

of **Tradinco Instrumenten en Apparaten B.V.**
Tradinco Calibration Laboratory (TCL)

This annex is valid from: **26-04-2017** to **01-05-2021**

Replaces annex dated: **14-11-2016**

Location(s) where activities are performed under accreditation

Head Office

Radonstraat 250
 2718 TB
 Zoetermeer
 Nederland

| HCS code | Measured quantity, Range | Frequency | CMC ¹ | Remarks |
|----------|--------------------------|-----------|-----------------------------|------------|
| LF 0 0 | DC/LF Quantities | | | |
| LF 11 | Direct voltage | | | |
| | 10 mV to 100 mV | | $5.0 \cdot 10^{-5} \cdot U$ | Measuring |
| | 100 mV to 1 V | | $2.0 \cdot 10^{-5} \cdot U$ | |
| | 1 V to 1000 V | | $1.5 \cdot 10^{-5} \cdot U$ | |
| | 1 mV to 10 mV | | $3.5 \cdot 10^{-3} \cdot U$ | Generating |
| | 10 mV to 100 mV | | $3.5 \cdot 10^{-4} \cdot U$ | |
| | 100 mV to 330 mV | | $1.0 \cdot 10^{-4} \cdot U$ | |
| | 330 mV to 1020 V | | $9.0 \cdot 10^{-5} \cdot U$ | |
| LF 2 1 | Direct current | | | |
| | 100 µA to 10 mA | | $1.5 \cdot 10^{-4} \cdot I$ | Measuring |
| | 10 mA to 100 mA | | $1.8 \cdot 10^{-4} \cdot I$ | |

This annex has been approved by the Board of the
 Dutch Accreditation Council, on its behalf,

J.A.W.M. de Haas
 Director of Operations

¹ Calibration and Measurement Capability (CMC): Demonstrated measurement uncertainty, with coverage probability of 95%, in a given measurement point or measurement range. Measurement uncertainty, *U*, is calculated according to EA-4/02 "Evaluation of the Uncertainty of Measurement in Calibration".

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| | 100 mA to 1 A | | $3.5 \cdot 10^{-4} \cdot I$ | |
| | 100 µA to 300 µA | | $6.0 \cdot 10^{-4} \cdot I$ | Generating |
| | 300 µA to 1 mA | | $3.0 \cdot 10^{-4} \cdot I$ | |
| | 1 mA to 3.3 mA | | $1.7 \cdot 10^{-4} \cdot I$ | |
| | 3.3 mA to 330 mA | | $2.0 \cdot 10^{-4} \cdot I$ | |
| | 330 mA to 2.2 A | | $4.1 \cdot 10^{-4} \cdot I$ | |
| | 2.2 A to 11 A | | $6.7 \cdot 10^{-4} \cdot I$ | |
| LF 3 1 | Alternating voltage | | | |
| | 100 mV to 100 V | 40 Hz to 1 kHz | $3.0 \cdot 10^{-4} \cdot U$ | Measuring |
| | 100 mV to 100 V | 1 kHz to 100 kHz | $1.7 \cdot 10^{-3} \cdot U$ | |
| | 100 V to 500 V | 40 Hz to 10 kHz | $5.0 \cdot 10^{-4} \cdot U$ | |
| | 500 V to 1000 V | 40 Hz to 10 kHz | $1.6 \cdot 10^{-3} \cdot U$ | |
| | 33 mV to 330 mV | 10 Hz to 45 Hz | $2.2 \cdot 10^{-3} \cdot U + 51 \mu\text{V}$ | Generating |
| | | 45 Hz to 10 kHz | $5.0 \cdot 10^{-4} \cdot U + 30 \mu\text{V}$ | |
| | | 10 kHz to 20 kHz | $9.0 \cdot 10^{-4} \cdot U + 22 \mu\text{V}$ | |
| | | 20 kHz to 50 kHz | $1.5 \cdot 10^{-3} \cdot U + 41 \mu\text{V}$ | |
| | | 50 kHz to 100 kHz | $2.1 \cdot 10^{-3} \cdot U + 0.15 \text{ mV}$ | |
| | | 100 kHz to 500 kHz | $6.1 \cdot 10^{-3} \cdot U + 0.29 \text{ mV}$ | |
| | 330 mV to 3.3 V | 10 Hz to 45 Hz | $1.3 \cdot 10^{-3} \cdot U + 0.34 \text{ mV}$ | |
| | | 45 Hz to 10 kHz | $3.0 \cdot 10^{-4} \cdot U + 0.17 \text{ mV}$ | |
| | | 10 kHz to 20 kHz | $7.0 \cdot 10^{-4} \cdot U + 0.07 \text{ mV}$ | |
| | | 20 kHz to 50 kHz | $1.3 \cdot 10^{-3} \cdot U + 0.29 \text{ mV}$ | |
| | | 50 kHz to 100 kHz | $2.1 \cdot 10^{-3} \cdot U + 1.5 \text{ mV}$ | |
| | | 100 kHz to 500 kHz | $4.4 \cdot 10^{-3} \cdot U + 2.9 \text{ mV}$ | |
| | 3.3 V to 33 V | 10 Hz to 45 Hz | $1.3 \cdot 10^{-3} \cdot U + 3.4 \text{ mV}$ | |

