Steeper Configuration Device
Myo Kinisi Programming Guide

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Creating life's turning points, together

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Contents

Introduction

This Programming Guide is for prosthetists wishing to program the Myo Kinisi hand from Steeper Group using the Steeper Configuration Device. This guide should be used in conjunction with STPPR107 - Steeper Configuration Device Technical Manual.

The Myo Kinisi is shipped in the default mode of ‘Mode 1’, however by utilising the Steeper Configuration Device, prosthetists may select between modes 0 - 4, allowing the Myo Kinisi to be adjusted to patient preferences.

Configuring the Myo Kinisi

The Myo Kinisi hand offers five mode options. Each mode provides a different variety of characteristics allowing mode selection based on the need of the user. These modes cannot be selected or adjusted without the use of the Steeper Configuration Device. The table adjacent illustrates the key attributes of each of the five modes.

Control Parameters Table

Control Mode	No. of Sites		Compatible Inputs				Control Strategy				Auto Grip
							Opening		Closing		
	Single	Dual	AC/DC Electrode	Force Sensitive Resistor (FSR)	Switch	Linear Transducer	Threshold	Proportional	Threshold	Proportional	
0	•		•	•	•	•	•	•			
1		•	•	•	•	•	•	•	•	•	•
2	•		•	•		•	•	•	•	•	
3	•		•	•	•	•	•	•	•	•	
4	•		•	•	•	•			•	•	

Adjustable Parameters Tables

The adjustment parameters available for use with each of the five Myo Kinisi hand modes are illustrated in the tables opposite.

Control Mode	Invert	Flip	Auto-Grip	Electrode Mode		
				Highest	First	Close priority
0	•					
1		•	•	•	•	•
2						
3						
4	•					

Control Mode	Input 1		Input 2		Control Parameters				
	On Level	Max Level *	On Level	Max Level*	Max Open Speed	Max Close Speed	Pulse Period	Alt Delay	Max Pulses
0	•	•			•	•			•
1	•	•	•	•	•	•			•
2	•	•			•	•			•
3	•	•			•	•		•	•
4	•	•			•	•	•		•

*Only available when using a Proportional mode

Mode 0: 'AUTO CLOSE'

Single Site: Auto Close

A signal rising above the 'ON Level' threshold will open the hand. When the signal drops below the 'ON Level' the hand will close, regardless of the speed at which it is removed.

There is an option to invert the functions in this mode, so that a signal rising above the 'ON Level' threshold will close the hand and when the signal drops below the 'ON Level' the hand will open.

Adjustable Parameters:

- Invert (Automatic closing/opening)
- E-1 Control Strategy (Proportional/Threshold)
- E-1 'ON Level' threshold
- E-1 'MAX Level' threshold
- Maximum opening speed
- Maximum closing speed
- Maximum pulses count

Mode 0 - Proportional Control	
Open	A signal rising above the *'ON Level'* threshold on the open input will cause the hand to open at a speed determined by the level of the signal, up to the *'maximum opening speed'*.
Close	When the signal drops below the *'ON Level'* threshold the hand will close at the *'maximum closing speed'*.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used; a switch will only produce movement at the maximum set speed.	
Mode 0 - Threshold Control	
Open	A signal rising above the *'ON Level'* threshold on the open input will cause the hand to open at the *'maximum opening speed'*.
Close	When the signal drops below the *'ON Level'* threshold the hand will close at the *'maximum closing speed'*
An AC or DC electrode, linear transducer, force sensitive resistor, or a switch can be used.	

Mode 1: ‘DUAL ELEC’

Dual Site: Open/Close Signal - Default Mode

This mode uses 2 inputs to provide proportional or threshold control over opening and closing the terminal device.

This is the default mode which is active on all Myo Kinisi hands when initially supplied. Default settings are:

- Proportional Control
- Maximum Opening/Closing Speeds
- Highest Electrode Mode
- Auto-Grip enabled
- Maximum Pulses Count of 3

An input signal must pass the ‘ON Level’ threshold to elicit movement in a respective direction. The method for changing the direction of movement is ‘Highest’ by default, meaning that the largest signal will take priority to determine the direction of the hand. When the ‘First Signal’ option is selected the first electrode to increase above its ‘ON Level’ threshold will determine the direction of travel. If the ‘Close Priority’ option is selected a valid close signal will take priority even if the hand is opening. This can be altered by ‘Electrode Mode’ selection. If the signals from both inputs drop below their independent ‘ON Level’ thresholds the device will stop moving.

