

OptiFlex-Ankle



Service Manual

Service Manual

OptiFlex-Ankle

Revision 4

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1 History

Revision	Date	Name	Change
1	01.10.2007	S. Herr	SM created.
2	30.03.2009	S. Herr	SM new design, Update Pos. 1, 3, 10
3	09.11.2012	S. Rietsche	Update Pos. 5,9
4	12.04.2013	S. Rietsche	Update Chapter 3.1, 5, 6, 8

2 Purpose

The purpose of this Service Manual is to help you to make simple repairs on the device.
Only authorized staff may perform repairs and maintenance as the manufacturer's warranty and liability would otherwise be invalidated.

Only original parts may be used for servicing in accordance with the attached spare parts list.

3 General

3.1 Declaration of symbol/label

Labels inside



Reading Instruction Manual!

3.2 Electronics, connection cables

No plugs may be connected or disconnected while the unit is switched on. Always switch the device off before connecting or disconnecting a plug.

The lock for spiral cable of the hand held programming unit has to be closed at all times.

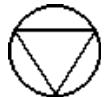
When you assembling with electronic parts make sure to use ESD (electro static discharge) equipment.

Only original chipcards may be used. Insert the chipcards so that OptiFlex is visible.

If you have to exchange any of the printed circuit boards including the hand held programming unit, motor control or power supply electronics you have to perform a calibration.

3.3 Error messages of the hand held programming unit

Following error codes in numbers will be shown on the display:



ERROR
XX

(xx = Number of error)



01 Potentiometer error

Wrong angle information provided from potentiometer

- Replace motor control

02 Failure at the potentiometer

Connection to the potentiometer is interrupted

- Replace motor control

03 Motor driver error

The motor driver IC reported an error

- Replace motor control

04 Motor error

The motor did not turn properly

- Replace motor control
- Replace motor

05 Motor over current

The current for the motor exceeded the maximum limit

- Replace motor motor
- Replace motor control

06 Motor control error

Internal error in the motor control

- Replace motor control

07 Eprom access error

Memory error in the access of the eprom

- Replace hand held programming unit

08 CPM ROM error

Memory error in the motor control

- Replace motor control

09 Communication

Communication to the motor control is not possible

- Check cables and connectors
- Replace hand held programming unit
- Replace motor motor control

10 Unknown error in the motor control

Unknown error in the motor control

- Replace motor control

11 Motor enable timeout

Motor could not be enabled in time

- Replace motor control

12 Invalid parameter motor error

Motor has received a invalid parameter

- Replace hand held programming unit
- Replace motor control

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13 Stop release error

The motor could not be released

- Replace motor control
- Replace hand held programming unit

14 Unexpected motor stop

- Check cables and connectors
- Replace motor control

15 Motor disabled

Motor control disabled the motor

- Replace motor control

16 Wrong command in the motor

- Replace motor control
- Replace hand held programming unit

17 5V supply error

5V supply of motor control not sufficient

- Replace motor control

18 Initialise error real time clock

- Replace hand held programming unit

19 Communication error real time clock

- Replace hand held programming unit

20 Error real time clock

- Replace hand held programming unit

21 Range exceeded

The measured angle is out of the range of motion

- Replace motor control

22 ROM error in the hand held programming unit

Memory error in the hand held programming unit

- Replace hand held programming unit

23 Invalid parameter

Internal error in the hand held programming unit

- Replace hand held programming unit

24 24V supply error motor control

Error in the 24V supply in the motor control

- Replace motor control
- Replace the power supply electronics

25 Bus error

Bus system error

- Replace the spiral cable of the hand held programming unit
- Replace hand held programming unit
- Replace motor control

