Program plynofikace T700

ORLEN Unipetrol RPA s.r.o.

Číslo projektu: **25PBEB32501/1**

Projekt: **01 Plynofikace dvou kotlů**

Technické místo:	Pol. z vyhl.č. 131/2024Sb.: **D.1.2.8.1 D.1.2.8.1**
DCC: **F01-TS04**	Stupeň projektu: **DETAIL DESIGN**

General Specification Zirconia Oxygen Analyzer

Rev.	Popis	Datum	Vypracoval	Kontroloval	Schválil
4					
3					
2					
1					
0	Pro poptávku / For Inquiry	14.09.2026	MTRO	VJAR	MLAB

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1 Scope

This document specifies the minimum requirements for construction, testing, packing and shipment of Zirconia Oxygen Analyzer to be supplied for the T700 Energetika Litvínov, Orlen Unipetrol RPA ČR. Specific requirements and quantities are identified in the attachments.

2 Definitions

For this specification the following definitions are applicable.

Bidder/Vendor the party that supplies/manufactures equipment and services to perform the duties as specified.

Contractor/Purchaser ORLEN Projekt Česká republika s.r.o., Brno, Czech Republic

Client ORLEN Unipetrol RPA s.r.o., Litvínov, Czech Republic

Wherever the word „**shall**“ has been used, its meaning is to be understood as mandatory.
Wherever the word „**should**“ has been used, its meaning is to be understood as recommended or advised.
Wherever the word „**may be**“ has been used, its meaning is to be understood as freedom of choice.
Specifications, Requisitions, Instructions, Specification Sheets, Standards, Drawings, and all other pertaining Documents are defined as “**Documents**”.

3 Reference documents

The zirconia oxygen analyzers, probes, transmitters and accessories covered by this specification shall conform to the requirements of the latest edition, unless indicated otherwise, of the following codes and standards:

EN 1092-1	Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code).
IEC 60079-0	Electrical Apparatus for Explosive Gas Atmospheres. – General Requirements
EN 60079-1	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
EN IEC 60079-14	Explosive atmospheres - Part 14: Electrical installation design, selection and installation of equipment, including initial inspection
EN 10204	Metallic Products – Types of Inspection Documents.
EN IEC 61000	Electromagnetic Compatibility - EMC
EN IEC 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.
EN IEC 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
Directive 2014/34/EU	Equipment and protective systems intended for use in potentially explosive atmospheres — ATEX
Directive 2014/30/EU	Electromagnetic compatibility — EMC
EN 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK Code)

Appropriate Czech republic application testing, pre-calibration and application license shall be supplied in case of requirement.

4 General

It is Vendor’s responsibility to ensure that all parts/materials of equipment in his offer shall comply with the requirements of standards and the specification.
The Vendor shall inform the Contractor about any conflict or ambiguity found in this specification.
The Vendor is responsible for the correct selection of proper equipment and its material with respect to the conditions and application specification described herein the requisition.
The Vendor shall be responsible for the design, engineering, coordination of Sub-Vendors/Vendors, testing and delivery of the equipment.

In the case of any conflict between the specified process conditions and parameters of any item are found, the Vendor shall inform the Contractor immediately and send the reasons in writing form.

5 Site conditions

All equipment of this specification shall be located in T700 Energetika, Unipetrol RPA, Litvínov ČR.

Outdoor conditions

Design Temperature	-25 - +40°C
Area up to 2m from Natural & Heat Gas piping/burners	Zone 2 IIC T3
Other Surrounding Area	Non-Hazardous, dust and soot
Corrosive air pollutants	low concentration aromatic hydrocarbons

Indoors conditions

Design Temperature	+5 – +50°C
Area up to 2m from Natural & Heat Gas piping/burners	Zone 2 IIC T3
Area classification	Non-Hazardous
Corrosive air pollutants	Not expected

Environmental conditions:
The equipment and accessories shall be located in the plant area and above grade. It is required that all herein specified instruments shall endure all above mentioned site conditions within the working life.
All necessary devices to prevent damages from shipping and erection shall be included.

