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Vienna Cooling Box

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Purpose

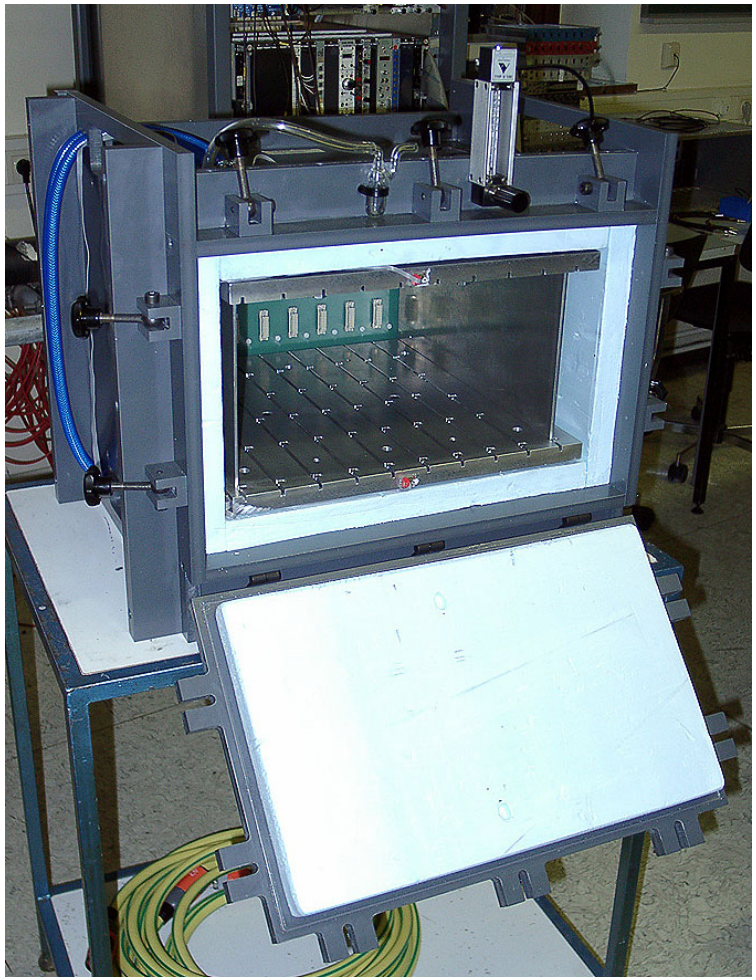
Module tests for CMS Tracker
and other accelerated ageing tests

Features

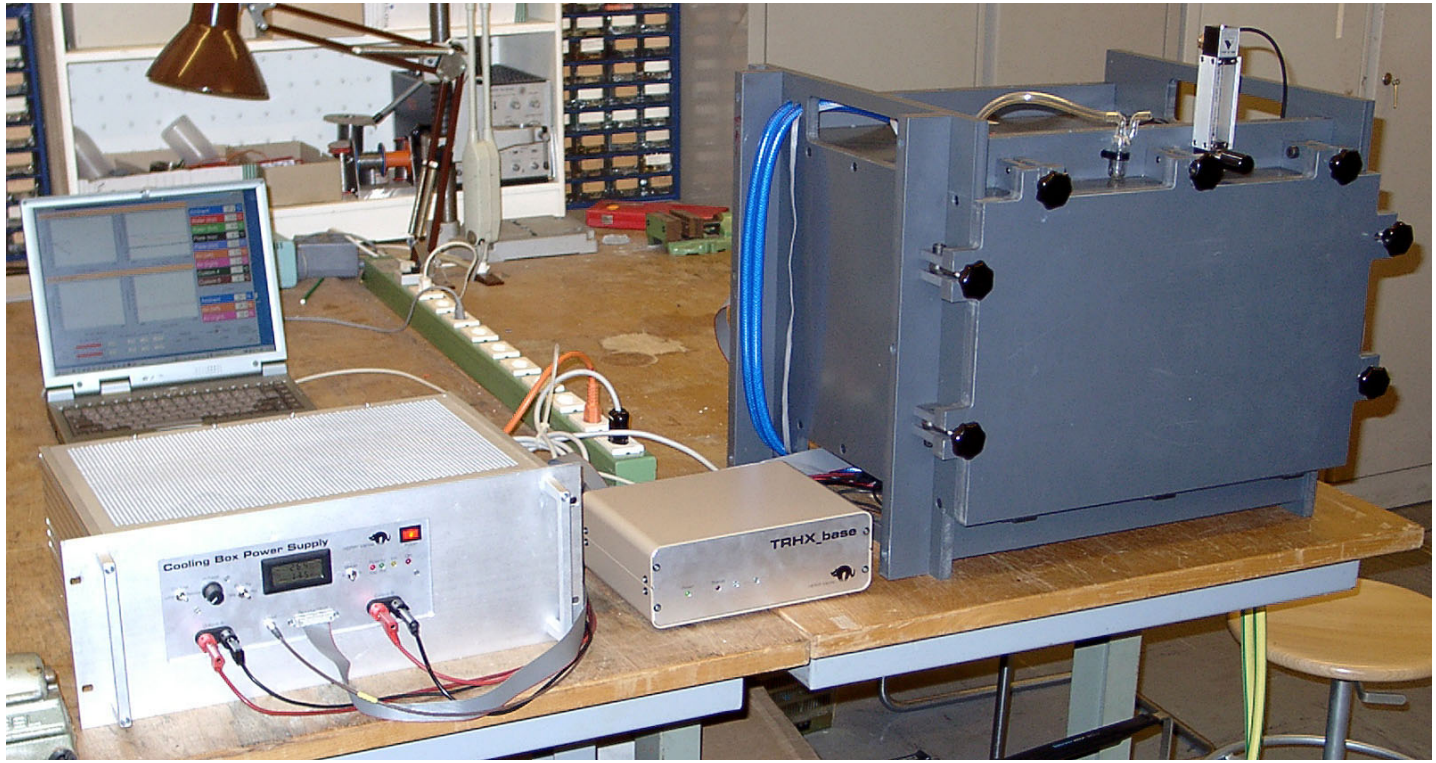
- Holds up to 10 modules
- Temperature range -30...+70°C
  (cooling or heating operation)
- TRHX monitoring and control
- Water cooled Peltier elements
- Linear power supply
- Remote control and monitoring
- Nitrogen flushing to reduce humidity

