

	Technical Specification for Verification and Inspection of Inductive Loop Speedometers	S/N	CNMV 204										
		Rev.	1										
1. These Technical Specifications are developed pursuant to Paragraph 2, Articles 14 and 16 of the Weights and Measures Act. 2. The date of promulgation, document number, date of enforcement and content of amendment are listed as follows: <table><tr><th>Rev.</th><th>Date of Promulgation</th><th>Document No. (Ching-Piao-Szu-Tsu)</th><th>Date of Enforcement</th><th>Content of Amendment</th></tr><tr><td>1</td><td>12.07.2009</td><td>09840005980</td><td>01. 04. 2010</td><td></td></tr></table> 3.Reference standards: A. ASTM E 2561-07 Standard (2007) B.Holland’s Standard of DRAFT REGULATIONS POLICE MEASURING INSTRUMENTS (2007) C. OIML D11 Standard (2004) D. Swiss verification form of METAS (2006) E. German PTB-A18.11 Standard (2006)				Rev.	Date of Promulgation	Document No. (Ching-Piao-Szu-Tsu)	Date of Enforcement	Content of Amendment	1	12.07.2009	09840005980	01. 04. 2010	
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NO GUARANTEE ON THE TRANSLATION

In case of discrepancies between the English translation and Chinese text, the Chinese text shall govern.

1. Scope:

- 1.1 This specification applies to inductive loop speedometers with photo-taking device (hereafter “inductive loop speedometer”) for law-enforcement applications subject to verification.
- 1.2 This specification only applies to inductive loop speedometers with rectangular sharp of loop buried under pavement.
- 1.3 An inductive loop speedometer shall contain two sets of inductive loops. The principle for measurement is as below:
Take the time difference between a moving target-vehicle passing through the first set and the second set of inductive loops,
Divide the corresponding distance of two set of inductive loop by the time difference taken from above step. The quotient is the speed of the detected car. The speed shall be displayed on the control panel inside the control box which equipped a photo-taking device to take the photo at the detected car automatically and simultaneously when the speed high than a pre-set value.

2. Terms and Definitions:

- 2.1 Inductive loop speedometer: The hardware of inductive loops speedometers consists of inductive loops and a control unit (main part). Its components shall include lead-in electric wire, a terminal box, lead-in cable and related equipment. The installation diagram is as shown in Fig. 1.

