MAPEFIX EP 50

Epoxy resin for structural chemical anchor

Rebar: post installed rebar

OP1: cracked and non cracked concrete

Coredrill: core drilled hole

WHERE TO USE

Mapefix EP 50 is an adhesive for chemically anchoring metal bars in holes drilled in building materials. It is a two-component, pure epoxy resin-based product containing no solvents. It is available in 585 ml bi-axial cartridges.
It is specifically formulated for anchoring threaded components and rebar made from steel and galvanized steel that transmit structural loads into solid substrates such as concrete, lightweight concrete, stone, wood and sound masonry.
It is also suitable for anchoring metal bars in tension and compression zones, in cracked or non-cracked concrete.
Also, because no stress is generated as with conventional mechanical expansion fasteners, it is an ideal solution for anchoring components close to edges or when there is a limited pitch between each anchor. The epoxy formulate **Mapefix EP 50** contains allows for extended workability times (see Table 1), thus making the resin ideal for anchoring in case of high surrounding temperatures or if the application needs to be interrupted.
The use of **Mapefix EP 50** is recommended for many kinds of anchors on a horizontal, vertical or sloping axis and on ceilings, in tension and compression zones subjected to static stresses. **Mapefix EP 50** may also be used for immersed and permanently damp anchors in marine and industrial surroundings exposed to aggressive chemicals. Application is allowed at temperatures between +5°C and +40°C, including on damp or wet substrates or for flooded holes. **Mapefix EP 50** may be used for smooth, rough, core-drilled holes or holes made with a hammer-drill, and anchors with big or small circular crests. **Mapefix EP 50** is recommended for anchoring elements and features such as:

· dolly bars for second pours;
· immersed anchors or in damp environments;
· underwater anchors;
· anchors in in marine and industrial surroundings;
· rails of overhead cranes and tramways;
· industrial engines;
· antennas and signs;
· pylons;
· safety barriers;
· street guardrails.

ADVANTAGES

· Compatible with damp and flooded holes for a great flexibility of use.
· Limited waste during application.
· High bond strength.
· Suitable for extended workability times, makes even complex works easier.
· Extended hardening times to ensure deep anchoring.
· Pure epoxy product: no volumetric shrinkage, suitable for every need and every substrate.
· ETA certification for cracked and uncracked concrete and post-installed rebar.
· Service life of the anchor: 50 years.

TECHNICAL CHARACTERISTICS

Mapefix EP 50 is a two-component chemical anchor supplied in 585 ml bi-axial cartridges containing the 2 components A (resin) and B (catalyser) separate and in their correct proportions. The 2 components are mixed together when they are extruded through the static mixer supplied with the cartridge. The mixer is screwed to the end of the cartridge and no

pre-mixing of the 2 components is required. The 585 ml cartridges can be used with specific guns for bi-axial cartridges from the **Mapei Gun** range.
If only part of the cartridge is used, the remaining product may be used, even after a number of days, by replacing the original static mixer clogged by hardened resin with a clean, new mixer. **Mapefix EP 50** does not have a significant volumetric shrinkage, therefore it is also siuitable for large applications or with big circular crests.
Mapefix EP 50 is compatible with many kinds of building materials, such as:
· concrete in tension and compression zones;
· lightweight concrete;
· cellular concrete;
· calcium silicate elements;
· masonry, stone, rock, bricks;
· solid and hollow-core substrates;
· wood;
· stone.

Mapefix EP 50 is certified according to European standards ETA option 1 (anchors in concrete in tension and compression zones); ETA REBAR (anchors fr supplementary reinforcement).
Mapefix EP 50 performance characteristics contribute to extend the service life of the anchor to over 50 years.

RECOMMENDATIONS

· Do not use on dusty and crumbling surfaces.
· Do not use on surfaces which are dirty with oil, grease or stripping compounds, the bonding could be compromised or reduced.
· Do not apply if the temperature of the air or substrate is lower than +5°C.
· Do not apply loads until it has completely hardened (T_{cure}) (see Table 1).

APPLICATION PROCEDURE

Anchor design
The size of the hole to be drilled in the substrate, the depth of the anchoring element, the diameter of the metal bar and the recommended loads must be calculated by a qualified design engineer.
The tables below sum up some values based on the experience and testing obtained following the test methods described in the European Assessment Document EAD 330499-01-0601 (for anchors) and EAD 330087-00-0601 (for post-installed rebar).
MAPEI has a specific software (Mapefix Software Design) to support technicians and designers in deciding the correct size of single and multiple anchors on any concrete element: please contact MAPEI Technical Services Department.

