



TECHNICAL REQUIREMENTS

AUTOMATION AND INSTRUMENTATION

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CONTROL AND AUXILIARY ROOMS

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1. SCOPE

This Specification covers requirements for equipment in the Auxiliary Rooms in the Control Room for the instrument cabinets.

2. REFERENCES

The latest editions of the following publications are to be used with this Specification as applicable:

LT Techninis Reglamentas	<i>Elektromagnetinio suderinamumo techninis reglamentas Nr IV-1328</i>
LST EN 60079	<i>Electrical apparatus for explosive gas atmospheres. Elektriniai aparatai, naudojami potencialiai sprogiose atmosferose</i>
Directive 2004/108/EEC	<i>Electromagnetic compatibility (EMC)</i>
IEC 60364	<i>Electrical Installations in Buildings</i>
LST EN 60529	<i>Degrees of protection provided by enclosures (IP code) (IEC 60529)</i>
LST EN 61000-4-2	<i>Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2)</i>
LST EN 61000-4-3	<i>Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3)</i>
OL-TR-GR-000	<i>General Requirements</i>
OL-TR-IR-000	<i>Automation and Instrumentation. General</i>

3. TERMS AND DEFINITIONS

For terms and definitions see:

OL-TR-IR-000	<i>Automation and Instrumentation. General</i>
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4. CONTROL ROOM

- 4.1 The operator stations of the DCS system are located in the process control room, as well as secondary systems, such as gas warning panel, emergency shutdown panel, telecommunications equipment and others.
- 4.2 The operator stations equipped with monitors are in the central location in the process control room.
- 4.3 The process control room shall to be air-conditioned. Capacity of the air-conditioning system shall be matched to the amount of heat released by the control equipment.

4.4 The separate air conditioning systems for control room and auxiliary boxes should be foreseen.

4.5 Air conditioning system in instrument control room should be designed in such a way that the operators can set the condition of this system.

5. ENGINEERING AND CONFIGURATION ROOM

The engineering and configuration room is located within the process control room. It is furnished and equipped as the computer station.

6. CONTROL CABINET AUXILIARY ROOM (TECHNICAL ROOM)

Instrumentation cabinets and other equipment such as electric power cabinets, intermediate relay cabinets, are installed in the control cabinet auxiliary room. The technical room shall be air-conditioned to assure the proper working environment for installed instrumentation equipment.

7. CONTROL AND AUXILIARY ROOM INSTALLATION REQUIREMENTS

7.1 Connections between the cabinet auxiliary technical room and the field-installed equipment shall be made with multi-core cables terminated in the junction boxes located in the field.

7.2 Instrumentation cables within the process plants shall be in the cable trays on the pipe racks. The cables will be terminated to the terminal strips in the relevant marshalling cabinets / panels in the cabinet auxiliary technical room.

7.3 The operator consoles, part of DCS system, with relevant display screens, keyboards, printers etc. will be installed in the control room (Operator Room).

7.4 PC's must be installed in special minimal IP55 enclosures with smooth operating temperature regulation/control. These enclosures must be accessible from front and rear door.

7.5 The series of cabinets installed in the auxiliary rooms (cabinet rooms) will consist of the following:

7.5.1 Marshalling cabinets.

7.5.2 DCS cabinets.

7.5.3 Programmable Logic Controller Cabinets – PLC / ESD.

7.5.4 Instrument electrical power supply distribution control cabinets.

7.5.5 Auxiliary cabinets.

7.6 Cabinets installed in the auxiliary rooms (cabinet rooms) shall include holders where the design documentation can be stored.

7.7 The interconnections between the various cabinets/consoles located in control or auxiliary room shall be made by means of multi-cables laid under false floor. All multi-cable entries to the control room shall be sealed to prevent water, moisture and combustible gases from entering the rooms. All instrument equipment, operator

consoles, cabinets etc., located in the control and auxiliary room shall be connected to the grounding system.

7.8 The grounding system consists of two independent separated sub-systems:

7.8.1 Protection Earthling System (PES)

All metal instrumentation cabinet enclosures, cable trays, etc. are connected to this system. Cable armor can be grounded in control room or in technical room or on the field using junction boxes.

