**Сравнителна таблица между ILAC-G24:2007 и ILAC-G24:2022**

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| **ILAC-G24:2007** | **ILAC-G24:2022** |
| **Preamble**  This Guidance Document is a revision of OIML D 10. It was drafted by ILAC (International Laboratory Accreditation Cooperation) and the OIML (International Organization of Legal Metrology) as a joint venture and is published as such.  It is important to point out that:  - It is not the responsibility of accreditation bodies to teach laboratories how to run their business.  - It is the responsibility of each individual laboratory to choose to implement any or none of the methods described in this Document based on its individual needs and its individual assessment of risks.  - It is also the responsibility of the laboratory to evaluate the effectiveness of the method it chooses to implement and take responsibility for the consequences of the decisions taken as a result of the method chosen. | **1. Introduction**  1.1 This guidance Document was developed by the OIML (International Organization of Legal Metrology) and ILAC (International Laboratory Accreditation Cooperation) as a joint venture and is published as such.  1.2 It is important to point out that  a) it is the responsibility of each laboratory to choose to implement any or none of the methods described in this Document based on its individual needs and risk assessments, and  b) it is also the responsibility of each laboratory to evaluate the effectiveness of the implemented method(s). The laboratory should also take responsibility for the consequences of the choice of the method(s). |
| **Purpose**  The purpose of this Document is to give laboratories, particularly while setting up their calibration system, guidance on how to determine calibration intervals. This Document identifies and describes the methods that are available and known for the evaluation of calibration intervals. | **2. Scope**  2.1 The purpose of this Document is to provide guidance to laboratories on methods to determine and review the recalibration intervals of measuring equipment under their control as part of establishing the calibration program of their laboratory. This Document is also applicable to other Conformity Assessment Bodies (e.g. Inspection Bodies and Certification Bodies) and other parties (e.g. manufacturers) that utilise measuring equipment. |
| **Authorship**  This publication was developed by the OIML and ILAC as a joint venture and as a revision of OIML D 10. Within ILAC the focal point has been the Accreditation Committee. |  |
|  | **3. Terms and definitions**  Unless otherwise stated in the following subclauses, the terminology used in this Document conforms to the VIM3 [1], ISO/IEC 17000 [12], ISO/IEC 17020 [13], ISO/IEC 17025 [3], ISO/IEC 17065 [17] and CIPM MRA-G-13 [2].  For the purpose of this Document, the definitions and abbreviations given below apply. Some of the terms in clause 3 are listed with alternative terms which are considered to have an identical definition. The text “for D 10” marks text which is not part of the definition found in the referenced documents (e.g. additional explanatory notes that specifically concern terms used in this Document). |
| **1. Introduction**  An important aspect for maintaining the capability of a laboratory to produce traceable and reliable measurement results is a determination of the maximum period that should be permitted between successive calibrations (recalibrations) of the reference or working standards and measuring instruments used. Various international standards take this aspect into account, e.g.:  ISO/IEC 17025:2005 [1] contains the following requirements:  Clause 5.5.2:  Clause 5.5.8:  Clause 5.6.1  “Calibration programs shall be established for key quantities or values of the instruments where these properties have a significant effect on the results”.  "Whenever practicable, all equipment under the control of the laboratory and requiring calibration shall be labeled, coded, or otherwise identified to  indicate the status of calibration, including the data when last calibrated and the date or expiration criteria when recalibration is due”.  “All equipment used for tests and/or calibrations, including equipment for  subsidiary measurements (e.g. for environmental conditions) having a  significant effect on the accuracy or validity of the result of the test,  calibration or sampling shall be calibrated before being put into service. The 5ILAC-G24:2007 / OIML D 10:2007 (E) laboratory shall have an established program and procedure for the calibration of its equipment.”  Note:  Such a program should include a system for selecting, using, calibrating,  checking, controlling and maintaining measurement standards, reference  materials used as measurement standards, and measuring and test equipment used to perform tests and calibrations.  ISO 9001:2000 [10] contains the requirement:  Clause 7.6:  Note:  “Where necessary to ensure valid results, measuring equipment shall:  a) be calibrated or verified at specified intervals, or prior to use, against  measurement standards traceable to international or national measurement  standards; where no such standards exist, the basis used for calibration or  verification shall be recorded”.  