

EMACO S88 thixotropic type

Non-shrink, sulphate resisting, thixotropic, rheoplastic mortar for repair jobs. It can be either sprayed or trowelled.

Description

EMACO S88, thixotropic type, is a ready-to-use product in powder form. Mixed with water, it provides rheoplastic, flowable and non-segregating, thixotropic, high strength mortars, with high bond to steel and concrete. EMACO S88, thixotropic type, mortar is non-shrink both in the fresh and in the hardened state; it is impermeable and extremely durable even in highly aggressive environments.

EMACO S88, thixotropic type, contains no metallic aggregate and is chloride free. It is recommended in repair jobs needing mortar layers up to 40 mm in thickness (see table 1 for thicker coatings).

Two formulations (C and D) of EMACO S88; thixotropic type, are produced; the only difference is in the setting times (see table 2) and, consequently, in the duration of workability. As a rule, EMACO S88 D is always recommended for sprayed or trowelled applications (high temperature or long distance transport or pumping prior to application) lower the workability of the mix excessively, EMACO S88 C is recommended for use, especially in hot conditions.

Cement mixes should always be damp cured (alternatively, a curing compound should be applied to prevent water evaporation). However, even without such protection, EMACO S88 C and D do not show crazing or cracks due to plastic shrinkage, as usually occurs when using mortar which has not been protected adequately during the first 24 hours of curing.

Table 1. Recommended type of Emaco according to thickness and type of application.

Application	Thickness, mm		
	10-40	40-100	>100
Pours	S88 SFR	S66	Contact MBT representative
Spray or trowel	S88D* S88C**	S88D*** S88C****	

* in winter, one layer only

** in the other seasons, one layer only

*** in winter, several layers

**** in the other seasons, several layers

Table 2. Setting times of EMACO S88, thixotropic type (consistency = 45% flow on flow table, ASTM C-230, 5 drops)

Temperature	setting times (hrs:min) of EMACO S88			
	Emaco S88C		Emaco S88D	
	Initial	Final	Initial	Final
5	2,00 h	3,00 h	1,30 h	2,30 h
20	1,45 h	2,45 h	1,15 h	2,15 h
40	1,00 h	2,00 h	0,45 h	1,30 h

Table 3. Water requirement to produce EMACO S88 C and D thixotropic mortars.

Mixing	type of application	suggested consistency	flow ASTM C-230*	Mixing water	
				min.	max.
by mixer	spray	plastic	70%	15%	16.7%
	trowel	plastic	70%	15%	16.7%

*Test method was modified to 5 drops

Transport and storage

EMACO S 88 C and D are packaged in 30 kg moisture-resistant bags, easy to store and handle thanks to their low weight. 1 000 kg bags are also available on request.

Preparation of the mortar

For correct mixing of EMACO S88 C and D mortar, the following procedure is recommended:

- Check that the available quantity of EMACO S88 is sufficient taking into account that 1950 kg of EMACO are needed to obtain 1 m³ of mortar.
- Make sure all the necessary materials (mixer, wheel-barrows, pails, trowels, etc.) are available on site.
- Check that the recommendations given, in the section "Directions for Repair Jobs", dealing with the preparation of the structure, have been followed
- Open the bags of EMACO S88 necessary for the job a short time before mixing is started. Pour the minimum amount of mixing water indicated in Table 3 into the mixer. Start the mixer and add EMACO S88 rapidly and continuously.

- Mix for 3 to 4 minutes after all EMACO S88 has been added, until the mortar is well mixed and lump free.
- Add water, if necessary (within the amounts indicated in Table 3), until required consistency is achieved and mix for a further 2 to 3 minutes. The water content may vary slightly with respect to that indicated in Table 3, depending on ambient temperature and relative humidity. In hot and dry climates, slightly higher amounts of water may be necessary, the contrary in cold and humid climates.

Hand mixing of EMACO S88 is not recommended. For small mixes, a drill with helical mixer can be used.

The influence of temperature

EMACO S88 C and D can be used when ambient temperature is between 5 - 50 °C. However, if the ambient temperature is very low (5 - 10 °C), strengths develop more slowly. When high early strength is required, the use of EMACO S88 D and the following precautions are advise:

- a) store the bags of EMACO S88 D in a location protected against cold weather
- b) use hot mixing water (30 - 50 °C)
- c) start placement in the morning
- d) protect the EMACO S88 D against cold weather by sheeting over. Do not place if temperature is below 0 °C. If ambient temperature is very high (> 30 °C), workability loss is the only problem. If workability loss is excessive with regard to the intended use, the use of EMACO S88 C and the following procedures are recommended:
 - a) store the bags of EMACO S88 C in a cool place
 - b) use cold mixing water or add crushed ice
 - c) prepare the mortar during the coolest period of the day.

Directions for repair jobs

The following recommendations and suggestions are based on field practice in the use of EMACO S88 C and D for repairs.

1. Preparation of concrete or masonry to be resurfaced

- a) Remove deteriorated concrete or mortar and laitance, by using a chisel or a scarifier, and provide rough and sound surfaces. Scarification must be deep enough to allow a mortar layer or at least 10 mm thickness. Square cut edges of repair area to a depth of at least 10 mm. This step is very important because EMACO S88 C or D needs a rough surface to bond to. All reinforcement should be sand blasted clean, and if necessary new reinforcement should be used to replace badly deteriorated old reinforcement.
- b) In the case of water loss or infiltration, the leak should be localised and the surrounding area made good before stopping the leak with a rapid setting material such as EMACO R500 L/R.
- c) Clean surface of grease, oil or paint stains, lime, dirt or dust.

