SHI

Cryogenics Group

CRYOCOOLER PRODUCT CATALOGUE

Sumitomo Heavy Industries, Ltd.

Sumitomo Heavy Industries, Ltd. (SHI) has a tradition of excellence and innovation that spans over 400 years. From its very beginning as a small shop selling medicines and books in Kyoto, Japan in the early 17th century, to its current status as a diverse, $6 billion corporation, SHI has continued to grow and flourish in an ever-changing international market.

SHI's acquisition of IGC-APD Cryogenics, Inc. in 2002 brought together two of the world's leading cryogenic companies to form the SHI Cryogenics Group, with an unsurpassed tradition of design, development and success in the manufacture of cryogenic equipment.

SHI Cryocoolers continue this tradition by supporting both global research & development as well as state-of-the-art technologies. Today, applications of cryogenic technologies can be found in our daily lives. SHI Cryocoolers are used directly or in the manufacturing of many of the world's medical, semiconductor, telecommunications, electronics, biochemical and other industrial products.

SHI offers a wide range of Cryocooler products: Gifford-McMahon, Pulse Tube and GM-JT Cryocoolers, with temperatures ranging from below 4K to 77K and higher. SHI Cryocoolers are built in world-class manufacturing facilities using the latest Six Sigma manufacturing and process capabilities. The result is a product portfolio that offers flexibility, high reliability and is supported by a global sales, service and support network.

SHI Cryogenics Group 4K Gifford-McMahon Cryocoolers are recognized as the most reliable and versatile systems available in the marketplace. These Cryocoolers feature high cooling capacities, compact designs and are orientation-free. Models like the RDK-408D2 are the standard for MRI and other superconducting magnets and can be found cooling a wide variety of analytical and experimental devices and offer a very cost effective alternative to open-cycle liquid helium systems.

SHI's 4K Pulse Tube Cryocoolers embody leading-edge technology and provide low vibration, high reliability and low maintenance requirements. They are uniquely designed with no moving parts inside the coldhead. In addition, they feature an optional separated valve unit to further reduce vibration, enable operation in higher magnetic fields and ease maintenance requirements. SHI Pulse Tube Cryocoolers provide a stable low-temperature solution for sensitive measurement and analytical applications.

SHI Cryogenics Group's 10K Gifford-McMahon Cryocoolers are versatile, closed-cycle systems that feature the same Displex® technology found in the complete line of Marathon® CP Cryopumps and MRI shield coolers, proven the world over with millions of reliable operating hours. They have been recognized as the industry standard since we developed the technology over 40 years ago. Our original pneumatic drive, which limits the number of wear parts in the refrigerator, combined with state-of-the-art design features, results in superior performance and low maintenance costs. Select models also feature Whisper® technology for quieter operation. SHI's 10K Cryocoolers have proven reliability in thousands of applications, including MRI, cryopumping, research and other custom low-temperature applications.

APPLICATIONS

Cryostats & Interfaces
Sample Cooling
Spectroscopy
Goniometry
Mossbauer
Optical
Laser

Astronomy
Sensor Cooling
Lens Cooling

Vacuum
Cryopumping

Electronics & Power
HTC Transmission Lines
Supercomputers

Magnets
High TC Lead & Coil Cooling
Shield Cooling

Six Sigma
Easy, In-situ
ISO 9001 & 14001 Manufacturing
Six Sigma Quality
High Relia
In-situ Maintenance
Global Service & Suppo
Six Sigma Quality
ISO 9001 & 14001
High Reliabi

SHI & APD CRYOGENICS: A HISTORY

Masatomo Sumitomo, founder of the Sumitomo family, opens a shop dealing in medicines and books in Kyoto, Japan	**17th Century**	
Discovery of Besshi Copper Mine—Sumitomo receives exclusive mining rights	**1690**	
Precursor to Sumitomo Heavy Industries, Ltd. established as a machinery production and repair facility at the Besshi Mine Plant	**1888**	
Establishment of Sumitomo Machinery Works, Ltd.	**1934**	
	1959	Precursor to APD Cryogenics established as Space and Missile Department of Air Products in Allentown, Pennsylvania, USA
Sumitomo establishes its cryogenics business at the Hiratsuka Research Laboratory in Hiratsuka City, near Tokyo.	**1962**	Renamed the Advanced Product Development Department of Air Products
	1968	Introduces Displex® cryocooler systems
Merger between Sumitomo Machinery and Uraga Heavy Industries results in the establishment of Sumitomo Heavy Industries, Ltd.	**1969**	
	1976	Pioneers current generation cryopump technology
Merger with Nittoku Metal Industries results in the establishment of the Precision Business Division, which today includes the Cryogenics Group	**1982**	
	1987	Becomes a subsidiary of Intermagnetics General Corporation
	2002	Becomes a subsidiary of Sumitomo Heavy Industries, Ltd.

CRYOCOOLER PRODUCT SPECIFICATION

Cold Head Model		RDK-101D	RDK-305D	RDK-205D	RDK-408D2	RDK-415D	RP-062B	RP-082B	CH-204N
1st Stage Capacity	50 Hz	3.0 W @ 60 K	15 W @ 40 K	3.0 W @ 50 K	40 W @ 43 K	35 W @ 50 K	30 W @ 65 K	40 W @ 45 K	—
	60 Hz	5.0 W @ 60 K	20 W @ 40 K	4.0 W @ 50 K	50 W @ 43 K	45 W @ 50 K	30 W @ 65 K	40 W @ 45 K	—
2nd Stage Capacity	50 Hz	0.1 W @ 4.2 K	0.4 W @ 4.2 K	0.5 W @ 4.2 K	1.0 W @ 4.2 K	1.5 W @ 4.2 K	0.5 W @ 4.2 K	1.0 W @ 4.2 K	2.5 W @ 10 K
	60 Hz	0.1 W @ 4.2 K	0.4 W @ 4.2 K	0.5 W @ 4.2 K	1.0 W @ 4.2 K	1.5 W @ 4.2 K	0.5 W @ 4.2 K	1.0 W @ 4.2 K	3.0 W @ 10 K
Minimum Temperature[1]		<3.0 K	<3.5 K	<3.5 K	<3.5 K	<3.5 K	<3.0 K	<3.0 K	6.5 K
Cooldown Time[1]	50 Hz	<150	<120	<90	<60	<60	<100	<80	40
	60 Hz	<150	<120	<90	<60	<60	<90	<80	35
Weight		7.2 kg (15.9 lbs.) [2]	16.0 kg (35.3 lbs.)	14.0 kg (30.9 lbs.)	18.0 kg (39.7 lbs.)	18.5 kg (40.8 lbs.)	23.2 kg (51.2 lbs.)	26.0 kg (57.3 lbs.)	7.8 kg (17.2 lbs.)
Bakeable Option									●
HC-4E1									●
CKW-21A				●					
HC-8E4									●
F-50L/H					●	●	●		
F-70LP/L/H					●	●		●	[3]
CNA-11B/C		●							
Zephyr®									●
CNA-31C/D			●						
CSA-71A					●	●			
CNA-61C/D					●	●			

Note: "RDK" and "RP" prefixes denote individual cryocoolers, while "SRDK" and SRP" prefixes denote complete systems. For example, SRDK-415D-A71A is the complete model number for a RDK-415D Cold Head with a CSA-71A Compressor.

