WORKSHOP/TRAINING SESSION FOR STAKEHOLDERS AND END-USERS FROM INDUSTRY - 26TH NOVEMBER 2018

IMPROVEMENT OF REFERENCE TECHNIQUES
CALORIMETRIC TECHNIQUE FOR MEASUREMENT OF TOTAL HEMISPHERICAL EMISSIVITY AT LNE

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Calorimetric technique for measurement of total hemispherical emissivity at LNE

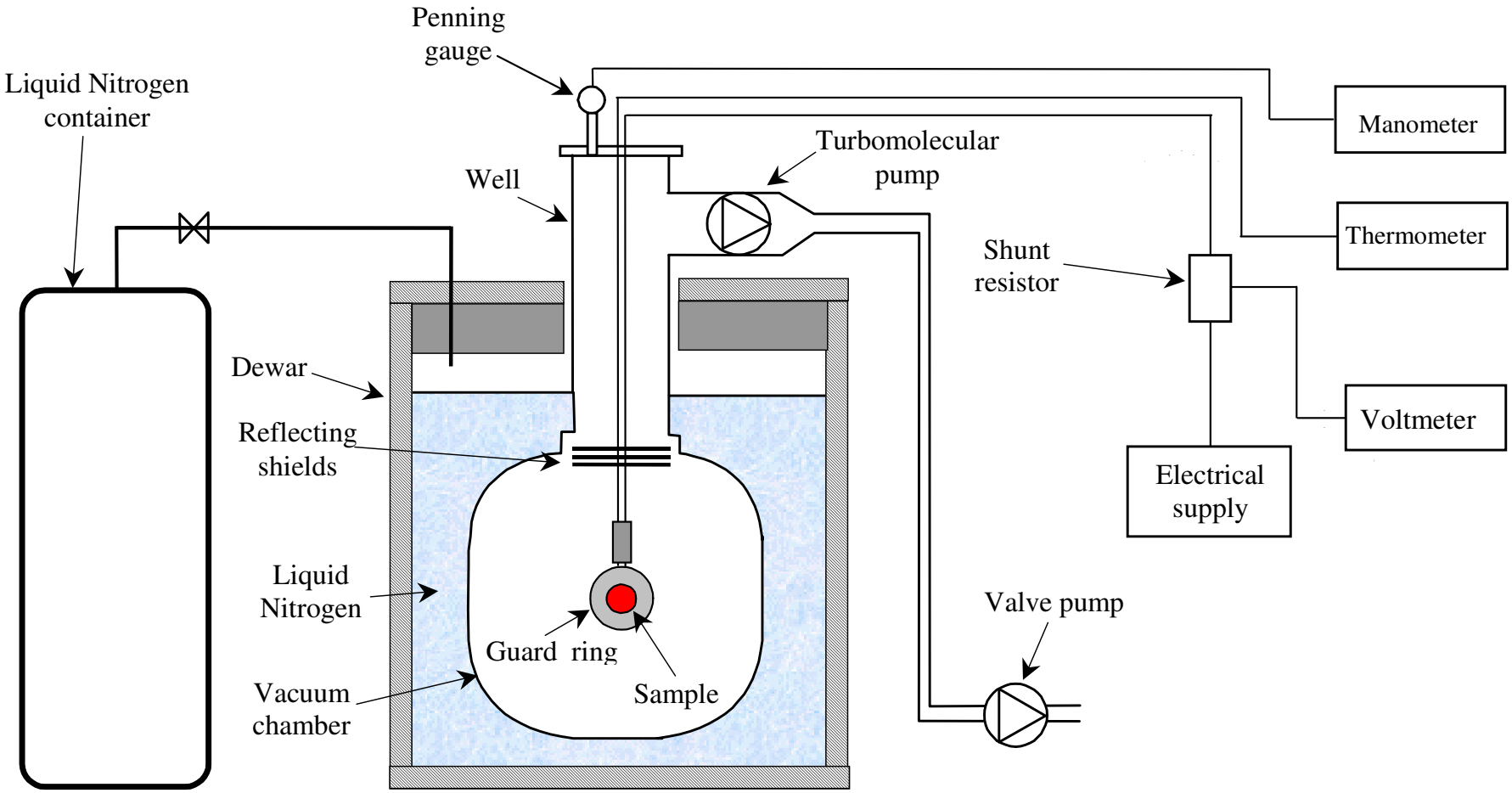
- **Calorimetric technique with a steady temperature :**

