

# Leak and pressure tests in magnets production chain

Galimov A.R.  
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# Applied helium leak test methods

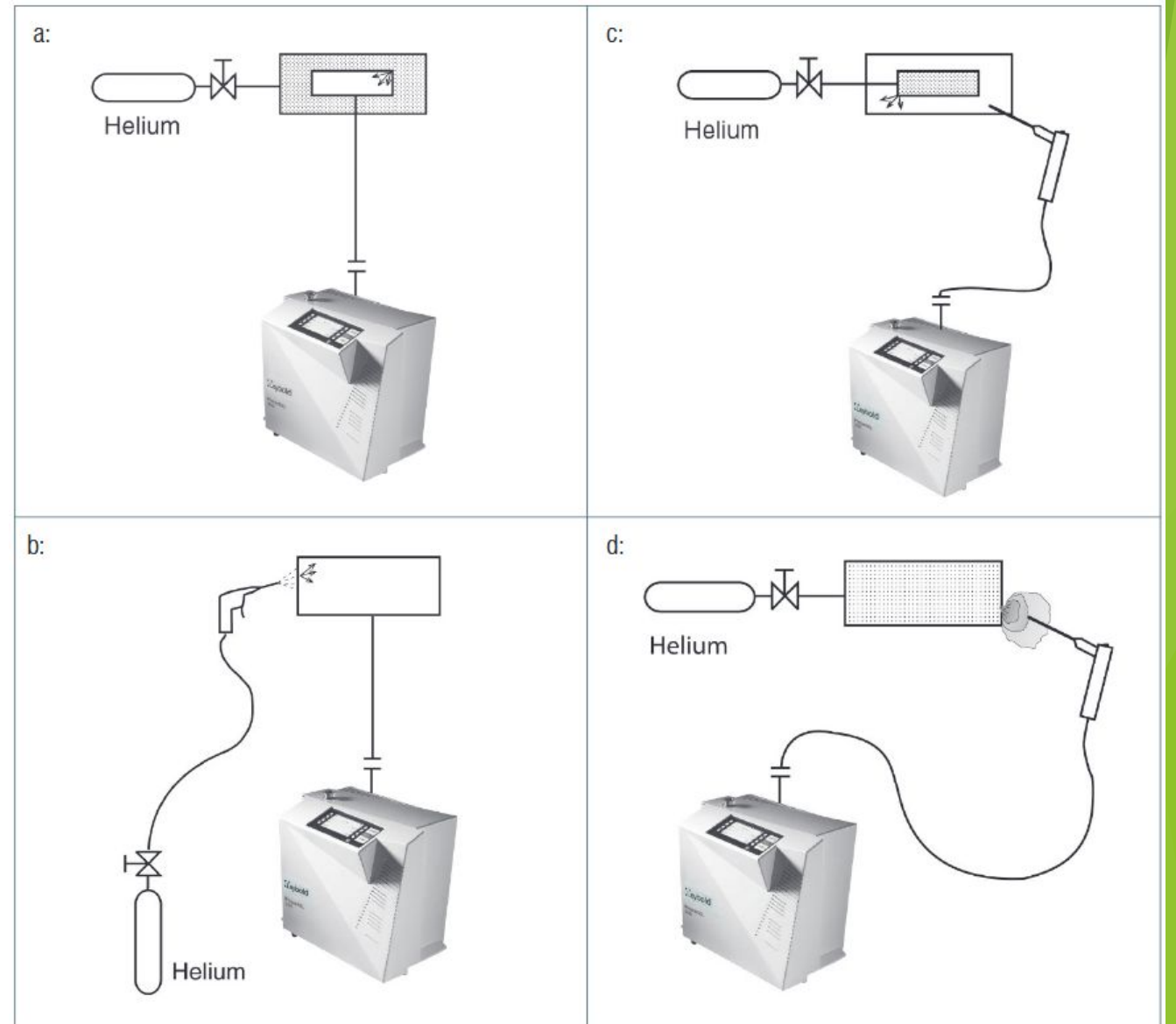
- ▶ A) Enclosure test (integral leak detection);
- ▶ B) Spray technique (local leak detection);
- ▶ C) Enclosure test (integral leak detection);
- ▶ D) Sniffer technique (local leak detection)
- ▶ E) Bubble test

Leak detectors:

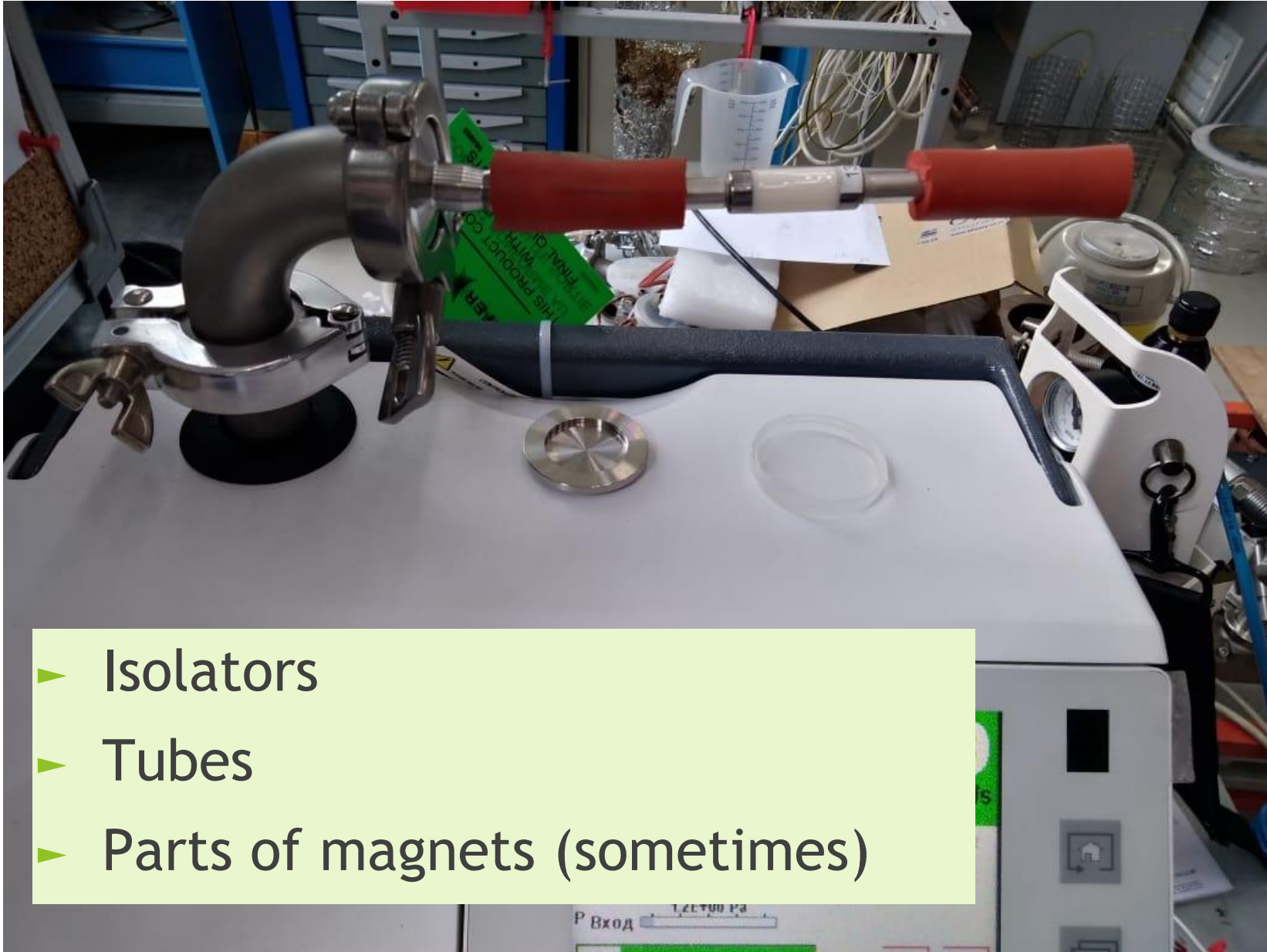
- ▶ ASM310
- ▶ ASM380
- ▶ HLT575
- ▶ ASM340

Maximum sensitive:

$5 \times 10^{-13}$  Па $\cdot$ м<sup>3</sup>/с ( $5 \times 10^{-12}$  mbar $\cdot$ l/c)

