

# Tamarack Flexure Joint®

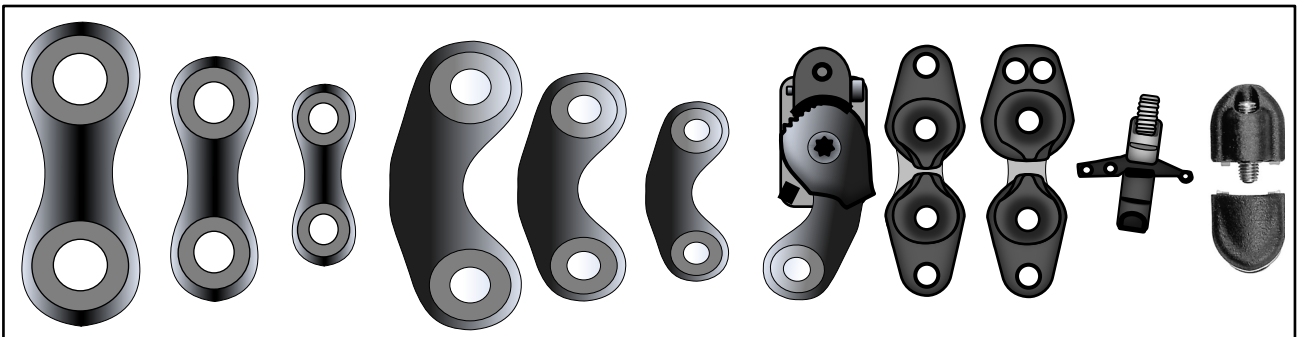
## Indications for Use Guide

3<sup>rd</sup> Edition

*A Clinical Reference for Custom AFO Fabrication*



*Tamarack Habilitation Technologies Inc., May 2024*



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### Acronyms and Terminology

**IFU:** Instruction for Use

**AFO:** Ankle Foot Orthosis

**M-L:** Medio-Lateral

**Plantarflexion:** the motion of the foot toward distal (forefoot down)

**Dorsiflexion:** the motion of the foot toward proximal (forefoot up)

**Plantarflexion Stop:** Device inhibiting partial or full plantarflexion

**Dorsiflexion Stop:** Device inhibiting partial or full dorsiflexion

**Durometer:** A unit of measure to describe the level of assist or resistance offered by a specific material hardness. Application of various durometers in the Flexure Joint® allows for a wide range of assistive and resistive response to gait forces.



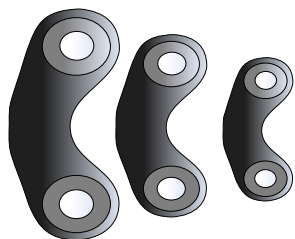
## Tamarack Flexure Joint® Product Line Overview



### Free Motion (Model 740)

Standard Tamarack Flexure Joint®; available in 3 sizes, 2 colors.

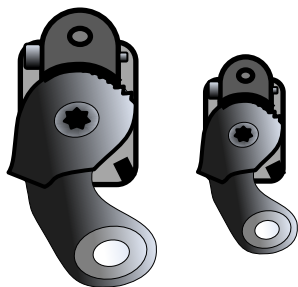
*All Tamarack Flexure Joints® are tested for tensile flexural durability in cyclic shock application for > 3 million cycles.*



### Dorsiflexion Assist (Model 742)

Forefoot Lift; available in 3 sizes, 2 colors and 3 durometers.

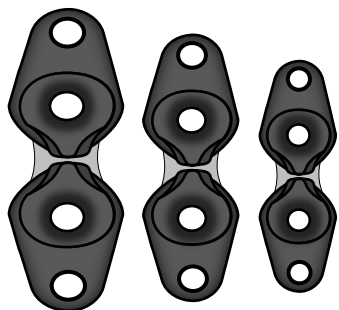
*Allows for a wide range of assistive/resistive responses to gait forces. Choose from light (75A), medium (85A) or strong (95A).*



### Variable Assist (Model 743)

Adjustable Forefoot Lift; available in 2 sizes.

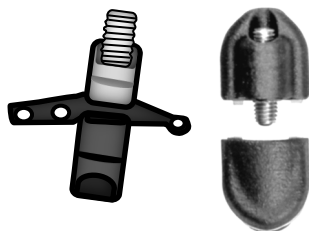
*The Variable Assist consists of a Dorsiflexion Assist-type joint and an adjustment gear drive. It allows for fine-tuning of assistive/resistive force by angular pre-tensioning.*



### Tamarack Flexure Joint® Caps (Model 741-CAP)

Alternative Pre-fab Joint Cavity; available in 3 sizes, 2 colors, standard or adjustable.