7.8.2 Functional Earthling System (FES)

All the electric / electronic ZERO VOLT reference signals, intrinsically safety barriers and shield of cables will be connected to this system.

8. MAJOR INSTRUMENTATION EQUIPMENT IN CONTROL AND TECHNICAL ROOMS

8.1 General Requirements

8.1.1 The concept for control room instrumentation shall be based on the following:

- a) DCS system for control, adjustment and data archiving purposes;
- b) Programmable Logic Controllers (PLCs) for ESD and interlocks;
- c) Dedicated PLC controllers supplied within the packages;
- d) Fire monitoring system;
- e) Combustible and toxic gas monitoring system;
- f) Anti-surge system;
- g) Machine Monitoring System;
- h) Industrial TV monitoring system;
- i) Assets Management System.

8.1.2 The following cabinets will be used for connection of the above-mentioned systems:

- a) Marshalling cabinets;
- b) Marshalling cabinets for electrical discipline;
- c) Power distribution cabinets;
- d) Relay cabinets between instrumentation and electrical disciplines;
- e) Marshalling cabinets for computer discipline.

8.2 Auxiliary Rooms (Cabinet Rooms) Layout and Wiring Requirements

8.2.1 All outdoor installations shall be provided with a rain and sun shield. The shelter shall be provided with appropriate lighting and convenience receptacles using a general-purpose power source.

- a) PLC systems installed outdoors shall preferably be in unclassified areas. A shelter protecting a paved, elevated area around outdoor PLC panels shall be provided to allow commissioning and maintenance during worst-case weather conditions.
- b) PLC systems shall not be installed in Zone 0 or Zone 1 areas.
- c) PLC systems shall not be installed in Zone 2 areas unless all components are certified for use in a Zone 2 area and prior project approval has been granted. Designs using purging or pressurization of enclosures to meet area classification requirements requires OL approval.

8.2.2 The power supplies should be located in an I/O rack at the top of the cabinet to provide adequate ventilation for heat dissipation.

- 8.2.3** Each PLC cabinet should have an internal power disconnect switch to allow for easy electrical isolation and reset of the CPU module. This switch may not be required if the CPU or the power supply module has an integrally mounted power disconnect switch.
- 8.2.4** The PLC cabinet shall be provided with at least one internal power receptacle to power a portable CPU programming unit. A second power receptacle may be installed to allow for additional test equipment (e.g., oscilloscope, millimeter) if required by OL. These receptacles shall not be connected to the instrument power supply system or be fed from inverter-supplied circuits, unless approved by OL.
- 8.2.5** Internal cabinet layout and wiring shall be in accordance requirements by OL. Particular attention should be given to signal segregation and a color-coding identification system for voltage levels present inside the cabinet.
- 8.2.6** Field wiring powered by external sources, which are brought into a PLC cabinet, shall be clearly marked at their termination point inside the cabinet to indicate the applicable voltage levels.
- 8.2.7** PLC Vendor requirements for segregation and spacing of PLC equipment within cabinets shall be strictly followed.
- 8.2.8** Inputs and/or outputs for independent equipment items (pumps, compressors, etc.) should utilize separate modules where practical to minimize the impact of a single module failure.
- 8.2.9** Module placement in I/O racks shall be done in a logical manner. Spare (empty) slots should be distributed throughout the I/O rack to provide space for future additions with an emphasis on the type most likely to be added. If a remote I/O network is a future possibility, a spare slot should be left next to the CPU for a remote base interface module, if required.
- 8.2.10** PLC system I/O racks and terminal blocks (set of individual terminals) shall be logically located and laid out in a manner that will provide easy access to all terminals and clear viewing of all status indicators. All calibration and testing terminals should be located between 0.3 m and 1.8 m above the floor.
- 8.2.11** Terminal blocks should be segregated by signal type to allow quick identification and prevent noise interference. Circuit supply terminal blocks shall be individually fused.
- 8.2.12** Location of terminal blocks shall provide suitable separation of discrete and analog circuit wiring to prevent noise interference.
- 8.2.13** Sufficient terminal blocks shall be provided for at least 20 percent spare capacity at the time of installation, where percent spare is defined with respect to utilized capacity.

