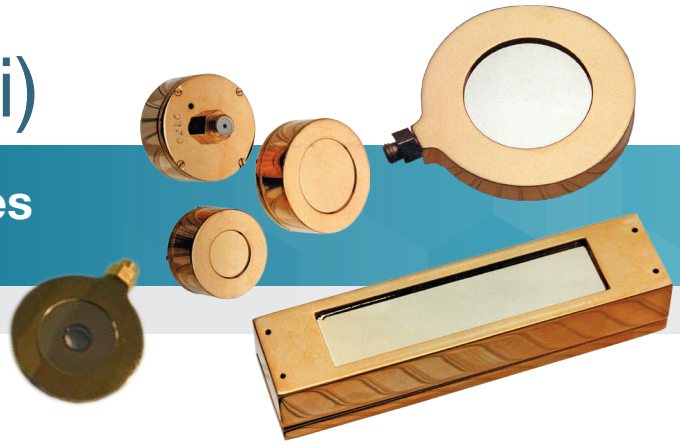
MIRION TECHNOLOGIES

Radiation Safety. **Amplified.**

Silicon Lithium (SiLi)

Detectors for Charged Particles



KEY FEATURES

- Designed for highly penetrating charged particles
- Better stopping power than common silicon detectors: up to 3 MeV Betas, 30 MeV protons, 140 MeV Alphas. More if detectors are stacked
- Thin back contact available (transmission option) for the dE/dx measurement or stack arrangement
- Designs for room temperature or LN_2 cooled applications

ROOM TEMPERATURE Si(Li) DETECTORS

Description

- Wide range of detector size: active areas from 200 mm^2 up to 1600 mm^2; thickness 2 mm and 5 mm. Other dimension are available on request
- Gold entrance window 0.2 µm equivalent silicon
- Lithium back contact 300 µm (50 µm for transmission option)
- Circular or rectangular gold plated brass mounts
- Microdot female connector

Operation

- The detectors can be operated either under vacuum or atmospheric pressure
- They must be used in darkness
- Maximum count rate 100 k count per sec at 524 keV electrons

Reference	Active Area (mm^2)	Active thickness (mm)	FWHM alpha (keV)	FWHM pulser (keV)
SiLi-RT-200-2-E/T-M/B	200	2	35	30
SiLi-RT-200-5-E/T-M/B	200	5	50	45
SiLi-RT-500-2-E/T-M/B	500	2	45	40
SiLi-RT-500-5-E/T-M/B	500	5	55	50
SiLi-RT-40x40-2-E/T-M/B	40x40	2	100	70

Measurement Conditions

- Alpha ^{241}Am source (5.486 MeV) under vacuum
- Short distance between the preamplifier and the diode (cable <10 cm)
- With a Canberra™ charge amplifier (2003BT or 2004 after loading resistor modification)
- Shaping time of 0.5 to 1 us with a Canberra amplifier 2025 or 2026
- At +20 C, in darkness

Operating Conditions

- Temperatures <+35 °C
- Humidity <80%, non-condensing

Storage Conditions

- Temperatures <+20 °C
- Humidity <80%, non-condensing

For higher storage temperatures, please consult factory to avoid any Lithium retro-drift.

Recommended Preamplifiers

- Model 2003BT or 2004 after loading resistor modification (10 M instead of 100 M)

Options

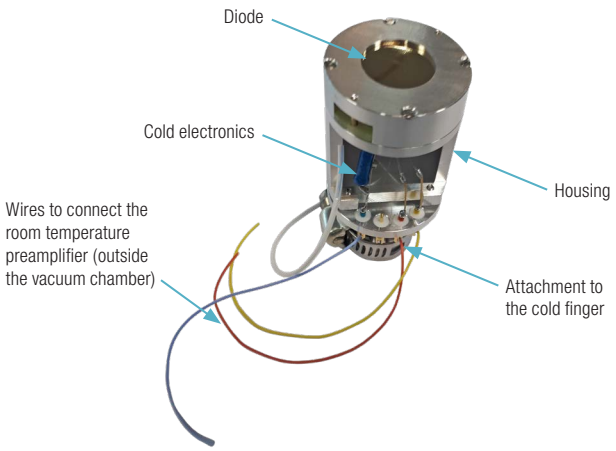
- Transmission type detector: thin back contact for the dE/dx measurement or stack arrangement (select /T in the reference table)
- BNC connector instead of microdot (select /B in the reference table)
- Microdot to BNC cable
- Optimized charge sensitive preamplifier

LN_2 COOLED Si(Li) DETECTORS

DESCRIPTION

A kit configuration is delivered with all components required for integration into an existing vacuum chamber:

- The aluminum mount including the diode and the first stage of the charge sensitive preamplifier (input FET, feedback network). The mount outputs on a 16 mm diameter cold finger
- Two feedthroughs (multipin and high voltage connectors) to be glued by the user on its cryostat
- A charge sensitive preamplifier with a 3.5 meter cable set



Reference	Active Area (mm^2)	Active thickness (mm)	FWHM electron (keV)	FWHM X at 5.9 kev (eV)
SiLi-LN2-200-5	200	5	2.2	
SiLi-LN2-300-5	300	5	2.2	
SiLi-LN2-500-5	500	5	2.2	
SiLi-LN2-500-2 w/ cryostat	500	5	2.0	460

