



Rev 4
04/19



AETERNUM 1 SP

High-efficiency reactive Compound for concrete and mortar with high durability (reactive powder concrete, rpc)



DESCRIPTION

AETERNUM 1 SP is a reactive powder-compound of new generation absorbed on active nanomicrosilicates combining high pozzolanic activity with an excellent rheology, fluidity in the absence of segregations, significant compressive strength and resistance to chemical and atmospheric attack and even excellent waterproofing property.

GENERAL FEATURES

AETERNUM 1 SP consists of spherical particles of the size of a few cents of microns, with a high specific surface area exceeding 220,000 cm²/g (Blaine). This feature gives it an high dispersion and reactivity on granules of cement and an high capacity to capture and secure the free lime into stable and irreversible hydrate calcium silicate. Despite its very high specific surface AETERNUM 1 SP, having inside an superplasticizer additive of latest generation and a phase-transfer guarantees, without any extra additives, high concrete workability, no phenomena of bleeding, no shrinkage and durable and higher performances. AETERNUM SP 1 (in addition of the mixture for 3 – 4% of the weight of cement) captures and reacts with the free lime, filling in the gaps as present in the cement paste, a feature that makes the concrete as less porous, more compact, more waterproof and more resistant to chemical environmental attack and therefore more durable over time and with great surface shape.

A concrete with AETERNUM 1 SP has total waterproofness, even in the air.

This additive allows the packaging of reoplastic concrete and SCC with water/cement ratio as very low and total absence of calcareous filler. Cause of the chemical characteristics of AETERNUM SP 1 in terms of acceleration of the cement hydration, it's advisable to do some initial qualification mainly during Summer season.

APPLICATION

AETERNUM 1 SP presents its main applications in all high-quality mortar and concrete, where homogeneous mixtures are requested as well as superfluids ultra low water/cement ratio with smooth finishing, resistance to external aggressive environmental attack, compensated shrinkage, high compressive and flexural strength.

AETERNUM 1 SP is used in the preparation of:

- protective grouts
- grouts for consolidation injections
- expansive grout with compensated shrinkage
- mortars or high compressive strength concrete
- mortars or high-waterproofing concrete
- prestressed concrete with high chemical attack resistance
- concretes for formworks (slip-form);
- mortars or concretes for underwater applications especially in aggressive environments
- thixotropic mortars for refurbishment and/or repairs
- no-shrinkage mortar, both premixed and wet



Without Aeternum



With Aeternum



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

TECHNICAL DATA SHEET



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For any application with high performances request such as:

- mechanical strength
- chemical resistance
- wear and cavitation resistance
- total waterproofness, even the air
- stability and cohesion
- compensated shrinkage
- overall durability

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

AETERNUM 1 SP is also especially recommended for mix design with lack of fine material.

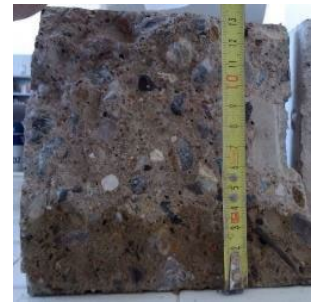
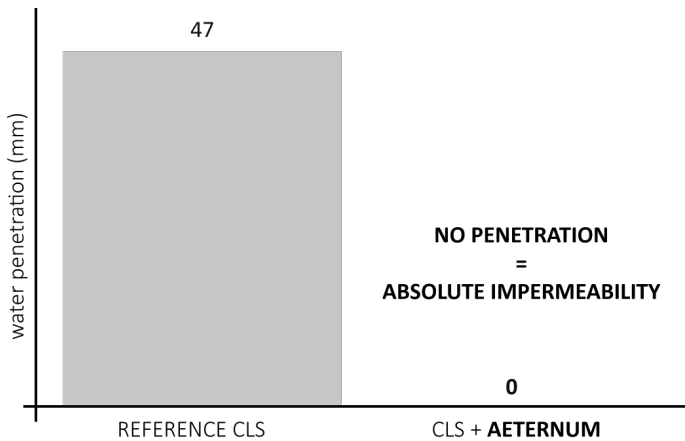
MAIN ADVANTAGES

