



FCU 500, FCU 505



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Protective system controls

- For monitoring and controlling central safety functions in multiple burner systems on industrial furnaces
- Valve proving system for a valve system leak tightness check (optional)
- Safety temperature monitor (STM) or safety temperature limiter (STL) (optional)
- Long service life due to replaceable power module for fail-safe outputs
- Visualization and adaptation to the specific application via the PC programming and diagnostic software BCSoft to simplify logistics management

Application



FCU with plug-in connection terminals

Protective system control FCU 500 is designed to monitor and control central safety functions, e.g. $gas_{min.}$, $gas_{max.}$, $air_{min.}$, pre-purge, tightness test, high temperature operation or start enable for burner control units, in multiple burner systems on industrial furnaces. In a furnace and zone control system, the FCU 500 assumes central functions. The FCU 505 is used to monitor local safety functions and to control the zone capacity. If the centrally checked safety requirements, e.g. pre-purge, flow detector and pressure switch check, have been met, the FCUs issue the start enable signal to the burner control units.

The FCU is optionally available with integrated safety temperature monitor or safety temperature limiter, integrated tightness control and with an interface for controlling the capacity of actuators or a frequency converter interface.

The program status and device parameters can be read directly from the unit. The FCU can be activated manually using the integrated Manual mode for setting and diagnostic purposes.

Thanks to the optionally integrated valve proving system, the valves can be checked for leaks by querying an external gas pressure switch or it can be checked whether the gas valve on the inlet side is closed.

Using the BCSOft program, the parameters, analysis and diagnostic information can be read from the FCU via the optionally available opto-adapter. All valid parameters are saved on an integrated parameter chip card. The parameter chip card can be removed from the old unit and inserted into a new FCU to transfer the parameters, for example when replacing the unit.

The monitored outputs for the actuator and valves are accommodated in a plug-in power module. This can simply be replaced if necessary.



Once the plug-in power module has been removed, the parameter chip card and fuses are accessible.

The FCU can be installed on a DIN rail in the control cabinet. Plug-in connection terminal strips on the FCU make it easier to install and remove.

The external operator-control unit OCU is available as an option for the protective system controls. The OCU can be installed in the control cabinet door instead of standard control units. The program status, statistics, parameter values or fault messages can be read on the OCU. For burner adjustment, the operating points can be approached conveniently in Manual mode using the operator-control unit.

Thanks to the operator-control unit OCU, display functions and operation of the FCU can be relocated to the control cabinet door.



The optional bus module BCM 500 makes it possible to connect the FCU to a fieldbus interface in a Profinet network. Networking via the fieldbus enables multiple FCUs to be controlled and monitored by an automation system (e.g. PLC). The bus module is prepared for DIN rail installation. It is pushed on to the FCU from the side.

The address for the fieldbus communication is set using three code switches.

