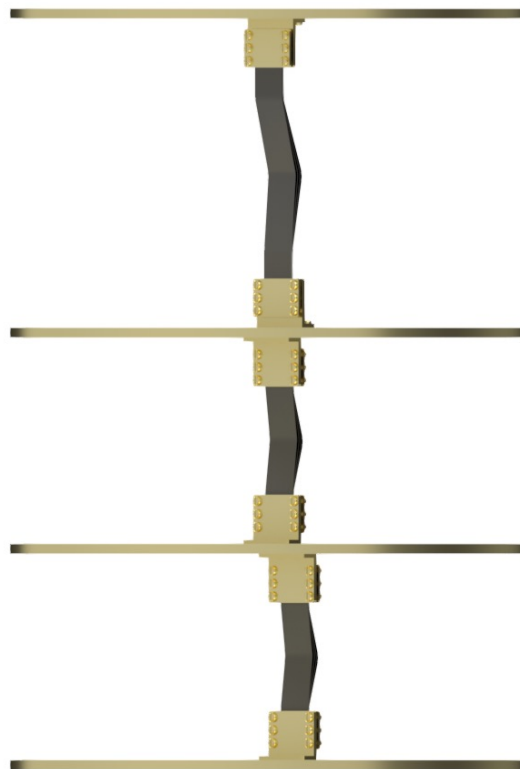


Introducing the **Nord Cryo Thermal Link**



Nord Cryo Thermal Link

Faster cooldowns. Easy installation. A cost-effective way to improve dilution fridge performance.

Nord Cryo Thermal Link - Faster cooldowns. Easy installation. A cost-effective way to improve dilution fridge performance.

Nord Cryo is introducing a new line of **Graphite-Based Thermal Self-Switching Links** for dilution refrigerators.

These passive thermal links are designed to help reduce cooldown times without heaters, control wiring, or complex mechanics. They are supplied with copper ends, cut to length, and designed to fit existing fridge setups without custom modification.

The principle is simple: the synthetic graphite has **high thermal conductivity at room temperature**, helping move heat quickly during cooldown. As the temperature drops, its conductivity decreases dramatically, becoming highly insulating below approximately **10 K**.

This makes these links a natural passive thermal switch.

For best performance, the links are designed to be installed between the stages below **4 K**, helping transfer heat from the payload toward the pulse tube during the early stages of cooldown.

Key benefits:

- Faster cooldowns
- Passive operation, no heaters or control wiring
- Compact and lightweight
- Fits existing fridge configurations
- Economical alternative to complex mechanical heat switches
- Can also improve warm-up times

In one example case, **a 3,5-day cooldown was reduced to around 3 days**, potentially meaning the difference between starting work in the morning rather than waiting until late afternoon.

Exact performance naturally depends on the cryogenic payload, with larger loads typically offering greater potential benefit.

Typical applications include:

- Fast-cycling dilution refrigerators
- Large-payload dilution refrigerators
- Cryogenic component test systems

The links are **made to order**, with lengths from 50 mm up to 310 mm per section.



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Why Graphite?

Since the early 2000s, graphite has been recognized for its unusual thermal conductivity profile, making it well suited for use as a **natural, fully passive thermal heat switch**.

The graphite used in the **Nord Cryo Thermal Link** has a thermal conductivity of approximately **700 W/mK at room temperature**. As the temperature falls below 50 K, its thermal conductivity decreases significantly, reducing the resulting heat load.

In the thermal “off” state, nominally below **10 K**, conductivity drops dramatically to levels comparable with highly insulating materials such as Vespel.

This temperature-dependent behavior allows the link to transfer heat effectively during the early stages of cooldown while becoming increasingly thermally isolating as the system approaches its operating temperature.

Expected Performance

As more systems adopt the **Nord Cryo Thermal Link**, we will continue gathering cooldown data and performance curves to better demonstrate its benefits across different cryogenic configurations and use cases.

If you are willing to share your cooldown data or performance results, please send them to info@nordcryo.com. Your feedback will help us build a broader performance picture across different cryogenic systems and use cases.

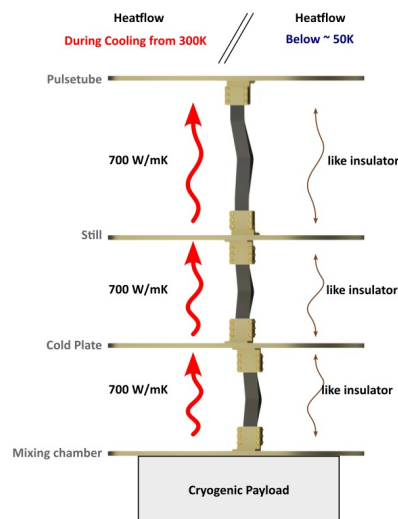
Recommended Installation

The Nord Cryo Thermal Link is designed to be **user-installable without special tools**.

