



Rev 0
01/22



AETERNUM PROOF

High-efficiency reactive formulation concretes and mortars with high durability (Reactive Powder Concrete RPC)



DESCRIPTION

AETERNUM PROOF is a high-efficiency reactive formulation for concrete and mortar with high durability. It's a new generation powder additive, adsorbed on active nano-micro silicates that combines the high pozzolanic activity of the latter with a unique rheology, fluidity without segregation, water resistance, high resistance to mechanical compression and to both chemical and atmospheric damage as well as an excellent impermeability.

CHARACTERISTICS

AETERNUM PROOF consists of spherical particles equal to the size of a few hundredths of a micron, so that its specific surface area is quite high: over 220,000 cm²/g (Blaine). This characteristic gives it high dispersion and reactivity on cement grains and a high ability to capture and fix the calcium hydroxide [Ca (OH) 2] and to transform it firstly into a silicate hydrate and subsequently into stable and irreversible calcium silicate.

Since it has a phase transfer agent within, despite its high specific surface, AETERNUM PROOF guarantees, without the use of additional superplasticizers, concretes with easy and good workability, with no bleeding, no shrinkage and with a higher and more long-lasting final performance.

If added to the mixture at a rate of 3 – 4% by weight of cement, AETERNUM PROOF captures and reacts with the free lime, filling the gaps in the cement paste. This makes it more compact, impermeable, resistant and consequently more long-lasting and with a better exterior.

If well designed, concrete with AETERNUM PROOF can be totally impermeable even to air.

This additive makes it possible to create rheoplastic concretes and rheo-dynamic SCC with very low w/c ratios.

Due to its chemical conformation, AETERNUM PROOF accelerates the cement hydration. Therefore, during the summer season it is highly recommended to run some precautionary tests.

HOW TO USE

AETERNUM PROOF is mainly used for all quality concretes and mortars that require homogeneous concretes, highly fluxing with a very low w/c ratio with excellent finishing of the exposed surface, resistant to external aggressive agents, with compensated shrinkage and with high resistance to compression and flexion.

AETERNUM PROOF is used in the preparation of:

- Protective grouts
- Grouts for consolidation injections
- Expansive grouts with compensated shrinkage
- Concrete or mortars with high mechanical resistance
- Concrete or mortars with high impermeability
- Pre-stressed concrete resistant to chemical damage
- Concrete for vertical formworks (slip-form)
- Concrete or mortars for under-water placing especially in harsh environments
- Thixotropic mortars for restauration



Without Aeternum



With Aeternum



Excellent workability in the **absence of bleeding** with w/c ratios lower than 0.45

TECHNICAL DATA SHEET



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- Anti-shrinkage mortars, both pre-mixed and wet

In any case when mortars or concretes are required to have higher performance levels such as:

- mechanical resistances
- chemical resistances
- resistance to cavitation and wear
- total impermeability even to air
- stability and cohesion
- compensated shrinkage
- overall durability

It is also used to reduce the bleeding of concretes, in pumpable concretes and in concretes with high mechanical and durability characteristics.

AETERNUM PROOF is also particularly recommended for concretes, in which the distribution of grains shows a lack of fines.

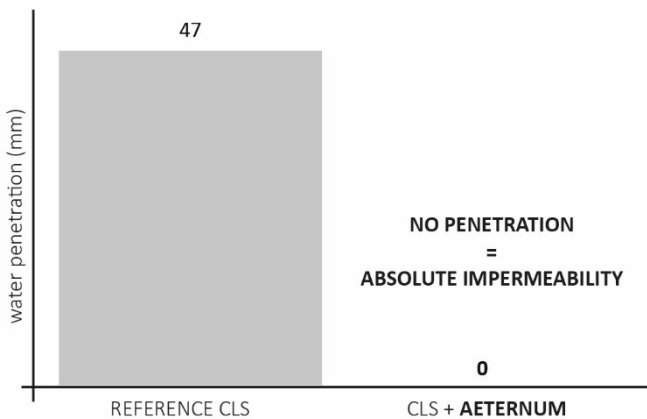
FEATURES

AETERNUM PROOF, despite the very reduced size of its particles:

- does not require the use of highly fluxing agents: it makes it possible to have self-compacting concretes with very low water dosages;
- gives more workability to the concrete;
- facilitates the pumping;
- guarantees high mechanical resistance without plastic shrinkage;
- guarantees a better aspect of the exposed surface and a better finishing;
- guarantees more impermeability;
- guarantees durability and so resistance to all types of exposure.

