DiPro – an open-source tool for processing of load-displacement diagrams

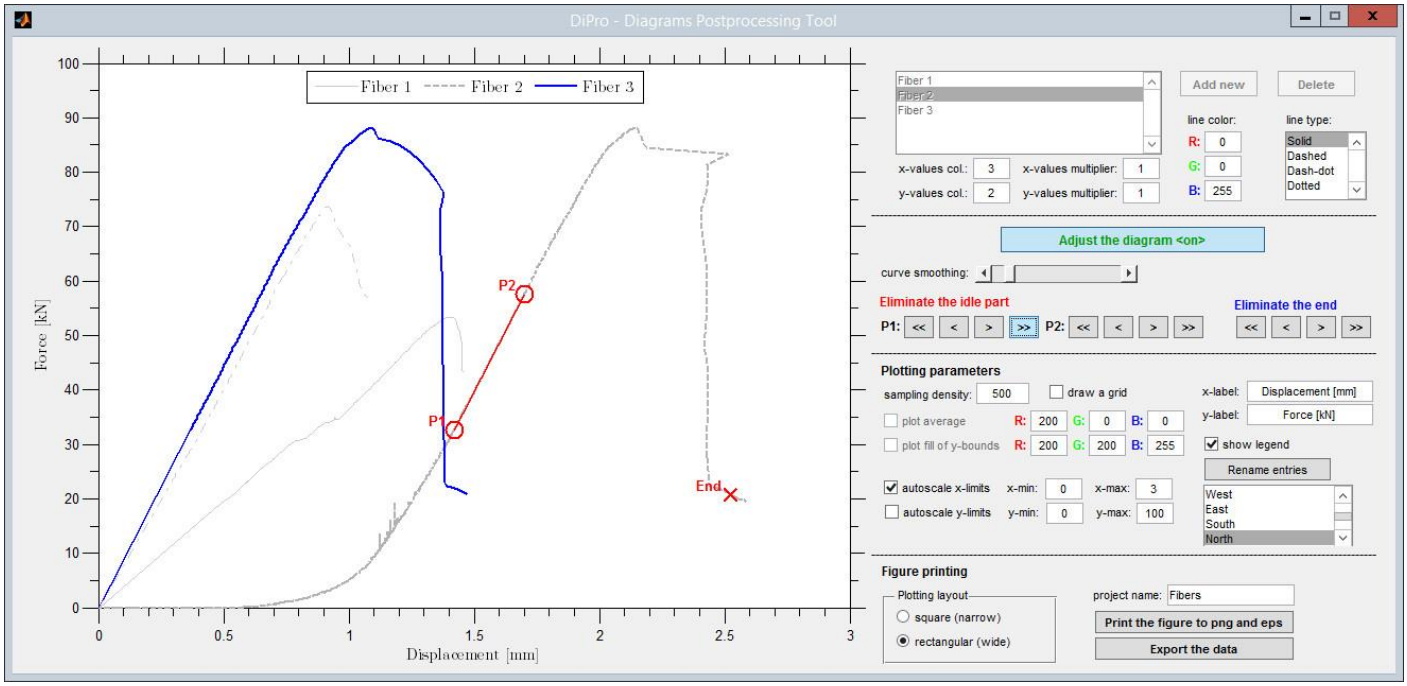
Instruction Manual

Version 1 (2/2016)

Václav Nežerka, Michael Somr, Jakub Antoš, Jan Trejbal and Pavel Tesárek

Department of Mechanics, FCE, CTU in Prague

vaclav.nezerka@fsv.cvut.cz



Introduction

DiPro is a processing tool tailored for adjustment and plotting of diagrams obtained from the data acquired during mechanical tests, such as compression, tension, bending, pull-out etc. The program was developed and can run only in the MATLAB environment. For an optimal performance it is recommended to use MATLAB R2011a or higher.

1. Running the Program

The program initiates after running (by pressing F5 in the editor window) the dipro.m file, located in the root program folder (Figure 1). The folder must be set as the present working directory (pwd). The input data (measured during mechanical testing) must be located in the “input” folder, while folders “files” and “functions” store the program auxiliary scripts and functions. Folder “output” contains exported figures and data in subfolders with the name of individual projects.

