TELEGROUP

Your reliable Partner for PFC Systems
and Harmonic Filtering

LV POWER FACTOR CORRECTION HARMONIC FILTERING

Brochure 2018 - 2019

About Us

Established in the mid-80s, TELEGROUP was born from an idea by Fabiano Bagnoli, still today Managing and Technical Director of the Company. At that time, he was already founder of a well-known electrical installation company in the Chianti hills, more precisely in Sambuca, a worldwide symbol of history, art and culture.

From the start, TELEGROUP has been focusing its activity on the development, production and marketing of Low-voltage Power Factor Correction systems, which still represent the core business of the Company.

In just a few short years, thanks to the business strategy which was entirely concentrated on extremely high quality products, TELEGROUP successfully established itself in the Italian market as a synonym of reliability.

The will and perseverance within the Company to continually insist on quality has over the years been rewarded with numerous supplies to Italian and international end customers, leaders in their sectors who have chosen and have entrusted TELEGROUP with the development and implementation of LV PFC Systems for their plants.

Today, after thirty years of operations, TELEGROUP remains a dynamic, innovative company on the Italian and International electrical stage, with a Distribution Network able to cover over 40 countries worldwide.

OVER
30 YEARS
OF EXPERIENCE

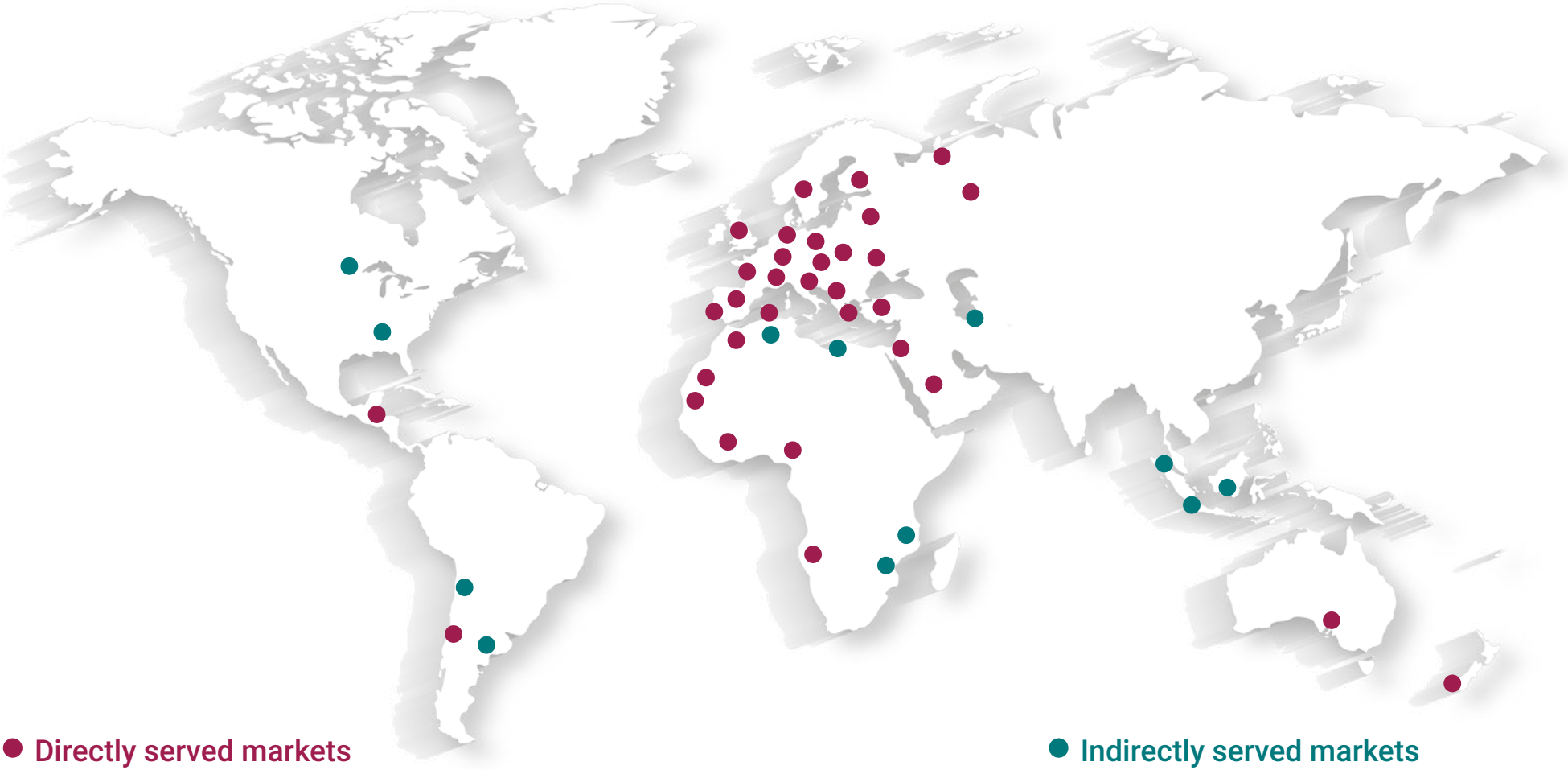
QUALITY
PRODUCTS

OVER
40 COUNTRIES
SERVED WORLDWIDE

International Presence

Our quality on the market

Thanks to its widespread distribution network, which includes 16 Agencies in Italy and over 25 partners abroad, TELEGROUP boasts the installation of its products in over 40 countries worldwide.



