#### AGICO Print No. 13

# SUMEAN - ver 2.0

#### Purpose

The program serves for on-line measurement (or evaluation of off-line measurements) and for calculation of the bulk or mass susceptibility of fragment or powder specimens made by the KLY-3S/KLY-3 Kappabridge, KLY-2 Kappabridge or by the KLF-3 MINIKAPPA and an IBM-PC type computer. The calculated data is printed on line printer and written on disk in a random access ASCII file. The first line of this file contains description of the stored data. The extension of this file is SUS.

#### **File Structure**

The data file has the following structure. The record length is 66 bytes and the first record contains the descriptors of the individual data recorded in the other lines. The descriptors are: *Specimen* (for specimen name), *Mass* (for specimen mass), *Volume* (for specimen volume), *Total s.* (for total susceptibility of the specimen, this term will be explained later), *Bulk s.* (for bulk susceptibility, related the the specimen volume), *Mass s.* (for mass susceptibility of the specimen). Two characters on the positions 63 and 64 in the first line denote the nominal volume of the instrument used (10 cm<sup>3</sup> for the KLY-3S/KLY-3 Kappabridge, for the standard coils of the KLY-2 Kappabridge and for the KLF-3 mini-Kappabridge and 65 cm<sup>3</sup> for the large coils of the KLY-2 Kappabridge). The data line is structured as follows (the second line in the table indicates the positions of individual data in the record)

Specimen	Mass	Volume	Total s.	Bulk s.	Mass s.	EOL
1 to 14	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65,66

#### **Opening New Data File**

The opening of a new data file is made before the measurement of each collection of specimens. First **Name of File (max 8 char)** is input and then the **path (CR is current).** 

## **Opening Old Data File**

The opening of the old data file is made, if work with already existing data file is needed (for example, for manual inputting the volume and mass data, etc.). The file opening starts with displaying all the files and subdirectories (<DIR>) in the root of the current drive (DIRECTORY C). The desired file or subdirectory is activated through highlighting it using arrows (the last item of the displayed file list can also be reached through pressing END key). The highlighted file is open by pressing ENTER. If one wishes to change the drive, one highlights the CHDRIVE, presses ENTER and inputs the name of the desired drive.

### **Program Operation**

After starting the program, the basic characterization of the program appears on the screen and the MAIN MENU is displayed

### MAIN MENU

- [1] on line measurement of susceptibility
- [2] off line measurement of susceptibility
- [3] manual inputting mass and volume data
- [4] calculation of bulk or mass susceptibility
- [5] print calculated data on line printer
- [6] viewing the disk file
- [7] end of work

The individual procedures are selected either by arrows or by simple pressing the corresponding number. The function of the individual procedures are as follows.

### [1] on line measurement of susceptibility

This selection serves for on-line measurement of the total susceptibility (i.e. the susceptibility unrelated to the volume or mass of the specimen). First, the measuring instrument is selected

#### ON LINE MEASUREMENT

- [1] using the KLY-3S/KLY-3 Kappabridge
- [2] using the KLY-2 standard coils
- [3] using the KLY-2 large coils
- [4] using the KLF-3 MINIKAPPA

and then the serial port

#### INSTRUMENT IS CONNECTED TO

[1] serial port No. 1

[2] serial port No. 2.

Afterthat, one decides whether and how to correct the measured data for the susceptibility of the measuring vessel

#### CORRECTION FOR SUSCEPTIBILITY OF VESSEL

- [1] no correction
- [2] input known vessel susceptibility
- [3] measure vessel susceptibility

Selection [1] is made, if the susceptibility of the measured specimens is known to be so high that the vessel susceptibility can be neglected. Selection [2] is made, if a vessel with known susceptibility is used; only the value of the **Selected Vessel Susceptibility** (in E-6) is input. Selection [3] is made, if one wishes to measure the vessel susceptibility actually. In this case, one measures the vessel susceptibility in exactly the same way as the specimen susceptibility (see below) one time or several times and then inputs the value of the **Selected Vessel Susceptibility** (in E-6).

Before measuring empty vessel or vessel with specimen, the communication of the instrument with the IBM-PC type computer via the serial channel RS-232 is tested. If there is something wrong in the communication, the following message appears on the screen

#### #### RS-232 COMMUNICATION ERROR

Current communication port: COM1 (or COM2)

In this case it is recommended to switch off the instrument and to check the connection of the instrument with the computer as well as to check whether the correct serial channel is set. Then, the program should be started once again after switching off and on the instrument.

If the communication is O.K. and the KLY-3S/KLY-3 Kappabridge is used for measurement, the instrument is first initialized (for details see Appendix 1).

Before measuring individual specimens, the data file is opened for storing the measured data after inputting the NAME OF FILE and PATH. If the opened file is not empty, the following message follows

This file contains data of some specimens [1] append [2] overwrite [3] close the file Selection [1] is used, if one wishes to append the measured data to the data already present in the file. However, it should be noted that only measurements made by the instrument having the same nominal volume as that already present in the file can be appended. Selection [2] is used, if one wishes to overwrite the old data, and selection [3] gives rise to the termination of the program.