1 For reference only. Refer to individual performance specifications.
2 Cold head weight only. Refer to individual performance specifications for weights of additional parts.
3 Up to two (2) cold heads can be operated with F-70 Compressor
4 Reduced capacities when operated with Zephyr®, HC-4E1 or HC-8E4 Compressors

RDK-408S2	CH-202	CH-204	CH-208R	CH-208L	CH-210	RDK-400B	CH-104	CH-110
35 W @ 45 K	7.3 W @ 77 K	13.5 W @ 80 K	65 W @ 77 K	28 W @ 77 K	110 W @ 77 K	54 W @ 40 K	34 W @ 77 K	175 W @ 77 K
40 W @ 45 K	8.8 W @ 77 K	16.2 W @ 80 K	80 W @ 77 K	35 W @ 77 K	120 W @ 77 K	70 W @ 40 K	42 W @ 77 K	200 W @ 77 K
5.4 W @ 10 K	1.8 W @ 20 K	6.7 W @ 20 K	6.0 W @ 20 K	8.0 W @ 20 K	6.0 W @ 20 K	N/A	N/A	N/A
6.3 W @ 10 K	2.2 W @ 20 K	7.1 W @ 20 K	7.5 W @ 20 K	10.0 W @ 20 K	7.0 W @ 20 K	N/A	N/A	N/A
<7 K	10 K	10 K	10 K	10 K	10 K	<25 K	<25 K	<25 K
<60	75	35	55	50	35	<30	<40	35
<60	65	30	45	40	30	<30	<30	30
17.2 kg (37.9 lbs.)	6.8 kg (15.0 lbs.)	7.8 kg (17.2 lbs.)	11.6 kg (25.6 lbs.)	11.8 kg (26.0 lbs.)	13.8 kg (30.4 lbs.)	16.0 kg (35.3 lbs.)	7.9 kg (17.5 lbs.)	13.7 kg (30.2 lbs.)
	●	●	●	●	●		●	●
	●	●					●	4
		●	●	●			●	4
●						●		
		3	●	●	●		3	●
	●	●					●	4
●						●		
●						●		

SRDK-101D 4K CRYOCOOLER SERIES

Performance Specifications

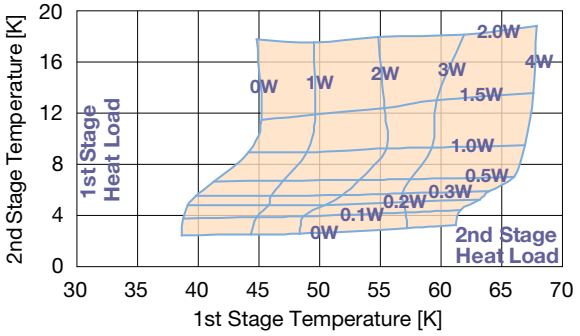
Power Supply Hz	50	60
2nd Stage Capacity Watts @ 4.2 K	0.1	0.1
1st Stage Capacity Watts @ 60 K	3.0	5.0
Cooldown Time to 4.2 K Minutes	150	150
Weight kg (lbs.)	7.2 (15.9)*	
Maintenance Hours	10,000	

*Cold head only. Drive unit weighs 1.0 kg (2.2 lbs.).

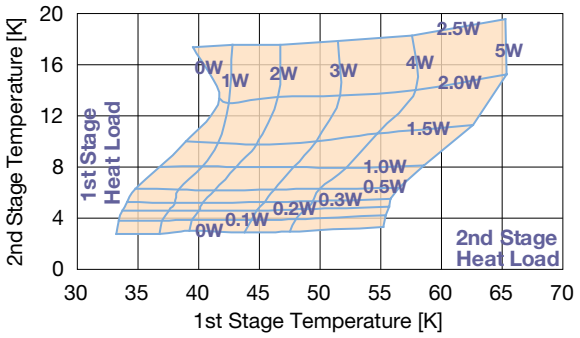
Standard Scope of Supply

- RDK-101D Cold Head
- CNA-11B/C Compressor
- 3 m (10 ft.) Helium Gas Lines
- 6 m (20 ft.) Cold Head Cable
- Tool Kit

SRDK-101D Cold Head Capacity Map (50 Hz)



SRDK-101D Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

SRDK-305D 4K CRYOCOOLER SERIES

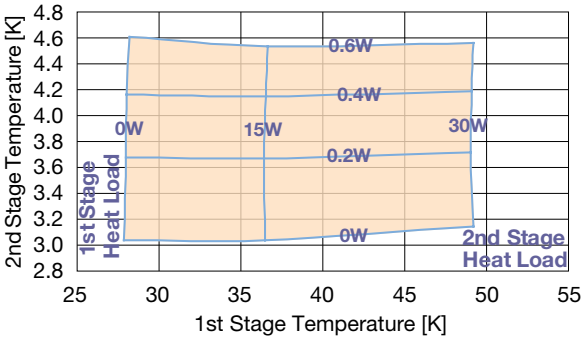
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 4.2 K	0.4	0.4
1st Stage Capacity Watts @ 40 K	15	20
Cooldown Time to 4.2 K Minutes	120	120
Weight kg (lbs.)	16.0 (35.3)	
Maintenance Hours	10,000	

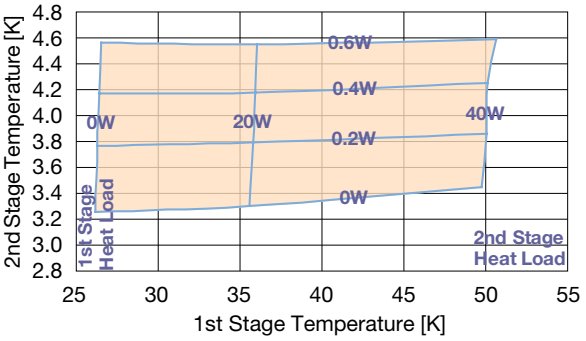
Standard Scope of Supply

- RDK-305D Cold Head
- CNA-31C/D Compressor
- 10 m (33 ft.) Helium Gas Lines
- 10 m (33 ft.) Cold Head Cable
- Tool Kit

SRDK-305D Cold Head Capacity Map (50 Hz)



SRDK-305D Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

SRDK-205D 4K CRYOCOOLER SERIES

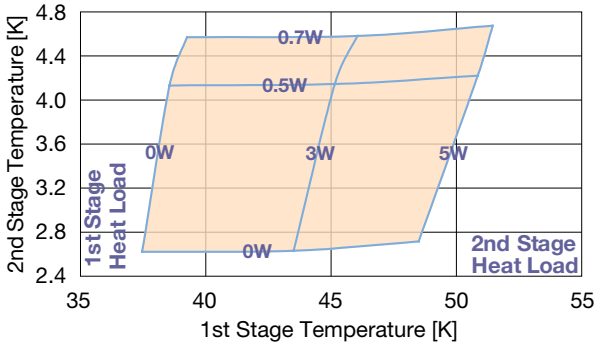
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 4.2 K	0.5	0.5
1st Stage Capacity Watts @ 50 K	3.0	4.0
Cooldown Time to 4.2 K Minutes	90	90
Weight kg (lbs.)	14.0 (30.9)	
Maintenance Hours	10,000	

