Grupa LOTOS S.A.	**TECHNICAL SPECIFICATION**	Spec. N^{o}
	Control panels	3630

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1 Subject of specification

This specification used in conjunction with other technical specifications of LOTOS Group S.A., establishes minimal requirements in scope of designing and fabrication of control panels within Control and Instrumentation branch. The specification describes both panels containing elements of manipulator and indicator type, and electronic panels with LCD display. The specification applies to panels located in central control room, TIR, and on plant as well.

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

4 Definitions and designations

GLSA – Grupa Lotos S. A.

TIR – Technical Instrumentation Room

Indicator – A device transferring specific information to human. According to PN-EN 60073, this is „A mechanical, optical or electrical device that presents visual, acoustic or additional information". An indicator can be, for example, a lamp, acoustic signalling device. This term does not apply to LCD display, which can contain many single indicators.

Manipulating element – according to PN-EN 60073, „The part of driving mechanism, which is put in motion by human action". Manipulating element activates driving element, which in turn causes closing/opening of coupler, switching over or different way of information sending to process control

and monitoring system. In cases where display on interactive screen is used, the part of screen serving for manipulation execution is considered manipulating element. A pushbutton, rotary coupler, lever, potentiometer, joystick, etc., can be considered manipulating elements.

Pushbutton – a pushbutton is specific type of manipulating element. It is „a part of electric device in form of button, which shall be pressed in order to cause an action".

Standard control panel (of manipulator / indicator type) – closed structure in form of box, adapted for assembling on cover of manipulating elements, indicators and other control instruments as well as connecting strips.

Control panel with LCD display (HMI)

Control panel with LCD display serves as local operator's station for complex machines (compressor for example), or process nodes, for which local visualisation and control is required. Single housing contains LCD display and microprocessor device responsible for communication with control system and displaying indispensable data as graphics or text.

The LCD display can be of touch-screen type, and can also be furnished with pushbuttons embedded on the panel, used for changing of displayed screen and entering of control commands and parameters. It is assumed, that the panel (HMI) is not an operating station (see specification GLSA 3620), in spite of they perform similar functions. Dedicated panels are preferred in the contrary to computers with LCD monitors.

5 Description

Considering type of instruments mounted on panel, two types of panels can be distinguished:

- Standard control panels
- Electronic control panels with LCD displays.

Both types of panels can be located on plant or inside buildings.

5.1 General requirements

The panel shall withstand 500V RMS AC voltage test between terminals and housing.

In case of plastic housings, antistatic materials shall be used, and surface resistance of housing measured according to PN-EN 60079-0 shall fulfil paragraph 7.4.2 a.m. standard..

The terminal strips of panel shall be of bolted type. Terminal strips for various signal types shall be separated and marked according to table given in p. 4.7.17 of specification GLSA 6120. Separate cables shall be assigned to various types of terminal strips (division of terminal strips according to signal types).

The cables and their individual cores shall be marked according to specifications GLSA 6120 and 3030.

Cores of cables entering the panel shall be terminated with ferrules type terminals.

Metal housings of panels and metal housings of instruments mounted on the panel or inside it, shall be connected with earthing grid.

One shall go by a rule, that screen of each cable shall be connected with earthing grid only in single place – namely in control room.

Number of terminals shall correspond to number of entered cable cores.

Each panel shall be marked according to specifications GLSA 6120 and 3030. The marking shall be made in durable way.

Each instrument mounted on panel shall be equipped with label, which unequivocally identifies it on plant, for example 110HS_002 (refer to specification GLSA 6120), as well as with tag containing description of performed function, for example „COMPRESSOR STOP". The tags shall be made in durable way, for example engraved, and description **on Polish language**.

Elements used for construction of panel: bolts, nuts, washers shall be made in such way, and of such materials that preclude their corrosion.

The place where panel is mounted shall take into consideration possibility of fast reaching it on a plant (on communication routes crossing, in plant node centre), while its location cannot increase risk of accidental pushbuttons use.