26 24V supply hand held programming unit

24V supply of the hand held programming unit is defective

- Replace hand held programming unit

27 5V supply hand held programming unit

5V supply of the hand held programming unit is defective

- Replace hand held programming unit

28 3.3V supply hand held programming unit

3.3V supply of the hand held programming unit is defective

- Replace hand held programming unit

29 Calibration

The calibration data in the motor control are wrong

- Perform a calibration

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30 Calibration error

- Repeat the calibration
- Replace motor element assembly

31 Calibration timeout

- Replace motor control

32 Motor enable error

The motor could not be enabled

- Replace motor control

33 Motor disable error

The motor could not be disabled

- Replace motor control

34 Motor stop error

Motor stop command timeout error

- Replace motor control

35 Configuration error

Invalid configuration of the hand held programming unit

- Replace hand held programming unit

36 Parameter not valid chipcard

- Replace chipcard
- Replace hand held programming unit

37 Checksum error chipcard

- Replace chipcard
- Replace hand held programming unit

38 Unknow chipcard error

- Replace hand held programming unit

39 A chipcard of another ARTROMOT® product got used

- Formate the chipcard
- Replace chipcard

40 Unknown chipcard

- Replace chipcard

41 Chipcard is missing

No chipcard is insert

- Insert chipcard
- Replace chipcard

42 Chipcard write error

The chipcard is not writable

- Replace chipcard
- Replace hand held programming unit

43 Chipcard read error

Chipcard is not readable

- Replace chipcard
- Replace hand held programming unit

44 Chipcard verify

- Replace chipcard
- Replace hand held programming unit

45 Wrong product combination

Mixed between non compatible device and hand held programming unit

- Use the correct hand held programming unit

46 Handset error internal communication

Invalid interchip communication inside the hand held programming unit

- Replace hand held programming unit

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47 Internal communication error motor control

Internal communication error motor control

- Replace motor control

49 Unknown error in the motor control

- Replace motor control

53 Conversion error motor B

- Check motor B fixation
- Check the permanent magnets

(B?)

- Check motor B fixation

3.4 Mechanics

No plugs may be connected or disconnected while the unit is switched on. Always switch the device off before connecting or disconnecting a plug.

The moveable screws should not be completely unscrewed when adjustments are being made. Make sure that the moveable screws are tightened for operation and transport.

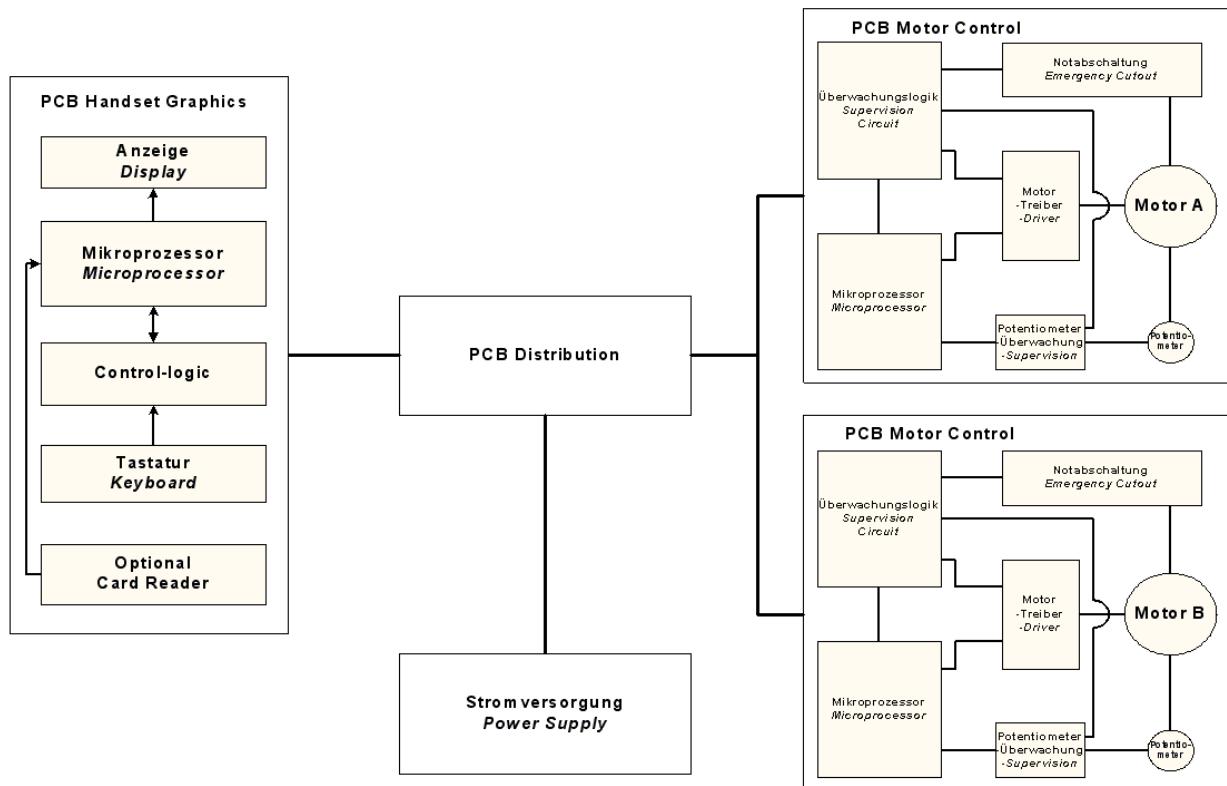
The frame is unstable: Possible cause, bolt/ screws are missing or loose. Tighten the screws.

