

## PRODUCT DATA SHEET

# SikaGrout<sup>®</sup>-4316

(formerly MasterFlow<sup>®</sup> 4316)

ULTRA HIGH-STRENGTH, HYBRID PERFORMANCE, HIGH-PRECISION GROUT

### PRODUCT DESCRIPTION

SikaGrout<sup>®</sup>-4316 is a unique grout that provides high early and ultimate compressive strengths over a wide variety of application and service temperatures. The superior performance of SikaGrout<sup>®</sup>-4316 lies in its novel hydraulic binder with premium mineral aggregates which, when mixed with water, produces a flowable and pumpable grout that can be installed in temperatures ranging from 35 to 100 °F (2 to 38 °C).

### USES

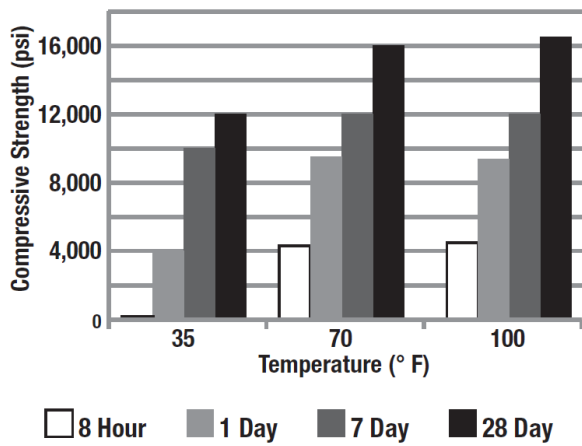
- Grouting of equipment, such as compressors and generators, pump bases and drive motors, tank bases, conveyors, foundations, etc.
- In cold weather, when tenting and/or heating are impractical
- Where high early and ultimate compressive strengths are required
- Where high service temperatures are present
- Where a non-shrink grout is required for optimum load transfer
- Applications requiring a pumpable grout
- Grouting anchor bolts, rebar, and dowel rods

### Substrates

- Concrete

### CHARACTERISTICS / ADVANTAGES

- Meets the requirements of ASTM C1107 at recommended consistencies.
- High early strength with low creep for rapid turnaround—up to 4,300 psi at 8 hours
- Excellent effective bearing area (95%) for even load distribution
- Extremely dense material with proven fatigue resistance—durable
- DNV Fatigue Resistance Tested – 20 years of in-service life for wind turbine grouting applications
- At 45% (7,639PSI) of design strength, the C5 = .88 when tested accordingly to DNV ST C502
- At 60% (10,186PSI) of design strength, the C5 = .836 when tested accordingly to DNV ST C502
- Outstanding shrinkage, impact, and vibration resistance
- Ability to be placed in hot weather – up to 100 °F
- Ability to place in cold weather (35 °F / 2 °C)
- Exceptional temperature resistance—up to 1000 °F (538 °C)
- Homogeneous, flowable, and pumpable
- Application advantage—one component, easy mixing, placement, and cleanup
- Positive expansion when tested according to ASTM C 1090
- Freeze/thaw stable
- The coefficient of thermal expansion equivalent to concrete
- 16,000 psi ultimate strength



## PRODUCT INFORMATION

<b>Packaging</b>	50 lb (22.7 kg) polyethylene-lined bags		
<b>Shelf Life</b>	8 months when properly stored		
<b>Storage Conditions</b>	Store in unopened bags in cool, clean, dry conditions.		
<b>Density</b>	<b>Mixed Density</b>		
	35 °F (2 °C)	72 °F (22 °C)	100 °F (38 °C)
	145 lb/ft <sup>3</sup> (2,323 kg/m <sup>3</sup> )	142 lb/ft <sup>3</sup> (2,275 kg/m <sup>3</sup> )	142 lb/ft <sup>3</sup> (2,275 kg/m <sup>3</sup> )
	(ASTM C 185)		

