1. CHARACTERISTICS

The cRIO monitoring unit is a modular system designed for the acquisition, processing, and interpretation of signals from mechanical systems. The unit is based on National Instruments hardware and 4dot software, algorithms, and patents.

The unit primarily enables the measurement of:

- Vibrations (acceleration, velocity, displacement)
- Deformations
- Temperature
- Digital inputs

The unit is intended for continuous condition monitoring of machinery and technological equipment in industrial environment, with support for autonomous operation.

2. APPLICATIONS

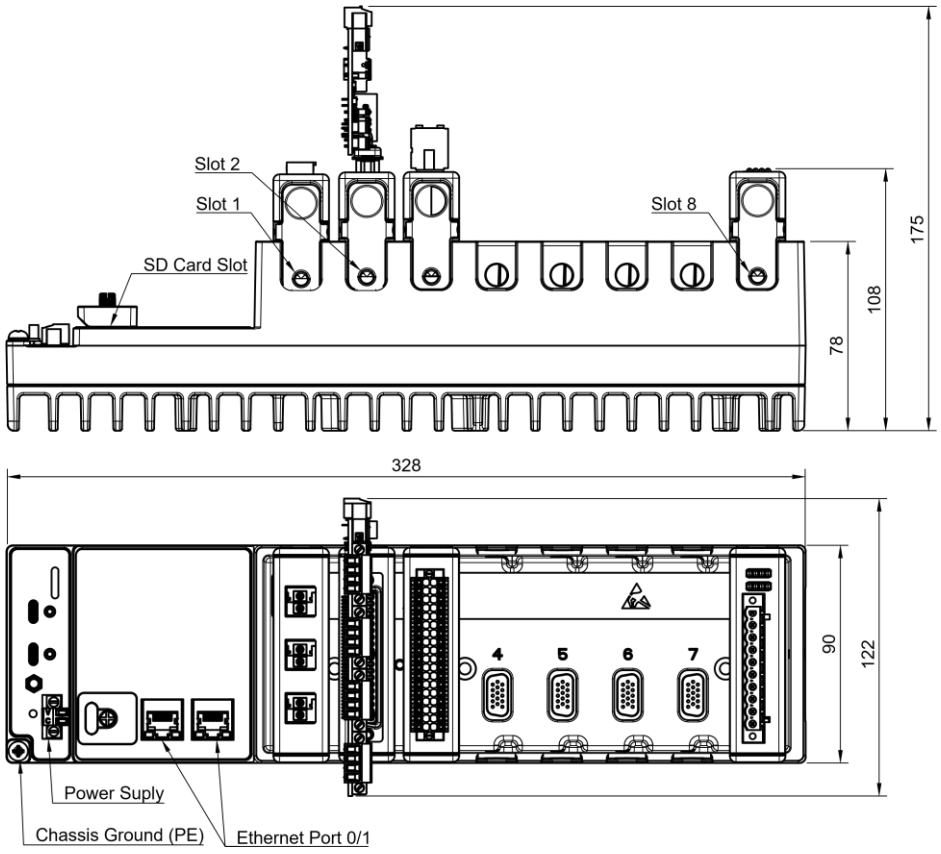
- Technical diagnostics
- Predictive maintenance
- Process monitoring
- Measurement and data acquisition

3. DIMENSIONS

The hardware of the unit consists of an industrial computer and modules, primarily measurement cards.

Computer	Height without modules [mm]	Max height with modules [mm]	Width without modules [mm]	Max width with modules [mm]	Length [mm]
9053	77,85	175	89,61	122	221,43
9054	77,85	175	89,61	122	221,43
9056	77,88	175	89,61	122	328,64
9057	77,88	175	89,61	122	328,64

Outline drawing of unit 9057-A1B1-C1D1



Installation

- The unit can be installed in a control cabinet using a DIN rail bracket.
- Mounting using M4 screws from the front or rear side.