Preparation of solid substrate
Make holes in the substrate with a drill, a hammer drill or a core drill, depending on the type of material to be drilled and the depth of the hole.
Remove all traces of dust and loose material from inside the holes with hand tools, compressed air or by hydro-blasting. Please refer to the specific recommendations contained in the available ETA certifications.
It is very important that holes are carefully cleaned in order for **Mapefix** to reach the maximum mechanical performance possible.

Preparation of the metal bar
Clean and degrease the bar before anchoring it in the substrate. Remove all traces of rust and form-release compounds.

Preparation of the resin for the chemical anchor
Remove the cap and screw the static mixer to the end of the cartridge. Insert the cartridge in a suitable sealant gun. Discard the first 3 shots of resin; they may not be mixed correctly. Starting from the bottom of the hole, extrude the product into the hole until it is sufficiently full. Insert the metal bar in the hole using a rotary movement to expel all the air until the excess resin comes out of the hole. The metal bar must be inserted in the hole within the start setting time indicated in Table 1. Only apply loads to the bar once the resin has completely hardened indicated in Table 1.

CONSUMPTION

According to the volume of the hole to be filled.

CLEANING

Use normal solvent-based paint thinners to clean all work tools and equipment.

PACKAGING

Boxes of twelve 585 ml cartridges with 12 static mixers with extension tube.

COLOURS

Grey.

STORAGE

24 months in their original packaging at a temperature of +5° to +25°C.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Instructions for the safe use of our products can be found on the latest version of the Safety Data Sheet, available from our website www.mapei.com.
PRODUCT FOR PROFESSIONAL USE.

TECHNICAL DATA (typical values)

PRODUCT IDENTITY	
Appearance:	thixotropic paste
Colour:	light grey
Density:	1.50 g/cm^3

APPLICATION DATA (at +23°C and 50% R.H.)	
Application temperature range:	from +5°C to +40°C
Start setting time:	see Table 1
Complete hardening time:	see Table 1

PERFORMANCE CHARACTERISTICS	
Compressive strength (EN 196-1):	122 N/mm^2
Flexural strength (EN 196-1):	66 N/mm^2
Modulus of elasticity (EN ISO 527-2):	6,300 N/mm^2
Resistance to UV rays:	good
Chemical resistance:	excellent
Resistance to water (EN 12390-8):	zero (0)
Service temperature:	-40°C to +72°C
Electrical resistivity (IEC 93):	8x10^{12} Ω
Thermal conductivitiy (EN 993-15):	0.5 W/m·K
Heat capacity (EN 993-15):	1,350 J/kg K

Hardness:	86 Shore D

ANCHORS	
Installation parametres for threaded rods:	see Table 2
Typical values for threaded rods:	see Table 3
Design loads for threaded rods:	see Table 4
Installation parametres for rebars:	see Table 5
Typical values for rebars:	see Table 6
Design loads for rebars:	see Table 7

POST-INSTALLED REBAR	
Design values of ultimate bond stress:	see Table

WARNING

Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product.
Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

LEGAL NOTICE

The contents of this Technical Data Sheet ("TDS") may be copied into another project-related document, but the resulting document shall not supplement or replace requirements per the TDS in force at the time of the MAPEI product installation.
The most up-to-date TDS can be downloaded from our website www.mapei.com.
ANY ALTERATION TO THE WORDING OR REQUIREMENTS CONTAINED OR DERIVED FROM THIS TDS EXCLUDES THE RESPONSIBILITY OF MAPEI.

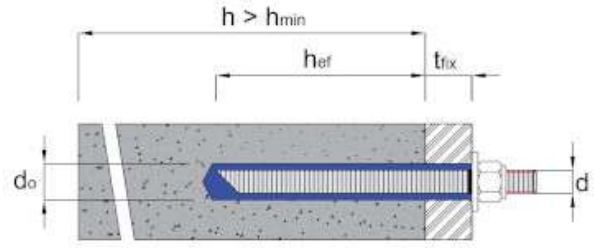
Table 1

Substrate	Gel time	Load time	
		dry substrate	wet substrate
+5°C	80 min.	60 h	120 h
+10°C	60 min.	48 h	96 h
+15°C	40 min.	24 h	48 h
+20°C	30 min.	12 h	24 h
+25°C	12 min.	10 h	20 h
+35°C	8 min.	7 h	14 h
+40°C	6 min.	4 h	8 h
Package temperature	+5°C/+25°C		
Service temperature	-40°C/+70°C		

