

ITIP

Universal station for testing image intensifier tubes



Fig. 1. ITIP test station

BASIC INFORMATION:

ITIP is a modular quasi universal station for expanded testing of image intensifier tubes. This station enables measurement of a long series imaging parameters, photometric parameters, electrical and temporal parameters of image intensifier tubes recommended in US MIL military standards. The station is generally designed for testing potted tubes (encapsulated II tubes powered from low voltage supply) but can be optionally delivered in versions capable to test bare tubes (modules before encapsulation powered from high voltage power supplies). Therefore ITIP stations can be used by manufacturers, test laboratories, repairing workshops at different stages of life of II tubes. The test procedures used by the ITIP station are based on recommendations of the US MIL series military standards.

From design point of view ITIP station is built from three main blocks: image projector, set of measuring tools, and computer system. The projector projects images of some standard targets to tube photocathode plane of precisely controlled light flux. The measuring tools enables capturing images of output images from tested II tubes and measurement of output light intensity at the tube screen. The computer system carries out processing of data from image projector block and the measuring tools and finally calculates parameters of tested II tubes.

TEST CAPABILITIES:

1. Image quality parameter: Resolution (center, peripheral, high level), Modulation Transfer Function (MTF), Signal To Noise Ratio (S/N), Halo, Useful cathode diameter, Dark and bright spots, Output Brightness Uniformity, Alignment, Distortion, Multi-Multi Pattern Noise, Multi-Boundary Pattern Noise, Image Inversion, Magnification.
2. Photometric parameters: luminance gain, saturation level (maximal output brightness), EBI (optionally also photocathode luminous sensitivity and radiometric sensitivity).
3. Electrical parameters: current consumption, power consumption
4. Temporal parameters: rise time, decay time and phosphor decay time.

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FEATURES:

- Computerized test station. Semi-automatic easy measurement of the above mentioned parameters.
- Testing II, III and IV generation tubes
- High resolution and stability of illuminance regulation
- Both 18mm, 25mm and 16mm tubes can be tested.
- ITIP station can be offered in different versions offering different measurement capabilities

SPECIFICATIONS

| | |
|---|---|
| Main modules | 1) Base blocks, 2) Set of measuring tools 3) System for data processing Ad1) BM-IP base module, OS-1 stage, set of 3 adapters, set of cables for potted tubes, Ad 2) VMI video microscope, DCI digital camera, MI microscope, LP1 luminance probe, LP2 luminance probe, CP current probe Ad 3) PC, frame grabber, TAS-IP program, ITS Display program, MC Viewer program |
| 1. BM I base module | The module projects on photocathode of II tube image of seven patterns at regulated illumination level. |
| <i>1.1 Light source</i> | |
| Light Source | Dual: 1) polychromatic 2850K color temperature halogen source 2) monochromatic 595nm LED light source |
| Spectral band of halogen light source | 400-1000nm |
| Illuminance range | 1 10^{-7} lx to 20 lx (option 200lx) |
| Regulation resolution | 0.05 μ lux (at low intensity range) |
| Light regulation type | continuous |
| Regulation stability | better than 2% of the set value |
| Illuminance uncertainty | better than 5% of the set value |
| <i>1.2 Projector of test patterns</i> | |
| Type of macro projector | Custom designed refractive objective |
| Resolution of target projector | ≥ 400 [lp/mm] |
| Target change mechanism | manual |
| Number of test patterns | 7 |
| Target | single multi-pattern target having the following patterns: USAF1951 pattern, edge/slit pattern, pinhole pattern, tube diameter pattern, gross/shear distortion pattern, uniform pattern |
| Maximal acceptable diameter of photocathode of tested II tube | 25 mm |
| Spatial frequencies of resolution targets | 16, 17.95, 20.16, 22.62, 25.39, 28.5, 32, 36.0, 40.3, 45.3, 47.9, 50.8, 53.8, 57, 60.4, 64.0, 67.8, 71.8, 76.1, 80.6 lp/mm |
| Tube holders | optimized for the following tubes: MX-10160, MX-10130, MX-11620, MX-9444 (other types are also possible – photocathode diameters up to 25mm) |
| LV power source | DC 2.7 V |
| Type of tube holders | exchangeable holders for 18 mm and 25 mm tubes |
| 2. Set of measuring tools | Tools: VMI video microscope, DCI digital camera, MI microscope, LP1 luminance probe, ultra sensitive LP2 luminance probe, CP current probe |
| <i>2.1. VM-I video microscope</i> | For analysis of small parts of screen of II tubes. It enables measurement of the following parameters: resolution, MTF, SNR, halo, distortion, image non alignment |
| VM-I video microscope type | high resolution, high sensitivity CCD camera integrated with custom macro objective, custom image processing electronics |
| Image resolution | 768 x 576 |
| Field of view | 1,97 x 1,49 mm |
| Max magnification | 200x |

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|----------------------------------|--|
| 2.2 DC-I digital camera | For analysis of images from entire area of screen of II tubes. It enables measurement blemishes, photocathode diameter, distortion, non uniformity |
| Type of DC-I camera | High resolution digital camera with custom designed objectives |
| Image resolution | 2554x1944 [5 MPx] |
| Depth of focus | Over 3.9 mm (optimized for testing tubes with curved screens) |
| Field of view | Dual FOV (optimized for 18mm and 25 mm II tubes) |
| FOV at 18 mm mode | >24,9 x 19 mm |
| FOV at 25 mm mode | >34,2 x 26 mm |
| PC communication | Yes. USB 2.0 |
| 2.3. Monocular microscope | To be used for resolution measurement, image quality evaluation, and photocathode diameter measurement |
| M-I microscope type | custom designed high-res mono microscope |
| M-I microscope magnification | 50x |
| Measurement resolution range | Up to 161 lp/mm |
| 2.4 LP1 luminance probe | |
| Spectral range | similar to human eye |
| Measurement range | 0.05 cd/m ² – 5000 cd/m ² |
| Resolution | <0.01 cd/m ² |
| Measurement uncertainty | <5% |
| 2.5 LP2 luminance probe | |
| Type | intensified silicon photodiode |
| Measurement range (linear range) | 10 µcd/m ² – 10 mcd/m ² |
| Resolution | 10 µcd/m ² |
| 2.6 CP current probe | |
| Current measurement range | 10 pA - 100µA |
| Current resolution | 5 pA |
| Other parameters | |
| Power | AC230/110 V 50/60 Hz (DC12V option) |
| Operating temperature | 5°C to 40°C |
| Storage temperature | -5°C to 60°C |
| Humidity | Up to 98% (non condensing) |
| Mass | <85 kg (including PC set) |
| Dimensions | Overall dimensions: 1300x600x730mm |

*specifications are subject to change without prior notice

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VERSIONS OF ITIP TEST STATION

ITIP test station can be delivered in different versions optimized for different customers. Both measurement capability and price depends significantly on version number.

| Version | List of measured parameters | Blocks of test station |
|---------|--|---|
| ITIP /A | Resolution, luminance gain, current consumption | BM-IP/A base module, MI microscope, VMI video microscope, OS1 stage, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/A computer program, ITS Display computer program, LP1 luminance probe |
| ITIP /B | Resolution (center, peripheral, high level), blemishes (dark and bright spots), photocathode diameter, gross distortion, output brightness non uniformity, power consumption, luminance gain, maximal output brightness, current consumption | BM-IP/B base module, MI microscope, VMI video microscope, DCI camera, OS1, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/B computer program, ITS Display computer program, LP1 luminance probe |
| ITIP /C | Resolution (center, peripheral, high level), MTF, SNR, power consumption, luminance gain, maximal output brightness, current consumption | BM-IP/C base module, MI microscope, VMI video microscope, OS1 stage, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/C computer program, ITS Display computer program, MC Viewer program, LP1 luminance probe |
| ITIP /D | Resolution (center, peripheral, high level), MTF, Blemishes (dark spots/fixed pattern noise), SNR, Output Brightness Uniformity, Halo, Useful cathode diameter, Image Alignment, Shear Distortion, Gross Distortion, Image inversion, Magnification, power consumption, luminance gain, maximal output brightness, EBI | BM-IP/D base module, MI microscope, VMI video microscope, DCI camera, OS1 stage, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/D computer program, ITS Display computer program, MC Viewer program, LP1 luminance probe, LP2 luminance probe |
| ITIP /E | As in D but additionally luminous sensitivity | BM-IP/D base module converted to BM-IP/E version, additional CP current probe, HVP high voltage power supply, set of three bare tube holders |
| ITIP /F | As in E but additionally radiometric sensitivity | BM-IP/E base module converted to BM-IP/F version |

- **Comparison of ITIP and other test stations**

ITIP test station represents a new generation of test stations for testing image quality of II tubes. It was developed by Inframet in 2017 year as the first commercially available single test station that enabled measurement of all image quality, photometric, electrical and temporal parameters of II tubes recommended by MIL standards. A few commercially available test stations were needed to do the same task. Several test stations offered by competitors are needed to do the same task.

ITIP design is based on experience that Inframet got working as trusted supplier of test equipment for top work manufacturers of image intensifiers and night vision devices since 2004 year. It should be noted that a significant portion of these manufacturers use Inframet test stations (different versions of ITS stations offered before manufacturing of ITIP has been started in in 2017 year.

Version 6.1

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