Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Annex to the Accreditation Certificate D-K-15025-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 08.12.2011 to 31.07.2012

Holder of certificate:

Jordan National Metrology Institute JNMI
Royal Scientific Society RSS
Ahmad Al-Tarawneh, P.O. Box 1438, Al-Jubeiha 11941, Amman, Jordan

Head:	B.Sc. Fawaz Al-Labadi
Deputy:	B.Sc. Loai Qdairat
	B.Sc. Ibrahim Mahmoud Sehweil
	B.Sc. Mustafa Flaifel
	B.Sc. Sukaina Deebajeh
	B.Sc. Mariam Bishtawi

Accredited since: 02.06.1998

Calibrations in the fields:

Electrical quantities
DC and low frequency quantities
- **DC voltage**
- **DC current**
- **DC resistance**
- **AC voltage**
- **AC current**

Dimensional quantities
Lenght
- **Length gauges**
- **Length measuring instruments**

Thermodynamic quantities
Temperature quantities
- **Resistance thermometers**
- **Liquid in glass thermometers**
- **Thermocouples**

Humidity quantities
- **Humidity**

Mechanical quantities
- **Mass (mass standards)**
- **Pressure**
- **Weighing instruments**

Abbreviations used: see last page

Permanent Laboratory

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
DC Voltage Sources, fixed values	100 mV 1 V; 1.018 V 10 V; 100 V 1000 V	using resistive divider and 10-V-reference standard	$6.4 \cdot 10^{-6} \cdot U$ $2.5 \cdot 10^{-6} \cdot U$ $2.4 \cdot 10^{-6} \cdot U$ $2.6 \cdot 10^{-6} \cdot U$	U = measured value
DC Voltage Sources	10 mV to < 100 mV 100 mV to < 1 V 1 V to < 10 V 10 V to < 100 V 100 V to 1000 V		$3.0 \cdot 10^{-6} \cdot U + 8\ \mu V$ $9.0 \cdot 10^{-6} \cdot U + 7\ \mu V$ $12 \cdot 10^{-6} \cdot U + 4\ \mu V$ $13 \cdot 10^{-6} \cdot U + 50\ \mu V$ $20 \cdot 10^{-6} \cdot U + 0.24$ mV	U = measured value
DC Voltage Measuring instruments	1 mV to 2.2 mV > 2.2 mV to 10 mV > 10 mV to 220 mV > 220 mV to 2.2 V > 2.2 V to 11 V > 11 V to 22 V > 22 V to 220 V > 220 V to 1000 V		$2.0 \cdot 10^{-6} \cdot U + 1.2\ \mu V$ $10 \cdot 10^{-6} \cdot U + 1.2\ \mu V$ $2.4 \cdot 10^{-6} \cdot U + 5.8\ \mu V$ $4.0 \cdot 10^{-6} \cdot U + 5.2\ \mu V$ $4.2 \cdot 10^{-6} \cdot U + 3.8\ \mu V$ $4.3 \cdot 10^{-6} \cdot U + 4.0\ \mu V$ $5.6 \cdot 10^{-6} \cdot U + 38\ \mu V$ $7.0 \cdot 10^{-6} \cdot U + 0.38$ mV	*U = measured value*
DC Current Sources, fixed values	50 µA 100 µA 200 µA 500 µA 1 mA 2 mA 5 mA 10 mA 20 mA 50 mA 100 mA 200 mA 500 mA 1 A 2 A 3 A 5 A 8 A 10 A		$14 \cdot 10^{-6} \cdot I$ $16 \cdot 10^{-6} \cdot I$ $14 \cdot 10^{-6} \cdot I$ $13 \cdot 10^{-6} \cdot I$ $13 \cdot 10^{-6} \cdot I$ $16 \cdot 10^{-6} \cdot I$ $15 \cdot 10^{-6} \cdot I$ $15 \cdot 10^{-6} \cdot I$ $21 \cdot 10^{-6} \cdot I$ $24 \cdot 10^{-6} \cdot I$ $22 \cdot 10^{-6} \cdot I$ $32 \cdot 10^{-6} \cdot I$ $19 \cdot 10^{-6} \cdot I$ $28 \cdot 10^{-6} \cdot I$ $59 \cdot 10^{-6} \cdot I$ $54 \cdot 10^{-6} \cdot I$ $52 \cdot 10^{-6} \cdot I$ $150 \cdot 10^{-6} \cdot I$ $142 \cdot 10^{-6} \cdot I$	I =measured value
DC Current Sources	10 µA to < 100 µA 100 µA to < 1 mA 1 mA to < 10 mA 10 mA to < 100 mA 100 mA to 1 A		$48 \cdot 10^{-6} \cdot I + 6.0$ nA $48 \cdot 10^{-6} \cdot I + 9.0$ nA $50 \cdot 10^{-6} \cdot I + 70$ nA $72 \cdot 10^{-6} \cdot I + 0.9\ \mu A$ $0.18 \cdot 10^{-3} \cdot I + 15\ \mu A$	I =measured value
DC Current Measuring instruments	10 µA to < 220 µA 220 µA to 2.2 mA > 2.2 mA to 22 mA > 22 mA to 220 mA > 220 mA to 2.2 A > 2.2 A to 11 A		$42 \cdot 10^{-6} \cdot I + 6.0$ nA $38 \cdot 10^{-6} \cdot I + 7.0$ nA $40 \cdot 10^{-6} \cdot I + 40$ nA $55 \cdot 10^{-6} \cdot I + 0.7\ \mu A$ $0.1 \cdot 10^{-3} \cdot I + 10\ \mu A$ $0.39 \cdot 10^{-3} \cdot I + 0.46$ mA	I =measured value

