Microscope Stages for Bio-Life-Sciences

# Positioning Systems made to measure.

**Linear motor based microscope stage of the LMT-Series with microtiter plate for high-throughput screening**

# Positioning

## Measure. Control. Move.

ITK stands for quality and system know-how in the development and production of mechatronic positioning systems. We traditionally develop, manufacture and measure components for new systems that are not available on the market - from ironless, patented linear motors for significantly higher performance in the same installation space to position measuring sensors for environments that do not allow optical measurements.

We were one of the world's first manufacturers to incorporate sensors designed according to the magneto-resistive principle in series products. We also broke new ground with MR technology, as ITK developed the first magnetising systems for our own use. Today, we are a supplier of both circular and linear magnetising systems for OEM companies - and a proud partner for demanding positioning tasks in these industries:

Semiconductor Industry

Bio-Life-Sciences

Material Sciences

Metrology

Magnetisers

We have not forgotten our roots in optics. At the Lahnau location, we benefit from immediate proximity to the optics metropolis of Wetzlar and its network of precision specialists.

Often it is precisely the broad spectrum of applications that opens up competitive advantages for customers. After all, their requirements in terms of precision, speed, reliability and fast time-to-market are very similar.

The ITK product portfolio is based on

- mechanical components
- controllers
- Linear actuators
- Positioning sensors
- performant software

This enables us to offer our customers

- High flexibility in designing products
- Series production for series from batch size 1 for mechatronic systems

The result of this strong combination: broad knowledge and extensive experience in the design and construction of complete machines, which we design in interdisciplinary teams. For added value that can only come about thanks to the integral technical understanding of the individual disciplines of electronics, mechanics and software.

Industry requirements for positioning systems and components

# Quality requires experience.

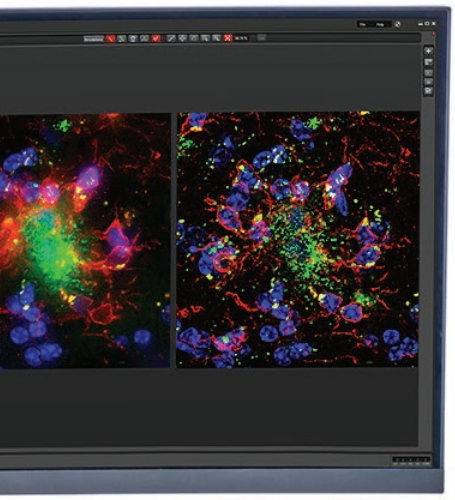
The challenge in microscopy - especially in the field of life sciences - is to quickly collect the smallest structures in combination with high precision and efficiency. More and more details of the sample material to be examined are needed in order to be able to produce even better and more accurate analyses. The finer the structures are imaged, the more information can be gained from the sample material.

With living cells, every fraction of a second counts in order to be able to take images. Dead cells are worthless! Fast image acquisition is therefore essential. In concrete terms, this means: „scanning the sample material“ in x-y-z direction must be done as quickly as possible. The positioning system (the microscope stage) as a component of the microscope application must therefore be moved quickly and precisely to the target position of the sample. Both the traversing speed and the acceleration and movement algorithm of the mechatronic positioning system are a decisive criterion and a component in the image acquisition. The individual image acquisitions should now be put together as quickly as possible. Then a complete overall picture of the examined sample material is created.  How quickly this happens depends largely on how precisely each individual image could be captured during the image acquisition

Source: Leica Microsystems CMS GmbH

process. Complete and crystal-clear overall images are created when one partial image can be joined exactly to the next, i.e. without gaps or overlapping. This is the only way to avoid unwanted artefacts. In order to be able to ensure in practice that the later overall image has neither missing image information nor overlapping, the „next partial image“ must exactly follow the previous one during image acquisition. To ensure this, the positioning system (the microscope stage) must be able to position precisely. The less overlapping that occurs when the partial images are placed next to each other, the fewer calculations the software behind it has to perform. Overlapping of the acquired image material leads to blurred transition areas in the overall image. Of course, intelligent computer programmes can correct these blurs. However, this is at the expense of speed in the evaluation of the sample material to be examined.

