



Combustion Process Quality Analyzer BCA-01

INSTRUCTION MANUAL

BRAGER Ltd.

Rolna St. 11 63-300 Pleszew

Tel. 795 750 933

e-mail: serwis@brager.com.pl

PREPARATION

Combustion Process Quality Analyzer BCA-01, is Poland's first compact analyzer of the combustion process of solid fuels in small and medium power boilers. **The patented design allows continuous measurement in dusty waste gases.** The measuring device is designed for continuous measurement of many physical and chemical parameters informing about the quality of the combustion process. The design of the measuring probe allows measurements to be carried out in dusty flue gases generated during the combustion of solid fuels. Due to the measuring elements used, the temperature of the exhaust gas must not exceed 450 C.°

The analyzer allows to measure such parameters of the combustion process as:

- Percentage concentration of oxygen O₂ in the flue gas (0 to 20.9%),
- Excess Air Coefficient [λ],
- Percentage concentration of carbon dioxide CO₂,
- Exhaust gas temperature,
- Boiler inlet air temperature,
- Chimney loss

TIPS FOR SAFE USE OF THE ANALYZER

1. The power supply module of the BCA-01 analyzer is supplied with AC 230 V, which requires its installation by qualified persons.
2. Use the analyzer according to the instruction manual
3. Do not perform any repairs yourself. Entrust repairs to an authorized technical service center
4. The power supply module is designed to be rail-mounted, therefore, it should be mounted in a dedicated enclosure (not included in the kit)
5. Ensure proper electrical protection of the power supply system
6. Before using the analyzer, it is imperative to check the grounding effectiveness of its enclosure
7. During the operation of the analyzer, there is line voltage at the power supply terminal strip. This creates a danger of electric shock. Before mounting or dismounting the device, cut off the power supply to the analyzer
8. The measuring probe is equipped with an electric heater that heats the measuring element to a very high temperature. In order to avoid burns, before installing or removing the probe from the flue gas duct, cut off the power supply to the device.

CONSTRUCTION AND DIMENSIONS OF COMBUSTION QUALITY ANALYZER BCA-01

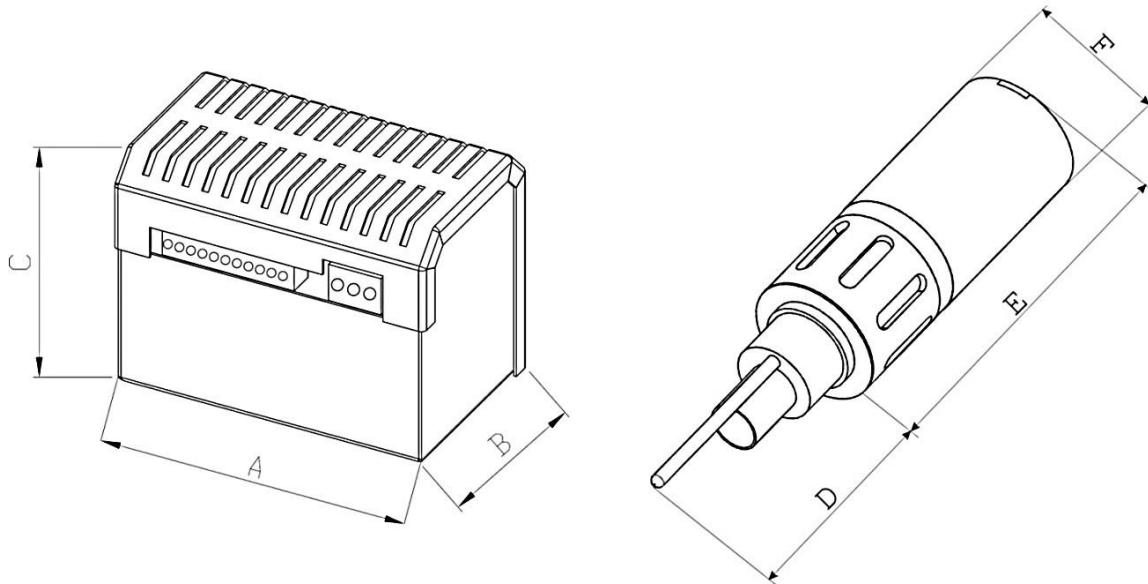
Due to the analyzer's intended use in low- and medium-power heating systems, the device has been adapted for installation directly in the flue gas ducts.

