

Proven Increase in Transport Capacity and noticeable Optimisation of Ride Quality thanks to Modifications in the Lift Controller



WHO doesn't know this Situation?



DEKRA Study Results and Requirements for successful Lift Optimization

Key Information:

- § **Scope:** > 500 ride quality & performance measurements
- § **Time:** 2012 & 2013
- § **Project leader:** DEKRA expert M. Gehrke
- § **Equipment:** Lift Control System & external sensors

Study Results:

- § **> 90%** of analyzed lifts are **not meeting** their **transport capacity potential**
- § **Average** time loss of **> 25%**
- § **Max.** time losses of up to **55%**
- § **High vibration values** in all 3 dimensions (X-Y-Z)

Requirements for successful System Optimization:

1. Lift controller in which the adjustment parameters can be modified
2. Reliable and accurate measuring equipment

LiKoS – The new DEKRA measuring system

The testing system developed by DEKRA with a brand new measuring principle!

LiKoS is a special laser measuring system, which measures 1,000 times per second with an accuracy of 0.1 mm. In just a few minutes you are provided with clear and informative key data.

Dimensions: L=40 W=20 H=20 cm
Weight: 7kg + 3kg

Laser system (7Kg) with integrated sensor pocket (3Kg).

The small sensor pocket can also be carried separately.



LiKoS – General advantages

- § Time-saving test setup
- § Possibility of long-term measurements due to elimination of any sensor drift
- § Significant reduction in measuring errors
- § Easy and fast lift diagnosis
- § Light and compact device
- § Reliable results



LiKoS – Mini Recorder

Acceleration sensor with data logger

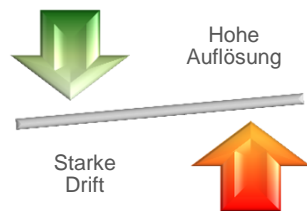
- § Additional metrics can be measured by the **Mini Recorder**, which can be attached to various components of the lift facility
- § Data from the **LiKoS measuring case** and the **LiKoS Mini Recorder** come together in one measurement file and allow the lift facility to be evaluated comprehensively and precisely

Mini Recorder to measure acceleration in the three spatial axes

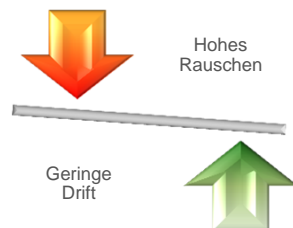


LiKoS Lift-Scan – Fusion of Sensor data

Velocity measured with acceleration sensor



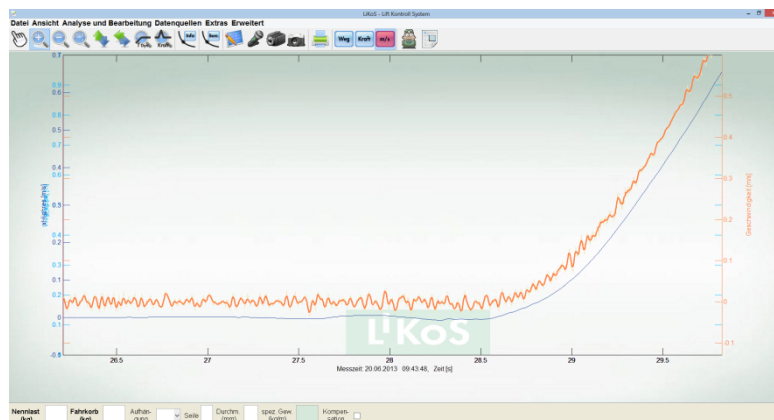
Velocity measured with laser



Data of acceleration data logger (LiKoS MiniRecorder) in the cabin are combined with the laser measurement in order to benefit from the advantages of both measuring principles

- § High resolution velocity curve (vHighres):
 - Precise analysis of vibration values
 - Elimination of sensor drift

- § Potential measurement gaps can be easily closed with the combined measurement principle



Orange: Velocity laser
Blue: Velocity data fusion



LiKoS – LiftExplorer

Innovative software

In accordance with the **ISO 18738** standard, the measurement of the lift ride must be divided into **different stages**

Accordingly, even **smaller lift heights** require several hundred individual stages to be **measured manually**

Consequence:

