

## MAKGROUT HES

**High flow, high ultimate strength, dual shrinkage compensated Class C, precision cementitious grout**

**Makgrout HES**, is a rapid set high strength cementitious precision grout, **Makgrout HES** is supplied as a ready to use powder. The addition of a controlled amount of clean water produces a free-flowing grout for gap thicknesses of 10 to 150mm. In addition, the low water requirement ensures high early strength and long-term durability.

**Makgrout HES** is a blend of cements, graded aggregates and additives which impart controlled expansion in the plastic and hardened state. The aggregate grading minimises segregation and bleeding over a wide range of application consistencies. Maximum aggregate size is 3.0 - 4.0mm.

**Makgrout HES** Grout is a high early strength gain, flowable, shrinkage compensated, Class C grout for use where rapid strength gain is required.

**Makgrout HES** Grout complies with US Corps of Engineers specification CRDC 621-82A and ASTM C1107-91 for Class C Grout.

### RECOMMENDED USES

- Cementitious grouting where high early strength is required
- Heavy duty support grout high load machine base plates
- Precast grouting applications
- Anchoring bolt holes
- Bridge bearing pads
- Crane rail plates
- Cavities, gaps and recesses
- Rapid reinstatement of plant equipment

## TECHNICAL DATA SHEET

- Grouting requiring dynamic load bearing and applications subject to continuous vibration
- Balustrade/Glass Installation
- Heavy duty precision grouting of gaps from 10 to 150mm, where high flow and high ultimate strength is required
- Baseplates and soleplates of large machines subject to dynamic loads
- Joints between precast panels
- High performance structural grouting
- Filling core holes created by core drilling
- Can be dry packed, rammed, trowelled, poured, and pumped

### FEATURES AND BENEFITS

- Rapid strength gain facilitates rapid installation and operation of plant within a matter of hours
- High strength gain is achievable even at low temperatures
- Excellent initial flow and flow retention
- Unique system compensates for shrinkage in plastic and hardened state
- High ultimate strength and low permeability ensure durability of the hardened grout
- Chloride free
- Suitable for pumping or pouring over a large range of application consistencies and temperatures
- High early strength, even at low temperatures. Dual stage expansion compensates for shrinkage in both the plastic and hardened states.
- High ultimate strength (28 days)
- Exceptional flow characteristics
- Gaseous expansion system compensates for shrinkage and settlement in the plastic state
- Pre-packaged material overcomes potential on-site mixing variations
- Develops high early strength without the

- use of chlorides
- Shrinkage compensated
- Non-metallic iron content eliminates staining
- Good impact and thermal resistance
- Complies with US Corps of Engineers specification CRD-C—621-82A and ASTM C1107-91 for expansion
- Pre-packaged material requires only the addition of clean water on site
- Grouting from 10mm to 150mm in a single application
- Dimensionally stable in plastic and hardened state
- Maximum aggregate size 3.0 - 4.0mm for pumping
- Hydrogen free gaseous expansion
- Australian Made and Australian Owned

## APPLICATION INSTRUCTIONS

### SURFACE PREPARATION

For maximum bond, surfaces should be abraded or roughened, preferably by mechanical means such as needle gun, grit blasting, grinding. The substrate to be grouted must be clean, sound, and free from dust, oil, grease, curing compounds or any foreign matter that will affect the grout adhesion bond. Bolt holes and anchor points must be clean and free of water. All laitance must be removed to expose a sound concrete base.

### BASE PLATE

It is essential that this is clean and free from oil, grease, or scale. Air pressure relief holes should be provided to allow venting of any isolated high spots.

### FORM WORK

The form work to be constructed is leak proof and watertight. To achieve this, it is recommended that foam rubber strips or a suitable sealant such as polyurethane or silicone be used underneath the formwork.

The formwork should allow for gravity flow of grout with a suitable grout head allowing for continuous flow between the base plate and the concrete substrate.

The form work should be coated with form oil or release agent prior to grouting (Consult Makrete Technical Department for additional information).

### SUBSTRATE PREPARATION

Pre-soak all prepared areas with water for a minimum of 2 hours prior to grouting. This will reduce the porosity of the substrate. Prior to grouting, any free or excess water must be removed, and all holes must be free from water and no ponding of water are present in area to be grouted.

If grouting under base plates, it is imperative that bleed holes or venting holes are provided (this will eliminate pressure build up in a confined area).

