CUTTING SOLUTIONS BY CERATIZIT

USER MANUAL

WHEEL SET MACHINING

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WHEEL SET MACHINING

Dear customers,

More than 100 years of experience in machining make us one of the most knowledgeable providers in this industry. From new wheel production and axle production to wheel rework and bogie machining, we are a reliable partner to our customers in the rail and rolling stock industry. Our international company structure brings us into close contact with companies based all over the world and helps us to understand local conditions and their precise needs. Close cooperation with manufacturers of wheelset machining components and machinery also helps us advance our knowledge and develop highly effective tool solutions that deliver the ultimate in performance. As a result, our high-quality cutting material solutions and tools for turning, drilling and milling are a guarantee for the very best quality and process security. We are here to help you with expert advice and would be delighted to introduce you to our impressively wide range of tools.

Your CERATIZIT team

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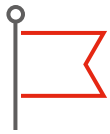
CERATIZIT – passion and pioneering spirit for carbides

For over 95 years, CERATIZIT has been a pioneer developing exceptional hard material products for cutting tools and wear protection. The privately owned company, based in Mamer, Luxembourg, develops and manufactures highly specialised carbide cutting tools, inserts and rods made of hard materials as well as wear parts. The CERATIZIT Group is the market leader in several wear part application areas, and successfully develops new types of carbide, cermet and ceramic grades which are used for instance in the wood and stone working industry.

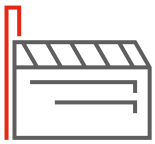
With over 9,000 employees at 34 production sites and a sales network of over 70 branch offices, CERATIZIT is a global player in the carbide industry. As a leader in materials technology, CERATIZIT continuously invests in research and development and holds over 1,000 patents. Innovative carbide solutions from CERATIZIT are used in mechanical engineering and tool construction and many other industries including the automotive, aerospace, oil and medical sectors.

The internationally active CERATIZIT Group unites the four competence brands Cutting Solutions by CERATIZIT, Hard Material Solutions by CERATIZIT, Tool Solutions by CERATIZIT and Toolmaker Solutions by CERATIZIT. The carbide expert also includes the subsidiaries WNT and CB-CERATIZIT, as well as the tool manufacturers Günther Wirth, PROMAX Tools, Klenk, Cobra Carbide India, Becker Diamantwerkzeuge, Best Carbide Cutting Tools and KOMET GROUP.

Facts & figures



1 headquarter
Mamer, Luxembourg



34
production sites

> 70
sales subsidiaries

> 9,000
employees

> 100,000
different products

> 1,000
patents and
utility models

> 200
employees in R&D

> 10
innovation awards

30%
of products
developed in the last 5 years

> 65,000 ARTICLES
AVAILABLE IN STOCK

> 3,000 ORDERS PER DAY

3 MIN. FROM THE INCOMING ORDER TO THE READY-FOR-TRANSPORT PACKAGING

ORDER BY 6:30pm WITH GUARANTEED DELIVERY ON THE FOLLOWING DAY

JUST IN TIME

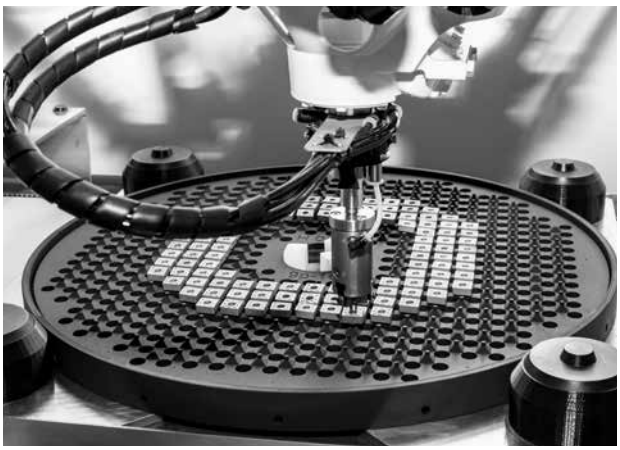
MINIMISATION
OF TOLL AND SHIPPING COSTS

The CERATIZIT highlights

Best possible quality and top-class customer service are our goal: with CERATIZIT the railway and rolling stock industry has a partner who guarantees quality standards and elaborates innovative solutions in dialogue with customers. Benefit from the extensive expertise that CERATIZIT specialists pass on to you in training courses with highly qualified staff, and let us help you find new and even more efficient tooling solutions. We will be happy to give you our full support!

Guaranteed quality standard

As we at Cutting Solutions by CERATIZIT manage the entire process chain of carbide production whilst also constantly ensuring precision and performance at the highest level. Our quality promise to you is a premium-class cutting tools solution with maximum tool life and optimal process security, which guarantees added value both technically and economically.



Universal expertise in solutions

As the products we supply will increase the economic efficiency of your production – from standard tools with an attractive price-performance ratio, to industry-specific and individually customised product innovations. As a creative partner, we consult with you and therefore understand what your requirements are. Accordingly, we develop the right solution for your challenges.

Reliable logistics

As you benefit from a logistics centre which sets standards throughout the world and keeps costs low thanks to harmonised processes. Rely on maximum availability of the products which we deliver you in minimum time and just in time to your desired destination.

Top-class service

Because we make it possible for you to expand your knowledge of your tools and machining processes at our test and training centres. This results in your production becoming even more efficient and forms the basis for the development of new tooling solutions in partnership with us.

Competent dialogue

As your consultant partners and application engineers, we speak your language and provide support enriched by knowledge, experience and passion. Our expertise in solutions will be evident in our consultation with you: it is always our top priority to understand your requirements in order to find the best solutions in cooperation with you. Just speak to the distribution partner closest to you.

CERATIZIT standard tools and inserts

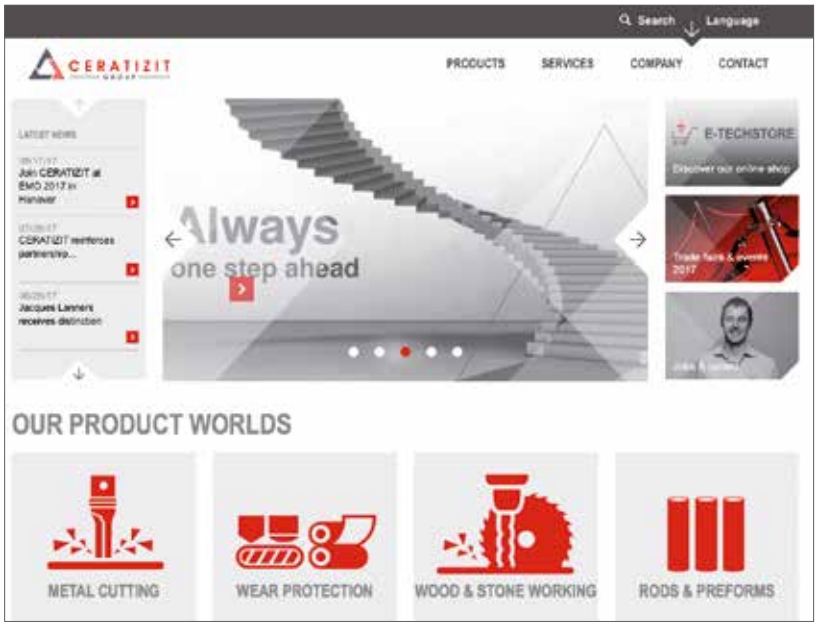
The CERATIZIT GROUP has the metallurgical expertise to control the entire process chain of carbide production: from raw materials production and powder preparation to forming, sintering and finishing, we can make the right adjustments at any time and adapt the material properties to your individual requirements. Just talk to us about your future projects!

Online service

Of course, we are also here for you online – 24 hours a day!

On the CERATIZIT website, you will not only find all the details on our innovative products, but can also order these products straight away.

Within the various product ranges, you have access to over 80 product details pages from the fields of machining, rods & moulded parts, wear protection and wood & stone working. Discover product videos, application examples and success stories.



Online shop – E-Techstore

The majority of our standard products are available from stock. Our well organised warehouse guarantees that your order will be processed quickly and reliably, even if it is for large quantities. Thanks to our modern supply chain management, our production capacities are flexible. We are therefore able to manufacture very large quantities in a very short period of time.

You can order products that are in stock from our online e-techstore, 24 hours a day.

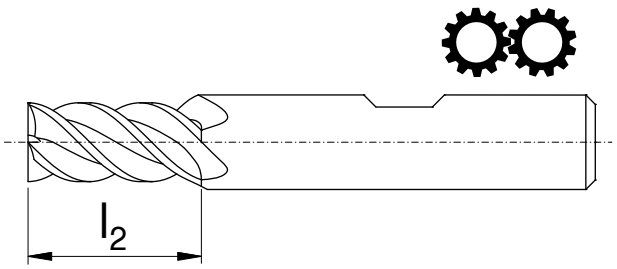
Tooling Academy

Make use of the fund of knowledge we have amassed at the CERATIZIT cutting tools centre. Here we subject tools and new developments to comprehensive endurance tests under realistic conditions. To ensure high-quality and economical production, all components – machine, spindle and tools – must be optimally coordinated. Should there be issues in a particular field, our experts can recommend the best tools for the purpose or develop a specific tool for you. Our application engineers and specialists look forward to sharing their knowledge with you – this is why the Tooling Academy organises customer-specific seminars and workshops regularly.

OEM services

You will receive not only excellent cutting tools, but also customised complete solutions and tooling packages for optimal machining of entire work pieces on your machine.

Every project is supported by a large team comprising various specialisations and fields of expertise: whether you are talking to a project director, field service or office employees, engineers, designers, workers in production or logistics – you will benefit from the full range of services of an international company with a worldwide service network.



Configurate service

Your tailor-made tool. Using the Configurate online solution, a tailor-made semi-standard tool can be configured with just a few clicks of the mouse. With the new Configurate tool, we offer you a quick and easy ordering process for solid carbide tools adapted to individual customer‘s requirements. In our e-techstore, you can create your tailor-made semi-standard tool with just a few clicks of the mouse – 24 hours a day, seven days a week!

Restore service

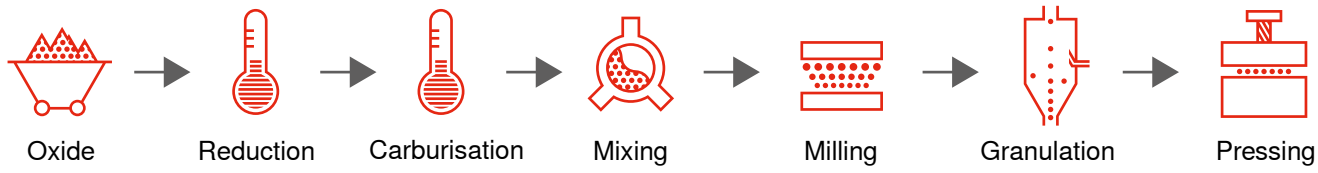
Re-grinding service for standard, semi-standard and special tools. Place your trust in the world-renowned and consistently high product quality of Cutting Solutions by CERATIZIT and the reliable service. This also includes re-grinding of solid carbide tools. Naturally, the prices for our restore service are also calculated fairly and transparent.

CERATIZIT – the carbide concept for success

Carbides are used today in numerous industries and production processes, and have become indispensable too for wheel set machining. Complex products and modern materials make ever higher demands on the tools and materials and call for machining accuracy.

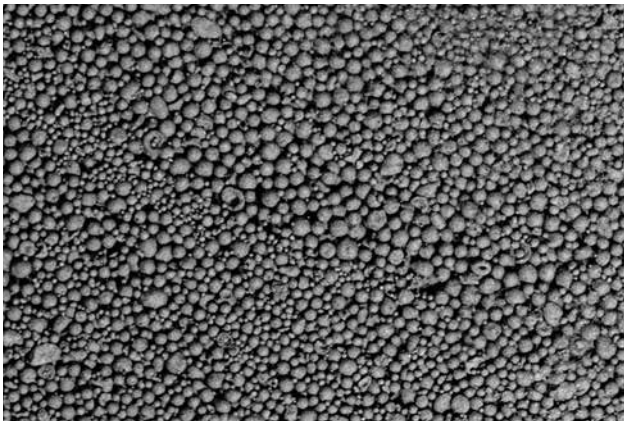
Hard materials are composite materials consisting of hard material and a very tough binder metal. They are exceptionally hard, and offer high wear resistance and heat resistance. Carbide is used wherever tools or components are exposed to high wear, as is the case when machining hard materials. CERATIZIT's composite carbides enhance the quality of the tools and parts, guarantee an extended tool life and ensure process reliability.
Carbides from CERATIZIT consist of a particularly hard tungsten carbide and a comparatively soft binder metal, such as cobalt. The two substances are mixed in the form of powder. CERATIZIT offers more than 130 carbide grades with different compositions. We have the ideal solution for every application and industry.
CERATIZIT commands the entire process chain – from powder preparation to forming, sintering, to finishing and surface treatment. The blanks are subjected to grinding, polishing and erosion and are subsequently provided with innovative wear protection coatings to ensure that the product has the required technical characteristics.

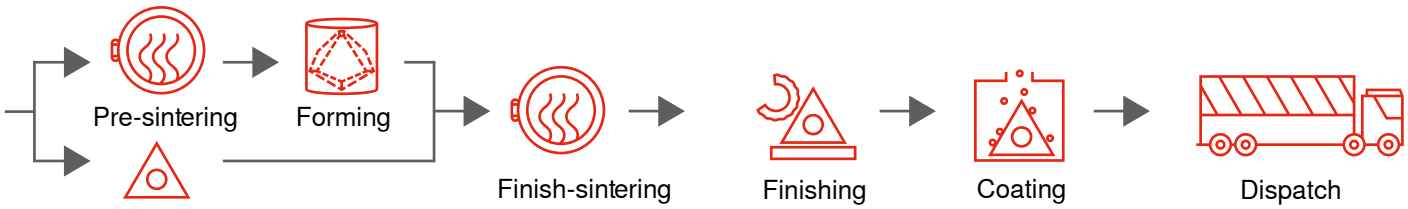
To make a ready-to-use carbide blank from the powder mixture, first it has to be pressed into a mould. The resulting green carbide blank can then be machined. But only after the sintering process (involving temperatures between 1,300 and 1,500 degrees Celsius and a pressure of up to 100 bar) does it become a homogeneous and dense carbide.



Carbide - a composite material with valuable properties

Both the metal binder content and the grain size of the tungsten carbide influence the performance characteristics of the carbide. The specific composition determines the hardness, transverse rupture strength and fracture toughness of the resulting material. The tungsten carbide grains have an average size of 0.5 to several micrometres (µm). The softer binder, cobalt, fills the gaps between the carbide grains.





On the one hand, when extremely high toughness is required, the cobalt content can amount up to 30%. On the other, the cobalt content is reduced and the grain size decreased to the submicron range (for example 0.3 µm), in order to guarantee maximum wear resistance.

CERATIZIT produces far more than 100 different carbide grades particularly for wear parts and cutting tools, thus offering a customised solution for every one of your applications in wheel set machining.

Wheel set machining

Wheels, axles and bogies of trains and other rail vehicles must measure up to the highest quality standards in order to ensure a maximum of operational safety. Covering thousands of kilometres on widely varying routes and carrying heavy loads, train wheels and other wheel set components are however subject to great stress, and the wear suffered is equally extreme. The service life of wheels and wheel sets is crucially dependent on a high standard of manufacturing quality and regular servicing. Particularly important in this connection are the running surfaces of the wheels, as these are responsible for comfort and smoothness of travel.

Your advantages

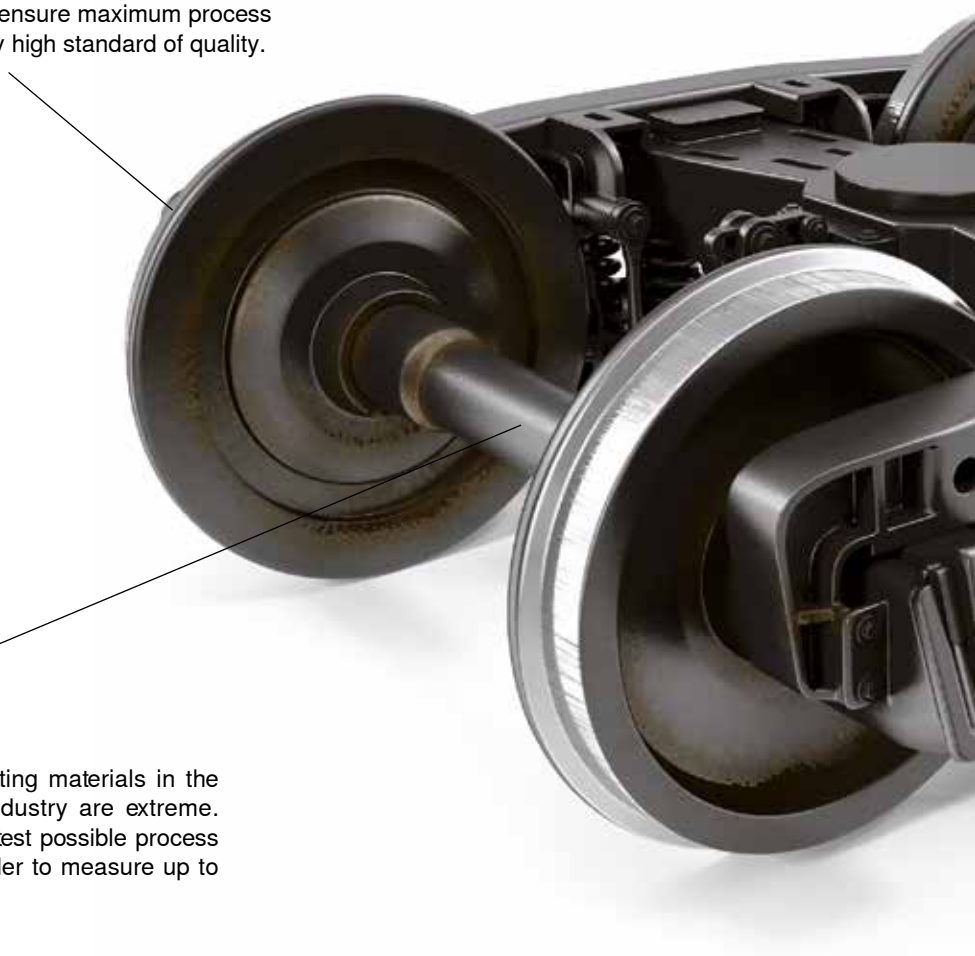
- ▲ For more than 50 years, CERATIZIT has been supplying cutting tools for the production and reprofiling of wheels and for all areas of wheel set machining.
- ▲ We go on developing our tools and tool holders continuously, so as to be able to meet the requirements and wishes of our customers.
- ▲ With CERATIZIT on your side, you have a reliable partner you can count on.

