attoTMS

1019548

Technical Specifications

General Specifications	
type of instrument	transport measurement insert for use with attoDRY cryostats with integrated atto3DR double rotator module
sensor head specifics	20 pin chip carrier based sample holder mounted on 2 combined rotators with eucentric rotation for 3D angle-dependent transport measurements based on single solenoid magnet
included hardware & software	transport measurement insert for attoDRY, 2 break-out boxes, atto3DR, ASH/CC/20 chip carrier sample holder, ANC350/3/RES piezo controller, Nanonis Tramea TRC real-time controller,
	TSC signal conversion interface, LD5-1 single lock-in generator, LD5-MF multidemodulator and multi-input option, software license for Tramea, attoCONTROL electronics rack, 19“ rack PC incl. 27“ screen
Nanonis Tramea control electronics	
base configuration	1x TRCe real-time controller, 1x TSC signal conversion interface and Nanonis V5e software
analog inputs	8 low-noise 18-bit analog inputs, differential BNC connectors, +/- 10V input range
analog input bandwidth	DC – 100 kHz (-3 dB), 5th-order Butterworth low-pass filter
Input noise density	< 150 nV/vHz @ 10 kHz, < 650 nV/vHz @ 10 Hz
analog outputs	8 high precision and low noise 20-bit analog outputs (22-bit with hrDAC), differential BNC connectors, +/- 10V output range
analog output bandwidth	DC – 40 kHz (-3 dB), 5th – order Butterworth low-pass filter
output noise density	< 25 nV/vHz @ 100 Hz, < 75 nV/vHz @ 1 Hz
software upgrade incl.	LD5-1 single lock-in generator, LD5-MF multidemodulator and multi-input option
attocube modules for Tramea	integrated control of temperature & magnetic field of an attoDRY2100 and of the two rotator axes of the atto3DR from within the Tramea software
additional information on Tramea specifications	see Nanonis Tramea detailed specification sheet (or contact attocube)
Modes of Operation	
general configuration	full flexibility (multi-terminal, 4-probe, 2-probe) via generic analog in- and outputs, software configurable, up to 24 input, and up to 48 output channels measured simultaneously
Sample Positioning	
total travel range	full 3D sphere via ±90° for both closed loop rotators (reserve: ±10°)
step size	approx. 1 m° @ 300 K, 0.5 m° @ 4 K
fine scan range	40 m° @ 300 K, 6 m° @ 4 K (scan resolution: µ°)
sensor resolution	approx. 6 m°
repeatability	approx. 50 m°
linearity	approx. 1%
sample holder	ASH/CC/20 fits 20 pin LCCC, connected to 20 wires as twisted pairs
Suitable Operating Conditions	
temperature range	1.5 K..300 K (dependent on cryostat)
magnetic field range	0..15 T+ (dependent on magnet)
operating pressure	designed for He exchange gas
Suitable Cooling Systems	
titanium housing diameter	48 mm
compatible cryostats	attoDRY2100
bore size requirement	designed for a 2" (50.8 mm) cryostat/magnet bore
Options and Upgrades	
TSC add-on(s)	8 additional analog in- and outputs per TSC; maximum of 3 TSCs, resulting in 24 outputs and 24 inputs together with base configuration
TSO add-on(s)	16 additional analog outputs per TSO; maximum of 2 TSOs, resulting in 50 outputs and 8 inputs together with base configuration
Nanonis Tramea software upgrades	large range of software upgrades available: multi-channel lock-ins, HR oscilloscope and FFT, programming interface, scripting module, generic PI controller, function generator
signal-amplifiers upgrade	several different low-noise, switchable gain amplifiers, fully integrated in the attoTMS software as well as in the hardware with power and data cable for remote control
Femto DDPCA-300	trans-impedance amplifier, 0.4 fA peak-to-peak noise, switchable gain 1e4 .. 1e13 V/A, bandwidth up to 400 Hz, cable to Tramea included
Femto DLPCA-200	trans-impedance amplifier, switchable gain 1e3 .. 1e11 V/A, bandwidth DC/1 Hz ... 500 kHz, cable to Tramea included
Femto DLPVA-100	voltage amplifier, switchable gain 20/40/60/80 dB, bandwidth DC .. 100 kHz, switchable to 1 kHz, 5.5 nV/vHz input noise, cable to Tramea included
Nanonis MCVA5	differential multichannel preamplifier with 4 independent channels, Gain of 1/10/100/1000, 500 kHz bandwidth, cable to Tramea included
Keysight SMU B2912A	precision Source/Measure Unit, supports two-channel configuration, minimum source resolution 10 fA/100 nV, minimum measurement resolution 10 fA/100 nV, maximum output 210 V