EURO NCAP

#FORSAFERCARS

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WorldSID 50th Specification and Certification

Crash Protection

Technical Bulletin CP 203

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PREFACE

During the test preparation, vehicle manufacturers are encouraged to liaise with the laboratory and to check that they are satisfied with the way cars are set up for testing. Where a manufacturer feels that a particular item should be altered, they should ask the laboratory staff to make any necessary changes. Manufacturers are forbidden from making changes to any parameter that will influence the test, such as dummy positioning, vehicle setting, laboratory environment etc.

It is the responsibility of the test laboratory to ensure that any requested changes satisfy the requirements of Euro NCAP. Where a disagreement exists between the laboratory and manufacturer, the Euro NCAP secretariat should be informed immediately to pass final judgment. Where the laboratory staff suspect that a manufacturer has interfered with any of the set up, the manufacturer's representative should be warned that they are not allowed to do so themselves. They should also be informed that if another incident occurs, they will be asked to leave the test site.

Where there is a recurrence of the problem, the manufacturer’s representative will be told to leave the test site and the Secretary General should be immediately informed. Any such incident may be reported by the Secretary General to the manufacturer and the person concerned may not be allowed to attend further Euro NCAP tests.

DISCLAIMER: Euro NCAP has taken all reasonable care to ensure that the information published in this protocol is accurate and reflects the technical decisions taken by the organisation. In the unlikely event that this protocol contains a typographical error or any other inaccuracy, Euro NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

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1 WORLDSID 50TH SPECIFICATION

1.1 General

WorldSID dummies must conform to the specification detailed in ISO 15830 parts 1-4:2022.

1.2 Certification

Full details of the WorldSID certification requirements are available in ISO 15830-2:2022.

No manufacturer shall have access to any pre-test information regarding any of the test equipment to be used by Euro NCAP, or be permitted to influence its selection in any way.

The WorldSID used on the driver's seat shall be re-certified after every FOUR impact tests.

The WorldSID used on the passenger's seat shall be re-certified after every TEN impact tests.

If an injury criterion reaches or exceeds its normally accepted limit (e.g. HIC of 700) then that part shall be re-certified.

If any part of the dummy is broken in a test, the part shall be replaced with a fully certified component.

A copy of the dummy certification certificate will be provided as part of the full report for a test.

1.3 Dummy instrumentation

All instrumentation used in the dummy shall be:

Calibrated before the test programme.

Re-calibrated after one year, regardless of the number of tests for which it has been used.

Re-calibrated if it reaches its channel amplitude class (CAC) during any test.

Listed in the test report along with calibration dates

Mounted according to procedures laid out in SAE J211.

Transducer sign convention is detailed in SAE J1733.

In accordance with the performance specifications detailed in SAE J2570.

In compliance with the shoulder, thorax and abdomen displacement sensors and their data processing as specified in ISO/TS21002:2021

The CAC for each transducer shall be chosen to cover the Minimum Amplitude listed in the table. In order to retain sensitivity, CACs which are orders of magnitude greater than the Minimum Amplitude may not be used.

The WorldSID shall be instrumented to record the channels listed below. Additional channels may be recorded.

Location	Parameter	CAC
Head	Linear acceleration, Ax, Ay, Az	250g
	Angular velocity, ωx, ωy, ωz	4000deg/sec
Upper neck	Forces Fx, Fy, Fz Moments Mx, My, Mz	5kN, 300Nm
Lower neck [1]	Forces Fx, Fy, Fz Moments Mx, My, Mz	5kN, 300Nm
Shoulder(s) [2] – Joint	Forces, Fx, Fy, Fz	8kN
Shoulder – Rib	Displacement & rotation	100mm
Thorax - Upper rib	Displacement & rotation	100mm
Thorax - Mid rib	Displacement & rotation	100mm
Thorax - Lower rib	Displacement & rotation	100mm
Thoracic temperature[3]	Temperature	30°C
Spine - T4	Linear acceleration, Ax, Ay, Az	200g
Abdomen - Upper rib	Displacement & rotation	100mm
Abdomen - Lower rib	Displacement & rotation	100mm
Spine - T12	Acceleration, Ax, Ay, Az	200g
Lumbar spine	Forces Fx, Fy, Fz Moments Mx, My, Mz	5kN, 300Nm
Pelvis	Acceleration, Ax, Ay, Az	200g
Pelvis – Pubic symphysis	Force	5kN
Femoral neck – struck side only	Force, Fx, Fy, Fz	5kN