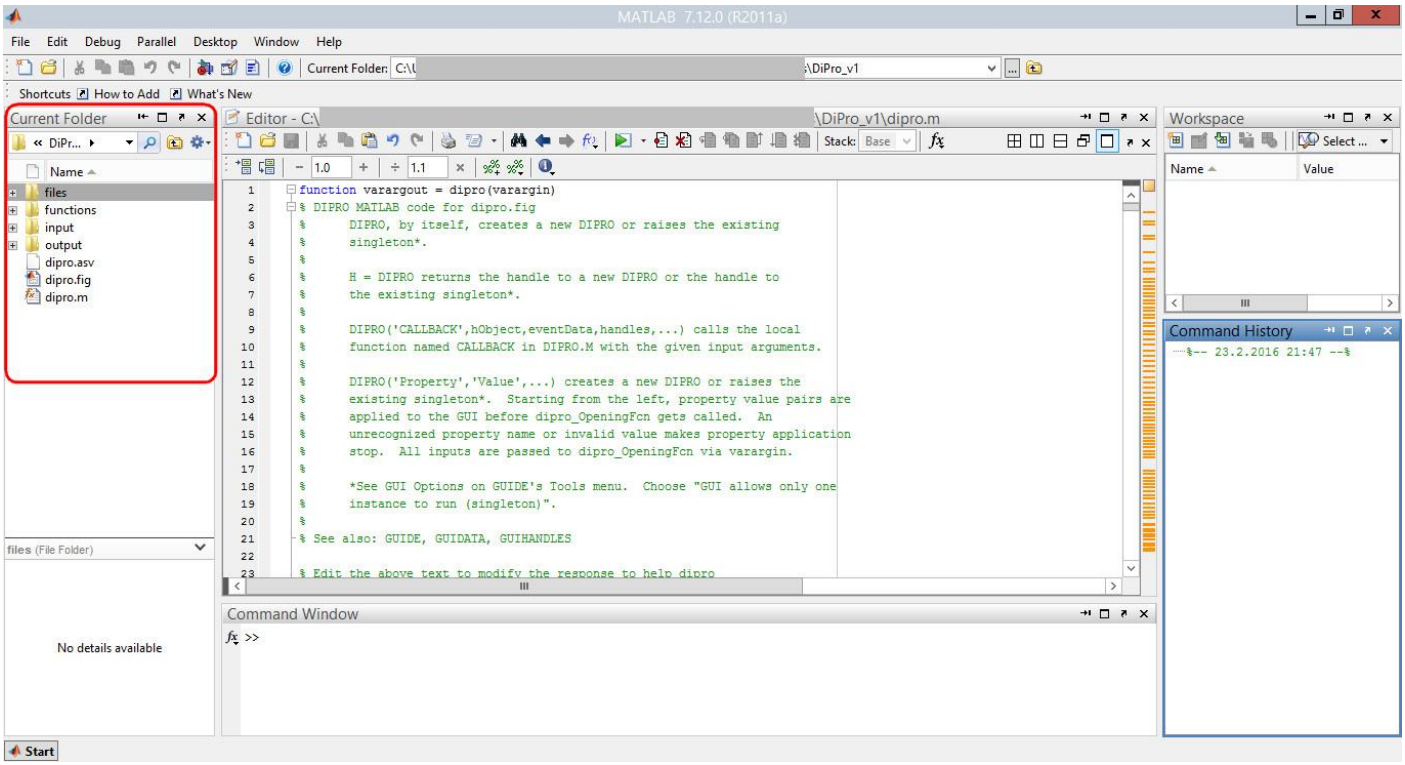


Figure 1: Structure of the program folders and files in the MATLAB environment.

2. Data Acquisition

When initiating the program, data from the measurements can be loaded by pushing the “Add new” button (Figure 2).

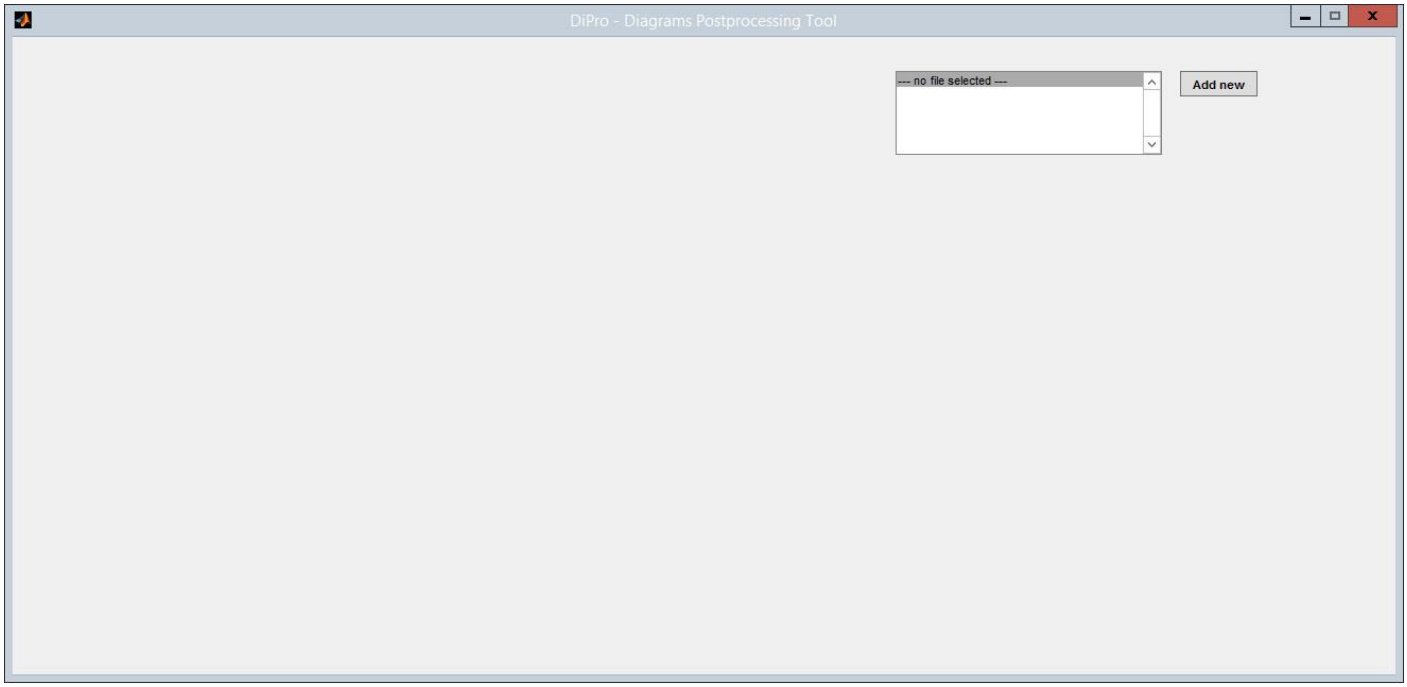


Figure 2: Initial GUI after opening DiPro.

