HAENNI

Wheel Load Scales WL 101

Operating Instructions

Contents

1. Technical details

Range		0...10 000 kg
Scale division		50 kg
Accuracy		OIML No. 76, Class 4
Acceptance tolerance		± 25kg (0-2500kg)
		± 50kg (2500-10000kg)
Maintenance tolerance		± 50kg (0-2500kg)
		± 100kg (2500-10000kg)
Temperature range		-20°C...+60°C
Dimensions	height of platform	17mm
	length of platform	724mm
	width of platform	393mm
Active weighing surface	length	660mm
	width	380mm
Maximum permissible load per area		12kg/cm^2
Weight		16 kg
Construction		Aluminium, watertight IP 65

2. Construction and Function

The Wheel Load Scale Type WL 101 is a portable flat weigher which is specially designed for the fast determination of the wheel load, the axle load and, as well the total weight of vehicles.

It consists of a platform for the weight registration and of a laterally fixed indicator. This platform contains a grating of measuring tubes which are connected mutually and with the indicator. They are filled with a non freezing liquid and are hermetically sealed. The grating is fixed between two metal plates.

The liquid displaced from the elastic measuring tubes produces a deflection proportional to the total load in the bellow of the indicator. As a consequence the indicator can be directly scaled in units of weight.

To eliminate the effect of the thermal expansion of the liquid, a second hydraulic system is installed with exactly the same volume. It acts on a second bellow. A system of levers subtracts the temperature related deflections of the two bellows from each other, thus making the reading independent of the temperature changes.

The changes of the sensitivity of the measuring tubes are compensated by a temperature dependent transmission ratio, employing a bimetallic element in the indicator mechanism.

3. Operating instructions

3.1 Requirements for weighing site selection

3.1.1 The weighing site must be even. For determinations of total weight, the maximum gradient in any direction may not exceed 5%. For axle load determinations the site must be horizontal in the lengthwise direction, while a maximum gradient of 5% is permissible in the crosswise direction. For wheel load determinations the site must be horizontal in all directions.

3.1.2 The base of the scale must be evenly supported by the road surface. Hard surfaces with protruding stones and roads with ruts are unsuitable. The space between the base of the scale and the road surface may not exceed 10 mm at any location.

3.2 Zero Adjustment

The zero adjustment must be checked before every weighing. Whenever the pointer is not exactly on zero position an equivalent correction has to be made with the knurled screw at the border of the indicator.

3.3 Process of weighing

3.3.1 General directions

⚠ Warning: When weighing a driving axle the scale may be catapulted by the wheel due to too rapid operation of the clutch!
The scale should be placed directly in front of the wheel to be weighed in accordance with the site selection instructions in section 3.1. Slowly move the vehicle with the wheels straight forward, so that the tire rests completely within the marked active weighing area of the scale. A possibly used levelling mat or additional scales must be treated analogous. After stopping the vehicle the proper position of the wheels must be checked.

3.3.2 Measurement of the wheel load

The wheel to be weighed must be driven correctly onto the scale. The overall height of the scale of 17 mm may cause a falsification of the result depending on the type of vehicle and the character of the load (see paragraph 4.1.6 and Appendix). This error can be avoided by using levelling mats (or any type of backings of 17 mm) or additional scales for the other wheels or by placing the scales into a recess in the pavement of 17 mm.

3.3.3 **Measurement of the axle load**

3.3.3.1 Measurement of the axle load with one scale:
The axle load of a vehicle can be determined by doing the process of weighing once each wheel according to paragraph 3.3.2. The axle load is the sum of the two wheel loads.

3.3.3.2 Measurement of the axle load with two scales:
The wheels of the axle which are to be measured must be driven against two correctly mounted scales at the same time. The axle load is the sum of the two wheel loads. The overall height of the scale of 17 mm may cause a falsification of the result depending on the type of vehicle and the character of the load (see paragraph 4.1.6 and Appendix). This error can be avoided by using levelling mats (or any type of backings of 17 mm) or additional scales for the other wheels or by placing the scales into a recess in the pavement of 17 mm.

