



Inorganic and multifunctional foam technology for sustainable and cost-efficient construction

MasterProtect NFF 1000 IN
MasterProtect NFF 2000 IN





Inorganic sustainable foams

MasterProtect NFF 1000 IN and MasterProtect NFF 2000 IN

Construction chemistry has achieved an important breakthrough in concrete and insulating material technology with the development of two new products in the segment of non-flammable foams (NFF). Based on the successful results of this effort, two new product lines are being launched MasterProtect NFF 1000 IN and 2000 IN.

The new Master Builders Solutions portfolio of inorganic foams, which comprises NFF 1000 IN and 2000 IN, is designed for use for pre-fabrication and insulation in a wide variety of application areas.



What is so special about MasterProtect NFF 1000 IN and 2000 IN?

The driving forces behind inorganic insulating materials are their excellent properties with respect to fireproofing, insulating capability, recyclability and their sustainable production.

These unique properties of the MasterProtect NFF product family offer many options to building designers and experts in the construction industry. For example, it is possible to produce pre-fabricated insulating boards with greater process reliability and ease.

Both MasterProtect NFF 1000 IN and 2000 IN are non-flammable, A1, and have sound-proofing / noise-proofing properties.





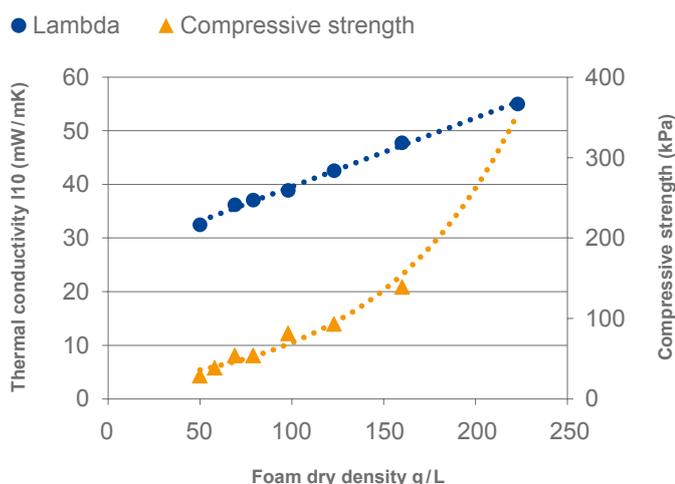
What distinguishes the MasterProtect products?

Natural lightweight minerals such as pumice inspired the development of MasterProtect NFF 1000 IN and 2000 IN. However, the greatest challenges for building materials have essentially been the same for centuries: high strength combined with low density and good insulation.

Imitation of the porous structure of natural pumice allowed for the development of similarly lightweight, noise-absorbing and thermally insulating products. However, these products can also be given any shape or cast and can be produced continuously and in large batch sizes.

As a result, MasterProtect NFF 1000 IN and 2000 IN can be implemented easily as boards, blocks, semi-finished parts, lightweight construction parts and much more. The artificial minerals demonstrate enduring strength, good resistance to external influences, and unchanging material properties and what's more, they can be completely recycled.

Thermal conductivity strength development for MasterProtect NFF 2000 IN, measured in accordance with DIN EN 12667 (Lambda), DIN EN 826 (compressive strength) and conditioned at 23°C and 50% RH



- With MasterProtect NFF 1000 IN and 2000 IN, a new technological level has been reached. Previously, no inorganic foam has been capable of demonstrating such versatility and the combination of advantageous properties as can be found in these new materials.
- The product lines of the non-flammable, inorganic materials consist of compounds that can be foamed with little effort, both mechanically and chemically.
- The products can be dried and hardened in ambient conditions even without additional energy input.
- They can be incorporated into a wide range of construction industry products as brick cavity fillers, as insulation for sandwich elements or as lightweight construction elements. Ask us about your desired applications, regardless of whether they are in fireproofing, thermal insulation or sound proofing.
- Both MasterProtect NFF 1000 IN and 2000 IN fulfill the relevant fireproofing criteria for non-flammability. All of our products are classified as A1 foam.
- Our products are particularly appealing with regard to health and safety regulations because they are non-hazardous both in processing and application.
- MasterProtect NFF products are sustainable, durable products with a long service life.**



The microstructure of the foam is formed through inorganic polycondensation using alkali-activated aluminosilicates.



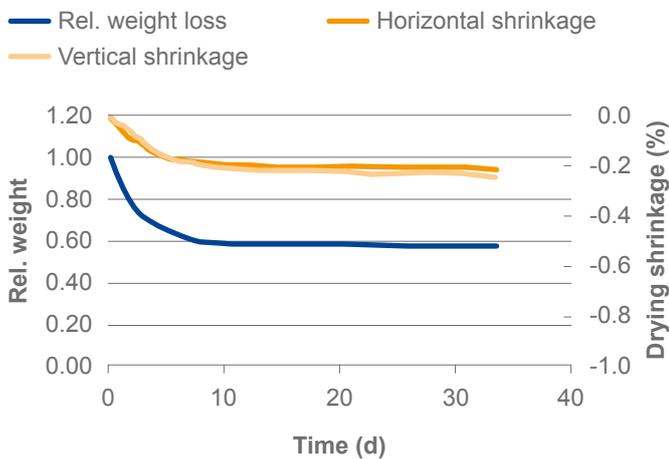
The pores in the microstructure offer excellent sound-proofing and heat retention properties.



