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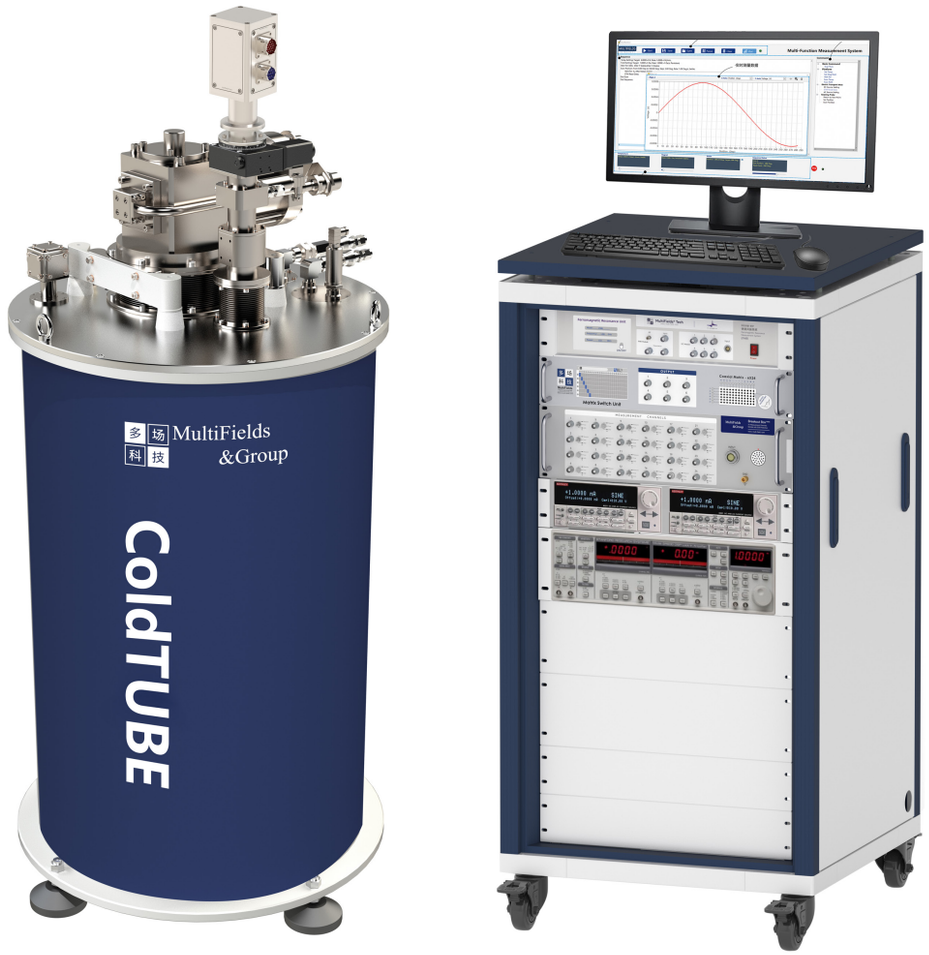


Cryogenic Systems - Product Catalog

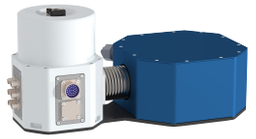
MultiFields Technologies | Beijing

ColdTUBE Series

Cryogenic Systems · Catalog

MF.ColdTUBE.Vertical

MF.ColdTUBE.Horizon.4.2



MF.ColdDESK

300 mK Options

	Features	MF.ColdTUBE.Vertical 1.6 K liquid helium-free cryogenic system with a vertical solenoid superconducting magnet	MF.ColdTUBE.Horizon.4.2 4.2 K liquid helium-free cryogenic system with a horizontal split superconducting magnet	MF.ColdDESK Convenient table-top system with liquid refrigerant-free chiller, ultra-fast temperature ramping rate	300 mK Options One-shot refrigeration options for mK application. Including He-3 and adiabatic demagnetization refrigeration (ADR)
1	Temperature Range	1.6 K ~ 350 K	4.2 K ~ 350 K	50 K ~ 350 K	300 mK ~ 350 K
4	Cooling Power	20 mW @ 2 K	60 mW @ 4.2 K	100 mW @ 60 K	50 μW @ 350 mK
5	Temperature Stability	± 10 mK	± 10 mK	± 10 mK	± 10 mK
4	Initial Cooling Time	≤ 20 h	≤ 4 h	≤ 20 min	Depends on systems
5	Sample Cooling Time	≤ 2 h	≤ 60 min	≤ 20 min	Depends on systems
2	Field Range	0 ~ 3 T / 5 T	0 ~ 1.5 T / 3 T / 5 T	0 ~ 1.5 T	0 ~ 18 T
3	Field Direction	Vertical / Horizonal		Horizonal	Depends on systems
8	Field Resolution	0.01 Oe		0.01 Oe	Depends on systems
9	Field Stability	≤ 0.5 Oe		≤ 0.1 Oe	Depends on systems
10	Ramping Rate	≥ 100 Oe / s		≥ 100 Oe / s	Depends on systems
11	Measurement Function	Electric transport, thermal transport, heat capacity, magnetic measurements, optical confocal measurements, ferromagnetic resonance, etc..		Electric transport, thermal transport, heat capacity, optical measurements, etc..	Electric transport measurements, etc..

* The above are all recommended configurations. Multifields Technologies provides customization services. If you have special requirements, please contact us.

