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 requirements 4
5.1.1 Principles of instrument equipment installation 4
5.1.2 Reception and storage of instrument equipment 4
5.2 Mechanical assembly of instrument equipment 4
5.3 Location of instrument equipment 5
5.4 Accessibility and visibility of instrument equipment 5
5.5 Process (primary) connections 6
5.5.1 General 6
5.5.2 Screwed connections with two clamping rings 6
5.5.3 Welded connections 7
5.5.4 Requirements for protection cabinets 7
5.5.5 Installation of instrument equipment directly in pipelines and on vessels 8
5.6 Connections of air supply and pneumatic signals 8
5.7 Heating of instrument equipment 8
5.7.1 General 8
It is required to use electric heating, exception where claims of processes distinctly define other kind of heating 8
5.7.2 LP steam heating 8

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

5.7.3 Electric heating 8
5.8 Cable routes 8
5.8.1 General principles for cable routing 8
5.8.2 Principles for cable shields grounding 8
5.9 Grounding of instrument equipment housings 9
5.10 Assembly of equipment in control room 9
5.11 Inspection, testing, calibration 9
6 Relevant documents 10
7 Codes and standards 10
8 Attachments 10
9 Record of changes 11

1 Subject of specification

This specification used in conjunction with other technical specifications of LOTOS Group S.A. establishes the minimum requirements for the design and execution of instrument equipment assembly.

2 Scope of validity

This specification applies to the preparation of tender documents, inquiries and contracts concerning new investments and modernization projects planned by LOTOS Group S.A.

It shall also be a basis for preparing both detailed specifications and inquiries for individual or package unit supplies.

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 with GLSA
- Data Sheets approved by GLSA
- This specification
- Other Specifications
- Drawings and other documents
- Standards

4 Definitions and designations

GLSA - LOTOS Group S.A.

DCS - Distributed Control System

PLC - Programmable Logic Controller

ESD - Emergency Shutdown System

SIS-PLC - PLC, that implements SIF functions, with defined SIL requirements

ESD-PLC - PLC, that implements functions without SIL requirements

Primary (process) connections – tubular connections between signal reception point and transmitter.

Primary welded connections – the tubular connections, where individual elements are joined by means of welding.

Primary screwed connections – the tubular connections made with use of tube couplings with two clamping rings and calibrated pipes.

Pneumatic connections – tubular connections between pneumatic equipment

Junction boxes – the boxes equipped with terminal strips for cable couplings

5 Description

5.1 General requirements

5.1.1 Principles of instrument equipment installation

Installation of instrument equipment shall be designed and executed in a manner ensuring its proper functioning and safe operating. The installation and connections shall comply with execution design. Mounting instruction for instruments, process and cables connections, and wall penetration with sealing for rooms and cabinets shall be integral part of design and shall be delivered to GLSA All deviations from the design must be agreed with GLSA representative. In particular cases it is allowed to assembly instrument equipment on the grounds of sketches made by the designer on site. Directions and guidelines of the equipment manufacturer, regarding its assembly and connections, shall be taken into account and observed. Assembling company is also obliged to employ requirements resulting from Health and Safety at Work, as well as Building Law regulations.

5.1.2 Reception and storage of instrument equipment

Recipient of equipment shall check whether the delivered equipment conforms to specification and order requirements, and was not damaged during transport.

If any damage is revealed the recipient shall prepare suitable report and send it to supplier for replacement, or equipment damages repair.

Instrument equipment shall be stored in clean and dry room, in temperature $0 \div 40$ºC.

The recipient shall check conformity of labelling against specification. In case of erroneous or missing designations, they shall be corrected or supplemented.

Instruments such as: valves, flowmeters, rotameters, level transmitters, level indicators and others, installed directly on vessels or pipelines, must be protected against penetration of foreign matters or dirt to their interiors.

5.2 Mechanical assembly of instrument equipment

All instruments and equipment, such as steam traps, separating traps, air distributors, junction boxes, must be adequately fastened.

It is the rule, that measuring instruments not installed directly in pipelines or on vessels, are mounted on independent racks or supports fastened to base or supporting structures. The racks, supports and supporting structures must be made of galvanized steel or be properly protected against corrosion, according to specification GLSA 1190.