Directly served markets

Albania, Austria, Australia, Angola, Saudi Arabia, Bulgaria, Chile, Costa Rica, Croatia, Estonia, France, England, Ireland, Northern Ireland, Germany, Ghana, Jordan, Greece, Lebanon, Malta, Morocco, Mauritania, Mexico, Nigeria, Poland, Portugal, Romania, Serbia, Spain, Switzerland, Sweden, Turkey, Tunisia.

Indirectly served markets

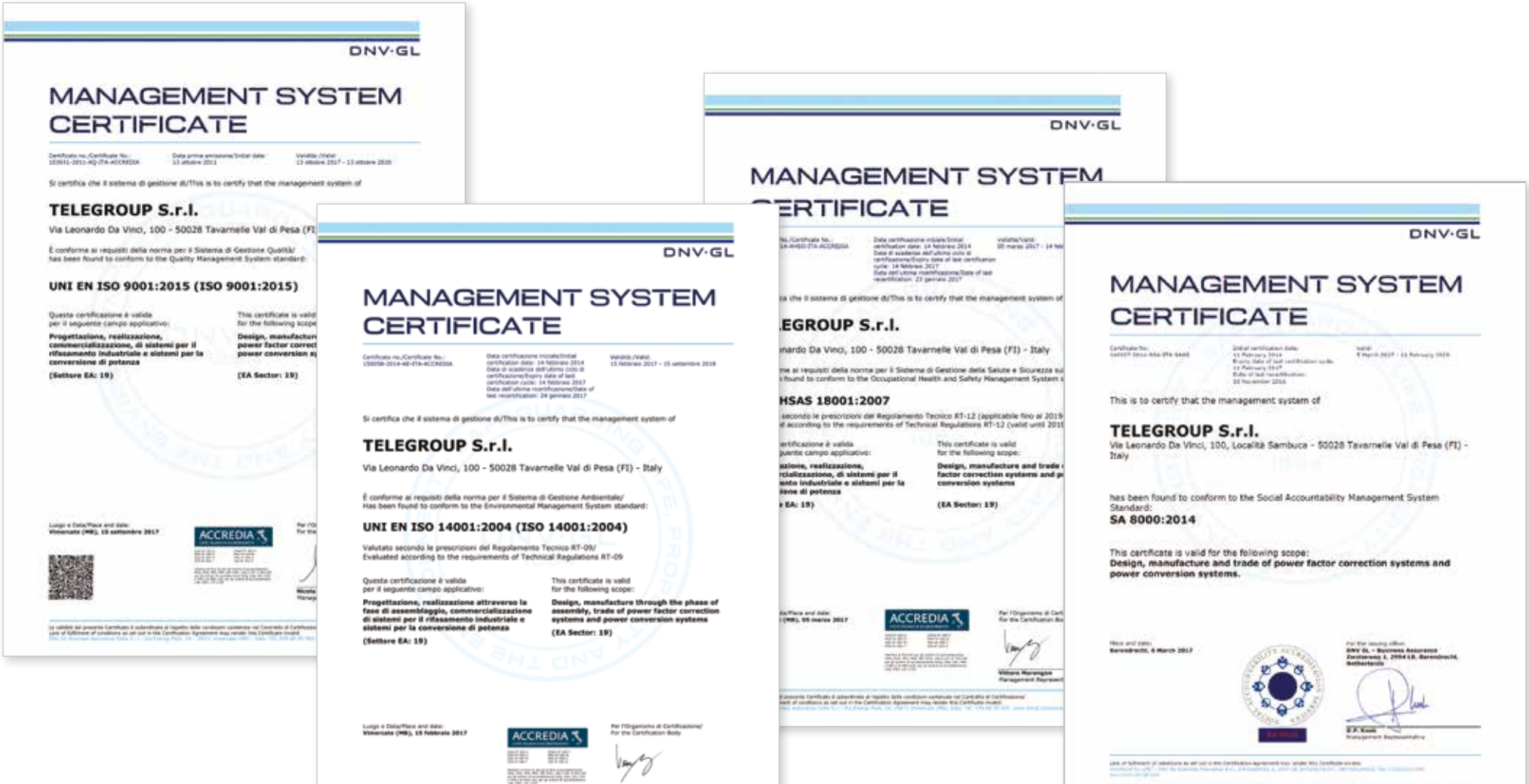
Algeria, Argentina, Egypt, Ethiopia, Indonesia, Iran, Iraq, Kenya, Peru, Russia, Singapore, USA.

