

Q3-Child Dummy

In the late 1970's and early 1980's, TNO and others developed the P-dummies, a series of child dummies that covers almost the complete child population up to 12 years. The P-series dummies are still test tools for the European regulation ECE-R44 and are also adopted by many other standards.



In 1993 the international Child Dummy Working Group started with the development of the Q-series of child dummies as successor to the P-series. The 3-year-old version, Q3, is the first dummy of the Q-series.

The Q3 differs considerably from the old P-dummies. It is not only advanced in terms of its biomechanical and anthropometric basis, it is also developed to be used in both front and side impact testing, making it the first "multi-directional" (child) dummy. The instrumentation for Q3 is interchangeable within the dummy and between members of the Q-series and consists among others of newly developed, compact load cells.

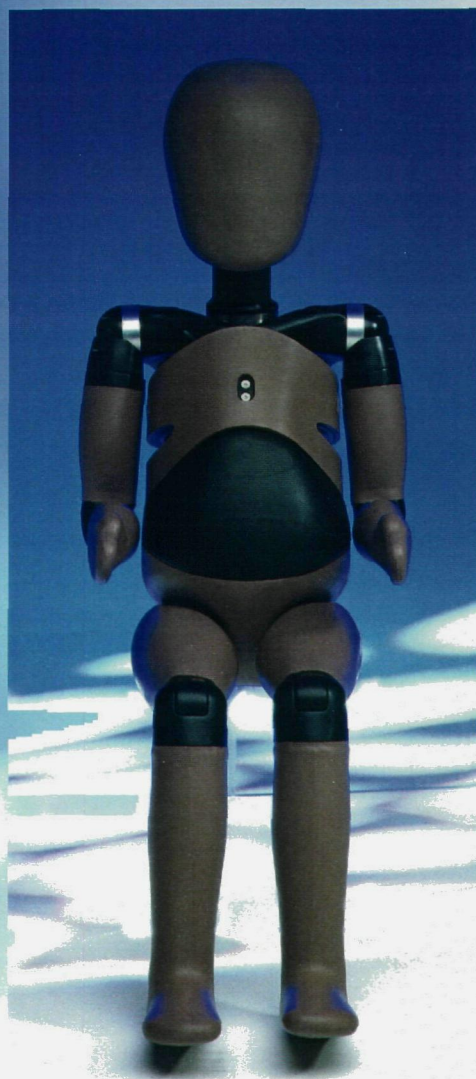


Special attention has been given to the usability of the dummy. This has resulted in a dummy that is easy to mount and handle and can be certified quickly.

The development of the Q3 dummy is partly financed by CREST, the European program for improved child safety in cars. The dummy will be manufactured by OTSP (Ogle TNO Safety Products).

Head and Neck

The Q3 dummy has separate joints at the occipital condyles (OC) and atlas-axis (C1-C2). These joints represent the low-resistance, large range of motion joints that are also present in the human neck and largely affect the head kinematics. The rest of the neck is simulated by a flexible column, allowing bending, twist, and to a limited degree shear, compression and elongation.



Thorax

The Q3 thorax includes a ribcage type structure, mounted onto a rigid thoracic spine box. The shape of the ribcage is derived from anthropometry data and analyses of X-rays of real children.

Shoulders and Arms

The shoulder of the Q3 incorporates a ball and socket joint to simulate the humerus-scapula joint, a scapula distributing load at the back, an anatomically shaped clavicle which is connected to the sternum area of the ribcage by a flexible coupling and a flexible and a compressible column between the ball and socket joint and the thoracic spine box.



Abdomen and Lumbar Spine

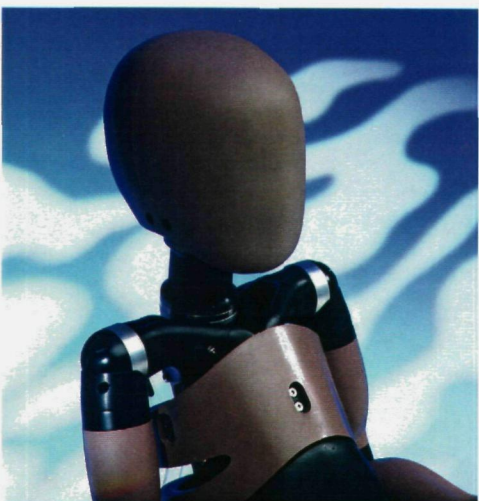
The Q3 abdomen is designed as a one-piece deformable element, allowing considerable deformation which takes place both as a result of bending of the complete dummy and as a result of contact loading. The lumbar spine is represented by a flexible column.

Pelvis

A lot of attention has been paid to designing anatomically shaped bony parts of the pelvis, using anthropometry data and X-rays of real children. The Q3 pelvis is not a rigid element but is made of a semi-rigid plastic skeletal structure, covered by flexible flesh and skin.

Legs

The compression characteristics of the upper legs are tuned to biomechanical data which is important to assess the risk of submarining.



Jacket

The Q3 is provided with a soft jacket, not simulating an anatomical structure but representing the combination of skin and clothing.

