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European cooperation in legal metrology

Guide for Measuring Instruments Directive 2004/22/EC
Taximeters Corresponding Tables
OIML R 21 2007 – MID-008 II

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WELMEC

European cooperation in legal metrology

WELMEC is a co-operation between the legal metrology services of the Member States of the European Union and EFTA. This document is the introduction to WELMEC.

WELMEC is publishing a number of Guides to provide guidance to manufacturers of measuring instruments and to notified bodies responsible for conformity assessment of their products. The Guides are purely advisory and do not themselves impose any restrictions or additional technical requirements beyond those contained in relevant EC Directives. Alternative approaches may be acceptable, but the guidance provided in these documents are representing the considered view of WELMEC as to the best practice to be followed.

Published by:
WELMEC Secretariat
BEV
Schiffamtsgasse 1-3
A-1020 Vienna
Austria

Tel: +43 1 211 10 2711
Fax: +43 1 211 10 4701

E-mail: welmec@bev.gv.at
Website: www.welmec.org

Taximeters
Cross Reference Table 2004/22/EC vs. OIML R 21 (2007)

Notes:

1. The column “Comments” indicates when necessary the relevant text of OIML R 21 and related explanations concerning the compliance with relevant MID requirement.

2. The column “Conclusion” gives the conclusion on the compliance between MID and OIML R 21 for the relevant requirement.

   The indication “Covered” means that:
   - The requirement of OIML R 21 is identical to the one of MID; or
   - The requirement of OIML R 21 is more severe than the one of MID; or
   - All the requirement of OIML R 21 fulfils MID requirements (even when MID allows other alternatives),
   - In case the requirement is not fully covered, a short statement explains what is covered.

   The indication “Not Covered” means that the MID requirement is either not compatible with the relevant OIML R 21 requirement or not included in OIML R 21.

   The indication “Not relevant” means that the MID Annex 1 requirement is not relevant for taximeters.

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
ANNEX 1			
1.1 Allowable Errors Under rated operation conditions and in absence of a disturbance, the error of measurement shall not exceed the maximum permissible error (MPE) value as laid down in the appropriate instrument-specific requirements. Unless stated otherwise in the instrument-specific annexes, MPE is expressed as a bilateral value of the deviation from the true measurement value.	2.4.5.4 2.5.5	*"Extreme values of an error permitted by specifications, regulations, etc, for a given instrument."* *"Conditions of use (e.g. reference conditions applicable in the IEC Standard) giving the range of values of the influence factors, for which the errors (of indication) of the EUT are required to be within the maximum permissible errors."*	**Covered**
1.2 Under rated operating conditions and in presence of a disturbance, the performance requirement shall be as laid down in the appropriate instrument-specific requirements. Where the instrument is intended to be used in a specified permanent continuous electromagnetic field the permitted performance during the radiated electromagnetic field-amplitude modulated test shall be within MPE.	 A.5.4.5	Specific requirement are addressed in the specific annex of MID: § 6.1, 6.2 (rated operating conditions); § 8.1, 8.2 (disturbances). *"immunity to electromagnetic fields"*	**Covered** **Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
1.3	The manufacturer shall specify the climatic, mechanical and electromagnetic environments in which the instrument is intended to be used, power supply and other influence quantities likely to affect its accuracy, taking into account of the requirements laid down in the appropriate instrument-specific annexes.	3.5.2	*"A taximeter shall maintain its metrological and technical requirements if the supply voltage varies from the lower and upper limits (Umin, Umax) of the nominal voltage supply for:* *(a) 12 V road vehicle battery voltage supply: lower limit is 9 V, upper limit is 16 V,* *(b) Other battery voltage supply specified by manufacturer with given lower and upper limits.* *A taximeter shall either continue to function correctly if there is a temporary voltage drop below the lower operating voltage limit or abort an existing measurement if the voltage drop is for a longer period (5.2.5)."* Other environments are addressed below	**Covered**

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
1.3.1 Climatic environments The manufacturer shall specify the upper temperature limit and the lower temperature limit from any of the values in Table 1 unless otherwise specified in the Annexes MI-001 to MI-010, and indicate whether the instrument is designed for condensing or non-condensing humidity as well as the intended location for the instrument, i.e. open or closed. Temperature limits: Upper temperature limit 30 °C; 40 °C; 55 °C; 70 °C Lower temperature limit 5 °C; -10 °C; -25 °C; -40 °C	3.5.1 5.1.2	*"The taximeter shall maintain its metrological properties within a nominal temperature range of –25 °C to +55 °C. There shall be a minimum temperature range of 80 °C with values to be chosen from lower limits of –40 °C, –25 °C, or -10 °C, and upper limits of + 40 °C, +55 °C, or +70 °C."* *"In addition to 3.5, an electronic instrument shall comply with the requirements under a relative humidity above 93 % when combined with cyclic temperature changes and condensation."*	**Covered**
1.3.2 (a) Mechanical environments are classified into classes M1 to M3 as described below M1: This class applies to instruments used in locations with vibration and shocks of low significance, e.g. for instruments fastened to light structures subject to negligible vibrations and shocks transmitted from local blasting or pile-driving activities, slamming doors, etc.			**Not relevant**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
	M2: This class applies to instruments used in locations with significant or high levels of vibration and shock, e.g. transmitted from machines and passing vehicles in the vicinity or adjacent to heavy machines, conveyor belts, etc.			**Not relevant**
	M3: This class applies to instruments used in locations where the level of vibration and shock is high and very high, e.g. for instruments mounted directly on machines, conveyor belts, etc.	A.5.4.4	Severity level for vibration tests of OIML R 21 correspond to the level M3 of MID and level M3 of OIML D 11. Mechanical shocks are not relevant, the taximeter being fixed to the car.	**Covered**
	(b) The following influence quantities shall be considered in relation with mechanical environments: - Vibration - Mechanical shock		See above.	**Covered**
1.3.3	(a) Electromagnetic environments are classified into E1, E2 or E3 as described below, unless otherwise laid down in the appropriate instrument-specific annexes.			
	E1: This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in residential, commercial and light industrial buildings.			**Not relevant**

