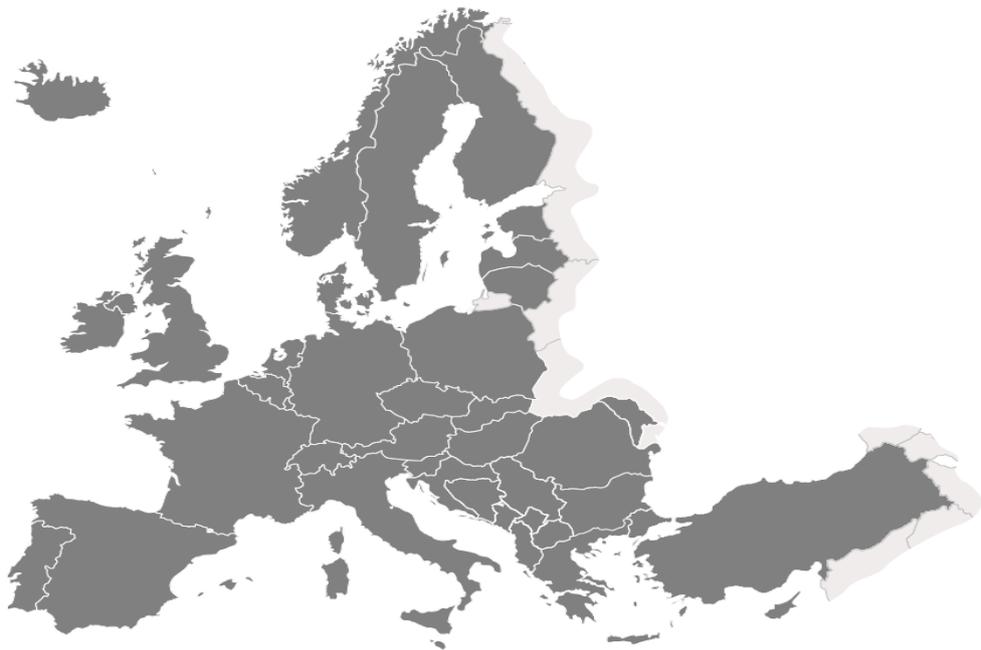


# WELMEC

European Cooperation in Legal Metrology

## Measuring Instruments Directive 2014/32/EU Multidimensional Measuring Instruments Corresponding Tables OIML R 129 2000 – Annex XI (MID-009) Chapter I and IV



For information:

This Guide is available to the Working Group Measuring Instruments for future reference on the Europa Website.

# WELMEC

European Cooperation in Legal Metrology

WELMEC is a cooperation between the legal metrology authorities of the Member States of the European Union and EFTA.

This document is one of a number of Guides published by WELMEC 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 EU Directives.

Alternative approaches may be acceptable, but the guidance provided in this document represents the considered view of WELMEC as to the best practice to be followed.

Published by:  
WELMEC Secretariat

E-mail: [secretary@welmec.org](mailto:secretary@welmec.org)  
Website: [www.welmec.org](http://www.welmec.org)

Multidimensional Measuring Instruments  
Corresponding Table 2014/32/EU vs. OIML R129:2000

**Notes:**

1. The column “Comments” indicates, if necessary, the relevant text of OIML R129 and related explanations concerning the compliance with the relevant requirements of Directive 2014/32/EU.
2. The column “Conclusion” gives the conclusion on the compliance between OIML R129 and the relevant requirements of Directive 2014/32/EU.

The indication “Covered” means that:

- the requirement of OIML R129 is identical to the one of Directive 2014/32/EU, or
- the requirement of OIML R129 is more severe than the one of Directive 2014/32/EU, or
- all the requirements of OIML R129 fulfil requirements of Directive 2014/32/EU (even when Directive 2014/32/EU allows other alternatives),
- The indication “Partially covered” means that the requirement is not fully covered or R 129 allows possibilities which are not foreseen in the directive.

The indication “Not Covered” means that the requirement in Directive 2014/32/EU is either not compatible with the relevant OIML R129 requirement or not included in OIML R129.

The indication “Not Relevant” means that the requirement in Annex I of Directive 2014/32/EU is not relevant for multidimensional measuring instruments.

The text in *italic* is an extract from the relevant clause of the OIML Recommendation.

