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Issue 1

WELMEC

European cooperation in legal metrology

Guide for Measuring Instruments Directive 2004/22/EC Gas Meters Corresponding Tables OIML R 137-1 2006 – MID-002 I

July 2008

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.

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Gas meters
Cross Reference Table 2004/22/EC vs. OIML R 137-1 2006

FOREWORD

The Measuring Instruments Directive (MID) 2004/22/EC entered into force on the 30th October 2006. In this new approach directive the presumption of conformity is mentioned in Article 13. In addition to the use of harmonised standards (Art. 13 point 1) a new route is open for the presumption of conformity by using OIML recommendations (Art. 13 point 2).

"*Member States shall presume conformity with the essential requirements referred to in Annex I and in the relevant instrument-specific Annexes in respect of a measuring instruments that complies with the corresponding parts of the normative documents and lists referred to in Article 16(1)(a), the references in respect of which have been published in the Official Journal of the European Union, C series.*"

Article 4(i) defines that
"normative document" means a document containing technical specifications adopted by the Organisation International de Métrologie Légale (OIML), subject to the procedure stipulated in Article 16(1)".

In Article 16 (1) (a) the functions of the Measuring Instruments Committee are described as follows:
"*identify normative documents drawn up by OIML and, in a list, indicate the parts thereof compliance with which gives rise to a presumption of conformity with the corresponding essential requirements of this Directive".*

In the WELMEC Committee Meeting in May 2005 WELMEC agreed to support the work of the Commission on this issue and the MI-xxx Annexes of the MID has been given to the Working Groups of WELMEC to develop corresponding tables including comments as a basis for the publication foreseen in the Directive.

In order to prepare the Cross Reference Table, the first draft was provided by BIML. The draft was discussed in the responsible Working Group (including industry). The results were sent to the WELMEC Secretariat and the WELMEC Committee Members were asked for comments.

The draft was adopted as a WELMEC Guide by the WELMEC Committee in July 2008.
The document was sent to the European Commission for further consideration and for drafting the publication required in the Directive.

The European Commission will present the simplified tables to the Commission Working Group on Measuring Instruments for further comments. After obtaining the positive advice from the Measuring Instruments Committee which is to be held on 23rd of July 2008, the simplified tables have to be published in the Official Journal of the European Union, series C.

As guidance, WELMEC is publishing the full tables with all the comments and detailed information underlying the simplified tables to aid all interested and concerned parties.

The European Commission webpage gives the link to the documents of WELMEC.

Notes:

1. The column “Comments” indicates when necessary the relevant text of OIML R 137-1 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 137-1 for the relevant requirement.

   The indication “Covered” means that:
   - the requirement of OIML R 137-1 is identical to the one of MID; or
   - the requirement of OIML R 137-1 is more severe than the one of MID; or
   - All the requirement of OIML R 137-1 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 137-1 requirement or not included in OIML R 137-1.

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

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	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.	5.3.1	*"Gas meters shall be designed and manufactured such that their errors do not exceed the limits of the applicable maximum permissible error under rated operating conditions, listed in 5.3.3."*	**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.	7.4.15 table 6 A.1	Table 6 defines the test program for electronic meters subject to disturbances. *"This Annex defines the program of performance tests intended to verify that electronic gas meters and their ancillary devices may perform and function as intended in a specified environment and under specified conditions."*	**Covered**

<table>
<tr><th colspan="2">Directive 2004/22/EC

Essential requirements of Annex 1 and Annex MI-002</th><th>OIML R 137-1 (2006)</th><th>Comments</th><th>Conclusion</th></tr>
<tr><td>1.3</td><td>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.</td><td>7.3.5</td><td>“Applications for type approval of gas meters shall be accompanied by the following documents:

• a description of the meter giving the rated operating conditions (5.1), the metrological and technical characteristics, and the principle of its operation;

• where applicable: a list of electronic components with their essential characteristics;”

