

Certified Axle Scale

Type 9193A

Low Speed Vehicle Weighing System

Axle scale Type 9193A allows certified dynamic weighing of vehicles at low speed.

- Certified measurement (legal for trade)
- Extremely accurate (up to class 0,2 % as per OIML R134)
- Unique technology (vibrating wire)
- Automatic weighing
- Very robust construction
- Compact design, easy to install
- Maintenance-free (no moving parts)
- Can be crossed in either direction
- CE approved

Description

The system consists of a beam scale system with vibrating wire load cells and a computer that determines the individual axle weights and the gross vehicle weight. A portable control unit is used for measurement data visualization and entry of settings. The system can also be enhanced with traffic lights to control weighing, a large digital display and a vehicle identification system.

Technical Data

System

Accuracy class (as per OIML R134)	%	0,2
Measuring range (axle load)	tons	0 ... 25
Measuring range (OIML certified)*	tons	0 ... 12
Overload capacity	tons	30
Threshold	kg	100
Display increment	kg	10
Operating temperature range	°C	-30 ... 60
Speed range	km/h	0 ... 10
Speed range (OIML certified)*	km/h	1 ... 4
CE conformity	EMC tested as per EN61326-1	

Load Cells

Measuring range	kg	0 ... 10 000
Overload capacity	kg	20 000
Linearity	%	0,01
Hysteresis	%	0,01
Operating temperature range	°C	-30 ... 70
Temperature coefficient of sensitivity	%/°C	0,001



Rigidity	kN/μm	0,5
Dimensions	mm	230x150x87
Cable length	m	10
Degree of protection (EN60529)		IP68

Computer Unit

Power supply	VDC	10 ... 48 6 W at 24 VDC
Temperature range	°C	-25 ... 70
Sensor inputs		8
Digital inputs (electrically isolated)		4
Digital outputs (electrically isolated)		4
Interface for communication, data and firmware updates		RS-232C/422/485
Dimensions (LxWxH)	mm	280x200x95
Weight	kg	2,8
Degree of protection (EN60529)		IP68

Control Unit

Supply voltage (via computer)	VDC	8 ... 25 (2W)
Temperature range	°C	-10 ... 70
Interface	with computer	RS-485
	with printer	RS-232C
Dimensions (LxWxH)	mm	201x155x56
Weight	kg	1,6
Degree of protection (EN60529)		IP35

* Ranges are restricted for trade and enforcement applications, according to the OIML certification

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This information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes. Liability for consequential damage resulting from the use of Kistler products is excluded.

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Application

The axle scale which is embedded in the road surface measures vehicle weights at walking speed. By contrast with the conventional static weighbridge, which only records the gross weight of the vehicle, the low speed WIM system determines the axle weights, which are added together to give the gross weight. The computer unit automatically detects whether the vehicle has crossed the scale correctly.

The axle scale is ideal for use where:

- Certified measurement is required (legal for trade)
- Both gross weight and axle weights have to be determined
- Installation space and weighing time are limited
- The weighing process is to be automated
- Equipment and maintenance costs have to be reduced (in comparison with a conventional static weighbridge)

Typical customers for such applications include:

- Police and customs
- Carriers and logistics companies
- Agriculture and animal foodstuff distributors
- Waste disposal (incinerator and composing facilities)
- Railway and ship loading stations (ports)
- Raw materials companies (quarries, concrete plants, etc.)
- Vehicle body manufacturers (for conformity tests)
- Commercial vehicles

Layout and Measurement

The typical layout of a weighing station is shown in Fig. 1. The vehicle is recognized and registered by the identification system. The WIM system is started and the traffic light is turned green. The vehicle must cross the scale at a constant walking speed. Track detection sensors give a signal if the vehicle is not crossing correctly. When the scale system has been crossed the gross weight is shown both on the control unit and the large display. The data can be transmitted to a computer for further processing. After a customer-defined delay, the next vehicle can cross the axle scale (traffic light turns from red to green).

If the vehicle with the same identification crosses the system again within a certain time, the difference between the two weights (net weight) is calculated, displayed and saved. This enables the determination of the weight of the increase or decrease in load. The fact that the vehicle can cross the scale in both directions is an advantage.

