Tradinco Instruments®

Calibration methods

Tradinco Calibration Laboratory K050

TRADINCO INSTRUMENTS OFFERS THE BEST SOLUTION FOR EVERY TEST, MEASURING AND CALIBRATION CHALLENGE IN THE INDUSTRY.

✓ CALIBRATION SPECIALISTS ✓ CUSTOMER-ORIENTED ✓ BROAD PORTFOLIO ✓ LONG-TERM COOPERATION

Introduction

Calibration methods used in the accredited Tradinco Calibration Laboratory (K050) are those already published in international, regional or national standards, by recognized technical organizations, in relevant scientific publications or periodicals, or as specified by the equipment manufacturer.

Calibration methods developed in-house or adapted by the TCL shall only be used if they are suitable for the intended use and if they have been validated. Self-developed calibration methods are specified according to the functionality of the instrument to be calibrated in terms of quantities, ranges and accuracies.

The types of calibrations are distinguished according to the Harmonized Classification Scheme code (HCS code), as listed on our scope published by the Council for Accreditation (RvA).

All calibrations at Tradinco go through the following process steps:

- Preparation in our specialized workshop for this purpose. Each instrument to be calibrated must be in good condition;
- Acclimatization of 4 hours;
- Setup and preparation of the calibration;
- Measurement of the instrument as offered 'As found calibration' and digital recording thereof using our calibration software;
- If necessary adjust (see chapter 4) and measure again 'As left calibration';
- Provide the instrument with a calibration label;
- Verification of the work performed and release of the instrument.

For each quantity, there are specific additions. We will select the calibration method including measurement points, unless otherwise desired and specified in the request or order.

Quantity	Calibration type	Performed under accreditation? (RvA-K050)	Accuracy	Number of measurement points	Standard/method	Test accuracy ratio (TAR value)
Pressure	Analog pressure gauge	yes	all class specifications	11 (6 up and 5 down)	DIN16005 / OIML 53 / Euramet CG-17	4:1
		no	≥ 0,2%	5 (3 up and 2 down)	Comparative measurement	4:1
			< 0,2%	11 (6 up and 5 down)	Comparative measurement	4:1
Pressure	Digital display units	yes	≥ 0.05%	11 (6 up and 5 down)	DIN16005 / OIML 53 / Euramet CG-17	2:1
			< 0.05%	21 (11 up and 10 down)		2:1
Pressure	Digital display units	no	≥ 0,2%	5 (3 up and 2 down)	DIN16005 / OIML 53 / Euramet CG-17	2:1
			< 0,2%	11 (6 up and 5 down)		2:1
Pressure	Deadweight tester cross float	yes	all class specifications	minimum 8 per piston	Euramet CG-3	1:1
Pressure	Transmitter P -> I	yes	all class specifications	9 (5 up and 4 down): 4/8/12/16/20mA	DIN16005 / OIML 53 / Euramet CG-17	2:1
		no				4:1
Pressure	Barometric reference cell	yes	all class specifications	11 (6 up and 5 down)	DIN16005 / OIML 53 / Euramet CG-17	2:1
		no				2:1
Electrical signals	Digital multimeters	yes	all class specifications	minimum 3 (depending on the linearity determination)	Euramet CG-15	4:1
		no				4:1
Electrical signals	Semi-electric temperature simulations	yes	all class specifications	min. 3 (depending on linearity/measuring range)	Euramet CG-15	4:1
					NEN-EN-IEC 60584-1	
		no			NEN-EN-IEC 60584-3	
					NEN-EN-IEC 60751	
Temperature	Dry block ovens	yes	all class specifications	9 (5 up and 4 down)	Euramet CG-13	4:1
		no	all class specifications	min. 5 ascending only	Comparative measurement	

Content

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1. Pressure & vacuum

For the quantity pressure, a distinction is made between analog, digital pressure measuring instruments with an elastic measuring element and pressure balances (deadweight testers).

General guidelines are taken from standardization. That concerns terminology (e.g. VIM, ISO 31, NEN 999), guidelines for the inspection of pressure gauges, guidelines for the determination of the measurement uncertainty (EA-4/02) and guidelines for the content of certificates according to ISO/IEC 17025.

For pressure gauges with an elastic measuring element, the main reference is standard DIN EN 837-1-1997, but parts can also be taken from OIML directive No. 53 and Euramet Calibration guide No. 17.

