

DISTRIBUTOR & FOREHEARTH



HEATING SYSTEM: CORA

innovation
ENGINEERED IN GERMANY

HORN
GLASS INDUSTRIES

The CORA system is a specially designed supply station to pre-mix gas and combustion air in a constant ratio for combustion inside the distributor and forehearths.

The major advantage of this combustion system is its near to 100% stable, **CO**nstant **RA**tio in gas/air supply over the entire control range under varying operating conditions.

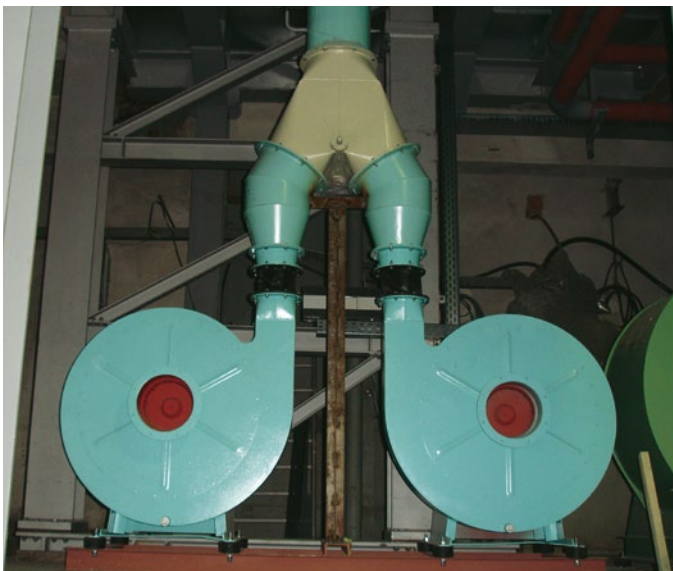
DESCRIPTION

Combustion air is required for the CORA stations, which is supplied by a special combustion air fan, the speed of which is controlled by a thyristor. This control guarantees a constant combustion air pressure of 60 - 90 mbar.

The combustion air fan not only supplies the forehearth heating system but also the distributor with combustion air. The combustion air fan is always set up with a second back-up fan.

A safety station supervises the current maximum and minimum gas pressure by means of a gas pressure monitor and, if necessarily, closes the gas supply by means of a gas safety valve.

The quantity of gas needed for the forehearths can subsequently be determined by means of gas volumeter. This can take place either individually for distributor and forehearth or for the entire system.



The natural gas supply is regulated by several gas stations. A gas filter and pressure control station supplies the required gas pressure of 80 to a maximum of 95 mbar. Mutual influences of the individual zones are thus avoided and the entire air system is stabilized and steadied.

The gas now enters the individual Cora stations where an exact gas/air mixture is created. The gas/air mixture is then channeled through a gas mixture line to a gas mixing manifold. Special HORN HGGB gas mixture burners are installed in this mixing manifold that burn the mixture in the forehearth.



ESSENTIAL FEATURES

Gas/air mixer

The required mixing of gas and combustion air takes place in a specially developed mixing pipe (1). The special design ensures that a turbulent current can be maintained even with very small gas and air volumes. In this way a favourable gas/air mixture is ensured.

The size of the gas/air mixers used, depends upon the heating levels required in the zones to be heated and can be changed easily.