1 Far side sled tests only

2 In a dual occupancy test, both driver shoulders shall be instrumented.

3 The onboard temperature sensor shall be attached in accordance with ISO TR 27957, and the temperature sensor shall meet the requirements of ISO 6784. It is not necessary for this channel to be recorded through the dummy onboard DAU.

Where the number of channels in the WorldSID is 45 or more, only in-dummy data acquisition systems may be used. Where there are fewer than 45 channels, the use of umbilical cables is at the laboratory's discretion.

The WorldSID on the passenger's seat shall be instrumented to record the channels listed below. Additional channels may be recorded.

Location	Parameter	CAC
Head	Linear acceleration, Ax, Ay, Az	250g
Upper neck	Forces Fx, Fy, Fz Moments Mx, My, Mz	5kN, 300Nm
Shoulder – Joint	Forces, Fx, Fy, Fz	8kN
Spine - T12	Acceleration, Ax, Ay, Az	200g
Pelvis	Acceleration, Ax, Ay, Az	200g
Pelvis – Pubic	Force	5kN

1.4 Additions and modifications

It is acceptable for the dummy to be equipped with build level E ankle joins.

1.5 Dummy clothing and footwear

The dummies shall be clothed in a sleeveless suit or a modified version of the sleeved suit with sleeves removed.

1.6 Dummy joints

Stabilise the dummy temperature by soaking in the required temperature range for at least 5 hours.

The WorldSID arms, knee pivots and ankle joints shall be adjusted according to the procedures in ISO 15830-4:2022, Annex E.

The dummy joint stiffnesses should be set as close as possible to the time of the test and, in any case, not more than 24 hours before the test.

Maintain the dummy temperature within the permissible temperature range between the time of setting the limbs and up to a maximum of 5 minutes before the time of the test.