Directive 2014/32/EU Essential requirements of Annex I and Annex XI (MI-009) Chapters I and IV	OIML R129:2000(E)	Comments	Conclusion
<b>ANNEX I</b>			
<p>Allowable Errors</p> <p>1.1. Under rated operating conditions and in the 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.</p> <p>Unless stated otherwise in the instrument-specific annexes, MPE is expressed as a bilateral value of the deviation from the true measurement value.</p>	2.26, 4.2 and 11.1.4.3	<p>MID (Article 4(7)) –“putting into use”, OIML R 129 “Initial verification” VIM 5.21,</p> <p>See also R 129 2.23-2.26 for definitions of errors</p>	Covered
<p>1.2. Under rated operating conditions and in the presence of a disturbance, the performance requirement shall be as laid down in the appropriate instrument-specific requirements.</p> <p>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.</p>	2.28, 5.3, A.3.4	<p>Covered except for permanent continuous electromagnetic fields</p> <p>The directive indicates <math>MPE \pm 1,0 d</math>, the R129 indicates “a significant fault is a fault greater than one scale interval (d). A fault equal to, or smaller than <math>1,0 d</math> is allowed during the disturbance</p>	Partially covered
<p>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 account of the requirements laid down in the appropriate instrument-specific annexes.</p>	Annex A	<p>Manufacturer to specify U/L temp limits, rest is specified in Annex A.</p> <p>Annex A describes the tests that needs to be performed not the fact that the manufacturer needs to specify the operating conditions.</p>	Partially covered

Directive 2014/32/EU Essential requirements of Annex I and Annex XI (MI-009) Chapters I and IV					OIML R129:2000(E)	Comments	Conclusion
1.3.1. <i>Climatic environments</i>  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 III to XII, 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.					5.1, 5.2	5.1.and 5.2 deals with the mpe during temperature and humidity test  No reference to condensing humidity or intended location. Covered except for condensing humidity or intended location  Manufacturer specify U/L temp. limits or they are -10 to 40 °C Range of temperature limits, if specified, shall be at least 30 °C (R 129 5.1)	Partially covered
	Temperature Limits						
Upper temperature limit	30 °C	40 °C	55 °C	70 °C			
Lower temperature limit	5 °C	- 10 °C	- 25 °C	- 40 °C			
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 supporting structures subject to negligible vibrations and shocks transmitted from local blasting or pile-driving activities, slamming doors, etc.						Not covered
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.						

<b>Directive 2014/32/EU</b> <b>Essential requirements of Annex I and Annex XI (MI-009)</b> <b>Chapters I and IV</b>	<b>OIML R129:2000(E)</b>	<b>Comments</b>	<b>Conclusion</b>
<p>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.</p> <p>(b) The following influence quantities shall be considered in relation with mechanical environments:</p> <ul style="list-style-type: none"> <li>- Vibration</li> <li>- Mechanical shock</li> </ul>			<p>Not covered</p>
<p>1.3.3. (a) Electromagnetic environments are classified into classes E1, E2 or E3 as described below, unless otherwise laid down in the appropriate instrument-specific annexes.</p>	<p>5.3, 11.1.4.4, Annex A.3</p>	<p>OIML R129 does not refer to the abbreviations used in MID (E1, E2 &amp; E3 are not mentioned), but the principle is identical. E3 is not foreseen.</p> <p>See comments below.</p>	<p>Partially covered</p>
<p>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.</p>		<p>Definition.</p> <p>Tests and severity levels in 1.3.3 (b) below shall be applied for E1</p> <p>This class may be appropriate</p>	<p>Partially Covered</p>
<p>E2 This class applies to instruments used in locations with electromagnetic disturbances corresponding to those likely to be found in other industrial buildings</p>		<p>Definition.</p> <p>Tests and severity levels in 1.3.3 (b) below shall be applied for E2</p> <p>This class would be appropriate</p>	<p>Partially Covered</p>

