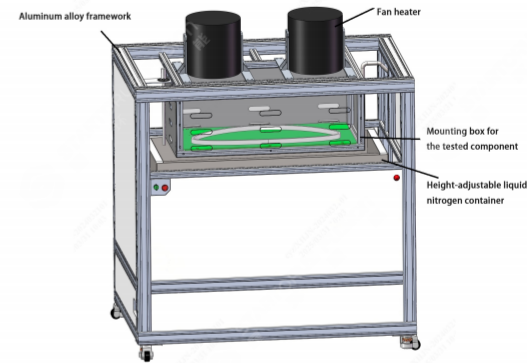


Pyro-Cryo Cycler

Introduction

Under pulsed operation, high-temperature superconducting (HTS) fusion devices undergo repeated cycles of heating/cooling and energizing/de-energizing. To evaluate the thermal cycling lifespan and ultimate performance of HTS magnets, Startorus Fusion has developed an automated, cyclic temperature control testing system: the Pyro-Cryo Cycler (PCC). This intelligent testing platform is designed for HTS magnet performance research. It can perform multiple rounds of fatigue and current-carrying tests on coils automatically and unattended, across a temperature range from liquid nitrogen to room temperature. This enables highly efficient, long-duration testing with comprehensive parameter monitoring



Core Advantage&Highlights

- **Automated Operation:** Enables unattended testing with multiple thermal cycles and electromagnetic loading, supporting 24/7 continuous operation.
- **Synchronous Multi-Parameter Measurement:** Simultaneously acquires key parameters (temperature, voltage, current, magnetic field) and computes coil performance indicators in real time.
- **Full Data Automation:** Automatically performs electromagnetic data analysis and curve fitting, extracting trends in coil inductance and joint resistance as a function of cycle count.
- **High Safety & Reliability:** Features built-in anomaly detection and protection mechanisms to ensure operational stability and safeguard both equipment and data integrity.
- **Data Traceability & Visualization:** Automatically records all test data, with integrated software providing capabilities for real-time monitoring and historical data analysis.
- **Modular Design:** The test chamber, power supply, and control & data acquisition units feature a modular architecture for flexible configuration to accommodate various coil types and experimental requirements.

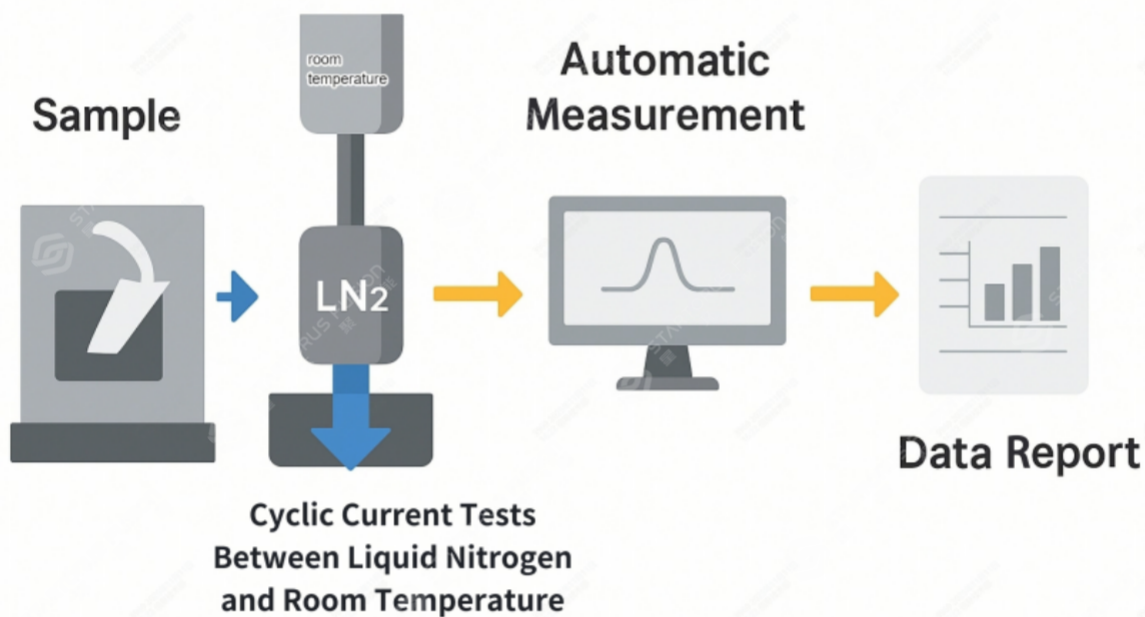
Parameters

Project			Specification description
Dimensions & Weight	Dimensions(mm)		1690*1180*1995
	Weight(kg)		Approx.750
Materials	Sheet Metal Parts		6061-T4(SS)
	Non-Metallic Parts		FR-4 Fiberglass Board、G10
	Metal Parts		6061-T4(SS)、AISI 304
	Profile Frame		6061-T4(SS)
Power Supply	Input Voltage/Current		380 V/40 A
	Power Consumption		26 KW
Core Performance	Sampling Rate	Voltage/Current/Magnetic Field	1-2000 HZ
		Temperature	1-10 HZ
	Acquisition Signal Error		< 0.5%
	Signal Types		Voltage, Current, Magnetic Field, Temperature, Liquid Level
	Operating Time		Unlimited
	Warm-up Time		30 mins(77 K to RT)
	Warm -up Temperature Selection		Adjustable,0~55℃
	Test Medium		Liquid Nitrogen
Environmental Parameters	Operating Temperature		0~40℃
	Test Temperature Range		-197~55℃
	Storage Temperature		Ambient Temperature
	Humidity Range		Dry Environment

Functional Details

- **Core Functions:** Enables unlimited, unattended cycles of automatic coil energization, data acquisition, processing, storage, quench protection, and automatic warm-up. The system also provides liquid level compensation and audible/visual alarms during testing.
- **Distinctive Function:** Intelligent Alarm System: Upon triggering any alarm during unattended operation the system automatically stop the test and simultaneously sends the alert to users via Lark, enabling a rapid response.

Process Flow Diagram



Application

This system is designed for long-term durability testing of HTS coils and samples. It automates the testing process to replace traditional manual methods, effectively addressing key pain points such as low efficiency, poor data continuity, and challenges in replicating test conditions. It enables researchers to accurately evaluate coil fatigue characteristics under combined thermal cycling and electromagnetic forces, thereby providing robust data support for magnet structure optimization and practical engineering applications.