

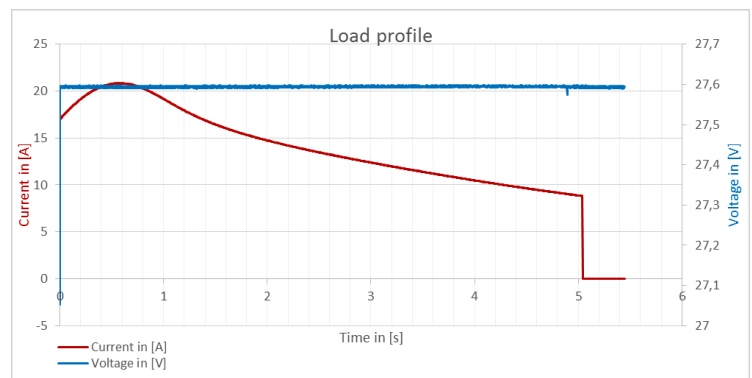
## Application Note #13

# Simulation of a CSV Load Profile

Electronic loads from Höcherl & Hackl are ideally suited for fast, dynamic operations which are controlled via the digital interfaces, due to their short execution times for SCPI commands and queries. Among other things, this enables the electronic loads to simulate load profiles saved in CSV files. For instance, a few lines of Python code can be used to read out the data from a CSV file and to control the electronic load accordingly. Usually the limiting factors are the transmission times of the data interfaces and the time resolution of the operating system.

### Example

The following load profile shall be simulated with the electronic load:



The single points of the load profile are saved in a CSV file with a time resolution of 1 ms. Due to the mentioned limitations the following execution times were achieved for the command sequence

CURR X.XXX;MEAS:CURR?;VOLT? (set nominal current and query current/voltage measurements):

RS-232 (115200, 8, 1, None): 7 ms\*

USB VCP (115200, 8, 1, None): 25 ms\*

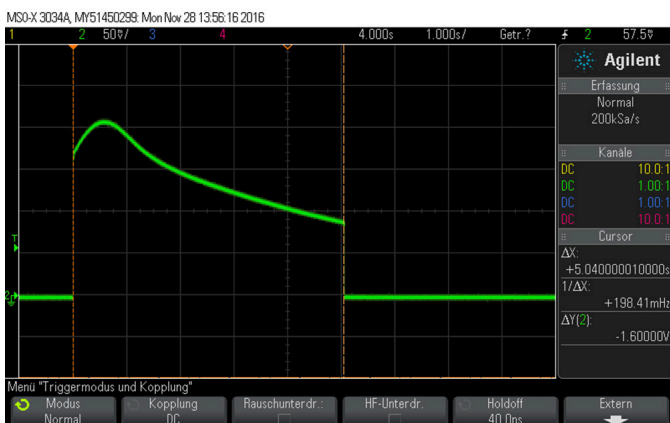
LAN: 5 ms\*

GPIOB: 4 ms\*

Since the execution time of one single command sequence is higher than the time resolution of the data points in the CSV file (1 ms) the script must ensure that the minimum execution times are observed. This means e.g. for the GPIB interface that just every 4th entry of the CSV file may be considered for controlling the load. Here, non-real-time operating systems like Microsoft Windows reach their limits since their time resolution is usually about 1 ms. Experiments showed that the best results with respect to the time accuracy are reached if the following execution intervals are applied:

- RS-232 (115200, 8, 1, None): 20 ms\*
- USB VCP (115200, 8, 1, None): 30 ms\*
- LAN: 15 ms\*
- GPIB: 15 ms\*

Measured load current:



The used Python script can be provided on demand. Please contact the H&H support department.

\*) The times were measured with the following PC under best conditions:

Windows 7 (64 Bit)  
Intel Core I7-3770 3.40 GHz, 8 GB RAM