Use of non-typical structures, fastenings or supports, shall be approved by GLSA representative. All drilling, welding or forging operations in steel structures or buildings shall have the Investor representative acceptance, and material used for their repairs must be the same type as the one that they have been built of. If supports are to be welded to structures protected with flame retardant mass, then suitable handles shall be prepared for this purpose prior to protection completion.

Junction boxes shall be installed with cable glands directed downwards and protected against penetration of dirt, moisture or water to inside. Additionally, protective roofs must be installed.

Instruments, protecting cabinets or junction boxes shall be installed in a manner enabling full opening of their housings or door.

5.3 Location of instrument equipment

Measuring instruments, as well as their process and cable connections, shall be located in adequate distance from hot pipelines, pipelines containing caustic media, rotating and vibrating machines.

While planning locations of instrument equipment, one shall take into account their accessibility, with consideration given to safety rules, as well as avoiding of their damage in case of process equipment service works.

The instruments that require frequent access shall not be mounted more than 1.7 m above ground or permanent platform level. Instruments which require often access can't be located higher than 1.7 m above ground or platform. If this is impossible, the permanent ladder shall be provided and ended with platform.

5.4 Accessibility and visibility of instrument equipment

In order to ensure necessary accessibility and visibility of instrument equipment, the rules given in following table shall be observed in course of design and assembly:

Equipment installed ≤ 3.5 [m]

Equipment	Accessibility				
	Level 00	Platform		Ladder	
		Permanent	Movable	Permanent	Movable
Control valves	X	X			
Cut-off valves at vessels		X		X	
Valves that are not operated during normal plant operation	X		X(2)		X(2)
Orifices	X		X(2)		X(2)
Level indicators	X(1)	X(1)	X(2)	X(1)	X(2)
Heads of level transmitters		X(3)	X2)		X(2)
Local thermometers	X(1)	X(1)	X(2)	X(1)	X(2)
Remote thermometers	X(2)	X(2)	X(2)	X(2)	X(2)
Manometers	X(1)	X(1)	X(2)	X(1)	X(2)
Analysers	X	X			
P, ΔP, T transmitters	X	X			

Equipment installed > 3.5 [m]

Equipment	Accessibility				
	Level 00	Platform		Ladder	
		Permanent	Movable	Permanent	Movable
Control valves		X			
Cut-off valves at vessels				X	
Valves that are not operated		X		X	

during normal plant operation					
Orifices		X		X(1)	
Level indicators		X		X	
Heads of level transmitters		X		X(1)	
Local thermometers		X		X	
Remote thermometers				X(1)	
Manometers					
Analysers		X			

(1) Readout possibility (2) Service enabled (3) Preferred

5.5 Process (primary) connections

5.5.1 General

One shall pursue for primary connections being as short as possible (which is particularly important for critical control circuits and safety circuits), with simultaneously maintaining the possibility for equipment operating. The hook-up lines can not be longer than 7 m, and for balance measuring not longer then 1,5 m.

Instrument manifolds shall be mounted under the transmitter in horizontal position which is enabling for drainage.

The primary connections shall be executed according to guidelines given in Attachements N° 5 – 25.

Signal tubes shall be fastened to permanent structures (not pipelines), in a manner precluding generation or transferring of vibrations from pipelines on the transmitter.

Connection around manifolds with O ring sealing shall be equiped with device according to PN-EN 61518:2004 dwg. 2 and 4.

Hook-ups documentation shall include as a minimum:

- Drawing connection with detail specification
- Information about supports (standard drawings),
- Information concern heating and insulation – documentation provides by heating design and mounting subcontractor.

5.5.2 Screwed connections with two clamping rings

The basic types of primary connections are screwed ones, with use of valve blocks (ball type) for transmitters' handling. Valve blocks shall be with straight channels of minimum diameter 6 mm. Three-valve blocks shall be used in general, with external vent/drain valves. Five-valve blocks can be used only for completely clean media that do not bring about any deposit accumulation. Material for valve blocks shall be AISI316 as minimum, or better if required by medium parameters.

Screwed unions with two clamping rings shall be used, so-called „double compressing fitting".

Screwed connections which contain more than one sealing element are forbidden also.

Signal tubes OD12x1.5 shall be used, made of AISI316 steel. For analytical purposes other diameters are allowed, as required.