*Designed for external mounting at initial fabrication or retrofit device articulations for both thermoplastic and thermoset AFOs.*



### Tamarack Plantarflexion Stops (Model 741-ML-)

Adjustable plantarflexion motion limiter stops, available in 2 styles, 4 sizes.

*Designed for thermoforming or external mounting at initial fabrication or retrofit to limit device articulations.*

Tamarack Flexure Joint® is a registered trademark of Tamarack Habilitation Technologies, Inc.  
Manufactured in the USA.





## Free Motion AFO

Joint Selection: *Free Motion (Model 740)*



### AFO Design

- Thermoplastic/fiber/hybrid designs
- *Free Motion (Model 740)* with full dorsiflexion and plantarflexion
- Varying footplate lengths
- All components are waterproof

### Functional Considerations

- Allowing full plantarflexion and dorsiflexion
- Frontal plane talar and subtalar joint alignment control

### Clinical Indications

- Posterior tibial tendon dysfunction
- Frontal plane instabilities of the subtalar and/or talar joint

### Clinical Contraindications

- Weak quadriceps
- Significant sagittal plane ankle weakness or instability
- High impact sports

### Options

- Proximal closures are required (hook & loop straps or similar)

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## Dorsiflexion Assist AFO

Joint Selection: *Dorsiflexion Assist (Model 742)*



### AFO Design

- Thermoplastic/fiber/hybrid designs
- *Dorsiflexion Assist (Model 742)*
- Varying footplate lengths
- All components are waterproof

### Functional Considerations

- Provides dorsiflexion assist with or without plantarflexion stop
- W/O plantarflexion stop facilitates a more natural first rocker
- Provides a significant dorsiflexion moment
- Support of ligament instabilities

### Options

- Joint durometer should be selected or exchanged to provide required resistance or assistance
- Three durometer choices are available for this purpose
- Optional motion control: Plantarflexion stop at desired angle (modified by careful grinding)
- Proximal closures are required (hook & loop straps or similar)

### Clinical Indications

- CP, CVA, weak dorsiflexors
- Frontal plane instabilities of the subtalar and/or talar joint
- Peroneal Palsy

### Clinical Contraindications

- Weak Quadriceps
- Spastic plantarflexors
- Knee flexion contracture
- High impact sports

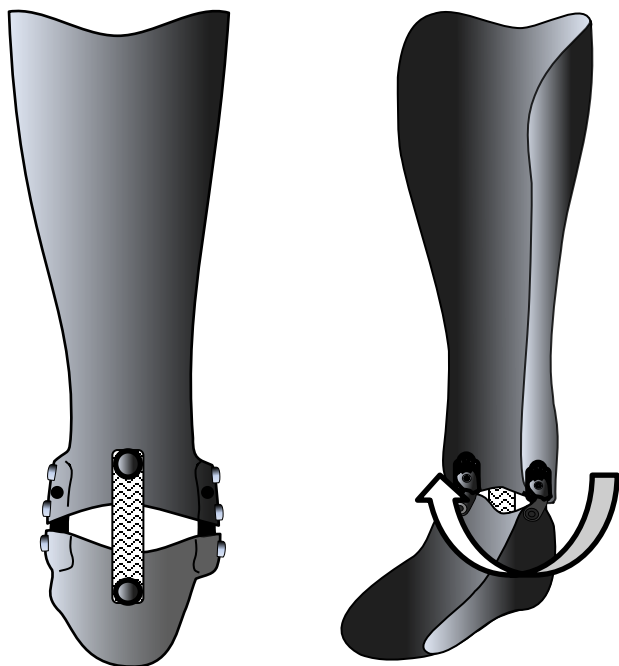
*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*





## Variable Assist AFO

Joint Selection: *Variable Assist (Model 743)*



### Options

- Joint is continuously adjustable to increase/decrease assistive force
- Proximal closures are required (hook & loop straps or similar)
- With or without dorsiflexion restraint strap
- Model 743 may be paired with 740 or 742

### AFO Design

- Thermoplastic/fiber/hybrid designs
- *Variable Assist (Model 743)*
- Varying footplate lengths
- All components are waterproof
- Metal parts are stainless steel and bronze

