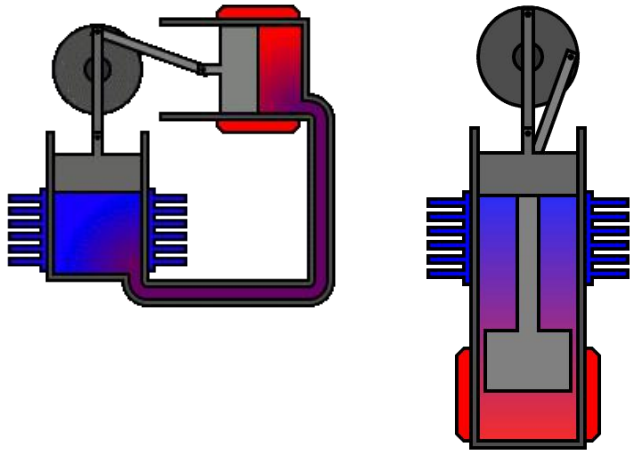
RIGID HVAC CO.,LTD


RIGID
RIGID STIRLING
Linear Free Piston Stirling
Application Module
RoHS
MADE IN CHINA

FPSC Stirling Technology



Stirling engine is also known as external combustion engine or hot gas engine

- As a heat engine, they are more efficient than internal combustion engines, with a maximum combined conversion efficiency of 97% when used as a cogeneration application.
- As a chiller, it has a unique advantage over compressors and can be used as a low temperature cooling source down to -233C (40K).

Stirling technology has been a unique secret in the military and aerospace fields, and the equipment manufacturing is expensive and cannot be mass produced. The industrialization capability of this technology has been monopolized by foreign countries for a long time, and the products are basically prohibited to China.

We are the first and only private company in China that has the ability to develop and industrialize high-end Stirling technology.

Lockheed Martin

-- A World Class Arms Giant

Manufacturer of the world's most advanced weapons, including the U.S. F-35 Lightning II fighter jet

ASRG: Advanced Stirling Radioisotope Generator

Free Piston Stirling Cooler

FPSC also is a kind of Magnetic Levitation Compressor (MagLev solution). But it is even more efficient chiller compressor, low energy cost, and consumption. It is small, portable, and it is widely used for precise temperature control for under -170℃ maximum.

RIGID, one of the leading Chinese companies in terms of innovation, designed a Free-Piston Stirling cooler – FPSC. The unit takes the entire product to a whole new level where it can save a lot of energy and significantly improve efficiency. The default version of Stirling coolers includes pistons, heat exchangers, and compression spaces. But we are seeing the technology advancements in all industries, such as Biotech, Pharmaceutical, Energy, Chemical, Foods, logistics, Metrology.

RIGID Free-Piston Stirling cooler is a game-changer for next-generation ultra-deep freezing

