

# ARTROMOT®-K3



## **Service Manual**

Up to Serial number 2999

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## 1. History

Revision	Date	Name	Change
1	17.09.2001	M. Nunnenmacher	Initial Release
2	19.09.2001	M. Nunnenmacher	Pos. 4.8 new partnumber 0.0013.104
3	15.10.2001	M. Nunnenmacher	Pos. 1.9, 1.15, 1.16 new partnumber
4	6.11.2001	M. Nunnenmacher	Update reference run, new packaging
5	15.01.2002	M. Nunnenmacher	Update Pos. 3.13, 3.45, 4.3, 4.5, Safetytest
6	06.02.2002	M. Nunnenmacher	Update Pos. 3.12 Labeled casting
7	27.03.2002	M. Nunnenmacher	Update Pos. 1.1 part-number power cord

## 2. Purpose

This service manual is to perform some repairs on ARTROMOT®-K3 products. Repair and maintenance work may only be carried out by authorised persons, as otherwise all warranty services and liabilities shall be void. It is not allowed to utilize any other spare part which is not mentioned in chapter 6.

## 3. General

### 3.1 Electronic and cable

- Make sure that the characteristic values of your power supply correspond to the voltage and frequency data indicated on the power adapter.
- Error possibilities, showed by the Hand-held programming unit:

Error 1: Spiral cable of the knee case is broken or not connected  
--> Verify the connection of the spiral cable or replace the spiral cable.

### 3.2 Mechanics

- Do not loosen the knurled handles completely for any adjustment. For operation or transport, make sure that the knurled handles are tight.

### 3.3 Others

- Do not clean the housing or the support with grease or oil.
- Do not utilize any solvent for cleaning the ARTROMOT®-K3.