Quality

Company certifications

TELEGROUP is a company certified in accordance with ISO 9001:2015, ISO 14001:2004, BS OHSAS 18001:2007, SA 8000:2014, issued by DNV, one of the most accredited certification bodies in the world.

All company processes, from design and procurement to production and testing up to sales and service, have been certified according to regulations and therefore represent further proof of the quality TELEGROUP process.



Product certifications

Following its internationalisation policy, TELEGROUP has over the years acquired multiple product certifications in order to meet the demanding requirements of foreign markets.

All products are designed and manufactured in compliance with international reference standards and, in particular, the entire TELEGROUP range of power factor correction systems is in compliance with:

EN 61921 EN 61439-1 IEC 60831-1 IEC 60831-2 EN 61642 EN 61000

TELEGROUP has carried out all the types of tests required by the KEMA laboratories for its low voltage power factor correction systems and in particular:

IEC 61439-1 par. 10.10 - required by TELEGROUP - Verification of resistance in a critical environment, **environmental temperature 52°C**.

IEC 61439-1 par. 10.11 - Verification of the resistance to short-circuit withstand current - 50 kA for 1 second - direct on busbars system, **not conditioned by a short-circuit protection device**.

DNV·GL

KEMA REPORT OF PERFORMANCE

5189-16

Object	400 kVAR power factor correction LV panel
Type	LV APFC PANEL Serial No. TLFG48400/1
	400 V - 1000 A - 50 kA - 50 Hz
Client	Telegroup S.r.l., Via Leonardo da Vinci 100, Tavarnelle Val di Pesa (FI), Italy
Manufacturer	Telegroup S.r.l., Via Leonardo da Vinci 100, Tavarnelle Val di Pesa (FI), Italy
Tested by	KEMA Laboratories Prague, Zkušebnictví, a.s., Podnikatelská 547, Prague 9, the Czech Republic
Date of tests	25 October 2016
Test specification	The tests have been carried out in accordance with IEC 61439-1:2011, subclause 10.11.5.3.3 (STC).
Summary and conclusion	The object has complied with the relevant requirements of the standard.

GOST CERTIFICATION

Certification acquired in 2012 for the entire range of products needed for export to the Russian market.

UL CERTIFICATION

Certification acquired on multiple occasions for the export of power factor correction systems in the American market.

CERTIFICATE OF CONFORMITY (SASO)

Acquired in 2015 for the power factor correction range, necessary for export to Saudi Arabia.

Services

Special solutions

In addition to its standard product range, TELEGROUP designs and manufactures power factor correction systems with voltages from 230 V to 800 V, 50 and 60 Hz, according to customer specifications.

Network analysis

TELEGROUP makes use of its technicians and advanced technology equipment to carry out inspections and network analysis, especially in the most critical applications and subject to a greater presence of harmonic phenomena.

Technical seminars

For years, technical meetings in collaboration with professional associations both in Italy and abroad have represented a key step in our activity.

Commissioning

Assistance in panel start-ups, verification of current transformer positioning, illustration of Controller functions.

Checking Electrical Bills

Verification of electricity consumption and penalties for excessive consumption of Reactive Energy imposed by Energy Distributors.

References

Ceramics, Plastics, Automotive, Paper Industry, Telecommunications, Service Sectors

Marazzi Group
Italy, USA // Ceramics industry
Realization of tailor-made Automatic Power Factor Correction systems, equipped with three-phase Capacitors in Nitrogen Gas and Filter Reactors
Total 18,000 kVAr

FCA (2014-2018)
Italy // Automotive industry
Realization of tailor-made Automatic Power Factor Correction systems, equipped with Thyristor modules, three-phase Capacitors in Nitrogen Gas and Filter Reactors
Total 5,000 kVAr

APM Terminals Moin (2016)
Costa Rica // Port terminal
Realization of tailor-made 480 V 60 Hz, Icw 65 kA 1s Automatic Power Factor Correction systems equipped with three-phase Capacitors in Nitrogen Gas
Total 9,000 kVAr

Alcantara (2017)
Italy // Textile industry
Realization of tailor-made Automatic Power Factor Correction systems, equipped with Thyristor modules, three-phase Capacitors in Nitrogen Gas and Filter Reactors
Total 8,000 kVAr

Jordan Petroleum Refinery (2013 e 2018)
Jordan // Oil & Gas
Realization of tailor-made Automatic Power Factor Correction systems, equipped with Thyristor modules, three-phase Capacitors in Nitrogen Gas and Filter Reactors
Total 3,000 kVAr

Amazon Logistic centers (2017 e 2018)
Italy // Large-scale retail
Realization of Automatic Power Factor Correction systems with Contactors and Three-phase Capacitors in Oil
Total 7,000 kVAr

NCIC (2017)
Egypt // Chemical industry
Realization of tailor-made Automatic Power Factor Correction systems, equipped with Thyristor modules, three-phase Capacitors in Nitrogen Gas and Filter Reactors
Total 4,000 kVAr





Reactive Energy penalties

Almost in all Countries worldwide, the Electric Utilities charge end users for excessive consumption of reactive energy, or Cos φ.
There are many regulation since every Country imposes to respect its target P.F. (usually not less 0,90 but in some areas it's required up to 0,98)

Which are the users under risk of penalties?