The scale can also be operated without traffic lights and identification system.

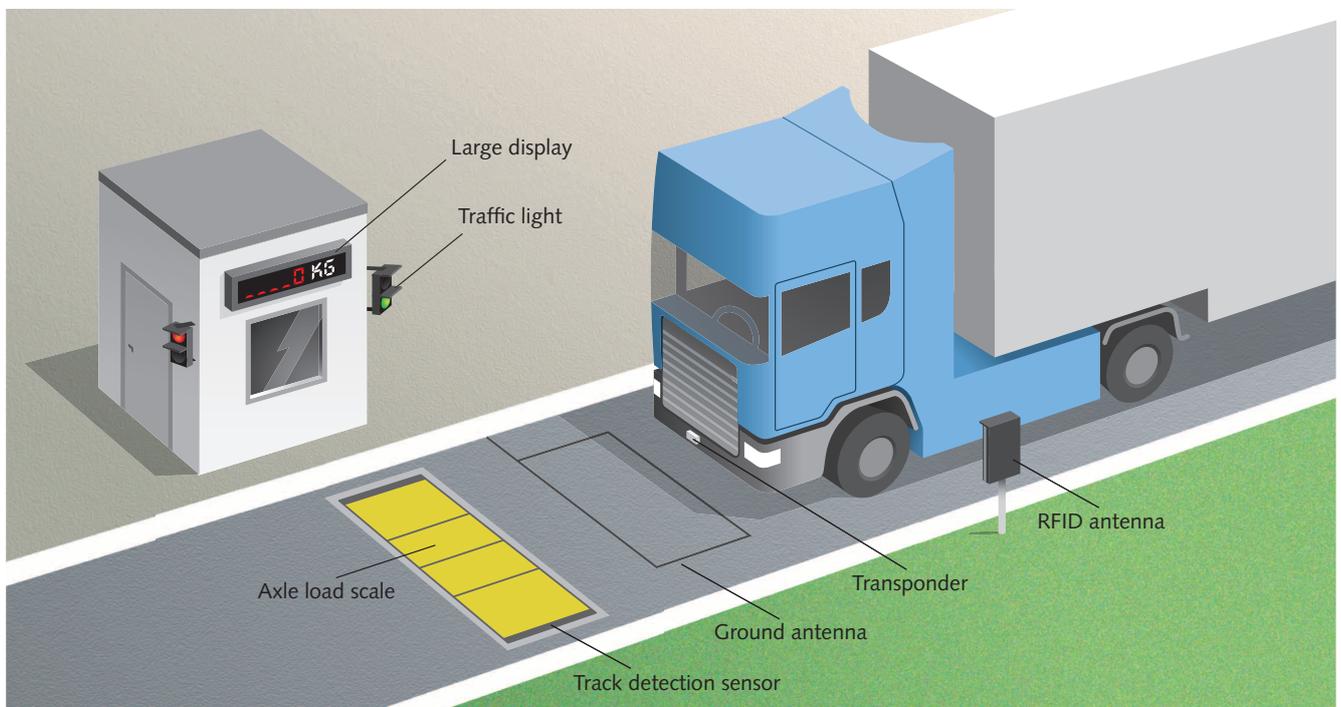


Fig. 1: Layout of a weighing station

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Product Details

The main components of the system are axle scale, computer unit and control unit. The system can be enhanced with the following options:

- Track and direction detection system
- Small printer
- Large display
- Switch cabinet with relay box for identification system, traffic lights and heating
- Traffic lights for controlling the weighing process
- Identification system with antenna and transponder
- Built-in heating system for frost protection

The accessories provided by Kistler do not include a computer for further processing the data (customized visualization and storage of data, printing of invoices and reports, etc.).

Fig. 2 shows the block diagram of the system. The individual components are explained below.