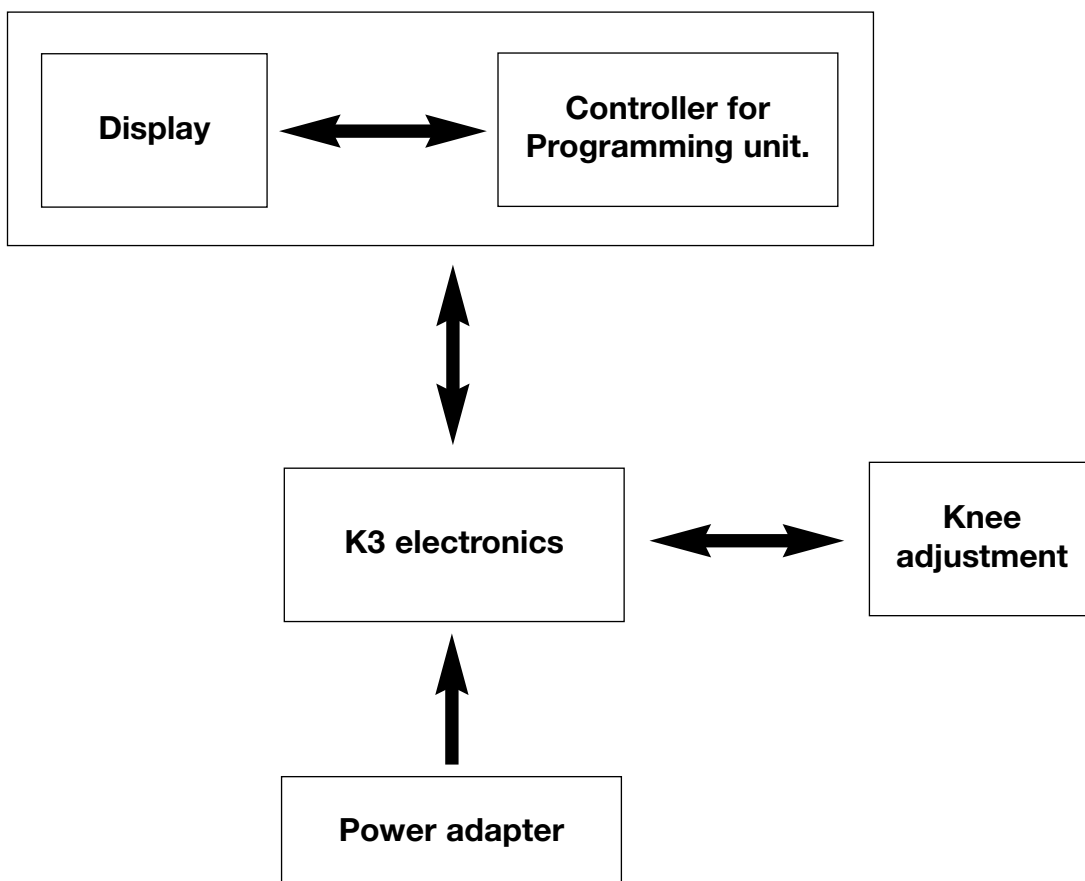
## 4. Assembly and disassembly

Preparations for transport the ARTROMOT®-K3 has to be done.

- The first step is to move the device in a maximum position of EXTENSION = -5 degrees.
- Remove the power adapter and put this part in a separate pad.
- Loosen the 2 knurled handles (Pos. 6.2), pull out the ankle joint (Pos. 4.x) and put the ankle joint just the other way round.
- Protect the hand-held programming unit against vibration and damage and put the hand-held programming unit in a separate pad.
- Make sure, that all of the knurled handles are tight.
- For transportation, use the original packaging.



## 5. Block diagram of the electronic parts



## 6. Bill of material for service parts

Position	Description	Order-Number
<b>1.0</b>	<b>Electronics</b>	
1.1	Power adapter 115V	0.0031.107
1.1	Power adapter 115V / 230V	0.0031.107W
1.2	Hand-held programming unit	0.0032.123
1.3	Motor control	0.0031.101
1.4	Rubber mat	2.0031.195
1.5	Sheet metal cover	2.0031.116
1.6	Motor electronics	0.0031.120
1.7	Fantype lock washer	799.011
1.8	Screw thread slab	962.903
1.9	Screw	LIKOM4x8A2
1.10	Metal distance reel	7E2.064
1.11	Hexagonal nut	DIN934M3vz
1.12	Cable strap	0.0013.118
1.13	Cloth white	0.0010.144
1.14	Sticker	2.0013.362
1.15	Phillips screw	9B2.013
1.16	Cover top black	9B2.013
1.17	Spiral cable	2.0032.129
1.18	Holding clip	0.0031.004
<b>2.0</b>	<b>Exterior underframe</b>	
2.1	Right profile	2.0032.107
2.2	Left profile	2.0032.106
2.3	Right rubber mat	2.0032.116
2.4	Left rubber mat	2.0032.115
2.5	Lip	2.0031.193
2.6	Interior slit	2.0032.113
2.7	Interior slit	2.0032.128
2.8	Right cover	2.0032.105
2.9	Left cover	2.0032.104
2.10	Shaft bearing	2.0031.112
2.11	DU collar	0.0031.110
2.12	Interior slit	2.0032.128
2.13	Fixing buckle	2.0031.184
2.14	Exterior slit	2.0032.114

2.15	Exterior slit	2.0032.114
2.16	Bottom plate	2.0032.108
2.17	Attachment plate femur bow	2.0032.101
2.18	Attachment plate femur bow	2.0032.100
2.19	Thread plate	962.901 M6
2.20	Pan head screw	DIN912M6x8A2
2.21	Pan head screw	DIN7984M5x25A2
2.22	Countersunk screw	DIN7991M4x8A2
2.23	Cylinder pin	DIN6325D5x10
2.24	Shell nut	0.0032.122
2.25	Countersunk screw	DIN7991M6x10A2
2.26	Sping wire	0.0031.300
2.27	Band white	2.0020.163
2.28	Cloth black	0.0032.110
2.29	Implementation spout	0.0031.145
2.30	Rivet	DIN7337D4AI/ST

