

Overview

Linux powered device with programmable microprocessor. RES-3 is the ideal solution for remote control and automation. It fulfills fieldbus as well as bidirectional control centre communication needs, exploiting both wired and wireless channels. This general purpose unit ensures top performance wherever high computational power is needed and diverse communication channels and protocols are required (i.e., smart city applications, smart grid management, home health care, home automation). Thanks to Linux operating system, RES-3 fully supports Open Source applications.



ARM9 processor



Linux Operating System



Wired and wireless communication



Thanks to its three available slots, RES-3 is capable of operate with up to 3 wireless communication standards at the same time. These standards can be freely chosen within a wide range of communication technologies (2G, 3G, 4G, WiFi, Bluetooth, ANT+, IEEE 802.15.4, ZigBee, 6LowPAN, WMBus, 169 MHz, 433 MHz, 868 MHz, LoRa etc.). RES-3 also features wired communication capability: 2 isolated RS485 lines, one two-wire RS232 line and one CAN BUS



Geolocation (cell tower triangulation if the unit is equipped with 2, 3 or 4G modem or using satellite signals if GPS module is available)



Wide range of natively supported network and field protocols



Provides both SNMP manager and SNMP agent capabilities (the first to perform data collection, the latter in order to be managed by a standard remote control system)



Firmware, configuration and communication drivers are remotely upgradeable (via GPRS and/or LAN)



Easy to install! RES-3 is available in 4 different types of enclosures to meet every need (home and office, DIN rail mount, weatherproof boxes, 19" rack mount). On demand customizations are possible



Low power consumption and wide range power supply

Disclaimer

Some of the mentioned features may be optional. Algorab srl reserves the right to carry out modifications and variations, both esthetic and functional, across the array of its products at any time and without forewarning. For the most up-to-date product specifics please contact us.

Main hardware technical specifications

- Freescale i.MX287 (ARM9) processor
- Clock frequency: up to 454 MHz
- RAM: 128 MB DDR2 DRAM
- Flash memory: 256 MB NAND
- Removable memory: microSD slot
- LCD controller 800x480 with touchscreen support
- 10/100 Mbit Ethernet interface with IEEE1588 support, PoE
- 2 isolated RS485 ports. Supported protocols: MODBUS, Algorab v 2.6. Further protocols can be added by installing proper drivers
- 1 2-wire RS232 port (Rx, Tx)
- 1 CAN Bus
- RTC clock with backup battery (estimated battery life: up to 8 years of battery backup mode)
- I/O: 2 relay out, 2 service opto-isolated inputs
- Temperature sensor or temperature / humidity sensor
- Multi-frequency buzzer
- 3 expansion slots for radio modules, one of them Hi-speed USB 2.0 compliant for high transfer rate (480 Mbit)
- External I/O: expansion bus with SPI and I2C bus
- Power supply: 12 – 48 V DC \pm 10% or PoE
- RGB led (software managed)
- LCD controller up to 800 x 480 with resistive touchscreen
- Power consumption: ~ 8W (without radio modules)
- Operating temperature range: -40 °C to +70°C
- Board dimensions (open frame): 157 x 87 mm
- Enclosures for indoor, for electrical panel (DIN rail), 19" 1U rack (even with 220V AC power supply with backup), desktop, outdoor IP65
- Firmware upgradeable remotely

Main software technical features

Security features

- Read-only unique ID for Digital Rights Management (DRM) algorithms
- Secure boot using 128-bit AES hardware decryption
- SHA-1 and SHA-256 hashing hardware
- High assurance boot (HAB4)
- Full turnkey security device chip

Operating system

- Linux 3.9 or later
- U-Boot

Functionalities supported by the operating system

- Standard file system
- TCP/IP
- UDP
- Socket
- WEB server (http, https)
- Telnet
- PPP
- FTP
- VPN
- Ipsec and SSL
- DHCP
- NAT
- NTP
- SNMP agent, SNMP manager

Modules

169 MHZ

- Radio frequency: 169 MHz
- Max TX power (with PA): 27 dBm
- RX sensitivity: -110 dBm
- Radio link budget: 137 dB
- Radio chip: Silicon Labs Si 4468
- Supported protocols: EN13757, IEEE 802.15.4g, M-Bus, Algorab V3.0

