

Pavement Monitoring by the ARGUS® Survey System



Multifunctional Survey System ARGUS® (TÜV Rheinland Schniering GmbH, Essen)

General Use

- Pavement monitoring of City streets, County roads, State roads, National roads, Motorways
- Acceptance inspection of construction and repair works
- Securing of evidence of road surface characteristics e. g. before and after the employment of heavy load transports
- Settlement of facts on road sections with frequent traffic accidents
- Localized evaluation of longitudinal and transverse evenness, macro texture and surface distress

Measurement System

- Multi-functional – Longitudinal evenness, transverse evenness, surface distress, videos
- High speed - survey speed up to 100 km/h
- Speed-independent results (0 up to 100 km/h)
- objective – survey with measurement technology instead of manual survey
- accurate – high precision by the use of laser measuring and digital video technology
- Self-securing (according to DIN 30 710 and HSM 2000).

Objectives of Pavement Monitoring

- Information supply of road network condition as basic elements of short , mid and long term maintenance policies
- Optimising the use of restricted funds
- Basic element for the transparency of maintenance policy
- Efficiency control of different maintenance policies
- Prognosis of the road network evolution
- Efficiency control of maintenance strategies and material conceptions

Types of Survey

Longitudinal Evenness

- Measurement of the longitudinal profile (e.g. IRI) in the wheel track using the HRM principle in the wavelength range of 0.2 to 100 m - as opposed to systems that measure the longitudinal evenness with e.g. just one laser and an accelerometer per wheel-track the HRM principle is speed-independent and thereby delivers reliable and complete data even in the case of the vehicle slowing down, stopping or accelerating.
- Online control and pre-processing of measurement data by on-board computer
- Output of the real longitudinal elevation profile measured in the wheel tracks of the lane, longitudinal data averaged over 10 cm, vertical resolution 0.025 mm in 10 m segments
- Calculation of spectral density, profile deviations using moving average datum, profile deviations above chosen threshold

Transverse Evenness

- Measurement of transverse profiles for determination of e.g. rutting
- Transverse scanning of the road surface with up to 37 highly-precise laser distance sensors (depending on the actual lane width), horizontal spacing of laser distance sensors of 10 cm
- Complete acquisition of the transverse profiles over the whole lane width
- The width of the transverse evenness measurement subsystem can be adjusted such that it does not exceed the maximum allowed vehicle width
- Sampling rate 50 kHz, vertical resolution: 0.025 mm
- Calculation of rut depth, theoretical water depth, shape index and crossfall (and other indices as specified by customer)

Macro texture

- Macro texture survey in the wavelength range from 1 mm up to 50 mm by the use of a laser roughness sensor
- 50.000 Scans per seconds at a definition of 0.025 mm
- Evaluation of the mean texture depth (MTD) according to ISO 13473-1:2004



Multi-functional Survey System ARGUS® with Macro Video Recording and nine High-Performance Stroboscopes

Surface Distress

Multi-Camera Front Video Recording

- Video recording by continuous high quality digital colour video recording over the hole lane width, optional off site surveys e.g. for the purpose of conducting an object inventory (e.g. kerbing, drainage, footways, bikeways, parking lanes, emergency lanes etc.)
- Off-line visual evaluation of patches, potholes, bleeding and other distress types
- Audio recording for additional information

Macro Video Recording (3 macro video detail cameras)

- Continuous high quality digital video recording of the road surface for the detection and documentation of cracks (crack width ≥ 0.5 mm)
- Use of high-performance stroboscope (shutter time 1/60.000 s)
- Semi-automatic crack detection through image processing



Positioning and Navigation

- High Precision Global Positioning System (with EGNOS differential correction)
- Linkage to the road network system, marker plates and coordinates
- Distance measurement by pulse transducer (resolution better than 1 mm)
- Event-keyboard entries by the operator during the measurements (and in post-processing)

Assessment of Survey Results

- Assessment according to the regulations of the 'German Road and Transport Research Association' FGSV or according to foreign regulations and client demands

Presentation of Survey Results

- Collection of survey results in a road database using e.g. the „STRADIVARI®“ software or PMS-software like “SibView”
- Presentation of the results in charts and maps
- Digital video images and collection in a video image data base (available on CD-ROM, DVD or USB-harddisks as JPEG, AVI or WMV), image data base with coordinates as e.g. *.dbf or *.xls. Further, the data format can be adapted according to the documentation of the required data format as provided by the client within the project specification.

Traffic Safety

The measurement vehicle is provided with traffic warning devices according to DIN 30 710 and HSM 2000 (recommendations for the protection of measurement vehicles). Additional protection is not needed. As the surveys are done at regular traffic speed the traffic flow is not interrupted.

Employment and Probation

- **1991 - 2012**
More than 490,000 measurement km on Highways and National Roads in Germany, Poland, Italy, Morocco, Czech Republic and Switzerland
- **1996 - 2012**
More than 160,000 measurement km on Federal State roads in Germany, Austria, Poland and France and Cantonal Roads in Switzerland
- **1996 - 2012**
More than 20,000 measurement km on city roads and communal roads in Germany, Austria, Poland and Switzerland