### Functional Considerations

- Lifts foot to prevent foot drop
- Assistive force for forefoot lift is continuously adjustable
- Hyper-Dorsiflexion restraint strap

### Clinical Indications

- CP, CVA, weak dorsiflexors
- Mild SCI
- Peroneus paralysis
- Pathomechanics of ALS, MD, MS
- Frontal plane subtalar and/or talar joint, as well as ligament instabilities

### Clinical Contraindications

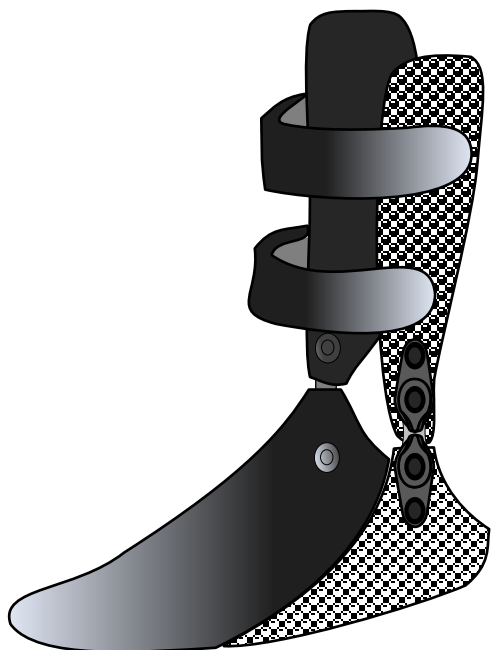
- Weak quadriceps
- Un-controlled fluctuating edema
- High impact sports

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## PTTD/Stirrup Style AFO

with Custom Footplate, Joint Selection: *Variable*



### Options

- Depending on required resistance or assistance, joints may be selected or exchanged for various durometers
- *Tamarack Flexure Joint® Caps (Model 741)*

### AFO Design

- *Free Motion (Model 740)* with optional *Tamarack Flexure Joint® Caps (Model 741)*
- Or *Dorsiflexion Assist (Model 742)* with *Tamarack Flexure Joint® Caps (Model 741)*
- Composite or hybrid designs.
- Full range of dorsi/plantarflexion
- All components are waterproof

### Functional Considerations

- Provides mild M-L stabilization
- Permits free dorsi/plantarflexion
- Moderate torsion control
- Footplate should stabilize subtalar alignment

### Clinical Indications

- Posterior tibial tendon dysfunction
- Mild or moderate frontal plane instabilities of talar and/or subtalar joints

### Clinical Contraindications

- Weak quadriceps
- Knee flexion contractures
- Spastic plantar flexors
- High impact sports

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## Dorsiflexion-Assist Carbon Fiber AFO

Joint Selection: *Dorsiflexion Assist (Model 742)*



### AFO Design

- *Dorsiflexion Assist (Model 742)* with optional *Tamarack Flexure Joint® Caps (Model 741)*
- Composite design
- Assisted dorsiflexion
- Resisted plantar flexion
- All components are waterproof

### Functional Considerations

- Provides dorsiflexion assist with resisted plantar flexion
- Heavy duty/lightweight design
- Open frame design (improved air circulation & heat dissipation)

### Options

- Depending on required resistance or assistance, joints may be selected or exchanged for various durometers
- *Tamarack Flexure Joint® Caps (Model 741)*

### Clinical Indications

- Weak dorsiflexors
- Frontal plane subtalar and/or talar joint and ligament instabilities
- Need for high strength, low profile, lightweight design

### Clinical Contraindications

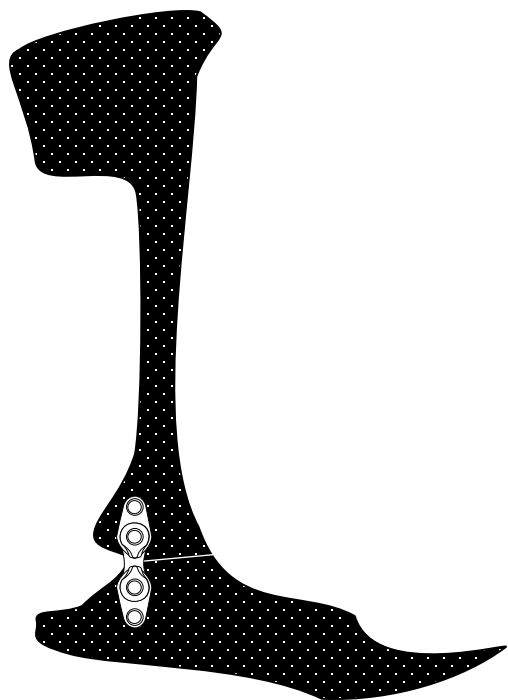
- Weak quadriceps
- Knee flexion contractures

