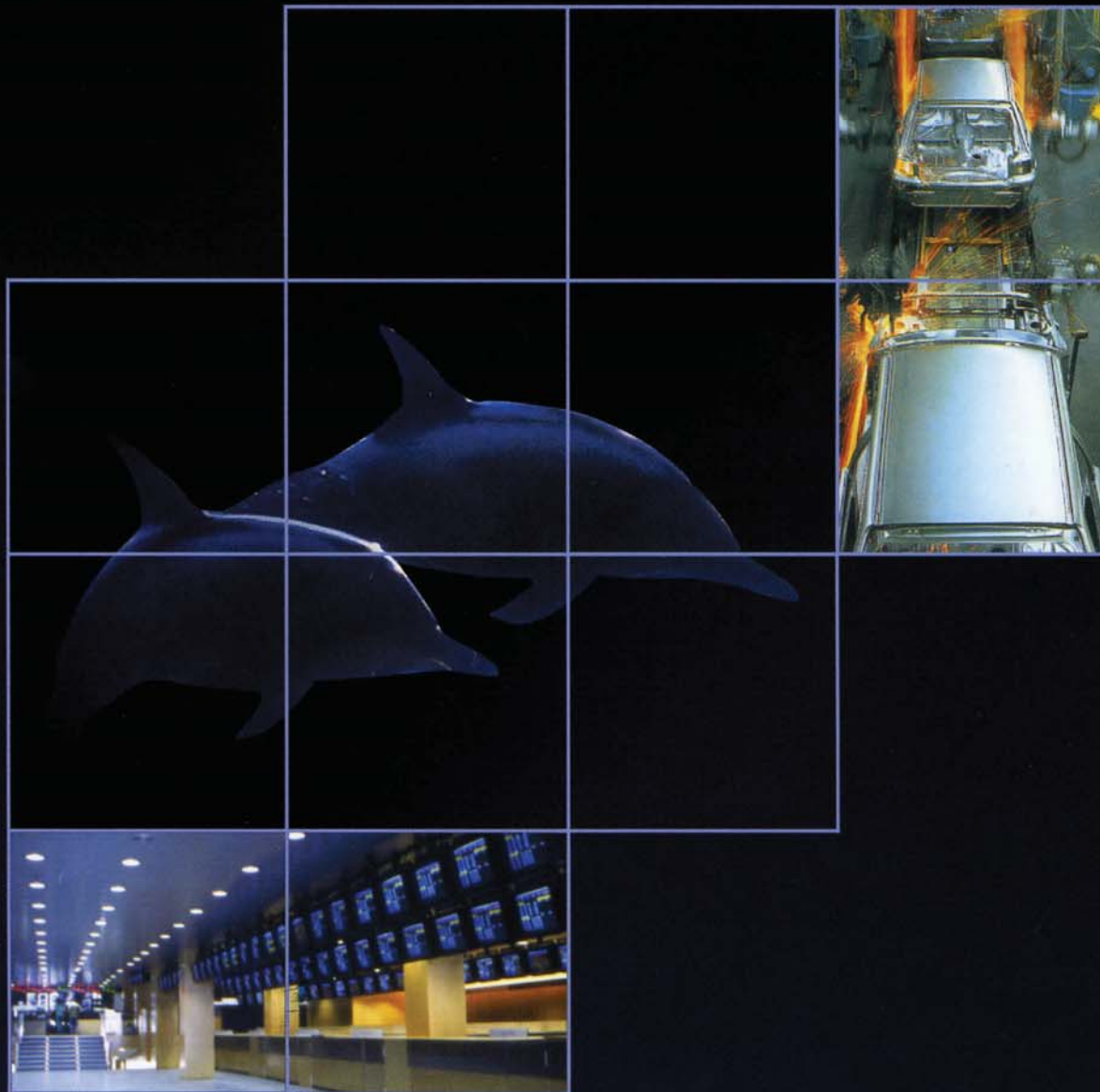


# HARMONIC FILTERING



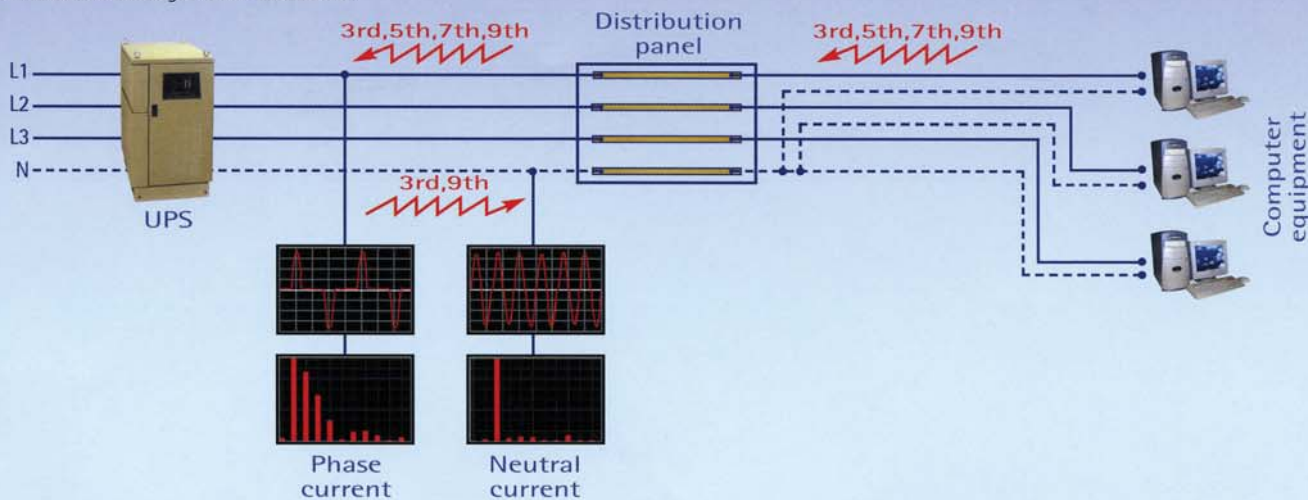
quality of the **Electrical** energy

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QUALITY AND TECHNOLOGY

## HARMONIC PROBLEMS IN OFFICE BUILDINGS

Office buildings have undergone a significant modernisation during the last years. Large quantities of computer equipment (personal computers, printers, network servers...) have been incorporated. All these equipments generate elevated levels of harmonics, which cause important problems in the electrical installation and the computer equipment itself. The triplen harmonics (3rd, 9th, ...) are especially harmful as these sum in the neutral conductor and generate a high neutral current causing serious failures and damages in the installation.

Polylux has developed a series of electromagnetic filters for elimination of harmonics named 'Compensators'. These equipments are based on the cancellation and compensation of magnetic fluxes. **The main advantage of the Compensators is the absence of electronic components and capacitors.** The Compensators are therefore maintenance free, have an extremely long lifetime compared with other types of filters and are compatible with any electrical installation.



### PROBLEMS

- Malfunctioning and failure in computer equipment.
- Overheating of neutral conductors.
- Low efficiency and overheating of UPS, transformers and cables of the installation.
- Tripping of protections without apparent reason.
- Interferences in communication networks.
- Incremented power consumption.

