CSCanada
Advances in Natural Science
Vol. 8, No. 4, 2015, pp. 27-35
DOI:10.3968/7851

ISSN 1715-7862 [PRINT]
ISSN 1715-7870 [ONLINE]
www.cscanada.net
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The Study of Low-Light Sights Reliability Test System in High and Low Temperature Environment

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Received 12 September 2015; accepted 19 November 2015
Published online 26 December 2015

Abstract

In a certain period of time Products and system complete the required function under the condition of rules, the ability is called the reliability. Reliability is an important factor to reflect the quality of products, is the focus of the weapons and equipment quality. There is no guarantee reliability, even the most advanced equipment can not also play a role. In this paper, the design of test system is mainly used for small arms LOW-LIGHT SIGHTS sight reliability test. The shimmer sight reliability tests provide light stress, electrical stress, thermal stress and other stress environment. Detection shimmer sight working conditions, on failure of the automatic screening and recording.

Key words: Low-light sights; Reliability detection system; High and low temperature environments; Thermal stress subsystem

Duan, J., Xue, K. J., Li, D. N., & Sun, X. Y. (2015). The Study of Low-Light Sights Reliability Test System in High and Low Temperature Environment. *Advances in Natural Science*, *8*(4), 27-35. Available from: http://www.cscanada.net/index.php/ans/article/view/7851
DOI: http://dx.doi.org/10.3968/7851

INTRODUCTION

There is a light enhancement technology, this technique is capable of seeing objects in a weak light environment. A photoelectric device is called a light level system, it can help people to observe objects in low light conditions, low light level conditions include the stars light, moonlight and the night sky light, etc.. It is an important symbol of night vision technology, after the emergence of infrared night vision, It was able to work under very low illumination (10^{-3} lx- 10^{-5}), its working style is passive. Early it was applied in the military field, with the maturity of night vision technology it is widely applied in public security law enforcement, scientific research, agriculture, military and aerospace and other fields.

As one of the important fighting equipments, low-light sights is aim to target and observe for weapons at night. Low-light sights reliability detection is beneficial to design and produce products of high-quality, high stability. The traditional detection system consists of optical stress subsystem and electrical stress subsystem. Based on the actual application environment of low-light sights, thermal stress subsystem is proposed, which could make more comprehensive low-light sights reliability detection.

On the basis of the demand of the project and my professional skills, this paper do some work for optical stress subsystem and thermal stress subsystem. The illuminance of the exit window in the integrating sphere is compared by deducing the basic principles of integrating sphere; design parameters of beam collimator are defined by the analysis of the detection system, it is designed by Zemax, and the result of simulation is feasible; we ascertain the parameters of CCD camera; according to the need of reliability detection system, the power supply and monitor system are analyzed. To the thermal stress subsystem, we design various components of the high-low temperature chamber; the cooling mode is selected, and some parameters of the cooling system are calculated.

Finally, the designed integrating sphere is tested, and its illuminance meets the index. In addition, the impact of various factors on the COP in the thermal stress subsystem is analyzed by experiments.

1. THE SYSTEM OVERALL DESIGN SCHEME

As military equipment, low-light sights equipment is the same as other weapons and equipment. Reliability is an important parameter of equipment. It is also key technical indicators of weapon equipment quality. Reliability parameters are the basic guarantee for the formation of weapon equipment. Integrated Individual Soldier Combat System requirements for the reliability test of low-light sights system. Specific technical indicators are as follows:

The average mean time to failure (MTBF) of low-light sights system is less than or equal 1,000 hours.

In accordance with the relevant contents of the military standard 2422A-2006. Method for reliable detection of low light level is used, Low-light sights system must work on the cycle in the conditions of different light stress, electrical stress, thermal stress, mechanical stress and so on. Working conditions of Low-light sights system are monitored in real time by CCD camera. Monitoring images are transmitted to a computer for image acquisition card, According to the number of different stages of the prototype. According to the military standard 2422A-2006 in the eleventh chapter second section, low-light sights system is identified as qualified or unqualified.

According to the system design requirements, the reliability test system of Low-light sights system can measure the reliability of aiming at different working conditions. So the test system contains 4 subsystems, it consists of a light stress subsystems, subsystems electrical stress, thermal stress sub-systems, image processing sub-systems and condition monitoring, schematic diagram of the test system is shown in Figure 1.

