Renesas and MinebeaMitsumi Collaborate on Stepping Motor Solutions for Robots

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Renesas Electronics Corporation
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Market Changes Driving Evolving Technology Needs

Labor saving

Automated robots

Automated driving

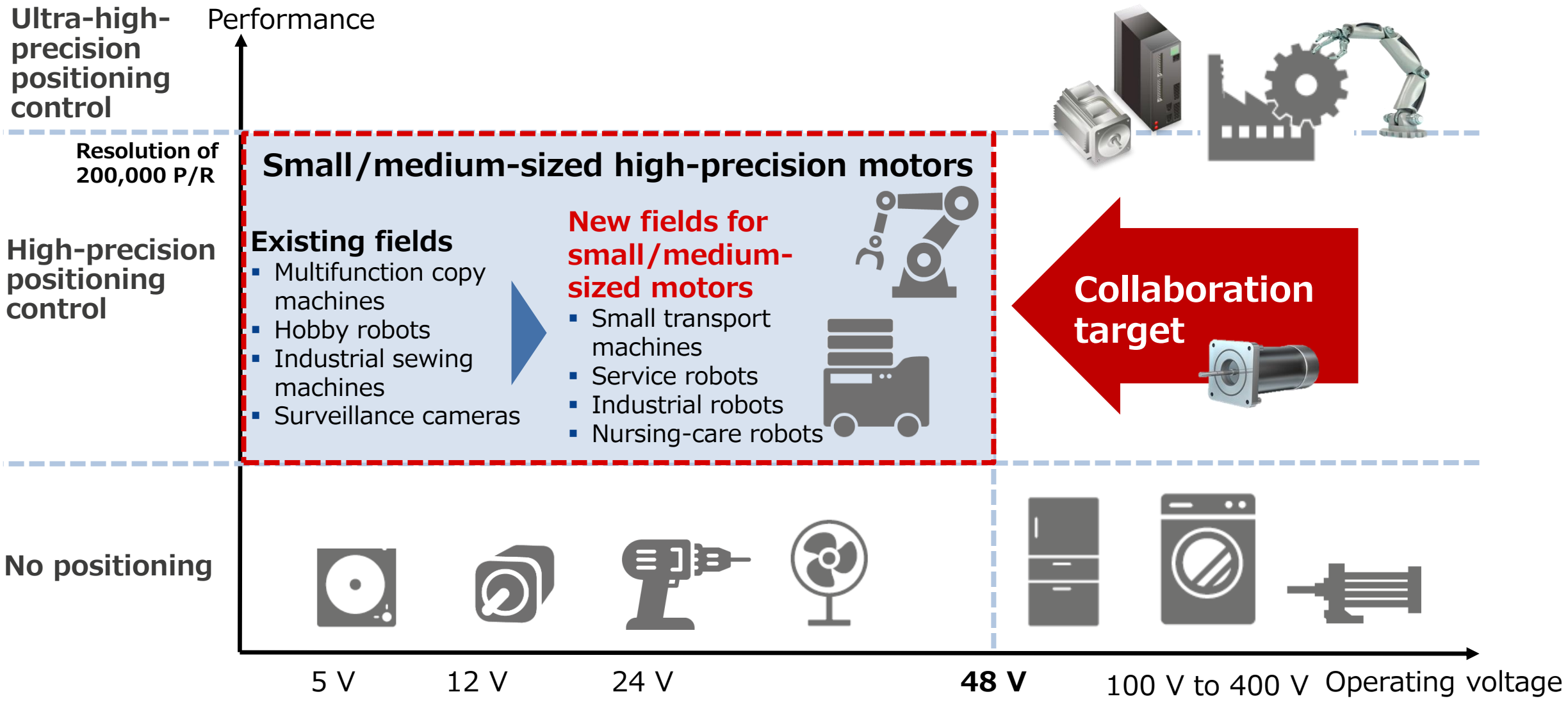
Automated logistics robots

Aging society

Nursing-care/medical robots

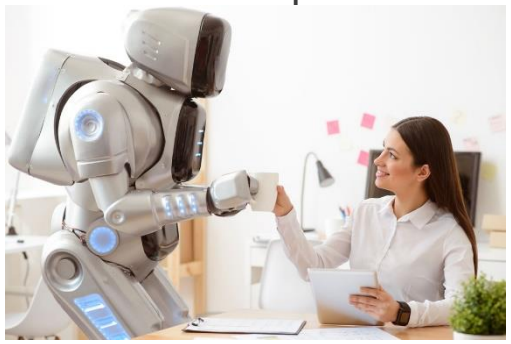
Increasing demand for small/medium-sized robots

