

1. -----IND- 2018 0329 CZ- EN- ----- 20180803 --- --- PROJET

Executive summary for the EC (*not part of this legislation*)

Hygrometers for cereals and oilseeds are placed on the market and put into use in the Czech Republic as specified measuring instruments following type approval and initial verification pursuant to Act No 505/1990 on metrology, as amended. This legislation contains national metrological regulation of type approval and verification of these measuring instruments.

(End of executive summary.)

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PUBLIC DECREE

As the authority with substantive and territorial jurisdiction in the matter of laying down metrological and technical requirements for specified measuring instruments and stipulating test methods for type approval and verification of specified measuring instruments pursuant to § 14(1) of Act No 505/1990 on metrology, as amended (hereinafter the Metrology Act), and in accordance with the provisions of § 172 et seq. of Act No 500/2004, the Code of Administrative Procedure (hereinafter the CAP), the Czech Metrology Institute (CMI) commenced ex officio proceedings on 26. 2. 2016 pursuant to § 46 of the CAP and, based on supporting documents, issues the following:

I.

DRAFT GENERAL MEASURE

number: 0111-OOP-C071-18

**establishing metrological and technical requirements for specified measuring instruments,
including testing methods for the type approval and verification of the specified measuring
instruments:**

hygrometers for cereals and oilseeds

1 Basic definitions

The terms and definitions pursuant to the VIM and VIML¹ as well as the following terms and definitions shall apply for the purposes of this general measure:

1.1

hygrometer for cereals

measuring instrument intended to measure the moisture of cereals within defined error limits The moisture is displayed directly on the basis of the measurement and conversion of certain physical parameters of the cereals, such as electrical or optical.

1.2

cereal

For the purposes of this document, this includes the seeds of cereals, oilseeds and legumes and potentially the seeds of other plants as well.

1.3

water content (moisture)

The proportion of loss in weight from the total weight of the sample expressed in % ($m \cdot m^{-1}$) established under the stipulated conditions using the applicable reference methods.

1.4

calibration curve (calibration)

Expression of conformity between the content of water (and liquid substances) and the dielectric values or other physical parameters of the measured sample recorded by the hygrometer; it is characterised by the calibration constants, designation and version number of calibration.

1.5

calibration network of hygrometers

a set of hygrometers of the same type with known identity of function and positioning

1.6

master calibration network

a standard gauge for hygrometers of the same type with known functionality

2 Metrological requirements

The metrological requirements are based on the requirements under Recommendation OIML R 59² and ISO 7700 – Parts 1 and 2³.

¹ TNI 01 0115 International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM) and International Vocabulary of Terms in Legal Metrology (VIML) are part of the technical harmonisation compendium ‘Terminology in the Area of Metrology’, which is publicly accessible at www.unmz.cz.

² OIML R 59 Moisture Meters for Cereal Grains and Oilseeds – *available to the public at* www.oiml.org

³ ISO 7700-1 Food product – Checking the performance of moisture meters in use – Part 1: Moisture meters for cereals a ISO 7700-2 Food product – Checking the performance of mousture meters in use – Part 2: Moisture meters for oilseeds

2.1 Measurement range

A hygrometer must be equipped with a selection of the cereals which may be measured. The moisture measurement range must be at least 6 % and the minimum number of cereals (calibration curves) must be three.

The usual moisture measurement range of hygrometers for cereals is 5 % to 45 %; the manufacturer may also determine others.

2.2 Rated operating conditions

Hygrometers for cereals must have an ambient temperature operating range set by the manufacturer of at least 20 °C, in which range must be at least 10 °C to 30 °C.

Hygrometers for cereals must have an temperature operating range for the sample of cereals measured set by the manufacturer of at least 2 °C to 40 °C.

Hygrometers for cereals must have a value of the maximum difference between the ambient temperature and the temperature of the sample of cereals measured set by the manufacturer. The value of this difference may not be less than 10 °C.

If the range of ambient temperature, temperature of the cereal sample and their difference in temperature is exceeded, the moisture value may not be displayed and printed out.

If the moisture of the surrounding environment exceeds 85 %, then condensation must not be allowed to form.

The atmospheric pressure range is 86 kPa to 106 kPa.

The range of supply values is -15 % to +10 % nominal values.