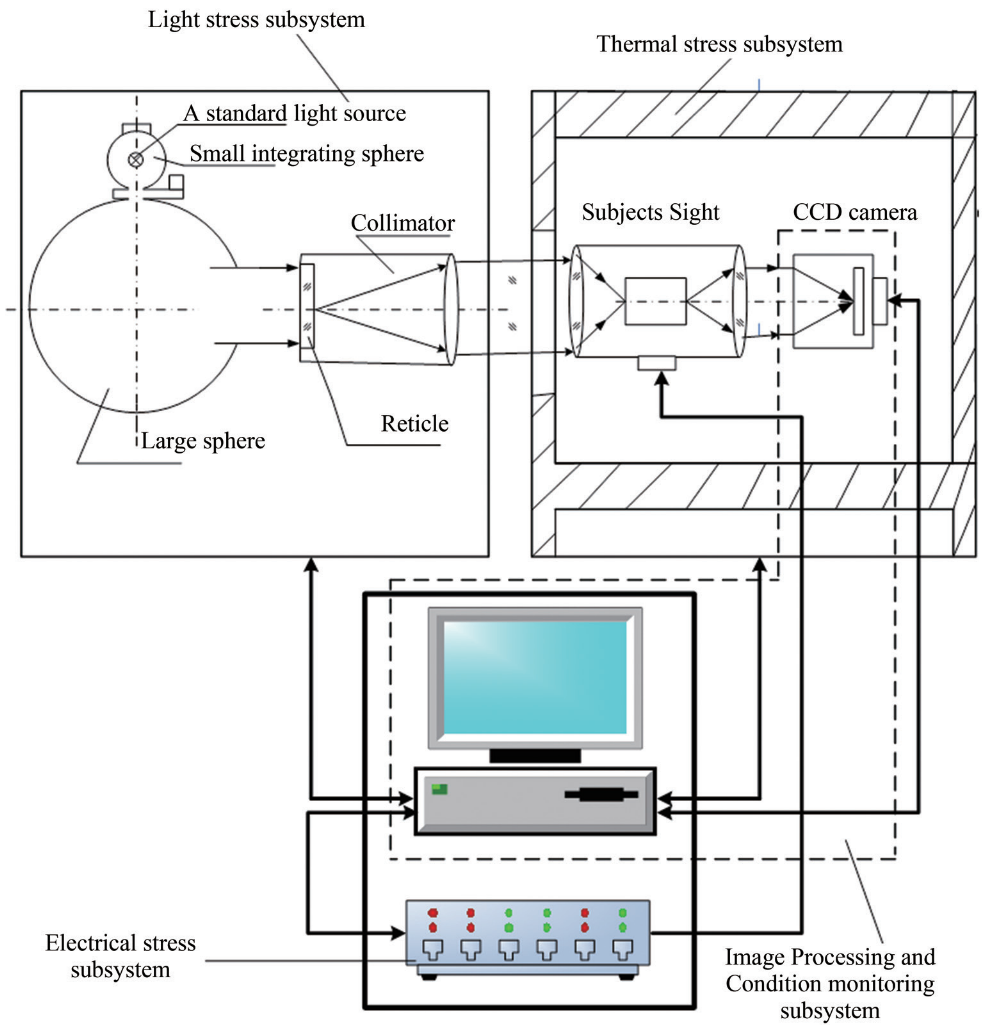

Figure 1.
Schematic Block Diagram of Low-Light Sights Reliability Test System

1.1 Light Stress Subsystem Design

One of the subsystems is the light stress system. Its function is to provide a low light level test environment for the measurement of the Low light level sight. Light stress values should be monitored and tested in real time and judged to be qualified, the intensity of the light source should be monitored and tested at the same time. The whole structure of light stress subsystem consists of integrating sphere light source, parallel light source, low light level sight, CCD image machine, computer and analysis software.

Provide a test for the shimmer sight desired target environment (ambient illumination can be switched four positions), and continuous monitoring of source emission intensity. The double integrating sphere light source, collimator, an optical platform and other components, as shown in Figure 2.

