



The Chemical Company

# MASTERFLOW<sup>®</sup> 928 T

**(T indicates a Tropicalised version with extended workability. No change has been made to the formulation)**

## High strength, non-shrink cementitious grout

### Description

MASTERFLOW<sup>®</sup> 928 T is a ready to use product in powder form, which requires only the on-site addition of water to produce a non-shrink grout of predictable performance.

### Applications

MASTERFLOW<sup>®</sup> 928 T is formulated for use at any consistency from fluid to damp-pack, and may be used with confidence for bedding, grouting and precision bearing operations such as:

- Gas or steam turbines
- Generators
- Presses
- Crane rails
- Milling machines
- Precast elements
- Anchor bolts
- Suitable for use in bridge bearing applications

### Advantages

- Non shrink.
- Adjustable consistency.
- Proven and predictable performance.
- Excellent workability retention even at high ambient temperatures.
- High bond strength to steel and concrete.
- Early strength development even at fluid consistency.
- Good fatigue and impact resistance.
- Micro silica content enhances strength and durability.
- Impermeable.

### Packaging

MASTERFLOW<sup>®</sup> 928 T is supplied in 25kg moisture-resistant bags.

### Standards

Complies with CRD-C 621  
ASTM C1107 - Grade B  
WRC Approval

### Application procedure

#### Preparation:

The surface onto which the grout is to be applied should be scabbled to remove laitance and expose aggregate. Do not use bush hammers or similar preparation equipment that can crush the aggregate but leave it in place. The surface must be free of oil, dust, dirt, paint, curing compounds, etc. Soak area to be grouted with water for 24 hours prior to grouting to minimise localised absorption and to assist in the free flow of the grout. Surfaces should be damp but free of standing water.

Particular attention should be paid to bolt holes to ensure that these are water-free. Use oil free compressed air to blow out bolt holes and pockets as necessary.

Base plate, bolts, etc. must be clean and free of oil, grease and paint etc. Set and align equipment. If shims are to be removed after the grout has set; lightly grease them for easy removal.

Ensure formwork is secure and watertight to prevent movement and leaking during the placing

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and curing of the grout. The area should be free of excessive vibration. Shut down adjacent machinery until the grout has hardened.

In hot weather, base plates and foundations must be shaded from direct sunlight. Bags of grout should be stored in the shade prior to use.

In cold weather, the temperature of base plates and foundations should be raised to >10°C.

### Mixing:

In hot weather use cool water to bring the mixed grout temperature to <30°C.

In cold weather use warm water to raise the mixed grout temperature to >10°C.

Damp down the inside of the grout mixer with water prior to mixing the initial batch of MASTERFLOW<sup>®</sup> 928 T. Ensure the mixer is damp but free of standing water. Add the pre-measured quantity of water. Slowly add the MASTERFLOW<sup>®</sup> 928 T, mixing continuously. Mix for at least five minutes until a smooth, uniform, lump free consistency is achieved.

### Placing:

Lengths of metal strapping laid in the formwork prior to placing may be necessary to assist grout flow over large areas and in compacting and eliminating air pockets. Pour the grout continuously. Maintain a constant hydrostatic head, preferably of at least 15 cm.

On the side where the grout has been poured, allow 10 cm clearance between the side of the form and the base plate of the machine.

On the opposite side allow 5-10 cm clearance between the formwork and the base plate.

MASTERFLOW<sup>®</sup> grouts are suitable for use with most types of pumping equipment.

Immediately after MASTERFLOW<sup>®</sup> 928 T grout is placed, cover all exposed grout with clean damp hessian, and keep moist until grout is firm enough to accept a curing membrane.

Should the grout shoulders require finishing work, this should be carried out prior to application of the curing membrane. We recommend the use of a curing membrane from our MASTERKURE range.

### Shoulders

Due to differences in temperature between the grout under the base plate, and exposed shoulders that are subject to more rapid temperature changes, debonding and / or cracking can occur. Avoid shoulders wherever possible.

If shoulders are required they should be firmly anchored with reinforcing to the substrate to prevent debonding.

