Power Quality Filters
PQFI – PQFM – PQFK – PQFS

The ABB comprehensive solution for active harmonic filtering, load balancing and reactive power compensation

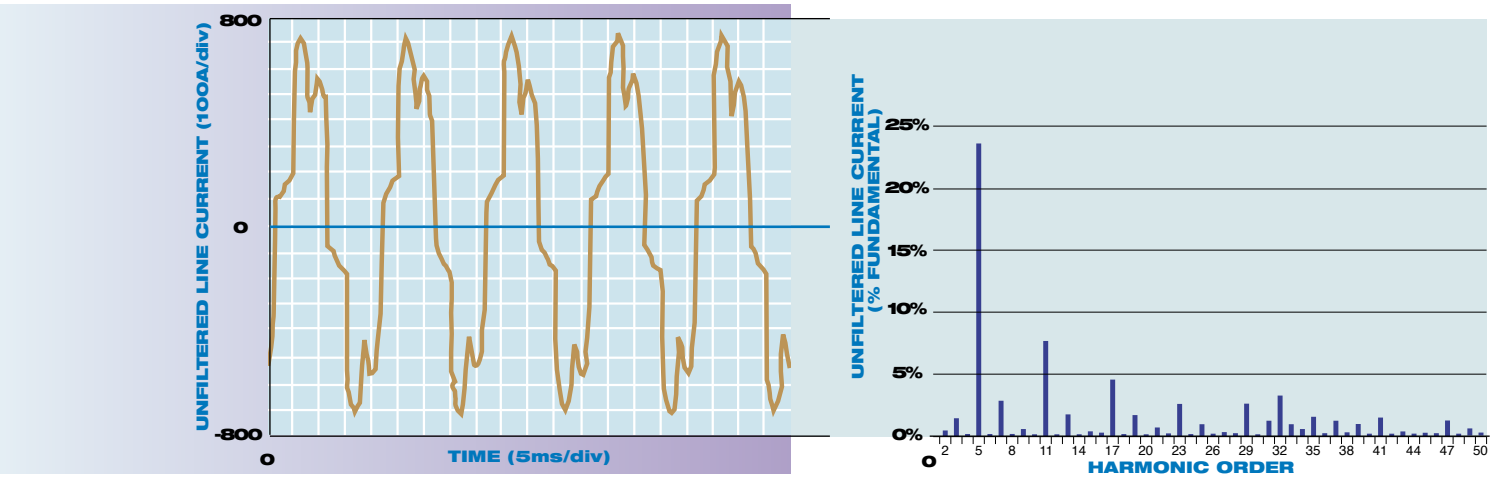
Harmonics and Power Quality

Power Quality relates to the amplitude, frequency and distortion of the supply system. While the amplitude and frequency of the supply is largely controlled by the utility, the distortion of the wave (voltage or current) is attributed to the user (of the power) or the loads. Linear loads like an induction motor, an incandescent bulb, resistive heating or a capacitor bank draw a sinusoidal current which follows the wave shape of the supplied voltage. On the other hand, most of the common loads nowadays are non-linear, like VSDs (Variable Speed Drives), rectifiers, UPS-systems, computers, TV sets, energy efficient (fluorescent) lamps, photocopiers etc. These loads draw a current from the source which does not follow the voltage wave shape and hence introduce distortion.
The distortion is introduced by harmonics generated by the non-linear devices. These harmonics are a growing problem for both electricity suppliers and users.

Harmonics can lead to serious problems:

- **reduced energy efficiency when harmonics are in the network**
- **overheating of cables, motors and transformers**
- **damage to sensitive equipment**
- **tripping of circuit breakers**
- **blowing of fuses**
- **premature ageing of the installation**
- **capacitor overloading and failures**
- **high current in neutral conductors**
- **excitation of network resonance**
- **no connection permit from the utility if harmonic levels are too high**

Typical VSD supply current



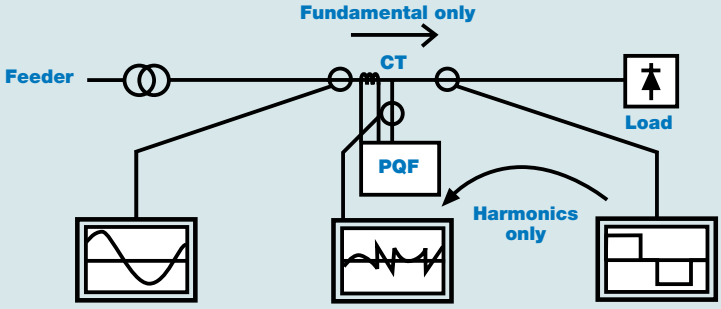
The ABB solution: The PQF Power Quality Filter

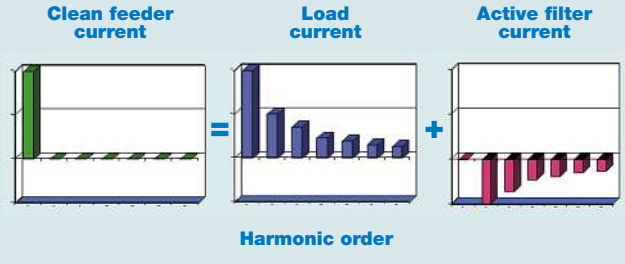
The ABB Power Quality Filter offers unprecedented ability to actively clean the network from harmonics, to perform smooth reactive power compensation and to do load balancing. This last feature allows for the much needed reduction of neutral to earth voltages in 4-wire systems.

The PQF is insensitive to large network impedance changes e.g. due to paralleling of sources, or switching between mains supply and generator operation.
It monitors the line current in real time and processes the measured harmonics as digital signals in a high-power multi-DSP (Digital Signal Processor) based system. The digital controller generates Pulse Width Modulated (PWM) signals that drive IGBT power modules which through line reactors inject harmonic currents in the network with exactly the opposite phase to the components that are to be filtered.

The PQF also offers communication facilities. Depending on the existing customer communication network, different solutions are available ranging from several digital I/O contacts to an optional Modbus RTU communication interface.

Principle of operation





PQF : The ultimate step in filtering efficiency, load balancing and reactive power compensation

The PQF offers the perfect solution for harmonic filtration. The net effect of a PQF is a clean sine wave. In other words, the feeding transformer carries a harmonic free current and consequently there is no network pollution introduced by the filtered load.

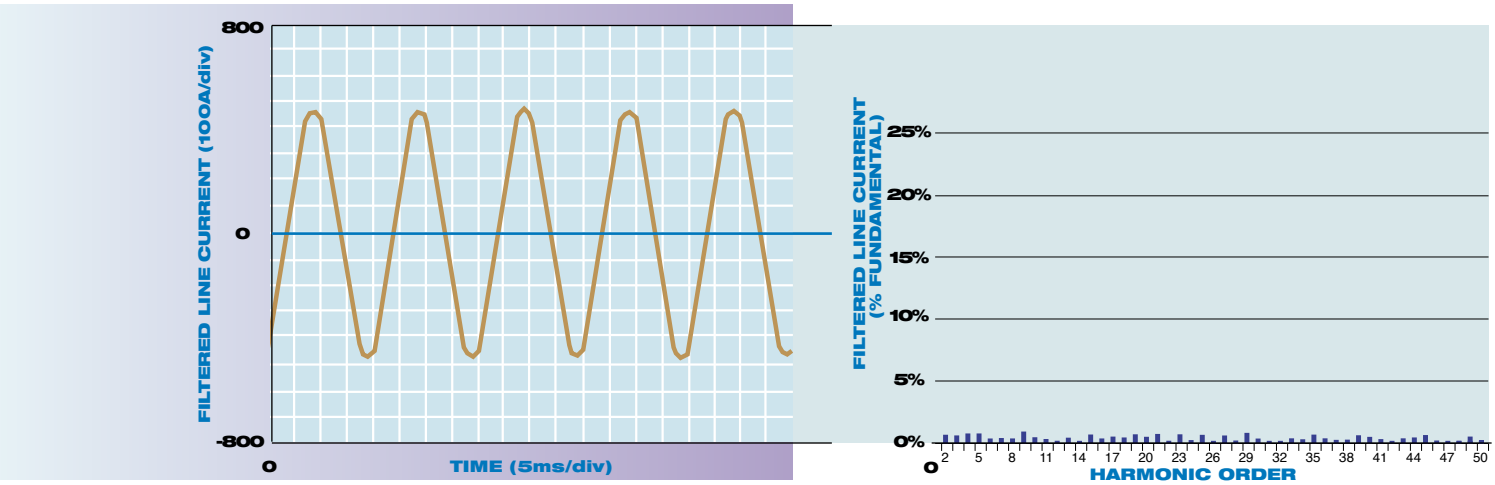
The PQF also incorporates load balancing functionality allowing load current to be distributed evenly over the phases and reducing neutral current stress (4-wire models). This feature is especially needed in 4-wire applications such as datacenters, hotels, banks, etc. The reactive power compensation mode allows to compensate precisely up to target cos φ values and this for both inductive and capacitive loads.