AETERNUM 1 SP, despite very small particles size:

- does not require contemporary use of superplasticizers indeed thanks to the same is possible to obtain self-compacting concrete at very low dosages of water;
- gives the most concrete workability;
- facilitates the pumping;
- ensures high mechanical strength without plastic shrinkage;
- ensures best smooth surface and degree of finishing;
- guarantees absolute waterproofing;
- guarantees durability and then resistance to all classes of exposure.

DETERMINATION OF THE DEPTH OF WATER PENETRATION UNDER PRESSURE

The test procedure was performed as required by paragraph 5 of the Norm, i.e. with a pressure of 500 KPa for 72 hours.



CLS without Aeternum
With waterproofing additive



CLS with Aeternum

Following the analysis of all samples there was a penetration depth for the reference CONCRETE of 47 mm, while the CONCRETE added with AETERNUM showed water penetration = 0

MEASURE OF AIR PERMEABILITY INTO CONCRETE MIX DESIGN C/W AETERNUM

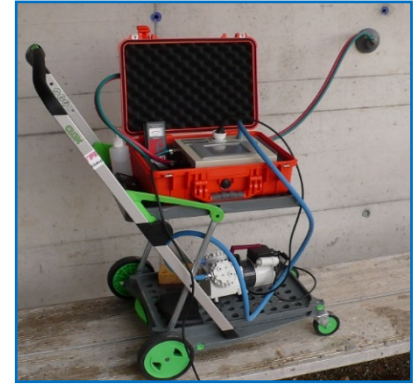
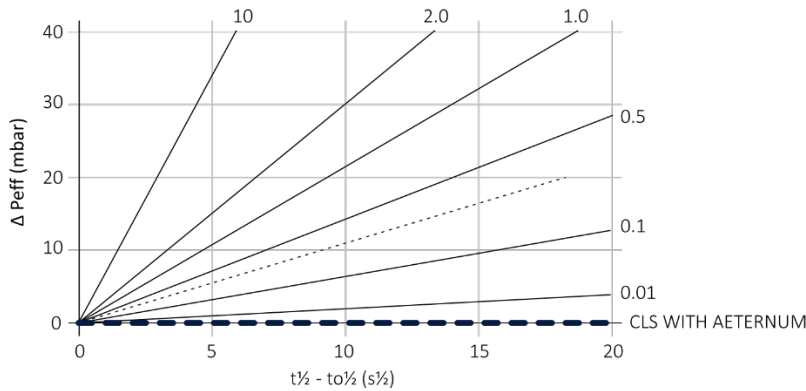
The air permeability shows an excellent correlation with properties related the durability of concrete: the speed of water absorption for capillarity, permeability of chlorides and permeability carbon dioxide and oxygen.



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The test points out that a concrete with AETERNUM is PK1 class (very low penetration and therefore very low porosity) as opposed to a concrete without AETERNUM whose penetration, and therefore porosity, is moderate/high.

RISULTATO PROVA (secondo SIA 262/1:2003 e confronto con UNI EN 12390-8)