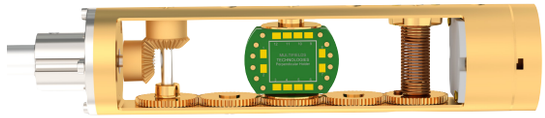
Materials Characterization

1. ColdTUBE - Measurement Functions

Compatible with multiple physical properties measurement options

MF.ColdTUBE.Vertical

Available Measurement Options



- Electric Transport Measurement

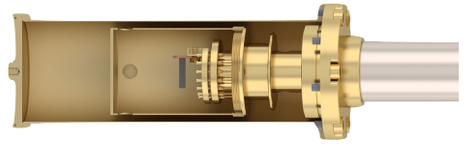
Resistance / Hall measurements (I-V, R-T, R-H, pulse), Van der Pauw, harmonic measurements, etc.. can be realized. There are also multiple probes with rotation function are available.

- Magnetic Measurement

Magnetization, DC & AC susceptibility measurements can be conducted using magnetic measurement option.

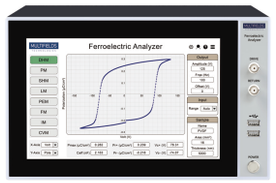
- Thermal Measurement

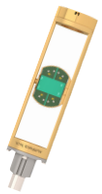
Thermal conductivity, Seebeck& Nernst effect, heat capacity and thermal expansion measurements can be conducted.



- Magneto-electric Measurement

Dielectric coefficient, ferroelectric properties and magneto-electric coupling coefficients, etc. measurements can be realized.





- FMR Measurement

Ferromagnetic Resonance (FMR), ST-FMR, spin pumping & ISHE measurements can be conducted by FMR measurement option.

- Confocal Optical Measurement

Confocal scanning microscopy, confocal Raman & fluorescence and magnetic optical Kerr effect measurements can be realized.

ColdTUBE Series

1. ColdTUBE - 1.6 K

Liquid helium free cryogenic measurement system

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ColdTUBE Cryogenic & Magnetic Field Measurement System - Specifications

Cryogenic System	
Temperature Range	1.6 K ~ 325 K (down to 300 mK with He-3 probe)
Cooling Power	20 mW @ 2 K (at sample position)
Temperature Stability	± 10 mK
Temperature Ramping Rate	0 ~ 5 K / min
Control Method	Dual channels: sample chamber and sample probe
Temperature Sensor	Qty 2, for sample chamber and sample probe
Initial Cooling Time	< 20 h
Sample Chamber	
Features	Rotating function compatible for any probe
Sample Cooling Time	≤ 120 min (from 300 K to 1.6 K)
Inner Diameter	29 mm; 50 mm
Vibration	≤ 1 μm
Sample Environment	Static exchange helium gas
Optical Window	Quantity up to 4; Quartz, Sapphire or others
Magnetic Field	
Configuration	Field in horizontal / vertical direction
Amplitude	3 / 5 Tesla for horizontal split SC magnet 7 Tesla for vertical solenoid SC magnet
Resolution	0.01 Oe
Stability	≤ 0.5 Oe
Ramping Rate	≥ 100 Oe / s

Others	
Vaccum Pump	Oil-free dry scroll pump with high pumping speed
Pump Working Mode	Automatically switching between OVC and sample chamber
Power Consumption	8 kW (without chiller and magnet)
Chiller Requirements	Cooling power > 10 kW; Water flow > 16 L / min; Pressure > 4 bar
Helium Requirements	Purity > 99.999 %

2. ColdTUBE - 4.2 K

Liquid helium free cryogenic measurement system

ColdTUBE Cryogenic & Magnetic Field Measurement System - Specifications

Cryogenic System	
Temperature Range	4.2 K ~ 325 K
Cooling Power	60 mW @ 4.2 K (at sample position)
Temperature Stability	± 10 mK
Temperature Ramping Rate	0 ~ 5 K / min
Control Method	Dual channels: sample chamber and sample probe
Temperature Sensor	Qty 2, for sample chamber and sample probe
Initial Cooling Time	≤ 4 h
Sample Chamber	
Features	Rotating function compatible for any probe
Sample Cooling Time	≤ 60 min (from 300 K to 4.2 K)
Inner Diameter	29 mm; 50 mm
Vibration	≤ 1 μm
Sample Environment	Static exchange helium gas
Optical Window	Quantity up to 4; Quartz, Sapphire or others
Magnetic Field	
Configuration	Field in horizontal / vertical direction
Amplitude	1.5 Tesla for electromagnet 3 / 5 Tesla for horizontal split SC magnet 7 Tesla for vertical solenoid SC magnet
Resolution	0.01 Oe
Stability	≤ 0.1 Oe (electromagnet) ≤ 0.5 Oe (SC magnet)
Ramping Rate	≥ 100 Oe / s

Others	
Vaccum Pump	Oil-free dry scroll pump with high pumping speed
Pump Working Mode	Automatically switching between OVC and sample chamber
Power Consumption	8 kW (without chiller and magnet)
Chiller Requirements	Cooling power > 10 kW; Water flow > 16 L / min; Pressure > 4 bar
Helium Requirements	Purity > 99.999 %