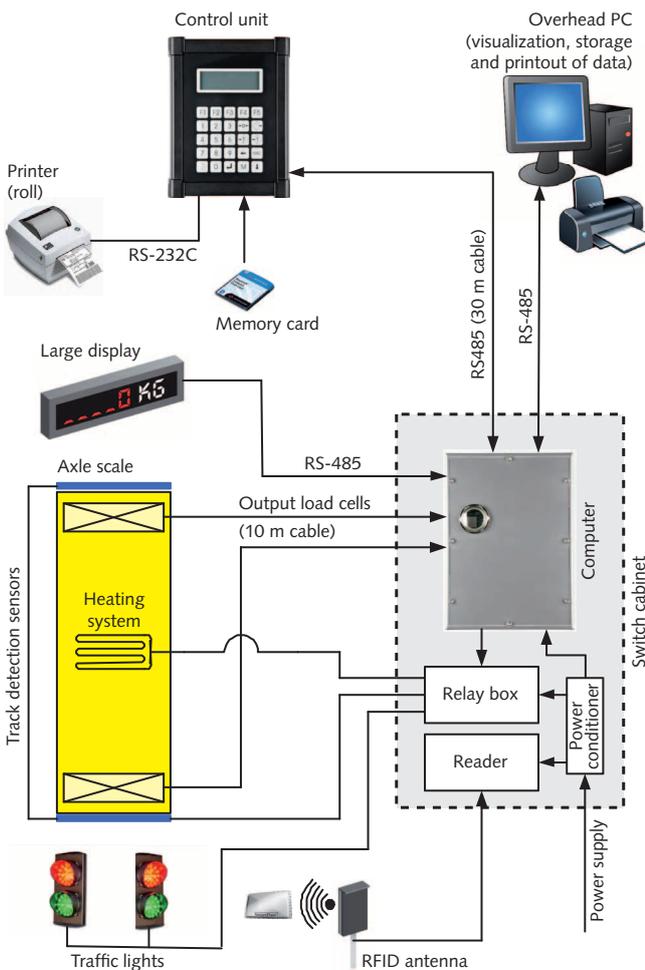


Fig. 2: Block diagram of system

Axle Scale

The axle scale consists of a bridge with two integrated load cells and a cover plate (Fig. 3) plus mounting frame (Fig. 4). The scale is supplied in a monoblock form that only requires positioning and securing on the mounting frame. The mounting frame has to be installed into the concrete beforehand. The dimensions of this pit and installation details are described on page 6.

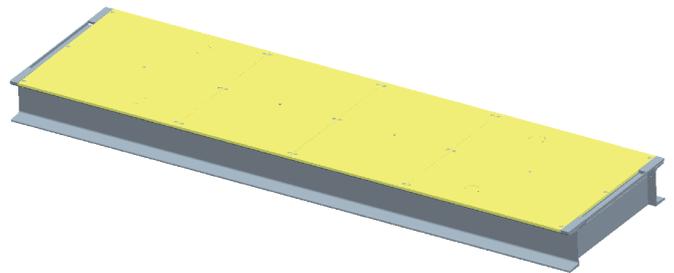


Fig. 3: Axle scale – External dimensions (LxWxH) = 2900x800x250 mm, weight = 620 kg

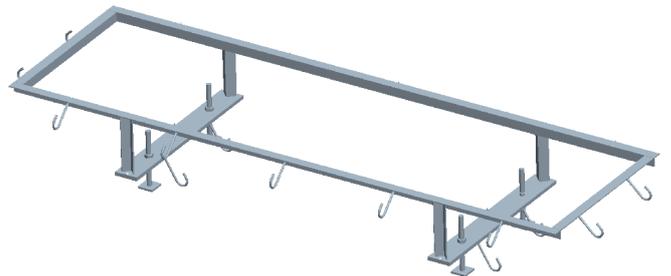


Fig. 4: Mounting frame – External dimensions (including anchors) (LxWxH) = 3240x1150x475 mm, weight = 80 kg

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Load Cells

The two load cells of the axle scale are high-strength steel force sensors based on vibrating wire technology. In these sensors the force to be measured is reduced and transferred to a vibrating wire. The wire made of a high-grade tungsten alloy is tensioned by means of four quartz pins. The resonant frequency of the wire is altered by the change in tension. The sensor's integral electronics measure the change in this frequency, which is exactly proportional to the force. The patented element therefore produces directly a digital frequency signal that depends on the force applied.