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
E2: This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in other industrial buildings.			**Not relevant**
E3: This class applies to instruments supplied by the battery of a vehicle. Such instruments shall comply with the requirements of E2 and the following additional requirements - voltage reductions caused by energizing the starter-motor circuits of internal combustion engines, - load dump transients occurring in the event of a discharged battery being disconnected while the engine is running.	A.5.4.3 A.5.4.5 A.5.4.6 A.5.4.7	Severity level for electromagnetic environment tests of OIML R 21 correspond to the level E2 of MID and level E2 of OIML D 11. Voltage reduction and load dump transient are respectively addressed in A.5.4.3.2 and A.5.4.7.1.	**Covered** when the field strength is 24V/m
(b) The following influence quantities shall be considered in relation with electromagnetic environments: - voltage interruptions - short voltage reductions - voltage transients on supply lines and/or signal lines - electrostatic discharges - radio frequency electromagnetic fields - conducted radio frequency electromagnetic fields on supply lines and/or signal lines - surges on supply lines and/or signal lines	Annex A		**Covered**

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV		OIML R 21 (2007)	Comments	Conclusion
1.3.4	Other influence quantities to be considered, where appropriate, are: - voltage variation - mains frequency variation - power frequency magnetic fields - any other quantity likely to influence in a significant way the accuracy of the instrument.	Annex A		**Covered**
1.4	When carrying out the tests as envisaged in this Directive, the following paragraphs apply:			
1.4.1	*Basic rules for testing and the determination of errors* Essential requirements specified in 1.1 and 1.2 shall be verified for each relevant influence quantity. Unless otherwise specified in the appropriate instrument-specific annex, these essential requirements apply when each influence quantity is applied and its effect evaluated separately, all other influence quantities being kept relatively constant at their reference value. Metrological tests shall be carried out during or after the application of the influence quantity, whichever condition corresponds to the normal operational status of the instrument when that influence quantity is likely to occur.	A.5.1	*"Metrological performance tests are intended to verify that taximeters can function as intended in the climatic, mechanical and electromagnetic environments and under the conditions specified. Each test indicates, where appropriate, the reference condition under which the intrinsic error is determined.* *Where possible, tests shall be carried out on a taximeter in its normal operational state under laboratory conditions. The permissible effects of the influence factors or disturbances, under these laboratory conditions, are specified for each test in Annex A.* *When the effect of one influence factor is being evaluated, all other factors are to be held relatively constant, at a value close to normal. After each test, the taximeter shall be subjected to the recovery condition as specified in A.3.3. The operational status of the taximeter shall be recorded for each test.* *When a taximeter is connected in other than a normal configuration, the procedure shall be mutually agreed on by the metrological authority and the applicant.* *The tests in Annex A are conducted at the rated operating voltage of 12 V DC unless otherwise specified. "*	**Covered**

