Rev 0
03/22

AETERNUM 3

Highly effective reactive formulation for highly durable concretes and mortars (reactive powder concrete, rpc)

IN 934-2

DESCRIPTION

AETERNUM 3 is a new generation reactive powder adsorbed on active nanomicrosilicates that combines, with the high pozzolanic activity of the latter, an extraordinary rheology, fluidity in the absence of segregation, impermeability and remarkable resistance to both mechanical compression and chemical and atmospheric aggression and above all an extraordinary impermeability.
Ideal for hot climates as it has excellent maneuverability support.

GENERAL CARACTERISTICS

AETERNUM 3 consists of spherical particles a few hundredths of a micron, so its specific surface is very High: greater than 220,000 cm^2/g (Blaine). Characteristic that gives it a high dispersion and reactivity on cement granules and a high ability to capture and fix calcium hydrate [$Ca(OH)_2$] and transform it first into hydrated silicate and then into stable and irreversible calcium silicate.
It must be said that in all mixtures containing cement, to obtain good workability, it is necessary to use an amount of water always greater than that necessary for the hydration of the cementitious, this leads to the hardening of the cementitious paste the formation of capillaries and cavities more numerous the more the amount of water used is important.
Despite its very high specific surface area, AETERNUM 3, also having a phase transfer inside, guarantees, without any use of additional superplasticizers, concretes of easy and good machinability, without shrinkage and with superior and durable final performance.
Given the chemical conformation of AETERNUM 3 which accelerates the hydration of cement, it is advisable for the summer season to make some first qualifications.
AETERNUM 3 added to the mixture in a ratio of 2 to 4% on the weight of the cement, picks up and reacts with the free lime, filling the voids present in the cement paste, making the conglomerate more compact, tighter and stronger and therefore more durable over time and with a better appearance. If well designed, a concrete with AETERNUM 3 seems to have total impermeability, even in the air.
This additive allows the packaging of rheoplastic and rheodynamic SCC concretes with very low a/c ratios.

Without Aeternum

With Aeternum

Excellent treatment ability **in the absence of bleeding** with w/c ratios less than 0.45

AREAS OF APPLICATION

AETERNUM 3 finds its main applications in all quality concretes and mortars, where homogeneous concretes are required, superfluids with a very low w/ c ratio, with an excellent face finish, impermeable to aggressive external agents, with compensated shrinkage, high flexural and compressive strength.
AETERNUM 3 is used in the preparation of:

- protective sludge - grout for consolidation injections
- expansive grout with compensated shrinkage
- mortars or concretes with high mechanical strength
- mortars or concretes with high impermeability
- prestressed concrete resistant to chemical attack
- concrete for creeping formwork (slip-form);

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- mortars or concretes for applications under
- marine especially in aggressive environments
- thixotropic mortars for restoration
- non-retractable, premixed and wet mortars

However, on any occasion when a mortar or upper concrete is required, such as:

- mechanical resistance
- chemical resistance
- resistance to wear and cavitation
- total impermeability , even in the air
- stability and cohesion - compensated withdrawal
- overall sustainability

Eli is also used to reduce bleeding from concrete, in pumpable concrete and in concrete with high mechanical characteristics and durability. AETERNUM 3 is also particularly recommended for concrete where the particle size distribution has an obvious lack of finish.

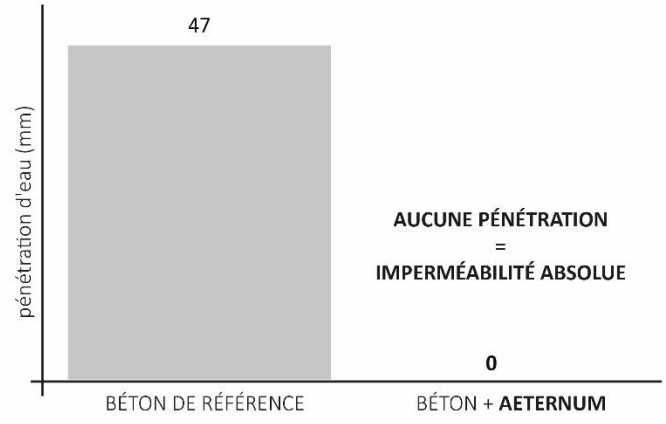
BENEFITS

AETERNUM 3, despite the very small particle size :