3.3.3.3 Measurement of the axle load of double or triple axle systems:
The measurement must be made analogous to paragraph 3.3.3.2 at which the non-weighed wheels of the multiple-axle system must be underlayed with levelling mats.

3.3.4 **Measurement of hard-rubber and metal wheels and supports of two-wheel trailers**
A intermediate plate must be put between the scale and the wheel or the support, to ensure that the load per area does not exceed the permissible value according to the specification.

4. Sources of Errors

4.1 Wrong application and operation.

4.1.1 The weighing site is not clean or uneven. The scale sags too much.

4.1.2 The gradient of the weighing site is too big. The weight does not lie right-angledly on the scale. The result is an underregistration.

4.1.3 The zero position of the scale is not correct.

4.1.4 The wheel is not completely within the marked active weighing area. The result is an underregistration.

4.1.5 The surface pressure is too high, when measuring a hard rubber wheel. The result is an underregistration.

4.1.6 The non-weighed wheels are not or not correctly underlayed. The result is an overregistration depending on the construction of the vehicle. Both wheels of an axle and all wheels of an axle group must be on the same level while weighing. If the spacing between an axle group and the adjacent axle or axle group is less than 3 m, then all axles of the vehicle must be on the same level.
In the case of weighing a tank truck, the liquid load flows away from the lifted axle. The result is an underregistration.

4.2 Static friction in the suspension of the vehicle. A small weighing error may arise because of the static friction especially when weighing multiple-axle systems.

4.3 The scale is defective.
Check the scale according to paragraph 5 when correct functioning is uncertain

5. Test Instructions

5.1 **Test measurement in use**

5.1.1 Swapping the scales:
The approximate precision of the scale can be determined by weighing a single axle with two scales. After the first measurement is made, swap the scales left to right and repeat the process. The individual wheel as well as axle weights should agree from the first to the second measurement.
The instructions in chapter 3 must be followed strictly.

5.1.2 Testing on a platform scale:
Place the wheel load scale to be tested onto a verified platform scale. Prior to testing both the wheel load scale and the platform scale must be zeroed. Load both scales with identical load by placing one wheel only of a truck on the wheel load scale. All other wheels of the vehicle must be located outside of the platform of the weigh bridge. The error of the wheel load scale is its indication minus the indication of the platform scale. Different loads may be applied by repeating the test with other wheels and by using different vehicles and different loading conditions.

5.2 Test measurement on the test bench

An exact check of the specified tolerance is only possible on the test equipment. The way of control must strictly be followed. The following conditions must be fulfilled:

The weight force must act equally distributed on the active area of the platform, without exceeding the maximum admissible loading per area specified.

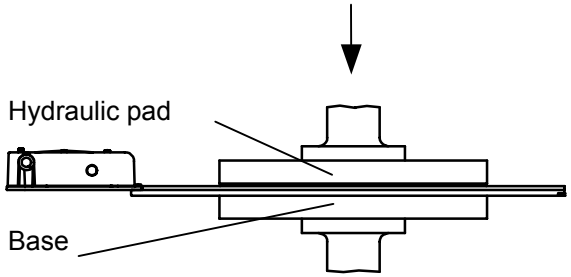
The base (HAENNI W12509) is a 40 mm plain steel plate.

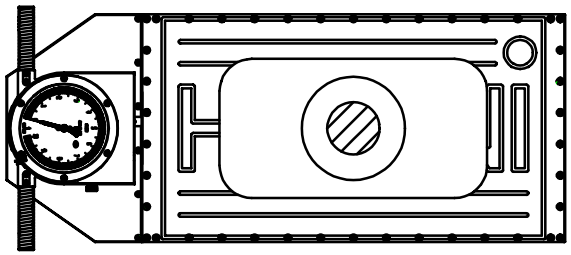
The force plate HAENNI W 12497 is specially designed to fulfil all above listed specifications.

