hard material matters

CERATIZIT

hard material matters

OvalFlex - the oval allrounder for aluminium wheel machining

CERATIZIT - the parent companies

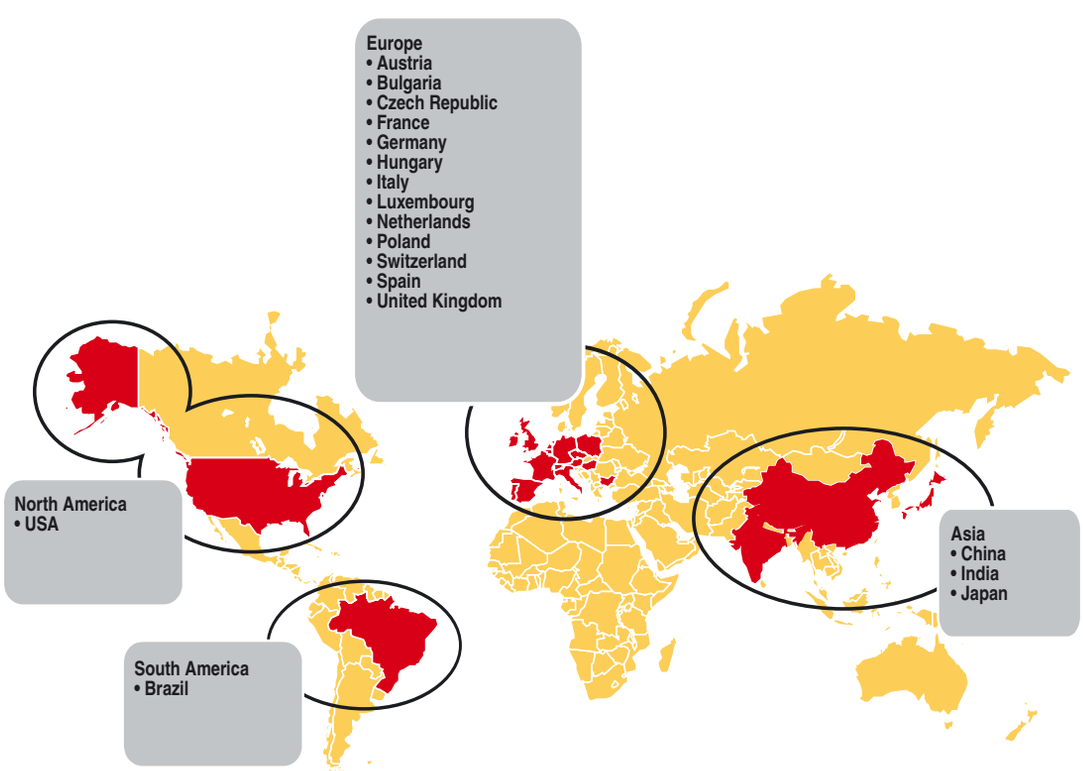
Headquarters and parent company in **MAMER** / Luxembourg

Parent company in **REUTTE** / Austria

Hard material matters - it is the core of our business. Through profound knowledge and highly flexible production facilities we strive to provide our business partners with direct competitive advantages in the field of hard materials for tooling solutions and wear parts. Our dedication to hard material matters creates intelligent solutions for tomorrow and time to come.

Production plants in the three main economic areas and a worldwide sales network of subsidiaries and distribution partners ensure a quick response to customer needs. In-house trainings and seminars guarantee that both business partners and employees share the latest information on our product range.

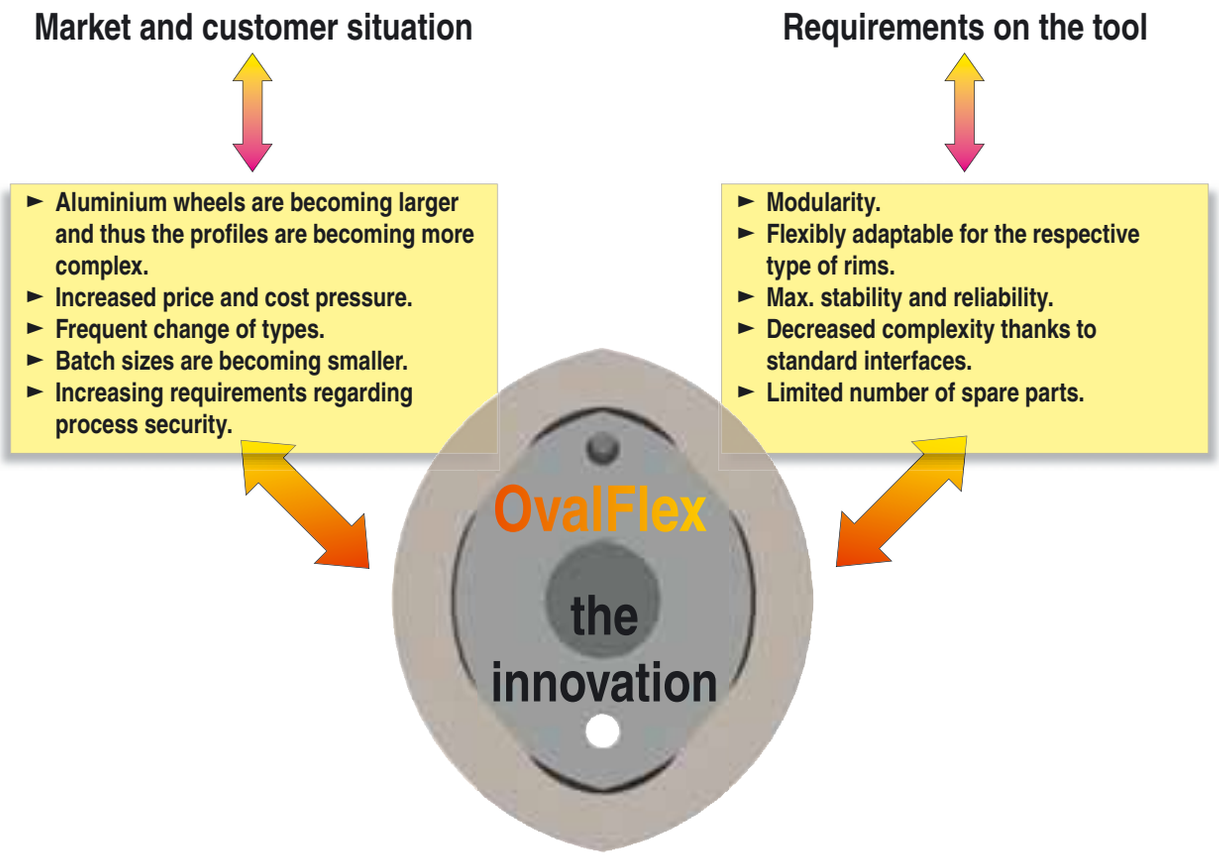
We promote intensive dialogue with our customers and strive for long-term business relations on a partnership basis. The CERATIZIT corporate value 'The focus and point of view of our business partners matters' is a guiding principle for all CERATIZIT employees worldwide.



Direct sales and distribution partners

OvalFlex – modular repeatability

WHY OvalFlex?



OvalFlex, the oval allrounder for aluminium wheels!

One of the special fields of **CERATIZIT** is aluminium wheel machining. For this type of machining the completely new tooling system OvalFlex has been introduced.

The dimensions of the wheels are ever increasing, machining methods are becoming more complex and the variety of types and designs is growing. Producers are required to guarantee more flexibility, productivity and process security.

Through OvalFlex **CERATIZIT** has managed to develop a completely new high-performance modular tooling system which is characterised by maximum stability and reliability.

The new tapered oval interface 'Oval Coupling (OC)' connects the tooling adapter with the tool head. The interface consists of four tapered surfaces which ensure a 100% accurate connection with the location face in both radial and axial direction.
The oval construction makes the tool's assembly height larger than in conventional round tools, therefore improved stability and performance are guaranteed for the entire tooling system.
As different tool heads can be mounted on the adapters, high flexibility is guaranteed. In this way complex special tools are avoided.

For OvalFlex also the new insert type X32 has been developed.
These are larger and extremely stable. The 30° top faces ensure extraordinarily precise positioning of the insert which also balances lateral cutting forces better. Thanks to the tapered shape of the top faces the insert is also protected against being pulled out.
The X32 inserts with radius R4, R3, R2 and R1.6 mm are available in the standard programme as carbide or PCD version.