1.7 Dummy measurements

1.7.1 AE-MDB and Pole tests

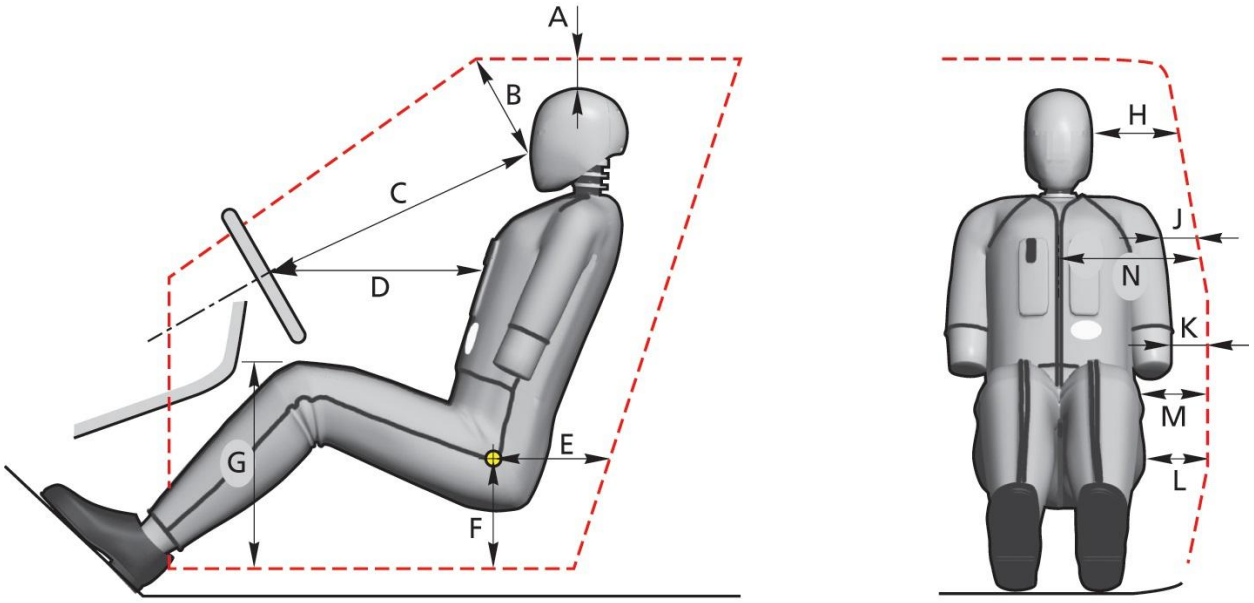


Figure 1: Driver dummy measurements – Note: Arm position NOT according to test setup.

Driver measurements	Description
A	Head/roof panel
B	Nose/windscreen joint
C	Nose/centre of the steering
D	Thorax strap/centre of the steering wheel centre (horizontal)
E	Hip-joint point/inside opening of the door (horizontal)
F	Hip-joint point/inside opening of the door (vertical)
	H-Point Co-ordinates (to vehicle reference)
G	Knee/floor covering (vertical)
H	Head/side window pane (or padding)
J	Shoulder/window pane (or padding)
K	Elbow/door (or padding)
L	Pelvis/door (or padding)
M	Knee/door (or padding)
N	Belt webbing to door (horizontally)
	Neck bracket notch

