



BCA-02 eco

OPERATION MANUAL

BRAGER®

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EU Declaration of Conformity no. 0061/2020

Brager Sp. z o. o. Pleszew ul. Rolna 11,
63-300 Pleszew declares that the product manufactured by us:

BCA-02 Combustion Process Quality Analyzer

meets the requirements of the following
directives:

2014/30/EU Electromagnetic Compatibility Directive (EMC)

Based on harmonized standards:

PN-EN 55022/2011 replaced by PN EN 50561 – 1/2013

The product is CE marked: 08/2020



1. **Safety**

1.1. **General safety notes**



Please read the following regulations before using the product. Failure to comply with them may result in personal injury or damage to the device. To ensure the safety of life and property, take the precautions contained in the following manual, as the manufacturer is not responsible for losses caused by improper use of the device or the User's negligence.

1.2 **Warnings**

- The assembly of the device should be performed by a person having the appropriate electrician qualifications.
- The device may only be operated by adults.
- Incorrect wiring can damage the device!
- Lightning can damage the device, so during a storm it should be disconnected from the network by removing the mains plug from the socket.
- The unit must not be used for purposes other than those intended.
- The measuring probe is equipped with an electric heater heating the measuring element to a very high temperature. In order to avoid burns, the power supply to the unit must be cut off before mounting or removal of the probe from the flue duct.
- Before and during the heating season it is necessary to check the technical condition of the cables, check the fixing of the unit, clean it from dust and other dirt.
- The manufacturer reserves the right to make changes in the software and principle of the device's operation without modification of the contents of the manual every time.

1.3 **Warranty notes**



- Any modifications and repairs made to the device on one's own may result in the deterioration of its operating parameters and safety of its use. Carrying them out is tantamount to losing the warranty for the device.

2. Intended use

The Combustion Process Quality Analyzer **BCA-O2_{eco}** is a compact control and measurement unit for complex analysis of combustion parameters in solid fuel boilers. The unit enables the readout of such parameters as flue gas temperature and oxygen content in the flue gas, and in cooperation with the Brager automation additionally records parameters of stack loss, energy efficiency, lambda and carbon dioxide concentration.

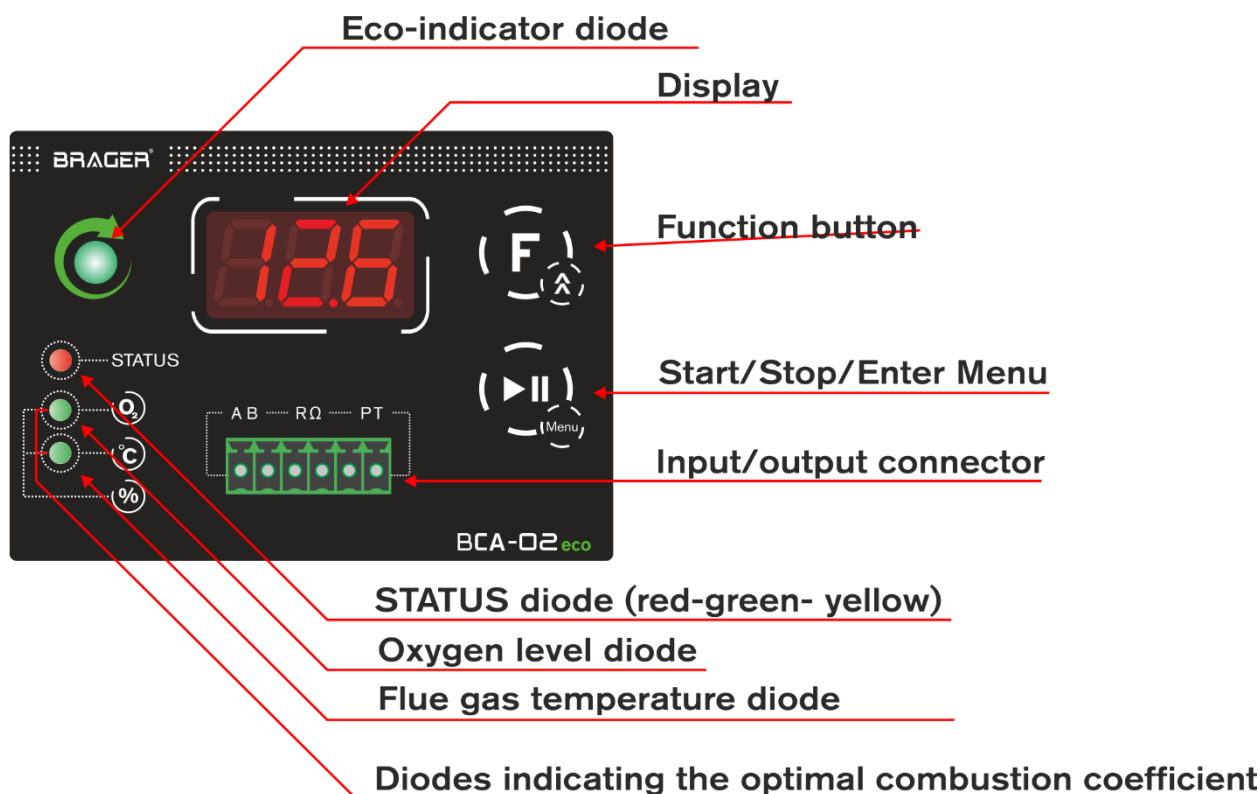
The **BCA-O2_{eco}** unit is equipped with an **Eco indicator** - an RGB diode that sums up all read parameters and keeps us informed about the quality of the combustion process taking place in the boiler. All the obtained parameters provide the control system with the necessary feedback, which allows for optimization and increase of energy efficiency of the regulated process. This information also enables the user to manually adjust the boiler operation parameters, reducing emissions of harmful substances contained in the flue gases, improving the quality of the environment and significantly reducing the costs associated with the amount of fuel combusted. The parameters are displayed on a clear LED display in real time, which together with the intuitive operation of the unit makes it easy to regulate the combustion process using **BCA-O2_{eco}**.

3. Design and description of the unit

3.1. Design of the unit



3.2. Panel description



3.3. Button and indicator functions



Function - the (F) button has two functions. When the device is in operation, the button serves as a switch between the display of one of the three parameters, which is signaled by an adequate combination of the (O₂) diodes and (°C). When in the Menu:

- When the name of the parameter is displayed. The first press of the (F) button displays the given parameter.
- The next press changes the value of the parameter through incrementation.
- For parameters with a larger value range there is an accelerated scrolling function. The parameter values are looped.



Start/Stop/Enter Menu - a single press of the (▶||) button switches the unit on or off. Holding the (▶||) button for 3 seconds will enter the MENU, and then the parameter "AL" will be displayed. A subsequent single press of the button will move to the next parameters.

Exiting the Menu is possible in two ways. The first one is holding the (▶||) button for 3 seconds or after 10 seconds not pressing any of the buttons when the parameter name is displayed.



Eco indicator diode - it switches on when the unit is in operation mode. Its color reflects the current value of the parameter that is displayed. For detailed instructions on color signaling see chapter 4.2.

STATUS STATUS diode (red-yellow-green)

- Yellow color – switches on when the unit is in the STOP state.
- Green color – when pulsating it indicates that the operation has started and the probe is being heated.
- Green color – indicates when the unit is in the operation mode.
- Red color – when pulsating it indicates a failure of the unit, e.g. damage to the probe or flue gas temperature sensor.
- Red and yellow colors – pulsate alternately in 2-second intervals (this means a communication error when operating in "AL.2" or "AL.3")



Oxygen level diode - switches on when the current oxygen concentration in the flue gas is displayed.



Flue gas temperature diode - switches on when the current flue gas temperature is displayed.



Diodes indicating the optimal combustion coefficient - the diodes (Oxygen level and fuel gas temperature) switch on simultaneously when the current optimal combustion coefficient is displayed.