5.1.1 Light indicators mounted on panels

Light-emitting diodes (LED) are preferred elements of visual signalling.

Durability of the diodes shall not be less than 25000 hours.

Light source intensity, expressed in millicandelas must be equal to 250 at least.

Light intensity of installed lamps must ensure unequivocal identification of the lamp state: *lamp lit – lamp off*.

The panel shall be furnished with pushbuttons for light indicators operation check.

Indicators supplied with 24 V DC voltage are preferred.

Application of the following colours is allowed for light indicators:

RED, YELLOW, GREEN, BLUE, WHITE.

The following table presents colours of light indicators and their meanings:

Colour	Meaning	Interpretation	Example
RED	Danger or alarm	Danger warning or signalling of state that requires immediate action	Exceeding of allowable temperature Stoppage in result of protections activation
YELLOW	Warning	Change of conditions, or threat of such change	Difference between current value and set value
GREEN	Safe state	Indication of safe state, permission for further action, open way	Unit in operation
BLUE	Signalling of special condition in specific case	It can indicate every condition or case, which is not marked with red, yellow or green colour.	Indication of remote control
WHITE	It does not have specific meaning assigned (neutral)	Arbitrary meaning – can be used in all cases where doubt exists as to use of red, yellow or green colour	

Blinker light signalling is allowed in order to:

- Draw attention of operating staff
- Bring about immediate action
- Indicate difference between required state and actual state
- Change of state signalling (blinking in period of transition from one state to another)

Two ranges of blinking frequency, f1 and f2, can be distinguished. Higher frequency depicts higher degree of hazard. The following frequency ranges shall be used:

- f1 – slow blinking, 0.4 Hz up to 0.8 Hz (24 up to 48 flashes per minute)
- f2 – normal blinking, 1.4 Hz up to 2.8 Hz (84 up to 168 flashes per minute).

Generally normal f2 blinking shall be used. Slow blinking f1 is not recommended.

Ratio of light impulse duration and break duration shall be close to 1:1. For f1 range, PULSE time cannot exceed break time, while for f2 range PULSE time can be shorter than break time, but PULSE/BREAK ratio 2:1 for f1 and 1:2 for f2 can never be exceeded.

It is recommended that if text blinking is used, background shall blink rather than text itself. If this is impossible, then ON duration time is recommended to be twice that of OFF duration time.

For alarm signalling, following logic is recommended to use:

Signalling	Meaning	Description
Lamp is switched off	No alarm	Normal process condition, no failure event or alarm has been acknowledged and it is not active.
Lamp is switched on	Active alarm	Abnormal process condition has been occurred, alarm has been acknowledged and it is active.
Lamp is normally flashing	New alarm has been appeared	New abnormal process condition has been occurred and alarm is not acknowledged.

5.1.2 Manipulating elements (pushbuttons, switches, couplers) mounted on panels

Manipulating elements shall be able to operate at 24VDC supply voltage and 0.5A current.

The following colours are allowed to use for manipulating elements:
RED, YELLOW, GREEN, BLUE, BLACK, WHITE, GREY.

The RED colour shall be used only for manipulating elements serving for emergency shutdown (STOP). In case where the same manipulating element is used both for emergency and normal shutdown, then RED colour shall be applied.

The BLACK colour is particularly recommended for STOP/OFF manipulating elements. The RED colour is also allowed. Use of GREEN colour for this purpose is forbidden.

The BLACK colour is particularly recommended for START/ON manipulating elements. GREEN colour is also allowed. Use of RED colour for this purpose is forbidden.

Manipulating elements, which simultaneously perform start and stop function, or ON and OFF function, shall have BLACK colour. The RED and GREEN colours shall not be used.

Confirming manipulating elements shall have WHITE colour, with exception to cancelling manipulating elements (RESET) that simultaneously perform STOP or OFF function, which shall have RED colour.