8.3 Interface Relay Cabinets Requirements

- 8.3.1** The Interface Relay Cabinet for sending the signals from instrument to electric disciplines and back shall meet the following requirements:
- a) A freestanding cabinet with one single front and rear doors. Hinges on the left side. The doors equipped with the handle with lock and 2 keys. The cabinet shall have removable transportation lugs on the top. Cable entry from the underside. Cables shall be attached by means of "U" holders.
 - b) Electrical accessories consistent with requirements of CENELEC-IEC.
 - c) The intermediate relays from DCS/PLC systems shall have the coil energized with 24V DC. The dry contacts of the relays shall be used in electrical discipline. The

relays shall be resistant on electromagnetic interference and equipped with LED lamp for status information.

- d) The intermediate relays fed by electrical discipline shall have the coil energized with 230V AC or 110V DC. The dry contacts of the relays shall be used in instrumentation discipline. The relays shall be resistant on electromagnetic interference.
- e) Intermediate outlet relays, connected to outlets of power supply blocks (sources) and controllers (PLV), shall have integrated diodes for self-induced voltage damping.
- f) The signals inside the cabinet shall be distributed into groups depending on the voltage – 24V DC, 110V DC, 230V DC. The separate terminal strips shall be provided for each voltage group.
- g) The system of uninterrupted power supply is not the subject of this elaboration.
- h) Dry relay signals or signals in the form MODBUS-RTU serial communication about improper operation of each UPS will be connected to DCS.

8.4 Environmental Requirements

8.4.1 A DCS, PLC and related system enclosure's internal environment shall meet the required operating specifications for all PLC equipment housed in the enclosure. Potential exposure to heat, dust, humidity, vibration and corrosive gasses shall be evaluated and properly addressed in the package design, based on local conditions. The operating temperature range of the electronics shall not be exceeded. Low noise fans/blowers, air-conditioners, or solid-state coolers/heaters should be used, if necessary. If some form of cooling/heating device is used, the device shall be rated for the electrical area classification. Loss of a cooling/heating device required to maintain the operating temperature range of the electronics shall be alarmed. OL will specify the need for redundant cooling/heating devices.

8.4.2 The DCS, PLC and related system shall be designed to operate in the following conditions where these assets are located:

- a) Temperature: upper and lower limits 18°C to 27°C;
- b) Temperature: control point tolerance $\pm 2^\circ\text{C}$;
- c) Temperature: max. rate of change $\pm 5^\circ\text{C}/\text{Hour}$;
- d) Humidity limits (% relative humidity) ± 45 to 55;
- e) Humidity: control point tolerance (% relative humidity) ± 5 .

8.4.3 Temperature sensors have to be installed in DCS/PLC/Network/Server or computer`s cabinets. The analog signal of temperature has to be connected to DCS / PLC. This measurement has to be included to archive.

9. PHYSICAL SECURITY REQUIREMENTS FOR ACS PREMISES AND CABLE TRAYS

9.1 General Provisions

9.1.1 The purpose of the Public Company ORLEN Lietuva Physical Security Requirements for ACS Premises and Cable Routes (hereinafter the Requirements) is to lay down the technical and organizational requirements for the installation and maintenance as well as physical security of cable trays and premises that contain automated control systems (hereinafter ACS).

9.1.2 The Requirements aim to ensure continuous ACS operation, adequate operating conditions for the ACS hardware equipment and physical security of the ACS.

Employees are allowed to stay in the ACS premises during maintenance and repair of the hardware equipment only. It is prohibited to set up permanent workplaces in the ACS premises.

9.2 General Requirements

9.2.1 The ACS premises must conform to safe atmosphere requirements (classification) in terms of explosion hazards.

The hostility of the atmosphere to electronic devices shall be less than Class G1 (i.e. corrosion caused by sulfur compounds) as stipulated in ISA S71.04 (Environmental Conditions for Process Measurement and Control Systems).

