

TECHNICAL LITERATURE ELECTRIC ELBOW LOCK C13110

The RSL Steeper Electric Elbow Lock makes elbow lock operation easier for those who have difficulties with shoulder shrug control. Used with an RSL Steeper Interlock System, it allows single cable control of a Servo electrical hand and forearm flexion. This provides a user with a high level of arm loss with a functional prosthesis without the need for excessive body movements during the lock-unlock sequence.

TECHNICAL SPECIFICATION

Audible indication of lock engagement.

Lock operation is always positive.

Weight of elbow unit 377g (O.851b)

Typical weight of forearm 280g (O.601b)

8 equal lock positions in flexion minimum 80°, maximum 134°

Lateral movement 360° with 15° between detents

Positive lock with twist control

A screw adjustable friction drum controls freedom of lateral movement

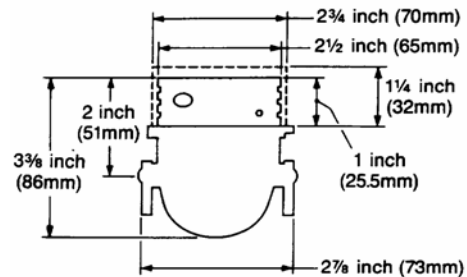


Figure 1 Elbow unit primary dimensions

SOCKET CONNECTION

Two socket connection rings are available. These have an internal thread which accepts the elbow unit. A medial screw is used to lock the mechanism in place. Connection rings are parallel or have 5° taper, these have knurled outer surfaces, selection depends upon the shape and bulk of the socket.

THE FOREARM

A forearm made from polyester laminate are available. These have a parallel distal section tape allows for final length adjustment. Two stainless side steels are laminated into the lateral and medial walls. These engage into two "shoes" on the elbow mechanism spindle and are locked in place with button screws. An internal wrist housing is glued into place. Apply to RSL STEEPER for information on appropriate components.

FOREARM ASSEMBLY

Determine whether the unit is to be for a left or right handed prosthesis. Determine the type of wrist and the flexion system required. Calculate the final forearm length (see fig. 3) ensuring that the measurement can be accommodated between the maximum and minimum lengths available.

Mark off the forearm circumferentially with a wax pencil using the cut distal end as a guide. Check measurements and cut the forearm distal to the mark. Sand carefully to the line marked parallel to an axis through the joint pivot centres. For double amputees 10° of internal flexion is desirable. This can be accommodated by the system and is best done by adjustment to the grinding angle at this stage. Use abrasive paper to smooth any rough edges. Sand raw edges with "Wet & Dry" glass paper, seal the sanded surfaces. Bond the internal housing in place with a quick setting two part resin* and fit the rotary disconnect.

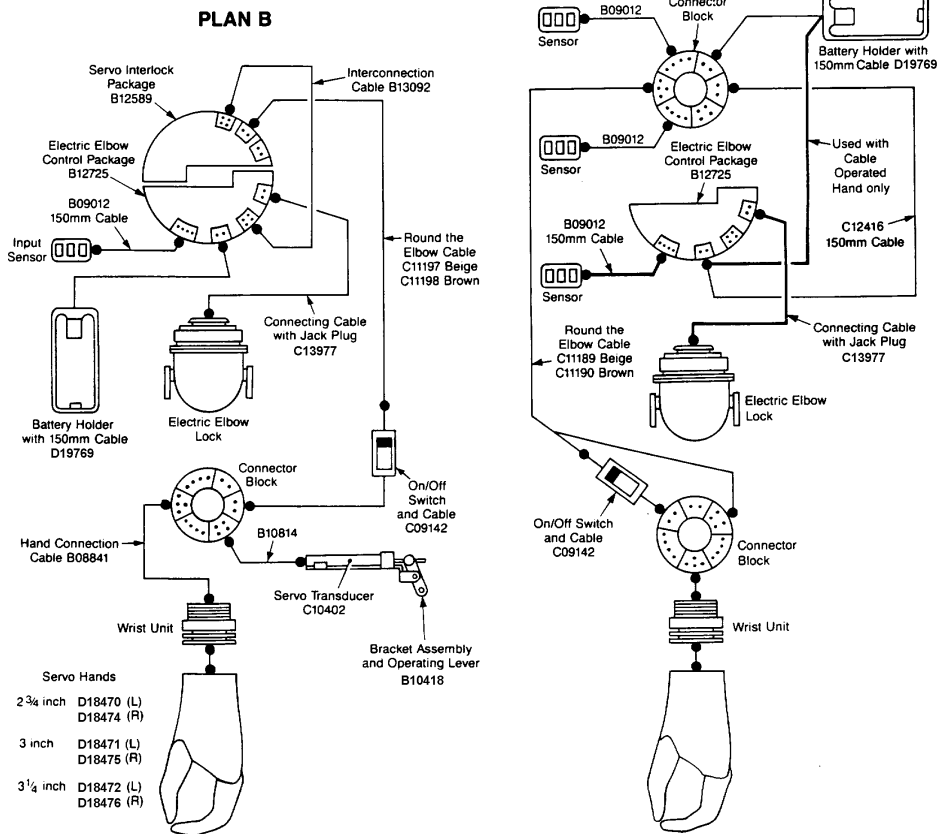
(Observe manufacturers instructions and appropriate health & safety precautions)