A B



AB communication connector

RΩ



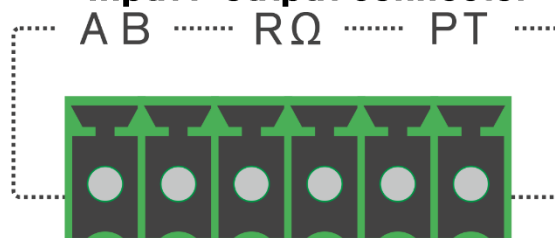
Resistive output

P T



Temperature input

Input / output connector

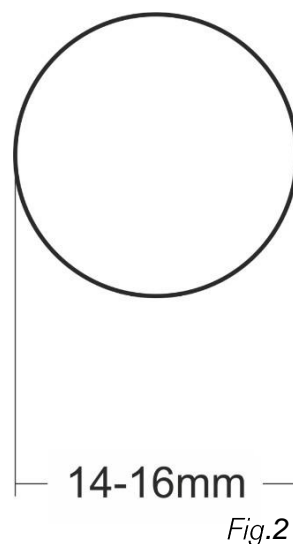
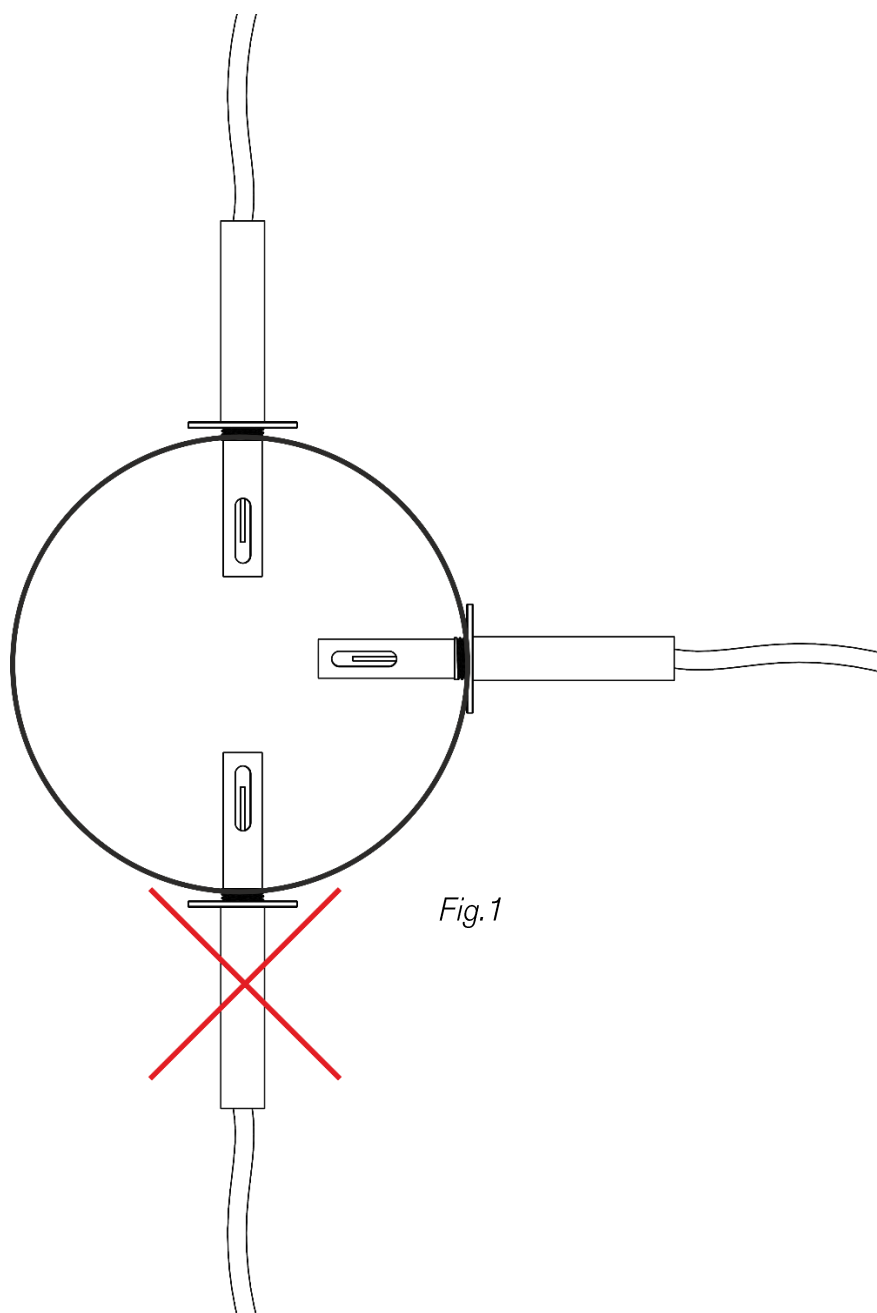


3.4. Mounting the probe

The Analyzer probe should be mounted in the flue duct, in a position that meets the following criteria:

- The temperature of the flue gases is the highest possible, but the maximum value does not exceed 400 degrees Celsius. This is the maximum value of the flue gas temperature measurement.
- The probe is not exposed to humidity and mechanical damage.
- The probe should not be mounted at the bottom of the outlet channel. The probe mounting method is shown in the figure (Fig.1).
- The diameter of the mounting hole should be from 14mm to 16mm (Fig.2).

The method of mounting the probe in the flue duct:



Mounting hole:



**CAUTION!
HOT**

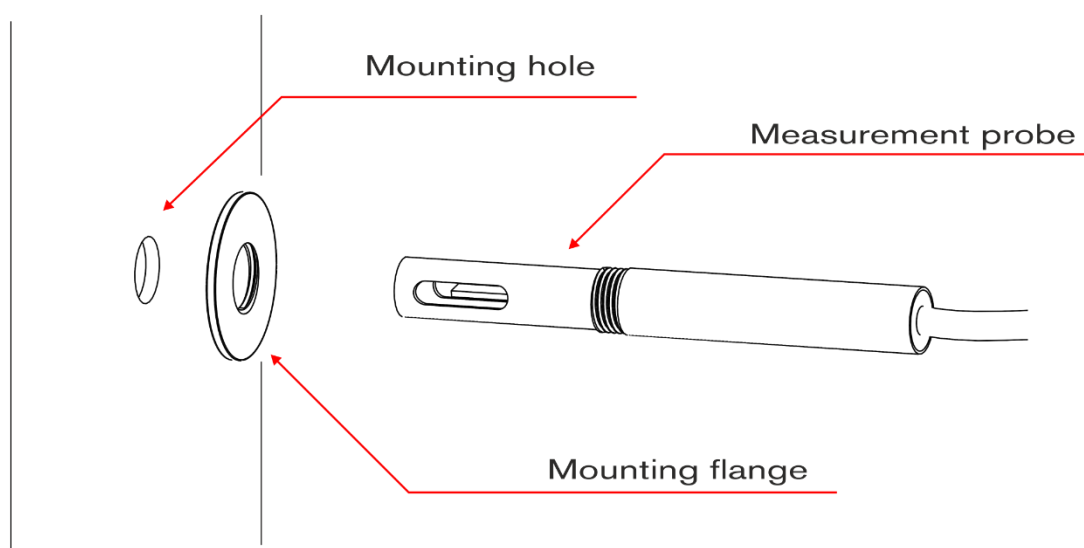


Fig.3

Warning!!! The probe is intended for continuous operation in the presence of flue gases. However, in order to ensure its proper use, the Analyzer probe should not be left in the presence of flue gases when non-powered.

The design of the measuring probe ensures proper transfer of heat to the environment, so it should not be covered with thermal insulation that may be covering the chimney or boiler smoke conduit.

3.5. Removal of the probe

The lambda probe heats up to a high temperature, so when removing it from the flue duct it is necessary to disconnect the unit from the network and wait until the probe cools down completely as touching the heated heater by hand may cause burns.

Attention should be paid to the flue gases escaping from the mounting hole, so the boiler should be turned off when removing the probe.

4. Handling and configuration of the unit

4.1. First start-up

After connecting **BCA-O2_{eco}** to the network via the power supply, the unit is in the inactive STOP mode (Fig.4), which is indicated by the yellow STATUS diode. The start-up of the unit is done by pressing the START (▶) button, which is followed by the heating of the probe.

When the probe reaches the required temperature, the measured values will appear on the display.

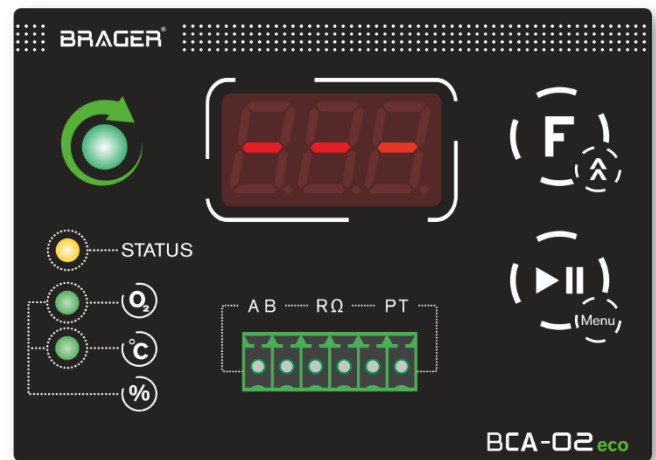


Fig.4

The button (F) changes the parameters displayed:

Oxygen level (Fig.5).