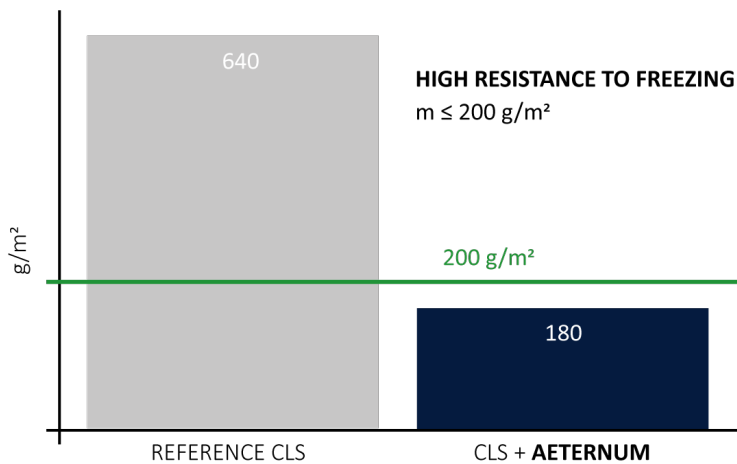
SUPERFICIE	CLASSE	kT	PROFONDITA'	PERMEABILITA'	PENETRAZIONE H ₂ O
CUBETTO AETERNUM	PK1	< 0,01	< 5 mm	MOLTO BASSA	< 1 mm
CUBETTO CONFRONTO	PK3/4	~ 1.0	~ 50 mm	MODERATA/ALTA	~ 35 mm

Classi di permeabilità correlate al Permea-Torr™

Classe	Coeff. kT (10 ⁻¹⁶ m ²)	Permeabilità
PK1	< 0.01	Molto bassa
PK2	0.01 – 0.1	Bassa
PK3	0.1 – 1.0	Moderata
PK4	1.0 -10	Alta
PK5	10 - 100	Molto alta

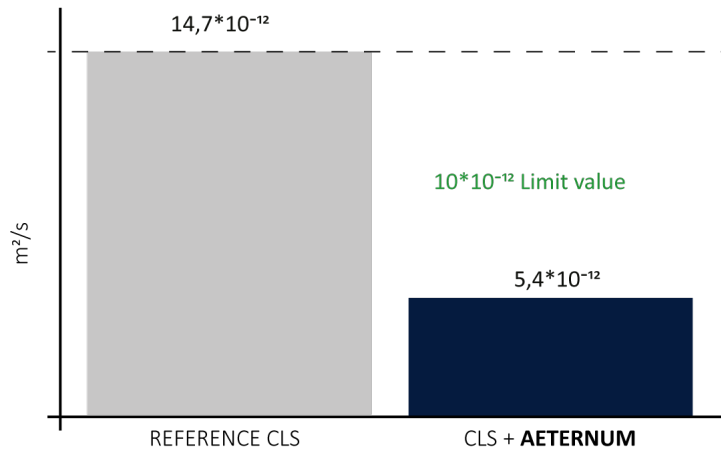
RESISTANCE TO FREEZING AND THAWING

The evidence is made through freezing and thawing of specimens of concrete, i.e. one face is placed in contact with deicing salts (CaCl₂). At the end of the different time cycles has been determined the loss of material dislodged from the surface of the specimen in contact with unfreezing salt.



The evaluation of "high frost resistance" highlights how the concrete with AETERNUM without any aerate agent (which lowers considerably the mechanical strength), indeed with a percentage of air below the 1%, is highly waterproof and resists well to freeze and thaw even in the presence of deicing salts. AETERNUM favours the creation a very compact cement matrix with consequent elimination of water permeability and capillary absorption, counteracting the deleterious effects of deicing salts. A concrete with AETERNUM, cause of no-absorbtion of water from the outside, has considerable resistance to frost and then to freeze-thaw cycles.