This Document focuses on the determination of calibration intervals of measuring instruments. The methods described can also be used in an appropriate manner for reference standards, working standards, etc., which are under the control of the laboratory.  In line with the terminology of the VIM [11], the term “measuring instrument” is used instead of “measuring equipment” in this Document.  The general purpose of a periodic calibration is:  • to improve the estimation of the deviation between a reference value and the value obtained using a measuring instrument, and the uncertainty in this deviation, at the time the instrument is actually used;  • to reassure the uncertainty that can be achieved with the measuring instrument; and  • to confirm whether or not there has been any alteration of the measuring instrument which could introduce doubt about the results delivered in the elapsed period.  One of the most significant decisions regarding the calibration is “When to do it” and “How often to do it”. A large number of factors influence the time interval that should be allowed between calibrations and should be taken into account by the laboratory. The most important factors are:  • uncertainty of measurement required or declared by the laboratory;  • risk of a measuring instrument exceeding the limits of the maximum permissible error when in use;  • cost of necessary correction measures when it is found that the instrument was not appropriate over  a long period of time;  • type of instrument;  • tendency to wear and drift;  • manufacturer’s recommendation;  • extent and severity of use;  • environmental conditions (climatic conditions, vibration, ionizing radiation, etc.);  • trend data obtained from previous calibration records;  • recorded history of maintenance and servicing;  • frequency of cross-checking against other reference standards or measuring devices;  • frequency and quality of intermediate checks in the meantime;  • transportation arrangements and risk; and  • degree to which the serving personnel are trained.  Although the cost of calibration cannot normally be ignored in determining the calibration intervals, the increased measurement uncertainties or a higher risk in terms of measurement quality and services  arising from longer intervals may mitigate against the apparently high cost of a calibration.  The process of determining calibration intervals is a complex mathematical and statistical process requiring accurate and sufficient data taken during the calibration process. There appears to be no universally applicable single best practice for establishing and adjusting the calibration intervals. This has created a need for better understanding of the calibration interval determination. As no single method is ideally suited for the whole range of measuring instruments, some of the simpler methods of assigning and reviewing the calibration interval and their suitability for different types of instruments are covered in this Document. The methods have been published in more detail in certain standards  (e.g. [2]), or by reputable technical organizations (e.g. [5], [6], [7]), or in relevant scientific journals.  The methods can be used for the initial selection of calibration intervals and the readjustment of these intervals on the basis of experience. Laboratory-developed methods or methods adopted by the laboratory may also be used if they are appropriate and if they are validated.  The laboratory should select appropriate methods and should document those used. Calibration results should be collected as historical data, in order to base future decisions for calibration intervals of the  instruments.  Independently from the determined calibration intervals, the laboratory should have an appropriate system to ensure the proper functioning and calibration status of the standards and measuring instruments used between calibrations (see Clauses 5.5.10 and 5.6.3.3 of ISO/IEC 17025:2005). | **4. General**  4.1 An important aspect for maintaining the capability of a laboratory to produce traceable measurement results is to determine the maximum period that should be permitted between successive calibrations (recalibrations) of the measuring equipment used. Various international  standards dealing with measurement activities take this aspect into account, e.g. ISO/IEC 17025 [3] and ISO 15189 [15]. In addition, this aspect is also included in international standards applicable to conformity assessment bodies and other parties operating according to e.g. ISO/IEC  17020 [13], ISO/IEC 17043 [14], ISO/IEC 17065 [17], ISO 9001 [11], ISO 17034 [16] or ISO 22870 [18].  *Note: Establishing and maintaining traceability of measurement results can be done by means such as, but not limited to*  *- defining calibration periodicity,*  *- defining process control measures,*  *- defining intermediate checks.