SM 01 *Sensor module*

with carbon potential calculation

with online carbon diffusion calculation

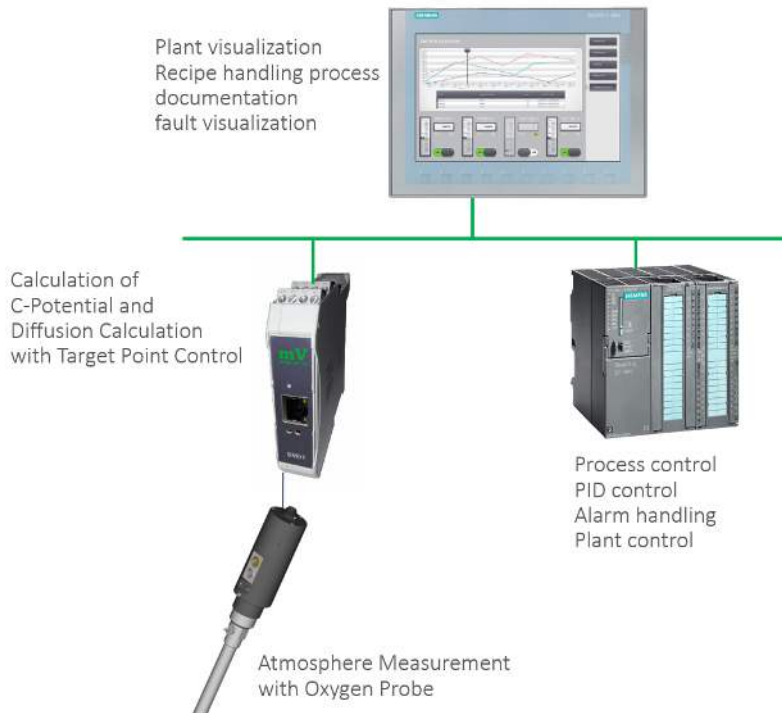*with K_N/ K_C/ K_O calculation*

with dew point and

residual oxygen calculation

- Sensor module for DIN rail mounting

- Available in different versions:
  - As a module for connecting an oxygen probe
  - for carburizing processes with carbon potential calculation
    and carbon online diffusion calculation with target size control
  - for gas nitriding and nitrocarburizing processes with KN / KC / KO calculation
  - with dew point (down to -120 ° C) and residual oxygen calculation

- Supply 24V DC, max. 100mA

- Inputs / outputs:
  1 x EMF oxygen probe signal 0 - 1600 mV, input impedance typical 800 MΩ, 24 Bit
  1 x thermocouple input, type configurable, 19 Bit
  1 x analogue input 0/4 - 20 mA, 24 Bit
  (all three analogue inputs are isolated against ground and between each other)
  2 x analogue output 0/4 - 20 mA, 16 Bit
  2 x digital output 24 V, 250 mA, short circuit proof
  1 x Ethernet, Modbus / TCP slave, and MQTT protocol, web server for configuration
  optional Modbus RTU
  optional CANopen

