YOUR PARTNER IN THE AUTOMOTIVE INDUSTRY

Grinding tools for machining engine components

Premium grinding tools since 1919
www.tyrolit.com

TYROLIT Group
A global company

As one of the world's leading manufacturers of bonded grinding, cutting, sawing, drilling and dressing tools as well as a system supplier of tools and machines for the construction industry, the family-run company TYROLIT has been synonymous with top quality products, innovative spirit and outstanding service since 1919.

Day in, day out, the experts at TYROLIT work on delivering tailor-made solutions for customers around the world, helping to make their businesses successful. Around 80,000 available products set the standards in a wide variety of industries.

TYROLIT company headquarters in Schwaz, Austria

TYROLIT business units

Metal / Precision

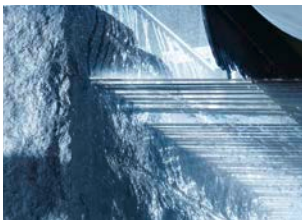
From precision machining in the engine and gearbox industry to the production of cut-off wheels with diameters up to 2,000 mm for the steel industry – the TYROLIT product range in the Metal & Precision business unit includes high-tech tools for a wide variety of applications.

Trade

Thanks to its global sales network, in addition to premium product solutions in the three core areas of cutting, grinding and surface treatment, the trade business unit of TYROLIT guarantees truly customer-focused marketing support.

Construction

In the Construction business unit, TYROLIT is a leading system supplier of drilling systems, wall and wire saws, floor saws and tools for the surface grinding of concrete motorways.



Stone – Ceramics – Glass

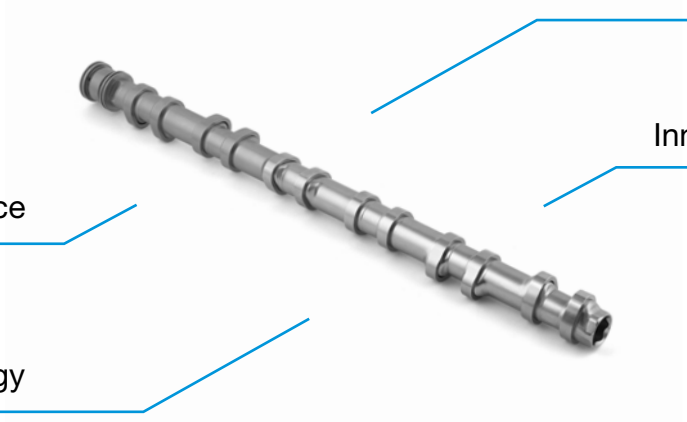
Our tailored diamond tools and grinding solutions in the Stone – Ceramics – Glass business unit impress through their exceptional performance and quality.

A competent partner **in the automotive industry**

Ever growing requirements relating to quality and weight with regard to engine components in the automotive industry make the machining of these components a great challenge. TYROLIT offers its customers a comprehensive service package to meet these requirements.

An extensive product range combined with numerous service offerings make TYROLIT a competent solutions provider for customers around the world.

Our services for the machining of engine components at a glance



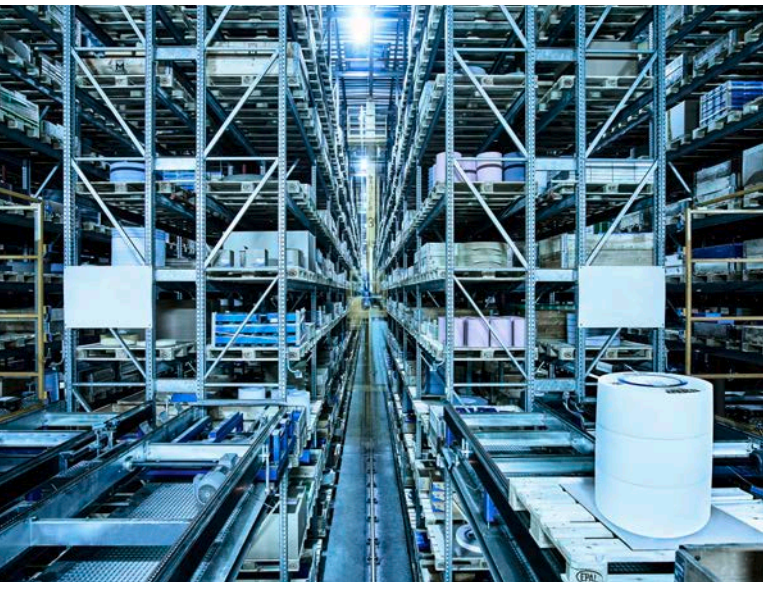
Competency & experience
Professional industry expertise

TYROLIT has long-standing experience in the automotive industry, particularly in the machining of engine shafts. Moreover, we work in close cooperation with established machine manufacturers, universities and numerous automotive suppliers.

