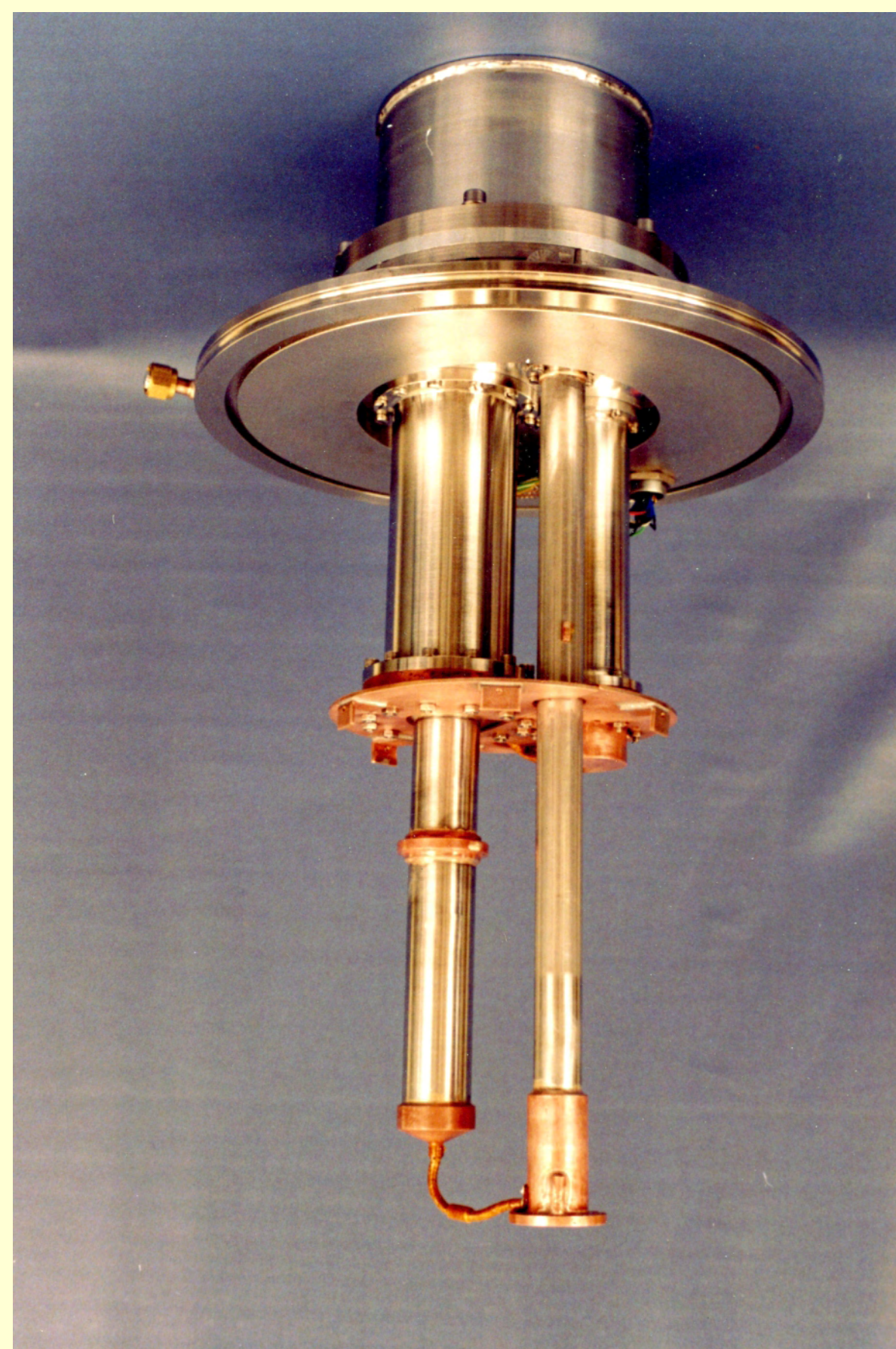
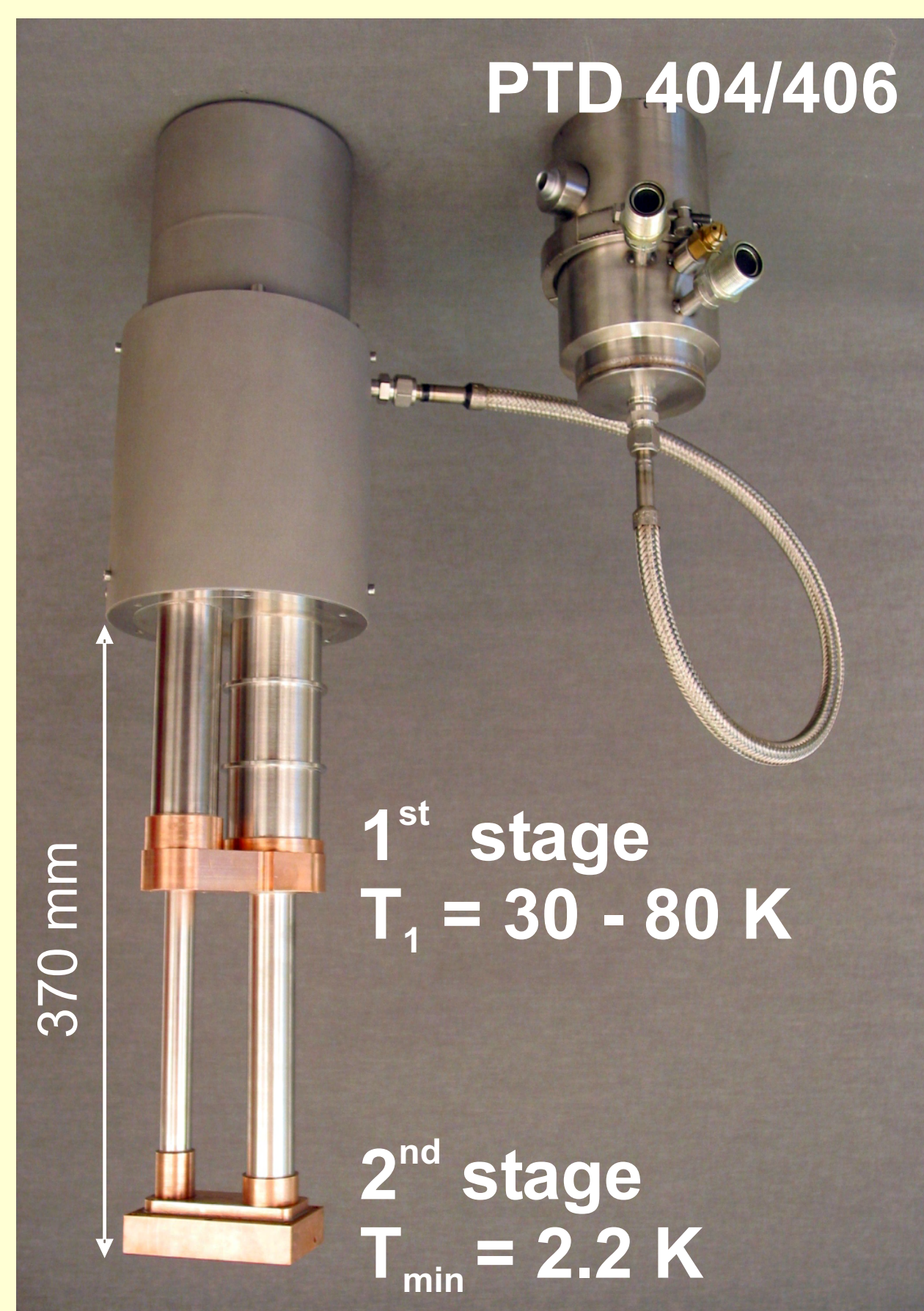
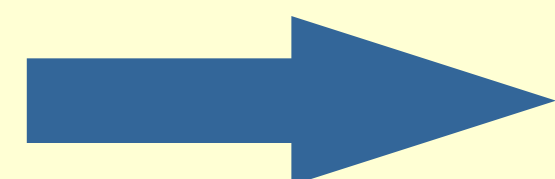