Manipulating elements serving for operation unblocking shall have BLUE colour, with exception to unblocking manipulating elements that simultaneously are used in quality of STOP/OFF manipulating elements. Similar principles as for STOP/OFF manipulating elements shall be applied for them.

Alarm and ESD pushbuttons shall be mushroom shaped in order to facilitate easy and fast pressing. In order to prevent accidental activation, they can be covered with easily removable cover or glass pane to break. Such pushbuttons shall feature two stable positions, in order to hold up alarm / interlock signal. Version of pushbuttons – NC (normally closed).

For important interlocking circuits pushbuttons with three contacts are used, which, when connected to controller with voting logic 2 out of 3, preclude interlock activation when contact on one of them is missing (verdigris contact, for example).

For actions that require special authorization, the pushbutton with key shall be used, which releases or enables the pushbutton activation – for example, alarm confirmation, interlock unlocking.

5.1.3 Acoustic signalling device

Similarly as in case of flashing light signals, acoustic signals may be used in order to attract operator's attention, his/her immediate reaction, and if visual signals cannot be received.

Various types of acoustic signals shall be unequivocally distinguished one from another. In control systems, such tones and its modulation must be used, which significantly differ from general alarms used for e.g. fire, chemical hazard, burglary or gas detection system. To avoid above mentioned, all kinds of signals used in control systems must be approved by LOTOS Group S.A. Kinds of signals used in DCS systems are subject to separate agreement.

While using these signals, one shall take into account noise in workplace, or ear protectors used by operators.

It is recommended to limit application of acoustic signals as much as possible.

Alarms caused by process must be in form of series of impulses with constant tone, height although continuous tone of constant level is also acceptable.

5.2 Additional requirements for panels mounted outside buildings

The requirements presented in point 4.1 are obligatory for panels of such type.

The panel design shall be adapted to vertical assembly on steel frame or wall.

The panel shall be equipped with suitable catches for fastening bolts. The panel shall be delivered along with fastening bolts.

If panel consists of several parts, then they shall be mounted on common frame, thus forming single whole fitted for assembly.

Housings of panels shall in general be made of stainless steel. For small panels (containing several manipulating elements or indicators), plastic housings are allowed.

External instruments, manipulating elements, indicators, LCD displays etc., shall be installed on panel's face. Convenient access to interior of panel shall be provided.

Climate conditions have been given in specification GLSA 3010.

Degree of protection against solid matters and water shall be IP65 at least.

The panel shall be delivered with canopy, protecting it against direct sunlight radiation and accumulation of ice and snow on it.

Cable entrances shall be located on bottom side. Each of them shall be furnished with cable gland. Cable glands not used by cables shall be blanked.

In case of standard panels, of manipulator, indicator type, the panel's housing shall have ATEX certificate, confirming possibility of usage in adequate for panel location explosion hazard area. Separate certificates shall also be available for instruments mounted on the panel and for glands.

In case of panels furnished with LCD displays, the certificate shall cover the housing together with instruments connected with it.

For explosion hazard areas, application of the following types is foreseen:

- Flame-proof Exd, or strengthened Exe panels
- Ordinary design panels – not explosion-proof – if the panel contains solely intrinsically safe circuits

The panels containing intrinsically safe circuits must have producer's declaration confirming acceptance for use with such circuits.

The panels cannot be located in Z0 zone.

Design of indicators shall ensure legibly information transferring, both at strong sun penetration, and in the night.

5.2.1 Panels containing both intrinsically safe, and not intrinsically safe circuits

In case when necessity exists for installing on local panel both intrinsically safe and not intrinsically safe equipment circuits, then not intrinsically safe equipment must be completely isolated from intrinsically safe circuits, by means of installing them in completely separate housings, which are adequately certified. It is also possible to create two separate local panels – one for intrinsically safe circuits, and the second for not intrinsically safe circuits.

