

iBWIM - Bridge Weigh in Motion SHM - Structure Health Monitoring

Innovative measuring systems for monitoring
of bridges and other structural buildings



BWIM

BRIDGE
WEIGH
IN MOTION

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iBWIM is the first patented system in Austria established as commercial device which can be mounted on bridge WIM systems.

iBWIM (Bridge Weigh in Motion) uses a bridge as weigh platform and parameters of the heavy traffic are measured to obtain informative data. Due to this investigation it is possible to predict the remaining lifetime and the maintainer receives a report which serves as decision basis.

At iBWIM sensors are installed under a bridge and measure data like speed, axle load and weight of each vehicle that passes the bridge. Results are amongst others a measuring report and an axle load and traffic flow model.

iBWIM identifies overloaded axles and vehicles, as well as assists with the evaluation of bridges to set required measures. It also provides more precise classification of trucks and opportunities to expand vehicle toll categories.

As soon as a truck crosses a bridge, the iBWIM measures strains and vibrations on lanes in each direction using up to 64 sensors installed underneath the bridge.

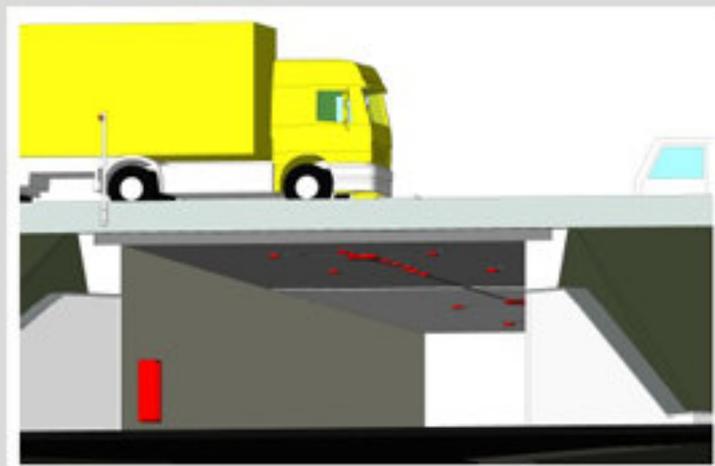
The sensors are connected in groups of eight with a computer-based "Spider" data collector and synchronised within a bandwidth of 1 ms.

The Spiders are interconnected via a local network which supplies them with energy. A computer installed in the system analyses the data and then sends it via GSM connection to a local database.

The entire process takes between 1 and 3 seconds, depending on traffic volumes and connection quality. Measurements can be performed at various locations along the road as well as railway network before the data is forwarded to a database and processed further. The final data is sent on request to mobile devices or desktop computers.

After the data has been collected, it is analysed by the iBWIM algorithm using raw signal parameters such as speed, axle spacing and weight. The analysis is combined with data from other sensors and high-speed cameras to obtain a complete picture of the vehicle crossing the bridge.

The result of each iBWIM measurement is a detailed, custom-built report .





iBWIM Spider is a data collection unit for iBWIM measurement. Several Spiders can be connected and powered by a local network. They are precisely synchronised and provide a maximum of 128 channels.

One Spider typically manages eight strain gauge sensors and one temperature sensor. The actual version offers two current channels optionally used by laser or ultrasonic sensors.

Data is collected with 32 bit ADC technology, enabling the measurement of very small changes in strains. The unit offers sampling rates ranging from 500 Hz up to 1400 Hz. Noise is reduced due to very high internal sampling and according averaging.

Every Spider transmits data packages over LAN to a router/server component, where they are treated and combined to data records for each truck event.

Typical application fields

- Assessment of bridges
- Pre-selection of overloaded vehicles
- Statistical load data from traffic

Technical data

Power Supply	PoE (IEEE 802.3af)
Operation temp.	-30 ... +80 *C
Dimensions	222 x 220 x 81 mm
Pins	4 wire opt. 5 wire
Casing protection	IP66
Power consumption	typ. 1,3 W

Assembly

The iBWIM Spider has two fastening rails with slots for M6 screws. The installation with impact dowels on concrete bridges and with neodym magnets on steel bridges is proved.





PSPLogger is a data grabber for autonomous data acquisition. It is powered by simple batteries enabling operation over at least two years given a typical setup. It targets structural surveys where quasi static values have to be recorded.

Data is stored locally on a USB stick and can be sent via GSM to a central web-service for further treatment.

PSPLogger offers two temperature-, three voltage- and two current channels where various sensors can be connected. Data is collected in intervals from 10s up to once per day, where the sampling rate can be defined from 10 Hz up to 1400 Hz.

Depending on the application the PSPLogger also contains a system called Pointer. It uses a camera on one side and a laser module on the other. The part with the camera is installed at the MP (Measuring Point) and the part with the laser module is installed at the FP (Fix Point). The laser module targets on the focusing screen of the camera, which takes a photo of the screen. With this method it is possible to detect elemental movements.