### CAUSES

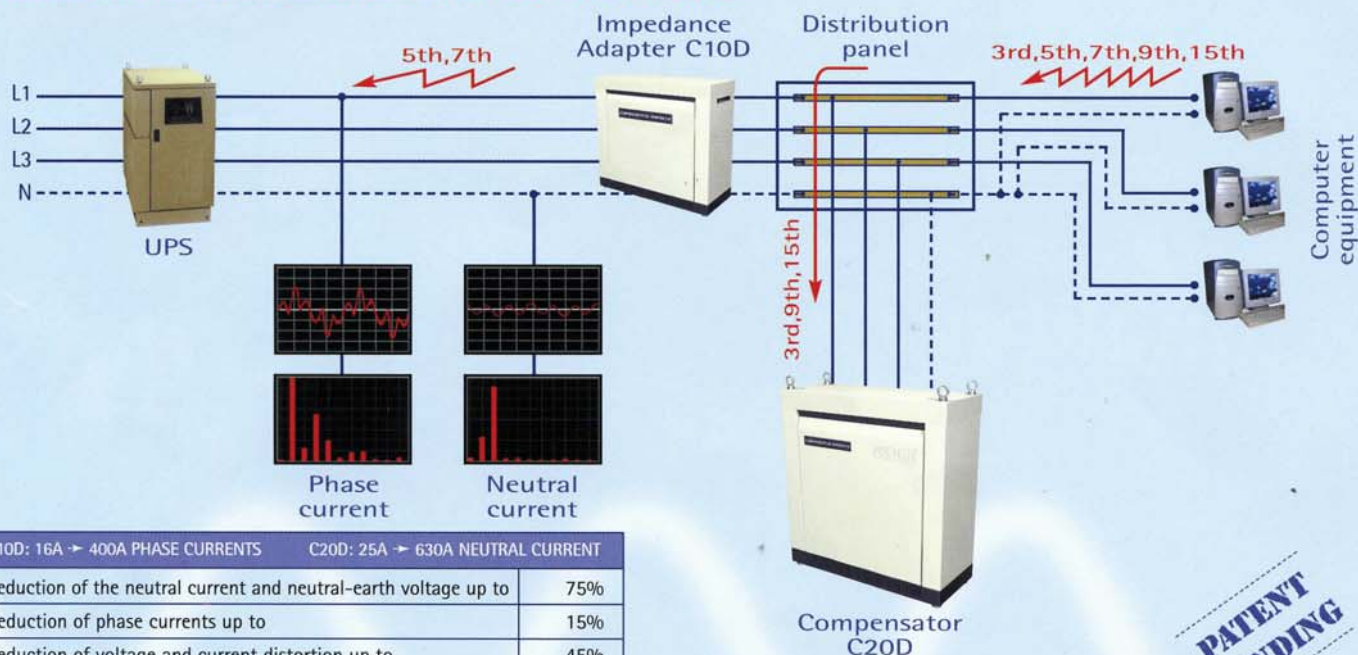
- Low quality electrical energy. Elevated harmonic distortion in the voltage.
- Elevated neutral - earth voltage.
- High harmonic distortion in the current.
- Excessive levels of 3rd and 9th harmonics in the neutral conductor.
- Elevated true RMS current in the phases.
- Low power factor due to harmonics.
- Elevated losses in the electrical installation.

## HARMONIC COMPENSATOR C10D AND C20D

The C20D series Compensator provides a very good cost-filtering relation. It reduces the triplen harmonics (3rd, 9th, 15th), and eliminates this way the main problems in office installations, which are overloaded neutral conductors and a high neutral-earth voltage. Additionally a reduc-

tion of the remaining problems caused by harmonics is obtained. It is recommended to install the C20D always in combination with the Impedance Adaptor C10D in order to obtain the most optimised filtering and functionality.

### Elimination of the 3rd, 9th, 15th harmonic



C10D: 16A → 400A PHASE CURRENTS      C20D: 25A → 630A NEUTRAL CURRENT

Reduction of the neutral current and neutral-earth voltage up to	75%
Reduction of phase currents up to	15%
Reduction of voltage and current distortion up to	45%
Obtain power factor up to	0.80