With analog pressure gauges, there is no tapping against the pressure gauges for reading. Analog and digital pressure gauges with an elastic measuring element are calibrated using our pressure balances by comparative measurement. The zero point of a measurement is taken after the device under test has been zeroed according to the manufacturer's prescribed procedure. Atmospheric pressure is taken as the reference for the zero point. The calibration of absolute pressure measuring instruments with an elastic measuring element is carried out with a digital absolute pressure gauge, which can be combined with a pressure balance if necessary. The overpressure portion of the total pressure is measured with a pressure balance, while the atmospheric pressure is measured with the absolute pressure gauge. The addition of both values gives the total pressure.

The instrument to be calibrated is measured by a comparative method at rising pressure and at falling pressure. The number of measuring points depends on the accuracy specification of the instrument to be calibrated. Minimum 21 measurement points (11 upward/10 downward).

The number of measurement points is reduced to 11 (6 upward/5 downward) if the instrument to be calibrated has a factory accuracy greater or equal to 0,05%. Exceptions are barometric reference cells and P/I transmitters.

Barometric reference cells usually have a small range and serve mainly for displaying the barometric pressure by which they are measured at 11 (6 upward/5 downward) measuring points. P/I transmitters are typically used in industry at the points 4mA, 8mA, 12mA, 16mA and 20mA. Therefore, these are measured at five points up and four points down.

In standard calibrations, the total number of measurement points is 11 (6 upward/5 downward) and may be reduced to 5 (3 upward/2 downward) if the instrument to be calibrated has a factory accuracy greater or equal to 0,2%. Determination of the corrections is done in the calibration software and the recording of the values are on the certificate.

Pressure balances are calibrated according to the "cross-floating" procedure as described in the Euramet CG-3. The number of measuring points when calibrating a pressure balance is at least 8, unless otherwise agreed with the customer. The measuring points are selected so that all weights of the pressure balance to be calibrated are included in the measurement. For pressure balances with 2 pistons and thus 2 measuring ranges, the number of measuring points per measuring range will also be at least 8, unless otherwise agreed with the customer. The measuring points are distributed as evenly as possible over the entire measuring range. The weights of the DWT shall be unambiguously marked.

If the marking is missing, after consultation with the client, a marking is made as follows: The conversion weight is marked " conv." to which is added " LP" (low piston) or " HP" (high piston) and the unit. The smallest weights are given the marking: 1A, 2A, 3A, etc. The following weights get the marking increasing with increasing weight: 1B, 2B, 3B, etc. 1C, 2C, 3C, etc. The heaviest weights are marked: 1,2,3, etc.

2. Electrical quantities

Electrical calibrations are performed with the quantities, voltage AC and DC, current AC and DC, resistance, and frequency. These quantities apply to both generation and measurement. Performing electrical calibrations is done with a validated procedure based on the prescribed guidelines of the "EURAMET cg15; Guidelines on the Calibration of Digital Multimeters". Using calibration software where the number of measuring points is chosen such that the linearity of the measured range can be determined, a validated protocol is followed in which each step is recorded through a comparative measurement using our accredited 8,5 digits electrical multimeter.

We can perform electrical safety tests upon customer request. Electrical measuring instruments are in fact designed, arranged, laid out, maintained and characterized in such a way that safe use of electricity is ensured to the greatest extent possible. To this end, the necessary provisions and protective measures are in place. The purpose of our electrical safety tests is to discover defects that could impede safe operation. Our expert technicians do this by carrying out, in accordance with the latest NEN3140+A3 standard, a visual inspection, an inspection by measurement and testing and a functional test, the results of which are recorded on a certificate.

3. Temperature

The dry-block calibrator is calibrated according to the method described in "EURAMET-cg13". The axial gradient and stability of the dry-block calibrator is determined beforehand. Then the calibration is performed using a "platinum resistance thermometer" (PRT) which is inserted up to the bottom of the insert. The calibration is performed at a minimum of 5 points upward and 4 points downward. The measuring points are evenly distributed over the entire measuring range of the dry block calibrator, whereby the lowest possible temperature is taken as the first measuring point and the highest possible temperature is taken as the last ascending measuring point. If the customer wishes, measurement points can also be taken on request. Again, calibration is performed at a minimum of 5 points upward and 4 points downward. However, if the customer specifies fewer desired measuring points, these are supplemented with measuring points selected in such a way as to cover the entire measuring range of the dry-block calibrator. The calibration is traceable to the International Temperature Scale of 1990, the ITS90.

In temperature calibrations a distinction is made between (semi-)electrical temperature calibrations and dry-block temperature calibrations. The (semi-)electrical temperature calibrations are performed according to the guidelines in the EURAMET cg15 guide.

