

## 1. Setting instructions for solid base material with Hammer drilling or Chemofast hollow drill bit system

**Drilling**

**Precaution:** Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal. (see dust extraction equipment by Chemofast to minimize dust emissions)

1 Drill a hole into the base material with a hammer drill tool to the size and embedment required by the selected steel hardware element (see Table 4). The tolerances of the carbide drill bit must meet the requirements of ANSI Standard B212.15. For bore holes drilled with the Chemofast hollow drill bit system (consisting of Heller Duster Expert drill bits and a Class M vacuum with air flow 150m³/h resp. 42l/s resp. 90cfm; the vacuum must be on!) no further cleaning is required → go to Step 3, otherwise to Step 2a for CAC hole cleaning instructions. In case of standing water in the drilled hole, except for submerged concrete, all the water has to be removed from the hole (e.g. vacuum, compressed air, etc.) prior to cleaning.

**CAC: Cleaning (dry, water saturated and water-filled) for all bore hole diameter in uncracked/cracked concrete**

2a Starting from the bottom or back of the anchor hole, blow the hole clean with compressed air (min. 6 bar / 90 psi) a minimum of two times, until return air stream is free of noticeable dust. If the back of the drilled hole is not reached an extension shall be used.

2b Determine brush diameter (see Table 3) for the drilled hole. Brush the hole with the selected wirebrush a minimum of two times (2x). A brush extension (supplied by Chemofast Anchoring GmbH) must be used for drill hole depth > 6" (150mm). The wire brush diameter must be checked periodically during use (d<sub>brush</sub> > d<sub>b,min</sub>, see Table 3a or 3b). The brush should resist insertion into the drilled hole - if not the brush is too small and must be replaced with the proper brush diameter. If the back of the drilled hole is not reached a brush extension shall be used.

2c Finally blow the hole clean again with compressed air (min. 6 bar / 90 psi) a minimum of two times, until return air stream is free of noticeable dust. If the back of the drilled hole is not reached an extension shall be used. When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material.

**UWC: Cleaning (submerged) for all bore hole diameter in uncracked and cracked concrete**

2a Starting from the bottom or back of the bore hole, rinse/flush the hole clean until clean water comes out. If the back of the drilled hole is not reached an extension shall be used.

2b Determine brush diameter (see Table 3) for the drilled hole. Brush the hole with the selected wire brush a minimum of two times (2x). A brush extension (supplied by Chemofast Anchoring GmbH) must be used for drill hole depth > 6" (150mm). The wire brush diameter must be checked periodically during use (d<sub>brush</sub> > d<sub>b,min</sub>, see Table 3a or 3b). The brush should resist insertion into the drilled hole - if not the brush is too small and must be replaced with the proper brush diameter. If the back of the drilled hole is not reached a brush extension shall be used.

2c Finally, starting from the bottom or back of the bore hole, rinse/flush the hole clean until clean water comes out. If the back of the drilled hole is not reached an extension shall be used.

**Preparing**

3 Check adhesive expiration date on cartridge label. Do not use expired product. Review Safety Data Sheet (SDS) before use. For the permitted range of the base material and cartridge temperature see Table 2. Attach a supplied mixing nozzle to the cartridge. Do not modify the mixer in any way and make sure the mixing element is inside the nozzle. Load the cartridge into the correct dispensing tool.

**Note:** Always use a new mixing nozzle with new cartridges of adhesive and also for all work interruptions exceeding the published gel (working) time of the adhesive.

4 Prior to inserting the anchor rod or rebar into the filled drilled hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.

**Installation**

5 Adhesive must be properly mixed to achieve published properties. Prior to dispensing adhesive into the drilled hole, separately dispense at least three full strokes of adhesive through the mixing nozzle until the adhesive is a consistent gray or red color. Review and note the published working and cure times (see Table 2) prior to injection of the mixed adhesive into the cleaned anchor hole.

