HeRo 5000

Testing Tool
HeadRoom Analysis Software

Operation Manual
English
Version 2.1.1

Date:	October 2017		Version:	2.1.1
Made by:			Checked by:	M. Egginger
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Contents

Please study this handbook carefully before initial use of the equipment. Keep this handbook at the working place, where you can easily find it and hand it over with the equipment to other persons.

1 Safety Regulations for Electrical Machines in Industrial Use

Danger

Electrical machines are equipment for use in industrial plants. During operation of the machine dangers may arise through rotating parts and/or high voltage.
In case of improper use of the machine during commissioning, operation and maintenance **severe injuries to persons and damage of property** may arise. The machine may only be used under the provisions stated in the instruction manual, additionally the local working conditions should be considered.

Warning

- Transportation, installation, commissioning, electrical connection, operation and maintenance may only be carried out by authorized and qualified specialist staff.
- Knowledge of the regulations for the prevention of industrial accidents and first aid measures is a prerequisite for safe and trouble-free operation of this system.
- This instruction manual contains the most important notes for operation of the system in accordance with safety requirements.
- This instruction manual and especially the safety notes contained herein must be observed by all the persons working with the system.

Non-observance is a safety risk!

Our “general sales and supply conditions” always apply as these are available to the user under www.cable-tec.net at any time. Any claims for warranty or liability in case of personal injury or property damage are excluded, if they can be traced back to one or several of the following causes.

- The equipment was not used according to the intended purpose.
- Improper installation, commissioning, operation, and maintenance of the equipment.
- Operation of the equipment with defective safety devices or with improperly mounted or non-functional safety and protection devices.
- Non-observance of the information in the operating instructions concerning installation, commissioning, operation and maintenance of the equipment.
- Unauthorized modifications of the equipment.
- Repair work performed improperly (no original spare parts) by unauthorized personnel.
- Events caused by the effect of foreign bodies and force majeure.

Hotline

In case of breakdown of the machine or in case of danger please call our service hotline :
Tel. +49 (0) 8554 94 23 9-0, Fax + 49 (0) 8554 94 23 9-20, eMail info@cable-tec.net

2 Function of the equipment

The Headroom can be calculated as the force of an open loop crimp cycle in respect to the peak force of an optimal crimp cycle in percent. At an optimal crimp all wires joined together in a crimp contact. The Crimp height is set to a nominal value while an open loop crimp is characterized by a crimped isolator. For calculation of the headroom only the minimum cable cross section is valid.
The FSI is powered by either an external power supply or by an internal rechargeable battery.

3 Intended use

HeRo 5000 is a tool to determine the “headroom” of crimped wires. The “headroom” is defined as the amount of crimping force related to the compression of the wire. The headroom analysis compares the peak force of a terminal crimped with a wire and the peak force of crimping a terminal without wire. The headroom should be >35%.
So the analysis of the headroom gives you a qualified evidence for the monitoring capability of special wire/terminal combinations. Terminals, which cannot be monitored safely by the crimp force monitor, can be filtered out before production starts.
The requirements for temperature and humidity have to be carefully observed. Ignoring these rules can cause accidents or damages. Other use as described in this manual is not allowed and can lead to the loss of warranty claims and liability exclusion of the supplier. Any unauthorized modification of the equipment carried out by user will invalidate the manufacturer’s liability to any resulting damage or injury to personnel. This statement also applies for any changes or conversions of the device.

4 System requirements

Operating system	Windows XP with service pack 3 / Windows 7 with service pack 1 / Windows 8
PC configuration	CPU 1 Ghz clock rate with 1 Gbyte RAM
Interface	RS232C

5 Scope of delivery

Standard delivery must include:

- FSI main unit
- BNC force sensor cable
- Connection cable for PC
- CD with HeRo 5000 analysis software
- Battery charger

6 Packing

The device is packed in a special transportation packing. Please re-use this package again or recycle it according to your local rules.

7 Transportation

The transportation of the unit must be free of vibration and shock. The normal packaging is not seaworthy and cannot be used for water carriage. The packing does not protect against wet conditions. Tumbling of the unit during transportation is not allowed. Handle with care! Throwing or falling down of the packed unit can cause damages or total demolition.

8 Storing

The device has to be stored in a dry and well-tempered room. The optimum storage temperature is at 20°C. Too high humidity can cause corrosion on important precision parts.

9 Set up

9.1 Installation

1. Connect your PC with the RS232 interface cable.
2. Connect the force sensor with the BNC cable to the FSI box.

9.2 Maintenance

In general, the device is maintenance-free. Though it has to be sent to the producer for inspection and adjustment before the lapse of the date on the test badge.

10 Installation and Maintenance

1. Connector for serial interface
2. Connector to the force sensor
3. Indicating light to show device mode (blinking = teach, normal = operating)
4. Connector for power supply / battery charger