DETERMINATION OF THE PENETRATION DEPTH OF THE WATER UNDER PRESSURE IN CONCRETE

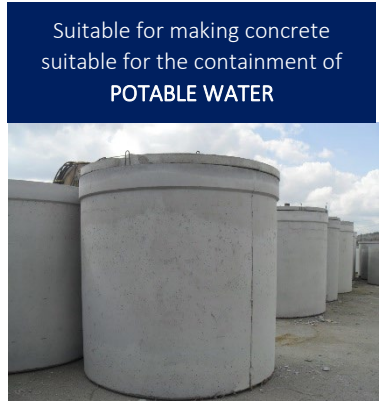
The test procedure was carried out according to the provisions of paragraph 5 of the reference standard (EN 12390-8), which means with a pressure of 500 KPa for 72 hours.



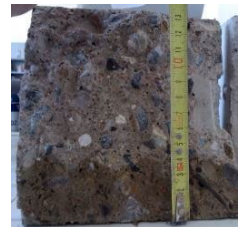
From the analysis of all the samples, a penetration depth for the reference CLS of 47 mm occurred, while the CLS to which AETERNUM was added, showed no water penetration.



Specific for
WHITE TANK SYSTEMS



Suitable for making concrete suitable for the containment of
POTABLE WATER



CLS without Aeternum with a waterproofing additive



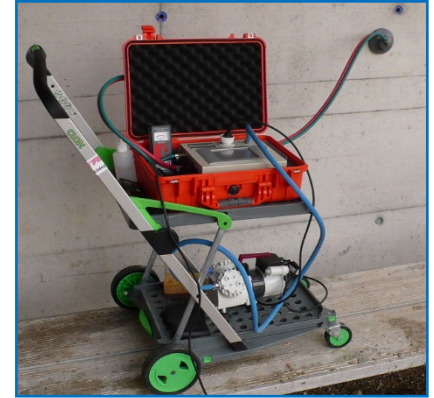
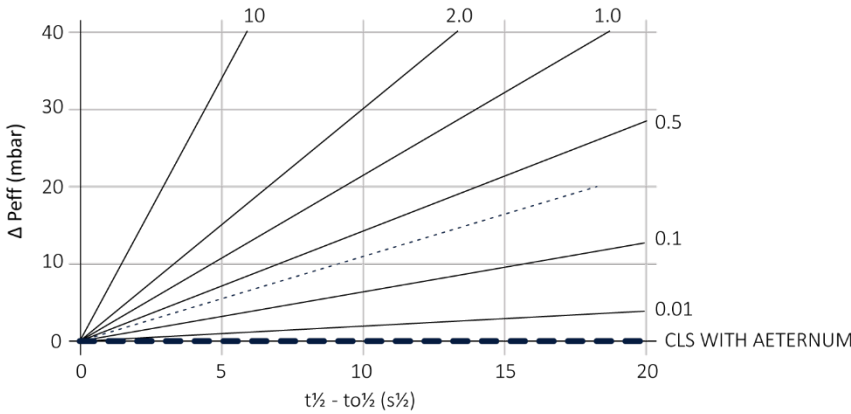
CLS with Aeternum





