iQ Platform-compatible PAC High-speed Digital I/O and Analog I/O Modules

MELSEC iQ-R series

Story

MELSEC iQ-R Series Broadcast

e-F@ctory

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.

Highlights

Digital I/O modules
- Response times[1] from 1 μs (input) and 2 μs (output)
- 8-point common terminal[2], 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

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.

High-speed Digital I/O Modules

High-speed Analog I/O Modules
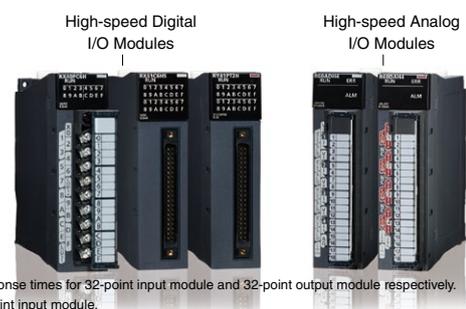
*1. Response times for 32-point input module and 32-point output module respectively.
*2. 16-point input module.

❶ 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.
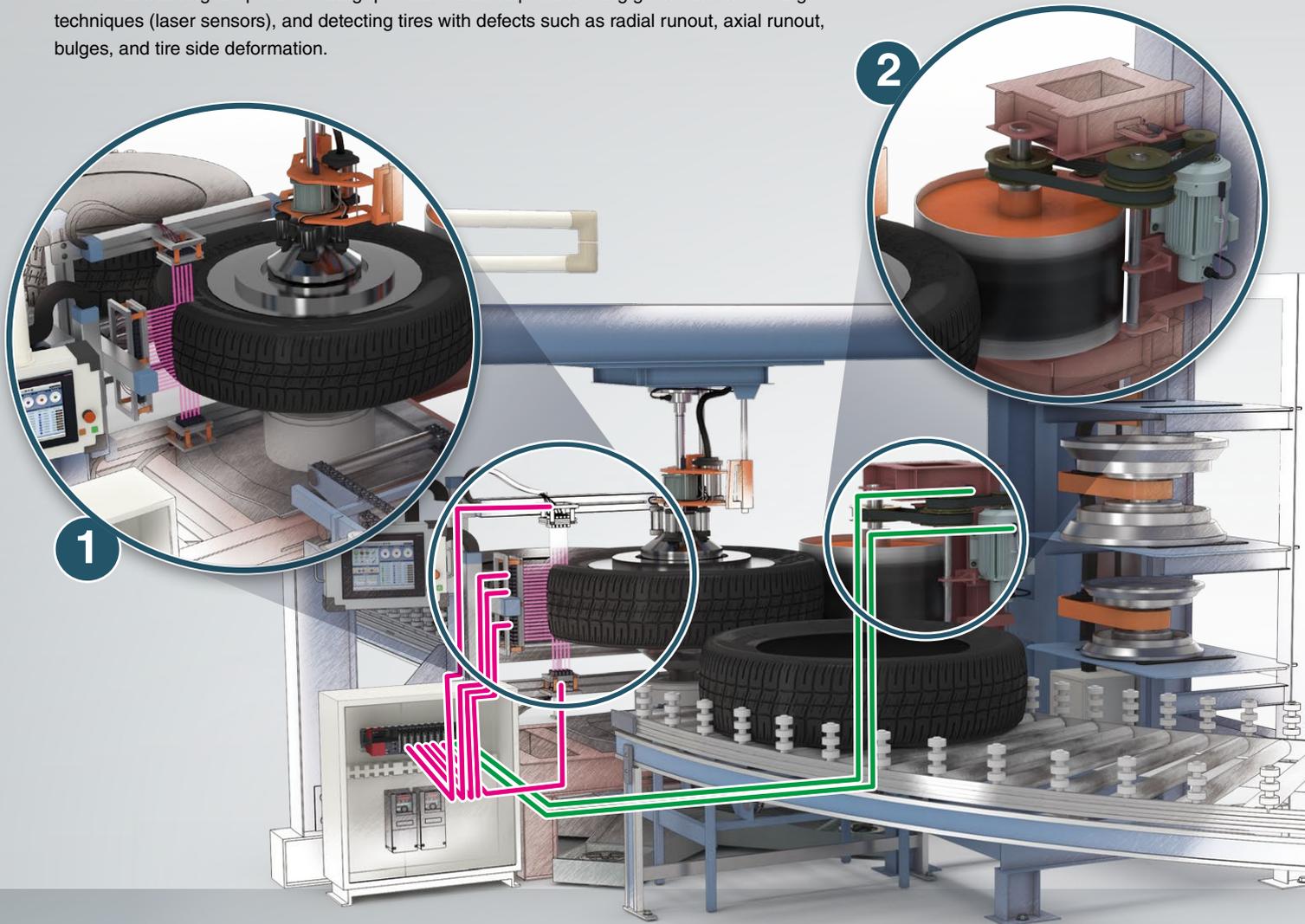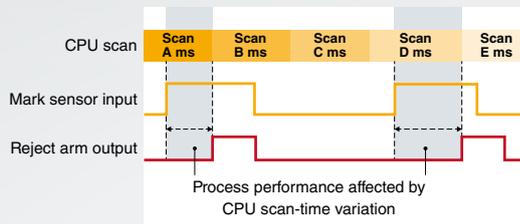
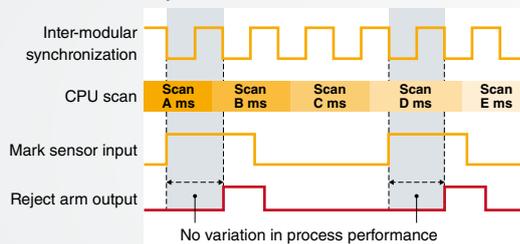## ❸ High-speed response between product detection and reject mechanism