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
1.4.2 *Ambient humidity* - According to the climatic operating environment in which the instrument is intended to be used either the damp heat-steady state (non-condensing) or damp heat cyclic (condensing) test may be appropriate. - The damp heat cyclic test is appropriate where condensation is important or when penetration of vapour will be accelerated by the effect of breathing. In conditions where non-condensing humidity is a factor the damp-heat steady state is appropriate.	5.1.2	*"In addition to 3.5, an electronic instrument shall comply with the requirements under a relative humidity above 93 % when combined with cyclic temperature changes and condensation."*	**Covered**
2 Reproducibility The application of the same measurand in a different location or by different user, all other conditions being the same, shall result in the close agreement of successive measurements. The difference between the measurement results shall be small when compared with the MPE.	7.5	Performing the test program prescribe in 7.5 demonstrates the reproducibility of the taximeter.	**Covered**
3 Repeatability The application of the same measurand under the same conditions of measurement shall result in the close agreement of successive measurements. The difference between the measurement results shall be small when compared with the MPE.	5.2.6	*"The application of the same taximeter under the same conditions of measurement shall result in the close agreement of successive measurements. The difference between the successive measurement results shall be less than the appropriate maximum permissible error in 3.2. "*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
4	Discrimination and sensitivity A measuring instrument shall be sufficiently sensitive and the discrimination threshold shall be sufficiently low for the intended measurement task.			**Not relevant**
5	Durability A measuring instrument shall be designed to maintain an adequate stability of its metrological characteristics over a period of time estimated by the manufacturer's instruction when in the environmental conditions for which it is intended.	4.1	*"A taximeter shall be designed to suit the method of operation and vehicles for which it is intended. It shall be of adequately robust construction in order that it maintains its metrological characteristics."*	**Covered**
6	Reliability A measuring instrument shall be designed to reduce as far as possible the effect of a defect that would lead to an inaccurate measurement result, unless the presence of such a defect is obvious.	3.3	*"A taximeter system shall be designed so that it can conform to the maximum permissible errors without adjustment for a period of not less than one year of normal use and in accordance with national regulations. Any malfunction of the taximeter arising from significant faults shall be automatically and clearly indicated (e.g. by a visible or audible fault indication or by automatic switch off). The documentation submitted by the manufacturer (6.2.1) shall include a description of how this requirement is met. "*	**Covered**
7 7.1	Suitability A measuring instrument shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.	4.2.1	*"A taximeter shall have no characteristics likely to facilitate its fraudulent use."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
7.2	A measuring instrument shall be suitable for its intended use taking account of the practical working conditions and shall not require unreasonable demands of the user in order to obtain a correct measurement result.	4.1 4.9.1	*"A taximeter shall be designed to suit the method of operation and vehicles for which it is intended. It shall be of adequately robust construction in order that it maintains its metrological characteristics."* *"The primary indications shall be by means of a display. Reading of the primary indications (2.4.3) shall be reliable, easy and unambiguous under conditions of normal use including in the daylight and night, and the figures forming the indications shall be of a size equal to or higher than 10 mm in height and of a shape and clarity that permits easy reading.* *Primary indications shall contain names or symbols of the units of measurement and comply with the requirements of 3.4.* *The indicator display shall be so designed that the indications of interest to the passenger are sufficient for a particular application, suitably identified and readable from a distance of at least 2 metres."*	**Covered**
7.3	The errors of a utility measuring instrument at flows or currents outside the controlled range shall not be unduly biased.			**Not relevant**
7.4	Where a measuring instrument is designed for the measurement of values of the measurand that are constant over time, the measuring instrument shall be insensitive to small fluctuations of the value of the measurand, or shall take appropriate action.			**Not relevant**
7.5	A measuring instrument shall be robust and its materials of construction shall be suitable for the conditions in which it is intended to be used.	4.1	*"A taximeter shall be designed to suit the method of operation and vehicles for which it is intended. It shall be of adequately robust construction in order that it maintains its metrological characteristics."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
7.6	A measuring instrument shall be designed so as to allow the control of the measuring tasks after the instrument has been placed on the market and put into use. If necessary, special equipment or software for this control shall be part of the instrument. The test procedure shall be described in the operation manual. When a measuring instrument has associated software which provides other functions besides the measuring function, the software that is critical for the metrological characteristics shall be identifiable and shall not be inadmissibly influenced by the associated software.	4.2.3 4.11	*"The taximeter shall be designed in such a way as to permit easy inspection and adjustments of the taximeter in order to assess its functionality and to conform to changes in its functions imposed by national regulations. Access to inspection and adjustment functions shall be secured in accordance with appropriate parts of 4.2.5."* The test procedure does not have to be a part of the operation manual according to OIML R 21. *"There shall be a distinct separation between the legally relevant and non-relevant software (2.2.8.6) in a taximeter. The legally relevant software of a taximeter shall be identified by the manufacturer, i.e., the software that is critical for measurement characteristics, measurement data and metrologically important parameters, stored or transmitted, and software programmed to detect system fault (software and hardware), is considered as an essential part of a taximeter and shall meet the requirements for securing software specified below. National regulation may specify the security that is required."*	**Covered** when the test procedure is included in the operation manual
8	Protection against corruption			
8.1	The metrological characteristics of a measuring instrument shall not be influenced in any inadmissible way by the connection to it of another device, by any feature of the connected device itself or by any remote device that communicates with the measuring instrument.	5.2.3.2	*"An interface through which the functions mentioned in 5.2.3 cannot be performed or initiated, need not be secured. For other interfaces and in accordance with national regulations there shall be adequate security to ensure that:* *(a) Interfaces shall not allow the metrological functions of the taximeter and its legally relevant software and data to be inadmissibly influenced by other interconnected instruments, or by disturbances acting on the interface. "*	**Covered**
8.2	A hardware component that is critical for metrological characteristics shall be designed so that it can be secured. Security measures foreseen shall provide for evidence of an intervention.	4.2.5	*"Means shall be provided for securing taximeter functions, measurement data, hardware, software and pre-set controls, to which access, adjustment or removal is prohibited. Security should be provided on all parts of the measuring system which cannot be sealed in any other way against operations liable to affect the measurement accuracy. "*	**Covered**