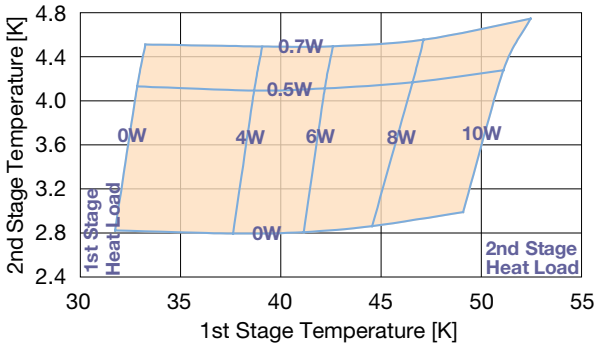
Standard Scope of Supply

- RDK-205D Cold Head
- CKW-21A Compressor
- 10 m (33 ft.) Helium Gas Lines
- 10 m (33 ft.) Cold Head Cable with Adapter
- Tool Kit

SRDK-205D Cold Head Capacity Map (50 Hz)



SRDK-205D Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

SRDK-408D2 4K CRYOCOOLER SERIES

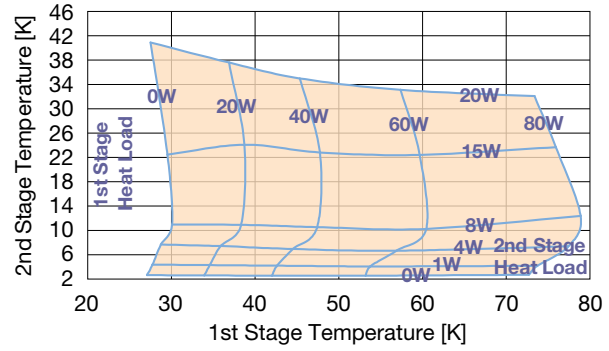
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 4.2 K	1.0	1.0
1st Stage Capacity Watts @ 43 K	40	50
Cooldown Time to 4.2 K Minutes	60	60
Weight kg (lbs.)	18.0 (39.7)	
Maintenance Hours	10,000	

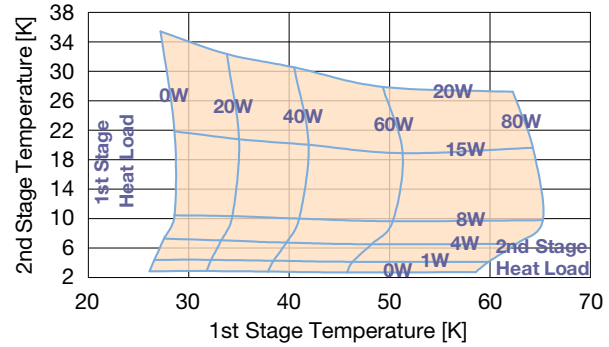
Standard Scope of Supply

- RDK-408D2 Cold Head
- CSA-71A, F-50L/H, F-70L/H or CNA-61C/D Compressor
- 6 m (20 ft.) Helium Gas Lines [10 m (33 ft.) with CNA-61C/D Compressor]
- 6 m (20 ft.) Cold Head Cable [10 m (33 ft.) with CNA-61C/D Compressor]
- Tool Kit

SRDK-408D2 Cold Head Capacity Map (50 Hz)



SRDK-408D2 Cold Head Capacity Map (60 Hz)



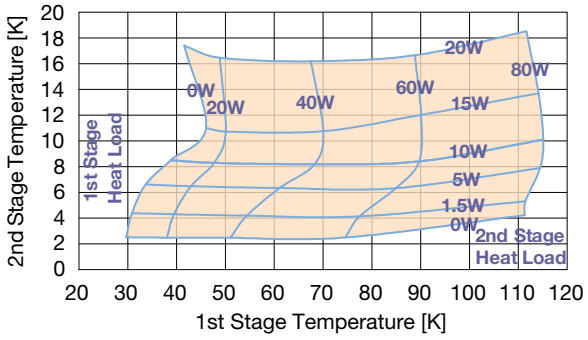
Note: Capacity maps for reference only.

SRDK-415D 4K CRYOCOOLER SERIES

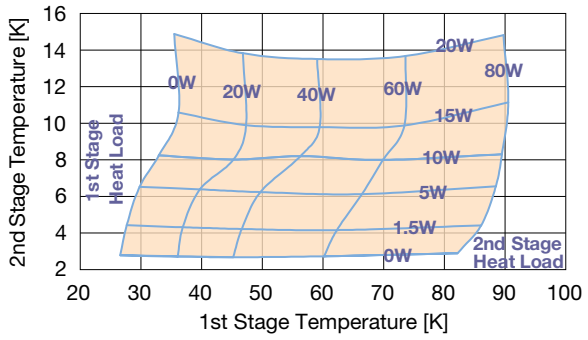
Performance Specifications

Power Supply Hz	**50**	**60**
2nd Stage Capacity Watts @ 4.2 K	1.5	1.5
1st Stage Capacity Watts @ 50 K	35	45
Cooldown Time to 4.2 K Minutes	60	60
Weight kg (lbs.)	18.5 (40.8)	
Maintenance Hours	10,000	

SRDK-415D Cold Head Capacity Map (50 Hz)



SRDK-415D Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

Standard Scope of Supply

- RDK-415D Cold Head
- CSA-71A, F-50L/H, F-70L/H, CNA-61C/D Compressor
- 20 m (66 ft.) Helium Gas Lines or 6 m (20 ft.) Helium Gas Lines with Buffer Tank [10 m (33 ft.) with CNA-61C/D Compressor]
- 6 m (20 ft.) Cold Head Cable [10 m (33 ft.) with CNA-61C/D Compressor]
- Tool Kit

4K GM-JT CRYOCOOLER SERIES

Performance Specifications

Model Number	**CG304SC**	**CG308SC**	**CG310SC**
3rd Stage Capacity* Watts @ 4.3 K (50/60 Hz)	1.0/1.2	3.0/3.5	4.2/5.0
Electrical Supply 50/60 Hz	3 phase, 200 V		
Power Consumption 50/60 Hz	4.5/5.4	5.1/6.4	5.1/6.4
Cooling Water L/min. (gal./min.)	5.5-6.5 (1.5-1.7)	8.0-10.0 (2.1-2.6)	8.0-10.0 (2.1-2.6)
Refrigeration Unit Weight kg (lbs.)	18.0 (39.7)	35.0 (77.2)	50.0 (110.2)
Compressor Weight kg (lbs.)	205 (452)	220 (485)	220 (485)
Maintenance Hours	10,000		

Standard Scope of Supply

- V304SC, V308SC or V316SC Cold Head
- U304CWA or U308CWA Compressor
- Helium Vapor Gauge (with CG308SC and CG310SC models)
- Hydrogen Vapor Gauge
- 6 m (20 ft.) Helium Gas Lines
- 6 m (20 ft.) Valve Motor Cable
- Tool Kit

* Capacity is measured at the JT valve outlet.