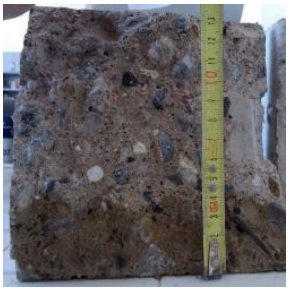
- does not require the simultaneous use of superplasticizers, indeed thanks to those
- here, it is possible to have self-compacting concretes at very low doses of water;
- gives greater concrete maneuverability;
- facilitates pumping;
- guarantees high mechanical strength without plastic shrinkage;
- guarantees the best visible face and the best degree of finish;
- ensures greater impermeability;
- guarantees durability and therefore resistance to all exposure classes.

DETERMINATION OF THE DEPTH OF PENETRATION OF PRESSURIZED WATER INTO THE CONCRETE

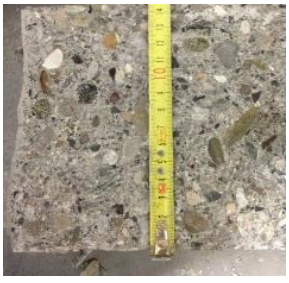
The test procedure was carried out in accordance with the provisions of paragraph 5 of the reference standard (EN 12390-8), i.e. with a pressure of 500 KPa for 72 hours.



From the analysis of all samples, a penetration depth for the reference concrete of 47 mm was verified, while the concrete with the addition of AETERNUM showed ZERO water penetration.



Concrete without Aeternum with sealing additive



Concrete with Aeternum

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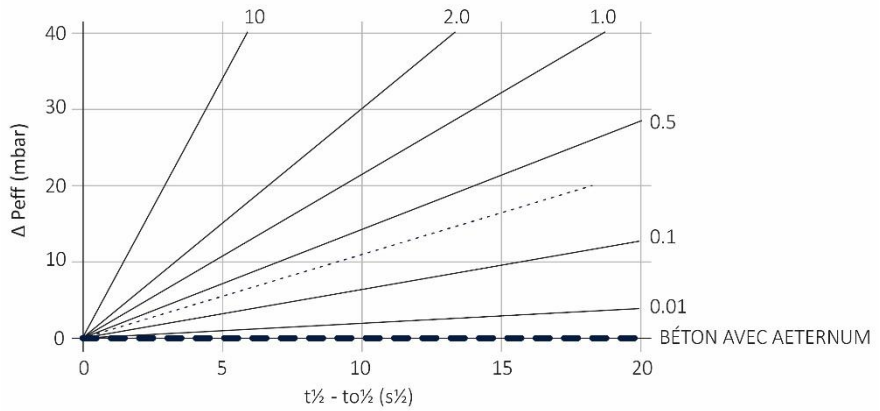
MEASURING THE AIR PERMEABILITY OF THE CONCRETE WITH AETERNUM

Air permeability shows an excellent correlation with the properties related to the durability of concrete: the rate of water absorption by capillarity, chloride permeability and permeability to carbon dioxide and oxygen.



The test shows that a concrete with AETERNUM is of class PK1 (i.e. very low penetration and therefore very low porosity) compared to a concrete without AETERNUM whose penetration, and therefore porosity, is moderate/high.

TEST RESULTS (according to SIA 262/1:2003 and compared to UNI EN 12390-8)

SURFACE	CLASS	Kt	DEPTH	PERMEABILITY	H2O PENETRATION
AETERNUM CUBE	PK1	< 0.01	< 5 MM	VERY LOW	< 1 MM
SAMPLE CUBE	PK3/4	~ 1.0	~ 50 MM	MODERATE/HIGH	~ 35 MM

Permeability classes related to Permea-TORR™

Class	kT coeff. (10^{-16} m^2)	Permeability
PK1	< 0.01	Very low
PK2	0.01 – 0.1	Low
PK3	0.1 – 1.0	Moderate
PK4	1.0 – 10	High
PK5	10 – 100	Very high

FROST RESISTANCE IN THE PRESENCE OF ANTIFREEZE SALTS

The tests are carried out by freezing and thawing cycles of concrete specimens, one side of which is brought into contact with de-icing salts ($CaCl_2$). At the end of the different time cycles, the loss of material detached from the surface of the specimen in contact with the snow removal salt is determined.

