Prostheses for the lower extremities

Above-knee socket types
The socket type we currently use the most is the M.A.S. socket, because it offers the best opportunities for embedding the femur stump into the prosthesis with as much freedom of movement as possible. The other socket types listed here are used if it is not possible to fit an M.A.S. socket.

M.A.S.
The M.A.S. socket enables above-knee amputees to save energy when using their prosthesis and helps improve their gait. This socket combines a high level of stability to prevent tipping over under stress with precise embedding of the stump in the prosthesis, rotational stability and enhanced wearing comfort: even sitting and general freedom of movement are no longer restricted by the prosthesis. The socket also makes it perfectly possible for users to sit on hard surfaces.

CAT CAM – longitudinal oval socket design
This type of socket keeps vessels and nerves free from pressure. Its precise grip on the bony structure of the pelvis prevents the socket from moving sideways. The stump is completely surrounded by the socket and comfortably embedded.

Saddle socket
The “saddle” socket presses against the bony parts of the pelvis from the inside in a similar way to a bicycle saddle. This means that the end of the stump does not have to be capable of bearing loads. This type of socket ensures good blood and lymph circulation and can also relieve the pressure on scars.

Below-knee socket types
In below-knee prosthetic treatment, short prostheses with a soft-lined socket are now increasingly being replaced by vacuum prostheses with a liner. This type of prosthesis features a kind of “stocking” made of gel or silicone instead of a soft socket lining. The advantages of this type of socket are its distal contact with the stump and even compression, which help to prevent atrophy (loss of tissue) in the stump.

Below-knee prostheses with vacuum fastening systems
This system uses a vacuum to keep the prosthesis optimally attached to the leg. The socket type in this case is more closely modelled on the stump and is therefore usually oval in shape. This type of below-knee socket exerts the lowest amount of compression on the soft tissue, which makes it comfortable to wear.
The leg amputee puts on the liner and slips the leg stump into the prosthesis socket. A knee sleeve is applied, half over the socket and half over the leg, to create an airtight seal. A valve in the socket is used to push the air out, creating a vacuum that holds the stump securely in the prosthesis socket. To take off the prosthesis, the vacuum seal can simply be released by removing the knee sleeve. Vacuum fastening systems use mechanical and electronic pumps to ensure an optimum prosthesis fit.

**Below-knee prostheses with liners and pin/shuttle locks**
A liner is a kind of stocking which is pulled over the stump from below and clings very well to the skin. Various locking systems are then used to attach the liner firmly to the prosthesis socket. Different models are distinguished based on the liner material used: silicone, polyurethane or copolymer. The socket tends to be trapezoidal in shape to prevent the stump from twisting inside it.

**Below-knee prostheses with condylar sockets**
The KBM (Kondylen-Bettung Münster) and PTB (Patella Tendon Bearing) fastening systems usually consist of a prosthesis with soft padding on the inside. A Derma Seal stocking or a simple woollen sock is placed over the stump, which is protected by the soft integrated padding material (soft socket).

**Socket fastening methods**
The orthopaedic technician decides which prosthesis fastening system is the most suitable based on the patient’s individual situation and requirements, such as their amputation level, degree of activity or need for security.

**Full-contact vacuum**
A vacuum is used to hold the prosthesis on the leg. The leg amputee puts on the liner and slips the leg stump into the prosthesis socket. A knee sleeve is applied, half over the socket and half over the leg, to create an airtight seal. A valve in the socket is used to push the air out, creating a vacuum that holds the stump securely in the prosthesis socket. The vacuum seal can simply be released by removing the knee sleeve.

**Vacuum fastening with mechanical (Harmony® system) and electronic pumps**
This system uses a vacuum pump to embed the stump in the prosthesis. The vacuum this creates ensures that the prosthesis is attached very securely to the stump. It also reduces the pressure on the vessels.
Liner systems with pin/shuttle locks
A liner is a kind of stocking which is pulled over the stump from below and clings very well to the skin. Various locking systems are then used to attach the liner firmly to the prosthesis socket. Different models are distinguished based on the liner material used: silicone, polyurethane or copolymer.

Condylar socket
The KBM (Kondylen-Bettung Münster) and PTB (Patella Tendon Bearing) fastening systems usually consist of a prosthesis with soft padding on the inside. A Derma Seal stocking or a simple woollen sock is placed over the stump, which is protected by the soft integrated padding material (soft socket).

Technical orthopaedic components
The individually customised sockets are used in combination with hip joints, knee joints and feet which have been selected specifically for you and adjusted to suit your degree of mobility. We mainly use the following joints and feet:

Hip joints
Helix3D hip joint system and others

Knee joints
A wide range of mechanical knee joints such as KX06, 3R80, VGK (“Very Good Knee”), Hybrid Knee, etc. and electronic knee joints such as C-Leg®, Genium®, Bionic-Rheo Knee, Plié 2.0, Energy Knee and Orion

Feet
Mechanical feet such as Vari-Flex, Freedom, C-Walk, Triton, Echelon, etc. and electronic feet such as Bionic-Rheo Knee, Elan and Echelon VT