### Typical water requirements

Application	Consistency	Flow Table*	Flow Cone**	Mix Water litres/ 25kg	
				min	max
Grouting machinery	Fluid	-	20-30	4.5	5
Grouting machinery	Flowable	130	-	3.5	4
Bedding pre-cast	Plastic	60	-	3.0	3.5
Filling tie-bar voids	Dry-pack	-	-	2.0	2.5

\* ASTM C230 / ASTM C827 (determination of consistency - previously referenced in CRD-C 588)

\*\* ASTM C939 (formerly CRD-C 79)

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## Flowable grouting techniques

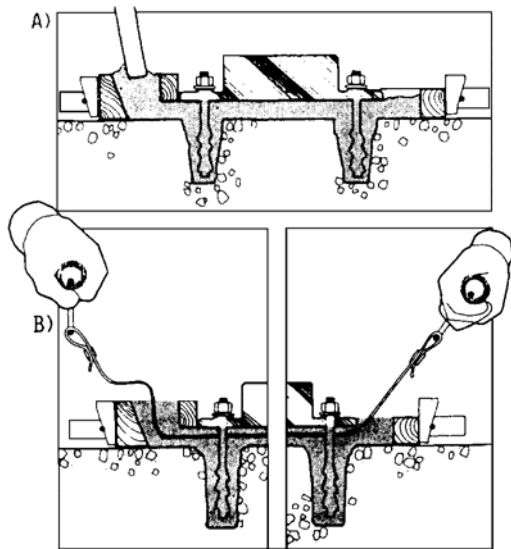


Diagram A illustrates the use of grout surcharge to ensure complete filling under a base.

Diagram B shows that straps can be used to aid grout flow under a wider base. A gentle “sawing” action with the strap allows the grout to flow without segregation for greater distances.

### Typical properties

**Properties listed are only for guidance and are not a guarantee of performance**

### Strength development:

The strength of grout is dependent on many factors which include mixing, water addition, curing, temperature and humidity. The table below gives typical average strengths of MASTERFLOW<sup>®</sup> 928 T at 25°C, when mixed with 4 litres (flowable) and 4.5 litres (fluid) per 25kg bag.

Time	Compressive Strength		Flexural Strength
	Flowable N/mm <sup>2</sup>	Fluid N/mm <sup>2</sup>	Fluid N/mm <sup>2</sup>
1 day	40	20	4.0
3 days	58	35	6.0
7 days	68	45	8.0
28 days	80	60	9.0

Table 2 shows compressive strength of 100 mm cubes and flexural strength of 40 x 40 x 160 mm prisms.

### Bleed water:

No bleed water is apparent (ASTM C-232) at recommended water addition rates.

### Expansion:

Tests were made following both ASTM Standard C-878, on the use of expansive cements and Corps of Engineers Standard for grout. Tests made as prescribed by ASTM standard C-878 show an expansion value of about 0.05%. Tests in conformity with Corps of Engineers show an expansion value of 0.3% that is lower than the maximum value (0.4%) fixed by the same standards. Moreover, MASTERFLOW<sup>®</sup> 928 T expansion occurs both in the plastic and in the early hardened state. However, the expansion action of MASTERFLOW<sup>®</sup> 928 T exhausts mainly during the first 12 hours of curing.

### Modulus of elasticity:

The static modulus of elasticity, measured by applying a load corresponding to  $\frac{1}{3}$  of the strength, is approximately 28,000 N/mm<sup>2</sup> at 28 days.

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**Fatigue resistance:**

Cube samples, produced with MASTERFLOW<sup>®</sup> 928 T and cured for a month, underwent fatigue tests of 2,000,000 pulsing stresses ranging between 20 and 50 N/mm<sup>2</sup> at a frequency of 500 cycles/min. Tested specimens were undamaged and their compressive strength was higher than that of similar specimens that were not subjected to fatigue tests.

**Bond to concrete:**

After a 28-day curing period, the MASTERFLOW<sup>®</sup> concrete bond was determined (about 6.5 N/mm<sup>2</sup>) by the load applied to cause the disbondment from the contact surface.

