Instructions Manual

Tapestar Viewer

Visualization for Tapestar Data

Translation

Software Version 5.10.0

THEVA DÜNNSCHICHTTECHNIK GMBH
ROTE-KREUZ-STR. 8
85737 ISMANING

CONTENTS

1. GENERAL INFORMATION 1-1

1.1. CONTACT 1-1
1.2. WARNING SYMBOLS 1-2
1.3. INTENDED USE 1-2
1.4. NON-INTENDED USE 1-2
1.5. TECHNICAL DATA 1-2

2. INSTALLATION 2-1

2.1. INSTALLATION 2-1
2.2. CONFIGURATION 2-1
2.3. UNINSTALL 2-2

3. USAGE 3-2

3.1. GENERAL 3-2
3.2. TRACEABILITY 3-2
3.3. USER INTERFACE 3-4
3.4. TOOL-BOX 3-20
3.5. I_C-GRAPH 3-20
3.6. MAGNETIC FIELD PICTURE 3-23
3.7. PROFILE-GRAPH 3-23
3.8. INFO BOX: SAMPLE INFORMATION AND STATISTICS 3-24
3.9. CONFIGURATION OF IC CALCULATION 3-25
3.10. DATA FORMAT 3-27

4. CONFIGURATION 4-29

LIST OF FIGURES

Figure 1: Exported x-ic Bitmap....3-5
Figure 2: Exported field picture....3-6
Figure 3: Exported scaled field picture of a 120mm long and 12mm wide sample....3-6
Figure 4: Example for print....3-8
Figure 5: Example for scaled print. Printed on A4, the scaling is around 1:1....3-8
Figure 6: Flipping state shown in status bar....3-9
Figure 7: Dialog box for setting position offsets....3-9
Figure 8: Since version 5.2: Position Offset is shown in status bar....3-9
Figure 9: Dialog box for setting position units....3-10
Figure 10: Description of procedure to readjust sensor offsets....3-10
Figure 11: PosMapForm Dialog....3-11
Figure 12: Dialog Edit measurement parameters: General parameters....3-12
Figure 13: Dialog Edit measurement parameters: Hall measurement parameters....3-12
Figure 14: Dialogue “Hall Sensor Properties”....3-13
Figure 15: Defect finder dialog box....3-14
Figure 16: Low-Ic-Finder dialog box....3-15
Figure 17: W-Detection Dialog....3-16
Figure 18: Manual Position Range Dialog....3-17
Figure 19: Manual Ic scaling Dialog....3-18
Figure 20: Show header dialog....3-19
Figure 21: The different display modes of the Ic graph. Left: Single line, right: two lines, center: both modes stacked. 3-21
Figure 22: Ic graph with optional elements: “Low-Ic”-Marking (red line with numbers), error line (dark green line) and ‘W’ detection (green step line) 3-22
Figure 23: Manual contrast control Magnetic Field Picture 3-23
Figure 24: Calculation using standard method....3-25
Figure 25: Calculation using Min-Max method....3-25

1. General Information

This manual was composed at THEVA Dünnschichttechnik GmbH. All rights on this documentation, especially the right for reproduction and distribution, as well as the right for translation are exclusively owned by THEVA GmbH. This documentation, in whole or in parts, must not be reproduced or processed, copied or distributed by the usage of electronic devices without prior written agreement by THEVA GmbH.
The following instructions and safety provisions must be complied with for the safe operation of the machine. Errors and technical changes excepted. THEVA GmbH is not reliable for any errors in this documentation. Liability for direct or indirect damages which may occur by the use of this manual is excluded, as far as legal acceptable.
This manual contains a description of the product as accurate as possible, but no assurance of certain properties or application results. The shipment of the product and its manual is carried out according to the latest technical status. Technical changes which serve the technical progress may happen any time and without separate announcement. Former manuals lose their validity after this.

1.1. Contact

In the case of a fault or malfunction, please contact THEVA:

THEVA Dünnschichttechnik GmbH
Rote-Kreuz-Str. 8
85737 Ismaning
Germany
Tel.: ++49 89 923346-0
Fax: ++49 89 923346-10
E-Mail: info@THEVA.com

1.2. Warning Symbols

The following symbols are used in this Operating Manual for dangers, warnings and safety instructions:

	This symbol indicates **warnings**.
	Not observing this indication may result in erroneous results and data loss.

1.3. Intended Use

TAPESTAR Viewer is software used to visualize and edit measurement data generated by THEVA Tapestar systems.

1.4. Non-intended Use

	Non-intended use.
	Any non-intended use will void all warranty and liability claims. The manufacturer is not responsible for damage arising due to non-intended use.

Any use for purposes differing from those cited under Chapter 1.3 shall be considered as non-intended use, in particular:

- Use with data generated by a different machine than Tapestar
- Use with data manipulated by different software than Tapestar Viewer
- Use of data for medical or life-sustaining use

1.5. Technical data

System requirements	
Operating system	Windows 7 (tested), Windows XP, 8, 10 (not tested)
Free memory for program data	15MB
RAM	30MB + 2*file size
Display resolution (minimum)	1045x624

Input data	
Format	Data from Tapestar hall scans: tsh (text format), tbh (binary format)
Maximal size of file	1GB
Number of field sensors	7-21
File size/sample length (21 sensors, tsh, 200m/h)	211MB/km
File size/sample length (21 sensors, tbh, 200m/h)	169MB/km

2. Installation

2.1. Installation

2.1.1. Running without installation

Tapestar Viewer can be deployed as single folder containing all necessary files. Execute the file ‚Viewer.exe' to run the program. It is convenient to create a shortcut on the desktop.
The datatypes ‚tsh' and ‚tbh' must be linked to the viewer.exe via the windows explorer context menu 'open with..'.

2.1.2. Installation

Installation does not require Administrative privileges. The Program folder will be created in the user folder (c:\users\{USERNAME}\TapestarViewer). In the start menu a folder named Tapestar is created. It contains:

- Manual DE The original German Version of the manual
- Manual EN This translation of the manual
- TSExplorer Tapestar Explorer (helper program)
- Uninstall uninstalling Viewer
- Viewer Viewer application

Data file extensions tsh and tbh will be linked with the Viewer.

2.1.2.1. Changes of windows registry

{app}: Program folder (usually c:\users\{USERNAME}\TapestarViewer)

Root: "HKCU"	Subkey: ".tsh"	ValueType: string	ValueData: "TapestarViewer_3_5_Hall"	Flags: uninsdeletekey
Root: "HKCU"	Subkey: "TapestarViewer_3_5_Hall"	ValueType: string	ValueData: "Tapestar Hall"	Flags: uninsdeletekey
Root: "HKCU"	Subkey: "TapestarViewer_3_5_Hall\DefaultIcon"	ValueType: string	ValueData: """{app}\Viewer.EXE,0"""	Flags: uninsdeletekey
Root: "HKCU"	Subkey: "TapestarViewer_3_5_Hall\shell\open\command"	ValueType: string	ValueData: """""""{app}\Viewer.EXE""""" """"%1"""""""""	Flags: uninsdeletekey
Root: "HKCU"	Subkey: ".tbh"	ValueType: string	ValueData: "TapestarViewer_3_5_Hall_Bin"	Flags: uninsdeletekey
Root: "HKCU"	Subkey: "TapestarViewer_3_5_Hall_Bin"	ValueType: string	ValueData: "Tapestar Binary Hall"	Flags: uninsdeletekey
Root: "HKCU"	Subkey: "TapestarViewer_3_5_Hall_Bin\DefaultIcon"	ValueType: string	ValueData: """{app}\Viewer.EXE,0"""	Flags: uninsdeletekey
Root: "HKCU"	Subkey: "TapestarViewer_3_5_Hall_Bin\shell\open\command"	ValueType: string	ValueData: """""""{app}\Viewer.EXE""""" """"%1"""""""""	Flags: uninsdeletekey

2.2. Configuration

The Viewer is configured in the file Tapestar.ini (description in Chapter 4).

2.3. Uninstall

2.3.1. Uninstalling without installation

Delete the viewer program folder. Links of the Viewer with data file extensions tsh and tbh must be deleted manually in the windows registry (important: Key tsh_auto_file).

2.3.1. Uninstalling with installation

The program can be removed via „System control / Add/remove programs“

3. Usage

3.1. General

The Software „Tapestar Viewer“ is used to visualize, print and process measurement data generated by Tapestar systems.
There are several functions for export data in various forms.
The software is available in English Language only.
All changes to the data are lost unless the data is explicitly saved.

	Danger of data loss!
	In order to avoid accidental deletion of data, work only with copies of the original data files.

3.2. Traceability

The Viewer can be used to change measurement data. Latest versions of the Viewer save some parameters in order to make manipulations visible. Some manipulations can be undone.

Table 1: List of data which can be changed in the Viewer software

Description	Traceable since version	Undo?
Position offset	5.2.0	Yes, set absolute offset to 0
Position flipped	5.2.0	Ja, flip again
Original position range	-	No

3.2.1. Running the Viewer

3.2.1.1. From the start menu

Start the application from the entry in the windows start menu (subfolder Tapestar). In this case a “File open” Dialog box opens on start up.