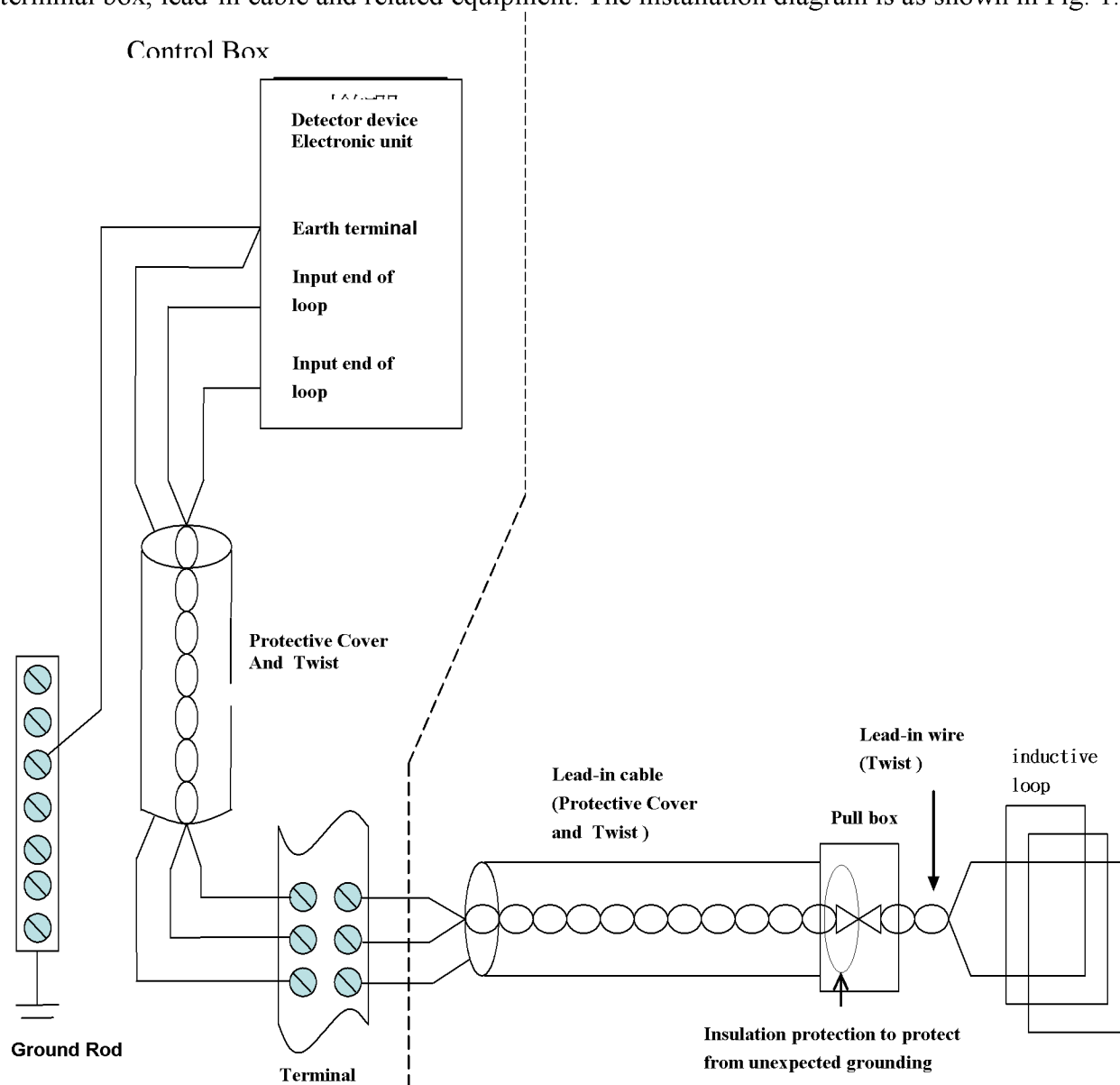


Fig. 1. Installation of inductive loop speedometer

- 2.2 Inductive loop: One loop or multiple loops of electric wire buried into a sawed kerf on the pavement.
 - 2.3 Inductance: Under a specified frequency, using an inductance meter measures the volume of inductive loops. The unit inductance is micro-henry (μH).
 - 2.4 Lead-in wire: The extended part of inductive loops extends from the end of the inductive loops under pavement to the pull box.
 - 2.5 Lead-in cable: Cable connects with the pull box and the lead-in wire in the pull box and extends from the box to the main.
 - 2.6 Pull box: A container contains the joint parts of the lead-in wire and the lead-in cable.
 - 2.7 Insulation resistance: The resistance measured with a megohmmeter between a conductor and the outer insulating jacket of a wire or cable.
3. General requirements:
- 3.1 When each type is sent for initial verification for the first time, the following documents shall be provided:
 - (1) Documents to identify the inductive loop speedometer under test is specific used.
 - (2) User manual and product specification (including operation instruction, electrical specification of the laser speedometer, measurement method, error range, photo-taking device-included complete assembly drawing, and related techniques data, etc.) .
 - (3) Photo-taking device mountable documents or certificates.
 - 3.2 When an inductive loop speedometer is sent for verification, photos taken by the speedometer under test at each lane where the inductive loops installed shall be submitted as well. The photo shall clearly distinguish the information such as the serial number of the main part, plate number, time (including year, month, day, hour and minute), number of the lane, speed, location of installation, etc.
 - 3.3 Inductive loop speedometers shall be installed and used properly as manufacturer's manual.
 - 3.4 After an inductive loop speedometer passes verification, the software installed on the main part and the accompanied inductive loops cannot be changed that may affect the accuracy of measurement.
 - 3.5 After the installation, the procedure of the verification of inductive loops shall be implemented at the site of the location of installation.
 - 3.6 The owner of the speedometer shall be responsible for maintenance and repair, so as to maintain the stability of the inductive loop speedometer
 - 3.7 If the inductive loops frame deformed or disappeared from the site of installation due to road construction or other factors, the owner shall apply for re-verification after reconstructing and installing inductive loops.
 - 3.8 The main part shall be used fixedly, accompanied with multiple sets of loops of single directions in a single intersection. If it is moved to another place, an application for its re-verification should be made, and the original certificate of verification should be returned as well. The location for installing the main part and the loops shall be recorded on the qualification certificate of verification.
 - 3.9 When implementing the verification of installed inductive loops on-site, the police agency shall detach police officers to do traffic control, so as to ensure the safety of the verification technicians.
 - 3.10 An inductive loop speedometer shall be built-up the function of identifying false signals of speed.
 - 3.11 An inductive loop speedometer shall automatically detect and measure at least three sets of statistic speed data, aimed at the target vehicle that is moving in different locations continually, within a timeframe in a fixed distance