2. ColdTUBE - 4.2 K

Liquid helium free cryogenic measurement system

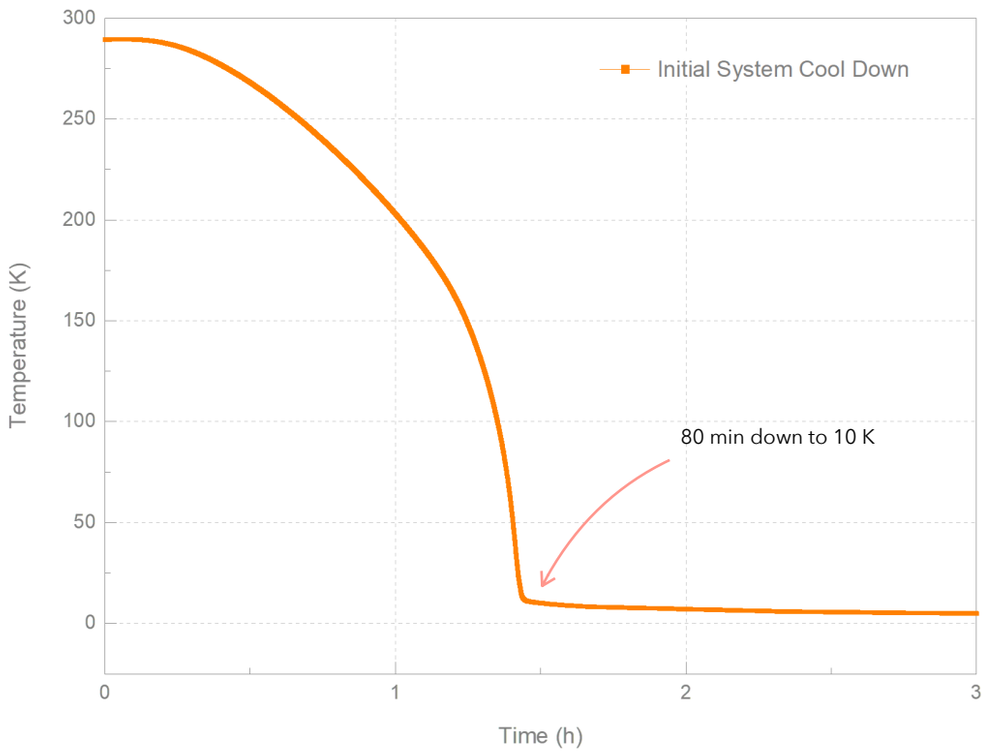
Performance (1)—

Initial Cooling Time

MultiFields Products
1. MF.ColdTUBE.Horizon.4.2
2. Kelvinion mini

• Initial Cooling Time < 3 h

Inspecting the temperature variation from starting cooling down to reaching at lowest temperature, it can be learned that it takes 80 minutes for the device to cool down from room temperature to 10K and less than 3 hours to 4.2 K.



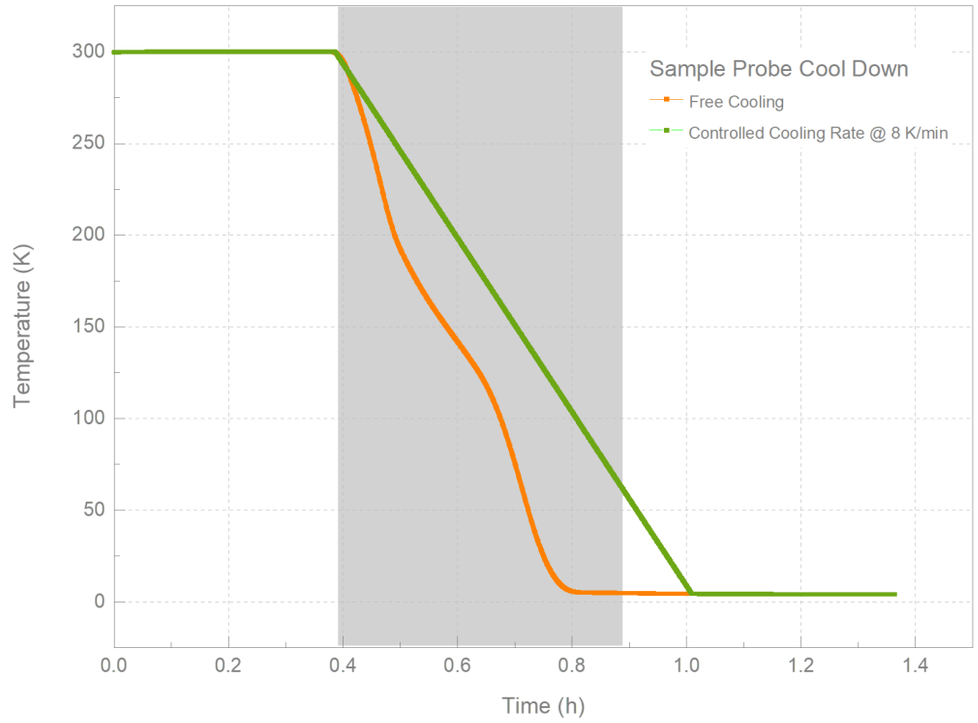
Performance (2)—

Sample Probe Cooling Time

MultiFields Products
1. MF.ColdTUBE.Horizon.4.2
2. ETM.MCProbe.MF12
3. Kelvinion mini

• Sample Probe Cooling Time < 30 min

If the ColdTUBE system have been cooled down, it takes about 30 min to simultaneously cool down the sample chamber and sample probe from room temperature to 4.2 K.