The vibrating wire system gives these sensors unique characteristics:

- High sensitivity (100 times more sensitive than strain gage)
- Outstanding accuracy and stability
- No thermal drift
- Excellent long-term stability (no material fatigue)
- Very high rigidity (deflection-free measurement)
- Interference immunity
- Zero point stability

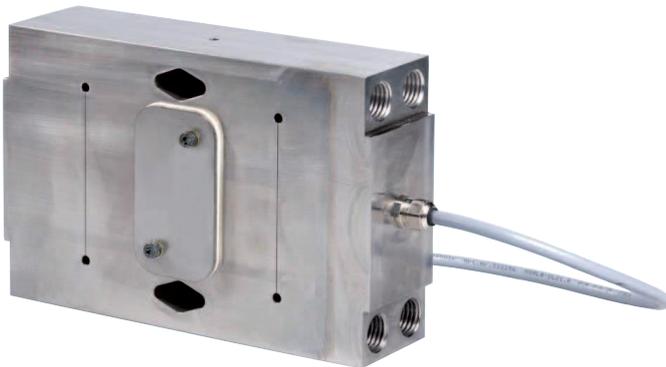


Fig. 5: Load cell with vibrating wire technology

Features of Load Cells

- Certified, according to OIML R60
- Robust, industrial design (IP68)
- Integrated memory with calibration data
- Cable length 10 m

Computer Unit

The unit evaluates and processes the cell signals in real time using complex algorithms. The axle loads and the gross weight are determined while vehicles are crossing the scale. The algorithm specially developed for dynamic measurement of vehicles is capable of independently detecting errors (due to factors such as excessive speed, vehicle vibrations, etc) and declaring the measurement to be "valid" or "invalid" accordingly.

The digital inputs and outputs are also used to handle complex open- and closed-loop control functions. These allow, for example, control of traffic lights, identification systems and track detection sensors.

The calibration data stored in the measuring cells, which is automatically loaded onto the computer, allows cells to be replaced without recalibration.

The robust construction and sealed stainless steel housing allow outdoor use. The computer unit can be mounted directly in the pit of the scale. To ensure ease of access it is advisable, however, to mount it in a cabinet alongside the axle scale.

The computer unit provides the following data:

- Axle loads
- Gross vehicle weight
- Date and time
- Customer address
- Vehicle identification number

Via the serial interfaces the data can be passed on to a master computer system (not included) for further processing (visualization, storage and printing of reports) as specified by the user.



Fig. 6: Computer unit

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Features of Computer Unit

- Sealed stainless steel housing
- Comprehensive self-test functions
- Suitable for dynamic measurements (250 real-time measurements/s)
- Serial interfaces for communication, data and firmware updates
- Digital inputs and outputs (electrically isolated)
- EMC tested
- Certified according to OIML

Control Unit

The control unit with display, keypad and data memory serves as a remote control for the computer and is usually positioned next to the user. Its display shows operating status and measurements (axle loads and gross weights). The keypad is used to enter data and provides full access to the computer's user menu. Data records are saved on a portable memory card (CF) and can be further processed on a PC. LEDs indicate the status of weighing (successful or error), communication and memory card.

A small printer with paper roll can be connected to the control unit for printing out the measurement data.

Features of Control Unit

- Compact and robust aluminum case
- Industrial membrane keypad
- Backlit LCD display (4 lines of 20 characters)
- Non-reflective display screen for ease of legibility
- 2 GB CF memory card
- Interface for connecting a small printer
- Four status and warning LEDs
- EMC tested
- OIML approved for certified measuring systems
- Standard length of cable for connecting to computer 30 m (up to 1 000 m possible)



Bild 7: Control unit

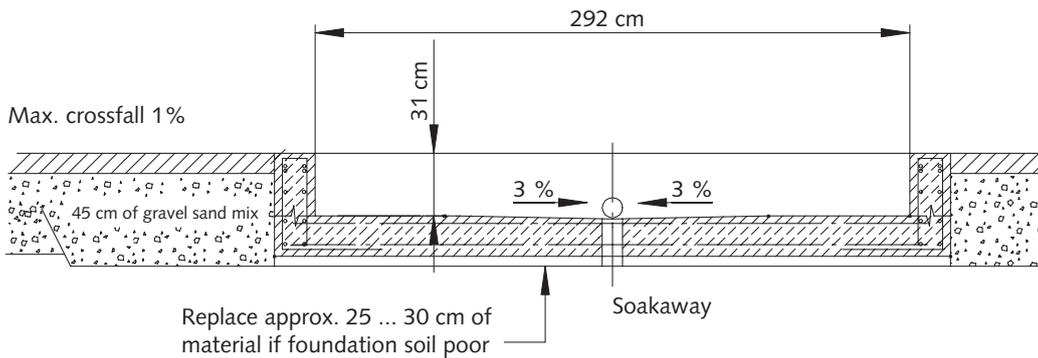
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Installation