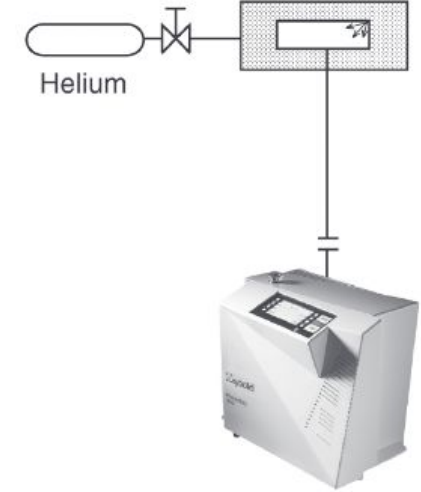


# Enclosure test



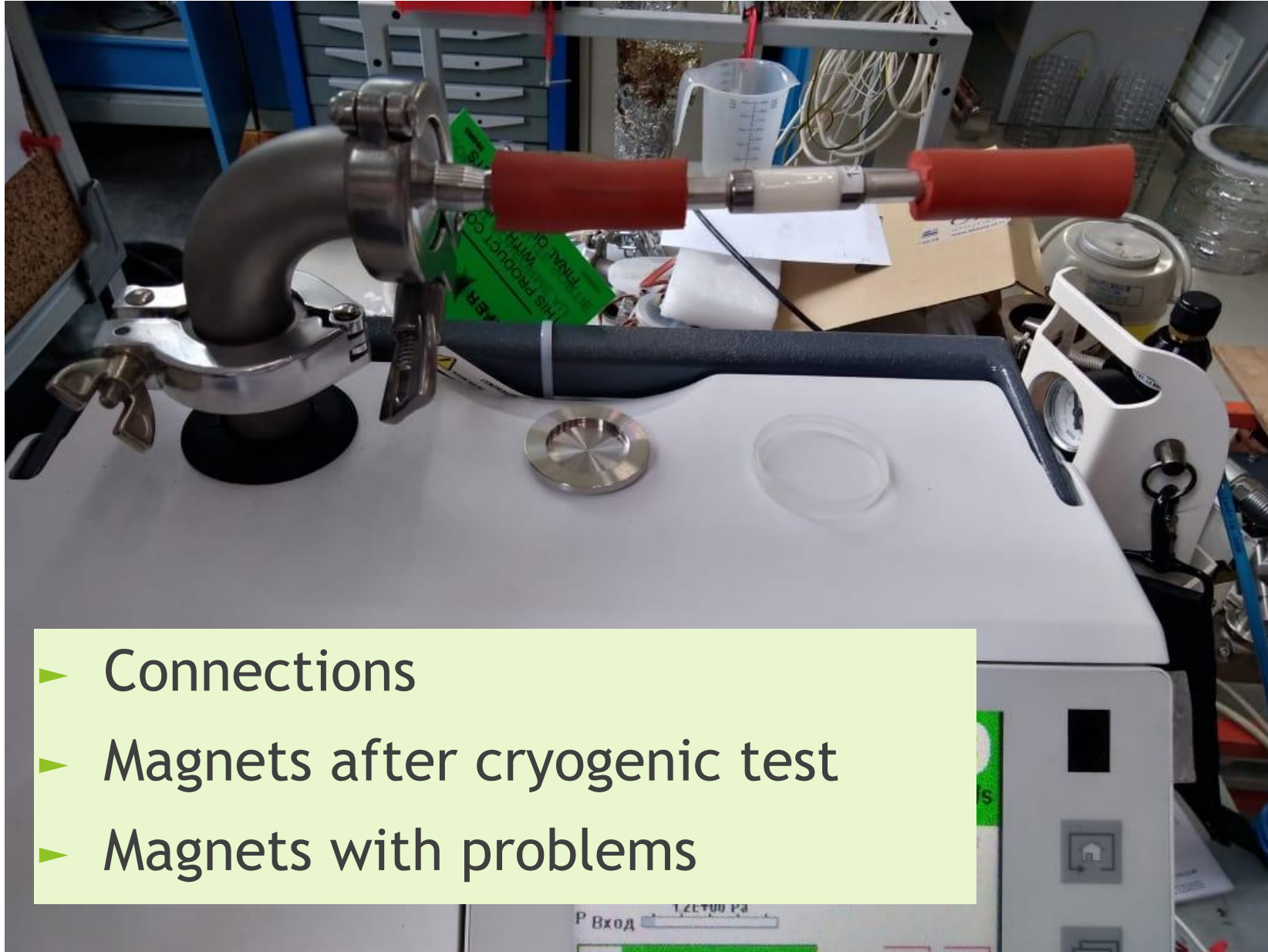
- ▶ Isolators
- ▶ Tubes
- ▶ Parts of magnets (sometimes)

a:

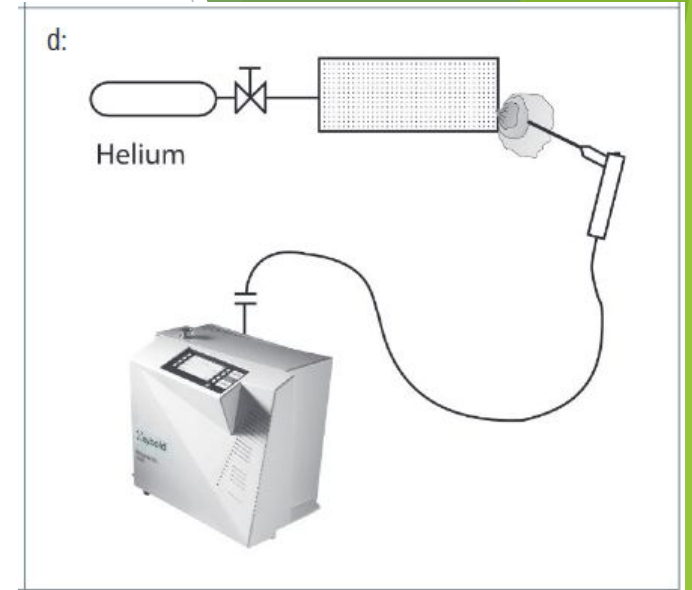


- ▶ Sensitive:  $5 \times 10^{-13}$  Па $\cdot$ м<sup>3</sup>/с
- ▶ Summarize leak

