ILK Dresden

Cooling System for a Superconducting DC-Rail

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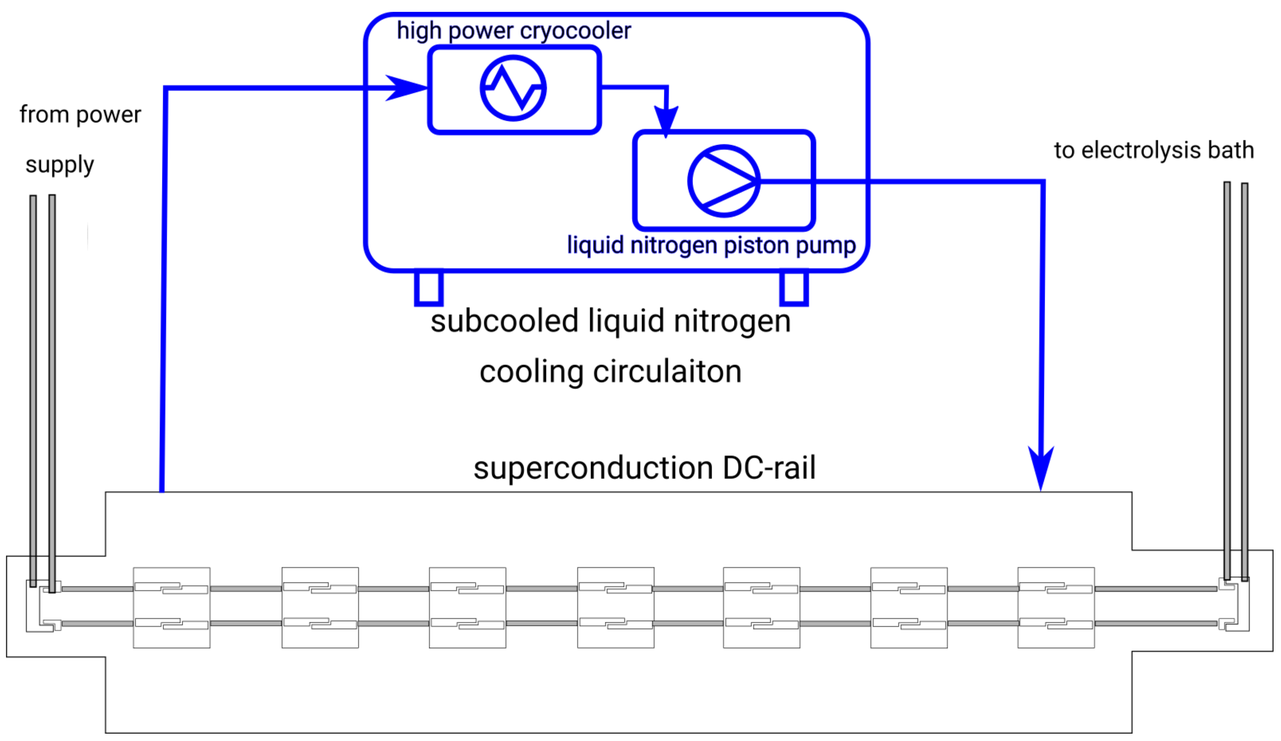
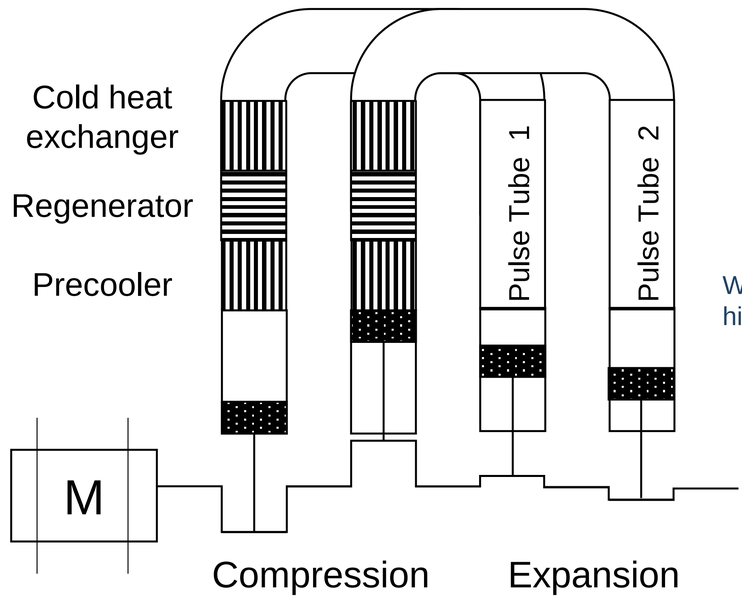
Objective

- Within the framework of the government founded research project “3S-SupraStromSchiene”,a superconducting DC-rail for a chlorine electrolysis plant was designed and is currently under final construction.
- The ILK Dresden is responsible for the development of the cooling system consisting mainly of a special high-power cryocooler and a cryogenic liquid pump.



The high-power cryocooler → an ILK Dresden development

- New pulse tube concept operating by use of the expansion work at the warm end of the pulse tube
- Using of two adapted commercial compressor, one acting as compressor the other as expander
- The phase shift between pressure wave and volume flow can be optimized via the crank angle concerning the two compressors
- **Improvement of cooling power and coefficient of performance (COP)**
- Cooling capacity: designed for **1000 W @ 65 K**
- Working fluid: Helium at 40 bar, operating frequency: 13 Hz
- Phase shift between expansion and compression: 80 … 135°
- Footprint: 1200 × 800 mm² (europallet)



Working principle of the high power cryocooler

The cryogenic liquid pump → an ILK Dresden development

- No mechanical link to 300 K (only electrical power supply needed), no problems with thermal expansion, no mechanical feedthrough means no leakage problems
- Double acting piston pump driven by an electro dynamic linear motor

“Linear Cold Drive”

Temperature range:	**4 K to 300 K**,	3S-Project: 68 K
Cryogenic media:	**e.g. LHe, LH_2, LN_2, LAr, LNG**	3S-Project: LN_2
Volume flow:	**up to 1000 liters per hour** (depending on design)	3S-Project: 400 l/h
Pressure range:	**up to a few hundred bar** (depending on design)	3S-Project: 2 bar

For a video of the running pump, go to: http://www.ilkdresden.de/cryogenicpump or scan the QR-code

High capacity pulse tube cryo cooler at test stand

3S-SupraStromSchiene
(project no. 03ET129C)
Project partner:
VISION ELECTRIC Super Conductors
Karlsruher Institut für Technologie
ILK Dresden
ptj Projektträger Jülich Forschungszentrum Jülich
Gefördert durch: Bundesministerium für Wirtschaft und Energie aufgrund eines Beschlusses des Deutschen Bundestages

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