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.

Synchronization between multiple I/O modules

Without inter-modular synchronization

CPU scan	Scan A ms	Scan B ms	Scan C ms	Scan D ms	Scan E ms

Mark sensor input

Reject arm output

Process performance affected by CPU scan-time variation

With inter-modular synchronization

Inter-modular synchronization

CPU scan	Scan A ms	Scan B ms	Scan C ms	Scan D ms	Scan E ms

Mark sensor input

Reject arm output
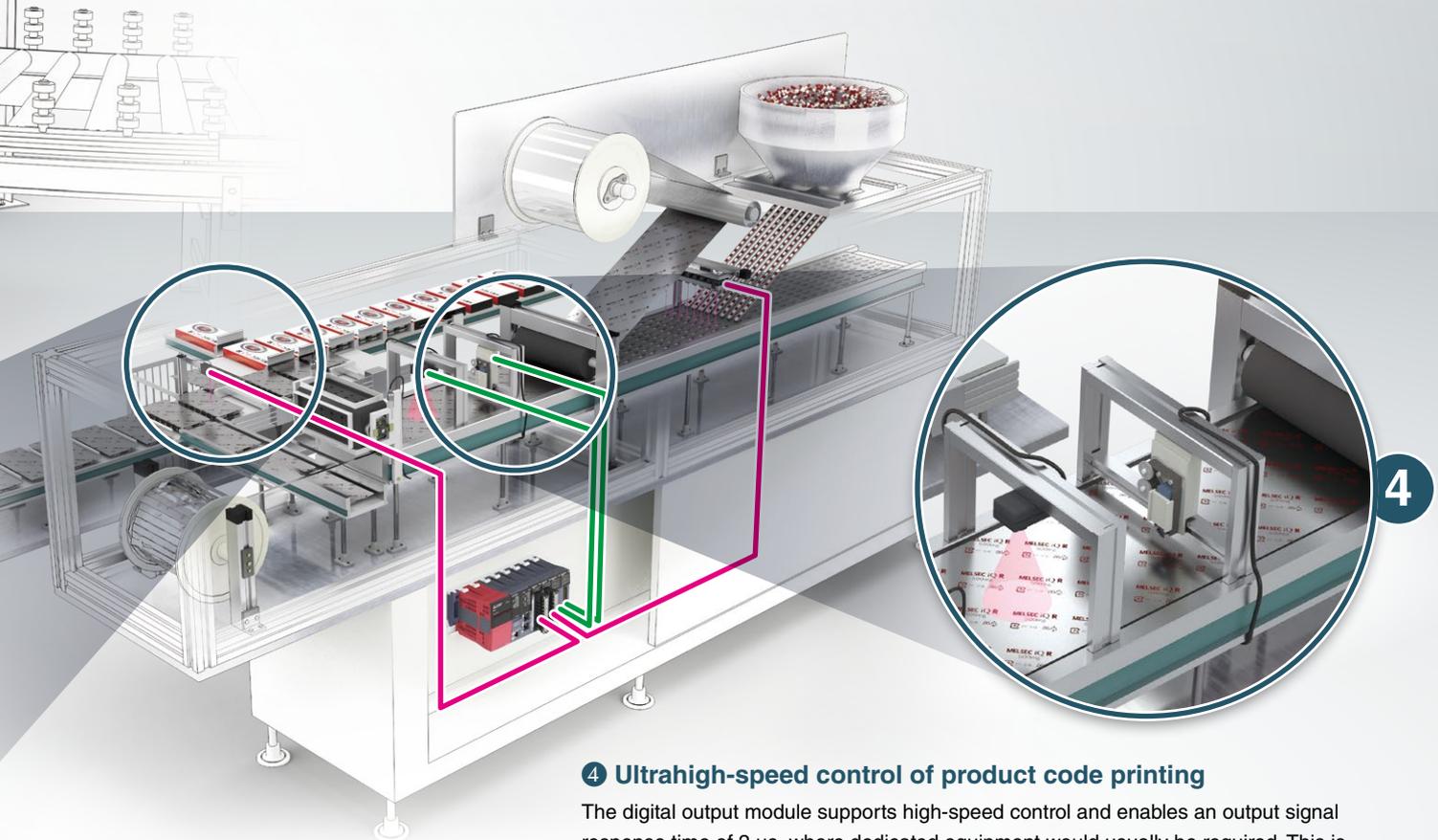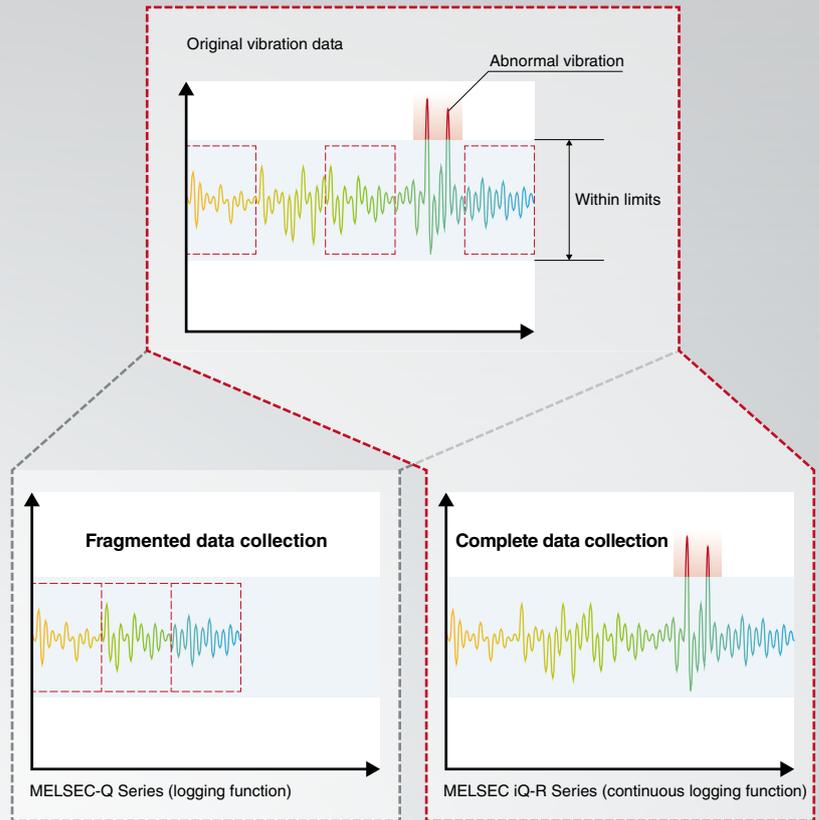
No variation in process performance

