



OptiSurf® LTM increases production efficiency at Pfeiffer Präzisionsoptik

Application report OptiSurf® LTM
in cooperation with Pfeiffer Präzisionsoptik

TRIOPTICS' solution for non-contact lens center thickness measurement significantly reduces reject volume

Being a highly specialized manufacturer of microlenses and customized lenses, company owner Marco Pfeiffer must be able to rely on precise and efficient center thickness measurements for the production of lenses with $\pm 5 \mu\text{m}$ tolerance. Already in 2018, he discovered the OptiSurf® LTM from TRIOPTICS. Since the company started using the measurement system, its production efficiency has increased significantly, thereby reducing manufacturing costs.

In January 2016, Marco Pfeiffer acquired the long-established and renowned Edgar Färber Präzisionsoptik GmbH & Co KG company, which until then had been mass producing precision optics for 64 years for customers all over the world at its location in Heuchelheim, Germany, near the town of Giessen. Since the company acquired the firm, the main focus of production has shifted from mass production to the special manufacturing of customized smaller batches. Now renamed PPO Pfeiffer Präzisionsoptik GmbH, the company serves a highly specialized optics sector by manufacturing small series and prototypes – and undertakes the particularly demanding, complex and high-precision production of microlenses and customized lenses for applications in industrial and medical technology as well as in the professional photography industry. “Our customers need a reliable manufacturing partner who optimally transforms the more exacting and stringent requirements for high-precision and sensitive lenses into production. We meet all the requirements that make a lens difficult,” company owner Marco Pfeiffer says with a smile. And he has a reason to smile, because his company is the specialist in the DACH region for lenses with a production tolerance of $\pm 5 \mu\text{m}$.

Since Pfeiffer took over Färber Präzisionsoptik, the manufacturing processes in his own company have been assessed and tested for efficiency and effectiveness. The results



The OptiSurf® LTM non-contact center thickness measurement system from TRIOPTICS

showed that, in particular, the technologies and systems being used to measure the center thickness of single lenses were too expensive and time-consuming. For center thickness measurements this especially applied to the mechanical dial gauge (micrometer) and its tactile measuring principle, which requires direct accessibility of both lens surfaces. As a result, the auxiliary carrier and protective lacquer had to be removed prior to the measurement and then cemented again afterwards in order to continue the processing. This tedious and lengthy work cycle was repeated three to four times for each lens to carefully approach the target specifications. Not only is the process time consuming, but it must also be done very carefully to ensure that the lens is not damaged.



Mechanical dial gauge in use at Pfeiffer Präzisionsoptik

The challenge for the company owner was to implement more efficient and therefore cost-cutting measurement processes. Thanks to the optical measuring principle of the OptiSurf® LTM and because the lens is held by the device's clamping chuck, lenses can be measured immediately without the need for intermediate processing steps. Since only one surface has to be directly accessible, even a cemented auxiliary carrier does not interfere with the measuring process. "By using the OptiSurf® LTM, we have significantly optimized the test procedure for measuring the center thickness of lenses in our company," Pfeiffer tells Dr. Patrik Langehanenberg, Product Manager at TRIOPTICS, and continues: "The non-contact optical measurement makes it easy to determine the precise center thicknesses of individual lenses during the manufacturing process, so that the target value is achieved quickly and reliably. We save a considerable amount of time and expense because we can now take the lens directly out of the processing machine and measure it immediately. We no longer have to waste time on unproductive interim steps."

Patrik Langehanenberg, who is responsible for advancing the development of OptiSurf® sys-

tems at TRIOPTICS and focuses on the suitability of the system as a top priority in his day-to-day work, is aware of these advantages and adds: "The low-coherence interferometer for the OptiSurf® center thickness and air gap measurement system has been an important part of our product portfolio for many years now. The high-precision measurement technology used in OptiSurf® was originally developed with a view to being used in development and test laboratories," Langehanenberg explains. Optics designers appreciate the material-protecting, non-contact measurement technology in conjunction with a low-coherence interferometer. They also like the automatic surface identification, which enables fast and precise measurements. "We took on the challenge of making the measurement system suitable for production and therefore rigorously aligned our design concept to the realities of production. We wanted to offer our customers an alternative to the laborious, pure mechanical measurement of center thicknesses by incorporating user-friendly software into the production."



Measuring the center thickness of a microlens using the OptiSurf® LTM

The result? The OptiSurf® LTM, a compact measurement system with an integrated touchscreen. A clamping chuck was developed as a holder for the test lens, which can be flexibly adjusted to different lens diameters and keeps the sample centered at all times.

USB interfaces offer the option, for example, to connect a barcode scanner for lens identification purposes. The software was also adapted to the production workflow and has an easy-to-use interface with an optimized touch function. "As is standard practice at our company, the measurement results are statistically evaluated and subjected to a pass/fail analysis. Compliance with the tolerances is indicated by a traffic light system, which is very straightforward and user-friendly for the customer." Pfeiffer views it just the same way. "Our employees were very pleased about the better working conditions for measuring the center thickness of microlenses. At first, they were skeptical about whether the center thickness measurement process would really be that easy. But when they realized that learning how to use the device was simple, it became obvious: the mechanical dial gauge has seen its day."

All of the employees in the microlens production company are sold on the new measurement system, ensuring a high degree of utilization. "The precision of the measurements is excellent," confirms Pfeiffer. "While the measurements taken with the dial gauge are naturally subject to fluctuations, we now get reliable measurement results that we can quickly use to tailor the production." Pfeiffer reports that his company's customers obtain the exact same measurements that the OptiSurf® LTM determined during the reception control process. That creates trust in the production quality.

"In the past, 65 to 70 % of our lenses were in the tolerance range at the time of the first intermediate inspection. Today it is 90 %. A first pass yield of almost 100 % is expected for the finished lenses. This is a very pleasing increase," Pfeiffer says. "In total, we have saved about 30,000 euros as seen over the course of a year. The savings result from the small number of rejects, the production time

which has been cut in half, and fewer work materials. As it looks now, we will be purchasing a second device soon." Since the company has been working more efficiently in the microlens manufacturing segment, it has acquired several customers who really appreciate the high-precision lenses and reliable delivery times.



Company owner Marco Pfeiffer in discussion with TRIOPTICS product manager Dr. Patrik Langehanenberg

By using the OptiSurf® LTM, the company now has a high degree of planning reliability. "We can accept more orders now because we can plan much more precisely. We used to conditionally accept orders, because we could not always foresee whether we could process the order within the specified timeframe. Now our working hours are fairly consistent. We can plan much better and our order books are already full for the next half year," Pfeiffer explains. Only he wants to be even a little more flexible, and that is why he would like the OptiSurf® LTM to be enhanced with another important function: "It would be really great if the measurement system could also measure doublets."

Patrik Langehanenberg has fulfilled this customer's request. The latest version of the product, introduced at the OptiFab 2017 exhibition, already includes this feature. In addition, the new model also features software-assisted measurement of the sag height. He knows that Pfeiffer Präzisionsoptik has acquired new and very satisfied customers over the past two years and has quickly established itself as a specialist and mainstay for customized products in the microlens segment in the DACH region. For German manufacturers, better and faster workflows have absolute priority in the global competition. Quantities of more than 100,000 can be manufactured in China at half the price or cheaper. But an occasional trend reversal can be observed here when it comes to the production of large quantities of microlenses: Since the average quality from China is generally good, but unfortunately not consistently so, some customers who have concerns decide to put their trust in the consistently high quality of Pfeiffer Präzisionsoptik, and commission the company to manufacture large production volumes – especially if they require highly complex and very sensitive lenses, where the quality of the lenses really matters in the further manufacturing process. As a result, Marco Pfeiffer's small series production occasionally becomes a large-scale one when a customer decides to play it safe with Pfeiffer Präzisionsoptik.

Now the company is providing its customers with even greater reliability when it comes to surface fitting for even complex lens geometries. In this segment as well, Pfeiffer's company has been using the μ Phase[®] Interferometer since December 2017, once again relying on measurement technology from TRIOPTICS: "We were very happy that the interferometer could be installed so quickly. Safeguarding the quality of the lens surfaces is of utmost importance to us."

Precision is crucial in the optics industry, and that is especially true for Pfeiffer Präzisionsoptik. "As a manufacturer of single lenses, some of which, during the production process, are intended for use in medicine and research, the quality is of absolute importance," says Pfeiffer. Because it really comes down to the center thickness. The OptiSurf[®] LTM optimally supports the company's quality standards by ensuring reliable and precise measurement results.

The TRIOPTICS' OptiSurf[®] LTM not only made center thickness measurements during the production processes easier and more efficient, but also created real economic value added for the Pfeiffer Präzisionsoptik company.



See the Difference

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