AIR PERMEABILITY MEASUREMENT OF CONCRETE WITH AETERNUM

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



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

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

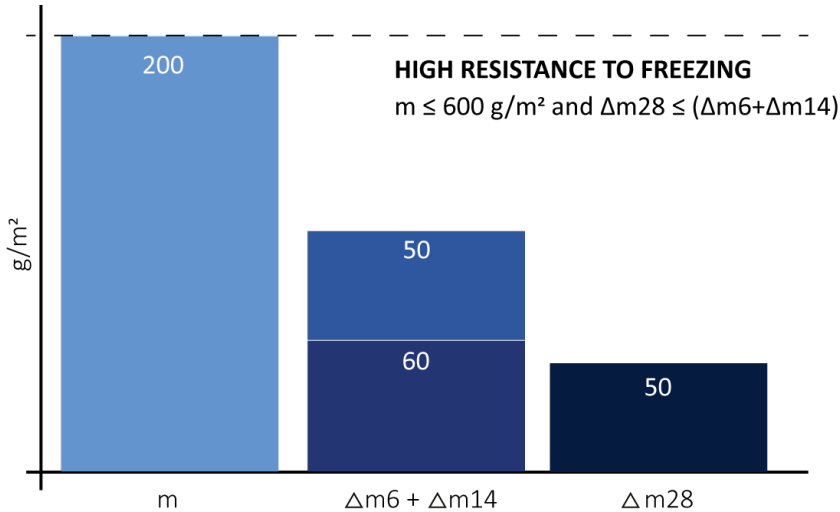
SURFACE	CLASS	kT	DEPTH	PERMEABILITY	H2O PENETRATION
AETERNUM CUBE	PK1	< 0,01	< 5 MM	VERY LOW	< 1 MM
SAMPLE CUBE	PK3/4	~ 1.0	~ 50 MM	MODERATE/HIGH	~ 35 MM

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

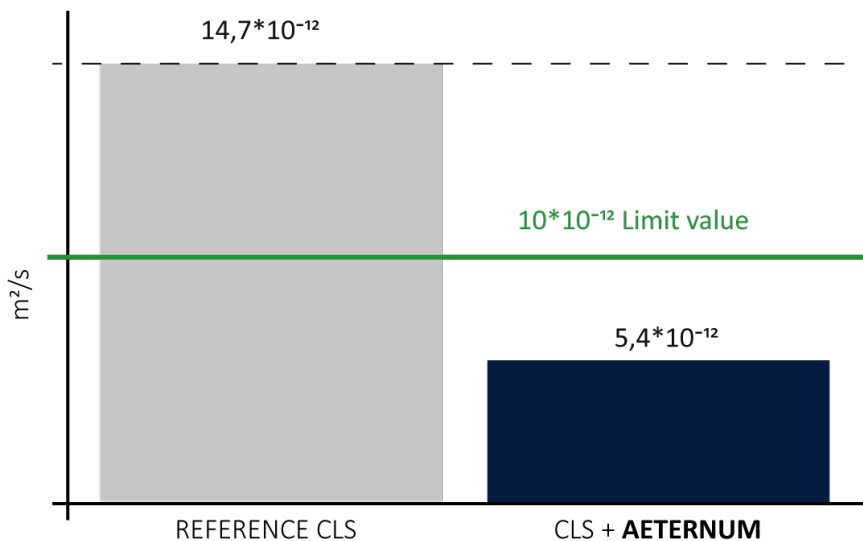
RESISTANCE TO FROST IN THE PRESENCE OF ANTI-FREEZE SALTS

The tests have been carried out through freezing and thawing cycles of the concrete samples, of which one face is put in contact with de-icing salts (CaCl_2). At the end of the various time cycles, the loss of material detached from the surface of the specimen in contact with the de-icing salt is determined.



The evaluation of "High frost resistance" highlights how concrete with AETERNUM, without any aerating agents (which considerably lower the mechanical strengths), indeed with a percentage of air lower than 1%, is highly waterproof and is extremely resistant to freeze-thaw cycles even in the presence of de-icing salts. AETERNUM favors the creation of a very compact cement matrix with the consequent elimination of water permeability and capillary absorption, contrasting the deleterious effects of de-icing salts. Concrete with AETERNUM has no problem of resistance to frost and therefore to freeze-thaw cycles, since it does not absorb water from the outside.

CHLORIDE MIGRATION COEFFICIENT



The average migration coefficient of the chloride of the reference probes is 14.7*10⁻¹² m²/s (it is specified that the limit value allowed for concrete that is highly resistant to the migration of the chloride is 10 *10⁻¹² m²/s).

