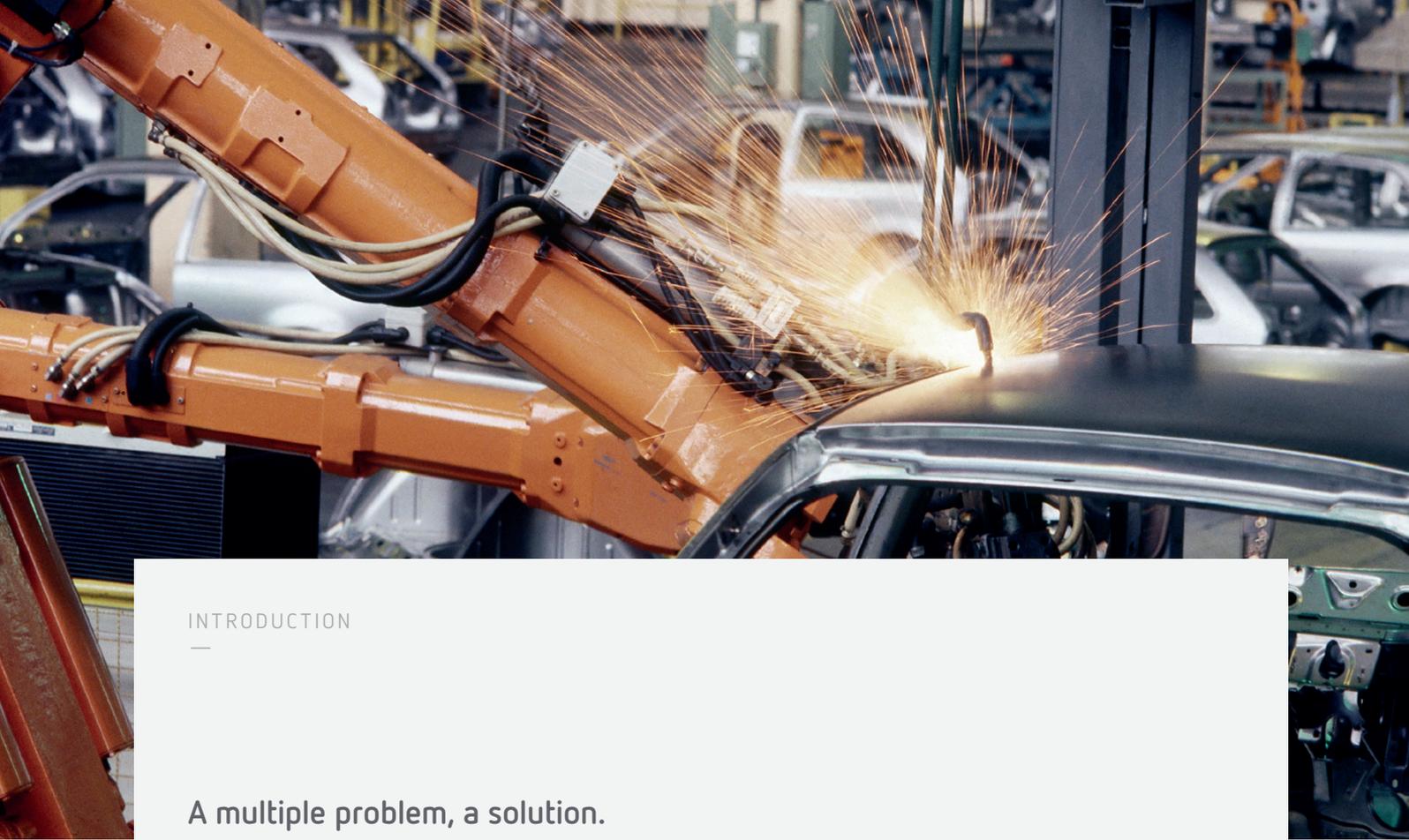HARMONIC FILTERING

# AFQm

Multifunction Active Filter
with multi-level technology

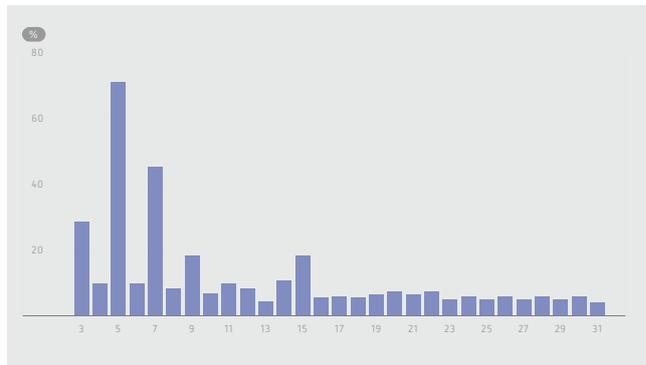**Circutor**

**A multiple problem, a solution.**

In recent years, substantial growth in the number of electronic devices designed to equip our installations has resulted in significant changes in the types of loads connected to the power distribution system.