The reactive energy penalties are charged to applications with a minimum available power of «X» kW. For example in Italy start from 16,5 kW, while in others areas from 30 kW, or 50 kW until 1 MW; it depends from the regulation of each Utility.

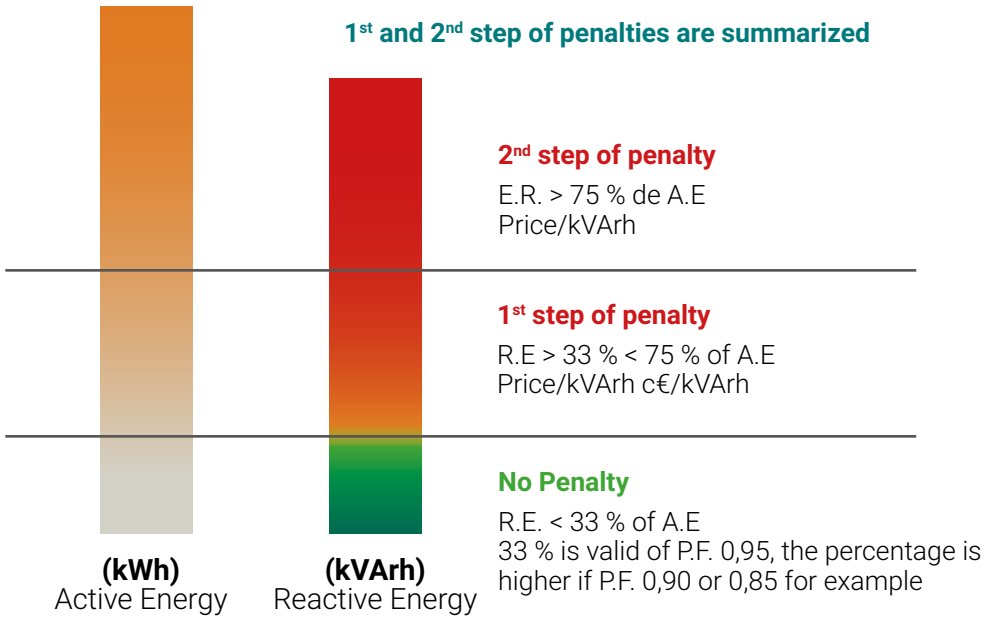
How much it costs?

The costs of penalties depends about the value of P.F. and the method appiedò from the Utility for the calculation. In Europe, the Utilities charge end users mainly with a fix price for each excessive kVArh consumed, compared to kWh consumption. In Africa, Asia ans South America, even if with different methods, the calculation is approximately the same, while in USA and Oceania are charged the extra kVA compared to kW.

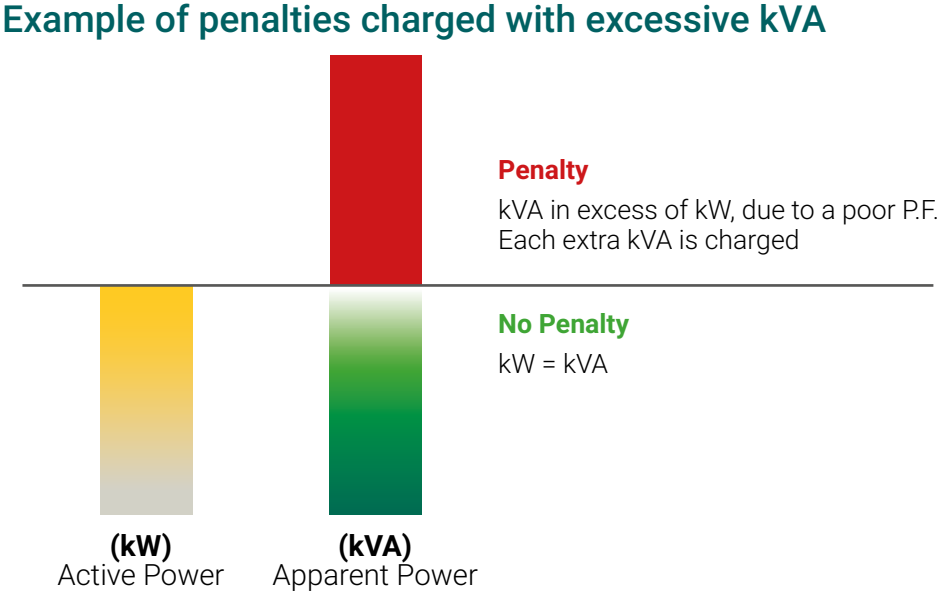
Which is the payback of a PFC?

The standard payback in major cases is inside the 12-18 months after PFC installation and not over 24 months.

