

WALTER – TOTAL CAPABILITY IN THE POWER GENERATION INDUSTRY



tec·nology by



THERMAL SHAFT (TURBINE) AND BLADES

No other components in the field of turbine engines face such great demands as thermal shafts and turbines. The ever-increasing stresses that these components are subjected to automatically increases the manufacturing requirements in terms of workpiece material, geometry and finished quality. In this regard, finished near net shape practices play a key role and leads to ever more sophisticated and new machining methods.

Customised tools and cutting materials combined with process monitoring and optimisation streamlines the activity, and enables increases in productivity. WALTER is your partner for success, our know-how, our tools and process technologies provide a solid foundation for your continued success.

For some tools and examples see page 6 etc.

Tools for:

- Blade section
page 6



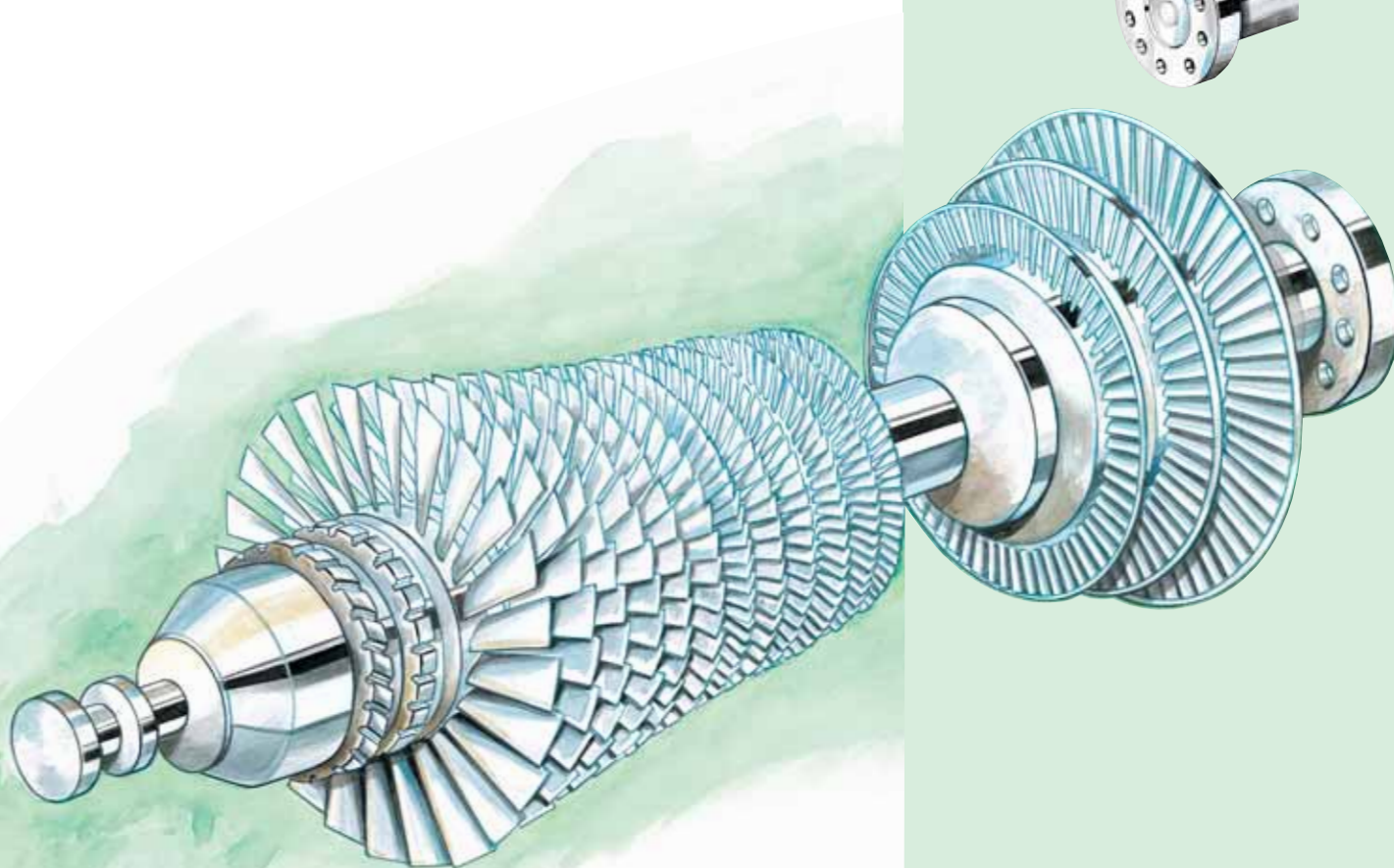
- Blade root
page 7



- Blade slots on the rotor disk
page 8



- Processing of coupling on
the rotor disk
page 9



CASING

The casing is probably the hardest working component in power station construction, and for this reason time-consuming and expensive production processes are required.

