CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

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 communciaton 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.

Datasheet   User Manual

Improves 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)
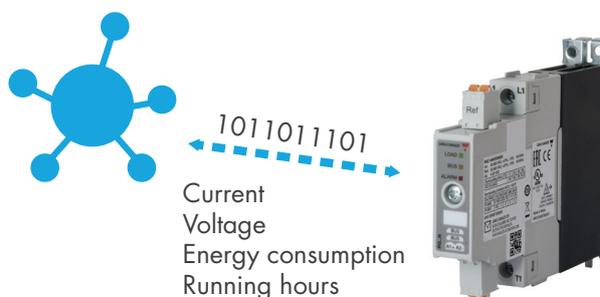
NRG BUS chain

Switches

Applications

The NRG is the ideal solution for heating applications where realiabilty 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 maintenace 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 facilitiate and reduce troubleshooting time

- **Versatile:**
  Easy integration in current machines and for retro fitting as the NRG solid state relay is switched in an identical manner to a solid state relay without a communication interface. The communication funtion 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 @ T_A 40°C

Current
Voltage
Energy consumption
Running hours

AUTOCONFIG

CARLO GAVAZZI Automation Components. Specifications are subject to change without notice. Illustrations are for example only.

Switches

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NRG series
Solid state relays with a fieldbus interface

The NRG system components

NRG controller	NRG solid state relay	Internal BUS cables, BUS terminator
NRGC	**RG..N**	**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
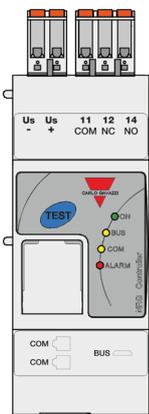
The alarm status is also indicated on each respective device by a red LED visible on the front facade. A flashing sequence is utilised to indicate the alarm type.

0.5 seconds ON, 0.5 seconds OFF with an interval of 3seconds OFF

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

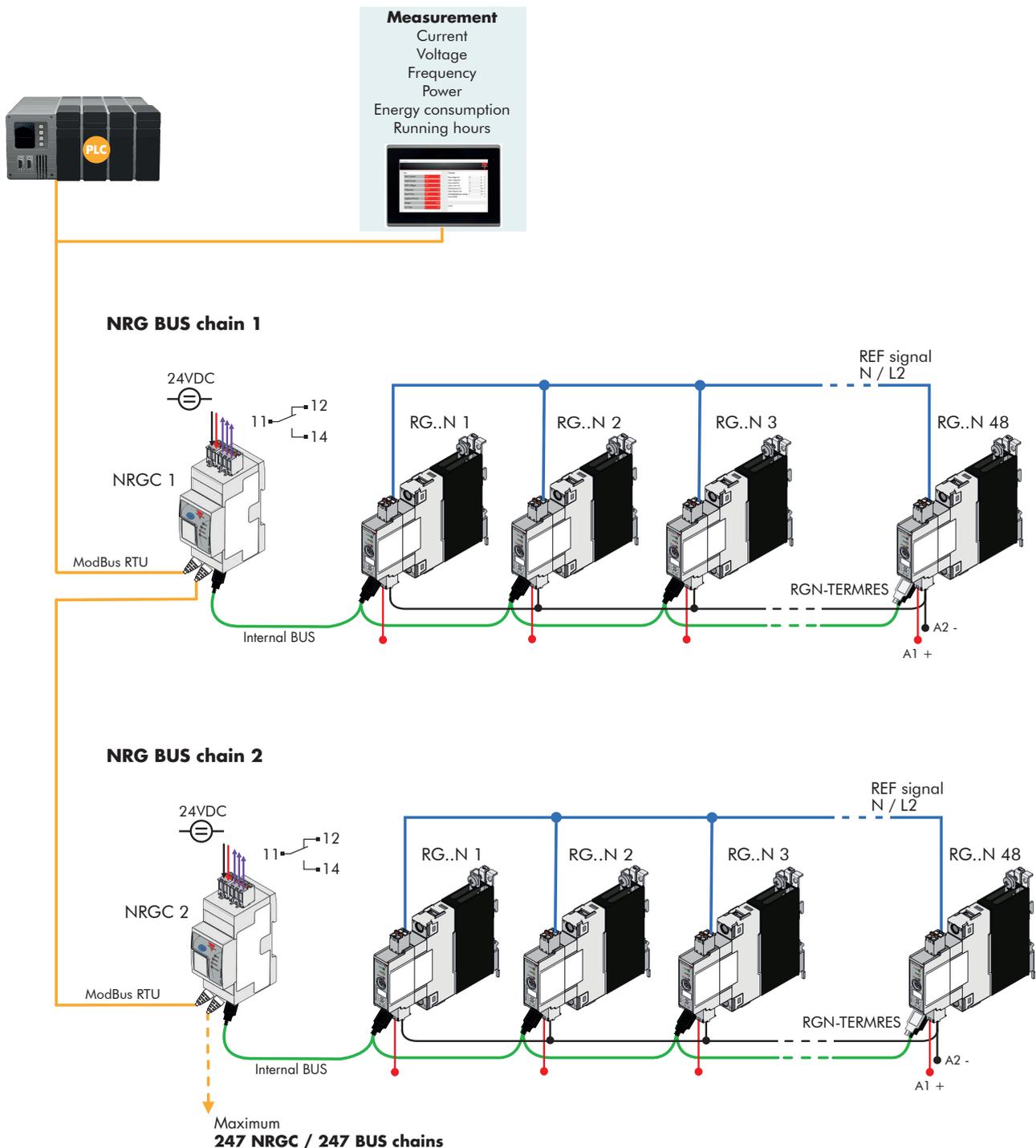### Flexibility with the NRG system to suit every need

