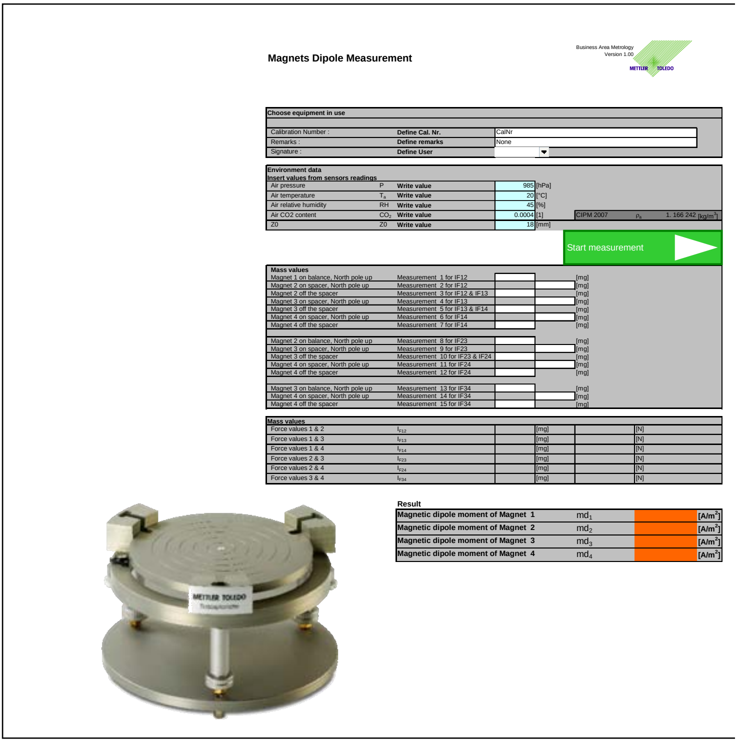
Operating Instructions

MagCal - Susceptometer

Magnets Calibration System



Magnets Dipole Measurement

Business Area Metrology
Version 1.00
METTLER TOLEDO

Choose equipment in use		
Calibration Number :	Define Cal. Nr.	CalNr
Remarks :	Define remarks	None
Signature :	Define User	

Environment data
Insert values from sensors readings

Air pressure	P	Write value	985	[hPa]				
Air temperature	T_a	Write value	20	[°C]				
Air relative humidity	RH	Write value	45	[%]				
Air CO2 content	CO_2	Write value	0.0004	[1]	CIPM 2007	ρ_a	1. 166 242	[kg/m^3]
Z0	Z0	Write value	18	[mm]				

Start measurement

Mass values				
Magnet 1 on balance, North pole up	Measurement 1 for IF12			[mg]
Magnet 2 on spacer, North pole up	Measurement 2 for IF12			[mg]
Magnet 2 off the spacer	Measurement 3 for IF12 & IF13			[mg]
Magnet 3 on spacer, North pole up	Measurement 4 for IF13			[mg]
Magnet 3 off the spacer	Measurement 5 for IF13 & IF14			[mg]
Magnet 4 on spacer, North pole up	Measurement 6 for IF14			[mg]
Magnet 4 off the spacer	Measurement 7 for IF14			[mg]
Magnet 2 on balance, North pole up	Measurement 8 for IF23			[mg]
Magnet 3 on spacer, North pole up	Measurement 9 for IF23			[mg]
Magnet 3 off the spacer	Measurement 10 for IF23 & IF24			[mg]
Magnet 4 on spacer, North pole up	Measurement 11 for IF24			[mg]
Magnet 4 off the spacer	Measurement 12 for IF24			[mg]
Magnet 3 on balance, North pole up	Measurement 13 for IF34			[mg]
Magnet 4 on spacer, North pole up	Measurement 14 for IF34			[mg]
Magnet 4 off the spacer	Measurement 15 for IF34			[mg]

Mass values					
Force values 1 & 2	I_{F12}		[mg]		[N]
Force values 1 & 3	I_{F13}		[mg]		[N]
Force values 1 & 4	I_{F14}		[mg]		[N]
Force values 2 & 3	I_{F23}		[mg]		[N]
Force values 2 & 4	I_{F24}		[mg]		[N]
Force values 3 & 4	I_{F34}		[mg]		[N]

Result

Magnetic dipole moment of Magnet 1	md_1		**[A/m^2]**
Magnetic dipole moment of Magnet 2	md_2		**[A/m^2]**
Magnetic dipole moment of Magnet 3	md_3		**[A/m^2]**
Magnetic dipole moment of Magnet 4	md_4		**[A/m^2]**

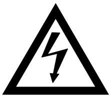
METTLER TOLEDO

Table of contents

1. Introduction

In purchasing this calibration set for Susceptometer magnets, you have chosen a talented, highly professional calibration system. Combining METTLER TOLEDO's world-class weighing sensor technology with the software application and measurement technology - new dimension to determination of magnetic properties is achieved.