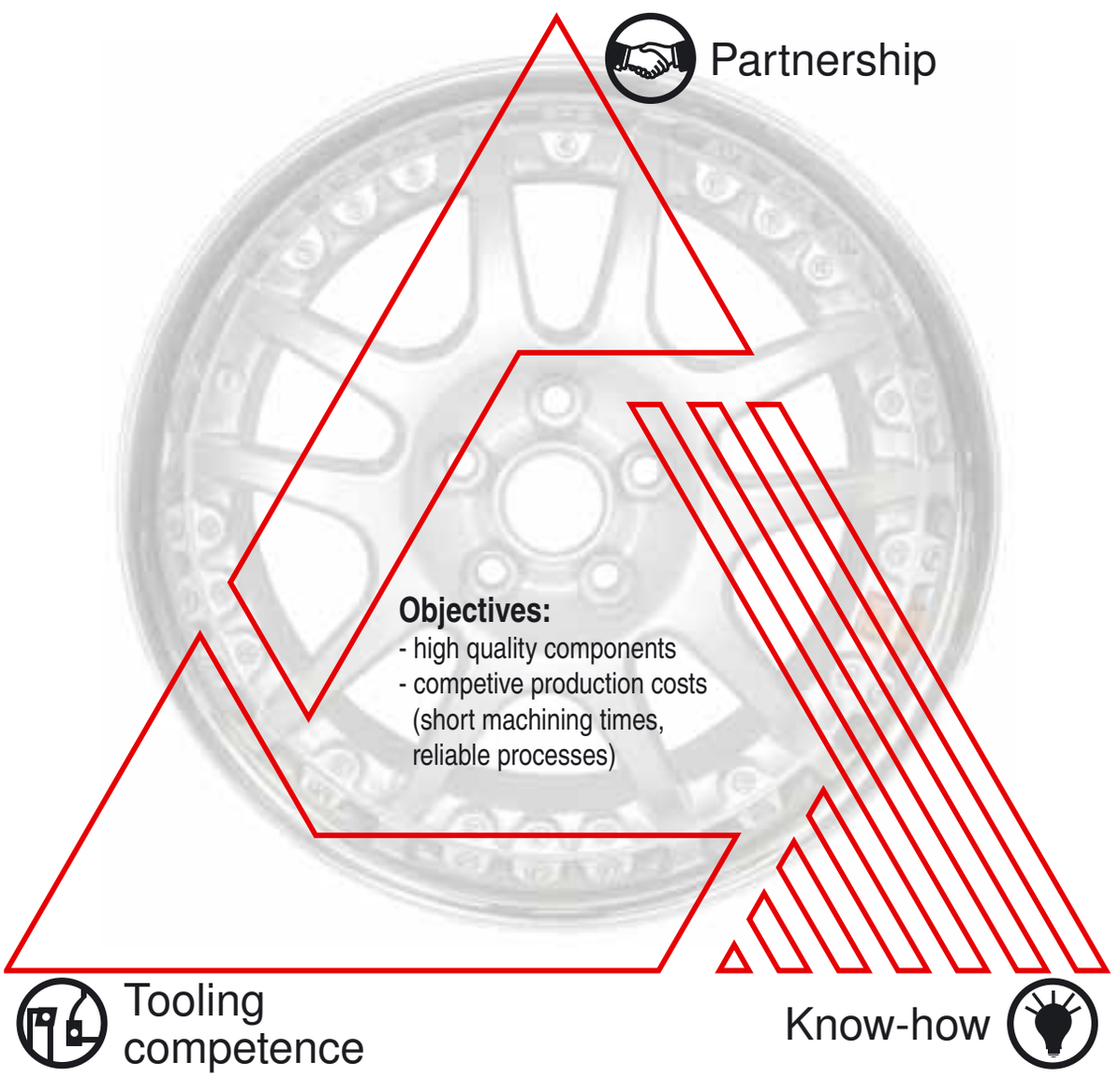
Conclusion:
The special highlight is the possibility to use all these inserts with different radii in one tool. The OvalFlex tooling system from **CERATIZIT** is the allrounder for aluminium production which the aluminium wheel market has been waiting for eagerly for a long time.

OvalFlex – benefits of use at a glance

- Tool life improved by up to 100 per cent.
- Maximum stability through oval and tapered construction.
- High flexibility through modular structure.
- Reduced stock-keeping, (complex special tools are no longer necessary).
- Maximum application security and economy.

CERATIZIT in the automotive industry

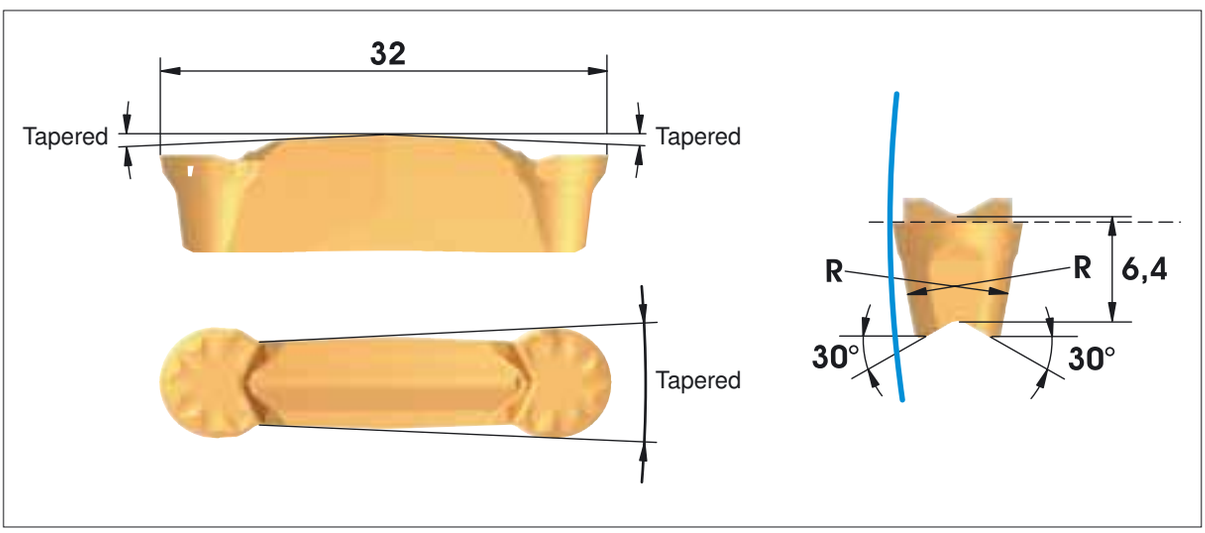
Success factors



OvalFlex – characteristics and advantages

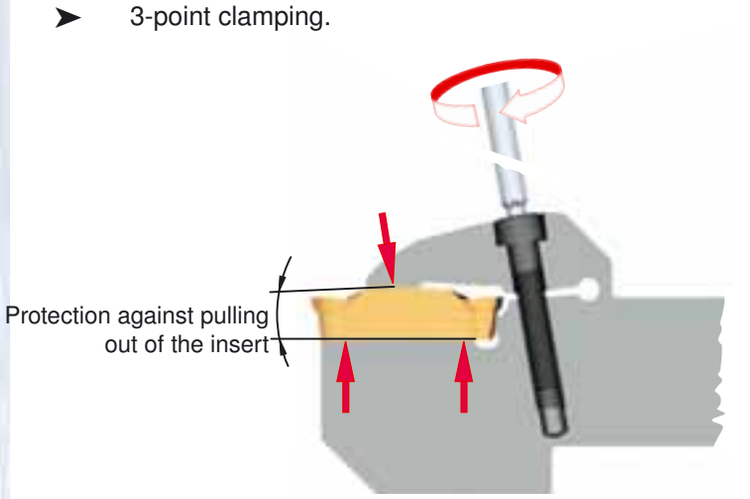
1. X32 insert

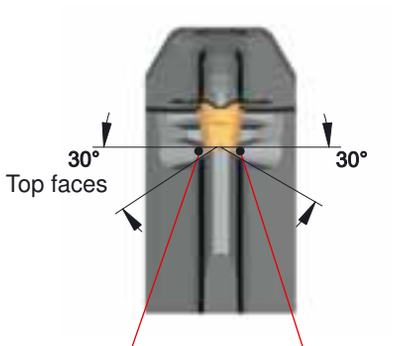
- Notably larger and more stable.
- Tapered top faces for optimum protection against pulling out.
- Improved positioning of the insert thanks to 30° top faces.
- Tapered central section provides larger insert width.



2. X32 insert seat and clamping

- Clamp protects against the insert pulling out.
- Insert is optimally positioned in the tool thanks to the 30° top faces.
- Tapered parting and grooving edge for improved stability.
- 3-point clamping.