6 Specification

6.1 General

Vendors shall include compliance with the Contractor's specification tag wise. Deviations if any from the specification shall be listed separately.
Equipment design, its installation shall comply with requirements specified in reference documentation (see Chapter 3).
It is the responsibility of the Vendor to ensure that the supplied Zirconia Oxygen Analyzer meet all the requirements of this specification together with the related attachments and data sheets.
Prototypes shall not be allowed; only a proven design shall be acceptable.
The devices and their accessories shall therefore be suitable for the intended process duty and for the environment of the installed plant area.
Vendor shall provide following services:

- Completion of the attachments where requested.
- Confirmation of the requirements as per this specification and the attached data sheets.
- Inform the buyer of any irregularities found in this specification and the attached data sheets.

All necessary devices to prevent damages from shipping and erection shall be included.

6.2 Zirconia Oxygen Analyzer

6.2.1 Zirconia Oxygen Analyzer and accessories

The Supplier shall provide in-situ zirconia oxygen system suitable for continuous measurement of oxygen concentration in flue gases for boiler combustion control purposes.
As Hazardous area inside flue gas channels can appear the construction of probe/oxygen detector shall be suitable for the area e.g. ATEX certified. Other components of the system shall be located in safe area.

The analyzer system shall be designed for reliable long-term operation in industrial boiler service, with stable measurement performance and low maintenance requirements.

The supplied probe and associated remote electronics shall be:

- based on the zirconia solid electrolyte measurement principle
- suitable for high-temperature flue gas service at the specified process conditions
- configured for continuous operation in boiler combustion control loops

1. Base Configuration - Instrument-Only / Manual Calibration

As the base configuration, the analyzer shall allow calibration initiated and performed from the analyzer/transmitter electronics or local display, without automatic calibration valve/sequencer hardware.

- The base calibration shall:
  - be operator-initiated from the instrument or service interface
  - allow span calibration using atmospheric air or a defined O_2 span gas; zero gas shall not be required for the base configuration unless recommended by the Vendor
  - be intended for operational checking and adjustment for boiler control service rather than for laboratory-grade calibration
- The analyzer electronics shall internally support offset and gain correction, even if only span calibration is used during normal operation

The analyzer system is intended primarily for:

- **boiler combustion control optimization**
- not for emission certification or high-precision laboratory measurement

Therefore, priority shall be given to:

- reliability
- robustness
- simplicity of operation
- low maintenance requirements

2. Option 1 - Semi-Automatic Calibration (Zero + Span)

As a separately priced option, the analyzer may be supplied with a semi-automatic calibration system, including:

- capability for **two-point calibration (offset + gain)**
- use of:
  - low oxygen calibration gas, e.g. approximately 0-1% O_2 in N_2
  - span calibration gas, e.g. air or a defined O_2 mixture
- calibration sequence:
  - guided by the analyzer electronics
  - with manual connection or manual switching of calibration gases, either locally or from a remote valve manifold

The semi-automatic calibration scope shall include:

- connection points for calibration gases
- required pressure regulators, filters and basic instrumentation for the offered solution
- calibration gas cylinders

The system shall allow operator-initiated calibration and shall not require automatic solenoid valve/sequencer hardware.

3. Option 2 - Fully Automatic Calibration System (Zero + Span)

As a separately priced option, the analyzer may be supplied with a fully automatic calibration system, including:

- automatic sequence control of:
  - zero gas
  - span gas
  - purge cycle
- automatic actuation of solenoid valves

- programmable calibration intervals and/or calibration triggering from analyzer diagnostics or DCS/PLC

The fully automatic calibration scope shall include:

- integrated or separate **calibration valve assembly / sequencer**
- **solenoid valves for automatic calibration gas switching**
- calibration gas cylinders
- full compatibility with remote start, permissive and status monitoring from DCS/PLC

The analyzer shall provide signals for:

- calibration active / in progress
- calibration success / failure
- analyzer fault status

The fully automatic calibration system shall be suitable for unattended operation.

For each offered calibration variant, the Bidder shall clearly state:

- calibration philosophy (instrument-only/manual, semi-automatic or fully automatic)
- required utilities, including calibration gases, instrument air and power supply
- scope of supply, exclusions and separate price for the calibration system components
- required DCS/PLC I/O interface for each calibration variant, including quantity of AI (analog input), DI (digital input) and DO (digital output) signals, signal descriptions and signal type

Detail specifications are in following documents:

- 24LT7P-01-IS-131 Zirconia Oxygen Analyzer Specification

6.2.2 Take-off

24LT7P-01-ID-512	Zirconia Oxygen Analyzer – Battery Limits

6.2.3 Transmitters

The remote type of transmitter is preferred. The transmitter shall be located in the Safe Area.
The probe is located in Hazardous area and shall be certified by the Authorities as suitable for the hazardous area classification specified in the data sheets.