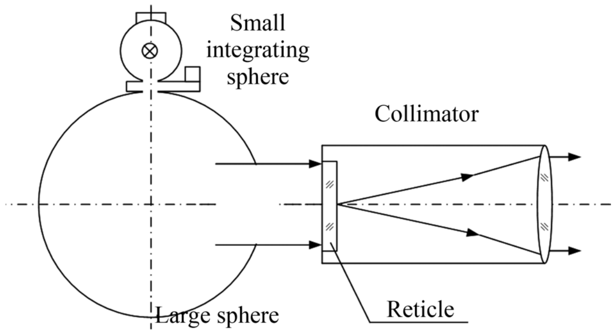

Figure 2
Schematic Diagram of Light Stress Subsystem

The system chooses two different volume integrator, they constitute the system light source by the interface connection, in the system there are two integral sphere, one is the big integral sphere, one is the small integral sphere. Small integral sphere is a part of the lamp chamber of light stress subsystem. A certain beam of light emitted from the light chamber. This part of the light is through the connection between the two different volume integrator, and then comes into the big integrator. These beams are reflected in a number of times through the coating. A certain light intensity beam of is emitted in the large integral sphere, the light source of different levels is needed In the experiment, In order to realize the illuminance transform of the light source, we can change output window aperture area of the small integrator and replacement rate through board. The parallel light source system can be replaced by a manual switch to replace the sub rate board, the switching device can switch to the desired position along the focal plane. The CCD camera and the low light level sight are fixed with the guide rail. This approach can make that the required parts are coaxial, and the axial part of the components is fixed easily.

1.2 Electrical Stress Subsystem Design

The electric stress distribution system is used to monitor the voltage stability. In accordance with the requirements of the test system it's another function provide a periodic variation of the electric stress for the test aim. The system is made up of charge battery, single chip microcomputer, digital analog converter DAC, voltage regulator circuit unit and so on. Single chip microcomputer according to the input of the main input—the operating voltage of low light level sight, the reference voltage value is calculated with the operating voltage. The data is sent to the DAC converter, and then they are converted by them to analog quantities. Finally, these analog quantities are fed into the regulator circuit unit. The output voltage of the system is adjusted; the adjusted values meet the requirements of the electric stress test. The role of the regulator circuit is to reduce the ripple, purpose is to improve the stability of the linear accuracy of voltage, it is actually an automatic battery control circuit, it is made up of adjusting the tube, the reference voltage source, the sampling circuit and the comparison of the amplifier.

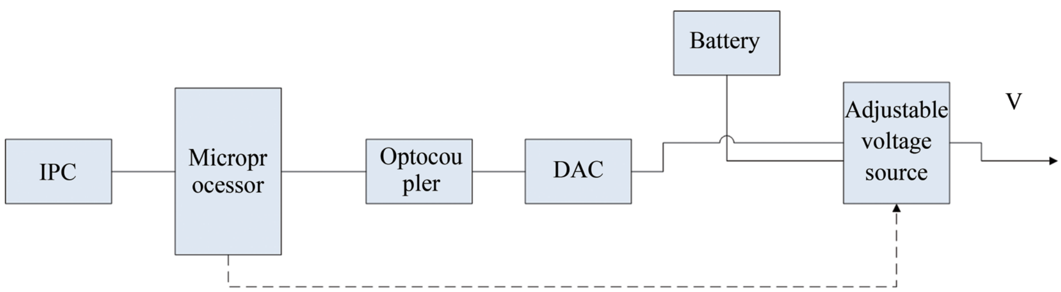

Figure 3
Block Diagram of Electrical Stress

Electrically adjustable stress subsystems controlled by a microprocessor in order to achieve the output voltage source. Since the output from the microprocessor to a digital signal, and an adjustable voltage source requires an analog control signal, so that the microprocessor with an adjustable voltage source in the intermediate digital-analog conversion is required. A block diagram of the specific electrical stress shown in Figure 3. In order to meet the technical specifications of ± 50mV regulation accuracy requirements, so the need to use a 12-bit digital to analog converter in order to ensure regulation precision. In order to ensure interference digital signal from an analog signal, digital to analog converter connected to the microprocessor and intermediate coupler, isolation. Electrical stress control using programmable DC power supply, the output voltage by the microprocessor according to the technical requirements for programming control. Voltage power supply by the output voltage of the real-time sampling and monitoring, and feedback to the control system, closed-loop control. Open electrical stress source, the shutdown is achieved by the microcontroller.