Auto-Grip is a function only available in Mode 1. It is armed when the button on the back of the Myo Kinisi hand is pressed for less than 1 second (producing a single short burst haptic vibration) and activated once the device is gripped onto an object, this must be done within 1 minute of pressing the button. Auto-Grip is disabled by pressing the function button a second time (producing a double burst haptic vibration) before gripping an object, or by producing a strong open signal after gripping an object, or if the gripped object does not slip within two minutes. Auto-Grip is enabled by default but can be disabled with the use of the Steeper Configuration Device.

The grip force achieved is determined by the strength and duration of the close signal. The grip can be incrementally increased by maintaining, or pulsing, the close signal above the ‘ON Level’ threshold to the ‘maximum pulse count’. This is set to 3 pulses by default.

Adjustable Parameters:

- E-1/E-2 Control Strategy (Proportional/ Threshold)
- E-1/E-2 ‘ON Level’
- E-1/E-2 ‘MAX Level’ threshold
- Electrode mode
- Auto-Grip - Disabled/Enabled
- Maximum opening speed
- Maximum closing speed
- Maximum pulses count

Mode 1 - 'DUAL ELEC'

Dual Site: Open/Close Signal - Default Mode

Mode 1 - Proportional Control	
Open	A signal rising above the '*ON Level*' threshold on the open input will cause the device to open at a speed determined by the signal strength, until the signal drops below the *'ON Level'* threshold at which point movement will stop. While between the *'ON Level'* and *'MAX Level'* thresholds the speed of movement is proportional to the strength. If the signal strength rises to a level at, or above the higher *'MAX Level'* threshold the device opens at constant *'Maximum Opening Speed'*
Close	A signal rising above the '*On Threshold*' on the close input will cause the device to close at a speed determined by the signal strength, until the signal drops below the *'ON Level'* threshold. Once the signal rises above the higher *'Max level'* threshold the device closes at a constant *'Maximum closing speed'*. The grip can be maximised by maintaining, or pulsing, the close signal after gripping an object. A number of pulses will be felt as the grip increases. This feature incrementally increases grip up to the pre-set *'Maximum pulse count'* (1-3). Once the *'maximum pulse count'* is achieved the grip is at a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used; a switch will only produce movement at the maximum speed set.	

Mode 1 - Threshold Control	
Open	A signal rising above the *'ON Level'* threshold from the open input will cause the hand to open at the *'Maximum opening speed'* until the signal drops back below the *'ON Level'* threshold.
Close	A signal going above the *'ON Level'* threshold from the close input will close the device at a constant programmable *'Maximum closing speed'* until the signal drops back below the *'ON Level'* threshold. The grip can be maximised by maintaining, or pulsing, the close signal after gripping an object. A number of pulses will be felt as the grip increases. This feature incrementally increases grip up to the pre-set *'maximum pulse count'* (1-3). Once the *'maximum pulse count'* is achieved the grip is at a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used.	

Mode 2 - 'QUICK OPEN'

Single Site: 2 Channel Signal

A fast-rising input signal will open the hand, and a slow-rising input signal will close the hand.

Adjustable Parameters:

- E-1 Control Strategy (Proportional/Threshold)
- E-1 'ON Level' threshold
- E-1 'MAX Level' threshold
- Maximum opening speed
- Maximum closing speed
- Maximum pulses count

Mode 2 - Proportional Control	
Open	A fast input signal that reaches above 30% of the range between the '*ON*' and *'MAX Level'* thresholds within 80ms, and remains above this level for 30ms. This will cause the hand to open at a rate proportional to the signal strength. The hand will stop and remain open once full open is achieved, or when the open signal falls below the '*ON Level*' threshold.
Close	A slow input signal, that reaches the *'ON Level'* threshold and remains below 30% of the range between the *'ON'* and *'MAX Level'* thresholds after 80ms, will cause the hand to close at a speed proportional to the signal strength. The hand will stop and remain closed when the maximum grip is achieved, or when the close signal falls below the *'ON Level'* threshold. The grip can be maximised by maintaining, or pulsing, the close signal after gripping an object. A number of pulses will be felt as the grip increases. This feature incrementally increases grip up to the pre-set *'Maximum pulse count'* (1-3). Once the *'Maximum pulse count'* is achieved the grip is at a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used; a switch will only produce movement at the maximum set speed.	