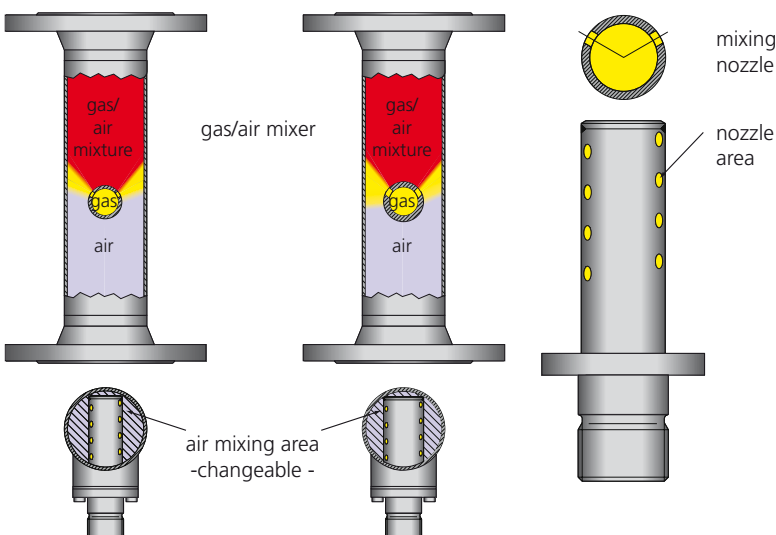
Gas/air ratio control

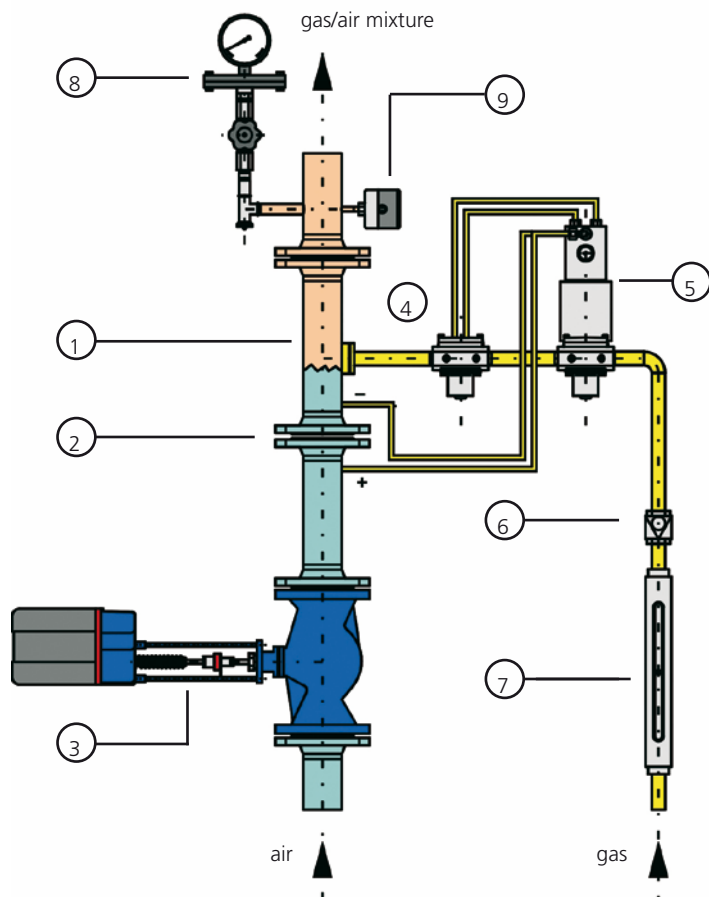
The combustion air flows through a differential pressure orifice plate (2) before it flows into the mixing pipe. The differential pressure is transferred to a ratio controller (4 + 5) which supplies the gas pressure proportional to the determined volume of air on the output side

An absolutely stable gas/air ratio along the entire control range is achieved due to the ratio control, which works according to volume, as opposed to a Venturi or injector mixer, which work according to pressure.

Fuel output control

The burner output in the respective control section is controlled via the combustion air volume. The volume of the combustion air can be adjusted by the motor control valve (3). This features a control cone with a linear KV value through which particularly accurate regulation of the combustion air volume is possible. The required volume of gas is automatically supplied by the ratio controller (4+5) as described in the section "Gas air ratio control".





