

# Users manual

for

Tool Monitor System - monitorsoftware TMSMon 1.9

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# Tool Monitor System TMS

## Features

- \* Visualization of cut
- \* Programming of parameters
- \* Statistics (power and work)
- \* Export of statistics for spread sheets
- \* Print of
  - active cut,
  - parameters
  - statistics

## 1 Introduction

TMSMon is made for visualization, setting up and collecting data (statistics) for Unipower Tool Monitoring System. The software is Windows based giving it the following system requirements.

### 1.1 System requirements

- Processor: Pentium 130MHz  
Harddisc: Min. 3Mb free disk space. 1.5Mb for each following statistics file  
COM-port: 1 available RS232-port. Max. COM8  
Monitor: Min. resolution 800x600.  
Operating system:
  - Windows 98, Me
  - Windows NT 3.5 or newer
  - Windows 2000
  - Windows XP
  - Windows 7
  - Windows 8, 8.1
  - Windows 10

### 1.2 Installation

The software may be supplied in different ways; on discette or CDROM together with the HPL600 or via Hydrias website: [www.unipower.dk](http://www.unipower.dk). The installation procedure depends on the media.

#### Download

Save or execute the downloaded file Setup.exe and follow the installation programme.

#### Discette

Run „a:setup“ and follow the installation programme.

#### CDROM

If the installation does not start automatically, run „setup.exe“ from the CDROM and follow the installation programme.

### 1.3 Starting up TMSMon for the first time

TMSMon is set up by default to communicate with

HPL600 via Com1. Therefore, if HPL600 is connected to a different Com-port, the Com status light will be red (see figure 1.1).



Figure 1.1 Com status

If so, the correct port must be chosen. Via the menu select Communication and the desired Com port or Auto connect (see figure1.2).

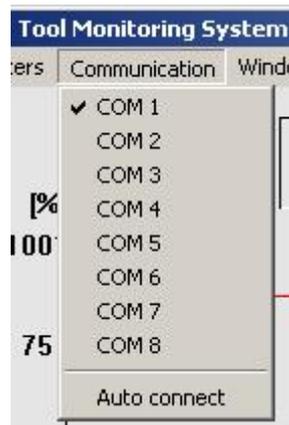


Figure 1.2 Communication

If HPL600 is found, the Com status light changes to green and the system is ready for use. If not the user must investigate and find the reason.

Next time TMSMon is started the correct Com port is stored (remembered), so setting up the port is only necessary the first time. User settings are generally stored to make use of the software as easy and straightforward as possible.

## 2 Layout

The main function of the software is the visualization of the actual cut, so a curve of it is always visible. As shown in figure 2.1 this means that approximately half of the screen area is fixed.

How the remaining area is used is partly up to the user who via the menu is given some possibilities. The different elements of the visualization will be explained below.