Product Model

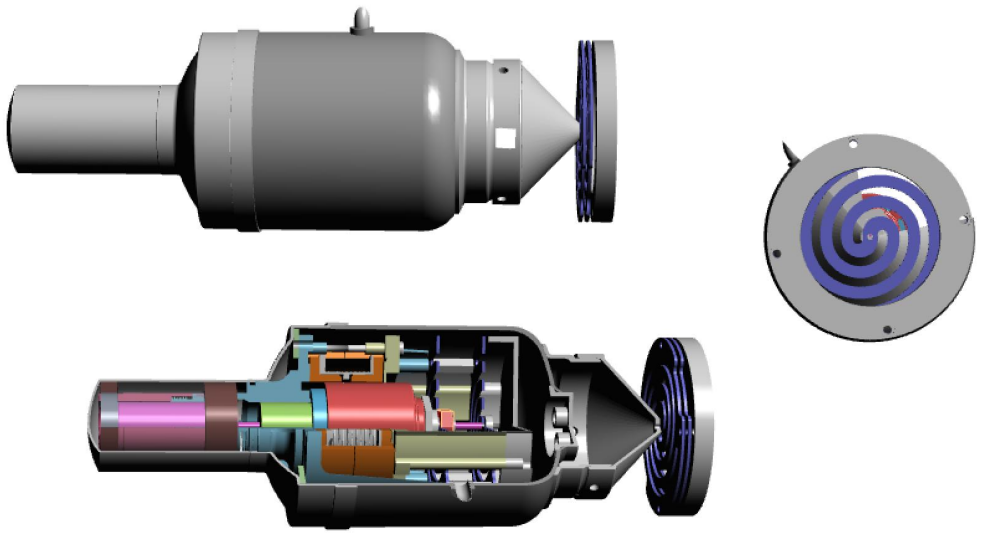
RS50

RS100

RS100 Plus

RS100 77K

2018/2019 Old Models



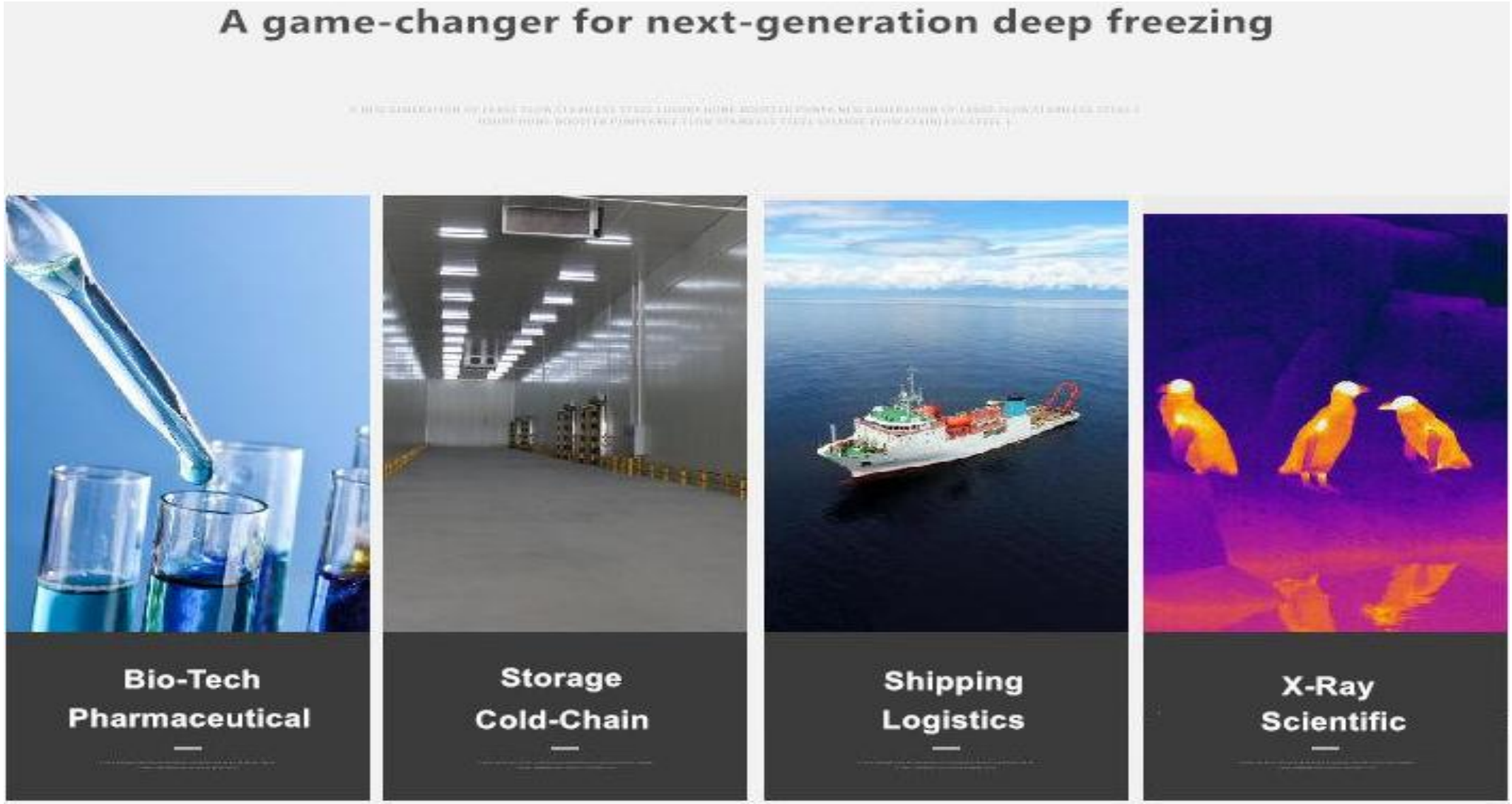
Power **S**

12/24V DC 60W / **8**0W

RS **X**S 77K

12V DC **10**W

Stirling Cooler Applications



Stirling Power Freezer -86°C

Production Name: RG01L86

Ultra-low Temp Vaccine Freezer -86℃

RIGID ultra-low temperature mobile vaccine freezer - RG01L86 is specially designed for the medical scene, with ultra-compact size, lightweight and minimum temperature of -86℃ to solve the industry pain point of vaccine transportation.

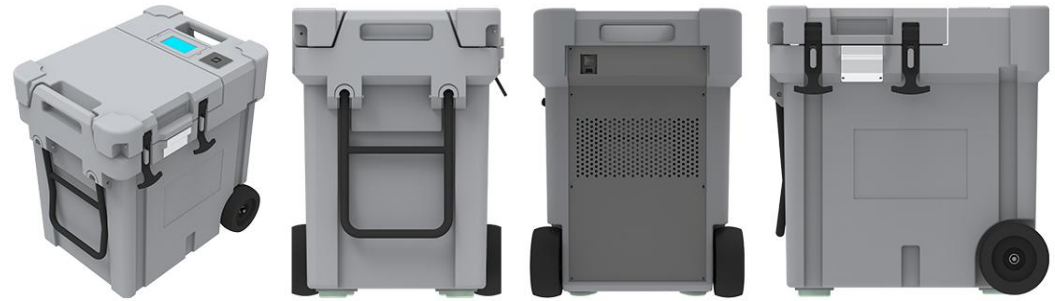
The vaccine freezer makes up for the shortage of vaccine transportation, with precise temperature control of ±0.1℃ to ensure high quality of transportation. Safety.

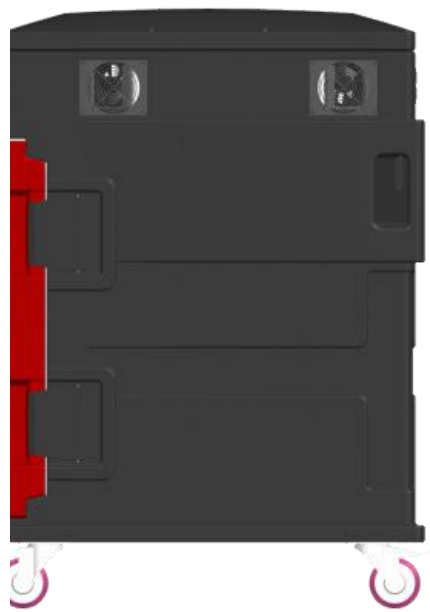
Stirling technology is a breakthrough in small and deep freezing. It can be used in abundant applications, also a better alternative to a refrigerated compressor.

RIGID breakthrough cooling technology makes the Stirling ultra-low temperature (ULT) freezer uniquely efficient, lightweight and flexible enough to meet today's unprecedented COVID-19 vaccine cold chain deployment challenges.

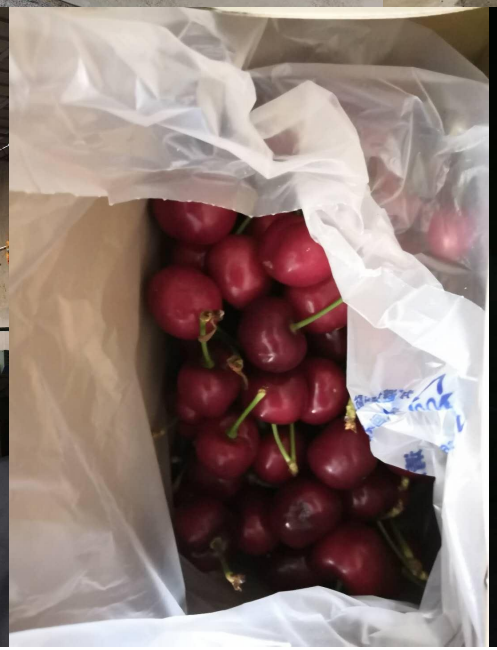
More Stirling Power Freezers And Applications






1.3 cubic meters Freezer Fresh 4℃



Use a 580L Stirling truck to deliver cherries in any convertible, Portability and Safety.

Ultra-low temperature inhibits enzyme decomposition and fatty acidification!

- Cold chain logistics as an industry trend.
- Cryogenic cold chain logistics will also become an industry trend.
- Stirling Cooler is a better alternative to liquid nitrogen and dry ice.

