easYgen | exciter-10

Excitation module for synchronous generators

DESCRIPTION

Woodward’s easYgen | exciter-10 (EX-10) module is a power electronics component designed to provide excitation current to the generator that is controlled by the Active Voltage Regulator (AVR) feature in the easYgen-3400/3500XT genset controls.

The active voltage regulation concept intends to substitute a traditional voltage regulation configuration by simplifying the overall topology. The easYgen internal controller regulates generator output voltage by sending a pulse width modulation (PWM) signal to the excitation module. The excitation module controls generator excitation and therefore generator output voltage. This topology eliminates the redundant voltage and current sensing from a traditional voltage regulator and also makes a feedforward control architecture at AVR level simplifying the cascaded PID control topology. For power input, EX-10 interfaces with any of the following excitation systems: Self/Shunt Excitation, Auxiliary winding/AREP Excitation and Permanent Magnet (PMG) Excitation systems to make it a standard yet versatile solution.

APPLICATION

- Simple plug and play excitation module
- Easy and convenient to install, operate, and diagnose
- No extra configuration tool required
- On-board protection schemes: Current limitation, Short circuit, Over-temperature
- Status LEDs for local annunciation
- Seamless integration with easYgen-3400/3500XT genset controls
- Active voltage Regulation (AVR)
- Soft start control
- Under frequency (Volt / Hz) regulation
- Voltage droop compensation
- Compact design
- Line drop compensation
- Fault Ride Through (FRT) support
- CE marked
- UL pending
FEATURES

- Current limitation – limit can be adjusted via a potentiometer (IEXC.)
- Over-temperature protection – as the heat sink temperature crosses a threshold EX-10 output shuts-off
- Short-circuit protection – when transient current output exceeds a threshold, the EX-10 decreases the excitation output to below 0.2A until shutdown

In conjunction with easYgen-3400/3500XT genset controls, the active voltage regulator system offers:
- Automatic Voltage Regulation (AVR)
- Soft start functionality
- Under frequency regulation (Volt/Hz) defined by five configurable points and activated by LogicsManager
- Line drop compensation via AnalogManager
- Power factor and kvar control
- Voltage droop compensation
- Fault Ride Through (FRT) support
- Setpoint configuration and AVR status overview on the easYgen screen and on Woodward ToolKit Service Tool

SPECIFICATIONS

**Electrical**

Power consumption ...................... max. 450 VA
At max. Continuous Rating.
Max. Continuous Field Current Output ....... 6 A
Max. Forcing Field Current Output .......... 10 A (for 10 s)
Max. AC Voltage Input ..................... 260 Vrms (X1:X2, Z1:Z2)
PWM Input Signal ....................... 500 Hz, 5~20 V DC
PWM duty cycle .......................... 0~100%

**Housing**

Connection ................ plug terminals 2.5 mm²
Weight ...................................... approx. 770 g

**Environmental**

Ambient temp. ....... -40 to 80 °C / -40 to 176 °F (operation, when mounted in landscape orientation)
Ambient temp. .......... -55 to 85 °C / -67 to 185 °F (storage)
Ambient humidity .......... 93 %, non-condensing

**Vibration**

5.05 G, 1 mm amplitude, 69 Hz in 3 orthogonal planes

**Generator Excitation Types**

Self / Shunt Excitation, Internal / Auxiliary Winding Excitation, Permanent Magnet (PMG), Single or Three Phase

**Approvals**

UL ................................................. Pending
CE In conformity with the applicable requirements of the following Standards

EN 61000-6-2, 2005: Generic Standards - Immunity for Industrial Environments
EN 61000-6-4, 2007: Generic Standards - Emissions for Industrial Environments
EN 61010-1, 2010: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements
### DIMENSIONS

200 [7.87"]
175 [6.89”]

### CONNECTION DIAGRAM

#### 3-Terminal Connector (Excitation command)

<table>
<thead>
<tr>
<th>Terminal Label</th>
<th>Function</th>
<th>According easYgen-3400/3500XT Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWM−</td>
<td>PWM neg. input</td>
<td>Terminal 20</td>
</tr>
<tr>
<td>PWM+</td>
<td>PWM pos. input</td>
<td>Terminal 19</td>
</tr>
<tr>
<td>Shield</td>
<td>Shield</td>
<td>To the common Protective Earth (PE)</td>
</tr>
</tbody>
</table>

#### 4-Terminal Connector Function (Excitation power supply input)

<table>
<thead>
<tr>
<th>Terminal Label</th>
<th>PMG Excitation</th>
<th>Self excitation</th>
<th>Aux. winding excitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>Phase A</td>
<td>Single phase A</td>
<td>Winding 1 A</td>
</tr>
<tr>
<td>Z1</td>
<td>n.c.</td>
<td>n.c.</td>
<td>Winding 2 A</td>
</tr>
<tr>
<td>X2</td>
<td>Phase B</td>
<td>Single phase B</td>
<td>Winding 1 B</td>
</tr>
<tr>
<td>Z2</td>
<td>Phase C</td>
<td>n.c.</td>
<td>Winding 2 B</td>
</tr>
</tbody>
</table>

#### LED Indicators

- **LED1**: Operation
  - Normal Operation: Green
  - Current limitation: Off
  - Short-circuit: Off
  - Over-temperature: Off

- **LED2**: Protection
  - Off
  - Blinking red 2/s
  - Blinking red 5/s
  - Illuminated red

#### 2-Terminal Connector (Excitation current output)

<table>
<thead>
<tr>
<th>Terminal Label</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F+</td>
<td>Excitation field positive</td>
</tr>
<tr>
<td>F –</td>
<td>Excitation field negative</td>
</tr>
</tbody>
</table>

Unit: mm [inch]
Woodward’s ToolKit, available to download from woodward.com is the service tool to program and troubleshoot the AVR feature and the full control in general.

**AVR DISPLAY SCREENS**

The AVR related parameters can be accessed directly through the easYgen screens.

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>easYgen</th>
<th>exciter-10</th>
<th>10-012-909</th>
</tr>
</thead>
</table>

**RELATED PRODUCT INFORMATION**

<table>
<thead>
<tr>
<th>easYgen-3400/3500XT-P1</th>
<th>37583</th>
<th>37580</th>
</tr>
</thead>
<tbody>
<tr>
<td>easYgen-3400/3500XT-P2</td>
<td>37583</td>
<td>37581</td>
</tr>
<tr>
<td>easYgen</td>
<td>exciter-10</td>
<td>B37909</td>
</tr>
</tbody>
</table>