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## Crash testing of the TA iQ FWD 97070, front wheel drive wheelchair according to ISO 7176-19:2008

(2 appendices)

### Summary

A crash test of the TA iQ FWD 97070, front wheel drive wheelchair has been performed according to ISO 7176-19:2008, chapter 5.2. The wheelchair was crash tested loaded with a Hybrid III-dummy, 102 kg, in 48.8 km/h.

Standard chapter		Comment	Fulfilment of requirement
5.2.1a	Horizontal excursion		Yes
5.2.1b	Knee vs. WC excursion		Yes
5.2.1c	Battery movement		Yes
5.2.2a	ATD torso angle <45°		Yes
5.2.2b	Securement points		Yes
5.2.2c	Separation of <100 grams		Yes
5.2.2d	Sharp edges radius > 2 mm		Yes
5.2.2e	Load carrying components		Yes
5.2.2f	Tilt-in space locking		Yes
5.2.2g	Removal of ATD, no tools		Yes
5.2.2h	WC removal, no tools		Yes
5.2.2i	Post height diff < 20%	< 4 %	Yes
5.2.2j	No webbing failure		Yes

The test object fulfilled the requirements according to ISO 7176-19:2008, chapter 5.2.

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## 1 Introduction

On assignment of TA Service A/S a crash test of the TA iQ FWD 97070, front wheel drive wheelchair was performed according to ISO 7176-19:2008, chapter 5.2. The purpose of the test was to evaluate if the wheelchair fulfilled the crash test requirements.

## 2 Test object

Wheelchair	TA iQ FWD 97070, front wheel drive
WC weight	155 kg
Max user weight	140 kg
Test object arrival at SP:	2013-12-03
Selection of test object:	The test object has been selected by the client without SP's assistance

## 3 Test method and performance

Test method:	ISO 7176-19:2008, section 5.2
Test date:	2013-12-03
Test facility:	SP Structural and Solid Mechanics crash laboratory in Borås.
Crash pulse:	15g for >40 ms, 20g for >15 ms, 48-50 km/h.
Pulse measurement:	Two accelerometers mounted on the sled, the graph can be found in appendix 1. SP inv. nos. 403201 and 403350
Velocity measurement:	Optical time sensors measuring the time for the sled to travel a distance of 1 meter just before impact. SP inv. no. 900081.
Excursion measurement:	The excursion values were measured from the high-speed film by the film analysis program, TEMA, with an accuracy of $\pm 5$ mm.
Film camera:	HG 2000 High-speed camera, 1000 frames per second, with a Schneider Variogon 1.8/10-100 lens.
Crash test dummy:	Hybrid III, 95 <sup>th</sup> percentile, 102 kg.
Occupant restraint system:	Shoulder belt Part No. 60-042, Lap belt Part No. 50-0363. Supplier: Ortho Safe Systems International, Inc.
4-point tie down system:	4pt wheelchair tie-down restraint, 200 kg. Part No. OR08. Supplier: Unwin Safety Systems, UK
Photographs:	Photos were taken before and after the test and can be found in appendix 2.

The test object was mounted in a forward direction on the impact sled and attached with the 4-point tie-down restraint. A Hybrid III-dummy, 102 kg, was positioned in the test object and fixated with the 3pt occupant restraint.

The sled was accelerated to a speed of 48.8 km/h before impact.

