AVAILABILITY OF UNCOOLED THERMAL IMAGING CAMERAS IN CONTROLLED COUNTRIES

A Foreign Availability Report Certified by the Sensors and Instrumentation Technical Advisory Committee (SITAC)

Submitted to:
The Bureau of Industry and Security (BIS)

13 August 2008

TABLE OF CONTENTS

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1.0 INTRODUCTION

Over the past decade, US Government policy makers and American companies supplying commercial and dual-use thermal imaging products have become increasingly concerned and challenged by the rapid growth of foreign competition. An October 2006 report from the Office of Strategic Industries and Economic Security documented the decline in export sales by the US industry. In addition to the obvious negative effect on the economic health of an industry founded in the US, many have understood the critical link between the health of this industry and the national security. The Sensors and Instrumentation Technical Advisory Committee (SITAC) has considered this situation in many deliberations. Via this report, the SITAC will demonstrate the existence of foreign availability of similar technology as defined by and in accordance with Part 768 of the Export Administration Regulations and the Supplement thereto. This report is submitted to the Bureau of Industry and Security (BIS), with the certification of the SITAC, to assist BIS in and request a formal Decontrol Assessment of Commerce Control List 6A003.b.4.b as provided in Part 768.4

By way of this report the SITAC will demonstrate that uncooled, dual-use thermal imaging cameras, such as those controlled for National Security reasons by 6A003 of the Commerce Control List, are available-in-fact in a controlled country, from a non-US source and are of comparable quality to controlled US products. Further the SITAC will demonstrate that these products are available in sufficient quantity to render US National Security controls ineffective.

While it is very likely that products can flow freely from producing countries to essentially all of the controlled countries listed in Part 768.1, there are relatively few of the controlled countries that have the level of economic development and growth to consume large numbers of thermal cameras. Of this list Russia and China are, by far, the most significant economies. Russia, as a party to the Wassenaar Arrangement, is ambiguous in its applicability to the definition of "available-in-fact" cited in Part 768.1.d. Therefore the SITAC has elected to focus this study on foreign availability within the People's Republic of China.

With this scope defined the report will proceed to profile several Chinese thermal imaging companies and their products. By doing so the report will demonstrate that the four criteria of foreign availability as defined in Part 768.1 are met. The four criteria are listed below with commentary as to how the report seeks to demonstrate that the criteria are, in fact, met.

Available-in-fact. Evidence of indigenous production and active marketing within China will be shown. The evidence includes company marketing information as well as independently obtained photographic evidence showing that the products are quite real and readily available in the Chinese market.

Non-US source. The legitimacy of the Chinese companies profiled will be shown drawing information from independent sources such as credit rating agencies and securities analysts that supports the information provided by the companies themselves.

Sufficient quantity. The standard presented by Part 768 is that the products must be available from non-US sources in quantities that meet the needs of the Chinese military. Thus US exports to China would not make a significant contribution to the military potential of China. Stated more directly, the question to be addresses is 'can the Chinese military get an adequate supply of the subject products from its Chinese producers?' The SITAC does not have access to information on the purchases and needs of the Chinese military. However, the report will show that Chinese camera makers are actively selling their products in non-military markets. Further, it will show that these companies are marketing outside of China on an aggressive basis. With these facts the SITAC concludes that these products could not be so freely available on the commercial and international market if the Chinese military's funded need for similar products was not already met.

The presence of French focal plane array supplier ULIS in the Chinese market is a major factor in the quantity expansion there. Recent announcement by GE of an equity investment in ULIS included some market information declaring very dramatic growth and a large export contribution. Members of the SITAC have provided BIS with some analysis of likely ULIS export numbers to China under separate cover.

Comparable quality. The report will describe products marketed by the Chinese suppliers and provide specifications and attributes that compare them to US products within the context of characteristics specified in the Commerce Control List under 6A003. The characteristics of 6A003 cast a broad net for thermal imaging cameras and include relatively little distinction of performance thresholds. BIS is presently proposing adoption of new performance thresholds pertaining to pixel count and frame rate on 6A003 cameras. Where appropriate, comment may be made on how the Chinese cameras compare to the proposed control criteria.

2.0 COMPANY PROFILE – Zhejiang Dali Technology Co., Ltd (DALI)

639 Binkang Road, Hangzhou
P.R.CHINA, 310053
www.dali-tech.com

Chairman and CEO: Mr. Huimin Pang
B.S. in Physics, East China University
Former Managing Director of Jiangsu T&M Technology Institute

2.1 Overview

Developed from Zhejiang Testing Technology Institute affiliated to the Science and Technology Department of Chinese Government, Zhejiang Dali Technology Co., Ltd is an enterprise that specializes in scientific research, production and sales. They were the first company in Zhejiang Province to successfully re-organize from state control to a limited liability company. The company was listed on the China stock exchange in 2007. Among objectives for the capital infusion is funding of internal focal plane development. The Chairman and CEO, Mr. Pang owns 32% of the company's shares.

The company has two R&D centers in Shanghai and Hangzhou, with 30,000 square meters (323,000 ft^2) of manufacturing. **Figure 2-1** pictures Dali's Headquarters.

Figure 2-1. Dali's headquarters facility is one of two major facilities.

The company manufactures and sells complete uncooled FPA thermal imaging cameras as well as engines/modules to other manufacturers. DALI camera products are similar in design and characteristics with those offered by US manufacturers and specifications are competitive. Dali cameras clearly would fall under current EAR controls if exported from the US to foreign destinations.

Of particular note is DALI's very public development of their own FPA to vertically integrate and move away from sourcing from ULIS. This work was a key point of their positioning for a successful public stock offering.

2.2 Camera Products – Availability in Fact From a Non-US Source

DALI produces a range of products from camera cores to full-featured portable cameras that combine thermal cameras with visible cameras and lasers. **Table 1-1** shows photos of some of DALI's products and provides the model number and features of each as described by the company's product literature. Cameras are built in one of DALI's two locations using imported FPAs sourced from ULIS (France).

Table 1-1. Model listing, photos, and features of representative products. Descriptions come directly from DALI's English language website.

MODEL	*PHOTO*	*COMPANY DESCRIPTION*
TE		The TE IR camera is an extremely affordable hot spot finder thermograph camera. With unbelievable precise thermal image and high price & performance ratio, TE meets a wide variety of application requirement including electrical industry and field of metallurgy.
T6-S/P		T6 ultra portable thermal infrared camera, built-in world's most powerful infrared detector with 384x288 pixel array, offers unmatched temperature measurement accuracy and the best image quality. The particular 90 degree rotated 2.8" LCD enhance the image displaying functions. It is the ideal option to maintenance detection and other control applications.
DL700E/E+		DL700E/DL700E+ offers outstanding image quality and temperature measurement performance in an affordable, rugged and easy to use infrared camera. It works as a professional tool for engineer or thermographer adaptable to every situation.
DL700C/C+		DL700C/DL700C+ is a rugged, economical and practical IR camera, which allows to capture infrared and visual images in the field. Comb(in)ing with the intelligent DALI Report software, the camera is perfect solution for all infrared inspections especially in filed of Electrical industry and Metallurgy equipment detecting.

MODEL	PHOTO	COMPANY DESCRIPTION
DM60		DM60 thermal imaging camera is idea for condition monitoring with accurate temperature available. This system is perfect for process control and analysis, as well as security and surveillance applications which are difficult or impossible to capture the record by using conventional means such as normal infrared or visible light cameras. It also meets and exceeds needs in many applications including: research & development, electronic R&D, industrial process control, public safety, etc.
DL780		DL780 is an uncooled FPA thermal imaging module, applying in its design the (FPA) of ULIS France and real-time image processing circuits independently developed by DALI. It helps to reduce the hardness of independent development of thermal infrared system, shortening the developing period. This module meets a wide variety of IR imaging needs in many applications including medical research, electronic R&D, public safety and surveillance, etc.

2.3 DALI Internal FPA Development Efforts

DALI intends to use part of IPO proceeds (i.e. RMB 50.65 M) to continue to fund its Un-cooled Infrared Focal Plane Array Detector (UIFPAD) localization project. Dali started developing its UIFPAD in 2001 with the full intention of manufacturing in China and eliminating the need to purchase FPAs other sources. Dali has already developed a prototype of it's UIFPAD with 160X120 resolution (**Figure 2-2**). Pictures and production projections below in **Figures 2-3 and 2-4** are derived from the prospectus for Dali's initial public offering.

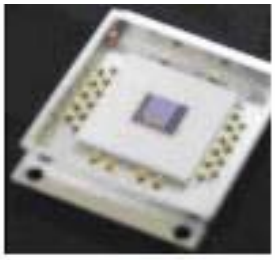
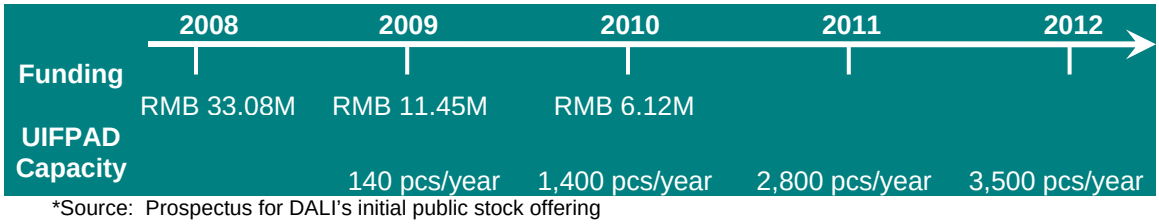


Figure 2-2. Prototype DALI FPA.

Figure 2-5 presents excerpts from a Dali sales presentation to an affiliate of a US company.



*Source: Prospectus for DALI's initial public stock offering

Figure 2-3. Expected UIFPAD yearly funding and production capacity.

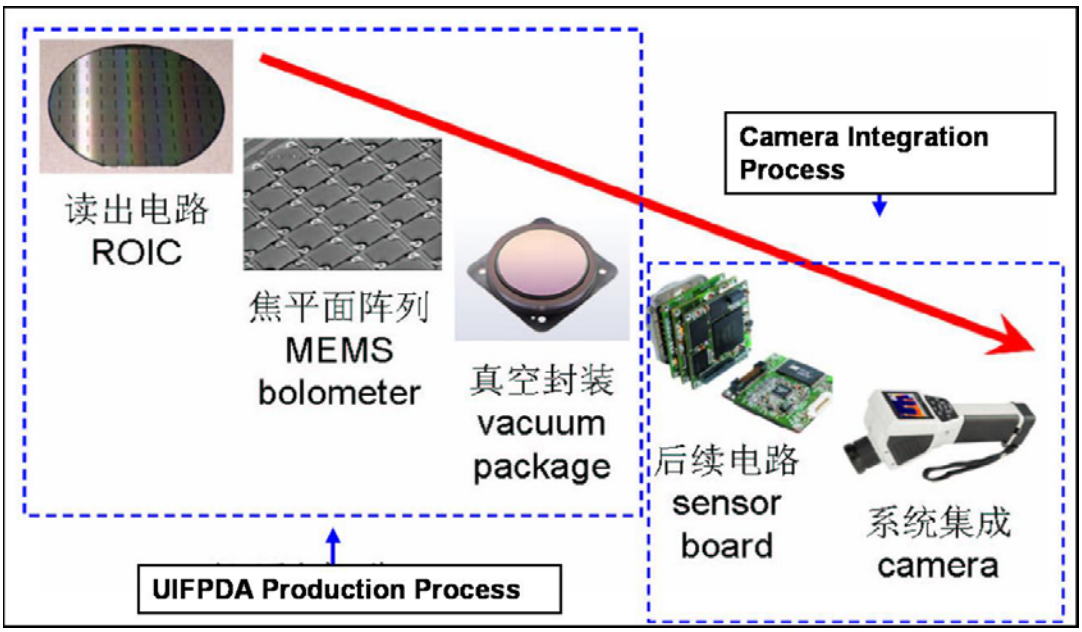


Figure 2-4. DALI's UIFPAD consists of ROIC, MEMS Bolometer & vacuum package.

Future Product R&D
In addition to the FPA development effort, stated product R&D efforts are:
- Real-time on-line thermal imager for process control. Prototype has been developed for electronics MFG and food processing
- Security monitoring thermal imager with high movement tracking capability. Application in border control, environmental monitoring and national security
- High capacity thermal imagers
  - High resolution, i.e. higher than 640X480. Design is already completed
  - Microscanning thermal imager
  - High-speed thermal imager, 100Hz has been developed and 200Hz is under-development
- Second-generation Firefighting thermal imager

Figure 2-5. Excerpts from a Dali sales presentation to an affiliate of a US company.

2.4 Market Availability – Sufficient Quantity

DALI markets its products in the US and other areas outside China and in multiple commercial markets indicating that DALI's production capability exceeds that needed to supply the Chinese military. Other aspects of the overall marketing presentation and product portfolio verify that a broad export market is being sought. Three specific distributors were located with a simple web search, two in the UK and one in Singapore.

2.5 Key Data Points for Broader Export Efforts

2.5.1 DALI Exhibits

DALI has exhibited at recent tradeshows in Orlando, FL, Birmingham, UK, and Las Vegas, NV (**Figure 2-6**).

Figure 2-6. Photos of displays at SPIE Show in Orlando.

2.5.2 DALI Website

DALI has an English language website to address the English-speaking world. **Figures 2-7 and 2-8** show examples of the website display.

Figure 2-7. Example of Dali website postings in English.

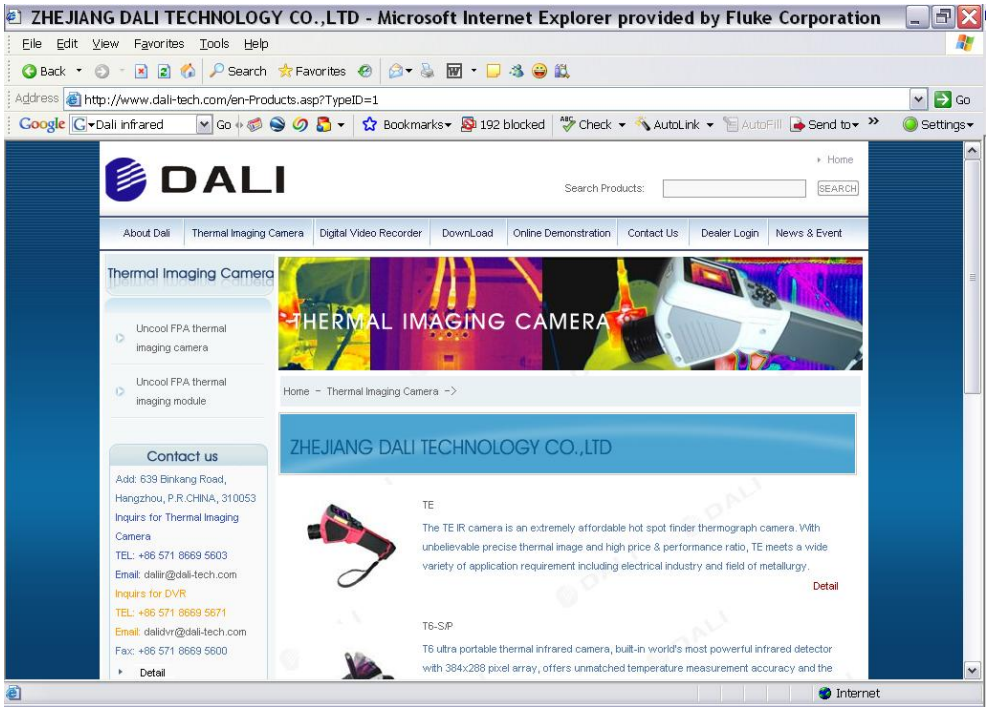


Figure 2-8. Another example of a DALI website posting.