WALTER meets this challenge by providing complete and innovative tool concepts that meet the highest quality demands and thus, the operation of WALTER's high-performance tools and tool systems, enable users to maximise cutting efficiency, minimise both downtime and the number of settings and/or manual tool changes, as well as combining various operations in an intelligent way.

For some tools and examples see page 11 etc.

Tools for:

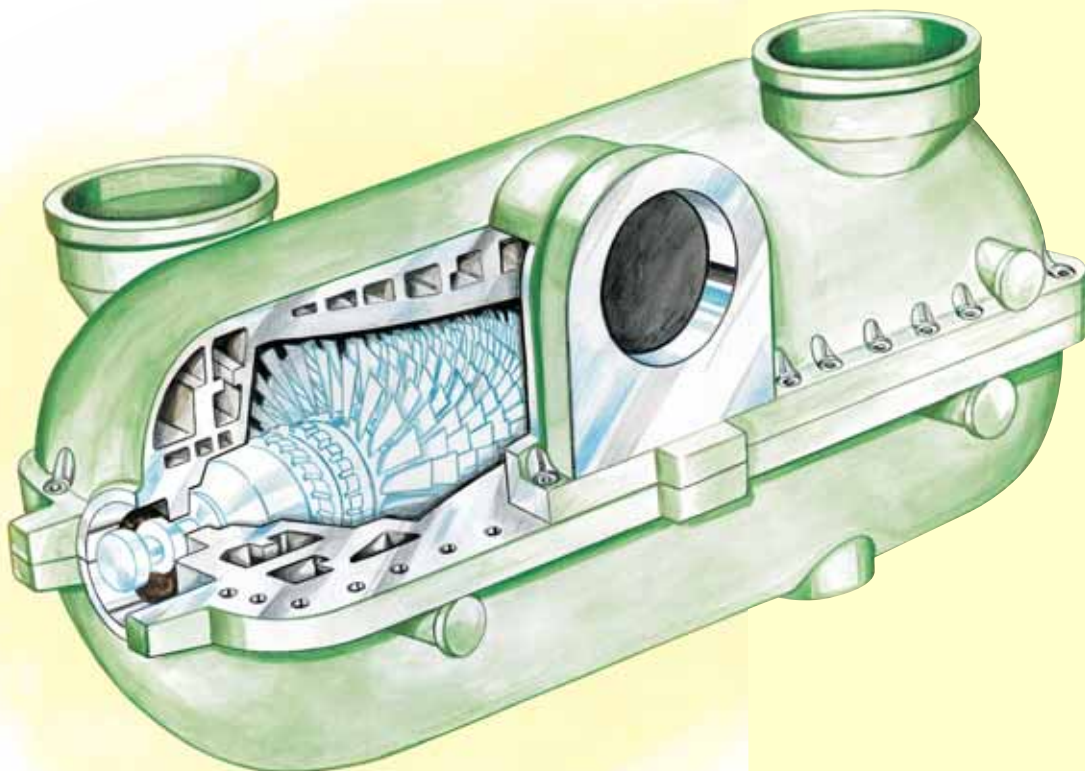
- Joint face machining and casing page 11



- Bores and countersinks on the joint face page 13



- Internal machining of casing page 14



ELECTRIC SHAFT (GENERATOR)

For generator production, the manufacture of winding slots, air slots, wedge-shaped slots and safety slots is one of the most important operations. WALTER's experienced development teams do not only provide the ideal solution to every problem, but they also continuously pursue the goal of optimising your production.

The main thrust of the optimisation process is a combination of workpiece and workpiece material, the machine and production quality, as well as the customer's specific applications. Seen from this point of view, the innovative and highly efficient tool system from WALTER provides the most profitable method of roughing and finishing winding slots in a single operation.

