

# 2704 2604 MODELS



## Furnace control supplement

### Ideal for:

- Temperature profiling
- Carbon potential
- Oxygen concentration
- Furnace dewpoint

### Features:

- Single, dual and three loop versions
- Setpoint programmer
- Automatic probe cleaning
- Sooting alarm
- CO correction

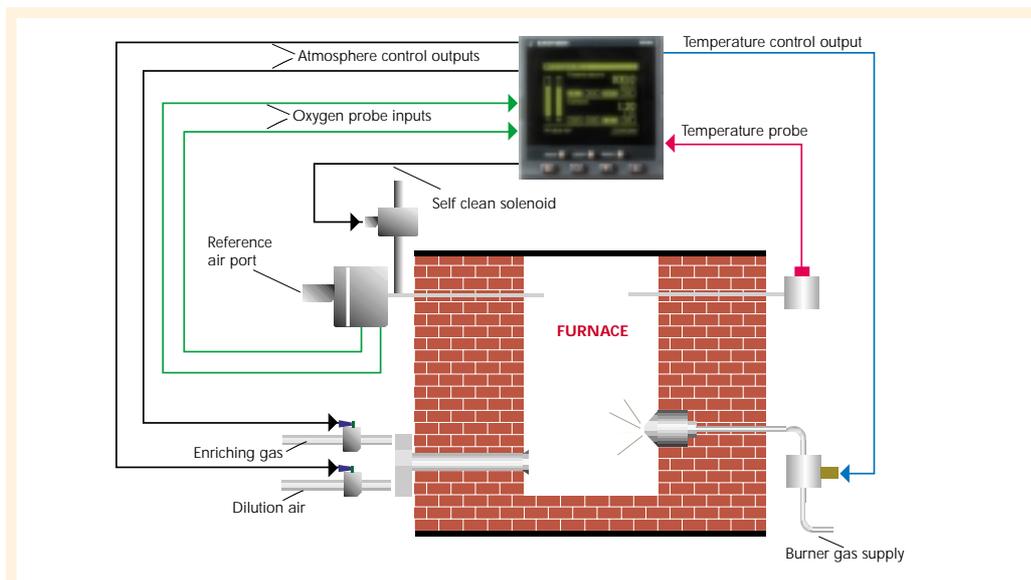
The 2704/2604 instruments are ideal for use in many heat treatment applications including gas carburising.

During the carburising process mild steel or certain low carbon alloy steels are heated at temperatures above 900°C in a carbon rich atmosphere, the surface of the steel absorbs carbon by diffusion. The depth of carbon enrichment depends on the time and temperature of the treatment. The presence of carbon in the steel causes a change in its physical properties. Accurate control of both temperature and the carbon potential are needed to achieve the required profile of carbon enrichment.

A three loop controller could be used to control both furnace temperature, carbon potential and quench. In many batch furnace applications a setpoint programmer is used to generate temperature and carbon profiles which are synchronised to a common time base.

A zirconia probe generates a millivolt signal based on the ratio of oxygen concentration between the reference airside of the probe and the amount of oxygen actually inside the furnace. Temperature is measured using a thermocouple at the tip of the probe. Together, these signals are used by a zirconia function block to calculate the actual percentage of carbon in the furnace atmosphere. The 2604/2704 zirconia probe interface is compatible with most commonly used zirconia probes.

The diagram below shows a typical furnace set-up.



Typical furnace setup



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## Furnace temperature control

Although the sensor input of the temperature loop can come from a zirconia probe, it is more common for a separate thermocouple to be used. The heat control output can either be connected to gas burners or thyristors. In some applications a cooling output may also be connected to a circulation fan or an exhaust damper.

## Furnace atmosphere control

In atmosphere loops the controller increases the carbon potential by opening a solenoid valve which allows a carburising gas (ie propane) to enter the furnace. Conversely, to decrease the carbon potential, air or nitrogen is introduced into the furnace.

## Automatic probe cleaning

The instrument has a probe clean and recovery strategy that can be programmed to occur between batches or requested by the operator. A short blast of compressed air is used to remove any soot and other particles that may have accumulated on the probe. Once the cleaning has been completed the time taken for the probe to recover is measured. If the recovery time is too long this indicates that the probe is ageing and replacement or refurbishment is due.

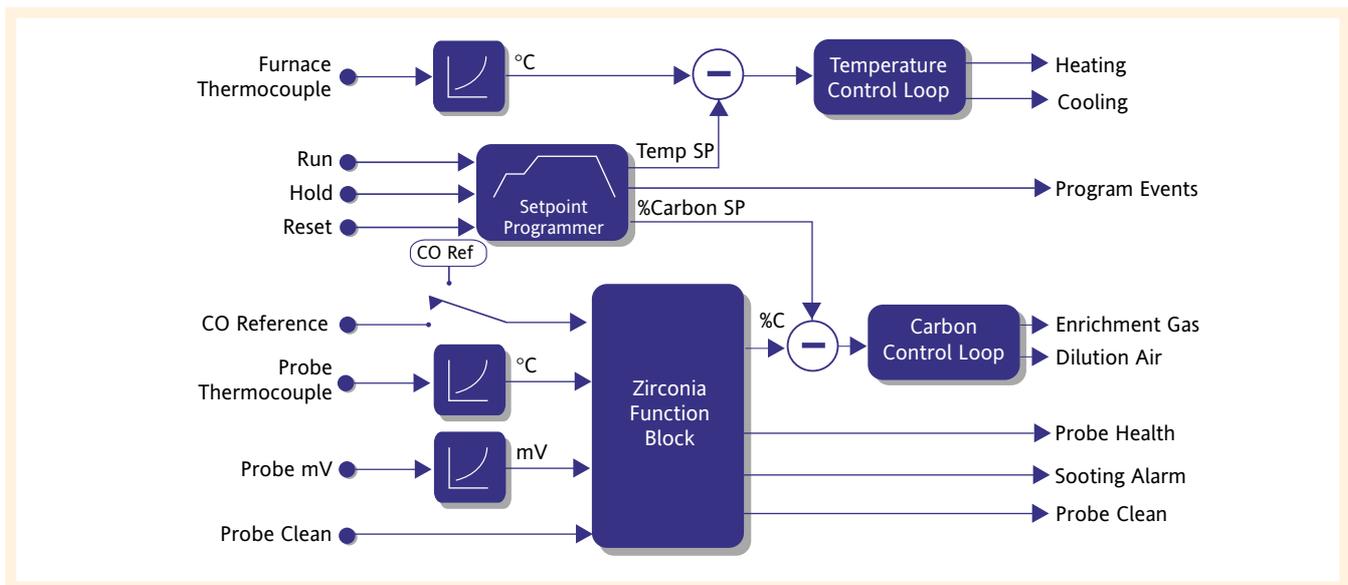
## Sooting alarm

In addition to alarms on the temperature and the carbon potential of the atmosphere, the 2604/2704 can trigger an alarm when the atmosphere conditions are such that carbon will be deposited as soot on all surfaces inside the furnace including the workpiece.

Avoiding soot protects the furnace lining, maintaining the accuracy of the zirconia probe and stops formation of a soot barrier on the workpiece which can prevent carbon diffusion.

## Automatic CO correction

A gas analyser can be used to determine the CO concentration of the gas and this value is retransmitted to the 2604/2704 to be used in calculating carbon potential. This feature is essential where town gas is used since the CO concentration may vary significantly from one day to the next.



Furnace control block diagram

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