

# Scintillation Detectors



Scintillation Materials  
and Standard Detectors

# scintillation crystals

## • crystal growth



We have the capability to grow high-quality large size alkali halide crystals for scintillation applications.

We also have developed specific techniques for extrusion, forging and crystal machining techniques and technologies that form the base for production of special scintillation detectors and assemblies.

We can provide either standard or customized detector assemblies for new systems or applications.



## • applications

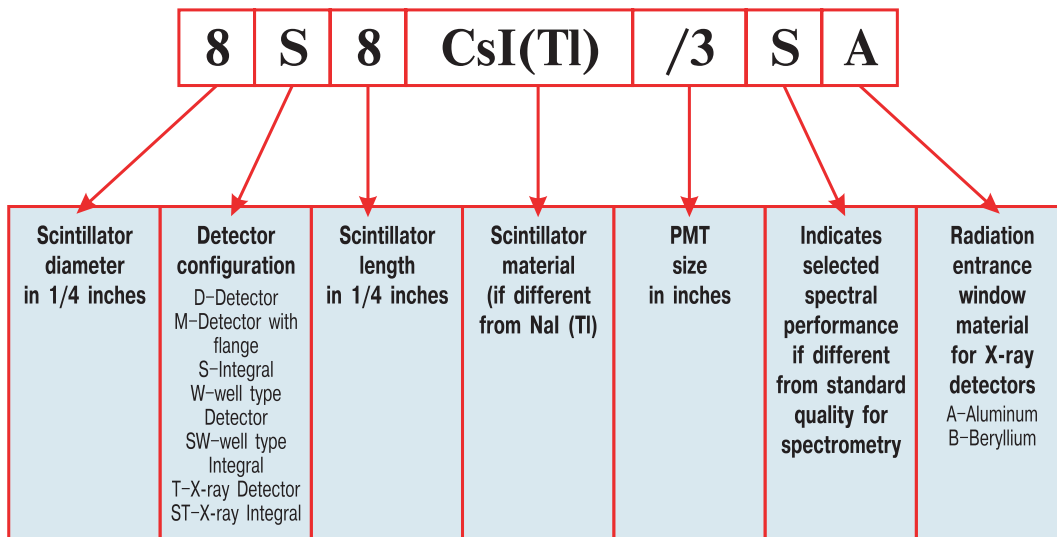
### Selection Guide for Alkali Halide crystals

NaI(Tl)	Very high light output, good energy resolution	General scintillation counting, health physics, environmental monitoring, high temperature use
CsI(Tl)	Non-hygroscopic, rugged, long wavelength emission	High energy physics, general detection, photodiode readout
CsI(Na)	High light output, rugged	Geophysical
CsI(pure)	Fast, non-hygroscopic, radiation hard	High energy physics (calorimetry)
CsI(CO <sub>3</sub> )	Medium decay time, low afterglow	gamma-detection and separation
LiF(W)	High neutron cross-section	Thermal neutron detection
LiI(Eu)	High neutron cross-section, high light output	Thermal neutron detection and spectroscopy

- medical imaging
- industrial
- astrophysics and high energy physics
- security control
- geophysics
- environmental monitoring

# general information

- detector nomenclature



- custom made products

We can modify detector design and sizes for specific applications. Custom-made detectors and assemblies are manufactured according to the customer's requirements.

- general operating conditions

Standard detectors can be stored at temperatures from -15 to +45 °C. The packaging must ensure that the rate of detector temperature variation does not exceed 0.25 °C per minute (15 °C/h). This condition must be maintained until the crystal is unpacked after shipping.

For standard detectors, the operating temperatures are typically in the range from 0 to +45 °C.

The allowable storage time depends on the specific detector type, but is not less than one year.

Scintillation detectors having increased resistance to external effects are available for special applications. Special detectors withstand overloads from several units to 30000 ms<sup>-2</sup>, and the frequency range of vibrational loading can be in the range from 0.5 to 3000 Hz.



