

Weigh2xTECH

Intelligent and Industry AI

Cutting-Edge **On-Board Weighing**

Intelligent Load Sensing System



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GX-6 Intelligent Load Sensing System

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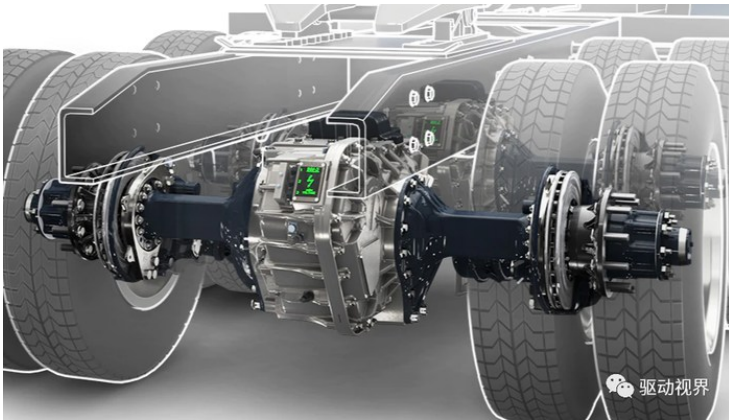
Weigh2X TECH



1. GX-6 Overview

Measurement Principle

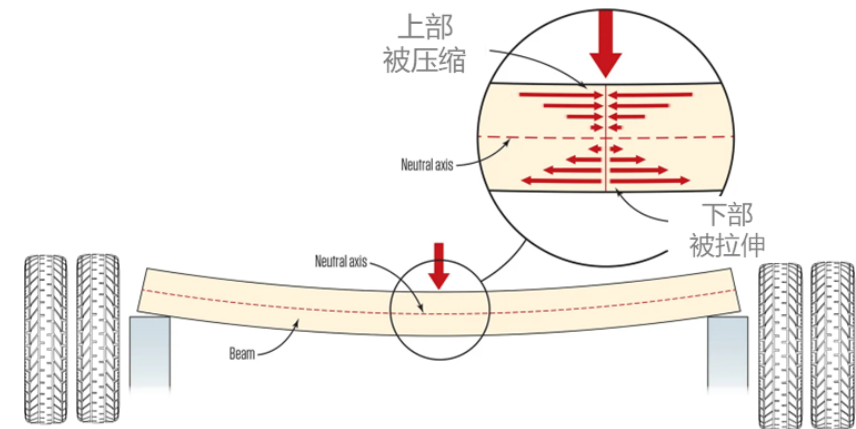
The illustration on the left shows a typical heavy-duty truck axle. The axle is supported by the wheels at both ends and behaves as a beam under load.



- Beam deformation
- Compression & tension
- Strain measurement
- Load calculation



车轴弯曲应力示意图



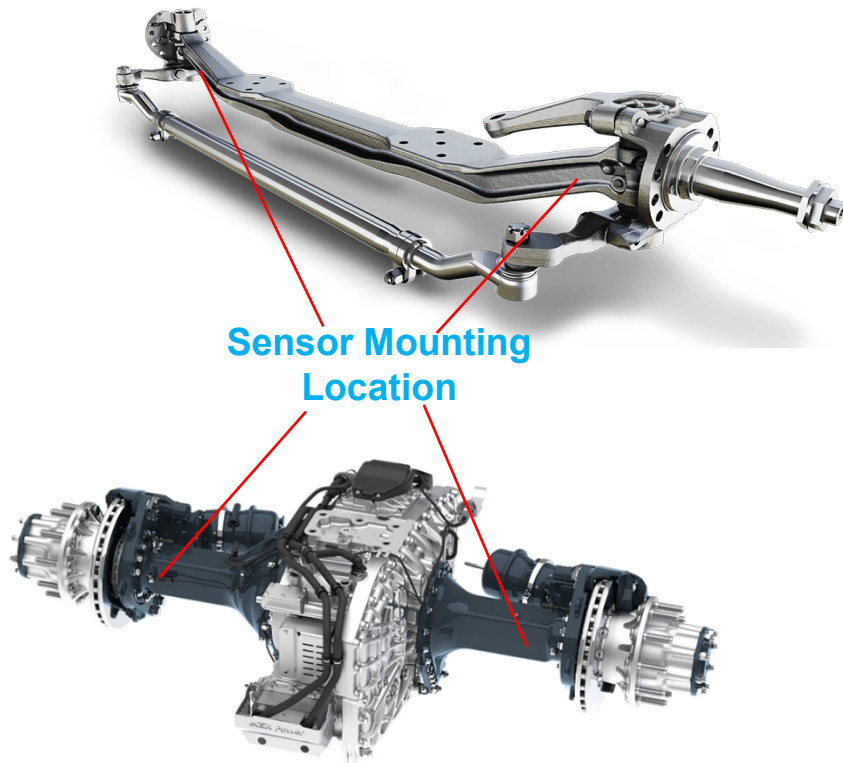
Vehicle loading induces elastic bending of the axle beam. The upper surface is subjected to compression, while the lower surface experiences tension.

Under typical payloads of 30–100 metric tons, the resulting structural deformation is only a few to several tens of micrometers (μm), corresponding to microscopic strain levels that cannot be observed directly. By accurately measuring these strain variations, the GX-6 converts structural deformation into axle load information, enabling real-time vehicle payload estimation without modifying the load-bearing structure.

Why Axle-Based Load Measurement ?

Why GX-6?

- GX-6 combines high-sensitivity strain sensing with embedded signal conditioning and edge processing to convert microscopic axle deformation into accurate real-time axle load and vehicle payload information.



Why Measure the Axle?

- First-principles measurement — All vehicle payload is transmitted through the axle.
- High structural consistency — Axle geometry and stiffness are highly repeatable across vehicles of the same model.
- No leaf-spring hysteresis — Eliminates errors caused by friction and stick-slip effects in the suspension.
- Simple installation — No drilling, welding, or structural modification required.

Engineering Challenges

- Although the axle directly reflects the applied load, accurate measurement is technically demanding:
- **Microscopic deformation** — Axle deformation is typically only a few to several tens of micrometers, even under full load.
- **High measurement sensitivity** — Requires precise strain acquisition with excellent long-term stability.
- **Advanced signal processing** — Temperature compensation, filtering, and noise suppression are essential for reliable load estimation.