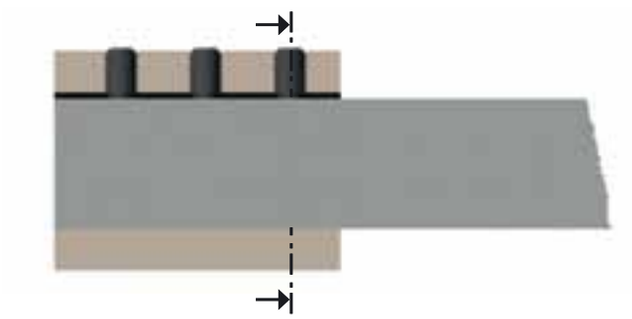


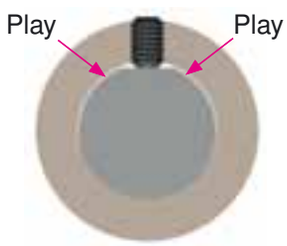
Coolant exit in OC heads
(not in tool shanks)

OvalFlex – characteristics and advantages

3. The connection ‘OvalCoupling’ (OC)

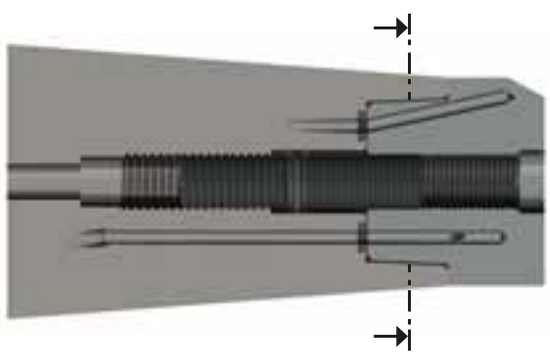
Comparison: conventional clamping - OvalFlex

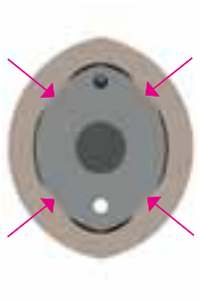




Conventional clamping – boring bar adapters:

- Play between round shank and bore of adapter.
- Unstable connection.





OvalCoupling (OC) – maximum stability of the connection through:

- Radial positioning through **four tapered contact faces.**
- Axial positioning through **tapered contact faces** and **location face.**
- 100% accurate connection.

OvalFlex – maximum rigidity through:

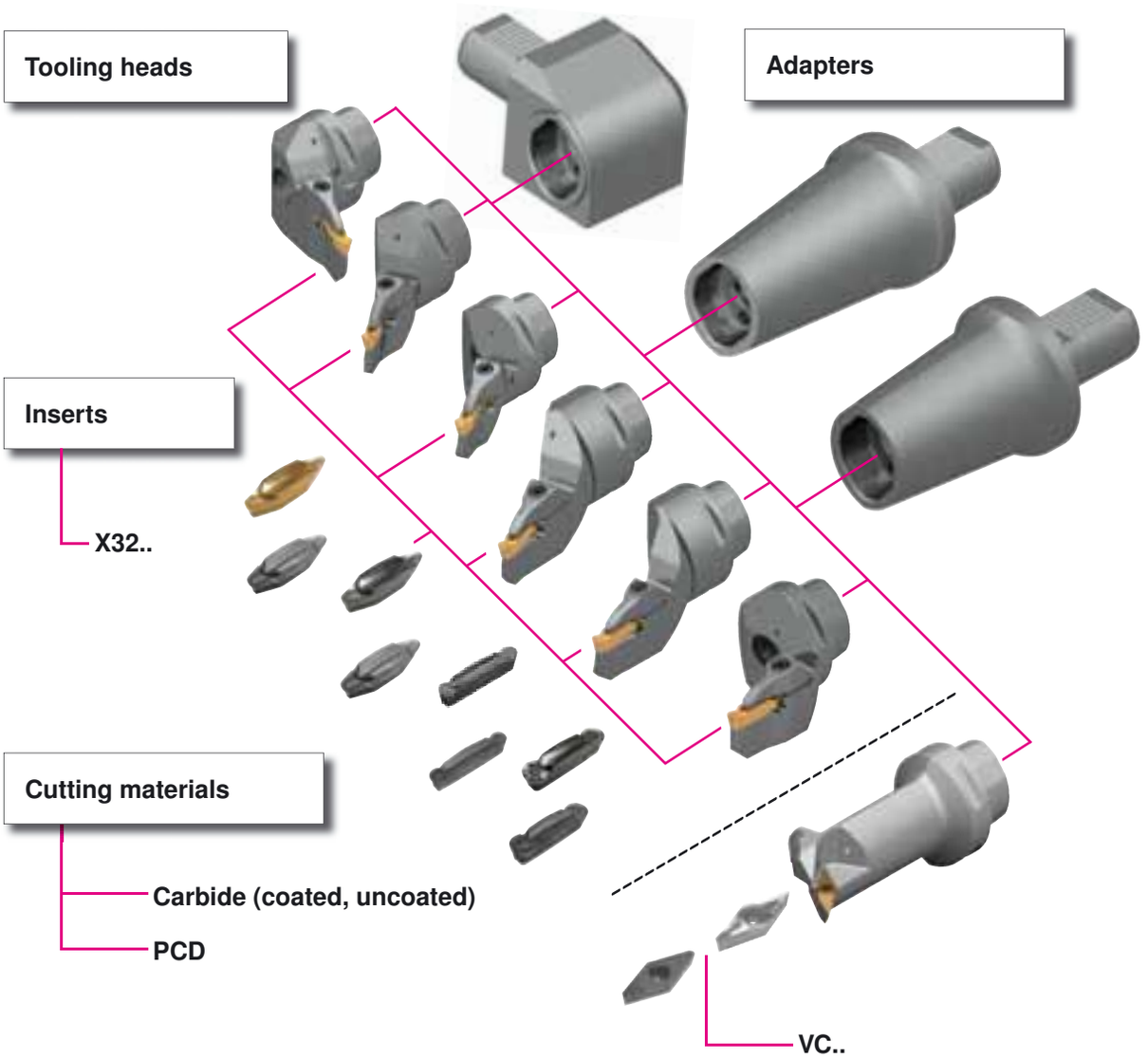
- Tapered oval construction.
- At the machine side the tool has a larger cross-section and therefore is more stable.

OvalFlex – characteristics and advantages

4. Modularity

Tooling system with consistently modular structure:

➤ **Adapters, tooling heads, inserts and also the cutting materials** are fully interchangeable. In this manner it is possible to machine almost every rim with standard tools.



5. Coolant supply

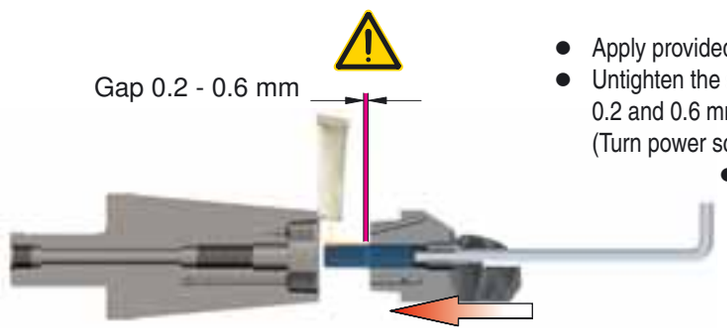
⚠ Recommended minimum coolant pressure: 6 bar

OvalFlex – mounting

1.

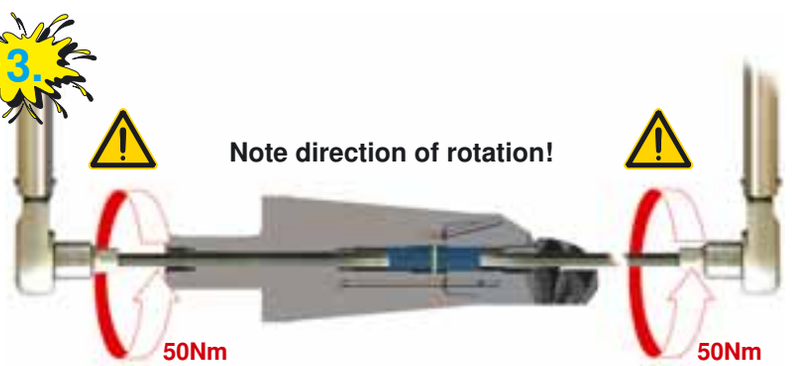
- Remove power screw (1).
- Remove screw plug (2).
- Apply provided lubricant to thread (M16x1,5).
- Turn the power screw (1) completely into the tool head up to the stop (3) .

2.



- Apply provided lubricant to thread (M16x1,5).
- Untighten the screw maintaining a gap of 0.2 and 0.6 mm.
  (Turn power screw outwards by ¼ a revolution).
- Insert tool head with power screw (leave gap between 0.2 and 0.6 mm) into tool holder and tighten.

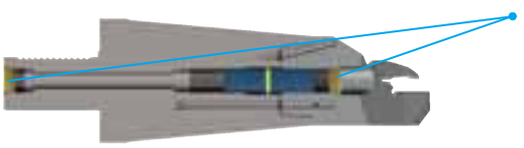
3.



- Tighten power screw with torque wrench.
  - ▸ Torque moment 50Nm.

The power screw can be accessed through the tool head from the front and through the adapter from the back.

4.



- Replace screw plugs on both sides into the tool head and adapter.

5.