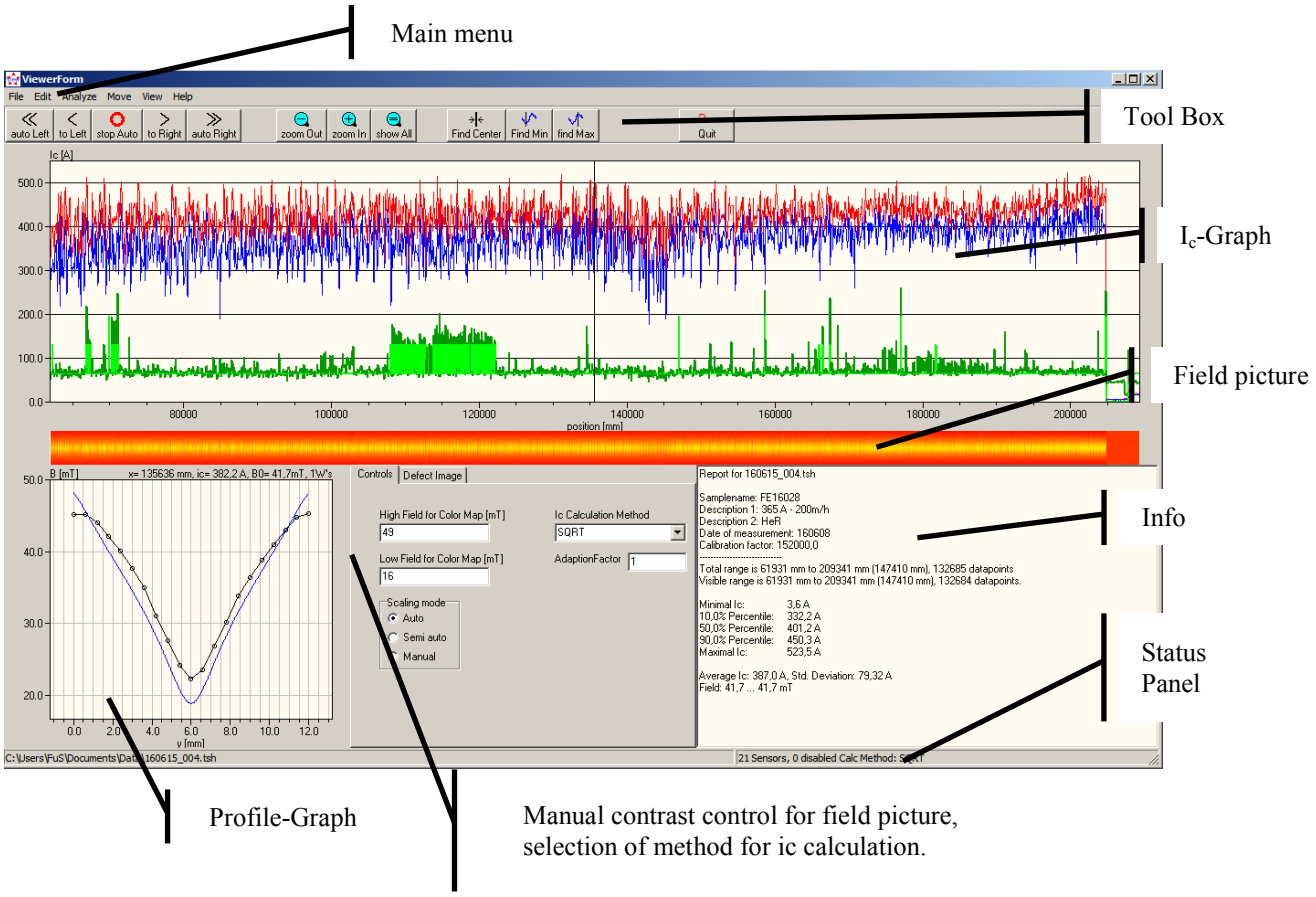
3.2.1.2. From Windows explorer

Installation links tsh and tbh file extensions to the Viewer application. Consequently a double click on these files opens them in the viewer application.

3.2.1.3. From command line

The application can be started from command line. In this case, the first argument is the data file name.

3.3. User Interface



3.3.1. Main Menu

3.3.1.1. File

This section contains functions to open, save, export and print data.

3.3.1.1.1. Open

Opens a tsh or tsb file. Selection is done in a standard windows file open dialog box.
If there is already a file open, it will be closed without saving. Changes to this file are lost.
Shortcut: Ctrl-o

3.3.1.1.2. Open in new Window

Opens a tsh or tsb file in a new window. Selection is done in a standard windows file open dialog box.
Shortcut: Ctrl-n

3.3.1.1.3. Save

Saves the current data using the original file name. The original file will be over written.

	Data loss
	Only the part of the measurement currently visible in the Ic-Graph will be saved. Invisible parts of the measurement are lost. Check if all necessary data is visible. Work only with copies of original data files.

Shortcut: Ctrl-s

3.3.1.1.4. Save as

Saves the current data using a different file name. Selection of new file name is done in a standard windows “file save as” dialog box.
Shortcut: Ctrl-a

3.3.1.1.5. Export x-ic Data

Exports the visible position and Ic data to a text file. Position data is written in the unit (mm, m, ..) currently used in the user interface.

The selection of the file name is done in a standard windows file save dialog box.

Table 2: Exported x-ic Data. The 3rd column is not in the file

ic calculation: SQRT		**Ic calculation method**
pos	Ic	**Header for data**
608.40	6.923e+02	**data**
…	…	

3.3.1.1.6. Export x-ic Bitmap

Exports an image of the ic-Graph as .bmp file. The selection of the file name is done in a standard windows file save dialog box.

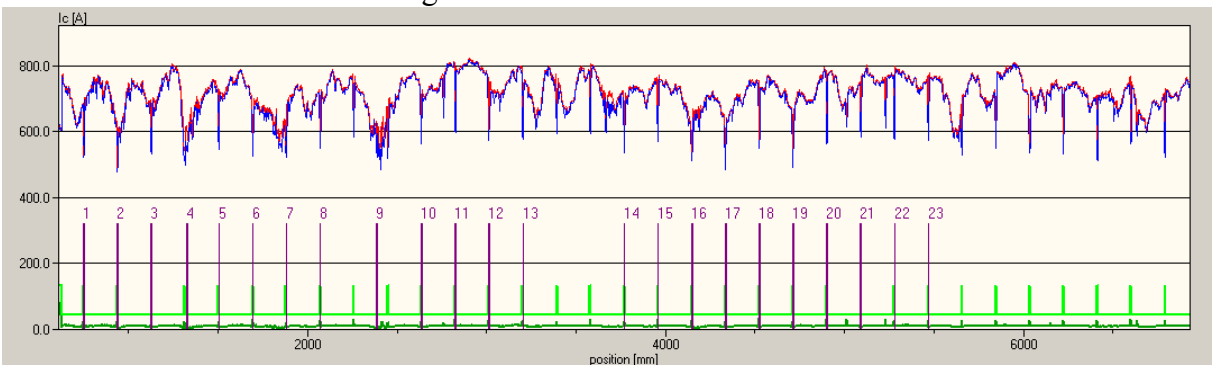


Figure 1: Exported x-ic Bitmap.

3.3.1.1.7. Export x-B Data

Exports the visible position and field data to a text file.
Position data is written in the unit (mm, m, ..) currently used in the user interface.
The first column contains the position data, the other columns contain the field data for each hall sensor.

The selection of the file name is done in a standard windows file save dialog box.

3.3.1.1.8. Export x-B Bitmap

Exports an image of the field picture as .bmp file.
The selection of the file name is done in a standard windows file save dialog box.

Figure 2: Exported field picture

3.3.1.1.9. Export x-B Bitmap scaled

Exports an image of the field picture as .bmp file.
The scaling in x and y direction is the same. For example, a picture of a 120mm long and 12mm wide sample will result in a picture with an aspect ratio 10:1. If the visible range is large (>>1m), the generated bitmap will have extreme aspect ratios.
The selection of the file name is done in a standard windows file save dialog box.

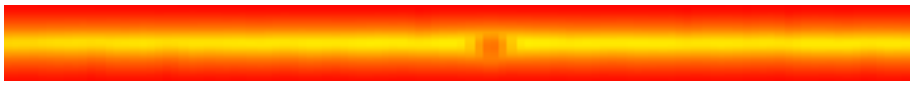


Figure 3: Exported scaled field picture of a 120mm long and 12mm wide sample

3.3.1.1.10. Field Profile

Exports the visible field profile to a text file.
The first column contains position data of the hall sensors. The second column contains the field values.
The selection of the file name is done in a standard windows file save dialog box.

Table 3: Example field profile export. The first line is not in the file.

Position data[m]	Field data [T]
0.000e+00	7.455e-02
6.000e-04	7.300e-02
1.200e-03	6.971e-02
1.800e-03	6.596e-02
2.400e-03	6.192e-02
3.000e-03	5.766e-02
3.600e-03	5.289e-02
4.200e-03	4.647e-02
4.800e-03	4.033e-02
5.400e-03	3.402e-02
6.000e-03	3.017e-02
6.600e-03	3.174e-02
7.200e-03	3.765e-02
7.800e-03	4.431e-02
8.400e-03	5.164e-02
9.000e-03	5.684e-02
9.600e-03	6.157e-02
1.020e-02	6.602e-02
1.080e-02	7.027e-02
1.140e-02	7.385e-02
1.200e-02	7.531e-02

3.3.1.1.11. Export x-ws

Exports the visible position and 'W'-detection data to a text file. Position data is written in the unit (mm, m, ..) currently used in the user interface.
The first column contains position data. The second column contains the data of 'W'-detection.
The selection of the file name is done in a standard windows file save dialog box.

Table 4: Example 'W's export. The first line is not in the file.

Pos	Number of ‚W's
3952.30	1e+00
3953.40	1e+00
3954.60	1e+00
3955.70	1e+00
3956.80	3e+00
3957.80	3e+00
3958.90	1e+00

3.3.1.1.12. X-error data

Exports the visible position and error data to a text file. Position data is written in the unit (mm, m, ..) currently used in the user interface.
The first column contains position. The second column contains the error data.

The selection of the file name is done in a standard windows file save dialog box.

Table 5: Example of x-error export. The first line is not in the file.