One GX-6 module is installed on each side of the axle

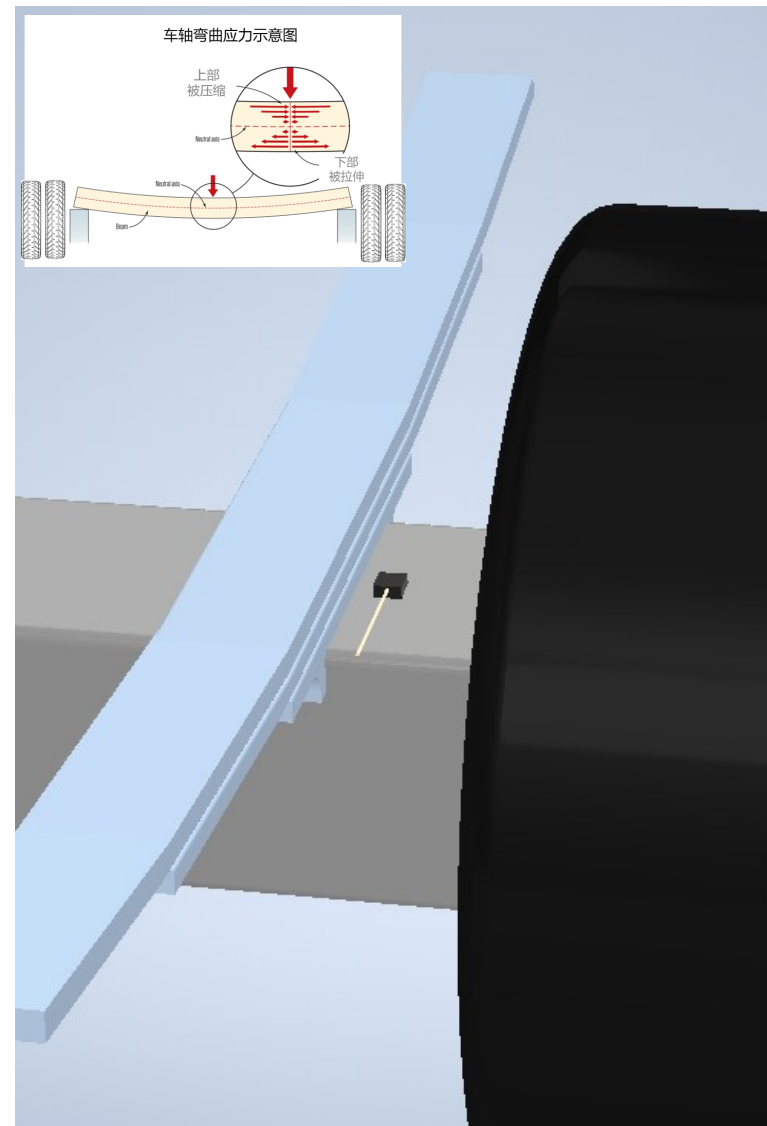
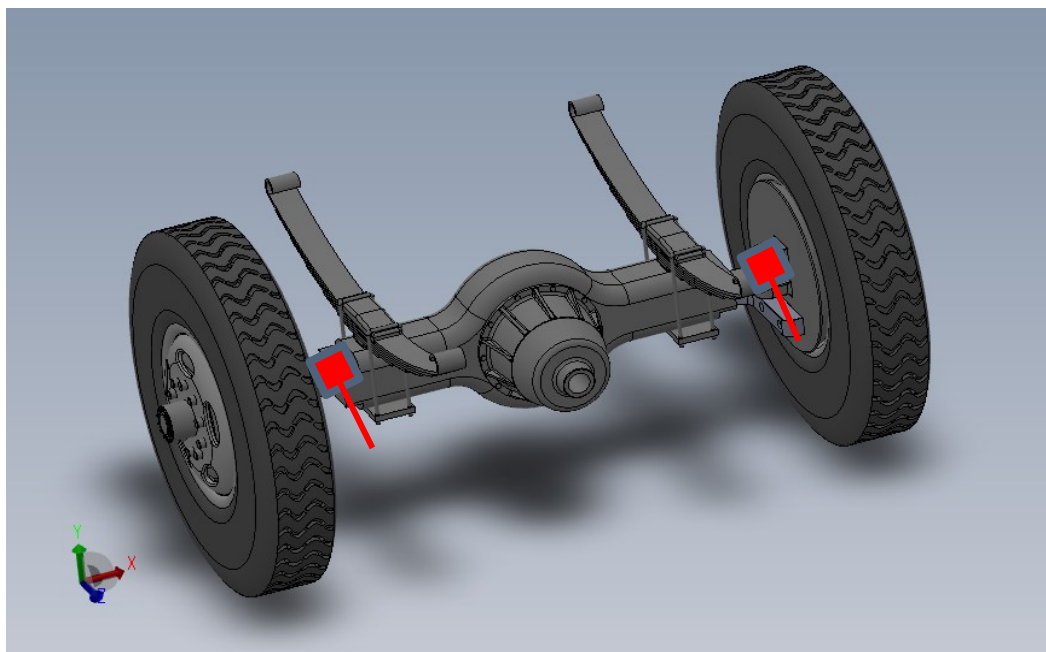
A compact axle load sensing module for heavy-duty vehicles

- **Sensor Mounting Location**

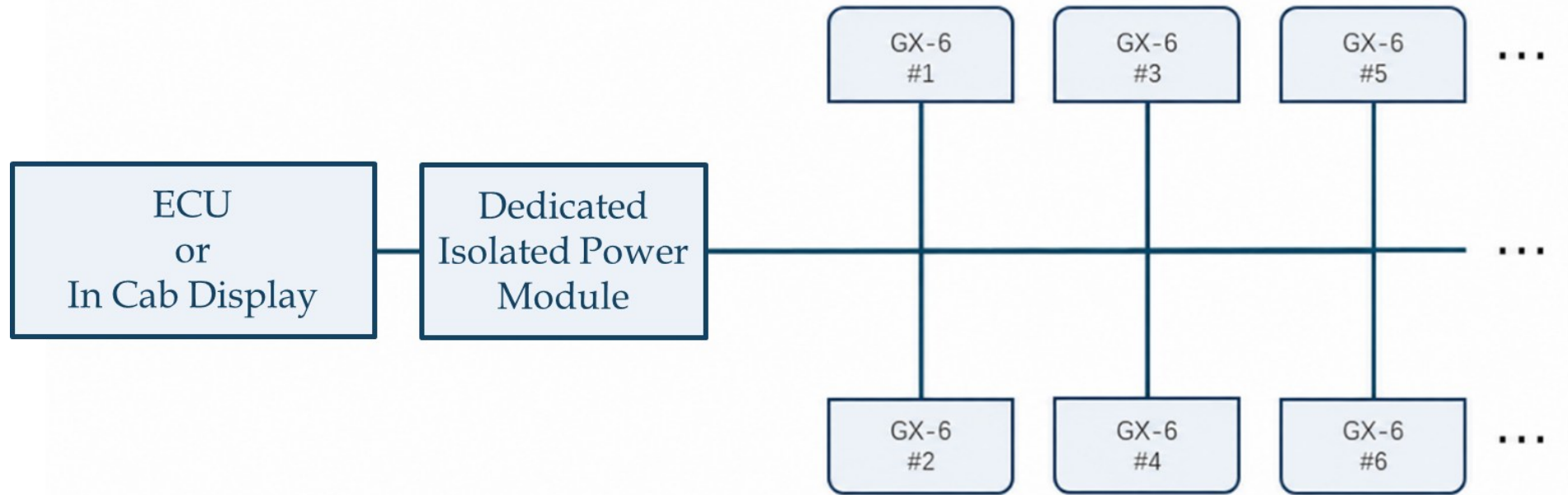
- One sensor is installed on each side of the axle, close to the wheel hub.