*  4.2 The purposes of calibrating measuring equipment as a measure of maintaining metrological traceability are:  a) to provide an estimate of the deviation between a reference value and the value obtained using the measuring equipment, and the uncertainty in this deviation, at the time the measuring equipment is actually used;  b) to support the validation of the required or declared measurement uncertainty that can be achieved with the measuring equipment; and  c) to confirm whether or not there has been any alteration of the measuring equipment which could introduce doubt about the results delivered in the elapsed period.  4.3 One of the most significant decisions regarding the calibration of measuring equipment is the timing and frequency of its implementation. The frequency between calibrations is a critical issue and is influenced by many factors that need to be taken into account by the laboratory. The most important of these factors are provided in 5.1.  4.4 The calibration records may be used to determine recalibration intervals, when calibrations are provided by, but not limited to:  a) national metrology institutes and designated institutes that have been subject to appropriate peer review processes under the CIPM MRA; or  b) laboratories that have been accredited by an accreditation body which is a signatory to the ILAC (International Laboratory Accreditation Cooperation) Arrangement or to Regional Arrangements recognised by ILAC; or  c) calibration provided by national metrological institutes, designated institutes or laboratories not fulfilling conditions a) or b) and whose services are suitable for the intended use, provided that conditions a) or b) could not be met for other than economic reasons (i.e. are not  available). Also refer to ILAC P10 [19].  The recommendations mentioned above do not preclude involvement of other parties, provided that sufficient evidence of metrological traceability is available.  4.5 It is acknowledged that the costs associated with performing recalibrations may be higher when increased recalibration frequencies are applied. However, these costs need to be balanced against increased measurement uncertainties or a higher risk in decreased measurement reliability which may occur with longer recalibration intervals.  4.6 There is no universally applicable single best practice for establishing and adjusting the recalibration intervals. This has created the need for a better understanding of the recalibration interval determination. As no single method is ideally suited for the whole range of measuring equipment, some of the simpler methods of assigning and reviewing the recalibration interval and their suitability for different types of measuring equipment are covered in this Document.  *Note: The methods have been published in more detail in certain standards by reputable technical organizations (e.g. [6], [7], [8]), or in relevant scientific journals.*  4.7 Methods for determining recalibration intervals developed by or adapted by the laboratory may also be used if they are appropriate and validated.  4.8 The laboratory should select the appropriate methods for determining recalibration intervals and should document those methods used. Calibration results should be collected and retained as the historical data, in order to form the basis of future decisions for recalibration intervals of the measuring equipment.  4.9 The laboratory should have an appropriate system of intermediate checks to ensure the correct functioning and calibration status of the measuring equipment used between calibrations (e.g. see ISO/IEC 17025 [3]).  4.10 The laboratory should check whether the results of external calibration and/or intermediate checks fall within predetermined limits prior to approving the measuring equipment for further use.  *Note 1: For some kinds of measuring equipment, each measuring instrument or device which composes the equipment may be calibrated separately. In this case, a combined standard measurement uncertainty of the measuring equipment is calculated from the uncertainties arising from all the measuring instruments and devices.*  *Note 2: It may be necessary to re-evaluate calibration intervals of whole measuring equipment, or its measuring instruments and devices based on data obtained from previous calibrations.* |
| **2. Initial choice of calibration intervals**  The initial decision in determining the calibration interval is based on the following factors:  • the instrument manufacturer’s recommendation;  • expected extent and severity of use;  • the influence of the environment;  • the required uncertainty in measurement;  • maximum permissible errors (e.g. by legal metrology authorities);  • adjustment of (or change in) the individual instrument;  • influence of the measured quantity (e.g. high temperature effect on thermocouples); and  • pooled or published data about the same or similar devices.  