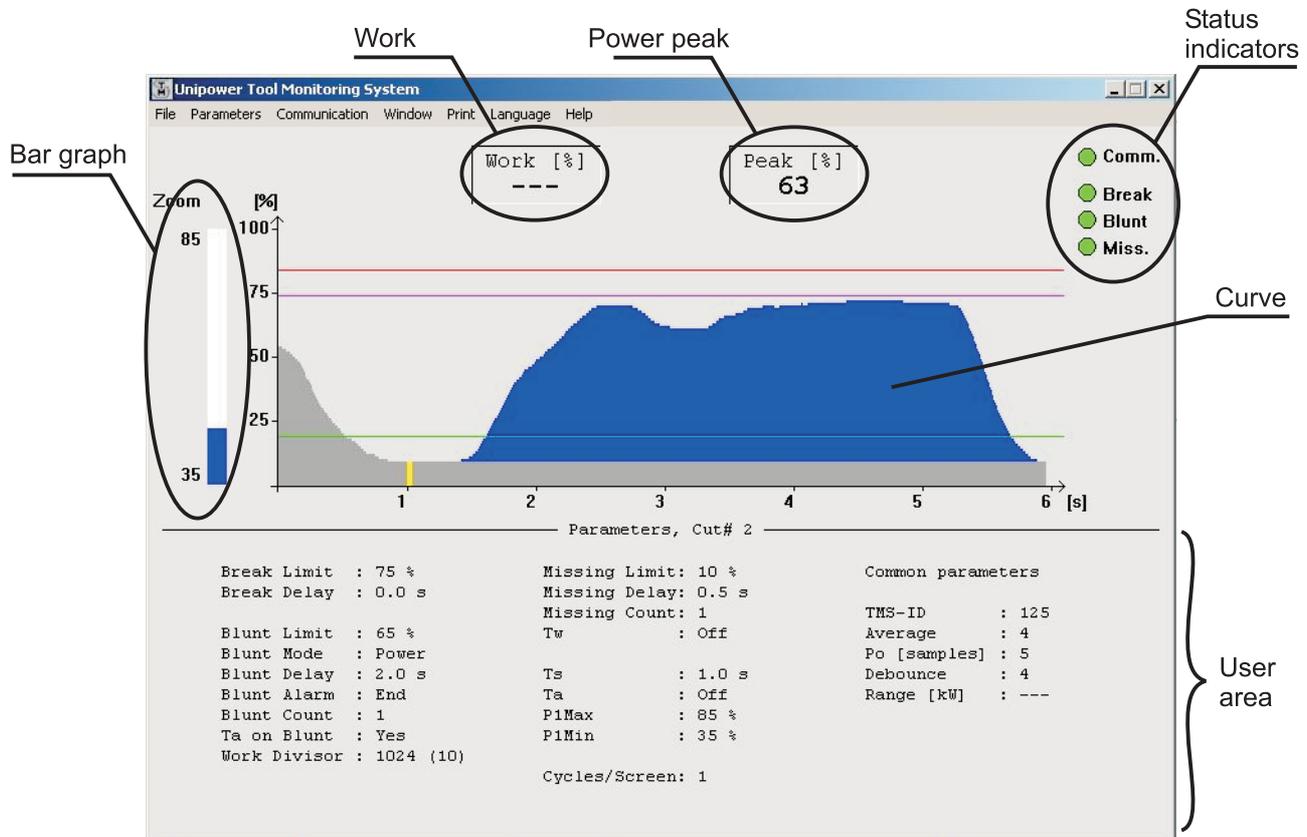


Figure 2.1 Layout of the visualization screen

### Bar graph

The actual value of the power measurement is shown here as soon as communication is established. The zoom settings are shown to the left of the bar graph.

### Work

If the blunt supervision is based on work measurement, the accumulated work measurement is displayed in this field. Otherwise the field shows „- - -“.

### Power peak

Peak value in this case means the largest value above Po. The value is updated continuously.

### Status indicators

A number of lights indicate to the user the status of the HPL600 - as well as the communication status to the unit.

### Curve

The machining sequence (Power) of the actual cut is shown with the active limits.

### User area

In this field the user chooses the data to be shown; parameters or statistics.

### 2.1 Bar graph

The measurement range of the bar graph depends on the zoom settings. The read out always corresponds to the measurement value (power) shown in the display of the HPL600; i.e. 0-100%. Should the absolute value be less than **P1Min** (Low zoom value) the bar graph is empty and if the value is above **P1Max**(Upper zoom value) the bar graph is full. The bar graph may be used as an indicator of correctly installed measurement transducer (e.g. APM100 or APM380).

### 2.2 Work

When Po has been calculated/measured the power measurements are integrated to produce a work measurement, with a range of 0-100%. Depending on the **Divisor** setting, this happens at different speeds; If 100% is reached before the end of the cut, the divisor must be increased, whereas a small work measurement is increased by decreasing the divisor.

### 2.3 Peak power

As soon as the supervision is active, which means after calculating/measuring  $P_o$ , this area shows the peak value of the power measurement above  $P_o$ . The value may be found on the curve as the largest vertical distance of the blue area. The value may be used to determine the limit for break supervision.

### 2.4 Status indicators

Four lights are shown, which under normal circumstances all are green, but changes to red when user intervention of some sort is required:

Comm.