Signal Interface

Transmitters shall provide configurable upscale/downscale fail-safe output and diagnostics. The electronics shall include polarity protection and shall be microprocessor based. Isolated output analogue signal 4 ÷ 20mA interface with HART shall be internally wired to the screw terminal strip.
All available binary signals shall be internally wired to the screw terminal strip. Potential free contacts of 24VDC SPDT type are preferred. List of alarms as a minimum:

- Calibration on – free contact
- General Analyzer fault– free contact

The serial link communication RS 485 (Modbus) or Ethernet e.g. connector at analyzer unit can be included.

Power Supply Interface

Supply voltage of analysing system equipment shall be 230VAC, 50Hz from UPS. Vendor shall indicate in the bid complete consumption requirements.
Where used, printed circuit boards shall be modular plug-in type, protected against corrosion and vibration. Terminal blocks shall be ceramic type and suitable for conductors up to 2,5 mm^2.
Terminals shall be corrosion-resistant and shall allow the sensing element/cell wiring to be disconnected without removing the terminal block, where applicable.
Each complete analyzer set shall be tested to meet the specified range and functional requirements stated in the requisition.

Transmitters shall be protected against radio frequency interference (RFI) and electromagnetic interference (EMI) in accordance with the IEC 61000 series.
Transmitters shall be factory configured and calibrated to the Contractor-specified range. Calibration and functional test certificates for the complete analyzer set shall be provided.

Vendor shall state and guarantee the measurement accuracy of the complete zirconia oxygen analyzer system. The accuracy and linearity shall be suitable for boiler combustion control applications and shall typically be as sum better than +/-1 vol.% O_2 within the normal operating range.

Repeatability shall be stated by Vendor and shall typically be better than +/-0.5 vol.% O_2. Response time shall be as 90% up to 5s.

Vendor shall state zero and span drift. Long-term drift shall be suitable for boiler control service and shall not exceed +/-1 vol.% O_2 per year under stable operating conditions and with the recommended maintenance/calibration.

6.2.3.1 Transmitter Housings

The zirconia oxygen analyzer transmitter housing shall meet the following requirements:

A) Head shall be weatherproof (min. IP 65 as per IEC 60529)
B) Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts min. IK07 (EN 62262)
C) Cable/conduit entry shall be metric e.g. M20x1,5 (cable glands for cables among probe, transmitter and accessories are in the scope of delivery)

The enclosure finish shall be manufacturer's standard.

6.3 Tag Plate

Each zirconia oxygen analyzer probe and each remote transmitter shall be provided with a stainless-steel tag plate or label showing the client's tag number and customer description. The tag plate shall be attached in a prominent position by stainless-steel wire. Letter height on the tag plate shall be 7 mm and engraving depth shall be 0,6 mm as minimum.

Probes:

TK20HBK30 CQ001 -B01 O_2 1 ve SPALINÁCH VÝST z EKO 3	**TK20HBK30 CQ002 -B01** O_2 2 ve SPALINÁCH VÝST z EKO 3
TK19HBK30 CQ001 -B01 O_2 1 ve SPALINÁCH VÝST z EKO 3	**TK19HBK30 CQ002 -B01** O_2 2 ve SPALINÁCH VÝST z EKO 3

Remote Head Transmitters:

TK20HBK30 CQ001 -U01 O_2 1 ve SPALINÁCH VÝST z EKO 3	**TK20HBK30 CQ002 -U01** O_2 2 ve SPALINÁCH VÝST z EKO 3

TK19HBK30 CQ001 -U01	TK19HBK30 CQ002 -U01
O_2 1 ve SPALINÁCH VÝST z EKO 3	O_2 2 ve SPALINÁCH VÝST z EKO 3

6.4 Manufacturer's Identification Plate

Letter height shall be 5 mm as minimum. Zirconia Oxygen Analyzer shall have a permanently fixed identification plate with the following information as a minimum:

- Client Tag Number
- Serial Number
- Full Model code

7 SCOPE OF SUPPLY

The scope of supply shall include but not necessarily be limited to the following items:

7.1 Material Requirements

Vendor shall supply the Zirconia Oxygen Analyzer in quantities specified in document 24LT7P-01-IS-131 Zirconia Oxygen Analyzer Specification including:

- Zirconia Oxygen Analyzers and required accessories
- Tag plate
- Itemized Spare parts for erection and commissioning
- Itemized Spare parts for 2-years of operation – as Option
- Transport packing
- Special tools to disassemble (if any)

7.2 Non-Material Requirements

Vendor shall provide:

- all requirements mentioned in doc. 24LT7P-01-IN-050 Schedule of Required Technical Documentation
- 24LT7P-00-DI-003 Documentation Instruction for I&C and ELE
- Testing, examination and inspection
- Manufacturing Data Report,
- Preparation for shipment

7.3 EXCLUSIONS

Following work and deliveries do not belong to Vendor's scope of supply:

- Site erection

8 INSPECTION AND TESTING

See commercial part of inquiry, doc. No.:
24LT7P-00-QC-001 - Requirements for Quality Assurance acc. to EN

9 PREPARATION FOR SHIPMENT

See commercial part of inquiry, doc. No.: 24LT7P-00-PC-003 - Requirements for packing, marking, expedition, Time schedule and progress report.

10 SPECIAL TOOLS AND WRENCHES

A complete set of special tools and wrenches for equipment installation, maintenance and repair shall be included in the supply. These or similar special tools shall be used during the shop assembly and post-test disassembly of the equipment.
The special tools shall be packed in separate, rugged metal boxes and marked “special tools for (tag/item number).” Each tool shall be stamped or tagged to indicate its intended use.
The Bidder shall include in his proposal a list of the necessary tools and wrenches.

11 PAINTING

All carbon-steel or low/intermediate alloy-steel parts not in contact with the medium shall be painted.
Paint shall be in accordance with manufacturer's standard. Paints shall not contain sulfur, lead, zinc, chloride or any harmful metal, which causes corrosive attack.
The paint shall be suitable to withstand the design temperature as indicated in the data sheets.
Manufacturer's proposed paint systems are subject to contractor's approval.

12 DRAWINGS AND DOCUMENTATION

Vendor shall provide complete set of documentation as specified in the:

- doc. No.: 24LT7P-01-IN-050, Schedule of Required Technical Documentation
- doc. No.: 24LT7P-00-DI-003, Documentation Instruction for I&C and ELE; see commercial part of inquiry

13 ASSISTANCE

Vendor shall confirm, as an OPTION, his availability for possible assistance for equipment erection, commissioning and start up. Vendor can provide site supervision for construction, commissioning and start-up, according to agreed per-day rates.
Vendor’s supervisor shall bring with him to the site, its own printed copy of the documentation.
In the similar way the Vendor shall provide daily rates for staff training courses.

14 TECHNICAL PROPOSAL PREPARATION

The bid shall be prepared and sent in accordance with the inquiry documents.

Vendor’s / Bidder’s quotation shall contain as minimum:

- Complete specification of the selected zirconia oxygen analyzer system, including the selected calibration variant and all quoted options
- DCS/PLC I/O list for each calibration variant, including the required quantity of AI, DI and DO signals
- CE or CZ certificates of Vendor and proposed production
- Itemized Spare parts information – filled in document 24LT7P-01-IN-051
- Delivery time for each Option (see calibration variant)
- Deviation List – document 24LT7P-01-IX-131. Bidder shall submit the completed deviation list. If there are no deviations, the Bidder shall state “No deviation”.

15 SPARE PARTS

The Vendor shall separately specify:

- Recommended quantity filled in document 24LT7P-01-IN-051
- Delivery Period
- Unit price

of spare parts / instruments and accessories for:

- Pre-commissioning, commissioning and start-up
- Price itemized 2 years operation

16 QC Documentation and certificates

The equipment and their accessories shall be fully checked prior to shipment.

Vendor shall submit the Quality control documentation for approval to demonstrate that the equipment performs the specifications.

All certificates shall state the Manufacturer's name and location; all forging certificates shall be from original forge. Certificates should include the purchase order number.

17 Attachments

Document Number	Description
24LT7P-01-IS-131	Zirconia Oxygen Analyzer Specification
24LT7P-01-IN-050	Schedule of Required Technical Documentation
24LT7P-01-ID-512	Zirconia Oxygen Analyzer – Battery Limits
24LT7P-01-IN-051	Spare part lists - Zirconia Oxygen Analyzer
24LT7P-01-IX-131	Deviation List - Zirconia Oxygen Analyzer