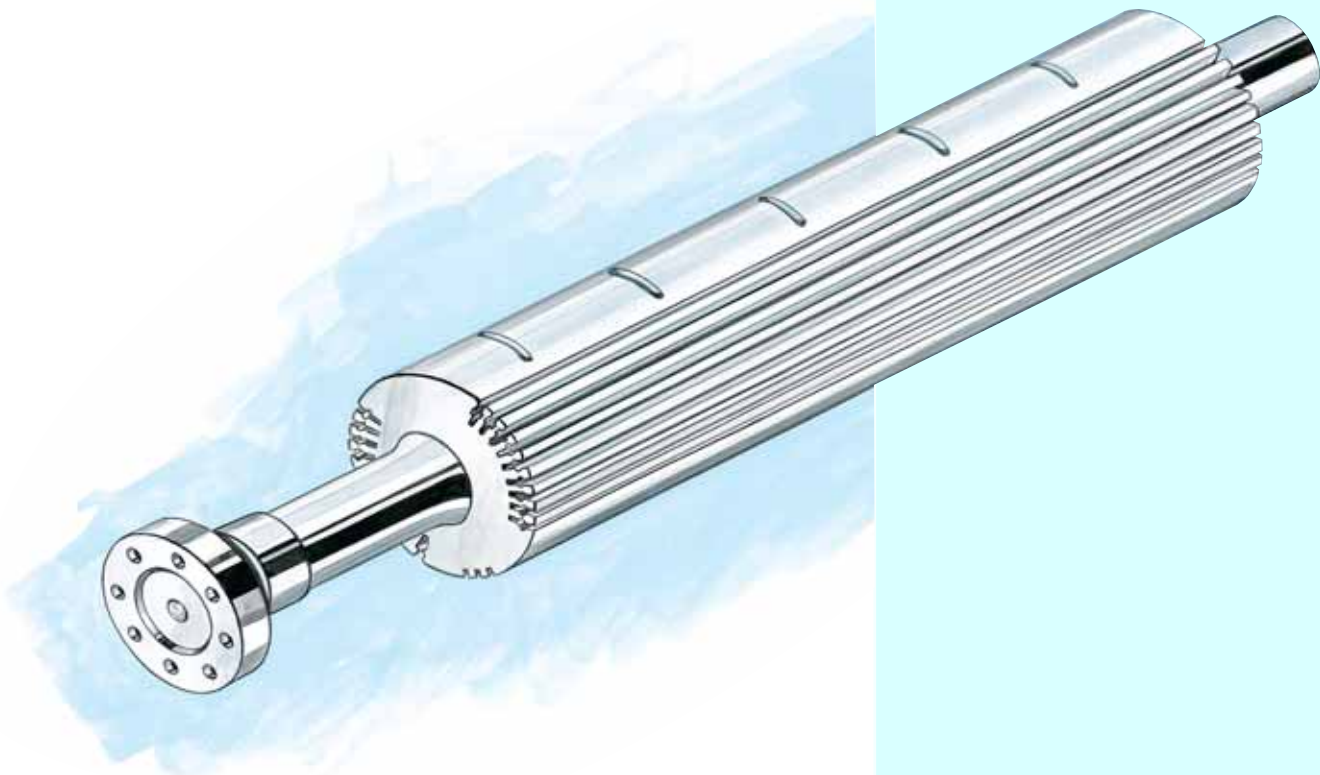
For some tools and examples, see page 15 etc.

Tools for:

- Winding slots, air slots and wedge-shaped slots
page 15



- Safety slot
page 16



WALTER – YOUR PARTNER IN SYSTEMS: TOTAL CAPABILITY IN THE POWER GENERATION INDUSTRY

The power generation industry is a very demanding industry sector. WALTER is committed to meeting these demands, and our vision of being your partner is based on the provision of complete manufacturing solutions - from planning to implementation, enabling you to increase productivity.

Capability: Our experts based worldwide are able to provide the best solutions, applying our patented and successful processing and application methods as well as our time-tested cutting materials and micro geometries. Our goal is your success.

Experience: Innovations require experience. Our project engineers have gained their high levels of expertise over many years by working with comprehensive and internationally recognised major projects, and by establishing close links with leading research institutes. The innovative ideas from WALTER are reflected everywhere in new projects as well as being successfully applied in streamlining existing projects.