CHLORIDE MIGRATION COEFFICIENT

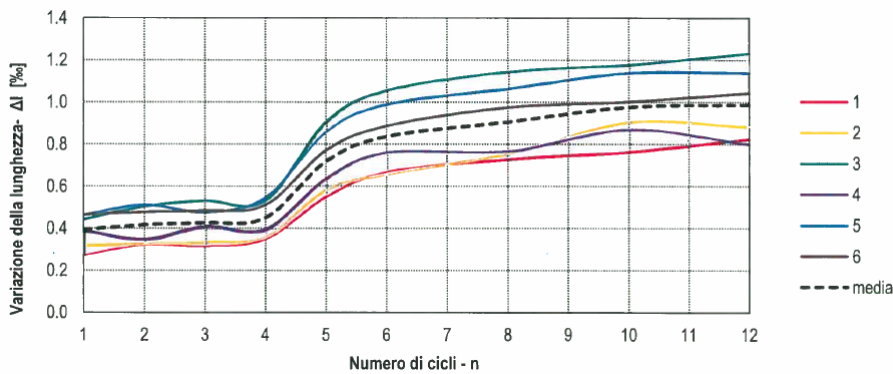


The average coefficient of chloride migration of probes should be $14,7 \cdot 10^{-12} \text{ m}^2/\text{s}$ (please note that the **allowed value** for a concrete with high resistance to migration of chloride is $10 \cdot 10^{-12} \text{ m}^2/\text{s}$).

This condition is possible to get just with a standard concrete with addition of AETERNUM: chloride migration coefficient in the mix design with **Aeternum** was much lower-approx $5,4 \cdot 10^{-12} \text{ m}^2/\text{s}$.

RESISTANCE TO SOLPHATE

It's determined by measuring the expansion of the specimen immersed in a highly concentrated sulphatic solution. Because a concrete immersed in a sulphatic solution and therefore subject to subsequent sulphatic reaction occur phenomena of swelling and surface delamination, the data demonstrate how a concrete with addition of AETERNUM does cope very effectively with swelling behaviour, with an average of swelling of 0.54% against a **limit value** permitted for an highly resistant concrete $\leq 1.2\%$.





ACCELERATED CARBONATION

The carbonation of concrete is due to penetration of CO₂ into the concrete matrix. CO₂ as reacting with free lime does lower the pH of the conglomerate favoring the process of corrosion of the steel reinforcement.

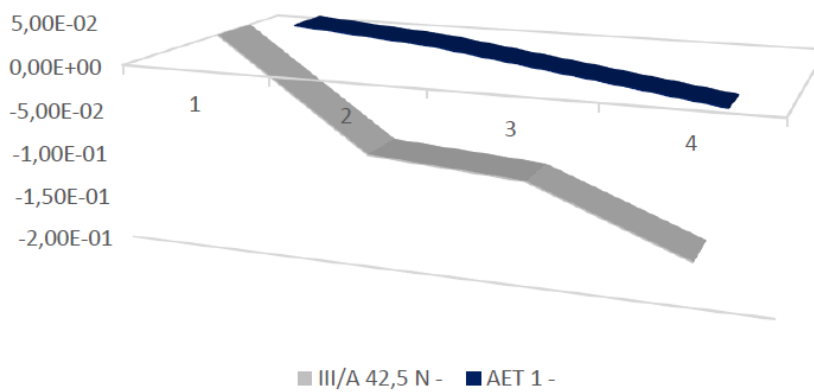
The image below shows the results after the stationing of specimens inside the room of carbonation.



HYDRAULIC SHRINKAGE

The concretes with AETERNUM guarantee a great compensation of hydraulic shrinkage.