❷ 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.

Original vibration data

Abnormal vibration

Within limits

Fragmented data collection

MELSEC-Q Series (logging function)

Complete data collection

MELSEC iQ-R Series (continuous logging function)

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❹ 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.

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

Item	Positive common	Negative common	Positive/negative common	Positive/negative common	Transistor (sink) output	Transistor (source) output
	RX40PC6H	RX40NC6H	RX41C6HS	RX61C6HS	RY41NT2H	RY41PT2H
Number of input points	16	16	32	32	32	32
Rated input voltage (V DC)	24	24	24	5	-	-
Rated input current (mA)	6.0	6.0	6.0	6.0	-	-
Rated load voltage (V DC)	-	-	-	-	5…24	5…24
Max. load current (A/point)	-	-	-	-	0.2	0.2
Response time	5 µs…70 ms	5 µs…70 ms	1 µs…70 ms	1 µs…70 ms	≤ 2µs	≤ 2µs
Common terminal arrangement (points/common)	8	8	32	32	32	32
Interrupt function	●	●	●	●	-	-
External interface						
18-point screw terminal block	●	●	-	-	-	-
40-pin connector	-	-	●	●	●	●

High-speed Analog I/O Modules

- High-speed conversion (input:1 µs, output:1 µs) 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

Item	Analog input	Analog output
	R60ADH4	R60DAH4
Number of channels	4	4
Accuracy		
Ambient temperature 25 ±5˚C	±0.1%	±0.1%
Ambient temperature 0…55˚C	±0.2%	±0.3%
Input/output specifications		
Operation mode	Normal mode (high-speed: 1 µs/CH)[*1]	High-speed output mode (conversion speed: 1 µs/CH)
	Normal mode (medium speed: 10 µs/CH)	Normal output mode (conversion speed: 10 µs/CH)
	Normal mode (low speed: 20 µs/CH)	Wave output mode (conversion speed: 20 µs/CH)
	Simultaneous conversion mode (5 µs/4CH)	-
Absolute max. input	±15 V, 30 mA	-
Voltage input/output		
Analog voltage (V DC)	−10…10	−10…10
Digital value range	−32000…32000	−32000…32000
Current input/output		
Analog current (mA DC)	0…20	0…20
Digital value range	0…32000	0…32000
External interface		
18-point screw terminal block	●	●

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

Country/Region Sales Office

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⚠ For safe use

- To use the products listed in this publication properly, always read the relevant manuals before use.

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