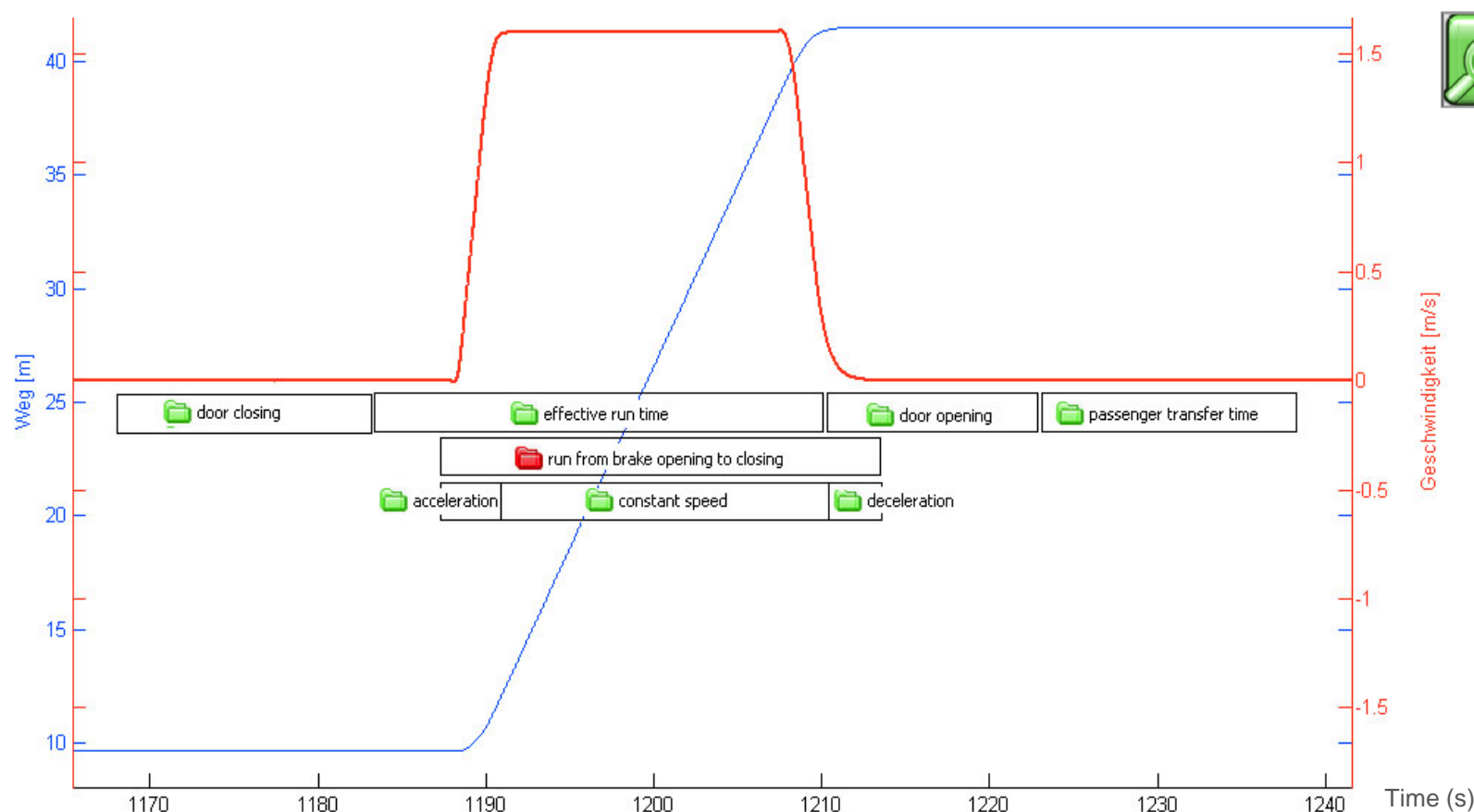
- § Large amount of **work**
- § Many potential **sources of error**
- § No **objective** comparability

