

MASTERFLOW® 928

High-precision mineral-aggregate grout
with extended working time

PRODUCT DATA

3 03600

Grouts

Description

Masterflow® 928 grout is a hydraulic cement-based mineral-aggregate grout with an extended working time. It is ideally suited for grouting machines or plates requiring precision load-bearing support. It can be placed from fluid to damp pack over a temperature range of 45 to 90° F (7 to 32° C). Masterflow® 928 grout meets the requirements of ASTM C 1107, Grades B and C, and the Army Corp of Engineers' CRD C 621, Grades B and C, at a fluid consistency over a 30-minute working time.

Yield

One 55 lb (25 kg) bag of Masterflow® 928 grout mixed with approximately 10.5 lbs (4.8 kg) or 1.26 gallons (4.8 L) of water, yields approximately 0.50 ft³ (0.014 m³) of grout.

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

Packaging

55 lb (25 kg) multi-wall paper bags
3,300 lb (1,500 kg) bulk bags

Shelf Life

1 year when properly stored

Storage

Store in unopened bags in clean, dry conditions.

Features

- Extended working time
- Can be mixed at a wide range of consistencies
- Freeze/thaw resistant
- Hardens free of bleeding, segregation, or settlement shrinkage
- Contains high-quality, well-graded quartz aggregate
- Sulfate resistant

Benefits

- Ensures sufficient time for placement
- Ensures proper placement under a variety of conditions
- Suitable for exterior applications
- Provides a maximum effective bearing area for optimum load transfer
- Provides optimum strength and workability
- For marine, wastewater, and other sulfate-containing environments

Where to Use

APPLICATION

- Where a nonshrink grout is required for maximum effective bearing area for optimum load transfer
- Where high one-day and later-age compressive strengths are required
- Nonshrink grouting of machinery and equipment, baseplates, soleplates; precast wall panels, beams, columns; curtain walls, concrete systems, other structural and nonstructural building members; anchor bolts, reinforcing bars, and dowel rods
- Applications requiring a pumpable grout
- Repairing concrete, including grouting voids and rock pockets
- Marine applications
- Freeze/thaw environments

LOCATION

- Interior or exterior

How to Apply

Surface Preparation

1. Steel surfaces must be free of dirt, oil, grease, or other contaminants.
2. The surface to be grouted must be clean, SSD, strong, and roughened to a CSP of 5 – 9 following ICRI Guideline 03732 to permit proper bond. For freshly placed concrete, consider using Liquid Surface Etchant (see Form No. 1020198) to achieve the required surface profile.
3. 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 03732.
4. Concrete surfaces should be saturated (ponded) with clean water for 24 hours just before grouting.
5. All freestanding water must be removed from the foundation and bolt holes immediately before grouting.
6. Anchor bolt holes must be grouted and sufficiently set before the major portion of the grout is placed.
7. Shade the foundation from sunlight 24 hours before and 24 hours after grouting.



Technical Data

Composition

Masterflow® 928 is a hydraulic cement-based mineral-aggregate grout.

Compliances

- ASTM C 1107, Grades B and C, and CRD 621, Grades B and C, requirements at a fluid consistency over a temperature range of 40 to 90° F (4 to 32° C)
- City of Los Angeles Research Report Number RR 23137

Test Data

PROPERTY	RESULTS			TEST METHODS
Compressive strengths, psi (MPa)				ASTM C 942, according to ASTM C 1107
		Plastic¹	Consistency Flowable²	Fluid³
1 day		4,500 (31)	4,000 (28)	3,500 (24)
3 days		6,000 (41)	5,000 (34)	4,500 (31)
14 days		7,500 (52)	6,700 (46)	6,500 (45)
28 days		9,000 (62)	8,000 (55)	7,500 (52)
Volume change*				ASTM C 1090
		% Change	% Requirement of ASTM C 1107	
1 day		> 0	0.0 – 0.30	
3 days		0.04	0.0 – 0.30	
14 days		0.05	0.0 – 0.30	
28 days		0.06	0.0 – 0.30	
Setting time, hr:min				ASTM C 191
		Plastic¹	Consistency Flowable²	Fluid³
Initial set		2:30	3:00	4:30
Final set		4:00	5:00	6:00
Flexural strength,* psi (MPa)				ASTM C 78
3 days		1,000 (6.9)		
7 days		1,050 (7.2)		
28 days		1,150 (7.9)		
Modulus of elasticity,* psi (MPa)				ASTM C 469, modified
3 days		2.82 x 10 ⁶ (1.94 x 10 ⁴)		
7 days		3.02 x 10 ⁶ (2.08 x 10 ⁴)		
28 days		3.24 x 10 ⁶ (2.23 x 10 ⁴)		
Coefficient of thermal expansion,* in/in/° F (mm/mm/° C)	6.5 x 10 ⁻⁶ (11.7 x 10 ⁻⁶)			ASTM C 531
Split tensile and tensile strength,* psi (MPa)				ASTM C 496 (splitting tensile) ASTM C 190 (tensile)
		Splitting Tensile	Tensile	
3 days		575 (4.0)	490 (3.4)	
7 days		630 (4.3)	500 (3.4)	
28 days		675 (4.7)	500 (3.4)	
Punching shear strength,* psi (MPa), 3 by 3 by 11" (76 by 76 by 279 mm) beam				Degussa Method
3 days		2,200 (15.2)		
7 days		2,260 (15.6)		
28 days		2,650 (18.3)		
Resistance to rapid freezing and thawing	300 Cycles RDF 99%			ASTM C 666, Procedure A

