

Premium hot rolls made of cemented carbide and ceramic



CERATIZIT is a high-tech engineering group specialised in tooling and hard material technologies.

Tooling the Future

www.ceratizit.com



Stephane Claude

**Specially developed for you:
as your expert partner
we create made-to-measure
carbide solutions.**

Hot rolls in cemented carbide and ceramic – join us in setting new standards!

You demand the best to achieve efficient hot rolling processes. That's not a problem! When rolling wire, rods, ribbons and tubes, resistant components are crucial as enormous forces and temperatures are characteristic of the process. Consequently very resistant hard materials are required.

Hard Material Solutions by CERATIZIT offers you exactly the solution you are looking for – and exactly for your application range:

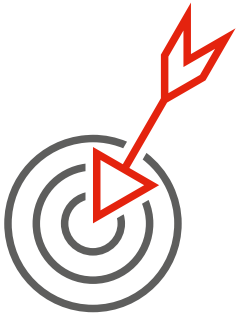
- ▲ Composite rolls for hot rolling lines up to a length of 1 metre
- ▲ Carbide rolls for No-Twist mills
- ▲ Guide and pressure rolls made of cemented carbide or ceramic (silicon nitride)

The rolls are available with or without groove; larger variants can be requested at any time. All solutions are developed individually and

precisely manufactured by the market leader who manages the entire process chain from the powder to the final product. As sintered, semi-finished or finish-ground: let us know what you need! CERATIZIT will provide it, with flexible delivery times.

Carbide solutions are naturally superior to steels. Carbide rolls offer maximum wear resistance, very high fracture toughness and excellent compressive strength, all properties which prove beneficial for any application. Furthermore our range includes rolls made of silicon nitride ceramic, a material which is both hard and incredibly light, and performs extraordinarily well when used in deflection rolls, and also reaches the desired production speed very quickly.





Advantages and benefits

Advantages

Hard materials **show notably less wear** than conventional steels: they are harder and characterised by higher fracture toughness and compressive strength.

Flexible delivery times

Thanks to CERATIZIT you will manage the **entire process chain** from the raw material to the finished product.

Broad selection, also for proven **corrosion-resistant** carbide grades

Large diameter possible when requested: up to 700 mm (external dimension).
Greatest range worldwide!

Certified product and process quality to DIN EN ISO 9001:2000 and ISO 14001

Technical advice on site: sales representatives and segment manager with technical know-how of the sector

More than 70 company sites worldwide

Highly precise versatile production procedures: minimum tolerances, optimal surfaces, maximum precision

Benefits

Excellent price-performance ratio

Efficient process, reduced warehouse

Excellent product quality precisely adapted to your needs, **maximum process reliability** and holistic know-how

Always the right individual solution for every application

Maximum flexibility, all solutions from one source

Optimal reliability for your production

A contact person for every challenge and innovation, rapid response when needed

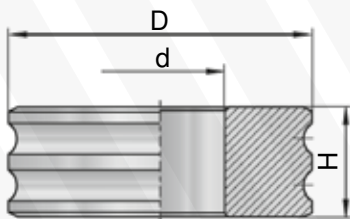
There is always a contact person nearby.

High production speed, optimal product quality

Your premium portfolio at a glance

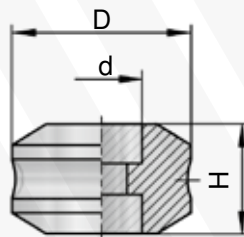
On the following pages you can find all the essential product characteristics which guarantee supreme quality and optimal economic efficiency.

Available in carbide:



- ▲ Carbide rolls for No-Twist mills (CTE product family)

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- ▲ Guide and pressure rolls (ready to use)

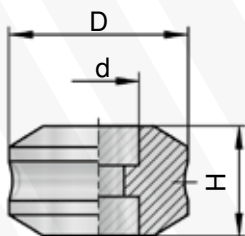
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- ▲ Composite rolls for conventional hot rolling lines

Page 8

Available in ceramic (silicon nitride):



- ▲ Guide and pressure rolls (ready to use) can be supplied in a range of outer diameter $D = 30$ to $D = 180$ mm.

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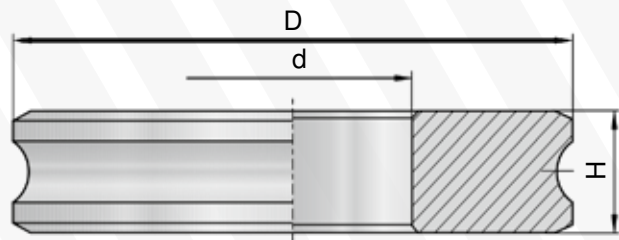
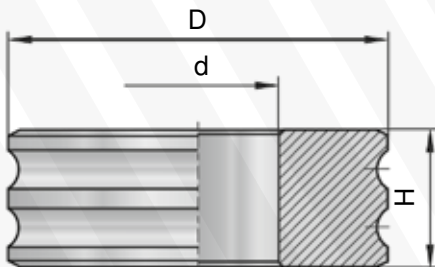
The best for No-Twist mills: carbide rolls from CERATIZIT

When you work long steel products in No-Twist wire rolling lines, carbide solutions from our CTE series can be used either as stretch-reducing rolls or as 8-inch standard rolls. CERATIZIT offers you sophisticated products which **guarantee a perfectly balanced ratio between wear resistance and toughness** thanks to the precise adjustment of the binder content, form and distribution of the tungsten carbide.