The control signal is issued by the microprocessor. Switching electrical stress is different strobe issued by the microcontroller to achieve. In order to keep the ripple voltage is less than 100 mV indicator requirements, all adjustable voltage source by the large capacity storage battery power supply. At the same time, in order to ensure that technical indicators 1V to 5V dc voltage output requirements, 5V battery rated output voltage.

1.3 Thermal Stress Subsystem

Thermal stress distribution system provides a temperature as will change the environment. Its role is to provide testing conditions for other tests. The reliability of the system is measured at high temperature and low temperature. It provides a high temperature and low temperature environment, thermal stress system is equivalent to the entire test system in a high and low temperature box. High and low temperature box is composed of mechanical structure, test case, cooling system, heat source, control system, temperature system, air circulation system and sensor system. Based on national standards for temperature testing. High temperature of its temperature range is 70℃, low temperature of its temperature range is -50℃. So it is very difficult to design the system.

Thermal stress subsystems from high and low box, work guides, instrument bench composition. To meet the reliability test requirements sights high and low temperature environment. Case has a temperature control panel. Independent controls of temperature stress from high temperature box. It provides power for the sights and CCD camera, work orders and transmit signals, cabinet installation dedicated cable channel.

In order to meet the requirements of the reliability test in the high temperature environment. First, the loading test of the light stress system and the electric stress system are carried out. It must be opened to the controller of high and low level at the same time. A light stress loading window is opened at the back of the test box. The loading window is made of two layers of insulating glass, outer layer with heating function is to prevent the environmental test frost, fog. These two layers of glass do not affect the illumination, the left side of the interface is provided with an electric stress loading interface window, power supply and electrical signals are connected with the peripheral by the interface. Observation window is in front of instrument the design of the instrument is based on the GB150.5-86- temperature impact test.

Temperature impact test condition:

(a) Test temperature range: High temperature is 70 degrees, low temperature is -55 degrees;

(b) The test temperature shall be maintained at a time: 1 hours or until the temperature of the test sample is stable, and the time is longer;

(c) Temperature conversion time: Less than or equal to 5 minutes;

(d) The number of cycles: 3 times.

1.4 Image Processing and Condition Monitoring Subsystem

Image Processing and condition monitoring subsystem monitoring of the image processing module, and state the composition and control module. Specifically shown in Figure 4. The image processing module is composed of CCD camera, image acquisition card and computer; Condition monitoring and control module are composed of computer and single chip microcomputer. The main collection LOW-LIGHT SIGHTS sight image. Through image processing, automatic identification, extracts the image fault - dark spots, bright, flashing and flickering, real-time image recording and post-fault processing and playback; dim light source light intensity monitoring stress, electrical stress source voltage stability and thermal stress system status. Electrical stress control light source intensity and stress switch and record start time, light stress levels, electrical stress levels, temperature, time of error, the cumulative operating time to sight and in which the number of test cycles and the number of working cycles until failure occurs, fault type, fault location, number, size, mean gray level fault, fault maximum gray level, the cumulative duration of the fault, and the fault image corresponding system status monitoring values and other test conditions, etc.. The above data save or print out the prescribed format.

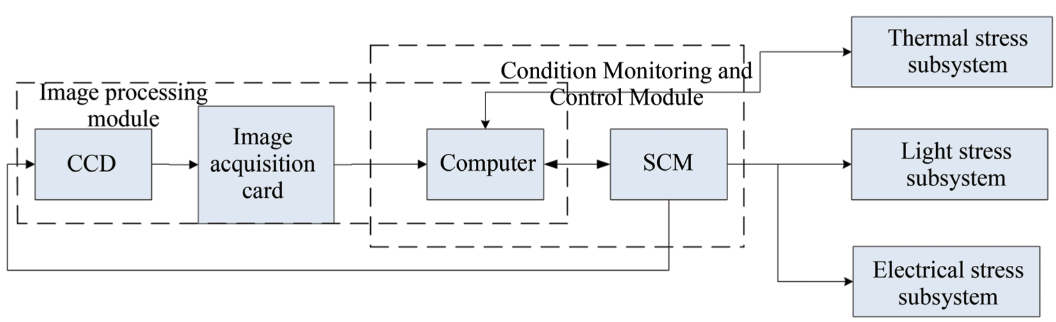

Figure 4
Image Processing and Condition Monitoring Subsystem Block Diagram

2. SYSTEM RELIABILITY DESIGN AND ANALYSIS

2.1 Mean Time Between Failures(MTBF)

Low-light sights reliability test system consists of a light stress, electrical stress, thermal stress, monitoring and recording system components. In the system, a component of any damage will be caused by the failure of the road. Thus, the reliability of the model subsystem is in series relationship, the reliability block diagram as shown.