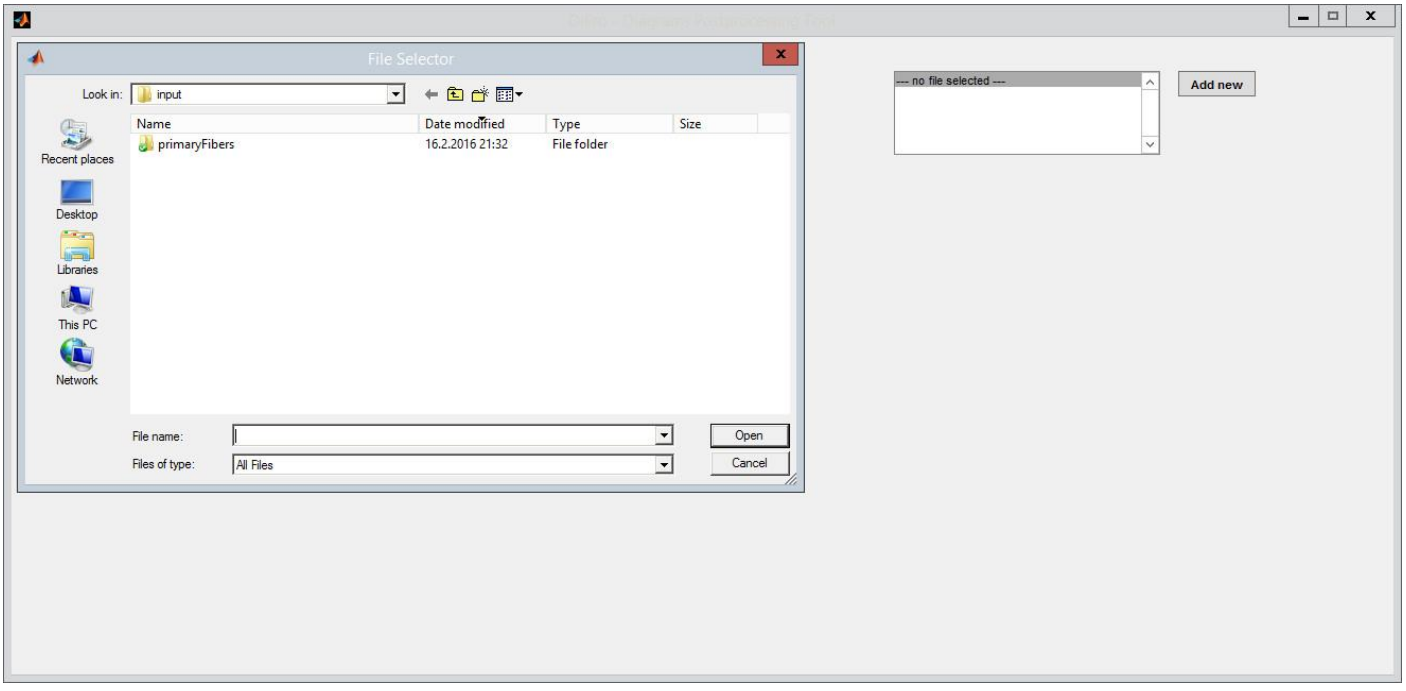
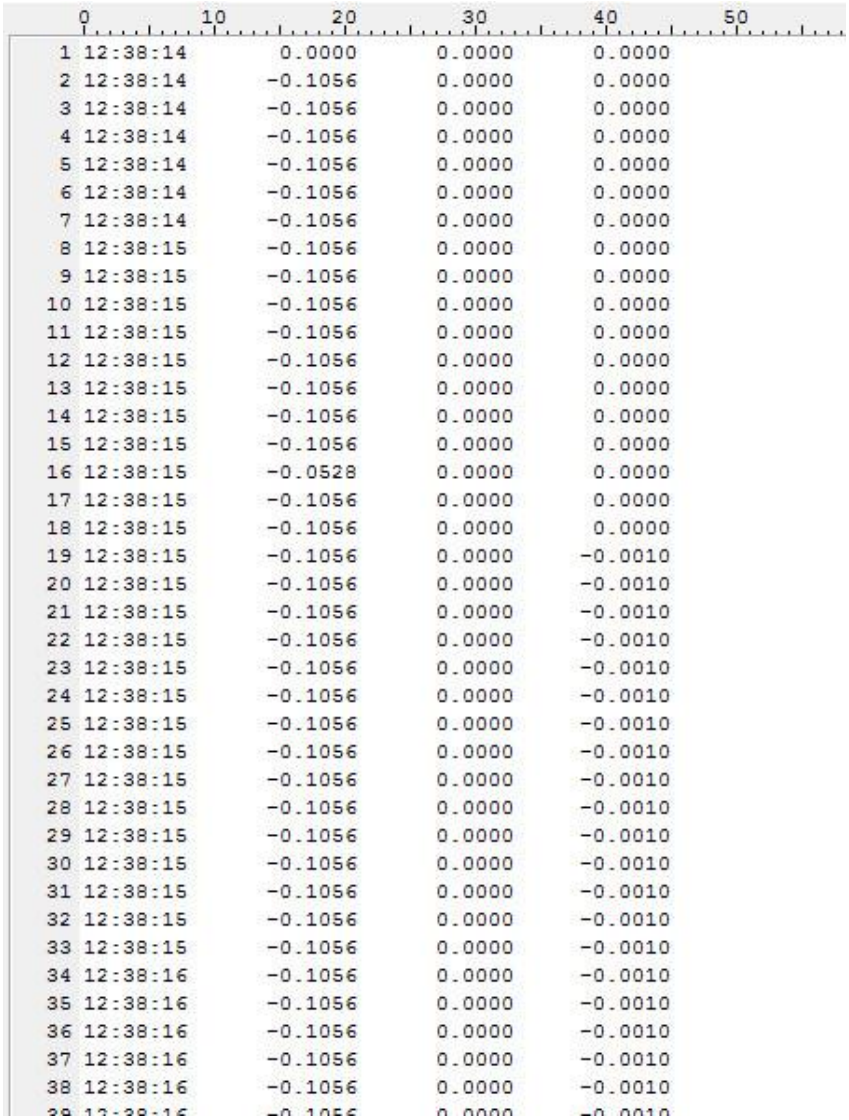


Figure 3: Prompt for loading the data.

The input files can contain an arbitrary number of columns with the measured data, however, no headers are allowed. The file extension does not matter, the only requirement is that the file must be saved in ASCII format.



