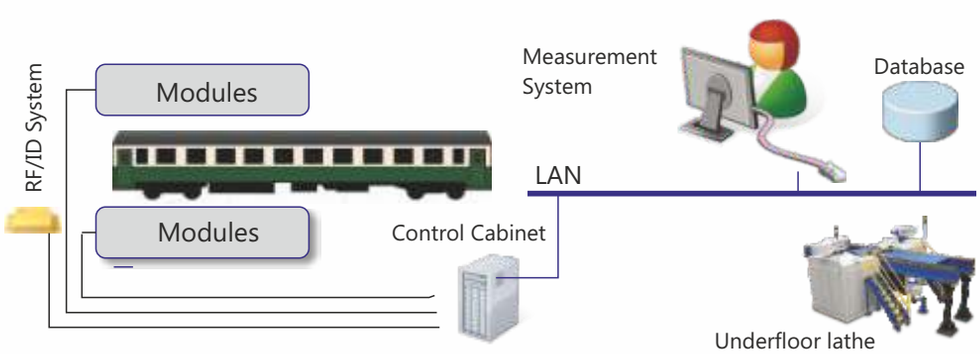
LWMS LASER WHEEL MEASUREMENT SYSTEM

The laser system is designed for depots to perform wheel measurements at a maximum speed of 10 km/h. Wheel geometry parameters are determined based on the reproduced wheel tread profiles. The measured wheel geometry parameters include the entire wheel tread profile, flange height h, flange thicknesses e1, e2, flange angle dimension (slope) qR, wheel diameters d1, d2 and the back-to-back dimension a1. Wheels of the railway or tram vehicles can be measured according to the Customer's requirements.

The measurement system is an entirely autonomous and non-contact one, therefore, it has no parts subject to wear. Solutions are implemented to provide the required climatic conditions to the system elements protecting them from dirt and mechanical damage. The measurement system transfers in real time information about wheel defects and can optionally be provided with a train speed measurement system displaying its speed. Measurement results can be used by an underfloor lathe.

MEASUREMENT SYSTEM SCHEMA

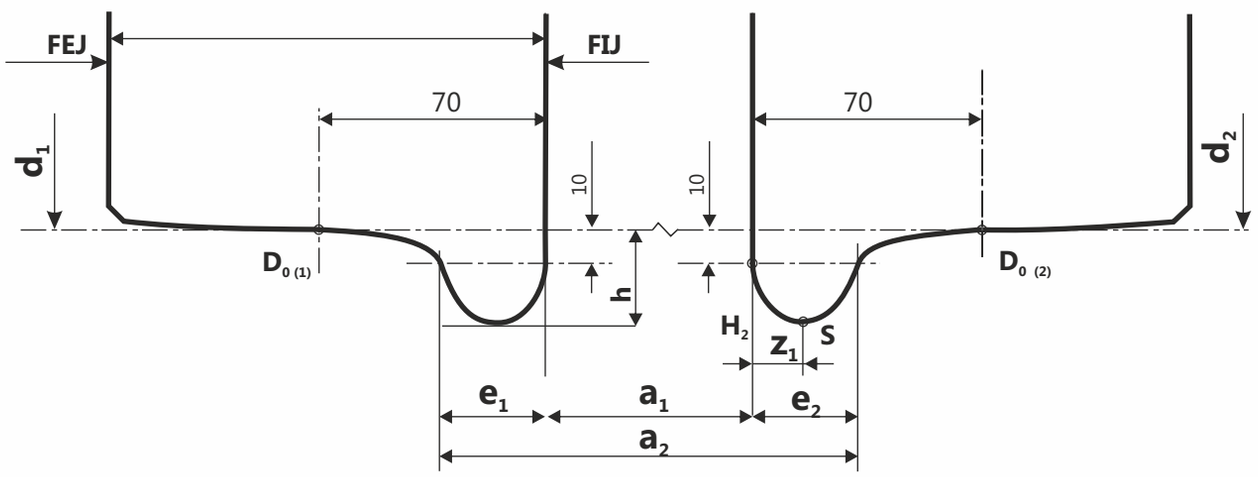


Optionally, identification of the individual cars is possible after mounting of RF/ID tags on them - this way all measurement results can be assigned to individual wheels for further analysis and reporting.

