

Selection Guide – Active Power Filter (APF)

System selection guide
and critical installation
information

Smart Distribution



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Selection Guide – Active Power Filter (APF)

The Delta APF system provides a premium solution for mitigating harmonic issues. These harmonics are caused by multiples of the fundamental frequency of the electrical installation impacting the supply, resulting in heavily distorted waveforms. This often has a direct effect on the bottom line of your facility. Improving power quality can reduce your energy costs, increase efficiency, and improve service life of infrastructure.

There are six steps in selecting the right system for you.

This guide also includes CT and breaker cable selection guides which are critical parts to the installation and operation of the system.



Step 1

How much compensation is needed (A)?

For an existing site:

To determine the amount of compensation current needed you will ideally have available the following information:

- Total harmonic current distortion (THID) in Ampere under load conditions
- New target THID level in Ampere under load conditions

The THID is normally available on more advanced energy meters. The Ampere measurements should be taken under different load conditions to get the compensation current. As the harmonics vary according to the load profile throughout the day/week, the best suited APF solution is determined through a power quality audit. NHP conducts a site-specific power quality study over a period of time to accurately measure the THID with respect to the load profile. A detailed report on the power quality issues is provided with suggestions on solutions.

Sizing tip:

Any changes made to the load can impact the harmonic distribution, so to avoid resizing the compensation current for minimal load changes, the total compensation current needs to be multiplied with a scale factor of 1.3.

- That is, if the compensation current required is 200A,
- The size of APF would need to be $200 \times 1.3 = 260A$
- As the incremental option for the APF module in the NHP range is 100A,
- The total compensation current would be rounded up to 300A.

For sites that are at the design/construction stage:

The compensation current can be calculated using tools such as PowerCad or vendor tools.

NHP's technical team can also assist with sizing up an appropriate system in accordance to the project details.

Step 2

How much spare capacity is wanted?

As previously mentioned, the THID on a site can change with the type and number of loads that are running. If you plan to expand your site, add equipment or replace exciting products, including slots for spare capacity would be beneficial as a future proof option.

Please note: Spare capacity options are only available in the floor standing system options.

The wall mount systems can be expanded by connecting two systems in parallel.

Step 3

3 wire or 4 wire?

The four-wire option is required when there is an imbalance in the network.

Network imbalance is when differing line voltages across phases occurs, caused by unbalanced loads, single phase and phase-to-phase connections. This information can be found on your meter or power quality audit report.

	Use	Applicable industry examples
3 wire	For balanced networks	<ul style="list-style-type: none">■ Mining■ Industrial■ Food and beverage■ Manufacturing
4 wire	For an unbalanced network with a fully rated neutral wire	<ul style="list-style-type: none">■ Commercial■ Office■ Education■ Shopping centers

Step 4

IP rating requirement?

The environment that the cabinet would be installed has a major impact on the IP rating. NHP offers options for IP30 or IP54 floor standing cabinets and wall mount units. It is not recommended for any of the IP rated cabinets to be installed outdoors with direct sunlight or without cover for rain.

Step 5

Colour of cabinet

RAL7035 Light Grey or X15 Orange

Ordering guide

Wall Mount System

For a wall mount Active Power Filter (APF) solution, the power module is included in the enclosure.

Module

Output (A)	IP Rating	3 wire or 4 wire	Catalogue No.
50	IP30	4 Wire	PQAPFW5030G4XXT1A
100	IP30, IP54	4 Wire	PQAPFWM10030G4XXT1A PQAPFWM10054G4XXT1A

Floor Standing System

Fixed Type Front - Connect

Module

Output (A)	3 wire or 4 wire	Catalogue No.
100A	3 Wire	PQAPFM100XG3FFCX1A
100A	4 Wire	PQAPFM100XG4FFCX1A

Cabinet

The front connect APF modules are only compatible with the SVG cabinets listed below.

