



# **TAXIMETER SPECIFICATION**

**Specification for a Taximeter to be approved for the use  
in a London Taxi**



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## Foreword

This specification supersedes the Transport for London Public Carriage Office Taximeter Specification 2006 which is hereby withdrawn.

## Preface

This document provides guidance for those involved with the design, manufacture, testing, maintenance and installation of taximeters for use in licensed London taxis. This specification document describes how those standards will be assessed.

Transport for London (TfL) reserves the right to amend this specification document, should there be situations which require it, such as changes in UK and EC legislation, EC Directives and to reflect, where applicable, current industry standards and best practice. Notice of such amendments will be disseminated as soon as practicable prior to any implementation date and any changes will also be published via the TfL website.

## Introduction

This specification describes a series of requirements to demonstrate that taximeters used in the London taxis meet the Measuring Instruments Directive (MID) 2014/32/EU and OIML R21 together with other specific requirements as defined by TfL. The latter includes audit and tariff change tests and details the approval process for taximeters approved for use in London taxis.

The Measuring Instruments Directive applies to the devices and systems with a measuring function defined in the instrument-specific annexes concerning:

- a) water meters (MI-001);
- b) gas meters and volume conversion devices (MI-002);
- c) active electrical energy meters (MI-003), heat meters (MI-004);
- d) measuring systems for continuous and dynamic measurement of quantities of liquids other than water (MI-005);
- e) automatic weighing instruments (MI-006);
- f) taximeters (MI-007);
- g) material measures (MI-008);
- h) dimensional measuring instruments (MI-009);
- i) exhaust gas analysers (MI-010).

The Annex for taximeters includes specific requirements for construction and performance as detailed in OIML R21.

## 1. References

The following referenced documents are indispensable with regard to the application of this document and for any taximeter manufacturer requiring approval of their product prior to installation in London taxis. For dated references, only the edition cited applies. For undated references the latest edition of the referenced document (including any amendments applies).

**Measuring Instruments Directive (MID)** - Directive 2014/32/EU of the European Parliament and of the Council of 31 March 2014 on Measuring Instruments - Annex MI-007; Official Journal of the European Union L135. This is implemented into UK Law by Statutory Instrument 2016 No 1153; Weights and Measures; The Measuring Instruments (Taximeters) Regulations 2016.

**OIML R21 2007:** Taximeters, Metrological and technical requirements, test procedures and test report format.

**BS EN ISO 17025:** General requirements for the competence of testing and calibration laboratories.

**BS EN ISO/IEC 17020:** Conformity assessment - Requirements for the operation of various types of bodies performing inspection.

**BS ISO/IEC 27002:** Information technology - Security techniques - Code of practice for information security management.

**ECE 10.04:** Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility.

**EC661/2009:** Concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units.

**2007/46/EC** Directive of the European Parliament and of the Council of September 5, 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles.

**Transport for London Public Carriage Office Taximeters and Taximeter Receipt Printers** – Specification for the Provision of an Installation Service.

**London Cab Order 1934,** Regulations as to Taximeters and Fares for Motor Cabs, Part VI, 38; Lighting of taximeters and taxi signs and 40; Fares for motor cabs.

## **2 Terms and definitions**

For the purposes of this specification, the terms and definitions set out in the Measuring Instruments Directive (MID) Directive 2014/32/EU and OIML R21 apply together with those below:

### **2.1 Audit test**

Series of standardised tests and checks performed at regular intervals on each taximeter to demonstrate continued compliance with this specification and programmed tariff structure.

### **2.2 Tariff change test**

Series of prescribed tests performed on representative taximeters to verify that they have been correctly programmed to display the correct fares on receipt of a specified number of pulses or after an elapsed time period in accordance with the tariff structure agreed by TfL.

### **2.3 Type test**

Series of prescribed tests performed on a taximeter to confirm that it meets the requirements of the Measuring Instruments Directive, OIML R21 and this specification.