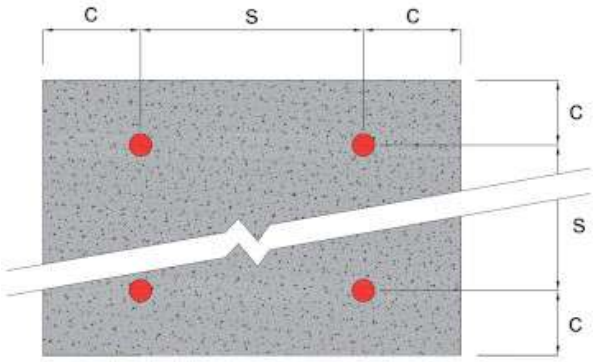
Table 2

Installation parameters for threaded rods										
threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
threaded rod diameter	d	mm	8	10	12	16	20	24	27	30
hole diameter	d_0	mm	10	12	14	18	22	28	30	35

minimum edge distance	c_{min}	mm	35	40	45	50	60	65	75	80
minimum spacing between rods	s_{min}	mm	40	50	60	75	95	115	125	140
embedment depth	h_{ef} $h_{ef\,min}$	mm	60	60	70	80	90	96	108	120
	h_{ef} $h_{ef\,max}$	mm	160	200	240	320	400	480	540	600
substrate minimum thickness	h_{min}	mm	h_{ef} + 30 mm (≥ 100 mm)			h_{ef} + 2 d_0				
maximum torque moment	$T_{inst\,max}$	Nm	10	20	40	60	100	170	250	300



Drawing 1



Drawing 2

Table 3

Characteristics values of tension loads under static and quasi-static action											
Working temperature(*)	**Threaded rod**			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
bond resistance in uncracked concrete C20/25											
+24°C/+40°C	dry, wet and flooded bore hole	$\tau_{Rk,ucr}$	N/mm²	15.0	15.0	15.0	14.0	14.0	13.0	13.0	13.0
+35°C/+60°C				10.0	10.0	10.0	9.5	9.5	9.0	9.0	9.0
+43°C/+70°C				7.0	7.0	7.0	6.5	6.5	6.0	6.0	6.0
bond resistance in cracked concrete C20/25											
+24°C/+40°C	dry, wet and flooded bore hole	$\tau_{Rk,cr}$	N/mm²	7.0	7.0	7.0	7.0	7.0	6.0	6.0	6.0
+35°C/+60°C				5.0	5.0	5.0	5.0	5.0	4.5	4.5	4.5
+43°C/+70°C				3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0
reduction factor in concrete C20/25											
Increasing factors for concrete		ψ_c	C25/30	1.02							
			C30/37	1.04							
			C35/45	1.07							
			C40/50	1.08							
			C45/55	1.09							
			C50/60	1.10							
(*) continuous working temperature/temporary maximum peak working temperature											

Table 4

Design loads(1) for a single anchor in concrete, hammer drill (HD) holes, dry/wet/flooded conditions

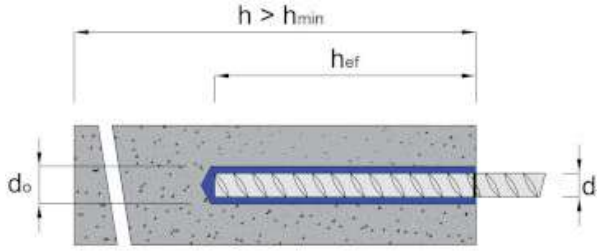
					M8		M10		M12		M16		M20		M24		M27		M30		M33		M36		M39		M42		
Embedment depth			h_{ef}	mm	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	h_{ef}	max h_{ef}
					60	160	60	200	70	240	80	320	90	400	96	480	108	540	120	600	132	660	144	720	156	780	168	420	840
	Temperatures(2)																												
Tensile load	+24°C/+40°C	non-cracked	$N_{Rec,stat}$	kN	11	12	11	19	14	28	17	53	20	82	22	118	26	153	31	187	36	231	40	273	46	325	51	202	374
		cracked	$N_{Rec,stat}$		5	12	6	19	9	28	12	53	14	82	15	103	18	131	22	162	25	179	28	213	32	228	36	132	264
	+35°C/+60°C	non-cracked	$N_{Rec,stat}$		7	12	9	19	13	28	17	53	20	82	22	118	26	153	31	187	36	231	40	273	46	325	51	185	369
		cracked	$N_{Rec,stat}$		4	10	4	15	6	22	10	38	13	60	15	78	18	98	22	121	25	130	28	155	32	159	36	92	185
	+43°C/+70°C	non-cracked	$N_{Rec,stat}$		5	12	6	19	9	28	12	50	18	78	21	103	26	131	31	162	33	163	39	194	41	205	42	106	211
		cracked	$N_{Rec,stat}$		3	7	3	10	4	15	7	27	9	42	10	52	13	65	16	81	16	81	19	97	18	91	21	53	106
Shear load without	+24°C/+40°C	non-cracked	$V_{Rec,stat}$		9	9	9	14	12	20	15	38	18	59	21	85	25	110	30	135	35	166	41	196	46	234	52	197	270