Includes thermal protection

**PATENT  
PENDING**

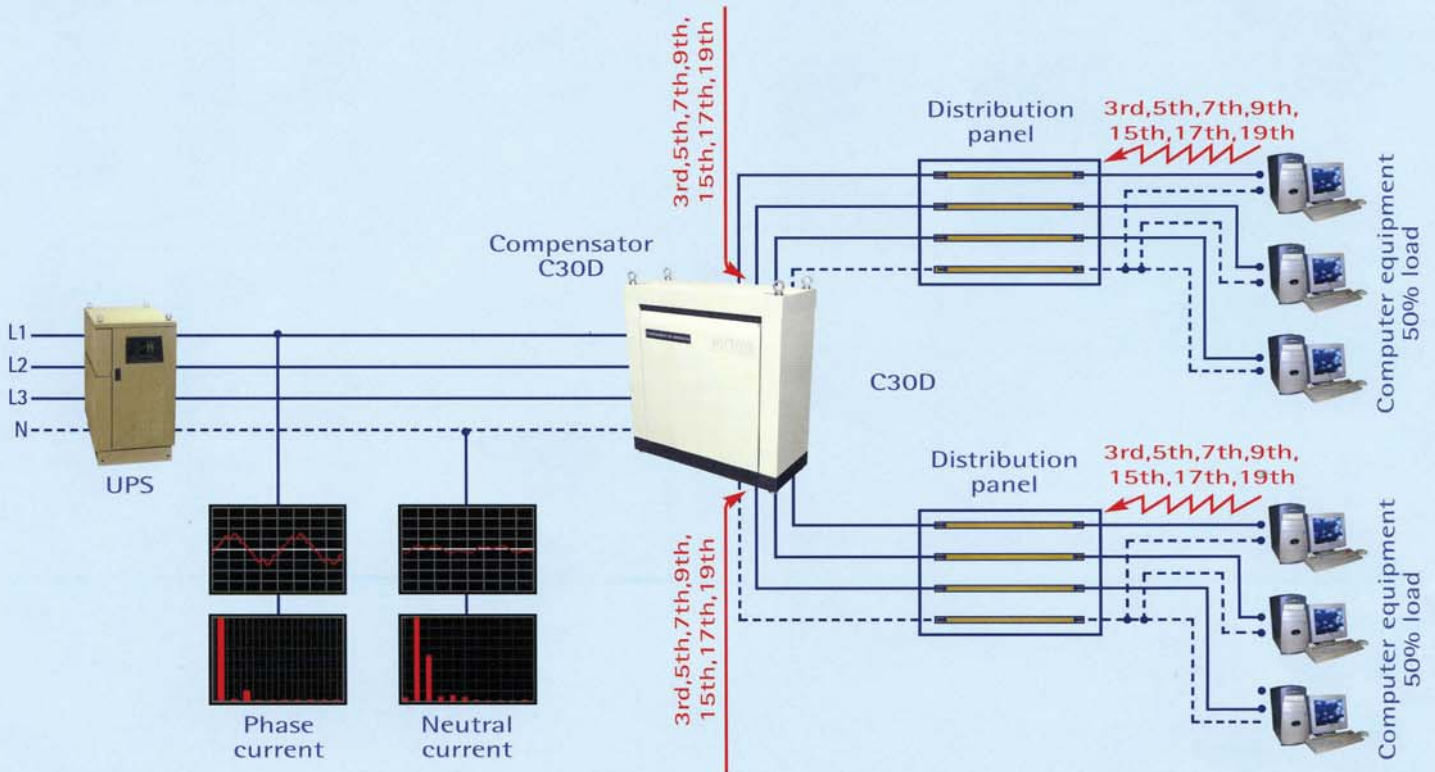
## HARMONIC COMPENSATOR C30D

The C30D series Compensator achieves the highest level of filtering in office installations. It eliminates the 3rd, 5th, 7th, 9th, 15th, 17th and 19th harmonic avoiding therefore all possible problems that harmonics can cause in the installation. The C30D is also suitable for installations where due to standards and legislations a high

level of filtering is required. It provides additional advantages such as: reduction of electromagnetic disturbances coming from the mains, optional voltage adaptation between input and output and the possibility to use independent earths as the neutral is isolated from the mains.