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## AFO – Floor Reaction

Joint Selection: *Free Motion (Model 740)*



### Options

- Proximal closures are required (hook & loop straps or similar)
- *Tamarack Flexure Joint® Caps (Model 741)*

### AFO Design

- *Free Motion (Model 740)* with optional *Tamarack Flexure Joint® Caps (Model 741)*
- Ground Reaction Force AFO
- Reinforced Carbon Fiber AFO with posterior entry
- Built-in dorsiflexion stop
- All components are waterproof

### Functional Considerations

- Heavy duty - lightweight design
- Open frame design (air exchange)
- Control of knee joint instabilities via rigid, long forefoot lever arm
- Joint permits plantar flexion
- Normalizes gait cycle from heel strike to mid-stance

### Clinical Indications

- Mild quadriceps weakness as is typical of ambulatory post-polio

### Clinical Contraindications

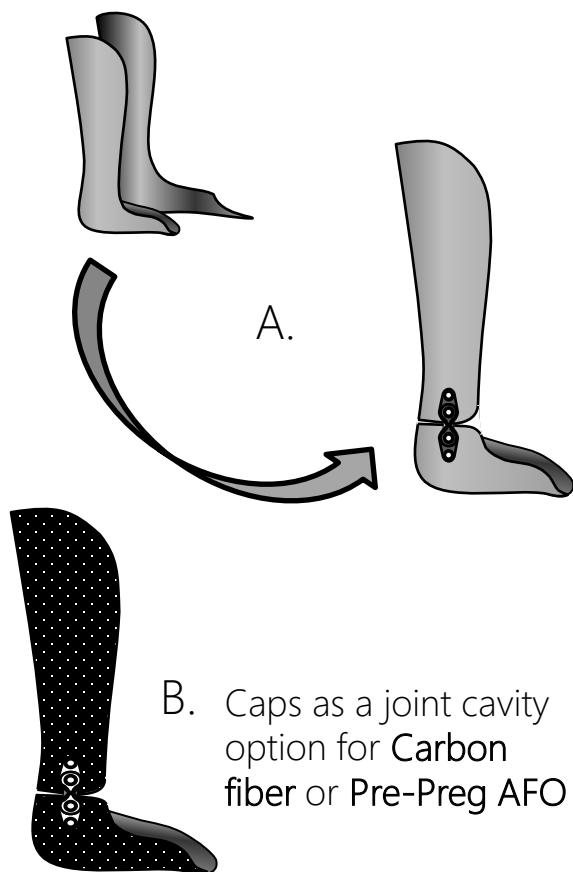
- Knee flexion contracture
- Complete quadriceps paralysis
- Un-controlled fluctuating edema

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## Tamarack Flexure Joint® Caps

Joint Selection: *Free Motion (Model 740) or Dorsiflexion Assist (Model 742)*



### AFO Design

- A. Rigid (non-articulated) AFO for the early phase treatment protocol

*Tamarack Flexure Joint® Caps (Model 741)* can be used to transform a non-articulated (solid) AFO into an articulated design (requires Tamarack Flexure Joints®)

- B. Facilitates installation of Flexure Joints® in composite materials

### Functional Considerations

- A. Easy conversion of a non-articulated (solid) AFO into an articulated version
- B. Caps for composite AFOs
- B. Eliminates the need for joint dummies
- B. Facilitates manufacturing processes