1	12:38:14	0.0000	0.0000	0.0000
2	12:38:14	-0.1056	0.0000	0.0000
3	12:38:14	-0.1056	0.0000	0.0000
4	12:38:14	-0.1056	0.0000	0.0000
5	12:38:14	-0.1056	0.0000	0.0000
6	12:38:14	-0.1056	0.0000	0.0000
7	12:38:14	-0.1056	0.0000	0.0000
8	12:38:15	-0.1056	0.0000	0.0000
9	12:38:15	-0.1056	0.0000	0.0000
10	12:38:15	-0.1056	0.0000	0.0000
11	12:38:15	-0.1056	0.0000	0.0000
12	12:38:15	-0.1056	0.0000	0.0000
13	12:38:15	-0.1056	0.0000	0.0000
14	12:38:15	-0.1056	0.0000	0.0000
15	12:38:15	-0.1056	0.0000	0.0000
16	12:38:15	-0.0528	0.0000	0.0000
17	12:38:15	-0.1056	0.0000	0.0000
18	12:38:15	-0.1056	0.0000	0.0000
19	12:38:15	-0.1056	0.0000	-0.0010
20	12:38:15	-0.1056	0.0000	-0.0010
21	12:38:15	-0.1056	0.0000	-0.0010
22	12:38:15	-0.1056	0.0000	-0.0010
23	12:38:15	-0.1056	0.0000	-0.0010
24	12:38:15	-0.1056	0.0000	-0.0010
25	12:38:15	-0.1056	0.0000	-0.0010
26	12:38:15	-0.1056	0.0000	-0.0010
27	12:38:15	-0.1056	0.0000	-0.0010
28	12:38:15	-0.1056	0.0000	-0.0010
29	12:38:15	-0.1056	0.0000	-0.0010
30	12:38:15	-0.1056	0.0000	-0.0010
31	12:38:15	-0.1056	0.0000	-0.0010
32	12:38:15	-0.1056	0.0000	-0.0010
33	12:38:15	-0.1056	0.0000	-0.0010
34	12:38:16	-0.1056	0.0000	-0.0010
35	12:38:16	-0.1056	0.0000	-0.0010
36	12:38:16	-0.1056	0.0000	-0.0010
37	12:38:16	-0.1056	0.0000	-0.0010
38	12:38:16	-0.1056	0.0000	-0.0010

Figure 4: Input file example.

3. Working with the Loaded Diagrams

The program allows to customize the look of the plot and via graphical user interface. Moreover, the diagrams can be adjusted so that the initial loading path or the end of the diagram are eliminated, average (mean) curve can be added, and the area bounded by the uppermost and the lowest diagram can be shaded.

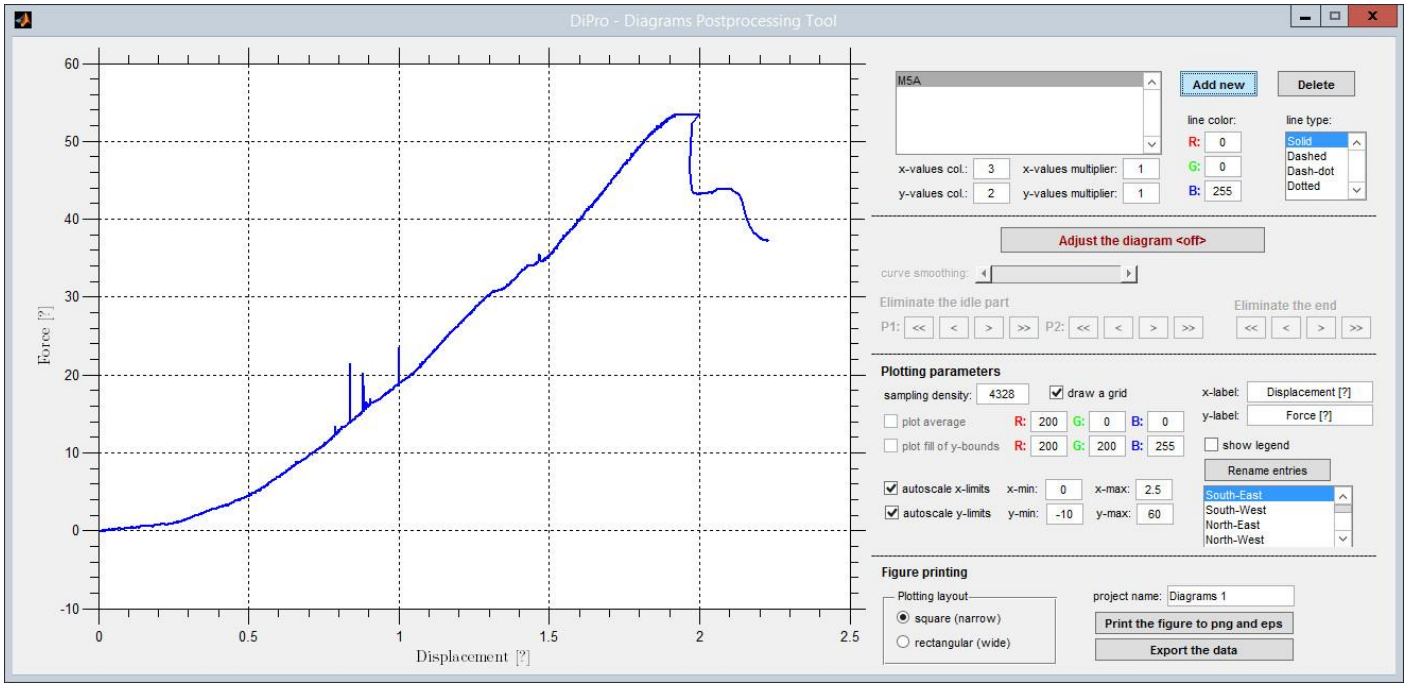


Figure 5: Diagram after loading the input file.