When giving the rated operating conditions, the manufacturer gives “Conditions of use giving the range of values of the measurand and the influence quantities, for which the errors of the gas meter are required to be within the limits of the maximum permissible error.” (2.2.15)</td><td>Covered</td></tr>
<tr><td>1.3.1</td><td>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.
<table>
<tr><td colspan="5">Temperature limits:</td></tr>
<tr><td>Upper temperature limit</td><td>30 °C</td><td>40 °C</td><td>55 °C</td><td>70 °C</td></tr>
<tr><td>Lower temperature limit</td><td>5 °C</td><td>-10 °C</td><td>-25 °C</td><td>-40 °C</td></tr>
</table></td><td>5.1

A.4.2.1

A4.2.2</td><td>“The rated operating conditions for a gas meter shall be as follows:
…
Ambient temperature range:

lower temperature to be chosen from
- 40 °C, - 25 °C, - 10 °C and + 5 °C

upper temperature to be chosen from
+ 30 °C, + 40 °C, + 55 °C and + 70 °C”

Damp heat steady-state and cyclic tests are mandatory and describe in the Annex A (A 4.2.1 & A 4.2.2).</td><td>Covered</td></tr>
</table>

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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. 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.	7.4.13 A.5.1 A.5.2	Severity levels of vibration and shock tests of OIML R 137-1 correspond to level M2 of MID and OIML D 11.	**Covered**
	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.		Level M3 is not relevant for the instruments covered by MID since MI-002 is limited to gas meters intended for residential, commercial and light industry use.	**Not relevant**
	(b) The following influence quantities shall be considered in relation with mechanical environments: - Vibration - Mechanical shock	7.4.13	*"Gas meters with a maximum weight of 10 kg, as well as the electronics of other gas meters shall be able to withstand vibrations and shocks as specified in Annex A (A.5.1 and A.5.2). The observed fault shall not be more than 0.5 times the applicable maximum permissible error afterwards."*	**Covered for meter up to 10 kg**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.	7.4.15 A.6.1.1 A.6.1.2 A.6.2 A.6.3 A.6.4 A.7.3 A.7.4 A.7.5	Severity levels for electromagnetic environment tests of OIML R 137-1 correspond to level E2 of MID and of OIML D 11.	**Covered**
	E2: This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in other industrial buildings.		Severity levels for electromagnetic environment tests of OIML R 137-1 correspond to level E2 of MID and of OIML D 11 except for surges on data lines. Severity level for surges on data lines correspond to level E1 in all cases. Nevertheless according to MI-002, this level is not applicable since MI-002 is limited to gas meters intended for residential, commercial and light industry use (level E1 - see above).	**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.		Level M3 is not relevant for the instruments covered by MID since MI-002 is limited to gas meters intended for residential, commercial and light industry use.	**Not relevant**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
	(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	7.4.15	Table 6 lists all these tests as relevant for gas meters that include electronic components.	**Covered**
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.	7.4.15 A.7	Chapter A.7 describes tests to conduct on mains power.	**Covered for voltage variation**
1.4	When carrying out the tests as envisaged in this Directive, the following paragraphs apply:			

