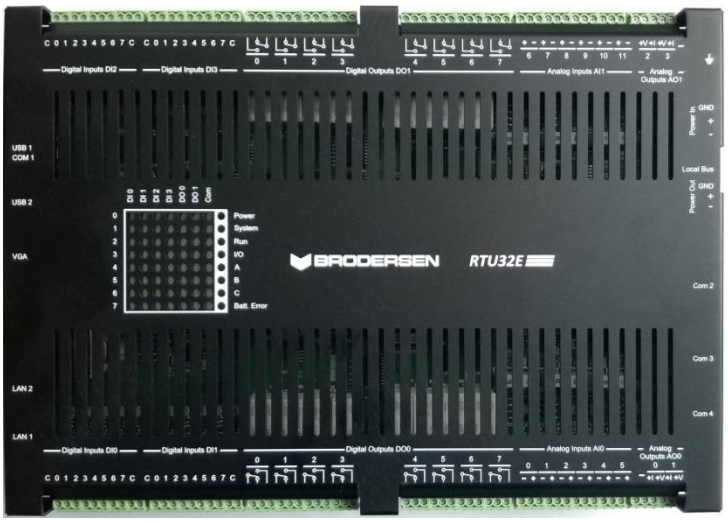
RTU32E

RTU32E Series – Powerful Compact Utility RTU

Data Sheet

Doc: 40347 v1.04 / March 29th, 2016



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INTRODUCTION

The Brodersen RTU32E controller series is based on a 32-bit platform that provides the RTU/PLC with power and leading edge functionality. It is provided with an open and adjustable platform with both the power and functionality required to control the most demanding industrial applications.

Fully equipped with a powerful IEC61131 PLC, web server configuration and real time clock with millisecond resolution, it provides you with all the advantages the combination of a very fast PLC and RTU can give you.

The RTU32E is supplied in a robust metal anodized enclosure and can be used with the wide range of Brodersen I/O expansion modules.

Ethernet and TCP/IP are the basic communication and data environments; however, serial communication interfaces like RS232 and USB also allow the RTU32E to interface to various devices within a network hierarchy.

FEATURES

- 64 channels of on-board IO
  - 32x digital inputs / counter inputs
  - 16x relay outputs
  - 12x analog inputs
  - 4x analog outputs
- Full IEC61131 (IL, LD, STL, FB, SFC.)
- Several Communication Protocols Supported;
  - Full Modbus suite.
  - IEC60870-5-101 Master/Slave
  - IEC60870-5-104 Client/Server
  - IEC60870-5-103 Master
  - IEC61850 Client
  - IEC61850 Server with GOOSE.
  - DNP3 Master/Slave
  - WITS-DNP3 Slave (UKWITS)
  - EtherNet/IP Scanner
  - DF1 Master
  - ProfiNET Client
  - RTU Distributed Binding Protocol
  - SMNP agent for network monitoring, alarming etc.
- Gateway / data concentrator functions.
- Dual Ethernet and 4x COM Interfaces.
- Support for over 1000 local I/Os and +60000 distributed I/O
- Robust Design for Industrial Applications.
- Full remote management with configuration, programming and flexible distribution of all levels of software from and to RTUs in remote locations.

VERSIONS / ORDERING CODES

Hardware basic version

Order code: **BRE-64IO/231B0131.D1**

Driver runtime license

RTU32E are delivered with a range of standard drivers that includes full Modbus Suite, IEC60870 Suite and RTU Distributed Binding protocol.

For additional drivers a runtime driver license has to be ordered separately.