11 Operation with FSI

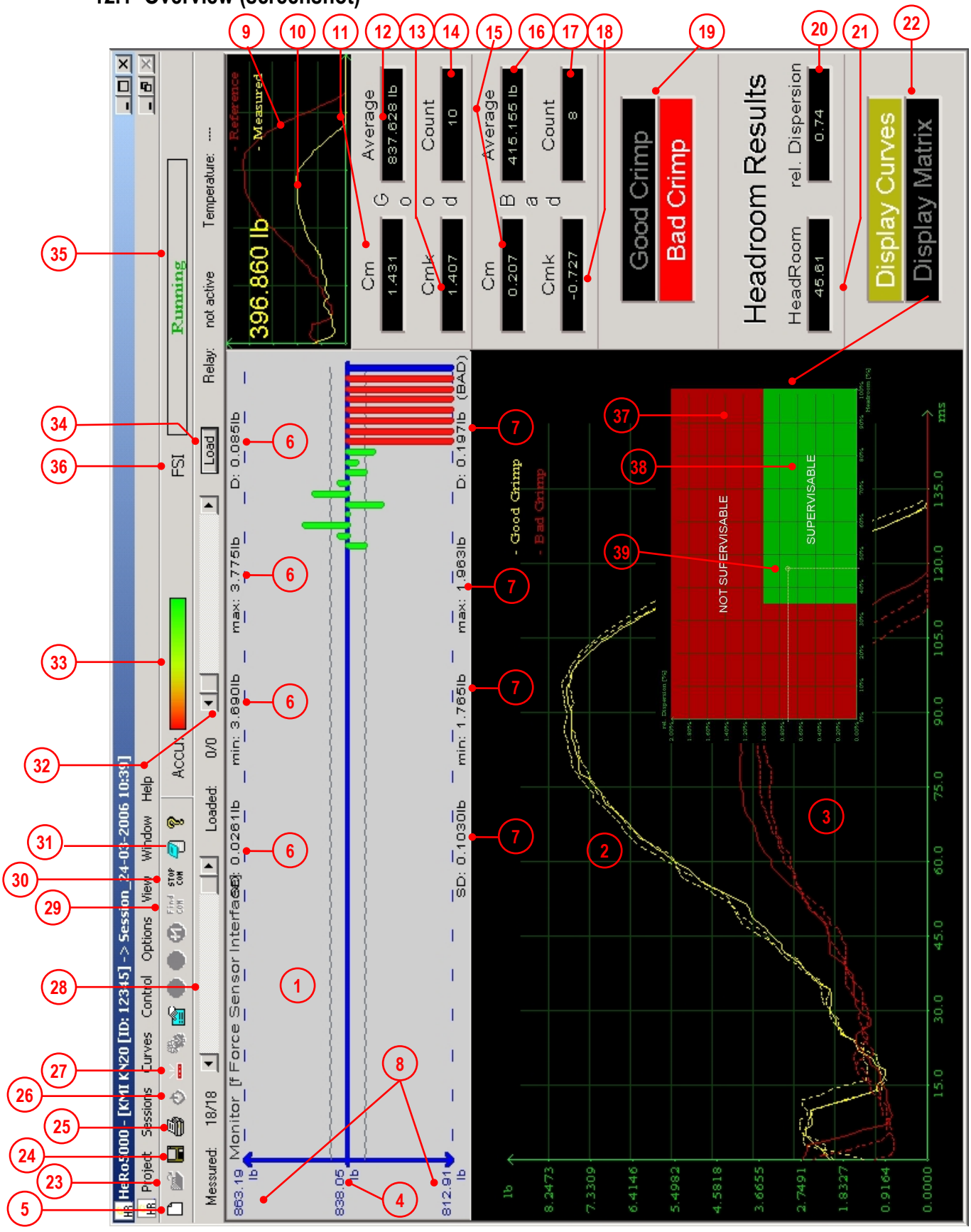
To switch on the device, press  until the green light gets on (after approx. 2 seconds). After releasing the key, the initialising procedure starts. The device is now ready for teaching-in new sample curves (showed by the blinking green LED).

To switch off the device, press  until the bottom red LED from the bar switches on. After releasing the key, the power is switched off.
The PC program can switch off the device either by clicking the “off” button or by closing the program.

When the device is not in use longer than 10 minutes, it switches off automatically. Not in use means: no serial communication, no curve is measured or no key is pressed.
When the battery is empty, the device makes a defined switch off, to prevent wrong actions caused by low voltage.

12 The HeRo5000 software

12.1 Overview (screenshot)

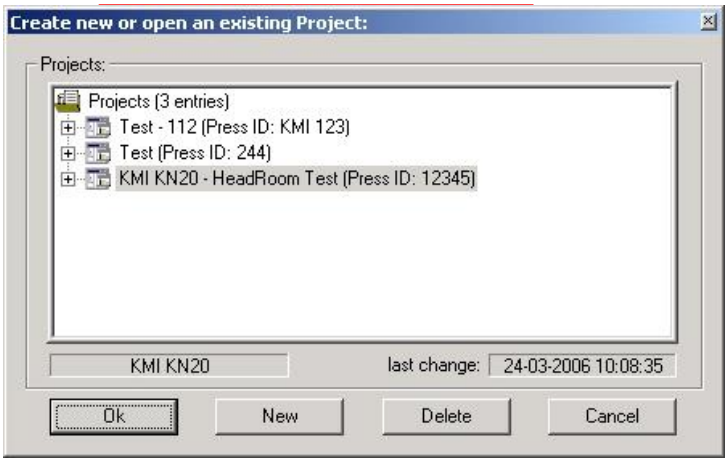


Elements and buttons:

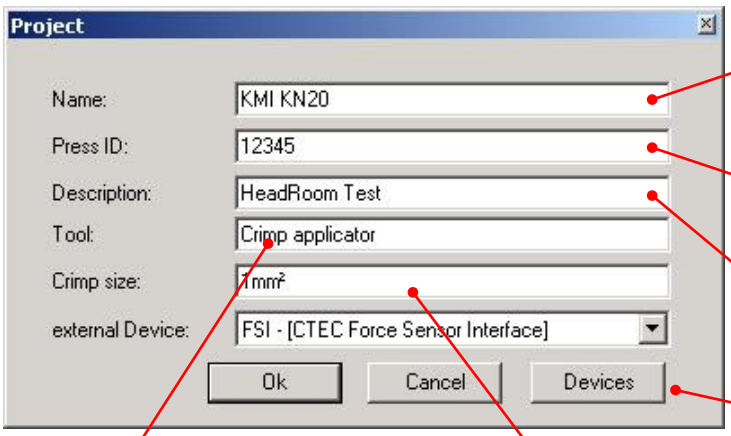
1. History of height data measured by the FSI unit
2. Min and max peak - curve of the good crimps
3. Min and max peak - curve of the empty crimps
4. Reference force calculated as the average value of the first five measurement values after teach in phase
5. Button for creating a new project
6. SDeviation, Min peak, Max Peak and delta for good crimps
7. SDeviation, Min peak, Max Peak and delta for bad crimps
8. Upper and lower specification limit (calculated automatically after teach in phase)
9. Reference force curve
10. Measured force curve
11. CM value (good crimps)
12. Overall maximum force average value (good crimps)
13. CMK value including CMK limit in brackets (good crimps)
14. Number of crimps (good crimps)
15. CM value (bad crimps)
16. Overall maximum force average value (bad crimps)
17. CMK value including CMK limit in brackets (bad crimps)
18. Number of crimps (bad crimps)
19. Button to mark the selected crimp as good or bad (double click on it)
20. Headroom value
21. Dispersion of good crimps
22. Button to change the main view (curve or headroom matrix)
23. Button for opening or creating a project
24. Button for saving current session data
25. Button for opening the printer dialog
26. Switch off button
27. Teach in button
28. Slide bar for selecting a range of data displayed at the measurement value history
29. Starts automatic com port search for either FSI
30. Stops automatic com port search
31. Opens a note pad for adding some additional measurement information
32. Slide bar for selecting a range of loaded data displayed at the measurement value history
33. Battery state (charging battery indicated by progress bar slow motion)
34. Load button gives possibility for loading already stored session data
35. Indicating FSI state (FSI can be disabled by double click)
36. Double click opens dialog to change FSI settings
37. Area which indicates crimps cannot monitored
38. Area which indicates crimps can be monitored
39. Intersection point of headroom value and dispersion value

12.2 Data management (creating a new project)

All received data of the FSI device are stored in a database. This database is Microsoft Access type and named **projects.mdb**.



After clicking the <New> button, the name of the press, an identity number, tool, size and a description have to be entered.



Enter a user defined project name unique to the project.