*2.5.3 DALI "CE" Mark

Most DALI products carry the "CE" mark meaning they are targeted for European sales. DALI also proudly displays FCC compliance credentials (**Figure 2-9**) to support it sales in the US market.

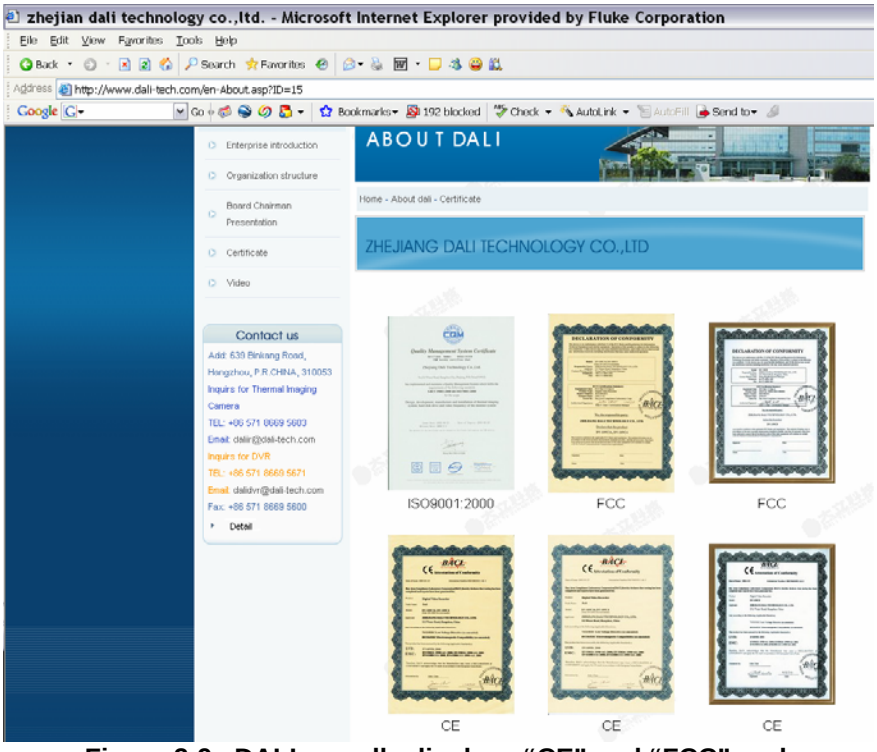


Figure 2-9. DALI proudly displays "CE" and "FCC"marks.

2.5.4 Export of DALI Products

DALI products are made available outside of China as illustrated in the examples below.

UK distributor – Barber Insys UK. From website (Figures 2-10and 2-11):
http://www.barber-insys.co.uk/themo/themog1.html

> A range of portable hand held thermal imaging cameras depending on the application requirements. The low cost TE unit suitable for plumbers/electricians, through to the T6 with enhanced detector size for building surveys or engineering applications requiring high image resolution at a reasonable cost. All the cameras are real time, therefore suitable for rotating machinery applications. **The cameras are fitted with European detectors and therefore not subject to US license regulations.**

Figure 2-10. Information from Barber Insys UK Website.

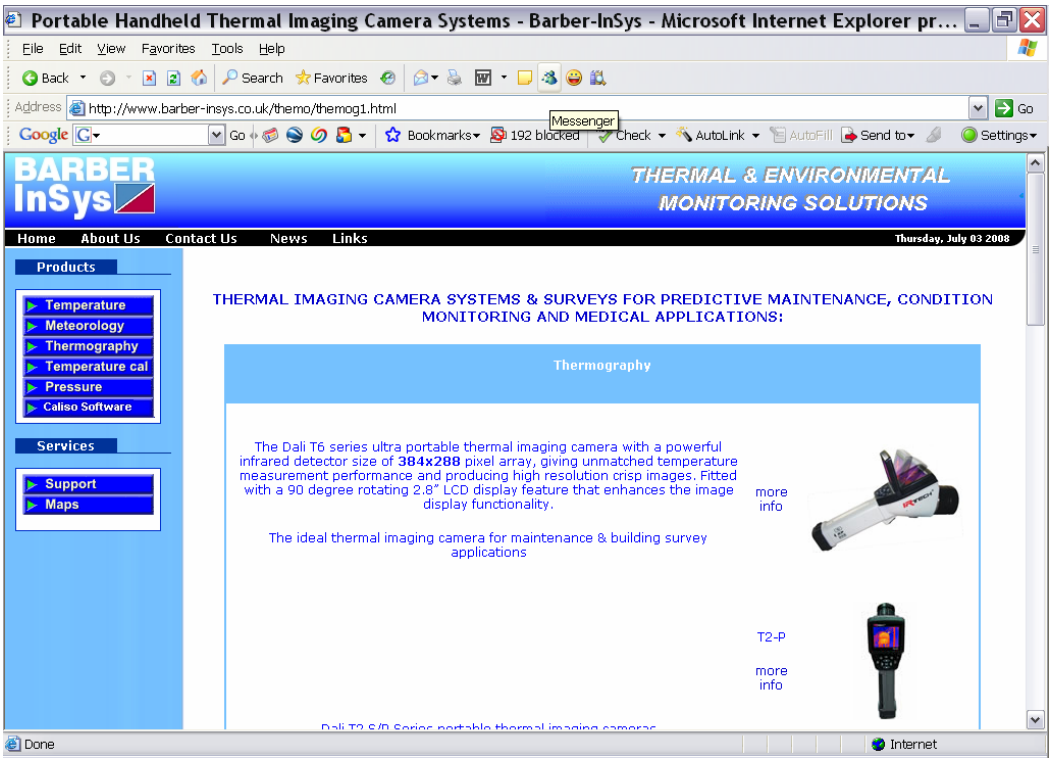


Figure 2-11. Example of display on Barber Insys UK website.

UK Distributor Metrum
http://www.metrum.co.uk/Dali_TE_Thermal_imaging_camera.htm

Figure 2-12 is an example of a UK Distributor Metrum website display.

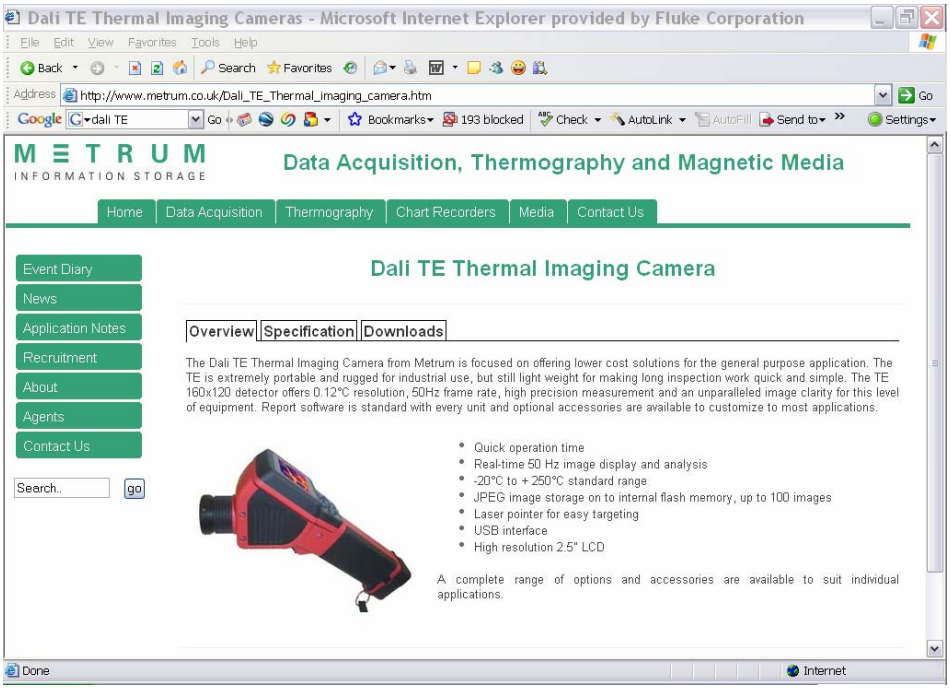


Figure 2-12. Website display from UK DISTRIBUTOR METRUM

2.6 DALI Camera Specifications and Capabilities – Comparable Quality

Appendix A includes English-language specification sheets on several products representative of the DALI line. A quick survey of the specifications will show these products to be of comparable quality to those currently controlled by the CCL. The characteristics of wavelength sensitivity and/or frame rate dictate that most of these products would be controlled under 6A003 of the CCL to all destinations except Canada if exported from the US. These products and those listed for other manufacturers all have sensitivity in the long wavelength infrared band around 8-12µm, a key parameter for control under the CCL. The final section of this report includes a table summarizing how these items would be controlled by current and pending US regulations if produced in the US or imported into the US for resale abroad.

3.0 COMPANY PROFILE – Guangzhou SAT

Guangzhou SAT Infrared Technology Co., Ltd.
No. 10 Dongjiang Avenue
Guangzhou Economic & Technological Development District
Guangzhou
China
510730
http://www.sat.com.cn/english
Jiping Wu, CEO

3.1 Overview

Guangzhou SAT Infrared Technology Co., Ltd. (SAT) claims 15 years experience in the thermal camera market and has grown to become a leading Chinese supplier of uncooled thermal cameras. SAT presents a market story through its website and literature that offers IR cameras, software and solutions in a variety of market areas including predictive maintenance, process and control monitoring, firefighting, border security and driving. The SAT marketing message is aimed largely at industrial and other civilian users. Products are marketed inside China and broadly outside of China. **Figure 3-1** shows portions of a SAT display during a China Electo-Optics Exposition. SAT aims to provide its customers with cameras, software and complete solutions. Camera products are similar in design and characteristics with those offered by US manufacturers and specifications are competitive. SAT cameras clearly would fall under current EAR controls if exported from the US to foreign destinations.

A recent Dunn & Bradstreet (D&B) Report cites seven domestic branch offices in addition to the headquarters operation. The same report grants SAT the lowest credit risk rating, a rating enjoyed by only 10% of industry peers.

SAT proudly touts its in-house design and development capabilities and associated achievements in securing intellectual property rights in China and abroad.

Figure 3-1. Scenes from the SAT display at the China Electro Optics Exposition in November 2007.

3.2 Camera Products – Availability in Fact from a Non-US Source

SAT IR produces a range of products from camera cores to full-featured portable cameras that combine thermal cameras with visible cameras and lasers. **Table 3-1** shows photos of representative SAT IR products and provides the model number and features of each. SAT provides cameras with some unique features including an explosion-proof version targeted for mining applications. SAT cameras have been demonstrated to DoD personnel at an industry meeting held in February 2002 and, more recently, shown as

exemplary of foreign production by Assistant Secretary Chris Padilla during testimony before Congress. Cameras are built in SAT's Guanzhou facility using imported FPAs. The relative value of the FPAs vs. camera market price is relatively large for the simplest cameras like the HY600 below but on the order of 10% - 15% of total value for the more full-featured products like the G90 that include multiple cameras as well as sophisticated electronic features.

Table 3-1 Model listing, photos, and features of representative SAT IR products.

MODEL	*PHOTO*	*FEATURES*
HY600		➢ IR camera core ➢ Serial digital communications ➢ 320 X 240 FPA ➢ Analog NTSC / PAL video out ➢ Digital video via USB 2.0
S160		➢ Small portable, rugged predictive maintenance camera ➢ 160 X 120 FPA ➢ Built-in display ➢ Thermographic / radiometric ➢ Laser pointer
GF3000A		➢ Portable IR camera for firefighting ➢ 160 X 120 FPA ➢ Submersible ➢ Large display
S280		➢ Full feature predictive maintenance camera ➢ 320 X 240 FPA ➢ Visible camera ➢ Flip out display plus viewfinder ➢ NTSC / PAL compatible ➢ Image capture and storage ➢ Integrated laser pointer

MODEL	PHOTO	FEATURES
G90		➢ Full feature predictive maintenance camera ➢ 320 X 240 FPA ➢ Visible camera, integrated laser pointer ➢ Flip out display plus viewfinder ➢ NTSC / PAL compatible ➢ Image capture and storage
SAT 618		➢ Quick installation automotive driving aid ➢ 384 X 288 resolution ➢ Full kit including display
MC602R		➢ Scientific camera ➢ 320 X 240 ➢ Variable frame rate

3.3 Market Availability – Sufficient Quantity

SAT markets its products in multiple areas outside China and in multiple commercial market segments indicating that SAT's production capability exceeds that needed to supply the Chinese military. For example, **Figure 3-2** shows a product display setup and personnel during a tradeshow in Birmingham, UK. SAT maintains a sales office for Southeast Asia and the Pacific located at the Guangzhou base. The above cited D&B Report claims export sales during 2003 to Europe, Latin America, Japan, Australia, and the US. The website also lists a sales office in India and a technical support operation in France. In the recent past, SAT products have been marketed in the US by ISG Thermal Systems with offices in Georgia, and Monroe Infrared with offices in Michigan and Maine. Other aspects of the overall marketing presentation and product portfolio verify that a broad export market is being sought.

Figure 3-2. SAT Display at a 2007 Tradeshow in Birmingham, UK

- SAT has an English language website to address the English-speaking world.

- Some SAT products carry the "CE" mark meaning they are targeted for European sales.
- Some SAT products have NTSC and PAL video output formats. The NTSC analog video standard is used in a relatively short list of countries, notably the US, Canada, Taiwan, Japan and South Korea.
- SAT's listing of recent tradeshow appearances includes events in Japan, the UK, France and Germany.

A notice on the SAT website regarding opening of a European Technical Center is shown in **Figure 3-3.**

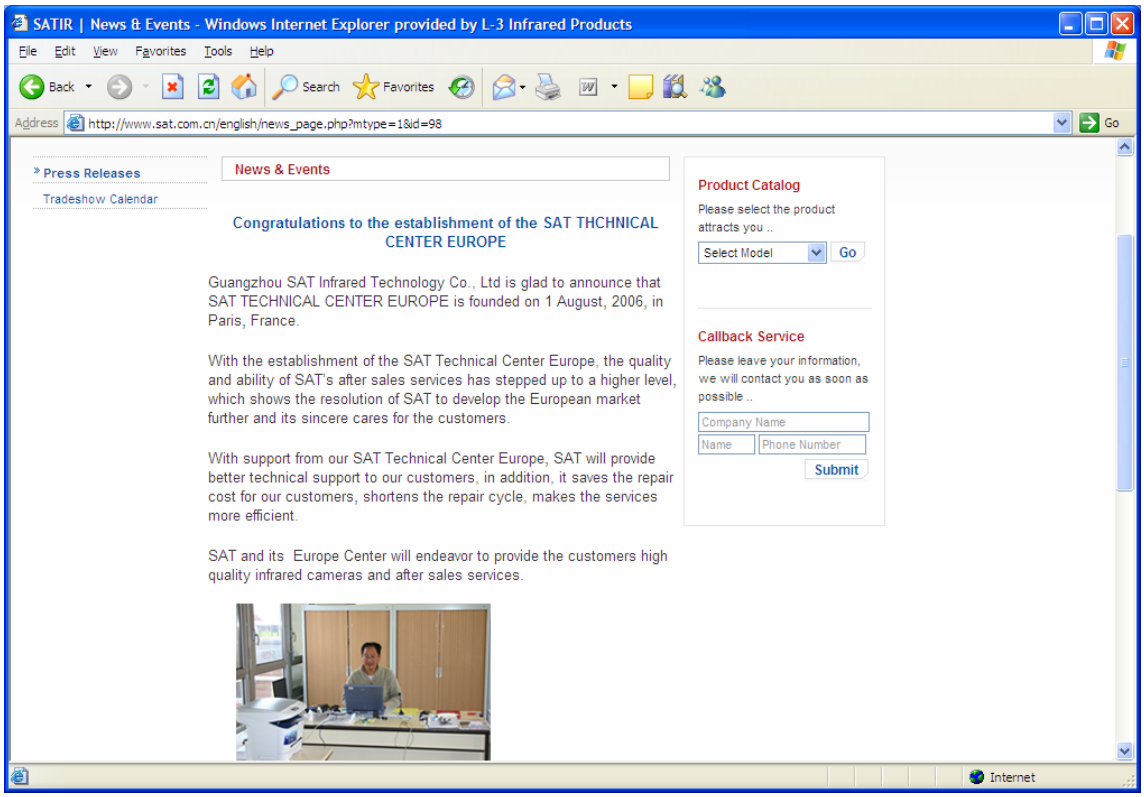


Figure 3-3. A notice on the SAT website regarding opening of a European Technical Center

Figure 3-4 is taken from a website for a company selling SAT products in Scandinavia.