The closed loop control system offers an added advantage of accurate operation without any need of special measuring devices. The digital controllers give increased flexibility, reliability and accuracy.

The PQF-Manager allows a wide range of choice for measurement of various network parameters, programming and settings of the PQF.

ABB PQFs are designed to meet the limitations on harmonic pollution as per various international guidelines like G 5/4, IEEE 519 etc. The complete range of PQF is CE marked. The PQF-range (except PQFS) can be offered in cUL execution for voltages up to 600V. C-Tick approved versions can also be obtained. ISO 9001 and ISO 14001 certifications ensure best quality in the manufacturing process.

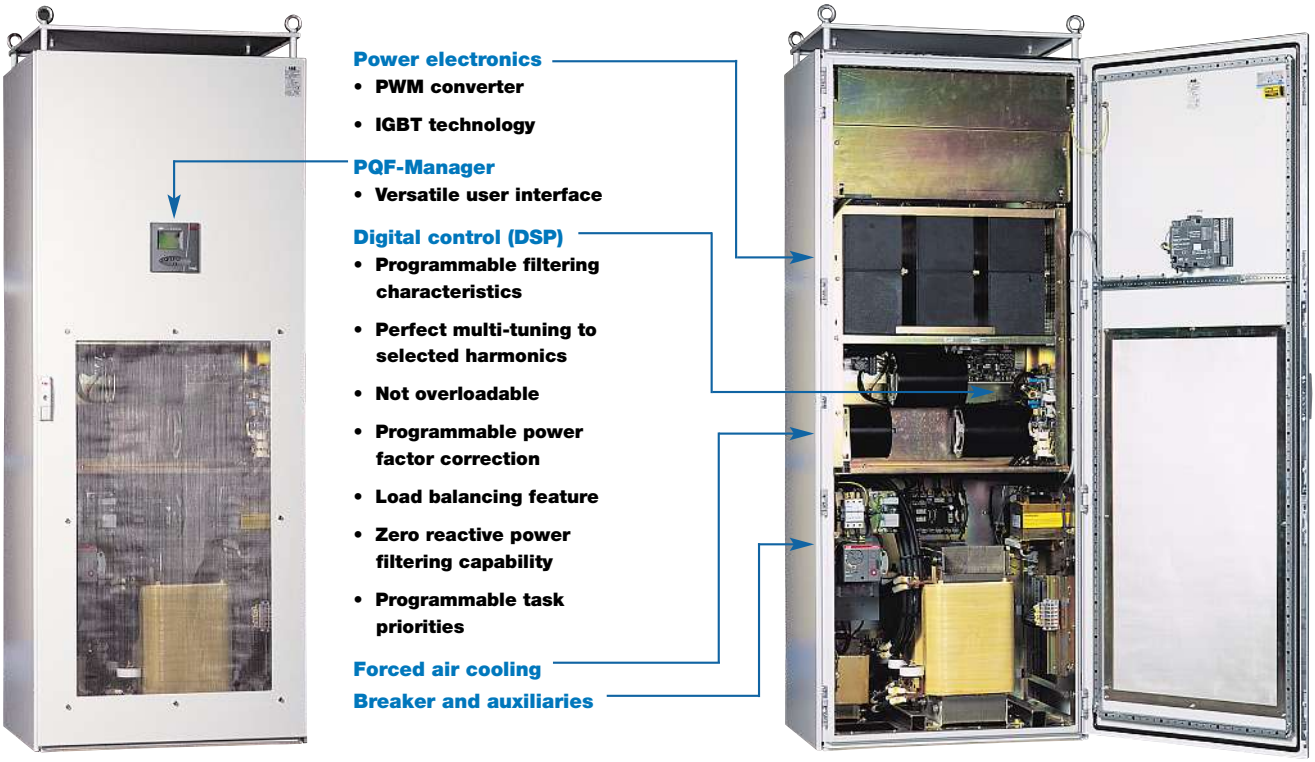
VSD supply current - Filter running



Advantages of the PQF

- **Allows installations to run more efficiently**
- **Filters up to 20 harmonics simultaneously (15 for PQFK and PQFS in 4-wire mode)**
- **Filters up to the 50th harmonic**
- **Filters zero phase sequence harmonics (3rd, 9th, ...) in the neutral (PQFK and PQFS)**
- **Harmonic attenuation factor better than 97%**
- **Fulfillment of international guidelines like G5/4, IEEE 519, etc**
- **Operates with closed loop control for best accuracy**
- **Has a programmable filtering strategy and free choice of harmonics selection**
- **Auto-adaptation to network impedance changes**
- **May filter without generation of reactive power/load balancing**
- **May generate reactive power and control power factor**
- **May balance the load current across the phases and between phases and neutral (PQFK and PQFS)**
- **Has programmable task priorities**
- **Two sets of compensation parameters for different load type compensation**
- **Is not overloadable**
- **Programmable stand-by and re-start functions**
- **Fault and event logging with real time stamp**
- **Direct connection up to 690V (CE/C-Tick) and 600V (cUL)**
- **Top or bottom cable entry (bottom cable entry only for PQFS)**
- **Easy commissioning – auto-detection of CT polarity and installed phase**
- **Does not require detailed network analysis**
- **Does not require special CTs**
- **Is easy to extend on site**
- **Comes factory tested**
- **Optical fiber isolation between power and control stages**
- **Advanced programmable digital I/O interface**
- **Modbus RTU communication compatible**
- **3 phase 3/4 wire connectivity (PQFS)**
- **Easy wall mounting design (PQFS)**
- **Backlit user interface (PQF-Manager)**

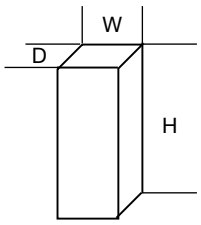
PQFI: The ABB solution for active filtering of harmonics for heavy industrial loads



Description

PQFI

The PQFI consists of one master and up to seven slave units mounted in cubicles together with auxiliary apparatus and wiring to form a factory assembled and tested system. The standard PQFI is offered in IP21 execution.



The dimensions of a single PQFI unit are 800 x 600 x 2150 mm (W x D x H). Large systems consisting of several PQFI units (master + slaves) may optionally be mounted on a base frame for a total height of 2250 mm.

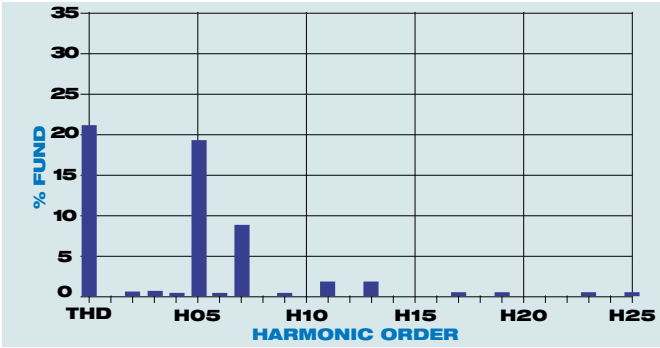
The PQFI filter is modular in design. On-site extensions are easily made by adding slave units (maximum seven) in parallel to the master unit. In standard execution each cubicle has its own power cable connection terminal. If desired, a common cable entry cubicle may be used (optional). The PQFI is suitable for direct connection up to 690V (600V for cUL versions) and is offered in two voltage groups (from 208V to 480V and from 480V to 690V). Each voltage group includes units of different current ratings. Intermixing of units of both equal and unequal rating is allowed in the same voltage group. The PQFI is suitable for operation on 50Hz and 60Hz networks.