Microscope stages with patented technology from ITK meet these demands in every respect. In many cases, they help to save human lives.



## End user requirements.

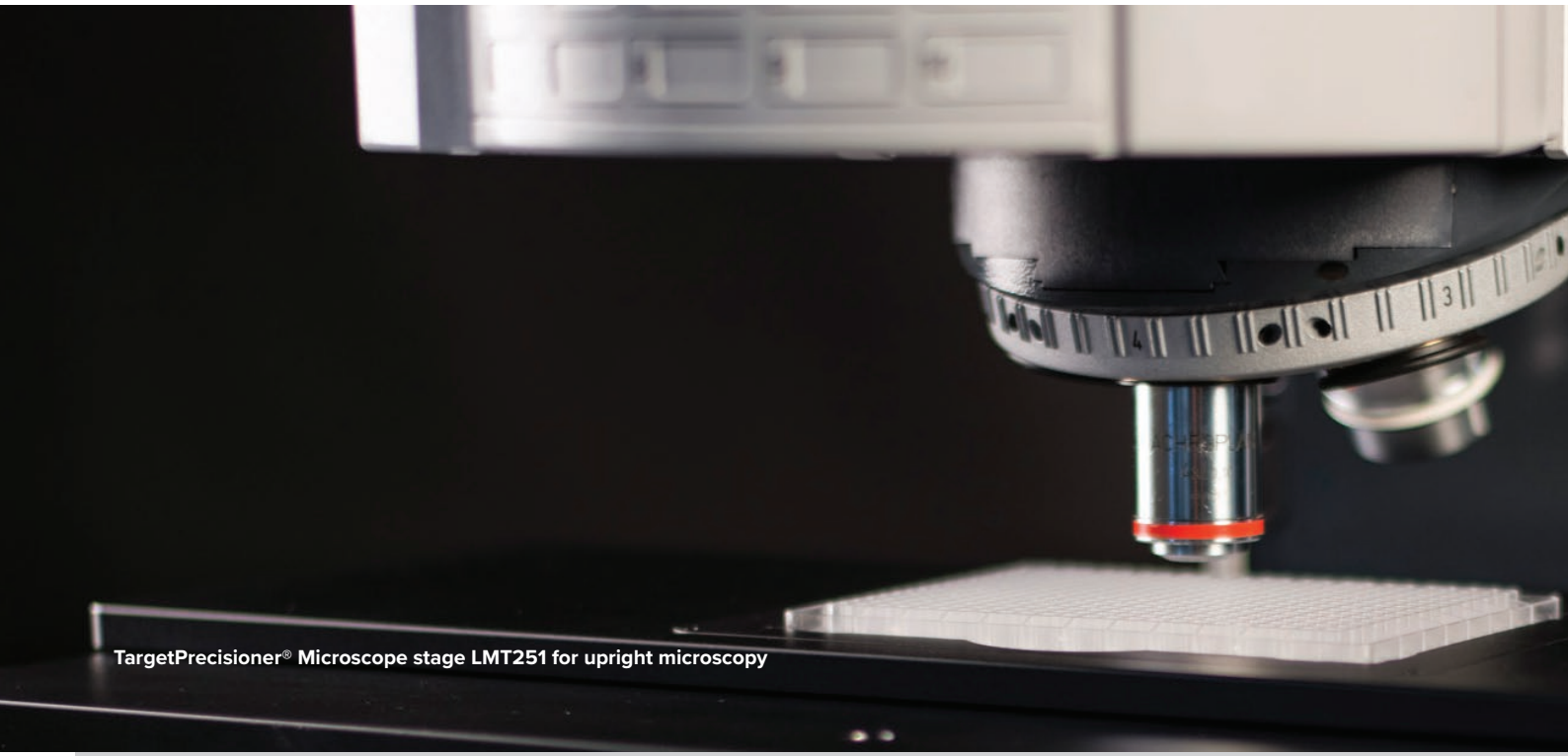
- High-screening, in order to be able to evaluate the samples to be examined more quickly
- High screening, in order to be able to examine and evaluate more samples per screening process.
- If possible, the samples to be examined should provide even more information. The sample to be examined should be imaged down to the smallest possible structure. We are then talking about resolutions of a few nanometres.

