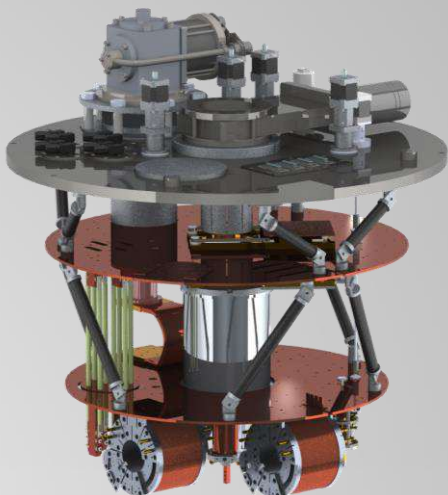


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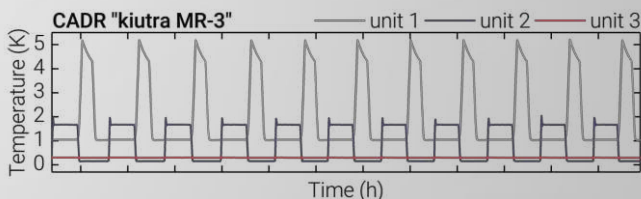
INFINITE COOLING



kiutra combines closed-cycle precooling with magnetic refrigeration to provide sub-Kelvin temperatures cryogen-free.



Our cryostats offer both standard ADR and continuous ADR, an ideal tool for experiments and applications which require long-term, cryogen-free cooling.



Features: cryogen-free | continuous cooling | compact size | large temperature range | automatic operation | robotic sample changes | open-source software

kiutra „MR“ product line – overview and technical specifications

The kiutra “MR” systems are cryogen-free multi-purpose cryostats for Kelvin and sub-Kelvin temperatures.

Our standard systems combine closed-cycle pre-cooling & magnetic refrigeration (adiabatic demagnetization refrigeration, **ADR**). Each system may be extended with multiple ADR units; due to a highly modular design the ADR units do not necessarily need to be installed all at once, but can be added successively, according to your cooling requirements. As first supplier in the market kiutra offers *continuous* ADR (**CADR**): Starting from our model “MR-2” this technique allows for the cryogen-free, automatic, and *permanent* generation of cryogenic temperatures.



All cryostats are easy to operate, hazard-free, and have minimal infrastructure requirements. All device parameters can be controlled and monitored using open-source Python software.

	MR-1	MR-1L	MR-2	MR-3
Working Principle				
Closed-cycle cooler GM / PT	• / •	• / •	• / •	- / •
ADR	•	•	•	•
CADR			•	•
Base temperatures (K)				
Closed-cycle cooler	< 4	< 4	< 4	< 4
ADR	1	0.5	0.3	0.1
CADR			1.5	0.5
Cooling Capacity @ T _{Base} (mJ)	3000	250	130	15
Cooling Power @ T _{Base} (μW)			100	25
Initial cooldown time (d)	2	2	3	3
Power requirements	6.6 - 7.2 kW (380/415 V3~, 50 Hz)			
Cooling water requirements	6 - 9 L/min, 5 - 25°C			
Dimensions				
Cryostat	Ø 810 mm x 1150 mm (bare) 862 mm x 1015 mm x 1750 mm (incl. covering & robotic sample changer)			
Rack	800 mm x 800 mm x 1200 mm			
Compressor unit	530 mm x 450 mm x 580 mm			

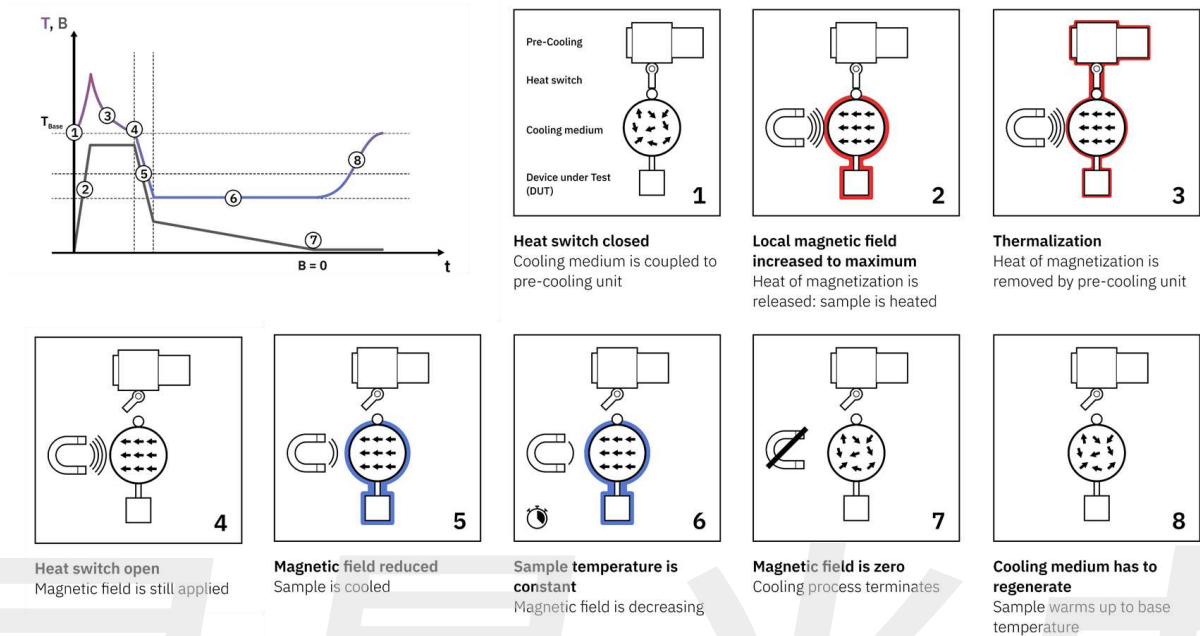
Standard configuration	
Max. sample size	Ø 100 mm x 200 mm, Ø 45 mm x 100 mm with robotic sampler changer
Magnetic stray field (w/o shielding)	< 0.5 mT
Wiring	12 twisted constantan pairs

Options				
Sample changer option	•	•	•	•
Cooldown time to T _{Base} (h)	5	5	6	7
Sample magnet (T)	3	3	3	3

Our cryostats can be adapted to various requirements. Please ask for custom solutions.

Cooling technology

Adiabatic Demagnetization Refrigeration (ADR) As shown schematically in the figure below, single-shot magnetic refrigeration may be used to generate temporary cooling. During the hold time (panel 6) magnetic temperature control offers excellent precision and stability.



Continuous Adiabatic Demagnetization Refrigeration (CADR) For some applications short-term cooling is not sufficient. For these cases kiutra offers cryogen-free magnetic heat pumps which provide permanent cooling. These systems are based on multi-stage magnetic refrigeration, where several magnetic cooling units are interconnected and carefully balanced. The trick: The heat of magnetization released in the n^{th} cooling unit is dissipated by the $(n-1)^{\text{th}}$ unit, and so on. This ensures that the final cooling unit, connected to the sample, never runs out of magnetic field and hence can provide Kelvin or even sub-Kelvin temperatures continuously.