SRP-062B 4K PULSE TUBE SERIES

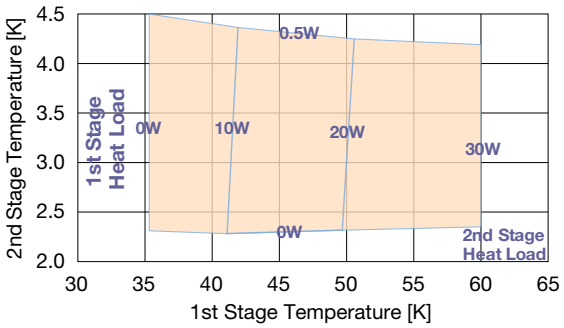
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 4.2 K	0.5	0.5
1st Stage Capacity Watts @ 65 K	30	30
Cooldown Time to 4.2 K Minutes	100	90
Weight kg (lbs.)	23.2 (51.2)	
Maintenance Hours	20,000	

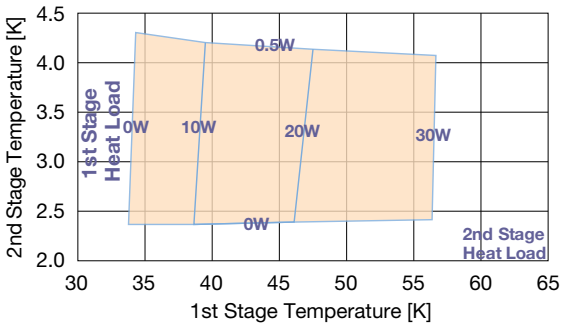
Standard Scope of Supply

- RP-062B Pulse Tube
- F-50L/H Compressor
- 20 m (66 ft.) Helium Gas Lines or 6 m (20 ft.) Helium Gas Lines with Buffer Tank
- 20 m (66 ft.) Cold Head Cable and Power Switch Box
- Tool Kit
- Optional Split Valve Unit

SRP-062B Pulse Tube Capacity Map (50 Hz)



SRP-062B Pulse Tube Capacity Map (60 Hz)



Note: Capacity maps for reference only.

SRP-082B 4K PULSE TUBE SERIES

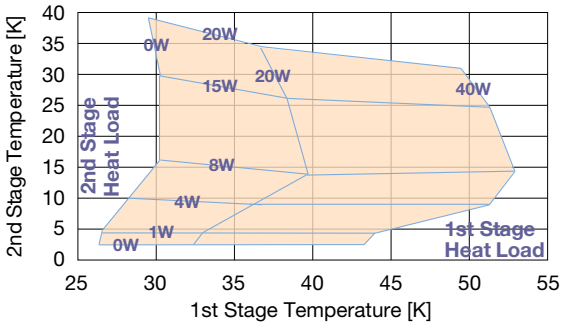
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 4.2 K	1.0	1.0
1st Stage Capacity Watts @ 45 K	40	40
Cooldown Time to 4.2 K Minutes	80	80
Weight kg (lbs.)	26.0 (57.3)	
Maintenance Hours	20,000	

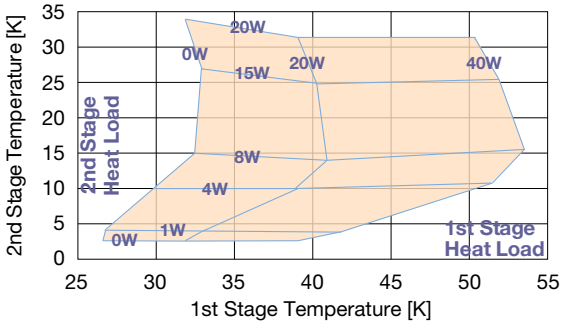
Standard Scope of Supply

- RP-082B Pulse Tube
- F-70LP/H Compressor
- 20 m (66 ft.) Helium Gas Lines
- 20 m (66 ft.) Cold Head Cable
- Tool Kit
- Optional Split Valve Unit

SRP-082B Pulse Tube Capacity Map (50 Hz)



SRP-082B Pulse Tube Capacity Map (60 Hz)



Note: Capacity maps for reference only.

CH-204N 6.5K CRYOCOOLER SERIES

Performance Specifications

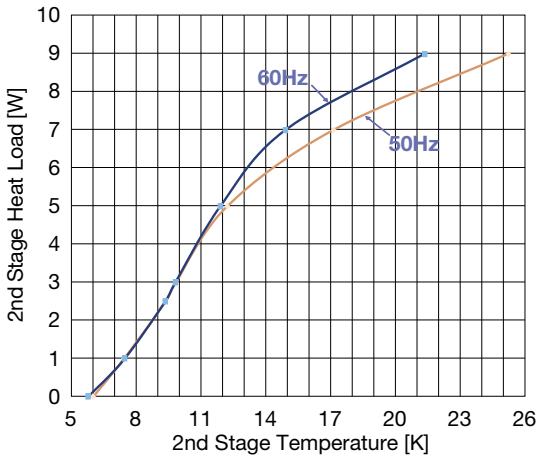
Power Supply Hz	50	60
2nd Stage Capacity Watts @ 10 K	2.5	3.0
1st Stage Capacity	—	—
Maximum 2nd Stage Capacity Watts @ 10 K (No 1st Stage Load)	2.5	3.0
Cooldown Time to 20 K Minutes	40	35
Weight kg (lbs.)	7.8 (17.2)	
Maintenance Hours	13,000	

Standard Scope of Supply

- CH-204N Cold Head
- Zephyr®, HC-4E1, HC-8E4 or F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3.5 m (11 ft.) Cold Head Cable
- Tool Kit

Note: Up to two (2) cold heads can be operated with F-70 Compressor.

CH-204N Cold Head Capacity Map (50/60 Hz)



Note: Capacity maps for reference only.

SRDK-408S2 10K CRYOCOOLER SERIES

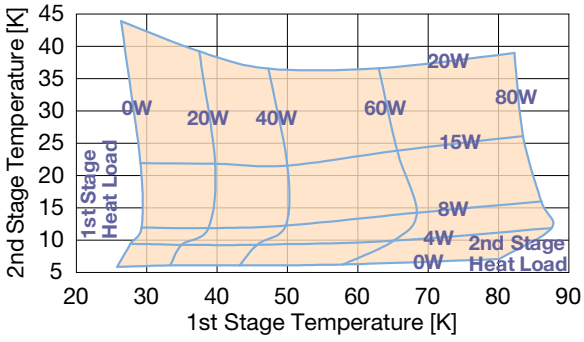
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 10 K	5.4	6.3
1st Stage Capacity Watts @ 45 K	35	40
Cooldown Time to 10 K Minutes	60	60
Weight kg (lbs.)	17.2 (37.9)	
Maintenance Hours	10,000	