- Easy integration into any automation environment possible

Example: Carburizing furnace with C-Pot. Control and Diffusion Calculation

Plant visualization
Recipe handling process documentation
fault visualization

Calculation of
C-Potential and
Diffusion Calculation
with Target Point Control

Process control
PID control
Alarm handling
Plant control
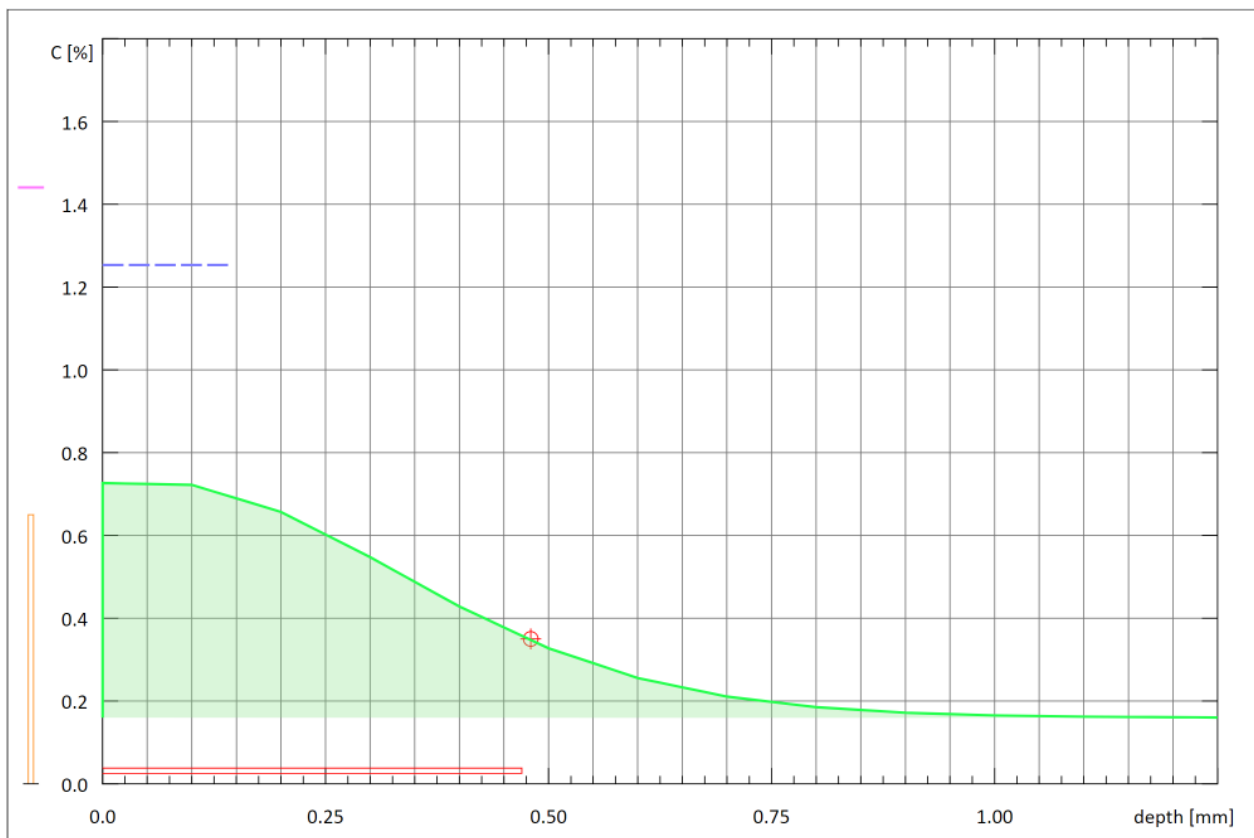
Atmosphere Measurement
with Oxygen Probe

The system visualization, editing of the recipes, the process documentation and the visualization of faults are made available on the control panel.

The process control, the PID control of temperatures and C-level, the fault processing as well as the complete system control is carried out on the system PLC.
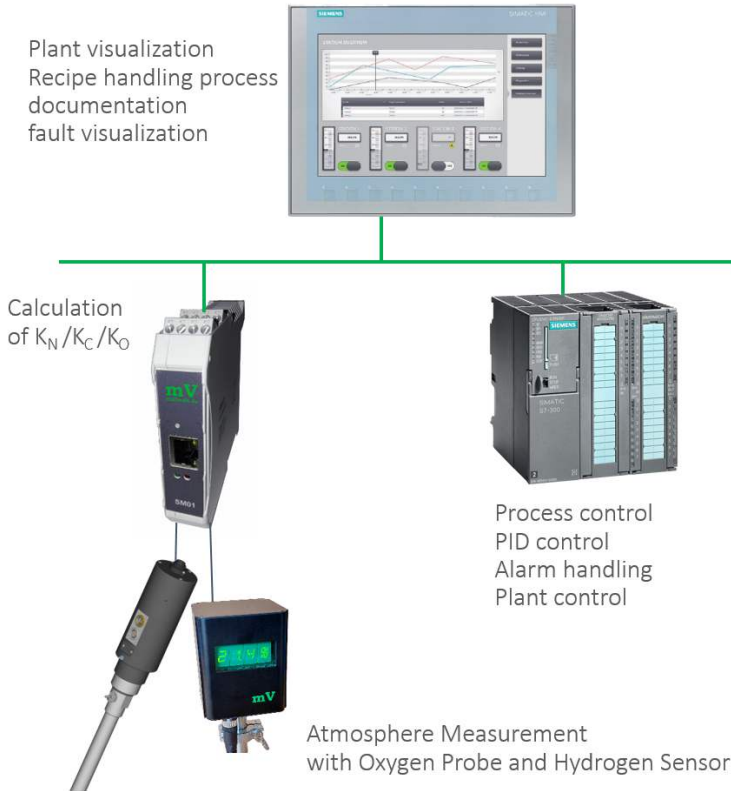
The sensor module is used to connect the atmosphere measurement consisting of an oxygen probe and an optional CO analyzer. The complete calculation of the C potential and the current carbon profile takes place in the sensor module.