New Application Fields for Small/Medium-Sized Motors



Needs and Challenges in Small/Medium-Sized Motor Market

As the robot industry expands, the increased demands become more difficult to satisfy using conventional motors

	High performance	Sturdiness	Compact size
Needs	▪ High-precision positioning control ▪ Smooth low-speed rotation 	▪ Heat resistance ▪ Dust/vibration resistance 	▪ Long battery life ▪ Small motor with high torque designed for compact devices 
Challenges	Installing a position sensor on the motor would solve the problem, but ➡ **An optical sensor is expensive.**	An optical sensor is ➡ **Vulnerable to heat and dust.**	A small stepping motor with high torque works the best, but ➡ **A step-out margin is required.** ➡ **Conventional control consumes large electricity and generates a lot of heat.**

Jointly Developed Solutions to Meet Changing Needs

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	A motor with an angle sensor "resolver" is ideal **Popular in automotive and aircraft industries** **High environmental resistance and cost effectiveness**		**Advanced motor control technology is required**

MinebeaMitsumi
World's leading supplier of stepping motors
50 years of experience in developing in-vehicle and aircraft resolvers

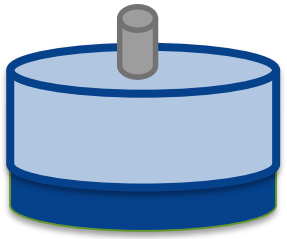
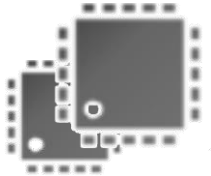
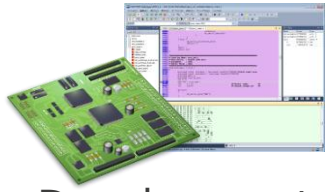
Renesas Electronics
Global market leader of 32-bit microcontrollers
Deep motor control design expertise

MinebeaMitsumi and Renesas: Jointly developed stepping motors with a resolver as well as semiconductors and the software required for control

Resolver-Based Stepping Motor Control Solutions

Ready-to-use solutions include everything needed for development

Integrates motor, sensor, semiconductor, and software for optimization

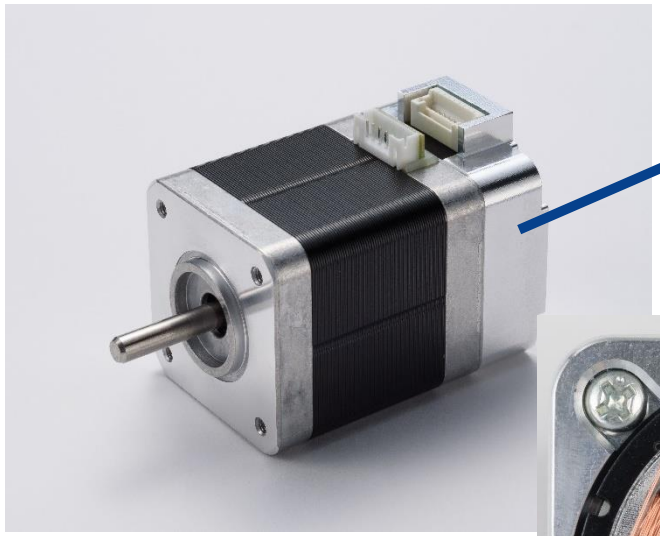
MinebeaMitsumi's stepping motor with resolver	Renesas' resolver-based stepping motor control solution
Stepping motor Resolver sensor	 +  Semiconductor  Software  Development kit

