

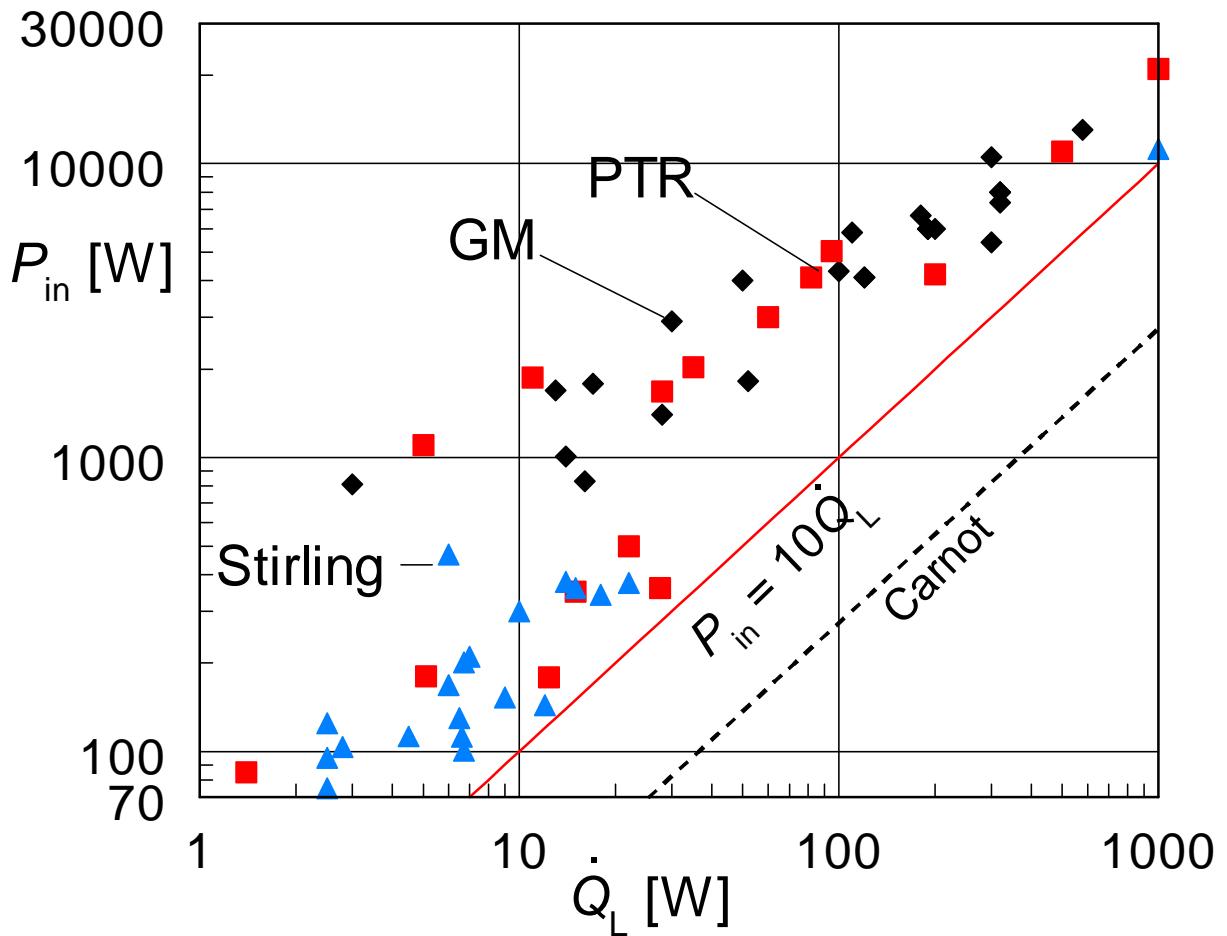
challenges of cryocooling

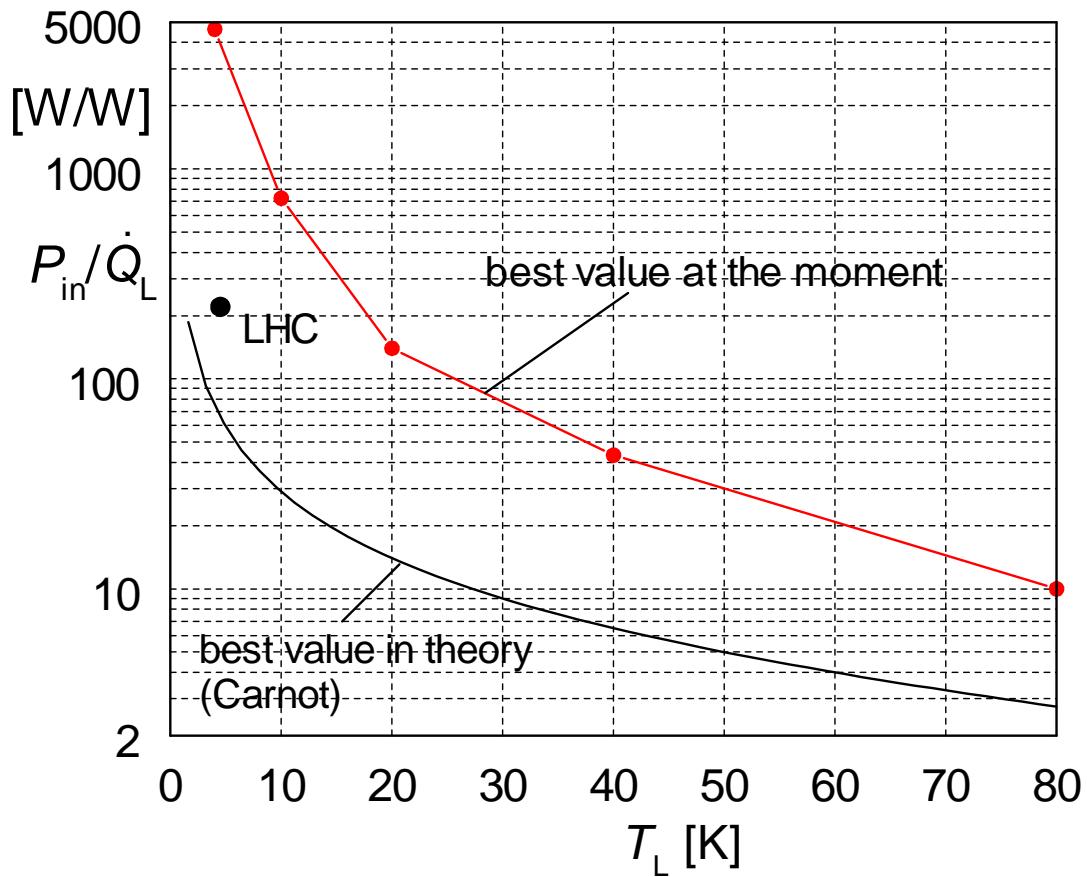
the invisible cooler (random order)

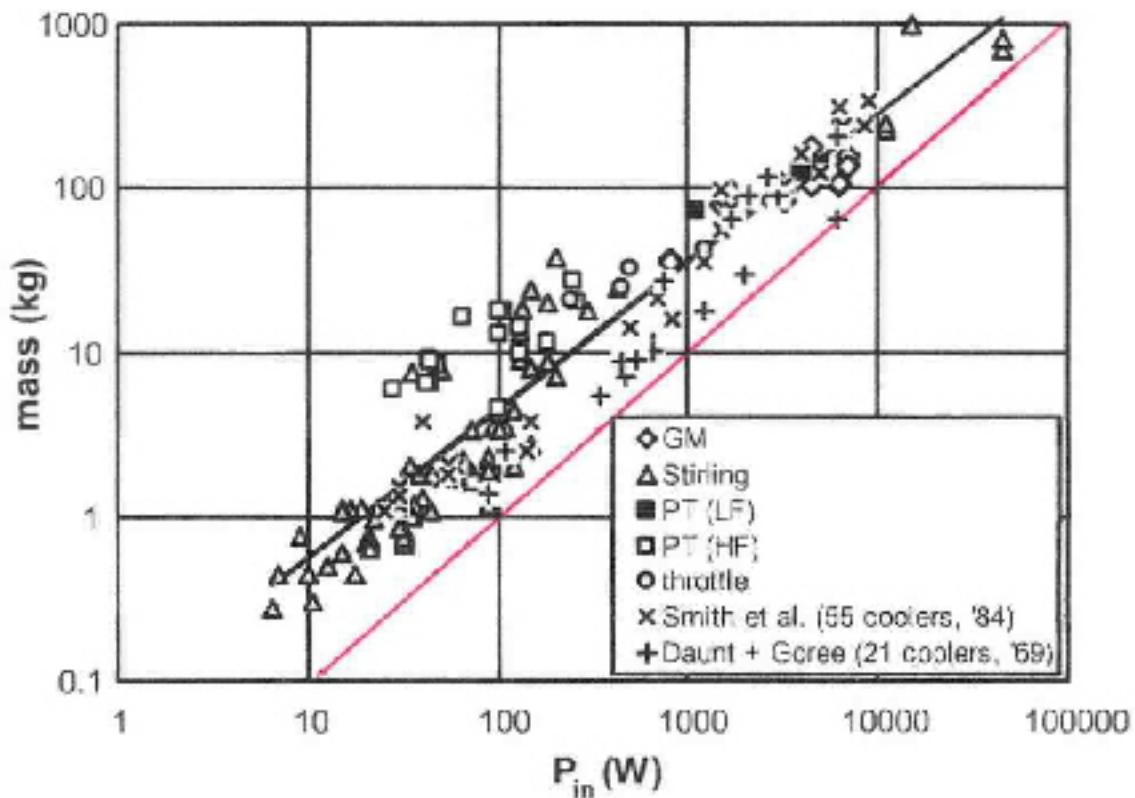
- no cost
- no maintenance
- no noise
- no vibrations
- no EM interference
- no space
- no weight
- no condensed water or ice
- no vacuum pump
- no cooling water
- no.... alternative