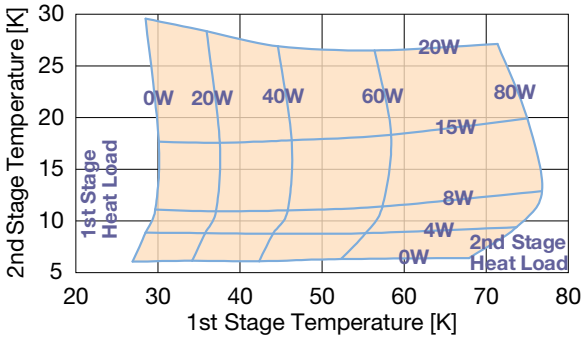
Standard Scope of Supply

- RDK-408S2 Cold Head
- CSA-71A, F-50L/H or CNA-61C/D Compressor
- 6 m (20 ft.) Helium Gas Lines [10 m (33 ft.) with CNA-61C/D Compressor]
- 6 m (20 ft.) Cold Head Cable [10 m (33 ft.) with CNA-61C/D Compressor]
- Tool Kit

SRDK-408S2 Cold Head Capacity Map (50 Hz)



SRDK-408S2 Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

CH-202 10K CRYOCOOLER SERIES

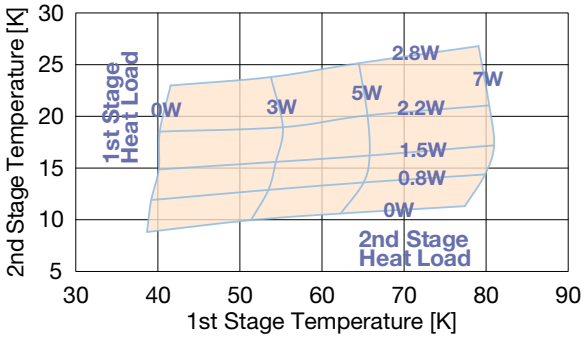
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 20 K	1.8	2.2
1st Stage Capacity Watts @ 77 K	7.3	8.8
Maximum 2nd Stage Capacity Watts @ 20 K (No 1st Stage Load)	2.0	2.5
Cooldown Time to 20 K Minutes	75	65
Weight kg (lbs.)	6.8 (15.0)	
Maintenance Hours	13,000	

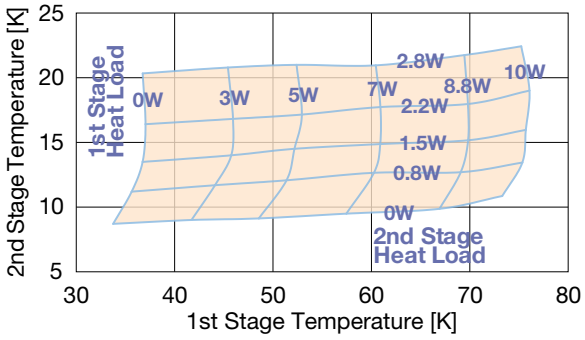
Standard Scope of Supply

- CH-202 Cold Head
- Zephyr® or HC-4E1 Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3.5 m (11 ft.) Cold Head Cable
- Tool Kit

CH-202 Cold Head Capacity Map (50 Hz)



CH-202 Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

CH-204 10K CRYOCOOLER SERIES

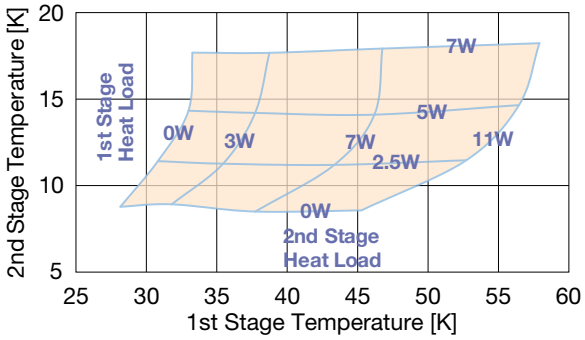
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 20 K	6.7	7.1
1st Stage Capacity Watts @ 80 K	13.5	16.2
Maximum 2nd Stage Capacity Watts @ 20 K (No 1st Stage Load)	7.5	9.0
Cooldown Time to 20 K Minutes	35	30
Weight kg (lbs.)	7.8 (17.2)	
Maintenance Hours	13,000	

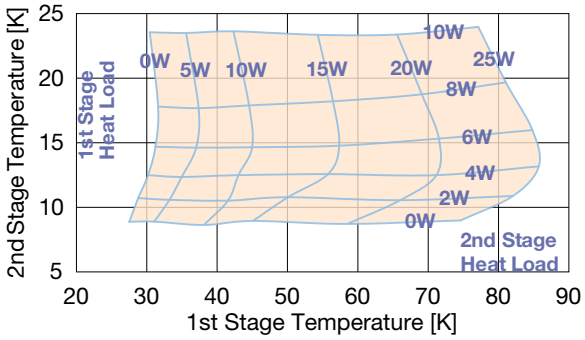
Standard Scope of Supply

- CH-204 Cold Head
- Zephyr®, HC-4E1, HC-8E4 or F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3.5 m (11 ft.) Cold Head Cable
- Tool Kit

CH-204 Cold Head Capacity Map (50 Hz)



CH-204 Cold Head Capacity Map (60 Hz)



Note: Up to two (2) cold heads can be operated with F-70 Compressor.

Note: Capacity maps for reference only.

CH-208R 10K CRYOCOOLER SERIES

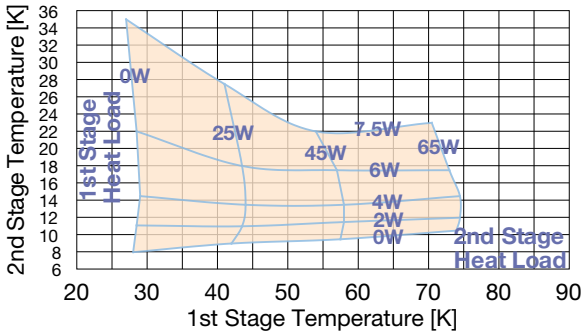
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 20 K	6.0	7.5
1st Stage Capacity Watts @ 77 K	65	80
Maximum 2nd Stage Capacity Watts @ 20 K (No 1st Stage Load)	5.5	6.5
Cooldown Time to 20 K Minutes	55	45
Weight kg (lbs.)	11.6 (25.6)	
Maintenance Hours	13,000	

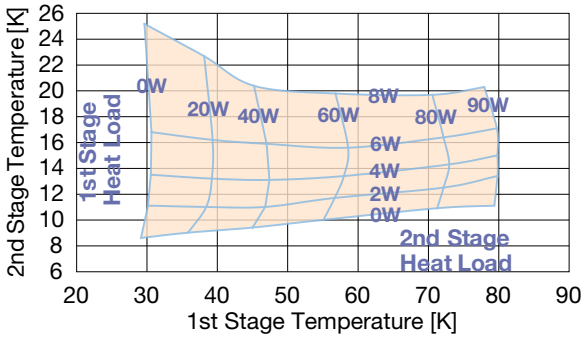
Standard Scope of Supply

- CH-208R Cold Head
- HC-8E4 or F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3 m (10 ft.) Cold Head Cable
- Tool Kit

CH-208R Cold Head Capacity Map (50 Hz)