Your benefits

- ▲ Ultra-modern cutting material solutions and tool holders for all areas of wheel set machining
- ▲ Maximum tool life with the highest standards of process reliability, based on use of tools from our extensive standard programme
- ▲ Tailor-made special solutions and tooling systems customised to your requirements can be supplied on request.

New wheel production

The production of new wheels makes great demands on cutting materials and tools. The challenge in the machining of the wheel forgings is the need to ensure maximum process reliability coupled with a consistently high standard of quality.

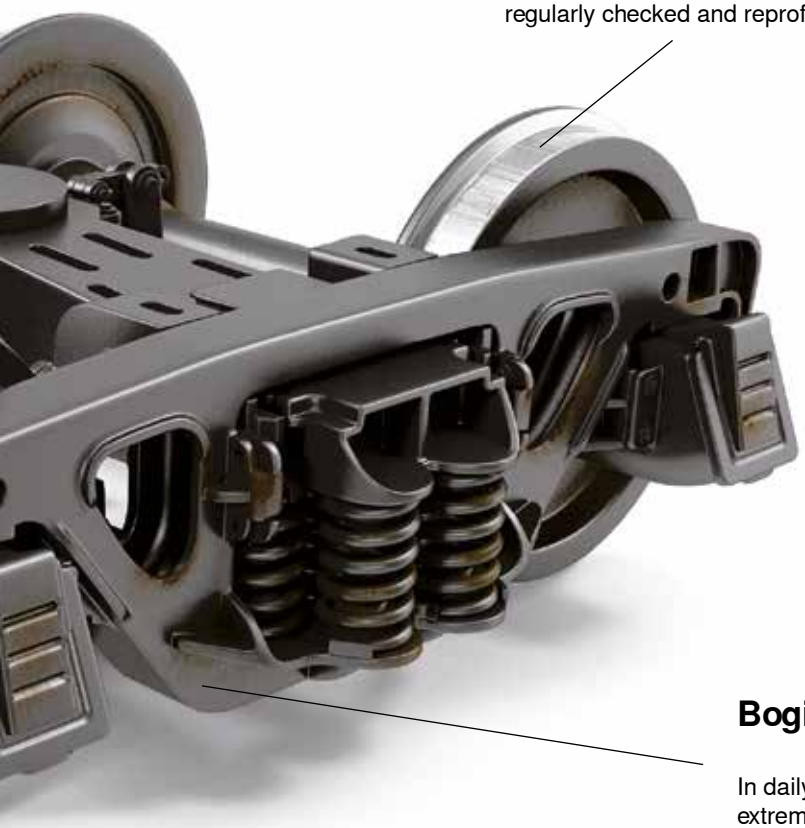


Axle production

The demands made on tools and cutting materials in the production of axles for the railway industry are extreme. Maximum surface quality and the greatest possible process reliability need to be guaranteed in order to measure up to mandatory standards.

Wheel reprofiling

In the course of daily operation, railway wheels are subjected to enormous pressures. In order to ensure safety and comfort of travel, the geometries of the wheel profiles and deviations must be regularly checked and reprofiled.



Bogie machining

In daily operation, the bogies of rail vehicles are subject to extreme and varying pressures. Production requirements are thus equally high, in order to guarantee comfort and safety when travelling by rail.

CERATIZIT standard tools

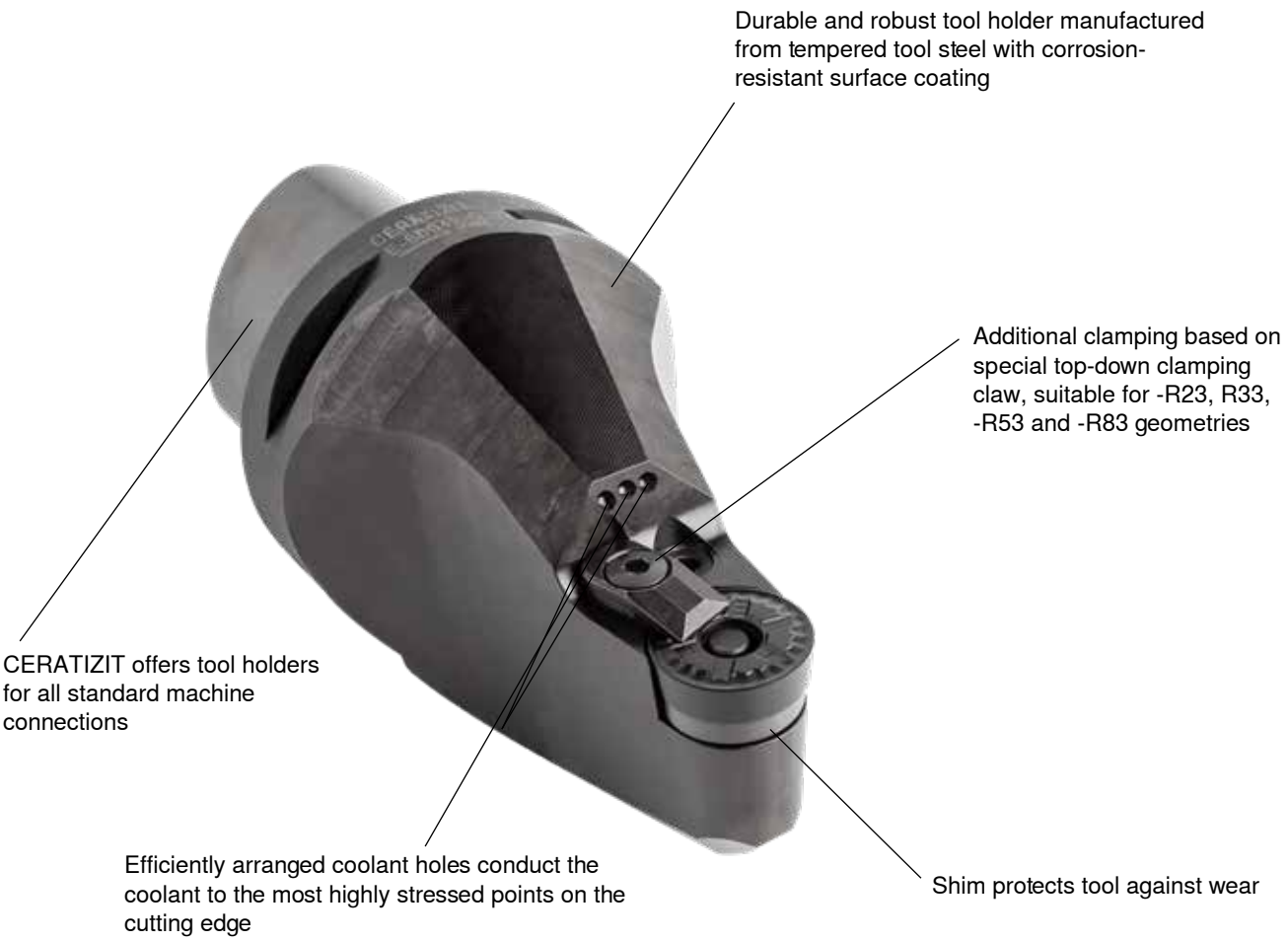
For the machining of wheel sets, CERATIZIT's performance-optimised standard products for turning and milling have proved their effectiveness. In combination with an insert that matches the requirements of the task in hand, these tool holders deliver the best results for the production of new wheels and axles and wheel reprofiling. The additional clamping, based on a specially designed clamping claw with an indexing system, prevents vibration and movement of the insert in the course of machining. This reduces the incidence of insert breakages.

Your advantages

▲ Extensive programme of CERATIZIT standard tools for wheel set machining
▲ Reliable process for both wet and dry machining
▲ Maximum process reliability

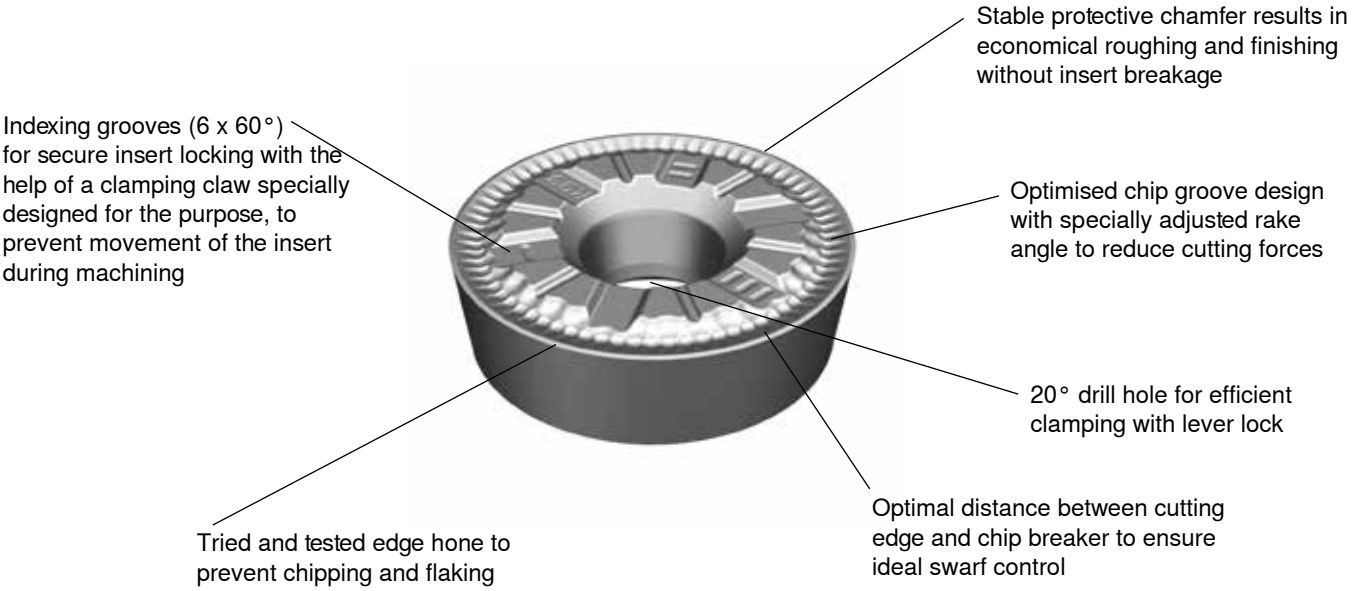
Your benefits

▲ Fewer insert breakages
▲ Optimised chip flow
▲ Ease of handling
▲ Maximum tool life
▲ Low cost



CERATIZIT standard inserts

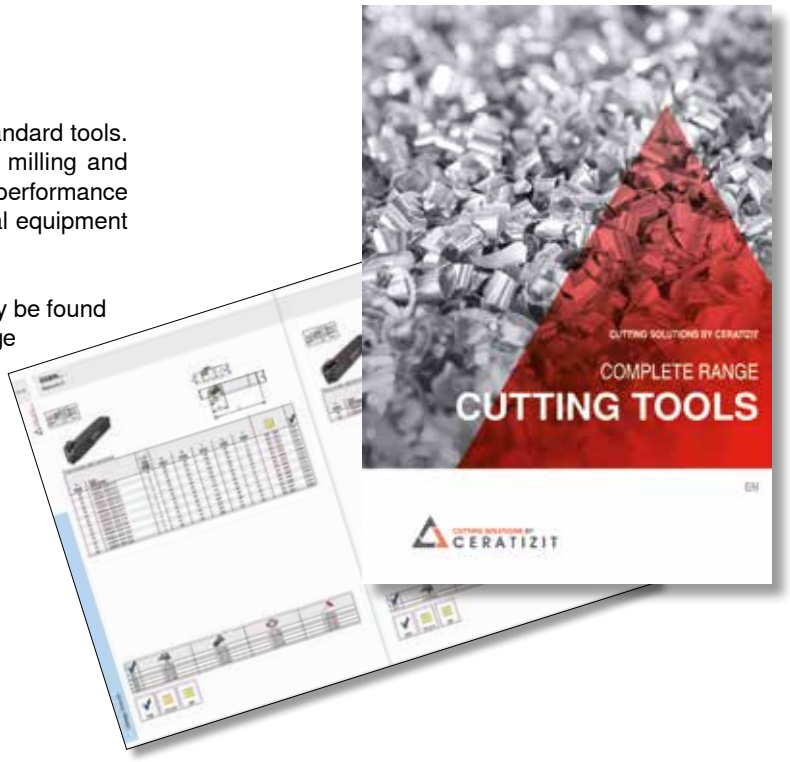
Inserts from CERATIZIT's standard programme are productive and economical, and guarantee maximum reliability. They are characterised by a high degree of cutting edge stability and high metal removal rates. Depending on the given requirements, the inserts can be supplied in different cutting material grades and geometries and deliver the best results in wheel set machining, whether for roughing and finishing the wheels and axles or for bogie machining.



CERATIZIT complete range

CUTTING TOOLS
Many of the tools for wheel set machining are standard tools. With our wide product range of robust turning, milling and drilling tools and our extensive assortment of high-performance carbide drills, you can be sure of finding the ideal equipment to meet your needs.

Detailed information about our standard tools may be found in the current CUTTING TOOLS complete range catalogue. You can download it from the following link:
www.ceratizit.com/en/service/downloads/



Special solutions

For more than 50 years, CERATIZIT has been a reliable partner to the railway industry in the field of demanding machining technology. Thanks to our expertise in all areas of carbide production, we can guarantee supreme quality for our customers.
In dialogue with our customers we look for innovative solutions for wheel set machining, and develop tools which match your needs and requirements exactly.

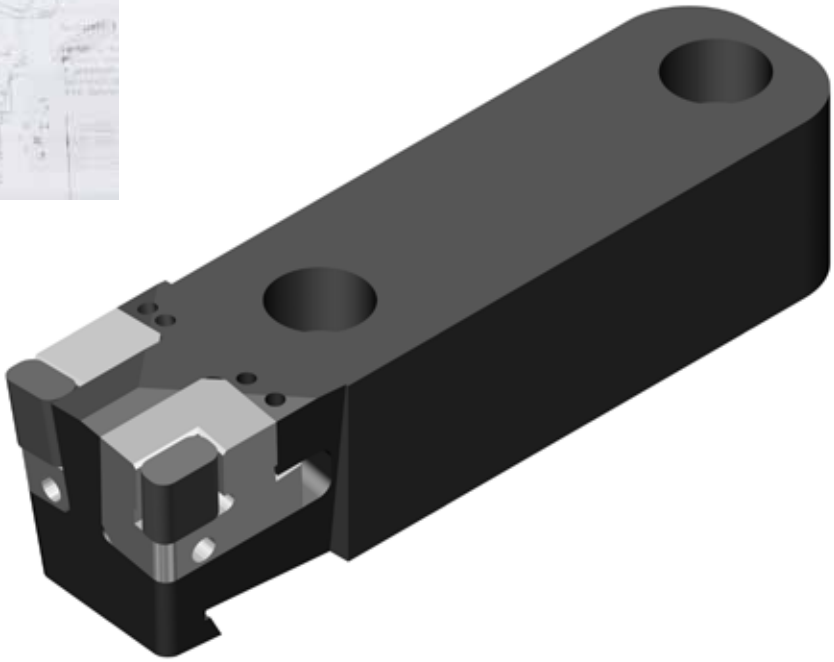
Just have a word with us – you can count on our expertise in finding solutions and our powerful and effective products.

