Contemporary systems for myoelectric fittings of upper limb amputees allow a variety of options for selection of a control system. The practitioner has to choose which system is the most appropriate for the patient’s needs and demands.

A new device, consisting of an interface connecting the myo-electrodes to the PC and a Windows-based software, allows the practitioner to test the patient’s capability for control of a myo-system. Based on this test, an appropriate control mode can be selected and evaluated by the patient. The PC system can emulate several modes.

During this phase of the session the EMG-signals of the patient are either shown as curves or they control a video animation of the selected myo-hand. In the first case all relevant levels of control are displayed. The practitioner therefore can evaluate if the selected control is right for the patient or not. Additionally, if more complex controls are selected – like those including co-contraction – every attempt at switching, if successful, is registered and displayed. If unsuccessful, the reason for failure is shown and the corresponding section of the graph is highlighted. Additionally possibilities for documentation are offered and a video game to motivate training is also included.

Training and selecting the right means of control for the myoelectric prostheses has shown that in general the amputee “adopts” and makes easier use of his prosthesis. Patients recognize improved functionality and due to the higher motivation a much smaller risk of rejection is experienced.

Several modes of controlling a prosthesis are known. The most popular and the first to be positively accepted is the digitally controlled myo-hand. The more sophisticated control modes developed since then as e.g. the Dynamic Mode Control, better known as DMC, demonstrated the growing demand for devices that help adjust the electrodes and help verify the ability of the patient to build up enough EMG signal. Practitioners as well as health care providers wanted to be sure of the outcome of the specific fitting well ahead of time.

Practitioners sought for easy ways to fit different forms of control without needing to invest in several control relays or highly sophisticated programmable equipment. Therefore Otto Bock implemented standardized control modes which still can be individually adjusted to the needs of the amputee. Switching between these modes is done very comfortably by means of so called coding plugs. The color of these plugs corresponds to the type of control.

Nowadays with the many different functions offered by a prosthesis e.g. a myo-hand with proportional speed/force control and pro- and supination by either co-contraction or complex switching or the traditional 4-channel control, the practitioner together with his patient naturally wishes to gain the necessary comfort and experience in working with the chosen control. Documentation will help improve the relationship between health service, practitioner and patient.
Otto Bock has developed the MyoBoy, a set consisting of the hardware-interface, the electrode adapter cable, the grounding pin and a Windows-based software, all packaged in a soft padded case. The MyoBoy hardware a) shows the EMG-levels on a LED-display and b) digitizes the EMG-signals and transfers these via serial interface to the PC system.

The software „Myosoft“ shows these EMG-signals in different ways:

• Measurement mode

This display mode is used to locate the best electrode position(s) location for the electrodes. Furthermore the EMG-signal strength can be determined. The mark „ON“ to the right side of the display must be exceeded. Depending on how high the signal is (markings „LOW“ and „HIGH“) the appropriate control mode can be chosen e.g. Digital, DMC or DMC Low Input.

• Training mode

The practitioner will now adjust the electrodes in a way that the patient can best utilize his EMG-signals. He should easily reach the mark „ON“ and only with strong effort reach the mark „HIGH“. The proportionality of the system will thus be best used.

In the upper left corner the signal strength in percentage of the „HIGH“ will be indicated. With this gauge one can prove the ability of the patient controlling DMC components.
• Animated mode

The display shows a sequence of pictures either opening/closing or pro- and supinating a hand prosthesis depending on the EMG-signals of the patient. The number and frequency of the individual pictures creates an animation similar to a video. The patient sees how he is controlling his prosthesis and how he is switching between the grasp and rotational modes.

• Game mode

To especially motivate younger amputees a video game has been included. The car shown has to be driven through the barriers otherwise it will crash. In the upper right corner the amount of points are shown, adding 5 points each time the car passes the barrier, subtracting 5 points each time the car crashes.
Indication

The practitioner can go through a process suggesting appropriate fitting and control possibilities depending on EMG-signal strength and number of electrode sites. Still simulating the control mode and closely watching and discussing the outcome with the patient on the MyoBoy a rather precise decision can be made.

Patient Database

A patient data base helps keep track of the success of training sessions, chosen mode control type, date of fitting, et cetera.

The goal to develop a flexible, upgradable, easy-to-learn and patient-motivating measuring as well as training instrument has been achieved. Nevertheless many other future "MyoBoys" will still have to be developed in order to improve the level of education and acceptance within the exciting field of myo-electric prosthetics.