

NEXT.assembly

x-proof 360

Vehicle-in-the-Loop setup for ADAS/AD tests and over-the-air stimulation

Automated driving will soon be a mandatory part of every new vehicle and autonomous driving is no longer a distant vision of the future. In order to ensure the safety of automatic driving functions today as well as autonomous driving tomorrow, Dürr has created the x-proof 360 essential setup for Vehicle-in-the-Loop (ViL) tests of ADAS/AD functions by combining over-the-air stimulation and two of our cutting-edge products:

- **x-road curve**
Multi-function roll test stand with steering function
Offers all conventional features of a roll test stand and allows an unmodified vehicle to not only drive straight ahead, but to perform cornering maneuvers as well.
- **x-around**
Multi-axial positioning system for dynamic scenarios
Offers full flexibility and precise positioning for over-the-air stimulation equipment in all directions, even in case of dynamically movable objects in front of the vehicle.

CUSTOMER BENEFITS

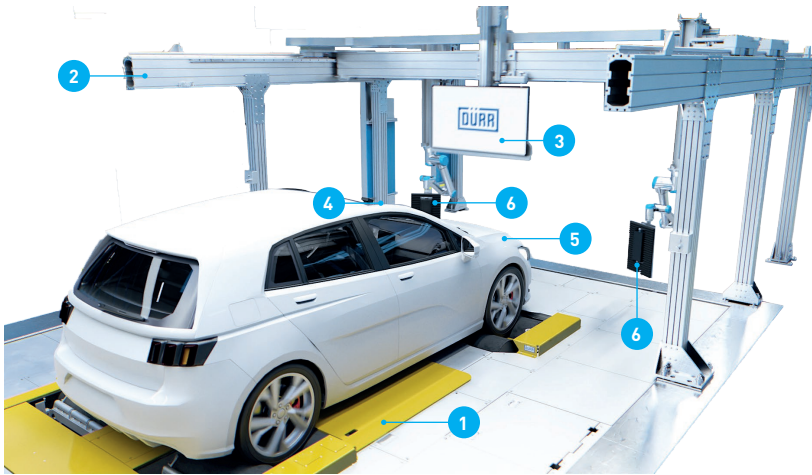


- Efficient ViL-testing of ADAS/AD functions
- Small scale compared to proving grounds
- Limited environmental or user influences
- Highly reproducible and repeatable results
- Contactless sensor stimulation over-the-air
- No vehicle modification or fixation required
- No sideways exit during steering maneuvers
- Allows UNECE, NCAP and NATM scenarios
- For R&D, homologation, end-of-line and periodic technical inspection applications

x-proof 360

The essential setup to prove modern vehicle safety

LAYOUT OF X-PROOF 360 - VIL SETUP



The operation of a test vehicle without modification or fixation on the 4-wheel-drive x-road curve [1] and the automatic positioning of contactless over-the-air stimulation equipment in all directions via the portal system x-around [2] are only two major advantages of Dürr's x-proof 360 VIL setup (see Layout).

By synchronizing all vehicle and object movements with a virtual environment, it is possible to test various scenarios for ADAS/AD functions described, e.g., by UNECE, NATM or Euro NCAP.

For example, two of the most relevant automatic driving functions can be tested in accordance with UN Regulations 152 and 157:

AUTOMATED LANE KEEPING SYSTEMS (ALKS)



The virtual environment displayed on a monitor [3] can stimulate various road markings or courses for a vehicle's camera sensor [4]. It is synchronized with the driving direction and speed of the tested vehicle on the x-road curve [1] in real-time.



Automatic steering interventions (e.g., in case of lane departures) are compensated by the swiveling front double roller sets (see Fig. 1). Solely this patented feature permits steering vehicles to hold a center position on the x-road curve [1] at all times.

ADVANCED EMERGENCY BRAKING SYSTEMS (AEBS)



Automotive radar sensors [5] can be stimulated with virtual moving objects in front of the tested vehicle via a combination of the dynamic x-around positioning system [2] and attached over-the-air radar test equipment RTS [6].



Automatic brake interventions caused by these objects are met with a realistic load simulation by the x-road curve [1] as well as a synchronized reaction of the real-time object movements on the monitor [3] and RTS [6] in a virtual environment (see Fig. 2).

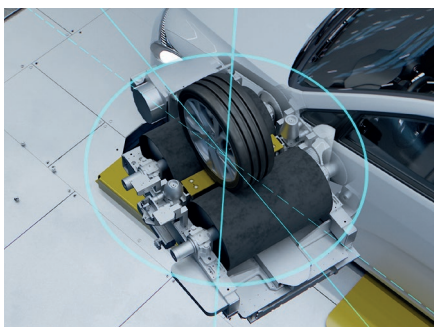


Fig. 1: x-road curve, vehicle steering function



Fig. 2: x-around, dynamic radar object positioning



CONTACT

Kai Künne
Product Line Management EoL
Dürr Assembly Products GmbH
Köllner Straße 122-128
66346 Püttlingen/Germany

E-mail: kai.kuenne@durr.com
www.durr.com