CATENARY EYE is an advanced OCS inspection system developed by Meidensha’s latest image processing technology on edge detection and pattern-matching.

Stability of overhead catenary system is essential for safe transportation of railroad. Inspection and analysis system of overhead catenary system, CATENARY EYE, was developed by Meidensha Corporation based on own advanced image processing technology. CATENARY EYE offers cost-effective maintenance service solution for overhead catenary system to world-wide railroad.

**Product Concepts**

**Easy OCS Maintenance**
- Replay of captured image and measurement data in synchronization.
- Recognition of abnormal data and location by pictorial image data with mileage.
- Manual wear measurement.

**Installation on Various Cars**
- Measurement with operation service speed.
- Flexible measurement schedule.
- Compact design using cameras.
- Installation on various vehicles and cars including commercial service cars.

**Method of Measurement**
- Image processing / Off-line data processing.
- Analysis and reports generated from captured data at any time.

**Night and day measurement**
- Advanced image processing system enables night and day measurement.
- Dynamic light control.

**Accurate location**
- Chainage is obtained through OBC, axle sensor and so forth.
- Direct detection of pull-off arms.

**Inspection / Measuring Items & Methods**

- **Wear and Stagger of contact wire**
  - To measure contact wire wear, Line sensor scans the wearing surface of the contact wire. The remaining diameter is calculated from the width of the wearing surface. Inclined wears are also measured by using mathematical method.
  - Stagger is calculated from displacement from the center of the track.
  - If an abnormal point is detected, the inspector is able to check the visual image data and measure both stagger and wear by clicking on the image data with the mouse directly.
  - **<Accuracy>** Remaining diameter : ±0.1mm, Stagger : ±5mm, Sampling step : (≤3cm)

- **Height and Gradient of contact wire**
  - To measure contact wire height, Line sensor scans the vertical range of the pantograph and locates the attached marker on the pantograph head. The top-end of the pantograph is found by an image analysis.
  - Gradient is calculated between pole span by heights.
  - **<Accuracy>** Height : ±5mm, Sampling step : (≤3cm), Hard Spot : ±0.5G, Sampling rate : 1kHz

- **Contact force / Hard spot**
  - Contact force of the pantograph is calculated by an addition of forces, the reaction force of the inner spring, inertia, and aerodynamic force.
  - **<Accuracy>** Based on EN50317 : 2012

- **Contact loss**
  - Detect certain UV (Ultraviolet) rays when arcing occurs between the pantograph and contact wire.
  - **<Accuracy>** Based on EN50317 : 2012

- **Monitoring**
  - Pantograph monitoring
  - OCS poles monitoring
  - OCS facilities monitoring
  - Monitoring OCS facilities, clipping, and classifying them from the video file for visual inspection.

- **Detection of pull-off arms**
  - To find general location of chainage, detect pull-off arms by laser beam sensor.

- **Geometry between mainline and crossover**
  - Measurement of height differences between mainline and crossover line at a defined stagger.

- **Geometry between pantograph and pull-off arms**
  - Inspection of applied angle of pull-off arms on captured image by measuring the angle of the pantograph head and pull-off arms.
System Configuration

Camera Box for Height / Hard spot measurement and Pantograph monitoring

Illumination for Pantograph

Illumination for Catenary wire

Camera Box for Stagger and Wear measurement

Rooftop Equipment

Measurement data (via Optical Cable)

Speed / Mileage data from Axle-sensor

Station PC

Image analyzing and data processing

Station PC Screens

Pantograph monitoring

Contact wire wear image

Inspection Report in Chart Form

Inspection Report in Tabular Form

Dynamic Linking among image data and numeric data

Interior Equipment Screens

Pantograph monitoring

Operation Screen (Multi Language User Interface)

OCS poles monitoring

Data Capture and Storage

Interior Equipment

Camera Box for Stagger and Wear measurement

Illumination for Pantograph

Camera Box for Height / Hard spot measurement and Pantograph monitoring

Illumination for Catenary wire

Measurement data (via Portable SSD or HDD)

- Recorded Camera data
- Speed/Mileage data

Station PC

Image analyzing and data processing

Measurement data (via Optical Cable)

Speed / Mileage data from Axle-sensor

Rooftop Equipment

Interior Equipment

Data Capture and Storage
On-board Unit Installation Categories

Class 1: High Speed Rail / Shinkansen Commercial service Car

Features
- All rooftop equipment is built into the rooftop cover in order not to affect the aerodynamics of the pantograph.
- The contact force measurement using a non-contact method is the first application case in the world.
- Running Speed: Up to 350km/h.
- Daytime and Nighttime measurements.

Measurement Items
- Height, Stagger, Wear, Gradient, Pantograph monitoring, Geometry between mainline and crossover, Contact force, Contact loss
- Optional: Geometry between pantograph and crossover

Class 2: Conventional Commercial Service Car

Features
- Non-inspection time: Use for commercial service (Interior Equipment is removable).
- Inspection time: Install Interior Equipment on the out-of-service train.
- Running Speed: Up to 160km/h.
- Daytime and Nighttime measurements.

Measurement Items
- Height, Stagger, Wear, Gradient, Hard spot, Pull-off arms detection, Pantograph monitoring
- Optional: OCS poles monitoring, Contact loss

Class 3: Conventional Dedicated Inspection Car

Features
- All equipment installed on the rooftop and interior.
- Running Speed: Up to 120km/h.
- Daytime and Nighttime measurements.

Measurement Items
- Height, Stagger, Wear, Gradient, Hard spot, Pull-off arms detection, Pantograph monitoring, Geometry between pantograph and crossover, Geometry between pantograph and pull-off arms.
- Optional: Contact loss, OCS poles monitoring, OCS facilities monitoring

Class 4: Maintenance Vehicle / Road-rail Vehicle

Features
- Static measurement without pantograph.
- Rooftop equipment and interior equipment are removable.
- Laser sensor for height measurement.
- Running Speed: Up to 40km/h.
- Nighttime measurement.

Measurement Items
- Height, Stagger, Wear, Gradient
- Optional: Pantograph monitoring, Pull-off arms detection
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