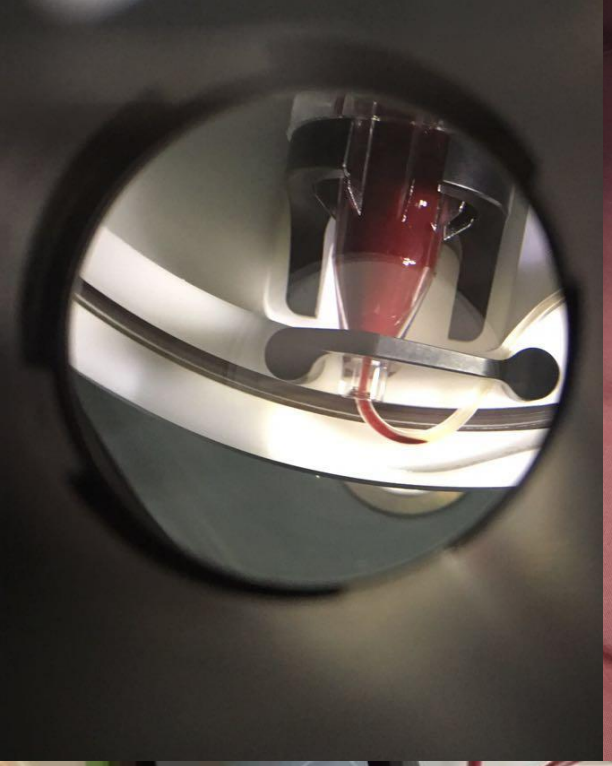
ITOCHU

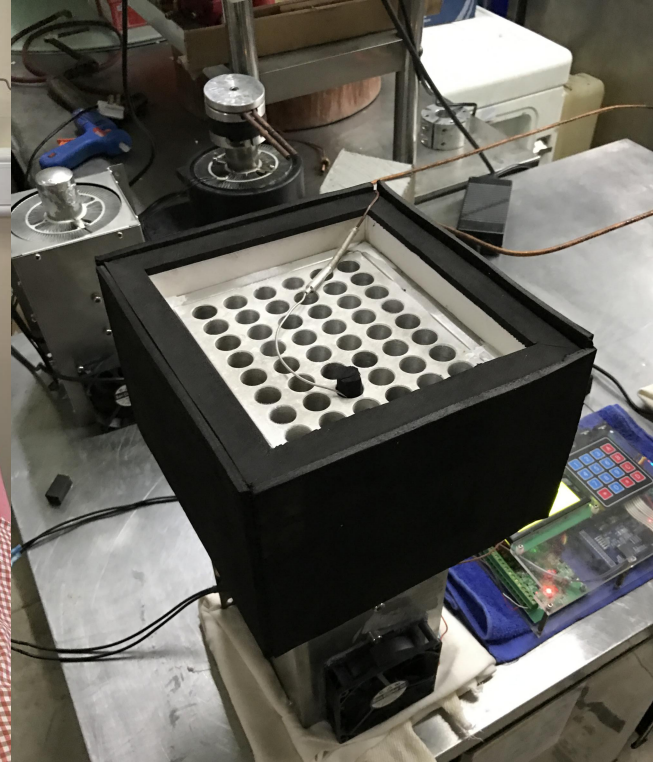
Food Refrigeration

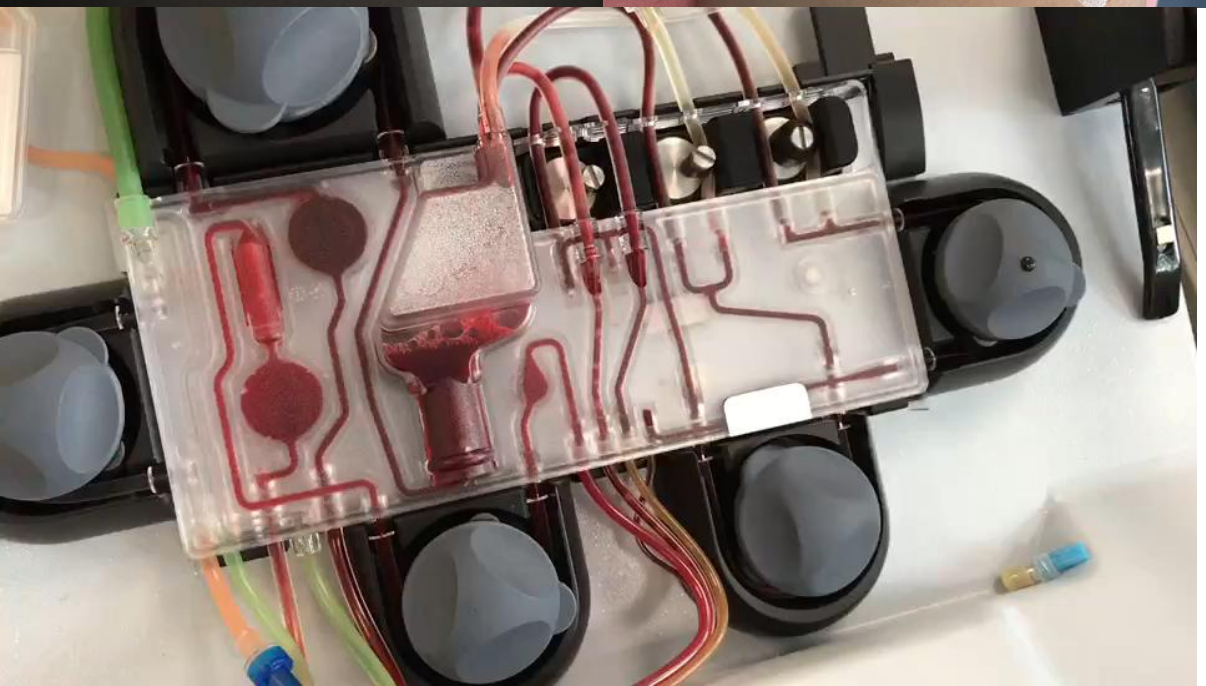
RIGID Haier

Biomedical

Collaborate with Haier in civilian organ and vaccine refrigerators







Biomedical

- Live Immune Cell Preservation
- Programmable Cooling Instrument
- Cell Freezing And Thawing Machine

Ice making on fishing boats

Smoothies made on site by fishing boats

Resistant to sea bumps

Quick freezing to protect fish appearance

Multiple chillers back up each other

Stirling Technology Core Competence

- Precise temperature control, 0.1C temperature control accuracy in the whole temperature zone.
- Completely anti-shaking, unlimited working angle, can be turned on immediately after transportation and restarted immediately after power failure.
- No condenser,No evaporator, smallest footprint for application.

- Lighter weight and more than 40% simpler structure than compressors/generators of the same class.
- No installation restrictions, can be inverted, low working noise.
- Use of helium as operating medium, more environmentally friendly and energy saving.
- Maintenance free for 10-25 years, low operating cost (TCO).
- Fully gas-tight, corrosion-resistant, radiation-resistant, vacuum environment.

- No demand for heat sources.
- Able to work at high latitudes and altitudes.

