EN 1992-4 and γ_{inst} according to ETA. Service temperature in base material: Minimum -40°C. Maximum long term service temperature +50°C. Maximum short term service temperature + 80 °C.

2) T_{max} is max applied torque on the threaded rod.

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

4) Volume correspond to requirement in concrete and do no include needed volume if push-through installation is applied.

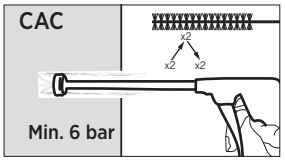
5) Diameter in () are max for push-through installation.

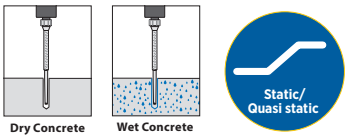
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

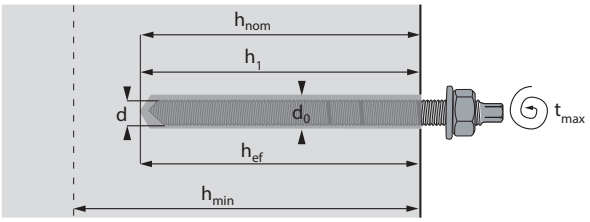
EHI Ultra w/ 5.8 steel threaded rod

Standard Hammer Drill

5.8 steel :M8-M30







Dimension	Installation							Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	Volume	T_{max} [2]	d_f	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
								Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embed-ment/ Effective depth	Drill hole diam-eter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole[4]	Max applied installation torque	Max clearance hole[5]	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Nm	mm	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇
M8 - 60	60	10	60	100	3,3	10	9 (12)	12,0	12,0	8,8	7,0	5,6	8,8
M8 - 80	80	10	80	110	4,4	10	9 (12)	12,0	12,0	8,8	9,4	7,4	8,8
M8 - 100	100	10	100	130	5,6	10	9 (12)	12,0	12,0	8,8	11,7	9,3	8,8
M8 - 150	150	10	150	180	8,3	10	9 (12)	12,0	12,0	8,8	12,0	12,0	8,8
M10 - 60	60	12	60	100	4,3	20	12 (14)	15,2	15,2	13,6	9,4	7,4	13,6
M10 - 90	90	12	90	120	6,5	20	12 (14)	19,3	19,3	13,6	14,1	11,2	13,6
M10 - 110	110	12	110	140	7,9	20	12 (14)	19,3	19,3	13,6	17,2	15,5	13,6
M10 - 150	150	12	150	180	10,8	20	12 (14)	19,3	19,3	13,6	19,3	18,6	13,6
M12 - 70	70	14	70	100	6,3	40	14 (16)	19,2	19,2	20,0	13,4	11,1	20,0
M12 - 90	90	14	90	120	8,1	40	14 (16)	28,0	28,0	20,0	18,1	14,3	20,0
M12 - 110	110	14	110	140	9,9	40	14 (16)	28,0	28,0	20,0	22,1	17,5	20,0
M12 - 150	150	14	150	180	13,6	40	14 (16)	28,0	28,0	20,0	28,0	23,8	20,0
M12 - 200	200	14	200	230	18,1	40	14 (16)	28,0	28,0	20,0	28,0	28,0	20,0
M16 - 80	80	18	80	116	10,0	60	18 (20)	23,5	23,5	37,6	16,4	19,0	32,9
M16 - 110	110	18	110	146	13,8	60	18 (20)	37,8	37,8	37,6	26,5	26,2	37,6
M16 - 125	125	18	125	161	15,7	60	18 (20)	45,8	45,8	37,6	32,1	29,7	37,6
M16 - 160	160	18	160	196	20,0	60	18 (20)	52,0	52,0	37,6	46,5	38,1	37,6
M16 - 210	210	18	210	246	23,6	60	18 (20)	52,0	52,0	37,6	52,0	50,0	37,6
M20 - 100	100	22	100	144	17,1	100	22 (24)	32,8	32,8	59,2	23,0	23,0	46,9
M20 - 170	170	22	170	214	29,1	100	22 (24)	72,7	72,7	59,2	50,9	47,8	59,2
M20 - 250	250	22	250	294	42,9	100	22 (24)	81,3	81,3	59,2	81,3	70,3	59,2
M20 - 350	300	22	350	344	60,0	100	22 (24)	81,3	81,3	59,2	81,3	81,3	59,2
M24 - 96	100	28	100	156	32,3	170	26 (30)	30,8	30,8	61,7	21,6	21,6	43,2
M24 - 140	140	28	140	196	45,2	170	26 (30)	54,3	54,3	84,8	38,0	38,0	76,1
M24 - 210	210	28	190	266	61,3	170	26 (30)	99,8	99,8	84,8	69,9	58,4	84,8
M24 - 290	290	28	290	346	93,5	170	26 (30)	117,3	117,3	84,8	102,0	80,6	84,8
M27 - 140	140	30	140	200	43,0	250	30 (33)	54,7	57,7	108,7	38,0	38,0	76,1
M27 - 240	240	30	240	300	73,6	250	30 (33)	121,9	121,9	110,4	85,4	75,0	110,4
M27 - 340	340	30	340	400	104,3	250	30 (33)	153,3	153,3	110,4	134,6	106,3	110,4
M30 - 120	120	35	120	190	58,4	300	30 (33)	43,1	43,1	86,2	30,2	30,2	60,4
M30 - 230	230	35	230	300	111,9	300	33 (40)	114,4	114,4	134,4	80,1	79,9	134,4
M30 - 270	270	35	270	340	131,4	300	34 (40)	145,5	145,5	134,4	101,8	93,8	134,4
M30 - 380	380	35	380	450	185,0	300	35 (40)	186,7	186,7	134,4	167,1	132,0	134,4

1) Design Resistance for a single anchor in Concrete C20/25 in Dry or Wet bore hole, without any influence from spacing and/ or edge distance together with threaded rod in 5.8 steel acc. to EN ISO 898-1. Partial safety factor, γm according to EN 1992-4 and γinst according to ETA. Service temperature in base material: Minimum -40 °C. Maximum long term service temperature +50 °C. Maximum short term service temperature + 80 °C.

2) T_{max} is max applied torque on the threaded rod.

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

4) Volume correspond to requirement in concrete and do no include needed volume if push-through installation is applied.

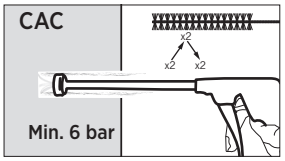
5) Diameter in () are max for push-through installation.

