



Rev 1
06/22



AETERNUM 3

Highly effective reactive formulation for highly durable concrete and mortar (powdered reactive concrete, rpc)



DESCRIPTION

AETERNUM 3 is a new generation reactive powder adsorbed on active nanomicrosilicates that combines the high pozzolanic activity of the latter with extraordinary rheology, fluidity in the absence of segregation, impermeability and remarkable resistance to both mechanical compression and chemical and atmospheric aggression and, above all, extraordinary impermeability.

Ideal for hot climates as it has excellent handling properties.

GENERAL FEATURES

AETERNUM 3 consists of spherical particles of a few hundredths of a micron and therefore has a very high specific surface area: over 220,000 cm²/g (Blaine). This characteristic gives it a high dispersion and reactivity on cement granules and a great ability to capture and fix calcium hydrate [Ca(OH)₂] and to transform it first into hydrated silicate and then into stable and irreversible calcium silicate.

It must be said that in all mixtures containing cement, in order to obtain good workability, it is necessary to use a quantity of water that is always higher than that necessary for the hydration of the cement, which leads to the hardening of the cement paste and the formation of capillaries and cavities that are more numerous the greater the quantity of water used.

Despite its very high specific surface area, AETERNUM 3, also having a phase transfer inside, guarantees, without the use of additional superplasticizers, concretes of easy and good workability, without shrinkage and with superior and long-lasting final performance.

Due to the chemical conformation of AETERNUM 3, which accelerates the hydration of the cement, it is advisable for the summer season to carry out some initial qualifications.

AETERNUM 3, added to the mixture in a ratio of 2 to 4% of the weight of the cement, picks up and reacts with the free lime, filling the voids in the cement paste, making the conglomerate more compact, waterproof and resistant and therefore more durable over time and with a better appearance. When designed correctly, concrete with AETERNUM 3 appears to be completely impermeable, even to air.

This additive allows the conditioning of rheoplastic and rheodynamic SCC concretes with very low w/c ratios.

AREAS OF APPLICATION

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

AETERNUM 3 is used in the preparation of:

- Protective grouts - grouts for consolidation injections
- Expansive grout with compensated shrinkage
- mortars or concretes with high mechanical resistance
- high-impermeability mortars or concretes
- Chemically resistant prestressed concrete



Without Aeternum



With Aeternum



Very good machinability
in the absence of bleeding
with A/C Ratios
less than 0.45

FICHE TECHNIQUE



TEKNA CHEM S.p.A.

Établissement: Renate (MB) - Via Sirtori, z.i. 20838 - Tel. +39 0362.91.83.11

Web: www.teknachemgroup.com - E-mail: info@teknachemgroup.com - Fax: +39 0362.91.93.96

- concrete for slip-form;
- mortars or concretes for underwater applications
- Underwater applications, especially in aggressive environments
- Thixotropic mortars for restoration
- Non-shrinking, premixed and damp mortars

However, on all occasions where a higher quality mortar or concrete is required, for example:

- Mechanical resistance
- Chemical Resistance
- Resistance to wear and cavitation
- Total waterproofing, even in the air
- Stability and cohesion - compensated shrinkage
- overall duration.

AETERNUM 3 is also used to reduce bleeding in concrete, pumpable concrete and concrete with high mechanical and durability characteristics. AETERNUM 3 is also particularly suitable for concretes where the particle size distribution shows a clear lack of finish.