Passenger dummy measurements

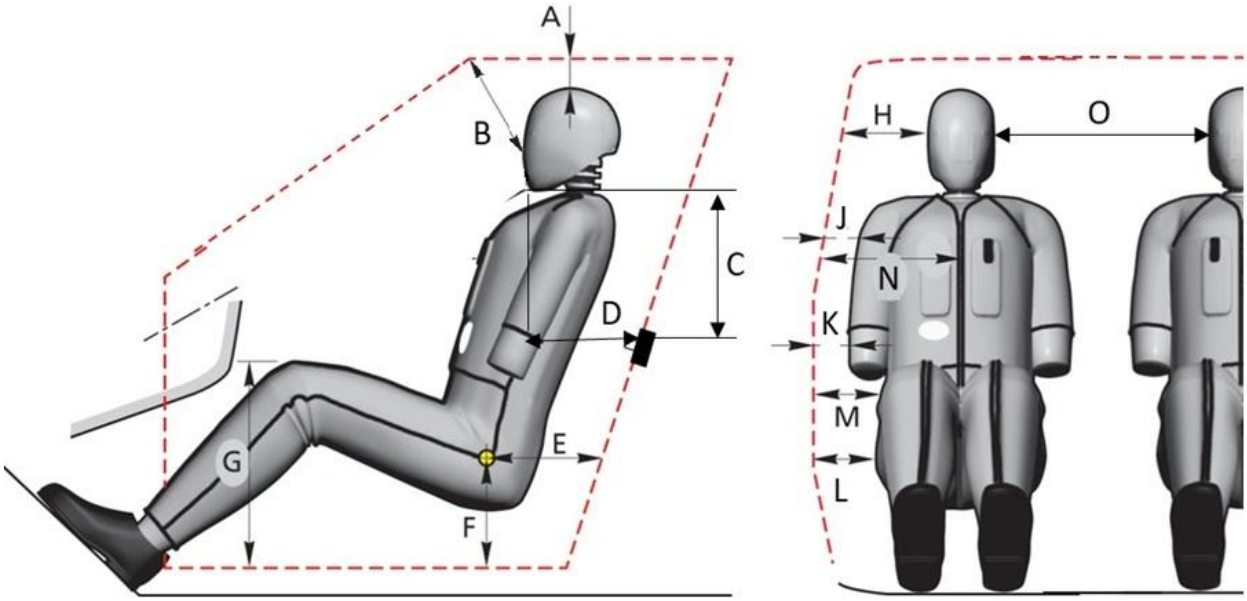


Figure 2: Driver dummy measurements

Passenger measurements	Description
A	Head/roof panel
B	Nose/windscreen joint
C	Chin/door hook plate top screw head (vertical)
D	Chin/door hook plate top screw head (horizontal)
E	Hip-joint point/inside opening of the door (horizontal)
F	Hip-joint point/inside opening of the door (vertical)
	H-Point Co-ordinates (to vehicle reference)
G	Knee/floor covering (vertical)
H	Head/side window pane (or padding)
J	Shoulder/window pane (or padding)
K	Elbow/door (or padding)
L	Pelvis/door (or padding)
M	Knee/door (or padding)
N	Belt webbing to door (horizontally)
O	Distance between CoG and impact line (horizontally)
	Neck bracket notch

1.7.2 Far side main loadcases

To ensure repeatability of dummy seating & positioning - take detailed static 3D measurements of dummy, seat belt anchorage points and vehicle interior after the dummy settling and positioning procedures have been carried out.

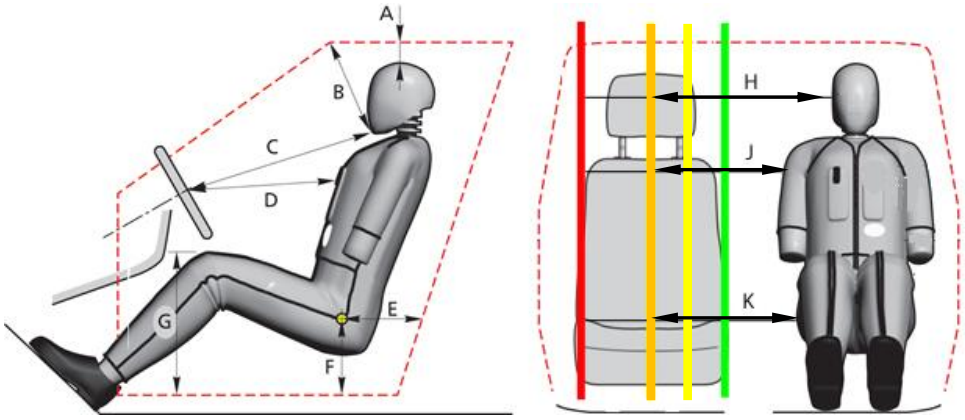


Figure 3: Pre-test measurements

Driver measurements	Description
A	Not required
B	Chin/windscreen joint
C	Chin/centre of the steering
D*	Thorax strap/centre of the steering wheel centre (horizontal)
E	Manikin and dummy hip-joint point/inside opening of the door (horizontal)
F	Manikin and dummy hip-joint point/inside opening of the door (vertical)
	H-Point Co-ordinates (to vehicle reference)
G	Knee/floor covering (vertical)
H	Head to seat centreline
J	Shoulder to seat centreline
K	Hip-joint to seat centreline
	Neck bracket notch

To ensure repeatability of dummy seating & positioning, take detailed static 3D measurements as detailed in the table below. These are to be used as a reference for comparison with the initial posture and position of the CAE dummy. A suitable origin for the CMM measurements is needed (e.g. door striker) and shall be specified by the vehicle manufacturer. See APPENDIX B for further information.

Measurement location	Description	Coordinates
Head CoG	Head skin outboard marking	X, Y, Z
Head	Tilt angle sensor	1 dimension
Neck bracket	Corner front	X, Y, Z
Neck bracket	Corner rear	X, Y, Z
Shoulder	Screw centre	X, Y, Z
Arm	Tip of foam centre	X, Y, Z
Arm	Upper arm angle	1 dimension
Thorax	Tilt angle sensor	1 dimension
H-point		X, Y, Z
Pelvis	Tilt angle sensor	1 dimension
Femur	Centreline of clevis	X, Y, Z
Femur	Angle	1 dimension
Knee	Joint screw centre	X, Y, Z
Ankle	Screw centre	X, Y, Z
Head restraint	OEM location, e.g. stem or hole	X, Y, Z
Seatback	Angle (OEM location)	1 dimension
Seatbelt	Upper belt edge at dummy centreline	X, Y, Z

1.8 Dummy painting and marking

The dummies shall have masking tape placed on the areas to be painted using the sizes detailed below. The tape must be completely covered with paint, with the exception of the driver head where only the outer edge of the tape is painted.

The paint must be applied close to the time of the test to ensure that the paint will still be wet on impact

Driver	Outboard side of dummy	Inboard side of dummy
Head tape outline	Blue, red & green	Red
	100mm square centreline of head with lower edge at C of G.	
Head CoG	Orange	Yellow

	Circle Ø40mm	
Head top along mid sagittal plane	Green & yellow	Green
	200mm x 20mm strip	
Shoulder & arm	Blue	
	25mm x 150mm, from bottom edge of shoulder hole	
2nd Thorax Rib	Green	
3rd Thorax Rib	Red	
1st Abdomen Rib	Blue	
2nd Abdomen Rib	Green	
	25mm x 150mm, from rearmost accessible location	
Pelvis	Orange	
	50mm x 100mm, centred on hip joint point	
Passenger	-	**Inboard side of dummy**
Head tape outline	-	Blue
Head CoG	-	Orange
Head top along mid sagittal plane	-	Yellow
Shoulder & arm	-	Green

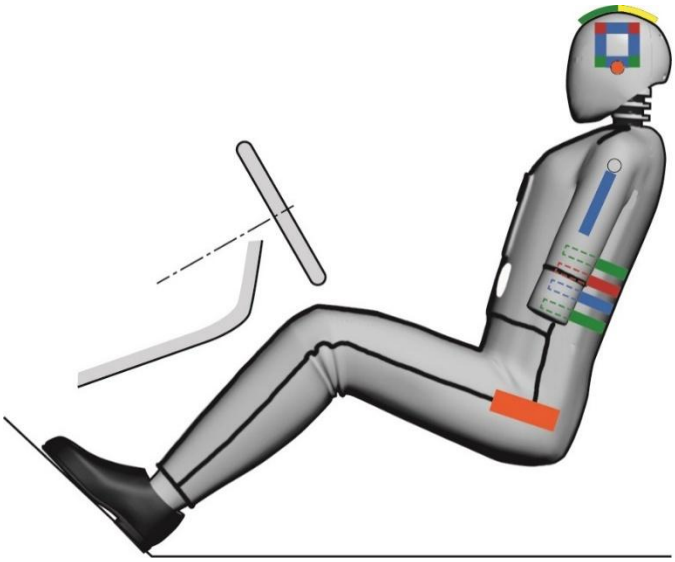


Figure 4: Dummy painting

1.9 Dummy temperature

WorldSID shall have a stabilised temperature in the range of 20.6°C to 22.2°C.

A stabilised temperature shall be obtained by soaking the dummy in temperatures that are within the range specified above for at least 1 hour prior to the test. The temperature shall be recorded at intervals not exceeding 10 minutes and not exceeding 5 minutes before test. All readings shall be supplied as part of the standard output of the test.

After switching on the in-dummy data acquisition, the air inside the dummy and the sensors may warm up whereas the dummy itself is still at a lower temperature. Such sudden temperature rises do not reflect the actual dummy temperature and may be ignored as long as they do not exceed a duration of 20 minutes.

1.10 Post Test Dummy Inspection

All dummies shall be visually inspected immediately after the test.

Any lacerations of the skin or breakages should be noted in the test details, a dummy may have to be re-certified in this case.

Any screws that have become loose or detached shall be re-tightened to the required torque or replaced as necessary.

APPENDIX A

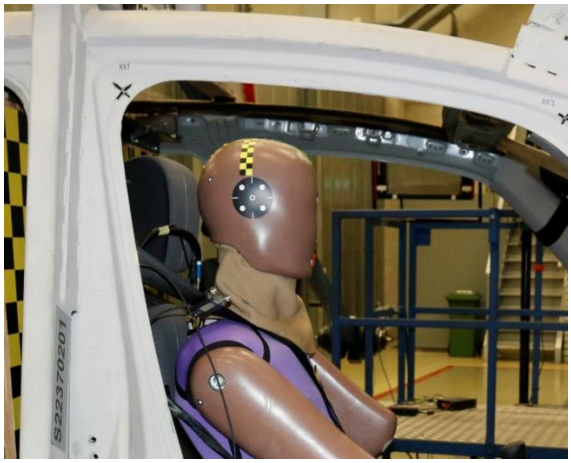
1. Far side sled test - Required channels

Location	Parameter	Axis	ISO Code
Head CoG	Angular velocities	x	1?HEAD0000WSAVX[0,P]
		y	1?HEAD0000WSAVY0
		z	1?HEAD0000WSAVZ0
	Accelerations	x	1?HEAD0000WSACX0
		y	1?HEAD0000WSACY0
		z	1?HEAD0000WSACZ0
Upper neck	Forces	x	1?NECKUP00WSFOX0
		y	1?NECKUP00WSFOY0
		z	1?NECKUP00WSFOZ0
	Moments	x	1?NECKUP00WSMOX0
		y	1?NECKUP00WSMOY0
		z	1?NECKUP00WSMOZ0
Lower neck	Forces	x	1?NECKLO00WSFOX0
		y	1?NECKLO00WSFOY0
		z	1?NECKLO00WSFOZ0
	Moments	x	1?NECKLO00WSMOX0
		y	1?NECKLO00WSMOY0
		z	1?NECKLO00WSMOZ0
Spine – T4	Accelerations	x	1?THSP0400WSACX0
		y	1?THSP0400WSACY0
		z	1?THSP0400WSACZ0
Spine – T12	Accelerations	x	1?THSP1200WSACX0
		y	1?THSP1200WSACY0
		z	1?THSP1200WSACZ0
Lumbar spine	Forces	x	1?LUSP0000WSFOX0
		y	1?LUSP0000WSFOY0
		z	1?LUSP0000WSFOZ0
	Moments	x	1?LUSP0000WSMOX0
		y	1?LUSP0000WSMOY0
		z	1?LUSP0000WSMOZ0
Shoulder joint	Forces	x	1?SHLD??00WSFOX0
		y	1?SHLD??00WSFOY0
		z	1?SHLD??00WSFOZ0
Shoulder – rib	Displacement	1D	1?SHRI??00WSDC00

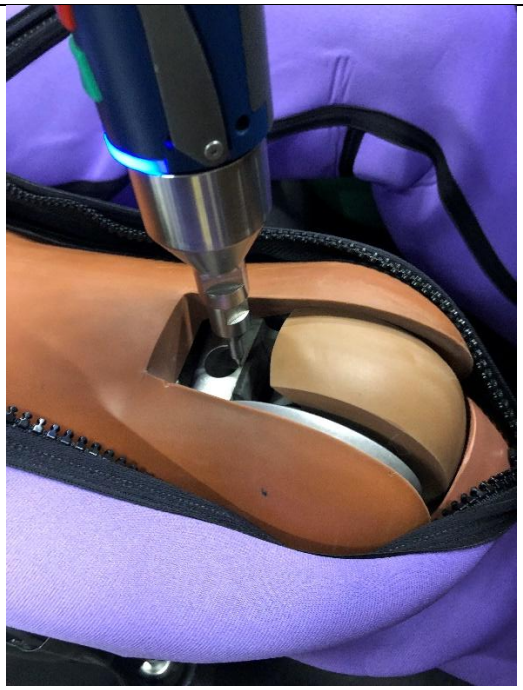
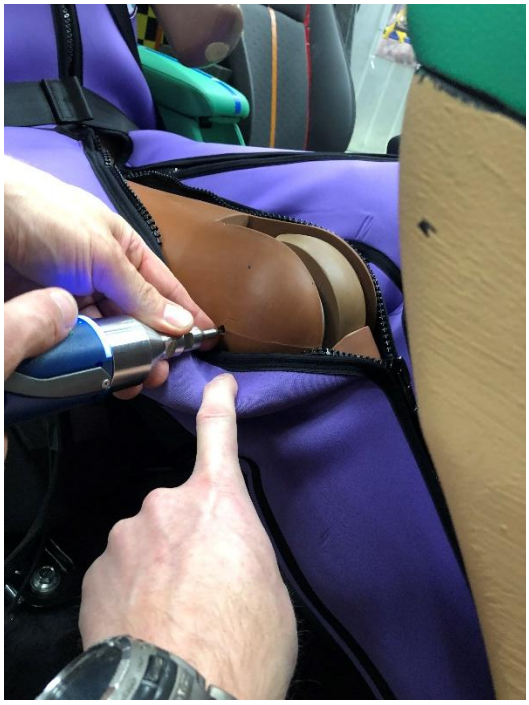
	Angular displacement		1?SHRI??00WSAN00
Thorax - Upper rib	Displacement	1D	1?TRRI??01WSDC00
	Angular displacement		1?TRRI??01WSAN00
Thorax - Mid rib	Displacement	1D	1?TRRI??02WSDC00
	Angular displacement		1?TRRI??02WSAN00
Thorax - Lower rib	Displacement	1D	1?TRRI??03WSDC00
	Angular displacement		1?TRRI??03WSAN00
Abdomen – Upper rib	Displacement	1D	1?ABRI??01WSDC00
	Angular displacement		1?ABRI??01WSAN00
Abdomen – Lower rib	Displacement	1D	1?ABRI??02WSDC00
	Angular displacement		1?ABRI??02WSAN00
Pelvis	Accelerations	x	1?PELV000000ACX0
		y	1?PELV000000ACY0
		z	1?PELV000000ACZ0
Pubic Symphysis	Force	y	1?PUBC0000WSFOY0
B-Pillar (non-struck side)	Accelerations	x	1?BPILLO0000ACX0
		y	1?BPILLO0000ACX0
		z	1?BPILLO0000ACX0
Lap Belt (B6)	Force	1D	1?SEBE0003B6FO00
Shoulder Belt (B3)	Force	1D	1?SEBE0003B3FO00
CALCULATED CHANNELS			
Shoulder – rib	Displacement corrected		1?SHRI??00WSDS00
Thorax - Upper rib	Displacement corrected		1?TRRI??01WSDS00
Thorax - Mid rib	Displacement corrected		1?TRRI??02WSDS00
Thorax - Lower rib	Displacement corrected		1?TRRI??03WSDS00
Abdomen – Upper rib	Displacement corrected		1?ABRI??01WSDS00
Abdomen – Lower rib	Displacement corrected		1?ABRI??02WSDS00
B-Pillar (non-struck side)	Calculated global velocities	x	1?BPILLO0000VEX0
		y	1?BPILLO0000VEY0
		z	1?BPILLO0000VEZ0
Total number of required channels:		63	

APPENDIX B

1. Far side sled test – Pre test dummy measurements

Description	
Head CoG, Outboard head skin marking	
Neck bracket, rearmost, outboard corner of the bracket	
Neck bracket, foremost, outboard corner of bracket	

Outboard arm, shoulder screw centre	
Outboard arm, tip of arm foam centre	
Outboard arm angle, place a straight edge alonFg the length of the arm	
Outboard femur, centreline of knee clevis	

	
Outboard knee, knee joint/bolt centre	
Outboard femur, angle, place a short length inclinometer on the femur centreline	

	
Outboard ankle, centre of bolt	
Outboard head restraint tube, most outboard part of the tube where it meets the seatback.	
Diagonal seatbelt