Weigh-In-Motion

UnicamWIM

The UnicamWIM system is a state-of-the art solution for a variety of high and low speed Weigh-In-Motion (HS/LS-WIM) applications as defined by international standards (e.g. COST323, ASTM E1318). It measures and records weights of wheels, axles and vehicles (gross) passing over weighing sensors embedded in the road pavement. All measurements are done at normal traffic speeds, so complete vehicle weighing (wheels, axles, gross) can be performed without any traffic flow disturbances. The system has been certified for direct WIM enforcement (type approval certificate valid in the Czech Republic).

Additional Features

The system is designed for **true multi-lane bi-directional free flow** measurement and verifies the accuracy of all measured parameters of the vehicles in both road directions and also when driving between road lanes.

The accuracy of weighing may be lowered by non-standard vehicle behavior (acceleration, deceleration, lane traversing, shoulder driving etc.) or other influences (bad vehicle or road conditions, uneven weight distribution etc.). So to determine whether the measured values are in the defined accurate class, the system provides **advanced measurement validity** evaluation.

The system can be combined with other ITS systems such as spot/section **speed enforcement** systems, dimension-in-motion (using a 3D scanner), vehicle search etc.

Highly accurate **traffic classification and data collection** is available.

Estimation of road ruts and sensor surface wear can be calculated from the collected data, so **load equivalence factor** evaluation can be provided (ESAL, AASHTO).

Applications

The system applications are as follows (gross weight, confidence level π = 95 %):

Application	Tolerance δ [%]	Accuracy Class
Enforcement	5-7	A(5) or B+(7)
Pre-selection	10-15	B(10) or C(15)
Statistics	15-25	D+(20) or D(25)

Basic Specifications

The certified direct enforcement version of the system has the following parameters (Czech Republic):

Confidence Level	π = 95 %
Speed Range	20 – 100 km/h
Gross Weight	δ = 5 % (>3.5 t)
Group of Axles, Single Axle, Axle of a Group	δ = 11 % (1 – 20 t)

Low and High Speed WIM

Offence Documentation

Installation

At the WIM site, there are several sensors installed in the road. Inductive loops are used for vehicle presence detection. Weighing sensors are installed across the direction that the vehicles travel. Optionally, position sensors can determine the vehicles' position in the road lane, to measure the vehicles' width and detect twin (dual) tires. A road surface temperature sensor can also be used for precise temperature linearization and compensation.

The weighing sensors are installed into the road surface at a location which must comply with the defined characteristics. The selection of an appropriate site significantly affects accuracy and lifetime of the weighing sensors.

The number of valid measurements (with a defined accuracy class at a certain confidence level) depends directly on road conditions and the number of sensors (more is better).

- **Two-row sensor setup** of highly accurate quartz sensors (e.g. Lineas by KISTLER) ensures the highest accuracy of the system when the road conditions comply with Class I - Excellent as defined in the COST 323 specification.
- **Three-row sensor setup** is recommended for direct enforcement due to the fact that more sensors mean more individual wheel weighing which results in lower measurement uncertainty.
- **Two staggered sensor setup** with lower accuracy can also be used e.g. for pre-selection and statistic acquisition purposes.
- **Low-cost piezo weighing sensors** (e.g. BL Traffic by MSI) can also be used for applications where high accuracy classes are not required.

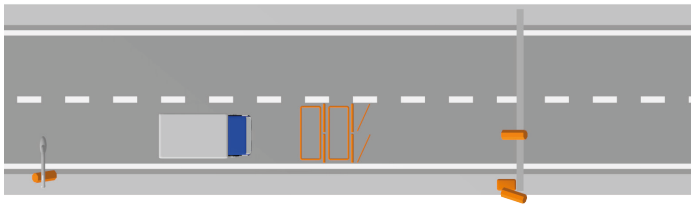
Maintenance

In case of road rut creation (depression, groove, erosion, road indentations etc.) the system cannot keep its accuracy class. The road surface should be then repaired which also can cause the need for system re-calibration and even sensor replacement.

During system operation the road conditions can change. This can affect the weighing sensor parameters and lower the system accuracy. To maintain the system accuracy a re-calibration procedure should be carried out on a regular basis. To simplify the system maintenance an in-the-field manual, semi-automatic and automatic calibration is available.

