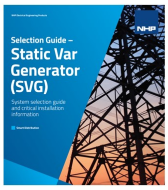
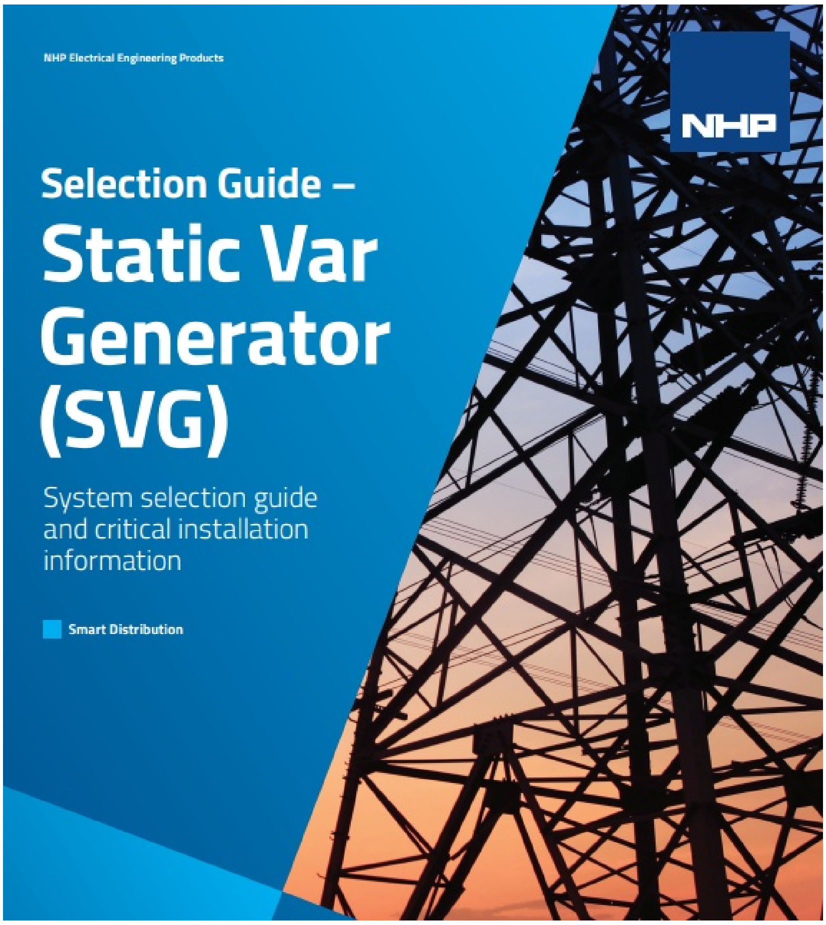
NHP Static Var Generator



NHP Static Var Generator User Guide

Contents

NHP Static Var Generator



Specifications

- Product: NHP Electrical Engineering Products – Static Var Generator (SVG)
- System Type: Smart Distribution
- Website: nhp.com.au | nhpnz.co.nz
- Contact: 1300 647 647 (AU) | 0800 647 647 (NZ)
- Email: nhpsales@nhp.com.au | sales@nhp-nz.com

Product Usage Instructions

Step 1: Determine Required Compensation (kVAr)
For existing sites:

1. Check existing power factor, total load kVA, and new target power factor.
2. Calculate the required total compensation (kVAr) based on the provided formula.

Sizing tip: Round up the total compensation to the nearest 100kVAr.

For design/construction stage sites:

1. Utilize tools like PowerCad or vendor tools to calculate required kVAr.
2. Consult NHP's technical team for assistance in sizing an appropriate system.

Step 2: Determine Spare Capacity in Cabinet

Consider future expansion when selecting cabinet size, ensuring spare capacity for additional loads.
Wall mount systems can be expanded by connecting two systems in parallel.

Step 3: Select 3 Wire or 4 Wire System
Choose based on network balance:

- Use 3 wire for balanced networks.
- Choose 4 wire for unbalanced networks with a fully rated neutral wire.

Step 4: Determine IP Rating Requirement
Assess the IP rating needed based on environmental conditions and installation location.

FAQ:

Q: What industries can benefit from using the Static Var Generator?
A: Industries such as mining, industrial, food and beverage, manufacturing, commercial, office, education, and shopping centers can benefit from the SVG system.

Selection Guide – Static Var Generator (SVG)

The Delta SVG System provides fast step-less compensation to correct leading and lagging power factor at a site. A poor power factor results in a phase angle difference between the current and voltage waveforms in an AC system. Improving power quality can reduce your energy costs, increase efficiency, and improve service life of infrastructure.
There are five steps in selecting the right SVG system for you.
This guide also includes breaker, cable and CT selection guides which is a critical part to the installation and operation of the system.