Satisfies new needs for small/medium-sized motors

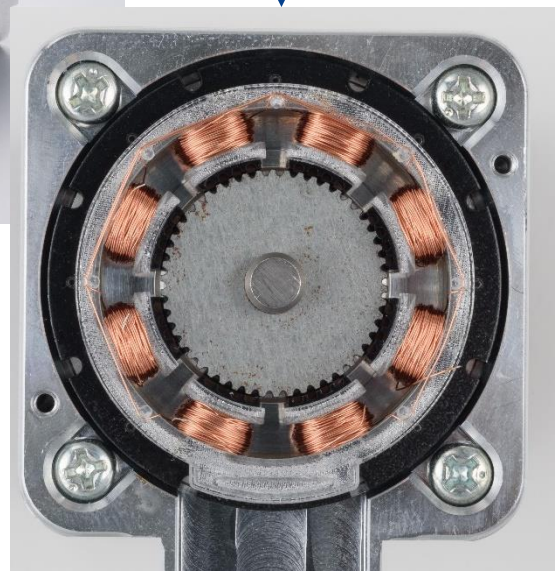
- High-precision control using a stepping motor with a resolver
- Environmental resistance of the resolver opens up a wider range of applications
- Easy development with the motor control development kit

MinebeaMitsumi's Stepping Motor with Resolver

MinebeaMitsumi's New Stepping Motor with Resolver



42-mm square stepping motor with resolver

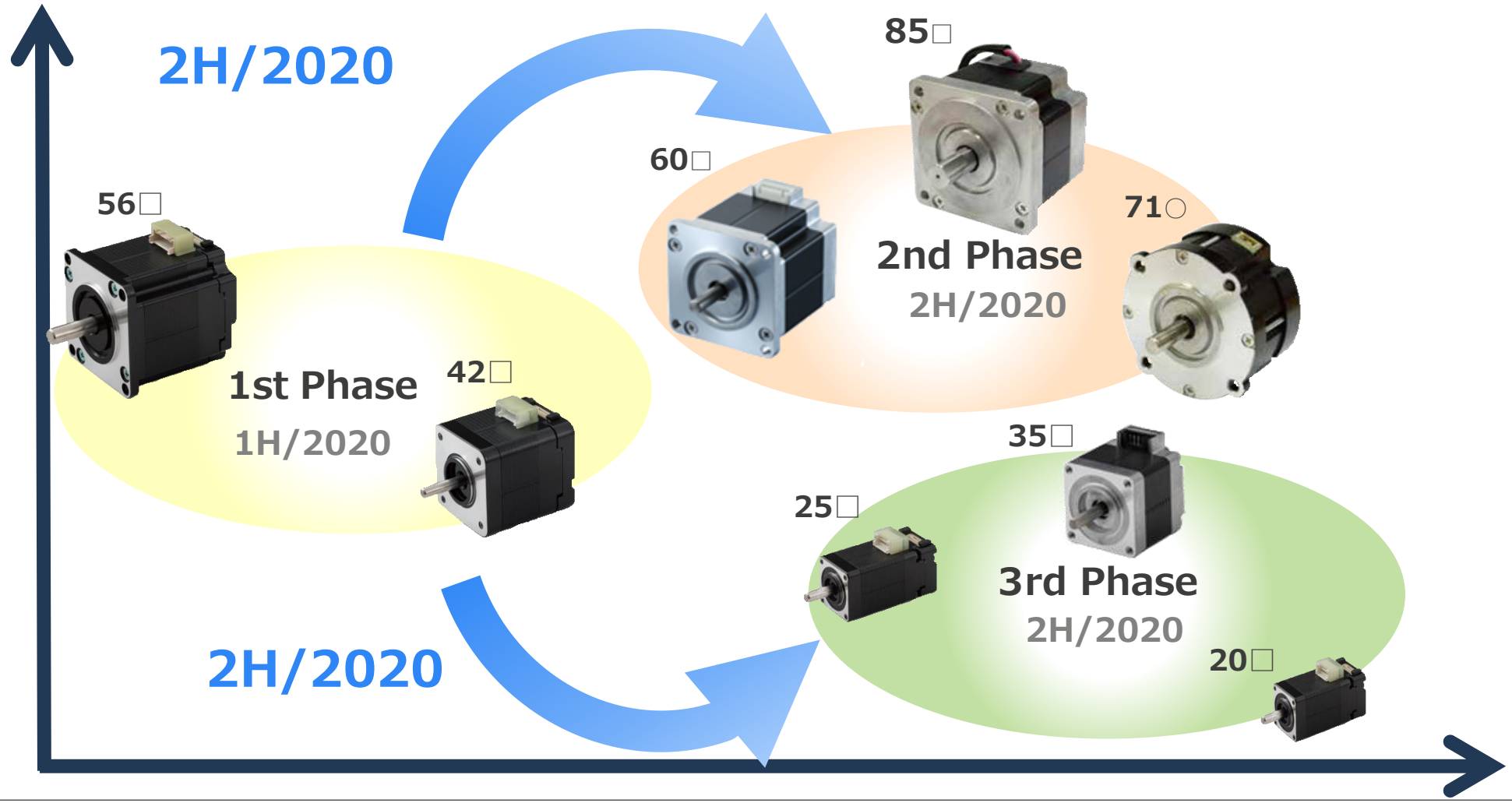


	Features
High torque characteristics	2-3x torque compared to existing products since no step-out control required
Control characteristics	Able to drive at both broadband and ultra-low speeds
Low power consumption	Current optimization by servo control that responds to the actual load
High precision	High position precision achieved by high resolution of 200,000 P/R
Environmental resistance	Highly resistant to heat, dust, and vibration due to its simple structure