We do not recommend any other test equipment as e.g. the use of a rubber intermediate layer as it exists the danger of a local overload. The consequence would be a underregistration in the upper indicating range.

With a correct zero adjustment the scale must keep the specified tolerance OIML No. 76, class. 4.

For more detailed information ask for specification P 1133.



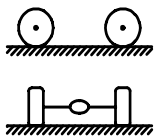
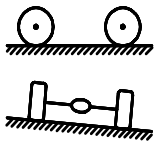
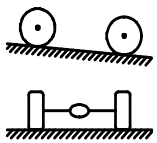
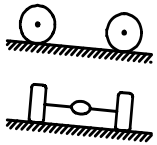
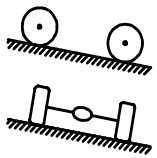


Appendix

How to weigh correctly with the Wheel Load Scale Type WL 101

A Error sources at the weighing site

A1 Weighing site gradient

Gradient \ Weighing		Total weight	Axle weight	Wheel weight
	longitudinal 0% transversal 0%	unaffected	unaffected	unaffected
	longitudinal 0% transversal 5%	unaffected	unaffected	affected 1)2)
	longitudinal 5% transversal 0%	unaffected	affected 1)3)	affected 1)3)
	Total 5%	unaffected	affected 1)4)	affected 1)5)
	Total >5%	affected 6)	affected 6)	affected 6)

1) The load of the axle and wheels in the lower position is greater than that in the horizontal position, that of the higher axle or wheels correspondingly less. Even though the scale is working perfectly, this will result in weighing errors that may range from small to large depending on the type of vehicle. In the case of vehicles carrying liquid payloads, the error is compounded by shifting of the load onto lower-lying axle or wheels.

2) When an unfavourable vehicle [7)] is being checked, the reading error is -/+7 % in the case of the more heavily loaded wheel of an axle (closer to centre of gravity) and +/-9 % for the axle's less heavily loaded wheel. (First sign: centre of gravity shifted towards the higher wheel; second sign: towards the lower wheel.)

3) When an unfavourable vehicle [7)] is being checked, the reading error is +/-4.3 % for the rear axle or wheels and, -/+12.5 % for the front axle or wheels. (First sign: upgrade; second sign: downgrade.)

4) As descried in 3) for axle loads.

5) The reading errors described in 2) and 3) for wheel load are cumulative.

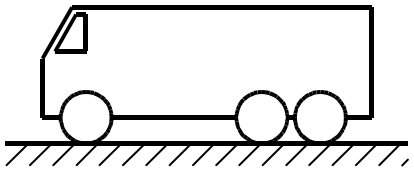
6) In the case of gradients steeper than 5 %: same is true as for 5 %, but the differences become proportionally greater. Furthermore, the total weight indicated will be perceptibly smaller (more than -0.12 %), because the scale registers only the weight component perpendicular to the platform. If the 5 % limit is badly exceeded, the scale may malfunction as well.

7) Assumption: The vehicle being checked has a wheel base of 4 m, an average track width of 1.6 m and its centre of gravity 1 m ahead of the rear axle, 0.2 m off the lengthwise centreline and 2.5 m above the road surface. The % errors stated are in relation to the respective axle and wheel loads. For gradients less than 5 % the errors are proportionally smaller.

A2 **Uneven place of weighing**

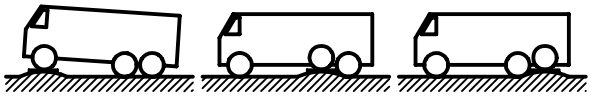
Even place of weighing

Correct weighing



Crown

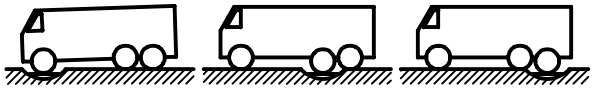
Incorrect weighing



The indicated total weight is higher than on a flat surface.

