- **C**alibration of instruments for radiation measurements
- **M**easurement of radiation from UV to IR
- **S**oftware for special requirements

The Austrian
Calibration **M**easurement **S**oftware Company

DLS-J1016

DEUTERIUM LAMP STANDARD
OPERATION MANUAL

Precision is our business

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CMS Ing. Dr. Schreder GmbH J1016

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TECHNICAL SPECIFICATIONS

Warranty

For warranty terms and conditions, contact CMS or your distributor for further details.

CMS guarantees that the product delivered to customer has been verified, checked and tested to ensure that the product meets the appropriate specifications. The product warranty is valid only if the product has been installed and used according to the directives provided in this instruction manual.
CMS shall in no event be liable for incidental or consequential damages arising from the faulty and incorrect use of the product.
In case of any manufacturing defect, the product will be repaired or replaced under warranty. However, the warranty does not apply if:

- Any modification or repair was done by any person or organization other than CMS service personnel.
- The damage or defect is caused by not respecting the instructions of use as given on the product brochure or the instruction manual.

Contact Information

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* On request

SAVETY INFORMATION

This product is designed and manufactured under the consideration of the safety precautions. Please make sure to read and understand this instruction manual thoroughly in order to be able to operate the instrument safely and in the correct manner.

Warning /Caution

Setup

- The installation base should have enough load capacity for the instrument to be mounted. Fix the system securely to the base with bolts and nuts. Otherwise, the instrument may drop which may lead to unexpected accidents.
- Make sure the instrument and the cables are installed in a location where they will not get soaked.

Lamp

- Be careful with lamps when handling instruments. Strong impact to this part may damage the glass and may cause injuries by broken glass parts.

Voltage Warning

Power Supply

- Make sure to check the power supply voltage and type (AC/DC) before connecting the device to the power supply. Connecting the device to other power supplies than specified will lead to damage and accidents.

GENERAL DESCRIPTION

This manual has been written to outline the Deuterium Lamp Standard DLS-J1016. There are instructions for use of the hardware and the installation.

The Deuterium Lamp System DLS-J1016-03 is a newly developed transfer standard for spectral irradiance in the UV wavelength range from 200 nm to 350 nm. It is based on a design by the Physikalisch-Technische Bundesanstalt (PTB), Germany. The deuterium lamp mounted in a housing (DLS-J1016-LAMP) is protected to reach stable and highly reproducible operating conditions. The deuterium lamp power supply DLS-J1016-POWER guarantees an optimum lamp operation. The alignment jig DLS-J1016-JIG allows an easy alignment of the system. The optional external SiC-monitor detector DLS-J1016-MON can be flanged to the lamp housing before and after spectral measurements to monitor the lamp drift.

A complete Deuterium Lamp System DLS-J1016-03 consists of three housed lamps DLS-J1016-LAMP incl. DLS-J1006-JIG, the power supply DLS-J1016-POWER and the monitor detector DLS-J1016-MON (with its own power supply unit). All components are available separately. A spectral irradiance calibration is available on demand.

A scientific description is published in:
'Metrologia 40 (2003) S111-S114. Characterization of deuterium lamps as transfer standards of spectral irradiance. Sperfeld P., Stock K. D., Raatz K.-H., Nawo B., Metzdorf J.'

P. Sperfeld, *Final Report on CCPR K1-b: Spectral irradiance from 200 nm to 350 nm*, Metrologia, 45, Techn. Suppl., 02002 (2008).
http://www.bipm.org/utils/common/pdf/final_reports/PR/K1/CCPR-K1.b.pdf

