Contents

1 Subject of specification 2
2 Scope of validity 2
2.1 Deviations 2
3 Hierarchy of documents 2
4 Definitions and designation 2
5 Description 3
5.1 Requirements of PN-EN 746.2 standard 3
5.2 Application criteria 3
5.2.1 Purpose 3
5.3 Number of sensors 3
5.3.1 Requirements 3
5.4 Flame monitoring system 4
5.5 Installation 4
6 Related documents 5
7 Standards and regulations 5
8 Record of changes 6

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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 execution of Furnace Burners' Flame Monitoring.

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 designation

GLSA – Grupa Lotos S. A.

Pilot burner – a burner serving for lighting-up of main burner

Main burner– a device converting fuel to thermal energy by means of combustion

Flame monitoring system – a system that monitors flame of each burner and reacts on fading of observed flame after expiration of safe time –time of reaction to flame fading (FFRT), without any influence coming from surroundings, i.e. adjacent burners or furnace background.

Flame sensor – flame scanner, flame detector

5 Description

Flame monitoring (supervision) systems integrally constitute BMS system for furnaces/boilers control and protection.

5.1 Requirements of PN-EN 746.2 standard

Flame of main burner, and, if possible, flame of pilot burner shall be monitored by flame detection devices.

When pilot burner and main burner are observed with separate flame sensors, then pilot flame shall not have effect on effectiveness of main burner flame sensor operation.

Flame sensor shall not react to unintential radiation.

In systems, where pilot burner stays lit during main burner operation, separate sensor for pilot flame monitoring, and separate one for main burner flame monitoring shall be installed. Sensor that monitors main burner flame shall be such positioned, that under no circumstances it can detect pilot burner flame.

In systems, where pilot burner flame is extinguished during main burner operation, one flame sensor is sufficient.

If main flame cannot be separately detected, air and fuel streams fed to pilot burner shall be continuously checked for main burner ignition correctness, in all operating conditions. In such case, monitoring of pilot burner operation is sufficient.

Flame monitoring device according to PN-EN 125 standard can be used for boilers in particular cases.

5.2 Application criteria

5.2.1 Purpose

The task of flame sensor is:

- Detection of pilot burner flame
- Detection of main burner flame.

Scanners of design based on ultraviolet (UV) or infrared (IR) radiation sensing, or both UV and IR, shall be used for flame detection purposes in refinery furnaces / boilers.

Type of sensing device must be such selected, that it would be capable to monitor presence or absence of selected flame, apart from adjacent burners operating conditions.

Flame detection system shall generate signal of flame intensity measurement, and flame state (present/absent).

5.3 Number of sensors

5.3.1 Requirements

GLSA requires burner units to be equipped with separate flame detection system for pilot burner and separate one for main burner.

- One flame monitoring system for each pilot burner.

- Two flame monitoring systems for each main burner, for combusting of one or two fuel types, or their mixture (gas – oil – gas/oil).

Range of sensor sensibility has to cover flame visibility for all combinations of combustion.

Selection of detector sensors for pilot burner shall take into consideration situation of main burner flame absence, and stream of atomisation vapour that limits visibility of pilot burner flame.

Specification of burners must contain types and parameters of fuels intended for burning.

Supplier of flame monitoring systems is obliged to submit for GLSA approval a solution of flame monitoring for specified fuels.

5.4 Flame monitoring system

Flame monitoring system has to be high reliability system, capable to meet requirements put on furnaces/boiler with automatic start-up.

Flame detection systems featuring certified electronic self-test function and failure signalling shall only be used. Self-test cycle time cannot exceed 1 second.

Output signal shall enable possibility of easy distinguishing between flame fading and circuit failure condition.

Use of flame sensors' signals shall be as follows:

1. Pilot burners:

- actuation of sensor, with simultaneous actuation of both sensors on main burners, shall result in complete shut-down of furnace and alarm generation

2. Main burners:

- actuation of one out of two sensors shall result in alarm generation
- actuation of both sensors shall result in monitored burner switching-off (partial furnace shut-down in case of common supply line for multiple burners), and alarm generation
- actuation of both sensors, with simultaneous actuation of sensor on pilot burner, shall result in monitored burner switching-off (complete furnace shut-down in case of common supply line for multiple burners), and alarm generation.

Actuation of detectors shall result in activation of light and acoustic signalling in control room, as well as in activation of dedicated pilot lamps on local LCP panels and burner panels.

Flame monitoring systems shall be of flameproof design. Detectors with sensor and amplifier encased in single housing are preferred. Flame detectors shall be equipped with air-cooling connection and adapted to continuous operation at 65°C temperature. In case where cooling air is missing, design of detectors shall enable their operation at temperature up to 100°C. Signalling of cooling agent shortage shall be provided.

Flame monitoring systems must fulfil classification requirements determined for BMS system of specific furnace/boiler, and requirements of notified body – Central Laboratory of Technical Inspection (CLDT) in this case.

5.5 Installation

Flame monitoring systems shall be installed according to supplier guidelines.

The cables connecting detector with amplifier (if any) must comply with requirements of monitoring system manufacturer.

Location of amplifiers must ensure easy access to them, for maintenance purposes.

Each detector shall be such installed, that can only detect flame assigned to it, by means of limiting its field of view (assembly in sight tube with application of ball-and-socket joint).

All best shall be done in order to avoid influence of heated up furnace elements on detector, which can result in false alarms. Method of detectors' installation shall facilitate their maintenance, while not hindering operation of other equipment.

Essential condition for proper installation of flame detectors is limiting of electric noise coming from igniters in particular, but also from contacts of relays and electric motors.

For the purpose of detectors' cooling it is necessary to connect instrument air through low flow regulators, or rotameters. Other inert gas can also be used, if it meets requirements regarding cleanness and humidity, and instrument air is not available in close vicinity (GLSA acceptance required). Connection of cooling air / gas shall be made topside of pipeline.

Each flame detector shall be independently power supplied from redundant 24Vdc power supply. The resignation from the power supply redundancy is only possible after GLSA approval and only to be considered if power supply failure of one detector does not interfere furnace work.

6 Related 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 standards and regulations listed below.

This specification quotes standards and regulations directly related to flame detection systems for furnaces and boilers. For remaining standards and regulations, refer to Specification N° 3010.

- PN-EN 746-2 Industrial equipment for thermal processes. Requirements regarding combustion system and fuel systems safety.
- PN-EN 125 Flame monitoring devices in receivers burning gaseous fuels. Thermo-electromagnetic devices.
- PN-EN 50156-1 Electrical equipment for furnaces and ancillary equipmentRequirements for application design and installation.

8 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