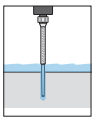
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

EHI Ultra w/ 5.8 steel threaded rod

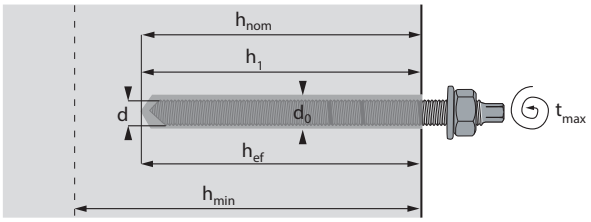
Standard Hammer Drill

5.8 steel :M8-M30





Flooded Holes



Dimension	Installation							Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	Volume	T_{max} [2]	d_f	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
								Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embed-ment/ Effective depth	Drill hole diam-eter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole[4]	Max applied installation torque	Max clearance hole[5]	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Nm	mm	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇
M8 - 60	60	10	60	100	3,3	10	9 (12)	10,9	9,6	8,8	5,0	4,0	8,8
M8 - 80	80	10	80	110	4,4	10	9 (12)	12,2	12,2	8,8	6,7	5,3	8,8
M8 - 100	100	10	100	130	5,6	10	9 (12)	12,2	12,2	8,8	8,4	6,6	8,8
M8 - 150	150	10	150	180	8,3	10	9 (12)	12,2	12,2	8,8	12,2	9,9	8,8
M10 - 60	60	12	60	100	4,3	20	12 (14)	10,9	10,9	13,9	6,7	5,3	13,9
M10 - 90	90	12	90	120	6,5	20	12 (14)	19,3	18,1	13,9	10,1	8,0	13,9
M10 - 110	110	12	110	140	7,9	20	12 (14)	19,3	19,3	13,9	12,3	9,8	13,9
M10 - 150	150	12	150	180	10,8	20	12 (14)	19,3	19,3	13,9	16,8	13,3	13,9
M12 - 70	70	14	70	100	6,3	40	14 (16)	13,7	13,7	20,2	9,6	7,9	19,2
M12 - 90	90	14	90	120	8,1	40	14 (16)	20,0	20,0	20,2	12,9	10,2	20,2
M12 - 110	110	14	110	140	9,9	40	14 (16)	27,0	25,0	20,2	15,8	12,5	20,2
M12 - 150	150	14	150	180	13,6	40	14 (16)	28,1	28,1	20,2	21,5	17,0	20,2
M12 - 200	200	14	200	230	18,1	40	14 (16)	28,1	28,1	20,2	28,1	22,7	20,2
M16 - 80	80	18	80	116	10,0	60	18 (20)	16,8	16,8	33,5	11,7	11,7	23,5
M16 - 110	110	18	110	146	13,8	60	18 (20)	27,0	27,0	37,7	18,9	18,7	37,7
M16 - 125	125	18	125	161	15,7	60	18 (20)	32,7	32,7	37,7	22,9	21,3	37,7
M16 - 160	160	18	160	196	20,0	60	18 (20)	47,4	45,4	37,7	33,2	27,2	37,7
M16 - 210	210	18	210	246	23,6	60	18 (20)	52,3	52,3	37,7	45,2	35,7	37,7
M20 - 100	100	22	100	144	17,1	100	22 (24)	23,4	23,4	46,9	16,4	16,4	32,8
M20 - 170	170	22	170	214	29,1	100	22 (24)	51,9	51,9	58,8	36,3	34,2	58,8
M20 - 250	250	22	250	294	42,9	100	22 (24)	81,7	81,7	58,8	63,6	50,2	58,8
M20 - 350	300	22	350	344	60,0	100	22 (24)	81,7	81,7	58,8	76,3	60,3	58,8
M24 - 96	100	28	100	156	32,3	170	26 (30)	23,4	23,4	46,9	16,4	16,4	32,8
M24 - 140	140	28	140	196	45,2	170	26 (30)	38,8	38,8	77,6	27,2	27,2	54,3
M24 - 210	210	28	190	266	61,3	170	26 (30)	61,4	61,4	84,7	49,9	41,7	84,7
M24 - 290	290	28	290	346	93,5	170	26 (30)	115,7	106,9	84,7	72,9	57,6	84,7
M27 - 140	140	30	140	200	43,0	250	30 (33)	38,8	38,8	77,6	27,2	27,2	54,3
M27 - 240	240	30	240	300	73,6	250	30 (33)	87,1	87,1	110,2	61,0	53,6	110,2
M27 - 340	340	30	340	400	104,3	250	30 (33)	146,9	141,0	110,2	96,1	75,9	110,2
M30 - 120	120	35	120	190	58,4	300	30 (33)	30,8	30,8	61,6	21,6	21,6	43,1
M30 - 230	230	35	230	300	111,9	300	33 (40)	81,7	81,7	134,6	57,2	57,1	114,4
M30 - 270	270	35	270	340	131,4	300	34 (40)	103,9	103,9	134,6	72,7	67,0	134,6
M30 - 380	380	35	380	450	185,0	300	35 (40)	173,5	173,5	134,6	119,4	94,3	134,6

1) Design Resistance for a single anchor in Concrete C20/25 in flooded bore hole, without any influence from spacing and/ or edge distance together with threaded rod in 5.8 steel acc. to EN ISO 898-1. Partial safety factor, γm according to EN 1992-4 and γinst according to ETA. Service temperature in base material: Minimum -40 °C. Maximum long term service temperature +50 °C. Maximum short term service temperature + 80 °C.

2) T_{max} is max applied torque on the threaded rod.

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

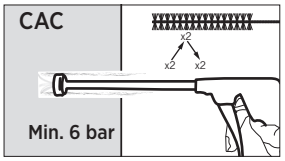
4) Volume correspond to requirement in concrete and do no include needed volume if push-through installation is applied.

5) Diameter in () are max for push-through installation.

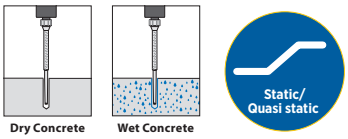
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

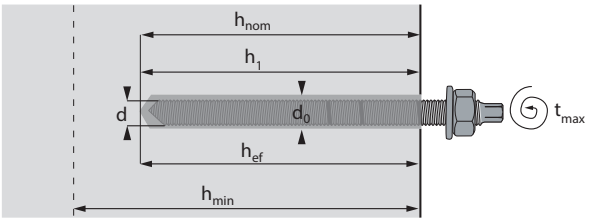
EHI Ultra w/ A2-70 or A4-70 stainless steel threaded rod