It is also necessary to remember, that intrinsically safe circuits shall be distinguished with blue colour used for glands and external insulation of cables.

5.2.2 Marking of explosion-proof housing

Marking scheme of explosion-proof housing on nameplate was presented in GLSA standard N° 3030.

5.3 Additional requirements for panels mounted inside buildings

The requirements presented in point 4.1 are obligatory for panels of such type.

Construction of the panel shall be adapted for assembling on operator's console, with consideration given to ergonomics and operator's console architecture.

The panels located inside buildings shall meet climate requirements presented in specification GLSA 5200.

5.4 Additional requirements for electronic panels with LCD display (HMI)

The requirements presented in points 4.1, 4.2 and 4.3 are obligatory for panels of such type.

In quality of interface between operator and controlled plant, an electronic panel can be used, which enables specific plant node or machine control. Also mixed solution is allowable, where some information is accessible on panel and control is carried out e.g. with push buttons.

Panels equipped with LCD displays can be mounted in central control room, technical room (TIR), on the plant, and must meet requirements in relation to environment in place of installation.

The displays shall be of colour type for presentation of adequate equipment conditions, as well as media and other elements of graphical process interface.

The screens shall ensure legibility of transferred information, in range of 160º viewing angles (both vertically and horizontally).

Active touch-screens are preferred, which enable execution of operations on panels in comfortable way, without need for gloves taking off.

Control panel communicates with control system (DCS, PLC) by means of single protocol (refer to specification GLSA 3710) for data exchange purposes, visualisation and control of specific plant node / machine. The field I/O cards can be placed in panel as well.

6 Relevant documents

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

7 Standards and regulations

Designing, fabrication and assembly shall conform to the latest editions of below listed standards and regulations.

The standards related directly to control panels are quoted in this specification. The remaining standards and regulations, according to specification GLSA 3010.

PN-EN 60073 Basic and safety principles for man-machine interface, marking and identification. Coding principles for indicators and actuators.

8 Enclosures

Enclosure N° 1 – Documents requirements.

9 Record of changes

No.	Date	Description	Introduced by
1	30-11-2013 (rev. 1)	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

Grupa LOTOS S.A.	**Enclosure No. 1**	Spec. N^{o}
	Documents requirements	3630

	With offer	At delivery	Remarks
TECHNICAL SPECIFICATION OF MANUFACTURER	Yes		
LIST OF DISCREPANCIES WITH SPECIFICATION TO BIDDING QUERY	Yes		
LIST OF SPARES TOGETHER WITH PRICES, RECOMMENDED FOR 2-YEAR OPERATION	Yes		
LIST OF SPARES FOR PERIOD OF PRE-COMMISSIONING AND COMMISSIONING	Yes		
TEST CERTIFICATES		Yes	If specified
MATERIAL CERTIFICATES CONFORMING TO EN-10204 3.1		Yes	If specified
CONFORMITY CERTIFICATES OF EQUIPMENT INTENDED FOR USE IN EXPLOSION HAZARD ZONE	Yes	Yes	If applicable
CERTIFICATES ISSUED BY AUTHORIZED BODY FOR EQUIPMENT USED FOR SETTLEMENT MEASUREMENTS		Yes	If applicable
DIMENSIONAL DRAWINGS	Yes		
ELECTRICAL WIRING DIAGRAMS		Yes	
ASSEMBLY, OPERATING AND MAINTENANCE INSTRUCTIONS		Yes	
ELECTRONIC VERSION ON CD		Yes	
INSPECTION LOGBOOK		Yes	If specified
PRODUCTION QUALITY PLAN		Yes	If specified
DECLARATION OF CONFORMITY TO EUROPEAN UNION DIRECTIVE (CE MARKING), ISSUED BY MANUFACTURER		Yes	
CERTIFICATES OF MANUFACTURER		Yes	If specified
CALIBRATION SHEETS		Yes	If specified
HYDROSTATIC TEST REPORT		Yes	If applicable