

TubeScan DS 660 sur Die Cutting machine Berhalter (566) / B6 (SN1360-CE-6)

4K Inspection Camera – DS 660 HR3

Serial Number : ASO105236_50.2949

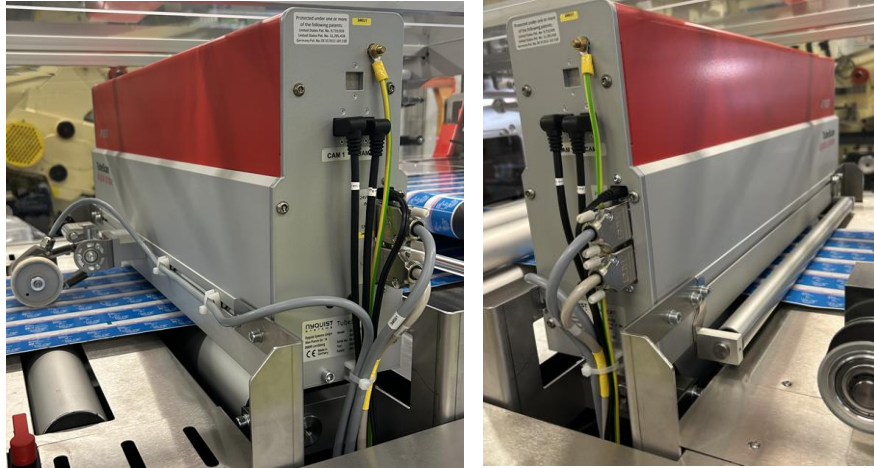
Technical Specifications :

- Optic Head : DS 660 HR3 / M2051dC (FF017699/FF019649)
- Resolution : 0.1388 mm/pixel
- Computer : OptiPlex SFF 7010 (3080) – Tag HDJRG24
16 GB (1x 16 3200 MHz)
Windows 10 Pro Version 22H2 (10.0.22621.0)
- Application software : v8.0.26.24240 to v8.0.34.30962

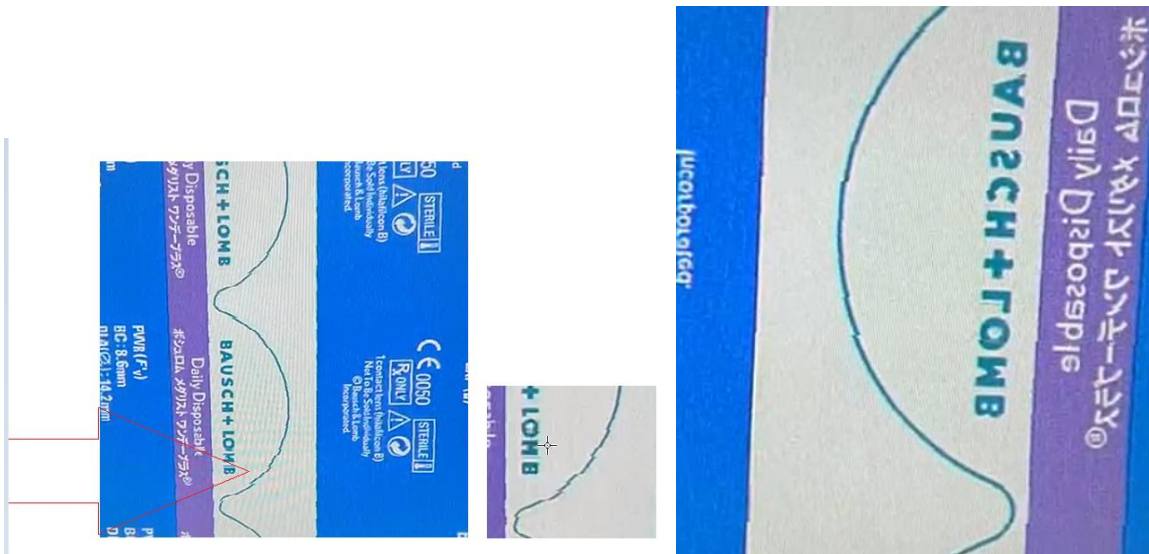
Camera Mounting and Machine Integration :

The camera assembly is mounted above a 200 mm roller with minimal contact area. The web travels nearly horizontally, with no contact on the exit roller where the encoder is installed.