Possible variants:

- ▲ As sintered up to an external diameter of max. 600 mm (tolerances common in the sector)*
- ▲ Semi-finished with external diameter as sintered (bore and sides finish-ground)*
- ▲ External diameter machined, bore and sides finish-ground, without groove*
- ▲ Completely finished with groove

* Upon request these variants can be delivered with a sintered groove.



Ready to use, stable and efficient guide rolls

Whether you need guide rolls or use pressure rolls for inductive heating in tube welding plants, Hard Material Solutions by CERATIZIT provides you with carbide products which stand for **long tool life and reliability**.

Guide rolls made from silicon nitride ceramic are also top of the class when maximum tool life is expected, **as they are extremely wear resistant – very hard, and extraordinarily resistant to thermal shock**. The low density of the material leads to equally low moments of inertia, which creates the ideal basis for the material being used to produce top-quality guide rolls.

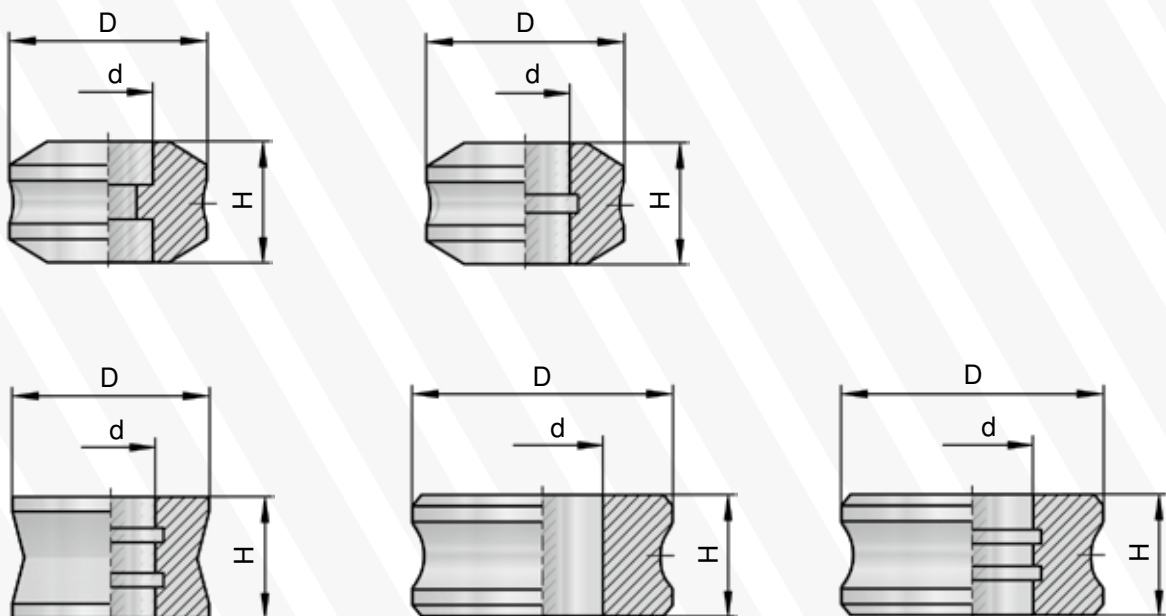
If tube welding plants are being used, silicon nitride pressure rolls will benefit your production as they ensure electric insulation, resulting in **long tool life combined with reliability**. This is what efficiency means.

All rolls can be produced with an external diameter starting from $D = 30$ mm.

Possible variants:

- ▲ As sintered up to an external diameter of max. 600 mm (tolerances common in the sector)*
- ▲ Semi-finished with external diameter as sintered (bore and sides finish-ground)*
- ▲ External diameter machined, bore and sides finish-ground, without groove*
- ▲ Completely finished with groove

* Upon request these variants can be delivered with a sintered groove.

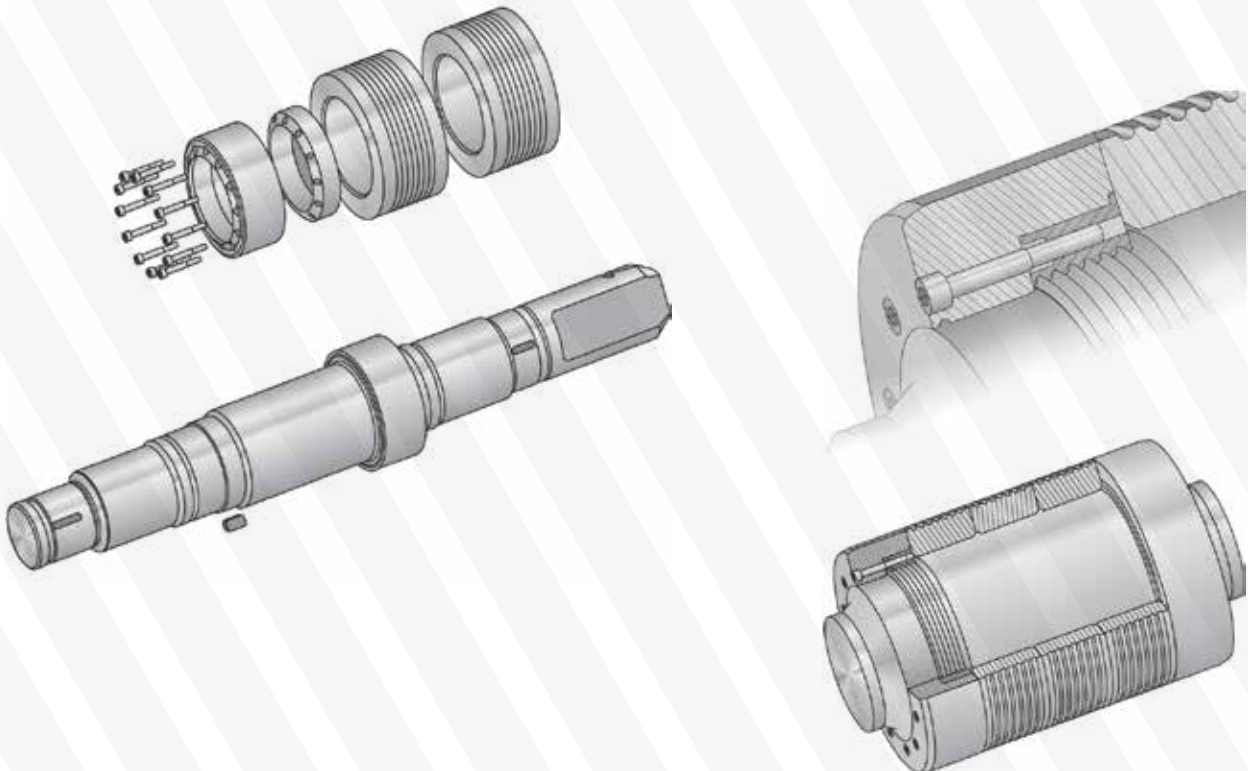


Proven technology, proven composite rolls up to 1 metre of length

For many years, composite rolls from Hard Material Solutions by CERATIZIT have been used in the conventional hot rolling lines of all manufacturers with consistent success: numerous regular clients trust in **Premium for various requirements**, including sometimes very complex application fields.

Our composite rolls are provided with a mechanical clamping system for purely axial pre-clamping. In this way the steel support and the carbide ring can be separated easily when

removing the rolls from service. **You will save time and resources**, and furthermore have a better basis for professional recycling. Premium in fact not only applies to products, services and know-how, it also includes sustainability.



A wide range and deep roots

Individual solutions from CERATIZIT provide reliable and permanent saving as **maximum tool life and an excellent price-performance ratio** go hand in hand.

Convince yourself and – as many other international companies do already – count on Premium when it comes to hot rolling.

- ▲ Rolling mills
- ▲ Automotive industry
- ▲ Steel mills
- ▲ Customised solutions

Particularly suited for the following materials:

- ▲ From classical constructional steel to high-alloyed steels
- ▲ Non-ferrous materials

Many grades for countless possibilities

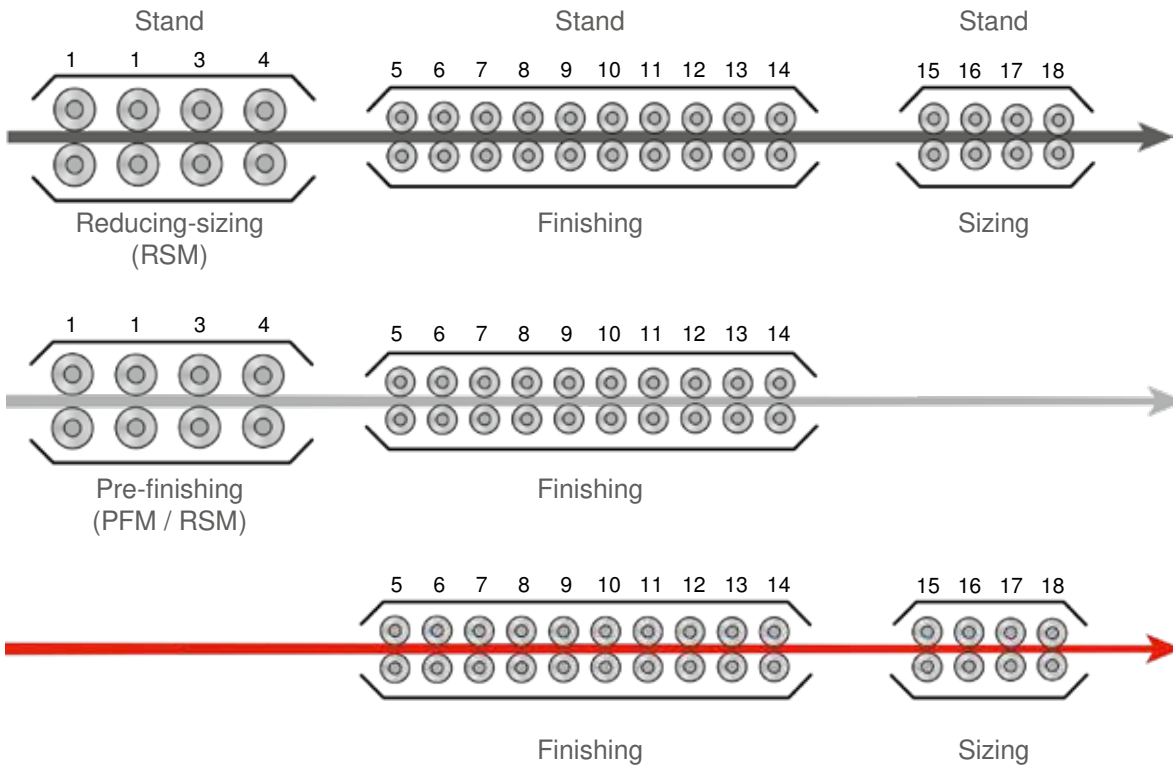
Which grade is suitable for your application? Here you can find the answer for both cemented carbide and ceramic.

Composition and properties

CERATIZIT grade code	Binder [m %]	Density [g/cm ³]	Hardness			Transverse rupture strength [MPa]	Fracture toughness [MPa·m ^{1/2}]	Compressive strength [MPa]	Modulus of elasticity [GPa]	Thermal expansion coefficient [W/mK]	Thermal conductivity [10 ⁻⁶ /K]
			HV10	HV30	HRA						
Coarse grain grades											
CTE12A	6.0	15.00	1300	1290	89.4	2400	16.0	4300	630	115	4.7
CTE20A	10.0	14.60	1130	1120	87.6	2600	18.0	4000	580	110	5.1
CTE25A	12.5	14.30	1050	1040	86.6	2700	20.0	3800	555	107	5.3
CTE30A	15.0	14.05	970	960	85.6	2800	22.0	3600	530	105	5.6
CTE35A	17.5	13.80	910	900	84.8	2850	23.0	3500	510	103	5.9
CTE40A	20.0	13.60	850	840	84.2	2900	24.0	3400	490	100	6.3
CTE44A	22.0	13.40	810	800	83.6	2900	25.0	3300	475	100	6.5
CTE50A	25.0	13.15	760	750	82.6	2800	26.0	3200	450	97	6.8
CTE60A	30.0	12.75	690	680	81.4	2700	27.0	3100	420	95	7.3
CTE20M	10.0	14.50	1140	1130	87.7	2600	21.0	3600	580	110	5.1
CTE30M	15.0	14.05	960	950	85.5	2900	23.0	3400	530	105	5.6
CTE40M	20.0	13.50	810	800	83.6	2800	25.0	3200	490	100	6.3
CTE50M	25.0	13.15	710	700	81.7	2700	27.0	3100	450	97	7.0
CTE60M	30.0	12.70	610	600	80.0	2700	29.0	3000	420	95	7.4
Silicon nitride grades											
SNC1	9	3.25	1550	1530	91.5	1100	6.5	3000	305	30	3.3

Grades with Co-Ni-Cr binder

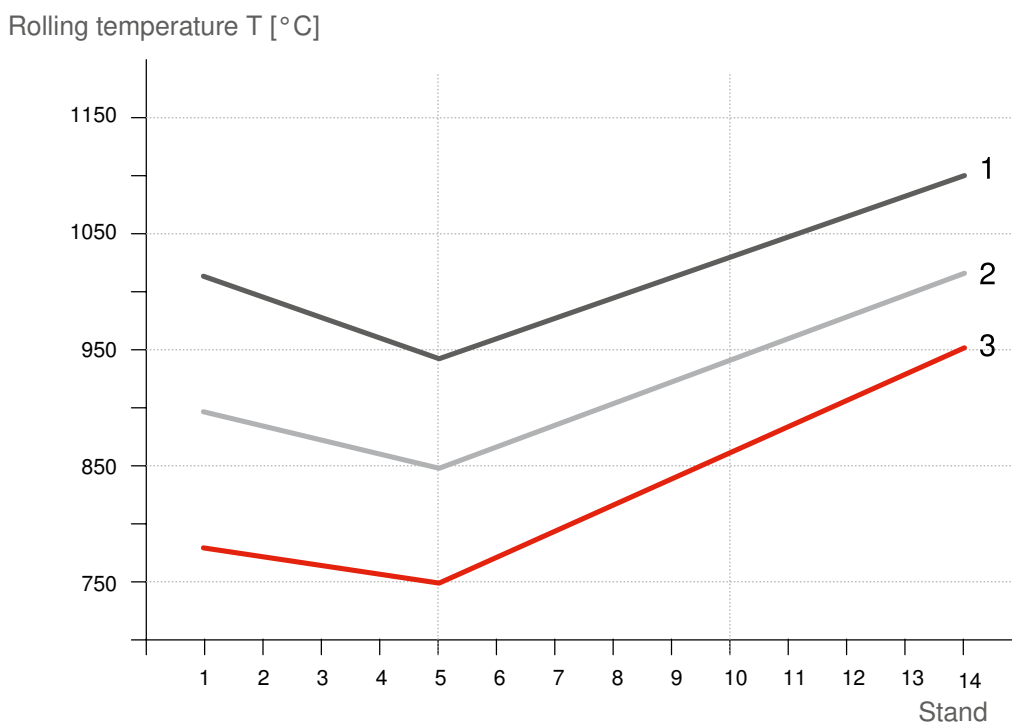
Schematic view of a No-Twist wire rolling mill



Grade/stand (recommended values)

Stand	1	2	3	4	5	6	7
Product Ø		21-24		18-20		15-17	
Binder % (Co-Ni-Cr)							
	CTE50M	CTE50M	CTE50M	CTE50M	CTE40M	CTE40M	CTE30M
	CTE60M	CTE60M	CTE60M	CTE60M	CTE50M	CTE50M	CTE40M
			CTE50M	CTE50M	CTE40M	CTE40M	
	CTE60M	CTE60M	CTE60M	CTE60M	CTE50M	CTE50M	CTE40M
			CTE50M	CTE50M	CTE50M	CTE50M	CTE40M
	CTE60M	CTE60M	CTE60M	CTE60M	CTE50M	CTE50M	CTE50M

Temperatures in the wire rolling mill

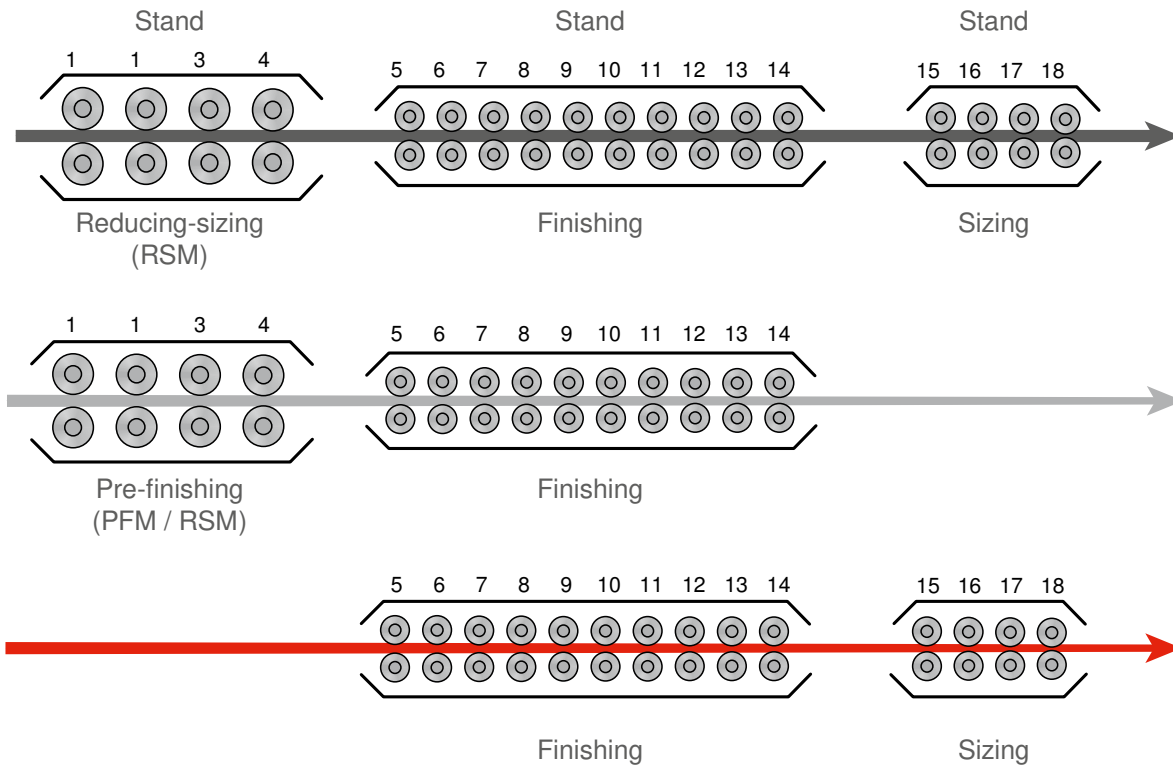


8	9	10	11	12	13	14	Material	Rolling temperature T [10 ⁻⁶ /K]
12-14		9-11		7-8		5.5-6		
CTE30M			CTE20M	CTE20M	CTE20M	CTE20M	A	1
	CTE30M	CTE30M					B	
CTE40M			CTE30M	CTE30M	CTE30M	CTE30M	C	
	CTE40M	CTE40M					D	
	CTE30M	CTE30M	CTE20M	CTE20M	CTE20M	CTE20M	A	2
CTE40M			CTE30M	CTE30M		CTE30M	B	
	CTE40M	CTE40M			CTE30M	CTE30M	C	
			CTE40M	CTE40M			D	
CTE40M	CTE30M	CTE30M	CTE30M	CTE30M		CTE30M	A	3
					CTE30M	CTE30M	B	
CTE50M	CTE40M	CTE40M	CTE40M	CTE40M			C	
					CTE40M	CTE40M	D	

Material: A = low carbon steel B = carbon steel C = alloyed steel D = special steel

Grades with Co binder

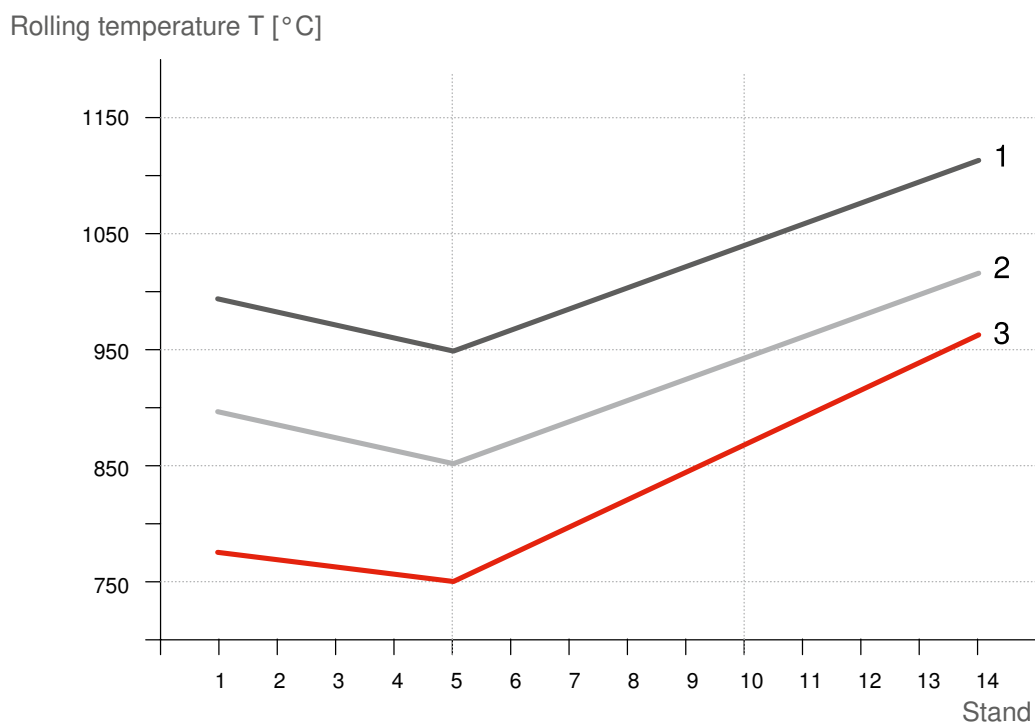
Schematic view of a No-Twist wire rolling mill



Grade/stand (recommended values)

Stand	1	2	3	4	5	6	7
Product Ø		21-24		18-20		15-17	
Binder % (Co)							
	CTE50A	CTE50A		CTE44A	CTE40A	CTE40A	CTE30A
			CTE50A	CTE50A	CTE44A	CTE44A	CTE40A
	CTE60A	CTE60A	CTE60A	CTE60A	CTE50A	CTE50A	CTE44A
			CTE50A	CTE50A	CTE44A	CTE44A	CTE40A
	CTE60A	CTE60A	CTE60A	CTE60A	CTE50A	CTE50A	CTE44A
			CTE50A	CTE50A	CTE44A	CTE44A	CTE40A
	CTE60A	CTE60A	CTE60A	CTE60A	CTE50A	CTE50A	CTE44A

Temperatures in the wire rolling mill



8	9	10	11	12	13	14	Material	Rolling temperature T [10 ⁻⁶ /K]
12-14		9-11		7-8		5.5-6		
CTE30A	CTE25A	CTE25A	CTE20A	CTE20A	CTE12A	CTE12A	A	1
CTE40A	CTE30A	CTE30A	CTE25A	CTE25A	CTE20A	CTE20A	B	
	CTE35A	CTE35A	CTE30A	CTE30A	CTE25A	CTE25A	C	
CTE44A	CTE40A	CTE40A	CTE35A	CTE35A	CTE30A	CTE30A	D	
CTE40A	CTE30A	CTE30A	CTE20A	CTE25A	CTE20A	CTE20A	A	2
	CTE35A	CTE35A	CTE30A	CTE30A	CTE25A	CTE25A	B	
CTE44A	CTE40A	CTE40A	CTE35A	CTE35A	CTE30A	CTE30A	C	
			CTE40A	CTE40A	CTE35A	CTE35A	D	
CTE40A	CTE35A	CTE30A	CTE30A	CTE30A	CTE25A	CTE25A	A	3
	CTE40A	CTE40A	CTE35A	CTE35A	CTE30A	CTE30A	B	
CTE54A			CTE40A	CTE40A	CTE40A	CTE40A	CTE35A	
	CTE40A	CTE40A			CTE40A	CTE40A	D	

Material: A = low carbon steel B = carbon steel C = alloyed steel D = special steel

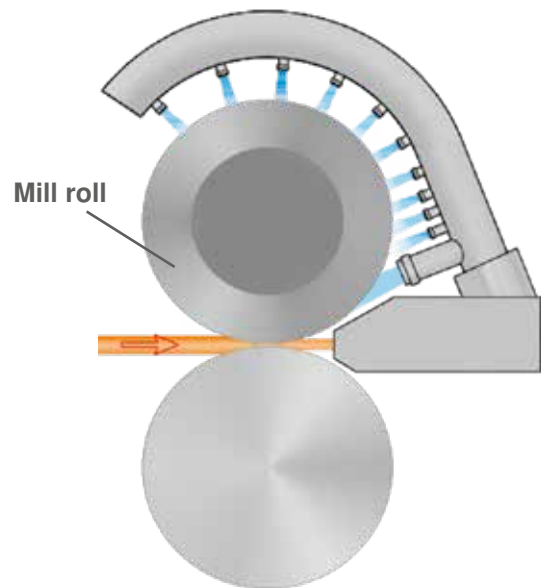
Just so that you are completely in the picture... here are a few practical tips

Coolant

High temperatures resulting from the process are principally in the contact zone between the roll and the wire, causing a series of effects which reduce roll life. Corrosion, wear, reduced dimensional accuracy and cracks need to be prevented as far as possible.

Adequate cooling is strongly recommended to avoid overheating of the material. No material likes to be overheated – be considerate in your cooling, and you can expect up to 100% longer tool life of the roll.

For optimum cooling it is essential to supply sufficient coolant volume, adequate pressure and correct positioning of the coolant exit nozzles. Around 30% of the coolant quantity should be focused on the exit side of the rolled product, close to the rolling line.



Corrosion

In hot rolling operations, corrosion represents an electro-chemical process which causes **undesirable wear**. This **can**, however, **be avoided**. Typical wear in this context results in a rougher surface of the groove. The degree of corrosion increases with the rolling temperature, therefore the groove shows more corrosion than the rest of the roll.

When corrosion occurs, it causes the binder matrix to detach from the tungsten carbide structure. In the case of **regular** surface corrosion this leads to considerably higher wear. With **irregular** corrosion it can result in mechanical or thermal cracks.

Apart from the rolling temperature, both the temperature and pH value of the coolant also need to be carefully controlled. The following

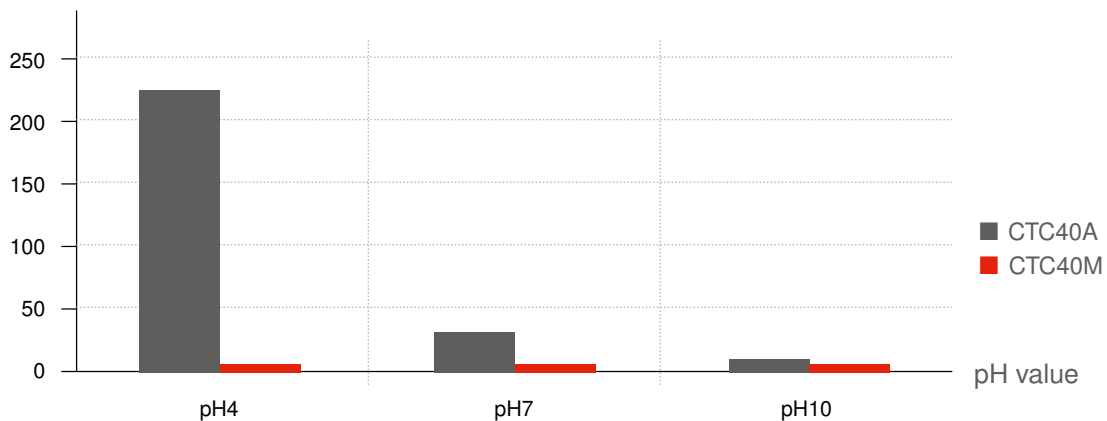
parameters are significant **when you want to avoid corrosion**: the highest acceptable temperature of the water with a pH value between 7.5 and 8.5 is 35 °C.

▲ If the water temperature is 25 °C, the pH value should be between 6.5 and 9. **The specific water quality is another important factor for success.** Acid water attacks the cobalt binder, while extremely alkaline water will attack the tungsten carbide. So please take your specific situation into account.

Special binders such as nickel-cobalt-chromium alloys show **notably higher corrosion resistance**, i.e. they may be used up to pH 5.5.

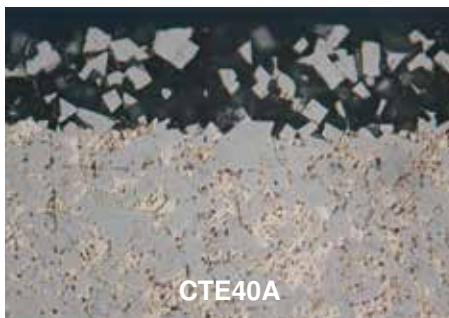
Corrosion test according to DIN 50905/ASTM G54

Material removal [g/(m²h)]



Binder: Co

High degree of cobalt detachment



Binder: Co/Ni

Low degree of cobalt detachment



pH4
Duration of test: 168 hours

Thermal cracks

As during the process the roll is subject to continually alternating cooling and heating phases, a considerable thermal gradient results. The **tension arising from these temperature changes** mainly affects the profile of the roll. This produces a superficial network of surface cracks, their type depending primarily on the carbide grade chosen.

