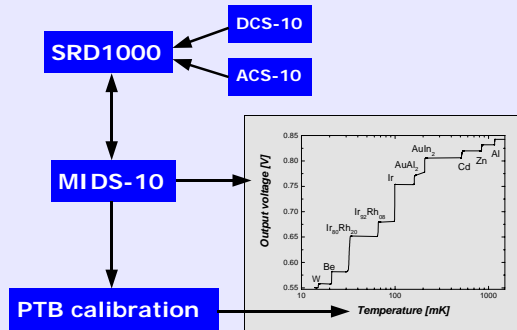


**SRD1000 system** supports precision thermometry on the PLTS-2000

The SRD1000 system comprises a cryogenic sensor (SRD1000) and a mutual inductance detection system (MIDS-10) to establish 10 accurate reference points for thermometry between about 10 mK and 1.2 K.

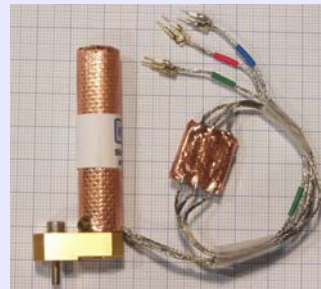
Each system is provided with a *calibration certificate* from PTB stating the calibration parameters of the reference points.

A degauss tool (DCS-10) and current source (ACS-10) are included to establish low magnetic field conditions in the sensor, essential for an accurate reproduction of the calibration points.



**SRD1000 cryogenic sensor**

- compact sensor that provides 10 reference points for thermometry between about 10 mK and 1.2 K
- superconducting to normal transitions of samples of various materials produce stable reference points
- includes a combined Cryoperm / niobium shielding and a magnetic coil to reduce ambient magnetic fields



SRD-1000

**MIDS-10 mutual inductance detection system**

- detection electronics to establish the temperature reference points of the SRD1000 sensor
- 'plug and play'; no adjustments are required for the entire range of the SRD1000 sensor
- system output voltage: 0 - 1000 mV<sub>DC</sub> proportional to the SRD1000 sensor signal
- system temperature coefficient < 50 ppm / °C



MIDS-10

**PTB calibration**

Each set of SRD1000 sensor and MIDS-10 electronics is supplied with a calibration certificate from PTB in Berlin.

PTB (the Physikalisch-Technische Bundesanstalt) is the national metrology institute of Germany providing scientific and technical services. PTB measures with the highest accuracy and reliability - metrology as the core competence (website: [www.ptb.de](http://www.ptb.de)).



PTB Berlin

### DCS-10 degauss tool

- tool for degaussing the Cryoperm shielding of the SRD1000 sensor to optimise its magnetic properties
- supply unit provides a current of 1.7 A, 50 / 60 Hz to drive the degauss coil



DCS-10

### ACS-10 current source

- battery powered precision current source for compensating residual magnetic fields in the SRD1000 cryogenic sensor
- output current adjustable between 0 - 2000  $\mu$ A with 10-turn potentiometer and polarity selection



ACS-10

### Characteristics SRD1000 reference points

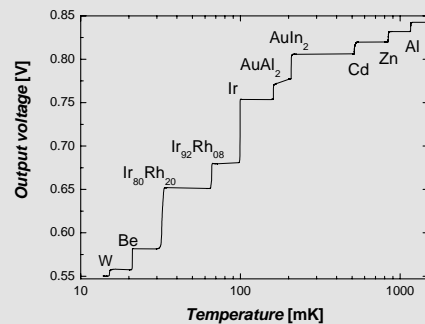
SRD1000 reference points with typical values of

$T_c$  = transition temperature

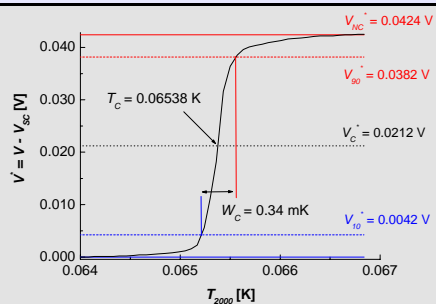
$W_c$  = transition width (temperature interval in which the signal of the transition changes by 80%)

$U_c$  = estimate of the uncertainty in determining  $T_c$  related to the transition characteristics

#	material	$T_c$ [mK]	$W_c$ [mK]	$U_c$ [mK]
1	W	15	< 0.2	< 0.04
2	Be	21	< 0.3	< 0.06
3	Ir <sub>80</sub> Rh <sub>20</sub>	30	< 0.5	< 0.1
4	Ir <sub>92</sub> Rh <sub>08</sub>	65	< 0.5	< 0.1
5	Ir	98	< 0.5	< 0.1
6	AuAl <sub>2</sub>	145	< 0.5	< 0.1
7	AuIn <sub>2</sub>	208	< 1	< 0.2
8	Cd	520	< 3	< 0.6
9	Zn	850	< 3	< 0.6
10	Al	1180	< 4	< 0.8



Output voltage MIDS-10 electronics versus SRD1000 sensor temperature showing 10 superconductive transitions at the reference points



Example: superconductive transition of Ir<sub>92</sub>Rh<sub>08</sub> with calibration parameters to establish a reference point on the PLTS-2000 at 65.4 mK

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