Typical applications

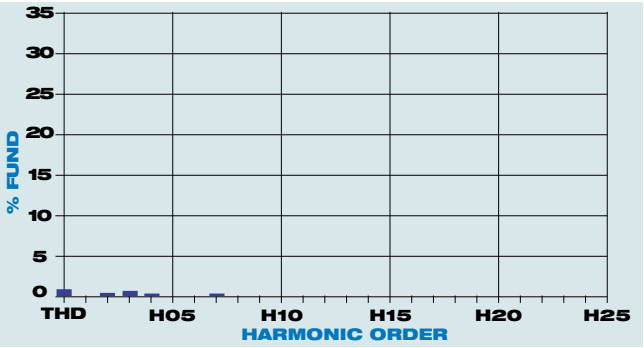
- **Oil and gas industry**
- **Steel industry**
- **Water industry**
- **Cement industry**
- **Automotive industry**
- **Process plants**
- **Pulp and paper**
- **...**

Typical result of PQFI filtering application

Harmonic current without PQF



Harmonic current with PQF



PQFI technical specifications

Active filter for three-phase networks with or without neutral for filtering of non zero phase sequence harmonics and reactive power compensation including load balancing.

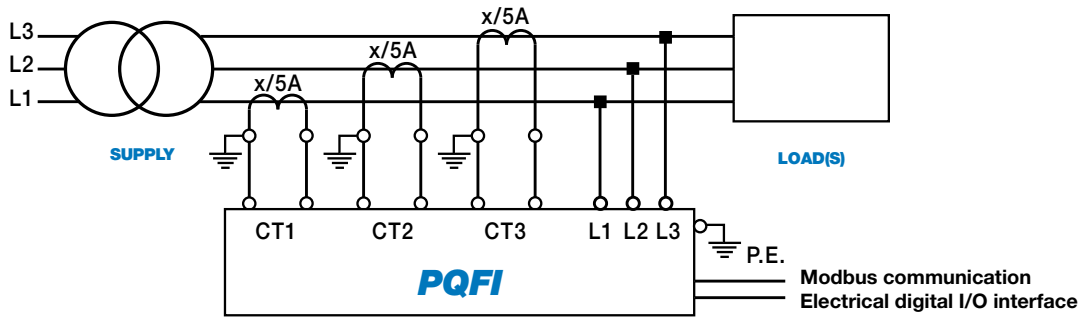
Filter line current per unit (RMS) (50 or 60 Hz)	208V≤U≤480V 480V<U≤690V* 250 A 180 A* 450 A 320 A*
CT requirement	3 CTs required (class 1.0 or better). 5 Amps secondary rating. Filter burden: 5 VA.
Modularity	Up to 8 units (intermixing of units of both equal and unequal rating is allowed in the same voltage group).
Physical mounting	One unit per panel.
Tolerance	+/- 10% in voltage. +/- 5% in frequency.
Harmonics to filter	20 individual harmonics selectable from 2nd to 50th order.
Degree of filtering	Individually programmable per harmonic in absolute terms.
Harmonic attenuation factor (I_H (source)/I_H (load))	Better than 97% at rated load.
Reactive power	Target displacement power factor programmable from 0.6 (inductive) to 0.6 (capacitive).
Load balancing	Programmable load balancing between phases.
Communication	Using Modbus RTU interface (optional). Through RS-232 port with optional dedicated software (PQF-Link).
Digital I/O	6 digital outputs (free of potential). 2 digital inputs (free of potential). 1 NO/NC alarm contact (free of potential).
Programming	Using PQF-Manager. Using PQF-Link software (optional) and PC (not provided).
Response time	< 0.5 ms instantaneous. 40 ms (10-90% filtering).

Active power	< 3% of the device power typically.
Protection degree	IP21 (IP20 open door). Optionally, IP41 protection degree can be provided.
Cubicle dimension	800 x 600 x 2150 mm (W x D x H).
Weight (unpacked)	Appr. 620 kg (450A/320A) or 525 kg (250A/180A) per unit.
Color	RAL 7035 (light gray). Other colors on request.
Installation	Floor fixation, lifting lugs provided, cable entry from bottom.
Environment	Indoor installation in clean environment up to 1000 m altitude (higher altitudes with suitable derating).
Ambient temperature	-10°C to +40°C (Up to 50°C with suitable derating).
Humidity	Maximum 95% RH; non-condensing.
Main options	PQF-Link software. Common cable entry cubicle with top/bottom cable entry. IP41 protection degree (10% derating applies). Base frame (100 mm). Modbus kit (RS-485 based). MCB position status lamps. Surge arresters. Space heaters. Temperature probes.

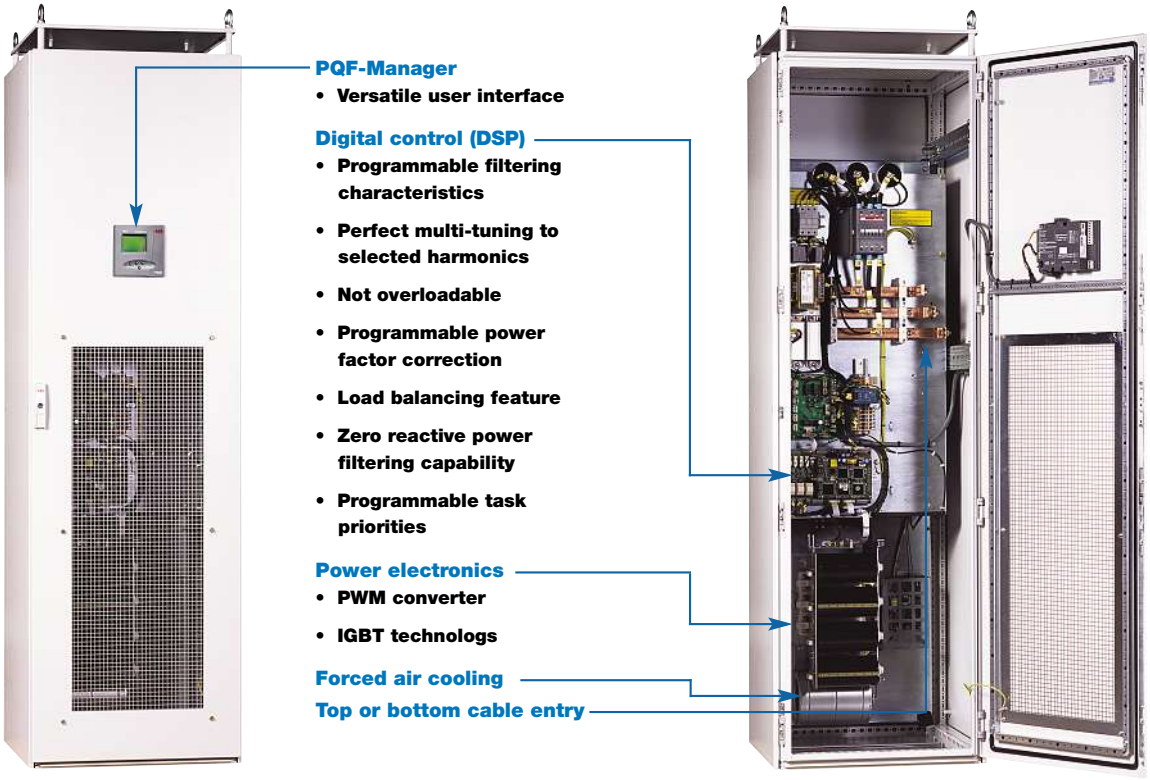
*** If the system voltage is higher than 600V the current rating of PQFI units may be derated automatically depending on the load conditions for ambient temperatures higher than 30°C. cUL versions are limited to 600V.**

The data here presented is an extract of the complete product specification. Please refer to the document "PQFI-PQFM-PQFK-PQFS detailed technical specifications" for more technical information.

