

HAKIR
HANDKIRURGISKT
KVALITETSREGISTER



NATIONAL MANUAL

for measuring motion and strength in the
elbow, forearm and hand



Manual for motion and strength measurement of elbow, forearm and hand



Version 1, 2019

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INTRODUCTION:

National measurement manual

This is a national measurement manual compiled in 2010 by the rehab units at hand surgery clinics in Göteborg, Linköping, Malmö, Stockholm, Umeå, Uppsala and Örebro.

Aim

The aim of the measurement manual is to ensure the highest possible reliability when measuring functions in HAKIR, and to try to create a Swedish standard for assessment of the hand and upper limb.

Status measurement

- All measurements are performed throughout with active movements
- Distances are measured in millimetres
- Strength is measured in kilograms, with one decimal point, using the mean of three measurements
- When specifying time and date for post-operative treatment, the date of the surgery is considered to be day 0.
- Minus and plus when measuring (1)

For extension/flexion of the elbow, fingers and thumb. Indicate hyperextension with a minus (-). Example:

Extension/flexion MCP 0/90°

For hyperextension MCP -10/90°

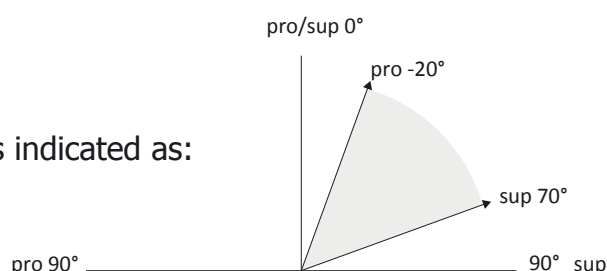
For extension deficit MCP 20/90°

For pronation, supination of forearm and extension, flexion, radial deviation and ulnar deviation of wrist. For lack of mobility, specify degree as a minus (-). Example:

Supination between 20° and 70° is indicated as:

Pronation -20

Supination 70





Instruments, reliability and validity

To ensure high reliability, it is important to define and use identical measuring positions and to repeat these in all measurements. A margin of error of around 5° when using a goniometer is considered acceptable. If measurements are taken in a way not prescribed by the manual, this should be described to increase reliability (2).

The goniometer is an instrument with high validity for measuring angles (2). The choice of goniometer should be based on each respective measuring situation, for example using a shorter-armed goniometer when measuring DIP flexion. The goniometer can be calibrated using known angles (3). Reference values for goniometer measurements are listed in a table (3).

The Jamar dynamometer has been shown to be reliable as long as normal calibration, standardised positions and instructions are used during testing (4). It is valid in the sense that it measures strength rather than pressure (5).

The measurement manual can be downloaded at www.hakir.se and is revised annually.

ELBOW



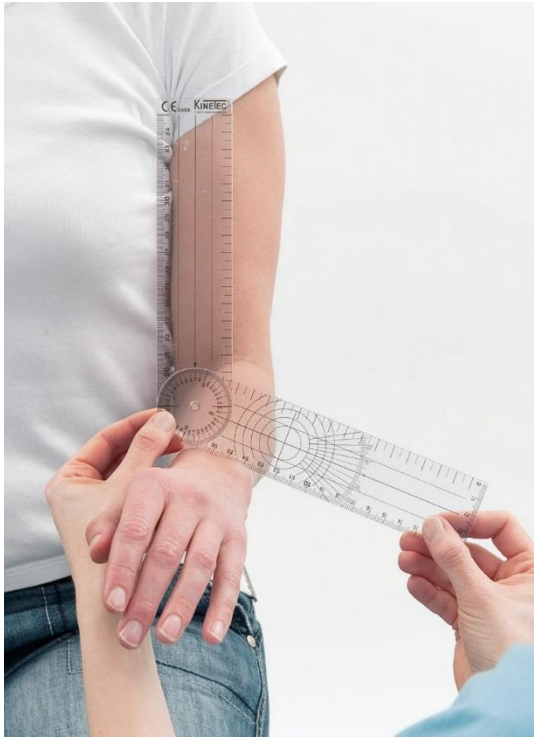
Extension



Flexion

Joint	Elbow joint.
Starting position	Standing, shoulder adducted, forearm supinated.
Axis of motion	Lateral humerus epicondyle.
Fixed arm	Lateral, parallel with the humerus.
Moving arm	Lateral, parallel with the radius.
Measuring method	Goniometer 20 cm.
Reference	2.