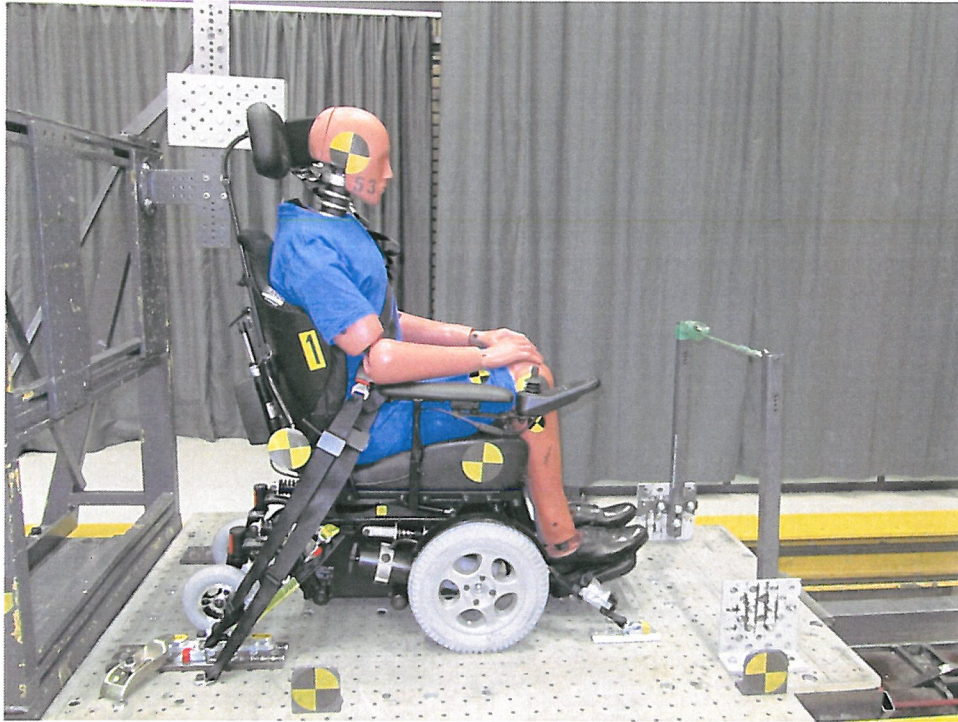


Figure 1 Test setup

#### 4 Test results

The test results showed in this report refer only to the tested object.

Table 1 Test results

Standard chapter		Requirement	Result/ Comment	Requirement fulfilment
5.2.1a	Horizontal excursion: Head forward	< 650 mm	322	Yes
5.2.1a	Horizontal excursion: Head rearward	< 450 mm	388	Yes
5.2.1a	Horizontal excursion: Knee forward	< 375 mm	272	Yes
5.2.1a	Horizontal excursion: Wheelchair point forward	< 200 mm	145	Yes
5.2.1b	Knee vs. WC excursion: $X_{knee} / X_{wc}$	> 1.1	1.96	Yes
5.2.1c	Batteries of powered wheelchairs shall: - not move completely outside the wheelchair footprint - not move into the wheelchair user's legs space			Yes

5.2.2a	The wheelchair shall remain in an upright position on the test platform. The ATD shall be retained in the wheelchair in a seated posture, as determined by the ATD torso being oriented at no more than 45° to the vertical.		Yes
5.2.2b	The wheelchair securement points shall not show visible signs of material failure.		Yes
5.2.2c	Components, fragments or accessories of the wheelchair with a mass in excess of 100g shall not have completely separated from the wheelchair.		Yes
5.2.2d	Wheelchair components that may contact the occupant shall not fragment or separate in a manner that produces sharp edges, as defined by having a radius less than 2 mm.		Yes
5.2.2e	Primary load carrying components of the wheelchair shall not show visible signs of failure.		Yes
5.2.2f	Locking mechanisms of tilt-in-space seat adjusters shall not show signs of failure.		Yes
5.2.2g	Removal of ATD from the wheelchair shall not require the use of tools.		Yes
5.2.2h	Release of wheelchair from the tiedown system shall not require the use of tools.		Yes
5.2.2i	The post-test height of the average of left and right ATD H-points relative to the wheelchair ground plane shall not have decreased by more than 20% from the pre-test height.	< 4 %	Yes
5.2.2j	The wheelchair and its components shall not cause partial or complete failure of the webbing of any of the WTORS assemblies during the test.		Yes

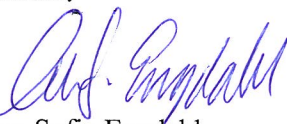
The test object fulfilled the requirements according to ISO 7176-19:2008, chapter 5.2.