Example of penalties charged with excessive kVArh



Example of penalties charged with excessive kVA



Benefits for Cos φ > 0.95

COST

Reduced energy costs

The installation of a power factor correction system inside a plant allows for immediate cancellation of the penalties for low Cos φ imposed by Energy Distributors.

EFFICIENCY

Plant efficiency

- ✔ Correcting the power factor from Cos φ=0.7 to Cos φ=0.98 reduces both the apparent power and the current by 40%, thus:
- ✔ 1) Extending the life of machines and components
- ✔ 2) Reducing Joule Losses (kW) on Generators, Transformers, Cables and Protection Equipment
- ✔ Thus, with power factor correction that is part of the energy efficiency measures of CEI 64-8 / 8-1, significant savings are also achieved on Active Energy.

QUALITY

Energy quality

The increase of the power factor with the consequent decrease of the current reduces voltage drops. Correcting the power factor and therefore reducing the current value with which electric transformers are charged, one moves away from saturation and therefore from operation in a non-linear zone, with a consequent reduction in the emission of harmonics.

POWER

Increased Active Power (kW) supplied by Generators and Transformers

The increased power factor also determines an increase of the Active Power (kW) available to Generator and Transformer terminals, since these machines, exempted from the burden of producing reactive power, can at minimum deliver as much active power as is their apparent power (kVA) by means of power correction.

Capacitors

Why Nitrogen Gas insulation?

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

Viscous resin/oil and bimetallised paper are the "classic" filling systems for single-phase and three-phase capacitors.
The aforementioned filling systems do not guarantee against:

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

Solutions?

Nitrogen gas (N2) filling, used in our Three-phase Capacitors, has been for the past 20 years been the most reliable, safe and long-lasting technology.

Nitrogen gas (N2) capacitors have been tested and approved by renowned certification bodies and are currently marketed and sold successfully all over the world.

It should however be noted that technical competence and know-how are the only key factors to guaranteeing a safe and reliable product.

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 constructed following an excellent quality standard already from the production process, which is then reflected in the application phase.

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.

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.

Automatic Power Factor Correction Systems

Configuration

Transformer

for separating auxiliary circuits from power circuits.

Automatic PFC Controller

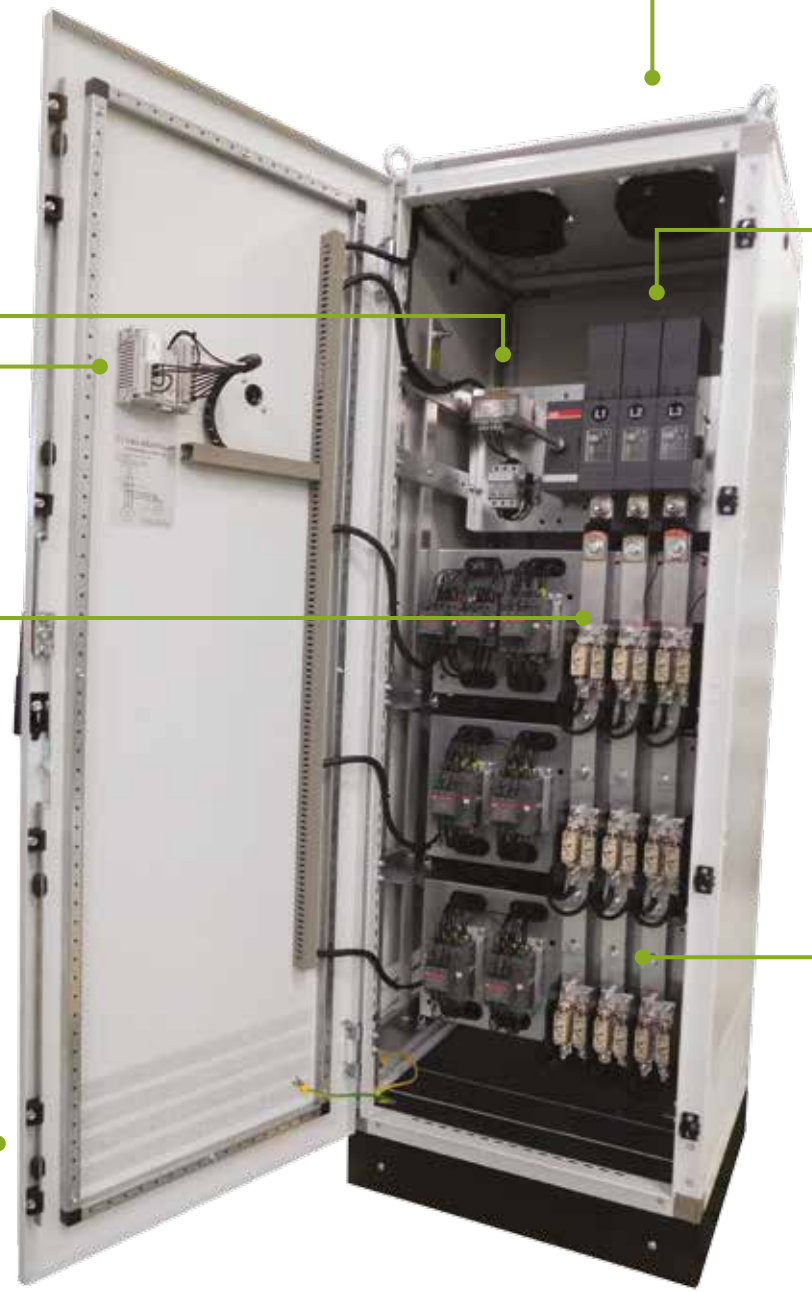
automatic Microprocessor with LCD display in 6 languages (PCRL) and 10 languages (PCRJ) for the insertion of capacitor banks.
Modbus protocol and remote control via RS232 and RS485 Serial Ports or Ethernet.