Standard Hammer Drill



A2-70: M8 – M30
A4-70: M8 – M30





Dimension	Installation							Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	**Volume**	T_{max} [2]	d_f	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
								Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embed-ment/ Effective depth	Drill hole diam-eter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole[4]	Max applied installation torque	Max clearance hole[5]	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Nm	mm	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇
M8 - 60	60	10	60	100	3,3	10	9 (12)	13,9	13,5	8,3	7,0	5,6	8,3
M8 - 80	80	10	80	110	4,4	10	9 (12)	13,9	13,9	8,3	9,4	7,4	8,3
M8 - 100	100	10	100	130	5,6	10	9 (12)	13,9	13,9	8,3	11,7	9,3	8,3
M8 - 150	150	10	150	180	8,3	10	12 (14)	13,9	13,9	8,3	13,9	13,9	8,3
M10 - 60	60	12	60	100	4,3	20	12 (14)	15,2	15,2	12,8	9,4	7,4	12,8
M10 - 90	90	12	90	120	6,5	20	12 (14)	21,9	21,9	12,8	14,1	11,2	12,8
M10 - 110	110	12	110	140	7,9	20	12 (14)	21,9	21,9	12,8	17,2	15,5	12,8
M10 - 150	150	12	150	180	10,8	20	14 (16)	21,9	21,9	12,8	21,9	18,6	12,8
M12 - 70	70	14	70	100	6,3	40	14 (16)	19,2	19,2	19,2	13,4	11,1	19,2
M12 - 90	90	14	90	120	8,1	40	14 (16)	28,0	28,0	19,2	18,1	14,3	19,2
M12 - 110	110	14	110	140	9,9	40	14 (16)	31,6	31,6	19,2	22,1	17,5	19,2
M12 - 150	150	14	150	180	13,6	40	14 (16)	31,6	31,6	19,2	30,1	23,8	19,2
M12 - 200	200	14	200	230	18,1	40	18 (20)	31,6	31,6	19,2	31,6	31,6	19,2
M16 - 80	80	18	80	116	10,0	60	18 (20)	23,5	23,5	35,3	16,4	19,0	32,9
M16 - 110	110	18	110	146	13,8	60	18 (20)	37,8	37,8	35,3	26,5	26,2	35,3
M16 - 125	125	18	125	161	15,7	60	18 (20)	45,8	45,8	35,3	32,1	29,7	35,3
M16 - 160	160	18	160	196	20,0	60	18 (20)	58,8	58,8	35,3	46,5	38,1	35,3
M16 - 210	210	18	210	246	23,6	60	22 (24)	58,8	58,8	35,3	58,8	50,0	35,3
M20 - 100	100	22	100	144	17,1	100	22 (24)	32,8	32,8	55,1	23,0	23,0	46,9
M20 - 170	170	22	170	214	29,1	100	22 (24)	72,7	72,7	55,1	50,9	47,8	55,1
M20 - 250	250	22	250	294	42,9	100	22 (24)	91,4	91,4	55,1	89,0	70,3	55,1
M20 - 350	300	22	350	344	60,0	100	26 (30)	130,7	130,7	55,1	91,4	84,4	55,1
M24 - 96	100	28	100	156	32,3	170	26 (30)	30,8	30,8	61,7	21,6	21,6	43,2
M24 - 140	140	28	140	196	45,2	170	26 (30)	54,3	54,3	79,5	38,0	38,0	76,1
M24 - 210	210	28	190	266	61,3	170	26 (30)	99,8	99,8	79,5	69,9	58,4	79,5
M24 - 290	290	28	290	346	93,5	170	30 (33)	132,1	132,1	79,5	102,0	80,6	79,5
M27 - 140	140	30	140	200	43,0	250	30 (33)	54,7	57,7	102,9	38,0	38,0	102,9
M27 - 240	240	30	240	300	73,6	250	30 (33)	121,9	121,9	102,9	85,4	75,0	102,9
M27 - 340	340	30	340	400	104,3	250	30 (33)	171,7	171,1	102,9	134,6	106,3	102,9
M30 - 120	120	35	120	190	58,4	300	33 (40)	43,1	43,1	86,2	30,2	30,2	60,4
M30 - 230	230	35	230	300	111,9	300	34 (40)	114,4	114,4	125,6	80,1	79,9	125,6
M30 - 270	270	35	270	340	131,4	300	35 (40)	145,5	145,5	125,6	101,8	93,8	125,6
M30 - 380	380	35	380	450	185,0	300	35 (40)	209,6	209,6	125,6	167,1	132,0	125,6

1) Design Resistance for a single anchor in Concrete C20/25 in Dry or Wet bore hole, without any influence from spacing and/ or edge distance together with threaded rod in A2-70 or A4-70 acc. to EN ISO 3506-1. Partial safety factor, γm according to EN 1992-4 and γinst according to ETA. Service temperature in base material: Minimum -40 °C. Maximum long term service temperature +50 °C. Maximum short term service temperature + 80 °C.

2) T_{max} is max applied torque on the threaded rod.

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

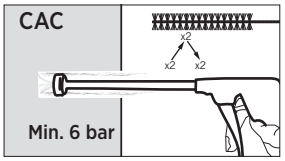
4) Volume correspond to requirement in concrete and do no include needed volume if push-through installation is applied.

5) Diameter in () are max for push-through installation.

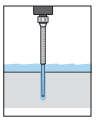
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

EHI Ultra w/ A2-70 or A4-70 stainless steel threaded rod

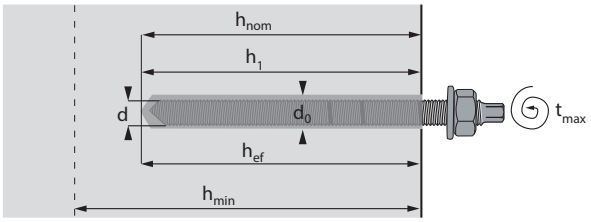
Standard Hammer Drill



A2-70: M8 – M30
A4-70: M8 – M30



Flooded Holes



Dimension	Installation							Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	Volume	T_{max} [2]	d_f	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
								Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embed-ment/ Effective depth	Drill hole diam-eter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole[4]	Max applied installation torque	Max clearance hole[5]	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Nm	mm	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79[3]	kN◇
M8 - 60	60	10	60	100	3,3	10	9 (12)	10,9	9,6	8,2	5,0	4,0	8,2
M8 - 80	80	10	80	110	4,4	10	9 (12)	13,7	12,9	8,2	6,7	5,3	8,2
M8 - 100	100	10	100	130	5,6	10	9 (12)	13,7	13,7	8,2	8,4	6,6	8,2
M8 - 150	150	10	150	180	8,3	10	9 (12)	13,7	13,7	8,2	12,6	9,9	8,2
M10 - 60	60	12	60	100	4,3	20	12 (14)	10,9	10,9	13,0	6,7	5,3	13,0
M10 - 90	90	12	90	120	6,5	20	12 (14)	20,0	18,1	13,0	10,1	8,0	13,0
M10 - 110	110	12	110	140	7,9	20	12 (14)	21,7	21,7	13,0	12,3	9,8	13,0
M10 - 150	150	12	150	180	10,8	20	12 (14)	21,7	21,7	13,0	16,8	13,3	13,0
M12 - 70	70	14	70	100	6,3	40	14 (16)	13,7	13,7	18,9	9,6	7,9	18,9
M12 - 90	90	14	90	120	8,1	40	14 (16)	20,0	20,0	18,9	12,9	10,2	18,9
M12 - 110	110	14	110	140	9,9	40	14 (16)	27,0	25,0	18,9	15,8	12,5	18,9
M12 - 150	150	14	150	180	13,6	40	14 (16)	31,6	31,6	18,9	21,5	17,0	18,9
M12 - 200	200	14	200	230	18,1	40	14 (16)	31,6	31,6	18,9	28,7	22,7	18,9
M16 - 80	80	18	80	116	10,0	60	18 (20)	16,8	16,8	33,5	11,7	11,7	23,5
M16 - 110	110	18	110	146	13,8	60	18 (20)	27,0	27,0	35,2	18,9	18,7	35,2
M16 - 125	125	18	125	161	15,7	60	18 (20)	32,7	32,7	35,2	22,9	21,3	35,2
M16 - 160	160	18	160	196	20,0	60	18 (20)	47,4	45,4	35,2	33,2	27,2	35,2
M16 - 210	210	18	210	246	23,6	60	18 (20)	58,8	58,8	35,2	45,2	35,7	35,2
M20 - 100	100	22	100	144	17,1	100	22 (24)	23,4	23,4	46,9	16,4	16,4	32,8
M20 - 170	170	22	170	214	29,1	100	22 (24)	51,9	51,9	55,0	36,3	34,2	55,0
M20 - 250	250	22	250	294	42,9	100	22 (24)	91,7	82,7	55,0	63,6	50,2	55,0
M20 - 350	300	22	350	344	60,0	100	22 (24)	91,7	91,7	55,0	76,3	60,3	55,0
M24 - 96	100	28	100	156	32,3	170	26 (30)	23,4	23,4	46,9	16,4	16,4	32,8
M24 - 140	140	28	140	196	45,2	170	26 (30)	38,8	38,8	77,6	27,2	27,2	54,3
M24 - 210	210	28	190	266	61,3	170	26 (30)	61,4	61,4	79,2	49,9	41,7	79,2
M24 - 290	290	28	290	346	93,5	170	26 (30)	115,7	106,9	79,2	72,9	57,6	79,2
M27 - 140	140	30	140	200	43,0	250	30 (33)	38,8	38,8	77,6	27,2	27,2	54,3
M27 - 240	240	30	240	300	73,6	250	30 (33)	87,1	87,1	103,0	61,0	53,6	103,0
M27 - 340	340	30	340	400	104,3	250	30 (33)	146,9	141,0	103,0	96,1	75,9	103,0
M30 - 120	120	35	120	190	58,4	300	30 (33)	30,8	30,8	61,6	21,6	21,6	43,1
M30 - 230	230	35	230	300	111,9	300	33 (40)	81,7	81,7	125,9	57,2	57,1	114,4
M30 - 270	270	35	270	340	131,4	300	34 (40)	103,9	103,9	125,9	72,7	67,0	125,9
M30 - 380	380	35	380	450	185,0	300	35 (40)	173,5	173,5	125,9	119,4	94,3	125,9

1) Design Resistance for a single anchor in Concrete C20/25 in flooded bore hole, without any influence from spacing and/ or edge distance together with threaded rod in A2, A4 or HCR steel in class 70 acc. to EN ISO 3605-1. Partial safety factor, γm according to EN 1992-4 and γ_{inst} according to ETA. Service temperature in base material: Minimum -40°. Maximum long term service temperature +50°. Maximum short term service temperature + 80 °C.

2) T_{max} is max applied torque on the threaded rod.

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

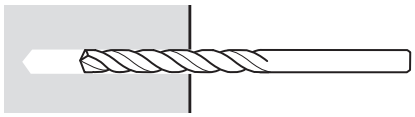
4) Volume correspond to requirement in concrete and do no include needed volume if push-through installation is applied.

5) Diameter in () are max for push-through installation.

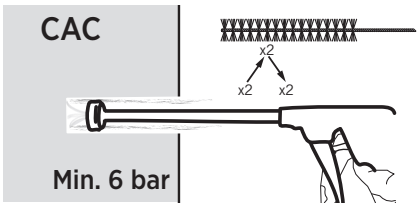
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

EHI Ultra: Installation of Threaded Rods

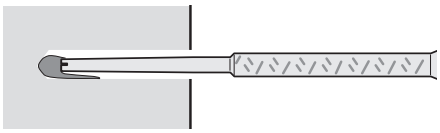
Installation:



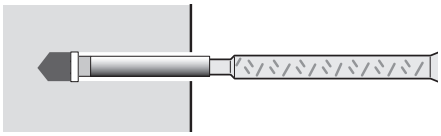
1 Drill borehole with hammer drill bit to correct depth.



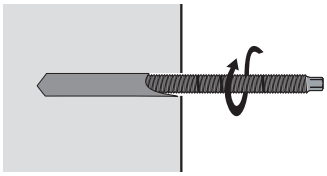
2 Clean the drilled hole thoroughly - follow above illustration.



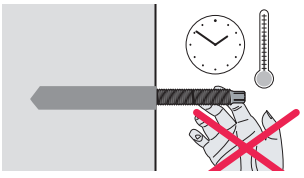
3 Insert the mixer into the drilled hole, and while the mixer is slowly retracted inject the correct volume of styrene free injection mortar.



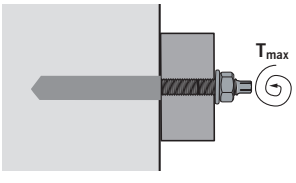
4 NB! For drill diameter ≥ ø18 and depth > 250 piston plugs shall be use. In case of overhead installation with drill diameter ≥ ø18 piston plugs shall be used.



5 Insert the treaded rod or socket in a slowly rotating motion, complying with specified embedment depth. For optimal filling of the hole excess mortar should flow out.
Observe temperature dependent curing time - see cartridge or matrix on the following page.
OBS: Use allways oil free treaded rod!



6 After ended curing time the fixing can be loaded Do not distrub during curing, after installation is finished.



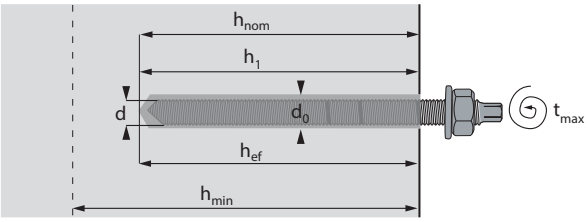
7 Fixture can be applied respecting T_{max}

CURING TIME EHI Ultra:

$t_{concrete}$	t_{gel}	t_{cure} 1)
-5 → -1°C	50 min.	300 min.
0 → +4°C	25 min.	210 min.
+5 → +9°C	15 min.	160 min.
+10 → +14°C	10 min.	60 min.
+15 → +19°C	6 min.	45 min.
+20 → +29°C	3 min.	25 min.
+30 → +40°C	2 min.	20 min.
		+5° → +40°C

1) In wet and flooded bore holes the curing time tcure must be doubled.

EHI Ultra: Installation parameters for threaded rods



Installation parameters for threaded rods

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Diameter of element	$d = d_{nom}$	[mm]	8	10	12	16	20	24	27	30
Nominal drill hole diameter	d_o	[mm]	10	12	14	18	22	28	30	35
Effective embedment 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
Diameter of clearance hole in the fixture1)	Prepositioned installation d_f	[mm]	9	12	14	18	22	26	30	33
	Push through installation d_f	[mm]	12	14	16	20	24	30	33	40
Maximum torque moment	$T_{max} \leq$	[Nm]	10	20	402)	60	100	170	250	300
Minimum thickness of member	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 distance	C_{min}	[mm]	35	40	45	50	60	65		80

Characteristic values for Concrete cone failure, Splitting and Combined Pullout

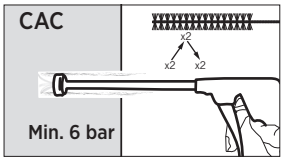
Anchor size				All Anchor types and sizes
Concrete cone failure [1]				
Non-cracked concrete		$k_{ucr,N}$	[-]	11
Cracked concrete		$k_{cr,N}$	[-]	7,7
Edge distance		$c_{cr,N}$	[mm]	$1,5\ h_{ef}$
Axial distance (spacing)		$s_{cr,N}$	[mm]	$2\ c_{cr,N}$
Splitting [1]				
Edge distance	$h/h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	$1,0\ h_{ef}$
	$2,0 > h/h_{ef} > 1,3$		[mm]	$2\text{-}h_{ef}(2,5\text{-}\frac{h}{h_{ef}})$
	$h/h_{ef} \leq 1,3$		[Nm]	$2,4\ h_{ef}$
Axial distance (spacing)		$c_{cr,sp}$	[mm]	$2\ c_{cr,sp}$
Combined Pullout [1]				
Axial distance (spacing) [2]		$S_{cr,Np}$	[mm]	$7,3d(\Psi_{sus}\ \tau_{Rk,unr})^{0,5} \leq 3h_{ef}$
Edge distance		C_{crNp}	[mm]	$S_{cr,Np} / 2$

1) If characteristic axial distance (spacing) or edge distance is reduced for a given hef it will reduce the load capacity of the anchor. Use Expandet Calculation services to perform calculation of specific cases. Can be downloaded at www.expandet.com.

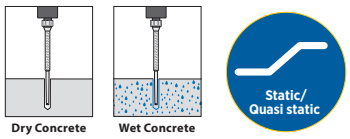
2) $\tau_{Rk,ucr}$ shall be for uncracked concrete C20/25.

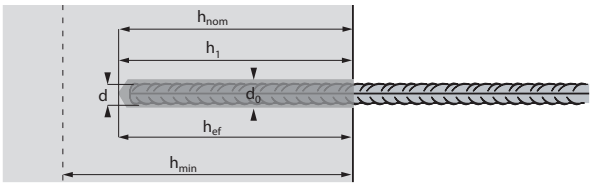
EHI Ultra w/ Rebar (f_{uk} = 550 N/mm²)

Standard Hammer Drill



Rebar: ø8 – ø32
(f_{uk} = 550 N/mm²)





Dimension	Installation					Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	Volume	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
						Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embedment/ Effective depth	Drill hole diameter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79 [3]	kN ◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79 [3]	kN ◇
ø8 - 60	60	12	60	100	4,9	14,7	11,6	9,2	5,5	4,3	9,2
ø8 - 80	80	12	80	110	6,5	18,7	14,8	9,2	7,3	5,8	9,2
ø8 - 110	110	12	110	140	9,0	19,6	19,6	9,2	10,1	8,0	9,2
ø8 - 160	160	12	160	190	13,0	19,6	19,6	9,2	14,7	11,6	9,2
ø10 - 60	60	14	60	100	5,8	15,2	12,0	14,5	6,9	5,5	13,8
ø10 - 90	120	14	120	150	8,7	26,4	20,8	14,5	10,3	8,1	14,5
ø10 - 150	150	14	150	180	14,5	31,0	31,0	14,5	17,3	13,7	14,5
ø10 - 200	200	14	200	250	19,3	31,0	31,0	14,5	23,0	18,2	14,5
ø12 - 70	70	16	70	100	7,9	19,2	19,2	20,7	10,6	8,4	20,7
ø12 - 110	110	16	110	142	12,4	38,7	30,6	20,7	16,6	13,1	20,7
ø12 - 150	150	16	150	182	16,9	44,4	41,7	20,7	22,6	17,9	20,7
ø12 - 240	240	16	240	272	27,1	44,4	44,4	20,7	36,2	28,6	20,7
ø16 - 80	80	20	80	120	11,6	23,5	23,5	36,8	16,4	13,7	36,8
ø16 - 125	125	20	125	165	18,1	45,8	43,0	36,8	27,2	21,5	36,8
ø16 - 210	210	20	210	250	30,4	78,6	72,2	36,8	45,7	36,1	36,8
ø16 - 320	320	20	320	360	46,7	78,6	78,6	36,8	69,7	55,1	36,8
ø20 - 100	100	25	100	150	22,2	32,8	32,8	57,5	23,0	21,5	45,9
ø20 - 170	170	25	170	220	37,7	72,7	72,7	57,5	46,3	36,6	57,5
ø20 - 250	250	25	250	300	55,4	123,4	107,6	57,5	90,7	81,1	57,5
ø20 - 400	400	25	400	450	88,6	123,4	123,4	57,5	108,9	86,0	57,5
ø25 - 100	100	32	100	164	38,4	32,8	32,8	65,6	23,0	23,0	45,9
ø25 - 210	210	32	140	274	80,5	99,8	99,8	90,0	69,9	60,8	90,0
ø25 - 300	300	32	190	364	115,1	192,9	161,3	90,0	110,0	86,9	90,0
ø25 - 500	500	32	290	564	191,8	192,9	192,6	90,0	183,3	144,8	90,0
ø28- 140	140	35	140	210	59,3	54,3	54,3	108,6	38,0	38,0	76,0
ø28 -270	270	35	270	340	114,3	145,5	145,5	112,9	102,0	102,0	112,9
ø28 - 560	560	35	560	630	237,1	241,4	241,4	112,9	241,4	241,3	112,9
ø32 - 200	200	40	200	280	110,0	92,8	92,8	147,3	64,9	64,9	129,9
ø32 - 300	300	40	300	380	165,0	170,4	170,4	147,3	119,3	111,2	147,3
ø32 - 450	450	40	450	530	247,3	313,1	309,7	147,3	221,1	166,8	147,3
ø30 - 640	640	40	640	720	350,7	315,7	315,7	147,3	315,7	315,7	147,3

1) Design Resistance for a single anchor in Concrete C20/25 in Dry or Wet bore hole, without any influence from spacing and/ or edge distance together with rebar, f_{uk} = 550 N/mm² . Partial safety factor, γm according to EN 1992-4 and γ_{inst} according to ETA. Service temperature in base material: Minimum -40 °C. Maximum long term service temperature +50 °C. Maximum short term service temperature + 80 °C.

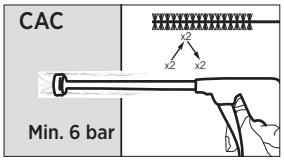
2)

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

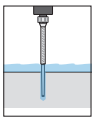
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

EHI Ultra w/ Rebar (f_{uk} = 550 N/mm²)

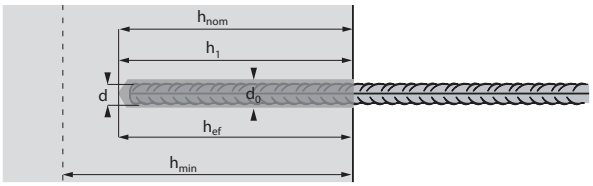
Standard Hammer Drill



Rebar: ø8 – ø32
(f_{uk} = 550 N/mm²)



Flooded Holes



Dimension	Installation					Design Resistance [1]					
Threaded Rod	h_{nom} / h_{ef}	d_0	h_1	h_{min}	Volume	N_{Rd}		V_{Rd}	N_{Rd}		V_{Rd}
						Non-cracked concrete			Cracked concrete		
Diameter / h_{nom}	Embedment/ Effective depth	Drill hole diameter	Depth of drill hole (Min.)	Min. thickness of concrete member	Approx. Mortar volume per hole	**Design resistance** tension kN		**Design resistance** shear	**Design resistance** tension kN		**Design resistance** shear
mm	mm	mm	mm	mm	ml	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79 [3]	kN◇	Ψ_{sus} = 1,00	Ψ_{sus} = 0,79 [3]	kN◇
ø8 - 60	60	12	60	100	4,9	10,1	7,9	9,2	3,9	3,1	8,7
ø8 - 80	80	12	80	110	6,5	13,4	10,6	9,2	5,3	4,2	9,2
ø8 - 110	110	12	110	140	9,0	18,4	14,6	9,2	7,2	5,7	9,2
ø8 - 160	160	12	160	190	13,0	19,6	19,6	9,2	10,5	8,3	9,2
ø10 - 60	60	14	60	100	5,8	10,9	9,9	14,5	4,9	3,9	10,9
ø10 - 90	120	14	120	150	8,7	25,1	19,9	14,5	9,9	7,8	14,5
ø10 - 150	150	14	150	180	14,5	31,0	24,8	14,5	12,3	9,8	14,5
ø10 - 200	200	14	200	250	19,3	31,0	31,0	14,5	16,5	13,0	14,5
ø12 - 70	70	16	70	100	7,9	13,7	13,7	20,7	7,5	6,0	16,7
ø12 - 110	110	16	110	142	12,4	27,0	21,8	20,7	11,8	9,4	20,7
ø12 - 150	150	16	150	182	16,9	37,7	29,8	20,7	16,2	12,8	20,7
ø12 - 240	240	16	240	272	27,1	44,4	44,4	20,7	25,9	20,4	20,7
ø16 - 80	80	20	80	120	11,6	16,8	14,7	33,5	9,3	7,4	20,6
ø16 - 125	125	20	125	165	18,1	32,7	30,7	36,9	19,4	15,4	36,9
ø16 - 210	210	20	210	250	30,4	65,3	51,6	36,9	32,7	25,8	36,9
ø16 - 320	320	20	320	360	46,7	79,0	78,7	36,9	49,8	39,3	36,9
ø20 - 100	100	25	100	150	22,2	23,4	23,4	46,9	16,4	15,4	32,8
ø20 - 170	170	25	170	220	37,7	51,9	51,9	57,6	33,1	26,1	57,6
ø20 - 250	250	25	250	300	55,4	92,6	76,8	57,6	48,6	38,4	57,6
ø20 - 400	400	25	400	450	88,6	123,4	122,9	57,6	77,8	61,5	57,6
ø25 - 100	100	32	100	164	38,4	23,4	23,4	46,9	16,4	16,4	32,8
ø25 - 210	210	32	140	274	80,5	38,8	38,8	77,6	49,9	43,4	90,0
ø25 - 300	300	32	190	364	115,1	61,4	61,4	90,0	78,5	62,0	90,0
ø25 - 500	500	32	290	564	191,8	115,7	115,7	90,0	130,9	103,4	90,0
ø28- 140	140	35	140	210	59,3	38,8	38,8	77,6	27,2	27,2	54,3
ø28 -270	270	35	270	340	114,3	103,9	103,9	112,9	72,7	62,5	112,9
ø28 - 560	560	35	560	630	237,1	242,0	240,9	112,9	164,2	129,7	112,9
ø32 - 200	200	40	200	280	110,0	66,3	66,3	132,5	46,4	46,4	92,8
ø32 - 300	300	40	300	380	165,0	121,7	121,7	147,4	85,2	79,4	147,4
ø32 - 450	450	40	450	530	247,3	223,6	221,2	147,4	150,8	119,1	147,4
ø30 - 640	640	40	640	720	350,7	315,9	314,7	147,4	214,5	169,4	147,4

1) Design Resistance for a single anchor in Concrete C20/25 in flooded bore hole, without any influence from spacing and/ or edge distance together with rebar, f_{uk} = 550 N/mm² . Partial safety factor, γm according to EN 1992-4 and γ_{inst} according to ETA. Service temperature in base material: Minimum -40 °C. Maximum long term service temperature +50 °C. Maximum short term service temperature + 80 °C.

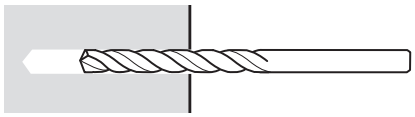
2)

3) Ψ_{sus} is product dependent factor, according to EN 1992-4: 7.2.1.6, considering ratio between sustined and variable load on the anchor. Ψ_{sus} = 0,79 is worst case scenario: I.e. 100% axial dead load with in the stated temperature range.

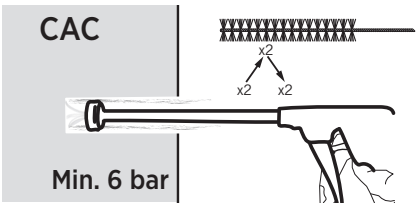
Use Expandet Calculation Services, ECS, to calculate anchorages of single anchors or groups with limited spacing and edge distances, other temperature regimes and Seismic C1 and C2 depending of scope of ETA. Available for free download at www.expandet.com.

ESI Ultra: Installation of Rebar (EN 1992-4)

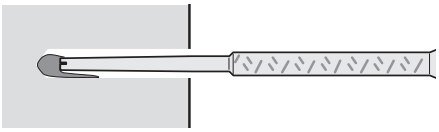
Installation:



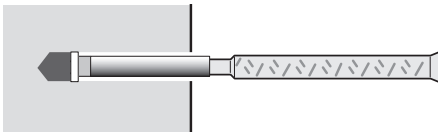
1 Drill borehole with hammer drill bit to correct depth.



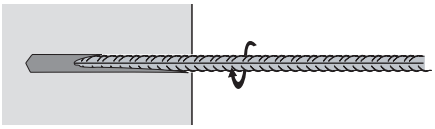
2 Clean the drilled hole thoroughly - using compressed air.



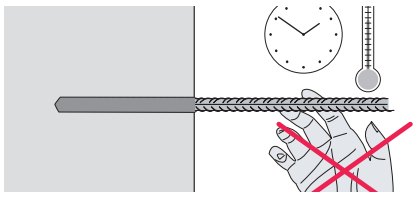
3 Insert the mixer into the drilled hole, and while the mixer is slowly retracted inject the correct volume of styrene free injection mortar.



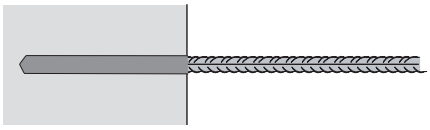
4 NB! For drill diameter ≥ ø18 and depth > 250 piston plugs shall be use. In case of overhead installation with drill diameter ≥ ø18 piston plugs shall be used.



5 Insert reinforcement bar in a slowly rotating motion. For optimal filling of the hole excess mortar should flow out.
Observe temperature dependent curing time.



6 Do not distrub installed rebar during curing time.



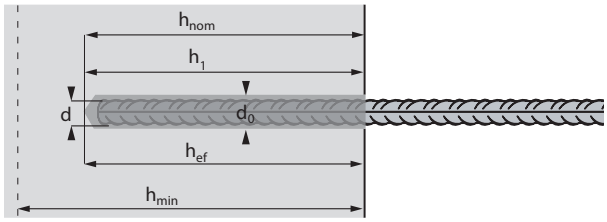
7 Installation is finished.

CURING TIME EHI Ultra:

$t_{concrete}$	t_{gel}	t_{cure} 1)
-5 → -1°C	50 min.	300 min.
0 → +4°C	25 min.	210 min.
+5 → +9°C	15 min.	160 min.
+10 → +14°C	10 min.	60 min.
+15 → +19°C	6 min.	45 min.
+20 → +29°C	3 min.	25 min.
+30 → +40°C	2 min.	20 min.
+5° → +40°C		

1) In wet and flooded bore holes the curing time tcure must be doubled.

ESI Ultra: Installation parameters for Rebar (EN 1992-4)



Installation parameters for Rebar (EN 1992-4)

Rebar size			Ø8	Ø10	Ø12	ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30
Diameter of element	$d = d_{nom}$	[mm]	8	10	10	14	16	20	24	25	28	32
Nominal drill hole diameter	d_o	[mm]	10 12	12 14	12 14	18	20	25	32	32	35	40
Effective embedment depth	$h_{ef,min}$	[mm]	60	60	60	75	80	90	96	100	112	128
	$h_{ef,max}$	[mm]	160	200	200	280	320	400	480	500	560	640
Minimum thickness of member	h_{min}	[mm]	h_{ef} + 30 mm			h_{ef} + $2d_0$						
Minimum spacing	S_{min}	[mm]	40	50	60	70	75	95	120	120	130	150
Minimum edge distance	C_{min}	[mm]	35	40	45	50	50	60	70	70	75	85

Characteristic values for Concrete cone failure, Splitting and Combined Pullout

Anchor size				All Anchor types and sizes
Concrete cone failure [1]				
Non-cracked concrete		$k_{ucr,N}$	[-]	11
Cracked concrete		$k_{cr,N}$	[-]	7,7
Edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}
Axial distance (spacing)		$s_{cr,N}$	[mm]	2 $c_{cr,N}$
Splitting [1]				
Edge distance	$h/h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	1,0 h_{ef}
	$2,0 > h/h_{ef} > 1,3$		[mm]	$2\text{-}h_{ef}(2,5\text{-}\frac{h}{h_{ef}})$
	$h/h_{ef} \leq 1,3$		[Nm]	2,4 h_{ef}
Axial distance (spacing)		$c_{cr,sp}$	[mm]	2 $c_{cr,sp}$
Combined Pullout [1]				
Axial distance (spacing) [2]		$S_{cr,Np}$	[mm]	$7,3d(\Psi_{sus}\,\tau_{Rk,unr})^{0,5} \leq 3h_{ef}$
Edge distance		C_{crNp}	[mm]	$S_{cr,Np}$ / 2

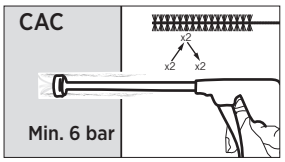
1) If characteristic axial distance (spacing) or edge distance is reduced for a given hef it will reduce the load capacity of the anchor. Use Expandet Calculation services to perform calculation of specific cases. Can be downloaded at www.expandet.com.

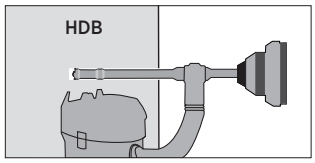
2) $\tau_{Rk,ucr}$ shall be for uncracked concrete C20/25.

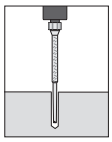
EHI Ultra w/ Rebar (f_{uk}= 550 N/mm²)

Standard Hammer Drill and
Compressed air drilling (CD)

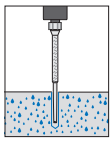
Rebar: ø8 – ø32
(f_{uk} = 550 N/mm²)







Dry Concrete



Wet Concrete

Design Anchorage lenght Rebar (f_{yk}= 500 N/mm²) in concrete, good bond conditions

Rebar Diameter d	Drill Diameter d_0	Concrete Class	Minimum anchorage length [1] $l_{b,min}$	Minimum lap lenght [1] $l_{0,min}$	Rebar Design Yield [2] $N_{Rd,y}$	Design achorage length (α_2 = 1,0) [3] $l_{bd,y}$	Approx. Mortar volume for lbd,y (α2= 1,0) Vol.	Design achorage length $l_{bd,y}$	Approx. Mortar volume for $l_{bd,y}$ (α_2= 0,7) Vol.	Maximum embedment depth (HD/CD) $l_{v,max}$	Maximum embedment depth (HBD) $l_{v,max}$
(mm)	(mm)	(N/mm2)	(mm)	(mm)	(kN)	(mm)	(ml)	(mm)	(ml)	(mm)	(mm)
ø8	12	C20/25	113	200	21,7	378	30,8	265	21,5	1000	1000
		C35/45	100	200	21,7	256	20,8	179	14,6	1000	1000
		C50/60	100	200	21,7	202	16,5	142	11,5	1000	1000
ø10	14	C20/25	142	200	34,3	473	45,6	331	31,9	1000	1000
		C35/45	100	200	34,3	320	30,8	224	21,6	1000	1000
		C50/60	100	200	34,3	253	24,4	177	17,1	1000	1000
ø12	16	C20/25	170	200	49,1	567	64,1	397	44,8	1200	1000
		C35/45	120	200	49,1	384	43,3	269	30,3	1200	1000
		C50/60	120	200	49,1	303	34,3	212	24,0	1200	1000
ø14	18	C20/25	198	210	67,0	662	85,1	463	59,6	1400	1000
		C35/45	140	210	67,0	448	57,6	313	40,3	1400	1000
		C50/60	140	210	67,0	354	45,5	248	31,9	1400	1000
ø16	20	C20/25	227	240	87,4	756	109,4	529	76,6	1600	1000
		C35/45	160	240	87,4	512	74,0	358	51,8	1600	1000
		C50/60	160	240	87,4	404	58,5	283	41,0	1600	1000
ø20	25	C20/25	284	300	136,5	945	209,5	662	146,6	2000	1000
		C35/45	200	300	136,5	639	141,7	448	99,2	2000	1000
		C50/60	200	300	136,5	506	112,0	354	78,4	2000	1000
ø22	28	C20/25	312	330	165,2	1040	303,1	728	212,1	2000	1000
		C35/45	220	330	165,2	703	205,0	492	143,5	2000	1000
		C50/60	220	330	165,2	556	162,1	389	113,5	2000	1000
ø25	32	C20/25	354	375	213,5	1181	453,1	827	317,2	2000	1000
		C35/45	250	375	213,5	799	306,5	559	214,6	2000	1000
		C50/60	250	375	213,5	632	242,4	442	169,6	2000	1000
ø28	35	C20/25	397	420	267,8	1323	560,3	926	392,2	2000	1000
		C35/45	280	420	267,8	895	379,1	627	265,3	2000	1000
		C50/60	280	420	267,8	708	299,7	495	209,8	2000	1000
ø32	40	C20/25	454	480	349,6	1512	831,1	1059	581,8	2000	1000
		C35/45	320	480	349,6	1023	562,2	716	393,6	2000	1000
		C50/60	320	480	349,6	809	444,6	566	311,2	2000	1000