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV		OIML R 21 (2007)	Comments	Conclusion
8.3	Software that is critical for metrological characteristics shall be identified as such and shall be secured. Software identification shall be easily provided by the measuring instrument. Evidence of an intervention shall be available for a reasonable period of time.	4.11.2.	*"In accordance with national regulations there shall be adequate security to ensure that:* *(a) The legally relevant software shall be adequately protected against accidental or intentional changes by means of an audit trail (2.3.6) or an event counter (2.2.3) providing information record of the changes to the software;* *(b) The legally relevant software shall be assigned with a software identification (2.2.8.4) which shall be adapted in the case of every software change that may affect the functions and accuracy of the taximeter. Software identification shall be easily provided by the taximeter;* *(c) The transmission, changing and updating of the legally relevant software shall be secured, e.g. through the use of protective interfaces connected to the taximeter, and comply with the relevant requirements and conditions of 5.2.3;* *(d) It shall be possible to access and display the information in the audit trail records; the records shall include the date and a means of identifying the authorized person making the intervention (see (a) above); the traceability of the interventions shall be assured for at least the period of time in between periodical verifications depending on national legislation. Legally relevant records may not be overwritten, and if the storage capacities for legally relevant records are exhausted, no further intervention shall be possible without breaking a physical seal.;"*	**Covered**
8.4	Measurement data, software that is critical for measurement characteristics and metrologically important parameters stored or transmitted shall be adequately protected against accidental or intentional corruption.	4.10	*"Legally relevant data stored in a memory of the taximeter or on external storage (e.g. hard drive) for subsequent legal use shall be adequately protected against intentional and unintentional changes during the storage and data transmission process."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
8.5	For utility measuring instruments the display of the total quantity supplied or the displays from which the total quantity supplied can be derived, whole or partial reference to which is the basis for payment, shall not be able to be reset during use.			**Not relevant**
9	Information to be borne by and to accompany the instrument			
9.1	A measuring instrument shall bear the following inscriptions: - manufacturer's mark or name - information in respect of its accuracy, plus, when applicable - information in respect of the conditions of use - measuring capacity - measuring range - identity marking - number of EC-type examination certificate or the EC design examination certificate - information whether or not additional devices providing metrological results comply with the provisions of this Directive on legal metrological control.	4.12 4.12.1	*"Taximeters shall bear the following markings, variable according to national regulations:* *– name or identification mark of manufacturer;* *– name or identification mark of the importer (if applicable);* *– serial number of the taximeter (if applicable);* *– type approval sign and/or number of type examination certificate;* *– relevant data in respect of the conditions of use;* *– year of manufacture;* *– specified range of the taximeter constant, k, (if applicable) in pulses per kilometre;* *– software identification (if applicable)"* *"Depending upon the particular use of the taximeter, one or more supplementary markings may be required, e.g.:* *– relevant data in respect of the conditions of use;* *– where a particular taximeter is verified using a particular type of vehicle (i.e. air suspension systems only)."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
9.2	An instrument of dimensions too small or of too sensitive a composition to allow it to bear the relevant information shall have its packaging, if any, and the accompanying documents required by the provisions of this Directive suitably marked.			**Not relevant**
9.3	The instrument shall be accompanied by information on its operation, unless the simplicity of the measuring instrument makes this unnecessary. Information shall be easily understandable and shall include where relevant: - rated operating conditions - mechanical and electromagnetic environment classes - the upper and lower temperature limit, whether condensation is possible or not, open or closed location - instructions for installation, maintenance, repairs, permissible adjustments - instructions for correct operation and any special conditions use - conditions for compatibility with interfaces, sub-assemblies or measuring instruments.		6.2.1 does not specify details concerning operating manual.	**Not covered**
9.4	Groups of identical measuring instruments used in the same location or used for utility measurements do not necessarily require individual instruction manuals.			**Not relevant**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
9.5	Unless specified otherwise in an instrument-specific annex, the scale interval for a measured value shall be in the form $1x10^n$, $2x10^n$, or $5x10^n$, where n is any integer or zero. The unit of measurement or its symbol shall be shown close to the numerical value.		See § 2 of Anne MI-007	**Not relevant**
9.6	A material measure shall be marked with a nominal value or a scale, accompanied by the unit of measurement used.			**Not relevant**
9.7	The units of measurement used and their symbols shall be in accordance with the provisions of Community legislation on units of measurement and their symbols.	3.4	*"The units of measurement to be used on a taximeter are:* *- time, in seconds, minutes and hours;* *- distance, in metres (m) or kilometres (km), or as specified in national regulations;* *- the fare with the monetary unit, as specified in national regulations."*	**Covered**
		4.9.1	*"Primary indications shall contain names or symbols of the units of measurement and comply with the requirements of 3.4."*	
9.8	All marks and inscriptions required under any requirement shall be clear, non-erasable, unambiguous and non-transferable.	4.12.2	*"Descriptive markings shall be indelible and of a size, shape and clarity that permit legibility under normal conditions of use of the instrument. Markings shall be grouped together in a clearly visible place on the instrument, either on a descriptive plate fixed near the indicating device or on the indicating device itself. It shall be possible to seal the plate bearing the markings, unless it cannot be removed without being destroyed."*	**Covered**
10	Indication of result			
10.1	Indication of the result shall be by means of a display or a hard copy.	4.9.1	*"The primary indications shall be by means of a display. Reading of the primary indications (2.4.3) shall be reliable, easy and unambiguous under conditions of normal use including in the daylight and night, and the figures forming the indications shall be of a size equal to or higher than 10 mm in height and of a shape and clarity that permits easy reading."*	**Covered**

Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV		OIML R 21 (2007)	Comments	Conclusion
10.2	The indication of any result shall be clear and unambiguous and accompanied by such marks and inscriptions necessary to inform the user of the significance of the result. Easy reading of the present result shall be permitted under normal conditions of use. Additional indications may be shown provided they cannot be confused with the metrologically controlled indications.	4.9.1	*"The primary indications shall be by means of a display. Reading of the primary indications (2.4.3) shall be reliable, easy and unambiguous under conditions of normal use including in the daylight and night, and the figures forming the indications shall be of a size equal to or higher than 10 mm in height and of a shape and clarity that permits easy reading."* *"The indicator display shall be so designed that the indications of interest to the passenger are sufficient for a particular application, suitably identified and readable from a distance of at least 2 metres. "*	**Covered**
10.3	In the case of hard copy the print or record shall also be easily legible and non-erasable.	4.9.2	*"In accordance with national regulations, a printer may be used to obtain a hard copy, e.g., of the results at the end of the measurement, audit trail record of changes to measurement features and parameters, etc. Printing shall be clear and permanent for the intended use. Printed figures shall be at least 2 mm high in height, clear, legible and unambiguous.* *If printing takes place, the name or the symbol of the unit of measurement shall be either to the right of the value or above a column of values, or placed in accordance with national regulation."*	**Covered**
10.4	A measuring instrument for direct sales trading transactions shall be designed to present the measurement result to both parties in the transaction when installed as intended. When critical in case of direct sales, any ticket provided to the consumer by an ancillary device not complying with the appropriate requirements of this Directive shall bear an appropriate restrictive information.	4.9.1	*"The primary indications shall be by means of a display. Reading of the primary indications (2.4.3) shall be reliable, easy and unambiguous under conditions of normal use including in the daylight and night, and the figures forming the indications shall be of a size equal to or higher than 10 mm in height and of a shape and clarity that permits easy reading.* *Primary indications shall contain names or symbols of the units of measurement and comply with the requirements of 3.4.* *The indicator display shall be so designed that the indications of interest to the passenger are sufficient for a particular application, suitably identified and readable from a distance of at least 2 metres."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
10.5	Whether or not a measuring instrument intended for utility measurement purposes can be remotely read it shall in any case be fitted with a metrologically controlled display accessible without tools to the customer. The reading of this display is the measurement result that serves as the basis for the price to pay.			**Not relevant**
11	Further processing of data to conclude the trading transaction			
11.1	A measuring instrument other than a utility measuring instrument shall record by a durable means the measurement result accompanied by information to identify the particular transaction, when: - the measurement is non-repeatable and - the measuring instrument is normally intended for use in the absence of one of the trading parties.			**Not relevant**
11.2	Additionally, a durable proof of the measurement result and the information to identify the transaction shall be available on request at the time the measurement is concluded.			**Not relevant**
12	Conformity evaluation A measuring instrument shall be designed so as to allow ready evaluation of its conformity with the appropriate requirements of this Directive.	4.2.3	*"The taximeter shall be designed in such a way as to permit easy inspection and adjustments of the taximeter in order to assess its functionality and to conform to changes in its functions imposed by national regulations. Access to inspection and adjustment functions shall be secured in accordance with appropriate parts of 4.2.5."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
DEFINITIONS	**Taximeter** A device that works together with a signal generator (1) to make a measuring instrument. This device measures duration, calculates distance on the basis of a signal delivered by the distance signal generator. Additionally, it calculates and displays the fare to be paid for a trip on the basis of the calculated distance and/or the measured duration of the trip. The distance signal generator is outside the scope of this Directive.	2.1.1	*"Instrument intended to measure duration and to measure distance on the basis of a signal delivered by a distance measurement transducer and to calculate and indicate the fare to be paid on the basis of the measured distance and/or measured duration."*	**Covered**
	Fare The total amount of money due for a trip based on a fixed initial hire fee and/or the length and/or the duration of the trip. The fare does not include a supplement charged for extra services.	2.3.1.1	*"Monetary amount calculated, indicated and displayed as a fare by the taximeter, due for a taxi journey based on a fixed initial fee (excluding any supplementary charges) and/or the length and/or the duration of the journey."*	**Covered**
	Cross-over speed The speed value found by division of a time tariff value by a distance tariff value.	2.3.1.2	*"Speed of the taxi (km/h) at which the time-counting and distance-counting methods operate the taximeter at the same rate. The speed value is determined by division of the time tariff value by the applicable distance tariff value."*	**Covered**
	Normal calculation mode S (single application of tariff) Fare calculation based on application of the time tariff below the cross-over speed and application of the distance tariff above the cross-over speed.	2.3.1.3.1	*"Fare calculation based on application of the time tariff below the cross-over speed and application of the distance tariff above the cross-over speed."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
	Normal calculation mode D (double application of tariff) Fare calculation based on simultaneous application of time tariff and distance tariff over the whole trip.	2.3.1.3.2	*"Fare calculation based on the combined application of time tariff and distance tariff over the whole journey."*	**Covered**