1. Step 1
    - How much compensation is needed (kVAr)?
    - For an existing site:
    - To determine the amount of kVAr needed you will ideally have available the following information:
    - Existing power factor
    - Total load kVA
    - New target power factor
    - This information may already be available via your electricity bill or can be requested from your energy retailer as part of your meter data. An NHP power quality audit can also be used to capture the exact power factor for the site as well as for individual loads. This audit would also help capture any other power quality issues that may not be initially visible such as harmonic distortion or load imbalance.
    - The example below calculates required total compensation (kVAr) from the power factor (PF) value found on your electricity bill or meter data.
    - Sizing tip:
    - If the required system is to correct a current PF of 0.75 to a new PF of 0.98, then the information required is as follows:
    - Existing power factor = 0.75
    - Total load kVA = 1333kVA

- New target power factor = 0.98
- If the load power is 1000kW at a PF of 0.75, the displaced (reactive) power is 882 kVAr.
- With the new target PF of 0.98, at the load of 1000 kW, the displaced (reactive) power is reduced to 203 kVAr.
- The compensation SVG system size required to achieve this is: 882kVAr – 203kVAr = 679kVAr.
- The total compensation in this case would need to be rounded up to the nearest 100th as the SVG system offered by NHP has modular increments of 100kVAr.
- Therefore, the total compensation: 700kVAr.
- Important note: Even though high kVAr can be a burden on the supply and electricity costs, inductive loads such as motors and welding equipment need some kVAr to maintain the electromagnetic fields required to operate.
- For sites that are at the design/construction stage:
- The kVAr required 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

2. Step 2
    - How much spare capacity do you need in the cabinet?
    - The power factor at 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, accounting for spare capacity would be beneficial as a future proof option.
    - The cabinet sizes are listed in the ordering guide, the incremental steps are by 100kVAr.
    - The wall mount systems can be expanded by connecting two systems in parallel.
3. 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	■ Mining ■ Industrial ■ Food and beverage ■ Manufacturing
4 wire	For an unbalanced network with a fully rated neutral wire	■ Commercial ■ Office ■ Education ■ Shopping centers

4. Step 4
   IP rating requirement?
   The environment that the cabinet would be installed in 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 in direct sunlight or without cover from rain.
5. Step 5
   Colour of cabinet
   RAL7035 Light Grey or X15 Orange

Ordering guide

Wall Mount System
For a wall mount Static Var Generator (SVG) 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	PQSVGW5030G4XXT1A
100	IP30, IP54	4 wire	PQSVGWM10030G4XXT1A PQSVGWM10054G4XXT1A

Floor Standing System

Module

Output (kVAr)	3 wire or 4 wire	Catalogue No.
100	3 Wire	PQSVGM100XG3FFCX1A
100	4 Wire	PQSVGM100XG4FFCX1A

Cabinet

Max Capacity (A)	Max. Number of Modules	IP rating	Colour	Catalogue No.
200	2	IP30	Grey	PQSVGC20030GXFFCX1A
500	5	IP30	Grey	PQSVGC50030GXFFCX1A
700	7	IP30	Grey	PQSVGC70030GXFFCX1A
300	3	IP54	Grey	PQSVGC30054GXFFCX1A
200	2	IP30	Orange	PQSVGC20030OXFFCX1A
500	5	IP30	Orange	PQSVGC50030OXFFCX1A
700	7	IP30	Orange	PQSVGC70030OXFFCX1A
300	3	IP54	Orange	PQSVGC30054OXFFCX1A

Ordering examples

1. Example 1:
   To get a 200kVAr 3 wire SVG system with 100kVAr spare capacity and an IP54, orange cabinet.
   Order:
   2 x PQSVGM100XG3FFCX1A and 1 x PQSVGC30054OXFFCX1A
2. Example 2:
   To get a 400kVAr 4 wire SVG system with 300kVAr spare capacity and an IP30, grey cabinet.

Order:

4 x PQSVGM100XG4FFCX1A

1 x PQSVGC70030GXFFCX1A

3. Example 3:

   To get a 50kVAr 4 wire SVG wall mount system.

