

# IOT Brick – BR001

Configurable logic device for IOT applications



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## Applications

- IoT
- Connected Objects

## General Description

IOT Brick - BR001 is a secure unit designed as general-purpose IOT device aimed to simplify the design, the implementation and the delivery of an IOT product in the market. With IOT Brick there is no need to develop hardware and firmware. The device comes already in a package with electronics and firmware and is ready for the deployment. It includes, among the others, a set of connectivity tools and an open logic based on functional blocks. Without any hardware development and firmware programming it is possible to implement a large variety of applications and use cases just configuring the functional blocks provided by the device. So, development moves from hardware and firmware development to logic configuration. IOT Brick is a connected object that can be controlled remotely by any device or application including app on smartphone or other smart devices. Each unit comes with six configurable inputs and four outputs. Input can be configured to be analog and digital. Number of inputs and outputs can be extended by connecting additional units via RS485 and Ethernet. To simplify the integration in operating environment and applications an SDK (Software development kit) for desktop, server and mobile (Android and IOS) is available.

## Product Features

- Functional blocks configurable logic
- Multi users control based on roles
- Ethernet 10/100, TCP/IP, SSL, MQTT
- RS485
- End to End security
- User authentication
- Initial password
- System logs
- Weekly time policy
- Remote configurable
- Remote reset and factory reset
- Real time clock
- 6 configurable analog/digital input
- 4 outputs NC/NO
- Power supply 12/24 Volt
- Wall mounting on standard DIN guide

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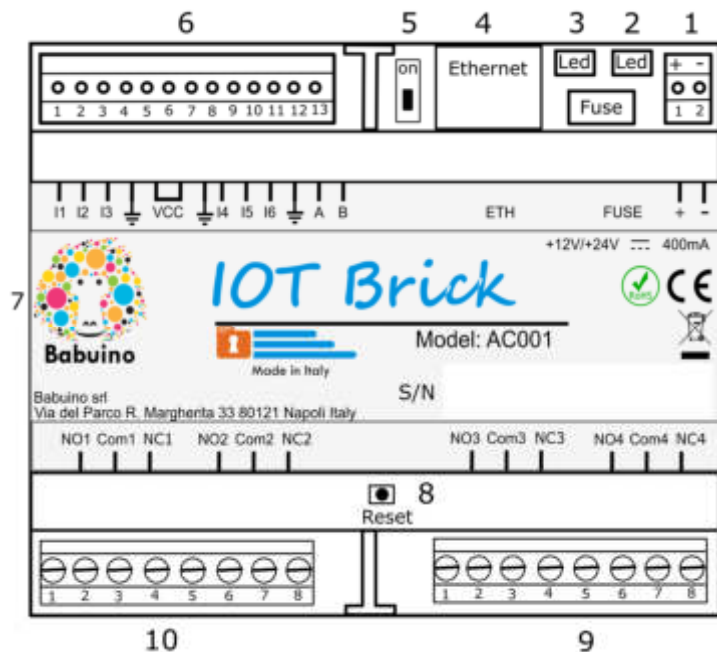
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## Overview

- 1 Power Supply
- 2 System Led
- 3 Status Led
- 4 RJ45 LAN
- 5 DIP RS485 Load
- 6 Input and Extension
- 7 Battery
- 8 Reset Button
- 9 Output A
- 10 Output B



## Configurable Logic

IOT Brick firmware do not implement any application. Application and relevant logic can be easily implemented by configuring and combining functional blocks available in the firmware. Functional blocks are studied to support the implementation of a wide range of use cases and applications. Functional blocks have inputs and outputs. Logic is created by instantiating a functional block and connecting the output of a functional block to the input of the others. Several types of functional blocks are available. Follow a short summary:

- **Sensor block:** used to read the value of an input or an output of the board or of others functional block. Input can be configured to read analog values (only from board input) and can implement a Schmitt Trigger whose thresholds are fully configurable. Sensor blocks can also be read remotely by users.
- **Switch block:** it is a switch that can be controlled remotely by user. It can be configured as monostable (pulse) or bistable (on/off or toggle). Activation of the switch is conditional to a weekly time policy defined by administrator.
- **Door block:** it is like a switch block but connected to relays driving device outputs.

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- **Mealy Machine:** finite State Machine based on a Mealy model with max 8 inputs, 4 outputs and 16 states. Activity of the machine can be conditioned by means of a weekly time policy defined by administrator. Outputs of the block can change its status only if the weekly time policy reports that the machine is active.
- **Digital Function Block:** implementing any combinatory logic on 4 inputs. Output can be configured as monostable (Pulse) or bistable. Moreover, transition from one logical level to the other can be delayed by configuring the function block. Block is active conditionally to a weekly timed policy.
- **Weekly policy block:** It defines a weekly time policy. Time policy is regulated by real time clock (RTC) operating in the board. Some of the functional block activities are regulated by the weekly time policy. Access control policy has a validity time defined by a starting time and an expiration time. Group access policy can be defined per user.