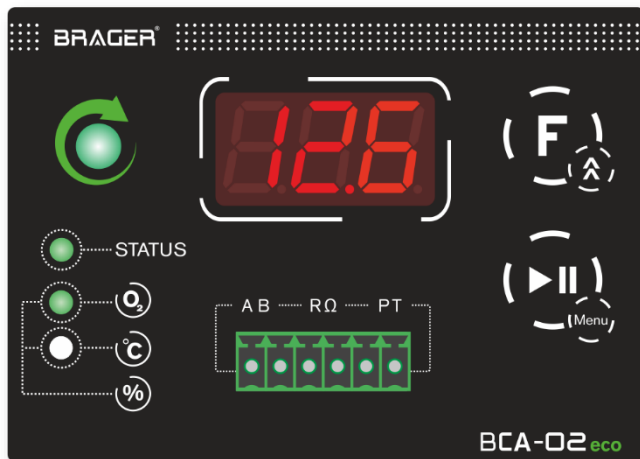


Fig.5

Flue gas temperature (Fig.6). The parameter is not available for P1=0.

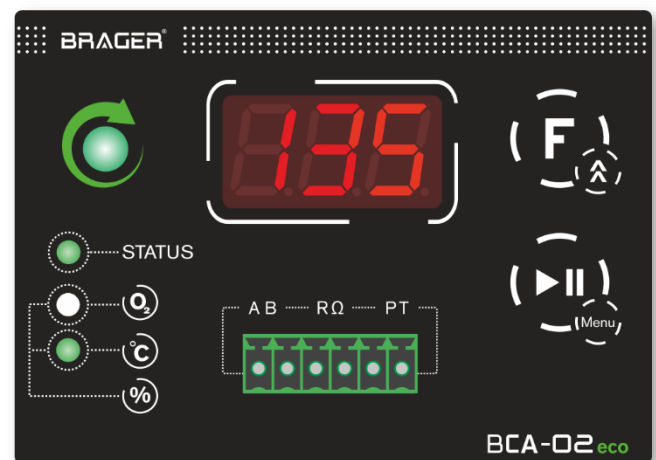


Fig.6

Optimal combustion coefficient (Fig.7).

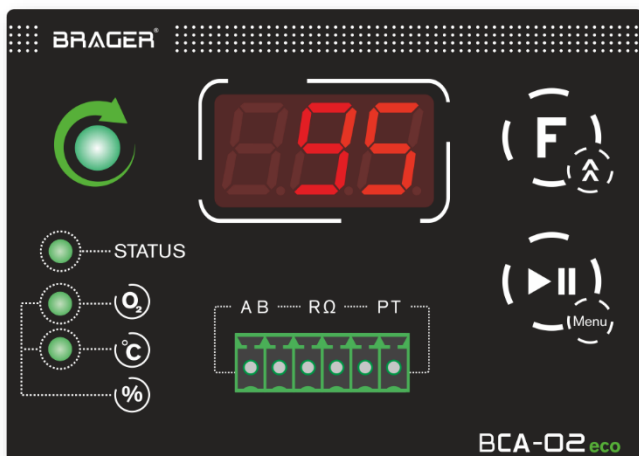


Fig.7

4.2. Eco indicator

The diode, depending on the selected main screen (Oxygen readout, flue gas temperature, optimal combustion coefficient screen), indicates the current quality of the combustion process by changing the color.

Diagram 1. Diode functioning based on the concentration of oxygen during combustion

P3 - lower oxygen value

P4 - upper oxygen value

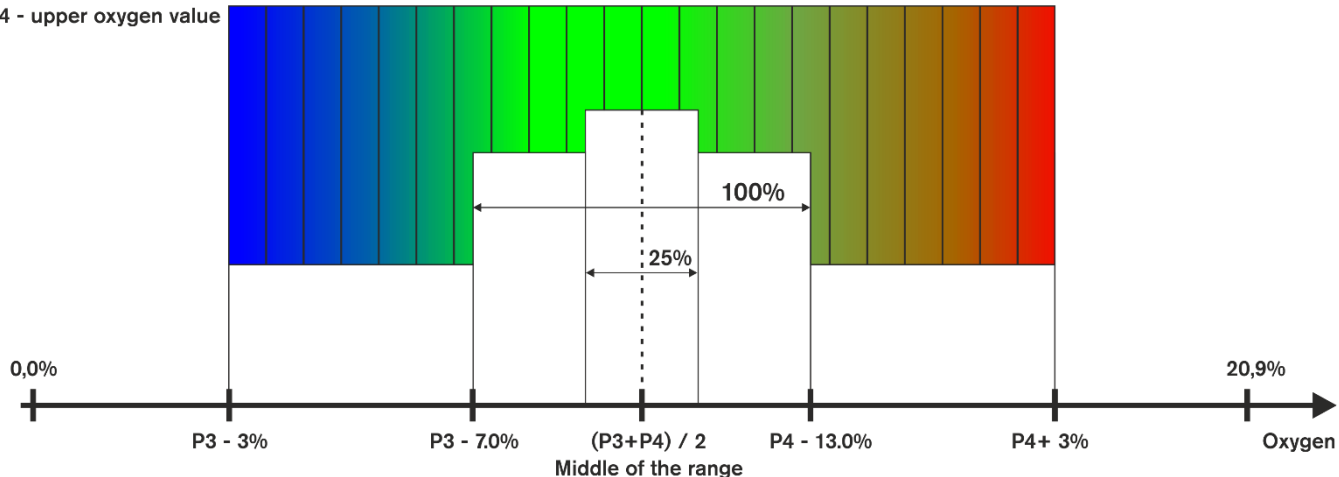


Diagram 2. Diode functioning based on the temperature of flue gas during combustion.

LOW - lower flue gas temperature limit (70°C)

P5 - upper flue gas temperature limit

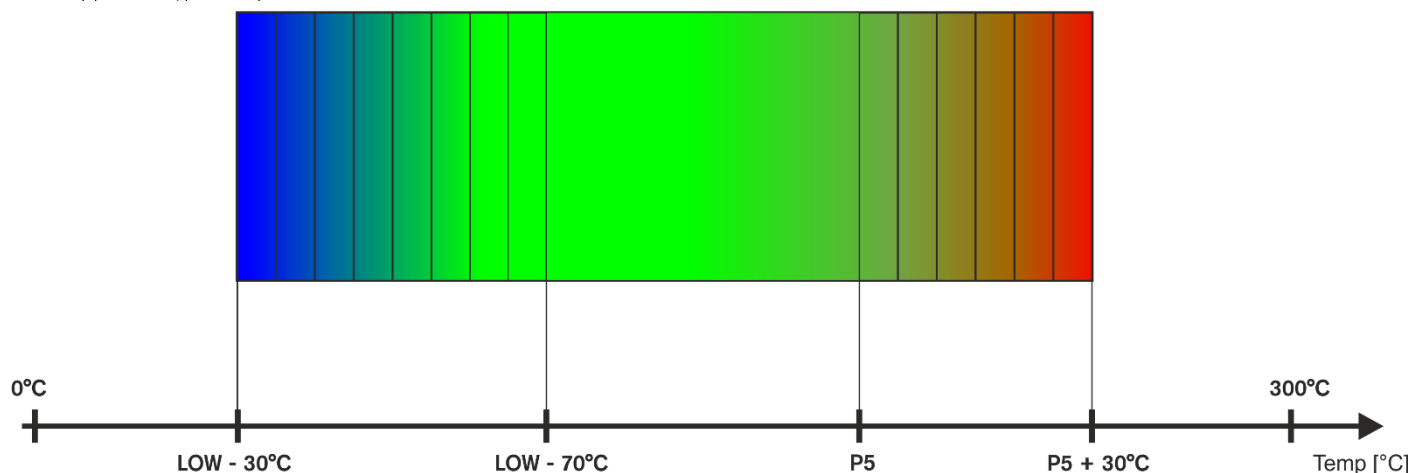
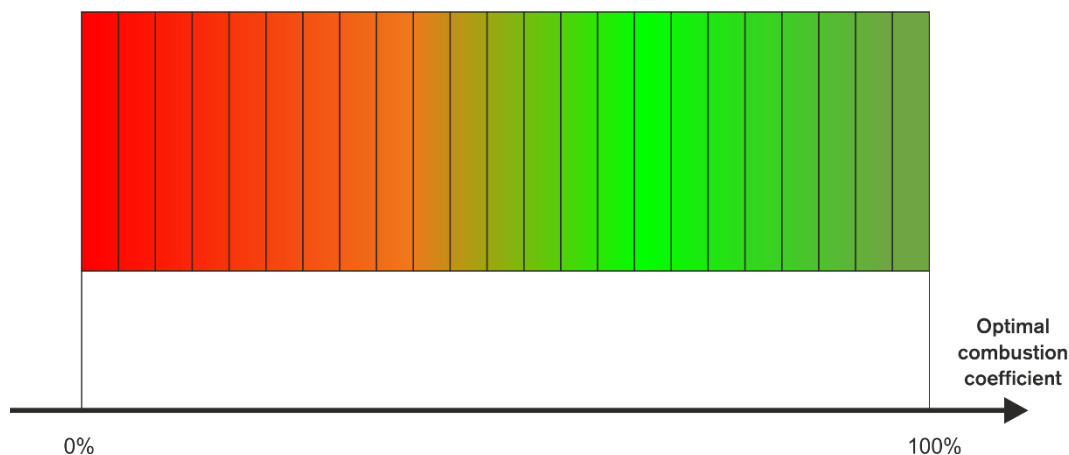
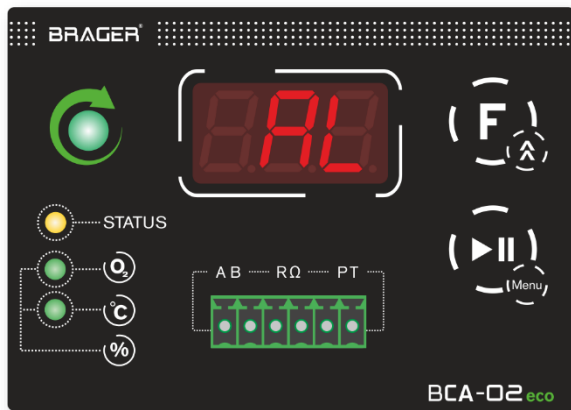