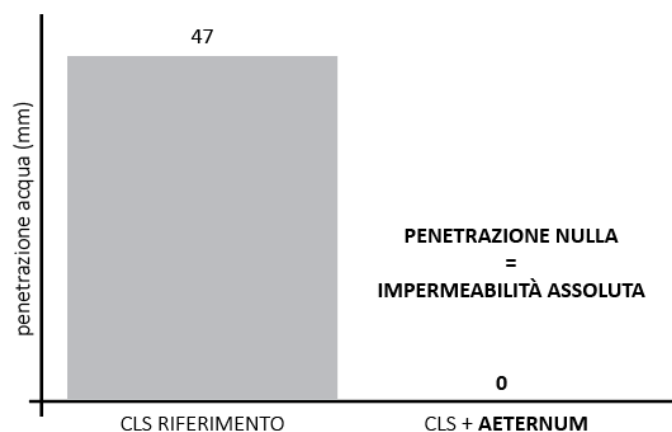
ADVANTAGES

AETERNUM 3, despite the very small particle size:

- it does not require the simultaneous use of superplasticizers, in fact thanks to these
- The use of superplasticizers makes it possible to produce self-compacting concretes with a very low water content;
- gives a greater workability of the concrete;
- facilitates pumping;
- guarantees high mechanical resistance without plastic shrinkage;
- guarantees the best visible surface and the best degree of finish;
- ensures greater waterproofing;
- It guarantees durability and therefore resistance to all classes of exposure.

DETERMINATION OF THE PENETRATION DEPTH OF PRESSURIZED WATER INTO CONCRETE

The test procedure was carried out in accordance with 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 of 47 mm was verified for the reference concrete, while the concrete with the addition of AETERNUM showed no water penetration.



Suitable for the packaging of concretes suitable for the containment of **DRINKING WATER**



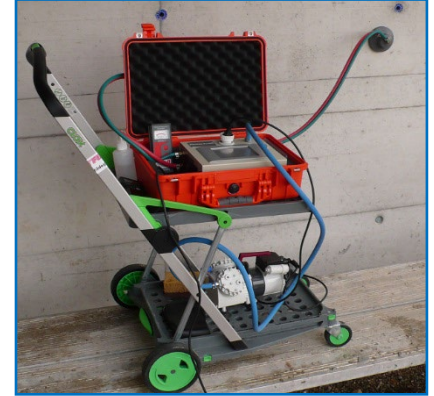
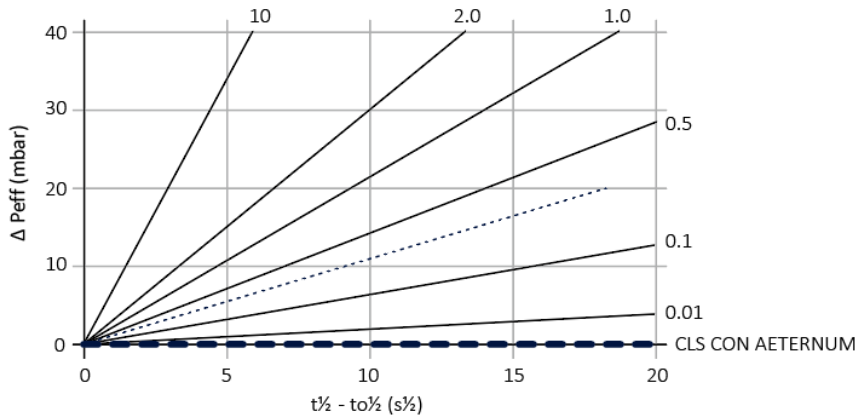
Cls without Aeternum with waterproofing additive



