



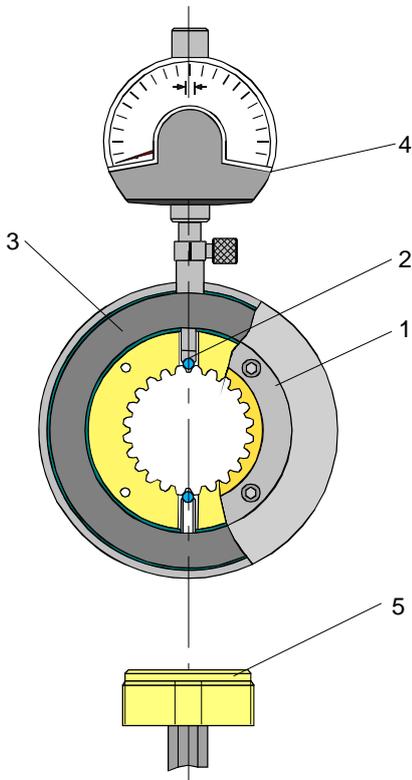
Users Manual

Indicating Spline Ring Gages Type AVM 1x1



1. The complete Indicating Spline Gage AVM 1x1

Indicating spline ring gages are precise gaging systems and should be handled with care. The instruments are delivered in assebled condition. Remove the protective coating from the surface of the ring and the setting plug.



- 1. Ring gage
- 2. Measuring insert with tungsten carbide balls
- 3. Floating ring
- 4. Frenco dial indicator or electronic readout unit
- 5. Setting plug min. actual
- 6. Control plug max. actual (optional)

The ring gage may be ordered to have a

- + Guiding spline profile only (black colour) , type AVMF
- + A go gauge profile identical to the sizes of the composite go gauge ring (ground surface), type AVML
- + A go gauge profile identical to the sizes of the composite go gauge ring with clearance in the front section (ground surface with front step), type AVML/F

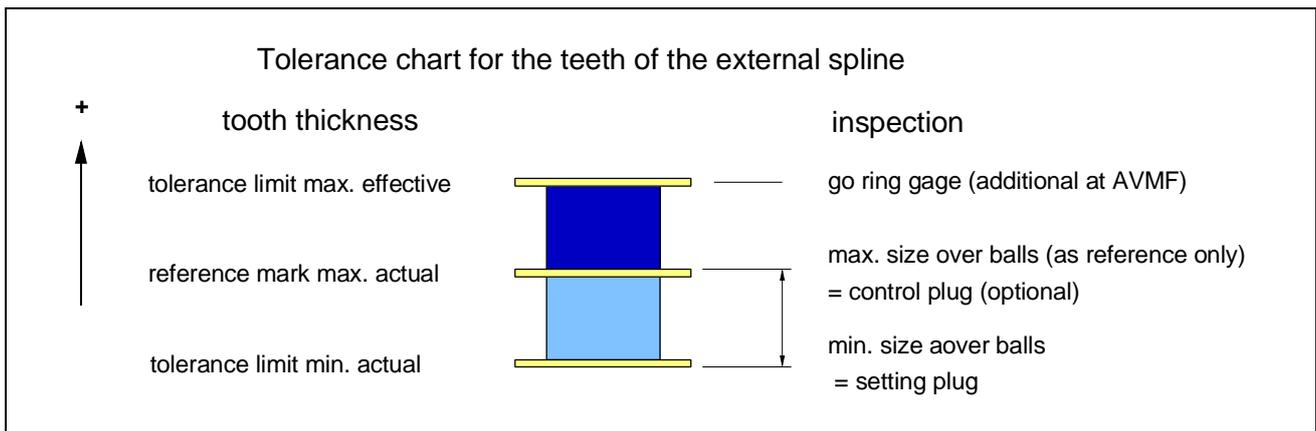
2. Design

The indicating gage has been designed specifically for the spline data of the part drawing submitted to this order. It does only fit this specified spline.

Type	Description
AVMF	If the ring gage has a guiding spline type AVMF , the instrument measures the size between balls, but not the go condition.
AVML	If the ring gage has a go gauge ring type AVML , it checks the go condition as well. If the ring does not fit the external spline of the part, the maximum effective tooth thickness is larger than the max. effective tolerance limit. In this case, the size over balls cannot be inspected, because the part does not fit the ring.
AVML/F	If the ring gage has a go gauge ring with clearance in the front section type AVML/F , the size over balls can be inspected even if the part does not fit the go gauge ring. It will enter the ring half way only.

The setting plug is designed to the minimum actual tooth thickness and represents the min. tolerance limit of the size over balls. This minimum setting plug is used to calibrate the gauge. If a control plug is delivered as an option, it is designed to the referenc mark of

the maximum actual tooth thickness. The control plug is used to control the measuring range of the gage.



3. Indicator or electronic probe selection

Frenco dial indicators have a limited range of travel, approximately 0,2 mm (.008"). Other indicators may be used but total travel should not exceed 0,5 mm (.020"). Indicators having too much travel may damage the measuring ball insert.

The measuring force required for the dial indicator is approximately 200 gramm to guarantee the proper function of the gage. This value is not common to most indicators. Electronic probes usually have a measuring force of 50 to 80 gr. This is too less. We recommend to always use a measuring force of 200 gramm and order dial indicators or electronic probes to this force.

4. Setting adjustment

Fit the setting plug min. actual in the ring gage. Carefully position the dial indicator or electronic probe until the indication shows a value close to " 0", which represents the tolerance limit of minimum size over balls.

The setting plug is made to the min. actual dimension over balls shown on the part print. Due to manufacturing variations, the setting plug will slightly vary from this size. For that reason, the setting plug is marked with 2 dimensions:

1. The min. actual dimension over pins as shown on the part print

2. The deviation from this size due to manufacturing variations

Example:

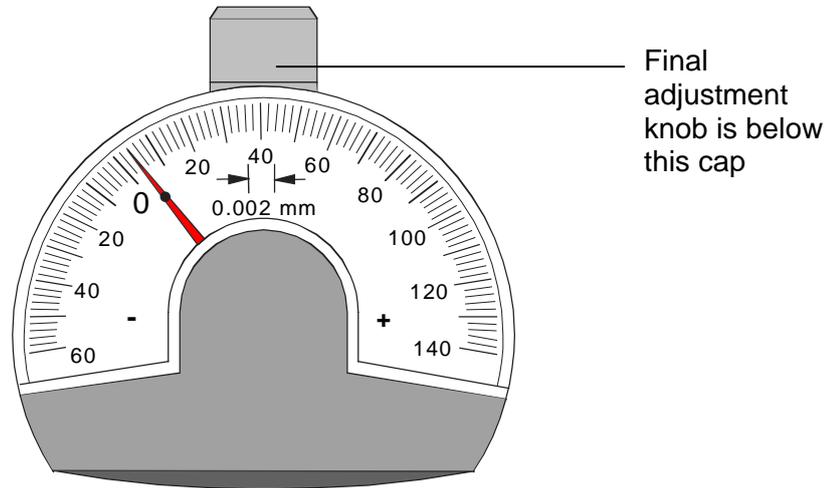
1. Part DOP 2,5 = 34,573 min.
(min. allowed dimension over 2,5mm dia pins or balls = 34,573)

marking:

2. Actual size = + 0,004
true size of setting plug deviates from the 34,573 mm dimension by + 0,004 mm, in other words, the size is 34,577.

The following setting procedure is necessary for above example:

As the setting plug shows a + 0,004 mm deviation from the min. actual size over balls, the needle is now set by the fine adjustment knob as shown below:



Indicator readings to the right of "0" represent plus deviations.