2.3 Reference conditions

Laboratory tests of the hygrometer shall be conducted at an ambient air temperature of 20 °C to 27 °C and a relative air humidity of 30 % to 70 % and an atmospheric pressure of 86 kPa to 106 kPa.

The measurement conditions may not change by more than ± 2 °C or ± 10 % air humidity over the course of each test.

The supply values are in nominal or tested values.

2.4 Maximum permissible errors

2.4.1 Maximum permissible errors during type approval of a hygrometer for cereals

The hygrometer's error for the given cereal or seed sample is defined as the difference between the average value from repeated measurements of the sample with the hygrometer and conventionally via the true value of moisture of the given cereal or seed sample defined by the reference method.

Table 1 – Maximum permissible errors (MPE) of hygrometers for cereals during type approval

(1)	(2)	(3)	(4)	(5)
Type of cereal or seed	Maximum permissible error (% moisture content w_{ref})	Systematic error (%)	Repeatability SD (%)	Reproducibility SDD _I (%)
Maize, rice, sorghum,	If $0.025w_{ref} < 0.4$, then MPE =	$0.5 \times$ maximum permissible error	$0.5 \times$ maximum permissible error	$0.6 \times$ maximum permissible error

sunflower, legumes, oats	0.4 Otherwise, MPE = $0.025w_{ref}$			
Other cereals	If $0.02w_{ref} < 0.35$, then MPE = 0.35 Otherwise, MPE = $0.02w_{ref}$	$0.5 \times$ maximum permissible error	$0.5 \times$ maximum permissible error	$0.6 \times$ maximum permissible error
NOTE w_{ref} is the moisture established by the reference gravimetric method				

2.4.2 Maximum permissible error during verification via reference gravimetric method in laboratory

The hygrometer’s error for the given cereal or seed sample is defined as the difference between each value from repeated measurements of the sample with the hygrometer and conventionally via the true value of moisture of the given cereal or oilseed sample defined by the reference method.

Table 2 – Maximum permissible errors of hygrometers for cereals during verification (MPE)

Type of cereal or seed	Maximum permissible error Δw_{max} v %	
	for $w_{ref} \geq 10$ %	for $w_{ref} > 10$ %
Cereals and oilseed except for *	0.7	$0.03 w_{ref} + 0.4$
*Maize, rice, sorghum, sunflower, legumes, oats	0.8	$0.04 w_{ref} + 0.4$
NOTE w_{ref} is the moisture established by the reference gravimetric method		

2.4.3 Maximum permissible error during test via master calibration network method

Table 3 – Maximum permissible errors of hygrometers for cereals (MPE)

Type of cereal or seed	Maximum permissible error Δw_{max} in %	
	$w_m < 22$ %	$w_m \leq 22$ %
Cereals and oilseed except for *	0.2	0.3
* Maize, rice, sorghum, sunflower, legumes, oats	0.3	0.4

NOTE

w_m is the moisture of the cereal sample established by the master calibration network of hygrometers

The error Δw_{ref} of the test samples during measuring with the master may not exceed 0.5 %.

3 Technical requirements

The technical requirements are based on the requirements under Recommendation OIML R 59².

3.1 General information

The measurement principle may be based on any kind of physical method which enables the ascertainment of the moisture content of the cereal and oilseed sample.

Hygrometers must be durable and sturdy in construction. They must be built as a single inseparable device. They must work automatically. The measuring system must be protected from dust and vibrations.

The minimum volume of the measured cereal sample must be 100 g or 400 grains of cereal.

The measuring system may not allow the operator to influence the precision of measurements of volume, weight or temperature of the sample conducted for determining the precise moisture of the cereal sample.

Milling, weighing and temperature measurement outside the measuring system of the hygrometer is not permitted.

The basic components of the hygrometer are:

- a measuring chamber with a funnel and measuring system corresponding to the measurement principle;
- a calculating unit with software for control, calculations, displaying results and saving information on the metrological integrity of the hygrometer;
- potentially an interface for data transmission;
- a built-in mill in case the measurement principle is based on measuring milled material;
- a printer (external or built-in);
- a classification device, if used (may be external).

3.1.1 Measuring chamber with funnel and measuring system

The principle of operation and design of the measuring chamber depends on the measurement principle used.