Max Capacity (A)	Max. Number of Modules	IP rating	Colour	Catalogue No.
200	2	IP30	Grey	PQSVG20030GXFFCX1A
500	5	IP30	Grey	PQSVG50030GXFFCX1A
700	7	IP30	Grey	PQSVG70030GXFFCX1A
300	3	IP54	Grey	PQSVG30054GXFFCX1A
200	2	IP30	Orange	PQSVG20030OXFFCX1A
500	5	IP30	Orange	PQSVG50030OXFFCX1A
700	7	IP30	Orange	PQSVG70030OXFFCX1A
300	3	IP54	Orange	PQSVG30054OXFFCX1A

Note: Rear-connect is also available on request.

Ordering examples

Example 1:

To get a 400A, 3 wire APF system with 100A spare capacity and a fixed type, IP30, Orange cabinet.

Order:

4 x PQAPFM100XG3FFCX1A and
1 x PQSVG50030OXFFCX1A

Example 2:

To get a 50A 4 wire APF wall mount system.

Order:

1 x PQAPFW5030G4XXT1A

Power Quality Commissioning



Services

FREE EXTENDED WARRANTY for all NHP Power Quality systems when commissioned by NHP Service team.

- Standard 12 month warranty is provided with all NHP Power Quality systems.
- Systems commissioned by NHP service team will receive an additional 12 months warranty.

It is critical that your power quality system is installed, connected and commissioned properly to ensure to ensure correct and reliable operation.

Common issues when equipment is not commissioned properly:

- System performance compromised - inability to reach and maintain target power factor and reduce onsite harmonics. This can also impact your energy bills, particularly where kVA and kVAr tariffs are in place.
- Incorrect operation of power quality equipment with potential impact on other onsite equipment
- Reduced equipment operating life
- Void of equipment warranty

Please note – Commissioning outside metropolitan areas may incur “Additional Travel and Accommodation Cost”.

Please contact service@nhp.com.au or
1300 NHP NHP

Cable and breaker Selection Guide

Appropriate cable and breaker selection are a vital part of ensuring the system will operate at its optimal capacity. Table 1 shows the required breaker rating and a guide to cable sizes for the respective APF system.

Note: The cable sizes are a guide only, always refer to AS/NZS3008 for specific requirements. Individual de-rating based on method of installation, cable lengths, volt drop, ambient temperature and cable configuration must be allowed for when sizing cable.

Table 1 – Cable and breaker selection guide for APF Systems

50A APF PM Quantity	APF Rated Current (A)	MCCB Rated Current (A)	Min. Conductor Size R/S/T/N Phases	Min. Conductor Size PE
1	50	80	35mm ²	25mm ²

100A APF PM Quantity	APF Rated Current (A)	MCCB Rated Current (A)	Min. Conductor Size R/S/T/N Phases	Min. Conductor Size PE
1	100	160	70mm ²	35mm ²
2	200	315	150mm ²	70mm ²
3	300	500	2x120mm ²	120mm ²
4	400	630	2x150mm ²	150mm ²
5	500	800	2x240mm ²	240mm ²
6	600	1100	2x300mm ²	300mm ²
7	700	1250	2x300mm ²	300mm ²

Note: For 3P3W APF, there are cooling fans in the cabinet, and rated voltage of these fans is AC220V, so a 1.5mm² cable should be connected to 3P3W APF cabinet's Neutral terminal powering AC220V fans in the cabinet. For 3P4W APF, Neutral cable diameter should follow the guideline in the above table.

CT Selection Guide

The correct CTs must be selected according to electric condition of installing site. Requirements of CT selection for APF are shown in Table 2.

Table 2 – Requirements for APF CT Selection

Specification	Requirement
CT Ratio	CT Primary Current: 5A
	CT Primary Current $\geq 1.7 \times$ Maximum Load Current
CT Accuracy	Class 0.5
CT Secondary Capacity (VA)	1~2 modules $\geq 10VA$
	3~4 modules $\geq 15VA$
	5~7 modules $\geq 20VA$
	>7 modules, please contact NHP for assistance

Note: Recommended secondary current of CT is 5A. When actual CT secondary current is 1A, CT ratio setting should be changed accordingly, for example, if the actual CT ratio is 500:1A, the CT ratio setting in APF Touch Panel HMI should be 2500:5A.