FOREARM



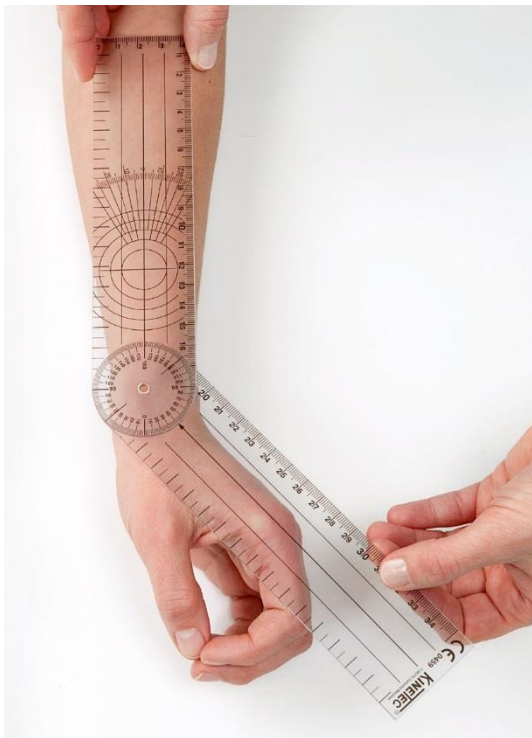
Pronation



Supination

Joint	Proximal and distal radioulnar joint (PRU and DRU).
Starting position	Elbow next to waist, elbow joint approx. 90° flexion, forearm in neutral position.
Axis of motion	Parallel with the forearm's longitudinal axis.
Fixed arm	Longitudinal in line with humerus.
Moving arm	Resting dorsally or volarly on radius and ulna, respectively proximal to caput ulnae parallel with radiocarpal joint.
Measuring method	Goniometer 20 cm.
Reference	1, 2.

WRIST



Extension



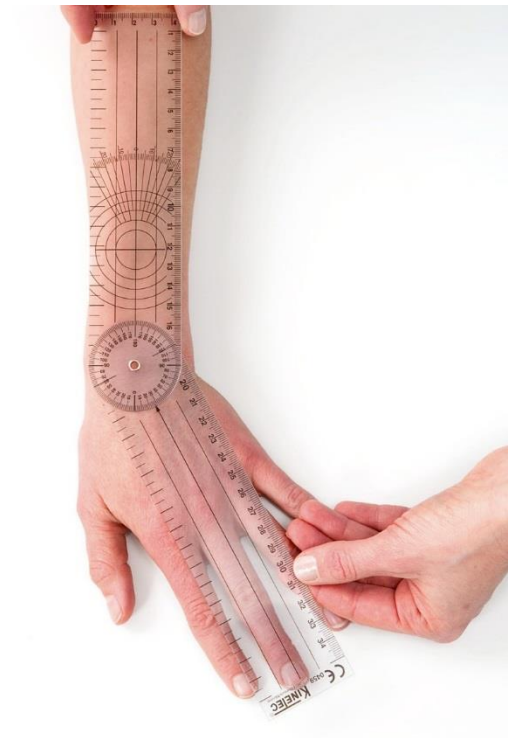
Flexion

Joint	Wrist.
Starting position	Flexed elbow, forearm in neutral position, relaxed fingers.
Axis of motion	Radiocarpal and midcarpal joint.
Fixed arm	Radially parallel with the radius.
Moving arm	Radially parallel with second metacarpal.
Measuring method	Goniometer 20 cm.
Reference	1.