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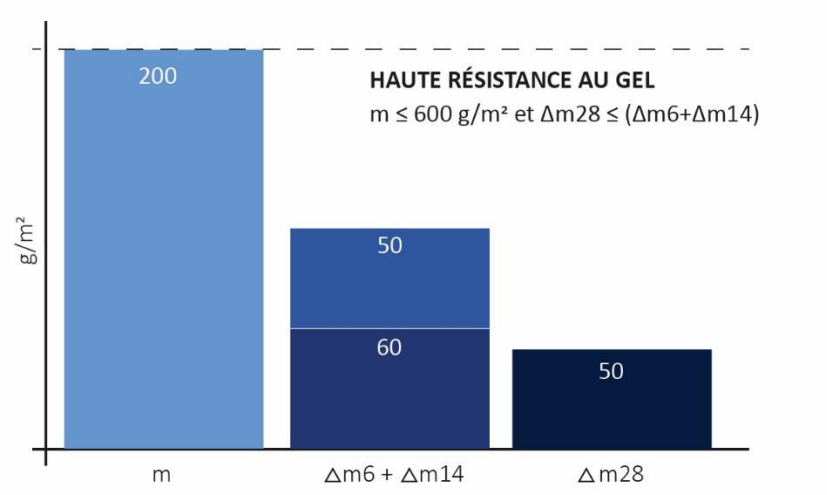
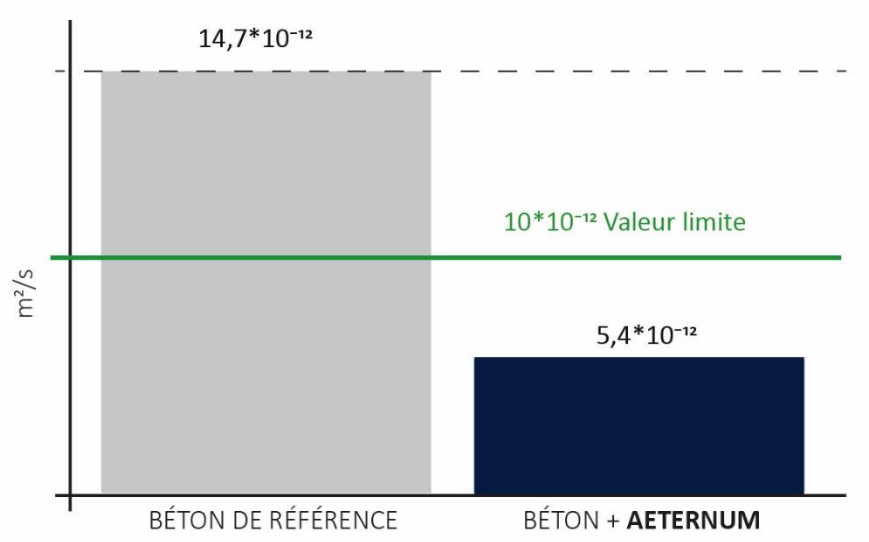


The evaluation of "High frost resistance" highlights how highly sealed concrete with AETERNUM, without any aeration agents (which significantly lowers the mechanical strength), or even with an air percentage of less than 1%, is highly sealed and optimally resists freeze and thaw cycles even in the presence of de-icing salts. AETERNUM promotes the creation of a very compact cementitious matrix with a consequent elimination of water permeability and capillary absorption, counteracting the deleterious effects of de-icing salts. A concrete with AETERNUM, not absorbing water from the outside, has no problem of resistance to freezing and therefore to freeze-thaw cycles

CHLORIDE MIGRATION COEFFICIENT



The average chloride migration coefficient of the reference probes is **14.7*10-12 m²/s** (it should be noted that the permissible limit value for concrete that is very resistant to chloride migration is **10*10-12 m²/s).**

This condition can be achieved with standard concrete with the addition of AETERNUM: the chloride migration coefficient in the test mixture with Aeternum was much lower - **5.4 * 10-12 m²/s** on average.

