MODULAR OBJECT COMMUNICATION DEVICES AS PART OF THE MKL OGIC-500 SOFTWARE-HARDWARE COMPLEX AND DC CURRENT MEASURING TRANSDUCERS KT

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Abstract: *The article examines the key components of the domestic software-hardware complex (SHC) for industrial automation based on the MKLogic-500 series programmable logic controller (PLC), including object communication device modules (OCD) and DC current measuring transducers KT. The architecture, technical specifications, module composition, connection elements, and the class of solvable tasks are described. Special attention is paid to galvanic isolation, redundancy, and integration with automated process control systems (APCS). The complex ensures reliable data collection, signal processing, and control of technological processes under conditions of heightened requirements for safety and fault tolerance. The proposed solutions contribute to import substitution in the energy sector, oil and gas industry, and mechanical engineering.*

Keywords: *Programmable Logic Controller, MKLogic-500, Object Connection Devices, Measuring Transducer CT, Automated Process Control System, Galvanic Isolation, Industrial Automation.*

List of Abbreviations and Designations

- PLC — Programmable Logic Controller.
- OCD — Object Connection Device.
- APCS — Automated Process Control System.
- OS — Operating System.
- SHC — Software-Hardware Complex.
- CT — CT Terminal Cable; DC Measuring Transducer CT.
- MI — Measuring Instrument.

Introduction

In the modern conditions of industrial digitalization, automated process control systems (APCS) play a key role, ensuring the collection, processing, and transmission of data in real time.

Domestic developers offer solutions such as the MKLogic-500 software-hardware complex (SHC), which combines high reliability, modularity, and compatibility with international standards (IEC 61131-3).

The central element of such systems is the object connection devices (OCD), including analog and discrete input-output modules, as well as specialized signal transducers, such as DC measuring transducers CT.

The purpose of the article is to systematize information on the composition, characteristics, and application of OCD modules in the MKLogic-500 SHC, as well as the role of CT transducers and terminal cables in providing the interface between field sensors and controllers.

The analysis is based on the manufacturer's technical documentation and allows for evaluating the advantages of domestic solutions for import substitution tasks.

Composition and Characteristics of Object Connection Device Modules

Object Connection Device (OCD) modules are the primary element of interaction between the PLC and real-world equipment: sensors, transducers, and actuators.

The MKLogic-500 series features a variety of module types, enabling flexible system configuration.

Each module includes galvanic isolation, built-in channel diagnostics, and a hot-swapping function without system shutdown. They are mounted on a DIN rail and connected to the CPU via an internal bus or RS-485. The main types of OCD modules are presented in Table 1.

Table 1. Types of OCD Modules in the MKLogic-500 Series

Name	Purpose	Number of Channels	Signal Range
MKLogic-AI8	Analog Input	8	0–10 V, 4–20 mA
MKLogic-AO4	Analog Output	4	0–10 V, 4–20 mA
MKLogic-DI16	Discrete Input	16	24 V DC (logic 0/1)
MKLogic-DO8	Discrete Output	8	Up to 220 V AC/DC
MKLogic-RTD8	Resistance Thermometer Input	8	Pt100/500/1000
MKLogic-TC8	Thermocouple Input	8	Types K, J, S, T

Measuring transducers CT are integrated as peripheral OCD modules. They are designed for the linear conversion of DC current strength to voltage, providing galvanic isolation and accuracy of ±0.1%. The transducer is housed in an insulating enclosure with precision resistors (shunts), without active components, which eliminates the need for external power supply for the device itself (power is required only for the sensors). Modifications: 8- or 16-channel versions, with options for isolation ("I") and redundancy ("R"). Inter-verification interval: 5 years.

CT terminal cables are multi-conductor assemblies with D1/P1 connectors (on the PLC side) and D2/D3 or W1 connectors (on the sensor side). Single- and double-line variants for redundancy are available. Insulation: non-flammable, low-smoke material for fire safety. The characteristics of the CT transducer are provided in Table 2 (based on documentation).

Table 2. Characteristics of the DC Measuring Transducer CT

Parameter	Value
Input Current Range	4–20 mA
Output Voltage	0–5 V (proportional to current)
Error	±0.1 %
Number of Channels	8 or 16
Galvanic Isolation	Per-channel (optional)
Power Supply	From sensor (passive mode)
Enclosure	DIN rail, IP20

(The continuation of the table in the original documentation includes additional parameters, such as operating temperature -40...+70°C and vibration resistance.)

Central Components and Connection Elements

The Central Processor Module CPU-500 is the core of the MKLogic-500 software-hardware complex (SHC). Its characteristics:

- Processor: ARM Cortex-A7/A53.
- RAM: 512–1024 MB.
- ROM: up to 8 GB eMMC.
- Interfaces: Ethernet 10/100 Mbps, RS-485 (×2), USB Host, CAN.
- Protocols: Modbus RTU/TCP, SNMP, OPC UA.
- Channels: up to 4096 discrete, 1024 analog.
- Cycle Time: 1–5 ms.

Configuration is performed in the MKLogic IDE environment. Connection of OCD and CT modules is achieved through detachable terminal blocks: the D1 connector on the CT cable is inserted into the socket of the PLC's analog module, while on the object side, it connects via XS3/XS4 to the sensors. In redundant systems, two connectors are used for the primary and backup paths.

This architecture ensures modularity, interchangeability, and ease of maintenance, minimizing downtime in automated process control systems (APCS).

Conclusion

The MKLogic-500 SHC with OCD modules and CT transducers is a reliable domestic solution for APCS, combining modularity, accuracy, and fault tolerance. Galvanic isolation, hot swapping, and unified interfaces minimize risks and simplify operation. Further development may include protocol expansion (e.g., Profinet) and AI algorithms for predictive diagnostics. The application of such complexes contributes to technological sovereignty in key industries.

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