Industrial gases are indispensable during the thermal treatment of metallic workpieces to optimize the material properties and the workpiece surfaces.

Of central importance is the ambient atmosphere. The requirements regarding monitoring and regulation of the stipulated composition are precisely satisfied by gas analyzers.

**Requirements**

In order to achieve optimum results during thermal treatment, it is necessary to continuously check the chemical composition of the atmosphere in which the processes are executed (fig. 1).

On the one hand, these are processes in industrial furnaces where the surface oxidation by O₂, CO₂ or H₂S has to be prevented while the thermal treatment has to achieve a specific crystalline structure (tempering, annealing). This is achieved by means of a controlled neutral gas atmosphere.

On the other hand, during these processes the surface has to be specifically influenced with respect to hardness and adhesion (e.g. for paints) using of an exactly defined atmosphere during the thermal treatment.
Procedures for thermal treatment

Procedures for thermal treatment are carbonizing, decarbo-
nizing and carbonitriding.

When carbonizing, the surface of steel parts is enriched
with carbon at high temperatures. Carbonizing furnaces
work with a mixture of nitrogen and methanol. By contrast,
decarbonizing reduces the hardness by removing carbon
from the workpiece surface.

A further procedure is carbonitriding. In this case, nitrogen
is added to the surfaces in addition to the carbon, resulting
in a particularly high degree of hardness. Ammonia (NH₃) is
therefore the additional component in the furnace atmos-
phere.

Alongside the mentioned, methane (CH₄) also has an
influence on the process (fig. 2). Hence measurement of
CH₄ is also important.

Technical solution

During thermal treatment it is decisive to select the gas
compositions precisely and to monitor them exactly. The
ULTRAMAT 23 multi-component gas analyzer (fig. 3) per-
mits measurement of the CO, CO₂ and CH₄ concentrations
in one device. The analyzer uses a non-dispersive infrared
sensor (NDIR) which guarantees high selectivity and
measuring accuracy. Relay control together with automatic
maintenance and remote diagnostics functions facili-
tate the integration of the ULTRAMAT 23 in a wide variety
of automation concepts.

Advantages at a glance

- Economic efficiency, reliability, product quality, and
  system concept
- High efficiency thanks to analysis of different gas compo-
  nents using only one analyzer
- Minimum consumption of calibration gas
- Low maintenance overhead
- Cost savings through precise control of the used gases
- Insensitive to external interferences thanks to multilayer
detector and autocalibration
- Significant reduction in workpiece rejects