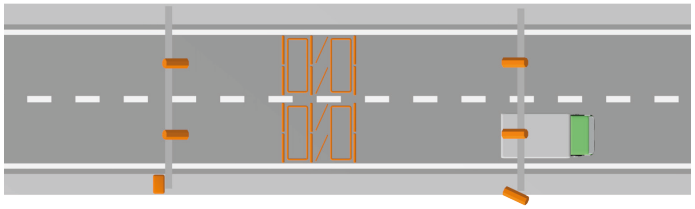
Standard Setup

Three-row sensor setup is recommended for direct enforcement.



Bi-directional Setup

To ensure bi-directional free flow measurement a special site setup is recommended.



camea Intelligent Transportation Systems

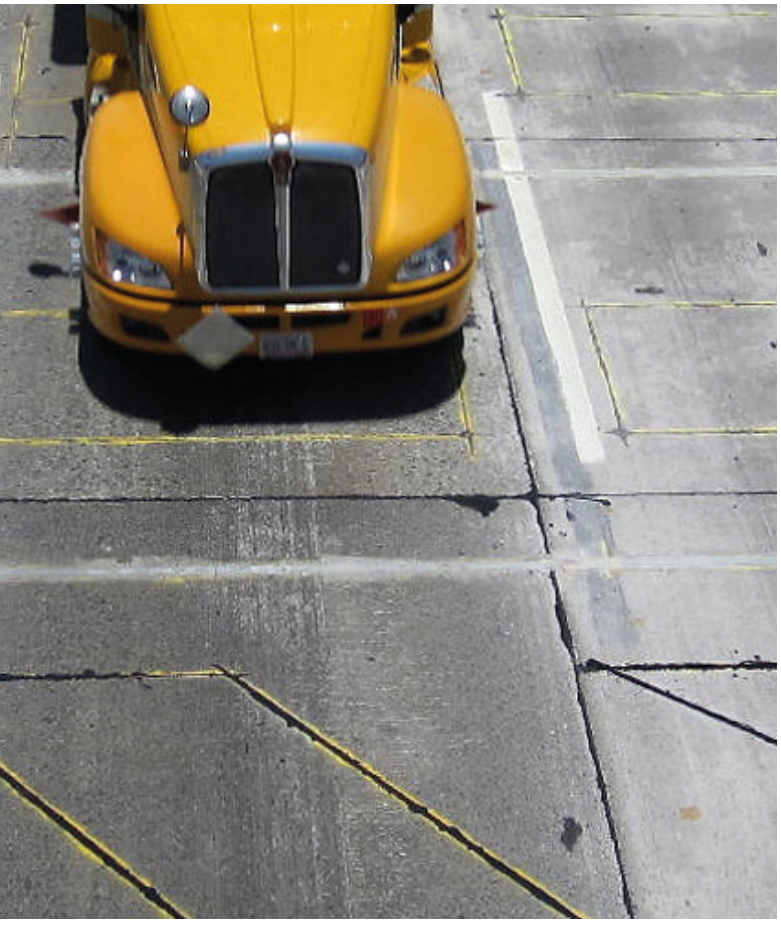
Output Data

The system provides complete vehicle data records including gross/axles/wheels weight, vehicle speed/class/length/direction, vehicle/axle count, wheel/axle bases, trailer presence, validity/error status, statistics and studies export generation etc.

Detail	Sensor	Time	Pictogram	Total weight	LP Image	v	l	l_n	m_1 l_{12}	m_2 l_{23}	m_3 l_{34}	m_4 l_{45}	m_5 l_{56}	m_6 l_{67}	m_7 l_{78}	m_8 l_{89}	m_9	Vehicle type Classification category
✔	ST-CE-W1	2012-03-13 09:06:24		55578	2AE 5277	58	12.50	9.93	7131 3.20	8899 1.34	8689 2.57	10323 1.41	10831 1.41	10705				truck with tripple axle traile 11
✔	ST-CE-W1	2012-03-13 16:05:14		54238	2AB 7027	70	14.30	11.69	6298 1.87	6954 2.38	11557 1.37	12497 4.77	8404 1.30	8528				lorry with double axle traile 13
✔	ST-CE-W1	2012-03-07 20:14:22		54232	3AB 6178	53	10.50	5.33	13693 1.64	13325 2.05	12768 1.64	14446						lorry 4
✔	ST-CE-W1	2012-03-07 11:23:40		49990	8AL 9362	56	14.60	12.02	4568 1.70	5897 2.60	11911 1.40	13420 5.03	6941 1.29	7253				lorry with double axle traile 13
✔	ST-CE-W1	2012-03-05 06:24:18		49969	8S5 5583	61	14.50	12.19	8552 3.49	10231 1.37	10158 3.90	8983 3.43	11145					lorry with double axle traile 6
✔	ST-CE-W1	2012-03-13 06:28:44		48158	1AD 0658	79	13.80	12.18	8371 3.49	10431 1.37	10618 3.90	8786 3.42	9954					lorry with double axle traile 6

Optionally, the system can provide the following: speed enforcement, vehicle position in the road lane, axle width, twin tire detection, road surface temperature, vehicle height, width and length measurement, vehicle 3D classification, over height violation etc.

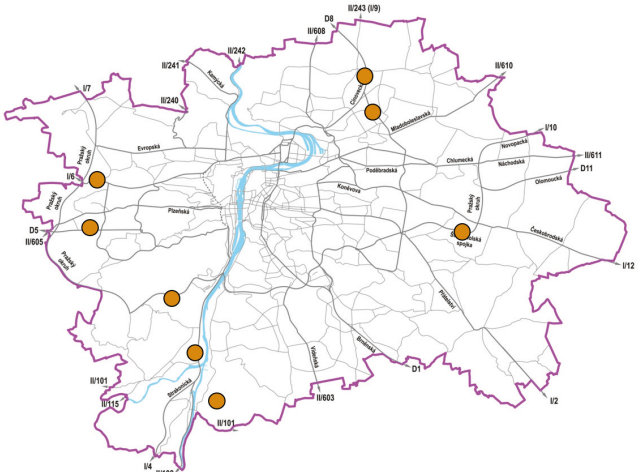
All data can be stored in a local or central database on a vehicle-by-vehicle basis. Various traffic data and studies can be exported via the Web interface or through direct database access (SOAP, file export - CSV, MS Excel, XML etc.).



Case Study

WIM stations can be connected to a central server and a back office to create a so-called CityWIM solution.

For example, in the city of Prague there are currently (2015) 8 centrally operated WIM stations installed with 17 monitored traffic lanes. The goal is to monitor all roads entering the city to prevent damage caused by overloaded vehicles.



Certificates

The systems has been type approved and holds the appropriate certificates.

Český metrologický institut

Type approval certificate

č. 0111-CS-A013-11

Czech Metrology in accordance with the Law of metrology No. 505/1990 Coll. as amended

approved

High-speed weigh-in-motion road vehicle scales type UnicamWIM

under observation of technical data referred to in Annex of this Certificate.

Type approval mark: **TCM 128/11 - 4831**

Applicant: **WIMTRADE SERVICE a.s.**
Vodičkova 710/31
110 00, Praha 1
Czech Republic
IČ: 27836878

Manufacturer: **CAMEA, spol. s r.o.**
Czech Republic

Valid until: **5 May 2021**

Information on judicial remedies:
The judicial remedies against this decision are available to the applicant through Czech Metrology Institute to Czech Office for Standardization, Metrology and Testing within 15 days since the receipt of this Certificate.

Description:
Essential characteristic, approved conditions special conditions, examination results including technical drawings and schemas are set out in the technical test report appertaining to this certificate. The certificate comprises the front page and the technical test report totally having 14 pages.

Brno, 6 May 2011

RNDr. Pavel Klusovský
Director General

ФЕДЕРАЛЬНОЕ АГЕНТСТВО
ПО ТЕХНИЧЕСКОМУ РЕГУЛИРОВАНИЮ И МЕТРОЛОГИИ

СВИДЕТЕЛЬСТВО

об утверждении типа средств измерений

CZ.C.28.010.A № 49780

Срок действия до 01 февраля 2018 г.

НАИМЕНОВАНИЕ ТИПА СРЕДСТВ ИЗМЕРЕНИЙ
Системы измерений параметров автомобильных транспортных средств в движении типа UnicamWIM

ИЗГОТОВИТЕЛЬ
CAMEA, spol. s r.o., Чешская Республика

РЕГИСТРАЦИОННЫЙ № **52647-13**

ДОКУМЕНТ НА ПОВЕРКУ
МП РТ 1781-2012

ИНТЕРВАЛ МЕЖДУ ПОВЕРКАМИ **1 год**

Тип средств измерений утвержден приказом Федерального агентства по техническому регулированию и метрологии от **01 февраля 2013 г. № 59**

Описание типа средств измерений является обязательным приложением к настоящему свидетельству.

Заместитель Руководителя Федерального агентства

Ф.В.Булыгин

2013 г.

Серия СИ

№ 008550