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

** The default limits for frequnecy, voltage and current can be modified and adapted to the application specific needs

Switches

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.

Measurement
Current
Voltage
Frequency
Power
Energy consumption
Running hours

NRG BUS chain 1

24VDC

11 — 12
   — 14

NRGC 1

ModBus RTU

Internal BUS

RG..N 1   RG..N 2   RG..N 3   RG..N 48

REF signal
N / L2

RGN-TERMRES

A2 -
A1 +

NRG BUS chain 2

24VDC

11 — 12
   — 14

NRGC 2

ModBus RTU

Internal BUS

RG..N 1   RG..N 2   RG..N 3   RG..N 48

REF signal
N / L2

RGN-TERMRES

A2 -
A1 +

Maximum
247 NRGC / 247 BUS chains

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NRG series
The NRG system components

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

24 VDC supply
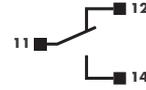Provides the necessary supply voltage to the NRGC

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

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

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

Selection guide

Reference	NRGC

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

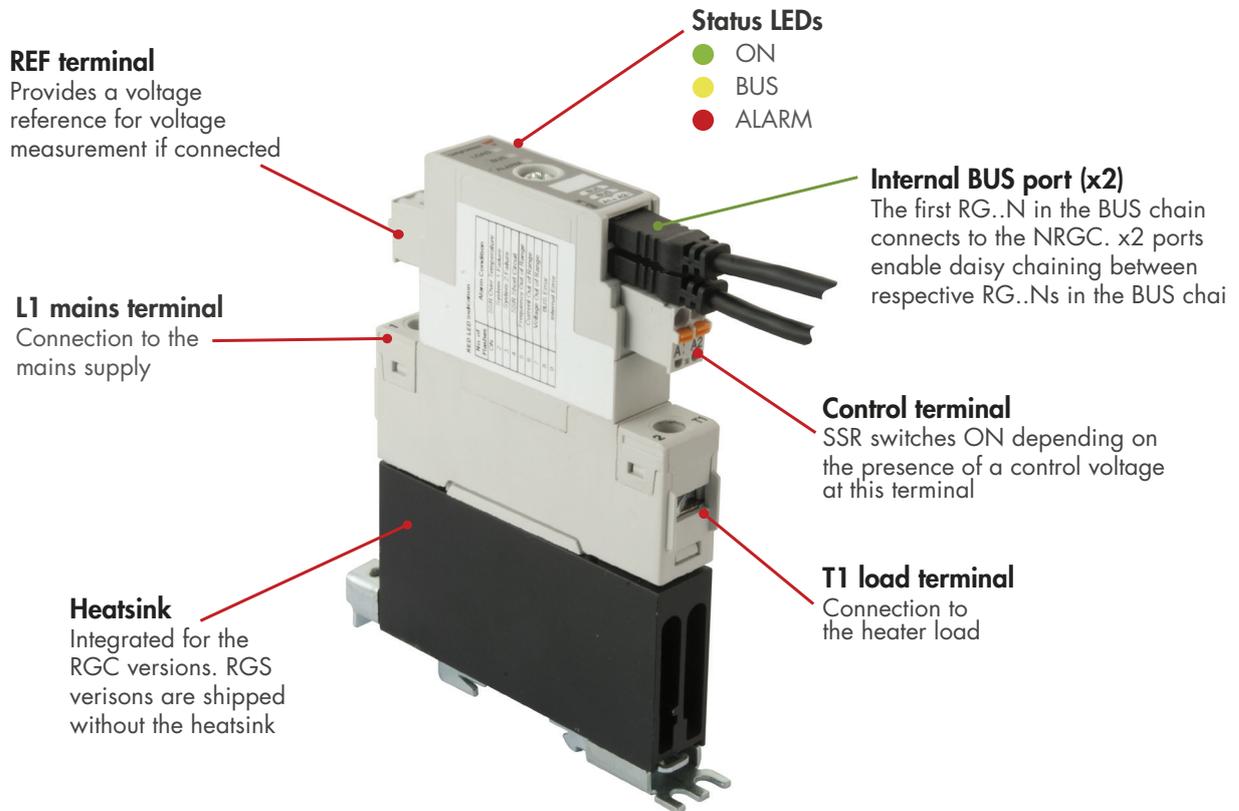## The NRG internal BUS cables - RCRGN..

- Proprietary cables of various lengths for the 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

Length	10 cm	75 cm	150 cm	350 cm	500 cm
