



# A QUALITY LEAP IN PRECISION MANUFACTURING.

**WILD recently added a new alignment turning station to its machine park. The machine is a pivotal element for utmost precision and efficiency in the manufacturing of complex optics.**

Optical systems such as those currently used as a standard in photolithography have changed the world. And they will continue to do so in the future. The decisive factor behind such high-performance lens assemblies is the enormous precision in manufacturing, only achievable through alignment turning. This process, however, is very sensitive. The chances of cost-effectively producing high-performance optical systems in both small and large volumes greatly depend on rendering this process more efficient. To guarantee this, the WILD Group recently invested in a new alignment turning station by German manufacturer Trioptics. "Using the ATS 200 UP, we can now guarantee an even higher reproducible precision of complex optics than before, while further increasing efficiency", stresses Stefan Werkl, Head of the Optical Technology Division at WILD.

## FULLY INTEGRATED MEASUREMENT TECHNOLOGY

The outstanding feature of this new system is that it combines manufacturing and measurement technology in one machine like no other. "The precision of the lens mount is checked after every machining step, guaranteeing improved process control and repeat accuracy", adds Production

Manager Christian Tazoll. In addition, all procedures are controlled by the machine itself in an automated step-by-step process and visualised using user-friendly software. This allows for greater speed and precision. And when Christian Tazoll speaks of precision, he means extremely tight tolerances of less than 0.5  $\mu\text{m}$ .

These extreme accuracy requirements are necessary because high-performance optics consist of several precisely polished and exactly positioned lenses or mirrors. The lenses are individually mounted and then, for instance, stacked in a lens barrel. During this process, both the alignment of the individual lenses and adherence to the tight tolerances of the air gaps are of essence. Even the smallest deviations are enough to produce defective images. This makes such lens assemblies very sensitive and very challenging to manufacture.

To rule out any errors, the new alignment turning station relies on integrated high-resolution autocollimators, as well as tactile and optical sensors that ensure highly accurate measurement of the relevant mechanical parameters. The new machine thus allows for highly precise adjustment

of air gaps between two lenses and exact measurement of the lens thickness directly inside the station. If necessary, it is possible to adjust the air gaps to the actual dimensions of the lens thickness according to the optical product's design. "In future, alignment turning in the quality we can now offer will open the door to new designs with very small air gaps", Stefan Werkl believes. Since the alignment of the lenses is done from two sides, it is also possible to centre optics that are not transparent in the visible range, such as in the case of germanium lenses. In the case of glued lenses, such as achromatic lenses, the two outer surfaces and the glued surface can be included in the centring process with freely selectable weighting. Moreover, the high machining accuracy makes it possible to precisely adjust the diameter to the counterpiece.

### WIDE RANGE OF APPLICATIONS

Since the individual mounted lenses are firmly attached in the lens barrel with their entire contact surface, the new alignment turning station makes lens assemblies more resistant to vibrations. "Such optical stability is essential where lens assemblies are exposed to large temperature fluctuations", adds Christian Tazoll. In principle, the range of applications for the alignment turning process is quite comprehensive: It extends from very small optics used in microscopes to optics for remote sensing. Moreover, the use of all common materials for the mounts, such as steel, Invar, aluminium or brass, paves the way for numerous manufacturing possibilities. "Besides, the manufacturer of



the alignment turning station has shown great willingness to further develop the machine according to our customer requirements. On our part, we support them with expertise as regards the structural design of lens mounts and their optimum accommodation in the alignment turning machine. The contour turning feature, for example, has so far been implemented exclusively for WILD", says Tazoll.

WILD has installed the new machine in the assembly hall in Völkermarkt, so that the entire value creation process can take place in a single line for the first time. For this purpose, not only the processing machine but also the optical measurement systems were relocated to the assembly area. "The result is a workplace where the lenses can be glued, the mounts can be centred and turned together with the lens, and the entire product can finally be measured and cleaned in the flow box on site", Tazoll explains. Thanks to the resulting proximity and the coordinated clock cycles, one employee per shift will be able to cover the entire process in the future.



#### The advantages of the ATS 200 UP at a glance:

- Suitable for small and medium-sized lens assemblies with a diameter of up to 200 mm and a weight of up to 5 kg
- Easy and quick setup of the workpiece
- Reproducible manufacturing with a repeat accuracy better than 0.5 µm