Universal rotation measuring instruments URM-K

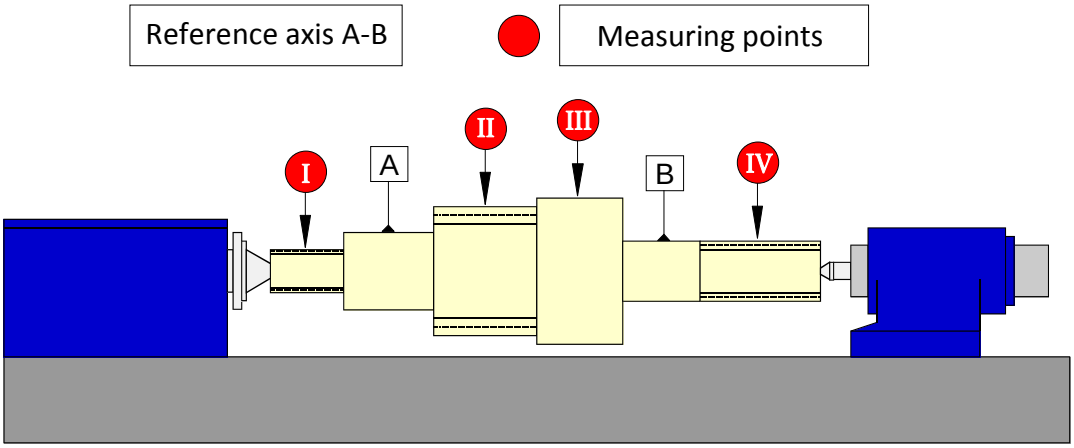
Fast measurements
in shop floor areas

pure perfection

FRENCO

General Information

Universal rotation measuring instruments are coordinate measuring devices for rotationally symmetric workpieces. The measurement is carried out by means of a measuring ball. Diameters, gear and spline parameters as well as ball tracks can be measured. To measure gears and splines or ball tracks, the measuring ball is in double flank contact. The in-house developed software URM-K evaluates and displays the measuring results.



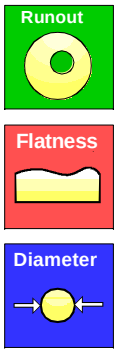
Once the reference axis has been determined any selected measuring points can be recorded

The URM-K series is flexible and designed for universal applications and can be used for a wide variety of workpieces.

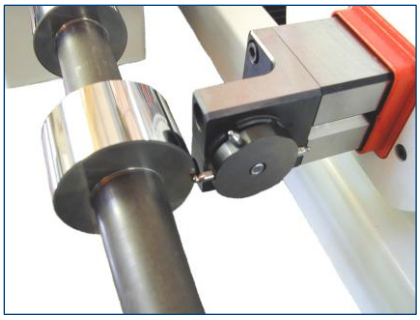
With the design being robust and wear resistant, and the software including temperature compensation, the machines are particularly suitable for use on the shop-floor. They can also be integrated into an automatic production line.