   Order:

   1 x PQSVGW5030G4XXT1A

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 SVG 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 SVG Systems

50kVAr SVG PM Quantity	SVG Capacity (kVAr)	SVG Rated Current (A) @400V	MCCB Rated Current (A)	Min. Conductor Size R/S/T/N Phases	Min. Conductor Size PE
1	50	75	100	30mm2	16mm2

100kVAr SVG PM Quantity	SVG Capacity (kVAr)	SVG Rated Current (A) @400V	MCCB Rated Current (A)	Min. Conductor Size R/S/T/N Phases	Min. Conductor Size PE
1	100	150	180	70mm2	25mm2
2	200	300	350	150mm2	50mm2
3	300	450	550	2x120mm2	95mm2
4	400	600	800	2x185mm2	150mm2
5	500	750	900	2x240mm2	185mm2
6	600	900	1100	2x300mm2	240mm2
7	700	1050	1250	2x300mm2	240mm2

Note: For 3P3W SVG, there are cooling fans in the cabinet rated for AC220V, so a 1.5mm2 cable should be connected to 3P3W SVG cabinet's neutral terminal powering AC220V fans in the cabinet. For 3P4W SVG, neutral cable diameter should follow the guideline in the above table.

CT Selection Guide

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

Table 2 – Requirements for SVG CT Selection

Specification	Requirement
CT Ratio	CT Primary Current: 5A
	CT Primary Current ≥ 1.5* Maximum Load Current
CT Accuracy	Class 0.5 or 1.0
CT Secondary Capacity (VA)	1~2 modules ≥10VA
	3~4 modules ≥15VA
	5~7 modules ≥20VA
	>7 modules, consult Delta or Delta distributor

Note: Recommended secondary current of CT is 5A. When actual CT secondary current is 1A, CT ratio setting should be changed accordingly, e.g., if actual CT ratio is 500:1A, the CT ratio setting in SVG Touch Screen HMI should be 2500:5A

Critical Installation Information

The placement of the CTs during the installation is critical to the operation of the system. This section outlines the placement options for different applications.
The following guides are for the most common installations. For applications where more than one SVG unit is required, solar panels are 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 SVG System

1. Closed loop, Unbalanced phases (4-wire system)
   In this single SVG system scenario, 3 CTs shall be installed at grid side (R/S/T phases). P1 should be facing the grid side, refer to Figures 1-1 and 1-2 for single line diagram (SLD) and detailed connection.
   If CT connection is following this pattern, CT related parameters should be set according to the following two tables for touch screen HMI.

Figure 1-1 CT Connection for closed loop, unbalanced phases - SLD scenario

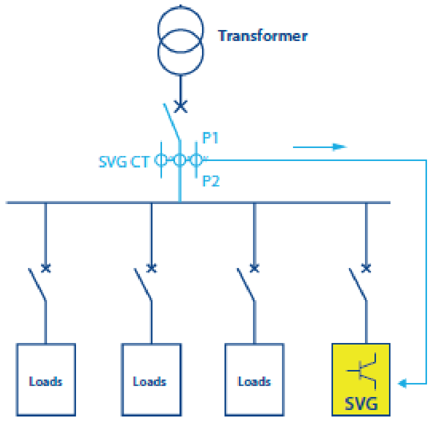
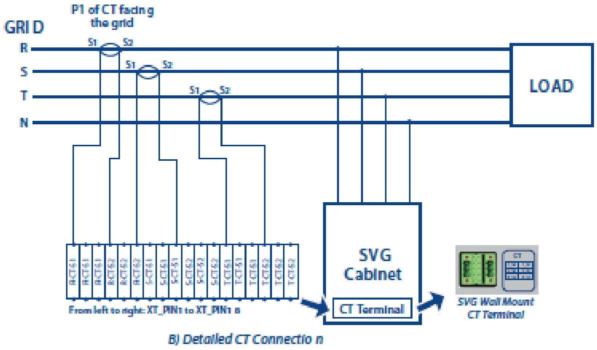


Figure 1-2 CT Connection for closed loop, unbalanced phase - Detailed



CT settings in Touch Screen HMI

Setting Location	Setting Value
CT Setting → CT Position	Grid 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

2. Closed loop, Balanced phases (3-wire or 4-wire systems)

In this single SVG system scenario, customer can use 3 CTs and follow the same CT connection configuration shown in Figures 1-1 and 1-2. Alternatively, only 1 CT can be installed at grid side (R phase), P1 should be facing the grid side. Refer to Figure 2-1 and 2-2 for single line diagram (SLD) and detailed connection.