## Users

Users can monitor remotely the application and perform actions. Before any command sent by user is executed user is authenticated. Only authenticated users can perform an action. User authentication is based on a key and additionally for some blocks like switch block or door block also by means of a PIN.

Three different roles can be assigned to users:

- Super Administrator with full access to all the features of the device including hardware settings and log analysis.
- Administrator able to create, delete users and define access policies.
- User allowed to open close the output based on the policy defined by the administrators.

On average 250 users can be registered with the system, Effective number of users depends on the settings. Each user has its own key used to guarantee end to end security.

## Communications

Communication is possible via ethernet 10/100 and RS485. When using ethernet TCP/IP protocol is used. Communication over TCP/IP is protected by means of SSL. TCP/IP wraps device secure protocol that is used also in RS485 communication.

Devices in the network are discovered through a discovery protocol. No need to configure the IP address.

MQTT over TCP/IP is supported too. If using Babuino.MQTT server then it is possible to communicate with the device securely over the internet.

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## Security

Communication between devices and administrator/user entities is protected by end-to-end security. Communication protocol creates a secure tunnel between users and Iot Brick that protect exchanged data guaranteeing authenticity confidentiality and integrity.

User are authenticated at each and every command by the end-to-end protocol. For some specific commands it is possible to enforce an additional level of user authentication through a PIN.

## Initial Password

Each device has an installation password different from the other. The administrator needs the initial password in order to get first access to the board after the first power on and need to change it at the first access.

## System Logs

User activities and activities of functional block is logged into the device memory. Logging details can be recovered by device administrators.

## Output

The device has four outputs with NC/NA contacts managed through relays. Output can work in ON/OFF mode or in pulse mode. Pulse time can be programmed by the super administrator for each output. For each output can be defined a minimum-security level that user need to satisfy in order to change output status. This includes PIN and biometric (biometric matches shall be guaranteed by an external entity).

## Input

The device includes 6 analog/digital input. Number of digital inputs can be extended via the extension I&O interface.

## Extensions

Number of input and output can be extended by adding additional units. Different interfaces are possible: RS485 and Ethernet.

## System Reset and Factory Reset

Device has a factory reset. Pressing reset button for more than 5s cause a system reset. Pressing for more than 15s cause a factory reset. Factory reset delete all the information from the non-volatile memory of the device.

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## RTC Backup Battery

A battery CR2032 rechargeable battery is used to keep time while device is powered off. Battery level can be checked querying the device. When battery level becomes low than replace the CR2032 coin battery with a rechargeable one.

## RS485

The unit support extension via an interface RS485. Load of RS485 can be balanced by means of input switch at 120Ω when it is set to on.

## Installation and power supply

The unit can be mounted on a wall or installed on a DIN rail (EN60715). In order to operate it is required a power supply between 12V/24V (current <500 mA). When power is up status led is blinking indicating the microcontroller activity. If status led is blinking twice then the device is ready for the service.

## Connectors

Power Connector	
Pin 1	VCC (12V/24V DC)
Pin 2	GND

Input & Extension Connector	
Pin 1	Input 1 (I1)
Pin 2	Input 2 (I2)
Pin 3	Input 3 (I3)
Pin 4	GND
Pin 5	Vcc
Pin 6	Vcc
Pin 7	GND
Pin 8	Input 4 (I4)
Pin 9	Input 5 (I5)
Pin 10	Input 6 (I6)
Pin 11	GND
Pin 12	RS485 B
Pin 13	RS485 A

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Output A Connector	
Pin 1	Not Connected
Pin 2	NA 4
Pin 3	CM 4
Pin 4	NC 4
Pin 5	Not Connected
Pin 6	NA 3
Pin 7	CM 3
Pin 8	NC 3

Output B Connector	
Pin 1	Not Connected
Pin 2	NC 2
Pin 3	CM 2
Pin 4	NA 2
Pin 5	Not Connected
Pin 6	NC1
Pin 7	CM1
Pin 8	NA1

## Specification

Generic information	
Size LxWxH	DIN43880 (106/88/47)
Mounting	Wall or DIN Rail (EN60715)
Compliance	CE, RHOS,

Operating condition	
Temperature	../..
Moisture	../..

Power Supply	
Input Voltage	12V/24V DC
Current absorption	Typ < 500mA

Output	
Number	4 Relays with 3 contacts: NA, NC, CM
Max Output Voltage	250VAC
Max Output current	10A

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Input	
Number	6
Type	Analog/Digital (Configurable)
Input Impedance	100K
Max Input Voltage	24V
Sampling input range	0 – 5V
Sampling frequency	
Resolution	12Bit

LAN	
Connector	RJ45
Speed	10/100 Mbps