MAPEFIX VE SF

Chemical styrene-free vinylester anchor for structural loads and construction bars in concrete

Feuerwiderstandsklasse F 120

C1: Seismic performance

OP1: cracked and non cracked concrete

OP7: non cracked concrete

European Technical Approval post installed rebar

Fast Track Ready

WHERE TO USE

Mapefix VE SF is an adhesive for chemically anchoring metal bars in holes made in building materials. It is a two-component, styrene-free product made from a mixture of synthetic resins. It is specifically formulated for anchoring zinc-plated threaded and deformed steel bars which transmit structural loads in solid and perforated substrates such as non-cracked concrete, lightweight concrete, stone, wood, bricks and mixed masonry. Specific also for anchoring metal bars in tension and compression zones in cracked and non-cracked concrete, including in areas at risk of seismic activity.
It is also an ideal solution for anchoring close to edges or when there is a limited space between each anchor, as no stress generated as with conventional mechanical expansion fasteners.
Mapefix VE SF is recommended for immersed anchors which are permanently damp, in marine and industrial environments subjected to chemical aggression, areas where the temperature is as low as -10°C when the product is applied and for anchors with a horizontal, vertical, inclined or overhead axis; it may also be used on substrates which are damp or wet at the moment of application where there are high static or dynamic stresses.
Mapefix VE SF 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;
· plant and sanitary equipment;
· aerials and signs;
· pylons;
· safety barriers.

TECHNICAL CHARACTERISTICS

Mapefix VE SF is a two-component chemical anchoring product, packaged in 300 and 420 ml cartridges with two separate compartments containing component A (resin) and component B (catalyser), at the correct mixing ratio in volume. 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. 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 one.
Mapefix VE SF does not contain styrene which makes it suitable for use in areas with poor ventilation and, due to its low shrinkage, it is also suitable for anchors with small circular crests.
Mapefix VE SF is a chemical anchor made from a mixture of styrene-free resins, suitable for application on a wide range of solid and perforated building materials, such as:
· non-cracked concrete;
· lightweight concrete;
· cellular concrete;

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· masonry;
· bricks;
· stone;
· wood.

Mapefix VE SF is applied to holes made with a drill or hammer drill. We recommend using only a drill on perforated substrates.
Mapefix VE SF is certified according to the European Standards ETA option 1 (anchors in concrete in tension or compression zones), ETA rebar (supplementary reinforcement) and fire certification, ETA seismic performance C1 (in seismic zones).
The **Mapefix VE SF** 300 ml size cartridges may be used with conventional silicone extrusion guns for 50 mm diameter cartridges, as long as they are robust enough. The 420 ml cartridges need to be used with a special extrusion gun for 65 mm diameter cartridges.

RECOMMENDATIONS

· Do not apply on dusty or crumbling surfaces.
· For use on damp or wet substrates, please contact the MAPEI Technical Services Department.
· Do not use on surfaces with traces of oil, grease and stripping compounds otherwise it will impede or reduce adhesion.
· Do not apply if the temperature is lower than -10°C.
· If used on natural stone, check if it impregnates into the stone.
· Do not apply loads until it has completely hardened T_{cure} (see table 1).
· Do not use the product in holes made with a diamond-tipped bit (cored holes): use **Mapefix EP 385** or **Mapefix EP 585**.

APPLICATION PROCEDURE

Design of the anchor

The size of the hole in the substrate, the depth of the anchor, the diameter of the anchoring element and the maximum permitted loads must be calculated by a qualified design engineer. The following tables contain practical design suggestions based on the company's experience and internal testing carried out in compliance with EOTA guidelines (European Organization for Technical Assesment). MAPEI has a special programme (Mapefix Software Design) available to help technicians and designers find the correct size for single and multiple anchors in any concrete element: consult the MAPEI Technical Services Department.

Preparation of solid surfaces

Make holes in the substrate with a drill or a hammer drill, according to the type of material to be drilled.
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.

Preparation of perforated surfaces

Make holes in the substrate with a drill.
Clean the surface inside the holes with a suitable long-bristled bottlebrush.
Place a mesh bush in the hole, with a diameter and length suitable for the size of the hole.
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. Eliminate every trace of form-release compounds.

Preparation of the resin for the chemical anchor

For the 300 ml cartridge, unscrew the upper cap and cut off the tips of the black and white sacks which protrude from the cartridge. This operation is not required with the 420 ml cartridge.
Screw the static mixer supplied with each pack 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}) of the resin; 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 (see tables 11 and 12).

CLEANING

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

PACKAGING

Boxes of 12 pieces (300 or 420 ml cartridges) with 12 static mixers.

