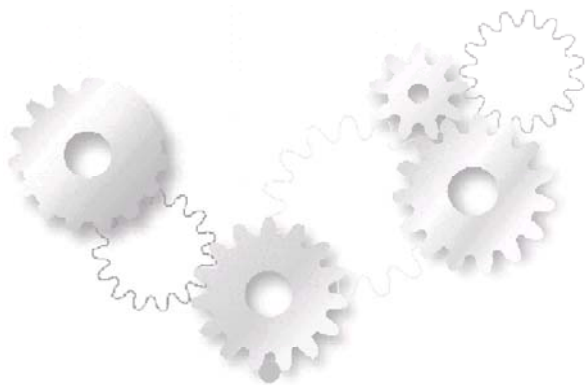




**Geared to ultra-high precision
for solid gages, tools
and prototypes**



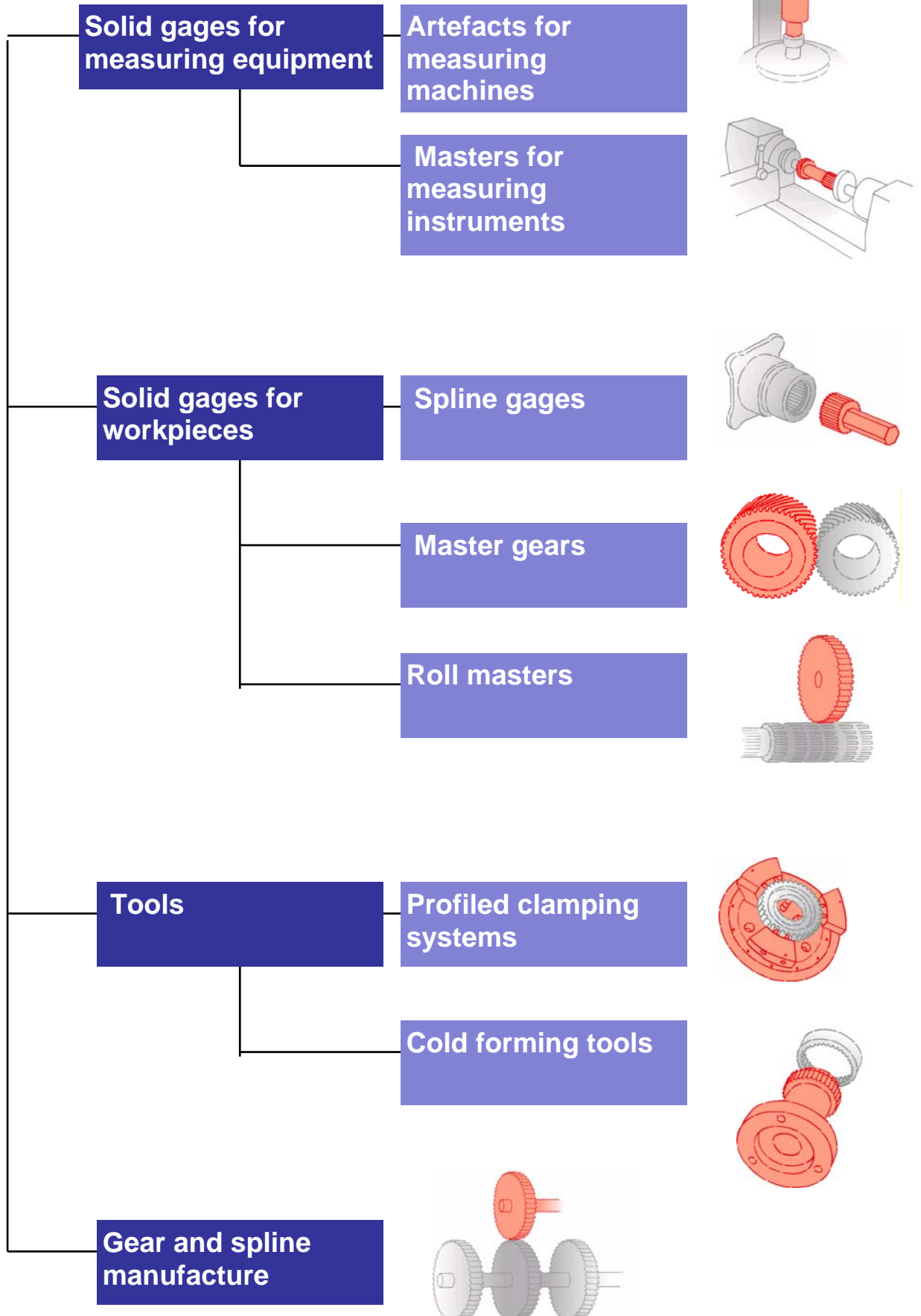
***Certified safety
for quality***



**pure
perfection**

FRENCO

Geared to ultra-high precision



Artefacts

Artefacts should embody all important geometric gear properties. These properties are calibrated and are traceable to national standards. Artefacts have the last word. Artefacts are used for calibration, acceptance and certification of measuring instruments. There are different artefacts available according to the specific measuring tasks and the spectrum of gear profiles to be measured. The closer the artefact is to the measuring task, the more reliable the traceability of the measurement.

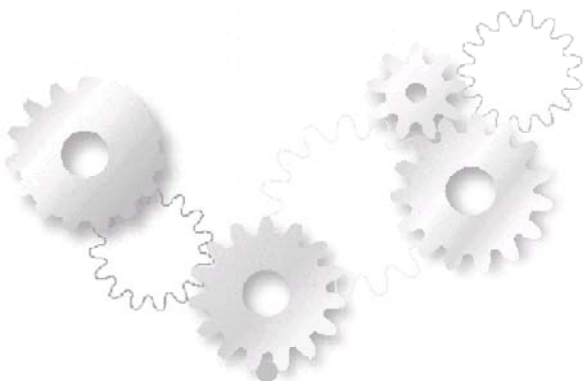


Profile and helix trace artefact



Internal gear artefact

Artefact for the calibration of URM measuring instrument



IC Artefacts

A new way of thinking about gear artefacts in modern times.



Artefacts should be geometrically similar to the specimens
(= identity condition)



IC Artefacts

Artefacts should embody all important gear features

Spur gears	+	Felical gears
Sector gears	+	Composite gears
Left flank	+	Right flank
A tooth space	+	Opposite tooth space
Even number of teeth	+	Odd number of teeth



Artefact combinations

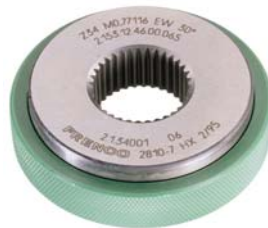
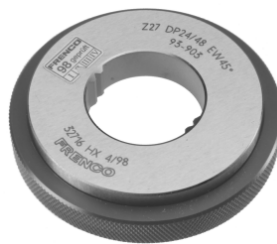
Profile deviation:	For spur gears and helical gears with 30° left and right hand helix angles.
Helix deviation:	For spur gears and helical gears with 30° left and right hand helix angles.
Index deviation:	For adjacent and total index.
Runout deviation:	For runout, axial position and roundness.
Size over two balls:	For odd and even number of teeth.

Masters