Directive 2014/32/EU Essential requirements of Annex I and Annex XI (MI-009) Chapters I and IV	OIML R129:2000(E)	Comments	Conclusion
<p>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:</p> <ul style="list-style-type: none"> <li>– voltage reductions caused energising the starter-motor circuits of internal combustion engines</li> <li>– load dump transients occurring in the event of a discharged battery being disconnected while the engine is running</li> </ul>		<p>Voltage reduction test is outdated in the recommendation but it is in D11:2013. Tests and severity levels in 1.3.3 (b) below shall also be applied for E3. (OIML D11:2013 (14.2, Tables 38, 39, 40))</p> <p>Load dump is not mentioned in R 129. OIML D11:2013 (14.2, Tables 41)</p>	Partially covered
<p>(b) The following influence quantities shall be considered in relation with electromagnetic environments:</p>	5.3, 11.1.4.4, Annex A.3	<p>Several tests are outdated or not up to the state of the art.</p> <p>E3 is not covered.</p>	Partially covered
<ul style="list-style-type: none"> <li>– Voltage interruptions,</li> </ul>	A.3.1	<p>A.3.1 covers voltage interruptions but the test is not up to date / not complete</p> <p>Covered on provision that the relevant severity level of OIML D 11:2013 is used.</p> <p>OIML D11:2013 (12.3, Table 23) For E1 use severity level 1. For E2 and E3 use severity level 2.</p>	Partially covered
<ul style="list-style-type: none"> <li>– Short voltage reductions,</li> </ul>	A.3.1	<p>A.3.1 covers voltage reductions but the test is not up to date / not complete.</p> <p>Covered on provision that the relevant severity level of OIML D 11:2013 is used.</p> <p>OIML D11:2013 (12.3, Table 23) For E1 use severity level 1. For E2 and E3 use severity level 2.</p>	Partially covered
<ul style="list-style-type: none"> <li>– Voltage transients on supply lines and/or signal lines,</li> </ul>	A.3.2	<p>Covered for E1 in the R129.</p> <p>Covered on provision that the relevant severity level of OIML D 11:2013 is used.</p> <p>OIML D11:2013 (12.3, Table 23 and 12.4 Table 28) For E1 use severity level 2. For E2 and E3 use severity level 3.</p>	Partially covered
<ul style="list-style-type: none"> <li>– Electrostatic discharges,</li> </ul>	A.3.3		Covered

– Radio frequency electromagnetic fields,	A.3.4	A.3.4 covers RF em fields but the test is not up to date. Covered on provision that the relevant severity level of OIML D 11:2013 is used. OIML D11:2013 (13.2, Tables 32, 33 and 34*). For E1 use severity level 2. For E2 use severity level 3.  * limit frequency range in Table 34 to 2 GHz.	Partially covered
– Conducted radio frequency electromagnetic fields on supply lines and/or signal lines.		Not covered by R129 but it is in D11:2013 OIML D11:2013 (13.2, Table 31). For E1 use severity level 2. For E2 use severity level 3.	Not covered
– Surges on supply lines and/or signal lines.		Not covered by R129 but it is in D11:2013 OIML D11:2013 (12.3, Table 27 and 12.4 table 29). For E1 use severity level 2. For E2 use severity level 3.	Not covered
1.3.4 Other influence quantities to be considered, where appropriate, are			Partially covered
– Voltage variation,	5.1, A.2.3, A.2.4	Covered for AC mains and battery power. Not covered for DC mains or instruments powered by a road vehicle (see D11)	Partially covered
– Mains frequency variation,		Not covered by R129 but it is in D11:2013 OIML D11:2013 (12.2, Table 21).	Not covered
– Power frequency magnetic fields,		Not covered by R129 but it is in D11:2013 OIML D11:2013 (13.1, Table 30).	Not covered
– Any other quantity likely to influence in a significant way the accuracy of the instrument.	6.6, A.1 5.4, A.4.1, A.4.2	Warm-up test Light and acoustic effects	Covered



<p align="center"><b>Directive 2014/32/EU</b></p> <p align="center"><b>Essential requirements of Annex I and Annex XI (MI-009)</b></p> <p align="center"><b>Chapters I and IV</b></p>	<p align="center"><b>OIML R129:2000(E)</b></p>	<p align="center"><b>Comments</b></p>	<p align="center"><b>Conclusion</b></p>
<p><b>2. Reproducibility</b> The application of the same measurand in a different location or by a 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.</p>			Not covered
<p><b>3. Repeatability</b> 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.</p>			Not covered
<p><b>4. Discrimination and Sensitivity</b> A measuring instrument shall be sufficiently sensitive and the discrimination threshold shall be sufficiently low for the intended measurement task.</p>			Not covered
<p><b>5. Durability</b> A measuring instrument shall be designed to maintain an adequate stability of its metrological characteristics over a period of time estimated by the manufacturer, provided that it is properly installed, maintained and used according to the manufacturer's instruction when in the environmental conditions for which it is intended.</p>			Not covered

Directive 2014/32/EU Essential requirements of Annex I and Annex XI (MI-009) Chapters I and IV	OIML R129:2000(E)	Comments	Conclusion
6. <b>Reliability</b> 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.	Section III, 10.2, 10.3	Reliability is not mentioned in R 129 but is the aim of section III.  <i>The following technical requirements ensure that the instrument is constructed so that it complies with the metrological requirements and will thus be suitable for legal use.</i>	Covered
7. <b>Suitability</b>			
7.1. A measuring instrument shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.	6.1		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.	6.2		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.	6.2		Covered

