



IGTS - Industrial Grip Trailer System

The reference for wet and dry grip road measurement

by Ralf Berres and Dr.-Ing. Dieter Barz
Altracon S.A.

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IGTS: The reference for wet and dry grip road measurements

Altracon has developed the new standard trailer for high-precision on-the-road tyre measurements in joint cooperation with tyre maker Michelin

By Ralf Berres and Dr. Dieter Barz

The Industry Grip Testing System (IGTS) is a brand new measurement trailer, developed as a joint project between tyre maker Michelin and solution provider Altracon. It comprehends the knowledge of both tyre and measurement equipment experts and represents the technically feasibility in terms of tyre characteristics measurement on the road with state of the art ease of use.

The Altracon Industrial Grip Trailer System IGTS consists of a modular concept design. One development target was to keep the system variable for existing as well as for future test- and measurement tasks and to adapt to any kind of on the road testing requirement.

The IGTS grip testing trailer is built for straight dry and wet-braking tests. The trailer's frame and wheel load station are optimised by FEM technology for highest stiffness and lowest deformation.

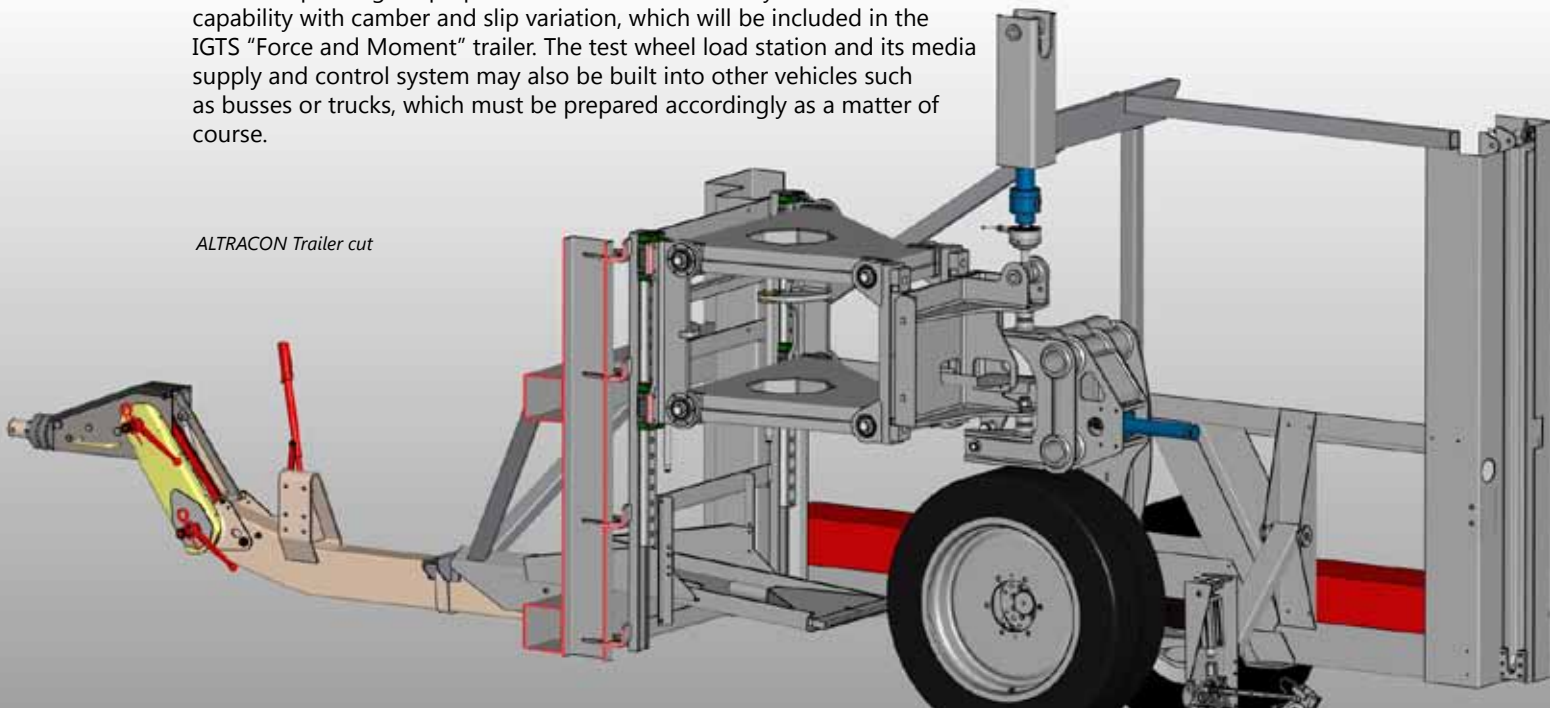
Design features

The trailer is made of a stiff frame with independent wheel suspension for the left and right wheels and is equipped with a variable towing bar to level different heights of the vehicles hitches. It may be pulled from any drawing vehicle with sufficient trailing load and engine torque for the measurements, no matter if it is a Pick-up, SUV, or truck. The IGTS hosts an independent test wheel load station. It is placed in the center of the trailer between the carrying wheels and presses the test wheel to the road surface on a path between the trailer wheels. The test-wheel load station is equipped with a high-performance disk brake to apply the braking torque/force to the test wheel for grip testing. All functions are independent from the drawing vehicle while it carries all the necessary supplies on board except of the water tank, which is carried by the drawing vehicle.

The concept design is prepared to be extended with dynamic test capability with camber and slip variation, which will be included in the IGTS "Force and Moment" trailer. The test wheel load station and its media supply and control system may also be built into other vehicles such as busses or trucks, which must be prepared accordingly as a matter of course.

The trailer is equipped with a modular undercarriage set-up. The basic trailer requires only one axle to perform grip measurements, which are done straight rolling/braking. The directional stability of the trailer is enhanced by two additional lift axles, one in front and one behind the carrying axle of the trailer, to run dynamic tests with the IGTS on the road when it is equipped with camber and slip variation functionality. These lift axles are only used during the actual measurement and will be lifted for taxiing and transportation. Both axles use smaller wheels than the carrying axle and also have independent wheel suspension. The wheels of the lift axles are moreover actively steered to balance side forces which may be generated during testing. The drive performance control system adjusts the trailers' Eigen modes in vertical and lateral direction and significantly improves the directional stability.

ALTRACON Trailer cut



The IGTS test wheel load station is light-weight to reduce the effect of mass of inertia. It is equipped with an active wheel load control while previous test trailers just use dead weights. A fully automatic and adjustable damping control at the testing axle adjusts the Eigen mode and cares for smooth running and best precondition for the measurement on any road. The high-performance long-life wheel spindle is specially designed for lowest rolling resistance.

Power supply is done by batteries, which are loaded by generators. These are inbuilt to the carrying axle at each side. The power supply engineering may be designed as 48V DC as well as 240/400 1- or 3-phase AC with converter for special applications.

Compressed air is supplied from an inbuilt compressor with air tank for inflation pressure adjustment or control as well as for connection of air driven tools.

Hydraulic supply from an inbuilt hydraulic pump system with accumulator tank enables dynamic load, brake, and steering function. The high-speed characteristics of the hydraulic supply is suitable to simulate braking performance (ABS) and quick release brake pressure at the test wheel. It allows to run up to 8 repeatable tests per 100 m in a sequence in combination with the high-performance brake-control techniques.

The optional water management system is integrated and allows controlled watering of the test-wheels path. The nozzles are placed in front of the test wheel. Their watering width is adjustable to 420mm and their watering height is controlled by flow-measurement, which is adjustable between 0 and 4mm at maximum speed of 100 km/h. The system is operating with continuous water flow for quickest reaction times. It is pressure-controlled and switches between circulating and spraying mode without any time lag and pressure loss.

Measurements

The trailer speed measurement is precisely done directly at both carrying wheels. Different speeds measured at the left and right side indicate deviation from the straight path. The alignment of the drawing vehicle and the trailer is moreover precisely measured with a laser-based alignment measurement system if the IGTS is equipped with camber and slip variation functionality. Inputs from both, the speed and the alignment measurement system, will generate correction of the directional stability by the control system.

The wheel speed of the test-wheel is precisely measured directly at the test-wheel spindle with an encoder, which also gives information about the braking process of the test wheel.

Forces and moments at the test wheel are synchronously measured in x- and z-direction with 1-component sensors. A multi-component force and moment dynamometer, which may use strain gauge or quartz technology, is optionally available as an alternative. It is integrated to the wheel spindle, fully covered and shielded. However, both set-ups are available either independent or together.

All measurements of motion are done with precision sensors, using various technologies, depending on the entire parameter. For referencing, speed and location recording different control and measurements techniques are used as well.

Ergonomics

The test-wheel carrier design enables to turn the wheel by 90° around its vertical axle for wheel exchange and service. This allows the operator to access the wheel fixation from the back of the trailer. ■

SUMMARY OF DISTINCTIVE FEATURES

- Light-weight wheel suspension to reduce the mass of inertia
- Low rolling resistance high-performance long-life wheel spindle
- Measurement systems as single axle or with dynamometer technics
- High precise load control designed for equalised axle weight
- Eigen-mode adjustment by fully automatic and adjustable damping control at the testing axle
- Brake system with high speed characteristics hydraulic supply to simulate braking performance (ABS) and quick release brake pressure
- High performance braking control system
- Test sequences with up to 8 tests per 100 m in a row.
- Modular trailer undercarriage for one or three axle systems for characteristics testing including drive performance measurement and control technics to adjust the trailers' Eigen-mode in vertical and lateral direction
- Integration in existing testing environment and customised data solution
- Different control and measurement technics for referencing, speed and position recording
- Optional water-levelling system to apply an adjustable water film in front of the test-wheel in case of a missing road watering system



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