# standard detectors and assemblies

- **standard detectors**



All crystals are hermetically sealed in aluminum housing. Copper or stainless steel housings are available for special (low background) applications. UV transmitting glass is used for the optical window. Standard housing wall thickness is 1/32". Special low-mass entrance windows are also available.

### Typical NaI(Tl) standard detector

Model	Crystal Size	Model	Crystal Size
4D4	Ø1"×1"	16M16	Ø4" ×4"
8D8	Ø2" ×2"	20M20	Ø5" ×5"
12D12	Ø3" ×3"	32M32	Ø8" ×8"

- **integrals**

For gamma detection and spectroscopy integrated assemblies having scintillation crystal optically coupled PMT in hermetically sealed housing are available. Standard integral assemblies are designed for crystals up to 6" in diameter. An internal magnetic shield is built in each detector. Typical housing wall thickness is 1/32". Special designs can be based on copper or stainless steel housing, light pipes. The assemblies can be provided with a built-in voltage divider and preamplifier. A large selection of PMT manufacturers is available upon request.

If you have a unique application, we can assist with custom made or special designs to assure that the performance is optimized.



### Typical NaI(Tl) integral assemblies

Model	Crystal size	PMT Size
6S4/2	Ø1.5"×1"	2"
7S8/2	Ø1.75"×2"	2"
8S4/2	Ø2"×1"	2"
8S8/2	Ø2"×2"	2"
12S4/3	Ø3"×1"	3"
12S12/3	Ø3"×3"	3"

# standard detectors and assemblies

- **well-type detectors**



A well-type receptacle in NaI(Tl) detector provide maximum absorption of radiation from a sample by approximating  $3\pi$  geometry. Both open window detector and integral assemblies are available. Typical housing wall thickness is 1/32". We can design the special well sizes detectors upon customer request.

### Typical NaI(Tl) well-type detector models

Model	Crystal size	PMT Size
7SW8/2C1	Ø1.75"×2"	2"
8SW8/2C2	Ø2"×2"	2"
12SW12/3C2	Ø3"×3"	3"

- **x-ray detector**

Thin NaI(Tl) crystal detectors are intended to detect the X-rays quanta energy in the 5 to 60 keV range. Aluminum or Beryllium entrance windows are used for standard detectors. Both open window and integral assemblies are available. The assemblies can be provided with built-in voltage divider and preamplifier.

### Typical NaI(Tl) X-ray detector models

Model	Crystal size
4T1m	Ø1"×1mm
6T2m	Ø1.5"×2mm
8T3m	Ø2"×3mm



- **shaped detectors and crystals**



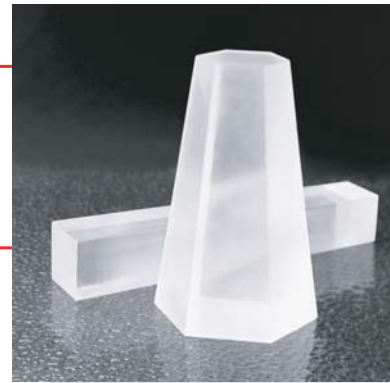
Special detectors with different scintillator type, shape and sizes are available upon customer request and specification. These detectors are intended for incorporation into multi-component detecting systems come in Aluminum or Stainless Steel housings and are available in open window and integrated design. These detectors can be manufactured in low background and ruggedized versions.



# customized detectors

- **detectors for astrophysics and high energy physics**

We have gained experience in developing and manufacturing high radiation stability detectors for space and high (medium) energy physics experiments. Extended size (up to 350-400 mm length) and complex shape (for barrel and ball calorimeters) uniform scintillators are available at high volume and short delivery time.



- **geophysical detectors**

Special ruggedized detectors for high temperature and mechanical shock exploration are available. We suggest some designs for well logging. Contact us with your requirements for more information.

- **combined detectors**

To identify different radiation sources at missed fields combined detectors containing at least two different scintillation crystals can be designed upon request. Any combinations of alkali halide, organic or plastic scintillator is available for detector design.

