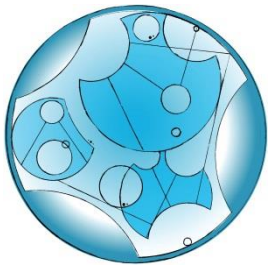

Technical Specification – Large Motorized System

SCRATCH AND DIG INSPECTOR

SavvyInspector™ SIF-16

Introduction

The SavvyInspector™ model SIF-16 is our largest and most ambitious model yet. Built on Zaber motion technologies, The system sports a 400 mm x stage, a 200 mm y stage, and a 70 mm focus stage, all motorized and joystick controlled. By using two setups per surface and the large part outriggers, the system can be used to evaluate parts up to 400 x 400 mm square or smaller.

On parts that larger, full part mapping is essential. The new "autoscan" feature allows unmanned scanning and documentation of the entire optical surface as the system steps and photographs the entire part in 9 x 12 mm position labeled images and puts all images in a folder for review by an inspector. This feature drops inspector time significantly and improves inspection accuracy, since the inspector no longer needs to scan thousands of square mm of pristine surface, but just review the locations which exhibit some level of scatter.

During review, the operator is able to step quickly from location to location using the "goto" feature of the motion software for faster evaluation of large optical surfaces.

All our scratch and dig measurement instruments are designed specifically to reproduce the conditions of an in-reflection visual inspection as described in ANSI/OEOSC OP1.002 "Appearance Imperfections" visibility method and Appendix C of MIL-PRF-13830B, "General specification governing the manufacture, assembly, and inspection of optical components for fire control instruments." The factory calibrated inspection head of the SavvyInspector™ uses invariant illumination and detection optics and propriety analysis software, allowing objective, repeatable, and recordable evaluation of scratch-dig surface quality.

Product Description

SavvyInspector™ SIF-16 is a complete large optics inspection system consisting of:

1. A custom LED-based illumination assembly.
2. A detection assembly with a digital megapixel camera.
3. A joystick controlled motorized 400 x 200 mm x-y stage platform for part holding and positioning.
4. A joystick controlled, motorized z-stage for easy focusing
5. A stand-alone computer with proprietary SavvyInspectior™ v6.0 analysis software.

Scratch/Dig Standards Supported

MIL-PRF-13830B
MIL-C-675C
ANSI/OEOSC OP1.002 Visibility Method
ISO 10110 general and coating imperfections (but not L-type imperfections)

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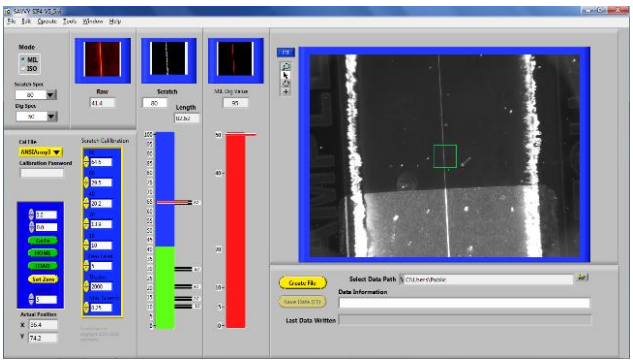
Instrument Calibration – Direct Traceability to the Army Calibration Standards

All SavvyInspector™ systems come from the factory with calibration files based on master scratch and dig limit standards at Picatinny Arsenal, as well as the respected Brysen, Davidson, Edmund and Thor Labs comparison standards. SavvyInspectors™ are the only Army traceable scratch and dig measurement systems available.

Version 6.0 Software

The SavvyInspector™ SIF-4M operator interface is designed for easy factory-floor operation, while expanding its application in the role of "Master Inspector" for QA, QC and MRB decisions. The operator enters the inspection level required, enters part geometry and size, and then uses the joystick to scan the surface for imperfections using the real-time viewing screen. The software reports the scratch grade or dig value automatically. There is no subjectivity; the grade is reported and the grade bar turns red if the imperfection is greater than the specification. A screen shot of each imperfection can be stored, and the location and type of imperfection are automatically added to the surface map and CSV data file for offline review. Accumulation rules can be applied using the SavvyAccumulator™ spreadsheet.

Custom calibration files can be created for specific project or customer needs by the Quality Engineer as needed. The calibration data can then be saved and accessed from the inspection mode.



Screen shot of v6.0 inspection mode

Feature	Specification	Comment
Inspection Head	1.4 Megapixel camera and fixed illumination and simulating reflection inspection for surface quality per MIL-PRF-13830B	Inspection setup is identical to that of MIL-PRF-13830B Annex C, MIL-C-675C and the visibility method described in ANSI/OEOSC OP1.002:2009
Camera Field of View	9 x 12 mm, digitally zoomable	Allows rapid location of imperfections
Inspection Area	One mm square in center FOV	Allows isolation of specific imperfection for evaluation
X-Y Stages	Five speed, motorized, joystick controlled x, y stage with 400 x 200 mm of travel (larger systems available on request)	Motor control buttons allow the user to automatically travel to home and load positions, or any x, y location
Focus	Motorized, joystick controlled 70 mm Z-stage for focus. Depth of focus > 1 mm	Easily accommodates thick parts
Test surface reflectivity	System can measure coated or uncoated parts, filters, windows, splitters, cubes, and most prisms.	Standard calibration files for metalized comparison standards are provided. Some custom calibrations or part fixturing may be required.
Test surface shape	Plano or mild concave surface	Designed for flat parts, but long radius concave parts can also be inspected with tooling
Reported Values	Scratch number- 10, 20, 40, 60, 80 Dig value – continuous from 5 to 70 ISO Grade – 0.025 to 0.63	Per MIL-PRF-13830B and ANSI/OEOSC OP1.002, visibility method ISO 10110-7 general and coating imperfections only
Comparison standards	Factory calibrated to Brysen, Davidson comparison artifacts, as well as various plastic inspection paddles	Customer can generate and save calibration files for any artifact set
Instrument repeatability	> 95% repeatability of reported scratch or dig grade	Presumes > 20 measurements of a clean surface in a proper environment of a stationary part
Instrument reproducibility	> 90% reproducibility of reported scratch or dig value	Presumes the clean part is removed, replaced and repositioned to the same location > 20 times