REXFM function module

for high-speed and low-latency signal processing
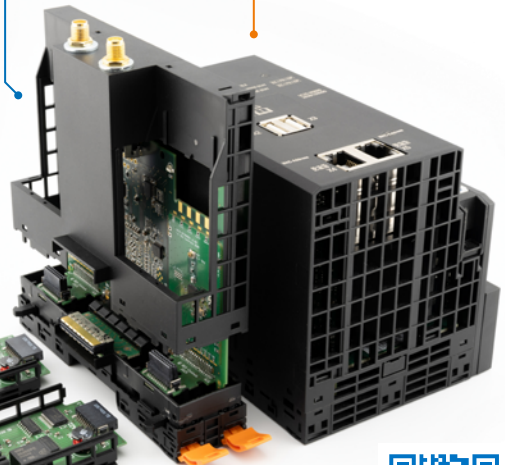
REXFM

REX CONTROLS

Weidmüller

EM422 transmitter and receiver

Weidmüller Hardware M3000/M4000 versatile platform

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REX CONTROLS

WMLM RFSAMR21 and RFMG12P modules

👑 REXFM function module

REXFM is a left-side function module for high-speed and low-latency signal processing. It is compatible with the M series of UC20 PLCs from Weidmüller. The module connects with the CPU in the PLC via the PCI Express interface. It contains a Cyclone IV FPGA for custom processing algorithms.

The design of the board is modular, allowing the connection of dedicated processing units in the form of internal daughter boards and extension modules. Up to two daughter boards and two extension modules can be attached to a single REXFM left-side module. Up to 8 general-purpose I/O from a single daughter board and up to 12 general-purpose I/O from a single extension module may be processed in the FPGA.

EM422 is a high-speed bi-directional RS-422 transmitter and receiver with error detection for three galvanically isolated channels. It allows the connection of quadrature encoders, incremental encoders, SSI encoders (both master and slave) and RS-422 and RS-485 communication lines with a transfer speed of up to 32 Mbps. It has a 5V/500 mA galvanically isolated power supply. The module is implemented as an extension module for the REXFM function module. Up to two EM422 modules can be connected to a single REXFM function module.

WMLM RFSAMR21 and RFMG12P modules are wireless network processors. RFSAMR21 operates in the 2.4 GHz band. It supports IEEE

802.15.4, ZigBee and 6LoWPAN protocols. RFMG12P features a dual-band RF transceiver operating in 433 MHz and 2.4 GHz frequency bands. In addition to the protocols listed for WMLM RFSAMR21, it also supports Bluetooth Low Energy and proprietary robust, low-latency protocol RETIS. RETIS is suitable for demanding industrial applications and is used in the triple inverted pendulum demo and in the wireless accelerometer demo. The modules are implemented in the form of a daughter board for the REXFM function module. Up to two WMLM modules can be connected to a single REXFM function module.

At SPS 2025 we present the REXFM function module with the M4000 PLC as an autonomous setup for real-time control of the inverted triple pendulum. The REXFM left-side module is equipped with two WMLM modules for quadrature encoders connected wirelessly and two EM422 modules for quadrature encoders connected by wire. All the signal processing tasks are performed in the REXFM function module while the M4000 PLC runs the control algorithm.

The data acquisition from the REXFM module and the control algorithm for the triple inverted pendulum are implemented completely in **REXYGEN.** The control algorithm runs at a frequency of 1 kHz.