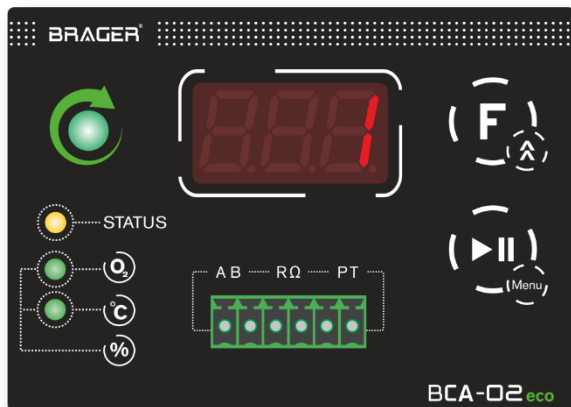
Diagram 3. Diode functioning based on the optimal combustion coefficient.



4.3. Initial configuration



To enter the Menu, press and hold the (Menu) button for 3 seconds. The AL parameter will be displayed on the screen.

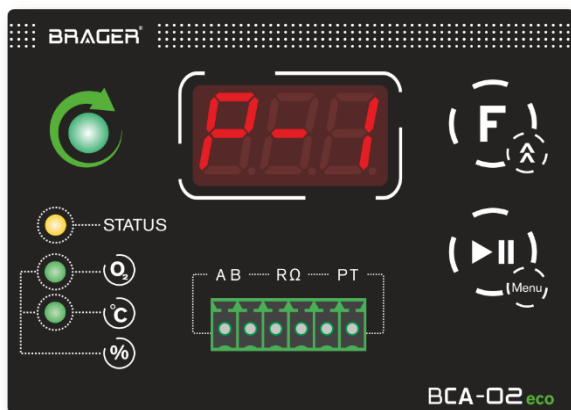


Then, using the (F) button select the unit operation mode.

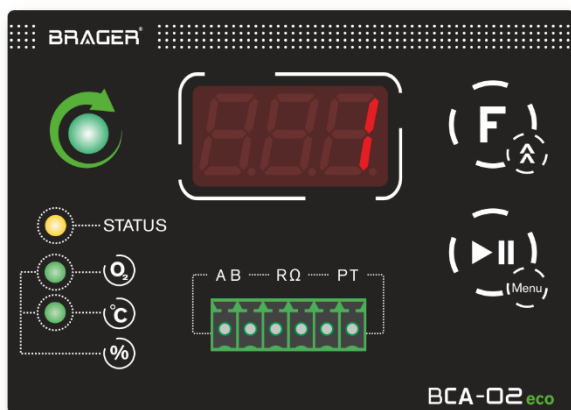
- 1 – Autonomous
- 2 – Bragerbus
- 3 – Modbus

Saving and exiting the parameter is done by pressing the (Menu) button.

4.4. Activation of flue gas temperature sensor



While in the main menu (Press and hold the Menu button for 3 seconds), find parameter P1 using the (Menu) button.



Then, using the (F) button, set the value to "1". Saving and exiting the parameter is done by pressing the (Menu) button.

5. Operating modes and maintenance menu

5.1 Autonomous operation

In autonomous operation mode, the unit allows continuous monitoring of the oxygen value in the flue gas, the flue gas temperature (when the temperature sensor is connected) and the optimal combustion coefficient, which is the sum of both parameters. The autonomous mode allows the unit to work without having to integrate it with other automation. The displayed parameters provide the data necessary to optimize the combustion process.

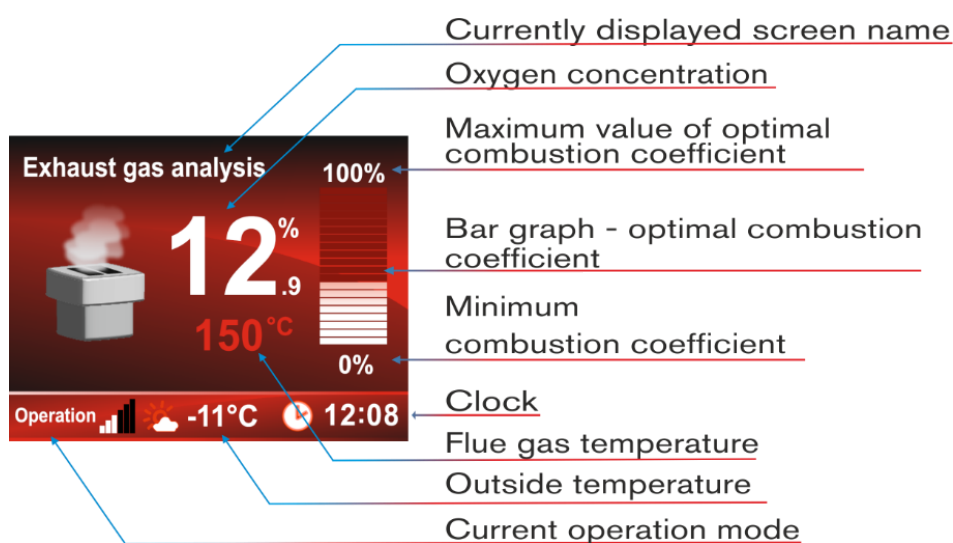
5.2 Bragerbus

In the Bragerbus mode, the unit operates with dedicated Brager automation. The **BCA-O2_{eco}** Analyzer continuously provides data to the controller on the boiler, which enables automatic regulation of the combustion process. Additionally, the controller on the boiler will have a dedicated main screen enabling the readout of the parameters from the probe and the main menu to manage its operation.

Activation and connection:

After the initial configuration (see section 4.3), when the Bragerbus communication is selected, connect the **BCA-O2_{eco}** Analyzer with the Brager controller. The connection is made via the "A B" connector. The communication between the units is automatic. When the Flue Gas Analyzer begins the readout of the flue gas parameters (the STATUS diode lights up green) an additional main screen "Flue Gas Analysis" will appear on the controller panel.

Panel description:

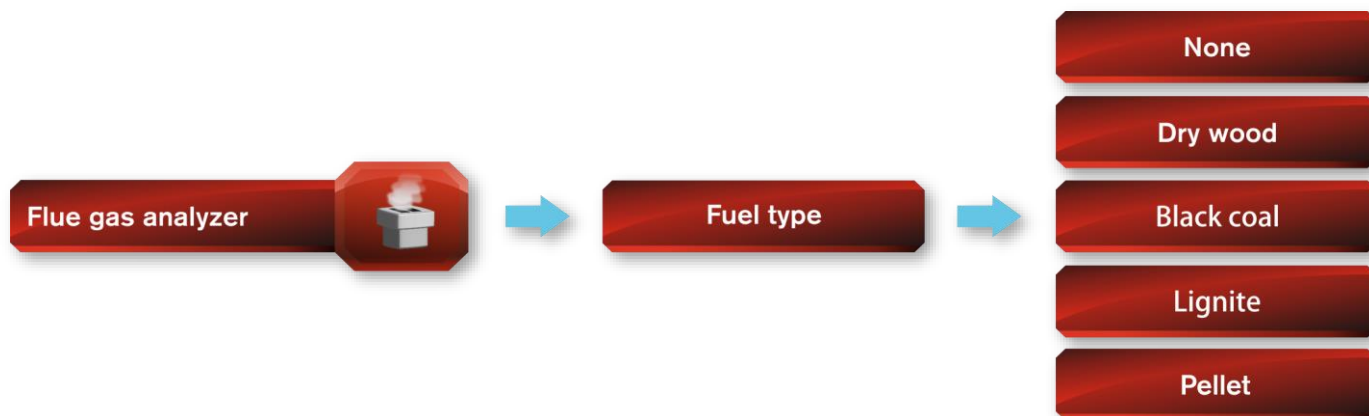


Configuration :

Entering the menu is possible by pressing and holding the button  for 3 seconds.

Then in the main menu find the Flue Gas Analyzer menu:

- **Fuel type selection**



Specifying the fuel type results in displaying additional parameters available in the **BRAGER CONNECT²** mobile application.

