Radiotherapy Patient System
„RPS base“ by gKteso: 6-DoF Robotic Couch System for Radiology Cancer Treatments

Description and essential performance features of the 6DoF couch system.

The RPS base features a robotic patient-positioning platform with six degrees of freedom. It enables accurate and remote geometric correction of any misalignments detected by state-of-the-art image guidance systems, thereby closing the gap in the 6DOF-chain of IGRT localisation and tumour isocentre targeting.

The RPS base allows sub-millimetre patient positioning accuracy in six degrees of freedom, improving clinical workflow and patient confidence. 6D means that the system can correct translational errors (x, y, z) in patient positioning as well as rotational errors (roll, pitch and yaw).

An internal sensor system which monitors the couch’s position is also part of RPS base system, allowing closing the control loops for patient positioning. All movements can be controlled either by the handheld controller next to the couch in the treatment room or by a software application.

The RPS base features the latest carbon fibre composite tabletop solutions.

Intended use and intended user
The RPS base is intended to be used for accurate patient positioning within a radiation therapy treatment environment. It comprises of:
• The RPS base to support and aid in positioning a patient,
• Software to control the RPS base position.

Indications:
The intended use of the RPS base is to support aid and control in positioning a patient during radiation therapy of various body regions. The system is not restricted to certain subpopulations (e.g., those defined by age, sex, ethnicity and organ function and disease severity or similar).

Couchtop specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>non-conductive Carbon fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>260cm / 102”</td>
</tr>
<tr>
<td>Width</td>
<td>53cm / 21”</td>
</tr>
<tr>
<td>Indexing system</td>
<td>14cm / 0.55”</td>
</tr>
<tr>
<td>Attenuation (% by 6MV)</td>
<td>&lt;2,4</td>
</tr>
<tr>
<td>Changable</td>
<td>yes / custom specified</td>
</tr>
<tr>
<td>Accesoires</td>
<td>metal side rails</td>
</tr>
</tbody>
</table>
### 6 DoF Couch motions

<table>
<thead>
<tr>
<th>Axis</th>
<th>Range</th>
<th>Speed</th>
<th>Absolute positioning accuracy</th>
<th>Corrective positioning accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical movement</td>
<td>64 - 151cm</td>
<td>0 - 50mm/s</td>
<td>+/- 0.5mm ( +/- 0.02&quot;)</td>
<td>+/- 0.1mm</td>
</tr>
<tr>
<td></td>
<td>25° - 59°</td>
<td>0 - 2&quot;</td>
<td></td>
<td>+/- 0.004&quot;</td>
</tr>
<tr>
<td>Lateral movement</td>
<td>+/- 250mm</td>
<td>0 - 50mm/s</td>
<td>+/- 0.5mm</td>
<td>+/- 0.1mm</td>
</tr>
<tr>
<td></td>
<td>+/- 22°</td>
<td>0 - 2&quot;</td>
<td>+/- 0.02&quot;</td>
<td>+/- 0.004&quot;</td>
</tr>
<tr>
<td>Longitudinal movement</td>
<td>+/- 570mm</td>
<td>0 - 80mm/s</td>
<td>+/- 0.5mm</td>
<td>+/- 0.1mm</td>
</tr>
<tr>
<td></td>
<td>+/- 22°</td>
<td>0 - 3&quot;</td>
<td>+/- 0.02&quot;</td>
<td>+/- 0.004&quot;</td>
</tr>
<tr>
<td>Pitch rotation</td>
<td>+/- 5°</td>
<td>0 - 1°/s</td>
<td>+/- 0.1°</td>
<td>+/- 0.05°</td>
</tr>
<tr>
<td>Roll rotation</td>
<td>+/- 5°</td>
<td>0 - 1°/s</td>
<td>+/- 0.1°</td>
<td>+/- 0.05°</td>
</tr>
<tr>
<td>Yaw rotation</td>
<td>+/- 5°</td>
<td>0 - 1°/s</td>
<td>+/- 0.1°</td>
<td>+/- 0.05°</td>
</tr>
<tr>
<td>Isocenter rotation</td>
<td>+/- 100°</td>
<td>0 - 5°/s</td>
<td>+/- 0.1°</td>
<td>+/- 0.05°</td>
</tr>
<tr>
<td>(optional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Couch specifications

- **Mode of operation**: continuous
- **6D translations and rotations corrections**: simultaneously
- **Isocentre accuracy at isocentric height**: <2,0mm (<0.1")
- **Typical couch deflection (IEC60976)**: <2,0mm (<0.1")
- **Maximum weight of patient**: 250kg (550lbs)
- **Dynamic isocenter**: yes / patient unique
- **Internal auto-calibration**: yes
- **External reference system (camera system)**: no
- **Side panels**: Motor STOP, Power failure lowering

### Control Features

- **Hand Held Controller**:
  - Digital display absolute motion enabling
  - Motion enabling
  - Speed selection
  - Home position
  - Preset position
  - RFID function

- **Operating from outside room**:
  - Software interface

- **Remote Enable Controller**:
  - Motion enabling

- **Interlocks**:
  - Touch guide HT
  - Illegal motion
  - Couchtop locked (optional)
  - Motor STOP

- **Operating with record and verify system**:
  - optional
Power Supply

<table>
<thead>
<tr>
<th>(VAC)</th>
<th>100 – 230 ±15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Hz)</td>
<td>50 / 60</td>
</tr>
<tr>
<td>(A)</td>
<td>20A / 100V</td>
</tr>
<tr>
<td></td>
<td>10A / 240V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>(VDC)</td>
</tr>
<tr>
<td>(A)</td>
</tr>
</tbody>
</table>

Conformity

The RPS base complies with the fundamental requirements of European Regulation 93/42 EEC for class I medical products and has been developed and tested in accordance with the following standards:

- EN980:2008
- EN1041:12008
- EN ISO 10993-1
- EN ISO14971:2012
- EN ISO 19054:2006
- EN 60601-1:2001
- EN 60601-1-2:2007
- EN 60601-1-4: 1996
- EN 60601-1-6: 2010
- EN 60601-1-8:2007
- EN 61217:2012
- EN 62304:2006
- EN 62366:2008
Technical data: RPS base – 6-DoF Robotic Couch System
for Radiology Cancer Treatments

Key Features

- **One integrated device** – a true 6DoF robotic system, with no external cables
- **Optional integrated isocenter movement** – for automatic full patient positioning
- **High accuracy** – due to build-in redundant sensor system.
- **No need for external camera system**
- **Optional integration of Gantry control** – for movement in non-coplanar treatment
- **Custom specified tabletop** – or standard 14cm indexed tabletop with side rails
- **Low patient entrance high** – 64cm
- **Patient weight** – 250kg
- **Dynamic isocenter** – all rotation about patient unique fixed or virtual isocenter
- **One software interface** – for simple workflow integration
- **Simultaneous 6DoF translations and rotations corrections**
- **Large 6DoF movement range** – ±5 Degrees
- **Highspeed movements** – prepared for motion management solutions