Masters are used for calibrating size inspection instruments for as they have a tooth profile identical with the specimen. Calibration masters are usually composite gears with just two tooth spaces. Multiple point measurement instruments (Frenco VM nx2) require composite gear calibration masters.

If size inspection instruments are used with mechanical dial indicators or sensitive displays, setting masters whose actual size is on the tolerance limit are sufficient. If electronic display devices and computers are used, a set of MIN-MAX setting masters is recommended, such that the electronic spread is also monitored.

Inspection masters are recommended for all profiled clamping systems. They serve to monitor function and accuracy.



Setting plugs

sector gears
composite gears

Setting rings

sector gears
composite gears

Inspection master for clamping systems

Profiled arbor and inspection master

Spline gages

Spline gages are described in several national and foreign standards and the international standard ISO 4156. All these standards deviate from one another.

The FRESCO INO system for spline gages represents a unified standard at the highest technical level.

Spline gages are available in various designs. You will find details in the brochure HPL "Spline gages".

Go and Not Go plug gages



Involute flanks



Serration flanks



Straight flanks

Go and Not Go plug gages



Involute flanks



Serration flanks



Straight flanks

Master gears

Master gears are available for single and double-flank gear roll inspection compliant with standards or without reference to standards.

FRENCO offers various designs. Even the most exacting demands are fulfilled.

Full details may be found in the special brochure HPRL "Master Gears".



Made out of gage steel HRc 60-62 not coated according to standard and the given qualities.