The analyzer unit consists of two basic components:

- Power supply module, designed to be mounted on a DIN rail, directly near the boiler control automation,
- Measuring probe module, designed for installation directly in the flue gas duct.

The connection between the two modules is made using standard 6 x 0.75 mm multicore cable². In order to facilitate installation and possible maintenance work, multi-pin industrial connectors are used for the connection.

Basic dimensions of the modules of the BCA-01 Analyzer



No.	A	B	C	D	E	F
Dimension [mm].	115	73,2	87	120	151	59

BASIC PARAMETERS OF BCA-01 ANALYZER MODULES

BCA-01 Analyzer Probe Module

- Module supply voltage: 15 VDC, 9 VDC
- Power consumption of the heater: 7,5 W
- Maximum flue gas temperature: 550 C°
- Flue gas temperature measurement: 0 - 400 C°
- Maximum ambient temperature: 50 C°

- Working position: see instructions
- Maximum error of indication of measurement value : - 0,5 % O₂
- Communication with the power supply module: RS 485 (proprietary communication protocol)
- Life span of the measuring element 1 to 3 years

Additional information:

When removing the oxygen probe from the flue gas duct, first turn off the analyzer from the power supply and wait for the probe body to cool down. The probe has an internal heater that heats up to a high temperature. Touching it with your hand may cause burns.

The probe is mounted in the flue duct using a threaded connection to an additional mounting ring (supplied). In order to enable installation in the flue duct housing, a hole with a diameter of 52 mm must be cut and a steel mounting ring welded into it.

When removing the measuring probe, pay attention to the flue gases escaping from the mounting hole, so when removing the probe, turn off the boiler.

The design of the measuring probe ensures proper heat transfer to the environment, so do not cover the probe with thermal insulation, which can be covered with a chimney or boiler flue.

BCA-01 analyzer power supply module

- Supply voltage: 230 V AC, 50 Hz
- Power consumption: max. 25 W
- Degree of protection of the housing: designed for installation in the control cabinet
- Operating temperature range: 0 - 50 C°
- Working position: any
- Mounting: DIN rail
- Inlet temperature measurement: 0 - 100° C (sensor not included)
- Communication:
 - First RS 485 interface - MODBUS protocol
 - Second RS 485 interface - own communication protocol
 - Analog output 0 - 10 V (freely configurable)
 - Analog output 4 - 20 mA (freely configurable)
 - GSM module (optional - (not included)
 - Ethernet module (optional - (not included)
 - Data archiving module (option - not included)

Additional information:

The power supply circuit should be protected with a short circuit fuse. The connection installation between the power supply and the electrical switchgear should be made with a wire with copper conductors and a cross section of not less than 0.75 mm². The insulation resistance of the wires to each other and to ground must be greater than 1 MΩ after installation and during operation.

After the device is made and connected, the effectiveness of protection against electric shock should be checked, these measurements can be carried out by persons authorized to carry out protective measurements.

