

WE ARE SUPER COOL

CRYOGENIC SYSTEMS & ACCESSORIES

LOW TEMPERATURE SOLUTIONS TO
BOOST YOUR EXPERIMENT

Photon Technology Italy SRL

Via G. Gigante 174, 80128 Naples (Italy)

Mobile phone: + 39 3500151403
Email: europe@cnphotec.com



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2

CRYOGENIC SYSTEMS

- 01 Special Cryogenic Systems And Fully Customizable Options

6

LOW TEMPERATURE ELECTRONICS

- 01 Cryogenic Thermometer
- 02 Capitalize F Radio-Frequency
- 03 Cryogenic Amplifier

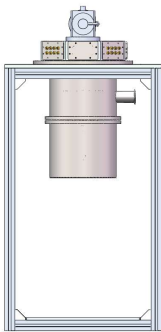
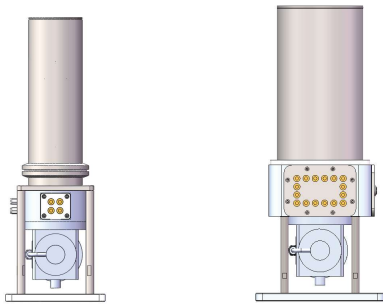
14

VACUUM ACCESSORIES

- 01 Vacuum Sealing SMA Flange
- 02 Fiber-optic Feedthroughs

CONTENTS

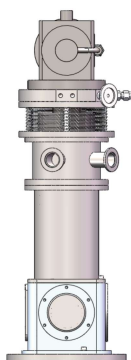
CRYOGENIC SYSTEMS



Performance parameters	P-CS-4K-Mini	P-CS-4K		P-CS-1K	P-CS-0.3K
Lowest temperature	2 K~4.2 K	2 K~4.2 K		850 mK	300 mK
Cryocooler	G-M	G-M		G-M and sorption	G-M and sorption
Cooling power	0.1~1 W @4.2 K	0.1~1 W @4.2 K		30 μ W/50 μ W/100 μ W @850 mK	50 μ W @350 mK
Temperature oscillation	\pm 5 mK	\pm 5 mK		\pm 25 mK	\pm 25 mK
Continuous operations 7 \times 24H	Yes	Yes		Optional	Optional
Numbers of RF channel	Up to 4	4/8/16/32		Up to 16	Up to 16
RF	SMA	SMA		SMA	SMA
DC interface	Optional	Optional		Optional	Optional
Optical interface and channel numbers	Fiber, up to 100 channels/Free space window			Fiber, up to 100 channels/Free space window	
Standard sample holder	\varnothing 68 \times 59 mm	\varnothing 130 \times 56 mm		\varnothing 190 \times 135 mm	\varnothing 190 \times 135 mm
Fully customizable service	Yes	Yes		Yes	Yes

Our cryostats cover the temperature range from 0.3 K to 4.2 K, and customizable services for special equipment requirements are also supplied. For the G-M cryocooler, the products of P-CS-4K provides the cooling power from 0.1W to 1W with base temperature in the range 2 K- 4.2 K. For the G-M cryocooler and sorption cooling module, the products P-CS-0.3 K and P-CS-0.3 K reach the temperature of 300 mK and 850 mK, respectively.

SPECIAL CRYOGENIC SYSTEMS & FULLY CUSTOMIZABLE SERVICE



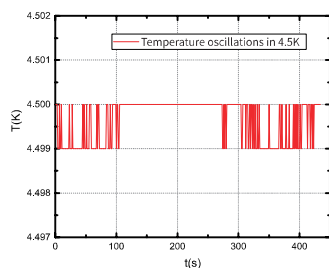
Ultra low-vibration cryostat

The ultra-low vibration is achieved through the design of the vibration isolation structure located between the cryocooler and the sample holder on an air floating platform.

Installation prerequisite	Passive air floating table
Lowest temperature	≤ 3.0 K
Vibration degree in Z-axis	< 100 nm
Vibration degree in X/Y-axis	< 100 nm

FULLY CUSTOMIZATION SERVICE

For special and unique requirements, we have room for customization, some of the options are listed in what follows.



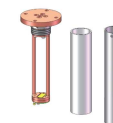
01 / Accurate Temperature Control

Installed with a combination of passive and active Temperature Control Systems to accurately control temperature in the range of 3 K~60 K.

Heater	HTR-50
Range of temperature control	3 K~60 K
Accuracy of temperature control	± 0.5 mK

02 / Sample holder with magnetic shield

To further reduce the magnetic remanence, a special permalloy sample holder with high permeability at cryogenic temperature can be mounted.