WSN 2.4 GHz

- Radio frequency: 2,4 GHz
- Max TX power: 3 dBm
- RX sensitivity: -101 dBm
- Radio link budget: 104 dB
- Radio chip: Atmelt AT86RF231
- Supported protocols: ZigBee, IEEE 802.15.4, 6LoWPAN, RF4CE, SP100, WirelessHART, Algorab V3.0, ISM Applications
- Security: AES 128 bit, True Random Number Generation

868 MHZ

- Radio frequency: 868 MHz
- Max TX power: 20 dBm
- RX sensitivity: -110 dBm
- Radio link budget: 130 dB
- Radio chip: Silicon Labs Si 4463
- Supported protocols: Wireless M-Bus (S1/2, T1/2, C1/2 modes)

Telephone modem

2G (GPRS / EDGE) available as a standard. As optional, 3G (UMTS, HSPA) or 4G (LTE) modem is also available

D-GPS

- For locationing and/or time sync
- 65 Channel GPS L1 C/A Code
- Perform 8 million time-frequency hypothesis testing per second
- Open sky hot start 1 sec
- Open sky cold start 29 sec
- Cold start sensitivity -148dBm
- Tracking sensitivity -161 dBm
- Multipath detection and suppression
- Accuracy 2.5m CEP
- Maximum update rate 10Hz
- Tracking current ~28mA
- Supports active and passive antenna
- Firmware customizable
- Operating temperature -40 °C ~ +85°C