These devices are currently equipped with electronics that in one way or another increase the efficiency of the tasks, production processes and activities we perform. Everyone uses computers for personal use or for processing and controlling production systems with speed drives, air-conditioning units, lifts that slow down when approaching their destination floor, etc. These devices are equipped with rectifiers, modulators, etc., which distort the wave shape of the current to achieve their correct operation.

All in all, these devices and units have definitely improved our quality of life; however, they also lead to greater contamination of our electric system and thus to high levels of harmonics.

# New technologies provide new advantages, but also new problems

New technological devices that have recently started to be used in electrical installations definitely optimise production processes in competitive terms, but they also pose new problems for electrical networks, whose negative effects must be avoided at all costs. Most of the new devices installed nowadays have embedded electronics which cause unwanted distortion to power lines, affecting the correct functioning of most of the connected equipment.



Harmonics without AFQm

| More Loads |
|---|

∨

| Further pollution through power lines |
|---|

∨

| Problems due to harmonics |
|---|
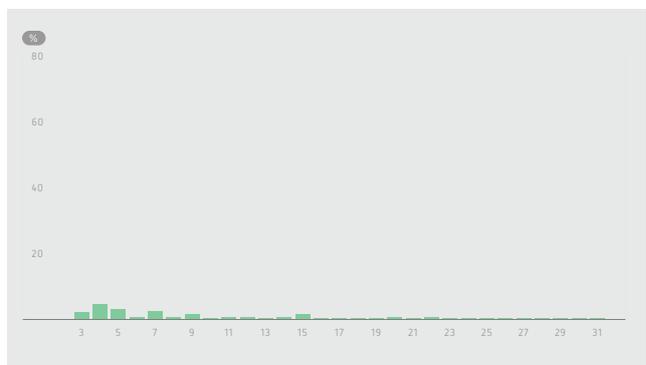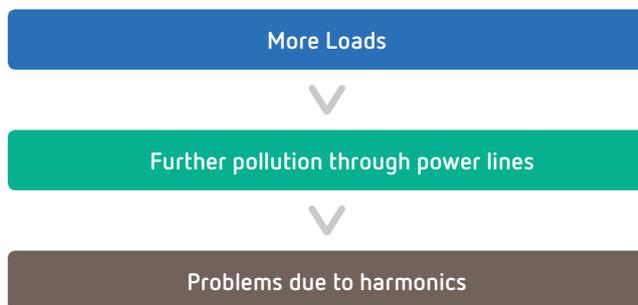


