Turntable Road-Marking Test System (RPA)

The turntable road-marking test system of the Federal Highway Research Institute (BASt) (Photo: Uwe Freier)

Seeing and being seen are important preconditions for safety on the road. The latter applies in particular to roadway markings which can be considered as an essential element of visual guidance for the road user. Motorists (including motorcyclists) in particular must be able to trust these road markings, both during the daytime and during the nighttime, particularly in wet conditions.

Standards throughout Europe for testing roadway markings have been elaborated with the cooperation of the Federal Highway Research Institute (BASt), so that the markings meet the requirements in respect of safety and also in respect of durability. These suitability tests have been conducted by the Federal Highway Research Institute since 1956 on behalf of the Federal German Ministry of Transport, Building and Urban Development (BMVBS).

Until 1976, roadway markings were tested only at road trials in real traffic. However, the field tests had the crucial disadvantage that results were available only after the real test time. Above all however, it was necessary to close off roads and divert traffic when applying the markings and when conducting the periodic measurements. This, in turn, led to traffic conflicts and great danger to the personnel involved in conducting the work. Such a procedure is no longer conceivable in view of today's prevailing traffic density on Germany's roads.

The road in the laboratory

The BASt developed a test method which is less complex and expensive and which is more informative under the same boundary conditions than is possible owing to the imponderable factors associated with the road field test. The road has been fetched into the laboratory with the turntable road-marking testing system (RPA). This is a special facility on which type approvals were conducted for the first time in 1989 after many years of development and trials.

The system

Essentially, the RPA consists of a horizontally arranged turntable with a diameter of 6.40 m to which up to 20 different marking samples can be applied at the same time. The samples are loaded with up to eight test wheels which produce the same degree of wear as real vehicles in traffic.

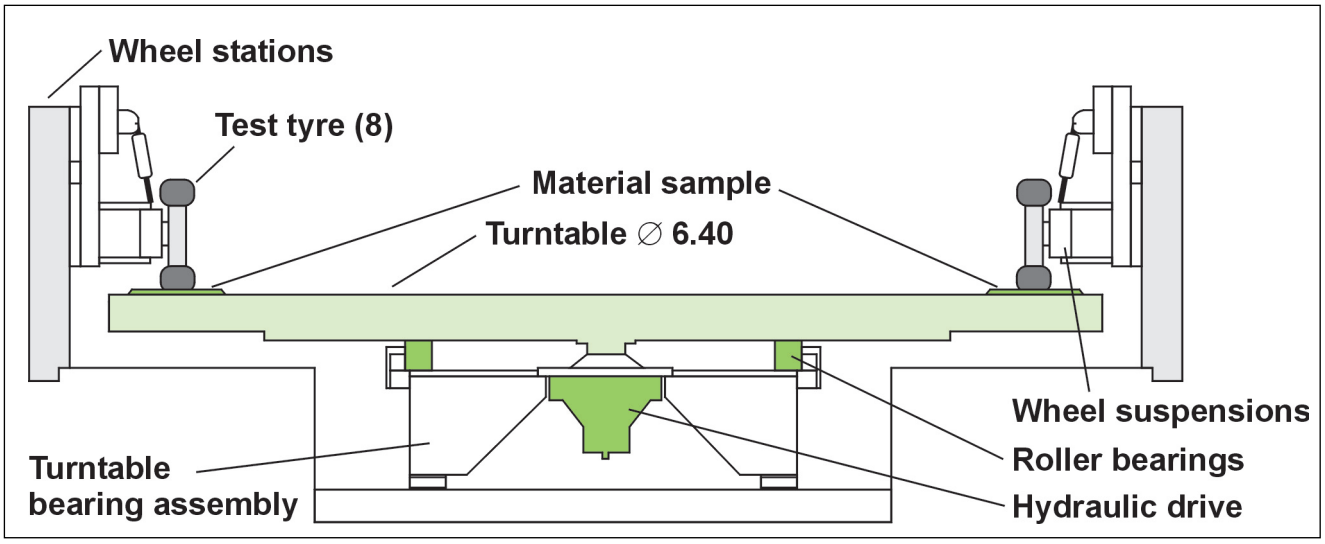
Testing

The test markings are applied to special test substrates whose composition and surface correspond to a finely structured roadway surface.

The RPA allows the annual loading of roadway markings to be simulated within one week. Marking systems may be produced from various materials, depending on the subsequent intended application. The marking materials most used today are

- paint,
- reactive materials (cold plastics),
- thermoplastic materials and
- prefabricated systems.

The test duration depends on the subsequent intended application scheduled for the relevant marking system. Thus, marking systems for brief, temporary use are subject to only 100,000 wheel roll-over cycles and marking systems for long-term use are subject to up to 4 million wheel roll-over cycles. The latter test stressing indicates an anticipated service life of the marking of 4 to 6 years. On average, approx. 150 different marking systems can be tested in one year. If the result of the test is positive, i.e. if all minimum requirements made in respect of traffic-engineering characteristics and durability are met, the Federal



Sketch showing basic mode of the operation of the turntable road-marking test system

Highway Research Institute issues a test certificate for the marking system.

The traffic-engineering characteristics differ as follows:

- Nighttime visibility in dry and wet state,
- Daytime visibility,
- Grip,
- Residual area.

Results

The test certificates issued by the BASt form the basis for invitation to tenders and contracts when the highway authorities responsible for federal highways award contracts for marking work.

Besides marking systems, it is also possible to use the RPA testing system of the Federal Highway Research Institute for testing other marking elements, such as temporary road markings and road studs.

The high performance of the RPA has led to the fact that industry has recently been very active in the sector of roadway markings. It uses the capabilities of the RPA far more frequently than it uses conventional road field tests. To date, an extremely wide variety of marking systems have been tested and the range of products has consequently been substantially expanded.

The environment also benefits from the tests on the turntable road-marking testing system. Today, only low-solvent marking paints and, to an increasing extent, also water-soluble materials are being used. No heavy metals now have to be used for yellow marking materials.

The findings obtained from the type approvals of the turntable road-marking testing system which are compared constantly with the results from practice are incorporated in national and international regulations. The results thus, ultimately, serve to enhance traffic and road safety.

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Technical data

Air-conditioned measuring laboratory:	8 m x 14 m
Air-conditioned test chamber:	7.50 m x 8.50 m
Diameter of the turntable:	6.40 m
Weight of the turntable:	approx. 15 metric tons
Testing speed:	0 km/h to 120 km/h, steplessly controllable
Drive:	electrohydraulic, 75 kW
Number of test wheels:	4 or 8
Wheel load:	3,000 N
Test temperature:	from -10 °C to 50 °C, steplessly controllable
Relative humidity:	from 40 % to 90 %, steplessly controllable
Air-conditioning:	2 air-conditioning systems which can be used alternately, each with 45 kW output and with an air throughput of 12,000 m^3/h