For liquids of high freezing point and containing suspended solids, connections must be performed with using tubes ½'' and ¾''.

5.5.3 Welded connections

Where blocking of channels in valve blocks is possible because of medium parameters, such as viscosity, contamination, cocking, crystallization, then connections made of tubes of ½'' and ¾'' diameters welded to individual cut-off valves unit shall be used, which shall be mounted in heated protection boxes or if they are close to pipeline, they can be without boxes and with good insulation. Ball valves used shall feature dismountable design, enabling ball or seal replacement without need for complete disassembling.

Nipple using in connection of impuls line to manifold is forbidden.

Materials used shall correspond to material class at least.

It is allowed, for unification purposes, to use materials of higher class, covering range of lower material classes.

5.5.4 Requirements for protection cabinets

Transmitters shall be mounted in protection boxes. Using of roof for transmitters protection requires GLSA approval.

Protection cabinet shall be cubic shape and be composed of two parts, upper part opening diagonally at the same time.

Cabinet mounting: from bottom side of the cabinet, on 2" pipe (from rear side of the cabinet, when signal tubes are introduced from bottom).

Design of protection cabinets shall ensure easy dismantling of transmitters for maintenance purposes.

The supplier shall provide adequate fittings inside the cabinet for transmitter installation. The transmitter shall be furnished with connection clip for 2" pipe mounting. The cabinet shall be equipped with sight glass made of tempered glass with dimensions 350x350 mm, for readouts of indicator integrated with the transmitter.

The cabinet shall be insulated correspondingly to design ambient temperature and heating temperatures. The supplier shall select adequate electric heater or steam coil pipe, as well as adequate insulation. Foam insulation protected with aluminium foil is prefer.

Caution:

The temperature inside the cabinet shall be maintained on level not lower than minimum heating temperature, but not higher than design temperature.

Material

Antistatic, non-combustible polyester, fibreglass reinforced according to Standards:

- PN-94/E-05204: Static electricity protection. Protection of objects, systems and equipment. Requirements.
- PN/EN-50014: Electric equipment in explosion hazard zones. General requirements and testing methods.

Resistances

Surface resistance: $Rs = 10^6 \div 10^9\ \Omega$

Energy of electrostatic charge on surface: Eq = V*Q must be less than ignition energy for explosive mixtures of IIA, IIB, IIC classes. $E_q < Ez_{min}$.

Colour-grey

5.5.5 Installation of instrument equipment directly in pipelines and on vessels

The installation is accomplished by mechanical branch under supervision of instrumentation branch inspector. The mechanical branch supplies all necessary gaskets, bolts and nuts in each case.

5.6 Connections of air supply and pneumatic signals

Distribution of supply air from connection on drying system to individual recipients , shall be realized according to specification GLSA3140.

Supply connections from distributors, and all connections of pneumatic signals shall be executed with stainless steel calibrated tubes (Cu in polyethylene coating is allowed for systems where H_2S is not present), of 8 mm minimum diameter (for quick closing valves according to requirements). Individual supply and signal tubes shall be fastened to structure, while tube bundles are to be routed in open trays. The tubes must be fastened in a manner precluding their vibration.

5.7 Heating of instrument equipment

5.7.1 General

Heating of instrument equipment shall be accomplished according to P&ID directions, as well as guidelines concerning heating temperatures.

It is required to use electric heating, exception where claims of processes distinctly define other kind of heating

5.7.2 LP steam heating

Direct heating of instrument equipment with LP steam is accomplished by Instrumentation branch, according to directions given in Attachements N° 30 – 34. Feeding of steam to sub-headers and condensate drain from sub-headers, as well as delivery and assembly of the sub-headers themselves, comes into piping branch scope of duties.

Hook-ups drawings shall include information concern steam source and condensate outgoing.

Inter-branch contact between Instrumentation and Piping branches shall proceed according to specification GLSA N° 1010.

5.7.3 Electric heating

Electric heating of instrument equipment is accomplished by Electric branch, on the grounds of assumptions from Process, Instrumentation and Mechanical branches, according to specification GLSA N° 4700. Control of supply circuits operation (signalling) shall be realized on level of local distribution cabinets for voltage distribution. Loss of voltage supplying specific cabinet shall be signalled in DCS.