# Sniffer test



- ▶ Connections
- ▶ Magnets after cryogenic test
- ▶ Magnets with problems

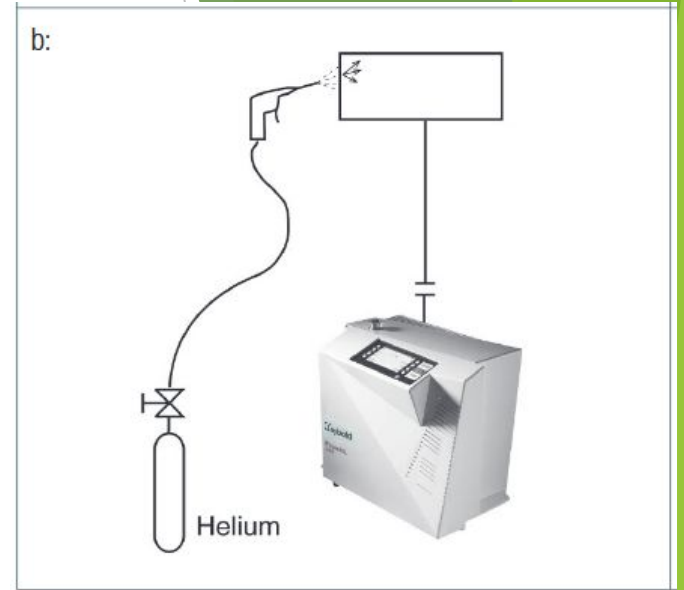


- ▶ Sensitive:  $5 \times 10^{-9}$  Па $\text{м}^3/\text{с}$
- ▶ Place of leak;
- ▶ Leak can be calculated