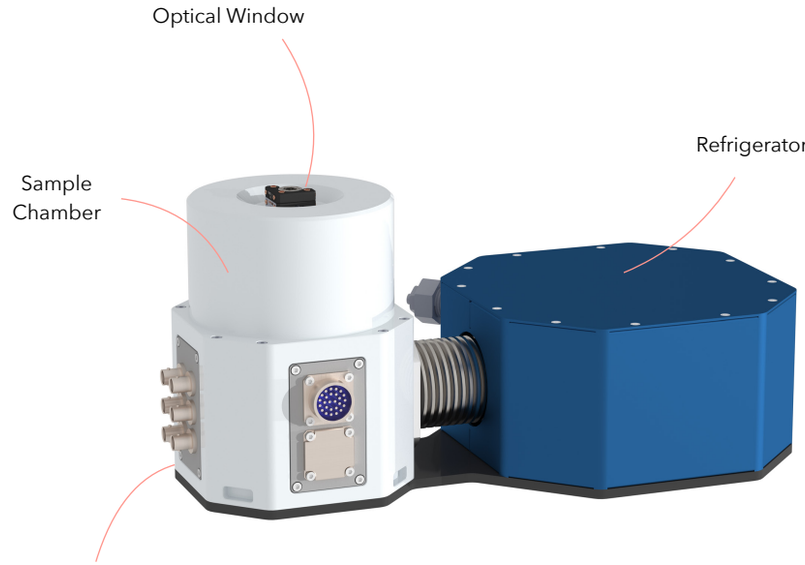


ColdTUBE Series

Cryogenic System

3. ColdDESK - 50 K

Liquid-refrigerant-free table-top cryogenic measurement system



MF.ColdDESK

ColdDESK Cryogenic Measurement System - Specifications

Cryogenic System	
Temperature Range	50 K ~ 325 K
Cooling Power	100 mW @ 60 K
Temperature Stability	± 10 mK
Temperature Ramping Rate	0 ~ 15 K / min
Control Method	Dual channels: sample stage and cold head
Temperature Sensor	PT100 temperature sensor, for sample stage
Initial Cooling Time	≤ 20 min
Sample Chamber	
Features	Compatible with multiple magnets with different configurations
Inner Dimensions	
Outer Dimensions	
Vibration	≤ 1 μm
Sample Environment	Vacuum (~ 0.1 Pa)
Optical Window	Quantity up to 6; Provides customized services
Magnetic Field	
Configuration	Field in horizontal direction
Amplitude	1.5 Tesla
Resolution	0.01 Oe
Stability	< 0.5 Oe
Ramping Rate	> 100 Oe / s

3. ColdDESK - 50 K

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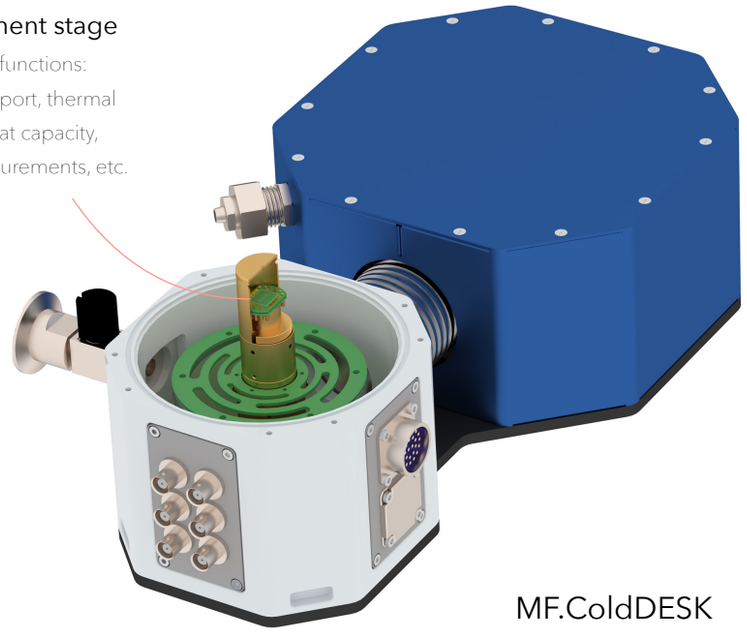
Compatible with electromagnets and piezoelectric probe stages

Measurement stage

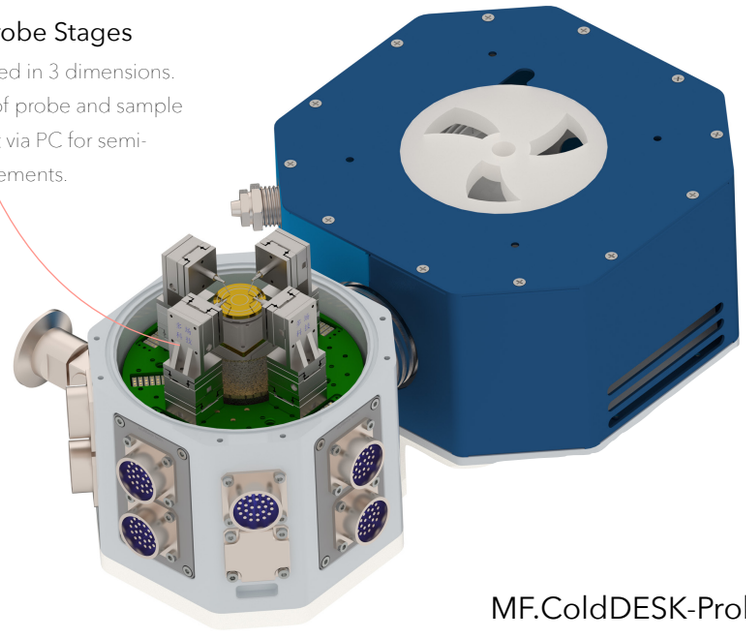
Compatible functions:
Electric transport, thermal transport, heat capacity, optical measurements, etc.



MF.ColdDESK

Piezoelectric Probe Stages

Probes can be moved in 3 dimensions. Automatic control of probe and sample stage displacement via PC for semi-automated measurements.