With an eye to the future:

The power generation industry is a pioneer in the technological development and processing of high-quality workpiece materials. WALTER has its eyes on the future, too, ensuring we maintain the leading edge. Working closely with customers, we continuously develop and design new and up-to-date generations of tools for the efficient machining of power plant components. "Creative Engineering" is our daily business.

Support: Our skilled application engineers provide global support wherever needed in the production of power generation components: no matter if you need support in terms of planning, implementation or after-sales service, you can rely on our on-site specialists. Reliable delivery of excellent results is a matter of course.

The following pages include a selection of the
"strong types from the WALTER System Partner series"





BLADE SECTION

Milling Cutter with round indexable inserts for the roughing of blades

- Maximum operational security due to indexable inserts featuring four defined contact faces.
- Minimum deflection even with extended tool length due to stable design.
- High cutting performance due to the perfect harmony of cutter body, cutting material and micro geometries



Milling Cutter with round indexable inserts F 2334
the cost-saving standard solution for roughing and semi-finishing



Porcupine Milling Cutter for Roughing and Semi-Finishing

- Highly efficient face and slab milling
- Complete-toothed, even with different cutter versions
- Optimal chip removal due to the open chip grooves and the insert clamping by means of close-tolerance screw
- Special cutting materials and micro geometries for low and high-alloyed blade materials

Porcupine Milling Cutter F 3038 -
High security with maximum cutting data

Octagon and Shoulder Milling
Cutter for roughing, semi-finishing
and finishing

- ideal for small-size blades and low-powered machines
- high economic efficiency
- maximum rigidity due to the secure clamping of the indexable insert

F 2280 and F 4042 - two attractive standard solutions
for roughing, semi-finishing and finishing
different cutter designs



Xtra-tec®



Solid Carbide Cutters for the finishing
of blade section

- High operational security, even when high-speed machining (HSC)
- Minimal deflection even with extended tool length
- Comprehensive range of standard milling cutters of shank-type and shrink-type versions
- High cutting performance thanks to the co-ordinated development of cutting material and micro geometries

The standard solution for finishing operations



Strong Types from the

BLADE ROOT



Profile cutter for roughing, semi-finishing and finishing of the external root profile

- The customised solution for specific requirements of a great variety of different root profiles
- The use of indexable inserts eliminates the need for regrinding and ensures consistent tool dimension.

The perfect solution for blade root operations with WALTER Patent

Profile Cutter for finishing of straight and curved internal root profiles

- Best for finishing a great variety of different flute profiles
- High process security when semi-finishing and finishing
- The use of indexable inserts eliminates the need for regrinding and ensures consistent tool dimension.

High-precision tool for blade slots



Side and Face Milling Cutter for roughing and finishing the root profiles

- Optimal for roughing and finishing of fork profiles
- Suitable for application as both a single tool and as a gang milling cutter
- The use of indexable inserts eliminates the need for regrinding and ensures consistent tool dimension

Side and Face Milling Cutter F 2255 - the efficient tool solution for blade root operations

**WALTER -
Your Partner
also during the
planning stage**





SLOT MILLING OPERATIONS



Side and Face Milling Cutter and Bell Milling Cutter for roughing of straight and curved blade slots

- Ideal for straight and curved blades slots
- High economic efficiency due to the application of system inserts
- Optimal process security
- The highly stable tool ensures close-to-contour first operation machining

Our special solution for maximum feed rates

Profile Cutter for semi-finishing of straight and curved slots

- Recommended for a great variety of different flute profiles
- Optimal pre-machining for finishing
- Optimal process security for roughing and semi-finishing one single pass
- The high stability ensures close-to-contour first operation machining
- The use of indexable inserts eliminates the need for regrinding and ensures consistent tool dimension.