Pos	error
3923.30	4.58e+01
3924.50	4.60e+01
3925.60	5.05e+01
3926.80	5.11e+01
3927.90	4.70e+01
3929.00	4.57e+01

3.3.1.1.13. Print

Prints a measurement report on one page. Only the visible data is printed. The printer control is done by a standard windows printer dialog box.
Shortcut: Ctrl-p

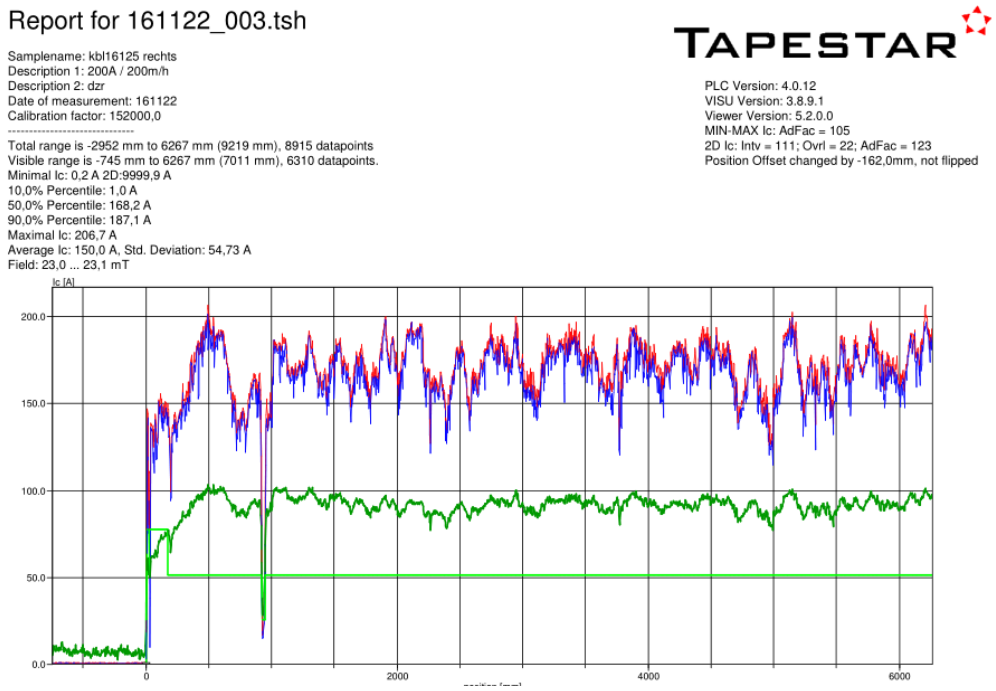


Figure 4: Example for print

3.3.1.1.14. Print scaled

Print x-ic graph and field picture with position scale 1:1. The printer control is done by a standard windows printer dialog box.

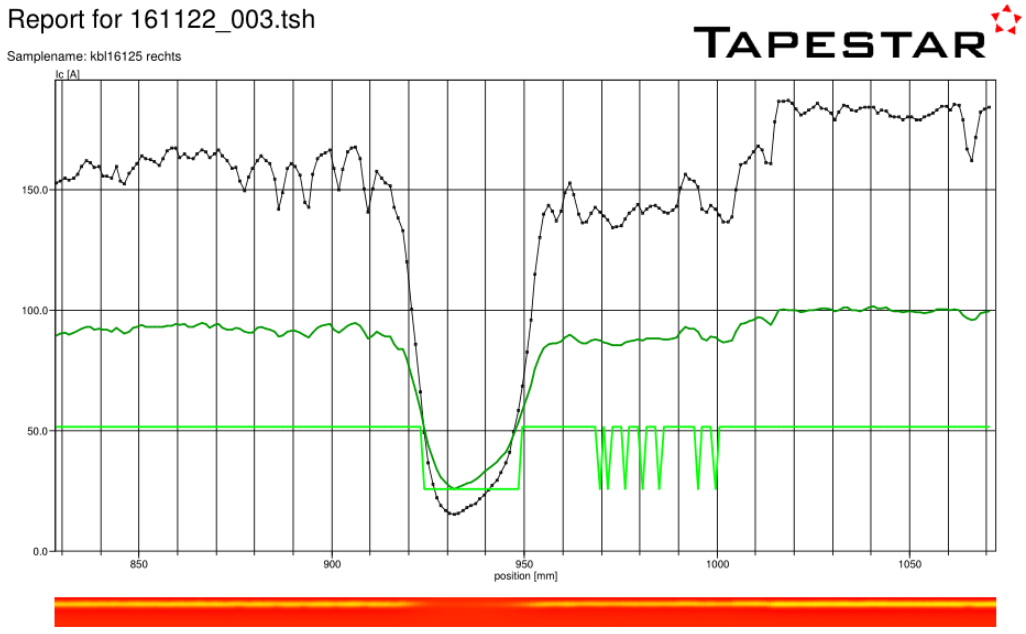


Figure 5: Example for scaled print. Printed on A4, the scaling is around 1:1

3.3.1.1.15. Quit

Quit the program. Unsaved changes are lost.

3.3.1.2. Edit

3.3.1.2.1. Copy x-Ic to Clipboard

Copy a picture of the x-Ic graph to the clipboard.

3.3.1.2.2. Copy Statistics to Clipboard

Copy the text in the info box to the clipboard.

3.3.1.2.3. Flip Tape Orientation

Data is inverted at x=0, i=N/2 (multiplies position data with -1 and interchanges sequence of sensor elements). This is used to be able to compare measurement of the same sample, measured with different orientation.
Since Version 5.2: The flipping state is saved in the file and is visible in the status bar.

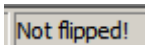


Figure 6: Flipping state shown in status bar.

3.3.1.2.4. Change Position Offset

Opens a dialog box for setting position offsets.

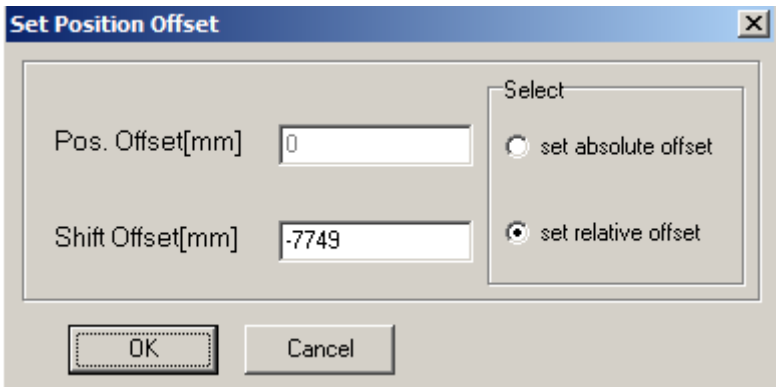


Figure 7: Dialog box for setting position offsets

After opening a measurement, the offset is always 0.
'Set absolute Offset' sets this offset to the value set in "Pos. Offset_mm".
‚Set relative Offset' shifts the offset by the value set in „Shift Offset[mm]".
When the dialog shows up, the value of „Shift Offset[mm]" is preset to the negative position value of the cursor.
As a consequence, if nothing is done than pressing OK, the position of the cursor is set automatically to zero.
Since version 5.2: The offset is saved in the file and displayed in the status bar.

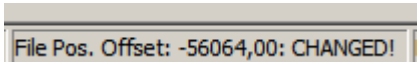


Figure 8: Since version 5.2: Position Offset is shown in status bar

3.3.1.2.5. Change Position Unit

Opens a dialog box for setting position units.

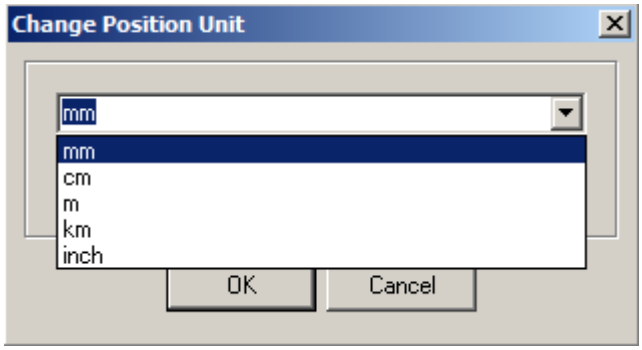


Figure 9: Dialog box for setting position units

Changing the position unit targets export functions, too. After restart of the application, the preset default unit is used.

3.3.1.2.6. Recalibrate Field

Used to readjust the sensor offsets. The procedure is described in a information box which shows up after the function is selected.

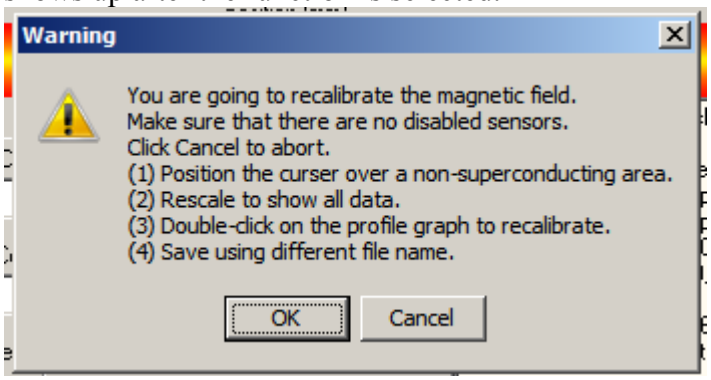


Figure 10: Description of procedure to readjust sensor offsets.

The function sets the offsets in a way so that all field values at the cursor position are the same.
The function is useful if a measurement was done with sensor calibration over magnetic sample.

3.3.1.2.7. Set Mark at Current Position

Opens the PosMapForm dialog box.