Read carefully through these operating instructions to fully understand the effects.



Ensure that the mass comparator is plugged into a grounded power socket. Use only the AC adapters supplied with the mass comparator and make certain that their voltage value matches the local line voltage. Ensure no liquids are spilled onto the comparator or any power connected device.

The mass comparator must be installed in a non-hazardous area.

2. Calibration system

The MagCal Set comprises (see Figure 1):

1 4 labeled Neodymium magnets in dimension 5 x d 5mm
Especially coated for long-term stability and corrosion resistance with magnetic polarization of approx. 0.1 A/m^2

2 Calibrate able spacer to decrease the attraction forces during the measurement.

3 Tweezers for appropriate magnets handling

4 Wooden box for safe storage and transportation

5 The Microsoft® Windows® Excel® based MagCal Control software for automatic data reading and calculation

Figure 1 Overview content of MagCal System

2.1. Precautions

The supplied magnets are of very high magnetism and need extra care in handling. Contact in between the magnets must be avoided. Protect each single magnet against self-movement (By attraction to other magnets or ferrite materials.

> ⚠ Do not allow magnets in the near vicinity of weights or other sensitive materials or measurement equipment. They might get magnetized in case of contact or near vicinity to the magnets.

2.2. Process

The magnets polarization is determined by inter comparing the 4 magnets in a defined distance (Spacer) and measuring the attraction forces in between. With multiple equations, the single magnets polarizations are calculated. All single measurements are performed with differential measurement method to eliminate influence of comparator drifting.

Process combinations	Magnet	Result
1 vs. 2	1 & 2	F_{12}
1 vs. 3	1 & 3	F_{13}
1 vs. 4	1 & 4	F_{14}
2 vs. 3	2 & 3	F_{23}
2 vs. 4	2 & 4	F_{24}
3 vs. 4	3 & 4	F_{34}

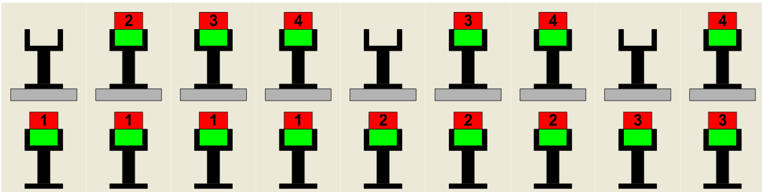


Figure 2 Process of magnets measurements

2.3. MagCal Control Software Installation

2.3.1. PC System requirements

The software requires MS Office 2003 or higher and Windows XP or more recent to run. In case the software is to be installed on a 64 bit systems please inquire with metrology@mt.com for further information's.

2.3.2. Installation

Preconditions: For the installation, you need to have administrator rights.

Process:
1. Insert the supplied CD ROM in the drive and open Windows explorer.
2. Select the file MagCal_Control_Ver_1_0_0.msi and double-click it
3. The software will install automatically. Please do not change the values set as default.
4. Go to the installation directory of the installed MagCal Control Software and generate a desktop link

3. MagCal Control Software

The MagCal Control Software fully controls the comparator during the polarization measurements. Within the software, numerous settings are defined and the process is conducted fully automatic.

