Motion Simulator Sim2D

QRM-Sim2D

A motion simulator for image quality assessment and optimization in cardiac imaging.

Stationary anthropomorphic phantoms for validation and quality control are state-of-the-art. QRM-Sim2D is designed to oscillate small cardiac phantoms, attached to a lever, in order to simulate more realistic situations in cardiac imagin.

The deflection of the lever (F) is controlled by a programmable high-speed Digital Signal Processing (DSP) computerized controller module. The deflection, as a function of time, can be customized by our accompanying software package "Motion Editor", a simple graphic platform for editing and import/export of motion profiles. Several preconfigured motion profiles are included.

Currently the device allows for a maximum amplitude of 25 mm, i.e. a total stroke of 50 mm, and up to eight motion profiles kept in memory. Figure 2 depicts a typical example of a motion profile.

ECG correlated CT reconstruction is also supported. At the start of a motion profile, the PC Controlled Phantom Device generates a synchronizing trigger pulse corresponding to the R-peaks of an ECG signal, either as a voltage signal (3 mV) or as a square current pulse (10 mA) in order to actuate an optoelectronic coupler.

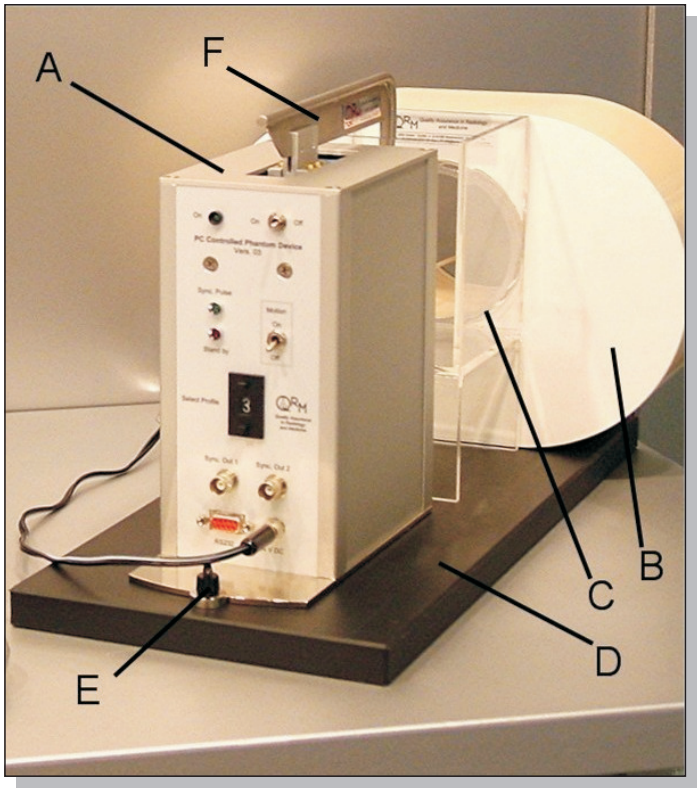
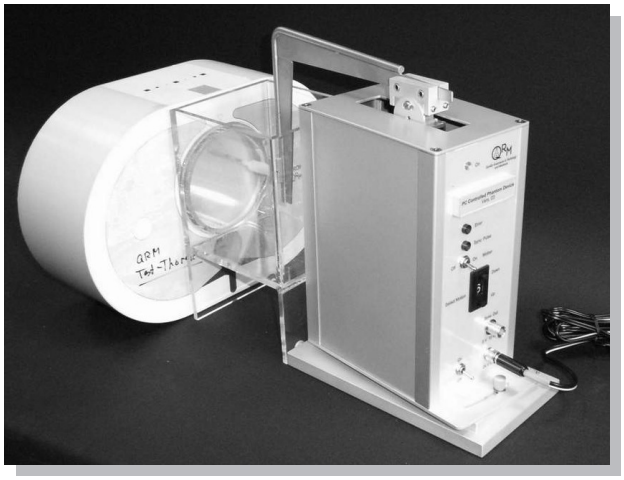


Figure 1: QRM-PC Controlled Phantom Device Motion Unit (A) is secured to a PE base plate (D) which also supports the PMMA water container (C) next to the thorax phantom QRM-Thorax. Lever (F), driven by a brushless DC motor, provides the specimen holder. Different orientations of the specimen are possible by modifying the orientation of the lever relative to the Motion Unit and the orientation of the Motion Unit relative to the base plate. Screw (E) firmly ties the Motion Unit to the base plate.



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Quality Assurance in Radiology and Medicine

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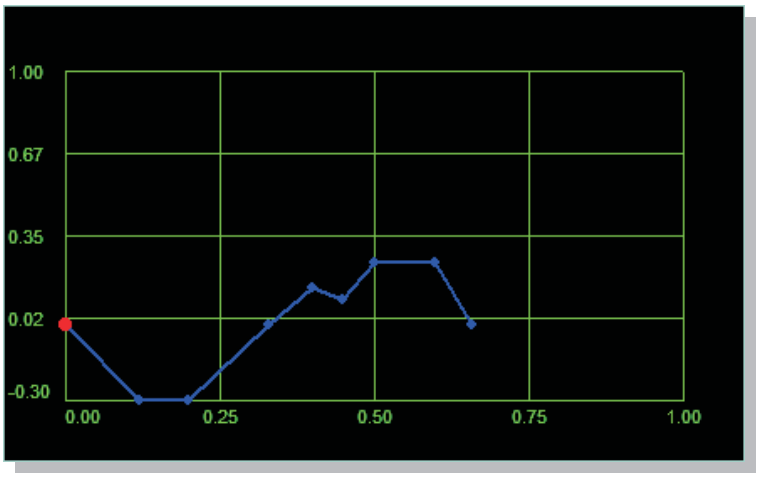

t/s	0.0	0.12	0.2	0.33	0.4	0.45	0.5	0.6	0.66
Position Ref/rot	0.0	-0.3	-0.3	0.0	0.15	0.1	0.25	0.25	0.0
Deflection/mm	0.0	-10.5	-10.5	0.0	5.25	3.5	8.75	8.75	0.0

Figure 2: A possible motion profile at 90 bpm. The red marker indicates the trigger signal generated for ECG correlation.

Specifications

- Precision of home position (zero reference) better than 0.2 mm
- Accuracy in static mode (constant displacement) better than 0.2 mm
- Accuracy of a sinusoidal motion at 140 bpm better than 6.3%.
- Reproducibility of motion profiles in quasi stationary state better than 1%
- Max. stroke 50 mm, max. amplitude 25 mm.
- Power supply: Mains 100-240V, Sec. 24V DC Stab, max. 70W
- Dimensions 200 mm x 100 mm x 200 mm
- Weight 2 kg

System components

- ***QRM-Thorax*** thorax phantom (optional)
- Cardiac phantom specimens (optional)
- PMMA water container (optional)
- PE base plate with permanent magnet clamps
- PC Controlled Motion Unit with specimen holder
- CD: "Motion Editor" Software package, Motion profiles QRM.prf Operation Manual
- Serial communication cable, 10 m
- USB / RS232 adapter
- ECG Adapter
- External power adapter
- Allen key for fixing brackets

The standard *QRM thorax* has to be ordered separately
Custom-designed sample probes, spheres, stents, etc. are available upon request:

info@qrm.de

References: [1] T Schlosser, T Scheuermann, S Ulzheimer, et al.
In vitro evaluation of coronary stents and in-stent stenosis using a dynamic cardiac phantom and a 64-detector row CT scanner.
2007, Clinical Research in Cardiology, Volume 96, Number 11

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