### **3.0 Drive technology**

3.1	Motor including transmission	0.0031.100
3.2	Right slide	2.0031.108
3.3	Left slide	2.0031.109
3.4	Thread strut	2.0032.109
3.5	Rubber ring	2.0031.175
3.6	Rubber ring	2.0031.176
3.7	Rubber plate	2.0028.170
3.8	Motor plate	2.0031.156
3.9	Spline shaft drive	2.0031.181
3.10	Toothed belt	0.0031.130
3.11	Toothed lock washer drive	2.0031.180
3.12	Labeled Casting	2.0032.032
3.13	Bearing plate left	2.0031.165
3.14	Rubber plate	2.0031.102
3.15	Sheet metal	2.0031.115
3.17	Ball bearing	910.008
3.18	Rubber ring	2.0031.105
3.19	Rubber disk	2.0031.104
3.20	Joint plate	2.0031.113
3.22	Covering plate	0.0028.105
3.23	Ring	0.0028.106
3.24	Split rivet	0.0031.136
3.25	Wire-Set power supply	0.0031.125
3.26	Retaining ring	DIN471A8x0,8
3.27	Rubber buffer	0.0031.109

3.28	Spacer sleeve	0.0031.104
3.29	Pin	2.0031.188
3.30	Countersunk screw	DIN7991M5x20vz
3.31	Screw thread pin	DIN916M4x4sw
3.32	Screw thread pin	DIN914M4x4sw
3.33	Countersunk screw	DIN7991M4x10vz
3.34	Hexagonal nut	DIN934M5vz
3.35	Pan head crew	DIN912M5x6vz
3.36	Countersunk screw	DIN7991M5x25A2
3.37	Countersunk screw	DIN7991M5x55vz
3.38	Countersunk screw	DIN7991M5x16vz
3.39	Bearing plate right	2.0031.103
3.40	Retaining plate	2.0031.200
3.41	Pan head screw	DIN912M4x10vz
3.43	Countersunk screw	DIN965M3x4vz
3.44	Pan head screw	DIN912M2,5x6vz
3.45	Spacer sleeve	0.0031.112
3.46	Pressure spring	0.0031.170
3.47	Case	2.0031.201
3.48	GS-Magnet	0.0031.160
3.49	Tube ring	0.0031.161
3.50	Countersunk screw	DIN7991M4x16vz
3.51	Pan head screw	DIN912M4x12vz
3.52	Plug	9A4.127

#### **4.0 Ankle joint**

4.1	Ankle joint bowl	2.0031.120
4.2	Base plate	2.0031.170
4.3	Knurled handle	GN534-40-M6-10sw
4.4	Washer	DIN9021D6,4vz
4.5	Washer	0.0031.111
4.6	Washer	0.0031.142
4.7	Screw rosette	0.0031.137
4.8	Spacer sleeve	0.0013.104
4.9	Sleeve nut	2.0031.178
4.10	Fastening band	0.0031.144
4.11	Rigid pipe	2.0031.117
4.12	Knurled handle	2.0031.031
4.13	Washer	DIN7349D6,4vz
4.14	Hinge box	2.0031.119
4.15	Washer	2.0031.118
4.16	Countersunk screw	DIN7991M5x8A2
4.17	Cylinder pin /	DIN7D4x20A2