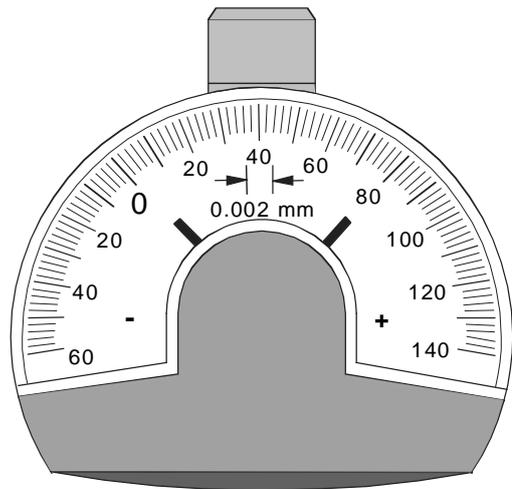
6. Checking the part

Set the tolerance signs on the dial indicator. The sign for the minimum actual tolerance limit is always set to the zero, because the setting plug is made to it and the deviation from the true size has already been corrected. The maximum actual tolerance sign does not represent a tolerance limit, but a reference mark. Set it as shown in below example:

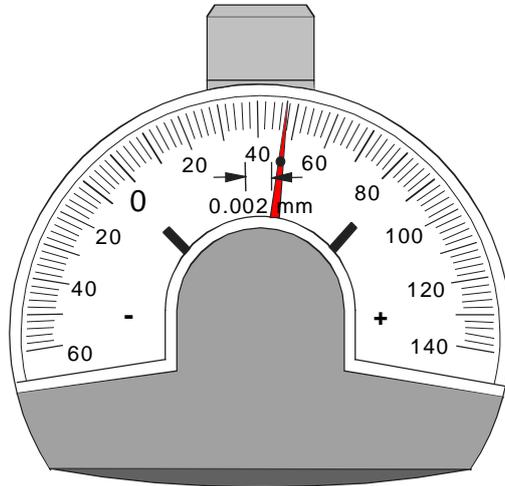
Example: DOP min. = 34,573,
DOP max. Ref. = 34,647

Set the tolerance sign for max. actual reference mark to:

DOP max. Ref.	34,647
- DOP min	<u>- 34,573</u>
=	+0,074



Fitting the gage over the part can be done in horizontal or vertical position. The size over balls will be shown on the dial indicator nearly without any movement of the pointer, even when the gage is moved in the part within the clearance. When the part is inside the gage, the dial indicator may show the following result and this indicates:



1.	The indicator reading provides the true dimension over balls, thus the deviation from the minimum actual size ($34,573 + 0,046 = 34,619$).
2.	The size over balls is larger than minimum tolerance limit which is ok.
3.	The size over balls is smaller than maximal reference mark and does not cause a problem
4.	Only at AVML, where the ring is a go gauge ring: As the go ring fits the part, the maximum effective size is inside the tolerance limit.

If the dial indicator readings are right of the max. size reference mark, the size of the parts come into a critical section. But the parts are ok as long as the go gage ring fits.

7. Cleaning

Indicating gages are precise measuring devices and a clean gage helps to get high accuracy. As the reading has 0,002 mm graduations, a clean part has advantages as well.

It may be necessary to clean the gage periodically. Use an air blast for easy cleaning and a cleaning fluid if desired. Cleaning fluids will not damage the gage. Where dirt effects the proper functioning of the gage and cannot be removed by these simple methods, we suggest returning the gage to us.

8. Trouble shooting

1. The Part does not fit the gage and the ring is a go gage ring AVML:

- part is too large or form errors are too large

Suggestion: Check the part over pins by use of a micrometer. If the size is within part tolerance, form errors are to blame. Use a analytical inspection machine to determine the kind of form error so to correct the source of the problem.

If this problem occurs often, it is possible to have us alter the go gage ring. Under this circumstance the front section of the go ring could be ground oversize to Type AVML/F in order to allow insertion and show size over balls even if the go gage does not fit.

2. The part does not fit the gage and the ring has a guiding spline AVMF

- The size and/or the form errors are much too large. The guiding spline is larger than a go gage ring and should fit in any case. Find the reason as shown in 8.1.

