Determination of Switch-off Momentum and Rotational Speed

Data Acquisition and Data Processing

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Problem Analysis and Concept

During the last decade, the accumulator screwdriver has become established on the market and enjoys great popularity. Most of the devices are equipped with a step-by-step adjusting of torque limitation, which is made in an undefined way. So it is of no use for screws with a defined torque.

The goal of the project is the development of a measuring set-up for the acquisition of switch-off momentums and rotational speed of compact accumulator screwdrivers. The acquisition of the measuring values must be done under realistic conditions in order to obtain representative results (see picture 1)

The data acquisition is done by the torque sensor „DR 2153 " of Lorenz Messtechnik GmbH and the digital storage oscillograph „MEphisto Scope 1" of Meilhaus Electronic GmbH. For data processing, the software „Agilent VEE Pro 9.0" is used.
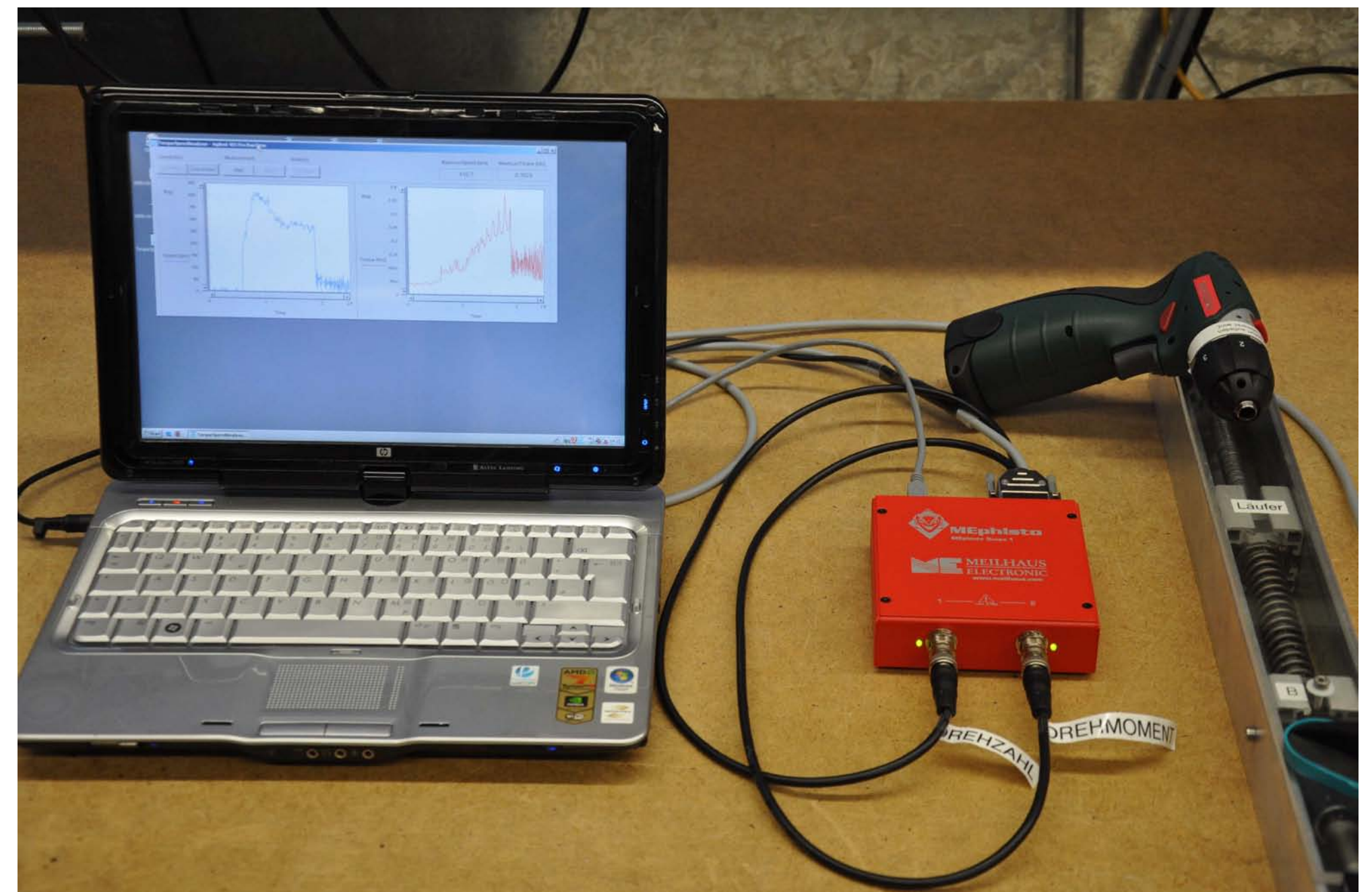

Picture 1: Set-up for measuring

Development and Specification

Different constructions for the realization of mechanical load were developed and compared with each other according to the following criteria in order to ensure an optimal breadboarding for the project.