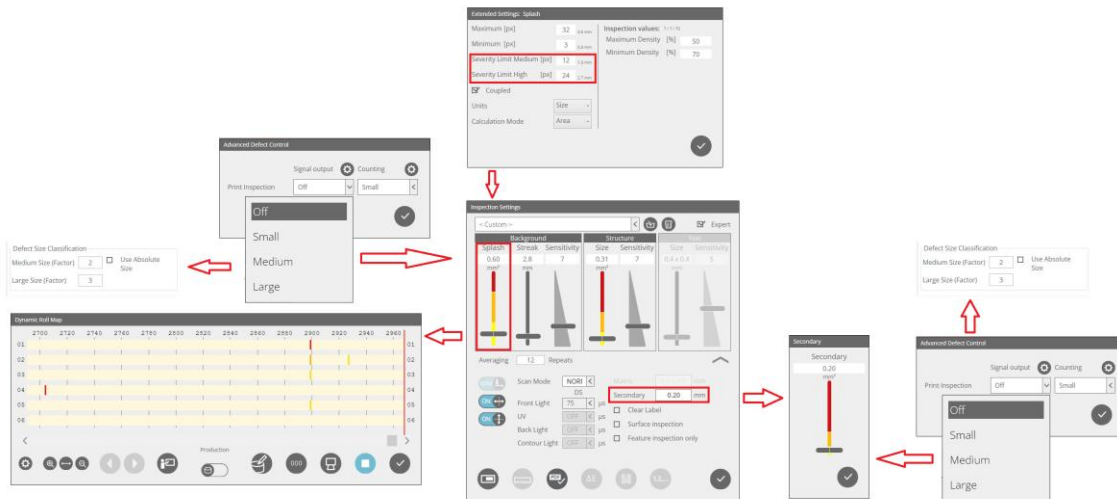


Due to vibrations generated by the 566 machine itself, as well as resonance propagated from surrounding equipment, intermittent image distortion (stuttering effect) has been observed. This phenomenon limits the ability to fully leverage the system's inspection performance.



Test - 4K Inspection Camera

The tests were performed using 'Expert' sensitivity settings, exploring all available inspection modes and applicable inspection zones.



Test 1

Test : Spot detection in the Background print area

Inspection Settings : 0.34 mm²

Scenario : Generation of spots with a minimum detectable area of 0.30 mm²





Final Assessment: All artificially generated or pre-existing defects in the background print area were reliably detected. Since the 0.34 mm² sensitivity threshold met the detection requirements, further testing at 0.17 mm² was not deemed necessary for this camera.

Test 2

Test Scenario : Line defects in structured/text areas

Inspection Settings : 0.34 mm² then 0.17 mm²

Scenario : Simulated vertical/diagonal line defects within structured (text/image) regions



Final Assessment: Defects were intermittently captured. As the same defects could not be reproduced identically, a margin of uncertainty remains in the test results. Overall, line-type defects were detected inconsistently and in a non-repeatable manner..

The 0.17 mm² sensitivity setting could not be reliably used in structured zones due to residual vibrations. This resulted in false detections or artifacts in the 'Edge' areas.



8K Inspection Camera – DS 660 8K

Serial Number : ASO105236_50.2949

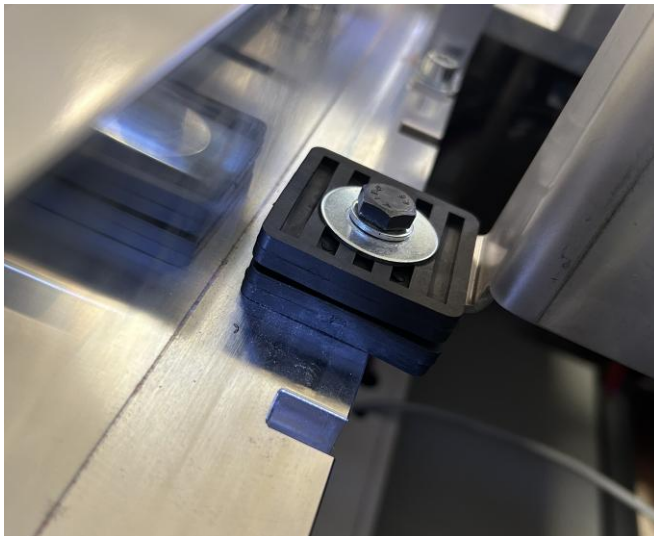
Technical Specifications :