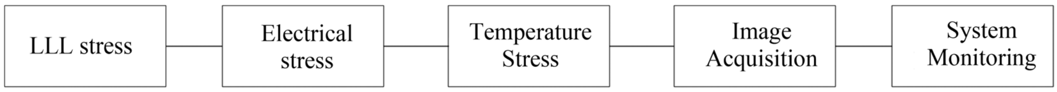

Figure 5
System Reliability Model Diagram

System Failure Rate:

$$\lambda_s \sum_{i=1}^{n} \lambda_i \ . \tag{1}$$

Component Failure Rates：

$$\lambda_i = \frac{1}{M_i} \ . \tag{2}$$

Among them: M_I—Parts trouble-free working time

Integrating sphere in the system, collimators, optical bench, table and other basic mechanical parts not exercise, do not bear a large load. In normal maintenance conditions, it can be considered as their reliability 100%.

The influence of light stress system components is, for the light source (lamp) 8,000 hours, a photo detector 20,000 hours, 60,000 hours drive motor and the control circuit 20 thousand hours. The greatest impact is the bulb, before the failure to take measures to replace the lamp.

$$\lambda_1 = \frac{1}{10000} + \frac{1}{60000} = 1.1666 \times 10^{-4} \ ,$$

$$M_1 = \frac{1}{\lambda_1} = \frac{1}{2 \times 10^{-4}} = 5000 \ .$$

Electrical stress system consists of microcontroller, batteries and electronic components and parts. In this system, the microcontroller than write cycle limit does not exist. Used correctly, its life is generally more than 20 years. Battery is the weak link, with three-step charger in the design, ie float, constant charging, constant voltage charging to avoid overcharging. In the course of discharge of the problem does not exist. So life of at least 10,000 hours. Screening devices and circuit design are the main factors. Preferably take typical circuit, optically isolated digital and analog circuitry, signal shielding measures more than 60,000 hours in their lifetime.

$$\lambda_1 = \frac{1}{10000} + \frac{1}{60000} = 1.1666 \times 10^{-4} \ ,$$

$$M_1 = \frac{1}{\lambda_1} = \frac{1}{1.1666 \times 10^{-4}} = 8571 \ .$$

Main factors affecting temperature stress are a temperature sensor and a temperature control circuit. The data given by the manufacturer for two years. We take 300 days to 7,200 hours.

The main factors that affect the monitoring and recording system are 50,000 hours CCD camera, frame grabber 180,000 hours, 60,000 hours computer.

$$\lambda_2 = \frac{1}{50000} + \frac{1}{180000} + \frac{1}{60000} = 1.9221 \times 10^{-4} \ ,$$

$$M_2 = \frac{1}{1.9221 \times 10^{-4}} = 5202 \ .$$

Each subsystem MTBF time list shown in Table 1:

Table 1
LOW-LIGHT SIGHTS Sight Reliability Test System Trouble-Free Working Hours on Average

Subsystem name	Failure rate $\lambda_i \times 10^{-4}$	Trouble-free working hours M_i
LOW-LIGHT SIGHTS stress system	2	5000
Electrical stress system	1.1666	8571
Thermal stress subsystem	1.3888	7200
Monitoring and recording system	1.9221	5202
The whole system（MTBF）	6.4775	1543

System average trouble-free working time （MTBF) ≥200h, meet the requirements.

2.2 Mean Time to Repair (MTTR)

LOW-LIGHT SIGHTS sight reliability test system consists of shimmer stress, electrical stress, thermal stress, monitoring and recording system components. The lamp functions involving replacement parts, optical sensors, light stress control circuit board electrical stress, temperature sensors, temperature stress control, CCD camera, image acquisition card, computer, UPS power supply. Each component maintenance time as shown in Table 2.

