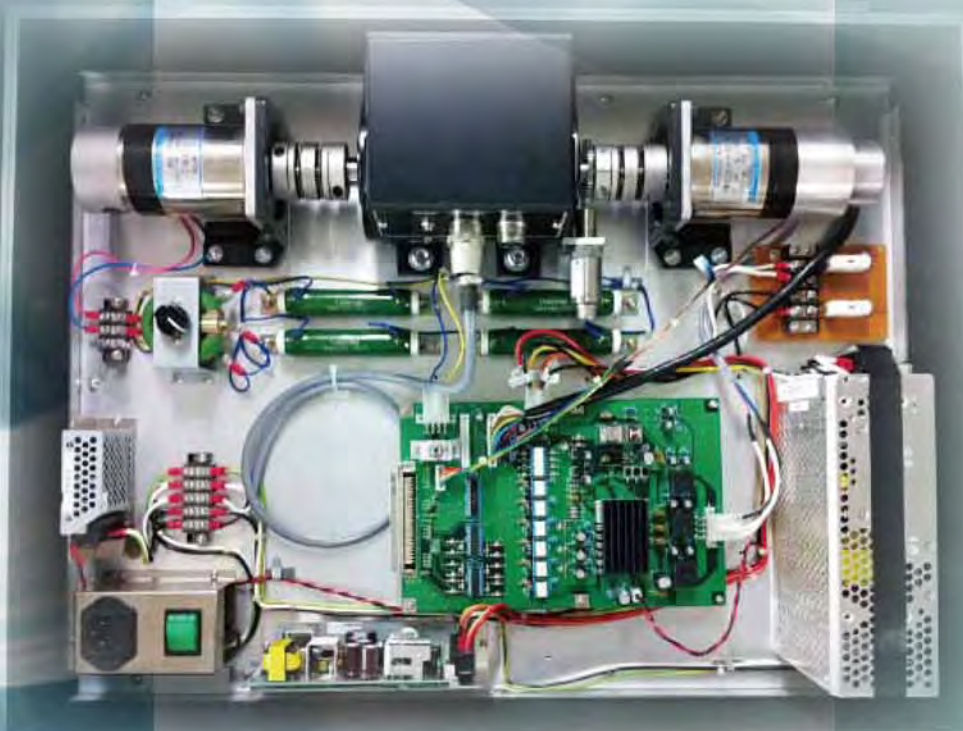


Electric Vehicles (EV) and Hybrid Vehicles (HEV)

# Mini Motor Bench

## Features

- 30W DC brushless motor
- Resolver outputs
- Controlled by DSP system (Real-Time Rapid Prototyping system)
- Controller model is based on MATLAB/Simulink™ design



MATLAB  
Enabled



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**AND** ...Clearly a Better Value

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- The Mini Motor Bench (MMB) provides a development environment for motor controllers.
- A motor controller is provided as a flexible Real-Time Rapid Prototyping (RT-RPT) controller device.
- The system is suitable for control algorithm development and parameter optimization.

### Motor controller development

Many motors have been introduced to the market for a variety of uses. There is also therefore a demand for a number of controllers in order to provide optimal control of motors. To match the pace of motor development, controllers must also be developed quickly, and one way to ensure this, while producing durable and effective products, is to develop motors and controllers in parallel.

Generally, motor controllers are developed with a HILS system but there is a demand to confirm the developed control algorithm with an actual motor. However, it requires huge investments to prepare a real target motor.

### Downsizing the target motor

Preparing a large size motor for motor controller development requires a high capacity of electric power, a rigid design system for withstanding high torque demand and a high running cost. In reality, most users just want to test their motor controller quickly and easily.

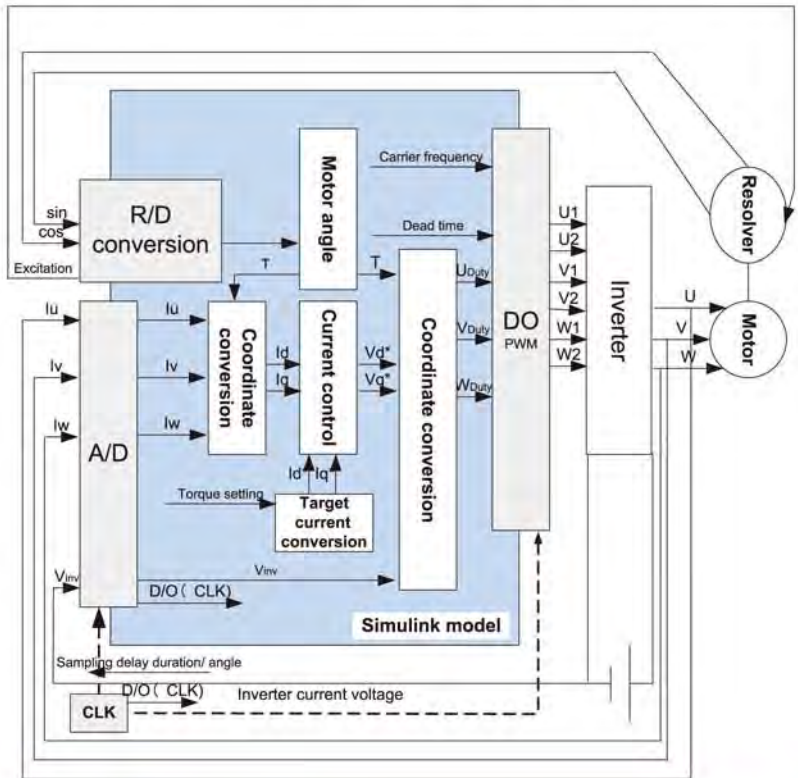
A&D offers the Mini Motor Bench system as an inexpensive but realistic motor controller development environment with a down sized motor bench system.

In general, the main difference between large motors and downsized motors is the difference in their moment of inertia, but this has little influence for the development of controllers. Therefore, confirming the control algorithm with a downsized motor can be considered sufficient for control of motors of larger size as well.

### Features of the Mini Motor Bench

All necessary components for motor controller development are prepared. Users are able to trial various motor control algorithms and optimize the number of parameters of the motor controller.

- A brushless DC motor (BLDC) as the target motor
- DC motor for simulating motor load  
Torque adjustment is performed by changing the load resistance.
- An inverter circuit and power unit for driving the motor is embedded inside the system.
- A resolver speed signal from the motor and a PWM signal from the RT-RPT controller act as interfaces between the MMB system and the RT-RPT.



### Real-Time controller

The RT-RPT system has a wide range of flexibility and can be used for various purposes.

- **AD5435: Real-Time Rapid Prototyping system**  
Main unit of the RT-RPT controller has seven option board slots for enhancing the system. Core model is created from MATLAB/Simulink™.
- **AD5430-18**  
Specialized board for motor control application (Other option boards are available.)

# Electric Vehicles (EV) and Hybrid Vehicles (HEV) **Mini Motor Bench**

## Application examples

### ● Motor controllers evaluation

It is possible to connect an actual motor controller to the MMB. Hence motor controllers can be evaluated in a realistic environment.

### ● Motor controller algorithm development

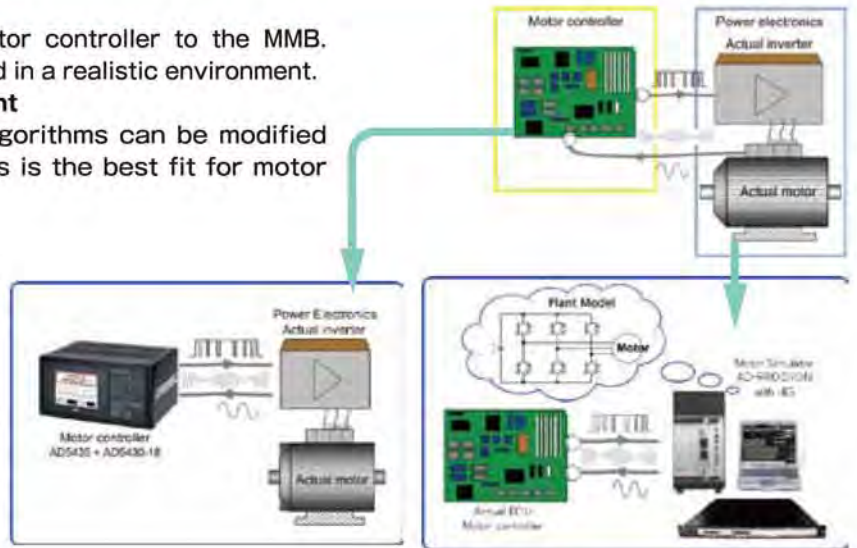
Using a RT-RPT controller, control algorithms can be modified with a MATLAB/Simulink™ model. This is the best fit for motor control engineers.

### ● Educational tool

Together with the compact size of the MMB and RT-RPT controller, they come with basic software that makes the system suitable as an educational tool.

### ● Bench-mark for new development

The control algorithm software and MMB hardware circuit diagram are open to the user. Therefore, users can use this system as a bench-mark and can modify the system by themselves.



## Software package

The RT-RPT controller system comes with a control program, so the system can be used immediately. Also users are able to modify the software such as the control algorithm and GUI interface for customization. Included:

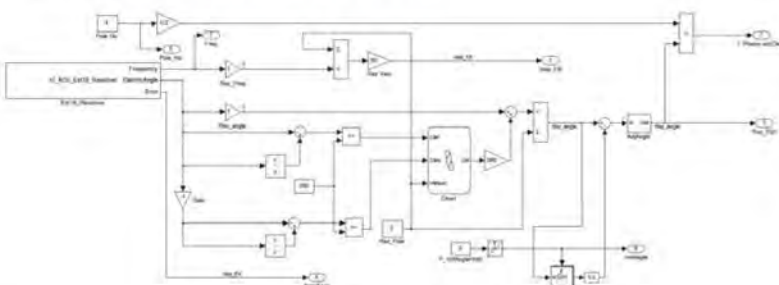
### ● Circuit diagram and parts list

### ● Control source code (MATLAB/Simulink™ model)

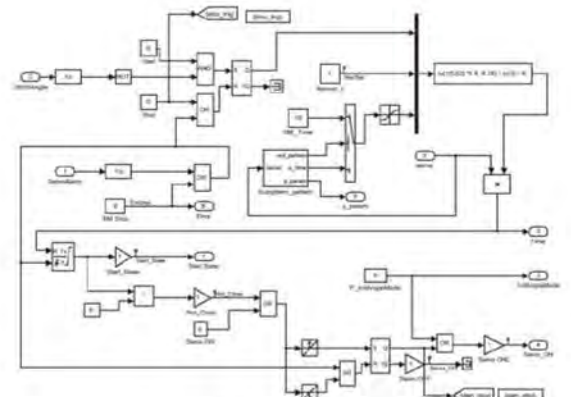
Includes MATLAB/Simulink™ add-on compiling environment (Please prepare MATLAB/Simulink™ separately.)

### ● GUI building software tool

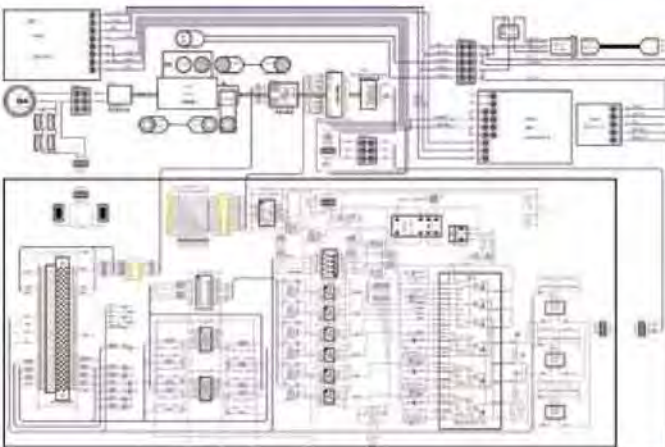
Design application software (VirtualDSPConsole) is included.



MATLAB/Simulink™



MATLAB/Simulink™



Circuit diagram



VirtualDSPConsole

### Mini Motor Bench Specifications (Reference)

Power	AC power specification 90 to 260V
Current	2.7A
Motor rotation speed	MAX 3000 rpm
Motor output	30W
Resolver specification	Can connect to AD5430-18
Carry case size	4500 mm × 3500 mm × 2000 mm

### Control Target (AD5435) Specifications

Memory	SDRAM 512MB
OS	RTOS
Display	5.7inch color TFT LCD (with backlight)
Operation interface	Resistive touch screen Customizable function keys
I/O slots	For AD5430 series I/O board 7 slots
PMC interface	For A&D link or FlexRay 1 slot (option)
Peripheral connections	Ethernet, 100base-T FTP server function
Power specifications	AC power specification (AD5435A) 85 to 264V DC power specification (AD5435) 12V (6 to 18Vpp) or 24V (16 to 36Vpp)
Power consumption	100VA (AC or DC power)
Operation temperature range	5 to 40°C
Operation humidity range	5 to 90% R.H. non-condensing
Dimensions	318(W) * 230(D) * 168(H) mm
Weight	About 6.5kg (chassis only)

### Control Board (AD5430-18) Specifications

Resolver input	R/D converter	AU6802NI (made by Tamagawa Seiki)
	Transformation ratio	0.286 / 0.5
	Output impedance	10Ω or less
	Output excitation signal	10kHz / 20kHz
	Maximum angle speed	240,000 rpm
Analog input	Number of channels	4
	Signal format	Differential signal
	Sampling frequency	40kHz (maximum) Can synchronize with PWM carrier wave.
	Input range	±5V
	Resolution	16 bit
PWM output	Number of control axes	6
	Output format	Differential (UH, VH, WH, UL, VL, WL)
	Output voltage	0 to 5V
	Carrier wave	Triangular wave, 20kHz (maximum)

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 <b>Safety Warning!</b>	● For proper use, read the instruction manuals carefully before use.
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