The C30D compensator consists of two secondary windings. Each secondary should supply 50% of the total load to be filtered. The filtered harmonics are compensated in the secondary windings and do not circulate through the rest of the installation.

### Elimination of the 3rd, 5th, 7th, 9th, 15th, 17th, 19th harmonic



10kVA → 160kVA

Reduction of the neutral current and neutral-earth voltage up to	90%
Reduction of phase currents up to	45%
Reduction of voltage and current distortion up to	85%
Obtain power factor up to	0.96

Galvanic isolation between input and output

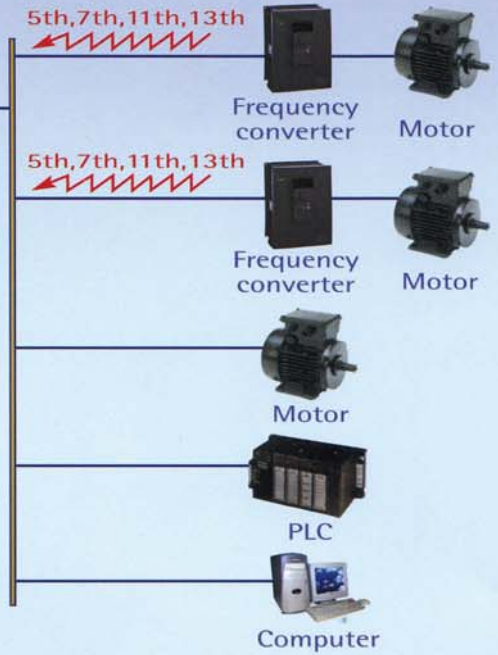
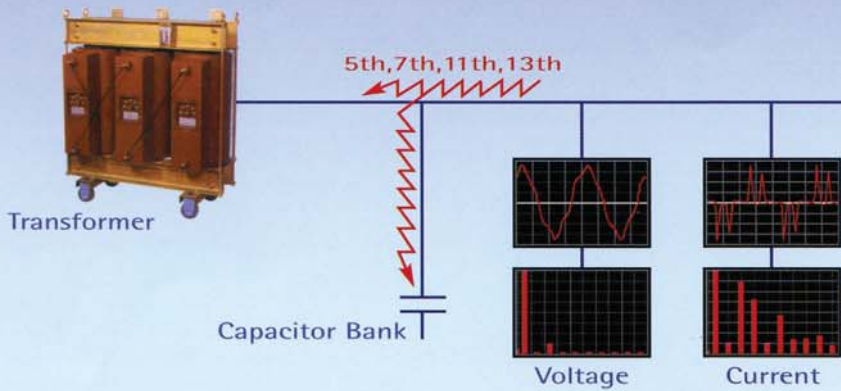
Includes thermal protection



# HARMONIC PROBLEMS IN INDUSTRIAL INSTALLATIONS

During the last years there has been a large modernisation of the industrial production processes and a fast evolution in power electronics, especially in the field of power converters such as variable speed drives for DC motors, frequency converters, UPS ... All these equipments have a common characteristic which is the generation of harmonic currents that reduce the quality of the electrical energy.

Polylux completes its range of filtering inductors with a range of electromagnetic harmonic eliminating devices named Compensators. The functioning of these devices is based on the cancellation and compensation of magnetic fluxes. The main advantage of the Compensators is the absence of electronic components and capacitors. The Compensators are therefore maintenance free, have an extremely long lifetime compared with other types of filters and are compatible with any electrical installation.



## PROBLEMS

- Malfunctioning and failure in electronic equipment.
- Overheating and failure in transformers and cables.
- Overload and failure in capacitor banks.
- Low efficiency of transformers and cables.
- Tripping of protections without apparent reason.
- Overload and failure in motors.
- Interferences in communication networks.

