Maximize productivity with ultrahigh-speed digital and analog modules
The MELSEC iQ-R Series lineup includes various ultrahigh-speed digital I/O and analog I/O modules, making them ideal for high-speed performance applications. Digital input modules support response times from 1 μs and output modules support response times of 2 μs. Analog input modules support a fixed sampling cycle of 1 μs per channel and 5 μs over all four channels.

Maintain manufacturing quality with high-speed synchronization
Both digital and analog modules enable high-speed synchronization across multiple modules. With analog modules, machine performance can be improved by enabling simultaneous sampling of five or more channels (simultaneous conversion of four channels per module), realizing high accuracy and faster control performance.

Reduce hardware costs by setting different response times for each digital input point
A different response time can be set for each input point of the high-speed input module. This functionality enables different devices operating at different response speeds to be connected to the same input module, helping to reduce the total cost as less hardware is required.

Simple preventative maintenance utilizing continuous logging
The analog module includes continuous logging that enables the module to log contiguous data, such as from vibration sensors on a motor. This data can then be analyzed, enabling faults to be highlighted leading to the correct planning of maintenance.

Improve performance of closed-loop control
The analog output module supports high-speed conversion of 1 μs improving output speed performance. This enables faster response of a feedback control system, such as drive control where speed is controlled by analog signals.

**Highlights**

**Digital I/O modules**
- Response times* from 1 μs (input) and 2 μs (output)
- 8-point common terminal**, mixing different sensor types
- Digital filter supporting 20 μs and 50 μs input response times (different times can be set for each input point)

**Analog I/O modules**
- High-speed conversion (input:1 μs, output:1 μs) and 16-bit high resolution
- Simultaneous multi-channel conversion (no. of channels increased with inter-modular synchronization)
- Preventative maintenance with continuous logging function
- Improve performance of closed-loop control systems

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1. Response times for 32-point input module and 32-point output module respectively.
2. 16-point input module.
1 **High-speed data measurement of tire profile**

High-speed analog measurements between multiple sensors can be synchronized, leading to improved accuracy of inspection data. Measurements are made at high speed, supporting 5 µs simultaneous sampling rates over five or more channels. This can be used for applications such as monitoring tire profiles during qualitative final inspection using geometric measuring techniques (laser sensors), and detecting tires with defects such as radial runout, axial runout, bulges, and tire side deformation.

2 **High-speed response between product detection and reject mechanism**

High-precision synchronization between inputs and outputs are ideal for situations requiring high-speed performance between each process, such as for product detection and rejection mechanisms in packaging machines. By utilizing the inter-modular synchronization function, sensor performance is not affected by variations in CPU scan time, which can normally cause slower process responses and cause missed products.

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**Synchronization between multiple I/O modules**

**Without inter-modular synchronization**

- CPU scan
- Mark sensor input
- Reject arm output

Process performance affected by CPU scan-time variation

**With inter-modular synchronization**

- Inter-modular synchronization
- CPU scan
- Mark sensor input
- Reject arm output

No variation in process performance
Ultrahigh-speed control of product code printing

The digital output module supports high-speed control and enables an output signal response time of 2 µs, where dedicated equipment would usually be required. This is useful when data received from a computer requires printing onto a workpiece, such as printing product identification information (e.g., date codes, batch numbers) on packaging after quality testing on a continuous high-speed packaging line.

Monitoring of motor vibration characteristics

The analog modules support continuous logging that enable collection of analog data at high speed (1 µs per channel, 5 µs over four channels) irrespective of the control CPU scan time, which otherwise may result in portions of uncollected data. This is useful for collecting vibration sensor data that is used to monitor motor performance for detecting any progressive vibrations that may indicate the possibility of a fault developing.

Greater accuracy of collected data

Due to the analog modules high-speed data sampling and improved resolution, even small changes in sensor output data values can be visible, especially as values change at high speed.
### High-speed Digital I/O Modules
- Available in positive or negative common (for 16-point input), both positive and negative common (for 32-point input), and with sink or source transistor (for output) depending on the type of device or sensor wiring.
- 8-point common terminal (16-point input) enables mixing of different sensor types on one input module (different response time can be set for each input point).
- Wide-range rated load voltage from 5 V DC to 24 V DC.
- 18-point screw terminal available for the input, and high-density 40-pin connector for the output.

### Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>RX40NC6H</th>
<th>RX40PC6H</th>
<th>RX61C6HS</th>
<th>RX61CH6HS</th>
<th>RX41C6HS</th>
<th>RX41CH6HS</th>
<th>RX61CH6HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of input points</td>
<td>16</td>
<td>16</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
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<tr>
<td>Rated input voltage (V DC)</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Rated input current (mA)</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rated load voltage (V DC)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5 ... 24</td>
<td>5 ... 24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max. load current (A/point)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.2</td>
<td>0.2</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Response time</td>
<td>5 μs ... 70 ms</td>
<td>5 μs ... 70 ms</td>
<td>1 μs ... 70 ms</td>
<td>1 μs ... 70 ms</td>
<td>≤ 2μs</td>
<td>≤ 2μs</td>
<td>-</td>
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<tr>
<td>Common terminal arrangement (points/common)</td>
<td>8</td>
<td>8</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
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<tr>
<td>Interrupt function</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>18-point screw terminal block</td>
<td>●</td>
<td>●</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>40-pin connector</td>
<td>-</td>
<td>-</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### High-speed Analog I/O Modules
- High-speed conversion (input: 1 μs, output: 1μs) and 16-bit high resolution.
- 18-point screw terminal block.

### High-speed Analog Input
- Synchronization of multiple channels (inter-modular synchronization increases the number of channels that can be converted simultaneously).
- Continuous logging enables high-speed collection of contiguous data (1 μs per channel, 5 μs over four channels).
- Various embedded filters (primary delay, low, high, band-pass filters).

### High-speed Analog Output
- High-speed conversion of 1 μs enables faster response of feedback control.
- Faster and smoother predefined wave signal output without requiring additional programming.

### Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>RX61C6HS</th>
<th>RX61CH6HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input</td>
<td>Analog output</td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1%</td>
<td>±0.1%</td>
</tr>
<tr>
<td>Ambient temperature 25 ±5°C</td>
<td>±0.2%</td>
<td>±0.3%</td>
</tr>
<tr>
<td>Temperature range</td>
<td>+55 °C</td>
<td>-40 °C</td>
</tr>
<tr>
<td>Operation mode</td>
<td>Normal mode (high-speed: 1 μs/CH)*1</td>
<td>High-speed output mode (conversion speed: 1 μs/CH)</td>
</tr>
<tr>
<td>Absolute max input</td>
<td>±15 V, 30 mA</td>
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<tr>
<td>Voltage input/output</td>
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<td>-10 ... 10</td>
</tr>
<tr>
<td>Analog voltage (V DC)</td>
<td>-32000 ... 32000</td>
<td>-32000 ... 32000</td>
</tr>
<tr>
<td>Digital value range</td>
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<td>0 ... 20</td>
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<tr>
<td>Digital value range</td>
<td>0 ... 32000</td>
<td>0 ... 32000</td>
</tr>
<tr>
<td>External interface</td>
<td>●</td>
<td>●</td>
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</table>

*1 Supports R60ADH4 with the first two digits of serial number “04” or later.