Miniaturization	The high torque of these motors makes miniaturizing application products possible

Sample shipments start in January 2020 with mass production starting in April 2020

Future Planned Products

MinebeaMitsumi's stepping motor with resolver lineup (Plan)



Renesas Electronics
Resolver-Based Motor Control Solutions

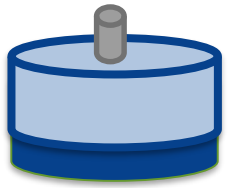
Renesas' Resolver-Based Motor Control Solutions

Provides the IC and software required for resolver control and motor control

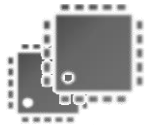
MinebeaMitsumi's stepping motor with resolver

Stepping motor

Resolver sensor

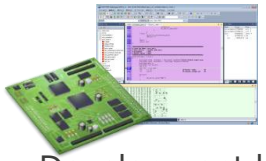


Renesas' resolver-based stepping motor control solution



Semiconductor

Software

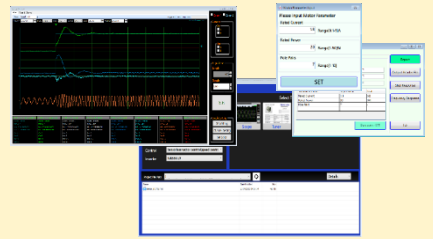


Development kit

Stepping motor control software

RDC-IC driver

Microcontroller **RDC-IC** **Inverter**



Development support tool
Renesas Motor Workbench

RX24T

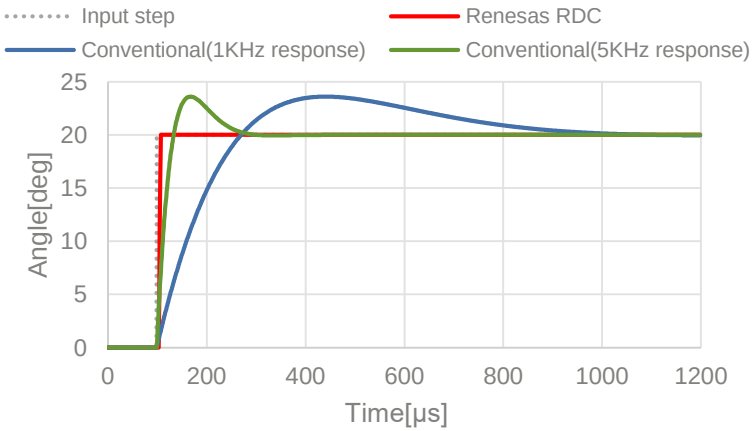
Resolver-to-digital converter (RDC)
RAA3064002GFP