Certification

The shoulder and elbow joints use click-stops to position the upper arm and lower arm in the initial position. Click-stops are also used in the neck atlas-axis joint and occipital axis joint. The initial position of head and neck is therefore defined. The hips and lower legs are frictionless joints which do not need pre-test adjustment. The neck and lumbar spine should be certified after every 10 tests. A part 572 and a head form are required for both components. If the dummy is to be used in frontal tests, a full body impact with a 3.8 kg impactor is required. If the dummy is to be used in a side impact, the 3.8 kg impactor is used to load the side of the ribcage. A simple compression test is required for the abdomen (every 10 tests). Certification of the Q3 and components is described in the Q3 user's manual.



Information

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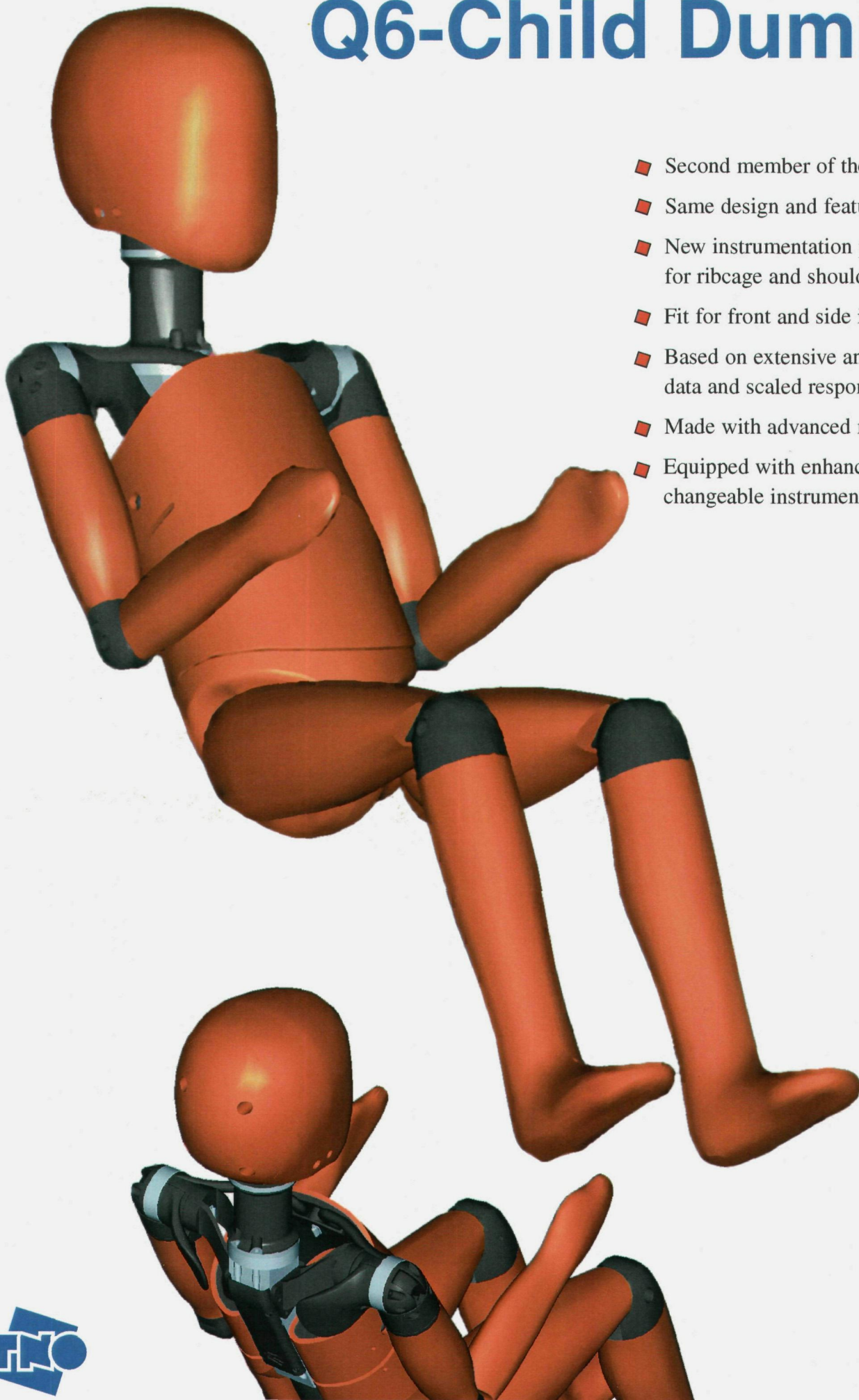