Hollow

Incorrect weighing



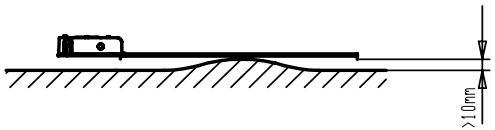
The indicated total weight is lower than on a flat surface.

Even place of weighing

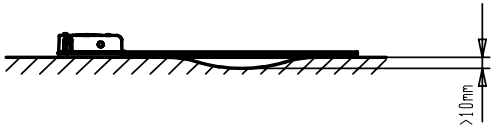
Correct weighing

The scale is correctly placed. The clearance between the scale and the ground is not more than 10 mm.

Uneven place of weighing



Incorrect weighing

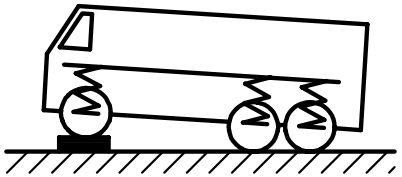


The clearance between the scale and the ground is more than 10 mm. The scale is deformed too much

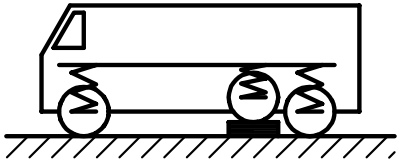
B Sources of errors through the suspension of the vehicles

B1 Influence of the suspension on the weighing

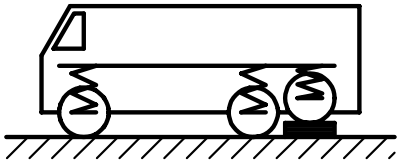
Front axle
correctly weighed



incorrect:
the indication is too high



incorrect:
the indication is too high



Result: total weight too high.

The error can be avoided if both rear axles are weighed at the same time with two additional scales or if the axle not being weighed, is supported with a dummy with the same thickness as the scale.

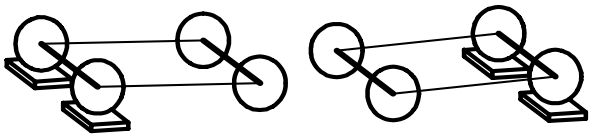
B2 Examples

B2.1 General

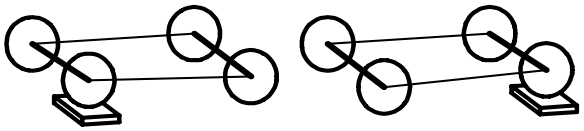
The rectangular plates under the wheels represent the wheel load scale type WL 103 respectively the levellers of 17 mm thickness. Aside from exceptional cases always two or more scales should be used. The required number of scales and backings can be seen from the maximum plates per sketch (e.g. vehicle with three axles, see B 2.3.1.: at least four scales and levellers.

B2.2 **Vehicles with 2 axles**

Correct weighing

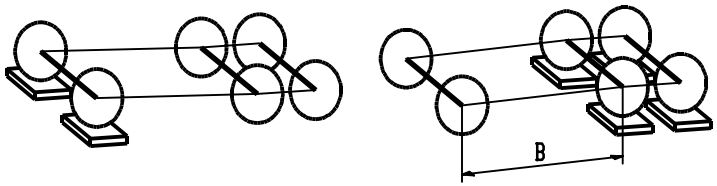


Incorrect weighing

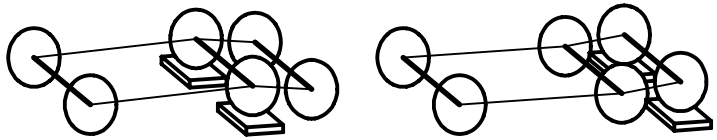


B2.3. **Vehicles with 3 axles**

B2.3.1 **Vehicles with long wheel base**
(B greater than 3 m)



Correct weighing

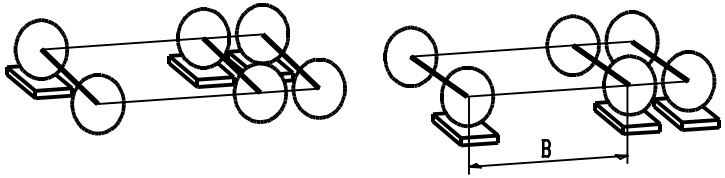


Incorrect weighing

The indicated weight too high.

