Program plynofikace T700

ORLEN Unipetrol RPA s.r.o.

Číslo projektu: **25PBEB32501/1**

Projekt: **01 Plynofikace dvou kotlů**

Technické místo: **<Technické místo>**	Pol. z vyhl.č. 131/2024Sb.: **<Položka dle 131>**
DCC: **F01-TS04**	Stupeň projektu: **DETAIL DESIGN**

General Specification CEMS + AES

Rev.	Popis	Datum	Vypracoval	Kontroloval	Schválil
4					
3					
2					
1	K poptávání / For Inquiry	20.10.2026	Vladimír Jaroš	Michal Troščák	Marcel Labor
0	Ke schválení / For Approval	10.07.2026	Vladimír Jaroš	Michal Troščák	Marcel Labor

Reprodukce, šíření a využívání tohoto dokumentu je bez výslovného souhlasu společnosti [ORLEN Projekt Česká republika s.r.o.] zakázáno.

Content:

1 Scope 4
2 Definitions 4
3 Reference documents 4
4 General 5
5 Site conditions 5
6 Specification 6
6.1 General 6
6.2 Situational review 6
6.3 General 6
6.4 Concept 7
Sample probe 7
Change-Over and Purging Valves (COPV) – Option 8
Sample conditioning system 8
Analytical measuring system 8
6.5 Dust measuring system 8
6.6 Calibration of the system 9
6.7 Automatic Evaluation System (AES) 9
6.8 Ecological Information System (EisOrgNet) 9
6.9 Analyzer Protective Cabinet 9
6.10 Analyzer Container (AC) 9
6.11 Interfaces 10
Tubing Interface 10
Signal Interface – Data Acquisition and Handling System (DAHS) 10
Power Supply Interface 10
6.12 Accessories 10
Calibration facility 10
HVAC system 11
Earthing & Lightning Protection 11
Tag plate 11
Nameplate 11
Special requirements 11
6.13 Vendor List 11
7 CEMS / AMS + AES SCOPE OF SUPPLY 12
7.1 Material requirements 12
7.2 Non-material requirements 12
7.3 Exclusion 12
8 INSPECTION AND TESTING 13
8.1 Inspection 13
8.2 Testing 13
General 13

Factory Acceptance Test 13
General description for tests prior to shipment..... 14
9 PREPARATION FOR SHIPMENT 14
10 SPECIAL TOOLS AND WRENCHES..... 14
11 PAINTING 15
12 DRAWINGS AND DOCUMENTATION..... 15
13 ASSISTANCE..... 15
14 TECHNICAL PROPOSAL PREPARATION 15
15 SPARE PARTS 15
16 SITE COMMISSIONING AND START-UP..... 16
17 ATTACHMENTS 16
17.1 Project specifications 16
17.2 Flue gas Composition..... 17
17.3 Emission Limits..... 18

1 Scope

The scope of the present specification is to define the minimum requirements for the design, manufacture, inspection, testing and the limit of supply of Continuous Emission Gas Analyzers for Automated Measurement Systems (AMS), Evaluation SW+HW for Local Authorities and Protection Cabinets.
Items listed in doc. No. 24LT7P-00-IN-052 to be installed for T700 Energetika Litvínov, Orlen Unipetrol RPA ČR.

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

Equipment and materials covered by this specification shall conform to the requirements of the following codes and standards (latest edition), unless indicated otherwise.

[1]	EN 14181	Stationary source emissions – Quality assurance of automated measuring systems
[2]	EN ISO 14956	Air quality – Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty
[3]	EN 15259	Air quality – Requirements for measurement sections,sites,objective,plan and report
[4]	EN 15267	Air quality – Certification of automated measuring systems – All parts
[5]	IEC 61285	Industrial-process control-Safety of analyzer houses
[6]	API RP 555	Process Analyzers
[7]	EN 1092-1	Steel pipe flanges, flanged valves and fittings
[8]	ISO 228, part 1	Pipe Threads where pressure-tight joints are not made on the threads. part 1: Designation, dimensions and tolerances.
[9]	ISO 724	ISO general purpose metric screw threads - Basic dimensions
[10]	ISO 128	Technical drawings – General principles
[11]	EN 10204	Inspection documents for metallic products
[12]	IEC 60079	Electrical apparatus for explosive gas atmospheres
[13]	IEC 60529	Classification of degree of protection provided by enclosures
[14]	IEC 61000	Electromagnetic Compatibility (EMC) – All parts
[15]	98/79/EEC	CE Marking
[16]	ANSI B1.20.1	Pipe Threads, General Purpose (Inch).
[17]	EN DIR. 2001/80/EC	Directive on the limitation of emissions of certain pollutants into the air from large combustion plats
[18]	NACE MR0175	Sulfide Stress Corrosion Cracking Resistant Metallic Materials for Oil Field Equipment
[19]	EN ISO 12944-5	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems
[20]	EN 17255	Stationary source emissions - Data acquisition and handling systems (DAHS)
[21]	ČSN EN 17025	General requirements for the competence of testing and calibration laboratories

[22] The Law č.25/2008 — The integrated register of environmental pollution and integrated system for fulfilling environmental reporting obligations

Appropriate Czech application testing and application license shall be supplied in case of requirement.

