

WEIGH2X WHITEPAPER

High-Precision Strain Sensing On-Board Weighing Systems

Axle-strain measurement for real-time axle load and payload data on trucks, trailers and heavy vehicles.

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Product line covered: GX-6 Axle Load Sensing Unit · NEW-T3000 In-Cab Terminal · WalkCloud API

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Disclaimer and scope. Specifications are subject to change without notice and do not constitute a warranty. GX-6 provides **reference weight data for operational management**; it is not a legal-for-trade measuring instrument and does not replace certified weighing equipment where metrological certification is required. Certification and test status for individual models is available on request.

1. Executive summary

On-board weighing (OBW) means knowing what a vehicle is actually carrying — continuously, while it is being loaded and while it drives. WEIGH2x measures the **elastic strain of the axle itself**: when a truck is loaded, each axle behaves like a loaded beam, its upper surface in compression and its lower surface in tension. At typical payloads of 30-100 tonnes the axle deflects by only a few to a few tens of micrometres — far beyond human perception, yet perfectly proportional to the load.

The GX-6 Axle Load Sensing Unit turns that microscopic deformation into a digital load value **at the point of measurement**: strain sensing, amplification, filtering, temperature compensation, edge processing and CAN communication are integrated in one 25 × 25 × 14 mm bonded unit. There is no separate signal processor to install, no drilling, no welding and no change to the load-bearing structure.

Because measurement is distributed (two units per axle, one near each wheel), the system reports **per-wheel, per-axle and total payload**, which is what makes overweight prevention, load distribution and per-trip settlement practical rather than approximate.

2. The weighing challenge, and how the system answers it

2.1 What fleets lose to guessed payloads

- **Overweight exposure** — loading by estimate means either running over the legal limit or leaving revenue behind.
- **Wasted trips** — part-empty runs, second loading passes and queues at a weighbridge.
- **Equipment wear** — overload and uneven loading accelerate structural, tyre and road damage.
- **Settlement disputes** — without on-vehicle data, tonnage is argued after the fact.

2.2 System architecture

Two GX-6 units per axle are bonded onto the load-bearing area, typically between the leaf spring and the wheel. All units talk over **one CAN 2.0B bus (500 kbps, extended frames, 120 Ω termination per end, up to 32 units, bus length $\leq$ 50 m)** to the **NEW-T3000** in-cab terminal, which displays per-axle and total load, gives the driver feedback during loading, and hosts the guided zero/load calibration workflow. Data can be pushed to fleet or telematics platforms through the **WalkCloud API** and standard interfaces (including J1939).

2.3 Why measure the axle rather than the suspension

Axle strain is a direct, first-principles measure of the load passing through the axle. It does not depend on air-bag pressure, ride height or spring travel, and it is unaffected by suspension wear. Each unit stores its own parameters and operates independently, so tractors and trailers can be paired in different combinations **without re-calibration** once each unit has been calibrated on its own structure.

3. Technical specifications — GX-6 Axle Load Sensing Unit

GX-6 · Weighing performance

Measurement range	2000 µε typ. · 2200 µε max.
Resolution	0.03 % F.S.
Sensor overall accuracy	±0.3 % F.S. typ. · ±0.5 % F.S. max.
Hysteresis	≤ 0.1 % F.S.
Temperature drift	≤ 0.01 % F.S./°C
Non-linearity	< ±1 % F.S.
Repeatability	0.1 % F.S.
ADC resolution	12 bit
Sampling interval	100–6000 ms, software configurable (internal acquisition up to 20 Hz)
Installation accuracy	≤ ±1.5 % F.S. with professional installation & calibration

GX-6 · Mechanical & electrical

Dimensions	25 × 25 × 14 mm (W × L × H)
Weight	5 g (unit only, excluding cable)
Housing	Carbon-fiber reinforced engineering plastic, fully potted, black
Protection	IP67 — dust-tight; protected against 1 m immersion for 30 min
Mounting	Dedicated two-component structural adhesive; surface flatness ≤ 0.2 mm recommended
Cable	4-core shielded, 2 m, Ø4 mm with nylon sleeve, side exit
Connector	M12 waterproof connector (VCC, GND, CAN_H, CAN_L, NC)
Supply voltage	4.5–7.2 V DC (typ. 5.0 V) via matched isolated supply module
Operating current	80 mA typ. · 150 mA max. @ 5 V
Protections	Reverse-polarity, ESD (±8 kV IEC 61000-4-2) & voltage monitoring
Communication	CAN 2.0B extended frames · 500 kbps · 120 Ω termination per end
Network scale	Up to 32 GX-6 units per bus · bus length ≤ 50 m
Operating temperature	–40 to +85 °C
Storage temperature	–40 to +125 °C

Environmental testing	Vibration 5 g rms (10-2000 Hz) · shock 30 g/11 ms · damp heat · salt spray
Compatible axles	Square-section axles (round/other sections: please contact us)

4. Measurement principle and signal chain

4.1 From strain to load

Strain gauges inside the GX-6 convert elastic deformation of the axle into an electrical signal. A low-noise, zero-drift, continuously variable-gain analog front end paired with a high-performance ADC captures micro-strain at the source. The unit filters noise, compensates temperature and computes the local load; the terminal sums the axles to give live payload.

