System Overview

Boiler Control System VC10

Control, visualisation and regulation of burner and boiler

Sensors and Systems for Combustion Engineering

LAMTEC
www.lamtec.de

Complete system for burner and boiler control.

Operating, controlling and regulating the burner and boiler with one system

LAMTEC VC10 makes it possible.

Design
The VC10 is a system based on the LAMTEC CMS that extends the Burner control unit with boiler functions. The VC10 consists of the GUI and additional I/O modules. The plant type (steam boiler or liquid heat transfer medium) is preselected using the internal digital inputs on the GUI.

Brief description
VC10 is a system for the operation, control and regulation of a boiler plant. The operator can access all relevant data and functions very quickly and clearly via the GUI.

The commissioning engineer can configure the boiler plant as required using the menu.
VC10 includes pre-configured controllers for e.g. power and level, which can be easily modified without having toswitch to the programming level of the system.

The most important boiler data is written to the 50 customer registers so that it is available for a higher-level control system.

The VC10 is a boiler control system in the non-safety soware programme. A corresponding boiler protection system is also required! As well as ensuring that the flue gas path is open, this must be connected directly to the CMS.

Advantages

■ Plug & Play
■ No programming knowledge required
■ Configurable
■ Extended controller functions
■ No additional control system

Detailed description
In addition to the following functions, the basic block contains the CPU for the control system of the boiler/burner and the touch panel for operating the plant. The module contains the functions
■ Basic control boiler and one burner
■ Power control for one burner with one component included.

Basic control boiler and one burner
The basic control includes the plant and burner release as well as the basic operation (acknowledgement, automatic release, collective fault and horn). After burner release, the damper control output is enabled first. If the „Open" acknowledgement is successful, the burner and the power control are by the CMS with the control mode signal.

Visualisation boiler and one burner
The visualisation includes a system overview, controller page, alarm lists and the configuration pages.

Firing On/OFF
The manometer is available for the steam boiler system type and the thermostat for the liquid heat transfer medium. Both types have the same behaviour, but the unit and values are different. The functions and settings are below using a thermostat. The different operating modes can be selected.

