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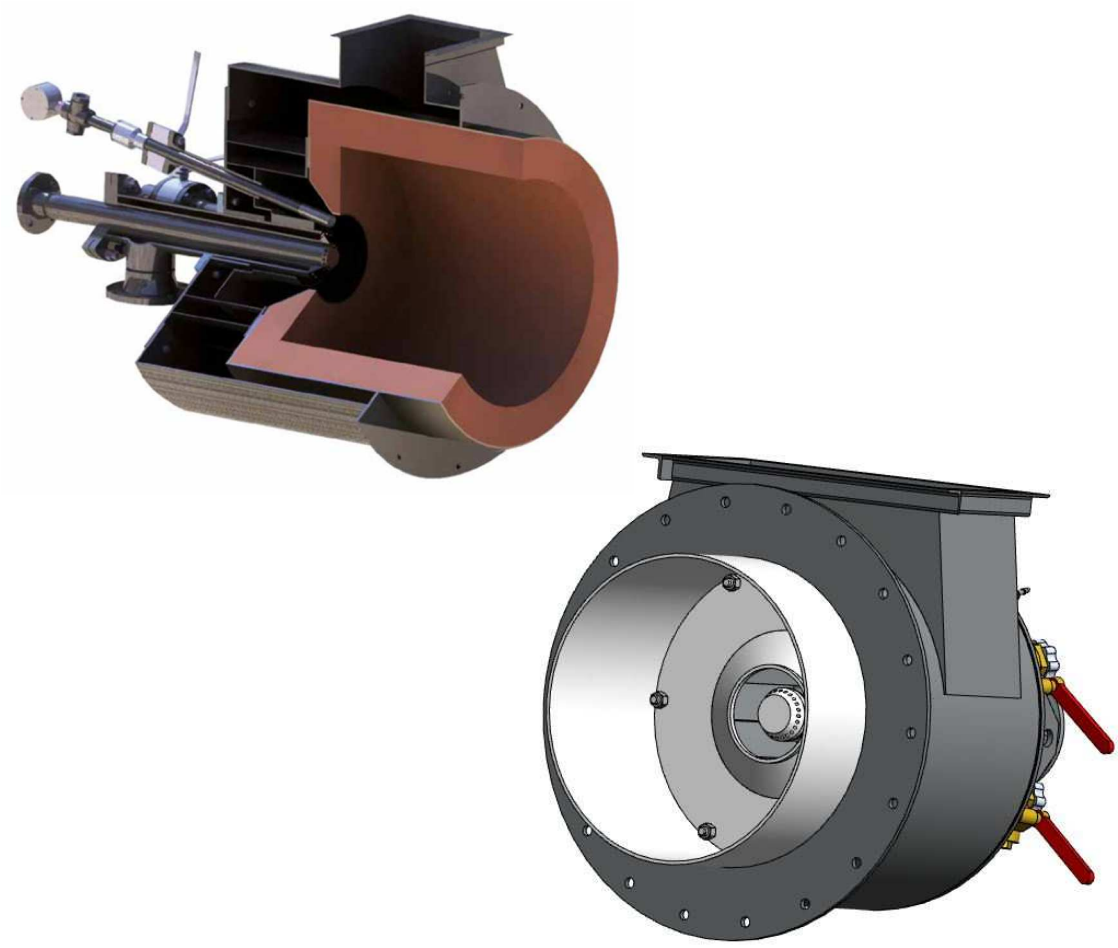
IMIFGM-20200610

# ITAS INTENSITYFLAME-GAS

# INSTALLATION AND MAINTENANCE MANUAL (METRIC)

Version June 2020



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- Use of the product by non-qualified personnel;
- Not following regulations of the country where the product is installed;
- Improper erection of the product;
- Improper integration of the product into any machine;
- Use of parts other than manufacturers parts or advised by manufacturer;
- Maintenance by unskilled personnel;
- Exceptional events;
- Not following instructions mentioned in this document.

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**Symbols**


The Danger signal used in this document indicates a hazardous situation which, if not avoided, will result in death or injury.