Mode 2 -Threshold Control	
Open	A fast input signal that reaches above 30% of the range between the *'ON'* and *'MAX Level'* thresholds within 80ms, and remains above this level for 30ms. This will cause the hand to open at a constant *'Maximum Opening Speed'*. The hand will stop and remain open once full open is achieved or when the open signal falls below the *'ON Level'* threshold.
Close	A slow input signal, that reaches the 'ON Level' threshold and remains below 30% of the range between the '*ON*' and *'MAX Level'* thresholds after 80ms, will cause the hand to close at a constant 'Maximum Opening Speed'. The hand will stop and remain closed once object grip is achieved or when the close signal falls below the *'ON Level'* threshold. The grip can be maximised by maintaining or pulsing the close signal after gripping an object. A number of pulses will be felt as the grip increases. This feature incrementally increases grip to the pre-set *'Maximum pulse count'* (1-3). Once '*Maximum pulse count'* is achieved the grip is at a maximum.
An AC or DC electrode, linear transducer or force sensitive resistor can be used.	

Mode 3 - 'ALTERNATE'
Single Site: Successive Signals

An initial input signal will move the hand when it rises above the 'ON Level' threshold. Any successive signals from the same input passing the 'ON Level' threshold, after a pre-programmed 'Alt delay' period has elapsed, will move the device in the opposite direction. Within the 'Alt delay' period, all signals passing the 'ON Level' threshold produce movement in the same direction as the initial signal.

Adjustable Parameters:

- E-1 Control Strategy (Proportional/Threshold)
- E-1 'ON Level' threshold
- E-1 'MAX Level' threshold
- Alt Delay (500 - 1000ms)
- Maximum opening speed
- Maximum closing speed
- Maximum pulses count

Mode 3 - Proportional Control	
Open	An initial signal greater than the *'ON Level'* threshold will cause the hand to open at a speed proportional to the signal strength while it remains above the *'ON Level'* threshold. All successive signals given within the *'Alt delay'* period and above the *'ON Level'* threshold will further open the hand. By default the *'Alt delay'* period is 800ms.
Close	Following an open signal and once the *'Alt delay'* period has elapsed, a signal greater than the '*ON Level'* threshold will close the hand at a speed proportional to the signal strength while it remains above the *'ON Level'* threshold. All successive signals given within the *'Alt delay'* period, and above the *'ON Level'* threshold, will further close the hand or increase grip. The hand will stop and remain in position when the EMG input signal falls below the *'ON Level'* threshold. Grip strength can be increased by maintaining, or pulsing the close signal after gripping an object. The device will then pulse up to a pre-set '*Maximum Pulses*' count (1-3) to incrementally increase grip to a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used; a switch will only produce movement at the maximum set speed.	

Mode 3 - Threshold Control	
Open	An initial signal greater than the *'ON Level'* threshold will cause the hand to open at a constant programmable 'Maximum opening speed' while it remains above the *'ON Level'* threshold. All successive signals given within the *'Alt delay'* period and s above the *'ON Level'* threshold will further open the hand. By default the *'Alt delay'* period is 800ms.
Close	Following an open signal and once the *'Alt delay'* period has elapsed, a signal greater than the '*ON Level'* threshold will close the hand at a constant programmable *'Maximum closing speed'* while it remains above the *'ON Level'* threshold. All successive signals given within the 'Alt delay' period, and above the '*ON Level'* threshold, will further close the hand or increase grip. The hand will stop and remain in position when the EMG input signal falls below the *'ON Level'* threshold. Grip strength can be increased by maintaining, or pulsing the close signal after gripping an object. The device will then pulse up to a pre-set '*Maximum pulses'* count (1-3) to incrementally increase grip to a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used.	

Mode 4 - ‘PULSE’
Single Site: 2 Channel Signal

A short burst input signal will open the terminal device; to close the device the user must provide a long burst signal.

A short burst signal is an input signal that rises to 400% of the ‘ON Level’ threshold and falls back below the ‘ON Level’ threshold within a programmable ‘Pulse Period’.