4 General

Design and construction shall be carried out in accordance with specifications, codes, standards and data sheets, listed herein. These shall be considered as integral part of this specification, as applicable.
Vendor shall clearly state on its proposal the acceptance of the responsibility for design, fabrication, assembly and testing procedures of the equipment and shall provide mechanical guarantee to cover the design.
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 General specification. The Vendor shall be responsible for the design, engineering, coordination of Sub-Vendors/Vendors, testing and delivery of the equipment.
The Vendor shall inform the Contractor about any conflict or ambiguity found in this specification.
Any comment and deviations from the specified design Codes for the components proposed according to Vendor's internal standards shall be clearly evidenced on the attached Deviation list Form and must be submitted for the approval of Purchaser.
The equipment will be expected to operate for the life of the Boiler which is taken to be 30years. Stress levels shall be kept to levels which ensure a creep life at the maximum temperature of at least 100,000 operating hours.

Order of priority
The order of priority of the documentation is the following:

1. Contract
2. Project specifications
3. This specification and relevant attachments
4. Codes and Standards
5. Vendor's bid

In case of conflict between the requirements of this specification and data sheets or related standards and codes the most stringent shall be followed.

5 Site conditions

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

Outdoor conditions

Design Temperature	-33 ÷ +40°C
Area up to 2m from Fuel Gases piping/burners	Zone 2 IIC T3
Other Surrounding Area	Non-Hazardous, dust and soot
Corrosive air pollutants	low concentration aromatic hydrocarbons

Indoor – Container conditions

Design Temperature	+5 – +35°C
Area classification	Non-Hazardous
Corrosive air pollutants	Not expected

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.

Utilities for instruments
Utilities available on site are as follows:

Instrument air pressure	Minimum	3,0 bar(g)

Design 10,0 bar(g)

Electricity: 3N/PE 400VAC, 50 Hz TN-S or 1N/PE 230VAC-50 Hz TN-S of UPS Power supply 24 VDC for solenoid valves – by Vendor

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.
All supplied instruments and equipment shall comply with standards listed in Chapter 3) and appropriate Czech standards. In case of ambiguity more rigorous requirement shall be followed.
It is the responsibility of the Vendor to ensure that the supplied analyzer equipment and accessories 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 nameplates, tag numbers, warnings and description shall be in order with approved Design and only in Czech Language. The list of nameplates and warnings shall be handed over to Client for Approval.

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

6.2 Situational review

Two pcs of Boiler shall be installed then two sets of CEMS and one set of AES are required to be provided.
The Boiler is designed for firing of two basic fuel gas mixtures based on the natural gas – see chapter below.
Control range of any boiler shall be within 30 to 100 %.
The system includes emission measurement units in accordance with European directives (flue gas and incineration conditions) as an extractive online measurement system to be located in a dedicated container.
Emission measurement according to EN 15259. On site two flue gas lines are installed.
The flue gas from the boiler shall be continuously monitored and recalculated to reference oxygen value, Nm3/h and dry gas..
Sample probe and heated line shall be connected to analyzer cabinet with CEMS. CEMS installation and start-up shall be in accordance with QAL 2 requirements.
Each flue gas line will be equipped by Contractor with all supporting steel structures, anti-vibration devices, necessary ladders, platforms and equipment required by the Regulatory Authorities (such as measuring points for air emission measurements, lightning protection, etc.).
Actual ID of a flue gas line is approximately H x W 2490x1690mm – it shall be confirmed before PO.

6.3 General

The gaseous emissions shall be monitored with a use of Continuous Emission Monitoring System (CEMS). The system will be designed to monitor emissions of O_2, CO, SO_2, NO_X and dust. Measured on line concentration will be used for recalculation of the monitored components to reference air value. The levels of NOx shall be reported as the sum of the nitrogen oxide and nitrogen dioxide and expressed in units of nitrogen dioxide equivalent.

The CO_2 should be calculated in AES according to requirements of EU ETS / ISPOP and to be available for Owner and Local Authorities. As preferred alternative direct measurement od CO_2 actual values to be proposed.
The system shall be designed to record and report the parameters as required by the Integrated Pollution and Prevention Control Authorization for the Plant.
The recalculation of measured values from ppm to mg/Nm^3 units will be done by a dedicated Approved Evaluating Emission system (AES) and SW that is included in the scope of delivery. The SW should be also able to report Czech system "ISPOP" in semiautomatic or automatic connection.

