Contents

1 Subject of specification 3
2 Scope of validity 3
2.1 Deviations 3
3 Hierarchy of documents 3
4 Definitions and designations 3
5 Description 4
5.1 General characteristics of DCS system and PLC controller 4
5.2 Software characteristics 5
5.3 Hardware requirements for I/O modules 6
5.4 DCS and PLC system diagnostic 7
5.5 Requirements regarding performance (capacity) – time performance 8
5.6 Requirements regarding communication of DCS/PLC system 8
5.7 Redundancy 9
5.8 MOS switches 9
5.9 POS switches 10
5.10 Crossing of I/O signals 10
5.11 General requirements for cabinets 11
5.11.1 Mechanical requirements for cabinets 11
5.11.2 Requirements regarding equipment and internal arrangement of cabinet 11
5.11.3 Marking and identification of cabinets 13
5.11.4 Electrical supply 13
5.12 Degree of utilization, free (redundant) resources 13
5.13 Spare parts and wear materials 14
5.14 Training 14

This document is the property of LOTOS Group SA.. Coping and giving it to other are forbidden without express written authority by LOTOS Group SA

5.15 Final acceptance tests of the system (FAT) 14
5.16 Documentation 14
6 Relevant documents 14
7 Standards and Regulations 14
7.1 Directives of European Union 14
7.2 Polish Standards - PN 15
8 Attachments 15
9 Record of changes 16

1 Subject of specification

This specification used in conjunction with other technical specifications of LOTOS Group S.A., establishes minimal requirements regarding design and execution of control systems on bases of Distributed Control System (DCS) and/or Programmable Logic Controllers (PLC).

2 Scope of validity

This specification shall be used when preparing both quotations and Purchase Orders concerning planned LOTOS Group S.A. new investments and modernizations. It shall also be a base for preparation of other detailed specifications and quotations relevant for package units or other equipment deliveries.

2.1 Deviations

Any deviation from this specification and the relevant specifications, standards and related documents including proposals, which the bidder claims to be economically and / or technically superior solutions, must be submitted in writing for review and approval by Grupa LOTOS SA. Non-approved exceptions are not acceptable by Grupa Lotos S.A.

The supplier must report in writing any ambiguity in this or any other specifications of Grupa LOTOS SA or non-compliance with the referred documents / standards and obtain a written explanation from Grupa Lotos SA.

3 Hierarchy of documents

In case of conflicts existing between this specification and other documents, the following order of precedence shall govern:

- The current Polish legislation
- Terms of purchase order / contract and other requirements agreed in writing GLSA
- Data Sheets approved by GLSA
- This specification
- Other Specifications
- Drawings and other documents
- Standards

4 Definitions and designations

GLSA- LOTOS Group S.A.

AC - Alternate current

CR - Operators' room / central control room

DC - Direct current

DCS - Distributed Control System

ER - Engineering stations' room

ES - Engineering station (located in TIR)

ESD - Emergency Shutdown System

FTA - Field Terminal Assembly

GPS - Global Positioning System

I/O - Input/Output

MCC - Switchgear

OS - Operator's station (located in CR)

PLC - Programmable Logic Controller

TIR - Technical Instrumentation Room (for location of system cabinets)

UPS - Uninterruptible Power Supply system

5 Description

This specification describes the most important requirements imposed on DCS control system as well as PLC controllers. This relates to devices, which are installed in DCS and PLC cabinets located in technical instrumentation room (TIR). The specification covers requirements for accessory materials and cabinets as well.

The subject matters regard both: hardware, software and functional requirements.

5.1 General characteristics of DCS system and PLC controller

Distributed control system (DCS) is dedicated for control and monitoring of separated plant or group of plants connected with process engineering train. The DCS is highly integrated system within hardware and software area, and flexible in implementation of set functions for plant control.

PLC programmable logic controller is used for control and monitoring of separated process units of a plant, or for single complex machine (compressor, steam turbine, etc.). The other application of PLC controllers is realisation of ESD and BMS systems, or system of interlocks for machinery – these subjects is covered by separate specification GLSA 3650.