Automatic operating mode:
The release takes place between the set switch-on and switch-off points. These can absolute or relative to the setpoint of the firing rate controller.
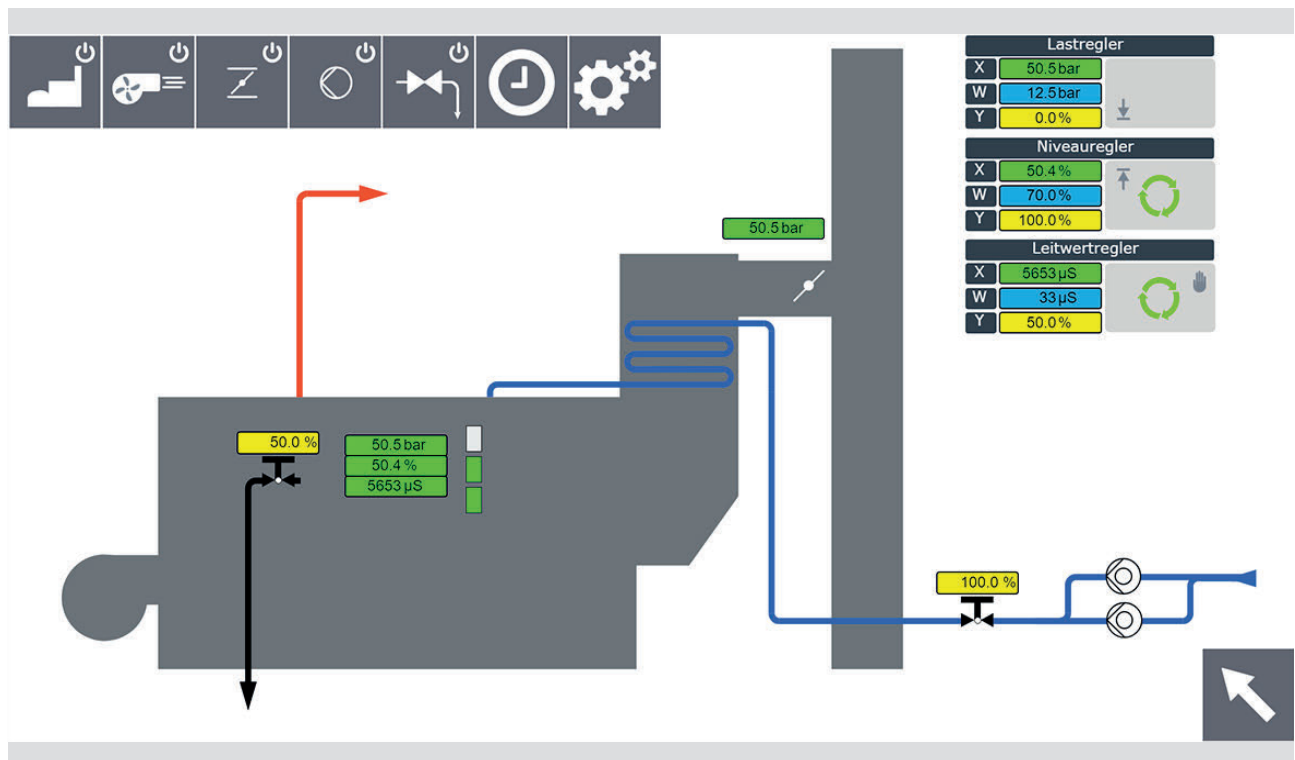
Bypass operating mode:
The operator can use the bypass function to test a superior switch-off function regardless of the set values. The switchoff bypass is enabled for the next 30 minutes. The operating mode then switches back to „Automatic".
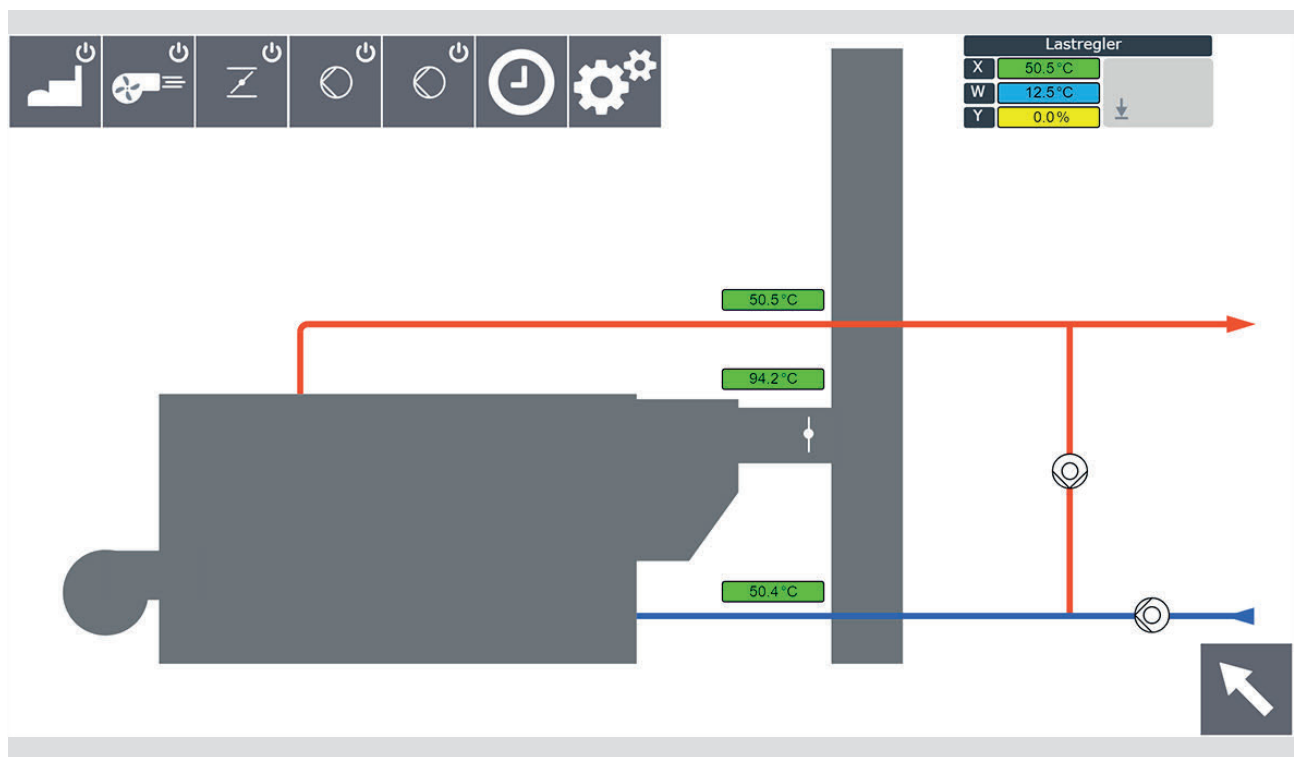
Absolute operating mode:
Two input fields are available for the switch-on and switch-off point.

System visualisation on the GUI610

Visualisation steam boiler

Visualisation of liquid heat transfer media

Relative operating mode:
Two setting values - delta and hysteresis - are available. For the switch-off point, the delta is added to the active setpoint of the firing rate controller and for the switch-on point, the hysteresis is subtracted from the switch-off point.
Example (setpoint 80 °C, delta 10 K, hysteresis 20 K): This results in a switch-off point of 90 °C and a switch-on point of 70 °C.

Power control for a burner with one component
The output control includes a digital controller for controlling the boiler pressure/boiler temperature. The setpoint can be set to 'Fixed' or specified by a time programme/analogue input. A manual setting and a load limit are available. It is also possible to activate different start-up ramps.

Time programme:
This function can be used to replace the setpoint of the firing rate controller with a default value at a specific time window. To do this, these time windows and default values must be set and activated. Outside of active time windows, the setpoint firing rate is active.

Overall efficiency (ETA)
The overall efficiency is calculated from the active losses and the performance data. The data/constants must be set correctly for the individual loss calculations. The desalting and blowdown losses can only be activated for the steam boiler system type. The efficiency calculation is only available with active flue gas temperature measurement.

Steam boiler binary
The following functions are included:
■ Boiler level control with a feed water pump and binary water level detection
■ Boiler level control with two feed water pumps with automated pump change and binary water level detection
■ Blowdown control

Niveausteuerung Kessel mit einer Speisewasserpumpe und binärer Wasserstandserfassung
Der feed water pump is switched on when the water level falls to 'Water level below'. If the „Water level at top" is exceeded, the feed water pump is blocked and only switched on again when the „Water level at bottom" is reached. If the water level in the feed water tank is too low, the feed water pump is forcibly stopped. The function is only active with plant „On".

Boiler level control with two feed water pumps with automated pump change and binary water level detection.
A feed water pump is switched on when the water level falls to 'Water level below'. If the „water level at top" is exceeded, the feed water pump is blocked and only switched on again when the „water level at bottom" is reached. If the water level in the feed water tank is too low, the feed water pump is forcibly stopped. An automatic pump change depending on the operating hours and an adjustable running time ratio is guaranteed. The pump is only changed via the pump status „OFF". When using fault and operating message, the system automatically switches to the redundant pump in the event of a pump fault. The function is only active with plant „On".

Blowdown control
The blowdown control system realises an automatic blowdown of the boiler. This removes impurities from the boiler tank at regular intervals.
For this purpose, the blowdown valve is activated in an adjustable pulse-pause ratio. The function is only active with plant „On".

Steam boiler analogue
The following functions are included:
■ Boiler level control with one feed water pump and analogue water level detection
■ Boiler level control with two feed water pumps with automated pump change and analogue water level detection
■ Level control via TPS control valve and a feed water pump
■ Level control via TPS control valve and two feed water pumps with automated pump changeover
■ Conductance control via TPS control valve
■ Blowdown control with overfill protection

Boiler level control with a feed water pump and analogue water level detection
The „Water level down" and „Water level up" switching points can be freely preselected between 0 and 100%. The feed water pump is switched on when the water level falls to „Water level below". If the „Water level above" is exceeded, the feed water pump is blocked and only switched on when the „Water level above" is reached. If the water level in the feed water tank is too low, the feed water pump is forcibly stopped. The function is only active with plant „On".

Boiler level control with two feed water pumps with automated pump change and analogue water level detection

The „Water level down" and „Water level up" switching points can be freely preselected between 0 and 100%. A feed water pump is switched on when the water level falls to „Water level below". If the 'Water level above' is exceeded, the feed water pump is blocked and only switched on again when the 'Water level below' is reached. If the water level in the feed water tank is too low, the feed water pumps are forcibly stopped.

An automatic pump change depending on the operating hours and adjustable running time ratio is guaranteed. The pump is only changed via the „OFF" pump status. When using fault and operating messages, the system automatically switches to the redundant pump in the event of a fault. The function is only active with plant „On".