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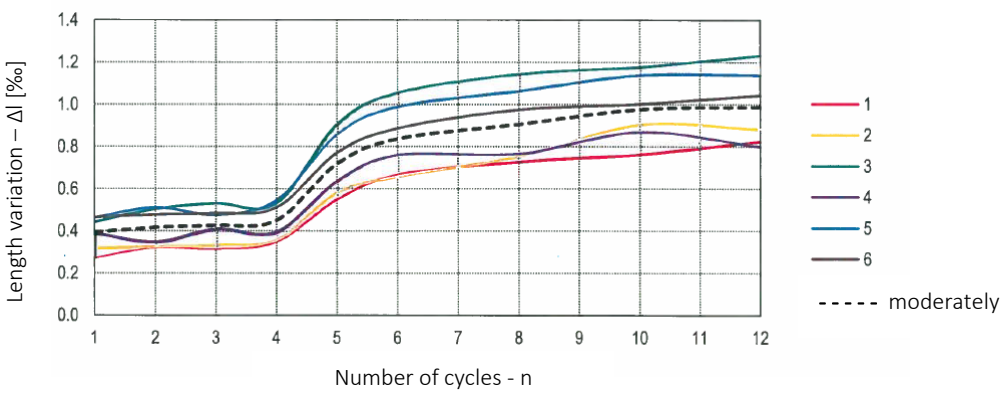
RESISTANCE TO SOLFATES

It is determined by measuring the expansion by expansion of the specimens immersed in a highly concentrated sulphate solution. Since in a concrete immersed in a sulphate solution and therefore subjected to the subsequent sulfatic reaction, phenomena of swelling and surface delamination occur. The data obtained show how concrete with AETERNUM contrasts expansion very effectively, obtaining an average Δls sulphate expansion value of 0.54 ‰ compared to the permissible limit value for a high resistance ≤ 1.2 ‰.



ACCELERATED CARBONATION

The carbonation of concrete is due to the penetration of $_{CO2}$ into the cementitious matrix. This one, by reacting with the free lime of the cement, lowers the pH of the conglomerate favoring the corrosion process of the concrete irons.

The following image shows the results at the end of parking the specimens inside the carbonation chamber:

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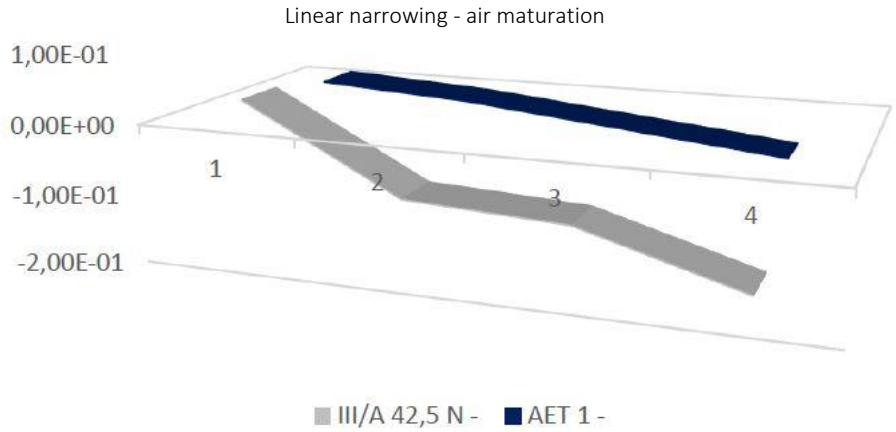
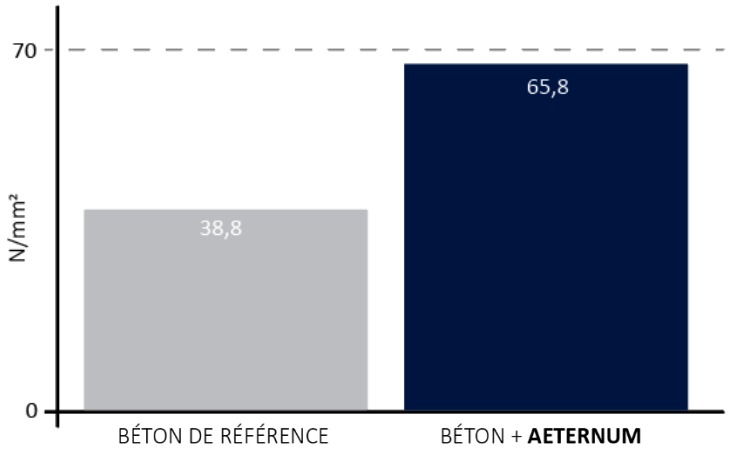
HYDRAULIC WITHDRAWAL



