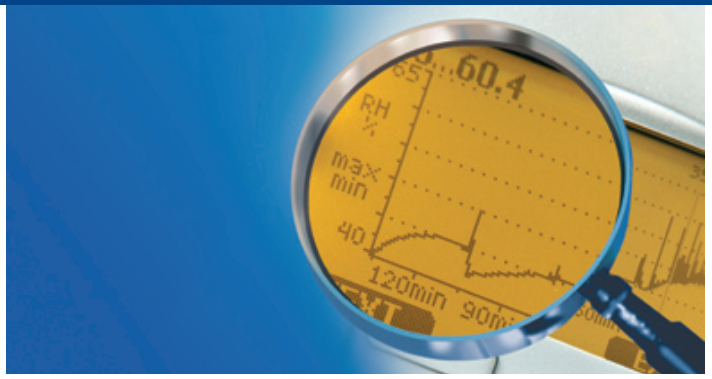
Calibration Traceability at Vaisala Instruments Production



What does traceability mean at Vaisala?

Traceability at Vaisala is organized either through Vaisala Measurement Standard Laboratory (MSL) or other calibration services. Vaisala uses only the best laboratories available for the source of traceability. The traceability is transferred to the Production working standards, using the knowledge of MSL.

Unbroken chain from SI units to each product

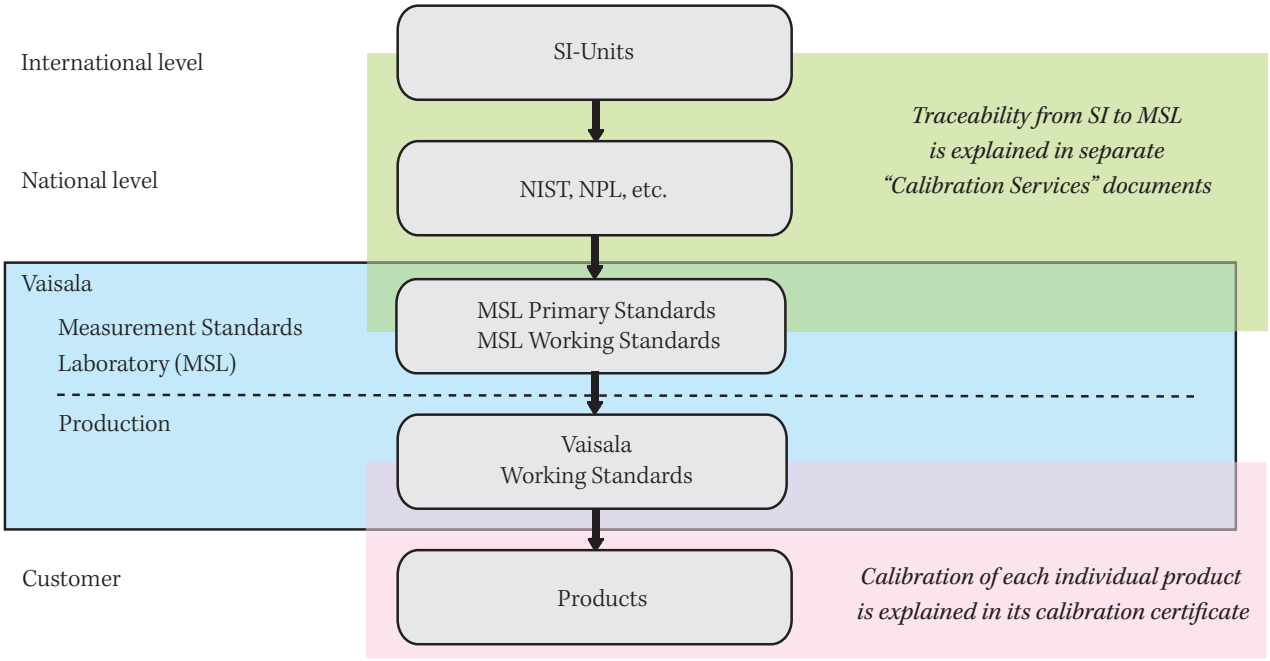
This document explains the traceability scheme for different product lines inside the Vaisala Instruments product factory.