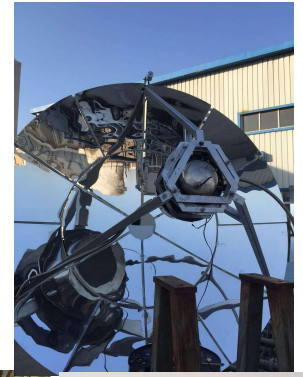
Stirling Is The Key To Unlocking Doors Of The Tndustry

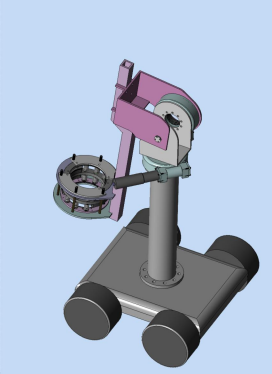
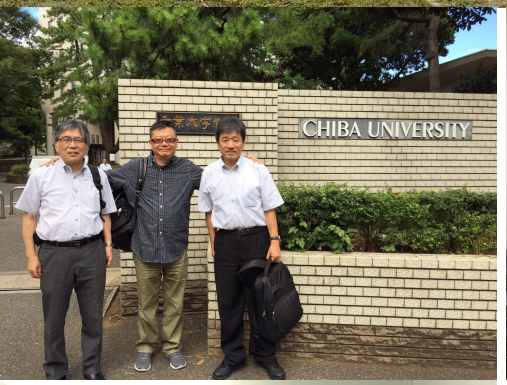
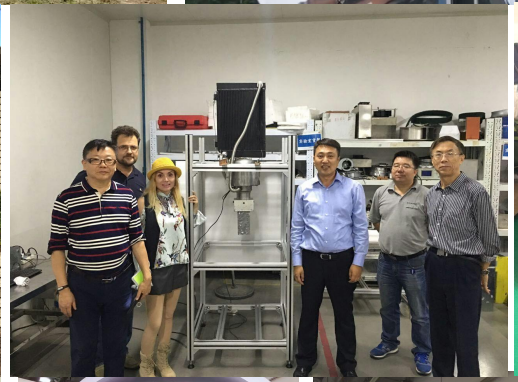
As a general technology for the entire industry chain
Stirling is a game-changer for next-generation deep freezing -State of the Art!

Applications of The Stirling Engine

1. Logistics
2. Aerospace
3. New Energy
4. Communication
5. Internet of Things
6. Big Data Services
7. Military, Research
8. Medical Equipment
9. Biopharmaceutical
10. Home Appliances
11. Environmental Protection
12. Electrical and Electronics
13. High-end Manufacturing





CHIBA UNIVERSITY


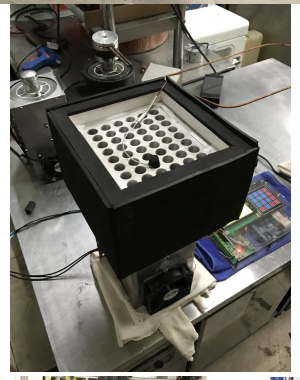

移动基



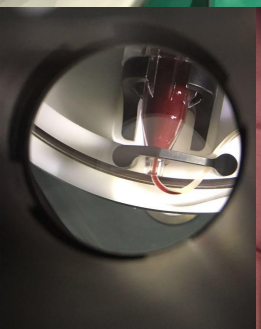

净化服穿着示意图

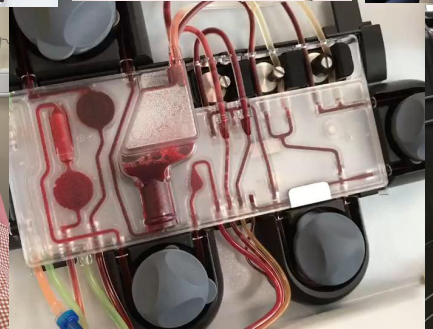
用友医疗
yonyouhlt.com

用友医疗
yonyouhlt.com








TWINBIRD

RIGID

Core Manufacturer

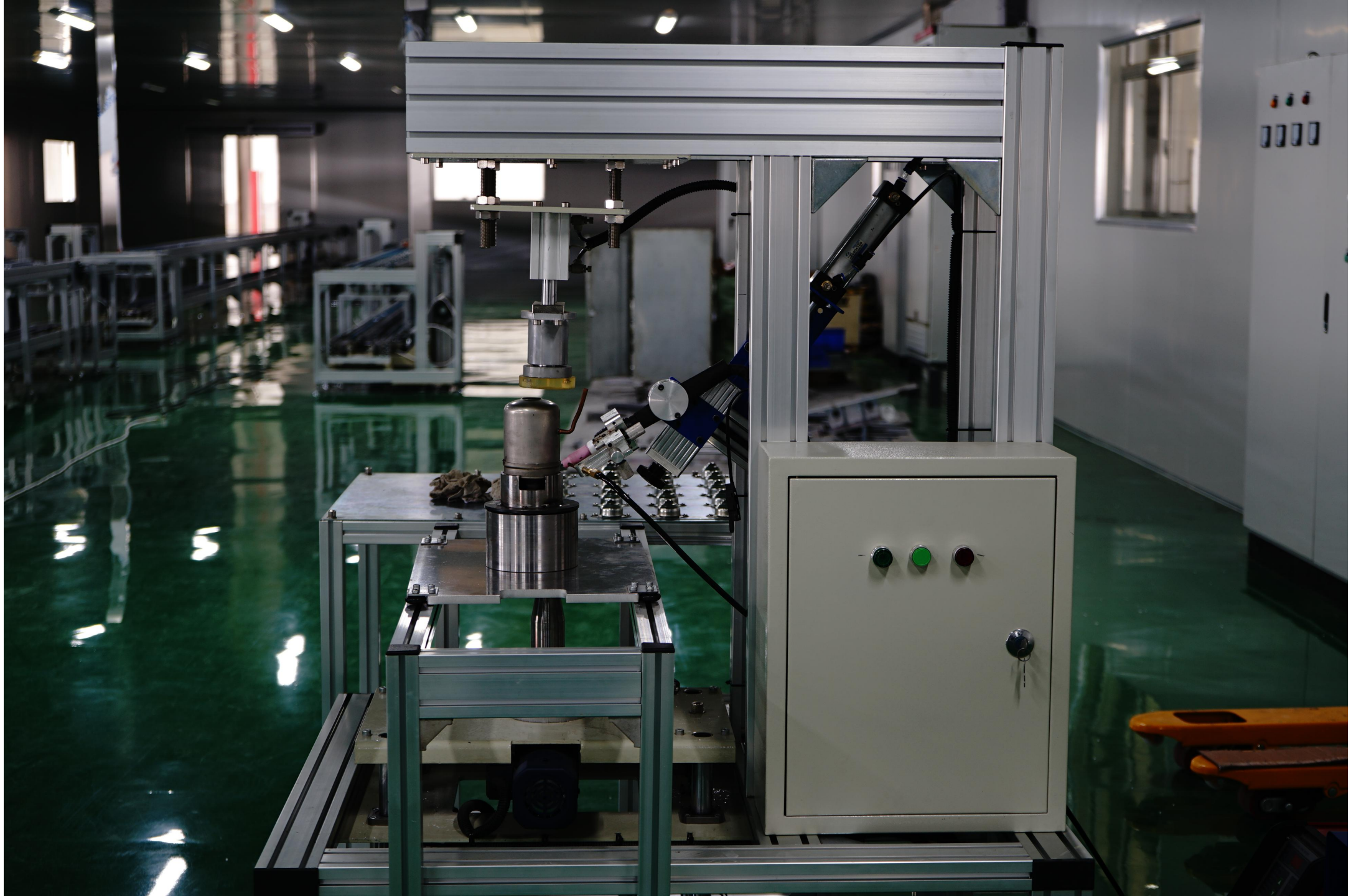
Manufacture The Best And Cheapest Stirling Machine

