Modern Drive Units for Railway Vehicles

Diesel-electric locomotive
CZ LOKO, 719 series
Control system and drive control
UniControls solution

Martin Kuchař, FEI, VŠB – TU Ostrava
martin.kuchar@vsb.cz
Electronic devices in modern locomotive

- TeleRail display unit
- Keyboard
- Processing for ATO
- Vehicle Control Unit
- ATO
- CAN bus 1
- Low voltage part
- High voltage part
- Information system
- Traction Control Unit
- I/O modules
- CAN bus 2
- CAN bus 3
- CAN bus 4
- WTB train communication
- Magnets (loop indicator)
Traction Control Unit

Main Features:
- 2x DSP TMS320F240
- SRAM, FLASH and shared memories
- 4x CAN lines, RTC, thermometer
- service serial link RS232 and JTAG connector
- 10x analog inputs including hardware comparators
- 12x optical PWM outputs
- 1x input for speed sensor

Board resistance to power discharges, magnetic field, electrostatic discharges, radio interference, vibration, mechanical impact according to related standards
Software implemented in TCU

- Vector control of induction motor
- Brake chopper control
- Slip & slide control
- Protections & diagnostics functions
- CAN/CANopen communication
Block scheme of traction container
IGBT Voltage Source Inverter, Brake chopper, TCU

Traction Control Unit (TCU)

Intelligent IGBT Drivers

Optical interface

U_{DC-link}, I_{U}, I_{V}, I_{W}

Motor speed

I_{ BrakeChopper}

Temperatures of heatsink

CANopen

Vehicle Control Unit (VCU)
Traction drives implemented in locomotive 719 series

- Diesel-electric locomotive with AC/AC power transmission system
- For medium-duty track and shunting applications
- Induction motor drive – operation savings
Traction container
Modular kit system – high variability of technical implementation
Traction Control Unit
Located in the bottom of the traction container
Induction motor drive
Type tests according to related standards
Testing room ČKD in Prague
Diesel-electric locomotive 719 series

InnoTrans Berlin – the world’s largest trade fair focused on the rail transport industry
Diesel-electric locomotive 719 series
Test Centre VÚŽ Velim
Railway Research Institute
Diesel-electric locomotive 719 series
Integration of the traction container in the locomotive
Mechanical characteristics

Torque of Traction Motor for Power Levels

Torque [Nm] vs Speed of Locomotive [km/h]

- 1. level
- 2. level
- 3. level
- 4. level
- 5. level
- 6. level
- 7. level
- 8. level
Results when slip & slide protection is switched off
Slip&slide testing
Thank you for your attention

Contact
Ing. Martin Kuchař, Ph.D.
Assistant Professor
email: martin.kuchar@vsb.cz
phone: +420 597 325 834