The measuring function and measuring algorithms of the hygrometer must be correct.

The hygrometer must be equipped with a digital indicator; the height of the letters (digits) on the display may not be less than 10 mm.

The moisture content results must be displayed immediately and printed out in per cent of moisture content on a wet basis. These units are expressed decadically; the value of the resulting indication must be displayed with a resolution of 0.1 % or, for the purposes of tests for type approval, with a resolution of 0.01 %.

The selection of the calibration curve for measurement according to the quality and type of cereal, oilseed and legumes must be clearly visible and unambiguously identifiable. Hygrometers must have at a capacity of at least 4 letters on the indication of the cereal type used.

The results of the moisture measurement may not be indicated or registered before the measurement cycle has ended.

The hygrometer may not display or register moisture content values if the moisture content of the grain sample is outside of its operating range; in that case, there must be a clear error message at the displayed and registered moisture value; the same applies in the case of moisture measurement outside the ambient temperature and sample temperature range.

After being turned on, the hygrometer may not display or print out any moisture value as long as the measuring instrument has not reached its fully operational state, i.e. once it has reached a stable operating temperature and ended the initialisation tests, or the hygrometer must give a clear signal that it must be turned on for a period of time specified by the manufacturer before use.

In case of measuring instruments indicating multiple measurement parameters (such as those measuring via volume weight, protein content or oils in cereals and oilseeds), the values must be allocated to the individual parameters when displayed, registered and saved so that they cannot be confused.

3.1.2 Calculation unit with software

Software for control, implementing calculations, displaying results and saving information on the metrological integrity of the hygrometer must meet the requirements of the document OIML D 31⁴ for level I and tests via procedure A.

In its documentation, the manufacturer must describe the software applied and its relation to the hardware equipment of the hygrometer and its securement by means of:

- describing its legal functions;
- identifying the software which is allocated to legal functions;
- recording and saving information on each intervention into the integrity of the measuring instrument.

The hygrometer must enter the performance of changes which affect the metrological parameters of the hygrometer (such as shift and inclination of calibration curves) into the list of events.

3.1.3 Data storage

The data must be saved after the end of measurement. All legally significant information identifying and influencing the results of measurement must be saved, and at least the identification of the measuring instrument, the date of the measurement, the version of the calibration curves, the type of cereal, a unique identification of the measurement and sample, the data measured, including the identification of the measured parameter and the units and an error announcement regarding the measurement.

In the case of external storage, the transmitted data must be protected.

3.1.4 Printer

Hygrometers must be equipped with a communication connection enabling connection with a printer or recording device. The scope of the data transferred must be at least the date, type of grain, result of the cereal moisture measurement and identification of the calibration curve. The data transmission must be verified.

⁴ OIML D 31 General requirements for software controlled measuring instruments, Available to the public at www.oiml.org.

3.2 Requirements for hygrometer operation

3.2.1 Conformity of calibration curves

During the test, the hygrometer must be able to display all calibration constants, an unambiguous identification of the calibration and the calibration version number as proof that their valid version was used during the moisture determination.

If the calibration constants are saved in electronic form, the hygrometer must display an automatic control of the error detection of the calibration constant. If the calibration constants are changed, a clear error message must be displayed.

The device hardware and software, calibration and communication software must allow the development of calibration curves and their transmission to hygrometers of the same type. Hygrometer setup procedures must be defined so as to ensure conformity of moisture measurement with hygrometers of the same type.

3.2.2 Measuring instrument positioning and operating position

If a change in the hygrometer's horizontal position by more than 5° causes the maximum permissible errors to be exceeded, the hygrometer must be equipped with a spirit level and elements for setting the horizontal position. The spirit level must be positioned to allow reading without removing parts of the measuring instruments using a tool.

The hygrometer must be installed in accordance with the manufacturer's recommendation in the measuring instrument's manual in order to make all measuring operations clearly visible.

3.2.3 Correct hygrometer operation check

The hygrometer must be equipped with a control function which can be used to check the correct operations of the hygrometer after turning it on or after selecting an operation.

3.3 Resistance to environmental influences

External disruptive influences acting upon the hygrometer may not lead to any measurement errors which would exceed the maximum permissible error of the hygrometer for individual tests.