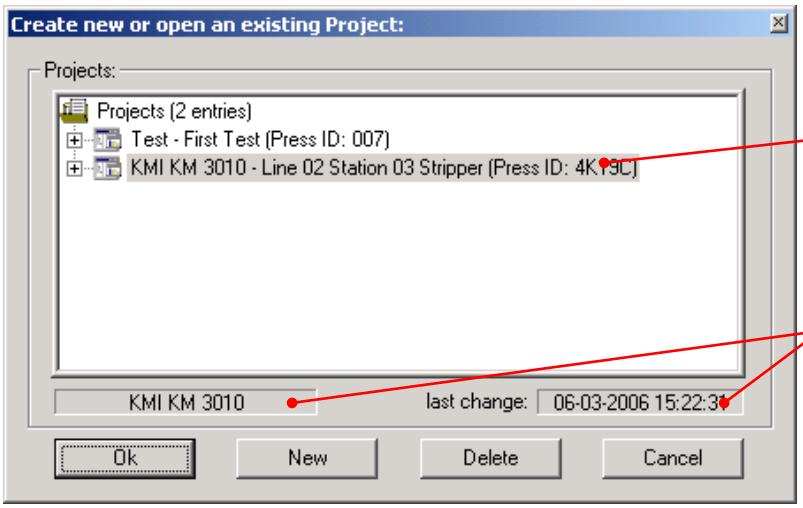
Press Identification number unique to the press

If necessary one can enter a short description.

Device button opens a dialog for managing devices (adding, deleting etc.). For more details, see 7.5 => managing hardware devices.

Enter a short description about the applicator.

Enter the size of the crimp contact.



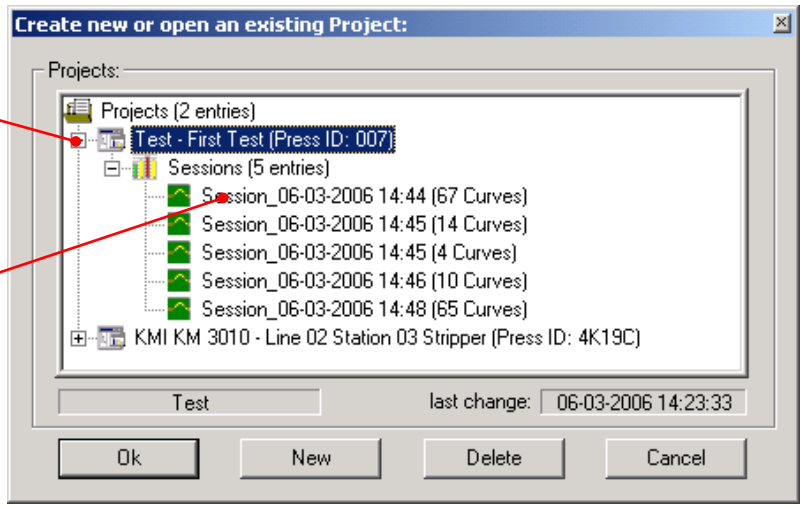
In the project list, the name, the description and the press ID for each project are displayed.

After clicking on project item, the project name and the date of the last modification are displayed again in the bottom of the window.

In each project a set of curves (sessions) can be stored. This set represents a quality test of the actual machine. Every set of curves can be loaded and directly compared with the actual curves coming online from the PAL device.

All sessions are listed after clicking the + sign in front of the projects name.

Name and date of the last modification are shown together with the number of curves (in brackets).



12.3 How to setup a press test

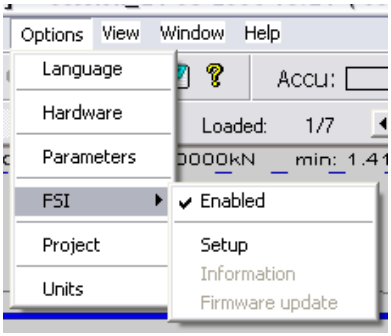
This guide helps you step-by-step to get more familiar with the HeRo software. It shows how to set up a new project and to connect with FSI device. It also shows the screenshots of the different steps.

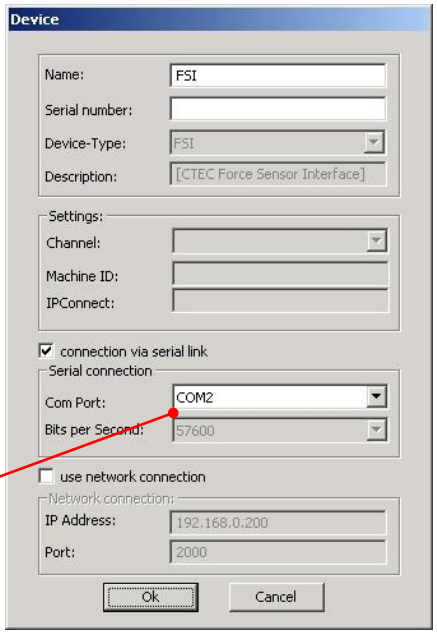
- After setting up a new project or opening an existing one, the program will try to connect to the FSI

Status: no device is connected

- Set up the FSI
  There are 2 possibilities for setting up:

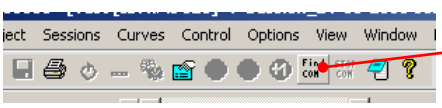
  1) Changing the settings manually





Select the com port corresponding to the FSI box.

  2) Automatic FSI setup



Press “Find COM” button for automatic FSI setup. If FSI has been found, press “STOP COM”.

- When the connection is established, the FSI state should change to “teach-in”

The FSI is ready for teaching in.

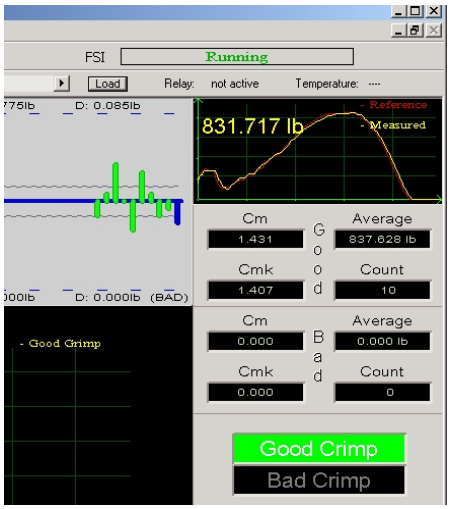
- Start triggering press cycles to adjust internal FSI parameters. At least up to 3 crimp cycles are needed.

Now the FSI is in learning – mode.

- After the teach-in phase the FSI is ready for sampling data.

Now the FSI is in “running” – Mode.

- For headroom calculation at least 7 optimal crimps are required



For a realistic calculation, at least 20 - 100 optimal crimps are recommended.

- After that switch to bad (empty) crimps.