Instrumentation

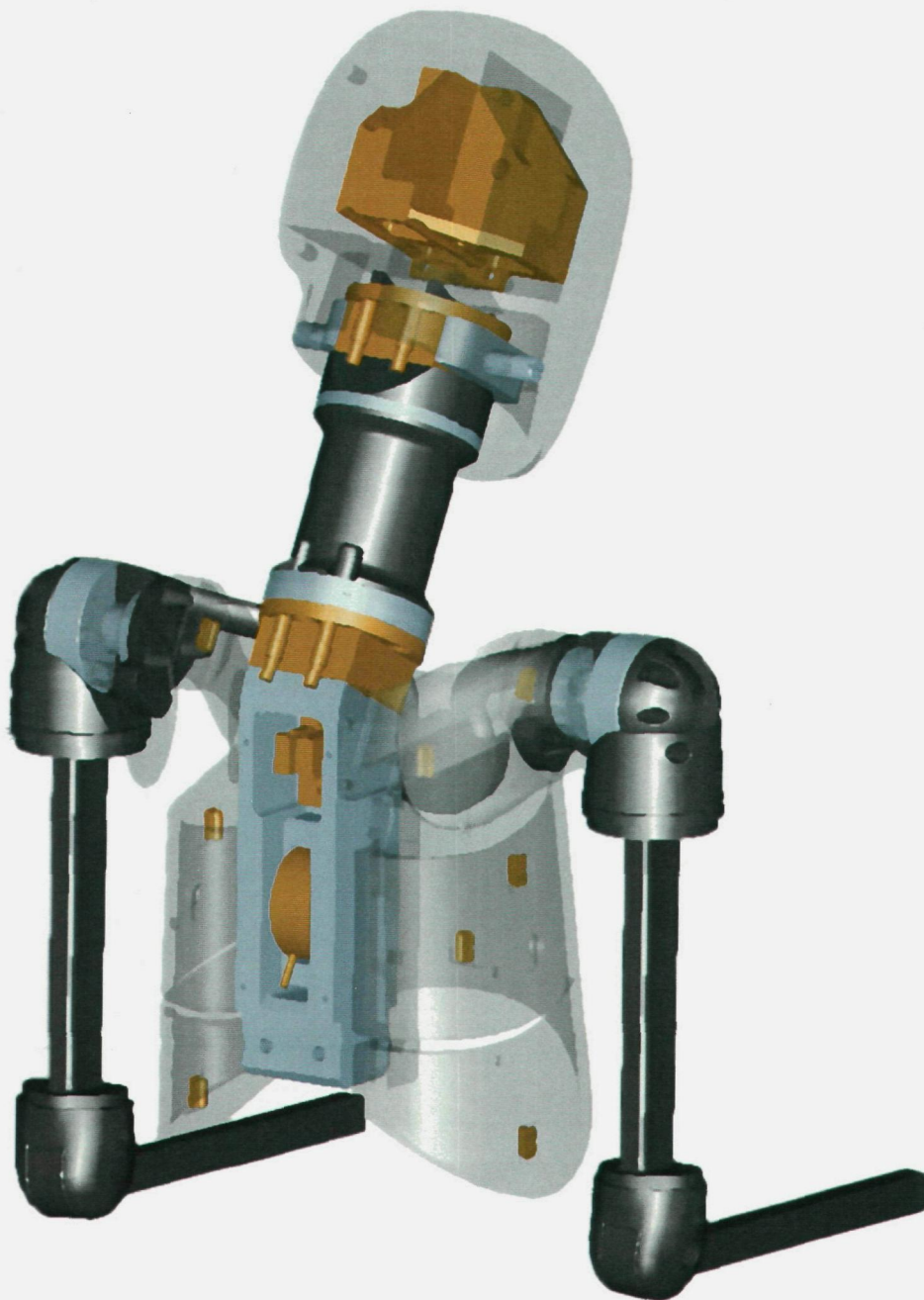
For testing according to ECE-R44 a tri-axial accelerometer is required. However, the Q3 allows many more measurements to be performed:

Head	Ax, Ay, Az linear accelerations
Head	Wx, Wy, Wz angular accelerations (optional)
Upper Neck	Fx, Fy, Fz forces and Mx, My, Mz moments
Lower Neck	Fx, Fy, Fz forces and Mx, My, Mz moments
Thoracic Spine	Ax, Ay, Az linear accelerations
Thorax 'ribcage'	Dx or Dy deflections
Thorax 'ribcage'	Ax and/or Ay linear accelerations (optional)
Lower Lumbar Spine	Fx, Fy, Fz forces and Mx, My, Mz moments
Pelvic	Ax, Ay, Az linear accelerations

Q6-Child Dummy



- ◆ Second member of the Q family
- ◆ Same design and features as Q3
- ◆ New instrumentation possibilities for ribcage and shoulders
- ◆ Fit for front and side impact
- ◆ Based on extensive anthropometry data and scaled response targets
- ◆ Made with advanced materials
- ◆ Equipped with enhanced and interchangeable instrumentation



Head

9 axis rotational accelerometer (W_x , W_y , W_z) or 3 axis linear accelerometer (A_x , A_y , A_z)

Neck

Forces and moments on upper and lower neck (F_x , F_y , F_z and M_x , M_y , M_z)

Shoulder

Linear accelerations (A_y)

Thoracic Spine

Linear accelerations (A_x , A_y , A_z)
Deflection (D_x or D_y)

Ribcage

Linear acceleration (A_x on two locations, A_y on four locations)

Pelvis

Forces and moments (F_x , F_y , F_z and M_x , M_y , M_z)
Linear accelerations (A_x , A_y , A_z)

Integrated cable routing



Information

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