## TECHNICAL INFORMATION

<b>Impact Strength</b>	<b>Impact Resistance, Mass Loss</b>	
	43% at 72 °F (22 °C)	(LA Rattler, 2,000 Cycles)
<b>Effective Bearing Area</b>	High - Greater than 95%	(ASTM C 1339)

## Compressive Strength

Time	Test Requirement	Strength at 35 °F (2 °C)	Strength at 72 °F (22 °C)	Strength at 100 °F (38 °C)	
8 hours	none	-	4,300 psi (30 MPa)	-	(ASTM C 109)
12 hours	none	-	6,500 psi (44.8 MPa)	-	
1 day	1,000 psi (7 MPa)	4,100 psi (28.3 MPa)	8,000 psi (55.2 MPa)	8,000 psi (55.2 MPa)	
3 days	2,500 psi (17 MPa)	8,700 psi (60 MPa)	10,900 psi (75.2 MPa)	10,600 psi (73.1 MPa)	
7 days	3,500 psi (24 MPa)	10,000 psi (68.9 MPa)	12,000 psi (82.7 MPa)	12,000 psi (82.7 MPa)	
28 days	5,000 psi (34 MPa)	11,900 psi (82 MPa)	16,000 psi (110.3 MPa)	17,000 psi (117.2 MPa)	

## Slant Shear Strength

### Slant Shear Bond

3 days	3,300*	(ASTM C 882 )
7 days	3,400*	
28 days	3,500*	

\*breaks in concrete base

## Creep

### Compressive Creep

Creep Coefficient 0.08\*\* (strain/initial elastic strain) (ASTM C 512)

\*\* Creep Coefficient of concrete ranges between 2-3

### Creep Strain

1 Year (600 psi @ 140 °F)  $2.3 \times 10^{-3}$  in/in (ASTM C 1181)

## Expansion

### Hardened Expansion

Requirement	Change at 35 °F (2 °C)	Change at 72 °F (22 °C)	Change at 100 °F (38 °C)	(ASTM C 1090 (CRD C621))
Max + 0.3%	0.09%	0.08%	0.05%	

### Early Height Change

Requirement	Change at 35 °F (2 °C)	Change at 72 °F (22 °C)	Change at 100 °F (38 °C)	(ASTM C 827)
<4%	0.4%	0.7%	0.9%	

## Coefficient of Thermal Expansion

$5.7 \times 10^{-6}$  in/in °F (ASTM C 531)

## Thermal Conductivity

2.1 W/mK at 28 days (ASTM C 518)

## Rapid Chloride Permeability

very low (< 500 coulombs) at 28 days (ASTM C 1202 Rapid Chloride Permeability)

## Freeze-Thaw Stability

Greater than 95% durability factor (ASTM C 666)

## APPLICATION INFORMATION

### Coverage

One 50 lb (22.7 kg) bag of SikaGrout®-4316 grout mixed with approximately 6

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**BUILDING TRUST**



lbs. (2.7 kg) or 0.72 gallons (2.72 L) of water provides approximately 0.39 ft<sup>3</sup> (0.011 m<sup>3</sup>) of grout.

Note: The water requirement may vary due to mixing efficiency, temperature, and other variables.

Consistency	Consistency, Flow Test			(2x4" cylinder)
	35 °F (2 °C)	72 °F (22 °C)	100 °F (38 °C)	
	10.5 in (260 mm)	10 in (250 mm)	9 in (225 mm)	
Set Time	Time at 35 °F (2 °C)	Time at 72 °F (22 °C)	Time at 100 °F (38 °C)	(ASTM C 191)
	180 min	180 min	150 min	
Final set time	Time at 35 °F (2 °C)	Time at 72 °F (22 °C)	Time at 100 °F (38 °C)	(ASTM C 191)
	220 min	210 min	180 min	

## BASIS OF PRODUCT DATA

Results may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

## ENVIRONMENTAL, HEALTH AND SAFETY

For further information and advice regarding transportation, handling, storage and disposal of chemical products, user should refer to the actual Safety Data Sheets containing physical, environmental, toxicological and other safety related data. User must read the current actual Safety Data Sheets before using any products. In case of an emergency, call CHEMTREC at 1-800-424-9300, International 703-527-3887.

## APPLICATION INSTRUCTIONS

### NOTES ON INSTALLATION

- Contact your local representative for a pre-job conference to plan the installation.
- Large, exposed areas of grout should be avoided.
- The structural integrity of the grout is not affected by superficial, hairline cracks occasionally observed in shoulders, near base plate edges, and around anchor bolts.
- Mix times closer to 5 minutes have resulted in better compressive strength development and working time.
- When grouting at minimum temperatures, see that the foundation, plate, and grout temperatures do not fall below 35 °F (2 °C) until after the final set. Protect the grout from freezing (32 °F or 0 °C) until it has attained a compressive strength of 3,000 psi (21 MPa) in accordance with ASTM C 109.
- Low temperatures delay the set, increase working time, and delay the strength development. High temperatures accelerate the set, decrease working time, and accelerate the strength gain. The procedures below help compensate for this. In light of this, store and mix grout to produce the desired mixed-grout

temperature. If bagged material is hot, use cold water, and if bagged material is cold, use warm water to achieve a mixed-product temperature as close to 70 °F (21 °C) as possible.

- Should not be used as a floor topping
- If placing material in skid-mounted applications with deep cavities, contact your local Sika representative
- Make certain the most current versions of the product data sheet and SDS are being used.
- Proper application is the responsibility of the user. Field visits by Sika personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

### SURFACE PREPARATION

1. Steel surfaces must be free of dirt, oil, grease, or other contaminants.
2. Cure the foundation until the design strength of the concrete is achieved and the foundation is dry. Use the recommended procedure according to ACI 351.1R, Grouting Between Foundations and Bases for Support of Equipment and Machinery. In lieu of mechanical surface preparation, surface retarders may be used on freshly placed concrete. Remove surface retarder after 24 hours by use of pressure washing to achieve an exposed aggregate finish. After pressure washing, regular curing practices should continue until design strength is reached.
3. The surface to be grouted must be clean, SSD, strong, and roughened to a CSP of 5–10 following ICRI Guideline 310.2 to permit proper bond.
4. When dynamic, shear, or tensile forces are anticipated, concrete surfaces should be chipped with a “chisel-point” hammer, to a roughness of (plus or minus) 3/8" (10 mm). Verify the absence of bruising following ICRI Guideline 310.2.
5. Concrete surfaces should be saturated (ponded) with clean water for 8 hours or more depending on site conditions, prior to grouting.
6. All freestanding water must be removed from the foundation and bolt holes immediately before grouting.
7. Anchor bolt holes must be grouted and sufficiently set

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- before the major portion of the grout is placed.
8. Shade the foundation from sunlight 24 hours before and 24 hours after grouting.

## **SURFACE PREPARATION**

### **Forming**

1. Forms should be constructed to include a 1" chamfer strip at the top of the forms, be watertight, and be non-absorbent. Seal forms with putty, sealant, caulk, or polyurethane foam. Use sufficient bracing to prevent the grout from leaking or moving.
2. Moderate to large-sized equipment and narrow placement applications should utilize a headbox to create additional pressure and enhance the grout placement.
3. Side and end forms should be a minimum 1" (25 mm) distance horizontally from the equipment to be grouted to permit expulsion of air and any remaining saturation water as the grout is placed.
4. Leave a minimum of 2" between the bearing plate and the form to allow for ease of placement.
5. Eliminate large, non-supported grout areas wherever possible.
6. Extend forms a minimum of 1" (25 mm) higher than the bottom of the equipment being grouted.
7. Expansion joints may be necessary. Consult your local Sika field representative for suggestions and recommendations.

### **MIXING**

1. Condition and maintain the grout and surfaces that contact the grout between 35 to 100 °F (2 to 38 °C) for mixing, placing, and curing.
2. Place estimated water (Use potable water only) into the mixer, then slowly add the grout. Start with 5.75 lbs. (2.6 kg) or 0.70 gallons (2.61 L) per 50 lb bag.
3. The water demand will depend on mixing efficiency, material, and ambient temperature conditions. Adjust the water to achieve the desired flow. The recommended flow is an 8–10" spread using a 2" diameter x 4" height plastic tube (such as PVC pipe) on a non-porous, level surface. Use the minimum amount of water required to achieve the necessary placement consistency. Do not exceed 6.25 lbs. (2.84 kg) or 0.75 gallons (2.84 L) of water per 50 lb bag.
4. Provide one or more clean mortar mixers (stationary barrels with moving paddles) for uninterrupted placement. Do not exceed one-half the maximum capacity. Pre-wet the mortar mixer, and empty excess water prior to use.
5. Mix grout for at least 4 minutes and no longer than 6 after all material and water is in the mixer until a homogenous consistency is achieved. Use a mechanical mixer only.
6. Transport by wheelbarrow or buckets or pump to the equipment being grouted. Minimize the transporting distance. Do not mix more material than can be placed within the working time of the grout. If grout stiffens as it sits, remix with a mechanical mixer to keep it flowable.

7. Do not retemper grout by adding additional water after it stiffens.
8. Do not add plasticizers, accelerators, retarders, or other additives.

### **APPLICATION**

1. Always place grout from only one side of the equipment to prevent air entrapment beneath the equipment. A headbox or similar device is required for a continuous pour to avoid air pockets. When pouring into the headbox, maintain at least half full of grout to ensure even flow. Discard grout that becomes unworkable. Make sure that the material fills the entire space being grouted and that it remains in contact with the plate throughout the grouting process.
2. Do not vibrate grout. Use steel straps inserted under the plate to help move the grout.
3. The minimum placement thickness is 1" (25 mm). Consult your Sika representative before placing lifts more than 6" (152 mm) in depth.
4. Immediately after placement, trim the surfaces with a trowel and cover the exposed grout with clean wet rags (not burlap). Keep rags moist until the grout surface is ready for finishing or until the final set.
5. The grout should offer stiff resistance to penetration with a pointed mason's trowel before the grout forms are removed or excessive grout is cut back.
6. Proper application is the responsibility of the user. Field visits by Sika personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite. For guidelines on specific anchor bolt applications, contact Sika Technical Services.

### **CURING TREATMENT**

Cure all exposed grout with an approved membrane curing compound compliant with ASTM C 309 or preferably ASTM C 1315. Apply the curing compound immediately after the wet rags are removed to minimize potential moisture loss.

### **LEGAL DISCLAIMER**

- **KEEP CONTAINER TIGHTLY CLOSED**
- **KEEP OUT OF REACH OF CHILDREN**
- **NOT FOR INTERNAL CONSUMPTION**
- **FOR INDUSTRIAL USE ONLY**
- **FOR PROFESSIONAL USE ONLY**

Prior to each use of any product of Sika Corporation, its subsidiaries or affiliates ("SIKA"), the user must always read and follow the warnings and instructions on the product's most current product label, Product Data Sheet and Safety Data Sheet which are available at [usa.sika.com](http://usa.sika.com) or by calling SIKA's Technical Service Department at 1-800-933-7452. Nothing contained in any SIKA literature or materials relieves the user of the obligation to read and follow the warnings and

instructions for each SIKA product as set forth in the current product label, Product Data Sheet and Safety Data Sheet prior to use of the SIKA product.

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within the product's shelf life. User determines suitability of product for intended use and assumes all risks. User's and/or buyer's sole remedy shall be limited to the purchase price or replacement of this product exclusive of any labor costs.

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**Product Data Sheet**

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