The available driver licenses are;

Order code	Description
DL-IEC61850S-RL	IEC61850 Server driver with GOOSE/MMS
DL-IEC61850C-RL	IEC61850 Client driver
DL-SNMP-RL	SNMP Agent driver
DL-PROFINETC-RL	ProfiNET Client driver
DL-DNP3S-RL	DNP3 Slave Serial/Ethernet driver
DL-DNP3M-RL	DNP3 Master Serial/Ethernet driver
DL-DNP3SWITS-RL	DNP3 WITS Slave Serial/Ethernet driver
DL-118.C37C-RL	118.C37 Phasor Client Driver
DL-DLMS.1-RL	DLMS/IEC62056 Master driver
DL-DF1M-RL	AB DF1 Master driver
DL-ETHIPC-RL	EtherNet/IP Scanner driver

Our range of drivers is developed all the time - ask if your driver is missing or have special requirements. Special versions can be delivered as an option. Contact us for more details.

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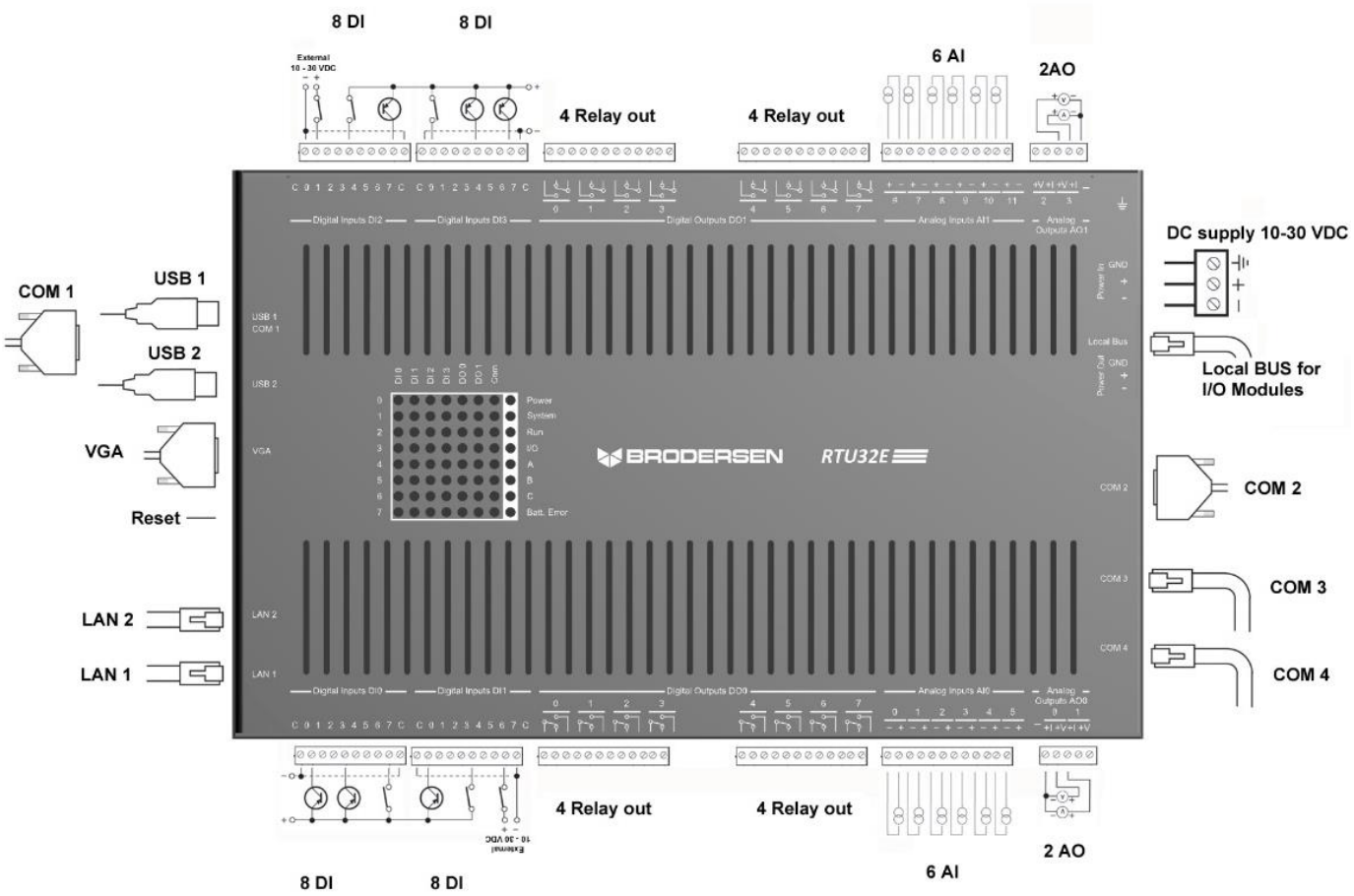
Wiring details – RTU32E