4. Verification and inspection equipment

4.1 The evaluation of the uncertainty to the verification and inspection equipment: shall be down before the verification and inspection equipment can be used and the verification and inspection equipment shall be traceable to national standards. The requirements for the equipment shall include:

- (1) Distance measuring equipment: resolution ≤ 1 cm,
- (2) LCR meter: the alternating current frequency used for measurement shall be 1kHz, and the minimum measurability of inductance shall be more than 10 μ H; the resolution of the resistance value shall be $\leq 0.1\Omega$,
- (3) Insulation tester: capable producing direct current voltage at least above 500 V; capable measuring resistance at least above 500 M Ω ,
- (4) Speed detection simulation system,
- (5) Thermostated container or thermometer: resolution $\leq 0.1^{\circ}\text{C}$.

5. Structure

5.1 On the control unit (main part), the inductive loop speedometer shall bear the following information:

- (1) Name or trademark of the manufacturer,
- (2) Model number and the serial number,
- (3) Specification of power supply.

5.2 The control unit (main part) of the inductive loop speedometer and its accessories, including the power cord and necessary ancillary devices for verification, shall be fully equipped.

5.3 All the switches, buttons, and knobs of the control unit (main part) of the inductive loop speedometer and its accessories shall function smoothly and reliably. There shall be no bad contact, loosening or arrearage with the operation.

5.4 The speed indication of the inductive loop speedometer shall be expressed as kilometers per hour (km/h).

5.5 The resolution of the speed indication of the inductive loop speedometer shall be ≤ 1 km/h

5.6 The speed detection range of the inductive loop speedometer shall at least cover the range from 30 km/h to 240 km/h.

6. Verification and inspection procedure

6.1 Structure and specifications of an inductive loop speedometer shall be verified and inspected in accordance with the following items and order:

- (1) Structure,
- (2) Distance between two sets of inductive loops (shall be implemented at the site of the installation) ,
- (3) Inductance and resistance of inductive loops (shall be implemented at the site of the installation)
- (4) Insulation resistance of inductive loop (shall be implemented at the site of the installation) .
- (5) Speed detection accuracy.
- (6) Temperature-resistant test (this item shall only be implemented on the main part for initial verification) .

6.2 Verification of the corresponding distance of two sets inductive loops:

The verification of the corresponding distance shall be implemented at the site of the installation and takes 6 distance as shown in Fig. 2