Cls with Aeternum

MEASURING THE AIR PERMEABILITY OF CONCRETE WITH AETERNUM

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



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

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

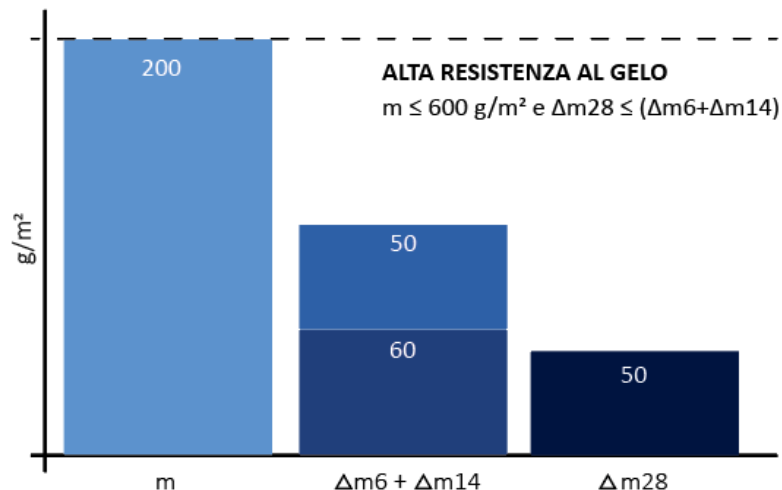
SURFACE	CLASS	Kt	DEPTH	PERMEABILITY	H2O PENETRATION
AETERNUM CUBE	PK1	< 0.01	< 5 MM	Very low	< 1 mm
CUBE COMPARISON	PK3/4	~ 1.0	~ 50 MM	Moderate/High	~ 35 mm

Permeability classes according to Permea-TORR™

Class	Coeff. kT (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

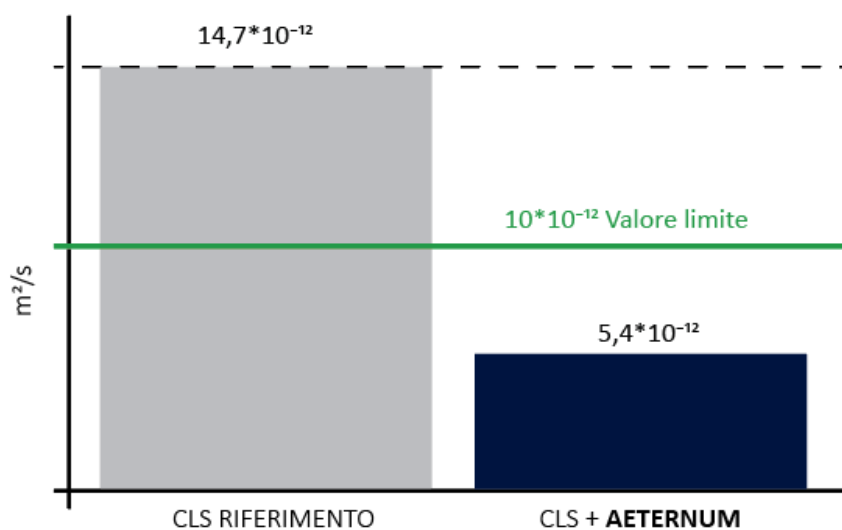
FROST RESISTANCE IN THE PRESENCE OF ANTIFREEZE SALTS

The tests are carried out by freezing and thawing cycles of concrete specimens, one side of which is placed in contact with de-icing salts (CaCl₂). 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 "High frost resistance" rating shows that concrete with AETERNUM, without any aerating agent (which significantly lowers the mechanical strength), or even with an air content of less than 1%, is highly impermeable and optimally resists freeze-thaw cycles even in the presence of de-icing salts. AETERNUM promotes the creation of a highly compacted cementitious matrix with consequent elimination of water permeability and capillary absorption, counteracting the deleterious effects of de-icing salts. Concrete with AETERNUM does not absorb water from the outside and therefore has no problems with resistance to frost and freeze-thaw cycles.