	Operating position The different modes in which a taximeter fulfils the different parts of its functioning. The operating positions are distinguished by the following indications: 'For Hire': The operating position in which the fare calculation is disabled 'Hired': The operating position in which the fare calculation takes place on the basis of a possible initial charge and a tariff for distance travelled and/or time of the trip 'Stopped': The operating position in which the fare due for the trip is indicated and at least the fare calculation based on time is disabled.	2.3.3 2.3.3.1 2.3.3.2 2.3.3.3	*"Specific operating position in which a taximeter fulfils different parts of its functioning."* *Operating position in which the taximeter is not calculating a fare and no paying customer is making a taxi journey.* *"Operating position in which the taximeter is indicating and calculating a fare which is based on a possible initial hire fee and a tariff for the time of the journey and/or distance travelled."* *"Operating position in which the taximeter is indicating a fare at the end of a fare-paying journey."*	**Covered**
1	The taximeter shall be designed to calculate the distance and to measure the duration of a trip.	3.1	*"The taximeter shall be designed to measure the duration, and calculate the distance of a fare-paying journey based on a signal delivered by a distance measurement transducer…"*	**Covered**
2	The taximeter shall be designed to calculate and display the fare, incrementing in steps equal to the resolution fixed by the Member State in the operation position 'Hired'. The taximeter shall also be designed to display the final value for the trip in the operating position 'Stopped'.	2.3.3.2 2.3.3.3 3.1	*"Operating position in which the taximeter is indicating and calculating a fare which is based on a possible initial hire fee and a tariff for the time of the journey and/or distance travelled."* *"Operating position in which the taximeter is indicating a fare at the end of a fare-paying journey."* *"…The taximeter displays the fare to be paid on the basis of the initial fare registered on the taximeter before distance is travelled and the fare incrementing with fixed intervals after the appertaining distance and/or time is delivered."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
3	A taximeter shall be able to apply the normal calculation modes S and D. It shall be possible to choose between these calculation modes by a secured setting.	4.3	*"…A taximeter shall be able to calculate the fare by both of the following calculation methods, with the possibility to choose between these calculation methods by a secured setting:…"*	**Covered**
4	A taximeter shall be able to supply the following data through an appropriate secured interface(s): — operation position: 'For Hire', 'Hired' or 'Stopped'; — totaliser data according to paragraph 15.1; — general information: constant of the distance signal generator, date of securing, taxi identifier, real time, identification of the tariff; — fare information for a trip: total charged, fare, calculation of the fare, supplement charge, date, start time, finish time, distance travelled; — tariff(s) information: parameters of tariff(s). National legislation may require certain devices to be connected to the interface(s) of a taximeter. Where such a device is required; it shall be possible, by secured setting, to inhibit automatically the operation of the taximeter for reasons of the non-presence or improper functioning of the required device.	5.2.3 4.2.2	*"A taximeter shall be equipped with interfaces (see 2.2.5) permitting the coupling of the taximeter to any other instruments or the vehicle for automatic transmission of information, and a user interface (2.2.6) permitting the exchange of information between a human user and the taximeter.* *A taximeter shall be able to transmit the following data through appropriate protective interfaces:* *– operation position: "For Hire", "Hired" or "Stopped";* *– totalizer data according to 4.7;* *– general information: constant of the distance measurement transducer, date of securing, vehicle identification, real time, tariff identification;* *– fare information for a journey: total charged, fare, calculation of the fare, supplement charge, date, start time, finish time, distance travelled;* *– appropriate tariff(s) information: parameters of tariff(s)."* *"If required by national regulations, the absence or improper functioning of connected instruments shall automatically prevent the operation of the taximeter. This setting of the taximeter shall be secured in accordance with 4.2.5. "*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
5	If relevant, it shall be possible to adjust a taximeter for the constant of the distance signal generator to which it is to be connected and to secure the adjustment.	4.2.3 4.2.5	*"The taximeter shall be designed in such a way as to permit easy inspection and adjustments of the taximeter in order to assess its functionality and to conform to changes in its functions imposed by national regulations. Access to inspection and adjustment functions shall be secured in accordance with appropriate parts of 4.2.5."* *"Means shall be provided for securing taximeter functions, measurement data, hardware, software and pre-set controls, to which access, adjustment or removal is prohibited. Security should be provided on all parts of the measuring system which cannot be sealed in any other way against operations liable to affect the measurement accuracy."*	**Covered**
6.1	The mechanical environment class that applies is M3.	A.5.4.4	Severity level for vibration tests of OIML R 21 correspond to the level M3 of MID and level M3 of OIML D 11. Mechanical shocks are not relevant, the taximeter being fixed to the car.	**Covered**
6.2	The manufacturer shall specify the rated operating conditions for the instrument, in particular: — a minimum temperature range of 80 °C for the climatic environment; — the limits of the DC power supply for which the instrument has been designed.	3.5.1 3.5.2	*"The taximeter shall maintain its metrological properties within a nominal temperature range of –25 °C to +55 °C. There shall be a minimum temperature range of 80 °C with values to be chosen from lower limits of – 40 °C, – 25 °C, or - 10 °C, and upper limits of + 40 °C, + 55 °C, or + 70 °C. "* *"The taximeter shall maintain its metrological and technical requirements if the supply voltage varies from the lower and upper limits (U_{min}, U_{max}) of the nominal voltage supply for:* *(a) 12 V road vehicle battery voltage supply: lower limit is 9 V, upper limit is 16 V* *(b) Other battery voltage supply specified by manufacturer with given lower and upper limits."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