M3 or M4 bolts can be used depending on the existing refrigerator configuration.

For installation:

- Brass fasteners are recommended to maintain a reliable connection at cryogenic temperatures.
- Stainless-steel or titanium washers are recommended.
- The graphite sheets should remain clear of surrounding components or objects that could come into contact with them.
- Approximately **5 mm of slack or deflection** should be maintained in the graphite to accommodate differential thermal contraction and reduce mechanical stress. This allowance is already included in the specified link length.
- A thin layer of thermal grease at the flange interfaces, such as Apiezon grease, is recommended to improve thermal contact.



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How It Works

The **Nord Cryo Thermal Links** are recommended for installation between the **cryogenic payload and the lower pulse-tube stage**.

During the early stages of cooldown, when temperatures and heat capacities are high, the graphite provides an effective thermal path from the payload to the pulse tube. This helps remove heat more rapidly and accelerates the cooling process.

As temperatures fall below approximately **50 K**, the thermal conductivity of the graphite decreases significantly. The lower stages therefore become increasingly thermally isolated, allowing the dilution refrigerator to continue cooling normally toward its final operating temperature.

Unlike gas-gap heat switches, the open and modular construction of the Thermal Link also allows **user-defined fine-tuning**.

Need greater thermal conductance during cooldown? Additional graphite layers can be added.

Experiencing excessive residual heat leakage at low temperature? The number of graphite layers can be reduced.

This provides a simple way to optimize the Thermal Link for the specific payload and cryogenic system.

Typical Use Cases

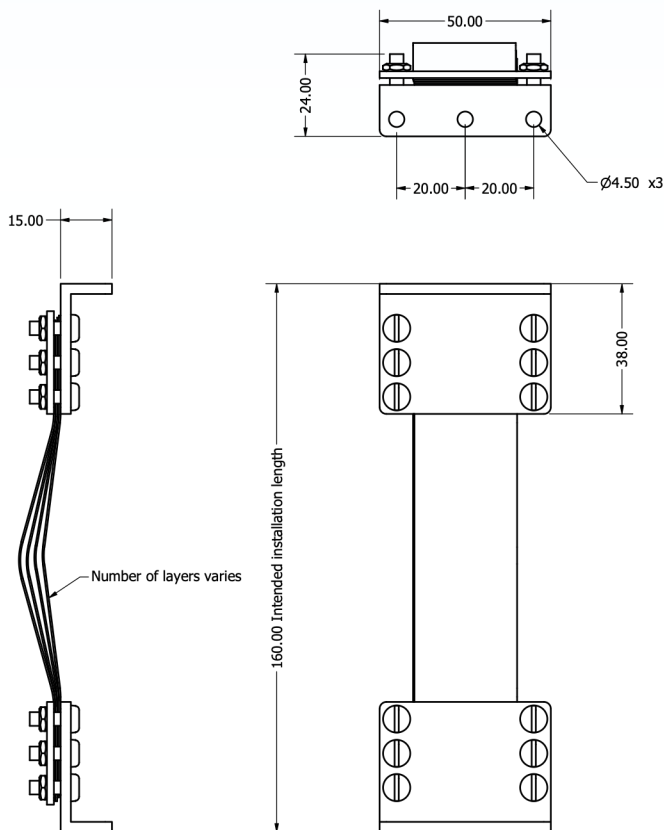
- Fast-cycling dilution refrigerators
- Large-payload dilution refrigerators
- Cryogenic component test systems

Specifications

Specification	Value
End connectors	Gold-plated high-purity copper
End mounting holes	3 × 4.5 mm on 20 mm
Graphite thickness	0.1 mm per sheet
Minimum bend radius	To be confirmed
Mass	<90 g of copper per foot (<180 g total)

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Outline Drawing



The Thermal Link is mounted using through-holes located in each copper foot. The **4.5 mm openings** accommodate either M4 or M3 fasteners.

The graphite section includes the required slack for the intended installation length, helping accommodate differential thermal contraction.

The graphite is highly flexible and can also accommodate **U-shaped or S-shaped routing** where required by the installation geometry.

Ordering Information

The Nord Cryo Thermal Link is a **made-to-order product**, allowing its dimensions and graphite configuration to be matched to the customer's cryogenic system.

Minimum length: 50 mm, measured foot-to-foot between the attached copper ends

Maximum length per section: 310 mm

The specified length already includes a small amount of slack for thermal contraction, so customers do not need to add additional length when specifying the distance between cryostat plates.

Example Configurations

NC1405-300×10

Thermal Link, 300mm, 10 layers.

NC1405-220×10

Thermal Link, 220mm, 10 layers.

NC1405-160×10

Thermal Link, 160mm, 10 layers.

NC1405-XLD

Set of three Thermal Links for XLD fridge.

Additional configurations and customizations are available. **Contact Nord Cryo with your requirements**, and we can help determine the appropriate configuration for your system.