




Optical identification

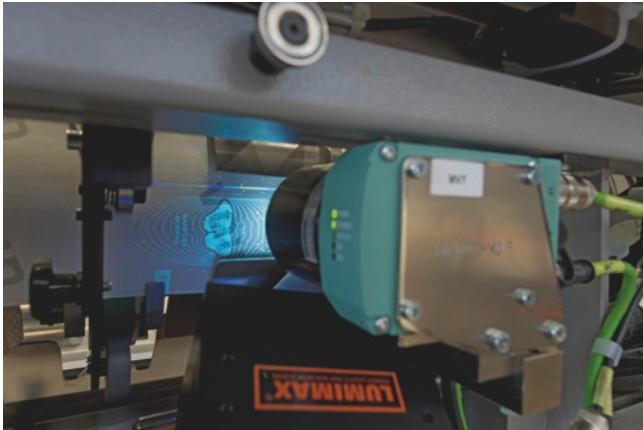
# Passport control – flashing into action

Secure passport production using optical readers with learning capability and UV flash light

Using optical readers that are „capable of learning“, together with UV flash lighting individually coordinated with the application, the renowned manufacturer Kugler-Womako implements maximum process security on its passport manufacturing machines. The system even enables passport numbers pre-printed with UV-readable security ink on paper with fluorescent fiber content to be recorded reliably, checked and documented via a controller as they speed past.

The „latent“ security features of identity cards, passports, driving licenses and similar documents include fluorescent fibers in the paper and ornamental designs or text printed in fluorescent ink which are only visible under ultraviolet (UV) light. Kugler-Womako GmbH, based in Nürtingen, Germany, one of the world's leading manufacturers of passport printing machines, was confronted with a less common configuration: a solution had to be found for a Latin American passport producer, in which passport pages pre-numbered with UV-readable security ink – and on paper containing fluorescent fibers – had to be checked for the right sequence during collation of the individual sheets into passports.

The evaluation of standardized, optically readable OCR (Optical Character Recognition) fonts (such as OCR-A and -B) under UV light with a wavelength of 365 nm in itself is no great challenge. In this special case, however, fluorescent characters of a special font had to be recognized and this consequently had to be learned in all variations that arose. In addition, it was essential that when reading characters passing at speed, accidental superimpositions of the characters caused by fibers in the paper – making an „O“ appear as „8“ or an „F“ as „E“, for example – had to be reliably overcome. This was not possible with the familiar standard readers.



A decisive factor for the process security are SIMATIC MV440 optical readers with „learning capability“ and with an OCR+ license extension, plus the high-power Lumimax LQ100 LED-UV flash lighting.

Kugler-Womako ultimately came up with a process-secure solution using stationary SIMATIC MV440 reader systems with a „learning“ capability, together with an OCR+ license extension from Siemens and UV flash lighting adapted individually to the task and supplied by iiM AG. The company managed to implement the solution in just three weeks, which says a lot for the simplicity, flexibility and performance of the systems!

### High-performance passport machines for the global market

Machines for manufacturing passports are one of the commercial mainstays of Kugler-Womako GmbH. From a modular toolkit the manufacturer realizes complete solutions – built individually to customer requirements – with independent machines for

- collating and sewing (PassPort 1),
- laminating of covers and/or chip inlays (PassPort 2),
- embossing, folding and punching (PassPort 3) as well as
- numbering the passports and programming the chips (PassPort 4).

This means that all common types of passport and electronically readable e-passports can be manufactured on a secure and rational basis.



The process results in booklets, sewn in two-up production, and checked for the correct collation of the individual sheets, ready for further processing.

The particular demands of this project involved collating the (invisibly) pre-numbered sheets into booklets on a PassPort 1 machine. The machine, which is tailor-made for this process, essentially comprises ten feeders for two-up sheets, one feeder for security films/polycarbonate cards (with or without chip), one ejector station, one sewing station for lock stitching and the stream delivery unit. Using the type of stitching requested by the customer, a delivery rate of 20 two-up products per minute is achieved, whereas using continuous chain stitching as many as 25 per minute would be possible. Both figures are many times higher than was previously possible with the largely manual production system used by this customer. These rates present no challenge to the optical reader systems installed, which are designed for reading a variety of 1D/2D codes with a resolution of 640x480 at a rate of 80 per second!

## Process reliability through coordinated components

When faced with unusual lighting tasks that cannot be solved with the tried and tested standards, Siemens calls upon the services of iiM Measurement Engineering AG, based in Suhl in the region of Thuringia. In collaboration with these lighting specialists and the designers from Kugler-Womako it was again possible to create optimum lighting conditions, even in the very cramped conditions at the ten feeders. The original ideas for lighting did not prove suitable: spot lighting for performance reasons, and an external ring light due to limited space. The required security of the process could only be achieved by using high-power Lumimax LQ100 LED-UV area flash lights in combination with a Fresnel lens that channels the light precisely onto the focal point of the MV440 reader.

