STARTORUS FUSION
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# Extreme Physics Instrument for Comprehensive Measurement(EPIC)

## Introduction

The Extreme Physics Instrument for Comprehensive Measurement (EPIC), developed by Startorus Fusion, serves as a precise multi-physics monitoring system for high-temperature superconducting magnets and as a versatile measurement tool for various physical fields in fusion and other physics experiments.

The system features a compact 2U chassis equipped with hot-swappable, high-precision acquisition cards capable of real-time monitoring of multiple experimental signals, including temperature, magnetic field, voltage, current, and stress. Its modular design supports flexible configurations, offering a range of subcards tailored to specific experimental needs, such as temperature, voltage, current, magnetic field, and stress measurement.

Leveraging FPGA-based hardware-synchronized acquisition technology, EPIC ensures parallel data collection of physical parameters with microsecond-level time synchronization. It supports a master-slave operation mode, enabling multiple units to work collaboratively for centralized data processing.

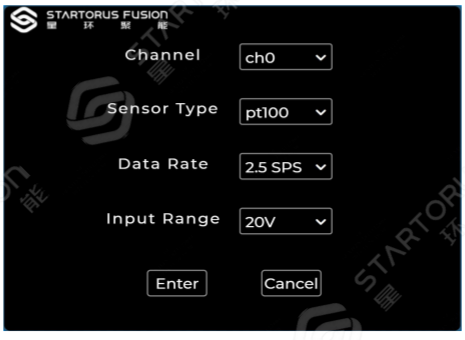
Measurement data can be stored locally or in a remote database and unloaded in real-time via the UDP protocol for experimental control and post-analysis.

## Software Interface

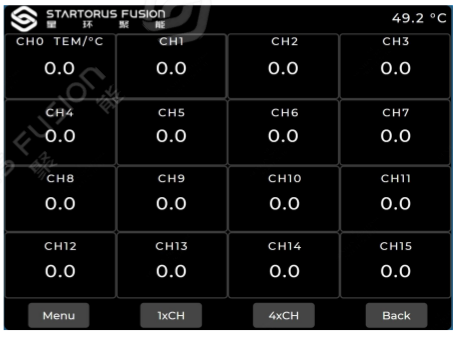
### Web-based Remote Display

### Chassis Screen Display


Start Page




Channel Real-Time Data




Channel Settings Page

# System Specifications

| Model | Startorus Fusion Extreme Physics Instrument for Comprehensive Measurement(EPIC) |
|---|---|
| CR Dimensions | 426 mm*240*88(mm) |
| Number of Cards | 16 |
| Channel Isolation | Compliant with UL 1577 standard, offering 5.7 kVrms isolation for up to 1 minute |
| Data Transmission | Electrical/optical interface (Gigabit UDP protocol) |
| Multi-Unit Networking | Wired networking capability |
| Synchronization (Multi-Card) | Supported |
| Time Synchronization Protocol | IEEE 1588 V2 |
| Power Supply | AC 220V / Built-in lithium battery (18,000 mAh) |

# Subcard Specifications

1. RTD (PT100) Temperature Measurement Supported Sensor Temperature Ranges

| | |
|---|---|
| Pt 100 | -50℃ ~ 150℃ |
| | 0℃~ 100℃ |
| | 0℃ ~ 200℃ |
| | 0℃~ 400℃ |
| | -200℃~ 200℃ |
| Pt 1000 | -40℃ ~ 160℃ |
| Resistance Measurement Range | 0~10 kΩ |
| Measurement Accuracy (℃) | 0.01℃ (typical) |
| Temperature Drift | 3 ppm/℃ |
| Converter Type | 24-bit |
| Maximum Sampling Rate | 40 kSPS |

## 2. RTD (Cernox) Temperature Measurement

| | |
|---|---|
| Resistance Measurement Range | 0~100 kΩ |
| Measurement Range(K) | 3~330 K (Cernox CX-1050) |
| Measurement Accuracy(K) | 0.01 k (Cernox CX-1050) |
| Temperature Drift | 3 ppm/°C |
| Converter Type | 24-bit |
| Maximum Sampling Rate | 40 kSPS |

## 3. Hall Sensor - Magnetic Field Measurement

| | |
|---|---|
| Excitation Current(mA) | 100 mA、20 mA、1 mA |
| Measurement Range | -150~150 KG (Lakeshore HGCA-3020) |
| Measurement Accuracy | 1 G (Lakeshore HGCA-3020) |
| Temperature Drift | 3 ppm/°C |
| Converter Type | 24-bit |
| Maximum Sampling Rate | 40 kSPS |

## 4. Strain Measurement

| | |
|---|---|
| Measurement Range | -10000~+10000 με (KYOWA KFLB-05-120-C1-23) |
| Measurement Accuracy | 1 με (KYOWA KFLB-05-120-C1-23) |
| Bridge Resistance | 120 Ω (default) |
| Temperature Drift | 3 ppm/°C |
| Converter Type | 24-bit |
| Maximum Sampling Rate | 40 kSPS |

5.4-20 mA Signal Transmitter Measurement

| | |
|---|---|
| Input Impedance | 150 Ω |
| Input Type | Current |
| Input Range | 4-20 mA |
| Measurement Accuracy | 0.01 mA |
| Temperature Drift | 3 ppm/°C |
| Converter Type | 24-bit |
| Maximum Sampling Rate | 40 kSPS |

6.Voltage Measurement

| | |
|---|---|
| Input Impedance | >1 GΩ |
| Input Type | Voltage |
| Input Coupling | DC |
| Measurement Range | ±10 V、±2 V、 ±200 mV、±20 mV |
| LNL Error | 20 ppm±500 nV@10 HZ |
| Noise | 45 nVRMS (gain = 128@20SPS) |
| CMRR | 105 dB |
| 50 Hz and 60 Hz Rejection | 95 dB |
| Input Protection | 40 V |
| Temperature Drift | 3 ppm/° C |
| Converter Type | 24-bit |
| Maximum Sampling Rate | 40 kSPS |

## Application

- Medical Imaging (MRI and NMR)
- Superconducting Power Transmission
- Fusion Energy Research
- Particle Accelerators
- Quantum Computing
- High-End Scientific Equipment
- Superconducting Maglev Technology
- Aerospace