**Bond to steel:**

The bond of MASTERFLOW<sup>®</sup> 928 T to steel, calculated by applying loads to the bars undergoing pull-out tests and by the grout steel contact surface, is 3 N/mm<sup>2</sup> at 7 days and 4 N/mm<sup>2</sup> at 28 days for plain bars; 20 N/mm<sup>2</sup> at 7 days and 30 N/mm<sup>2</sup> at 28 days for deformed bars.

**Workability:**

Tests at the fluid consistency performed according to ASTM C939, show compliance with the requirements of CRD-C 621-82.

Flowable and plastic consistency tests were made using ASTM C230 apparatus.

**Capillary pores and permeability:**

Even under a pressure of 20 atm, water does not penetrate MASTERFLOW<sup>®</sup> 928 T specimens. The permeability factor is calculated to be therefore lower than  $1.10^{-12}$  cm/sec.

**Resistance to chemical attack:**

Thanks to its watertightness, MASTERFLOW<sup>®</sup> 928 T grout is protected against environmental aggressive agents in solution.

**Resistance to high temperature:**

MASTERFLOW<sup>®</sup> 928 T grouts can withstand high temperature (+400°C) for very long periods without deteriorating substantially.

**Resistance to low temperature:**

After 300 freezing and thawing cycles, the modulus of elasticity decreases only 5%. This indicates that MASTERFLOW<sup>®</sup> 928 T is highly resistant to the disrupting action of frost.

**Storage**

Store out of direct sunlight, clear of the ground on pallets protected from rainfall. Avoid excessive compaction. Storage life is approximately 12 months when stored as above in original sealed bags.

Failure to comply with the recommended storage conditions may result in premature deterioration of the product or packaging. For specific storage advice consult BASF's Technical Services Department.

**Precautions**

The temperature of both the grout and elements coming into contact with the grout should be in the range of >10°C to >35°C. Do not use water in an amount or at a temperature that will produce a consistency more than fluid or cause mixed grout to bleed or segregate.

MASTERFLOW<sup>®</sup> 928 T should be laid at a minimum thickness of 10mm and to a maximum depth of 80mm.

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For applications above 80mm consider the use of MASTERFLOW<sup>®</sup> 980 T. For applications below 10mm consult BASF's Technical Services Department for advice.

To simulate on-site conditions it is necessary to restrain cubes for the first 24 hours immediately after casting.

**DO NOT OVERWORK AND AVOID USING MECHANICAL VIBRATION.**

**UNDER NO CIRCUMSTANCES SHOULD MASTERFLOW<sup>®</sup> 928 T BE RETEMPERED BY THE LATER ADDITION OF WATER.**

It is essential that a mechanically powered grout mixer is used to obtain the optimum properties.

## Yield / consumption

13.5 litres / 25kg bag at 5 litres water addition rate.

74 x 25kg bags / m<sup>3</sup>

## Warning

As with other products containing Portland cement, the cementitious material in MASTERFLOW<sup>®</sup> 928 T grout may cause irritation. Avoid contact with eyes and prolonged irritation. In case of contact with eyes, immediately flush with plenty of water for at least 15 minutes. Call a physician. In case of contact with skin, wash skin thoroughly.

## Note

The fatigue and impact resistance of MASTERFLOW<sup>®</sup> 928 T grout is exceeded only by the metallic reinforced, non-catalysed MASTERFLOW<sup>®</sup> 885 grout. The specially prepared metallic aggregate in this product contributes to impact resistance, a desirable property of grout to be subjected to severe dynamic operating forces and repetitive loading such as found in steel and aluminium rolling mills, crane rails, heavy presses, etc.

When a very rapid set is required in areas subject to chemical spillage or contamination, use epoxy grouts MASTERFLOW<sup>®</sup> 400/410.

For additional information on MASTERFLOW<sup>®</sup> 928 T grout or other non-shrink grouting materials, contact your local BASF representative.

## Quality and care

All products originating from BASF's Dubai, UAE facility are manufactured under a management system independently certified to conform to the requirements of the quality, environmental and occupational health & safety standards ISO 9001, ISO 14001 and OHSAS 18001.

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REQUEST AND REFER TO RECOMMENDED INSTALLATION PROCEDURES FOR <b>MASTERFLOW<sup>®</sup></b> GROUTS PRIOR TO USE
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