Linear shrinkage - air maturation

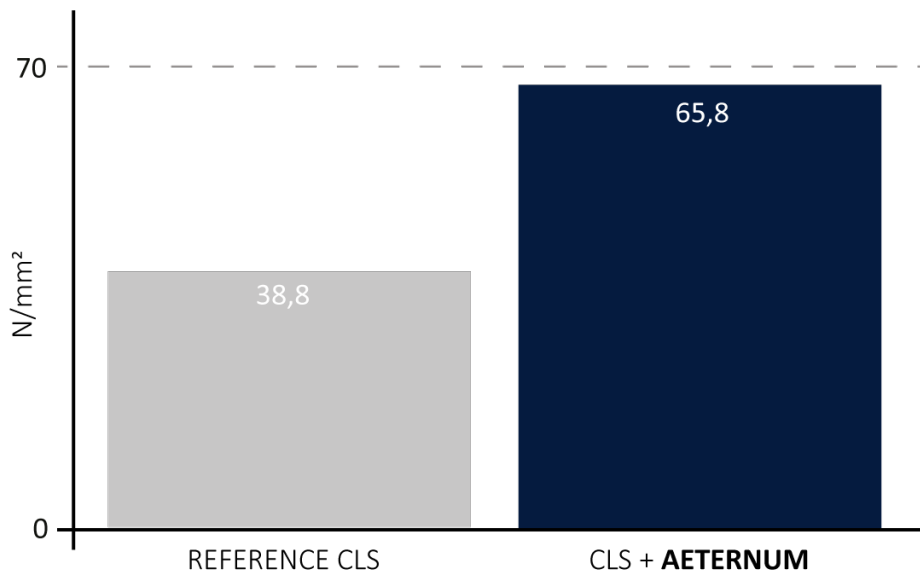




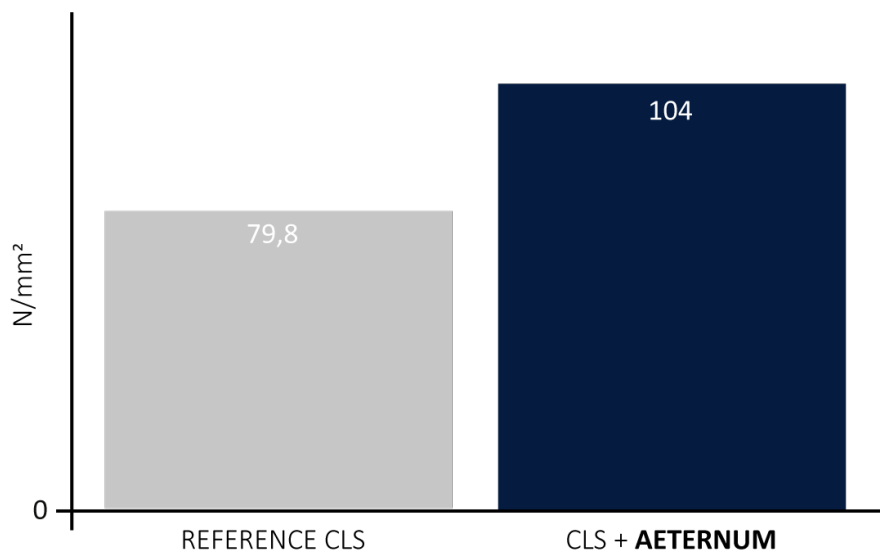
COMPRESSIVE STRENGTH

Comparative analysis between a standard concrete and a concrete added with Aeternum highlights excellent compressive strength with the use of AETERNUM.

Both in standard concrete



as well as in high-resistance concrete

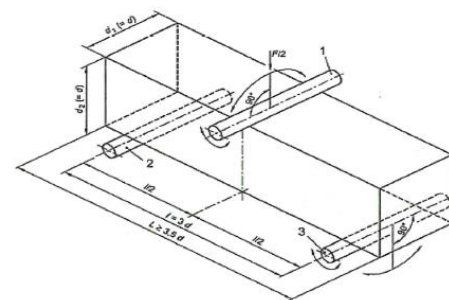
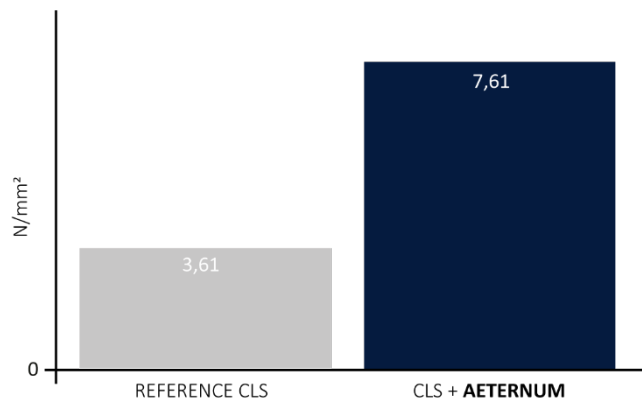