4.18	Nut	0.0031.108
4.19	Nut	0.0031.105
<b>5.0 Knee case</b>		
5.1	Knee case	2.0032.125
5.2	Retaining ring	DIN471A10x1
5.3	Bearing shell	2.0032.122
5.4	Washer	2.0032.123
5.5	Shim	DIN988D10x16x0,1
5.6	Knee case	2.0032.119
5.7	Knee case (Poti)	2.0032.121
5.8	Knee electronics	0.0031.121
5.9	Spiral cable for knee case	0.0031.122
5.10	Lid potentiometer	2.0031.189
5.11	Shaft	2.0032.120
5.12	Countersunk screw	DIN7991M4x12A2
5.13	Countersunk screw	DIN7991M4x20A2
5.14	Tapping screw countersunk	DIN7982D3,9x13A2
5.15	Screw thread pin	DIN913M4x8sw
5.16	Washer	2.0013.231
5.17	Shim	DIN988D10x16x0,3
<b>6.0 Femur bow</b>		
6.1	Femur bow	2.0032.001
6.2	Knurled handle	GN534-32-M6-10
6.3	Right pipe thigh	2.0032.004
6.4	Left pipe thigh	2.0032.006
6.5	Stop bow femur adjustment	2.0032.127
6.6	Support	2.0032.005
6.7	Washer	DIN125D2,2A2
6.8	Washer	DIN125D3,2A2
6.9	Hexagonal nut	DIN934M2A2
6.10	Pin	DIN1481D3x16A2
<b>Patient kits</b>		
No illustration	Patient kit fleece	2.0032.155
No illustration	Patient kit cool-quilt	2.0032.155B

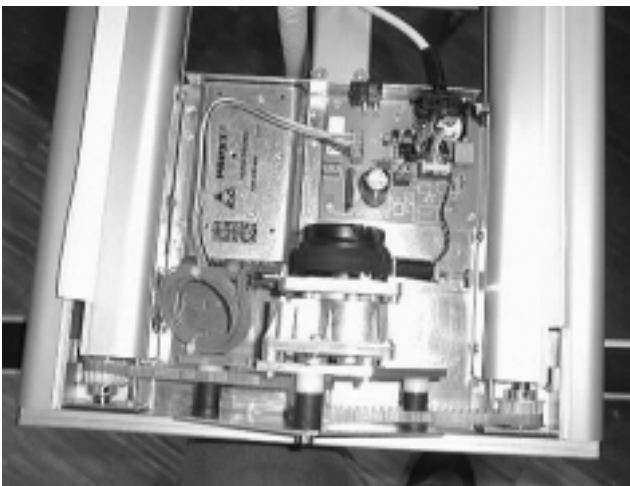
## 7. How to perform the repair

### 7.1 How to remove the casing (Pos. 3.12)

- Move the ARTROMOT®-K3 in a position of approximately 110 degrees.
- Turn the power OFF at the ARTROMOT®-K3 and remove the power adapter.
- Hit the 4 pins of the split rivet (Pos. 3.24) inwards.
- Remove the 2 covering plates (Pos. 3.22)
- Loosen the 2 countersunk screws (Pos. 3.50) and remove the casing.
- Remove the 4 pins of the split rivet, which are inside the casing.
- If you have exchanged any of the printed circuit boards including the knee elec-tronics and the hand held programming unit or any parts of the drive technology (Pos. 3.x), you have to perform a reference run. See chapter 7.4
- Finally, a function- and safetytest has to be performed.

### 7.2 How to exchange the hand-held programming unit (Pos. 1.2)

- Remove the casing. See chapter 7.1
- Pull out the connector of the hand held programming unit.  
**Attention:** Use your ESD (Electro Static Discharge)-equipment.
- Put in the connector of the new hand held programming unit.



- Rebuild the casing.
- Perform a reference run. See chapter 7.4
- Finally, a function- and safetytest has to be performed.