The efficient tool solution for blade slotting with WALTER patent



Profile cutter for the finishing of straight and curved slots

- Recommended for a great variety of different slot profiles
- Optimal process reliability for finishing in two passes
- The use of indexable inserts eliminates the need for regrinding and ensures consistent tool dimension

High-Precision Tool for blades slots



COUPLING



Drills for pre-drilling of coupling bore

- Effective for producing high-quality bores and excellent surface finish
- High boring efficiency with indexable inserts featuring 4 cutting edges
- Recommended also for application on inclined and uneven surfaces

Drills B 3214, maximum operational security is ensured when drilling high-quality workpieces

Boring-Milling Tool for the production of coupling bores

- High process reliability
- Each tool covers a diameter range of 23.5 mm
- Production of short chips
- High economic efficiency
- Minimum stock requirements

A real alternative to drills



Boring tool for coupling bores

- Universal, adjustable, modular twin-flute boring system
- Recommended for a diameter range of 20 - 640 mm.
- ISO standard insert seat for CCMT and WCMT indexable inserts
- WALTER cartridge system for reduced stock requirements

Boring Tool B 3230 - a precise and stable solution that reduces the tool costs

**WALTER -
Your Partner
also during
the planning
stage**



COUPLING

Back spot facing tool for the roughing of coupling countersinks (backwards)

- Suitable for the application with standard indexable inserts
- No downtime during the machining process for manual intervention, e.g. exchange of cutting blades

The perfect tool solution for automatic operations with no machine downtime



Back spot facing tool for the finishing of coupling countersinks (backwards)

- Finishing in one operation
- Circular milling and internal finish turning is possible
- No machine downtime for manual intervention, e.g. exchange of cutting blades

The perfect tool solution for automatic operations with no machine downtime



**WALTER –
Your Partner in
Systems from
Engineering
to Service**

Precision boring tool for the finishing of coupling bores

- Quick and easy application for high-quality bores
- High-precision boring with micro adjustment as a standard
- Reduction of non-productive time due to the simple adjustment
- Direct coolant supply to the cutting edge

Precision boring tool B 3230 - simple and efficient



JOINT FACE



Heavy-duty milling cutter for the roughing of joint face

- Optimal for high requirements in terms of roughing
- High cutting performance due to the stable design of body fitted with indexable inserts featuring micro geometry
- Optimal chip clearance due to the open chip spaces

Heavy-duty milling cutter F 2265 - The standardised roughing tool for maximum cutting data and highest requirements



Steam-tight cutter for finishing joint faces

- Maximum surface finish due to the rigid design
- Simple adjustment of inserts within microns
- Optimal chip removal
- Cutting materials and micro geometries for GG, GGG and cast steel casings

The solution for optimal surface finish when steam-tight milling

WALTER
provides best
production solutions
with integrated
productivity



CASING, IN GENERAL



Porcupine Cutter for heavy roughing operations

- High-performance slot/slab milling
- Optimal chip removal due to open chip flutes
- Reinforced indexable inserts
- Cutting materials and micro-geometries suitable also for heavy cutting operations on turbine casings
- High economic efficiency due to the application of periphery cutting inserts featuring 4 cutting edges

Porcupine cutter F 2338

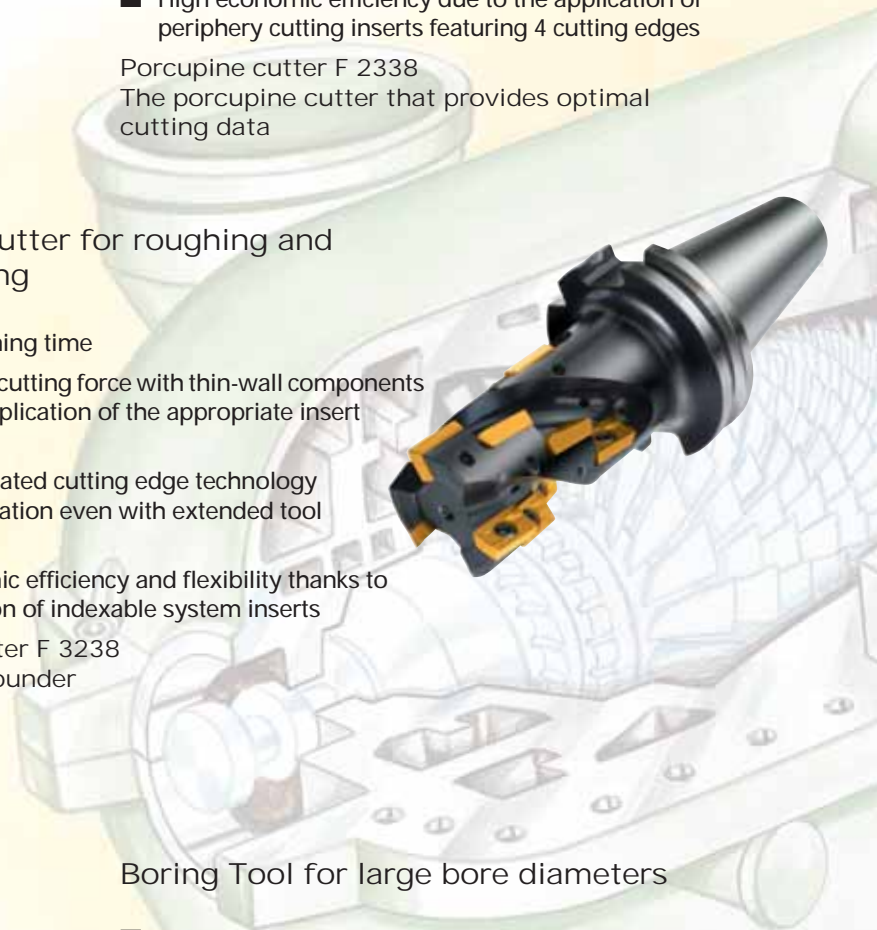
The porcupine cutter that provides optimal cutting data

Porcupine cutter for roughing and semi-finishing

- Short machining time
- Reduction of cutting force with thin-wall components due to the application of the appropriate insert geometry
- The sophisticated cutting edge technology prevents vibration even with extended tool lengths
- High economic efficiency and flexibility thanks to the application of indexable system inserts

Porcupine Cutter F 3238

A reliable all-rounder



Boring Tool for large bore diameters

- Maximum range of adjustment for diameter due to the cartridge-type system
- Versatile cartridge-type system for different applications and indexable inserts
- Reducing the number of teeth from $Z = 2$ to $Z = 1$ enables very heavy cuts to be taken in one pass
- Absorption of extremely high radial cutting forces due to the 90° front geometry (axial lifting excluded)
- Diameter range (standard): 150 - 640 mm.

Boring Tool B 3220

High-performance boring tool for maximum requirements



BORES AND COUNTERSINKS ON THE JOINT FACE



Drill

- Efficient production of joint face bores of consistent size and surface quality
- Stable and low-cost cartridge solution for the diameter range of 59.50 - 120 mm.
- Recommended also for application on inclined and uneven surfaces

Drill B 3011 -

The safe solution for high-quality component bores



Spot facing tool for the countersinking of joint face bores (forwards)

- Ideal for the countersinking of joint face bores, "joint face down" (turned clamping position)
- High economic efficiency due to roughing by using indexable standard inserts
- No downtime during the machining process for manual intervention, e.g. exchange of cutting blades

The right answer to machine downtime caused by the exchange of tools

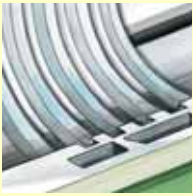


Spot facing tool for the countersinking of joint face bores (backwards)

- Ideal for countersinking of joint face bores in the classic "joint face up" clamping position.
- Simple manual exchange of bore heads due to the bayonet fixing
- High economic efficiency due to the application of indexable standard inserts
- Reduced downtime makes this a highly efficient concept

Highly efficient tool solution for roughing and finishing operations ensuring ease of handling

WALTER
Your Competent
Partner for
High-Tech
Production Ideas



INTERNAL MACHINING OF CASING



Side and face milling cutter for internal circular milling and roughing operations

- For extremely heavy roughing operations related to the internal machining of casing
- High cutting efficiency due to the stable design of cutter body fitted with indexable inserts featuring micro geometry
- Maximum number of teeth due to optimal chip flutes
- No restriction in terms of cutting performance

Side and face milling cutter F 2253 - Circular milling and roughing without compromise

WINDING SLOTS, AIR SLOTS AND WEDGE-SHAPED SLOTS



Side and face milling cutter for winding and air slots

- Roughing and finishing in one single pass
- Due to the flexible cartridge-type system different slot shapes can be machined
- No restriction in terms of cutting performance
- High economic efficiency due to the flexible cartridge-type system

The perfect tool solution for the production of winding and air slots



Form milling cutter for wedge-shaped slots

- High economic efficiency
- Ease of handling
- Short set-up time
- Minimal machine downtime