The traceability from the International System of Units, SI-Units, to the Measurement Standard Laboratory, MSL, are described in the following separate documents:

- Temperature Calibration Services at Vaisala European Service Center
- Pressure Calibration Services at Vaisala European Service Center
- Dew-Point Calibration Services at Vaisala Measurement Standards Laboratory
- Gas Flow Calibration Services at Vaisala Measurement Standards Laboratory
- Calibration Services for Electrical Quantities at Vaisala MSL

The working standards used for the calibration of each individual product are specified in the appropriate calibration certificate.

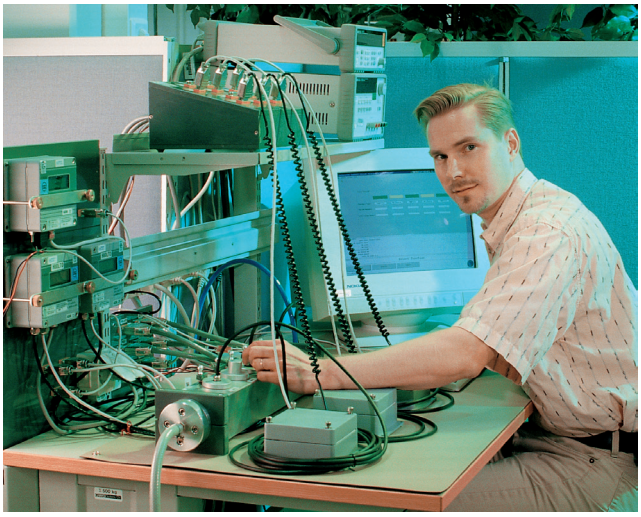
The general traceability scheme for Vaisala Instruments products:



Relative humidity measurement products

The traceability chain

The traceability chain goes directly from the product up to the National Institute of Standards and Technology in USA (NIST) with an unbroken chain of calibrations. The reference humidity values are measured directly with dewpoint meters and the relative humidity is calculated from the measured dewpoint and temperature values, or with calibrated humidity and temperature transmitters.



The references used in the humidity traceability chain

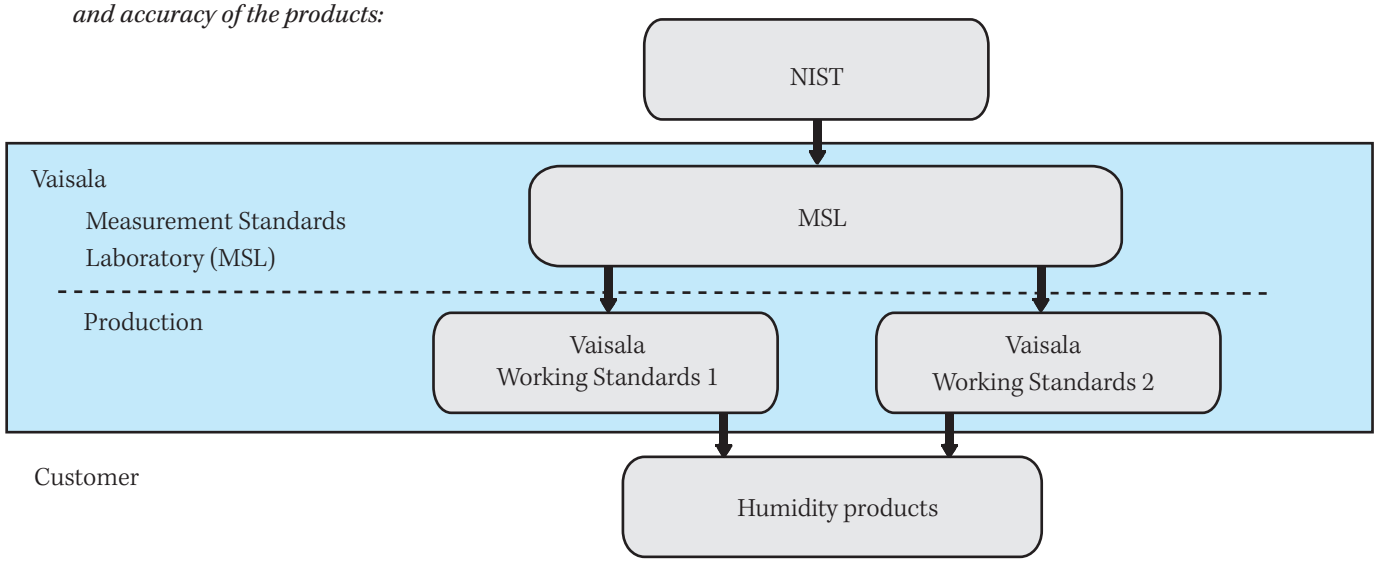
1. The Working Standards for dewpoint temperature in Production are several dewpoint meters calibrated at MSL at intervals of 2 years or more frequently.