### Clinical Contraindications

- Weak quadriceps
- Un-controlled fluctuating edema
- High impact sports

### Clinical Indications

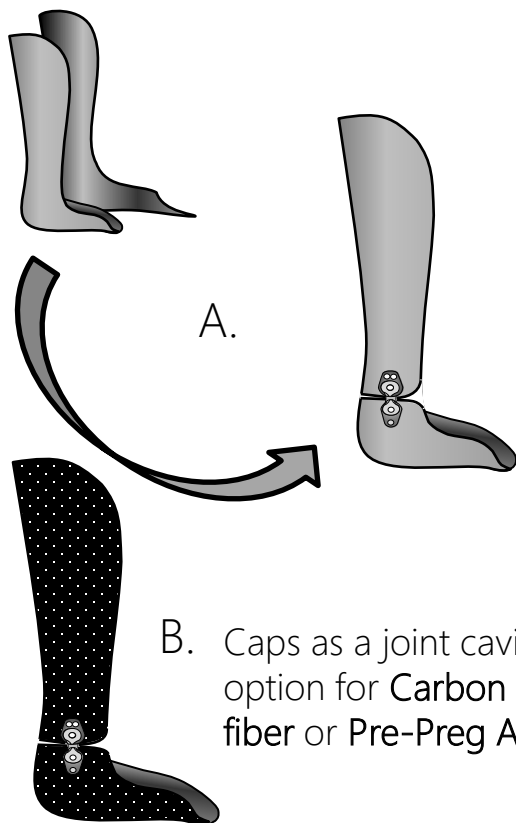
- When the rehabilitation process allows for or requires increased ROM
- Articulated version when use of dummy and/or vacuum forming is difficult

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## Tamarack Flexure Joint® Adjustable Caps

Joint Selection: *Free Motion (Model 740) or Dorsiflexion Assist (Model 742)*



### AFO Design

- A. Rigid (non-articulated) AFO for the early phase treatment protocol
- A. PTTD/Stirrup Style AFO (p8)
- A. Dorsiflexion Assist Carbon Fiber AFO (p9)
- A. AFO Floor Reaction (p10)

*Tamarack Flexure Joint® Caps (Model 741)* can be used to transform a non-articulated (solid) AFO into an articulated design (requires Tamarack Flexure Joints®)

- B. Facilitates installation of Flexure Joints® when composite materials are used for the shell
- B. Tamarack Flexure Joint® sizes P, M, L

### Clinical Indications

- When the rehabilitation process allows for or requires increased ROM
- Articulated version when use of dummy and/or vacuum forming is difficult
- Boosts dorsiflexion assist for fine-tuning independently on each side

### Clinical Contraindications

- Weak quadriceps
- Un-controlled fluctuating edema
- High impact sports

### Functional Considerations

- A. Easy conversion of a non-articulated (solid) AFO into an articulated version
- B. Caps for composite AFOs
- B. Eliminates the need for joint dummies
- B. Facilitates manufacturing processes

Posterior hole is standard position; anterior hole boosts dorsiflexion assist as much as 20% on each side

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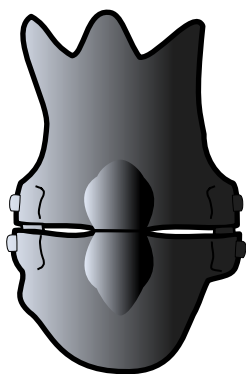


## AFO - Custom Fab Joint Stops

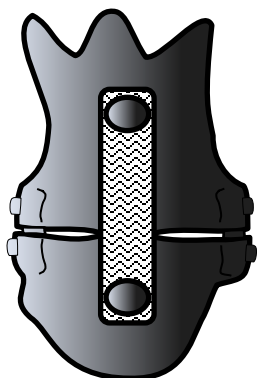
Joint Selection: *Free Motion (Model 740) or Dorsiflexion Assist (Model 742)*



A.



B.



### Options

- Proximal closures are required (hook & loop straps or similar)
- Instep strap may be required
- Motion Control: Plantarflexion stop at desired angle (modified by careful grinding)
- Dorsiflexion control strap is frequently used to avoid overstretch of the Achilles tendon
- *Tamarack Flexure Joint® Caps (Model 741)*

### AFO Design

- A. Reinforced shell with plantarflexion stop in posterior trim line
- B. Posterior dorsiflexion control strap
  - Varying footplate lengths
  - All components are waterproof

### Functional Considerations

- A. The plantarflexion stop provides foot drop control, and can be adjusted (by grinding) to fine tune the joint angle
- B. The dorsiflexion control strap provides sagittal stabilization of the knee (assisting knee extension)

### Clinical Indications

- Weak dorsiflexors / Drop foot
- Frontal plane instabilities of the subtalar and/or talar joint
- CVA and flaccid paralysis
- Moderate weakness of the quadriceps muscle and knee instabilities
- Tight plantarflexors
- Cerebral palsy
- Peroneal nerve paralysis