Made of tool steel coated with tip chamfers and with a FRENCO QF special tolerance certificate



Special designs satisfy every wish

Specialities



Master racks



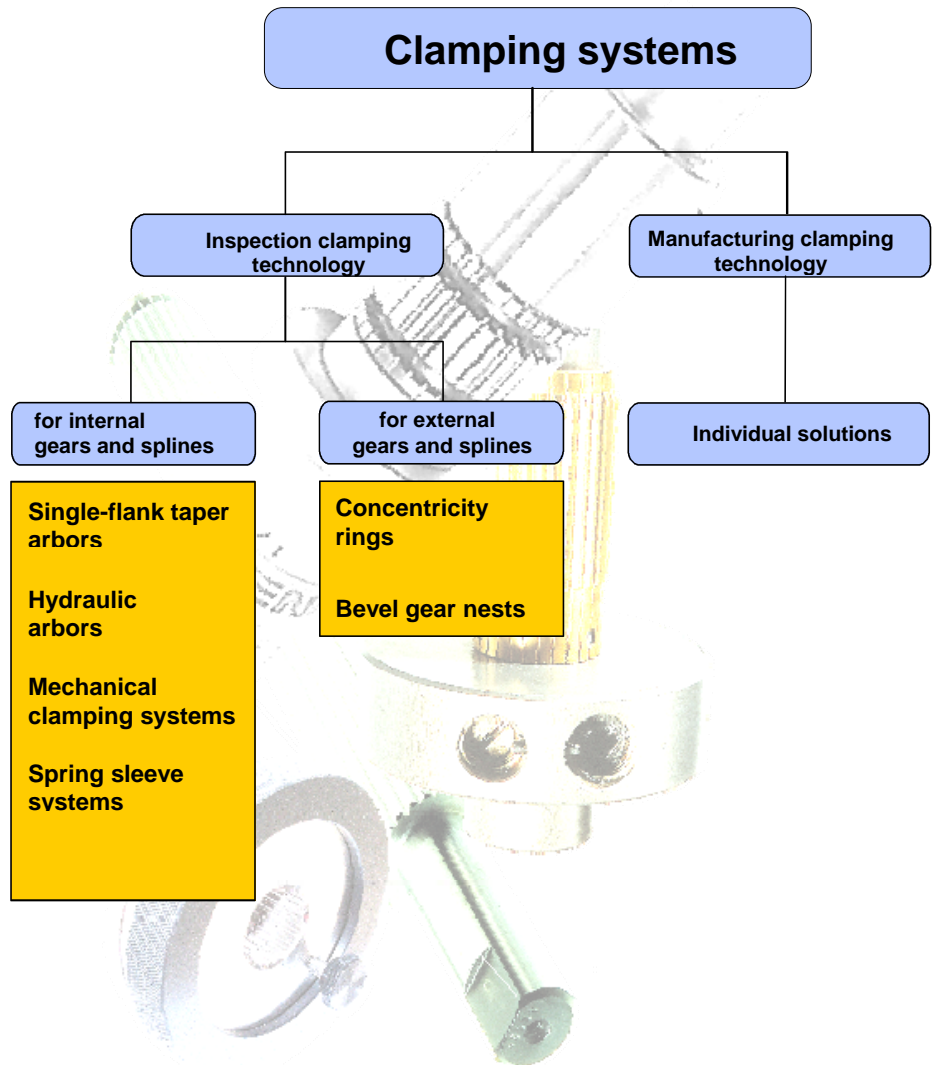
Master worms



Master ring gears

Profiled clamping systems

Clamping systems secure workpieces in the gear or spline profile where they are centered and clamped in the tooth flanks. Both testing operations as well as machining processes are possible relative to the tooth flank datum. Arbors are used for internal gears and splines and chucks for external gears and splines. The design of these clamping devices is diverse in its implementation. Various clamping methods may be suitable depending on the task at hand. Selection of the most appropriate methods requires expertise and knowledge. Both are offered by the FRENCO specialists as a result of their many years of research and experience. The basic selection of the clamping methods should only be undertaken by specialists.