Additional important information:
In the future - next to the CEMS can appear a requirement to be installed the analyzer of NH_3 +H_2O as the low emission NO_x technology SCR type could be installed at the Boiler. Consideration of two lines in the heated hose shall be used as basic eg. do apply the principle in the Bid.

6.4 Concept

The CEMS analyzers shall be provided as a package unit placed in the cabinet. The CEMS cabinet "TKxxCFF10" shall be located inside Air-conditioned Analyzer Container (AC) "TKxxUCL10", located on the ground under to the Boiler flue gas line.
The complete system CEMS should contain the following devices and components but not limited:

a. Heated Sample probe – two connections
b. Heated sample gas hose – double tubing
c. Components for sample conditioning
d. Common multi-component analyzers of O_2, CO, SO_2 and NOx for emission measurement
e. Solution for CO_2 evaluation as per ETS/EU and ISPOP requirements – as noted herein
f. 3-way manifolds for selection or purging of sample lines with remote control – if necessary
g. Fully equipped CEMS Cabinet (Rittal 800x800x2000-100)
h. Flue gas exhaust – 3m tubing, water drain bottle with high level switch
i. All assembly material for individual components of CEMS
j. All signal and power cabling/wiring among components of CEMS and signal handling remote I/O system or PLC with I/O devices to be connected/transferred to AES located in auxiliary control room SO1122.243.
k. Other auxiliary equipment and full wiring inside the CEMS cabinet
l. Cabinet allow reading of analyzers LCDs, common or failure statuses without opening the cabinet doors, cabinet shall be equipped with the plinth for cable input/output
m. Whole system for Measurement of Dust/Soot concentrations in flue gas channel behind the boiler
n. Spare terminals inside the cabinet for flow, temperature and pressure measurement of flue gas (e.g. 3-4 pcs of AI), direct HW connection from DCS
o. Auxiliary integral CEMS "power switchboard" including surge protection B and C

Options:

p. Calibration gases for analyzers – start-up, commissioning, testing and 1-year operation

Analyzers shall have 4÷20mA analogue output signals for each component connected to Evaluation part of AMS (data evaluation-logger unit).

Sample probe

Sample probe installation shall be confirmed after Vendor selection. It shall be then shown on the drawing 24LT7P-01-ID-808-A0208.
Flue gas sampling will be done with use of heated sample probe installed at the flue gas duct. Heated sampling hose to the measuring system located in the analytical container then transports flue gas sample. Temperature controller controls the temperature of the heated line.
Sample probe and sample delivery system shall include following items but not only:

a. Heated sample probes with protective cover for ambient conditions

b. Heated sample lines (heated hoses) with SS end fittings and tube <7mm

The sample gas brought to the analytical container from sampling point by the heated hose is led to the gas cooler. Preliminary length of heated hose is cca 20m for Boiler line.
Exact hose length shall be confirmed up to 2 weeks after PO placement.

Change-Over and Purging Valves (COPV) – Option

Before sample conditioning system a set of manifolds shall be installed. The reason is to allow change of inputs, purging of unused line for a period time and stop the sample flow. A drain bottle with a HH switch shall be provided for each sample line before COPV.
Material of manifolds shall be 316SS as minimum, it shall be heated and resistant to flue gas sample. If the coil is used to maintain manifolds a 24Vdc low power coil (<5W) should be provided.
Manifold process connection should be NPT thread.
Cable glands shall metric M20 and included in the delivery.

Sample conditioning system

Sample conditioning system is shown on the drawing 24LT7P-01-ID-091.
This drawing is only example. The drawing will be changed according to manufacturer´s design after owner´s approval of bidder.
The cooler can has two cooling heat exchangers, connected into a series. To maximize the cooling efficiency the sample gas pump can be located between the first and second cooler's units. The temperature at the cooler outlet is set to 4-5°C. The gas pump should be equipped with a by-pass valve, regulating the sample gas output from the pump. Behind the pump and before the second cooling unit the calibration 3/2-way solenoid valve is installed. In the gas path then there is a relief valve protecting analytical system against overpressure damage. At the cooler gas outlet an acid coalescing filter is installed to protect the analyzer against acid aerosols. In the gas path there is then installed fine dust filter. In the acid filter body, there can be a moisture sensor.
Peristaltic condensate pumps remove the condensate water from the first and second cooling units of the cooler. The condensate is collected in a condensate vessel with a high-level alarm switch. The switch shall be connected to the DCS.

Analytical measuring system

The conditioned gas can be divided into two gas paths GP1 and GP2 behind the sample conditioning system. Each gas path flow is controlled with a flow meter with needle valve. Converter with carbon cartridge performs conversion of the present NO_2. A special fine dust filter, removing smallest dust particles that can get out of the carbon cartridge of the converter, once more filters gas outlet from the converter.
The conditioned sample gas is brought to the analyzer. The methods used for the measurement should be standard photometric NDIR methods for NO, SO_2 and CO and paramagnetic method for O_2. Measuring ranges are set to cover the expected concentrations of the monitored components in the flue gas with the respect to the operational limits.
The NO_x analyzer will be provided with performance specifications in accordance with ISO 10849 or equivalent.
CO, SO_2 and O_2 analyzers will be provided with performance specifications in accordance with the ISO 12039.
The analyzers are configured so that they measure the concentration in ppm units. This is done because the calibration gases are preferentially supplied as ppm concentration certified standards. Recalculation of the ppm concentrations to mg/Nm^3 is performed by AES (dedicated Automatic Evaluation System).
Calibration of the analyzer shall be automatic or by command from operator screen or locally on demand.
Vendor shall ensure proper installation in separated cabinet and all connection to the CEMS and AES system with data logging and reporting to Local Authorities.

6.5 Dust measuring system

One dust concentration measuring systems shall be provided for the boiler. Transmitter and receiver shall be located on line and control unit with LCD display and manual control can be located in common Analyzer Container. Distance shall be approximately up to 25m.
Control unit shall provide a 4-20mA signals, discrete status signals and RS485 Modbus Protocol.
The measuring system shall be provided in accordance to installation conditions indicated in attached Project Specifications and environmental condition mentioned here above.
Required length of the adjustment flanges is (preliminary 450mm with OD 89mm) and material shall correspond to process temperatures of the flue gas.
Weather protection covers shall be also provided.

6.6 Calibration of the system

The calibration of the system shall be fully automatic or activated by operator pressing the push button on DCS monitor inside Control Room (CR) or locally on demand from the analyzer's LCD panel. The calibration gas cylinders are connected permanently to the system with stainless steel/PTFE tubing. Cylinder reduction valves, flow meter needle valve three 2/2-way solenoids and one calibration solenoid valve 3/2-way control gas flow.
Vendor shall offer as option calibration gas bottles including pressure reducing regulators with pressure gauges, manifolds etc. for rent and 1-year operation. Calibration gas cylinders should be installed in the separated room in the AC. Assembly instruction and installation requirements to the cylinders with calibration gasses in AC are to be provided according to [4] and attached Project specifications.

6.7 Automatic Evaluation System (AES)

As a part of complete Environmental Monitoring system the AES shall be included. It is evaluating SW of data received from measuring analyzers in accordance with CZ standards. The PLC should be used for data collection and desktop PC DELL or equal shall be used for visualization of the evaluated data and data logging. The AES SW and equipment should be only one for both boilers.
The PLC shall be located in the Analyzer Cabinet and desktop PC in new IT cabinet (Rittal 800x800x2000-200 type) in the I&C Room inside the Boiler house SO1122.243, on +8,0m.
Manufacturer DELL is recommended for desktop PC including HDD with RAID 1; RAM 16GB as min. recommended. The operator monitor and keyboard shall be provided by Vendor and connection to desktop PC as well.
The PLC shall be connected to main DCS system communication link with a net. It will allow to separate the Datalogger in desktop PC from the process unit bus.
External connection from Environmental Authorities (to be ready) should be connected to AES desktop PC ports – the application „EMON“ shall be installed on the server, and the PROMOTIC development environment (SCADA system) allowing to collect and evaluate data from continuous emission measurement (AMS), located in CEMS cabinets.
Both the EMON server application and the PROMOTIC development environment are designed with regard to the existing solution on the T700. The PROMOTIC server application has an integrated https server, which allows access to the visualization system from computers in the LAN network without the need to install the PROMOTIC system on individual PC stations.

6.8 Ecological Information System (EisOrgNet)

The entry into the existing ecological information system (EisOrgNet), the new technology of the K19 and K20 boilers, will be implemented by a separate new web server application “EisOrgNet”, which will run on a new server located in the new IT cabinet for the K19 and K20 boilers.

6.9 Analyzer Protective Cabinet

The CEMS cabinet (Rittal or equal) will provide sufficient space for complete analyzing system including power supply, terminals etc. Any analyzer alarm shall be visible and readable without opening the door of the cabinet. Housing of cabinet shall offer a protection of IP 54 (IEC 60529).
Cable input should be from the bottom of the cabinet or through the plinth. Internal lights, air vents / conditioning with thermostat are also included. The door switch and temperature monitoring element shall be provided and connected to the DAHS.

6.10 Analyzer Container (AC)

Due to the ambient condition the CEMS cabinet shall be located in a weather protection container.
Detailed specification and requirements are indicated in separated document and could be provided by others. The container design is in General Specification, doc. Nbr. 24LT7P-01-IQ-932 with attachments.

6.11 Interfaces

Tubing Interface

Complete analyzing tubing path shall be provided. Also, calibration tubing shall be installed inside cabinet for easy connection of calibration gases in the analyzer container.
Each connection point shall be marked of durable material. Contractor shall approve type of nameplates.

Signal Interface – Data Acquisition and Handling System (DAHS)

Isolated output analogue signal 4 ÷ 20 mA interface shall be internally wired to the screw terminal strip. In case of intrinsic safe signal, the color of terminals and cables shall be light blue.
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 ready to connect DCS as a minimum:

- General Power fault – free contact
- Calibration on – free contact
- Analyzer fault for each component – free contact
- Condensate bottle – Level switch high (LSH)
- HVAC/Conditioning fault – connected by others

Selected Input

- CEMS cabinet – Door switch (0=Open) and Temperature (TSH) – free contacts
- Remote control signal of Analyzer Calibration start – 24Vdc
- Remote control signals for COPV – 24Vdc – if applied
- Dust measurement system fault – free contact
- Dust measurement system calibration on – free contact
- NH_3 + H_2O calibration on – SPARE

Complete internal wiring shall be provided in the CEMS cabinet “TKxxCFF10”.
Vendor shall provide also all necessary circuit breakers, power supply and signal terminals, cable glands and accessories inside or outside the CEMS cabinet. A quantity of spare terminals 20% for future connection to dedicated emission system shall be also in the scope of supply.
Preparation for serial link communication RS 485 (Modbus) or Ethernet e.g. connector at analyzer units shall be included.
The calculation of CO_2 in DAHS/AES shall be prepared due to IPCC based on CEMS measurement result.

Power Supply Interface

Supply voltage of analyzing system equipment shall be 230VAC, 50Hz from UPS. Lights and other systems in the container shall be supplied from other power source. 400Vac/50Hz or 230Vac/50Hz are available.
Vendor shall indicate in the bid complete list of consumers with requirements.

All equipment shall be internally wired to the screw terminal strip with circuit-breakers. (Analyzer, heating, lighting, etc.) The main power supply box TKxxCFF10GH301 is provided by others.

6.12 Accessories

Calibration facility

Accessories to permit on line calibration of the analyzer, regulators, gauges, valves, shall be included in the AC specification. Calibration bottles can be provided by Vendor or on Vendors and Analyzer Manufacturer recommendations – it shall be confirmed within 2weeks after Purchase Order.

HVAC system

It is a part of AC. It shall be provided in accordance heat dissipation of the CEMS and AES. Vendor shall provide data for proper design of the HVAC or Conditioning Units in AC.

Earthing & Lightning Protection

Earthing system shall comply with the requirements of IEEE 80.
The cross sections of the various earth conductors shall be determined in accordance with IEEE. However, the minimum copper conductor cross sections shall be 10mm2 as minimum.

Tag plate

Each component used for the CEMS shall be provided with a stainless-steel tag plate showing the Vendor's project number and for selected items also client's tag number. Both shall be securely attached to the component in a prominent position by means of a stainless-steel wire or chain. Letter height on the tag-plate shall be 8 mm and depth 0,5mm as minimum.

Nameplate

Each analyzer shall have non-corrosive nameplate permanently fastened to part of analyzer system (probe, heated lines and control unit if separated). The nameplate shall be visible when the analyzer is in service. The nameplate shall include:

- Manufacturer's name
- Serial number
- Model number of the transmitter (including options code)
- Cell Constant
- Range limits

Note: calibrated range shall not be marked on the transmitter.

Special requirements

Material certificate
Material certificate EN 10204 2.2 shall be provided.
Asbestos or asbestos-containing materials shall not be used.

6.13 Vendor List

According to Client standards N11022/23 next list of Manufacturers is available for equipment and accessories:

Analyzers : ABB – HARTMANN & BRAUN / BUHLER / DURAG / EXTEC (SENSIGAS) / EMERSON / ENVEA / GE SENSING / HORIBA / YOKOGAWA / SERVOMEX / PANAMETRIA / SW TECHNOLOGY

Sample probe: M&C TechGroup or equal

Heated Hose:	JCT or equal
Cabinet:	RITTAL
Junction Boxes:	GENERI / STAHL / CEAG / CZ-EX
Cables:	LAPPKABEL / PRAKAB / KABEX / CICM
FDS + GDS:	ESSER + HONEYWELL
Gas-proof and water-proof plugs:	HILTI / ROXTEC
PLC	S7-1500
Server, PC	DELL
Acessories	Ph.Contact / Weidmuller / Siemens

7 CEMS / AMS + AES SCOPE OF SUPPLY

7.1 Material requirements

Vendor shall supply the CEMS package unit including all equipment as shown on the drawing No. 24LT7P-01-ID-091 and listed in 24LT7P-01-IN-052:

- Sampling probes
- The insulated and heated extraction hoses from the extraction points to the CEMS cabinet
- Sample conditioning system including air purging, filters, humidity protections etc.
- Analytical measuring system CEMS + DAHS and AES
- Dust measurement system for flue gas lines
- Analyzer protective cabinets 800x800x2000-200 “TKxxCFF10”
- All necessary take-off sampling accessories including 1pc of flange (counter-flange is a part of delivery of mechanical part).
- An overvoltage protection equipment on the input cables entering CEMS system, interconnecting electrical devices located in the CEMS cabinet and devices outside CEMS container. Surge protection type B and C is required.
- Construction Spare parts, Consumables and first filling for start-up
- Rittal IT cabinet 800x800x2000-200 “TS01CFF01” for all parts of “AES”
- AES HW (a PC case) with communication connection to local network acc. to 24LT7P-01-WR-259
- Completed and Approved by Local Authorities the Automated Measurement System AMS for evaluation, trends and logs (PC, Monitor, SW, Interconnection links etc.)
- All SW licenses for AMS + AES and CEMS

This item shall be included in quote as Option A:

- Analyzer system for NH_3 + H_2O measurement of flue gas, cabinet located next to the CEMS cabinet.

This item shall be included in quote as Option B:

- Completed Analyzer system for NOx measurement of flue gas in channel located before SCR unit at each boiler + cabinets with IP66

7.2 Non-material requirements

- Design, Manufacture, SW Programing for the Installation and reporting to Owner and Local Authorities
- Calibration system design + specification
- Testing, examination and inspection,
- Preparation for shipment (after the FAT, equipment shall be dried, water residues not tolerated),
- Supply of documentation acc. to Schedule of Required Technical Documentation
- Guaranties for Mechanical Design, Material and Workmanship
- Inspection and shop test – if required by Client
- FAT for Completed Cabinet with CEMS and Complete Dust/Soot monitoring system
- Certification from CZ Authorities, QAL 1
- Itemized list of Spare parts for 2-years of operation
- Site commissioning and start-up (daily rate) – As Option
- QAL 2 procedure, including measurement and final protocols – As Option C
- Training of the Owner maintenance staff (CZ language) in daily rate

7.3 Exclusion

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

- Site erection

8 INSPECTION AND TESTING

The equipment manufactured will meet normal industry quality standards and shall be free from defects in material or workmanship.
Vendor will hand over for approval to the Purchaser the Quality Control Plan / Inspection and Test Program to be applied for the construction.

Shop Inspection and Tests
Inspection and tests in compliance with the specified codes and other tests according to Vendor's standards will be carried out in Vendor's or his Sub-Supplier's workshops.
During the fabrication period the equipment can be subject to inspection by the Purchaser's, Owner's and/or

8.1 Inspection

The inspection and testing requirements are in addition to manufacturing and fabrication standards of the Vendor.
Mechanical items to be checked against the following:

- Compliance with design drawings and materials used to be in compliance with approved bill of material.
- Check conformity to data sheets, specifications and manufacturer's specifications and vendor drawings.
- Visual inspection for quality of workmanship.
- Test and/or material certificates shall be available prior to inspection.
- Alloy verification to be provided by means of material certificates.

Inspection on products part of this requisition, resides under the responsibility of Vendor.
Contractor inspection shall be limited to monitoring Vendor by means of random inspection and auditing of the QA/QC system. In case the inspection of Vendor is deemed not sufficiently, Contractor will impose corrective actions. In this case Contractor reserves the right to perform inspections at the production facilities.

8.2 Testing

General

CEMS, AES and all accessories shall be fully pre-tested prior to shipment to demonstrate that the equipment performs as specified.
The results of complete checking and tests shall be added to the Final Documentation. Vendor's test documentation is required for approval before delivery.
The following certification is required as minimum:

- CEMS (AES) certified for the Czech republic
- Material test EN 10204 2.2
- Enclosure Degree of protection
- EMI
- CE marking
- Complete set of Certificates required by Client and Czech Authorities

Factory Acceptance Test

The CEMS (AMS) shall be inspected and tested at manufacturer's workshop according to agreed factory acceptance test procedure prior to shipment.

Testing shall comprise a full check on the operational requirements and on proper functioning of all hardware and software. Calibration shall be demonstrated with a test sample gas giving approximately one-half scale reading for the measured components.

It shall be Vendor's responsibility to provide all facilities and man power required to demonstrate that the CEM has been manufactured in accordance with the Requisition. The Owner's representative shall witness and approve the FAT and shall have the right to approve or reject the test procedure and the results.
Vendor shall specify duration, place and charge of a witnessed FAT to be carried out according to Manufacturer's standard test procedures.
All herein mentioned requirements shall be applied to the container if delivered

General description for tests prior to shipment

Any analyzer (together with its accessories if part of the supply) shall be subjected to the following checks and tests as minimum:

- QA/QC manufacturer check
- Functional tests

The test results shall be made available to the purchaser as part of the package of final document and drawing.