The mechanical device was to generate a load showing a torque course, as linear as possible above the rotational angle of the accumulator screwdriver. In addition, it was to be ensured that the torque applied for the system would not be decomposed without control.

The software to be developed must show a user interface which demonstrates as clearly as possible the data within the measuring time and the maximum data of the rotational speed and the torque. An archive function for the data should be implemented. (see picture 2).
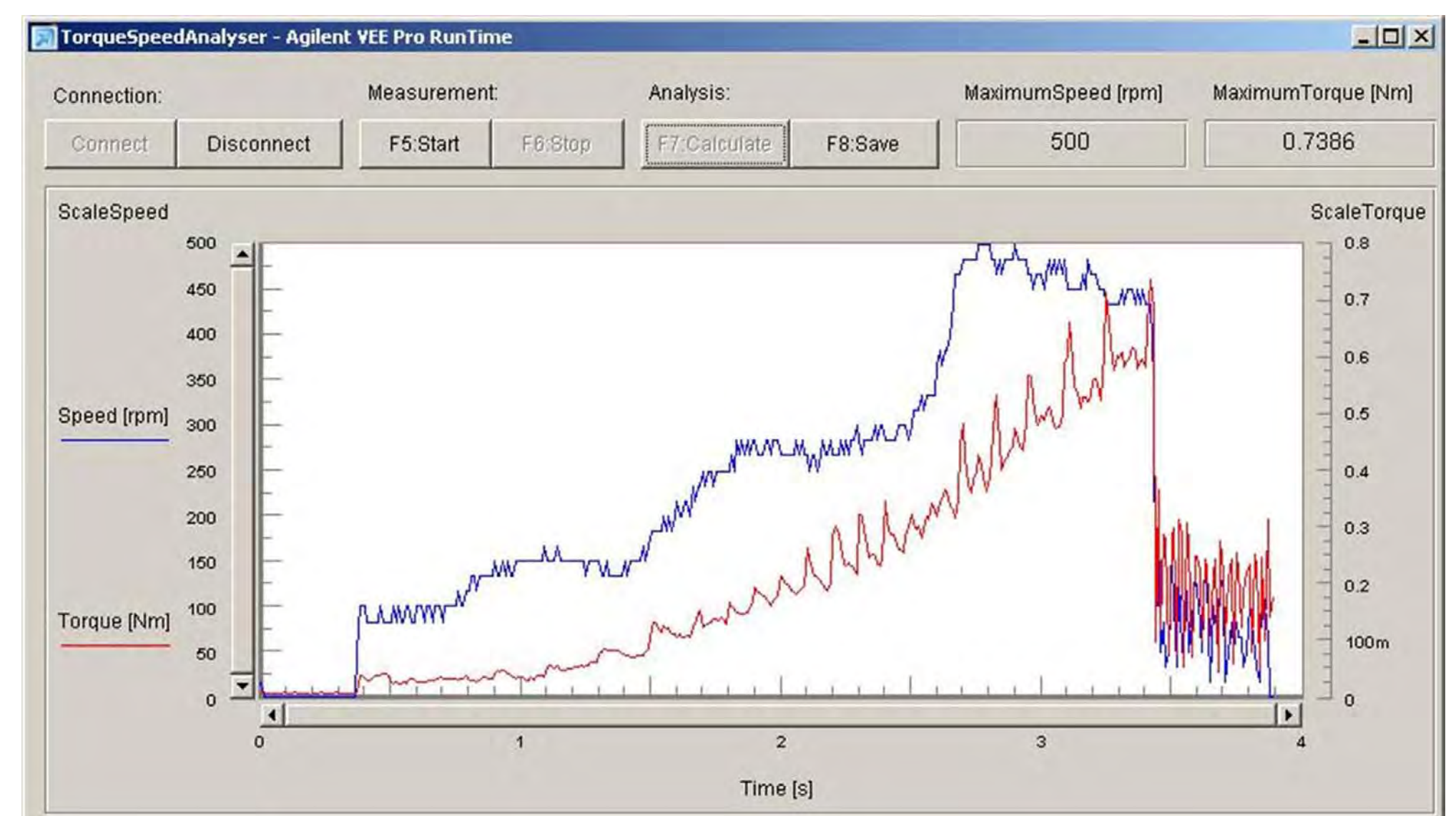
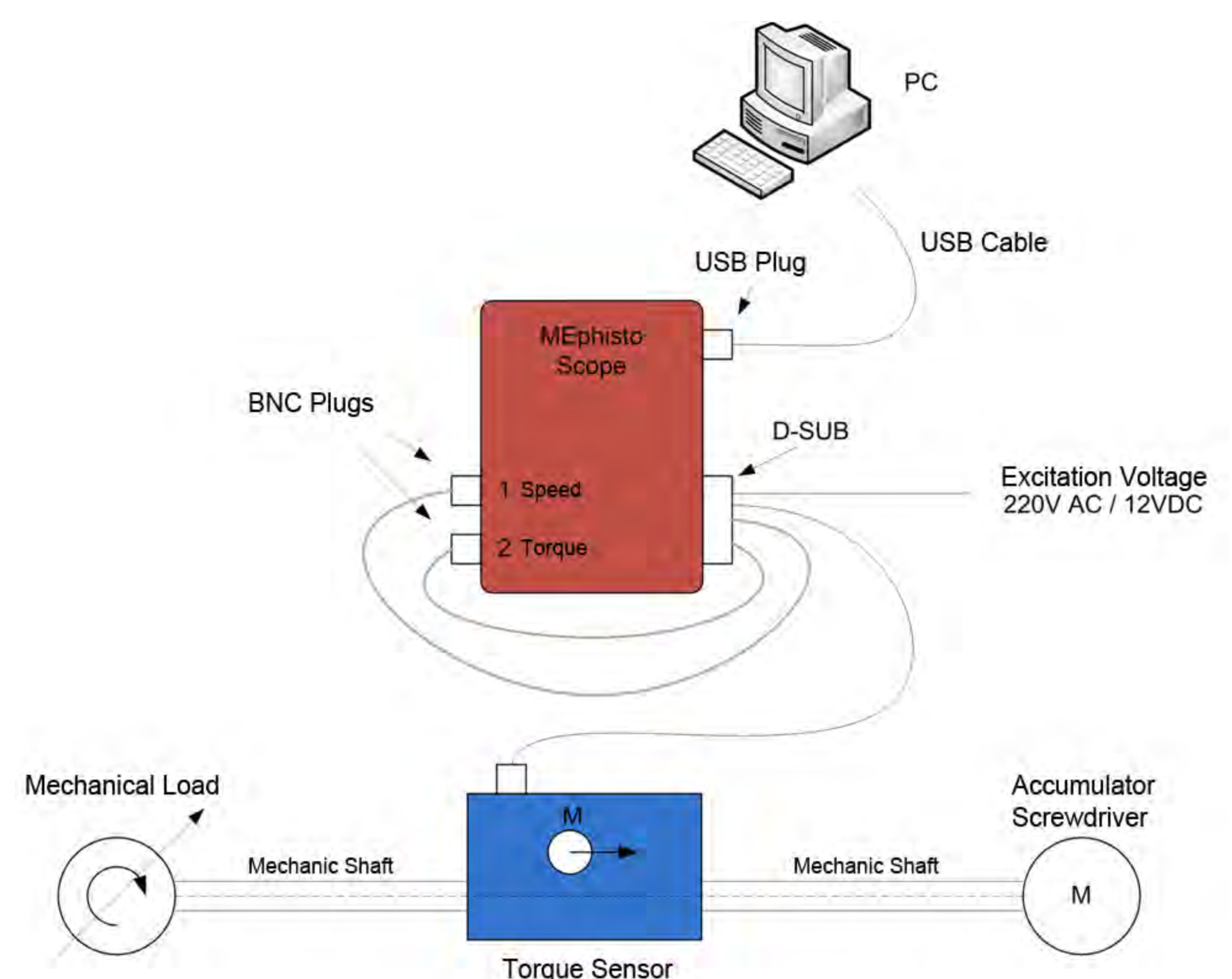

Picture 2: Operating interface of the VEE-Program

Technical Realization

The accumulator screwdriver to be tested is connected via ¼ inch six-edge input of the torque sensor. The shaft of the torque sensor drives the mechanical set construction of the test system. The turning movement leads to a compression of the spiral spring, so that an almost linearly rising torque is generated. (see picture 4)

The torque is read out by the DR 2153 as voltage between 0V and 10 V. The rotational speed is read out as digital pulse signal, in which 360 rectangular impulses signify one rotation.