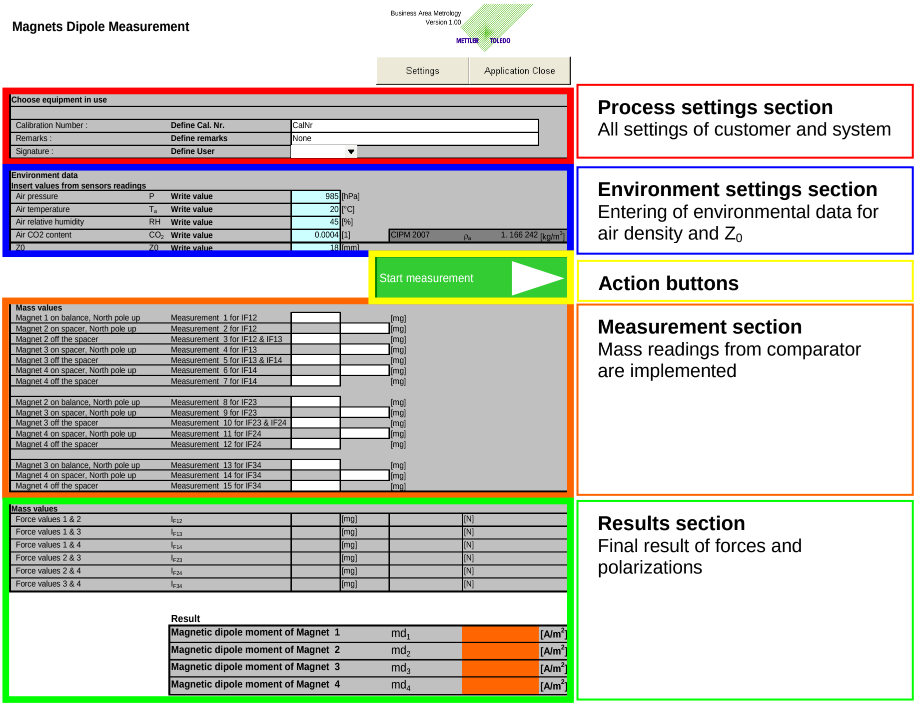


Figure 3 MagCal Control Software main screen

3.1. MagCal Control Settings

Within the settings all required process definitions are made. See following chapters for full details.

3.2. Password protection

The settings section is password protected to ensure high data security.
The initial password is “magnet”. Please see section 3.7 to change password

Figure 4 Password check

3.3. Installation code inquiry

The software is licensed and is verifying this by checking the connected comparator with the model type and the serial number in combination with a supplied code.

Please inquire for the installation code with Mettler Toledo AG for final installation
Please send following information to metrology@mt.com

Customer Institute :
Customer position :
Customer Name, Surname :
Customer address :
City including ZIP :
Country :
Customer phone number :
Customer Email :
Customer web Page :
Balance Model :
Serial number :
Latitude of City:
Altitude of installation :

Remarks: The software can control following models only
XP6U, XP6, XS3DU,
UMX5, MX5
UMT5, MT5

3.4. Settings overview

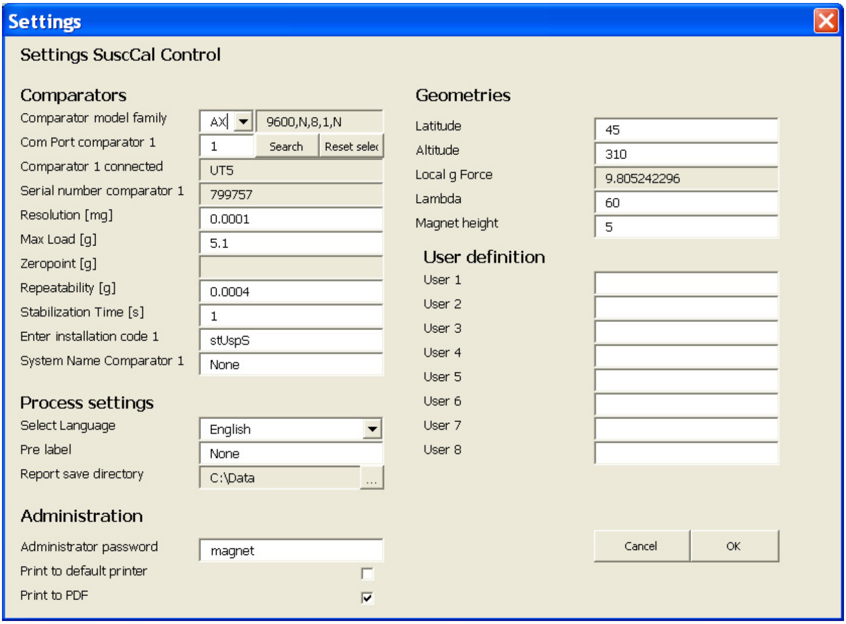


Figure 5 Settings screen

The settings is split in 4 sections

- Comparator settings
- Process settings
- Administration
- Geometries
- User settings

3.5. Comparator Settings

In the first section the comparator is defined. Major parameters are defined by the system automatically.