The solution

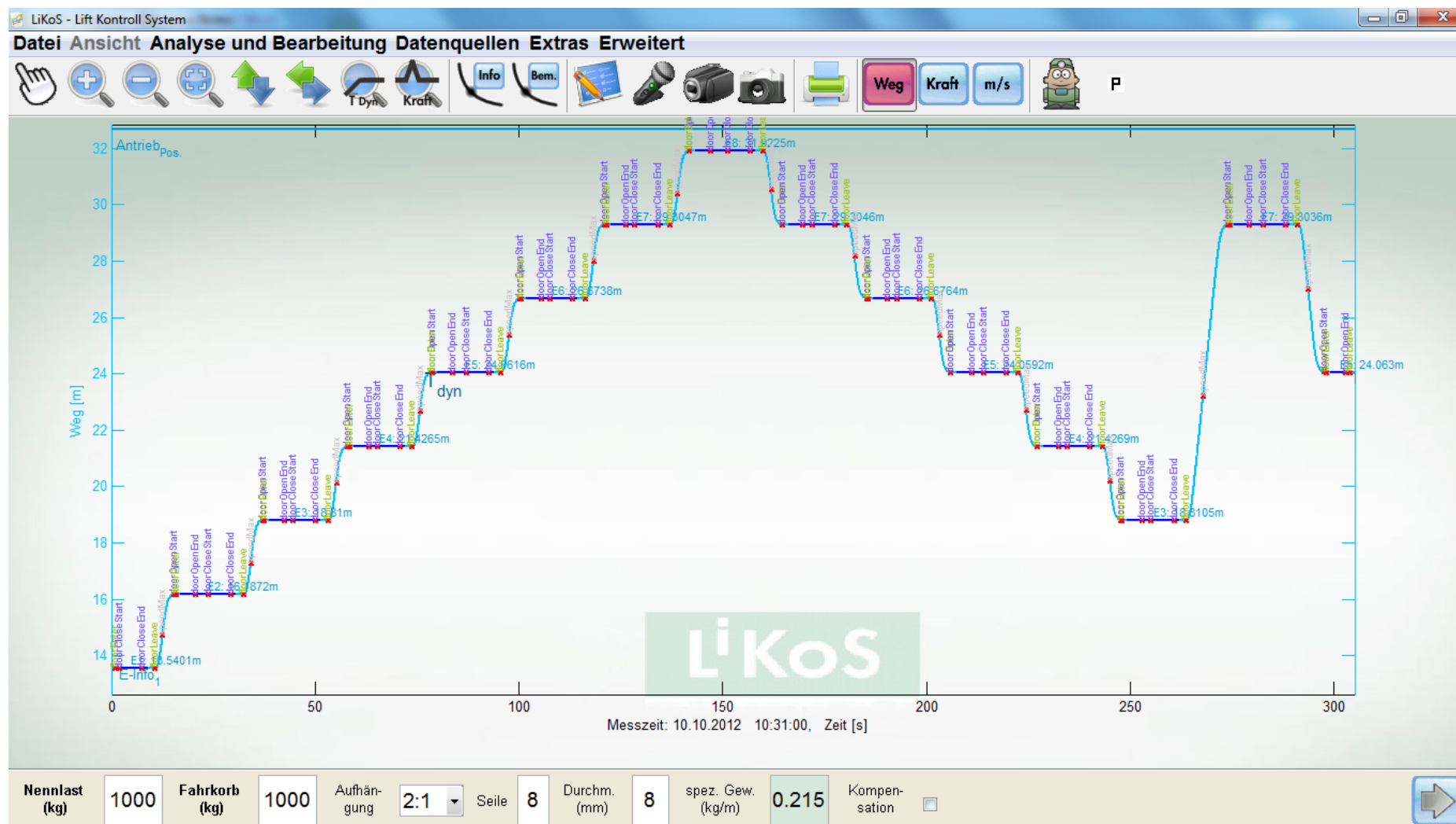


LiKoS LiftExplorer – Automatic Ride Stage Recognition

Balance between pre-defined metrics and individually adjustable limits



LiKoS LiftExplorer – Travel Data with automatic Display of Levels and Door Movements