3. The part can be inserted, but the size over balls is left of "0"

- The size over balls is too small and therefore your part is out of tolerance.

Note: It may occur that you have to produce your parts undersize to allow your go ring to fit. The reason for it are exceeded form errors. They are that large that no tolerance is left for actual size. In this case check the tooling, your machine or the process.

4. The part fits the gage, but the size over balls is larger than the max. reference mark

- congratulations, you have less form errors than allowed. The contact area of the profile is better than specified

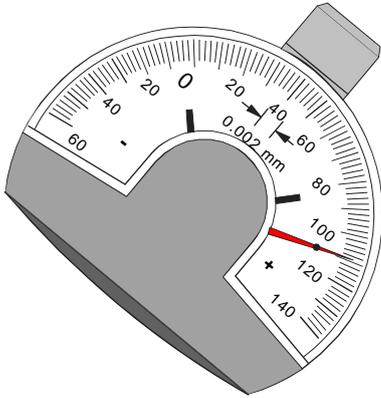
Suggestion: You may proceed as long as the go ring fits.

5. You do not get an indicator reading at all

- the spacer between the indicator shaft and the ball point is too short
- the dial indicator has to be positioned deeper into the gage
- the lower measuring ball insert in the floating ring has a wrong position

6. Readings do not repeat

- are you using the correct dial indicator or probe force of 200 gramm?
- are the screws of measuring insert and spacer fastened tight enough ?
- is the dial indicator or the probe working correctly?
- is the function of the indicating gage affected by dirt?
- is the part acceptably clean for inspection?



If you use the indicating gage in vertical position, be sure the dial indicator is close to upright 90° position.

← **This is wrong**

Note: If your problem does not apply to the items above and you require further assistance, please call us.

9. Wear

The go gage ring and the measuring balls are subject to wear. Wear flats will appear on the measuring balls even though they are made of tungsten carbide after a certain period of use.. The flats do not influence the accuracy, as the contact points are identical to the setting plug spline profile. If the flats become too large (more than 0,5 mm), the measuring balls should be replaced.

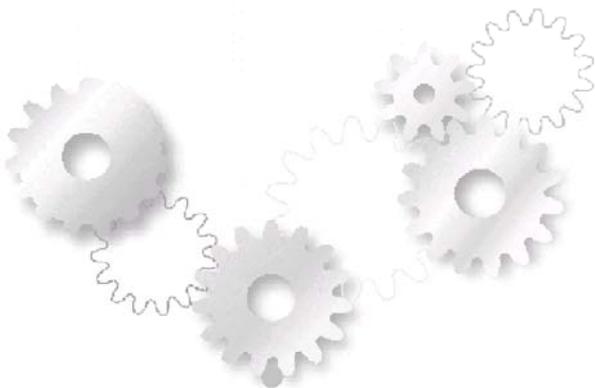
Gage wear should be checked periodically in accordance with normal practices. The gage drawing shows a worn size between pins and worn values for the form errors of the go ring age. When the go gage ring is larger than the worn dimension, or the form errors exceed the worn values, the go ring must be replaced.

Please order replacements according to the numbers supplied on the drawing. Frenco will refit your measuring insert to the new go ring at no additionally charge and in a short period of time. Order your parts in advance of your need. Allow 6 weeks minimum for a go gage and 4 weeks minimum for a new measuring insert.

The setting master has to be inspected periodically too. There is no worn size on the drawing. If the size changes after a period of use, the true size over pins has to be remarked. If the form errors increase due to wear, the setting plug may be reground.

The easiest way of handling the wear inspection is to send back the complete indicating gage to Frenco for wear inspection periodically.

If there are any additionally questions, please contact us.



FRENCO

Frenco GmbH

Verzahnungstechnik·Messtechnik

Jakob-Baier-Straße 3

D 90518 Altdorf, Germany

Tel.: +49 (0) 9187 9522 0

Fax: +49 (0) 9187 9522 40

E-mail: frenco@frenco.de

Web: www.frenco.de