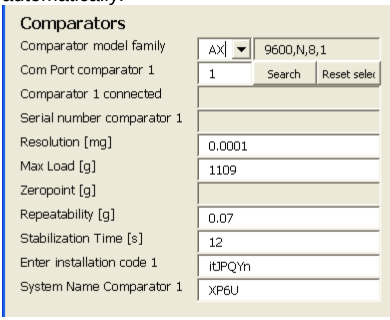


Figure 6 Comparator settings

Comparator model family Select out of XP, AX or AT according comparator to be connected
XP6U, XP6, XS3DU ➔ XP
UMX5, MX5 ➔ AX
UMT5, MT5 ➔ AT
Adjust the serial port settings of the connected comparator as shown in the right field. If settings are not identical on the comparator as shown, no communication can be established.
Settings of Susceptometer control software (must be set on comparator)

Model Family	**Baud**	**Parity**	**Data Bits**	**Stop Bit**	**Handshake**
XP:	9600	None	8	1	No Handshake
AX	9600	None	8	1	No Handshake
AT	2400	Even	7	1	No Handshake

Com port comparator Serial communication port RS232 for comparator communication
Search Starts the communication to comparator and retrieving model type and serial number
Reset Resets all settings of the balance communication to default.
Comparator connected Indication of connected comparator model. Information retrieved automatically from comparator
Serial number comparator Serial number of connected comparator. Information retrieved automatically from comparator
Resolution comparator [mg] Indication of comparator resolution / readability. Information is automatically set, but can be changed.
Max Load comparator [g] Maximum load of comparator. Information is automatically set, but can be changed. Indicates the maximum applicable load according data sheet
Zero point [g] Load of the comparator when turned on including the under water weighing pan. Value is set automatically at comparator installation
Comparator repeatability [mg] Repeatability of comparator. Used for calculation of uncertainty contribution of comparator repeatability to combined uncertainty.
Stabilization time [s] Time required to stabilize after load is applied. Value is set automatically, but can be changed.

Enter installation code	Code for enable software to run. Please see more details in section 3.3
System name comparator	Define name of the system (e.g. Susc_VGR_003)

3.5.1. Comparator installation process

1. Connect comparator with serial cable to control computer
2. Select comparator model family (XP, AX, AT)
3. Adjust comparator serial port settings according shown definitions (Factory settings)

	XP	**AX**	**AT**
Baud rate	9600	9600	2400
Parity	No	No	Even
Data bits	8	8	7
Stop bit	1	1	1
Handshake	No	No	No

Remarks:

Set the handshake for XP, AX and AT comparators to off
Other software's of Mettler Toledo use following settings

Susceptometer Control	AT	2400 baud, 7 data bits, 1 stop bit, even parity, no handshake
	AX	9600 baud, 8 data bits, 1 stop bit, no parity, no handshake
MCLink	AT	2400 baud, 7 data bits, 1 stop bit, even parity, handshake pause
	AX	9600 baud, 8 data bits, 1 stop bit, no parity, no handshake

4. Enter number of Serial com port on the computer (If doubt, try 1 .. 9 until communication established)
5. Click on search button to verify connection
6. Change defined comparator parameters according local performance and requirements
7. Enter acquired installation code of the connected comparator
8. Define System name (Appears in report files)

The comparator is installed and ready to communicate to the controlling computer

3.5.2. Troubleshooting

Issue: If the serial port settings of the comparator are not set the above defined settings, communication can not be established.
Solution: Set the serial port settings of the comparator to the defined settings

Issue: No communication can be established due to wrong serial port number

Solution: Enter different number in field “Com Port Comparator”

Remarks: Set the handshake to none

3.6. Process Settings

Within the process settings, customer and process specific settings are defined

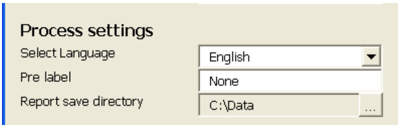


Figure 7 Process settings

Select language — Select out of selectable languages. If the selected language is not available, please inquire with us.

Pre Label — Label to be integrated in file name at foremost position. Standard restrictions regarding use of special characters for file names apply.
Label = MagCal_Control ➔ File Name MagCal_Control_34582.xls

File name definition: — The file name is built up of
- Pre Label
- Calibration number as defined in the measurement settings

If one of the above is not defined, the content is disregarded

Report save directory — Select with the  button the desired saving directory of your reports. This can be a network drive or local hard disk

3.7. Administration settings

Within administration basic program display settings are defined.

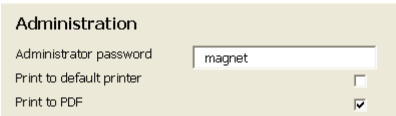


Figure 8 Administration settings

Administrator password — Enter desired password to protect administration section. Password is inquired as described in section 3.1

Password history:

Date:	Password:
Initial	magnet

Print to default printer	Select to print the report to the default printer
Print to PDF	Select to save the report as PDF File. To allow this function, the PDF creator or similar must be installed
PDF Creator:	Free of charge PDF printer. Download under http://sourceforge.net/projects/pdfcreator/

3.8. Geometry settings

Within geometry settings, the gravitational force constant factors are defined and calculated. Magnets and spacer dimensions are defined.