Cost-effective and user-friendly tool for the production of wedge-shaped slots





SAFETY SLOT



Side and face milling cutter for safety slots

- High degree of flexibility due to the cartridge-type system
- Universal application, both for plunge cutting and circular milling
- Tried and tested tool system ensuring best chip removal and the appropriate number of teeth according to requirements
- Optimal carbide grades and micro cutting edge geometries

The sophisticated and effective tool solution for the reduction of costs

Carbide Production by WALTER AG

As the world's leading innovative manufacturer of high-quality indexable inserts and tools for turning, boring and milling, we are committed to our customers, since the customer's success is our goal. Our way is to optimise the quality of our cutting tool material to continuously increase your productivity. Our capability is based on our expert's long years of experience. As a global player, we start at the source, since contrary to other suppliers we produce our own carbide. From the pressing of green blanks to the coating and further processing of the ready-to-use indexable inserts, everything is performed under the WALTER company logo. We provide an extremely wide range of products. In addition to series production, we manufacture special tools for individual requirements.

The success of our trendsetting technological developments has made us the innovative leader in our industrial sector. Our extremely efficient and popular indexable insert range **Tiger-tec**, which has become the international benchmark, is proof for our success.



Software from WALTER



TDM V4 – Intuitive management of tools

Based on decades of experience in the field of tool management systems we lead the marketplace.

- The simple and intuitive operation of TDM 4V is based on the recognised Windows Standard. The special icons and operating symbols have been designed for the needs of tool data management. They contribute to further simplify the operation.

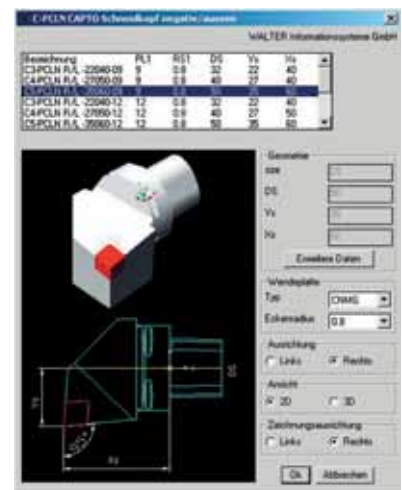
- The optimised circulation and stock inventory management with the presentation of stock levels and storage area in the form of a graphic is another outstanding feature of TDM V4.
- The integrated 3-D-models of tools are the basis for simulation and process security.

- The generator includes the parameters for more than 4,000 tools divided into 38 ISO and 35 Capto groups.
- The selection is supported by graphics. All standard dimension is completely integrated in the form of parameter bars. They can be selected by means of a scrollbar.

TDM 2-D/3-D-Generator

The automatic graphics generator in TDM 4V for tools and adaptors

- The TDM 2-D/3-D graphics generator simultaneously creates a 2-D graphics and a 3-D-model of tool based on the geometrical parameters of the tool manufacturers catalogues.



WALTER – TOTAL CAPABILITY IN THE POWER GENERATION INDUSTRY

Headquarters:

WALTER AG

Derendinger Str. 53, D-72072 Tübingen
P.O. Box 20 49, D-72010 Tübingen, Deutschland
Tel. +49-70 71-70 10, Fax +49-70 71-70 12 12
Hotline: +49-70 71-70 16 04
E-mail: info@walter-ag.de
E-mail: tools@walter-ag.de

Europe

WALTER DEUTSCHLAND

Derendinger Straße 53, D-72072 Tübingen
Tel. +49-70 71-70 16 04, E-mail: tools@walter-ag.de

WALTER HARTMETALL GmbH

Dottinger Straße 91, D-72525 Münsingen
Tel. +49-73 81-92 94 0, E-mail: info.whm@walter-ag.de

WALTER INFORMATIONSSYSTEME GmbH

Derendinger Straße 53, D-72072 Tübingen
Tel. +49-70 71-70 17 60, E-mail: wis@walter-info.de

WALTER (SCHWEIZ) AG

Industriestrasse 6, CH-4513 Langendorf
Tel. +41-32-617 40 70, E-mail: info.ws@walter-ag.com

WALTER BENELUX N.V./S.A.

Leuvensesteenweg, 510, B-1930 Zaventem
Tel. (B) +32-2-725 85 00 / Tel. (NL) +31-900-265 85 22
E-mail: info.wb@walter-ag.com

WALTER GB LTD.