- **Ultra-Compact Design**

- Designed for space-constrained installation.



System Architecture

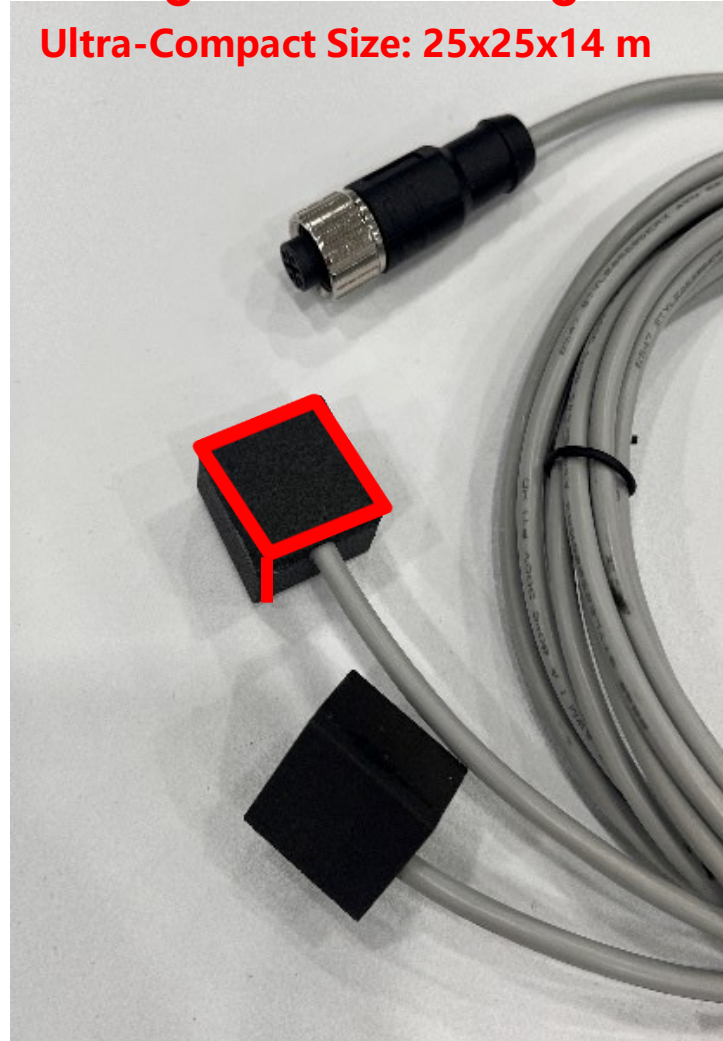


System Configuration Example

(Example: 4-Axle Heavy-Duty Truck Application)

- Compatible with most heavy-duty trucks equipped with square-section axles.
- One sensing unit set is deployed on each axle. One per each side.
- Each axle sensing set consists of two compact load sensing modules, installed on both LH and RH wheel ends.

Intelligent Load Sensing Unit
Ultra-Compact Size: 25x25x14 mm



In-Cab Display



4-Axle Preinstalled GX-6 Harness



System Architecture



2. Product Specifications

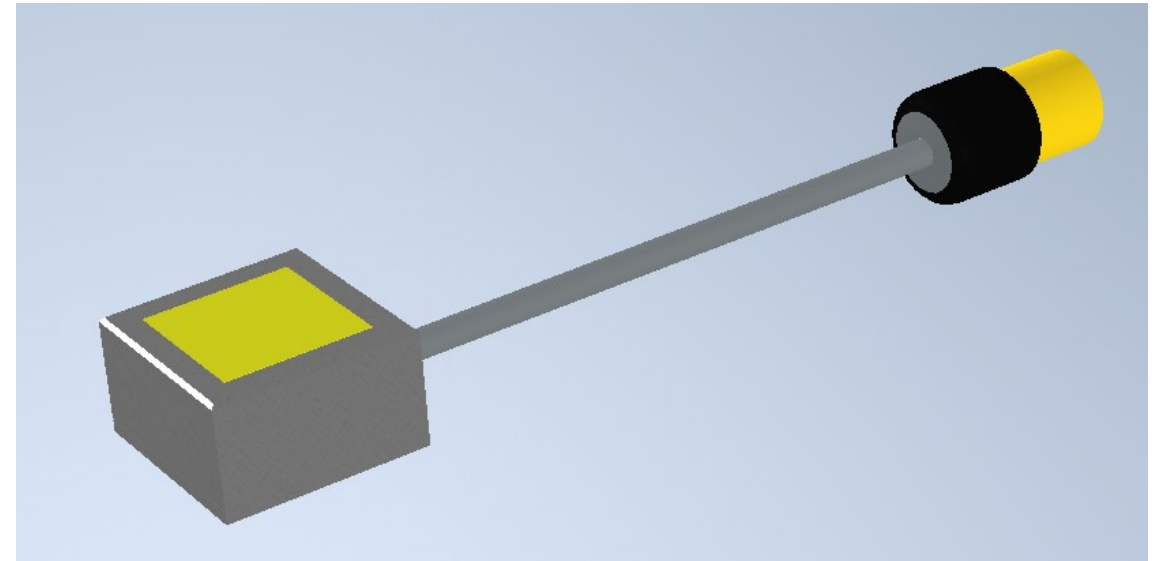
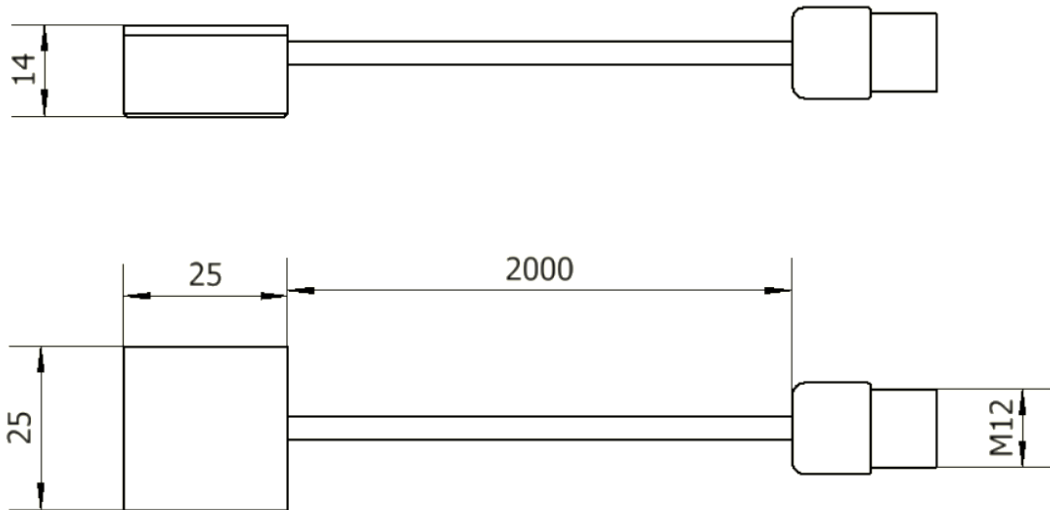
System Composition: Front-end sensors + edge computing processor, in-cab display, and cloud back-end platform