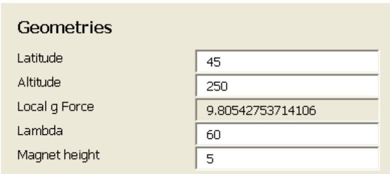


Figure 9 Geometry settings

Latitude	[°]	Define latitude of the location of the Susceptometer
Altitude	[m]	Define altitude of the location of the Susceptometer
Local g Force	[m/s^2]	Calculated g force constant according 6.3
Lambda	[mm]	Define height of spacer
Magnet height	[mm]	Define height of magnet

3.8.1. Calibration of spacer

The length of the spacer (λ) is a main factor for the determination of the magnetic polarization. Therefore it must be measured / calibrated accurately with suitable measurement equipment.

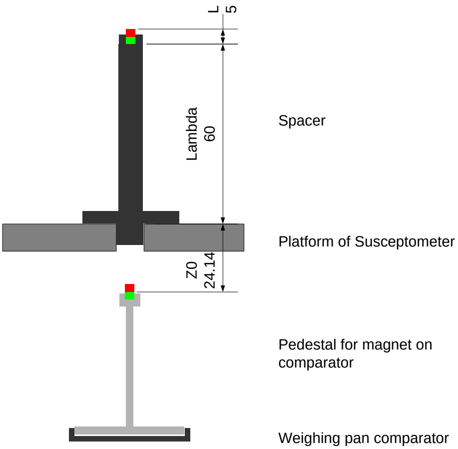


Figure 10 Definition spacer measurement

The length Lambda of the spacer is in between the rest of the magnet and the contact ring (contacting the surface of the platform of the Susceptometer).
To measure the length accurately and traceable, the use of calibrated micrometers is strongly recommended.

Figure 11 Micro meter for accurate determination of spacer length

3.9. User Settings

Within user settings up to 8 users can be predefined for selection at process start.
Enter desired name / definition within white fields.

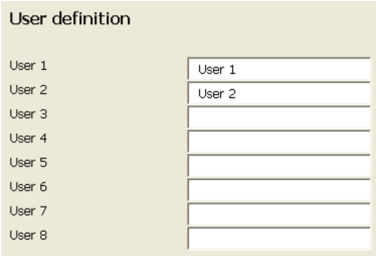


Figure 12 User settings

3.10. Save settings

To save the defined settings, select “Save settings”. To reject changes, select cancel.

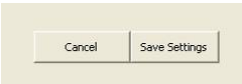


Figure 13 Save settings

4. Measurement

4.1. Comparator and magnet measurement conditions

The comparator must be in standard operation conditions. Mettler Toledo recommends to perform some warm up measurements prior the measurement to enable best possible performance of the comparator.
To do so, install magnet Nr.1 on the pedestal of on the comparator and close the lid over the ultra micro balance. Ensure the magnet is placed firmly on the lower rest of the recess and is flat.

Figure 14 Magnet correct placement

With older models of the Susceptometer, the recess for the magnet might be too tight. Please widen up with mechanical drilling or lathe on turning lathe to a diameter of
5.1mm + 0.05/- 0.00

Place the platform of the Susceptometer and place the spacer into the center hole on it. Install the magnet Nr.2 into the spacer. Remove magnet Nr.2 and place again for 3... 5 times.

4.2. Performing the measurement

Define the required parameters of the measurement. Ensure the settings are defined according your local requirements.

Environment data								
Insert values from sensors readings								
Air pressure	P	**Write value**	985	[hPa]				
Air temperature	T_a	**Write value**	20	[°C]				
Air relative humidity	RH	**Write value**	45	[%]				
Air CO2 content	CO_2	**Write value**	0.0004	[1]	CIPM 2007	ρ_a	1. 166 242	[kg/m^3]
Z0	Z0	**Write value**	18	[mm]				

Figure 15 Measurement parameters definition

4.2.1. Define process parameters

Step	Parameter	Description	Required for
1.	Air pressure	Enter air pressure	Calculation of air density
2.	Air temperature	Enter air temperature	Calculation of air density
3.	Air relative humidity	Enter relative air humidity	Calculation of air density
4.	Air CO2 content	Enter CO_2 content	Calculation of air density
5.	Z_0	Distance platform – center magnet	Calculation of magnetism

Remarks: The values for the air density are not taken into any calculation, but are defined as reference for further analysis.

4.2.2. Starting the measurement

Click on the Start measurement button to start the communication with the connected comparator.