- **Setting the lower oxygen range**



- **Setting the upper oxygen range**



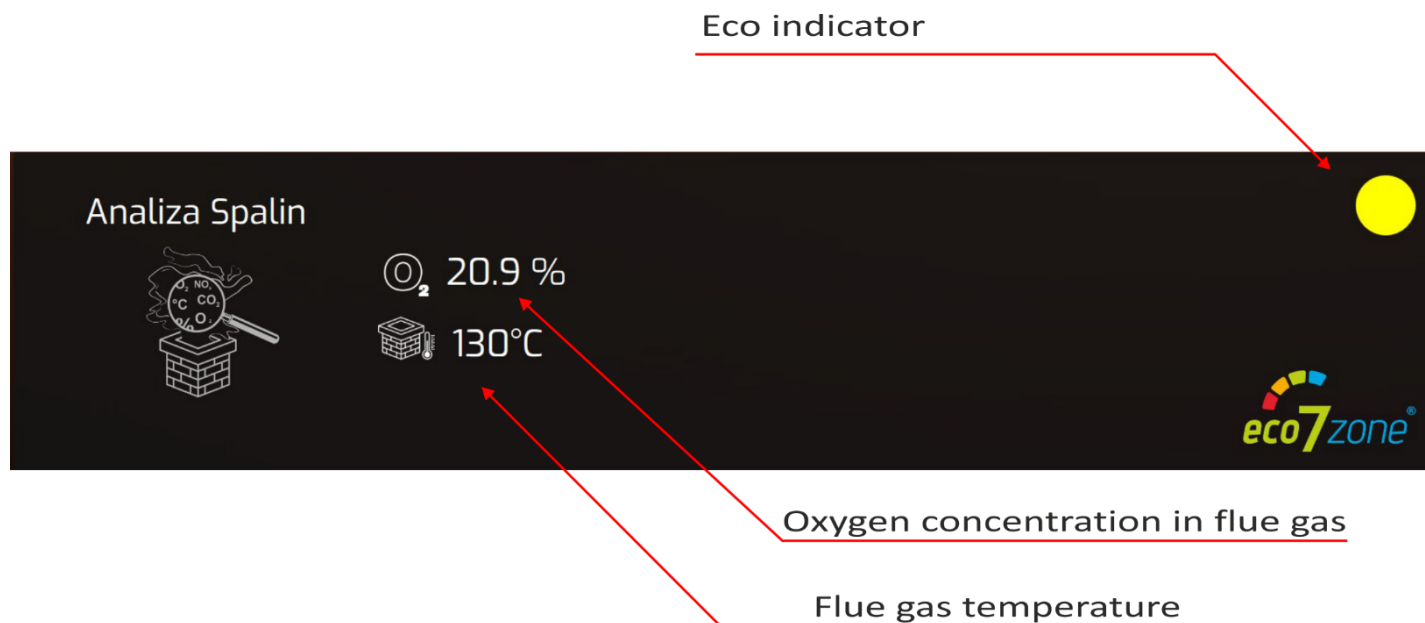
- **Setting the maximum flue gas temperature**



Mobile application:

Communication of the **BCA-O2_{eco}** unit with the mobile application is possible after connecting the analyzer to a dedicated Brager controller equipped with an Intern **BRAGER CONNECT2** et module.

Description of the "Flue gas analysis" tile in the application:



Use of the application:

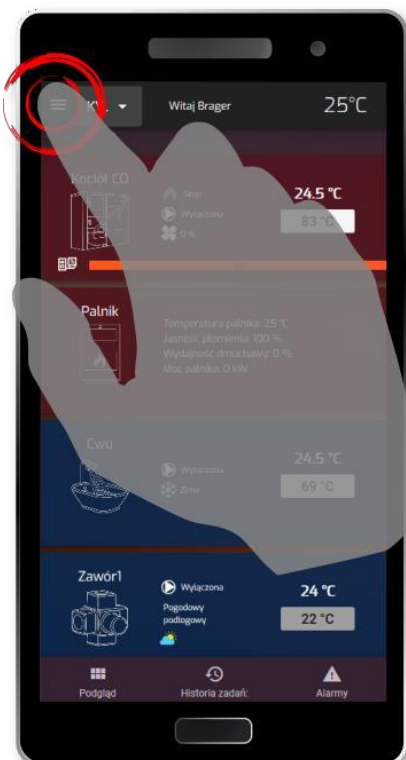


Fig. 8

Start the Pop-up Menu with the icon in the upper left part of the screen. Fig.8

Then select the option "FLUE GAS ANALYZER" (Fig.9).

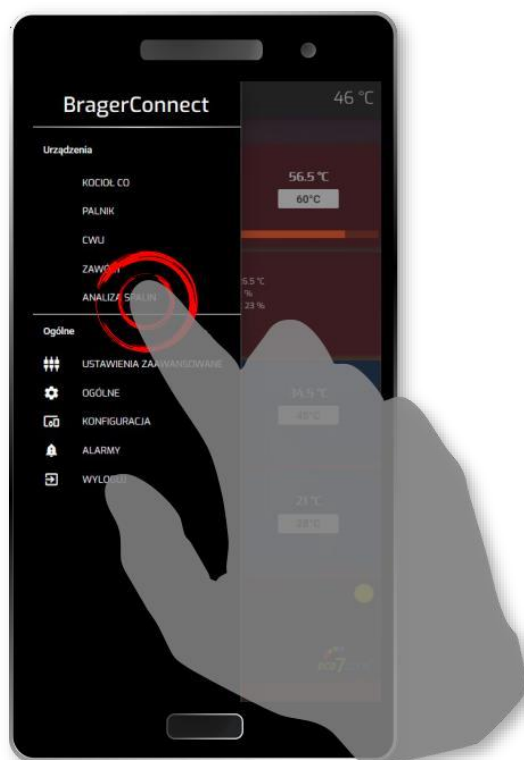


Fig.9

All available parameters will appear on the screen (Fig.10).

Parameters that can be modified:

- Fuel type
- Lower oxygen range
- Upper oxygen range
- Maximum flue gas temperature

Readout parameters:

- Probe version
- Oxygen concentration
- Optimal combustion coefficient
- Flue gas temperature
- *Stack loss
- *Energy efficiency
- *Lambda
- *CO2 concentration



Fig.10

***Additional parameters, available only in the mobile application after determining the type of fuel to be combusted.**

5.3 MODBUS

The **BCA-02 eco** unit is equipped with an additional connector for communication with external units supporting the RS485 serial transmission standard.

Activation and connection:

After the initial configuration (section 4.3), when the Modbus communication is selected, connect the analyzer to the selected regulator via the "A B" controller.

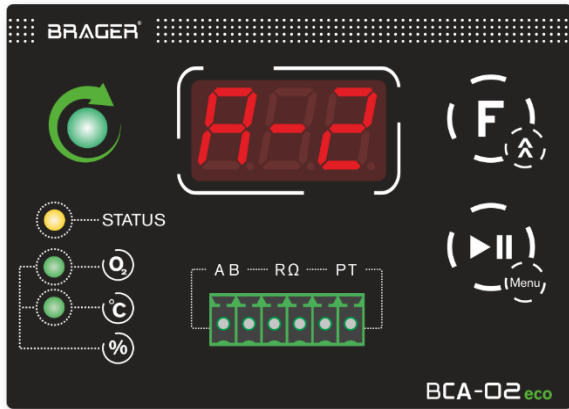
Communication parameters available in the unit :



Module address – this parameter indicates the address at which the BCA-02 module will be visible in the internal network.

Adjustment range: 1 –127

Factory setting: 1

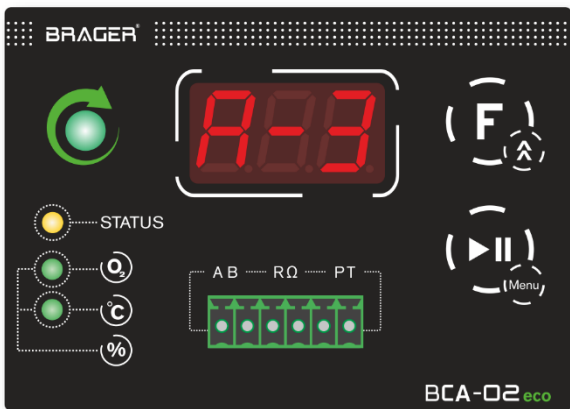


Communication speed – this parameter indicates the transmission speed in kb/s.