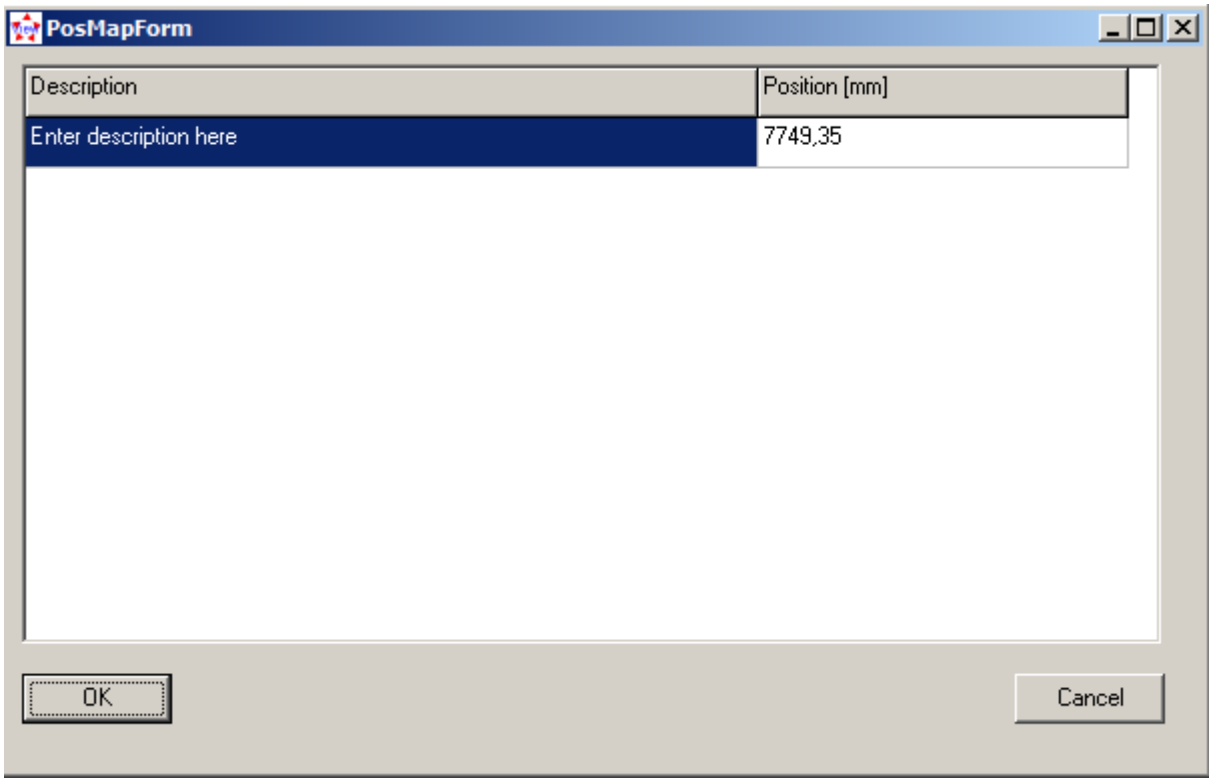


Figure 11: PosMapForm Dialog.

The position field is preset to the actual cursor position. Enter an arbitrary text in the description field. The text will be displayed at the position in the x-Ic graph.

3.3.1.2.8. Position Cursor at Mark

Opens the PosMapForm dialog box.
Select an entry. After pressing OK, the cursor will be set to the position of the chosen entry.

3.3.1.2.9. Edit Measurement Parameters

The dialog box is used to change parameters saved with the measurement. The dialog has 2 tabs. Both tabs must have been in focus before the dialog can be finished.

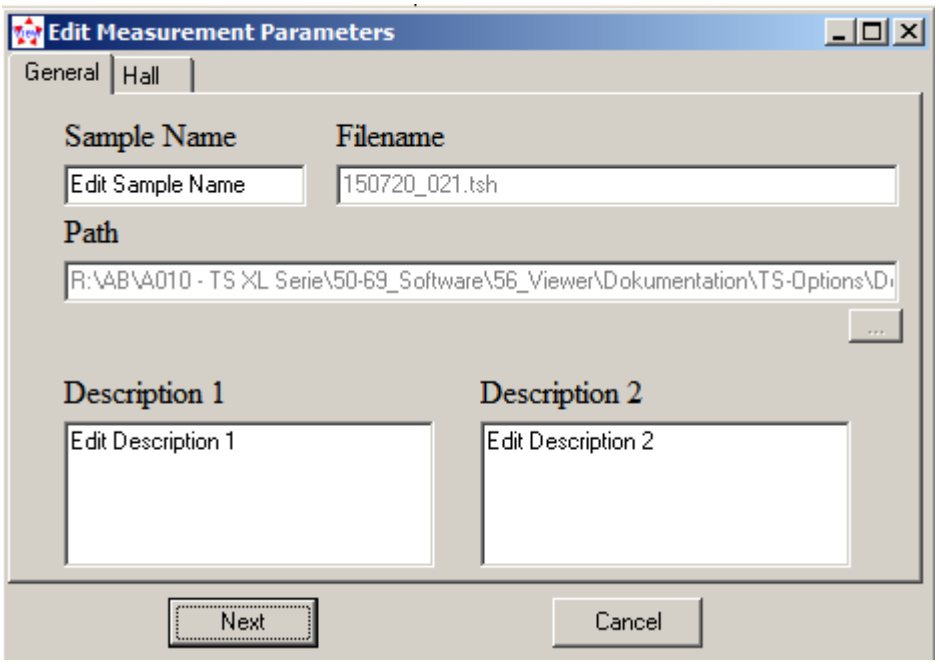


Figure 12: Dialog Edit measurement parameters: General parameters

In the General tab, the following parameters can be changed:

- Sample Name
- Description 1
- Description 2

A valid entry consists of arbitrary text without special characters and returns.

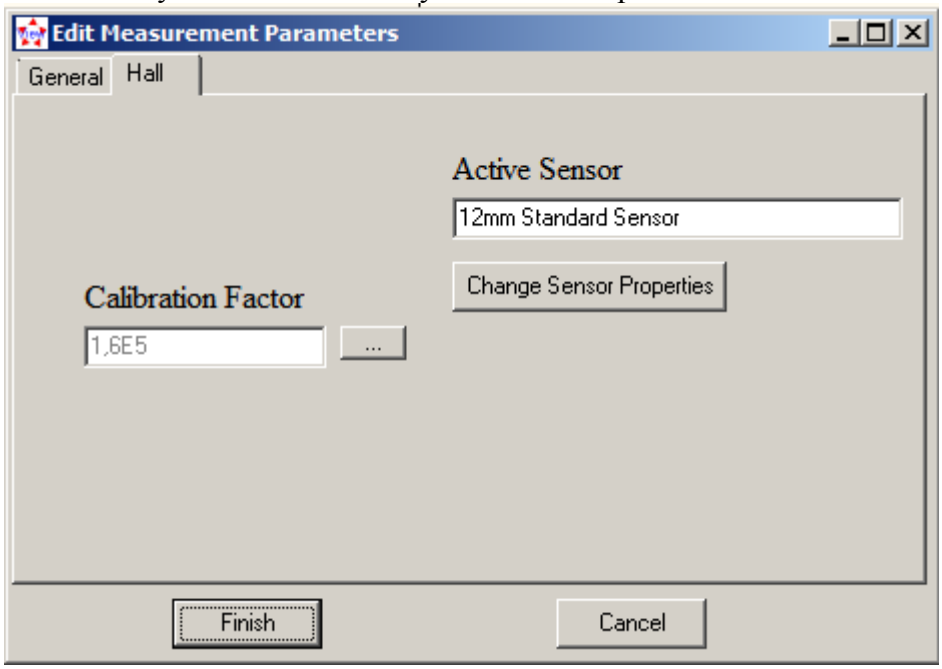


Figure 13: Dialog Edit measurement parameters: Hall measurement parameters

In the Hall tab the calibration factor can be changed: Press the "…" Button and accept the following warning.
„Active Sensor" shows the type of sensor used for the measurement. "Change Sensor Properties" opens a dialog box where properties of the hall sensor can be changed:

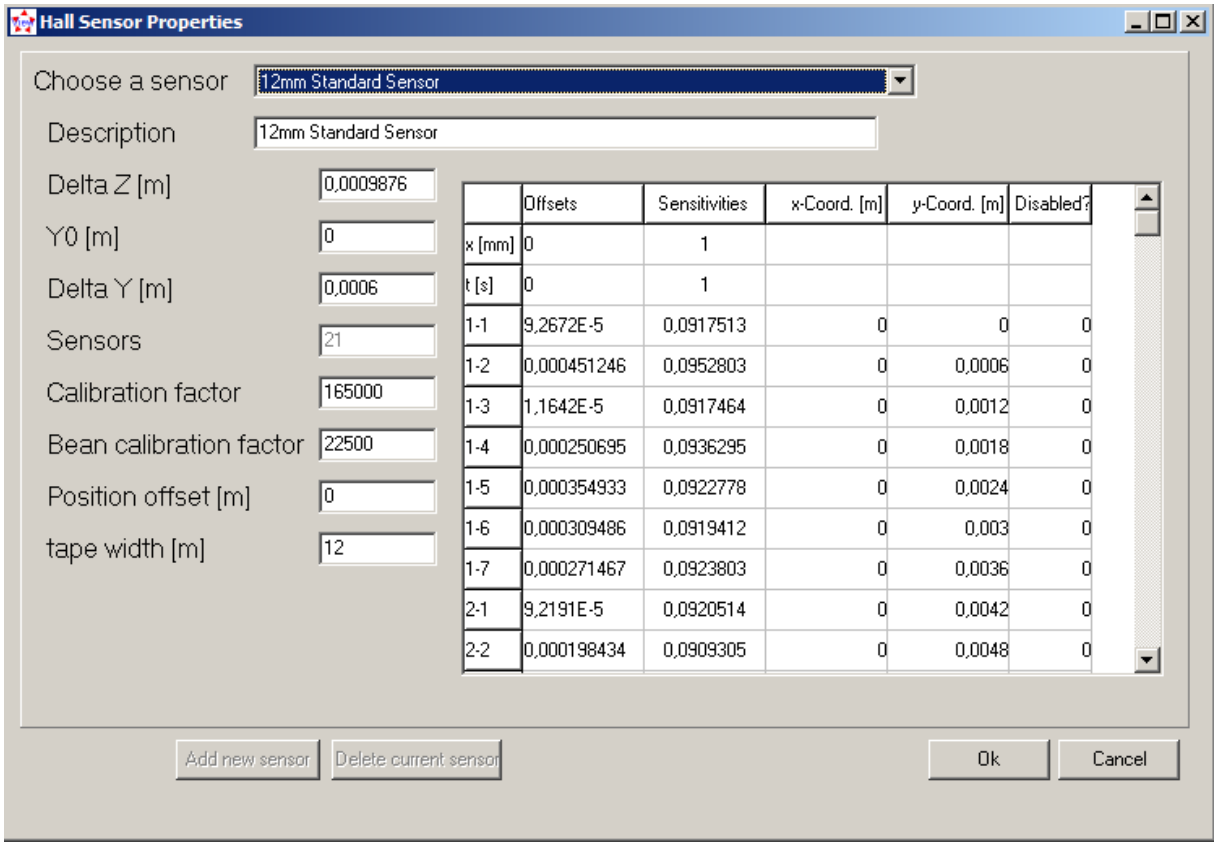


Figure 14: Dialogue "Hall Sensor Properties"

3.3.1.3. Analyze

Several functions to analyze the data.

3.3.1.3.1. Defect Finder

Opens the „Defect finder“ dialog.
OK starts the function.
The Defect Finder can be used to locate local defects of limited width.

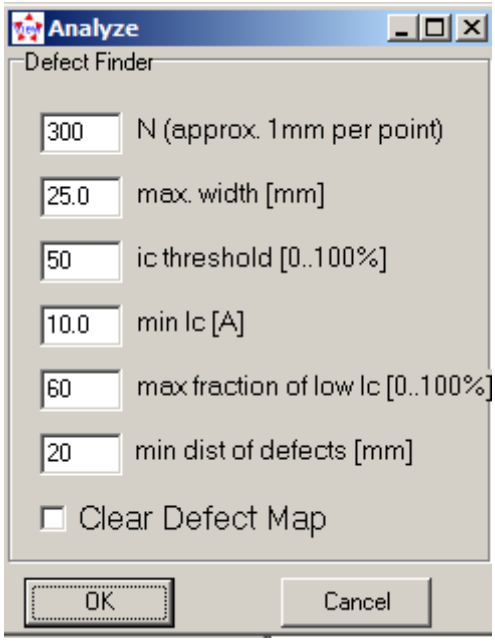


Figure 15: Defect finder dialog box

3.3.1.3.2. Low Ic Finder

Opens the „Low-Ic-Finder“ dialog.
OK starts the function.
The Low-Ic-Finder locates all ranges with Ic lower than a threshold Ic.

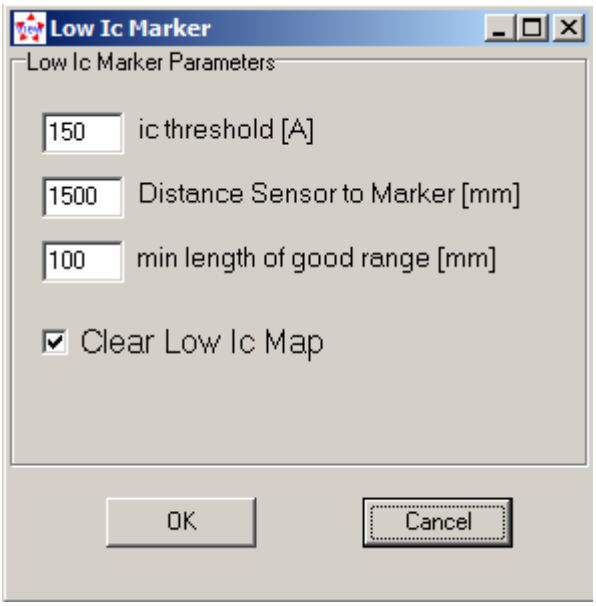


Figure 16: Low-Ic-Finder dialog box.

3.3.1.3.3. W-Detection

Opens the „W-Detection“ dialog.
OK starts the function.
The function counts local extrema in each field profile. It is used to locate scratch like defects, which often generate ‘W’-shaped profiles.

Detailed description

Counts extrema (minimum and maximum) of a field profile.
Edge values do not count as extrema.
If an extrema consists of more than one equal measurement values, it counts as one extrema.
The function can be tuned by the following parameters:

Left points to ignore , Right points to ignore

An arbitrary number of left (`ignore_left`) and right(`ignore_right`) edge values can be excluded from being counted as extrema. These excluded values are still used to determine extremes further inside the profile.
This can be used to reduce noise from small position shifts during the measurement.
Reasonable values at 21 sensors: 0..5

Minimal field change [µT]

Sets a minimal elevation of the extrema. This reduces the noise in areas with flat profiles (defects and leader tape).
Reasonable values: 0,5mT .. 5mT
A value of 0mT results in high values in normal conducting areas.

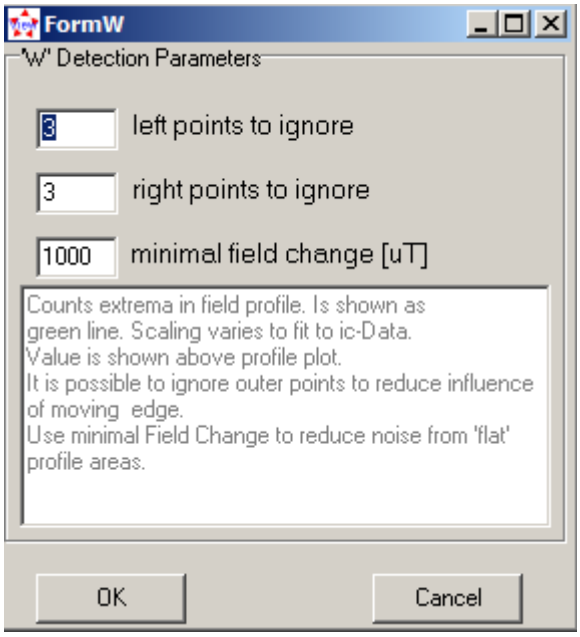


Figure 17: W-Detection Dialog

The following parameters can be used to reduce noise in w-detection:

Table 6: Parameters for W-Detection

Minimal field change [µT]	Minimal field difference [µT]. Should be > 100 in order to reduce noise from areas with flat profiles (defects and leader tape).
Left points to ignore	Number of sensors ignored at left edge
Right points to ignore	Number of sensors ignored at right edge

3.3.1.5. Move

The menu Move contains functions which change the visible area of the measurement. All functions have corresponding buttons in the tool box.

3.3.1.5.1. Auto-Left

Point of view moves to left (Graph moves to right).
Moving is automatic until the user hits the Stop Auto button, or there is no more data in the visible range.

3.3.1.5.2. To Left

Point of view moves to left (Graph moves to right).

3.3.1.5.3. Stop Auto

Stops automatic movement.

3.3.1.5.1. To Right

Point of view moves to right (Graph moves to left).

3.3.1.5.2. Auto-Right

Point of view moves to right (Graph moves to left).
Moving is automatic until the user hits the Stop Auto button, or there is no more data in the visible range.

3.3.1.5.3. Zoom Out

Visible position range is enlarged.

3.3.1.5.4. Zoom In

Visible position range is restricted.

3.3.1.5.5. Show All

Visible position range is set to full scale.

3.3.1.5.6. Manual Position Range

Set the visible position range to specific limits.

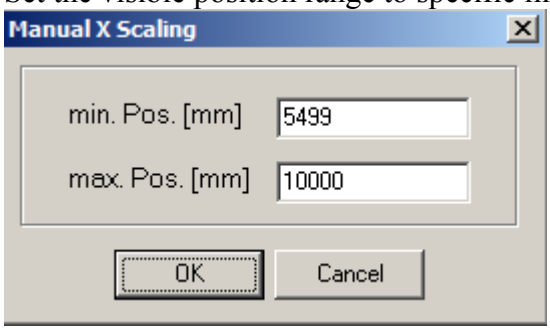


Figure 18: Manual Position Range Dialog

3.3.1.5.7. Manual Ic Range

Set the visible Ic range to specific limits. Repeated call of this function resets the default auto scaling.

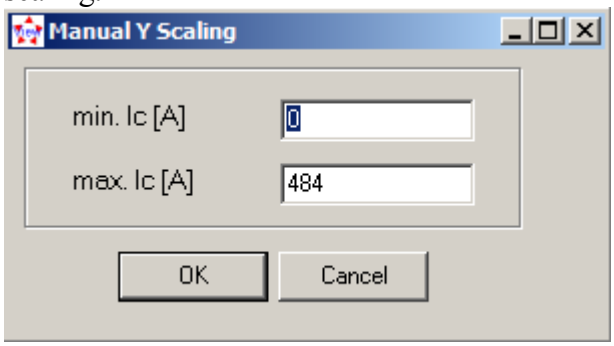


Figure 19: Manual Ic scaling Dialog

3.3.1.5.8. Find Center

Set Cursor position to center of visible range.

3.3.1.5.9. Find Min

Set Cursor position to minimal Ic of visible range.

3.3.1.5.10. Find Max

Set Cursor position to maximal Ic of visible range.