## **3 Requirements**

### **3.1 General**

#### **3.1.1 General requirements**

For the purposes of this specification taximeters shall meet the performance requirements of the Measuring Instruments Directive and OIML R21, in addition to those indicated below:

#### **3.1.2 Device constant**

The taximeter device constant 'k' shall be represented as pulses generated per kilometre and be capable of being adjusted to match the appropriate vehicle's 'w' factor. Where 'k' is the number of pulses the taximeter must receive to register a kilometre travelled.

The 'w' factor being the number of pulses generated by the vehicle in normal operating condition and recorded over a measured km.

#### **3.1.3 Fare units**

The units of fare shall be displayed in pounds sterling (£) and pence (p).

#### **3.1.4 Operating positions**

The operating positions shall be 'FOR HIRE', 'HIRED' and 'STOPPED'.

The fare calculation based on distance shall continue to operate when the meter is in 'STOPPED' mode.

#### **3.1.5 Tariff structure**

The tariff structure is currently calculated in normal mode S (single application of tariff) - see Measuring Instruments Directive Annex MI-007 and OIML R21 Cross-over speed is as specified in the London Cab Order 1934, 40; Fares for Motor Cabs.

Periodic updates to the tariff structure and fare rates, including cross-over speed and increments for the "Extras" key, will be determined and issued by TfL. These updates may include differing rates according to time of day, date or value of fare.

### 3.1.6 Language

The taximeter display, markings and instructions shall be in the English language.

## 3.2 Physical requirements

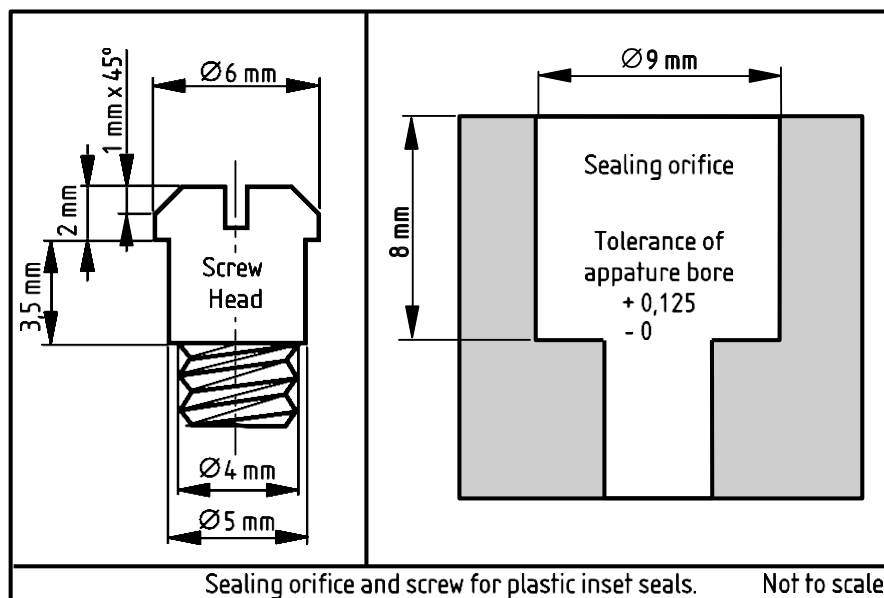
### 3.2.1 Sealing points

Each taximeter shall be fitted with recesses or other approved sealing devices, as approved by TfL:

- To receive a seal to cover the fitting screw attaching the taximeter to the body of the vehicle. Typical recess dimensions shall be 9.00 – 9.125 mm diameter and 8.00 – 8.25 mm deep (see Figure 1 for dimensions);
- To receive a seal to indicate the year and month of audit testing. Typical recess dimensions shall be tapering from 9.3 – 9.5 mm at the mouth to 10.5 – 11.0 mm at the root which shall be 2.4 - 2.6 mm deep;
- If applicable, to seal the cover to any port where the '*k*' constant and the tariff can be changed.

All seals must be of a tamper proof design and be incapable of reuse when removed; new seals must be used upon resealing.