Sample holder material	Oxygen-free Copper	Material of DC wire	NbTi twisted pair
Surface treatment	Non-magnetic gold plating	Remanence	≤ 100 nT
Material of magnetic shield	Cryoperm		



03 / Flanges for electric access

Flange specification	KF25/40	CF35
Vacuum degree	1E-8 mbar	1E-12 mbar
Channels number of DC	≤ 32	≤ 32
Operating temperature	-20°C~ 80°C	-20°C~ 80°C
Connection method	Soldering	Soldering
Pin Diameter	0.9 mm	0.9 mm
Pin Resistance	< 4.8 mOhm	< 4.8 mOhm



04 / Optical window

Vacuum sealed windows and low-temperature filtering are adopted to ensure a good coupling between the user's optical path and the sample on the cold stage.


Window Material	Coated viewport
Window size	Typical 2 inch
Window type	Detachable flange
Filters material	User needs
Filter band	Terahertz/Mid-infrared

05 / DC wire performance parameters



Materials	Manganese bronze	Phosphor bronze	NbTi
Resistance@293K	61 Ω /m	8.7 Ω /m	52 Ω /m
Wire diameter	0.1 mm	0.12 mm	0.1 mm
Voltage Withstand	600 V	600 V	/
Thermal conductivity	4 K	0.5 W/(K·m)	1.6 W/(K·m)
	10 K	2 W/(K·m)	4.6 W/(K·m)
			/

To provide the solution for DC readout in cryogenic system, our 12 pairs DC wire assembly, which is exclusively used in high vacuum cryogenic systems, matches DC wires with high integration and low heat leakage, vacuum sealed connectors, and standard high vacuum flange.

A person wearing a white hairnet, safety glasses, and a blue surgical mask is working in a cleanroom. They are wearing blue gloves and using a purple-handled tool to work on a complex, gold-colored electronic component. The background is a blurred cleanroom environment with bright lights.

LOW TEMPERATURE ELECTRONICS



THERMOMETERS

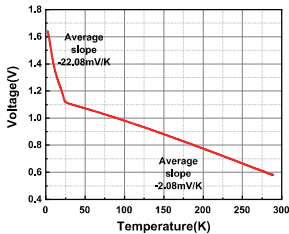
PHOTEC DT-Series cryogenic thermometers are based on silicon diodes, and they offer excellent stability in a wide range of temperature. Following the standard V-T curve, the DT series has higher temperature sensitivity below 30 K. Easy sensor interchangeability, no need for individual calibration in general applications.

Features

- Low excitation current, negligible self-heating effect
- Conformance to the standard V-T curve, good interchangeability
- High accuracy in the temperature range of 1.8 K~325 K
- Individual calibrations available
- Compatible with temperature controllers from Lakeshore, Cryocon, Oxford and other manufacturers

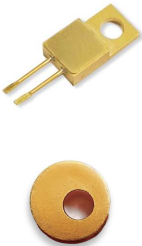
Figure 1

Typical DT series diode V-T curve



Technical Specifications

Standard V-T curve	DT series, Figure 1
Recommended excitation	10±0.1% µA
Max reverse voltage	70 V
Max current before damage	1 mA DC or 100 mA AC
Dissipation (@10µA)	16 µW@4.2 K, 10 µW@77 K, 5 µW@300 K
Thermal response time	10 ms@4.2 K, 100 ms@77 K, 200 ms@305 K
Repeatability	±15 mK@77 K
Use in magnetic fields	Not recommended for use in magnetic field applications
Use in radiation	Recommended for use only in low level radiation



TO and CU Package

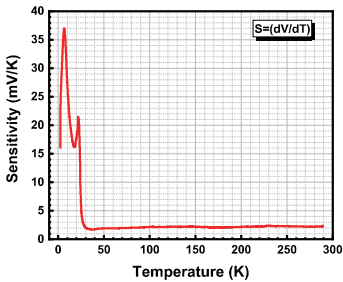


Temperature Response

Temperature (K)	Voltage (V)	dV/dT(mV/K)
1.8	1.66	-13.2
4.2	1.59	-30.6
10	1.39	-27.1
77	1.02	-2.0
305	0.55	-2.3

Figure 2

Typical DT series diode sensitivity



Type

Mass

Wire type

Sensor material

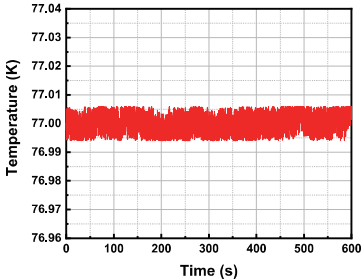
DT-TO	400 mg	Phosphor bronze twisted pair	Ceramic Gold Plated Package
DT-BR (bare chip)	85 µg	N/A	Silicon wafer
DT-SD	40 mg	Phosphor bronze twisted pair	Sapphire base, goldplated ceramic body cover

