

---

# **cRIO-9038**

# **Specifications**

---

2025-03-11



# Contents

cRIO-9038 Specifications..... 3

# cRIO-9038 Specifications

## Definitions

**Warranted** specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

**Characteristics** describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Typical** unless otherwise noted.

## Conditions

Specifications are valid for -40 °C to 70 °C unless otherwise noted.

## Processor

|                 |                  |
|-----------------|------------------|
| CPU             | Intel Atom E3825 |
| Number of cores | 2                |
| CPU frequency   | 1.33 GHz         |
| On-die L2 cache | 1 MB (shared)    |

## Operating System



**Note** For minimum software support information, visit [ni.com/r/SWsupport](http://ni.com/r/SWsupport).

|  |   |
|--|---|
| Supported operating system               | NI Linux Real-Time (64-bit)   |
| <b>Application software requirements</b> |   |
| LabVIEW                                  | LabVIEW 2014 or later, LabVIEW Real-Time Module 2014 or later,<br>LabVIEW FPGA Module 2014 or later |



**Note** LabVIEW FPGA Module is not required when using Scan Interface mode. To program the user-accessible FPGA on the cRIO-9038, LabVIEW FPGA Module is required.



**Note** C/C++ Development Tools for NI Linux Real-Time is an optional interface for C/C++ programming of the cRIO-9038 processor. Visit [ni.com/r/RIOcdev](http://ni.com/r/RIOcdev) for more information about the C/C++ Development Tools for NI Linux Real-Time. For information on setting up a C/C++ based toolchain, visit [ni.com/r/NILRTCrossCompile](http://ni.com/r/NILRTCrossCompile).

|                              |  |
|------------------------------|--|
| Driver software requirements | NI CompactRIO and Drivers August 2014 or later |
|------------------------------|--|

## Network/Ethernet Port

|                   |   |
|-------------------|---|
| Number of ports   | 2   |
| Network interface | 10Base-T, 100Base-TX, and 1000Base-T Ethernet |

|                          |   |
|--------------------------|---|
| Compatibility            | IEEE 802.3                                    |
| Communication rates      | 10 Mb/s, 100 Mb/s, 1,000 Mb/s auto-negotiated |
| Maximum cabling distance | 100 m/segment                                 |

## RS-232 Serial Port

|                            |                            |
|----------------------------|----------------------------|
| Maximum baud rate          | 115,200 b/s                |
| Data bits                  | 5, 6, 7, 8                 |
| Stop bits                  | 1, 2                       |
| Parity                     | Odd, even, mark, space     |
| Flow control               | RTS/CTS, XON/XOFF, DTR/DSR |
| RI wake maximum low level  | 0.8 V                      |
| RI wake minimum high level | 2.4 V                      |
| RI overvoltage tolerance   | ±24 V                      |

## RS-485/422 (DTE) Serial Port

|                   |  |
|-------------------|--|
| Maximum baud rate | 115,200 b/s                              |
| Data bits         | 5, 6, 7, 8                               |
| Stop bits         | 1, 2                                     |
| Parity            | Odd, even, mark, space                   |
| Flow control      | XON/XOFF                                 |
| Wire mode         | 4-wire, 2-wire, 2-wire auto              |
| Isolation voltage | 60 V DC continuous, port to earth ground |



**Note** The RS-485 serial port ground and shield are not connected to chassis ground. This isolation is intended to prevent ground loops and does not meet UL ratings for safety isolation.

|                   |  |
|-------------------|--|
| Cable requirement | Unshielded, 30 m maximum length (limited by EMC/surge) |
|-------------------|--|



**Note** RS-485 is capable of 1.2 km (4,000 ft) length without surge limitation.

## USB Ports

|                 |
|-----------------|
| Number of ports |
|-----------------|

|              |                         |
|--------------|-------------------------|
| Device ports | 1 standard B connector  |
| Host ports   | 2 standard A connectors |



**Note** The USB device port is intended for use in device configuration, application deployment, debugging, and maintenance.

|                                  |                   |
|----------------------------------|-------------------|
| USB interface                    | USB 2.0, Hi-Speed |
| Maximum data rate                | 480 Mb/s per port |
| Maximum current (USB host ports) | 1 A (aggregate)   |

