

**DESCRIPTION**

The "S"-Series low- $T_c$  dc SQUIDs from STAR Cryoelectronics are available with input inductances ranging from 100 nH to 2.6  $\mu$ H. Two feedback modes are supported: the modulation and feedback signals may be combined and connected to a coil that is transformer-coupled to the SQUID inductance for conventional flux-lock operation, or the feedback may be separately connected to a coil that is transformer-coupled to the SQUID input circuit for input current-lock operation (requires a superconducting load, *e.g.*, a pickup loop made using superconducting wire). In this latter mode, the feedback signal opposes any change of the current in the pickup loop and SQUID input circuit. This feedback technique offers the advantage that the superconducting pickup loop does not introduce any distortion of the ambient magnetic field. This is particularly important where precise magnetic field measurements are required (*e.g.*, applications in biomagnetism).

Eight contact pads are available for normal-metal wire bond connections to the SQUID chip: one pair for current bias/voltage out, one pair for the modulation/feedback coil, one pair for the input circuit feedback coil, and one pair for an integrated thin-film heater resistor that can be used to efficiently de-flux the SQUID if necessary. Two large pads are available for superconducting wire bond connections to the SQUID input. The SQUID is available encapsulated in a miniature package with solder terminals or together with a removable niobium shield and multi-pin connector to simplify installation. Mating cryocables with braided or solid stainless steel shielding are available. The SQUID package is compatible with operation in liquid cryogen or vacuum.

The "S"-Series dc SQUIDs are simple to operate using pcSQUID™, STAR Cryoelectronics' advanced PC-based closed-loop feedback and readout electronics. The SQUID may be operated using standard two-transformer coupling, or, using the single-transformer option in the feedback loop electronics, the SQUID may be operated without any cooled matching circuitry. This greatly simplifies installation for many applications. Alternately, the smooth dc characteristics of the SQUID ensure easy operation using any compatible feedback electronics.

**FEATURES**

- Small 2 mm × 3 mm (nom.) chip size.
- Compatibility with a wide range of load inductances.
- Feedback may be coupled to the input circuit to enable input current-lock operation using standard closed-loop feedback electronics (desirable for magnetic field measurements using superconducting pickup coils).
- Cooled matching circuitry is not required using pcSQUID™ electronics.
- May be operated with as few as four wires (plus two for heater) using pcSQUID™.
- Fabricated using a robust and reliable Nb/Al-AIO<sub>x</sub>/Nb trilayer Josephson junction technology.

### Available Models

Seven SQUID models are currently in production, typical specifications are summarized in the table below. For package specifications and information on available cryocables please contact STAR Cryoelectronics.

### Specifications (typical, with matched load attached)

	SQ100	SQ180	SQ300	SQ600S	SQ680	SQ1200	SQ2600	Unit
Screened SQUID Inductance $L_{dc}$	39	183	91	102	134	110	102	pH
Input Inductance $L_i$	112	188	307	651	723	1162	2585	nH
Maximum Recommended Load Inductance	-	200	300	-	700	1200	-	nH
Input Coupling $1/M_i$	0.93	0.35	0.44	0.20	0.20	0.13	0.10	$\mu A/\Phi_0$
Feedback Coupling:								
Current-Lock	47	49.5	41	50.5	44	45	50	$\mu A/\Phi_0$
Flux-Lock	28.4	12.4	7.4	10.4	7	8.5	10.4	$\mu A/\Phi_0$
Energy Resolution $\epsilon_c$	3.9	1	2.3	1.1	1.9	1.6	1.1	$\times 10^{-31}$ J/Hz
Flux Noise $S_\Phi^{1/2}$	3	3	3	3	4	4		$\mu\Phi_0/\text{Hz}^{1/2}$
Input Current Noise $S_I^{1/2}$	2.8	1	1.3	0.6	0.8	0.5	0.3	$\text{pA}/\text{Hz}^{1/2}$

Specifications are subject to change without prior notice.

### Also Available from STAR Cryoelectronics:

LTS series SQUID array amplifiers and integrated two-stage amplifiers

LTS low inductance input SQUIDs for TES detector readout

LTS integrated dc SQUID magnetometers with nom. 3 fT/Hz<sup>1/2</sup> rms field noise

LTS miniature integrated dc SQUID magnetometers with 0.5 mm OD pickup loops

LTS vector magnetometers

LTS axial and long-baseline planar gradiometers

LTS series Josephson junction arrays and Q-Spoiler SQUID arrays

LTS miniature dc SQUID susceptometers