Grupa LOTOS S.A.	**TECHNICAL SPECIFICATION**	Spec. N° 4210
	Control boxes and intermediary boxes of motors	

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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 regarding designing and manufacture of control boxes as well as intermediary and terminal boxes for low and medium voltage motors.

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.

The Contractor is independently responsible for selection of equipment and materials to be purchased on the basis of technical design particularly in relation to instruments and equipment made in explosion – proof execution.

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 GL SA
- Data Sheets approved by GL SA
- This Specification
- Other Specifications
- Drawings and other documents
- Standards

4 Definitions and designations

CONTRACTOR: GL SA., LOTOS Group Inc., / BUYER

SUPPLIER: BIDDER/ SUPPLIER/CONTRACTOR

4.1 Designations

GL SA - LOTOS Group Inc

SN – medium voltage

DC – direct current

IT – electrical network with isolated neutral point

SZR – Auto Transfer Switching system

PPZ – Scheduled Supply Switching-over

DOL – Direct online Motor Start-up

CSNiM – Central Monitoring and Supervision System

KiA – Control Systems and Instrumentation

EMC – Electromagnetic Compatibility

Shall – Indicate a mandatory requirement.

5 Description

5.1 Ambient conditions

- Atmosphere — marine, aggressive industrial, chemical and dusty
- Ambient temperature (max/min) — +36°C/-25 °C
- Relative humidity (max/min) — 90%/70%
- Elevation above sea level — 1m
- Wind speed — 26 m/s
- Work conditions — refinery, sea coast

5.2 Electric supply system data

Medium voltage	15kV (LOTOS Railway, North Marine and 6000V, Przejazdowo Water Supply Point), 3-phase, IT (isolated network) 10.5kV (GPZ3), 3-phase, IT (isolated network) 6kV (GPZ1, GPZ2), 3-phase, IT (isolated network)
Frequency	50Hz with +4%/-6% allowable tolerance
Low voltage	400V, TN-C/S, TN-S with +/-10% allowable tolerance
Low voltage (lighting, heating)	230V, TN-S
Low voltage (emergency lighting)	110V DC
Alternate current control voltage	230V, 1-phase
Direct current control voltage	24V DC, 110V DC or 220V DC

5.3 Documentation

List of documentation that shall be delivered to LOTOS Group S.A.:

- list of documents,
- GL SA dimension drawings
- connection diagrams
- list of materials
- transport and storage procedure
- certificates and approvals required for operation in explosion hazard conditions,
- manufacturer declarations of product fabrication conformity to standards
- requirements of specification 1020-Classification of Explosion Hazard Zones
- summary list of selection cable glands (according to reference table)

5.4 Design requirements

5.4.1 General requirements

For explosion-proof devices Ex, specification 1020-Classification of Explosion Hazard Zones, is required.

- All equipment of explosion-proof design shall be certified for operation in Zone 1.
- Enclosures made of plastics shall have impact resistance better than 7Nm, dielectric strength better than 2kV, surface resistance below $10^9\Omega$, and shall be resistant to influence of aggressive chemicals, such as acids, lye, bases, salts, oils and greases.
- Covers for outdoor use shall be resistant to weather conditions, and in particular UV radiation.

  glands and hole plugs made of plastic shall be fire resistant and self-extinguishing.
- Enclosures made of reinforced polyester may be used in case of junction boxes and terminal boxes.
- Metallic elements of terminal boxes and intermediary boxes, as well as control boxes, such as bolts, springs, washers and terminals, shall be made of stainless steel.
- Conductors for internal wiring in power and control circuits shall have minimum cross section of 2.5 mm^2.
- For one core cables are not allowed to use the green and yellow colour to avoid confusion with the yellow-green cable PE
- All ends of wires shall be marked with special tags, and shall have numeration conforming to connected terminals by the full address method. Is not permitted by the marking wire potential method.
- Degree of protection provided by enclosures shall be at least IP65, excluding intermediary boxes of low voltage motors, where minimum acceptable degree of protection is IP56. For Non-Ex local control stations (LCS), for indoor location, minimum IP56 can be used.