7	The MPE, excluding any errors due to application of the taximeter in a taxi, are: — For the time elapsed: ± 0,1 % minimum value of mpe: 0,2s; — For the distance travelled: ± 0,2 % minimum value of mpe: 4 m; — For the calculation of the fare: ± 0,1 % minimum, including rounding: corresponding to the least significant digit of the fare indication.	3.2.1.1	*"For a taximeter not installed in the vehicle:* *(a) For the elapsed time, 0.2 s or 0.1 % whichever is greater;* *(b) For the distance travelled, 4 m or 0.2 % whichever is greater;* *(c) For the fare calculated, 0.1 %. Allowance shall be made for the rounding of the least significant digit of the fare indication."*	**Covered**
8	**Electromagnetic immunity**			
8.1	The electromagnetic class that applies is E3.		See Answer to Annex 1 § 1.3.3	**Covered**
8.2	The MPE laid down in paragraph 7 shall also be respected in the presence of an electromagnetic disturbance.	5.1.3	*"Taximeters shall be so designed and manufactured that when exposed to disturbances, either:* *(a) Significant faults do not occur (i.e. the difference between the indication due to the disturbance and the indication without the disturbance (intrinsic error), either shall not exceed the value given in 2.4.5.6, or* *(b) Significant faults are detected and acted upon. The indication of significant faults in the display should not be confusing with other messages that appear in the display. "*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
9	In case of a reduction of the voltage supply to a value below the lower operating limit as specified by the manufacturer, the taximeter shall: — continue to work correctly or resume its correct functioning without loss of data available before the voltage drop if the voltage drop is temporary, i.e. due to restarting the engine; — abort an existing measurement and return to the position 'For Hire' if the voltage drop is for a longer period.	5.2.5	*"In case of a voltage drop below the lower operating voltage limit, the taximeter shall automatically:* *(a) Continue to function correctly or resume its correct functioning without loss of data available before the voltage drop if the voltage drop is temporary (e.g. less than 20 seconds), for example due to restarting the vehicle engine;* *(b) Abort an existing measurement and return to the "For Hire" (Free) operating position if the voltage drop is for a longer period (e.g. greater than 20 seconds). In this case, the taximeter shall resume its correct functioning and the stored measurement data concerning the aborted journey must be correct;* *(c) Show a significant fault or is automatically put out of service if the voltage drop is for a lengthy period."*	**Covered**
10	The conditions for the compatibility between the taximeter and the distance signal generator shall be specified by the manufacturer of the taximeter.	3.1	*"The taximeter shall be designed to measure the duration, and calculate the distance of a fare-paying journey based on a signal delivered by a distance measurement transducer. "*	**Covered**
11	If there is a supplement charge for an extra service, entered by the driver on manual command, this shall be excluded from the fare displayed. However, in that case a taximeter may display temporarily the value of the fare including the supplementary charge.	4.5.3.b)	*"If there is a supplementary charge for an extra service, entered by manual command, this shall be displayed separately from the indicated fare. However, in this case a taximeter may indicate temporarily the value of the fare including the supplementary charge."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
12	If the fare is calculated according to calculation mode D a taximeter may have an additional display mode in which only the total distance and duration of the trip are displayed in real time.	4.5.4	*"If the fare calculation is according to the normal calculation method D, the taximeter may be equipped with the "Measure" operating position in which the distance and duration of the journey are measured and displayed in real time on a separate indicator as follows:* *(a) Time measured in hours with the smallest increment of 30 seconds;* *(b) Distance measured shall have a resolution better than or equal to 0.1 km;* *(c) Readings for both time and duration may be given at the same time, or may be recalled one after the other by means of the operating position device;* *(d) The period of use shall be shown as hh:mm:ss and the indicated unit of measurement shall comply with the requirements of 4.9.1 so that there can be no confusion as to the quantity indicated."*	**Covered**
13	All values displayed for the passenger shall be suitably identified. These values as well as their identification shall be clearly readable under daylight and night conditions.	4.9.1	*"The primary indications shall be by means of a display. Reading of the primary indications (2.4.3) shall be reliable, easy and unambiguous under conditions of normal use including in the daylight and night, and the figures forming the indications shall be of a size equal to or higher than 10 mm in height and of a shape and clarity that permits easy reading.* *Primary indications shall contain names or symbols of the units of measurement and comply with the requirements of 3.4."*	**Covered**
14.1	If the fare to be paid or the measures to be taken against fraudulent use can be affected by the choice of functionality from a pre-programmed setting or by free data setting, it shall be possible to secure the instrument settings and data entered.	4.2.4	*"Controls and keys on taximeters affecting measurements shall be so designed that they cannot normally come to rest in positions other than those intended by design, unless during the manoeuvre all indication is made impossible. Keys shall be marked unambiguously. Controls shall be secured in accordance with appropriate parts of 4.2.5."*	**Covered**
14.2	The securing possibilities available in a taximeter shall be such that separate securing of the settings is possible.	4.2.5	*"(h) The securing possibilities available in a taximeter shall be such that separate securing of tariff data is possible;* *(i) The securing possibilities available in a taximeter may be such that separate securing of the settings is possible."*	**Covered** when 4.2.5.i of OIML R 21:2007 is mandatory