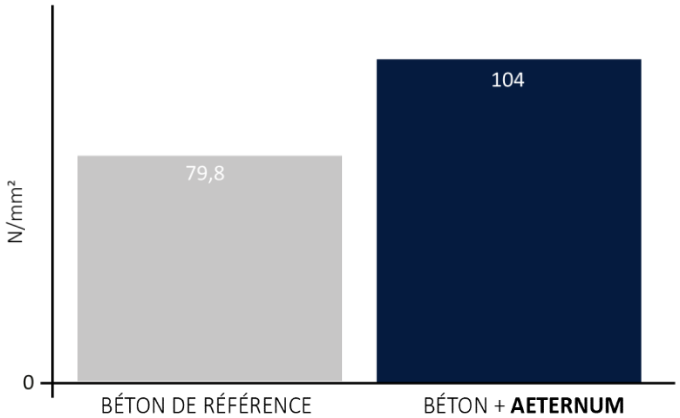
COMPRESSIVE RESISTANCE

Comparative analyses between a reference concrete and a concrete with the addition of Aeternum show the best compressive strength of the latter.

Both in standard concrete :



than in high-strength concrete:



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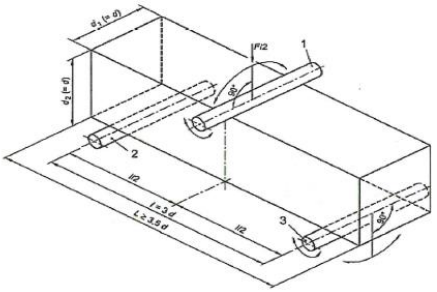
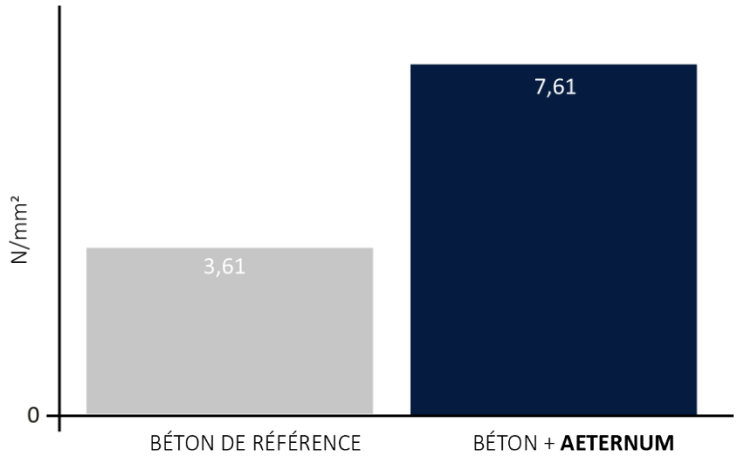
FLEXURAL RESISTANCE

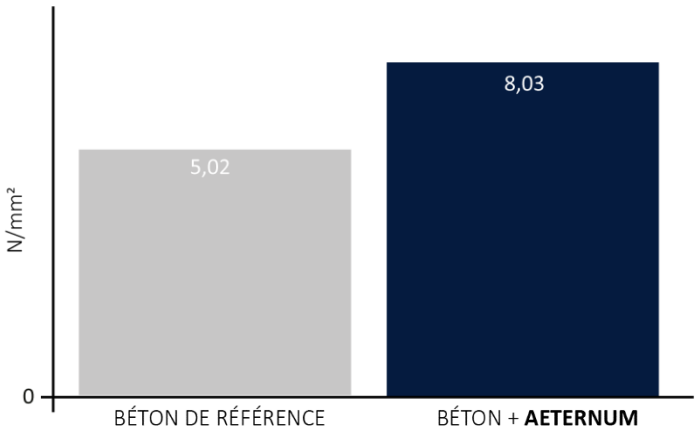
Tests carried out with a central load on specimens with the addition of Aeternum show physico-geometric characteristics indicating good flexural strength.