## CAUSES

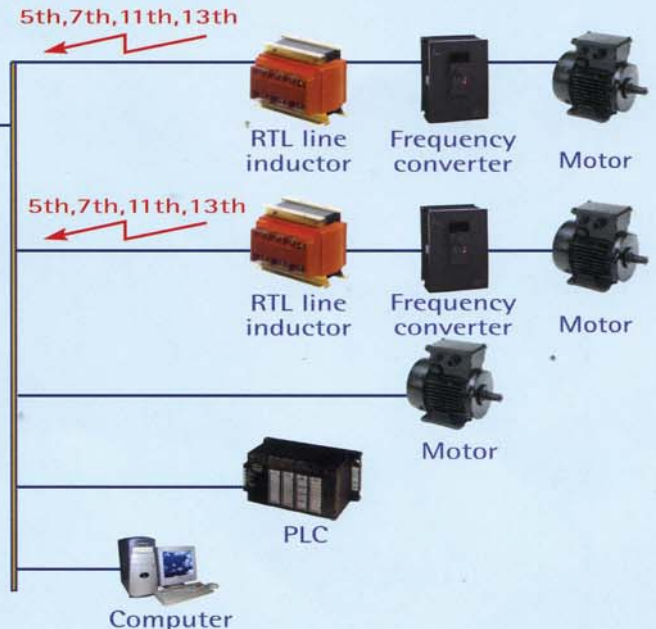
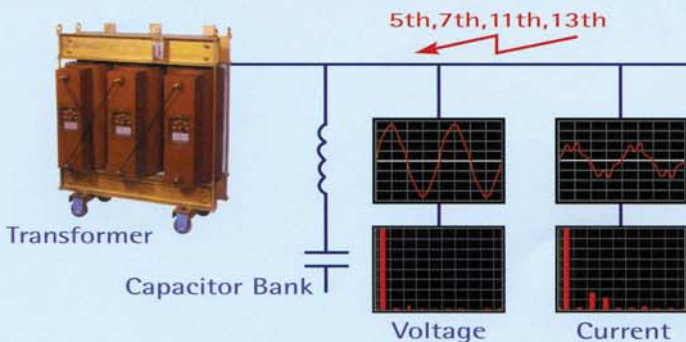
- Low quality electrical energy. Elevated harmonic distortion in the voltage.
- Notches and transients in the voltage caused by power converters.
- Elevated harmonic distortion in the current.
- Resonance in capacitor banks.
- Elevated true RMS current in the phases.
- Low power factor due to harmonics.

## RTL LINE INDUCTORS

The RTL series line inductors provide the most optimised cost-filtering relation of all solutions for harmonic filtering available in the market. The RTL line inductor features a very significant filtering of the whole harmonic spectrum, especially those of higher order (11th, 13th...). Additionally it solves one of the most important problems related to power converters, which are the notches and transients in the voltage causing malfunctioning and failure of electronic devices (PLC's, computers, ...). These problems are often erroneously associated with harmonics and other, usually expensive filters are installed without providing any solution to the problem.

The installation of the RTL line inductors is straightforward and does not depend on any parameter of the electrical network. It is selected simply according to the rating of the motor that the power converter will supply. One inductor has to be installed with each power converter and it is important not to use a model with a higher current rating than necessary. All other electronic equipment should be installed at the input of the inductor as indicated in the figure.

### Reduction of the 5th, 7th, 11th, 13th harmonic



0,75kW → 315kW Motor	
Reduction of phase currents up to	30%
Reduction of voltage and current distortion up to	60%
Obtain power factor up to	0.93
Includes thermal protection	