Make the first bad crimp and double click on “Bad Crimp”. Now all further crimps will be marked as “Bad Crimp” as well.

- At least 7 empty crimps are required.

For a realistic calculation, at least 20 - 100 bad crimps are recommended.

- Switch to matrix display to check the “Supervisable” of the crimp contact.

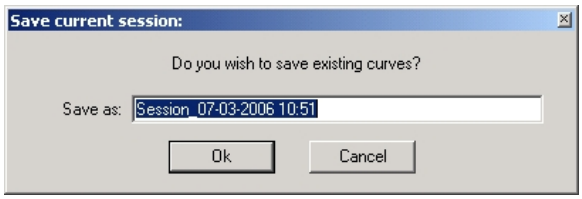
Change the main display from the “curve view” to “matrix view” by double clicking.

Y axis = relative dispersion scale

Intersection point of headroom and relative dispersion

X axis = headroom scale

- Save the collected data by either clicking the “Save” button in the toolbar or the menu item “Sessions\Save”

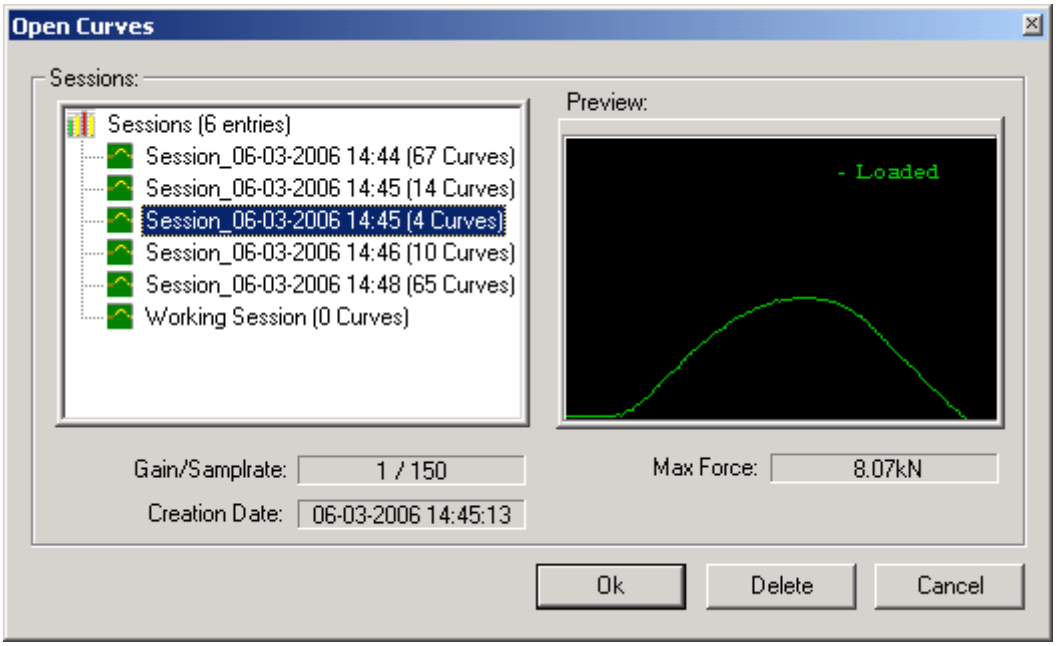


Enter a suitable name for the current session.

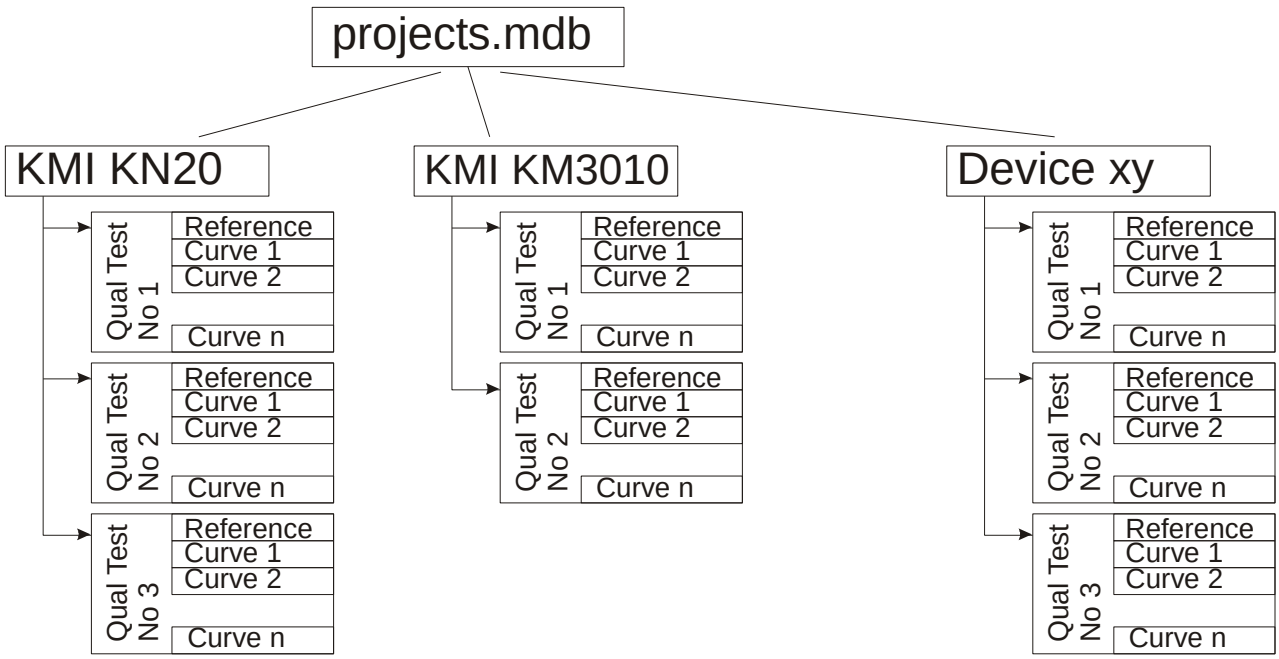
Remark: If connection to the device is lost or the teach button is pressed, the save dialog appears automatically.

12.4 Loading a reference curve

After selecting a session and clicking OK the project is opened and the session is loaded as reference. By selecting the project name and clicking OK, the project opens and the last modified session loads automatically as reference. When a project already is open, it is possible to load another set of the project sessions by clicking the load button. In this window, additional information is displayed, e.g. sampling rate gain of the press analyzer and a preview of the shape of the reference curve.