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|----------|--------------------------|-------------------|--|------------|
| | | 45 Hz to 10 kHz | $4.0 \cdot 10^{-4} \cdot U + 1.5 \text{ mV}$ | |
| | | 10 kHz to 20 kHz | $7.0 \cdot 10^{-4} \cdot U + 2.4 \text{ mV}$ | |
| | | 20 kHz to 50 kHz | $1.7 \cdot 10^{-3} \cdot U + 4.6 \text{ mV}$ | |
| | | 50 kHz to 100 kHz | $2.1 \cdot 10^{-3} \cdot U + 16 \text{ mV}$ | |
| | 33 V to 330 V | 45 Hz to 1 kHz | $5.0 \cdot 10^{-4} \cdot U + 15 \text{ mV}$ | |
| | | 1 kHz to 10 kHz | $7.0 \cdot 10^{-4} \cdot U + 15 \text{ mV}$ | |
| | | 10 kHz to 20 kHz | $8.0 \cdot 10^{-4} \cdot U + 33 \text{ mV}$ | |
| | 330 V to 1020 V | 45 Hz to 1 kHz | $4.0 \cdot 10^{-4} \cdot U + 0.17 \text{ V}$ | |
| | | 1 kHz to 10 kHz | $1.8 \cdot 10^{-3} \cdot U + 0.46 \text{ V}$ | |
| LF 4 1 | Alternating current | | | |
| | 100 μ A to 100 mA | 40 Hz to 5 kHz | $1.7 \cdot 10^{-3} \cdot I$ | Measuring |
| | 100 mA to 1 A | 40 Hz to 1 kHz | $3.0 \cdot 10^{-3} \cdot I$ | |
| | | | | |
| | 29 μ A to 0.33 mA | 10 Hz to 20 Hz | $2.1 \cdot 10^{-3} \cdot I + 0.17 \mu\text{A}$ | Generating |
| | | 20 Hz to 45 Hz | $1.0 \cdot 10^{-3} \cdot I + 0.17 \mu\text{A}$ | |
| | | 45 Hz to 1 kHz | $1.1 \cdot 10^{-3} \cdot I + 0.22 \mu\text{A}$ | |
| | | 1 kHz to 5 kHz | $3.5 \cdot 10^{-3} \cdot I + 0.14 \mu\text{A}$ | |
| | | 5 kHz to 10 kHz | $1.1 \cdot 10^{-2} \cdot I + 0.16 \mu\text{A}$ | |
| | 0.33 mA to 3.3 mA | 10 Hz to 20 Hz | $1.8 \cdot 10^{-3} \cdot I + 0.27 \mu\text{A}$ | |
| | | 20 Hz to 45 Hz | $8.0 \cdot 10^{-4} \cdot I + 0.91 \mu\text{A}$ | |
| | | 45 Hz to 1 kHz | $9.0 \cdot 10^{-4} \cdot I + 0.47 \mu\text{A}$ | |
| | | 1 kHz to 5 kHz | $1.8 \cdot 10^{-3} \cdot I + 0.41 \mu\text{A}$ | |
| | | 5 kHz to 10 kHz | $5.2 \cdot 10^{-3} \cdot I + 0.82 \mu\text{A}$ | |
| | 3.3 mA to 33 mA | 10 Hz to 20 Hz | $1.7 \cdot 10^{-3} \cdot I + 61 \mu\text{A}$ | |
| | | 20 Hz to 45 Hz | $9.0 \cdot 10^{-4} \cdot I + 4.7 \mu\text{A}$ | |
| | | 45 Hz to 1 kHz | $8.0 \cdot 10^{-4} \cdot I + 4.1 \mu\text{A}$ | |
| | | 1 kHz to 5 kHz | $1.8 \cdot 10^{-3} \cdot I + 3.6 \mu\text{A}$ | |