6 Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. If the bottom or back of the anchor hole is not reached with the mixing nozzle only an extension tube supplied by Chemofast Anchoring GmbH (Cat# 16009 or Cat# 16004) must be used with the mixing nozzle. In case of using the extension tube VL16/1,8 (Cat# 16004), cut the tip of the mixer nozzle at position "X".

Piston plugs (see Table 3a or 3b) must be used with and attached to mixing nozzle and extension tube for:

- overhead installations and installations between horizontal and overhead
- all installations with drill hole depth > 10" (250mm)
- all installations in submerged bore holes

with anchor rod 5/8" to 1-1/4" (M16 to M30) and rebar sizes #5 to #11 (Ø14 to Ø36).

Insert piston plug to the back of the drilled hole and inject as described in the method above. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure. **Attention!** Do not install anchors overhead or upwardly inclined without installation hardware supplied by Chemofast and also receiving proper training and/or certification. Contact Chemofast for details prior to use.

**Curing & fixture**

7 The anchor should be free of dirt, grease, oil or other foreign material. Push clean 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. Observe the gel (working) time.

8 Be sure that the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If there is not enough adhesive in the hole, the installation must be repeated. For overhead applications and applications between horizontal and overhead the anchor must be secured from moving/falling during the cure time (e.g. wedges). Minor adjustments to the anchor may be performed during the gel time but the anchor shall not be moved after placement and during cure.

9 Allow the adhesive anchor to cure to the specified minimum curing time prior to applying any load (see Table 2). Do not disturb, torque or load the anchor until it is fully cured.

10 After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque (shown in Table 4) by using a calibrated torque wrench. Take care not to exceed the maximum torque for the selected anchor.

Temperature of base material			Maximum working time	Initial curing time <sup>1)</sup>	Full curing time
41 °F (+5 °C)	to 49 °F (+9 °C)		80 min	24 h	48 h
50 °F (+10 °C)	to 58 °F (+14 °C)		60 min	15 h	30 h
59 °F (+15 °C)	to 67 °F (+19 °C)		40 min	10 h	20 h
68 °F (+20 °C)	to 76 °F (+24 °C)		30 min	5 h	11 h
77 °F (+25 °C)	to 85 °F (+29 °C)		12 min	4 h	9 h
86 °F (+30 °C)	to 103 °F (+39 °C)		8 min	3 h	6 h
104 °F (+40 °C)			7 min	2 h	4 h

Cartridge temperature must be between 41°F (+5°C) and 104°F (+40°C)

<sup>1)</sup> Initial cure times are for post-installed rebar applications only. After the initial curing time, the installation of connecting reinforcements and formwork attachments is permitted.

## ESR-4901

**Drilling**

**Precaution:** Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal. (see dust extraction equipment by Chemofast to minimize dust emissions)

1 Drill a hole into the base material with a diamond drill tool to the size and embedment required by the selected steel hardware element (see Table 4). In case of standing water in the drilled hole, all the water has to be removed from the hole (e.g. vacuum, compressed air, etc.) prior to cleaning.

**SPCAC: Cleaning for all bore hole diameter in uncracked concrete**

2a Starting from the bottom or back of the bore hole, rinse/flush the hole clean until clean water comes out. If the back of the drilled hole is not reached an extension shall be used.

2b Determine brush diameter (see Table 3) for the drilled hole. Brush the hole with the selected wire brush a minimum of two times (2x). A brush extension (supplied by Chemofast Anchoring GmbH) must be used for drill hole depth > 6" (150mm). The wire brush diameter must be checked periodically during use (d<sub>brush</sub> > d<sub>b,min</sub>, see Table 3a or 3b). The brush should resist insertion into the drilled hole - if not the brush is too small and must be replaced with the proper brush diameter. If the back of the drilled hole is not reached a brush extension shall be used.

2c Finally, starting from the bottom or back of the bore hole, rinse/flush the hole clean until clean water comes out. If the back of the drilled hole is not reached an extension shall be used.

2d Starting from the bottom or back of the anchor hole, blow the hole clean with compressed air (min. 6 bar / 90 psi) a minimum of two times, until return air stream is free of noticeable dust. If the back of the drilled hole is not reached an extension shall be used.

