Intelligent burner controller

SCU 4.1/SCU 4.2

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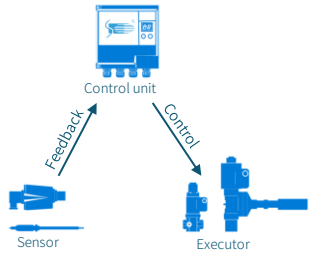
CHARACTERISTICS

- Intelligent burner controller SCU 4.1/4.2 could be used for safety ignition and flame state monitoring of industrial burners.
- With integrated digital circuit and built-in high-performance control chip, it is suitable for hard wiring, Profibus-dp and Profinet control.
- The operating state, current and fault code are displayed by digital tubes, controller parameters can be viewed and modified through panel buttons.
- With ignition transformer integrated, remote or local ignition and reset are available and with the protection class of IP 54, the SCU can be installed next to the burners in facilities.
- Optional additional functions: air pressure monitoring, high temperature mode, flameless mode, purge control, gas valve control, air valve control, safety auxiliary function, etc.

APPLICATIONS

- Burner controller is the core of industrial furnaces combustion system. It receives the signal of control system, controls ignition transformer, gas valve, air valve and other executors to ignite burner safely. It also monitors the operating state and sends feedback to the control system. The use of burner ignition controller can effectively reduce the complexity of industrial furnace control system.



- SCU 4.1/4.2, especially the bus topology types of which, are mainly used in industrial furnaces with a large number of burners due to their stability and reliability, simple and convenient control. Such as roller hearth furnace, mesh belt furnace, galvanizing operation line, silicon steel production line, stainless steel continuous retreating furnace, ring furnace, steel retreating furnace and other heat treatment and heating furnace.

SPECIFICATION

Control mode

Hard wiring control, SCU

The ignition, purge and air valve control functions of the controller are controlled by switch input (220 V AC). The operating and fault dry contact signal fed back by controller are received through the cable.

Profibus-dp control, SCU..DP

SCU..DP bus ignition controller supports additional Profibus-dp bus control, the system (PLC) sends instructions to control the burner controller, reads the present state code of the controller, and detects the current through the bus.

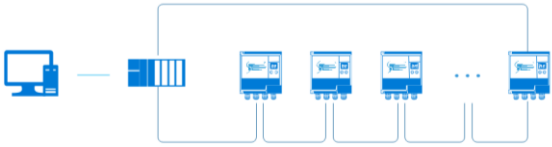
Profibus-dp adopts a bus chain topology network. Theoretically, each network can be connected to a maximum of 127 physical sites (including master station, trunk device and burner controller). The actual number of connections depends on transmission distance and transmission speed, the bandwidth is up to 1.5 Mb/s.

Profinet control, SCU..NET

SCU..NET supports additional Profinet network control, the system (PLC) sends instructions to control the burner controller, reads the present state code of controller and detects current through Profinet network.

Profinet is a new Ethernet communication approach with multi-manufacturer product communication capabilities, automation and engineering patterns, which is optimized for distributed intelligent automation systems. Profinet has a good real-time performance and can be directly connected to the field equipment with a bandwidth up to 100 Mb/s. Theoretically, the length of a single network cable shall be less than 100 m.

Based on Ethernet, Profinet has the topology of Ethernet, such as ring, bus and star network.



Ring topology network

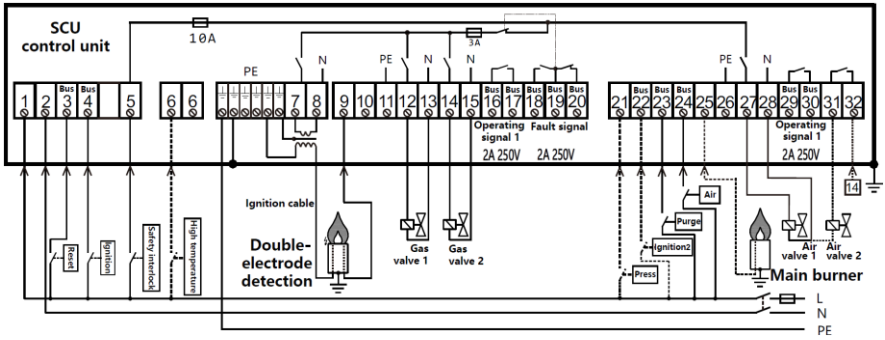
Star topology network

Bus topology network

Type table

Type			SCU	4.1	DP	/ IT8
Flame detection	4.1: single	4.2: double				
Control mode	DP: Profibus-dp	NET: Profinet				
Ignition voltage	IT5: 5.5kV	IT8: 7.5kV				

