supracon
SQUID and Microfabrication Technologies

Certificate

Sensor serial number: S0039
Sensor type: Current sensor SQUID
Model: CP2S blue

Test report number: 4SO/1973 - 12/24
Date: 27.06.2013
Signature:

	Parameter	Value	Unit
4.2K (open input coil)	critical current I_c	22	µA
	SQUID resistance R_n	2,17	Ω
	voltage swing ΔV	25	µV
	flux feedback coupling ΔI_{MOD}	10,5	µA
	current feedback coupling ΔI_{FB}	4,2	µA
	input coupling ΔI_{EK}	0,195	µA
	equivalent flux noise	5,6	$\mu\phi_0/Hz^{1/2}$
	switch resistance @ 5mA	35	Ω
300K (room temperature)	input coil	52,7	kΩ
	flux feedback coil	1,92	kΩ
	current feedback coil	48	kΩ
	SQUID	110	Ω
	heater SQUID	210	Ω
	heater switch	210	Ω

This sensor has been fabricated and tested according to a quality managment system ISO 9001:2008

TÜV International Certification TÜV THÜRINGEN CERT ISO 9001:2008 15 100 21272 TIC

SQUID Current Sensors Model CPxS blue with thermal switch

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Description

The Model **CPxS blue** is a low-T_C dc SQUID designed as a current sensor. It provides a very low current noise referred to the input of the sensor. Model **CPxS blue** is suited for various types of magnetometers and gradiometers with niobium wire wound pickup coils (*e.g.* for biomagnetism or low field NMR) or other systems where a superconducting current is to be measured. The Model **CPxS blue** allows also a controllable disconnection of the superconducting input loop if necessary.

The Model **CPxS blue** has integrated input coil, coil for flux modulation in SQUID, feedback coil for compensation of the superconducting input current, and heater integrated on the chip. An encapsulated thermal switch controlled with a heater allows introducing a resistance of about 30 Ohm in the input circuit. Both heaters are connected to the same terminals so that the current up to 8 mA activates only the thermal switch. Thereby the SQUID remains operable. The current larger than 30 mA activates both heaters simultaneously allowing expelling of frozen flux in the SQUID. For mechanical protection and easy handling the SQUID Model **CPxS blue** is placed inside a glass fiber package. Two Nb terminals with screws are available with superconducting wire bond connections to the input coil. The advanced SQUID package may be used directly immersed in liquid helium or in the vacuum.

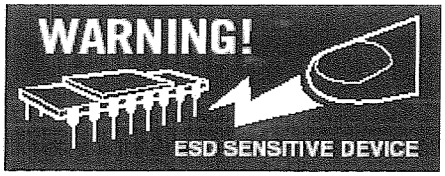
The installation of the SQUID Model **CPxS blue** is very simple because of the lack of any cooled matching circuitry if using our standard flux locked loop electronics model **Jessy**. The SQUID can be used also with other compatible feedback electronics.

Features

- Fabricated using the robust all-refractory Nb/Al-AlO_X/Nb technology.
- Input coil with inductance in the range of 50nH to 1.1 µH integrated on chip.
- Modulation coil for flux modulation in the SQUID.
- Feedback coil for compensation of the superconducting input current .
- Integrated on chip heater to expel frozen flux.
- Fast thermal switch with normal resistance of about 30 Ohm in series with input coil (switching time <5µs) incorporated in the pakadge
- Low current noise (better 1.5 $pA/Hz^{1/2}$)

Precautions for handling

SQUID should never subjected to the current larger than 0.1 mA at room temperature. Check the measurement current from an Ohmmeter before connecting to the SQUID. Do not use the Ohmmeter with automatic range selection.



SQUID is ESD (electrostatic discharge) sensitive device.
A permanent damage may occur on devices subjected to high-energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

Overheating during soldering may result in drastic change of the SQUID characteristics or loss of functionality. Recommended soldering time is not more than 2 sec (soldering temperature <300°C) with interval at least 10 sec between soldering

Supracon AG, An der Lehmgrube 11, D-07751 Jena, Germany
Phone: +49-3641-2328100 • FAX: +49-3641-2328109 • info@supracon.com

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Main technical parameters

Model	SQUID inductance at open input coil (pH)	Input coil inductance (nH)	Input coil – SQUID mutual inductance (nH)	Current FB mutual inductance (nH)
CP1 blue	400	1850	27	21
CP2 blue	270	460	10.5	21
Cp3 blue	150	230	5.1	10
Cp4 blue	110	160	3.5	7.0
Cp5 blue	110	80	2.5	5.0
Cp6 blue	110	50	2.1	4.2

For all models	Value
Working temperature	≤ 5 K
Flux modulation coil – to – SQUID mutual inductance	200 pH
Flux modulation coupling *	10… 12 $\mu A/\Phi_0$
Resistance of the thermal switch when active *	30…40 Ohm
Heater current to activate thermal switch	4…6 mA
Heater current to expel a frozen flux	50…100 mA

* exact value will be given for every particular SQUID in certificate.

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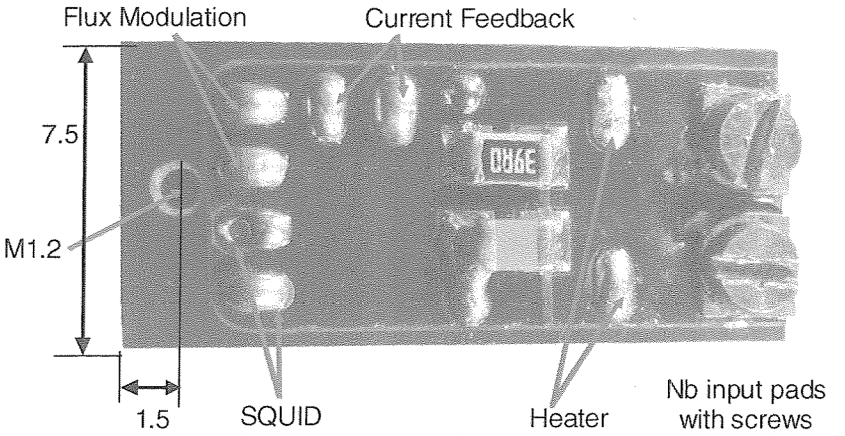
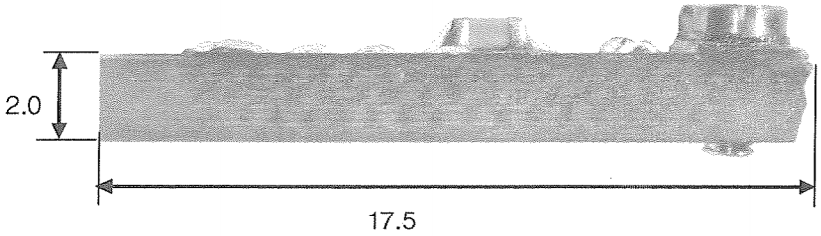
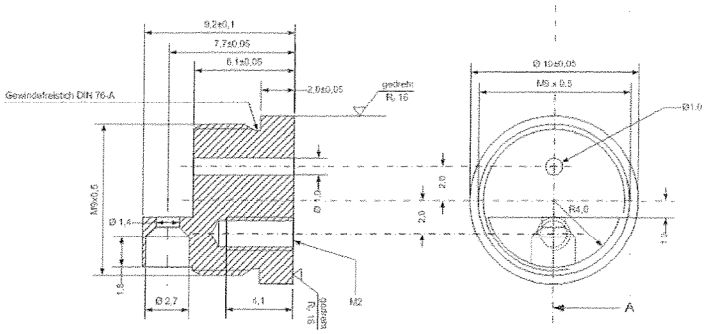
Advanced SQUID package



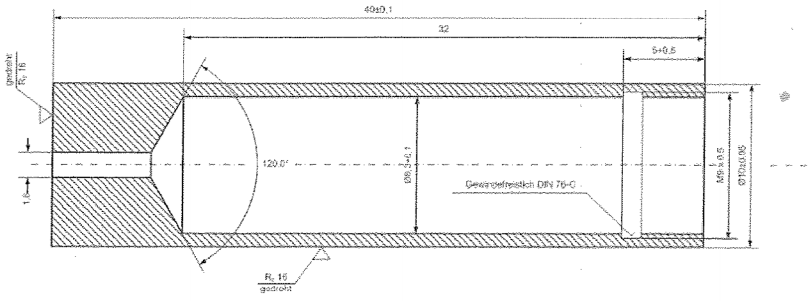
Top view



Side view



Niobium cap



Niobium cylinder

All dimensions in mm

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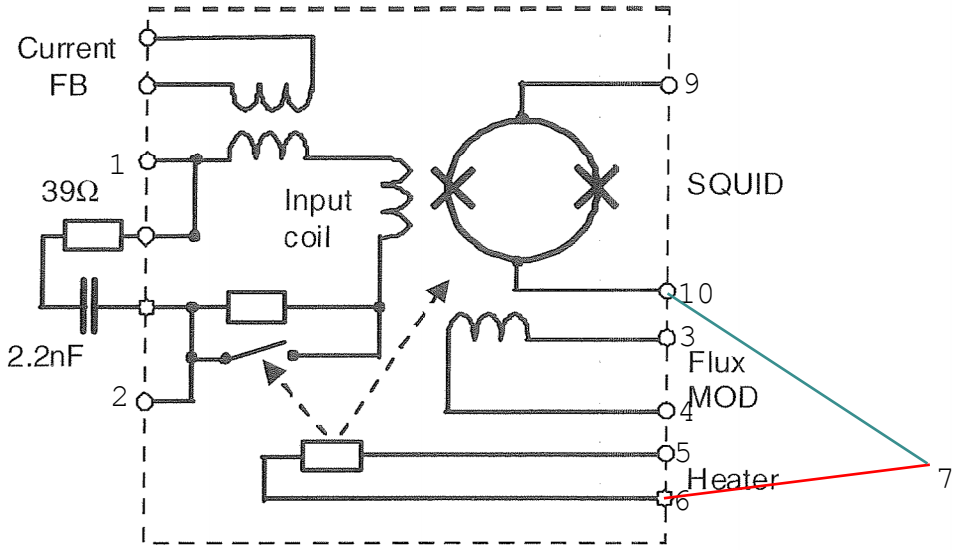
The circuit diagram of the SQUID with encapsulated thermal switch



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