Figure 16 Start button

6. Click on “Start measurement” System establishes communication and follows measuring process as defined in the default settings
7. Follow information’s given by software and display of comparator. See chapter 2.2 for application flow of process

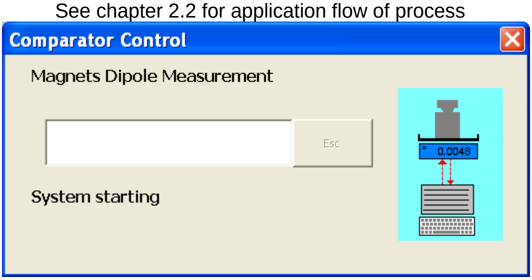


Figure 17 MagCal Control communication panel

8. In case no communication can be established to the comparator, verify again the settings.
9. At finalizing the process, report is generated automatically and saved to the defined directory. Report
10. Print out the report for your archive as PDF and / or paper by clicking on the print button

5. Report

In the report section all the defined and measured parameters are listed including the intermediate and final results.

Susceptometer magnet calibration

Business Area Metrology
Version 1.00

METTLER TOLEDO

Calibration Number :	CalNr
Date :	31.Aug 2010
Remarks :	None
Signature :	0

Environment data			
Air pressure	P	985	[hPa]
Air temperature	T_a	20	[°C]
Air relative humidity	RH	45	[%]
Air CO2 content	CO_2	0.0004	[1]
Air density	ρ_a	1.166242	[kg/m^3]
Local g Force	g	9.805427537	[kg/m^2]
Lambda	λ	60	[mm]
Z0	Z0	18	[mm]
Magnet height	L	5	[mm]

Mass values			
Measurement 1 for IF12	0.0		[mg]
Measurement 2 for IF12		0.0	[mg]
Measurement 3 for IF12 & IF13	0.0		[mg]
Measurement 4 for IF13		0.0	[mg]
Measurement 5 for IF13 & IF14	0.0		[mg]
Measurement 6 for IF14		0.0	[mg]
Measurement 7 for IF14	0.0		[mg]
Measurement 8 for IF23	0.0		[mg]
Measurement 9 for IF23		0.0	[mg]
Measurement 10 for IF23 & IF24	0.0		[mg]
Measurement 11 for IF24		0.0	[mg]
Measurement 12 for IF24	0.0		[mg]
Measurement 13 for IF34	0.0		[mg]
Measurement 14 for IF34		0.0	[mg]
Measurement 15 for IF34	0.0		[mg]

Force values			
Force values 1 & 2	I_{F12}		[mg]
Force values 1 & 3	I_{F13}		[mg]
Force values 1 & 4	I_{F14}		[mg]
Force values 2 & 3	I_{F23}		[mg]
Force values 2 & 4	I_{F24}		[mg]
Force values 3 & 4	I_{F34}		[mg]

Result

Magnetic dipole moment of Magnet 1	**md1**		**[A/m^2]**
Magnetic dipole moment of Magnet 2	**md2**		**[A/m^2]**
Magnetic dipole moment of Magnet 3	**md3**		**[A/m^2]**
Magnetic dipole moment of Magnet 4	**md4**		**[A/m^2]**

Calculation generated with SuscCal Control software Ver. 1.00

Figure 18 Report

6. Theory & Calculations

By measuring the forces in between the pairs of magnets the magnetic dipole can be calculated.
With measuring all possible combinations of pairs of the 4 magnets, a closed system of equations can be used to calculate each single magnetic dipole of the magnets.

Parameters

λ	Height of pedestal	[mm]
Z_0	Distance platform to center of magnet on weighing pan	[mm]
L	Height of magnet	[mm]
μ_0	Magnetic permeability in vacuum	1.257×10^{-6} Vs/Am = 1.257×10^{-6} H/m
F12	Force measured in between magnet 1 and 2	
F13	Force measured in between magnet 1 and 3	
F14	Force measured in between magnet 1 and 4	
F23	Force measured in between magnet 2 and 3	
F24	Force measured in between magnet 2 and 4	
F34	Force measured in between magnet 3 and 4	

The base distance for the calculation is the distance in between the magnets centers.