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

Figure 2-1 CT Connection for closed loop, balanced phases-SLD

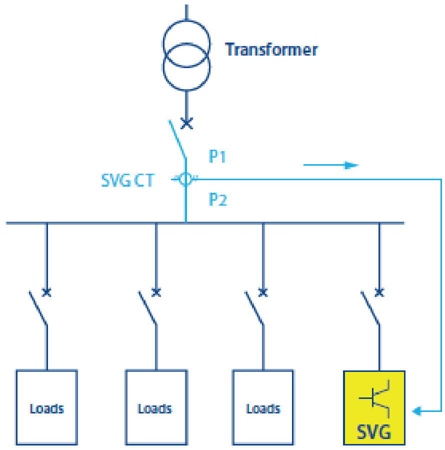
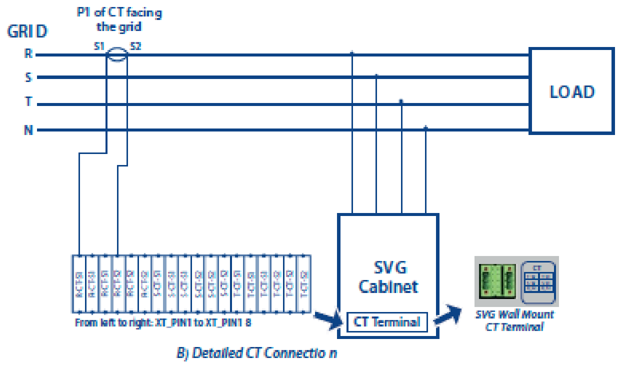


Figure 2-2 CT Connection for closed loop, balanced phase - Detailed



Setting Location	Setting Value
CT Setting → CT Position	Grid Side
CT Setting → CT Direction	Positive
CT Setting → CT Number	1-CT
CT Setting → 1-CT Location	Phase-A
CT Setting → CT Ratio	Actual CT ratio

3. Open loop, Unbalanced phases (4-wire)

In this single SVG system scenario, 3 CTs shall be installed at load side (R/S/T phases), P1 should be facing the grid side. Refer to Figures 3-1 and 3-2 for single line diagram (SLD) and detailed connection.

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

Figure 3-1 CT Connection for open loop, unbalanced phases - SLD

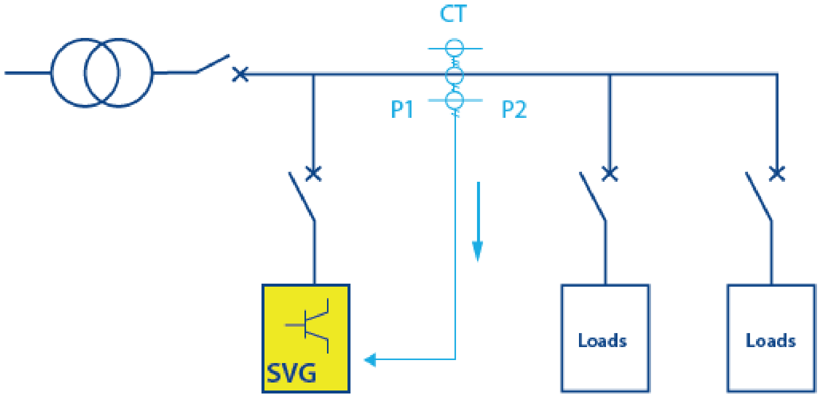
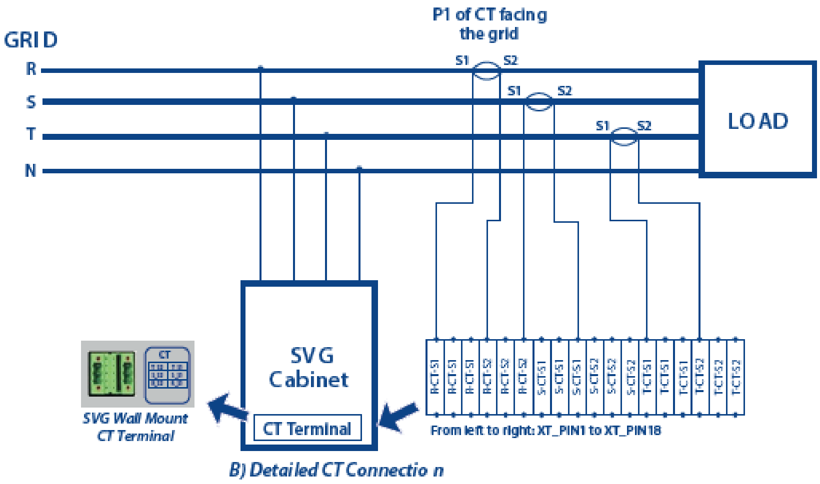


Figure 3-2 CT Connection for open loop, unbalanced phases - Detailed



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

4. Open loop, Balanced phases (3 wire or 4 wire)

   In this single SVG system scenario, customer can use 3 CTs and follow the same CT connection configuration shown in Figures 3-1 and 3-2. Or only 1 piece of CT can be installed at grid side (R phase), P1 of which should be facing the grid side, refer to Figure 4-1 and 4-2 for single line diagram (SLD) and detailed connection.