WIRING



Terminal 1#, 2# Power supply

Terminal 1# is the live wire input of power supply, and the power consumption of controller is <10 W.

Terminal 2# is the neutral wire input of power supply, which is shared by the controller power supply and the controller load.

Power supply: 220 V AC, ±10%, 50/60 Hz. The power supply doesn't conform to the technical specification is forbidden.

Terminal 3# Remote reset

Terminal 3# is a remote reset signal input. The input signal duration must be less than 2 s, setting automatic reset or consecutive manual reset is forbidden.

Input signal: 220 V AC, ±10%, 5～10 mA, in phase with the power supply.

Terminal 4# Remote ignition

Terminal 4# is a remote ignition signal input. The input signal must be continuous, ignition starts when the signal is input, stops when the signal cut off. Prohibit to ignite over 8 times within 1 minute.

Input signal: 220 V AC, ±10%, 5～10 mA, in phase with the power supply.

Terminal 5# Safety interlock

The power input of the load in controller can be controlled by the input power of terminal 5# to implement the safety interlocking function. For example: in the authority management of industrial furnace control system, when the industrial furnace does not reach the ignition state, or an emergency stop is needed, the external circuit could cut off the power supply to terminal 5# to ensure production safety.

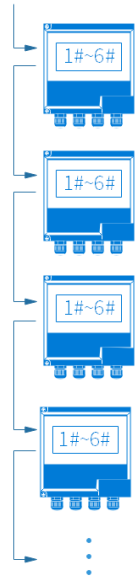
Input signal: 220 V AC, ±10%, in phase with the power supply, the current is the sum of all loads (ignition transformer included).

Terminal 6# High temperature mode

Terminal 6# is the signal input of high temperature mode. The furnace temperature is monitored through furnace control system. The high temperature mode can be switched on only when the furnace temperature is above the safe operation temperature (e.g., natural gas: 750 °C). You can choose to restart the controller or continue to work after the high temperature mode switched on through parameter setting. The high temperature mode is disabled by default.

Input signal: 220 V AC, ±10%, 5～10 mA, in phase with the power supply.

The controller internal parallel interface for terminal 1#～6# is reserved, which can be used for the parallel control of power supply and related control signals between adjacent controllers.



Terminal 7#, 8# Ignition transformer

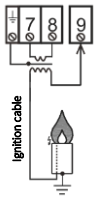
Terminal 7#, 8# are ignition transformer power outputs, which controls the discharge of ignition transformer.

Terminal 9# Flame detection signal

SCU 4.1: Burner flame detection signal input.

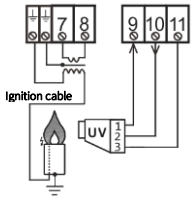
SCU 4.2: Pilot burner flame detection signal input.

Single-electrode detection



Single-electrode detection, double-electrode detection and UV detection are available for burner flame detecting. the length of detection signal cable must be less than 5 m.

UV detection



Terminal 10#, 11# UV sensor

Terminal 10#, 11# are the power outputs for UV sensor, connected when using UV sensor for detection and can be suspended while using ion detection.

Terminal 12#, 13# Gas valve 1

SCU 4.1: Power output for electrical gas shut-off valve 1.

SCU 4.2: Power output for the electrical gas shut-off valves of pilot burner.

Terminal 14#, 15# Gas valve 2

SCU 4.1: Power output for electrical gas shut-off valve 2, active after burner ignites successfully.

SCU 4.2: Power output for the electrical gas shut-off valves of main burner.

Terminal 16#, 17# Operating signal 1

SCU 4.1: Feedback of the burner igniting success signal.