Load/Weighing Sensing Performance

Parameter	Min	Typical	Max	Unit
Measurement Range	—	2000	2200	με
Resolution	—	0.03	—	% F.S.
Sensor Overall Accuracy	—	±0.3	±0.5	% F.S.
Zero Thermal Drift	—	—	±0.01	% F.S./°C
Span Thermal Drift	—	—	±0.01	% F.S./°C
Hysteresis	—	—	0.1	% F.S.
Repeatability	—	0.1	—	% F.S.
ADC Resolution	—	12	—	bit
Sampling Interval (Configurable)	100	—	6000	ms

0. Miniature Integrated Design 25*25*14mm

- Ultra-Compact Size: 25x25x14 mm
- Easy to install



Weigh2x Technological Advantage: Full-Stack Precision Instrumentation Engineering

**Mechanics
Structural Design**

**Instrumentation
Engineering**

**Mathematics
Applied
Mathematics**

**Electronics
Electronics
Design**

**Manufacturing
Precision
Manufacturing**

Design properly

Measure accurately

Solve optimally

Compute efficiently

Product yield

The screenshot displays the Weigh2x software interface with the following sections:

- Port:** CAN BUS (selected), RS485
- Vehicle Parameters (Load Unit: Ton):**

No. of Axles:	3	Rated Load:	40
Axle 1 NW:	2.50	Axle 1 Load:	10
Axle 2 NW:	2.50	Axle 2 Load:	15
Axle 3 NW:	3.80	Axle 3 Load:	15
Axle 4 NE:	0	Axle 4 Load:	0
Axle 5 NW:	0	Axle 5 Load:	0
Axle 6 NW:	0	Axle 6 Load:	0

Save Vehicle Parameters
- Sensor Parameters:**
 - Sensor Sel: L1
 - Gain: 60
 - Zero: 0.5
 - Zero Temp:
 - Interval: 1000
 - Weight K: 1
 - K Temp:
 - Filter: No Fil
 - Inverting: Non-inv
- Buttons:** Sensor On, Exit
- Keypad:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, ., del

■ **Temperature compensation algorithms that resolve strain-gauge thermal stability challenges;**

Real-Time Weighing Application Scenarios



Rapid Weighing
Improve loading efficiency



Overload Prevention
Reduce overload risk



Mining Trucks
Real-time payload monitoring



Mining Trucks
Real-time payload monitoring



Electric Trucks
Optimize energy consumption



Hazardous Waste Transport
Improve compliance and traceability

**Key
Value:**

**Accurate
Weighing**

**Cost-Effective
Product**

**Simple
Installation**

**Rugged &
Durable**

3. Load Dashboard & In-cab Display

Real-Time Functions

Port Open

MQTT Connected

京KL3300

WALKHORIZON

00090

2026-07-17 11:59:08

Current Load (t)

0.39

Axle Load

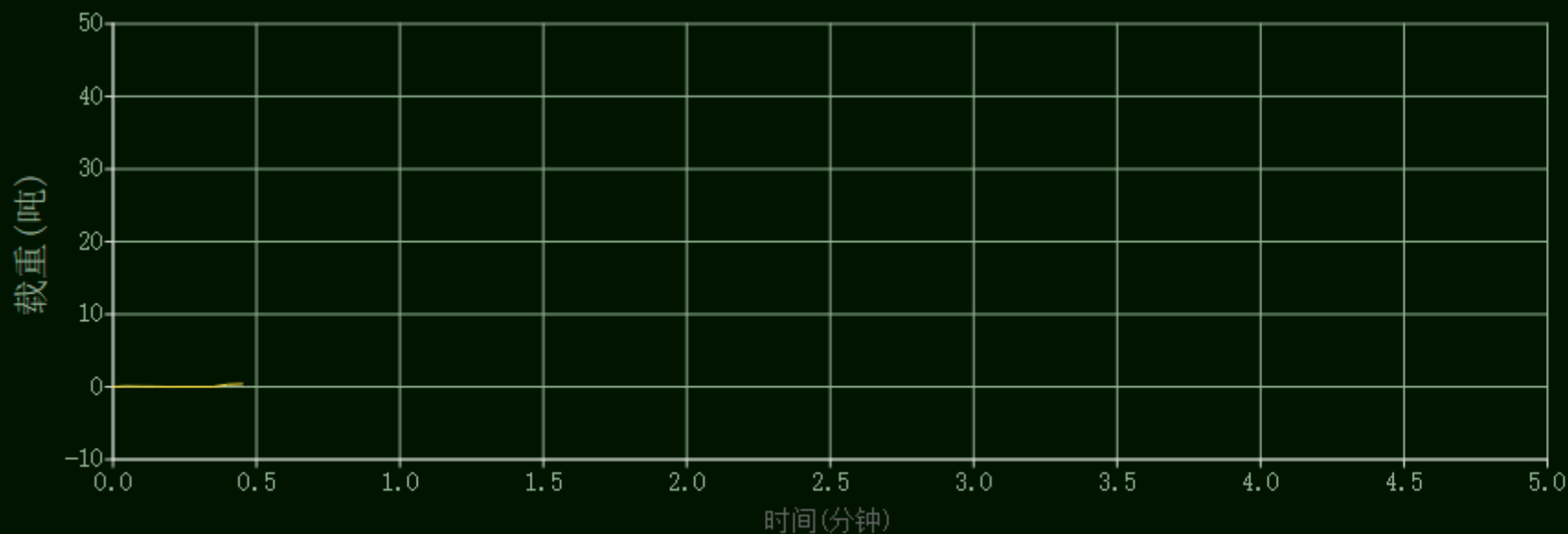
0	A 1	0
0	A 2	0
0.39t	A 3	0
0.27t	A 4	0
0	A 5	0
0	A 6	0

Zero

Adjust

Calibrate

Settings



Real-Time Functions

Load Weight Calibration

Wait for the current measured value to stabilize, enter the scale measured value (kg), and click the "Calibrate" button to complete calibration.