The DCS system and PLC controllers shall accomplish the following functions:

- acquisition and processing of I/O signals
- equipment controlling, including shutdown interlocks of low importance level in relation to safety
- sequential control
- automatic PID control
- communication with operator stations, engineering station, process data servers for process control realized by operator, process visualisation, as well as introducing changes in software and diagnostic of control system
- communication with external devices equipped with serial interfaces (PLC programmable controllers, industrial computers, field equipment – e.g. multiplexers), in order to exchange control signals, monitoring of diagnostic signals of the equipment, as well as visualisation of process parameters on operator stations
- and shall be characterised with the following, basic features:
- uninterruptible operation
- safety of data connected with high comfort of operating staff
- possibility of easy and prompt repair; the repair shall proceed on DCS and PLC controllers installation site

- possibility for uninterruptible – from the plant point of view – introduction of changes, hardware extension, as well as software update by GL in course of production, also after expiration of guarantee period

Delivery of analogue and digital signals from field to a controller can be, depending on the plant topology, accomplished in the following configuration:

- centralized, where all system cabinets are located in TIR, and connection to field instruments is accomplished by means of multicore cables
- distributed, where use of field outposted cabinets with I/O modules (e.g. multiplexers or an interface with electrical signals in MMC) is allowed, and connection to them is accomplished by means of transmission cables
- mixed – centralized for part of the signals, and distributed for the others.

DCS and PLC controllers' system supplier, as well as its hardware and software configuration must be agreed and approved by GLSA.

5.2 Software characteristics

Software applications implemented in DCS system and PLC controllers, and relating to control functions, shall always operate without need for access to operator stations (servers) and communication links. They shall be accomplished with use of the latest revisions of utility software. Access to applications shall be protected against unauthorized access by adequate protection mechanisms, such as hardware switch or password. Process control applications, such as drive control, sequential control and automatic control systems, as opposed to optimisation algorithms, shall be implemented in the controller (and never within OS, ES, servers or other computers). Solutions of „soft PLC" type (PC emulation of controller) are impermissible.

System supplier is obliged to deliver controllers with uploaded, ready to run software application as well as to handover to GLSA source codes on movable carrier, such as CD-ROM. RAM memory in CPU module shall be protected against data loss with back-up battery in case of power supply failure.

Access to modify software application shall be granted to GLSA without invalidation of guarantee. Actions, which would cause invalidation of guarantee, shall be specified in details during contract preparation phase, but minimised also.

Utility software used for creation of applications shall have the following features:

- creation, modification and copying of application (or their parts) as well as lists of variables, and creation of own function and control blocks
- free programming of logic, logical sequences and automatic regulation systems, with use of the following functional blocks:
  - logical Boolean functions (NAND, OR, XOR, NOT)
  - time functions (timers, counters, delays)
  - mathematical functions (multiplication, dividing, root, addition, subtraction, etc.)
  - standard computational functions (e.g. compensation functions for various media flow in dependence on various parameters)
  - functions comparing signals (greater, less, equal, etc.)
  - diagnostic functions (control of measuring channels – line break, short-circuit, range exceeding)

- analogue functions (signal level limiting functions, PID controller, proportional controller, multi-channel controller – „split range", ramp, Min/Max selector, lead/lag, multiplexer)
- alarm functions (SOE / SER – sequence of events recording)

- transition between various modes of operation (Manual, Automatic, Cascade) shall be programmed in a way precluding abrupt increase of process parameters (bumpless)
- programming language conforming to PN-EN 61131-3, with allowable representations:
  - FBD - functional block diagrams
  - LAD - ladder diagram
  - SFC – sequential function chart
- easy possibility for configuration of communication interfaces to other systems
- possibility for on-line program modification
- possibility for I/O signal forcing for service purposes
- off-line simulation of created applications without need for equipment connecting
- manipulation on variable names, and not on memory cells
- dynamical allocation of controllers memory, if enabled by system
- inclusion of selfdocumenting function is recommended

For system unification purposes, hypothetical logical diagrams of analogue input handling, usage of MOS switch, shutdown interlock and first out logic, are presented in Attachments No 1 ÷ 5.

5.3 Hardware requirements for I/O modules

Controllers of DCS and PLC system shall be installed in system cabinet according to requirements specified in p. 4.11.

All system and I/O modules shall:

- be of the same type within the same function or I/O characteristic
- be installed in system racks of the same type
- include all I/O signals according to specified list of signals
- take into account requirements regarding redundancy
- be of non-intrinsic safe design.

State of binary signals, as well as failure of I/O module shall be signalled with LED type diodes on front panel of a module.

