



# HIGH-PRECISION POSITIONING OF OPTICS

**Precision adjustment, adjustment milling and alignment turning. WILD possesses all the methods needed to cost-effectively manufacture optical systems in the required quality and with utmost precision.**

**High-performance optics are the result of tremendous precision in development, design, and manufacturing, which can only be achieved with a lot of experience and state-of-the-art technical equipment.**

WILD offers both, thus creating the foundation for the best possible performance in terms of resolution, image quality and optical stability. In addition, the technology partner guarantees the cost-effective manufacturing of high-performance optical systems both in small batches and in large quantities.

**Precision adjustment**

During precision adjustment, mostly non-rotationally symmetric optics such as prisms or cylindrical lenses and sensors are glued or screwed in the desired position in the mount using a suitable measurement method. Through continuous control of the adjustment results, WILD can achieve precision at micrometer level.

**Adjustment milling**

The adjustment milling process ensures that the mechanical mount is perfectly adjusted to the optical element. To achieve this, the latter is precisely measured or adjusted inside or outside the milling machine. Subsequently, the mount is milled to perfectly accommodate the lens. Since the exact positioning of prisms requires completely different methods than those applied in the high-precision positioning of sensors, WILD resorts to different measuring instruments depending on the given requirement, such as 3D measurement microscopes, autocollimator telescopes, beam profilers or wavefront sensors.

**Alignment turning**

WILD uses alignment turning for the high-precision positioning of round optical elements. During this process, the individual

or composite lenses are mounted one by one and stacked, for instance, in a lens barrel. In alignment turning, the optical axis of a mounted spherical, aspherical or cylindrical lens is aligned to the rotating axis of the mount. The mount is machined so that its spin axis and the optical axis of the lens coincide. At the same time, the flange surfaces of the mount are machined so as to achieve the required air gaps. Both steps are important to achieve the best possible image quality. The requirements for optical axis stability are particularly high in the case of zoom optics and lenses designed to deliver extremely high resolutions. Moreover, alignment turning is an excellent technology for the optimisation of manufacturing



production speed since all steps are self-controlled in an automated gradual process.

Moreover, the new alignment turning station uses integrated high-resolution autocollimators, as well as tactile and optical sensors, allowing for a highly precise adjustment of air gaps between two lenses and an exact measurement of the lens thickness directly inside the station.

**The advantage of modular optical systems**

Due to the precise manufacturing of the interfaces, the components of optical assemblies are interchangeable modular elements, often removing the need for complex adjustments.

Even in terms of overall performance of sophisticated optics, however, there is a strong case in favour of a modular design. After all, the quality of the overall system is the result of the cumulate tolerances in the manufacturing of the lenses and the mechanical parts. A multi-lens system, for instance, involves a long chain of tolerances in which the latter can offset each other. In a worst-case scenario, however, they may also add up. The outcome can only be established in the finished assembly. Though it is possible to slightly improve the quality by selecting certain combinations, alignment errors cannot be offset in the case of an omnidirectional assembly.

WILD therefore applies a modular design in combination with various positioning methods, which can be chosen on the basis of the customer requirements. These allow for greater tolerances for individual lenses, since deviations can be offset by alignment turning. This approach also results in significant cost savings. Since the lenses are glued into the mount, thus reducing play to almost zero, this results in a greater stability of the optical axis and ultimately a very high optical performance, despite a tolerance-critical design.

costs since optical components produced cost-effectively with higher tolerances deliver very good system results after alignment turning.

**New alignment turning station with integrated measurement technology**

"Alignment turning in the quality we offer is a door opener for new optical designs", believes Stefan Werkl, Head of Business Unit Optical Technologies. Largely responsible for this confidence is the new ATS 200 UP alignment turning station purchased from German manufacturer Trioptics. The machine combines manufacturing and measurement technology in a single device like no other system on the market. This guarantees a mechanical manufacturing precision of 0.5 µm. "If you were to extend the optical axis of a lens to a distance of 100 metres, it would result in a deviation of just 0.5 mm", explains Martina Trinkel-Rudman, Business Developer at WILD Group. In addition, improved process control and repeat accuracy result in a higher



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## THE WILD GROUP

The WILD Group is comprised of the WILD brands which are established in Völkermarkt and Wernberg (Austria) and Trnava (Slovakia), as well as Vienna-based Photonic. The technology partner develops and produces optomechatronic systems for medical and industrial applications as well as optical technologies exclusively on behalf of its customers. Approximately 500 staff members are always the first choice whenever precision and reliability are called for and wherever innovation takes place.