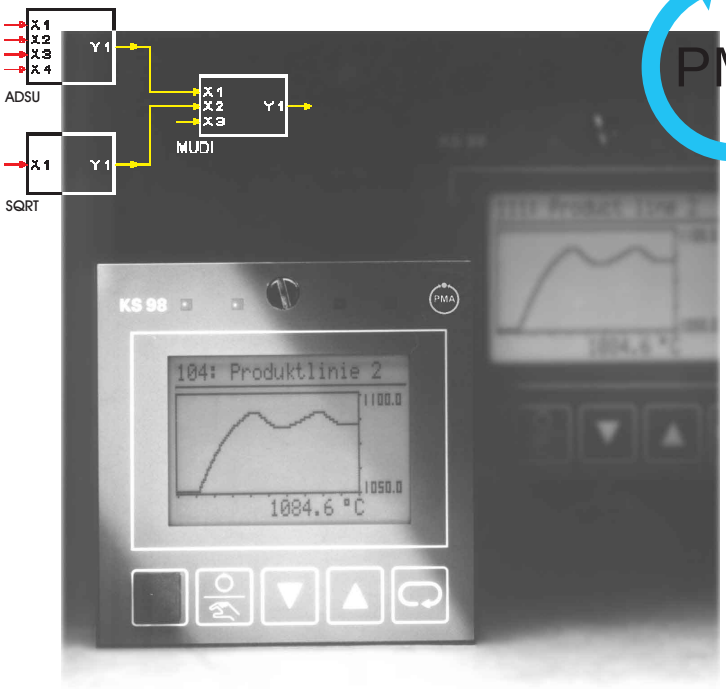


PMA

KS 98 APPLICATION

Controller for pulsed burner operation

8 burners can be connected (extendable)

Simple, clear operation

Rotating ignition sequence

Minimum deviations in case of a burner fault

Disturbance indication in the display

Automatic switch-off in case of total failure

KEY WORDS

Burner control, pulsed burner control, heat treatment machines, furnace control

PROFILE

With a number of heat-treatment processes, mainly large-volume batch processes such as ceramic kilns, annealing furnaces, etc., a considerable improvement in the transfer of heat to the charge can be achieved through forced and controlled turbulence of the combustion gases in the furnace. The advantages in terms of efficiency, product quality, and environmental aspects are obvious:

- Higher throughput due to shorter processing times
- Reduced operating costs through lower fuel consumption
- Lower environmental effects through less waste gas per charge
- More even temperature distribution inside the furnace due to turbulence
- Improved product quality for the entire charge because of uniform heat transfer to the entire charge

DESCRIPTION

The heat energy demanded by a controller is supplied by several burners that are arranged around the furnace or kiln. Higher turbulence results in a better distribution of the heat; therefore, the burners are not operated simultaneously, but in a programmed sequence.
Depending on type, size, and purpose of the plant, the burners can be fired individually or in groups.

Control

A continuous set-point controller is used for temperature control. Instead of a fixed set-point, a programmable set-point with several (program) recipes can also be fitted.
Computation of the required duty cycle (on/off ratio of the burners), the firing periods, the sequential timing of the burner ignition signals, and their assignment to the relevant burners is done automatically.

Transposition of the control signal

The continuous output of the temperature controller represents the total required heat energy. Therefore, the sequence controller distributes the demand evenly among the available burners. In addition, the logic program ensures that the burners are fired in a defined sequence, whereby the relevant duty cycles are also computed automatically.

Two-point behaviour

The burners are not operated continuously, but in a two-point (on/off) mode. This means that they are switched from pilot flame to full load at regular intervals, which results in a pulsed flow of combustion gases, thus producing and maintaining the required turbulence.

Minimum values for burner on/off periods

With a duty cycle of 50%, the periods T_{on} and T_{off} are equal. In order to ensure linear control of the duty cycle, also at the upper and lower limits of control signal y, the off-period T_{off} is increased when $y < 50\%$, and the on-period T_{on} is increased when $y > 50\%$.

Simultaneously, the corresponding opposite period is maintained at a constant value.

The control signal y is monitored by means of adjustable limit values (y_{-}, y_{-}). An exceeded limit results in total switch-on or switch-off.

Computation of ignition sequence

The total effective operating cycle of the burners is computed from the sum of all the duty cycles ($T_{on} + T_{-}$). This cycle represents the time within which all available burners are ignited once.

Burner failure

The availability of each burner is signalled by a contact or a logic signal. Defective burners are taken into consideration automatically, so that even if more than one burner fails, the ignition sequence is distributed evenly among the remaining burners. Furthermore, it is possible to define how many burners are permitted to fail before the entire plant must be switched off, because correct operation is no longer ensured.All defective burners are displayed sequentially in the top line of every operating page of the KS 98. If the plant must be shut down, the display shows `Plant SHUT-DOWN` !!(see Fig. 2). By means of the Engineering Tool ET/KS 98, the messages can be modified by the user as required.

Control signal compensation with burner failure

Failure of one or more burners is compensated automatically, without an appreciable drop in process temperature. As soon as a burner goes back into service, the control signal is adapted automatically to the new situation (see Fig. 1).

Operating pages

The controller's operating page is displayed as standard. All the other pages are called by means of a menu (see Fig. 3). If required, certain pages can be blanked or can be protected by a password.

Optional functions

- Addition of more burners
- Programmable set-point
- Heating/Cooling operation
- Reduction of the central air and fuel supply by means of motorized control valves, e.g. during light load operation (modulating)
- Different burner ratings
- Password protection for operating pages

Fig. 1 Minimum temperature deviation after failure and re-start of a burner:

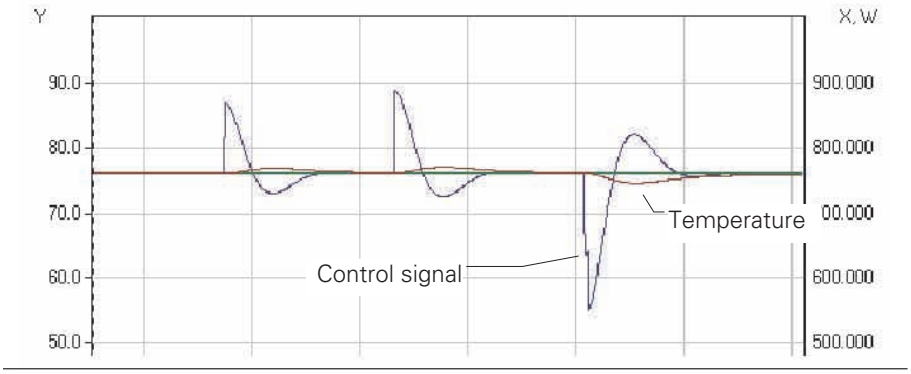


Fig. 2 Display on failure of burner 6:

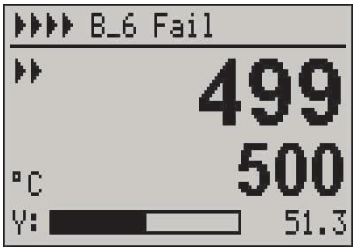


Fig. 3 Selection menu:

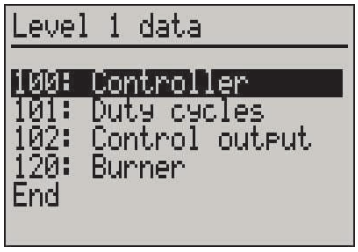


Fig. 4 Controller operating page:

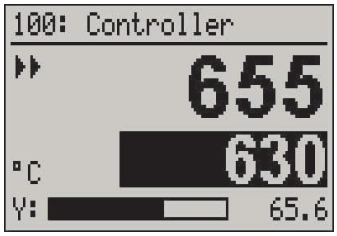


Fig. 5 Duty cycle operating page:

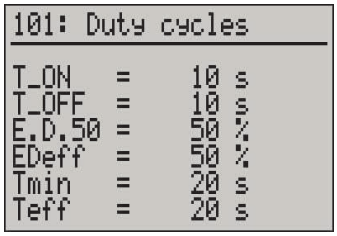


Fig. 6 Control signal operating page:

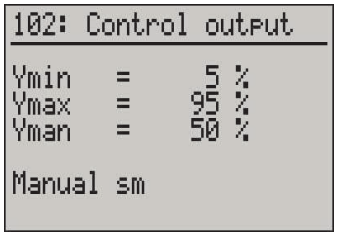
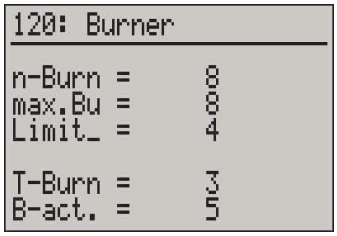


Fig. 7 Burner operating page:



Description	***Order no.***
Engineering "Pulsed burner" (required once)	DIKS-ENG-98002
KS 98	9407-963-11091
KS 98 with PROFIBUS-DP	9407-963-31091
KS 98 with INTERBUS	9407-963-41091

KS 98 version with 4 relays, 90...250 VAC, INP3, INP4, OUT3, di/do
For other versions and detailed technical data, *see KS 98 data sheet no. 9498 737 32113*

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