MAPEI

Mapefix EP 385

Chemical anchor for structural loads

European Technical Approval option 1 for cracked concrete

European Technical Approval option 7 for non cracked concrete

Ø8 ÷ Ø32
M8 ÷ M30

WHERE TO USE

Mapefix EP 385 is an adhesive for chemically anchoring metal bars in holes made in building materials. It is a two-component, solvent-free product made from pure epoxy resin. It has been specifically developed for chemically anchoring steel and zinc-plated steel threaded and deformed bar, which transmit structural loads, to solid substrates such as concrete, lightweight concrete, stone, wood and compact masonry.
It is also used to anchor metal bar in tension zones.
It is an ideal solution for anchoring close to edges or when there is a limited pitch between each anchor, in that there is no stress generated as with conventional mechanical expansion fasteners.
The epoxy formulate of **Mapefix EP 385** gives the resin extended workability time (see table 1), which makes it particularly suitable when anchoring operations have to be interrupted.
Mapefix EP 385 is recommended for all types of anchor with a horizontal, vertical, inclined or overhead axis and in tension or compressed zones, which are subjected to static and dynamic stress.
Mapefix EP 385 may also be used for immersed anchors which are permanently damp, in marine and industrial environments and in areas subjected to chemical aggression. This product may be applied within a temperature range of from +5°C to +40°C, including on damp or wet substrates. **Mapefix EP 385** may be applied in both smooth and rough holes and in holes which have been cored or made with a hammer drill, and may be used for anchors with both small or large crowns.

Mapefix EP 385 is recommended for anchoring elements in place, such as:
- strengthening rods in construction joints;
- immersed anchors and anchors in damp environments;
- anchors in marine and industrial environments;
- overhead crane and tram rails;
- industrial motors;
- aerials and signs;
- pylons;
- safety barriers.

TECHNICAL CHARACTERISTICS

Mapefix EP 385 is a two-component chemical anchoring product, packaged in a 385 ml bi-axial cartridge with 2 separate compartments containing component A (resin) and component B (catalyser) at the correct mixing ratio of 3:1 in volume (3 parts in volume of resin, 1 part in volume of catalyser). The two components are mixed together when they are extruded via the static mixer supplied with the cartridge. The mixer is screwed to the end of the cartridge, and no preliminary mixing of the two components is required. The 385 ml cartridge may be used by inserting it into a special extrusion gun for bi-axial cartridges.
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 new one.
Mapefix EP 385 has no significant loss in volume when it sets, which makes it suitable for applications where large cavities need to be filled or where there are large circular crests.

Mapefix EP 385 is compatible with a large number of building materials, such as:
- concrete in tension and compressed zones;
- lightweight concrete;
- cellular concrete;
- elements made from calcium silicate;
- masonry, stone, rock and bricks;
- solid and perforated substrates;
- wood;
- stone.

Mapefix EP 385 is certified according to ETA European Standards option 1 (anchors in concrete in tension zones) reaction to fire.

RECOMMENDATIONS
Do not apply on dusty or crumbling surfaces.
Do not use on surfaces with traces of oil, grease and stripping compound otherwise the bond may be compromised.
Do not apply if the air temperature or if the temperature of the substrate are lower than +5°C.
Do not apply loads until it has completely hardened T_{cure}.

APPLICATION PROCEDURE
Design of the anchor
The size of the hole in the substrate, the depth of the anchor, the diameter of the metal bar and the maximum permitted loads must be calculated by a qualified design engineer. The tables below illustrate a practical summary of some of our suggestions, based on experience and testing carried out within the company.

Preparation of solid surfaces
Make holes in the substrate with a drill, a hammer drill, by coring or with a diamond-tipped cup-type drill, according to the type of material to be drilled and the depth of hole required.
Remove all traces of dust and loose material from inside the holes with compressed air.
Clean the surface inside the holes with a suitable long-bristled bottlebrush.
Remove all traces of dust and loose material again from inside the holes with compressed air.
If possible, remove any stagnant water from inside the holes, which will also help reduce the reaction time for the **Mapefix EP 385** epoxy resin.

Preparation of the metal bar
Clean and degrease the bar before anchoring it in the substrate.