<b>Directive 2014/32/EU</b> <b>Essential requirements of Annex I and Annex XI (MI-009)</b> <b>Chapters I and IV</b>	<b>OIML R129:2000(E)</b>	<b>Comments</b>	<b>Conclusion</b>
<p>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.</p> <p>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.</p>	6.3	<p>Covered except for operation manual</p> <p>No reference to operation manual in R129</p>	<p>Partially Covered</p> <p>Not covered</p>
<p>8. <b>Protection against corruption</b></p>			
<p>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.</p>	10.4		Covered
<p>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.</p>	9.2		Covered

<p align="center"><b>Directive 2014/32/EU</b>  <b>Essential requirements of Annex I and Annex XI (MI-009)</b>  <b>Chapters I and IV</b></p>	<p align="center"><b>OIML R129:2000(E)</b></p>	<p align="center"><b>Comments</b></p>	<p align="center"><b>Conclusion</b></p>
<p>8.3. Software that is critical for metrological characteristics shall be identified as such and shall be secured.</p> <p>Software identification shall be easily provided by the measuring instrument.</p> <p>Evidence of an intervention shall be available for a reasonable period of time.</p>		See Welmec guide 7.2	Not covered
<p>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.</p>			Not covered
<p>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.</p>			Not relevant

<p align="center"><b>Directive 2014/32/EU</b>  <b>Essential requirements of Annex I and Annex XI (MI-009)</b>  <b>Chapters I and IV</b></p>	<p align="center"><b>OIML R129:2000(E)</b></p>	<p align="center"><b>Comments</b></p>	<p align="center"><b>Conclusion</b></p>
<p><b>9. Information to be borne by and to accompany the instrument</b></p>			
<p>9.1. A measuring instrument shall bear the following inscriptions:                      (a) manufacturer's mark or name;                      (b) information in respect of its accuracy,                       and, where applicable:                       (c) information in respect of the conditions of use;                      (d) measuring capacity;                      (e) measuring range;                      (f) identity marking;                      (g) number of the EC-type examination certificate or the EC design examination certificate;                      (h) information whether or not additional devices providing metrological results comply with the provisions of this Directive on legal metrological control.</p>	<p>8.1</p>		<p>Covered</p>
<p>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.</p>			<p>Not relevant</p>

Directive 2014/32/EU Essential requirements of Annex I and Annex XI (MI-009) Chapters I and IV	OIML R129:2000(E)	Comments	Conclusion
<p>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:</p> <ul style="list-style-type: none"> <li>(a) rated operating conditions;</li> <li>(b) mechanical and electromagnetic environment classes;</li> <li>(c) the upper and lower temperature limit, whether condensation is possible or not, open or closed location;</li> <li>(d) instructions for installation, maintenance, repairs, permissible adjustments;</li> <li>(e) instructions for correct operation and any special conditions of use;</li> <li>(f) conditions for compatibility with interfaces, sub-assemblies or measuring instruments.</li> </ul>	8.1, 8.2		Covered
<p>9.4. Groups of identical measuring instruments used in the same location or used for utility measurements do not necessarily require individual instruction manuals.</p>			Not relevant
<p>9.5. Unless specified otherwise in an instrument-specific annex, the scale interval for a measured value shall be in the form <math>1 \times 10^n</math>, <math>2 \times 10^n</math>, or <math>5 \times 10^n</math>, where n is any integer or zero.</p> <p>The unit of measurement or its symbol shall be shown close to the numerical value.</p>	7.4  7.3		Covered
<p>9.6. A material measure shall be marked with a nominal value or a scale, accompanied by the unit of measurement used.</p>			Not relevant
<p>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.</p>	3		Covered

<b>Directive 2014/32/EU</b> <b>Essential requirements of Annex I and Annex XI (MI-009)</b> <b>Chapters I and IV</b>	<b>OIML R129:2000(E)</b>	<b>Comments</b>	<b>Conclusion</b>
9.8. All marks and inscriptions required under any requirement shall be clear,	8.1		Covered
10. <b>Indication of result</b>			
10.1. Indication of the result shall be by means of a display or hard copy.	7.1	Indicator or printer: (See comments to 10.3 and 11.1)	Covered
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 presented result shall be permitted under normal conditions of use. Additional indications may be shown provided they cannot be confused with the metrologically controlled indications.	7.2 and 7.9		Covered
10.3. In the case of hard copy the print or record shall also be easily legible and non-erasable.	7.9	A record is not mentioned in R 129.	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.	7.1.b	The second part of 10.4 is not covered in R129	Partially Covered