2. The Working Standards for relative humidity in Production are Vaisala humidity and temperature transmitters (HMP233 and HMT337). A set of 2 transmitters is used in every working station. The humidity sensors of these Working Standards are calibrated against the Production Working Standard dewpoint meter at intervals of 3 months.

The references used in the temperature traceability chain

2. The Working Standards for temperature in Production are Vaisala humidity and temperature transmitters (HMP233 and HMT337). A set of 2 transmitters is used in every working station. The temperature sensors of these Working Standards are calibrated against the MSL Working Standards at intervals of 1 year.

The following traceability scheme is used in Vaisala production to ensure the traceability and accuracy of the products:



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Dewpoint measurement products

The traceability chain

The traceability chain goes directly from the product up to the National Institute of Standards and Technology in USA (NIST) or National Physical Laboratory in UK (NPL) with two unbroken chains of calibrations.

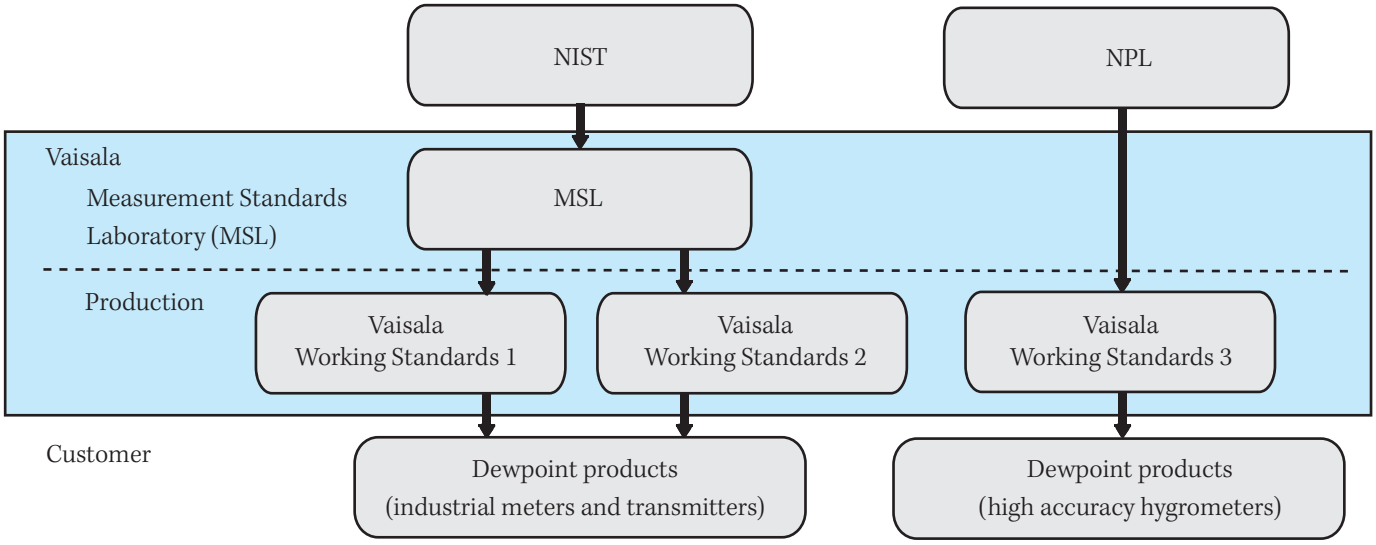
The references used in the traceability chain

1. The Working Standards for dewpoint temperature in Production are;
   - Several dewpoint meters calibrated against the MSL Primary Standard at intervals of 2 years or more frequently.

2. The Working Standards for temperature in Production are several Vaisala Combined Pressure, Humidity and Temperature Transmitter PTU200´s with two temperature probes.

3. The Working Standard for dewpoint temperature in Production is a dewpoint meter calibrated directly at NPL at intervals of 3 years.