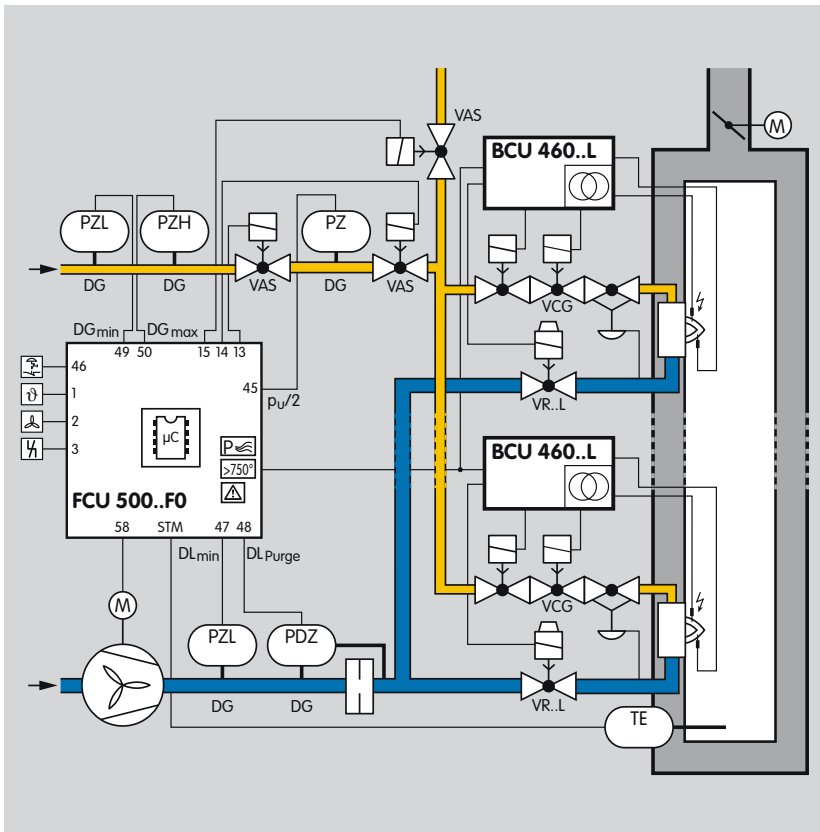


Roller hearth kiln in the ceramics industry



Shaft melting furnace

Application examples



ON/OFF rotary impulse control

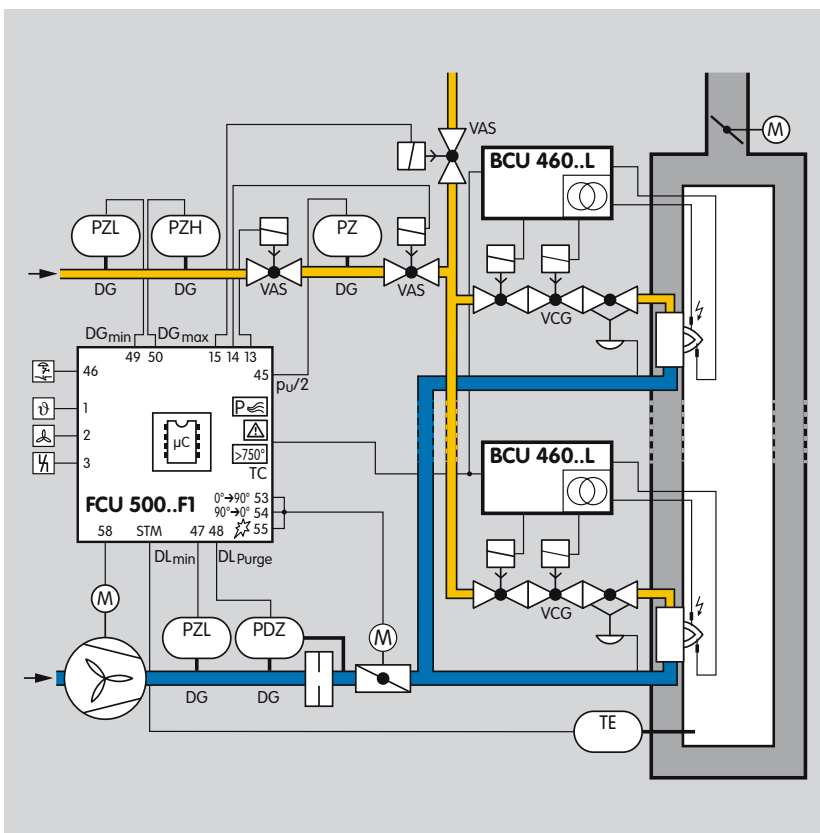
For processes which require a turndown of more than 10:1 and/or those which require heavy circulation of the furnace atmosphere to ensure a uniform temperature, e.g. heat treatment furnaces operating at low and medium temperatures in the metallurgical industry.

With ON/OFF cyclic control, the capacity supplied to the process is controlled by means of a variable ratio of the operating time to the pause time. In this type of control, the burner output pulse frequency always maintains full momentum and results in maximum convection in the furnace chamber, even with regulated heating.

The pneumatic ratio control system controls the gas pressure on the burner proportionally to the air pressure and thus maintains a constant air/gas ratio. At the same time, it acts as a low air pressure protection device.

