

# DEVICES

# SOFTWARE MEASURING COMPLEX SKU-0 6 FOR CONTINUOUS MONITORING OF PULVERIZED COAL BURNING

The measuring complex is used for monitoring the carbon contents in coal ash in pulverized coal in Heat Power Stations (HPS). **Fuel economy is till 5-7%**

**Express device for monitoring carbon content PKUP-06**



## ENERGY RESOURCES QUALITY CONTROL

Automatic quality control device of oil fuel (colourness according to International Scale ASTM, International standards, D 1500, ISO 2049, GOST 20284) CU-TEP TM

The devices are Implemented at UkrTatnafta, enterprise Ariana and others.

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# QUALITY CONTROL OF BIODIESEL DEVICE

- Automatic quality control device (colourness in accordance with ISO 15305, GOST 20284, GOST 28582) for biodiesel fuel : CU TEP-RM with the International Scale - Lovibond Scale.
- The devices are Implemented at 12 oil extraction plants in Ukraine.



## THE DEVICE OF QUALITY CONTROL OF POWDERS CU TEP-B INCLUDING THE WHITENESS OF FLOUR.

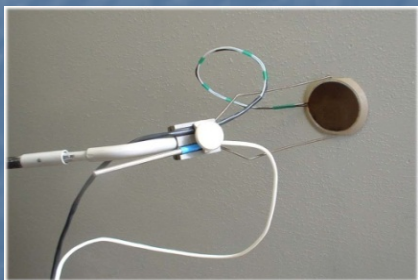


- The device of quality control of powders CU TEP-B including the whiteness of flour is desined and produced.
- The devices are implemented at 23 enterprises in Ukraine.

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# SENSORS

**HEAT FLUX SENSORS:** sensors that are thermoelectric converters heat flow into an electrical signal according to State Standard DSTU 3756 and intended for measuring heat flow, and (or) the surface heat flux. The department started to produce sensors of different models and sizes, taking into account the characteristics of the controlled object and operating conditions



**TEMPERATURE SENSORS:** sensors that are thermoelectric converters or resistance thermometers and are intended for contact temperature measurement. Mastered several models of small probe and the surface sensors for temperature measurement and control in different technological equipment.



## BASIC SPECIFICATIONS

The measuring range of the surface heat flux, W / m <sup>2</sup>	10 <sup>-6</sup> -10 <sup>5</sup>
Operating temperature range, °C	-200...+300
Measurement error,%	±1...4



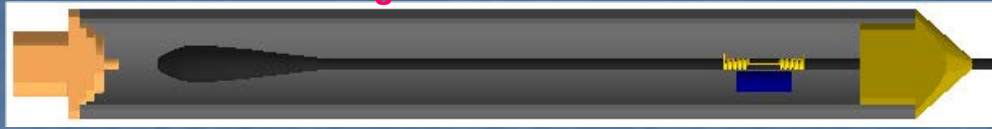
## BASIC SPECIFICATIONS

Temperature measurement range, °C	-50...+300
Measurement error,%	±0,5

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# SENSORS FOR ULTRASONIC CONTROL ON THE BASIC OF THE MAGNETOSTRICTION EFFECT