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**Assistance**
Should the user need any assistance, contact the local Fives ITAS S.p.A. representative or contact the Headquarter:

Fives ITAS S.p.A.
Via Metauro, 5 – 20900Monza (MB) – Italy
Tel. +39 039 27331

**Audience**
This manual is written for people having experience with all aspects of combustion, nozzle-mix burners and its related components. These aspects include, but are not limited to, design, installation, operation and maintenance.

**Related documents**
This installation manual comes is provided with, and cannot be used without:

- Technical datasheets of the ITAS Intensityflame-gas burner series. Each burner size has its own datasheet.
- Engineering manual of the ITAS Intensityflame-gas burner series.

**Purpose of this document**
The purpose of this document is to ensure a safe, effective and trouble-free installation, start-up and operation of the burner.

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# 1. THE PRODUCT

## 1.1 Description

ITAS Intensityflame-gas burner is a nozzle-mix burner designed for integration into a combustion system or machine. The burner is designed for firing single gas or dual gas with:

- High turndown
- On ratio air- and gas control
- High flame stability
- Simple adjustment

## 1.2 Intended use

ITAS intensityflame-gas burner is designed for use on a wide range of industrial air-heaters, direct- or indirect-fired. Typical industrial applications are:

- Industrial grass and grain dryers
- Yankee hoods for paper industry
- Base material drying in the minerals industry
- Calcination dryers for Gypsum industry
- Drying applications for food and feed
- Hot gas generators for general drying applications

## 1.3 Certification

ITAS Intensityflame-gas burner complies with the EN746-2 and the machine directive 2006/42/EC. This can be confirmed by manufacturer's Declaration of incorporation.
ITAS Intensityflame-gas meets the technical specifications of the Eurasian Customs Union (EAC).

## 1.4 Mechanical construction

The burner is available in twelve (12) different capacity sizes from 1500 kWlhv up to 55000 kWlhv. The mild steel burner body (figure 2.1) houses an alumina air bond refractory or AISI 310 combustor, a mild steel swirling plate and a gas gun. The gas gun comes in 2 options. One for single gas operation and the second for dual gas operation. The gas gun is rotatable in 4 different positions to have the best fit with the arriving gas- and air flanges.

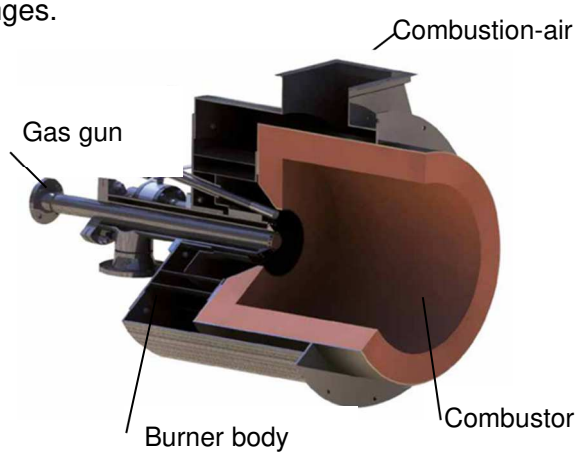


*Figure 2.1 - Intensityflame-gas part recognition*

## 1.5 Functioning

After starting the combustion air fan, the burner controller unit opens the gas supply towards the pilot burner and combustion air towards the burner. At the outlet of the pilot-nozzle, the pilot gas is ignited by the spark rod. Combustion is completed with the oxygen from the combustion air. The burner controller unit opens the main gas(es) supply towards the burner. Main gas and combustion air flow through their separated ways towards the burner's nozzle. The combustible gas/air mixture is produced at the nozzle, downstream of the gas gun, but inside of the combustor. The gas-/air mixture is ignited by the pilot flame. A flame is produced, which will be monitored by a flame-sensor. The pilot switches off.

## 1.6 Control methodology

ITAS Intensityflame-gas burner is designed for on-ratio control with certain levels of air excess. Within the pre-defined limits, the burner offers a wide flexibility in excess air operation (see burner's technical datasheet). During operation, the air- and gas flows are controlled via separate control valves applying the gas and air pressure data at the burner inlet as indicated in the burner datasheet.