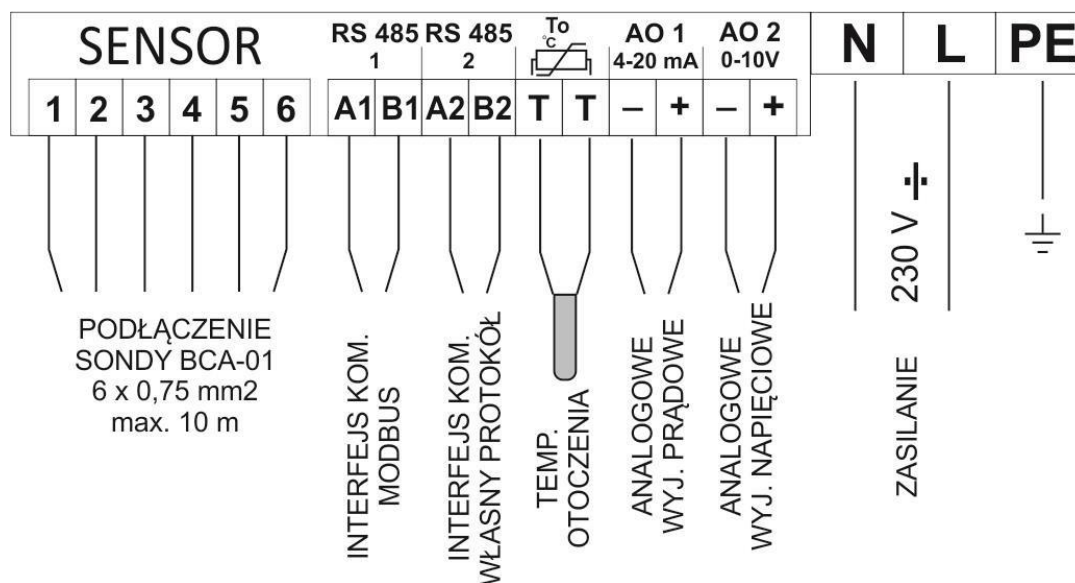
The installation of the Analyzer should be equipped with an electrical switch, which should be labeled as a disconnecting device for the analyzer.

HOW TO CONNECT THE POWER SUPPLY STRIP OF THE COMBUSTION PROCESS QUALITY ANALYZER BCA-01

In order to enable the analyzer to work properly, it is recommended to make the connection according to the following information.

The connection should be made by yourself. A professional WEIPU ST12 connection connector is included as standard, allowing flexible connection and removal of the Analyzer probe. PIN numbers on the cables correspond to the corresponding numbers on the power supply. Connection cable requirements: 6 x 0.75mm² in wire, outer diameter of wire up to 8mm. The connection of the cables to the WEIPU socket should be made in soldered form. The maximum length of the cable used is 15m. If you need to use a longer cable, please contact our technical department.

Communication connections and analog outputs are optional connections not required for proper operation of the device. It is allowed to use any number of communication interfaces.