Exemplary dimensions measured by the system

EN 15313:2016 (E)

Dimensions in mm



Key

a_1	back-to back dimension
a_2	front-to-front dimension (a_1 + e_1 + e_2)
D_0	location of the wheel tread, 70 mm from its internal face. (1) wheel 1, (2) wheel 2
e_1, e_2	flange thicknesses
h	flange height
L	rim nominal width
Z1	internal zone of flange (H2 - S)
FEJ	external face of the rim
FIJ	internal face of the rim
S	connection at the tip of the flange
d_1, d_2	wheel diameters

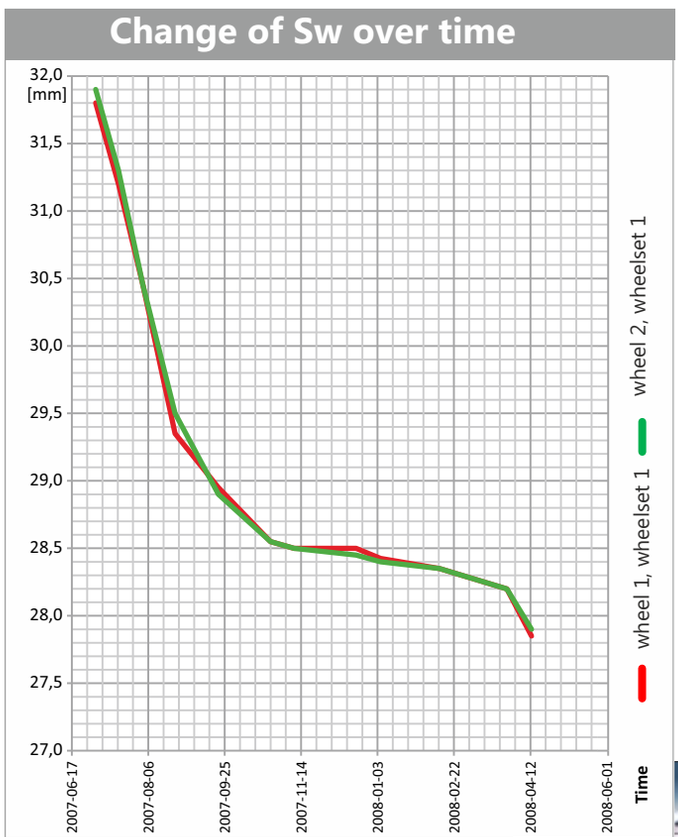
Figure 8 - Interface dimensions - Wheelset functional references

5.2.2 Wheel functional references

The essential dimensional references of the wheel are defined in Figure 9.

Measured values and their accuracy:

Wheel diameter: new/worn out - according to agreement	
Wheel diameter measurement accuracy:	± 0.6 mm
Wheel flange height measurement accuracy:	± 0.2 mm
Wheel rim width measurement accuracy:	± 0.2 mm
Wheel back-to-back dimension measurement accuracy:	± 0.3mm
Wheel tread profile reproduction accuracy:	± 0.2 mm
Flange angle dimension (slope) measurement accuracy:	± 0.3 mm