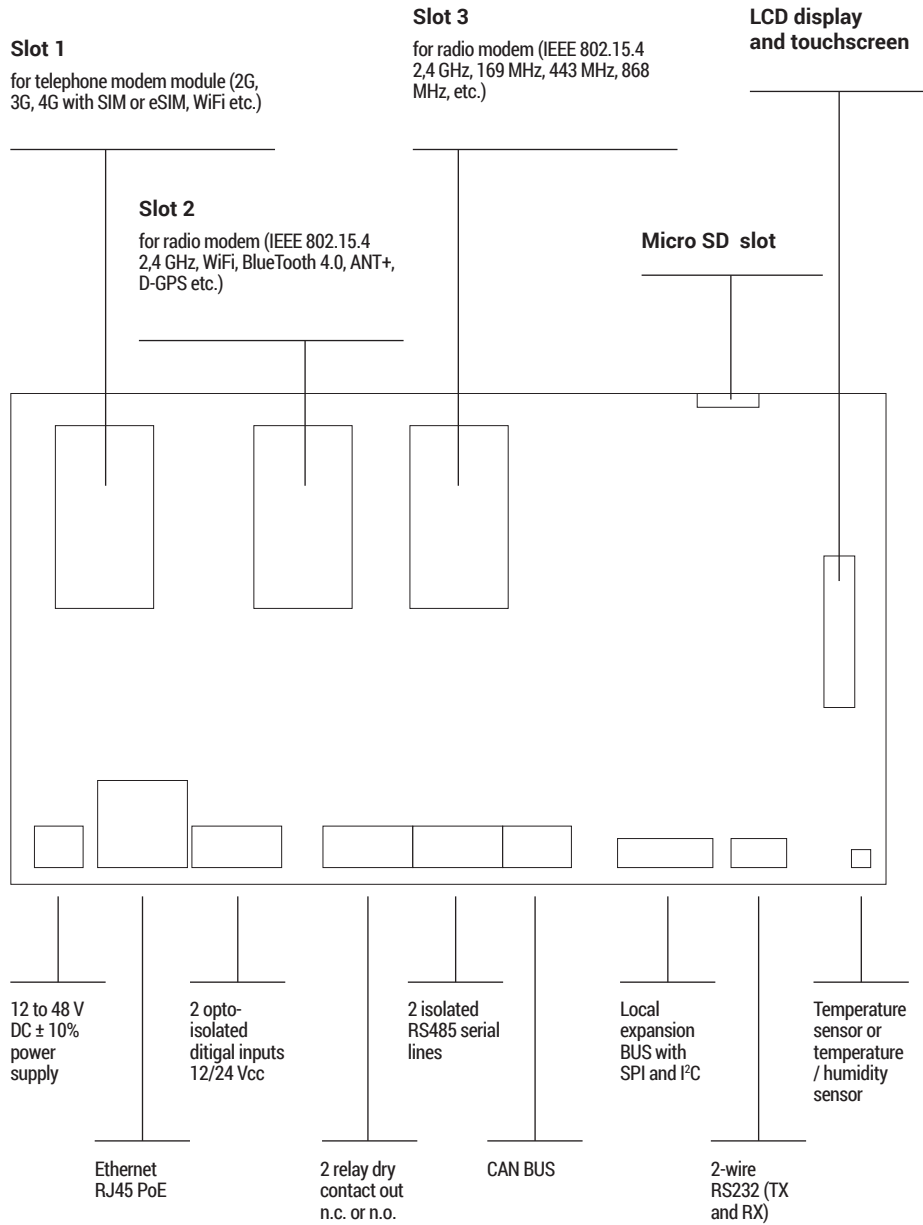
Wifi

Support for IEEE 802.11 b/g/n standard

Bluetooth

Up to Bluetooth 4.0 compliant

Electronic board layout



Configuration of the wireless expansion slots

The customization of communication channels is made easy thanks to three expansion slots that RES-3 provides for hosting wireless and wired communication modules. Each slot has its own specific features in order to operate with different communication buses.

Interfaces	Slot 1	Slot2	Slot 3
USB	USB HOST	USB OTG	-
UART	UART TTL 3V3	-	-
SPI	-	SPI with 1 CS	SPI with 1 CS
I ² C	I ² C BUS	I ² C BUS	I ² C BUS
Power supply	3V8 and 3V3	3V3	3V3

Remarks

SPI are separate. I2C Bus is unique and shared among the three slots.

RES-3 manages up to three radio modules simultaneously, according to the allowed combinations listed in the following table.

	Slot 1	Slot 2	Slot 3
2G modem (GPRS, EDGE)	●	-	-
3G modem (UMTS, HSDPA)	●	-	-
3G modem + GPS(1)	●	-	-
4G modem (LTE)	●	-	-
WiFi IEEE 802.11 b/g/n module	●	●	-
2,4 GHz (IEEE 802.15.4) module	-	●	●
Bluetooth 4.0 module	-	●	●
ANT+ module	-	●	●
169 MHz radio modem	-	●	●
433 MHz radio modem	-	●	●
868 MHz radio modem	-	●	●
868 MHz LoRa radio modem	-	●	●
D-GPS*	-	●	●

Remarks

* Locationing, when high precision is not required, can be performed by mean of telephone modem (cell tower triangulation algorithms). This geolocation method, however, requires to access to databases available on the internet.

The expansion slot can also host wired communication modules, according to the following table.

	Slot 1	Slot 2	Slot 3
USB 2.0 module with OTG device/host port or host port ⁽¹⁾	●	●	-
Mbus serial interface	●	-	-
4-wire RS232 interface (TX, RX, RTS, CTS) ⁽²⁾	●	-	-
4-wire SPI/RS232 interface (TX, RX, RTS, CTS) ⁽³⁾	-	●	●

Remarks

⁽¹⁾ USB module must be hardware-configured depending on its destination slot (1 or 2). RES-3 supports up to 2 USB modules. Slot 1 supports USB host ports, slot 2 supports on-the-go (OTG) USB device/host port. ⁽²⁾ UART lines (four) are available on slot 1. Therefore, only one physical layer TTL to RS232 converter is needed. ⁽³⁾ This module is equipped with an UART SPI and level converter TTL to RS232 since UART lines aren't available on slot 2 and slot 3 (only SPI lines are available on these two slots)

Service I/O

RES-3 provides 2 relay outputs and two on/off opto-isolated digital inputs. These resources are assigned to provide auxiliary functionalities (e.g., restarting of an external device by cutting off its power supply, or to collect information from a switch or button). These resources are software managed, therefore further applications are possible according to their electrical specifications (see below).

The output connector can be set as normally closed or normally opened by using the jumper placed aside the relays. The maximum current supported by connectors is 0.5A at 125 VAC (resistive load) and 1A at 24 VDC. Highest applicable voltage is 125 VAC and 60 VDC.

Inputs are opto-isolated. In order to activate them, a 12 – 24 V DC signal is required ($\pm 10\%$).