Both in standard concrete :

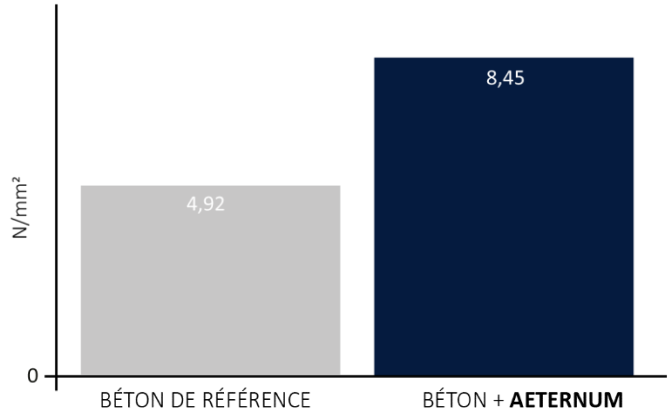


than in high-strength concrete:



RESISTANCE TO INDIRECT TRACTION

The tests carried out with a central load on the specimens with the addition of Aeternum show physico-geometric characteristics indicating excellent tensile strength.



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AETERNUM 3

TECHNICAL

Physical state	powder
Silver color	
Particle size distribution	0-30 µm
Bulk density	400-600 g/dm^3
Solubility in	insoluble water
pH7 ± 1	
Specific area	20-30 m^2/g

DOSAGE

The dosage of AETERNUM 3 is on average 2 to 4% on the weight of the cement depending on the mixture to be added and the desired characteristics.
However, we recommend as an ideal dosage of 3 to 3.3% on the weight of the lowcon.
However, dosages other than those that can be usedrecommended after preliminary orientation tests.

HARDENING OF THE CONCRETE

Reactions in the pozzolanic environment are quite long and occur in a humid environment; for this reason, a correct sassionment of the mortar or concrete is required in order to avoid drying too quickly.
In this regard, it is advisable to protect the jets during the first phase of hardening, with polyethylene sheets and subsequently apply on the exposed surfaces a film of TEKCURING or TEKNAPUR, which will avoid a rapid evaporation of the jets, allowing them a correct pozzolanic reaction.

CONFECTIONS

Bulk in tanks
Large bags from 6,000 to 7,00 kg
Bags 9 kg

STOCKAGE AND CONSERVATION

STORAGE AND STORAGE AETERNUM 3, if stored in a dry place and in bags d'originperfectly closed, it is valid for 12 months.
The moisture possibly adsorbed by the neil product affects the effectiveness, but makes its dosage difficult and imprecise in addition to a homogeneous distribution in the finished mixture.
We therefore recommend that you carefully close the bags afterwards each withdrawal.
AETERNUM 3 is available in bulk, in big-bag or bag. The bulk product is transported with conventional torpedoes and can be stored in normal cement silos and dosed with equipment from the concrete plant or with screw implant for big bag.

AVVERTISSEMENT/PRECAUTIONS

AETERNUM 3 is harmless in contact with the epidermis. li can be easily removed with soap and water from any surface.
Inhalation may cause mild irritation of the upper streetsrespiratory for which the use of a dust mask is recommended. In case of accidental loss, it must be collected dry and disposed of in an authorized landfill.

LEGAL NOTICE

The information contained in this data sheet, while representing the most advanced stage of knowledge, does not exempt the user from carrying out precise preliminary tests under his own conditions of use and operation. We therefore disclaim all liability in the event of misuse of the product.

CE

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Italy

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EN 934-2

AETERNUM 3

Highly efficient water reducer /

superplasticizer T 3.1 / 3.2

Maximum presence of chlorides 0.1%
High presence of alkalis 0.1%

No hazardous substances

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