MasterFlow 9400

Ultra-high strength, cement based grout for onshore wind turbine installations

MATERIAL DESCRIPTION

MasterFlow 9400 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. The product exhibits increased fatigue. Latest best binder packing models and applied nanotechnology produces a grout with superior technical performance, exceptional rheological properties, and uniquely, extended open times.

AREAS OF APPLICATION

MasterFlow 9400 has been especially formulated for:

- Grouting of wind turbine installations, that are installed using pre-stressing techniques e.g. base plate grouting of onshore wind turbines
- Installations where excellent fatigue resistance is required
- Onshore turbines where ultra-high final strengths are required
- Grouting in a wide temperature range
- Anchoring anchor bolts of wind turbine towers
- All void filling from 25mm to 600mm (under tower flange) where high strength, high modulus, high ductility is important

Contact the Technical Department of your local Master Builders Solutions office regarding any application or dimensions required not mentioned here.

CERTIFICATES & TEST REPORTS

- Initial type test and early strength development of grout material – Verification by Applus Laboratories
- Tests on fresh and hardened grouting mortar - verification by MPA Hannover
- Certification of conformity according to the “DAfStb-Richtlinie – Herstellung und Verwendung von zementgebundenem Vergussbeton und Vergussmörtel“ (QDB)
- Declaration of performance according to EN 1504-6
- Declaration of freeze and thaw with de-icing salts performance according to EN 13687-1
- Pull-out resistance tests according to DIN EN 1881 in wet concrete
- Investigations on the fatigue behavior – verification by Leibniz Universität Hannover

CHARACTERISTICS AND BENEFITS

- Ultra-high compressive strength: above highest class of EN206, i.e. > C100/115
- Ultra-high modulus for exceptional stiffening properties
- Excellent fatigue resistance
- Quick return to service and removal of temporary supports due to high early strength build-up ≥ 70 MPa @ 24hrs at 20°C
- No segregation or bleeding to ensure consistent final physical performance and to prevent pump blockages
- Extended pot life of ≥ 2 hours
- Can be pumped into complex areas or areas inaccessible to conventional grouting methods
- Dust reduced for ease of handling
- Cement based
- Low chromate

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0749

Master Builders Solutions Belgium nv
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BE0105/02

EN 1504-6
Cement based grout

EN 1504-6 Principles 4.2

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 Belgium nv

VeBMR

QDB

QUALITÄTSGEMEINSCHAFT DEUTSCHE BAUCHEMIE EV

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APPLICATION METHOD
MasterFlow 9400 has been especially formulated for use in specific applications. As such MasterFlow 9400 should be installed by experienced fully trained and licensed contractors. Detailed application procedures are available on request.

(A) MIXING
Do not add cement, sand or other materials that affect the properties of this quality-controlled product. Mix full bags only.
Use one or more mixers (forced action pan mixers are advised) to permit mixing and placing operations to proceed simultaneously without interruption.
Mix with potable water only. Put most of the water required in the mixer and add slowly the grout material. Mix until a homogeneous mortar (3 to 4 minutes), add the remaining water and continue mixing for at least another 2 minutes until the required fluid or flowable consistency is obtained.

(B) PREPARATION OF THE CONCRETE SUBSTRATE
Remove all formwork, formwork release agents and other materials that can prevent good adhesion of MasterFlow 9400 to the concrete foundation.
Thoroughly clean out the foundation area to be grouted back to a clean and structurally sound concrete.
Saturate the cleaned foundation with plenty of water. Remove all free standing water just prior to grouting.

(C) PLACEMENT OF GROUT
Mix and place the grout as close as possible to the area to be grouted. Have sufficient manpower, materials and tools to make mixing and placing rapid and continuous.
MasterFlow 9400 should be pumped into the area to be grouted.
The grout shall be placed continuously and from one side only, to avoid air entrapment while grouting. Make sure grout fills the entire space to be filled and remains in contact with the base plate and foundation throughout the entire grouting process.
DO NOT VIBRATE MasterFlow 9400.

CLEANING OF TOOLS
Tools and spillages can be cleaned with water while MasterFlow 9400 is still uncured.
Once hardened, the material can only be removed mechanically.

CONSUMPTION
ca. 2.2 kg powder for 1 litre of mixed mortar

PACKAGING
MasterFlow 9400 is supplied in 25 kg bags or 500 kg big bags.

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

NOTES
- Sands or other products that could affect the products properties must not be added.
- MasterFlow 9400 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 with moist cloth or plastic foil, or by using appropriate MasterKure curing agents.
- The temperature of the grout material, mixing water and elements added in the mixed grout should be in the range of +2°C to +40°C
- Grouting in environments below +2°C or above +40°C are possible but contact the Technical Department of your local Master Builders Solutions office for additional information.

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TECHNICAL DATA	Unit	Values				
Density of mixture (DIN18555-2)	g/cm³	Approximately 2.4				
Mixing water demand	temperatures	2-15 °C	16-25 °C	26-30 °C	31-35 °C	36-40 °C
	litre / 25 kg bag	1.70	1.75 ± 0.05	1.85 ± 0.05	1.95 ± 0.05	2.15 ± 0.05
	litre / 500 kg bag	34.0	35.0 ± 1.0	37.0 ± 1.0	39.0 ± 1.0	43.0 ± 1.0
Pot life of mixed material	hours	≥ 2				
Setting time	hours	9				
Air content (EN 1015-7)	%	≤ 4				
Application temperature (substrate and material)	°C	From +2 to +40				
Application thickness	mm	25 – 600				
Mechanical properties:						
Compressive strength @ 20 °C (40 x 40 x 160 mm prisms – EN 12190) (50 x 50 x 50 mm cubes – ASTM 579-01)	N/mm²	1 day	7 days	28 days		
		> 75	> 120	> 135		
Characteristic compressive strength – 28 days (150 x 300 mm cylinders – EN 12390-3)	N/mm²	> 140				
Flexural strength (40 x 40 x 160 mm prisms – EN196-1)	N/mm²	≥ 19				
Static modulus of elasticity (EN 1048-5)	GPa	Approximately 48				
Poisson ratio		0.18				
Resistance to fatigue loading		Verification by test report				
Adhesion strength to concrete (EN 1542)	N/mm²	≥ 2				
Pull-out strength of rebar (EN 1881) displacement at 75kN load	mm	≤ 0.6				
Installation / Additional information						
Maximum grain size	mm	4				
Mixing time	minutes	Approximately 5				
Mixer type		e.g. pan mixer				
Application method		One continuous pour				
Fire resistance (EN13501-1)	class	A1 (fl)				

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Classification according to DAfStb VeBMR Rili			
Flow class	class	f2	
Consistency flow channel slump cone	mm	675 300	
Expansion	volume %	≥ 0.1	
Compressive strength class	class	> C100/115	
Early strength class	class	A	
Early strength (40 x 40 x 160 mm prisms – EN196-1)	MPa	At 2 °C 24 / 48 hours ≥ 3 / ≥ 40	At 20 °C 16 / 24 hours ≥ 45 / ≥ 75
Shrinkage	class	SKVM 0	
Exposure class (EN 206-1, DIN 1045-2)		XO, XC4, XD3, XS3, XF4, XA2, WF	
Data are given for conditions of 20ºC and 65% R.H. unless otherwise stated. The technical data provided do not represent guaranteed minima.			

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 9400 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

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DISCLAIMER

Edition 20/06/2023 The present data sheet becomes null and void on issuance of a new edition.