MF.ColdDESK-ProbeStation

Key Features

- Temperature range 50 K ~ 325 K;
- Ultra-low vibration and optional optical windows helps ColdDESK to be applied in infrared spectroscopy, Raman spectroscopy and other low-temperature optical experiments;
- Compatible with multiple magnets with different configurations;
- Ultra-fast ramping rate and short initial cooling time (~ 20 min);
- Compatible with electric transport, thermal transport, heat capacity and thermal expansion measurements;

Key Features

- Table-top compact cryogenic probe station;
- Piezoelectric probe stage with displacement precision of 50 nm;
- Semi-automatic measurement based on image recognition algorithms for automatic movement of probes and sample;
- Compatible with multiple magnets with different configurations;
- Measurement frequency from DC to GHz using different probes;

3. ColdDESK - 50 K

Fast cooling rate and excellent temperature stability at full temperature range

MultiFields Products

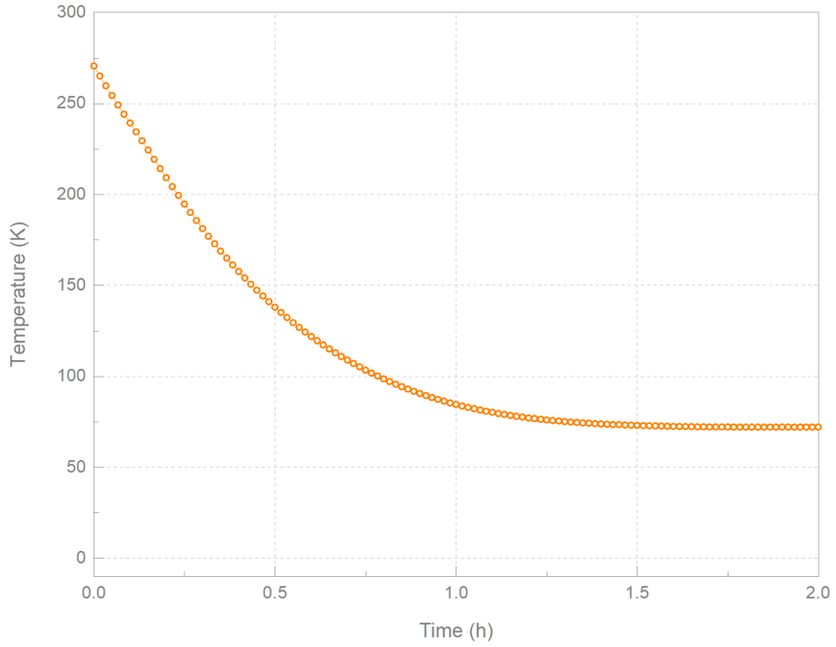
1. MF.ColdDESK-Probe Station
2. Kelvinion mini

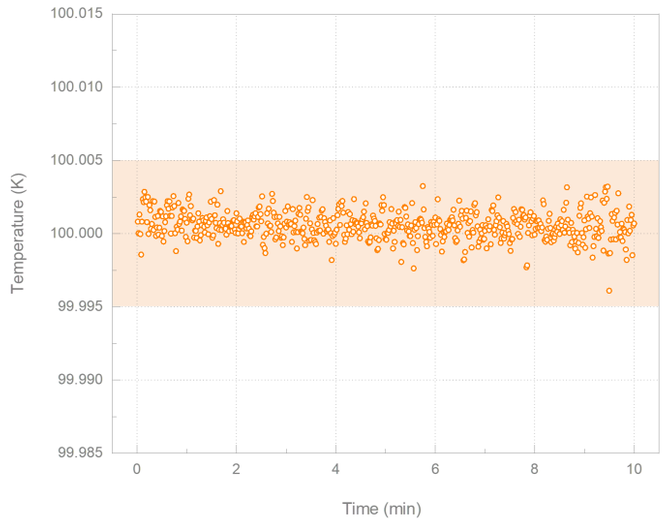
• Stability

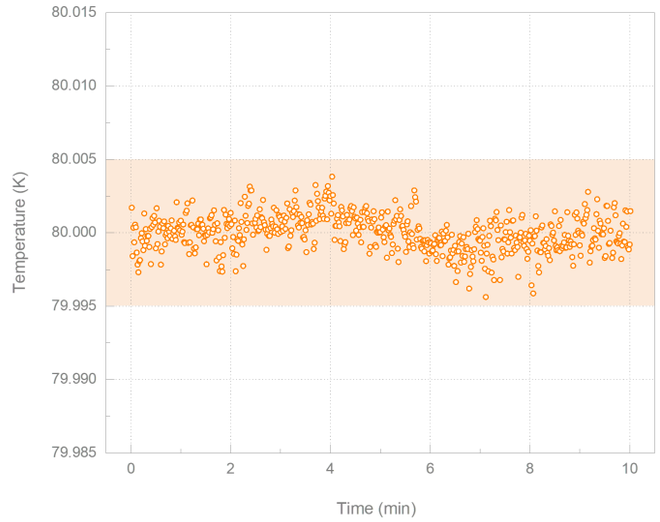
It is installed a temperature sensor on the sample base of the station. We could obtain the peak-to-peak noise of the temperature at sample position is less than ± 5 mK.