CH-208R Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

CH-208L 10K CRYOCOOLER SERIES

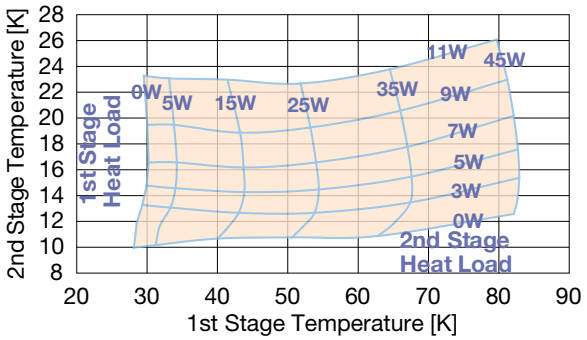
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 20 K	8.0	10.0
1st Stage Capacity Watts @ 77 K	28	35
Maximum 2nd Stage Capacity Watts @ 20 K (No 1st Stage Load)	8.5	10.0
Cooldown Time to 20 K Minutes	50	40
Weight kg (lbs.)	11.8 (26.0)	
Maintenance Hours	13,000	

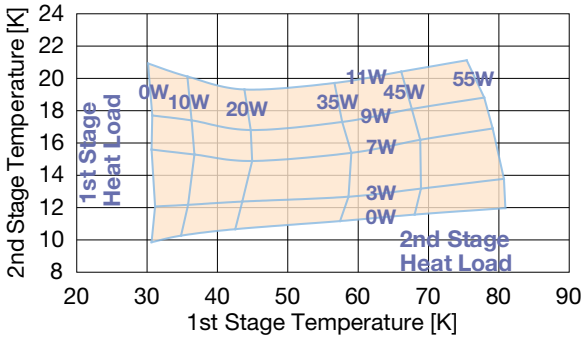
Standard Scope of Supply

- CH-208L Cold Head
- HC-8E4 or F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3 m (10 ft.) Cold Head Cable
- Tool Kit

CH-208L Cold Head Capacity Map (50 Hz)



CH-208L Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

CH-210 10K CRYOCOOLER SERIES

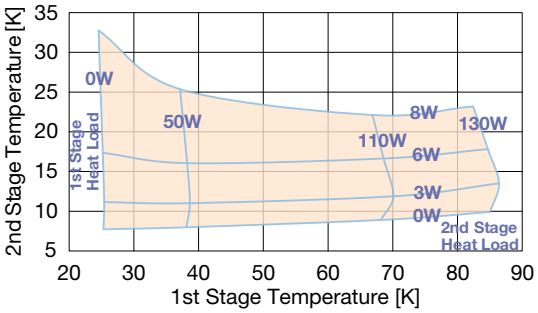
Performance Specifications

Power Supply Hz	50	60
2nd Stage Capacity Watts @ 20 K	6.0	7.0
1st Stage Capacity Watts @ 77 K	110	120
Maximum 2nd Stage Capacity Watts @ 20 K (No 1st Stage Load)	6.0	6.0
Cooldown Time to 20 K Minutes	35	30
Weight kg (lbs.)	13.8 (30.4)	
Maintenance Hours	13,000	

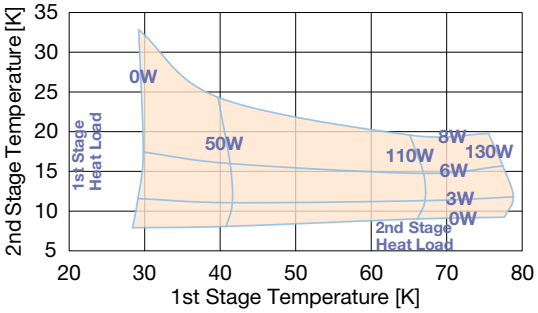
Standard Scope of Supply

- CH-210 Cold Head
- F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3 m (10 ft.) Cold Head Cable
- Tool Kit

CH-210 Cold Head Capacity Map (50 Hz)



CH-210 Cold Head Capacity Map (60 Hz)



Note: Capacity maps for reference only.

SRDK-400B 40K CRYOCOOLER SERIES

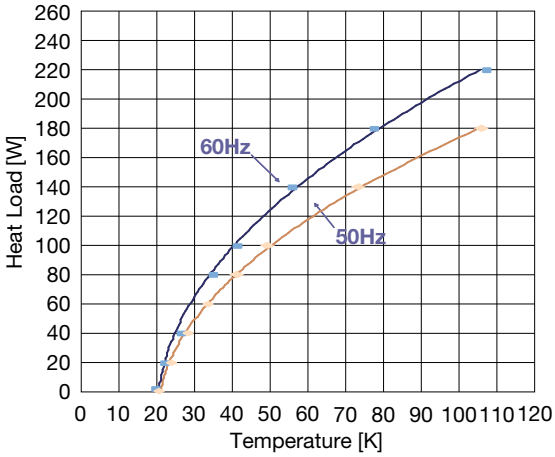
Performance Specifications

Power Supply Hz	50	60
1st Stage Capacity Watts @ 40 K	54	70
Cooldown Time to 40 K Minutes	30	30
Weight kg (lbs.)	16.0 (35.3)	
Maintenance Hours	10,000	

Standard Scope of Supply

- RDK-400B Cold Head
- CSA-71A, F-50L/H, CNA-61C/D Compressor
- 20 m (66 ft.) Helium Gas Lines or 6 m (20 ft.) Helium Gas Lines with Buffer Tank
- 6 m (20 ft.) Cold Head Cable [10 m (33 ft.) with CNA-61C/D Compressor]
- Tool Kit

SRDK-400B Cold Head Capacity Map (50/60 Hz)



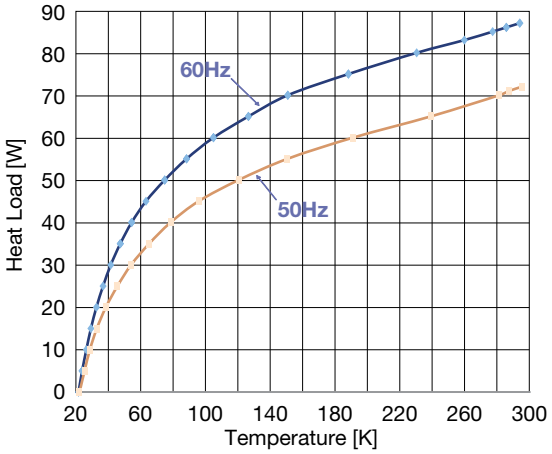
Note: Capacity maps for reference only.

CH-104 77K CRYOCOOLER SERIES

Performance Specifications

Power Supply Hz	50	60
1st Stage Capacity Watts @ 77 K	34	42
Cooldown Time to 20 K Minutes	40	30
Weight kg (lbs.)	7.9 (17.5)	
Maintenance Hours	13,000	

CH-104 Cold Head Capacity Map (50/60 Hz)



Standard Scope of Supply

- CH-104 Cold Head
- Zephyr®, HC-4E1, HC-8E4 or F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3.5 m (11 ft.) Cold Head Cable
- Tool Kit

Note: Up to two (2) cold heads can be operated with F-70 Compressor.