Communication. Green = OK, Red = No connection

Break

The limit for break supervision has been exceeded and produced an alarm.

Blunt

The limit for blunt supervision (Power or work) has been exceeded and a blunt alarm is given.

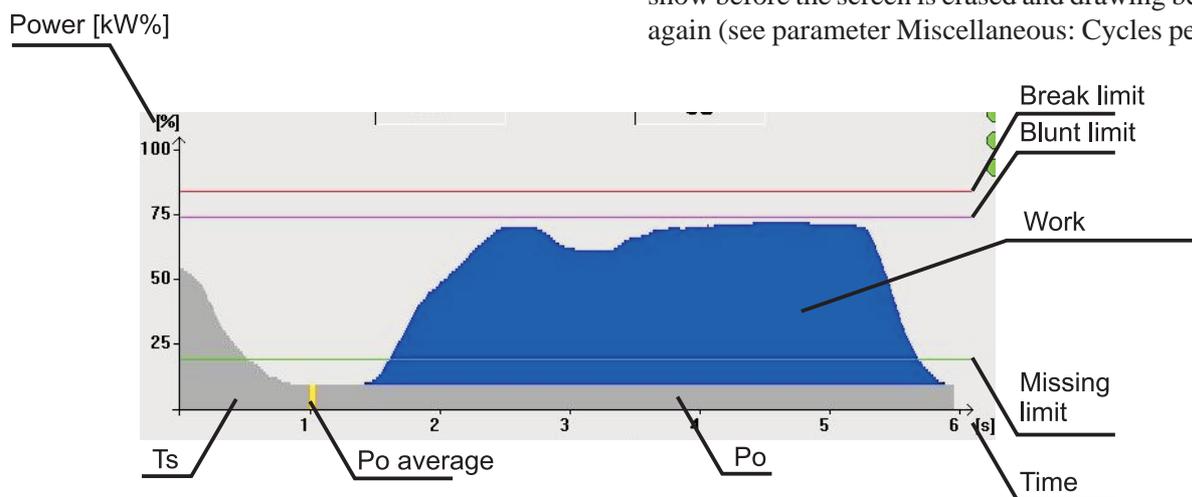


Figure 2.2 Visualization of the actual cut

See explanation of the elements below:

Power [kW%]

The measurement after zoom (see parameter Measurement: P1Max and P1Min). Always lies between 0 and 100%.

$T_s$

In case the motor hasn't reached the correct rpm when the start signal comes (as shown in figure 2.2),  $T_s$  may be used to „delay“ calculating/measuring the idle power ( $P_o$ ). If  $T_s$  was not used in this circumstance the measured  $P_o$  would be far too high.

$P_o$  average

To cope with a possibly fluctuating power signal,  $P_o$  may be calculated as an average of a number of measure-

Missing

The power measurement did not exceed the missing limit for the entered duration resulting in an alarm.

In addition the following light appears during this given error:

Err 1

If the measured/calculated  $P_o$  value added to the break limit exceeds 100%, this text is shown along with a red light.

All alarms may be reset from the keyboard, provided the start signal is no longer present. Reset is done by hitting the space bar.

### 2.5 Curve

Visualization of the actual cut contains many elements, all of which contribute to provide the user with a quick impression of the quality of the cut (see figure 2.2). The curve is updated, as long as the start signal is present. Subsequently the curve remains visible until the next start signal. However, the user may set up how many cycles to show before the screen is erased and drawing begins over again (see parameter Miscellaneous: Cycles per screen).

ments. This number may be set from 1 to 25, which means that a very fast  $P_o$  measurement (10ms) also is possible.

$P_o$

After calculating/measuring  $P_o$ , this value is the basis of the following supervision, since it is subtracted from the actual measurement producing true shaftpower (blue curve). Measurements below  $P_o$  are set to 0%.

Time

The best resolution of the curve is with cuts shorter than 6 seconds. After this duration, the number of measurements per point (pixel) is doubled every time the curve takes up the whole screen (12, 24, 48... seconds).