MasterProtect NFF products are solid, durable and lightweight at the same time.

- At low, medium and high density, these foams are resistant to freezing and thawing. They exhibit low water absorption if the cells are not interconnected and high stability in case of cyclic exposure to temperature and humidity. Their volume is also stable.
- MasterProtect 2000 IN exhibits a low drying shrinkage rate of approx. 0.2 percent in the horizontal and vertical direction when stored at ambient conditions (20 °C and 75% rel. humidity) and a specific dry density of 70 g/L. The equilibrium moisture content with the environment is reached after seven days without additional drying.

Drying shrinkage and equilibrium moisture content



Example of insulated double-layer masonry. MasterProtect NFF 2000 IN insulates the wall and holds the facing formwork without reinforcement.



Example of a filled concrete block with insulating foam 35 mW/m²K



Successful production for the first exterior wall applications



Even small aluminum profiles can be successfully filled and provided with fireproof insulation.



How are MasterProtect NFF 1000 IN and 2000 IN produced?

- MasterProtect NFF 1000 IN and 2000 IN can be combined with organic and inorganic adhesives, plaster or clay products to form boards, blocks or stones. This results in the advantage of high versatility for individual project specifications.
- MasterProtect NFF 1000 IN is formed mechanically. The microstructure of the foam is generated in a continuous process.
- MasterProtect NFF 2000 IN is foamed chemically or mechanically. Insulating boards for composite thermal insulation systems or cavity fillings can be manufactured in a scalable process both in batches and continuously.

- Both foams can be produced safely at specified densities. It is possible to generate the desired product properties at a tolerance of less than one percent deviation in a continuous production process. The production processes are proven and have been in operation on the first customer's premises since mid-2018.
- MasterProtect NFF 2000 IN and NFF 1000 IN can easily be cast in blocks. These can then be cut to the desired shape and size using a wire, which makes both products attractive for further processing into location-specific products. This also makes it possible to reduce cutting waste and accelerate the assembly process.
- Sustainability is an essential feature of the MasterProtect NFF product line. It is a "green" product line because it uses recycled materials and bonding agents with particularly low CO₂-equivalent values. Both MasterProtect NFF products offer a production process that uses resources efficiently. For instance, neither of the products requires an energy-intensive autoclave. The concept provides the option of moving the entire foaming process to the customer's premises, which significantly reduces the energy demand that would be required with other products for transport to the location of use.



Form and board manufacturing are possible with the new product family from Master Builders Solutions.



If you are interested in sustainable, energy-efficient, durable, thermally insulating and sound-proofing high-performance products, do not hesitate to contact us.

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MasterProtect foams compared to products on the market

Compressive strength DIN EN 826

Lambda 10, 70 °C: Thermal conductivity DIN EN 12667 (10 °C) after 70 °C sample drying to constant mass

Product	MasterProtect NFF 1000 IN		Foam glass
	Insulation	Acoustics	Board
Lambda rated mW/m ² K	40	70	60
Dry density g/L	110	250	250
Flammability	A1	A1	A2, B1
Compressive strength (kPa)	100	>700	1200
Unique selling point	High strength, good sound-proofing and thermal insulation, easy production, performance		Strength

Product	MasterProtect NFF 2000 IN		Mineral wool	AAC	Cement
	Cavity insulation	Insulating board	Board	Board	Foam
Lambda 10, 70 °C mW/m ² K	31	33			
Lambda rated mW/m ² K	<35	37	35	45	42
Dry density g/L	55	75	100	100	70
Flammability	A1	A1	A1	A1	A1
Compressive strength (kPa)	17	51	5	300	30
Unique selling point	Price/performance ratio, fast hardening, can be adapted to different requirements, sustainability				



Abstract on foaming

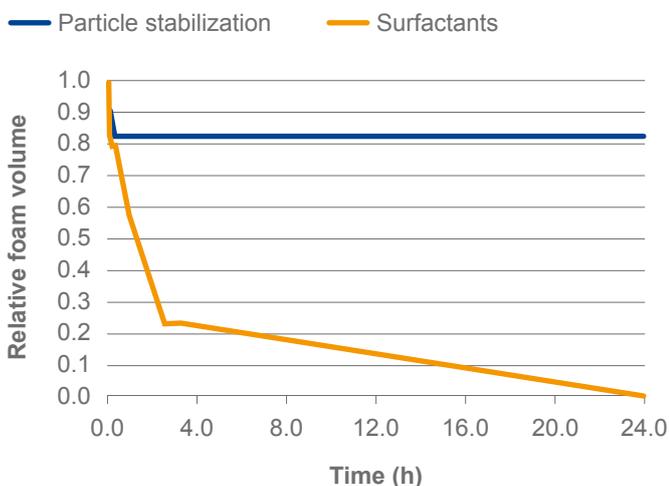
The process of foaming inorganic materials is made up of at least three process steps that must be coordinated with each other and optimized:

1. **Air introduction; this can be done mechanically or chemically**
2. **Air stabilization**
3. **Hardening of the matrix material**

Each of these process steps determines the quality of the end product and has significant influence on the next step. The size and number of pores is essentially determined by the type and duration of the air supply, which in turn influences the strength and density of the material. The mixing process, duration and energy play an important role here.