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

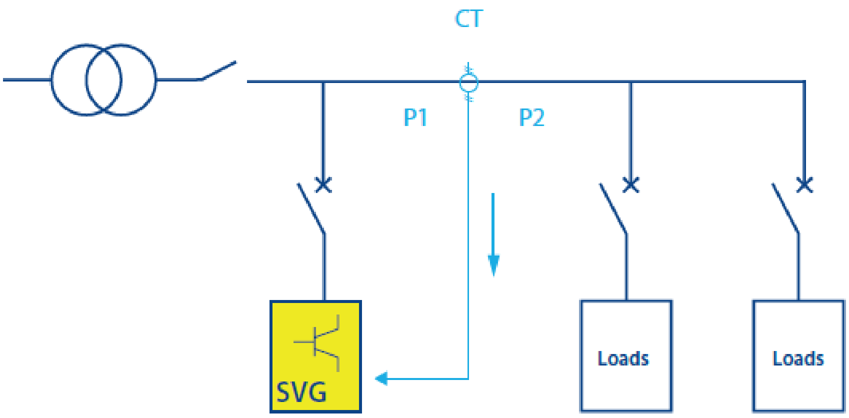


Figure 4-1 CT Connection for open loop, balanced phases - SLD

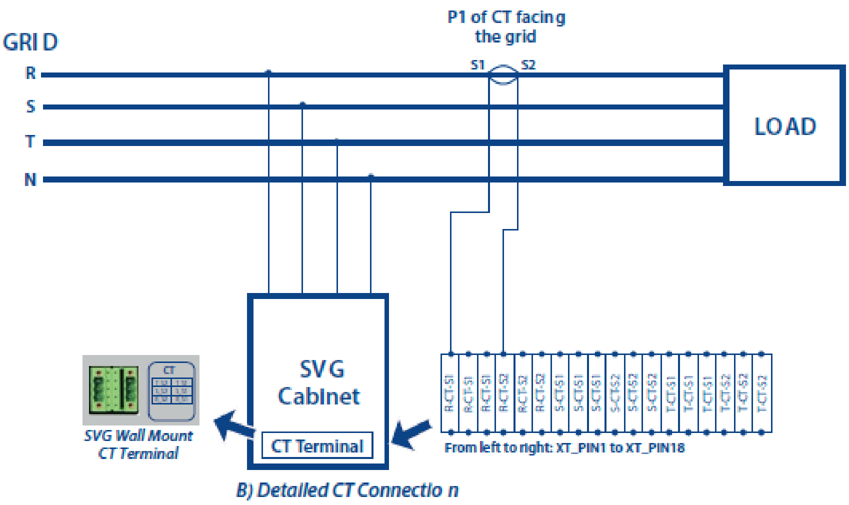


Figure 4-2 CT Connection for open loop, balanced phases-Detailed

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	1-CT
CT Setting → 1-CT Location	Phase-A
CT Setting → CT Ratio	Actual CT ratio

Services and training solutions to improve your business

To support our range of quality products, NHP also offer a wide range of service and training options, including technical support, field service, maintenance contracts, repair services and training – all of which are delivered by qualified technicians.

This access to NHP's expertise, combined with our extensive local stockholding further enables customers to experience a holistic approach across their automation, industrial switchgear, training and commissioning business requirements, for complete peace of mind.

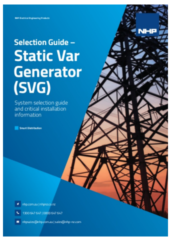
At NHP, we understand the complexities of your project and our product and service offering is designed to help you overcome them. If your project is focused on a profitable, safe and sustainable operation, NHP's customised value add service and training offering is the place to start.

nhp.com.au
1300 NHP NHP | 0800 NHP NHP sales@nhp.com.au | sales@nhp-nz.com

nhp.com.au
SALES 1300 647 647 nhpsales@nhp.com.au

NHP Electrical Engineering Products

Documents / Resources

	NHP Static Var Generator [pdf] User Guide Static Var Generator, Var Generator, Generator

References

- NHP Australia - Specialists in electrical and automation products, systems and solutions.
- NHP New Zealand - Specialists in electrical and automation products, systems and solutions.
- User Manual