2. Reinforcement positioning

If the coating is thicker than 20 mm, anchor a welded wire reinforcement to the concrete to be treated, leaving some space between the mesh and the surface. The required cover of EMACO S88 over reinforcement shall be of at least 10 mm. If thickness is less than 20 mm, no mesh is needed, provided that the surface has been keyed with ridges of approx. 5 mm in height, in order to provide the needed restraint to the mortar expansion.

3. Water saturation

After reinforcing bars or mesh fixed in place, saturate the concrete or masonry to be repaired with water for at least 6 hours before placing mortar. Remove excess water, if any, with air hose or rags.

4. Placement of the mortar

After EMACO S88 has been mixed with water following the suggestions in the section "Preparation of the mortar", the mortar can be either sprayed or trowel applied. The surface of the repair should be levelled using a wooden float. Final finishing may be with a wooden, plastic or synthetic sponge trowel, depending on the finish required. Trowelling after the spray application may start only when the mortar has set; that is, when fingers do not sink beneath the surface, but mark it lightly. EMACO S88, thixotropic type does not show crazing or cracks due to plastic shrinkage, as usually occurs when using mortars which are not protected adequately in the first 24 hours of curing. In particularly dry and windy

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conditions even EMACO S88, thixotropic type, may need adequate curing. Damp curing of cement mixes (or the application of a curing compound to prevent evaporation) is always recommended whatever the conditions, but particularly under dry and windy conditions.

Recommended applications

- Repairs in ports or other marine environments
- Repairs in industrial areas, especially in environments containing mineral oils, lubricants, etc.
- Protection of concrete against aggressive water containing sulphates, sulphides, chlorides, etc.
- Repair of damaged members
- Repair of members subjected to repetitive stresses
- Repair of structural members (reinforced or prestressed beams under normal or eccentric stress).

Do not use EMACO S88 C and D MORTAR

- For precision grouting (the use of Masterflow 928 is recommended)
- In contact with water having a pH less than 5,5 (contact MBT representative)
- For pours into forms (use EMACO S88 pourable)
- For concrete toppings (use EMACO SFR or other recommended MBT products)

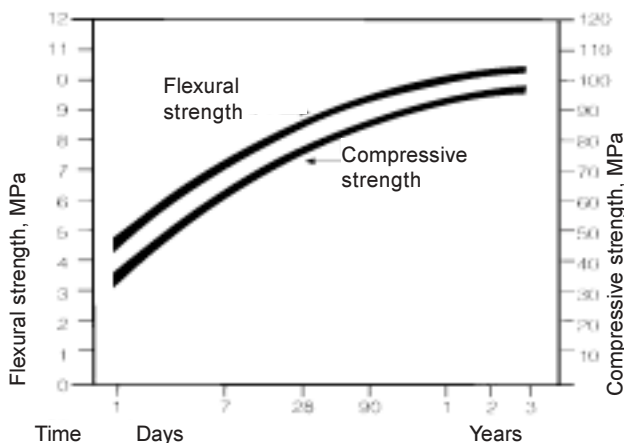


Fig 1. Typical average strengths of EMACO S88, thixotropic type, at 20 °C, mixed with 16% water.

Properties

- Compressive strength (100 - mm cubes): flexural strength (40 x 40 x 160 - mm specimens); see fig 1.
- Modulus of elasticity 25,000 MPa at 7 days and 30.000 MPa at 28 days
- Bond to concrete: 6,5 MPa at 28 days
- Bond to steel: 3 and 4 MPa at 7 and 28 days, respectively, when using smooth bars; 20 and 30 MPa at 7 and 28 days respectively, with deformed bars
- Capillary porosity: see fig 2
- Resistance to freezing and thawing cycles; after 3000 cycles ranging between - 20 and 6 °C, 5 % lowering of the elastic modulus is observed
- Sulphate resistance: no degradation is observed after magnesium sulphate attack, in accordance with ASTM C-88 for 7-dat cured mortars
- Oil resistance: no degradation is observed after immersion in oil at 40 °C for 60 days.

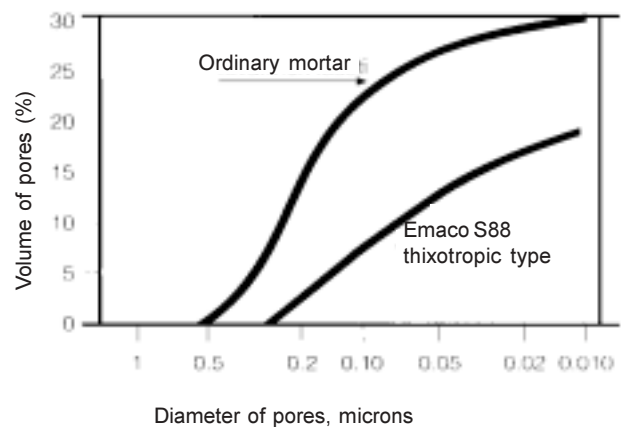


Fig 2. Cumulative volume of pores of EMACO S88, thixotropic type (measured by mercury porosimeter), compared with that of ordinary mortar having same flow.