3.3.1 Electrical supply

A hygrometer supplied from the mains must be resistant to changes in supply in a supply voltage range from ($U_{\text{nom}} - 15\%$) to ($U_{\text{nom}} + 10\%$) during a short interruption in supply and within a frequency range from 59.5 Hz to 60.5 Hz.

The measurement error may not exceed the values of the maximum permissible systematic errors pursuant to Table 1, Column 3.

If a battery is used as a source of supply, it must be replaceable without violating the official and protective marks of the hygrometer.

Marginal or insufficient supply of a hygrometer via battery may not enable the hygrometer to display, record or print measured moisture values outside of the applicable tolerance limits.

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3.3.2. Influence of climatic conditions

The hygrometer must be resistant within the boundary temperatures of the lower and upper temperature range and at reference temperature.

The hygrometer must be resistant within the boundary temperatures of cereal samples during moisture measurement under reference conditions at a sample temperature within the reference temperature

specified by the manufacturer in the measuring instrument's manual and at temperatures of +10 °C to -10 °C.

The hygrometer must be resistant to the effects of extreme conditions for the duration of its storage or during transport at temperatures from -20 °C to +50 °C.

3.3.3 Instrument stability

The hygrometer must be resistant to changes in measurement of the moisture values of the same samples in intervals of at least 4 weeks. The measurement stability of the hygrometer is tested by measuring the moisture of the same cereal samples with the hygrometer before and after the tests for type approval.

3.3.4 Initialisation period

If the manufacturer has defined the hygrometer's initialisation period – the measuring instrument's run-up to its fully operable state – then the hygrometer must be resistant to changes in the measuring of the moisture values of the samples after the end of the initialisation period and for another hour or twice the length of the initialisation period.

If an initialisation period has not been defined, the hygrometer must be resistant to changes in measuring the moisture values of the same samples immediately after turning off the hygrometer and repeatedly for one hour.

3.3.5 Horizontal position test

Hygrometers with and without spirit levels must be resistant to the influence of misalignment of the hygrometer from the horizontal position by 5° in all orientations. Resistance is tested by comparing the measurement of the samples' moisture before misalignment, during misalignment and after restoring the hygrometer to the horizontal position in at least two orientations.

3.4 Resistance to interference

The hygrometer must be resistant to short-term drops in supply voltage, short interference and slow changes in voltage, electrical rapid transient phenomena/groups of impulses, radiated electromagnetic fields, interference induced by high-frequency fields and electrostatic discharge.

3.5 Protection from unauthorised tampering

The hygrometer must allow lead security sealing or other measures to prevent access to the device and disruption of its metrological parameters.

The measuring system and metrological software must be protected from unauthorised interventions by means of security measures.

The hygrometer must enter the performance of changes which affect the metrological parameters of the hygrometer into the list of events. This must contain:

- serial number;
- parameter ID;
- date and time of the change;
- new parameter value.

The hygrometer need not depict this information, but a printout or electronic file must be available. The record of events must have a capacity of records equalling 25 times the number of parameters in the device, max. 1 000 records.

The zero setting, test values and other settings of metrological parameters must be fitted with a lead seal or other means of security.

4 Inscriptions and marks

4.1 Markings on the measuring instrument

The hygrometer must bear the following information:

- a) manufacturer identification;
- b) hygrometer type designation;
- c) hygrometer serial number;
- d) type approval mark.

All inscriptions and marks must be legible, permanent, unambiguous and visible and unremovable by ordinary means, including on the external parts of the hygrometer.

4.2 Information provided by the manufacturer

The manufacturer must provide an instruction manual with each measuring instrument which provides the operator with all information needed to install the hygrometer and its accessories and maintain and measure it in order to minimise the influence of human actions on the precision of measurement.

The instruction manual must contain at least the following information:

- a) manufacturer's name and address;
- b) hygrometer type;
- c) date of manufacture;
- d) types or varieties of cereal for which the hygrometer is designed;
- e) the hygrometer's limits of use – ranges in measured moisture and temperature, maximum possible difference between the temperature of the sample and the hygrometer, ranges of voltage and supply frequency, EMC compatibility.

The manual must be provided in Czech.