## Mini DisplayPort

|                    |                      |
|--------------------|----------------------|
| Maximum resolution | 2560 × 1600 at 60 Hz |
|--------------------|----------------------|

## SD Card Slot

|                 |                       |
|-----------------|-----------------------|
| SD card support | SD and SDHC standards |
|-----------------|-----------------------|

## Memory

Nonvolatile<sup>1</sup>

1. 1 MB is equal to 1 million bytes. 1 GB is equal to 1 billion bytes. The actual formatted capacity might be less.

|                              |             |
|------------------------------|-------------|
| SD removable (user supplied) | Up to 32 GB |
| Solid-state drive            | 8 GB        |



**Note** Visit [ni.com/info](http://ni.com/info) and enter the Info Code `ssdbp` for information about the life span of the nonvolatile memory and about best practices for using nonvolatile memory.

|  |  |
|--|--|
| <b>Volatile</b>                                    |  |
| <b>Processor memory</b>                            |  |
| Density  | 2 GB                                       |
| Type   | DDR3L                                      |
| Maximum theoretical data rate                      | 8.533 GB/s                                 |
| <b>Data throughput</b>                             |  |
| System memory to SD removable storage <sup>2</sup> | 10 MB/s                                    |
| Module slots to system memory                      | 20 MB/s, application- and system-dependent |

## Reconfigurable FPGA

|           |                        |
|-----------|------------------------|
| FPGA type | Xilinx Kintex-7 7K160T |
|-----------|------------------------|

2. Consult the manufacturer specifications of your SD removable storage.



|  |              |
|--|--------------|
| Number of flip-flops                       | 202,800      |
| Number of 6-input LUTs                     | 101,400      |
| Number of DSP slices (18 × 25 multipliers) | 600          |
| Available block RAM                        | 11,700 kbits |
| Number of DMA channels                     | 16           |
| Number of logical interrupts               | 32           |

## Internal Real-Time Clock

|          |                          |
|----------|--------------------------|
| Accuracy | 200 ppm; 40 ppm at 25 °C |
|----------|--------------------------|

## CMOS Battery

|  |           |
|--|-----------|
| Typical battery life with power applied to power connector   | 10 years  |
| Typical battery life when stored at temperatures up to 25 °C | 7.8 years |
| Typical battery life when stored at temperatures up to 85 °C | 5.4 years |

## Power Requirements



**Note** Some C Series modules have additional power requirements. For more information about C Series module power requirements, refer to the C Series module(s) documentation.

| Voltage input range (measured at the cRIO-9038 power connector) |             |      |
|---|-------------|------|
| V1  | 9 V to 30 V |      |
| V2  | 9 V to 30 V |      |
| Maximum power consumption                                       |             | 46 W |



**Note** The maximum power consumption specification is based on a fully populated system running a high-stress application at elevated ambient temperature and with all C Series modules and USB devices consuming the maximum allowed power.

|   |         |                        |
|---|---------|------------------------|
| Typical standby power consumption   |         | 3.4 W at 24 V DC input |
| Recommended power supply  |         | 100 W, 24 V DC         |
| Typical leakage current from secondary power input (V2) while system is powered from primary power input (V1) |         |                        |
| At 9 V  | 0.4 mA  |                        |
| At 30 V   | 1.93 mA |                        |



**Notice** Do not connect V2 to a DC mains supply or to any supply that requires a connecting cable longer than 3 m (10 ft). A DC mains supply is a local DC electricity supply network in the infrastructure of a site or building.