Both of the signals are taken by an 8 pole plug and the two BNC connectors of the MEphisto Scope. The data is supplied for the computer by a USB interface. (see picture 3)

The recorded signals are processed and evaluated by Agilent VEE. The torque value and the rotation speed within the measuring time are shown in two diagrams. In addition, the maximum quantities of both values are shown during the measurement. The user can save the registered quantities in a CSV file.


Picture 3: Instrument layout

Results

Within the project, a measuring set up for the determination of the switch-off momentum and the torque of compact accumulator screwdrivers has been developed.

With the help of the operating interface of the program, even persons without any knowledge concerning the applied technology can carry out successful measurements. In addition, it is suitable for presentation purposes through the mobile and open construction of the mechanical load.

Basically, the mechanical construction has to be regarded as prototype. Because of the materials used, the construction is only appropriate for small torques (< 2Nm).
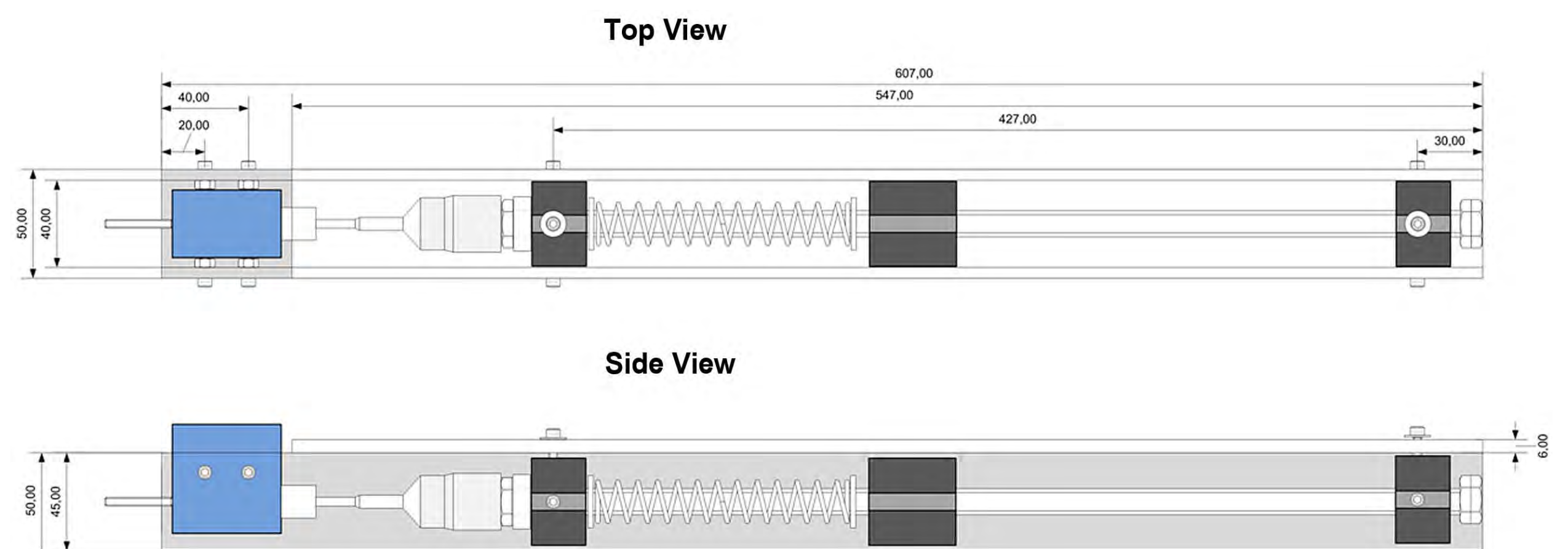
Picture 4: Mechanical assembly of the load