Table 2
LOW-LIGHT SIGHTS Sight Reliability Test System Components Replacement List

The name of the subsystem	Quantity N	Mean time to repair (unit: min)	Failure rate $\lambda_i \times 10^{-4}$
LOW-LIGHT SIGHTS Stress system	1	10	2.0000
Electrical stress system	1	15	1.1666
Thermal stress subsystem	1	20	1.3888
Monitoring and recording system	1	20	1.9221

$$\mathrm{MTTR}=\frac{10\times 2.0\times 10^{-4}+15\times 1.1666\times 10^{-4}+20\times 1.3888\times 10^{-4}+20\times 1.9221\times 10^{-4}}{2\times 10^{-4}+1.1666\times 10^{-4}+1.3888\times 10^{-4}+1.9221\times 10^{-4}}$$
$$=\frac{20+24.99+27.776+38.442}{2.00+1.1666+1.3888+1.9221}=\frac{111.208}{6.4775}=17.168\ \text{minutes}\,.$$

Calculation shows, The system MTTR 17.168 minutes. Meet the design requirements.

3. SYSTEM EXPERIMENT

According to the experimental requirements, the stability of the test integrating sphere light source is tested. The illumination level is divided into four levels 1×10^{-1}lx, 1×10^{-2}1x, 1×10^{-3}1x , 1×10^{-4}1x. In four illuminance level illumination, the characteristics of low light sights in the night sky under the uniform illumination are tested.

There is no light reflection objects in a completely closed chamber, Integral ball, the weak light meter and constant current power supply that are required to test is provided. The weak light intensity meter is the production of Hangzhou remote photoelectric Limited company, model is PHOTO-2000 m. The experiment includes the following five steps, the first step is that a light detector probe is covered; the second step is that the signal output plug of the probe is connected to the signal input port socket on the instrument panel; the third step is to open the main power supply, host is preheated 10-20 minutes; the fourth step is to open the probe cover in order to the Light that is testing beams on photosensitive surface of the probe; The fifth step is to read the value, Value of light intensity can be obtained from the instrument display window. In general, the voltage changes 0.1%, the spectrum will move. Therefore, in order to eliminate weaken the supply current and the output current of load resistance or the ambient temperature changes, powered of light source selects constant current power supply.

Experiment is illumination test in resolution testing range of micro optical sight, test distance is the value when the focal length of low light level sight collimator is 1.5 m (f=1.5 m). The target plate in the measurement resolution is a diffuse reflection target plate in the test area.

Firstly operator adjusts the light intensity of the integral sphere with illumination meter, when it is 1 X I 0-1 lx, eight edge points (A, B, C, D, E, F, G, H) of the illumination values are tested in the specified distance.

3.1 Provide Illumination Environment Experiment

Switching gears illumination by computer operations. At the outlet of a large sphere illuminance value detected by illuminometer. Twilight illumination detection data shown in Table 3

Table 3
Glimmer Illumination Detection Data

Illuminance stalls	Illuminance values (1 time)	Illuminance values (2 times)	Illuminance values (3 times)	Illuminance values (4 times)	Illuminance values (5 times)
10^{-1}lx	0.096 lx	0.105 lx	0.104 lx	0.101 lx	0.103 lx
10^{-2}lx	0．016 lx	0.013 lx	0.016 lx	0.014 lx	0.013 lx
10^{-3}lx	0.0019 lx	0.0021 lx	0.0020 lx	0.0022 lx	0.0019 lx
10^{-4}lx	0.00032 lx	0.00029 lx	0.00031 lx	0.00030 lx	0.00027 lx

Above table can be seen in the dim light illumination 1×10^{-1}(±10%)lx，1×10^{-2}～2×10^{-2}lx，1×10^{-3}～3×10^{-3}lx, 1×10^{-4}～4×10^{-4}lx Four kinds of gear illuminance available.

3.2 Color Temperature Detection Experiment

Before light source is mounted with a calibrated temperature meter detection. Specific test data is shown in Table 4.

Table 4
Color Temperature Detection

Illuminance stalls	Color test values (1 time)	Color test values (2 times)	Color test values (3 times)	Color test values (4 times)	Color test values (5 times)
10^{-1}lx	2799 K	2781 K	2776 K	2771 K	2780 K
10^{-2}lx	2820 K	2899 K	2861 K	2865 K	2780 K
10^{-3}lx	2888 K	2833 K	2849 K	2869 K	2781 K
10^{-4}lx	2799 K	2799 K	2791 K	2865 K	2798 K

The above table shows the color temperature of the light source to meet the technical specifications 2856±100K requirements.