NOTE: All DI are also working as 32bit counter inputs. 8 x 1kHz and 24 x 100Hz. DI 4-7 in section DI1 and DI3 are 1kHz counter inputs and rest is 100Hz.

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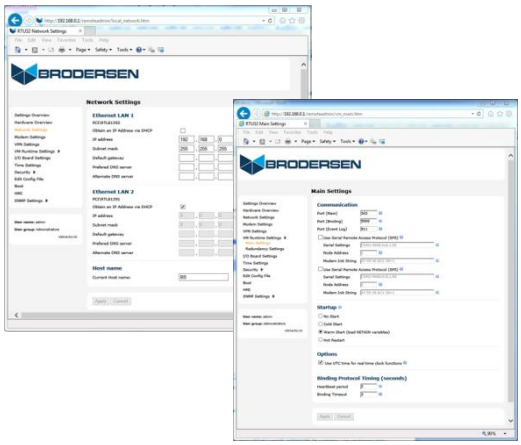
TECHNICAL DESCRIPTION

General

All the RTU32E software is stored on a removable Compact Flash card. During start-up, the operating system and applications are moved to RAM where it is executed. System configuration settings are stored on the Flash. Retained variables and buffered events can be stored in non-volatile RAM.

Using the Ethernet network for primary communication provides all the advantages of existing TCP/IP networking communication facilities such as FTP, HTTP, Telnet, SNTP etc. Fast, reliable and secure communication is the main topic. Standard networking components (software, routers, switches, etc.) are available to use with the RTU32E. In addition, serial ports for interfacing to application specific protocols (e.g. Modbus, Fieldbus, utility protocols, network management protocols etc.) are available.

Software – Basic Setup and Configuration



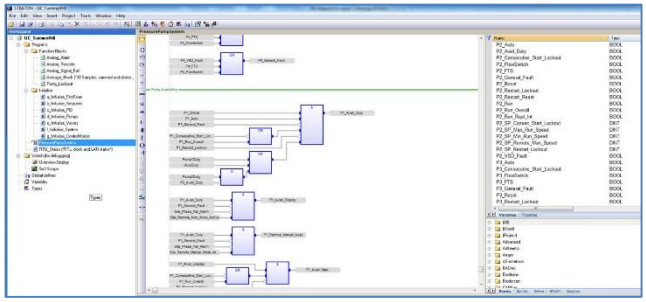
RTU32E main settings are configured via the internal webpages as on all other kind of networking devices.
Default IP: 192.168.0.1

The main configuration also includes;

- LAN network settings (IP, subnet, gateway, DNS etc.).
- Basic PLC mode settings.
- Built-in I/O settings/actual configuration
- Hardware Overview / Status on I/Os
- Modem / VPN Settings
- Security
- Real time clock settings / SNTP
- SNMP agent
- Redundancy
- Remote secure protocols
- HMI
- Online status of physical I/O

The main page contains information about the software (version, build, type), installed drivers and actual connection data.

Software – RTU Configuration and Programming



The Brodersen WorkSuite fully supports EN/IEC61131 and is used for creating and compiling PLC runtime projects in the RTU32E. WorkSuite supports programming languages such as Structured Text (ST), Function Block (FB), Ladder (LD), Instruction List (IL) and Sequential Function Chart (SFC). The RTU32E supports cold restart, hot restart and on-line changes.

Brodersen WorkSuite is also a powerful tool for complete system design and programming, providing unique functions for event based communication. The Global Binding Editor makes it possible to publish and subscribe variables in a large network with minimal communication load. The events are time stamped.