bending moment		cracked	$V_{Rec,stat}$		6	9	6	14	8	20	11	38	13	59	15	85	18	110	21	135	25	166	29	196	33	234	37	139	270
	+35°C/+60°C	non-cracked	$V_{Rec,stat}$		9	9	9	14	12	20	15	38	18	59	21	85	25	110	30	135	35	166	41	196	46	234	52	197	270
		cracked	$V_{Rec,stat}$		6	9	6	14	8	20	11	38	13	59	15	85	18	110	21	135	25	166	29	196	33	234	37	139	270
	+43°C/+70°C	non-cracked	$V_{Rec,stat}$		9	9	9	14	12	20	15	38	18	59	21	85	25	110	30	135	35	166	41	196	46	234	52	197	270
		cracked	$V_{Rec,stat}$		6	9	6	14	8	20	11	38	13	59	15	85	18	110	21	135	25	166	29	196	33	234	37	139	270
Distance from hedge			$C_{cr,N}$	mm	90	240	90	300	105	360	120	480	135	600	144	720	162	810	180	900	198	990	216	1080	234	1170	252	630	1260
Pitch between bars			$S_{cr,N}$	mm	$2 \times C_{cr,N}$																								

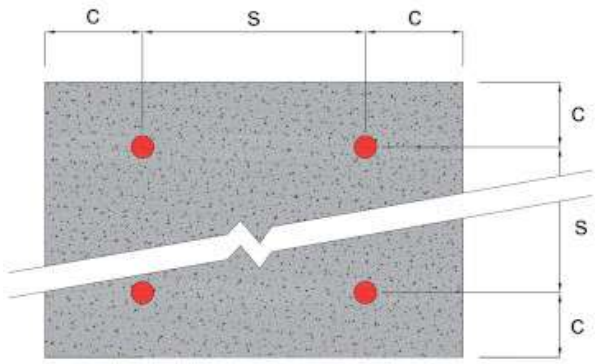
not covered by the ETA

Table 5

Installation parameters for rebars												
rebar			**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ32**
rebar diameter	d	mm	8	10	12	14	16	20	24	25	28	32
hole diameter	d_0	mm	10-12	12-14	14-16	18	20	25	30-32	30-32	35	40
minimum edge distance	c_{min}	mm	35	40	45	50	50	60	70	70	75	85
minimum spacing between rebars	s_{min}	mm	40	50	60	70	75	95	120	120	130	150
embedment depth	h_{ef}	$h_{ef\,min}$ 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
substrate minimum thickness	h_{min}	mm	h_{ef} + 30 mm (≥ 100 mm)			h_{ef} + 2 d_0						



Drawing 3



Drawing 4

Table 6

Characteristics values of tension loads under static and quasi-static action													
Temperatures(*)	**Rebar**			**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ32**
bond resistance in uncracked concrete C20/25													
+24°C/+40°C	dry, wet and flooded bore hole	$\tau_{Rk,ucr}$	N/mm²	14.0	14.0	14.0	12.0	12.0	12.0	12.0	11.0	11.0	11.0
+35°C/+60°C				9.5	9.5	9.5	8.5	8,5	8,5	7.5	7.5	7.5	7.5
+43°C/+70°C				6.0	6.0	6.0	6.0	6.0	5.5	5.5	5.5	5.0	5.0
bond resistance in cracked concrete C20/25													
+24°C/+40°C	dry, wet and flooded bore hole	$\tau_{Rk,cr}$	N/mm²	6.0	7.0	7.0	6.5	6.5	6.0	6.0	6.0	5.5	5.5
+35°C/+60°C				4.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	3.5	3.5
+43°C/+70°C				2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
reduction factor in concrete C20/25													
increasing factors for concrete		ψ_c	C25/30	1.02									
			C30/37	1.04									
			C35/45	1.07									

C40/50	1.08
C45/55	1.09
C50/60	1.10

(*) continuous working temperature/temporary maximum peak working temperature

Table 7

Design loads[1] for a single anchor in concrete. hammer drill (HD) holes. dry/wet/flooded conditions