Measured Value: 370

Scale Value:

Empty Weight: 8800

Actual Load: 0

1

2

3

4

5

6

7

8

9

0

.

del

Calibrate

Exit

Real-Time Functions

Calibration Method

☒ Wheel Calibration ☐ Axle Calibration

Calibration Values (kg)

	Measured	Scale Value
--	----------	-------------

L1:		>>
-----	----------------------	-------------------------

L2:		>>
-----	----------------------	-------------------------

L3:		>>
-----	----------------------	-------------------------

L4:		>>
-----	----------------------	-------------------------

L5:		>>
-----	----------------------	-------------------------

L6:		>>
-----	----------------------	-------------------------

	Measured	Scale Value
--	----------	-------------

R1:		>>
-----	----------------------	-------------------------

R2:		>>
-----	----------------------	-------------------------

R3:		>>
-----	----------------------	-------------------------

R4:		>>
-----	----------------------	-------------------------

R5:		>>
-----	----------------------	-------------------------

R6:		>>
-----	----------------------	-------------------------

1	2	3
4	5	6
7	8	9
0	.	del

Exit

Real-Time Functions

Port:

☒ CAN BUS ☐ RS485

Vehicle Parameters (Load Unit: Ton)

No. of Axles: 3 ☒

Rated Load: 40

Axle 1 NW: 2.50 ☒

Axle 1 Load: 10

Axle 2 NW: 2.50

Axle 2 Load: 15

Axle 3 NW: 3.80

Axle 3 Load: 15

Axle 4 NE: 0

Axle 4 Load: 0

Axle 5 NW: 0

Axle 5 Load: 0

Axle 6 NW: 0

Axle 6 Load: 0

Save Vehicle Parameters

Sensor Parameters

Sensor Sel: L1 ☒

Gain: 60

>>

Zero: 0.5

>>

Zero Temp:

>>

Interval: 1000

>>

Weight K: 1

>>

K Temp:

>>

Filter: No Fil ☒

>>

Inverting: Non-in ☒

>>

1

2

3

4

5

6

7

8

9

0

.

del

Sensor On

Exit

4. Case Study

Load Intelligent Unit install base and Partnerships



.....

If you have portable weighing bridge, choose “Wheel Calibration”



Calibration Method



Wheel Calibration



Axle Calibration

Calibration Values (kg)

If you use the normal weighing bridge, Choose “Axle Calibration”



Calibration Method

☒ Wheel Calibration ☐ Axle Calibration

Calibration Values (kg)

2.1 Empty Axle Weight

Procedure

- Drive the empty vehicle onto the truck scale and measure total empty weight $W_e(\text{empty})$
- Move Axle 1 off the scale and measure Axles 2+3 combined weight W_{23}
- Move Axles 1+2 off the scale and measure Axle 3 weight W_3



Calculation Formulas

- Axle 1: $W_1 = W_e(\text{empty}) - W_{23}$
- Axle 2: $W_2 = W_{23} - W_3$
- Axle 3: W_3 (direct measurement)

2.2 Full Axle Weight

- After loading (full $\pm 10\%$), measure the full-load weights of the three axles **using the same method as for empty load**.
- Subtract the empty weights to obtain the actual payload per axle.



Calculation Formulas

- Axle 1: $W_1 = W_e(\text{full}) - W_{23}$
- Axle 2: $W_2 = W_{23} - W_3$
- Axle 3: W_3 (direct measurement)

Full: Input the “Weighing Bridge Data” to [Scale Value], then click but

>>

Measured = NEW-T3000 Screen Data, will automatically shows there;
Scale Value: pls manually input the data from weighing bridge.

Manually Input
weighing bridge
data

Data by NEW-T3000
Load Display
Automatically

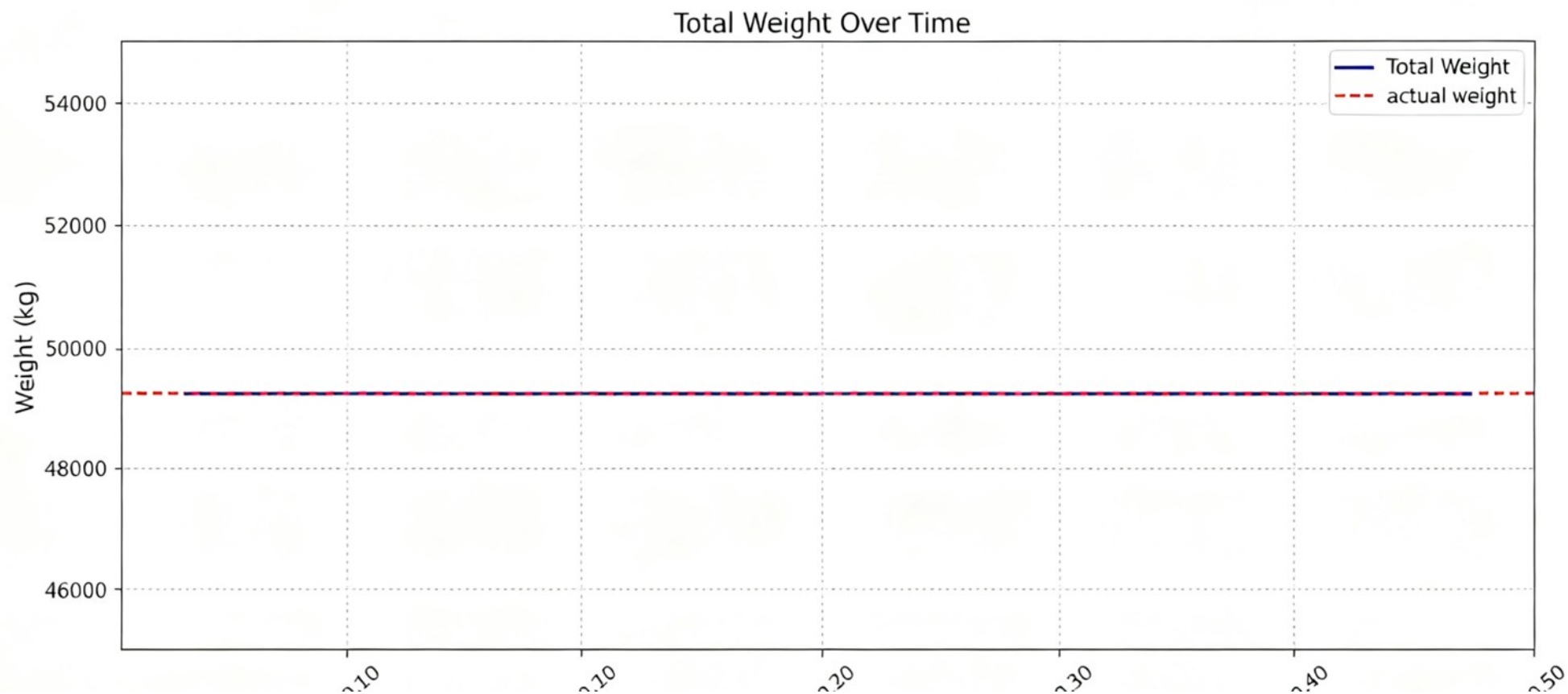
The screenshot shows the 'Calibration Method' screen with 'Axle Calibration' selected. Below is a table for 'Calibration Values (kg)' with columns 'Measured' and 'Scale Value'. The 'Measured' column contains data from the NEW-T3000 screen, and the 'Scale Value' column is for manual input. A red box highlights the '23160' in the 'Scale Value' column for Axle A1, with a hand icon pointing to it. A red dashed box encloses the entire table. A large red 'Axle' watermark is overlaid on the table. To the right is a numeric keypad and an 'Exit' button.