Busbar system

constructed through aluminium busbar system (copper or tinned copper upon request) and 50 kA resistance for 1 s. PFCs with short-circuit resistance over 65 kA or also 80 kA for 1 s are available upon request.

Metal enclosure

painted with epossidic dust paint, standard external degree of protection IP31 (others up to IP54 upon request), internal degree of protection IP00 (IP20 with doors open on live parts).



Ventilation System

Natural or Forced depending on powers and types. Forced Ventilation is achieved through one or more fans and thermostat or, in the case of an IP54 degree of protection, through a Suction Tower (IP54 Extractor).

Switch Disconnector Device

Three-Pole Switch Disconnector with door Interlock sized 1.5 times the nominal current of the Board.
Switch Disconnectors with Fuses or MCCB can be installed upon request.

Modular Racks

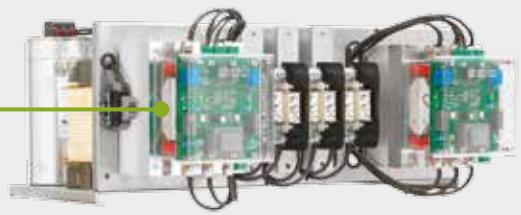
The entire range of Automatic systems (not including powers up to 75 kVAr in the R40, R46 and G44 series) is made with a modular system that provides extractable racks connected in DIN rails.

Three-phase Capacitors with Oil or Nitrogen Gas (N2) insulation, depending on types.

Filter Reactors (if required)
made of a core of oriented crystal metal plate, complete with thermal probe.
Tuning freq. (134 Hz. 189 Hz, 210 Hz)

Three-Pole Contactors or Thyristor Modules

Protection fuses
NH00 100 kA



LV Power Factor Correction Systems

Solutions with Nitrogen (N2) Capacitors

g Series

After more than 15 years from the first use, power factor correction systems equipped with three-phase Capacitors and Nitrogen Gas (N2) insulation still today represent the core business of TELEGROUP.

The high quality and reliability of this technology have provided a decisive push for the creation of a whole range of products, from standard boards for small and medium users to large power modular systems for the energy-intensive industries.

kVAr produced since 2003
5.2 million

Capacitor faults
0.00001 %

Standard warranty
on Capacitors
24 months

Standard Automatic PFC systems

G44, **G48** Series
Automatic systems for applications with medium harmonic content (THDi max 25%). Powers from 12.5 to 750 kVAr, Three-phase Nitrogen capacitors with voltage 440 V (G44) and 480 V (G48)

Our capacitors can withstand the most severe work cycles (up to 30-35% of harmonic load in plants). That said, more than 20-25% of harmonic content could trigger parallel resonance phenomena between the Plant and the Power Factor Correction System with consequent stresses beyond the regulatory levels in both voltage and current. In these conditions, it is essential to use a Filter Reactor (CEI EN 61642).

Automatic Systems with Filter Reactors

G48Filter Series
Automatic systems with 189 Hz (134 Hz upon request) Filter Reactors for applications with a high harmonic content in voltage and current to avoid the triggering of dangerous parallel resonance phenomena.
Powers from 18 to 750 kVAr (or higher powers upon request), Three-phase Capacitors in Nitrogen Gas with 480 V voltage and insertions through contactors. All panels are made with a modular system with 50 kA busbar system.

G48Filter-T Series
This range of panels has the same characteristics of the G48Filter Series, differentiating from it only for the Capacitor bank insertion type, which occurs through Thyristor Modules. The use of Static modules is essential for types of load such as welding machines, sharpeners, rewinders and hydraulic presses, which cannot accept an insertion time of more than one second.

Fix PFC Systems

G44Fix, **G48fFilter-Fix** Series
Fix panels for vacuum power factor correction on MV/LV Transformers on Asynchronous motors. The G48FilterFix series is equipped with 189 Hz Filter Reactors.

Modular Racks

G44Rack, **G48fFilterRack**, **G48fFilterRack-T** Series
Modular Racks for the realization of Automatic systems, equipped with 50 kA busbar system, protection fuses, contactors or thyristors, 189 Hz filter reactors for the "detuned" series.
Optimal solution for the integration of the power factor correction bank inside low voltage panels.