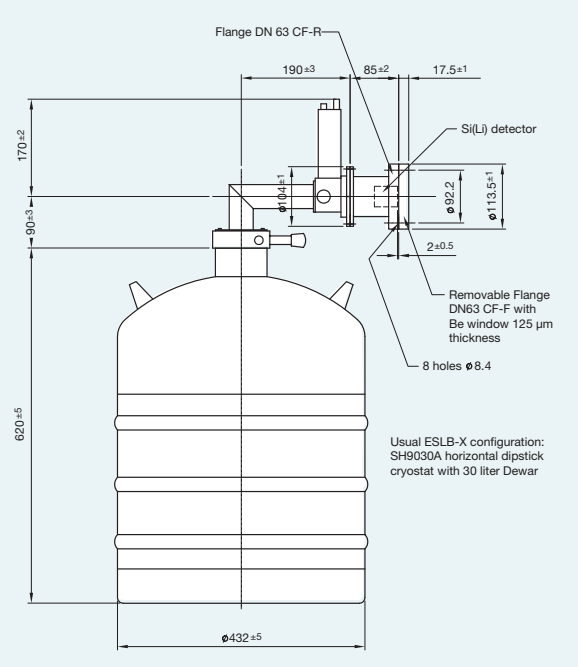
OPERATION

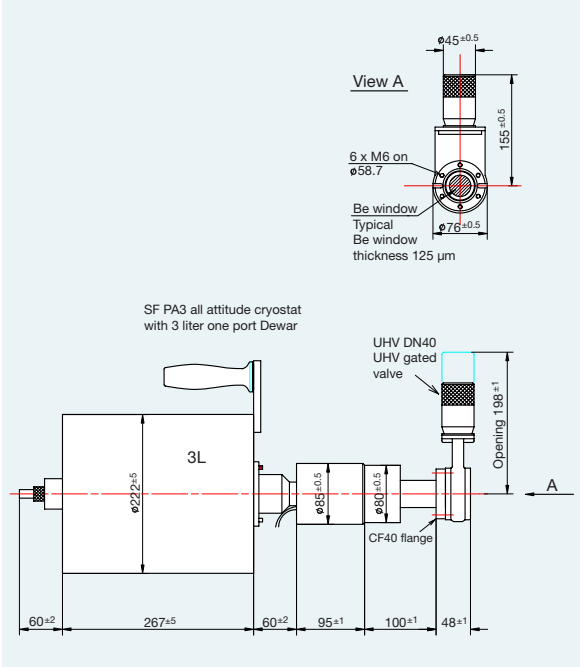
The detector is to be mounted by the user on the cold finger of its cryostat (not supplied). The remaining part of the resistive preamplifier is mounted outside the experiment chamber.

A complete cryostat version is also available, providing user friendly features to create a common vacuum between the cryostat and the experiment chamber. It consists in:

- Lithium drifted Silicon diode
- Flanged dipstick cryostat with horizontal output and with a 30 liter Dewar – additional cryostat configurations and electrical cryocooling are available as an option
- Flange on the cap enables a vacuum connection on the customer's vacuum chamber
- The removable flange is equipped with a Be window (typ. 125 µm) for x-ray measurements. Also, gated valves are available as an option to replace the removable flange, allowing for much easier vacuum operations
- Charge-sensitive preamplifier with a cold input stage and resistive feed-back network – an alarm card drives the bias shut down signal in case of incorrect temperature
- Set of cables (power supply – signal – high voltage)
- VOP10 vacuum operator to enable easy access to the cryostat vacuum

Silicon Lithium (SiLi) detectors for charged particles





RECOMMENDATIONS

Because the Si(Li) detector is sensitive to visible light, there must be no light leaks on the vacuum chamber of the experiment.

No outgasing at high temperature is possible with Si(Li) detectors to avoid drift of the Lithium. The pumping should only be performed at room temperature.

Be careful with the Beryllium window on the removable flange when dismounted.

Always avoid breaking the vacuum if the Si(Li) detector has not reached room temperature: the icing effect will cause irreparable damage to the detector.

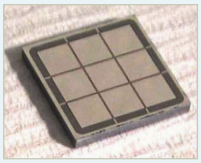
Mechanical contact between the Si(Li) diode and any hardware should be avoided.

The UHV-vacuum-gated valve makes it possible to directly connect the cold detector to the vacuum chamber. This will avoid the time consuming warm up and cool down periods.

Please contact Mirion for any additional information.

SEGMENTED DETECTORS

Segmented Si(Li) detectors can also be provided on request for imaging (radiography, compton camera, non destructive testing), nuclear physics, synchrotron or PIXE experiments.



DSSD with an active area of 24x24 mm², active thickness 3.5 mm, both faces are segmented in 8 strips (3 mm strip pitch). The detectors is cooled by LN_2 through a 5 liter all attitude Dewar. Special ultra flat end cap (23 mm thick) to enhance the energy range of a Compton camera consisting of two HPGe DSSDs.

Double Sided Strip Detector (DSSD) type with active area 3500 mm², active thickness 8 mm, each face segmented in 13 strips. The detector is cooled by the Cryo-Pulse® 5 electrical cooler.

ISO 9001 SYSTEM CERTIFIED

CANBERRA