Setting, a MAPAL competence
Product information
MAPAL is a recognised specialist for fine boring using adjustable tools. The exact adjustment and measurement of these tools is a prerequisite for high part quality.

This situation led MAPAL to become involved in the development and manufacture of mechanical and electronic setting fixtures. MAPAL has always placed very high value on precision and longevity.

The high precision of the MAPAL setting fixtures is the result of the combination of a highly accurate, solid mechanical construction and a tactile measuring method.

The new UNISET-V vision supplements the MAPAL setting fixtures with a new series of fixtures that combine familiar MAPAL accuracy with extraordinary ease of use and ergonomics. The combination of this new development with a CNC system opens up the world of fully automatic measuring processes.

On MAPAL setting fixtures the combination of a solid basic mechanical set-up with exact, reliable electronics and optical image processing results in a precise setting fixture. The outstanding precision mechanical technology is made possible by the use of high-quality materials, for example granite and carbon.

General properties of the series of fixtures:
- Resilient to vibration and oscillations due to fixed portal construction
- The fixtures are suitable for both the measuring room and right beside the machine
- High stiffness, resilience to oscillations and vibration even with changing loads
- Fully automatic measuring processes
- Optimal material design in relation to the ambient thermal effects
- Manufacture of the individual parts in-house
- Stability due to granite and large guide cross-sections

INDEX

Setting, a MAPAL competence 2 | 3
Applications 4 | 5
MAPAL UNISET-V vision 6 | 7
MAPAL UNISET-H standard 8 | 9
MAPAL UNISCALE-M 10 | 11
MAPAL MASTERSET 12 | 13
MAPAL special applications 14 | 15
MAPAL Service 16 | 17
Equipment and technical datas 18 | 19
Easy to assemble and maintain due to modular system
Due to the modular system on both the horizontal design and the vertical design, the setting fixture can be exactly adapted to the requirements. In addition, the modular design permits the use standard components that are easy to fit and maintain, also on custom solutions.

Highest dimensional accuracy due to tactile measuring method
High dimensional accuracy is provided by the usage of a tactile measuring method. Due to a special adaptation the contact forces are so low that even delicate cutting materials such as PCD and PCBN can be set to the µm without the risk of damage.

Setting to µm accuracy
A key parameter that affects tool lives, specifically exact, consistent setting, is made possible by MAPAL setting fixtures that provide the certainty of setting to consistent µm accuracy, despite their ease of use.

Increasing product reliability and increasing cost-effectiveness
During the fine machining of bores, a key criterion is the dimension of the bore. Highly reliable setting means that the available tolerance range can be better utilised. As a result reliability in production is improved and cost-effectiveness increased.

Technical features:
- Measurement range: Lengths up to 1,000 mm and ø up to 400 mm
- Fast movement
- Fast adjustment and fine adjustment for exact movement to the precise measurement point
- Various measuring methods
- Swinging lever easy to fit and remove
- Combination of high accuracy mechanical contact and convenient optical image processing
Setting, a MAPAL competence
Applications

The MAPAL UNISET vario series is ideally suited to measuring and setting finely adjustable indexable blades for the following range of tools:
- Guided reamers with indexable blades or HX indexable blades
- Reamers and boring tools with short cartridges, chamfering blades, radius inserts, face inserts and ISO inserts.
- Milling cutters (PCD cutter heads, face milling cutters, shoulder milling cutters, groove milling cutters, end milling cutters and form cutters)
- Drills (single-stage or multi-stage)
- Tap drills
- Angular heads
- Actuating tools
- Solid carbide tools

Fast, efficient setting
An important parameter for manufacturing on a machining centre is the comparison between the time during which the machine is producing and the total running time for the machine. To keep this availability high, the following are required:
- Setting of the tools away from the machine
- Production to the required tolerances
- No re-adjustment on the machine
- No "test cut"

Particularly on multi-stage tools and complete machining tools with face inserts and chamfering blades, MAPAL setting fixtures permit quick and as a result efficient setting.

Consequences of tools that are not set optimally are:
- Loss of process reliability
- Unnecessary downtimes
- Risk of collision
- Tool life reduction
- On multi-bladed tools the blades are used in different ways
- Time-consuming corrections

MAPAL setting fixtures for setting all common tools, for example:
- adjustable reamers | milling cutters | face, shoulder, end and groove milling cutters | form cutters | drills | step drills | PCD cutter heads | external machining tools | angular heads actuating tools | end milling cutters | solid carbide tools
The following different measuring methods are possible:

**Absolute measurement**
The absolute measurement is normally used if the tool does not have a guide pad.

**Protrusion measurement**
The protrusion measurement is used if there is no guide pad opposite the insert, or if for technological reasons the cutter overhang is to be set.