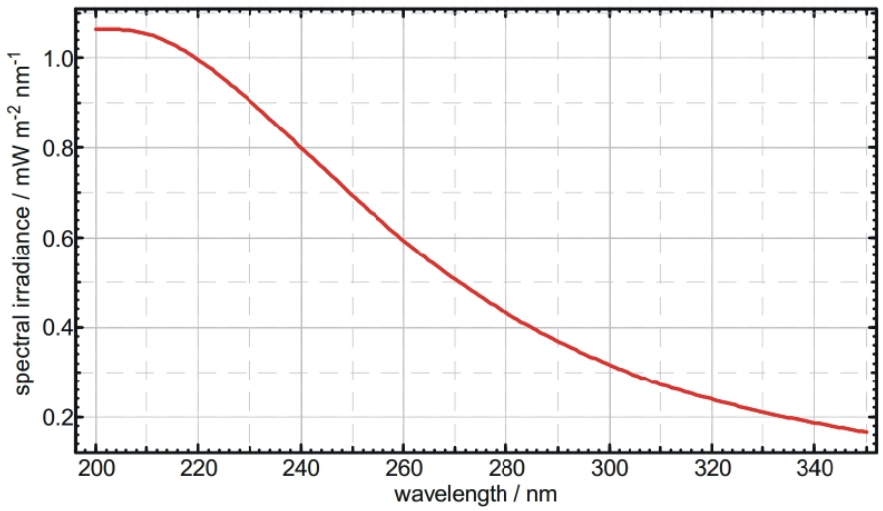

Figure 1 Typical irradiance of a DLS lamp

DESCRIPTION

Power supply DLS-J1016-POWER

The **Pre Heating** voltage if the power supply DLS-J1016-POWER should be set to **10V**. Do not change the setting for the aligned lamp.

The deuterium lamp power supply used is a DLS-.J1016-POWER type especially designed for the 30 W deuterium lamp type. The nominal output current after the lamp ignition is (300 ± 3) mA. The relative reproducibility and stability of the power supplies have been found to be better than 10^{-4} under normal laboratory conditions. Each power supply has its own assigned operating current which is independent of the lamp operated. However, each lamp is equipped with its own resistor to measure the lamp current. The corresponding current values for each lamp-power-supply combination are given in the accompanying technical documents. Each power supply also includes a (pre-) heater for the deuterium lamp cathode. A pre-heating time of 20 s and a heating value of 10 V for pre-heating and 6 V for heating under operation has to be selected. A power supply should only be used with the set of lamps that is assigned to it by the system notation. The power supplies can be set to 115 V, where necessary.

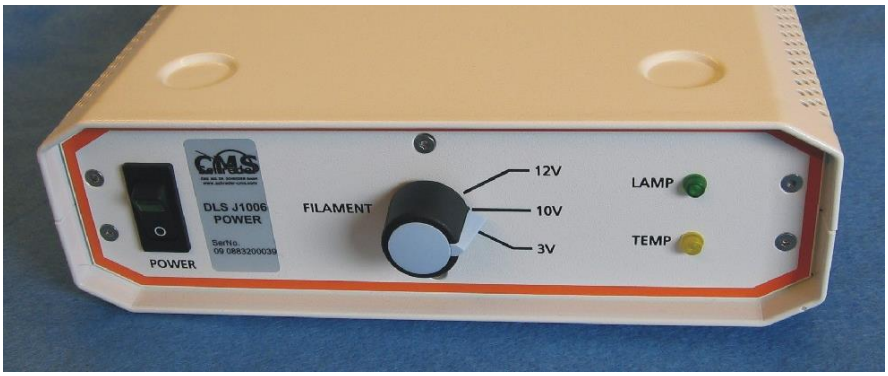

Figure 2 The settings for preheating level (10V) have to be set as shown on the picture

Lamps DLS-J1016-SPARELAMP

The deuterium lamp has been thoroughly investigated by PTB and an optimum selection, characterisation and operational procedure have been determined. Each lamp is operated at a current of (300.0 ± 3) mA. The lamps are working at a nominal DC voltage of 72 - 80 volts and are operated in constant current mode. Each lamp is assigned to its own special power supply and must only be operated with this power supply and must be aligned using its jig.
The lamps must be allowed to warm up at least 45 min before starting spectral measurements.

Lamp housing DLS-J1016

Figure 3 Lamp Housing. In use from year 2007 to 2021.

Figure 4 Lamp Housing in use since year 2022. Justage unit with 2 axis. X-X, Z-Z

Each deuterium lamp is set up in its own housing, which protects the lamps from environmental conditions. The housing together with the alignment jig is defining the optical measurement axis which is perpendicular to the centre of the jig marked with a target. The base plate of the housing allows it be placed on a table or to be mounted on a measurement system.
Each lamp has its own alignment jig with a glass window and a target in its centre. The jig has to be connected to the lamp housing in that way that the sign on it shows upwards. It is necessary to remove it for spectral calibrations. The front of the jig below the glass target is used as the reference plane for the distance measurement

Figure 5 The alignment jig in front of the lamp. Each jig is assigned to one lamp and has to be connected so that the sign on it shows upwards. The reference point for distance measurements is below the window.

Lamp holder:

The lamp housing can directly be placed on an optical table. To allow the lamp system to be mounted on a mechanical alignment facility, an adapter has been delivered with the system.

Figure 6 Holder for the lamp system

Lamp pre-alignment:

The lamp mounting inside the lamp housing allows the lamp to be aligned to the optical measurement axis which is defined by the housing and the jig. The operating Lamp has been aligned so that its UV-irradiance is at its maximum on the optical axis. Therefore, the irradiance distribution of the lamp at a distance of 300 mm from the front jig has been measured using a SiC photodiode. The lamp has been turned and tilted until the centre of the irradiance distribution is on the optical axis. The centre of the UV irradiance is dependent on the electrode ignition. It is shown that its position is reproducible even after several re-ignitions of the lamps. But it may not be coinciding to the distribution of the visible light. Therefore, it is possible that the visible light spot is not centred to the optical axis. This should be ignored. The lamp pre-alignment must not be changed and the accompanying screws are secured (!) to avoid accidental misalignment during transportation or use of the lamp systems

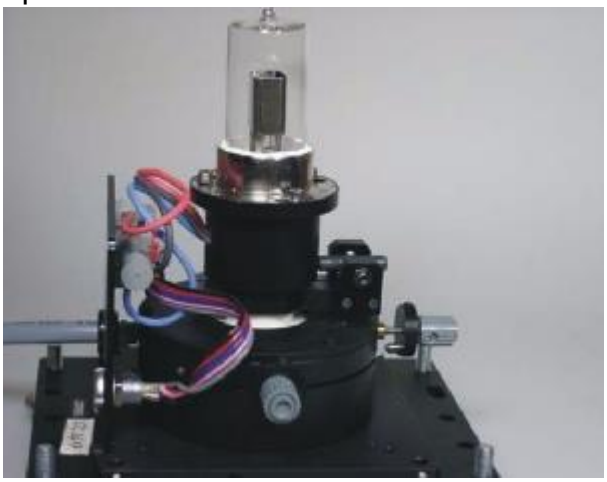

Figure 7 Lamp pre-alignment

Measuring connector Lamp housing DLS-J1016

The lamps are equipped with a connector to measure the electrical parameters of the lamps. The pin occupancy of the connector is shown on the back of each lamp housing. The lamp current is determined measuring the voltage drop over a 1 Ω resistor inside each lamp. The lamp voltage and the voltage of the heater are measured to monitor sudden changes of the lamps. The ignition voltage pulse of the lamps can be up to 600 V so that the measuring instruments should be capable to stand such voltage pulses.

The heating voltage, lamp voltage and lamp current may be monitored. (Lemo socket: ECP.1S.305.CLN). A cable with Lemo plug (FFA.1S.305.CLL65) is supplied for easy handling. The lamp current is monitored as voltage by the help of a high precise resistor (Burster, typ 1178-5001, 1 Ω, ±0.1%).

DLS-J1016

30 W deuterium lamp, J60
to be aligned with DLS J1006-JIG
to operate with DLS J1016-POWER
monitored with DLS-J1016-MON

Lemo connectsor configuration

	+	-	
heater voltage:	3	2	(~6V)
lamp voltage:	1	3	(<600V)
lamp current:	4	5	(~300mV @ 1Ω)

Cable colour:
Art.No.: 101613
1 … **red**
2 … **blue**
3 … **black**
4 … **pink**
5 … grey

Cable colour:
Art.No.: 101613
1 … white (‘U_L’)
2 … **brown (‘U_H’)**
3 … **green (‘⏚’)**
4 … **yellow (‘I_L⏚’)**
5 … grey (‘I_L+’)

Monitor detector DLS-J1016-MON

Each set of lamp systems comes with a monitor detector equipped with a SiC photodiode. This detector can be connected to the front of the lamp housing before and after each spectral measurement to monitor the drift of the lamps during calibration. A power supply for each detector is also part of the equipment. The photocurrentequivalent voltage (< 0,2 V) can be measured at a LEMOSA connector

MON:

Monitoring of the lamp signal.
Lemo socket ECP.1S.302.CLN
Lemo plug FFA.1S.302.CLLC62

Cable colour:
Art.No.: 101612
1 … **white ('+')**
2 … **brown**

PT100:

Monitoring of the detector temperature.
Lemo socket: ECP.1S.304.CLN
Lemo plug: FFA.1S.304.CLLC64
Connection: Pin 1&2, Pin 3 & 4

Cable colour:
Art.No.: 101613
1 … **white**
2 … **brown**
3 … **green**
4 … **yellow**

Power supply:

5V DC;
2,5 x 5,5 mm DC connector
Ripple: <100mV

Lamp characterisation:

The initial ageing of the lamps will take about 100 h at minimum. The characteristic drift of each lamp could be used to correct for changes during the calibration process (usually not necessary).

ALL PARTS

CMS Schreder
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DLS- J1016

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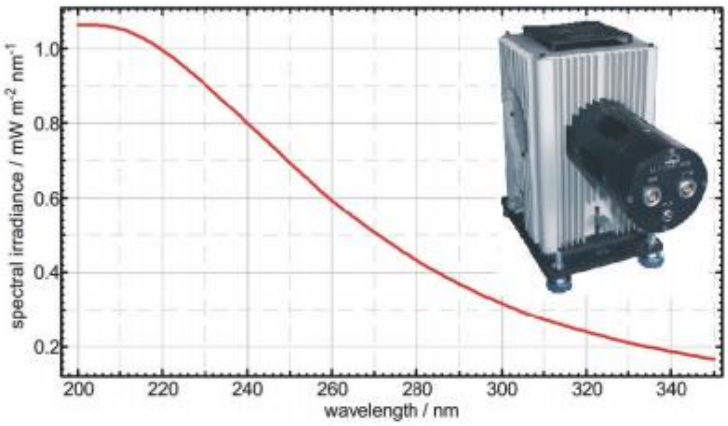

APPLICATION

The Deuterium Lamp System DLS-J1016 is a newly developed transfer standard for spectral irradiance in the UV wavelength range from 200 nm to 350 nm. It is based on a design by the Physikalisch-Technische Bundesanstalt (PTB), Germany. The deuterium lamp mounted in a housing (DLS-J1016-LAMP) is protected to reach stable and highly reproducible operating conditions. The alignment jig DLS-J1016-JIG allows an easy alignment of the system. The deuterium lamp power supply DLS-J1016-POWER guarantees an optimum lamp operation. The optional external SiC-monitor detector DLS-J1016-MON can be flanged to the lamp housing before and after spectral measurements to monitor the lamp drift.
A complete Deuterium Lamp System DLS-J1016 consists of up to three housed lamps DLS-J1016-LAMP incl. DLS-J1016-JIG, the power supply DLS-J1016-POWER and the monitor detector DLS-J1016-MON. All components are available separately. A spectral irradiance calibration is available on demand.
A scientific description is published in 'Metrologia 40 (2003) S111-S114. Characterization of deuterium lamps as transfer standards of spectral irradiance. Sperfeld P., Stock K. D., Raatz K.-H., Nawo B., Metzdorf J.'

SPECIFICATION

The system is planed to be available in a small series.

DLS-J1016-LAMP:	30W deuterium lamp mounted and aligned in a housing with removable alignment-jig. Built-in resistor and connectors to measure lamp current and lamp voltage. Connection cable to the power-supply with plug.
DLS-J1016-MON:	Hybrid SiC photodiode in a housing that can be flanged to the lamp opening. Connectors for power and photo signal. Comes with power-adapter.
DLS-J1016-POWER:	Power supply for 30W deuterium lamps with plug socket for the deuterium lamp.
DLS-J1016-01:	Deuterium Lamp System consisting of one DLS-J1016-LAMP incl. DLS-J1016-JIG,one DLS-J1016-MON and one DLS-J1016-POWER.
DLS-J1016-03:	Full Deuterium Lamp System consisting of three DLS-J1016-LAMP incl. DLS-J1006-JIG, one DLS-J1016-MON and one DLS-J1016-POWER.
Available:	DLS-J1016-POWER

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DLS- J1016-POWER

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APPLICATION

The deuterium lamp power supply DLS-J1016-POWER guarantees an optimum lamp operation for the deuterium lamp transfer standard DLS-J1016.

SPECIFICATION

Mains voltage:	100 V...240 V ac (±1%); 50…60 Hz
Power consumption:	max. 100 VA
Anode current:	300 mA (±1%)
Stability (over 8 h)	≤0.01%
Pre heating voltage	(adjustable) 3 / 10 / 12 V
Pre heating time	about 15 sec

Physical data

Weight	2.0 kg
Size	220 mm x 75 mm x 235

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DLS- J1016-JIG

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APPLICATION

The deuterium lamp jig DLS-J1016-JIG allows an easy alignment of the deuterium lamp transfer standard DLS-J1016.

Physical data

Weiht	0.2 kg
Diamater	69 mm

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