MIGRATION COEFFICIENT OF CHLORIDES



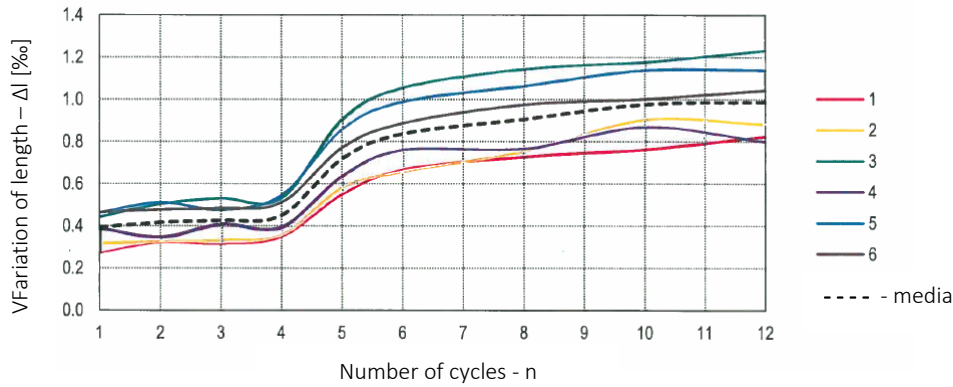
The average chloride migration coefficient of the reference probes is $14,7 \cdot 10^{-12} \text{ m}^2/\text{s}$ (it should be noted that the permissible limit value for a concrete that is highly resistant to chloride migration is $10 \cdot 10^{-12} \text{ m}^2/\text{s}$).

This condition can be achieved with a standard concrete with the addition of AETERNUM: the chloride migration coefficient in the test slurry with **Aeternum** was much lower - i.e. $5,4 \cdot 10^{-12} \text{ m}^2/\text{s}$ on average.



SULPHATE RESISTANCE

It is determined by measuring the expansion by expansion of samples immersed in a highly concentrated sulfate solution. Because concrete is immersed in a sulfate solution and then subject to the subsequent sulfate reaction, surface swelling and delamination occur. The data obtained show that concrete with AETERNUM counteracts expansion very effectively, obtaining an average sulphate expansion value Δl_s equal to 0.54 ‰ compared to the permissible limit value for high-strength calcs ≤ 1.2 ‰.



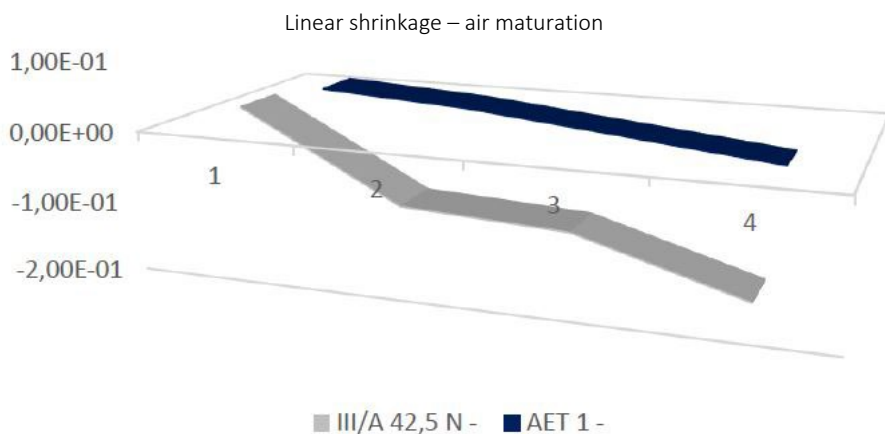
ACCELERATED CARBONATION

The carbonation of concrete is due to the penetration of CO₂ into the cement matrix. By reacting with the free lime in the cement, CO₂ lowers the pH of the conglomerate, thus aiding the corrosion process of the reinforcing bars.

