MasterFlow® 928

High strength, non-shrink cementitious grout

DESCRIPTION

MasterFlow 928 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 928 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.
- Can be extended by the addition of 5-13mm clean washed aggregate when large volume void filling is required - **MasterEmaco FL 100** aggregate supplied in 20kg bags, subject to approval by BASF Construction Chemicals, Technical Services Department.

PACKAGING

MasterFlow 928 is supplied in 25kg moisture-resistant bags.

STANDARDS

Complies with CRD-C 621
ASTM C1107-14

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 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.

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

MasterFlow Grouts

When aggregate "bulking" is required addition rate for the 5-13mm aggregate should be confirmed by site trials. Typically the addition rate would be between 10-15kg's of clean dry aggregate per 25kg bag of **MasterFlow 928**.

Add the aggregates to the mixing water in the concrete mixer and then slowly add the **MasterFlow 928** powder and mix for 5 minutes until a lump free uniform consistency is achieved - Ideally the slump should be 75-200mm depending upon application requirements

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 15cm.
On the side where the grout has been poured, allow 10cm clearance between the side of the form and the base plate of the machine.

On the opposite side allow 5-10cm clearance between the formwork and the base plate. **MasterFlow** grouts are suitable for use with most types of pumping equipment.

MasterFlow 928 when bulked with aggregate as above should be placed and compacted by light rodding and tapping of formwork faces only. Mechanical vibration should NOT be utilized.

Immediately after **MasterFlow 928** 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– TABLE 1

Application	Consistency	Flow Cone*	Mix Water litres/ 25kg min	max
Grouting machinery	Fluid	20-30	4.5	5

* ASTM C939 (formerly CRD-C 79)

TYPICAL PROPERTIES

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 928** at 25°C, when mixed with 4.5 litres (fluid) per 25kg bag.

For compressive strength 100mm cubes and flexural strength 40 x 40 x 160mm prisms were used.

	Compressive Strength	Flexural Strength
Time	Fluid N/mm²	Fluid N/mm²
1 day	20	4
3 days	35	6
7 days	45	8
28 days	>60	>9

Wet density : approx. 2220kg/m³

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BLEED WATER

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

EXPANSION

Tests were made following both ASTM C-827/827M, on the use of expansive cements and Corps of Engineers Standard for grout. Tests made as prescribed by ASTM C-827/827M 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 928** expansion occurs both in the plastic and in the early hardened state. However, the expansion action of **MasterFlow 928** exhausts mainly during the first 12 hours of curing.

MODULUS OF ELASTICITY

The static modulus of elasticity, measured by applying a load corresponding to $^1/_3$ of the strength, is approximately 22,000 N/mm² at 28 days.

FATIGUE RESISTANCE

Cube samples, produced with **MasterFlow 928** and cured for a month, underwent fatigue tests of 2,000,000 pulsing stresses ranging between 20 and 50N/mm² 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

Typical direct tensile “pull off” testing indicates a bond to concrete in the region of 2-4Mpa.

WORKABILITY

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

CAPILLARY PORES AND PERMEABILITY

Even under a pressure of 20 atm, water does not penetrate **MasterFlow 928** 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 928** grout is protected against environmental aggressive agents in solution.

RESISTANCE TO LOW TEMPERATURE

After 300 freezing and thawing cycles, the modulus of elasticity decreases only 5%. This indicates that **MasterFlow 928** 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 928 should be laid at a minimum thickness of 25mm and to a maximum depth of 100mm.
For grouting applications above 80mm consider the use of **MasterFlow 980**. For applications below 25mm 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.

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DO NOT OVERWORK AND AVOID USING MECHANICAL VIBRATION.
UNDER NO CIRCUMSTANCES SHOULD MasterFlow 928 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

13.8 litres/25kg bag at 5 litres water addition rate.
73 x 25kg bags / m³

WARNING

As with other products containing Portland cement, the cementitious material in **MasterFlow 928** 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.

QUALITY AND CARE

All products originating from MBCC'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.

Request and refer to recommended installation procedures for **MasterFlow** grouts prior to use

* Properties listed are based on laboratory controlled tests.

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