High-performance low-noise dc SQUID sensors

- Integrated two-stage current sensors, single-stage current sensors, series SQUID arrays, and magnetometers
- Input inductances from 1 nH to 1.8 µH
- Robust and easy-to-use
- Low noise and high dynamic performance
- Additional optimized versions for ultra-low temperatures << 4 K
- Built-in heating capability
- Available as bare chips or in sophisticated package
- SQUID products developed in collaboration with PTB Berlin
# Technical Data

## General
- Chip size: 3 x 3 x 0.38 mm³
- Cooling field up to: 60 µT
- Built-in heating feature for de-fluxing
- Integrated rf filters
- Convenient operation with Magnicon SQUID electronics

## Single-stage current sensors
- Low-noise SQUID sensor for almost all applications
- Additional positive feedback (APF) for direct readout
- Sensors without APF also available
- R-C shunt across input coil
- Optional current limiter (Q-spoiler) in series to input coil
- Optional feedback transformer in series to input coil
- Six input inductances available: 24 nH to 1.8 µH
- Input sensitivity: 2.2 µA/Φ₀ to 0.225 µA/Φ₀
- Typical flux noise @ 4 K: 1.2 µΦ₀/√Hz
- Typical energy resolution @ 4 K: 100 h
- 1/f corner frequency: ≈ 3 Hz

## Integrated two-stage current sensors
- Ideal sensor if ultimate noise performance is required
- Single sensor SQUID read out by 16-SQUID series array amplifier
- Single-SQUID-like overall V-Φ characteristics
- Same basic features as single-stage current sensors
- Typical flux noise @ 4 K: 0.8 µΦ₀/√Hz
- Typical energy resolution @ 4 K: 45 h
- 1/f corner frequency @ 4 K: ≈ 4 Hz
- Typical flux noise @ 0.3 K: 0.25 µΦ₀/√Hz

## Series SQUID arrays
- Optimized for readout of cryogenic detectors
- Integrated bias resistors for TES or two-stage applications
- Magnetically unshielded operation in Earth field possible
- Direct chip mounting to Cu block possible
- Two independent array channels per chip
- Input inductance: 3 nH
- Input sensitivity: 23 µA/Φ₀
- Current noise @ 4 K: < 10 pA/√Hz
- Current noise @ 0.1 K: < 5 pA/√Hz

## Field sensors
- For direct field measurements
- Integrated multiloop (cartwheel) design
- Additional positive feedback (APF)
- Outer pickup-coil dimension (S,M): 1.7 mm, 2.8 mm
- Flux noise @ 4 K: 1.2 µΦ₀/√Hz
- Flux density noise @ 4 K (S, M): 8.4 fT/√Hz, 3.6 fT/√Hz
- 1/f corner frequency: ≈ 4 Hz
- Multiloop gradiometer also available
- PTB type W9L magnetometer on 7.2 x 7.2 mm² substrate also available

All noise data obtained with XXF-1 electronics