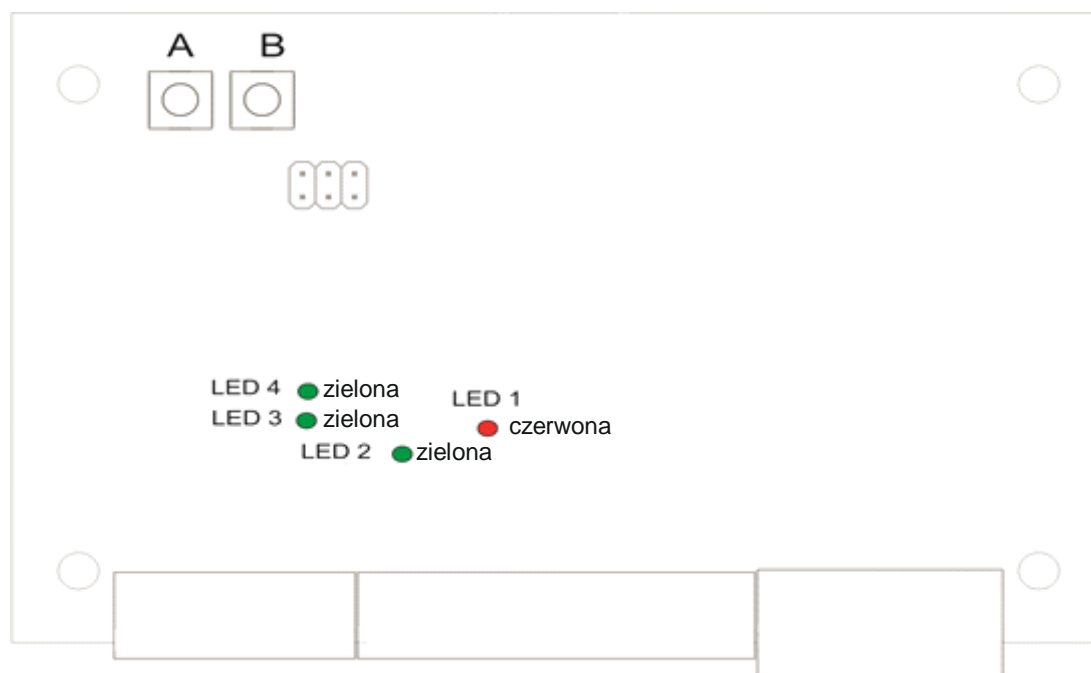
COMMUNICATION WITH THE USER, BASIC SERVICE INFORMATION

The basic version of the BCA-01 analyzer is devoid of a display, which means that basic service information is indicated by six color LEDs.

Two diodes are located in the analyzer probe, while the other four are mounted in the power supply module on the PCB.

Information table of basic information signaled by LEDs.

L.p.	Name and position of the diode	Working condition
1	Failure, BCA-01 probe	"Red" diode, its illumination indicates an error of the exhaust gas temperature sensor, or an error of the oxygen sensor
2	Work, probe BCA-01	"Green" diode, its flashing indicates correct operation of the probe, continuous illumination indicates heating of the measuring element
3	LED 1, power supply BCA-01	LED "Red", its lighting indicates the failure of the inlet temperature sensor, exhaust gas temperature sensor, oxygen sensor or broken communication between modules. Several short flashes indicate acceptance of the calibration request
4	LED 2, power supply BCA-01	Diode "Green", its blinking indicates the correct operation of the analyzer system BCA-01
5	LED 3, power supply BCA-01	"Green" diode, its flashing indicates communication of the probe module with the power supply module
6	LED 4, power supply BCA-01	LED "Green", its blinking indicates MODBUS protocol communication



Board view of the BCA-01 power supply module

The drawing of the power supply board shows the arrangement of the four indicator LEDs with their colors identified.

RESTORING FACTORY SETTINGS AND CALIBRATING THE ANALYZER

NOTE !!!

Due to the presence of mains voltage, operations related to restoring factory settings and calibrating the measuring probe can only be performed by qualified installers.

In order to facilitate basic configuration operations, the BCA-01 power supply board is equipped with configuration buttons. The view of the power supply board shows their location and particular combinations.

1. **Calibration of the measuring probe.** Due to operation in particularly harmful conditions, there is a risk of changing the values measured by the measuring probe. This is influenced by a number of chemical compounds included in the waste gas. In order to maintain the correct measured values throughout the lifetime of the Analyzer, it is advisable to calibrate the measuring probe every 3 months during intensive operation.

To carry it out, perform the following procedure:

- a) Disconnect the power supply to the BCA-01 power supply module
 - b) Remove the probe from the flue and place it in clean atmospheric air
 - c) Remove the top cover from the power supply module
 - d) Switch on the power supply to the device (Note the presence of mains voltage)
 - e) Press and hold button "A" for 3 seconds
 - f) Correct calibration will be indicated by LED 1 (red) on the power supply board flashing several times.
 - g) Disconnect the power supply to the BCA-01 power supply module
 - h) Put the cover on the power supply module
 - i) Install the probe in the flue pipe
 - j) Switch on the power supply module BCA-01
2. **Restoring the factory settings of the BCA-01 Analyzer *.**

In a situation where you need to restore factory settings, perform the following procedure:

- a) Disconnect the power supply to the BCA-01 power supply module
- b) Remove the top cover from the power supply module
- c) Switch on the power supply to the device (Note the presence of mains voltage)
- d) Press and hold button "B" for 5 seconds
- e) Restoration of factory settings will be indicated by LED 1 (red) on the power supply board flashing several times.
- f) Disconnect the power supply to the BCA-01 power supply module

- g) Put the cover on the power supply module
- h) Switch on the power supply module BCA-01

When the calibration or reset is pressed, the failure LED indicates acceptance of the request in the form of several short flashes.