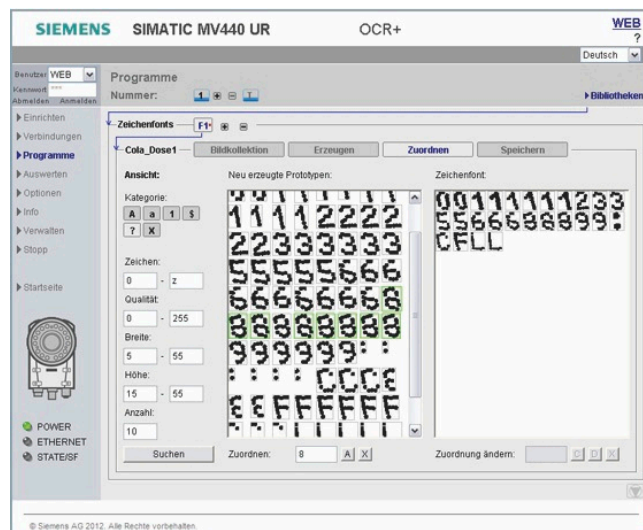
Following intensive testing in the local laboratories of iiM and Siemens, the reading distance, the trigger signal and the flash duration were coordinated in such a way that the illumination of the fibers in the paper does not negatively impact the reading of the passport numbers. „We literally haggled over millimeters and tried out a wide range of constellations and arrangements in order to come up with a stable and reproducible reading process in the extremely limited space available“, says Karsten Moses, sales manager for the Lumimax systems at iiM AG. At a transportation speed of between 0.2 and 0.3 m/s for the sheet feeding, a time slot of no more than 750 µs is available for the reading. In this short time, the flash systems with nine UV-LEDs (wavelength 365 nm) emit so much light at the reading point that the MV440 optical reader with an appropriate lens can record and evaluate a sharp image. Space was also saved by incorporating the power and signal cables of the flash lights into the cabling of the optical readers by means of T1 adapter cables.

Somewhat less cramped were the conditions at the end of the collating line, where an identical reader-light combination records the numbers of the second passport page on the two-up sheets for documentation purposes as they speed by.

## Powerful optical readers allow easy integration

The SIMATIC MV440 in its standard resolution (SR) of 640 x 480 was ideally suited to this task with an additional license („Text-Genius Plus“) for extended text recognition (OCR+) with a learning capability. The compact devices are developed at Siemens in Karlsruhe and manufactured for the global market. They are designed with IP67 degree of protection and are therefore suitable for use directly in the field.

The commissioning of the devices is extremely simple: after connecting to a PC or a programming device, the IP address can be assigned and the optical reader conveniently configured by means of a standard web browser.



Using the „Text-Genius Plus“ license extension (OCR+), any character fonts can be „learned“ and thereafter read reliably by the SIMATIC MV440 optical reader system.

Even the subsequent character training is self-explanatory and takes up very little time. In this process, training is only required for the characters with a low rate of recognition or widely fluctuating print patterns. This is confirmed by Mile Avramoski, a programmer at Kugler-Womako: „The teaching of the individual letters and digits of the special font is really user-friendly and we have achieved a very high reading success rate in a very short time.“ In quite tricky cases, various means of electronic image processing could be overlaid and characters could be expanded or condensed, for example, in order to stabilize the recognition rate. On this project, Avramoski has worked with an optical reader from Siemens for the first time and has been able to perform all his tasks promptly after a short period of instruction.

He has also appreciated the simple, direct connection of the readers to the machine communication and the application program. These enable the devices to be integrated via Profinet and a SCALANCE X208 switch directly into the automation network and easily integrated via pre-assembled function blocks into the higher-level S7 application. A failsafe SIMATIC S7-300F controller is a standard feature on all PassPort machines, so that even the latter task was performed without any protracted introductory phase.

## Open for other tasks and typefaces

In order to be able to produce other types of pass on the PassPort 1 where required, one optical reader was additionally equipped at the customer's request with an internal, original ring light which reads a number that is printed on a sheet in a clearly readable font.

With the SIMATIC MV440 optical reader system, the machine builder is open in every respect to future requirements, whether they relate to the font, the resolution or the integration into the company's automation concept or that of its customers. In this respect, the optical reader supports a wide variety of options. And the interaction with lighting systems and the specialists at iIM AG has proven to be very open and flexible.



With the PassPort 1 – 4 machines from Kugler-Womako all types of passport, as well as electronically readable e-passports, can be manufactured on a secure and rationalized basis.

## Partner to the paper processing industry

Kugler-Womako GmbH (Nürtingen), a company within the BW Paper Systems Group, has been designing and manufacturing a huge variety of machines for the paper processing industry for many years.

The product portfolio wire forming machines and binders for wire, spiral and plastic spiral bindings – and for a recently developed paper-based binding. In addition, there are automatic punches, labelling systems and machines for manufacturing writing pads and folders, as well as format cutters for wet-glue labels, films and other highly sensitive special papers. One other area of the company's business are the production lines for security documents with integrated chips, including the PassPort machine used for the project described here.

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