### MIXING

A forced action mixer is essential. Mixing at low speed with a forced action mixer is essential. Mix for 3 to 5 minutes at slow speed (500/600rpm).

**Makgrout HES** is ready to use, simply requiring the addition of water.

**Makgrout HES** must be mixed with a mechanical mixer with a high shear helical mixing paddle to create forced action mixing. For smaller quantity mixing, an electric drill with aspiral mixing paddle is suitable. The drill speed should be approx. 500-600 rpm.

The selected water content should be accurately measured into the mixing bucket. While mixing, slowly add the total contents of the **Makgrout HES**, mix continuously for a total of 5 minutes, ensuring a smooth, even consistency is obtained. Always add the powder to the water.

- Always add grout to pre-measured water
- The water level should be accurately gauged

- Do not add additional water as this will lead to segregation and bleeding
- Any grout that is unworkable or has set should be discarded and not to be re-used
- Grout should not be mixed by hand
- Do not use mechanical vibrators to assist flow
- Unrestrained grout must be kept to a minimum

## MAKGROUT HES MIXING CONSISTENCY

Required Consistency	Litres of water added per 20kg bag	Yield - Litres of mixed material
Stiff	2.0 -2.4	10.0
Plastic	2.5 -2.8	10.3
Flowable	2.9 -3.2	11.0

## Grout Placement

At 20°C place the grout within 20 minutes of mixing to gain full benefit of the expansion process.

**Makgrout HES** can be placed in thicknesses from 10mm up to 150mm in a single pour when used as an underplate grout. Where the grouting gap beneath the base plate exceeds the maximum thickness allowed, then the grout can be filled / bulked out with **Makrete Filler M4/M6** to minimise exotherm heat build-up.

Filling/bulking out of the grout should not exceed a ratio of 2:1 grout: Makrete Filler (M4/M6) by weight (2 parts grout to 1 part Filler M4/M6)

Continuous grout flow is essential. Sufficient grout must be prepared before starting. The time taken to pour a batch must be regulated to the time to prepare the next one.

## GROUTING TECHNIQUES:

### 1. Trowelable/Stiff Grout-

Ensure sufficient water is present to obtain a stiff/ dry pack consistency. If the grout is too dry, insufficient hydration of the cements will cause low strength gain and inadequate curing.

Using a tamping rod or a suitable tamping tool, apply the grout in the required position tamping to ensure adequate compaction. This consistency can also be used as a patching mortar for horizontal surfaces.

### 2. Gravity flow using header box-

**Makgrout HES** can be placed in thicknesses from 10 -150mm in a single application.

Mix the grout to a flowable consistency and pour grout from one side to avoid air entrapment.

Ensure a grout head box is used and the grout head is always maintained. This will ensure continuous flow of grout without the possibility of air entrapment.

### 3. Large volume mixing/pumping -

Mix the grout using a forced action mixer. A positive displacement pump is the recommended pump for large placement application.

For large grout pours ensure the grout is pumped from the base of the formwork, especially for column application an inlet port should be positioned at the bottom of the column and grout pumped from the base of the column. By pumping or placing from the base of the column this will minimise any air entrapment. Ensure complete void filling.

For base plates, pump from one side ensuring an air bleeder hole is available in the formwork or base plate to ensure any build- up of pressure is released from the bleeder hole.

For continuous pumping Makrete recommend Putzmeister S5 or Putzknecht S30 or similar.

## APPLICATIONS - LIMITATIONS

### Low temperature working/mixing

When the air or substrate surface temperatures are 5°C or below, warm water (30 - 40°C) is recommended to accelerate strength development.

For ambient temperatures below 10°C the formwork should be kept in place for at least 12-24 hours.

Normal precautions for winter working with cementitious materials should then be adopted. At low temperatures the grout will take longer to cure and reach maximum strength gain.

Unrestrained grout must be kept to a minimum.

### High temperature working/mixing

At ambient temperatures above 30°C cool water (below 20°C) should be used for mixing the grout prior to placement. At high temperatures the grout will set and cure faster, working time will be significantly reduced.

- Unrestrained area must be kept to a minimum
- Do not add additional water other than what is specified
- Never apply mixed grout to a dry porous substance
- Refer to SDS (material safety data sheet) prior to mixing
- Always apply grout in a continuous operation ensure grout head is maintained

## CURING

On completion of the grouting operation, exposed areas should be thoroughly cured. This should be done using **Makrete** curing membrane, continuous application of water and/or wet hessian.