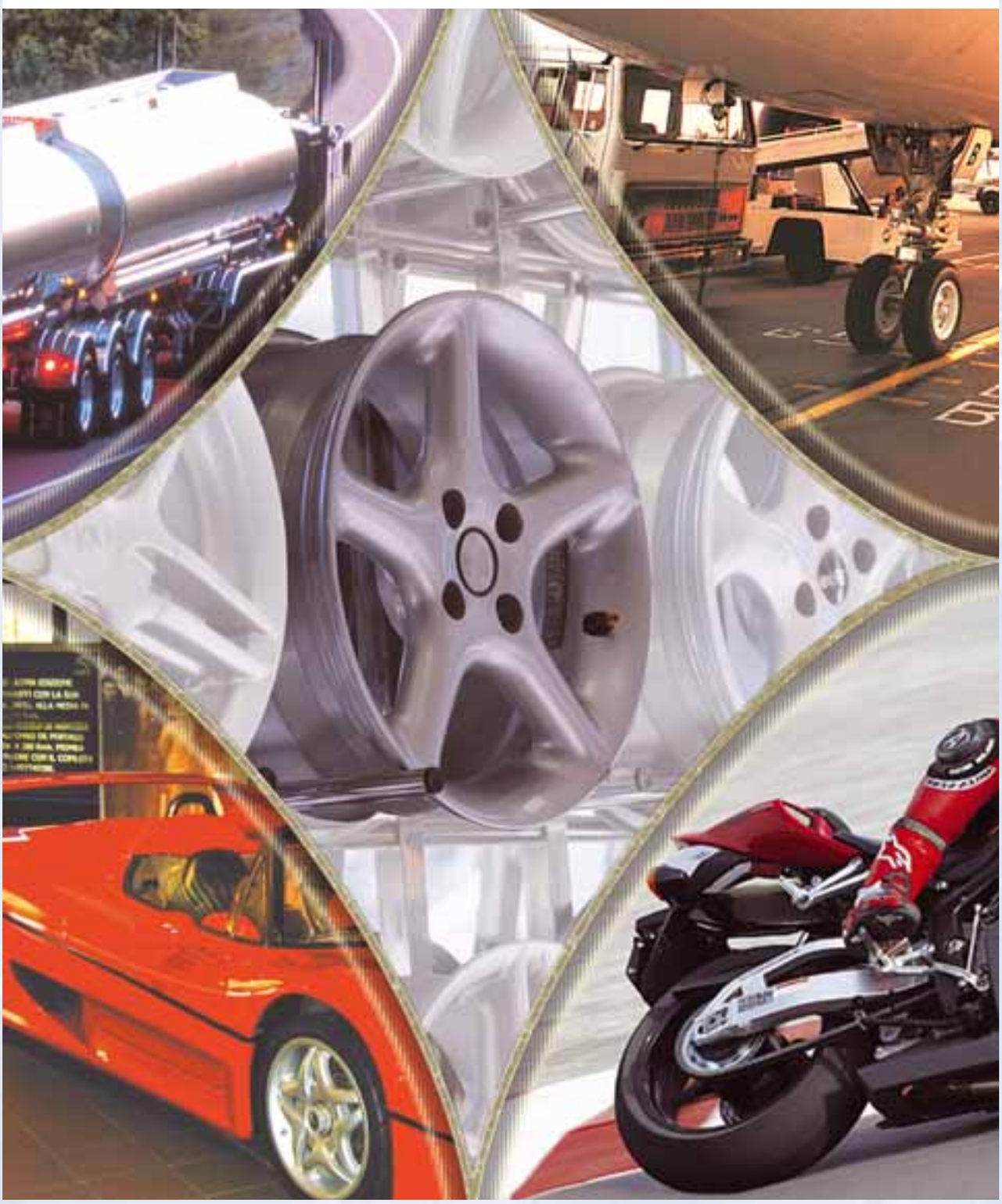
Clamping of the insert:

- Mount insert and tighten using clamping screw M5x20.
  - ▸ Optimum torque moment 7.5Nm.
  - ▸ Never tighten clamping system without an insert in place.

The OvalFlex tool has been mounted completely and is now ready for use.

Complete aluminium machining

There are no limits to mobility!
CERATIZIT always offers you the suitable tooling solution for all types of aluminium wheels.
The delivery programme includes tools for external and internal machining, for the manufacture of hubs, valve bores and bolt holes for front machining.



OvalFlex – programme

Tool adapters / tool holders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Tool heads

						
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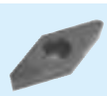
Inserts

Carbide (coated + uncoated)

PCD

				
X32-R1.60N...	**X32-R2.00N...**	**X32-R3.00N...**	**X32-R4.00N...**	**VCGT 1604..**
				
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Tool shanks

		
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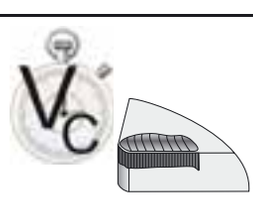
Accessories / spare parts / techn. information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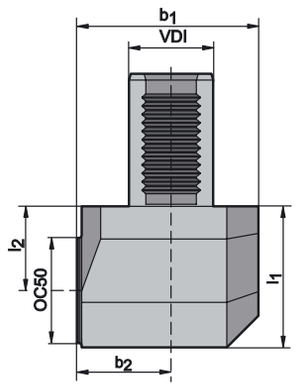
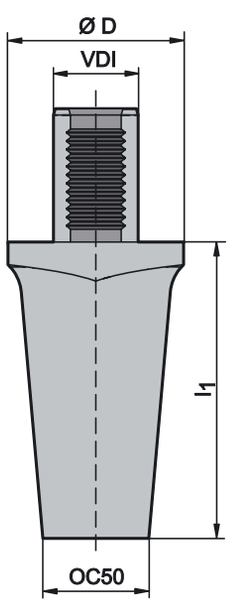
OvalFlex – tool holders / adapters

External machining



Type, description	DIN69880 VDI ..	b_1 mm	b_2 mm	l_1 mm	l_2 mm
OC50-DIN69880-40ER	40	86.5	45	67	40
OC50-DIN69880-50ER	50	104.0	55	77	50

Internal machining

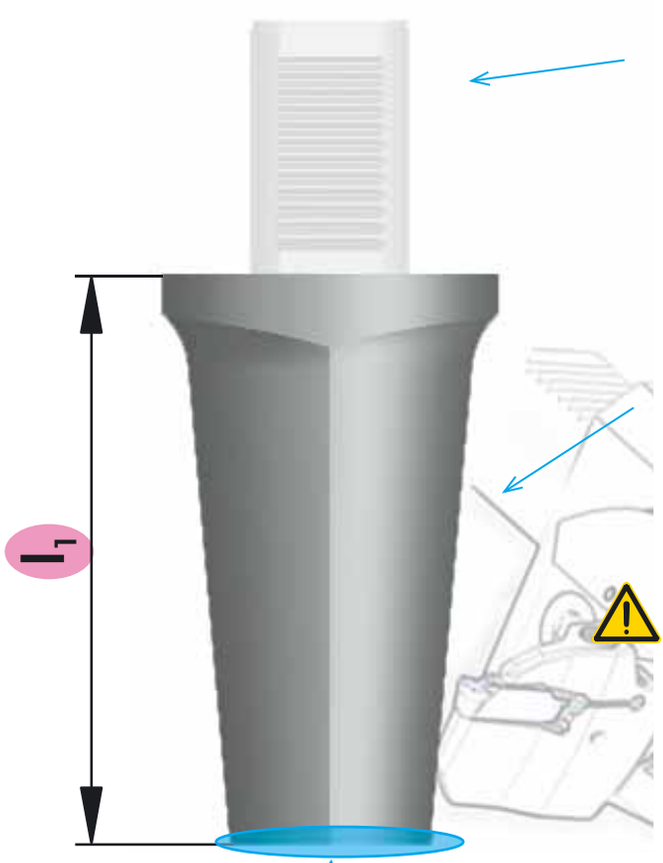


Type, description	DIN69880 VDI ..	l_1 mm	Ø D mm
OC50-DIN69880-40IN110	40	110	83
OC50-DIN69880-40IN140	40	140	83
OC50-DIN69880-50IN130	50	130	98
OC50-DIN69880-50IN170	50	170	98

OvalFlex tool holders are provided with a power screw.
Ordering example: 1 piece OC50-DIN69880-40IN110

OvalFlex – adapter for special tool

Should you need an adapter that is not included in the current standard programme, we offer the possibility to produce adapters for external or internal machining according to your needs.



Interface

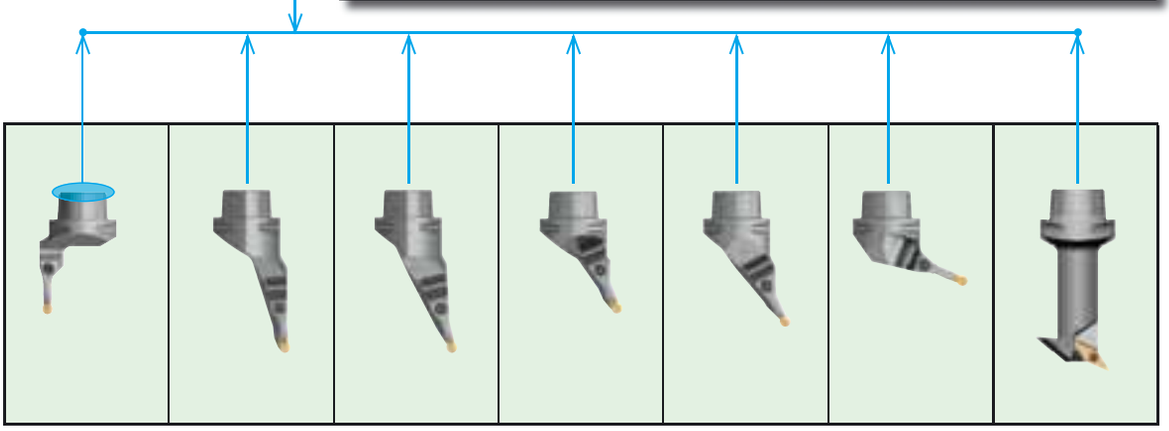
- Manufactured to customer request.