## 2. SAFETY



In order to avoid personal injury and damage to the property or facility, the following warnings shall be observed:

- All involved personnel shall carefully read this entire manual before proceeding with designing, starting or operating the combustion system. If any part of the information in this manual is not clear, contact Fives ITAS S.p.A. before proceeding.
- The burners, described herein, are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices can produce fires and explosions if improperly applied, installed, adjusted, controlled or maintained.
- Do not bypass any safety feature; fire or explosion might occur. In this document the critical safety features are marked with above shown “danger” or “warning” signs.
- Never try to light a burner if it shows signs of damage or malfunction.
- The burner and duct sections are likely to have hot surfaces. Always wear the appropriate protective equipment when approaching the burner (such as heat resistant gloves, safety glasses, ear protection, fire resistant clothes and safety shoes).
- This manual provides information regarding the use of these burners for their specific design purpose. Do not deviate from any instructions or application limits described herein without written approval from Fives ITAS S.p.A.
- Only qualified personnel, with mechanical and electrical aptitude and experience with combustion equipment, shall adjust, maintain or troubleshoot any mechanical or electrical part of a burner or combustion system.
- The best safety precaution is an alert and trained operator. Train new operators thoroughly and have them demonstrate an adequate understanding of the equipment and its operation. A regular retraining schedule shall be administered to ensure operators maintain a high degree of proficiency.
- Use original replacement parts from Fives ITAS S.p.A. only.


Make sure the external combustion air supply delivers the correct amount and pressure of air to the burner connection flange.

Fives ITAS strongly recommends the use of a combustion air filter to remove airborne particles. If corrosive fumes or materials are present in the air, supply the blower with fresh, clean air from an uncontaminated area of the plant.


If the burner shuts off during operation at temperatures above 100°C, provisions shall be made to provide an adequate cooling of the burner internals.


Be sure the burner operates at proper gas and air ratios. Low air flow might cause uncomplete combustion, emission formation or other unsafe circumstances.

# 3. HANDLING

## 3.1 Receipt and storage

Upon receipt of the product, inspect the product, make sure the delivery is complete, clean and free of damages. Report any transport damages immediately. Store the product in a dry and clean place at ambient temperature. Exposure to the elements can damage the product. Use appropriate support and handling equipment when lifting the product. For lifting, use the holes in the burner's assembling flange or use proper lifting ropes around the burner housing. Do not use any of the burner's piping for lifting the burner system.
Never remove or alter the manufacturer's type plate of the burner.
Dispose of packing materials according to local rules and (recycling) regulations.

## 3.2 Checklist before installation

Before installing the burner on the application, it is necessary to assure that:

- Sufficient fresh air enters the working area;
- The combustion air blower supplies fresh and clean air to the burner;
- Exhaust from the application is not entering the working area;
- The burner is installed on an easily accessible location;
- The environment matches the original design parameters (such as voltage, frequency, fuel temperature etc.);
- Install components on the burner.

## 3.3 Component Installation on the burner

Before the burner can be installed on the heater and operate, several components shall be installed onto the burner.

Gas gun: The position of the gas gun in relation to the burner cone shall be checked. Burners are shipped with the gas gun in the correct position, but it is possible that the gas gun shifts during transport. Loosen the gland to adjust the gas gun in the position as shown in figure 3.1. Check the centre position of the gas gun as well. Uneven centre position might cause uneven flows and flame instability.