  2 samples are heated in a black vacuum chamber at 78 K

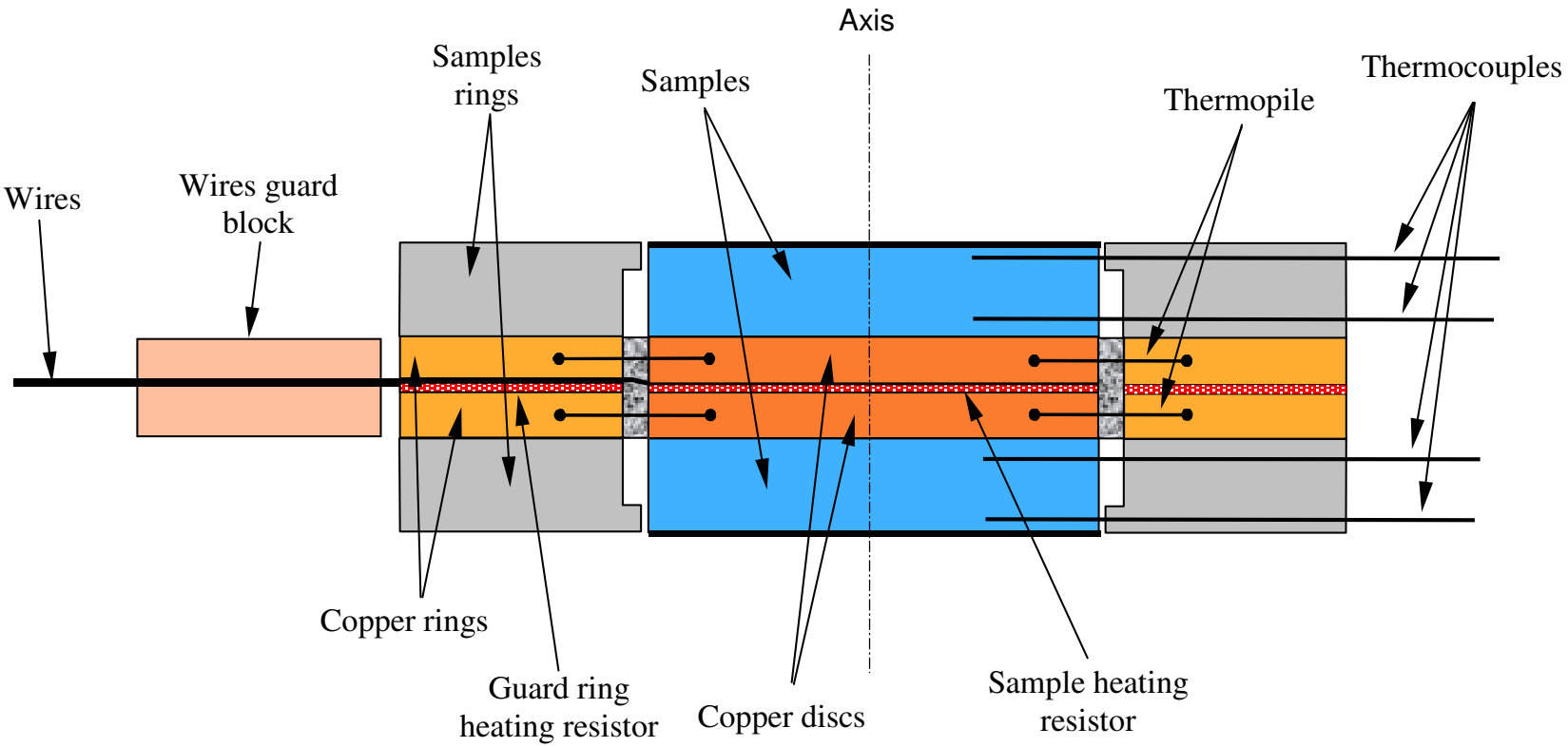
  The density of power radiated by the surface of the 2 samples is measured directly as well as the surface temperatures