<b>Directive 2014/32/EU</b> <b>Essential requirements of Annex I and Annex XI (MI-009)</b> <b>Chapters I and IV</b>	<b>OIML R129:2000(E)</b>	<b>Comments</b>	<b>Conclusion</b>
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 consumer. The reading of this display is the measurement result that serves as the basis for the price to pay.			Not relevant
<b>11. Further processing of data to conclude the trading</b>			
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: <ul style="list-style-type: none"> <li>– the measurement is non-repeatable and;</li> <li>– the measuring instrument is normally intended for use in the absence of one of the trading parties.</li> </ul>	7.9	R129 has no requirements on data storage and to identify the transaction	Partially Covered
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.	7.9 note 2		Covered
<b>12. Conformity evaluation</b>  A measuring instrument shall be designed so as to allow ready evaluation of its conformity with the appropriate requirements of this Directive.	6.3	There is a difference in the text, but the principle is the same	Covered

<p align="center"><b>Directive 2014/32/EU Essential requirements of Annex I and Annex XI (MI-009) Chapters I and IV</b></p>	<p align="center"><b>OIML R129:2000(E)</b></p>	<p align="center"><b>Comments</b></p>	<p align="center"><b>Conclusion</b></p>
<p><b>ANNEX XI DIMENSIONAL MEASURING INSTRUMENTS (MI-009)</b></p>			
<p>The relevant essential requirements of Annex I, the specific requirements of this Annex and the conformity assessment procedures listed in this Annex, apply to dimensional measuring instruments of the types defined below.</p>			
<p><b>DEFINITIONS</b></p>			
<p><b>Length Measuring Instrument</b> A length measuring instrument serves for the determination of the length of rope-type materials (e.g. textiles, bands, cables) during feed motion of the product to be measured.</p>			<p>Not Relevant</p>
<p><b>Area Measuring Instruments</b> An area measuring instrument serves for the determination of the area of irregular shaped objects, e.g. for leather.</p>			<p>Not Relevant</p>
<p><b>Multi-dimensional Measuring Instruments</b> A multi-dimensional measuring instrument serves for the determination of the edge length (length, height, width) of the smallest enclosing rectangular parallelepiped of a product.</p>	<p>2.1</p>	<p>Not the same text, but in conformity with MID</p>	<p>Covered</p>



<p align="center"><b>Directive 2014/32/EU</b>  <b>Essential requirements of Annex I and Annex XI (MI-009)</b>  <b>Chapters I and IV</b></p>	<p align="center"><b>OIML R129:2000(E)</b></p>	<p align="center"><b>Comments</b></p>	<p align="center"><b>Conclusion</b></p>								
<p><b>CHAPTER IV — Multidimensional measuring instruments</b></p>											
<p><i>Operating conditions</i></p>											
<p>1.1. Range Dimensions within the range specified by the manufacturer for the instrument.</p>			<p>Not covered</p>								
<p>1.2. Minimum dimension The lower limit of the minimum dimension for all values of the scale interval is given in Table 1 <small>Table 1</small></p> <table border="1" data-bbox="138 711 936 890"> <thead> <tr> <th>Scale interval (d)</th> <th>Minimum dimension (min) (lower limit)</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 2 \text{ cm}</math></td> <td>10 d</td> </tr> <tr> <td><math>2 \text{ cm} &lt; d \leq 10 \text{ cm}</math></td> <td>20 d</td> </tr> <tr> <td><math>10 \text{ cm} &lt; d</math></td> <td>50 d</td> </tr> </tbody> </table>	Scale interval (d)	Minimum dimension (min) (lower limit)	$d \leq 2 \text{ cm}$	10 d	$2 \text{ cm} < d \leq 10 \text{ cm}$	20 d	$10 \text{ cm} < d$	50 d	<p>4.1</p>		<p>Covered</p>
Scale interval (d)	Minimum dimension (min) (lower limit)										
$d \leq 2 \text{ cm}$	10 d										
$2 \text{ cm} < d \leq 10 \text{ cm}$	20 d										
$10 \text{ cm} < d$	50 d										
<p>1.3. Speed of the product The speed must be within the range specified by the manufacturer for the instrument.</p>			<p>Not covered</p>								
<p><i>MPEs</i></p>											
<p>2. Instrument The MPE is <math>\pm 1,0 d</math>.</p>	<p>4.2, 4.5</p>	<p>Covered except when the error is rounded to whole scale intervals.  In R129 is MPE stated without decimal (as <math>\pm 1 d</math>). R129 allows the error to be rounded to whole scale intervals, so error up to <math>\pm 1.5 d</math> can be</p>	<p>Partially covered</p>								