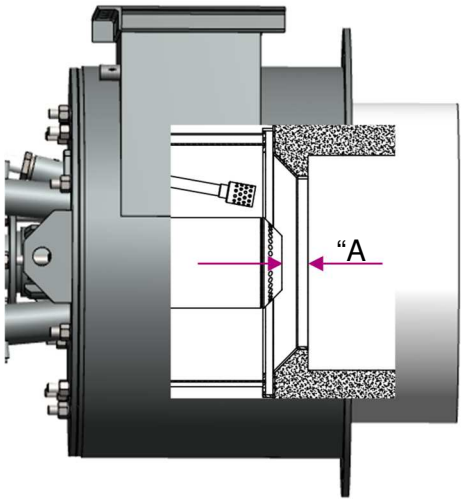


*Figure 3.1 – position of the Gasgun*

| Burner | Size "A" |
|---|---|
| IF0015-G | 18 |
| IF0028-G | 34 |
| IF0045-G | 34 |
| IF0060-G | 40 |
| IF0085-G | 42 |
| IF0115-G | 50 |
| IF0145-G | 50 |
| IF0205-G | 58 |
| IF0235-G | 57 |
| IF0330-G | 80 |
| IF0420-G | 80 |
| IF0550-G | 100 |

Flame-scanner: Two assembling ports (figure 3.2) are located near the gas gun and pilot assemblies. When using a burner with a (standard) clockwise swirling flame, the flame scanner shall be located in the port shown in figure 3.2 to prove both pilot- and main-flame. If a second flame-scanner is preferred, use one of the lower sight glass positions for this.
Make sure the flame-scanner is connected to the electrical circuit of the burner.
For detailed information on flame-scanner installation and connection, refer to the supplier's literature.

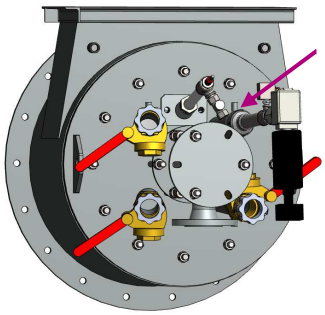


*Figure 3.2 – Flame scanner installation*

Pilot assembly and spark rod: The insertion length of the pilot is fixed by the manufacturer. This position is critical for proper ignition of the burner. Check if the burner is equipped with the original manufacturer's pilot. The manufacturer installed the spark rod on the pilot. Make sure that you connect the spark rod to the electrical circuit of that burner. Do not apply any grease to the spark rod. This might cause bad grounding.

Refractory: The burner's refractory lining is fixed by manufacturer before shipment. Before burner installation, carefully check the quality of the refractory. If any damages or cracks are visible, contact Fives ITAS S.p.A.

## 3.4 Burner installation on the heater

Use the burner's assembling flange to connect the burner to the heater.

- Make sure that the heater wall is strong enough to carry the weight of the burner. If necessary, put supports under the burner.
- The opening in the heater wall shall be 60mm larger in diameter compared to the burner. This allows installing 30mm fibre lining between the burner's combustor and the heater wall. (Figure 3.3)
- Install a gasket between the burner flange and the heater wall. Make sure the gasket does not leak, especially when the heater is on over-pressure.
- Make sure the flame is covered with the proper designed flame shield.
- Connect the gas- and air-piping systems to the burner. Make sure all connections are tight.
- Install a pipe union or flange in the gas- and air-line to the burner. This simplifies installation and removal of the burner.

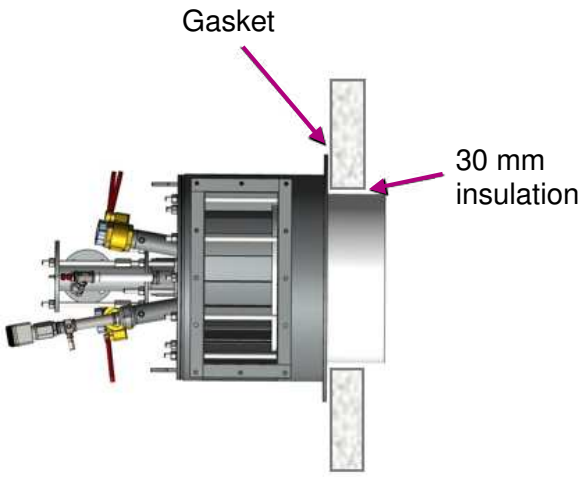


*Figure 3.3 – Burner installation on heater*

The use of flexible pipes (expansion joints) is recommended to absorb stress due to heat expansion and slight misalignment. Be aware that flexible pipe nipples might cause inaccurate measurements of pressures.