5.4.2 Cable glands

The supplier of Ex equipment is responsible for selection of adequate cable glands, on the base of cable data provided together with data sheets for Ex equipment.

Cable glands for armoured cables – made of brass or nickel plated, suitable for cables armoured with round steel wires, screwed in from bottom side of enclosure to brass plate, connected with earthing PE terminal by means of yellow-green colour 2.5 mm^2 copper strand. For cables in lead armour (existing power and control cables), special glands for reinforced, armoured cables are required.

Cable glands for non-reinforced cables – made of metal or plastic, suitable for PVC insulated cables. The type of cable glands shall be agreed with LOTOS Group S.A.

5.4.3 Control boxes

Each motor shall be provided with control box installed locally. The control box shall be equipped as follows:

- Start – Stop control pushbuttons
- Emergency stop pushbutton
- „Local – Remote" switch – the option required in case of control executed from numerous locations
- An ammeter (if required)
- Cable glands selected according to p. 4.4.2.
- Terminal strip (if necessary), adapted to connector of 4 mm2 cross-section
- white nameplate of dimensions 40x15 mm, with LCS full technological number and descriptions of all equipment components , being controlled, engraved in black colour.

  The nameplate shall be bolted to enclosure by the manufacturer only and not have an impact

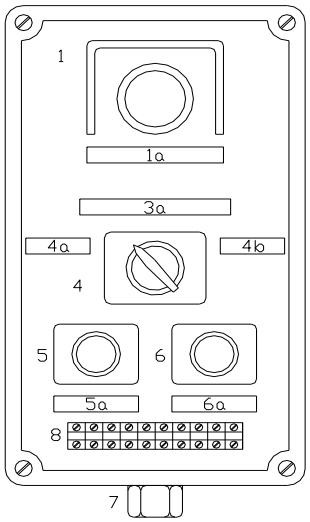
  On the characteristics of the Ex or IP degree

Control box shall have enough space inside for easy control cable connection. Outdoor mounted control boxes shall have rain canopy (above control box).

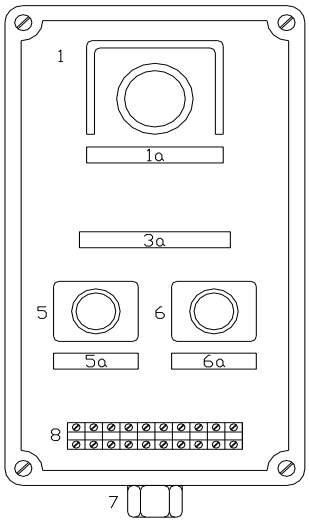
The control box shall provide enough internal space for easy connection of control cables.

