RAMSIS Module Seat Belt Design

Digital ergonomics

Belt design – safe and efficient

Safety, ergonomics and regulations in international markets

Most vehicles nowadays are produced for the world market – and safety components like the seat belt are critical global sales factors. The belt must not only function correctly, it must also convince each of your target groups, both ergonomically and economically. This is no problem... with the RAMSIS Seat Belt Design module from the house of Humanetics Digital Europe GmbH.

The Seat Belt Design Module for RAMSIS Automotive can test and optimize every seat belt system in a fully digital process. And our leading ergonomics tool not only takes humans into account, it also addresses seats and the kinematic belt anchorage configuration. This means that belt routing can be realistically and completely reproduced in 3D as early as the CAD phase. Different concepts can be compared and optimized.

Your advantages
> Optimized belt systems in CAD – ergonomic, safe and profitable
> Time & cost savings, such as fewer physical test stands, easier documentation and reproducible results
> Testing based on target group-specific manikins and conventional test devices
> Automatically-generated test report –legally recognized

Real occupants and test devices

Optimal belt simulation starts with human beings. And that's why RAMSIS Seat Belt Design doesn't simply reproduce the CAD model of the vehicle – it also includes 3D manikins representing the future (real) occupants of the target market. The module also provides a wide range of different CAD models of global test devices, including the Anthropomorphic Test Device (ATD) and the Gabarit.

Ergonomics test

Safety first should *always* be of primary importance – and a safety belt must be ergonomically perfect, because it has physical contact with the wearer for the entire journey. RAMSIS Seat Belt Design shows you all the contact areas for the various occupants of your target markets. Once the human model has been selected, it's all systems go: The human model is placed in the vehicle and belt routing and anchorage positions are checked on the model.

During the visual inspection of the belt routing, you can identify problem areas caused by twisting or belt detachment. And a scale shows you the critical distances of the belt strap to the neck and to the shoulder. The results of the belt analysis and the evaluation of the different anchor points provide comprehensive data for the optimization of the belt system.

Thanks to target group-specific analysis, you get valuable ergonomic information, *plus* a very practical benefit… exactly how long the belt strap must be for your markets.

General belt testing

To analyze certain design criteria such as belt length and storage, you *could* of course calculate belt routing digitally without using human beings or test devices. Here the belt tongue can be inserted into the belt lock or the belt can be analyzed in unfastened resting position.

Fig. 1: Analysis of ergonomic belt routing

RAMSIS Seat Belt Design

Regulatory compliance

RAMSIS Seat Belt Design contains, eBTD – so you can ensure that all eBTD criteria are met at a very early development stage directly on the CAD model. In accordance with your settings, the eBTD CAD test device is automatically positioned in the seat and the belt route calculated and optimized, if necessary. You can then check the positional criteria on the belt That's it, it's done!

Crashworthiness

Hominoid devices such as anthropomorphic test devices (ATDs) and crash test dummies are used for testing the safety of belt systems in an accident.

The system can simulate the belt route just before the time of the accident (pre-crash), enabling you to optimize your belt system for emergencies on the digital model. CAD models (ATDs) of men, women and children take the place of their human counterparts. They are positioned in the vehicle and the performance of the belt routing in an emergency is checked based on the individual belt anchorage configuration. The safety clearance of the belt to the chest sensor of the test device is then displayed. This serves as a criterion for the optimum belt anchorage design, helping to minimize bruising of the chest by the belt in a crash. The test procedure method complies with the FMVSS208 directive.

Safe for children

A safety belt for children makes special demands on the belt components. The optional Gabarit test device is used to test the standardized installation requirements for child restraint systems in compliance with the 77/541/EEC and ECE R16 directives.

After positioning the standard-compliant Gabarit model in the seat, you can define your belt anchorage as usual and calculate the relevant belt routing. This delivers important information for your belt design: you know the design-critical length of the strap and the optimal positioning of the belt lock in relation to the test device. And thanks to the analysis of different versions of the anchorages, you can now optimize your belt system in terms of child safety.

USING RAMSIS SEAT BELT DESIGN

Software and service

If you are already using RAMSIS Automotive for ergonomic studies, this will be a breeze for you, because the RAMSIS Seat Belt Design module can be seamlessly integrated into the existing RAMSIS Automotive version. Humanetics Digital Europe GmbH does, however, recommend and provide preliminary training for the Seat Belt Design module.

New customers can use the module together with RAMSIS Automotive, either as stand-alone software or integrated in Catia V5, 3DExperience or Siemens NX. Our coaching and training will consolidate the productivity of your development and construction. And if you do not wish to add to your company's resources at this time, you can still reap the benefits of RAMSIS Seat Belt Design – because as an alternative, we do also offer our design services for your seat belt development.