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OIML Member State	**OIML Certificate No.**
Czech Republic	R134/2006-A-CZ1-25.02

OIML CERTIFICATE ISSUED UNDER SCHEME A

OIML Issuing Authority

Name: **Czech Metrology Institute**
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Czech Republic

Person responsible: Jan Kalandra

Applicant

Name: **CESTEL d.o.o**
Address: Špruha 32
1236 Trzin
Slovenija

Manufacturer

Name: **CESTEL d.o.o**
Address: Špruha 32
1236 Trzin
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Identification of the certified type *(the detailed characteristics will be defined in the additional pages)*

Automatic instrument for weighing road vehicles in motion and measuring axle loads type SiWIM

Designation of the module *(if applicable)*

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This OIML Certificate attests the conformity of the above identified type (represented by the sample(s) identified in the OIML type evaluation report) with the requirements of the following Recommendation of the International Organization of Legal Metrology (OIML):

OIML R 134 **Edition (year): 2006**

Český metrologický institut
-3-

This OIML Certificate relates only to metrological and technical characteristics of the type of measuring instrument covered by the relevant OIML Recommendation identified above.

This OIML Certificate does not bestow any form of legal international approval.

The conformity was established by the results of tests and examinations provided in the associated reports:

Test report No. 6012-PT-R0019-25 dated 5.8.2025 that includes 38 pages.
Test report No. 6012-PT-R0020-25 dated 5.8.2025 that includes 20 pages.
Test report No. 6012-PT-R0021-25 dated 7.8.2025 that includes 44 pages.
Test report No. 8551-PT-E0156-24 dated 30.10.2024 that includes 1+45 (Test report + annex) pages.
Test report No. 6011-PT-SW022-25 dated 6.8.2025 that includes 3+3 (Test report + annex) pages.

OIML type evaluation report 0511-ER-W143-23 dated 26.8.2025 that includes 6 pages.

The technical documentation relating to the identified type is contained in documentation file:

0511-UL-W143-23

OIML Certificate History

Revision No.	Date	Description of the modification
-	27 August 2025	Issuing of certificate

The OIML Issuing Authority
RNDr. Pavel Klenovský
Director of Certification Body

Date: 27 August 2025

Important note: Apart from the mention of the Certificate's reference number and the name of the OIML Member State in which the Certificate is issued, partial quotation of the Certificate and of the associated OIML type evaluation report(s) is not permitted, although either may be reproduced in full.

1 INSTRUMENT NAME AND DESCRIPTION

SiWIM is a weighing instrument designed for determining the weight of axles and the total weight (gross vehicle weight) of road vehicles. The system uses bridge as a weighing receptor.

1.1 Weighing instrument sensors

Strain transducer ST-504 is a mechanical device that measures strains (relative change of length or $\Delta L/L$), which are proportional to the bending moments used in the bridge WIM algorithm for calculating weights. Each strain transducer is equipped with 4 strain gauges in a full Wheatstone configuration.

2 MAIN METROLOGICAL CHARACTERISTICS

Accuracy class for Vehicle mass	10
Accuracy class for Axle load and Axle group load	F
Max_{GVW}	1.500,0 t
Min_{GVW}	3,5 t
Max_{axle}	50,0 t
Min_{axle}	1,0 t
Maximum number of axles A_{max}	50
Scale interval d	100 kg
Operating speed range	30 km/h – 100 km/h
Temperature range	-10°C - +40°C

Table 1: SiWIM metrological characteristics

The weighing range for *the total vehicle weight* (Gross vehicle weight - GVW) is determined as the product of the weighing range of one axle and the maximum number of weighable axles (A_{max}).

$$Max_{GVW} = Max_{axle} * A_{max}$$

3 WEIGHING INSTRUMENT DESIGN

3.1 Mechanical design of the load receptor

ST-504 sensor is full Wheatstone bridge of strain gauges, which have precision-machined steel housing with four strain gauges in the full Wheatstone bridge configuration.

3.2 Electronics

The SiWIM system electronics are designed to amplify, digitize, and interpret strain data caused by vehicle loads and convert it into real-time axle weights and traffic records.

Main components of the SiWIM electronics system are:

- Strain Gauge Signal Conditioning Unit
- Data Acquisition Unit
- Processing Unit
- Power supply
- Ethernet switch

3.3 Principle of operation

The SiWIM system turns an existing bridge into a weighing scale, using strain gauge sensors to measure how much the bridge deflects when a vehicle crosses it. This physical response is then used to calculate the weight of each axle, and thus the total vehicle weight.

Sensors are installed on the soffit (underside) of the bridge girders or slabs and aligned longitudinally (in the direction of traffic). When a vehicle passes over the bridge, the bridge flexes slightly under its weight — this flexing causes strain in the bridge structure. System is measuring strain to calculate axle loads and then summing axles into gross vehicle weight (GVW). The strain data is amplified, filtered, and digitized using signal conditioning electronics. The SiWIM processing unit combines strain data, axle timestamps, vehicle speed and lane position to perform calculations in real-time to output axle weights, axle spacing, total weight, vehicle classification, overload status and others.