This also generates a graphic of the carbon profile, which is made available via the integrated web server. This graphic can be transferred to the control panel without further programming.

Carbon Profile in Carburizing and Case Hardenning

Example: Nitriding furnace with K_N / K_C / K_O Control

Plant visualization
Recipe handling process documentation
fault visualization

Calculation
of K_N/K_C/K_O

Process control
PID control
Alarm handling
Plant control

Atmosphere Measurement
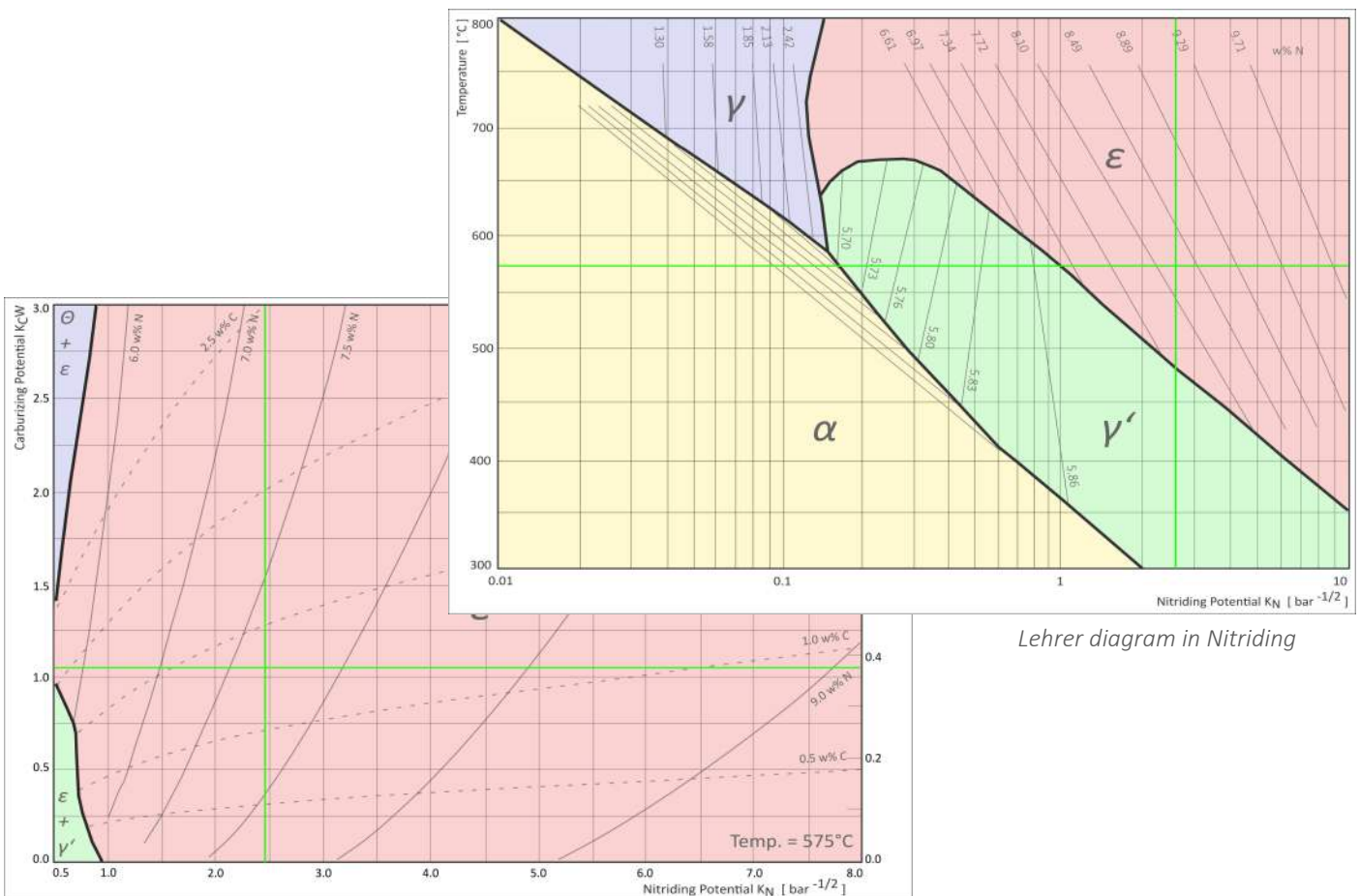with Oxygen Probe and Hydrogen Sensor