## 5 Measurement uncertainty

The measurement uncertainty for the deceleration pulse is less than 1.5%.  
Reported uncertainty corresponds to an approximate 95 % confidence interval around the measured value. The interval has been calculated in accordance with GUM (The ISO guide to the expression of uncertainty in measurements), which is normally accomplished by quadratic addition of the actual standard uncertainties and multiplication of the resulting combined standard uncertainty by the coverage factor  $k=2$ .

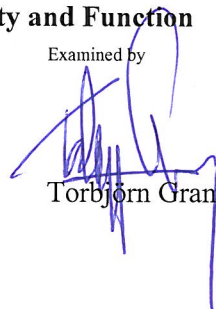
### SP Technical Research Institute of Sweden SP Structural and Solid Mechanics - Safety and Function

Performed by



Ann-Sofie Engdahl

Examined by



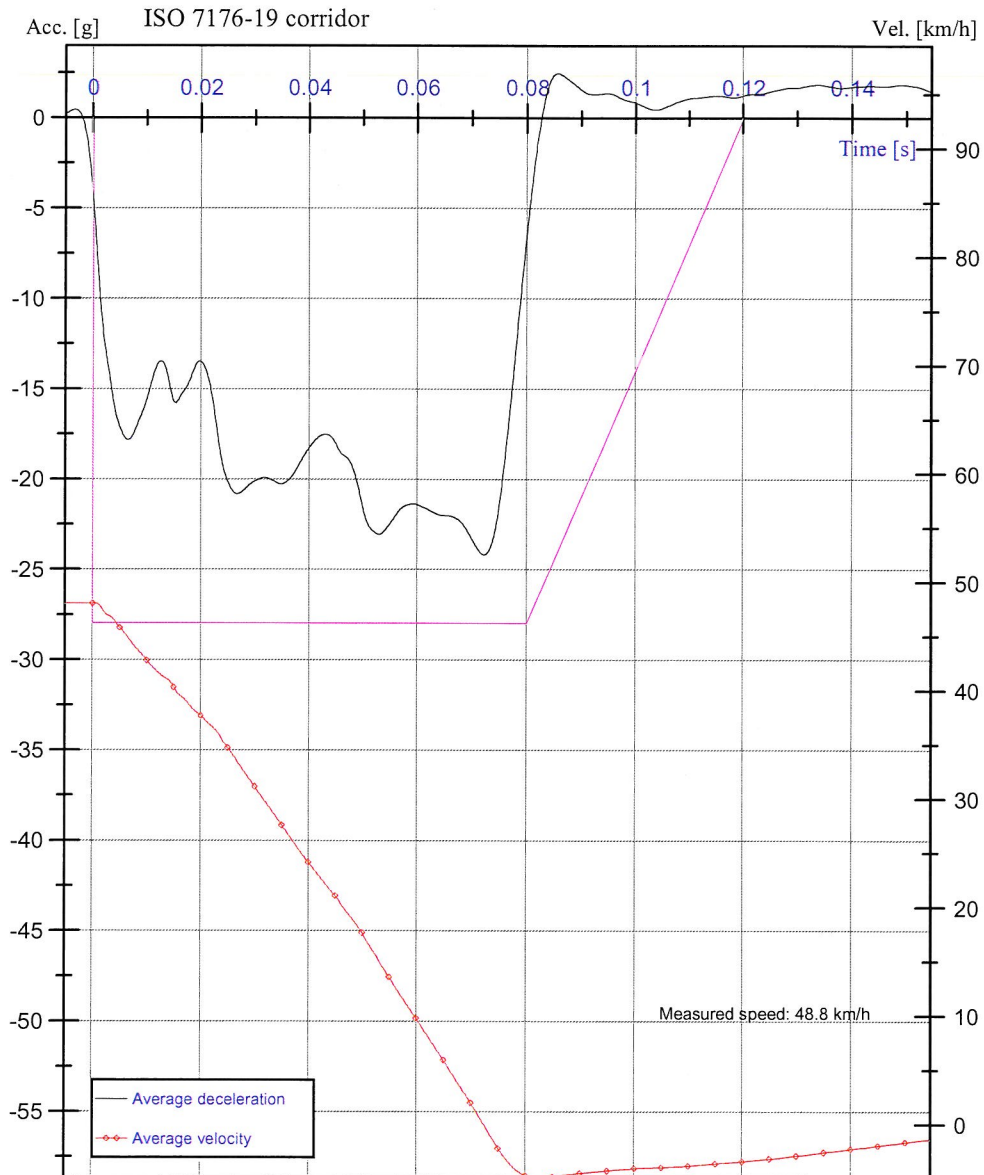
Torbjörn Granberg

### Appendices

Appendix 1 Deceleration graph (1 page)  
Appendix 2 Photos (5 pages)