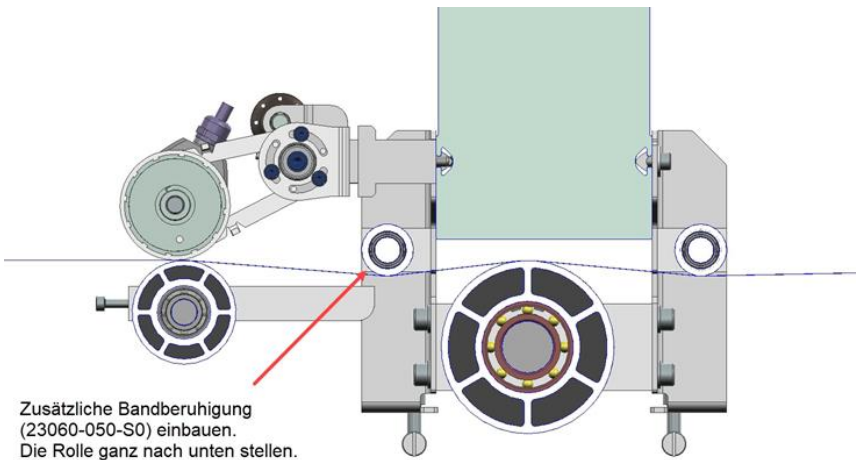
- Optic Head : DS 660 8K / M2189ac (FF021482/FF021485)
- Résolution : 0.0833 mm/pixel
- Computer : OptiPlex SFF 7010 (3080) – Tag 6JFR614
32 GB(2x 16 4800 MHz)
Windows 11 Pro Version 10.0.22631.0 (Build 22631)
- Application software : v 8.0.42.34898 to v8.0.42.36731.hotfix-8

Camera Mounting and Machine Integration :

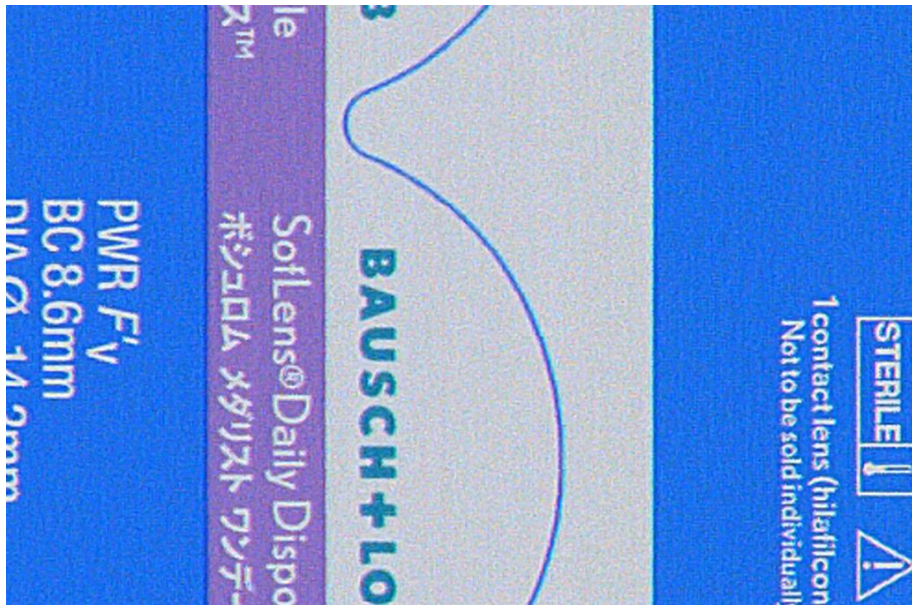
The camera assembly was mounted on 4.7 mm rubber vibration dampers from Rakiuty. In addition to lowering the existing outfeed roller by 5 mm, a second identical roller was installed upstream of the camera under the same conditions.