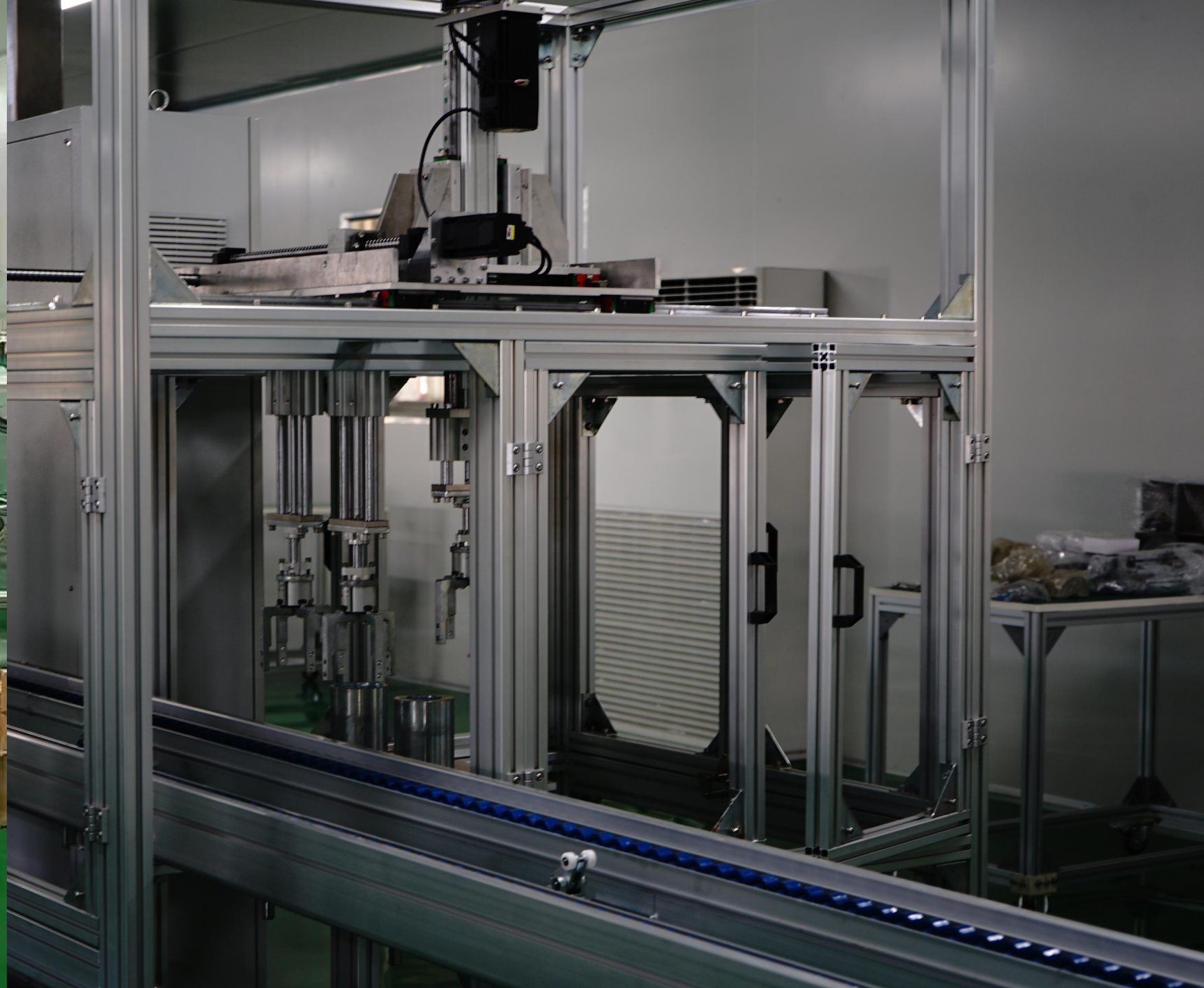
Factory - Stirling core production base
36000 square meters - Registered capital 360 million yuan

Plant Progress

- The plant is partially completed
- High gloss self-leveling
- Office decoration is basically completed
- The main road is basically completed
- The factory was completed in November 2017.

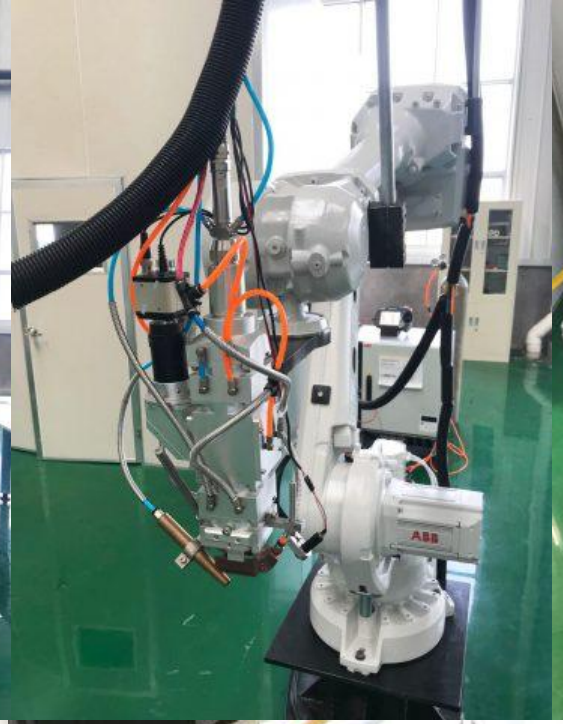
2017-10-10

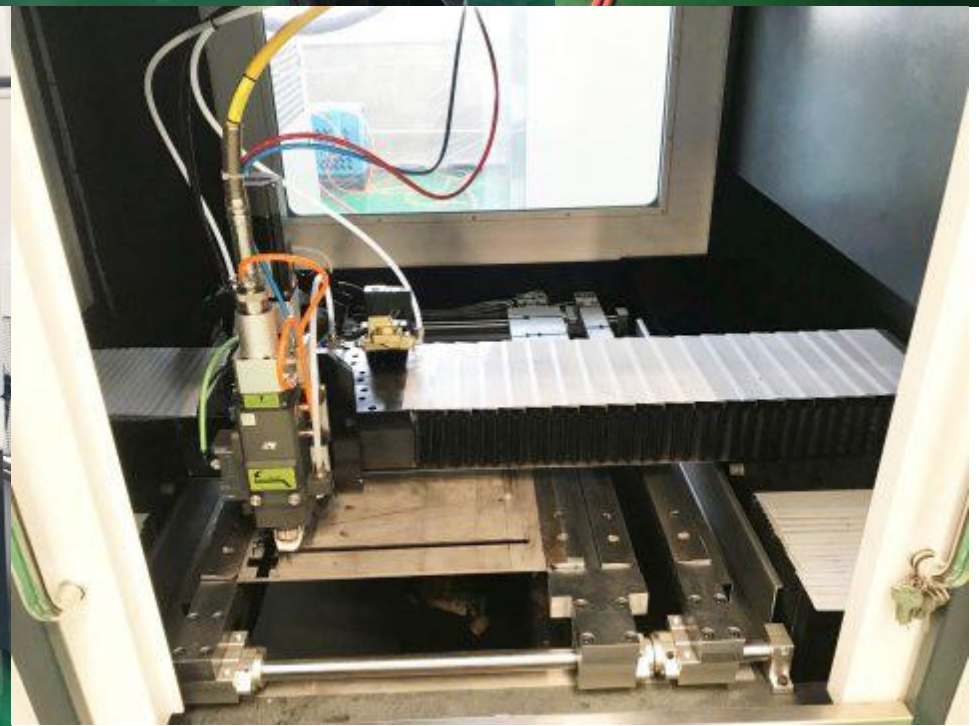




Measuring & Processing Equipment

Full set of Stirling industry chain processing equipment,
10 minutes blending, fully automatic production line.