	Measured	Scale Value	
A1	2028	23160	>>
A2	4210	24150	>>
A3	5640	39420	>>
A4			>>
A5			>>
A6			>>

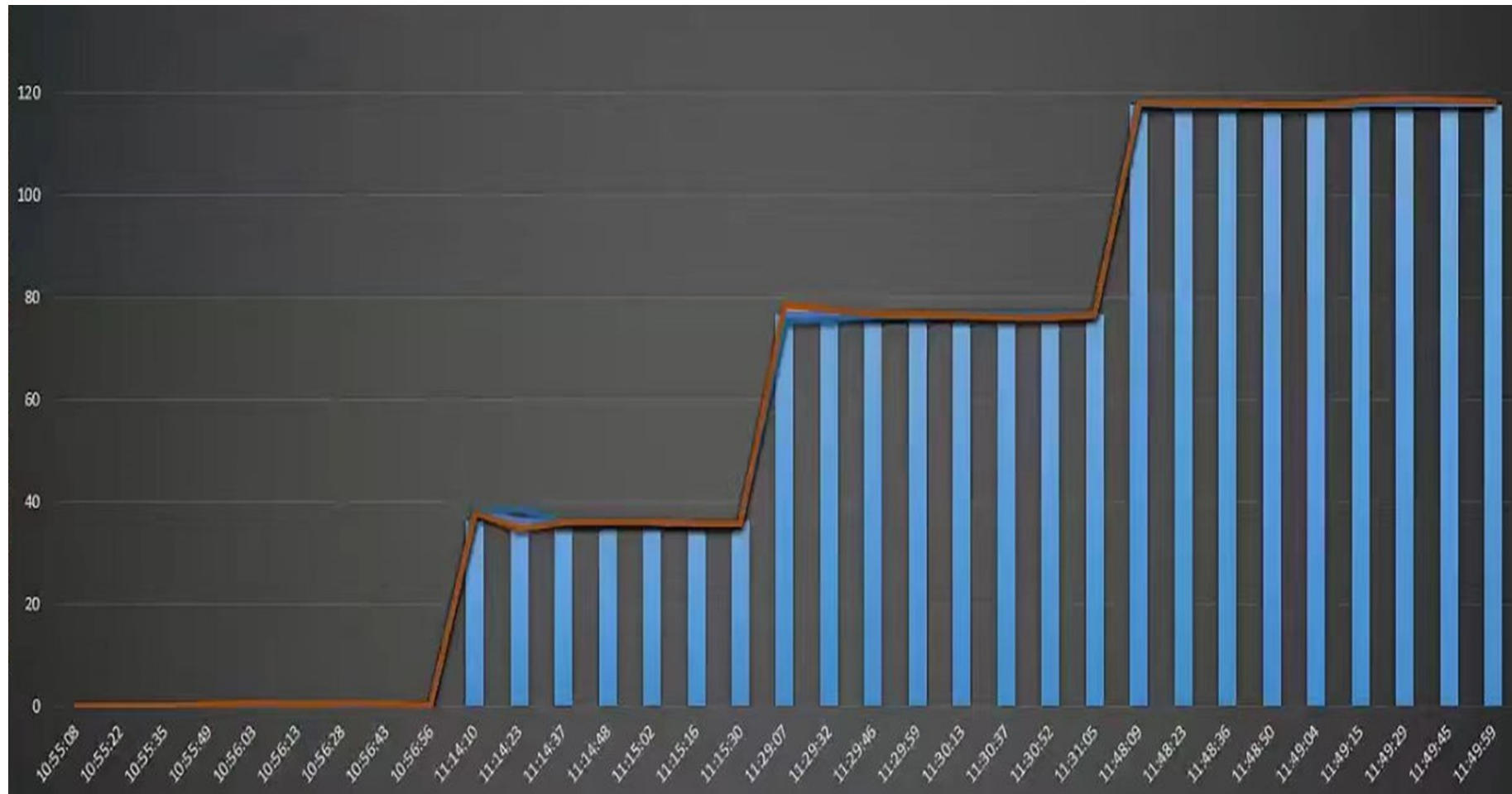
Exit

Static Weighing Data — Resolution Reaches 0.1%

Full Load - Static

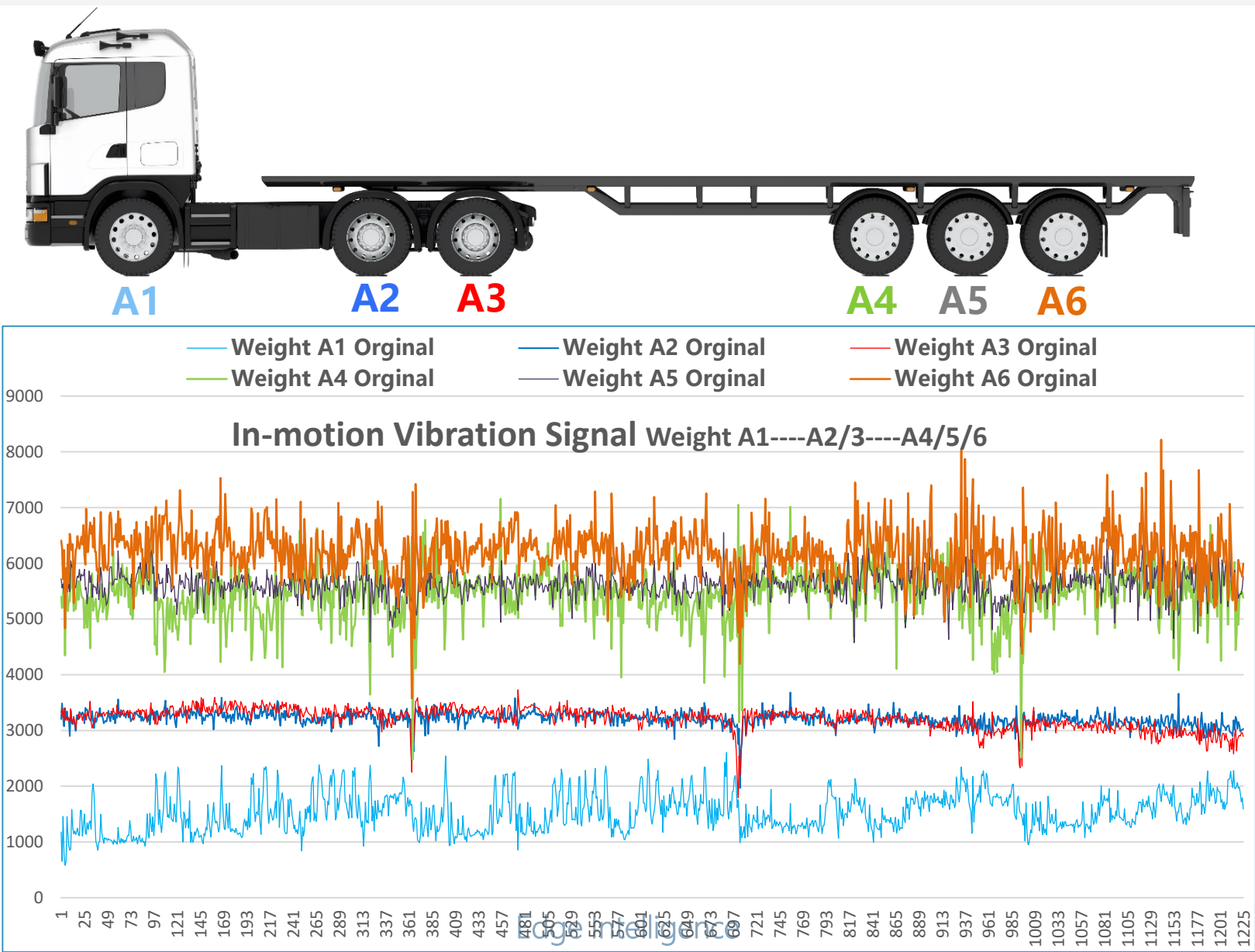


Loading Data vs. Weighbridge — Accuracy: 1–2%

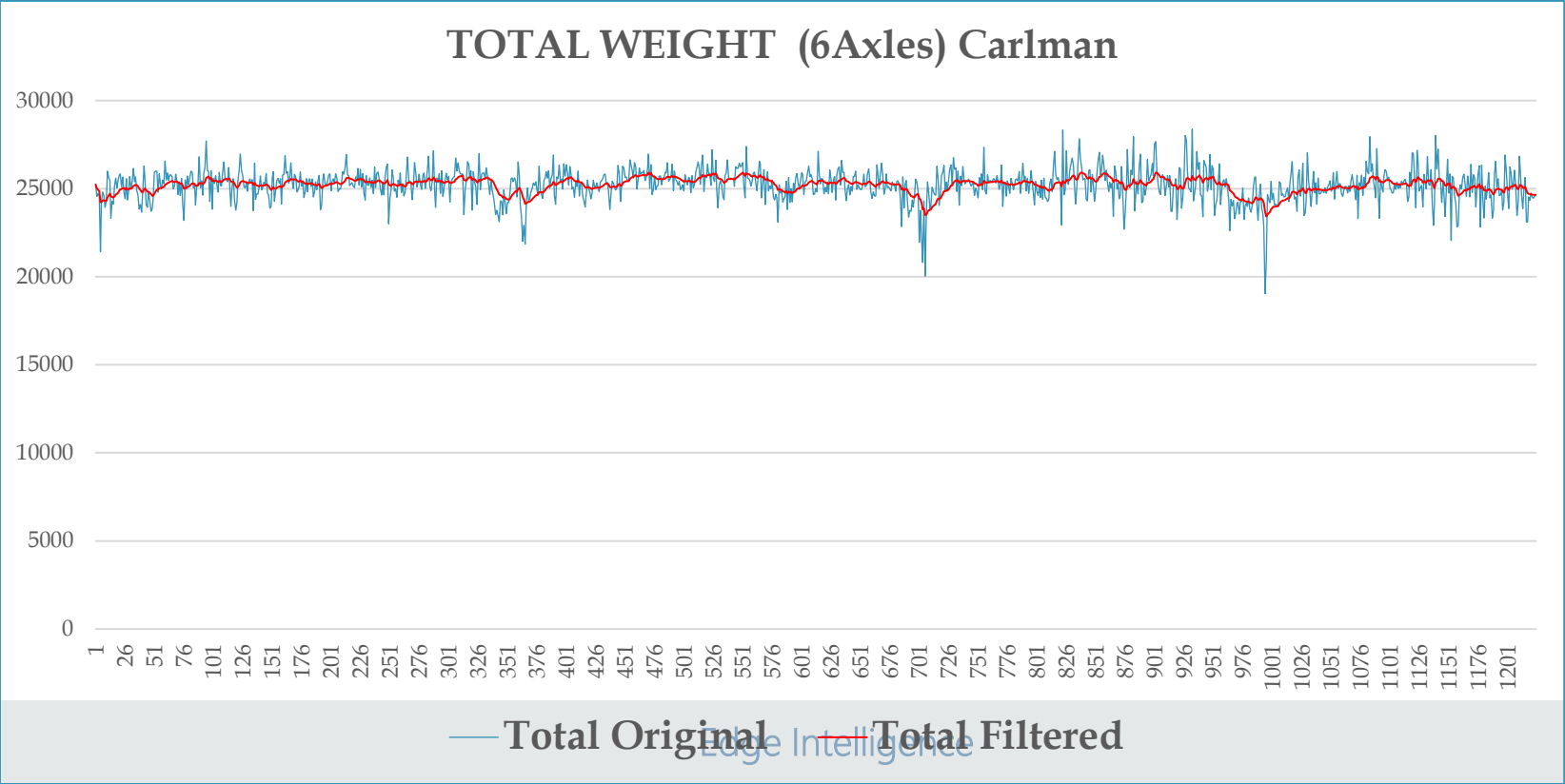


Data Source: XCMG H150 wide-body mining truck. Three bucket loads compared against weighbridge data (blue bars)

Measured In-Motion Data — Real-time road-condition monitoring (enables joint academic research on road-traffic spectra and dynamic load interaction)



In-Motion Gross Vehicle Weight Data (Post-Filtering)



ROI Case: Tianjin Port Bulk Cargo Handling

Eliminating Re-Weighing to Increase Productivity

Before

- ◆ Approximately 10 round trips per day between the pier and the storage yard.
- ◆ Around two overload events occurred each day, requiring partial unloading and re-weighing, resulting in more than 20 minutes of additional handling time.

1. Key Results

After

1. Real-time onboard payload monitoring enables every load to maximize payload without exceeding the vehicle's rated capacity.
2. Helps prevent uneven load distribution, improving vehicle stability and operational safety.
3. Re-weighing is eliminated, enabling each truck to complete two additional round trips per day.