4.2 Stability where it matters

- **Dual temperature compensation** — two integrated temperature sensors monitor the sensing element and the PCB; temperature drift is held to $\leq \pm 0.01$ % F.S./°C over -40 to $+85$ °C.
- **Edge filtering** — moving-average, FIR and Kalman filtering run inside each unit to separate true load from road-induced vibration and vehicle dynamics.
- **EMC-hardened CAN** — extended-frame filtering and ESD protection (± 8 kV, IEC 61000-4-2) for vehicle electrical environments.
- **Field firmware upgrade** — bootloader-based online updates over the bus.

5. Installation, calibration and maintenance

GX-6 is a standard product, not a bespoke measurement project. The engineering — sensing, amplification, filtering, temperature compensation and CAN communication — is inside the unit; on site only two things remain:

- **Bonded installation.** The mounting surface is cleaned, degreased and abraded (flatness ≤ 0.2 mm recommended); the unit is bonded with a dedicated two-component structural adhesive and left to cure — typically around 24 hours. No drilling, no welding, no structural modification.
- **Software calibration.** A zero reading and a loaded reading are taken through the NEW-T3000 terminal; the unit computes its K-factor. Zero and gain are set in software with no mechanical adjustment, and parameters are stored in Flash.

After installation, per-axle and total readings are checked against a reference load such as a weighbridge. Re-calibration is a routine, software-only operation — recommended every 6 months or after major axle service.

6. Field validation

In pilot deployments, GX-6-equipped vehicles showed consistent agreement with weighbridge references — typically **within 1-2 %**. Load tests on mining trucks (XCMG XDE150-class) showed 1-2 % agreement across loading cycles, and system-level static weighing resolution

reaches 0.1 % of applied load. Customer-specific results can be shared, with the customer's consent, under NDA.

7. Compliance, boundaries and governance

- **Reference data, clearly bounded.** GX-6 provides weight data for operational management, compliance alerting and settlement support. It is not a legal-for-trade instrument; where a jurisdiction requires certified weighing, a certified device is still required. We state this boundary explicitly rather than implying certification we do not hold.
- **Certification status.** We drive product certification for target markets as a programme, and we publish only currently valid compliance documents. Status for a specific model and market is confirmed on request.
- **Data ownership.** Load data belongs to the customer; integration is through documented CAN and API interfaces.
- **Business conduct.** No kickbacks, facilitation payments or payments tied to political influence; third-party agents and partners are subject to compliance due diligence.

8. Version history

V4.1 changes the product naming only: the sensing unit is now the **GX-6 Axle Load Sensing Unit** (previously published as “GX-6 Intelligent Load Sensing Unit”). No specification has changed since V4.0.

Version log — V4.1 (October 2026): product name updated, no specification changes. · **V4.0** (October 2026): alignment with the current product line, figures and compliance boundaries (table below). · **V3.2** (April 2026): previous published version, superseded.

The values below are the ones that apply today. If you hold an earlier version, refer to www.weigh2xtech.com/pdf/ for the current document.

Item	V3.2 (April 2026)	V4.0 / V4.1 (October 2026) — current
Sensing unit	GH-200	GX-6 Axle Load Sensing Unit
Terminal / controller	GC-50 edge computing controller (IP68)	NEW-T3000 in-cab terminal
Temperature drift	< 0.05 % FS/°C	≤ 0.01 % F.S./°C
Protection class	IP68	IP67 (dust-tight; 1 m immersion for 30 min)
System accuracy	±2 % FS	≤ ±1.5 % F.S. after professional installation & calibration (1-2 % vs weighbridge in field tests)
Resolution	0.02 %	0.03 % F.S. (repeatability 0.1 % F.S.)
Interface	CAN, up to 32 devices	CAN 2.0B extended frames, 500 kbps, up to 32 units, bus ≤ 50 m; J1939 supported

9. About WalkHorizon / WEIGH2x

WalkHorizon Technology (Beijing) Co., Ltd. is more than an R&D company. Founded in 2010 by a team with backgrounds from Tsinghua University and Oracle, we build and support precision sensing and measurement systems — for vehicle axles, data-centre infrastructure and bridge bearings. WEIGH2x TECH is the on-board weighing and axle load sensing brand.

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