Adjustment range: 0 – 3

- **0 – 9.6 kb/s**
- **1 – 19.2 kb/s**
- **2 – 57.6 kb/s**
- **3 – 115.2 kb/s**

Factory setting: 0

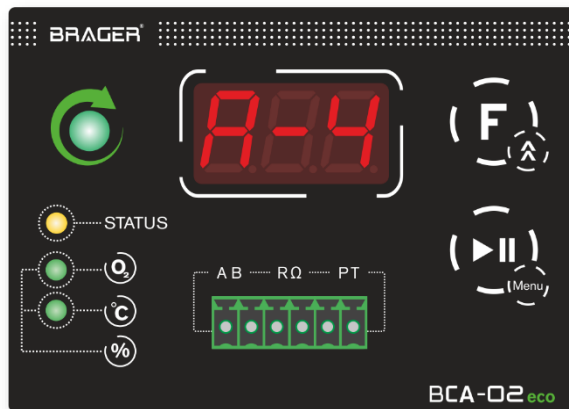


Setting the transmission parity – this parameter indicates the transmission parity.

Adjustment range: 0 – 2

- **0 – NONE**
- **1 – EVEN**
- **2 – ODD**

Factory setting: 0



Stop bits – this parameter indicates the number of transmission stop bits.

Adjustment range: 0 – 1

- **0 – 1 bit**
- **1 – 2 bits**

Factory setting: 0

Characteristics and description of registers :

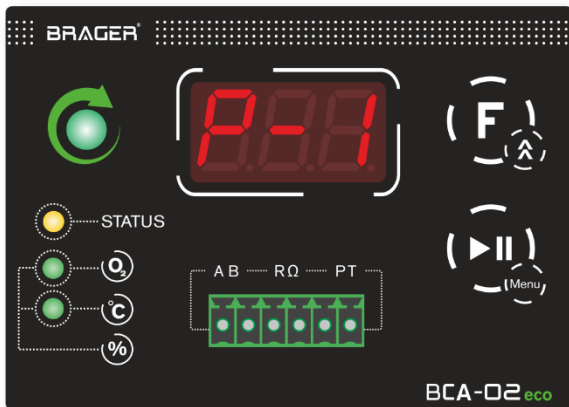
| Register number | Register name | Description |
|-----------------|---|--|
| 0 | Reserved | Read – parameter value read |
| 1 | Register status | <p>Read:</p> <ul style="list-style-type: none"> • 0 – Unit not operating • 1 – Unit operating • 0 – Probe heating • 0 – Unit error Write: • 0 – Stop of unit operation • 1 – Start of unit operation |
| 2 | Oxygen concentration | Read oxygen value |
| 3 | Oxygen concentration measurement status | <p>Read:</p> <ul style="list-style-type: none"> • 0 – Correct measurement • 1 – Measurement error • 2 – No measurement |
| 4 | Reserved | Read – parameter value read |
| 5 | Reserved | Read – parameter value read |
| 6 | Reserved | Read – parameter value read |
| 7 | Reserved | Read – parameter value read |
| 8 | Flue gas temperature | <p>Read:</p> <ul style="list-style-type: none"> • Read value of flue gas temperature |
| 9 | Flue gas temperature measurement status | <p>Read:</p> <ul style="list-style-type: none"> • 0 – Correct measurement • 1 – Measurement error • 2 – No measurement |

| | | |
|----|----------------------------|---|
| 10 | Reserved | Read – parameter value read |
| 11 | Ambient temperature | Read: <ul style="list-style-type: none"> • Read ambient temperature value |
| 12 | Ambient temperature status | Read: <ul style="list-style-type: none"> • 0 – Correct measurement • 1 – Measurement error • 2 – No measurement |
| 13 | Reserved | Read – parameter value read |
| 14 | Reserved | Read – parameter value read |
| 15 | Reserved | Read – parameter value read |
| 16 | Reserved | Read – parameter value read |
| 17 | Calibrate oxygen | Read: <ul style="list-style-type: none"> • 1 – Calibration in progress Write: <ul style="list-style-type: none"> • 1 – Calibrate oxygen |
| 18 | Unit status | Write: <ul style="list-style-type: none"> • The value of this parameter is the unit address in Modbus. <ul style="list-style-type: none"> ○ Minimum value: 1 ○ Maximum value: 127 ○ Default value: 1 |
| 19 | Baud rate | Read/Write: <ul style="list-style-type: none"> • 0 – 9.6 kbps • 1 – 19.2 kbps • 2 – 57.6 kbps • 3 – 115.2 kbps • Default value – 0 |

| | | |
|----|-----------|---|
| 20 | Parity | Read/Write: <ul style="list-style-type: none"> • 0 – None • 1 – Even • 2 – Odd • Default value: 0 |
| 21 | Stop bits | Read/Write: <ul style="list-style-type: none"> • 0 – 1 bit • 1 – 2 bits • Default value: 0 |
| 22 | Reserved | Read – parameter value read |
| 23 | AutoOff | <p>The parameter activates the Modbus transmission failure detection function in the device</p> Read/Write: <ul style="list-style-type: none"> • 0 – off • 1 – on • Default value: 0 |
| 24 | Reserved | Read – parameter value read |

5.4 MAINTENANCE MENU

BCA-O2^{eco} parameters available in the Menu:

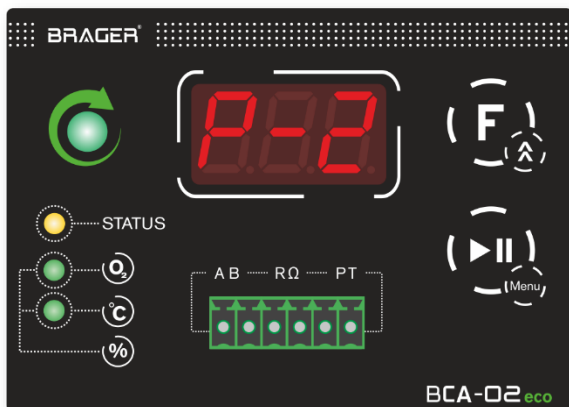



Flue gas sensor activation – this parameter determines which sensor will be used to collect data containing the exhaust gas temperature.

When the parameter value is set to "0", the readout from the built-in sensor is disabled, and the exhaust gas temperature data is taken from the boiler controller (provided that the boiler controller is equipped with a exhaust gas temperature sensor and data transfer is via the Brager bus protocol).

Adjustment range: 0 – 1

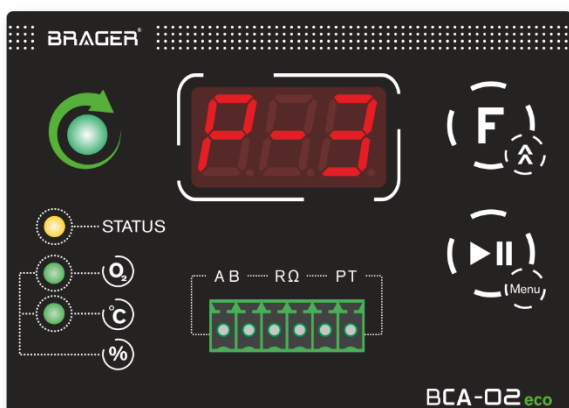
Factory setting: 0



Operation – this parameter determines how the measurements are activated. When the parameter value is "1", the unit switches on autonomously without the need to press the  button.

Adjustment range: 0 – 1

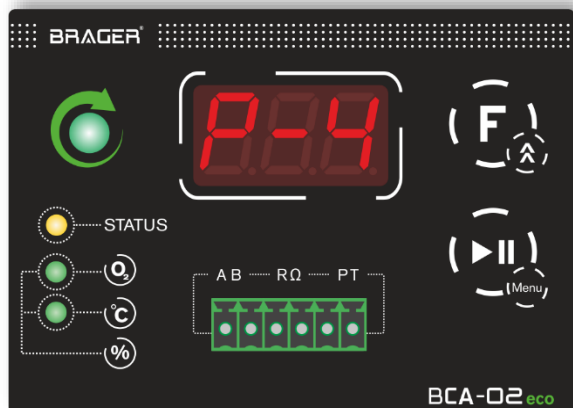
Factory setting: 0



Lower oxygen range – this parameter defines the lower limit of oxygen concentration value for which combustion is optimal.

Adjustment range: 4 – 14

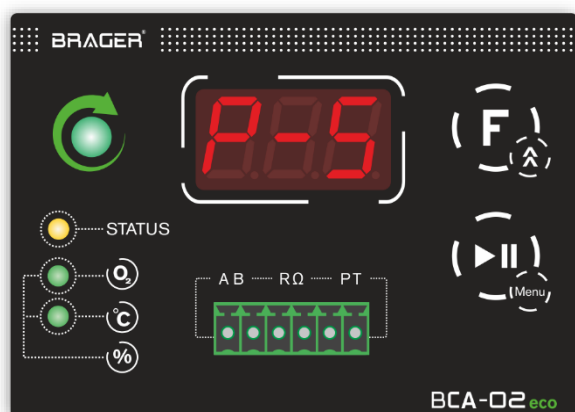
[%] Factory setting: 8 [%]



Upper oxygen range – this parameter defines the upper limit of oxygen concentration value for which combustion is optimal.