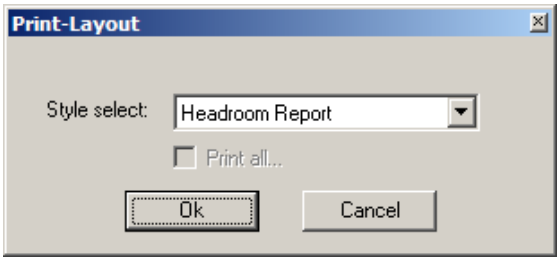


The data is organized as shown below:

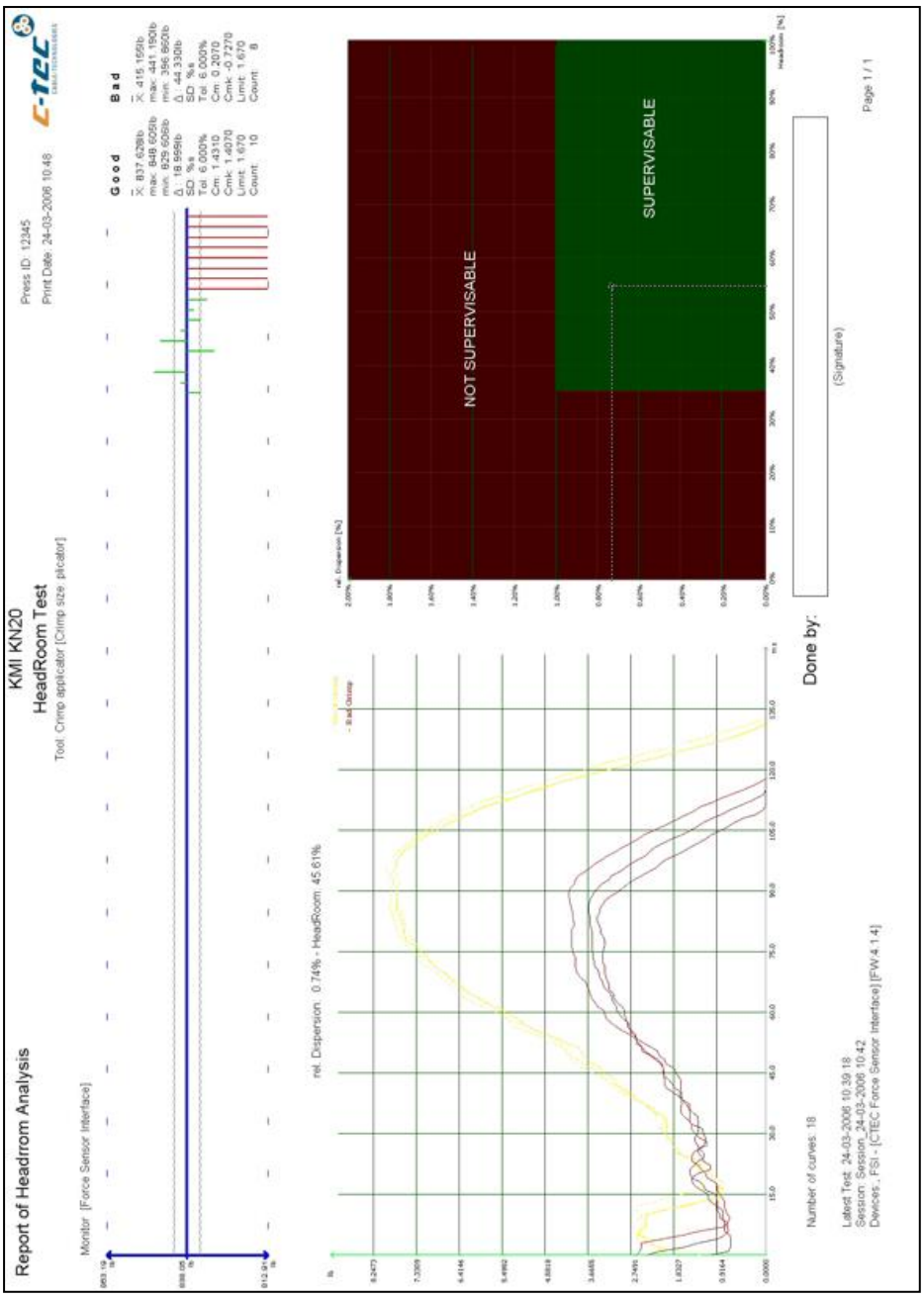


12.5 Printing the results

The printed reports contain the peak value history as a bar diagram (similar as shown on the screen), the shape of the measured curves and the headroom matrix



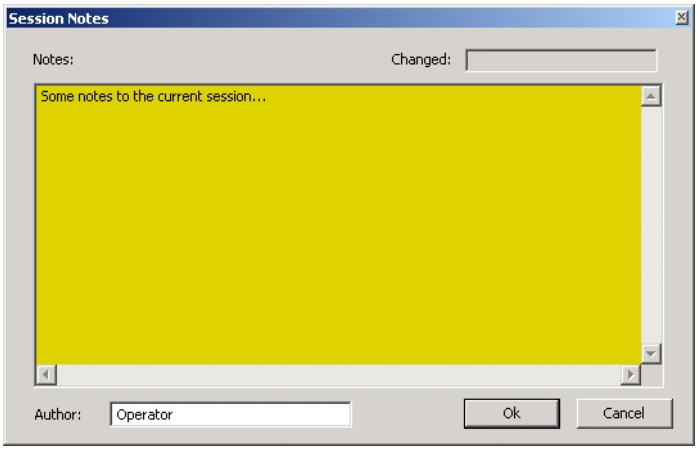
On the hardcopy, the results of the actual test are displayed. (Notes, which have been added by the user, will be attached automatically on the printout.)



12.6 Additional software features

- Notes (toolbar button)

If required, additional information can be attached to the measurement session.



- Device info (Menu: Options\FSI\Information)

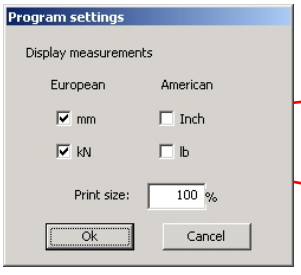
By clicking the menu item “Information” a dialog window appears. The window contains information about the firmware version used by the FSI and the remaining number of trigger events before maintenance.

- Change language settings (Menu: Options=>Language)

Either English or German can be chosen as system language.
Select menu: Options=>Language.

- Units (Menu: Options=>Units)

Select the units for the displayed data, millimeter and kilo Newton for European or inch and pound for American. The printout size can be adjusted by changing the print size field. 100% = ISO A4

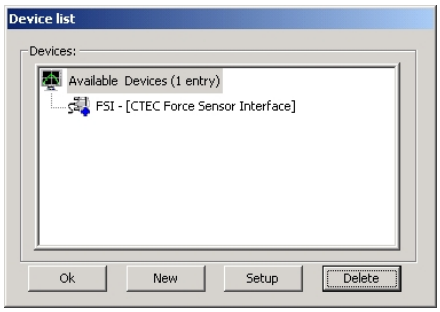


Either metric or American measurement units can be used.
Select menu: Options=>Units.

