PORTABLE ASH METER „WALKER”

USER MANUAL

CONTENTS

1.Application

The meter is designed for quick determination of ash content in coal at dumping grounds or in wagons. Measurement is based on the analysis of natural gamma radiation (NGR).

The meter has a built-in accumulator and non-volatile memory to collect measuring results; thus it can operate in the field. Thanks to a built-in device to measure temperature and using an algorithm for compensation of its effect, the meter can operate within the wide temperature range : -10^{o}C to +50^{o}C.

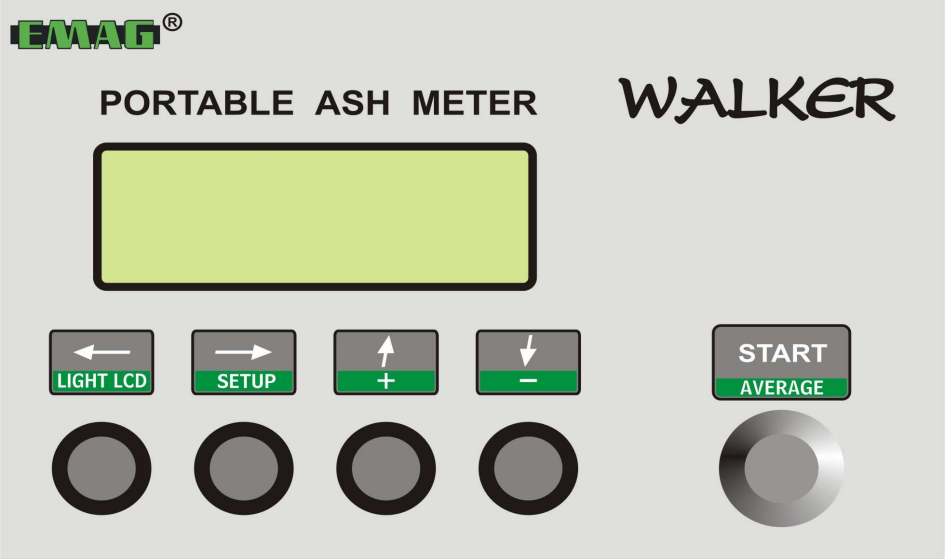
Transmission link RS232 makes the transfer of measuring results to a computer possible. The meter software allows making and recording the unit measurements and also calculating the mean value from a measuring series (e.g. 10 measurements in wagons and then calculation and recording of a fit-to-them mean value).

2.Technical Data

Principle of operation:	measurement of natural gamma radioactivity of coal
Battery life between charging:	depends on working temperature; battery 12V/1,8Ah ;min. 50 hours' continuous operation at 20^{o}C
Charging supply	220 V
Number of stored calibration : and undertaken by a customer ;	16 different calibrations can be straight forward
Number of measurements per pile :	99
Measurement time;	5 – 999s (to be chosen)
Readings of Ash %	Instant
Accuracy:	depends on type of coal : mean σ = 1 % ash
Data computerization:	The data can be downloaded to a computer for later analysis ; RS 232(9600,n,8,1)
Buffer of measurements	10000 records
Displayed information	possibility choice of language version
Weight:	<8 kg (total)
Surrounding temperature	- 10 - + 50 ^{o} C

3.Operation of the Meter

The front panel with keyboard and display unit is presented below:



On the side-wall there are placed link RS 232, charging socket and power switch.

The meter is switched over by a small key being at the side of the casing. The meter doesn't switch off automatically. Two operating modes have been distinguished: measurement and setting. The push-buttons perform various functions depending on the operating mode of the Ash Meter.

key	mode measurement	mode setting
← (light LCD)	switch on backlight of the display;	displacement to the left in setting menu; giving up the load number -"escape"
→ (SETUP)	hold down a push-button causes entry to settings of the Meter	displacement to the right in setting menu; acceptance of the stored-in number- "enter";
↑	change in calibration curve	displacement upward in setting menu; increase in the stored-in digit
↓	change in calibration curve	displacement downward in setting menu; decrease in the stored-in digit
START (AVERAGE)	start measurement and recording of the mean.	

Settings of the Meter have been arranged in a form of menu where it is possible to move by push-buttons:←→↑↓ . Access to particular menu branches is locked by access code PIN.

The structure of settings looks as follows:

A* REVIEW OF MEASUREMENTS

B* CALIBRATION

- testing measurement
- spectrum acquire
- spectrum – in a digital way
- spectrum – in a graphical way

C* CALIBRATION COEFFICIENTS

- curve (00 to 15)

D* PARAMETERS SETTINGS

- clock
- time of measuring -*tm*
- high voltage -*HV*
- center of potassium window - *CN*
- width of potassium window - *WN*
- language
- code pin

E* FACTORY SETTINGS

- clear buffer
- initiate equations
- serial number
- accumulator description

Review measurements

Each measurement is displayed within four lines and it includes serial number in measuring buffer, name of curve,date and time of measuring, ash content rating and calorific value, or mean values . The survey begins on the last measurement. Rewinding is set in by push-buttons ↑↓ and return to menu – by push-button ←.

