MasterFlow 9500

Ultra high strength, high modulus, cement based grout with applied nanotechnology for grouting offshore wind turbine installations

PRODUCT DESCRIPTION
MasterFlow 9500 is a shrinkage compensated, cement based grout which when mixed with water, produces a homogeneous, flowable and pumpable grout with exceptionally high early and final strength and modulus. Latest best binder packing models and applied cementitious nanotechnology produces a grout with superior technical performance, exceptional rheological properties, and, uniquely, extended open times.

FIELDS OF APPLICATION
MasterFlow 9500 has been especially formulated for large scale, pump applications.
- Grouting of wind turbine installations, e.g. foundations, mono-piles, transition pieces of wind towers, where very good fatigue resistance is required.
- Grouting under very harsh conditions, e.g. off-shore applications or below water grouting, at temperatures as low as 0°C.
- All void filling from 25mm to 600mm thickness where high strength, high modulus is important (in other applications or where void dimensions of 10 - 25 mm are to be filled contact our technical department).

Contact the Technical Department of your local BASF Construction Chemicals office regarding any application required not mentioned here.

FEATURES AND BENEFITS
- Certified by Det Norske Veritas (DNV)
- Ultra high mean compressive strength ≥135MPa.
- Ultra high modulus for exceptional stiffening properties.
- Very good fatigue resistance.
- Quick return to service and removal of temporary supports due to high early strength build-up. ≥ 60 MPa @ 24hrs at 20°C
- Excellent strength gain at low temperatures @ 0°C at 24hrs
- No segregation or bleeding to ensure consistent final physical performance and to prevent pump blockages
- No wash-out during below water grouting
- Pumpable over long distances and large heights.
- Extended pot life of ≥ 4 hours
- Specially graded sands and exceptional flow and low friction increases pump output, reduces installation times and costs as well as reducing pump pressures and wear
- Dust reduced for ease of handling and safety of workers
- Available in special, watertight big bags for large scale application.
- Meets the requirements of EN1504-6 for anchoring reinforcement bars.

APPLICATION METHOD
MasterFlow 9500 has been especially formulated for use in specific applications. As such MasterFlow 9500 should be installed by experienced fully trained contractors. Full application procedures are available on request.

CLEANING OF TOOLS
Tools and spillages can be cleaned with water while MasterFlow 9500 is still uncured. Once hardened, the material can only be removed mechanically.

CONSUMPTION
Approximately 2.2 kg powder is needed for 1 litre of mixed mortar. Or, 1000 kg powder will yield approximately 450 litre of mixed grout.

PACKAGING
MASTERFLOW 9500 is supplied in special watertight 1000 kg big bags.

STORAGE
Store in cool and dry conditions. Shelf life under these conditions is 12 months in unopened original big bags.

NOTES
- sands or other products that could affect the products properties must not be added.
- MasterFlow 9500 which will be exposed to strong drying conditions, e.g. mortar which is directly exposed to heavy wind and/or direct sunlight, should be protected using appropriate MasterKure curing agents.
- Independent test report is available on request.
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DNV – VALIDATION
The certification programme for MasterFlow 9500, which is the basis for issuing the DNV product certificate, comprised the following main activities:

- Validation and acceptance of test methodology, procedures and extent of testing
- Evaluation and acceptance of the external, independent testing laboratory for testing properties of Masterflow 9500
- Witnessing and acceptance of the laboratory tests, and the reporting thereof
- Evaluation and witnessing of mock-up tests, and large scale pumping trials, and the acceptance of the reporting thereof
- Audit, evaluation and acceptance of grout manufacturing equipment and facilities
- Audit, evaluation and acceptance of BASF internal laboratory with respect to production quality control of Masterflow 9500
- Evaluation and acceptance of results of the tests and trials carried out to demonstrate the materials suitability for use in offshore applications, such as grouted connections of monopile foundations for offshore wind turbines or similar.

The validation and certification related to the above mentioned activities are carried out in accordance with applicable EN-standards and DNV-OS-C502 (Offshore concrete structures)

FATIGUE RESISTANCE as part of DNV verification
Individual values for MasterFlow 9500 exposed to water and air, are represented in the graph below in view of DNV-OS-C502.
More detailed results are available on request.

HEALTH AND SAFETY
Usual preventive measures for the handling of chemical products should be observed when using this product, for example do not eat or drink while working and wash hands when taking a break or when the job is completed. MasterFlow 9500 contains cement. Avoid contact with eyes and prolonged contact with skin. 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. Specific safety information referring to the handling and transport of this product can be found in the Material Safety Data Sheet.

Disposal of product should be carried out according to the local legislation in force. Responsibility for this lies with the final owner of the product.

Hazards Identification
Symbol:

Possible hazards:
Irritating to respiratory system and skin. Risk of serious damage to eyes.