Harmonics with AFQm

**Types of loads that generate harmonics:**
› Air-conditioning systems
› Variable speed drives, converters...
› Cooling chambers
› PLC's
› Electronic light ballasts (LED)
› Personal computers (PC's)
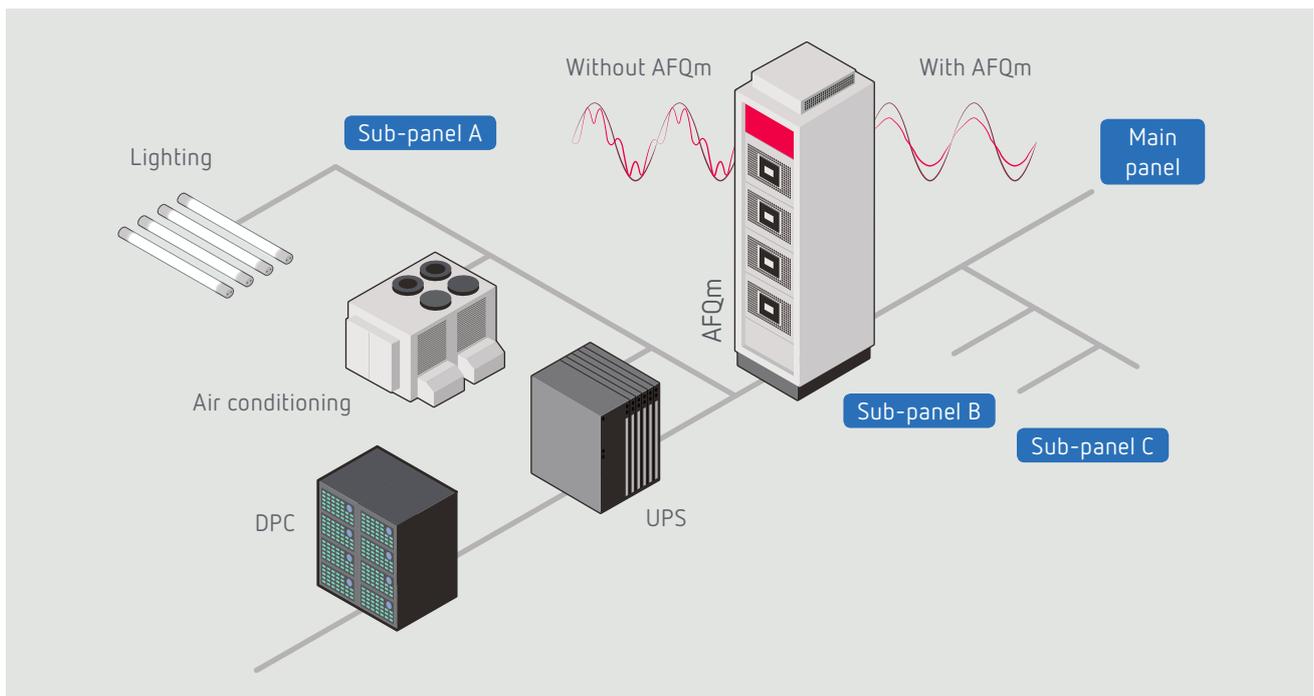› Pumping stations

# Problems caused by harmonics

| CAUSE | EFFECT | PROBLEM |
|---|---|---|
| Rise of the total current harmonic distortion rate (THDI %) | Current increase in conductors<br>Temperature increase in conductors<br>Possible insulation loss in conductors<br>Malfunction in PLC | Economic losses due to production downtimes |
| Unwanted tripping of circuit breakers and residual current devices | Power cuts in production lines | Economic losses due to production downtimes |
| Increase in transformer temperature | Premature ageing of the transformer | Extra costs in maintenance |
| Decrease in UPS performance | Need to expand UPS | Installation extra costs and risk of production downtime and data loss |
| Decrease in motor performance | Premature ageing of motors | Extra costs in maintenance |

# The solution: AFQm Active Filters



Lighting

Sub-panel A

Air conditioning

DPC

UPS

Without AFQm

AFQm

With AFQm

Main panel

Sub-panel B

Sub-panel C

# Improve all aspects of your installation

| 3 functions in 1 | → Priority configurable by the user |

## 1. Harmonic filtering

Eliminates harmonics to clean the installation's waveform.

Reduction of harmonic currents up to the fiftieth harmonic (2500 Hz). Posibility of selection of the harmonic frequencies to be filtered in order to achieve higher efficiency. Response <20 ms

## 2. PF correction

Helps avoid penalties due to reactive power consumption.

Power factor correction, in both consumption and generation of inductive and capacitive currents. 0.7 inductive ... 0.7 capacitive

## 3. Phase balancing

Reduces the circulation of neutral current, avoiding overheating, insulation loss and unwanted tripping.

Current balancing correction, improving the phase-to-phase consumption of an installation. The 4-wire model reduces the neutral current.

# Easy to install

**Various formats:**
› Wall-mounted devices.
› Enclosure-fitted devices (rack type).
› For 3-wire networks (up to 400 V) or 4-wire networks (up to 480 V).
› 50 or 60 Hz

Features handles for an easy and quick installation and removal of each module.

Integrated communications on the front of the device to facilitate connectivity.