5 Type approval of the measuring instrument

5.1 General information

The process of type approval of a hygrometer includes the following tests:

- a) external inspection;
- b) hygrometer tests in the laboratory;
- c) tests of the hygrometer's resistance to disruptive environmental influences.

5.2 External inspection

The following shall be assessed during an external inspection of the hygrometer:

- a) the completeness of the required technical documentation, including operating instructions;
- b) conformity of the metrological and technical characteristics specified by the manufacturer in the documentation with the requirements of this regulation, specified in Chapters 2, 3 and 4;
- c) the completeness and condition of the hygrometer's functional units according to the specified technical documentation;
- d) conformity of the hygrometer's software version with the version specified by the manufacturer.

5.3 Hygrometer tests in the laboratory

5.3.1 Test equipment

The following measuring instruments and equipment are used for laboratory tests of the hygrometer:

a secondary reference gauge for the moisture of solid substances:

- high-precision scales, $d = 0.1$ mg, maximum measurement error ± 0.0005 g;
- a device for milling, drying and subsequent treatment of the samples according to standards for reference specification of moisture of cereal, oilseed and legumes;
- a thermometer with a scale in 0.1 °C increments.

5.3.2 Precision, repeatability, reproducibility

5.3.2.1 Test sample selection

Tests are conducted in at least three intervals of a total scope of the calibration curves of cereal and oilseed moisture in which at least 30 samples are examined in each interval. The type and species of cereal must factor into the expected measurement volumes, differences in physical structure and importance of moisture ranges. The tests must always be conducted at the maximum interval values.

The sets of samples must be tested for moisture homogeneity by comparing the measurement by the tested hygrometer and specifying the moisture with the applicable reference gravimetric method. The standard deviation of differences (SDD) of the measured moisture values in each of the moisture intervals may not exceed the maximum permissible error specified in Table 1, Column 2, reduced by 0.1.

5.3.2.2 Accuracy test

The tests of the hygrometer's accuracy include:

determining the error \bar{y}

$$\bar{y} = \frac{\sum_{i=1}^n (\bar{x}_i - r_i)}{n} \quad (1)$$

and standard deviation of differences (SDD)

$$SDD = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{y})^2}{n-1}} \quad (2)$$

for each of the three test moisture intervals. The reference moisture determination must be determined before and after measurement with the test hygrometer. The error and SDD may not exceed the maximum permissible error specified in Table 1, Column 2 for each interval of moisture.

Legend on equations (1) and (2):

\bar{y} the average of all measurements with the test hygrometer;

y_i $\bar{x}_i - r_i$;

\bar{x}_i the average of the measurements of moisture values measured by the test hygrometer for sample i (3 repetitions);

r_i moisture sample i determined by the reference method;

n the number of samples of cereal in each of the three moisture intervals tested ($n = 30$).

5.3.2.3 Repeatability test

The repeatability of hygrometers is defined as the standard deviation (SD) of the three repeated measurements for each cereal sample and moisture interval. The repeatability may not exceed the maximum permissible repeatability error specified in Table 1, Column 4 for each interval of moisture.

$$SD = \sqrt{\frac{\sum_{i=1}^n \sum_{j=1}^3 (x_{ij} - \bar{x}_i)^2}{2n}} \quad (3)$$

where: x_{ij} is the moisture determined by the hygrometer for the sample i and repetition j ;

\bar{x}_i the average of the three moisture values determined with the hygrometer;

n the number of samples of cereal in each of the three moisture intervals tested ($n = 10$).

5.3.2.4 Reproducibility test

The reproducibility of the moisture measurement is given by calculation as standard deviation of differences SDD_i . The reproducibility may not exceed the maximum permissible reproducibility error specified in Table 1, Column 5 for the entire measurement scale.

$$SDD = \sqrt{\frac{\sum_{i=1}^n (d_i - \bar{d})^2}{n-1}} \quad (4)$$

where: $d_i = \bar{x}_i^{(1)} - \bar{x}_i^{(2)}$;

$\bar{x}_i^{(1)}$ = average of 3 measurements of sample i with hygrometer 1;

$\bar{x}_i^{(2)}$ = average of 3 measurements of sample i with hygrometer 2;

\bar{d} = Average of d_i ;

n = number of samples in all moisture intervals.