Figure 3-4. Website Notice of a Scandinavian Distributor of SAT Products.

3.4 Camera Specifications and Capabilities – Comparable Quality

Appendix B includes English-language specification sheets on several products representative of the SAT line. A quick survey of the specifications will show these products to be of comparable quality to those currently controlled by the CCL. The characteristics of wavelength sensitivity and frame rate dictate that most of these products would be controlled under 6A003 of the CCL to all destinations except Canada if exported from the US. SATIR appears to be the first of the Chinese manufacturers to introduce a high resolution uncooled thermal camera using a 640X480 pixel FPA. This resolution is comparable to the state of the art in US military systems. To date, the US government has controlled products with comparable resolution as munitions items. **Figure 3.5** is a screenshot from the same Scandinavian distributor's web site touting the high resolution product. It should be noted that this product does not appear in this fashion on the SAT web site at this writing.

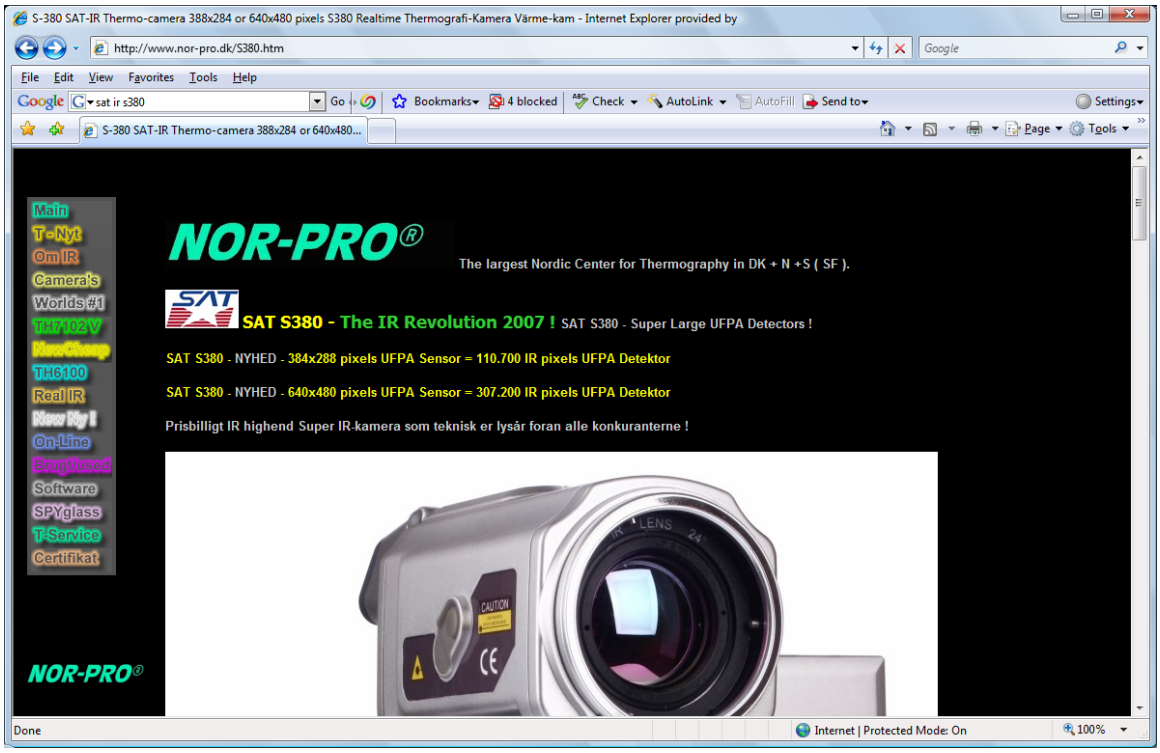


Figure 3-5. SAT's Scandinavian Distributor Announces S380 using a 640X480 FPA.

4.0 COMPANY PROFILE – Wuhan Guide

Wuhan Guide Infrared Company, Ltd
No.26 Shucheng RD.HongShan District
Wuhan 430070
P.R.China
http://www.guide-infrared.com/en/index_en.asp

4.1 Overview

Guide Group, located in the Wuhan-China Optics Valley, is a high-tech company specialized in the design, development, manufacturing, and sales of Infrared Thermal Imaging cameras, optics, accessories and test equipment. Wuhan Guide claims to be a pioneering enterprise in China independently developing infrared thermal imagers. Its newly developed products, Uncooled and Cooled Focal Plane Array infrared thermal imager IR series, with advanced technology and internally developed Intellectual Property, filled a void in China. Guide IR series have been listed under the National Torch Program and have been honored among National New Products in China. Guide products and manufacturing processes have received multiple certifications including ISO9001, CE Certificate, CMC Certificate, and Medical Equipment Manufacturing License and have been recognized as a result of the National Infrared Products Quality Examination. The first three of these are internationally recognized indications of a mature and capable product and/or business.

Guide products have been widely used for various end-uses such as electric power generation plants, firefighting, public security, metallurgy, medical, and petrochemical industry applications. Wuhan Guide is rapidly expanding its international marketing network and claims to cover more than 50 countries. Wuhan further claims to have developed strategic alliances with companies in the European Union, Asia, and the United States. Wuhan Guide has doubled its sales volume every year, becoming an important profit source of Guide Group. Wuhan Guide claims to be the leader in infrared technology application development and market share among its Chinese counterparts.

Many progressive Chinese companies have established business processes and company cultures modeled after US companies found in high tech business areas such as the Silicon Valley. Wuhan Guide counts itself among these and feels that it stands out from the typical Western impression of a Chinese manufacturing company. A high priority on quality, satisfaction and innovation are central to Guide's message. The company's profile on its web page includes the following company culture ideals and values (Guide's translation):

- *Create and maintain an environment that encourages new thinking on the part of all employees.*
- *Provide customers with products and services of consistently superior quality.*
- *Assure that all orders are delivered to customers complete and on time.*
- *Grasp latest trend of the industry by active learning and smooth communication with competitors and partners.*
- *Keep a positive, open-minded and patient culture that inspires individual employees to willingly contribute to the achievement of team goals while growing professionally and personally.*

4.2 Camera Products

Guide produces a wide range of products including camera cores and full-featured portable and hand-held cameras with visible cameras and lasers. Guide's product portfolio is broad and includes several models that have features common to military products. An example of the latter is the IR513 detailed below.

Guide created a stir in the thermal imaging world when it introduced a thermal camera in cell phone form factor around 2006. This demonstrated the ability of Chinese manufacturers with ready access to high-tech electronics to put together attractive and very competitive products given access to the basic thermal imaging technology. A sampling of some their products is provided in **Table 4-1**.

Table 4-1. Model listing, photos, and features of representative WUHAN GUIDE products.

MODEL	*PHOTO*	*FEATURES*
MobIR M3		➢ High performance, low price radiometric camera ➢ Ultra-compact ➢ Integrated alarming, hot-spot tracing & laser locating ➢ Digital image storage with voice recording ➢ USB connectivity
TP8S		➢ Radiometric camera ➢ 384X288 pixel, 35μm uncooled FPA ➢ Detachable touch screen ➢ Intelligent auto speech control of the camera ➢ Bluetooth voice recording technology ➢ High-resolution 640×480 OLED viewfinder & 1280×1024 visual camera
IR112		➢ 384X288 uncooled FPA OEM module ➢ Rugged, compact and lightweight ➢ High resolution, high sensitivity and high accuracy ➢ Mass produced

MODEL	PHOTO	FEATURES
Thermal Goggle GUIDIR ®IR528		➢ Helmet-mounted or handheld ➢ 160X120 FPA ➢ <300 g ➢ Instant on imaging ➢ Spot temperature measurement
GUIDIR IR513		➢ Long range handheld ➢ IR, GPS, Laser range finder, day optics, compass ➢ 384X288 uncooled FPA ➢ 5.5º HFOV IR lens

4.3 Market Availability – Sufficient Quantity

Wuhan Guide markets its products in 50 countries outside of China in multiple market segments indicating that Wuhan's production capacity exceeds that needed to supply the Chinese military. The images in **Figure 4-1** below show Wuhan Guide's tradeshow booth from an Electro-Optics Exposition held in Beijing in November 2007. The display featured the range of Guide products including an array of military-like products in helmet-mounted and weapon-mountable configurations. Guide's product descriptions on the website such as for the MobIR M3 proudly proclaim "license free & rapid delivery".

4.4 Camera Specifications and Capabilities – Comparable Quality

Appendix C includes English-language specification sheets on several products representative of the Guide line. The characteristics of wavelength sensitivity and/or frame rate dictate that most of these products would be controlled under 6A003 of the CCL to all destinations except Canada if exported from the US. The final section of this report includes a table summarizing how these items would be controlled by current and pending US regulations if produced in the US.

A quick survey of the specifications in Appendix C will show these products to be of comparable quality to those currently controlled by the CCL

The MobIR product is sold in the US by Sierra Pacific Innovations as the RazIR. The website below promotes these sales and features a video product testimonial from a satisfied user.

http://raz-ir.com/news/models/raz-ir-pro.html

Figure 4-1. Views of Wuhan Guide's tradeshow booth from an Electro-Optics Exposition held in Beijing in November 2007

5.0 COMPANY PROFILE – Wuhan Huazhong Numerical Control Co. Ltd. (HCNC)

H.U.S.T Park,Miaoshan Region,
East-lake Development Zone,
Wuhan, Hubei, P.R.China 430223
+86-27-87180051
+86-27-87180306 fax
http://www.huazhongcnc.com/
http://english.huazhongcnc.com.cn/
Chairman: Chen Jihong, born 1965

Wuhan Huazhong Numerical Control Co. Ltd. (HCNC) is located in Wuhan, about 300 miles to the east of Shanghai. Wuhan is also the location for Wuhan Guide Infrared, another well-known infrared thermography company and camera manufacturer. As its name implies, HCNC was founded in 1994 as a company to manufacture high-precision CNC machining instruments. It works closely with the Huazhong University of Science and Technology (HUST) which setup the CNC National Engineering Research Center with support from the Ministry of Science and Technology (MOST). HCNC has been selling their CNC machines on the worldwide market, including the US, Latin America, and southeast Asia. HCNC touts its highly educated staff citing "30-odd professors and 60-odd employees with master's degrees or doctorate".

Over the years, HCNC has received $24 million worth of contracts from the Chinese government and developed an extensive network of sales and training centers within China. Their modern headquarter buildings in Wuhan cover 11,600 square meters of space **(Figure 5-1)** and are located in the Science and Technology park of HUST. The company counts a staff of 260 skilled engineers and technicians and prides itself on innovation and research spending. It is one of the portfolio companies of HUST VC, a venture-capital firm located in Wuhan with focus on optics and 1.1B RMB ($134M) in funds.

More recently, the company decided to expand into infrared products. Its proximity to the Wuhan Optical Valley and funding from HUST VC were likely contributors to that expansion. Wuhan Optical Valley is well-known for its established optoelectronics and fiber-optic industries. The company now offers a series of infrared imaging products spanning the full size spectrum of handheld to desktop.

Figure 5-1. Photographs of the headquarter building of HCNC and one of their manufacturing lines.

5.1 Camera Products

The company offers on their website five families of infrared cameras (**Table 5-1**) focused on industrial thermography, medical thermography, remote monitoring, night vision, and surveillance. A few of HCNC's product specifications make reference to FPAs sourced from the US. During the investigation for this report, a third party inquiry with the company resulted in similar claims by HCNC. With all other companies' products profiled here, the FPA source is either claimed to be ULIS, determined through inquiry to be ULIS, or is gleaned to be ULIS by virtue of the specifications and descriptions cited.

Table 5-1. HCNC offers five families of infrared cameras focused on industrial thermography, medical thermography, remote monitoring, night vision, and surveillance

MODEL	PHOTO	FEATURES
HY-1088		➢ 160x120 pixels microbolometer UFPA ➢ Portable, rugged, 400 grams. ➢ Night vision (8 to 14 micrometer) ➢ Built-in display, 2.5 in LCD ➢ NTSC/PAL ➢ Battery life > 10 hours
HY-3088G		➢ 320x240 pixels, microbolometer UFPA ➢ States that UFPA sourced from USA ➢ 25 Hz ➢ 8 to 14 micrometer wavelength range ➢ Thermographic/radiometric ➢ Build-in display, 3.5 in LCD ➢ 17 x 14 degree field of view
HY-2005		➢ Same specs as HY-3088B but adapted for medical and clinical purposes.
HY-5800		➢ Dual visible and infrared surveillance camera. ➢ 320x240 UFPA ➢ 50/60 Hz.
HY-5000		➢ Scientific infrared camera with similar specs to the 3088B series but with USB connectivity to a PC.

5.2 Market Availability – Sufficient Quantity

HCNC has no obvious presence in the US or Europe. It markets and sells its cameras in China and, possibly, other portions of Asia. However, they have an English-language website that details their products and specifications indicating aspirations to pursue other geographic markets. Provision of both NTSC and PAL video formats also indicates aspirations to sell to markets outside China. Finally the HY-3088G camera includes both Chinese and English control menus. The products advertised on the HCNC website are largely commercial in nature, further demonstrating that there is ample capacity in Chinese industry to serve needs outside those of the Chinese military.

A description of the company by HUST VC on their website (**Figure 5-2**) indicates that the company has a well established sales, marketing and post-sales operations (see below). The large manufacturing floor of the company and the size of its employee population suggests that its only limiting factor on camera production is the availability of the UFPA from the US or Europe. It is unknown whether the company is engaged with UFPA development efforts within the Wuhan Optical Valley.

Infrared thermography system: independent IP focal plane thermography systems. They are widely used in industries of electricity power, chemicals, metallurgy, and army supplies.

HCNC has a sales, marketing and post-sale service team with technical background, among which 80% are holding bachelor's degree or above. Dozens of employees with bachelor and doctor degrees are serving for R&D of the company.

In 2005, HCNC was awarded as the Innovative Enterprise, and Software Enterprise of Excellence of Hubei province. In August 2006, HCNC was listed in 103 Innovative Example and Test Enterprises by the Ministry of Science & Technology, State-owned Assets Supervision and Administration Commission of the State Council, and All China Federation of Trade Unions.

Figure 5-2. HUST VC website posting with a description of HCNC.

5.3 Camera Specifications and Capabilities – Comparable Quality

Appendix D includes English-language specification sheets on several products representative of the HCNC line. A quick survey of the specifications will show these products to be of comparable quality to those currently controlled by the CCL. The characteristics of wavelength sensitivity and/or frame rate dictate that most of these products would be controlled under 6A003 of the CCL to all destinations except Canada if exported from the US. The final section of this report includes a table summarizing how these items would be controlled by current and pending US regulations if produced in the US.