These two rollers increase the contact surface on the support roller located beneath the camera, helping to stabilize the web. They also ensure proper web contact on the roller where the encoder is mounted.





The vibrations generated by this machine were significantly reduced but not entirely eliminated.
Shockwaves transmitted from nearby equipment remain perceptible.



Tests - 8K Inspection Camera

The tests were performed using 'Expert' sensitivity settings, exploring all available inspection modes and applicable inspection zones.



Test 1

Test Scenario : Spot detection in the Background print area

Inspection Settings : 0.34 mm²

Scenario : Generation of spots with a minimum detectable area of 0.30 mm²

As the tests had already been successful with the 4K version, it was not deemed necessary to investigate the "Background" area further.

It was nevertheless confirmed that 0.3 mm² type defects are still reliably detected.

Additional tests at 0.17 mm² and 0.09 mm² also demonstrated fine detection and good stability.

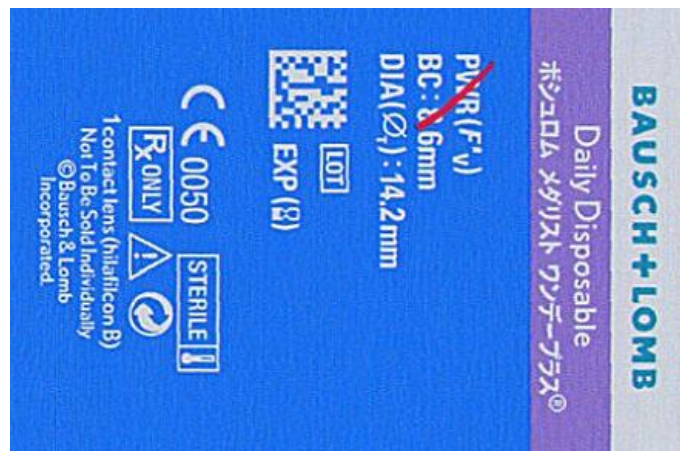
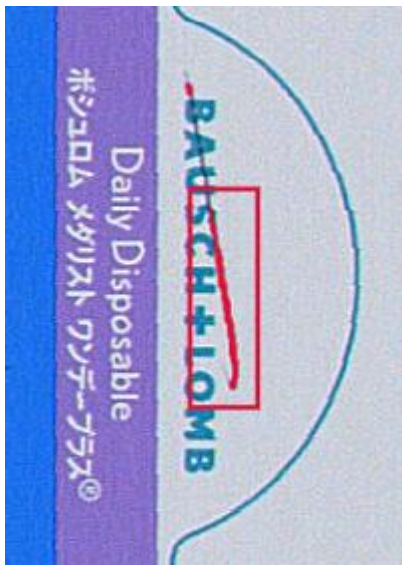
Final Assessment : All artificially generated or pre-existing defects in the background print area were reliably detected a une sensibilité de 0.34 mm² avec succès et un abaissement à 0.17 mm² et 0.09 mm² montre également de la detection de spot sans faux défaut.

Test 2

Test Scenario : Line defects in structured/text areas

Inspection Settings : 0.34 mm² then 0.17 mm²

Scenario : Simulated vertical/diagonal line defects within structured (text/image) regions





Final Assessment : Defects were intermittently captured. Since identical reproduction of the defects was not possible, a certain degree of uncertainty remains in the test results. Defects were more consistently detected at 0.34 mm², but some were also captured at 0.17 mm² on occasion.

Inspection at sensitivities below 0.17 mm² in structured areas proved unmanageable due to residual vibrations, leading to false positives or unstable detection in structured print zones.

Conclusion

Performance Evaluation

- Defects in the *Background* area were consistently detected as expected, starting from the 4K version. The 8K version enables detection of even smaller spots, below 0.3 mm².
- Structure* area defects—detectable at 0.34 mm² depending on defect type with the 4K system—became detectable at 0.17 mm² with the 8K version, but remained unstable below that threshold.

Nyquist has made significant improvements to the detection algorithm to minimize the impact of surrounding machine vibrations while maintaining reliable detection performance tailored to production needs.