2e Determine brush diameter (see Table 3) for the drilled hole. Brush the hole with the selected wire brush a minimum of two times (2x). A brush extension (supplied by Chemofast Anchoring GmbH) must be used for drill hole depth > 6" (150mm). The wire brush diameter must be checked periodically during use (d<sub>brush</sub> > d<sub>b,min</sub>, see Table 3a or 3b). The brush should resist insertion into the drilled hole - if not the brush is too small and must be replaced with the proper brush diameter. If the back of the drilled hole is not reached a brush extension shall be used.

2f Finally blow the hole clean again with compressed air (min. 6 bar / 90 psi) a minimum of two times, until return air stream is free of noticeable dust. If the back of the drilled hole is not reached an extension shall be used. When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material.

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5 Adhesive must be properly mixed to achieve published properties. Prior to dispensing adhesive into the drilled hole, separately dispense at least three full strokes of adhesive through the mixing nozzle until the adhesive is a consistent gray or red color. Review and note the published working and cure times (see Table 2) prior to injection of the mixed adhesive into the cleaned anchor hole.

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Piston plugs (see Table 3a or 3b) must be used with and attached to mixing nozzle and extension tube for:

- overhead installations and installations between horizontal and overhead
- all installations with drill hole depth > 10" (250mm)

with anchor rod 5/8" to 1-1/4" (M16 to M30) and rebar sizes #5 to #10 (Ø14 to Ø32).

Insert piston plug to the back of the drilled hole and inject as described in the method above. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure. **Attention!** Do not install anchors overhead or upwardly inclined without installation hardware supplied by Chemofast and also receiving proper training and/or certification. Contact Chemofast for details prior to use.

**Curing & fixture**

7 The anchor should be free of dirt, grease, oil or other foreign material. Push clean 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. Observe the gel (working) time.

8 Be sure that the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If there is not enough adhesive in the hole, the installation must be repeated. For overhead applications and applications between horizontal and overhead the anchor must be secured from moving/falling during the cure time (e.g. wedges). Minor adjustments to the anchor may be performed during the gel time but the anchor shall not be moved after placement and during cure.

9 Allow the adhesive anchor to cure to the specified minimum curing time prior to applying any load (see Table 2). Do not disturb, torque or load the anchor until it is fully cured.

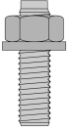

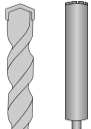


10 After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque (shown in Table 4) by using a calibrated torque wrench. Take care not to exceed the maximum torque for the selected anchor.

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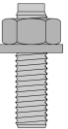

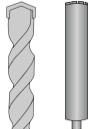


Cartridge temperature must be between 41°F (+5°C) and 104°F (+40°C)

<sup>1)</sup> Initial cure times are for post-installed rebar applications only. After the initial curing time, the installation of connecting reinforcements and formwork attachments is permitted.

3a. Parameter cleaning and setting tools (fractional sizes)

									
Threaded Rod	Rebar	d <sub>0</sub> Drill bit - Ø	d <sub>b</sub> Brush - Ø		d <sub>b,min</sub> min. Brush - Ø		Cat. #	Piston plug	Cat. #
[inch]	[inch]	[inch]	[mm]	[inch]	[mm]	[inch]	[-]	(No.)	[-]
3/8"	-	7/16	13.5	0.53	11.6	0.46	16111	No plugs required	
-	#3	1/2	14.3	0.56	13.2	0.52	16112		
1/2"	-	9/16	16.3	0.65	14.8	0.58	16114		
-	#4	5/8	18.3	0.72	16.5	0.65	16116		
5/8"	-	11/16	20.0	0.79	18.0	0.71	16117		
-	#5	3/4	21.5	0.85	19.5	0.78	16118	11/16	40355
3/4"	#6	7/8	24.8	0.98	23.0	0.91	16121	3/4	40341
7/8"	#7	1	28.5	1.12	26.2	1.03	16123	7/8	40343
1"	#8	1 1/8	31.8	1.25	29.5	1.16	16125	1	40345
1-1/4"	#9	1 3/8	38.2	1.50	35.8	1.41	16128	1 1/8	40346
-	#10	1 1/2	41.4	1.63	39.0	1.54	16129	1 3/8	40349
-	#11	1 3/4	47.0	1.85	45.0	1.77	16080	1 1/2	40350
-	-	-	-	-	-	-	-	1-3/4	40352