Your advantages

- ▲ Fully qualified contact person on site and at the CERATIZIT machining centre
- ▲ Analysis of your requirements
- ▲ Development of innovative solutions
- ▲ Reduced downtime and increase in production thanks to CERATIZIT's complete solutions

Your benefits

- ▲ Individually tailor-made solutions
- ▲ Competitive advantage thanks to innovation
- ▲ Individually manufactured, powerfully efficient tools and suitable inserts
- ▲ Low costs resulting from the perfect interplay of all factors in wheel set machining



Connection systems

CERATIZIT offers tool holders with all standard connection systems – including for example the polygon adapter (PSC Capto™), HSK-T, UTS and square shanks.

Polygon adapters (PSC Capto™)

▲ The advantages of the new CERATIZIT polygon adapters (PSC Capto™) lie in the extreme rigidity and transverse rupture strength. This offers maximum precision, a high degree of repeatability and high torque transmission.

HSK-T

▲ HSK-T turning tools for complete machining are characterised by high radial positioning accuracy and precise tip height. HSK-T tool holders are suitable for use with HSK-T and HSK-A spindles, can be clamped in overhead position and come with an optimised coolant supply.

UTS

▲ Universal tooling systems (UTS) make it possible to keep tool changing times to a minimum, while adhering to the highest quality and safety standards, resulting in greater productivity.

Square shank

▲ The CERATIZIT shank holder for proven conventional clamping.

New wheel production

The production of new wheels makes great demands on cutting materials and tools. The challenge in the machining of the wheel blanks consists in the need to ensure maximum process reliability coupled with a consistently high standard of quality.

NEW WHEEL PRODUCTION

OVERVIEW

Requirements

Materials

Machining examples

Tooling systems

Inserts

Requirements for new wheel production

After the forging process, railway wheels are given their final form by cutting tools. Cast skins, irregular parts and superfluous material will be removed. The requirements in terms of quality and process reliability are extreme, and the cutting materials and tools thus need to be designed to the highest standards.

Depending on the type of rail vehicle, wheel disks of different sizes are required. The diameter will generally be between 400 and 1600 mm. Likewise the form of the wheel's side profiles or webs may vary. Depending on the use to which the wheels will be put, these may be either straight or undulating. This results in different requirements for the tools and inserts.
The machining of new wheels involves several working steps on vertical lathes, with either wet or dry machining. The choice of tools and inserts will be dependent on the size, form and material of the blanks. Generally speaking, large button inserts with extremely stable tool holder systems are used. When it is a matter of new wheel production, the railway industry has a reliable partner in CERATIZIT.

Materials in new wheel production

New wheels are made from special tempered steels, with designations such as R1 and R9 for example. Details about the chemical composition and mechanical properties may be found in the following table.

Material designation	Chemical composition [%]											As delivered Heat treatment	Mechanical properties	
	C	Si	Mn	P	S	Cr	Cu	Mo	Ni	V	(Cr+Mo +Ni)		Tensile strength R_m [N/mm²]	Brinell hardness [HB]
R1	0,48	0,50	0,90	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	N	600–720	178–214
R2	0,58	0,50	0,90	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	N	700–840	208–249
R3	0,70	0,50	0,90	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	N	800–940	238–278
R6	0,48	0,40	0,75	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	T, E	780–900	231–266
R7	0,52	0,40	0,80	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	T, E	820–940	242–278
R8	0,56	0,40	0,80	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	T, E	860–980	255–290
R9	0,60	0,40	0,80	0,035	0,035	0,30	0,30	0,08	0,30	0,05	0,50	T, E	900–1050	266–311

N = tempered
T = wheel and rim, heat-treated
E = entire wheel heat-treated

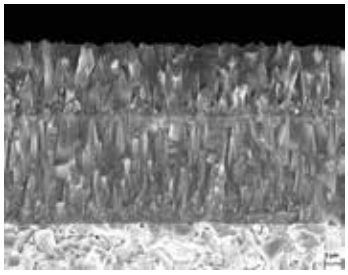
Cutting material grades for new wheel production

The two CERATIZIT high-performance grades, CTCP115 and CTCP125, cover the entire range of requirements in new wheel machining. They offer excellent wear resistance and maximum process security, and are suitable for both wet and dry machining.

The advantages at a glance

▲ Extreme heat resistance
▲ High toughness
▲ Excellent resistance to notching
▲ CVD high-performance layer
(maximum hardness, extremely smooth surface)

CTCP115 BLACKSTAR™	HC-P15 | HC-K25 | HC-M10	● ● ○

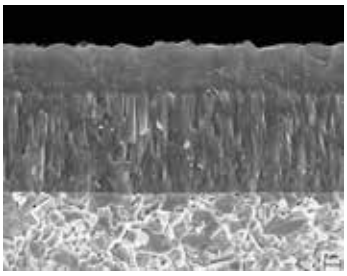


Specification:
Composition: Co 5.8%; mixed carbides 6.4%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1550 | Coating specification: CVD TiCN-Al_2O_3

Recommended application:
The wear-resistant high-performance grade for steel machining

CTCP 115 – high hardness – ideal for :
▲ Slightly interrupted cut ▲ Materials with higher strength ▲ Higher cutting parameters

CTCP125 BLACKSTAR™	HC-P25 | HC-K30 | HC-M20	● ● ○



Specification:
Composition: Co 7.0%; mixed carbides 8.0%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1450 | Coating specification: CVD TiCN-Al_2O_3

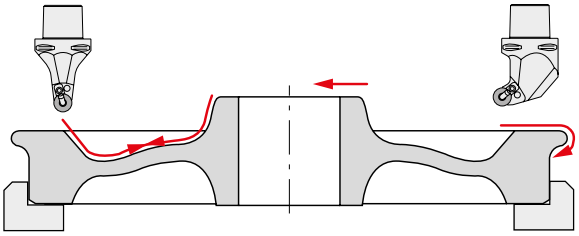
Recommended application:
The first choice for the universal machining of steel.

CTCP 125 – high toughness – ideal for:
▲ Inconsistent cutting depth ▲ Skin on castings or forgings ▲ Heavily interrupted cut ▲ Materials with medium tensile strength

New wheel production – the process

The machining of new wheels calls for several working steps in two clamping positions. First of all comes the roughing of the wheel rim and the first side profile (the inside of the wheel), then the finishing of the surfaces and the machining of the hub bore. Then the wheel is turned outside the machine and clamped again on the jaw chuck for the roughing and finishing of the second side profile (the outside of the wheel).

1st clamping position (inside of wheel uppermost)



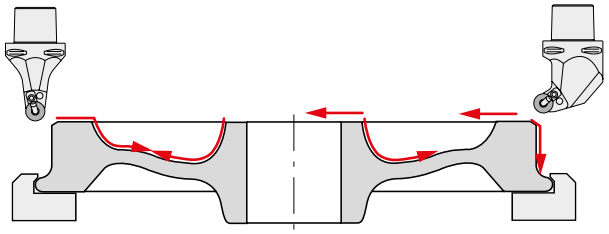
Machining steps

▲ Roughing of running surface, wheel rim and side profile (outside of wheel)
▲ Finishing of running surface, wheel rim and side profile (outside of wheel)

Recommended inserts

▲ Roughing: RCMX -R53, -R83, -R33
▲ Finishing: RCMT -M23, -SM
RCMX -R33

2nd clamping position (outside of wheel uppermost)



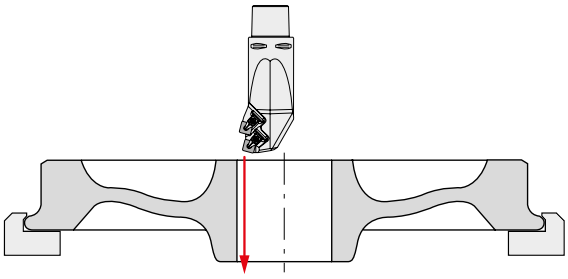
Machining steps

▲ Roughing of wheel rim and side profile (inside of wheel)
▲ Finishing of wheel rim and side profile (inside of wheel)

Recommended inserts

▲ Roughing: RCMX -R53, -R83, -R33
▲ Finishing: RCMT -M23, -SM
RCMX -R33

3. Machining the hub bore



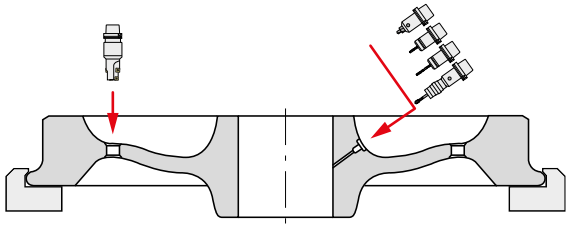
Machining steps

▲ Roughing and finishing of the bore

Recommended inserts

▲ Roughing and finishing: CNMM -R58, -R88
SNMM -R58, -R88

4. Drilling



Machining steps

▲ Drilling of the oil feed hole
▲ Drilling of the fastening bores on the webs

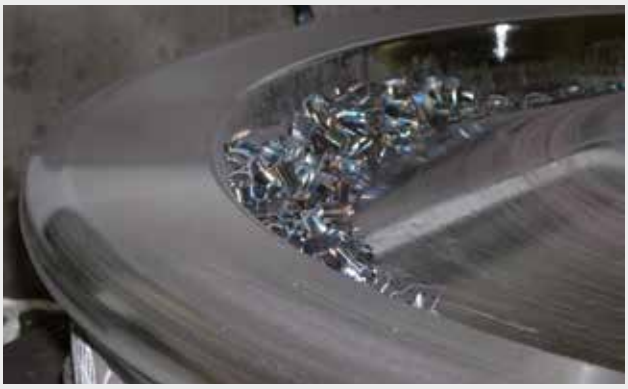
Recommended inserts

▲ Drilling: SONT -M30, -R6 special insert
solid carbide step drill
solid carbide high-performance drill h7

Roughing the side profile with the RCMX 3209MOSN-R33

The roughing of the side profiles (webs) is one of the challenges of new wheel production. The machining of large areas, with varying depths of cut and interrupted cut, and the high chip removal rate make great demands on the tools and inserts.

The following machining example contains customer reference values and supplies guide values for this machining step.



Work piece	railway wheel
Material	R7
Machine	vertical lathe
Tool	C10-DRGCL-32
Insert	RCMX 3209MOSN-R33

Grade	CTCP125
V_c [m/min]	80 – 120
f [mm/rev]	1.0 – 1.4
a_p [mm]	5 – 12
Coolant	emulsion

C10-DRGCL-32

RCMX 3209MOSN-R33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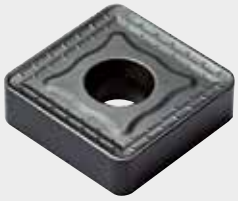
Machining the hub bore with the SNMM 250932SN-R88

In the machining of the hub, precision of the bore is absolutely essential. This calls for speed, surface quality and process reliability, and consequently the roughing of the bore is frequently carried out with appropriate tandem tools in a single working step. This is made possible by the CERATIZIT -R88 chip groove, as the customer reference values of this machining example well illustrate.

Work piece	railway wheel
Material	R7
Machine	vertical lathe
Tool	DSKNR-2-25
Insert	SNMM 250932SN-R88

Grade	CTCP125
V_c [m/min]	150
f [mm/rev]	1.0
a_p [mm]	5 – 10
Coolant	emulsion

DSKNR-2-25



SNMM 250932SN-R88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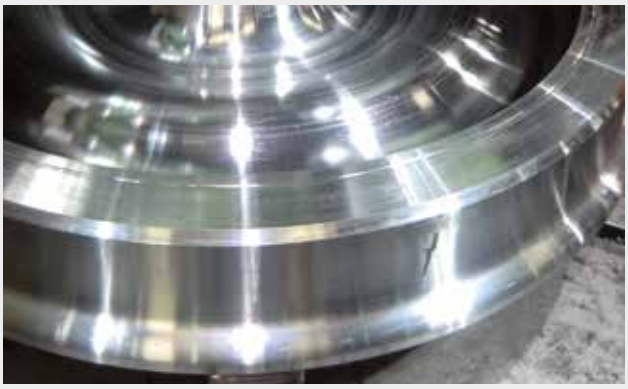
Finishing the running surface with the RCMX 2507MOSN-R33

For finishing the running surface and the wheel rim, supreme surface quality is essential. For the fine machining of these surfaces, the recommended tool is the universal CERATIZIT button insert with chip grooves -SM, -R33 and -M23 in the cutting material grade CTCP115. The following customer reference values supply proven indications for this working step in new wheel production.



Work piece	railway wheel
Material	R7
Machine	vertical lathe
Tool	C10-DRGCL-25
Insert	RCMX 2507MOSN-R33

Grade	CTCP115
V_c [m/min]	220 – 250
f [mm/rev]	1.0 – 1.6
a_p [mm]	0.5 – 1.0
Coolant	emulsion

C10-DRGCL-25

RCMX 2507MOSN-R33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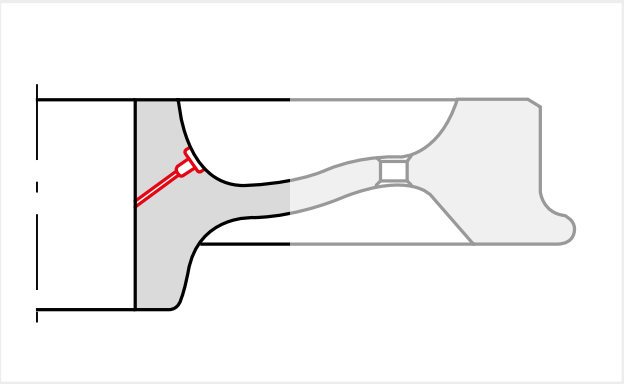
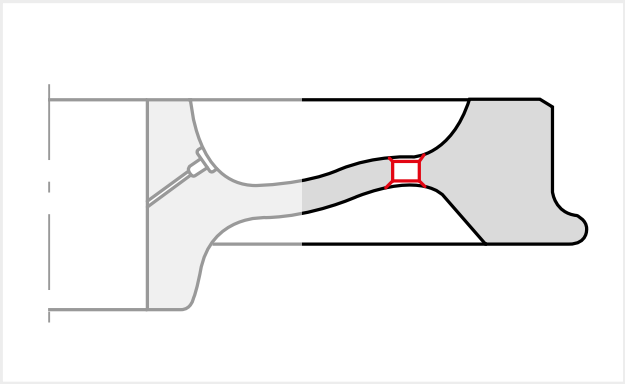
HIGH SURFACE QUALITY THANKS TO OPTIMISED
CHIP GROOVE

Machining the oil feed hole and web holes

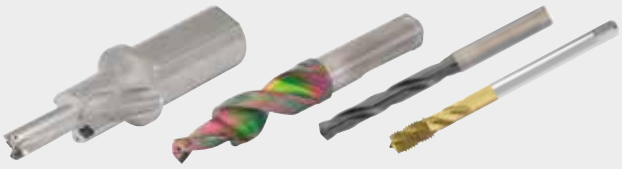
In the final machining step of new wheel production, the oil feed hole will be drilled, and where necessary also the fastening bores for the fitting of additional components like driving toothed wheels and wheel brake disks. In this phase of manufacturing, process reliability is a supreme priority – and here CERATIZIT's tool systems offer the best performance and production safety.



Work piece	railway wheel oil feed hole
Material	R7
Machine	vertical lathe
Tool	MaxiDrill 900 special tool solid carbide step drill solid carbide twist drill solid carbide tap
Insert	SONT 155312ER-M30 CTPP430



Work piece	railway wheel fastening bores
Material	R7
Machine	vertical lathe
Tool	MaxiDrill 900
Insert	SONT 155312ER-M30 CTPP430

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Drilling tools and inserts – see main catalogue

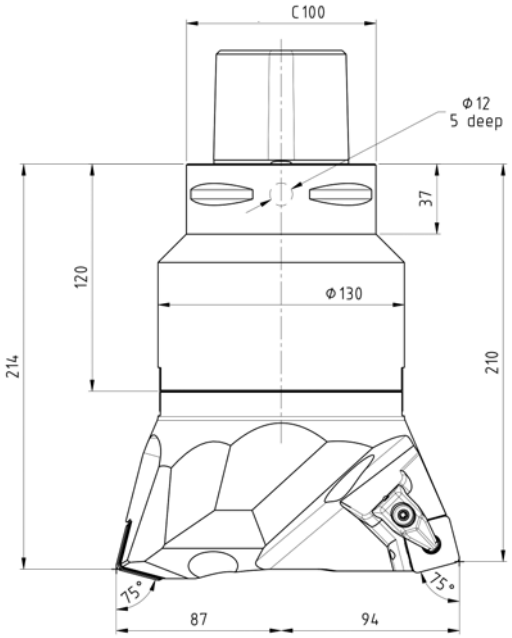
TOOL CONCEPT PROVIDES MAXIMUM
EFFICIENCY


442 222

Tool holders with different connection systems

All tools for new wheel production are made to order.

If you are interested in CERATIZIT tools for new wheel production, please send your enquiry to:
info.austria@ceratizit.com



CERATIZIT clamping system

As an addition to the lever lock clamp, the clamping claw system improves process reliability for the processing of new wheels. A special top-down clamping claw with an indexing bulge grips one of the three indexing grooves of the CERATIZIT RCMX inserts, and so prevents any displacement of the insert as a result of vibration during machining.