1. Gas/air mixer
2. Air differential pressure-orifice flow meter
3. Air motor control valve
4. Gas reducing valve
5. Gas control valve incl. shut-off valve
6. Gas non-return valve
7. Gas flow meter
8. Mixer pressure indicator / display
9. Mixer pressure guard (min. mixture pressure)

SAFETY SYSTEMS

The CORA system is equipped with the following safety devices:

- Gas safety shut-off valve in the main gas line
- Gas safety shut-off valve in each control section
- Gas pressure switch for min./max. gas pressure monitoring
- Air pressure switch for min. air pressure monitoring
- Gas pressure switch for min. mixture pressure monitoring

Safety switch-off

The gas supply will be shut off automatically in the following cases:

- Electrical power failure
- Inacceptable gas and air pressure

The gas safety valves in the main line and in all heated sections shut off. After a shut off, the defect must be eliminated. The CORA system must be restarted after a manual reset.

Mixture pressure line

The gas/air mixture emitted from the mixture pipe is highly flammable. To avoid the gas/air mixture from backstroking or backfiring, a pressure switch (9) is installed after the mixer as well as a gas safety valve (4) before the mixer. The required constant pressure is adjusted and fixed by a special manual control valve which is installed in the by-pass line of the air control valve (3).

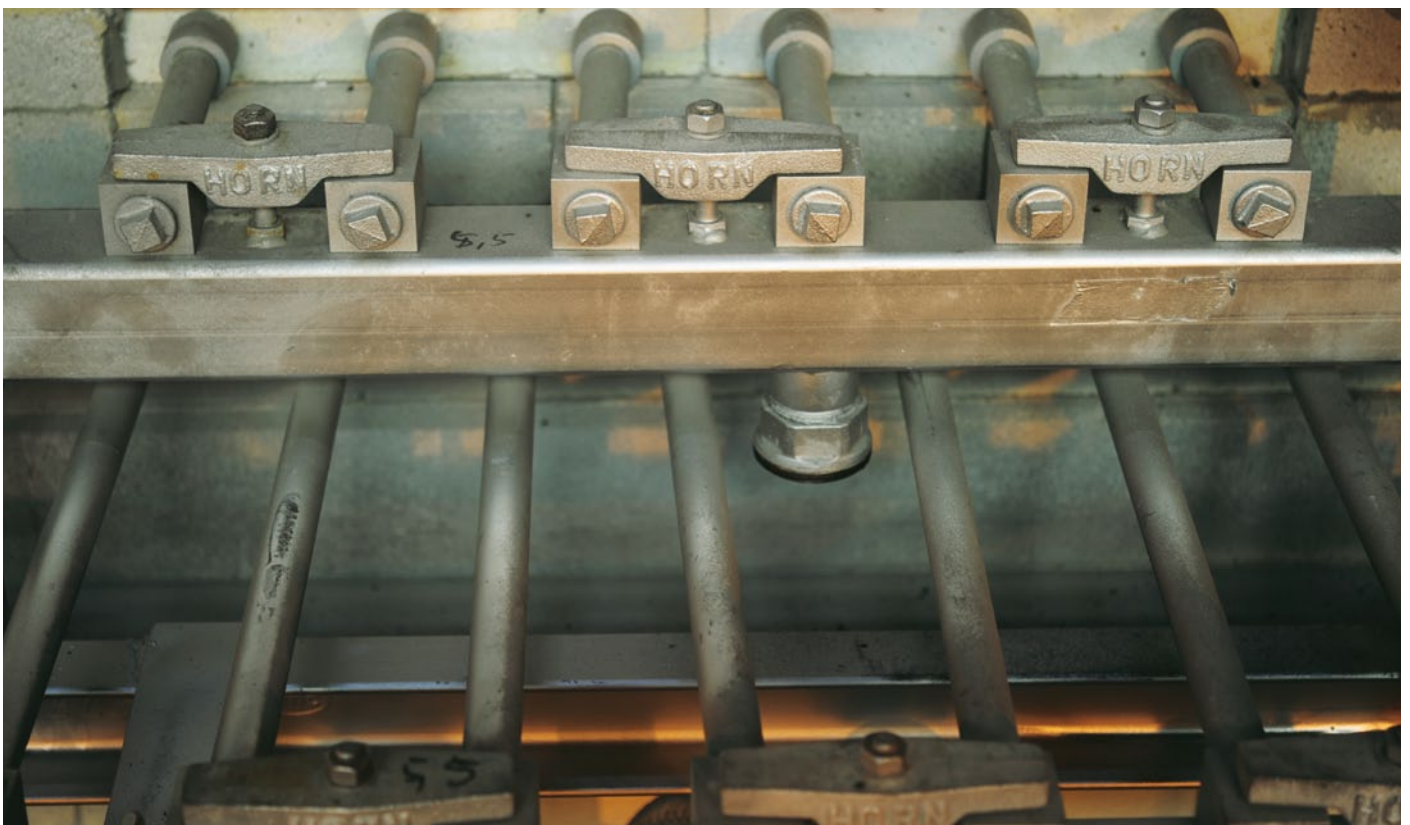
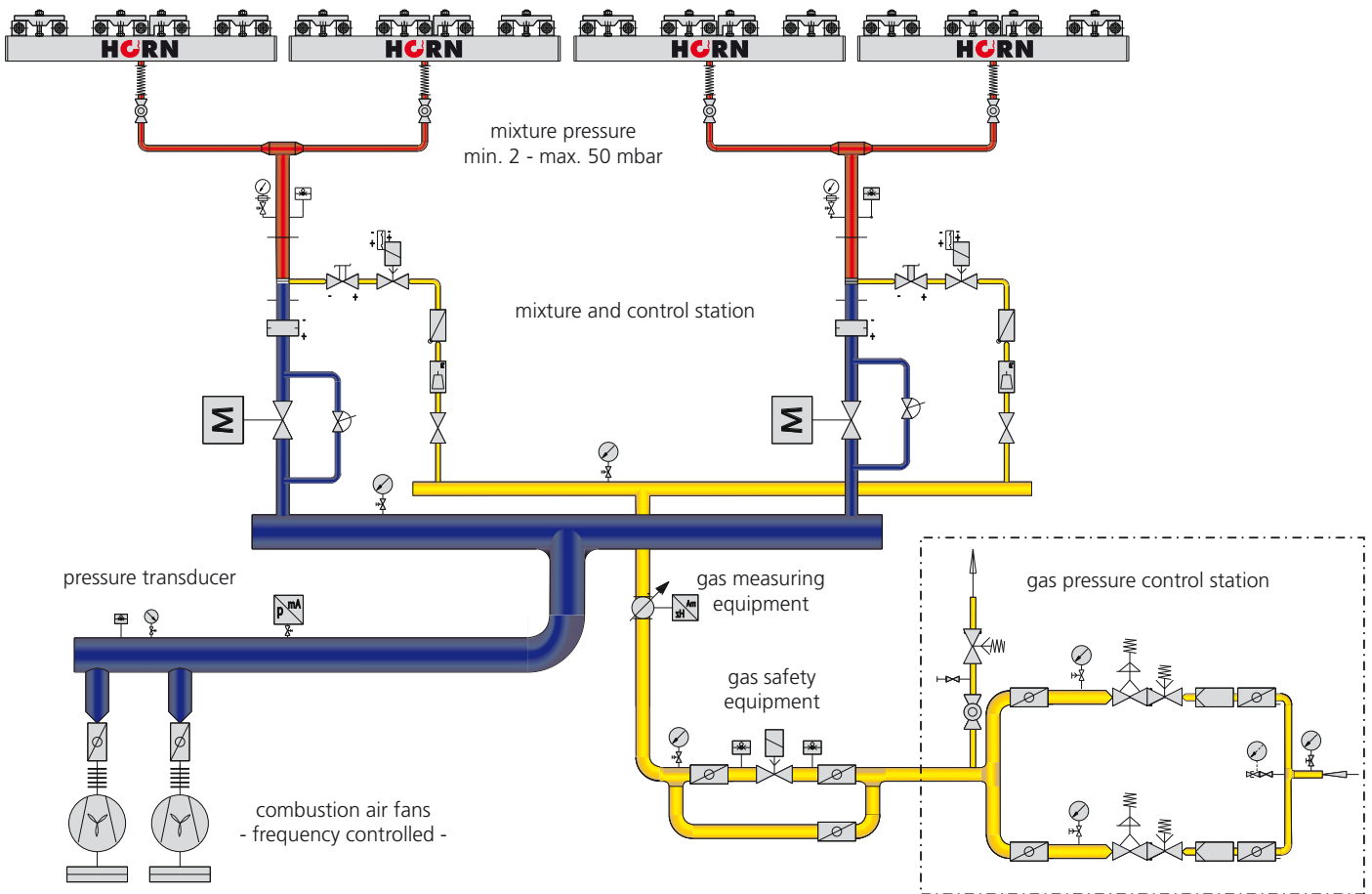
In case of pressure loss, the gas supply is interrupted in the respective control section by the gas safety valve. As soon as normal operating conditions prevail, the gas safety valve (4) automatically releases gas.