I/O measuring signals on modules shall be grouped according to the following criteria:

- the same function (safety, control device, regulation system)
- the same plant number
- the same level of supply (preferred supply for all I/O signals shall be 24 V DC voltage)

Processing accuracy of analogue I/O modules (A/D and D/A converters) ≤0,1%.

If I/O signals are used in voting (e.g. of 1oo2 / 2oo2 / 2oo3 type), or for controlling of devices constituting direct reserve of one for another, then they shall be allocated to different modules.

In case of PLC controller and small number of I/O, it is allowed to implement crossing in PLC system cabinet.

Connection of the following signal types is allowed:

Signal type	Input:	Output:
Analogue	- 4-20 mA - frequency - Pt100, TC (thermocouple)	- 4-20 mA
Binary	- NAMUR - Potential-free contact	- 24 VDC

Caution: Application of modules with mixed types of I/O signals is allowed only for small systems, such as: compact controllers, specialised controllers.

Profibus and FF (Fieldbus Foundation) are not accepted.

For field inputs, type of those inputs shall also be specified: active, passive, two-wire, three-wire – condition by field equipment applied, as well as with, or without insulation between channels. Insulation between channels on I/O modules is required, when galvanic isolation in crossing cabinets for specific signals does not exist.

Replacement of damaged modules shall be possible when live, without need for any counductors disconnection.

If measuring instrument (including intrinsic safe separators) enables control features, then for all I/O signals diagnostic signal of measuring channel shall be specified (line break, short-circuit, exceeding of measuring range). Diagnostic signals shall be transmitted to operator stations of DCS system through serial link, for purposes of indication on process visualisation screens or dedicated diagnostic screens.

5.4 DCS and PLC system diagnostic

All signals connected with DCS and PLC system diagnostic, such as:

- module removal (CPU, communication module, I/O)
- module failure (CPU, communication module, I/O)
- channel failure on I/O module
- I/O signal value out of range
- communication errors
- operation without redundancy (CPU, I/O, communication)
- supply failure (system, field)
- failure of system cabinets' ventilation system
- low voltage level of RAM back-up batteries in CPU

shall, if controller applied enables it, be sent to operator stations of DCS system through serial link, for purposes of indicating them on dedicated diagnostic screens.

5.5 Requirements regarding performance (capacity) – time performance

Scanning period of program loops (calling of program blocks) for specified types of measuring points, shall fulfil requirements presented in below given table:

Loop type	Measuring point type	Scanning period for analogue signal	Scanning period for binary signal
PID Control	Flow	250 ms	-
	Level	500 ms	-
	Pressure	250 ms	-
	Temperature	1 s	-
	Others	500 ms	-
Indication / Status	Flow	500 ms	1 s
	Level	500 ms	1 s
	Pressure	500 ms	1 s
	Temperature	1 s	1 s
	Others	500 ms	1 s
Interlock / Alarm	All	100 ms	100 ms
Non-critical alarm	All	1 s	1 s

Other time parameters:

- Sending of alarm/event signal (from I/O module to operator station): 2 sec max
- Sending of command from operator station to I/O or communication module: 1 sec max
- Refreshing of signals on screen of operator station (from I/O or communication module): 4 sec max
- Scanning of communication interface: 4 sec max

5.6 Requirements regarding communication of DCS/PLC system

DCS/PLC communication system shall provide quick data exchange between:

- I/O devices
- Main controllers (CPU units)
- Operator stations
- System servers, constituting database for operator stations
- Complex calculating modules
- Other internal devices of the system
- External devices, such as PLC controllers, computers

The system of PLC controller must be provided with communication port for communication with DCS through RS-232/422/485, or optional Ethernet interface. Communication link shall operate with, Modbus (preferably) or TCP/IP as an option. Close cooperation of PLC system supplier with DCS supplier is required, for proper determination of these communication requirements in scope of transmission parameters and format of transmitted data (refer also to specification GLSA 3710).

Supplier of the system shall submit complete list of I/O signals transmitted by serial link to DCS, taking into account at least the following data:

- number of measuring point (tag number)
- description of measuring point (service)
- data type: analogue/binary
- range and unit of value (in case of „raw" data sending, also range expressed in engineering units, to which specific variable shall be scaled in DCS)
- value of active binary signal 0/1
- communication address (register number, transmission function code)

Internal clock of PLC system shall be synchronized with DCS system clock. The supplier shall specify method of this synchronization implementation (list of data registers, transmission function code). Central synchronization of time shall be implemented on GPS base.