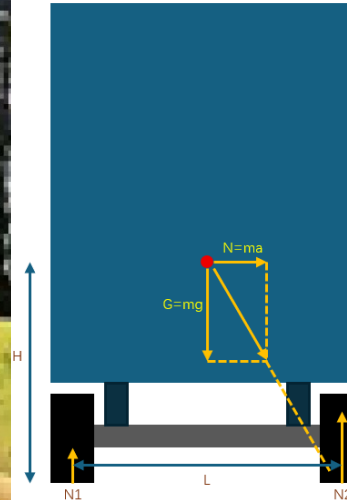
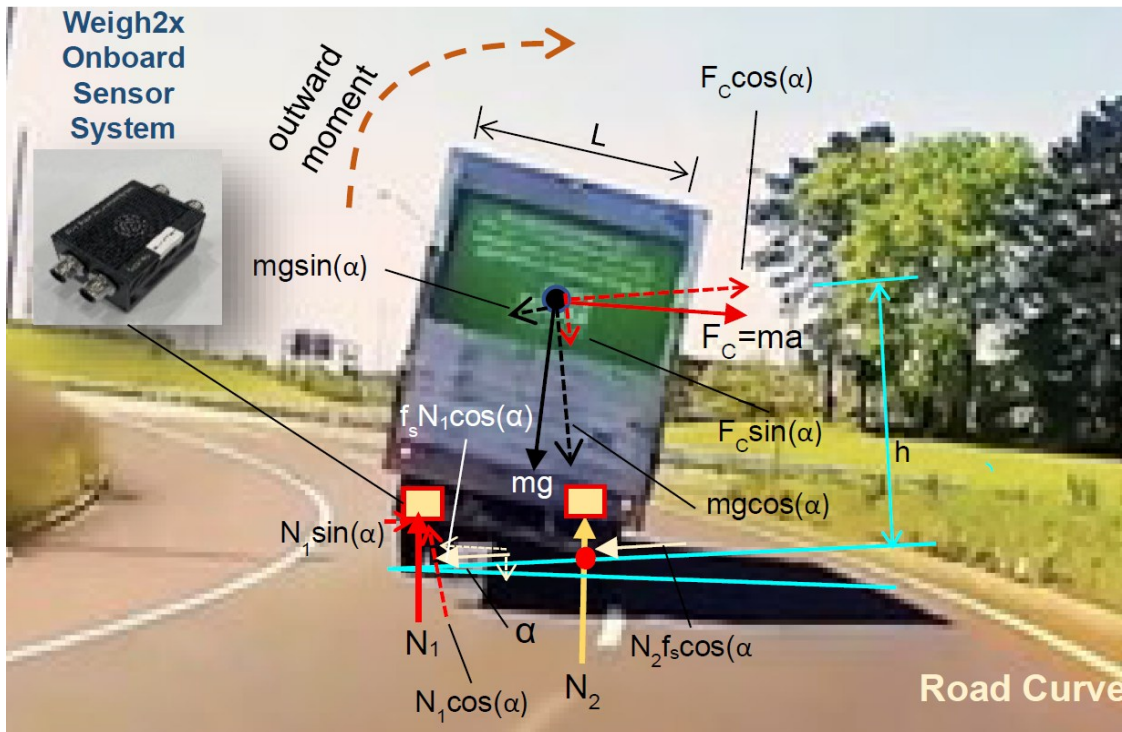
1. **Payload per trip: +2%**
2. **Re-weighing delay eliminated: 20 min**
3. **Daily transported payload per truck: +20%**

Wheel Load Next-Generation Applications: Rollover Prevention (Dump Trucks) + Autonomous Driving + Air pressure Part

Next-gen product definition:
Integrate accelerometer data to calculate
center of gravity and provide rollover

Rollover Risk Propagation Chain:

Load Differential → Torque → CG Height →
Critical Acceleration → Risk



直行时轮胎对路面压力

$$N1 = N2 = \frac{1}{2} mg$$

当有侧向加速度a时，两侧轮胎压力分别为：

$$N1 = \frac{1}{2} mg - \frac{mah}{L}$$

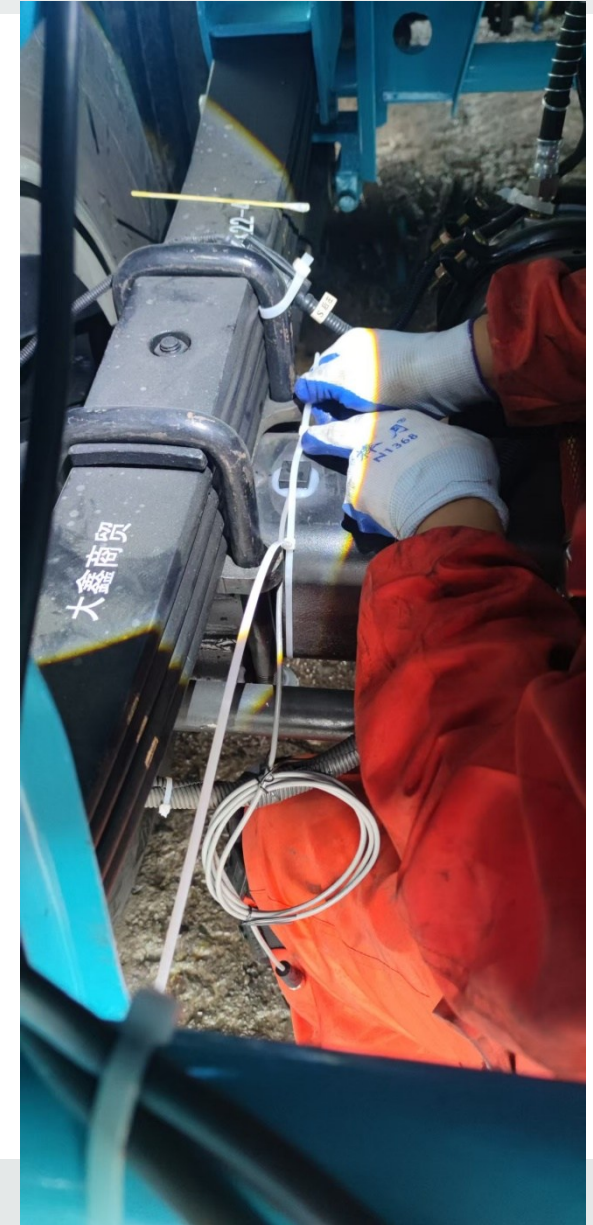
$$N2 = \frac{1}{2} mg + \frac{mah}{L}$$

当测得侧向加速度为a时可以计算中心高度：

$$h = \frac{L(\frac{mg}{2} - N1)}{ma}$$

当探测到N1值很小时卡车就有侧翻风险。

Bonding Process: Rust removal → Surface grinding/Clean → Adhesive application → Reinforcement



24-Hour Curing → Calibration



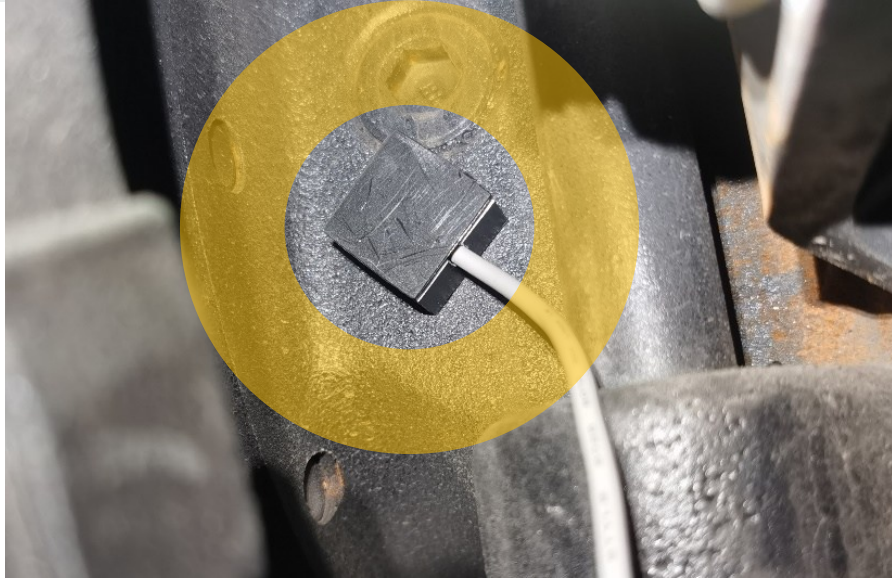
Calibration & Verification



Calibration & Verification



Simple Calibration Across Vehicle Models



Built for Harsh Operating Conditions (Temperature / Vibration / Impact...)



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THANKS

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