Web

http://cern.ch/friedl → Cooling Box



Photos

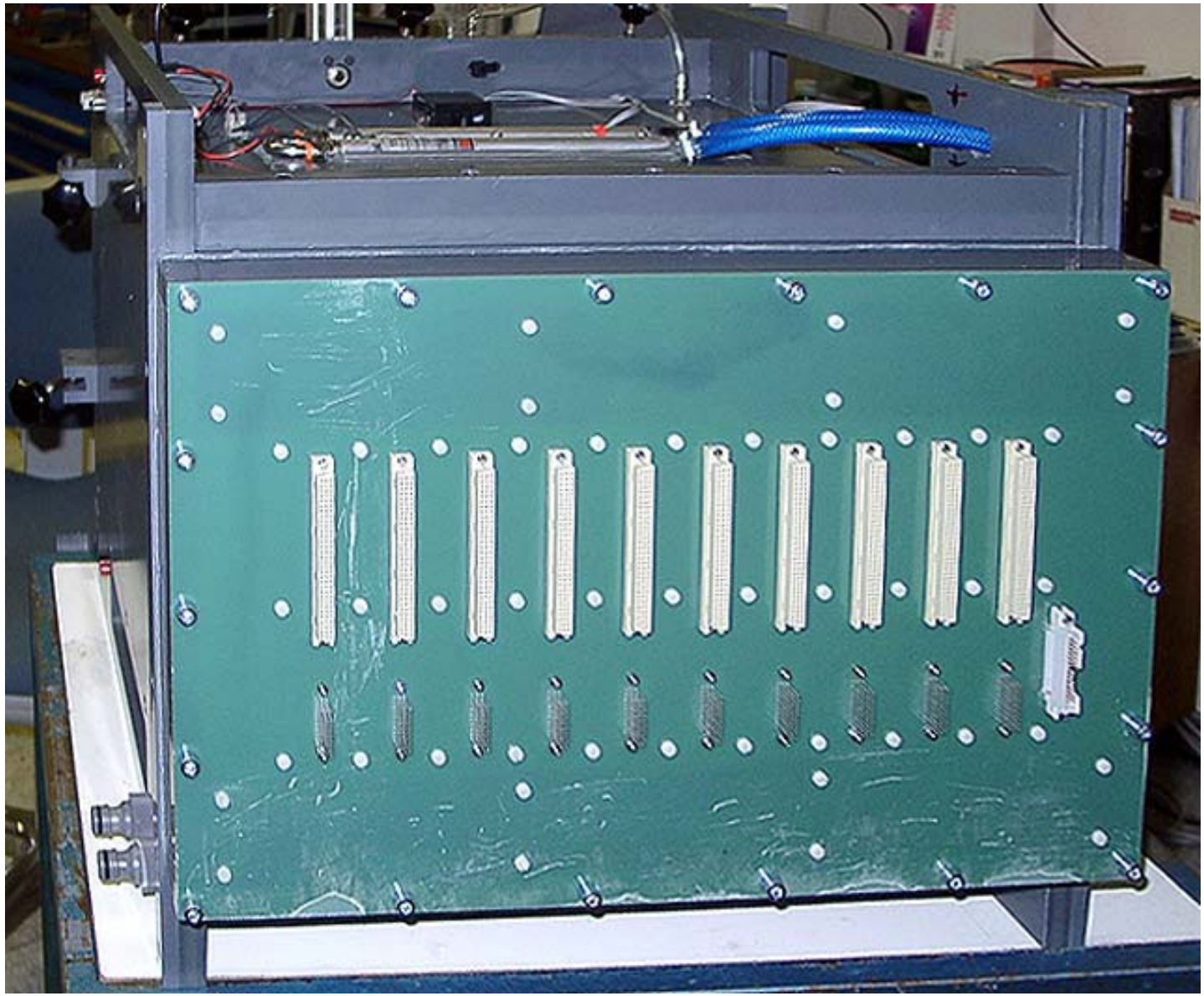


Full system:

- Cooling Box (right)
- TRHX (center)
- Power Supply (left)
- PC control (back)

Cooling Box internals

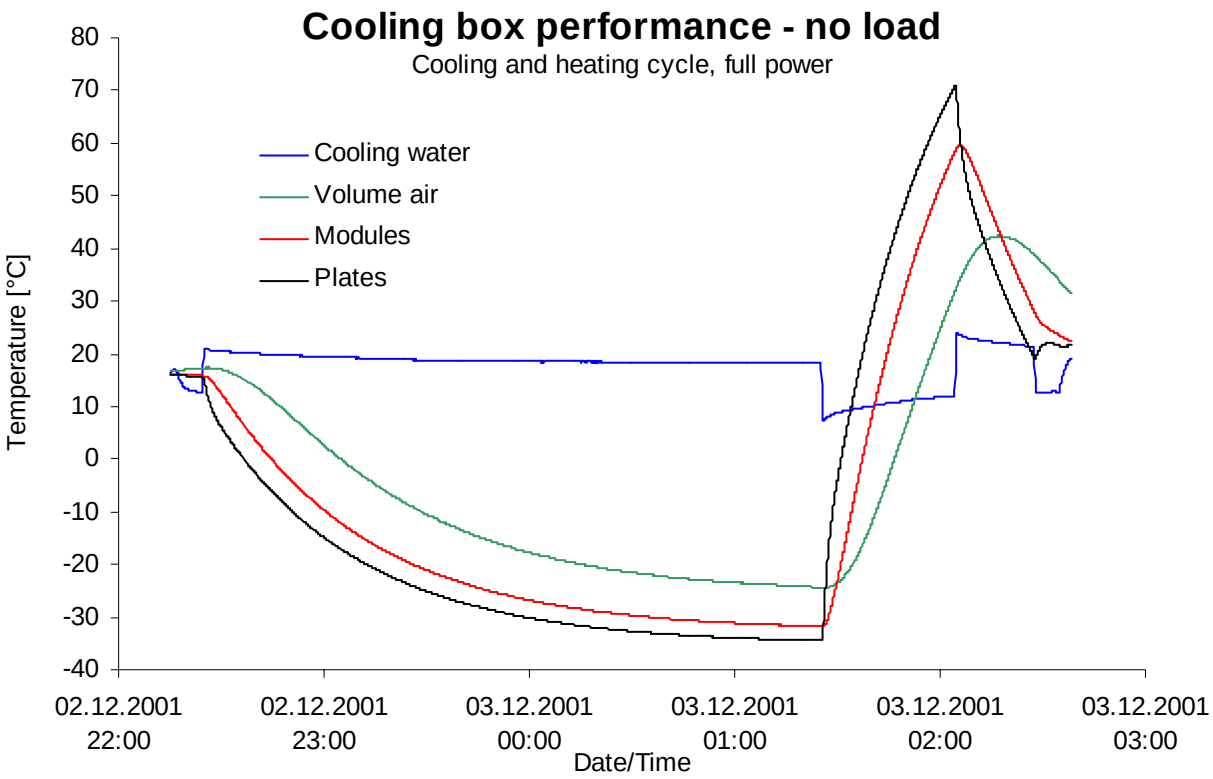
Two temperature sensors can be placed by the user (attached to inserts here)