*** restoration of settings will be done when the power supply is turned off and on, after following the steps in point 2d.**

Information table of factory values of BCA-01 Combustion Process Quality Analyzer

L.p.	Parameter name	Factory value
1	MODBUS-RTU transmission parameters	9600, 8, N, 1, address 1
2	Type of fuel	Hard coal
3	Output mode 4-20 mA	Oxygen concentration
4	Output mode 0-10 V	Oxygen concentration

Reading of all measured values is possible in several ways:

- Using MODBUS interface, which allows full communication with the Analyzer as well as configuration of all analog outputs. It is a standard MODBUS RTU protocol, which allows cooperation with all industrial automation systems
- Using a serial interface based on a proprietary transmission protocol. This solution allows communication with the analyzer using additional panels manufactured by BRAGER. The panels come in two versions. A basic version equipped with a large and easy-to-read led display. This panel allows basic configuration and very good visualization of the selected parameter measured by the analyzer. The full version equipped with a two-line LCD display, allowing full configuration of the analyzer settings.

Signaling of measured quantities using analog outputs.

This solution allows transmission via analog signals (voltage and current), any two values measured with the analyzer. Assignment of the measured values to the corresponding outputs is possible using the MODBUS protocol and the full version of the configuration panel. In addition, it is possible to configure analog outputs at the stage of placing an order for a set of BCA-01 analyzer.

The analyzer can optionally be equipped with a data archiving module.

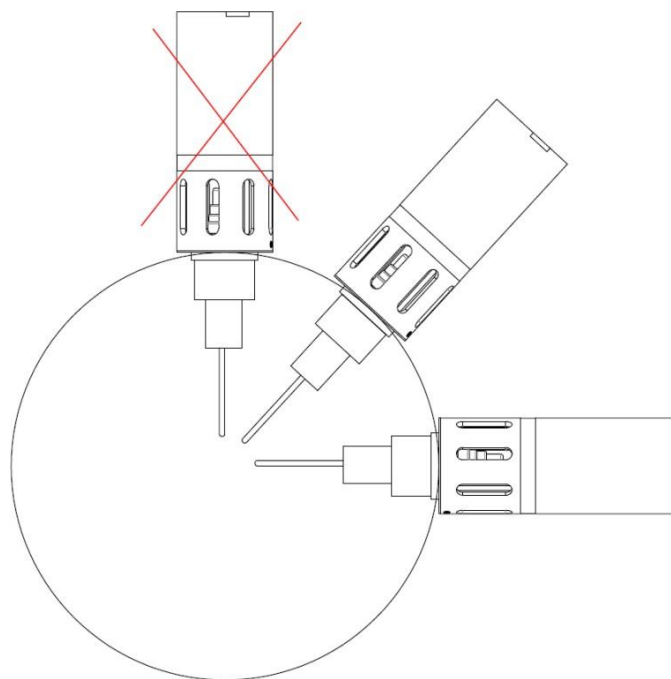
A record of oxygen and exhaust gas measurements is then made every 10 seconds along with the measurement time.

The device saves a separate daily data file for each day. The device does not save in STOP mode

HOW TO INSTALL THE BCA-01 ANALYZER IN THE FLUE PIPE

The probe of the Analyzer should be installed in the flue pipe in a place that meets the following criteria:

- The exhaust gas temperature is as high as possible, but its maximum value does not exceed 400 degrees Celcius. This is the maximum value of the exhaust gas temperature measurement.
- The probe is not exposed to moisture and mechanical damage
- The probe should not be mounted in a vertical position of the probe axis, it is recommended to mount it in a position where the probe axis is close to 45 degrees., however, due to the frequent use of rectangular cross-sections of flue pipes, mounting in a horizontal position is allowed. This is shown in the figure.



Permitted method of installation of the BCA-01 Combustion Process Quality Analyzer Probe

- The Probe Module is a sophisticated electronic device, designed to operate at elevated temperatures. However, due to the presence of electronic circuits, it is recommended that the temperature of the electronic part does not exceed 70 C.°
- The probe is designed for continuous operation in the presence of flue gases. However, to ensure its proper operation, the Analyzer probe should not be left unpowered in the presence of flue gases.