4 Kelvin Pulse Tube Coolers (PTCs)

Very First 2-Stage 4 K PTC

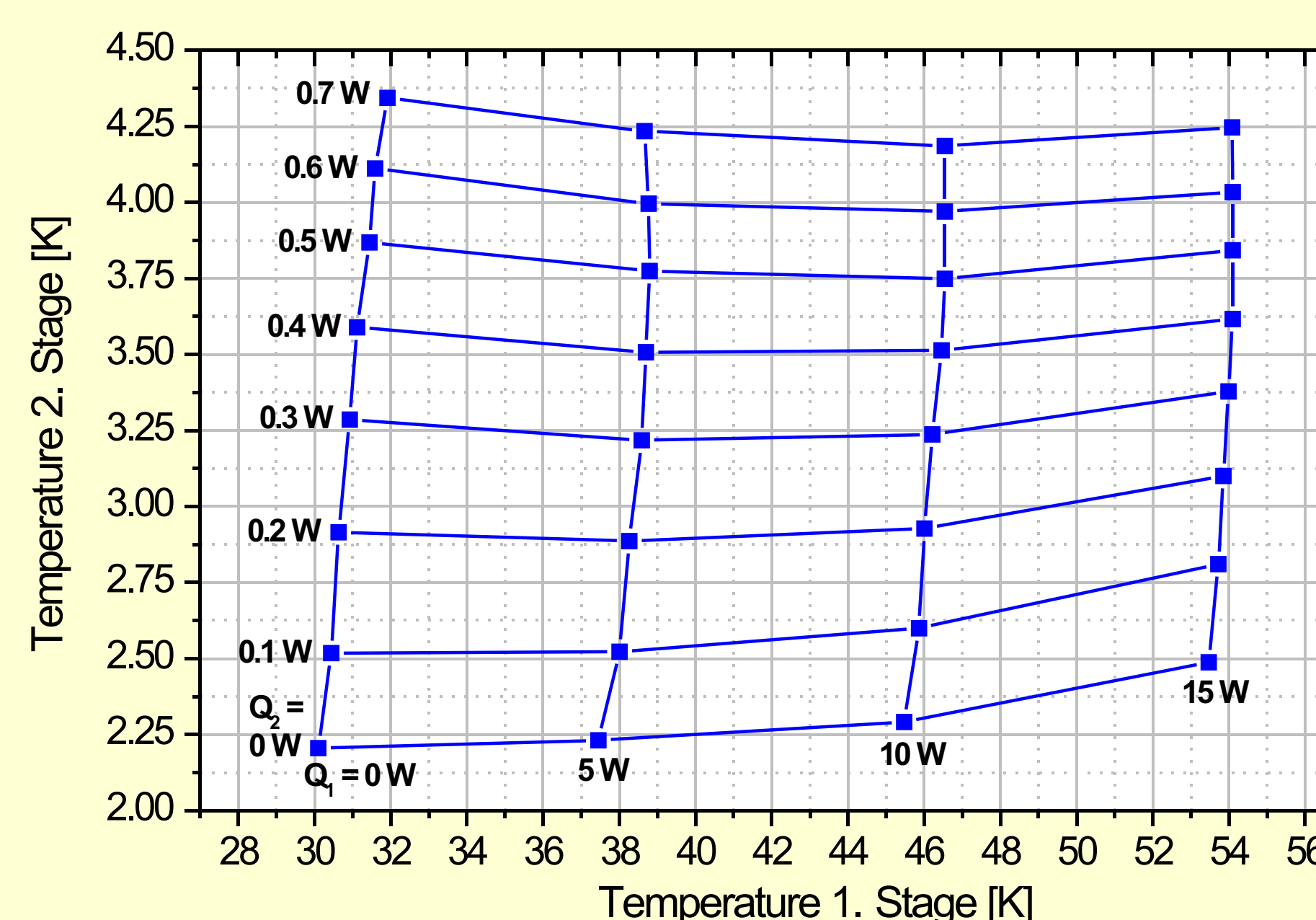


University
of Giessen
1996



Current 4 K PTCs of TransMIT Giessen

Type	Compressor	Base Temp.	Cooling Power	Cooldown Time 4 K
PTD 411	CP6000 + 4000, 10 kW	< 2.4 K	1.1 W @ 4.2 K	< 70 min
PTD 406	CP6000, 6 kW	< 2.4 K	0.7 W @ 4.2 K	< 75 min
PTD 404	CP4000, 4 kW	< 2.5 K	0.5 W @ 4.2 K	< 90 min
PTD 402	CP2000, 2 kW	< 3.0 K	0.15 W @ 4.2 K	< 180 min