Adjustment range: 10 – 18[%]

Factory setting: 12 [%]

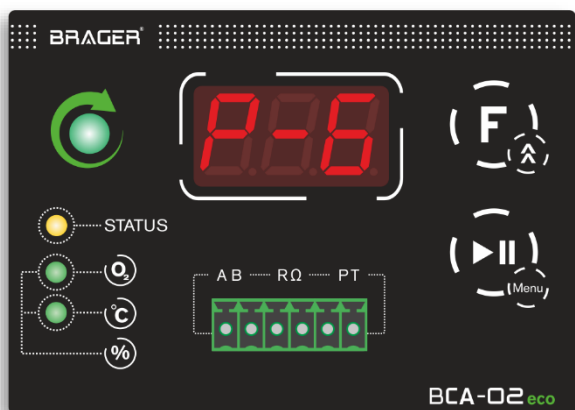


Flue gas temperature limit – the parameter determines the flue gas temperature threshold, exceeding of which informs about the boiler exchanger becoming dirty.

Adjustment range: 100 – 300 [°C]

Factory setting: 150 [°C]

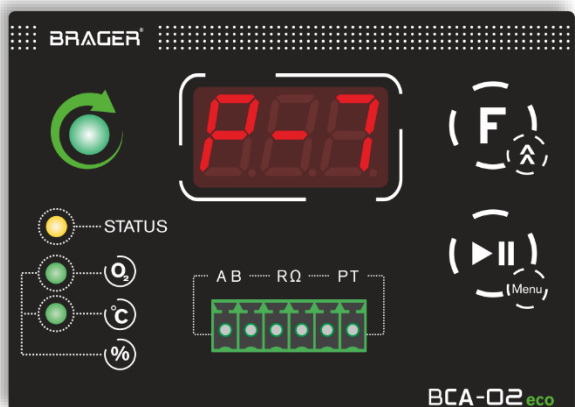
*Parameter P5 is visible in the Menu only if parameter



Restoring factory settings – this parameter restores the unit to the factory settings.

Adjustment range: 0 – 1

Factory setting: 1



Program version – this parameter displays the program version of the unit

6. Input/output connector support

The unit is equipped with 3 inputs/outputs, which are used to download, send data and communicate with controllers.

6.1. A B connector

A B



A connector designed to connect the unit to another controller. The communication takes place in the Bragerbus or Modbus mode.

6.2. Temperature input

PT



The input is designed to connect the PT1000 sensor. The measured temperature range is from -50°C to 400°C. The activation of the boiler temperature sensor is presented in section 4.4.

Warning!!! The PT1000 sensor is not supplied with the unit.

6.3. Resistance output

R Ω



The device is equipped with an additional output in which the resistance values transmitted from the unit correspond to the values of oxygen concentration in the flue gas.

| Resistor in the divider | Reference voltage | ADC resolution |
|-------------------------|-------------------|----------------|
| 1,5 [k Ω] | 3.3 [V] | 4096 [bits] |

Detailed parameters of the resistance output are presented in the table below.

| Oxygen concentration Error/No measurement | Resistance R > 2500 | ADC result 2560 | Oxygen concentration Error/No measurement | Resistance R > 2500 | ADC result 2560 | Oxygen concentration Error/No measurement | Resistance R > 2500 | ADC result 2560 |
|--|------------------------|--------------------|--|------------------------|--------------------|--|------------------------|--------------------|
| 0.0% | 1033 | 1670 | 7.0% | 1311 | 1910 | 14.0% | 1591 | 2108 |
| 0.1% | 1037 | 1675 | 7.1% | 1315 | 1913 | 14.1% | 1595 | 2111 |
| 0.2% | 1041 | 1678 | 7.2% | 1321 | 1918 | 14.2% | 1599 | 2113 |
| 0.3% | 1045 | 1682 | 7.3% | 1325 | 1921 | 14.3% | 1603 | 2116 |
| 0.4% | 1048 | 1685 | 7.4% | 1329 | 1924 | 14.4% | 1605 | 2117 |
| 0.5% | 1052 | 1689 | 7.5% | 1333 | 1927 | 14.5% | 1609 | 2120 |
| 0.6% | 1056 | 1692 | 7.6% | 1336 | 1930 | 14.6% | 1613 | 2122 |
| 0.7% | 1060 | 1696 | 7.7% | 1340 | 1933 | 14.7% | 1617 | 2125 |
| 0.8% | 1066 | 1702 | 7.8% | 1344 | 1935 | 14.8% | 1620 | 2127 |
| 0.9% | 1070 | 1706 | 7.9% | 1348 | 1939 | 14.9% | 1624 | 2130 |
| 1.0% | 1074 | 1709 | 8.0% | 1350 | 1940 | 15.0% | 1628 | 2131 |
| 1.1% | 1078 | 1713 | 8.1% | 1354 | 1944 | 15.1% | 1632 | 2134 |
| 1.2% | 1081 | 1716 | 8.2% | 1358 | 1946 | 15.2% | 1638 | 2138 |
| 1.3% | 1085 | 1720 | 8.3% | 1362 | 1949 | 15.3% | 1642 | 2141 |
| 1.4% | 1089 | 1722 | 8.4% | 1365 | 1951 | 15.4% | 1646 | 2143 |
| 1.5% | 1093 | 1726 | 8.5% | 1369 | 1955 | 15.5% | 1650 | 2145 |
| 1.6% | 1095 | 1728 | 8.6% | 1373 | 1957 | 15.6% | 1653 | 2147 |
| 1.7% | 1099 | 1732 | 8.7% | 1377 | 1960 | 15.7% | 1657 | 2150 |
| 1.8% | 1103 | 1735 | 8.8% | 1383 | 1965 | 15.8% | 1661 | 2152 |
| 1.9% | 1107 | 1739 | 8.9% | 1387 | 1968 | 15.9% | 1665 | 2155 |
| 2.0% | 1110 | 1742 | 9.0% | 1391 | 1970 | 16.0% | 1673 | 2160 |
| 2.1% | 1114 | 1746 | 9.1% | 1395 | 1974 | 16.1% | 1677 | 2162 |
| 2.2% | 1118 | 1749 | 9.2% | 1398 | 1976 | 16.2% | 1681 | 2164 |
| 2.3% | 1122 | 1753 | 9.3% | 1402 | 1979 | 16.3% | 1685 | 2167 |
| 2.4% | 1128 | 1758 | 9.4% | 1406 | 1981 | 16.4% | 1688 | 2169 |
| 2.5% | 1132 | 1762 | 9.5% | 1410 | 1985 | 16.5% | 1692 | 2171 |
| 2.6% | 1136 | 1765 | 9.6% | 1418 | 1990 | 16.6% | 1696 | 2173 |
| 2.7% | 1140 | 1769 | 9.7% | 1422 | 1994 | 16.7% | 1700 | 2176 |
| 2.8% | 1143 | 1771 | 9.8% | 1426 | 1996 | 16.8% | 1706 | 2180 |
| 2.9% | 1147 | 1775 | 9.9% | 1430 | 1999 | 16.9% | 1710 | 2182 |
| 3.0% | 1151 | 1778 | 10.0% | 1433 | 2001 | 17.0% | 1714 | 2184 |
| 3.1% | 1155 | 1782 | 10.1% | 1437 | 2004 | 17.1% | 1718 | 2187 |
| 3.2% | 1163 | 1789 | 10.2% | 1441 | 2007 | 17.2% | 1721 | 2189 |
| 3.3% | 1167 | 1793 | 10.3% | 1445 | 2010 | 17.3% | 1725 | 2191 |
| 3.4% | 1171 | 1795 | 10.4% | 1451 | 2014 | 17.4% | 1729 | 2193 |
| 3.5% | 1175 | 1799 | 10.5% | 1455 | 2017 | 17.5% | 1733 | 2196 |
| 3.6% | 1178 | 1802 | 10.6% | 1459 | 2019 | 17.6% | 1735 | 2197 |
| 3.7% | 1182 | 1806 | 10.7% | 1463 | 2022 | 17.7% | 1739 | 2199 |
| 3.8% | 1186 | 1808 | 10.8% | 1466 | 2025 | 17.8% | 1743 | 2201 |
| 3.9% | 1190 | 1812 | 10.9% | 1470 | 2028 | 17.9% | 1747 | 2204 |
| 4.0% | 1196 | 1817 | 11.0% | 1474 | 2030 | 18.0% | 1750 | 2206 |
| 4.1% | 1200 | 1821 | 11.1% | 1478 | 2033 | 18.1% | 1754 | 2208 |
| 4.2% | 1204 | 1823 | 11.2% | 1480 | 2034 | 18.2% | 1758 | 2210 |
| 4.3% | 1208 | 1827 | 11.3% | 1484 | 2037 | 18.3% | 1762 | 2212 |
| 4.4% | 1211 | 1830 | 11.4% | 1488 | 2039 | 18.4% | 1768 | 2216 |
| 4.5% | 1215 | 1833 | 11.5% | 1492 | 2042 | 18.5% | 1772 | 2218 |
| 4.6% | 1219 | 1836 | 11.6% | 1495 | 2045 | 18.6% | 1776 | 2220 |
| 4.7% | 1223 | 1840 | 11.7% | 1499 | 2048 | 18.7% | 1780 | 2223 |
| 4.8% | 1225 | 1841 | 11.8% | 1503 | 2050 | 18.8% | 1783 | 2225 |
| 4.9% | 1229 | 1845 | 11.9% | 1507 | 2053 | 18.9% | 1787 | 2227 |
| 5.0% | 1233 | 1848 | 12.0% | 1513 | 2057 | 19.0% | 1791 | 2229 |
| 5.1% | 1237 | 1851 | 12.1% | 1517 | 2060 | 19.1% | 1795 | 2231 |
| 5.2% | 1240 | 1854 | 12.2% | 1521 | 2062 | 19.2% | 1798 | 2233 |
| 5.3% | 1244 | 1857 | 12.3% | 1525 | 2065 | 19.3% | 1802 | 2236 |
| 5.4% | 1248 | 1860 | 12.4% | 1528 | 2067 | 19.4% | 1806 | 2237 |
| 5.5% | 1252 | 1863 | 12.5% | 1532 | 2070 | 19.5% | 1810 | 2240 |
| 5.6% | 1258 | 1868 | 12.6% | 1536 | 2072 | 19.6% | 1813 | 2241 |
| 5.7% | 1262 | 1872 | 12.7% | 1540 | 2075 | 19.7% | 1817 | 2244 |
| 5.8% | 1266 | 1874 | 12.8% | 1543 | 2077 | 19.8% | 1821 | 2246 |
| 5.9% | 1270 | 1878 | 12.9% | 1547 | 2080 | 19.9% | 1825 | 2248 |
| 6.0% | 1273 | 1880 | 13.0% | 1551 | 2082 | 20.0% | 1831 | 2252 |
| 6.1% | 1277 | 1884 | 13.1% | 1555 | 2085 | 20.1% | 1835 | 2254 |
| 6.2% | 1281 | 1886 | 13.2% | 1558 | 2087 | 20.2% | 1839 | 2256 |
| 6.3% | 1285 | 1890 | 13.3% | 1562 | 2090 | 20.3% | 1843 | 2258 |
| 6.4% | 1288 | 1892 | 13.4% | 1566 | 2092 | 20.4% | 1846 | 2260 |
| 6.5% | 1292 | 1896 | 13.5% | 1570 | 2095 | 20.5% | 1850 | 2262 |
| 6.6% | 1296 | 1898 | 13.6% | 1576 | 2099 | 20.6% | 1854 | 2264 |
| 6.7% | 1300 | 1902 | 13.7% | 1580 | 2101 | 20.7% | 1858 | 2266 |
| 6.8% | 1303 | 1904 | 13.8% | 1584 | 2103 | 20.8% | 1860 | 2267 |
| 6.9% | 1307 | 1907 | 13.9% | 1588 | 2106 | 20.9% | 1864 | 2270 |