6.0 COMPANY PROFILE – Nanjing Kuyee Tech

No 301 Room, 168 Longpan Road,
Jiangsu Software Park 53,
Nanjing, China
+ 86-25-84660588
+ 86-25-84660599 Fax
http://www.kuyee.cn

Nanjing Kuyee Technology Co., Ltd. (Kuyee) is an optoelectronics company located in Nanjing, about 100 miles east of Shanghai. It lists itself as a company that focuses upon the development, manufacturing and marketing of infrared cameras for medical diagnostics, security, fire fighting, electrical utilities, petrochemical, aviation, defense and scientific applications. It numbers 50 to 100 employees, making it the smallest of the companies profiled here. It claims it was founded in 2006, and has about 100,000 square meters (nearly a million sq. ft.) of manufacturing and R&D space. In a survey published by the European Commission external cooperation office, the company lists its interest in finding sales and marketing channels for its products (**Table 6-1**).

Table 6-1. Survey highlighting the types of cooperation priorities for Nanjing Kuyee. (*1* is highest, and *4* is lowest).

	Priority Ranking			
	1	*2*	*3*	*4*
Joint Venture				X
Investment				X
Export	X			
Import		X		
Distribution in China	X			
Distribution in Europe			X	
Technology Transfer				X
Transfer of Know How				X
Manufacturing	X			
Sell Components		X		
Buy Components		X		

The company has been exhibiting in tradeshows in China. The next exhibit for the company will be ILOPE (International Lasers, Optoelectronics and Photonics Exhibition) in Beijing, China, 25-27 November 2008.

6.1 Camera Products

The company offers multiple uncooled thermal cameras on their website, as depicted **Table 6-2**. All appear pointed to commercial applications. Resolutions range from 160x120 to 384X288 with frame rates of up to 50 Hz or better, varying primarily by the packaging and software. The core specifications are very similar indicating that they derive from the same camera engines. Kuyee also sells what it calls camera cores under part numbers C20 and C30.

Table 6-2. Nanjing Kuyee Technology Co., Ltd. (Kuyee) uncooled thermal cameras offered on their website.

MODEL	PHOTO	FEATURES
Checker K10		➢ 160x120 pixels microbolometer FPA ➢ Portable, rugged, water-proof design ➢ Thermographic/radiometric ➢ Built-in display ➢ 50 Hz
Checker K20		➢ 320x240 pixels, microbolometer FPA ➢ Dual-vision visible CCD ➢ Portable, rugged, water-proof design ➢ Thermographic/radiometric ➢ Built-in display ➢ 50 Hz operation ➢ 21 x 15.5 degree field of view
Inspector K26		➢ 320x240 uncooled FPA ➢ Suitable for fixed operation ➢ PAL video output
Groper A20		➢ 320X240 uncooled FPA ➢ Mountable on a tripod. ➢ Conceived for automotive application
Core C30		➢ 384X288 uncooled FPA ➢ 16-bit digital video interface ➢ Temperature measurement ➢ PAL output
Firefinder F20		➢ 320X240 firefighting camera ➢ 5” display

MODEL	PHOTO	FEATURES
Monitor N20		➢ 320X240 uncooled FPA ➢ Packaging adapted to fixed applications
Gy601		➢ 320X240 uncooled FPA ➢ Medical imaging software ➢ Temperature measurement

6.2 Market Availability – Sufficient Quantity

In the past few months, Kuyee went from no presence on the website, to a cryptic presence to a good website in Chinese and English that highlights products, contact and other relevant commercial information. Without a doubt, they are increasing their marketing activities reaching out to a broader audience. They are visible on the European Commission ASIA Invest website as well as the Made-In-China.com website that promotes products manufactured in China. The company is increasing their presence at tradeshows with initial emphasis on China and an eye on export to other geographies. Having said this, Kuyee remains the least sophisticated in its marketing message to non-Chinese markets of the companies profiled here. The company's sales channels appear to be limited at this time to the Chinese market.

In researching this report, the company was contacted by telephone through a third party fluent in Chinese. Kuyee indicated that the products are available immediately and provided an asking price of $15,000 to $20,000 for their Checker K20 product. The imported FPA content is estimated to be no more than 10% of that value.

6.3 Camera Specifications and Capabilities – Comparable Quality

Appendix E includes English-language specification sheets on several products representative of the Kuyee line. A quick survey of the specifications will show these products to be of comparable quality to those currently controlled by the CCL. The characteristics of wavelength sensitivity and/or frame rate dictate that most of these products would be controlled under 6A003 of the CCL to all destinations except Canada if exported from the US. The final section of this report includes a table summarizing how these items would be controlled by current and pending US regulations if produced in the US.

7.0 ANALYSIS OF CHINESE CAMERAS IN LIGHT OF CCL CONTROLS

The primary reasoning in the Commerce Control List (CCL) for control of similar products is the wavelength at which the FPAs are sensitive or have their peak response. Specific parameters called out in 6A002.a.3.c and 6A002.a.3.f capture all cameras in this report on this basis. Some exception is made for certain automotive system cameras or for cameras with relatively slow frame rates. Thus, frame rate is established as a distinguishing control factor in the CCL. A proposed change to the CCL, first published BIS in April of 2006 and still pending at this writing, mirrors some past Wassenaar Expert Group discussions by introducing resolution or pixel count as a basis for graduated controls. These parameters are commonly used to compare camera performance.

The table that forms the bulk of this section (**Table 7-1**) is a highly representative if not comprehensive listing of products offered by the companies profiled earlier in the report. It lists key technical specifications of each product as they relate to parameters that have been either adopted or considered for adoption as threshold criteria in the Wassenaar Dual-use Control List and, thus, the CCL. These parameters and associated values are then used to suggest how these products would be controlled for export from the US by the current CCL.

In the right-most column, it is suggested how these products would be controlled for export from the US if a proposed change to the CCL were to be published. This proposed ruling is sometimes known as the "RS Proposal". In the two right-most columns, the control criterion from the CCL that would be most restrictive, that is to say, require a license to the most destinations, is listed as the "dominant control".

As Table 7-1 shows, were these products manufactured by US companies and proposed for export markets, all would be tightly controlled under US export regulations. Further all will remain under fairly restrictive control, even if the pending BIS proposal is implemented. In effect, the table demonstrates in summary form that the test of comparable quality is met time and time again.

Table 7-1. Analysis of Chinese Cameras in Light of CCL Language

Manufacturer	Product		Key Control Attributes	Dominant Control Under CCL as of 7/1/08	Dominant Control Under Proposed "RS" Revision
Zhejiang Dali	DL700E		384X288, 50/60 Hz	RS1	RS2
	DL700C		384X288, 50/60 Hz	RS1	RS2
	T6-S/P		384X288, 50/60 Hz	RS1	RS2
	TE		160X120, 50 Hz	RS1	NS2
	DL780		384X288, 50/60 Hz	RS1	RS2
	F2		160X120, 50 Hz	RS1	NS2
	S730		384X288, 50 Hz	RS1	RS2

Manufacturer	Product		Key Control Attributes	Dominant Control Under CCL as of 7/1/08	Dominant Control Under Proposed "RS" Revision
	DM60		384X288, 50/60 Hz	RS1	RS2
SAT IR	HY600		320X240, 50/60 Hz	RS1	RS2
	S160		160X120	RS1	NS2
	GF3000A		160X120	RS1	NS2
	S280		320X240, 50/60 Hz	RS1	RS2
	S380		640X480 50/60 Hz	*ITAR*	*ITAR*
	G80		320X240, 50/60 Hz	RS1	RS2

Manufacturer	Product		Key Control Attributes	Dominant Control Under CCL as of 7/1/08	Dominant Control Under Proposed "RS" Revision
	SAT618		384X288	RS1	RS2
	MC602R		320X240, 50/60 Hz	RS1	RS2
	HY6800		320X240, 50/60 Hz	RS1	RS2
Wuhan Guide	MobIR M Series		160X120, 50/60 Hz	RS1	NS2
	TP8S		384X288	RS1	RS2
	IR112		384X288	RS1	RS2
	IR210		320X240	RS1	RS2
	IR510		320X240, 50/60 Hz	RS1	RS2
	IR513		384X288	RS1	RS2

Manufacturer	Product		Key Control Attributes	Dominant Control Under CCL as of 7/1/08	Dominant Control Under Proposed "RS" Revision
	IR516		320X240, 50/60Hz	RS1	RS2
	IR519		348X288	RS1	RS2
	IR528		160X120, 50/60 Hz	RS1	NS2
Wuhan Huazhong Numerical Control Co. Ltd.	HY-3088G		320X240, 25 Hz	RS1	RS2
	HY-1088A		160X120	RS1	NS2
	HY-1088B		320X240	RS1	RS2
	HY-5800		320X240. 50/60 Hz	RS1	RS2
Nanjing Kuyee Tech	A20		320X240, 50 Hz	RS1	RS2
	C20		320X240, 50Hz	RS1	RS2

Manufacturer	Product		Key Control Attributes	Dominant Control Under CCL as of 7/1/08	Dominant Control Under Proposed "RS" Revision
	C30		384X288	RS1	RS2
	F20		320X240, 50 Hz	RS1	RS2
	Gy603		320X240, 50 Hz	RS1	RS2
	K10		160X120, 50 Hz	RS1	NS2
	K20		320X240, 50 Hz	RS1	RS2
	K26		320X240, 50 Hz	RS1	RS2
	N20		320X240, 50 Hz	RS1	RS2

7.1 Further Comment On Comparable Quality

As outlined earlier in this section, frame rate and pixel count are often used as comparisons of quality and performance. They were used in the table above because of their relationship to control language and because they are widely published parameters on specification sheets. Resolution of the Chinese cameras studied is comparable to cameras from US manufacturers that are controlled on the CCL with one notable exception shown in the table above. The SATIR S380 has a 640X480 sensor. To date, the US has taken the position that all cameras using sensors of this resolution are munitions (ITAR) items.

Another frequently published performance parameter is thermal sensitivity, often specified as Noise Equivalent Temperature Difference (NETD). There are variations among products in this parameter. Most commercially available products will be listed as

0.1ºC or better. The products described here are consistent with this. There are many US products with larger NETD numbers (lower sensitivity) that are exported and are tightly controlled. In short, the CCL does not distinguish based on this performance parameter and it appears that the Chinese cameras described herein are quite comparable to those of their US counterparts.

More recently, US Military programs have placed emphasis on the response time of thermal detectors. This is sometimes referred to as thermal time constant. While this is rarely specified for commercial products it is an area in which the FPAs from Ulis in France have a superior performance to US products. For example, the US Army is currently developing its next generation of uncooled FPAs and requiring time constants of <10msec. This represents an aggressive goal vs. current generation performance. Ulis FPAs are often specified to have <7msec time constants. This high performance specification is cited in at least one product shown in an appendix to this report, the Dali DL720.

8.0 SUMMARY AND CONCLUSION

This report provides compelling evidence to initiate a determination of foreign availability of thermal imaging cameras in China, a controlled country per Part 768.1 of the EAR. The information contained herein serves to compile and document information that should already be well known to concerned government regulators that have paid attention to the development of this technology and market in recent years. US regulators have seen and held cameras at meetings with industry. Those who have attended trade shows and conferences have seen these products and noted their proliferation. Repeatedly presentations and discussions in industry / government forums have stressed the growth of Chinese camera makers. In fact, it is expected that knowledgeable readers of this report will find nothing truly new here but may be assisted by its assemblage into one document that specifically addresses the construct of Part 768.

Thermal imaging cameras such as those controlled under the CCL have been shown to be readily available in China from Chinese manufacturers. The quantities of these cameras have been shown to be sufficient so as to be widely available for commercial uses and export indicating large excess beyond the needs of the Chinese military. Cameras have been shown to be of comparable or better technical capability and quality to those controlled by the CCL. There should be no doubt that the criteria of Part 768 are demonstrated time and time again.

By certifying this report, the SITAC urges BIS to pursue the process of foreign availability determination to its statutory conclusion.

APPENDICES TO:

AVAILABILITY OF UNCOOLED THERMAL IMAGING CAMERAS IN CONTROLLED COUNTRIES

A Foreign Availability Report Certified by the Sensors and Instrumentation Technical Advisory Committee (SITAC)

Presented to:
The Bureau of Industry and Security (BIS)

LIST OF APPENDICES

APPENDIX A

Zhejiang Dali Technology Co., Ltd (DALI)

ENGLISH-LANGUAGE SPECIFICATION SHEETS ON SEVERAL PRODUCTS REPRESENTATIVE OF THE DALI LINE

Contact us

Add: 639 Binkang Road

Hangzhou, P.R.CHINA,

310053

Inquirs for Thermal Imaging

Camera

TEL: +86 571 8669 5603

Email: daliir@dali-tech.com

Inquirs for DVR

TEL: +86 571 8669 5671

Email: dalidvr@dali-tech.com

Fax: +86 571 8669 5600

Detail

DL720 Series

OVERVIEW

DL780 is an uncooled FPA infrared imaging module, applying in its design the of ULIS France and real-time image processing circuits independently developed by DALI. It helps to reduce the hardness of independent development of thermal infrared system, shortening the developing period. This module meets a wide variety of IR imaging needs in many applications including medical research, electronic R&D, public safety and surveillance, etc.

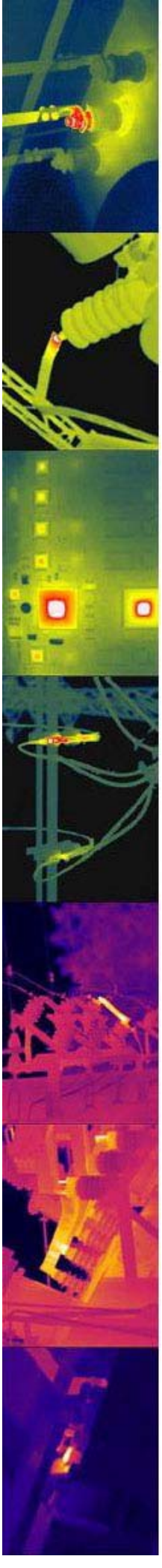
MAIN FEATURES

The auto temperature constancy ensures, under the different ambient temperature between -40□~60□, a constant operating temperature for detector, ensuring its working stability.
The function of real time noise reduction contributes to reducing the noise shown on the background, producing out an enhanced image of target.
Manual correction
Manual brightness/contract adjustment
Auto brightness adjustment
Numerical 2×
Color swap
Sight
Motor drive for lens adjust
Standard PAL video output
16bit digital video data output

TECHNICAL SPECIFICATIONS

Detector	
Material	Amorphous silicon
Thermal time constant	7 ms
Resolution	384×288
Pixel size	35μm×35μm
Spectral range	8 ~ 14μm
NETD	≤85mK
Module	
A/D	14bit
D/A	10bit
Start-up time	<45s（nearly 25s@-30□，25s@25□，40s@50□）
Power	7.5 ~ 9V
Video output	PAL
Focus drive	8V 10 mA
Power consumption	<2.2W(Normal)
Operating temperature	-20□ ~ +50□(Commercial) -40□ ~ +60□(industrial)
Storage temperature	-40□ ~ 70□

T2 Series
THERMAL IMAGING INFRARED CAMERA
Low Cost affordable solution



Features:

- ✓ State-of-art thermal imaging camera with all necessary functions for industrial use
- ✓ Ergonomic lightweight and portable
- ✓ Real-time 50Hz image display and analysis
- ✓ Three types of temperature units available (^{0}C, K, ^{0}F)
- ✓ 40 sec voice annotation with the image *(depending on models)*
- ✓ Built-in laser pointer for easy target locating
- ✓ Powerful and easy-to-use full function thermal image software to support analysis work and creating reports

T2-E

T2-P / T2-S

Detect hot spots, diagnose condition of electrical components to prevent failure due to heat built-up and increase product reliability.

Early detection of faulty and poor electrical connections, fuses, circuit breakers, wirings - enhances productivity and averts unscheduled system shutdowns.

For enquiry, please contact:

Hi-Tech Electronics Pte Ltd
60 Kaki Bukit Place, Unit 01-11 Eunos Techpark, Singapore 415979
Tel : (+65) 67472555 Fax : (+65) 6747 2511
Email: sales@hitech.com.sg Website: www.hitech.com.sg

T2 Series
THERMAL IMAGING INFRARED CAMERA
Low Cost affordable solution

Technical Specifications

Model:			T2-E	T2-S	T2-P
Detector characteristics	Detector type		Amorphous Silicon micro-bolometer		
	Array size/format, Pixel Pitch		160 x 120, 35um		
Imaging characteristics	Field of view/min focus distance		18°×13°/0.3m (std)	18°×13°/0.3m (std) 36°×26°/0.3m (3609)	18°×13°/0.3m (std) 36°×26°/0.3m (3609)
	Spatial resolution (IFOV)		1.9mrad		
	Thermal sensitivity		0.1^{0}C @30^{0}C		
	Frame rate		50/60Hz		
	Focus		Manual		
	Electronic Zoom		NO		2X
	Spectral range		8-14um		
Built-in Optic Lens			STD Lens	STD Lens	STD Lens or 3609 (2x) lens
Image display	LCD		Built-in high-resolution color 2.5" LCD		
Measurement	Temperature ranges		-20℃ to +250^{0}C	-20℃ to **+500^{0}C**	-20℃ to **+250^{0}C** **Extendable to +1000^{0}C**
	Accuracy		± 2 °C or ± 2% of reading, Whichever is greater		
	Measurement correction		Automatic / Manual		
	Measurement mode	Movable spots	1	1	4
		Movable areas	NO	1	3
		Area Max/Min temperature	NO	YES	YES
		Area average temp.	NO	YES	YES
		Line Profile	NO	NO	YES
		Isotherms	NO	YES	YES
		Temp. difference	NO	NO	YES
		Alarm (Voice, color)	NO	YES	YES
	Image Controls	Color palette	3	8	11
		Image adjustment	Auto gain and brightness	Auto / manual gain and brightness	
	Setup functions		Date / Time, temperature unit, language		
	Emissivity correction		Variable from 0.1 to 1.0		
	Ambient temperature correction		Automatic corrections according to user input		
	Atmospheric transmission correction		NO	Automatic correction according to user object distance, relative humidity, ambient temperature	
Image storage	Type	Storage card	Built-in flash memory, up to 100 images	Built-in flash memory, Up to 1000 images	
		Storage mode	Manual single image saving	Automatic/manual single image saving	
	File format-thermal		JPEG, 14 bit thermal image with measurement data		
	Voice annotation		NO	Input via built-in microphone up to 40 seconds of digital voice per image stored with image	
Laser pointer			Class 2, 1mw/635nm(red)		
Power supply	Battery type		Li-Ion, rechargeable, field-replaceable		
	Battery operating time		3 hours continuous operation		
	Charging system		Intelligent charger or power supply adaptor(optional), online charge		
	Power saving		Automatic shutdown and sleep mode (user-selectable)		
	External power		NO	10-15V DC	
Environment	Operating temperature		-15^{0}C to +50^{0}C		
	Humidity		≤90%non-condensing		
	Encapsulation		IP54		
Physical characteristics	Dimensions, Weight		250mm×100mm×72mm, 0.6Kg		
Interface	External DC input		NO	YES	
	Audio output		NO	YES	
	Video output		NO	PAL/NTSC	
	USB		YES		
Standard Accessories			Thermal Imaging camera, Carrying case, Lens cap, Li-Ion batteries (2), Charger, USB cable, Adumbral cover, Operator's manual, Dali Image Explorer, Dali Infrared Reporter	Thermal Imaging camera, Carrying case, Lens cap, Li-Ion batteries(2), Charger, Earphone, USB cable, Adumbral cover, Video cable, Audio adaptor cable, Operator's manual, Dali Image Explorer, Dali Infrared Reporter	Thermal Imaging camera, Carrying case, Lens cap, Li-Ion batteries(2), Charger, Earphone, USB cable, Adumbral cover, Video cable, Audio adaptor cable, Operator's manual, Dali Image Explorer, Dali Infrared Reporter
Optional Accessories				Power supply adaptor, 3X Lens, 0.5X Lens	Power supply adaptor, 3X Lens, 0.5X Lens, 1000^{0}C extendable lens

Hi-Tech Electronics Pte Ltd
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Email: sales@hitech.com.sg Website: www.hitech.com.sg

DL700 Series
THERMAL IMAGING INFRARED CAMERA
High Performance – Auto Focus

Features:

- ✓ High speed DSP real time image processing for a well defined and stable infrared thermal images
- ✓ Advanced world standard temperature measurement technology
- ✓ Auto-Focus, Full Screen LCD
- ✓ Continuous 8x digital zooming
- ✓ 300,000 pixels CCD picture display
- ✓ 640 x 480 pixels LCD screen
- ✓ NTSC / PAL Video or VGA output
- ✓ Up to 1200 degree C temperature sensing
- ✓ 40 sec voice annotation with the image
- ✓ Built-in laser pointer
- ✓ IP54 water and dust resistant
- ✓ Built-in 64MB Flash and extendable CF card memory slot
- ✓ Powerful and easy-to-use full function thermal image software to support analysis work and creating reports

DL700 Series

Detect hot spots, diagnose condition of electrical components to prevent failure due to heat built-up and increase product reliability.

Early detection of faulty and poor electrical connections, fuses, circuit breakers, wirings - enhances productivity and averts unscheduled system shutdowns.

For enquiry, please contact:

Hi-Tech Electronics Pte Ltd
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Email: sales@hitech.com.sg Website: www.hitech.com.sg

DL700 Series
THERMAL IMAGING INFRARED CAMERA
High Performance – Auto Focus

Technical Specifications

Model:			DL700C	DL700E	DL700C+	DL700E+
Detector characteristics	Detector type		Amorphous Silicon micro-bolometer, uncooled			
	Array size/format, Pixel Pitch		320 x 240, 45um		384 x 288, 35um	
Imaging characteristics	Field of view/min focus distance		20°×15°/0.5m		16°×12°/0.5m	
	Spatial resolution (IFOV)		1.13mrad		0.88mrad	
	Thermal sensitivity		0.08^{0}C @30^{0}C			
	Frame rate		50/60Hz			
	Focus		Manual	Manual / Automatic	Manual	Manual / Automatic
	Electronic zoom		1 – 8x continuous			
	Spectral range		8-14um			
	Built-in Visual camera		300,000 pixels, Pic in Pic or FULL			
Image display	LCD		High-resolution color LCD, 640 x 480			
Measurement	Temperature ranges		-20℃- +500^{0}C, Extendable to +1,200^{0}C *(optional)*			
	Accuracy		± 2 °C or ± 2% of reading, Whichever is greater			
	Measurement correction		Automatic / Manual			
	Measurement mode	Movable spots	4	10	10	10
		Movable areas	3	5	5	5
		Area Max/Min temperature	YES			
		Area average temperature	YES			
		Line Profile	YES			
		Isotherms	YES			
		Temp. difference	YES			
		Alarm (Voice, color)	YES			
	Color palette		11			
	Image adjustment		Auto / manual gain and brightness			
	Setup functions		Date / Time, temperature unit, language			
	Emissivity correction		Variable from 0.1 to 1.0 or select from listings in pre-defined material list			
	Ambient temperature correction		Automatic corrections according to user input			
	Atmospheric transmission correction		Automatic correction according to user object distance, relative humidity, ambient temperature			
Image storage	Type	Storage card	Built-in 64MB Flash memory, COMPACT FLASH memory slot, Up to 3000 images			
		Storage mode	Automatic/manual single image saving			
	File format-thermal		JPEG, 14 bit thermal image with measurement data			
	Voice annotation		Input via built-in microphone up to 40 seconds of digital voice per image stored with image			
	Image Improvement		Averaging (Σ2, Σ4, Σ8, Σ16) image spatial filter			
Laser pointer			Class 2, 1mw/635nm(red)			
Power supply	Battery type		Li-Ion, rechargeable			
	Battery operating time		2 hours continuous operation			
	Charging system		Intelligent charger or power supply adaptor(optional) online charge			
	Power saving		YES			
	External power		10-15V DC			
Environment	Operating temperature		-15^{0}C to +50^{0}C			
	Humidity		≤90%non-condensing			
	Encapsulation		IP54			
Physical characteristics	Dimensions		305mm×130mm×135mm			
	Weight		1.83Kg	1.69 kg	1.83Kg	1.69 kg
Interface	External DC input		Yes			
	Audio & Video output		Yes, PAL/NTSC			
	USB		Image (thermal and visual), measurement data and voice transfer to PC			
Standard Accessories			Thermal Imaging camera, Carrying case, Lens cap, Li-Ion batteries(2), Charger, LCD Bracket, LCD cable, Earphone, Audio cable, VGA cable, USB cable, 1G CF card, Shoulder strap, CD Card Reader, Operator's Manual, Dali Image Explorer, Dali Infrared Reporter			
Optional Accessories			Power supply adaptor, 2X Lens, 0.5X Lens			

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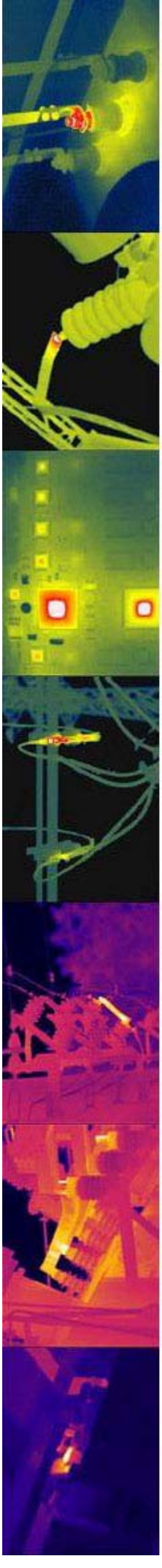
Email: sales@hitech.com.sg Website: www.hitech.com.sg

T6 Series
THERMAL IMAGING INFRARED CAMERA
High Resolution Razor-sharp thermal images



Features:

- ✓ Ergonomic lightweight and portable
- ✓ High resolution 384 x 288 pixels detector
- ✓ 2.8 inch LCD rotatable screen with brightness and gain adjustment
- ✓ Precise temperature measurement with thermal sensitivity of 0.1°C
- ✓ 40 sec voice annotation with the image
- ✓ Built-in laser pointer
- ✓ 1-GB Flash memory, store up to 3,000 thermal images along with voice annotation
- ✓ Powerful and easy-to-use full function thermal image software to support analysis work and creating reports

Detect hot spots, diagnose condition of electrical components to prevent failure due to heat built-up and increase product reliability.

Early detection of faulty and poor electrical connections, fuses, circuit breakers, wirings – enhances productivity and averts unscheduled system shutdowns.

For enquiry, please contact:

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T6 Series
THERMAL IMAGING INFRARED CAMERA
High Resolution Razor-sharp thermal images

Technical Specifications

Model:			T6-S	T6-P
Detector characteristics	Detector type		Amorphous Silicon micro-bolometer	
	Array size/format, Pixel Pitch		384×288, 35um	
Imaging characteristics	Field of view/min focus distance		16°×12°/0.5m	
	Spatial resolution (IFOV)		0.88mrad	
	Thermal sensitivity		0.1℃@30℃	
	Frame rate		50/60Hz	
	Focus		Manual	
	Electronic zoom		N/A	2x
	Spectral range		8-14um	
Image display	LCD		Built-in high-resolution color 2.8” LCD	
Measurement	Temperature ranges		-20℃- +500℃	
	Accuracy		± 2 °C or ± 2% of reading, Whichever is greater	
	Measurement correction		Automatic / Manual	
	Measurement mode	Movable spots	1	4
		Movable areas	1	3
		Area Max/Min temperature	YES	YES
		Area average temperature	YES	YES
		Line Profile	N/A	YES
		Isotherms	YES	YES
		Temp. difference	N/A	YES
		Alarm (Voice, color)	YES	YES
	Color palette		8	11
	Image adjustment		Auto / manual gain and brightness	
	Setup functions		Date / Time, temperature unit, language	
	Emissivity correction		Variable from 0.1 to 1.0	
	Ambient temperature correction		Automatic corrections according to user input	
	Atmospheric transmission correction		Automatic correction according to user object distance, relative humidity, ambient temperature	
Image storage	Type	Storage card	Built-in 1G flash memory, , Up to 3000 images	
		Storage mode	Manual single image saving	Automatic/manual single image saving
	File format-thermal		JPEG, 14 bit thermal image with measurement data	
	Voice annotation		Input via built-in microphone up to 40 seconds of digital voice per image stored with image	
Laser pointer			Class 2, 1mw/635nm(red)	
Power supply	Battery type		Li-Ion, rechargeable	
	Battery operating time		3 hours continuous operation	
	Charging system		Intelligent charger or power supply adaptor(optional) online charge	
	Power saving		YES	
	External power		10-15V DC	
Environment	Operating temperature		-15℃-+50℃	
	Humidity		≤90％non-condensing	
	Encapsulation		IP54	
Physical characteristics	Dimensions, Weight		310mm×127mm×90mm, 0.91Kg	
Interface	External DC input		Yes	
	Audio & Video output		Yes, PAL/NTSC	
	USB		Image, measurement data and voice transfer to PC	

Standard Accessories

Thermal Imaging camera, Carrying case, Lens cap, Li-Ion batteries(2), Charger, Earphone, Adumbral cover, USB cable, Video cable, Operator’s manual, Dali Image Explorer, Dali Infrared Reporter

Optional Accessories

Power supply adaptor, Car charge cable, Convertible lens 8.6°×6.4°/1.5m

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APPENDIX B

Guangzhou SAT

ENGLISH-LANGUAGE SPECIFICATION SHEETS ON SEVERAL PRODUCTS REPRESENTATIVE OF THE SAT LINE

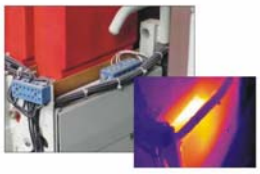
SAT-S160

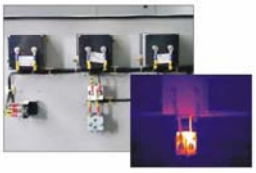
Based on the excellent 160x120 UFPA detector, the super compact IR camera SAT-S160 can meet your need with low-cost, precise measurement, easy-to-use, laser pointer, dual-screen display, and so on.

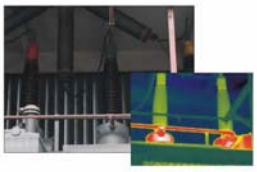
SAT INFRARED

The New Millennial Pioneer in Infrared Cameras

- **Rugged and Ergonomic Construction, Easy to Use**
- **Point & Shoot**
- **Precision Direct Temperature Measurement**
- **Dual Display**
- **Uncooled Focal Plane Array Technology**
- **Temperature Tracking**
- **Semitransparent Menu and Automatic Power-Off**
- **Laser Pointer**
- **USB Image Download**
- **Smart Power Management**







Description	Characteristics	Performance
Detector	Type	Microbolometer UFPA
	Spectral range	8 ~14 micron
	Resolution	160 x 120
Imaging Performance	NETD	0.1°C
	Lens / focusing	20°x 15°manual focusing
	Min focus distance	0.1m
Image presentation	Video output	Pal / NTSC
	Image display	2.5" color LCD, pseudocolor, multi-palettes
Features	Image freeze	Run or freeze
	Image function	Open and delete
Measurement	Temperature range	-20~250°C (standard); -40 ~ 1000°C (extendable)
	Accuracy	±2°C or ±2%
Analysis Functions	Spot	4 Spots；3 of them are Full-screened moveable
	Temperature tracking	Tracking the highest or lowest temperature spot automatically in the whole image
	Temperature Alarm	Preset the alarm temperature value and camera will show alarm when over or below it; Beep when alert.
	Adjustment	Level and span can be adjusted automatically or manually.
	Correction	Emissivity, distance, environmental temperature, relative humidity
Software	Analysis software	Report generation software
Laser	Power consumption	1 mw
	Wavelength	635 nm (red)
System	Settings	Time, date, °C or °F, Multi-language
	LCD power save	Automatically or User-Defined
	Power supply	SONY 7.2V Lithium battery, 8 ~ 11V DC supply
	Power-Off	Automatically or User-Defined
	BWT	About 2 hours
Environmental specification	Operational temperature	-20°C ~ 50°C
	Storage temperature	-40°C ~ 70°C
	Relative humidity	20 ~ 90%
Interfaces	Mechanism	Standard tripod mounting (Optional)
	Electric	USB, Video output
Physical Characteristics	Weight	< 700g (including the battery)

SAT INFRARED

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SAT-618

Vehicle-mount Thermal Imager

Survey shows that the distance or time spent on the driving during the night takes up only 28% of the total driving; however, the death rate caused by the accidents occurred during the night driving takes up 55% of the whole death rate.