### 3.5Checklist after installation

After installing the burner on the heater, it is necessary to assure that:

- There are no leakages in gas and air connections, lines and flanges;
- Gas arrives to the burner at the required pressure and flow rate;
- Check if combustion air arrives to the burner at the required pressure and volume;
- Electrical connections are made properly and function correctly. This includes flame sensors, spark rods, pressure switches, motors and blowers;
- The valves are installed in the correct flow direction;

## 4. BURNER COMISSIONING

### 4.1 Checklist before start-up

Prepare the burner installation to be ready for a safe commissioning.

- Check all electrical connection have been made in a safe and proper way;
- Make sure all required instruments are available;
- Check if all components, pipework, constructions and installation work have been made according to current local legislation and standards;
- Ensure that all gas supply pipes have been purged in compliance with the current local legislation;
- Ensure all air piping has been connected;
- Check whether all external safety components, such as process air pressure switches, exhaust air pressure switches, protecting thermal regulators, etc. have been installed and connected;
- Make sure the gas pressure is in conformity with the value submitted by the supplier of the combustion system;

### 4.2 Start-up description

The start-up cycle is controlled by the Burner programmer as per supplied by ITAS or supplied by others.

- Purge the application according to the local regulations;
- Push start button;
- Check safety loop;
- Combustion air pressure switch is deactivated;
- Combustion air blower is energized and starts running;
- Combustion air pressure switch is activated;
- Burner programmer starts to cycle*;
- Control motor drives gas and air valves to start position;
- Pilot gas valve opens;
- Ignition transformer is energized by the burner programmer;
- Ignition electrode generates a spark (for a preset number of seconds);
- Gas flows to the pilot nozzle, mixes with the combustion air and ignites;
- UV-scanner detects the flame.
- Safety shut off valves main gas open;
- Gas flows to the burner's nozzle, mixes with air and ignites;
- Pilot switches off;

- UV-scanner detects the main flame. In case of a stable flame, the system is released for capacity control (signal from others);

* some types of programmers (BMS) provide a verification of the cycle of the servo motor.

## 4.3 Alarms and Safety

The burner system shall be equipped with a variety of safety features required by EN746-2. Any activation or failure on these components shall lead to immediate lock-out of the burner.

- Combustion air pressure switch to safeguard against low air flow to the burner. In case of continuous operation of the combustion air fan, the switch is equipped with a 3-way solenoid valve to ensure safe changeover of the pressure switch at start up.
- Minimum gas pressure switch to safeguard the availability of sufficient gas pressure towards the burner.
- Maximum gas pressure switch to prevent the system against high gas pressures;
- Some types of programmers (BMS) provide a verification of the cycle of the servo motor.
- Flame safety device to check the availability of a flame during burner operation.

## 4.4 Burner adjustment


ITAS Intensityflame-gas burner shall only be used when integrated in a combustion system and mounted on an air-heater/ machine. The adjustment of the burner and the start/ stop of the burner shall be carried out by experienced people who designed the system for its purpose. Only qualified field technicians shall start, regulate and stop the burner. All burner regulation shall be within the parameters specified in the burner's technical datasheet.

A common adjustment procedure consists in the following steps:

1. System reset;
2. Close the safety shut-off valves and the manual fuel valves;
3. Fully open any manual air valve (if applicable);
4. Start the combustion air blower.

A. Set maximum air position:
   1. Set the air control damper to maximum air, but do not ignite the burner;
   2. Use the pressure curves from the burner's technical datasheet to find the required differential air pressure;
   3. Connect the manometer to the Taps as indicated in the datasheet;
   4. Adjust the servomotor end-switch until the air pressure is at the target value;
   5. Remove the manometer.