7. Alarms

During the operation of the **BCA-O2_{eco}** Analyzer, emergency situations and alarm states may occur. Alarms are displayed directly in the front panel of the Analyzer in the form of "Err" and the STATUS diode in red (Fig.11).

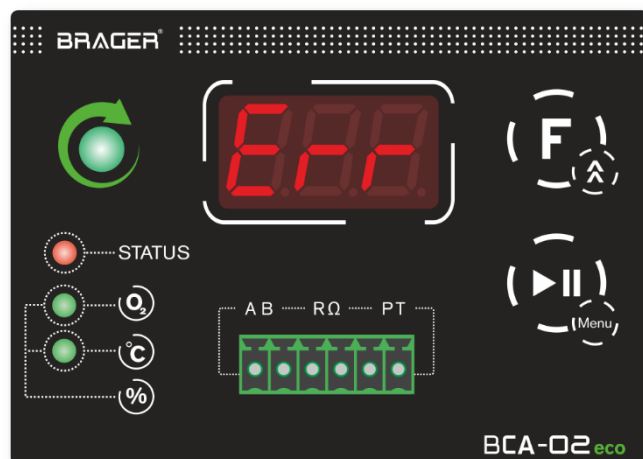


Fig.11


The following failures may occur in the analyzer:

- **Oxygen measurement error (probe error)** – occurs when the maximum probe initialization time of 120s is exceeded. The STATUS diode signals the error by pulsating red light.
- **Flue gas temperature sensor error** – occurs if P1=1 (active sensor) and the measurement is out of range (0°C - 450°C). The STATUS diode signals the error by pulsating red light.
- **Transmission error**
 - Modbus mode – an error occurs when no valid transmission frame is received for 20s and MB_autoOff = 1 (par: 7; pool:2). The STATUS diode signals the error by pulsating alternately red and yellow light.
 - Bragerbus mode – an error occurs when no valid transmission frame is received for 20s. The STATUS diode signals the error by pulsating alternately red and yellow light.

In case several statuses/errors occur simultaneously, priorities from the highest to the lowest were introduced:

- Probe error/sensor error
- Transmission error
- Probe status (Stop/Heating/Operation)

Error reset:

- Oxygen measurement error (probe error) – the error is reset by pressing the  button when the current oxygen concentration is displayed.
- Flue gas temperature sensor error – the error is reset automatically after receiving a measurement in the correct range.
- Transmission error – the error is reset automatically after receiving a correct transmission frame.

8. Unit operating conditions and power supply

8.1. Analyzer operating conditions

| Unit operating conditions | Value/Range |
|---|--------------|
| Power supply | 12 V/ 2A |
| Humidity range | 30 - 75% |
| Ambient temperature | 5 - 40°C |
| Power consumption of the unit together with the probe | 15 W |
| | |
| Power supply parameters | Value/Range |
| Input voltage | 230V/50Hz AC |
| Output voltage | 12 V DC |
| Output current | 2A |
| Frequency | 50-60Hz |
| DC plug standard | 2.1/5.5 |

Disposal of electrical and electronic waste



v 1.00

Taking care of the natural environment is our top priority. Awareness that we produce electronic devices obliges us to dispose of waste electronic components and devices in a nature-friendly way. Therefore, the company received a registration number assigned by the Chief Inspector of Environmental Protection.

000002627

The symbol of a crossed-out waste container on a product means that the product must not be disposed of in normal waste bins. By sorting recyclable waste we help to protect the environment. It is the user's responsibility to deliver the waste equipment to a designated collection point for recycling of waste from electrical and electronic equipment.

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Warranty and service conditions

The condition for granting the warranty is the proper use of the unit as specified in the instructions manual.

1. The warranty for the correct operation of the equipment is provided by Brager Sp. z o. o. for a period of 24 months, but no longer than 36 months from the date of manufacture. The starting date of the warranty is the date of issue of the purchase document, recorded in the Warranty Certificate.
2. Faults revealed during the warranty period will be removed free of charge by the service of the guarantor Brager Sp. z o.o. Pleszew ul. Rolna 11, 63-300 Pleszew e-mail: serwis@brager.com.pl phone no. 795,750,933
3. The warranty covers equipment faults caused by defective parts and/or manufacturing defects.
4. The Claimant should send the defective equipment (after receiving the guarantor's consent) to the address of the service facility: Brager Sp. z o. o. ul. Rolna 11, 63-300 Pleszew
Parcels shipped by Pocztex - Poczta Polska Courier Services and courier companies cash on delivery will not be accepted by the service). Conditions for acceptance of equipment for repair: the damaged equipment should be thoroughly checked and the type of damage should be described, the description of the damage together with the damaged equipment and the warranty card should be delivered to the service facility of Brager Sp. z o. o. ul. Rolna 11, 63-300 Pleszew
5. Any faults or damage to the equipment revealed during the warranty period will be removed free of charge within 6 working days, but in justified cases this period may be extended, but not longer than to 14 days from the date of delivery of the equipment to our service. The service facility is not responsible for the time of the return shipment of the equipment (postage time).
6. The warranty does not cover damages and faults resulting from: inappropriate use or use contrary to the instruction manual, independent repairs, alterations, tuning or structural changes made by the Customer/User.
7. Warranty claims and inquiries regarding the controller should be addressed to the manufacturer Brager Sp. z o. o.
8. After the repair is completed, the equipment is transferred to the Customer via Poczta Polska (at the expense of the service facility), or to the point of sale.

| Date of repair | Description of the fault | Signature |
|----------------|--------------------------|-----------|
| | | |
| | | |

Warranty repair annotations

Unit Warranty Certificate

.....
Symbol and serial
number

.....
Date of manufacture

.....
(Date of sale)

.....
(Stamp of the seller)

Warranty claims and inquiries regarding the controller
should be addressed to the manufacturer:

BRAGER[®]

Brager Sp. z o. o.
Pleszew, ul. Rolna 11, 63-300
Pleszew e-mail:
serwis@brager.com.pl
phone no.: 795 750 933