**Figure 1**



**Design of sealing socket for screw securing the taximeter to the body of the vehicle**

### **3.2.2 Tariff identification**

The tariff programme contained within the taximeter shall be clearly identified by a colour code as directed by TfL. This identification may be in the form of a spot having a visible area of not less than 5mm diameter or as a homogeneous coloured tariff programme cover. It must not be accessible nor shall it be possible to gain access to the components permitting the change of tariff or, with the exception of an approved disabling device, to make any functional adjustments to the meter without breaking the approved seals.

### **3.2.3 Electronic tariff injection methods**

In the event that tariff identification is electronically displayed by use of an appropriate coloured code the colour code shall be constantly illuminated at a suitable intensity to facilitate identification whilst the taximeter is in use. When the taximeter is not in use the colour code may be either constantly illuminated or flashing. Access to the electronic tariff update portals will not be permitted unless the interface link is encrypted and contains security measures that prevent any form of unauthorised adjustment of the installed firmware/software. (Declaration of this shall be supplied by the taximeter manufacturer as part of the approval process).

**3.2.4 Securing the integrity of the Taximeter.** The taximeter and its functions shall not be influenced in any inadmissible way by the connection of any unauthorised device either directly or remotely. The taximeter must be capable of providing evidence of any unauthorised intervention.

See Measuring Instruments Directive Annex 1 para 8 and OIML R21 clause 5.2. All taximeters must be compliant with the above not later than 1 November 2016.



### **3.2.5 Unit Display**

All characters displayed shall be clearly visible and 10mm or greater in size. In accordance with OIML R21 (paragraph 4.9.1).

## **3.3 Tolerances**

### **3.3.1 Pulses**

The tolerance on the number of pulses required to effect a change in the fare displayed by a taximeter shall be  $\pm 0.1\%$  (see Measuring Instruments Directive Annex MI007 clause 7, OIML R21 clause 3).

### **3.3.2 Time**

The tolerance on the time taken to effect a change in fare for the taximeter fitted to a taxi shall be  $\pm 0.1\%$  (see Measuring Instruments Directive Annex MI007 clause 7 and OIML R21 clause 3).

### **3.3.3 Electromagnetic compatibility**

Reference shall be made to ECE 10.04 (as amended) in regard to e-marking of electronic sub assemblies (ESA) , installed in taxis.

## **3.4 Peripheral devices**

### **3.4.1 Printers**

The use of printers shall comply with "Transport for London Public Carriage Office Taximeters and Taximeter Receipt Printers – Specification for the Provision of an Installation Service".

### **3.4.2 "For Hire" lamp**

The taximeter shall be constructed to operate light boxes in accordance with the London Cab Order 1934, Regulations as to Taximeters and Fares for Motor Cabs, Part VI, 38 lighting of taximeters and taxi signs.

### **3.4.3 Lamp Boxes**

A taximeter shall be connected with associated external lamp boxes, to show the appropriate blue or yellow light to the vehicles nearside. The blue lamp lens or panel shall have an area not less than 1060 sq.mm. The yellow lamp lens or panel shall have an area not less than 2750 sq.mm and be permanently marked with the words 'FOR HIRE' in contrasting capital letters. The height of the letters shall not be less than 16mm. The lenses of any lamp box shall not be interchangeable.

## **4 Testing**

### **4.1 General**

Taximeters for use in the London shall be subject to performance tests by a Notified Body under the Measuring Instruments Directive or by a laboratory assessed and accredited as meeting the requirements of BS EN ISO 17025. All test laboratories so accredited must also meet the "Requirements for inspection bodies (Type A)".as laid out in Annex A, Paragraph A.1: of BS EN ISO/IEC 17020.

Any laboratory so designated and accredited must also be approved to operate by TfL prior to engaging in audit or performance testing.

Only a Notified Body may carry out Type testing of taximeters prior to approval by TfL. Flow charts for testing are given in Annex A to C below.

## **Type test (See Annex A)**

### **4.1.1 Laboratory tests**

A sample of each type of taximeter shall be submitted to a Notified Body as described under the Measuring Instruments Directive together with full written operating instructions and all necessary equipment to adjust the time and date of each taximeter. All taximeters shall be type tested in accordance with the requirements defined in the Measuring Instruments Directive, OIML R21 and the current TfL Taximeter Specification.