Technical Facts

Capacities	
Size	Output
DN 40	40 – 80 kW, max. 9 Nm ³ /h
DN 50	100 – 140 kW, max. 15 Nm ³ /h
DN 65	160 – 220 kW, max. 22 Nm ³ /h
DN 80	250 – 450 kW, max. 43 Nm ³ /h

Gas Pressures	
Type of gas	Pressure
Natural Gas / LPG	max. 100 mbar
Combustion air	max. 120 mbar
Gas-Air-Mixture	max. 70 mbar

THE CORA STATION



AUTOMATIC LAMBDA CONTROL

Controlling reduced atmospheres, when manufacturing coloured glass for example, can prove problematic. In such cases it is desirable to measure the current flue gas oxygen levels to improve the control accuracy of the CORA station.

HORN provides a solution to this problem: A heated zircon oxide sensor measures the oxygen levels in the flue gas. The measuring sensor simultaneously serves as a reaction chamber for the gas air mixtures. Due to a catalytic reaction the oxidation of the gas mixture up to ideal transformation occurs in an extremely short time.

This allows fast measuring groups (less than 2 minutes per measuring cycle), so that practically constant measuring is already realised in as little as 20 to 30 seconds of measuring time.

The physical basis of measuring is the current-free voltage metering at a gas-tight, ceramic, solid electrolyte (zircon oxide) which is contacted porously with platinum on either side. This makes it suitable as an excellent oxygen ion conductor at high temperatures. Therefore a voltage difference (0 - 1000 mV) can be measured, which is proportional to the number of oxygen ions in the flue gas. Thus values of 100% oxygen up to an oxygen partial pressure of 10^{-30} can be measured in gases.

Using the measured differential voltage and a conversion formula, the oxygen content in the flue gas can be measured in volume percent by volume and partial oxygen charge. The lambda value calculated from the measured values now serves as a reference value for the CORA station. Depending on the set lambda values, the control of the CORA station corrects the required gas volume.



Advantages:

- almost 100% stable gas/air ratio is realised along the entire control range (2-70 mbar)
- accurate gas/air ratio control (+/- 0,1% deviation) enables a stable combustion
- proportional gas and air volume control irrespective of pressure
- according to the ambient conditions, individual gas/air ratio may be adjusted manually at the gas reducing valve
- homogeneous mixing of gas and air even at minimum output range due to turbulent flow rates
- increased stability in production conditions leads to increased glass quality
- exchangeable gas nozzle inserts in the mixer make future output adjustment possible
- can be operated with LPG
- constant pressure control of the combustion air fans through a thyristor, leads to reduced electricity consumption of the motors during lower pull
- less pressure loss of the mixers enable the application of combustion air fans with lower compression which results in reduced electricity consumption