WRIST



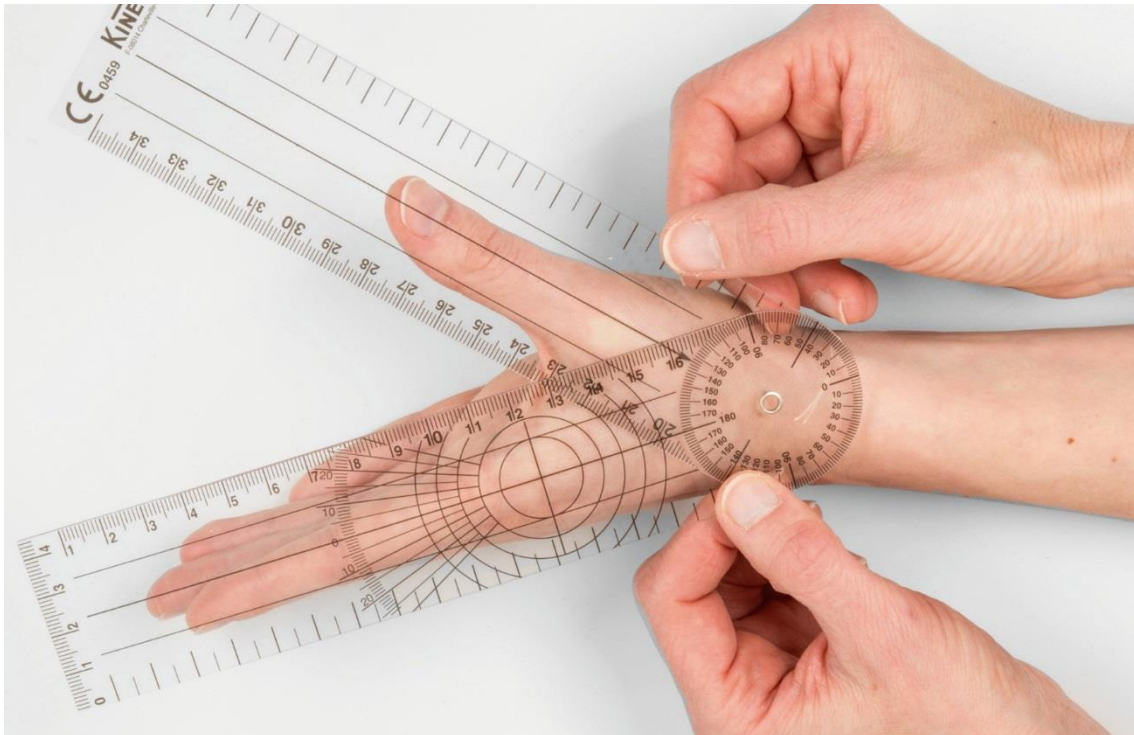
Radial deviation



Ulnar deviation

Joint	Wrist.
Starting position	Forearm resting pronated on surface, wrist 0° extension/flexion.
Axis of motion	Radiocarpal and midcarpal joint.
Fixed arm	Dorsally, midline of forearm.
Moving arm	Dorsally, midline of third metacarpal.
Measuring method	Goniometer 20 cm.
Reference	2.