Connection diagram



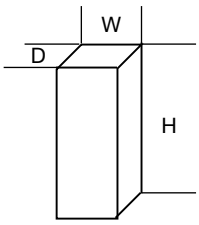
PQFM: The ABB solution for active filtering of harmonics for industrial loads of lower capacity



Description

PQFM

The PQFM consists of one master and up to seven slave units mounted in cubicles together with auxiliary apparatus and wiring to form a factory assembled and tested system. The standard PQFM is offered in IP21 execution and plate execution (IP00).



The dimensions of a single PQFM unit are 600 x 600 x 2150 mm (W x D x H). The dimensions of the IP00 execution are 498 x 504 x 1697 mm (W x D x H).

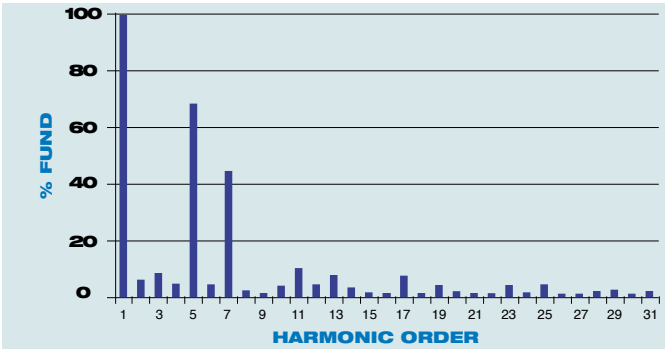
The PQFM filter is modular in design. On-site extensions are easily made by adding slave units (maximum seven) in parallel to the master unit. In standard execution each cubicle has its own power cable connection terminal. If desired, a common cable entry cubicle may be used (optional). The PQFM is offered in the range from 208V to 480V (600V for cUL versions). This range includes units of different current ratings. Intermixing of units of both equal and unequal rating is allowed (maximum one unit rating difference between the largest and the smallest unit rating in a filter system). The PQFM is suitable for operation on 50Hz and 60Hz networks.

Typical applications

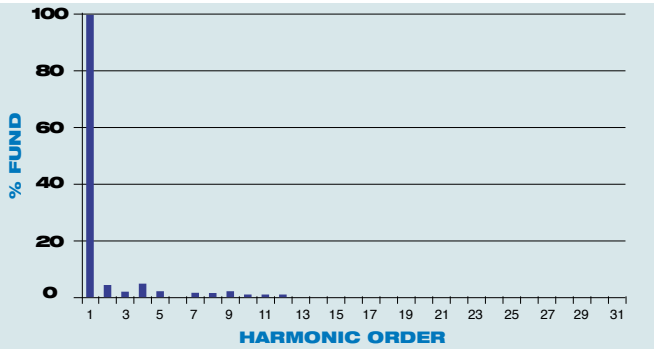
- **Water industry**
- **Steel industry**
- **Oil and gas industry**
- **Cement industry**
- **Automotive industry**
- **Process plants**
- **Pulp and paper**
- **...**

Typical result of PQFM filtering application

Harmonic current without PQF



Harmonic current with PQF



PQFM technical specification

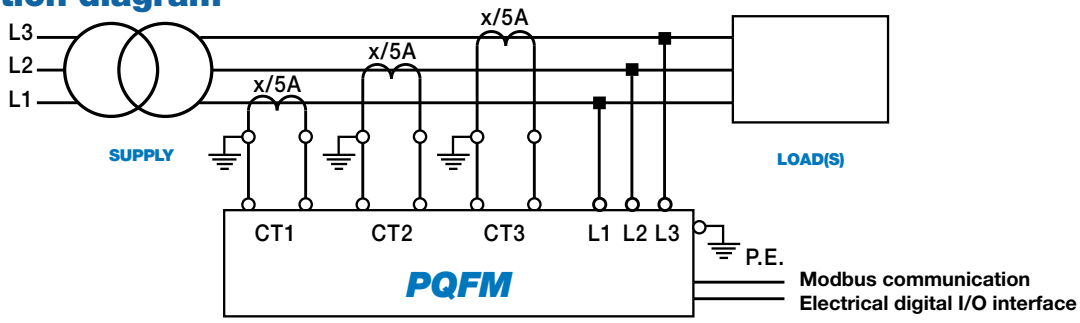
Active filter for three-phase networks with or without neutral for filtering of non zero phase sequence harmonics and reactive power compensation including load balancing.

Filter line current per unit (RMS) (50 or 60 Hz)	208V≤U≤480V 70 A 100 A 130 A 150 A	480V≤U≤600V* 100 A
CT requirement	3 CTs required (class 1.0 or better). 5 Amps secondary rating. Filter burden: 5 VA.	
Modularity	Up to 8 units (intermixing of units of both equal and unequal rating is allowed. Maximum one unit rating difference between the largest and the smallest unit rating in a filter system).	
Physical mounting	One unit per panel.	
Tolerance	+/- 10% in voltage. +/- 5% in frequency.	
Harmonics to filter	20 individual harmonics selectable from 2nd to 50th order.	
Degree of filtering	Individually programmable per harmonic in absolute terms.	
Harmonic attenuation factor (I_H (source)/I_H (load))	Better than 97% (at rated load).	
Reactive power	Target displacement power factor programmable from 0.6 (inductive) to 0.6 (capacitive).	
Load balancing	Programmable load balancing between phases.	
Communication	Using Modbus RTU interface (optional). Through RS-232 port with optional dedicated software (PQF-Link).	
Digital I/O	6 digital outputs (free of potential). 2 digital inputs (free of potential). 1 NO/NC alarm contact (free of potential).	
Programming	Using PQF-Manager. Using PQF-Link software (optional) and PC (not provided).	
Response time	< 0.5 ms instantaneous. 40 ms (10-90% filtering).	

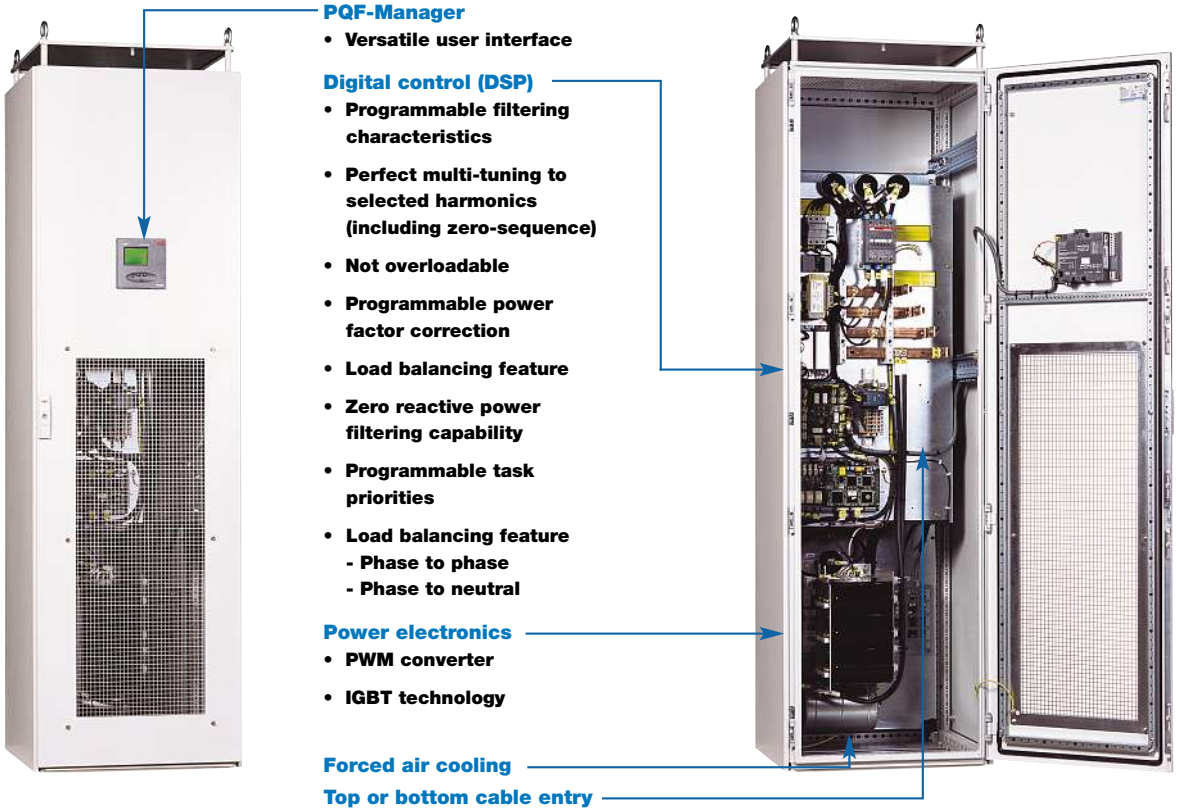
Active power	< 3% of the device power typically.
Protection degree	IP21 (IP20 open door). IP00 plate execution. Optionally, IP41 protection degree can be provided.
Cubicle dimension	600 x 600 x 2150 mm (W x D x H).
Weight (unpacked)	IP21: appr. 255 kg. IP00: appr. 125 kg.
Color	RAL 7035 (light gray). Other colors on request.
Installation	Floor fixation, lifting lugs provided, cable entry from top or bottom. (To be specified at time of ordering.)
Environment	Indoor installation in clean environment up to 1000 m altitude (higher altitudes with suitable derating).
Ambient temperature	-10°C to +40°C (Up to 50°C with suitable derating).
Humidity	Maximum 95% RH; non-condensing.
Main options	PQF-Link software. Top cable entry for individual cubicles. Common cable entry cubicle with top/bottom cable entry. IP41 protection degree (10% derating applies). Base frame (100 mm). Modbus kit (RS-485 based). Main contactor position status lamps. Surge arresters. Space heaters. Temperature probes. Fuse disconnector.