The maximum amount of heat energy generated by the equipment located inside the premises shall be less than the cooling capacity of the heating, ventilation and air conditioning (hereinafter HVAC) system.

9.3 Construction Part

9.3.1 The entrance door must be made of steel, have thermal insulation and be fire resistant with a fireproofing time span of at least 30 minutes (EI-30). It must be HORMAN or similar. The door shall be designed to open outward and have self-shutting lock with the possibility to open the door from the inside without a key, using an anti-panic handle. The tightness of the door must be of IP54 class.

9.3.2 The recommended height of the premise must be 3.0 meters from the raised access floor to the ceiling.

9.3.3 The premise must have prefabricated anti-slip, non-conductive flooring installed at a height of about 0.6m above the pavement level. The flooring must be designed for a minimum load of 500kg/m² and correspond to fire-hazard class REI 60.

9.3.4 Equipment racks must be placed on metal stands designed for a minimum load of 500 kg/m².

9.3.5 The external zinc-coated straight staircase in front of the entrance door shall be designed for a 250kg/m² load.

9.3.6 Other requirements:

- a) ROXTEC or similar seals shall be used for the inlets of cables coming from the outside (explosive atmosphere);
- b) There must be grounding main (4 x 20mm steel strip) installed along the entire perimeter of the premise at a height of 20-40cm above the floor level;
- c) The premise shall be free of oil product or water/steam piping and/or radiators;
- d) Primer/sealer shall be applied to concrete bottom of cable tunnels to reduce dusting.

9.3.7 All potential sources of fluid leaks should be removed from the adjacent premises and the area above the ACS premises.

9.4 Heating, Ventilation and Air-Conditioning

9.4.1 HVAC system must be designed and installed following the *Technical Regulation on Construction STR 2.09.02:1998 Heating, Ventilation and Air Conditioning*.

9.4.2 The premise must be equipped with an HVAC system to maintain air temperature at a constant level and create environment that is suitable for the ACS equipment. The

system must have two conditioners with 50/50% redundancy (functioning). The outdoor part of the system must conform to the requirements of explosive zone, if any.

- 9.4.3** Ventilation must rely on heat recovery and maintain the excess air pressure at the level of 44Pa (minimum level – 10Pa). The recommended air exchange rate for the premises is 0.5-0.8 times/hour. Air shall be supplied to the premises from intrinsically safe areas.
- 9.4.4** The premise shall be equipped with an air filtration system for the removal of dust and mechanical particles as well as for chlorine and sulphur compounds, if required.
- 9.4.5** If there is a possibility of occurrence of explosive gases at the place of air supply, the air ducts must be fitted with redundant gas sensors so that the air supply can be cut off in case of their activation.
- 9.4.6** The exhaust air outlet shall be at least 12 m away from the fresh air inlet pipe.
- 9.4.7** Ventilation openings must be protected so that no animals, insects and rain water get inside the premises, i.e. a roofing and mesh should be installed.
- 9.4.8** Air supply ducts of the ventilation system must go through the entire room to ensure uniform air distribution.
- 9.4.9** There should be technical means for condensate removal from the air ducts as well as means that would prevent the condensate from getting onto/into the ACS racks and/or cable tunnels.
- 9.4.10** Electric heaters or oil-filled radiators (with overheat protection) can be used to heat the premises.
- 9.4.11** The HVAC system must ensure the following temperature:
a) In winter, the indoor temperature must be +15°C – +20°C when the outdoor temperature is -36°C;
b) In summer, the indoor temperature must be +18°C – +25°C when the outdoor temperature is +33°C.
- 9.4.12** Information about the condition of HVAC equipment and HVAC malfunctions/failures must be transmitted to ACS (DCS or PLC).

