

# MasterFlow 9500

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

## MATERIAL 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.

## AREAS 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. offshore 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 Master Builders Solutions office regarding any application required not mentioned here.

## CHARACTERISTICS AND BENEFITS

- Certified by Det Norske Veritas (DNV)
- Ultra-high mean compressive strength  $\geq 135\text{MPa}$ .
- 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.  $\geq 60\text{MPa}$  @ 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
- Pump able over long distances and large heights.
- Extended pot life of  $\geq 4$  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 to 465 litre of mixed grout.

## PACKAGING

MasterFlow 9500 is supplied in special watertight big bags.

## STORAGE

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



Certificate No. TAK-00000T1

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## 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 reports are available on request.

## 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 Master Builders Solutions' 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.

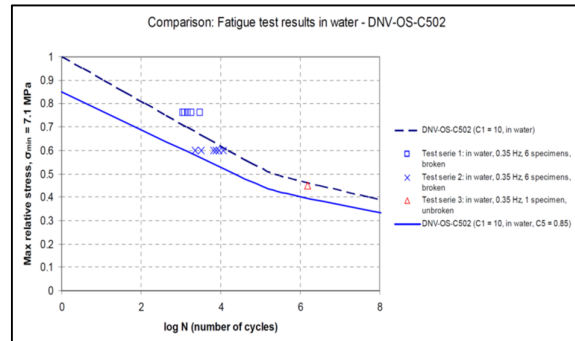
The validation and certification related to the above mentioned activities are carried out in accordance with applicable EN-standards and DNV-OS-C502 (Offshore concrete structures)

## FATIGUE RESISTANCE

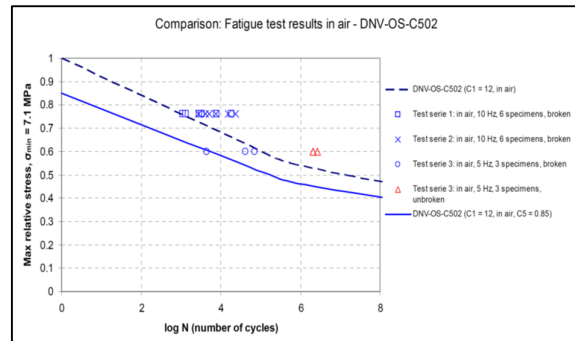
as part of DNV verification

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.



Fatigue resistance measured in water at 0.35 Hz



Fatigue resistance measured in air at 5 / 10 Hz

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TECHNICAL DATA	Unit	Values			
Density of mixture (DIN18555-2)	g/cm <sup>3</sup>	Approx. 2.4			
Mixing water demand	litres	Approx. 75 / 1000 kg powder (min .70 – max. 80)			
Pot life of mixed material	hours	≥ 4			
Setting time	hours	≤ 10			
Air content (EN 1015-7)	%	≤ 4			
Application temperature (grouted connection)	°C	From 0 to +30			
Application thickness	mm	25 - 600			
<b>Mechanical properties determined as part of DNV verification:</b>					
Autogenous shrinkage (ASTM 1698) - after 7 days - after 94 days - after 365 days	mm/m	- 0.0146 - 0.0455 + 0.0006			
Compressive strength (75 mm cubes – EN12390-3) - after 1 day - after 3 days - after 7 days - after 28 days - after 4 months	N/mm <sup>2</sup>	20°C 90 110 125 140 160	12°C 40 105 125	5°C 10 75 100	
Flexural strength (40 x 40 x 160 mm prisms – EN196-1) - after 28 days	N/mm <sup>2</sup>	20°C 20.3			
Tensile splitting strength (10 x 20 cm cylinders – EN12390-6) - after 28 days	N/mm <sup>2</sup>	20°C 8.6			
Modulus of elasticity (10 x 20 cm cylinders – EN13412) - after 28 days	GPa	20°C 49.9			
<b>Characteristic strength:</b>					
Compressive strength (15 x 30 cm cylinders) Compressive strength (75 mm cubes) Flexural strength (16x4x4 cm prisms)	MPa	122 135 17.8			
<b>Typical values – additional test results</b>					
Compressive strength (75 mm cubes – EN12390-3) - after 1 day - after 2 days - after 3 days - after 7 days - after 28 days	N/mm <sup>2</sup>	20°C ≥ 50 ≥ 80 ≥ 95 ≥ 120 ≥ 135	10°C ≥ 15 ≥ 60 ≥ 85 ≥ 120	5°C ≥ 35 ≥ 65 ≥ 85	2°C ≥ 25 ≥ 45 ≥ 60
Flexural strength (40 x 40 x 160 mm prisms – EN196-1) - after 28 days	N/mm <sup>2</sup>	20°C ≥ 15		2°C ≥ 12	
Capillary water absorption (EN 13057)	kg/m <sup>2</sup> .h <sup>-0.5</sup>	≤ 0.05			
Crack resistance - Coutinho-ring		no cracking after 180 days			
Pull-out strength of rebar (EN 1881) displacement at 75kN load	mm	≤ 0.6			
Exposure classes (EN 206-1, DIN 1045-2)		XO, XC4, XD3, XS2, XS3, XF3, XA2, WA			
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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## 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

 <b>0749</b>	
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<b>EN 1504-6</b> <b>Cement based grout</b>  <b>EN 1504-6 Principles 4.2</b>	
Pull-out strength	Displacement ≤ 0,6 mm at 75 kN load
Chloride ion content	≤ 0,05 %
Reaction to fire	Euroclass A1
Dangerous substances	Complies with 5.3

## Master Builders Solutions

c/o PCI Augsburg GmbH

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## DISCLAIMER

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.

Master Builders Solutions reserves the right to modify the composition of the products provided these continue to comply with the characteristics described in the data sheet. Other 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.

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

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