Printout size can be adjusted by changing the value in the print size field.
100% corresponds to ISO A4.

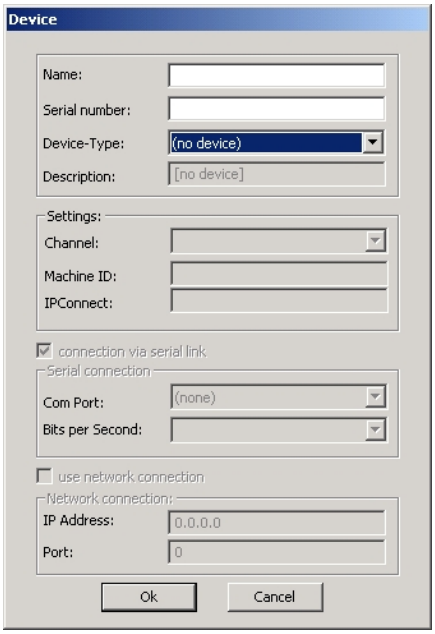
- Managing hardware devices

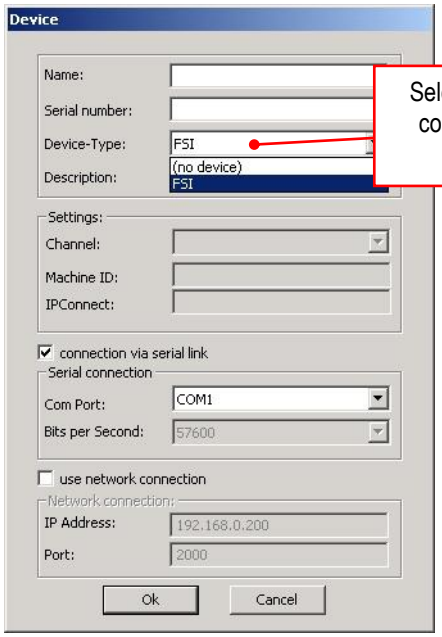
If a new hardware device should be used either select Menu: Options=>Hardware or open the project dialog and select “Devices”.



Device managing dialog: create new devices, remove or change existing devices.

Create a new device

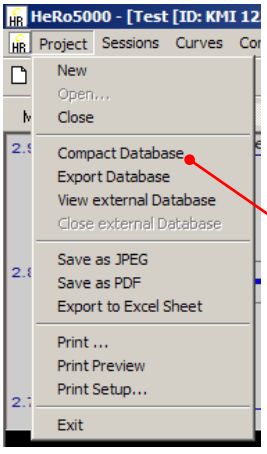




Select FSI device type corresponding to the used FSI.

Select „New“. A dialog appears where the device settings can be changed.

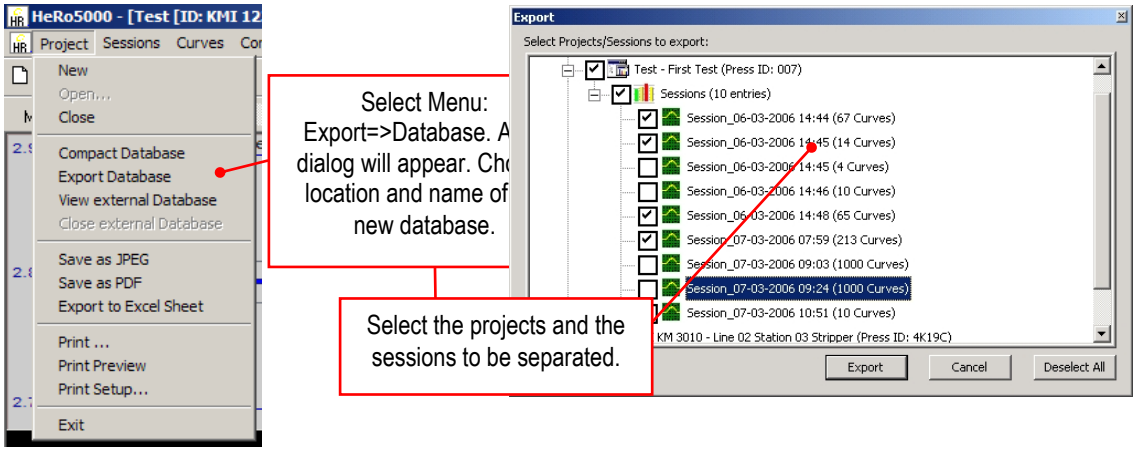
- Reducing database size: Compact database (Menu: Project\Compact Database)



With every software usage, the database size will increase. Therefore, it is recommended to reduce size. This can be done by selecting Menu: Project=>Compact Database.

- Export projects and sessions to a new empty database

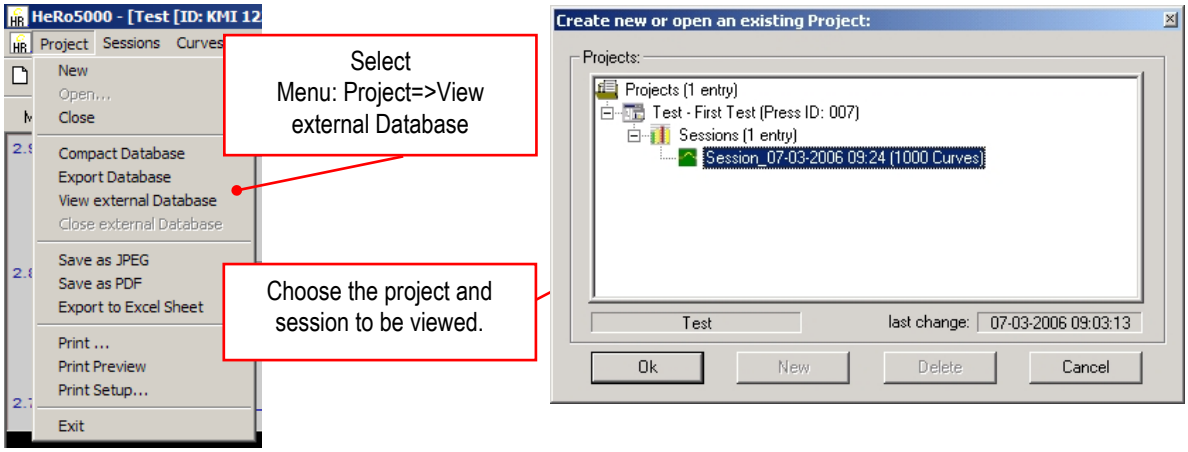
Exporting projects to an empty database might be useful i.e. if data should be sent via e-mail for further analysis.