Units 19-21 Manor Side Industrial Estate, Walkers Road
North Moons Moat, GB-Redditch, WORCS., B98 9HE
Tel. +44-1527-60281, E-mail: info.wgb@walter-ag.com

WALTER USAP S.R.L.

I-22073 Fino Mornasco (CO), Via Garibaldi, 118
Tel. +39-031-926111, E-mail: info.wu@walter-ag.com

WALTER FRANCE

Zac de Fond Ratel, 26, rue de l'Europe, F-38640 Claix
Tel. +33-4-76 98 40 90, E-mail: info.wf@walter-ag.com

WALTER TECNO UTIL, S.A.

Feixa Llarga, 74, E-08907 L'Hospitalet de Llobregat
Tel. +34-93-336 94 00
E-mail: info.wtu@walter-ag.com

MONTANWERKE WALTER Ges.m.b.H

Johannesgasse 14, A-1015 Wien
Tel. +43-1-512 73 00-0,
E-mail: info.mww@walter-ag.com

WALTER CZ spol.s.r.o.

Blanenská 1289, CZ-66434 Kurim
Tel. +420-541-423 340, E-mail: info.wcz@walter-ag.com

WALTER POLSKA sp.z.o.o

ul. Taborowa 20, PL-02-699 Warszawa
Tel. +48-22-852 04 95, E-mail: info.wpo@walter-ag.com

WALTER HUNGÁRIA Kft.

H-1117 Budapest, Budafoki út 209
Tel. +36-1-371-1600, E-mail: info.whu@walter-ag.com

MONTANWERKE WALTER Ges.m.b.H

Reprezentanta Romania

Str. Vasile Goldis Nr. 1, Ap. 5, RO-1900 Timisoara,
Tel. +40-256-406218, E-mail: info.wro@walter-ag.de

America

WALTER WAUKESHA, INC.

1111 Sentry Drive, Waukesha, WI 53186, USA
Tel. +1-262-542-4426, E-mail: info.wwa@walter-ag.com

WALTER GRINDERS, INC.

5160 Lad Land Drive, Fredericksburg, VA 22407, USA
Tel. +1-540-898-3700
web: www.walter-grinders.com

WALTER DO BRASIL Ltda.

Rua Campinas, 77, Jardim Leocádia
CEP 18085-400 Sorocaba – SP, Brasil
Tel. +55-15-224 5700
E-mail: walterbr@walter-br.com.br

Asia and Oceania

WALTER WUXI Co. Ltd.

531 West Xibu Road, Wuxi, Jiangsu, 214011, P.R. China
Tel. +86-510-241 9399, E-mail: info.ww@walter-ag.com

WALTER AG SINGAPORE PTE LTD

25, International Business Park
#01-18/21 German Centre, Singapore 609916
Tel. +65-65-62 87 60, E-mail: info.wsi@walter-ag.com

WALTER KOREA LTD.

605 BL 23-2 L, Banwol Industrial Complex
1060-6, Singil-dong, Ansan, Kyungki-do, Korea
Tel. +82-31-493 0008, E-mail: info.wko@walter-ag.com

WALTER INDIA

Mumbai-Pune Road, Dapodi, Pune 411012, India
Tel. +91-20-7145028, E-mail: info.win@walter-ag.com

WALTER JAPAN K.K.

No. 28-1, Futatsuike, Nihongi-cho
Anjo City, Aichi Prefecture, Japan 446-0054
Tel. +81-566-71-1666, E-mail: info.wjp@walter-ag.com

WALTER TAIWAN

3F-2, No. 308, Chung Cheng Road, LuChu Township
Taoyuan County, Taiwan R.O.C.
Tel. +886-3-3115368, E-mail: info.wtw@walter-ag.com

WALTER THAILAND Rep. Office

4th Floor, Galaxy Place, 149 Nonsee Road,
Yannawa District, Bangkok 10120, Thailand
Tel. +662-681 1305-7, E-mail: info.wth@walter-ag.de

WALTER SPEEDMAX Pty. Ltd.

44-46 Overseas Drive, Noble Park,
Victoria, Australia 3174
Tel. +61-3-9790 0999
E-mail: info@walter-speedmax.com.au