SCU 4.2: Feedback of the pilot burner igniting success signal.

Dry contact signal, contact capacity: max. 250 V, 2 A. Normally open contact.

Terminal 18#, 19#, 20# Fault signal

SCU 4.1: Feedback of the burner fault signal.

SCU 4.2: Feedback of the pilot burner fault signal.

Dry contact signal, contact capacity: max. 250 V, 2 A. 19# is a communal contact, 18# is normally open and 20# is normally closed.

Terminal 21# Pressure control

Terminal 21# is a pressure control signal input. Generally, the supporting air pressure (pressure difference) or exhaust gas pressure (pressure difference) of combustion system is detected after the air valve is opened through pressure switch (purchased separately). You can select whether to detect during purging and whether to detect during burner operation by adjusting parameters. This function is not available by default.

Terminal 22# Remote ignition 2 (SCU 4.2)

Terminal 22# is the second remote ignition signal input, controls the ignition of main burner (only for SCU 4.2, terminal 22# can be suspended on SCU 4.1). The input signal must be continuous, ignition starts when the signal is input, stops when the signal cut off.

Input signal: 220 V AC, ±10%, 5～10 mA, in phase with the power supply.

Terminal 23# Purge mode

Terminal 23# is a purge mode signal input. This function enables the controller to open air valve directly, which is commonly used for safe purging before furnace startup or emergency shutdown.

The input signal must be continuous, the purge starts when the signal is input, stops when the signal cut off.

Input signal: 220 V AC, ±10%, 5～10 mA, in phase with the power supply.

In addition, the forced purge time before ignition can be set by adjusting the controller parameters, and no additional signal input is required (this function is not available by default).

Terminal 24# Air valve control

Terminal 24# is an air valve control signal input, actives the air valve individually, it is often used for cooling mode.

When an air valve is set to follow the gas valve, the air valve can be opened separately before receiving ignition signal; when receiving the ignition signal, the air valve will close and follow the action of gas valve. When an air valve is set as external control, the air valve will open separately without other influence.

In controller fault locking state, you can set whether to allow the air valve to open separately by adjusting the internal parameters (it is not allowed to open by default).

Input signal: 220 V AC, ±10%, 5～10 mA, in phase with the power supply.

Terminal 25# Main burner flame detection (SCU 4.2)

Terminal 25# is a main burner flame detection signal input (only for SCU 4.2, this function is not available on SCU 4.1 and 25# can be suspended). The signal cable can be directly connected when using ion detection; it must be used with terminal 10# and 26# when using UV sensor for detection.

Terminal 27#, 28# Air valve

SCU 4.1: Power output for air valve.

SCU 4.2: Power output for air valve 1.

Optional air valve operating mode: external control only; open together with gas valve 1; open together with gas valve 2; controlled by operating signal 2.

Terminal 29#, 30# Operating signal 2 (SCU 4.2)

Terminal 29#, 30# are the feedback of main burner igniting success signal.

Dry contact signal, contact capacity: max. 250 V, 2 A. Normally open contact.

Terminal 31#, 32# The third valve control

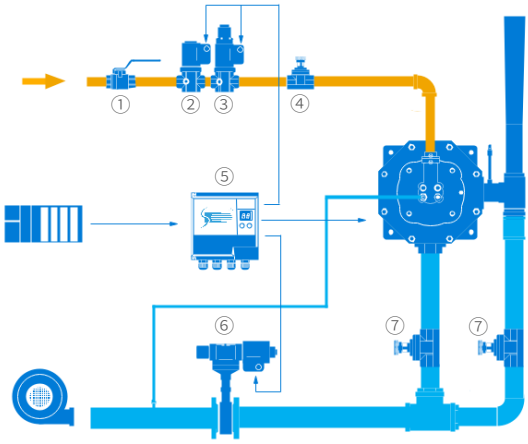
SCU 4.1: Dry contact signal, active together with the air valves.

SCU 4.2: Connected in parallel to the solenoid gas valve of main burner, which can be used to control the main burner air valve.

SOLUTIONS

SCU 4.1

SCU 4.1 has a single line flame monitoring mode, which is mostly used for the ignition control of single burner combustion system.



① Manual gas shut-off valve

② Gas solenoid valve SG..Q

③ Gas solenoid valve SG..S

④ Manual gas linear flow control KV

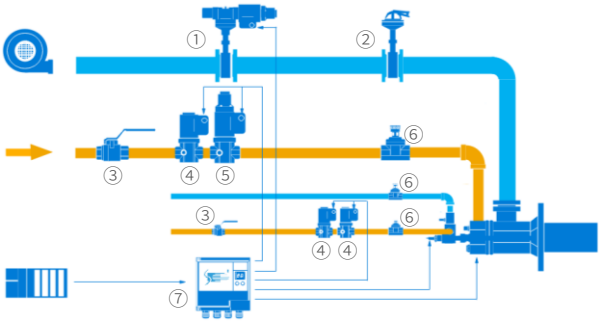
⑤ Burner controller SCU 4.1

⑥ Air solenoid butterfly valve MC+HTB (Use SA series as air shut-off valve while DN＜40)

⑦ Manual air linear flow control

SCU 4.2

SCU 4.2 has a double-line flame monitoring mode, which is mainly used for the ignition control of the combustion system contains a pilot burner and a main burner.



① Air solenoid butterfly valve MC+HTB

② Manual air butterfly valve with lever HK

③ Manual gas shut-off valve

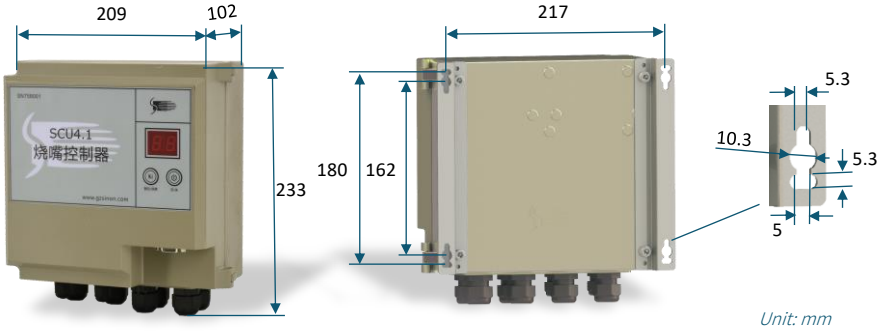
④ Gas solenoid valve SG..Q

⑤ Gas solenoid valve SG..S

⑥ Manual gas linear flow control KV

⑦ Burner controller SCU 4.2

Dimensions



Unit: mm

Installing attention

The SCU shall be installed next to burners with lugs and as far away from the heat as possible. There shall be no obstruction in front to facilitate operation and maintenance.

Ambient temperature: -15 ~ 60 ℃ (5 ~ 140 °F).

Enclosure: IP 54.

Cable installation

- Signal and control line: max. 2.5 mm^2 (AWG 14).
- Cable for controller ground/PE wire: max. 4 mm^2 (AWG 12).
- Mark ⏚ indicates PE terminal, which is connected with the controller shell through ground wire. The PE terminal connects to ground wire together with the burner shell.
- Recommended length of ignition cable for ignition transformer: 1.5 m, no longer than 5 m. Feed the ignition cable out of the controller by a separate gland, and use special anti-interference high voltage cap.
- Terminal 1# for live wire, 2# for neutral wire separately, use BVR line of 1.0 ~ 2.5 mm^2 with withstand voltage above 500 V, the live wire and the neutral wire shall be connected through a dual switch.

