

## Vehicle misuse extreme testing

imc CRONOS*flex* measurement systems in use at IDIADA proving ground



Fig. 1: Extreme vehicle testing

In order to validate chassis components and chassis system behaviour, while also ensuring the correct level of calibration of passive safety ECUs to avoid crash misdetections, IDIADA Vehicle Misuse team, with more than 20 years of expertise in the field, drives our customer's vehicles through different extreme events, such as potholes, ramps, jumps or curbs and evaluates their safety and performance. During manoeuvres, data coming from vehicle (CAN-FD, Flexray, vehicle internal sensor signals...) and from installed sensors (accelerometers, gyroscopes, displacement transducers, effort transducers, strain gauges...) is recorded synchronized using imc CRONOS*flex* systems.

## Rough environment for vehicle testing at Applus IDIADA's proving ground

Applus IDIADA is a global partner to the automotive industry with over 30 years' experience supporting its clients in product development activities by providing design, engineering, testing and homologation services. IDIADA's success in product development is built on a unique blend of a highly experienced team, state-of-the-art test & development facilities and the constant drive towards innovation.

Within its headquarters and proving ground in south of Barcelona, Vehicle Misuse team offers its customers the possibility of testing vehicles against many different inputs. Those inputs represent not common situations a customer may face on open roads and would force the car to work over their normal operational limits. During these manoeuvres, the different systems involved are closely analysed to evaluate occupants' safety, vehicle design and software calibrations.



Fig. 2: imc CRONOSflex measurement system



Fig.3: Entering the “Misuse” proving Ground

### Chassis Misuse

Chassis system and components really suffer with vehicle driving over obstacles. It is therefore crucial to ensure that all critical parts remain functional, not putting into risk vehicle controllability and passengers’ safety. To evaluate movements and deformations, imc systems are used to collect all information coming from the sensors installed on suspension components, such as strain gauges, displacement transducers or load cells. Together with visual inspection, driving evaluation and advanced 3D measurements, it is possible to detect any minor problems.

### Airbag mis-firing calibration

Once known that chassis performs as expected, it is also important to verify software calibrations, especially for the crash detection ECU, as many different impacts on the vehicle may cause the system to mis-detect a crash event, firing the airbags unnecessarily with the potential risk, once again, for vehicle occupants. In this case, accelerometers and gyroscopes mainly, together with internal vehicle signals are monitored using imc DAQ running at high frequency (10kHz).

### Roll-over events

The possibility of connecting to imc systems through WiFi also allows IDIADA Vehicle Misuse team to monitor test data from outside test vehicle on real time, understanding how the vehicle is behaving, even when the events are of such severity that the vehicle needs to be driven remotely using state-of-the-art driverless robots (this including our IDIADA U-Drive robot). A clear example of driver-less testing is a vehicle rolling over on an embankment. Here, as well as on many other one-shot events, imc CRONOSflex systems reliability becomes essential, as it is not possible to repeat such kind of tests. The usage of imc battery handles and imc internal SSDs help ensuring that no single data point is ever going to be lost.

### Instrumentation needs

In order to record all vehicle and external sensors data, a capable and robust system is required. imc CRONOSflex system did give IDIADA’s team the flexibility to adapt the equipment to each customer and vehicle, including different modules according to requirements.

As a baseline, kit is always ready to record:

- CAN or CAN-FD
- FlexRay
- Extensiometric accelerometers
- Analogic channels  
(vehicle speed, pressures, displacements, efforts, gyroscopes, etc.)
- Voltage signals  
(internal firing signals, tensions, etc.)
- Strain gauges



Is it also important to remark that due to the difficulty of repeating such types of tests, it is really important that data is never lost. Is for that reason that imc CRONOSflex 2000 units used are equipped with SSD units, to be able to record the data both in the acquisition laptop and within the imc DAQ system. Further to that, all units are equipped with a Battery Handle with Li-ion batteries to ensure there is always power in the unit, even if there is a loss of power supply from the vehicle.

Vehicle misuse tests are considered extreme events for all three involved parts: vehicle, driver and instrumentation. Not only because of the environment (dust and high temperatures) but also because of the high levels of acceleration vehicles may suffer. For that reason, imc systems toughness is considered an asset. Nevertheless, installation procedure can also mark the difference, so our technicians study each vehicle and kit requirement to ensure any data point is always kept safe.

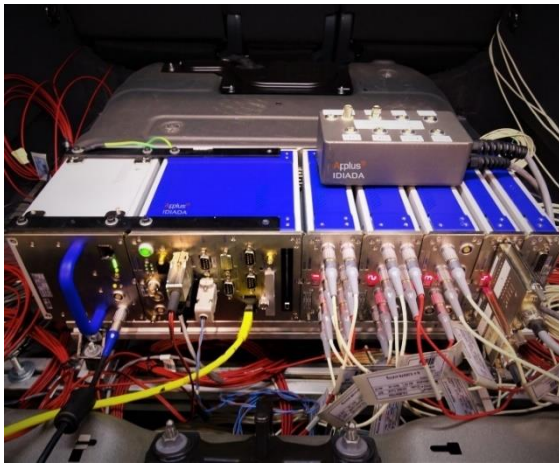


Fig. 4: imc CRONOSflex measurement system with different channel modules installed in a vehicle boot

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imc Test & Measurement GmbH is a manufacturer and solution provider of productive test and measurement systems. imc implements metrological solutions for research, development, service and production. imc has particular expertise in the design and production of turnkey electric motor test benches. Precisely outfitted sensor and telemetry systems complement our customer applications.

Our customers from the fields of automotive engineering, mechanical engineering, railway, aerospace and energy use imc measurement devices, software solutions and test stands to validate prototypes, optimize products, monitor processes and gain insights from measurement data. As a solution provider, imc offers their customers an attractive

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