5.3.3 **Basic instrument tests**

5.3.3.1 Selection of samples

Single sample types with a stable moisture which is documented by reference or instrument moisture measurements, preferably of wheat, are selected for the basic instrument tests.

5.3.3.2 Measuring instrument stability test

The moisture of a single cereal sample is measured in at least three moisture intervals at the beginning and after the end of testing of the hygrometer, at least after 6 weeks.

The maximum difference between the averages before and after testing may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.3 Test of measuring instrument's warm-up time

The hygrometer stabilised within reference conditions can be stabilised after being turned on after the warm-up time specified by the manufacturer.

The moisture of the sample is measured five times after 1 and 2 hours after the warm-up time has elapsed. If this time has not been specified by the manufacturer, then the measurement shall be conducted after being switched on and after 1 hour.

The maximum difference between the averages of the moisture measurement may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.4 Supply

5.3.3.4.1 *Test of resistance to deviations in supply*

The moisture of the sample is measured 10 times at a supply of -15% and $+10\%$ from the nominal value and at the nominal value. The hygrometer is left to stabilise for 30 minutes after each change in supply.

The maximum difference between the averages of the moisture measurement at altered and nominal supply value may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

The standard deviation of 10 repeated measurements at each supply point may not exceed 0.10% moisture.

5.3.3.4.2 *Test of resistance to low internal battery voltage*

The moisture measurement and recording of the data displayed is conducted at full and reduced battery function. At least one measurement cycle must be conducted at reduced function.

The maximum difference between the averages of the moisture measurement at altered and nominal supply value may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.5 Test of resistance to temperature during storage of the hygrometer

The hygrometer is exposed to a temperature cycle: it is heated up to $+50\text{ }^{\circ}\text{C}$ over 1 hour, the temperature is maintained for a period of 3 hours, the temperature is reduced to $-20\text{ }^{\circ}\text{C}$ over 1 hour, then maintained for a period of 3 hours. The average of 10 moisture measurements of the cereal sample with the hygrometer is compared before and after the temperature loading cycle.

The maximum difference between the averages of the moisture measurement before and after the temperature loading cycle may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.6 Test of resistance to misalignment from the balanced position of the hygrometer

A moisture measurement of the sample is conducted in horizontal position, a misalignment of 5% to the front and the right and to the left and the right in hygrometers without horizontal position indication and in hygrometers with indication in a balanced position and in the marginal positions in both directions.

The maximum difference between five moisture measurements of the cereal sample in balanced position and each of the misaligned positions may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.7 Test of resistance to ambient humidity

The hygrometer is exposed to a humidity cycle: it is heated up to $+50\text{ }^{\circ}\text{C}$ over 1 hour, the temperature is maintained for a period of 3 hours, the temperature is reduced to $-20\text{ }^{\circ}\text{C}$ over 1 hour, then maintained for a period of 3 hours. The average of 10 moisture measurements of the cereal sample with the hygrometer is compared before and after the temperature loading cycle.

The maximum difference between the averages of the moisture measurement before and after the temperature loading cycle may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.8 Test of resistance to changes in ambient temperature

The moisture of a single cereal sample is measured at three intervals in an environment with a reference temperature and relative humidity of 65 % and in the hygrometer's lower and upper temperature range. One third of the cereal sample is used for each temperature point.

The maximum difference between the averages of the moisture at reference temperature and extreme ambient temperature may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.3.9 Test of resistance to changes in sample temperature

The moisture of three cereal samples is measured at three moisture intervals in an environment with a reference temperature and relative humidity of 65 % and in the lower and upper temperature range of the cereal sample specified by the manufacturer. One third of the cereal sample is used for each temperature point.

The maximum difference between the averages of the moisture at reference temperature and at extreme temperatures may not exceed the maximum permissible systematic error specified in Table 1, Column 3.

5.3.4 **Electromagnetic compatibility tests**

5.3.4.1 Selection of samples

Single sample types with a stable moisture which is documented by reference or instrument moisture measurements, preferably of wheat, are selected for the basic instrument tests.

5.3.4.2 Resistance to mains voltage drops, short interruptions and voltage variations

The moisture sample is measured 10 times at moderate stable moisture under conditions of reduced and interrupted supply to the hygrometer so that at least one drop/interruption has taken place during the course of sample moisture measurement. The moisture measurement, error indication and events during measurement are recorded over the course of this.