Contact with electric branch for electric heating operation indicating signals, according to specification GLSA 1010.

5.8 Cable routes

5.8.1 General principles for cable routing

Routes of instrument cables shall be designed and executed according to specification GLSA 3110.

5.8.2 Principles for cable shields grounding

5.8.2.1 - Individual cables: the instrument – junction box

Cable shield must be isolated from any housings and grounding. In junction box, the shield shall be connected to dedicated terminal on terminal strip, or to independent, isolated bus-bar.

5.8.2.2 Individual cables: the instrument – control room

The shield must be isolated from the instrument housing and grounding, and connected to isolated bus-bar for shield grounding in the control room.

5.8.2.3 - Multi-core cables: junction box – control room

In junction box, individual shields (if any) and external shield shall be connected to dedicated terminals, or independent, isolated bus-bar. In the control room, both shields shall be connected to isolated bus-bar for shields grounding

The cores of spare pair wires must be grounded on TIR site.

Method of cable shields grounding is presented in Annex N° 48.

In applications of PROFIBUS or FIELDBUS Foundation communication systems, cable shields grounding must correspond to directions of these systems' suppliers.

5.9 Grounding of instrument equipment housings

Housing of instruments, as well as all boxes, cabinets and cable trays, shall be connected to plant grounding system.

Grounding of instrument equipment by means of connecting them to structures or pipelines, is not allowed.

Housings of equipment installed on panels made of plastics, shall be individually connected to grounding system.

Connection of housings to grounding system shall be accomplished through intermediate, collecting grounding bus-bars, as showed in Attachments N° 36 – 38. Individual connections of housing to these bars shall be made with insulated lead 4 mm^2 minimum, whereas connection of the collecting bar to grounding systems through insulated lead with 6 mm^2 minimum cross-section area.

5.10 Assembly of equipment in control room

All instrument equipment installed in technical control room (TIR), shall be mounted in closed cabinets. The cabinets shall be mounted in a manner enabling easy access to them, while maintaining safe escape routes.

The cables shall be introduced from bottom (from cable room) through flame-proof, individual cable glands provided it results from fire zone classifications. Cables between individual cabinets shall also be routed through cable room.

System cables from TIR premise to operators' and engineering stations' room, shall be routed through adequately prepared ducts.

The idea of instrument equipment grounding connections is presented in Attachments N° 47 and 48.

5.11 Inspection, testing, calibration

Each element of instrumentation requires inspection after installation, and an instrument calibration or adjustment, as well as functional testing in measuring and control circuit.

Elaboration of detailed requirements concerning individual stages of inspection, calibration and testing, constitutes subject matter of technical design. Assembling company shall prepare necessary

report forms for confirmation of required action completion. List of such reports is contained in Specification GLSA 3010, p. 4.1.13.4.

It is stringently required to observe the rule, that installing of instrument equipment in pipelines and vessels can be started only after submitting of cleaning, leak-proof testing and purging completion reports by piping branch contractor.

6 Relevant documents

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

7 Codes and standards

Designing, execution and assembly shall comply with the latest editions of below listed norms and standards:

PN-94/E-05204: Protection against static electricity. Protection of buildings, installation and equipment.

PN/EN-50014: Electrical apparatus for potentially explosive atmospheres. General requirements.

Building Law

Health and Safety at Work regulations.

8 Attachments

Attachments N° 1, 3, -4 Orientation of nozzles

Attachments N° 1 - Deleted

Attachments N° 5 - 24 Primary connections

Attachments N° 25 - 28 Pneumatic connections

Attachments N° 29 - 34 Steam heat tracing

Attachments N° 35 - 37 Field instrument grounding

Attachments N° 38 - 48 Installation guidelines

Załącznik nr 49 Osłony osprzu p.poż i teletechnicznego

9 Record of changes

No.	Date	Description	Introduced by
1		This specification entirely replaces the former LOTOS Group S.A. standard No. PR 07 302 with the same title.	M. Domaniewski
2	4.05.2011	1. Correction of item 2.1. 2.Minimum length of signal traces are added – item 4.5.1. 3.Claim of electric heating are added – item 4.7.1. 4.Grounding of spare pair wires on TIR are added – item 4.8.3.	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