The following traceability scheme is used in Vaisala production to ensure the traceability and accuracy of the products:



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Barometric pressure measurement products

The traceability chain

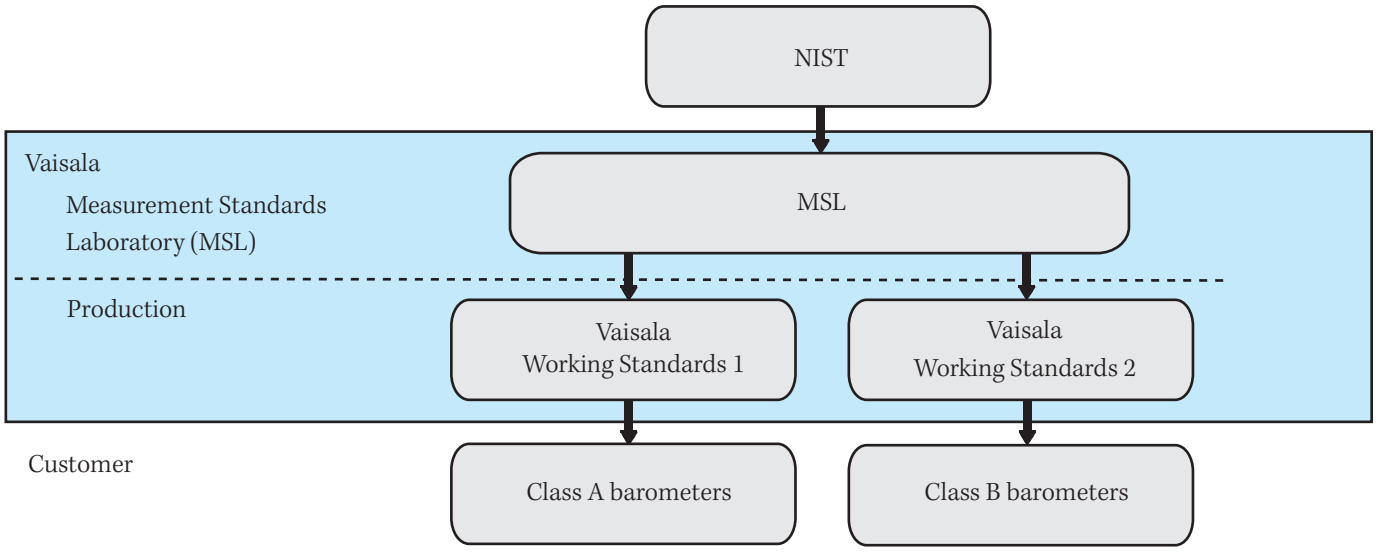
The traceability chain goes directly from the product up to the National Institute of Standards and Technology in USA (NIST) with an unbroken chain of calibrations.

The references used in the traceability chain

1. The Working Standards for pressure in Production are;
   - Pressure balance calibrated against the MSL Primary Pressure Standard at intervals of 1 year.
   - Vacuum meter calibrated against the MSL Primary Vacuum Standard at intervals of 1 year.

2. The Working Standards for pressure in Production are Vaisala barometers (PTB220) calibrated against the MSL Primary Pressure Standard at intervals of 6 months.

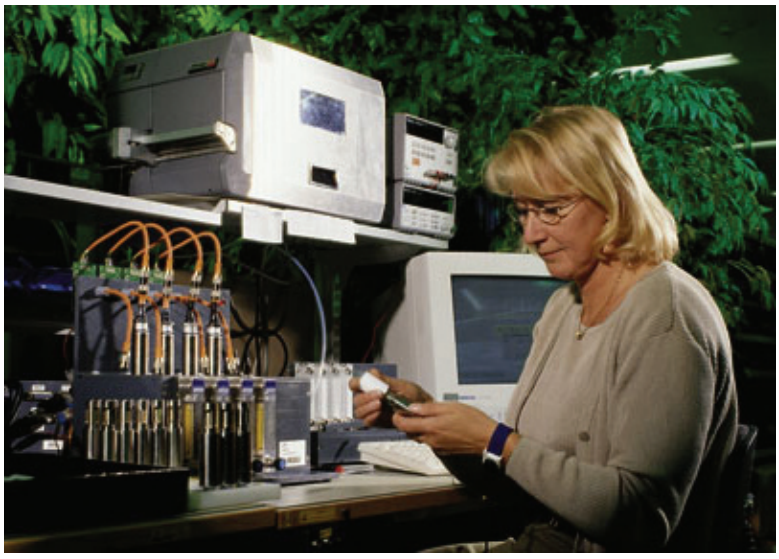
The following traceability scheme is used in Vaisala production to ensure the traceability and accuracy of the products:



Carbon dioxide measurement products

The traceability chain

The traceability chain goes directly from the product up to the National Institute of Standards and Technology in USA (NIST), or Nederlands Meetinstituut in The Netherlands (NMI) with unbroken chains of calibrations with known uncertainties.