With the concerns to the safety of lives, SATIR has lately launched a new night vision system for the night driving, which greatly enhanced the safety of the night driving, establishing another milestone for the night driving safety technology.

By simply turning on the power of the car-load thermal imager, the night vision system will be started up. With the attached LCD display, drivers can see the obstacle of 100 meters away, so that they can recognize the path, pedestrian, motorcycle, and other obstacle etc. This night vision system can also reduce the stress brought about to the drivers by the exhausted night journey, enabling them to keep alert and take proper action to respond to the emergency.

SAT-618

Mount

Click

Plug

Specification

Description	Parameter
Detector	UFPA
Resolution	384 x 288 Pixels
Wave	8 to 14 micron
FOV	40°X 30°
Image Settings	Brightness, Contrast, Digital zoom,
	Image noise reduction
Power Supply	Cigarette Lighter

The vehicle-mount thermal imager is encapsulated with metal housing, completely in line with the IP54 standard, and it is firmed and durable.

SATIR

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GF3000A

SAT INFRARED

Based on the years of developing experience and technology of IR cameras of Guangzhou SAT Infrared Technology LTD, SAT introduces the new generation fire fighting uncooled IR camera SAT-GF3000A. It adopts the UFPA 160X120 detector and integrates advanced electronic technology, detector technology and IR image processing technology. It will play a great role in fire fighting and saving lives of human being.

GF3000A

::Specification::

Physical Characteristics:	
Weight	≤1.25Kg （with battery）
Dimensions	175x119x125mm
Color	Red or Yellow
Infrared Characteristics:	
Detector	α-Silicon , UFPA Micro Bolometer
Pixel	160X120
Spectral range	8～14um
Focus	0.5m to infinity
NETD	≤120mk
FOV	38°
Spatial resolution	4.1mrad
Electrical Characteristics:	
Video Standard	PAL/NTSC
Battery Technology	Rechargeable NiMH
RechargeCycles	1000+
Rechargetime	2.5 Hours (nominal)
Battery life	≥2 hours.

Environmental Characteristics:	
Shock	30g
Vibration	3g
Drop	1.8m
Water resistance	IP67, 1.0m(3'3") depth
Burning arrestment	UL94-V0
Operating temperature	-20℃ ~ +55℃ long time working 55℃ ~ 430℃, short periods

1.Detector

High definition UFPA detector can provides excellent resolution, rapid refresh rate, and wide dynamic range. Even in widely varying temperature environments, the camera can make thermal images.

2.Mechanical

The camera is light and small which can be hold by one hand for a long time. The design of both sides handle allows firefighters can use the camera by each hand comfortably for the natural movements, such as crawling, standing, overhead, etc.

3.Features and configuration

1)The NiMh battery can provide over 2 hours uninterrupted operation;

2)With less than 15 seconds startup time, GF3000A can be available on time;

3)With the IP67 encapsulation, GF3000A can works properly after imersing in one meter deep water for about 30 minutes;

4.Display function

1)GF3000A is equipped selectable pseudo-color palettes to optimize the display image for different scenario.

2)With the large size TFT LCD screen, GF3000A can provides excellent infrared images for the operator.

SAT INFRARED

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SAT-HY6800

The SAT-HY6800 is a high performance infrared camera, embedded with the complete processing and analysis functions such as multi-spot measurement, temperature tracking and alarm, isothermal, line and area analysis. Firstly-introduced at SPIE2002, the SAT-HY6800 is now involved in the wide range of IR imaging applications all over the world.

SAT INFRARED

The New Millennial Pioneer in Infrared Cameras

Uncooled FPA detector and high definition image

Integration design and easy operation

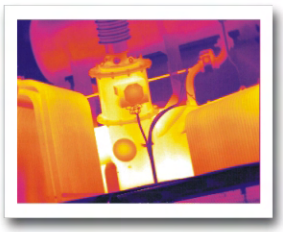
Record over 500 digital image in 128M PCMCIA card

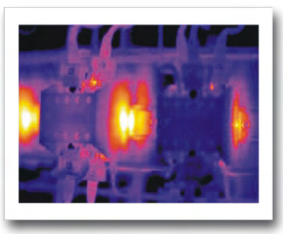
16-second testing voice annotation for each image

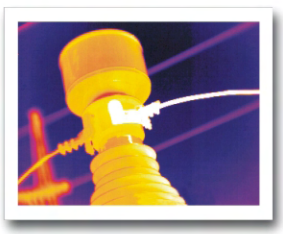
Powerful analysis and processing functions

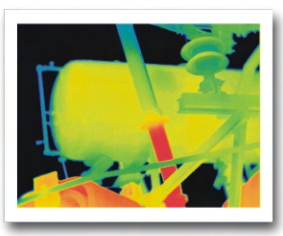
High reliability and solid structure

Smart battery system









SAT-HY6800 Technical Specifications

Description	Characteristics	Performance
Detector	Type	Microbolometer UFPA
	Spectral range	8-14μm
	Resolution	320 x 240
Imaging Performance	NETD	0.08℃ at 30℃
	Lens / focusing	24° x 18° ;motor focusing
	Spectral resolution	1.3 mrad(for24° lens)
	Min focusing distance	0.3m
	Frame rate	50Hz PAL/ 60Hz NTSC, non-interlaced
Image presentation	Video output	Pal / NTSC (optional)
	Image display	256 level, Black/White and pseudocolor
Features	Image freeze	Run or freeze
	Image storage	500 pcs /128M Flash card (Image and sound)
Measurement	Temperature range	-20-600°C, Standard; -40-2000°C, extendable
	Accuracy	±2°C or ±2%
Analysis Functions	Multi-Spot	Four spots analyzed in the meantime
	Temperature capture	highest or lowest temperature
	Line analysis	Analyze temperature distribution on the line
	Area analysis	Analyze temperature distribution in the area
	Parameter	Emissivity, ambience temperature, relative humidity and distance
	Isothermal	Display the same temperature area in sharp color
	Temperature Alarm	When the max or min temperature is highter or lower than the preset walue
	Voice annotation	16-seconds voice annotation can be saved within each image
	Adjustment	Level, gain and color span can be adjusted
	Quad-image display	Display four images in the meantime
	Image zooming	zoom in and zoom out (up to 8x)
Software	Analysis software	Report generation software
Environmental specification	Operational temperature	-20℃ ~ 50℃
	Storage temperature	-40℃ ~ 70℃
	Encapsulation	IP54
	Vibration	2.5G
	Shock	25G
Physical Characteristics	Weight	<1.7 Kg (including battery)
	Size (L x W x H)	200mm x 105mm x 110mm (camera only)

SAT INFRARED

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SAT-S280

Upright style infrared camera

UPRIGHT DUAL DISPLAY 4 IN 1

With over 10-year engineering experiences, SAT-IR introduces the innovative upright style infrared cameras (world patent pending). Design with the professional in mind, the S280 IR camera features powerful analysis tools, dual display, laser pointer, visual camera, and it is an ideal tool for predictive maintenance and various measurement and control applications.

Upright style
S series

Specifications (Preliminary Version)

Thermal	Field of view / min. focus distance	24° X18° /0.26m
	Spatial resolution (IFOV)	1.3mrad
	Thermal sensitivity	80mK@30℃
	Frame rate	50/60Hz non-interlaced
	Focus	Manual
	Digital zoom	1x-8x (0.1 increment)
	Detector type	Focal Plane Array (FPA), uncooled microbolometer 320x240 pixels
	Spectral range	8 to 14μm
Visual	Build-in digital camera	640x480 pixels, full color
	PIP	6 modes
LCD display	Viewfinder	Built-in, 640X480 color LCD (TFT)
	LCD display	320X240 color LCD (TFT)
	PIP	6 modes
Measurement	Measurement range	-20℃ to +500℃, (-4°F to +932°F),Up to 1500℃(2732°F) or +2000℃(3632°F), optional
	Accuracy	±2℃, ±2% of reading
Measurement mode	Spot	(up to 10 movable), manual or automatic placement
	Area	5 movable area, reading of max., min. and average temperature within area
	Isotherm	5 modes
	Line profile	Horizontal or vertical profile
	Emissivity correction	Variable from 0.01 to 1.00, automatic correction based on user input
	Measurement correction	Automatic, based on user input for ambient temperature, distance, relative humidity
Image storage	Memory	Built-in flash memory,128MB
Formats	Thermal image	SAT format, 14 bit measurement data included
	Visual image	CCD format
	Voice annotation	Input via headset up to 40 sec. of digital voice “clip” stored with thermal image
	Text annotation	Predefined by user and stored with image
Laser pointer	Classification	Class 2, red
Power source	Battery	Li-on, rechargeable, field replaceable
	Battery operating time	2.5 hours continuous operation
	External power operation	AC adapter
	Charging system	External intelligent charger
	Power saving	Automatic shutdown and sleep mode (user-selectable)
Environmental	Operation temperature range	-15℃ to +50℃ (5°F to +122°F)
	Storage temperature range	-40℃ to +70℃ (-40°F to +122°F)
	Humidity	Operating and storage 10% to 95%, non-condensing
	Encapsulation	IP 54 IEC 529
	Shock	Operational: 25g IEC 68-2-29
	Vibration	Operational: 2g IEC 68-2-6
Physical characteristic	Size	90mm X 160mm X 184mm
	Weight	1Kg
	Tripod mounting	1/4"-20
Interfaces	USB	Image (thermal and visual), measurement data, voice and text, real-time thermal video with measurement data (Optional) transfer to PC
	Video output	CCIR/PAL or RS170 EIA/NTSC composite video

SATIR

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APPENDIX C

Wuhan Guide

ENGLISH-LANGUAGE SPECIFICATION SHEETS ON SEVERAL PRODUCTS REPRESENTATIVE OF THE GUIDE LINE

Groundbreaking IR Thermal Radiometric Camera MobIR® M3

Imaging Performance	
Detector Type:	Focal plane array (FPA) uncooled microbolometer ; 160×120 pixels, 35μm
Spectral Range:	8 to 14μm
Thermal Sensitivity:	≤120mk at 30□
Image Frequency:	50Hz PAL/60 NTSC, non-interlaced
Field of View (FOV):	25°×19°
Electronic Zoom:	×2
Image Presentation	
External Display:	2.2″ TFT & 1.2″ CSTN high resolution color LCD
Display Colors:	256 level, 5 palettes
Video Output:	PAL/ NTSC, composite video
Measurement	
Temperature Range	-20□ to +250□
Accuracy	±2□ or ±2% of reading
Measurement Modes	Spot, area, isotherm, line profile, auto hot spot, auto alarm
Emissivity Correction	Variable from 0.01 to 1.00 (in 0.01 increment)
Measurement Features	Automatic correction based on user input for reflected ambient temperature, distance, relative humidity, atmospheric transmission and external optics
Image Storage	
Type	Built-in Flash Memory
Capacity	100 images
File Format	IRI (An individual file consists of infrared image and voice annotation if any)
Voice Annotation	Variant for different files, up to 30 seconds per file
System Status Indication	
LCD Display	Display of battery status, indication of power
Sound Alarm	Automatic alarm for power shortage
Laser Locator	
Classification Type	Class 2 semiconductor laser
Battery System	
Type	Li-ion battery, rechargeable, filed replaceable
Operating time	Over 2 hours continuous operation
Charging System	In camera via USB interface from AC adapter (96 – 250 VAC) or in battery charger
Power Dissipation	2W
Environmental Specification	
Operating Temperature	-10℃ to +50℃
Storage Temperature	-20℃ to +60℃
Humidity	Operating and storing 10% to 95%, non-condensing
Encapsulation	IP54
Shock	25G, IEC 68-2-29
Vibration	2G, IEC 68-2-6
Interfaces	
USB1.1	Image, measurement and digital video transfer to PC
Physical Characteristics	
Size	120mm×60mm×30mm
Weight	0.265kg (including battery)

IR Thermal Imaging Miracle MobIR® M4

Imaging Performance	
THERMAL	
Detector Type	Focal plane array (FPA) uncooled microbolometer ; 160×120 pixels, 35μm
Spectral Range	8 to 14μm
Field of View	25°×19°
Thermal Sensitivity	≤120mk at 30□
Image Frequency	50Hz PAL/60 NTSC, non-interlaced
Electronic Zoom	×2
VISUAL	
Built- in Digital Video colors	CMOS Sensor, 640 x 480 pixels, 2^{24} colors
Image Presentation	
External Display	2.2″ TFT & 1.2″ CSTN high resolution color LCD
Display Color	256 level, 8 palettes (Rainbow, iron, B&W, etc)
Video Output	PAL/ NTSC, composite video
Measurement	
Temperature Range	-20□ to +250□
Accuracy	±2□ or ±2% of reading
Measurement Modes	Spot / manual (up to 4 moveable), spot / automatic placement at max, area (up to 4 moveable) displaying either max, min, or average, isotherm, line profile, auto alarm
Emissivity Correction	Variable from 0.01 to 1.00 (in 0.01 increment)
Measurement Features	Automatic correction based on user input for reflected ambient temperature, distance, relative humidity, atmospheric transmission and external optics
Image Storage	
Type	Built-in Flash Memory
Capacity	600 images
File Format	IRI (An individual file consists of infrared image, visual image and voice annotation if any)
Voice Annotation	Variant for different files, up to 30 seconds per file
System Status Indication	
LCD Display	Shows status of battery, indication of power
Sound Alarm	Automatic alarm for power shortage
Laser Locator	
Classification Type	Class 2 semiconductor laser
Battery System	
Type	Li-ion battery, rechargeable, filed replaceable
Operating time	Over 2 hours continuous operation
Charging System	In camera via USB interface from AC adapter (96 – 250 VAC) or in battery charger
Power Dissipation	2W
Environmental Specification	
Operating Temperature	-10□ to +50□
Storage Temperature	-20□ to +60□
Humidity	Operating and storing 10% to 95%, non-condensing
Encapsulation	IP54
Shock	Operational: 25G, IEC 68-2-29
Vibration	Operational: 2G, IEC 68-2-6
Interfaces	
USB1.1	Image (thermal & visual), measurement, voice and digital video transfer to PC
Physical Characteristics	
Size	120mm×60mm×30mm (standard model)
Weight	0.265kg (including battery)
Color	2 colors alternative