The ignition and monitoring of the individual burners is ensured by burner control unit BCU 460..L.

The centrally checked safety functions such as pre-purge, tightness test, flow detector and pressure switch check ($gas_{min.}$, $gas_{max.}$, $air_{min.}$) are provided by the FCU 500.



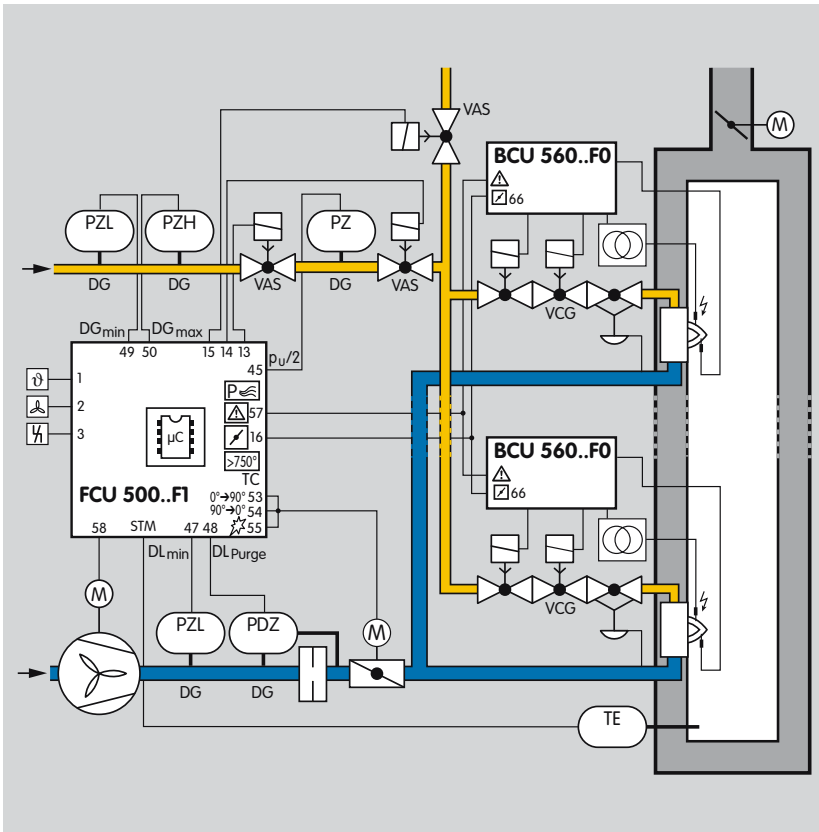
Modulating burner control

For processes that do not require heavy circulation in the furnace, e.g. aluminium smelting furnaces.

This system is suitable for processes in which infiltrated air may flow into the furnace through switched off burners. The capacity can be adjusted continuously by activating the air control valve (analogue or 3-point step signal). The pneumatic ratio control system controls the gas pressure proportionally to the air pressure and thus maintains a constant air/gas ratio. At the same time, it acts as a low air pressure protection device.

One burner control unit per burner is required for ignition and monitoring.

The centrally checked safety functions such as pre-purge, setting the valve to ignition position via a butterfly valve control system, tightness test, flow detector and pressure switch check ($gas_{min.}$, $gas_{max.}$, $air_{min.}$) are provided by the FCU 500.

