MasterFlow 648

High-strength, high-flow, chemical resistant epoxy grout

DESCRIPTION

MasterFlow 648 is a three-component epoxy resin-based precision grout used to secure critical equipment for proper alignment and transmission of static and dynamic loads. With carefully balanced physical properties and excellent resistance to chemical attack, elevated service temperatures, vibration and torque, MasterFlow 648 is formulated for easy installation, with good flow characteristics suitable for pouring or pumping in thicknesses from 10mm up to 150mm, low dust generation and soap and water clean-up.

MasterFlow 648 is available in all regions of the world, supported by trained Master Builders Solutions sales and technical personnel with experience in the specification and installation of epoxy grouts on every continent.

FIELD OF APPLICATION

MasterFlow 648 is used for assembling and fixing of the following items:

- Industrial turbines, generators and compressors
- Very large reciprocating compressors
- Industrial turbines, generators and compressors.
- Rolling, stamping, grinding, drawing and finishing mills.
- Forging hammers.
- Rail tracks, crane rails.
- Paper machine sole plates.
- Machinery and equipment requiring high strength maximum bearing.

Note: For wind turbine installations please refer to our MasterFlow 9000 series grouts.

FEATURES AND BENEFITS

- High early and ultimate strengths for rapid turnaround
- Low creep maintains equipment alignment
- Retains physical properties at elevated temperatures increasing the service range
- Low-dusting for added worker comfort and safety
- Very low shrinkage for full baseplate contact and load transfer
- Excellent flowability with high bearing area for even load distribution
- Variable fill ratio for desired flowability
- Excellent adhesion to steel and concrete for optimum load transfer and vibration dampening
- High chemical resistance enables use in challenging environments
- Excellent freeze/thaw resistance for equipment in low temperature service environments
- Resists water and chloride intrusion for use in wet and aggressive environments
- Resists impact and dampens torque to protect equipment and extend service life
- Extended working time
- Pumpable for maximum productivity on large grout installations
- Durable bond to concrete and steel optimizes load transfer
- Meets the requirements of EN 1504-6
- Can be applied in thickness from 10 to 150 mm
- Globally available for consistent project results.

APPLICATION METHOD

(a) Surface Preparation

The concrete should be free of frost, curing membranes, waterproofing treatments, oil stains, laitance, friable material and dust. The concrete surfaces should be chipped and if there is a water leakage it must be drained or properly plugged. Surfaces should be dry. Particular attention should be paid to bolt holes to ensure that these are dry. Use vacuum and/or oil free compressed air to remove free standing water. The concrete areas to be grouted should not be primed or sealed.

Base plates, bolts, etc. must be clean (SA 2½) and free of oil, grease and paint etc. to obtain proper adhesion. Set and align equipment. If shims are to be removed after the grout has set, then lightly grease them for easy removal. Priming the metal surfaces is only required when a long delay between cleaning and grouting will allow corrosion and contamination.

A head box should be installed with the formwork to ease the pour and flow of the mixed grout:

Use head box to assist flow

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Ensure formwork is secure and watertight to prevent movement and leaking during the placing and curing of the grout. The area should be free of excessive vibration. Shut down adjacent machinery until the grout has hardened. In hot weather, base plates and foundations must be shaded from direct sunlight. Bags and buckets of grout should be stored in the shade prior to use. In cold weather, the temperature of base plates and foundations should be raised to over 10°C.

(b) Mixing

The fill ratio is the weight of the aggregate to combined resin and hardener components. MasterFlow 648 is designed to be utilised at a variable fill ratio (resin / aggregate) from the standard 1 / 6.7 ratio to as low as 1 / 5 (hi-flow version).

The standard 57.5 litre unit of MasterFlow 648 includes 100kg (four 25kg bags) of Part C aggregate. This can be reduced to as low as 3 bags yielding 51.5 litres.

Resin and filler components can be purchased separately. Unlike most epoxy grouts, MasterFlow 648 maintains high bearing area when fill ratios are decreased. In addition, physical properties including high temperature performance are maintained. By determining the proper fill ratio for a particular project and purchasing accordingly, the cost per litre, flow and physical properties are optimised. A guideline for suggested fill ratios is shown in the following table.

Temperature	Thin pours or long distance	Standard grouting
> 30°C	4 bags	4 bags
20 - 30°C	3.5 – 4 bags	4 bags
> 10 - 20°C	3 – 3.5 bags	3.5 bags

In using this guide the temperature of the foundation and plate is the critical concern, however, grout and ambient temperature are also important.

Add all the contents of the hardener container to the resin part and mix thoroughly for at least 3 minutes. Transfer to a mechanical mixer. Add the aggregate, mixing thoroughly until a uniform consistency is obtained. At low temperatures (10°C) the flow characteristics of MasterFlow 648 will be reduced and installation times increased.

(c) Application Underplate

Lengths of metal strapping laid in the formwork prior to placing may be necessary to assist grout flow over large areas and in compacting and eliminating air pockets. Have sufficient manpower, materials and tools to make mixing and placing rapid and continuous. Where grout must flow some distance, make the initial batch slightly more fluid or flowable than required; this lubricates the surfaces and avoids blockage of the grout that follows. The grout shall be poured continuously and from one side only, to avoid entrapment of air while grouting.