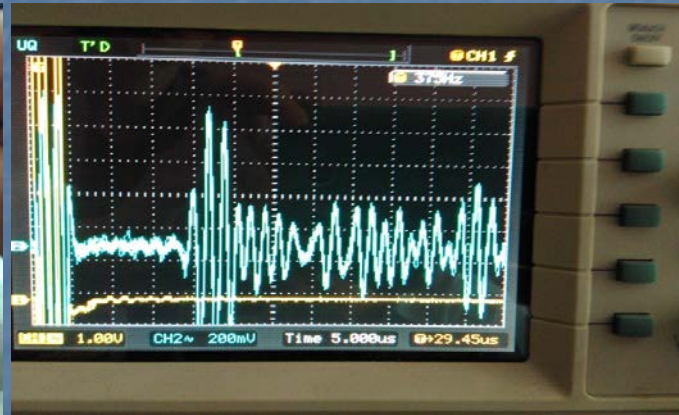
Single-sectional MSS



Internal module of four-section MSS

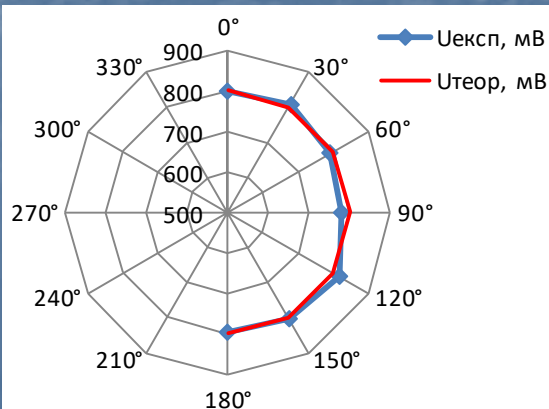


Experimental determination of the directional diagram



MSS orientation diagram for surface waves

Control of turbines blades



The essence *of the method is* the excitation of an unidirectional semispherical longitudinal ultrasonic wave in the object of investigation and the scanning of its surface by a point receiver (magnetostrictive sensor). The acoustic signal is converted into an electric, whose parameters determine the distribution of acoustic pressure over the surface of the object, which provides information for detecting defects, their type and location.

## BASIC SPECIFICATIONS

Frequency range, MHz	0,5...5,0
Area of contact surface, mm <sup>2</sup>	0,07...0,8
Duration of probing pulses, μs	0,4...32
Double conversion ratio	0,008...0,02
Electrical impedance, ohm	0,1...30
Directional diagram:	
for surface waves	circular
for longitudinal waves	spherical

**Advantages:** radiation and reception of longitudinal, superficial, transverse and other types of ultrasonic waves; Acoustic contact with the object without the use of contact liquids; Curie point for magnetostrictive materials 600-1200 ° C; small area of the surface of the radiation, which increased the resolution of the order of magnitude compared with piezoelectric sensors. **No analogues.**

**Patents of Ukraine:** №104567, №105611, №107629

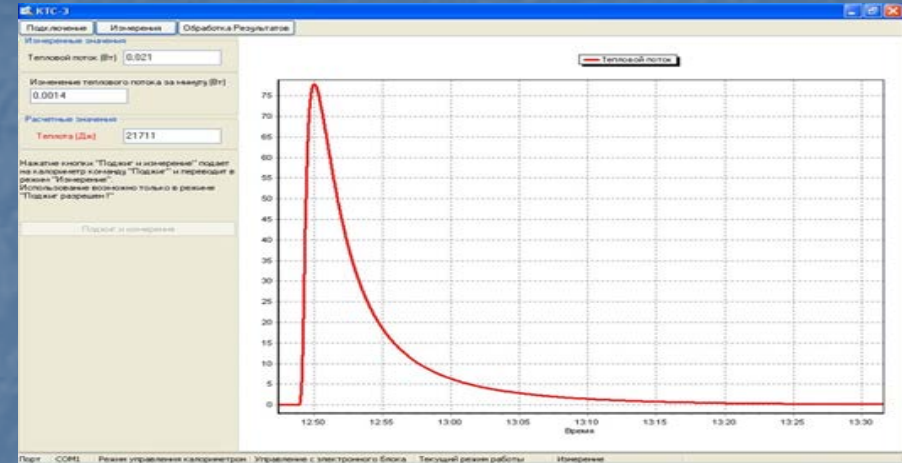
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# UNIVERSAL BOMB CALORIMETER

CALORIMETER is anhydrous bomb calorimeter for measuring the heat of combustion of solid, liquid and gaseous fuels.



## EXAMPLE OF RECORDING OF THE MEASUREMENT PROCESS



## BASIC SPECIFICATIONS

Measuring range of quantity of heat, kJ	10 ... 35
Limits of a supposed basic relative error, %	±0,1
General time of preparation for measurements, hours, no more than	1,5
Power supply of the device from electrical network with the voltage of 220 V and frequency of 50 Hz, no more than, V·A	850
Indication of results of measurements	Digital

**Advantages:** provides automation of measurement, processing and documentation of the results; not need to distilled water; compact design, ease of maintenance; not require the room with stable temperature and humidity conditions; replaces the traditional water calorimeters which are not produced in Ukraine.