Backplane for VUTRI and auxiliary modules

Extra connector (bottom right) is for internal temperature and humidity sensors

Performance – no load



Full power, no load

Room → -30°C: ≈1.5hrs

-30°C → +70°C: ≈40min

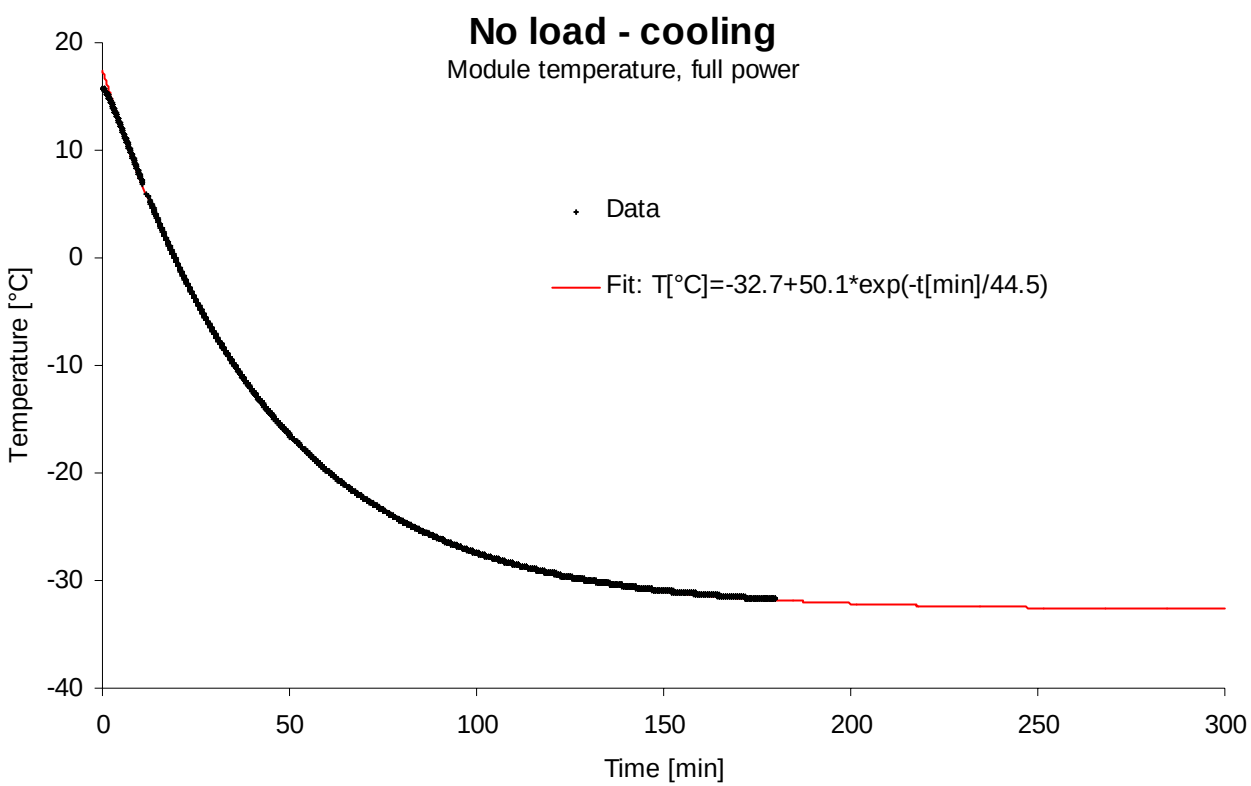
Water flow ≈5l/min

Legend:

Plates: cold side of Peltier elements

Modules: Inserted module transportation plates

Cooling – no load



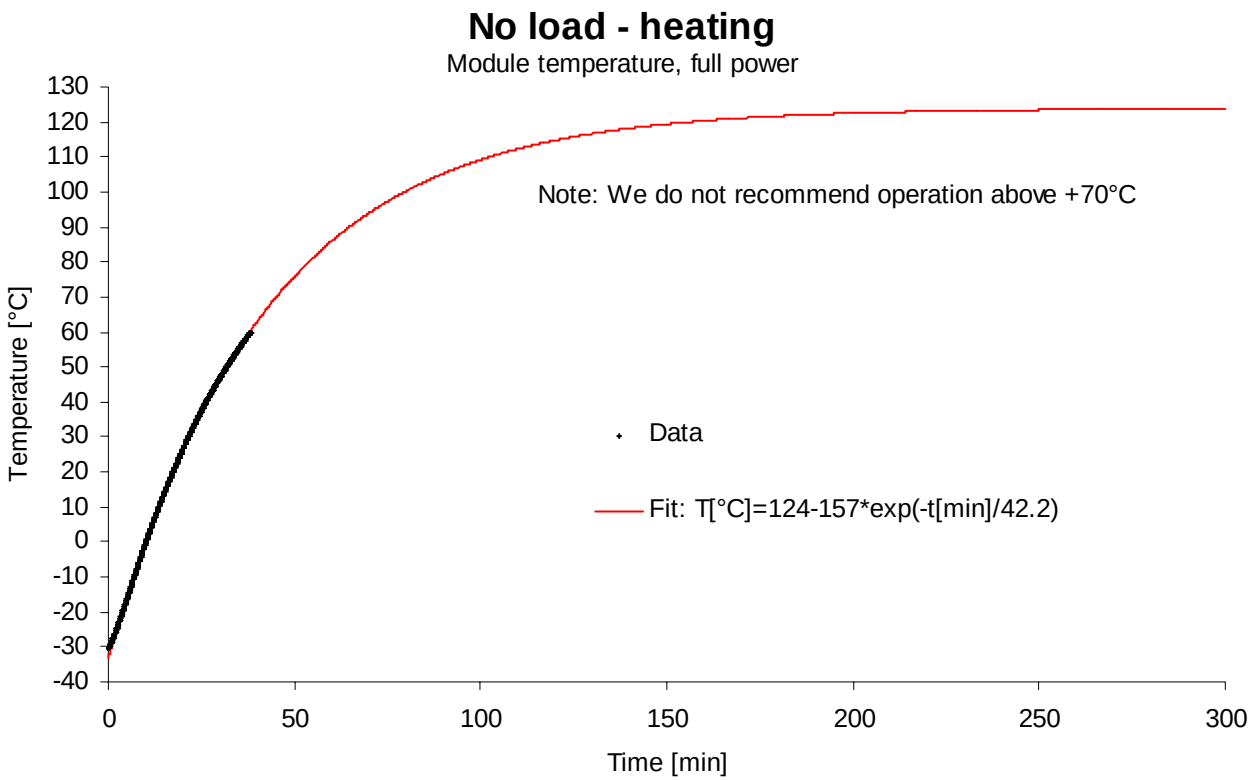
Full power, no load

First-order system

Time constant: 44.5min

T_∞=-33°C (depending on water temperature)