Measurement of geometries

Measurement of cylinders

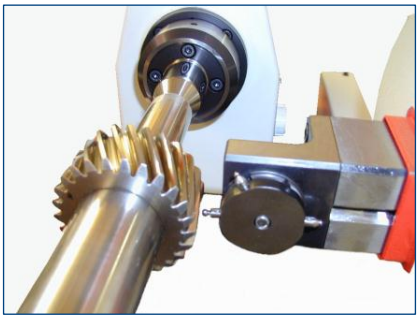


diameters

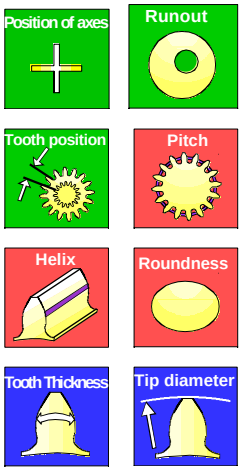


plane face

Measurement of gear and spline features



gears

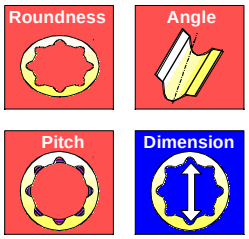


internal splines

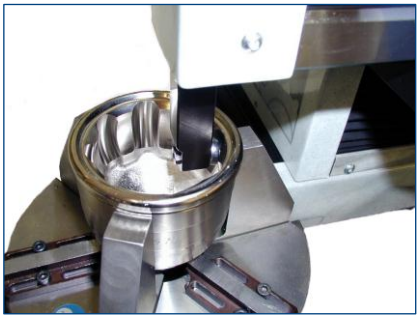
gear rim

tooth position

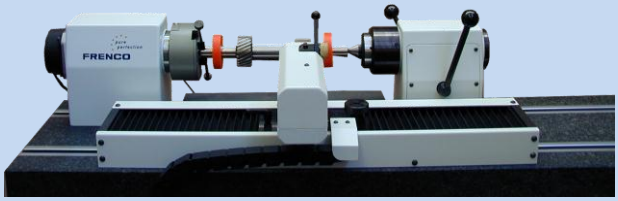
Measurement of ball tracks



ball track



Types of URM-K machines

Type	Specification	Image
URM-K HGM	horizontal with tip center manual	
URM-K HGAL	horizontal with tip center automatic light	
URM-K HGAS	horizontal with tip center automatic heavy	
URM-K VA	vertical automatic	

Technical data

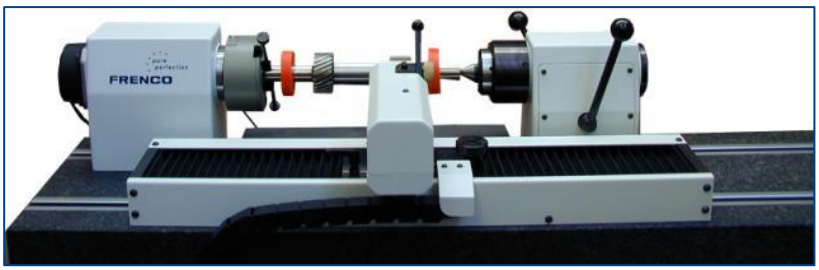
		HGM	HGAL	HGAS	VA
part	max. length / height	750 mm	750 mm	750 mm	300 mm
	max. external dia.	230 mm	230 mm	230 mm	300 mm
	min. internal dia.	-	-	-	40
	min. pitch circle dia.	20 mm	20 mm	30 mm	40 mm
	max. weight	15 kg	15 kg	30 kg	20 kg
measuring range	slide	65 mm	85 mm	85 mm	150 mm
	horizontal / vertical slide	400 mm	750 mm	750 mm	300 mm
measurement sequence	manual	●			
	automatic		●	●	●
clamping	between tips manual	●	●		○
	between tips automatic			●	
	with triple jaw chuck	○	○		●
calibration	profiled setting master	●	●	●	●
	ground shafts	○	○	○	○
change of balls	manual	●	●	●	●
	automatic		○	○	○

● standard ○ optional ☐ not available

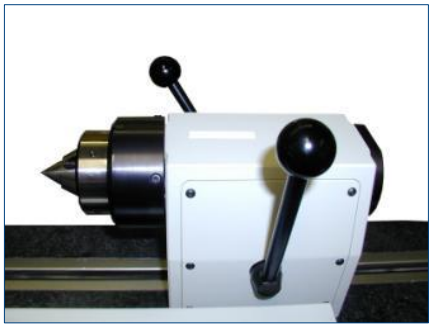
URM-K-HGM-manual

Manual rotation measuring instruments have 3 axes which are operated manually.

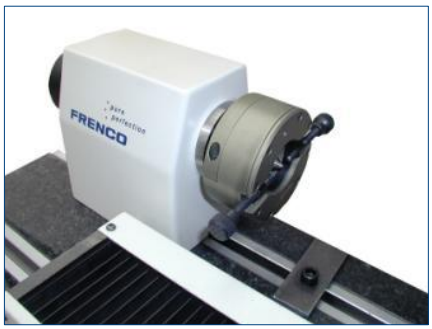
They are particularly suitable for random inspections during production.



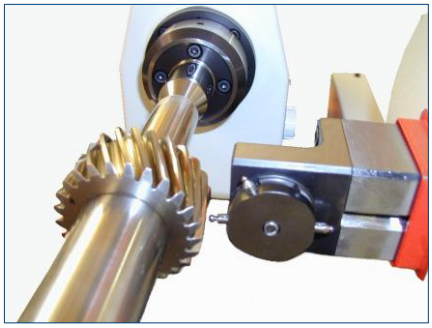
Details



Tailstock with hand lever for retraction and manual travel adjustment.



Spindle head with floating driver and encoder.

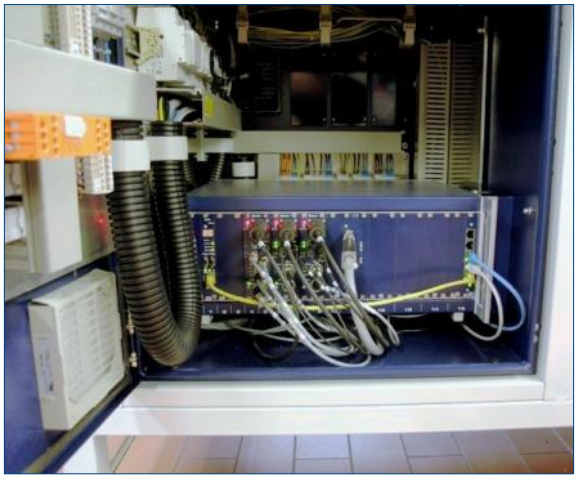


Turret with various ball diameters.