3.3.1.5.1. Back to last manual scale

Reset visible range to the last manual position range in use (chapter 3.3.1.5.6).
Shortcut: Alt –Backspace

3.3.1.6. View

3.3.1.6.1. Show Ic Legend

Shows a legend for data visible in x-Ic graph

3.3.1.6.2. Show Position List

Opens the PosMapForm dialog.

3.3.1.6.3. Ic Graph: Enable Min-Max mode

Activates / deactivates the Min-Max display mode in x-Ic graph (blue & red line ←→black dots).

3.3.1.6.4. Show Marked Positions

Shows/hides the marks of PosMapForm.

3.3.1.6.5. Show Low Ic Marks

Shows/hides the marks of Low Ic Detection.

3.3.1.6.6. Show Defect Positions

Shows/hides the marks of Defect Detection.

3.3.1.6.7. Show Process Marks

Shows/hides the marks of Process Marks.

3.3.1.6.8. Show Error

Shows/hides the marks of error line.

3.3.1.6.9. Show w-Detection

Shows/hides the marks of w-Detection.

3.3.1.6.10. Show Header

Opens a dialog showing all entries of the data file header.

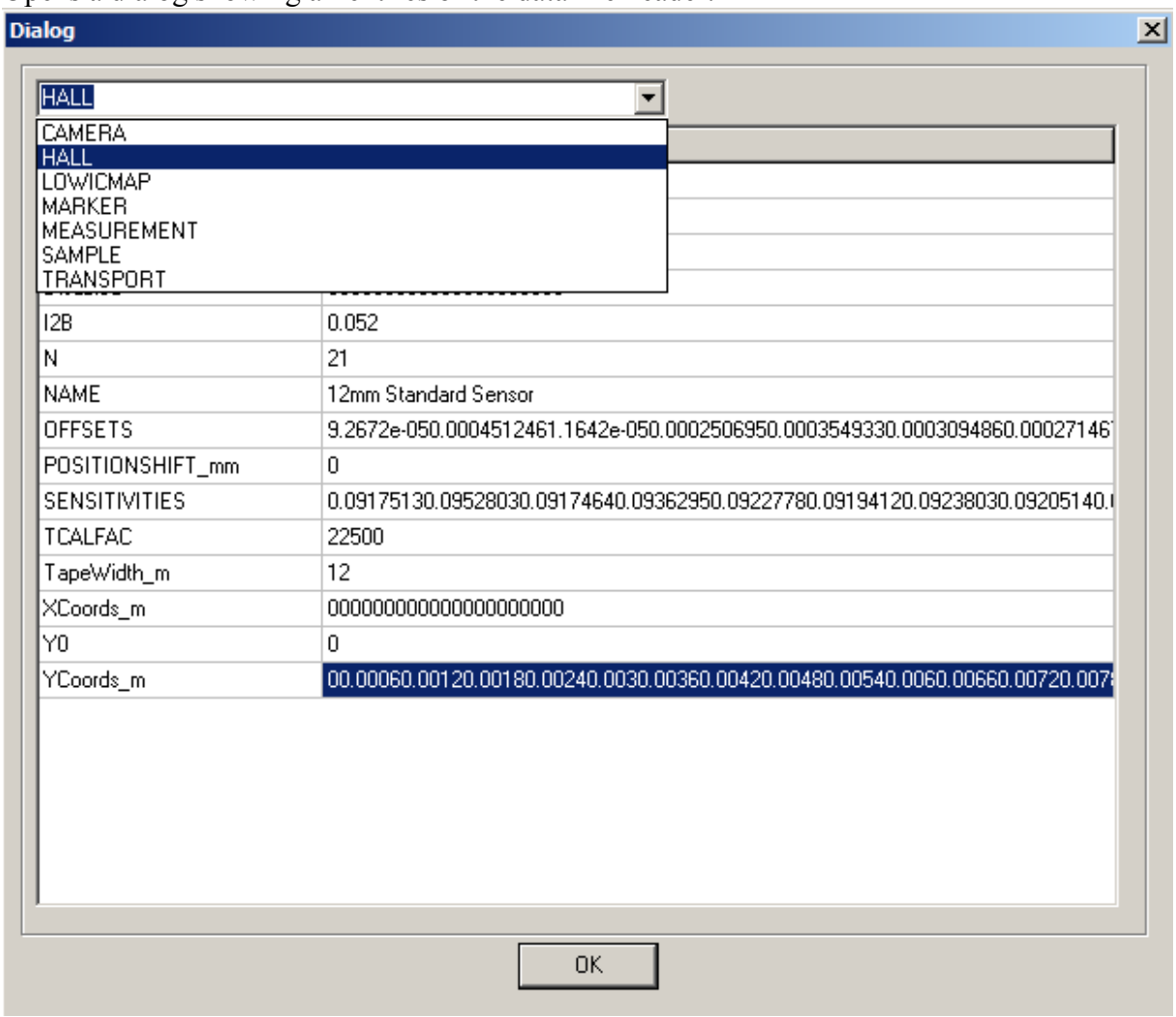


Figure 20: Show header dialog

The selection box on top contains all sections of the header. The key-value pairs of the selected section are listed in the table below.
Values representing a list are displayed without delimiters. The delimiters are visible if the field gets focus.
Though the value fields are writable, changes are not committed to the header.

3.3.1.7. Help

3.3.1.7.1. Show Help

Shows this document as PDF.

3.3.1.7.2. About

Shows version number and contact information.

3.4. Tool-Box

The tool box shows some frequently used menu entries as buttons (for the documentation refer to the Main Menu reference 3.3.1): **Fehler! Verweisquelle konnte nicht gefunden werden.**

- Auto-Left
- To Left
- Stop Auto
- Auto-Right
- To Right
- Zoom Out
- Zoom In
- Show All
- Find Center
- Find Min
- Find Max
- Quit

3.5. I_c-Graph

Shows the critical current Ic over position.
There are two different display modes:

- *Single line with symbols* – Used as long as the amount of visible data is small. Every single data point is drawn to display.
- *Two lines* – Used with large amount of visible data points. Shows minimal- (blue) and maximal (red) values in a certain position interval.

See Figure 21 for a comparison of the two display modes.

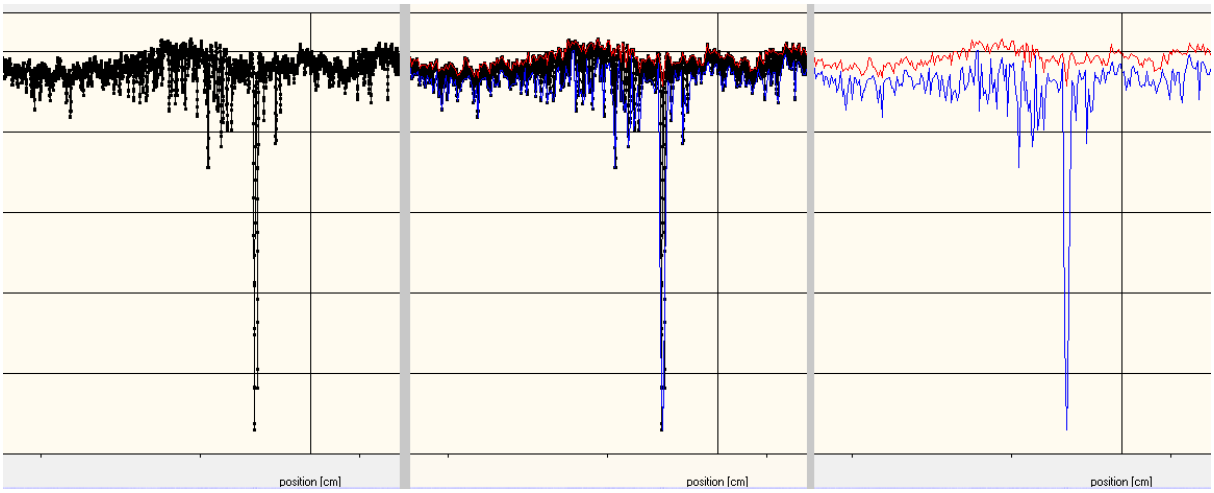


Figure 21: The different display modes of the Ic graph. Left: Single line, right: two lines, center: both modes stacked.

Navigate within the Ic Graph using the buttons in the Toolbar or the corresponding keyboard shortcuts.
The thin, black, vertical line (cursor) is used to select a position. The corresponding profile is shown in the Profile-Graph.
To zoom into a certain range, two green vertical cursers can be dragged into the graph from the left and right edge. A double-click in between the two green lines sets the corresponding range.

