



# MRI/NM Head Phantom BHC

## Instruction manual

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#### ● Features

- This phantom can be used with MR devices as well as devices for nuclear medicine.
- Skeletal structures are made from artificial bone (cancellous bones are not included).
- The skull model inside the phantom is made from materials with an x-ray absorption rate equivalent to that of a human skull.
- Includes a spherical container imitating a tumor.

Phantom specifications



- size of a male adult's
- tumor sizes: (one each)  
insertion rods (straight, curved (one each))
- height: ca. 33cm
- material: acrylic resin, epoxy resin

**⚠ Caution**

● **Handle with care**

The phantom materials are a special composition of resin. Please handle with care at all times.

● **Don't leave printed materials on the phantom**

Please make sure to not leave printed materials on the phantom as the resin absorbs the ink and stains will be irremovable.

● **Don't mark on the phantom with pen**

As ink stains will be irremovable, don't mark on the phantom with pen.

● **The phantom's color may change over time**

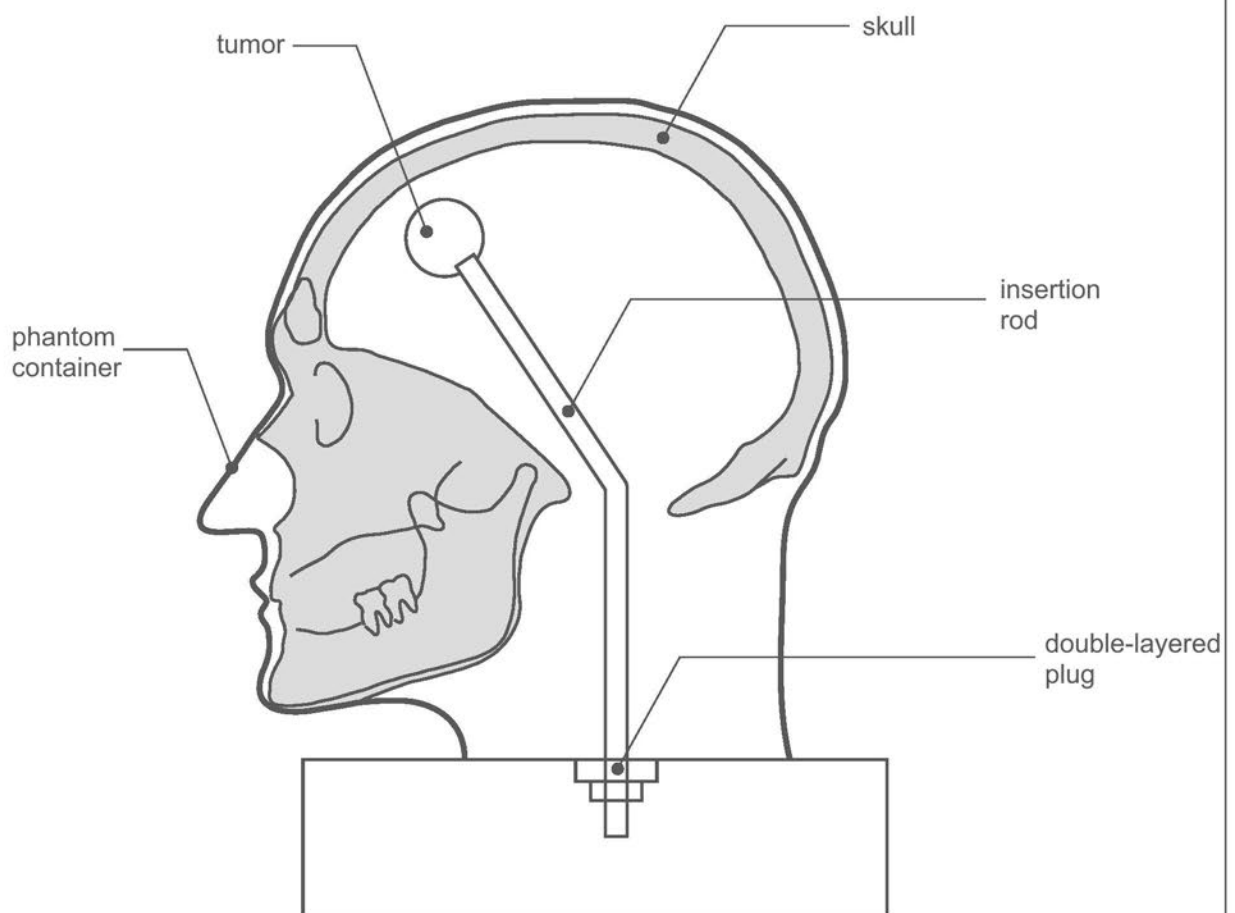
Note that the color of the phantom may change over time. However, this has no effect on the performance of the phantom.

● **Keep away from heat and moisture**

Keep the phantom at room temperature, away from heat, moisture and direct sunlight.

### Setting the tumor

1. Remove the tumor from the rod, fill with solution and put back on rod.
2. Remove the double-layered plug, attach the O-rings (1. between plug layers, 2. between plug and phantom) and insert the rod through the plug.
3. Allocate the tumor as you like and fix the plug in place.



# Aqueous solution for MRI

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○ **Regarding the solution used for MRI testing**

MRI is the most advanced diagnostic imaging device but the standards for quality assurance and maintenance are not yet uniform.

For our MRI phantom's aqueous solution, after safety considerations, we have decided to use Nickel chloride (II) solution ( $\text{NiCl}_2$ ), which is one of the substances that has been mentioned in the Report of AAPM\* as a phantom.