Switching on signals between DCS/PLC and PLC shall be accomplished by means of relay (hardwired); they shall be voted if highly important.

5.7 Redundancy

In general, the controllers used in DCS/PLC system shall be of „fault tolerant" type. This means, that hardware architecture of the system shall be resistant to occurrence of single error on level of applied electronic modules and communication links.

Redundancy in DCS/PLC system shall be implemented on level of:

- supply – as in p. 5.11.4
- CPU central unit – 2 controller modules, mutually controlling each other and reacting to discrepancy in control algorithms execution
- internal communication bus between CPU units and I/O modules
- external communication link with PLC controllers, executing ESD, BMS or Machinery Monitoring System functions
- I/O modules in case of important control signals or regulation circuits
- **optional** – external communication link with PLC controllers, in case when essential control shall be executed in the PLC, which source are operator commands ordered from operator stations' level (e.g. individual control of single equipment or automatic regulation systems)
- **optional** – field sensors (fully doubled measuring channels) for critical process parameters

5.8 MOS switches

The switches overriding signals, which perform interlocking functions in PLC systems (MOS – Maintenance Override Switch).

- the switches shall be programmed in DCS system
- they shall be configured for signals' servicing purposes
- function of MOS switch activation is accessible for authorized personnel only
- status of individual MOS switches shall be transmitted to PLC systems by means of serial link
- for specific plant, process unit or machine, a single, separate hardware switch application is foreseen (MASTER MOS – hardware switch with key), which shall enable selection of MOS switch in DCS when set in „PERMIT" position

- MASTER MOS switch shall be installed on door of system cabinet or crossing cabinet of PLC system
- MOS switch does not lock alarm function for specific signal
- MOS switches shall not be used during start-up sequences.

5.9 POS switches

For start-up sequences, which require overriding of interlock signals determined by process engineering, software switches of POS type (Process Override Switch) shall be defined in DCS system. Those switches shall be automatically deleted on adequate stages of the sequence.

Structure of PLC system logical diagrams shall be clear and shall include, in the following order:

- processing of input signals, with consideration given to MOS and POS overriding switches
- interlocks with signalling of readiness for deletion
- start-up sequences
- actuation of outputs for equipment (valves, motors, etc.)
- additional services (for interlock functions – first out logic, detection of incompatibility of device condition to command given, etc.)

5.10 Crossing of I/O signals

Feeding of analogue and binary signals from field to I/O modules shall be implemented in separated crossing cabinets of DCS, PLC systems. The cabinets serve for matching of cabling between arrangement of connections in field junction boxes and specific allocation of I/O modules in DCS, PLC cabinets, installed in TIR. Such matching shall be considered for the following criteria:

- addressing – assigning of specific measurement to specific channel on I/O modules is accomplished by connecting these signals between crossing strips and I/O termination modules (called also as FTA – Field Terminal Assemblies), according to allocation of signals. Connection of signals from crossing cabinets to I/O modules by means of system cabling is required.
- matching of signals – matching of various signals to standard ones proceeds in crossing cabinet, on devices installed in here (e.g. converter of frequency signal, amplifier, relay, others)
- separation – this applies also to EExi signals, for which EExi separators with galvanic isolation shall be installed in crossing cabinets – therefore all connections „downstream" the crossing cabinet shall be non-intrinsically safe (ordinary ones)
- protections – by means of overcurrent circuit breakers, each I/O signal shall be protected – 1 circuit breaker for 1 analogue signal, 1 circuit breaker for maximum of 8 binary signals

Each cable coming in from field shall be connected to input terminal strip corresponding to it. The rule that shall be rigorously observed, is that ALL cable conductors shall be connected to terminals in terminal block connected with specific cable (the block marked with specific cable number and terminals with numbers corresponding to numbers of conductors).

I/O termination modules (FTA) are meant here as an interface between cable connections from field, and I/O modules of target system. They shall be installed in crossing cabinet, which shall enable connecting them to I/O modules cabinets by means of typical system cables. As far as possible, I/O termination modules (FTA) shall have possibility of supplying from redundant source.

In scope of separation of EExi from non-EExi connections, use of separate crossing cabinets is preferred solution.