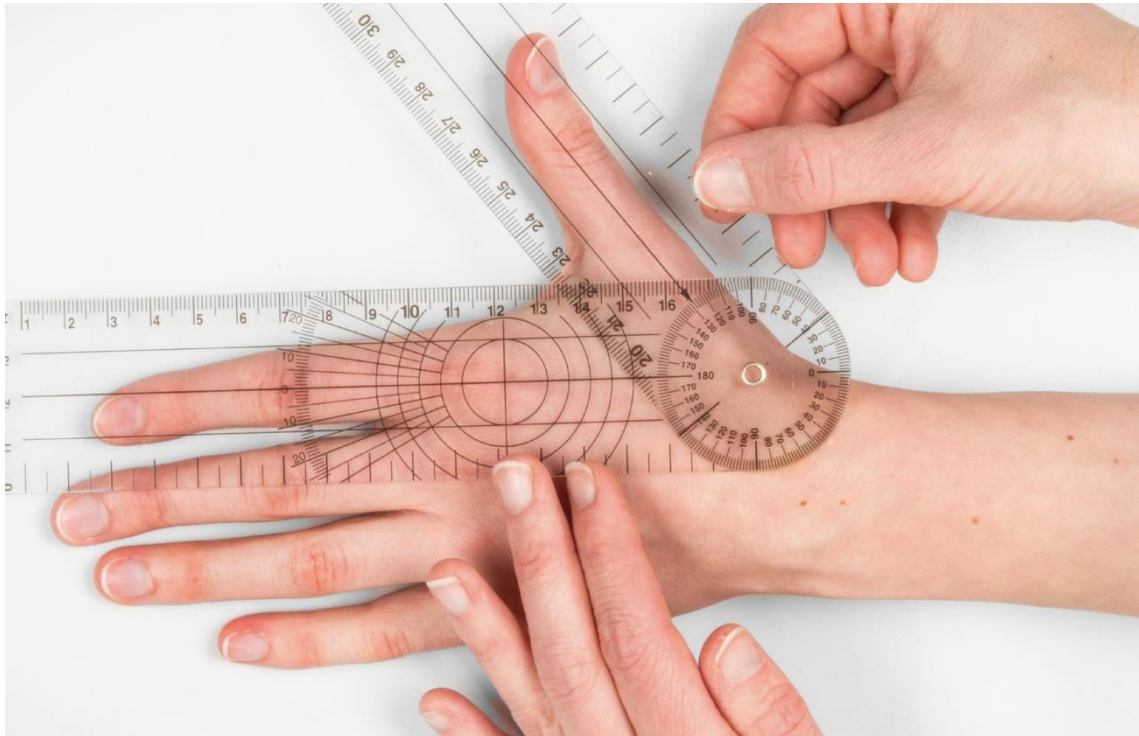
THUMB



Palmar abduction

Joint	CMC I joint.
Starting position	Forearm resting with ulnar side against a surface, wrist 0-30° extension (neutral position).
Motion	Thumb is abducted at a right angle to the palm.
Axis of motion	Intersection of the lines created between metacarpals I and II.
Fixed arm	MC II radially.
Moving arm	MC I dorsally.
Measuring method	Goniometer 20 cm.
Reference	2.

THUMB



Radial abduction

Joint	CMC I joint.
Starting position	Forearm pronated, wrist in neutral position, palm on surface.
Motion	Thumb is abducted in radial direction.
Axis of motion	Intersection of the lines created between metacarpals I and II.
Fixed arm	MC II dorsally.
Moving arm	MC I dorsally.
Measuring method	Goniometer 20 cm.
Reference	2.

THUMB



Extension of MCP and IP joint

Joint	MCP and IP joint dig I.
Starting position	Forearm, wrist and CMC I joint in neutral position.
Axis of motion	MCP and IP joint.
Fixed arm	Dorsally, metacarpal and proximal phalanx, respectively.
Moving arm	Dorsally, proximal phalanx and distal phalanx, respectively.
Measuring method	Finger goniometer ___°/ Hyperextension indicated with a minus.
Reference	1 pages 175-176, 180.

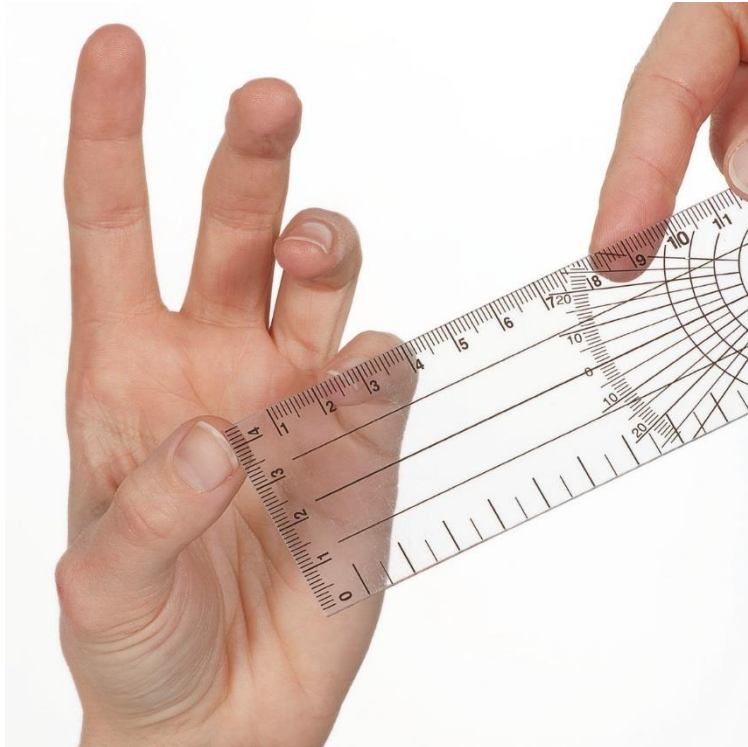
THUMB



Flexion of MCP and IP joint

Joint	MCP and IP joint dig I.
Starting position	Forearm, wrist and CMC I joint in neutral position.
Axis of motion	MCP and IP joint.
Fixed arm	Dorsally, metacarpal and proximal phalanx, respectively.
Moving arm	Dorsally, proximal phalanx and distal phalanx, respectively.
Measuring method	Finger goniometer / ___°
Reference	1 page 181.