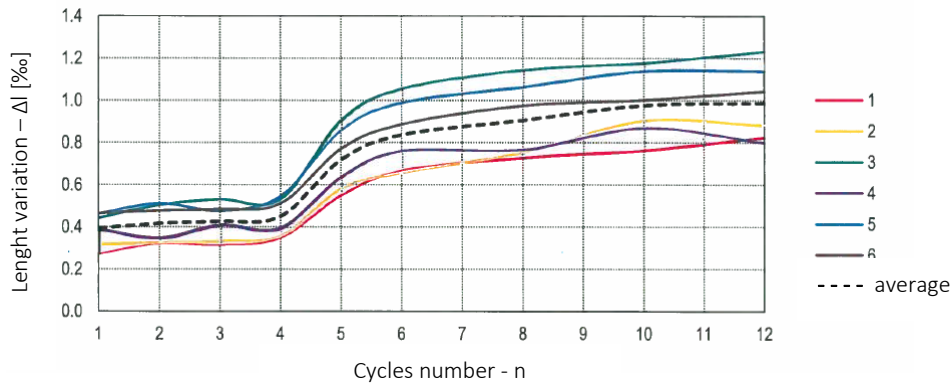
This condition can be achieved with standard concrete with the addition of AETERNUM: the migration coefficient of chloride in the test mixture with AETERNUM was much lower – i.e., 5.4*10⁻¹² m²/s on average.





RESISTANCE TO SULPHATES

It is determined by measuring the dilatation by expansion of the specimens dipped in a highly concentrated sulphate solution, since in concrete dipped in a sulphatic solution and therefore subject to the subsequent sulphatic reaction, phenomena of swelling and surface delamination occur. The obtained data demonstrate how concrete with AETERNUM very effectively contrasts expansion, obtaining an average expansion value to sulphates Δl s of 0.54 ‰ against the limit value allowed for highly resistant concrete ≤ 1.2 ‰.



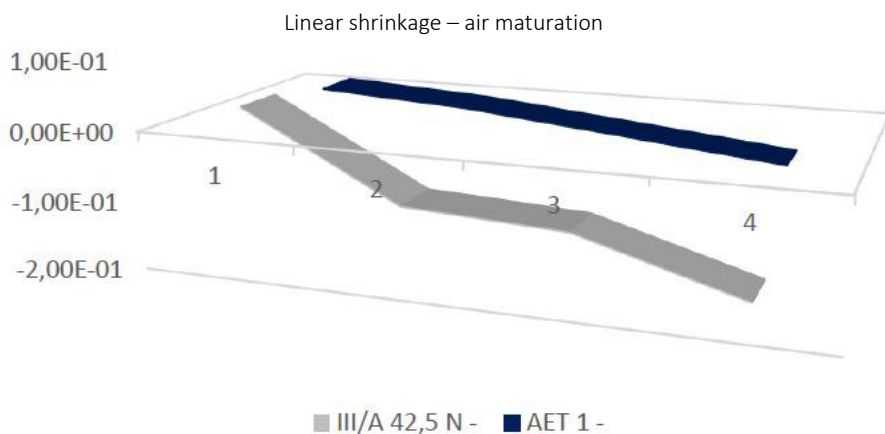
ACCELERATED CARBONATION

The carbonation of the concrete is due to the penetration of CO_2 into the cement matrix. This, reacting with the free lime of the cement, lowers the pH of the conglomerate favoring the corrosion process of the reinforcement rods.

The following image illustrates the results at the end of the stationing of the specimens inside the carbonation chamber:



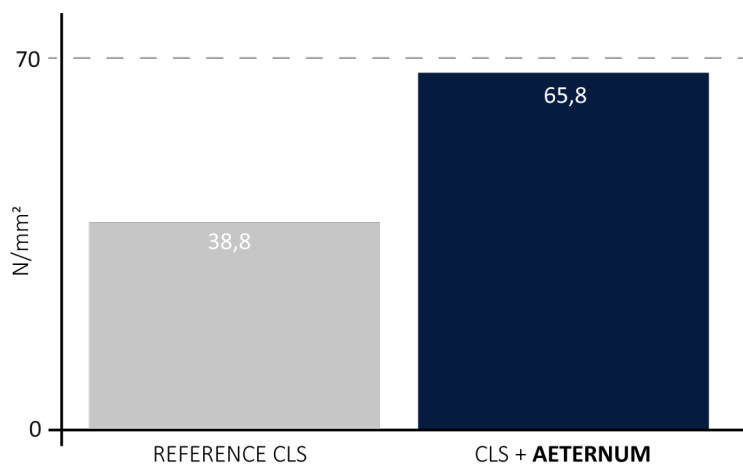
HYDRAULIC RECESSION



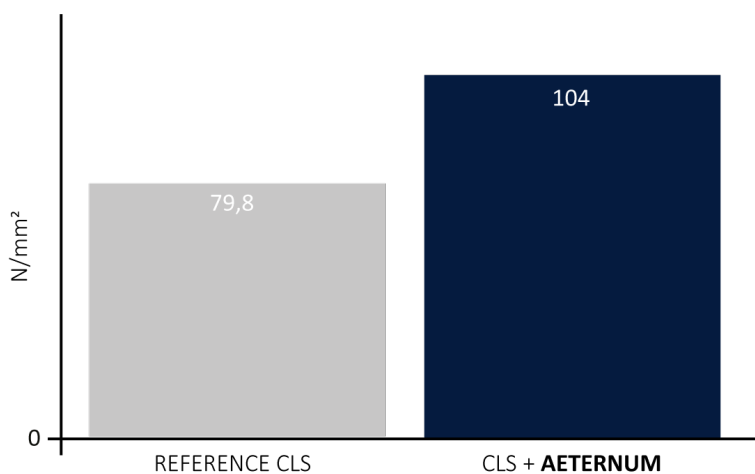
COMPRESSION STRENGTH

Comparative analyses between a reference concrete and one admixed with AETERNUM highlight the best compressive strength of the latter.

Both in standard cls:



as well as in high-resistance cls:

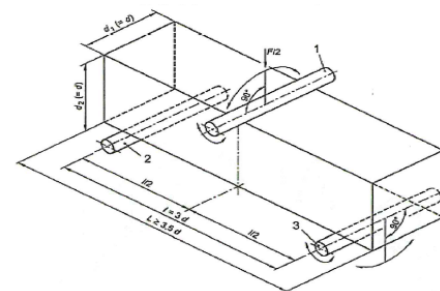
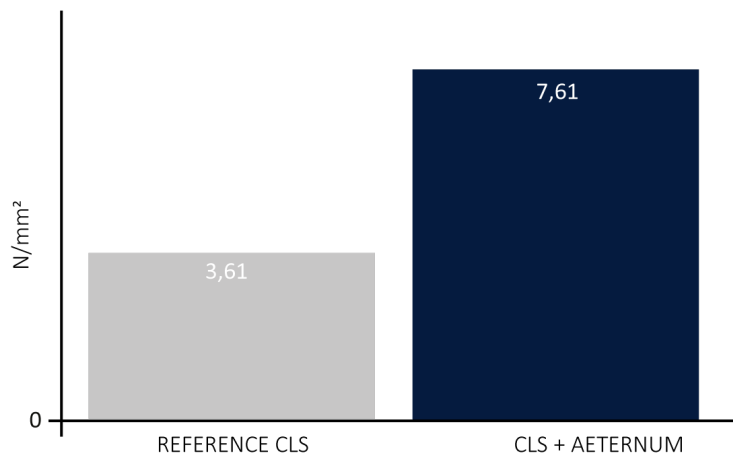