¹100 – 125% flow on flow table per ASTM C 230

²125 – 145% flow on flow table per ASTM C 230

³25 to 30 seconds through flow cone per ASTM C 939

*Test conducted at a fluid consistency

Test results are averages obtained under laboratory conditions. Expect reasonable variations.

Test Data, continued

PROPERTY		RESULTS		TEST METHODS
Ultimate tensile strength and bond stress				ASTM E 488, tests*
Diameter in (mm)	Depth in (mm)	Tensile strength lbs (kg)	Bond stress psi (MPa)	
5/8 (15.9)	4 (101.6)	23,500 (10,575)	2,991 (20.3)	
3/4 (19.1)	5 (127.0)	30,900 (13,905)	2,623 (18.1)	
1 (25.4)	6.75 (171.5)	65,500 (29,475)	3,090 (21.3)	

*Average of 5 tests in $\geq 4,000$ psi (27.6 MPa) concrete using 125 ksi threaded rod in 2" (51mm) diameter, damp, core-drilled holes.

Notes:

1. Grout was mixed to a fluid consistency.
2. Recommended design stress: 2,275 psi (15.7 MPa).
3. Refer to the "Adhesive and Grouted Fastener Capacity Design Guidelines" for more detailed information.
4. Tensile tests with headed fasteners were governed by concrete failure.

Jobsite Testing

If strength tests must be made at the jobsite, use 2" (51 mm) metal cube molds as specified by ASTM C 942 and ASTM C 1107. DO NOT use cylinder molds. Control field and laboratory tests on the basis of desired placement consistency rather than strictly on water content.

Forming

1. Forms should be liquid tight and nonabsorbent. Seal forms with putty, sealant, caulk, polyurethane foam.
2. Moderately sized equipment should utilize a head form sloped at 45 degrees to enhance the grout placement. A moveable head box may provide additional head at minimum cost.
3. Side and end forms should be a minimum 1" (25 mm) distant horizontally from the object 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. Use sufficient bracing to prevent the grout from leaking or moving.
6. Eliminate large, nonsupported grout areas wherever possible.
7. Extend forms a minimum of 1" (25 mm) higher than the bottom of the equipment being grouted.
8. Expansion joints may be necessary for both indoor and outdoor installation. Consult your local Degussa field representative for suggestions and recommendations.

Temperature

1. For precision grouting, 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.

Recommended Temperature Guidelines for Precision Grouting

	MINIMUM ° F (° C)	PREFERRED ° F (° C)	MAXIMUM ° F (° C)
Foundation and plates	45 (7)	50 – 80 (10 – 27)	90 (32)
Mixing water	45 (7)	50 – 80 (10 – 27)	90 (32)
Grout at mixed and placed temp	45 (7)	50 – 80 (10 – 27)	90 (32)

2. If temperature extremes are anticipated or special placement procedures are planned, contact your local Degussa representative for assistance.
3. When grouting at minimum temperatures, see that the foundation, plate, and grout temperatures do not fall below 40° F (7° C) until after 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).

Mixing

1. Place estimated water (use potable water only) into the mixer, then slowly add the grout. For a fluid consistency, start with 9 lbs (4 kg) (1.1 gallon [4.2L]) per 55 lb bag.
2. The water demand will depend on mixing efficiency, material, and ambient-temperature conditions. Adjust the water to achieve the desired flow. Recommended flow is 25 – 30 seconds using the ASTM C 939 Flow-Cone Method. Use the minimum amount of water required to achieve the necessary placement consistency.
3. Moderately sized batches of grout are best mixed in one or more clean mortar mixers. For large batches, use ready-mix trucks and 3,300 lb (1,500 kg) bags for maximum efficiency and economy.
4. Mix grout a minimum of 5 minutes after all material and water is in the mixer. Use mechanical mixer only.
5. Do not mix more grout than can be placed in approximately 30 minutes.
6. Transport by wheelbarrow or buckets or pump to the equipment being grouted. Minimize the transporting distance.
7. Do not retemper grout by adding water and remixing after it stiffens.
8. DO NOT VIBRATE GROUT TO FACILITATE PLACEMENT.

