Static Var Generator (SVG) – installation guide

Revision A

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1.0 System Overview

Automatic power factor correction equipment is broadly applied in NZ industry to ensure the electrical network is utilised to its best capacity. The usual form of such power factor correction is an automatic controller that monitors one incoming phase to a plant and switches banks of capacitors to try and maintain a target power factor.

The problems with capacitor based automatic power factor correction are vast and varied. It is slow to react to load changes so the system is constantly in a state of over compensation or under compensation. In today’s harmonic rich environments the capacitors suffer with overload.

System resonance is a risk and the life expectancy of the system is reduced. Contactors regularly fail and overloaded capacitors leak, presenting a real fire risk.

Sinexcel’s SVG is an entirely new approach to power factor correction. The SVG utilises a high speed three level inverter that reacts to changes in reactive power, exchanging corrective reactive power into the system. Full correction is made in 3/4 of a cycle. This rapid response provides stable accurate real-time power factor correction without the drawbacks of traditional capacitor based systems. The SVG can continuously adjust reactive power dynamically and bi-directionally (leading or lagging). There is no chance of system resonance and even under low voltage conditions SVG will provide full reactive power compensation. The Sinexcel SVG is 100% inverter based so there are no AC capacitors to fail.
2.0 SVG Plain English Touchscreen 4.3” (Wallmount Only)

The 4.3” colour touchscreen is available on all wallmount variants of the SVG and ASVG. Commissioning is undertaken via this display with the password to access all user settings set at default to “080808”.

Navigation through the screen groups is achieved by touching one of the four main screen groupings as listed on the left hand side of the display. Touching the appropriate group will bring all the appropriate subgroups or settings for that group to the screen. Adjustment of the groups is achieved by touching the screen group that is required to be adjusted. A drop down box or number keypad will appear to allow the user to amend the setting. Exiting the setting ensures all changed parameters are saved.

Please note the 4.3” Touchscreen and 7.0” Touchscreen cannot be used together.

3.0 SVG Plain English Touchscreen 7.0” (Cabinet or Rackmount Only)

The 7.0” colour touchscreen is available on all variants of the SVG and ASVG not fitted with a 4.3” Touchscreen. It is supplied as standard on all Sinexcel Plug In or Flexi cabinets but is also available as a loose item for custom built systems. Commissioning is undertaken via this display with the password to access all user settings set at default to “080808”.

Navigation through the screen groups is achieved by touching one of the six main screen groupings across the top of the display. Touching the appropriate group will bring all the appropriate subgroups and settings for that group to the screen. Adjustment of the groups is
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achieved by touching the screen group that is required to be adjusted. A drop down box or number keypad will appear to allow the user to amend the setting. Exiting the setting ensures all changed parameters are saved.

Please note the 4.3” Touchscreen and 7.0” Touchscreen cannot be used together.

4.0 Modes Of Operation

The principal purpose of the SVG is to provide reactive power in order to improve power factor. The SVG can also be configured to use its capacity to provide current balancing, voltage regulation (on request only), and in the case of the ASVG harmonic correction.

This installation guide has been prepared to assist with the installation and configuration for operation in reactive power mode. For applications requiring the SVG or ASVG to use the additional functionality described above please contact your local Power Electronics office for assistance.

5.0 Supply MCCB Sizing

<table>
<thead>
<tr>
<th>SVG Model (KVAR)</th>
<th>MCCB Size (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Cabinet or Custom Systems</td>
<td>System Current Rating x 1.25 (1KVAR = 1.5Amp)</td>
</tr>
</tbody>
</table>

6.0 Heat Dissipation And Airflow

<table>
<thead>
<tr>
<th>SVG Model (KVAR)</th>
<th>Heat Losses Max (W)</th>
<th>Airflow (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>1384</td>
<td>220</td>
</tr>
<tr>
<td>100</td>
<td>2786</td>
<td>405</td>
</tr>
</tbody>
</table>

PLEASE NOTE ALL SINEXCEL PROPRIETARY CABINETS MUST BE INSTALLED WITH 300MM CLEARANCE AT THE REAR OF THE CABINET FOR CORRECT AIRFLOW
7.0 CT Sizing

Traditional power factor correction has monitored power factor in one phase only and has connected reactive power on the basis that the two unmonitored phases will have exactly the same power factor as the monitored phase. In reality this condition very rarely exists. It is typical of the power factor on all three phases to be completely different.

The SVG will monitor and provide reactive power for all three phases individually. Thus a minimum of three CTs (one per phase) are required to be installed for the SVG to operate correctly. The CTs should be of 0.5 accuracy class or better.