The scale is mounted in a drained pit with the dimensions shown in Fig. 8. A flat approach surface without any corrugations, raised sections or steps must be formed over at least six meters before and after the measuring pad. Good quality construction is an important prerequisite for accurate weighing of vehicles and must be carried out as shown on the separate drawings provided.

The frame must be installed into the concrete in the course of construction. The scale is then lowered onto this frame in one piece, for example with the aid of a fork-lift truck, and secured with four bolts. These bolts allow accurate height adjustment.

Installation Site – Front View



Installation Site – Side View

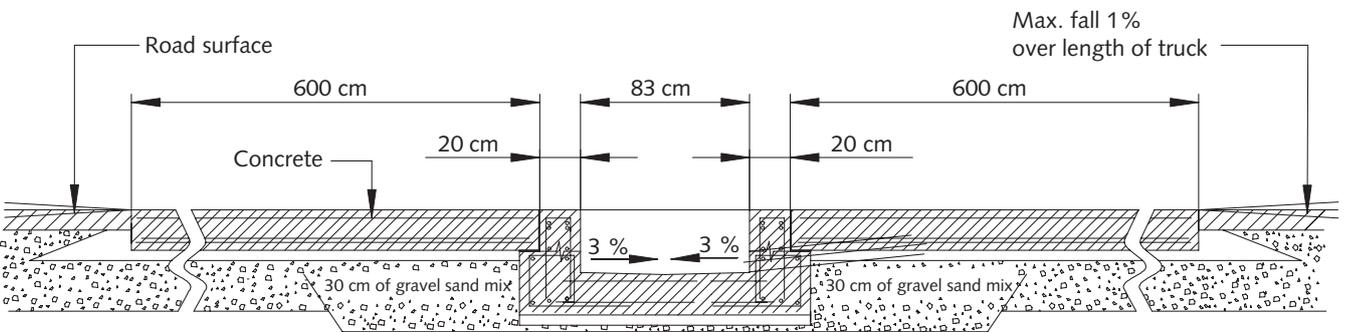


Fig. 8: Construction of pit for axle scale installation

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Included Accessories

- 2 load cells, 1 computer unit, 1 control unit, 1 power supply, 2 cables (10 m) from load cells to computer unit, 1 connecting cable (30 m) from computer unit to control unit, steel components (bridge, cover and mounting frame)

Type/Art. No.

9193A

Identification system with ground antenna and transponder

- Reader 5765A202
- Antenna for ground installation (loop 2 000x600 mm) 5765A203
- Transponder (122x50x70 mm) with holder for mounting on vehicle 5765A204

Optional Accessories

- Track and direction detection system
2 track detection sensors for mounting on the side of the scale and 1 direction detection sensor with mounting rail for installation in the surface before the scale
- Printer
Small printer with paper roll (8 cm) and power supply, for connecting to the control unit
- Large digital display
5-digit LED display (red), character height = 100 mm, marked "kg", IP65
- Cabinet
Switch cabinet with power supply unit and relay box, for controlling the traffic lights, the identification system and the built-in heating system
- Traffic lights for controlling the operating sequence
1 traffic light, with 2 lights (red/green), with arms for wall mounting

Type/Art. No.

5765A100

Identification system with antenna and ID cards

- Reader 5765A202
- Antenna, 200x200 mm, for mounting on side of road 5765A205
- Identification cards (86x54x1,5 mm) 5765A206

5765A101

Built-in heating system
Two heating elements for mounting in the scale as frost protection

5765A207

- Heating relay box 5765A208
Relay box for controlling the built-in heating system. Only required if cabinet (Type 5765A200) not present

5765A102

5765A200

Ordering Code

- Certified axle scale – low speed vehicle weighing system

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