9. For aggregate extension guidelines, refer to Appendix MB-10: Guide to Cementitious Grouting.

Application

1. Always place grout from only one side of the equipment to prevent air or water entrapment beneath the equipment. Place Masterflow® 928 in a continuous pour. Discard grout that becomes unworkable. Make sure that the material fills the entire space being grouted and that it remains in contact with plate throughout the grouting process.
2. Immediately after placement, trim the surfaces with a trowel and cover the exposed grout with clean wet rags (not burlap). Keep rags moist until grout surface is ready for finishing or until final set.
3. 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. After removing the damp rags, immediately coat with a recommended curing compound compliant with ASTM C 309 or preferably ASTM C 1315.
4. Do not vibrate grout. Use steel straps inserted under the plate to help move the grout.
5. Consult your Degussa representative before placing lifts more than 6" (152 mm) in depth.

Curing

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

For Best Performance

- For guidelines on specific anchor-bolt applications, contact Degussa Technical Service.
- Do not add plasticizers, accelerators, retarders, or other additives unless advised in writing by Degussa Technical Service.
- The water requirement may vary with mixing efficiency, temperature, and other variables.

- Hold a pre-job conference with your local representative to plan the installation. Hold conferences as early as possible before the installation of equipment, sole plates, or rail mounts. Conferences are important for applying the recommendations in this product data sheet to a given project, and they help ensure a placement of highest quality and lowest cost.
- The ambient and initial temperature of the grout should be in the range of 45 to 90° F (7 to 32° C) for both mixing and placing. Ideally the amount of mixing water used should be that which is necessary to achieve a 25 – 30 second flow according to ASTM C 939 (CRD C 611). For placement outside of the 45 to 90° F (7 to 32° C) range, contact your local Degussa representative.
- For pours greater than 6" (152 mm) deep, consult your local Degussa representative for special precautions and installation procedures.
- Use Embecco® 885 grout for dynamic load-bearing support and similar application conditions as Masterflow® 928.
- Use Masterflow® 816, Masterflow® 1205, or Masterflow® 1341 post-tensioning cable grouts when the grout will be in contact with steel stressed over 80,000 psi (552 MPa).
- Masterflow® 928 is not intended for use as a floor topping or in large areas with exposed shoulders around baseplates. Where grout has exposed shoulders, occasional hairline cracks may occur. Cracks may also occur near sharp corners of the baseplate and at anchor bolts. These superficial cracks are usually caused by temperature and moisture changes that affect the grout at exposed shoulders at a faster rate than the grout beneath the baseplate. They do not affect the structural, nonshrink, or vertical support provided by the grout if the foundation-preparation, placing, and curing procedures are properly carried out.
- The minimum placement depth is 1" (25 mm).
- Make certain the most current versions of product data sheet and MSDS are being used; call Customer Service (1-800-433-9517) to verify the most current version.

- Proper application is the responsibility of the user. Field visits by Degussa personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

Health and Safety

MASTERFLOW® 928

Caution

Risks

Eye irritant. Skin irritant. Causes burns. Lung irritant. May cause delayed lung injury.

Precautions

KEEP OUT OF THE REACH OF CHILDREN. Avoid contact with eyes. Wear suitable protective eye-wear. Avoid prolonged or repeated contact with skin. Wear suitable gloves. Wear suitable protective clothing. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. Wash soiled clothing before reuse.

First Aid

Wash exposed skin with soap and water. Flush eyes with large quantities of water. If breathing is difficult, move person to fresh air.

Waste Disposal Method

This product when discarded or disposed of, is not listed as a hazardous waste in federal regulations. Dispose of in a landfill in accordance with local regulations.

For additional information on personal protective equipment, first aid, and emergency procedures, refer to the product Material Safety Data Sheet (MSDS) on the job site or contact the company at the address or phone numbers given below.

Proposition 65

This product contains materials listed by the state of California as known to cause cancer, birth defects, or reproductive harm.

VOC Content

0 lbs/gal or 0 g/L.

**For medical emergencies only,
call ChemTrec (1-800-424-9300).**

Degussa Building Systems

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Technical Service 800-243-6739

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