However, the foam of an aqueous solution is not stable for a long period. The external temperature and the type of the surfactant have a strong influence on the duration of air stabilization. Drainage and coalescence, i.e. the transition process of a system from many small air pores to a few large ones result in a significant de-aeration of the foam so that, after a short period, only a small part of the introduced air is still present. The foam thus collapses.

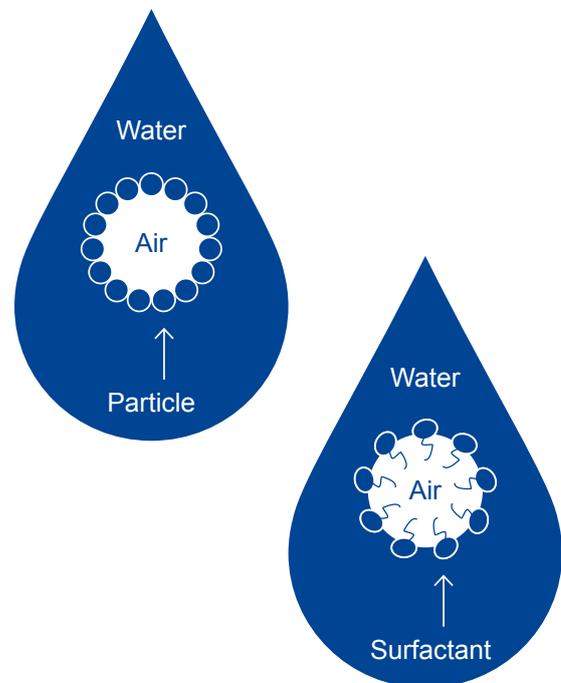
Comparison of particle stabilization and classic surfactant technology



Inorganic bonding agents, e.g. cement, also react depending on the temperature and usually take some time to become stable. High temperatures accelerate the development of strength but unfortunately also the collapse of the foam. If the development of strength is significantly slower than the de-aeration, the foam will deflate. At least part of the introduced air will escape. If strength develops too quickly, air introduction will be impeded, and the maximum air content cannot be introduced into the system.

These problems have been solved by the particle stabilization used in the MP NFF 2000 IN. Unlike surfactant-based foaming agents, the particles form a shell structure at the water-air boundary. This shell is stable for a longer period (see graph) and permits the bonding agents to react more slowly and achieve lower densities.

Influence of particle stabilization on air introduction





Master Builders Solutions

The Master Builders Solutions brand brings all of our expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry. The know-how and experience of a global community of construction experts form the core of Master Builders Solutions.

We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions and solutions for on- and offshore wind energy.

Our comprehensive portfolio

- Concrete admixtures
- Cement additives
- Chemical solutions for underground construction
- Waterproofing solutions
- Sealants
- Concrete repair and protection solutions
- Performance grouts
- Wind turbine grouts
- Performance flooring solutions





Master Builders Solutions for the Construction Industry

MasterAir

Complete solutions for air entrained concrete

MasterBrace

Solutions for concrete strengthening

MasterCast

Solutions for the manufactured concrete product industry

MasterCem

Solutions for cement manufacture

MasterEase

Low viscosity for high performance concrete

MasterEmaco

Solutions for concrete repair

MasterFinish

Solutions for formwork treatment and surface improvement

MasterFlow

Solutions for precision grouting

MasterFiber

Comprehensive solutions for fiber reinforced concrete

MasterGlenium

Solutions for high performance concrete

MasterInject

Solutions for concrete injection

MasterKure

Solutions for concrete curing

MasterLife

Solutions for enhanced durability

MasterMatrix

Advanced rheology control for concrete

MasterPel

Solutions for hydrophobization, anti-efflorescence and surface protection

MasterPolyheed

Solutions for mid-range concrete

MasterPozzolith

Solutions for water-reduced concrete

MasterProtect

Solutions for concrete protection

MasterRheobuild

Solutions for high strength concrete

MasterRoc

Solutions for underground construction

MasterSeal

Solutions for waterproofing and sealing

MasterSet

Solutions for set control

MasterSphere

Solutions for guaranteed freeze-thaw resistance

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MasterSure

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Master X-Seed

Advanced accelerator solutions for concrete

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Flooring solutions for harsh environments



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