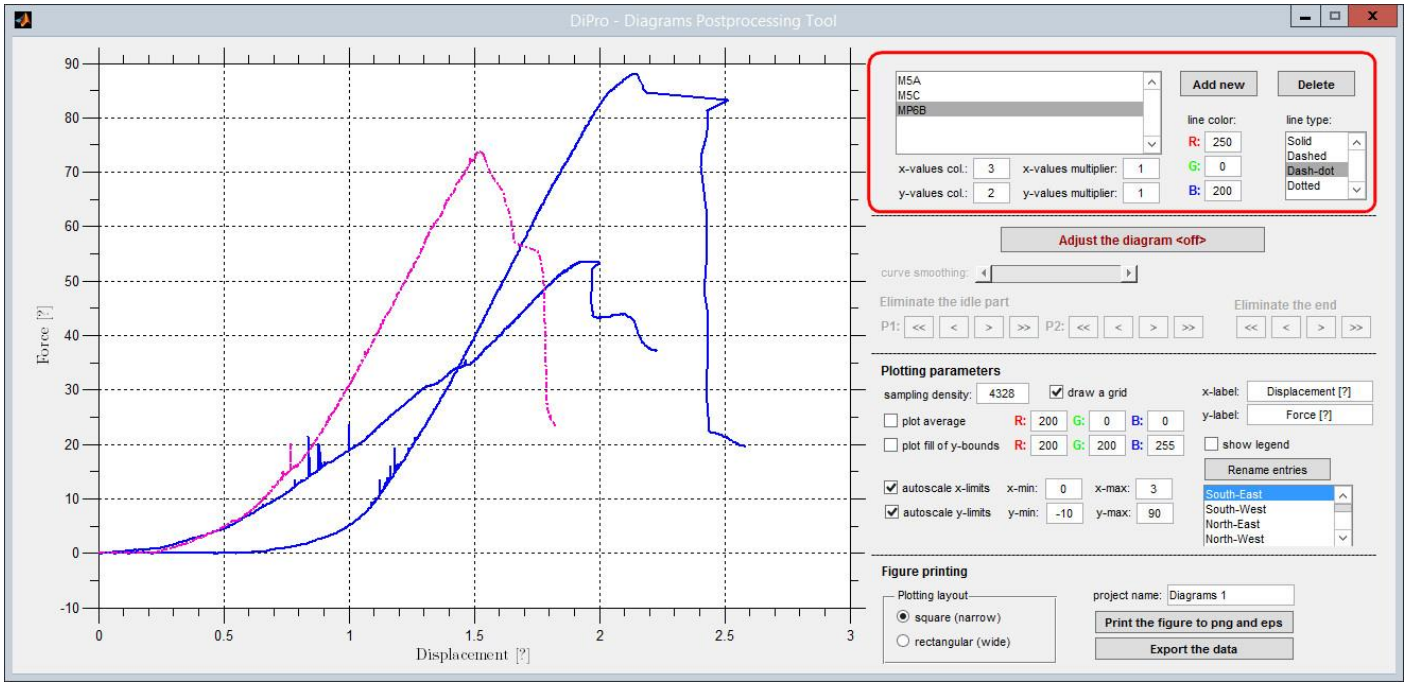


Figure 6: Panel allowing to choose the input-file columns to be displayed on x- and y-axis (*x-values col.* and *y-values col.*), mirror or scale the diagrams using multipliers, adjust the color or line-type of individual diagrams, and finally add another or delete the diagrams.

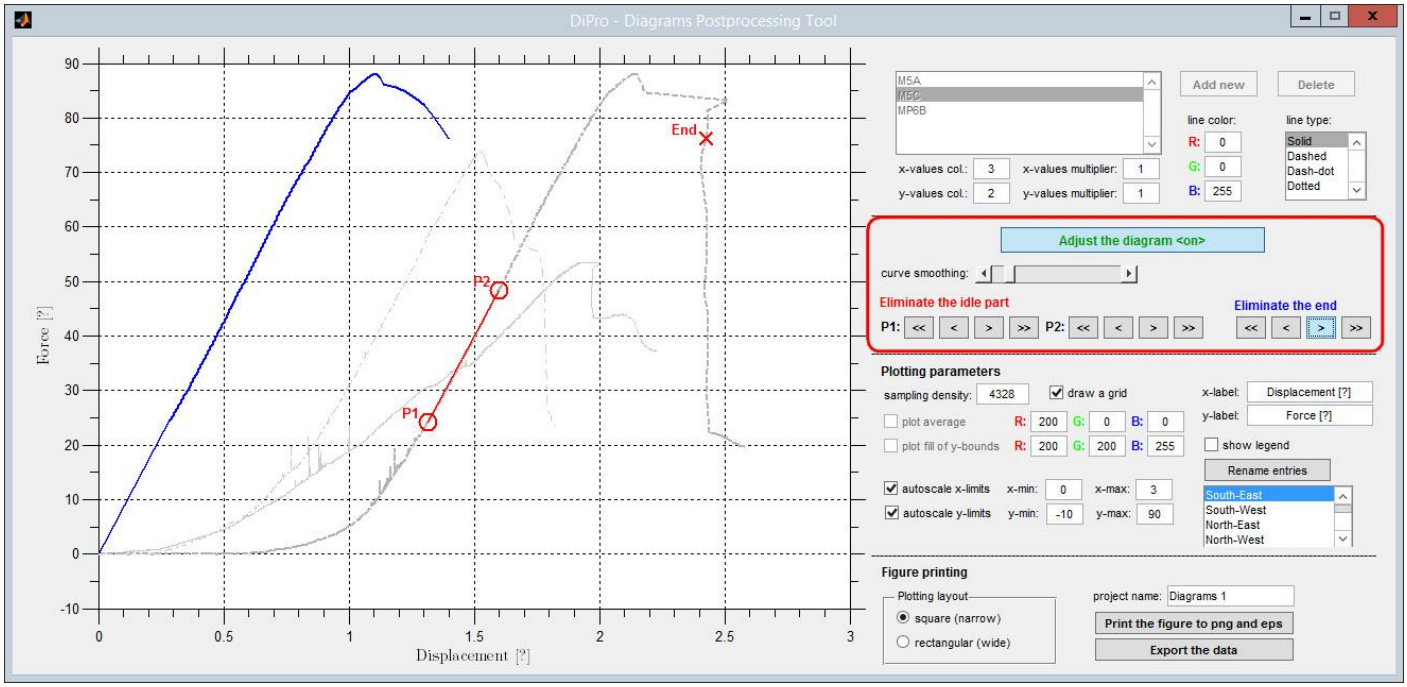


Figure 7: Panel allowing to adjust individual diagrams; after pushing the toggle button *Adjust the diagram <off>* the button turns green and the selected diagram can be adjusted by smoothing, elimination of initial idle part or elimination of the end; the adjustment is terminated by pushing the green toggle button *Adjust the diagram <on>*.