LiKoS Lift Scan – Summary of Measurement Principle

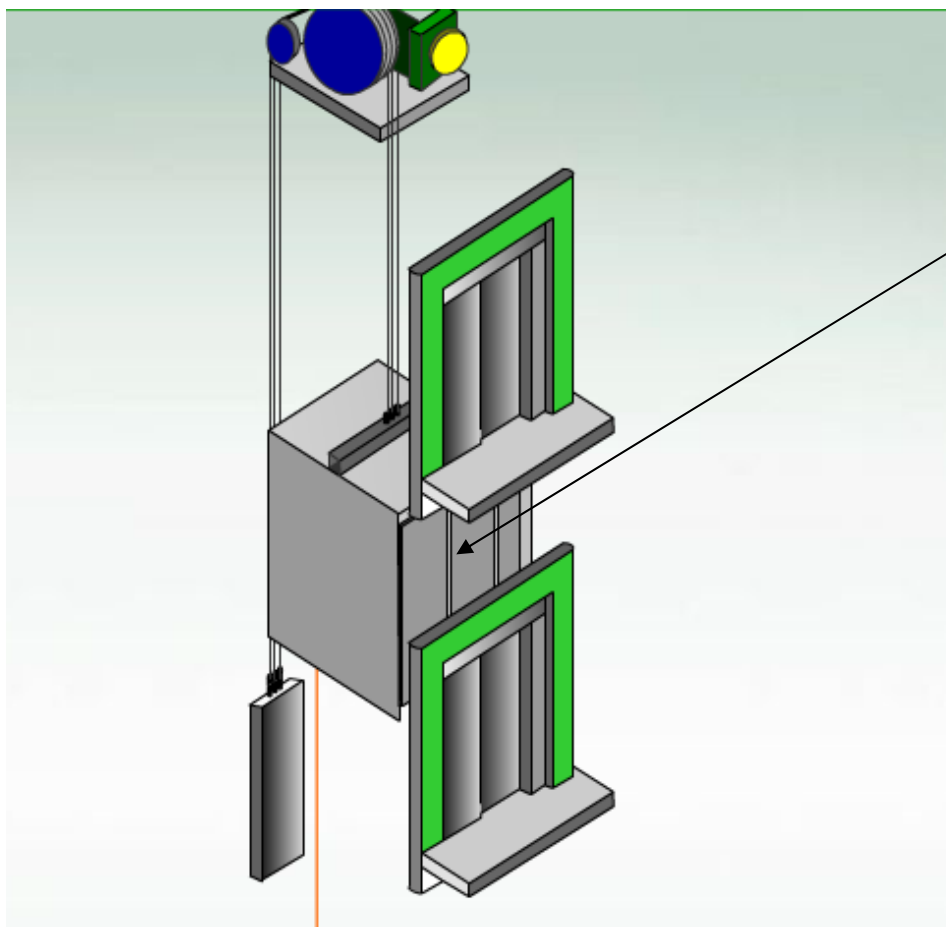


LiKoS Lift Scan:

- § Synchronised measurement
- § Combined analysis
- § Result: Fingerprint of the lift