COLOURS AVAILABLE

Light grey.

STORAGE

300 ml cartridges: 12 months in its original packaging at a temperature of between +5°C and +25°C.
420 ml cartridges: 18 months in its original packaging at a temperature of between +5°C and +25°C.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Mapefix VE SF component A is irritant for the respiratory tract; both component A and component B can cause sensitization when in contact with the skin. Furthermore, **Mapefix VE SF** component B may irritate the eyes. We recommend, during the application, to use protective goggles and gloves and to take the usual precautions for handling chemicals. In case of contact with eyes or skin wash immediately with plenty of water and seek medical attention. It is recommended to work in well-ventilated areas. If there is insufficient ventilation wear a face mask.
For further and complete information about the safe use of our product please refer to the latest version of our Material Safety Data Sheet.
PRODUCT FOR PROFESSIONAL USE

TECHNICAL DATA (typical values)	
PRODUCT IDENTITY	
Consistency:	thixotropic paste
Colour:	light grey
Density (g/cm³):	1.77
APPLICATION DATA (at +23°C and 50% R.H.)	
Application temperature range:	from -10°C to +35°C
Start setting time T_{gel}:	see table 1
Final hardening time T_{cure}:	see table 1
PERFORMANCE CHARACTERISTICS	
Compressive strength (EN 196-1) (N/mm²):	100
Flexural strength (EN 196-1) (N/mm²):	15
Modulus of elasticity (EN 196-1) (N/mm²):	14000
Resistance to UV rays:	good
Chemical resistance:	very good

Resistance to water (EN 12390-8):	excellent
In-service temperature range:	from -40°C to +80°C (provisionally up to +120°C)
Design parameters:	see tables 2 and 6
Recommended loads:	see tables 5 and 9
Fire resistance:	see table 10
Consumption:	see tables 11 and 12

WARNING

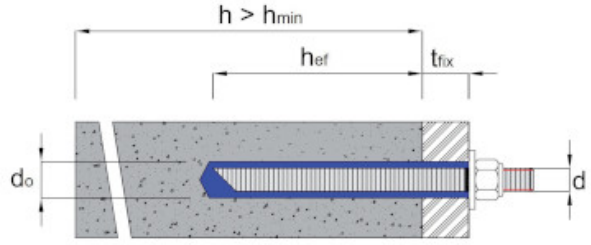
Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, 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

Reaction time of product			
Substrate temperature (°C)	**Start setting time T_{gel}**	**final hardening time T_{cure}**	
		dry substrate	**damp/wet substrate**
–10*	90’	24 h	48 h
-5*	90’	14 h	28 h
0	45’	7 h	14 h
+5	25’	2 h	4 h
+10	15’	80’	3 h
+20	6’	45’	90’
+30	4’	25’	50’
+35	2’	20’	40’

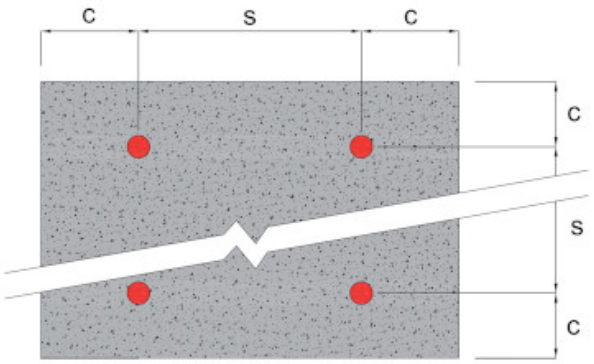
*Table 1: reaction time of resin * temperature of product at least +15°C*

Installation paremeters for threaded bar											
Threaded bar				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Diameter of threaded bar	d		mm	8	10	12	16	20	24	27	30
Diameter of hole in concrete	d_0		mm	10	12	14	18	24	28	32	35
Minimum distance from edge	c_{min}		mm	40	50	60	80	100	120	135	150
Minimum pitch between bars	s_{min}		mm	40	50	60	80	100	120	135	150
Minimum and maximum anchoring depth of threaded bar	h_{ef}	$h_{ef,min}$	mm	60	60	70	80	90	96	108	120
		$h_{ef,max}$	mm	160	200	240	320	400	480	540	600
Minimum thickness of concrete element	h_{min}		mm	h_{ef} + 30 mm (≥ 100 mm)			h_{ef} + 2 d_0				
Required tightening torque	T_{inst}		Nm	10	20	40	80	120	160	180	200