Preparation of the resin for the chemical anchor
Unscrew the cap and screw the static mixer to the end of the cartridge.
Insert the cartridge in the extrusion gun.
Discard the first three shots of resin, it may not be mixed correctly.
Starting from the bottom of the hole, extrude the product in the hole until it is full.
Insert the metal bar in the hole using a rotary movement to expel all the air until all excess resin comes out of the hole. The metal bar must be inserted in the hole within the start setting time T_{gel} and only apply loads to the bar once the resin has completely hardened T_{cure}, as indicated in table 1.

CONSUMPTION
According to the size of hole to be filled.

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

PACKAGING
Boxes of 12 pieces (cartridges 385 ml) with 12 static mixers with extension tube.

COLOURS AVAILABLE
Grey.

STORAGE
24 months in its original packaging at a temperature of between +5°C and +25°C.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION
Mapefix EP 385 part A irritates if it comes into contact with the eyes.
Mapefix EP 385 part B is corrosive and may cause sensitisation in anyone allergic to such products. May also cause irreversible damage.
We recommend using protective clothing and suitable gloves. Only use in well ventilated areas.
If the product comes into contact with the eyes, wash immediately with plenty of clean water and seek medical attention.
Mapefix EP 385 is harmful for aquatic life. Do not dispose of the product in the environment.
For further and complete information about the safe use of our product please refer to our latest version of the Material Safety Data Sheet.

PRODUCT FOR PROFESSIONAL USE.

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

All relevant references for the product are available upon request and from www.mapei.com

TECHNICAL DATA (typical values)	
PRODUCT IDENTITY	
Appearance:	thixotropic paste
Colour:	light grey
Density (g/cm^3):	1.41
APPLICATION DATA (at +23°C and 50% R.H.)	
Application temperature range:	from +5°C to +40°C
Start setting time T_{gel}:	see table 1
Final hardening time T_{cure}:	see table 1
PERFORMANCE CHARACTERISTICS	
Compressive strength (N/mm^2):	137
Flexural strength (N/mm^2):	47
Dynamic modulus of elasticity (N/mm^2):	3240
Resistance to UV rays:	good
Chemical resistance:	excellent
Resistance to water:	excellent
In-service temperature range:	from -40°C to +72°C
Design parameters:	see tables 2 and 3
Characteristic strength:	see tables 4, 5, 6 and 7
Maximum recommended loads:	see tables 8 and 9
Design suggestions:	see tables 10 and 11
Fire resistance:	see table 12

Reaction time of product			
Substrate temperature	**Start setting time T_{gel}**	**final hardening time T_{cure}**	
		dry substrate	**damp substrate**
°C	minutes/hours	days/hours	days/hours
+5	2 h	2 days	4 days
+10	90’	30 h	2 ½ days
+20	30’	10 h	20 h
+30	20’	6 h	12 h
+40	12’	4 h	8 h

Table 1: reaction time of resin

Design parameters for anchors with threaded bar											
threaded bar	M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
recommended distance from edge (mm)	113	135	165	188	255	304	342	379	400	436	472
minimum distance from edge (mm)	40	50	60	80	100	120	135	150	165	180	195
recommended pitch between anchors (mm)	226	270	330	375	510	607	683	759	799	872	945
minimum pitch between anchors (mm)	40	50	60	80	100	120	135	150	165	180	195
depth of threaded bar (mm)	80	90	110	125	170	210	250	280	320	350	380
depth of anchor hole (mm)	110	120	140	161	214	266	314	350	394	432	472
diameter of threaded bar (mm)	8	10	12	16	20	24	27	30	33	36	39
diameter of anchor hole (mm)	10	12	14	18	24	28	32	35	37	42	46
tightening torque (Nm)	10	20	40	60	120	150	200	250	350	500	700

Table 2: design parameters for anchors with threaded bar

Design parameters for anchors with deformed bar											
deformed bar	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø36	Ø40
recommended distance from edge (mm)	97	121	139	170	180	219	274	298	330	372	413
minimum distance from edge (mm)	40	50	60	70	80	100	125	140	160	180	200
recommended pitch between anchors (mm)	194	242	277	339	360	438	548	596	661	744	826
minimum pitch between anchors (mm)	40	50	60	70	80	100	125	140	160	180	200
depth of deformed bar (mm)	80	90	110	115	125	170	210	250	280	340	360
depth of anchor hole (mm)	110	120	142	151	165	214	274	320	360	432	460
diameter of deformed bar (mm)	8	10	12	14	16	20	25	28	32	36	40
diameter of anchor hole (mm)	12	14	16	18	20	24	32	35	40	46	50

Table 3: Design parameters for anchors with deformed bar

Characteristic strength of threaded bar												
maximum permitted tensile loads according to EOTA Technical Report 029, method A												
threaded bar		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
failure of steel												
characteristic strength of 5.8 class steel (kN)		18	29	42	78	122	176	230	280	347	409	488
characteristic strength of 8.8 class steel (kN)		29	46	67	125	196	282	368	449	555	654	781
safety factor		1.5										
characteristic strength of A4 and HCR stainless steel (kN)		26	41	59	110	172	247	321	393	370	436	521
safety factor		1.87					2.86					
failure of concrete cone												
24°C/40°C (in kN)	non-cracked concrete	30	42	62	88	139	190	254	317	365	435	512
	cracked concrete	15	21	31	41	72	101	136	177	229	273	317
43°C/60°C (in kN)	non-cracked concrete	19	27	37	53	85	119	159	198	232	277	326
	cracked concrete	9	13	19	26	43	62	82	107	139	166	192
43°C/72°C (in kN)	non-cracked concrete	17	24	33	47	75	111	138	172	199	238	279
	cracked concrete	8	11	17	23	39	55	74	97	125	149	173
safety factor for damp/wet concrete		1.8				2.1						
anchor depth (mm):		80	90	110	125	170	210	250	280	320	350	380
distance from edge (mm)		113	135	165	188	255	304	342	379	400	436	472
pitch (mm)		226	270	330	376	560	608	684	758	800	872	944

Table 4: characteristic tensile strength with threaded bar

characteristic shear strength according to EOTA Technical Report 029, method A											
threaded bar	M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
failure of steel with no bending moment											
bending moment of 5.8 class steel (kN)	9	15	21	39	61	88	115	140	174	205	244
bending moment of 8.8 class steel (kN)	15	23	34	63	98	141	184	224	278	327	390
safety factor	1.25										
bending moment of A4 and HCR stainless steel (kN)	13	20	30	55	86	124	115	140	174	205	244
safety factor	1.56						2.38				
failure of steel with bending moment											
bending moment of 5.8 class steel (kN)	19	37	65	166	324	560	833	1123	1547	1976	2580
bending moment of 8.8 class steel (kN)	30	60	105	266	519	896	1333	1797	2476	3162	4129
safety factor	1.25										
bending moment of A4 and HCR stainless steel (kN)	26	52	92	232	454	784	832	1123	1547	1976	2580
safety factor	1.56						2.38				
failure of edge of concrete											
anchor length (mm)	80	90	110	125	170	210	250	280	320	350	380
diameter of hole (mm):	10	12	14	18	24	28	32	35	37	42	46
safety factor	1.5										

Table 5: characteristic shear strength with threaded bar

Characteristic strength of deformed bar												
characteristic tensile strength according to EOTA Technical Report 029, method A												
deformed bar		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø36	Ø40
failure of steel												
characteristic tensile strength of BSt 500 S class steel (kN)		28	43	62	85	111	173	270	339	442	560	691
safety factor		1.4										
failure of concrete cone												
24°C/40°C (in kN)	non-cracked concrete	22	31	42	56	60	96	148	187	225	308	362
	cracked concrete	15	21	30	34	42	68	106	147	194	265	308
43°C/60°C (in kN)	non-cracked concrete	13	18	27	33	38	59	91	110	127	173	204
	cracked concrete	9	13	18	21	26	42	64	89	118	161	187
43°C/72°C (in kN)	non-cracked concrete	12	17	23	28	35	59	83	99	113	154	181
	cracked concrete	8	11	17	19	23	37	58	81	106	145	168
safety factor for damp/wet concrete		1.8					2.1					
anchor depth (mm):		80	90	110	115	125	170	210	250	280	340	360
distance from edge (mm)		97	121	139	170	180	219	274	298	330	372	413
pitch (mm)		194	242	278	340	360	438	544	596	660	742	816

Table 6: maximum permitted tensile loads with deformed bar

maximum permitted shear loads according to EOTA Technical Report 029, method A											
deformed bar	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø36	Ø40
failure of steel with no bending moment											
bending moment of BSt 500 S class steel (kN)	14	22	31	42	55	86	135	169	221	280	346
safety factor	1.5										
failure of steel with bending moment											
bending moment of BSt 500 S class steel (Nm)	33	65	112	178	265	518	1012	1422	2123	3023	4147
safety factor	1.5										
failure of edge of concrete											
anchor length (mm)	80	90	110	115	125	170	210	250	280	340	360
diameter of hole (mm):	10	12	16	18	20	24	32	35	40	46	50
safety factor	1.5										

Table 7: maximum permitted shear loads with deformed bar

Recommended loads													
recommended loads on concrete with threaded bar according to EOTA Technical Report 029, method A													
	threaded bar		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
tensile	24°C/40°C	non-cracked concrete (kN)	8.6	13.8	20.0	28.0	38.1	52.3	67.9	80.5	98.3	113	127
		cracked concrete (kN)	6.0	8.3	12.0	17.0	24.3	34.5	46.2	57.4	70.1	80.2	90.7
	43°C/60°C	non-cracked concrete (kN)	7.6	10.7	14.8	21.2	29.1	40.4	54.1	67.3	79.0	94.2	111
		cracked concrete (kN)	3.6	5.0	7.3	10.3	14.8	20.9	28.0	36.5	47.2	56.4	65.3
	43°C/72°C	non-cracked concrete (kN)	6.8	9.5	13.2	18.7	25.4	37.7	46.9	58.3	67.7	80.8	95.0
		cracked concrete (kN)	3.3	4.5	6.6	9.3	13.3	18.8	25.2	32.8	42.5	50.7	58.8
shear*	non-cracked concrete (kN)		5.1	8.3	12.0	22.6	35.1	50.3	65.7	78.8	88.6	102	117
	cracked concrete (kN)		5.1	8.3	12.0	16.5	27.0	37.0	46.7	55.8	62.8	72.5	82.8
depth of threaded bar (mm)			80	90	110	125	170	210	250	280	320	350	380
distance from edge (mm)			113	135	165	188	255	304	342	379	400	436	472
pitch (mm)			226	270	330	396	510	608	684	758	800	872	944

Table 8: recommended loads with threaded bar ****without bending moment***

recommended loads on concrete with deformed bar according to EOTA Technical Report 029, method A												
	deformed bar deformed bar		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø36	Ø40
tensile	24°C/40°C	non-cracked concrete (kN)	8.8	12.3	16.5	20.1	23.7	32.7	50.5	63.6	76.6	105	117
		cracked concrete (kN)	6.0	8.3	12.0	13.6	16.7	23.3	35.9	48.4	57.4	76.8	83.6
	43°C/60°C	non-cracked concrete (kN)	5.2	7.3	10.7	13.0	15.0	20.0	30.9	37.4	43.1	58.9	69.2
		cracked concrete (kN)	3.6	5.0	7.3	8.3	10.1	14.1	21.8	30.4	40.1	54.8	63.5
	43°C/72°C	non-cracked concrete (kN)	4.8	6.7	9.1	11.0	13.7	20.0	28.0	33.7	38.3	52.3	61.5
		cracked concrete (kN)	3.3	4.5	6.6	7.5	9.1	12.7	19.6	27.4	36.1	49.3	57.1
shear*	non-cracked concrete (kN)		6.7	10.2	14.8	19.1	22.5	33.2	47.8	56.3	67.2	83.2	97.9
	cracked concrete (kN)		6.1	8.6	11.0	13.9	16.6	23.5	33.9	39.9	47.6	58.9	69.4
depth of threaded bar (mm)			80	90	110	125	170	210	250	280	320	350	380
distance from edge (mm)			97	121	139	170	180	219	274	298	330	372	413
pitch (mm)			194	242	278	340	360	438	548	596	660	744	826

Table 9: recommended loads on concrete with deformed bar ****without bending moment***

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Design suggestions for anchoring threaded bar												
threaded bar			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
distance from edge (mm)			113	135	165	188	255	304	342	379	400	436	472
pitch between anchors (mm)			226	270	330	396	510	608	684	758	800	872	944
depth of threaded bar (mm)			80	90	110	125	170	210	250	280	320	350	380
depth of anchor hole (mm)			110	120	140	161	214	266	314	350	394	432	472
diameter of threaded bar (mm)			8	10	12	16	20	24	27	30	33	36	39
diameter of anchor hole (mm)			10	12	14	18	24	28	32	35	37	42	46
tightening torque (Nm)			10	20	40	60	120	150	200	250	350	500	700
tensile	24°C/40°C	non-cracked concrete (kN)	8.6	13.8	20.0	28.0	38.1	52.3	67.9	80.5	98.3	113	127
		cracked concrete (kN)	6.0	8.3	12.0	17.0	24.3	34.5	46.2	57.4	70.1	80.2	90.7
	43°C/60°C	non-cracked concrete (kN)	7.6	10.7	14.8	21.2	29.1	40.4	54.1	67.3	79.0	94.2	111
		cracked concrete (kN)	3.6	5.0	7.3	10.3	14.8	20.9	28.0	36.5	47.2	56.4	65.3
	43°C/72°C	non-cracked concrete (kN)	6.8	9.5	13.2	18.7	25.4	37.7	46.9	58.3	67.7	80.8	95.0
		cracked concrete (kN)	3.3	4.5	6.6	9.3	13.3	18.8	25.2	32.8	42.5	50.7	58.8
shear*	non-cracked concrete (kN)		5.1	8.3	12.0	22.6	35.1	50.3	65.7	78.8	88.6	102	117
	cracked concrete (kN)		5.1	8.3	12.0	16.5	27.0	37.0	46.7	55.8	62.8	72.5	82.8

Table 10: design suggestions for anchoring threaded bar ****without bending moment***

Design suggestions for anchoring deformed bar												
deformed bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32	Ø36	Ø40
recommended distance from edge (mm)			97	121	139	170	180	219	274	298	330	372	413
minimum distance from edge (mm)			40	50	60	70	80	100	125	140	160	180	200
recommended pitch between anchors (mm)			194	242	277	339	360	438	548	596	661	744	826
minimum pitch between anchors (mm)			40	50	60	70	80	100	125	140	160	180	200
depth of deformed bar (mm)			80	90	110	115	125	170	210	250	280	340	360
depth of anchor hole (mm)			110	120	142	151	165	214	274	320	360	432	460
diameter of deformed bar (mm)			8	10	12	14	16	20	25	28	32	36	40
diameter of anchor hole (mm)			12	14	16	18	20	24	32	35	40	46	50
tensile	24°C/40°C	non-cracked concrete (kN)	8.8	12.3	16.5	20.1	23.7	32.7	50.5	63.6	76.6	105	117
		cracked concrete (kN)	6.0	8.3	12.0	13.6	16.7	23.3	35.9	48.4	57.4	76.8	83.6
	43°C/60°C	non-cracked concrete (kN)	5.2	7.3	10.7	13.0	15.0	20.0	30.9	37.4	43.1	58.9	69.2
		cracked concrete (kN)	3.6	5.0	7.3	8.3	10.1	14.1	21.8	30.4	40.1	54.8	63.5
	43°C/72°C	non-cracked concrete (kN)	4.8	6.7	9.1	11.0	13.7	20.0	28.0	33.7	38.3	52.3	61.5
		cracked concrete (kN)	3.3	4.5	6.6	7.5	9.1	12.7	19.6	27.4	36.1	49.3	57.1
shear*	non-cracked concrete (kN)		6.7	10.2	14.8	19.1	22.5	33.2	47.8	56.3	67.2	83.2	97.9
	cracked concrete (kN)		6.1	8.6	11.0	13.9	16.6	23.5	33.9	39.9	47.6	58.9	69.4

Table 11: Design suggestions for anchoring deformed bar ****without bending moment***

Fire resistance				
	exposure to fire in minutes			
	30'	60'	90'	120'
threaded bar	residual strength in kN			
M8	≤ 0.90	≤ 0.50	≤ 0.30	≤ 0.20
M10	≤ 3.20	≤ 1.80	≤ 1.10	≤ 0.75
M12	≤ 4.20	≤ 2.30	≤ 1.40	≤ 0.90
M16	≤ 8.25	≤ 5.30	≤ 3.80	≤ 3.00
M20	≤ 17.25	≤ 10.20	≤ 6.70	≤ 5.00
M24	≤ 24.85	≤ 14.75	≤ 9.70	≤ 7.20
M30	≤ 39.50	≤ 23.40	≤ 15.40	≤ 11.35

Table 12: resistance of anchor to fire

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