Programming, debugging and upload and download of application programs can be done remotely via Ethernet or RS232.

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Software – Communication Drivers
The basic drivers and protocols available for the RTU32E are:

- I/O drivers for integrated I/O and I/O Expansion.
- Modbus RTU Master and Slave.
- Modbus TCP Client and Server.
- Modbus ASCII Master and Slave.
- IEC60870-5-101 Master and Slave.
- IEC60870-5-103 Master.
- IEC60870-5-104 Client and Server.
- IEC61850 Client
- IEC61850 Server incl. GOOSE
- SNMP Agent driver.
- PROFI NET Client.
- DNP3 Master / Slave Full Suite
- DNP3 UK-WITS Slave
- EtherNet/IP Scanner
- DF1 Master
- COMLI Master
- DLMS/IEC62056 Master
- 118.C37 Client
- Distributed event based binding etc.

I/O's and Database
Internal I/O and expansion I/O are managed in an independent database. The I/O database structure is designed as a multi-accessible database. The database runs in its own high priority task and provides fast and reliable I/O communication.

The PLC runtime includes a flexible variable database that the user configures with names and data types – with no need for fixed or special mapped registers.

In addition, an API for programmers provides access to the database from your own C#, C++ or VBA application. It can also be used as gateway access to the application program.

I/O Driver
The RTU32E I/O can be accessed via variable profiles (each I/O is directly addressed). I/O diagnostic/status information is also available. The I/O driver supports up to 32 I/O expansion modules - and more than 1000 I/Os.

IEC60870-5-101/103/104
Utility protocols IEC60870-5-10x provide full configuration flexibility of almost any interoperability requirements. The protocol links are provided as a driver in the application layer data and protocol structures are generated in Structured Text (ST). This gives full access to set up any Interrogation and ASDU required for the application.

In addition, the driver supports advanced features for gateway functions where, for example, information in the monitor direction can be moved from one protocol interface to another without compromising the actual value and original time stamp. Also sharing data queues from more ports are possible.

To simplify and provide fast configuration, a RTU32 IEC60870 Configurator tool is available. See the IEC60870 Configurator for details.

IEC61850 Client and Server
The RTU32E Series support both IEC61850 Client and Server driver functions. The IEC61850 Client is KEMA certified and is fully configured in WorkSuite using the SCL file details.

The IEC61850 Server driver is configured based on a SCL file. The Brodersen WorkSuite includes a SCL file editor where you can import or create your own SCL file by adding the Logical Nodes and Data Attributes you want. And after configuring your Server driver, you can verify it with the WorkSuite IEC61850 Test Client.

DNP3 Master / Slave - Full Suite
DNP3 Drivers with enhanced support for manual data handling and diagnostic are supported. DNP3 UK WITS Slave with full connection manager details is also supported.

Data Logging
A special data logging function block is available for logging event based or cyclical data to the flash file system. The data logging also supports functions for formatted logs directly exportable to zenon® HMI and SCADA software. Log files can be downloaded from the RTU32E via FTP.

Modem Control / Dial-up / Dial-in
Both dial-up and dial-in functions via a PSTN, ISDN or GSM modem connected to the serial port of the RTU32E are possible when using the PLC modem function. It can be used for serial communication e.g. ModbusRTU and IEC60870 serial protocols.

Real-Time / Real-Time Clock
The real-time task is used for the application program execution. Time stamps and cyclic execution are also based on the real-time clock. Time stamps are reported in milliseconds. In order to achieve high time accuracy the clock has synchronization options with SNTP and a special clock slave and master function for synchronization from RTU32E to RTU32E.

COM communication for NullModem, Radio and LeasedLine modems
The RTU32E has extended data communication features for communication of ModbusRTU, serial IEC60870-5-101 etc. over serial modems and converters. The features cover detailed handshake control with timing of RTS and CTS.