Advantage

- ▲ Additional clamping security thanks to special top-down clamping claw, matching the -R33, -R53 and -R83 geometries
- ▲ No displacement of the insert during machining
- ▲ Reduction of vibration in the machining process
- ▲ Reduction in the number of insert breakages means greater process reliability, longer tool life and reduced costs resulting from tool breakage

The correct clamping procedure

1 Manual alignment of the insert and the top-down clamp: the indexing bulge of the clamp engages in one of indexing grooves of the button insert.

Indexing bulge

Indexing grooves

2 Positioning of the insert through easy pre-clamping with the clamping claw

3 Strong tightening of the lever with the lever screw

4 Final fastening by strongly tightening the top-down clamping claw

INSERTS

BUTTON INSERTS RCMT.. / RCMX..

-M23

▲ Soft cutting geometry with excellent chip control for small depths of cut in finishing operations

Machining conditions

CTCP115	CTCP125	CTCP125

-R33

▲ Soft cutting geometry for machining various wheels in continuous and slightly interrupted cut

Machining conditions

CTCP115	CTCP125	CTCP125

-R23

▲ For high surface quality in machining operations with continuous cut

Machining conditions

CTCP115	CTCP125	CTCP125

-R53

▲ Soft cutting geometry with a very positive rake angle in combination with a stable land
▲ For medium turning

Machining conditions

CTCP115	CTCP125	CTCP125

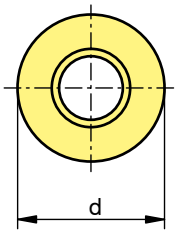
-R83

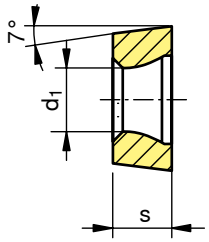
▲ Geometry for high feed rates and large depth of cut as well as varying forging allowance
▲ For a very good chip control

Machining conditions

CTCP115	CTCP125	CTCP125
CTCP115	CTCP125	CTCP125

			P	M	K	N	S	H	CTCP115	CTCP125	d [mm]	s [mm]	d_1 [mm]
-M23		RCMT 1204MOSN-M23			●				●	●	12,00	4,76	4,90
		RCMT 1606MOSN-M23			●				●	●	16,00	6,35	5,30
		RCMT 2006MOSN-M23			●				●	●	20,00	6,35	6,50
-SM		RCMT 1204MOSN-SM			●				●	●	12,00	4,76	4,90
		RCMT 1606MOSN-SM			●				●	●	16,00	6,35	5,30
		RCMT 2006MOSN-SM			●				●	●	20,00	6,35	6,50
		RCMT 2507MOSN-SM			●				●	●	25,00	7,94	7,20
-R33		RCMX 3209MOSN-R33			●				●	●	32,00	9,52	9,50
-R23		RCMX 2507MOSN-R23			●				●	●	25,00	7,94	7,20
		RCMX 3209MOSN-R23			●				●	●	32,00	9,52	9,50
-R53		RCMX 2507MOSN-R53			●				●	●	25,00	7,94	7,20
		RCMX 3209MOSN-R53			●				●	●	32,00	9,52	9,50
-R83		RCMX 2507MOSN-R83			●				●	●	25,00	7,94	7,20
		RCMX 3209MOSN-R83			●				●	●	32,00	9,52	9,50
									CTCP115	CTCP125	d	s	d_1



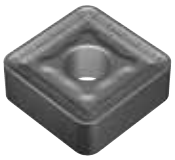


INSERTS

90° INSERTS SNMM..

-R28

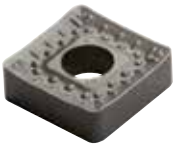
▲ Single-sided roughing geometry
▲ Longitudinal and face turning, profiling
▲ Inconsistent cutting depth
▲ For steels with high strength (800 N/mm²)
▲ Good chip control



Machining conditions		
CTCP115	**CTCP125**	**CTCP125**
CTCP115	CTCP125	CTCP125
CTCP115	**CTCP125**	**CTCP125**

-R58

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ Slightly interrupted cut
▲ Low cutting forces
▲ Unstable machines



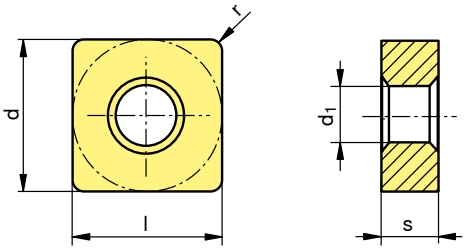
Machining conditions		
CTCP115	**CTCP125**	**CTCP125**
CTCP115	CTCP125	CTCP125
CTCP115	**CTCP125**	**CTCP125**

-R88

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ High feed rates
▲ Large depths of cut
▲ Heavily interrupted cut

Machining conditions		
CTCP115	**CTCP125**	**CTCP125**
CTCP115	CTCP125	CTCP125
CTCP115	**CTCP125**	**CTCP125**

			P	M	K	N	S	H	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
			CTCP115	CTCP125									
-R28		SNMM 190616EN-R28	●	●					19,05	19,05	6,35	1,60	7,94
		SNMM 250924EN-R28	●	●					25,40	25,40	9,52	2,40	9,12
-R58		SNMM 190612EN-R58	●	●					19,05	19,05	6,35	1,20	7,94
		SNMM 190616EN-R58	●	●					19,05	19,05	6,35	1,60	7,94
		SNMM 190624EN-R58	●	●					19,05	19,05	6,35	2,40	7,94
		SNMM 250724EN-R58	●	●					25,40	25,40	7,94	2,40	9,12
		SNMM 250924EN-R58	●	●					25,40	25,40	9,52	2,40	9,12
-R88		SNMM 190616SN-R88	●	●					19,05	19,05	6,35	1,60	7,94
		SNMM 190624SN-R88	●	●					19,05	19,05	6,35	2,40	7,94
		SNMM 250724SN-R88	●	●					25,40	25,40	7,94	2,40	9,12
		SNMM 250732SN-R88	●	●					25,40	25,40	7,94	3,20	9,12
		SNMM 250924SN-R88	●	●					25,40	25,40	9,52	2,40	9,12
		SNMM 250932SN-R88	●	●					25,40	25,40	9,52	3,20	9,12
			CTCP115	CTCP125					d	l	s	r	d_1



INSERTS

80° INSERTS CNMM..

-R28

▲ Single-sided roughing geometry
▲ Longitudinal and face turning, profiling
▲ Inconsistent cutting depth
▲ For steels with high strength (800 N/mm²)
▲ Good chip control

Machining conditions

CTCP115	CTCP125	CTCP135

-R58

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ Slightly interrupted cut
▲ Low cutting forces
▲ Unstable machines

Machining conditions

CTCP115	CTCP125	CTCP135

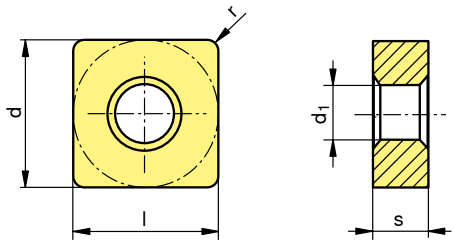
-R88

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ High feed rates
▲ Large depths of cut
▲ Heavily interrupted cut

Machining conditions

CTCP115	CTCP125	CTCP125

			P	M	K	N	S	H	CTCP115	CTCP125	CTCP135	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
-R28		CNMM 190612EN-R28	●	○	●				●	●	●	19,05	19,30	6,35	1,20	7,94
		CNMM 190616EN-R28	●	○	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMM 190624EN-R28	●	○	●				●	●	●	19,05	19,30	6,35	2,40	7,94
-R58		CNMM 190612EN-R58	●	○	●				●	●	●	19,05	19,30	6,35	1,20	7,94
		CNMM 190616EN-R58	●	○	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMM 190624EN-R58	●	○	●				●	●	●	19,05	19,30	6,35	2,40	7,94
		CNMM 250924EN-R58	●	○	●				●	●	●	25,40	25,80	9,52	2,40	9,12
-R88		CNMM 190616SN-R88	●	○	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMM 190624SN-R88	●	○	●				●	●	●	19,05	19,30	6,35	2,40	7,94
		CNMM 190624SN-R88Q	●	○					●	●		19,05	19,30	6,35	2,40	7,94
		CNMM 250924SN-R88	●	○	●				●	●	●	25,40	25,80	9,52	2,40	9,12
									CTCP115	CTCP125	CTCP135	d	l	s	r	d_1



Axle production

The demands on tools and cutting materials in the production of wheel set axles for the railway vehicle industry are extreme. Maximum surface quality and the highest possible degree of process reliability must be guaranteed, in order to meet the mandatory standards.

AXLE PRODUCTION

OVERVIEW

Requirements

Materials

Machining examples

Tooling systems

Inserts

Requirements for axle production

In railway vehicles, the axle connects the two wheel disks rigidly with one another. In daily operation it is subjected to extreme stresses (deflection, torsion) and loads (weight). So in the manufacturing of wheel set axles extremely high standards of quality and safety need to be met. Construction, design, production and quality assurance are all regulated by various standards.

For the machining of the steel forgings, top-quality tools and cutting materials are required. These must offer maximum process reliability along with economy. With CERATIZIT's tooling systems, you have an experienced and reliable partner for axle production.

For the production of axles, CERATIZIT offers an extensive range of standard inserts in different geometries and cutting material grades.

The most commonly used solutions for axle production may be found in this brochure. An overview of the entire programme of CERATIZIT machining tools and cutting material grades is given by the current CUTTING TOOLS complete range.

Materials for axle production

Axles are made from special tempered steels, the grades being classified from A1 to A5. For details of the chemical composition and mechanical properties, please see the table below.

Material designation	Chemical composition [%]											As delivered Heat treatment	Mechanical characteristics	
	C	Si	Mn	P	S	Cr	Cu	Mo	Ni	V	(Cr+Mo +Ni)		Tensile strength R_m [N/mm²]	Brinell hardness [HB]
A1/ EA1T	0,42	0,40	0,70	0,045	0,045	0,40	–	0,10	0,40	–	0,63	**T** **N**	550 550–700	163–208
A2	0,22	0,40	1,20	0,025	0,030	0,45	0,25	0,15	0,15	0,10	–	**N**	510–620	152–184
A3	0,50	0,40	0,70	0,045	0,045	0,40	0,10	0,10	0,40	–	0,63	**T** **N**	620–770 600–750	184–228
A4/ EA4T	0,25	0,25	0,80	0,020	0,015	0,12	–	0,20	0,30	–	–	**T**	650–800	193–238
A5	0,25	0,25	0,70	0,020	0,015	1,00	–	0,20	0,30	–	–	**T**	730–880	216–261

N = tempered
T = heat-treated

DIN material designation

Material designation	Standard designation (DIN)
A1 / EA1T	C35
A2	22MnCrV5
A3	C45
A4 / EA4T	25CrMo4
A5	42CrMo4

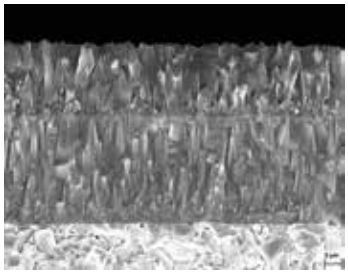
Cutting material grades for axle production

Three CERATIZIT carbide grades cover the entire spectrum of axle production. From process security for forged surfaces using CTCP135 to high wear resistance in the finishing and reworking process using CTCP115, they deliver the ultimate in performance for a whole range of applications.

The advantages at a glance:

- ▲ Extreme thermal resistance
- ▲ Great toughness
- ▲ Excellent notching resistance
- ▲ High-performance CVD layer (maximum hardness, extremely smooth surface)

CTCP115 BLACKSTAR™	HC-P15 | HC-K25 | HC-M10	● ● ○

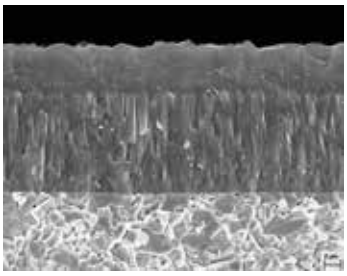


Specification:
Composition: Co 5.8%; mixed carbides 6.4%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1550 | Coating specification: CVD TiCN-Al_2O_3

Recommended application:
The wear-resistant high-performance grade for steel machining.

CTCP 115 – high hardness – ideal for:
▲ Slightly interrupted cut ▲ Materials with higher strength ▲ Higher cutting parameters

CTCP125 BLACKSTAR™	HC-P25 | HC-K30 | HC-M20	● ● ○

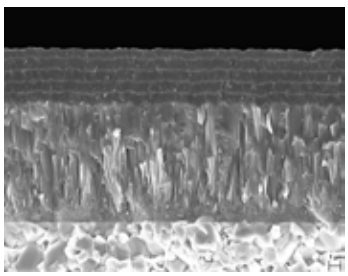


Specification:
Composition: Co 7.0%; mixed carbides 8.0%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1450 | Coating specification: CVD TiCN-Al_2O_3

Recommended application:
The first choice for the universal machining of steel.

CTCP 125 – high toughness – ideal for:
▲ Inconsistent cutting depth ▲ Skin on castings or forgings ▲ Heavily interrupted cut ▲ Materials with medium tensile strength

CTCP135 COLORSTAR™	HC-P35 | HC-M25 | HC-S25	● ● ○



Specification:
Composition: Co 9.6%; mixed carbides 6.7%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1460 | Coating specification: CVD TiCN-Al_2O_3 multi-layer

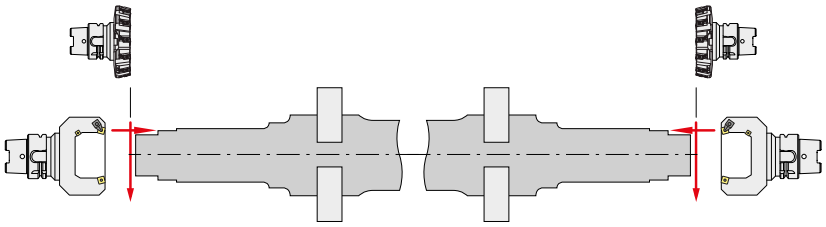
Recommended application:
The tough alternative for heavily interrupted cutting action.

CTCP 135 – high toughness – ideal for:
▲ Heavily interrupted cut ▲ Widely varying cutting depth

Axle production – the process

Axle production requires several steps. First the forged blank undergoes face milling at both rod ends, the axle journal is machined on both sides and various holes are bored on the face. The axle is then roughed to size on a turning machine in line with customer requirements. This removes any residual forging and casting skin. Fine machining of the wheelset profile then takes place using a finishing process.

Machining of the axle ends



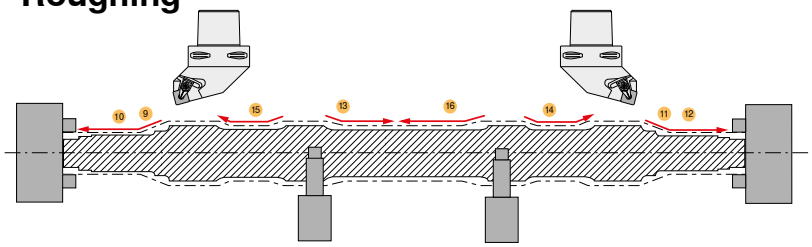
Machining steps

▲ Face milling of the rod ends on both sides
▲ Milling of the axle end on both sides

Recommended inserts

▲ LNUJ 220920SR
▲ SNMM 120612SN-R88
▲ SNMG 120408EN-M50

Roughing



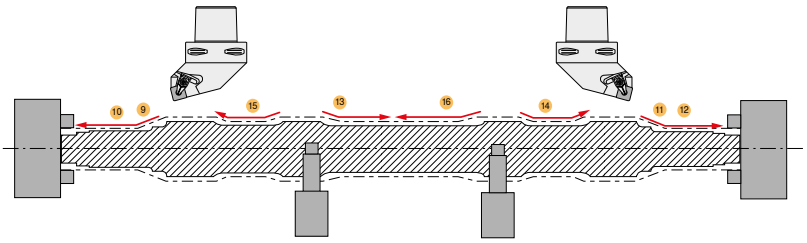
Machining steps

▲ Roughing of the wheel set shaft
▲ Roughing of the profile

Recommended inserts

▲ CNMM -R58, -R88
▲ DNMG -R58
▲ SNMM -R58, -R88

Finishing



Machining steps

▲ Finishing of the wheel set shaft
▲ Finishing of the profile

Recommended inserts

▲ CNMG -M70, CNMM -R28
▲ DNMG -M70, -TMQ, DNMM -R28
▲ SNMG -M70, SNMM -R28
▲ TNMG -M70, TNMM -R28
▲ RCMT -SM, -M23

Machining the axle ends

In preparation for a precise and secure clamping of the axle with a view to rough machining on the lathe, as a first step both axle ends are face milled and both axle ends are milled with precise reference to the form and the position. This task is accomplished by the use of CERATIZIT standard milling tools and special milling tools created for the specific application case.

