



Vision-Based Gap Measurement System

Automated elongation monitoring for railway sleeper stressing units

±0.1–1 mm
TYPICAL ACCURACY

±10°
ANGLE TOLERANCE

≤ 1 s
PLC CYCLE LIMIT

2 Devices
PER BENCH (L+R)

8 Markers
MARKER DETECTION

CHALLENGE

HTS wire must reach a defined elongation on the stressing bench. Manual gauging is slow and unsafe. The current **4-sensor laser method** shows **±2–5 mm observed** accuracy under plant conditions (alignment drift, reflectivity, vibration).

HARDWARE COMPARISON

Factor	Laser — 4 Sensors (Current)	Vision — 2 Devices + 8 Markers
Active sensors	4 lasers (2 per side)	2 devices (1 per side)
Markers / plates	4 measuring plates	8 markers (4 per side)
Practical accuracy	±2–5 mm observed	±0.1–1 mm typical
Angle / vibration	Precise aim; drift under movement	±10° + filtering / signal hold
Marker feedback	No image feedback	Fault if target missing
PLC / repair	4 analog channels; typically replace sensor	Modbus TCP; markers low-cost swap

SOLUTION

2 vision devices + 8 markers (4 per side: Marker Plate 1 on bench, Plate 2 on anchor). Typical practical accuracy **±0.1–1 mm**. Feeds one stressing PLC via Modbus TCP — half the active sensors vs laser.

HOW IT WORKS

1

Fit Markers
Plate 1 + Plate 2, top & bottom (2–5 s)

2

Position Cameras
1 device per side reads all 4 markers

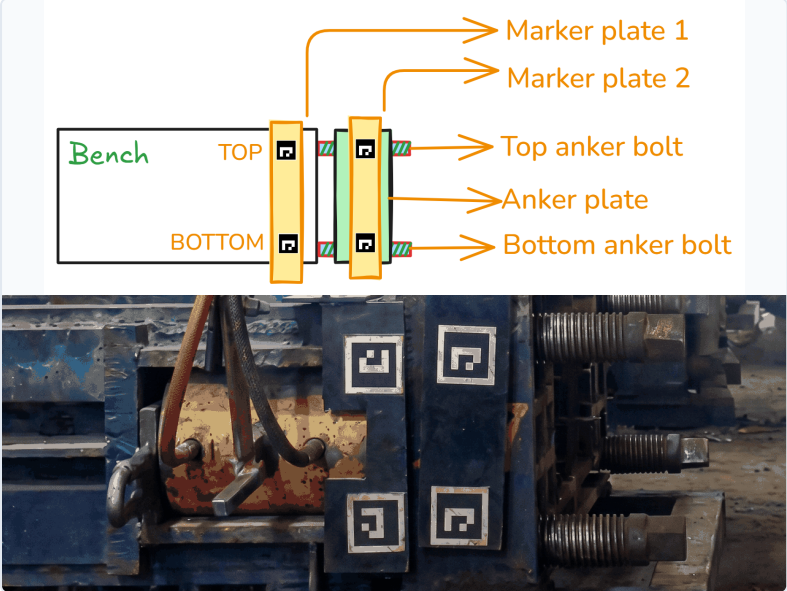
3

Monitor Pull
Gap to PLC within 1 s cycle limit

4

Auto Stop
Halt at target; log for traceability

MEASUREMENT LAYOUT



KEY BENEFITS

Higher Accuracy
±0.1–1 mm typical vs ±2–5 mm laser.

Faster Cycles
Continuous read; meets ≤1 s PLC limit.

Operator Safety
Remote view — no tension-zone entry.

Traceability
Digital log per sleeper cast.

Angle & Vibration
±10° mount + onboard filtering.

Lower Repair Cost
Markers swap cheaply; parts replaceable.

PLC INTEGRATION

- Gap (mm) — live extension vs setpoint
- Faults — missing marker, blocked view, stop
- Heartbeat — device online before cycle
- Cross-side — uneven tension / misalignment

DEPLOYMENT

- Team: 2 operators (L/R) + 1 in-charge
- Setup: plates + camera in 2–5 s per side
- Stays on stressing unit — not to curing
- Standards: IS 1785-I, IS 6006, IRS T-39