# Spray technique

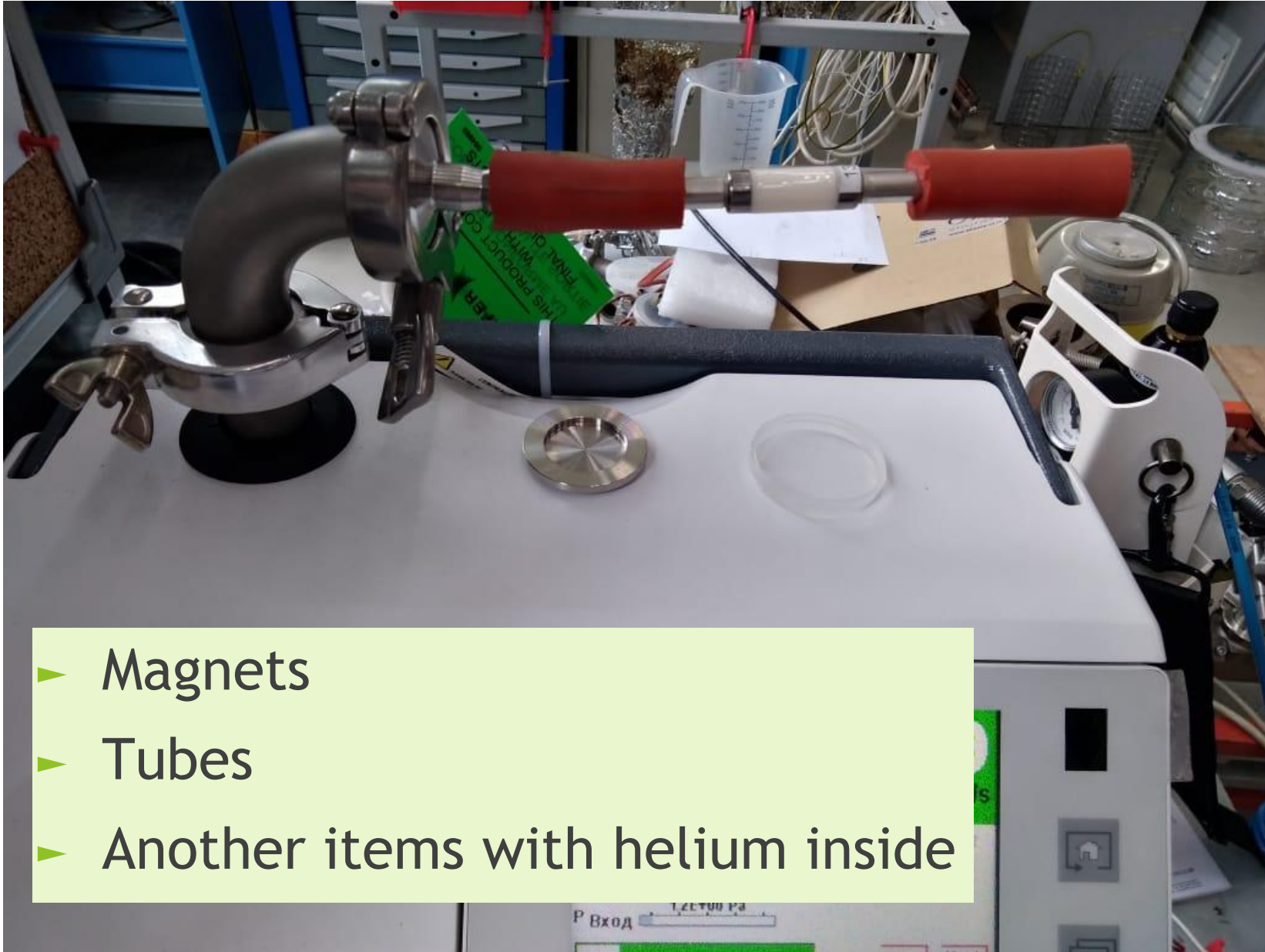


- ▶ Parts of magnets before cryotest
- ▶ Magnets before cryotest
- ▶ Another items for vacuum

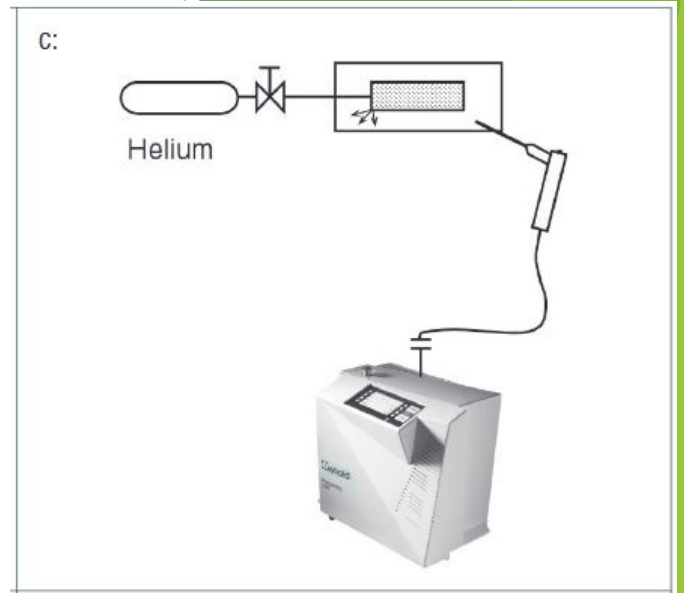


- ▶ Sensitive:  $5 \times 10^{-13}$  Па $\text{м}^3/\text{с}$
- ▶ Place of leak;
- ▶ Leak can be calculated;