LV Power Factor Correction Systems

Solutions with Three-phase Oil Capacitors

r Series

Parallel to the Nitrogen Capacitor range, TELEGROUP proposes the same solutions using three-phase capacitors with oil insulation. Although it does not have the same properties as nitrogen, this type is certainly the best known and also our company has used this type since its inception with excellent results.
The wide range of types and powers allows for installation of the R Series boards both in small and medium users and in the most critical industrial applications.

Standard Automatic PFC Systems

R40, **R46** Series
Automatic systems for applications with medium harmonic content (THDi max 15 - 19 %). Powers from 12.5 to 750 kVAr, Three-phase Oil capacitors with voltage 440 V (R40) and 460 V (R46)

Automatic Systems with Filter Reactors

R48Filter Series
Automatic systems with 189 Hz (134 Hz upon request) Filter Reactors for applications with both a high harmonic content in voltage and at risk of Resonance.
Powers from 18 to 750 kVAr, Three-phase Oil capacitors with voltage 480 V and insertions through contactors. All panels are made with a modular system with 50 kA busbar system.

Fix PFC Systems

R46Fix, **R48fFilter-Fix** Series
Fix panels for vacuum power factor correction on MV/LV Transformers on Asynchronous motors. The R48FilterFix series is equipped with 189 Hz Filter Reactors.

Modular Racks

R40Rack, **R46Rack**, **R48fFilterRack** series
Modular Racks for the realization of Automatic systems, equipped with 50 kA busbar system, protection fuses, contactors or thyristors, 189 Hz filter reactors for the "detuned" series.
Optimal solution for the integration of the power factor correction bank inside low voltage panels.

Thyristor Modules

Thanks to the positive experiences gained with the use of this component, TELEGROUP decided to conduct thorough research and development, which led to the total internal production of Thyristor Modules.

This has allowed the company to obtain highly prestigious know-how, complete control over production steps and greater flexibility and competitiveness that drastically reduce the economic gap between insertion to Contactors and insertion to Thyristors.

Why Thyristor modules?

There are applications within Heavy Industry which, due to their operating cycle, tend to vary the load diagram in such a short time (from 1 to 5 seconds) and in some cases to such a high current peak (up to 20 In) that no contactor is able to follow and above all endure operation over time without becoming damaged.

The above conditions therefore require the use of Thyristor Modules for the insertion of Capacitor banks.

Advantages

- Capacitor bank insertion in times that can be estimated in milliseconds
- Increased Capacitor life
- Unlimited number of cycles

Applications

- Industrial welding machines
- Robotics
- Hydraulic presses
- Automotive systems

Automatic PFC Controller

In an Automatic Power Factor Correction System, the PFC Controller is, along with Capacitors, the essential element for the management and control of all the components.

Designed with advanced features, they combine a modern design with practical and intuitive functionalities.
Backlit LCD display with icons, alarm codes with scrolling texts, can be set in 6 languages (PCRL) and 10 languages (PCRJ).

Operation on 4 quadrants for cogeneration systems, drastic reduction in the number of switching, homogeneous use of equal power capacitor banks, reactive power measurement installed for each step, capacitor overcurrent protection, board over temperature protection by internal sensor, protection against micro breaks, wide range of available measurements, including voltage and current THD with analysis of the individual harmonics up to the 15th order.

KEY FEATURES

- Microprocessor control and management
- Intelligent auto adjustment
- Versions from 2 to 24 steps and up to 32 with Master-Slave function
- Versions with static outputs (PCRJ)
- Use in cogeneration and medium voltage plants
- USB, RS485, RS232, Ethernet communication interfaces Modbus RTU, ASCII e TCP communication protocols PROFIBUS communication protocol by adding an appropriate expansion module

Harmonics in Electrical Networks

If in the past it may not have been necessary to carry out evaluations regarding the presence of harmonics in user plants, today the situation has totally changed.

The massive and increasing introduction of non-linear discrete spectrum loads (static power converters: inverters, rectifiers, variable speed drives, Servers, HVAC, non-IGBT UPS, etc.) or even in continuous spectrum (DC drives, welding machines, arc furnaces, etc.) has completely changed the industrial plant scenario, producing on the one hand great benefits in terms of productivity, reliability and yield, but also putting the designer in the condition of having to take into account previously neglected parameters.

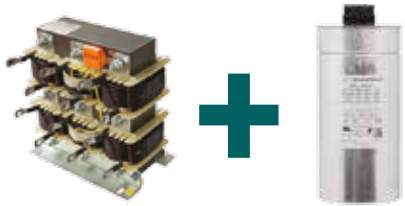
Some examples of applications where normally it is usual to find high harmonic contents, depending on the loads present:

Steelworks, Paper mills, Refineries, Pharmaceutical Industry, Food Industry, Plastic and Injection Moulding, Cements, Mining and Quarries, Automotive Industry, Ceramics Industry, Textile Industry.