I/O expansion BUS

This BUS has two serial synchronous communication channels:

- I²C BUS, for parallel connection of peripherals (addressable BUS)
- SPI with 3 Chip Select signals. Up to 3 compliant devices are connectable

Electrical levels are TTL at 3,3V.

From electrical point of view, RES-3 and RES-2 are equipped with the same I/O expansion BUS. Therefore, RES-2 I/O compliant boards (RES-2 IO and RES-2 IOA) are fully supported by RES-3 unit. However, to achieve this compatibility specific cabling is required because of different connectors positions.

Keep in mind that this BUS, unlike RS232 and RS485 lines, allows only to connect devices at short distances (a few centimeters).

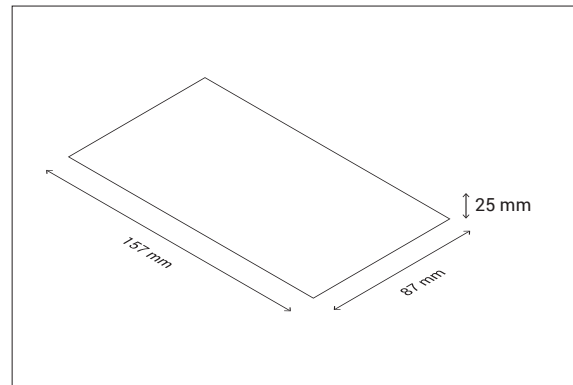
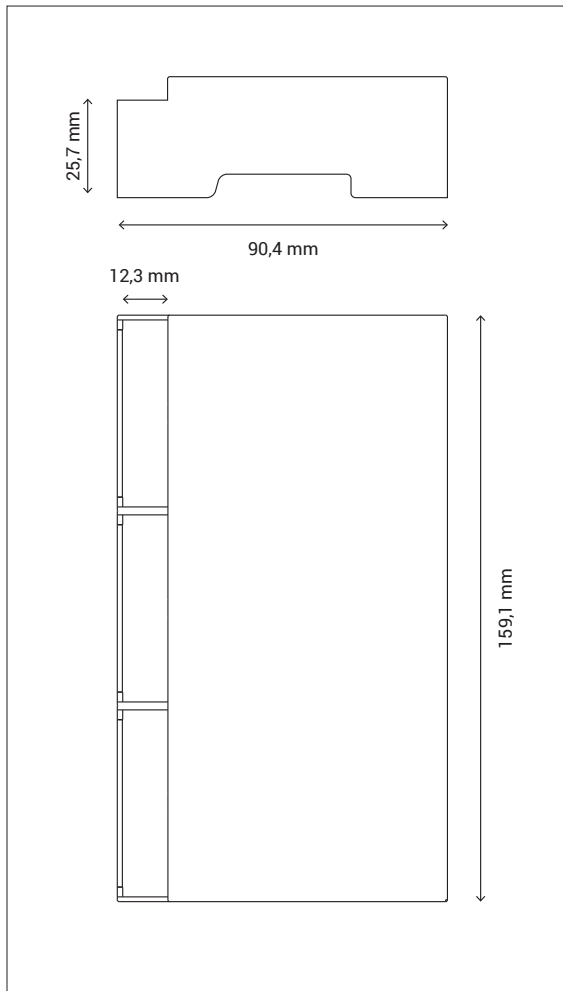
Power supply

RES-3 can be powered at a nominal supply voltage from 12 to 48 V DC $\pm 10\%$ (absolute values from 9 to 57V DC). Power consumption is approx. 8W (without expansion modules). When a M2M modem is used, power consumption increases up to 19W. Power over Ethernet supply is also supported. Thanks to its low power consumption, RES-3 can be powered by electricity generated by solar panels or other alternative power sources. Also a power unit, with a backup battery where appropriate, can provide power supply at 220 V AC or at -48V DC/DC.

Enclosures

RES-3 is available in a variety of versions:

- Open frame (no enclosure)
- DIN rail compliant plastic case (power supply 12 / 24 V DC or PoE)
- 19" 1U rack compliant case. As optional, 220 V AC power supply with integrated battery charger
- Outdoor enclosure (pole or wall mount). As optional, power supply or power supply 220V AC with integrated battery charger.
- Desktop enclosure with external power supply



Open frame board dimensions (25 mm of height is determined by terminals, that are the tallest componens mounted on the circuit board)

Enclosure for DIN rail mount: dimensions