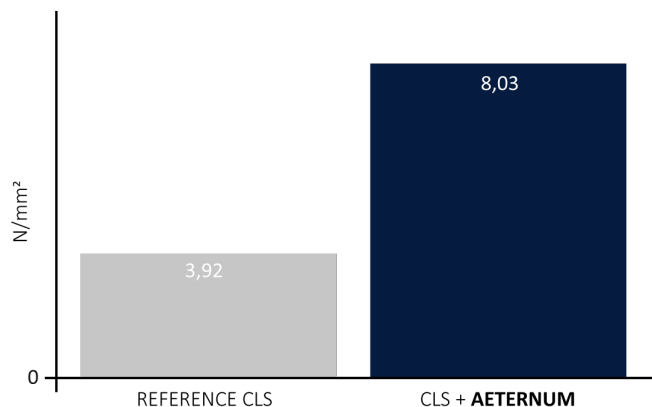
FLEXURAL STRENGTH

Tests performed with central load on the specimens by adding Aeternum show features of great flexural strength.

Both in standard concrete

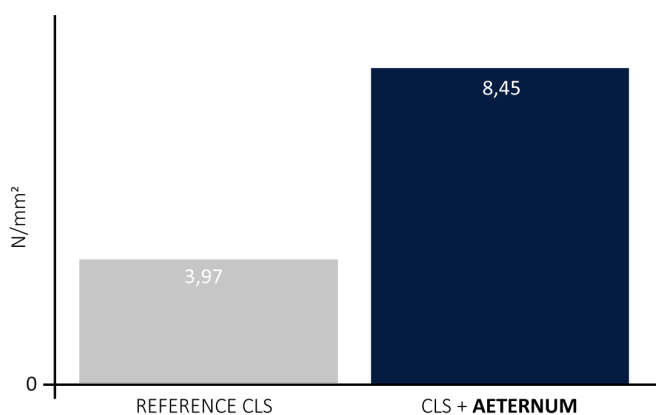


as well as in high-resistance concrete



TENSILE STRENGTH (INDIRECT)

The evidence made for the determination of tensile strength on the samples with adding Aeternum show characteristics of excellent tensile strength.





TECHNICAL FEATURES

Physical state	powder
Colour	silver
Particle size distribution	0-30 µm
Bulk density	400-600 g/dm ³
Solubility in water	insoluble
Ph	7 ± 1
Specific surface area	20-30 m ² /g

DOSAGE

The dosage of AETERNUM 1 SP is on average from 3 – 4% of the cement weight depending on the mixture and requested features.

We recommend as ideal dosage 3.5% on weight of cement.

Can be used different dosages by previous guidance tests.

CONCRETE AGING

The reactions in pozzolanic environment are quite long and occur in wet environment; for that reason a correct aging of mortar or concrete has requested in order to prevent too fast drying.

For this reason we recommend to protect the concrete pouring, during the first stage of hardening, with polyethylene membranes and later to apply on surfaces a film of TEKCURING or TEKNAPUR, which will avoid a rapid evaporation, allowing pozzolanic reaction correctly.

PACKAGING

Tanks

Big bags of 700-800 kg

Bags of 9 kg

STORAGE

AETERNUM 1 SP is valid for 12 months if stored in dry condition and in original bags firmly closed.

Moisture possibly adsorbed by the product does not affect the effectiveness, but makes the dosage as difficult and imprecise as well as a homogenous distribution in the mixture. We recommend to close the bags carefully following any single operation.

AETERNUM SP 1 is available in tanks, in big bags or sacks. The bulk product is delivered with the classics means and can be stored into normal cement silos and weighted by the equipment as present into the batching plants or by screw conveyor device for big bags.

WARNINGS

AETERNUM 1 SP is harmless for contact with the skin.

Please remove easily with water and soap from any surface.