Typical
load map
of PTD 406

Application Samples

Helium liquefaction
0.3 - 0.7 liter / h

Adiabatic demagnetisation

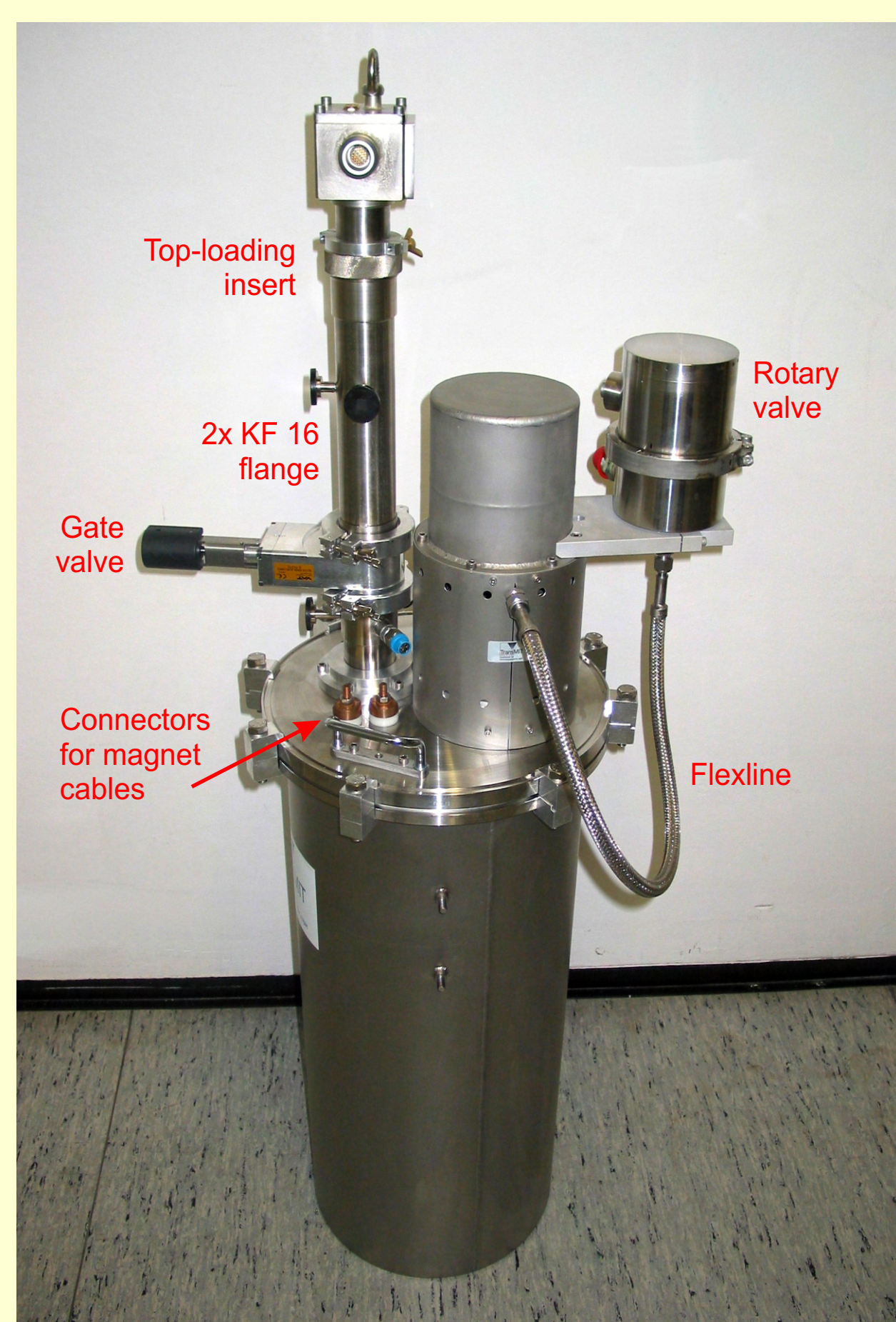
Cooling of Josephson-
voltage-standards
T = 5 mK IPHT Jena
PTB Braunschweig