B. Set low air position:
   1. Set the air control damper to minimum air, but do not ignite the burner;
   2. Use the pressure curves from the burner's technical datasheet to find the desired differential air pressure;
   3. Connect the manometer to the Taps as indicated in the datasheet;
   4. Adjust the servomotor end-switch until the air pressure is at the target value;
   5. Remove the manometer;

C. Cycle between high- and low air settings a couple of times and check that the settings are not moving.

D. Check the air switch and adjust if necessary.

E. Set up the pilot:
   1. Test the spark igniter;
   2. Make sure the combustion air fan is running;
   3. Set the system to “operate pilot only” mode;
   4. Set the pilot pressure regulator to the outlet pressure shown in the burner’s technical datasheet;
   5. Open the pilot adjusting valve;
   6. Start and ignite the pilot;
   7. Visually check the pilot flame; A proper pilot flame is thick, blue with curls;
   8. Make sure the flame-scanner has good detection of the pilot flame.

F. Burner ignition and low fire setting:
   1. Make sure the combustion air fan is running;
   2. Set the main gas pressure regulator to the minimum outlet pressure indicated in the burner’s technical datasheet; *
   3. Make sure that the main gas control valve is in minimum position;
   4. Light the pilot;
   5. Open all manual shut-off valves;
   6. Initiate the ignition process;
   7. Make sure that pilot- and main flames have ignited;
   8. Measure the gas pressure drop;
   9. If necessary, adjust the minimum position of the main gas control valve.

G. Set the burner’s high fire position:
   1. Drive the main gas valve to its maximum position:
   2. Set the main gas pressure to the pressure indicated in the burner’s technical datasheet;*
   3. If necessary, adjust the maximum position of the main gas control valve.

H. Re-check all settings:
   1. Cycle the burner up- and down between low and high fire positions a couple of times. Make sure the pressures and settings do not change;
   2. Shut down the burner and re-ignite to ensure all works properly;
   3. Check all safety interlocks and limits to ensure proper operation.

When stopping the burner, make sure the combustion air stays at low air operation until the chamber and the refractory block are cooled down to 100°C.

* The pressures specified in the technical datasheet are based on the gases specified in that datasheet. A correction of the gas pressure at the burner when running fuel gas with deviating caloric value and/or density may be necessary. The required pressure may be calculated with:

$$p2 = p1 * \frac{\rho 2}{\rho 1} * \frac{hv2}{hv1}$$

p1 = adjustment pressure for reference input [mbar] (from technical datasheet)*
p2 = adjustment pressure for actual input [mbar]
$\rho 1$ = density of reference fuel [kg/Nm³] (from technical datasheet)
$\rho 2$ = density of actual fuel [kg/Nm³]
hv1 = heating value of the reference gas [kWh/m³] (from technical datasheet)
hv2 = heating value of the actual gas [kWh/m³]

# 5. MAINTENANCE

Preventive maintenance is essential to keep ITAS Intensityflame burner in operation and ensure the highest level of safety. The below actions shall be considered as a minimum level of maintenance. Only trained and competent personnel is allowed to carry out the work.

| Action | Interval |
|---|---|
| Maintenance and safety check by Fives ITAS service technician | Yearly |
| Check functioning of Continuous operating flame safeguards | Weekly |
| Inspect pipe connections on leaks | Monthly |
| Visually check cables and connectors | Monthly |
| Check safety devices | Monthly |
| Test alarm systems | Monthly |
| Clean the burners and components | Monthly |
| Check the condition of painted parts | 6 Months |
| Clean filter (cartridges) | Weekly |
| Inspect pipework on leaks and damages | Monthly |
| Inspect impuls piping for leaks | Monthly |
| Make sure burner components are not damaged | Monthly |
| Check and reset the gas-air ratio | Yearly |
| Clean or replace the spark-plug and flame-scanner | Yearly |
| Check moving parts | Yearly |

Additional to the above maintenance on ITAS Intensityflame burner, it is strongly recommended to carry out frequent checks on the complete combustion system.
To improve the safety of the working area:

- Frequently check the performance of the shut-off valves and other safety devices installed to the burner (follow the manufacturer's instructions);
- Test all alarm systems;
- Inspect pipework on leaks and damages.