3.5 Other

Do not clean the housing or the support with grease or oil.

No solvents may be used when cleaning the device.

4 Block diagram of the electronic parts



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5 Bill of materials for service parts

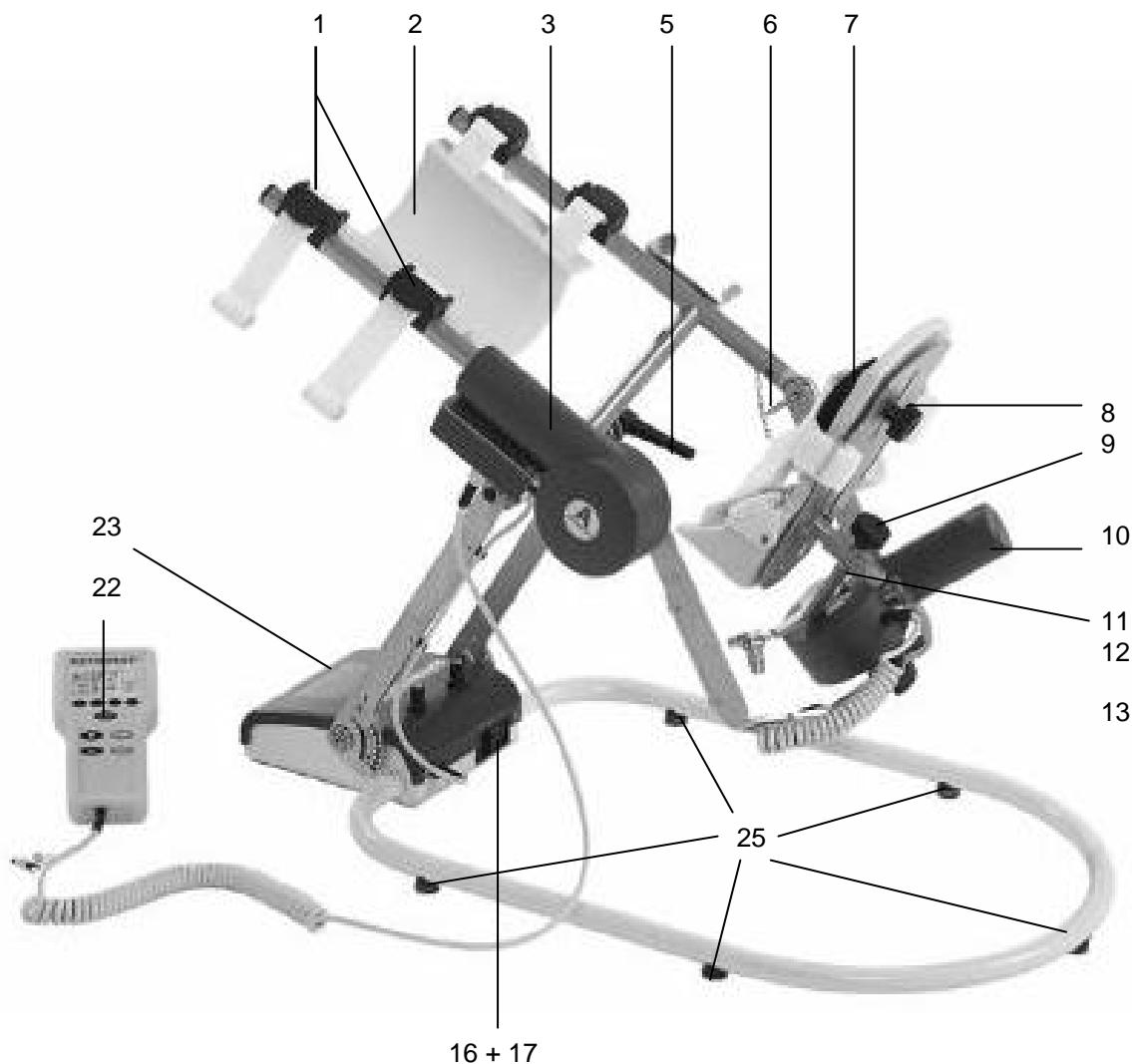
Position	Description	Order number
1	Clamping lever	2.0037.202
	Pin for OptiFlex Ankle up to serial number 1203	2.0013.352
	Circlip up to serial number 1203	DIN6799D2,3A2
	Spike for OptiFlex Ankle starting with serial number 1204	2.0037.243
2	Lower leg support complete with belts	2.0013.074
	Lower leg support	2.0013.291
	Belt with belt strap	2.0013.059
3	Motor housing left	2.0034.402
	Motor housing right	2.0034.401
	Sticker OptiFlex A	0.0034.054
	Motor control motor A	2.0038.901
5	Clamping lever	GN503-63-8-sw
	Washer	DIN9021D8,4x25x1
6	Setting pin	401.218
7	Footrest shell OptiFlex Ankle complete with plate	0.0038.064
	Footrest complete with belts	0.0038.063
	Belt loop for footrest	2.0013.087
8	Knurled screw for footplate	0.0038.060
9	Knurled screw for footplate complete	GN-534-32-M6-10-sw
	Motor housing left	2.0034.402
	Motor housing right	2.0034.401
	Sticker OptiFlex B	0.0034.055
	Sticker scale	2.0038.146
	Motor control motor B	2.0038.901
	Jumper motor control motor B	0.0034.068
11	Footplate bracket	0.0038.062
12	Fixation screw motor B	0.0038.061
13	Magnet	0.0038.010
16	Power switch (on/ off) with connection up to s/n 19999	0.0034.245
	Power switch (on/off) with connection starting with s/n 20000	0.0034.270
	Cover Power switch	0.0034.261
17	Fuses cap	0.0034.246
	Fuse 1AT up to s/n 19999	0.0000.005
	Fuse 2AT starting with s/n 20000	0.0000.107
22	Hand held programming unit with spiral cable OptiFlex Ankle	0.0038.054
	Standard with chip card	
	Spiral cable for hand held programming unit	2.0038.018
	Protection for hand held programming unit	0.0037.103
23	Power supply electronics up to s/n 19999	0.0034.244
	Power supply electronics starting with s/n 20000	0.0034.270
25	Rubber for basic frame	0.0038.012
	Washer distance disk	0.0038.011
	Washer	DIN902D6,4vz
	Power cord US version	0.0034.011