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



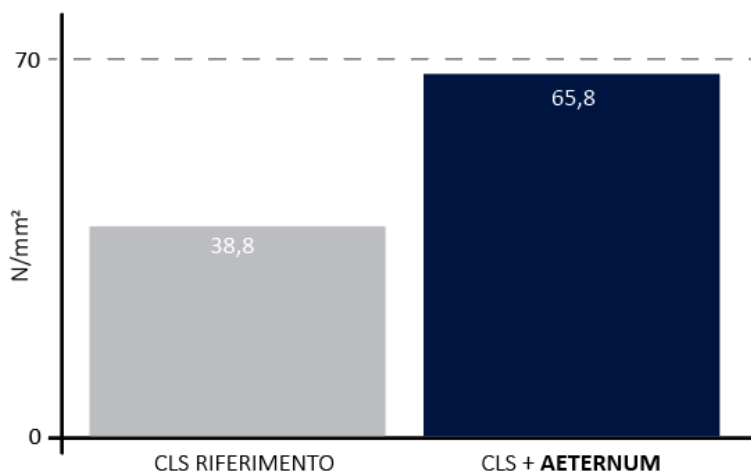
HYDRAULIC BACKLOG



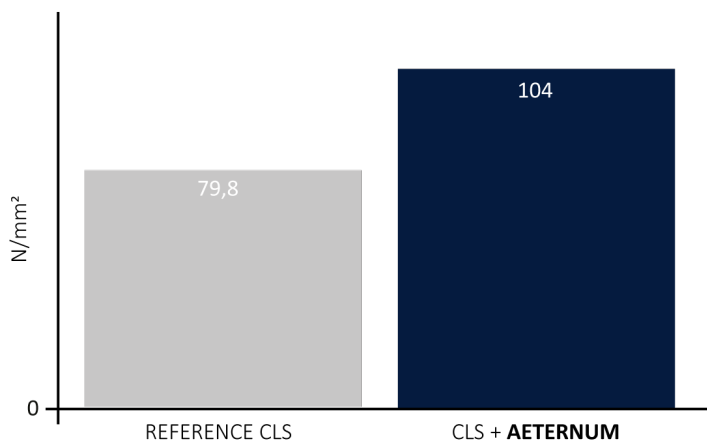
COMPRESSIVE STRENGTH

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 concretes:



and in high-strength concretes:

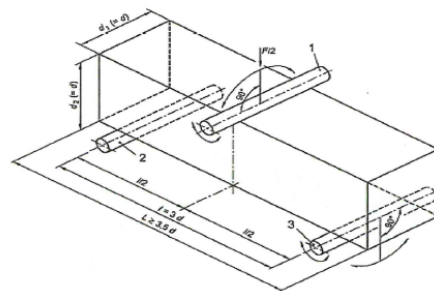
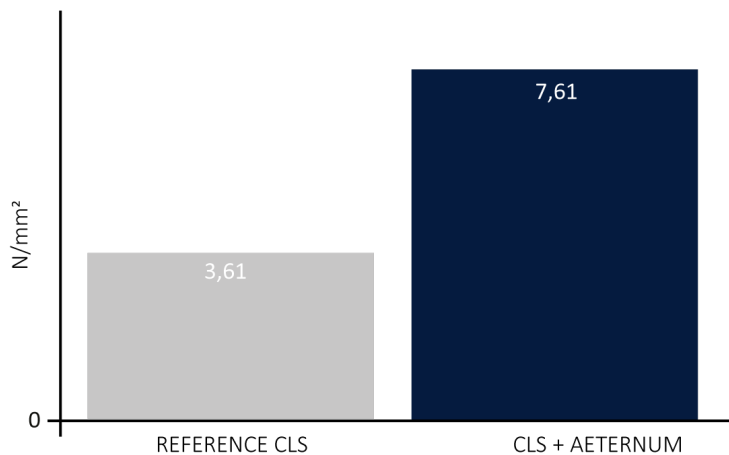