## Limits

Each limit is drawn with its own colour; Break = red, blunt = purple and missing = green. If the blunt supervision is based on work measurements, the limit isn't shown on this curve, but on the statistics of work values (see chapter 4).

## Work

The area of the blue curve is integrated (summed up) to a large value depending on the duration of the cut. This sum is the actual work, but due to the limitations of three digits (HPL600) the sum is divided by a divisor (see parameter Measurement: Work divisor), producing a number between 0 and 100%.

## 2.6 User area

The area below the curve of the actual cut has several purposes - depending on the user's wish. Changing the content of the area is done via the menu under „Window“, as shown on the following figure 2.3.

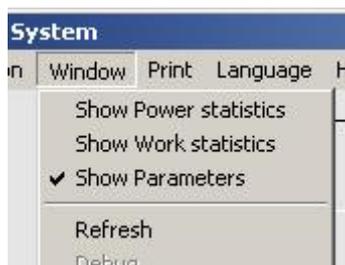


Figure 2.3 Choosing the user area

The choices include two statistics (Power and Work) as well as the parameters for the actual cut. Selecting a new cut replaces the parameters with those for the newly selected cut.

## 3 Setting up HPL600

The HPL600 may be programmed from TMSMon parameter by parameter, cut by cut or with a whole parameter set loaded from disc. In addition a parameter set may be saved on disc, making programming of several HPL600 with the same set of parameters easy.

### 3.1 Parameters

Via the menu (see figure 3.1) a cut is selected, for which the parameters may be altered. All cuts may be programmed independantly of the actual cut in operation making the user independant of the CNC controlling the machine. If HPL600 isn't correctly connected to TMSMon with the status light for communication red, a warning is given at the start of parameter setup, telling that changes cannot be sent to HPL600. The parameter window may still be opened for viewing.

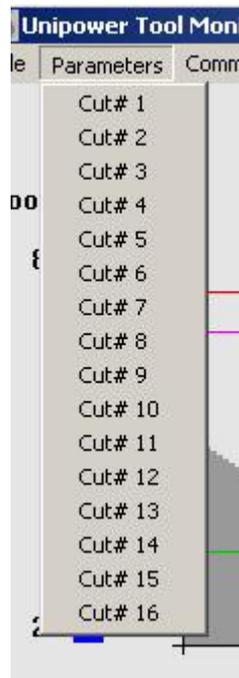


Figure 3.1 Cut select for parameters

Selecting a cut produces the following dialogue box, where all parameters for the cut in question may be altered. Also parameters common to all cuts are altered through this dialogue box.

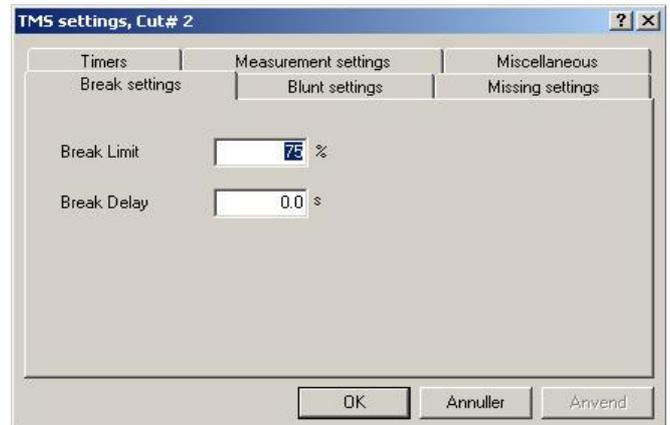


Figure 3.2 Altering parameters

Each group of parameters is shown by selecting the corresponding property sheet. The parameters are altered by entering the desired value or for some parameters selecting from a list. When the changes should be sent to HPL600 press „Apply“ or „OK“. „Apply“ gives the possibility of testing the new values and subsequently returning to the old values by pressing „Cancel“. If „OK“ is pressed returning to original values is only possible by re-entering them.

To give a quick general view of all parameters and their range they are all listed in the following. Please refer to the manual for HPL600 for a thorough explanation of the meaning and use of the parameters.