# Enclosure test (main test for magnets)

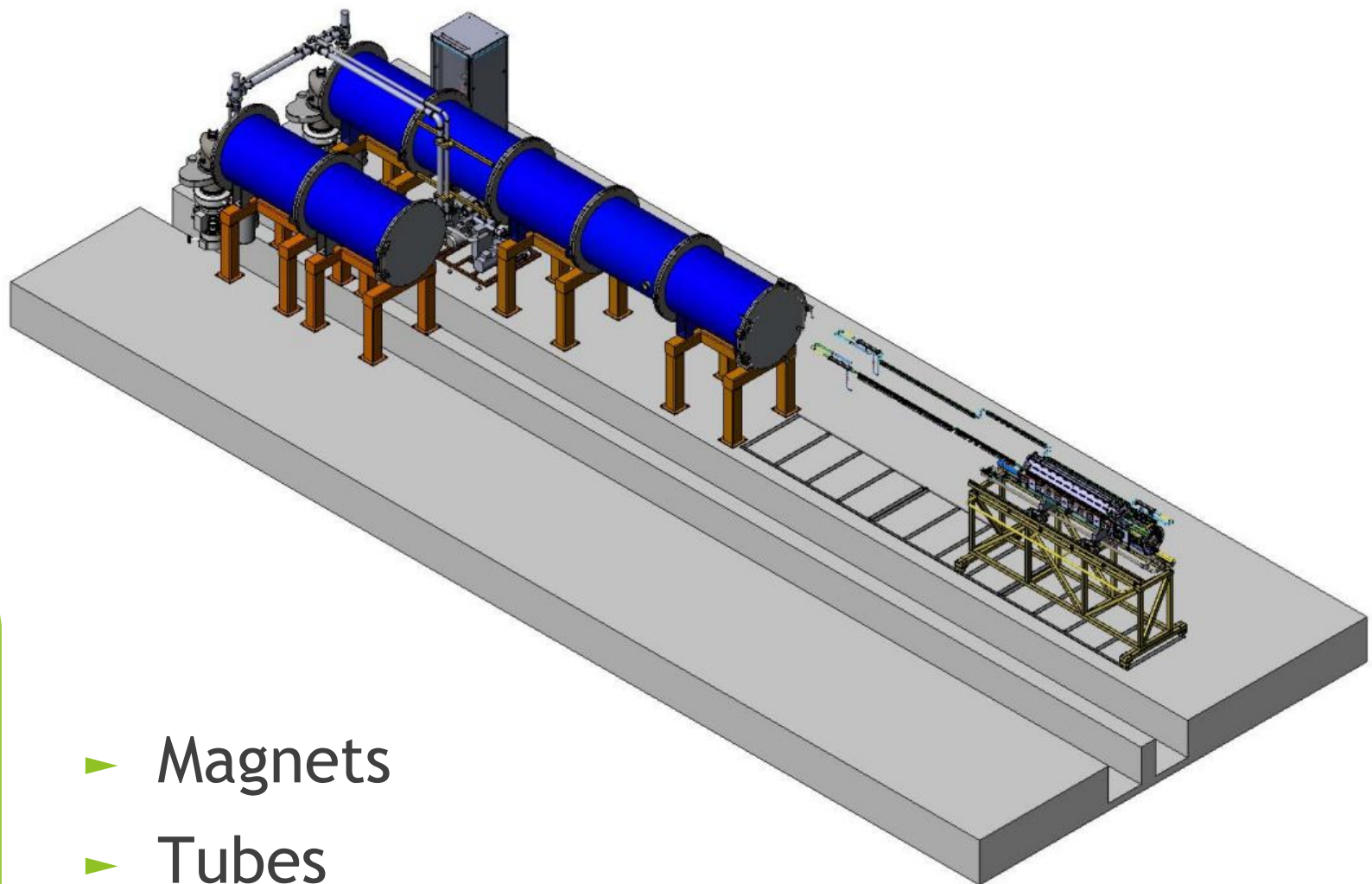


- ▶ Magnets
- ▶ Tubes
- ▶ Another items with helium inside

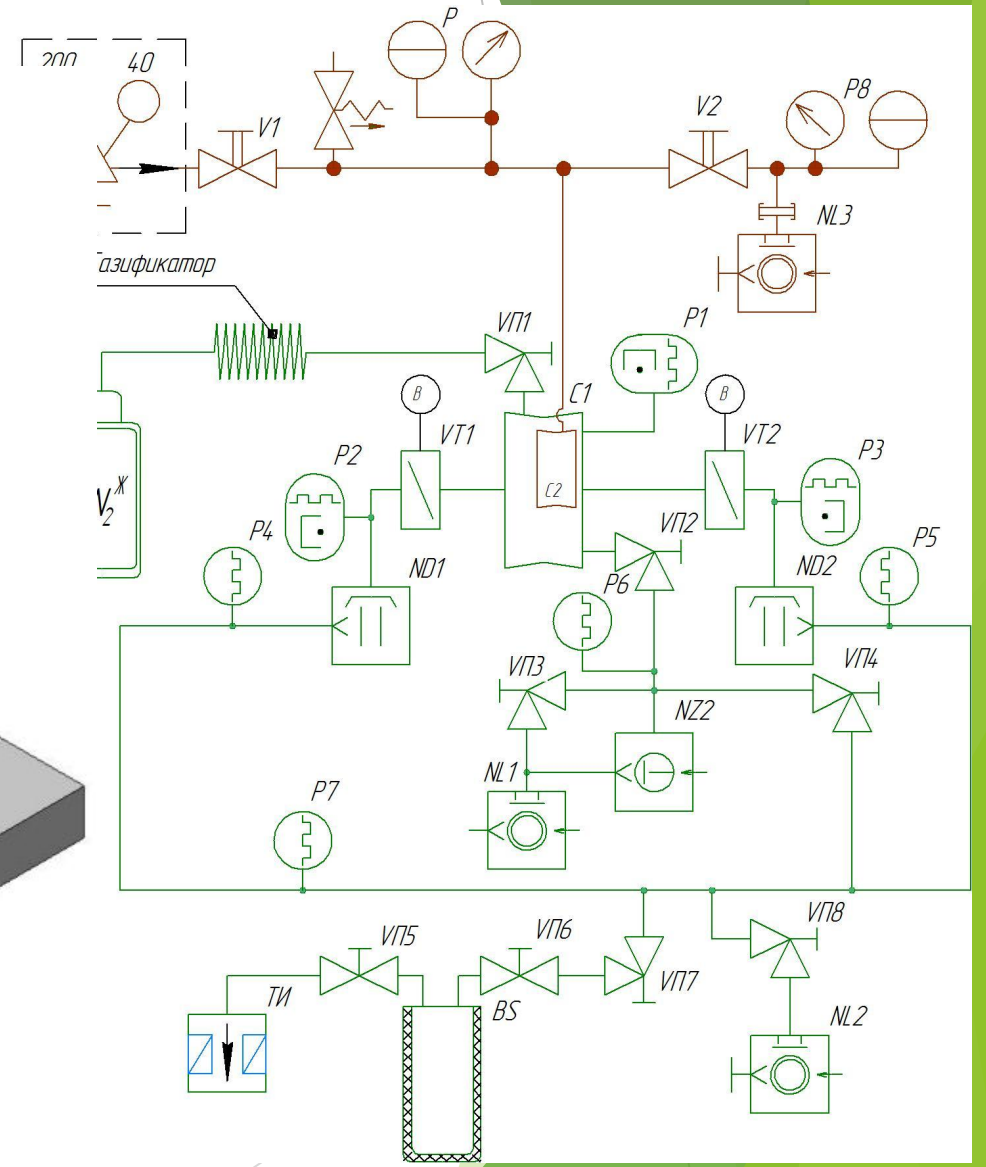