Tool body

- The OC interface and the oval design are included as a standard (internal machining).
- The shank length is variable **(l_1)**.

When defining the length of the adapter the length of the tool head has to be taken into account.

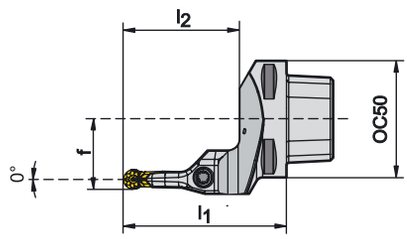
OC interface for all standard tool heads



Every OC50.. tool head is suitable for internal and external machining and can be applied with all adapters which are provided with an OC50.. interface (VDI 40, VDI 50 etc.).

OvalFlex - tool heads
0° / 5° / 15°

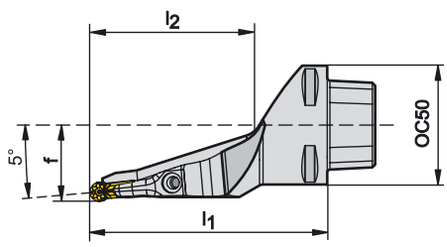
... 0°



Picture shows right-hand tool

Type, description	L N R	OC	l_1 mm	l_2 mm	f mm	
OC50-X32R00E	R	50	70	50	30	X32 ...
OC50-X32L00E	L	50	70	50	30	X32 ...

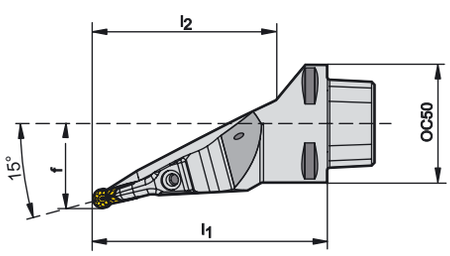
... 5°



Picture shows right-hand tool

Type, description	L N R	OC	l_1 mm	l_2 mm	f mm	
OC50-X32R05H	R	50	100	66	32	X32 ...
OC50-X32L05H	L	50	100	66	32	X32 ...

... 15°

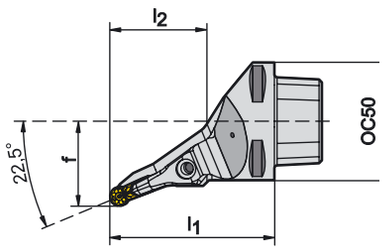


Picture shows right-hand tool

Type, description	L N R	OC	l_1 mm	l_2 mm	f mm	
OC50-X32R15H	R	50	100	80	36	X32 ...
OC50-X32L15H	L	50	100	80	36	X32 ...

OvalFlex - tool heads
22,5° / 27,5° / 67,5°

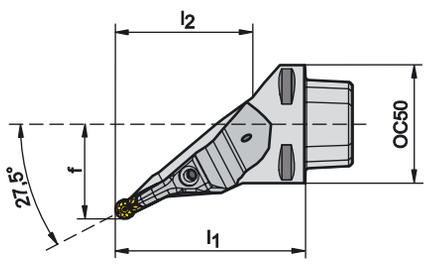
... 22,5°



Picture shows right-hand tool

Type, description	L N R	OC	l_1 mm	l_2 mm	f mm	
OC50-X32R22.5E	R	50	70	40	36	X32 ...
OC50-X32L22.5E	L	50	70	40	36	X32 ...

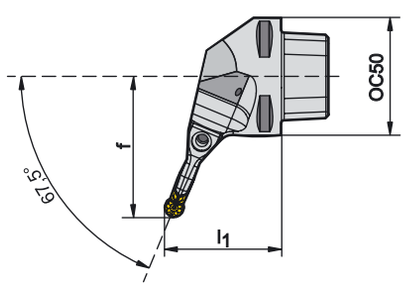
... 27,5°



Picture shows right-hand tool

Type, description	L N R	OC	l_1 mm	l_2 mm	f mm	
OC50-X32R27.5F	R	50	80	60	40	X32 ...
OC50-X32L27.5F	L	50	80	60	40	X32 ...

... 67,5°

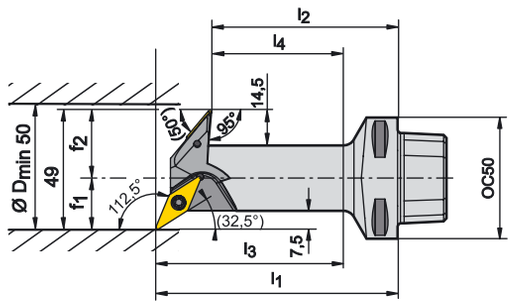


Picture shows right-hand tool

Type, description	L N R	OC	l_1 mm	l_2 mm	f mm	
OC50-X32R67.5C	R	50	50	-	60	X32 ...
OC50-X32L67.5C	L	50	50	-	60	X32 ...

OvalFlex - hub tools
0° / 5° / 15°

... 112,5°

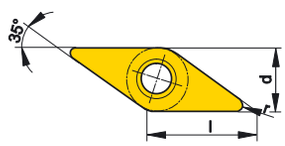


Type, description	L N R	OC	l_1 mm	l_2 mm	l_3 mm	l_4 mm	f_1 mm	f_2 mm	
OC50-50R112.5H	R	50	100	77	82	59	21	28	VCGT/VCUW 16..

The OvalFlex hub tool is provided with clamping screws, whereas inserts and the power screw are not included.
Ordering example: 1 piece OC50-50R112.5H

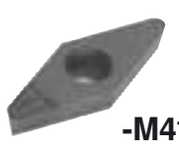
VCGT

-25P

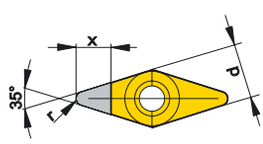


Type, description	l mm	d mm	r mm	Cutting data: a_p max (mm)	Cutting data: f mm/rev	H210T	CTP4115
VCGT 160404FN-25P	16,5	9,52	0,4	3,00	0,05 – 0,25	●	●
VCGT 160408FN-25P	16,5	9,52	0,8	4,00	0,05 – 0,40	●	●
VCGT 160412FN-25P	16,5	9,52	1,2	4,00	0,10 – 0,50	●	●

VCUT



-M41

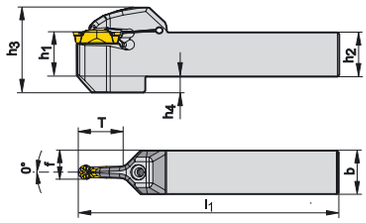


Type, description	x mm	d mm	r mm	Cutting data: a_p max (mm)	Cutting data: f mm/rev	CTD4110
VCUT 160408**FN**/**TN**-M41	6	9,52	0,8	2,00	0,05 – 0,30	●
VCUT 160412**FN**/**TN**-M41	6	9,52	1,2	2,50	0,05 – 0,40	●

Cutting edge: **FN** = sharp edge
TN = with chamfer

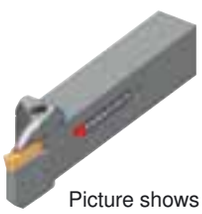
X32 – tool shanks
0° neutral / 0° / 22.5°

0° neutral

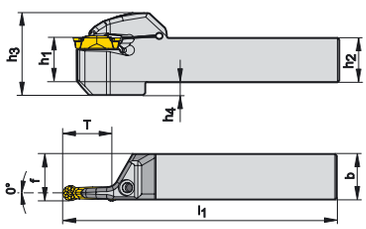


Type, description	L N R	$h_1 = h_2$ mm	h_3 mm	h_4 mm	b mm	l_1 mm	f mm	T mm	
X32N00-2525M	N	25	48	6	25	150	12,5	24	X32 ...
X32N00-3225P	N	32	50	4	32	170	12,5	24	X32 ...

... 0°



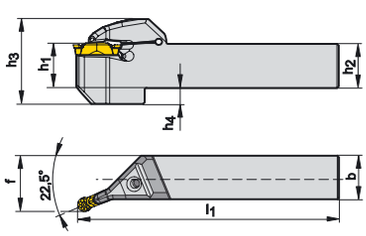
Picture shows right-hand tool



Type, description	L N R	$h_1 = h_2$ mm	h_3 mm	h_4 mm	b mm	l_1 mm	f mm	T mm	
X32R/L00-2525M	R/L	25	48	6	25	150	25,5	24	X32 ...
X32R/L00-3225P	R/L	32	50	4	32	170	25,5	24	X32 ...