Fuel sample is prepared in accordance with the requirements of existing standards, is burned at high pressure oxygen in a bomb calorimeter, located in the thermal block of calorimeter.

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Patents of Ukraine: №101716, №108312

# MEASURING SYSTEM OF HEAT CAPACITY MATERIALS

SYSTEM created based on multicell calorimeter, operating on the principle of step-scan (DSTU ISO 11357-4) and intended for measuring the heat capacity of polymer and synthetic materials, including rubber, plastic, composites, etc.



## BASIC SPECIFICATIONS

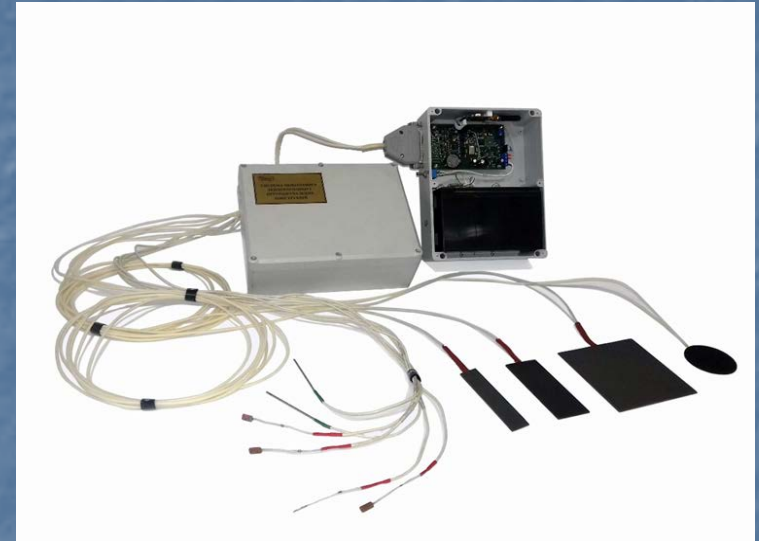
The range of the heat capacity measurement, J/(kg·K)	300 ... 3000
Operating temperature range , K	300...450
The number of samples that are investigated at the same time, pcs.	5
Permissible relative error of measurement of the specific heat , %	±2
Permissible absolute error of measurement referring temperature, K	±1

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# MEASURING COMPLEX "RESOURCE"

**Areas of Application:** determination of thermal resistance of building envelopes according to ISO 9869: 2014 requirements.

Used for energy audit of buildings and certification tests of enclosing constructions.



## BASIC SPECIFICATIONS

Number of channels	8 ... 160
The heat flux surface density range of measurement, W / m <sup>2</sup>	1...2000
Heat flux density relative error of measuring, %	±1,5 ... ± 3
Range of measured temperature values, °C	-30...+100
The basic absolute error of temperature measurement, °C	±0,5

**Advantages:** conducting measurements simultaneously in 2 ... 40 zones of enclosing structures of complex form; the measurement errors are reduced in comparison with the existing world analogues; the duration of the measurements cycle is reduced; stand-alone data acquisition and processing; using Wi-Fi, Ethernet, 3G and 4G data transfer technology; the reliability of the monitoring results, software for registration and processing of measurement information