- ▶ Sensitive:  $5 \times 10^{-13}$  Па $\cdot$ м<sup>3</sup>/с
- ▶ Summarize leak;

# Test bench for enclosure test



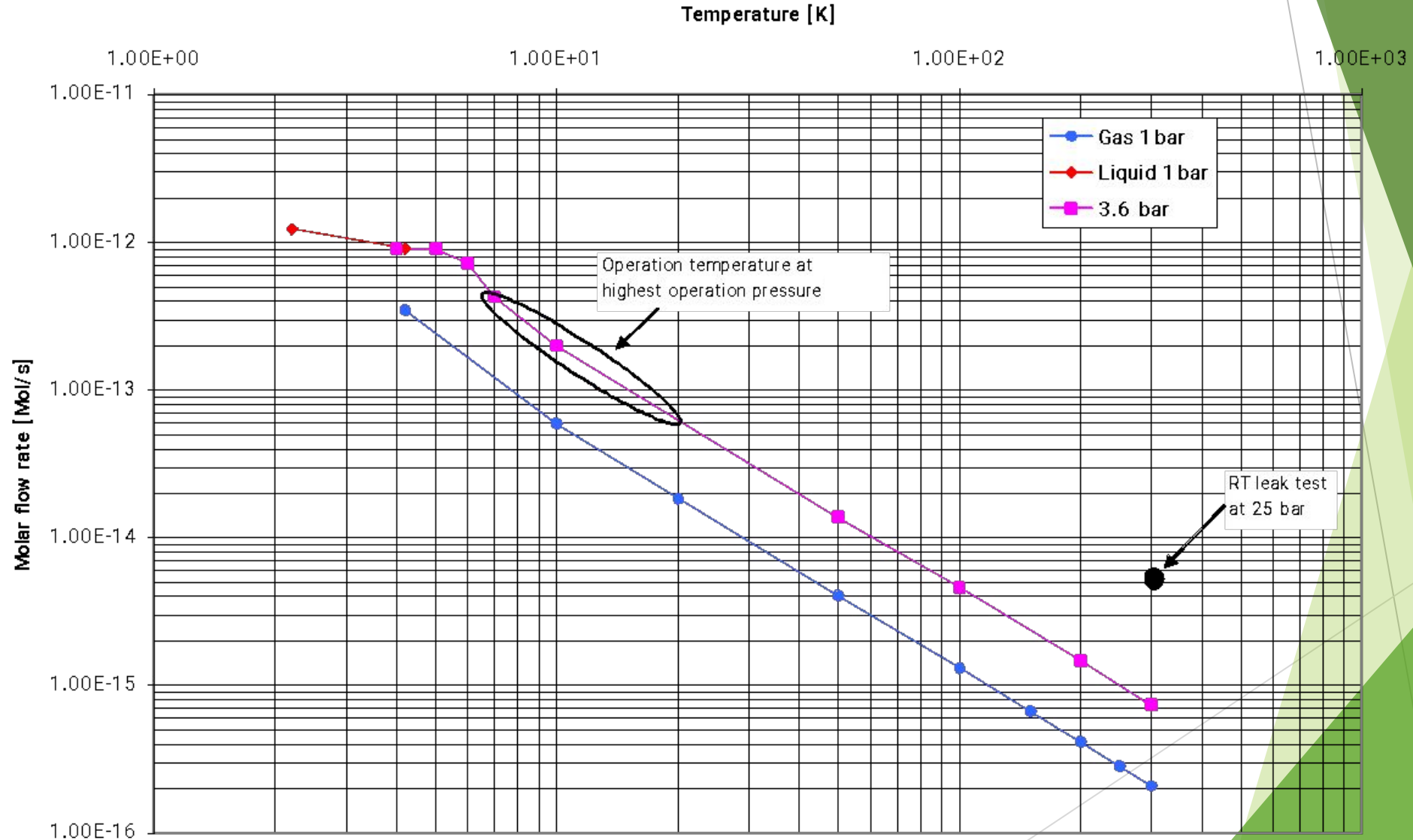
- ▶ Magnets
- ▶ Tubes
- ▶ Pressure test is done last leak test