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.	5.3.1 7.4 A.1	*"Gas meters shall be designed and manufactured such that their errors do not exceed the limits of the applicable maximum permissible error under rated operating conditions, listed in 5.3.3."* Section 7.4 defines the type examination tests and summarized the associated requirements. *"When the effect of one influence quantity is being evaluated, all other influence quantities are to be held within the limits of the reference conditions."*	**Covered for class 0.5 or if MPE are fulfilled during application of influence quantities**
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.	A.4.2.1 A.4.2.2	Steady-state (non condensing) and cyclic (condensing) damp heat tests have to be performed in all cases.	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.		Not relevant	**Not relevant**
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.	7.4.4	*"At flowrates equal to or greater than Qt the errors shall be determined independently at least six times, by varying the flowrate between each consecutive measurement. For each flowrate the experimental standard deviation of the six measurements shall be less than or equal to 0.15 times the maximum permissible error."*	**Covered**
4	Discrimination and sensitivity A measuring instrument shall be sufficiently sensitive and the discrimination threshold shall be sufficiently low for the intended measurement task.	6.1.3	*"Resolution* *The quantity corresponding to the least significant digit shall not exceed the quantity of gas passed during one hour at Qmin.* *If the least significant digit (last drum) shows a decimal multiple of the quantity measured, the faceplate or electronic display shall bear:* *a) either one (or two, or three, etc.) fixed zero(s) after the last drum or digit; or* *b) the marking : "× 10 " (or "× 100 ", or "× 1 000 ", etc.),* *so that the reading is always in the units mentioned in 4.1."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.	7.4.9	The aims of the durability test (R 137-1 §7.4.9) is to demonstrate the stability of the metrological characteristics of the meter.	**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.	3.1.1 6.5	*"A gas meter shall be made of such materials and be so constructed to withstand the physical, chemical and thermal conditions to which it is likely to be subjected and to fulfill correctly its intended purposes throughout its life."* Section 6.5 requires checks, limits and alarms that are mandatory for electronic gas meters.	**Covered**
7	Suitability			
7.1	A measuring instrument shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.	3.1.4 4.3.1	*"A gas meter shall be constructed and installed in such a way that mechanical interference capable of affecting its accuracy is either prevented, or results in permanently visible damage to the gas meter or to the verification marks or protection marks."* *"Protection of the metrological properties of the meter is accomplished via hardware (mechanical) sealing or via electronic sealing devices."*	**Covered**
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.	3	Constructional requirements	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
7.3	The errors of a utility measuring instrument at flows or currents outside the controlled range shall not be unduly biased.	7.4.11	Flow rate over Qmax are covered by R 137-1. 7.4.11 that gives requirements for the overload flow test. The MID clause shall avoid that especially a electronic meter does not count below Qmin having large positive error, this is not mentioned in OIML R-137	**Covered for mechanical meters**
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.		A gas meter is an integrating instrument. Thus, this requirement is not applicable.	**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.	3.1.1	*"A gas meter shall be made of such materials and be so constructed to withstand the physical, chemical and thermal conditions to which it is likely to be subjected and to fulfill correctly its intended purposes throughout its life."*	**Covered**
		3.1.4	*"A gas meter shall be constructed and installed in such a way that mechanical interference capable of affecting its accuracy is either prevented, or results in permanently visible damage to the gas meter or to the verification marks or protection marks."*	

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	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.	6.2.1 7.3.5 7.4.16 4.2.4.x	*"Gas meters shall be designed and constructed incorporating:* *a) an integral test element, or* *b) a pulse generator, or* *c) arrangements permitting the connection of a portable test unit."* *"Applications for type approval of gas meters shall be accompanied by the following documents:* *…* • *where applicable: software version number;"* *"If a gas meter is provided with software, it shall be tested to ensure that no metrological or legal parameters can be changed, having regard to the precautions as described in 4.3.4 for electronic sealing devices.* *Communication with the gas meter shall not have any influence on the accuracy of the measurements."* *"Additional markings for gas meters with electronic devices* *…* *Software identification of the firmware"* R 137-1 does not require that test procedures be included in the operating manual. In addition, such requirement is not part of International Recommendation for any category of measuring instruments. Test conditions and requirements are defined in the relevant OIML Recommendation.	**Covered except for test procedure**
8	Protection against corruption			