### **4.1.2 Road tests**

Prior to approval by TfL an MID compliant taximeter must undertake a road test consisting of a minimum of 250 hirings and 500 paid miles. These shall be verified by an approved taximeter installer and all road tests shall be performed using a London licensed taxi.

## **4.2 Tariff change test (See Annex B)**

TfL will periodically notify the approved taximeter installers of any change to the tariff for taxis in the London area. The proposed tariff will be circulated by TfL and its implementation shall be verified using the method described in Annex B.

The testing shall be performed on each meter type using each device's k value constant expressed in pulses per km.

## **4.3 Audit or routine test (See Annex C)**

Audit or routine testing of taximeters shall be performed at least once within 12 calendar months from date of last test, on each type of taximeter, by performing the required tests in accordance with Annex C.

All TfL approved laboratories shall be required to supply ongoing detailed records of all audit or routine testing in a format, and frequency, outlined by TfL prior to approval. All paper records being retained by the laboratory for a period of not less than 12 months.

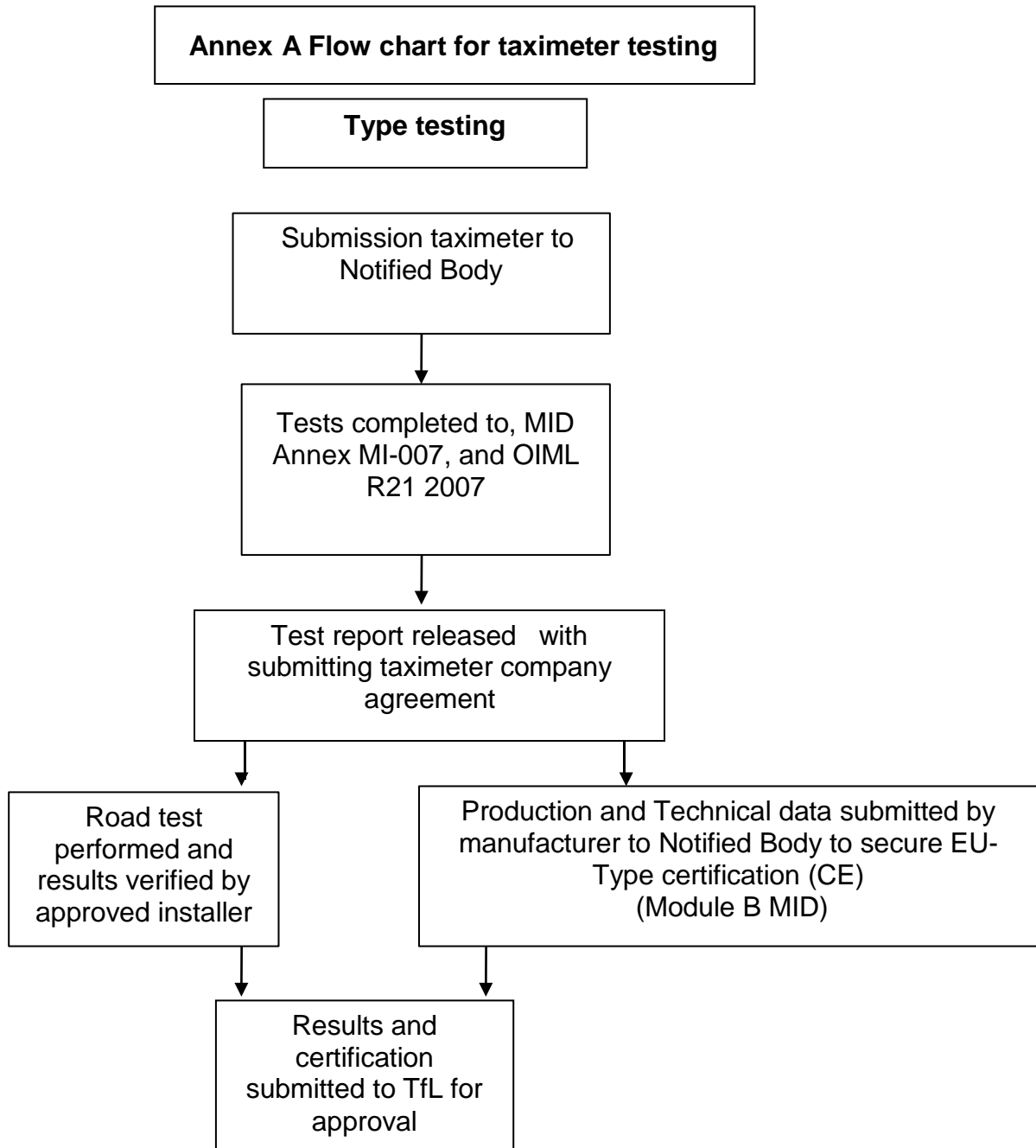
The taximeter shall then be sealed with a seal as described in **4.2.1 (b)** to indicate the month and year of testing.