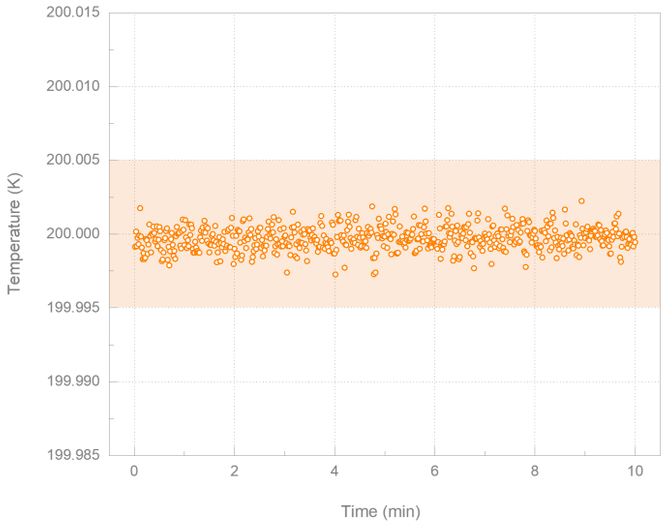
Performance —

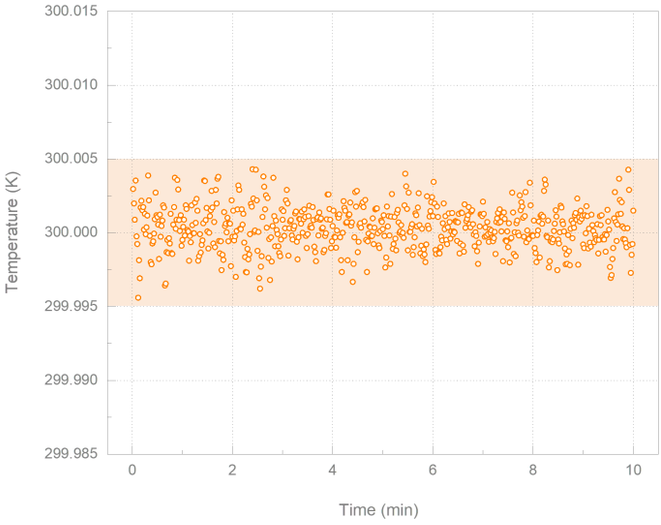
Initial Cooling Time and Temperature stability of the ColdDESK-ProbeStation





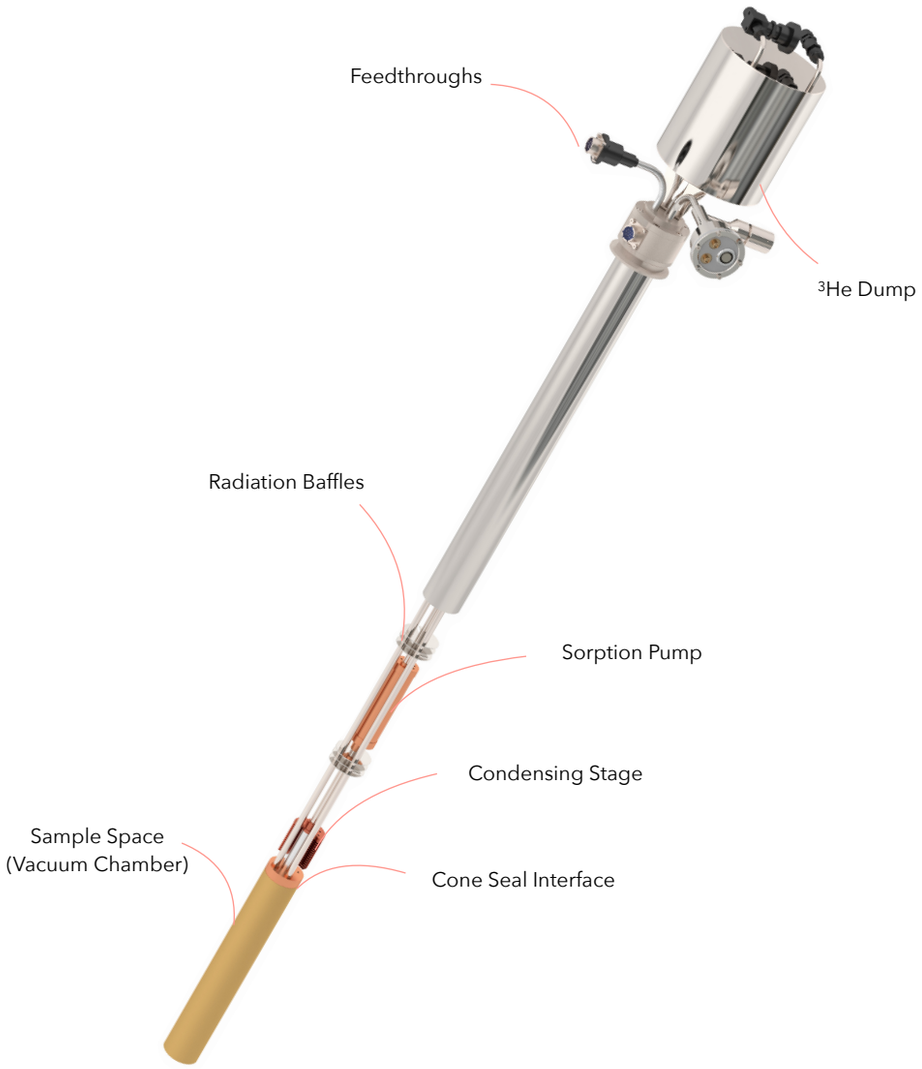






4. 300 mK Options - Helium-3 Probe

One-shot refrigeration through pumping ^{3}He liquid, lowest temperature ~ 275 K



MF.He-3.Probe

Helium-3 Probe - Specifications

Performance	
Temperature Range	300 mK ~ 300 K
Base Temperature	≤ 300 mK
Temperature Stability	≤ ± 10 mK
Cooling Power	≥ 50 μW @ 350 mK
Holding Time	40 hrs with no heat load 6 hrs with 50 μW heat load
Magnetic Field Compatibility	0 ~ 14 T
Temperature Sensor	Qty. 4 2 for He-3 Pot 1 for Sorb 1 for 1K plate
Others	
Method	^{3}He
Weight	5.4 kg
Dimensions	250 (W) * 300 (L) * customized size (H) （unit: mm）
Compatible Platforms	Compatible with common platforms such as Multifields ColdTUBE, QD-PPMS, Oxford-TeslatronPT, Pride-CPMS, Cryogenic-CFMS and others；