***cUL version only.**
The data here presented is an extract of the complete product specification. Please refer to the document "PQFI-PQFM-PQFK-PQFS detailed technical specifications" for more technical information.

Connection diagram

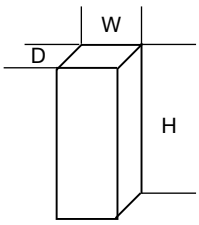


PQFK: The ABB solution for active filtering of harmonics for commercial loads including zero-sequence harmonics in the neutral



Description

PQFK



The PQFK consists of one master and up to three slave units mounted in cubicles together with auxiliary apparatus and wiring to form a factory assembled and tested system. The standard PQFK is offered in IP21 execution and plate execution (IP00).

The dimensions of a single PQFK unit are 600 x 600 x 2150 mm (W x D x H). The dimensions of the IP00 execution are 498 x 403 x 1697 mm (W x D x H).

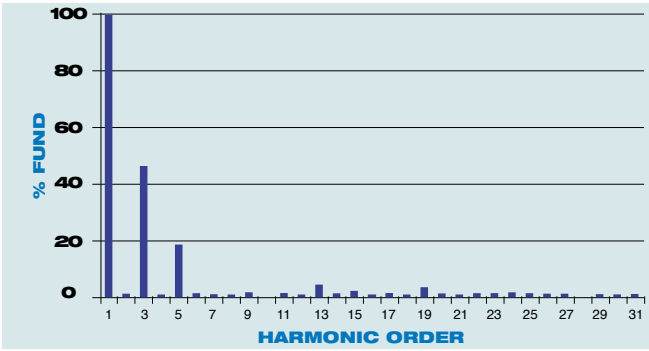
The PQFK filter is modular in design. On-site extensions are easily made by adding slave units (maximum three) in parallel to the master unit. In standard execution each cubicle has its own power cable connection terminal. If desired, a common cable entry cubicle may be used (optional). The PQFK is suitable for direct connection up to 415 V. The PQFK is offered in units of different current ratings. Intermixing of units of unequal rating is not allowed. The PQFK is suitable for operation on 50Hz and 60Hz networks.

Typical applications

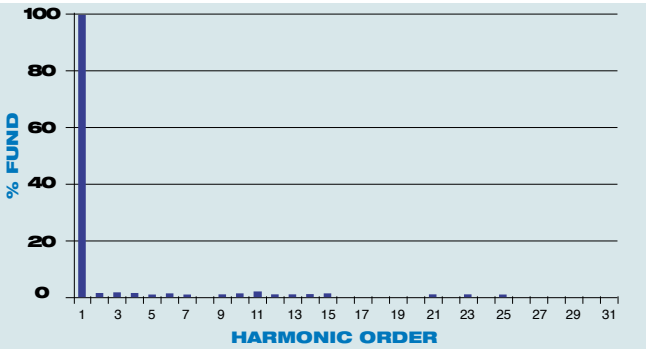
- **Offices and buildings,**
- **UPS systems,**
- **HVAC,**
- **Computer centers,**
- **Lifts,**
- **...**

Typical result of PQFK filtering application

Neutral harmonic current without PQF



Neutral harmonic current with PQF



Note: the PQFK filters also harmonics between lines apart from the neutral conductor.

PQFK technical specification

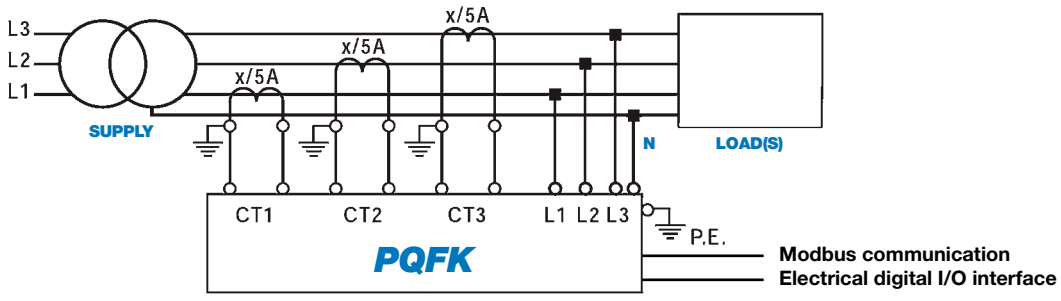
Active filter for three-phase four-wire systems for filtering of harmonics, including zero phase sequence current in the neutral, reactive power compensation and load balancing between phases as well as between phases and neutral.

Filter line current per unit (RMS) (50 or 60 Hz)	208V≤U≤415V 70 A 100 A
Neutral current	3 times the line RMS current mentioned above.
CT requirement	3 CTs required (class 1.0 or better). 5 Amps secondary rating. Filter burden: 5 VA.
Modularity	Up to 4 units of equal rating.
Physical mounting	One unit per panel.
Tolerance	+/- 10% in voltage. +/- 5% in frequency.
Harmonics to filter	15 individual harmonics selectable from 2nd to 50th order.
Degree of filtering	Individually programmable per harmonic in absolute terms.
Harmonic attenuation factor (I_H (source)/I_H (load))	Better than 97% (at rated load).
Reactive power	Target displacement power factor programmable from 0.6 (inductive) to 0.6 (capacitive).
Load balancing	Programmable load balancing between phases and between phases and neutral.
Communication	Using Modbus RTU interface (optional). Through RS-232 port with optional dedicated software (PQF-Link).
Digital I/O	6 digital outputs (free of potential). 2 digital inputs (free of potential). 1 NO/NC alarm contact (free of potential).
Programming	Using PQF-Manager. Using PQF-Link software (optional) and PC (not provided).
Response time	< 0.5 ms instantaneous. 40 ms (10-90% filtering).

Active power	< 3% of the device power typically.
Protection degree	IP21 (IP20 open door). IP00 plate execution. Optionally, IP41 protection degree can be provided.
Cubicle dimension	600 x 600 x 2150 mm (W x D x H).
Weight (unpacked)	IP21: appr. 250 kg. IP00: appr. 175 kg.
Color	RAL 7035 (light gray). Other colors on request.
Installation	Floor fixation, lifting lugs provided, cable entry from top or bottom. (To be specified at time of ordering.)
Environment	Indoor installation in clean environment up to 1000 m altitude (higher altitudes with suitable derating).
Ambient temperature	-10°C to + 40°C (Up to 50°C with suitable derating).
Humidity	Maximum 95% RH; non-condensing.
Main options	PQF-Link software. Top cable entry for individual cubicles Common cable entry cubicle with top/bottom cable entry. IP41 protection degree (10% derating applies). Base frame (100 mm). Modbus kit (RS-485 based). Main contactor position status lamps. Space heaters. Temperature probes. Fuse disconnector.

The data here presented is an extract of the complete product specification. Please refer to the document "PQFI-PQFM-PQFK-PQFS detailed technical specifications" for more technical information.

Connection diagram



PQFS: The ABB solution for active filtering of harmonics for commercial, residential and light industrial loads for installations with or without neutral

Compact wall mounted design

3 and 4 wire functionality

PQF-Manager

- **Versatile user interface**

Digital control (DSP)

- **Programmable filtering characteristics**
- **Perfect multi-tuning to selected harmonics (including zero-sequence)**
- **Not overloadable**
- **Programmable power factor correction**
- **Load balancing feature**
  - **Phase to phase**
  - **Phase to neutral**
- **Zero reactive power filtering capability**
- **Programmable task priorities**

Power electronics

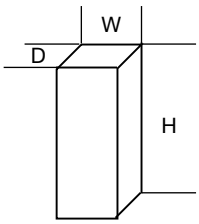
- **PWM converter**
- **IGBT technology**

Bottom cable entry

Description

PQFS

The PQFS is suitable for connection to electrical networks with and without neutral. Its wall-mount, compact design allows it to be installed at any location where only limited space is available.The PQFS is offered in IP30 execution.



The dimensions of a single PQFS unit are 585 x 310 x 700 mm (W x D x H).

The PQFS is modular in design and consists of one master and up to three slave units. On-site extensions are easily made by adding the slave units side by side in parallel to the master unit. PQFS units are available in the current range from 30 A to 100 A. Intermixing of units of unequal rating is not allowed.

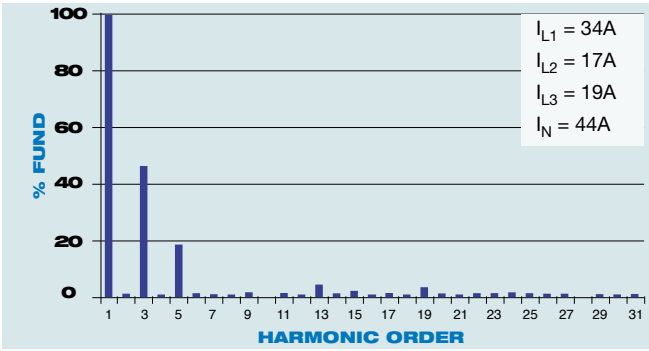
The PQFS is suitable for direct connection to network voltages in the range 208 V - 240 V and 380 V - 415 V. It is suitable for operation on 50 Hz and 60 Hz networks.

Typical applications

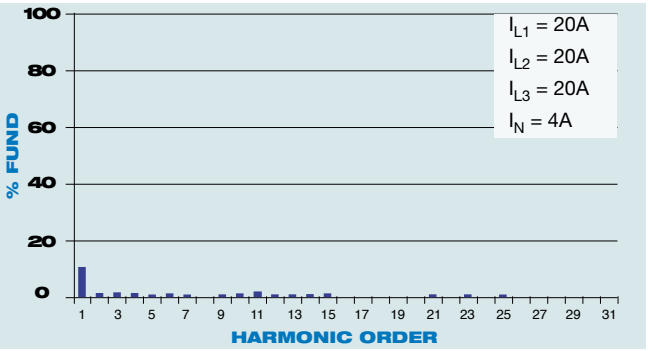
- **Offices and buildings,**
- **UPS systems,**
- **Residential buildings,**
- **Computer centers,**
- **Light industrial loads,**
- **...**

Typical result of PQFS filtering application

Neutral harmonic current without PQF



Neutral harmonic current with PQF



Note: the PQFS filters also harmonics between lines apart from the neutral conductor when connected.

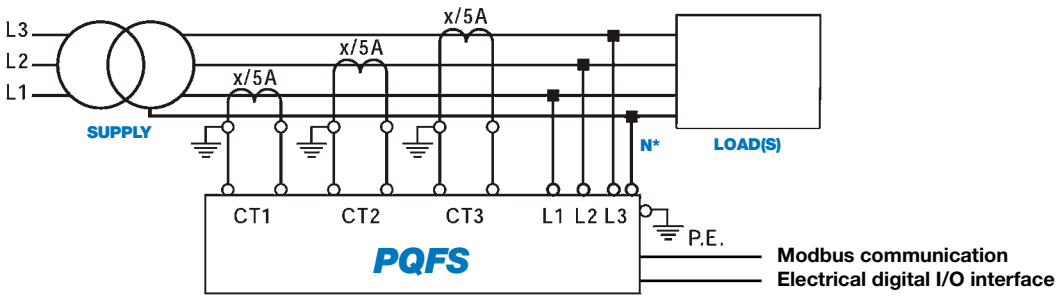
PQFS technical specification

Active filter for three-phase three-wire and four-wire systems for filtering of harmonics, including zero phase sequence current in the neutral, reactive power compensation and load balancing between phases as well as between phases and neutral.

Filter line current per unit (RMS) (50 or 60 Hz)	208V≤U≤240V 30 A 45 A 60 A 70 A 80 A 90 A 100 A	380V≤U≤415V 30 A 45 A 60 A 70 A 80 A 90 A 100 A	Communication	Using Modbus RTU interface (optional). Through RS-232 port with optional dedicated software (PQF-Link).
Neutral current	3 times the line RMS current mentioned above limited to 270 Arms.		Digital I/O	6 digital outputs (free of potential). 2 digital inputs (free of potential). 1 NO/NC alarm contact (free of potential).
CT requirement	3 CTs required (class 1.0 or better). 5 Amps secondary rating. Filter burden: 5 VA.		Programming	Using PQF-Manager. Using PQF-Link software (optional) and PC (not provided).
Modularity	Up to 4 units of equal rating.		Response time	< 0.5 ms instantaneous. 40 ms (10-90% filtering).
Physical mounting	Wall mount type enclosure.		Active power	< 3% of the device power typically.
Tolerance	+/- 10% in voltage. +/- 5% in frequency.		Protection degree	IP30.
Harmonics to filter	3-wire connection: 20 individual harmonics selectable from 2nd to 50th order. 4-wire connection: 15 individual harmonics selectable from 2nd to 50th order.		Enclosure dimension	585 x 310 x 700 mm (W x D x H).
Degree of filtering	Individually programmable per harmonic in absolute terms.		Weight (unpacked)	120 kg.
Harmonic attenuation factor (I_H (source)/I_H (load))	Better than 97% (at rated load).		Color	RAL 7035 (light gray) Other colors on request.
Reactive power	Target displacement power factor programmable from 0.6 (inductive) to 0.6 (capacitive).		Installation	Wall mounting, cable entry from bottom.
Load balancing	Programmable load balancing between phases and between phases and neutral.		Environment	Indoor installation in clean environment up to 1000 m altitude (higher altitudes with suitable derating).
			Ambient temperature	-10°C to + 40°C (Up to 50°C with suitable derating).
			Humidity	Maximum 95% RH; non-condensing.
			Options	PQF-Link software. Cable connection box. Modbus kit (RS-485 based). Temperature probes. PQF-Manager extension kit.

The data here presented is an extract of the complete product specification. Please refer to the document "PQFI-PQFM-PQFK-PQFS detailed technical specifications" for more technical information.

Connection diagram



*** not compulsory**

The PQF-Manager

The PQF-Manager is the Graphical User Interface provided with all the PQF types as a standard accessory. It offers direct control, programming, monitoring capabilities without a PC, communication facilities and detailed fault and event logging with real time stamp.

The PQF-Manager (144 x 144 mm), fitted in the front panel of the PQF with its large backlit LCD screen display (64 x 132 pixel) makes operating the filter very convenient.