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The parameters are listed by group meaning that group:parameter refers to the „group“ property sheet and the „parameter“ parameter.

**Break:Break limit**

Max. limit for break supervision. [0 - 100] %

**Break:Break delay**

Response time for break alarm. [0.0 - 2.5] s. 0.0s means app. 30ms.

**Blunt: Blunt limit**

Max. limit for blunt supervision. [OFF, 0 - 100] %

**Blunt: Blunt mode**

Supervision mode for blunt. [Power, Work]

**Blunt: Blunt delay**

Response time for blunt alarm, provided the blunt mode is Power. If it is Work the blunt delay is ignored.

**Blunt: Blunt alarm mode**

Point of executing the blunt alarm. [End, Immediately]. By „End“ the alarm is given after expiration of the start signal, i.e. the cut is completed. By „Immediately“ the cut is interrupted as soon as the blunt alarm is detected.

**Blunt: Blunt count**

No of blunt alarms before executing it. [1 - 8]

**Missing: Missing limit**

Min. limit for missing supervision. [OFF, 1 - 100] %

**Missing: Missing delay**

Time for the measurement to exceed the missing limit during the supervision.

**Missing: Tw**

Duration of the missing supervision. [OFF, 0.1 - 25.0] s. (see manual for HPL600 for more information)

**Missing: Missing count**

No of missing alarms before executing the alarm. [1 - 8]

**Timers: Ts**

Start delay for the cut. [0.0 - 25.0] s. 0.0 means app. 30ms.

**Timers: Ta**

Duration of the supervision. [OFF, 0.1 - 25.0] s. Off means supervision for as long as the start signal is present.

**Timers: Ta on blunt**

Decides whether expiration of Ta deactivates blunt supervision or not. [Yes, No]

**Measurement:P1Max**

Scales the range from the top. [P1Min+10 - 100] %

**Measurement: P1Min**

Scales the range from the bottom. [0 - P1Max-10] %

**Measurement: Average**

Each measurement value is an average of a number of measurements [1 - 25]

**Measurement: Work divisor**

The work measurement is scaled with this number to produce a value between 0 and 100%. [1 - 16] The number is entered as a power of 2, i.e. entering e.g. 8 gives a divisor of 256.

**Measurement: Po**

The idle power (Po) is calculated as an average of a number of measurements. [1 - 25] This number is common to all cuts.

**Miscellaneous: Cycles pr. screen**

Number of cuts shown on the screen before it is erased and redrawn from the left. [1 - 8]

**Miscellaneous: Debounce**

Number of internal cycles (@ 10ms) where an external signal must be present to be recognized. [1 - 8]. This parameter is common to all cuts.

**Miscellaneous: Unit ID**

Each HPL600 unit may be assigned an ID. [1 - 255] This setting is included for future use and has no function in this version. The parameter is common to all cuts.

**Miscellaneous: kW range**

The parameter has no function in HPL600.

**3.2 Save parameters on disc**

All parameters for an HPL600 may be stored on disc for documentation or easy programming of a new HPL600. This function is found on the menu as shown on figure 3.3.



Figure 3.3 Save parameters on disc

The parameters are stored in a format, which is compatible with spread sheets. This way the parameters may be moved and displayed without HPL600 or TMSMon.

### 3.3 Load parameters from disc

To load a parameter set from disc, please activate the following submenu:



Figure 3.4 Load parameters from disc

If HPL600 is not connected to TMSMon, a warning is displayed and the command is aborted. Otherwise the parameters are loaded and sent to HPL600, displaying a message window with the progress of the process.

## 4 Statistics

The Statistics functionality in TMSMon is quite comprehensive and gives the user the ability of storing up to 50.000 cycles for each cut separately. If this limit is exceeded, the first cycles are replaced with new ones, making the statistics represent the latest 50.000 cycles at all time. Besides showing the statistics, it is also possible to reset it (cut by cut and totally), print it as well as exporting it in a spread sheet format.