All dimensions (including overall length) shall be as shown on the Manufacturer/Supplier drawings.
Flange face finish shall be checked by visual comparison as minimum.

For the testing the analyzer shall be completely assembled and fitted with all accessories according to specification. The Performance and Mechanical Tests shall include test of functioning.
All tests shall be properly recorded and will be part of supplied documentation.

All certificates shall state the manufacturer name and location; all forgings and casting certificates shall be from original forge or foundry.
Certificates shall include PO Number, purchase order item number and project datasheet.
Other metal parts of analyzer shall be verified according to EN 10204 2.2.
All tests shall be properly recorded and will be part of supplied documentation.

9 PREPARATION FOR SHIPMENT

Packing and shipping shall be made after all testing and inspection has been accomplished and the Purchaser has released the equipment for shipment.
It shall be the Vendor's responsibility to ensure that the equipment and its components are adequately braced and blocked for shipment as well as to ensure that damage is not caused during loading, shipment and unloading. The small components shall be shipped in boxes or otherwise protected against damage or loss.
All construction spares must be packaged separately and packing must be marked as a "Spare Parts" and delivered together with the equipment.
Vendor will advise specific requirements (IP, min-max temperature etc.) for outdoor storage up for one-year period as part of the bid.

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 requirements.
Manufacturer's proposed paint systems are subject to contractor's approval.

12 DRAWINGS AND DOCUMENTATION

Vendor shall provide set of documentation as specified in the “Documentation instruction for I&C and ELE" 24LT7P-00-DI-003 and “Schedule of required technical documentation” 24LT7P-01-IN-053.
All documents shall be elaborated in Czech or bilingual Czech & English languages except certificates (e.g. material certificate, quality certificate, calibration certificate) that can be in English or Czech language.

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 agree 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 selected Analyzer equipment, Sample conditioning system and its accessories
- Desing and Calculation report with identification of time delay from connection to the “QT” output
- Proposed CEMS cabinet Layout with specification of each item
- Proposed AES cabinet Layout with specification of main items
- CZ and CE certificates of Vendor and proposed production
- Technical description of items, i.e.. Specification datasheets with material used, min./max. design metal temperature comments, detailed accessories description
- Confirmation of AES ability to be connected to existing network “EisOrgNet”
- Spare parts information (construction and 2-years spares)
- Delivery time
- Deviation List (if any)

15 SPARE PARTS

The Vendor shall separately specify

- Recommended quantity (minimum 1 pc per type of accessories)
- Delivery Period
- Unit price

of spare parts / instruments and accessories for:

- Pre-commissioning, commissioning and start-up
- 2 year operation

16 SITE COMMISSIONING AND START-UP

The Vendor shall specify necessary scope of work to commission and start-up CEMS and AES by manufacturer's representative at site QAL1 and before QAL2.

The Vendor shall provide training of service and maintenance on site.

The Vendor should provide a competent service engineer to review installation and supervise calibration and initial start-up before QAL 2 for CEMS and AES. Vendor shall provide inspection services free of charge during warranty period.
Servicing of the analyzer system after expiration the warranty period shall be provided by Vendor as per Owner's request and at Owner charge.

17 ATTACHMENTS

17.1 Project specifications

List of Equipment	doc. No. 24LT7P-00-IN-052
Datasheet – Gas Analyzer CEMS	doc. No. 24LT7P-01-IS-132
Datasheet – Dust Monitor	doc. No. 24LT7P-01-IS-133
Take-off A0801 - Uspořádání odběrů pro CEMS	doc. No. 24LT7P-01-ID-807
Take-off A0208 - Analyzátor spalin CEMS / NOx	doc. No. 24LT7P-01-ID-808
Take-off A0412 - Dust concentration measurement	doc. No. 24LT7P-01-ID-809
CEMS + AES – Základní schéma zapojení	doc. No. 24LT7P-01-ID-091
System config. – Emission System "EnergisOrgNet"	doc. No. 24LT7P-01-WR-259
Schedule of required technical documentation	doc. No. 24LT7P-00-IN-053
Spare parts list form	doc. No. 24LT7P-00-IN-054
Standard deviation list form	doc. No. 24LT7P-00-IX-132

17.2 Flue gas Composition

Table 1. - Flue Gas Composition – Actual Values for Natural Gas Mixture used for Boiler