3.5.1. Context Menu

The context menu of the ic-graph shows the following entries (Documentation see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**):

- Change Position Offset
- Manual Position Range
- Manual Ic Range

3.5.2. Additional information in Ic-Graph

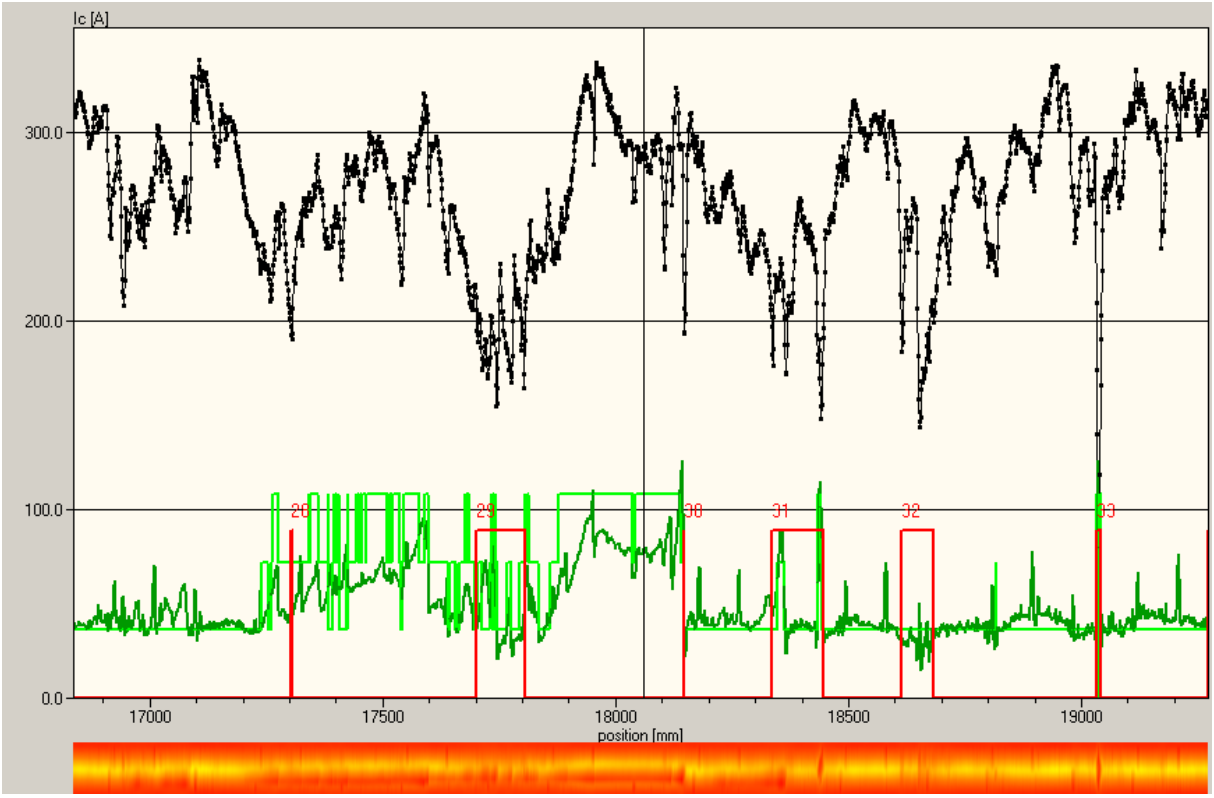


Figure 22: Ic graph with optional elements: "Low-Ic"-Marking (red line with numbers), error line (dark green line) and 'W' detection (green step line)

3.5.2.1. Low-Ic Marking, Defect marking

Low-Ic Marking and Defect marking are shown as step graph with two possible values (marked, not marked). A number helps identifying certain ranges / defects.

3.5.2.2. Error line

The error line shows the deviation of the measured profile from the field profile of homogeneous distributed currents. This calculated profile is shown in the Profile Graph.
The value of this error is increased by

- Inhomogeneity in current density distribution across the tape (e.g. small defect, scratches...)
- Asymmetric profiles (e.g. tape not centered with respect to sensor)

The error line is always scaled so that it fits well in the lower part of the graph.
Since version 5.3:
The error graph shows the number of sections between adjacent sensors in which the difference of field values is smaller than expected from the simple centered bean model. Thus the value iws correlated to the fraction of tape affected by defects.
It can be controlled in the Tapestar.ini.

3.5.2.3. ‚W'-detection

The ‚W'– detection line shows the number of detected extrema in the profile. A large number of extrema indicates a 'W'-shaped profile.
For configuration see chapter 3.3.1.3.3.

3.6. Magnetic Field Picture

Under the Ic graph, a color coded picture shows the 2-d map of the magnetic field data. The position range is synchronized with the Ic-Graph.

3.6.1. Manual contrast control Magnetic Field Picture

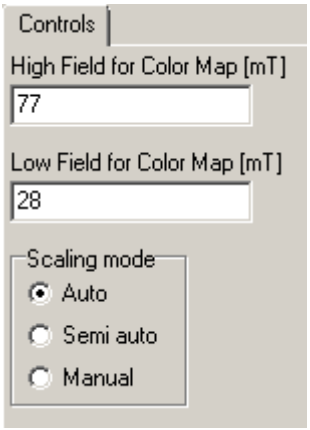


Figure 23: Manual contrast control Magnetic Field Picture

The scaling of the color map of the fied picture can be switched between ‚Auto', Semi-auto' and Manual'. The minimal / maximal values of the color map range are determined as follows:

Auto	Lowest / highest magnetic field value in measurement

Semiauto, tsh Datei
If B0 set point is stored in measurement
	`Bmin = no_auto_min_fac * B0`
	`Mmax = no_auto_max_fac * B0`
	B0 is set point for magnetic field

Semiauto, tsh Datei
If B0 set point is not stored in measurement
	`Bmin = no_auto_min_fac * B0`
	`Mmax = no_auto_max_fac * B0`
	B0 is measurement value of magnet coil current multiplied with factor I2B Faktor from tsh-header.

Manual	Values from input fields (commit by ‚RETURN'-key).

The factors no_auto_min_fac / no_auto_max_fac are fixed in the configuration file (default 1.5 und 0.0).
If the information about applied field is not available in the data header (until Tapestar VISU 3.7/2016), the automatic scaling is always enabled.

3.7. Profile-Graph

The profile graph is located in the lower left area of the user interface. It shows the measurement data (magnetic field) of the hall sensors at the currently selected position.
The blue line is calculated for an ideal conductor carrying the current indicated as critical current. In the graph, it helps evaluating the measured profile.
On top of the graph, the actual position, the applied magnetic field [mT], the critical current [A] and the result of ‚W'-detection is displayed.
Scaling of the field axis can be switched between ‚Full Scaling' and ‚Standard Scaling' by the context menu (right mouse click) of the graph.

3.8. Info box: Sample information and statistics

This is a text field showing information entered before the measurement and some statistics.
The statistical data refers to the visible range.

Table 7: Contents of the info box

Entry	Description
Report for 160205_015.tsh	File name
Samplename: Ugly sample #5	Sample Information
Description 1: using way too much field	Sample Information
Description 2: Meas by Jonny Walker	Sample Information
Date of measurement: 160205	Date of measurement (YYMMDD)
Calibration factor: 165000,0	Calibration factor

Total range is 5499 mm to 10000 mm (4501 mm), 4540 datapoints	Information about the complete file
Visible range is 5499 mm to 10000 mm (4501 mm), 4540 datapoints.	Information about the visible range
	Statistics of visible range:
Minimal Ic: 1,0 A	Minimal Ic
10,0% Percentile: 148,7 A	Percentile 10%
50,0% Percentile: 390,7 A	Percentile 50%
90,0% Percentile: 426,6 A	Percentile 90%
Maximal Ic: 461,2 A	Maximal Ic
Average Ic: 342,9 A, Std. Deviation: 117,44 A	Average und standard deviation
Field: 40,2 ... 40,2 mT	Range of applied magnetic field

3.9. Configuration of Ic calculation

The way Ic is calculated from the magnetic field data can be selected by the selection bax “Ic Calculation method”. If another method than the standard SQRT method is selected, a yellow warning box is visible.
As different methods result in different Ic, there is an adaption factor to fit the non-standard results to the SQRT results. The unit of the adaption factor is ‰, so an Adaption factor of 1000 does not change anything.

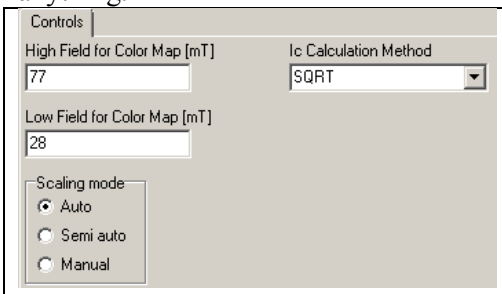


Figure 24: Calculation using standard method

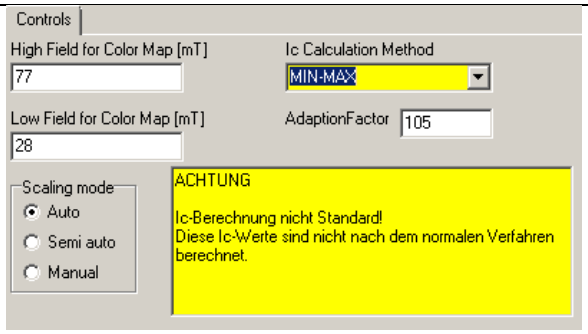


Figure 25: Calculation using Min-Max method

	Danger of erroneous results.
	Exported data is generated using the active calculation method. Before you export data be sure that the calculation method is the one you want to use.

3.9.1. Usage of non-standard Ic methods

- Select SQRT and look for a measurement point with uniform profile an high Ic. Note the Ic IC_{sqrt} of this point.
- Select FABS or MinMax
- Note the changed Ic
- Calculate the new adaption factor af=afalt * IC_{sqrt}/Ic and enter it in the input field
- Check if the Ics of SQRT method and non-standard method are in good accordance in other areas with uniform profiles.

3.9.2. Description of calculation methods

Ic can be calculated using three different methods. The standard method is SQRT, which is in use in Tapestar systems since 2004.
All methods calculate a local Ic using the data of a single field profile. It is a general problem of these methods that long, inclined defects (like inclined scratches) cannot be assessed properly. The ‘W’-detection feature helps at least detecting such problematic structures.

Common parameters:

cf	Calibration factor from header
noSens	Number of sensors
`adaptionFac`	Adaption factor for non-standard methods

3.9.2.1. SQRT (Standard)

```
Ic=cf*sqrt(j/(noSens-1.0))
```

j: Sum of squares of field differences of adjacent sensors.

`adaptionFac` is not needed.

3.9.2.2. FABS

```
Ic=cf*j/(noSens-1.0)*(1.0+0.01*5.0/7.0*noSens)*adaptionFac
```

j: Sum of absolute values of field differences of adjacent sensors.

The term `(1.0+0.01*5.0/7.0*noSens)` makes the Adaption factor around 1000 independent of the number of sensors.

