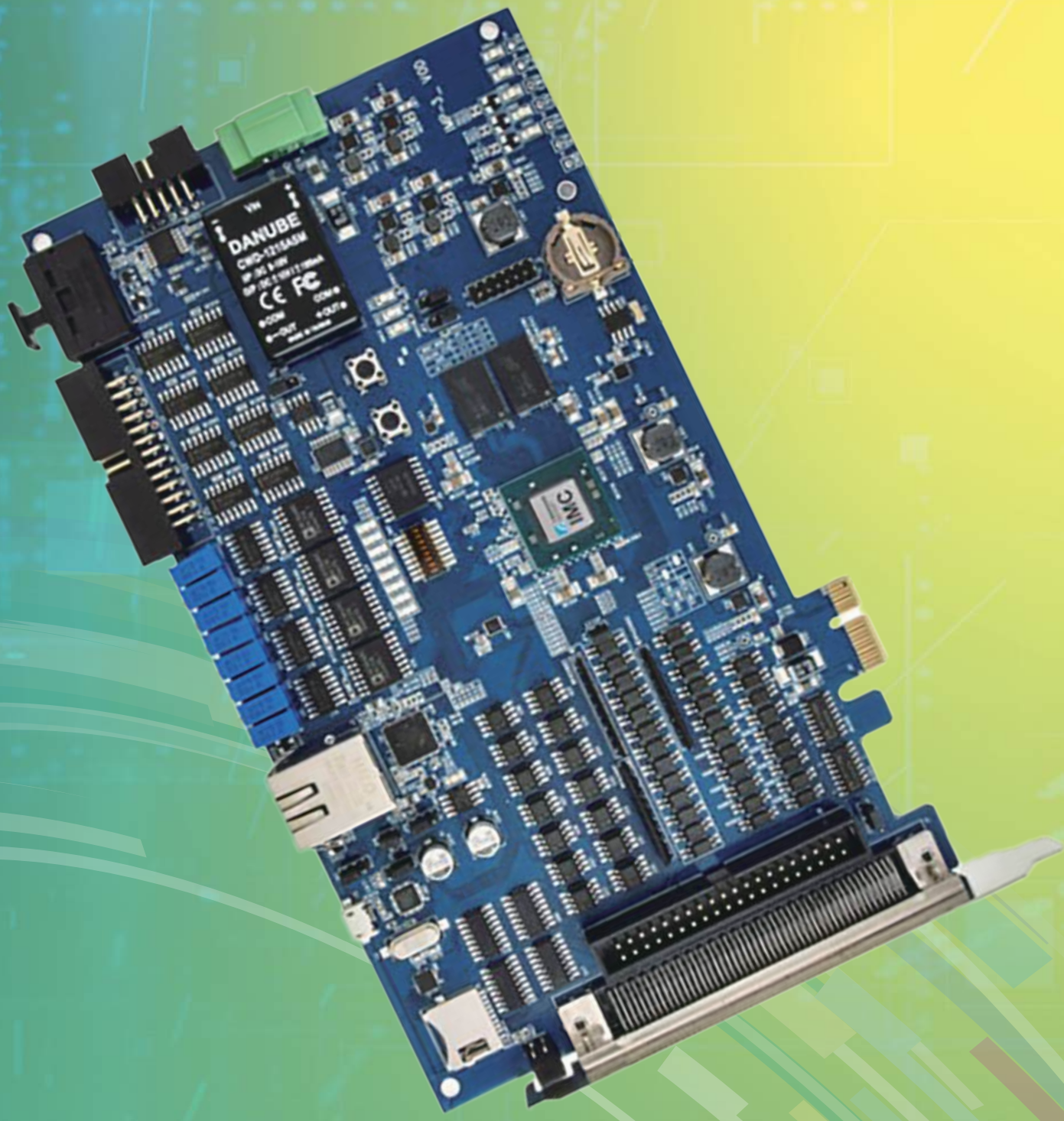
機械與機電系統研究所

MECHANICAL AND MECHATRONICS SYSTEMS
RESEARCH LABORATORIES, MMSL.

Motion Control Systems



EtherCAT Motion Control Platform

The evolution of robots, machine tools, and semiconductor equipment is marked by the integration of sophisticated mechatronics systems, necessitating increased axis capabilities, heightened precision, and seamless multi-axis synchronization. Crafting these advanced mechatronics systems relies heavily on the expertise of skilled professionals adept at navigating complex wiring intricacies and crafting bespoke designs tailored to precise applications. Domestic operators are actively addressing these challenges.

Technical Advantages and Features

Cross-Platform Library

- Offers a diverse range of motion control function libraries, encompassing linear, arc,circular, and point-to-point movements.
- Supports common network communication protocols (EtherCAT) and input/output modules (I/O).

Customized Multi-Axis Synchronous Control

- Supports multi-axis control up to 128 axes (typically limited to 32 axes).
- Provides customized motion trajectory planning.