Tolerance Bands And Temperature Accuracy

Tolerance bands	2 K~77 K	77 K~305 K
C	±1 K	±1 K
B	±0.5 K	±0.5 K
A	±0.25 K	±0.25 K
Individual calibration	±20 mK	±40 mK

Figure 3

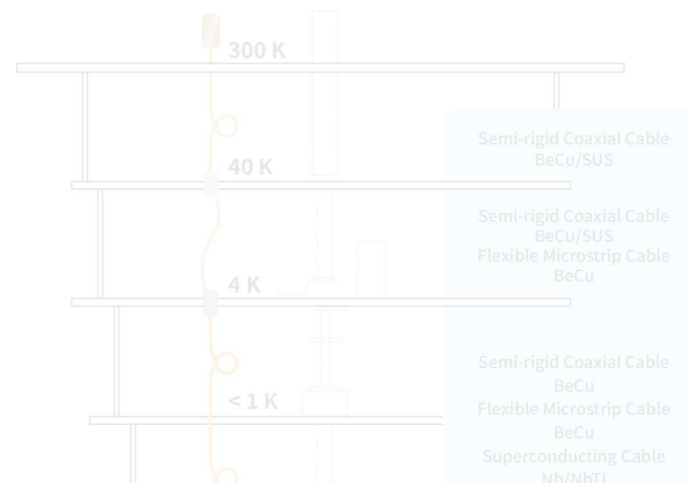
Accuracy at 77 K liquid nitrogen bath



Note:

- ① Short term repeatability is obtained by repeatedly conducting thermal shock experiments from 305 K to 4.2 K on the sensor
- ② Long term repeatability is obtained by applying 200 thermal shocks to the sensor from 305 K to 77 K
- ③ Sensor accuracy $(\text{-calibration uncertainty}^2 + \text{repeatability}^2)^{0.5}$

LOW TEMPERATURE RF CABLES

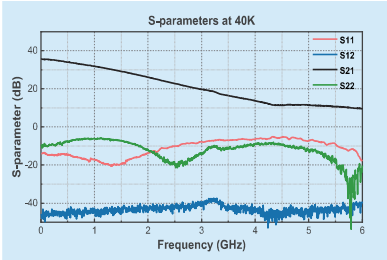
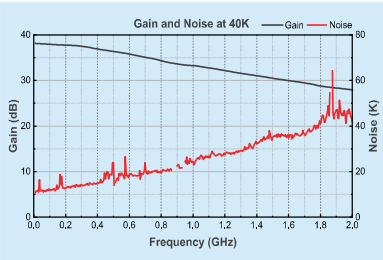


Semi-rigid Coaxial cable					Superconducting Coaxial cable	Flexible Microstrip cable	Low pass filter cable	
Performance parameters		CC-200-BeCu	CC-100-BeCu	CC-076-Becu	CC-086-SUS	SC-210-Nb	Flexible microstrip cable BeCu	Low pass filter cable BeCu
Outer conductor	Diameter	2.00±0.025 mm	1.00±0.025 mm	0.86±0.025 mm		0.86±0.025 mm	2.1±0.025 mm	/
	Material	BeCu	BeCu	BeCu		Stainless steel	Nb	/
Dielectric layer	Diameter	1.6±0.025 mm	0.80±0.025 mm	0.66±0.0254 mm		0.66±0.0254 mm	1.6±0.025 mm	/
	Material	PTFE	PTFE	PTFE		PTFE	PTFE	/
Inner conductor	Diameter	0.5±0.013 mm	0.29±0.013 mm	0.20±0.013 mm		0.20±0.013 mm	0.5±0.013 mm	/
	Material	Silver plated copper	Silver plated copper	BeCu		BeCu	Nb	/
Thermal conductivity@3K		/	/	1.0E-5 W/(cm*K)		7.0E-6 W/(cm*K)	/	/
Impedance characteristic		50±2.5 Ω	50±2.5 Ω	50±2.5 Ω		50±2.5 Ω	50±2.5 Ω	50±2.5 Ω
Medium withstand voltage		> 1000 V	> 1000 V	> 1000 V		> 1000 V	> 1000 V	> 1000 V
Transmission loss	1.0 GHz	2 dB/m	2 dB/m	3.7 dB/m		4.6 dB/m	/	<-3 dB/40 cm
	5.0 GHz	3 dB/m	3.8 dB/m	9 dB/m		11 dB/m	/	<-3 dB/40 cm
	10.0 GHz	5 dB/m	6 dB/m	13 dB/m		16 dB/m	/	<-3 dB/40 cm
	20.0 GHz	<10 dB/m	10 dB/m	23 dB/m		28 dB/m	/	>-30 dB/40 cm
Operating temperature		mK ~ 350 K	mK ~ 350 K	mK ~ 350 K		mK ~ 350 K	mK ~ 350 K	mK ~ 350 K
Minimum bending radius		5 mm	3.5 mm	3.5 mm		3.5 mm	3.5 mm	/
Length		≤ 150 cm	≤ 150 cm	≤ 150 cm		< 150 cm	< 100 cm	25 cm

