BUILDING TRUST
CONSTRUIRE LA CONFIANCE

PRODUCT DATA SHEET

# SikaGrout®-9400

(formerly MFlow 9400)

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

## PRODUCT 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 and modulus. The product exhibits increased fatigue resistance. Latest best binder packing models and applied nanotechnology produce a grout with superior technical performance, exceptional rheological properties, and uniquely, extended open times.

## WHERE TO USE

SikaGrout®-9400 has been especially formulated for:

- Grouting of wind turbines that are installed using pre-stressing techniques, such as 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 25 mm to 600 mm (1 in to 26.5 in) (under tower flange where high strength, high modulus, high ductility are important factors)

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

## CHARACTERISTICS / ADVANTAGES

- 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 (10 150 psi) at 24 hours (at 20 °C / 68 °F)
- 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
- Low-dust material for safer and easier handling
- Cement-based
- Low chromate

## APPROVALS / CERTIFICATES

- 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 Vergussmör-tel“ (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** | 25 kg (55 lb) bag and special 500 kg (1102 lb) FIBC*<br>**Flexible Intermediate Bulk Container* |
| **Appearance / Colour** | Powder / Light grey |
| **Shelf Life** | 12 months from date of production |
| **Storage Conditions** | Product must be stored in original, unopened and undamaged sealed packaging in dry conditions. |
| **Density** | Approximately 2.4 g/cm³ (24.1 lb/gal) |
| **Maximum Grain Size** | $D_{max}$: ~4 mm (5/32 in) |

## TECHNICAL INFORMATION

**Compressive Strength** (EN 12190)

| Age | MPa (psi) |
|---|---|
| 1 day | ≥ 75 (10 880) |
| 7 days | ≥ 120 (17 400) |
| 28 days | ≥ 135 (19 580) |

**Compressive strength class:**
> C100/115 (EN 206-1)

**Characteristic compressive strength:**

| | | |
|---|---|---|
| 28 days | ≥ 135 MPa (19 580 psi) | (EN 12390-3) |

**Early compressive strength:** (EN 196-1)

| | |
|---|---|
| at 2 °C (36 °F) - 24 / 48 hours | at 20 °C (68 °F) - 16 / 24 hours |
| ≥ 3 / 40 MPa (435 / 5800 psi) | ≥ 45 / 75 MPa (6525 / 10 875 psi) |

According to DAfStb VeBMR Rili

**Early strength class:**
A (According to DAfStb VeBMR Rili)

**Exposure classes:**
XO, XC4, XD3, XS3, XF4, XA2, WF (DIN EN 206-1 / DIN 1045-2)

**Modulus of Elasticity in Compression** ≥ 48 GPa (6.9 X $10^6$ psi) (EN 1048-5)

**Poisson ratio:** 0.18

**Tensile Strength in Flexure** ≥ 18 MPa (2610 psi) (EN 196-1)

**Pull-Out Resistance** ≤ 0.6 mm (15/64 in) [EN 1881 - displacement at 75 kN (16,860 lbf) load]

**Shrinkage** **Shrinkage class:** SKVM 0 (According to DAfStb VeBMR Rili)

**Expansion** > 0,1 % volume after 24 hours

**Pull-Off Strength** > 2 MPa (290 psi) (EN 1542)

**Resistance to Fire** A1 (fl) (EN13501-1)

## APPLICATION INFORMATION

| | | | | | | |
|---|---|---|---|---|---|---|
| **Mixing Ratio** | **Temperatures** | **2–15 °C** | **16–25 °C** | **26–30 °C** | **31–35 °C** | **36–40 °C** |
| | L / 25 kg | 0.45 | 1.75 ± 0.05 | 1.85 ± 0.05 | 1.95 ± 0.05 | 2.15 ± 0.05 |
| | L / 500 kg | 34.0 | 35.0 ± 1.0 | 37.0 ± 1.0 | 39.0 ± 1.0 | 43.0 ± 1.0 |
| | **Temperatures** | **36–59 °F** | **61–77 °F** | **79–86 °F** | **89–95 °F** | **97–104 °F** |
| | US gal / 55 lb | 0.45 | 0.46 ± 0.013 | 0.49 ± 0.013 | 0.51 ± 0.013 | 0.56 ± 0.013 |
| | US gal /1102 lb | 8.98 | 9.24 ± 0.26 | 9.77 ± 0.26 | 10.3 ± 0.26 | 11.36 ± 0.26 |
| **Consumption** | 2.2 kg (4.85 lb) of powder for 1 litre (0.26 US gal) of mixed mortar | | | | | |
| **Layer Thickness** | 25–600 mm (1– 23.5 in) | | | | | |
| **Product Temperature** | 2 °C (36 °F) min. / 40 °C (104 °F) max. | | | | | |
| **Ambient Air Temperature** | 2 °C (36 °F) min. / 40 °C (104 °F) max. | | | | | |
| **Substrate Temperature** | 2 °C (36 °F) min. / 40 °C (104 °F) max. | | | | | |
| **Pot Life** | ≥ 2 hours | | | | | |
| **Flowability** | Flow channel | 675 mm (26.5 in) | (According to DAfStb VeBMR Rili) | | | |
| | Slump cone | 300 mm (12 in) | | | | |
| | Flow class | f2 | | | | |
| **Setting Time** | 9 hours | | | | | |

## BASIS OF PRODUCT DATA

Product properties are typically averages, obtained under laboratory conditions. Reasonable variations can be expected on-site due to local factors, including environment, preparation, application, curing and test methods.

## FURTHER INFORMATION

Refer to Sika Method Statement: SikaGrout®-9400

## LIMITATIONS

- 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.

## ENVIRONMENT, HEALTH & 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

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|---|---|
| Mixer type | Pan mixer |
| Mixing time | Approx. five (5) 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

#### Equipment
SikaGrout®-9400 must be mixed using suitable grout mixing equipment combined with agitator for continuous large volume mixing. Volume capacity of the grout mixer must be applicable to the volume of material being mixed for a continuous operation. Equipment trials must be considered to ensure product can be mixed satisfactory before full project application.

#### Mixing
Put most of the water required in the mixer and slowly add the powder. Mix the material for three (3) to four (4) minutes until a homogeneous consistency is achieved. Add the remaining water and continue mixing for at least another two (2) minutes until the required consistency (fluid or flowable) is obtained.
Mix with potable water only. Do not add more water than the maximum specified.

**Note :** Do not use 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 grout 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



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