3b. Parameter cleaning and setting tools (metric sizes)

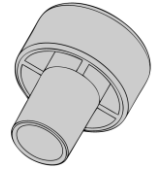

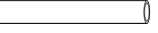

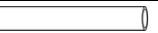

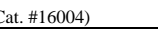
									
Threaded Rod	Rebar	d <sub>0</sub> Drill bit - Ø	d <sub>b</sub> Brush - Ø		d <sub>b,min</sub> min. Brush - Ø		Cat. #	Piston plug	Cat. #
[mm]	[mm]	[mm]	[mm]	[inch]	[mm]	[inch]	[-]	(No.)	[-]
M10	-	12	13.5	0.53	12.5	0.41	16111	No plugs required	
M12	10	14	15.5	0.61	14.5	0.49	16113		
-	12	16	17.5	0.69	16.5	0.57	16115		
M16	14	18	20.0	0.79	18.5	0.65	16117		
-	16	20	22.0	0.87	20.5	0.73	16119		
M20	-	22	24.0	0.94	22.5	0.81	16120	18	40340
-	20	25	27.0	1.06	24.5	0.89	16122	20	40342
M24	-	28	30.0	1.18	28.5	0.96	16124	22	40343
M27	-	30	31.8	1.25	30.5	1.12	16125	25	40345
-	25	32	34.0	1.34	32.5	1.20	16126	28	40346
M30	28	35	37.0	1.46	35.5	1.28	16127	30	40347
-	32	40	43.5	1.71	40.5	1.40	16130	32	40348
-	36	45	47.0	1.85	45.0	1.77	16080	35	40349
-	-	-	-	-	-	-	-	40	40351
-	-	-	-	-	-	-	-	45	40352

4. Anchor property / Setting information (fractional and metric sizes)

	Nominal threaded rod (fractional)							Nominal threaded rod (metric)							Reinforcing bar (fractional)											Reinforcing bar (metric)										
	inch; ft.-lb.							mm; Nm							inch; ft.-lb.											mm; Nm										
Anchor size	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	M10	M12	M16	M20	M24	M27	M30	#3	#4	#5	#6	#7	#8	#9	#10	#11	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32	Ø 36				
d <sub>s</sub> = Nominal anchor rod diameter	0.375	0.500	0.625	0.750	0.875	1.000	1.250	10	12	16	20	24	27	30	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	10	12	14	16	20	25	28	32	36				
d <sub>o</sub> (d <sub>bit</sub> ) = Nominal ANSI drill bit size	7/16	9/16	11/16	7/8	1	1-1/8	1-3/8	12	14	18	22	28	30	35	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	1-3/4	14	16	18	20	25	32	35	40	45				
Parameter valid for anchors																																				
T <sub>max</sub> = Maximum torque	20 <sup>2)</sup>	30	44	66	96	147	221	20	40	80	120	170	250	300	20 <sup>2)</sup>	30	44	66	96	147	185	221	-	20	40	45	80	120	175	250	300	-				
h <sub>ef,min</sub> = Minimum embedment	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	5	60	70	80	90	96	108	120	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	4-1/2	5	-	60	70	75	80	90	100	112	128	-				
h <sub>ef,max</sub> = Maximum embedment	7-1/2	10	12-1/2	15	17-1/2	20	25	200	240	320	400	480	540	600	7-1/2	10	12-1/2	15	17-1/2	20	22-1/2	25	-	200	240	280	320	400	500	560	640	-				
s <sub>min</sub> = Min. spacing	1-7/8	2-1/2	3	3-3/4	4-1/4	4-3/4	5-7/8	50	60	80	95	115	130	145	1-7/8	2-1/2	3	3-3/4	4-1/4	4-3/4	5-1/4	5-7/8	-	50	60	70	80	95	120	135	150	-				
c <sub>min</sub> = Min. edge distance (100% T <sub>max</sub> )	1-5/8	1-3/4	2	2-3/8	2-1/2	2-3/4	3-1/4	40	45	55	60	70	75	80	1-5/8	1-3/4	2	2-3/8	2-1/2	2-3/4	3	3-1/4	-	40	45	50	55	60	70	75	85	-				
c <sub>min</sub> = Min. edge distance (45% T <sub>max</sub> <sup>1)</sup> )	-	1.75					2.75	-			45			70	-			1.75			2.75		-	-		45			70			-				
h <sub>min</sub> = Minimum member thickness	h <sub>ef</sub> + 1-1/4		h <sub>ef</sub> + 2d <sub>o</sub>					h <sub>ef</sub> + 30			h <sub>ef</sub> + 2d <sub>o</sub>				h <sub>ef</sub> + 1-1/4			h <sub>ef</sub> + 2d <sub>o</sub>					h <sub>ef</sub> + 30			h <sub>ef</sub> + 2d <sub>o</sub>										
Parameter valid for post-installed rebar																																				
h <sub>ef,min</sub> = Minimum embedment	-							-							2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	4-1/2	5	5-1/2	60	70	75	80	90	100	112	128	128				
h <sub>ef,max</sub> = Maximum embedment (PIR)	-							-							22-1/2	30	37-1/2	45	52-1/2	60	67-1/2	75	82-1/2	600	720	840	960	1200	1500	1680	1920	2160				