# 6. TROUBLE SHOOTING

The below overview shows a general list of potential alarms on the combustion system.

| | Alarm | Possible cause | Remedy/ Action |
|---|---|---|---|
| 1 | Max. temperature of combustion chamber. | a) Alarm threshold | Check set-point and operation |
| | | b) Thermocouple | Check thermocouple state and operation. |
| 2 | Exhaust air ventilator not started | Improper ventilator operation | Check motor absorbed current<br>Check 3-phase power supply<br>Check thermal protection set point |
| 3 | Process air ventilator not started | Improper ventilator operation | Check motor absorbed current<br>Check 3-phase power supply<br>Check thermal protection set point |
| 4 | Combustion air ventilator not started | Improper ventilator operation | Check motor absorbed current<br>Check 3-phase power supply<br>Check thermal protection set point |
| 5 | Exhaust air minimum pressure | a) Faulty feeding line | Check all cocks opening |
| | | b) Low air pressure | Check with the pressure gauge the correct feeding pressure |
| | | c) Exhaust air ventilator stopped | Check correct operation |
| | | d) Pressure switch | Check set-point and its operation |
| 6 | Minimum process air pressure | a) Faulty feeding line | Check all cocks opening |
| | | b) Low air pressure | Check with the pressure gauge the correct feeding pressure |
| | | c) Process air ventilator stopped | Check correct operation |
| | | d) Pressure switch | Check set-point and its operation |
| 7 | Minimum combustion air pressure | a) Faulty feeding line | Check all cocks opening |
| | | b) Low air pressure. | Check with the pressure gauge the correct feeding pressure |
| | | c) Combustion air ventilator stopped. | Check correct operation |
| | | d) Pressure switch + 3-way valve | Check set-point and its operation |
| | | e) Inlet fan or filter blocked | Clean the filter and blower inlet |
| 8 | Minimum pressure of main burner gas | a) Low gas pressure | Check right supply pressure |
| | | b) Pressure regulator | Check set-point and operation |
| | | c) Pressure switch | Check set-point and operation |
| | | d) Ball valve closed | Open ball valve |
| 9 | Maximum pressure of main burner gas | a) a) High gas pressure | Check right supply pressure |
| | | b) Pressure regulator | Check set-point and operation |
| | | c) Pressure switch | Check set-point and operation |
| 10 | Minimum pressure pilot burner gas | a) Low gas pressure | Check right supply pressure |
| | | b) Pressure stabilizer | Check set-point and operation |
| | | c) Pressure switch | Check set-point and operation |
| | | d) Ball valve closed | Open ball valve |
| 11 | Missed consent from minimum value of gas adjusting valve | Limit switch | Check the return to minimum position of actuator<br>Check if minimum switch is triggered |

| | Alarm | Possible Cause | Remedy/ Action |
|---|---|---|---|
| 12 | Gas leakage | a) Valves faulty at test phase 1 | If the shut-off takes place during the first phase (test 1) the leakage is in the main gas safety valve. It is necessary to dismantle them and clean them or replace the part |
| | | b) Valves faulty at test phase 2 | If the shut-off takes place during the second phase (test 2) the leakage is in the main gas shut-off valve. It is necessary to dismantle them and clean them or replace the part |
| | | c) Pressure switch | Check setpoint and its operation |
| | | d) Equipment fault | Replace valve sealing control device |
| 13 | No flame | a) Fault during pilot flame firing | Check gas supply pressure to the pilot burner<br>Check power supply and operation of firing transformer<br>Check cleaning state and correct operation of firing plug and flame detection scanner<br>Check power supply and correct operation of pilot gas valves<br>Check through the sight glass if pilot flame is present at firing moment<br>Check the connection of flame detection scanner |
| | | b) Fault during firing of main gas or during burner running | Check supply pressure of main gas<br>Check power supply and correct operation of main gas valves<br>Check through the sight glass if main flame is present at firing moment<br>Check cleaning state of flame detection scanner<br>Check the connection of flame detection scanner as well as the ground connection of reference cable<br>Check the flow of cooling/cleaning air on flame detection scanner |

## 7. NOTES