DISPLAY

The PQF-Manager backlit large display provides the following main functions :

- Starting, stopping and resetting the filter
- Measurement, analysis, logging and printing of characteristic parameters
- Setting up the filter
- Monitoring the filter load and fault logging
- Providing filter identification information

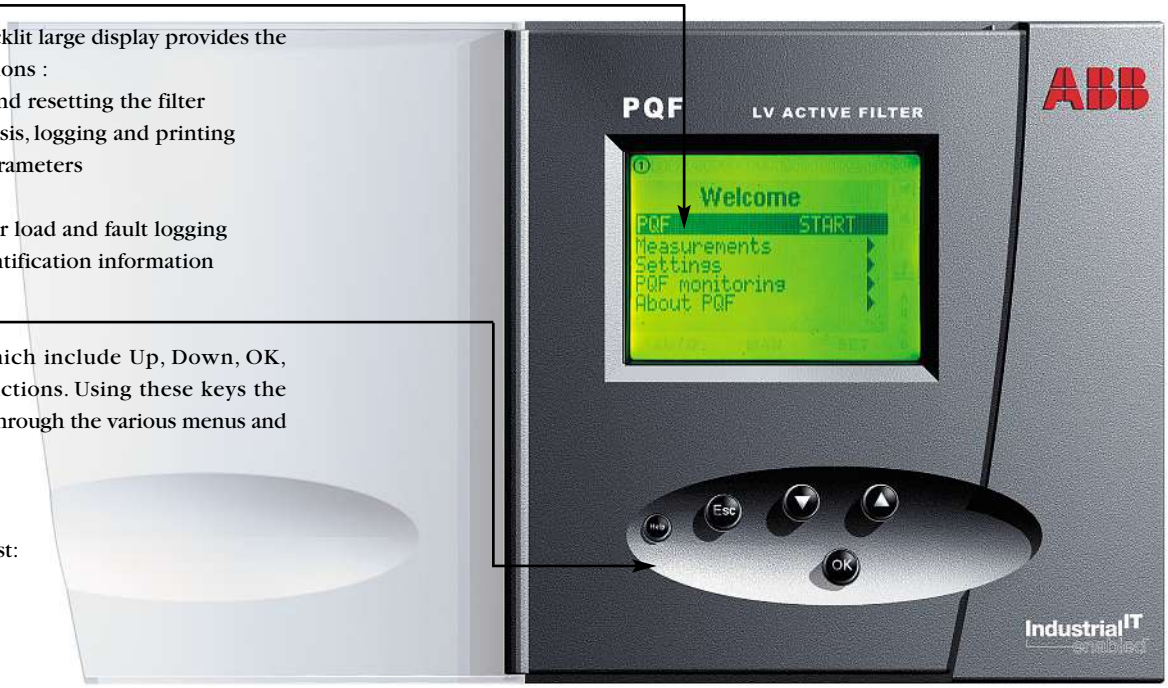
KEYPAD

There are 5 keys which include Up, Down, OK, Escape and Help functions. Using these keys the user easily navigates through the various menus and controls the PQF.

MENUS

Four main menus exist:

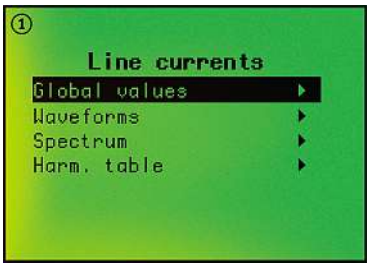
- Measurements
- Settings
- PQF monitoring
- About PQF

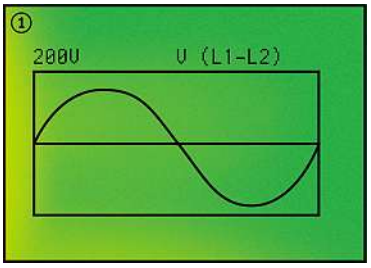


Measurements

The PQF-Manager measures all parameters like

- Line voltages* (RMS and fundamental)
- Line currents* (RMS and fundamental)
- Filter currents* (RMS)
- Frequency
- Voltage distortion
- Current distortion
- Line voltage imbalance
- Active power (kW)
- Reactive power (kvar)
- Apparent power (kVA)
- Displacement Power Factor (DPF)
- Power Factor (PF)
- DC voltage indication
- Max. IGBT temperature





Furthermore the PQF-Manager allows monitoring of temperatures using two optional temperature probes.

The PQF-Manager offers an excellent min/max logging function. For most of the measured parameters, it can display the defined threshold value and the duration during which the threshold value is exceeded. The maximum value encountered is also shown.

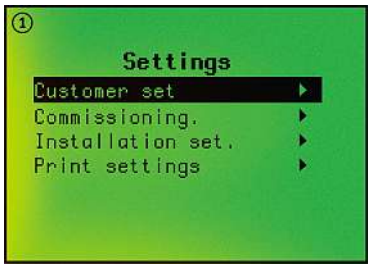
* Harmonic charts, harmonic tables and waveforms can be displayed.

Settings

The Settings menu has various sub-menus allowing a wide range of possibilities for the user to set up the PQF parameters, target values, task priorities and installation settings like CT ratio, derating factor, unit current rating, network parameters like voltage and frequency,…

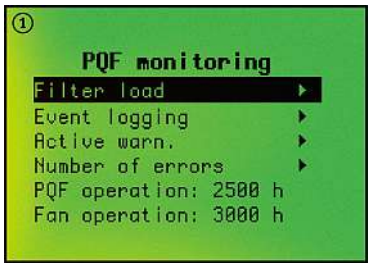
The commissioning settings are used to set the basic parameters which include the network characteristics, unit rating, derating, real time clock settings, print and communication settings. There is also an automatic CT detection program which finds wrong CT connections and proposes the CT ratio.

The settings may be protected by a password. A hardware lock is also available to avoid any unauthorized or accidental change of PQF-Manager settings.



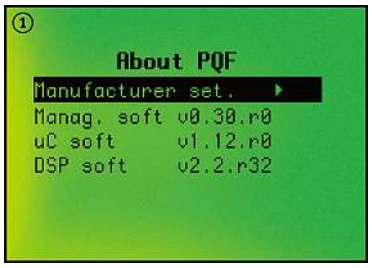
PQF Monitoring

This menu allows an overview of the PQF operation including the fault and event log. The PQF loading indicates the percentage of filter capacity used. The faults and events logged have a real time stamp.



About PQF

This menu shows the serial number and software version of the PQF.



Powerful features

Fully graphics backlit display

With its large dimensions and the clear positioning of information, prompts and icons, the backlit PQF-Manager offers a high level of readability and an unprecedented level of viewing comfort.

Menu navigation

A simple and user friendly organization of menus and items makes the navigation easy and intuitive.

Communication

The PQF-Manager is provided with Modbus RTU communication features. Through a Modbus RS-485 converter (optional), the PQF can be linked to a supervision system of the customer. All parameters, settings and measurements are accessible remotely.

Help button

The Help button gives instant access to a comprehensive description of most of the features and functionality of the PQF.

Easy commissioning

With automatic detection and correction of CT reversal commissioning is made easy.

Main/auxiliary parameters

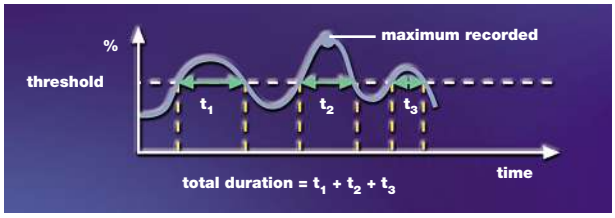
The PQF-Manager allows for two sets of parameters for harmonic filtering and reactive power compensation and load balancing.

Programmable electrical digital I/O

The PQF-Manager has two opto-isolated digital inputs, six programmable digital outputs and one potential free alarm relay with a NO and a NC contact.

Min/Max logging

The PQF-Manager can record the total duration any specific network parameter has exceeded the set value as well as record the extreme values measured.



The PQF-Link software (optional)

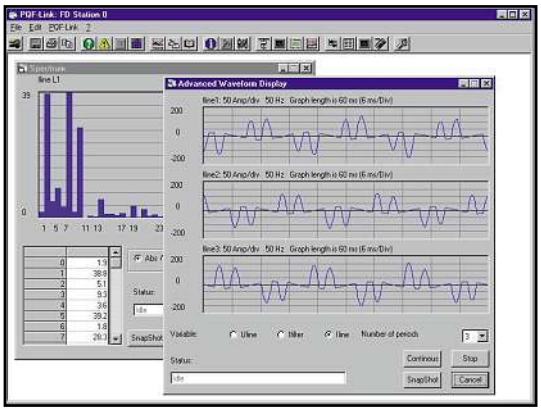
The PQF-Link software offers direct control, programming and monitoring capability from a PC through the RS-232 serial port.
All the features of the PQF-Link are directly accessible by clicking on the icons of the shortcut menu.
According to the login level of the user, different features are available.