Heating – no load



Full power, no load

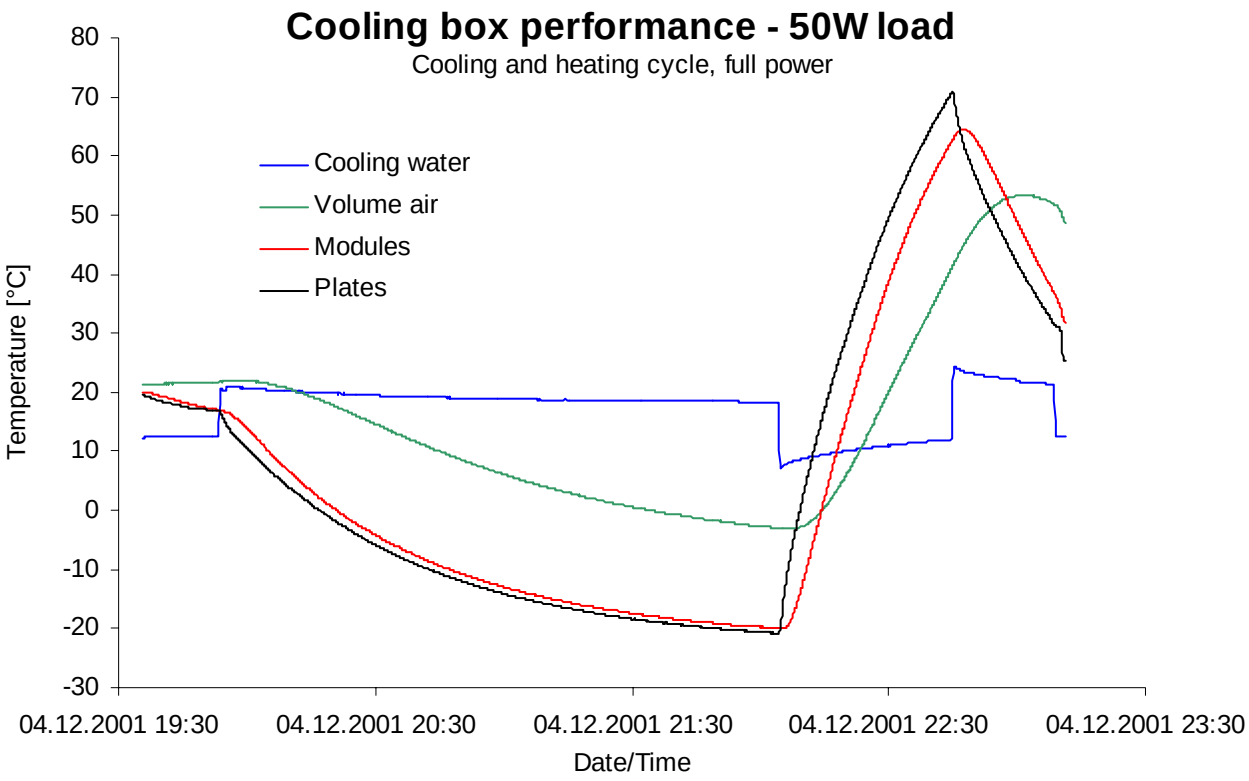
First-order system

Time constant: 42.2min

T_∞ = 124°C (depending on water temperature) – extrapolation

We do not recommend operation above +70°C

Performance – 50W load



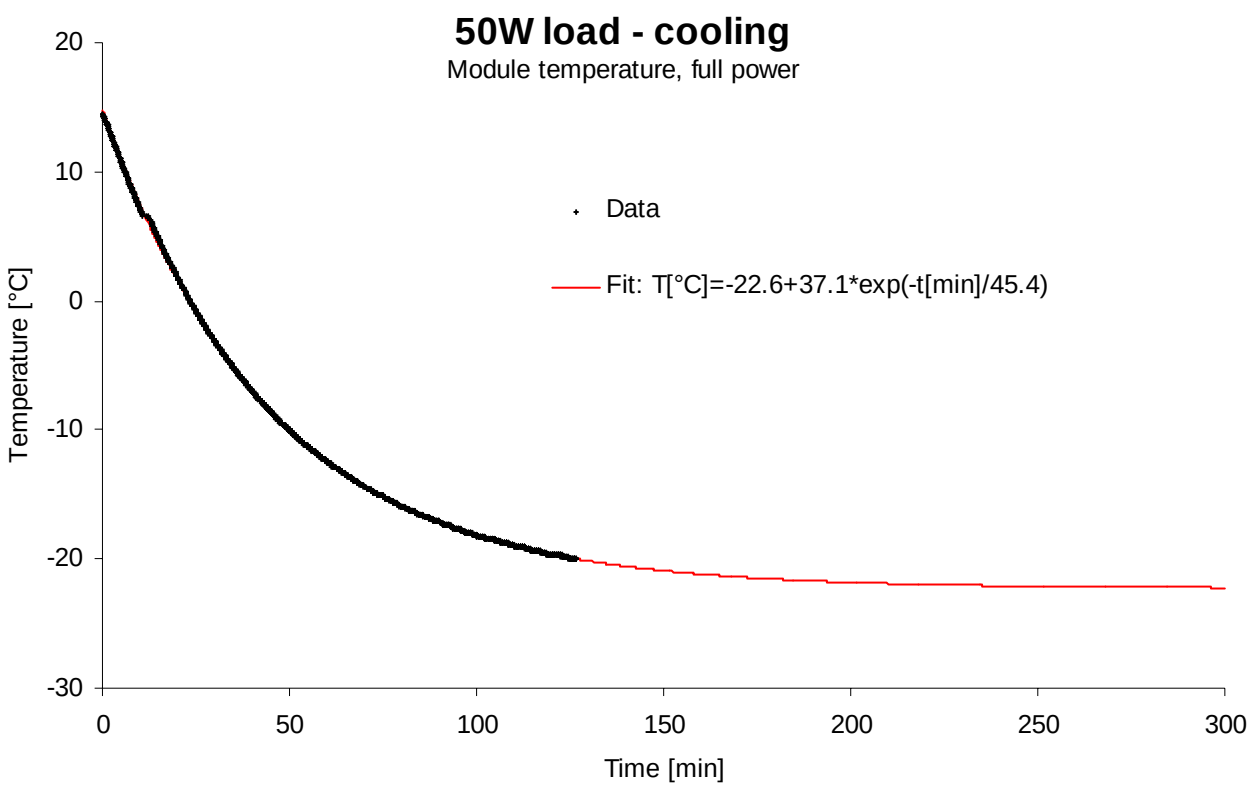