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3G / GPRS Modem controlled directly by RTU32E
The RTU32E support Brodersen 3G/GPRS modems connected via their USB2 Interface. Webpage configuration for the 3G/GPRS modems is available to allow automatic handling of connection to a defined APN. Alternative and more advanced modem connection handling is supported via dedicated WorkSuite PLC Functions.

Power supply
The RTU32E is available with 10-30 VDC power supply.

Other Connectivity / Interfaces
The two USB ports support mouse, keyboard, Flash disc storage devices, USB to LAN converters to extend the number of LAN/Ethernet ports, 3G/GPRS communication devices etc.

A VGA port for connecting a monitor provides possibility for work with the RTU directly on the OS user interface and use local HMI/SCADA via a touch monitor.

Security
Security in access and communication is supported. The network servers like Webserver and FTP Server are login and password protected, providing multiple access levels with dedicated adjustable rights.

The RTU32E Series support PPTP and L2TP VPN Clients and can be used to login to VPN Servers. VPN is configured via the Webserver and can be controlled from the PLC logic

Utility drivers including authentication or encryption features are supported to the extent that is commonly used. E.g. DNP3 drivers all support Secure Authentication V2.

Firewall functions can be enabled and adjusted via Remote Desktop and the Registry Editor.

Status and Diagnostic Information
The RTU32E provides status information on internal temperature, battery and supply voltage level, memory and interface board status etc. All status information is available via a WorkSuite functions in the PLC application.

I/O Configuration
The RTU32E Series is designed to support a wide range of physical IO configurations primarily obtained via the range of Brodersen external IO Expansion modules via a LocalBus RJ45 connector. The RTU32E can also be used with 3rd party distributed I/O via any of the supported drivers – e.g. ModbusTCP or DF1.

Integrated I/O options
The RTU32E is available with 64 I/Os - 32DI + 16RO + 12AI + 4AO.

All digital inputs are also working as 32bit counter inputs. 8x are 1kHz and 24x are 100Hz inputs. DI 4-7 in section DI1 and section DI3 are 1kHz counter inputs and the rest is 100Hz. The counters are read and reset using ZI profile I/O in the PLC application.

I/O Expansion options

The RTU32E can be used with all existing UCL type Brodersen I/O Expansion modules. No programming or configuration is required – the RTU32E supports automatic I/O configuration of Brodersen I/O Expansion modules.

The LocalBus IO communication bus includes power supply for I/O Expansion modules. The RTU32E can deliver up to 300mA@12VDC for IO modules. For I/O Module configuration with current requirements that exceeds 300mA, you must add I/O Additional power supply.

Please see the I/O Expansion selection guide for selecting your I/O modules.

RTU hardware monitoring
Parameters like power supply voltage level, internal temperature and battery status are available for monitoring in the RTU32E logic application. Furthermore memory load status can be monitored.

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TECHNICAL SPECIFICATIONS

Basic 32-Bit CPU System

CPU: Onboard AMD Geode™ LX800, 500 MHz with 128K L2 cache

BIOS: AWARD 512KB Flash BIOS

System chipset: AMD Geode™ LX800 / CS 5536.

System RAM memory:
One 200-pin SODIMM socket supports up to 256MB DDR 333 SDRAM.
Standard configuration is 128MB RAM.

Non-volatile RAM:
1MB battery backed RAM.

Disc / SSD: Min. 128MB removable Compact Flash in Type I/II socket. Support up to 1GB.

Real time clock: Accuracy: Max. 30ppm, typically 10-12ppm
Resolution: 1 msec
Back-up time: min. 2 years, typical 5 years
(Battery ONLY used if no power is applied).

Watchdog: Level 1: Main CPU Watchdog.
Level 2: External watchdog controller.

Physical Interfaces

Dual Ethernet: 2 x LAN: Dual Realtek RTL8101L.

COMS: 4 x RS232 (COM1, COM2 full handshake)

USB: 2 x USB 2.0 ports.

VGA/LCD: VGA/LCD interface

PS/2: Single interface for keyboard and mouse.

I/O Expansion: RJ45 LocalBus interface for Brodersen I/O Expansion modules.