**Three-step commissioning**

| CONNECT | CONFIGURE | START |

**Commissioning**
› Local configuration via the touchscreen, saving time during commissioning.

**Easier to install**
› Allows installing transformers both on the mains side and on the load side.

**Self-diagnostic system**
› Internal self-diagnostic system during commissioning guaranteeing perfect operation.
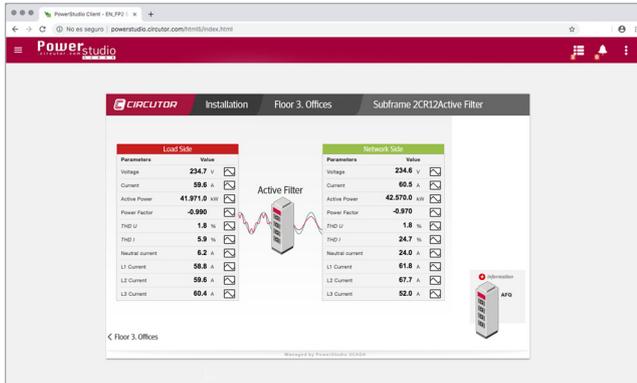
**Harmonic selection**
› Individual selection of harmonics to be filtered to ensure maximum performance.

# Connectivity

## PowerStudio Driver

Para Sistemas de Gestión Energética: monitorización de todos los parámetros eléctricos, creación de pantallas personalizadas para el Filtro Activo.



## Built-in Web Server

Real-time, online, website monitoring of instantaneous values.
Data download without requiring any software.
Ethernet: TCP/IP, Modbus TCP.
Remote configuration of the device.
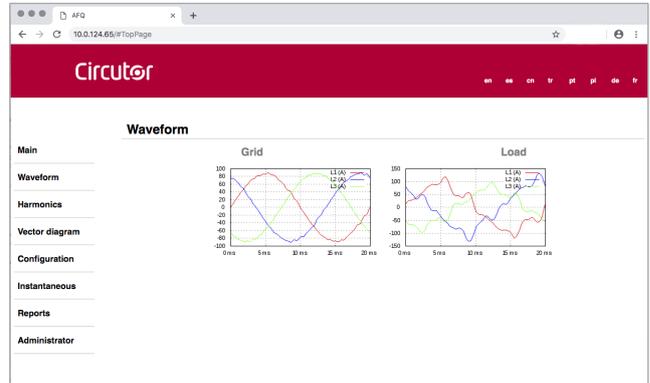


## Datalogger

All electrical parameters recorded by the filter (per minute) are stored by the integrated datalogger for up to 7 years.
It also allows the log report to be downloaded in spreadsheet format.

## Parameter display

**Touchscreen to monitor:**

**Filter activation status:**
› Powers and harmonic distortion before and after the filter.

**Instantaneous values:**
› Values of voltages and currents; active, reactive and apparent power; THD*U* %, THD*I* % and cos *fi*
› Voltage and current individual harmonics (before and after the filter)
› Phasor diagram
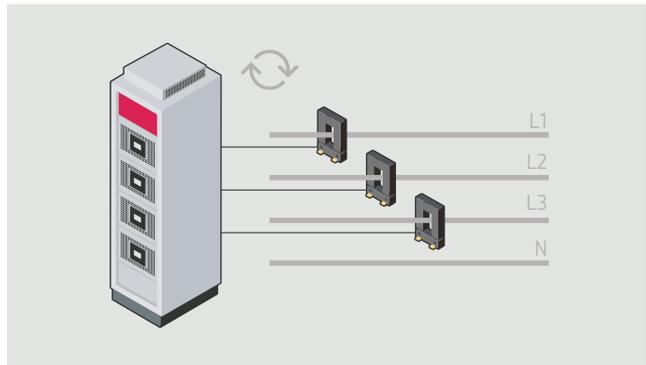› Waveform (voltage and current).
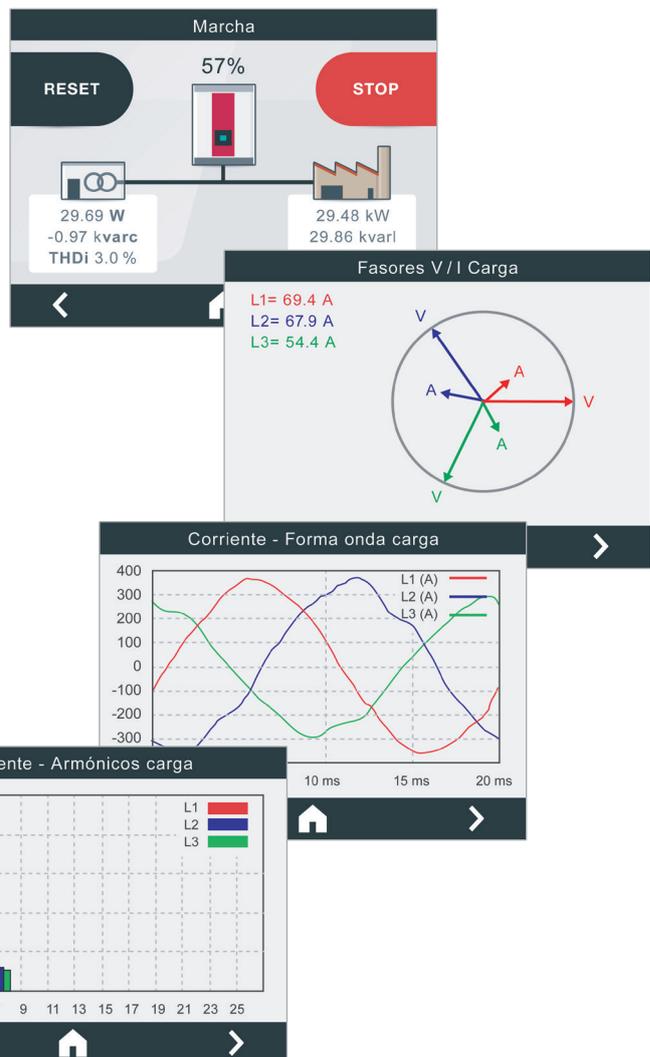
# Designed to be safe and intuitive