Typical application fields

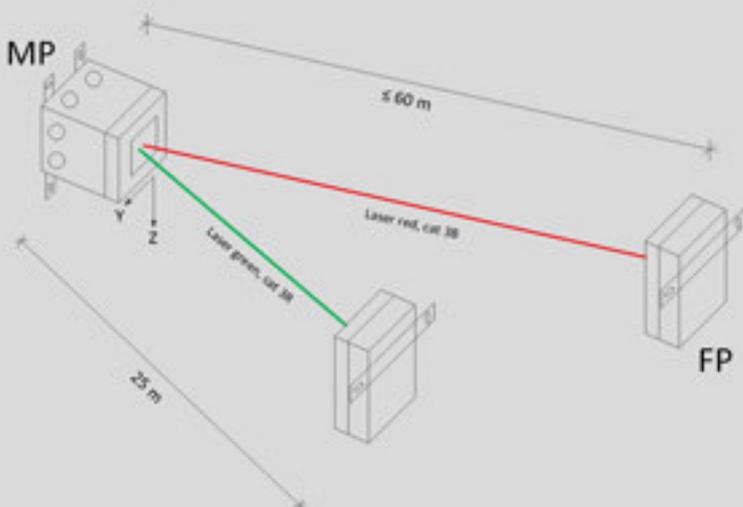
- Gap monitoring
- Monitoring of roadway transitions
- Monitoring of fluid levels
- Stress monitoring at construction parts
- Stress monitoring at welding seams
- Movement of bearing walls
- Inclination of supports and walls
- Monitoring of settlements
- Image acquisition

Technical data

Supply voltage	12 V
Battery type	8x Mignon
Operation temp.	-20 ... +50 °C
Housing dimensions	160 x 90 x 90 mm
Casing protection	IP66
Power consumption	typ. 1,8 W
Power cons. Laser	typ. 1,5 W
Power cons. Cam	typ. 1,8 W

Assembly

Impact dowels at concrete bridges, neodym magnets on steel bridges.





The iBWIM standard sensor is a strain gauge based sensor developed by PSP GmbH.

It uses two strain gauges in full bridge circuit to guarantee high sensitivity and accuracy of the signals.

Due to the aluminium body the standard sensor is very robust and perfect suitable for long term measurements and all weather conditions.

The temperature dependence is compensated continuously by iBWIM SpiderServer software.

Standard sensors are available as 4 wire, as well as 5 wire model which increases the signal accuracy.

Typical application fields

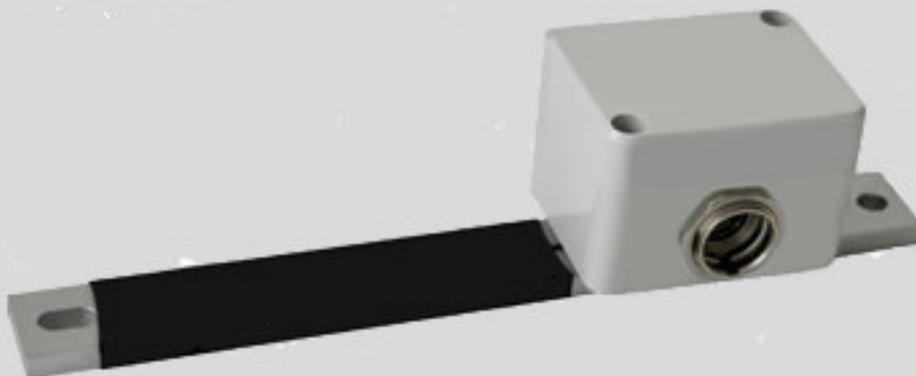
- Strain measurements on bridges

Technical data

Power supply	5 VDC
Operation temp.	-30 ... +30 °C
Dimensions	220 x 50 x 51 mm
Pins	4-wire opt. 5-wire
Casing protection	IP66
Power Consumption	typ. 0,1 W

Assembly

Impact dowels at concrete bridges, neodym magnets on steel bridges.





The iBWIM ring sensor is a strain gauge based sensor developed by PSP GmbH.

It uses four strain gauges equal plottet on a steel ring in full bridge circuit, which makes it even more precise than the iBWIM standard sensor.

The assembly with neodym magnets is proved.

The body made of stainless steel guarantees a high stability.

The temperature dependence is compensated continuously by iBWIM SpiderServer software.

Ring sensors are available as 4 wire, as well as 5 wire model which increases the signal accuracy.

Typical application fields

- Strain measurements on steel bridges

Technical data

Power supply	5 VDC
Operation temp.	-30 ... +80 °C
Dimensions	220 x 50 x 51 mm
Pins	4-wire opt. 5-wire
Casing protection	IP66
Power consumption	typ. 0,1 W

Assembly

Impact dowels at concrete bridges, neodym magnets at steel bridges.