Cables per bag	4	1	1	1	1
Reference	RCRGN-010-2	RCRGN-075-2	RCRGN-150-2	RCRGN-350-2	RCRGN-500-2

Switches

REF terminal
Provides a voltage reference for voltage measurement if connected

Status LEDs
- 🟢 ON
- 🟡 BUS
- 🔴 ALARM

Internal BUS port (x2)
The first RG..N in the BUS chain connects to the NRGC. x2 ports enable daisy chaining between respective RG..Ns in the BUS chai

L1 mains terminal
Connection to the mains supply

Control terminal
SSR switches ON depending on the presence of a control voltage at this terminal

Heatsink
Integrated for the RGC versions. RGS verisons are shipped without the heatsink

T1 load terminal
Connection to the heater load

RGS..N

RGC..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

Ratings @ T_A 40°C	25 AAC	30 AAC	37 AAC	43 AAC	65 AAC
I²t	1800 A²s	18000 A²s	18000 A²s	18000 A²s	18000 A²s
Product width	17.8 mm	17.8 mm	17.8 mm	35 mm	70 mm
Output termination	Screw	Screw	Box	Box	Box
Reference	**RGC1A60D25KEN**	**RGC1A60D32KEN**	**RGC1A60D32GEN**	**RGC1A60D42GEN**	**RGC1A60D62GEN**

Selection guide - RGS..N

Ratings @ T_A 40°C	50 AAC	90 AAC	90 AAC		
I²t	1800 A²s	18000 A²s	18000 A²s		
Product width	17.8 mm	17.8 mm	17.8 mm		
Output termination	Screw	Screw	Box		
Reference	**RGS1A60D50KEN**	**RGS1A60D92KEN**	**RGS1A60D92GEN**		

Further details are available on online datasheets at www.gavazziautomation.com

Switches

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