Harmony System
Active vacuum volume management
The Harmony System is an active vacuum volume management system for transtibial (and transfemoral) prostheses. By means of a pump unit, the Harmony System creates a vacuum between liner and socket. This vacuum makes for an unprecedented socket fit.

The Harmony System: A strong connection.
Studies carried out at St. Cloud State University in Minnesota (USA) have shown that the Harmony System prevents volume loss and minimizes volume fluctuations in the residual limb throughout the day.

The excellent connection between prosthesis and residual limb reduces tissue elongation and displacement and thereby prevents limb/socket movements and improves proprioception.

Furthermore, a study has pointed out that a prosthetic fitting with this system promotes residual limb blood circulation.

**What are the effects of the Harmony System?**

- Reduced volume fluctuations
- Improved suspension
- Reduced forces within the socket
- Improved proprioception

**Indications:**

- Volume fluctuations of the limb up to 2cm in circumference
- Diabetes and occlusive arterial diseases
- Prominent bone structures and difficult scar conditions
- Need for increased suspension due to higher activity level
- Need for continuous, adjustable suspension (only Harmony E2)

**Contraindications:**

- Interim fittings
- Dialysis patients
- Neuroma, preventing patient from being able to bear pressure on the residual limb
- Missing cognitive abilities of the patient to “manage” the system
Residual limb fluctuations

Why is it that our feet are thicker in the evening than in the morning? The reason lies in the pressure of our blood circulation. Arterial pressure is higher than venous pressure. In the course of the day, the arteries transport more fluid into our tissue than the veins are able to transport back. So why do prosthesis wearers often complain about their residual limb volume diminishing in the course of the day? Conventional sockets are specific weight-bearing sockets that influence the fluid balance in the tissue of the residual limb. During the stance phase, these sockets carry or “press” tissue fluid out of the residual limb. The volume of the residual limb is furthermore decreased by the basic biomechanical function of the gait cycle.

Each residual limb is subject to volume fluctuations. The extent of the fluctuations depends on different factors such as the condition of the connective tissue, age of the patient, vascular diseases and, of course, the kind and fit of the socket.

To compensate for volume loss, amputees often add an additional sock over their residual limb or liner in the afternoon. However, this measure only provides short-term relief from the symptoms and does not eliminate the cause. In the long term, the measure even causes partial pressure build-up because the fluid in the residual limb tissue is not drawn out evenly.

Simple one-way valves release only the amount of air that the residual limb volume can press out. Although the suction created in this way provides for sufficient connection, it cannot prevent volume fluctuations in the residual limb. Even shuttle lock systems cannot prevent volume fluctuations. The connection is ensured as the prosthesis is secured by the pin. Nevertheless, both mechanisms entail volume loss that reduces the residual limb circumference. This leads to residual limb/socket movement and can thus result in painful skin irritations. Volume management through fluid balance is the right way to counteract these consequences.
Volume Management

The Harmony System prevents volume fluctuations in the residual limb. Unlike conventional specific weight-bearing sockets, Harmony sockets are total surface weight-bearing sockets. Pressure peaks in the load areas are prevented and replaced by full contact. The pump unit of the Harmony System creates a vacuum in the socket. It draws the entire surface of the liner onto the socket, thereby relieving pressure from the residual limb. During the stance phase, the pressure increases evenly over the entire surface rather than partially. This effectively reduces the total pressure affecting the tissue. The residual limb tissue is thereby relieved, while the amount of fluid, i.e. the residual limb volume, is kept stable – in each phase of the gait.

Fitting

Only an optimal socket fit can allow amputees to make full use of their prostheses. Up to now, the natural contour of the residual limb had to adapt to a specific weight-bearing socket. The more the contour differed from the socket shape, the greater the compromise between comfort and technical feasibility. A new plaster cast and modeling technique now makes it possible to represent individual residual limb structures in a plaster negative and to transfer them into the socket shape. The new technique not only optimizes the socket fit but also simplifies the modeling process. Moreover, it is also applicable for ordering custom liners.

This plaster cast and modeling technique is taught in the certification course required for fitting the Harmony System.
Harmony E2 is the new electronic pump option for the Harmony System. It has been designed for intuitive and easy use by the amputee. It is very quiet, removable, and waterproof to 10ft submersed.

It is also the first removable solution. Due to its connection to the prosthesis by a special 4-hole adapter plate, it can easily be removed, e.g., to charge it without removing the leg. The adapter plate with its integrated valve keeps the vacuum in the socket.