4. 300 mK Options - Helium-3 Probe

Excellent adiabatic environment helps the device maintain lowest temperature for more than 40 hours

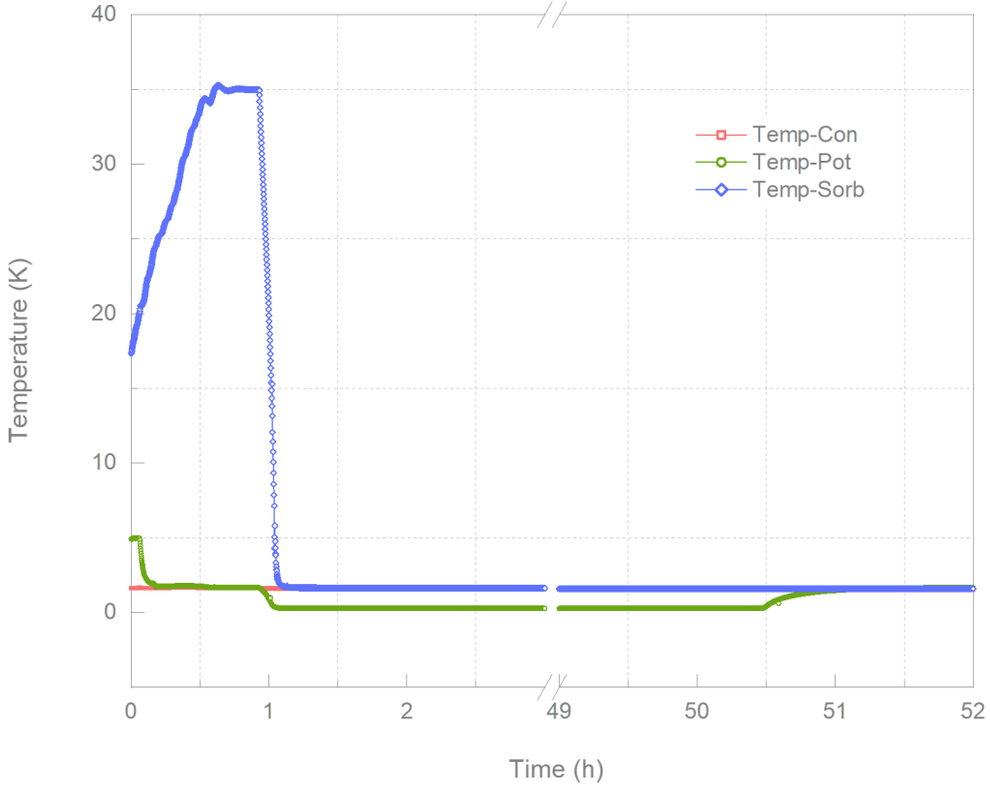
Performance (1)—

Lowest Temperature

MultiFields Products	1. MF.He-3.Probe 2. Kelvinion mini
Platform	MF.ColdTUBE.Vertical

• Lowest temperature ~ 275 mK

The temperature at the sample position can be reduced to 275 K by a one-shot heat absorption through ^{3}He evaporation.



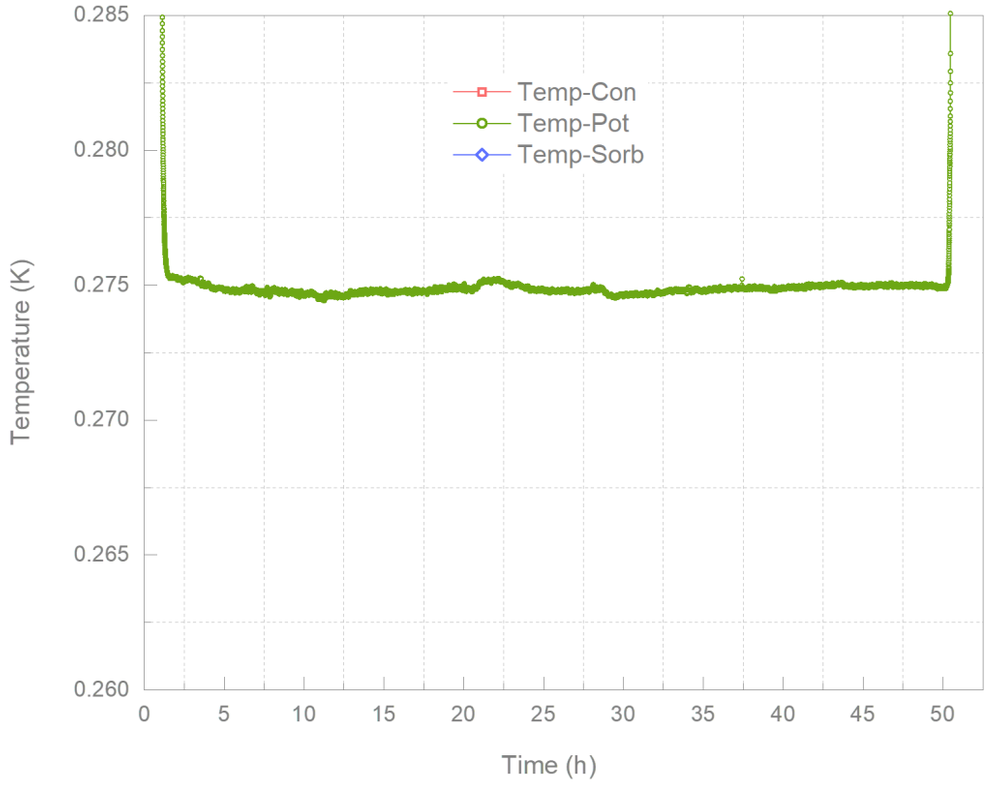
Performance (2)—

Holding Time at Lowest Temperature

MultiFields Products	1. MF.He-3.Probe 2. Kelvinion mini
Platform	MF.ColdTUBE.Vertical

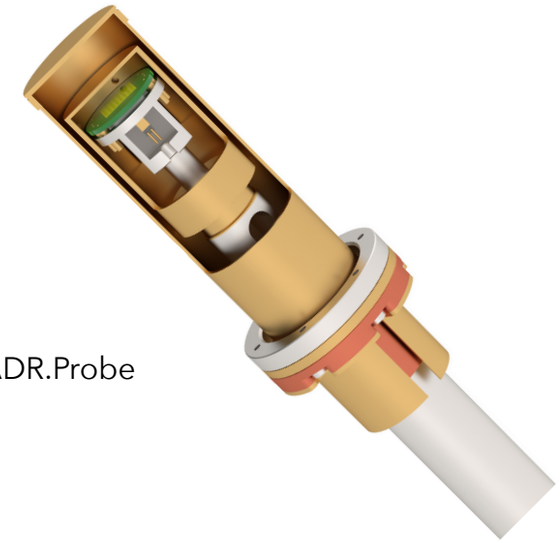
• Holding time ~ 50 h

Benefiting from excellent adiabatic design, the probe could maintain lowest temperature for more than 40 h with no heat load, and for 6 h with 50 μW heat load.



4. 300 mK Options - ADR

300 mK measurement solution via adiabatic demagnetization refrigeration method



MF.ADR.Probe

Performance —

Holding Time at Lowest Temperature

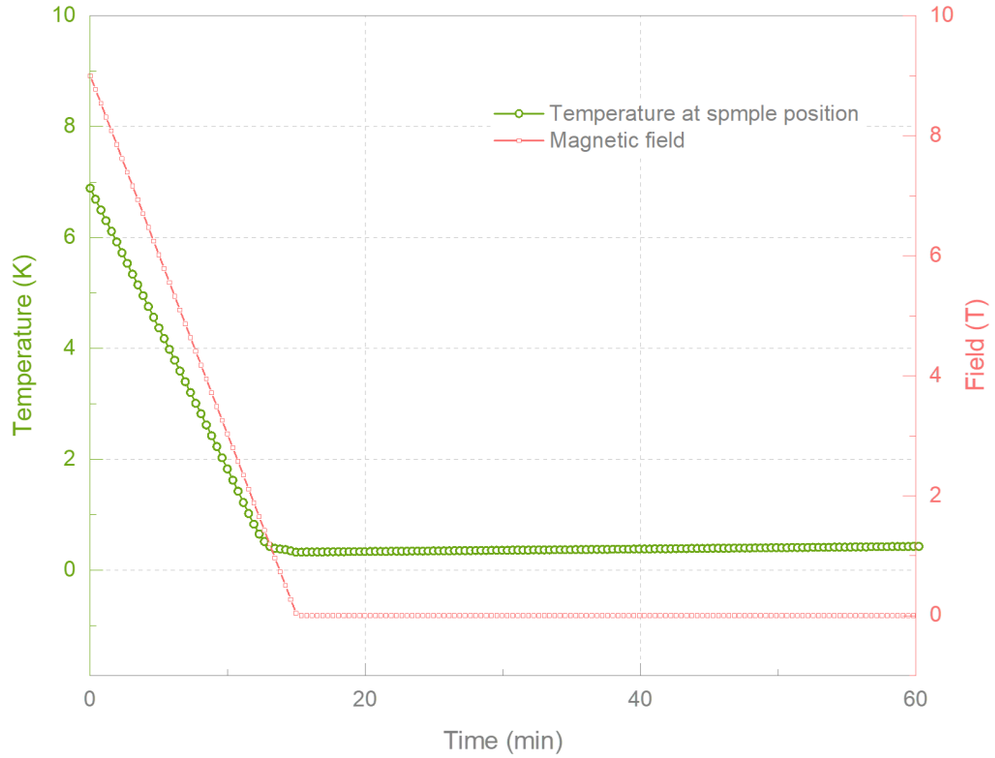
MultiFields Products	1. MF.He-3.Probe 2. Kelvinion mini
Platform	ColdTUBE 1.6 K

- Lowest Temperature ≤ 400 mK

The paramagnetic salt placed in a adiabatic environment at 2 K is isothermally magnetized by applying a magnetic field. The magnetic field is then removed, which produces a chilling effect due to the large amount of heat absorption by the adiabatic demagnetization of the paramagnetic salt. The temperature can be reduced to less than 400 mK.

Adiabatic Demagnetization Refrigeration (ADR) Probe - Specifications

Performance	
Temperature Range	300 mK ~ 300 K
Lowest Temperature	≤ 400 mK
Temperature Stability	≤ ± 10 mK
Holding Time	3 hrs up to 500 mK, with no heat load
Magnetic Field Compatibility	0 ~ 14 T
Temperature Sensor	Qty. 2 1 for the probe 1 for the sample base
Others	
Method	Heat absorption by the adiabatic demagnetization
Compatible Platforms	Compatible with common platforms such as Multifields ColdTUBE, QD-PPMS, Oxford-TeslatronPT, Pride-CPMS, Cryogenic-CFMS and others；



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ColdTUBE Series