### 7.3 How to exchange the motor electronics (Pos. 1.3 and 1.6)

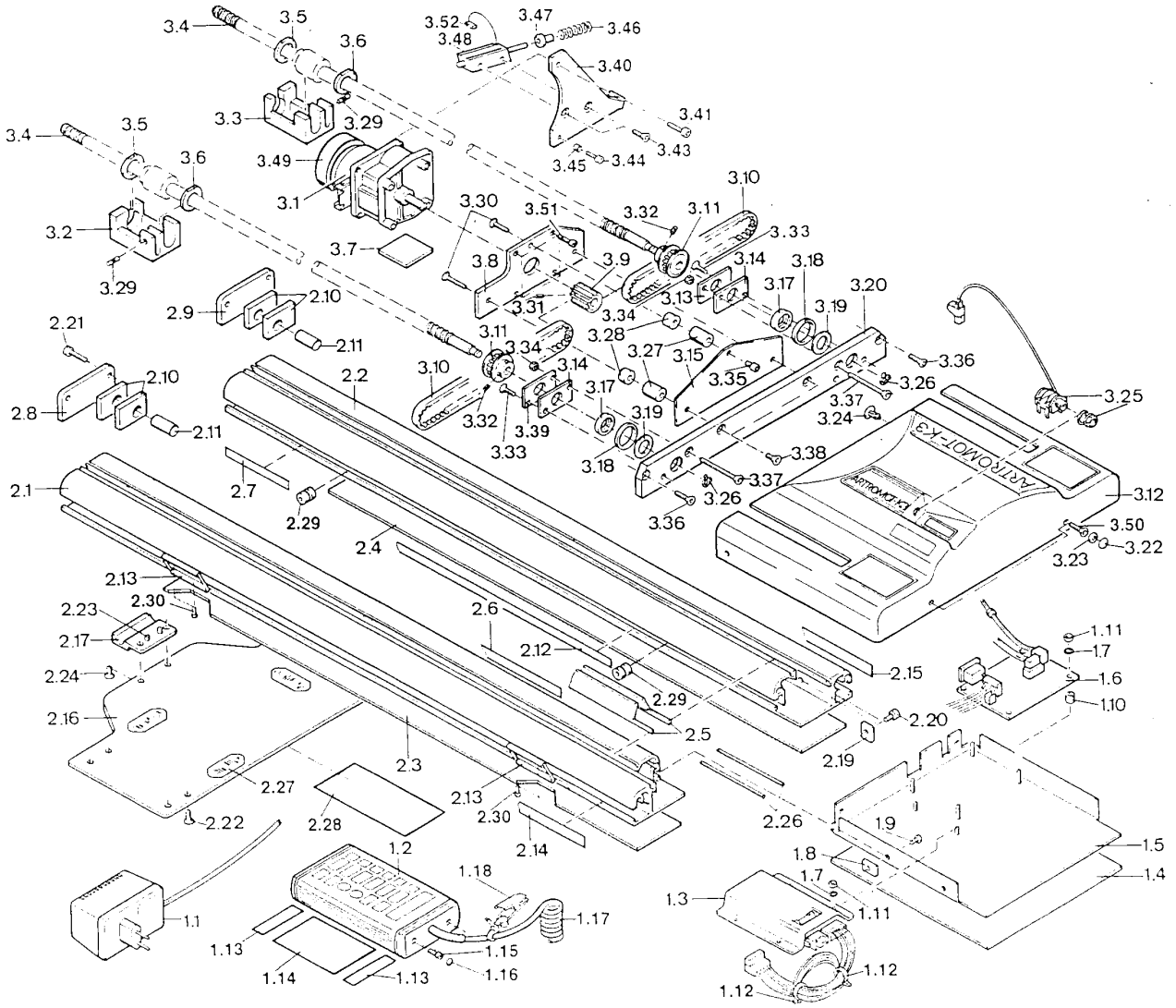
- Remove the casing. See chapter 7.1
- Pull out the required cables at the printed circuit board (Pos. 1.6)  
**Attention:** Use your ESD (Electro Static Discharge)-equipment.
- Exchange the defect printed circuit board.
- Put in the cables at the same position. (Pay attention to the code)
- Rebuild the casing.
- Perform a reference run. See chapter 7.4
- Finally, a function- and safetytest has to be performed.