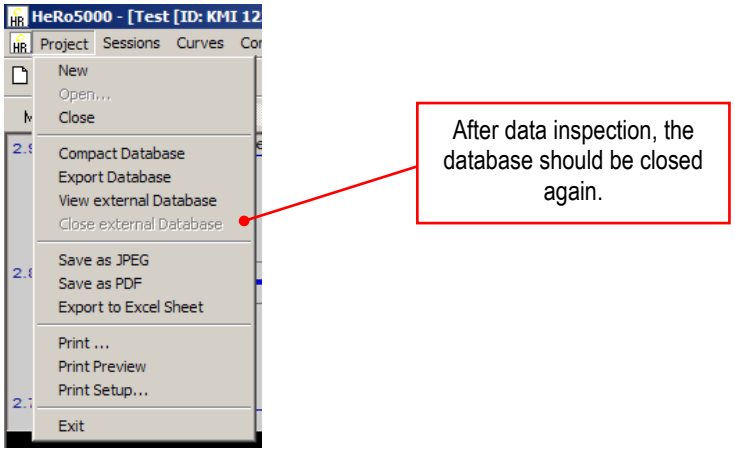


The time for exporting a database depends on the number of project and sessions. This may take several seconds. A progress bar during export will give more information.

- View external projects and session

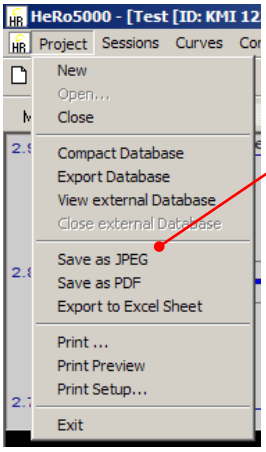
This item is used for opening an exported database in read only mode. In this mode neither the stored data can be changed nor a device can be selected (devices are offline).



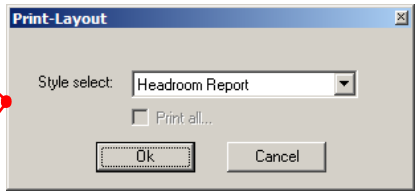


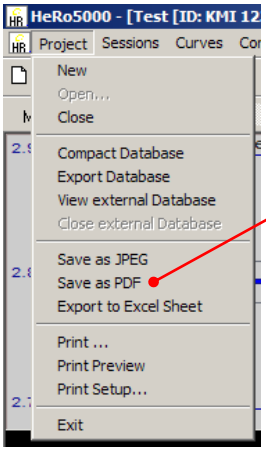
- Save data as picture or PDF – document

This item provides possibility to save sampled data as picture.



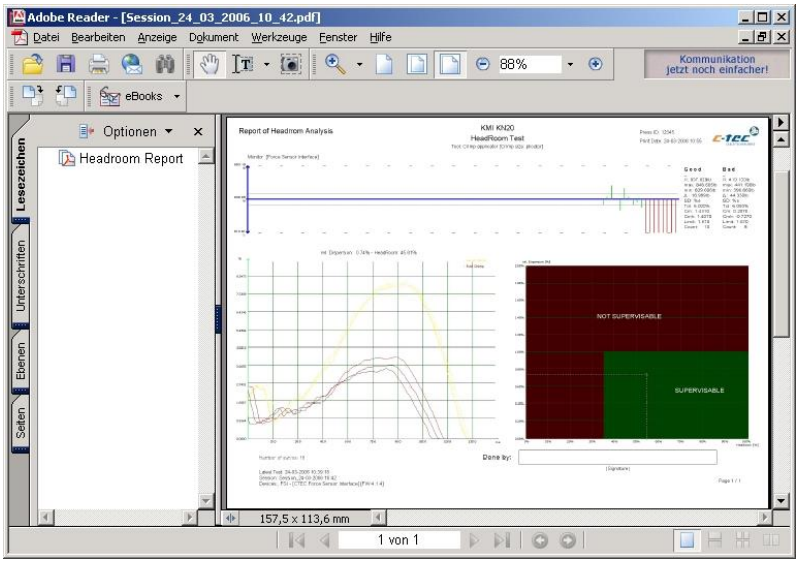
Select Menu:
Project=>Save as JPEG





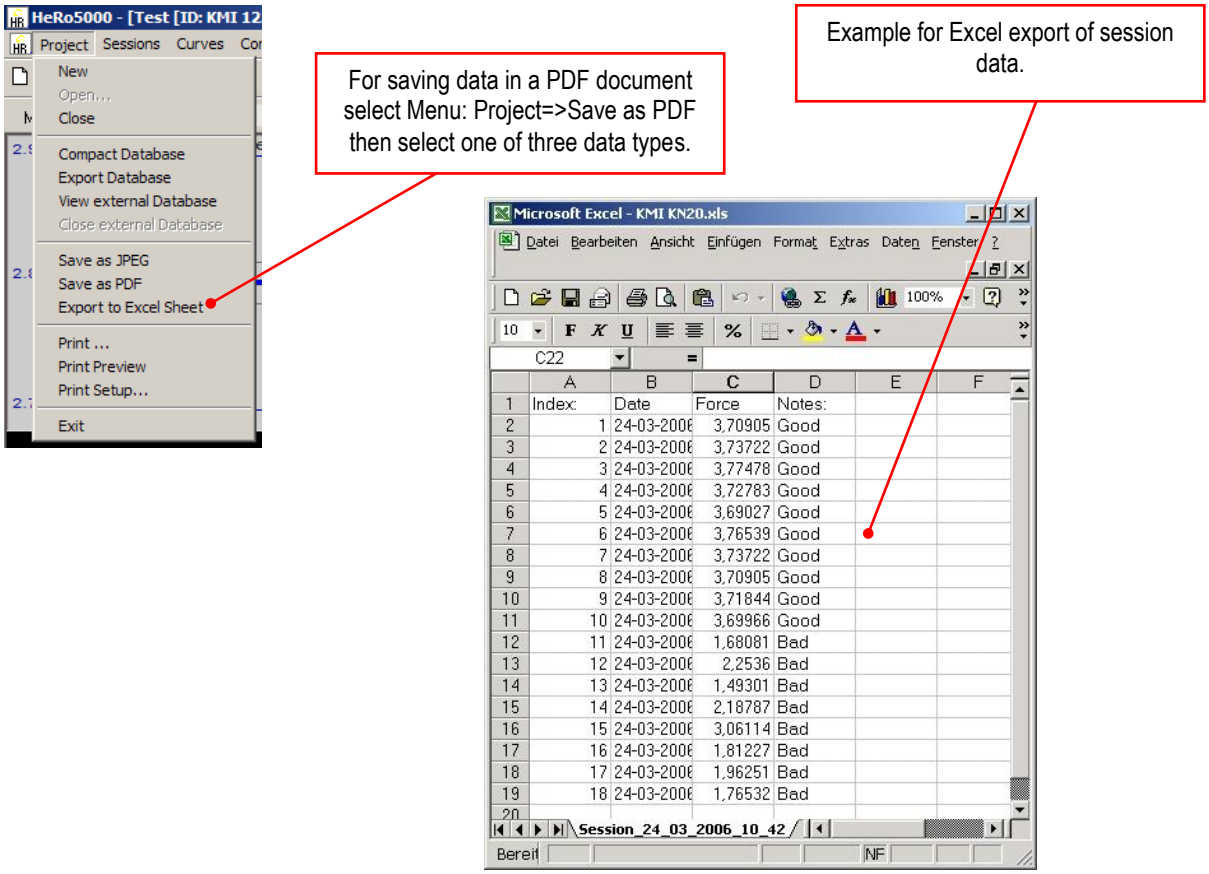
For saving data in a PDF – Document
select Menu: Project=>Save as PDF

I.e. related PDF – document including all data type in one file.