One flank taper mandrel



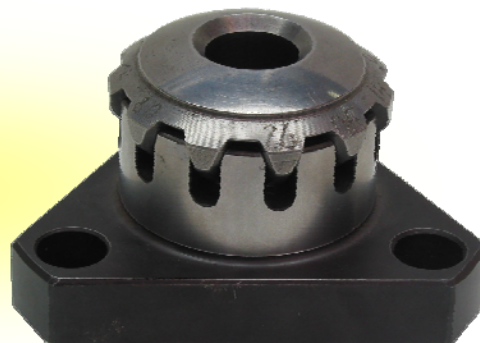
Hydraulic arbors



Concentricity rings



Bevel gear nests



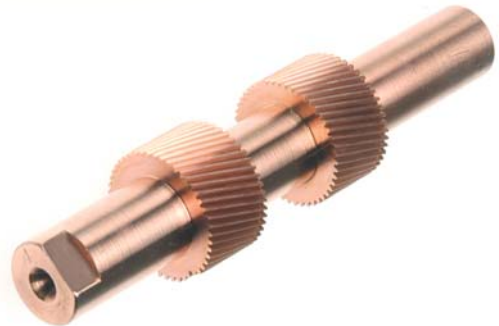
Cold forming tools

Profiled punches and dies are suitable for the manufacture of gears/splines without fixtures. The accuracy of these tools is transferred to the workpiece.

Allowance for shrinkage processes are built into the tool. In the case of electrodes, defined spark gaps are taken care for. Electrodes may be made of copper or graphite.



spur and helical profiles



external or internal profiles



Gear and spline manufacture

Gears of a quality higher than quality grade 5 are difficult to produce with normal methods and manufacturing equipment. FRENCO commercially manufactures spur and helical gears in DIN Q3 and Q4 precision.



Gear/spline manufacture is possible within the following dimensional ranges:

max. part length	Grinding external profile		560 mm
	Grinding internal profile		300 mm
	Wire EDM		200 mm
max. profile length	Grinding external profile		500 mm
	Schleifen internal profile	pitch circle up to 30	70 mm
		pitch circle up to 60	110 mm
		pitch circle up to 150	150 mm
max. conducting diameter	Wire EDM		200 mm
	Grinding		300 mm
	Wire EDM		220 mm
max. pitch circle diameter	Grinding external profile		300 mm
	Grinding internal profile		approx. 250 mm
	Wire EDM		approx. 210 mm
min. pitch circle diameter	Grinding internal profile		16-18 mm
max. part weight	Schleifen		50 daN
	Wire EDM		100 daN
Materials	Grinding		steel
			copper
			graphite
	Wire EDM		steel
			copper
Gear/spline accuracy	DIN 3962		non-ferrous
	DIN 5480		Q 3
			Q 3
Inspection machines	Klingelnberg PNC 35		
	Höfler EMZ 402		

FRENCO Product Lines



Gear and spline high precision

Spline Gages
Master Gears, master wheels
Artefacts, masters
Profiled tools
Clamping systems
Gear and spline manufacturing



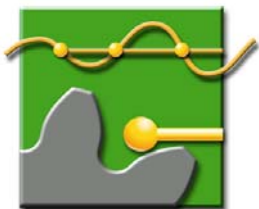
Instruments for size inspection Series V

Ball inserts and pins VRK
Instruments for rocking VA
Instruments with face stop VP
Indicating Gages VM
Variable 3-Disc Gages VD
Customized solutions VS



Rotation Measuring Systems

URM - K with balls and pins
URM - R with master wheels
EWP Single flank gear rolling
ZWP Double flank gear rolling
WS Gear Rollscan



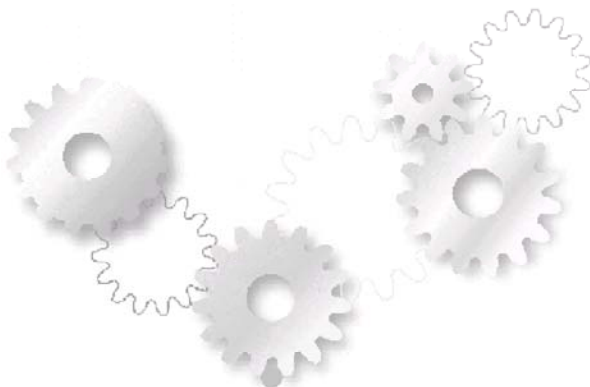
Gear and spline inspection

DKD gear calibration
Gage wear inspection
Part inspections
Deviation analysis



Know-how transfer

Software for gear and spline calculating
Training, seminars and workshops
Consulting and calculations
Literature and documents
National and international standards



FRENCO

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