- a drop from U_{nom} to 0 for a time of 0.5 AC voltage period;
- a drop from U_{nom} to 0 for a time of 1 AC voltage period;
- reduction from U_{nom} to 70 % for a time of 25/30 (50 Hz/60 Hz) AC period;
- reduction from U_{nom} to 0 % for a time of 250/300 (50 Hz/60 Hz) AC period.

All operations must take place correctly. The moisture measurement error may not exceed the maximum permissible error specified in Table 1, Column 2 without the hygrometer detecting it and reacting to it.

5.3.4.3 Resistance to electrical rapid transient phenomena/impulse groups

The moisture sample is measured 10 times at moderate stable moisture under the conditions of application of the disturbance in AC and DC mode so that the disturbance takes place in the course of measurement.

Conditions: amplitude: 1 kV, repetition frequency 5 kHz

All operations must take place correctly. The moisture measurement error may not exceed the maximum permissible error specified in Table 1, Column 2 without the hygrometer detecting it and reacting to it.

5.3.4.4 Resistance to a radiated electromagnetic field

The moisture of a single sample of moderate stable moisture is measured 10 times under the conditions of application of the disturbances from each side of the cover of the hygrometer in frequency bands of 26 MHz to 80 MHz and at 2 GHz at an intensity amplitude of the test field of 10 V/m and a modulation amplitude of 80 % AM of the sine wave by a frequency of 1 kHz so that the disturbances takes place during the course of measurement.

All operations must take place correctly. The moisture measurement error may not exceed the maximum permissible error specified in Table 1, Column 2 without the hygrometer detecting it and reacting to it.

5.3.4.5 Resistance to conducted disturbances induced by high-frequency fields

The moisture of a single sample with moderate, stable moisture is measured 10 times against conducted disturbances induced by high-frequency fields under the conditions of application of the disturbances in a frequency zone of 150 kHz to 80 MHz at a test voltage amplitude of 10 V.

All operations must take place correctly. The moisture measurement error may not exceed the maximum permissible error specified in Table 1, Column 2 without the hygrometer detecting it and reacting to it.

5.3.4.6 Resistance to electrostatic discharge

The moisture of a single sample is measured 10 times at moderate, stable moisture under the conditions of application of disturbance via contact discharge 2 V, 4 V and 6 V, or via air discharge 2 V, 4 V, 6 V and 8 V so that the disturbance takes place in the course of measurement.

All operations must take place correctly. The moisture measurement error may not exceed the maximum permissible error in Table 1, Column 2 without the hygrometer detecting it and reacting to it.

6 Initial verification

6.1 General information

The following is conducted during the initial verification of hygrometers for cereals:

- a) visual inspection;
- b) hygrometer tests in the laboratory.

6.2 Visual inspection

The following shall be evaluated during the visual inspection of the hygrometer submitted for verification:

- a) conformity of the hygrometer with the approved type;
- b) completeness of the hygrometer according to the specified technical documentation;
- c) whether individual parts of the hygrometer are damaged and whether the hygrometer is functional;
- d) conformity of the hygrometer's software version with the version approved during the type approval of the hygrometer.

6.3 Tests of hygrometers for cereal

Measuring instruments pursuant to Article 5.3.1 are used for laboratory tests.

A master hygrometer of the same type is used for hygrometers verified using the master calibration network method.

6.3.1 Preparation of cereal samples for testing

The test cereal samples must be of a single type, without admixtures, impurities, and pests and must be homogenous, of natural moisture and tempered. The accuracy of each calibration curve is tested with the crop in question.

The moisture is determined from the sample using the associated reference method.

6.3.2 Accuracy test by comparing with reference method

Each calibration curve is tested in two to three points of the moisture range.

Four repeated measurements of each sample are conducted with the tested hygrometer. The hygrometer error is determined as the difference of four measurements via hygrometer and the average from two reference moisture determinations.

The error of each measurement may not exceed the maximum permitted error listed in Table 2.

6.3.3 Accuracy test via method of comparing with master calibration network

At least eight test samples are tested at various points of the moisture range of at least two calibration curves.

The reference determination is conducted by measuring the moisture on the master calibration network.

The test sample moisture error measured on the master calibration network in relation to the moisture determined by the reference method may not exceed 0.5 %.