## Easy to set up

**Current transformer reversal**
Solves current transformers' connection
errors using its touchscreen.

**Safe mode**
Avoids the filter from connecting automatically
by setting a minimum start-up current,
preventing injection when not required.



L1
L2
L3
N

## Escalable

Master / Slave system that allows connecting
up to 100 filters in parallel managed by a single master.

Save resources by avoiding the installation
of current transformers for each slave.
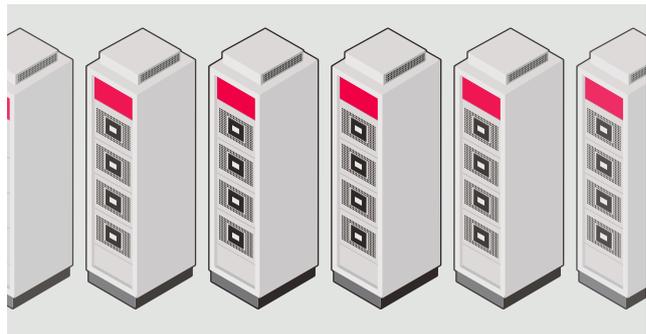


## Safe

**Safe Mode activation in the
event of detecting a fault.**

**Smart thermal management system:**
Adjusts the internal fan speed according to filtering needs.
Adjusts the filtering rating when temperature is above
the operating limit to ensure the device's life span.

**Alarm identification:**
Records the last 5 seconds prior to triggering
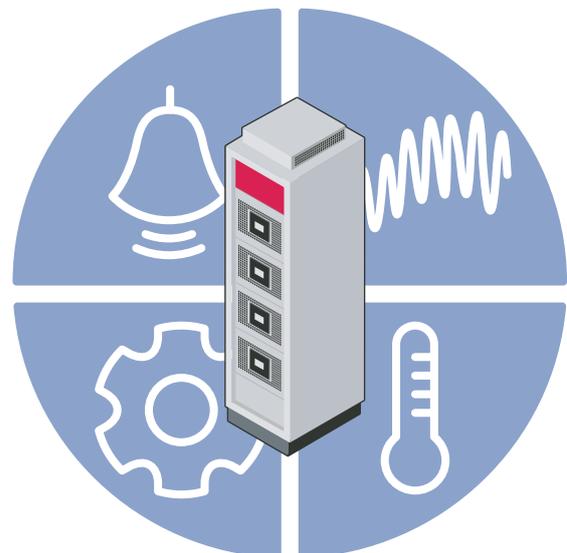an alarm with a recording period of 1 second.

**Features an internal protection system that
avoids start-up in the event of a problem.**

**Includes an anti-resonance system.**
The device avoids operating in resonance frequencies
(specific harmonics) and continues operating in the rest of the
spectrum without affecting its operation.

**Alarm monitoring from the display for
easy identification and correction.**

**Designed according to the IEC- 60730 standard,
selfdiagnosing the code and hardware executing it.**

**Circutor**