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6 Figure for bill of materials



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OptiFlex- Ankle up to s/n 19999



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OptiFlex-Ankle starting with s/n 20000



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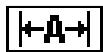
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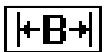
7 Special function Service Menu

Possible function of the special function Service Menu

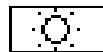
Menu level 1



Calibration motor A



Calibration motor B



Display contrast



Error log



Runtime motor A



Runtime motor B

Entering the service menu

Press the menu key until Service Menu shows up



Press the key for 5 seconds



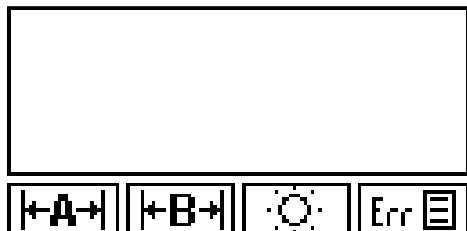
Is flashing on the display

The display will change and show
Entering code.

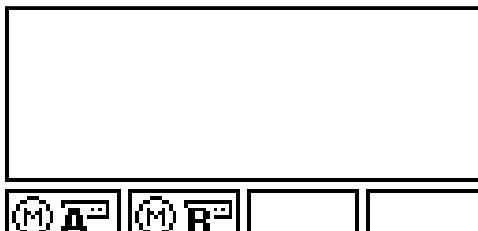


For the code press: 1 3 2 4

Now you see the symbols of the service menu



menu level 1



menu level 2

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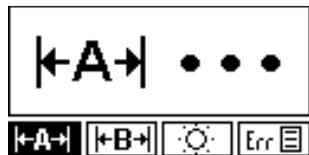
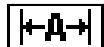
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7.1 Calibration

Attention: Before you do a calibration switch the device OFF and ON.