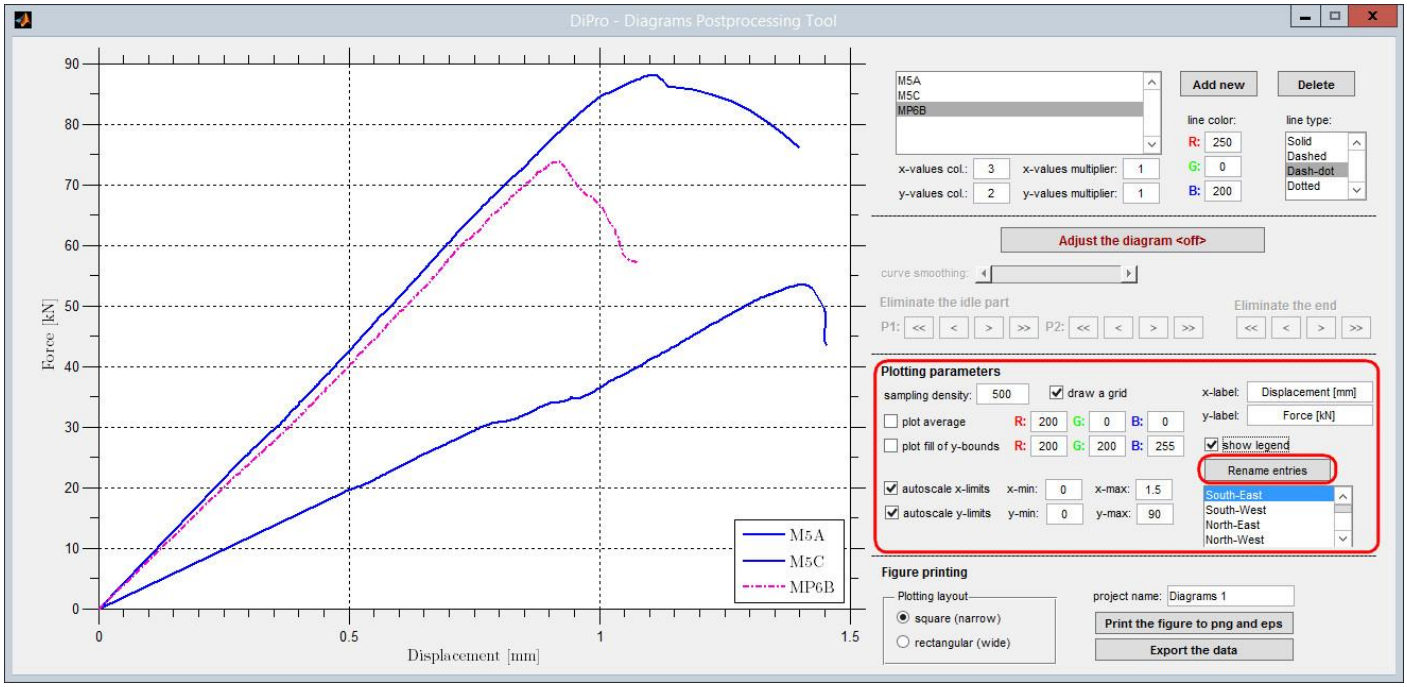


Figure 8: Panel allowing to display average curve, plot hatch (fill) bounded by the curves, change the limits of x- and y-axis, rename individual diagrams (indicated by red ellipse), display a legend and choose a proper location.