3.3 Light Stress Unevenness

Illuminometer used in large multi-point at the outlet of the integrating sphere for testing. After processing the detection data shown in Table 5.

Table 5
Unevenness Detection

Illuminance stalls	10^{-1}lx	10^{-2}lx	10^{-3}lx	10^{-4}lx
Unevenness	6.1%	6.9%	7.2%	8.4%

The above table shows that unevenness of light stress to meet the technical indicators≤10% Requirements.

3.4 Output Voltage Electrical Stress Test

Computer set the output voltage. Electrical stress on the output side with a calibrated precision millimeter or oscilloscope to detect. Test data are shown in Table 6.

Table 6
Electrical Stress Detection

Voltage (v)	Voltage detection value(mv)	Output current (mA)	Ripple factor (mv)	Regulation accuracy (mv)
1v	1001.800	300	52	<±14
2v	2002.600	260	55	<±12
3v	3006.120	256	55	<±11
4v	4003.320	248	53	<±8
5v	5002.560	232	50	<±14

The above table shows that the output voltage of the electrical stress 1~5V, meet the technical requirements.

3.5 Thermal Stress Test Subsystem

On the basis of theoretical calculation, the performance of the refrigeration system is analyzed. The effects of mixed refrigerant, air suction temperature and evaporation temperature on the energy efficiency ratio (cop) of the refrigeration system are studied.

3.5.1 The Effect of Mixed Refrigerant Mixture Allocation Ratio on COP

Firstly, the pressure of suction gas, temperature and condensation temperature are set up, they are constant values. On the basis of this, the effect of mixed refrigerant composition on cop is studied. In the choice of two refrigerants one of the lower boiling points is used to reduce the evaporation temperature in the evaporation process, change of the low boiling refrigerant is very important, Because according to it, it can be deduced that the cop of the refrigeration system. When the one of refrigerant (R23) increases from 20% to 28%, The value of COP increased from 0.2 to 0.280. When the content of low boiling point refrigerant (R23) is increased, COP increases. It is showed that the mixed refrigerant mixture has a great influence on COP.

3.5.2 The Influence of Suction Temperature on COP

Effect of suction temperature is on the performance of refrigeration system, when the refrigerant composition and the outlet temperature of the condenser remain unchanged, the reduction of the compression ratio can improve the compressor suction temperature. When the suction temperature rises, the balance of the parts, will be wanted to keep, the value of the refrigerant flowing out of this opening system needs to be increased. At the same time, the entropy of the system should also increase, because the temperature of the condenser outlet position remains constant, reducing the exhaust pressure can make the entropy balance of exports, when the temperature rises, the compression ratio and COP are all decreased. When the suction temperature rises from -25 to - 4C, COP decreased from 0.281 to 0.255, at the same time the compression ratio decreases from 8.40 to 7.68.

Table 7
High Temperature Box Detection

Temperature	Starting time	End time	After stabilizing sampling point spacing within half an hour (10 times)
20°	9:00	9:03	20.3°, 20.4°, 20.4°, 20.3°, 20.1°, 20.3°, 19.9°, 20.3°, 20.2°, 20.1°
50°	10:00	10:40	50.8°, 50.5°, 50.6°, 50.4°, 50.4°, 50.5°, 50.3°, 50.1°, 5 0.4°, 50.5°
75°	13:00	14:16	74.8°, 75.0°, 75.4°, 75.5°, 75.7°, 75.5°, 75.3°, 75.6°, 75.5°, 75.3°
45°	15:00	15:38	45.8°, 45.6°, 45.4°, 45.4°, 45.4°, 45.5°, 45.4°, 45.7°, 45.5°, 45.3°
0°	16:25	17:25	0.3°, 0.2°, 0.2°, 0.3°, 0.1°, 0.2°, 0.2°, 0.2°, 0.1°, 0.3°
-20°	9:00	9:26	-19.7°, -19.6°, -19.8°, -19.9°, -20.2°, -19.9°, -19.8°, -20.2°, -20.1°, -20.0°
-40°	10:39	11:05	-40.8°, -40. 5°, -40.6°, - 40.4°, -40.4°, -40.5°, -407°, -40.6°, -40.4°, -40.5°
-55°	13:00	14:26	-54.6°, -55.1°, -54.9°, -55.1°, -55.3°, -55.2°, -55.3°, -55.2°, -55.0°, -55.4°