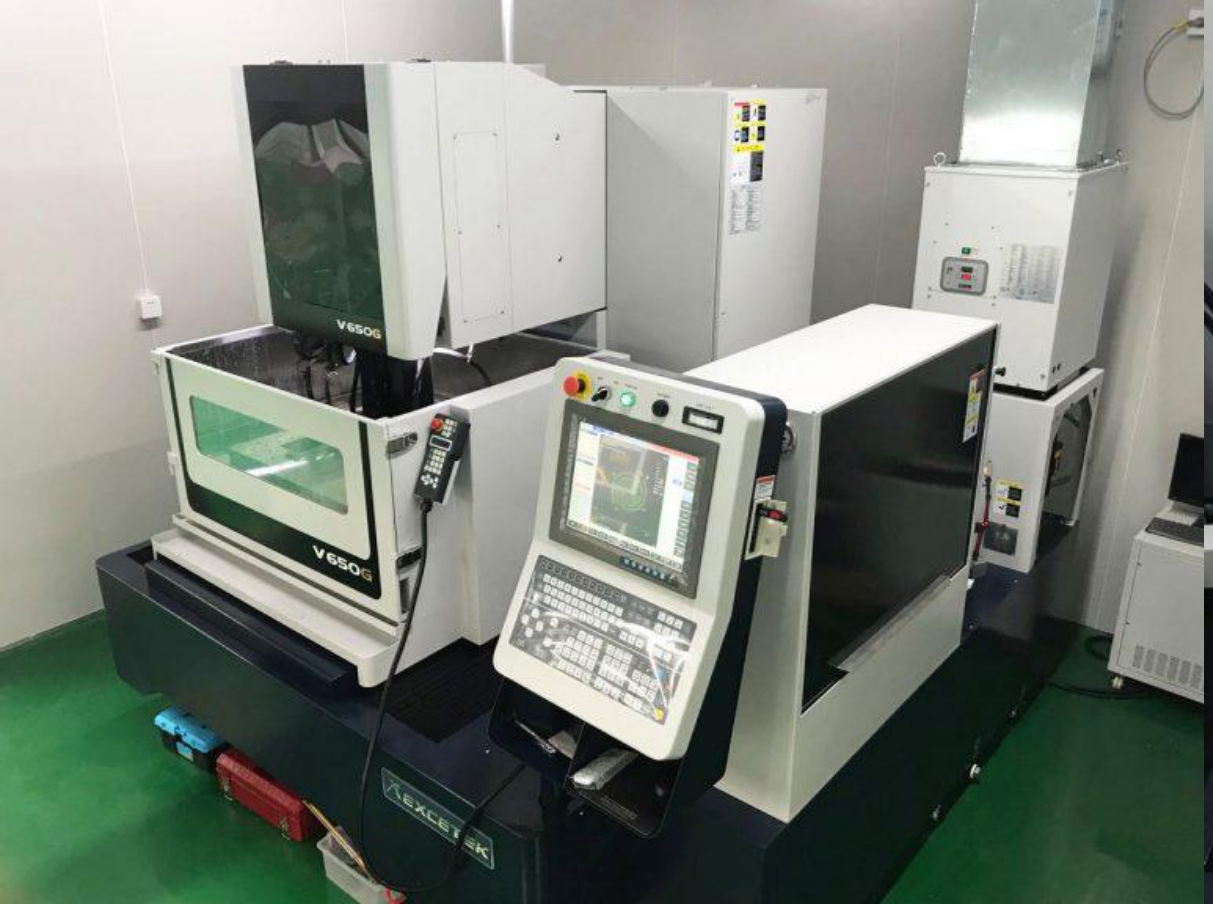
1. **4KW Robotic Laser Welding Machine**
2. **4KW High Precision Laser Cutting Machine**

- Fast cutting of various plate parts;
- Fast verification of Stirling leaf spring profile and stiffness relationship.

IPG PHOTONICS

ABB

RIGID

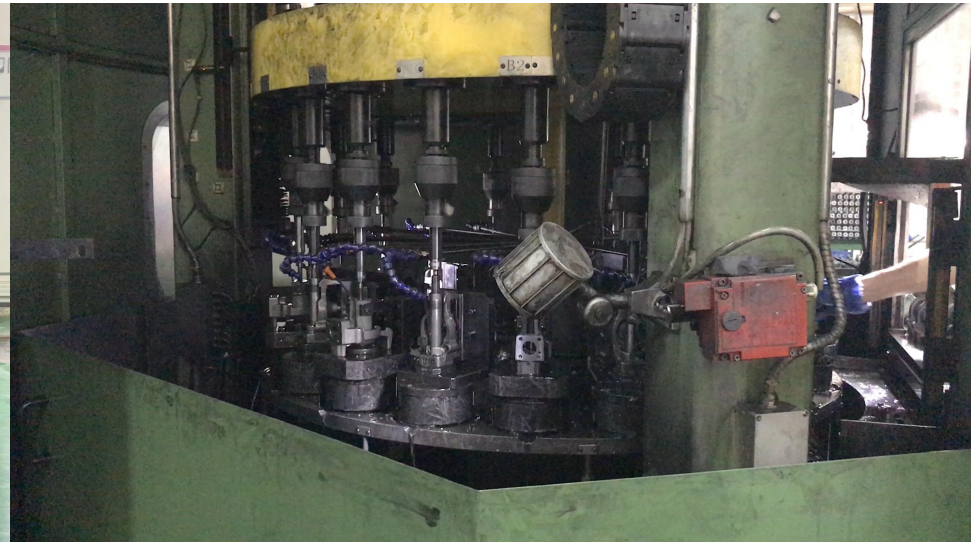


1. **High-Precision Slow Motion Cutting Machine**
2. **Slow-Walking Hole Punching Equipment**

Performing special cutting tasks with the preparation of Stirling leaf springs.

1. **Vacuum Brazing Furnace**
2. **Vacuum Furnace**
3. **Honing Machine**
4. **Lapping Machine**
5. **Double Side Grinder**
6. **Shock Mill**

Complete Stirling machine heat treatment, surface treatment and other processes.