- Terminal 5# shall be connected to the live wire with BVR line of 1.0～2.5 mm^2 with withstand voltage above 500 V, and controlled by a separate switch after dual switch. This wire is the power supply wire for all the outputs of SCU, and all outputs will be interrupted when this wire is disconnected.
- Terminal 6# is high temperature mode signal input terminal, it shall be connected to the live wire with BVR line of 1.0～2.5 mm^2 with withstand voltage above 500 V, and controlled by a separate switch after dual switch. Note the temperature conditions of high temperature mode.
- Terminal 12# and 13# connect with the live wire and neutral wire of gas valve 1. It shall be connected with BVR line of 1.0～2.5 mm^2 with withstand voltage above 500 V.
- Terminal 14# and 15# connect with the live wire and neutral wire of gas valve 2. It shall be connected with BVR line of 1.0～2.5 mm^2 with withstand voltage above 500 V.
- Terminal 22# connects with the live wire through a separate switch after dual switch (use BVR line of 1.0～2.5 mm^2 with withstand voltage above 500 V). The purge mode operates in top priority once signal is input to terminal 22# regardless of any state, even in alarming state.
- A group of multiple SCUs (quantity ⩽12) must be connected to a circuit breaker.
- Other interference shall be considered when wiring communication cable.

Note:

The wire diameter above refers to the diameter of the wire connected to a single SCU. If it is connected by a zone wiring method, you shall select the corresponding wire diameter for the actual current after parallel connection.

OPERATION

Code table (SCU..DP and SCU..NET)

Controller SCU..DP and SCU..NET can control burners through network. In wiring diagram, the terminals marked with "bus" can send commands through the network to control and read the present operating state of controller, detect current, receive fault code, etc. without additional wiring.

SCU → PLC Code table

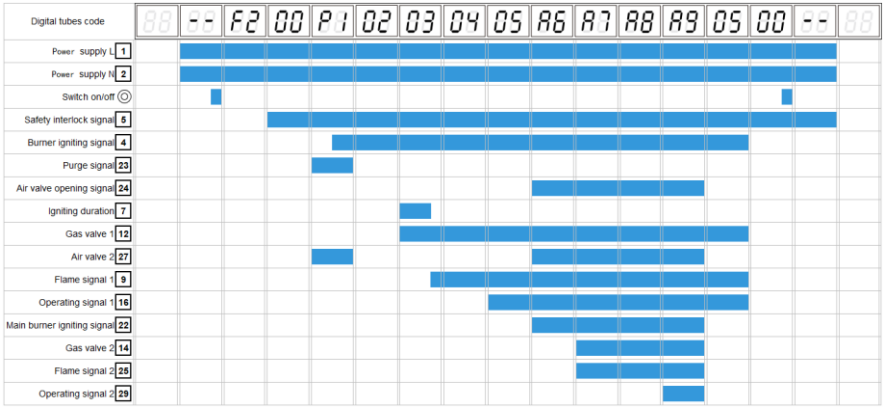
Bit	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0	Burner 1 igniting success	N/A	Status code	The Flame detection signal value of burner 1	The Flame detection signal value of burner 2
1	Burner 2 igniting success				
2	Device fault warning				
3	Purge mode				
4	Air valve opened				
5	High temperature mode				
6	Self-checking completed				
7	Manual mode				

PLC → SCU Code table

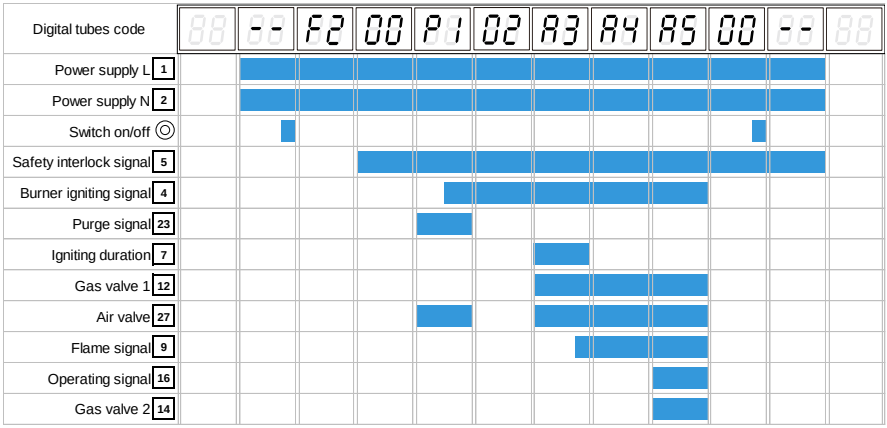
Bit	0	1	2	3	4	5	6	7
Byte0	Burner 1 ignition	Burner 2 ignition	Reset	Purge mode	Air valve open			