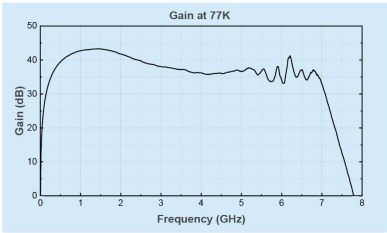
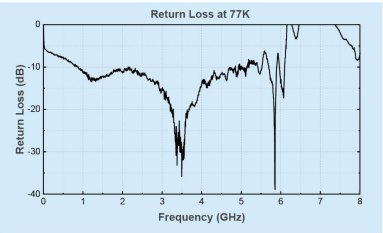
Note: A customizable service is supplied according to the user's working circumstances, such as cable operating frequency, connector type, physical specification, and so on.

LOW TEMPERATURE AMPLIFIER

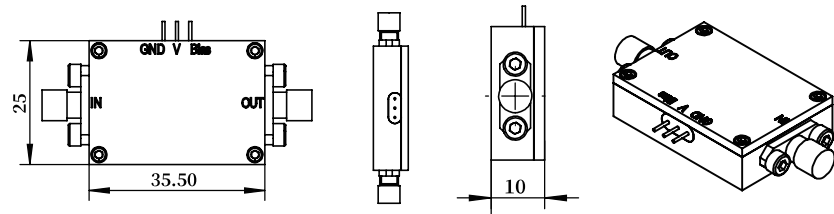
LTA 1: 0.1 MHz~1 GHz



LTA 2: 0.3 MHz~5 GHz



Low temperature amplifier size Note:Dimensions are in millimeter [mm]



Product Features

	LTA 1:0.1 MHz~1 GHz	LTA 2: 0.3 MHz~5 GHz
RF Bandwidth	0.1 MHz~1 GHz	0.3 MHz~5 GHz
Noise Temperature	25 K@40 K, 15 K@4 K	150 K@300 K
Noise Figure	0.36 dB@40 K, 0.2 dB@4 K	1.8 dB@300 K
Gain	35 dB@4 K, >30 dB@77 K	35 dB@77 K
Operating Temperature	4 K to 325 K	4 K to 325 K
Typical DC Power	3.5 V/6 mA	3 V/25 mA
RF Connectors	SMA (Female)	SMA (Female)
DC Connectors	3-pin, 2.54 mm	3-pin, 2.54 mm

Parameters

		LTA 1 :0.1 MHz~1 GHz	LTA 2: 0.3 MHz~5 GHz
V_{ds}	Min	0	0
	Max	4 V	4 V
	Typical	3.5 V	3 V
I_{ds}	Min	/	/
	Max	30 mA	40 mA
	Typical	6 mA @3.5 V	25 mA@3 V
V_{gs}	Min	/	/
	Max	/	/
	Typical	/	/
RF Input Power		-10 dBm	-10 dBm
Operating Temperature	Min	4 K	4 K
	Max	325 K	325 K
ESD Rating (HBM)		+2000 V (Class 2)	+2000 V (Class 2)

VACUUM ACCESSORIES



HERMETICALLY SEALED SMA ADAPTER

HA1108 Technical Data Sheet

Connector type	SMA(Female) to SMA(Female)
Installation form	Bulkhead Mount
Outer size(length*diameter)	L*Dia=27*13 mm
Helium gas leak rate	<1E-11 cc/sec@1 atm helium
Operating temperature	-65 to +165 deg C

Electrical Specifications

Frequency range	DC-18 GHz
Characteristic impedance	50 Ω
VSWR	<1.4: 1@ 18 GHz

Material Specifications

Inner conductor	Beryllium Copper
Insulating layer	PTFE
Outer conductor	Stainless Steel (Gold Plating Option)

The vacuum sealing adapter/connector HA1108 was designed to achieve RF interconnect between various applications requiring very low temperature, high vacuum, and so on.



FIBER FEED-THROUGH FLANGE

High vacuum fiber feed-through flange is typically used to make the optical signal exchange between high vacuum and low vacuum. We invented the "high vacuum four-wire feed-through technique", which allows one HA1108 to reach hundred optical fibers feed-through, resulting in a highly integrated fiber feed-through flange.

Performance parameters

High vacuum degree	Lower than 1E-8mbar
Fiber	Single Mode Fiber(SMF)/Multi Mode Fiber(MMF)
Feed number	1~100 fiber channels
Low insertion loss	Insertion loss ≤ 0.01 dB
Fiber	User specified
Flange type	KF/CF/User specified