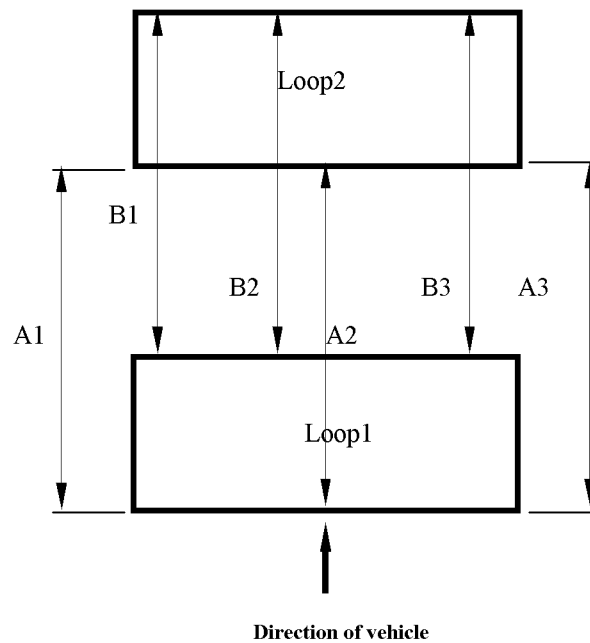


Fig. 2. Distances of A1, A2, A3, B1, B2, and B3, between two sets of inductive loops

6.3 Verification of the inductance value and resistance value of the inductive loop:

When do verification of the inductance value and resistance value, the two ends of the circuits of the terminal blocks of the inductive loops shall be connected with a LCR meter to measure the inductance value and resistance value with 1 kHz of current frequency, as shown in Fig. 3.

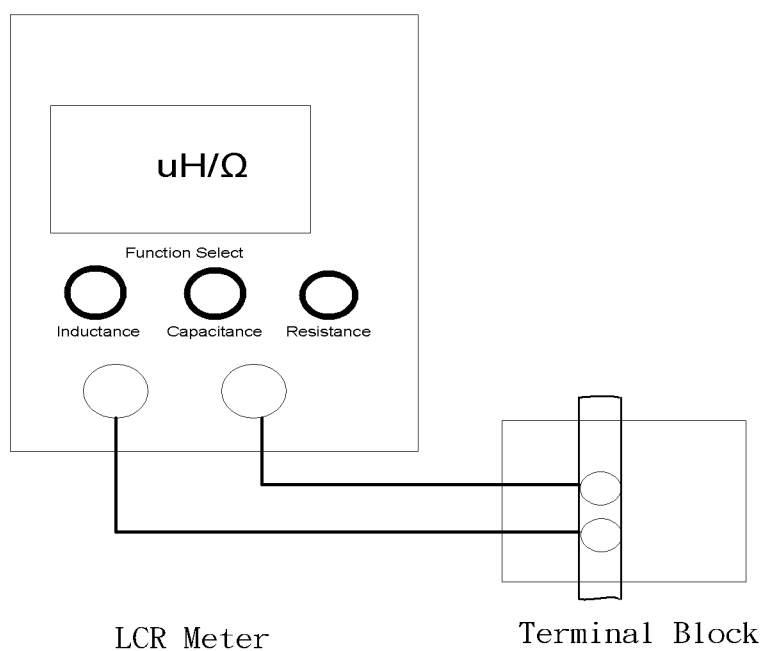


Fig. 3. Inspection of inductance value and resistance value of an inductive loop

6.4 Verification of the insulation resistance value of an inductive loop:

An insulation resistance meter with 500V of direct current shall be used when do the verification of the insulation resistance value of an inductive loop. The positive terminal of the insulation resistance meter shall be connected to the terminal block of the inductive loop, while the negative terminal is grounded, so as to measure the insulation resistance of the inductive loop, as shown in Fig. 4.

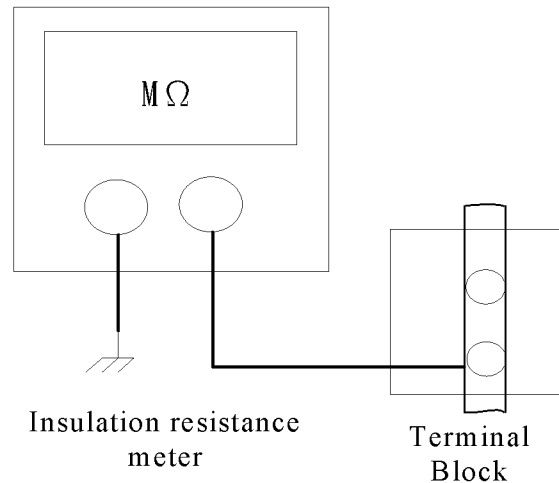


Fig4. Inspection of the insulation resistance value of an inductive loop

6.5 Verification of speed accuracy:

The verification of the speed accuracy of the control box (main part) of the inductive loop speedometer is shown as Fig. 5. The verification procedure is as follows:

- (1) The verification of the speed accuracy is implemented in a laboratory; the speed simulation verification system is connected to the tested main part, as shown in Fig. 5.
- (2) The distance between the two sets of inductive loops in the speed simulation inspection system shall be set as the same as that in the real inductive loops which correspond to the main part under test.
- (3) Corresponding to the set speed, the speed simulation verification system produces standard signals as a simulated vehicle passing the inductive loop, and then transmits them to the tested main under test.
- (4) The verification of speed accuracy shall conduct at least ten sets of speed.
- (5) The main part under test shall conduct verification according to the number of applicable lanes.

Speed simulation inspection system

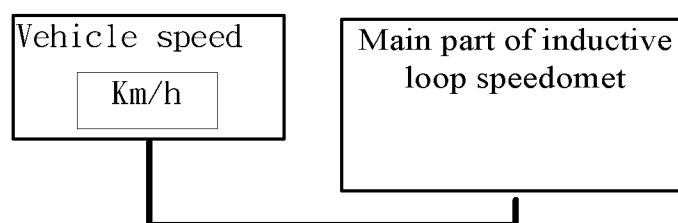


Fig. 5. Inspection of the speed accuracy of the main part

6.6 Verification of the Temperature resistant test:

When implement the verification of Temperature resistant test, put the main part of the inductive loop speedometer in a thermostated container and then connect it to the speed simulation verification system outside the thermostated container, and then turn them on (as shown in Fig. 6). When the temperature inside the thermostated container (or thermometer) has reached 55 °C and keeps steady for 30 minutes, conduct the verification as the procedure of paragraph 6.5.

Speed simulation inspection system

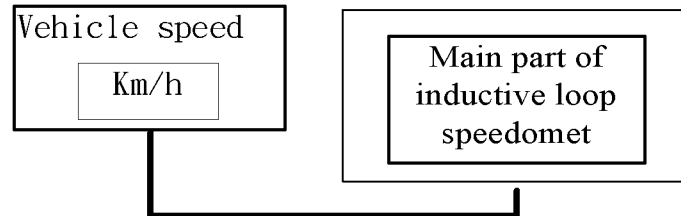


Fig.6 Inspection of the Temperature Effect on the main part

7. Maximum permissible errors for verification and inspection

7.1 Maximum permissible errors for verification of an inductive loop speedometer:

- (1) Distance between two sets of inductive loops: shall be 2.0 m or 2.5 m; the maximum permissible error shall be $\pm 0.5\%$.
- (2) Inductance value of inductive loop: the inductive loops under test shall at least be composed of two laps and the LCR meter shall be under 1 kHz of current frequency; the testing value shall be $\geq 39\mu\text{H}$.
- (3) Resistance value of an inductive loop: Resistance value $< 3 \Omega$.
- (4) Insulation resistance value of inductive loop: Insulation resistance value $> 100 \text{ M}\Omega$.
- (5) Speed accuracy: $\pm 2 \text{ km/h}$, when speed value $\leq 100 \text{ km/h}$; $\pm 3 \text{ km/h}$, when speed value $> 100 \text{ km/h}$.
- (6) Under the Temperature resistant test, the maximum permissible errors for verification of speed inspection are the same as the maximum permissible errors for verification of speed accuracy in (5).

7.2 The maximum permissible errors for the inspection of inductive loop speedometer are the same as the maximum permissible errors for verification.

8. Compliance marks and period of validity of verification

8.1 The period of validity of verification is 1 year, commencing from the day that a verification compliance mark is affixed to the speedometer, and expiring on the first day of the following month of the following year.

8.2 The placement of verification compliance tag of an inductive loop speedometer shall be obvious and stuck on the cover of the main part

8.3 After the speedometer passes verification, a verification compliance certificate shall be issued.