The decision should be made by a person or by persons with general experience of measurements, or of the particular instruments to be calibrated, and preferably also with knowledge of the intervals used  by other laboratories. An estimate should be made for each instrument or group of instruments as to the length of time the instrument is likely to remain within the maximum permissible error after calibration. | **5. Initial choice of recalibration intervals**  5.1 The initial decision in determining the recalibration interval is based mainly on a risk assessment analysis and should take into account, but not limited to, the following factors:  a) measurement uncertainty required and evaluated by the laboratory;  b) type of measuring equipment and its components;  c) risk of the measuring equipment exceeding the predetermined limits (e.g. maximum permissible error), or accuracy requirements in use;  d) manufacturer’s recommendations regarding the measuring equipment (e.g. when the measurement uncertainty is required and evaluated by the laboratory based on the accuracy of the instrument);  e) tendency to wear and drift;  f) expected extent and severity of use;  g) environmental conditions (e.g. climatic conditions, vibration, ionising radiation);  h) influence of the measured quantity (e.g. high temperature effect on thermocouples) on measurement results;  i) pooled or published data about the same or similar devices;  j) frequency of comparisons with other measurement standards or measuring instruments;  k) frequency, quality and results of intermediate checks;  l) transportation arrangements of the measuring equipment and associated risks;  m) degree to which the operating staff are trained and extent to which the established procedures are implemented; and  n) legal requirements.  5.2 The decision should be made by personnel having the relevant technical competence. An estimate should be made for each piece (or a group of pieces) of measuring equipment as to the time period  in which the piece(s) is (are) likely to remain within the prescribed limits (i.e. maximum permissible error, accuracy requirements) after a calibration. |
| **3. Methods of reviewing calibration intervals**  Once calibration on a routine basis has been established, adjustment of the calibration intervals should be possible in order to optimize the balance of risks and costs as stated in the introduction. It will probably be found that the intervals initially selected do not give the desired optimum results due to a number of reasons, for example:  • instruments may be less reliable than expected;  • the usage may not be as anticipated;  • it may be sufficient to carry out a limited calibration of certain instruments instead of a full calibration; and  • the drift determined by the recalibration of the instruments may show that longer calibration intervals may be possible without increasing risks, etc.  A range of methods is available for reviewing the calibration intervals. The method chosen differs according to whether:  • instruments are treated individually or as groups (e.g. by manufacturer’s model or by type);  • instruments exceed the calibration by drift over time or by usage;  • instruments show different types of instabilities;  • instruments undergo adjustments; and  • data are available and importance is attached to the history of calibration of the instruments.  The so-called “engineering intuition” which fixed the initial calibration intervals, and a system which maintains fixed intervals without review, are not considered as being sufficiently reliable and are therefore not recommended. | **6. Methods of reviewing recalibration intervals**  *Note: The methods described in this section may also be used to review the type and frequency of intermediate checks.*  6.1 General principles  Once calibration has been conducted on a routine basis (based on a defined number of consecutive results), adjustment of the recalibration intervals should be possible in order to optimise the balance of risks and costs as stated in the general aspects. It will probably be found that the intervals initially selected do not give the desired optimum results due to a number of reasons, for example:  a) measuring equipment may be more or less reliable than expected;  b) the extent of usage and care in maintenance may not be as anticipated;  c) for certain measuring equipment it may be sufficient to carry out a partial calibration instead of a full calibration; and  d) the instrumental drift determined by the recalibration of the measuring equipment may show that shorter calibration intervals are required or longer calibration intervals may be possible without increasing risks, etc.  Several different methods are available for reviewing the recalibration intervals. The method chosen differs according to whether  a) measuring equipment is treated individually or as groups (e.g. by the manufacturer’s model or by the type),  b) the measuring equipment’s performance fails to meet prescribed limits (e.g. maximum permissible error, accuracy requirements) due to drift over time or by usage,  c) the measuring equipment shows different types of instabilities,  d) the measuring equipment undergoes adjustments, and  e) data are available and the history of calibration of the measuring equipment (e.g. trend data obtained from previous calibration records, recorded history of maintenance and servicing of the measuring instrument, data from intermediate checks) can be analysed.  New measuring equipment should be calibrated more frequently to identify any trend in its performance characteristics which may indicate that a change to the recalibration interval may be warranted. Ongoing review of the recalibration interval and equipment performance is necessary and for this reason, fixed recalibration intervals are not recommended unless the interval has been specified in a normative document such as a reference measurement procedure, specified method  or a consensus standard. |
| **Method 1: Automatic adjustment or “staircase” (calendar-time)**  Each time an instrument is calibrated on a routine basis, the subsequent interval is extended if it is found to be within e.g. 80 % of the maximum permissible error that is required for measurement, or reduced if it is found to be outside this maximum permissible error. This “staircase” response may produce a rapid adjustment of intervals and is easily carried out without clerical effort. When records are maintained and used, possible trouble with a group of instruments indicating the need for a  technical modification, or preventive maintenance, will be known.  A disadvantage of systems treating instruments individually may be that it is difficult to keep the calibration workload smooth and balanced, and that it requires detailed advanced planning.  It would be inappropriate to take an interval to extremes using this method. The risk associated with withdrawing large numbers of certificates issued, or redoing large numbers of jobs may ultimately be  unacceptable. | **6.2 Method 1: Automatic adjustment or “staircase” (calendar-time)**  6.2.1 Each time a piece of measuring equipment is calibrated on a routine basis, the subsequent recalibration interval is extended (or kept unchanged) if the deviation from the reference value is found to be within an appropriately defined percentage of the range between the maximum  permissible errors. Otherwise, the recalibration interval is reduced when the deviation from the reference value is outside this percentage of the range. The maximum permissible errors may be replaced with any other set of limits as required. It is recommended that appropriate decision  criteria for extension or reduction of the recalibration interval of measuring equipment are specified for typical individual cases. This “staircase” response may produce a rapid adjustment of intervals and is easily carried out without administrative effort. When the records of calibration are maintained and utilised, future issues with a group of measuring equipment become predictable because the records indicate the need for technical modifications or preventive maintenance.  6.2.2 A disadvantage of systems dealing with measuring equipment individually may be that it is difficult to keep the calibration workload smooth, relatively stable and balanced between risks and costs, and that it requires detailed advanced planning.  6.2.3 It would be inappropriate to set an extremely long recalibration interval using this method. Such a case may lead to risks associated with withdrawing large numbers of reported measurement results, or repeating a significant amount of work, and such risks may ultimately become  unacceptable. |
| **Method 2: Control chart (calendar-time)**  Control charting is one of the most important tools of Statistical Quality Control (SQC) and well-described in publications (e.g. [3], [4]). In principle, it works as follows: Significant calibration points are chosen and the results are plotted against time. From these plots, both dispersion of results and drift are calculated, the drift being either the mean drift over one calibration interval, or in the case of very stable instruments, the drift over several intervals. From these figures, the optimum interval may  be calculated.  This method is difficult to apply (in fact it is very difficult to apply in the case of complex instruments) and can virtually only be used with automatic data processing. Before calculations can commence, considerable knowledge of the law of variability of the instrument, or similar instruments, is required. Again, it is difficult to achieve a balanced workload. However, a considerable variation of the calibration intervals from those prescribed is permissible without invalidating the calculations;  reliability can be calculated and in theory at least gives the efficient calibration interval. Furthermore, the calculation of the dispersion of results will indicate whether the manufacturer’s specification limits  are reasonable and the analysis of drift found may help in indicating the cause of drift. | **6.3 Method 2: Control chart (calendar-time)**  6.3.1 Control charting is one of the most important tools of Statistical Quality Control (SQC) and is well described in various publications (e.g. [4], [5], [9]). In principle, it works as follows:  Significant calibration points are chosen and the results are plotted against time. From these plots, both the dispersion of the results and the instrumental drift are calculated. The instrumental drift is the mean drift normally over one recalibration interval, although several intervals may be taken into account in the calculation for very stable measuring equipment. From these figures, the optimum interval may be calculated.  