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.	6.3.1 4.3.4.2	*"Ancillary devices shall not affect the correct operation of the instrument. If ancillary devices are not subject to legal metrology control this shall be clearly indicated."* *"For instruments with parts which may be disconnected one from another, whether these are interchangeable or not, the following provisions shall be fulfilled:* *a) It shall not be possible to access parameters that participate in the determination of results of measurements through disconnected points unless the provisions in clause 4.3.4.1 are fulfilled;* *b) Interposing any device which may influence the accuracy shall be prevented by means of electronic and data processing securities or, if not possible, by mechanical means.* *c) Moreover, these instruments shall be provided with devices which do not allow them to operate if the various parts are not configured according to the manufacturers' specification."*	**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.	4.3.1 4.3.3	*"Protection of the metrological properties of the meter is accomplished via hardware (mechanical) sealing or via electronic sealing devices."* *"In case of hardware sealing the location of the marks shall be chosen in such a way that the dismantling of the part sealed by one of these marks results in permanently visible damage to this seal."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	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.	7.4.16 4.2.4 4.3.4.1	*"If a gas meter is provided with software, it shall be tested to ensure that no metrological or legal parameters can be changed, having regard to the precautions as described in 4.3.4 for electronic sealing devices."* *"Additional markings for gas meters with electronic devices* *…* *x) Software identification of the firmware"* *"The traceability of the most recent intervention shall be assured. If it is possible to store the records of more than one intervention, and if deletion of a previous intervention must occur to permit a new record, the oldest record shall be deleted."*	**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.	4.3.1 7.4.1.16	*"Protection of the metrological properties of the meter is accomplished via hardware (mechanical) sealing or via electronic sealing devices. In any case, memorized quantities of gas shall be protected by means of a hardware seal."* *"If a gas meter is provided with software, it shall be tested to ensure that no metrological or legal parameters can be changed, having regard to the precautions as described in 4.3.4 for electronic sealing devices."*	**Covered**
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.	6.1.1	*"Indicating devices shall be non-resetable and shall be non-volatile (i.e. they shall be able to show the last stored indication after the device has recovered from an intervening power failure)."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.	4.2.1	All the listed inscriptions are included in the § 4.2.1.of R 137-1 except information related to the presence of additional device. In case of gas meters, additional devices which display metrological results are conversion devices. These devices are considered as sub-assemblies according to Annex MI-002 and bear their own metrological inscription.	**Covered except for the information about additional devices**
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.	4.2.1	*"As relevant, the following information shall be marked on the casing or on an identification plate, or clearly and unambiguously visible via the indicating device: …"* OIML R 137-1 requirement is more severe than the one in MID since the information is available on the instrument whatever its size.	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
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.	4.2	Most of the information is indicated on the identification plate.	**Covered for information on data plate**
9.4	Groups of identical measuring instruments used in the same location or used for utility measurements do not necessarily require individual instruction manuals.		Providing an operating manual is not required in OIML R 137-1. According to 9.3 of Annex 1 it could be understood that such manual is not necessary (see comment above in 9.3).	**Not relevant**
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.	6.2.2 6.1.1	*"The scale interval shall be in the form 1×10^n, 2×10^n, or 5×10^n <unit> (n being a positive or negative whole number or zero)."* *"The indicating device associated with the gas meter shall indicate the quantity of gas measured (volume, mass or energy) in the corresponding units. The reading shall be clear and unambiguous. "*	**Covered**
9.6	A material measure shall be marked with		Gas meters are not material measure.	**Not relevant**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
	a nominal value or a scale, accompanied by the unit of measurement used.			
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.	4.1	*"All quantities shall be expressed in SI units [3] or as other legal units of measurement [4], unless a country's legal units are different."*	**Covered**
9.8	All marks and inscriptions required under any requirement shall be clear, non-erasable, unambiguous and non-transferable.	4.2	*"All markings prescribed in 4.2 shall be visible, easily legible and indelible under rated conditions of use.* *Any marking other than those prescribed in the type approval document shall not lead to confusion. "*	**Covered**
10	Indication of result			
10.1	Indication of the result shall be by means of a display or a hard copy.	6.1.1	*"The indicating device may be:* *a) a mechanical indicating device as described in 6.1.4;* *b) an electromechanical or electronic indicating device as described in 6.1.5;* *c) a combination of a) and b)."* Hard copy is not considered as an indication device in R 137-1 (see 2.1.7)	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	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.	6.1.1	*"The reading shall be clear and unambiguous.* *…* *It may be possible to use one display for other indications as well, as long as it is clear which quantity is being displayed."*	**Covered**
10.3	In the case of hard copy the print or record shall also be easily legible and non-erasable.	2.1.10 6.3	A printing device is considered in OIML R 137-1 as an ancillary device. In the event that the ancillary device is subject to legal metrology control, it shall fulfil the requirements of OIML R 137-1 and in particular those related to legibility and non-erasability defined in 6.1.1 of OIML R 137-1.	**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.		Not for direct sales trading.	**Not relevant**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	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.	3.1.5	*"The indicating device can be connected to the meter body physically or remotely. In the latter case the data to be displayed shall be stored in the gas meter.* *Note: National or regional requirements may contain provisions to guarantee access to the data stored in the meter for customers and consumers."*	**Covered**
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 - the measuring instrument is normally intended for use in the absence of one of the trading parties.		Gas meters addressed by MID are utility meters.	**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.		See comment in 11.1.	**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.		No equivalent specific requirement but an instrument in conformity with the R allows its ready evaluation.	**Covered**