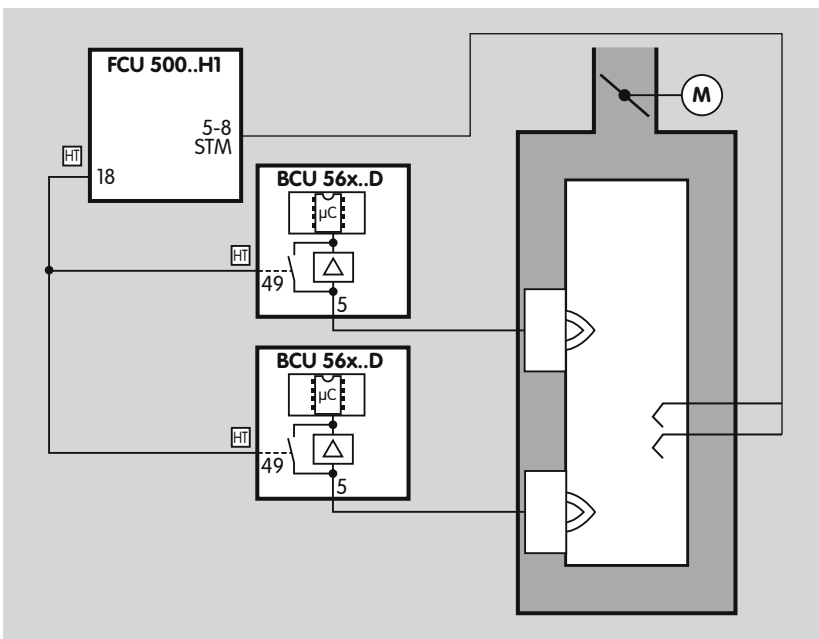


Safety limits (LDS) for modulating burner control

The centrally checked safety functions such as pre-purge, setting the valve to ignition position via a butterfly valve control system, tightness test, flow detector and pressure switch check ($gas_{min.}$, $gas_{max.}$, $air_{min.}$) are provided by the FCU 500. The capacity can be adjusted continuously by activating the control element (analogue or 3-point step signal).

To ensure that the correct air volume is available for ignition (start fuel flow rate) when starting the burners, the FCU sends the burner start enable signal to the BCUs via the "LDS (limits during start-up)" output.

The circuit design of the safety interlock and LDS outputs on the FCU and the corresponding inputs on the BCUs ensures that the burners can only start if the safety interlocks and the LDS output have enabled burner start-up.