Full power, 50W load

10 modules with 6 APVs each dissipate ≈25W at nominal settings

Room → -20°C: ≈1.5hrs

-20°C → +70°C: ≈40min

Cooling – no load



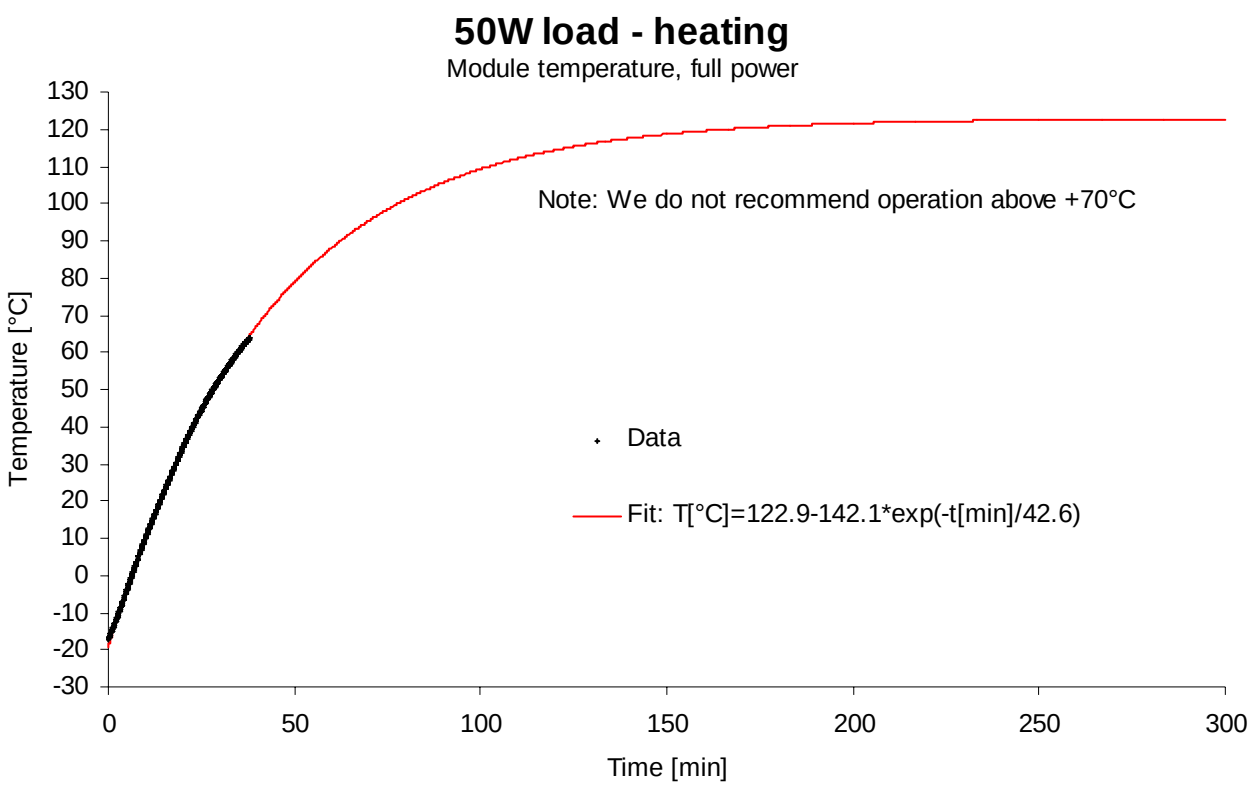
Full power, 50W load

First-order system

Time constant: 45.4min

T_∞=-23°C (depending on water temperature)

