

Capacitors

Why Nitrogen (N2) insulation?

While the winding of any single-phase or three-phase capacitor is made with a metallised polypropylene film, there are 3 different possible types of materials for filling (insulation).

Viscous resin/oil and metallised paper are the 2 "classic" filling systems for single-phase and three-phase capacitors.

In any case, these insulation systems do not guarantee 100% that certain risks are avoided:

- **Air/moisture infiltration inside the cylinder, which is the main cause of capacitor breakage**
- **Flammability and fire propagation**
- **Failure to activate the overpressure device with consequent explosion (viscous resin type)**

Solutions?

Insulation using **Nitrogen gas (N2)**, usually used in our Three-phase Capacitors, has been the most reliable, safe and long-lasting technology, able to make up for the two main causes of failure.



Nitrogen Capacitors

The 7-step filling process

One of the main problems that needs solving in capacitor production processes is moisture.

It requires adequate attention during the filling phase, since the presence of moisture inside the cylinder substantially compromises the life of the capacitor.

With cylinder filling in Nitrogen Gas (N₂), possible air/humidity infiltration is entirely avoided, because Nitrogen is a “dry type” gas and therefore without moisture.

Nitrogen in fact is also used in other specific areas, for example for removing the same moisture from various conductors/pipes.

In addition, **Nitrogen is a non-flammable gas** and therefore the risk of a probable fire due to Capacitor failure is also eliminated.

These characteristics mean that the Capacitors are realized following an excellent quality standard already from the production process, which is then reflected in the application phase.

Step 7

Thanks to a special tracer gas, each individual capacitor is tested in conditions that far exceed the real leak conditions. We have not for the past 20 years have any reports in the field of moisture penetration or consequent loss of capacity.

Step 1

The windings (pre-assembled) are positioned in the cylinder.

Step 2

The (fixed) cover is positioned on the cylinder and wiring is inserted from the holes on the IP20 terminal.

Step 3

The capacitors are placed in the "drying chamber".

Step 4

2 terminals are welded, leaving only the central terminal open.

Step 5

The capacitors are filled with Nitrogen Gas (N₂) from the central terminal, which is immediately welded.

Step 6

The capacitors are placed in the “test room” to detect any possible gas leaks. The hermetic sealing is a measure that prevents leaks and testing checks the seal.



Nitrogen Capacitors

some values

Rated voltage (Uc): **from 230 to 800 V**

Rated frequency: **50 – 60 Hz**

Temperature: **- 40°C / D**

Insulation: **Nitrogen (N2)**

Execution: **Three-phase**

Discharge resistors **Included**

Dielectric loss: **< 0.2 W / Kvar**

Reference standards: **EN 60831 1-2 / UL N. 810**



Temperature class

Cat.	Max. environmental temperature		
	Max.	Average 24h	Average 365 days
B	45°	35°	25°
C	50°	40°	30°
D	55°	45°	35°
60°	60°	50°	40°

Overvoltage

Uc	Hz	Uc Max					
		24 h	8 h	30 min	5 min	1 min	Peak
440 V	50/60	440 V	490 V	510 V	530 V	575 V	1350 V
480 V		480 V	530 V	560 V	580 V	625 V	1450 V
525 V		525 V	580 V	600 V	630 V	680 V	1600 V

Overcurrent

The overcurrent value cannot be generalised only in a similar way for all Capacitors

The max overcurrent of TELEGROUP Capacitors (not including the test value which arrive up to 10 In) are from **1.5 to 3 In**

Nitrogen Capacitors

a benefit for those who design, realize and install.

Nitrogen Capacitors

Resin/Oil Capacitors

Moisture risk	ZERO	Nitrogen is a moisture-free gas; therefore, the risk of a possible infiltration of air, which would generate electric shocks, is entirely avoided.	HIGH	Because of their properties, resin, oil or other viscous materials never avoid the risk of possible infiltration of air (moisture) inside the cylinder. In fact, the life of these Capacitors is around 95% less than that of Nitrogen Capacitors.
Mean life expectancy	> 150.00 hours	Three-phase Capacitors with Nitrogen insulation (N ₂) currently represent the best construction technology in terms of quality, safety, reliability and durability. The expected life is in fact double compared to the Resin/Oil insulated Capacitors thanks to the properties of the nitrogen.	< 80.00 hours	This value gets even worse in the case of Capacitors with Single-phase technology. In fact, adding the type of insulation to the archaic and dangerous single-phase technology and to production processes that are not always technologically advanced, the result is a drastic reduction in the life of the Capacitors.
In case of failure	NO fire	It is not possible to speak of "explosions" in the case of Nitrogen capacitors. In fact, in case of failure, the Nitrogen would escape from the cylinder through venting, without impregnating the other components of the system or spreading any fire.	Fire hazard	Regardless of three-phase or single-phase technology, in case of failure the explosion of a Resin, oil or other viscous material Capacitor would involve a risk of fire, possible propagation of the flame and damage to most of the components.
Flammability	ZERO	Nitrogen is not a flammable Gas.	HIGH	Resin, oil and other viscous materials are flammable by nature.
Fire hazard	ZERO	Nitrogen does not propagate flames.	HIGH	Due to the characteristics described above
Assembly	Vertical / Horizontal	Thanks to the properties of Nitrogen, these Capacitors can be installed in both vertical and horizontal positions.	Vertical	Risk of dispersion of the insulating material
Ecology	TOTAL	The disposal of a Capacitor with Nitrogen insulation is comparable to the disposal of a can.	Depends on the type of insulation	Depends on the type of insulation
Toxicity	ZERO		Depends on the type of insulation	Depends on the type of insulation

Nitrogen Capacitors

the results have rewarded our choice

TELEGROUP was the first company in Italy to fully commit to three-phase technology, abandoning the single-phase type, and to the type of capacitors filled with nitrogen gas (N₂).

Approximately 13 years have passed since TELEGROUP first used Capacitors with nitrogen insulation. Thanks to excellent results and customer satisfaction, we decided after a trial period of about 4 years to develop an entire range with all the standard and Detuned series, using this Capacitor technology.

This choice has proved to be profitable and satisfactory over the years, especially for critical applications
Automotive Industry, Ceramics Industry, Plastics Industry, Cements, Oil & Gas, Food & Beverage, etc.

Some numbers

kVAR realized since 2003

6 million

Faults

0.00001 %

Standard warranty

24 months

Who has chosen it