Thanks to this expertise, we meet the latest technical standards with regard to the machining processes used in the automotive industry and, with this knowledge, are always in a position to offer our customers an optimally adapted package of grinding solutions and attractive service offerings for the economically efficient machining of engine shafts.

Your benefits

+ Customer-specific system solutions from a single source
+ Individually adapted tool specifications for machines and processes
+ Optimum tool design for maximum economic efficiency
+ Close cooperation with machine manufacturers
+ Hosting of workshops and training courses



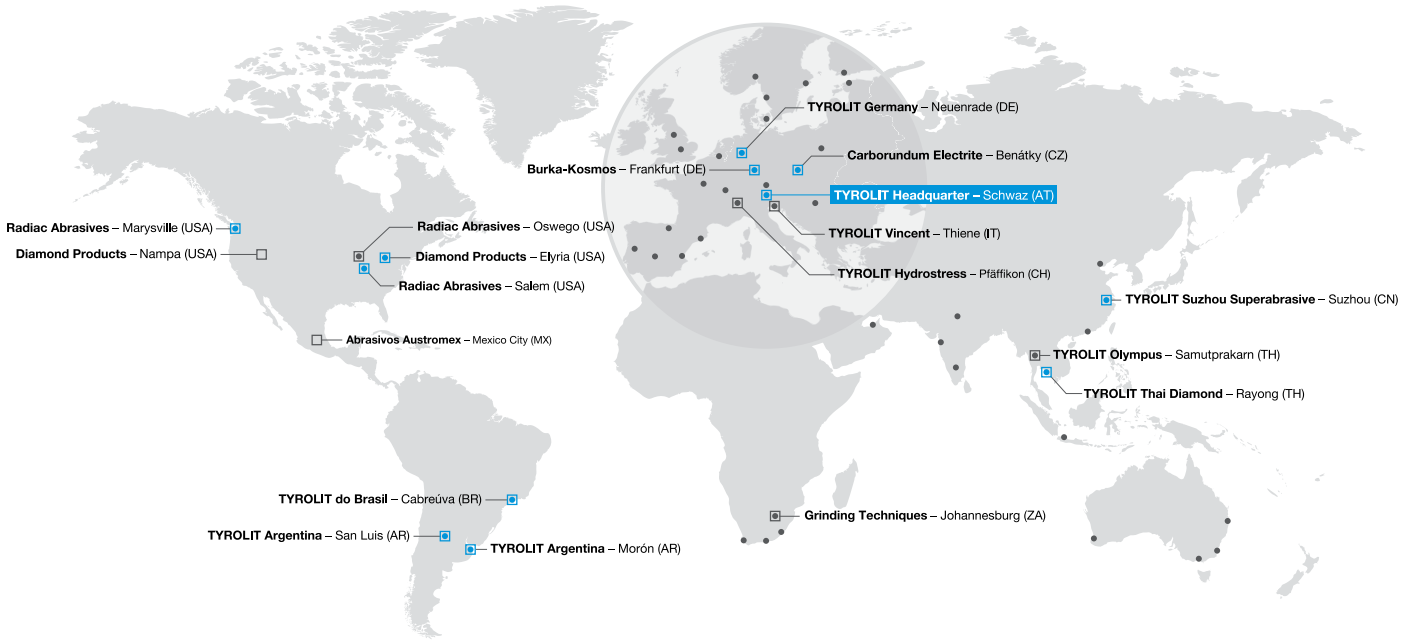
Global presence
In your vicinity

Global presence
TYROLIT stands for global thinking and activities. With a worldwide sales network currently in 65 countries and with our own production plants in 12 countries on five continents, we offer our customers all the advantages of a globally operating company.

Local availability
Global thinking, local action – in your national language and in your vicinity. This is the principle we follow in dealing with our customers. Local contacts near your premises and a global team of specialist application engineers ensure optimum customer support and first-class service.

Your benefits

+ Global presence with local contacts
+ Short response and service times



TYROLIT Metal / Precision production locations **TYROLIT production locations** **TYROLIT sales locations**

Application technology
The best team for your application

An experienced team of specialist application engineers is available to our customers throughout the world and works to produce the most economically efficient solutions. All employees in the various countries have excellent links to our headquarters in Austria, where they obtain thorough support on all technical issues.

Jointly with our customers, TYROLIT application engineers improve grinding processes with an aim to reducing the component costs to a minimum.

TYROLIT application technology in practice

1. Documenting and analysing the customer-specific task
2. Drawing up individual proposals for a solution to the customer's requirements
3. Working on a process solution in close consultation with the customer
4. Implementing the process solution at the customer's site
5. Passing on acquired knowledge in training sessions

Your benefits

+ The global presence of our application engineers
+ Tailor made solutions and process optimisation to suit individual tasks
+ Close cooperation with machine manufacturers
+ Internal and external seminars and training courses

Innovative products
Quality that impresses

TYROLIT is one of the world's leading manufacturers of grinding wheels for cutting and grinding a large number of widely differing components.

All products are manufactured and tested to the highest quality standards. In addition, specialised expert teams ensure the continuous further development of products, under consideration of individual customer needs. An extensive product portfolio provides our technicians with a wide variety of abrasives and bond systems and consequently to meet customer-specific requirements.

Your benefits

+ Continuous improvement of existing products
+ Innovative products for optimising economic efficiency
+ System solutions, comprising grinding and dressing tools from a single source
+ Cooperation with machine manufacturers and universities

Conventional abrasives (A + C)

TYROLIT offers its customers a comprehensive range of conventional grinding wheels based on corundum and silicon carbide. Conventional grinding wheels are primarily used for external cylindrical grinding of bearing journals and for the centreless grinding of camshaft tubes.

Superabrasives (D + B)

Extremely hard abrasives - known as superabrasives - are primarily used for machining ultra-hard materials. TYROLIT boasts a wide range of tailored CBN tools based on different bond systems (metal, resin, ceramic, electroplated). Superabrasives show their strengths particularly where low component machining costs are the priority, as is the case with camshafts and crankshafts, for example.

Combustion engines of the future
Growing quality requirements for grinding tools

The greatest challenge in the development of future combustion engines will be to resolve the conflicting requirements relating to fuel consumption and range, exhaust emissions, comfort and driving dynamics to the best possible effect. Achieving these objectives place particularly high demands on the complete system during manufacturing.

Machine, grinding wheel, dressing tool and process control must all be matched to one another. Reducing friction and downsizing combustion engines continue to offer significant potential in terms of cutting fuel consumption as well as CO_2 emissions. Above all, the weight of the rotating engine components will be reduced in future through the use of new alloys and materials. Improved surface finishes and optimum component geometries will be vital in new engine generations with low fuel consumption and greater power. In order to solve these challenges, TYROLIT acts as a reliable and competent partner to its customers.

Trends with regard to camshafts and crankshafts

+ Assemblies and adjustable camshafts for optimal combustion
+ Optimisation of component geometries (roundness, running truth and surface finish)
+ Continuous further development of machining concepts
+ New materials for weight reduction

Cam contour grinding in package

Cam contour grinding of a cam disc piece

Customer-specific solutions
Tailored for your industry

Owing to their different designs, the machining of camshafts and crankshafts represent a particular challenge during machining. Over many decades, TYROLIT has gathered well-founded expertise in the machining of these parts and provides its customers with on-site support.

During the optimisation of combustion engines, the crankshaft plays a decisive role owing to its large mass. New, lighter, but nevertheless torsionally rigid materials as well as improved component properties (surfaces and geometries) are required.

Variability is perhaps the most important key word when it comes to defining potential for engine optimisation. Camshafts of the new generation must perform optimum valve control at different engine speeds and power requirements. This is associated with constantly growing quality requirements.

Machining concepts

Component	Grinding position	Grinding process	Product recommendation
 **Camshaft**	Bearing journal Cam profile Camshaft tube Individual cam faces	External cylindrical / elliptical of round Centreless Surface grinding Superfinishing	**GENIS 2 / GENIS 2-CF** **CSS ULTRA / CSS REGULATOR** **POLARIS BASIC LW / POLARIS PLUS LW** **CENTURIA** **FACETEC MF FINISHING ROLLS** **TYROLIT FINISHING STONES**
 **Crankshaft**	Main-bearing journal Crank-pin journal Thrust bearing journal Flange Stub Polygon	External cylindrical Angled flute grinding Side grinding Superfinishing	**GENIS 2 / GENIS 2-CF** **CSS ULTRA** **POLARIS BASIC LW / POLARIS PLUS LW** **FACETEC MF FINISHING ROLLS** **TYROLIT FINISHING STONES**
 **Balancer shaft**	Bearing journal	External cylindrical Superfinishing	**GENIS 2 / GENIS 2-CF** **CSS ULTRA** **FACETEC MF FINISHING ROLLS** **TYROLIT FINISHING STONES**
 **Con-rod**	Small-end eye Big-end eye	Surface grinding	**CENTURIA**

GENIS 2 / GENIS 2-CF

Vitrified bonded CBN grinding tools for external cylindrical grinding

With the GENIS 2 product line, TYROLIT defines a new performance level and a wider range of applications for external cylindrical grinding with vitrified-bonded CBN tools. GENIS 2 is characterised by a high-strength bond with excellent wetting properties, coating the CBN grain and securely binding the grain within the bond. Thus bond volumes can be reduced enabling very open, cool-grinding and extremely easy-cutting specifications with a long lifetime. GENIS 2 is also available with a CF core.

Your benefits

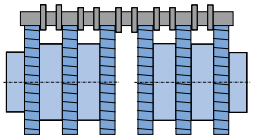
+ High economic efficiency
+ Wide range of applications
+ High running precision
+ Optimum grain utilisation
+ Replating option

CF core

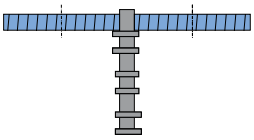
+ Low weight
+ Best damping
+ Simultaneous machining

Camshaft grinding applications

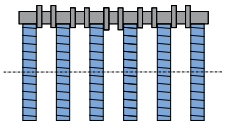
– Bearing journal



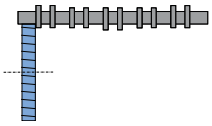
Multi-layer grinding wheel



Vertical grinding machine

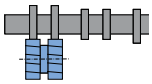


Gang and multi wheel grinding

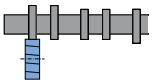


Individual wheel

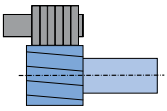
– Cam profile / camshaft tube



Dual-layer grinding wheel

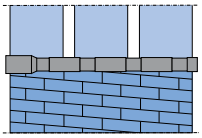


Individual wheel

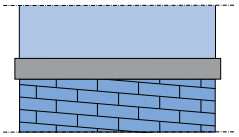


Individual cams in package

Variable cam lobe re-entry



Centreless plunge grinding

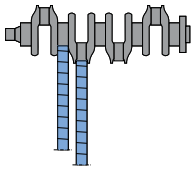


Centreless through feed grinding

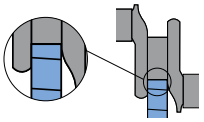
Crankshaft grinding applications

– Crank-pin and main bearing journals

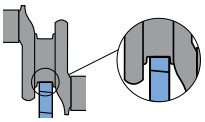
Different processes for bearing journal grinding



Separate wheels

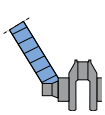


Straight plunge grinding along the entire journal width

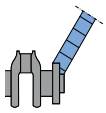


Combined grinding of the shoulders, radii and diameters

– Flange and pin



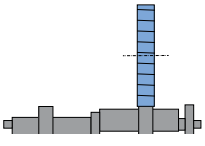
Stub



Flange

Balance shaft grinding applications

– Bearing journal



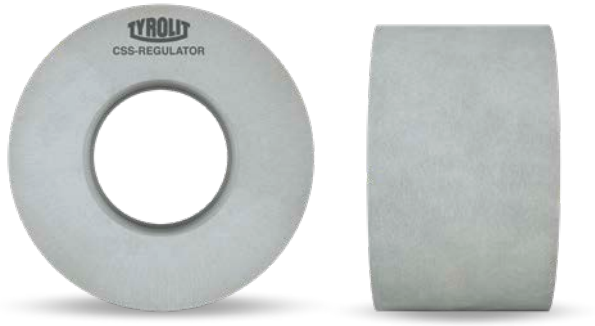
Individual wheel

CSS ULTRA / CSS REGULATOR

Vitrified bonded grinding tools for external cylindrical grinding & regulating wheels for centreless grinding.

With the CSS ULTRA product line, TYROLIT has created a sustainable grinding wheel micro-architecture through the use of new, high-quality components and innovative sintering technologies.

The CSS REGULATOR from TYROLIT is manufactured as a unitised version. The extremely high compaction ensures uniform quality of the regulating wheel.



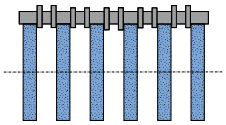
Your benefits

- \+ Long lifetime
- \+ Good profile retention
- \+ Cool grinding
- \+ Shorter grinding time / higher productivity
- \+ Approved up to 125 m/s

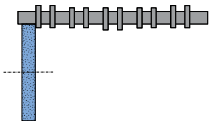
- \+ Good profile retention
- \+ High coefficient of friction
- \+ Constant grinding pressure

Camshaft grinding applications

– Bearing journal

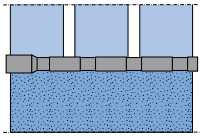


Grinding wheel set

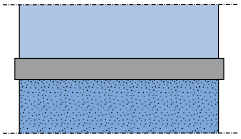


Individual wheel

– Camshaft tube



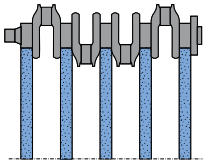
Centreless plunge cut grinding



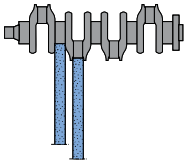
Centreless through-feed grinding

Crankshaft grinding applications

– Crank-pin and main bearing journals

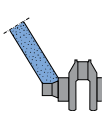


Multi wheel set

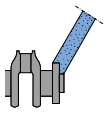


Separate wheels

– Flange and pin



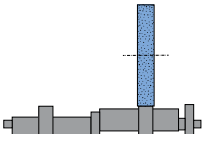
Stub



Flange

Balancer shaft grinding applications

– Bearing journal



Individual wheel

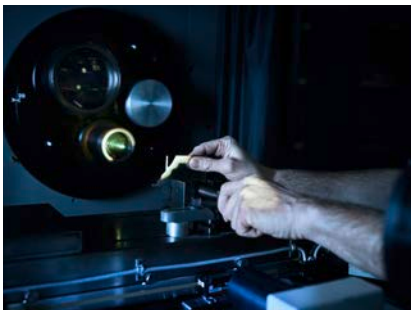
POLARIS BASIC LW / POLARIS PLUS LW

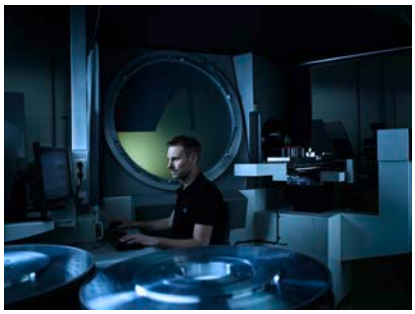
Electroplated CBN grinding wheel with lightweight core for external cylindrical grinding

With the POLARIS LW product line, TYROLIT is a pioneer and technology leader in the area of lightweight electroplated grinding tools. Through targeted material reduction, the wheel weight has been significantly reduced. The stock removal rate at the core is not random, but is calculated using a computational FEM analysis (Finite Element Method). This means that deformations and potential performance losses can be excluded. Through use of the lightweight POLARIS LW version, the maintenance intervals at the grinding machines can be reduced and handling significantly simplified for personnel in production.

Your benefits

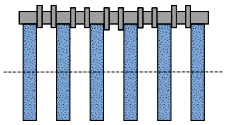
+ Weight optimisation
+ Replating-compatible
+ Maximum tool life
+ Computational FEM simulation



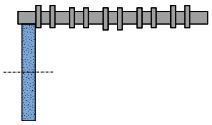


Camshaft grinding applications

– Bearing journal (pre-grinding)

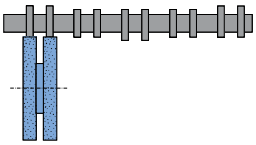


Multi wheel set

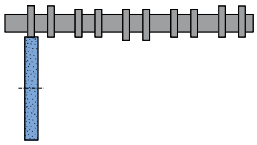


Individual wheel

– Cam profile (pre-grinding)



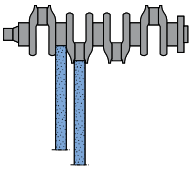
Dual-layer
grinding wheel



Individual wheel

Crankshaft grinding applications

– Crank-pin and main bearing journals (pre-grinding)



Separate wheels

CENTURIA

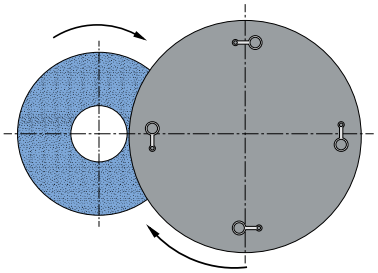
Resin-bonded grinding tools for side grinding

With its CENTURIA product line, Tyrolit offers a complete range of conventional, resin-bonded tools for surface grinding. Different surface grinding methods are used for the efficient production of functional surfaces that must satisfy exacting requirements in terms of flatness, plane parallelism and surface finish. Either both faces are machined simultaneously (double side face grinding), or just one face is machined using single wheels, segments, rings or cup wheels. The components are often mass-produced, which means they face stringent requirements with respect to process stability.

Your benefits

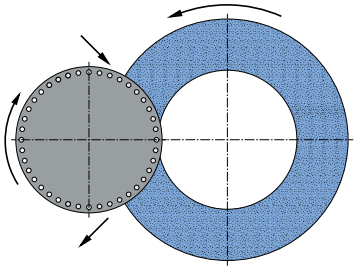
+ Consistent grinding behaviour
+ Cool grinding
+ Long lifetime

Con-rod grinding applications:



Centreless through-feed grinding

Individual cam grinding applications



Centreless through-feed grinding

FACETEC MF

Microfinishing film roll for superfinishing rotation-symmetric components

With the FaceTec MF product line, TYROLIT offers a high-performance product in the area of belt-superfinishing. The focus is on customers whose surface quality requirements can only be achieved by means of a superfinish machining operation. These requirements relate primarily to the automotive (crankshafts and camshafts) and steel industry (roll grinding). Because finishing belongs to the final operations in the value-added chain, process stability is an essential criterion. The high quality standard and the high service level make FaceTec MF to an optimal solution for critical finishing processes.

Your benefits

+ high process stability
+ broad product portfolio
+ high economic efficiency
+ high service level

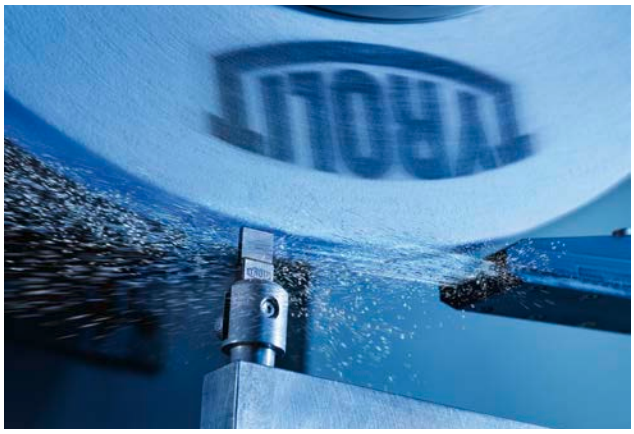
DIAMOND DRESSING TOOLS

Rotating and stationary diamond tools for dressing grinding tools

In addition to an extensive range of grinding tools, TYROLIT also supplies the corresponding dressing tools and is therefore able to offer its customers best service as a system supplier. The dressing tools are produced to the highest quality standards at the plant in Neuenrade.

Your benefits

+ Maximum profile accuracy
+ Maximum lifetime
+ Customised production



TYROLIT SCHLEIFMITTELWERKE SWAROVSKI K.G.
Swarovskistrasse 33 | 6130 Schwaz | Austria
Tel. +43 5242 606-0 | Fax +43 5242 63398

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