Heating – no load



Full power, 50W load

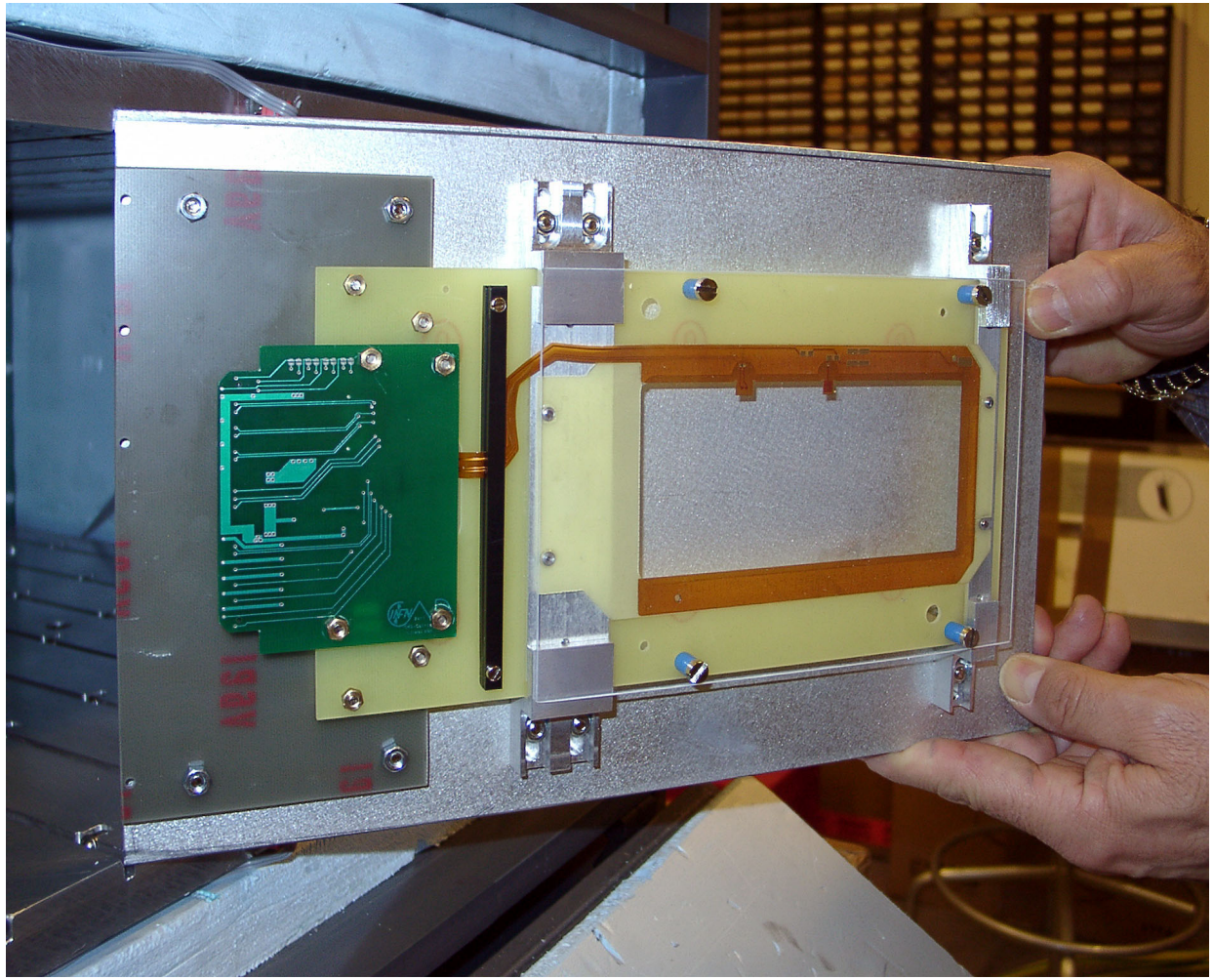
First-order system

Time constant: 42.6min

T_∞ = 123°C (depending on water temperature) – extrapolation

We do not recommend operation above +70°C

Module transportation plate



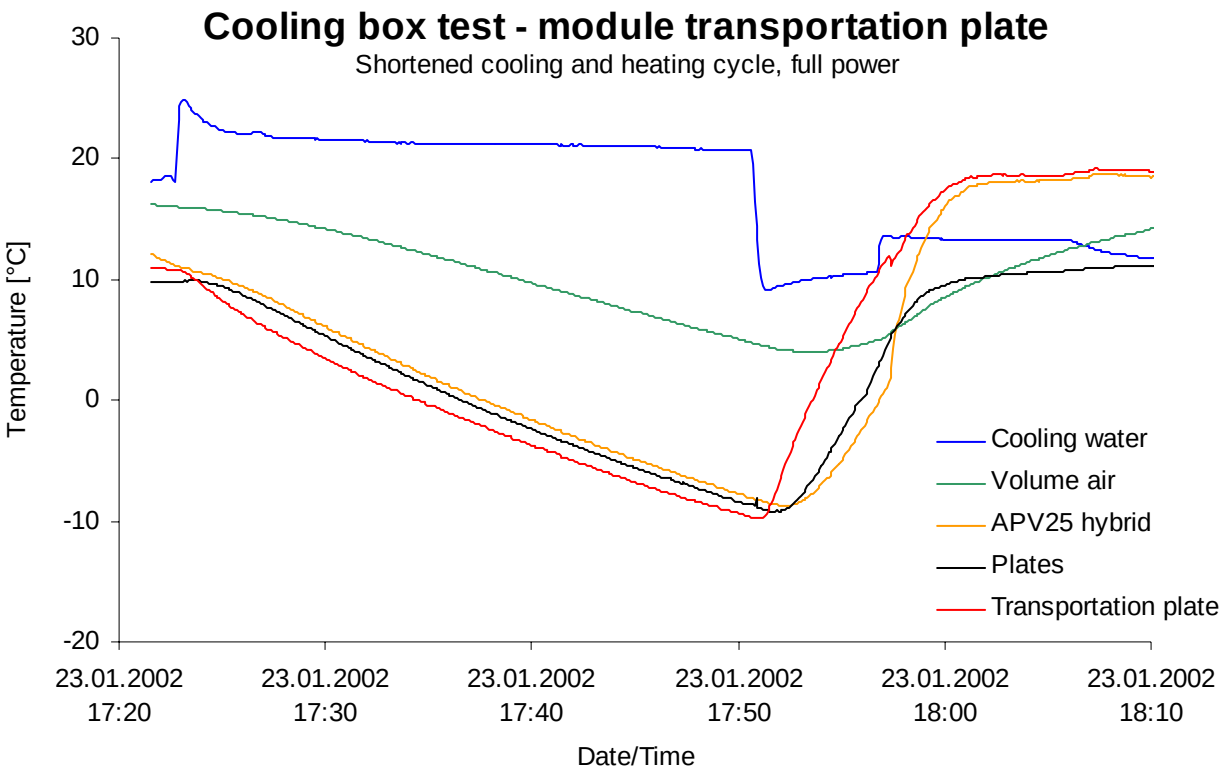
Provided by Paolo Tempesta (Paolo.Tempesta@ba.infn.it)

Tested with connectors: fits perfectly

Cooling test

Two temperature probes attached to transportation plate and to APV25 location

Module transportation plate



Full power, quick test (cooling stopped before reaching saturation)

Both transportation plate and APV25 hybrid closely follow plate temperature

Transportation plate responds a bit faster than plates because plate sensors are located on the outside edge (i.e. thermal delay line)

Technical data

Peltier	2 elements with 350W max. each
Power supply	Dual channel linear power supply
	Each channel individually adjustable between 0...25V
TRHX	Temperature and humidity monitoring
	Remote control and monitoring of power supply

Temp. range	-25°C...+70°C (with 10 modules installed ≈ 25W)
Time constant	≈44min (first order system)
Cooling speed	Room temperature → -25°C: ≈1.5hrs
Heating speed	-20°C → +70°C: ≈40min

Price list

Components	Cooling Box mechanics (including 2 Peltier elements, gas flow meter and bubbler)	CHF 3000
	Cooling Box power supply (dual linear 0...25V 15A)	CHF 1800
	TRHX_base + 3 combined sensors + 3 dual temperature sensors	CHF 1440
	Shipping	CHF 100
Payment	TID is preferred method	
Contact	Manfred Pernicka <pernicka@hephy.oeaw.ac.at> (Cooling box)	
	Markus Friedl <markus.friedl@cern.ch> (Power supply, TRHX)	