					Ø8		Ø10		Ø12		Ø14		Ø16		Ø20		Ø24		Ø25		Ø28		Ø32		Ø34		Ø36		Ø40	
temperatures[2]					min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}	min h_{ef}	max h_{ef}
Embedment depth			h_{ef}	mm	60	160	60	200	70	240	75	280	80	320	90	400	96	480	100	500	112	560	128	640	136	680	144	720	160	800
Tensile load	+24°C/+40°C	non-cracked	$N_{Rec,stat}$	kN	10	20	11	31	14	44	15	61	17	79	20	124	22	178	23	193	28	242	34	316	37	356	40	400	47	494
		cracked	$N_{Rec,stat}$		4	11	6	21	9	30	10	38	12	50	14	72	15	103	16	112	19	129	24	169	26	190	28	213	33	263
	+35°C/+60°C	non-cracked	$N_{Rec,stat}$		7	18	9	28	12	41	13	50	16	65	20	102	22	129	23	140	28	176	34	230	37	259	40	291	47	359
		cracked	$N_{Rec,stat}$		3	8	4	13	6	19	7	26	8	31	11	48	14	69	15	75	16	82	21	107	24	121	27	136	33	168
	+43°C/+70°C	non-cracked	$N_{Rec,stat}$		4	11	5	18	8	26	9	35	11	46	15	66	19	95	21	103	23	117	31	153	35	173	39	194	47	239
		cracked	$N_{Rec,stat}$		2	5	2	7	3	11	4	15	5	19	7	30	9	43	9	47	12	59	15	77	17	86	19	97	24	120
Shear load without bending moment	+24°C/+40°C	non-cracked	$V_{Rec,stat}$		9	9	9	15	12	21	13	29	15	37	18	58	21	83	22	90	27	113	33	147	37	167	41	187	48	231
		cracked	$V_{Rec,stat}$		6	9	6	15	8	21	9	29	11	37	13	58	15	83	16	90	19	113	24	147	26	167	29	187	34	231
	+35°C/+60°C	non-cracked	$V_{Rec,stat}$		9	9	9	15	12	21	13	29	15	37	18	58	21	83	22	90	27	113	33	147	37	167	41	187	48	231
		cracked	$V_{Rec,stat}$		6	9	6	15	8	21	9	29	11	37	13	58	15	83	16	90	19	113	24	147	26	167	29	187	34	231
	+43°C/+70°C	non-cracked	$V_{Rec,stat}$		9	9	9	15	12	21	13	29	15	37	18	58	21	83	22	90	27	113	33	147	37	167	41	187	48	231
		cracked	$V_{Rec,stat}$		5	9	6	15	8	21	9	29	11	37	13	58	15	83	16	90	19	113	24	147	26	167	29	187	34	231
Distance from edge			$C_{cr,N}$	mm	90	240	90	300	105	360	112,5	420	120	480	135	600	144	720	150	750	168	840	192	960	204	1020	216	1080	240	1200
Pitch between bars			$S_{cr,N}$	mm	2 x $C_{cr,N}$																									
	not covered by the ETA																													

(1) recommended load valid if there are the following conditions:
- design according to EN 1992-4:2018 (Eurocode 2)
- $\alpha_{sus} \leq 0.60$
- $\gamma_{sus} = 1.0$
- class 5.8 steel bar
- shear load without bending moment
- concrete minimum class C20/25
- $C \geq C_{cr,N}$
- $S \geq S_{cr,N}$
- $h \geq 2 \times h_{ef}$
- $\alpha_{gap} = 1,0$ (no hole clearance)
- for other anchoring conditions use Mapefix Software Design, developed in compliance with current European standards

(2) continuous working temperature/temporary maximum peak working temperature

Table 8

Design values of ultimate bond stress, all drilling methods

drilling method	rebar ϕ		concrete class C 12/15	C 16/20	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
HD, HDB, CD	from 8 to 32 mm	N/mm²	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
	34 mm		1.6	2.0	2.3	2.6	2.9	3.3	3.6	3.9	4.2
	36 mm		1.5	1.9	2.2	2.6	2.9	3.3	3.6	3.8	4.1
	40 mm		1.5	1.8	2.1	2.5	2.8	3.1	3.4	3.7	4.0
DD	from 8 to 32 mm		1.6	2.0	2.3	2.7					
	34 mm		1.6	2.0	2.3	2.6					
	36 mm		1.5	1.9	2.2	2.6					
	40 mm		1.5	1.8	2.1	2.5					

5810-7-2022 en (IT)