



Prosthetic Elbows

An above elbow amputee has to decide, in consultation with a prosthetist, what kind of elbow joint to incorporate into their prosthesis. The appropriate elbow will aid the amputee in manipulating the arm and hand to more easily carry out tasks.

Often a prosthesis will be a hybrid design, meaning it combines different types of components; for example, a common setup for an above elbow amputee is an arm with an electric hand and a mechanical elbow.

There are numerous elbow options to choose from, as detailed below.

Conventional Elbows (Friction and Mechanical)

Conventional elbows are a popular choice for amputees. They offer good function and are more lightweight than electric elbows. Weight is a very important consideration especially for above elbow and even higher level amputations: the higher the level of amputation, the more difficult it becomes to carry the weight of heavier components. The most commonly used conventional elbows include adjustable friction and/or mechanical (cable-operated) controls.

Elbows with adjustable friction allow the amputee to use the sound hand to raise or lower the elbow to the desired position. There are friction elbow options for adults and children.

Cable-operated mechanical elbows are operated by a cable and harness system. An amputee wearing such a prosthesis can swing the arm forward using body movement to raise the lower part of the arm; the elbow

then locks the lower part of the arm into a bent elbow position. Using shoulder and back muscle movements, the amputee can pull a cable to unlock the elbow joint to lower it, raise it higher or leave it free-swinging.

Hosmer has two mechanical elbows (the **E-400** and **E-200**) with eight to 11 locking positions and a friction elbow with adjustable friction that allows manual positioning of the forearm.

RSLSteeper has a mechanical elbow with seven lockable positions and a lockable humeral rotation feature. A free-swing option is also available. The humeral rotation unit allows the user to manually turn the lower part of the arm inwards or outwards and can be locked to facilitate using the arm for certain tasks.

Ottobock has the **ErgoArm** series of elbows. Within this series are a basic mechanical elbow and a mechanical elbow with a feature called automatic forearm balance (AFB). AFB allows for smoother motion when the user swings the arm and makes the forearm easier to lift. Both models are suitable for passive and body powered prostheses.



12K41 ErgoArm

Electric Elbows

Electric elbows can be raised or lowered using a variety of controls, such as myoelectrics, switches, touch pads or force-sensitive resistors.

The biggest issue for the amputee to consider with an electric elbow is that it adds extra weight to the limb, making it heavier than a mechanical elbow. The amputee must weigh the benefits of the extra function over the extra weight, especially for those with high levels of amputation. Another issue to consider is the high cost of some of the items, as funding may be a concern.

If an electric elbow is preferred, there are numerous prosthetic companies that make them.

Hosmer has an **Endoskeletal Electric Elbow** and the **E-Two Electric Elbow** series, which can be operated with myoelectric or switch controls and comes in styles for an exoskeletal (hard outer shell) or endoskeletal (foam cover) prosthesis.

Liberating Technologies' **Boston Elbow II** can lift up to 9 lb. while in motion. It has a free-swing range of 45 degrees. It has a clutch that automatically locks the elbow whenever it stops moving and unlocks it as soon as power is applied to its motor.

Motion Control has the **Utah Arm**. The elbow of this prosthesis locks automatically whenever the elbow is motionless for about one second, and it is unlocked by triggering a button or switch or by using a muscle contraction. It can then hold up to 50 lb. when locked. The elbow is otherwise free-swinging.

The **ErgoArm Electronic plus** from Ottobock can be locked and unlocked with myoelectric signals as well as with a switch. It combines low weight with extraordinary function. Ottobock also has the **DynamicArm** elbow joint, which is controlled entirely by myoelectric signals.

12K50 ErgoArm Electronic plus



Children's Elbows

VASI manufactures the smallest electric elbows suitable for a child's prosthesis. The VASI elbow series includes the world's smallest electric elbow and can accommodate children aged 3 to 12 years.

Liberating Technologies and RSLSteeper both have friction elbows that come in two pediatric sizes; both can be used with passive or myoelectric hands. They can also be used as a shoulder joint.

Hosmer's **E-50 Elbow** is a child-size mechanical elbow with 10 locking positions.

The Ottobock **MovolinoArm Friction** elbow is appropriate for children aged 3 to 5 years. It is compatible with passive, body powered and myoelectric prostheses. This elbow has two friction settings: one for humeral rotation and one for flexion/extension of the forearm.