Grupa LOTOS S.A.	**TECHNICAL SPECIFICATION**	Spec. No.
	General requirements for machines and drives	2400

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1 Subject of specification

This specification used in conjunction with other technical specifications of Grupa LOTOS S.A. establishes the minimum requirements for the design and fabrication of machines and drives.

2 Scope of validity

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

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

2.1 Order of precedence

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 Grupa LOTOS S.A.
- Data Sheets approved by GRUPA LOTOS S.A.
- This specification
- Other Specifications
- Drawings and other documents
- Standards

2.2 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 S.A. or non-compliance with the referred documents / standards and obtain a written explanation from Grupa LOTOS S.A.

3 General requirements

3.1 The operating characteristic of a machine

The required performance and characteristic of a machine shall be described by the data sheet.

3.2 Types of machines

The selected types of machines shall have already been successfully operated in similar applications (references) and they shall be consistent with the recommendations stated by the process licensor.

3.3 Design requirements

3.3.1 Design solutions

Machine design shall ensure the fulfillment of the requirements given in the data sheet and the relevant specifications. They shall be based on advanced, tested solutions ensuring continuous operation in the required conditions. In addition, they shall be in compliance with the current edition of standards applicable to each machine.

Machines shall be fitted with all elements necessary for meeting the requirements of safety and accident prevention regulations.

An especially important aspect shall be the protection against the emission of toxic, flammable and explosive substances, both during normal operation and in case of a failure.

The design of machines must meet the requirements concerning the noise level defined in the equipment data sheets or technical specifications of Grupa LOTOS S.A., and if this is technically not possible, adequate protections shall be designed as well as solutions reducing the noise level to an acceptable value (e.g. noise attenuation enclosure, silencers).

If other documents do not require more stringent values then the sound pressure level is limited to 85dB(A) at 1m distance from the machine.

3.3.2 Materials

The materials used shall be identifiable with ASTM or EN standards. If materials identified by factory names are used their equivalents shall be stated according to the above mentioned standards.

Use of materials containing asbestos is not allowed.

3.3.3 Connections

All flanged connections shall be consistent with ANSI standards.

Piping within a machine shall fulfill the following conditions:

- For nominal diameters up to $1^1/_2$":
- Butt welded pipes and fittings shall have wall thickness not less than SCH 80.
- Pipes and fittings of stainless steel shall have wall thickness not less than SCH 40S.
- Fittings for fillet welding and with threaded endings shall be at least series 3000 lb.
- Flanges shall be at least series 600 lb.
- For nominal diameters 2" and more:
- Pipes and fittings of carbon and low-alloy steels shall have wall thickness not less than SCH 40.
- Pipes and fittings of stainless steel shall have wall thickness not less than SCH 10S.
- Threaded connections shall not be allowed.
- Flanges of nominal diameters $2^1/_2$", 5" and 22" shall not be used at battery limits of supply.

3.3.4 Bearings

Antifriction bearings shall be selected for lifetime L10 as required per machine related standard (API/ISO). Bearings shall be installed directly on the machine shaft.

3.4 Auxiliary equipment

3.4.1 Piping

All piping necessary for the proper operation of the machine (i.e. for lubrication, cooling, flushing) with suitable connections for the supplied instrumentation shall be supplied by the Supplier of the machine. The scope of supply shall include also supports for that piping. Pipelines shall be subjected to a water-pressure test at 1.5x working pressure at the manufacturer's plant. Process piping that is a part of the scope of supply of the machine and that is subject to supervision by a Notified Body must meet requirements stated in specification no. 8800. Piping supplied as prefabricated elements shall be trial-assembled at the manufacturer's workshop.

Lubricating systems of a capacity exceeding 200 l shall have oil sampling points. The sampling points location shall be approved by Grupa LOTOS S.A.

3.4.2 Oil filters

Oil filters used in pressure lubricating systems of machines shall maintain the purity class of oil as below, if higher purity is not required by manufacturer:

- centrifugal compressors, steam turbines — ISO 4406 class 15/12
- centrifugal pumps — ISO 4406 class 16/13
- other machines — ISO 4406 class 17/14

3.4.3 Auxiliary equipment

Elements of auxiliary equipment, such as pressure vessels, heat exchangers, filters that are subject to supervision by a Notified Body, must fulfill the requirements defined in specification no. 8200. Safety valves must meet the requirements of specification no. 8400.

3.4.4 Control and measuring equipment

A machine shall be fitted with a complete set of local instruments necessary for full control, regulation and protection. Instruments shall be typical for refinery industry modified as required by Grupa LOTOS S.A. specifications 3000 series.

PLC control and protection system for compressors and turbines shall be definied at pre-contractual stage of agreement and described in the contract.