A long burst signal is an input signal that is sustained for a longer than usual ‘Pulse Period’.

There is an option to invert the functions in this mode, so that a short burst will elicit a full close of the terminal device, and a sustained burst will allow controlled opening of the hand.

Adjustable Parameters:

- Invert (Pulse Open/Close)
- E-1 Control Strategy (Proportional/Threshold)
- E-1 ‘ON Level’ threshold
- E-1 ‘MAX Level’ threshold
- Pulse Period
- Maximum opening speed
- Maximum closing speed
- Maximum pulses count

Mode 4 - Proportional Control	
Open	A short burst input signal, that rises above 400% of the '*ON Level*' threshold and falls back below the *'ON Level'* threshold within a programmable '*Pulse Period*', will open the terminal device fully at a speed proportional to the signal pulse peak, up to a '*Maximum opening speed'*.
Close	An input signal sustained for longer than the *'Pulse Period'* or that does not reach 400% of the '*ON Level'* threshold will close the terminal device at a speed proportional to the strength of the output signal, up to a programmable '*Maximum closing speed'*. Full control of the degree to which the hand closes is achieved by allowing the close signal to drop back below the '*ON Level'* threshold, at which point closing will stop. Grip strength can be increased by maintaining, or pulsing the close signal after gripping an object. The device will then pulse up to a pre-set *'Maximum pulses'* count (1-3) and incrementally increase grip to a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used; a switch will only produce movement at the maximum set speed.	

Mode 4 - Threshold Control	
Open	A short burst input signal, that rises above 400% of the *'ON Level'* threshold and falls back below the *'ON Level'* threshold within a programmable *'Pulse Period'*, will open the terminal device fully at a constant programmed *'Maximum opening speed'*.
Close	An input signal sustained for longer than the *'Pulse Period'* or that does not reach 400% of the *'ON Level'* threshold, will close the terminal device at a constant programmed *'Maximum closing speed'*. Full control of the degree to which the hand closes is exerted by allowing the close signal to drop back below the '*ON Level'* threshold, at which point closing will stop. Grip strength can be increased by maintaining, or pulsing the close signal after gripping an object. The device will then pulse up to a pre-set *'Maximum pulses'* count (1-3) and incrementally increase grip to a maximum.
An AC or DC electrode, linear transducer, force sensitive resistor or switch can be used.	

Glossary of Terms

Dual Site - 2 sites, or 2 inputs, are used to control the device.

E-1/E-2 - Refers to the myoelectric inputs, 1 and 2 respectively. This can include all electric inputs such as AC/DC electrodes, linear transducers, switches and touch pads. Any adjustments made to parameters labelled E-1 or E-2 will only affect the input referred to.

Electrode Gain Control (EGC) - An adjustable setting that influences the amplification of a captured EMG signal so that the user can optimally control the EMG signal range in reference to the 'ON' or 'MAX' Level thresholds.

Electromyography signal (EMG) - An EMG signal captures the movement of a muscle electronically, representing the varying power of a given muscle contraction. It is measuring the action potential created when electrical impulses are generated during muscle contraction. These EMG signals allow the user to control an electronic device through contracting selected muscle groups to varying degrees.

Proportional Control Strategy - This control strategy allows control of when and at what speed/grip a myoelectric terminal device will open or close. Once the given signal reaches a predetermined strength (the 'ON Level' threshold) the terminal device responds, depending upon its programming, at a speed representative of the signal strength. Increasing the signal strength will increase the terminal device speed proportionally, until a second 'MAX Level threshold' is met; at which point the hand responds with a maximum speed and grip strength.

Pulse - A pulse is a fast rising/falling EMG signal with a peak of adequate amplitude to rise above the 'ON Level' threshold for less than a predetermined 'Pulse Period'.

Single Site - 1 site, or 1 input, is used to control the device.

Site - The position on a muscle belly that allows an electrode to capture an optimal EMG signal, on a contraction of the given muscle.

Threshold Control Strategy - This simple control strategy allows control of when

a myoelectric terminal device will open or close. Once the open signal reaches a predetermined strength (the 'ON Level' threshold) the terminal device responds, depending upon its programming, at a constant speed. Increasing the signal strength will not increase the speed at which the terminal device operates.

Notes

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