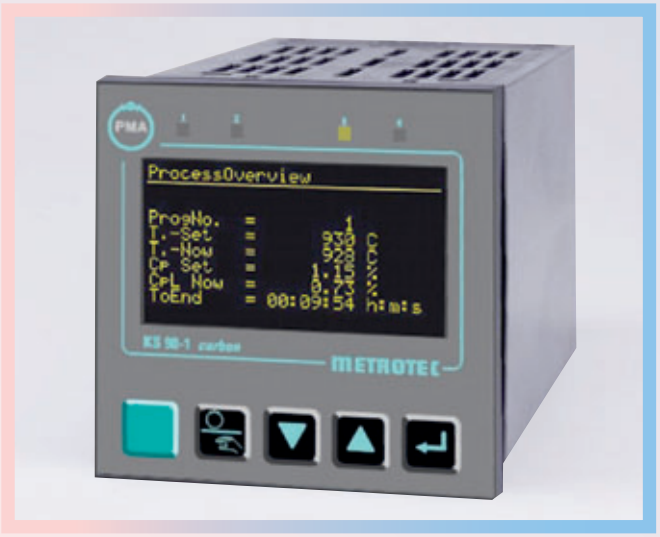
A compact answer for C potential control: KS 98-1 carbon

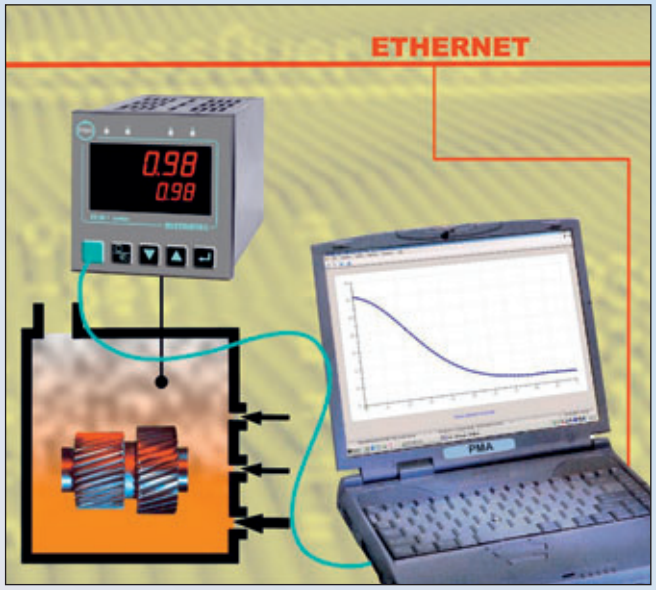
- Ideal for gas carburizing in continuous and batch furnaces
- Complete processing sequence with all measurement, control, monitoring, and operating functions integrated in a single unit
- Simple, transparent operation
- Cost-effective direct connection of temperature and oxygen sensors
- Calculation of the C potential (Cp)
- Recipes also take the alloying factor into account
- Simple configuration of the programmer for temperature and C potential
- Clear display layouts with plain text ensures fast process monitoring
- Automatic quality monitoring during the carburizing process
- Straightforward, clear alarm handling
- Connection of remote operating buttons for distinct functions
- Commissioning and servicing menus with convenient graphics
- Serial interface for data exchange with PC and for linking into networks and supervisory systems
- Competent and reliable solution thanks to close cooperation with specialized sensor manufacturer (METROTEC)



Batch reports and recipe generation

The KS 98-1 carbon comes ready-wired for connection to a superordinate process management level (e.g. a PC with PMA's software tool MSI)::

- Convenient batch reporting
- Online diffusion calculation with graphical visualization
- x/y representation of carbon distribution in the material
- Fast preparation of new recipes
- Process parameters are saved in a database
- Graphic display of historic process curves



PMA's control concepts provide established solutions to obtain optimal production results, cut commissioning times, and help to reduce manufacturing costs permanently. Simply ask us – we give competent advice and we have solutions.

PMA Prozeß- und Maschinen-Automation GmbH
Miramstraße 87
34123 Kassel/Germany
Tel./Fax: +49 561 505-1307/-1710
E-mail: mailbox@pma-online.de
www.pma-online.de

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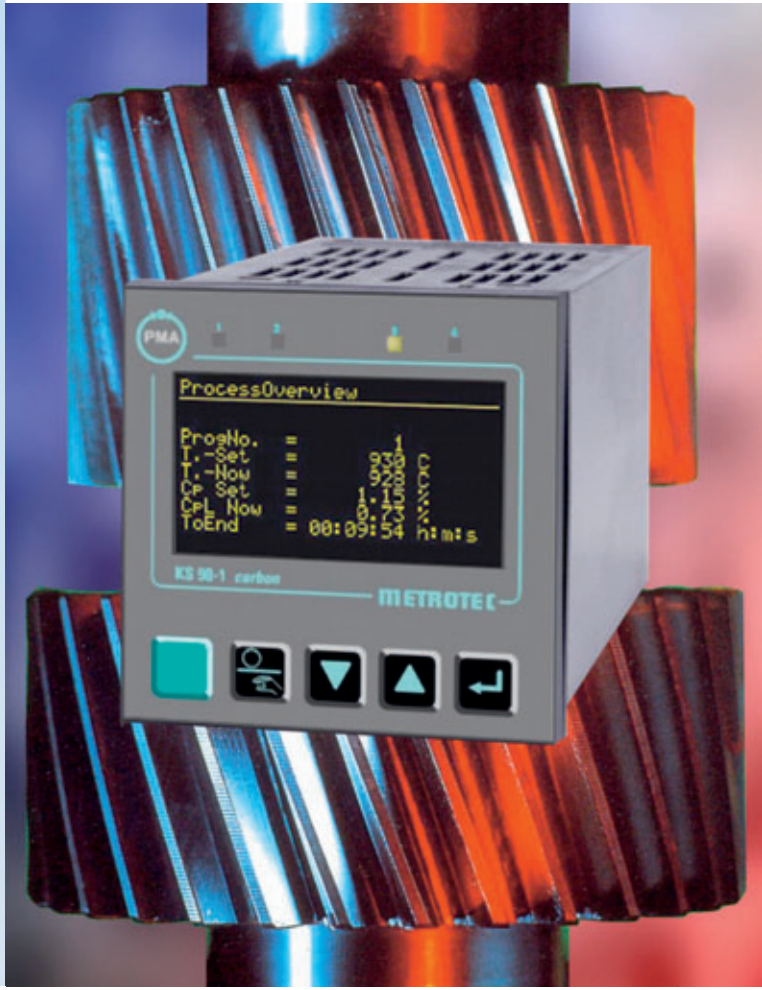
KS 98-1 carbon

Control of C potential in gas carburizing plants for precise case hardening



- **Customized automation**
- **Simple recipe management**
- **Online diffusion calculation in the master PC**

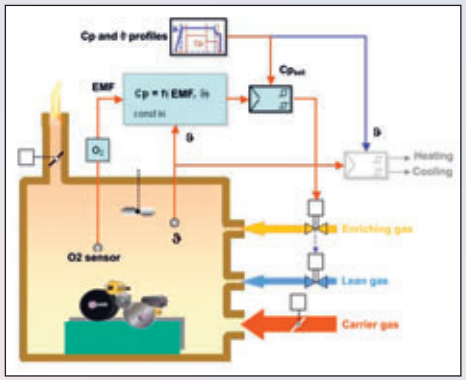
Wir kriegen's geregelt
Close the loop with

PMA

New approaches solve practical needs

Are you looking for consistently defined surface hardness within tight tolerances for steel components?