<table>
<tr><th colspan="2">Directive 2004/22/EC

Essential requirements of Annex 1 and Annex MI-002</th><th>OIML R 137-1 (2006)</th><th>Comments</th><th>Conclusion</th></tr>
<tr><td colspan="5">ANNEX MI-002</td></tr>
<tr><td>Definitions</td><td>Gas meter

Minimum flowrate

Maximum flowrate

Transitional flowrate

Overload flowrate</td><td>2.1.1

2.3.3

2.3.2

2.3.4

2.4.4 & 7.4.11</td><td></td><td>Covered</td></tr>
<tr><td>1</td><td>Rated operating conditions

The manufacturer shall specify the rated operating conditions of the gas meter, taking into account:</td><td>7.3.5</td><td>“Applications for type approval of gas meters shall be accompanied by the following documents:

• a description of the meter giving the rated operating conditions (5.1), the metrological and technical characteristics, and the principle of its operation;”</td><td>Covered</td></tr>
<tr><td>1.1</td><td>The flowrate range of the gas shall fulfil at least the following conditions:

<table><tr><th>Class</th><th>Qmax/Qmin</th><th>Qmax/Qt</th><th>Qr/Qmax</th></tr><tr><td>1.5</td><td>≥150</td><td>≥10</td><td>1.2</td></tr><tr><td>1.0</td><td>≥20</td><td>≥5</td><td>1.2</td></tr></table></td><td>5.2</td><td>“The flowrate characteristics of a gas meter shall be defined by the values of Qmax, Qt and Qmin as stated in Table 1.

Table 1 Flowrate characteristics
<table><tr><th>Qmax / Qmin</th><th>Qmax / Qt</th></tr><tr><td>≥ 50</td><td>≥ 10</td></tr><tr><td>≥ 5 and < 50</td><td>≥ 5</td></tr></table>The flowrate ratios are compatible only when the ratio is comprise between 20 and 50 (excluded) and when the ratio is greater or equal to 150.</td><td>Covered for class 1.5 if $Q_{max}/Q_{min} \geq 150$

