



# Sensor Measurement Solution

RX23E-A offers a high-precision Analog Front End (AFE) with a 24-bit  $\Delta\Sigma$  A/D converter in a compact package for industrial sensor measurement analog/digital conversion solution.



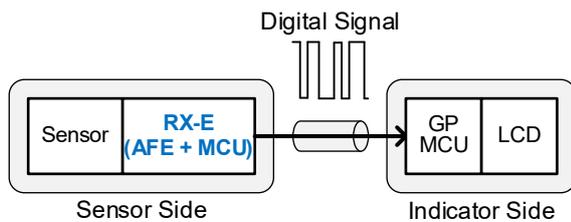
Reference designs of high-precision measurements and evaluation kit for the RX-E series introduction are available.

## Features

Due to trends in factory automation and IoT, sensor devices are evolving towards miniaturization, digitalization, multi-sensing, distributed processing, and wireless capabilities. We offer solutions from the RX23E-A group aligned with these latest technology trends.

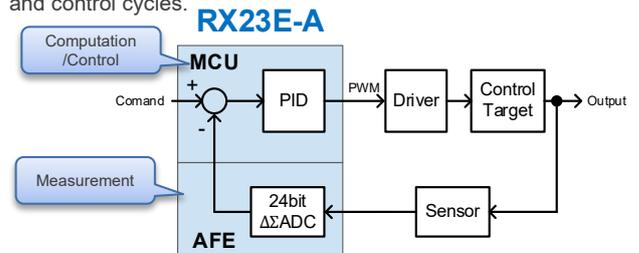
### Digitalizing Sensor Modules By Compact Circuit

The RX23E-A, integrating a high-precision AFE and a high-performance RX CPU onto a single chip, can realize intelligent digital sensors that balance digitalization and miniaturization



### Measurement, Computation/Control Into A Single Chip

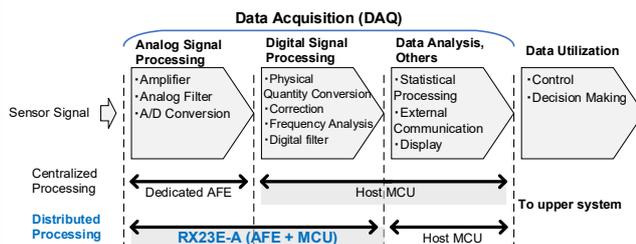
The roles of dedicated AFE and general-purpose MCU combine into one chip RX23E-A. No need to handle communication between the AFE-MCU and easy to synchronize measurement and control cycles.



### Data Acquisition (DAQ) And Distributed Processing

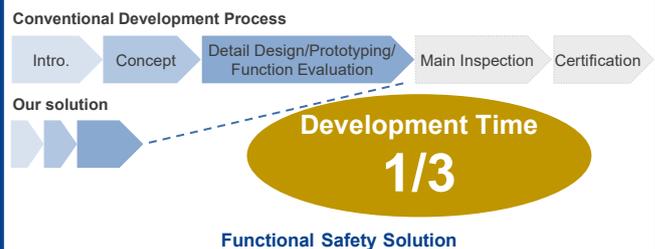
Distribute analog/digital signal processing on the sensor side and reduce the processing load on the host MCU.

\*DAQ: A function that collects, analyzes, and displays data from various sensors



### Connectivity and Industrial Functional Safety Support

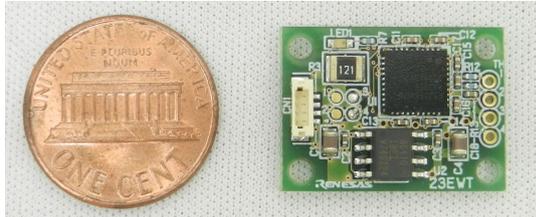
Support connectivity such as IO-Link and wireless (Wi-Fi, Bluetooth) aligning with the advancement of sensor intelligence. Also compile with functional safety requirements such as the European standard (IEC61508)



## Reference Designs

### Tiny Board for Digital Loadcell

RX23E-A with high-precision AFE aids in circuit board miniaturization. Achieve 22mm x 16mm size integrable with a loadcell.



### Thermoelectric Peltier Controller

Temperature control using the Peltier effect for heating and cooling. Single RX23E-A can implement the measurement, computation, and control.



### Multi-channel Isolated Analog Measurement

4 RX23E-A for 4-channel synchronous, isolated measurement. Utilize RX23E-A's processing capability for distributed processing.



### IO-Link Solution / Functional Safety Solution

IO-Link (IEC61131-9) reference designs and functional safety solutions for functional safety standards (IEX61508) are available.



IO-Link Solution

Functional Safety Solution

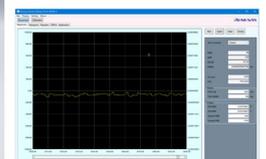
## Development Tools

### RX23E-A Development Tools (Renesas solution Starter Kit for RX23E-A)

Evaluation kit for RX23E-A introduction: equipped with RX23E-A and sensor measurement circuits, GUI tool, reference software  
Without software development, evaluating AFE functions with the packaged sensor is possible

On-board circuit-supported sensor types: thermocouple, temperature resistance detector (RTD), strain gauge.

GUI function: Parameter setting via GUI, waveform of A/D conversion values, histogram display, etc



## TIPS: Sensor Categories

Category	Overview	Example
Sensor Device (Sensor Element)	<ul style="list-style-type: none"> <li>A sensor element without electronic circuits</li> <li>Not packaged or only simply packaged</li> <li>The mechanical structure needed for sensing is not constructed.</li> </ul>	<p>RTD   Strain gauge   Temp. sensor   CO2 sensor</p>
Sensor Assembly (Sensor ASSY)	<ul style="list-style-type: none"> <li>Does not include electronic circuits</li> <li>Features the sensor element attached to a structure and sealed to protect it from external air/exposure</li> <li>The mechanical structure required for sensing is mostly assembled.</li> </ul>	<p>Loadcell   Sheathed RTD</p>
Sensor Module	<ul style="list-style-type: none"> <li>A sensor ASSY or sensor element with added electronic circuits (e.g., signal amplification with an amp, digital output through AD conversion, physical quantity conversion, etc.)</li> <li>Rarely used on its own; often integrated into devices.</li> </ul>	<p>Pressure Sensing Module   Thermopile Module</p>
Sensor Device (Sensing System)	<ul style="list-style-type: none"> <li>Features an LCD display, can output alarms, capable of communicating with higher-level devices; essentially, it's finished goods as a device.</li> </ul>	<p>Temperature Controller   Pressure Meter</p>

  Target applications of this solution

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