Table 2



Drawing 3



Drawing 4

Recommended TENSILE and SHEAR loads (*) for a single anchor in concrete in a rough hole												
	Working temperature (°)				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Tensile load	24°C/40°C	Non-cracked	$N_{Rec,stat}$	kN	8.6	13.5	19.7	28.0	44.4	61.0	79.2	88.9
		Cracked	$N_{Rec,stat}$		4.3	6.2	9.1	13.7	23.3	34.6	54.7	63.4
		Seismic	$N_{Rec,seis}$		2.9	4.2	6.2	9.3	15.9	23.8	37.7	45.3
	50°C/80°C	Non-cracked	$N_{Rec,stat}$		7.2	10.1	14.8	22.4	38.1	53.4	63.1	65.6
		Cracked	$N_{Rec,stat}$		2.9	4.5	6.6	10.0	17.0	25.1	37.9	45.4
		Seismic	$N_{Rec,seis}$		2.0	3.1	4.5	6.8	11.5	17.3	26.1	31.4
	72°C/120°C	Non-cracked	$N_{Rec,stat}$		5.3	7.3	10.7	16.2	27.6	40.8	46.3	50.5
		Cracked	$N_{Rec,stat}$		2.4	3.4	4.9	7.5	12.7	18.8	29.5	35.3
		Seismic	$N_{Rec,seis}$		1.6	2.3	3.4	5.1	8.6	13.0	20.3	24.4
Shear load without bending moment		Non-cracked	$V_{Rec,stat}$	kN	5.1	8.6	12.0	22.3	34.9	50.3	59.3	65.5
		Cracked	$V_{Rec,stat}$		3.8	5.6	7.5	12.3	18.0	23.7	31.9	37.8
		Seismic	$V_{Rec,seis}$		1.8	2.8	3.8	6.1	9.0	11.9	16.0	18.9
Anchoring depth of reinforcing bar			h_{ef}	mm	80	90	110	125	170	210	250	270
Distance from edge			$c_{cr,N}$	mm	92	126	152	188	253	291	312	329
Pitch between bars			$s_{cr,N}$	mm	2 x $C_{cr,N}$							

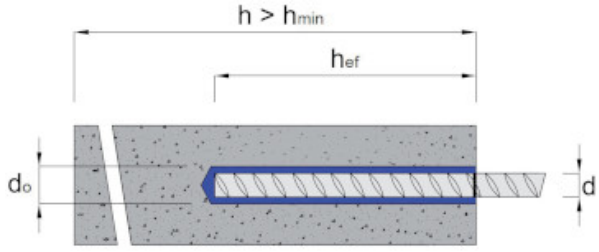
Table 5

(*) recommended load valid if there are the following conditions
· concrete minimum class C20/25
· shear load without bending moment
· class 5.8 steel bar
· C ≥ $C_{cr,N}$
· S ≥ $S_{cr,N}$
· h ≥ 2 x h_{ef}
· includes safety factors
· for other anchoring conditions use Mapefix Software Design, developed in compliance with current European standards
(°) continuous working temperature/temporary maximum peak working temperature

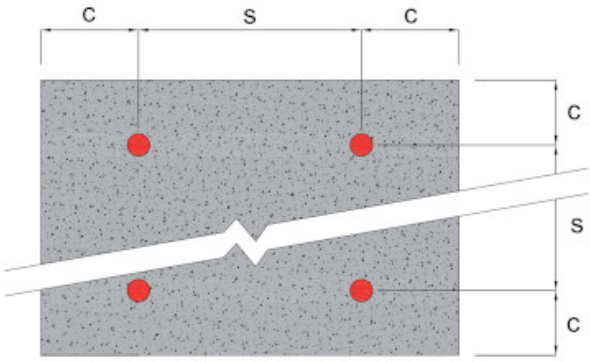
Installation parameters for reinforcing bars												
Reinforcing bar				**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Diameter of reinforcing bar	d		mm	8	10	12	14	16	20	25	28	32
Diameter of hole in concrete	d_0		mm	12	14	16	18	20	24	32	35	40
Minimum distance from edge	c_{min}		mm	40	50	60	70	80	100	125	140	160
Minimum pitch between bars	s_{min}		mm	40	50	60	70	80	100	125	140	160
Minimum and maximum anchoring depth of threaded bar	h_{ef}	$h_{ef,min}$	mm	60	60	70	75	80	90	100	112	128
		$h_{ef,max}$	mm	160	200	240	280	320	400	480	540	640

Minimum thickness of concrete element	h_{min}	mm	h_{ef} + 30 mm (≥ 100 mm)	h_{ef} + 2 d_0