... 22,5°

Picture shows right-hand tool



Type, description	L N R	$h_1 = h_2$ mm	h_3 mm	h_4 mm	b mm	l_1 mm	f mm	T mm	
X32R/L22.5-2525M	R/L	25	48	6	25	150	32	-	X32 ...
X32R/L22.5-3225P	R/L	32	50	4	32	170	32	-	X32 ...

X32 tool shanks are provided with a clamping screw, but the inserts are not included.
Ordering example: 1 piece X32R22.5-2525M

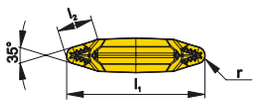
Type, description	Inserts			
	X32-R1.60V..	X32-R2.00V..	X32-R3.00N..	X32-R4.00N..
	application in tools			
X32N00-...	(x)	(x)	x	x
X32R/L00-...	(x)	(x)	x	x
X32R/L22.5-...	x	x	x	x

x Suitable for all workpiece profiles. (x) Particular applications.

OvalFlex – inserts

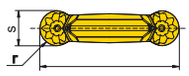
X32 inserts with different radii can be applied in all OvalFlex tool heads and tool shanks

-27P



R 1.6 / 2.0

-27P
-27DF



R 3.0 / 4.0

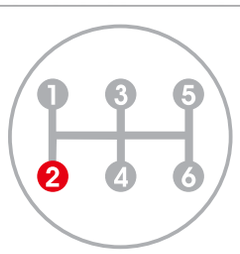
Carbide

Type, description	l_1 mm	l_2 mm	s mm	r mm	a_p max (mm)	f (mm/U)	H216T	CTP4115
X32-R1.60VN-27P	32	7,5	-	1.60	5,0	0,10 – 0,50	●	●
X32-R2.00VN-27P	32	7,5	-	2.00	5,0	0,10 – 0,60	●	●
X32-R3.00N-27P	32	-	6.0	3.00	3,0	0,20 – 0,60	●	●
X32-R4.00N-27P	32	-	8.0	4.00	4,0	0,20 – 0,80	●	●
X32-R4.00EN-27**DF** ⚠	32	-	8.0	4.00	4,0	0,20 – 0,80	●	

⚠ **(DF) DEFLASH — the insert with the best price-performance ratio.**

The Deflash programme has been specifically developed for wheel machining and is perfect for all roughing operations of the external and internal profile as well as for the removal of casting flash.

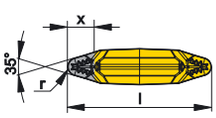
The inserts are manufactured in tolerance class M and are less suitable for finishing.
The edges are provided with a slight hone.



Innovative and flexible thinking matters

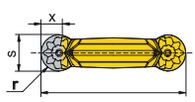
- We have the power to challenge state-of-the-art technologies and the courage to develop intelligent alternatives.

-M41



R 1.6 / 2.0

-M41



R 3.0 / 4.0

PCD - inserts with chip groove / edge types FN and TN

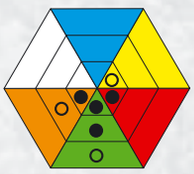
Type, description	l mm	s mm	x mm	r mm	a_p max mm	f (mm/U)	CTD4110
X32-R1.60V**FN/TN**-M41	32	-	6.0	1.6	3.0	0,10 – 0,50	●
X32-R2.00V**FN/TN**-M41	32	-	6.0	2.0	3.0	0,10 – 0,50	●
X32-R3.00**FN/TN**-M41	32	6.0	4.5	3.0	2.0	0,15 – 0,60	●
X32-R4.00**FN/TN**-M41	32	8.0	6.0	4.0	3.0	0,15 – 0,70	●

Ordering example: 10 pieces X32-R1.60VFN-M41 CTD4110

Cutting edge: **FN** = sharp edge
TN = with chamfer

Grade description

H210T
(K10)

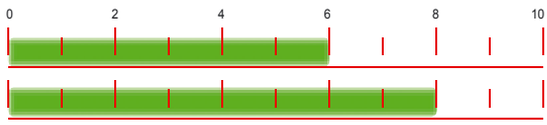


Composition: Co 6.0%; WC rest

Grain size: fine grain grade 0.8 µm

Hardness: HV 1820

Properties/application:
> Optimally suitable for aluminium, super alloys, titanium, refractory metals (W, Mo), glass & carbon fibre reinforced plastics
> Low tendency to adhesion



H216T
(K10 - K15)

Composition: Co 6.0%; WC rest

Grain size: 1 µm

Hardness: HV 1630

Properties/application:
> Optimally suitable for aluminium
> Low tendency to stick

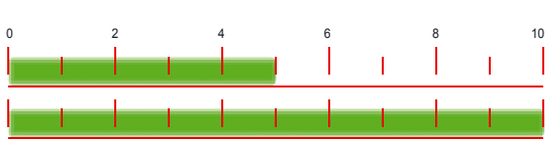
CTD4110
(DP-K01)

Composition: polycrystalline diamond (PCD)

Grain size: ~ 5 mm

Properties/application:
> Maximum wear resistance and hardness
> Low toughness

⚠ For abrasive non ferrous metals, plastic, graphite



CTP4115
(K10)

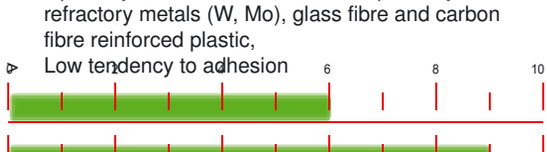
Composition: Co 6%, WC rest

Grain size: 0.8 µm

Hardness: HV1820

Schichtsystem:
> PVD - TiAlN; 5 µm

Properties/application:
> Optimally suitable for aluminium, super alloys, titanium, refractory metals (W, Mo), glass fibre and carbon fibre reinforced plastic,
> Low tendency to adhesion

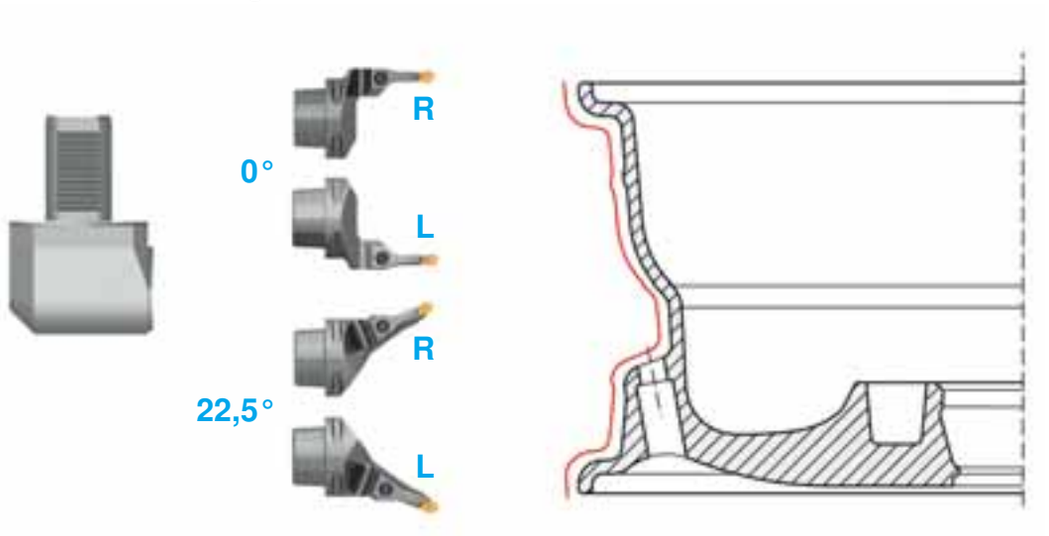


OvalFlex – application

External profile:

Right-hand and left-hand heads

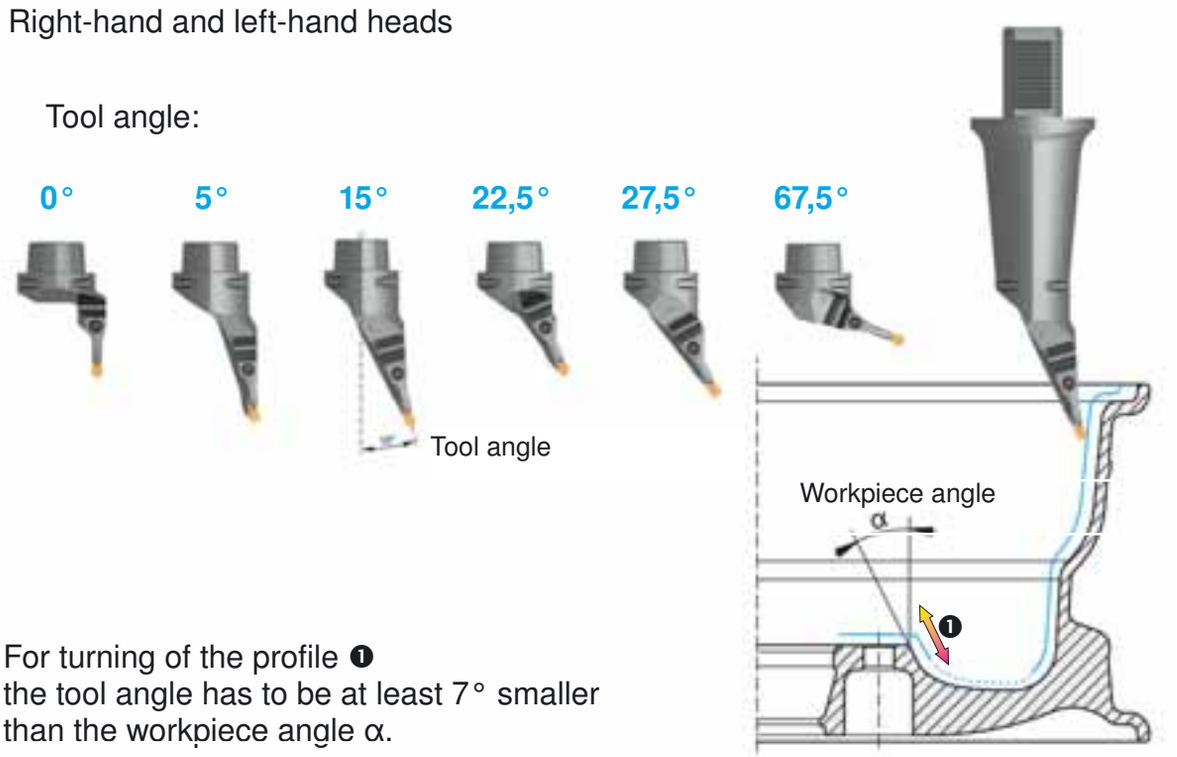
Tool angle:



Internal profile:

Right-hand and left-hand heads

Tool angle:



For turning of the profile ❶
the tool angle has to be at least 7° smaller
than the workpiece angle α.

OvalFlex – application

Location face and hub profile

Tool head for:

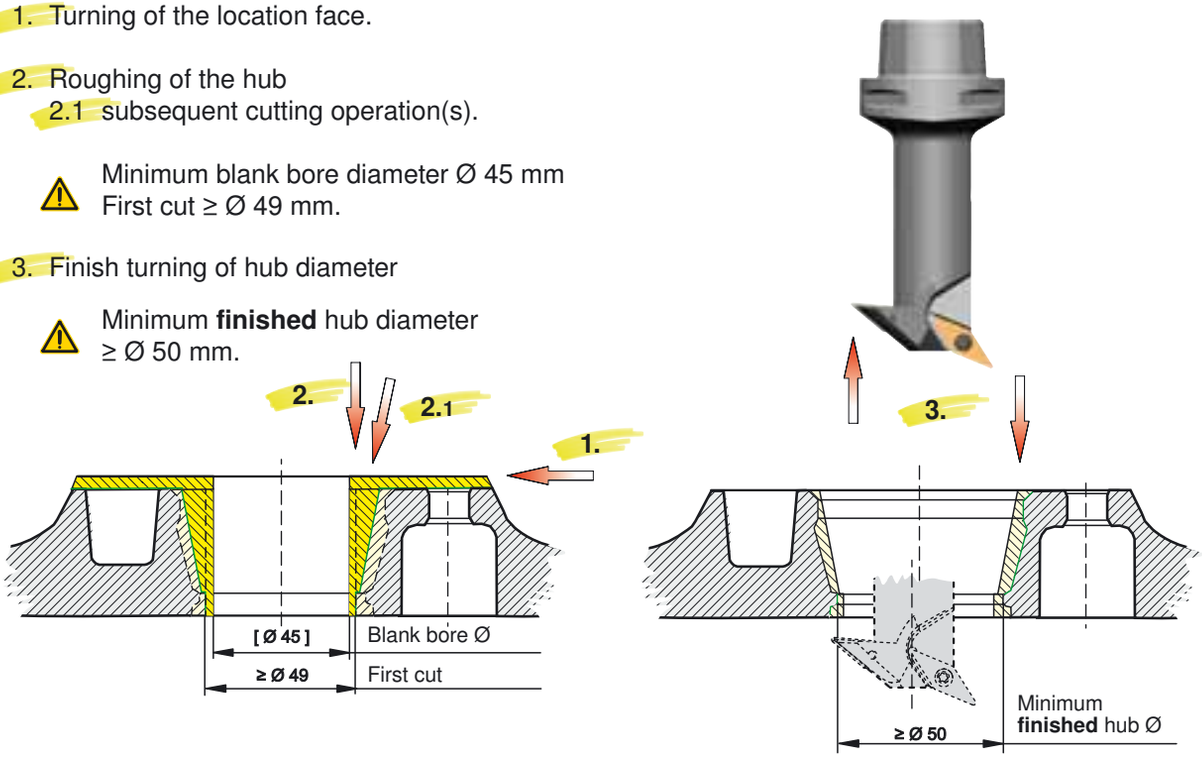
1. Turning of the location face.

2. Roughing of the hub
   2.1 subsequent cutting operation(s).

⚠ Minimum blank bore diameter Ø 45 mm
First cut ≥ Ø 49 mm.

3. Finish turning of hub diameter

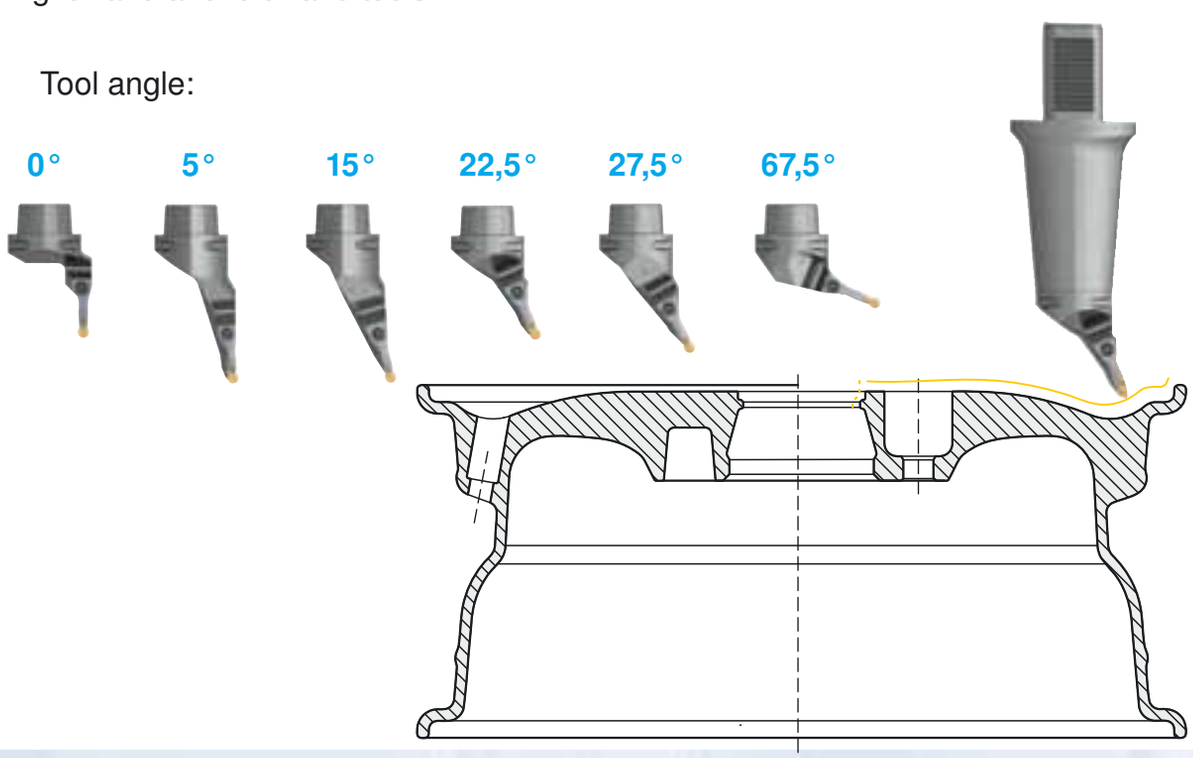
⚠ Minimum **finished** hub diameter
≥ Ø 50 mm.



Front side:

Right-hand and left-hand tools

Tool angle:



Drilling tools for bolt holes and valve bores

Our Standard Programme Includes:

SOLID CARBIDE DRILLS: aluminium solid carbide drills meet the requirements for precision, cutting parameters, tool life and economy.
They are delivered with high profile precision and in every requested geometry.

STEP DRILLS (SOLID CARBIDE) for bolt holes and valve bores.

For further details see special catalogue
“Drills for aluminium wheel machining“
No. 306

Cutting data

Grades/material

	Workpiece material	Type of treatment / alloy		Relative machinability*	Hard-ness HB	H210T H216T v_c [m/min]	CTD4110 CTP4115 vc [m/min]
N	Aluminium wrought alloy	hardened	Al Mg Si 1	3 - 4	100	2500 - 400	2800 - 400
N	Aluminium cast alloy	non hardened	G - Al Si 1	3	50 - 70		
N			G - Al Si 7				
N			G - Al Si 12				
N			G - Al Si 7 Mg	2 - 3	80		

* 1 = very good machinability / 5 = bad machinability

Machinability can be defined as the degree of difficulty that a material creates when being machined.
In order to assess the machinability of a material basically four parameters have to be taken into consideration:
► Cutting force / ► Tool life / ► Surface quality / ► Chip formation

Causes of wear - wear types

Flank wear

Causes:
> Cutting speed too high
> Carbide grade with too low wear resistance
> Feed rate too low (insufficent chip thickness)

Corrective measures:
> Reduce cutting speed
> Select more wear resistant carbide grade
> Adapt feed rate to cutting speed and cutting depth (increase feed rate)

Abrasion on flank, normal wear after a certain machining time.