5.11 General requirements for cabinets

All equipment constituting subject matter of this specification shall be installed in free-standing cabinets, located in TIR. Design and manufacture of the cabinets shall fulfil the basic requirements given below, for purposes of used solutions standardization, also aesthetic issues, and facilitating the TIR arrangement.

Basic requirements for cabinets predestined for usage in TIR are given below. With relation to cabinets located in the field, the imposed requirements shall be verified with reference to climate conditions and Ex zone present. In particular cases, quoted notes apply to field mounted cabinets. In such cases appropriate references are inserted into description.

The supplier shall present electrical energy consumption and thermal energy emission for each cabinet.

5.11.1 Mechanical requirements for cabinets

Material:	steel sheet
Height:	2100mm, including 100 mm plinth (the height without transport holders)
Depth:	800mm
Width:	preferably 800mm (possible, but not preferred 1600 and 1200 mm)
Degree of protection:	IP40
Cabinet colour:	RAL 7035
Door:	double, full, opening by 180°, key locked
Access:	double-sided
Cable entrances:	from bottom side of cabinet
Transport holders:	top of the cabinet

5.11.2 Requirements regarding equipment and internal arrangement of cabinet

Equipment of cabinets depends on their intended use. This paragraph describes requirements regarding basic equipment (standard), whereas all devices related to characteristic of individual cabinet are omitted.

Fastening of cables:	a rail with cable clamps together with sealing plate (dust-proof)
Distribution of connections:	cables and conductors shall always be run in trays

Main supply disconnector switch: separate for each supply fed from UPS

Protective devices:	fuses, breaker switches – according to design
Terminal strips:	all conductors shall be connected to terminals on strips, according to electric signal type and level. Single, one-level, or maximum two-level terminals shall be used. All conductors shall be fastened on terminals by means of screws, in case of strand with use of cable ferrules. For terminal strips of signal connections, knife edge disconnectors shall be used. Terminals with protecting guards shall be used for 230V AC terminal strips.

Colour scheme of terminals:	according to directions of GLSA 3030 specification
Conductors:	copper, flexible (strand), wire for power conductors. Minimum cross section: for signal conductors 0.5mm^2, for 24V DC supply 2.5 mm^2, for 230V AC supply 1.5 mm^2. PVC jacket.
Colour scheme for conductors:	230V AC supply: brown (phase), blue (neutral), yellow-green (protective) 24V DC supply: red (+), blue (-) signal connections: white (+), black (-) (the colours shall comply with specification GLSA 3120)
Colour scheme for trays:	black for 230VAC, grey for 24VDC supply, grey for non-EExi signals, blue for EExi supply and EExi signals.
Separation / isolation	Separation of connections (on level of terminal strips, protective and matching devices, trays, etc) shall be provided according to the following criteria: - power supply and measuring signals - 24VDC and 230VAC voltages level. CAUTION: Clear marking of supply voltage shall be used at supply strips. - EExi and non-EExi signals.
Protections:	all protective devices for protection of persons, cables and equipment shall be implemented inside the cabinet, according to its specifics and detailed design.
Earth bars:	the following busbars shall be installed inside the cabinets: *protective earth bar* (PE), to which all conductors of protective connections and cabinet enclosure shall be connected *insulated bar of electronic circuits earthing* (PA), to which supply common of all electronic devices installed in the cabinet shall be connected, as well as minus pole of 24VDC supply and all screens of signal cables Lighting – sufficient cabinet lighting shall be provided (e.g. by proper lighting of TIR room). Lighting inside the cabinet shall be used in case of low lighting intensity on cabinet installation place (e.g. for field located cabinets)
Ventilation / heating:	The cabinets, in which equipment heat expenditure exceeds capacity of gravitational heat dissipation, shall be equipped with ventilation system. For this purpose air grates and fans shall be used (redundancy of fans is preferred). Cabinets with forced air circulation shall be equipped with thermostat with signalling of allowable temperature exceeding inside the cabinet. In situations where specific cabinet characteristics, or its location imposes such solution (in the field for example), the cabinet shall be furnished with heater and also with thermostat, with signalling of low and high temperature level.

For field-installed cabinets, remote indication of temperature inside the cabinet shall be foreseen (for cabinets in TIR, temperature monitoring in technical room – TIR shall be sufficient)

Supply outlet socket: UPS supplied. It shall be foreseen in system cabinets, such as DCS, PLC for engineering purposes (e.g. for portable ES).