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Annex to the accreditation certificate D-K-15025-01-00

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
DC Resistance	0.1 Ω		$45 \cdot 10^{-6} \cdot R$	R = measured value
Resistors, fixed values	1 Ω		$9.0 \cdot 10^{-6} \cdot R$	
	1.9 Ω		$8.0 \cdot 10^{-6} \cdot R$	
	10 Ω		$16 \cdot 10^{-6} \cdot R$	
	100 Ω		$9.0 \cdot 10^{-6} \cdot R$	
	1 kΩ		$4.0 \cdot 10^{-6} \cdot R$	
	10 kΩ; 19 kΩ		$2.5 \cdot 10^{-6} \cdot R$	
	100 kΩ		$4.0 \cdot 10^{-6} \cdot R$	
	1 MΩ		$12 \cdot 10^{-6} \cdot R$	
	10 MΩ		$0.11 \cdot 10^{-3} \cdot R$	
	19 MΩ		$0.13 \cdot 10^{-3} \cdot R$	
	100 MΩ		$0.62 \cdot 10^{-3} \cdot R$	
DC Resistance	1 Ω		$12 \cdot 10^{-6} \cdot R$	R = measured value
Measuring instruments	1.9 Ω		$11 \cdot 10^{-6} \cdot R$	
	10 Ω		$16 \cdot 10^{-6} \cdot R$	
	100 Ω		$18 \cdot 10^{-6} \cdot R$	
	1 kΩ		$8.0 \cdot 10^{-6} \cdot R$	
	10 kΩ		$2.5 \cdot 10^{-6} \cdot R$	
	19 kΩ		$3.4 \cdot 10^{-6} \cdot R$	
	100 kΩ		$4.6 \cdot 10^{-6} \cdot R$	
	1 MΩ		16 · 10-6 · R	
	10 MΩ		$0.13 \cdot 10^{-3} \cdot R$	
	19 MΩ		$0.14 \cdot 10^{-3} \cdot R$	
	100 MΩ		$0.59 \cdot 10^{-3} \cdot R$	
	1 GΩ		$18 \cdot 10^{-3} \cdot R$	
DC Resistance	1 Ω to 10 Ω		$27 \cdot 10^{-6} \cdot R$ + 0.11 mΩ	R = measured value
Resistors	> 10 Ω to 100 Ω		$28 \cdot 10^{-6} \cdot R$ + 1.1 mΩ	
	> 100 Ω to 1 kΩ		$19 \cdot 10^{-6} \cdot R$ + 1.1 mΩ	
	> 1 kΩ to 10 kΩ		$18 \cdot 10^{-6} \cdot R$ + 12 m Ω	
	> 10 kΩ to 100 kΩ		$18 \cdot 10^{-6} \cdot R$ + 0.11 Ω	
	> 100 kΩ to 1 MΩ		$28 \cdot 10^{-6} \cdot R$ + 4.4 Ω	
	> 1 MΩ to 10 MΩ		$0.16 \cdot 10^{-3} \cdot R$ + 86 Ω	
	> 10 MΩ to 100 MΩ		$1.3 \cdot 10^{-3} \cdot R$ + 1.1 kΩ	
	> 100 MΩ to 1 GΩ		$21 \cdot 10^{-3} \cdot R$ + 6.4 kΩ	

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
AC Voltage Sources	100 mV	40 Hz to 1 kHz using AC-DC voltage transfer	$25 \cdot 10^{-6} \cdot U$	U = measured value
	1 V		$24 \cdot 10^{-6} \cdot U$	
	10 V		$25 \cdot 10^{-6} \cdot U$	
	100 V		$27 \cdot 10^{-6} \cdot U$	
	1000 V		$39 \cdot 10^{-6} \cdot U$	
AC Voltage Sources	10 mV to < 100 mV	40 Hz to 1 kHz using AC voltmeter	$77 \cdot 10^{-6} \cdot U + 18\ \mu V$	U = measured value
	100 mV to < 1 V		$0.11 \cdot 10^{-3} \cdot U + 29\ \mu V$	
	1 V to < 10 V		$96 \cdot 10^{-6} \cdot U + 0.23$ mV	
	10 V to < 100 V		$0.24 \cdot 10^{-3} \cdot U + 2.4$ mV	
	100 V to 700 V		$0.47 \cdot 10^{-3} \cdot U + 24$ mV	
AC Voltage Measuring instruments	22 mV to 220 mV	40 Hz to 1 kHz	$67 \cdot 10^{-6} \cdot U + 13\ \mu V$	U = measured value
	> 220 mV to 2.2 V		$50 \cdot 10^{-6} \cdot U + 12\ \mu V$	
	> 2.2 V to 22 V		$52 \cdot 10^{-6} \cdot U + 46\ \mu V$	
	> 22 V to 220 V		$59 \cdot 10^{-6} \cdot U + 0.56$ mV	
	> 220 V to 1000 V		$80 \cdot 10^{-6} \cdot U + 3.2$ mV	
AC Current Sources	50 mA	40 Hz to 1 kHz using AC-DC current transfer	$29 \cdot 10^{-6} \cdot I$	I = measured value
	100 mA		$26 \cdot 10^{-6} \cdot I$	
	200 mA		$35 \cdot 10^{-6} \cdot I$	
	500 mA		$26 \cdot 10^{-6} \cdot I$	
	1 A		$33 \cdot 10^{-6} \cdot I$	
	2 A		$67 \cdot 10^{-6} \cdot I$	
	3 A		$62 \cdot 10^{-6} \cdot I$	
	5 A		$61 \cdot 10^{-6} \cdot I$	
	10 A		$0.16 \cdot 10^{-3} \cdot I$	
AC Current Sources	10 mA to < 100 mA	40 Hz to 100 Hz	$0.71 \cdot 10^{-3} \cdot I + 24\ \mu A$	I = measured value
	10 mA to < 100 mA	> 100 Hz to 1 kHz	$0.37 \cdot 10^{-3} \cdot I + 24\ \mu A$	
	100 mA to 1 A	40 Hz to 100 Hz	$0.96 \cdot 10^{-3} \cdot I + 0.24$ mA	
	100 mA to 1 A	> 100 Hz to 1 kHz	$1.2 \cdot 10^{-3} \cdot I + 0.24$ mA	
AC Current Measuring instruments	> 22 mA to 220 mA	40 Hz to 1 kHz	$0.13 \cdot 10^{-3} \cdot I + 2.5\ \mu A$	I = measured value
	> 220 mA to 2.2 A		$0.27 \cdot 10^{-3} \cdot I + 34\ \mu A$	
	> 2.2 A to 5 A		$0.47 \cdot 10^{-3} \cdot I + 0.17$ mA	
	> 5 A to 11 A		$0.49 \cdot 10^{-3} \cdot I + 0.16$ mA	

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
Length				
Micrometer for external measurements	0 mm to 250 mm	VDI/ VDE/ DGQ 2618 Part 10.1	3 µm + $10 \cdot 10^{-6} \cdot l$	
Vernier caliper for external, internal and depth measurements (including digital and dial indicators)	0 mm to 400 mm > 400 mm to 500 mm	VDI/ VDE/ DGQ 2618 Part 9.1	30 µm + $30 \cdot 10^{-6} \cdot l$ 60 µm + $30 \cdot 10^{-6} \cdot l$	
Dial Gauges	0 mm to 100 mm	VDI/ VDE/ DGQ 2618 Part 11.1	6 µm + $10 \cdot 10^{-6} \cdot l$	
Gauge blocks made of steel or ceramics according to ISO 3650	0.5 mm to 100 mm	Measurement of the deviation of the central length l_c from the nominal length l_n by comparision method. Standard and gauge block under test must be of same nominal length. Standards made of ceramics. Measurement of the deviations f_o and f_u from the central length l_c by 5 point comparision method.	For the central length 0.08 µm + $0.8 \cdot 10^{-6} \cdot l$, l is the length of the gauge block. For the deviations f_o and f_u from the central length 0.05 µm.	Quality of the measuring faces according to the commitments in the Laboratory Quality Manual and the Calibration Procedure
Gauge blocks made of tungsten carbide according to ISO 3650	0.5 mm to 100 mm	Measurement of the deviation of the central length l_c from the nominal length l_n by comparision method. Standard and gauge block under test must be of same nominal length and made of the same material. Measurement of the deviations f_o and f_u from the central length l_c by 5 point comparision method.	For the central length 0.08 µm + $0.5 \cdot 10^{-6} \cdot l$, l is the length of the gauge block. For the deviations f_o and f_u from the central length 0.05 µm.	Quality of the measuring faces according to the commitments in the Laboratory Quality Manual and the Calibration Procedure

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
Conventional Mass	1 mg, 2 mg, 5 mg		0.003 mg	OIML recommendation R 111, class E_2
	10 mg, 20 mg		0.003 mg	
	50 mg		0.004 mg	
	100 mg		0.005 mg	
	200 mg		0.006 mg	
	500 mg		0.008 mg	
	1 g		0.010 mg	
	2 g		0.012 mg	
	5 g		0.016 mg	
	10 g		0.020 mg	
	20 g		0.025 mg	
	50 g		0.030 mg	
	100 g		0.05 mg	
	200 g		0.10 mg	
	500 g		0.25 mg	
	1 kg		0.5 mg	
	2 kg		1 mg	
	5 kg		2.5 mg	
	10 kg		5 mg	
	20 kg		30 mg	OIML recommendation R 111, class F_1
	50 kg		80 mg	
Conventional Mass	1 mg to 100 mg		0.005 mg	For free nominal values
	> 100 mg to 200 mg		0.006 mg	
	> 200 mg to 500 mg		0.008 mg	m_c = conventional mass
	> 500 mg to 1 g		0.010 mg	
	>1 g to 2 g		0.012 mg	
	> 2 g to 5 g		0.015 mg	
	> 5 g to 10 g		0.020 mg	
	> 10 g to 20 g		0.025 mg	
	> 20 g to 50 g		0.030 mg	
	> 50 g to 100 g		0.05 mg	
	> 100 g to 10 kg		$5 \cdot 10^{-7} \cdot m_c$	
	> 10 kg to 50 kg		$16 \cdot 10^{-6} \cdot m_c$	

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Annex to the accreditation certificate D-K-15025-01-00

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
Temperature				
Standard platinum resistance thermometers	0.01 °C		8 mK	Calibration at fix point temperatures of ITS-90
	29.7646 °C		10 mK	
	156.5985 °C		10 mK	
	231.928 °C		10 mK	
	419.527 °C		15 mK	
	660.323 °C		20 mK	
	961.78 °C		50 mK	
Resistance thermometers, direct-reading thermometers and data loggers	–65 °C to –40 °C	Ethanol bath	50 mK	Comparison with standard platinum resistance thermometer
	> –40 °C to 0 °C	Ethanol bath	20 mK	
	> 0 °C to 95 °C	Water bath	20 mK	
	> 95 °C to 250 °C	Oil bath	30 mK	
	200 °C to 500 °C	Salt bath	50 mK	
	0 °C to 70 °C	Climatic chamber	0.5 K	
Liquid in glass thermometers	–40 °C to 0 °C	Ethanol bath	30 mK	Comparison with standard platinum resistance thermometer
	> 0 °C to 95 °C	Water bath	30 mK	
	> 95 °C to 250 °C	Oil bath	35 mK	
	200 °C to 500 °C	Salt bath	100 mK	
Noble metal thermocouples	231.928 °C		0.6 K	Calibration at fixed point temperatures of ITS-90
	419.527 °C		0.7 K	
	660.323 °C		0.8 K	
	961.78 °C		1.0 K	Calibration at fixed point temperatures
	1084.62 °C		1.2 K	
	–65 °C to 0 °C	Ethanol bath	0.5 K	Comparison with standard platinum resistance thermometer
	> 0 °C to 95 °C	Water bath	0.2 K	
	> 95 °C to 250 °C	Oil bath	0.7 K	
	200 °C to 500 °C	Salt bath / Furnace	0.8 K	Comparison with noble metal thermocouple
	> 500 °C to 1100 °C	Furnace	1.5 K	
Base metal thermocouples	0 °C to 400 °C	Furnace	0.8 K	Comparison method
	> 400°C to 1100 °C	Furnace	2.0 K	
Humidity	10 % to 20 %	0°C to 70°C	0.28 % RH	Reference is dew point mirror
Hygrometers / Humidity Sensors, Humidity Indicators	> 20 % to 30 %	JNMISMP56	0.37 % RH	Uncertainty is an Absolute Value of Relative Humidity
	> 30 % to 50 %		0.67 % RH	
	> 50 % to 75 %		0.90 % RH	
	> 75 % to 90 %		1.00 % RH	
	> 90 % to 95 %		1.18 % RH	
	10 % to 20 %	0°C to 70°C JNMISMP57	0.50 % RH	Reference is capacitive sensor
	> 20 % to 30 %		0.66 % RH	Uncertainty is an Absolute Value of Relative Humidity
	> 30 % to 50 %		1.2 % RH	
	> 50 % to 75 %		1.6 % RH	
	> 75 % to 90 %		1.8 % RH	
	> 90 % to 95 %		2.2 % RH	

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
Pressure				
Absolute pressure p_{abs}	0,1 bar to 3,5 bar > 3,5 bar to 35 bar > 35 bar to 201 bar	DAkkS-DKD R 6-1 EURAMET/cg-17/v.01	$4{,}6 \cdot 10^{-5} \cdot p_{abs}$ but not less than 12 µbar $4{,}6 \cdot 10^{-5} \cdot p_{abs}$ $7{,}5 \cdot 10^{-5} \cdot p_{abs}$	Pressure medium: Gas The uncertainty of the residual pressure has to be taken into account. in connection with a gas/ oil volume Principle of measurement: $p_{abs} = p_e + p_{amb}$. The uncertainty of the measured atmospheric pressure has to be taken into account.
Absolute pressure p_{abs}	0,8 bar; 20,8 bar to 700,8 bar	DAkkS-DKD R 6-1 EURAMET/cg-17/v.01	$7{,}5 \cdot 10^{-5} \cdot p_{abs}$ but not less than 4,8 mbar	Pressure medium: Oil Principle of measurement: $p_{abs} = p_e + p_{amb}$. The uncertainty of the measured atmospheric pressure has to be taken into account.
Gauge pressure p_e	–0,7 bar to 0 bar > 0 bar to 0,1 bar > 0,1 bar to 3,5 bar > 3,5 bar to > 35 bar > 35 bar to 200 bar	DAkkS-DKD R 6-1 EURAMET/cg-17/v.01	0,12 mbar 0,80 mbar $4{,}6 \cdot 10^{-5} \cdot p_e$ but not less than 12 µbar $4{,}6 \cdot 10^{-5} \cdot p_e$ $7{,}5 \cdot 10^{-5} \cdot p_e$	Pressure medium: Gas in connection with a gas/ oil volume
Gauge pressure p_e	20 bar to 700 bar	DAkkS-DKD R 6-1 EURAMET/cg-17/v.01	$7{,}5 \cdot 10^{-5} \cdot p_e$ but not less than 4,8 mbar	Pressure medium: Oil

On-site calibration

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability [1)]	Remarks
Balances	up to 470 kg	EURAMET/cg-18/v.02 Calibration at place of installation and at other places	$3 \cdot 10^{-6}$	
Pressure Gauge pressure p_e	–0,7 bar to 0,7 bar > 0,7 bar to 20 bar > 20 bar to 200 bar	DAkkS-DKD R 6-1 EURAMET/cg-17/v.01	0,12 mbar 0,80 mbar 21 mbar	Pressure medium: Gas
Gauge pressure p_e	0 bar to 700 bar	DAkkS-DKD R 6-1 EURAMET/cg-17/v.01	21 mbar	Pressure medium: Oil

Abbreviations used:

DAkkS-DKD-R 6-1 Guideline on „Calibration of Pressure Gauges"

EURAMET/cg-xx Calibration Guideline from "European Association of National Metrology Institutes"

[1)] The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.