Carbide grades with a major binder content have a higher thermal expansion coefficient and are characterised by lower thermal conductivity. In such grades cracks occur more often but are basically limited to the surface. Obviously, for carbide grades with a **low** binder content the opposite is true.

The depth of the cracks **is normally limited to 0.2 mm** when the following conditions are present:

- ▲ Optimal cooling
- ▲ Maximum reduction of the section 20 %
- ▲ Rolling speed of more than 10 m/sec.

NB:

For **lower** rolling speeds, involving longer contact time between the roll and the rolled product, the crack depth can be as much as 0.8 mm.



Another tip:

When redressing the roll, make sure that all thermal cracks are completely eliminated.

Redressing of carbide rolls

Hard materials such as carbides or silicon nitride are mainly ground with a diamond grinding wheel.

For finish-machining rolls with a binder content of >15% **the use of a geometrically defined cutting edge is recommended**. Finish-machining here is essentially limited to turning. Suitable cutting materials are cubic boron nitride (CBN) and polycrystalline diamond (PCD). With CBN dry machining is suitable, while **PCD requires an abundant quantity of coolant**.

Here are some more comments:

- ▲ The cutting edge should be as robust **as possible**, obviously depending on the roll profile.
- ▲ For classic longitudinal and face turning operations, **button inserts** have proven to be best.
- ▲ When finish-turning the groove, it is the shape of the groove itself which is decisive for the choice of the insert type. The cutting edge should be sharp; a negative protective edge chamfer is however not necessary.



Binder content [%]	v_c [m/min]	a_p [mm]	f [mm/rev]
15-20	10-20	0.1-2.5	0.15-0.3
20-25	20-30		
>25	30-50		

Hard Material Solutions by CERATIZIT

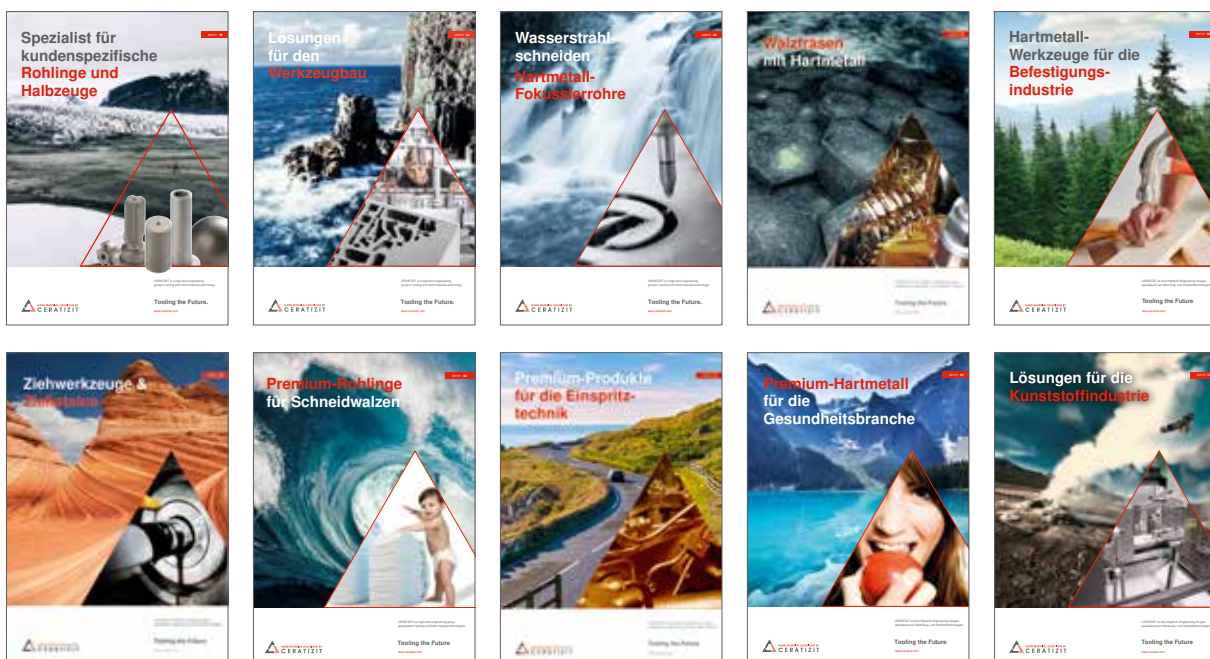
Wear protection for all applications
and industries



- ▲ Individual carbide solutions for your application
- ▲ Tools for metal forming
- ▲ High-performance components for tool construction



Extract from our product portfolio



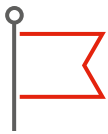
The CERATIZIT Group

For over **95 years**, CERATIZIT has been a **pioneer** developing exceptional hard material products for cutting tools and wear protection.

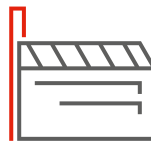
The privately owned company, based in Mamer, Luxembourg, develops and manufactures highly specialised carbide cutting tools, inserts and rods made of hard materials as well as wear parts.

The CERATIZIT Group is the **global market leader** in several wear part application areas, and successfully develops new types of cemented carbide, cermet and ceramic grades which are used for instance in the wood, metal and stone working industries.

Facts and figures



1 headquarters
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

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