<sup>1)</sup> s<sub>min</sub> = 5x d<sub>s</sub>. <sup>2)</sup> for ASTM 36 and F1554 Grade 36, T<sub>max</sub> = 15 ft.-lb.

5. EP 800 adhesive anchor system and accessories

Injection tools		Cartridge system	Extra mixing nozzles	Piston Plug	Compressed air nozzle (min. 90 psi)	Extension tube VL10/0,75	Extension with wood handle
9,5 fl. oz. dispenser	Cat. #30006 Manual tool	EP800 9,5 fl. oz. (280mL)	Mixing nozzle Cat. #40154			 (Cat. #16009)	 (Cat.#16132)
13,5 fl. oz. dispenser	Cat. #30215 Manual tool	EP800 13,5 fl. oz. (400mL)				Extension tube VL16/1,8  (Cat. #16004)	Brush extension 
20 to 20.5 fl. oz. dispenser	Cat. #30216 Manual tool Cat. #30220 Pneumatic tool	EP800 20 to 20.5 fl. oz. (600 to 610 mL)					If the bore hole ground is not reached an extension shall be used.  (Cat.#16131)
50.5 fl. oz. dispensers	Cat. #30202 Pneumatic tool	EP 800 50.5 fl. oz. (1500mL)					

6. Post-installed rebar h<sub>ef</sub> ≥ 20d

Cartridge	Injection tools	d <sub>s</sub>	h <sub>ef</sub>	Extension tube
9,5 to 20.5 fl. oz.	Manual tool	≤ #5 ≤ 16 [mm]	≤ 27-1/2 [inch] ≤ 700 [mm]	VL10/0,75 (Cat.#16009) or VL16/1,8 (Cat.#16004)
9,5 to 20.5 fl. oz. 50.5 fl. oz.	Pneumatic tool	≤ #5 ≤ 16 [mm]	≤ 51-1/2 [inch] ≤ 1300 [mm]	
9,5 to 20.5 fl. oz. 50.5 fl. oz.	Pneumatic tool	≤ #8 ≤ 25 [mm]	≤ 39-1/2 [inch] ≤ 1000 [mm]	
50.5 fl. oz.	Pneumatic tool	≤ #11 ≤ 36 [mm]	≤ 75 [inch] ≤ 2160 [mm]	VL16/1,8 (Cat.#16004)



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