**Swinging lever measurement**
The swinging lever method is applied if the tool to be set has a guide pad opposite the insert.
Electronic setting fixtures are available in a vertical design. Due to the vertical design and the robust basic mechanical set-up, it is possible to set very long, heavy tools to the µm without problems.

A key aspect for the developers was suitability for use in a workshop in a somewhat harsher environment. The major advantage of the measuring system used is its robustness in relation to external interference effects. In addition, all mechanical components are designed with the highest precision and stability. Due to the high-precision bearing for the spindle and the matched linear tracks, a radial run-out accuracy of ≤ 3 µm is guaranteed for a projection length of 300 mm.

The new and ergonomic design offers easy access thanks to a moving tool carriage. The height-adjustable monitor also allows comfortable working even when seated. In addition, the monitor with touchscreen function makes work particularly intuitive and fast. Furthermore, practical storage compartments keep the working area tidy.

Dynamic, flexible control modules and the possibility of fine positioning ensure optimum setting precision of the tools. The teach-in programming allows automatic measurement and setting of the tools. Thanks to the ultramodern camera with CNC and the new operating software, a setting precision of < 2 µm is achieved more easily than before with the modular UNISET-V vision.

However, despite the new design and innovative technology, one thing has not changed in the new MAPAL setting fixtures - the accuracy.

**Advantages of UNISET-V vision**
- Solid basic mechanical set-up with fixed measuring tower
- Resilient to vibration and oscillations due to split portal construction
- The easy to service fixtures can be used in the measuring room or right at the machines
- Optimal access thanks to moving tool carriage
- Modular construction with easy to maintain individual components
- System components can be upgraded as an option
- Easy to use due to optional touchscreen
- High measuring accuracy due to moving measuring sensor
- Teach-in programming
- Tool database / tool management
- Practical storage compartments and optional tool carriage to “encourage tidiness”
- Innovative operation with the aid of a joystick

**Technical data**
- Footprint 740 x 1,800 mm (optionally with tool carriage 740 x 2,500 mm)
- Measuring length up to 1,000 mm
- Ø up to 400 mm
- Tool weight up to 50 kg
- Weight: 1,100 kg (optionally with tool carriage 1,220 kg)
UNISET-V

- CNC electronic setting fixture
- Spindle with SK50 and heel (optional HSK adapter)
- Electronic measuring sensor
- Protrusion measurement
- Swinging lever measurement
- Camera system with newly developed software for the optical measurement
- Tool database
- Teach-in programming
- Measuring force 200 mN, particularly suitable for contact with highly delicate inserts such as PCBN for instance

Combination of moving measuring sensors and convenient optical image processing
Electronic setting fixtures are also available in a horizontal design. With the horizontal design it is also possible to set even long tools at an optimal, ergonomic working height.

Suitable for fitting, setting and measuring indexable blades in tools, and also boring bars and fine boring heads with carbide, polycrystalline CBN and Cermet cutting edges etc.

Due to the typical construction with two measurement points, the setting dimensions for inserts that are to be set with a back taper can be observed at two points at the same time. As a result a very short setting time per tool is achieved and incorrect settings are practically excluded.

The new ergonomic design is also reflected in the new horizontal series. Comprising standard components, the typical features of the solid mechanical construction are clear to see.

For instance in the granite design as well as in the guide rails accurate to the µm. The modular design of the UNISET-H series is such that the fixture can also be changed into a bench-top device. The standard variant of the MAPAL UNISET-H standard includes a well thought-out base with many storage features and useful compartments.

Advantages UNISET-H standard
- Tool insert always at one level
- Optimal ease of use
- Left or right hand design possible
- Guide slides for fast, finely adjustable positioning of the measuring units in the axial and radial direction with pneumatic clamping
- Using MAPAL setting fixtures it is possible to make measurements and set tools very easily after a short familiarisation phase, independent of a specific operator

Technical data
- Footprint 650 x 1,600 mm
- Measuring length up to 600 mm
- ø up to 190 mm
- Tool weight up to 20 kg
- Weight: 300 kg
UNISET-H

- Granite design
- Precision spindle with roller bearings
- Spindle with SK50 and heel (optional HSK adapter)
- Measuring force 200 mN, particularly suitable for contact with highly delicate inserts such as PCBN for instance
- Continuously adjustable measuring sensor distance from 4 – 20 mm
- Collision protection measuring sensor
- Optional swinging lever measuring method, based on the caliper gauge principle
- Accuracy of repetition 2 μm
- Resolution 1 μm
- Camera system
Using the MAPAL UNISCALE-M any type of drill, milling cutter or reamer can be measured. This fixture is used in goods receipt inspection, intermediate production inspection, as well as in final inspection at manufacturers of machining tools. The UNISCALE-M is also suitable for measuring tools that have been re-ground.

The MAPAL UNISCALE-M measuring device is used for, among other tasks, measuring face geometries, peripheral geometries and step lengths on shank tools, for instance solid carbide drills, solid carbide milling cutters or solid carbide reamers. It is also possible to analyse and view surface details on the solid carbide tool. Furthermore, the thickness of coatings can be measured. Well-organised documentation of the tools measured and a log are very easy using the MAPAL UNISCALE-M.

The new ergonomic design is reflected in the measuring device series UNISCALE-M. Various prism elements are used for fitting the tools. Due to the solid mechanical construction and vibration-damped adjustable feet, the instrument is mounted optimally and vibration is therefore low. During development of the new UNISCALE-M special attention was paid to easy, user-friendly handling. Useful storage features also make working with the MAPAL UNISCALE-M easier. On request the new instrument can also be ordered with a base.

Advantages UNISCALE-M:
- Solid basic mechanical set-up due to granite slab with precision guide resilient to vibration and oscillations
- Easy to service instruments used in the measuring room or right at the machines
- Modular construction with easy to maintain individual components
- Convenient data transfer and documentation of the data for the administration of inspection plans
- Adapter can be pivoted in both directions (180°)
- Storage compartment for cleaning utensils, quick clamping systems
- Contrast panel and additional lighting for optimum illumination

Technical data
- Footprint approx. 800 x 1,400 mm
- Tool adapters with ø 30 mm
- ø up to 50 mm
- Weight: 250 kg
Easy, user-friendly tool inspection

UNISCALE-M

- Any type of length, angle and radius measurement
- Measurement of cutting edges
- Measurement of wear
- Grid zoom system 12 with 0.67x adapter with angular optics
- 0.5x ancillary lens and C-mount adapter
- Xenon cold light source
- High resolution camera
- Encoder
- Attachment sleeve
- Telescope light easy to integrate
For the easy, safe handling of adjustable tools fitted with blades, MAPAL offers various mechanical setting fixtures. These manual versions are available alongside the electronic setting fixtures of horizontal and vertical design in different variants.

The MAPAL MASTERSET series comprises modular assemblies and therefore offers the greatest possible flexibility to suit the related task. Due to various measuring principles, either the absolute diameter or the magnitude of the protrusion of the blade in relation to the guide pads can be measured.

**MASTERSET-V**

**Mechanical setting fixtures, a MAPAL competence**

**Vertical setting fixture MASTERSET-V**

**Technical data:**
- Tool weight, up to 15 kg
- Measuring lengths up to max. 750 mm
- ø up to 200 mm for protrusion measurement
- ø up to 150 mm for swinging lever measurement
- Mounting between centres
  (customer-specific elements possible)
Mechanical setting fixtures, a MAPAL competence
Horizontal setting fixture MASTERSET-H

Advantages MASTERSET:
- Easy clamping of the tools using hand lever and sleeve withdrawal
- Lockable swinging lever for "caliper gauge" and "protrusion" measuring principle
- Double measurement point – fast axial positioning of the measurement point on multi-stage tools with adjustable blades
- Sleeve for replaceable elements for mounting different centre points, for example for HSK shanks
- Fine axial adjustment for adjusting the highest axial cutting point
- Rotating centre point for setting heavy tools easily
- Spring force reduction for setting delicate thin tools

Technical data:
- Tool weight, up to 8 kg
- Measuring lengths up to max. 750 mm
- ø up to 200 mm for protrusion measurement
- ø up to 150 mm for swinging lever measurement
- Mounting between centres
  (customer-specific elements possible)
Customer-specific setting and measuring processes require corresponding custom customer-specific fixtures. MAPAL, as a specialist for custom solutions, also offers numerous possible ways of implementing customer requirements one-to-one in the setting fixtures area.

MASTERSET calibre

Mechanical setting fixtures, a MAPAL competence
Setting fixture for special applications MASTERSET calibre

In the area of gauge manufacture, MAPAL has developed a standard system series that comprises various standard components. The individual components for the caliper gauges are designed to suit the size of the tool to be measured.

The basic design always comprises a magnetic prism with extension arm and dial gauge. To measure the tools, the prism-shaped attachment with the dial gauge fitted is simply placed on the tool.
Mechanical setting fixtures, a MAPAL competence
Setting fixture for special applications MASTERSET special
Like any item of quality-related, certified measurement equipment, the MAPAL setting fixture must be re-calibrated and checked.

During this process all the individual parts are carefully checked to see if they can be re-used and, if necessary, reworked or replaced with spare parts.

For instance the basic geometry of the axes is measured, re-adjusted and set, as necessary.

By performing maintenance at regular intervals, any wear on the equipment can be detected and rectified in good time. Degradation in the machining results and production downtimes are thus avoided.

The correct function of the repaired setting fixture is certified with the corresponding inspection plate. All components replaced are covered by warranty for a further year.
Like all MAPAL products, very high value is placed on service also in the setting fixture area. Competent, quick service for your MAPAL measurement equipment is guaranteed by MAPAL specialist personnel and service personnel.

We would be pleased to prepare, with you, a service concept optimised to your specific needs. Our range of service models includes, for example, customer-specific maintenance contracts that cover all the costs for personnel and their travel expenses. You can then plan and calculate your costs accurately.

Furthermore, with MAPAL you can also request the direct implementation of your specific requirements on a setting fixture. Your wishes in relation to dates can also be met.

Service is so important for these reasons:

- High quality during the manufacturing process
- Increase in the service life
- Claims under the warranty
- No production downtimes

![Graph showing quality and accuracy over time for new fixture and services 1 and 2, with warranty for a further year.](image-url)
<table>
<thead>
<tr>
<th>Series</th>
<th>Type</th>
<th>Design</th>
<th>Meas. range length (mm)</th>
<th>Meas. range ø (mm)</th>
<th>Measuring operation</th>
<th>Measuring process</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNISET</td>
<td>-V vision</td>
<td>Vertikal</td>
<td>1,000</td>
<td>400</td>
<td>Electronic measuring sensor and optical image processing system</td>
<td>CNC controlled</td>
</tr>
<tr>
<td>UNISET</td>
<td>-H standard</td>
<td>Horizontal</td>
<td>600</td>
<td>190</td>
<td>Electronic measuring sensor and optical image processing system</td>
<td>System motorised</td>
</tr>
<tr>
<td>UNISCALE</td>
<td>-M</td>
<td>Horizontal</td>
<td>-</td>
<td>50 (tool adapter ø 30 mm)</td>
<td>Optical image processing system</td>
<td>Manual</td>
</tr>
<tr>
<td>MASTERSET</td>
<td>-V</td>
<td>Vertikal</td>
<td>750</td>
<td>200</td>
<td>Mechanical with dial gauge</td>
<td>Manual</td>
</tr>
<tr>
<td>MASTERSET</td>
<td>-H</td>
<td>horizontal</td>
<td>750</td>
<td>200</td>
<td>Mechanical with dial gauge</td>
<td>Manual</td>
</tr>
<tr>
<td>MASTERSET</td>
<td>calibre</td>
<td>Custom</td>
<td>On request</td>
<td>On request</td>
<td>Mechanical with dial gauge</td>
<td>Manual</td>
</tr>
<tr>
<td>MASTERSET</td>
<td>special</td>
<td>Custom</td>
<td>On request</td>
<td>On request</td>
<td>Mechanical with dial gauge</td>
<td>Manual</td>
</tr>
<tr>
<td>Series</td>
<td>Type</td>
<td>Technical features</td>
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</tr>
</tbody>
</table>
| UNISET     | -V vision  | - Electronic control and measuring equipment  
- Touchscreen with graphic user interface  
- MAPAL image processing with telecentric lens  
- Regulated transmitted light for cutting edge inspection  
- Tool management  
- Data to be output on label printer can be edited  
- Monitoring functions using various sensors  
- Innovative operation with the aid of a joystick |
| UNISET     | -H standard| - Setting at one working level  
- Left or right design possible  
- Easy, ergonomic operation |
| UNISCALE   | -M         | - Stable, vibration-free basic set-up  
- Data transfer and documentation  
- Tool adapter can be pivoted 180°  
- Quick clamping systems  
- Optimum tool illumination |
| MASTERSET  | -V         | - Easy clamping by means of hand lever withdrawal  
- Lockable swinging lever  
- Double measurement point  
- Sleeve for replaceable elements  
- Fine axial adjustment  
- Rotating centre point  
- Spring force reduction |
| MASTERSET  | -H         | - See technical features for MASTERSET-V |
| MASTERSET  | -calibre   | - Modular system  
- Freedom of movement |
| MASTERSET  | -special   | - Freedom of movement |
Clamping
Customer Service
Drilling
Generating slide tools
Hard turning
Milling
Precision boring tools
Reaming and Fine Boring
Setting