Covered for class 1.0 if $Q_{max}/Q_{min} \geq 20$</td></tr>
</table>

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
1.2	The temperature range of the gas, with a minimum range of 40°C.		No requirement in OIML R 137-1	**Not Covered**
1.3	The fuel/gas related conditions. The gas meter shall be designed for the range of gases and supply pressures of the country of destination. In particular the manufacturer shall indicate: – the gas family or group; – the maximum operating pressure.	5.1	*"The rated operating conditions for a gas meter shall be as follows:* *…* *Working pressure range: pmin to pmax inclusive* *Gases: the family of natural gases, industrial gases, or supercritical gases; to be specified by the manufacturer "*	**Covered**
1.4	A minimum temperature range of 50 ºC for the climatic environment.	5.1	*"The rated operating conditions for a gas meter shall be as follows:* *…* *Ambient temperature range: lower temperature to be chosen from - 40 °C, - 25 °C, - 10 °C and + 5 °C* *upper temperature to be chosen from + 30 °C, + 40 °C, + 55 °C and + 70 °C* *"* Three options of OIML R 137-1 are not compatible with MID requirements: - - 10 °C to + 30 °C - + 5 °C to + 30 °C - + 5 °C to + 40 °C	**Covered except for three temperature ranges of OIML R137-1**

<table>
<tr><th colspan="2">Directive 2004/22/EC

Essential requirements of Annex 1 and Annex MI-002</th><th>OIML R 137-1 (2006)</th><th>Comments</th><th>Conclusion</th></tr>
<tr><td>1.5</td><td>The nominal value of the AC voltage supply and/or the limits of DC supply</td><td>4.2.4</td><td>“Additional markings for gas meters with electronic devices
v) For an external power supply: the nominal voltage and nominal frequency;
w) For a non-replaceable or replaceable battery: the latest date by which the battery is to be replaced, or the remaining battery capacity.”</td><td>Covered</td></tr>
<tr><td>2</td><td>Maximum permissible error (MPEs)</td><td></td><td></td><td></td></tr>
<tr><td>2.1</td><td>Gas meter indicating the volume at metering conditions or mass

<table><tr><td>Class</td><td>1,5</td><td>1.0</td></tr><tr><td>Qmin < Q < Qt</td><td>3%</td><td>2%</td></tr><tr><td>Qt < Q < Qmax</td><td>1,5%</td><td>1%</td></tr></table>Table 1

When the errors between Qt and Qmax all have the same sign, they shall all not exceed 1% for class 1.5 and 0,5% for Class 1.0.</td><td>5.3.3</td><td>“Gas meters shall be classified into the Accuracy Classes given in Table 2. The errors shall be within the applicable values given in Table 2.
Table 2 Maximum permissible errors of gas meters
<table><tr><td rowspan="2">Flowrate Q</td><td colspan="3">On type approval and initial verification Accuracy Class</td><td colspan="3">In-service Accuracy Class</td></tr><tr><td>0.5</td><td>1</td><td>1.5</td><td>0.5</td><td>1</td><td>1.5</td></tr><tr><td>Qmin ≤ Q < Qt</td><td>± 1 %</td><td>± 2 %</td><td>± 3 %</td><td>± 2 %</td><td>± 4 %</td><td>± 6 %</td></tr><tr><td>Qt ≤ Q ≤Qmax</td><td>± 0.5 %</td><td>± 1 %</td><td>± 1.5 %</td><td>± 1 %</td><td>± 2 %</td><td>± 3 %</td></tr></table>Note: National Authorities may decide whether they will implement in-service maximum permissible errors or not”

The accuracy classes 1 and 1.5 of the OIML R 137-1 are the same as the MID. Class 0.5 is not foreseen in MID

R 137 uses the weighted mean error concept instead of the same sign rule in MID.</td><td>Covered except for the requirement on errors of same sign in 2.1, Annex MI-002</td></tr>
</table>

<table>
<tr><th colspan="2">Directive 2004/22/EC

Essential requirements of Annex 1 and Annex MI-002</th><th>OIML R 137-1 (2006)</th><th>Comments</th><th>Conclusion</th></tr>
<tr><td>2.2</td><td>For a gas meter with temperature conversion, which only indicates the converted volume, the MPE of the meter is increased by 0,5% in a range of 30°C extending symmetrically around the temperature specified by the manufacturer that lies between 15ºC and 25ºC. Outside this range, an additional increase of 0,5% is permitted in each interval of 10°C.</td><td>5.3.4</td><td>“Mechanical gas meter with a built-in mechanical temperature conversion device For a mechanical gas meter with a built-in mechanical temperature conversion device having only one indicating device displaying the volume at base conditions, the maximum permissible errors as indicated in Table 2 are increased by 0.5 % in a range of 30 °C extending symmetrically around the temperature tsp specified by the manufacturer. Outside this range an additional increase of 0.5 % is permitted in each interval of 10 °C. Compliance with these requirements shall be verified at temperatures deviating by not more than 2 °C from the upper and lower limits of the specified intervals.”

