BUILDING TRUST

PRODUCT DATA SHEET

SikaGrout®-9400

(formerly MFlow 9400)

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

DESCRIPTION

SikaGrout®-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 as well as a high modulus of elasticity. The product exhibits increased fatigue resistance. The latest binder packing models and applied nanotechnology produce a grout with superior technical performance, exceptional rheological properties, and, uniquely, extended open times.

USES

SikaGrout®-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 Sika office regarding any application or dimensions required not mentioned here.

FEATURES

- 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
- Can be pumped into complex areas or areas inaccessible to conventional grouting methods
- Dust reduced for ease of handling
- Cement based
- Low chromate

CERTIFICATES AND 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

PRODUCT INFORMATION

Packaging	SikaGrout®-9400 is supplied in 25 kg bags and special 500 kg big bags
Appearance and colour	Light grey powder
Shelf life	12 months from date of production
Storage conditions	The product must be stored in original, unopened and undamaged packaging in dry conditions at temperatures between +5 °C and +35 °C. Always refer to the packaging. Refer to the current Safety Data Sheet for information on safe handling and storage.
Density	Approximately 2.4 gr/cm³
Maximum grain size	D_{max}: ~4 mm

TECHNICAL INFORMATION

Compressive strength (EN 12190)

Age (Conditioned at 20 °C)	N/mm²
1 day	≥ 70
7 days	≥ 120
28 days	≥ 130

Results of 40 x 40 x 160 mm specimens

Compressive strength class	> C100/115

(EN 206)

Characteristic compressive strength:

28 days (Conditioned at 20 °C)	≥ 135 N/mm²

(EN 12390-3)

Results of 150 x 300 mm cylinders

Early compressive strength:

at 2 °C - (24 / 48 hours)	at 20 °C - (16 / 24 hours)
≥ 2/ 35 N/mm²	≥ 45 / 75 N/mm²
Early strength class	A

(EN 196-1)

Results of 40 x 40 x 160 mm prisms

Early strength class is defined in accordance with DAfStb Guideline

Exposure classes: (EN 206)

XO, XC4, XD3, XS3, XF4, XA2, WF

Modulus of elasticity in compression ≥ 48.000 N/mm² (EN 1048-5)

Poisson ratio: 0.18

Flexural-strength (EN 196-1)

Age (Conditioned at 20 °C)	N/mm²
28 days	≥ 18

Pull-out resistance ≤ 0.6 mm (EN 1881)

Displacement at 75 kN load

Shrinkage < 0.4 mm/m (EN 12617-4)

Shrinkage class: SKVM 0 According to DAfStb Guideline

Expansion > 0,1 % volume after 24 hours

Tensile adhesion strength > 2 N/mm² (EN 1542)

Resistance to fire A1 (fl)

APPLICATION INFORMATION

Mixing ratio

Temperatures	2-15 °C	16-25 °C	26-30 °C	31-35 °C	36-40 °C
lt / 25 kg	1.70	1.75 ± 0.05	1.85 ± 0.05	1.95 ± 0.05	2.15 ± 0.05
lt / 500 kg	34.0	35.0 ± 1.0	37.0 ± 1.0	39.0 ± 1.0	43.0 ± 1.0

Consumption

2.2 kg powder for 1 litre of mixed mortar

Layer thickness

25 - 600 mm

Material temperature

+2 °C min. / +40 °C max

Ambient air temperature

+2 °C min. / +40 °C max

Substrate temperature

+2 °C min. / +40 °C max

Pot Life

180 minutes at 20 °C
Pot life depends on temperature Note: Pot life will be shorter at higher temperatures. Pot life will be longer at lower temperatures.

Flowability

Flow channel	> 650 mm	(ASTM C1437; EN 13395-2)
Slump cone	> 300 mm	
Flow class	f2	

Flow class is defined in accordance with the DAfStb Guideline

Setting time

9 hours

BASIS OF PRODUCT DATA

All technical data stated in this Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

FURTHER DOCUMENTATION

Sika Method Statement: SikaGrout®-9400

IMPORTANT CONSIDERATIONS

- To avoid cracking of exposed surfaces, protect from direct sun and, or strong wind.
- Use only on clean, sound substrate.
- The substrate must be free of ice.
- Do not exceed water addition.
- Protect freshly applied material immediately.
- Keep exposed surfaces to a minimum.
- To avoid cracking in warm temperatures keep bags cool & use cold water for mixing.
- Do not use vibrating pokers.
- Do not use continuous mixing equipment.
- Pour or pump from one side only.
- Avoid exposing surfaces during rainfall and prior to final set.

ECOLOGY, HEALTH AND SAFETY

User must read the most recent corresponding Safety Data Sheets (SDS) before using any products. The SDS provides information and advice on the safe handling, storage and disposal of chemical products and contains physical, ecological, toxicological and other safety-related data.

APPLICATION INSTRUCTIONS

EQUIPMENT

Mixer type	Pan mixer
Mixing time	Approximately 6 minutes
Application method	One continuous pour

SUBSTRATE QUALITY

Concrete
The concrete must be structurally sound, thoroughly clean, free from oil, grease, dust, loose material, surface contamination and materials which will impair the grout flow or reduce adhesion strength. Laitance, delaminated, weak, damaged and deteriorated concrete and where necessary sound concrete must be removed by suitable mechanical preparation as directed by the engineer or supervising officer. Any pockets or holes for structural fixings must also be cleaned of all debris.

Shutter Formwork
Where formwork is to be used, all formwork must be of adequate strength, treated with release agent and sealed to prevent leakage of pre-wetting water and grout. Ensure formwork includes outlets for removal of the pre-soaking water or use vacuum extraction equipment to remove water.

MIXING

Grout mixer
SikaGrout®-9400 must be mixed using suitable grout mixing equipment combined with an agitator for large-volume mixing applications. The volume capacity of equipment must be appropriate for the amount of material being mixed to allow continuous operation. Equipment trials should be carried out to ensure that the product can be mixed satisfactorily before full-scale project application. Add most of the required water into the mixer, then slowly add the grout material. Mix for 4 minutes until a homogeneous mortar is achieved. Add the remaining water and continue mixing for at least another 2 minutes, until the desired fluid or flowable consistency is obtained. Use potable water only. Do not add more water than the maximum specified.
IMPORTANT
Do not use continuous mixing equipment. The product is not designed for processing with continuous mixing equipment.

APPLICATION

Strictly follow installation procedures as defined in method statements, application manuals and working instructions which must always be adjusted to the actual site conditions.

Pre-wetting
The prepared concrete substrate must be thoroughly saturated with clean water for a recommended 12 hours before application of the grout. The surface must not be allowed to dry within this time. Prior to application of the grout, all water must be removed from within formwork, cavities or pockets and the final surface must achieve a dark matt appearance (saturated surface dry) without glistening.

Placing: Grout pump application
For large volume placement, grout pumps are recommended. Equipment trials must be considered to ensure product can be pumped satisfactory.

Surface finishing
Finish exposed grout surfaces to the required surface texture as soon as the grout has started to stiffen. Do not add additional water on the surface. Do not over work surface as this may cause surface discolouration and cracking. After the grout has initially hardened, remove formwork and trim edges while concrete is ‘green’.

Cold weather working
Consider storing bags in a warm environment and using warm water to assist with achieving strength gain and maintaining physical properties.

Hot weather working
Consider storing bags in a cool environment and using cold water to assist with controlling the exothermic reaction to reduce cracking and maintaining physical properties.

CURING TREATMENT

Protect exposed grout surfaces after finishing (immediately after levelling) from premature drying and cracking by curing under water for at least 72 hours. In cold weather apply insulated blankets to maintain a constant temperature to prevent surface damage from freezing and frost.

LOCAL RESTRICTIONS

Note that as a result of specific local regulations the declared data and recommended uses for this product may vary from country to country. Consult the local Product Data Sheet for exact product data and uses.

LEGAL NOTES

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product’s suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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