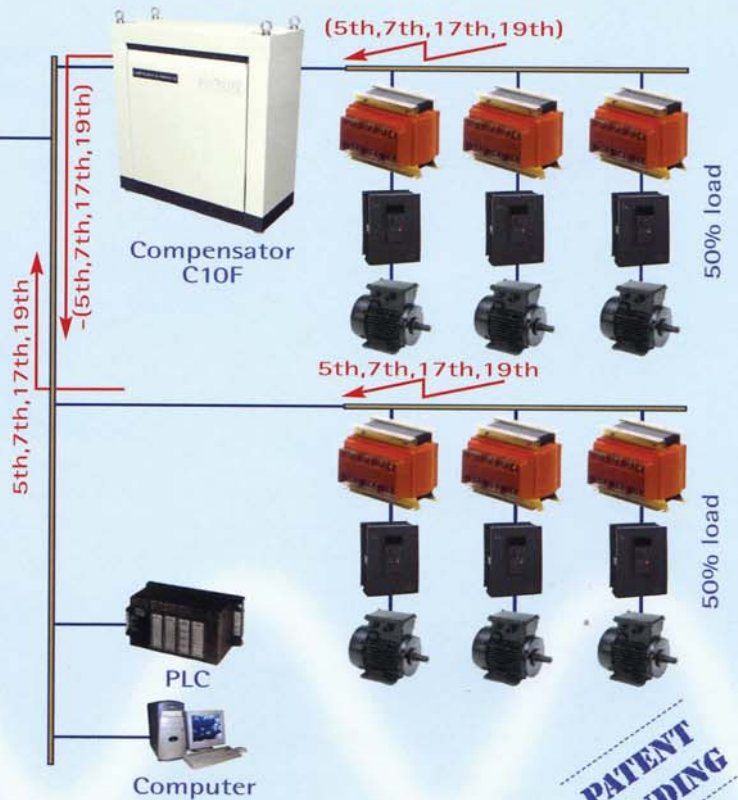
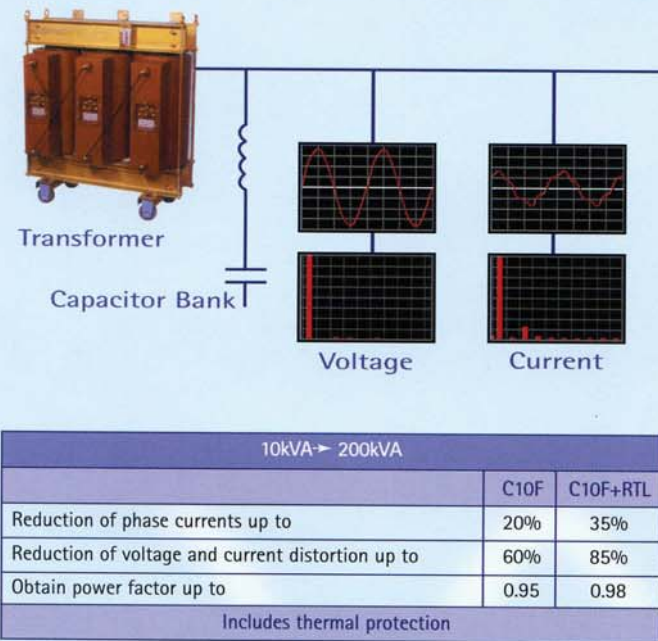
In order to achieve a correct functioning of the installation and avoid resonance, it is important that only capacitor banks with filtering inductors are used.

## HARMONIC COMPENSATOR C10F

The C10F series Compensator is used in case a high level of filtering is requested, whether for being compliant with legislations or for meeting high quality requirements for the electrical supply. In order to obtain a correct filtering it is necessary to install as well a RTL line inductor with each DC converter or frequency converter. The C10F should be installed in such a way that it supplies 50% of the load to be filtered while the other

50% of the load should be supplied directly. The harmonic currents (5th, 7th, 17th, 19th), that have already been reduced by the RTL line inductors, will be compensated at the junction of the two branched of the load. This way the installation will be totally free of harmonics. The C10F represents an economic solution, as only one unit has to be installed for 50% of the load.