The system visualization, editing of the recipes, the process documentation and the visualization of faults are made available on the control panel.

The process control, the PID control of temperatures, atmospheric values such as K_N, K_C and K_O etc., the fault processing as well as the complete system control is carried out on the system PLC.

The sensor module is used to connect the atmosphere measurement consisting of a hydrogen sensor and an optional oxygen probe. The complete calculation of the furnace atmosphere and the atmosphere parameters K_N, K_C and K_O takes place in the sensor module. This also generates graphics of the

Lehrer diagram and the Kunze diagram, which are made available via the integrated web server. These graphics can be transferred to the control panel without further programming.
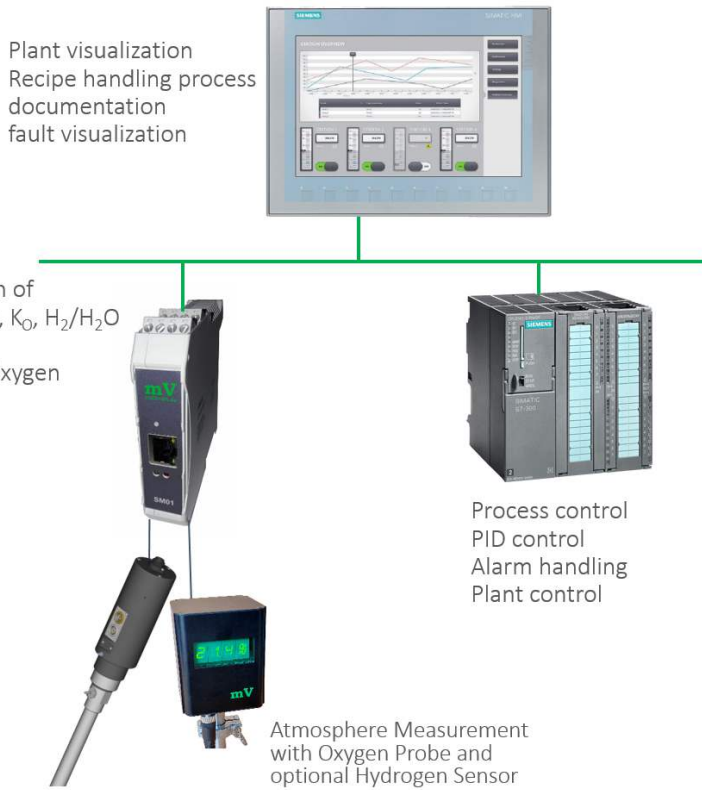

Lehrer diagram in Nitriding

Kunze diagram in Nitrocarburizing

Example: Furnace with Dew point- or Residual Oxygen Control

Plant visualization
Recipe handling process
documentation
fault visualization

Calculation of
Dew point, K_O, H_2/H_2O
and
Residual Oxygen

Process control
PID control
Alarm handling
Plant control

Atmosphere Measurement
with Oxygen Probe and
optional Hydrogen Sensor

The system visualization, editing of the recipes, the process documentation and the visualization of faults are made available on the control panel.