Hazard Statement:
H318 Causes serious eye damage
H315 Causes Skin irritation
H335 May cause respiratory irritation

Precautionary Statements:
P102 Keep out of reach of children
P280 Wear protective gloves and eye/face protection
P261 Avoid breathing dust
P264 Wash with plenty of water and soap thoroughly after handling
P305/P351/P338 If in eyes: rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P315 Get immediate medical advise/attention.
P304/P340 If inhaled: remove victim to fresh air and keep at rest in a position comfortable for breathing
P302/P352 If on skin: wash with plenty of soap and water
P332/P313 If skin irritation occurs: get medical advise/attention
P362 Take off contaminated clothing and wash before reuse

MAL-kode (1993): 00-4): 00-4
PR-no.: 2093192

Fatigue resistance measured in water at 0.35 Hz

Fatigue resistance measured in air at 5 / 10 Hz
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<table>
<thead>
<tr>
<th>TECHNICAL DATA</th>
<th>Unit</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density of mixture (DIN18555-2)</td>
<td>g/cm³</td>
<td>Approx. 2.4</td>
</tr>
<tr>
<td>Mixing water demand</td>
<td>litres</td>
<td>Approx. 75 / 1000 kg powder (min .70 – max. 80)</td>
</tr>
<tr>
<td>Pot life of mixed material</td>
<td>hours</td>
<td>≥ 4</td>
</tr>
<tr>
<td>Setting time</td>
<td>hours</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Air content (EN 1015-7)</td>
<td>%</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Application temperature (substrate and material):</td>
<td>ºC</td>
<td>From 0 to +30</td>
</tr>
<tr>
<td>Application thickness</td>
<td>mm</td>
<td>25 - 600</td>
</tr>
</tbody>
</table>

**Mechanical properties determined as part of DNV verification:**

| Autogenous shrinkage                | %                     | - 0.0093                              |
|                                     |                       | + 0.0006                              |
| Compressive strength (75 mm cubes – EN12390-3) | N/mm² | 20°C                          |
| - after 1 day                       | 90                    | 12°C                                |
| - after 3 days                      | 110                   | 40                                  |
| - after 7 days                      | 125                   | 105                                 |
| - after 28 days                     | 140                   | 125                                 |
| - after 4 months                    | 160                   | 100                                 |

| Flexural strength (40 x 40 x 160 mm prisms – EN196-1) | N/mm² | 20°C          |
|                                                      |       | 18            |

| Tensile splitting strength (10 x 20 cm cylinders – EN12390-6) | N/mm² | 20°C          |
|                                                               |       | 8             |

| Modulus of elasticity (10 x 20 cm cylinders – EN13412)       | GPa   | 20°C          |
|                                                               |       | 50            |

**Characteristic strength:**

| Compressive strength (15 x 30 cm cylinders) | MPa   |
|                                           | X k(10) = 116 |

**Typical values – additional test results:**

| Compressive strength (75 mm cubes – EN12390-3) | N/mm² | 20°C        | 10°C        | 5°C         | 2°C |
|                                                 |       | ≥ 60        | ≥ 25        | ≥ 10        | ≥ 8 |
| - after 1 day                                   |       | ≥ 80        | ≥ 70        | ≥ 50        | ≥ 25|
| - after 2 days                                  |       | ≥ 95        | ≥ 85        | ≥ 65        | ≥ 45|
| - after 3 days                                  |       | ≥ 120       | ≥ 120       | ≥ 95        | ≥ 60|
| - after 7 days                                  |       | ≥ 135       |             |             |     |
| - after 28 days                                 |       |             |             |             |     |

| Flexural strength (40 x 40 x 160 mm prisms – EN196-1) | N/mm² | 20°C                | 2°C              |
|                                                      |       | ≥ 15               |

| Capillary water absorption (EN 13057) | kg / m².h⁰.⁵ | ≤ 0.05 |
| Drying shrinkage (EN 12617-4)         | mm/m     | ≤ 0.3     |
| Crack resistance - Coutinho-ring       |           | no cracking after 180 days |
| Adhesion strength to concrete (EN 1542) | N/mm² | ≥ 2 |
| Adhesion strength after freeze/thaw (EN 13687-1) | N/mm² | ≥ 2 |
| Pull-out strength of rebar (EN 1881)    |           | displacement at 75kN load |
|                                         | mm       | ≤ 0.6       |

Data are given for conditions of 20°C and 65% R.H. unless otherwise stated. The technical data provided do not represent guaranteed minima.
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Type Approval Certificate
Certificate No. K-5944
by Det Norske Veritas

NOTE:
Similar to all the other recommendations and technical information, this technical data sheet serves only as a description of the product characteristics, mode of use and applications. The data and information given are based on our technical knowledge obtained in the bibliography, laboratory tests and in practice. The data on consumption and dosage contained in this data sheet are based on our own experience and are therefore subject to variations due to different work conditions. Real consumption and dosage should be determined on the job by means of prior tests and are the liability of the client. Our Technical Service is at your disposal for any additional advice.

BASF Construction Chemicals reserves the right to modify the composition of the products provided these continue to comply with the characteristics described in the data sheet. Additional applications of the product not covered by those indicated shall not be our liability. In the case of defects in the manufacturing quality of our products we provide a guarantee, any additional claims being exempt and our liability being only to return the value of the goods supplied. The possible reservations with respect to patents or third party rights should be noted.

The present data sheet becomes null and void on issuance of a new edition.

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