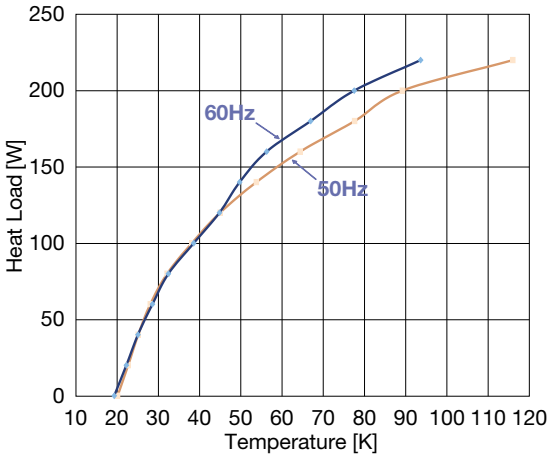
Note: Capacity maps for reference only.

CH-110 77K CRYOCOOLER SERIES

Performance Specifications

Power Supply Hz	50	60
1st Stage Capacity* Watts @ 77 K	175	200
Cooldown Time to 20 K Minutes	35	30
Weight kg (lbs.)	13.7 (30.2)	
Maintenance Hours	13,000	

CH-110 Cold Head Capacity Map (50/60 Hz)



Standard Scope of Supply

- CH-110 Cold Head
- Zephyr®, HC-4E1, HC-8E4 or F-70L/H Compressor
- 3 m (10 ft.) Helium Gas Lines
- 3.5 m (11 ft.) Cold Head Cable
- Tool Kit

* Low temperature version also available. Reduced capacities when operated with Zephyr®, HC-4E1 or HC-8E4 Compressors. Capacity maps for reference only.

CRYOCOOLER ACCESSORIES

Helium Gas Lines

SHI Cryocooler systems come equipped with flexible helium gas lines. Standard lengths range from 3 meters (10 feet) to 20 meters (66 feet), depending on the system. Gas lines terminate in coupling halves for quick connect and disconnect to and from the cold head and compressor and are also available with one end at 90°. All flexible gas lines are pre-charged with clean helium gas.

SHI superflex lines offer superior flexibility and smaller bend radius without thinning the wall of the hose and offer a higher flexing cycle life than standard lines. Superflex lines also dampen vibration and noise of the helium gas traveling through the lines.

Cold Head Cables

SHI offers a complete line of cables that transmit the appropriate power from the compressor to the cold head on our standard cryocooler systems. Cable lengths vary by type of system.

Tool Kits

Tool kits are available from standard installation wrench kits to more comprehensive kits that include such items as gas charging valves and additional tools for installation, maintenance or service on SHI cryocooler systems. Standard kits that accompany new equipment vary by type of system. Contact your local SHI office for details.

Replacement Parts Kits and Exchange Units

SHI offers a complete line of replacement parts kits that include all of the required parts and assemblies to completely recondition CH Series cryocoolers and related compressors. Complete exchange units can also be available, particularly for our 4KGM and Pulse Tube Cryocoolers (actual service and maintenance work is required at SHI authorized Service Centers). Contact your local SHI office for details.

COMPRESSOR OPTIONS

All SHI Cryocoolers and Pulse Tubes are driven by highly-efficient and reliable helium compressors. These compressors boast industry-leading 20,000 or 30,000 hour maintenance intervals, and are available in single-phase and three-phase, low and high voltage, and water and air-cooled versions.

Compressor Model	HC-4E1	CKW-21A	HC-8E4	F-50		F-70		
				L	H	LP	L	H
Cooling	Water Cooled	Water Cooled	Water Cooled	Water Cooled		Water Cooled		
Electrical Supply	1 Phase 200 V, 230/240 V, 50 Hz 208/230 V, 60 Hz	3 Phase 200 V, 50/60 Hz	3 Phase 220 V, 50 Hz 220/230 V, 60 Hz	3 Phase 200 V, 50/60 Hz	3 Phase 380, 400, 415 V, 50 Hz 480 V, 60 Hz	3 Phase 200 V, 50/60 Hz		3 Phase 380-415 V, 50 Hz 480 V, 60 Hz
Power Consumption*	2.6 kW at 50 Hz 3.0 kW at 60 Hz	2.7-3.3 kW at 50 Hz 3.5-4.0 kW at 60 Hz	3.7 kW at 50 Hz 4.3 kW at 60 Hz	6.5-7.2 kW at 50 Hz 7.5-8.3 kW at 60 Hz		6.7-7.2 kW at 50 Hz 8.0-8.5 kW at 60 Hz	6.6-6.9 kW at 50 Hz 7.5-7.8 kW at 60 Hz	
Ambient Temperature	4-40 °C (40-104 °F)	5-35 °C (41-95 °F)	4-40 °C (40-104 °F)	5-35 °C (41-95 °F)		4-40 °C (40-104 °F)		
Cooling Water (Inlet)	2.7 L/min. (0.7 gal./min.) 4-27 °C (40-80 °F)	3.0-3.5 L/min. (1.8 gal./min.) 28 °C (82 °F)	5.7-9.5 L/min. (1.5-2.5 gal./min.) 4-21 °C (40-70 °F)	7-10 L/min. (1.8 gal./min.) 28 °C (82 °F)		6-9 L/min. (1.6-2.4 gal./min.) 5-25 °C (41-77 °F)		
Cooling Air	N/A	N/A	N/A	N/A		N/A		
Dimensions (HxWxD)	504 x 430 x 485 mm (19.8 x 16.9 x 19.1 in.)	461 x 400 x 450 mm (18.1 x 15.7 x 17.7 in.)	504 x 430 x 485 mm (19.8 x 16.9 x 19.1 in.)	591 x 450 x 588 mm (23.3 x 17.7 x 23.2 in.)		532 x 443 x 493 mm (20.9 x 17.4 x 19.4 in.)		
Weight	75 kg (165 lbs.) 82 kg (180 lbs.) w/ transformer	70 kg (155 lbs.)	75 kg (165 lbs.)	120 kg (264 lbs.)		100 kg (225 lbs.)		
Maintenance	30,000 Hours	20,000 Hours	30,000 Hours	30,000 Hours		30,000 Hours		

* Typical power consumption

To find the most compatible compressor for your cryocooler or pulse tube system, please refer to the individual product specifications in this catalogue or contact your local SHI Cryogenics Group sales office.