Inhalation may cause a mild irritation of the respiratory system so it is advisable to use the proper dust mask.

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

LEGAL NOTES

The information contained in this leaflet, while representing the advanced knowledge, do not exempt the user from performing accurate preliminary tests in their conditions of employment and exercise. All responsibility for improper use of the product has been declined.



1305

TEKNA CHEM SPA

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1305 – CPD – 1146

EN 934-2

AETERNUM 1 SP

Highly effective / superplasticizer

water reducer T 3.1 / 3.2

Highest chlorides presence 0.1%

Highest alkalis presence 0.5%

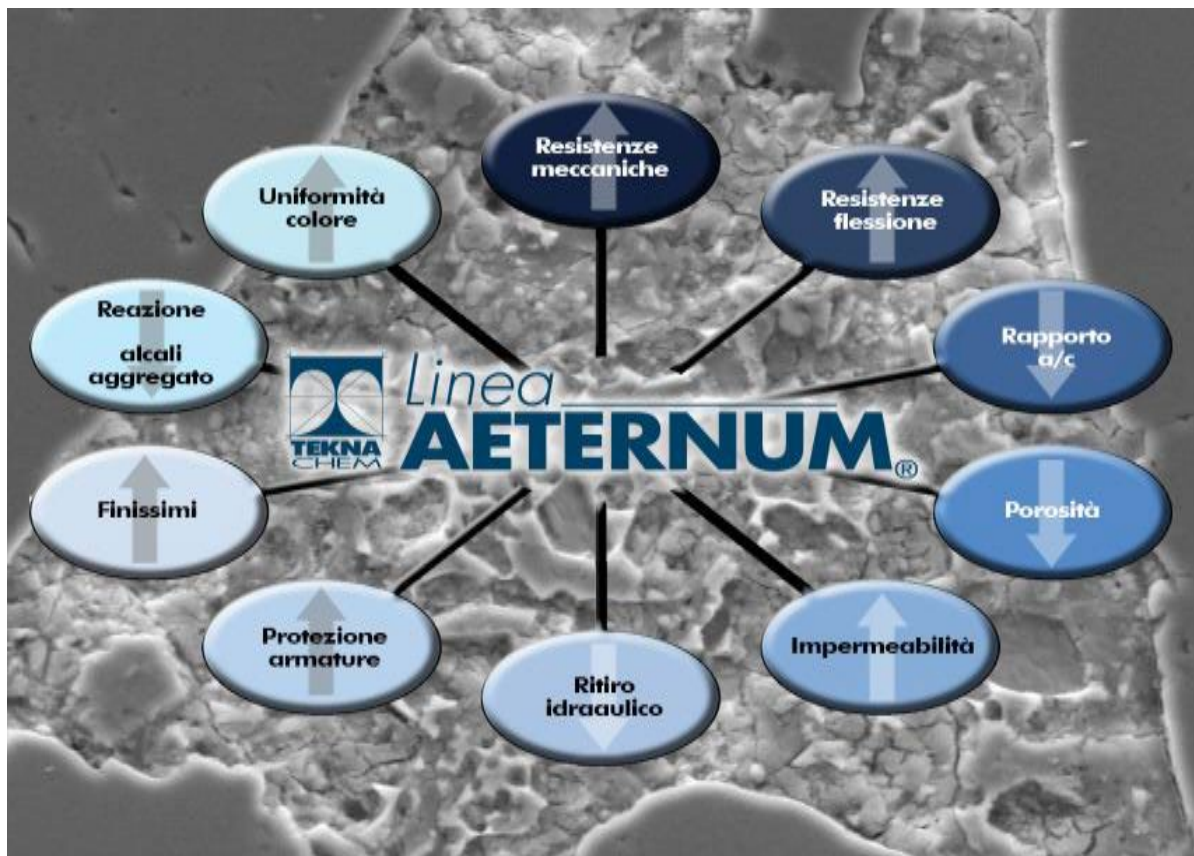
No dangerous substances



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