If a taximeter model has not been submitted for routine testing for a period of 12 calendar months, from date of last test, then TfL may remove its approval for use in London taxis.

#### 4.4 Marking

All taximeters shall be clearly and permanently marked to the front of the device with the information required in Measuring Instruments Directive (MID) Directive 2014/32/EU and shall include the device constant  $k$  in pulses per km.

Reference should also be made to the marking requirements of the Measuring Instruments Directive and the Statutory Instrument 2016 SI 1153.



## **Tariff change test (Annex B)**

### **5 General**

When the tariff in the Greater London area is changed the following tests shall be performed to demonstrate the correct calculation and display of fares. These tests shall be performed with the time and date of the taximeters set to activate the different tariff rates. For any changes in tariff rate that depends on a Bank or Public Holiday the dates shall be confirmed by TfL.

If the changes to a tariff are performed electronically, either by means of a SIM card or remotely utilising, for example, GSM/GPRS networks, or other means of transmission, then suitable security and encryption measures shall be in place to protect the transmission of data to each taximeter and the data held by each taximeter installer. Tariff change utilising communication over a computer network must ensure security utilising the communications protocol HTTPS and SSL/TLS encryption standards.

Security and integrity of the entire system (base station premises, equipment, procedures and personnel, taxi, taximeter and any associated equipment, such as a modem) of an 'Over the Air' (OTA) tariff change service must be of the highest suitable and appropriate standard. Suppliers of this service shall, as a minimum, be able to demonstrate they meet or exceed the relevant guidance, practices and standards as laid out in BS ISO/IEC 27002:2013 (Information technology- Security techniques-Code of practice for information security controls). With emphasis on the areas laid out in Annex D of this document.

Standards of security encryption and certification shall meet current industry best standards and shall, as a minimum, meet both FIPS 140-2 levels 2 and 3 certification and the standards of Common Criteria EAL4+.

Note: All associated encryption validation certificates must be kept current and up to date.

The proposed standards and security measures shall be demonstrated to TfL prior to any consideration of approval for use of this system.

Only UK Notified Bodies can provide the OTA transmission of tariff data to London taximeters. Taximeter manufacturers/suppliers of OTA tariff change enabled taximeters must supply the necessary equipment to the appropriate Notified Body to enable the provision of the OTA tariff change service.

#### **5.1 Samples**

Each manufacturer or taximeter agent shall submit, to a notified body or to a TfL accredited laboratory, meeting requirements of BS EN ISO 17025, two taximeters of each type and of each device constant 'k' value in pulses per km with the proposed tariff programmed for testing. Submitted taximeters shall be accompanied by full written instructions and all necessary equipment required to adjust the time and date of each taximeter.

## **5.2 Test procedure**

**A.0.1** Suitable dates and times shall be set on each taximeter to perform a series of tests to verify the following inputs in the proposed tariff:

**5.2.2** With each taximeter set to 'STOPPED' mode supply the agreed number of pulses to effect the first change in fare and a change in fare at any change in rate. The number of pulses taken to effect these changes shall be within the tolerances laid down by TfL (see **3.3.1**).