According to R 137-1, the manufacturer is free to define the temperature. It is not required that it shall be chosen between 15 °C and 25 °C.</td><td>Covered if selected temperature lies between 15 °C and 25 °C</td></tr>
<tr><td>3</td><td>Permissible effect of disturbances</td><td></td><td></td><td></td></tr>
<tr><td>3.1

3.1.1</td><td>Electromagnetic immunity

The effect of an electromagnetic disturbance on a gas meter or volume conversion device shall be such that:

– the change in the measurement result is no greater than the critical change value as defined in 3.1.3, or

– the indication of the measurement result is such that it cannot be interpreted as a valid result, such as a momentary variation that cannot be interpreted, memorised or transmitted as a measuring result.</td><td>7.4.15</td><td>“If a gas meter includes electronic components, the tests as described in Annex A shall be performed. An overview of the test program is shown in Table 6, with the requirements pertaining to each test. After each test it shall be verified that no loss of data has occurred…”

Table 6
<table>
<tr><th>Test</th><th>Clause</th><th>I/D</th><th>Minimum No. of samples</th><th>Requirement</th></tr>
<tr><td>Electrostatic discharge</td><td>A.6.2</td><td>D</td><td>1</td><td>Δe ≤ 0.5 MPE after</td></tr>
</table></td><td>Covered</td></tr>
</table>