## PACKAGING

**Makgrout HES** is supplied in 20kg poly lined bags.

## SHELF LIFE

**Makgrout HES** has shelf life of 12 months if stored in the original sealed packaging in dry, low humid environments. Do not use if there are any lumps in the product.

## CLEAN UP

**Makgrout HES** should be removed from tools and equipment with clean water immediately after use. Cured material can only be removed mechanically.

## HEALTH AND SAFETY INFORMATION

Avoid contact with skin. Protective gloves and clothing are recommended when mixing or using this product. Please refer to full Safety Data Sheet for this product, which is available from Makrete Building Solutions.

## TECHNICAL SPECIFICATIONS PERFORMANCE CHARACTERISTICS

Test Method	Standard	TYPICAL PROPERTIS (Results) MPa						
		Consistency	Water Addition	2 hours	4 hours	1 Day	7 Days	28 Days
Compressive Strength	AS 1478.2:2005	Stiff	2.0-2.4	35	40	50	60	70
		Plastic	2.5 -2.8	30	36	44	55	60
		Flowable	2.9 -3.2	25	32	40	48	55
Flexural Strength (Modulus of Rupture)	AS 1012.11 - 2000	1 Day 7 Days 28 Days	2.9 MPa 4.2 MPa 6.4 MPa					
Indirect Tensile Strength	AS 1012.10.2000	1 Day 7 Days 28 Days	1.3 MPa 2.4 MPa 3.1 MPa					
Setting Time – Stiff Consistency	AS 1012.18:1996	15-20 mins - initial set @ 20 C 20-25 mins - final set @ 20 C						
Setting Time – Plastic Consistency	AS 1012.18:1996	25-30 mins - initial set @ 20 C 30-35mins - final set @ 20 C						
Setting Time – Flowable Consistency	AS 1012.18:1996	35-40 mins - initial set @ 20 C 40-45 mins - final set @ 20 C						
Fresh Wet Density	AS1012.5	2200 kg/m <sup>3</sup> - depending on consistency used						
Minimum Thickness Maximum Thickness		10mm 150mm						
Flow consistency	CRDC-621-82	40 – 50 secs using CRDC Flow Cone						
Working time	AS1012.18	Approx. 30 mins @ 20C in a flowable state						
Bond Strength	ASTM C882-1987 Slant Shear Method	>14MPa @ 28 Days						
Expansion Characteristics	In Plastic State ASTM C940	1-2% in plastic state Expansion starts in 5 mins and finishes in 1 hour						
Application Temperature		Min 5 C Max 30 C						
Hardened State Volume Change		Dual expansion grout – 28 Days +0.03% and 56 Days +0.03%						
Shrinkage		< 750 microstrain						
Maximum Particle Size		4mm for pumping						
Maximum Aggregate Addition (Bulking Out)		20% by weight of 20kg bag (4kg aggregate filler M4/M6)						

## YIELDS

Consistency	STIFF	PLASTIC	FLOWABLE
Water per 20 kg bag - LITRES	2.0 - 2.4	2.5- 2.8	2.9 – 3.2
Yield per 20 kg bag - LITRES	10.0	10.3	11.0
Fresh Wet Density in kg/m <sup>3</sup>	2230	2220	2200
Bags required per cubic metre (m <sup>3</sup> )	100 Bags	97 Bags	91 Bags

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Product	MAKGROUT HES
Issue Date	AUG 2022
Issue No:	1
Item Code	MAKG25
Pack Size	20 kg Bag

### Product disclaimer

This Technical Data Sheet (TDS) summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time.

The TDS should be carefully read and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied.

Our responsibility for products sold is subject to our standard terms and conditions of sale. Makrete does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.

The information and any recommendations relating to the application and end-use of all MAKRETE products are provided in good faith based on MAKRETE's knowledge and experience of the products. In applications, the differences in materials, and variances of substrates and actual site conditions can vary such that no warranty in respect of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be taken as inferred either from this information, or from any written recommendations, or from any other advice offered by MAKRETE. The proprietary rights of third parties must be observed. All orders are accepted subject to our sale terms and conditions.

It is recommended that all products be properly stored, handled and applied in accordance with the printed literature (TDS).

PLEASE CONSULT OUR TECHNICAL DEPARTMENT FOR FURTHER INFORMATION.