I/O options

Expansion I/O: Expansion I/O is possible via the Brodersen I/O LocalBus system to all Brodersen I/O Expansion modules.
Supports up to 32 I/O Expansion modules of any type.

Integrated I/O: 64IO board integrated;
32 Digital inputs (also works as counter inputs).
16 Relay outputs.
12 Analogue inputs.
4 Analogue outputs.

Integrated Digital Inputs (counter inputs)

Inputs:

Input voltage activated:	10-30V DC.
Input voltage deactivated:	Max. 3V DC.
Input current:	12V DC: Typical 3mA. 24V DC: Typical 6mA.
Input delay:	Typical 1ms.

Isolation: 1kV AC

Indicators: One LED for each digital input

Count input frequency:
1kHz (8x) and 100Hz (24x).

Integrated Relay Outputs

Relay outputs:	16 potential free SPDT contacts.	
	Output voltage:	Max. 60V DC.
	Output current:	Max. 2A DC (resistive).
	Output delay:	Typical 5ms.

Lifetime (relay): Min. 100.000 operations at rated load.

Contact material: Gold overlay silver alloy.

Isolation (coils-contacts): 1kV AC 50Hz 1 min (IEC255-5).

Indicators: One LED for each output (yellow) indicating active output.

Integrated Analogue Input

Inputs: 12 multiplexed analogue channels with solid state multiplexer.

Input configuration:
Differential (+/ -), flying capacitor type.

Input measuring ranges:
0 - 10V
0 - 5V
-5 - +5V
-10 - +10V
0-2V/0 - 20mA
0.4-2V/4 - 20mA
Selection between these ranges shall be done on Web page and jumper setting. Default range settings are 4-20mA (with jumpers set).

Resolution: 14 bit, 0-16383.

Impedance:	Voltage:	1M Ohm.
	Current:	100 Ohm ±0,25%.

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Absolute maximum ratings:
Input voltage: ±15V DC.
Input current: ±30mA DC.

Update time: Better than 350 msec.

Measuring accuracy:
25°C: ±0.1% (typically 0.05%).
-10°-55°C: ±0.3% (typically 0.1%).

Linearity: Better than ± 0.05%.

Temperature stability: Better than ± 50ppm/°C (typical).

Common mode voltage: Max. ±80V DC.

Common mode rejection ratio: Min. 72dB.

Series mode rejection: Min. 36dB (50-120Hz)

Isolation: (input to input): 350VDC.

Integrated Analogue Output

Outputs: 4 sourced analogue channels.

Output ranges:
0 - 10V
0 - 5V
-5 - +5V
-10 - +10V
0 - 20mA
4 - 20mA
Selection between these ranges are done in web page.

Resolution: 14 bit, 0-16383.

Absolute maximum ratings:

Iout:	Output voltage:	27V DC.
	Load:	1kOhm
	Output current:	25mA DC.
Vout:	Output voltage:	±15V
	Load:	1kOhm

Update time: Better than 100 msec.

Accuracy I_{out}: 25°C @ 100Ohm: ±0,2%
-10°-60C° @ 100Ohm: ±0,4%

Linearity: Better than ± 0,05%.

Leakage current: Max. 20 µA (typically 5µA)

Temperature stability: Better than ± 50ppm/°C, @ 100Ohm.

Accuracy Vout: 25°C: ±0.2%
-10°-60°C: ±0.4%

Linearity: Better than ± 0,05%.

Isolation: (output to output): No isolation.

Software

OS: Windows Embedded Compact 6.

PLC Runtime Details

PLC Runtime performance:
Minimum PLC cycle time: >1 msec.
Typical PLC cycle time: 3-5 msec.

Maximum variables: 200.000

Scan time internal I/O: Approx. 2-5 msec.
Scan time external I/O: Min. 6 msec. (see User Manual for details).

Power Supply

Supply Voltage: 10-30VDC.

Power consumption: Max. 30W and typical 13W – Configuration dependent.