High-Speed Synchronized and Real-time Updates

- Real-time precision motion control, with update cycles as fast as 250 μs (typically 1,000 μs).

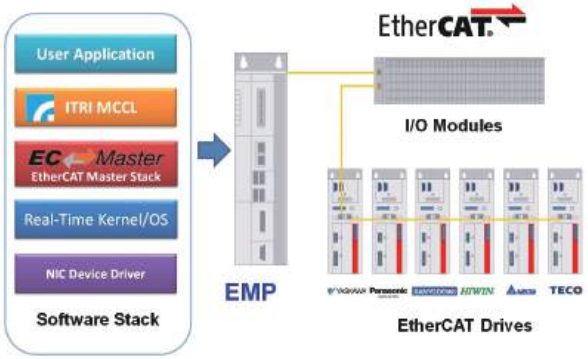
Industrial Benefits and Business Opportunities

Industry Applications:

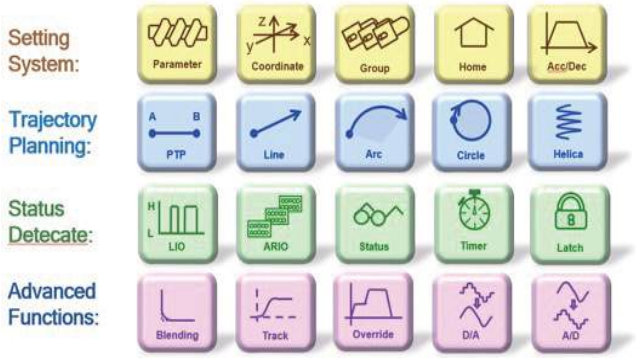
Industrial Robotics, CNC Machine Tools, Semiconductor Equipment.

Application Examples:

Assisted Company F, the world's largest EMS manufacturer, in transitioning to a fully digital multi-axis motion control platform. Designed and developed a range of robots for diverse tasks such as polishing, grinding, pick-and-place, welding, assembly, and painting. Successfully integrated over 1,000 digital motion control platforms into their 24-hour production lines, resulting in a remarkable productivity increase of approximately 20%. This initiative also led to the achievement of domestic controller self-sufficiency.



EtherCAT Motion control Platform (EMP)



Motion Control Command Library (MCCL)

Contact Person Kuei-Ming Lee /Manager
TEL: +886-3-5917942
E-mail: kmlee@itri.org.tw

Reduced Rare Earth Magnet Motor Technology

High-performance industrial control motors and automotive permanent magnet motors are highly dependent on foreign rare earth magnets, especially heavy rare earth (such as dysprosium and terbium), which are essential for motor temperature resistance and high magnetic energy. Consequently, motor design that reduces the use of rare earth magnets has become a key technology.

Technical Advantages and Features

Advanced Materials

- Selecting high saturation magnetic flux materials (>1.8T) and high-performance silicon steel (characterized by low iron loss, self adhesion, and high strength), combined with composite magnets, to reduce motor iron loss by more than 10% and simultaneously decrease magnet costs by 5%.

Innovative Design to Enhance Performance

- By implementing low rare-earth electromagnet and high-voltage designs, the motor speed is increased to over 20,000 revolutions per minute. Utilizing a multi-layer magnetoresistive reluctance structure enhances motor output torque by 5% and ensures the rotor's mechanical strength and rigidity.

Heat Dissipation

- Utilizing external circulation active cooling, such as liquid cooling channels inside or outside the stator, ensures that the motor operates within the appropriate temperature range, maintaining efficiency, safety, and stability.
- Optimizing the flow field of the working fluid reduces the energy consumption of fluid circulation and enhances the cooling effect.

Industrial Benefits and Business Opportunities

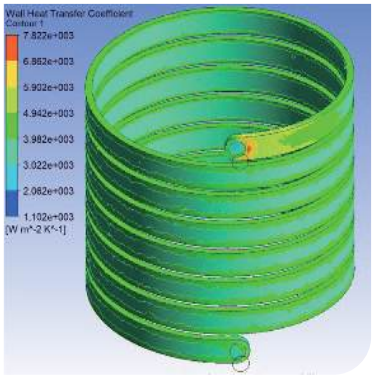
Industry Applications:

Mobile Vehicle Equipment Industry, Automotive Motor Manufacturing Industry.

Application Examples:

Currently collaborating with leading domestic electric vehicle manufacturers, we are jointly applying low-rare-earth motor development technology to smart mobile vehicles and electric vehicles, and partnering with the industry to enter international electric vehicle-related markets.

Using Advanced Materials to Build Lightweight, High-Efficiency Motors



Optimized Cooling Design with a Water Jacket Flow Field

Contact Person Cheng-Ming Chang /Manager
TEL: +886-3-5918643
E-mail: cm_chang@itri.org.tw