Maintain a constant hydrostatic head, preferably of at least 15 cm. On the side where the grout has been poured, allow 10 cm clearance between the side of the form and the base plate of the machine. On the opposite side allow 5-10 cm clearance between the formwork and the base plate.

Due to differences in temperature between the grout under the base plate, and exposed shoulders that are subject to more rapid temperature changes, debonding and / or cracking can occur. Avoid shoulders wherever possible.

If shoulders are required, they should be firmly anchored with reinforcing to the substrate to prevent debonding.
Make sure grout fills the entire space to be grouted and remains in contact with the plate throughout the entire grouting placement.
Note: Do not use vibrator for placing the grout!

COVERAGE

2,000 kg / m^3 Filling ratio 1 / 6.7 (1 set resin + 4 bags)
1,750 kg / m^3 Filling ratio 1 / 5 (1 set resin + 3 bags)

FINISHING AND CLEANING

After the pour is complete, remove uncured epoxy from the mixer, wheelbarrow and tools with soap and water or a citrus degreaser. Cured material can only be removed mechanically.

CURING

Full cure is reached in 7 days after the application at a constant temperature of 23 ºC

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WORKING TIME

The following chart is a guide for the working time of a MasterFlow 648 grout at various ambient temperatures.

Temperature	Working time
at 30°C	50 – 60 minutes
at 21°C	90 – 120 minutes
at 10°C	120 – 150 minutes

PACKAGING

MasterFlow 648 is available in the following package sizes:

Part A	Part B	Part C	Set	Yield
11.35kg pail	3.55kg pail	25kg bag	114.9kg (1A+1B+4C)	57.5 l

STORAGE

Store at ambient temperatures, out of direct sunlight, in cool, dry warehouse conditions and clear of the ground on pallets protected from rainfall prior to application. The resin parts need to be protected from frost!

SHELF LIFE

24 months if stored at above mentioned storage conditions.

WATCH POINTS

- Do not apply at temperatures below +10 ºC nor above +30 ºC.
- Do not add solvent, water, or any other material to the grout.
- Do not alter the resin or hardener proportions.
- Cold material will exhibit decreased flowability and reduced strength development.
- Chamfering the concrete edge helps reduce thermal cracking. Following proper installation procedures also reduces the potential for cracking.
- Severe chemical attack may lead to discolouration of MasterFlow 648. This is however no sign of physical weakening of the product.
- In case of thicker applications and complex geometries consult your local Master Builders Solutions representative.

HANDLING AND TRANSPORT

Usual preventive measures for the handling of chemical products should be observed when using this product, for example do not eat, smoke or drink while working and wash hands when taking a break or when the job is completed.

Specific safety information referring the handling and transport of this product can be found in the Material Safety Data Sheet. For full information on Health and Safety matters regarding this product the relevant Health and Safety Data Sheet should be consulted.

Disposal of product and its container should be carried out according to the local legislation in force. Responsibility for this lies with the final owner of the product.

CONTACT DETAILS

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Product Data			
Property	**Standard**	**Data**	**Unit**
Chemical Base	-	Epoxy	-
Colour	-	Grey	-
Layer Thickness minimum maximum	-	10 150	mm
Fresh Mortar Density filling ratio: 1 / 6.7 filling ratio: 1 / 5	-	approx. 2.0 approx. 1.75	g/cm^3
Working Time 10 ºC 23 ºC 30 ºC	-	120 – 150 90 – 120 50 – 60	Minutes
Application Temperature (ambient and substrate)	-	+10 - +30	°C
Flow Time full plate contact to back of box	ASTM C1339	< 20 < 30	Minutes
Bearing Area	ASTM C1339	≥ 85	%
Compressive strength (50x50mm cubes) 1 day 7 days	ASTM C579	≥ 72 ≥ 97	N/mm²
Elasticity Modulus (7 days) filling ratio: 1 / 6.7 filling ratio: 1 / 5	EN 13412	≥ 15,000 ≥ 12,000	N/mm^2
Adhesion to concrete 7 days	EN 1542	≥ 3.0	N/mm^2
Adhesion to steel 1 day	EN 12188	≥ 10.0	N/mm^2
Adhesion to Concrete after Freeze-Thaw (50 cycles with salt) 28 days	EN 13687-1	≥ 2.0	N/mm^2
Slant Shear Strength (7 days) 50 º slope 60 º slope 70 º slope	EN 12188	76 61 73	N/mm^2
Pull-out strength at 75 kN load	EN 1881	≤ 0.6	mm
Creep under tensile load for 3 months at 50 kN load	EN 1544	≤ 0.6	mm
Shrinkage 28 days	EN 12617-4	≤ 0.2	mm/m
Water tightness under pressure	Internal method	passed, no leakage	-
Thermal expansion coefficient 7 days	EN 1770	3.7 x 10^{-5}	1/K
Peak exotherm	Internal method	approx. +43	°C
Glass transition temperature	EN 12614	+80	°C
Reaction to fire (1)	EN 13501-1	class E_{fl}	-
Reaction to fire (2)	EN ISO 11925-2	no ignition	-

Note: Technical data shown are statistical results and do not correspond to guaranteed minima.