Based on high and low box test methods and test report for testing. Table 7 shows the thermal stress system temperature range: -55-70℃; temperature fluctuation: ±0.5℃; temperature uniformity: ≤2℃; temperature deviation: ±2.0℃; the average rate of heating and cooling: 0.5-1.0℃/min (No-load).

The reliability test and test of the micro optical sight are great significance to the development and production of the micro optical sight. However, the existing testing system is generally only for the light stress and the electric stress, according to the practical application environment of micro optical sight. On the basis of the existing test system, a high temperature test system with low light level sight is added. This makes the detection of the micro optical sight more comprehensive, in this paper, the design and analysis of the two aspects (the light stress system and the thermal stress system)were done.

(a) light stress system design

(i) The principle and structure of the integrating sphere light source are introduced, the light intensity distribution of Integrating sphere outlet is analyzed, according to the design parameters, the light intensity distribution of the integrating sphere is calculated;

(ii) The appropriate parameters of the parallel light tube are selected, the structure is designed and its parameters are optimized by optical design software Zemax, simulation results are very good, and the structure and installation of parallel light tube are analyzed;

(iii) According to the design requirement, the CCD camera is selected, and the installation is described;

(iv) Detection subsystem and control subsystem of the optical system are designed and illustrated.

(b) Thermal stress system design

(i) The parameters of the test system designed in this paper are clearly defined;

(ii)The principle and structure of thermal stress system are introduced;

(iii) The structure of thermal stress system is designed from four aspects, they are the entrance window, the body insulating layer material, the liner and the shell body;

(iv) Refrigeration subsystem and temperature control subsystem of thermal stress system were designed, Suitable refrigeration cycle mode and refrigerant are selected, the parameters of the refrigeration system are calculated, the temperature control circuit of the test box is designed, it provides a theoretical basis for the back actual design;

(c) The integrating sphere light source is designed, and a prototype is made, In the experiment of illumination uniformity, it is tested, Experimental results show that the parameters meet the requirements

SUMMARY

Reliability is an important factor, this indicator reflects the quality of the products, it is the key technology indicators of weapon performance. A weapon no matter how beautifully designed and manufactured to clever use of how advanced science and technology will eventually be considered for the use of the environment, as well as the stability of the weapon in combat, and the only way to play its biggest role. Gun sights with the shimmer are a night vision device, and the environmental adaptability and reliability are crucial photoelectric high-end weapons and equipment specifications. The developed countries have made great breakthroughs in key technologies for its research. Chinese study of night vision technology started relatively late, a big gap with the developed countries. Currently rely on existing test equipment developed in the general environment of artificial means within 8 hours of continuous work test. The test equipment is not fully detecting the presence of weapons and equipment failure problems. To improve night vision sight equipment environmental adaptability and reliability, the reliability of the design and development of appropriate detection system is necessary. Therefore, this paper studied shimmer high and low temperature environments sight reliability of the detection system, the dim light of the new development and setting sights very important significance.

Reliability is an important factor to reflect the quality of products, is the focus of the weapons and equipment quality. There is no guarantee reliability, even the most advanced equipment can not also play a role. This article is designed to detect system is mainly used for reliability test glimmer of light weapons sight. A glimmer shimmer sight stress test provides the reliability, electrical stress, thermal stress environment. Detection shimmer sight working conditions, for failure to be recorded and screened. Through experimental verification shows that light stress detection subsystem able to 10^{-1}lx, 10^{-2}lx, 10^{-3}lx and 10^{-4}lx gear illuminance. Electrical stress detection subsystem detects 1-5V power supply voltage, and meets the accuracy requirements. Thermal stress detection subsystem is able to detect temperature range: -55-70℃, Temperature fluctuation: ±0.5℃; Temperature uniformity: ≤2℃; Temperature deviation: ±2.0℃; The average rate of heating and cooling: 0.5-1.0℃/min. The system is designed for the development of shimmering sight of an important protection.

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