- **medical imaging detectors**



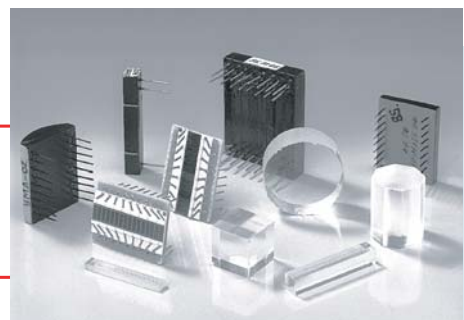
NaI(Tl) single and poly crystal based large area gamma camera detectors for medical imaging systems can be developed in accordance with customer design in any shape detectors for gamma cameras are available.

- **gain stabilization detectors**

Gain stabilization detectors (detectors with built in radioactive sources) are currently in production line. We offer light pulsers with alpha sources ( $^{241}\text{Am}$  or  $^{239}\text{Pu}$ ) or beta-gamma sources ( $^{60}\text{Co}$  or  $^{22}\text{Na}$ )

- **"scintielectronic" assembly (SELDI)**

SELDI™ (scinti-electronic detectors) are the series of "scintillator-photodiode" assemblies and arrays.



# detector design and performance

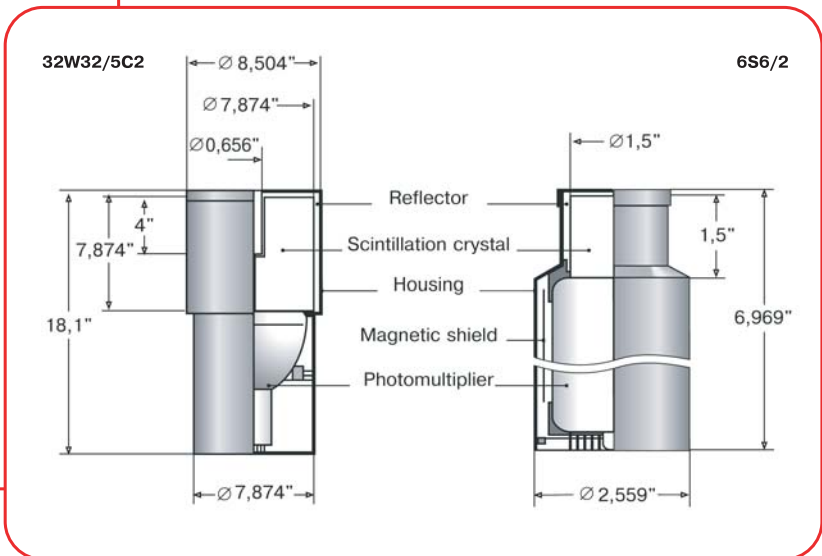
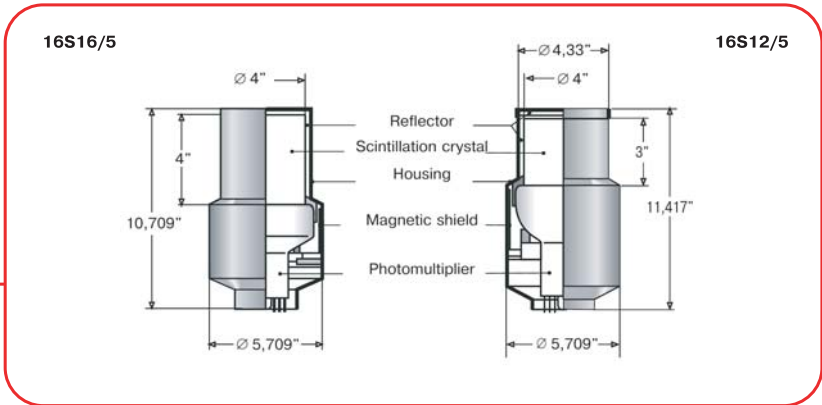
- **standard and customized design**

Commonly used integral detector designs are shown.