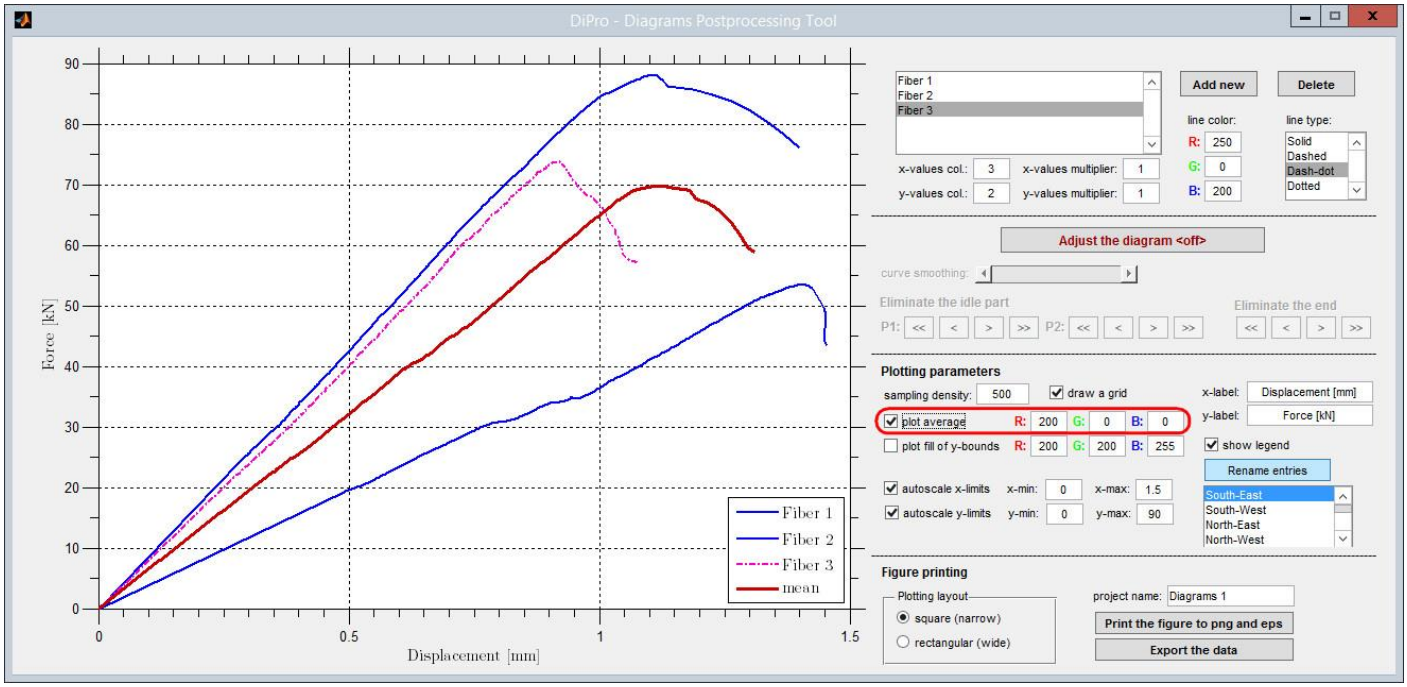


Figure 9: Average (mean) curve; the sampling density defines the number of segments into which the diagrams are divided for the purpose of the average curve calculation.

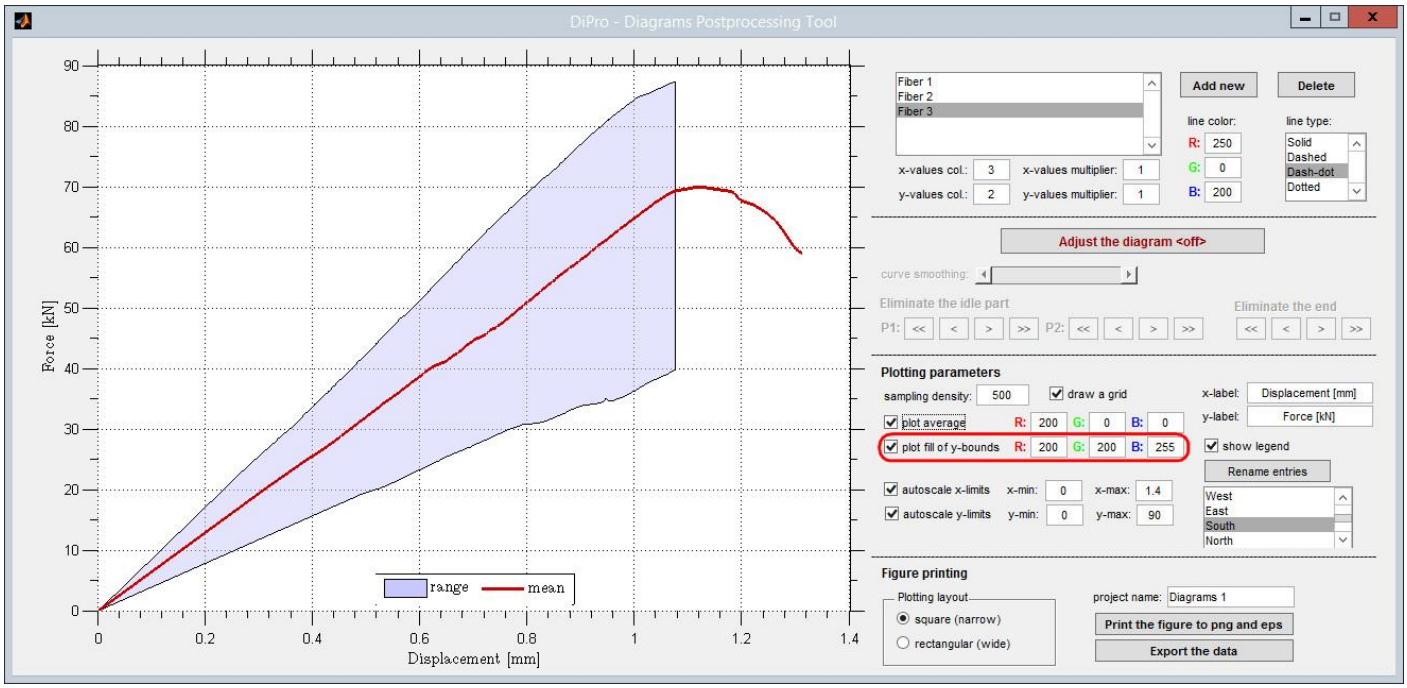


Figure 10: The fill bounded by minimum and maximum curves (with respect to y-values); the range in x-direction is limited by the curve that reached the minimum x-value.

4. Data Export

The statistical data and figures can be easily saved using the last panel in the user interface. The files are saved into the output folder and a subfolder named by *project name*. The layout of the printed (exported) figures can be either square narrow (suitable for two-column journal templates) or rectangular wide, which can be selected using the radio buttons.