URM-K-HGAL-automatic

The three axes are NC-controlled.
A measuring program coordinates
the automatic measuring process.

Details



In-house developed measuring electronics
MEG 32. PC can be integrated.

Printer in workbench drawer

URM-K-HGAS-automatic

These devices feature three NC controlled axes and a tip center that can be programmed.

The tip center is pneumatically activated and can be integrated into the measurement process.

Details

Automatic turret

Automatic part ejection

Deposit and loading station

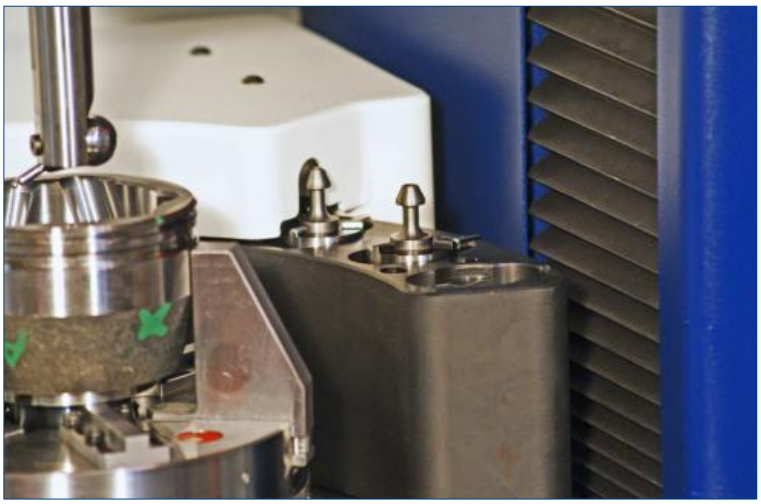
URM-K-VA-automatic

The vertical automatic URM-K instruments are delivered on a work bench, fully wired.

The vertical stroke is generated via ribbons equipped with a counterbalance for compensation.

Details

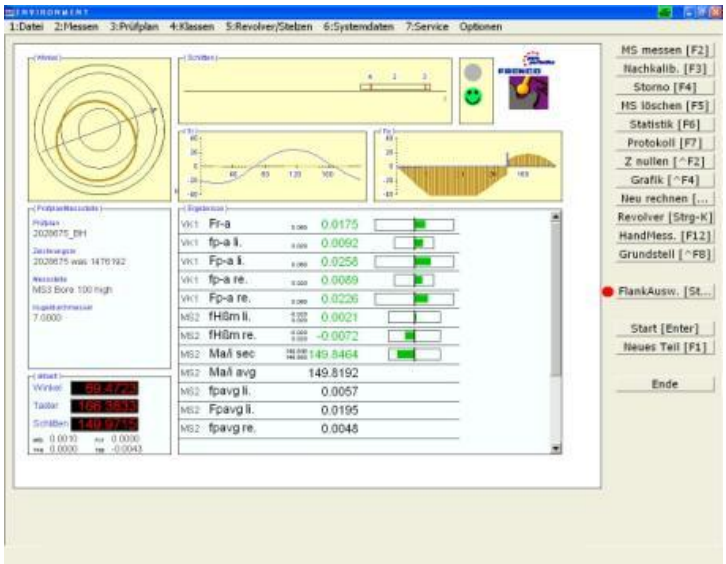
Measuring probe with two different ball diameters for internal contours



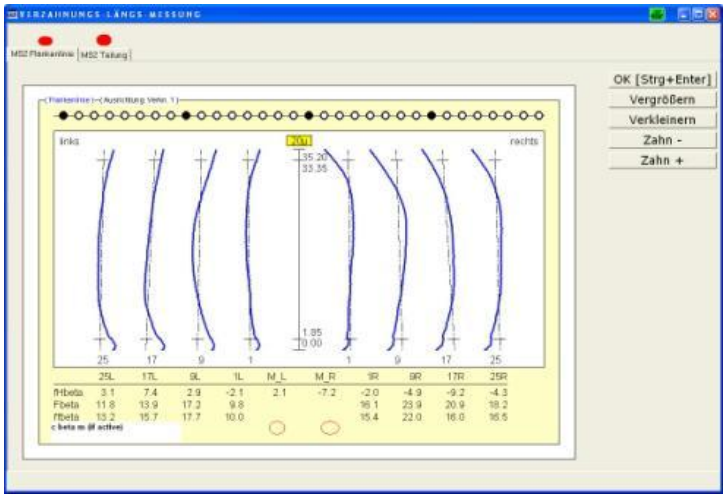
Magazine for automatic tool change

Software

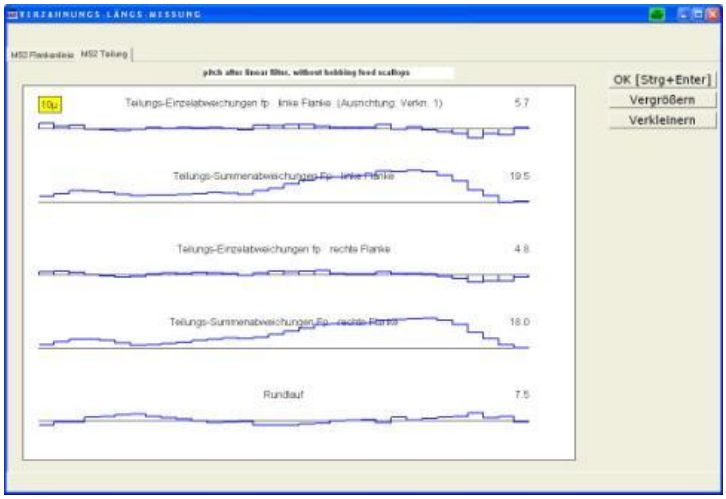
The URMK software is designed very functionally. All necessary information is displayed in a clear manner. With the measuring results being marked in colour and a tolerance bar being displayed, the workpiece can quickly be classified as fail or pass.



The helix evaluation is displayed in the usual way.



Likewise, the graphs of the single pitch deviation, total pitch deviation and runout deviation are displayed in the usual way.



Interfaces to your database and for qs-stat® are available.

Precision of measurement

FRENCO measuring instruments are always calibrated with artefacts. The calibration of the FRENCO inspection artefacts is carried out in our own DAkkS calibration laboratory. After calibration, these artefacts are measured 25 times with a FRENCO measuring instrument. Out of these measuring values the following statistical features are be calculated.

Repeatability:
The repeatability describes the range of measuring values around their average. It is calculated with this formula:

$$WBK = \pm 2 * k * s$$

k = factor to consider the number of measured values
(for 25 measuring values k = 1,32)
s = standard deviation calculated from the 25 measuring values

Max. deviation of measurement:
The. max. deviation of measurement describes the biggest deviation between one single measuring value and the actual value of the inspection artefact. It is calculated with this formula:

$$MA = \pm \text{Max}\left(|X_{Max} - X_{Normal}| \; ; \; |X_{Min} - X_{Normal}|\right)$$

X_{Max} = biggest single value out of the 25 measurements
X_{Min} = smallest single value out of the 25 measurements
X_{Normal} = actual value of the artefact

Thus the following example accuracies are calculated for a URM-K with automatic measurement process :

Spline feature		*Traceability**	*Max. deviation**
size over/ between balls average	MdK	±0.002	±0.0025 – 0.005**
size over/ between balls min/max	MdK	±0.003	±0.004 - 0.006**
eccentricity	e	±0.002	±0.002
runout	Fr	±0.004	±0.004
roundness	Fr-e	±0.003	±0.003
total index deviation	Fp / Fp-e	±0.004	±0.004
single index deviation	fp / fp-e	±0.003	±0.004
tooth position deviation	in degree	±0.005	±0.006
General features		***Traceability****	***Max. deviation****
internal or external diameter average	Ø	±0.0025	±0.005**
internal or external diameter min/max	Ø	±0.004	±0.006**
eccentricity	e	±0.002	±0.002
runout	Fr	±0.003	±0.003
roundness	Fr-e	±0.0025	±0.003
axial distance		±0.010	±0.050

*The coverage factor is k=2. The values are within the associated range of values with a probability of 95%.

**The max. deviation for size over two balls and diameter depends on the calibration.

Frenco Product Range

High Precision Gears and Splines

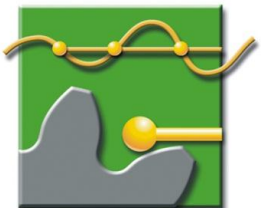
Gear and Spline Gauges
Master gears, Master wheels
Artefacts, Masters
Punches, Dies & Electrodes
Profiled Clamping Systems
Gear and spline manufacture

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

pure perfection

FRENCO

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gear + spline technology

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