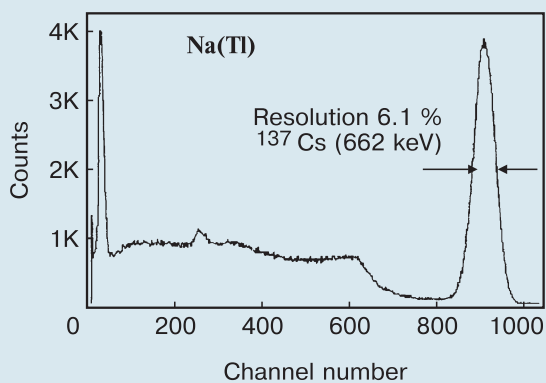
Different options are available:

- PMT selection for standard and selected quality
- Voltage divider, preamplifier fixed at the same housing
- Aluminum or stainless steel housing with specified wall thickness
- Thin entrance window design
- Specified mounting fixtures and flange
- Multi PMT assemblies
- Ruggedized and high temperature designs
- Low back ground design

We have the engineering and production resources to support the customer design for specific applications.



- **standard and selected quality**



The Amcrys-H detector production line was certified in 2002 for the correspondence to ISO 9001 International Standard.

The general approach implies the production of scintillation materials and detectors according to two classifications:

- \*\* Standard quality detector for spectrometry
- \*\* Selected quality detector for high-precision spectrometry.

Typical spectra for selected grade 2"x2" NaI(Tl) base scintillator is shown by the picture. The energy resolution for a standard quality of the same size detector is 7.5%.

For the more detail selected performance specification contact us.

- **crystal replacement and refurbishment**

We can provide customers with detector repair service. Crystal replacement and/or refurbishment is available upon request for detectors with crystal size greater than 3"x3" and gamma camera detectors. Contact us for price and delivery information.



### **Warranty:**

All standard and custom made detectors and assemblies (except some X-ray and geophysical detectors) guaranteed for one year against defects and workmanship.

The photomultiplier tube manufacturer's warranty is extended for the whole assembly warranty time.

All guarantees are void if failure occurs due to modification of assembly, faulty installation, improper operating conditions, or damage by improper handling. No other warranty is implied.

Extended warranty up to three years can be purchased for some products. Check with our distributors for more details.

# **RADCORE**

---

**RADCORE Co., Ltd.**, B202, Sci.&Tech. Bldg., Hanyang University, Seoul 133-791, Rep. of Korea  
Tel: 82-2-2220-4677 • Fax:82-2-2296-8154 • E-mail: [admin@radcore.co.kr](mailto:admin@radcore.co.kr) • <http://www.radcore.co.kr>

#### **World:**

**Amcrys** • 60, Lenin Ave, Kharkov, 61001, Ukraine • Tel: 380 (57) 3410206 • Fax: 380 (57) 3409341  
E-mail: [amcrys-h@isc.kharkov.com](mailto:amcrys-h@isc.kharkov.com) • <http://www.amcrys-h.com>

#### **USA:**

**ScintiTech** • 221 Bear Hill Road • Waltham MA, 02451 • USA • Tel: (781) 890-0402 • Fax: (781) 890-2050  
E-mail: [mail@scintitech.com](mailto:mail@scintitech.com) • <http://www.scintitech.com>

#### **Europe:**

**DETEC-Europe** • 2, alee de Kerpayen • 56000 VANNES • France • Tel.: 33 (1) 30 05 14 78 • Fax: 33 (1) 30 05 14 61  
E-mail: [sleblanc@detec-rad.com](mailto:sleblanc@detec-rad.com)

#### **Asia:**

**Electronic Enterprises (India) PVT.Ltd** • 216, Regal Industrial Estate • P.B. No 6367 • Acharrya Done Marg, Sewri, Mumbai-400 015 • India  
Tel: 91-(022)-4137096 • Fax: 91-(022)-4133341 • E-mail: [electronicARA@gems.vsns.net.in](mailto:electronicARA@gems.vsns.net.in)

#### **Australia:**

**MSTA** • 5 Muneela Place • Yowie Bay 2228 NSW • Australia • Tel: (612) 9350 3855 • Fax: (612) 9524 1169  
E-mail: [100362.150@compuserve.com](mailto:100362.150@compuserve.com)