1. **Agilent Helium Mass Spectrometer Leak Detector**
2. **CSCI Helium Mass Spectrometer Leak Detector**
3. **Pfaff Molecular Pumps**
4. **Various Mechanical Pumps**

Complete the necessary processes such as evacuating and filling the Stirling machine with helium.

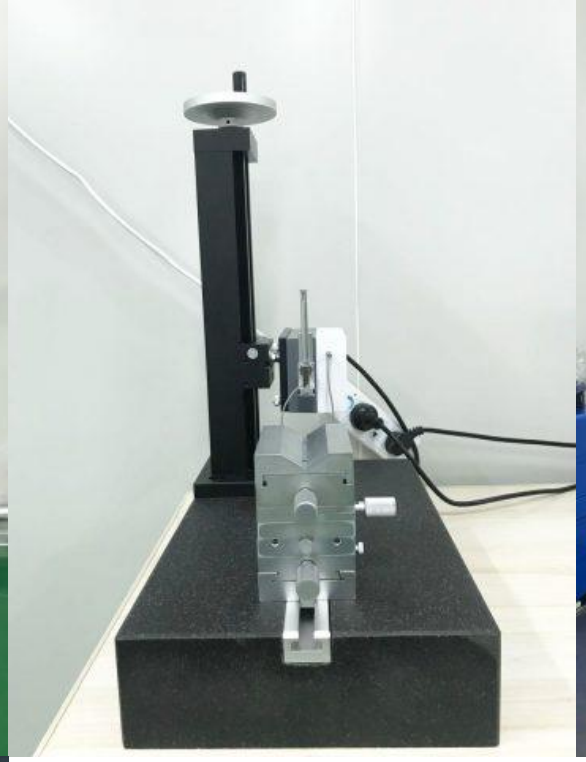
PFEIFFER VACUUM

Agilent Technologies


1. **Three Dimensional**
2. **Cylindricity Meter**
3. **Automatic 2D Imaging Instrument**

Quickly confirm dimensional accuracy of Stirling parts.






1. Spring Stiffness Gauge
2. Hardness Gauges
3. Altimeter
4. Oscillometer
5. Smoothness Meter

- **Light Curing 3D Laser Printer**

Quickly create industrial first editions and shorten mold opening and trial times
Print size 600x600x400

1. **Dynamic Column Type Machining Center**
2. **CNC Machine Tools**
3. **CNC Milling Machine**
4. **CNC Punching Machine**

Exactly, we acquired a direct high precision machining plant.

Equipments Import List

Partial list of contents

kawasaki new energy 1200 molds ship to china ningbo list with pictures

SE使用金型・治具 一覧表

	Parts Number 部品番号	Parts Name 部品名	Tooling or Jig 金型・治具	Tooling or Jig Name 金型・治具名	Type 種類	Process 工程	Installation Location 使用場所	Availability 使用状況	Qty 数量	Manufacturer 製造者	Purchase Price 支払い金額	Total 合計	Limit Shot	Photo 写真
1	KW01-01	Alternator Bobbin オルタネーターボビン	Tooling 金型	Plastic Tooling プラスチック金型	Injection インジェクション	1	Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	1,150,000.00	1,150,000.00	200,000	
2	KW01-02	Outer Laminate アウターラミネート	Tooling 金型	Press Tooling プレス金型	Blank ブランク	1	Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	5,500,000.00	5,500,000.00	200,000	
3	KW01-03	Outer Stator Assy アウターステータassy	Jig 治具	アウターラミネート溶接治具			Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株		2,500,000.00	200,000	
4	KW01-04	Outer Stator Assy アウターステータassy	Jig 治具	アウターラミネート組立治具			Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	2,500,000.00	0.00	200,000	
5	KW01-05	Coil Bobbin コイルボビン	Tooling 金型	Plastic Tooling プラスチック金型	Injection インジェクション	1	Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	1,150,000.00	1,150,000.00	200,000	
6	KW01-05	Outer Laminate アウターラミネート Inner Laminate インナーラミネート	Tooling 金型	Press Tooling プレス金型	Blank ブランク	1	Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株		57,000,000.00	200,000	
7	KW01-06	Outer Carrier アウターキャリアー	Tooling 金型	Press Tooling プレス金型	Drawing ドロー	1	Aichi Elec アイチエレック株	NA	1	Aichi Elec アイチエレック株		0.00	200,000	
8	KW01-07	Outer Carrier アウターキャリアー	Tooling 金型	Press Tooling プレス金型	Restriking サイジング（バリトリ）	2	Aichi Elec アイチエレック株	NA	1	Aichi Elec アイチエレック株		0.00	200,000	
9	KW01-08	Outer Carrier アウターキャリアー	Tooling 金型	Press Tooling プレス金型	Pierce ピアス	3	Aichi Elec アイチエレック株	NA	1	Aichi Elec アイチエレック株	57,000,000.00	0.00	200,000	
10	KW01-09	Outer Stator Assy アウターステータassy	Jig 治具	熱組治具			Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	800,000.00	800,000.00	200,000	
11	KW01-10	Outer Stator Assy アウターステータassy	Jig 治具	アウターラミネート溶接治具			Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	1,000,000.00	1,000,000.00	200,000	
12	KW01-11	Outer Stator Assy アウターステータassy	Jig 治具	アウターラミネート組立治具			Aichi Elec アイチエレック株	A	1	Aichi Elec アイチエレック株	2,000,000.00	2,000,000.00	200,000	
13	KW02-01	External Acceptor Fin A B エクスターナルフィンA B	Tooling 金型	Press Tooling プレス金型	Blank ブランク	0	Hashimoto 橋ハシモト	A	1	Hashimoto 橋ハシモト	1,800,000.00	1,800,000.00	200,000	
14	KW02-02	External Acceptor Fin A エクスターナルフィンA	Tooling 金型	Press Tooling プレス金型	Blank ブランク(中抜)	1	Hashimoto 橋ハシモト	A	1	Yoshi （有）吉井金型	1,900,000.00	1,900,000.00	200,000	
15	KW02-03	External Acceptor Fin A エクスターナルフィンA	Tooling 金型	Press Tooling プレス金型	Flange Up フランジアップ（大）	2	Hashimoto 橋ハシモト	A	1	Yoshi （有）吉井金型	2,200,000.00	2,200,000.00	200,000	
16	KW02-04	External Acceptor Fin A エクスターナルフィンA	Tooling 金型	Press Tooling プレス金型	Cut カット	3	Hashimoto 橋ハシモト	A	1	Yoshi （有）吉井金型	9,000,000.00	9,000,000.00	200,000	
17	KW02-05	External Acceptor Fin A エクスターナルフィンA	Tooling 金型	Press Tooling プレス金型	Cut カット	4	Hashimoto 橋ハシモト	A	1	Yoshi （有）吉井金型	9,300,000.00	8,300,000.00	200,000	