**5.2.3** With each taximeter set to 'HIRED' mode verify the time taken for the taximeter to display the first or other agreed change in fare and the time taken for that fare change to the equivalent of the fare at any change in rate in 'STOPPED' mode. The time taken shall be within the tolerances laid down by Transport for London (see **3.3.2**).

**5.2.4** With the taximeter set to a suitable alternative date or time to affect a different tariff rate the tests given in **5.2.2** and **5.2.3** shall be repeated.

**5.3** Repeat the tests given in **5.2.2** and **5.2.3** to verify any additional tariff rates or fare structures.

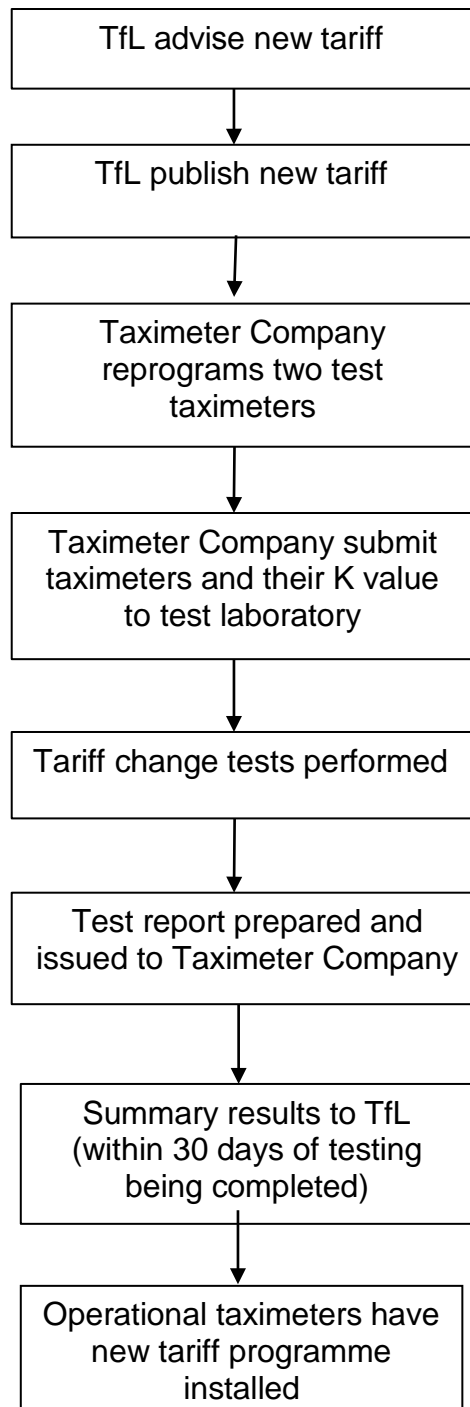
## **5.4 Test report**

The completed test report shall include all of the following information:

- a) The model and serial number of the taximeter;
- b) The submitter;
- c) Details of the testing performed;
- d) References to the equipment used to perform the tests;
- e) Dates and times set on the taximeters;
- f) Date of the tests.

This information must be submitted to TfL within 30 days of notification.

## Annex B Tariff change testing



## **Audit or routine testing of taximeters (Annex C)**

### **6 General**

**6.1** Taximeters shall be tested at a minimum frequency of once per year in accordance with the method described below to demonstrate continuing conformity.

**6.1.2** All taximeters shall be inspected to ensure that the appropriate London tariff colour identifier, applicable to the tariff in use, is in position.

**6.1.3** The taximeters shall not differ in construction from their relevant pattern meter.

### **6.2 Functional assessment of taximeter**

**6.2.1** Each meter shall be operated following the manufacturer's instructions to ensure that all features of the meter are operating correctly. Such tests shall include the correct operation of the following:

- a) Lights indicating 'FOR HIRE', 'HIRED' and 'STOPPED' operating positions;
- b) 'EXTRAS' button and display;
- c) Totalisers;
- d) Fare display;
- e) Modes;
- f) Date and time.

### **6.3 Performance tests**

**6.3.1** Each taximeter shall be tested for accuracy and distance using a suitable test rig.

**6.3.2** Pulses shall be injected to the taximeter to simulate the distance covered to the first agreed change in fare. The number of pulses taken to effect these changes shall be within the tolerances laid down by TfL (see **3.3.1**).