- Easy Installation
- Flexibility

4-hole Adapter Plate for convenient use with, e.g., 5R2 plate and the desired distal adapter.

Free orientation around the pylon: medial, lateral or even anterior or posterior.

Two Air Channels in adapter plate for direct tubeless distal connection or use of a socket connector (e.g., for retro-fittings).

No computer or programming required!

Easy Removability of the pump unit, e.g., for charging, weight reduction, or switching between different legs. The adapter plate with its integrated valve keeps the vacuum in the socket.

Rechargeable AA Batteries (also replaceable, in case no power supply is available).

USB Charging Cable
1 **Automatic Mode**
adjusts elevated vacuum according to activity level. No manual switching necessary.

2 **4 Manual Levels**
to adjust vacuum to personal preferences from comfort (small dots) to high suspension (large dots).

3 **Reverse Mode**
allows patient to flush the pump and reverse air flow for quick pressure relief.

4 **Top Air Channel**
for direct tubeless socket connection.

5 **Side Air Channel**
for use with a socket connector.

**Rotary Switch**
to select and indicate setting at the same time. No sight necessary, touch is sufficient to “read” setting.

**Waterproof**
up to 10 ft. (3 m) water depth. Splash water, rain, or even swimming in fresh water is no problem.
Harmony P3 and Triton Harmony are mechanical pump options for the Harmony System. With every step, the weight activated pumps create (or maintain) the vacuum in the socket. In addition, the 3-in-1 functional ring that creates the vacuum provides vertical shock absorption and a natural rotation function.

The 4R147 Harmony P3 is a slim and lightweight modular pump. It can be combined with a huge variety of feet and is suitable for active end-users up to 275 lbs. body weight.

The 1C62 Triton Harmony combines the excellent functionality of the 1C60 Triton carbon fiber foot with the proven Harmony P3 technology: Smooth roll-over characteristics, split forefoot for more safety and control on uneven surfaces, and excellent energy storage and energy return, combined with active vacuum for volume management of the residual limb and unmatched suspension. The Triton Harmony with its compact design is suitable for highly active end-users up to 330 lbs. body weight.

1. **Carbon Forefoot Spring**
   The split forefoot spring allows the foot to adapt to uneven surfaces. It offers energy return, stability, and control at rollover and toe-off.

2. **Base Spring**
   The split base spring made of high-performance polyester has a separate big toe and connects the forefoot and the heel spring to form a complete system.

3. **Carbon Attachment Spring**
   The attachment spring made of carbon fiber material gives the foot the required stability.

4. **Carbon Heel Spring**
   The heel spring dampens the impact at heel strike and stores the energy for a smooth rollover.

5. **Replaceable Heel Wedge**
   The heel wedge provides a simple method for adapting the Triton to the individual needs of the patient.
Harmony P3

- **Adapter**
  Pyramid receiver made of titanium

- **Pylon Receiver**
  for 34 mm pylons

- **3-in-1 Functional Ring**
  Exchangeable elastomeric ring with intake and exhaust valve for vacuum generation, vertical shock absorption, and torsion

- **Housing**
  Harmony P3 and Triton
  Harmony housing made of lightweight aluminum

Triton Harmony

- **Adapter**
  Pyramid adapter made of titanium

- **Pylon Receiver**
  for 34 mm pylons
Technological Data and Order Information

Harmony Pumps

4R152 Harmony E2

Harmony E2 is the new electronic pump option for the Harmony System. It provides volume management for the residual limb, enhanced suspension, and reduced forces in the socket. Quiet, removable, and waterproof up to 10 ft. submerged.

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<th>4-hole adapter plate 4X267</th>
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4R147 Harmony P3

The slim pump weighs only 399 g (0.88 lbs) which is a 20% reduction in weight, and it has a reduced system height. The core function of the Harmony P3 is provided by a functional ring. It assumes the pumping function, offers vertical shock absorption, and permits natural rotation. The functional rings can be easily adjusted and exchanged to meet the user’s needs. The 3-in-1 functional rings additionally make the Harmony P3 field-serviceable.

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**Legend:**
- **☐ Slim footshell available**
- **☐ Both footshells available**
- **☐ Normal footshell available**

### Also still available

- **4R144 Harmony P2**
  - max 220 lbs
- **4R150 Harmony HD**
  - max 330 lbs

### Complementary system components for TT prosthesis

- **6Y512 Anatomic 3D PUR Liner**
- **453A3 DermaProFlex**
- **6Y81 ProSeal SIL Liner**
- **452A1 ProSeal Ring**

### Complementary system components for TF prosthesis