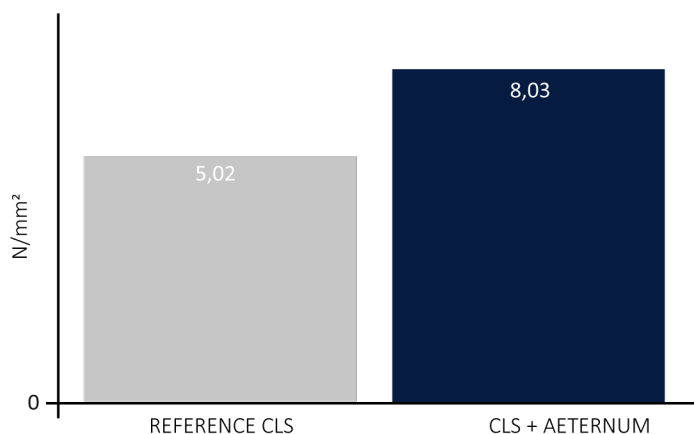
FLEXING STRENGTH

The tests carried out with central load on the specimens with the addition of AETERNUM show physical-geometric characteristics that indicate good resistance to flexion.

Both in standard concrete:

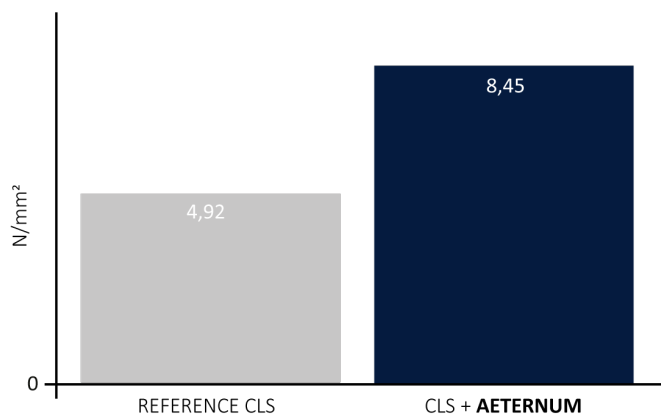


as well as in high-resistance concrete:



RESISTANCE TO INDIRECT TRACTION

Tests with central weight on the AETERNUM samples highlight physical-geometric characteristics that show a great resistance to traction.





PHYSICAL PROPERTIES

Physical state	powder
Color	silver
Granulometric distribution	0 – 30 µm
Density in pile	400 – 600 g/dm ³
Solubility in water	insoluble
pH	7 ± 1
Specific surface	20-30 m ² /g

DOSAGE

The dosage of AETERNUM PROOF is on average 3-4 % of the cement weight depending on the mixture it has to be added to and the desired characteristics.

However, the ideal recommended dosage is 3,5 % by weight of cement.

Different dosages can still be used, but only after having performed preventive tests.

CONCRETE CURING PROCESSES

The reactions in a pozzolanic environment are quite long and generally take place in a moist environment; for this reason, a proper curing of the mortar or concrete is required in order to prevent too rapid drying processes.

In this regard, during the first phase of hardening, it is recommended to protect the casting with sheets of polyethylene and to subsequently apply on the exposed surfaces a film of TEKCURING or TEKNAPUR, which will avoid a rapid evaporation of the casting, allowing them to have a correct pozzolanic reaction.

STORAGE AND CONSERVATION

If stored in a dry place in its original and perfectly sealed package, AETERNUM PROOF is valid for 12 months.

The moisture possibly adsorbed by the product does not affect its effectiveness, but it can make its dosage difficult and imprecise as well as affecting the homogeneous distribution in the finished mixture.

It is therefore advisable to carefully close the bags after each use.

AETERNUM PROOF is available in bulk, in big bags or in bags.

The bulk product is transported with classic torpedoes, it can be stored in normal cement silos and can be dosed with the equipment of the batching plant or through a mixing implant for big-bags.

PACKAGING

Bulk in tanks.
700 - 800 kg big-bags
9 kg bags

WARNINGS / PRECAUTIONS

AETERNUM PROOF is harmless by contact with the epidermis. It can be easily removed from every surface with water and soap. Inhalation may cause a slight irritation of the upper respiratory tract; therefore, the use of a dust mask is recommended.

In case of accidental loss, it must be collected in the dry state and disposed of in an authorized landfill.

LEGAL WARNING

The information contained in this data sheet, even though it represents the latest state of knowledge, do not exempt the user from running accurate preliminary tests in their own conditions of usage and operation. In light of this, we assume no responsibility for any improper use of the product.