Cratering

Causes:
> Too high cutting speed and / or feed rate
> Insufficient coolant supply
> Rake angle too shallow
> Grade with insufficient wear resistance

Corrective measures:
> Reduce cutting speed and / or feed rate
> Increase coolant quantity and / or pressure, optimise coolant supply
> Use grade which is more resistant to cratering

Built-up edge

Reasons:
> Cutting speed too low
> Rake angle too small
> Wrong cutting material
> Lack of cooling / lubrication

Corrective measures:
> Increase cutting speed
> Increase rake angle
> Apply TiN coating
> Use emulsion with higher concentration

Built-up material / edge occurs when the chip is not evacuated properly due to a lack of cooling or too low speed.

Spare parts / accessories

	Tool holder DIN 69880 VDI40 / VDI50	**Tool heads:** internal/external OC50.. R/L Approach angle: 0°/15°/22.5°/ 27.5°/67.5°	**Hub tools OC50..** Approach angle: 112.5° * 2 items	**Tool shanks** X32... N/R/L
 Material number / clamping screw *		11187405 M5x20-T25 ■	7815102 * M3,5x11/T15 ■	11187405 M5x20-T25 ■
 Torque moment Nm		7,5	3,0	7,5
 Material number / screwdriver		7883304 Torx T25 T ■	7883301 * Kombi T15 ■	7883304 Torx T25 T ■
 Material number / screw plug	10002788 M16x1.5x6-SW8 ■	10002788 M16x1.5x6-SW8 ■		
 Material number / Allen key	11084803 SW8-200K ■	11084803 SW8-200K		
 Material number / O-ring (*2 items)	11199436 4,3-2,40 ■			
 Material number / lubricant	7730102 Molykote ■	7730102 Molykote	7730102 Molykote	
 Material number / power screw	10002105 M16x59.5-SW8 ■	10002105 M16x59.5-SW8	10002105 M16x59.5-SW8	
■ = included with purchase				

Accessories available upon request

 Material number / torque wrench	8081392500 0.28.007.202.9NCK2.125	8081392500 0.28.007.202.9NCK2.125	8081392500 0.28.007.202.9NCK2.125	
 Material number / torque hex drive	11261119 SE1/2-SW8-200	11261119 SE1/2-SW8-200	11261119 SE1/2-SW8-200	

Headquarters: CERATIZIT S.A.
Main site Luxembourg
CERATIZIT Luxembourg Sarl
Route de Holzem, B.P. 51
L-8201 Mamer
Tel.: +352 312 085-1
Fax: +352 311 911
E-Mail: info@ceratizit.com

Main site Austria
CERATIZIT Austria Gesellschaft m.b.H.
A-6600 Reutte/Tyrol
Tel.: +43 (5672) 200-0
Fax: +43 (5672) 200-502
E-Mail: info.austria@ceratizit.com

www.ceratizit.com

Sales Companies

Austria
CERATIZIT Austria Gesellschaft m.b.H.
A-6600 Reutte/Tyrol
Tel.: +43 (5672) 200-0
Fax: +43 (5672) 200-502
E-Mail: info.austria@ceratizit.com

Brazil
CERATIZIT AMERICA LATINA LTDA.
Praça das Orquídeas, 52
C. COMERCIAL ALPHAVILLE
CEP 06453-002 Barueri - SP, Brazil
Tel.: +55 11 4191 4557
Fax: +55 11 4191 4557
E-Mail: info.americalatina@ceratizit.com

Bulgaria
CERATIZIT Bulgaria AG
Boulevard Stoletov 157
BG-5301 Gabrovo
Tel.: +359 (66) 812 207
Fax: +359 (66) 801 608
E-Mail: info.bulgaria@ceratizit.com

China
CERATIZIT China Ltd.
Room 1201-1204
Hollywood Centre
233 Hollywood Rd., Sheung Wan
Hong Kong
Tel.: +852 (2542)-1838
Fax: +852 (2854) 3777
E-Mail: info.china@ceratizit.com.hk

Czech Republic
CERATIZIT Austria Gesellschaft m.b.H.
Kancelar Ceska Republika
Pod Hradbami 2002/1
CZ-59401 Velke Mezirici
Tel.: +420 (566)520-341
Fax: +420 (566) 521-340
E-Mail: info.czechrepublic@ceratizit.com

France
CERATIZIT France Sarl
Pontoise
20, Rue Lavoisier
F-95300 Pontoise
Tel.: +33 (1) 3433-3180
Fax: +33 (1) 3030-9339
E-Mail: info.france@ceratizit.com

Germany
CERATIZIT Deutschland GmbH
Office Langenfeld
Hans-Böckler-Straße 10
D-40764 Langenfeld
Tel.: +49 (2173) 97 25-0
Fax: +49 (2173) 97 25-25
E-Mail: info.deutschland@ceratizit.com

CERATIZIT Deutschland GmbH
Office Dettingen
Karlstraße 80
D-72581 Dettingen
Tel.: +49 (7123) 9201-0
Fax: +49 (7123) 9201-190
E-Mail: info.deutschland@ceratizit.com

Great Britain
CERATIZIT UK Ltd.
Cliff Lane
Grappenhall
Warrington WA4 3JX
Tel.: +44 (1925) 261-161
Fax: +44 (1925) 267-933
E-Mail: info.uk@ceratizit.com

Hungary
CERATIZIT Austria Gesellschaft m.b.H.
Iroda Magyarorszag
Kórház u 6-12
HU-1033 Budapest
Tel.: +36 1 43709-30
Fax: +36 1 43709-31
E-Mail: info.hungary@ceratizit.com

India
CERATIZIT India Pvt. Ltd.
58, Motilal Gupta Road
Barisha
IN-700 008 Kolkata
Tel.: +91 (33) 2494-5435
Fax: +91 (33) 2494-1472
Telex: 021 8142 ihm in
E-Mail: info.india@ceratizit.com

Italy
CERATIZIT Italia SpA
Piazza F. Martelli, 7
I-20162 Milano
Tel.: +39 (02) 6441-111
Fax: +39 (02) 6611-6040
E-Mail: info.italia@ceratizit.com

Japan
CERATIZIT Japan Ltd.
3-13-9, Mizuho
Shizuoka 421 - 0115
Tel.: +81 (54) 268 1060
Fax: +81 (54) 257 8181
E-Mail: info.japan@ceratizit.com

Luxembourg
CERATIZIT Luxembourg Sarl
Route de Holzem, B.P. 51
L-8201 Mamer
Tel.: +352 312 085-1
Fax: +352 311 911
E-Mail: info@ceratizit.com

Netherlands
CERATIZIT Nederland B.V.
Bergrand 224
NL-4707 AT Roosendaal
Tel.: +31 (165) 55 08 00
Fax: +31 (165) 55 61 76
E-Mail: info.nederland@ceratizit.com

Poland
CERATIZIT Austria Gesellschaft m.b.H.
Biuro Polska
U. Lagiewnicka 33a
PL-30-417 Kraków
Tel.: +48 12 252 85-91
Fax: +48 12 252 85-93
E-Mail: info.polska@ceratizit.com

Spain
CERATIZIT Ibérica SL
Office Pozuelo
Vía de las Dos Castillas, 9c
Portal 2, Bajo B
E-28224 Pozuelo (Madrid)
Tel.: +34 (91) 351-0609
Fax: +34 (91) 351-2813
E-Mail: info.iberica@ceratizit.com

CERATIZIT Ibérica SL
Office Bilbao
Avda. Mazarredo 41 1 Izqda.
E-48009 Bilbao
Tel.: +34 (944) 23 71 18
Fax: +34 (944) 23 97 18
E-Mail: info.bilbao@ceratizit.com

USA
CERATIZIT USA Inc.
777 Old Clemson Road
Columbia
South Carolina 29229
Toll free: +1 (800) 334 1165
Tel.: +1 (803) 736 1900
Fax: +1 (803) 736 1902
E-Mail: info.usa@ceratizit.com

www.ceratizit.com - just a click.

Headquarters: CERATIZIT S.A.
Main site Luxembourg
CERATIZIT Luxembourg Sarl
Route de Holzem, B.P. 51
L-8201 Mamer
Tel.: +352 312 085-1
Fax: +352 311 911
E-Mail: info@ceratizit.com

Main site Austria
CERATIZIT Austria Gesellschaft m.b.H.
A-6600 Reutte/Tyrol
Tel.: +43 (5672) 200-0
Fax: +43 (5672) 200-502
E-Mail: info.austria@ceratizit.com

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7001323