Then, the measurement of individual specimens follows. First, the specimen is put into the measuring vessel in order to be ready to be measured immediately. Afterthat, the **Specimen name (max 12 chars, 0 -> end of work)** is input manually and after the computer beeps, it is necessary to insert the specimen into the measuring coil. When measuring on the KLY-3S/KLY-3 Kappabridge or KLF-3 mini-Kappabridge, the measured data appears on the screen and the name of the next specimen is asked for. When measuring on the KLY-2 Kappabridge, the measured data appears on the screen only, if the measured value on the display DATA is in the interval between 500 and 2000. If it is lower or higher, the messages **reading is too low, change range** or **reading is too high, change range** appear and it is necessary to change range manually and re-measure the specimen. In this way, one continues in the measurement until all the specimens are measured. Then, 0 is input instead of the specimen name and the program returns to the MAIN MENU.

#### [2] off line measurement of susceptibility

This procedure is made in the way very similar to that of the procedure [1]. The only difference is that instead of the measurement proper the earlier measured and manually recorded data are input manually.

#### [3] manual inputting mass and volume data

This procedure serves for manual inputting of the volume and/or mass data into the file. These data are necessary for subsequent calculation of the bulk and/or mass susceptibility from the measured total susceptibility. According to the operator's demand, i.e. whether he/she wants to calculate the bulk susceptibility or mass susceptibility or the both, one can select inputting the following data

Input Manually the Following Data

- [1] mass and volume
- [2] mass and density
- [3] only mass
- [4] only volume
- [5] only constant volume for all specimens

The selections [1] or [2] are chosen, if the calculation of both bulk and mass susceptibilities is needed, the selection [3] is chosen, if only mass susceptibility should be calculated, and the selection [4] is chosen, if only bulk susceptibility should be calculated. The selection [5] serves for the case that regular specimens of the constant volume (for example, cylinders or cubes) are measured.

In the case of the selection [5], the **Constant Volume** (in ccm) is input and this volume is written on the disk to all the specimens in the file. Then, the program returns to the MAIN MENU.

In the case of the selections [1] to [4] the content of the file under consideration is displayed on the screen. Then, one inputs the succession numbers of the specimens of the interval in which the mass/volume data should be input. This enables these data to be input by parts (or the entire file). Then, the name of each specimen is displayed and one inputs the corresponding mass/volume data. After inputting the data of all the specimens of the selected interval the program returns to the MAIN MENU.

### [4] calculation of bulk or mass susceptibility

One only opens the file whose data should be calculated and the calculation is made automatically. Then, the program returns to the MAIN MENU.

The bulk susceptibility is calculated as follows

$$k_{\text{bulk}} = (v_{0}/v) k_{\text{tot}} = (v_{10}/m) k_{\text{tot}}$$

where  $v_0$ , v, m, d,  $k_{bulk}$ ,  $k_{tot}$  are the nominal volume (10 cm<sup>3</sup> for the standard coils of the KLY-3S/KLY-3, KLY-2 Kappabridges and for the KLF-3 MINIKAPPA and 65 cm<sup>3</sup> for the large coils of

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the KLY-2 Kappabridge), the actual volume (in cm<sup>3</sup>) of the measured specimen, the specimen mass (in grams), the specimen density (in  $g/cm^3$ ), the bulk susceptibility and the total susceptibility, respectively. The bulk susceptibility in the file is given in the International System of Units (SI) in the order of  $10^{-6}$  (the bulk susceptibility is dimensionless).

The mass susceptibility is calculated as follows

 $k_{\text{mass}} = (v_{o}/m) k_{\text{tot}}.$ 

The mass susceptibility is given in  $m^3/kg$ .

If both the mass and volume data are absent for a specimen, an information appears on the screen **volume and mass unknown, calculation impossible** and the program goes to the next specimen. If both the mass and volume data exist in the file both the mass and bulk susceptibilities are calculated and displayed on the screen. If only one of these data exists, only the corresponding susceptibility is calculated. After calculation of all the specimens, the program returns to the MAIN MENU.

## [5] print calculated data on line printer

One only opens the file whose data should be printed and the printing is then made automatically. The program first tests whether the bulk or mass susceptibility is written in the file for all the specimens. If at least one specimen exists for which neither the bulk nor the mass susceptibility has been calculated, the following message appears on the screen **Susceptibilities not calculated, printing supressed** and the program returns to the MAIN MENU.

## [6] viewing the disk file

One only opens the file whose data should be displayed and the printing on the screen is then made automatically.

## Appendix 1. Initialization of the KLY-3S/KLY-3 Kappabridge

If the communication is O.K., the following informations subsequently appear on the screen of the computer

Initialization in progress...

\*\* LEVEL SET

\*\* AUTO RANGE

Zeroing in progress ...

END OF ZEROING

READY

These are informations of the current activities of the instrument.

In the case that initialization or zeroing failed for some reasons (for example, too strong disturbing magnetic fields in the vicinity of the pick up coil) the following message appears

## FATALERROR

error message (blinking)

Press any key to abort program

It is recommended to remove the causes of the disturbances and re-start the program.

If there are no zeroing problems, the offer of the MAIN MENU appears.