  The total hemispherical emissivity is calculated using the heat balance equation :

Calorimetric technique for measurement of total hemispherical emissivity at LNE



Calorimetric technique for measurement of total hemispherical emissivity at LNE



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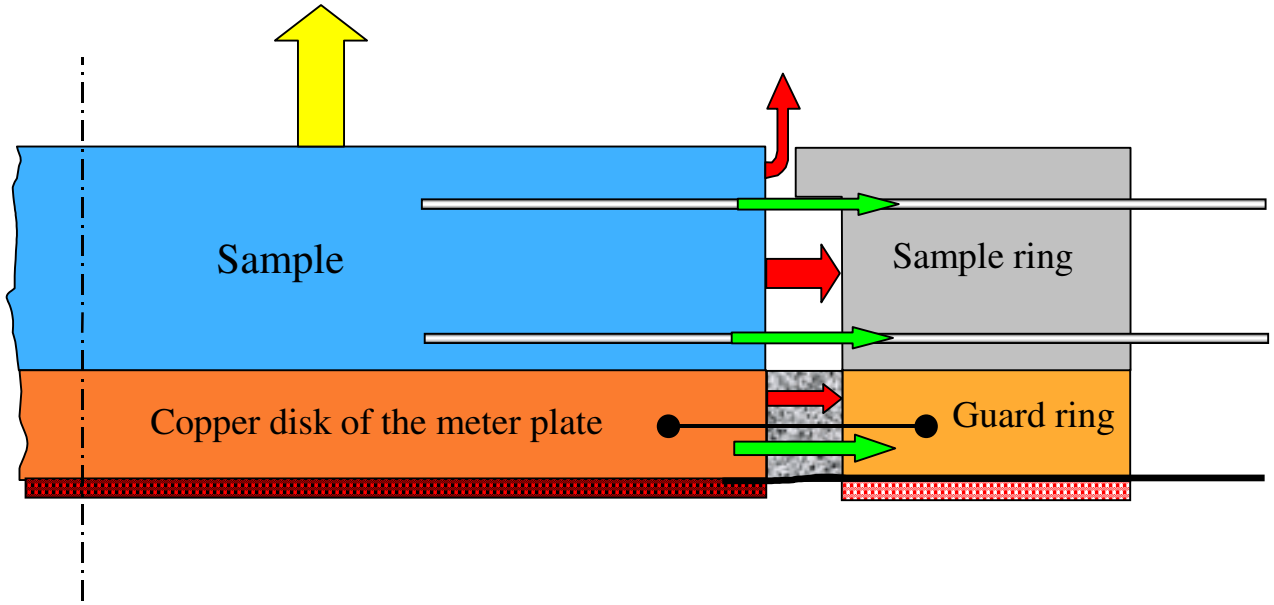
Heat losses evaluation



Conduction and/or convection through the gas

Conduction through solid materials (wires, thermocouples, bindings)

Radiation

Calorimetric technique for measurement of total hemispherical emissivity at LNE

Sources of uncertainty
Areas of the samples
Area of the chamber
Surface of the samples rings
Emissivity of the chamber walls
Mean total hemispherical emissivity of the rings
Electrical power
Mean surface temperature of the samples
Mean temperature of the chamber walls
Mean surface temperature of the rings
Edge heat loss by radiation
Heat loss by conduction (samples / rings)
Heat loss by conduction (meter plate / guard ring)
Heat loss by air
Model used for emissivity calculation
Random variations of measured emissivities
Expected uncertainty for new configuration< 0.02

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New sample heating system : Samples diameter = 100 mm (relative increase of the radiating area = 2.58).

Better mechanical contact between the metal parts and the heating resistors → better control of the temperatures of the parts, better thermal guard of the samples.

Status : new heating system operational by end of March 2019.