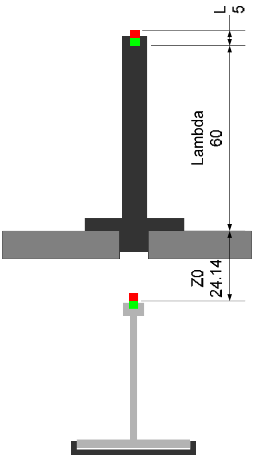


Figure 19 Spacer / Susceptometer dimensions

6.1. Calculation formulas

$$m^2{}_{d1} = (Z_0 + \lambda + \frac{L}{2})^4 \left(\frac{4\pi}{6\mu_0} \right) \sqrt[3]{\frac{F_{12}{}^2 F_{13}{}^2 F_{14}{}^2}{F_{23}{}^2 F_{24}{}^2 F_{34}{}^2}}$$

$$m^2{}_{d2} = (Z_0 + \lambda + \frac{L}{2})^4 \left(\frac{4\pi}{6\mu_0} \right) \sqrt[3]{\frac{F_{12}{}^2 F_{23}{}^2 F_{24}{}^2}{F_{13}{}^2 F_{14}{}^2 F_{34}{}^2}}$$

$$m^2{}_{d3} = (Z_0 + \lambda + \frac{L}{2})^4 \left(\frac{4\pi}{6\mu_0} \right) \sqrt[3]{\frac{F_{13}{}^2 F_{23}{}^2 F_{34}{}^2}{F_{12}{}^2 F_{14}{}^2 F_{24}{}^2}}$$

$$m^2{}_{d4} = (Z_0 + \lambda + \frac{L}{2})^4 \left(\frac{4\pi}{6\mu_0} \right) \sqrt[3]{\frac{F_{14}{}^2 F_{24}{}^2 F_{34}{}^2}{F_{12}{}^2 F_{13}{}^2 F_{23}{}^2}}$$

Figure 20 Formulas calculation of magnetic dipole

6.2. Air density

The air density is calculated according CIPM 2007, which is the updated (argon content of air) version of the CIPM 81/91 stated in the OIML R111 2004 Annex E.1

$$\rho_a = \frac{pM_a}{ZRT}\left[1 - x_v\left(1 - \frac{M_v}{M_a}\right)\right]$$

Figure 21 Air density according CIPM 2007

P Pressure;
M_a Molar mass of dry air;
Z Compressibility;
R Molar gas constant (CIPM 2007 constant defined to 8.314472)
T Thermodynamic temperature using ITS-90;
x_v Mole fraction of water vapor; and
M_v Molar mass of water (CIPM 2007 constant defined to 0.1801528)

$$\mathrm{M_a} = \left[28.96546 + 12.011\left(\mathrm{x}_{\mathrm{CO_2}} - 0.0004\right)\right] \times 10^{-3}$$

Figure 22 Air density molar mass of dry air

X_{co2} Mole fraction of carbon dioxide

$$x_v = (hr) f(p,t) \frac{p_{sv}(t)}{p}$$

Figure 23 Air density mole fraction of water vapor

x_v mole fraction of water vapor
hr relative humidity expressed as a fraction;
P pressure;
t temperature in degrees Celsius;
$p_{sv}(t)$ saturation vapor pressure of moist air; and
t_r dew-point temperature.

The mole fraction of water vapor x_v is calculated as follows

$$x_v = h(\alpha + \beta p + \gamma t^2) \cdot \left[\frac{e^{\left(AT^2 + BT + C + \frac{D}{T}\right)}}{p} \right]$$

Figure 24 Air density more fraction of water vapor details

where:

h	Relative humidity [%]
P	Station pressure [Pa]
T	Temperature [°C]
T	Temperature [°K]

Constants follow 1991 recommendations (2007 is identical):

α	1.00062
β	3.14 x 10-8 Pa -1
γ	5.6 x 10-7 K^{-2}
A	1.2378847×10^{-5} K^{-2}
B	$-1.9121316 \times 10^{-2}$ K^{-1}
C	33.93711047
D	-6.3431645×10^{3} K

The compressibility (Z) is calculated as follows

$$Z = 1 - \frac{p}{T}\left[a_0 + a_1 t + a_2 t^2 + (b_0 + b_1 t)x_v + (c_0 + c_1 t)x_v^2\right] + \frac{p^2}{T^2}\left(d + e x_v^2\right)$$

Figure 25 Air density compressibility

where:

P	Station pressure in KPa
T	Temperature in K (273.15 + t)
T	Temperature in °C
Xv	Mole fraction of water vapor (from above)

Constants follow 1991 (CIPM 2007 identical) recommendations:

a_0	1.58123×10^{-6} KPa^{-1}
a_1	-2.9331×10^{-8} $K^{-1}Pa^{-1}$
a_2	1.1043×10^{-10} Pa^{-1}
b_0	5.707×10^{-6} KPa^{-1}
b_1	-2.051×10^{-8} KPa^{-1}

c_0	1.9898×10^{-4} KPa $^{-1}$
c_1	-2.376×10^{-6} KPa $^{-1}$
d	1.83×10^{-11} KPa $^{-2}$
e	-0.765×10^{-8} KPa $^{-2}$