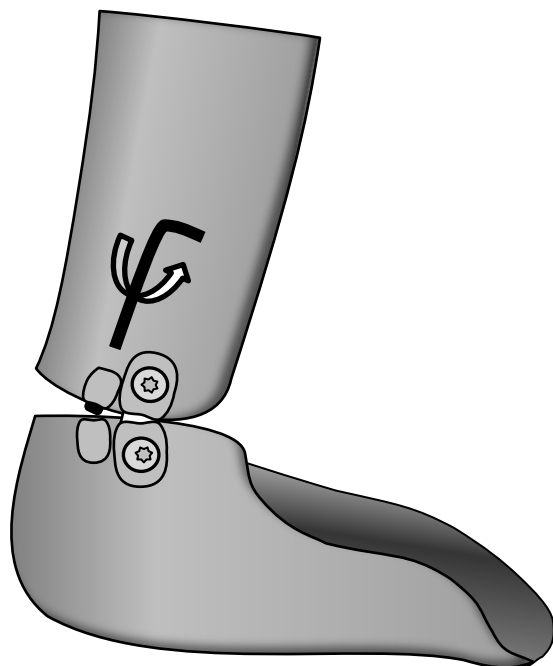
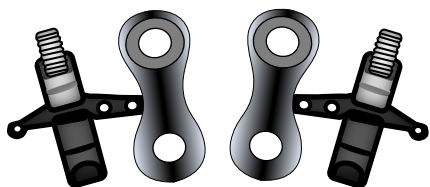
### Clinical Contraindications

- Weak quadriceps
- Knee flexion contractures
- High impact sports



## Tamarack Plantarflexion Stop

Joint Selection: *Free Motion (Model 740) or Dorsiflexion Assist (Model 742)*



### Options

- *Tamarack Flexure Joint® Caps (Model 741)*
- *Tamarack Free Motion Joints (Model 740) or Dorsiflexion Assist Joints (Model 742)*
- Posterior dorsiflexion control strap

### AFO Design

- Thermoplastic shell with plantarflexion stop
- All components are waterproof

### Functional Considerations

Use of *Tamarack's Plantarflexion Stop (Model 741-ML-PF)* to Limit Motion

- The plantarflexion stop provides foot drop control
- Changes made while patient is wearing AFO
- Facilitates variable adjustability

### Clinical Indications

- Drop foot
- CVA and flaccid paralysis
- Moderate weakness of the quadriceps muscle and related knee instabilities
- When adjustable range of dorsiflexion is required

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## Tamarack Plantarflexion Slot-Stop

Joint Selection: *Free Motion (Model 740) or Dorsiflexion Assist (Model 742)*



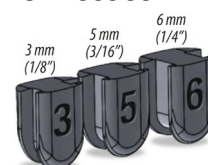
### AFO Design

- Thermoplastic / composite / hybrid shell with plantarflexion stop
- All components are waterproof

### Functional Considerations

Use of *Tamarack's Plantarflexion Stop (Model 741-ML-SS)* to Limit Motion

- Easy conversion of a non-articulated (solid) AFO into an articulated version when used in conjunction with *Tamarack Flexure Joint® Caps*.
- The plantarflexion stop provides foot drop control
- Changes made while patient is wearing AFO
- Facilitates variable adjustability
- 3mm, 5mm, & 6mm thicknesses



### Options

- *Tamarack Flexure Joint® Caps (Model 741)*
- *Tamarack Free Motion Joints (Model 740) or Dorsiflexion Assist Joints (Model 742)*
- Posterior dorsiflexion control strap

### Clinical Indications

- Drop foot
- CVA and flaccid paralysis
- Moderate weakness of the quadriceps muscle and related knee instabilities
- When adjustable range of dorsiflexion is required

*Drawings do not suggest a particular length of footplate. Footplate length and shoe features have a significant effect on gait safety and gait efficiency.*



## Acknowledgements



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## Disclaimer

The Tamarack Flexure Joint® Indications for Use Guide was designed by Tamarack Habilitation Technologies, Inc. and was clinically edited by external professional peers.

The Guide cannot be considered the sole determinant of the optimal solution for any specific individual with a disability, pathology or trauma-related orthotic problem. Individual cases may vary greatly from any norm. Departures from componentry and other design features suggested in this document may be appropriate in such cases.



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