H.J.M. ter Brake, G.F.M. Wiegerinck, *Low-power cryocooler survey* Cryogenics 42 (2002) 705–718

input power versus cooling power at $T_L = 80$ K

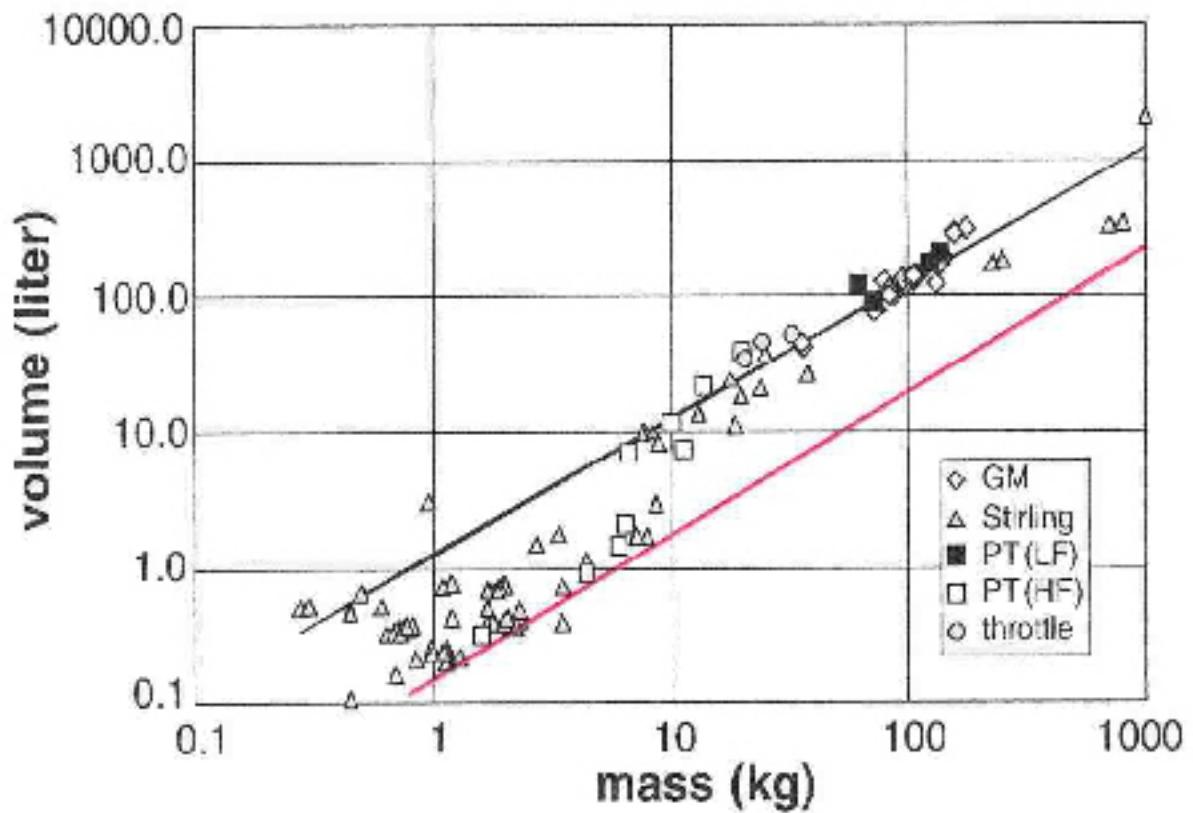






lowest mass M (cold head plus compressor plus electronics) versus P_{in} (red line ($M = 0.01P_{in}$) too optimistic?)

$$\frac{M}{\text{kg}} = 0.03 \frac{P_{in}}{\text{W}}$$



smallest volume

$$\frac{V}{\text{liter}} = 0.2 \frac{M}{\text{kg}}$$

density 5 kg/liter

a cooler with 100 W cooling power at 80 K

	e.g. AL125	possible
	50 Hz, air cooled	
P_{in} [W]	3500	1000
M [kg]	89	30
V [liter]	160	6

the future is for crank-driven Stirling?