3.9.2.3. Min-Max

```
Ic = cf * (Bmax - Bmin) * adaptionFac
```

Is underestimating Ic of defects where the current splits up into 2 independent paths.

`adaptionFac` is usually around 100 … 120.

3.10. Data format

The tsh and tbh files consist of a header with information about the sample and the measurement, and a following section containing the measurement data. The header is readable using any text editor.

Table 8: data file header

[CAMERA]	Section for camera (optional)
Active=0	Camera active
DefIcThreshold_pc=80	Defect detection Ic-Threshold %
DefLowLevelIc_A=20	Defect detection non SL limit
DefMaxFractLowLevelIc_pc=20	Defect detection max fraction of non-SL
DefMaxWidth_m=2	Defect detection max width of defect
Def_N=200	Defect detection number of measurements to average
DistToSens_m=2054	Distance camera to sensor
[HALL]	Section for Hall measurement parameters. Can be changed after measurement.
CALIBRATION_FACTOR	Calibration factor
DY=0.0006	Distance Sensor-Sensor
DZ=0.0009876	Distance Sensor – SL
Disabled	For each sensor 0=enabled, 1=disabled
I2B=0.052	Magnet Current to Field ratio, used to calculate magnet field
N=21	Number of sensors in use
NAME=12mm Standard Sensor	Name of sensor
OFFSETS=	Electrical offsets of sensor elements (N values, [V])
POSITIONSHIFT_mm=0	Shift of hall sensors, reserved.
SENSITIVITIES=	Sensitivities of Hall Sensors [V/T]
TCALFAC	
TapeWidth_m=12	
XCoords_m=	
Y0=0	
YCoords_m=	
[MARKER]	Parameter for marker (optional)
DistToSensKey_m=1498	
IcThreshold_A=200	
Label100TapeStartLeft=0	
Label100TextureToUser=0	
LabelText=	
MinHighLength_m=80	
Mode=2	0: not activ, 1: LowIc (defects), 2: Labels, -1: LowIc generated by Viewer software (no physical marking)
[MEASUREMENT]	The parameters as entered by user before the measurement. Are not visible in the Viewer. Only for traceability, do not change.
CalibrateSens=1	0, 1: Sensor calibration?
CalibrationFactor=165000	Calibration factor
SetB_T=36	Set point for magnetic field.
SetIH_A=0.01	Setpoint current hall sensors
SetIc_A=360	Target Ic

[SAMPLE]	Can be changed in Viewer (not DATE)
DATE=	Date of measurement YYMMDD
INFO1=	Free text
INFO2=	Free text
MODE=	Hall or F3 (F3 deprecate)
NAME=	Sample name
[TRANSPORT]	Transport as entered by user before the measurement. Changes after start of measurement are not visible.
EncoderDiameter_m=0.16	
SetLimit=0	Was a position limit set ?
SetSCIn=1	Tape Orientation
SetSpeed_mph=0.00415134	Set point speed [m/h]
SetTension_N=20	Set point tension [N]
TapeThick_m=0.0001	Tape thickness [m]
TapeWidth_m=0.012	Tape width [m]
PositionOffset_mm=1000	0: Original state
is_flipped_key=0	0: not flipped, 1: flipped

The content of the header can be shown in the main menu „Show Header“.
The measurement data starts after „[DATA]“:

Column	Content
1	time [s]
2	position [mm]
2+n	Magnetic field [T] at hall sensor n (n = 1 .. N sensors)
2+N+1	Magnet current [A] (last column)

The [DATA] section can be saved in text (tsh) or binary (tbh) format.
The binary format needs less disk space (~20%), has better precision and reads/writes faster.
On the other hand, it is not possible to edit these files in text editors, Excel, etc.

4. Configuration

The application can be configured in the file Tapestar.ini. It is located in the program folder.

Boolean values are given in 0 or 1.

Table 9: Entries in Tapestar.ini. Boolean types are set by 0 and 1.

[APPLICATION]	
VERSION=2.0.0	Not in use
MAX_FORMS=0	Not in use
preferBinary=0	Not in use
WindowMaximized=1	0: Application is opened using previous windows size and position 1: Application is opened maximized.
posUnit=mm	Default position unit.
showHeaderMenu=1	Visibility of main menu entry ‘Show Header’ (3.3.1.6.10).
windowsPosX=58	Last position of window
windowsPosY=-4	Last position of window
[PATH]	
Data=	Folder for “Open” dialog. Always replaced by the last folder in use.
Save=	Folder for “Save” dialog. Always replaced by the last folder in use.
[IcGraph]	Configuration of Ic graph
BLOCKS=1024	For 2-lines display mode
RAWCHNO=3	1-line mode (internal)
RAWCAPTION=no averaging	1-line mode: Channel name as shown by legend
RAWCOLOR=0x000000	1-line mode: Color (0xRRGGBB) for 1-line mode
RAWLINE=1	1-line mode: draw line?
RAWMARK=10	1-line mode: mark (0= off, 1, .. different symbols)
RAWLINEWIDTH=1	1-line mode: line width
RAWVISIBLE=1	1-line mode: Visible?
MINCHNO=2	2-line mode (internal)
MINCAPTION=min	2-line mode: Channel name as shown by legend
MINCOLOR=0xFF0000	2-line mode: Color (0xRRGGBB) for 1-line mode
MINLINE=1	2-line mode: draw line?
MINMARK=0	2-line mode: mark (0= off, 1, .. different symbols)
MINLINEWIDTH=1	2-line mode: line width
MINVISIBLE=1	2-line mode: Visible?
MAXCHNO=1	2-line mode (internal)
MAXCAPTION=max	2-line mode: Channel name as shown by legend
MAXCOLOR=0x0000FF	2-line mode: Color (0xRRGGBB) for 1-line mode
MAXLINE=1	2-line mode: draw line?
MAXMARK=0	2-line mode: mark (0= off, 1, .. different symbols)
MAXLINEWIDTH=1	2-line mode: line width
MAXVISIBLE=1	2-line mode: Visible?
AVRCHNO=0	Not in use
AVRCAPTION=Average	Not in use
AVRCOLOR=0x000000	Not in use
AVRLINE=1	Not in use
AVRMARK=0	Not in use

AVRLINEWIDTH=1	Not in use
AVRVISIBLE=0	Not in use
ERRCHNO=4	Error line (internal)
ERRCAPTION=Error	Error line: Channel name as shown by legend
ERRCOLOR=0x00A000	Error line: Color (0xRRGGBB) for 1-line mode
ERRLINE=1	Error line: draw line?
ERRMARK=0	Error line: mark (0= off, 1, .. different symbols)
ERRLINEWIDTH=1	Error line: line width
ERRVISIBLE=1	Error line: Visible?
MOVEZOOMSTEP=0.02	Factor for move functions
ZOOMSTEP=0.2	Factor for zoom functions
AUTOMOVEDELAY=100	Delay for Auto-Left and Auto-Right function [ms]
HALLERRSCALE=0.5	Scaling factor for error line
F3ERRSCALE=1.0	Not in use
STARTAVERAGED=1	Not in use
wCHNO=5	W line (internal)
wCAPTION=Number of extrema (w-detection)	W line: Channel name as shown by legend
wCOLOR=0x00FF00	W line: Color (0xRRGGBB) for 1-line mode
wLINE=1	W line: draw line?
wMARK=0	W line: mark (0= off, 1, .. different symbols)
wLINEWIDTH=2	W line: line width
wVISIBLE=1	W line: Visible?
[PRINT]	Setting for printing
TITLEFONT=Arial	
TITLESIZE=20	
TEXTFONT=Arial	
TEXTSIZE=10	
[FieldImage]	
OVERFLOWCOLOR=0x000000	Color (0xRRGGBB) for fields > max field
HICOLOR=0x0000FF	Color (0xRRGGBB) for fields = max field
LOCOLOR=0x00FFFF	Color (0xRRGGBB) for fields = min field
UNDERFLOWCOLOR=0xFFFFFF	Color (0xRRGGBB) for fields < min field
autoscale=1	Automatic scaling? (last value)
no_auto_max_fac=1.5	Upper field limit (*B0) (for semiautomatic scaling)
no_auto_min_fac=0.0	Lower field limit (*B0) (for semiautomatic scaling)
[PositionUnits]	Position Units. Standard unit is set in [APPLICATION]. Key = Name, Value = mm/Unit. Can be extended.
mm=1.0e+0	
cm=1.0e-1	
m=1.0e-3	
km=1.0e-6	
inch=3.937007874e-2	
[Percentiles(0-1)]	Percentiles as shown in the info box. The keys must be unique but do not have any meaning
0=0.10	
1=0.50	
2=0.90	

[ANALYSE]	Parameters for defect detection
N=300	Last value in use
c_threshold=50	Last value in use
max_width_mm=25	Last value in use
min_Ic=10	Last value in use
max_low_Ic_fraction=60	Last value in use
enabled=1	
max_dist_between_marks_mm=20	
[LOW_IC_DETECT]	Parameters Low Ic Detection (last in use)
ic_Threshold=150	
min_Len_Good=100	
dist_Sens_Mark=1500	
thresholdWs=2	
[W_DETECT]	Parameters W Detection (last in use)
n_threshold=0	
n_ignore_left=1	Left points to ignore
n_ignore_right=1	Right points to ignore
min_dB_uT=1000	Minimal field change [µT]
[IC_CALC]	Parameters ic calculation method
PreferredMethod=SQRT	Set preferred method
FabsToSqrt=1000	(last in use)
MinMaxToSqrt=105	(last in use)
[Dev_Err]	
Enabled=1	Not in use
ignore_0-10=0	Ignore edge (0 to 10 points)
threshold_0-1=0.4	Detection threshold: eg 0.4 for 40%
ignore_Ic_A=100	If Ic < ignore_Ic_A, set the error value to 0
to_ic=10	For scaling in plot