Process control, PID control of temperatures, atmospheric values such as dew point, H_2/H_2O ratio or residual oxygen, the fault processing as well as the complete system control is carried out on the system PLC.

The sensor module is used to connect the atmosphere measurement consisting of an oxygen probe and an optional hydrogen sensor. The atmospheric parameters dew point, H_2/H_2O ratio or residual oxygen are measured in the sensor module. This also generates graphics of the Ellingham diagram based on the H_2/H_2O ratio and residual oxygen, which is made available via the integrated web server. These graphics can be transferred to the control panel without further programming.
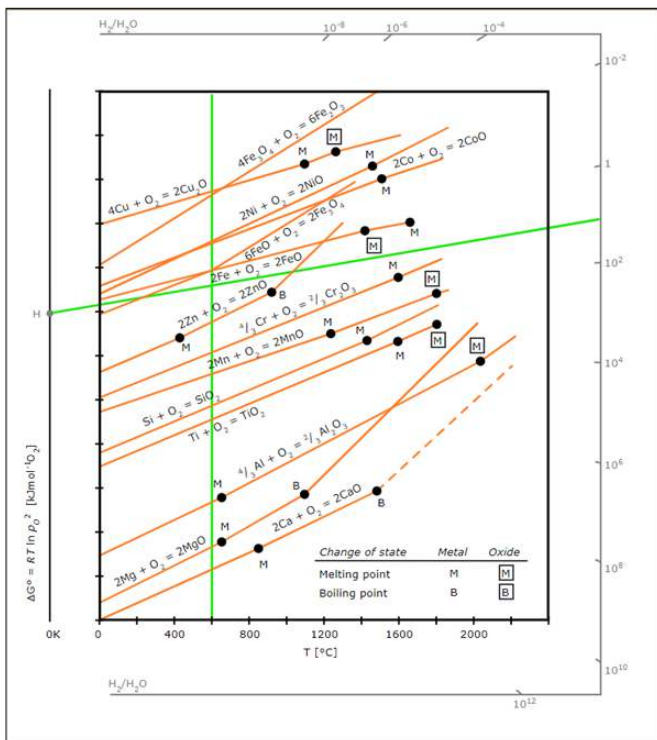
Ellingham-Diagram H_2/H_2O Ratio
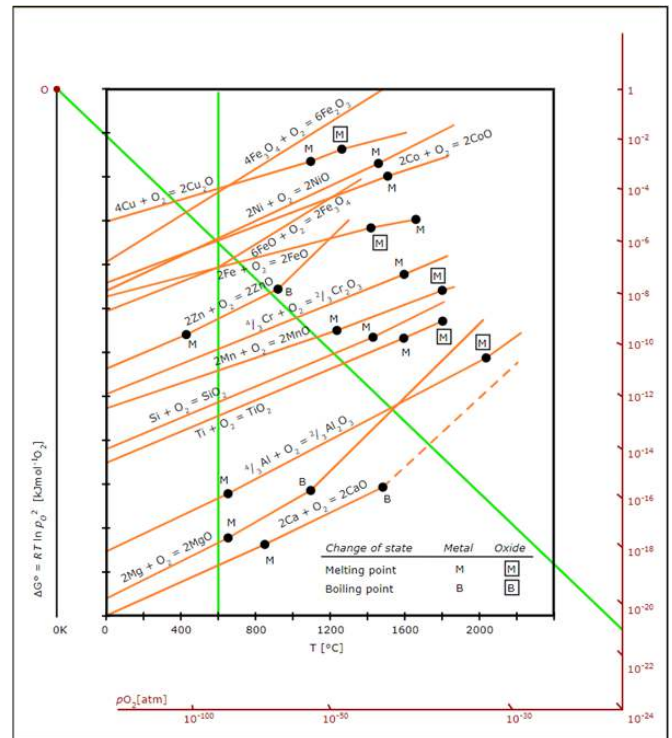
Ellingham-Diagram Residual Oxygen