Calibration motor A

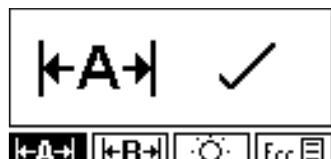
Press the symbol calibration motor A



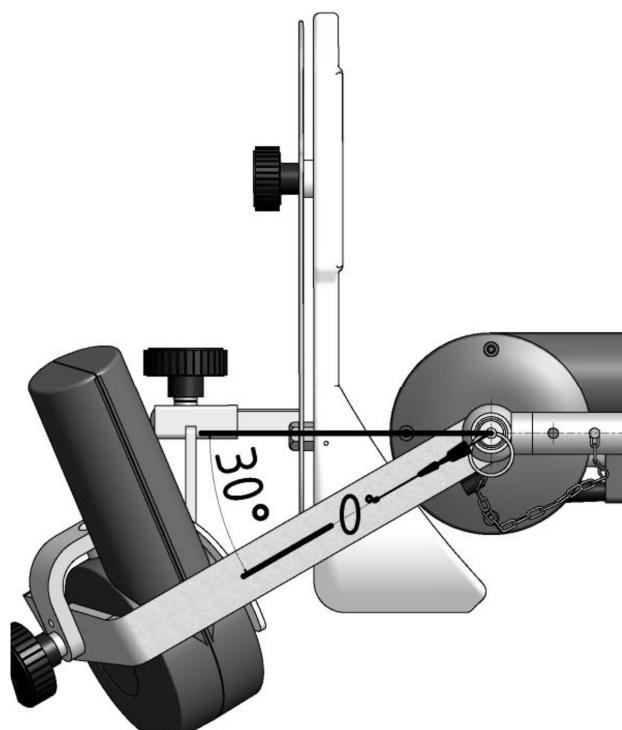
Press + and/ or – to move motor A to 0 degrees (see figure below).

Press START. The calibration starts automatically. Motor A moves in the range of motion.

Wait until motor A stops. If the calibration was successful motor A stops at 0 degrees and show following symbols on the display:



Press STOP twice to leave the Service Menu.



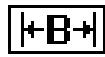
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Calibration motor B

Press the symbol calibration motor B



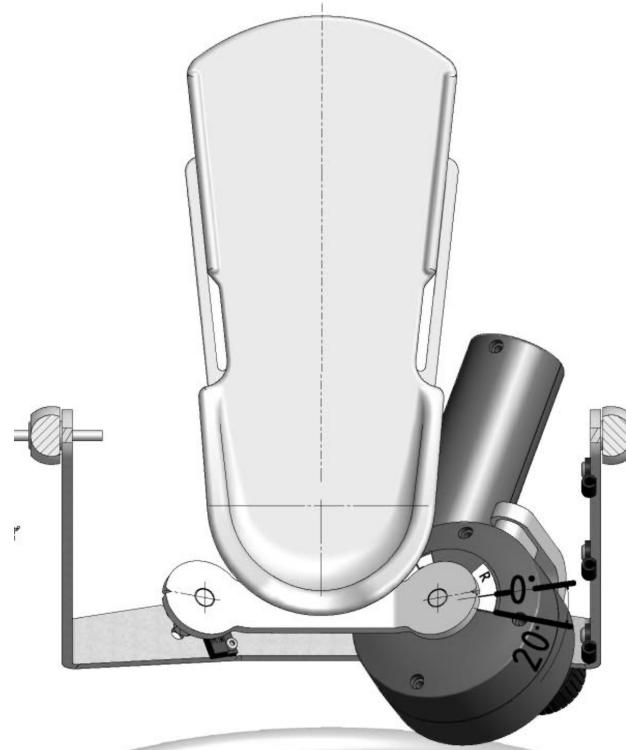
Press + and/ or – to move motor B to 0 degrees.

Press START. The calibration starts automatically. Motor B moves in the range of motion.

Wait until motor B stops. If the calibration was successful motor B stops at 0 degrees and show following symbols on the display:



Press STOP twice to leave the Service Menu.



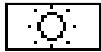
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7.2 Display contrast

Press the symbol display contrast



Display:



XX %

Press STOP twice to save the setting and to leave the Service Menu.

7.3 Error log

Press the symbol error log



You will find following information on the display.

Upper line: Number of the current showed error message and the total number of the saved error messages.

Starting with software V2.X XX.XX.XX (X = optional): Number on the right is the error code of the error message (see chapter 3.2).

Lower line: Error message.

Left side of lower line: The symbol of the causer.



Hand held programming unit



motor A



motor B

Press + or - to see the entries of the error log.

General note to the error log:

Entries are always in english.

The entries are ordered by causer and not in temporal order.

Press STOP twice to leave the Service Menu.

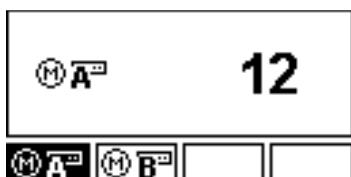
7.4 Runtime

Runtime motor A

Press the symbol for runtime motor A.