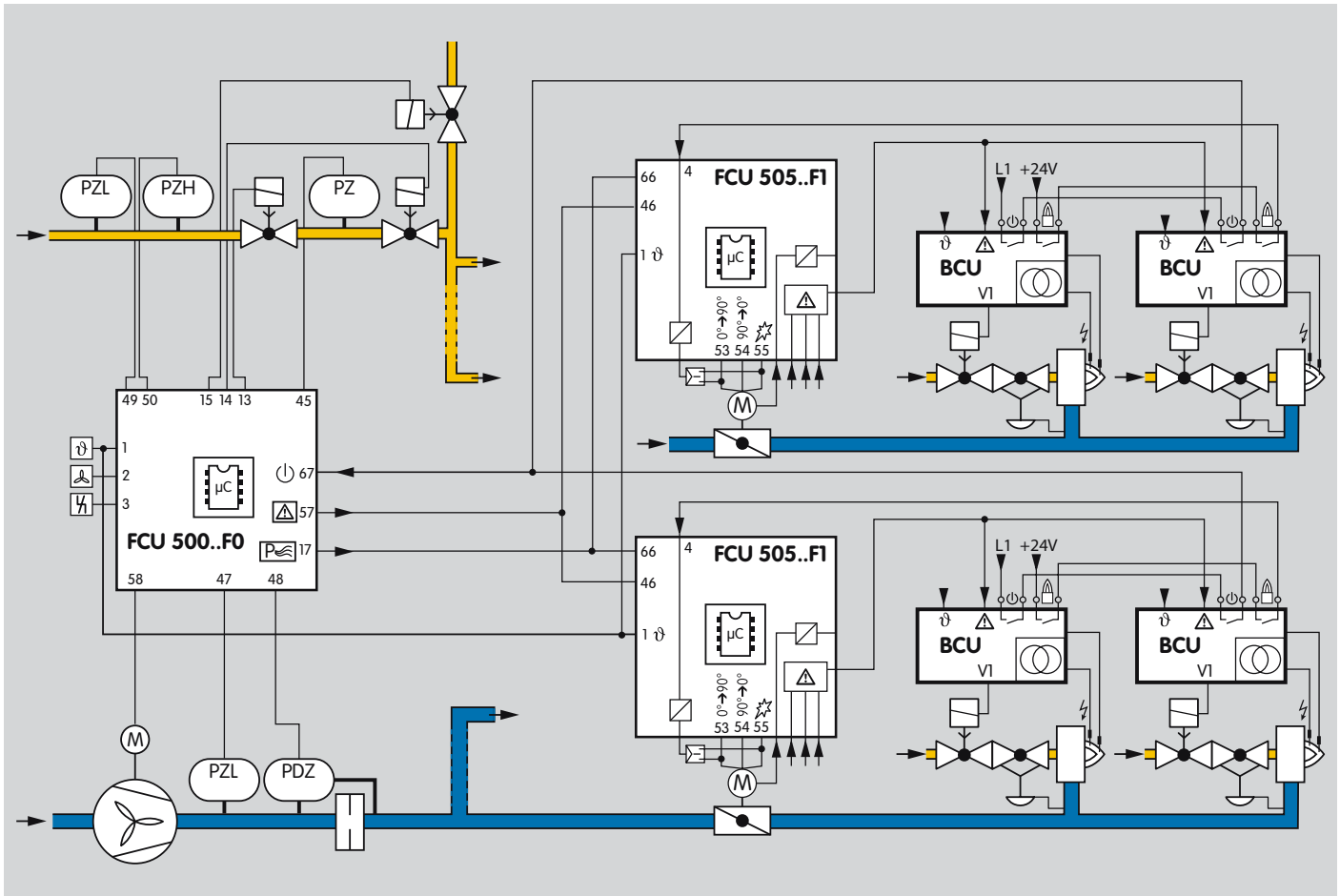
Flame control using the temperature

In high temperature systems (temperature $> 750^{\circ}\text{C}$), the flame may be controlled indirectly via the temperature. As long as the temperature in the furnace chamber is below 750°C , the flame must be controlled by conventional methods.

If the temperature in the furnace chamber rises above the spontaneous ignition temperature of the gas/air mixture ($> 750^{\circ}\text{C}$), the FCU signals to the burner control units via the fail-safe HT output that the furnace system is in High temperature mode (HT). When the HT input is activated, the burner control units switch to High temperature mode. They operate without evaluation of the flame signal and their internal flame control system is non-functional.

If the furnace temperature falls below the spontaneous ignition temperature ($< 750^{\circ}\text{C}$), the FCU disconnects the HT output from the electrical power supply. There is no active signal at the HT inputs of the burner control units. The flame signals are monitored once again by the UV sensor or flame rod.

In the event of a fault in a temperature monitoring component (e.g. sensor discontinuity, sensor short-circuit) or in the event of a mains failure, the flame control task is transferred to the burner control units.



Furnace and zone control

The FCU 500 (furnace FCU) performs central tasks such as checking the safety interlocks, fan control, system leak tightness check and pre-purge.

It signals to the FCU 505 in the zones that the butterfly valves can be moved to the purge position. Signals are sent to the butterfly valves by the FCU 505. The butterfly valves move into position. A signal is sent to the FCU 505 via their safety interlock input that the central FCU 500 has issued the enable signal for the burners.

Technical data

Electrical data

Mains voltage

FCU..Q: 120 V AC, -15/+10%, 50/60 Hz, $\pm 5\%$,
FCU..W: 230 V AC, -15/+10%, 50/60 Hz, $\pm 5\%$,
for grounded mains only.

Power consumption

FCU..Q: at 120 V AC approx. 3 W/5.5 VA plus
power consumption per AC input of approx.
0.08 W/0.2 VA,
FCU..W: at 230 V AC approx. 6 W/11 VA plus
power consumption per AC input of approx.
0.15 W/0.4 VA.

Contact rating

- Control outputs LDS (terminal 16), purge (terminal 17), HT (terminal 18), safety interlocks (terminal 57): max. 0.5 A, $\cos \varphi = 1$.
- Valve outputs V1, V2 and V3 (terminals 13, 14 and 15): max. 1 A, $\cos \varphi = 1$.
- Actuator outputs (terminals 53, 54 and 55): max. 50 mA, $\cos \varphi = 1$.
- Total current for the simultaneous activation of control outputs HT, purge, LDS and safety interlocks, valve outputs V1, V2 and V3 and the actuator: max. 2.5 A.
- 24 V DC signalling contact for fault/operation (terminal 41, 42): max. 0.1 A.
- Fan: max. 3 A (start-up current: 6 A < 1 s).