THUMB



Opposition

Joint	CMC I.
Starting position	Forearm and wrist in neutral position.
Reference points	The distance between thumb and each respective fingertip as well as to the base of dig V. Measured from the middle of the pulp under the nail. Note if the thumb only reaches the radial side of the pulp.
Measuring method	Ruler. Opposition distance in mm.
Reference	1 page 181.

FINGERS



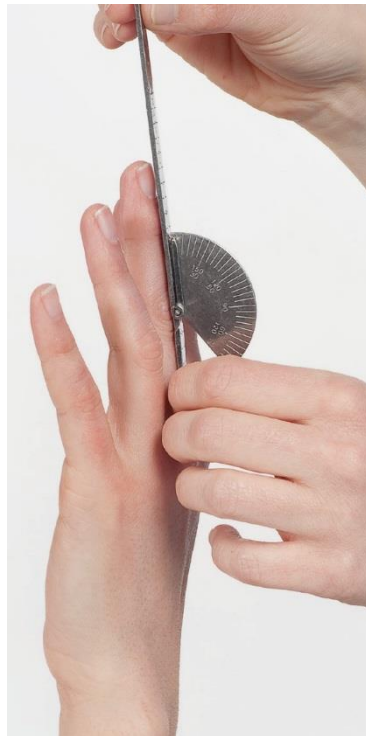
Abduction

Joint	Dig II-V MCP.
Starting position	Forearm resting pronated on surface. Wrist in neutral position. Extended MCP and IP joints.
Axis of motion	MCP joint.
Reference points	Distance between middle of fingertips.
Measuring method	Ruler. Distances are indicated in mm.
Reference	1 page 179.

FINGERS



MCP



PIP



DIP joint dig II-V

Finger extension

Joint	MCP, PIP and DIP joint dig II-V.
Starting position	Forearm and wrist in neutral position.
Axis of motion	MCP, PIP and DIP joint.
Fixed arm	Dorsally, metacarpal, proximal phalanx and middle phalanx, respectively.
Moving arm	Dorsally, proximal phalanx, middle phalanx and distal phalanx, respectively.
Measuring method	Finger goniometer ___°/ Hyperextension indicated with a minus.
Reference	1 pages 175-176, 178.

FINGERS



MCP



PIP



DIP joint dig II-V

Finger flexion

Joint	MCP, PIP and DIP joint dig II-V.
Starting position	Forearm and wrist in neutral position.
Axis of motion	MCP, PIP and DIP joint.
Fixed arm	Dorsally, metacarpal, proximal phalanx and Middle phalanx, respectively.
Moving arm	Dorsally, proximal phalanx, middle phalanx and distal phalanx, respectively.
Measuring method	Finger goniometer / ___°
Reference	1 page 178.

FINGERS



Pulp to palm distance when attempting to fully fist the fingers.

Joint	MCP, PIP and DIP joint dig II-V.
Starting position	Forearm and wrist in neutral position.
Motion	Combined finger flexion.
Measuring method	Ruler. Distances are indicated in mm. Distance from finger pulp to distal palmar crease. 0 mm means full flexion.
Reference	1 pages 171-172.

GRIP STRENGTH



Grip strength

Measuring instrument	Jamar dynamometer.
Starting position	Sitting with elbow by waist, elbow joint approx. 90° flexion, forearms and wrist in neutral position. The examiner supports the dynamometer.
Procedure	Grip in second position. Start with the unaffected hand. Switch between right and left hand. Instruction: "Squeeze the handle as hard as you can, a little harder, a little harder, and relax".
Measuring method	Mean of three measurements in kg. One decimal point.
Reference	5, 6.

PINCH STRENGTH



Two-point pinch

Measuring instrument Pinch Gauge.

Starting position Sitting with elbow by waist, elbow joint approx. 90° flexion, forearm and wrist in neutral position. The patient grabs the gauge between the index finger and thumb making an O, with the remaining fingers flexed in towards the distal palmar crease. The examiner holds the Pinch Gauge lightly at the other end.

Procedure Start with the unaffected hand. Switch between the right and left hand. Instruction: "Pinch as hard as you can, a little harder, a little harder, and relax".

Measuring method Mean of three measurements in kg. One decimal point.

Reference 6.

PINCH STRENGTH



Tripod pinch

Measuring instrument Pinch Gauge.