6.3.2 Considerable knowledge of the variability properties of the measuring equipment is required to use this method. A considerable variation of the recalibration intervals from those prescribed is  possible, because the performance of a control chart can be calculated and in theory at least gives the efficient recalibration interval. Furthermore, the calculation of the dispersion of the results will indicate whether the manufacturer’s specification limits are reasonable and the analysis of  the instrumental drift found may indicate the cause of the drift.  *Note: This method is not suitable for calibrations of measuring equipment without an instrumental drift. This method is suitable, for example, for a material measure with a single assigned quantity value, e.g. calibration of a gauge block or a standard resistance.* |
| **Method 3: “In-use” time**  This is a variation on the foregoing methods. The basic method remains unchanged but the calibration interval is expressed in hours of use, rather than calendar months. The instrument is fitted with an elapsed time indicator and is returned for calibration when the indicator reaches a specified value.  Examples of instruments are thermocouples, used at extreme temperatures, dead weight tester for gas 8ILAC-G24:2007 / OIML D 10:2007 (E) pressure, length gauges (i.e. instruments that may be subject to mechanical wear). The important theoretical advantage of this method is that the number of calibrations performed and therefore the  cost of calibration varies directly with the length of time that the instrument is used.  Furthermore, there is an automatic check on instrument utilization. However, there are many practical disadvantages in using an automatic check, including:  • it cannot be used with passive instruments (e.g. attenuators) or standards (resistance, capacitance, etc.);  • it should not be used when an instrument is known to drift or deteriorate when on the shelf, or when handled, or when subjected to a number of short on-off cycles;  • the initial cost of the provision and installation of suitable timers is high, and since users may interfere with them, supervision may be required which again will increase costs;  • it is even more difficult to achieve a smooth flow of work than with the methods mentioned above, since the (calibration) laboratory has no knowledge of the date on which the calibration interval will terminate. | **6.4 Method 3: “In-use” time**  6.4.1 Method 3 is a variation of Method 1 and Method 2. The basic method remains unchanged but the recalibration interval is expressed in hours of use, rather than in calendar time, e.g. months. The measuring equipment is equipped with a device which indicates the actual “in service” time and is returned for calibration when the indication reaches a specified value. Such measuring equipment are for example thermocouples used at extreme temperatures, standard lamps of which the drift is subject to their burning time, and dead weight testers for gas pressure or length gauges (i.e. measuring equipment that may be subject to mechanical wear). The major advantage in principle of this method is that the number of calibrations performed and therefore the cost of the calibration varies directly with the length of time that the measuring equipment is used. Another advantage of this method is that an automatic timer for the hours of use of the measuring equipment may be  available.  6.4.2 Nevertheless, this method also has the following practical disadvantages:  a) it is not suitable for measuring equipment containing passive (not requiring additional energy input source for providing output) measuring instruments (e.g. attenuators) or passive measurement standards (e.g. resistance, capacitance);  b) it is not suitable for measuring equipment known to have a drift or deteriorate when not in use (e.g. it is on the shelf) or when handled or subjected to a number of short on-off cycles;  c) the initial cost of providing and installing suitable timers for measuring the “in-service” time may be high if the time is not recorded manually. Since users may interfere with the timers, additional supervision may be required which will increase the costs; and  d) the planning of recalibration work is more difficult in comparison with the procedures of Methods 1 and 2 since is it not possible to predict the precise date on which the next calibration is required. |
| **Method 4: In service checking, or “black-box” testing**  This is a variation on methods 1 and 2 and is particularly suitable for complex instruments or test consoles. Critical parameters are checked frequently (once a day or even more often) by portable calibration gear, or preferably, by a “black box” made up specifically to check the selected parameters.  If the instrument is found to be outside the maximum permissible error by the “black box”, it is returned for a full calibration.  The major advantage of this method is that it provides maximum availability for the instrument user. It is very suitable for instruments geographically separated from the calibration laboratory, since a  complete calibration is only done when it is known to be required. The difficulty is in deciding on the critical parameters and designing the “black box”.  