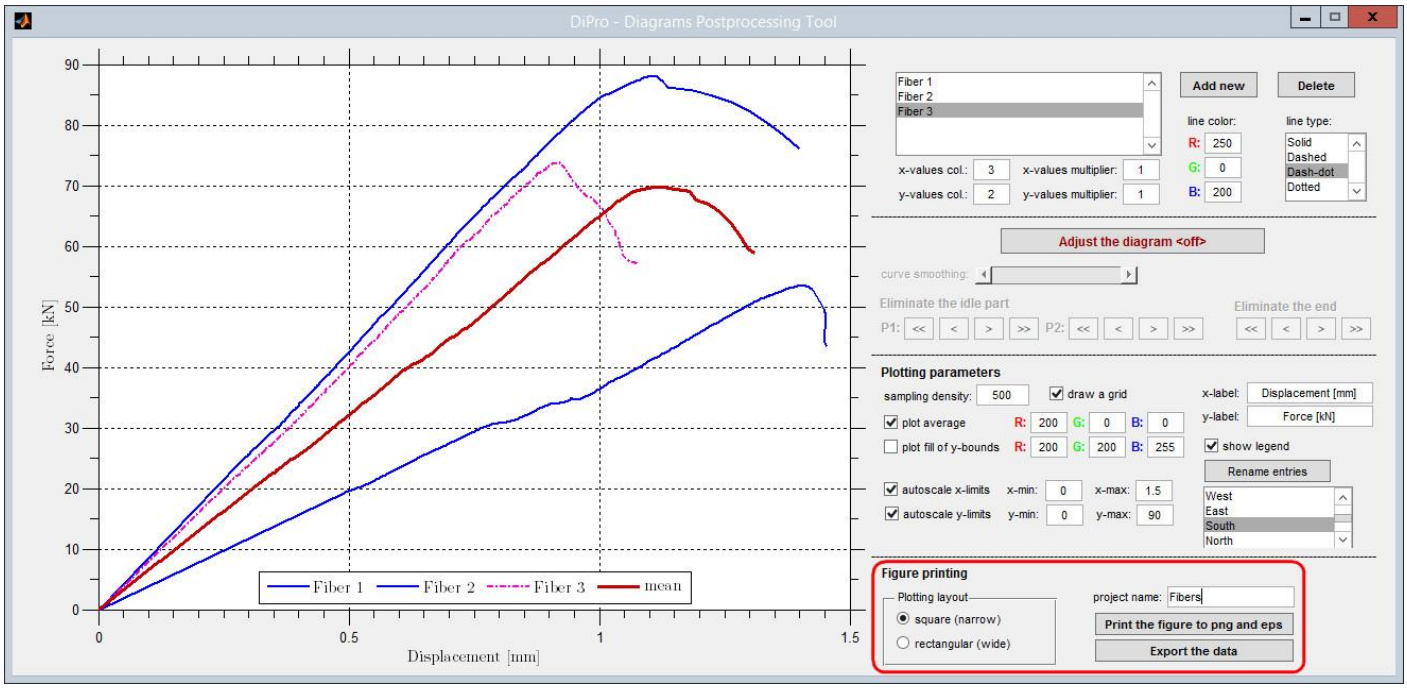


Figure 11: Panel with export controls.

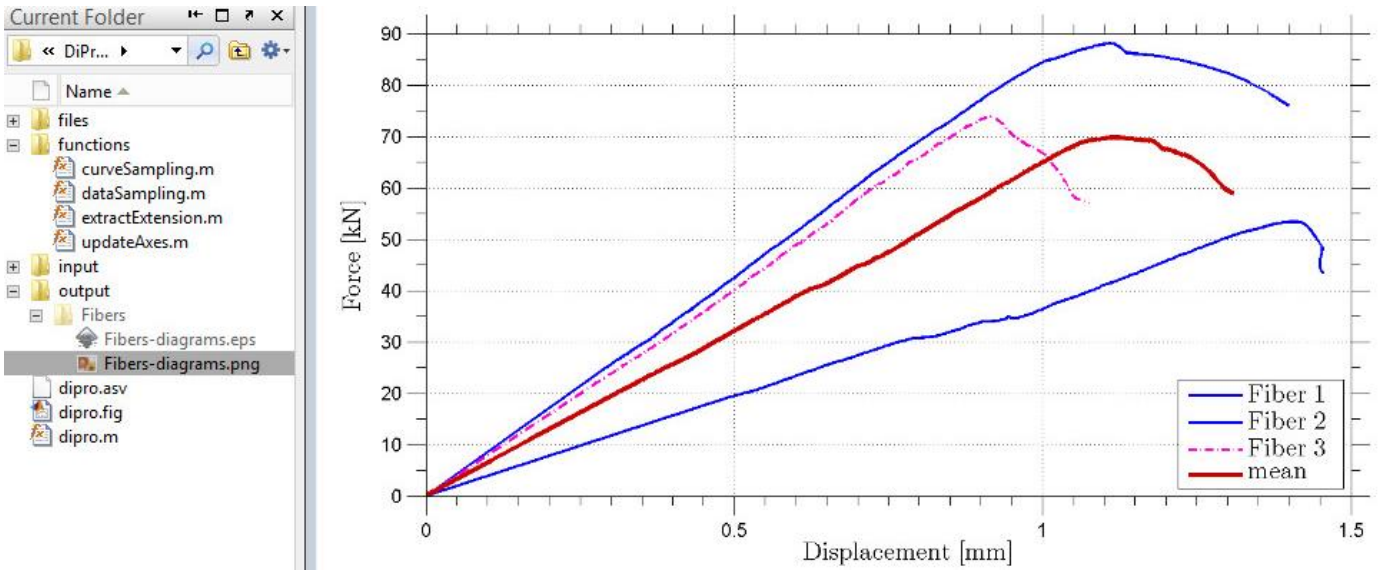


Figure 12: Exported figure; higher quality of typesetting and better quality is reached in the vector (eps) format, which is recommended for publishing.

```
LATEX INPUT:
------------
------------

\begin{table}[ht]\caption{--> here comes the table caption <--}
\label{tab:--> here comes the table caption <--}
 \centering
 \begin{tabular}{c c c c c }
  \hline
    \multirow{2}{*}{mix} & $F_{\mathrm{max}}$ & $d$ at $F_{\mathrm{max}}$ & $G_f$          & $d_{\mathrm{max}}$  \\
                         & [y-unit]           & [x-unit]                  & [energy unit] & [x-unit]              \\ \hline
    Fibers  & 71.734 ($\pm$~17.425) &  1.139 ($\pm$~0.252) &  54.118 ($\pm$~20.547) &  1.334 ($\pm$~0.225) \\ \hline
 \end{tabular}
\end{table}


DATA SUMMARY:
-------------
-------------

Mean values:
------------
Y max    X @ Y max   area    X max
71.734     1.139     54.118      1.334

Standard deviations:
--------------------
Y max    X @ Y max   area    X max
17.425     0.252     20.547      0.225

Coefficients of variation [%]:
------------------------------
Y max    X @ Y max   area    X max
24.3     22.1      38.0      16.9
```

Figure 13: Exported data to txt file using the *Export the data* button.

Acknowledgement

The financial support by the Czech Science Foundation research projects 15-12420S is gratefully acknowledged.