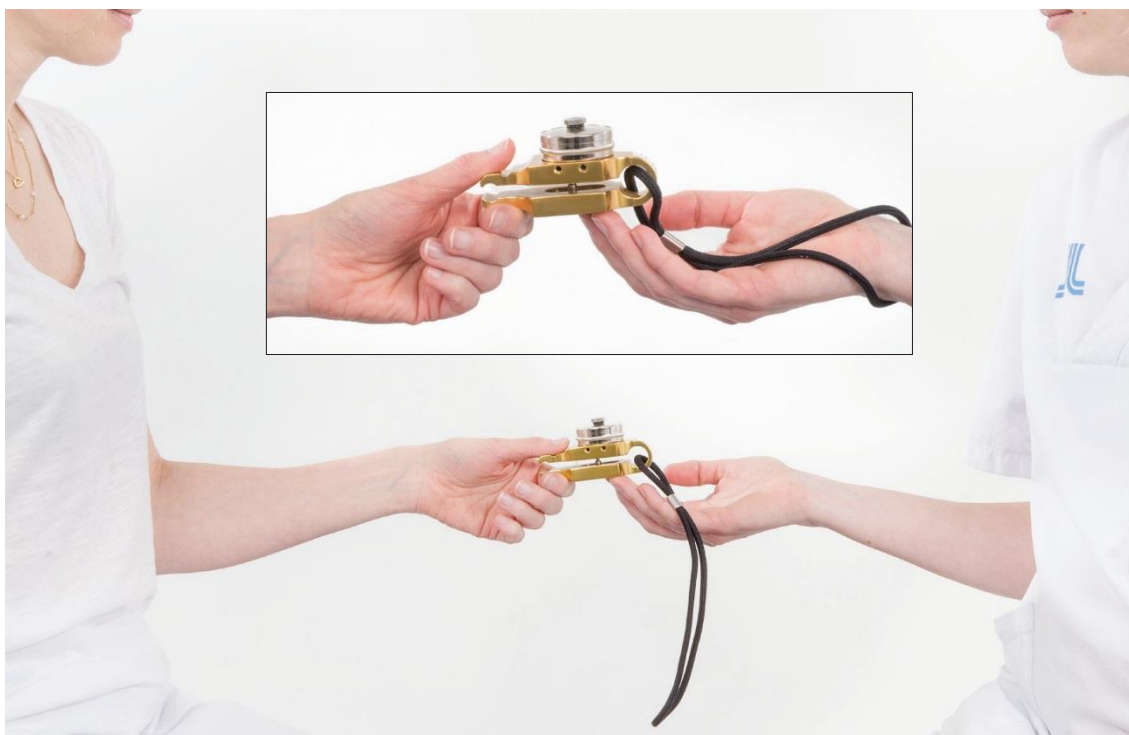
Starting position Sitting with elbow by waist, elbow joint approx. 90° flexion, forearm and wrist in neutral position. The patient grabs the gauge between the thumb, index and middle finger. The examiner holds the Pinch Gauge lightly at the other end.

Procedure Start with the unaffected hand. Switch between the right and left hand. Instruction: "Pinch as hard as you can, a little harder, a little harder, and relax".

Measuring method Mean of three measurements, in kg. One decimal point.

Reference 6.

STRENGTH



Key pinch

Measuring instrument Pinch Gauge.

Starting position Sitting with elbow by waist, elbow joint approx. 90° flexion, forearm and wrist in neutral position. The gauge rests on the index finger's middle phalanx, top of thumb on opposite side. The examiner holds the Pinch Gauge lightly at the other end.

Procedure Start with the unaffected hand. Switch between the right and left hand. Instruction: "Pinch as hard as you can, a little harder, a little harder, and relax".

Measuring method Mean of three measurements in kg. One decimal point.

Reference 6.

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1. Cambridge-Keeling, C. A. (2002). Range-of-motion measurement of the hand. In Mackin, E. J., Callahan, A. D., Skirven, T. M., Schneider, L. H. & Osterman, A. L. (Eds.), *Rehabilitation of the hand and upper extremity* (5th ed., pp. 169- 181). St. Louis: The CV Mosby Company.
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Paramedical reference group with representatives of the hand surgery clinics in Göteborg, Linköping, Malmö, Stockholm, Umeå, Uppsala and Örebro.



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