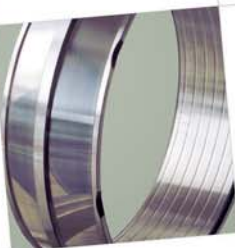


**supfina**

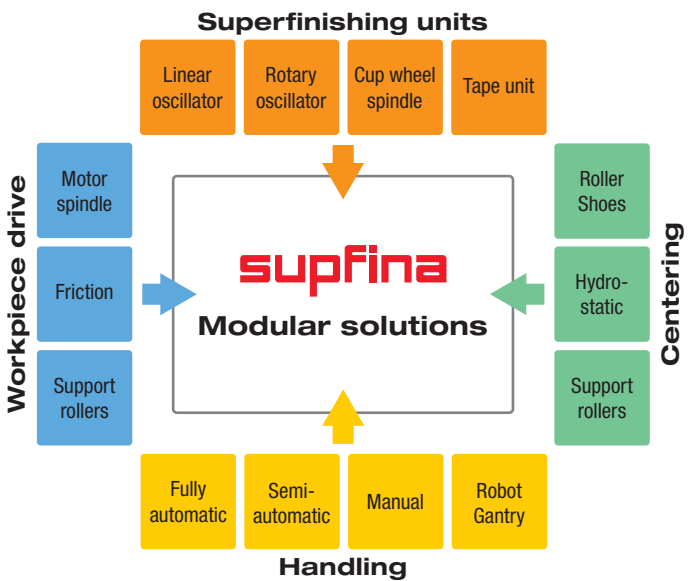


## Superfinish for the antifriction bearing industry





## Modular solutions



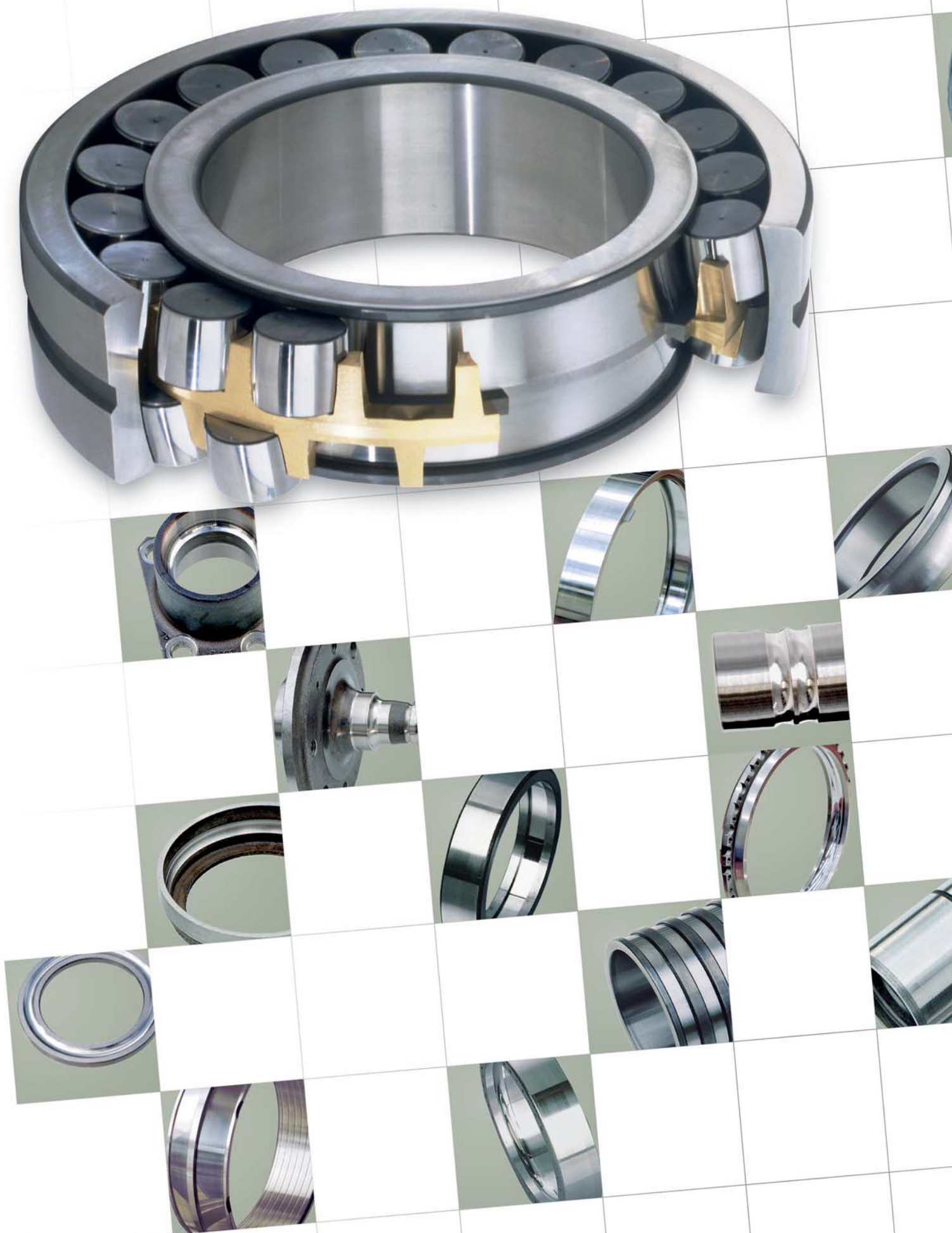
The tasks defined by our customers are multifaceted – the modular concepts of the Supfina machines for the antifriction bearing industry always offer the suitable solution.

Based on the given production environment and the incoming condition, we combine the modular assemblies

- Superfinishing units
- Centering systems
- Workpiece drives
- Handling systems

to a powerful Superfinishing machine.

Here, we rely on components which unite our decades of experience and the latest state of technology. Our modular solutions guarantee fast return on investment, today and in the future.





## **Superfinish improves the functionality and the life of bearing components**

Increasing quality demands on functionality, safe operation, service life, efficiency and reduced noise require a continuous improvement of manufacturing technology. Here Superfinishing plays a crucial roll as the last and decisive step for the final product quality.

## **Improvement of bearing lubrication**

Superfinish generates constant surface characteristics in a very consistent way. The resulting surface structure (plateau) with a high material ratio and optimum lubrication properties will be maintained during the entire service life of the bearing. The cross-hatch pattern generated by the Superfinishing process leads to a favorable distribution of the lubricant. Thanks to the 2-step process, plateaus with a large bearing ratio are generated while intersecting channels are maintained for the oil retention.

## **Improvement of the workpiece geometry**

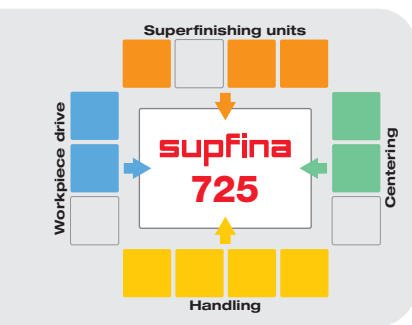
In Superfinishing, the contact between the tool and the workpiece is always defined by an area rather than a line or point as in grinding or turning. Consequently, roundness errors, waviness, form and profile are improved considerably.

## **Optimization of the workpiece boundary layer**

During grinding and precision turning, structural changes of the material can be triggered due to high temperatures and cutting forces. The resulting soft skin has a negative effect on function and wear of bearing elements. Superfinishing however removes the damaged surface layer completely so that the sound, indelible material will become the supporting surface. At the same time, a compressive stress is induced to the upper layer which prevents pitting and crack propagation.

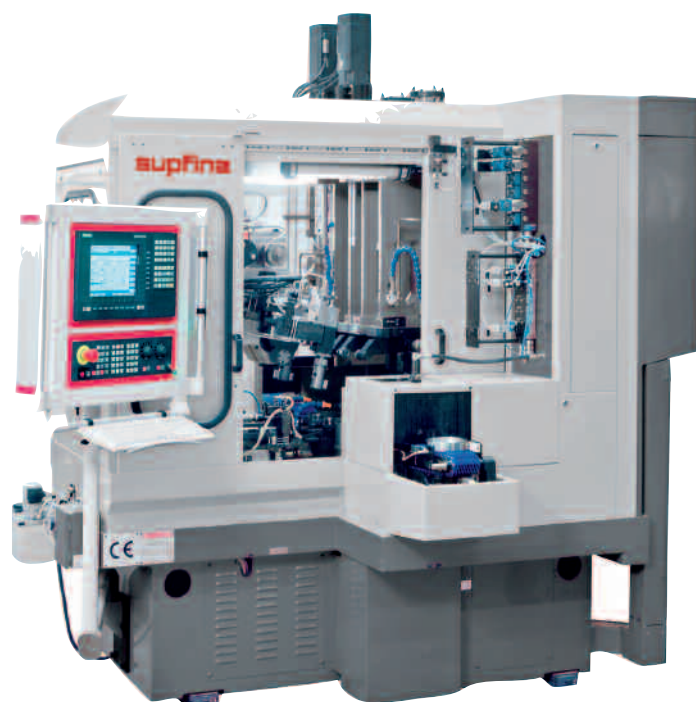
## **High profitability**

The implementation of Superfinishing can make expensive hard machining processes like precision turning, precision grinding or lapping obsolete. In addition to that, Supfina technologies are able to finish fine- or hard-turned surfaces, eliminating the need for grinding.



# Superfinish

## Machining of roller bearings inner and outer rings



- Machining of any type of profile like e.g. concave, convex, straight, spherical and logarithmic with the patented NC-controlled superimposed stroke
- Infinitely adjustable oscillation frequency
- NC-controlled pressure rollers
- NC-controlled centering device
- Automatic or manual loading and unloading
- Control with digital drives for linear and rotary motions
- One- or multi-step operation method with 2/3 way stone indexing device
- Vertical spindles and actively controlled workpiece handling to avoid damages
- Optional flange, shoulder and IR bore operation
- Optional IR flange and OR outer diameter finishing with tape

### supfina 725

Type:	Workpiece Ø:	Workpiece width:
A	50 – 320 mm	8 – 100 mm
B	100 – 650 mm	20 – 200 mm
C	600 – 1200 mm	50 - 400 mm

## Our system features → your benefit

### NC-controlled Superfinishing units

- Adjustment of the oscillation frequency optimized for the respective cycle
- Patented superimposed stroke for Superfinishing of any profile type

### Stone indexing device for two- or three-step process

- Generation of optimized bearing surface quality
- Extended tool live

### One or optionally two operating stations with servo driven spindles

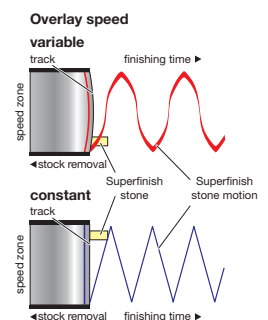
- Improved torque and speed characteristics
- Reduced cycle time
- Additional productivity through second station

### Flexible, infinitely adjustable centering systems

- Fast setting process
- Range tooling with only few exchange parts

### Large working range and versatility for different workpiece types

- Suitability for small and medium size batches
- Built-in capability to cope with future changes in your product range



The Supfina 725 combines the well-established vertical arrangement of the workpiece spindles with Superfinishing units optimized for the various machining operations around cylindrical and taper roller bearings. The ingenious design also supports Superfinishing of spherical roller bearings.

Tape finishing units for flange or outer diameter as well as cup wheel spindles for the flange operation can be combined with powerful linear oscillator systems for raceway finishing.

Regarding the Superfinishing operation, the Supfina 725 is the perfect choice – this also applies to the auxiliary functions centering, workpiece drive as well as loading/unloading.

In every case, precise and at the same flexible modules are available which can be adjusted to a new workpiece quickly while requiring only a minimum of type dependent tooling. Through the intelligent use of NC-controlled adjusting axes, set-up times of less than 15 minutes are achieved.

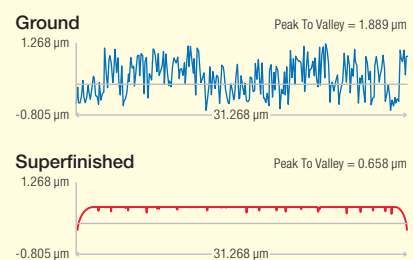
*With the patented Supfina NC superimposed stroke, raceways with any given profile (e.g. crowning of 15 µm) can be operated.*

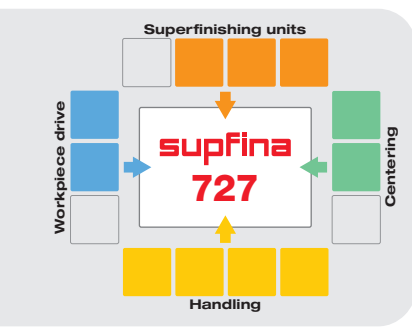
### Tapered roller bearing outer ring, double row



Ring outer Ø : 180 mm  
Raceway Ø : 150 mm  
Raceway width approx.: 42 mm each  
Ring width: 150 mm

Material: hardened bearing steel  
Roughness Ra: 0,07 µm  
Roundness: < 1,5 µm





# Superfinish

## Machining of ball bearings inner and outer rings



- NC controlled rotary oscillator to produce the desired surface (plateau)
- NC controlled, infinitely adjustable oscillating angle/amplitude optimized for the respective cycle
- Automatic infinitely adjustable contact angle
- Infinite adjustment of oscillation frequency
- NC-controlled pressure rollers
- NC-controlled roller centering device
- NC controlled hydrostatic mandrels for bore centering
- Automatic or manual loading and unloading
- Control with digital drives for linear and rotary motions
- One- or multi-step operation method with 2 way stone indexing device
- Vertical spindles and actively controlled workpiece handling to avoid damages
- Optional IR flange and OR outer diameter finishing with tape

### supfina 727

Type:	Workpiece Ø:	Workpiece width:
A	50 – 320 mm	8 – 100 mm
B	100 – 650 mm	20 – 200 mm



## Our system features → your benefit

### NC-controlled Superfinishing units

- Fast setting through automatic contact angle adjustment
- Optimum quality due to automatic adjustment of the oscillation frequency and amplitude, optimized for the respective cycle

### Stone indexing device for 2-step process

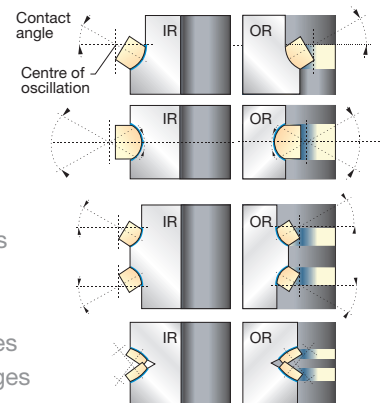
- Generation of optimized surfaces with high bearing ratio and good lubrication
- Extended tool life

### One or optionally two operating stations with servo driven spindles

- Improved torque and speed characteristics
- Reduced cycle time
- Additional productivity available through second station

### Flexible, infinitely adjustable centering systems

- Fast setting process
- Range tooling with only few exchange parts
- Large working range and versatility for different workpiece types**
- Suitability for small and medium size batches
- Built-in capability to cope with future changes in your product range



Deep groove and angular contact ball bearings are the domain of the Supfina 727. This machine comes with vertical workpiece spindles and Superfinishing units which have been tailored to the demands of the application. Due to the automatic contact angle adjustment, the Supfina 727 features multi-step Superfinishing of double row angular contact bearings and gothic profiles.

Tape finishing units for grinding shoe mark removal as well as cup wheel spindles for the flange operation can be added to the powerful rotary oscillator raceway finishing systems.

The Supfina 727 is the optimum equipment for the requirements of today and tomorrow, also when it comes to the auxiliary functions centering, workpiece drive and loading/unloading. Highly accurate and at the same flexible modules are available which can be adjusted to a new workpiece quickly while requiring only a minimum of type dependent tooling. Through the intelligent use of NC-controlled adjusting axes, set-up times of less than 15 minutes are achieved. The modular structure and high flexibility of the machine allow for the Superfinishing operation of different raceway locations and geometries in a single clamping.

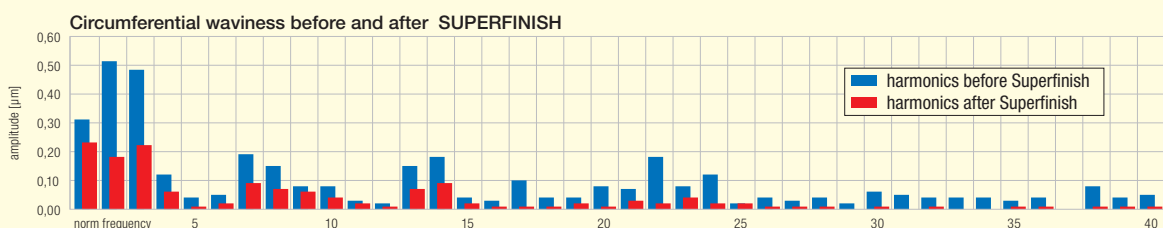
*The versatile concept is designed for IR and OR of various bearing types.*

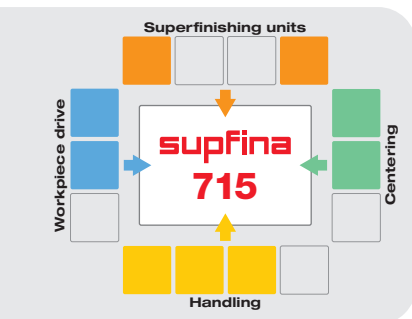
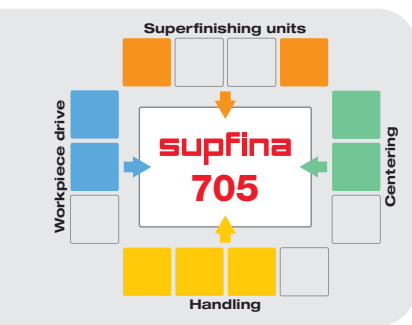
### Angular contact ball bearing inner ring



Ring Ø approx.: 220 mm  
Raceway Ø approx.: 205 mm  
Raceway radius approx.: 21 mm  
Ring width: 50 mm

Material: hardened bearing steel  
Roughness Ra: 0,03 µm  
Roundness: < 1,0 µm  
Profile error: < 1,2 µm





# Superfinish

## Machining of roller bearings inner and outer rings

The Supfina Race 705 and Race 715 are designed for the Superfinishing operation on raceways of roller bearing inner and outer rings up to 160 mm in diameter. The track record and benefits of the well established Supfina 725 for larger ring diameters have been converted into this newly developed machine concept.

The Race 705 and Race 715 cater to different diameter ranges. While the Supfina Race 705 can machine rings of up to 90 mm diameter, the Race 715 covers a range of up to 160 mm.

Workpieces:

- Cylindrical roller bearings
- Tapered roller bearings
- Needle roller bearings



### **supfina Race 705**

Working stations:	2
Workpiece diameters:	28 – 90 mm
Workpiece width:	up to 45 mm
Taper angle:	0 – 30°

### **supfina Race 715**

Working stations:	2
Workpiece diameters:	62 – 160 mm
Workpiece width:	up to 65 mm
Taper angle:	0 – 30°

# supfina Race 705 715

- 2 operating stations
- 2 Superfinishing units
- Vertical workpiece spindles
- NC positioning of the Superfinishing units
- NC-controlled spindle drives
- Variable centering systems
- Automatic loading and unloading
- Multi-step process with automatic sequence
- State-of-the-art control system
- Integrated control cabinet
- Multi-range tooling
- High productivity due to minimized loading times
- Low tooling cost
- Set-up times < 15 minutes
- Operator friendly HMI design
- Optimum accessibility
- Small footprint
- Swivel unit for tapered roller bearing operation
- Superimposed stroke for crowned / logarithmic raceways
- Optional attachment for flange operation



The modular structure of the machines supports fast and easy customization. Depending on the combination of available options, set-up times of < 15 minutes can be achieved. Setting up the machine for a new part is accomplished with just a few, easily manageable tasks.

Hardly any workpiece-dependent tooling is required, a typical feature of all Supfina machines. The horizontally arranged feeding system supplies the parts to the vertical spindles. In combination with the actively controlled workpiece handling, damages to the parts and wear on the machine are avoided.

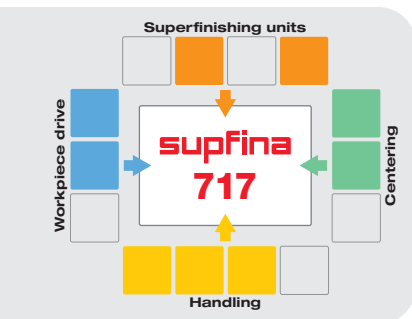
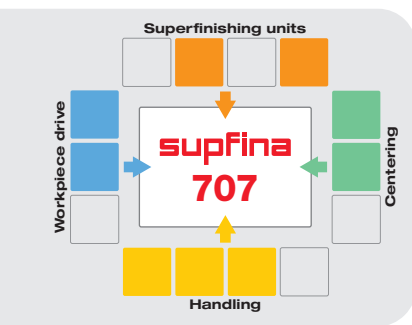
The central part handling grips, lifts and transports 3 bearing rings simultaneously. Compared to conventional systems, the loading time is reduced by more than 50 %.

The two operating stations are located at the front side of the machine and are readily accessible. The workflow can be easily monitored by the operator. State-of-the-art electronic controls support the machine functions during setting, manual and automatic mode. To guarantee reproducible Superfinishing results and consistent quality parameters, the machine offers extensive memory for the technological know-how.

## Taper roller bearing inner ring with simultaneous flange operation



Ring outer Ø approx.:	140 mm	Roughness Ra raceway:	< 0,08 µm
Raceway Ø approx.:	120 mm	Roughness Ra flange:	< 0,08 µm
Raceway width approx.:	38 mm	Roundness:	< 1,5 µm
Ring width:	50 mm		
Material:	hardened bearing steel		



# Superfinish

## Machining of ball bearing raceways inner and outer rings

The innovative Supfina Race 707 and Race 717 are setting new standards in Superfinishing ball bearing inner and outer rings. Both have been optimized to meet the highest productivity demands, while achieving best quality results, fast set-up times and superior reliability.

Valuable input from our customers, combined with extensive experience of the Supfina 727 machine types for the large diameter range, are the cornerstones of this newly developed machine concept.

The Race 707 and Race 717 cater to different diameter ranges. While the Supfina Race 707 can machine rings of up to 90 mm diameter, the Race 717 covers a range of up to 160 mm.

### Workpieces:

- Deep groove ball bearing
- Angular contact ball bearing
- Spherical roller bearing
- Wheel bearing

### **supfina Race 707**

Working stations:	2
Workpiece diameters:	28 – 90 mm
Workpiece width:	up to 45 mm
Contact angle:	0 – 55°

### **supfina Race 717**

Working stations:	2
Workpiece diameters:	62 – 160 mm
Workpiece width:	up to 65 mm
Contact angle:	0 – 55°





# supfina Race 707 717



- 2 operating stations
- 2 Superfinishing units
- Vertical workpiece spindles
- NC positioning of the Superfinishing units
- NC-controlled spindle drives
- Variable centering systems
- Automatic loading and unloading
- Multi-step process with automatic sequence
- State-of-the-art control system
- Integrated control cabinet
- Multi-range tooling
- High productivity due to minimized loading times
- Low tooling cost
- Set-up times < 15 minutes
- Operator friendly HMI design
- Optimum accessibility
- Small footprint
- Swivel unit for angular contact ball bearing operation
- Optional attachment for OR outer diameter finishing

The optimum module for every task:

In the highly productive Supfina Race 707 and Race 717 the highlights are the rotary oscillators with unmatched efficiency and a very fast loading system.

At the same time, setting the machine is easy, changing to another workpiece takes less than 15 minutes.

Versatile multi-range tooling makes the machine flexible while limiting additional expenses, making the Supfina Race a very reasonable investment.

Supfina Race 707 and Race 717 are fully integrated machines designed for simple transportation by crane or fork lift.

Installation and starting-up are fast, making the machine ready for operation in just a few hours.

The integrated part handling system offers two external loading / unloading positions for interfacing with the production part flow via conveyors, robots or gantry loaders.

Excellent accessibility and state-of-the-art controls are contributing to the operator friendliness of the concept. Via the control panel with LCD color display, setting, manual and automatic modes are monitored. The Superfinishing know-how is stored in the vast technology memory. This guarantees reproducible Superfinishing results and consistent quality parameters at all times.



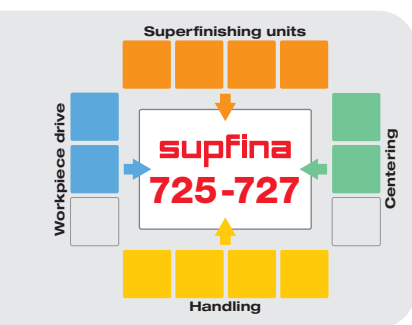
*Raceway  
Superfinishing of  
an inner ring on a  
Supfina Race.*

## Angular contact ball bearing inner ring, double row



Ring outer  $\varnothing$  approx.: 64 mm  
Ring width: 36 mm  
Material: hardened bearing steel

Roughness Ra: < 0,04  $\mu\text{m}$   
Roundness: < 1,2  $\mu\text{m}$   
Profile error: < 1,2  $\mu\text{m}$



# Superfinish

## Machining of ball bearing and roller bearing inner and outer rings

- NC controlled rotary oscillator to produce the desired surface (plateau)
- NC controlled, infinitely adjustable oscillating angle/amplitude optimized for the respective cycle
- Automatic infinitely adjustable contact angle
- NC-controlled linear oscillator for machining of any type of profile like e.g. concave, convex, straight, spherical and logarithmic with the patented NC-controlled superimposed stroke
- Infinitely adjustable oscillation frequency
- NC-controlled pressure rollers
- NC-controlled roller centering device
- NC controlled hydrostatic mandrels for bore centering
- Manual or optional automatic loading and unloading
- Control with digital drives for linear and rotary motions
- One- or multi-step operation method with 2/3 way stone indexing device
- Vertical spindles and actively controlled workpiece handling to avoid damages
- Optional flange, shoulder and IR bore operation
- Optional IR flange and OR outer diameter finishing with tape



### supfina 725-727

Type:	Workpiece Ø:	Workpiece width:
A	50 – 320 mm	8 – 100 mm
B	100 – 650 mm	20 – 200 mm
C	600 – 1200 mm	50 - 400 mm

## Our system features → your benefit

### NC-controlled rotary and linear oscillator Superfinishing units

- Highest possible flexibility to machine any given raceway geometry
- Reproducible top quality also in small batch production

### Stone indexing device for two- or three-step process

- Generation of optimized bearing surface quality
- Extended tool live

The Supfina 725-727 is designed to achieve consistent top quality and highest flexibility in Superfinishing Aeroengine bearings, prototypes or other small production batches. Unmatched versatility is based on the combination of up to four different Superfinishing units in one machine.

The powerful rotary and linear oscillator systems for the raceway finishing operation can be complemented with tape finishing units for outer diameters and flanges as well as cup wheel spindles for lip and thrust face operations.

Machine can be upgraded with one or two auxiliary Superfinishing units

- Tape unit for OR outer diameter
- Tape unit for tapered roller bearing IR lip
- Cup wheel unit for cylindrical roller bearing flange
- Cup wheel unit for spherical roller thrust bearing flange

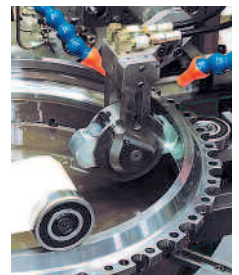
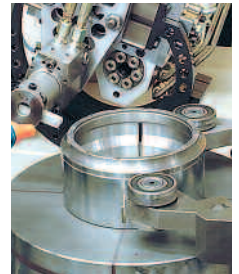
Flexible, infinitely adjustable centering systems

- Fast setting process
- Range tooling with only few exchange parts

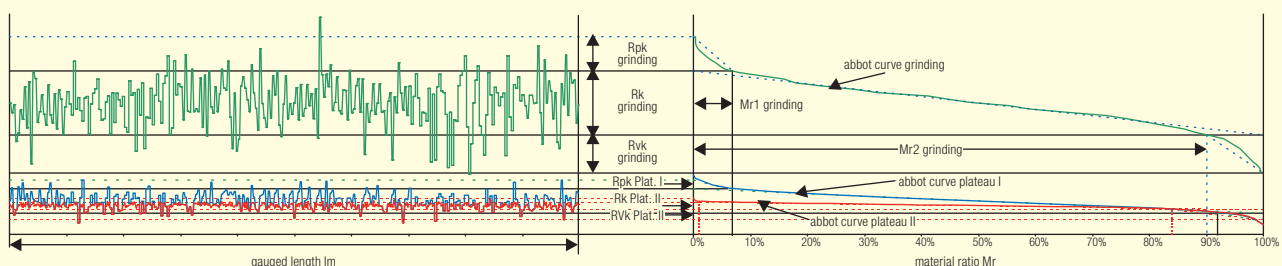
Large working range and versatility for different workpiece types

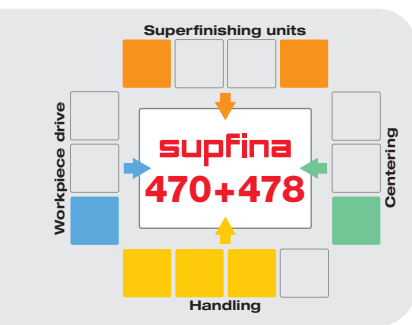
- Suitability for small and medium size batches
- Built-in capability to cope with future changes in your product range

Clamping and centering systems as well as the workpiece drive are just as flexible. Supfina relies on state-of-the-art modules that have been optimized over decades and that can be adjusted to a new workpiece quickly while requiring only a minimum of type dependent tooling. Due to the intelligent design, set-up times of less than 20 minutes are achieved, supported by NC controlled adjusting axes.



## Plateau finishing: Comparison of surface properties (Abbot curve) of grinding and Superfinish results





# Superfinish

## Machining of cylindrical rollers and tapered rollers

- Continuous Superfinishing process for high volume production of rollers
- Dynamically balanced pneumatic oscillator
- Vertical Superfinishing unit adjustment for stone and roller change
- Optional superimposed stroke

- Connection of up to 14 stone guides with fast change system
- Infinitely adjustable and individually controllable stone pressure
- Stone wear indication supporting fully automatic operation
- Infinitely adjustable transport rollers, optionally automatic
- Transport rollers with an effective length of 900 and 1100 mm
- Profiled transport rollers available to generate specific workpiece geometries
- Automatic workpiece feed



### **supfina 470**

Workpiece diameter:

6 – 100 mm

Workpiece length:

up to 250 mm

### **supfina 478**

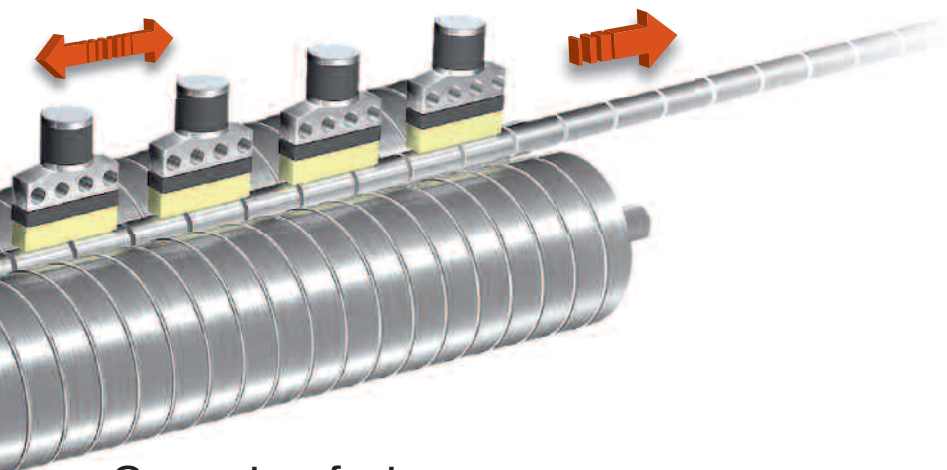
Workpiece diameter:

5 – 24 mm

Workpiece length:

up to 65 mm





# supfina 470 478

## Our system features → your benefit

Powerful pneumatic oscillator carrying up to 14 stone guides

- High production output through large stock removal
- Long service life and low wear
- No undesired vibrations
- Short set-up time due to quick change systems and automatic vertical adjustment

### Flexible transport roller adjustment

- Workpieces with varying dimensions can be machined
- The setting time can be further reduced by utilizing the optional NC adjustment

The Supfina 470 and Supfina 478 are the sprinters among the Superfinishing machines. Depending on the workpiece dimensions, hundreds of rollers per minute can be machined in the centerless through-feed process. At the same time, the highest demands regarding geometrical and surface quality are met.

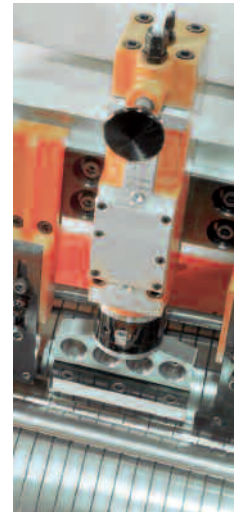
Modular options available are designed for different levels of automation.

Transport rollers with an effective length of up to 1100 mm with optimized profiles

- Increased productivity with production speeds to 9 m/min and beyond
- Generation of fully crowned, cylindrical / convex and logarithmic workpieces

### Safety and monitoring devices

- In case of stone wear, the machine stops automatically to avoid damage
- Parts with incorrect orientation or dimension can not enter the machine
- Operator supervision required is reduced to a minimum



*Superfinishing operation of cylindrical rollers*

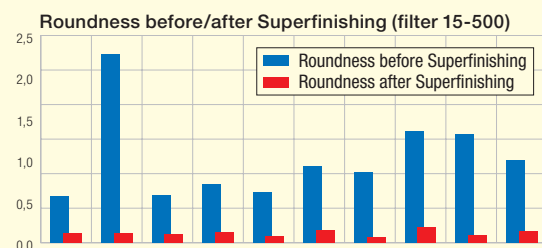
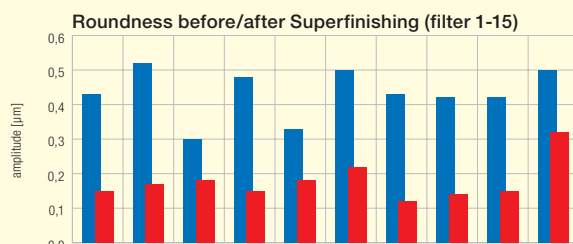
Through the intelligent use of NC-controlled adjusting axes, very short set-up times are achievable. Transport rollers with an effective length of up to 1100 mm and specific profile designs open up new potentials.

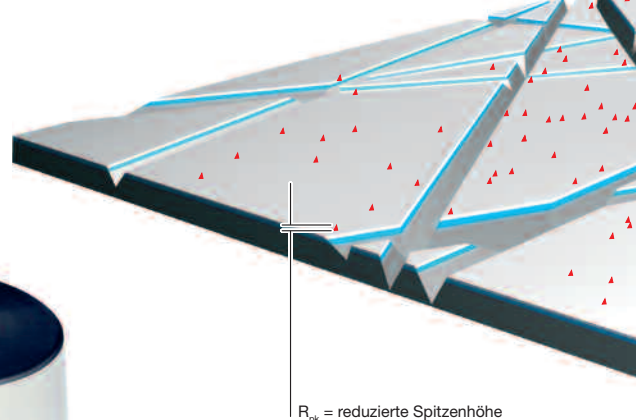
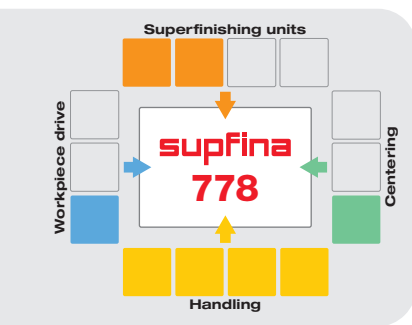
On the raceway of antifriction bearing rollers, the centerless through-feed Superfinishing process generates defined crowned or logarithmic profiles.

## Cylinder rollers



Roller Ø approx.: 13 mm  
Length approx.: 18 mm  
Roughness Ra: 0,04 µm  
Production rate: 400 parts per min.





# Superfinish

## Machining of bearing rollers

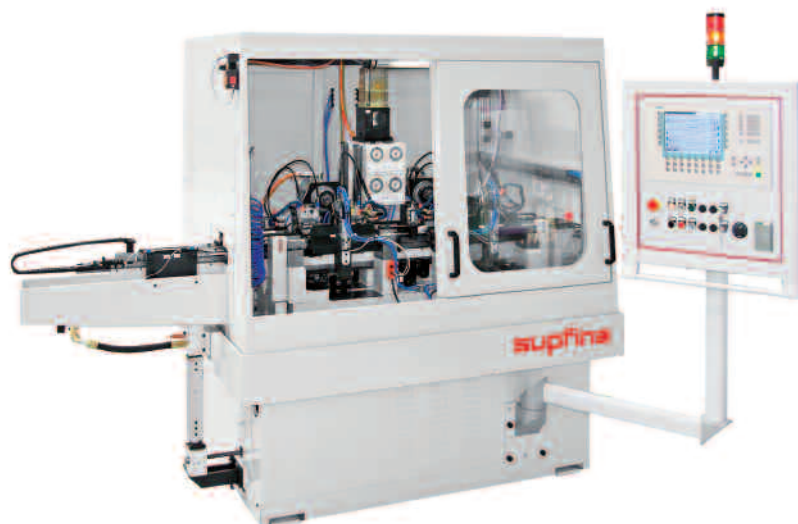
The Supfina 778 marks the industry standard for the Superfinishing of bearing rollers.

In the most recent generation of roller bearings, the improvements in performance and permissible load are based on the consistent reproduction of exactly defined surface parameters. Here, the highly productive Supfina 778 plays a crucial roll. The machine's dynamically balanced Superfinishing units are designed for high frequencies and amplitudes. The resulting large stock removal rates lead to short machining times.

The two-step Superfinishing process of the Supfina 778 generates plateau surfaces with a defined cross-hatch pattern, an optimum profile and roundness as well as a high bearing ratio.

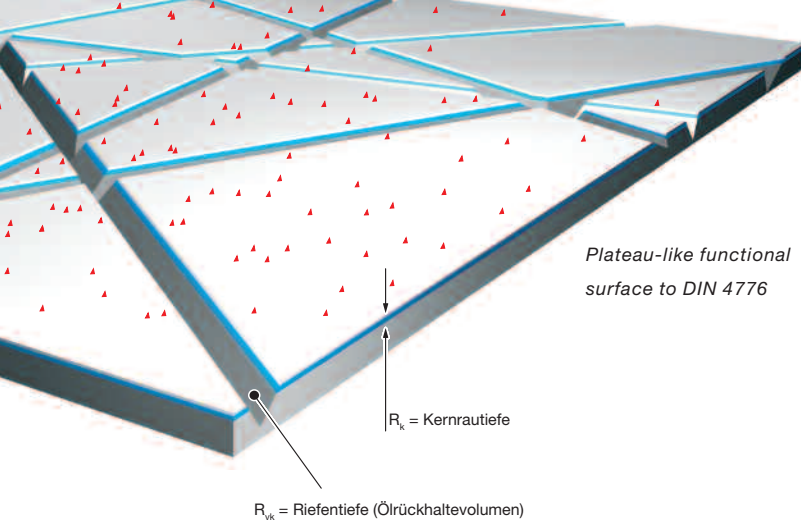
The integrated loading system is very versatile and can be adjusted to different workpiece dimensions quickly. Through the intelligent use of NC-controlled adjusting axes, set-up times of less than 20 minutes are achieved.

- Two or four operating stations
- Two or four Superfinishing units
- Workpiece drive and centering by horizontally arranged support rollers
- NC-controlled adjustment
- Digital drives for tools and workpiece
- Integrated loading and unloading, NC controlled
- Two-step Superfinishing process
- State-of-the-art control system
- Multi-range tooling
- Set-up times < 20 minutes



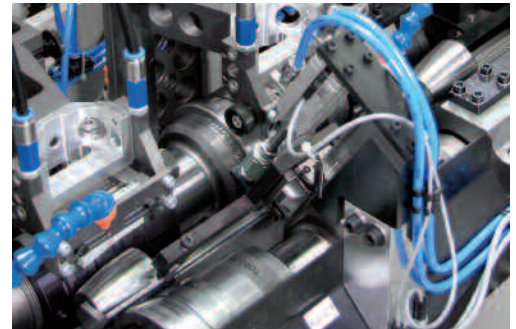
### supfina 778

Type:	Workpiece Ø:	Workpiece length:
A	14 – 50 mm	12 – 60 mm
B	50 – 120 mm	50 – 200 mm



Plateau-like functional surface to DIN 4776

Operation of asymmetrical spherical rollers



## Our system features ⇒ your benefit

### NC-controlled Superfinishing units

- ⇒ Fast setting through automatic adjustment of the oscillator
- ⇒ Optimum quality due to automatic adjustment of the oscillation frequency, optimized for the respective cycle
- ⇒ Patented superimposed stroke for Superfinishing of any given profile on parts > Ø 50 mm

### Two-step Superfinishing process

- ⇒ Generation of optimized bearing surface quality
- ⇒ Extended tool live

Two or optionally four operating stations with digital drives

- ⇒ Improved torque and speed characteristics
- ⇒ Reduced cycle time
- ⇒ Additional productivity

Flexible, infinitely adjustable support rollers

- ⇒ Fast setting process
- ⇒ Range tooling with only few exchange parts

Large working range and versatility for different workpiece types

- ⇒ Suitability for small, medium and large size batches
- ⇒ Optimized for spherical, cylindrical and tapered rollers

## Spherical rollers



Spherical rollers Ø approx.:

20 mm

Roundness:

0,41 µm

Roughness Ra:

0,038 µm

Rpk:

0,049 µm

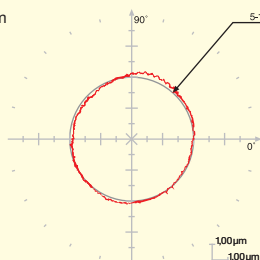
Stock removal:

6 µm

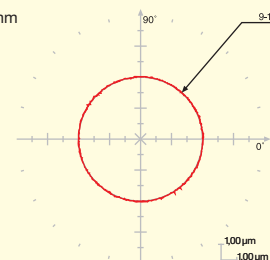
Cycle time:

3,5 Sek.

Measuring range: 1,000mm  
Measuring interval: 0,10°  
□15-500



Measuring range: 1,000mm  
Measuring interval: 0,10°  
□15-500



# Superfinish

## Service

Service is one of the key foundations of our corporate philosophy. We consult our customers extensively and engineer in close collaboration the best-possible solution for their individual surface design.

Our pre-sales-service with process consulting and prototype production is a matter of course for us as well as our after sales service with maintenance, repairs and rebuilds of machines and the supply of custom-made perishable Superfinishing tooling.

Our modular machine concepts with its outstanding versatility stand for easy and quick change-over in case of multiple workpieces and/ or different surface parameters.

These flexible concepts allow our customers to quickly respond to new demands from their customers which can be of an essential competitive advantage for them.



We offer continuous development for new process technologies to meet increasing quality requirements with regard to complex geometries and new material specifications.

## Process Development

The Superfinishing of prototypes or small production runs closes the loop in our process development chain.



We thoroughly analyse the requirements of our customers to demonstrate solutions and alternatives with focus on cost-effective process integration.

## Application consulting



We offer training either on customer's floor or at Supfina. We have customized programs for operators, maintenance personnel or supervisors.

## Training

The contents of our outstanding manuals serve as baseline for our theoretical and practical training classes.



We offer production support during start-up or running production as well as fast process development for changed production requirements (cycle time, tolerance, stock removal)

## Production Support



With our 24h-service support a Supfina technician will be at your site within 24 hours, even during week-ends or holidays. With our Supfina Online Support via Telephone, Online and Videocamera we

## 24h-Service

are able to circle in potential problems so that the service trip can be better prepared or the problem can be resolved without being on-site.



The majority of our standard spare parts and consumables can be shipped directly out of our extensive part inventory within 24 hours. With the delivery of every machine we will supply you with

## Consumables and Spare parts

a first set of high quality tools designed for your application to ensure a smooth and successful start-up.



With our three-step service concept scheduled repairs and preventative maintenance are easily carried out. Minimizing downtimes, increasing the machine reliability and an extension of the

## Maintenance

lifetime of the main wear components will result in a production tool you can count on.





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