# Enclosure test under the helium temperature

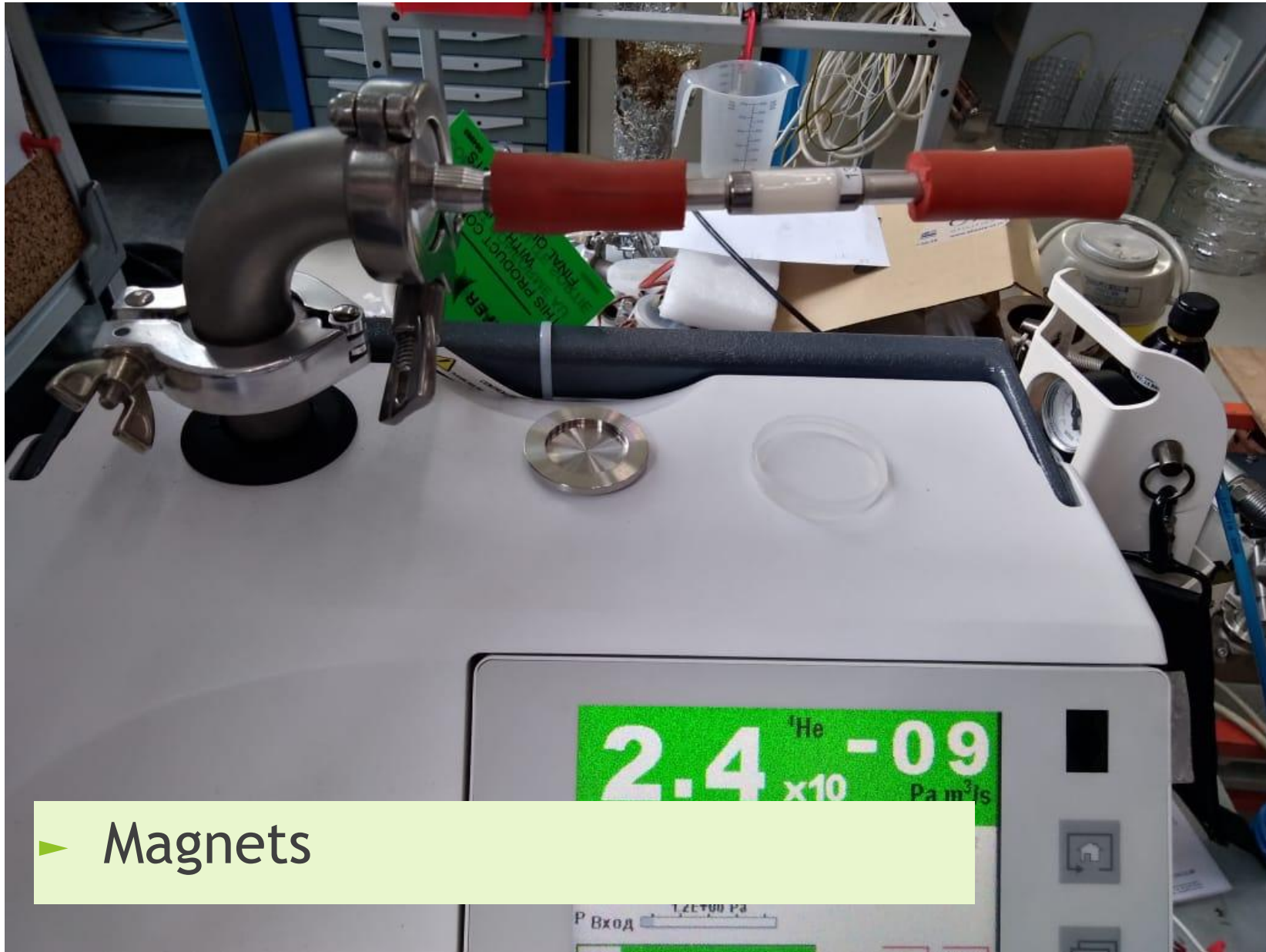
## Theoretical leak rates of a tubular leak of 80 nm diameter and 1 mm long

Applying law of Hagen-Poiseuille (laminar flow, non-compressible fluides), conservative approach





# Enclosure test under the helium temperature



► Magnets

- Sensitive:  $5 \times 10^{-13}$  Pa m<sup>3</sup>/s
- Temperature;

# Bubble test