CNA-11		Zephyr®	CNA-31		CSA-71A	CNA-61	
B	C		C	D		C	D
Air Cooled		Air Cooled	Air Cooled		Air Cooled	Air Cooled	
1 Phase 100 V, 50/60 Hz	1 Phase 100, 120, 220, 230, 240 V, 50/60 Hz	1 Phase 200 V, 220 V, 230/240 V, 50 Hz 220 V, 60 Hz	3 Phase 200 V, 50/60 Hz	3 Phase 380, 400, 415 V, 50 Hz 460, 480 V, 60 Hz	3 Phase 200 V, 50/60 Hz	3 Phase 200 V, 50/60 Hz	3 Phase 380, 400, 415 V, 50 Hz 460, 480 V, 60 Hz
1.2-1.3 kW at 50 Hz 1.3-1.5 kW at 60 Hz		3.0 kW at 50 Hz 3.4 kW at 60 Hz	3.8-4.6 kW at 50 Hz 4.8-5.6 kW at 60 Hz		6.5-7.2 kW at 50 Hz 7.5-8.3 kW at 60 Hz	7.5-8.0 kW at 50 Hz 8.5-9.2 kW at 60 Hz	
4-38 °C (39-100 °F)		4-32 °C (40-90 °F)	4-38 °C (39-100 °F)		5-35 °C (41-95 °F)	5-35 °C (41-95 °F) - Indoor -30-45 °C (-22-113 °F) - Outdoor	
N/A		N/A	N/A		N/A	N/A	
2.7 m^3/min. (95 cfm), 50 Hz 3.3 m^3/min. (117 cfm), 60 Hz		20 m^3/min. (706 cfm), 50/60 Hz	20.1 m^3/min. (710 cfm), 50 Hz 23.0 m^3/min. (812 cfm) 60 Hz		28 m^3/min. (989 cfm), 50/60 Hz	29.7 m^3/min. (1049 cfm), 50 Hz 29.8 m^3/min. (1052 cfm), 60 Hz	
400 x 390 x 450 mm (15.7 x 15.3 x 17.7 in.)	610 x 390 x 450 mm (24.0 x 15.4 x 17.7 in.)	715 x 453 x 488 mm (28.2 x 17.8 x 19.2 in.)	901 x 520 x 520 mm (35.5 x 20.5 x 20.5 in.)		885 x 550 x 550 mm (34.8 x 21.7 x 21.7 in.)	630x270x570 mm (24.8 x 10.6 x 22.4 in.) 1050x910x400 mm (41.3 x 35.8 x 15.7 in.)	705x270x610 mm (27.8 x 10.6 x 24.0 in.) 1050x910x400 mm (41.3 x 35.8 x 15.7 in.)
42 kg (93 lbs.)	75 kg (165 lbs.)	102 kg (225 lbs.) 111 kg (245 lbs.) w/ transformer	95 kg (210 lbs.) 104 kg (229 lbs.)		140 kg (309 lbs.)	45 kg (95 lbs.)/ 115 kg (254 lbs.)	55 kg (121 lbs.)/ 115 kg (254 lbs.)
30,000 Hours		30,000 Hours	30,000 Hours		20,000 Hours	20,000 Hours	

GLOBAL SERVICE & SUPPORT PROGRAMS

At SHI Cryogenics Group, we realize that our customers are diverse and the markets they serve are demanding and unique. In response, our global service and support network offers responsive and value-added support for our complete range of products. Our factory-trained technicians are located in strategic service centers around the globe and offer 24/7 live, on-call support.

Our cryocooler service offerings differ by product type. However, our complete range of services are both flexible and cost effective, including:

- Product return to local service depot for service, repair or complete refurbishment
- Assistance in diagnosing equipment issues via phone or e-mail
- Product exchange programs
- Customer training programs
- Customized service contracts

RDK Series GM, RP Series Pulse Tube and CG Series GM-JT Cryocoolers are high-quality, ultra-reliable designs that operate at extremely low temperatures (typically liquid helium temperatures). Due to the unique operating environment of these cryocoolers, on-site service and maintenance by non-SHI technicians is not recommended at this time. The most reliable approach to service and maintenance on these cryocoolers is to return them to one of SHI's service centers. We also understand that there are cases where complete removal and return of the Pulse Tube or RDK Cryocooler is overly difficult. In response, SHI also offers "Hot Swap" service performed by SHI technicians.

Hot Swap service allows for "in situ" maintenance, without the need to remove the complete cryocooler for return or replacement. Hot Swap service involves complete exchange of the cryocooler assembly, with the exception of the cylinder, which remains installed in the customer's system. Hot Swap implies that the customer's system is warm to allow for reliable removal and exchange.

SHI CH Series Cryocoolers can be serviced on-site, in-situ by the customer or by an SHI factory-trained technician, without removing the cryocooler for return or replacement. This unique service option is the result of the high-quality, ultra-reliable Displex® Cryocooler technology found in all CH Series Cryocoolers. Displex® Cryocoolers have a long and successful operating history, and feature a pneumatic drive that optimizes performance and reliability and permits quick and easy removal of the displacer assembly for maintenance.

Performing in-situ service lowers the total cost of ownership by:

- Eliminating the cost of shipping a complete cryocooler to a service center
- Eliminating labor costs associated with complete disassembly of the cryocooler from your system
- Minimizing the "down time" of your system for service or repair
- Minimizing the required capital investment in spare parts

SHI factory-trained service technicians are also available for on-site training, scheduled maintenance or emergency visits, offering rapid-response service for mission-critical applications.

Whichever service program is right for you, you can be assured that all SHI work will be performed in our world-class service centers or by a qualified service technician on site. Please feel free to contact your local SHI Cryogenics Group office for more information or for a service and support package that meets the needs of your organization.

OTHER PRODUCTS FROM SHI CRYOGENICS GROUP

In addition to the cryocoolers featured in this catalogue, SHI Cryogenics Group designs and manufactures Cryopumps, Shield Coolers and other low temperature cooling technology.

The SICERA® Cryopump uses SHI proprietary inverter technology to reduce customer energy costs by 20-30%. The resulting savings and increased production efficiency make SICERA® ideal for high-volume production of semiconductor wafers, flat panel display and other semiconductor-related products.

The complete SICERA® cryopump system includes a compressor and remote controller, which have been thoroughly tested to withstand the most demanding vacuum applications. Through continuous control of both the cryocooler and compressor, SHI Cryogenics Group is able to offer a reliable cryopump system with significant energy savings, as well as excellent temperature and vacuum stability.

Marathon® CP Series Cryopumps from SHI Cryogenics Group are specifically designed to meet the needs of high vacuum processes. Applications for these versatile systems range from custom laboratory equipment to industrial-scale tools. Manufacturers of semiconductor devices, flat panel displays, test equipment, solar manufacturing and a wide variety of coating and thermal vacuum systems require efficient, reliable and robust systems that offer a low cost of ownership. The Marathon® CP Series Cryopumps from SHI Cryogenics Group deliver on all fronts.

A range of standard and low profile enclosures, ANSI, ISO and CF flanges, as well as manual and fully automatic features, ensure that users have modularity and flexibility to choose from when designing their systems.

All Marathon® CP Series Cryopumps are driven by highly-efficient and reliable helium compressors. These compressors boast an industry leading 30,000 hour maintenance interval. Compressors are available in single-phase and three-phase, low and high voltage versions.

For those users requiring the latest in efficient, fully-automated operation, SHI Cryogenics Group offers our Marathon® Cryopump Controller (MCC). The MCC enables fully automatic operation and monitoring of the cryopump system using commands from a host computer and industry standard cryopump protocol. If you do not utilize a host computer, optional software is available to interface the MCC to a standard Windows-based computer. The result of utilizing the Marathon® CP Cryopump with MCC is greatly reduced downtime between production cycles, improved process times and better overall efficiency of the user's process.

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