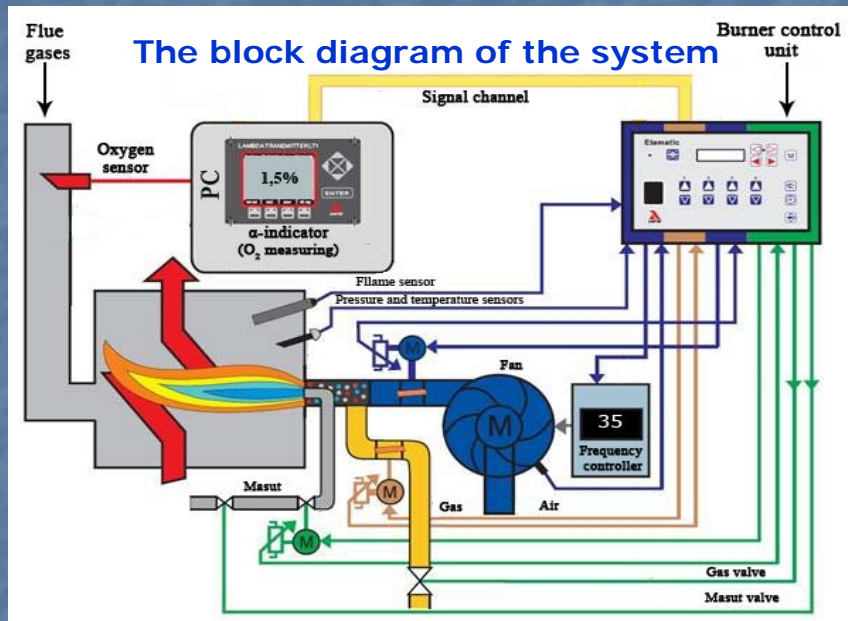
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# SYSTEM OF AUTOMATIC CONTROL OF THE FUEL COMBUSTION PROCESS IN BOILERS

The system is designed to improve fuel efficiency up to 3.5 MW using  $\alpha$ -probes. Fully automated boiler operation using a broadband oxygen sensor, which allows for continuous boiler operation, taking into account energy consumption and air consumption, depending on the oxygen content in the flue gases.

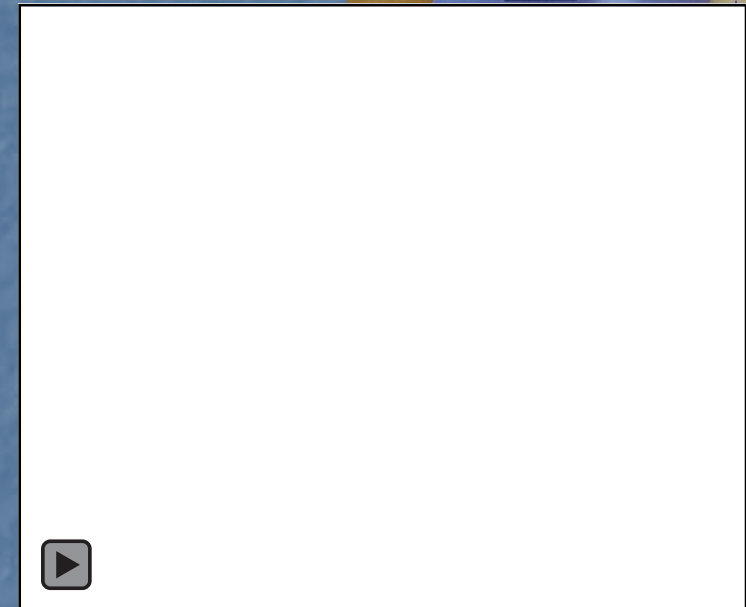
Introduction the "air-gas" ratio control system with automatically adjusts speed of air fan in operating area boiler allowed for low emissions combustion of natural gas in particular, to reduce nitrogen oxide emissions by 20-30%, and carbon monoxide - 4-10 %. In addition, automatic adjustment of the burner operating modes provides a high level of safety and reduce noise during operation of the thermal unit.



## BASIC SPECIFICATIONS

Output signal of the measuring sensor, V	0,1...5,0
Indication delay for 50% stepping distortion, s	0,1...0,3
Preparation time for measurements, s	≤30
Parameter measurement range $\alpha$	0,5...8
Integrated error, %	1
Indication of measurement results	Mixed up

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**The results of the research:** increase efficiency on 6-20%; support for concentration of CO within up to 50 ppm (at the level of EU standards).

**Patents of Ukraine:** №101842, №102512

**Advantages:** absence of sampling and preparation systems, rapid measurement of oxygen concentration in the outgoing gases (0,1-0,2 s), continuous operation, long service life, easy installation on different types of thermal units.