FLEXION SYSTEM

When the appropriate flexion system has been selected, the flexion lever rivet positions, R & M can be marked out (see fig. 2). These are pre-drilled but fill with resin during the laminating procedure. A (3.0 mm) drill should be used to clear the resin.

Two hollow stemmed rivets are used to secure the flexion lever. An anchor point for the flexion/ operating cable can be provided. This is sited on the medial surface of the forearm, usually about 1 inch (25mm) proximal to the wrist disconnect face.

Figure 4 Electronic Control Package connection plans



A 3/8 inch (5mm) hole is drilled and a terminal eye mounted through this hole. It is retained with the nut provided.

A laterally routed system has similar elements, but uses a metal cable running within a flexible conduit. Suitable conduit anchors are provided to ensure that the correct line is maintained and friction within the system is minimised.

An anchor will not be required if a forearm servo transducer is used (see Servo Interlock Information).

SYSTEM ASSEMBLY

The socket is finished off with the connector ring laminated, glued or riveted into place. The distal edge of the ring is exposed and the cut distal socket surface suitably finished.

INSTALLATION OF THE ELECTRONIC CONTROL PACKAGE (see fig.4)

The electronic control package for the Steeper 2.3/4" Electric Elbow Lock is fitted to the medial wall of the upper arm just above the laminating ring. The installation kit comprises :

- a) The Electronic Control Package
- b) 2.3/4" Electronics Mounting Adapter
- c) 2.3/4" Drilling Template
- d) Connecting Cable with Jack Plug Termination
- e) Two Screws - M3 X 12mm Countersunk Stainless Steel.
- f) Electric Elbow Lock 2.3/4"

- 1) Position the 2.3/4" template on the distal lateral wall of the outer socket with the lip held against the distal rim. Secure with clear tape.
- 2) Mark through to give approximate drilling positions
- 3) Drill through both of these positions 3mm clear

- 4) Remove the template and discard
- 5) Finish the holes with a countersink
- 6) Two connection plans are possible:
 - a) If the elbow is to be used with a switch or myoelectric input, with independent control of the hand use plan A
 - or**
 - b) If a servo hand is to be used with a function interlock use plan B
- 7) Connect the appropriate input and output cables. Insert jack plug into the centre of the elbow unit.
- 8) Snap the 2.3/4" mounting adapter onto the electronics package
- 9) Insert into the socket cavity and secure with two M3 screws.

INSTALLATION OF THE ELBOW UNIT

The mechanism is screwed fully home into the lateral ring and two holes A & B are drilled in the positions shown in fig.5. Please note that hole A is drilled obliquely into the socket to allow adequate access to the friction adjustment screw.

Hole B is countersunk and tapped 4mm and a M4 x 8 raised countersunk screw is used to lock the assembly together. With the lateral rotator unlocked, the mechanism is rotated into the anterior-posterior plane.

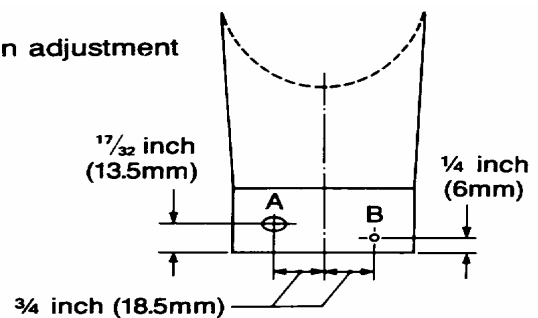
The finished forearm is fitted into the shoes and is secured with two button screws A00564 which are tightened to 22.5 lbf. with a suitable torque driver.

The final assembly is then carried out by fitting the hand and wrist unit, or rotary disconnect unit, the flexion cord and cable pulley. The flexion cord is either crimped or stitched in place.

