NRG: Solid state relays with real-time monitoring

Switches
NRG series

Solid state relays with a fieldbus interface

In order for machine builders to make informed decisions, solve urgent problems on short notice and develop machines that are more autonomous, data from the various components within the machine needs to be collected and analysed. The NRG has been developed to fit this purpose since data from each solid state relay is accessible through a fieldbus interface (Modbus RTU).

The RG series of solid state relays (SSRs) has evolved to integrate additional monitoring and a communication interface to allow read out of variables from each solid state relay in the machine. The communication between the machine controller or PLC and the RG solid state relays is facilitated by an NRG controller.

Implements machine uptime and reduces maintenance costs

The NRG system

The NRG is a system consisting of one or more BUS chains that communicate with the machine controller (or PLC) through ModBus RTU over an RS485 interface.

• Maximum 247 BUS chains
• 1 BUS chain =
  minimum 1 NRG Controller
  maximum 48 NRG Solid State Relays

Through the NRG it is possible to read out variables such as current, voltage, frequency, power, energy consumption and SSR running hours. Diagnostic information is also accessible from each SSR. The SSRs in the NRG system are controlled with a DC voltage signal.

UR, CSA only for RGS. N (version without integrated heatsink)
Applications

The NRG is the ideal solution for heating applications where reliability and precision maintenance of temperature is crucial to the quality of the end product.

- Plastic injection machines
- PET blow moulding machines
- Packaging machines
- Semiconductor manufacturing machinery
- Glass tempering machines

Benefits

- **Onboard fieldbus interface:**
  Enables integration in Industry 4.0 machinery. Solid state relay parameters and diagnostic data are accessible through Modbus RTU over an RS485 interface

- **Reduced maintenance costs and downtime:**
  Real-time data can be utilised for prevention of machine stoppages during operation (preventive maintenance)

- **High quality of end products:**
  Through real-time monitoring the machine controller can make timely decisions for optimal temperature process control thus ensuring low or no scrap

- **Reduced efforts in troubleshooting:**
  A number of faults can be distinguished to facilitate and reduce troubleshooting time

- **Versatile:**
  Easy integration in current machines and for retrofitting as the NRG solid state relay is switched in an identical manner to a solid state relay without a communication interface. The communication function and the switching function of the NRG solid state relay are independent

- **Fast installation and set-up:**
  The solid state relays on the BUS are configured by an AutoConfiguration command for very fast set-up and prevention of incorrect settings

- **Panel space savings:**
  The NRG solid state relays use the same compact platform of the slimline RG series. The product width is 17.8mm. For the versions with integrated heatsink this is valid up to 37 AAC @ Tc 40°C

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NRG series

Solid state relays with a fieldbus interface

The NRG system components

NRG controller
NRGC

NRG solid state relay
RG..N

Internal BUS cables, BUS terminator
RCRGN..

The NRGC is the master of the BUS chain when performing actions on the respective BUS chain and a gateway for the communication between the PLC and the RG..Ns.

The RG..Ns are the switching components in the NRG system. The RG..Ns integrate a communication interface to provide data of the monitored variables in real-time to the main controller (PLC).

The internal BUS cables are proprietary cables that connect the NRGC to the first RG..N in the BUS chain and respective RG..Ns. The BUS terminator is plugged to the last RG..N in the BUS chain.

Time savings in troubleshooting with the NRG series

Status registers give access to the general status of both the NRGC and RG..N. In case of an alarm condition, troubleshooting of the issue can be done very fast since the alarm type is identified.

Typical flashing sequence of the red LED for a 3 flash alarm. Example: COM error on the NRGC

Identified alarms with the NRGC and RG..N

NRGC alarms | Flashes
---|---
Configuration error (Device mismatch, Device limit error) | 2
COM error | 3
BUS error | 8
Internal error | 9
Termination resistor error | 10

Default setting for NRGC Auxiliary EMR (11, 12, 14) is in Alarm mode. This will change state when any NRGC alarm is present (unless configured otherwise).

RG..N alarms | Flashes
---|---
SSR over-temperature* | ON
System fault 1 | 2
System fault 2 | 3
SSR short circuit | 4
Frequency out of range** | 5
Current out of range** | 6
Voltage out of range** | 7
BUS error | 8
Internal error | 9

Flexibility with the NRG system to suit every need

* It is possible to set a delta temperature as a pre-warning of an approaching over-temperature condition

** The default limits for frequency, voltage and current can be modified and adapted to the application specific needs
Real-time monitoring via Modbus RTU over RS485

The figure below shows an illustration of a system setup for switching of heaters utilising the NRG.