### Elimination of the 5th, 7th, 17th, 19th harmonic

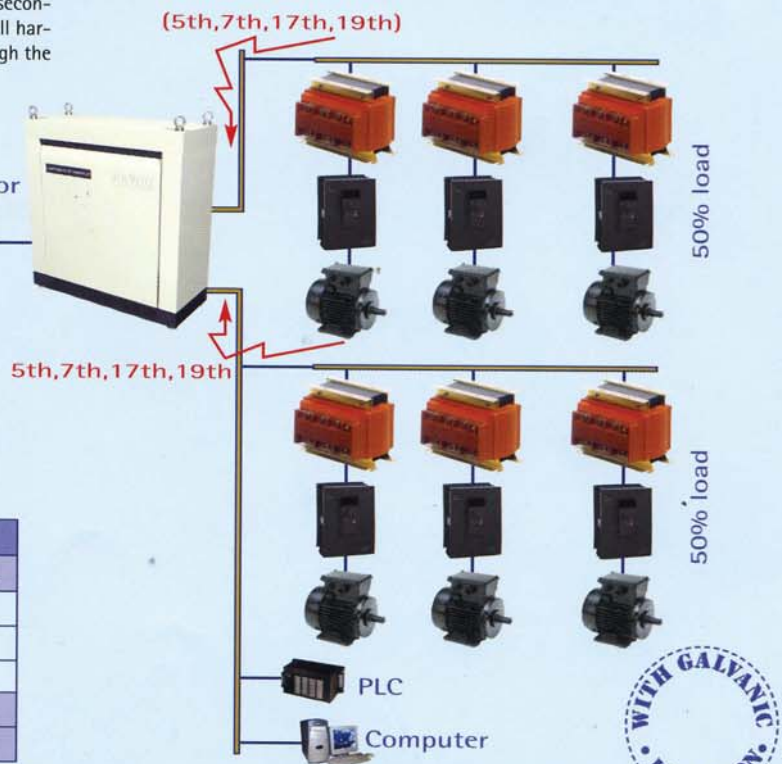
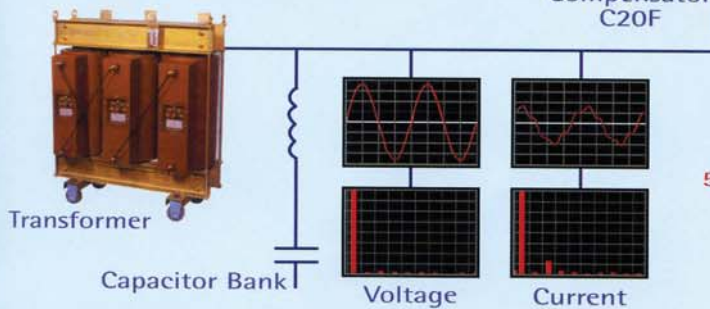


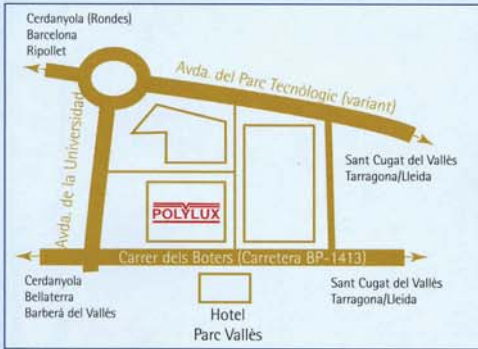
## HARMONIC COMPENSATOR C20F

The C20F series Compensator achieves the highest protection level for industrial installations. An elevated level of filtering of the 5th, 7th, 17th and 19th harmonic is obtained in combination with galvanic isolation of the entire load. In order to obtain a correct filtering it is necessary to install as well a RTL line inductor with each DC converter or frequency converter. The C20F Compensator consists of two secondary windings. Each secondary should supply 50% of the load to be filtered. All harmonics are compensated in the secondary windings and do not circulate through the rest of the electrical installation.

The C20F provides additional advantages such as: reduction of electromagnetic disturbances, optional voltage adaptation between input and output and the possibility to use independent earths, as the neutral is isolated from the mains.

### Elimination of the 5th, 7th, 17th, 19th harmonic





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