Four repeated measurements of each sample are conducted with the tested hygrometer. The hygrometer error is determined as the difference of each moisture measurement of the cereal sample with the hygrometer and the average of the four moisture determinations with the master calibration network.

The error of each measurement may not exceed the maximum permitted error listed in Table 3.

7 Follow-up verification

During follow-up verification, tests pursuant to Chapter 6 are conducted, with the exception of accuracy tests via the method of comparison with the master calibration network.

The measurement may be conducted externally at the hygrometer's installation site.

7.1 Follow-up verification via method of comparing with master calibration network

At least two samples are tested at various points on the moisture range of the calibration curves which are identical to the calibration curves of the master calibration network.

The reference moisture determination is conducted by measuring the moisture on the master calibration network.

The test sample moisture error measured on the master calibration network in relation to the moisture determined by the reference method may not exceed 0.5 %.

Four repeated measurements of each sample are conducted with the tested hygrometer. The hygrometer error is determined as the difference of each moisture measurement of the cereal sample with the hygrometer and the average of the four moisture determinations with the master calibration network.

The error of each measurement may not exceed the maximum permitted error listed in Table 3.

8 Measuring instrument examination

When examining measuring instruments pursuant to § 11a of the Metrology Act at the request of a person who may be affected by an incorrect measuring instrument, please proceed according to Chapter 7. The maximum permitted errors shall be 1.25 times the maximum permitted errors pursuant to Chapter 7.

9 Notified standards

For the purposes of specifying the metrological and technical requirements for measuring instruments and specifying the testing methods for their type approval and verification arising from this general measure, the CMI shall provide notification of the Czech technical standards, other technical standards or technical documents of international or foreign organisations, or other technical documents containing more detailed technical requirements (hereinafter notified standards). The CMI shall publish a list of these notified standards attached to the relevant measures, together with the general measure, in a manner accessible to the public (at the website www.cmi.cz).

Compliance with notified standards or parts thereof is considered, to the extent and under the conditions stipulated by a general measure, to be compliance with the requirements stipulated by this measure to which these standards or parts thereof apply.

Compliance with notified standards is one way of demonstrating compliance with the requirements. These requirements may also be met by using another technical solution guaranteeing an equivalent or higher level of protection of legitimate interests.

II.

GROUNDS

The CMI issues, pursuant to § 14(1)(j) of the Metrology Act, for the implementation § 6(2), § 9(1) and (9) as well as § 11a(3) of the Metrology Act, this measure of a general nature, stipulating metrological and technical requirements for specified measuring devices during type approval and test methods for verification of these specified measuring devices – hygrometers for cereals and oilseeds.

Decree No 345/2002 laying down measurement instruments for mandatory validation and measurement instruments subject to type approval, as amended, classifies the measuring instruments under Items 7.3.1 in the Annex to the Second List of Specified Measurement Instruments of the specified type as measurement instruments subject to type approval and mandatory validation.

This legislation (general measure) will be notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.

III.

LEGAL INSTRUCTIONS

In accordance with § 172(l), in conjunction with § 39(l) APC, the CMI has stipulated a time limit for comments of 30 days as of the date of posting on the official notice board. Comments submitted after this time limit will not be considered.

The persons concerned are hereby invited to comment on this draft general measure. With a view to the provisions of § 172(4) of the APC, comments shall be submitted in writing and meet the requirements for submissions in accordance with § 37 of the APC.

The comments shall include the particulars referred to in § 37(2) APC and clearly state the following: who is making the comments; which general measure they concern; to what extent the comments challenge the measure; how the general measure runs contrary to legislation or how the general measure or the procedure that preceded it is inaccurate; which matters the comments concern and what is being proposed. Said comments must also identify the administrative authority to which they are addressed and be signed by the person making them.

The supporting documents for this draft general measure may be consulted at the Czech Metrology Institute, Legal Metrology Department, Okružní 31, 638 00 Brno, after making arrangements by telephone.

This general measure shall be posted for 15 days.

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RNDr. Pavel Klenovský

Director-General

Person responsible for accuracy: Mgr. Tomáš Hendrych

Posted on: 22 March 2018

Signature of the authorised person confirming posting:

Removed on:

Signature of the authorised person confirming removal: