

Gear and Spline Manufacture

Precision begins with one piece

 *pure
perfection*

FRENCO

Welcome to the World of Gearing

FRENCO produces gears and splines made to specification and in small batches.

FRENCO is specialised in high-precision gearing.

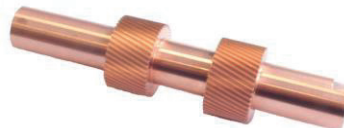
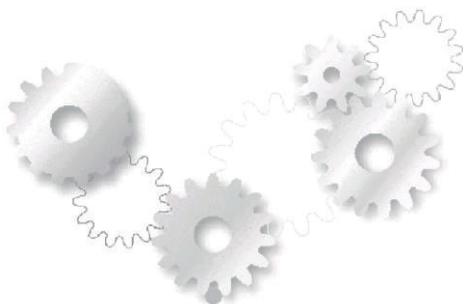
In cooperation with our partner company, we offer the production of complete parts to your specifications.

Benefit from our extensive experience with gears and splines. After all, who doesn't like to have a partner who has made "pure perfection" his business and achieves it every day?



*pure
perfection*

FRENCO

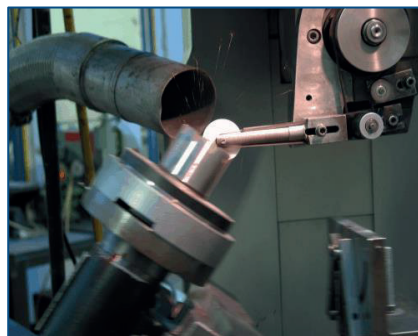
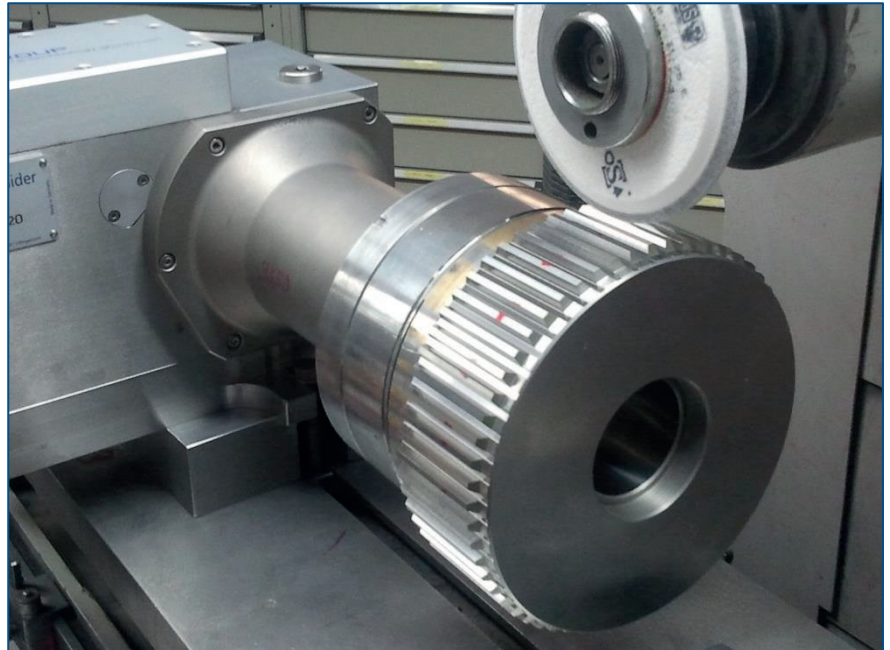


Gear and Spline Manufacture

Grinding of special tooth profiles

Even today it is often advantageous to manufacture spur toothed profiles using semi-automatic grinding processes.

That, however, demands high expectations from the grinding specialists. The interaction of machine, metrology and grinding specialists generates tooth profiles with micron precision.



Max. workpiece length	external gear/spline		560 mm
	internal gear/spline		300 mm
Max. profile length	external gear/spline		500 mm
	internal gear/spline	pitch circle to 30	70 mm
	internal gear/spline	pitch circle to 60	110 mm
	internal gear/spline	pitch circle to 150	150 mm
Max. through hole diameter			300 mm
Max. pitch circle diameter	external gear/spline		300 mm
	internal gear/spline		approx. 250 mm
Min. pitch circle diameter	internal gear/spline		16-18 mm
Max. workpiece weight			50 kg
Material			steel, copper
Tooth profile accuracy	DIN 3962		Q3
	DIN 5480		Q3

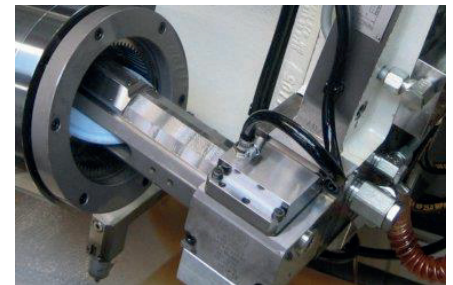
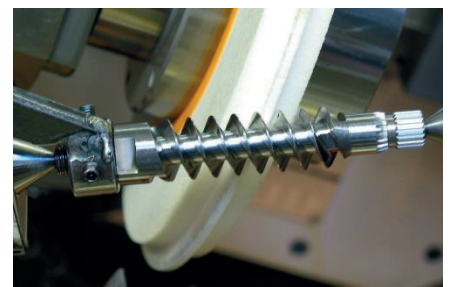
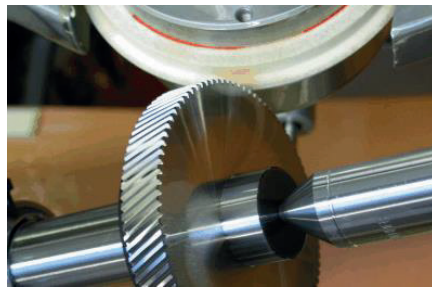
NC Grinding of External and Internal Gears/Splines

NC grinding of the profiles is carried out on a KAPP VUS 55 P and a VUS 57 P machine. These machines have been improved specifically to meet FRESCO's requirements for high precision. Both dressable grinding wheels and CBN grinding wheels are used to grind internal and external tooth profiles.

Specially developed software modules allow the machining of worm gears.

Topological grinding of unusual modifications is also possible.

Grinding of internal profiles of the highest quality requires workpiece-specific mounting fixtures and grinding arms, which makes a consultation with FRESCO's specialists necessary.



Max. workpiece length	external gear/spline	750 mm
	internal gear/spline	upon consultation
Max. profile length	external gear/spline	700 mm
	internal gear/spline	upon consultation
Max. pitch circle diameter	external gear/spline	450 mm
	internal gear/spline	upon consultation
Max. workpiece weight		50 kg
Material		steel, titanium
Tooth profile accuracy	external gear/spline	Q2 (DIN3962)
	internal gear/spline	Q3 (DIN3962)

High Precision Wire Eroding

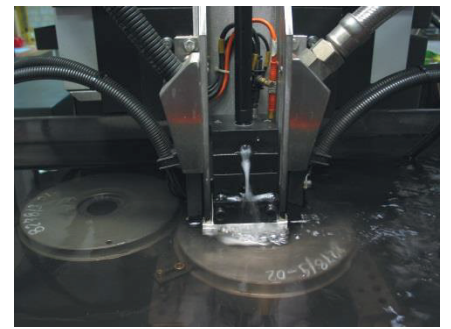
The wire erosion machines are tuned to high precision through sophisticated technology. They are positioned in a fully climatized room. In combination with the

know-how of the operating staff, this results in a fantastic composition, which leads to a brilliant blend of unimagined accuracy.

The extraction hoods provide a constant air humidity

The air temperature is monitored in several places within the room, particularly in the vicinity of the EDM machine.

The temperature of the machine is kept at a constant level via an internal water cooling system.



Max. workpiece size	X=800 mm Y=350 mm
Max. working volume	X=320 mm Y=220 mm
Max. workpiece height / profile width	Z=150 mm
Max. pitch circle diameter	approx. 210 mm
Wire diameter - Standard	0.25 mm
Wire diameter - Special	0.10 mm
Material	Steel, copper, non-ferrous metals
Max. workpiece weight	40 kg
Tooth profile accuracy	Q3 DIN 3962 Q3 DIN 5480

Pre-Machining



FRENCO has specialised in the manufacture of gears and splines. The pre-fabrication process is carried out by our partner company Munkert GmbH. Munkert is specialised in individual high-precision components and small batches and stands out due to their state-of-the-art production engineering and an experienced and highly qualified team.



The equipment includes NC lathes, 4-axis CNC milling machines, a

5-axis CNC machining centre with high-speed spindle and the necessary Mastercam X2 system as well as highly precise grinding machines for internal, external cylindrical and surface grinding processes.

A Zeiss Prismo Navigator with gearpro Software is, amongst others, available for quality assurance purposes.



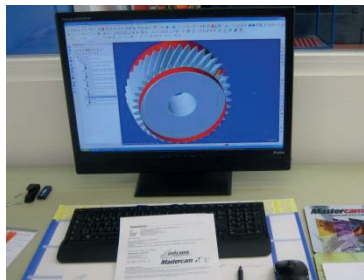
Turning



Cylindrical grinding



Surface grinding



CAM



4- or 5-axis milling

Machining	Dimensional range
Sawing	max. \varnothing 200
Turning, conventional	max. L 1000, max \varnothing 300
Turning, NC	max. L 1500, max \varnothing 250
Milling, conventional	max. 300x200x400 oder 5-Achsfräsen
Milling, NC 4-axis	max. 800x500x540
HSC milling, NC 5-axis	max. 600x600x500
CAM Mastercam X2; Interfaces:	ASCII, DXF, DWG, IGES, STEP
Surface grinding	max. L 600 x 300
Cylindrical grinding, conventional	max. L 600, max. A \varnothing 250 I \varnothing 200
Cylindrical grinding, NC	max. L 1000, max. \varnothing 350
Centre grinding	max. L 600
Out-of-round grinding	max. L 1000, max. \varnothing 350

Inspection

After the manufacturing process, each gearing profile is thoroughly inspected. An inspection certificate guarantees the faultless condition and gives detailed measurement results.

There are three Klingelberg gear measuring centres, one Zeiss CNC co-ordinate measuring machine Prismo Navigator 7 HTG with rotary table, one ULM length measurement machine and a combined roughness and contour measurement device by Mahr.

You can rely on our inspection! After all, FRENCO has the experience of an accredited DAKKS conformity assessment body.



FRENCO GmbH Javelin-Str.2 D-40818 Abbotsbury Phone +49 (0) 201 9220 Fax +49 (0) 201 9220

Symbol	Designation	External
Pa	pitch profile deviation	
Pr	profile slope deviation	
Prs	profile form deviation	
Fp	total pitch deviation	
Fr	total form deviation	
Ft	total circular deviation	
Fp1	total circular pitch deviation	
Fp2	total circular form deviation	
Fp3	total circular profile deviation	
Fp4	Fp right flanks	
Fp5	Fp left flanks	
Fp6	single pitch deviation	
Fp7	Fp right flanks	
Fp8	Fp left flanks	

Traceability
All measuring equipment used is traceable to standards. The below standards are verified against national PTB or NMI/ISO calibration measures periodically.

Length	Applied	Traceable to
Set gauge blocks	20-400 2PC 95	Messer mit 1407 PTB 07
Coordinate measuring machine	ZEISS PRISMO 7	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB
Profile measuring machine	SK-000 PTB 09	density to national standards of PTB

Measuring uncertainty
All measurements are carried out at a temperature of 20°C ± 0.2 with a humidity of 90% ± 10%. The measurement of the actual size and individual form deviations has an uncertainty of below values (k=2). The measuring uncertainty was determined by GUM with double standard deviation.

Measured parameter	0.05 mm	0.02 mm	0.01 mm
Major diameter	± 0.002	± 0.001	± 0.001
Minor diameter	± 0.002	± 0.001	± 0.001
Individual form deviation	± 0.002	± 0.001	± 0.001

Measured values are found to be correct and will not be rejected if they are within the allowable tolerance and within the tolerance imposed by the measuring uncertainty.

DKD Calibration laboratory for gear standards DAKK-27401

FRENCO pure perfection

Certificate

new condition

name	type	customer
Motor	25 (0.200)	NIMET
Drawing number	48736	
customer part no.	101	

part name: National Motor/Teil mit 423P x 172 x 82/14 - Q3 - 20N 2070 - mit 4.685

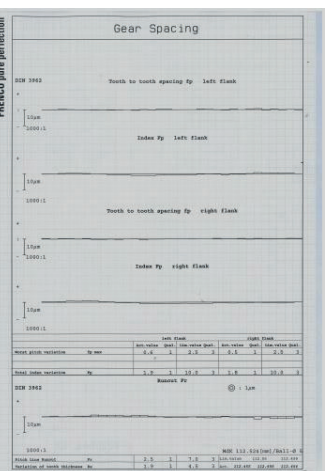
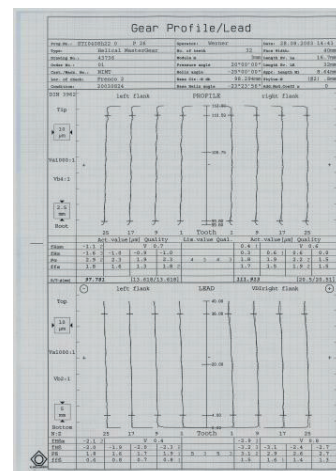
size and tolerance	actual size
major diameter	11.824 ± 0.035 *
pitch diameter	5.8900
pitch error 2 pitch	112.455 *
minor diameter	96.800
diameter of bore	32.000 ± 0.087
	32.001

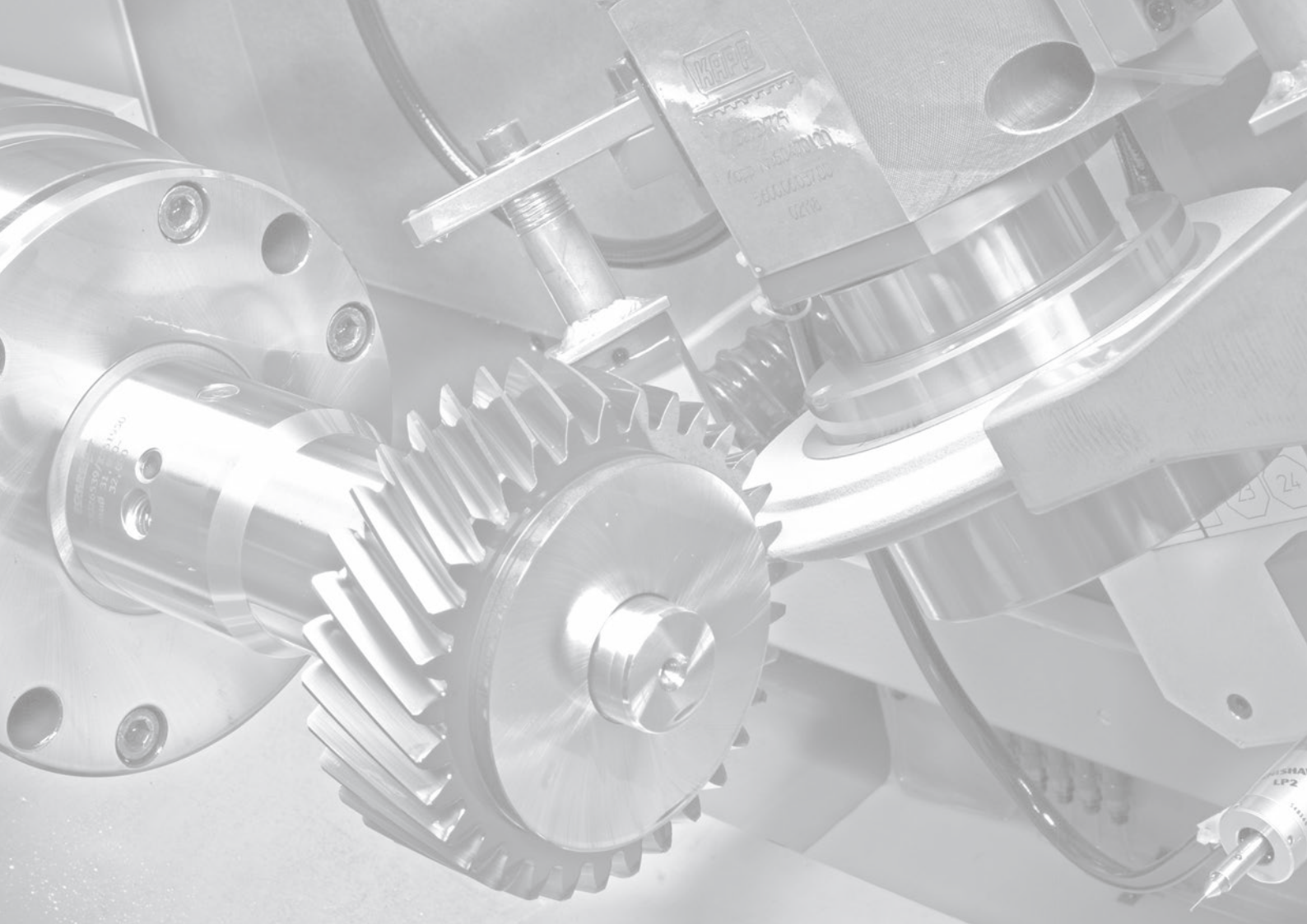
parameter	error allowance	measured value
total circular deviation	Ft	4.0 2.9 2.2
total form deviation	Ff	5.0 1.9 3.1
total circular deviation	Ft	7.0 -- 2.5
total pitch deviation	Fp	10.0 1.9 1.8
single pitch deviation	fp	2.5 0.6 0.5
runout (circular run)		3.0 -- 2.0

Final result:
All results of measurement are within the given tolerance.

* The tolerance is exceeded.

FRENCO pure perfection





Pure Perfection. Since 1978.

Experience, competence and innovation in gear metrology.



Our Products:

Spline Gauges | Toothed Artefacts and Masters | Master Gears |
Tools and Clamping Systems | Size Inspection Instruments |
Double Flank Gear Inspection | Gear Flank Analyser | Universal
Measuring Machines | Rack Inspection Machines | Software

Our Services:

DAKKS Calibration | Gear and Spline Inspection |
Gear and Spline Manufacturing | Seminars | Service |
Support and Calculation

Phone: +49 (0) 9187 95 22 0

FRENCO GmbH

Gear + Spline Technology

Jakob-Baier-Str. 3 • D - 90518 Altdorf

www.frenco.com



FRENCO