Sequence diagram

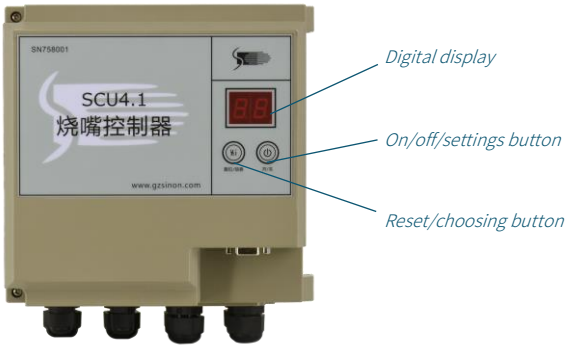
SCU 4.1



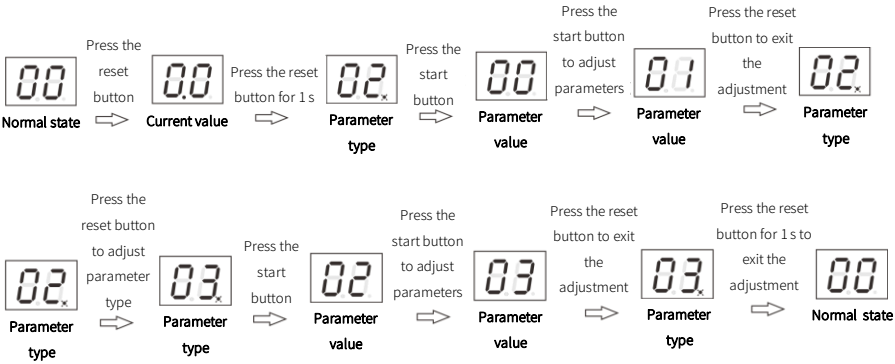
SCU 4.2



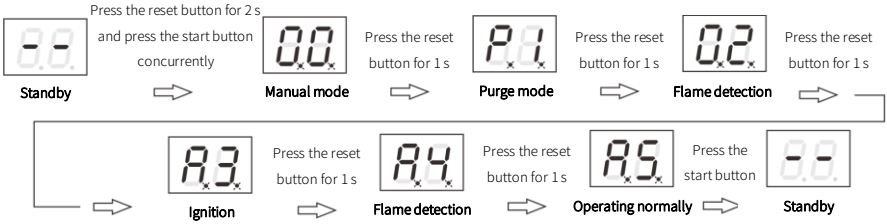
Operation interface



Parameters checking and setting



Manual ignition



Fault code

Display	Fault message
	False flame signal. Check the circuit of electrode and UV sensor.
	Abnormal flame signal: flame signal undetected. Check the circuit of transformer, electrode and UV sensor.
	Abnormal flame state calibration: flame signal unstable. Check the circuit of electrode and UV sensor.
	Abnormal flame operating state: flame signal unstable. Check the circuit of electrode and UV sensor.
	False flame signal on the main burner. Check the circuit of solenoid valve, electrode and UV sensor.
	Abnormal flame signal on the main burner: flame signal undetected. Check the circuit of transformer, electrode and UV sensor.
	Abnormal flame state calibration on the main burner: flame signal unstable. Check the circuit of electrode and UV sensor.
	Abnormal flame operating state on the main burner: flame signal unstable. Check the circuit of electrode and UV sensor.
	Abnormal parameters. Sent it back to the distributor if the fault cannot be fixed after rewriting the parameters.
	Power supply voltage <200 V or internal fault of the controller.
	Abnormal pressure switch signal. Check the circuit of pressure switch.
	Fault locking: multiple faults detected.
	Bus signal undetected. Check the bus circuit.
	Too many resets. Do not reset over 8 times in 1 min.
	Safety interlock signal undetected. Check terminal 5# or insurance F1.
	Overlength reset duration: reset signal duration must not longer than 2 s. Check the terminal 3#.
	Too many Ignitions. Do not ignite over 8 times in 1 min.
Others	Internal fault of the controller. Please send it back to the distributor.