6.3. Gravitational force constant

The gravitation is calculated according WELMEC formula with standard gravitation γ_a according
GRS80 of 9.780 327 m/s^2

$$g_0(\varphi) = \gamma_a \left(1 + c_1 \cdot \sin^2(\varphi) + c_2 \cdot \sin^4(\varphi) + c_3 \cdot \sin^6(\varphi) + c_4 \cdot \sin^8(\varphi)\right)$$

$$g(\varphi, h) = g_0(\varphi) \cdot \left(1 - \left(k_1 - k_2 \cdot \sin^2(\varphi)\right) \cdot h + k_3 h^2\right)$$

$g_0(\varphi)$	Gravitation on latitude φ
$g(\varphi,h)$	Gravitation on latitude φ and height h
h	Height of weighing pan of comparator at Susceptometer location [m]
γ_a	Standard gravitational acceleration 9.780 327 m/s^2
φ	Latitude of weighing position
c_1	$5.279\,041\,4 \cdot 10^{-3}$
c_2	$2.327\,18 \cdot 10^{-5}$
c_3	$1.262 \cdot 10^{-7}$
c_4	$7 \cdot 10^{-10}$
k_1	3.157 04 * 10 $^{-7}$/ m
k_2	2.102 69 * 10 $^{-9}$/ m
k_3	7.374 52 * 10 $^{-14}$/ m^2

7. Terms and warranty of software

MagCal control is sold as software and therefore is subject to the general warranty and software terms of Mettler Toledo AG. Following is an extract from the document " General terms of warranty and license for software" dated 1998.
The listed terms of warranty and license for software are subject to change. Please refer to www.mt.com for most recent version.

7.1.1. General terms of warranty and license for software

By accepting the accompanying software the licensee of this METTLER TOLEDO software (hereinafter "the User") concludes with Mettler-Toledo GmbH, Im Langacher, CH- 8606 Greifensee,
Switzerland (hereinafter "METTLER TOLEDO") a license agreement comprising the following terms and conditions.

If the User does not accept the terms of the agreement, he is required to notify METTLER TOLEDO by registered letter, enclosing the software (return of the product) and documentation, within 10 days of receiving the software. Different or additional provisions must be expressly agreed in writing.

7.1.2. Scope and use

METTLER TOLEDO grants to the User the non-exclusive and non-transferable right to use the METTLER TOLEDO software (hereinafter "the software") and the related documentary material in connection with a METTLER TOLEDO instrument. The User acquires no other rights by this agreement, in particular no right to ownership of the software or the documentary material.

7.1.3. Copies

The User is entitled to make a copy of the software for purposes of data back-up, but not if the software is protected against reproduction and bears the words "Copy protected". The User
is entitled to copy the documentary material to the extent necessary for the use agreed.
All copies and partial copies of the software and the documentary material remain the property
of METTLER TOLEDO. The User undertakes to keep records of the number and location of all copies.

7.1.4. Warranty

Within one year of delivery METTLER TOLEDO will make good any significant deficiencies in the software free of charge, or at its discretion supply a replacement, provided the User reports
the deficiencies immediately after they are discovered. If the deficiencies cannot be remedied by METTLER TOLEDO, the User may withdraw from this agreement, in which case at most

the single license fee will be refunded. Deficiencies within the meaning of this warranty exist if the
software does not conform to the specifications agreed in writing and thereby is not, or only to a severely reduced extent, suitable for the use agreed. The warranty extends only to reproducible deficiencies. METTLER TOLEDO disclaims all other liability relating to use of the software (including loss of data) and for the results obtained, in particular any liability for consequential damage.

7.1.5. Confidentiality

The User declares that the software and the documentary material will not, either wholly or in part, be made accessible in any form to third parties, made public or utilized to an extent beyond the use agreed. The User makes sure by means of instructions, agreements and other suitable precautions that all persons having access to the software and the documentary material abide by this declaration.

7.1.6. Duration

This agreement becomes effective on receipt by the User of the subject of the agreement, and remains in force for as long as the software is used. The agreement can be terminated by the User at any time, whereupon no claim arises for a refund of the license fee.
METTLER TOLEDO can terminate the agreement at any time without notice if the User violates its terms or conditions, particularly that of confidentiality.

7.1.7. Transferability

The User is not entitled to transfer or surrender any rights or obligations arising from this agreement without the prior and written consent of METTLER TOLEDO.

7.1.8. Applicable law, venue

The contractual relationship between the parties is subject exclusively to Swiss substantive law. The place of jurisdiction is Zurich, Switzerland. However, METTLER TOLEDO is at liberty to seek redress at the appropriate court at the User’s place of domicile.

8. Index

www.mt.com

For more information

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