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|----------|----------------------------------|-----------------|---|-------------------|
| | | 5 kHz to 10 kHz | $5.2 \cdot 10^{-3} \cdot I + 52 \mu\text{A}$ | |
| | 33 mA to 330 mA | 10 Hz to 20 Hz | $1.7 \cdot 10^{-3} \cdot I + 61 \mu\text{A}$ | |
| | | 20 Hz to 45 Hz | $9.0 \cdot 10^{-4} \cdot I + 47 \mu\text{A}$ | |
| | | 45 Hz to 1 kHz | $8.0 \cdot 10^{-4} \cdot I + 41 \mu\text{A}$ | |
| | | 1 kHz to 5 kHz | $1.8 \cdot 10^{-3} \cdot I + 36 \mu\text{A}$ | |
| | | 5 kHz to 10 kHz | $5.2 \cdot 10^{-3} \cdot I + 52 \mu\text{A}$ | |
| | 330 mA to 2.2 A | 10 Hz to 45 Hz | $1.7 \cdot 10^{-3} \cdot I + 0.63 \text{ mA}$ | |
| | | 45 Hz to 1 kHz | $8.0 \cdot 10^{-4} \cdot I + 0.65 \text{ mA}$ | |
| | | 1 kHz to 5 kHz | $6.5 \cdot 10^{-3} \cdot I + 0.41 \text{ mA}$ | |
| | 2.2 A to 11 A | 45 Hz to 65 Hz | $4.0 \cdot 10^{-4} \cdot I + 4.1 \text{ mA}$ | |
| | | 65 Hz to 500 Hz | $8.0 \cdot 10^{-4} \cdot I + 3.8 \text{ mA}$ | |
| | | 500 Hz to 1 kHz | $2.8 \cdot 10^{-3} \cdot I + 7.4 \text{ mA}$ | |
| LF 6 2 | DC Resistance | | | |
| | 1 Ω to 10 Ω | | $7.0 \cdot 10^{-5} \cdot R$ | 4-wire measuring |
| | 10 Ω to 1 k Ω | | $4.0 \cdot 10^{-5} \cdot R$ | 4-wire |
| | 1 k Ω to 100 k Ω | | $3.0 \cdot 10^{-5} \cdot R$ | 4-wire |
| | 100 k Ω to 1 M Ω | | $4.0 \cdot 10^{-5} \cdot R$ | 4-wire |
| | 1 M Ω to 10 M Ω | | $8.5 \cdot 10^{-5} \cdot R$ | 4-wire |
| | 10 M Ω to 100 M Ω | | $8.5 \cdot 10^{-4} \cdot R$ | 4-wire |
| | 100 M Ω to 1 G Ω | | $8.5 \cdot 10^{-3} \cdot R$ | 2-wire |
| | | | | |
| | 1 Ω to 11 Ω | | $5.5 \cdot 10^{-3} \cdot R$ | 4-wire generating |
| | 11 Ω to 33 Ω | | $9.5 \cdot 10^{-4} \cdot R$ | 4-wire |
| | 33 Ω to 110 Ω | | $4.0 \cdot 10^{-4} \cdot R$ | 4-wire |
| | 110 Ω to 110 k Ω | | $3.0 \cdot 10^{-4} \cdot R$ | 4-wire |
| | 110 k Ω to 3.3 M Ω | | $3.0 \cdot 10^{-4} \cdot R$ | 2-wire |
| | 3.3 M Ω to 11 M Ω | | $7.0 \cdot 10^{-4} \cdot R$ | 2-wire |

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| | 11 MΩ to 33 MΩ | | $1.0 \cdot 10^{-3} \cdot R$ | 2-wire |
| | 33 MΩ to 330 MΩ | | $4.6 \cdot 10^{-3} \cdot R$ | 2-wire |
| TF 0 0 | Time and frequency | | | |
| TF 2 1 | Frequency | | | |
| | 0.01 Hz to 225 MHz | | $10 \cdot 10^{-6} \cdot f$ | Measuring |
| | 1 Hz to 300 Hz | | $2.5 \cdot 10^{-5} \cdot f + 1 \text{ mHz}$ | Generating |
| | 300 Hz to 2 MHz | | $2.5 \cdot 10^{-5} \cdot f$ | |

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|----------|--|------------------|------------------|--|
| TE 13 1 | Self-indicating thermometers | | | |
| | Dry Block Calibrators | -50 °C to 400 °C | 0.06 °C | See remark at bottom of the scope |
| | | 400 °C to 650 °C | 0.1 °C | |
| TE 9 0 | Simulators/ Display Units | | | |
| TE 9 1 | Resistance thermometer | | | Electrical Calibration |
| | | -200 °C to 0 °C | 0.05 °C | Generating and Measuring |
| | | 0 °C to 630 °C | 0.10 °C | |
| | | 630 °C to 800 °C | 0.30 °C | |
| TE 9 2 | Thermocouples | | | Electrical Calibration |

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|----------|--|--------------------|------------------|--------------------------|
| | Type B | 600 °C to 800 °C | 0.51 °C | Generating and Measuring |
| | | 800 °C to 1000 °C | 0.40 °C | |
| | | 1000 °C to 1550 °C | 0.34 °C | |
| | | 1550 °C to 1820 °C | 0.34 °C | |
| | Type C | 0 °C to 150 °C | 0.30 °C | |
| | | 150 °C to 650 °C | 0.26 °C | |
| | | 650 °C to 1000 °C | 0.29 °C | |
| | | 1000 °C to 1800 °C | 0.49 °C | |
| | | 1800 °C to 2316 °C | 0.92 °C | |
| | Type E | -250 °C to -100 °C | 0.49 °C | |
| | | -100 °C to -25 °C | 0.15 °C | |
| | | -25 °C to 350 °C | 0.13 °C | |
| | | 350 °C to 650 °C | 0.16 °C | |
| | | 650 °C to 1000 °C | 0.20 °C | |
| | Type J | -210 °C to -100 °C | 0.26 °C | |
| | | -100 °C to -30 °C | 0.15 °C | |
| | | -30 °C to 150 °C | 0.13 °C | |
| | | 150 °C to 760 °C | 0.17 °C | |
| | | 760 °C to 1200 °C | 0.22 °C | |
| | Type K | -200 °C to -100 °C | 0.32 °C | |
| | | -100 °C to -25 °C | 0.17 °C | |
| | | -25 °C to 120 °C | 0.15 °C | |
| | | 120 °C to 1000 °C | 0.26 °C | |
| | | 1000 °C to 1372 °C | 0.38 °C | |
| | Type L | -200 °C to -100 °C | 0.33 °C | |
| | | -100 °C to 800 °C | 0.24 °C | |
| | | 800 °C to 900 °C | 0.17 °C | |

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|----------|--|--------------------|--|---------|
| | Type N | -200 °C to -100 °C | 0.41 °C | |
| | | -100 °C to -25 °C | 0.22 °C | |
| | | -25 °C to 120 °C | 0.19 °C | |
| | | 120 ° to 410 °C | 0.17 °C | |
| | | 410 °C to 1300 °C | 0.28 °C | |
| | Type R | 0 °C to 250 °C | 0.63 °C | |
| | | 250 °C to 400 °C | 0.38 °C | |
| | | 400 °C to 1000 °C | 0.35 °C | |
| | | 1000 °C to 1767 °C | 0.43 °C | |
| | Type S | 0 °C to 250 °C | 0.56 °C | |
| | | 250 °C to 1000 °C | 0.39 °C | |
| | | 1000 °C to 1400 °C | 0.37 °C | |
| | | 1400 °C to 1767 °C | 0.45 °C | |
| | Type T | -250 °C to -150 °C | 0.64 °C | |
| | | -150 °C to 0 °C | 0.23 °C | |
| | | 0 °C to 120 °C | 0.15 °C | |
| | | 120 °C to 400 °C | 0.14 °C | |
| | Type U | -200 °C to 0 °C | 0.50 °C | |
| | | 0 °C to 600 °C | 0.25 °C | |
| PV 0 0 | Pressure and vacuum | | | |
| PV 1 1 | Absolute gas pressure | 1 kPa to 3.5 kPa | $6 \text{ Pa} + 1.0 \cdot 10^{-4} \cdot p$ | Gas |
| | | 3.5 kPa to 67 kPa | $45 \cdot 10^{-6} \cdot p$ (not smaller than 2 Pa) | |
| | | 67 kPa to 7 MPa | $35 \cdot 10^{-6} \cdot p$ (not smaller than 3 Pa) | Gas |
| | | 7 MPa to 40 MPa | $7.0 \cdot 10^{-5} \cdot p + 3 \cdot 10^{-5} \cdot p_{amb} + 6.0 \text{ Pa}$ | |
| PV 1 2 | Over atmospheric gas pressure | 20 Pa to 1.4 kPa | $2.5 \cdot 10^{-4} \cdot p_e$ (not smaller than 0.15 Pa) | |

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|----------|--|--------------------|--|---------|
| | | 1.4 kPa to 7 MPa | $35 \cdot 10^{-6} \cdot p_e$ (not smaller than 0.35 Pa) | |
| | | 7 MPa to 40 MPa | $7.0 \cdot 10^{-5} \cdot p_e$ | Oil |
| PV 2 1 | Absolute liquid pressure | 350 kPa to 1.5 MPa | $1.1 \cdot 10^{-4} \cdot p + 6.0 \text{ Pa}$ | |
| | | 1.5 MPa to 80 MPa | $7.0 \cdot 10^{-5} \cdot p + 3 \cdot 10^{-5} \cdot p_{amb} + 6.0 \text{ Pa}$ | |
| | | 80 MPa to 100 MPa | $1.2 \cdot 10^{-4} \cdot p + 6.0 \text{ Pa}$ | |
| | | 100 MPa to 250 MPa | $2.0 \cdot 10^{-4} \cdot p + 6.0 \text{ Pa}$ | |
| PV 2 2 | Over atmospheric liquid pressure | 260 kPa to 1.5 MPa | $1.1 \cdot 10^{-4} \cdot p_e$ | Oil |
| | | 1.5 MPa to 80 MPa | $70 \cdot 10^{-6} \cdot p_e$ (not smaller than 150 Pa) | |
| | | 80 MPa to 100 MPa | $1.2 \cdot 10^{-4} \cdot p_e$ | |
| | | 100 MPa to 250 MPa | $2.0 \cdot 10^{-4} \cdot p_e$ | |
| PV 3 1 | Under atmospheric pressure | -100 kPa to -4 kPa | $1.0 \cdot 10^{-4} \cdot p_e $ | Gas |

Remarks:

The calibrations are carried out at an ambient temperature of 20 °C (nominal).
 $p_e = p - p_{amb}$; p_e is the gauge pressure, p_{amb} is the ambient pressure.

This annex is applicable to calibrations carried out in the own laboratory.

TE 13 1: The CMC value excludes the characteristic influence of the Dry Block Calibrators.