Table 6



Drawing 7



Drawing 8

Recommended TENSILE and SHEAR loads (*) for a single anchor in concreete in a rough hole													
	Working temperature (°)				**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Tensile load	24°C/40°C	Non-cracked	$N_{Rec,stat}$	kN	9.6	13.5	19.7	24.1	28.0	44.4	61.0	79.2	88.9
		Cracked	$N_{Rec,stat}$		4.3	6.2	9.1	11.0	13.7	23.3	36.0	56.5	63.4
		Seismic	$N_{Rec,seis}$		2.9	4.2	6.2	7.5	9.3	16.1	24.8	39.1	48.3
	50°C/80°C	Non-cracked	$N_{Rec,stat}$		7.2	10.1	14.8	18.1	22.4	38.1	52.4	61.1	64.6
		Cracked	$N_{Rec,stat}$		2.9	4.5	6.6	8.0	10.0	17.0	26.2	39.3	48.5
		Seismic	$N_{Rec,seis}$		2.0	3.1	4.5	5.5	6.8	11.7	18.1	27.1	33.4
	72°C/120°C	Non-cracked	$N_{Rec,stat}$		5.3	7.3	10.7	13.0	16.2	27.6	39.3	43.6	48.5
		Cracked	$N_{Rec,stat}$		2.4	3.4	4.9	6.0	7.5	12.7	19.6	30.5	37.7
		Seismic	$N_{Rec,seis}$		1.6	2.3	3.4	4.1	5.1	8.8	13.5	21.1	26.0
Shear load without bending moment		Non-cracked	$V_{Rec,stat}$	kN	6.7	10.5	14.8	20.0	26.2	41.0	56.6	62.5	69.3
		Cracked	$V_{Rec,stat}$		3.8	5.6	7.5	9.9	12.3	18.0	25.7	33.6	41.4
		Seismic	$V_{Rec,seis}$		1.9	2.8	3.8	5.0	6.1	9.0	12.8	16.8	20.7
Anchoring depth of reinforcing bar			h_{ef}	mm	80	90	110	115	125	170	210	250	270
Distance from edge			$c_{cr,N}$	mm	92	126	152	173	188	253	303	323	341
Pitch between bars			$s_{cr,N}$	mm	2 x $C_{cr,N}$								

Table 9

(*) recommended load valid if there are the following conditions
· concrete minimum class C20/25
· shear load without bending moment
· class 5.8 steel bar
· C ≥ $C_{cr,N}$
· S ≥ $S_{cr,N}$

· $h \geq 2 \times h_{ef}$
· includes safety factors
· for other anchoring conditions use Mapefix Software Design, developed in compliance with current European standards
(°) continuous working temperature/temporary maximum peak working temperature

Fire resistance				
exposure to fire in minutes				
	30'	60'	90'	120'
Threaded bar	Residual strength equal to or less than (kn)			
M8	≤ 1.65	≤ 1.12	≤ 0.59	≤ 0.33
M10	≤ 2.60	≤ 1.77	≤ 0.94	≤ 0.52
M12	≤ 3.35	≤ 2.59	≤ 1.82	≤ 1.44
M16	≤ 6.25	≤ 4.82	≤ 3.40	≤ 2.69
M20	≤ 9.75	≤ 7.52	≤ 5.30	≤ 4.19
M24	≤ 14.04	≤ 10.84	≤ 7.64	≤ 6.04
M30	≤ 18.26	≤ 14.10	≤ 9.94	≤ 7.86

Table 10

Consumption of Mapefix VE SF										
Threaded bar			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Diameter of threaded bar	d	mm	8	10	12	16	20	24	27	30
Diameter of hole in concrete	d_0	mm	10	12	14	18	24	28	32	35
Anchoring depth	h_{ef}	mm	80	90	110	125	170	210	250	280
Theoretical consumption per hole		ml	3	4	5	8	28	41	69	86
Number of holes with 300 ml cartridge		n°	111	80	56	37	11	7	4	3
Number of holes with 420 ml cartridge		n°	155	113	78	52	15	10	6	5

Table 11

Consumption of Mapefix VE SF										
Reinforcing bar			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Diameter of threaded bar	d	mm	8	10	12	14	16	20	25	28	32
Diameter of hole in concrete	d_0	mm	12	14	16	18	20	24	32	35	40
Anchoring depth	h_{ef}	mm	80	90	110	115	125	170	210	250	280
Theoretical consumption per hole		ml	6	8	12	14	17	28	79	104	152
Number of holes with 300 ml cartridge		n°	50	37	26	22	18	11	4	3	2
Number of holes with 420 ml cartridge		n°	70	52	36	30	25	15	5	4	3

Table 12