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
14.3	The provisions in paragraph 8.3 of Annex I apply also to the tariffs.		See answer to Annex 1 § 8.3	**Covered**
15.1	A taximeter shall be fitted with non-resettable totalisers for all of the following values: — The total distance travelled by the taxi; — The total distance travelled when hired; — The total number of hirings; — The total amount of money charged as supplements; — The total amount of money charged as fare. The totalised values shall include the values saved according to paragraph 9 under conditions of loss of power supply.	4.7	*"A taximeter shall be fitted with non-resettable totalizers which can clearly and unambiguously display all of the following values:* *(a) Total distance travelled by the taxi;* *(b) Total distance travelled when hired;* *(c) Total number of journeys;* *(d) Total amount of money charged as supplements;* *(e) Total amount of money charged as fare.* *Other data may be totalled and indicated provided that they comply with national regulations and with the requirements of 4.9.1 for quality of indication to prevent the display of totalized values being used to deceive passengers."*	**Covered**
15.2	If disconnected from power, a taximeter shall allow the totalised values to be stored for one year for the purpose of reading out the values from the taximeter to another medium.	4.7	*"Values saved under conditions of power loss shall be included in the total and shall be stored for at least one year for subsequent use and in accordance with national regulations. In all cases the requirements for data storage given in 4.10 apply."*	**Covered**
15.3	Adequate measures shall be taken to prevent the display of totalised values from being used to deceive passengers.	4.9.1	*"The indicator display shall be so designed that the indications of interest to the passenger are sufficient for a particular application, suitably identified and readable from a distance of at least 2 metres."*	**Covered**
16	Automatic change of tariffs is allowed due to the: — distance of the trip; — duration of the trip; — time of the day; — date; — day of the week.	4.8	*"The automatic change of tariffs may be triggered by the:* *(a) Distance of the journey;* *(b) Duration of the journey;* *(c) Time of day;* *(d) Date;* *(e) Day of the week; or* *(f) Other data specified in accordance with national regulation.* *Any alteration of tariff values shall be secured in accordance with 4.2.5."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
17	If properties of the taxi are important for the correctness of the taximeter, the taximeter shall provide means to secure the connection of the taximeter to the taxi in which it is installed.	4.1 4.14.1	*"A taximeter shall be designed to suit the method of operation and vehicles for which it is intended. It shall be of adequately robust construction in order that it maintains its metrological characteristics."* *"Taximeters shall be manufactured, tested and installed so as to minimize any adverse effects of the testing and installation environment. If the correct testing or operation of the taximeter is likely to be affected by the properties of other connected equipment and the vehicle in which it is installed, then the taximeter shall be provided with a means to secure the correct testing and operation of the taximeter (e.g. a test connector interface as specified in 5.2.3 for testing purposes). Where particular details of installation have an effect on the accuracy of the taximeter these details shall be recorded in the test report (e.g. influence of the vehicle) and in the operating and installation manual of the taximeter. "*	**Covered**
18	For the purpose of testing after installation, the taximeter shall be equipped with the possibility to test separately the accuracy of time and distance measurement and the accuracy of the calculation.	5.2.4 3.2.1.1	*"Where the accuracy of the taximeter is to be determined through the functional testing described in A.4, the taximeter shall have a test connecter that is capable of processing at least the signals in Table 1. The functioning of this test connector shall be checked once to ensure that it is capable of processing the signals in Table 1*. " Calculation is testable by using the test connector and the MPE of 3.2.1.1.	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
19	A taximeter and its installation instructions specified by the manufacturer shall be such that, if installed according to the manufacturer's instructions, fraudulent alterations of the measurement signal representing the distance travelled are sufficiently excluded.	4.14.1 4.2.1	*"Taximeters shall be manufactured, tested and installed so as to minimise any adverse effects of the testing and installation environment. If the correct testing or operation of the taximeter is likely to be affected by the properties of other connected equipment and the vehicle in which it is installed, then the taximeter shall be provided with a means to secure the correct testing and operation of the taximeter (e.g. a test connector interface as specified in 5.2.3 for testing purposes). Where particular details of installation have an effect on the accuracy of the taximeter these details shall be recorded in the test report (e.g. influence of the vehicle) and in the operating and installation manual of the taximeter."* *"A taximeter shall have no characteristics likely to facilitate its fraudulent use. "*	**Covered**
20	The general essential requirement dealing with fraudulent use shall be fulfilled in such a way that the interests of the customer, the driver, the driver's employer and the fiscal authorities are protected.	4.2.1	*"A taximeter shall have no characteristics likely to facilitate its fraudulent use."*	**Covered**
21	A taximeter shall be designed so that it can respect the MPEs without adjustment during a period of one year of normal use.	3.3	*"A taximeter system shall be designed so that it can conform to the maximum permissible errors without adjustment for a period of not less than one year of normal use and in accordance with national regulations. Any malfunction of the taximeter arising from significant faults shall be automatically and clearly indicated (e.g. by a visible or audible fault indication or by automatic switch off). The documentation submitted by the manufacturer (6.2.1) shall include a description of how this requirement is met. "*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-007 Chapter IV	OIML R 21 (2007)	Comments	Conclusion
22	The taximeter shall be equipped with a real-timeclock by means of which the time of the day and the date are kept, one or both can be used for automatic change of tariffs. The requirements for the real-time clock are: — The timekeeping shall have an accuracy of 0,02 %; — The correction possibility of the clock shall be not more than 2 minutes per week. Correction for summer and wintertime shall be performed automatically; — Correction, automatic or manually, during a trip shall be prevented.	3.7	*"The real time-clock shall keep track of the time of the day and the date. One or both values may be used for the automatic change of tariffs. The following requirements apply:* *(a) The timekeeping accuracy shall be 0.02 % of the time* *(b) The correction possibility of the clock shall be not more than 2 minutes per week. Correction for summer and winter time shall be performed automatically in applicable countries and shall be secured in accordance with 4.2.5;* *(c) Other time corrections, automatic or manual, shall be prevented during a journey, unless conducted during a verification process."*	**Covered**
23	The values of distance travelled and time elapsed, when displayed or printed in accordance with this Directive, shall use the following units: Distance travelled: — in the United Kingdom and Ireland: until the date which will be fixed by these Member States according to Article (1)(b) of Directive 80/181/EEC: kilometres or miles; — in all other Member States: kilometres. Time elapsed: — seconds, minutes or hours, as may be suitable; keeping in mind the necessary resolution and the need to prevent misunderstandings.	3.4	*"The units of measurement to be used on a taximeter are:* *- time, in seconds, minutes and hours;* *- distance, in metres (m) or kilometres (km), or as specified in national regulations;* *- the fare with the monetary unit, as specified in national regulations."*	**Covered**