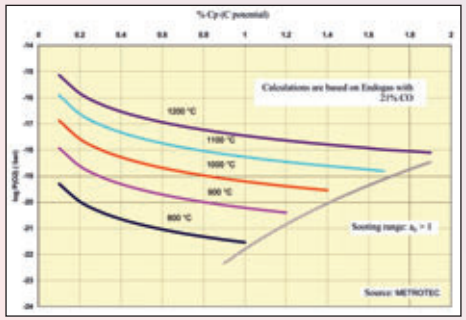
Our solution enables you to achieve this aim cost-effectively and reliably.



Example for control of the carburizing process in a batch furnace

The highly specialized processes in gas carburizing plants require suitably adapted automation technology. Operators expect a simple, transparent, and unmistakable procedure when preparing and activating different recipes. For monitoring the variable temperature and gas concentrations, and for calculating the C potential to obtain defined carbon enrichment in the surface layer of steel components, the indirect measurement method using sensors to determine oxygen partial pressure has proved to be most effective.

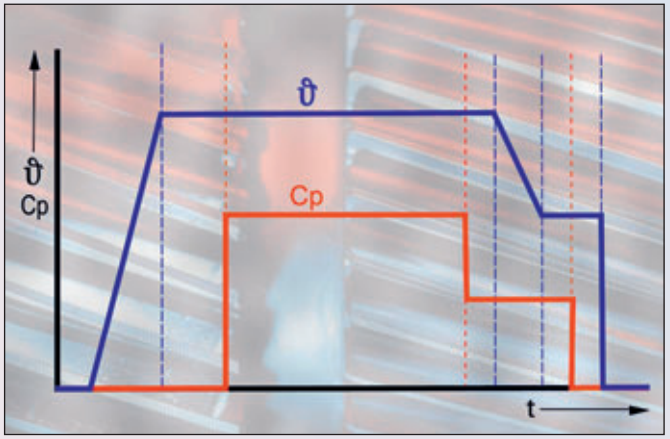
This new PMA controller permits the direct connection of temperature and oxygen sensors, calculates the C potential Cp in the furnace atmosphere (also taking the alloying factor and the C potential of the batch into account), and meets all the processing requirements of these highly complex thermo-chemical procedures – coupled with previously unknown user-friendliness.



C potential as a function of oxygen partial pressure at various temperatures

Control technology in the background – precise processing sequence

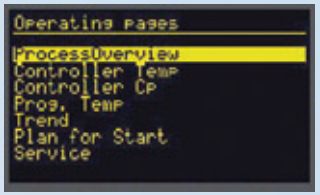
- Atmosphere controller with switching control mode (2-point and 3-point)
- Precise calculation of the Cp value
- Exact control of setpoints for temperature and Cp value using two independent control loops
- Sooting alarm triggered by means of timer-controlled monitoring of an exceeded Cp setpoint (limit monitoring of the time integral)
- Programmer functions ensure an accurate control profile (with automatic bandwidth monitoring of the carburizing process)
- Program start according to date/time or via an external signal
- Programmer outputs available for additional processing steps (e.g. ammonia)
- Introduction of carrier and carburizing gas, with controlled setpoint for the Cp program according to the individual durations of the batch recipe
- Comprehensive selection of parameters for plant and batch conditioning as well as special testing and flushing procedures
- Options: Control of the indirect heating/cooling
  Pressure control in the reaction chamber
  Monitoring of carrier gas flow
  Selection of the application-specific intermediate cooling
  Integration of additional plant equipment for material charging/removal



Safe operation has priority

- The user interface has been reduced to the essentials
- Consistent menu guidance
- Precise readout of the "day & night" display
- Master menu and a few more pages for:
  ➤ Process overview, controller, programmer, batch parameters, and service
- Password-protected access to the individual operating levels
- In case of critical process conditions, an alarm list automatically displays the correct sequence of alarms that need to be acknowledged.

The following display examples show:



Master menu

Most important process conditions displayed on one pagee

Operation of Cp controller at a glance

Direct access to program controller

Disturbance: Immediate status display "Disturbance" or "Everything within limits" by means of visual effects
- *event-controlled color change*
- *direct / inverse display*
- *display flashes*