Control boxes for 0.4 kV motors – standard design

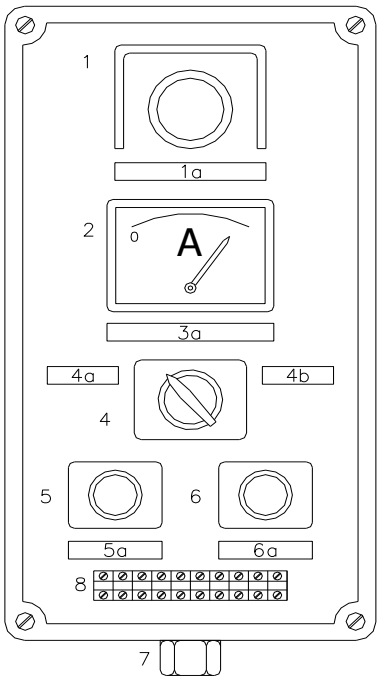
Option 1



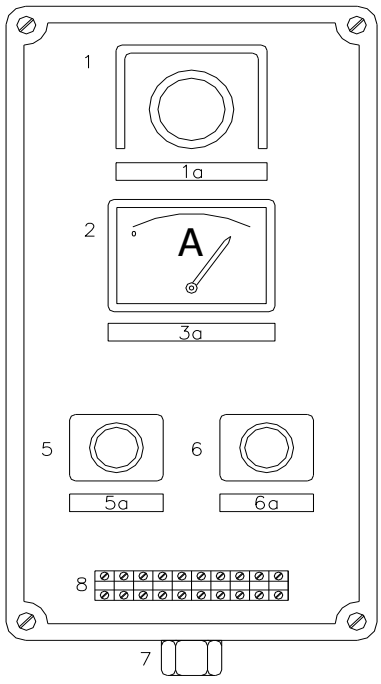
Option 2



Option 3

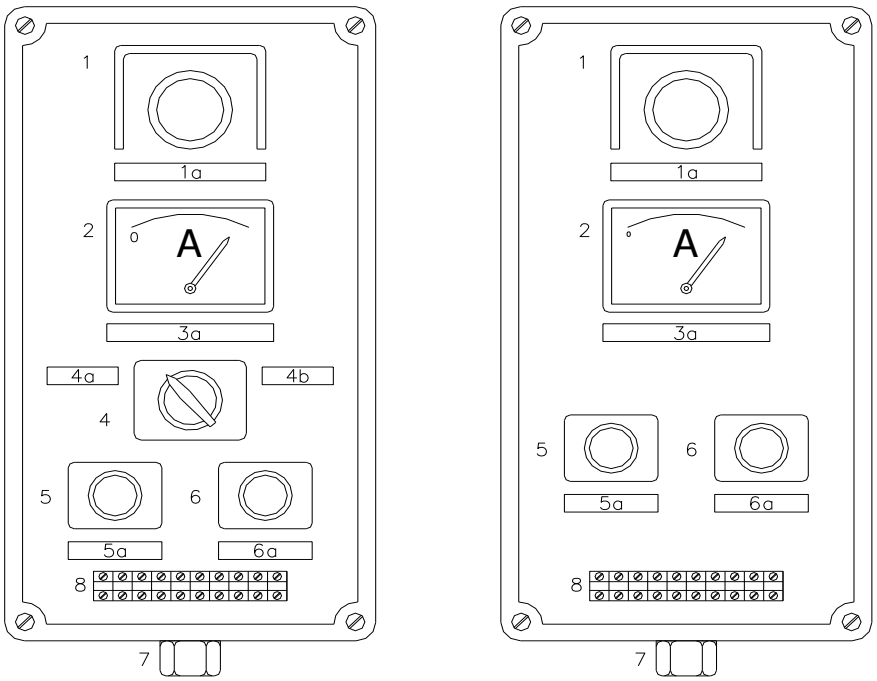


Option 4



Item	Description	Notes
1	Emergency pushbutton with protecting guard and lock	2xNC, 6A, 500V
1a	Plate – Emergency pushbutton	
2	Ammeter – overload capacity x 5, adjustable red pointer for rated current indication.	72x72mm, .../1A
3a	Plate with process number, e.g. 100 MS-MP1A	
4	„Local – Remote" switch	16A, 500V
4a	Plate – Remote control	
4b	Plate – Local control	
5	„Start" pushbutton	6A, 500V (1xNO)
5a	Plate - START	
6	„Stop" pushbutton	6A, 500V (1xNC)
6a	Plate - STOP	
7	Cable gland – metric cable glands are preferred	
8	Terminal strip – EEx e , for Ex-zone	min.4mm^2, 500V

Control boxes for motors - standard design



Item	Description	Notes
1	Emergency pushbutton with protecting guard and lock	6A, 500V (1xNC, 1xNO)
1a	Plate – Emergency pushbutton	
2	Ammeter – overload capacity x 5, adjustable red pointer for rated current indication.	72x72mm, .../1A
3a	Plate with process number, e.g. 100 MS-MP1A	
4	„Local – Remote" switch	16A, 500V
4a	Plate – Remote control	
4b	Plate – Local control	
5	„Start" pushbutton	6A, 500V (1xNO)
5a	Plate - START	
6	„Stop" pushbutton	6A, 500V (1xNO)
6a	Plate - STOP	
7	Cable gland – metric cable glands are preferred	
8	Terminal strip – EEx e , for Ex-zone	min.4mm^2, 500V

5.4.4 Intermediary junction boxes of motors

Local intermediary boxes are required for feeding of 0.4kV motors. All cable entrances for intermediary boxes shall be located on bottom side of the box.