### 7.4 How to perform a reference run. (Reference run connector: 0.0031.007)

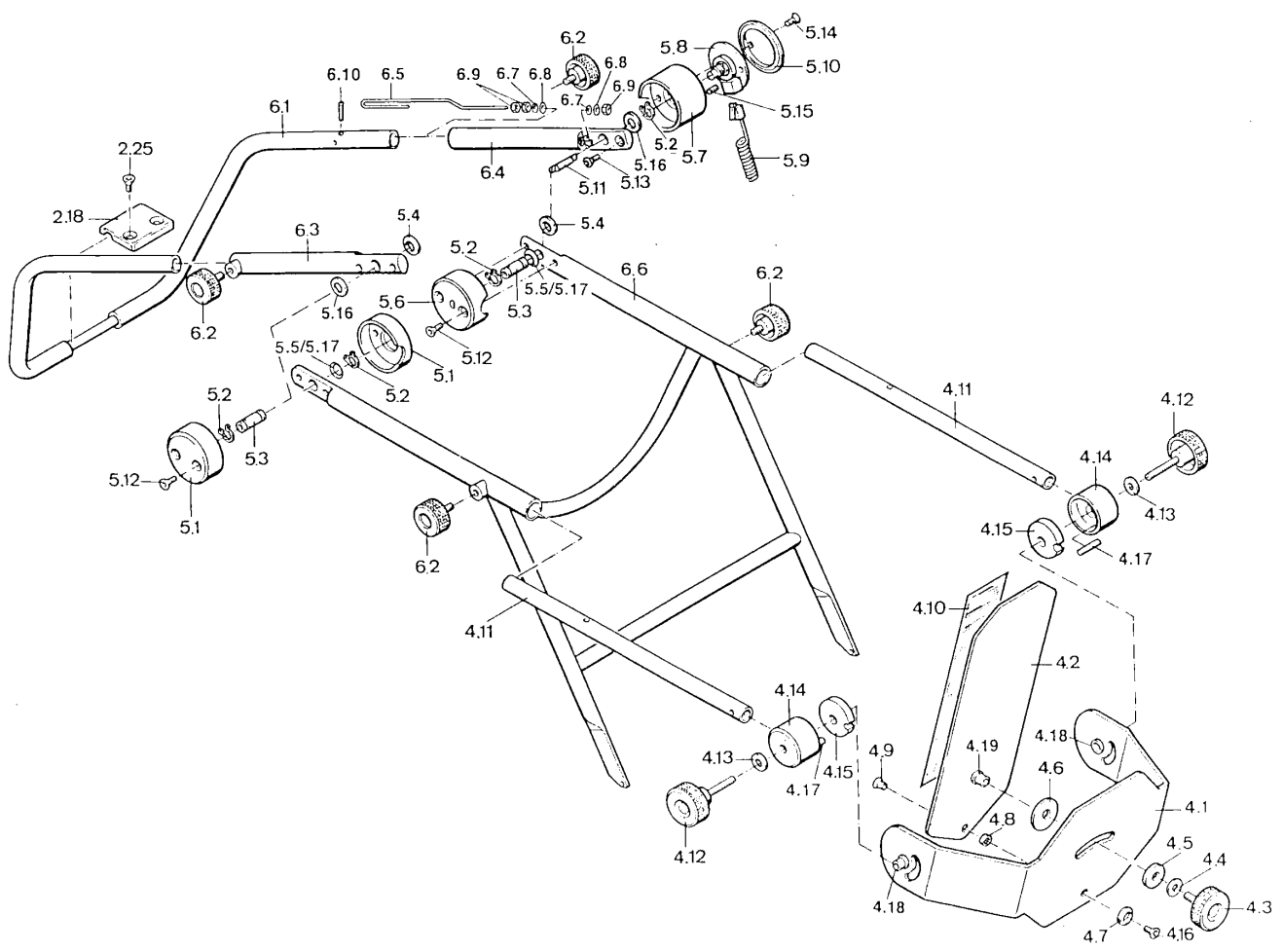
- Move the ARTROMOT®-K3 in a position of approximately 10 degrees.
- Turn the power OFF at the ARTROMOT®-K3.
- Adjust a maximum femur length.
- Open the housing of the hand-held programming unit vis-à-vis to the spiral cable side. At the printed circuit board is an unused socket. Insert the reference run connector at this socket. (Pay attention to the code)
- Turn the power ON at the ARTROMOT®-K3.
- The display shows „REFERENCE RUN“
- Press „START“
- After about 2 minutes, when the ARTROMOT®-K3 reached both points of changing direction, (first minimum at EXTENSION = -5 degrees afterwards maximum at FLEXION = 127 degrees) the ARTROMOT®-K3 will stop at EXTENSION / FLEXION = 110 degrees.  
**Attention:** It is important to push or pull at the femur bow so that in direction Flexion the ARTROMOT®-K3 reach the mechanical stud. (approximately 3 cm in front of the right/left cover). (Pos. 2.8/2.9)
- Pull out the reference run connector.
- Turn the power OFF at the ARTROMOT®-K3 and close the housing of the hand-held programming unit.
- Finally, a function- and safetytest has to be performed.