In Table 1, the T1 and T2 values for the magnetic resonance of nickel chloride (II) solution have been listed (Figure 1 shows this data as a graph).

10mM of the solution are included with our phantom.

\*Quality assurance methods and phantoms for magnetic resonance imaging  
: Report of AAPM nuclear magnetic resonance Task Group No.1

## ○ Important

As the T1 and T2 values depend on the temperature, please make sure to always perform tests with the same temperature conditions.

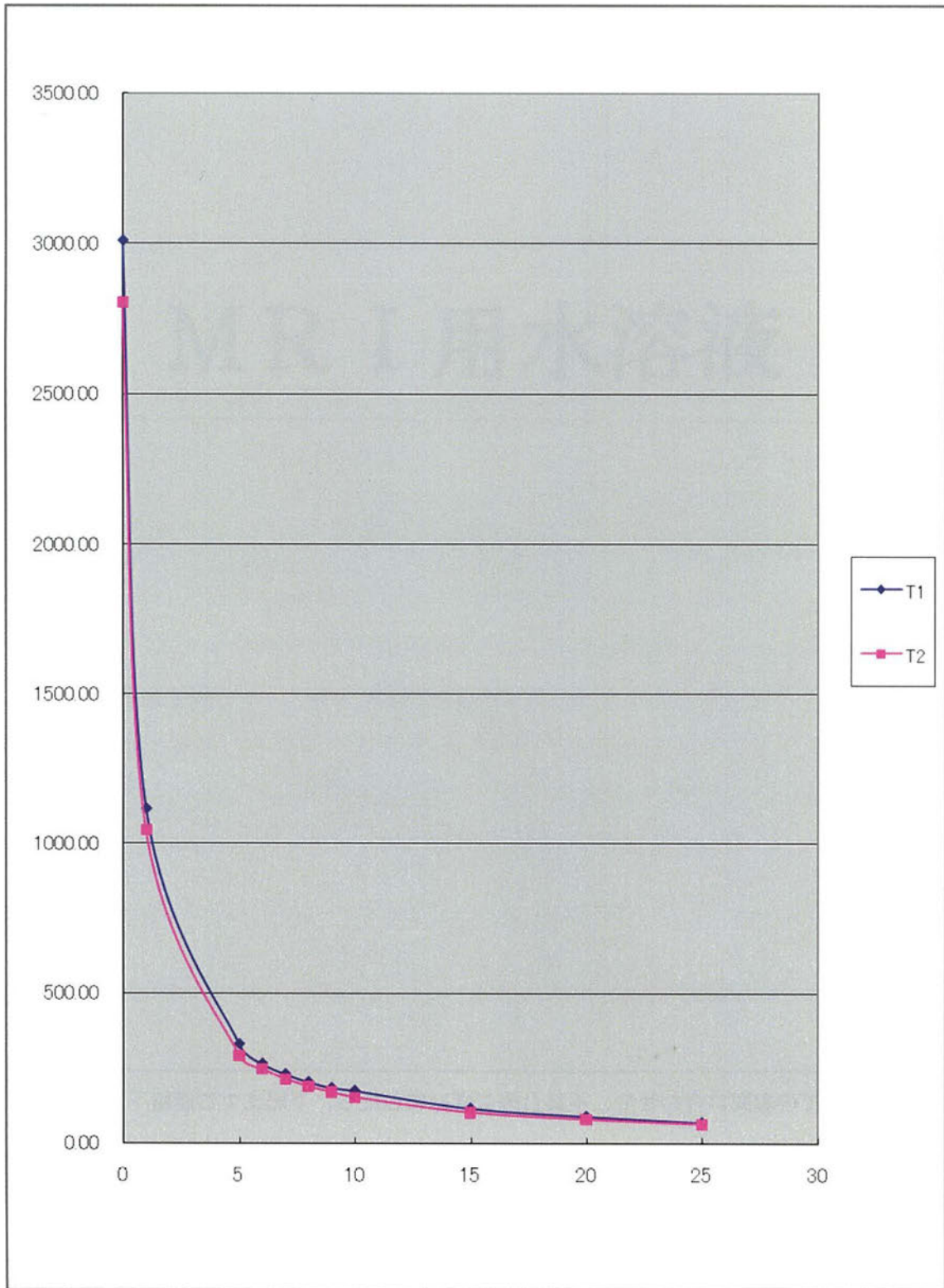
If left in a room with a consistent temperature for 24 hours, the solution inside the phantom will have reached that room's temperature.

The raw materials for our nickel chloride (II) solution that comes with our phantom was produced at a room temperature of 23°C and a relative humidity of 40%.

NiCl <sub>2</sub> concentration (mM)	1	5	6	7	8
T1 value (msec)	1117	329	264	229	203
standard deviation	23.53	5.54	10.11	4.5	3.02
T2 value (msec)	1044	291	246	213	189
standard deviation	6.96	0.83	0.56	0.61	0.66
NiCl <sub>2</sub> concentration (mM)	9	10	15	20	25
T1 value (msec)	184	174	116	89	69
standard deviation	4.28	2.11	1.27	1.03	0.71
T2 value (msec)	169	152	102	79	64
standard deviation	0.51	0.65	0.5	0.11	0.4

**table 1** T1, T2 values for magnetic resonance of different concentrations of nickel chloride (II)

※ this data was taken with a room temperature of 24°C and a magnetic field strength of 1.5 tesla



**Figure 1** T1, T2 value for varying concentrations of nickel chloride (II)



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