As previously mentioned, the statistics is shown in the user area of the screen by selecting it as described in paragraph 2.6. TMSMon distinguishes between power statistics and work statistics. Both are calculated in real time and may be selected independantly. Figure 4.1 shows an example of a work statistics with the corresponding blunt limit. This means that blunt supervision is based on work in this case.

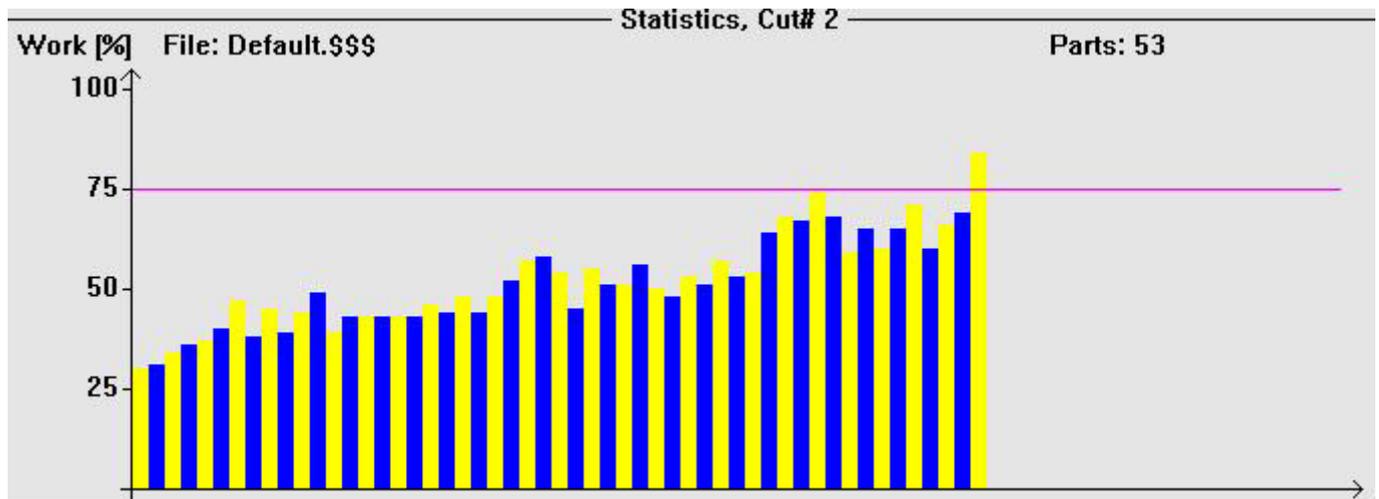


Figure 4.1 Work statistics

Besides the calculated measurements the user area for statistics also displays the name of the file containing the data as well as the number of cycles stored for the active cut.

Figure 4.1 shows a statistics of fewer than 75 cycles, in which case every second cycle is displayed in yellow and every other second in blue. For statistics larger than 75 cycles all cycles are shown as blue bars. Up to 600 cycles can be shown with one cycle pr. bar, whereas more than 600 cycles must be shown as a number of cycles pr. bar. How many depends on the total number of cycles and may be calculated as the total number of cycles divided by 600 then adding one; If for instance a number of 2200 cycles is present every bar represents 4 cycles. Every bar is always the largest of the represented cycles.

As for parameters the statistics may also be stored and loaded from disc. These functions are both activated from the menu.

### 4.1 Save statistics

Figure 4.2 shows how to find the command in the menu.



Figure 4.2 Save statistics

As soon as the statistics are saved the file name in the user area changes to the new file name. This also stops adding to the „old“ file, since it is no longer the active file. The name of the new file is stored so this statistic

file will be loaded and made the active file the next time TMSMon is started.

## 4.2 Load statistics

If the user wishes to load/use a different set of statistics, please select the following from the menu:



Figure 4.3 Load statistics

After loading of the new statistics the file name in the user area is replaced with the new one and the new data is shown for the actual cut.

## 4.3 Export statistics

For possible processing of data a function for exporting the statistics (Power or Work) in a spread sheet format is included in TMSMon. This function is found in the menu as shown in figure 4.4.