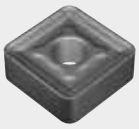
Work piece	railway axle – face milling
Material	EA4T / 25CrMo4
Machine	lathe
Tool	MaxiMill AHDM.160.R.08-75-22
Insert	LNUJ 220920SR

Work piece	railway axle – milling of the axle ends
Material	EA4T / 25CrMo4
Machine	lathe
Tool	special combination tool
Insert	SNMM 190612SN-R88

AHDM.160.R.08-75-22

LNUJ 220920SR

GW-DSKNR-2-19-D125



SNMM 190612SN-R88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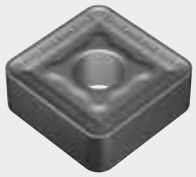
Roughing the axle

Rough machining on the lathe gives the railway axle its basic profile. Here what is called for is a high degree of process reliability, with considerable and varying depth of cut and high feed rates. The following machining example, with the CERATIZIT -R88 insert, supplies customer reference values for this first part of axle production.

Work piece	railway axle
Material	EA4T / 25CrMo4
Machine	lathe
Tool	SSBNR 4040 T25
Insert	SNMM 250924SN-R88

Grade	CTCP125
V_c [m/min]	160
f [mm/rev]	0.5
a_p [mm]	3–6
Coolant	emulsion

SSBNR 4040 T25



SNMM 250924SN-R88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HIGH PROCESS RELIABILITY THANKS TO STABLE
PROTECTIVE CHAMFER

Finishing the axle

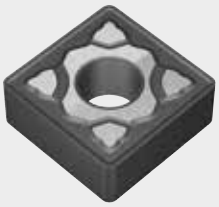
When finishing the wheel set shaft, the highest degree of surface quality and process reliability is essential. Even the smallest notches can make a critical difference to functionality.

For perfect finishing, the -M70 insert in cutting material grade CTCP115 is ideal. The table below shows established customer reference values.

Work piece	railway axle
Material	EA4T / 25CrMo4
Machine	lathe
Tool	PSBNL 3232 P15-T
Insert	SNMG 150612EN-M70

Grade	CTCP115
V_c [m/min]	220
f [mm/rev]	0.4
a_p [mm]	1
Coolant	emulsion

PSBNL 3232 P15-T



SNMG 150612EN-M70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HIGH SURFACE QUALITY THANKS TO OPTIMISED CHIP GROOVE

CERATIZIT standard tools

CERATIZIT offers an extensive range of tools and inserts for axle production, in various geometries and cutting material grades. The most commonly used inserts are listed on the following pages of his brochure. Other tools and geometries may be found in our main catalogue.

Special tool holders

Special tool holders can be manufactured on request.

If you are interested in finding out more about CERATIZIT's tools for axle production, please send your enquiry to: info.austria@ceratizit.com.

CERATIZIT CUTTING TOOLS complete range

Most tools for axle production are standard tools. With our wide product assortment of turning tools and inserts, you can be sure of having the best equipment for the task in hand.

Detailed information about our standard turning tools and inserts may be found in the CUTTING TOOLS complete range catalogue. Here is the link to download the file: www.ceratizit.com/en/service/downloads/

INSERTS

80° INSERTS CNMG.. / CNMM..

-TMQ

▲ Masterfinish geometry
▲ Light to medium roughing
▲ Very high feed rates
▲ High surface quality

Machining conditions

CTCP115	CTCP125	CTCP135

-M70

▲ Light to medium roughing
▲ Skin on castings or forgings
▲ Stable cutting edge
▲ Interrupted cut
▲ For blanks and forged parts

Machining conditions

CTCP115	CTCP125	CTCP135

-R28

▲ Single-sided roughing geometry
▲ Longitudinal and face turning, profiling
▲ Inconsistent cutting depth
▲ For steels with high strength (800 N/mm²)
▲ Good chip control

Machining conditions

CTCP115	CTCP125	CTCP135

-R58

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ Slightly interrupted cut
▲ Low cutting forces
▲ Unstable machines

Machining conditions

CTCP115	CTCP125	CTCP135

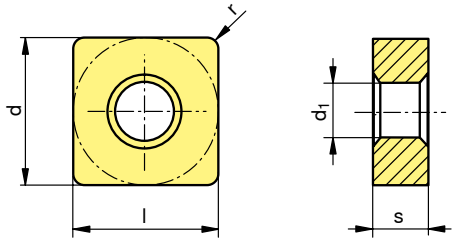
-R88

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ High feed rates
▲ Large depths of cut
▲ Heavily interrupted cut

Machining conditions

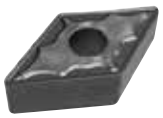
CTCP115	CTCP125	CTCP125

			P	M	K	N	S	H	CTCP115	CTCP125	CTCP135	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
-TMQ		CNMG 120408EN-TMQ			●					●		12,70	12,90	4,76	0,80	5,16
		CNMG 120412EN-TMQ	●	○	●				●	●		12,70	12,90	4,76	1,20	5,16
-M70		CNMG 120408EN-M70	●	●	●				●	●	●	12,70	12,90	4,76	0,80	5,16
		CNMG 120412EN-M70	●	●	●				●	●	●	12,70	12,90	4,76	1,20	5,16
		CNMG 120416EN-M70	●	●	●				●	●	●	12,70	12,90	4,76	1,60	5,16
		CNMG 160608EN-M70	●	●	●				●	●	●	15,88	16,10	6,35	0,80	6,35
		CNMG 160612EN-M70	●	●	●				●	●	●	15,88	16,10	6,35	1,20	6,35
		CNMG 160616EN-M70	●	●	●				●	●	●	15,88	16,10	6,35	1,60	6,35
		CNMG 190612EN-M70	●	●	●				●	●	●	19,05	19,30	6,35	1,20	7,94
		CNMG 190616EN-M70	●	●	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMG 190624EN-M70	●	●	●				●	●	●	19,05	19,30	6,35	2,40	7,94
		CNMG 250924EN-M70		○	●					●		25,40	25,80	9,52	2,40	9,12
-R28		CNMM 120408EN-R28	●	●	●				●	●		12,70	12,90	4,76	0,80	5,16
		CNMM 120412EN-R28	●	●	●				●	●	●	12,70	12,90	4,76	1,20	5,16
		CNMM 120416EN-R28	●	●	●				●	●	●	12,70	12,90	4,76	1,60	5,16
		CNMM 160612EN-R28	●	●	●				●	●	●	15,88	16,10	6,35	1,20	6,35
		CNMM 160616EN-R28	●	●	●				●	●	●	15,88	16,10	6,35	1,60	6,35
		CNMM 190612EN-R28	●	●	●				●	●	●	19,05	19,30	6,35	1,20	7,94
		CNMM 190616EN-R28	●	●	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMM 190624EN-R28	●	●	●				●	●	●	19,05	19,30	6,35	2,40	7,94
-R58		CNMM 120408EN-R58	●	●	●				●	●	●	12,70	12,90	4,76	0,80	5,16
		CNMM 120412EN-R58	●	●	●				●	●	●	12,70	12,90	4,76	1,20	5,16
		CNMM 120416EN-R58	●	●	●				●	●	●	12,70	12,90	4,76	1,60	5,16
		CNMM 160612EN-R58	●	●	●				●	●	●	15,88	16,10	6,35	1,20	6,35
		CNMM 160616EN-R58	●	●	●				●	●	●	15,88	16,10	6,35	1,60	6,35
		CNMM 190612EN-R58	●	●	●				●	●	●	19,05	19,30	6,35	1,20	7,94
		CNMM 190616EN-R58	●	●	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMM 190624EN-R58	●	●	●				●	●	●	19,05	19,30	6,35	2,40	7,94
		CNMM 250924EN-R58	●	●	●				●	●	●	25,40	25,80	9,52	2,40	9,12
-R88		CNMM 190616SN-R88	●	●	●				●	●	●	19,05	19,30	6,35	1,60	7,94
		CNMM 190624SN-R88	●	●	●				●	●	●	19,05	19,30	6,35	2,40	7,94
		CNMM 190624SN-R88Q	●	●					●	●		19,05	19,30	6,35	2,40	7,94
		CNMM 250924SN-R88	●	●	●				●	●	●	25,40	25,80	9,52	2,40	9,12
									CTCP115	CTCP125	CTCP135	d	l	s	r	d_1



-TMQ

▲ Masterfinish geometry
▲ Light to medium roughing
▲ Very high feed rates
▲ High surface quality



Machining conditions

CTCP115	CTCP125	CTCP135

-M70

▲ Light to medium roughing
▲ Skin on castings or forgings
▲ Stable cutting edge
▲ Interrupted cut
▲ For blanks and forged parts

Machining conditions

CTCP115	CTCP125	CTCP135

-R28

▲ Single-sided roughing geometry
▲ Longitudinal and face turning, profiling
▲ Inconsistent cutting depth
▲ For steels with high strength (800 N/mm²)
▲ Good chip control

Machining conditions

CTCP115	CTCP125	CTCP135

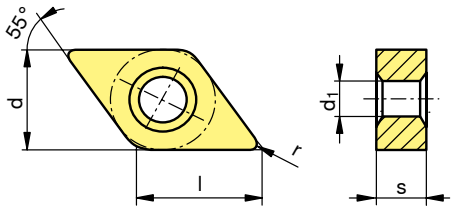
-R58

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ Slightly interrupted cut
▲ Low cutting forces
▲ Unstable machines

Machining conditions

CTCP115	CTCP125	CTCP135

			P	M	K	N	S	H	CTCP115	CTCP125	CTCP135	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
--TMQ		DNMG 150608EN-TMQ			●					●		12,70	15,50	6,35	0,80	5,16
		DNMG 150612EN-TMQ			●				●	●		12,70	15,50	6,35	1,20	5,16
-M70		DNMG 110408EN-M70		○	●				●	●	●	9,52	11,60	4,76	0,80	3,81
		DNMG 110412EN-M70		○	●				●	●	●	9,52	11,60	4,76	1,20	3,81
		DNMG 150408EN-M70		○	●				●	●	●	12,70	15,50	4,76	0,80	5,16
		DNMG 150412EN-M70		○	●				●	●	●	12,70	15,50	4,76	1,20	5,16
		DNMG 150416EN-M70		○	●				●	●	●	12,70	15,50	4,76	1,60	5,16
		DNMG 150608EN-M70		○	●				●	●	●	12,70	15,50	6,35	0,80	5,16
		DNMG 150612EN-M70		○	●				●	●	●	12,70	15,50	6,35	1,20	5,16
		DNMG 150616EN-M70		○	●				●	●	●	12,70	15,50	6,35	1,60	5,16
-R28		DNMM 150612EN-R28							●	●	●	12,70	15,50	6,35	1,20	5,16
		DNMM 150616EN-R28							●	●	●	12,70	15,50	6,35	1,60	5,16
-R58		DNMM 150612EN-R58							●	●	●	12,70	15,50	6,35	1,20	5,16
		DNMM 150616EN-R58							●	●	●	12,70	15,50	6,35	1,60	5,16
			P	M	K	N	S	H	CTCP115	CTCP125	CTCP135	d	l	s	r	d_1



INSERTS

BUTTON INSERTS RCGT.., RCMT..

-M23

▲ Soft cutting geometry with excellent chip control for small depths of cut in finishing operations

Machining conditions

CTCP115	CTCP125	CTCP135

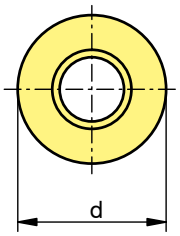
-SM

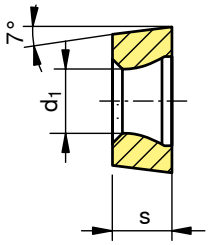
▲ Medium machining
▲ Universal application
▲ Stable cutting edge
▲ Inconsistent cutting depth
▲ Wide range of applications

Machining conditions

CTCP115	CTCP125	CTCP135

			P	M	K	N	S	H	CTCP115	CTCP125	CTCP135	d [mm]	s [mm]	d_1 [mm]
-M23		RCMT 1204MOSN-M23	●	●	●				●	●		12,00	4,76	4,90
		RCMT 1606MOSN-M23	●	●	●				●	●		16,00	6,35	5,30
		RCMT 2006MOSN-M23	●	●	●				●	●		20,00	6,35	6,50
-SM		RCGT 0602MOEN-SM	○	○	○					●	●	6,00	2,38	2,80
		RCGT 0803MOEN-SM	○	○	○					●	●	8,00	3,18	3,40
		RCMT 1003MOSN-SM	○	○	○					●	●	10,00	3,18	4,00
		RCMT 1204MOSN-SM	●	●	●				●	●	●	12,00	4,76	4,90
		RCMT 1606MOSN-SM	●	●	●				●	●	●	16,00	6,35	5,30
		RCMT 2006MOSN-SM	○	○	○					●	●	20,00	6,35	6,50
		RCMT 2507MOSN-SM	●	●	●				●	●	●	25,00	7,94	7,20
-R33		RCMX 3209MOSN-R33	●	●	●				●	●		32,00	9,52	9,50



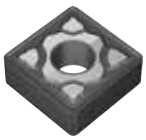


INSERTS

90° INSERTS SNMG.. / SNMM.. / SNMT..

-M70

- ▲ Light to medium roughing
- ▲ Skin on castings or forgings
- ▲ Stable cutting edge
- ▲ Interrupted cut
- ▲ For blanks and forged parts

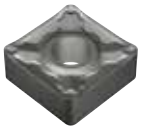


Machining conditions

CTCP115	CTCP125	CTCP135

-R28

- ▲ Single-sided roughing geometry
- ▲ Longitudinal and face turning, profiling
- ▲ Inconsistent cutting depth
- ▲ For steels with high strength (800 N/mm²)
- ▲ Good chip control

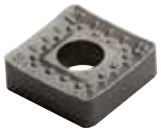


Machining conditions

CTCP115	CTCP125	CTCP135

-R58

- ▲ Single-sided roughing geometry
- ▲ Longitudinal and face turning
- ▲ Slightly interrupted cut
- ▲ Low cutting forces
- ▲ Unstable machines

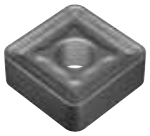


Machining conditions

CTCP115	CTCP125	CTCP135

-R88

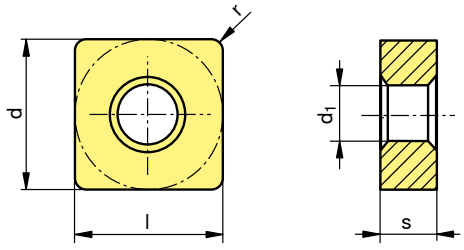
- ▲ Single-sided roughing geometry
- ▲ Longitudinal and face turning
- ▲ High feed rates
- ▲ Large depths of cut
- ▲ Heavily interrupted cut



Machining conditions

CTCP115	CTCP125	CTCP135

			P	M	K	N	S	H	CTCP115	CTCP125	CTCP135	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
-M70		SNMG 120408EN-M70	●	○	●				●	●	●	12,70	12,70	4,76	0,80	5,16
		SNMG 120412EN-M70	●	○	●				●	●	●	12,70	12,70	4,76	1,20	5,16
		SNMG 120416EN-M70	●	○	●				●	●	●	12,70	12,70	4,76	1,60	5,16
		SNMG 150612EN-M70	●	○	●				●	●	●	15,88	15,88	6,35	1,20	6,35
		SNMG 150616EN-M70	●	○	●				●	●	●	15,88	15,88	6,35	1,60	6,35
		SNMG 190612EN-M70	●	○	●				●	●	●	19,05	19,05	6,35	1,20	7,94
		SNMG 190616EN-M70	●	○	●				●	●	●	19,05	19,05	6,35	1,60	7,94
		SNMG 190624EN-M70	●	○	●				●	●	●	19,05	19,05	6,35	2,40	7,94
		SNMG 250924EN-M70		○	●					●		25,40	25,40	9,52	2,40	9,12
-R28		SNMM 150612EN-R28	●	○	●				●	●	●	15,88	15,88	6,35	1,20	6,35
		SNMM 150616EN-R28	●	○	●				●	●	●	15,88	15,88	6,35	1,60	6,35
		SNMM 190616EN-R28	●	○	●				●	●	●	19,05	19,05	6,35	1,60	7,94
		SNMM 250724EN-R28		○	●						●	25,40	25,40	7,94	2,40	9,12
		SNMM 250924EN-R28	●	○	●				●	●	●	25,40	25,40	9,52	2,40	9,12
-R58		SNMM 120408EN-R58	●	○	●				●	●	●	12,70	12,70	4,76	0,80	5,16
		SNMM 120412EN-R58	●	○	●				●	●	●	12,70	12,70	4,76	1,20	5,16
		SNMM 150612EN-R58	●	○	●				●	●	●	15,88	15,88	6,35	1,20	6,35
		SNMM 150616EN-R58	●	○	●				●	●	●	15,88	15,88	6,35	1,60	6,35
		SNMM 190612EN-R58	●	○	●				●	●	●	19,05	19,05	6,35	1,20	7,94
		SNMM 190616EN-R58	●	○	●				●	●	●	19,05	19,05	6,35	1,60	7,94
		SNMM 190624EN-R58	●	○	●				●	●	●	19,05	19,05	6,35	2,40	7,94
		SNMM 250724EN-R58	●	○	●				●	●	●	25,40	25,40	7,94	2,40	9,12
		SNMM 250924EN-R58	●	○	●				●	●	●	25,40	25,40	9,52	2,40	9,12
-R88		SNMM 190616SN-R88	●	○	●				●	●	●	19,05	19,05	6,35	1,60	7,94
		SNMM 190624SN-R88	●	○	●				●	●	●	19,05	19,05	6,35	2,40	7,94
		SNMM 250724SN-R88	●	○	●				●	●	●	25,40	25,40	7,94	2,40	9,12
		SNMM 250732SN-R88	●	○	●				●	●	●	25,40	25,40	7,94	3,20	9,12
		SNMM 250924SN-R88	●	○	●				●	●	●	25,40	25,40	9,52	2,40	9,12
		SNMM 250932SN-R88	●	○	●				●	●	●	25,40	25,40	9,52	3,20	9,12
		SNMM 310932SN-R88	●	○	●				●	●		31,75	31,75	9,52	3,20	9,12
		SNMT 310932SN-R88	●	○	●				●	●	●	31,75	31,75	9,52	3,20	9,12
									CTCP115	CTCP125	CTCP135	d	l	s	r	d_1



INSERTS

60° INSERTS TNMG.. / TNMM..