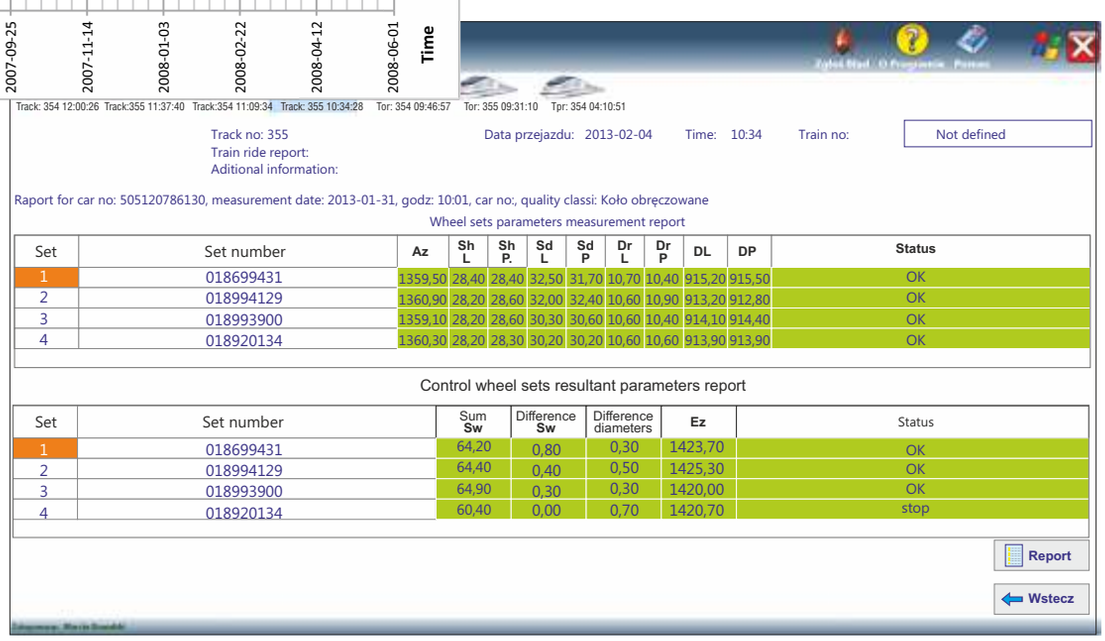


The measurement system provides the entire wheel tread profile, regardless of the wheel position during its measurement, therefore, it has the following advantages:

- all profile defects and types of wear can be seen on the entire cross-section of the wheel tread profile,
- all profile wear parameters are determined in full conformity with their geometric definitions,
- wheel diameter is determined on a required plane in relation to the wheel face surface

Measurement results can be analysed and stored in the database to assess the progress of wheel wear. The system software warns about the exceeding of the permissible wear for the currently measured wheelset. The relevant wheel wear-related analysis takes into consideration the history of each wheel and one can make decision concerning its reprofiling. Measurement results can be transferred directly to the underfloor lathe.