Load Case	Unit	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Ambient pressure	kPa-g	97,5	97,5	97,5	97,5	97,5	97,5
Ambient temperature	°C	25	25	25	25	25	25
Relative Humidity	%	60	60	60	60	60	60
Boiler Load	%	100	25	100	25	100	25
Fuel gas type	% Vol	***NG***	***NG***	***NG + TP***	***TP max***	***NG + H2***	***NG + H2***
Flue Gas Flow	Nm3/h	158 597	43 331	158 790	42 440	156 800	42 100
Flue Gas Temp.	°C	98	84	98	86	106	85
Flue Gas Density	kg/Nm3	1,234	1,24	1,228	1,215	1,226	1,232
Flue Gas Dew Point	°C	79	70	78	76	79	76
FG Composition							
Argon	% Vol.	0,831	0,841	0,82	0,8	0,83	0,84
Nitrogen	% Vol.	69,8	70,6	68,8	66,75	69,4	70,16
Oxygen	% Vol.	0,89	3,15	0,87	2,64	0,89	2,87
Carbon monoxide	% Vol.	0,004	0,004	0,004	0,003	0,004	0,004
Carbon dioxide	% Vol.	8,98	7,95	8,82	7,56	8,41	7,56
Water	% Vol.	19,5	17,47	20,67	22,26	20,44	18,57
Sulphur dioxide	mg/Nm3	1,0	1,0	0,9	0,2	1,0	1,0

The fuel gas of the new boilers K19 and K20 shall consist of the following:

- Natural gas (NG) - is supplied from outside (the GasNet network) and it shall be the primary fuel. In the future, it is considered to add Hydrogen H_2 to Natural Gas up to a maximum of 20% vol.
- Heating gas (TP) – this is an off-gases mixture by Agro/Petro-chemical Units (TEA, PSA, Ethylen Unit, etc), from the Unipetrol area and mixed up in the Unit MSP315 in dependance of units production, see herein below Table

Table 3. – Fuel Gas Mixtures – the Composition – Average Values

Component	Unit	NG	NG+H2	TP MIX 0	TP MIX 2	TP MIX 7
CH_4	% Vol.	97,88	78,3	13,72	14,3	11,9
N_2	% Vol.	0,87	0,7	9,78	0,4	6,89
CO_2	% Vol.	0,14	0,11	15,15	27,3	13,86
C_2H_6	% Vol.	0,7	0,56	0,05	0,10	0,05
C_3H_8	% Vol.	0,27	0,22	0,02	0,04	0,02
H_2O	% Vol.					
H_2	% Vol.		20,0	59,37	56,3	65,73
CO	% Vol.			0,77	1,4	0,7
O_2	% Vol.			0,1		0,01
Ar	% Vol.			1,0	0,12	0,8
C_4H_{10}	% Vol.	0,09	0,07	0,01		0,01
C_5H_{12}	% Vol.	0,03	0,02			
NH_3	% Vol.			0,03		0,02
S	mg/Nm3	4 – 5,6	4 – 5			

17.3 Emission Limits

Table 4a – Calculated values for Flue gas emissions of a Boiler – NG as Fuel gas

Item	Unit	Year average	Month average	Daily average	Half hour
NOx	mg/Nm3	60	84	84	200
TZL	mg/Nm3	5	5	5	10
SO_2	mg/Nm3	35	35	38	70
CO	mg/Nm3	40	100	110	200
NH_3	mg/Nm3	3	-	-	-

Table 4b – Calculated values for Flue gas emissions of a Boiler – FG Mixture as Fuel gas

Item	Unit	Year average	Month average	Daily average	Half hour
NOx	mg/Nm3	80	100	100	200
TZL	mg/Nm3	5	5	5	10
SO_2	mg/Nm3	35	35	38	70
CO	mg/Nm3	40	100	110	200
NH_3	mg/Nm3	3	-	-	-
PCDD/F	ngI-TEQ/Nm3	0,036	-	-	-
HCl	mg/Nm3	< 5	-	-	-
HF	mg/Nm3	< 2	-	-	-
TVOC	mg/Nm3	< 12	-	-	-

When co-combusting natural gas (NG) and heating gas (FG Mixture), the mixed emission limit will be determined from the current share of fuels based on the thermal input. The decision shall be done in DCS and moved to DHAS.

Table 5. – Emission air pollution from a boiler as per 415/2012:

Air pollutant	Analyzer Measuring range [ppm]	Emissions limits [mg/Nm^3]	Emissions range [mg/Nm3]	Reference oxygen [%vol.]	Remark
Carbon monoxide [CO]	250	100	250	3 % dry	
Nitrogen „Dioxide“ [NOx]	300	100	250	3 % dry	
Sulfur dioxide [SO_2]	50	35	87,5	3 % dry	
O_2	25 Vol%		0 ÷ 25 Vol%		
Particulate / Dust	15 mg	5	12,5	3 % dry	

Note: The operation of boilers K19 and K20 will comply with the specific emission limits (calculated to an oxygen content of 3% and based on normal conditions and dry gas). The reported monthly, daily and half-hourly averages shall also include comparative data in % of the corresponding limit.