REPAIR AND SERVICE

We recommend that repairs are carried out in our facility. We will provide a 'loan' unit while the repair is undertaken. Please discuss this with your supplier or RSL Steeper Sales and Marketing.

Figure 5 Posterior view of socket showing friction adjustment and locking screw positions (left/right)



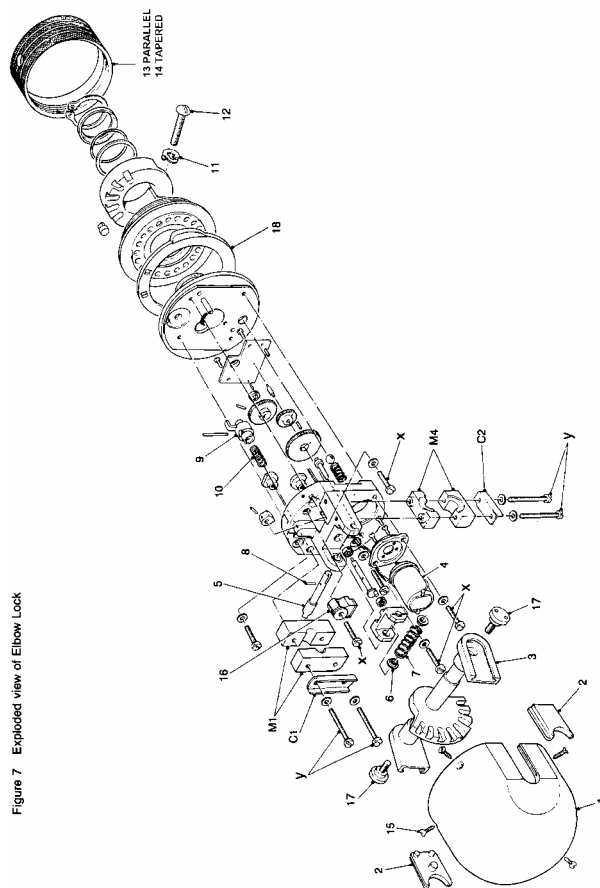


Figure 7 Exploded view of Elbow Lock

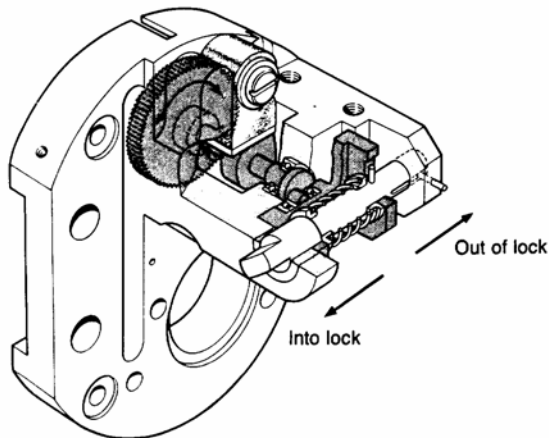


Figure 6

SERVO INTERLOCK SYSTEM

The Elbow Lock can be used in a variety of system configurations. If it is used with a cable operated or Myo Electrically Controlled terminal device, no additional control system is required. If however a Servo Electric Hand is supplied, the use of a Servo Interlock System allows the hand and elbow flexion to be controlled using a single operating cable.

In this case, operation of the lock switches the hand **off** during flexion and **on** when the lock is engaged. If this system is required, the following parts will be required in addition to the Servo Electric Hand, gloves, batteries, battery housing, chargers, connector block, hand connector cable wrist unit etc .

Servo Interlock Package (SIP)		B12589
Drilling Template 2.3/4"		B12599
ELP to SIP Connection Cable		B13092
Round the Elbow Cable (4 way)	Beige	C11189
	Brown	C11190

Round the Elbow Cable (2 way)	Beige	C11197
	Brown	C11198
Servo Transducer		C10402
Transducer Mounting Bracket + Lever	}	B10418
Cable Clamp		
Template for Drilling Forearm		
Pop Stem Rivets (4) Monel Pop		NRT0008
200mm Servo Cable		B10815
On/Off Switch and Cable		C09142

In addition other cables and connections may be required for the individual application. (See plans A and B)

PARTS LIST (Please Note : Certain items above are sold in minimum quantities)