The ratio of CT to be fitted is 1.75 x, to 4 x, the rated full load current supply to the switchboard. For example – a 100A supply requiring power factor correction would require a CT ratio of between 175/5 to 400/5. The secondary of the CT must always be rated 5A.

Positioning of the CTs is critical. Separate detail is available in this document showing CT positioning for various installations. Some applications may require multiple CTs. If multiple CTs per phase are required – the CT ratio for all CTs must be the same.

7.1 Typical CT Ratios

<table>
<thead>
<tr>
<th>CT Ratio</th>
<th>Outer Diameter (mm)</th>
<th>Inner Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150/5</td>
<td>110*90</td>
<td>30*20</td>
</tr>
<tr>
<td>200/5</td>
<td>145*114</td>
<td>80*50</td>
</tr>
<tr>
<td>300/5</td>
<td>145*114</td>
<td>80*50</td>
</tr>
<tr>
<td>500/5</td>
<td>145*114</td>
<td>80*50</td>
</tr>
<tr>
<td>600/5</td>
<td>145*114</td>
<td>80*50</td>
</tr>
<tr>
<td>1000/5</td>
<td>185*144</td>
<td>120*80</td>
</tr>
<tr>
<td>1500/5</td>
<td>185*144</td>
<td>120*80</td>
</tr>
<tr>
<td>2000/5</td>
<td>185*144</td>
<td>120*80</td>
</tr>
<tr>
<td>2500/5</td>
<td>193*144</td>
<td>125*55</td>
</tr>
<tr>
<td>3000/5</td>
<td>193*144</td>
<td>125*55</td>
</tr>
<tr>
<td>4000/5</td>
<td>185*144</td>
<td>120*80</td>
</tr>
<tr>
<td>5000/5</td>
<td>245*174</td>
<td>160*80</td>
</tr>
<tr>
<td>6000/5</td>
<td>245*175</td>
<td>160*80</td>
</tr>
</tbody>
</table>
8.0 Basic Commissioning Settings For Plain English 4.3” Touchscreen

Select Settings Group

Enter Password 080808

Ensure set to Reactive mode

Power On mode to Automatic

Set to Line or Load as per CT location shown in config drawings

Set to total current rating of all SVG modules combined. Setting is in Amps. Use 100KVAR = 150Amps

Set to Intelligent mode

Set correct CT ratio
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Set required power factor
9.0 Basic Commissioning Settings For Plain English 7” Touchscreen

- Touch anywhere on default screen to bring up main menus.

- Select System Menu. When prompted enter 080808 as the password.

- Ensure set to Reactive mode
- Set required power factor
- Set to total current rating of all SVG modules combined. Setting is in Amps. Use 100KVAR = 150Amps
- Set correct CT ratio
- Set to Intelligent mode
- Set to total number of modules connected to display
- Power On mode to Automatic

SCROLL DOWN THE SCREEN
10.0 **Wiring Connections And Terminal Layout For Wallmount Modules**

**PLEASE NOTE THE SVG PROVIDES OPTIMAL PERFORMANCE WHEN A NEUTRAL CONNECTION IS PROVIDED TO THE UNIT. POWER ELECTRONICS WOULD RECOMMEND THE CONNECTION OF A NEUTRAL CONDUCTOR THE SAME CROSS SECTIONAL AREA AS THE PHASE CONDUCTORS**
SVG single module supply side
11.0 Wiring Connections And Terminal Layout For Pluggable Cabinets

PLEASE NOTE THE SVG PROVIDES OPTIMAL PERFORMANCE WHEN A NEUTRAL CONNECTION IS PROVIDED TO THE UNIT. POWER ELECTRONICS WOULD RECOMMEND THE CONNECTION OF A NEUTRAL CONDUCTOR THE SAME CROSS SECTIONAL AREA AS THE PHASE CONDUCTORS.

SVG Cabinet 3 CT Option
12.0 Tips for the Sinexcel Plug In Cabinets

12.1 Enabling The Plug In Module Before Insertion Into The Cabinet

On the backplane within the Sinexcel plug in cabinet the jumper plug must be shifted from the right position to the left position to enable the SVG module. Should the jumper plug remain in the right position then that slot will be ignored.
12.2 CT Shorting Blocks

At any time the CTs are be connected, removed, or their associated circuits are being worked on the CTs should be shorted out. This can be done at the CT shorting block by changing the positions of links 3, 5, and 8.

CT terminal block with CTs shorted out.  
CT terminal block with the links on 3, 5, and 8 open. This is the correct operating position.

12.3 Incoming Phase Orientation

Please note the input bars at the bottom of the 1000Amp isolator are L3 (Blue), L2 (White), Line1 (Red) from left to right. This makes the orientation on the modules L1, L2, L3 from the rear which is correct for operation.