These calibrations are electrical measurements and are performed by simulating voltage and resistance. The conversion of voltage and resistance to temperature is done by means of reference tables that are traceable to IEC standards.:
NEN-EN-IEC 60584-1
NEN-EN-IEC 60584-3
NEN-EN-IEC 60751

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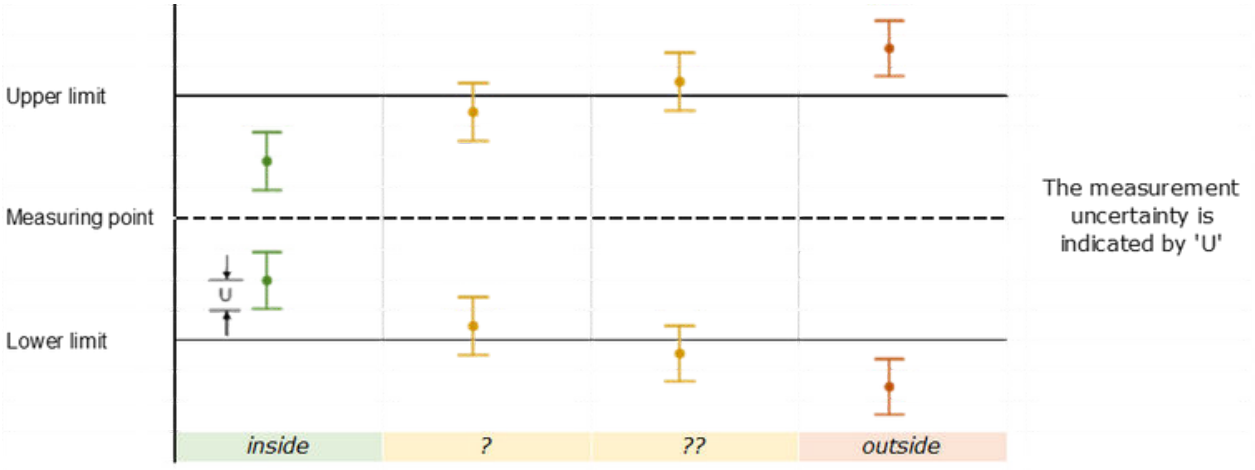
When simulating Resistance Devices (RTD's), a two, three or four wire connection is used depending on the instrument and/or measurement principle under test. When simulating thermocouples, the cold welding compensation is switched off in the instrument to be measured and set to 0° Celsius by default. Connecting a thermocouple measurement can differ depending on the instrument to be measured.

The cold-weld compensation is measured separately. This is done in different ways and depends on the type of instrument.

4. Adjusting the measuring equipment

Adjustment means that the measuring instrument is adjusted so that it measures as accurately as possible within the set specifications.There are specific instruments, knowledge and software for adjustment. At Tradinco, adjustment is often one of the options (when within our technical capabilities) and is carried out when an order has been received.

If an instrument is found out of specification during calibration, the instrument is adjusted. The factory specifications of the measuring instrument or the specifications specified by the customer are used. Below is shown when making adjustments:



		To adjust
inside	The measuring point including the uncertainty is within specifications	no
?	The measurement point is within specification, but the measurement point including the uncertainty may be outside specifications	yes
??	The measurement point is out of specification, but the measurement point including the uncertainty may be within specifications	yes
outside	The measuring point including the uncertainty is outside specifications	yes

When the adjustment has been made, a second calibration follows.The customer receives a calibration certificate before the adjustment (as found) and a calibration certificate after the adjustment (as left).The same measuring points are used for calibration before adjustment as for calibration after adjustment. With the exception of a dry-block calibrator where the data from before adjustment only contains the ascending series.

Should the pre-calibration reveal deviations greater than those indicated in the specifications, the instrument should be adjusted. You should then also bear in mind that the deviation found applies to the measurements, which you then performed with this instrument. Adjusting means adjusting the instrument so that it measures as accurately as possible and within the set specifications. By no means every calibration laboratory is capable of doing this. It often requires specific knowledge, software, parts and training for the instrument to do this. Depending on the result of measuring instrument calibration, the instrument is adjusted or not. If adjustment is necessary, a second calibration follows after adjustment with recording of the values on the certificate. The data for adjustment are also stored. Before adjustment is carried out, the client is informed, unless the order shows that the client agrees. The client then receives a calibration certificate before adjustment and a calibration certificate after adjustment.

The calibration before adjustment uses the same measuring points as the calibration after adjustment. With the exception of a dry- block calibrator where the pre-adjustment data contains only the rising series.

5. Expiration date & calibration periods

No opinions or interpretations relating to the calibration performed are shown on the certificates. Only at the express request of the customer a recalibration date or an appendix with opinions or interpretations regarding the calibration can be added to the certificate.

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