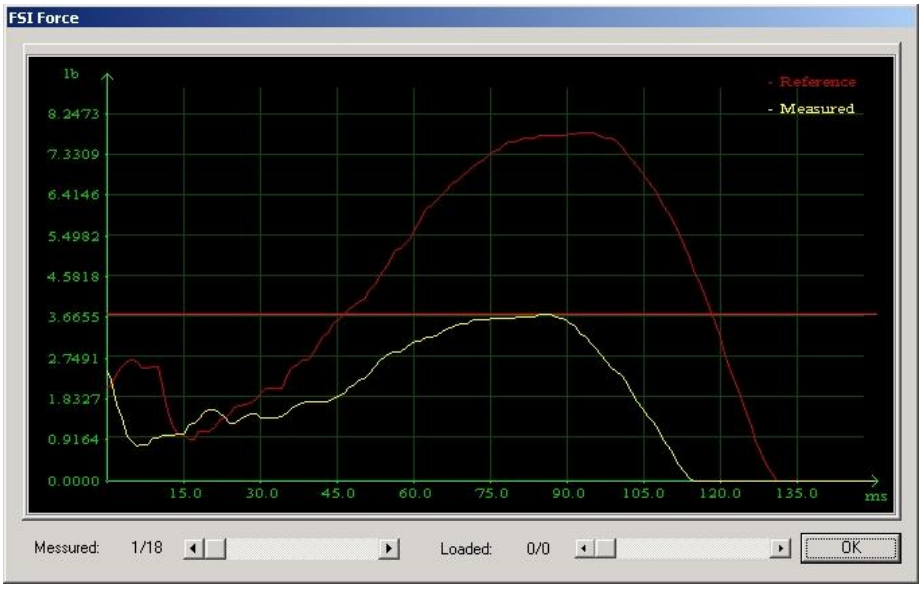
- Export data to excel

For further analysis, data can be stored in an Excel file.



	A	B	C	D	E	F
1	Index:	Date	Force	Notes:		
2	1	24-03-2006	3,70905	Good		
3	2	24-03-2006	3,73722	Good		
4	3	24-03-2006	3,77478	Good		
5	4	24-03-2006	3,72783	Good		
6	5	24-03-2006	3,69027	Good		
7	6	24-03-2006	3,76539	Good		
8	7	24-03-2006	3,73722	Good		
9	8	24-03-2006	3,70905	Good		
10	9	24-03-2006	3,71844	Good		
11	10	24-03-2006	3,69966	Good		
12	11	24-03-2006	1,68081	Bad		
13	12	24-03-2006	2,2536	Bad		
14	13	24-03-2006	1,49301	Bad		
15	14	24-03-2006	2,18787	Bad		
16	15	24-03-2006	3,06114	Bad		
17	16	24-03-2006	1,81227	Bad		
18	17	24-03-2006	1,96251	Bad		
19	18	24-03-2006	1,76532	Bad		
20						

- Inspecting the curve shape



It is possible to maximize each curve by double clicking the displayed small curve. So it is possible to examine and compare the shape of the actual curves for example with the shape of the loaded curves from a previous test.

13 Mathematical expressions

Headroom:

$$Headroom = \left(1 - \frac{\overline{x_1}}{\overline{x}}\right) \cdot 100\%$$

$\overline{x_1}$ = Empty press cycle peak force average

$\overline{x_1}$ = Valid press cycle peak force average

Standard deviation:

$$sd = \sqrt{\frac{n \cdot \sum x^2 - \left(\sum x\right)^2}{n \cdot (n-1)}}$$

sd = Standard deviation

n = Number of measured values

$\overline{x_1}$ = Valid press cycle peak force

Relative

$$\upsilon = \frac{sd}{\overline{x}} \cdot 100\%$$

$\overline{x_1}$ = Valid press cycle peak force average

14 EU Declaration of conformity

EG – Konformitätserklärung

EU Declaration of Conformity

-Original-

CE

Die Firma: *The Company:* C-tec Cable technologies GmbH & Co.KG Ilztalstrasse 11, 94513 Schönberg, Germany

Produktbezeichnung: *Product:* Force Sensor Interface

Typenbezeichnung: *Type:* FSI

Seriennummer: *Serial no.:*

Herstellungsjahr: *Year of production:*

Das bezeichnete Produkt erfüllt die Bestimmungen der Richtlinien:

The above mentioned product complies with the regulations of the directives and amendments:

2014/35/EU Niederspannungsrichtlinie *low voltage directive*

2011/65/EU RoHs Richtlinie *RoHs directive*

2014/30/EU EMV-Richtlinie *directive for electromagnetic compatibility*

durch Einhaltung folgender Normen:

by adhering to the following standards:

DIN EN 12100:2011-03

Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze - Risikobeurteilung und Risikominderung

Safety of machinery - General principles for design - Risk assessment and risk reduction

DIN EN 60204-1:2014-10

Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen

Safety of machinery - Electrical equipment of machines - Part 1: General requirements

DIN EN 50581:2013-02

Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe (RoHs)

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (RoHs)

DIN EN 61000-6-1:2007-10

Elektromagnetische Verträglichkeit (EMV) - Teil 6-1: Fachgrundnormen - Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe

Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments

DIN EN 61000-6-3:2011-09

Elektromagnetische Verträglichkeit (EMV) - Teil 6-3: Fachgrundnormen - Störaussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe

Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

DIN EN ISO 13849-1:2008-12

Sicherheit von Maschinen - Sicherheitsbezogene Teile von Steuerungen - Teil 1: Allgemeine Gestaltungsleitsätze

Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design

Diese Erklärung wird verantwortlich abgegeben durch:

This declaration is submitted by:

Schönberg, 04.02.2016

Ort, Datum
Place, Date

Lothar Schreiner
Geschäftsführer *General Manager*

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Notes: