



C L E P A

*European Association of
Automotive Suppliers*

REGULATION 129 PHASE 2 TESTING

INVESTIGATION INTO THE EFFECTS OF ISOFIX

17/03/2015



Safety Benefits of ISOFIX on Booster Seats

- ISOFIX prevents loose seats moving around in vehicle when unoccupied
- Testing to determine if greater safety benefits in front & side impact
 - Compare with/without ISOFIX
 - Investigate rigid and flexible ISOFIX
 - Investigate effect of seat mass

Test Matrix – Front Impact

Test No.	CRS	Attachment	CRS Mass (kg)
I01	Type 1	Belt	6.7
I02	Type 1	Belt & ISOFIT	6.7
I05	Type 2	Belt	6.7*
I06	Type 2	Belt & ISOFIT	6.7*

*1.7kg Mass added to crs type 2 to make same as CRS type 1

CRSs – 3 different types used



CRS Type 1
Rigid ISO-FIT
(6.7 kg)



CRS Type 2
Flexible ISO-FIT
(6.7 kg)
(1.7 kg mass added to
equal XP mass)

Front Impact - CRS type 1 Results

- Acceleration and neck results similar between belt/ISOFIX:

Body Region	Belt	Belt & ISOFIX	Difference (%)
Head resultant acceleration (3ms)	81.8 g	79.7 g	-3%
Chest resultant acceleration (3ms)	40.5 g	43.4 g	+7%
Pelvis resultant acceleration (3ms)	39.2 g	37.0 g	-6%
Upper neck force (Fz)	2.7 kN	2.6 kN	-3%
Upper neck moment (My)	-14.4 Nm	-13.5 Nm	-6%
Head horizontal excursion	380 mm	364 mm	-4%

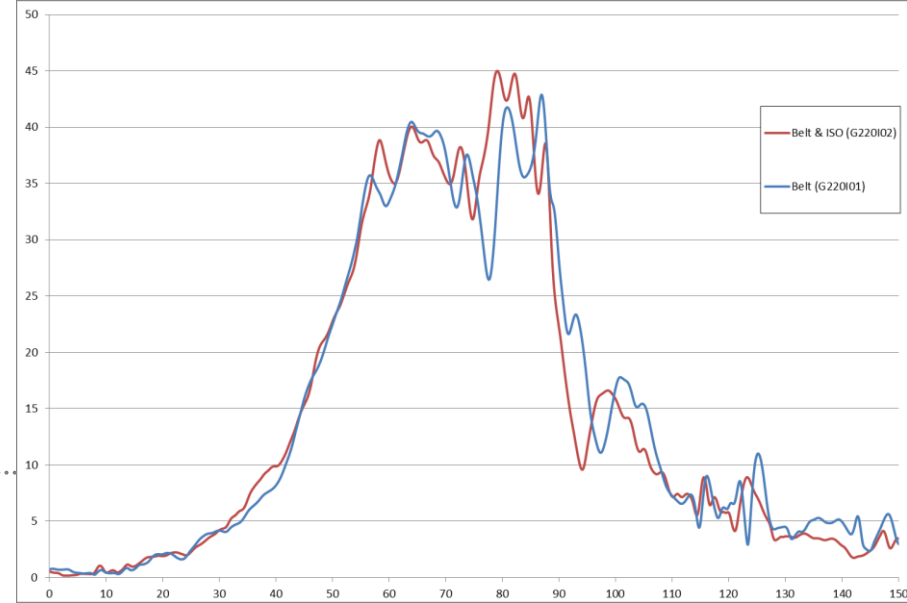
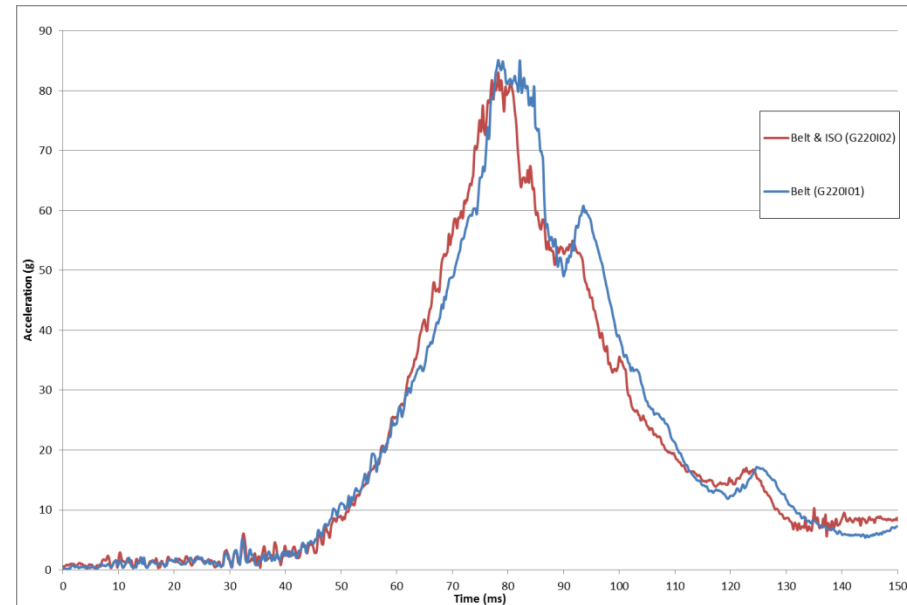
- Reduction seen in:

Body Region	Belt	Belt & ISOFIX	Difference (%)
Chest compression (belt loading)	29 mm	24 mm	-17%
Abdomen loading (buckle side)	0.46 bar	0.34 bar	-26%
Lap belt force	1.8 kN	1.5 kN	-14%

Front Impact – CRS type 1 Results

- Head resultant acceleration
 - Minimal reduction in loading duration and peak (3ms)
 - Belt = 81.8g
 - Belt & ISOFIX = 79.7g

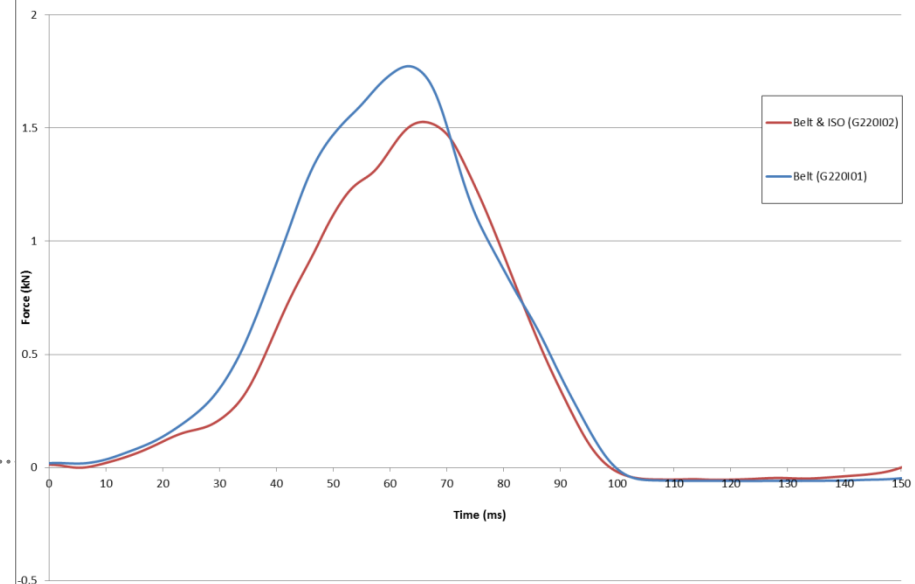
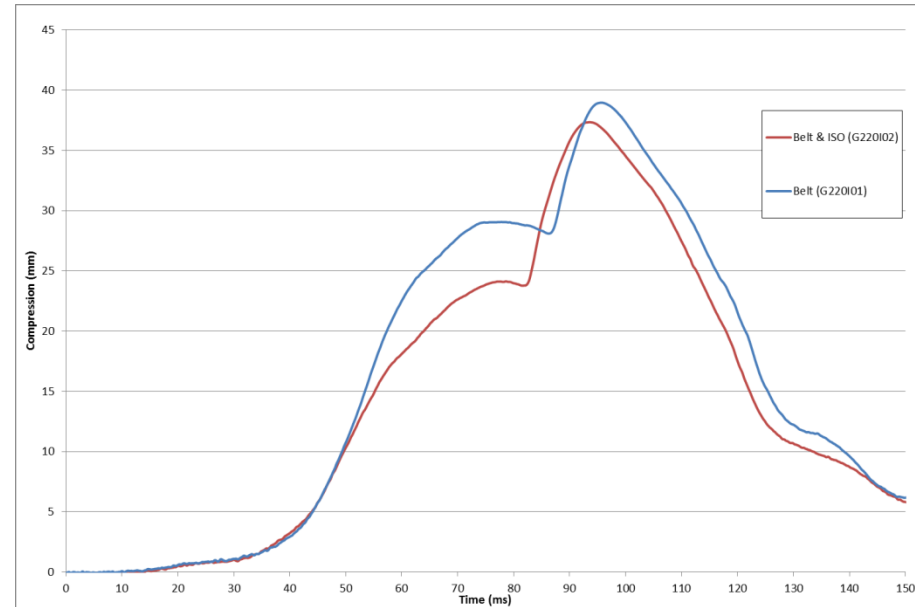
- Chest resultant acceleration
 - No reduction in duration, slight increase in peak (3ms)
 - Belt = 40.5g
 - Belt & ISOFIX = 43.4g



Front Impact – CRS type 1 Results

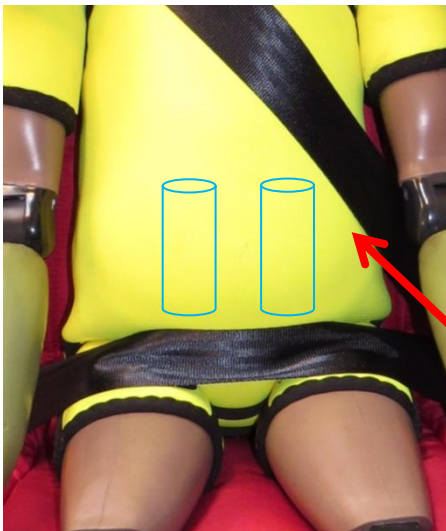
- Chest compression
 - Reduction in loading duration and first peak (belt loading) and second peak (chin-chest contact)
 - Belt = 29mm
 - Belt & ISOFIX = 24mm

- Lap belt force
 - Reduction in duration and peak
 - Belt = 1.8kN
 - Belt & ISOFIX = 1.5kN

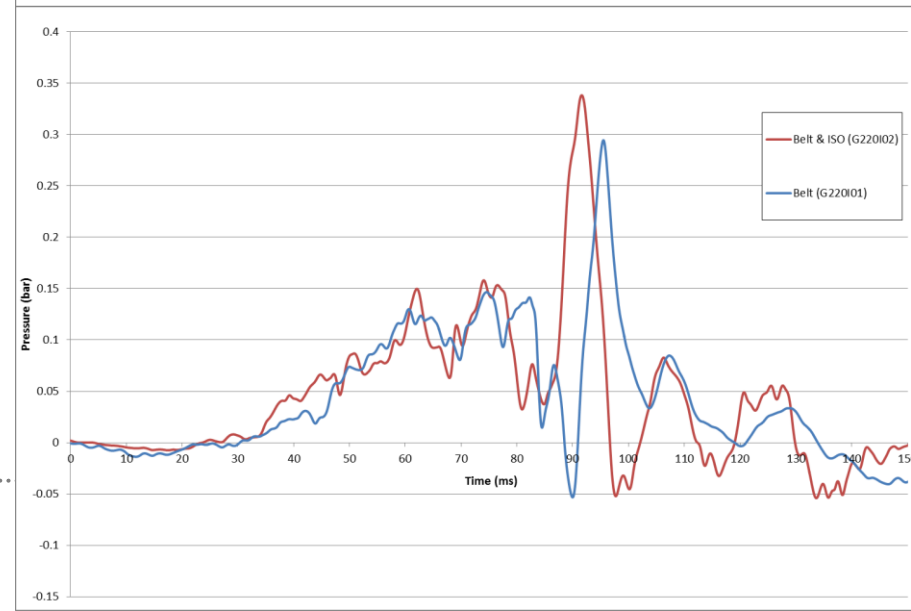
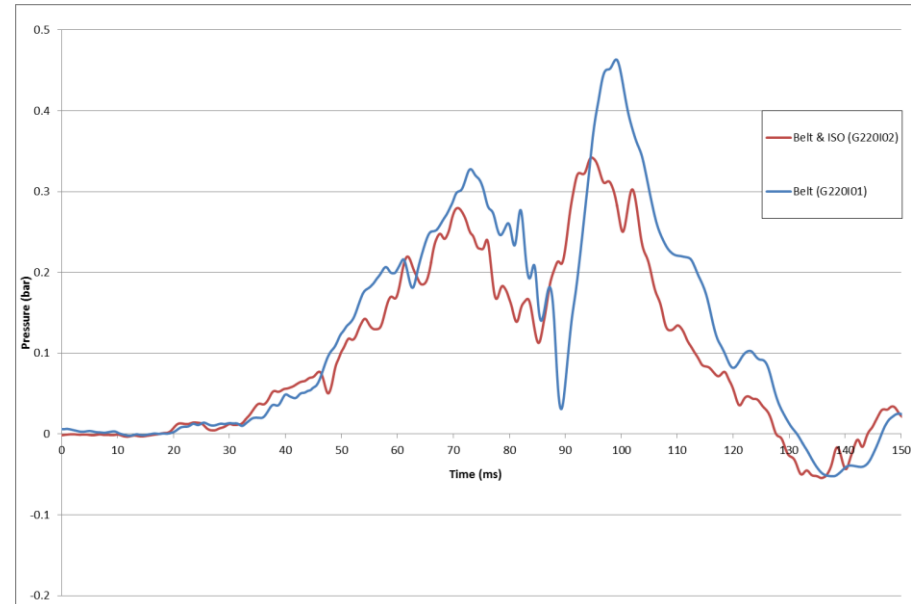


Front Impact – CRS type 1 Results

- Abdomen pressure
 - Slight overall reduction in pressure,
 - Buckle side – reduced
 - Belt = 0.46 bar
 - Belt & ISOFIX = 0.34 bar
 - Outboard side – slight increase
 - Belt = 0.29 bar
 - Belt & ISOFIX = 0.34 bar



Pressure from shoulder belt acts on sensors



Test Matrix – Side Impact

Test No.	CRS type	Attachment	CRS Mass (kg)
I07	1	Belt	6.7
I08	1	Belt & ISOFIT	6.7
I09	2	Belt	6.7*
I10	2	Belt & ISOFIT	6.7*

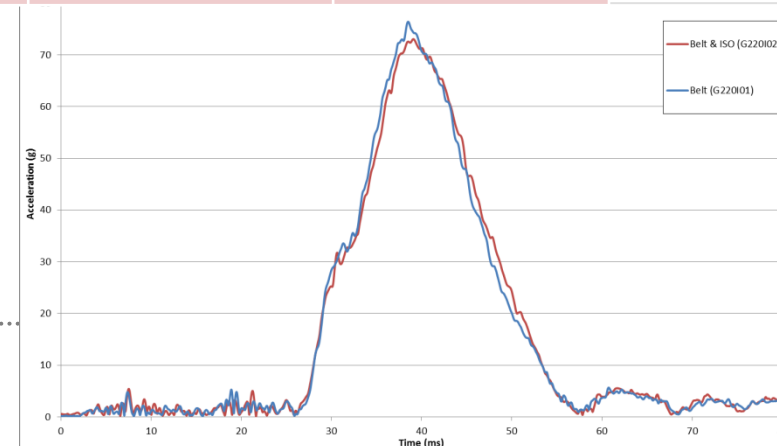
*1.7kg Mass added to CRS type 2 to make same as CRS type 1

Side Impact - Results

- All body regions similar between belt/ISOFIX:

Body Region	Belt	Belt & ISOFIX	Difference (%)
Head movement (From door line)	116 mm	114 mm	+2%
Head resultant acceleration (3ms)	70.2 g	69.6 g	-1%
Chest resultant acceleration (3ms)	51.8 g	51.2 g	-1%
Pelvis resultant acceleration (3ms)	78.3 g	72.9 g	-7%
Upper neck force (Fz)	1.0 kN	1.0 kN	+5%
Upper neck moment (Mx)	-11.2 Nm	-12.3 Nm	+10%
Chest compression	18.8 mm	20 mm	+7%

Head Resultant Accelerations



Conclusions

The present set of data shows slight benefit in frontal impact and no difference is observed in side impact.

- Reduction seen in front impact in:
 - Chest compression loading (-17%)
 - Abdomen loading (-26%)
 - Lap belt force (-14%)

- No significant difference in side impact results