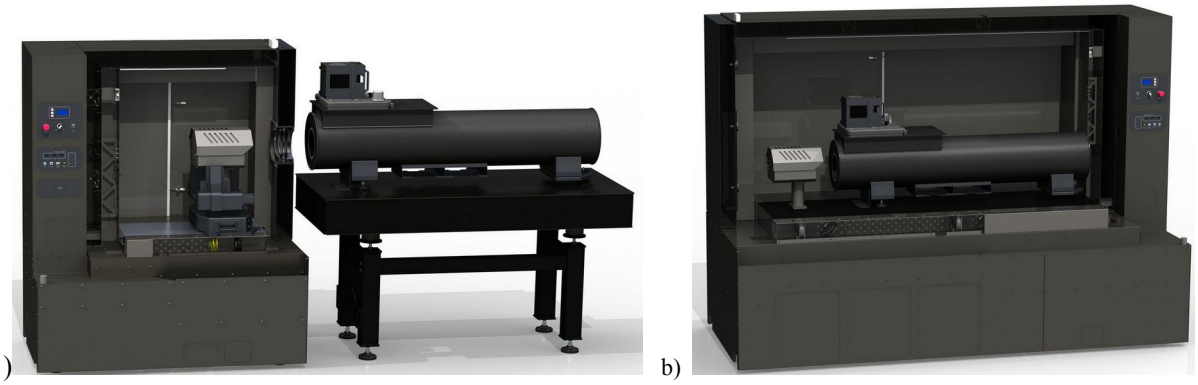
EX

Systems for testing EO systems at extreme temperatures



) b)

Fig. 1. Cross section of EX systems for testing EO systems at extreme temperatures:a)EX1, b)EX-2

1 Introduction

Electro-optical imaging/laser systems (thermal imagers, VIS-NIR cameras, SWIR imagers, multi-sensor imaging/laser systems) are typically tested at laboratory conditions, when ambient temperature is equal to about 20ºC, in situation when in real life this temperature can vary in range from about -40ºC up to about +70ºC. This shockingly high difference between laboratory test conditions and real work conditions make difficult, or even impossible to precisely evaluate effectiveness of EO imaging/laser systems working at extreme temperatures on a basis of tests made at laboratory conditions.

In order to partially solve this problem, manufacturers of surveillance thermal imagers often carry out environmental tests of these imagers according to requirements of the popular MIL-810-STD military standard. The tests are typically done by subjecting the imager located in a temperature chamber to a set of extreme ambient temperatures for a prescribed time period and later checking if there is negligible performance deterioration due to the environmental tests comparing to performance tests before the environmental tests. However, results of such environmental tests according to MIL-810-STD standard give precise information only about the ability of EO system to survive a certain period of time at extreme ambient temperatures without substantial performance loss after the test is finished. These tests do not give information on real performance of tested EO system when working at extreme temperatures.

2 What Inframet can offer?

Typical Inframet systems for testing EO imaging/laser systems (DT, TVT, ST, MS and related systems) enable testing thermal imagers, VIS-NIR cameras, SWIR imagers, multi-sensor imaging/laser systems at laboratory/depot/workshop conditions. It is typically expected that work temperatures vary in range from about +10ºC up to about +35ºC. Therefore tests using typical Inframet test systems cannot deliver information on performance of tested EO imaging/laser systems working at extreme temperatures. In order to eliminate this limitation Inframet can also deliver optional EX series systems that enables testing EO imaging/laser systems (thermal imagers, VIS-NIR cameras, SWIR imagers, multi-sensor imaging/laser systems) at extreme temperatures.

There are two main types of EX series systems based on two different test concept:

EX-1: tested EO system is located into special translucent temperature chamber

EX-2: both tested EO system and test system are located into typical temperature chamber,

It means that:

1. Design of EX-1 system is achieved by building special translucent temperature chamber,
2. Design of EX-2 system is achieved by conversion of typical laboratory class system into special hardened version capable to work at temperature chamber.

3 Test capabilities

EX systems in most expanded version can measure parameters from four groups:

1. image quality parameters (like resolution, MTF)
2. noise/sensitivity parameters (like NETD, or NEI)
3. boresight parameters (angles between optical/mechanical axis)
4. focus parameters (focus range of variable focus imagers or ability to keep infinity focus of fixed focus imagers).

4 Technical specifications

Both types of EX system are offered as special customized products. Potential customer is expected to deliver detail information on tested EO imaging/laser systems. After analysis Inframet shall propose detail technical proposal.

5 Summary

Inframet has developed EX series test systems that enable expanded testing of EO imaging/laser at simulated real work conditions. Such systems can simulate work of these imagers not only at typical laboratory conditions but also at extreme conditions.

Applications of these new tests systems in process of evaluation of surveillance EO systems can bring revolution in EO metrology. The new test systems enable much more accurate evaluation of performance of EO systems at real work conditions comparing to typical test systems capable only to simulate laboratory conditions. The new test systems can also show new ways of technical modifications to improve performance at real work conditions. Therefore the EX test systems can become in near future a very valuable tool for both users and manufacturers of EO imaging/laser systems.

Version 2.1

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