1) Minimum anchorage length ($l_{b,min}$) acc. to EN 1992-1-1: 2004 (8.6) and Minimum lap length ($l_{0,min}$) acc. To EN 1992-1-1:2004 (8.11) for good bond conditions and rebar yield strength 500 N/mm² including partial safety factor of 1,15 and α6= 1,0.

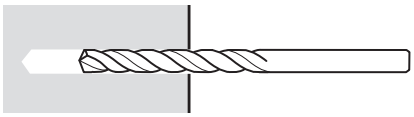
2) Design yield resistance is based on a f_{yk} = 500 N/mm² and includes a partial safety factor $\gamma_{m,s}$ for steel = 1,15.

3) Concrete cover acc. to EN 1992-1-1: 2004: Table 8.2 satisfying α2 = 1

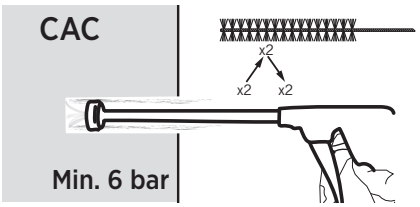
4) Concrete cover acc. to EN 1992-1-1: 2004: Table 8.2 satisfying α2 = 0,7

ESI Ultra: Installation of Rebar (EN 1992-1-1)

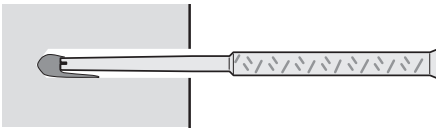
Installation:



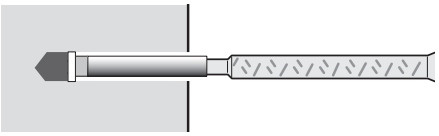
1 Drill borehole with hammer drill bit to correct depth.



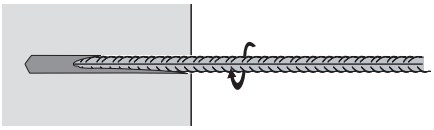
2 Clean the drilled hole thoroughly - using compressed air.



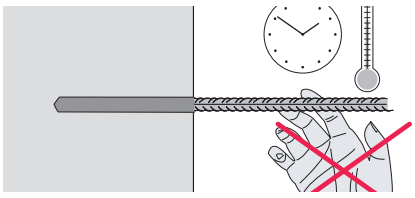
3 Insert the mixer into the drilled hole, and while the mixer is slowly retracted inject the correct volume of styrene free injection mortar.



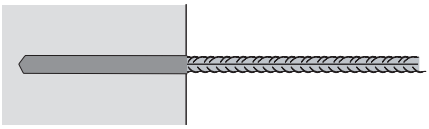
4 NB! For installation depths deeper than 240 mm a piston plug must be used.



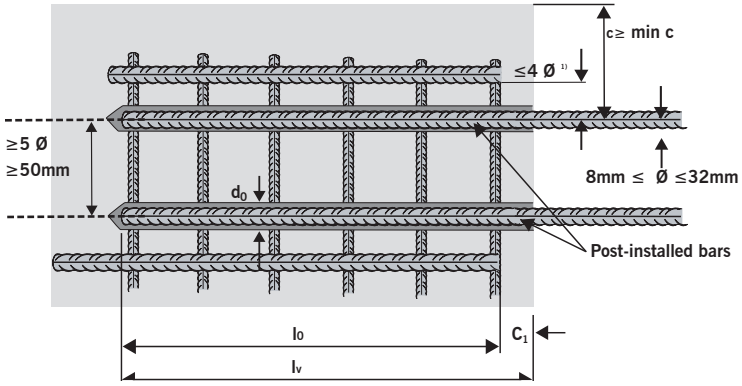
5 Insert reinforcement bar in a slowly rotating motion. For optimal filling of the hole excess mortar should flow out.
Observe temperature dependent curing time.



6 Do not distrub installed rebar during curing time.



7 Installation is finished.



Minimum Concrete cover

Drilling method	Rebar diameter	Concrete cover	Without drilling aid 1)	With drilling aid 1)
Hammer drilling (HD) Hollow drill bit system (HBD)	< 25 mm	min. c	30 mm + 0,06 x $l_{bd,y}$ ≥ 2 ø	30 mm + 0,02 x $l_{bd,y}$ ≥ 2 ø
	≥ 25 mm	min. c	40 mm + 0,06 x $l_{bd,y}$ ≥ 2 ø	40 mm + 0,02 x $l_{bd,y}$ ≥ 2 ø
Compressed air drilling (CD)	< 25 mm	min. c	50 mm + 0,08 x $l_{bd,y}$	50 mm + 0,02 x $l_{bd,y}$
	≥ 25 mm	min. c	60 mm + 0,08 x $l_{bd,y}$	60 mm + 0,02 x $l_{bd,y}$

1) The minimum concrete cover acc. to EN-1992-1-1:2004 + AC:2010 must be observed. Min. c is to to ensure installation safety.

CURING TIME EHI Ultra:

$t_{concrete}$	t_{gel}	t_{cure} 1)
-5 → -1°C	50 min.	300 min.
0 → +4°C	25 min.	210 min.
+5 → +9°C	15 min.	160 min.
+10 → +14°C	10 min.	60 min.
+15 → +19°C	6 min.	45 min.
+20 → +29°C	3 min.	25 min.
+30 → +40°C	2 min.	20 min.
+5° → +40°C		

1) In wet and flooded bore holes the curing time tcure must be doubled.

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