Appendix 1

**Sled deceleration, Average pulse, CFC 60**



<b>Customer:</b>	TA Service
<b>Test object:</b>	IQ FW front wheel drive, 102 kg dummy
<b>Standard:</b>	ISO 7176-19
<b>Test date:</b>	2013-12-03 <b>Test:</b> 1

Appendix 2



Photo 1. Before test



Photo 2. Before test

Appendix 2



Photo 3. Before test



Photo 4. Before test

Appendix 2

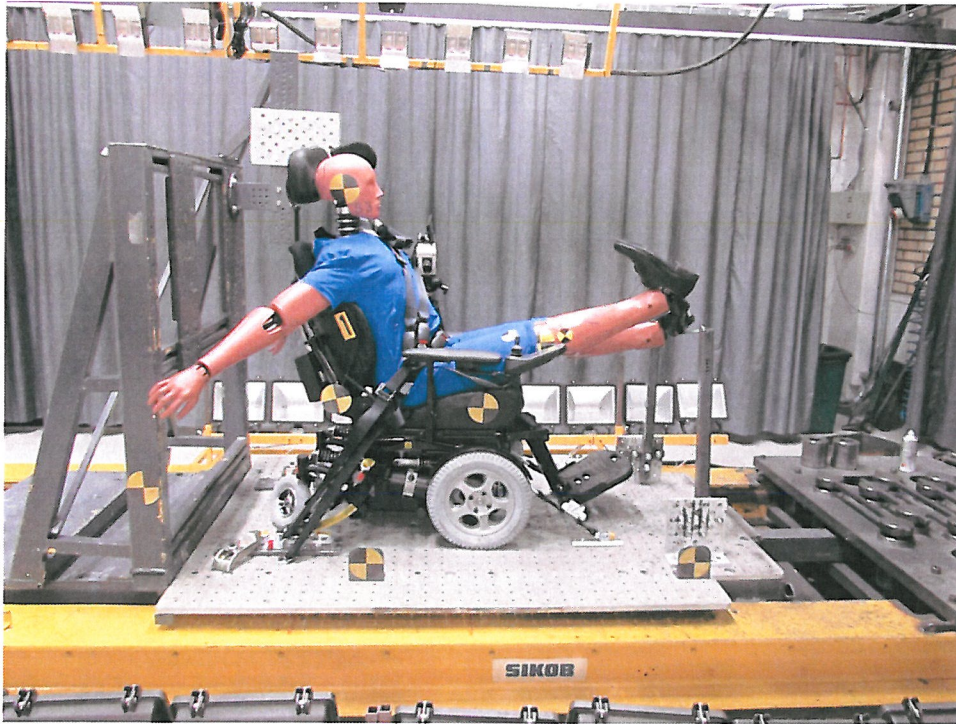


Photo 5. After test



Photo 6. After test

Appendix 2



Photo 7. After test



Photo 8. After test

Appendix 2

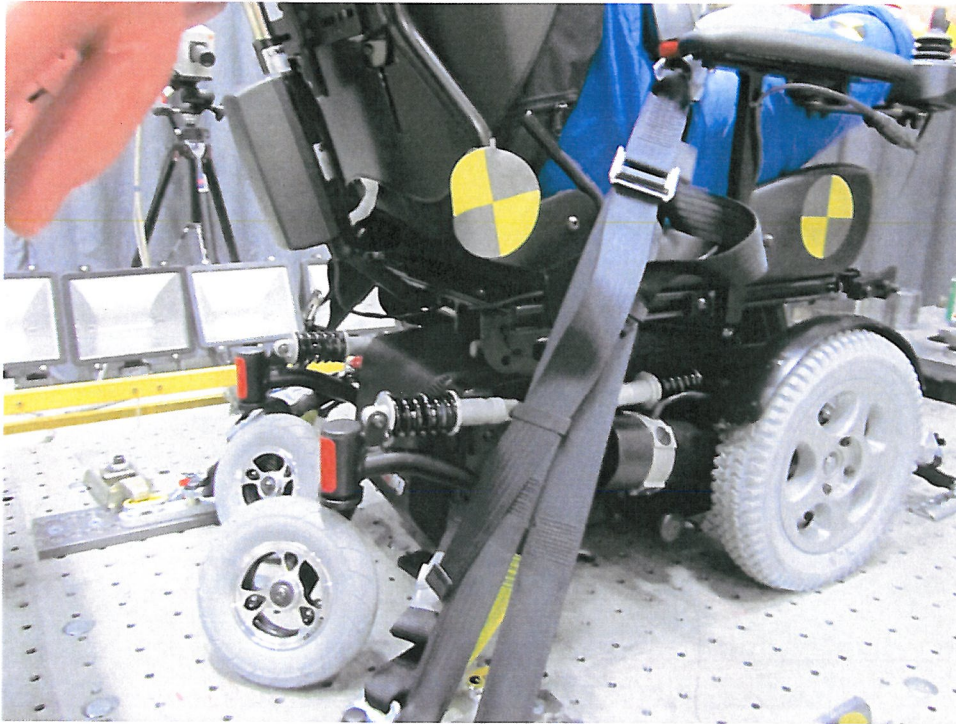


Photo 9. After test

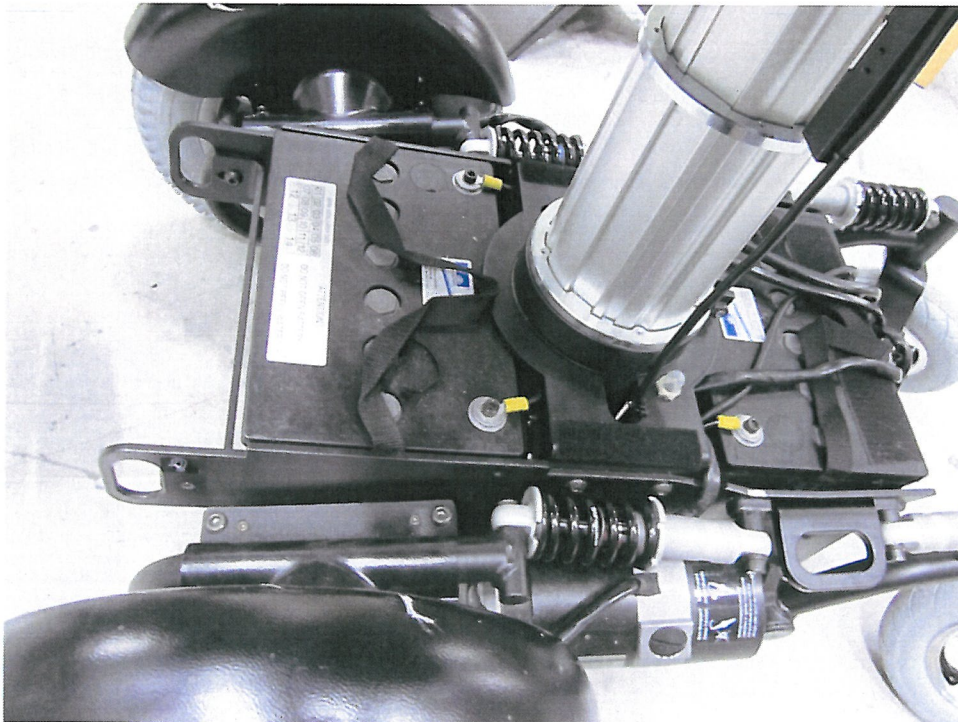


Photo 10. After test