-M70

▲ Light to medium-rough machining
▲ Skin on castings or forgings
▲ Stable cutting edge
▲ Interrupted cut
▲ Blanks and forged parts

Machining conditions		
CTCP115	CTCP125	CTCP135

-R28

▲ Single-sided roughing geometry
▲ Longitudinal and face turning, profiling
▲ Inconsistent cutting depth
▲ For steels with high strength (800 N/mm²)
▲ Good chip control

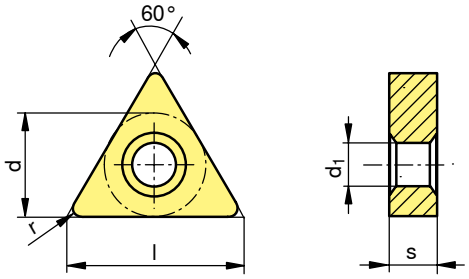
Machining conditions		
CTCP115	CTCP125	CTCP135

-R58

▲ Single-sided roughing geometry
▲ Longitudinal and face turning
▲ Slightly interrupted cut
▲ Low cutting forces
▲ Unstable machines

Machining conditions		
CTCP115	CTCP125	CTCP135

			P	M	K	N	S	H	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
			CTCP115	CTCP125	CTCP135								
-M70		TNMG 160408EN-M70	●	●	●				9,52	16,50	4,76	0,80	3,81
		TNMG 160412EN-M70	●	●	●				9,52	16,50	4,76	1,20	3,81
		TNMG 220404EN-M70		●					12,70	22,00	4,76	0,40	5,16
		TNMG 220408EN-M70	●	●	●				12,70	22,00	4,76	0,80	5,16
		TNMG 220412EN-M70	●	●	●				12,70	22,00	4,76	1,20	5,16
		TNMG 220416EN-M70	●	●	●				12,70	22,00	4,76	1,60	5,16
-R28		TNMM 220416EN-R28	●	●	●				12,70	22,00	4,76	1,60	5,16
-R58		TNMM 220412EN-R58	●	●	●				12,70	22,00	4,76	1,20	5,16
			CTCP115	CTCP125	CTCP135				d	l	s	r	d_1



Wheel reprofiling

As a result of the interaction of the wheel and the rail in daily operation, the wheels of railway vehicles are subjected to enormous stress. In order to ensure safe and comfortable travel, the geometries of the wheel profiles need to be regularly checked and reprofiled.

WHEEL REPROFILING

OVERVIEW

Requirements

Materials

Machining examples

Tooling systems

Inserts

Requirements for wheel reprofiling

In view of the long distances and long hours of travel, the wheels of rail vehicles suffer a great deal of wear. Material abrasion and deformation are the result. The stress is particularly great when the brakes are sharply applied, or on curved sections of track. In the case of blocking wheels the material becomes compacted, extremely hard surface areas form, the wheel is no longer round and runs irregularly.
Along with the condition of the rails, the wheel profile is the crucial factor for safety and comfort. In order to guarantee smooth running and low noise, rail wheels need to be reprofiled at regular intervals. The intervals of reprofiling will vary according to the requirements involved. With freight trains it may come to several years; in the case of high speed trains, it may be as often as every few months.
The reprofiling of wheels and wheel sets makes great demands on the cutting tools. The task involves machining changing materials, under widely varying conditions and at different depths of cut – all of this with perfect process reliability and in the shortest time possible.
The challenge for the tool manufacturer, when it comes to reprofiling the wheels consists in developing tools and inserts that are hard, wear-resistant and at the same time tough enough to achieve the required length of service life when machining the rim, running surface and the hard braking points. CERATIZIT's CTCP115 and CTCP125 grades have all the necessary properties for meeting these high expectations.

Materials in wheel reprofiling

For wheel reprofiling, we find the same tempered steels (R1 to R9) in use as in new wheel production. Their chemical composition and mechanical properties are shown in the table below.

Material designation	Tensile strength R_m [N/mm²]	Brinell hardness [HB]
R1	600–720	178–214
R2	700–840	208–249
R3	800–940	238–278
R6	780–900	231–266
R7	820–940	242–278
R8	860–980	255–290
R9	900–1050	266–311

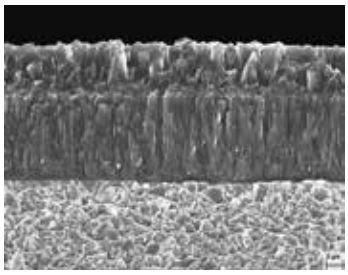
Cutting material grades for wheel reprofiling

The CERATIZIT cutting material grade CTCK120 is the all-rounder for extremely hard steel materials. Together with the two CERATIZIT high-performance grades CTCP115 and CTCP125, this covers the entire spectrum of requirements in connection with wheel reprofiling. All three offer extreme wear resistance, as well as meeting the highest standards of process reliability.

The advantages at a glance:

▲ Extreme heat resistance
▲ High toughness
▲ Excellent resistance to notching
▲ CVD high-performance coating
(extreme hardness, very smooth surface)

CTCK120 BLACKSTAR™	HC-K20 | HC-P10	● ○

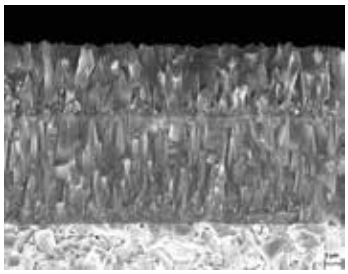


Specification:
Composition: Co 6.0%; TaC 2.0%; WC balance | Grain size: 1 µm | Hardness: HV_{30} 1630 | Coating specification: CVD TiCN-Al_2O_3

Recommended application:
The first choice for the machining of cast iron at high cutting speeds and where high toughness is required.

CTCK 120 – high toughness – ideal for:
▲ High cutting speed ▲ Stable cutting conditions ▲ Materials with high strength

CTCP115 BLACKSTAR™	HC-P15 | HC-K25 | HC-M10	● ● ○

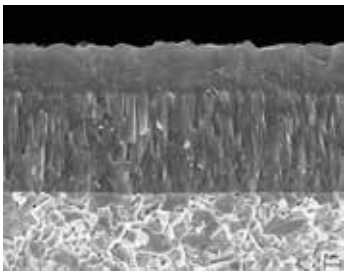


Specification:
Composition: Co 5.8%; mixed carbides 6.4%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1550 | Coating specification: CVD TiCN-Al_2O_3

Recommended application:
The wear-resistant high-performance grade for steel machining.

CTCP 115 – high hardness – ideal for:
▲ Slightly interrupted cut ▲ Materials with higher strength ▲ Higher cutting parameters

CTCP125 BLACKSTAR™	HC-P25 | HC-K30 | HC-M20	● ● ○



Specification:
Composition: Co 7.0%; mixed carbides 8.0%; WC balance | Grain size: 1 - 2 µm | Hardness: HV_{30} 1450 | Coating specification: CVD TiCN-Al_2O_3

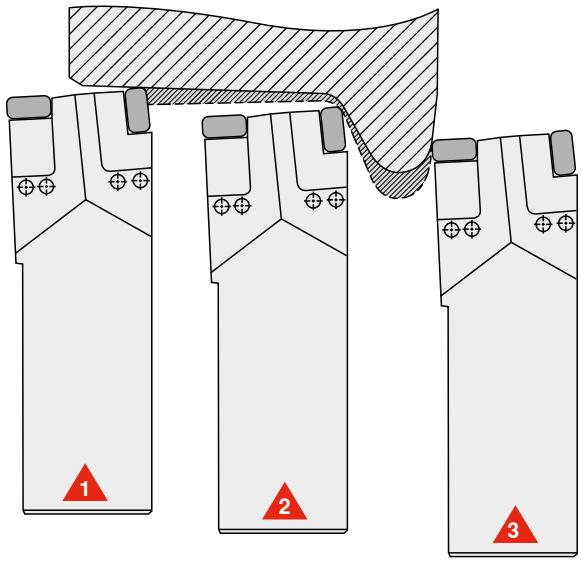
Recommended application:
The first choice for the universal machining of steel.

CTCP 125 – high toughness – ideal for:
▲ Inconsistent cutting depth ▲ Skin on castings or forgings ▲ Heavily interrupted cut ▲ Materials with medium strength

Wheel reprofiling – the process

Wheel reprofiling is a dry machining operation. It comes in two variants. First there is underfloor machining – here the wheel set lathe is located beneath the train or wagon in a work pit. The wheels can be machined without being taken off the vehicle. Then there is overfloor machining – here the wheel sets are removed. This is very much more laborious, but speeds up the machining time by half.

Reprofiling of the wheel flange and running surface



Requirements

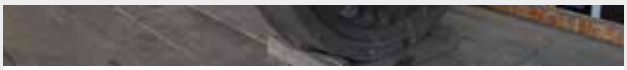
1. Outer insert: LNUX 191940SN-R70 – the extremely hard surface and flat areas are frequently problematic
2. Outer insert: LNUX 191940SN-R70 – difficulties result on the one hand from the tight approach angle, and on the other from the long chips that are produced
3. Inner insert: LNUX 191940SN-R70 – when machining the inner side, the challenge lies in the need to ensure the long service life of the insert.

Recommended inserts:

- CNMX 19..
- SNMG 21..
- LNUX 19..
- LNUX 30..

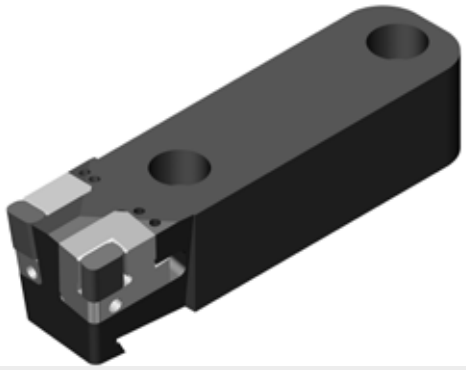
Wheel reprofiling with LNUX 301940SN-R70

The reliable roughing and finishing of the wheel flange and running surface is a challenge for the maintenance of rail vehicle wheels. As a result of flat areas and cracks, the material hardness can vary, which makes the machining very much more difficult. The following customer reference values provide benchmarks for the reprofiling of wheels.



Work piece	wheel set
Material	R7
Machine	portal lathe for wheel sets
Tool	RKH 6060-R / L
Insert	LNUX 301940SN-R70

Grade	CTCP125
V_c [m/min]	75
f [mm/rev]	0.7
a_p [mm]	5–10
Coolant	dry



RKH 6060-R / L

LNUX 301940SN-R70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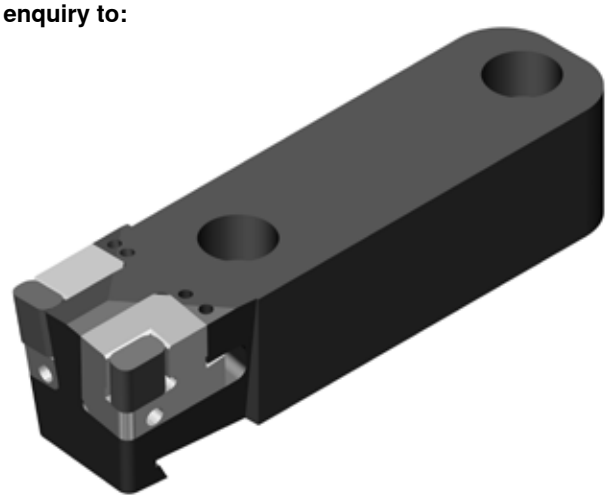
REDUCED CUTTING FORCES
THANKS TO OPTIMISED GEOMETRY

Tools upon request

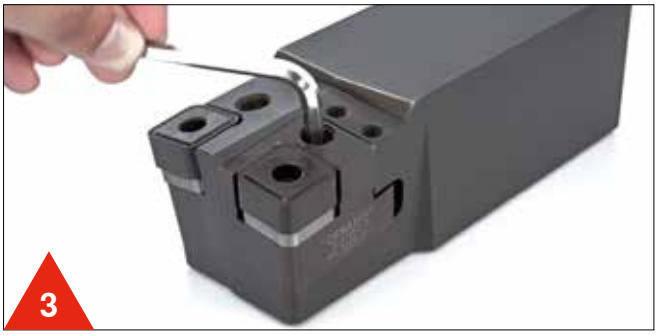
All tools for wheel reprofiling can be manufactured upon request.

If you are interested in CERATIZIT's tools for wheel reprofiling, please send your enquiry to: info.austria@ceratizit.com



CERATIZIT cartridge systems

Use of CERATIZIT cartridge systems can extend the service life of your tool holders significantly. If the insert pocket is worn or damaged, you don't need to change the complete holder, you can just replace the cartridge. This offers our customers extended tool life in combination with reduced costs. Our cartridge systems for wheel reprofiling are available for various different inserts. Most of them are available from the standard product range.

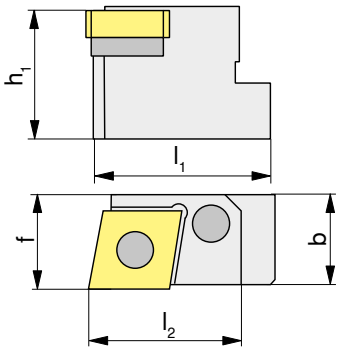


Easy cartridge change

1. Disassemble the worn or broken cartridge system
2. Insert a new cartridge system and fix it in place
3. Mount a new insert and fix the lever lock clamping screw in place

TOOLING SYSTEMS

CARTRIDGE SYSTEM CNMX 19..



Picture shows right-hand version

h_1 [mm]	Type, designation	L N R	l_1 [mm]	l_2 [mm]	b [mm]	f [mm]		
31,00	RK 3219-C19R	R	42,70	36,50	17,90	19,00	CNMX 19..	E01
31,00	RK 3219-C19L	L	42,70	36,50	17,90	19,00	CNMX 19..	E01
31,00	RK 3223-C19R	R	42,70	36,50	21,90	23,00	CNMX 19..	E01
31,00	RK 3223-C19L	L	42,70	36,50	21,90	23,00	CNMX 19..	E01

E01	59448	357187		59439	59434	86178	4209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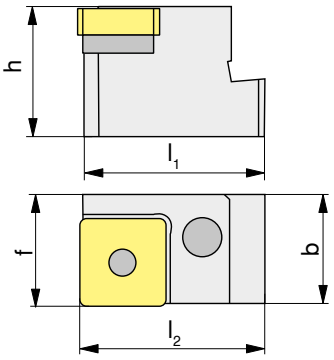

Picture shows right-hand version

h_1 [mm]	Type, designation	L N R	l_1 [mm]	l_2 [mm]	b [mm]	f [mm]		
32,00	RK 3226-21R	R	43,00	35,00	24,80	26,00	SNMG 21..	E03
32,00	RK 3226-21L	L	43,00	35,00	24,80	26,00	SNMG 21..	E03

E03	59448		308268	59439	59434	86178	4209

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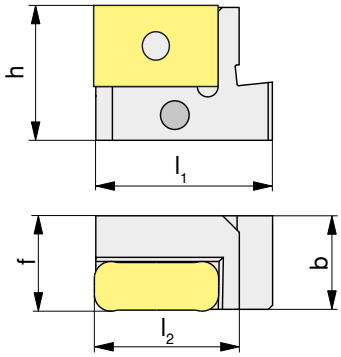

Picture shows right-hand version

h_1 [mm]	Type, designation	L N R	l_1 [mm]	l_2 [mm]	b [mm]	f [mm]		
32,00	RK 3223-19R	R	43,00	35,00	22,50	23,00	LNUX 19..	E02
32,00	RK 3223-19L	L	43,00	35,00	22,50	23,00	LNUX 19..	E02
32,00	RK 3223-30R	R	43,00	35,00	22,50	23,00	LNUX 30..	E02
32,00	RK 3223-30L	L	43,00	35,00	22,50	23,00	LNUX 30..	E02

E02	59441				59433		4771


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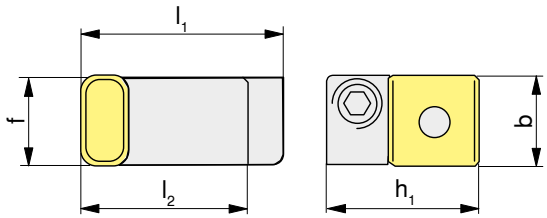

Picture shows right-hand version

h_1 [mm]	Type, designation	L N R	l_1 [mm]	l_2 [mm]	b [mm]	f [mm]		
32,00	RK 3219-19R	R	43,00	35,00	18,60	19	LNUX 19..	E02
32,00	RK 3219-19L	L	43,00	35,00	18,60	19	LNUX 19..	E02

E02	59441				59433		4771

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INSERTS

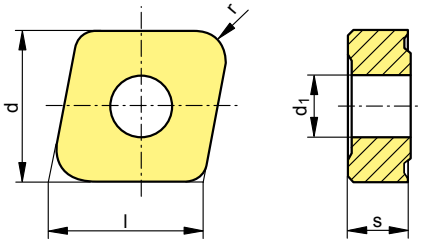
80° insert CNMX 19..

