Spline measuring instruments
VM with guiding profile
Dimension over balls
for series production parts
Function

The measuring instruments VM are equipped with a guiding profile. They measure the size over two balls without reversing point. The guiding profile is matched to the gear and spline of the specimen. Thus the measuring instruments VM are single-purpose machines and only suited for the relevant series. But this is where they convince with their professionalism. They are robust, simple and the measuring results are not reliant on the operator.

For splines the guiding profile can be supplied as go gauge profile - as under-size (in front section) or over-size profile (see below).

The choice of VM measuring instruments ranges from simple hand operated versions to the fully automatic FAPP system.

All VM measuring instruments are calibrated with a profiled setting master.

A UPM certificate contains the measuring uncertainty of the instrument and allows the ascertainment of the measuring uncertainty in daily use.

Guiding profile

The guiding profile can be supplied:

- as under-size Typ VMF
- as go gauge Typ VML
- as go gauge with under-size in front section Typ VML/F

The size over two balls is measured either with measuring balls or radius disks.

The probing always occurs on double flanks.

The floating suspension of the measuring inserts guarantees a double flank contact. Since the guiding profile has some clearance to the profile of the specimen, all necessary degrees of freedom are provided by the mechanical suspension.
Overview

The different instrument types have different features, which are shown in the following table.

**Table: Instrument Types and Features**

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<th>Measuring Process</th>
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<tr>
<td>AVM 1x1</td>
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<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
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<tr>
<td>IVM 1x1</td>
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<tr>
<td>AVM nx2 K</td>
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<td><img src="image10.png" alt="Image" /></td>
<td><img src="image11.png" alt="Image" /></td>
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<tr>
<td>AVM nx2 RS</td>
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<td>IVM nx2 RS</td>
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<td><img src="image21.png" alt="Image" /></td>
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</tr>
</tbody>
</table>
Measuring instrument AVM 1x1

AVM 1x1 instruments have a profiled guidance ring, a measuring insert with two carbide measuring balls and come with either a dial indicator or a digital measurement display. A measuring stand is also available for simplified handling:

The AVM 1x1 instruments are usually used for measuring medium-sized workpiece batches.

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<th>measuring process</th>
</tr>
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<tbody>
<tr>
<td><img src="image1.png" alt="AVM 1x1 with dial indicator" /></td>
<td><img src="image2.png" alt="AVM 1x1 with dial indicator and measuring stand" /></td>
<td></td>
</tr>
</tbody>
</table>
Accessories and design

Configuration

Accessory parts

Design with inductive probe

Accessories

plug gauge (only necessary for inductive probes)

setting plug (always necessary)
Measuring instruments IVM 1x1

IVM 1x1 have a profiled guidance plug, a measuring insert with 2 carbide measuring balls, a handle or a measuring stand and a dial indicator or a digital display. Both measuring ball inserts are mechanically connected.

IVM 1x1 are mainly used for the measurement of medium-sized batches.

The measuring insert can be rotated and is suspended in pendulum fashion.
Accessories and design

Configuration
- dial indicator
- handle
- profile plug
- measuring insert

Accessory parts
- adjustable stop
- measuring stand

Design with inductive probe
- inductive probe
  - For digital data processing via illuminated bollard or software.

Design with handle and measuring force retraction
- measuring force retraction

Accessories
- setting ring (always necessary)
- control ring (only necessary for inductive probes)
Measuring instrument AVM nx2 K

All VM nx2 measuring instruments from Frenco have multiple measuring inserts. To determine the diametrical size over two balls, two inductive probes (located opposite each other) are added together. The types nx2 K use carbide measuring ball inserts, which are screwed into the inductive probes. Worn measuring balls can be replaced.

Due to the major wear of the measuring balls, the measuring instruments VM nx2 K are only suitable for small and medium-sized batches. Larger batches or hardened workpieces are best inspected with VM nx2 RS instruments, which work with radius disks.

AVM nx2 K: longitudinal dynamic adapter
Accessories and design

Configuration

Accessory parts

Design with longitudinal dynamic adapter

Accessories

Set:
setting plug (grey) and
check plug (blue)
AVM nx2 RS instruments are working with radius disks and not with measuring balls. They are clamped in a floating insert and can be turned. The wear of radius disks is much lower than that of measuring balls. Thanks to the option of turning the disks, wear does not pose a problem. AVM RS measuring instruments have a simple design, are very robust and easy to handle.

RS instruments are suitable for automation.

AVM nx2 RS with longitudinal dynamic adapter

AVM 3x2 RS: 3x2 floating inserts with radius disk

Adapter for FAPP automation unit
Accessories and design

**Assembly**
- guiding mandrel
- bearing bolt
- covering disk
- upper cover
- lower cover
- pilot diameter
- radius disk
- measuring lever
- inductive probe
- housing

**Accessory parts**
- measuring stand

**Accessories**
- setting plug (grey)
- check plug (blue)

**Design with longitudinal dynamic adapter**
- inductive probe
- dynamic adapter

FAPP-Adapter
- FAPP-adapter for automation with the FAPP system with integrated automatic setting master
Tripod measuring instrument IVM 3x1 K

IVM 3x1 K is used to measure tripod ball tracks. This version is only available with a longitudinal dynamic adapter.

To guarantee a best possible adaption in the ball track, the three ball insert pairs are clamped in a floating insert.

The measuring inserts for gothic contours have two-point contact. Those for the ball tracks have single-contact.

IVM 3x1 K are very robust and easy to handle.

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<tbody>
<tr>
<td>88</td>
<td></td>
<td>or</td>
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</tbody>
</table>

Measuring head with measuring ball inserts and distance bolt

IVM 3x1 K with dynamic adapter

Tripod with gothic contour
Accessorie and design

Configuration

Measuring inserts:
- Measuring insert for gothic shape
- Measuring insert for ball path

Accessories:
- Setting plug and check plug
- Measuring insert for gothic shape
- Measuring insert for ball path
- Profile mandrel
- Dynamic adapter
- Measuring insert
- Upper cover with distance bolt
- Inductive probe
- Housing
Measurement software L-Dyn

All gear testing instruments with adapter are suitable for dynamic measurements. The travel of the table or the bars is assigned to one measurement reading and recorded. Thus the workpiece can be measured in hundreds of planes and the values can be evaluated on a PC.

The measurement enables the determination of the dimension over balls and the evaluation of the following values:

- tapering
- crowning
- roundness

When a measurement is complete the values are marked in colour:

- **Green**: Measured value within accepted tolerance
- **Yellow**: Measured value within intervention limits
- **Red**: Measured value outside accepted tolerance

Interfaces for your database and QS-Stat are available.

Furthermore, the data can be exported to Excel. It is therefore possible to evaluate several data sets. When a workpiece is measured before and after hardening, the quenching distortion can also be determined.
Workbench set-up

L-Dyn systems reach pure perfection when they are set up on a FRENCO workbench: the wiring and electronic systems are securely and invisibly stored away and the control masters are protected against damage in the drawers.

FAPP

Our FAPP system enables automatic inspections of internal and external gears and splines. Integrated in a production line, a cycle time of about 10 s can be achieved.

All FRENCO gear inspection machines type VM nx2 RS can be automated with the FAPP-System.

The FAPP-Systems are designed as autonomous units. They are equipped with a pneumatic and electric control for the motion processes of the fitting unit and that of the linear feed. Interfaces for the communication with handling machines are standard. Further interfaces are optional.

FRENCO also offers complete FAPP inspection cells with integrated handling systems and sorting units.
Frenco Product Range

**High Precision Gears and Splines**
- Gear and Spline Gauges
- Master gears, Master wheels
- Artefacts, Masters
- Punches, Dies & Electrodes
- Profiled Clamping Systems
- Gear and spline manufacture

**Instruments for Size Inspection Series V**
- VRK Measuring Pins and Balls
- VA Gauges, Rocking Type
- VP Gauges with Face Stop
- VM Gauges, Gear & Spline Profiles
- VD Circumferential Backlash Measuring Instrument
- VS Customised solutions

**Rotation Measuring Systems URM**
- URM - K with Balls and Pins
- URM - R with Master Wheels
- EWP Single flank gear roll inspection
- ZWP Double flank gear roll inspection
- WS Gear roll scan

**Gear & Spline Inspection**
- DAkkS - Calibration
- Monitoring of Inspection Equipment
- Workpiece Inspections
- Analysis of Deviations

**Know-how Transfer**
- Software
- Training, Seminars, Workshops
- Consulting and Calculations
- Literature and Documentations
- National and International Standards

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