#### EMC ratings for inputs as described in IEC 61000

|                       |  |
|-----------------------|--|
| V1                    | Short lines, long lines, and DC distributed networks                                       |
| V2                    | Short lines only   |
| Power input connector | 4-position, 3.5 mm pitch, pluggable screw terminal with screw locks, Sauro CTF04BV8-AN000A |

## Physical Characteristics



**Tip** For two-dimensional drawings and three-dimensional models of the cRIO-9038, visit [ni.com/dimensions](http://ni.com/dimensions) and search by module number.

|                              |   |
|------------------------------|---|
| Weight (unloaded)            | 2,250 g (4 lb 15 oz)  |
| Dimensions (unloaded)        | 328.8 mm × 88.1 mm × 109.2 mm (12.94 in. × 3.47 in. × 4.30 in.)                     |
| <b>Screw-terminal wiring</b> |   |
| Gauge                        | 0.5 mm <sup>2</sup> to 2.1 mm <sup>2</sup> (20 AWG to 14 AWG) copper conductor wire |
| Wire strip length            | 6 mm (0.24 in.) of insulation stripped from the end                                 |

|                             |   |
|-----------------------------|---|
| Temperature rating          | 85 °C   |
| Torque for screw terminals  | 0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.) |
| Wires per screw terminal    | One wire per screw terminal                             |
| <b>Connector securement</b> |   |
| Securement type             | Screw flanges provided                                  |
| Torque for screw flanges    | 0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.) |

## Safety Voltages

Connect only voltages that are below these limits.

|                              |   |
|------------------------------|---|
| V1 terminal to C terminal    | 30 V DC maximum, Measurement Category I |
| V2 terminal to C terminal    | 30 V DC maximum, Measurement Category I |
| Chassis ground to C terminal | 30 V DC maximum, Measurement Category I |

## Measurement Category



**Caution** Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV.



**Attention** Ne pas connecter le produit à des signaux dans les catégories de

mesure II, III ou IV et ne pas l'utiliser pour effectuer des mesures dans ces catégories.



**Warning** Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV, or for measurements on MAINS circuits or on circuits derived from Overvoltage Category II, III, or IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation. The product can only withstand transients up to the transient overvoltage rating without breakdown or damage to the insulation. An analysis of the working voltages, loop impedances, temporary overvoltages, and transient overvoltages in the system must be conducted prior to making measurements.



**Mise en garde** Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour des mesures dans ces catégories, ou des mesures sur secteur ou sur des circuits dérivés de surtensions de catégorie II, III ou IV pouvant présenter des surtensions transitoires supérieures à ce que le produit peut supporter. Le produit ne doit pas être raccordé à des circuits ayant une tension maximale supérieure à la tension de fonctionnement continu, par rapport à la terre ou à d'autres voies, sous peine d'endommager et de compromettre l'isolation. Le produit peut tomber en panne et son isolation risque d'être endommagée si les tensions transitoires dépassent la surtension transitoire nominale. Une analyse des tensions de fonctionnement, des impédances de boucle, des surtensions temporaires et des surtensions transitoires dans le système doit être effectuée avant de procéder à des mesures.

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as **MAINS** voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.



**Note** Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

## Environmental Characteristics

|                     |                                 |                 |
|---------------------|---------------------------------|-----------------|
| Temperature         |                                 |                 |
| Operating           |                                 | -40 °C to 70 °C |
| Storage             |                                 | -40 °C to 85 °C |
| Humidity            |                                 |                 |
| Operating           | 10% RH to 90% RH, noncondensing |                 |
| Storage             | 5% RH to 95% RH, noncondensing  |                 |
| Ingress protection  |                                 | IP20            |
| Pollution Degree    |                                 | 2               |
| Maximum altitude    |                                 | 5,000 m         |
| Shock and Vibration |                                 |                 |
| Operating vibration |                                 |                 |
| Random              | 5 g RMS, 10 Hz to 500 Hz        |                 |

|                 |  |
|-----------------|--|
| Sinusoidal      | 5 g pk-pk, 10 Hz to 500 Hz   |
| Operating shock | 30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations |

To meet the shock and vibration specifications, you must mount the cRIO-9038 system directly on a flat, rigid surface as described in the user manual, affix ferrules to the ends of the terminal wires, install an SD card cover (SD Door Kit, 783660-01), and use retention accessories for the USB host ports (NI Industrial USB Extender Cable, 152166-xx), USB device port (NI Locking USB Cable, 157788-01), and mini DisplayPort connector (NI Retention Accessory for Mini DisplayPort, 156866-01). All cabling should be strain-relieved near input connectors. Take care to not directionally bias cable connectors within input connectors when applying strain relief.