LiKoS Lift Scan – Recording Door Movements

Example: Door movement



Door Movement

1. Apply LiKoS Minirecorder to the cabin door
2. Analysis with LiKoS LiftExplorer

LiKoS Lift Scan – Recording Door Movements

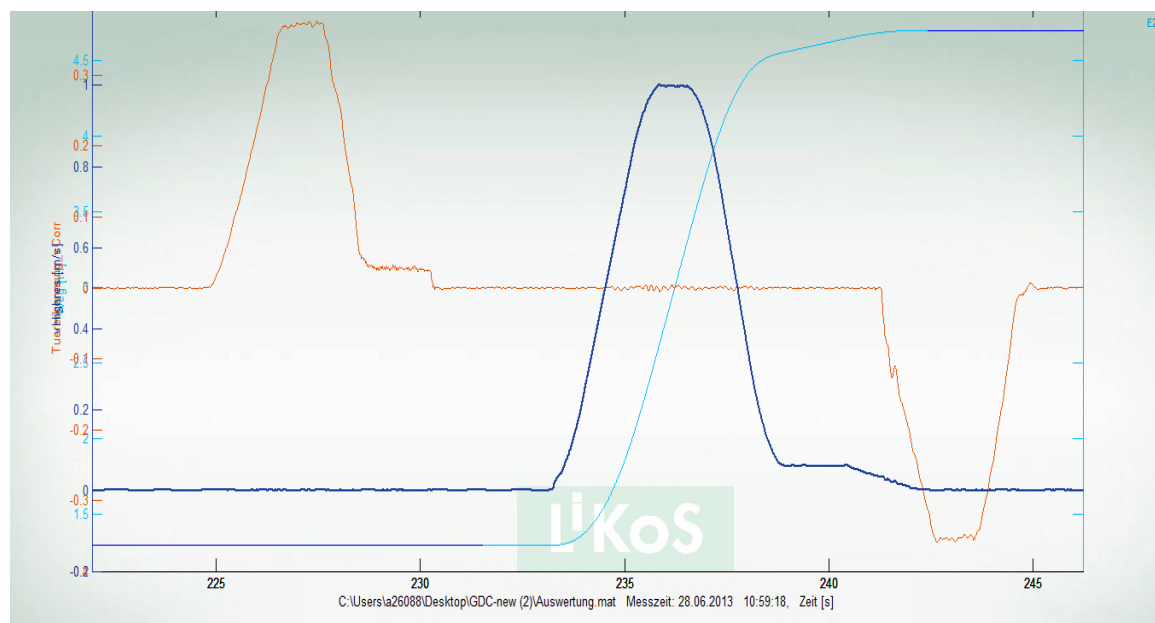
Door Movement

In order to conduct a comprehensive analysis of the transport capacity of a lift, the separate analysis of door movements is an important factor as well as the analysis of the interaction between cabin and door movements.

Closing Time and Velocity

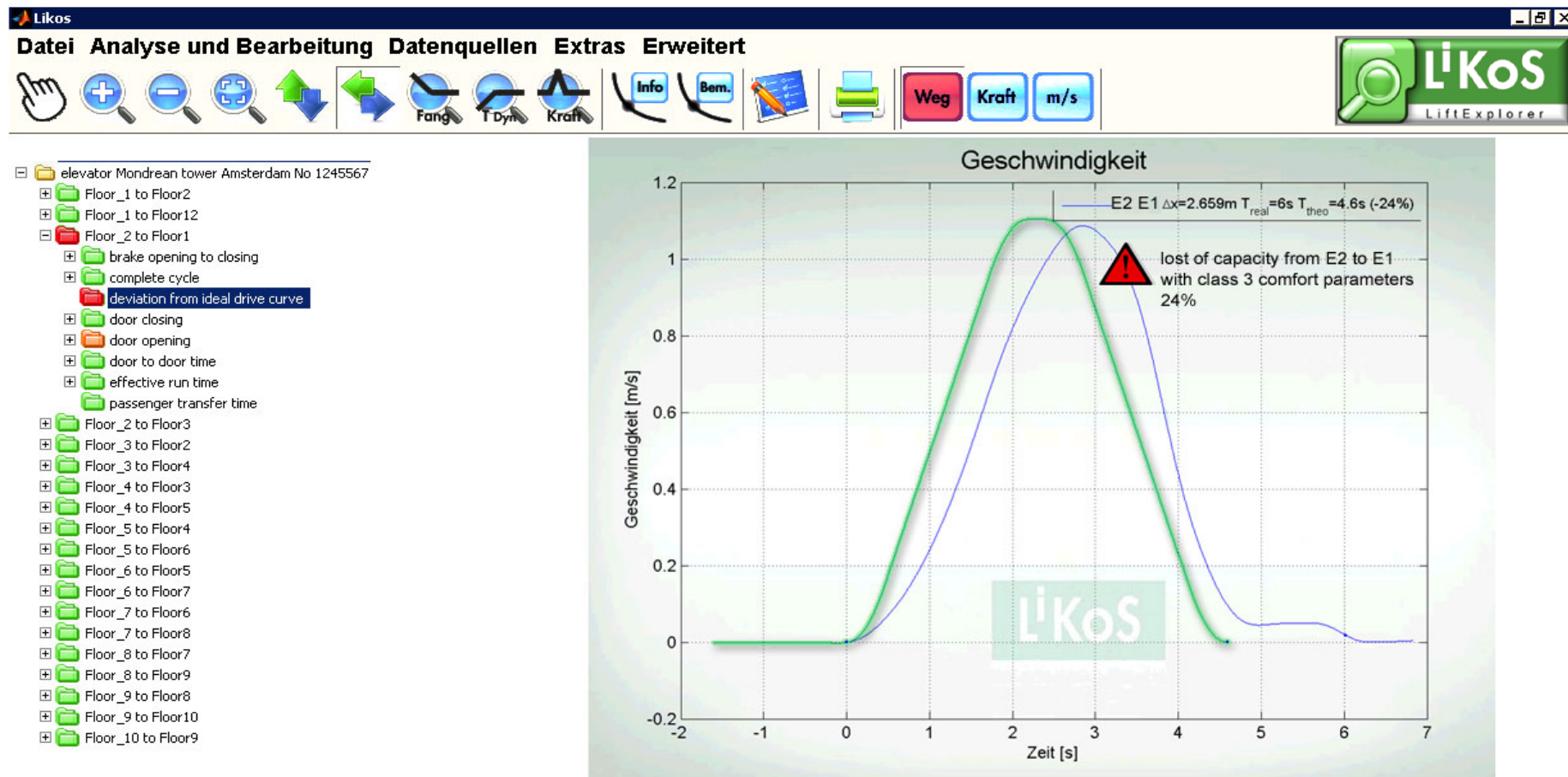
A recorded closing time of 6 seconds is relatively long with regard to the regular closing velocity of ca. 0,35m/s.