Superb & Simpler IR Thermographic Camera ThermoPro™ TP8S

Imaging Performance	
THERMAL	
Detector type:	Uncooled FPA microbolometer (384× 288 pixels, 35μm)
Spectral Range:	8-14μm
Thermal Sensitivity:	0.08°C at 30°C (Frame averaging algorithm)
Field of View/ Focus:	22°× 16°/ 35mm
Focusing:	Automatic or motorized
Electronic Zoom:	×1 to ×10 continuous zoom
VISUAL	
Built- in Digital Video:	CMOS Sensor, 1280× 1024 pixels, 2^{15} colors
Image Presentation	
External Display:	3.5″ high resolution color VGA LCD, 640× 480 pixels
Viewfinder	0.6″ built-in high resolution color OLED, 640× 480 pixels
Video Output:	VGA/PAL/ NTSC switchable
Image Display:	Thermal image alone/ Visual image alone/ Picture in picture
Man-Machine Communication	
Remote Control Handle (optional) :	Respond as per operators' operation
Joystick & Buttons:	Respond as per operators' operation
Menu:	Microsoft® Windows style
Measurement	
Temperature Range:	-20 °C- +600°C (down to -40 °C, up to +2000°C optional)
Accuracy:	±1°C or ±1% of reading
Measurement Modes:	Auto hot/cold spot , auto alarm for temperature above or below ; 10 movable spots,10 movable & changeable areas displaying either max, min, or average, vertical & horizontal line profile, delta-t, histogram & isotherm in live/zoomed/frozen/saved image
Emissivity Correction:	Variable from 0.01 to 1.00 (in 0.01 increment)
Measurement Features:	Automatic correction based on distance, relative humidity, atmospheric transmission and external optics
Optics Transmission Correction:	Auto, based on signals from sensors
Image Storage	
Type:	Removable 2GB SD card or built-in flash memory
File Format:	JPEG (an individual file consists of infrared image, visual image, voice annotation and text annotation if any)

Voice Annotation:	Up to 60 seconds per file
Text Annotation:	Selected from preset texts
Optional Lenses	
Field of View/ Focus:	7.7°× 5.8°/ 100mm 45.6°× 35°/ 16mm
Laser Locator	
Classification Type:	Class 2 semiconductor laser
Power System	
Battery Type:	Rechargeable Li-ion Camcorder battery, field-replaceable
Charging System:	In camera or in battery charger
Battery Operating Time:	Over 2.5 hours continuous operation
External Power Operation:	AC adapter 110/ 220 VAC, 50/ 60Hz
Environmental Specification	
Operating Temperature:	-20°C~+60°C(extended range optional)
Storage Temperature:	-20°C~+60°C(extended range optional)
Humidity:	Operating and storing 10% to 95%, non- condensing
Encapsulation:	IP54 IEC 529 housing
Shock:	Operational: 30G, IEC 68-2-29
Vibration:	Operational: 3G, IEC 68-2-6
Interfaces	
USB 2.0:	Image (thermal and visual), measurement data and voice text transfer to PC
RS232 communication:	Control of camera on PC
Man-Machine Communication	
Touch Screen:	Present and receive operator's commands given by touch
Physical Characteristics	
Housing:	Magnalium
Weight:	0.85kg (excluding battery & LCD); 1.1kg (including battery & LCD)
Size:	186mm×106mm× 83mm (standard model)
Tripod Mounting:	1/4″- 20

Thermal Security Camera GUIDIR® IR210

Imaging Performance

Detector	Uncooled FPA Microbolometer 320x240 pixels
Pitch	45μm×45μm
Spectral range	8-14μm
Thermal sensitivity	0.08□@30□
Start-up time	<30 seconds
Gain control	Automatic / manual
Image Presentation	
Video output	PAL/NTSC
Display	White / black (pseudo color optional)
Contrast / brightness	Manual / Automatic
Electronic zoom	2X, 4X
Power System	
Voltage	DC9V
Power dissipation	4W
Environmental Specification	
Operating temperature	-20□-+50□(-40□-+60□ optional)
Storage temperature	-40□-+60□
Interface	
Remote control	RS232 serial communication
Physical Characteristics	
Size	120mm×60mm×60mm(camera body)
Weight	220g

Multifunctional Locating Handheld Thermal Viewer GUIDIR® IR513

Thermal Imager	
Detector:	384x288 pixels
Spectral range:	8-14 microns
Bad pixels:	<1%
NETD:	<85mk at 25℃
FOV:	5.50°x4.12°
Electronic zoom:	x2
Polarity:	White heat/ Black heat
Operating temperature range:	-25~+55℃
Storage temperature range:	-40~+60℃
Communication:	RS232
GPS	
Accuracy:	Single unit <3m (2DRMS)
Cold start:	<60 sec
Hot start:	<20 sec
Re-acquisition time:	<1 sec
Operating temperature range:	-25~+55℃
Storage temperature range:	-40~+85℃
Laser Range Finder	
Laser ranging performance:	50 ~ 5000 m
Ranging accuracy:	±3m
Wavelength:	1.06μm
Beam disperse angle:	≤1.0mrad
Repeat frequency:	10 times/ minute
Working voltage:	7~12V
Digital Compass	
Accuracy:	0.3°
Operating temperature range:	-25~+55℃
Storage temperature range:	-40~+125℃

Security Monitoring IR Thermal Camera GUIDIR® IR516

Image Performance	
Detector Type:	Microbolometer UFPA (320 x 240 pixels, 45μm)
Spectrum Range:	8-14μm
Field of View/ Min focus distance:	5.5°×4.1° /150mm
Spatial Resolution (IFOV):	0.3mrad (IFOV)
Thermal Sensitivity:	0.08℃ at 30℃
Image Frequency:	50Hz PAL/ 60Hz NTSC, non-interlaced
Focus:	Motorized
Electronic Zoom:	×2, ×4
Image Presentation	
Image display:	Black/ white (pseudo color optional)
Environmental Specification	
Operating Temperature:	-20 to 50℃ (-40 to 60℃ optional)
Storage Temperature:	-40 to 60℃
Encapsulation:	IP54
Interfaces	
Communication:	RS422
Video Output:	PAL/ NTSC composite video
AC power supply:	AC adapter,110/220V,50/60Hz

Handheld Thermal Viewer GUIDIR® IR510

Imaging Performance	
Detector Type	Uncooled FPA microbolometer 320×240 pixels, 45um
Spectral Range	8- 14 μm
Field of View:	9.1°×6.9°
Thermal Sensitivity	0.08℃Cat 30℃
Gain & Offset	Auto & manual control
Electronic Zoom	×2, ×4 interpolating
Image Presentation	
Video Output	PAL or NTSC, composite video
Integrated Display	CRT viewfinder
Image Color	B & W, B & W inverse (pseudo color optional)
Power System	
Battery Type	7.2V rechargeable Li-ion Battery
Battery Operating Time	2 hours continuous operation
External Power Operation	AC adapter 110/ 220VAC, 50/ 60 Hz
Environmental Specification	
Operating Temperature	-20 - +50 (-40 - +60 optional)
Storage Temperature	-40℃-+60℃
Humidity	Operating and storing 10% to 95%,non-condensing
Shock	GJB
Vibration	GJB
Physical Characteristics	
Weight	2.0 Kg
Size	143mm× 82mm× 83mm
Tripod Mounting	1/4″- 20

Portable Handheld Thermal Viewer GUIDIR® IR519

Imaging Performance	
Detector Type	Uncooled FPA microbolometer 384× 288 pixels, 35μm
Spectral Range	8- 14 μm
Field of View	8.5°× 6 .4°
NETD	≤80mK
Gain & Offset	Auto & manual control
Electronic Zoom	×2, ×4 by interpolating
Image Presentation	
Video Output	PAL or NTSC, composite video
Integrated Display	OLED viewfinder
Image Color	B& W, B& W inverse, (pseudo color optional)
Power System	
Battery Type	7.2V rechargeable Li-ion Battery
Battery Operating Time	2 hours continuous operation
External Power Operation	AC adapter 110/ 220VAC, 50/ 60 Hz
Environmental Specification	
Operating Temperature	-20□- +50□(-40□- +60□ optional)
Storage Temperature	-40□- +60□
Humidity	Operating and storing 10% to 95%, non-condensing
Shock	GJB
Vibration	GJB
Physical Characteristics	
Weight	2.0 Kg
Size	232mm× 103mm× 126mm
Tripod Mounting	1/4″-20

Smallest & Lightest Thermal Goggle GUIDIR®IR528

Imaging Performance	
Detector type	Uncooled FPA, 160×120 pixels
Spectral range	8～14μm
FOV	32.4°×24.6° (5.1°×3.8° optional)
Image frequency	50/ 60Hz
Image zoom	×2
Image Presentation	
Display	OLED viewfinder, 256 grey levels
Video output	PAL/NTSC
Gain & offset	Auto & manual control
Temperature Measurement	
Measurement mode	Single spot measurement
Accuracy	±2℃ or ±2% of reading
Power Supply	
Rechargeable battery	4.2V
Power dissipation	< 2.5W
Battery operating time	> 2.5h
Environmental Specifications	
Operating temperature	-25℃~+55℃
Storage temperature	-40℃~+60℃
Humidity	Operating and storing 10% to 95%, non-condensing
Interfaces	
Video/Power	Analog video output/power input
Physical Characteristics	
Weight	< 300g
Size	148mm×50mm×70.5mm

UFPA IR Module GUIDIR® IR112

Detector	
Type	Uncooled FPA Microbolometer (384× 288 pixels)
Pitch:	35μm
Spectral Response:	8-14μm
Fill Factor:	>80%
Response Rate:	> 5 MV/K @ 30℃
Response Time:	10mS
Bad Pixel:	<1%
NETD:	<80mK @30°C
Power	
Input Voltage:	9VDC- 12VDC
Power Dissipation:	<3.5W
Environmental	
Operating Temperature:	-20°C- +60°C (-40°C optional)
Storage Temperature:	-20°C- +60°C (-40°C optional)

APPENDIX D

Wuhan Huazhong Numerical Control Co. Ltd. (HCNC)

ENGLISH-LANGUAGE SPECIFICATION SHEETS ON SEVERAL PRODUCTS REPRESENTATIVE OF THE HCNC LINE

Specifications: HY-1088B

Infrared detector	Place of origin	USA
	Material	VO_x
	Pixel	320×240
	Range of wave-length	7~14μm
	Thermal sensitivity	≤35mK
Picture characteristics	Start-up time	3-second
	Brightness/contrast	automatic
	Body detecting range	1000m
Optics characteristics	Field angle	9°×7°
	Focal length	75mm
Video characteristics	Format	NTSC or PAL
	Display mode	3.5-inch, colors with 16-million
	Video-recording hours	>2-hour
Power	Battery	3.6V , 8800mAh lithium-battery
	Available hours	>10-hour
	Charging hours	5-hour
Environmental characteristics	Application temperature	-40□~ + 75□
	Storage temperature	-45□~ + 80□
Mechanical characteristics	Size	219 mm ×110 mm ×100 mm
	Weight	1600g
Interface	Video and USB	

Product Content

HY Infrared Thermography
>>HY-3088G series
>>HY-3000G series
HY Infrared Thermography for Human body
>>HY-2005A series
>>HY-2005B series
HY Infrared Image Remote Monitoring System
>>HY-5800 series
HY Night-vision Infrared Thermography Setting
>>HY-1088A series
>>HY-1088B series
HY Infrared Image Monitoring Setting
>>HY-5000 series

Product Content

HY-3088G series

Integrating advanced optoelectronic technology, thermal-imaging technology as well as image processing technology, HY series infrared thermography features as many advantages as high temperature sensitivity, wide range temperature measurement, non-interfering detected target and easy-to-use. Infrared thermography, as one of the state-of-the-art and effective means in foreseeing maintenance and condition surveillance, has been increasingly recognized and valued with bringing users remarkable economic benefits. HY series infrared thermography is an up-to-date and the third-generation product with lots of features such as advanced technologies, reliable system, perfect functions, easy to operate, bottommost pricing and so on. Even in very bad conditions, it works wonderfully and satisfies requirements for measurement as well.

Characteristics:

1. No cooling necessary, start-up rapidly.
2. Image distinction, perfect functions.
3. High temperature resolution.
4. Temperature measuring both swiftly and accurately.
5. Storage and replay of thermal image.
6. High integration and reliability.
7. Mighty dedicated analyzing software.
8. Lightweight, extremely portable.

Technical specifications of HY-3088G infrared thermography

Image specifications	
Type of detector	Uncooled FPA detector (USA)
Pixel	320×240
Range of wave-length	8～14μm
Temperature resolution	0.07℃（when 30℃）
Spatial resolution	1.3mrad
Frame frequency	25HZ
Field of view/Min.focal length	17°×14°/0.5m
Focusing	Manual
Image display	
Video output	PAL composite video
Display mode	3.5-inch color-LCD, color electronic view-finder(clearly visible under bright light)
Type of menu	Chinese/English menu

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Pseudo -color set-up	Users can set up 256 pseudo-color mode, 5 palette options
Adjusting function	Brightness and contrast adjustable.
Visible-light image	Picture-in-picture display
Temperature measurement	
Range of temperature measurement	-20℃~+450℃ expandable up to 2000℃
Accuracy of temperature	±2℃ or ±2% of readings
Measurement mode	1. Automatically measuring and catching max. temperature on entire screen. 2. Temperature measuring to any point. 3. An upper limitation of temperature alarm can be set up. 4. The system alarms automatically once temperature is higher than the upper limitation.
Correction of air penetrating-rate	Performing automatically based on input target distance, air temperature and relative humidity.
Emissivity correction	Calibrating in terms of given emissivity.
Image storage and replay	
Type of storage	Built-in, large capacity FLASH-memory, storage images≥1000.
Image replay	Replay simultaneously and analyze on a 4-picture basis.
Audio notes	10-second audio notes in each thermal picture.
Clock function	Real clock
Battery	Built-in, rechargeable lithium-battery, available hours: 2 hours, changeable on-site.
Environmental parameters	
Operation temperature	-10℃~+50℃
Storage temperature	-40℃~+70℃
Humidity	10%~95%
Physical Characteristics	
Size	160mm×105mm×80mm
Weight	2kg
Interface mode	USB

Back

Home | About us | Product Content | Application | Download Center | Contact us

Telephone：87180040 87180302 87180292
Postcode：430223

Product Content

HY Infrared Thermography
>>HY-3088G series
>>HY-3000G series
HY Infrared Thermography for Human body
>>HY-2005A series
>>HY-2005B series
HY Infrared Image Remote Monitoring System
>>HY-5800 series
HY Night-vision Infrared Thermography Setting
>>HY-1088A series
>>HY-1088B series
HY Infrared Image Monitoring Setting
>>HY-5000 series

Product Content

HY-3000G series

Integrating advanced optoelectronic technology, thermal-imaging technology as well as image processing technology, HY series infrared thermography features as many advantages as high temperature sensitivity, wide range temperature measurement, non-interfering detected target and easy-to-use. Infrared thermography, as one of the state-of-the-art and effective means in foreseeing maintenance and condition surveillance, has been increasingly recognized and valued with bringing users remarkable economic benefits. HY series infrared thermography is an up-to-date and the third-generation product with lots of features such as advanced technologies, reliable system, perfect functions, easy to operate, bottommost pricing and so on. Even in very bad conditions, it works wonderfully and satisfies requirements for measurement as well.

Characteristics:

1. No cooling necessary, start-up rapidly.
2. Image distinction, perfect functions.
3. High temperature resolution.
4. Temperature measuring both swiftly and accurately.
5. Storage and replay of thermal image.
6. High integration and reliability.
7. Mighty dedicated analyzing software.
8. Lightweight, extremely portable.