Calibration

testing measurement is put into motion as a common one, is recorded in the Meter memory and it monitors the amount of countings.

Spectrum measurement: The Meter divides spectrum into 60 sections. By push-buttons →↑↓ one can set the measuring time of each section (named on display unit as “tm1”) and the number of section ,on which measurement will start. After setting the parameters , the first measurement should be started by push-button with amplitudes exceeding 2 adjustable thresholds. The value of countings in sections are evaluated from displayed values. To collect information about 60 sections requires making 30 measuring cycles (each one needs “tm 1” seconds).

Spectrum in a digital way : by push – buttons ↑↓ the recorded values of countings in each channel can be seen; push – button ← brings about return to menu.

Spectrum – in a graphical way :the recorded values of countings in each channel are shown in a form of histogram. Scaling of axis Y is made by pressing buttons ↑↓ and displace of the diagram in axis X – by pressing buttons ←→. At the right upper corner of the display unit the number of channel, being at the extreme right side of of the display, is shown. Return to menu follows simultaneous pressing of buttons ←→.

Calibration coefficients

Select a proper curve by push-buttons ↑↓. Its number and the 10-character description is shown on the display unit. Confirm by button → and select an adequate coefficient by buttons ↑↓. Seven characters including ‘-‘ and ‘.’ can be introduced.

Parameters settings

clock: data are in format dd/mm/yyyy hh:mm

time of measuring: value tm from the range of 5s to 999s.

high voltage: value HV from the range 0 – 1250V

centre of potassium window: value CN from the range of 2 to 58

width of potassium window: value WD from the range of 2 to 50 (the following requirements have to be met: (CN-WD/2>0 and (CN + WD/2)<60

language: select language (Polish or English)

code pin : four – digit access code to the Meter settings

Presets

clear buffer : measuring buffer deletion

initiate equations: zeroing the equation coefficients and assigning to them the descriptions “curve – 0xx”

serial number : 4-digit value displayed when the Meter is switched on,

accumulator description : 6-digit accumulator description

4.Making measurements

In the Meter, the display unit ordered in four lines each of 20 characters is used. When the Ash Meter is at position “Measurement”, on the display unit the following data are shown:

*	*	*	*	*	*	*	*	*	*							0	0	3	8
A	=	2	3	.	5		Q	=	2	1	5	3	4			H	=	1	0
a	=	2	1	.	7		q	=	2	0	1	7	2					0	3
	2	2	º	C			H	V	=	7	8	0	V			1	2	.	9

Line 1, item 1 to 10 - description of scaling curve
item 17 to 20 - amount of records in measuring buffer
Line 2, item 3 to 6 - last measured ash
item 10 to14 - calorific value
item 19 to 20 - humidity (parameter)
Line 3, item 3 to 6 - mean ash value
item 10 to 14 - mean calorific value
item 19 to 20 - amount of averaged measurements
Line 4, item 2 to 3 - temperature
item 11 to 13 - present high voltage
item 17 to 20 - accumulator condition

Before measuring, select a proper scaling curve by push – button ↑↓. Hold down button (START) to start measuring. Holding down the button, when measurement goes on, results in reducing the time, remained to end the measurement, up to 5s, and this result is not stored in the Meter memory. If the Meter is not in the course of measuring, and the button is held down over 3s, the counting and recording of the mean of the last measurements will follow. Changing scaling curve also causes calculating and recording of the mean. Counting of the next mean will be possible

only after making the successive measurements. When measurement doesn't go on, then holding down button → causes entry to the Meter settings ordered in accordance with the above description.

5.Calibration of the Ash Meter

Before starting the measurements it is necessary to establish a relationship between the intensity of gamma radiation in each measuring channels of Meter and ash content.

For this purpose, measuring and recording of the amount of countings at a selected measuring point, sampling of coal and determination of ash content are required.

The principles related to scaling of a portable ash meter are decribed in procedure B-4/ZBP.

Computer program specifies the coefficients that should be introduced to the Ash Meter. Coefficients can also be introduced manually. For proper calibration, the following principles have to be observed :

- to avoid sampling of a non-representative sample, scaling should be done for homogeneous coal,
- the values of countings intended for calculation should be the mean of 3 measurements at least made for the same coal sample,
- chemical determination should be done twice at least for each sample, and in calculation the mean value has to be taken into account.