Exemplary user interface window

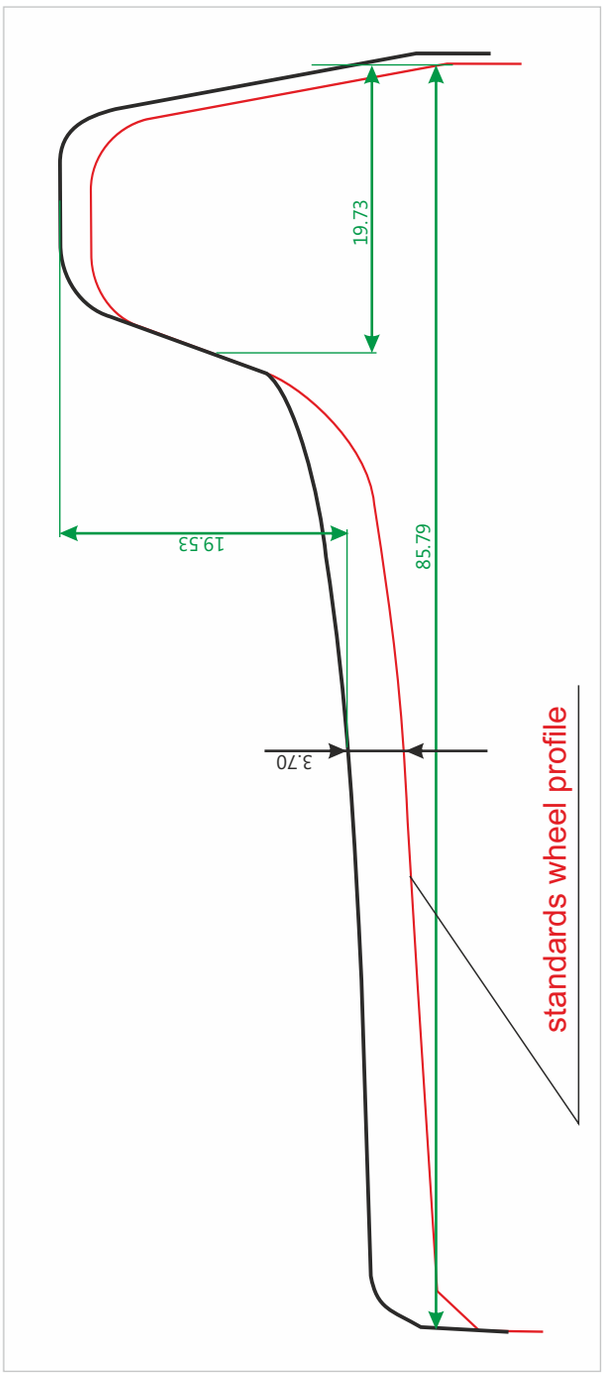


Set	Set number	Az	Sh L	Sh P.	Sd L	Sd P	Dr L	Dr P	DL	DP	Status
1	018699431	1359,50	28,40	28,40	32,50	31,70	10,70	10,40	915,20	915,50	OK
2	018994129	1360,90	28,20	28,60	32,00	32,40	10,60	10,90	913,20	912,80	OK
3	018993900	1359,10	28,20	28,60	30,30	30,60	10,60	10,40	914,10	914,40	OK
4	018920134	1360,30	28,20	28,30	30,20	30,20	10,60	10,60	913,90	913,90	OK

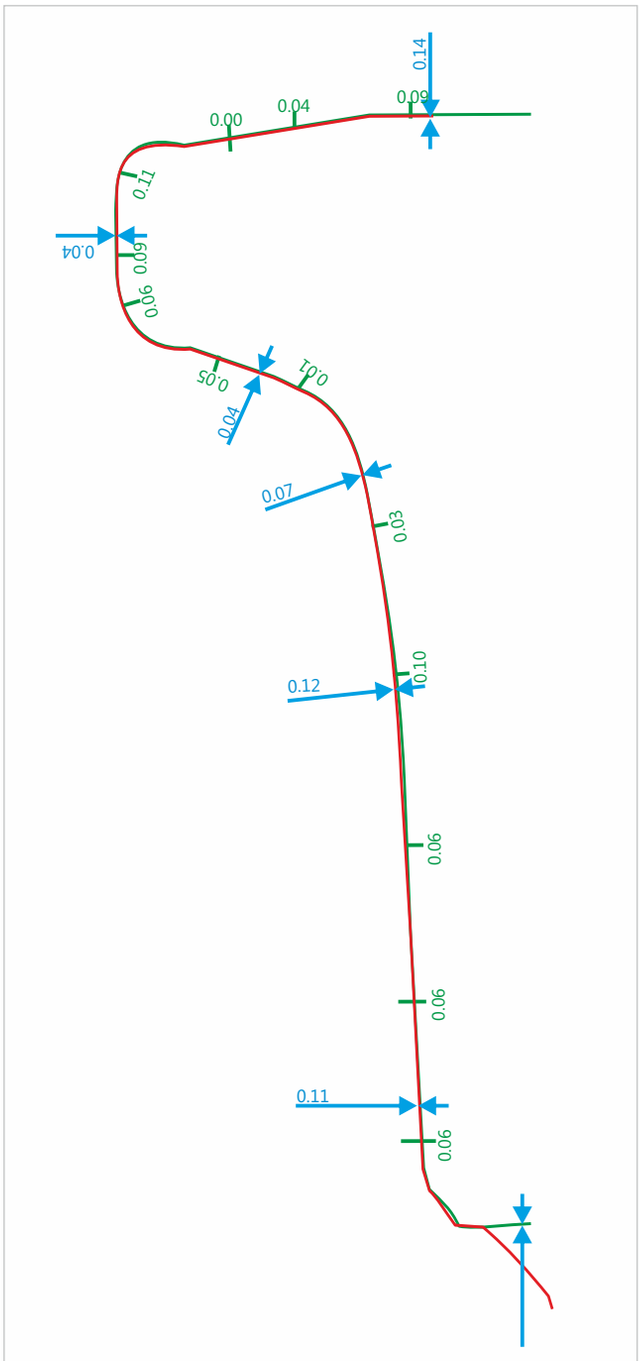
Set	Set number	Sum Sw	Difference Sw	Difference diameters	Ez	Status
1	018699431	64,20	0,80	0,30	1423,70	OK
2	018994129	64,40	0,40	0,50	1425,30	OK
3	018993900	64,90	0,30	0,30	1420,00	OK
4	018920134	60,40	0,00	0,70	1420,70	stop

Measurement results generated by the system may be used for selection of machining parameters on the underfloor lathe, which increases its productivity significantly and makes machining of up to 24 wheels per shift (8 hours) possible.

Example of use of measurement results for a tram wheel work planning on the underfloor lathe



Comparison of the optical measurement results for the tram wheel with measurements obtained using the contact method.



Laser wheel measurement system: repeatability of six wheel optical measurements and difference between them and measurement results obtained with the portable devices.

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