Although theoretically the method is very reliable, this is slightly ambiguous, since the instrument may be failing on some parameter not measured by the “black box”. In addition, the characteristics of the  “black box” itself may not remain constant.  Examples of instruments suitable for this method are density meters (resonance type); Pt-resistance thermometers (in combination with calendar-time methods); dosimeters (source included); and sound  level meters (source included). | **6.5 Method 4: In service checking, or “black box” testing**  6.5.1 Method 4 is also a variation of Method 1 and Method 2, and is especially suitable when a quick/easy check of the measuring equipment or one of its components is possible. Critical parameters are checked frequently (e.g. once a day or even more often) by portable calibration  gear, or preferably, by a “black box” designed specifically to check the selected parameters. If the measuring equipment is found to be outside the maximum permissible error (or any other set of limits as required) by the “black box” or portable calibration gear, it is returned for a full  calibration and adjustment if necessary. Method 4 may prove to be more effective than evaluating the original measuring equipment’s interval.  *Note: Measuring equipment suitable for this method are for example density meters (resonance type), Pt-resistance thermometers (in combination with calendar-time methods), dosimeters (source included), or sound level meters (source included).*  6.5.2 The major advantage of this method is that it provides maximum availability for the user of the measuring equipment. It is very suitable for measuring equipment which is geographically distant from the laboratory, since a complete calibration is only performed when it is known to be  required. The difficulty is in deciding on the critical parameters and designing the “black box”.  6.5.3 Although the method is in principle very reliable, this is slightly ambiguous, since the measuring equipment may be failing on some parameter that is not measured by the “black box”. In addition, the characteristics of the “black box” itself may not remain constant, thus requiring a choice and periodic review of the recalibration interval of the black box. |
| **Method 5: Other statistical approaches**  Methods based on statistical analysis of an individual instrument or instrument type can also be a possible approach. These methods are gaining more and more interest, especially when used in combination with adequate software tools. An example of such a software tool and its mathematical background is described by A. Lepek [9].  When large numbers of identical instruments (i.e. groups of instruments) are to be calibrated, the calibration intervals can be reviewed with the help of statistical methods. Detailed examples can be found for example in the work of L.F. Pau [7]. | **6.6 Method 5: Other statistical approaches**  6.6.1 Methods based on statistical analysis of individual measuring equipment or groups of measuring instruments can also be a possible approach. These methods are gaining more and more interest,  especially when used in combination with adequate software tools. An example of such a software tool and its mathematical background is described by A. Lepek [10].  6.6.2 When large numbers of identical measuring equipment (i.e. groups of measuring equipment) are to be calibrated, the recalibration intervals can be reviewed with the help of statistical methods (see e.g. [8]). Detailed examples are presented for example in the publication of the National Conference of Standards Laboratories (NCSL) International - Recommended Practice RP-1 Establishment and Adjustment of Calibration Intervals [7]. |
| **Method comparison**  No one method is ideally suited for the full range of instruments encountered (see Table 1).  Furthermore, it should be noted that the method chosen will be affected by whether the laboratory intends to introduce planned maintenance. There may be other factors which will affect the laboratory’s choice of method. The method chosen will, in turn, affect the form of records to be kept.  Table 1: Comparison of methods reviewing calibration intervals | **6.7 Comparison of methods for reviewing recalibration intervals**  6.7.1 No single method described in 6.2 to 6.6 is ideally suited for all situations, for all measuring equipment, and for all laboratories (see Table 1). The laboratory may choose the most appropriate method for each case while considering a variety of factors as discussed in 4, 5 and 6.1. There  may also be additional factors that will affect the laboratory’s choice of method. It should be noted that the choice of method will be affected by whether the laboratory intends to introduce a planned maintenance schedule for the equipment. It should also be noted that the method chosen will certainly affect the recalibration records that are kept.  6.7.2 For comparison of methods, see Table 1.  Table 1 - Comparison of methods of reviewing recalibration intervals |
| Bibliography | 7. Bibliography |

*Легенда:*

*маркиран текст – нов текст*

*подчертан текст – променен текст*