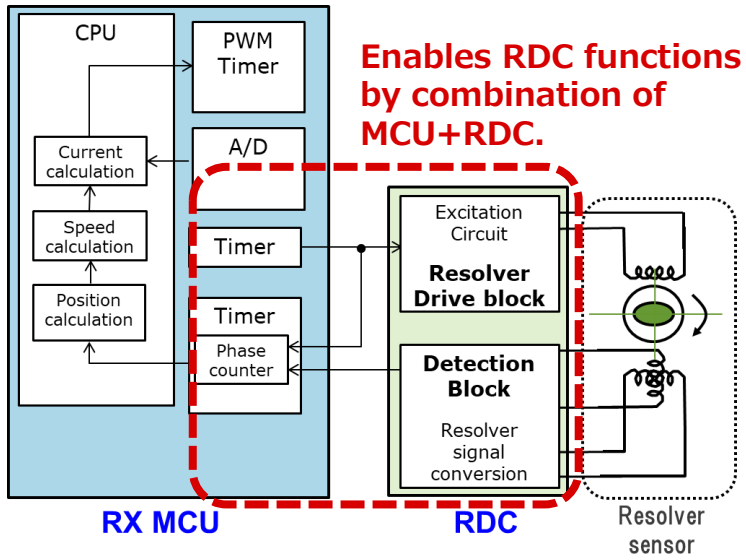
Features of New Renesas RDC-IC

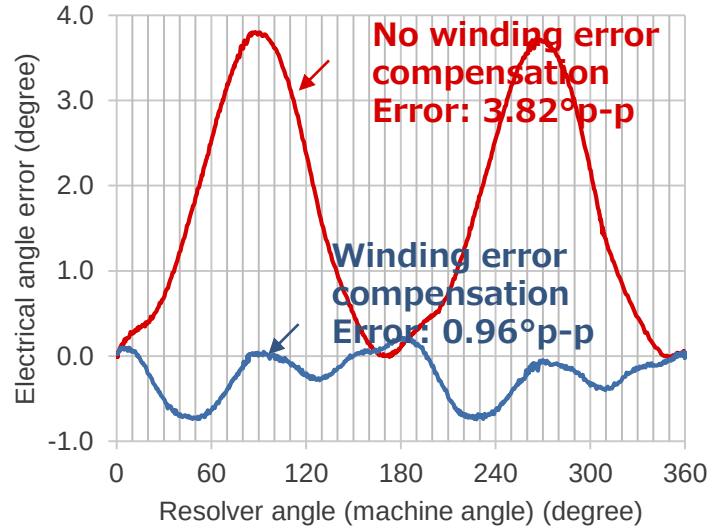
Realizing new cost-effective resolver solutions

High-speed response using new control method	Cost reduction in RDC-IC	Cost reduction in resolver sensors
A new type of RDC-IC used in combination with a microcontroller to deliver high-speed response, reducing takt time.	The RDC-IC circuit is simplified by using some microcontroller functions, reducing RDC-IC circuits and costs.	Supports both voltage- and current-detection type resolver sensors and implements the winding error compensation function to reduce resolver sensor costs.

Renesas RDC immediately follows input commands.







Resolver-Based Stepping Motor Control Kit

Evaluation System for Stepping Motor with Resolver

Item	Specification
Kit name	Evaluation System for Stepping Motor with Resolver
Kit model number	RTK0EMX270S01020BJ
Kit configuration	48 V 2 A stepping motor drive inverter board
	RX24T CPU card with RDC
	Stepping motor with a resolver (Made by MinebeaMitsumi)
Inverter specifications	▪ Rated voltage: 48 V ▪ Rated current: 2 A (continuous) ▪ Rated output: 100 W ▪ Detection function: Phase current, bus voltage ▪ Protection function: Overcurrent protection
I/F specifications	▪ External equipment I/F: RS485, CAN, pulse command, general-purpose I/O
Development support function	▪ Renesas Motor Workbench ▪ On-board emulator circuit (flash programming circuit)

The ready-to-use kit will be launched in January 2020

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