Telegroup solutions in plants with a Harmonics presence

“Detuned” Power Factor Correction Systems

Connection of a Reactor in series with the Capacitor, tuned to a resonance frequency lower than the lowest frequency of the voltages and harmonic currents of the network.
Over the tuning frequency, the capacitor reactor connection impedance is inductive. The interaction of the network inductance and the inductive impedance of the capacitor reactor connection can no longer create resonance conditions at the frequencies of the voltages and harmonic currents present on the network.



Active Filter

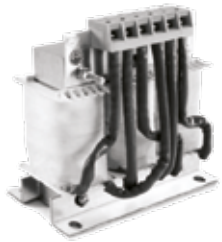
Definitively cancel out the harmonics and compensate for individual disturbances, automatically adapting to changing network topologies.
Harmonic residue after installation <3%. The AHF analyses network disturbances and provides an opposite compensation current, eliminating disturbances in less than 300 µs. Range from 30 to 100 A, for voltages from 400 to 480 V up to 690 V with 3 or 4-wire technology.

Passive Filter

After filter installation, the harmonic residue will be less than 5..10% with a significant impact on thermal and electrical overload. These can be applied on three-phase lines in any type of power electronics with front-end.

Line Reactors

These work on the line side or on the load side to provide a simple, economical solution that reduces total harmonic distortion by 63%. Power units with high performance. Quick installation that does not require thorough system analysis.



Calculation of reactive power

Automatic Power Factor Correction Systems

Necessary data

- ✔ Active Power **(kW)**
- ✔ Initial Cos φ (also deduced from the Active and Reactive Energy consumed)
- ✔ Desired Cos φ

Calculation

Q = P * k

Q: Necessary reactive power
P: Active Power (kW)
K: Cos φ coefficient from the table

Example

Plant with active power 650 kW and initial Cos φ 0.75, to be brought to 0.95.

What is the necessary reactive power?
650*0,553 = **360 kVAr**

It is advisable to oversize the necessary reactive power by 15-20% in order to maintain an average Cos φ of 0.95 even with load variations.
In this specific case, it would be advisable to propose an Automatic systems with power **400 kVAr**.

Initial Cos φ (also deduced from the Active and Reactive Energy consumed)	**Desired Cos φ**						
	0.90	**0.92**	**0.94**	**0.95**	**0.96**	**0.98**	**1.00**
0.30	2.695	2.754	2.817	2.851	2.888	2.977	3.180
0.35	2.192	2.250	2.313	2.348	2.385	2.473	2.676
0.40	1.807	1.865	1.928	1.963	2.000	2.088	2.291
0.45	1.500	1.559	1.622	1.656	1.693	1.781	1.985
0.50	1.248	1.306	1.369	1.403	1.440	1.529	1.732
0.55	1.034	1.092	1.156	1.190	1.227	1.315	1.518
0.60	0.849	0.907	0.970	1.005	1.042	1.130	1.333
0.65	0.685	0.743	0.806	0.840	0.877	0.966	1.169
0.70	0.536	0.594	0.657	0.692	0.729	0.817	1.020
0.75	0.398	0.456	0.519	0.553	0.590	0.679	0.882
0.80	0.266	0.324	0.387	0.421	0.458	0.547	0.750
0.85	0.135	0.194	0.257	0.291	0.328	0.417	0.620
0.90	-	0.058	0.121	0.156	0.193	0.281	0.484
0.95	-	-	-	-	0.037	0.126	0.329

TELEGROUP sizes its Boards to a Cos φ of 0.98.

Fix PFCs

MV/LV Transformers and Asynchronous Motors.

Compensation of MV/LV Trafo

For economic reasons, it is advisable to compensate the reactive power that the Transformer absorbs for the magnetisation of the core and for the winder reactors. The choice of Reactive power can be made based on the table below.

Power (kVA)	Type	
	Oil kVAr **Vacuum**	**Resin** kVAr
100	5	2.5
160	7	4
200	7.5	5
250	8	7.5
315	10	7.5
400	12.5	8
500	15	10
630	17.5	12.5
800	20	15
1000	25	17.5
1250	30	20
1600	35	22
2000	40	25
2500	60	35
3150	60	50

Compensation of Asynchronous motors

The reactive power necessary for the power factor correction of Asynchronous Motors is chosen from the following table. It is always advisable in these situations to take into account the possible self-excitation of the capacitors, which is why the installation of an automatic board rather than a fixed one is preferred.

It is always advisable in these situations to take into account possible operation of the Motor as a self-excited generator, and this can result in voltages that are considerably higher than those of the network.

Power		Necessary reactive power (kVAr)				
HP	**kW**	**3000 rpm**	**1500 rpm**	**1000 rpm**	**750 rpm**	**500 rpm**
10	7.38	3	3	4	4	5
15	11	4	5	5	6	6
30	22.1	10	10	10	12	15
50	36.8	15	20	20	25	25
100	73.6	25	30	30	30	40
150	110	30	40	40	50	60
200	147	40	50	50	60	70
250	184	50	60	60	70	80

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