**6.3.3** A time test is to be conducted on at least 10% of all taximeters submitted for testing. The duration will take the taximeter to a suitable change in fare. The time taken shall be within the tolerances laid down by TfL (see **3.3.2**).

**6.3.4** In accordance with TfL requirements the taximeter clock display shall be correct to within 3 minutes, this shall be referenced to UTC (co-ordinated universal time).

### **7 Sealing**

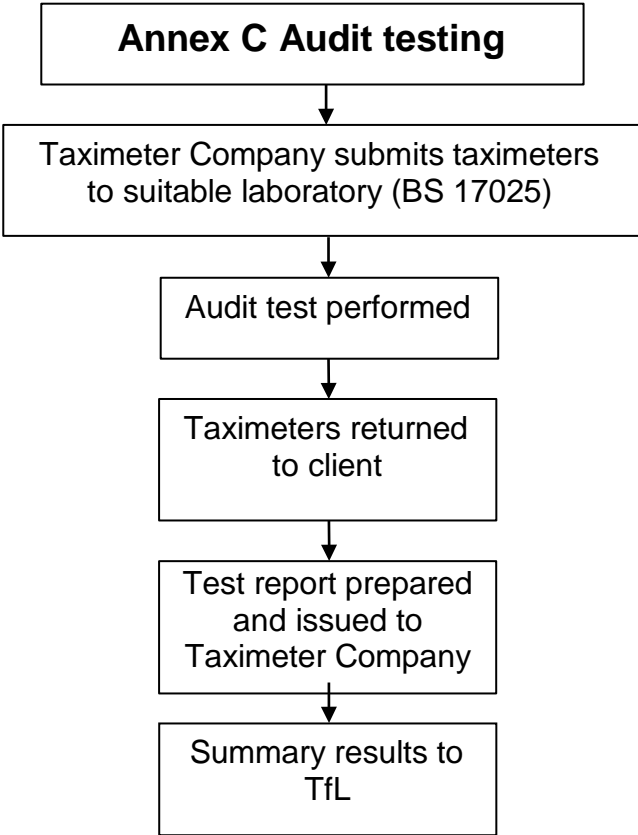
Taximeters that have met with the above requirements shall have the tariff access, or other agreed point, sealed by means of coloured plastic seals indicating the month and year of the test.

### **8 Test report**

The test report shall include the following information:

- a) The model, serial number and device constant k value of the taximeter;
- b) The submitter;
- c) Details of the testing performed;
- d) References to the equipment used to perform the tests;
- e) Date of the tests.

Taximeter manufacturers shall supply TfL with a summary of the testing including make, model number, serial number and a laboratory reference.





## **Annex D (Over The Air tariff update security requirements)**

To ensure the security and integrity of the entire 'Over the Air' (OTA) tariff change service the provider must publish a policy document implementing commonly accepted information security controls as outlined in ISO 27002 (*Information technology — Security Techniques — Code of practice for information security controls* (Clause 5.1.1 ISO 27002). The policy document must incorporate the clauses mentioned below contained within ISO 27002.

This required policy document should be divided into broadly four categories:

- Organisational security policies;
- Personnel security;
- Physical security; and
- Logical security (firewalls, data encryption)

This policy document should reference all relevant clauses incorporated within ISO 27002 and must include the following:

- Organisation of Information security (Clause 6)
- Access Control (Clause 9.1.1 (Access control policy) 9.4.1, 9.4.2)
- Personnel/employees who have access permissions permitting configuration changes, or other privileged access to OTA equipment (9.4.4, 9.4.5)
- Physical security to accessible areas containing OTA equipment and data (Clauses 10/11)
- Operational security of data (12.1, 12.2, 12.3, 12.4, 12.5, 12.6.2)
- Network Data protection (Clause 13)
- Information security incidents (Clause 16)
- Compliance (Clause 18)

The OTA tariff change service provider will be expected to demonstrate they meet the standards set out in their policy document. This will be subject to periodic auditing and compliance check by an independent service appointed by TfL.