# 8. Explosion drawing part 1



# 9. Explosion drawing part 2



## 10. Checklist for Function- und Safetytest

<b>Safetytest</b>	<b>Measuring</b>	<b>Date/Signature</b>
Enclosure Leakage Current    EN60601-1/ VDE 0751 $\leq 100 \mu\text{A}$	$\mu\text{A}$	
<b>Or</b>		
Enclosure Leakage Current    UL2601 (115 Volt) $\leq 100 \mu\text{A}$	$\mu\text{A}$	

<b>Functiontest</b>	<b>OK</b>	<b>Error</b>
<p>1. Turn the power ON at the ARTROMOT® -K3 and press "SET" .</p> <p style="margin-left: 20px;">→ Display: Software Version    K3 V33 070600    (for the new generation of hand-held programming units)</p> <p style="margin-left: 40px;">No display change    (for the old generation of hand-held programming units)</p>		
<p>2. The set range of motion for Extension/Flexion is from -5 to 110 degrees.</p> <p style="margin-left: 20px;">→ Verify the angle in a position of 0 degrees with a tolerance of +/- 5 degrees.</p> <p style="margin-left: 20px;">→ Verify the angle in a position of 60 degrees with a tolerance of +/- 5 degrees.</p> <p style="margin-left: 20px;">→ Verify the angle in a position of 105 degrees with a tolerance of +/- 5 degrees.</p>		
<p>4. Safety - OFF Functions.</p> <p>Start the ARTROMOT® -K3 in a continuous mode.</p> <p style="margin-left: 20px;">→ Press any of the buttons (with the exception of "SET", "+" and "-") to stop the motor immediately. Verify this for all buttons.</p>		
<p>6. Perform the following settings.</p> <p>Extension:    →    -5 degrees</p> <p>Flexion:       →    110 degrees</p> <p>Pause Ex.:    →    5 sec.</p> <p>Pause Flex.: →    10 sec.</p> <p>Force:        →    45 kp</p> <p>Speed:        →    100%</p> <p>Adjust a maximum femur length.</p>		
<p>7. First press "STOP" and afterwards press "START".</p> <p style="margin-left: 20px;">→ The ARTROMOT®-K3 should then reach both points of changing direction within 50 to 65 seconds.</p>		
<p>8. Change the speed to 50% and repeat test 7</p> <p style="margin-left: 20px;">→ The ARTROMOT®-K3 should then reach both points of changing direction within 105 to 125 seconds.</p>		
<p>9. Verify the settings for "Pause Ex." and "Pause Flex."</p> <p style="margin-left: 20px;">→ The tolerance for both is +/- 3 seconds.</p>		



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