9.5 Lighting and Power Supply

- 9.5.1** The ACS premises must be equipped with a light system (230V AC) that would ensure the light intensity of 500lx in accordance with the *Lithuanian Hygiene Norm HN 98:2000 Natural and Artificial Lighting of Workplaces. Limit Values of Light Intensity and General Measuring Requirements*.
- 9.5.2** Luminescent illuminators with electronic switches shall be used for the lighting of the premises. Ingress protection degree shall not be less than IP44. Circuit-breakers must be installed at both doors inside the building. Evacuation lights and the battery shall be installed above both doors.
- 9.5.3** The premises must be equipped with work and emergency lighting that rely on different power supply sources. Emergency lights shall be appropriately marked.
- 9.5.4** There must be 16A single phase sockets mounted on different walls of the premise as well as one 32A, 400V three phase socket. The sockets must have IP44 ingress protection.

- 9.5.5** Single phase sockets must be SCHUKO. Three phase socket must be CEE 3p+N+PE, 6 h (as per standard EN 60309).
- 9.5.6** There must be 2 separate main grounding conductors in the premise - one for general use, the other - for the grounding of digital equipment. The grounding main for digital equipment shall be protected against direct contact with metal structures and connected to the grounding system somewhere outside the building.
- 9.5.7** Separate cable trays are required for electrical cables, i.e. other than those used for cables that are not intended for power supply. Separate non-perforated metal trays must be used for redundant cable lines.
- 9.5.8** ACS systems shall have power supplies fed from UPS sources. Critical ACS systems shall be fed from two UPS sources.
- 9.6 Safety and Alarm Systems**
- 9.6.1** The premises must be equipped with detectors cable of identifying:
- a) HVAC failures. Alarm should be routed to a respective ACS system;
 - b) Fire or smoke in any part of the premise. Alarm must be routed to a respective ACS and Mažeikiai Fire and Rescue Board for Protection of Facilities;
 - c) Smoke inside ACS racks. For that purpose, aspirating smoke detectors shall be installed in each rack or for a row of racks. Alarm should be routed to a respective ACS system and the Fire and Rescue Board.
- 9.6.2** The premise shall be equipped with an electronic access control system.
- 9.6.3** Surveillance cameras shall be installed in the premise.
- 9.7 Other Requirements**
- 9.7.1** The ACS premises must always be locked. The premises can be accessed by authorized employees only.
- 9.7.2** The premises, including cable tunnels and routes under the floor, must be maintained in a neat and orderly condition. They should be free of any irrelevant items, fluids, equipment etc. Once in a year, it is required to perform dry cleanup of the premises, using vacuum cleaners and under the supervision of person responsible for operation of the ACS system. Dust must be removed from the inside of equipment and all the surfaces.
- 9.7.3** The raised access floor must be covered over the entire area of the premise. It allowed to uncover them only when carrying out maintenance works.
- 9.7.4** At least two portable carbon dioxide fire extinguishers (not less than 5 kg) shall be stored in a highly visible, easily accessible place on the opposite sides of the premise. Fire extinguishers must be mounted at a height of not more than 1.5 meters from the floor surface to the bottom of the extinguisher and open door shall not obstruct access to the extinguisher.
- 9.7.5** All ACS racks shall be locked, using specials keys. The keys shall be kept safe by authorized persons. It is allowed to keep the rack door open in critical cases, i.e. when more intensive cooling of equipment inside the rack is required.

- 9.7.6** Pursuant to the *Information Security Policy of Public Company ORLEN Lietuva*, premises containing equipment that control the most important process operations of the Company are assigned to facilities subject to a high level of physical security. These Requirements apply to such facilities.
- 9.7.7** Premises that contain ACS equipment shall be equal to Control Rooms as it is set out in the *Rules for Key Management and Locking of Premises and Controlled Territories of Public Company ORLEN Lietuva*.
- 9.7.8** Cables outside the AVC premise must be installed at a safe height in order to prevent any physical damage (the recommended height is not less than 4m from the surface of the ground); there must be no free/easy access to the cables. Trays used for power supply cables shall be separated from trays intended for instrumentation, alarm and control cables. Cable trays and support structures shall not be damaged by pit corrosion. Hot-dipped galvanized cable trays and ladders shall be used for the new facilities.