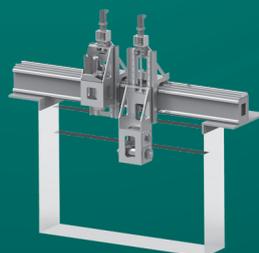




TG drives

TGMmini

compact control system



TGMmini

TGMmini is hardware optimized version of the TG Motion control system. TGMmini serves for two simultaneous processes - real-time control with Virtual PLC and Human Machine Interface (HMI). Its compact dimension and wide temperature operating range allow large application usage. TG Motion is developed according to safety standard AUTOSAR and is prepared for Safety over EtherCAT industrial protocol.



kinematics mechanism models



point-to-point positioning



positioning to brand (indexing)



servo motors synchronization (electronic gearing)



electronic cam shaft



CNC interpolation

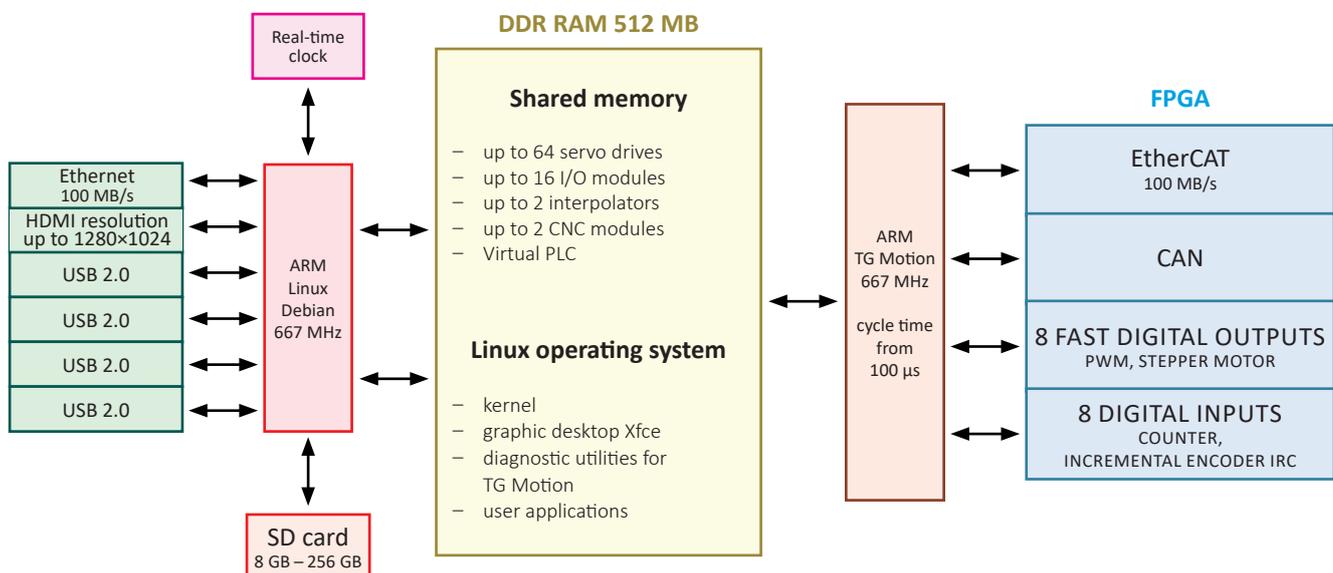


free programming

Description of the system

Dual core ARM processor ensures high speed and security of user applications. The first core operates the Linux operating system (distribution Debian 8). The second core runs separated real-time system TG Motion, which controls devices on EtherCAT bus. The main control loop works with 40 kHz frequency. User programmed Virtual PLC programs run on a separate process in sync with the main control loop. Integrated communication library simplifies connection between user applications running on the first processor core, remote PC or tablet applications and the TG Motion system.

The Linux operating system is fully-fledged with graphics interface (Xfce desktop), complete network services, USB support etc. It also offers high security by sophisticated user accounts system.



Programming and functions

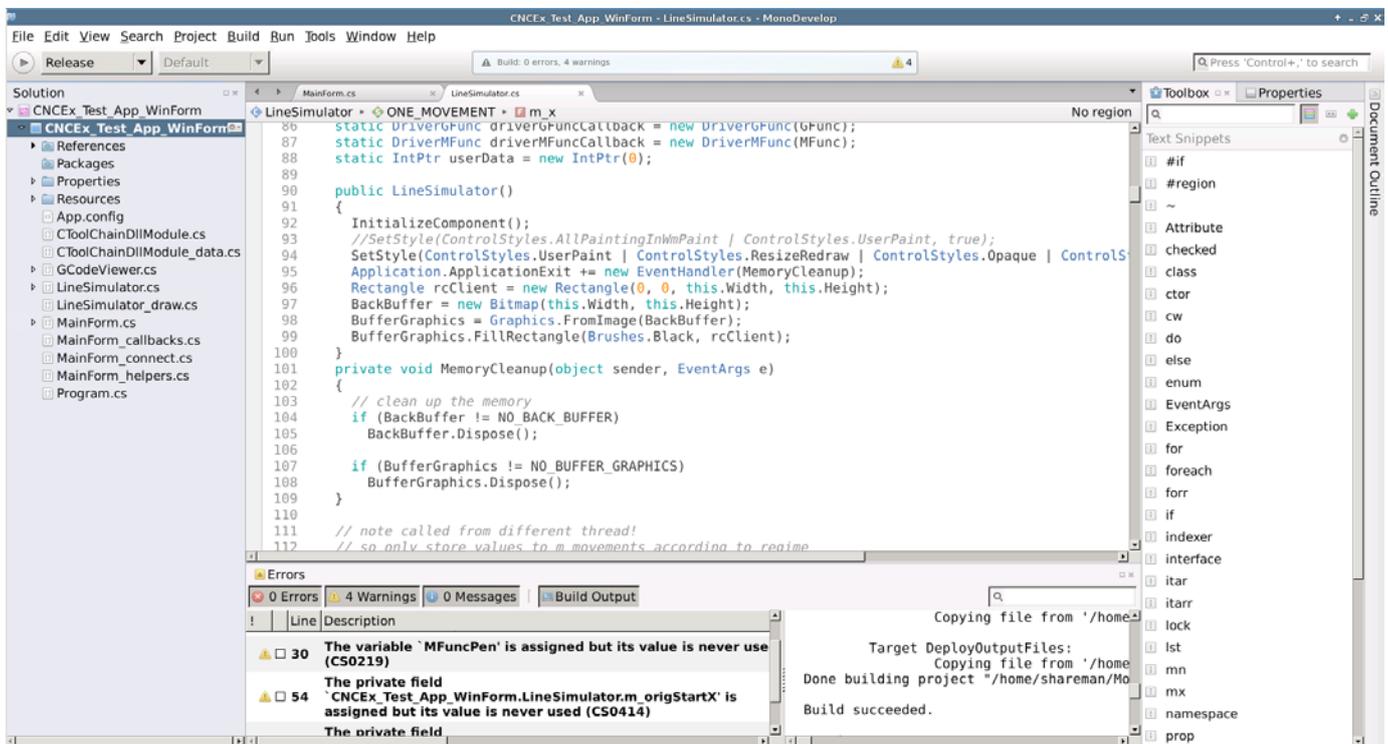
Virtual PLC module

Virtual PLC is basic control module, which controls all logical function of a machine, servo-controllers and CNC module. Programming of the PLC is under general development environment (Visual Studio, Code::Blocks) in program language C or C++. PLC programs are source code compatible with TG Motion running on Windows.

Virtual PLC accesses to memory space, where are shared registers of inputs and outputs and control registers of the servo-controllers and CNC module. This memory can be shared by other Linux programs or accessed remotely from PC.

PLC module can control other devices via EtherCAT or CAN bus by SDO objects. It is necessary to write HMI program - a Linux or remote Windows application, which allows control, diagnostics and service of the machine.

Example of C# development environment on TGMmini:



Parameters of the Virtual PLC

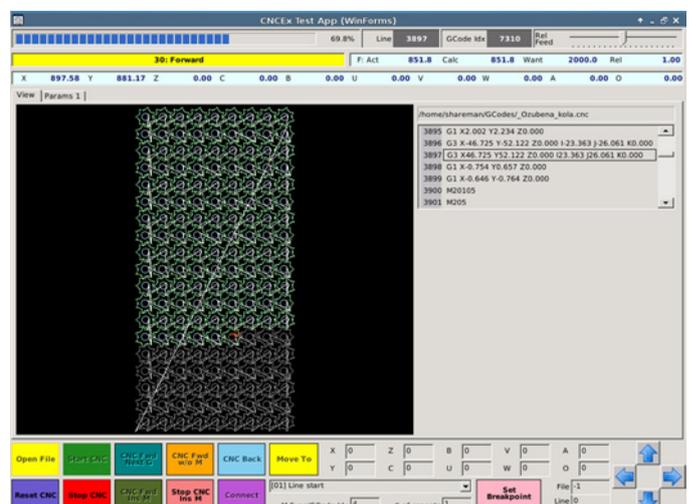
Cycle time	from 100 μ s
Numbers of the parallel programs	4
Numbers of the timers (1 ms discrete)	128
Process priorities	yes
Periodic call of PLC programs	yes
Capture (positions, inputs)	yes
Memory of the internal PLC (shared memory)	512 kB
Typical delay – input to output	200–500 μ s

CNC module

Ensures real-time transformation of the end point position to servo axis position according to the required trajectory. Parameters of a mechanism are defined in data CNC file. The CNC kernel can access up to 10 interpolated servo drives.

User can transform data from CNC module to any coordinate system and back or can create algorithms of axis dependence. These algorithms can be created in Virtual PLC. Calculations of the library are realized in the same cycle as the calculation of interpolator.

CNC kernel (interpolator) reads G-codes (ISO codes) and executes them in real-time. Trajectory of the movements are created in a CAM program outside the TG Motion control system. In addition, it is possible to create user applications under Linux or Windows. It would generate G-codes and feed them to the interpolator.

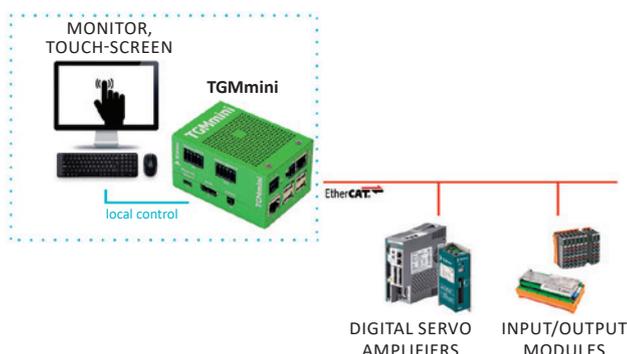


Diagnostic tools

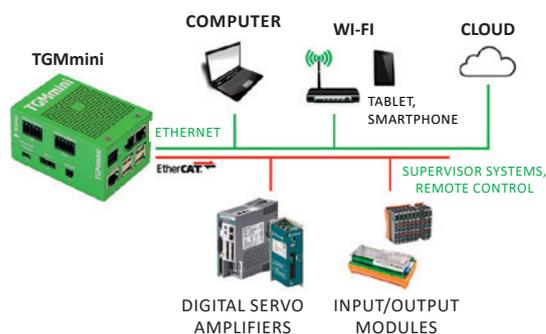
TGMmini is delivered with a range of utilities and diagnostic programs which help to implement Virtual PLC and user applications. Example applications with complete source code in C# and C++ are available, as well as C++ Virtual PLC template. With the help of network connection, all the state-of-art Windows development systems can be used together with remote control and easy data transfer between PC and TGMmini.

Application examples

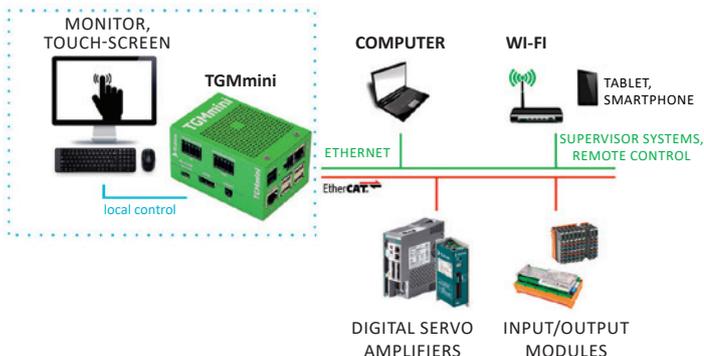
◆ Local control with display



◆ Local control with connection of remote systems



◆ Local control with display together with remote systems



Technical parameters

Parameter	
Processor	FPGA Xilinx Zynq (667 MHz)
Memory	512 MB DDR3 RAM
Storage	micro SD card, min 8 GB
Communication	2 × Fast Ethernet (100 Mb/s) 4 × USB 2.0 port 1 × CAN
Digital input/output	8 × digital inputs (24 V/5 kΩ/1 MHz) 8 × digital outputs (24 V/250 mA/100 kHz)
Supplemental output voltage	5 V DC - max 100 mA
Video	HDMI port max resolution 1280 × 1024
Real-time clock	yes, up to 1 month without power supply
Dimensions	50 × 60 × 90 mm
Power supply	24 V DC/0.3 A

Up-to-date list of supported digital servo amplifiers and I/O modules supported by TGMmini can be found at www.tgdrives.cz.

Servo motors ◆ Servo amplifiers ◆ Gear boxes ◆ Control systems

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