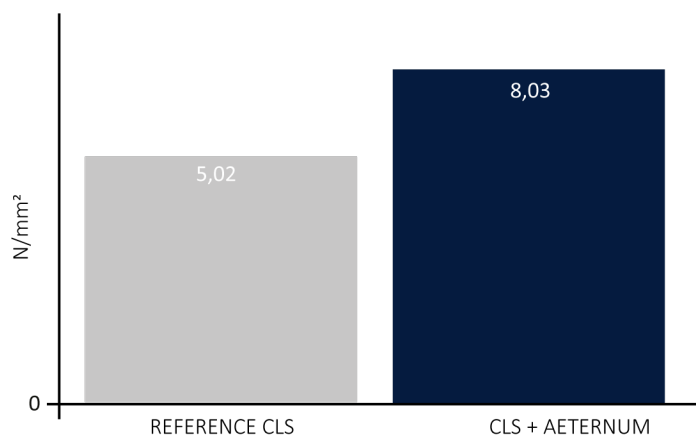
R BENDING EXISTENCE

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

Both in standard concretes:

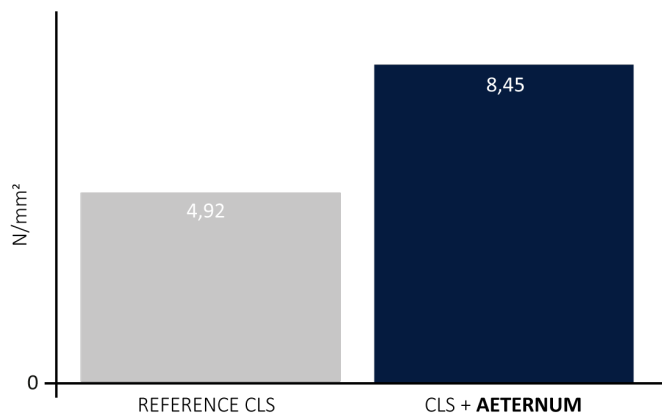


and in high-strength concretes:



INDIRECT TENSILE STRENGTH

Tests carried out with central load on specimens with the addition of Aeternum show physical-geometric characteristics indicating excellent tensile strength.





CARACTERISTIQUES TECHNIQUES

Physical Status	dust
Color	silvery
Particle size distribution	0-30 µm
Density in pile	400-600 g/dm ³
Solubility in water	Inulable
ph	7 ± 1
Specific Surface	20-30 m ² /g

DOSAGE

The dosage of AETERNUM 3 averages 2-4% by weight of the cement, depending on the mixture to be added and the desired characteristics.

However, an ideal dosage of between 3 and 3.3% by weight of the concrete is recommended. However, dosages other than these can be used and are recommended after preliminary orientation tests.

CONCRETE CURING

The reactions in the pozzolanic environment are quite long and take place in a humid environment; For this reason, proper curing of the mortar or concrete is required in order to avoid too rapid drying.

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

CONFECTIONS

Bulk in tanks
Big-bags from 600 - 700 kg
Bags 9 kg

STORAGE

AETERNUM 3, if stored in a dry place and in the original bags perfectly closed, is valid for 12 months. The moisture that may be adsorbed by the product does not affect its effectiveness, but it makes its dosage difficult and imprecise, as well as a homogeneous distribution in the finished mixture. It is therefore advisable to close the bags carefully after each withdrawal.

AETERNUM 3 is available in bulk, in big-bags or in bags. The bulk product is transported with classic torpedoes and can be stored in normal cement silos and dosed with the equipment of the batching plant or with a screw conveyor system for big-bags

WARNINGS/CAUTIONS

AETERNUM 3 is harmless in contact with the epidermis.

It can be easily removed with soap and water from any surface.

By inhalation it can cause a slight irritation of the upper respiratory tract so the use of a dust mask is recommended.

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

LEGAL

The information contained in this data sheet, although it represents the most advanced stage of knowledge, does not exempt the user from carrying out accurate preliminary tests in his own conditions of use and operation. We therefore decline any responsibility for improper use of the product.

CE

1305
TEKNA CHEM SPA
Via Sirtori z.i. 20838 Renate (MB)
Italie

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1305 – CPD – 1146
EN 934-2

AETERNUM 3

High Water Reducer Additive
efficacy / superplasticizer T 3.1 / 3.2
Max chloride content..... 0.1%
Max alkali content..... 0.1%
No hazardous substances