Critical Installation Information

The placement of the CTs during the installation is critical to the operation of the system.

The following examples are for the most common installations. Unlike the SVG systems, the CT placements for APF are the same for both balanced and unbalanced loads. For applications where more than one APF is required, there are capacitor banks present or any other variations to the scenarios outlined above, please refer to the full CT selection and installation guide.



External CT Connection Guide – Single APF System

1) Closed loop

In this scenario, 3 CTs shall be installed at grid side (R/S/T phases), and another 3 CTs shall be installed at APF input side. All the CTs P1 should be facing grid side with same CT ratio.

Refer to Figure 1-1 for single line diagram (SLD) and Figure 1-2 for detailed connection.

If CT connection is following this pattern, CT related parameters should be set according to following table for touch screen HMI.

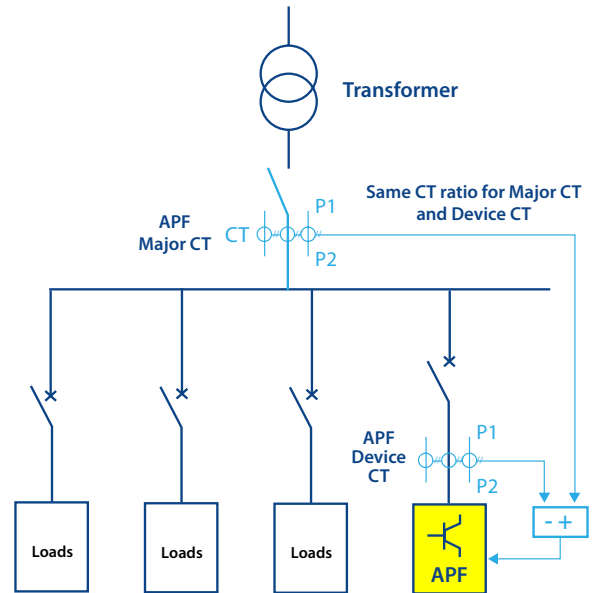


Figure 1-1 CT Connection for closed loop, without cap bank scenario – SLD

Corresponding CT settings in Touch Screen HMI

Setting Location	Setting Value
CT Setting → CT Position	Load Side
CT Setting → CT Direction	Positive
CT Setting → CT Number	3-CT
CT Setting → 1-CT Location	No need to set
CT Setting → CT Ratio	Actual CT ratio

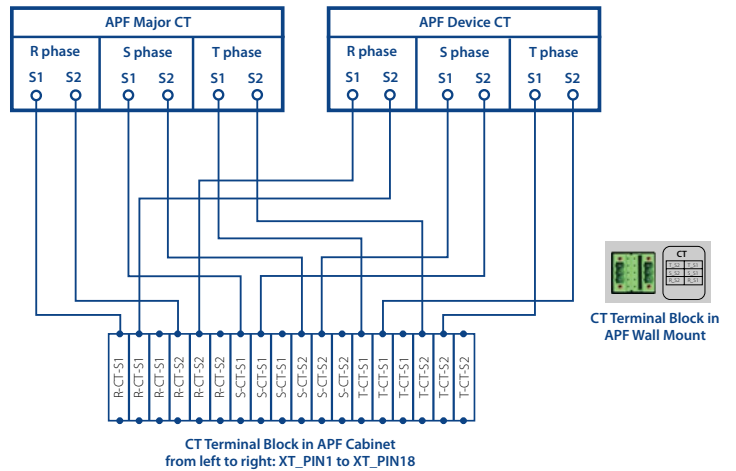


Figure 1-2 CT Connection for closed loop, without cap bank scenario – Detailed

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