5 T magnet with persistent
mode switch

5 T magnet
system with
50 mm top-
loading insert

$T_{Magnet} = 3 K$

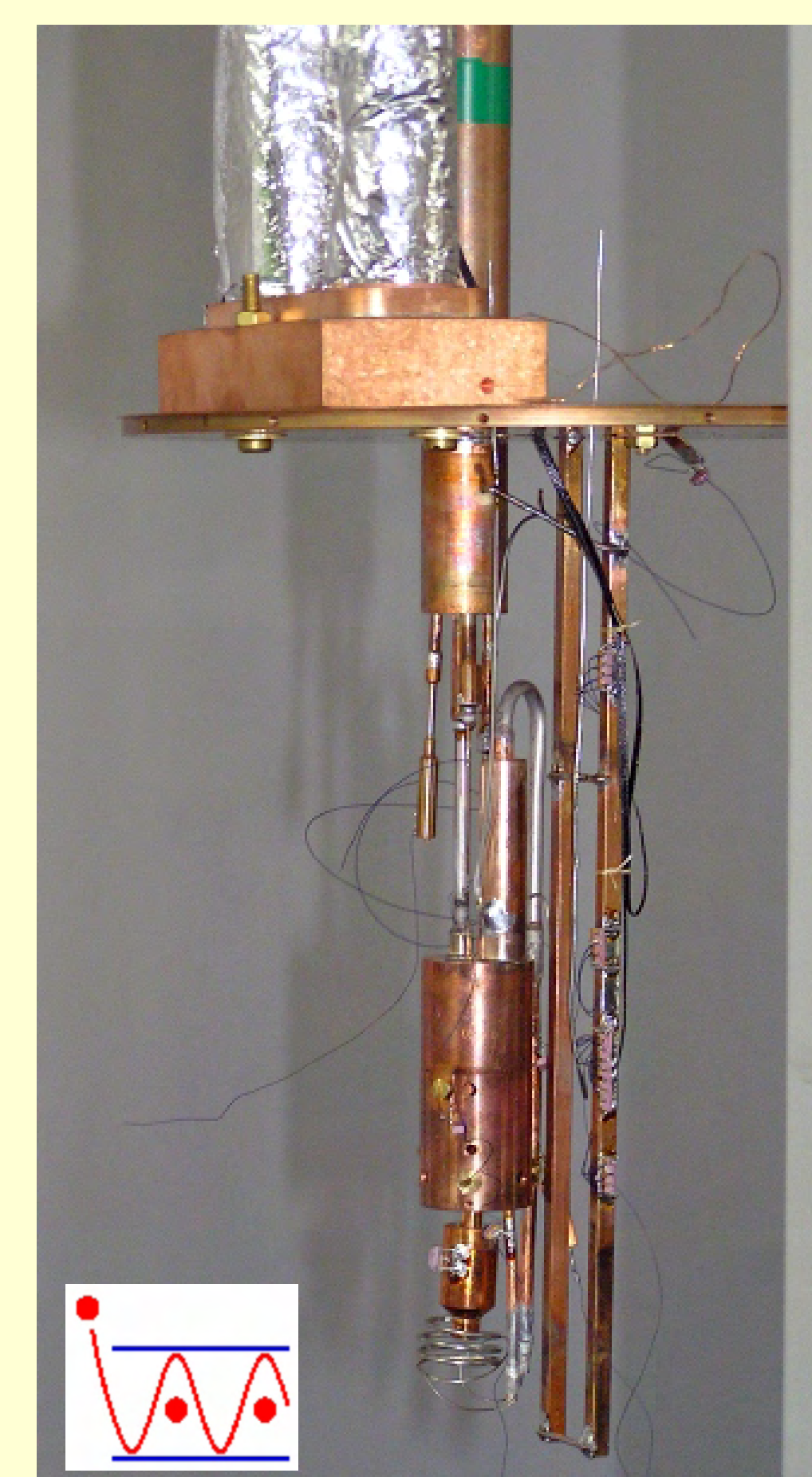
CP6000
compr.
(6 kW)