CNMX19.. -SN

▲ Special geometry for wheel reprofiling
▲ For excellent chip control

Machining conditions		
CTCK120	CTCP115	

			CTCK120	CTCP115	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
P			●	●					
M			○	○					
K			●	●					
N									
S									
H									
-SN		CNMX 190740SN	●	●	19.05	19.30	7.94	4.00	7.93
			CTCK120	CTCP115	d	l	s	r	d_1

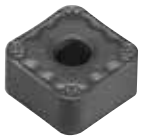


INSERTS

90° INSERTS SNMG 21..

SNMG 21.. -R70

▲ Roughing geometry for wheel reprofiling
▲ Stable geometry for long tool life
▲ For excellent chip control



Machining conditions		
CTCP115	CTCP125	CTCP125

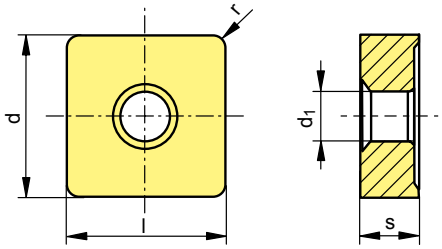
SNMG 21.. -R71

▲ Finishing geometry for wheel set machining
▲ Very soft cutting action for excellent surface quality
▲ Special chip groove for good chip control
▲ Short chipping at low feed rates

Machining conditions		
CTCP115	CTCP125	CTCP125

			CTCP115	CTCP125	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
-R70		SNMG 211040SN-R70	●	●	21.00	21.00	10.50	4.00	7.84
-R71		SNMG 211040SN-R71	●	●	21.00	21.00	10.50	4.00	7.84

	CTCP115	CTCP125	d	l	s	r	d_1



INSERTS

90° INSERTS LNUX 19.. / LNUX 30..

LNUX 19.. -R70

▲ Roughing geometry for wheel reprofiling
▲ Stable geometry for long tool life
▲ Very stable cutting edge for difficult cutting conditions
▲ For excellent chip control

Machining conditions

CTCP115	CTCP125	CTCP125

LNUX 30.. -R70

▲ Roughing geometry for wheel reprofiling
▲ Stable geometry for long tool life
▲ Very stable cutting edge for difficult cutting conditions
▲ For excellent chip control

Machining conditions

CTCP115	CTCP125	CTCP125

LNUX 19.. -R74

▲ Universal geometry for wheel set machining
▲ For soft cut, short chipping

Machining conditions

CTCP115	CTCP125	CTCP125

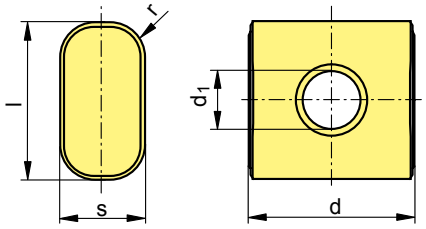
LNUX 30.. -R74

▲ Universal geometry for wheel reprofiling
▲ For soft cut, short chipping

Machining conditions

CTCP115	CTCP125	CTCP125

			P	M	K	N	S	H	CTCP115	CTCP125	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
-R70		LNUX 191940SN-R70	●	○	●				●	●	19,05	19,05	10,00	4,00	6,35
		LNUX 301940SN-R70	●	○	●				●	●	19,05	30,00	12,00	4,00	6,35
-R74		LNUX 191940SN-R74	●	○	●				●	●	19,05	19,05	10,00	4,00	6,35
		LNUX 301940SN-R74	●	○	●				●	●	19,05	30,00	12,00	4,00	6,35



Bogie machining

In daily operation, the bogies of railway vehicles are subject to extreme stresses of many different kinds. This places equally high demands on their production, with the aim of ensuring safety and comfort when travelling by rail.

BOGIE MACHINING

OVERVIEW

Requirements

The process

Tools

Requirements for bogie machining

The undercarriages of railway vehicles consist of a cast or welded (in rarer cases riveted) frame placed over the axle box, to which the wheel sets, springs and dampers are attached. The task of the undercarriages or bogies is to keep the train moving safely and comfortably on the tracks. To do this they must transmit the forces that are generated, so they are permanently exposed to a variety of extremely high pressures.

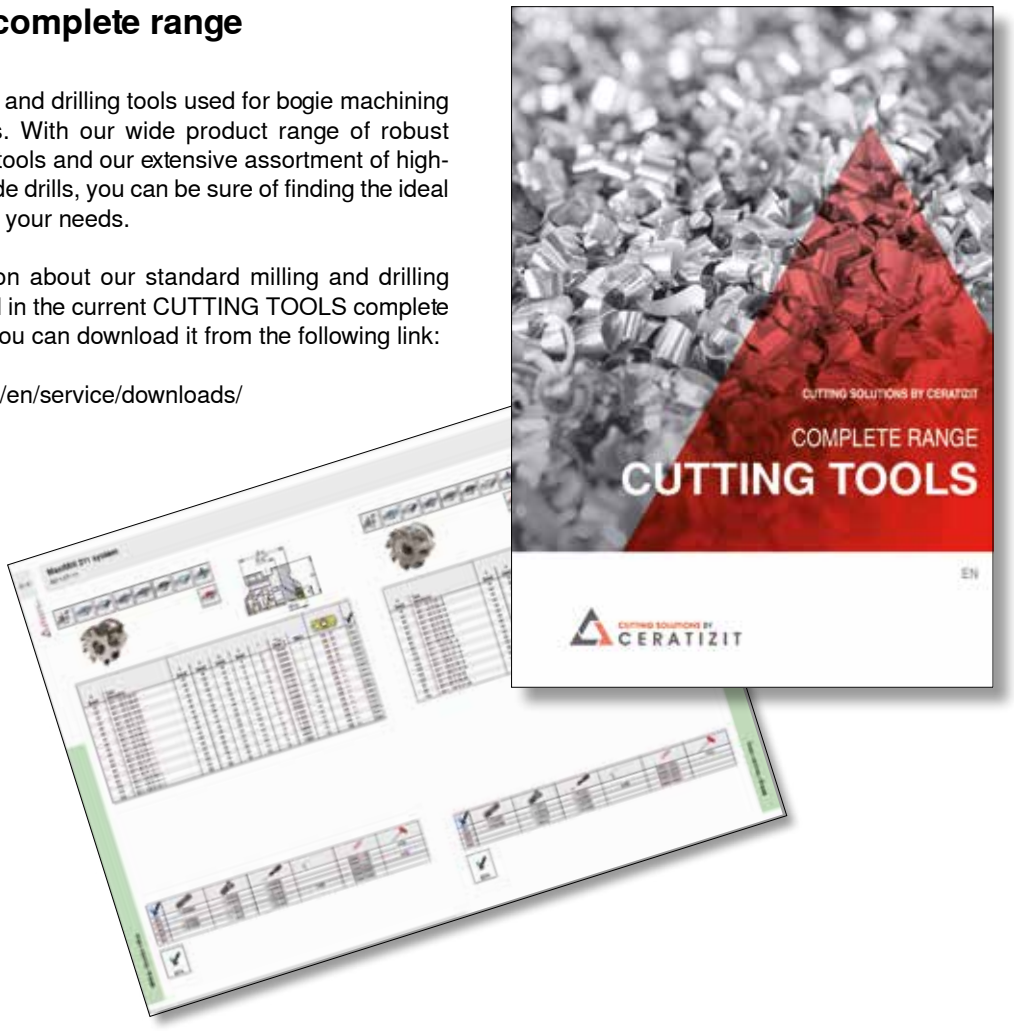
Undercarriages come in a great many different variants: for locomotives, passenger train carriages and goods train wagons, with primary or secondary springs, with or without a cradle and with different kinds of dampers. The challenge in the machining of these components that are crucial to the railway industry lies in the wide variety of the parts and materials involved. For the machining of the undercarriage, accurate cutting tools with maximum economy are called for. High-performance cutting materials and ultra-precise tools for drilling and milling from CERATIZIT's standard range meet these requirements perfectly. They offer a maximum of process reliability along with the short machining times that are needed. With CERATIZIT, our customers in the railway vehicle industry have an experienced and reliable partner they can count on.

CERATIZIT complete range

Many of the milling and drilling tools used for bogie machining are standard tools. With our wide product range of robust milling and drilling tools and our extensive assortment of high-performance carbide drills, you can be sure of finding the ideal equipment to meet your needs.

Detailed information about our standard milling and drilling tools may be found in the current CUTTING TOOLS complete range catalogue. You can download it from the following link:

www.ceratizit.com/en/service/downloads/



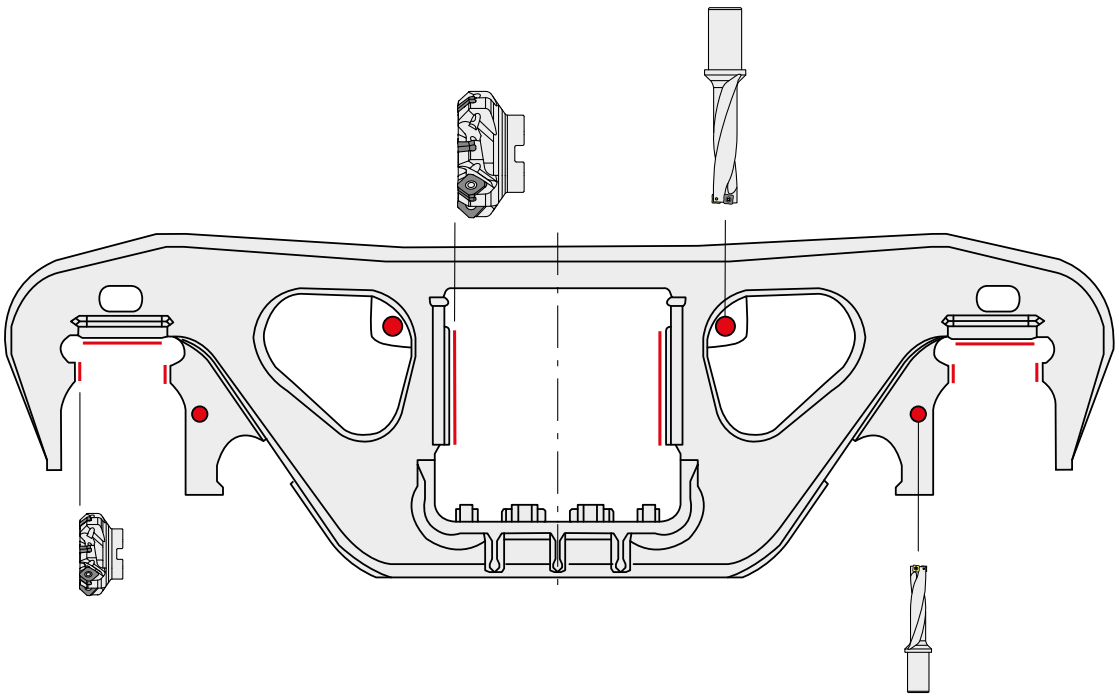
Bogie machining – the process

In view of the varying structure and materials of bogies and undercarriages, their machining involves different cutting techniques. CERATIZIT's tool systems for drilling, face milling, slot milling and shoulder milling have proved fully effective in this context, offering the benefits of long tool life along with maximum flexibility.

Bogie machining

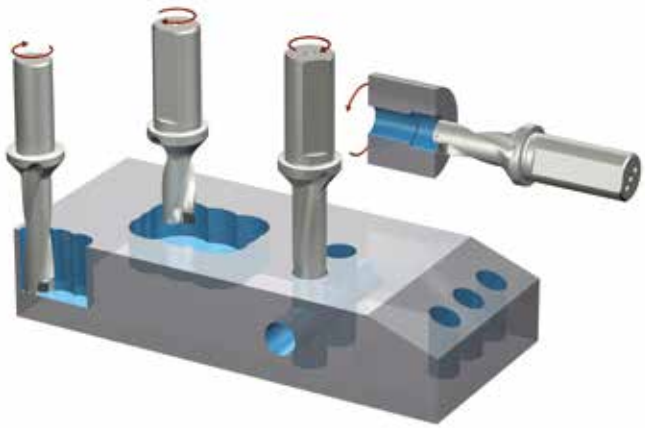
Application range

- ▲ Drilling
- ▲ Face milling
- ▲ Slot milling
- ▲ Shoulder milling



CERATIZIT drills

For bogie machining CERATIZIT offers a wide range of efficacious tools for drilling into solid material. The MaxiDrill 900 in particular, with its top-quality, long-lasting coating and patented insert system, can contribute to improved productivity and greater economy.



Recommendations for bogie machining

High-performance carbide drills

For bogie machining, CERATIZIT's universally versatile high-performance drills guarantee a very long tool life, narrow manufacturing tolerances, constant performance and stable processes.

CERATIZIT offers its customers in the railway vehicle industry a comprehensive range of carbide drills for universal application and for the machining of steel and cast metals.

Further information may be found on our website
www.ceratizit.com

MaxiDrill 900 – our high-performance tool for solid drilling

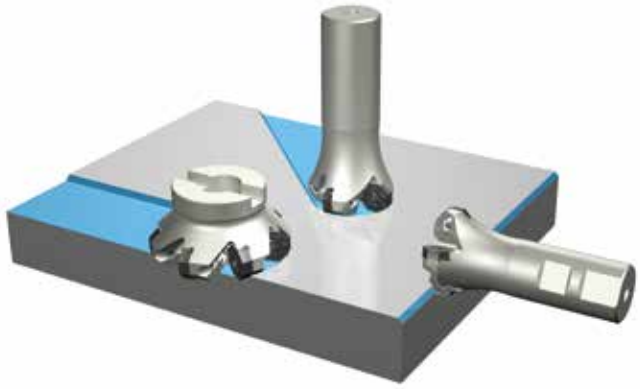
The MaxiDrill 900 combines superb performance with maximum productivity. Thanks to its stable structure and asymmetrical, innovative design, it offers perfect drilling quality and ideal chip removal even with high cutting values. Its controlled deflection forms the basis for drilling without retraction grooves, and protects surfaces and cutting edges.
In combination with CERATIZIT's patented inserts, the MaxiDrill 900 high-performance drill is an economical system solution, and guarantees great precision along with maximum process security and reduced costs.

Product characteristics

- ▲ Easy handling
- ▲ One geometry and one grade for profile and periphery
- ▲ Wide product range

CERATIZIT face milling cutters

CERATIZIT offers a wide range of tools and inserts for face milling. Above all the MaxiMill 271, MaxiMill 273 and MaxiMill HFC high-performance milling cutters are perfectly capable of managing the complex machining tasks in bogie machining and offer the required high process reliability.



Recommendations for bogie machining

MaxiMill 271 – maximum power

Maximum depths of cut for high productivity
With depths of cut up to 8.4 mm and 8 effective cutting edges per insert, MaxiMill 271 achieves a very good metal removal rate at low cost per edge.

Economic efficiency + process reliability
The stable double-sided insert with positive clearance angle ensures very soft cutting action in virtually all materials. The optimised geometry and open chip pockets provide for best chip evacuation and maximum process reliability.

Application range
▲ Face milling
▲ Slot milling
▲ Chamfering

MaxiMill 273 – 16 times face milling with one insert

Economical for a wide range of materials
16 cutting edges per insert guarantee maximum economy of the machining process. The milling cutter is for universal application and suitable for both roughing and finishing.

Stability and process security combined with low power consumption
The negative position of the insert and the positive clearance angle on two sides ensure stable and secure processes. At the same time MaxiMill 273 is characterised by low vibration and ensures clean work piece surfaces despite its low power consumption.

Application range
▲ Face milling
▲ Slot milling
▲ Chamfering

MaxiMill HFC – the superlative milling cutter

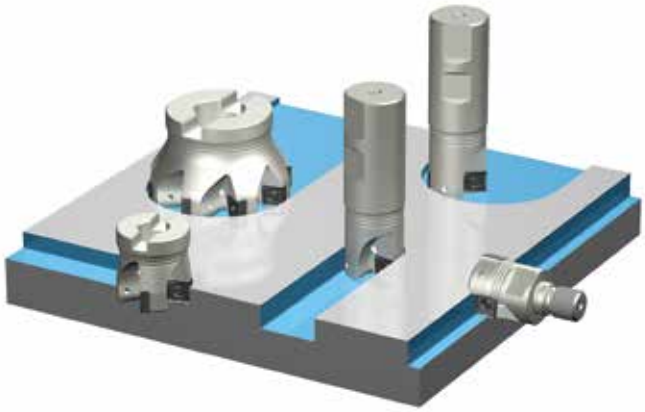
Maximum metal removal rate
MaxiMill HFC achieves maximum cutting performance. The rake angle of the insert is very low so that the cutting forces are in the direction of the spindle. Feed rates up to 3 mm per tooth are therefore possible.