3.4.5 Nameplates

Nameplates shall be as per Grupa LOTOS S.A. specification relative to the machine in question. Machines which are not covered with Grupa LOTOS S.A. specifications shall be equipped with nameplate as specified below.

Every machine must have a plate of Cr-Ni 18/8 steel located in a visible place and attached by rivets, which shall contain the following information as a minimum:

- type of the machine
- name of the manufacturer
- factory serial number
- operating parameters
- year of fabrication.

The factory serial number shall also be cast or stamped on the machine casing.

The direction of rotation shall be shown on the casing by means of a cast or stamped arrow.

4 Inspection and testing

4.1 General

Grupa LOTOS S.A. authorized representative shall have the right to inspect the design, materials and workmanship at manufacturer's shop or his subsupplier, and to report thereon at any time during progress of fabrication and after completion. If any incompliance has been discovered in production process (and written in the report) Supplier shall provide explanation in writing. Grupa LOTOS S.A. shall have right to participate in tests and has to be informed in advance to make use of this right.

4.2 Technical inspection and testing of a machine, drive and auxiliary equipment

The Supplier shall provide a separate document of planned inspections and tests (Inspection and Tests Plan) at the manufacturing plant and at the subsupplier's plants.

The Inspection and Test Plan shall include:

- Typical factory inspections
- Required inspections and tests as per technical specifications for each specific machine type
- Inspections and tests indicated on machine data sheet
- Inspections and tests required by law and standards.

Supplier shall state tentative dates of all inspections and tests, in particular the witness tests.

Invitation to inspection or test shall be sent by the Supplier to Grupa LOTOS S.A. two weeks (14 days) before the date of inspection or test.

If it is impossible to carry out the tests at the manufacturer's shop, Grupa LOTOS S.A. may require the Supplier to carry them out on site to verify the guaranteed parameters.

5 Painting

5.1 General

Preparation of the surface for painting shall comply with ISO 8501-1.

For mechanical surface preparation the degree of surface cleanliness St 3 shall be obtained.

For sandblasting the degree of surface cleanliness Sa $2^1/_2$ shall be obtained.

No painting work or spotting-in shall be carried out in the following weather conditions:

- ambient temperature below 5^oC,
- air humidity above 85%,
- metal surface temp. 3^oC below the dew point.

If special requirements have not been specified, the manufacturer's standards shall additionally apply taking into account the operating conditions (the type of the medium, temperature). Special processes and the use of special paints may be required by the project specification or the data sheet.

Grupa LOTOS S.A. reserves the right to receive and review the Supplier's painting procedure at any time during the order.

Painting system is subject to Grupa LOTOS S.A. approval.

5.2 Quality of painting coats

The coating of the equipment shall withstand the environmental and service conditions as specified in the Grupa LOTOS S.A. specifications for a minimum period of five years unless otherwise specified in the data sheets. Paint coats shall be resistant to full range of operating temperature including max. temperature of heating medium.

6 Preparation for shipment

6.1 Protection for the time of transport and storage

The Supplier shall provide adequate protection of the machine and machine elements against corrosion for a period of 12 months.

6.1.1 Machines and their parts

All internal elements that may suffer corrosion shall be protected with appropriate anticorrosion agents.

Loose machine elements, such as spare parts and instruments shall be painted or covered with appropriate grease and tightly enveloped in moisture-proof paper, or they shall be covered with a removable layer of plastic and suitably marked.

All threaded connections of the machine shall be protected by plugs. Flanges shall be blinded with wooden disks or disks of other material to protect against penetration by impurities.

6.1.2 Auxiliary equipment

Elements of auxiliary equipment, such as prefabricated pipelines, valves etc. shall have their ends closed with appropriate protecting plugs. All threaded openings (e.g. drains, vents, instrument connections) shall be protected by suitable plugs.

7 Documentation

Documentation shall be in Polish language or English language with additional translation to Polish. Polish version governs. Translation shall be performed in a neat manner by a person who is familiar with technical terms.

It is also applicable to any notes in drawings.

Supplier is responsible for checking documentation of subsuppliers.

Detailed requirements on documentation are stated in relevant specifications of machines.

8 Spare parts

The machine Supplier shall be obligated to supply with the machine a set of spare parts necessary for commissioning and start-up of the machine and to submit an offer for spare parts for three years operation, based on the Supplier's experience.

9 Special tools

The Supplier of the machine shall be obligated to supply together with the machine all special tools necessary for machine maintenance and overhauls.

10 Relevant documents

10.1 Grupa LOTOS S.A. specifications

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

10.2 Standards

- ISO 8501-1 – "Preparation of steel substrates for the application of paint and similar products".

11 Record of changes

No.	Date	Description	Introduced by
0		This specification entirely replaces the former Grupa LOTOS S.A. standard No. PR 07 240 with the same title.	B. Kowalewski
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