Level control via TPS control valve and a feed water pump

The level control includes a digital controller for controlling the boiler level. The controller opens or closes the control valve depending on the boiler level. An adjustable limit value (minimum opening control valve position) with hysteresis releases the feed water pump. In addition, the pump is blocked if the adjustable 'Water level at top' is exceeded. If the water level in the feedwater tank is too low, the feedwater pump is forcibly stopped. The function is only active with plant „On".

Level control via TPS control valve and two feed water pumps with automated pump change

The level control includes a digital controller to regulate the boiler level. The controller opens or closes the control valve depending on the boiler level. An adjustable limit value (minimum opening control valve position) with hysteresis releases the feed water pump. In addition, the pump is blocked if the adjustable 'Water level at top' is exceeded. If the water level in the feedwater tank is too low, the feedwater pump is forcibly stopped. The function is only active with plant „On".

Conductance control via TPS control valve

The conductivity control (desalting controller) comprises a digital controller for controlling the conductivity and thus the concentration of conductive components in the boiler. The controller opens or closes the control valve depending on the conductance. The function is only active with plant „On".

Blowdown control with overfill protection

The 'Overfill protection' function is added to the blowdown control of module 10. The switching point „Overfill" can freely preselected between 0 and 100%.. When exceeding the switching point „Overfill", the blowdown valve is activated in an adjustable pulse-pause ratio to lower the boiler level. The function is only active with plant „On".

Liquid heat transfer medium

The following functions are included:
- Bypass RLA pump or valve

The return flow boost controller includes a digital controller for controlling the boiler return flow temperature. The return flow booster can be designed as a pump or control valve. The controller changes the flow rate via the bypass depending on the boiler return temperature. The function is only active with plant „On".

Assignment of I/O modules for a steam boiler.

Connected modules from the GUI

AI 1 Boiler pressure
AI 2 Boiler level
AI 3 Boiler conductivity
AI 4 Flue gas temperature or external setpoint
DI 1 External plant On
DI 2 External burner On
DI 3 Acknowledgement plant
DI 4 Exhaust gas flap or air flap is open
DI 5 Automatic mode
DI 6 Alarm message 1
DI 7 Alarm message 2
DI 8 Alarm message 3
DI 9 Feedwater Pump 1 Operation
DI 10 Feedwater pump 1 fault
DI 11 Feedwater Pump 2 Operation
DI 12 Feedwater pump 2 fault
DI 13 Boiler lower water level
DI 14 Boiler upper water level
DI 15 Boiler high water level
DI 16 Feedwater dry run protection
DO 1 Collective fault
DO 2 EWM - Horn
DO 3 Acknowledgement for external devices
DO 4 Exhaust air flap or supply air flap
DO 5 Blowdown control
DO 6 Feedwater pump 1
DO 7 Feedwater pump 2
DO 8 Level control valve OPEN
DO 9 Level control valve CLOSED
DO 10 Desalination control valve OPEN
DO 11 Desalination control valve CLOSED
DO 12 - -
DO 13 - -
DO 14 - -
DO 15 - -
DO 16 - -

Internal inputs on the GUI

DI 1 Selection steam boiler control
DI 2 Selection liquid heat transfer medium
DI 3
DI 4

Assignment of I/O modules for a liquid heat transfer medium

Connected modules from the GUI

AI 1 Boiler supply temperature
AI 2 Boiler return temperature
AI 3 Flue gas temperature
AI 4 External setpoint
DI 1 External plant On
DI 2 External burner On
DI 3 Acknowledgement plant
DI 4 Exhaust gas flap or air flap is open
DI 5 Automatic mode
DI 6 Alarm message 1
DI 7 Alarm message 2
DI 8 Alarm message 3
DI 9 Boiler circuit pump operation
DI 10 Boiler circuit pump fault
DI 11 Bypass pump operation
DI 12 Bypass pump fault
DI 13 - -
DI 14 - -
DI 15 Release pumps external
DI 16 Water shortage
DO 1 Collective fault
DO 2 EWM - Horn
DO 3 Acknowledgement for external devices
DO 4 Flue gas flap or supply air flap
DO 5 - -
DO 6 Boiler circuit pump On
DO 7 Bypass pump On
DO 8 RLA valve open
DO 9 RLA valve closed
DO 10 - -
DO 11 - -
DO 12 - -
DO 13 - -
DO 14 - -
DO 15 - -
DO 16 - -

Internal inputs on the GUI

DI 1 Selection steam boiler control
DI 2 Selection liquid heat transfer medium
DI 3
DI 4