CE

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EN 934-2

AETERNUM PROOF
Highly effective / superplasticizer
water reducer T 3.1 / 3.2

Highest chlorides presence 0.1%
Highest alkalis presence 0.1%

No dangerous substances

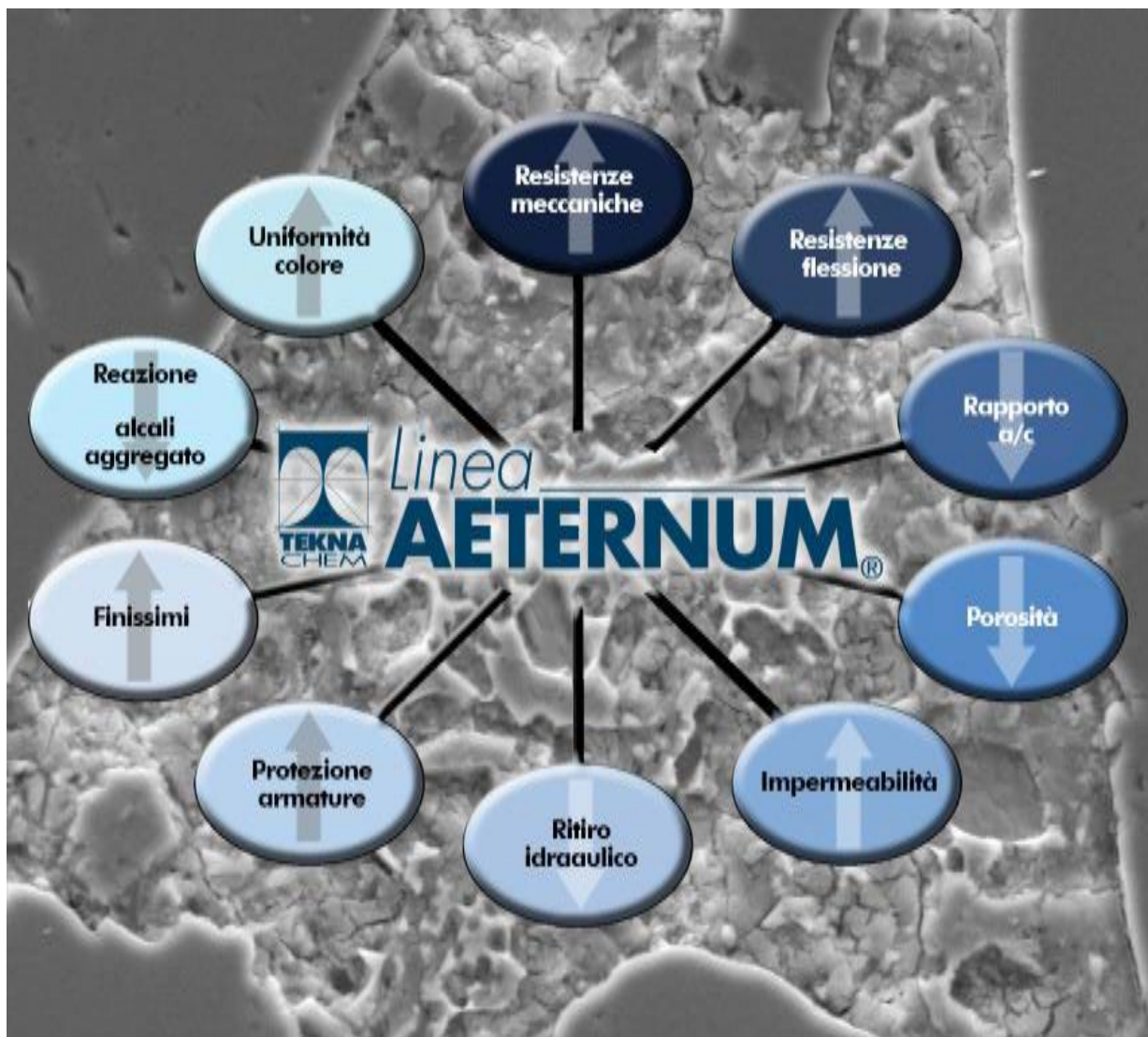


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