Dimensional drawings for individual models are available at:

9053 - https://www.ni.com/en/support/documentation/dimensional-drawings/model.crio-9053.html

9054 - https://www.ni.com/en/support/documentation/dimensional-drawings/model.crio-9054.html

9056 - https://www.ni.com/en/support/documentation/dimensional-drawings/model.crio-9056.html

9057 - https://www.ni.com/en/support/documentation/dimensional-drawings/model.crio-9057.html

4. TECHNICAL DATA

Power Supply

- Supply voltage: 9–30 VDC, recommended 24 V
- Maximum power consumption: 30 W

Environmental Conditions

- Operating temperature: −20 to 55 °C
- Storage temperature: −40 to 85 °C

- Operating humidity: 10 to 90 % RH, non-condensing
- Storage humidity: 5 to 9 5% RH, non-condensing

External Memory

- MicroSD slot: yes

Time Management

- Internal CMOS battery for real-time clock (RTC) backup
- Time synchronization via NTP (public or customer-defined NTP servers)

Industrial Computer Parameters

Model	Slots	RAM	Processor	FPGA	Internal storage	Ethernet ports
9053	4	1 GB	1.33 GHz Dual Core Intel Atom	Artix-7 50T	4 GB	1
9054	4	2 GB	1.33 GHz Dual Core Intel Atom	Artix-7 100T	4 GB	2
9056	8	1 GB	1.33 GHz Dual Core Intel Atom	Artix-7 75T	4 GB	1
9057	8	2 GB	1.33 GHz Dual Core Intel Atom	Artix-7 100T	4 GB	2

Input Module Parameters

Model	Measurements	Description	Range	Channels	Frequency & Resolution	~ RAW [kB/s/ch]
9232	vibration	IEPE, AC/DC	±30 V	3	102,4 kHz 24 bit	150-250
9226	temperature	RTD	±5000 Ω	8	400 Hz 24 bit	1
9421	position	DI 24V	0-24 V	8	10 kHz 1 bit	15-25
9237	deformation	Bridge	±25 mV/V	4	50 kHz 24 bit	75-125
9215	voltage	DC ±10 V	±10 V	4	10 kHz 16 bit	75-125

Maximum data throughput depends on the configuration of modules, sensors, and sampling frequency.

Measurement accuracy is determined by the measurement modules used, according to National Instruments specifications.

Output Module Parameters

Model	Description	Range	Channels	Frequency & Resolution
9482	Relay	N/A	4	15 ms max relay operate time
9472	DO	6-30 V	8	10 kHz 1 bit

5. DATA MEASUREMENT AND PROCESSING

RAW

- Raw data from converters
- Stored in binary files
- Synchronously acquired from all modules and channels
- Acquired up to the maximum sampling rate of the module
- Primarily used for detailed offline analysis and diagnostics
- RAW file length configurable from 0.01 s to 270 s (for the current maximum length, contact 4dot)
- Identification: timestamp, sensor number

SDF

- Asynchronous, compressed, post-processed data
- Used for long-term monitoring and transmission to higher-level systems
- Frequency: 400–1600 Hz (depending on module)
- Identification: timestamp, sensor number, analysis type

Wav

- Time-domain waveforms of post-processed data
- Used for further analysis or signal visualization
- Frequency: 400–1600 Hz depending on module
- Identification: timestamp, sensor number, analysis type

6. COMMUNICATION

4dot Servers

- Encrypted TCP communication to a fixed address and port; connection initiated by the unit
- In case of transmission issues, SDF data can also be sent via UDP

Rarog Visualization Panel

- REST API available on both the unit and the visualization panel

Machine and Other Systems

- Digital inputs and outputs / relays (see Output Module Parameters)
- REST API
- OPC UA

Example: Reading the current cRIO board temperature using SDF via the unit REST API.

Query parameters: sensor_number=0&analysis_type=53

Unit response: {"data":[{"timestamp":[1765890539],"value":[37.8]}]}

Communication interfaces are intended for integration into supervisory systems and visualization tools.

The security of communication interfaces depends on system configuration and higher-level system requirements.

The unit provides basic diagnostic and status information via SDF and REST API.

For additional requirements, please contact 4dot.

7. UNIT DESIGNATION

9057 Industrial Computer	-	A2B1	-	D1E1	-	F2
		Module type and quantity				

Modul	Code
9232	A
9226	B
9421	C
9482	D
9237	E
9215	F
9472	G

Example: 9054 - A2C1

The monitoring unit consists of a 9054 computer, two 9232 modules, and one 9421 module.

8. SAFETY AND INSTALLATION WARNINGS

- The unit must be powered only within the specified voltage range.
- The device must be properly grounded using the grounding points on the unit enclosure.
- The unit is intended for installation exclusively inside a control cabinet or other protected industrial enclosure. Adequate cooling must be ensured.

9. ACCESSORIES

- MicroSD card
- DIN rail mounting bracket
- 4dot Vibration sensor PM3 https://4dot.cz/en/products#vibration-sensor-pm3
- 4dot Strain sensor 4dot SM https://4dot.cz/en/products#strain-sensor-4dot-sm

10. CONTACT

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Technical parameters are subject to change depending on device configuration.