## Requirements for the technology.

- Fast and high-resolution camera systems
- Larger data storage for image processing
- Fast, precise and reliable positioning systems
- More demanding requirements for the thermal stability of positioning systems

## Your benefits with our solution.

- High precision of the microscope stage and that to the nanometre.
- High traversing speed up to 5 x faster compared to spindle tables.
- High availability, as (almost) no service work is required. Keyword: Almost wear-free drive concept with patented linear motors. No limit switches, no grease for lubrication, as no spindles are needed.
- Absolute measuring system. Annoying reference runs are no longer necessary. After switching on, you start directly with your examinations.



TargetPrecisioner® Microscope stage LMT251 for upright microscopy

# TargetPrecisioner®
# High-End-Microscope Stages.

## Reliable, precise and fast in image acquisition.

Microscope stages from ITK Precisioning GmbH belong to the new TargetPrecisioner® product familiy. They cover a wide range in image acquisition. This includes stereo microscopy, laser microdissection, upright or inverted microscopy and confocal microscopy.

Typical samples to be examined are:
- stone samples
- bio-life-sciences (plants, samples of living organisms)
- Metals

Depending on the samples to be examined, the microscope stage has to meet very different requirements.

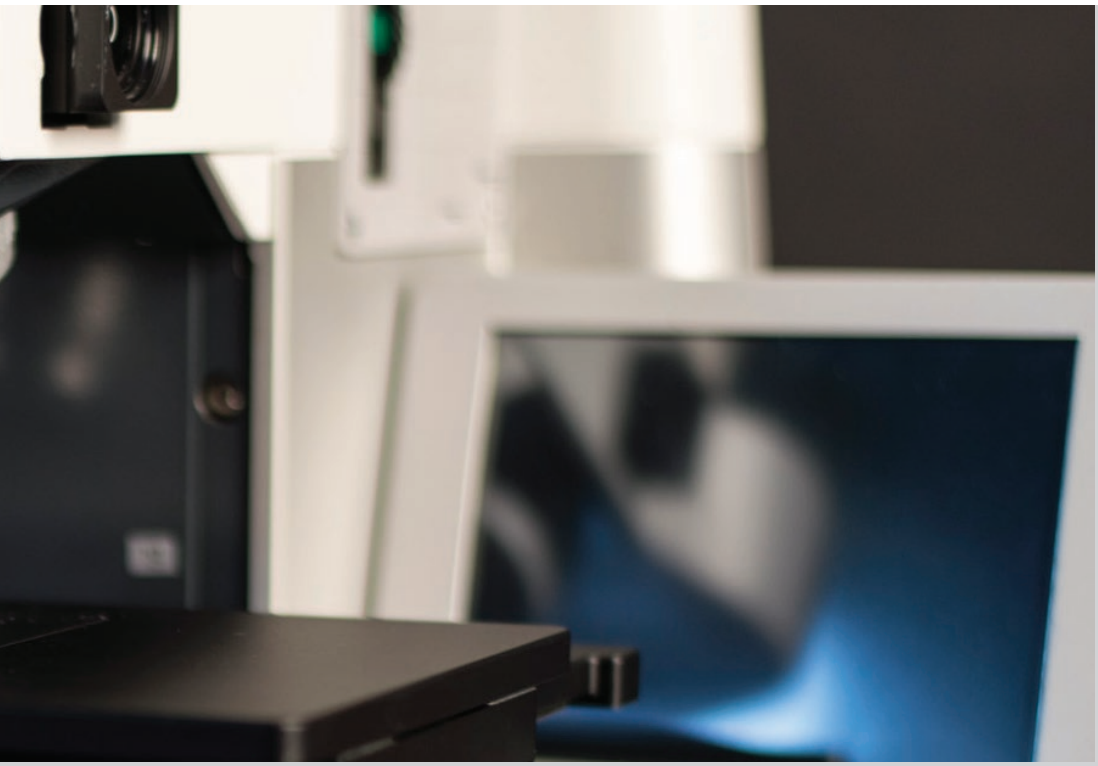
**Geologists**, for example, examine stones. Stones can be heavy and you cannot see the inside from the outside. Furthermore, stones have sharp edges and vary in their dimensions.