The boxes shall be provided with brass plate mounted in bottom part of the box, and connected to internal and external PE earthing terminal by means of yellow-green copper strand. Earthing junction boxes only using power cable PE core are not allowed.

The white plate of dimensions 40x15 mm shall be mounted on the box, with full technological number, engraved in black colour. The plate shall be bolted to enclosure. The plate shall be bolted to enclosure by the manufacturer manner only.

Intermediary boxes for low voltage motors of power 25 kW and higher, shall be provided with draining stuffing boxes.

Scope of delivery includes the boxes together with all necessary accessories, as terminal strips, PE busbar, stuffing boxes, internal wiring, etc.

For purposes of 10 kV, 6kV motors supply, use of intermediary box in normal conditions is not recommended; in separate cases it shall be agreed with LOTOS Group S.A.

5.5 Technical requirements

5.5.1 Control boxes

Explosion protection:

Ⓔx II 2G Ex de II...;

terminals : Ⓔx Ex e II…

Rated voltage:	500V AC minimum
Rated current:	6A minimum, for contacts and terminals
Degree of protection:	IP 65 (For Non-Ex local control stations for indoor location, IP56 can be used)
Terminal strip:	min.8 terminals + 2 PE, Cu 4mm^2
Ammeter:	n/1A (an option required for motors of power 10 kW and higher)

5.5.2 Intermediary boxes of motors

Explosion protection:	II 2 G Ex e IIC T4 minimum
Rated voltage:	500V AC minimum
Rated current:	6A minimum, for terminals
Degree of protection:	IP 56
Terminal strip:	min. 3 terminals + min. 2 PE + external PE terminal or PE connection

5.5.3 Explosion protection

Live parts of equipment operating in explosion hazard zones shall be protected with enclosures of flameproof EEx d design.

Junction boxes, terminal boxes and intermediary boxes shall be of reinforced EEx e design.

Minimum requirements:

Ex II 2G Ex e II…;

terminals : Ex Ex e II…

All cable glands shall be certified for operation in Zone 1.

6 Relevant documents

- 4200 „Electrical motors”
- 6120 „Process Identification System ”
- 1020 „Classification of Explosion Hazard Zones”
- Other Technical Specifications, shown on delivered List of Technical Specifications for GL S.A

7 Codes and standards

Control boxes, intermediary boxes and terminal boxes together with accessories shall fulfil requirements of Polish norms and standards listed below, as well as requirements of their European IEC, ISO/CENELEC equivalents:

PN-EN 60529	Degrees of protection provided by enclosures (IP Code).
PN-EN 60079-0	Electric equipment in explosion hazard zones. Part 0. General requirements.
PN-EN 60079-1	Electric equipment in explosion hazard zones. Part 1. Flameproof „d” enclosures.
PN-EN 60079-7	Electric equipment in explosion hazard zones. Part 7. Degree of protection „e”
PN-EN 60947-7-1	Low voltage switchgear and controlgear. Part 7.1 Auxiliary equipment. Terminal strips for copper conductors.
PN-EN 60947-7-2	Low voltage switchgear and controlgear. Part 7.2 Auxiliary equipment. Terminal strips for copper conductors.

8 Record of changes

No.	Date	Description	Introduced by
0		This specification entirely replaces the former LOTOS Group S.A. standard No. PR 07 422 with the same title.	J. Bućko
1	28.04.2011	Review update, incorporated changes after realization P10+	J. Bućko M. Chorosz M. Rompa
2	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 content changes.	T. Wróbel