Three different access levels are defined in the login procedure.

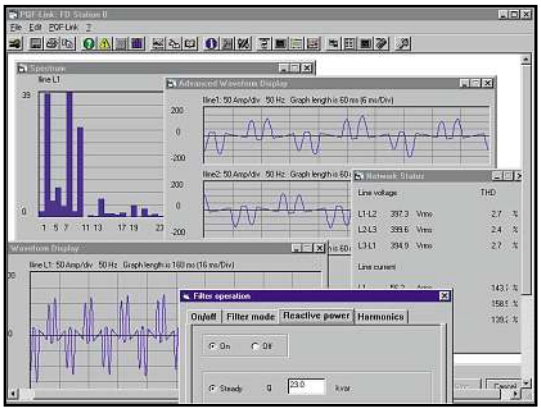
Particular features include:

- **Detailed information on PQF status:**
  - % of filter capacity used
  - Fault history
- **Advanced spectrum display - bar graph and table of values in the same window:**
  - Line/phase voltages
  - Line currents
  - Filter currents
- **Display of the PQF and network waveforms with a variable time base:**
  - Line voltages
  - Line currents
  - Filter currents
- **Network information (RMS, THD, ...)**
- **Simultaneous waveform display for the 3 phases**
- **Continuous updating of displayed information or snapshot display**
- **Remote control and programming of the PQF**
  - On/off
  - Mode selection
  - Reactive power control and load balancing
  - Harmonic requirements set up
- **Installation set-up**
  - Network characteristics
  - Filter sensors
  - Filter hardware
- **Display of several windows simultaneously**
- **Add/remove users and define their access level**

The PQF-Link works under Windows NT® 4 (Service Pack 3 minimum), Windows 2000® or Windows XP®. A cable for PC connection is supplied with the PQF-Link.



Line current spectrum and waveform (3 phases) displayed simultaneously



Simultaneous display of several windows

Examples of unit combinations

PQFI — From 208V to 480V (voltage group V1) — PQFM

Filter line current	Unit combinations for PQFI
250 A	PQFI – V1 – M25
450 A	PQFI – V1 – M45
700 A	PQFI – V1 – M45 + S25
900 A	PQFI – V1 – M45 + S45
1150 A	PQFI – V1 – M45 + S45 + S25
1350 A	PQFI – V1 – M45 + S45 + S45
1600 A	PQFI – V1 – M45 + S45 + S45 + S25
1800 A	PQFI – V1 – M45 + S45 + S45 + S45
2050 A	PQFI – V1 – M45 + S45 + S45 + S45 + S25
2250 A	PQFI – V1 – M45 + S45 + S45 + S45 + S45
2500 A	PQFI – V1 – M45 + S45 + S45 + S45 + S45 + S25
2950 A	PQFI – V1 – M45 + S45 + S45 + S45 + S45 + S45 + S25
3600 A	PQFI – V1 – M45 + S45 + S45 + S45 + S45 + S45 + S45 + S45

M25: Master 250 A S25: Slave 250 A
M45: Master 450 A S45: Slave 450 A

[1] **only for CE version.**

Filter line current	Unit combinations for PQFM
70 A	PQFM – V1 – M07
100 A	PQFM – V1 – M10
130 A	PQFM – V1 – M13
150 A	PQFM - V1 – M15[1]
170 A	PQFM – V1 – M10 + S07
200 A	PQFM – V1 – M10 + S10
230 A	PQFM – V1 – M13 + S10
260 A	PQFM – V1 – M13 + S13
280 A	PQFM – V1 – M15 + S13[1]
300 A	PQFM – V1 – M15 + S15[1]
360 A	PQFM – V1 – M13 + S13 + S10
430 A	PQFM – V1 – M15 + S15 + S13[1]
450 A	PQFM – V1 – M15 + S15 + S15[1]

M07: Master 70 A S07: Slave 70 A
M10: Master 100 A S10: Slave 100 A
M13: Master 130 A S13: Slave 130 A
M15: Master 150 A[1] S15: Slave 150 A[1]

PQFI — From 480V to 690V (voltage group V2) — PQFM[2]

Filter line current	Unit combinations for PQFI
180 A	PQFI – V2 – M18
320 A	PQFI – V2 – M32
500 A	PQFI – V2 – M32 + S18
640 A	PQFI – V2 – M32 + S32
820 A	PQFI – V2 – M32 + S32 + S18
960 A	PQFI – V2 – M32 + S32 + S32
1140 A	PQFI – V2 – M32 + S32 + S32 + S18
1460 A	PQFI – V2 – M32 + S32 + S32 + S32 + S18
1780 A	PQFI – V2 – M32 + S32 + S32 + S32 + S32 + S18
1920 A	PQFI – V2 – M32 + S32 + S32 + S32 + S32 + S32
2100 A	PQFI – V2 – M32 + S32 + S32 + S32 + S32 + S32 + S18
2560 A	PQFI – V2 – M32 + S32 + S32 + S32 + S32 + S32 + S32 + S32

M18: Master 180 A[3] S18: Slave 180 A[3]
M32: Master 320 A[3] S32: Slave 320 A[3]

Filter line current	Unit combinations for PQFM
100 A	PQFM – V2 – M10
200 A	PQFM – V2 – M10 + S10
300 A	PQFM – V2 – M10 + S10 + S10
400 A	PQFM – V2 – M10 + S10 + S10 + S10
500 A	PQFM – V2 – M10 + S10 + S10 + S10 + S10

M10: Master 100 A[2] S10: Slave 100 A[2]

[2] **cUL version only, limited up to 600V**
[3] **If the system voltage is higher than 600V the current rating of PQFI units in this voltage range may be derated automatically depending on load conditions for ambient temperatures higher than 30°C.**

PQFK — From 208V to 415V — PQFK

Filter line current	Unit combinations for PQFK
70 A	PQFK – M07
100 A	PQFK – M10
140 A	PQFK – M07 + S07
200 A	PQFK – M10 + S10

Filter line current	Unit combinations for PQFK
210 A	PQFK – M07 + S07 + S07
300 A	PQFK – M10 + S10 + S10
400 A	PQFK – M10 + S10 + S10 + S10

M07: Master 70 A S07: Slave 70 A
M10: Master 100 A S10: Slave 100 A

All units in a PQFK filter system must be of equal rating. Filter neutral current rating equals three times its line current rating.

PQFS — From 208V to 240V and 380V to 415V — PQFS

Filter line current	Unit combinations for PQFS
30 A	PQFS – M03
45 A	PQFS – M04
60 A	PQFS – M06
70 A	PQFS – M07
80 A	PQFS – M08
90 A	PQFS – M09
100 A	PQFS – M10
120 A	PQFS – M06 + S06
140 A	PQFS – M07 + S07
160 A	PQFS – M08 + S08
180 A	PQFS – M09 + S09
200 A	PQFS – M10 + S10

Filter line current	Unit combinations for PQFS
240 A	PQFS – M08 + S08 + S08
270 A	PQFS – M09 + S09 + S09
300 A	PQFS – M10 + S10 + S10
360 A	PQFS – M90 + S90 + S90 + S90
400 A	PQFS – M100 + S100 + S100 + S100

M03: Master 30 A S03: Slave 30 A
M04: Master 45 A S04: Slave 45 A
M06: Master 60 A S06: Slave 60 A
M07: Master 70 A S07: Slave 70 A
M08: Master 80 A S08: Slave 80 A
M09: Master 90 A S09: Slave 90 A
M10: Master 100 A S10: Slave 100 A

CE ratings only. All units in a PQFS filter system must be of equal rating.
Filter neutral current rating equals three times its line current rating limited to 270 Arms.

Other ratings can be obtained by other combinations. Please contact ABB for best possible combinations for your application.

2GCS304017A0070 April 2008

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