B2.3.2 **Vehicles with short wheel base**
(B smaller than 3 m)

Correct weighing



The indicated weight is approximately 1% too low
The error might be more important when measuring vehicles with liquid payload.

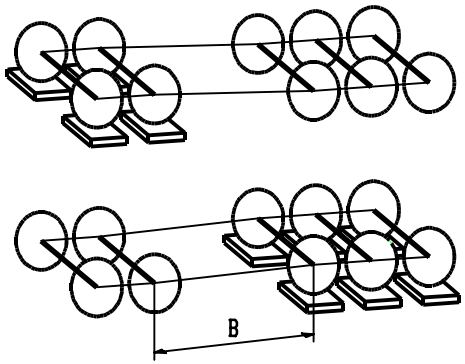
B2.4 **Vehicles with 4 axles**

The same remarks apply as for vehicles with 3 or 5 axles.

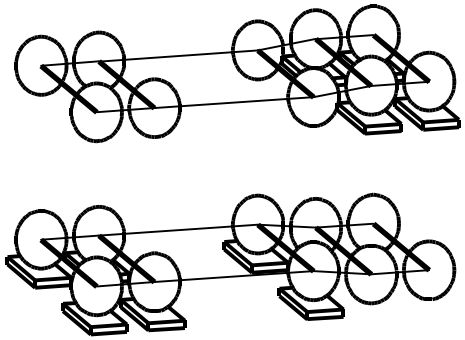
B2.5 Vehicles with 5 axles

B2.5.1 Vehicles with long wheel base
(B greater than 3 m)

Correct weighing



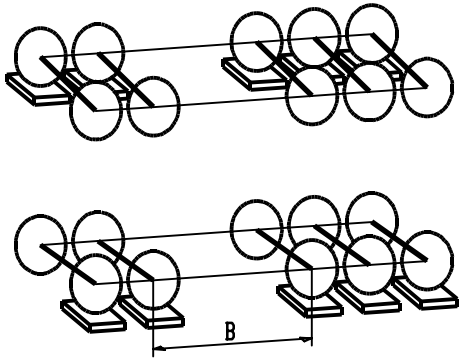
Incorrect weighing



The indicated weight too high.

B2.5.2 Vehicles with small wheel base
(B smaller than 3 m)

Correct weighing



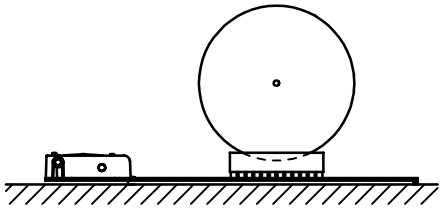
The indicated weight is approximately 1% too low.
The error might be more important when measuring vehicles with liquid payload.

C Errors because of „hard“ wheels

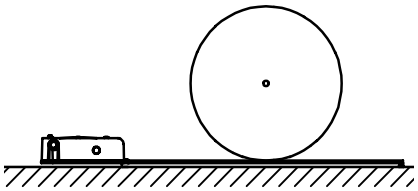
Solid rubber and steel wheels need special precautions. For such wheels the pad D 12590 must be used between the scale and the wheel to ensure that the load per area doesn’t exceed the value specified in chapter 1 „Technical Details“.

Correct weighing

Pad D 12590 with deepening for proper centring of the load.



Incorrect weighing



The indicated weight may be far too low due to local overload.

HAENNI

the portable scale for all type of vehicles with rubber tires

protects against overloading as well as insufficient loading

assures the exact observance of the permissible total weights and axle loads

can always and at any time be used without connections or ramps

can easily be transported and put to use by one person alone

is robust, does not require any maintenance, is practically unaffected by ambient temperature and is accurate

Distributor:

A 8186.3 02.04

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