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
3.1.2	After undergoing a disturbance, the gas meter shall: – recover to operate within MPE, and – have all measurement functions safeguarded, and – allow recovery of all measurement data present just before the disturbance.	7.4.15	*"If a gas meter includes electronic components, the tests as described in Annex A shall be performed. An overview of the test program is shown in Table 6, with the requirements pertaining to each test. After each test it shall be verified that no loss of data has occurred…"*	**Covered**
3.1.3	The critical change value is the smaller of the two following values: – the quantity corresponding to half of the magnitude of the MPE in the upper zone on the measured volume; – the quantity corresponding to the MPE on the quantity corresponding to one minute at maximum flowrate.	7.4.15 2.2.10	The critical change value, called fault in R 137-1, shall be smaller or equal to 0.5 MPE (§7.4.15, table 6). *"Fault Δe (OIML D 11, 3.9)* *Difference between the error of indication and the intrinsic error of a measuring system or of its constituent elements."* The second condition of the MID is not included in OIML R 137-1.	**Covered for the first clause of the requirement**
3.2	Effect of upstream-downstream flow disturbances Under installation conditions specified by the manufacturer, the effect of the flow disturbances shall not exceed one third of the MPE.	7.4.8	*"Gas meters whose error is affected by the influence of flow disturbances shall be submitted to a test as specified in Annex B. During the test the meter shall be installed according to the manufacturers' specifications. The shift of the error curve shall not exceed 0.33 times the maximum permissible error."*	**Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
4	Durability After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criteria shall be satisfied:		This is not a requirement	
4.1	Class 1.5. meters			
4.1.1	The variation of the measurement result after the durability test when compared with the initial measurement result for the flow rates in the range Qt to Qmax-shall not exceed the measurement result by more than 2%	7.4.9	*"The fault due to the durability test shall not exceed the following values for the flowrates Qt up to Qmax:* *1.0 times the applicable maximum permissible error on initial verification for accuracy class 1.5;"* (1.5% according to § 5.3.3, that is more restrictive than 2%)	**Covered**
4.1.2	The error of indication after the durability test shall not exceed twice the MPE in paragraph 2.	7.4.9	*"After the durability test the gas meters (with the exception of one of them if the durability test has been carried out on a number of gas meters according to option 2) shall comply with the following requirements:* *• The error shall be within the limits of the double maximum permissible error on initial verification as stated in 5.3.* *."* Identical requirement.	**Covered**
4.2	Class 1.0 meters			
4.2.1	The variation of the measurement result after the durability test when compared with the initial measurement result shall not exceed one-third of the MPE in paragraph 2.	7.4.9	*"The fault due to the durability test shall not exceed the following values for the flowrates Qt up to Qmax:* *0.5 times the applicable maximum permissible error on initial verification for other accuracy classes. "* (0.5% according to § 5.3.3)	**Not Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
4.2.2	The error of indication after the durability test shall not exceed the MPE in paragraph 2.			**Not Covered**
5	Suitability			
5.1	A gas meter powered from the mains (AC or DC) shall be provided with an emergency power supply device or other means to ensure, during a failure of the principal power source, that all measuring functions are safeguarded.			**Not covered**
5.2	A dedicated power source shall have a lifetime of at least five years. After 90% of its lifetime an appropriate warning shall be shown.	6.4.4	*"If the instrument is powered by a replaceable battery, the manufacturer shall give detailed specifications for the replacement thereof. The date by which the battery shall be replaced shall be indicated on the meter. Alternatively, the remaining battery life can be displayed or a warning can be given when 10 % of the estimated life of the battery remains.* *The properties and parameters of the meter shall not be affected during replacement of the battery.* *The battery shall be able to be replaced without breaking the metrological seal.* *The battery compartment shall be capable of being secured from tampering."*	**Covered by one of the alternatives**
5.3	An indicating device shall have a sufficient number of digits to ensure that the quantity passed during 8000 hours at Qmax does not return the digits to their initial values.	6.1.2	*"The indicating device shall be able to record and display the indicated quantity of gas corresponding to at least 1000 hours of operation at the maximum flowrate Qmax, without returning to the original reading."*	**Not Covered**

	Directive 2004/22/EC Essential requirements of Annex 1 and Annex MI-002	OIML R 137-1 (2006)	Comments	Conclusion
5.4	The gas meter shall be able to be installed to operate in any position declared by the manufacturer in its installation instruction.	3.4 7.4.5	*"The manufacturer shall specify the installation conditions (as applicable) with respect to:* *…* *"* *"If the meter is marked as operating only in certain orientations, then it shall be tested in these orientations.* *In the absence of such marks the meter shall be tested in at least three orientations: horizontal, vertical up and vertical down, unless the construction of the meter is orientation independent.* *If the meter is able to measure the flowrate in two directions, the accuracy measurements as stated in 7.4.3 are performed in both directions."*	**Covered**
5.5	The gas meter shall have a test element, which shall enable tests to be carried out in a reasonable time.	6.2.1	*"Gas meters shall be designed and constructed incorporating:* *a) an integral test element, or* *b) a pulse generator, or* *c) arrangements permitting the connection of a portable test unit."*	**Covered**
5.6	The gas meter shall respect the MPE in any flow direction or only in one flow direction clearly marked.	3.2 7.4.5	*"If the meter is marked as operating only in certain orientations, then it shall be tested in these orientations.* *In the absence of such marks the meter shall be tested in at least three orientations: horizontal, vertical up and vertical down, unless the construction of the meter is orientation independent.* *If the meter is able to measure the flowrate in two directions, the accuracy measurements as stated in 7.4.3 are performed in both directions."*	**Covered**
6	Units Metered quantity shall be displayed in cubic metre, or in kilogram.	4.1	*"All quantities shall be expressed in SI units [3] or as other legal units of measurement [4], unless a country's legal units are different. In the next section the unit corresponding to the quantity indicated is expressed by <unit>."*	**Covered if kg or m^3 is used**