Production Operations & Procedures

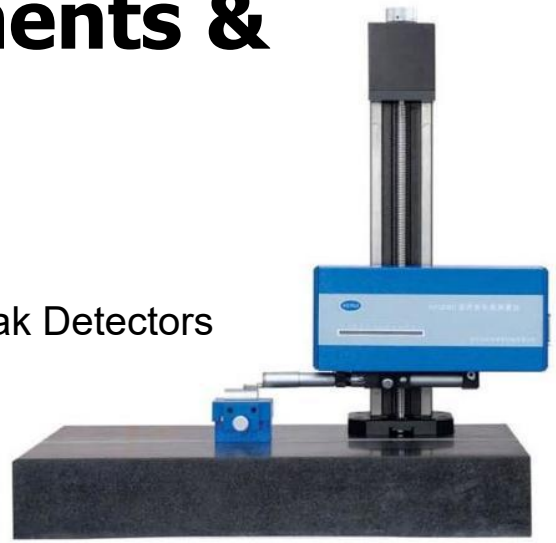
1. Parts Manufacturing Standard Operation Manual
2. Parts Assembly Standard Operation Manual
3. Component assembly standard operation manual
4. Standard operation manual for final assembly
5. Component Inspection Standard Operation Manual
6. Motor testing standard operation manual
7. Equipment standard operation manual
8. Personnel confidentiality and tracking procedures
9. If all standard operation manuals are followed.

Currently a Stirling machine can be assembled in less than 16 minutes.

Production Equipments & Devices

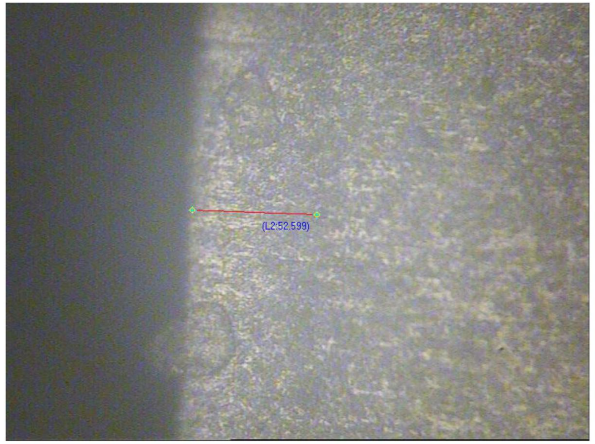
1. Agilent Helium Mass Spectrometer Leak Detectors
2. Pfaff Modular Molecular Pumps
3. Oil-free Mechanical Pumps
4. True Cylindrical Meter (Titanium)
5. Coordinate Measuring Instrument
6. Surface Roughness Meter
7. Spring Tensiometer
8. Hardness Meter
9. Laser Marking Machine
10. High Resolution Electron Microscope,

Adopts 99.999% High Purity Helium Gas.



RIGID

Other Development Project Proposal



Core Projects

- Low cost large cooling capacity Stirling superconducting 77K.
- World's leading high-temp superconducting Stirling 77K equipment (capacity over 12 watts)
- Stirling vaccine freezer -86°C for civil logistics and transport, apply to a ultra-low temp cold chain logistics
- Stirling power cold storage instead of liquid ammonia (alternative to liquid ammonia compressors)

Application Development

- Low Price Stirling High Temperature Superconducting Filters
- Ultra high temperature superconducting filter with large bandwidth
- Stirling diesel multi-device DC power supply backpack
- Stirling self-circulating eco-container
- Stirling medical ultra-low temperature refrigerator
- Stirling program-controlled cooling instrument
- Stirling live cell slicer
- Stirling intercity logistics box
- New energy cold chain logistics vehicle
- Stirling Interprovincial Cold Chain Container…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AVIATION INDUSTRY CORPORATION OF CHINA
中国科学院理化技术研究所
Technical Institute of Physics and Chemistry, CAS
宁波国家高新区
宁波新材料科技城
复旦大学附属肿瘤医院
Fudan University Shanghai Cancer Center
陕汽控股
品质成就未来
中国航天
中国南方电网
CHINA SOUTHERN POWER GRID
ZKJI
ZJ INNOPARK
张江高科技园区
浙江省红十字会
RED CROSS SOCIETY OF CHINA ZHEJIANG BRANCH
SEARI
上電科
中关村
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Royalstar
World Health Organization
上海电气
SHANGHAI ELECTRIC
MicroPort®
一个属于患者和医生的品牌
微创医疗
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电子科技大学
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川崎新能源製造株式会社
ENN新奥
用我所能 善待明天
ITOCHU
Nanotecnología de Sonora
浙江工业大学 机械工程学院
ZHEJIANG UNIVERSITY OF TECHNOLOGY COLLEGE OF MECHANICAL ENGINEERING
MicroPowers
齐耀动力
CIMC中集
CHIBA UNIVERSITY
上海理工大学
CETC 中国电子科技集团公司第十六研究所
CETC 中国电子科技集团公司第二十一研究所
原能细胞
Origincell
CSIC
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開能
Canature
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東南大學
楚雄中高光热太阳能产业基地有限公司
Kolden Solar-Tech Chuxiong Industrial Park Ltd
SOLARVERSAL
聚达能源
HIGHLY 海立
WESS
德勤电工
西安电子科技大学
XIDIAN UNIVERSITY
上海交通大學
SHANGHAI JIAO TONG UNIVERSITY
BAG APPLE
中国中车
CRRC
INTELLECTUAL SYNERGY
中国冶金科工集团有限公司
CHINA METALLURGICAL GROUP CORPORATION
中国冶金科工股份有限公司
METALLURGICAL CORPORATION OF CHINA LTD.

Registered Intellectual Property

207+ Patents

71+ Innovation Patents

1-2 new invention patents registered every month.

RIGID

Self-Developed

X

Research Institutes

Market Research & Advantages

- Once in mass production, the stirling design advantages in structure and weight can quickly reduce manufacturing costs.
- The existing size of China's cold chain logistics market is 158.3 billion and is expected to reach 347.9 billion in 2020, of which 65% is refrigerated transportation, and the current rate of rot and damage caused by refrigerated transportation is about 15%.
- More than 300,000 units of equipment in the communications industry are used for high-temperature superconductivity transformation each year.
- Refrigeration equipment used under strong bumpy working conditions such as fishing boats is still in early technology, and more than 6,000 small fishing boats and supporting transport facilities are in urgent need of upgrading.
- Medical equipment in ultra-low temperature is still unable to precise temperature control, this status quo is in urgent need of change, the country's tertiary hospitals, 120 emergency vehicles, etc., more than hundreds of thousands of units of demand.
- The best long-term preservation temperature zone for biotechnology is -130C, and a large number of biological banks still use -196C liquid nitrogen storage.
- The internal combustion engine is now worth over a trillion dollars, and the external combustion engine is the same level of technology as the internal combustion engine.
- The total market volume of stirling cooler is over 100 billion.

RIGID

Market Competition

RIGID HVAC CO.,LTD

We Are The Only And First Company In The World With A Full Range Of Stirling Technology

- Stirling Capacity: 30W to 30,000W
- Drive Principle: crankshaft connecting rod to free piston
- Operating Mode: Refrigeration to power generation