Requirements for the microscope stage:
- The surface coatings of the LMT must be robust against scratches.
- The LMT must be able to move the relatively large mass of stones

**Physicians**, for example, examine tissue samples or liquids under different „external conditions“. Typical temperature ranges for living cells are 20 °C - 37 °C. In some cases, investigations are also carried out well below and above this (3 °C - 40 °C). Certain experiments are carried out at high humidity in climate chambers, so-called incubators. Temperature gradients play a major role here.

Particularly high demands are then placed on the positioning system:
- Always with the claim to receive „fast and precise“ information.
- Aggressive liquids may damage the positioning system.
- The surface must be resistant to certain liquids.

**Metallurgists** use microscope technology to determine the composition of metals. The samples here can weigh up to several kilograms and be sharp-edged. The microscope stage and its surface must withstand these demands.



## Technical Data.

| Property | Unit | Value | Remark |
|---|---|---|---|
| Maximum acceleration | $mm/s^2$ | 5000 | |
| Minimum acceleration | $\mu m/s^2$ | 1 | |
| Maximum velocity | mm/s | 500 | limited by the possible acceleration and the travel range |
| Minimum velocity | nm/s | 100 | |
| Traversing range | mm | 120 x 80 | |
| Positioning resolution | nm | 5 | |
| Positioning accuracy | µm | ≤ ±1 | |
| Repeatability | µm | ≤ ±0.25 | |
| Peak force | N | 10 | |
| Nominal force | N | 8 | |
| Dimensions | mm | 374 x 247 x 28.1 / 374 x 247 x 36.1 | bottom surface to surface / with front bridge |
| Overall dimensions | mm | 408 x 247 x 61.8 | with controller |
| Weight | kg | 4.26 | with controller |

*These exemplary technical data are based on systems that have already been realised. They are intended to give you a first impression of the possible bandwidth.*

Microscope stages and accessories for a wide range of applications

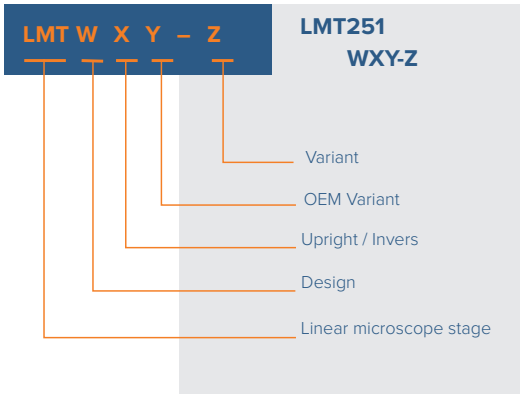
# Linear motor-driven microscope stages for bio-life sciences.

Alongside the top dogs, more and more companies are establishing themselves on the market. Always with the goal: to declare war on viruses, bacteria and pathogens in a race against time! Just think of the Corona virus! We, the employees at ITK, are a little proud to be able to contribute to this and, above all, to be able to do so.

A range of our microscope stages has been specially developed to meet the requirements of this market. Today we can proudly say: we are a pioneer of linear motor-driven microscope stages. In retrospect, exactly the right way to support all the other pioneers, scientists and medical professionals in their daily work in their quest to obtain more detailed information even faster.

## The microscope stages.

- **Incomparable dynamic acceleration and speed range**
- **Space-saving on the worktop**
- **Extremely fast acquisition of image information**
- **Precise position retrieval for marking and search applications**
- **Ergonomic hand-held control units enable fatigue-free work.**
- **Quick, convenient reaching of the respective position, precisely at the touch of a button.**




### For your product selection: Nomenclature of LMT variants

| Product | Parameter | | | |
|---|---|---|---|---|
| W | 2 = standard version 3 plates (120 x 80 mm) | 3 = Microdissection | 8 = 8 inch 203 mm travel | T = Titanium |
| X | 0 = Invers | 5 = Upright | 6 = Stereo | |
| Y | 0 = Leica | 1 = Zeiss | 2 = Olympus | 3 = Nikon |
| Z | T = Titanium | F = Frontloader | HS = High Speed Trigger | VX = Version 1, 2, 3 etc. |

Example: LMT251 = LMT251 microscope stage as standard version, upright, Zeiss compatible.

