

SENSOR

HYDRAULIC KNEE

2SR500

For patients up to 125kg

Instructions for Use



DESCRIPTION

The Sensor weight-activated hydraulic knee is unique to ST&G USA and is widely recognized as an ideal choice for moderately to high active amputees. The highly sophisticated hydraulic system allows the amputee to walk naturally with smooth transitions between speeds, and smooth movement throughout the walking cycle (I.E. Stance Flexion during loading response), with little effort.

APPLICATION

The Sensor Knee has the unique feature of a Manual Lock, a Stance Lock and Stance Yield - all within the same unit. The use of these functions will allow a new amputee to develop from a first time user to one who will demand and receive a high performance.

Proximally the Sensor Knee has an oversized pyramid receiver which will also accept a standard pyramid and comes fitted with a plastic insert for this purpose. For angulation only 'DO NOT' remove the insert.

Hydraulic cylinder adjustment provides independent control of 'Stance Lock' or 'Stance Yield', Knee Sensitivity, Swing Flexion Resistance + Stance Flexion Resistance (or Yield). Additionally there is an adjustable Swing Extension + Stance Extension damping which provides the limb wearer a sense of position of the prosthesis for heel strike and during the end of the Stance Flexion into Stance Extension.

CONSTRUCTION AND ASSEMBLY

- A range of components are available to complement and support the use of the Sensor Knee:
 - Sensor tube clamp
 - ø30mm x 250mm aluminium tube
 - Knee pyramid (Part number - 6PC508)
 - M8 Short screw alternative pack of 10
- **Note: Carbon fibre tubes are not compatible with this knee**

TECHNICAL DATA

Product Weight	Patient Weight Limit	Max Flexion	Activity Level	Operating Temperature
1141g	125kg	120 degrees	Low to High	-10 TO 50°C



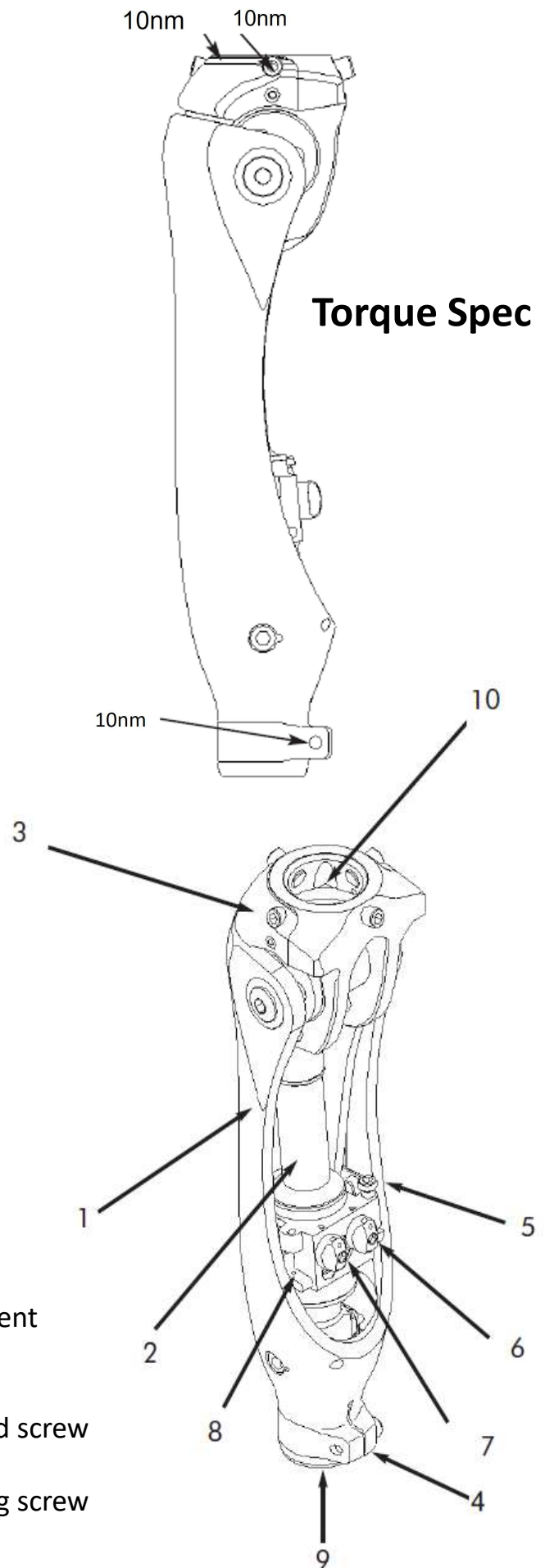
Sensor Alignment

Weight line through:

1. Trochanter with appropriate hip flexion of socket
2. Center of knee
3. Foot (according to manufactures recommendations)

Sensor Diagram Locator

1. Lightweight frame
2. Hydraulic unit
3. Knee ball with pyramid receiver
4. Distal 30mm tube clamp attachment
5. Silver sensitivity screw
6. Silver flexion (Heel Rise) screw
7. Black Stance / Stance Flexion yield screw
8. Yield / Lock Switch
9. Swing / Stance extension damping screw
10. Plastic Insert



FEATURES

The Sensor Knee has a hydraulically controlled stance phase, initiated on weight bearing at heel strike, loading response stance flexion, and released at toe off. Swing phase aspects of heel rise, swing extension / terminal impact, and stance extension damping are controlled and explained in detail later.

INTENDED PURPOSE AND INTERFACING

The Sensor Knee is a hydraulic knee for external prostheses for Trans-femoral (or higher) lower limb amputations. The Sensor Knee has been tested to cover amputees weighing up to 125kg/275lbs. It is preferable to use the Sensor Knee with other Premier or Sensor parts, each of the parts used in the trial or definitive prosthesis must be suitable to the amputee's weight rating. ST&G USA recommends suitable interfacing in the product catalogue, a table with effective end of stump to Knee Centre can be found on page 1.12.

ROTATION

Depending on the socket accessory used, a rotation option is possible using rotatable socket adapter with or without a lock feature (I.E. 1214T + 1725T or 1225T, 1254T, 1421S + 1725T or 1225T, 1223T + 1725T or 1225T).

ANGULATION

IMPORTANT: WHEN A STANDARD SIZE MALE PYRAMID IS INSERTED INTO THE KNEE BALL, THIS MUST BE CARRIED OUT WITH THE PLASTIC INSERT ITEM 10 IN PLACE.

Tighten all four screws prior to walking trial. To disassemble the pyramid from the receiver, while retaining the previous set alignment, loosen the two most deeply set, adjacent adjustment screws. Secure all screws with Loctite 243. All allen grub screws and pinch bolts must be torqued and Loctite before issue to the end user.

STANCE PHASE CONTROL

The Sensor Knee allows the patient 2 different stance modes – 'Stance Lock' and 'Stance Yield'. In 'Stance Lock' mode, the knee will be locked when body weight is applied at heel strike, up to approximately 15 - 20 degrees of knee flexion. On release of body weight, the knee will then switch to swing phase. We recommend that the amputee starts off in 'Stance Lock' position, before progressing to 'Stance Yield'. The Yield/Lock switch (8) allows switching between Yielding and Locking at heel strike, and the Black Yield screw (7) sets the rate of yield. Yield is possible when the Yield / Lock switch is in the up position. To increase resistance rotate the Black Yield screw clockwise and to decrease resistance rotate counter-clockwise.

Note: 'Yield' refers to the controlled knee flexion under weight bearing to aid in Stance Flexion, Declines, and Stair Descents.

SENSITIVITY

The Sensor Knee is weight activated. The stance phase is engaged during heel contact under load (patient's weight). The Sensitivity Screw (5) should be adjusted to suit the load. There are two factors to consider, the physical size of the amputee and the manner in which the amputee walks. A hesitant gait will need a much more sensitive setting than an aggressive walker. Where a sensitive setting facilitates an easily achieved stance phase (either lock or yield mode), too sensitive a setting in the more active patient may cause some 'sticking' at initial swing. If the screw is set too insensitive, then buckling of the knee could occur at heel contact.

We recommend at initial fitting of the knee, that the amputee does a static heel contact test (between the parallel bars) to ensure that the sensitivity screw is adequately set. When the sensitivity screw is turned clockwise, the sensitivity is decreased, turning counter-clockwise increases the sensitivity.

Changing the sensitivity must be done with due care. Too sensitive a setting may cause difficulty in swing initiation, and too insensitive a setting may result in unsafe heel contact conditions.

THE CLINICIAN MUST ENSURE THAT THE LIMB PERFORMANCE IS CORRECT, AND ADVISE THE AMPUTEE NOT TO ADJUST THE SENSITIVITY SETTING.

SWING PHASE CONTROL

Swing Phase is controlled by the Silver Flexion screw (6) and the Swing/Stance extension damping screw (9).

FLEXION SCREW

The Flexion screw (6) controls the heel rise and resistance to knee flexion in swing. Clockwise rotation increases the resistance, turning counter-clockwise decreases resistance.

Lever Selector
Up = Walk
Down = Lock

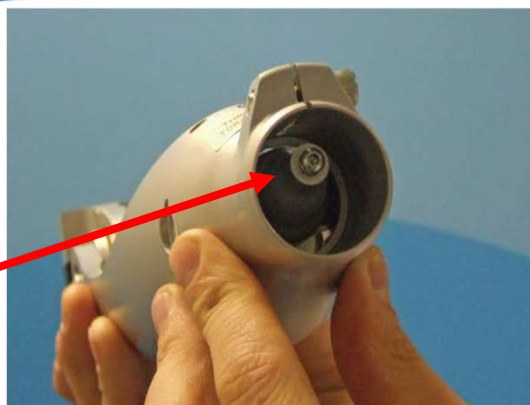
Stance Phase Screw (Yield)
Clockwise = More Stance Flexion
and Yield Resistance
Counter-Clockwise = Less Stance
Flexion and Yield Resistance
Will influence both Yield and
Stance Flexion

Sensitivity Screw
Clockwise = Less Sensitive
Counter-Clockwise = More
Sensitive

Swing Phase Screw (Heel Rise)
Clockwise = Less Heel Rise
Counter-Clockwise = More Heel Rise

SWING/STANCE EXTENSION DAMPING SCREW

Swing/Stance extension damping screw can be adjusted by removing the tube from the tube clamp and turning the adjusting hexagon screw (inside the 30mm tube clamp) Clockwise with a 2mm Allen = More Swing/Stance Damping
Counter-Clockwise = Less Swing/Stance Damping
Will influence both Yield and Stance Flexion



SWING/STANCE EXTENSION DAMPING SCREW

Swing/Stance extension damping screw (9) can be adjusted by removing the tube from the tube clamp and turning the adjusting hexagon screw (inside the 30mm tube clamp) clockwise with a 2mm Allen key to increase Swing/Stance extension dampening, and counter clockwise to decrease the dampening. Make sure that the knee extends fully in the end of swing. If not, decrease the sensitivity screw until satisfactory. This will influence both Swing and Stance extension damping.

NOTE: Because there is no extension resistance in the Sensor Knee during swing, users with experience of other knees will report reduced energy expenditure (less or no effort during swing phase), as the Sensor is a swing phase knee by default.

FITTING PROCEDURES

Familiarize the user with the knee and its functions while standing in the parallel bars:

- Check that, with the Yield/Lock Switch (8) down, the knee locks when weight applied at heel strike; simulate with the heel in front and attempt to bend the knee. With the Switch up, confirm an acceptable resistance for safe stance stability. Repeat the simulation.
- Check that in normal standing the amputee feels stable and secure.
- When taking the first steps confirm that the knee releases readily during toe-off with good timing.

NOTE: In the event of the knee not releasing at toe-off, decrease/adjust the sensitivity. Also be sure that the user has adequate timing to initiate swing versus trying to push or lift to initiate swing phase.

DOWN STAIRS WALKING - STEP OVER STEP

Ensure the Yield / Lock switch is in the 'up' position. The correct technique is for the amputee to place the heel portion of the shoe on the stair, shift weight onto the leg, and push into the knee to flex, and carry an upright posture over the foot with a fixed hip flexion angle, and ride the knee while carefully placing the sound foot for the next step. Timing and posturing is critical!

NOTE : It is vital to progress down the stair and transfer weight onto the prosthesis in a coordinated effort while carefully anticipating where to place the sound foot for the next step.

Adjust the Black Yield Screw (7) the correct/comfortable level of resistance/controlled speed. The patient must place the prosthetic foot so that the edge of the stair is, at maximum, up to midfoot. If too far back, it will be difficult to initiate flexion and balance will be disrupted. If too far forward, there is a risk that the heel will slip off the stair. Encourage the user to practice correct foot positioning, timing (pushing into the knee and carrying the hip forward with fixed hip flexion angle), and body posture (fixed upright body).

DOWN SLOPE WALKING

As the User becomes increasingly competent with descending stairs step over step, they might be ready for decline walking. For very gentle slopes, the new amputee will need to determine if they are comfortable riding the knee yield, or simply walking down. For slopes greater than 20 degrees the amputee should be encouraged to use the yield function of the Sensor Knee by pushing into a slightly flexed knee, and holding a fixed hip flexion angle, allowing the knee to flex under the yield resistance carrying the body center of gravity along as the knee flexes. Ensure the user understands that it is vital to maintain an upright posture and hip angle to progress forward so knee will flex while progressing forward in a smooth action.

NOTE : Whenever a change is made to the yield valve or sensitivity screw, ALWAYS let the amputee try and confirm the suitability of the new stance setting by placing their heel in front of them and pushing into the prosthesis to flex it, and try to break or yield the knee to their satisfaction.