Equipment access and dismantling:

installation of equipment in cabinet shall be of modular type, and shall enable easy access to all its elements, as well as easy dismantling of individual components, such as a module (card), relay, separator and others.

Unification of solutions: on stage of cabinets' designing the principle of used elements standardization as well as adopted technical solution shall be kept. This applies also in scope of individual elements' arrangement, cable and leads entrances and routing, etc. As far as possible and purposeful, the final design shall feature repeatability of solutions.

All control and instrumentation cabinets shall be manufactured with consideration given to electromagnetic compatibility (EMC) directions, and shall have adequate conformance documents for the whole.

5.11.3 Marking and identification of cabinets

Each cabinet, equipment, terminal strip, terminal, cable and other, shall be marked according to identification system adopted in GLSA 3030 specification.

The principle of marking in place of connection is adopted for single conductors, by reference to name (identifier) of target place on opposite end of specific conductor.

5.11.4 Electrical supply

In basic variant, two-cable 230V 50Hz redundant supply shall be fed from uninterruptible UPS supply network in TN-S configuration. In particular cases 3x400V 50Hz UPS supplied voltage can be fed. Feeding of ordinary supply (external to UPS) to Control and Instrumentation cabinet, is not foreseen.

Supply distribution network inside the cabinets shall be designed basing on clear, hierarchic system, while keeping to principles described in GLSA 3130 specification.

5.12 Degree of utilization, free (redundant) resources

It is assumed, that Supplier of DCS/PLC system shall deliver:

- 10% of free channels in each type of installed I/O modules full equipped together with Ex separators
- 20% of free extension space in each cabinet
- 15% reserve in software licences
- Feeder shall cover power consumption of all installed consumers – active and spare
- processor load after starting of all control and visualisation functions, and connection of all I/O, not greater than 60%

5.13 Spare parts and wear materials

For each type of system and I/O module, spare module shall be delivered.

The supplier of the system shall present list of spare parts and wear materials for start-up period and 2-year of normal operation period.

5.14 Training

GLSA representatives shall be trained in scope of working in the system – in particular on such work posts, as operator, process engineer, and serviceman of DCS and PLC system.

5.15 Final acceptance tests of the system (FAT)

General requirements concerning final acceptance of DCS and PLC systems can be found in specification GLSA 3710.

5.16 Documentation

List of required documentation – refer to specification GLSA 6400.

6 Relevant documents

Any "Technical Specification" issued by GRUPA LOTOS S.A. listed in Contract Files.

7 Standards and Regulations

In each case it is assumed that standards, regulations, directives and orders called are of their latest editions along with amendments, annexes and supplements in force.

Standards that are specifically connected with computers are principally listed here. Remaining standards related to Control and Instrumentation, are given in specification GLSA 3010 – Instrumentation general requirements.

7.1 Directives of European Union

Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits

Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC)

Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility

93/465/EEC: Council Decision of 22 July 1993 concerning the modules for the various phases of the conformity assessment procedures and the rules for the affixing and use of the CE conformity marking, which are intended to be used in the technical harmonization directives

Corrigendum to Directive 94/9/EC of the European Parliament and of the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)

Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (ATEX 137)

7.2 Polish Standards - PN

- PN-EN 61131 (all parts): Programmable controllers
- PN-EN 61069 (all parts): Industrial-process measurement and control. Evaluation of system properties for the purpose of system assessment.

8 Attachments

- Attachment N° 1 – Functional blocks used in hypothetical logical diagrams
- Attachment N° 2 – Processing of analogue signal
- Attachment N° 3 – Handling of analogue signal from MOS
- Attachment N° 4 – Shutdown interlock
- Attachment N° 5a – First out logic of interlock – functional block
- Attachment N° 5b – First out logic of interlock

9 Record of changes

No.	Date	Description	Introduced by
1		This specification entirely replaces the former LOTOS Group S.A. standard No. PR 07 371 with the same title.	M. Domaniewski
2	4.05.2011	1.Correction of item 2.1. 2.Requirements for s/w delivery are added – item 4.2. 3..ProfibusDP protocol is deleted – item 4.6. 4.Claims of reservations in DCS/PLC/ESD systems are detailed – item 4.12.	M.Baryła
3	30-11-2013 (rev. 2)	Review, update, standardize and changes to the Standard within scope of order No. OK/990/2012	Editorial board coordinated by T.Wróbel
-	31-08-2015	Page layout corrections, no contents changes.	T. Wróbel