Isolation: Power supply to electronics: 1500VDC

Max loads: LocalBus (for supply of I/O Expansion modules) are 300mA for standard power supply versions.

General

Indicators (LEDS):

Power:	Indicating power ON.
System:	Indicate system status.
Run:	Indicate PLC program status.
I/O:	Indicate status of integrated and expansion I/O.
A-C:	Not used.
Batt. error:	Internal battery error.
Com 1-4:	Indicate Rx/Tx activity on the COM ports.
DI x and DO x:	Indicate active digital I/O

Ambient temperature:
Storage: -40 - +85°C
Operation: -20 - +60°C.
(Optional: -40 - +70°C - See note 1)

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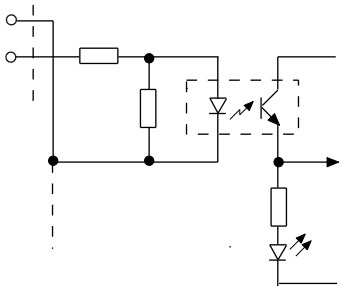
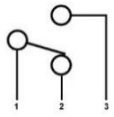
EMC/LVD:	EN55022:1998 Class A EN61000-3-2:2000 EN61000-3-3:1995 EN55022:1998 Class A EN55024:1998 (EN61000-4-2:1995, EN61000-4-3:1996,EN61000-4-4:1995, EN61000-4-5:1995, EN61000-4-6:1996, EN61000-4-8:1993, EN61000-4-11:1994) EN 61000-6-2: EMC/ Immunity Industry. EN 60950: Safety requirements for electrical equipment for measurement and control.	
Climatic:	Dry heat:	IEC 68-2-2, Test Bd, Temp. +55°C, Duration 8h.
	Cold:	IEC 68-2-1, Test Ad, Temp. -10°C, Duration 8h.
	Damp heat:	IEC 68-2-3, Test Ca, Temp. 40°C, RH 95%, Duration 8h.
Mechanical:	Vibration:	IEC 68-2-6, Test Fc (sinusoidal), Freq. 10-150Hz, Amp.4g, 5 sweeps in 3 orthogonal axes.
	Shock:	IEC 68-2-27 (half sine), Acc. 15g, Pulse time 11msec., 3 x 6 shocks.
Protection:	IP20.	
Mounting:	Backplane	
Housing:	Metal black anodized	
Dimensions: HxWxD:	55x302x192 mm. (incl. mounting bracket and I/O connectors).	

Circuit Configuration (Digital)

Inputs:

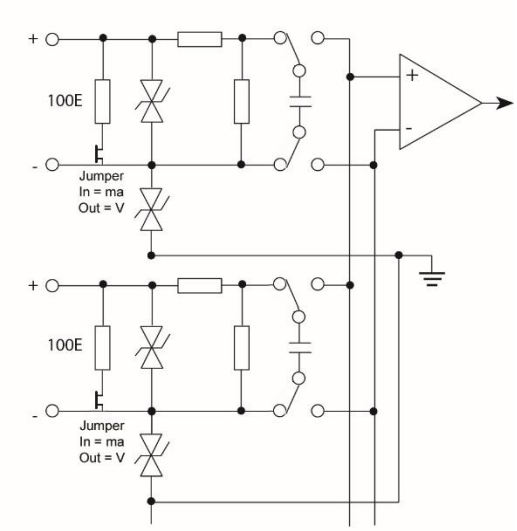


Output Relay (SPDT):



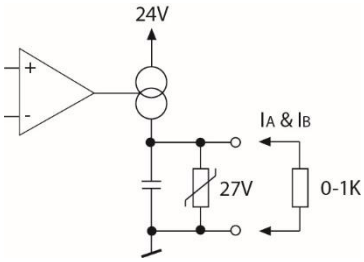
Circuit Configuration (Analogue)

Analogue input:

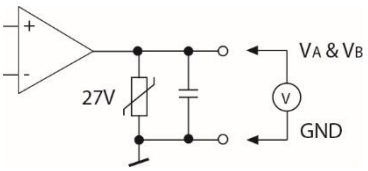


Analogue Output:

I_{out}



V_{out}



Interface Overview

Right side

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Left Side

Change analogue input type – mA DC to V DC

Step 1
Unscrew both screws located as figure 1

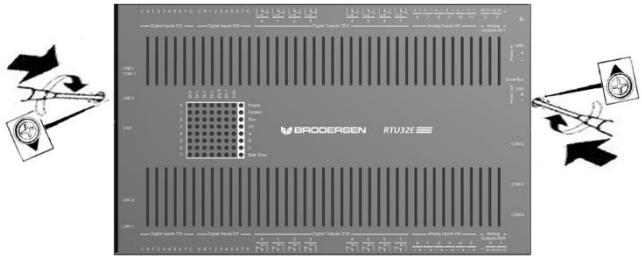

Figure 1

Step 2
Take lid off - Figure 2

Figure 2

Step 3
Locate jumpers Figure 3

Figure 3

Step 4
Position jumpers for correct input type V or mA.
Measurement Range for analogue inputs is defined in Webpage default address 192.168.0.1
See possible input variation at page 8

Jumper designation SW300-SW311

SW 300	ON Channel 0 = mA
	OFF Channel 0 = V
SW 301	ON Channel 1 = mA
	OFF Channel 1 = V
SW 302	ON Channel 2 = mA
	OFF Channel 2 = V
SW 303	ON Channel 3 = mA
	OFF Channel 3 = V
SW 304	ON Channel 4 = mA
	OFF Channel 4 = V
SW 305	ON Channel 5 = mA
	OFF Channel 5 = V
SW 306	ON Channel 6 = mA
	OFF Channel 6 = V
SW 307	ON Channel 7 = mA
	OFF Channel 7 = V
SW 308	ON Channel 8 = mA
	OFF Channel 8 = V
SW 309	ON Channel 9 = mA
	OFF Channel 9 = V
SW 310	ON Channel 10 = mA
	OFF Channel 10 = V
SW 311	ON Channel 11 = mA
	OFF Channel 11 = V

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Change Battery for NV RAM and System clock

Step 1
Unscrew both screws located as figure 4

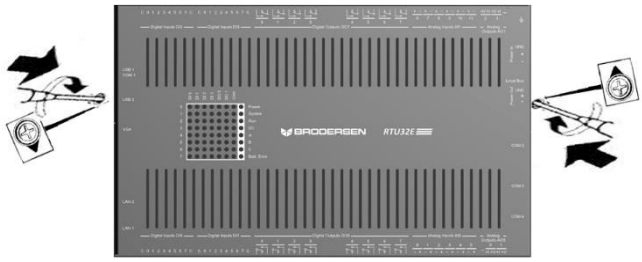

Figure 4

Step 2
Take lid off Figure 5

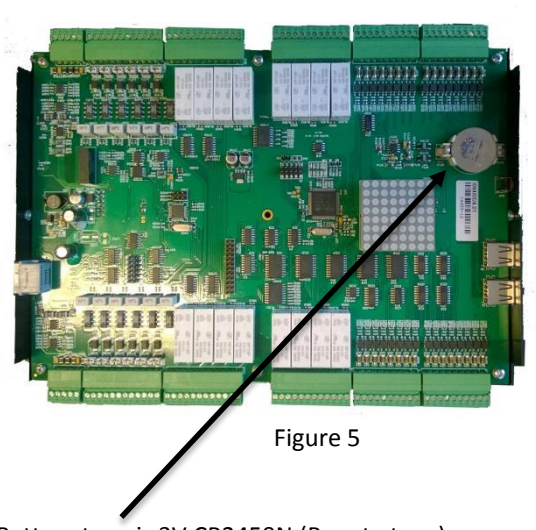

Figure 5

Battery type is 3V CR2450N (Renata type)

NOTES:

Note 1:
Extended operating temperature range can be delivered as an option. Please contact us for details.
Note 2:
This data sheet is subject to change without any prior notice!

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