Maximum spindle protection
The light cutting geometry in combination with a compact and stable cutter body construction provides for smooth and vibration-reduced milling action while protecting the spindle.

Application range
▲ Face milling with max. fz = 3mm/tooth
▲ Helical plunging to produce deep pockets with maximum metal removal rates
▲ Angled ramping to produce deep pockets with maximum metal removal rates
▲ Slot milling
▲ Plunging

CERATIZIT shoulder and slot milling

In view of the numerous different shapes and components which have to be machined, the tools used for slot and shoulder milling must above all be robust, suitable for universal application and flexible. The CERATIZIT MaxiMill 211 and MaxiMill 491 milling cutter meet these requirements perfectly, offering both maximum precision and supreme process reliability.



Recommendations for bogie machining

MaxiMill 211 – for roughing and universal application

Precise machining
The 'notch' provides additional stability when plunging (up to r 1.60 mm). Reduced machining noise without vibration is therefore largely guaranteed.

Application range
▲ Peripheral milling
▲ Shoulder milling
▲ Angled ramping & pocket milling
▲ Axial & helical plunging
▲ Trochoidal slot milling
▲ Slot milling
▲ Shoulder & face milling

MaxiMill 491 – shoulder milling system with 8 usable cutting edges per insert with exactly 90° approach angle

Best performance and quality
The MaxiMill 491 milling system produces an exact 90° profile with 8 usable cutting edges. The inserts receive a peripheral grinding and achieve very high surface quality together with excellent axial run-out and concentricity. The perfectly adapted chip flute guarantees optimum chip transport, while low power consumption of the spindle ensures reduced vibration during the milling process.

Application range
▲ Face milling
▲ Shoulder milling
▲ Slot milling
▲ Trochoidal slot milling
▲ Peripheral milling

Further information may be found on our website
www.ceratizit.com

OEM services

We not only offer our partners in the railway industry excellent cutting tools but also customised complete solutions. Every one of our projects is supported and centrally coordinated by a dedicated OEM team. The experts at the CERATIZIT centre of excellence for cutting tool solutions are concerned to meet your individual requirements providing complete process solutions and tool packages for the most varied challenges of wheel set machining. In this way you can count on being given the solution best adapted to your needs.

COMPLETE PROCESS SOLUTIONS

CERATIZIT OEM SERVICES

Customised complete solutions

In collaboration with machine and wheel set manufacturers CERATIZIT offers complete process solutions. We not only supply you with excellent cutting tools, we will also give you the expert support you need when implementing your specific concept on site with CERATIZIT OEM services.

Here is what you can expect:

- ▲ Analysis and optimisation of machining processes
- ▲ Offer of suitable tool packages
- ▲ Time studies
- ▲ Recommendation of cutting data
- ▲ Detailed technical information
- ▲ Support on site

CERATIZIT OEM services

For every project we set up a dedicated team of experts comprising various specialisations. Make use of the fund of knowledge we have amassed at the CERATIZIT cutting tools centre - ranging from application engineering to design, comprising construction, production, sales and logistics.

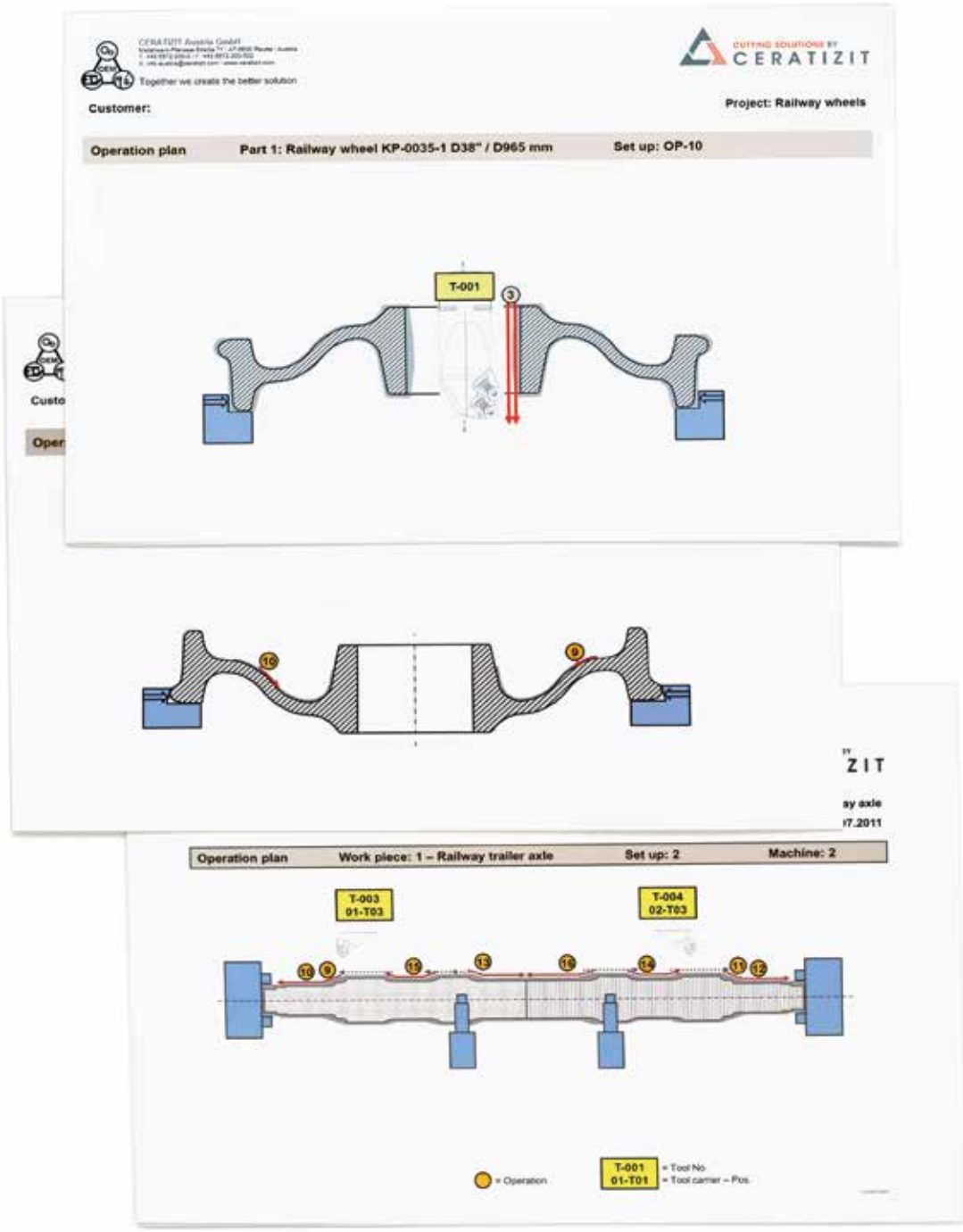
In this way we are able to guarantee maximum professionalism and reliability as well as solutions that are individually adapted to your needs. Additionally, we will help you to implement your specific concept on site.

Our OEM services include:

- ▲ Definition of machining phases
- ▲ Determination of cutting data and calculation of machining times
- ▲ Calculation of machining costs per piece
- ▲ Projection of tooling costs per piece
- ▲ Calculation of performance (cutting forces, spindle power, torque moment)
- ▲ Tool mounting and presetting
- ▲ Support during final acceptance and commissioning runs
- ▲ Detailed project documentation

A detailed operation plan

First of all CERATIZIT's OEM team draws up a detailed operation plan for the tool. This is where the different working steps are defined and numbered. The suitable tools for the job are allocated directly in optical terms. They can immediately be identified by their designation (e.g. TU001) in subsequent lists and plans. This way you can see at a glance which tool package is going to be used for which working step.



Machining study

The OEM machining study lists all the defined working steps by number, allocates the various tools to each step and provides all the associated information, cutting parameters and calculated machining times.
In this way the machining study gives a perfect overview of all the intended operations for wheel set machining – all entirely in keeping with our customers' individual specifications and requirements.

CERATIZIT Deutschland GmbH
D-72186 Empfingen
www.ceratizit.com
Together we create the better solution

CUTTING SOLUTIONS BY CERATIZIT

Customer:

Project Railway wheels

Machining study: k piece 2 KP-0035-1 D38" / D965 mm Set-up 2 Machine 1

Operations			Assembled Tool				Dimensions			Cutting data						Surface	Time calculation			
No.	Type	Description	No.	Pos.	z	Spindle	D mm	d mm	L mm	v_c m/min	n min^{-1}	f_z mm	v_f mm/min	a_p mm	i	R_z µm	t_c min	t_c min	t_h min	t_{ch} %
1	Downtime	Tool change on Carrier 1 - RH		00-T00	0	1	0	0	0	0	0	0	0	0	0	0	0	0,4	0,4	100
2	Downtime	Tool change on Carrier 2 - LH		00-T00	0	1	0	0	0	0	0	0	0	0	0	0	0	0,4	0,4	0
3	Face turning	Hub face	T-001	02-T01	1	1	335	189	73	105	100	1,2	120	10	1	2,81	0,61	0	0,61	100
4	Taper turning	Hub outside contour	T-002	01-T02	1	1	330	315	70	104	100	1,2	120	8	1	2,81	0,59	0	0,59	0
5	Face turning	Tread face	T-002	01-T02	1	1	360	855	62,5	108	35	1,4	49	5	1	3,83	1,28	0	1,28	0
6	Taper turning	Tread	T-001	02-T01	1	1	970	962	110	107	35	1,4	49	7	1	3,83	2,25	0	2,25	0
7	Taper turning	Tread face to bridge	T-002	01-T02	1	1	890	770	65	96	35	1,4	49	8	2	3,83	3,81	0	3,81	100
8	Downtime	Tool change on Carrier 2 - LH		00-T00	0	1	0	0	0	0	0	0	0	0	0	0	0	0,4	0,4	100
9	Taper turning	Bridge 1. section	T-002	01-T02	1	1	770	880	50	116	48	1,4	67						1	0
10	Taper turning	Bridge 2. section	T-002	02-T02	1	1	880	840											1,05	100
11	Taper turning	Bridge 3. section																	1,04	0
																			1,15	100
																			0,34	0
																			0,37	100

CERATIZIT Austria
A-6600 Reutte, Tirol
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Gemeinsam schaffen wir die bessere Lösung

CUTTING SOLUTIONS BY CERATIZIT

Customer

Projekt: Eisenbahnachse
O-000198 / Datum: TT.MM.JJJJ

Bearbeitungsstudie: Workpiece 1 Trailer axle Set up 2 Machine 2

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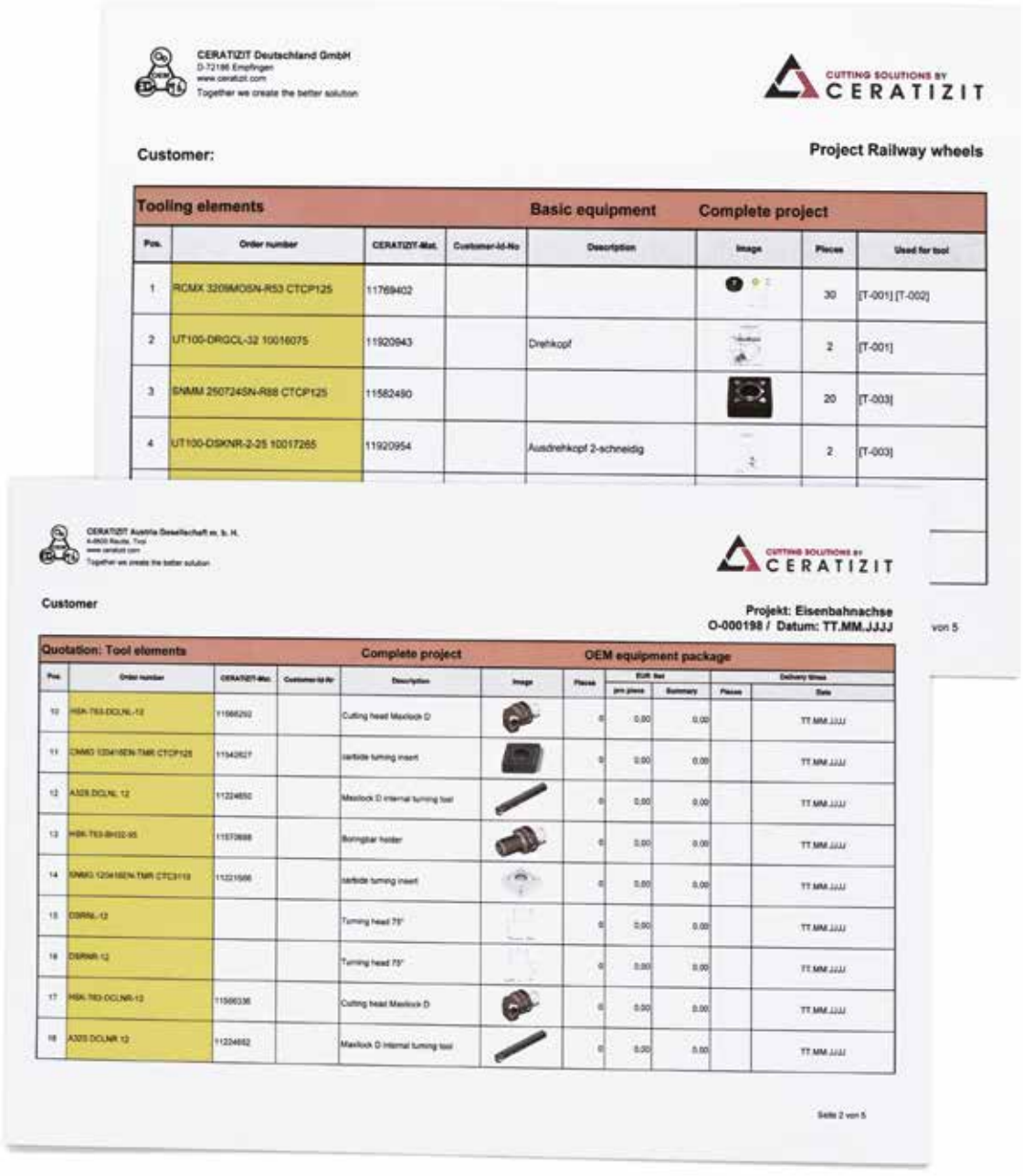
Tooling studies

Tooling sheets provide detailed information about the different tools and tool holders to be used for wheel set machining. The technical drawings convey precise specifications as to the dimensions, interfaces and clamping mechanisms. With the tooling sheets you have all the important information you need for an optimal work flow at your fingertips.

Tooling elements

The tooling element sheets give an overview of all the components used for undercarriage machining, along with the different order numbers. They convey information about the necessary basic equipment of tool systems and inserts, including specifications of the calculated annual requirement and the computed order date.

If you are interested in CERATIZIT's OEM services, please send your enquiry to: info.austria@ceratizit.com



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Customer:

Project Railway wheels

Tooling elements				Basic equipment	Complete project		
Pos.	Order number	CERATIZIT-Mat.	Customer-Id-No	Description	Image	Pieces	Used for tool
1	RCMX 3209MO0SN-RS3 CTCP125	11769402				30	[T-001] [T-002]
2	UT100-DRGCL-32 10016075	11920943		Drehkopf		2	[T-001]
3	SNMM 250724SN-R88 CTCP125	11582490				20	[T-003]
4	UT100-DSKNR-2-25 10017265	11920954		Ausdrehkopf 2-schneidig		2	[T-003]

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CUTTING SOLUTIONS BY CERATIZIT

Customer

Projekt: Eisenbahnachse
O-000198 / Datum: TT.MM.JJJJ

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Quotation: Tool elements				Complete project		OEM equipment package				
Pos.	Order number	CERATIZIT-Mat.	Customer-Id-Nr	Description	Image	Pieces	EUR /Set		Delivery times	
							per piece	Summary	Pieces	Date
10	HSK-T63-DCLNL-12	11566202		Cutting head Maxilock D		0	0,00	0,00		TT.MM.JJJJ
11	CNMG 120416EN-TMR CTCP125	11342627		carbide turning insert		0	0,00	0,00		TT.MM.JJJJ
12	A32S.DCLNL 12	11224650		Maxilock D internal turning tool		0	0,00	0,00		TT.MM.JJJJ
13	HSK-T63-B032-95	11573688		Borngstar holder		0	0,00	0,00		TT.MM.JJJJ
14	CNMG 120416EN-TMR CTC3115	11321566		carbide turning insert		0	0,00	0,00		TT.MM.JJJJ
15	DSRNL-12			Turning head 75°		0	0,00	0,00		TT.MM.JJJJ
16	DSRNR-12			Turning head 75°		0	0,00	0,00		TT.MM.JJJJ
17	HSK-T63-DCLNR-12	11566036		Cutting head Maxilock D		0	0,00	0,00		TT.MM.JJJJ
18	A32S.DCLNR 12	11224652		Maxilock D internal turning tool		0	0,00	0,00		TT.MM.JJJJ

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Tooling Academy

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