The switching function is done by the RG..Ns that are controlled with a DC voltage applied to A1, A2. Communication with the solid state relays is done via the NRGC controller. The NRGC acts as a master of the system when it needs to take certain actions on the specific BUS chain, for example, when it needs to assign a valid ID to each RG..N in the BUS chain through an AutoConfiguration. Otherwise, the NRGC is just a facilitator of the communication between the main controller and the RG..Ns.
**NRG series**

**The NRG system components**

**The NRG controller - NRGC**

- **24 VDC supply**
  Provides the necessary supply voltage to the NRGC

- **TEST push button**
  Enables a check of the internal BUS when the NRGC is not connected to a PLC

- **Selector switch**
  Enables physical setting of NRGC ModBus addresses 1-15

- **Configurable relay output**
  The default setting is for the relay to change state in case of an alarm status of the NRGC

- **Status LEDs**
  - ON
  - BUS
  - COM
  - ALARM

- **Internal BUS port**
  Connects the NRGC to the first NRG SSR in the BUS chain

- **RJ45 Modbus port (x2)**
  BUS connections between the NRGC and PLC or between multiple NRGCs

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**Main features**

- Modbus RTU over RS485
- Connects up to 48 RG..N solid state relays
- 24 VDC supply voltage
- 1x configurable auxiliary relay output
- Product width 35mm
- Selector switch for Modbus addresses 1-15
- TEST button for verification of the internal BUS

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**Selection guide**

**Reference** | **NRGC**
---|---

Note: The BUS chain terminator resistor is shipped with the NRGC.

**The NRG internal BUS cables - RCRGN..**

- Proprietary cables of various lengths for the internal BUS of the NRG
- The RCRGN connects the NRGC to the RG..Ns and respective RG..Ns
- Cables are terminated at both ends with a microUSB plug

**Selection guide**

<table>
<thead>
<tr>
<th>Length</th>
<th>10 cm</th>
<th>75 cm</th>
<th>150 cm</th>
<th>350 cm</th>
<th>500 cm</th>
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<tbody>
<tr>
<td>Cables per bag</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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</tbody>
</table>

**Reference**

- RCRGN-010-2
- RCRGN-075-2
- RCRGN-150-2
- RCRGN-350-2
- RCRGN-500-2

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**Switches**

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The NRG solid state relay - RG..N

Main features
- 1-phase, AC zero cross switching with an RS485 interface
- Operational ratings for RGC: up to 660 VAC, 65 AAC
- Operational ratings for RGS: up to 660 VAC, 90 AAC*
- DC control voltage range: 4-32 VDC
- Product width 17.8mm up to 37 AAC, up to 70mm for 65 AAC @ T_a 40°C
- Up to 18,000A²s for protection with Type B Miniature Circuit Breakers
  * with external heatsink

Selection guide - RGC..N

<table>
<thead>
<tr>
<th>Ratings @ T_a 40°C</th>
<th>25 AAC</th>
<th>30 AAC</th>
<th>37 AAC</th>
<th>43 AAC</th>
<th>65 AAC</th>
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<tbody>
<tr>
<td>Pt</td>
<td>1800 A²s</td>
<td>18000 A²s</td>
<td>18000 A²s</td>
<td>18000 A²s</td>
<td>18000 A²s</td>
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<tr>
<td>Product width</td>
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<td>17.8 mm</td>
<td>35 mm</td>
<td>70 mm</td>
</tr>
<tr>
<td>Output termination</td>
<td>Screw</td>
<td>Screw</td>
<td>Box</td>
<td>Box</td>
<td>Box</td>
</tr>
<tr>
<td>Reference</td>
<td>RGC1A60D25KEN</td>
<td>RGC1A60D32KEN</td>
<td>RGC1A60D32GEN</td>
<td>RGC1A60D42GEN</td>
<td>RGC1A60D62GEN</td>
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</table>

Selection guide - RGS..N

<table>
<thead>
<tr>
<th>Ratings @ T_a 40°C</th>
<th>50 AAC</th>
<th>90 AAC</th>
<th>90 AAC</th>
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<tbody>
<tr>
<td>Pt</td>
<td>1800 A²s</td>
<td>18000 A²s</td>
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Further details are available on online datasheets at www.gavazziautomation.com

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