# Sample holders, handhelds and external controllers.

The products shown here are only excerpts from our portfolio. We offer the right product for every sample and every application. No matter whether liquids or solid samples are being examined: we not only have the ideal microscope stage for your application, but also supply you with the matching holder. We will be happy to advise you.

## Accessories.

### Handheld control units

**Product example: Handwheel**

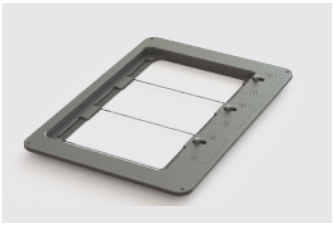
- For moving two axes
- Ergonomic and dynamic in use
- Sensitive and precise positioning due to high encoder resolution and precision bearings

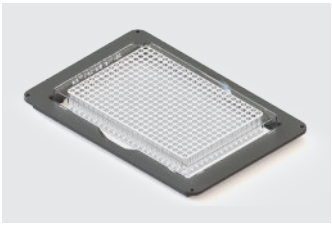
**Product example: Multiwheel PG**

- For moving three axes
- With eight individually programmable buttons
- I² C-interface
- Ergonomic design
- High encoder resolution
- Precision bearings
- Ideal accessory for the positioning systems of the LMT series

### Sample holders

**Product examples: Inlay variants**



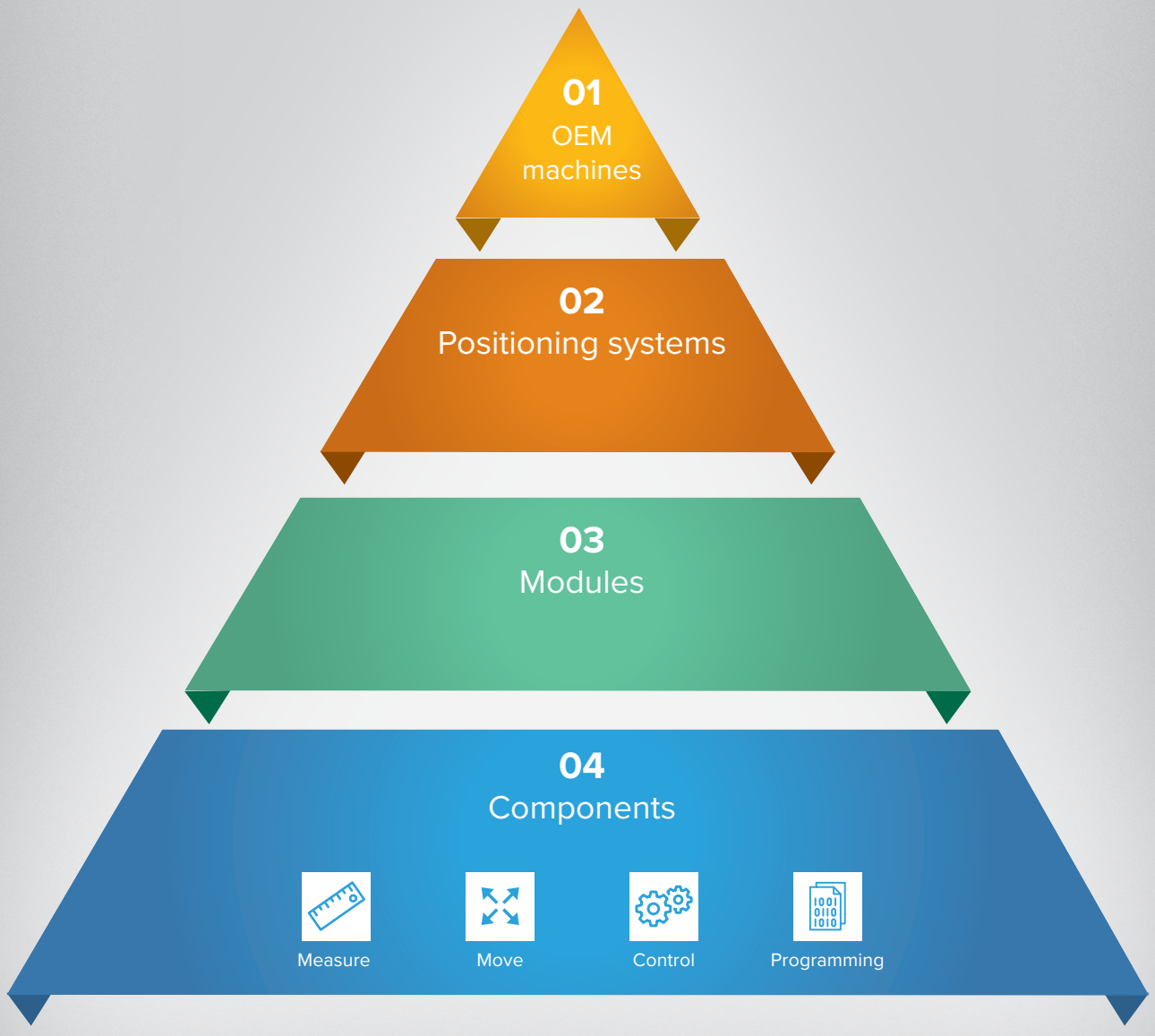


- We offer optional inlays for our microscope stages, available in various designs, with customised top plates or external CAN joystick. Increase your efficiency in producing depth-focused images for precise and fast results. We offer a full range of optional accessories for our motion systems on request.

All from a single source

# From the component to the system.

**ITK as partner of complete systems for high-precision positioning tasks.**
On the way to ever more precise and flexible systems, we have continuously expanded and optimised our product portfolio. The result is impressive. But it can also be measured: We can display a position resolution of up to 5 nanometres at system level. .



01

## ITK OEM Machines

The reason for the production of our first magnetization system for coding scales fits into our history: Own demand! The development of the machine over 20 years ago was the birth of a new business field for ITK. Since then, the demand for solutions from OEM customers has increased year after year. We meet this demand with high-precision, high-performance systems – developed and approved in accordance with the Machinery Directive. Today, a team of experts from various disciplines at ITK implements special projects based on the pillars of „Positioning. Measure. Control. Move.“ are the cornerstones. Rotary and linear magnetization systems make up the largest share.

02