1 & 2a	Elbow Dome & Slides kit Pink	E18722PK
1 & 2b	Elbow Dome & Slides kit Suntan	E18722ST
1 & 2c	Elbow Dome & Slides kit Mid-Brown	E18722MB
1 & 2d	Elbow Dome & Slides kit Dark-Brown	E18722DB
3	Quadrant Assembly	Not Available as Spare
4	Motor and Pinion Assembly	Not Available as Spare
5	Locking Plunger	Not Available as Spare
6	Spring Collar	Not Available as Spare
7	Compression Spring	Not Available as Spare
8	Spirol Pin	Not Available as Spare
9	Lateral Bolt Sub-Assembly	Not Available as Spare
10	Compression Spring	Not Available as Spare
11	Spring Washer - 2BA Double Coil	Not Available as Spare
12	Round Head Screw, 2BA x 1" St/Stl	Not Available as Spare
13	Socket Connection Ring	Parallel Internal 5° Taper Internal
14		B00230 B06563
13/14	Socket Attachment M4 x 8 Screw, Raised CSK St/Stl	NSC0005
15	Elbow Dome Screw - No2 x 3/8" Raised CSK St/Stl S'Tap	Not Available as Spare
16	Rubber Stop Moulding	B09753
17	Button Screw	A00564
18	Humeral Lock Ring	Not Available as Spare
19	Jack Socket Holder	B12734
20	Elbow Lock Control Package	B12725
21	2.3/4" Packing Piece	Not Available as Spare
22	EEL to Electronics Cable	B13182
23	Drilling Template 2.3/4"	Not Available as Spare
24	Servo Interlock Package (SIP)	See Servo List
25	Connection Cable	See Servo List
	Loctite 495 Adhesive - Shaft Stop Assembly	NAD0033
	Loctite 601 Adhesive - Lateral Bolt Assembly	NAD0031
	Rocol MTS2000 Lubricant	NGR0003
	Forearm Cable Connector Eye	B11396
	Nut for Connector Eye	Not Available as Spare
	Hollow Stemmed Rivets - Flexion Lever UK	NRT0035
	Electronics Package Screws - M3 x 10 Raised CSK St/Stl	Not Available as Spare

INSTALLATION OF THE INTERLOCK PACKAGE (See Fig. 3)

The installation procedure for the Servo Interlock Package is similar to that described above for installation of Electric Control Package. The two packages, B12589 & B12725 are designed to fit above the humeral rotator of the elbow unit and are linked by a connector cable, B13092.

During assembly and maintenance the moulded shape on the upper part of the jack plug is held between the two packages to prevent damage to the cable itself as the elbow is screwed into its laminated ring.

INSTALLATION OF THE FOREARM TRANSDUCER

The position of the transducer control lever is determined by establishing a good 'line' from the forearm cable guide. The lever will act as both control element and cable anchor. Using adhesive tape secure the template to the forearm with the lever slot towards the distal end.

Mark the position of the bracket securing rivets and the slot. Remove the template and drill through the laminate using a 1/8 inch (3mm) drill. The ends of the slot can be drilled in a similar way, using a small knife and file to achieve the final shape.

The transducer and bracket assembly is connected using the appropriate cable (see Plan B).

The assembly is fixed in place using the appropriate rivets or screws.

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Figure 3 Calculation of final forearm length

$$C = A - H - B + 1\frac{3}{8} \text{ inch (35mm)}$$

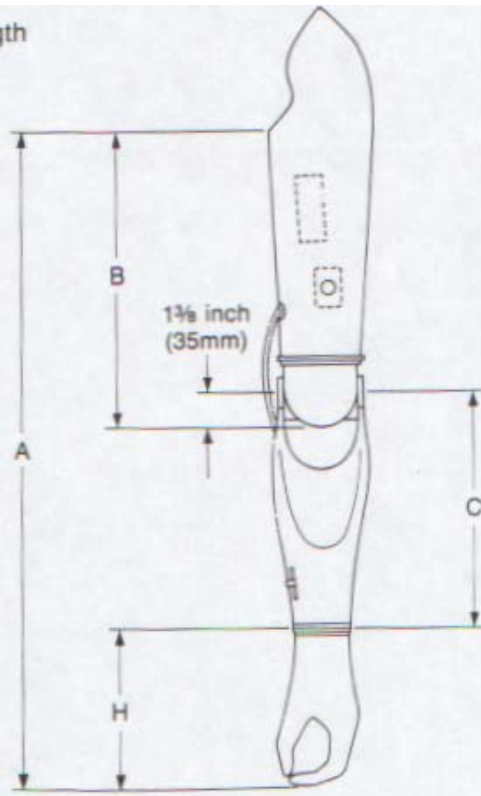


Figure 2