à Long creeping speed (only at door closing)



LiKoS LiftExplorer – Drive curve analysis

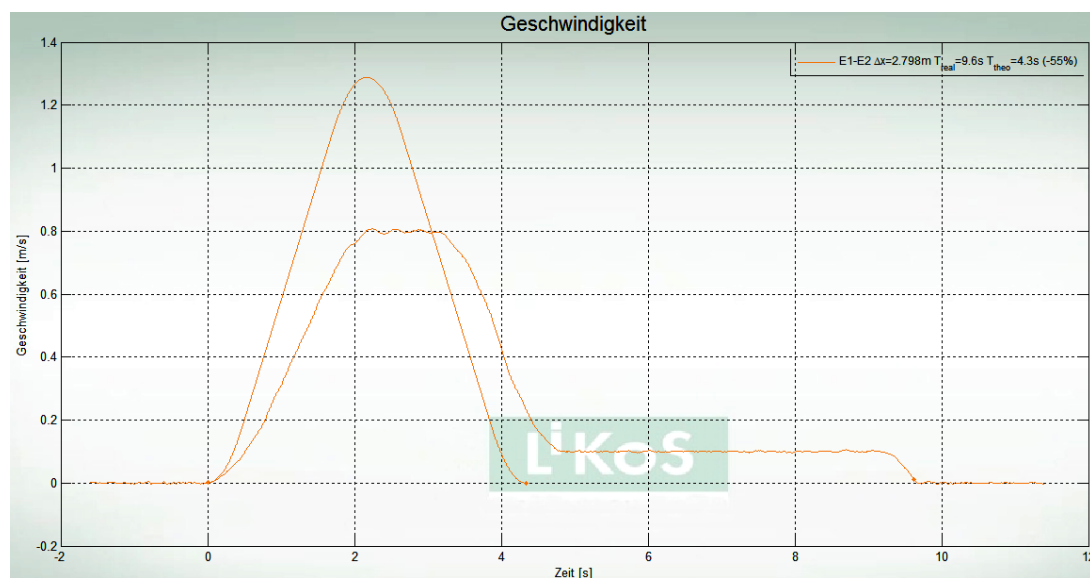
Time saved by optimising the drive curve



LiKoS Lift Scan – An Example from Practice (1/2)

Characteristic Data of the Lift:

- Year of Manufacture: 1990
- Type: Traction Drive
- Suspension Elements: Ropes
- Number of Stops: 12
- Nominal Load: 1.000 kg / 13 Persons
- Suspension: 1:1



Major Findings:

- Lift did **not reach** the **nominal speed** defined in the test book
- **Time losses** of more than **50 %**
- After the doors have closed, the lift **cabin remains at the stop** for more than 1 second before it leaves.
- Lift slows down passenger throughput when arriving at the target stop as the **doors are opened too late and too slowly**
- **Measured vibrations/resonances** are **very high** in all three spatial dimensions.
- **Arrival accuracy** was very good: - The maximum arrival error was **4.8 mm** for all stops.

LiKoS Lift Scan – An Example from Practice (2/2)

Readjustment of the Lift:

- The **travelling time** of several travelling stages could be **reduced by more than 40 %** with an **additional improvement of the ride comfort** (lower deceleration when braking).
- The **time** required for arriving once at all 12 stops in upwards and downwards direction could be **reduced by more than 2 minutes**.
- Based on 400 travel cycles per day, the **actual use time** of the lift is reduced by approx. **30 minutes** per day.
- Thus, the lift is **saving energy every day** and could even be rated at a lower use category.
- Particularly **high vibration values** (in all three spatial axes) could be **improved**.

The lift users confirm the improved ride characteristics of the lift and perceive the lift to be significantly "faster" and "smoother" after the optimisation.



LiKoS - Unlock the potential!

Increase the **safety**, **ride quality**, **ride performance** and **energy efficiency** of your systems!