Number of operating cycles

FCU:
24 V DC signalling contact for fault/operation:
max. 10,000,000,
On/Off button, Reset/Information button: 1000,
power module:
control outputs LDS (terminal 16), purge (terminal 17), HT (terminal 18), safety interlocks (terminal 57),
gas valves V1 (terminal 13), V2 (terminal 14), V3 (terminal 15),
butterfly valve control element (terminals 53, 54 and 55),
fan (terminal 58): max. 250,000.

Input voltage of signal inputs:

Rated value	120 V AC	230 V AC
Signal "1"	80 – 132 V	160 – 253 V
Signal "0"	0 – 20 V	0 – 40 V

Rated value	24 V DC
Signal "1"	24 V, $\pm 10\%$
Signal "0"	< 1 V

Signal input current:

Signal "1"	max. 5 mA
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Fuses, replaceable,
F1: T 3.15A H,
F2: T 5A H, pursuant to IEC 60127-2/5.

Mechanical data

Weight: 0.7 kg

Connections

- Screw terminals:
nominal cross-section 2.5 mm²,
wire cross-section rigid: min. 0.2 mm², max. 2.5 mm²,
AWG: min. 24, max. 12.
Contact rating: 12 A.
- Spring force terminals:
nominal cross-section 2 × 1.5 mm²,
wire cross-section: min. 0.2 mm², max. 1.5 mm²,
AWG: min. 24, max. 16,
Contact rating: 10 A (for UL 8 A).

Environment

Ambient temperature: -20 to +60°C
(-4 to +140°F),
no condensation permitted.

Enclosure: IP 20 pursuant to IEC 529.

Installation location: min. IP 54 (for installation in a control cabinet).

FCU..H1

Terminals 5, 6, 7 and 8: Maximum voltage: ± 5 V,
input voltage range for double thermocouples:
Type K: 0 to 54.9 mV,
Type N: 0 to 47.5 mV,
Type S: 0 to 18.7 mV.

Function of Type 2 to EN 14597,
type of action: 2B, 2K and 2P,
with STL also 2A and 2N.

ESD protection of terminals 5 to 8:
Level 4 to IEC 61000-4.2 (ESD).

Maximum deviation of temperature values of
STM/STL module when using Class 1 thermo-
couples:

Type K: 0.63% at 25°C, ± 340 ppm/K at ambient
temperature,

Type N: 0.55% at 25°C, ± 340 ppm/K at ambient
temperature,

Type S: 1.38% at 25°C, ± 1570 ppm/K at ambi-
ent temperature.

Type code

Code	Description
FCU 500	Protective system control
FCU 505	Furnace zone control
Q	Mains voltage: 120 V AC, 50/60 Hz
W	230 V AC, 50/60 Hz
C0	Integrated tightness control or POC: none
C1	with integrated tightness control or POC
F0	Capacity control: none
F1	modulating with interface for actuator IC
F2	modulating with interface for RBW
H0	Temperature monitoring: none
H1	with temperature monitoring
K0	Connection terminals: none
K1	screw terminals
K2	spring force terminals

Maintenance

The fail-safe outputs (valve outputs V1, V2 and V3) of the power module are monitored for correct functioning. In the event of a fault, the system is set to a safe status using a second shutdown method (isolation of the valve outputs from the mains). In the event of a defect (e.g. fault 36), the power module must be replaced.

See www.partdetective.de

(optimized for smartphones)

for a replacement/order option for the power module.

The device and user statistics can be displayed using the operator-control unit OCU or engineering tool BCSoft for further diagnostics and troubleshooting. The user statistics can be reset using engineering tool BCSoft.

Technical Information bulletin for this product

www.docuthek.com

Search term:

FCU 500, FCU 505

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