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Mechanical Strength at:		+10 °C	+23 °C		+30 °C
Filling Ratio (resin / aggregate):		1 / 6.7 (1xA+1xB+4xC)	1 / 6.7 (1xA+1xB+4xC)	1 / 5.0 (1xA+1xB+3xC)	1 / 6.7 (1xA+1xB+4xC)
Compressive Strength acc. to EN 12190 [N/mm²] (40x40x160mm prisms)	8 hours	-	≥ 40	≥ 35	≥ 50
	16 hours	-	≥ 70	≥ 60	≥ 75
	1 day	≥ 30	≥ 75	≥ 65	≥ 80
	3 days	≥ 80	≥ 85	≥ 68	≥ 85
	7 days	≥ 90	≥ 95	≥ 70	≥ 95
Flexural Strength acc. to EN 12190 [N/mm²] (40x40x160mm prisms)	8 hours	-	≥ 16	≥ 17	≥ 20
	16 hours	-	≥ 22	≥ 20	≥ 22
	1 day	≥ 15	≥ 25	≥ 22	≥ 25
	3 days	≥ 25	≥ 27	≥ 23	≥ 27
	7 days	≥ 28	≥ 30	≥ 25	≥ 28

Note: Technical data shown are statistical results and do not correspond to guaranteed minima.

Chemical Resistance acc. to EN 12808-1				
Test liquids according to EN 13529			Change in compressive strength	
Group	**Description**	**Test Liquid**	after 72 h	after 500 h
DF 1	Gasoline	47.5% toluene + 30.4% isooctane + 17.1% n-heptane + 3% methanol + 2% 2-methyl-propanol-(2)	< 5	< -20
DF 3	Fuel oil, Diesel fuel and other unused combustion motor oils	80 % n-paraffin (C12 to C18) + 20 % methylnaphthalene	< -5	< -5
DF 4	All hydrocarbons as well as mixtures containing benzene with max. 5 Vol. %	60% toluene + 30% xylene + 10% methylnaphthalene	< 1	< 3
DF 5	Mono- and polyvalent alcohols (up to a max. 48 vol.-% methanol), glycol ethers	48 Vol.-% methanol + 48 Vol.-% IPA + 4% water	< -10	< -15
DF 7	All organic esters and ketones	50 % ethyl acetate + 50 % methyl isobutyl ketone	< -5	< -5
DF 10	Mineral acids (non-oxidizing) up to 20% and inorganic salts in aqueous solution (pH<6) except HF	Sulphuric acid (20%)	< -5	< -30
DF 11	Inorganic lye (except oxidizing) and inorganic salts in aqueous solution (pH>8)	Sodium hydroxide solution (20%)	< -5	< -10
DF 12	Aqueous solutions of inorganic non-oxidizing salts with a pH value between 6 and 8	Aqueous sodium chloride solution (20%)	< -5	< -5
-	Concentrated acids	Phosphoric acid (85%)	< -15	< -5
-	Concentrated acids	Hydrochloric acid conc. (37%)	< -10	< -30
-	Concentrated acids	Sulphuric acid (70%)	< 5	< 5
-	Oxidizing acids	Nitric acid (10%)	< -15	< -20

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Health and Safety
*For full information on Health and Safety matters regarding this product the relevant Health and Safety Data Sheet should be consulted.

The following general comments apply to all products.

As with all chemical products, care should be taken during use and storage to avoid contact with eyes, mouth, skin and foodstuffs, (which may also be tainted with vapour until the product is fully cured and dried). Treat splashes to eyes and skin immediately. If accidentally ingested, seek medical attention. Keep away from children and animals. Reseal containers after use.

Solvent Based Products
Use in well ventilated areas; avoid inhaling. Suitable respiratory equipment may be needed, eg when spraying. Can cause skin, eye irritation. Wear protective eye shields and gloves during use. Do not smoke or allow sparks or naked lights when stored or in use.

Resin Products
Can cause irritation, dermatitis or allergic reaction. Use protective equipment particularly for skin and eyes. Use only in well ventilated areas.

Spillage
Chemical products can cause damage; clean spillage immediately.

DISCLAIMER
"Master Builders Solutions UK Ltd" (the Company) endeavours to ensure that advice and information given in Product Data Sheets, Method Statements and Material Safety Data Sheets (all known as Product Literature) is accurate and correct. However, the Company has no control over the selection of its products for particular applications. It is important that any prospective customer, user or specifier, satisfies him/her-self that the product is suitable for the specific application. In this process, due regard should be taken of the nature and composition of the background/base and the ambient conditions both at the time of laying/applying/installing the material and when the completed work is to be brought into use.

Accordingly, no liability will be accepted by the Company for the selection, by others, of a product, which is inappropriate to a particular application.

Products are sold subject to the Company's standard conditions of sale and all customers, users and specifiers, should ensure that they examine the Company's latest Product Literature.