Precooling of
an autonomous
³He-⁴He dilution
refrigerator

$T_{min} = 50 mK$

*Institute of
Applied Photonics
Berlin Adlershof*

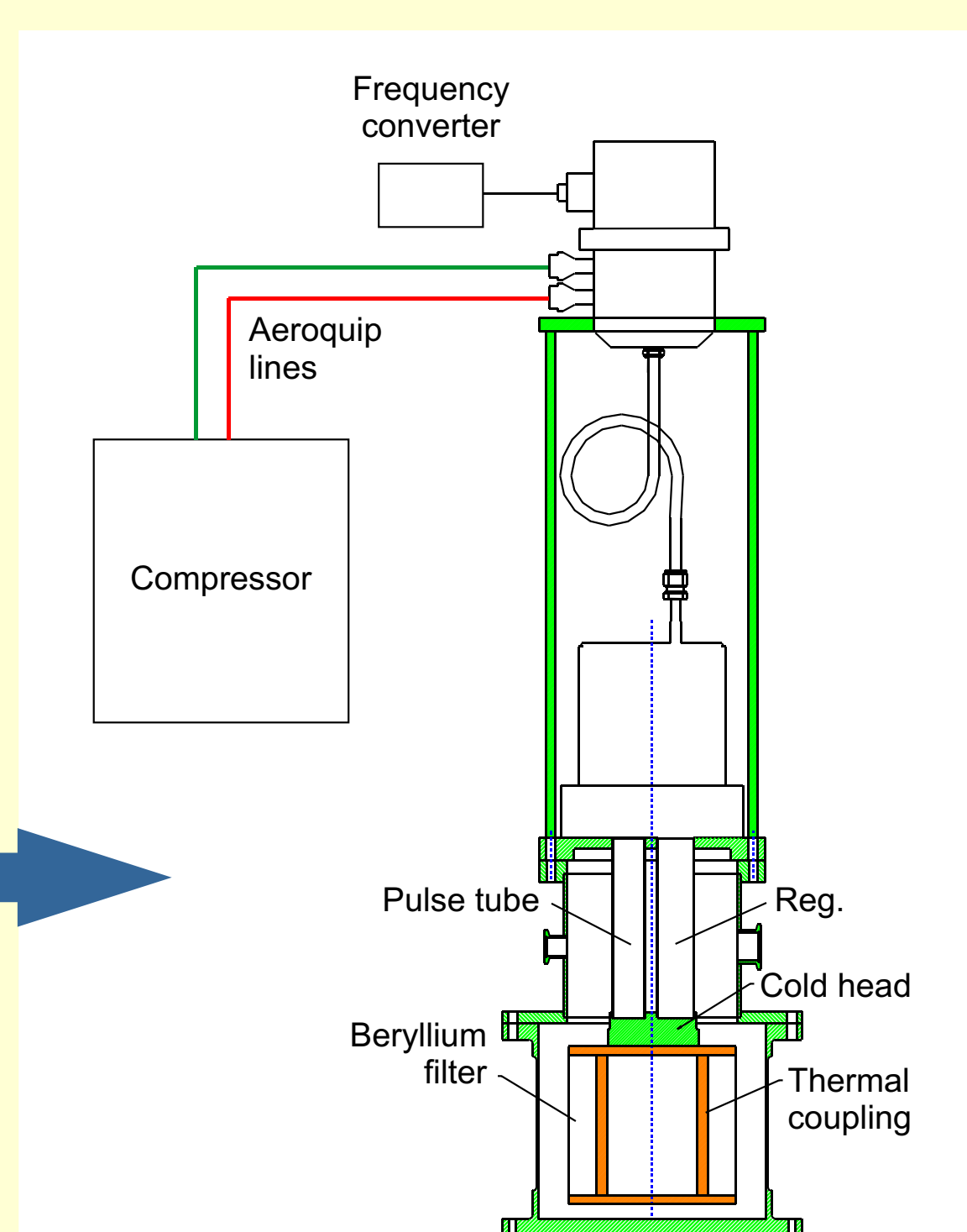


Single-Stage PTCs for T = 30 K

PTC PTS 8030 with air-cooled 2 kW compressor
Cooldown to 80 K: 25 min
Cooling power: 30 W @ 80 K