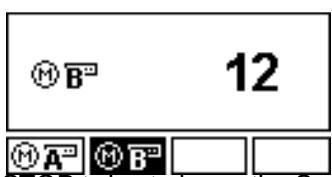
The display shows the runtime of motor A:



Press the symbol for runtime motor B.



The display shows the runtime of motor B:



Press STOP twice to leave the Service Menu.

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8 Checklist of safety and function test up to serial number 19999

Safety test		Measured value	Date/ Signature
Protective earth conductor resistance	$\leq 0,1$ Ohm	Ohm	
Ground leakage current IEC62353/ VDE 0751-1	≤ 500 μ A	μ A	
or			
Ground leakage current as in UL 2601	≤ 500 μ A	μ A	

Function test	OK	Error								
<p>Switch on the OptiFlex-Ankle. Press the two outer buttons simultaneously. Display: Software version VX.X XX.XX.XX (x=optional)</p> <p>Keep on pressing. Display: OptiFlex-Ankle Standard Chip</p>										
<p>Set up the maximum range of motion. Motor A: Dorsal/ Plantar 40/-50 degrees. Motor B: Eversion/ Inversion 20/-40 degrees.</p> <p>Check the angle of motor A in position 0 degrees. Tolerance +/- 3 degrees.</p> <p>Check the angle of motor B in position 0 degrees. Tolerance +/- 3 degrees.</p>										
<p>Check the emergency-off function.</p> <p>Switch the device on in continuous operation. Press any key to stop motors A and B immediately. Check this for all keys.</p>										
<p>Set up the special function NEW PATIENT. Press START. The device will move automatically to Motor A = 0 degrees and motor B = 5 degrees and will stop.</p>										
<p>Check the set values of NEW PATIENT:</p> <table style="margin-left: 20px;"> <tr> <td>Dorsal/ Plantar</td> <td>-> Display: 20 -20</td> </tr> <tr> <td>Eversion/ Inversion</td> <td>-> Display: 15 -5</td> </tr> <tr> <td>Speed</td> <td>-> Display: 50 %</td> </tr> <tr> <td>Therapy Duration</td> <td>-> Display: 00:00</td> </tr> </table>	Dorsal/ Plantar	-> Display: 20 -20	Eversion/ Inversion	-> Display: 15 -5	Speed	-> Display: 50 %	Therapy Duration	-> Display: 00:00		
Dorsal/ Plantar	-> Display: 20 -20									
Eversion/ Inversion	-> Display: 15 -5									
Speed	-> Display: 50 %									
Therapy Duration	-> Display: 00:00									
<p>Check the display symbols for the conversion right to left ankle joint. Display for motor B right conversion: </p> <p>Now convert motor B from right to left. After you removed motor B from The bracket the display show: </p> <p>Now mount motor B correct on the left part of the bracket and fix it with the screw. Display for motor B left conversion: </p>										

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9 Checklist of safety and function test starting with serial number 20000

Safety test	Measured value	Date/ Signature
Touch current IEC 62353/ VDE 0751-1	$\leq 100 \mu\text{A}$	μA
or		
Patient leakage current	$\leq 100 \mu\text{A}$	μA

Function test	OK	Error
Switch on the OptiFlex-Ankle. Press the two outer buttons simultaneously. Display: Software version VX.X XX.XX.XX (x=optional) Keep on pressing. Display: OptiFlex-Ankle Standard Chip		
Set up the maximum range of motion. Motor A: Dorsal/ Plantar 40/-50 degrees. Motor B: Eversion/ Inversion 20/-40 degrees. Check the angle of motor A in position 0 degrees. Tolerance +/- 3 degrees. Check the angle of motor B in position 0 degrees. Tolerance +/- 3 degrees.		
Check the emergency-off function. Switch the device on in continuous operation. Press any key to stop motors A and B immediately. Check this for all keys.		
Set up the special function NEW PATIENT. Press START. The device will move automatically to Motor A = 0 degrees and motor B = 5 degrees and will stop.		
Check the set values of NEW PATIENT: Dorsal/ Plantar -> Display: 20 -20 Eversion/ Inversion -> Display: 15 -5 Speed -> Display: 50 % Therapy Duration -> Display: 00:00		
Check the display symbols for the conversion right to left ankle joint. Display for motor B right conversion: 		
Now convert motor B from right to left. After you removed motor B from The bracket the display show: 		
Now mount motor B correct on the left part of the bracket and fix it with the screw. Display for motor B left conversion: 		

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