## ITK Positioning Systems

Gantry and microscope stages form the foundation of all ITK positioning systems. Gantry tables are usually of classic gantry design and are used wherever relatively light workpieces and specimens have to be positioned with high precision and dynamically.
The same components are used in microscopy, but in a much more compact design. The latest microscope stages are equipped with five active axes to provide the best possible support for fully automated laboratory operation. Our product portfolio thus ranges from small dimensions under the microscope and samples in the gram range to four-square-metre scanning systems with up to eight active positioning axes.

03

## ITK Modules

The modular design of all ITK systems is the basis of our flexibility. Our assemblies are subdivided according to type of movement. The three superordinate assembly categories result in a wide range of linear tables, cross tables and rotary tables. In this context, the interaction with the ITK controls developed in-house should be emphasised.
The control technology is our origin and the decisive factor in exploiting the full performance potential of the mechatronic assemblies.
Talk to us about how our in-house software and electronics development can implement your special requirements in a customised manner.

04

## ITK Components (our foundation)

The basis for every ITK system are real-time capable multi-axis controllers for the high-precision precise control of stepper and linear motors. In addition, we offer you further components as stand-alone products (OEM variants).

Our own developments and in-house produced components include:

- Controllers (up to 6 axes)
- Position measuring systems according to the magneto-resistive principle (MR sensors and measuring scale)
- Ironless linear motors with patented ITK functional principle
- Software and motion algorithms

**ITK stands for high-precision positioning systems and assemblies for one- to three-dimensional movements.**

With over 40 years of experience, all mechatronic systems and their components are developed and manufactured by us.

We understand the interaction of mechanics, electronics and software to ensure sub-micron accuracy and nanometre resolutions.

This expertise helps our customers to build chips more reliably, develop vaccines faster, make sensors more accurate and accelerate the energy transition.

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Subject to technical changes.

**ITK Precisioning GmbH**
Am Römerlager 5 | 35633 Lahnau | Germany
T +49 6441 65005-0 | info@itknet.de | www.itknet.de