Technical specifications of HY-3000G infrared thermography:

Image specifications	
Type of detector	Uncooled focal plane array detector
Pixel	320×240
Range of wave-length	8～14μm
Temperature resolution	0.07℃（when 30℃）
Spatial resolution	1.3mrad
Frame frequency	9HZ

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Image enlargement	×2
Field of view/Min.focal length	17°×14°/0.5m
Focusing	manual
Image display	
Video output	NTSC composite video
Display mode	3.5-inch color-LCD, color electronic view-finder(clearly visible under bright light)
Type of menu	Chinese/English menu
Pseudo -color set-up	Users can set up 256 pseudo-color mode, 5 palette optional
Adjusting function	Brightness and contrast adjustable
Visible-light image	Picture-in-picture display
Temperature measurement	
Range of temperature measurement	-20℃~+350℃ expandable up to 2000℃
Accuracy of temperature measurement	±2℃ or ±2% of readings
Measurement mode	1. Automatically measuring and capturing max. temperature on entire screen. 2. Temperature measuring to any point. 3. An upper limitation of temperature alarm can be set up. 4. The system alarms automatically once temperature is higher than the upper limitation.
Correction of air penetrating-rate	Performing automatically, based on input target distance, air temperature and relative humidity.
Emissivity correction	Calibrating in terms of given emissivity.
Image storage and replay	
Type of storage	Built-in, large capacity FLASH-memory, storage images≥1000.
Image replay	Replay and analyze on a 4-picture basis.
Audio notes	There is 10-second audio notes in each thermal picture.
Clock function	Real clock
Battery	Built-in, rechargeable lithium-battery, available hours: 2 hours, changeable on-site.
Environmental parameters	
Operation temperature	-10℃~+50℃
Storage temperature	-40℃~+70℃
Humidity	10%~95%
Physical Characteristics	
Size	160mm×105mm×80mm
Weight	1.5kg
Interface mode	USB

Back

Home | About us | Product Content | Application | Download Center | Contact us

Telephone：87180040 87180302 87180292
Postcode：430223

Product Content

HY Infrared Thermography
>>HY-3088G series
>>HY-3000G series
HY Infrared Thermography for Human body
>>HY-2005A series
>>HY-2005B series
HY Infrared Image Remote Monitoring System
>>HY-5800 series
HY Night-vision Infrared Thermography Setting
>>HY-1088A series
>>HY-1088B series
HY Infrared Image Monitoring Setting
>>HY-5000 series

Product Content

HY-1088A series

HY-1088A series night-vision infrared thermography, a newly developed product, forms infrared images by detecting tiny differences of temperature. It may observe targets not only under completely lightless condition but in dark night, thick smoke, and dense fog as well, even including disguised and speedy moving targets. Currently it plays an important roles in locating and rescuing victims, search for criminals, maritime patrol and surveillance.

Characteristics
1. Real-time photographing, rapid start-up.
2. Body detecting range covering up to 450m.
3. Enhanced picture processor obtains ideal picture.
4. Lightweight, merely 400g.
5. Lithium-battery, long working hours.

Application areas
1. Target search
2. Compulsory protection
3. Daily patrol
4. Firefighting
5. Rescue
6. Surveillance
7. Capturing convicts on the lam

Technical specifications of HY-1088A series infrared thermograph:

FPA	Material	Micro bolometer
	Pixel	160×120
	Range of wave-length	7~14μm
	Thermal sensitivity	≤50mK
Picture characteristics	Start-up time	3-second
	Brightness/contrast	Entire automation
	Body detecting range	450m
Optics characteristics	Instantaneous field view	11°×8°
	Focal length	25mm
Video characteristics	Format	NTSC or PAL
	Display	2.5-inch LCD
Power	Battery	7.2V，4000mAh Lithium-battery
	Available hours	>10-hour
	Application temperature	-20℃~+60℃
	Storage temperature	-20℃~+80℃

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characteristics		
Mechanical characteristics	Size	135 mm ×93 mm ×57 mm
	Weight	400g

Back

Telephone：87180040 87180302 87180292
Postcode：430223

`

Product Content

HY Infrared Thermography
>>HY-3088G series
>>HY-3000G series
HY Infrared Thermography for Human body
>>HY-2005A series
>>HY-2005B series
HY Infrared Image Remote Monitoring System
>>HY-5800 series
HY Night-vision Infrared Thermography Setting
>>HY-1088A series
>>HY-1088B series
HY Infrared Image Monitoring Setting
>>HY-5000 series

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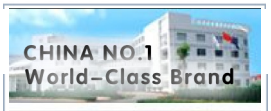

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Postcode：430223

Product Content

HY Infrared Thermography
>>HY-3088G series
>>HY-3000G series
HY Infrared Thermography for Human body
>>HY-2005A series
>>HY-2005B series
HY Infrared Image Remote Monitoring System
>>HY-5800 series
HY Night-vision Infrared Thermography Setting
>>HY-1088A series
>>HY-1088B series
HY Infrared Image Monitoring Setting
>>HY-5000 series

Product Content

HY-5000 series

It tends to be difficult to monitor temperature changing process of the detected target in scientific research and manufacturing.
Blending with advanced infrared thermal imaging technology, video gathering technolgy, measuring technlogy, the infrared thermography for process monitoring developed by HCNC performs well in on-line monitoring and real-time analysis for changes of temperature and its field of the detected target, obtaining many kinds of data in the process of rapid temperature changes of the detected target. Also it may analyze any single frame static picture.

Characteristics:
1. On-line monitoring temperature changes of target.
2. Dynamic capturing image with static analysis.
3. Analyzing recording data frame by frame.
4. Interface: USB
5. Two kinds of data deriving ways: function and text with allowing to insert other application programs in it.

System operation settings
Windows2000Pro or 2000Server/nt4.0 operation system P4-1.8G/256M/80G++ computer(or server) Server end software.

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Infrared camera		HY-5000 series	HY-5100 series
	Type of detector	The third-generation uncooled FPA(USA)	The third-generation uncooled FPA(USA)
	Pixel	320×240	160×120
	Output format	PAL	NTSC
	Response wave band	8～14μm	8～14μm
	Measurement range	-20℃～300℃ (expandable up to -20℃～300℃)	-20℃～300℃ (expandable up to -20℃～300℃)
	Temperature resolution	0.08℃(when 30℃)	0.08℃(when 30℃)
	Spatial resolution	1.3mrad	1.3mrad
	Range of focal distance	0.5m～∞	0.5m～∞
	Field frequency	50HZ	60HZ
	Focal length	Electrically operated/manual	Electrically operated/manual
	Operation setting	-20℃～+60℃	-20℃～+60℃
Video data interface	USB2.0		
PAN/TILT(optional)			
Software functions	1. Temperature measuring for any point of dynamic picture. 2. Automatically demarcating and monitoring of max.temperature. 3. Capturing dynamic images promptly and regularly, dividing object into single-frame picture for either in-depth static analysis or regional temperature contrast. 4. Thermal map can be enlarged (or lessened) with image filtering and adjusting to temperature range. 5. Automatic generation of corresponding technical report, or copied into WORD for self-definition editing. 6. The report is of universality, being unalterable, readable and transmissible. 7. The software may be installed in multi computers for normal use with early failure judgement, historic trend analysis by which aging information and its historic trend can be gripped properly. 8. Data deriving way is divided into two kinds: function & text that may be inserted into other application program.		

Back

Home | About us | Product Content | Application | Download Center | Contact us

Telephone：87180040 87180302 87180292
Postcode：430223

APPENDIX E

Nanjing Kuyee Tech

ENGLISH-LANGUAGE SPECIFICATION SHEETS ON SEVERAL PRODUCTS REPRESENTATIVE OF THE KUYEE LINE

Core C20

使用环境 Requirements on Operation environment

Operating Temperature	- 10□ ~ + 50□
Storage Temperature	- 40□ ~ + 70□
Humidity	≤95%

外型尺寸 Physical Characteristics

Weight	1Kg
Size	112mm×61mm×64mm
Tripod mounting	1/4〃- 20

技术性能指标 Technic capability

Detector type	Uncooled microbolometer FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	3mrad
Pixel	320×240
Field of view	56.1°×43.6°
Focus distance	0.2m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Manual focus

电源 Power

Power	+8VDC
Power Dissipation	<3 W

测量功能 Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightnesscontrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots contemporary most
Max/min temp capture	Max/mini temperature capture availabe

Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□

接口定义 Interfaces

Video	BNC Q9
Power source	ACadapter 85/260VAC,50/60HZ,8VDC,20W
Menu button	5 buttons

Core C30

Requirements on Operation environment

Operating Temperature	- 20□ ~ + 50□
Storage Temperature	- 40□ ~ + 70□
Humidity	≤95%

Physical Characteristics

Weight	1.1Kg
Size	175mm×64mm×70mm
Tripod mounting	1/4〃 - 20

Technic capability

Detector type	Uncooled microbolometer FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	0.7mrad
Pixel	384×288
Min focus distance	2m ~ ∞
Respond time	4ms
Video output	PAL
Startup	35 second
Focusing	Manual focus
Circular FOV/Focus	19.1°/50mm
Magnify of image	Real time magnifying of images
Image Color	B&W inverse
Adjustion	Auto/Manual Adjust Gain，Brightness contrast

Power

Power	+12VDC
Power Dissipation	<3 W

Interfaces

Video	BNC Q9
Power source	ACadapter 100/260VAC,50/60HZ,12VDC,20W
Menu button	5 buttons

Technical Datasheet

Model:	**GY603**
Detector:	UFPA micro bolometer
Field-of-View:	40mm
Frame Rate:	50HZ
Lens:	068.28 °
Temperature Resolution:	0.08℃
Spatial Resolution:	1.125mrad
Spectral:	8~14 micron
Detector Pixel:	320x240 pixels
Focus areas:	0.5m∞
Working Environmental Temperature:	0℃-- +40℃
Recommended Temperature:	16℃-- +32℃
Output data:	14bit
Data output:	USB2.0

Technical Datasheet Checker K10

Requirements on Opertation environment

Operating Temperature	- 10□ ~ + 50□
Humidity	≤95%
Storate Temperature	- 40□ ~ + 70□

Physical Characteristics

Weight	1.1Kg (include battery)
Size	200mm×85mm×130mm
Tripod mounting	1/4〃-20

Technic capability

Detector type	Uncooled microbolmoter FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	1.13mrad
Pixel	160×120
Image and measurement	Full screen simulant colour and measurement
Structure	Integrity design , one hand operation
Frame rate	50frame/sec ; PAL
Package	High strength plastic portable box
Fileld of view	20.6°×15.5°
Min focus distance	0.5m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Built-in focus motor

Power

Power	7.2V Li-Lon battery >3 hours
Power Dissipation	<3.5W

Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightness/contrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots contemporary most

Max/min temp capture	Max/mini temperature capture availabe
Laser point	1mw/635nm(red)
Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□

Technical Datasheet Checker K20

Requirements on Opertation environment

Operating Temperature	- 10□ ~ + 50□
Humidity	≤95%
Storate Temperature	- 40□ ~ + 70□

Physical Characteristics

Weight	1.6Kg (include battery)
Size	200mm×85mm×130mm
Tripod mounting	1/4〃-20

Technic capability

Detector type	Uncooled microbolmoter FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	1.13mrad
Pixel	320×240
Image and measurement	Full screen simulant colour and measurement
Structure	Integrity design , one hand operation
Frame rate	50frame/sec ; PAL
Package	High strength plastic portable box
Fileld of view	20.6^{o}×15.5^{o}
Min focus distance	0.5m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Built-in focus motor

Power

Power	7.2V Li-Lon battery >3 hours
Power Dissipation	<3.5W

Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightness/contrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots contemporary most

Max/min temp capture	Max/mini temperature capture availabe
Visible light image	CCD
Laser point	1mw/635nm(red)
Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□

Technical Datasheet Inspector K26

Requirements on Opertation environment

Operating Temperature	- 10□ ~ + 50□
Humidity	≤95%
Storate Temperature	- 40□ ~ + 70□

Physical Characteristics

Weight	1.6Kg (include battery)
Size	200mm×85mm×130mm
Tripod mounting	1/4〃-20

Technic capability

Detector type	Uncooled microbolmoter FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	1.13mrad
Pixel	320×240
Image and measurement	Full screen simulant colour and measurement
Structure	Integrity design , one hand operation
Frame rate	50frame/sec ; PAL
Package	High strength plastic portable box
Fileld of view	20.6°×15.5°
Min focus distance	0.5m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Built-in focus motor

Power

Power	7.2V Li-Lon battery >3 hours
Power Dissipation	<3.5W

Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightness/contrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots

	contemporary most
Max/min temp capture	Max/mini temperature capture availabe
Visible light image	CCD
Laser point	1mw/635nm(red)
Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□

Technical Datasheet Groper A20

Requirements on Opertation environment

Operating Temperature	- 10□ ~ + 50□
Humidity	≤95%
Storate Temperature	- 40□ ~ + 70□

Physical Characteristics

Weight	1.6Kg (include battery)
Size	200mm×85mm×130mm
Tripod mounting	1/4〃-20

Technic capability

Detector type	Uncooled microbolmoter FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	1.13mrad
Pixel	320×240
Image and measurement	Full screen simulant colour and measurement
Structure	Integrity design , one hand operation
Frame rate	50frame/sec ; PAL
Package	High strength plastic portable box
Fileld of view	20.6°×15.5°
Min focus distance	0.5m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Built-in focus motor

Power

Power	7.2V Li-Lon battery >3 hours
Power Dissipation	<3.5W

Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightness/contrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots contemporary most

Max/min temp capture	Max/mini temperature capture availabe
Visible light image	CCD
Laser point	1mw/635nm(red)
Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□

Technical Datasheet Firefinder F20

Requirements on Opertation environment

Operating Temperature	- 10□ ~ + 50□
Humidity	≤95%
Storate Temperature	- 40□ ~ + 70□

Physical Characteristics

Weight	1.6Kg (include battery)
Size	200mm×85mm×130mm
Tripod mounting	1/4〃-20

Technic capability

Detector type	Uncooled microbolmoter FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	1.13mrad
Pixel	320×240
Image and measurement	Full screen simulant colour and measurement
Structure	Integrity design , one hand operation
Frame rate	50frame/sec ; PAL
Package	High strength plastic portable box
Fileld of view	20.6°×15.5°
Min focus distance	0.5m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Built-in focus motor

Power

Power	7.2V Li-Lon battery >3 hours
Power Dissipation	<3.5W

Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightness/contrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots contemporary most

Max/min temp capture	Max/mini temperature capture availabe
Visible light image	CCD
Laser point	1mw/635nm(red)
Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□

Technical Datasheet Monitor N20

Requirements on Opertation environment

Operating Temperature	- 10□ ~ + 50□
Humidity	≤95%
Storate Temperature	- 40□ ~ + 70□

Physical Characteristics

Weight	1.6Kg (include battery)
Size	200mm×85mm×130mm
Tripod mounting	1/4〃-20

Technic capability

Detector type	Uncooled microbolmoter FPA
Spectral range	8 ~ 14μm
Thermal resolution	≤0.1□at 30□
Spatial resolution	1.13mrad
Pixel	320×240
Image and measurement	Full screen simulant colour and measurement
Structure	Integrity design , one hand operation
Frame rate	50frame/sec ; PAL
Package	High strength plastic portable box
Fileld of view	20.6°×15.5°
Min focus distance	0.5m ~ ∞
Respond time	4ms
Video output	PAL
Startup	45 second
Focusing	Built-in focus motor

Power

Power	7.2V Li-Lon battery >3 hours
Power Dissipation	<3.5W

Measurement function

Operation	Drop-down menu
Adjustion	Auto adjust brightness/contrast, Auto/manual mix colours
Dot temperature	Decussation dot temperature display,and sustain 10 dots contemporary most

Max/min temp capture	Max/mini temperature capture availabe
Visible light image	CCD
Laser point	1mw/635nm(red)
Simulation colour option	User can setup simulation option , sieve the background to emphasize high temperature target
Magnify of image	Real time magnifying of images
Temperature range	-20□ ~ 250 □ (Standard)
Temperature accuracy	±2% or ±2□