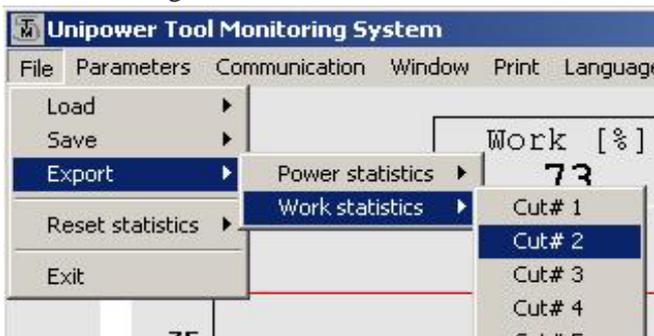


Figure 4.4 Export Work statistics for cut 2

As shown in figure 4.4 the export is split up, so the output is a unique statistic (Power or Work) for one cut (1 - 16). This gives the user the possibility of selecting the output independantly of parameter settings and active cut.

## 4.4 Reset statistics

Reset of the statistics is done via the menu in the following way as shown in figure 4.5.

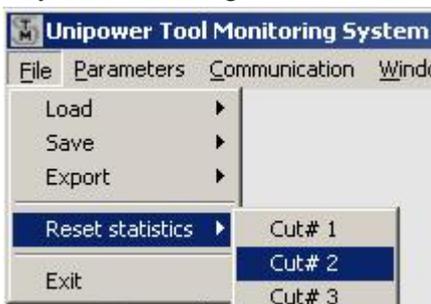


Figure 4.5 Reset statistics for cut 2

The statistics for each cut may be reset separately or the whole statistics (for all cuts) may be reset with one command („All“). Once the command for resetting a

statistic is given it can not be undone. Therefore please pay attention when using this function.

## 5 Print

If a printer driver is installed for the operating system TMSMon includes several print possibilities as shown on figure 5.1.

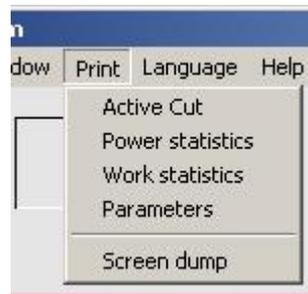


Figure 5.1 Print

For Windows 98 and Me the default printer is used, and the orientation of the paper is landscape. For Windows NT, 2000 and XP the user may select both printer and orientation as well as a number of other settings.

### Active cut

This function prints out the curve for the actual cycle - i.e. the upper half of the screen except the bar graph and status lights. With this feature a sequence may be printed and then discussed at a later time.

### Power statistics

The power statistics may be printed for the actual cut only; It is not possible to print the statistics for a non active cut.

### Work statistics

The work statistics for the active cut is printed. Statistics for non active cuts can not be printed.

### Parameters

The parameters are printed for all cuts starting with the the common parameters followed by a table with all cut specific parameters and corresponding cut numbers.

### Screen dump

Choosing a Screen dump produces a file of the shown display contents in Windows BMP-format. The location and name of the file is selected by the user. With this function it is possible to store a curve for later analysis or documentation without the need of a printer.

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## 6 Language

TMSMon supports at present three languages; English, German and Danish - see figure 6.1.



Figur 6.1 Language

After selecting a language all menus and texts change. This way also all printouts and exports are presented in the selected language.

## 7 Help

In the „Help“ menu a brief legend of the elements of the curve for the actual cut may be selected („Legend“) as well as the software version of TMSMon („About“) - see figure 7.1.



Figur 7.1 Help

## Appendix A Error codes

Code	Meaning
<b>30001</b>	The file selected for opening is not a parameter file for HPL600
<b>30002</b>	A common parameter from the parameter-file could not be read. The format is corrupted.
<b>30003</b>	The kW range could not be read from the parameter file. The format is corrupted.
<b>30004</b>	A cut specific parameter from the parameter file could not be read. The format is corrupted.
<b>30005</b>	A timer parameter could not be read from the parameter file. The format is corrupted.
<b>30007</b>	The file to be read is corrupted. Error in the format.