Application sample:
Cooling of a Beryllium filter
Hahn-Meitner Institute Berlin

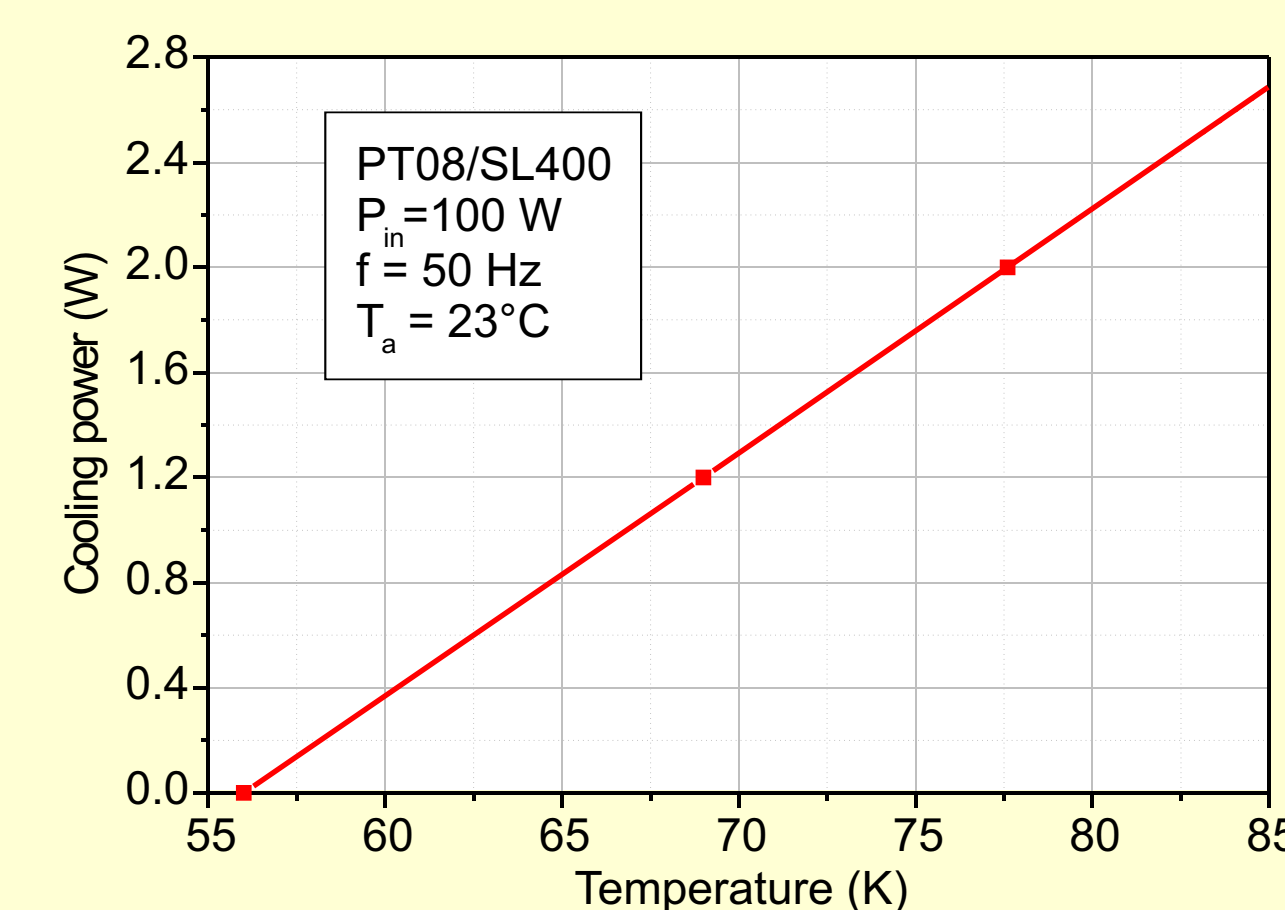
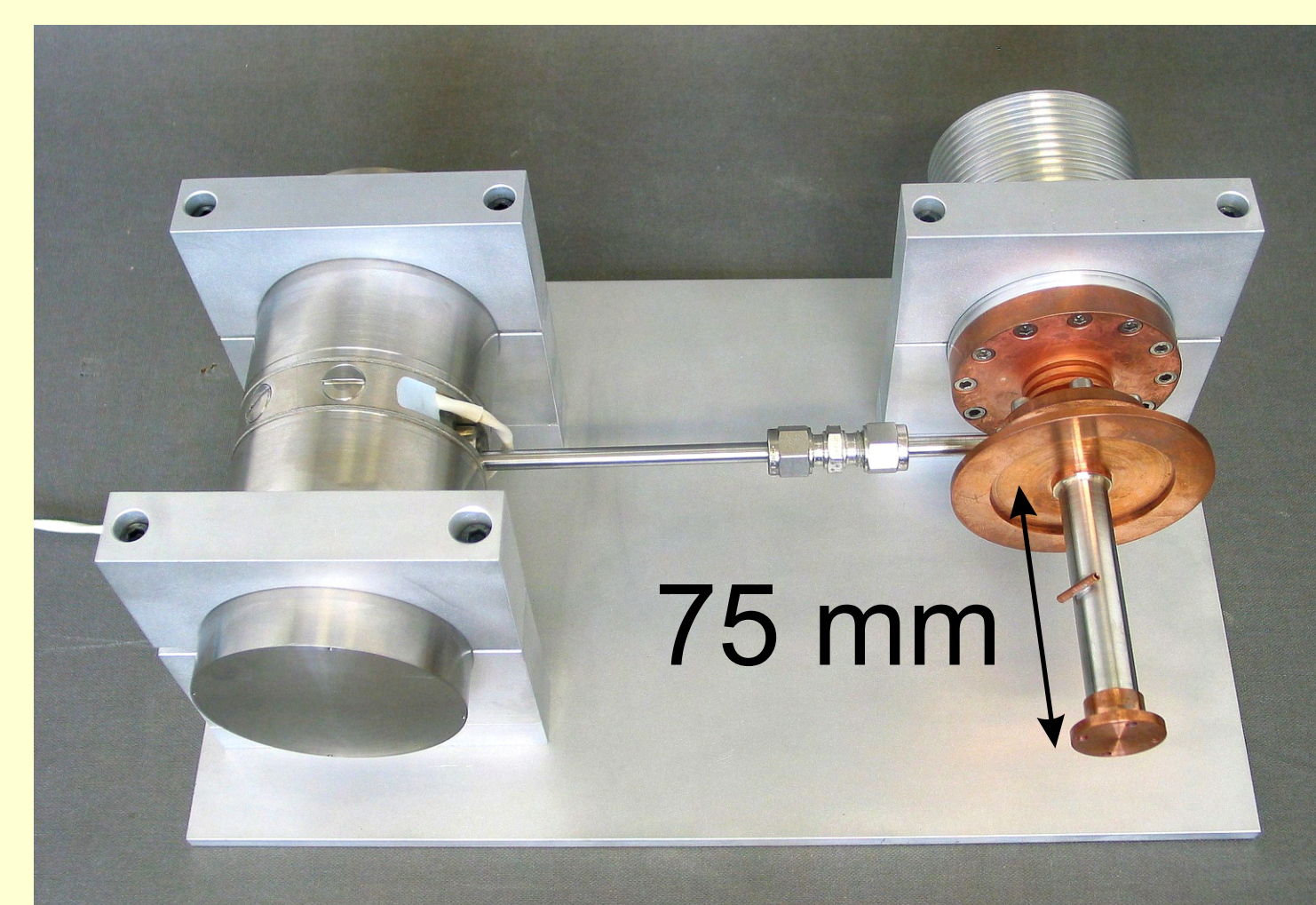


Cooldown
time of
Be-filter:
170 min
to 80 K

$T_{Be-filter}$
= 39 K

Miniature PTCs for T = 60 K

Stirling-type PTC PT08 with coaxial coldfinger
operated on linear compressor with dual-opposed
pistons



- Input power: 100 W
- Cooling power: 2 W @ 80 K
- High frequency (50 Hz)

Cooler operates in all orientations

Application sample:
Gas adsorption experiments *Hahn-Meitner Institute Berlin*