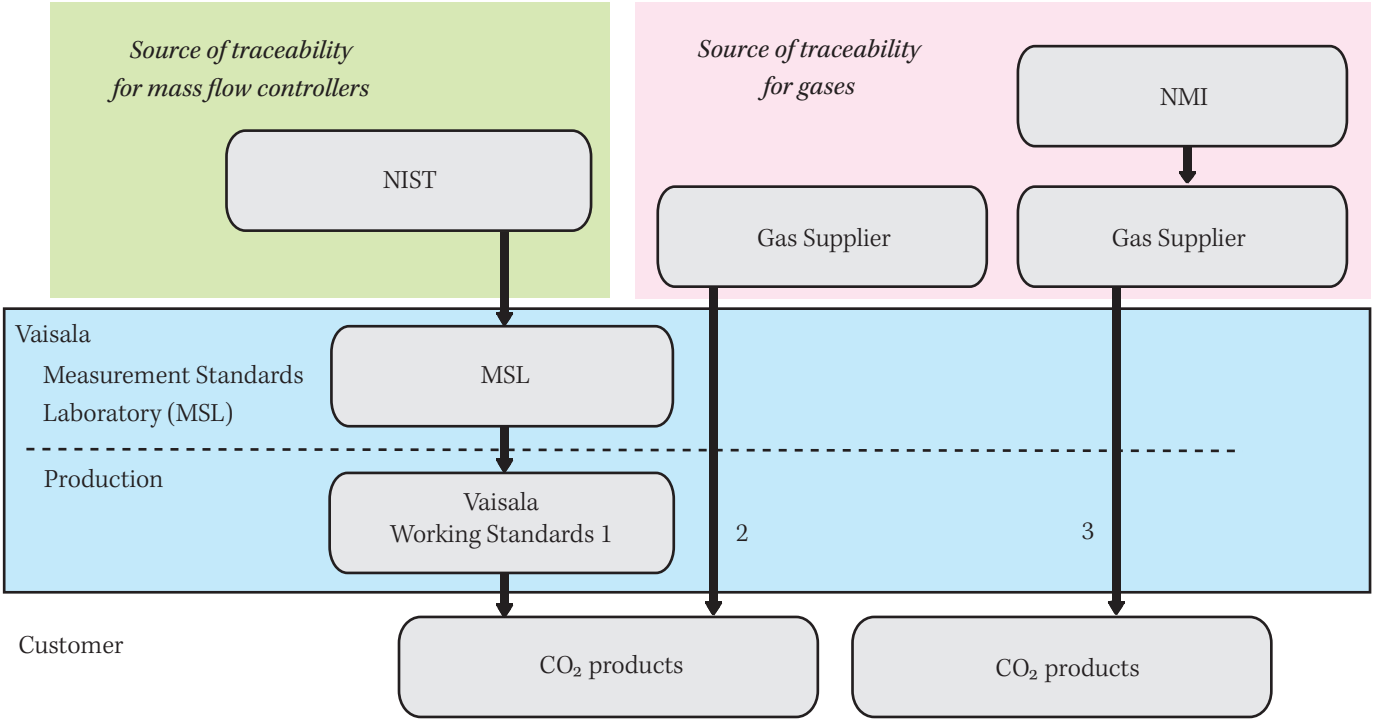
The references used in the traceability chain

1. The Working Standards in Production are digital mass flow controllers calibrated against the MSL Primary Flow Standard at intervals of 3 months.

2. The Working Standards in Production are certified pure CO_2 and N_2 gases used for mixing gases of high CO_2 concentrations.

3. The Working Standards in Production are gravimetrically produced and analyzed (by gas supplier) CO_2 mixtures used as reference gas mixtures at low gas concentrations.

The following traceability scheme is used in Vaisala production to ensure the traceability and accuracy of the products:



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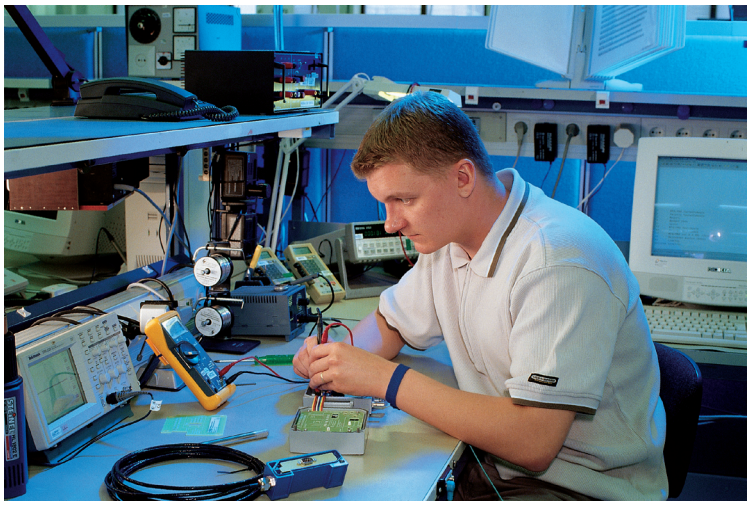
Traceability of analog output values

Some of the products are equipped with one or more analog outputs. These analog outputs may be chosen as voltage or current. During production the voltage output signals are measured with high precision digital multimeters. The current output signals are measured as voltage measurement with high precision digital multimeters over reference resistors connected to the current loop.

Some of the products are equipped with a resistive temperature sensor to be connected to users electronics. The resistance of the temperature sensor is measured with a high precision digital multimeter.



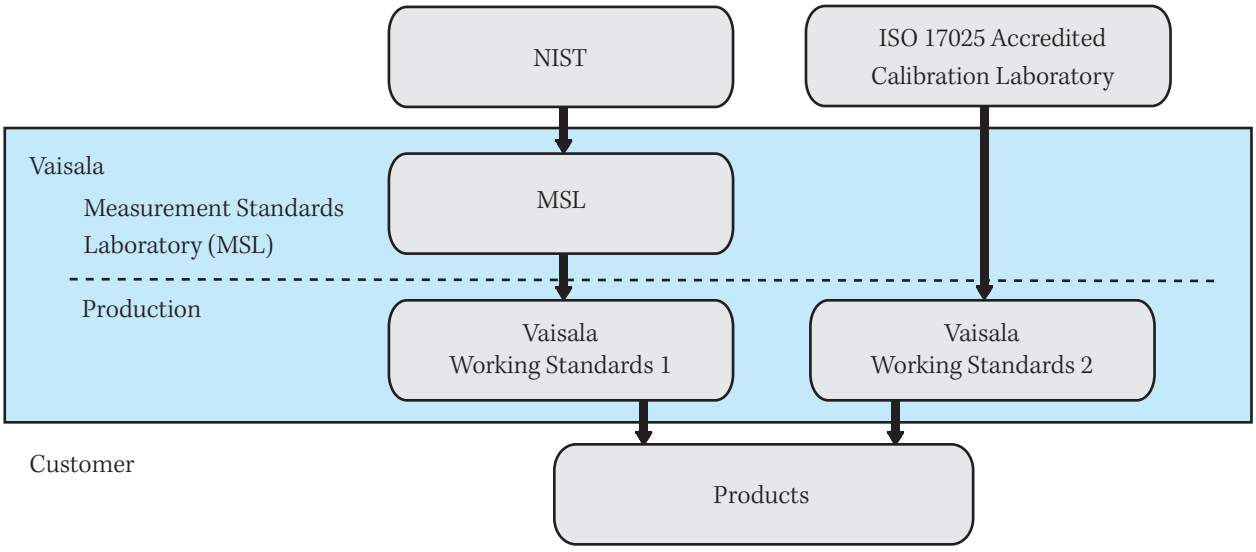
The traceability chain

The traceability chain goes directly from the product up to national calibration laboratories with unbroken chains of calibrations with known uncertainties.

1. The Working Standards for current measurement in Production are several High Precision Reference Resistors. Reference Resistors are calibrated at intervals of 1 year.

2. The Working Standards for voltage and resistance measurement in Production are several Agilent Technologies, Hewlett Packard and Fluke High Precision Digital multimeters. Digital multimeters are calibrated at intervals of 1 year.

The following traceability scheme is used in Vaisala production to ensure the traceability and accuracy of the products:



Ref. B210569EN 2006-02

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Vaisala Oyj
P.O.Box 26, FIN-00421 Helsinki, Finland
Tel. (+358 9) 894 91
Fax. (+358 9) 8949 2227
www.vaisala.com