3.4 Wired or wireless communication

SiWIM system is connected to the external control computer either via Ethernet cable or Wi-Fi connection.

3.5 Controlled weighing area (bridge description)

Bridge Weigh-in-Motion (B-WIM) systems work best on bridges that exhibit predictable, linear elastic behaviour under moving loads. The ideal construction types allow for accurate strain measurement with minimal noise from vibrations or non-uniform structural responses.

4 SOFTWARE

The legally relevant software of the scales and its security meet the requirements of the WELMEC 7.2:2023 software guide.

4.1 Power supply

Power supply unit provides power (+12V DC) for all the components of the system's electronics and also excitation voltage for the sensors (±5V DC).

4.2 Interfaces and optional peripheral devices

The SiWIM system offers a range of interfaces to ensure reliable communication, integration with other systems, and remote accessibility. While Ethernet is the primary and most common interface for network communication, several other physical and logical interfaces are supported for data acquisition and system control:

- Wi-Fi as an optional way to communicate with the system.
- Analogue ports for ST-504 sensors.
- Digital ports for optional axle detectors.
- USB ports for software protection keys.
- HDMI port for optional connection of the monitor.

5 VERIFICATION AND SECURING OF THE WEIGHING INSTRUMENT

The metrological tests must be carried out according to national applicable regulations.

5.1 Securing components and verification marks

All hardware components are protected with anti-tamper stickers and software is protected with hash calculation. In addition to tamper proof stickers on the chassis of the computer unit and electronics, sensors

itself should be protected from unintentional removal of the sensors, so after fixing the sensors, anti-tamper seal is used on the screws. More in SiWIM Operating Manual.

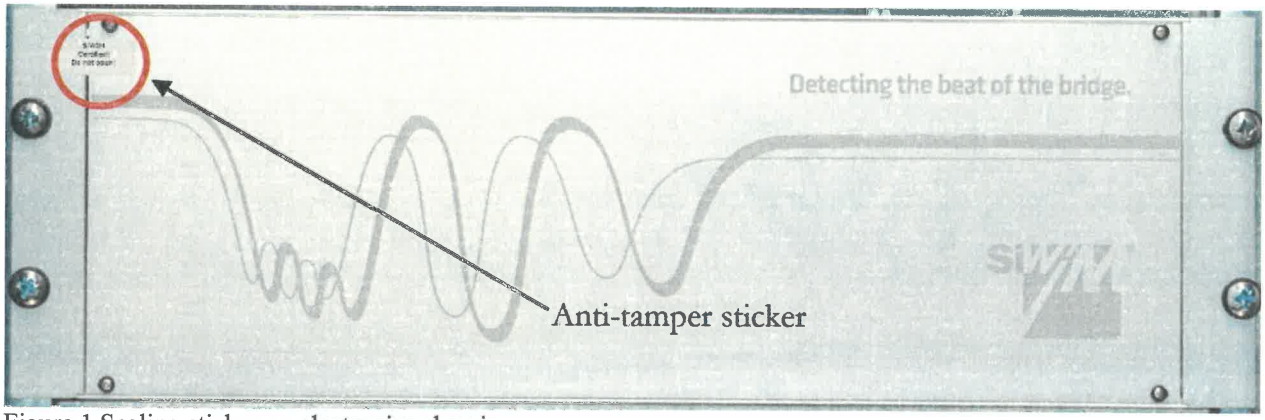

Figure 1 Sealing sticker on electronics chassis

Figure 2 Anti-tamper paint on the sensor

5.1.1 Securing the calibration switch on weighing platforms

During the calibration phase, the system operates in Read & Write mode. Upon successful completion of the measurement site calibration, the system transitions to Read-only mode.

5.1.2 Main instrument label

Manufacturer		Cestel d.o.o., Slovenia
Type designation		SiWIM Mk.IV
Serial number		2503SI040
Maximum transit speed		250 km/h
Direction of weighing		Not applicable
Electrical power supply voltage		220-250 V~ or 12 V⎓
Temperature range		− 10 °C ; + 40 °C
Software version		v6.42.251
Accuracy class vehicle mass		10
Accuracy class single-axle (where applicable):		F
Accuracy class axle-group (where applicable):		F
Maximum capacity:	Max =	1.500,0 t
Minimum capacity:	Min =	3,50 t
Scale interval:	d =	0,1 t
Maximum operating speed:	v_{max} =	100 km/h
Minimum operating speed:	v_{min} =	30 km/h
Maximum number of axles per vehicle:	n_{max} =	50
Type approval sign in accordance with national regulations		

Table 2: Main label of the weighing instrument

The main label is secured with a verification mark.