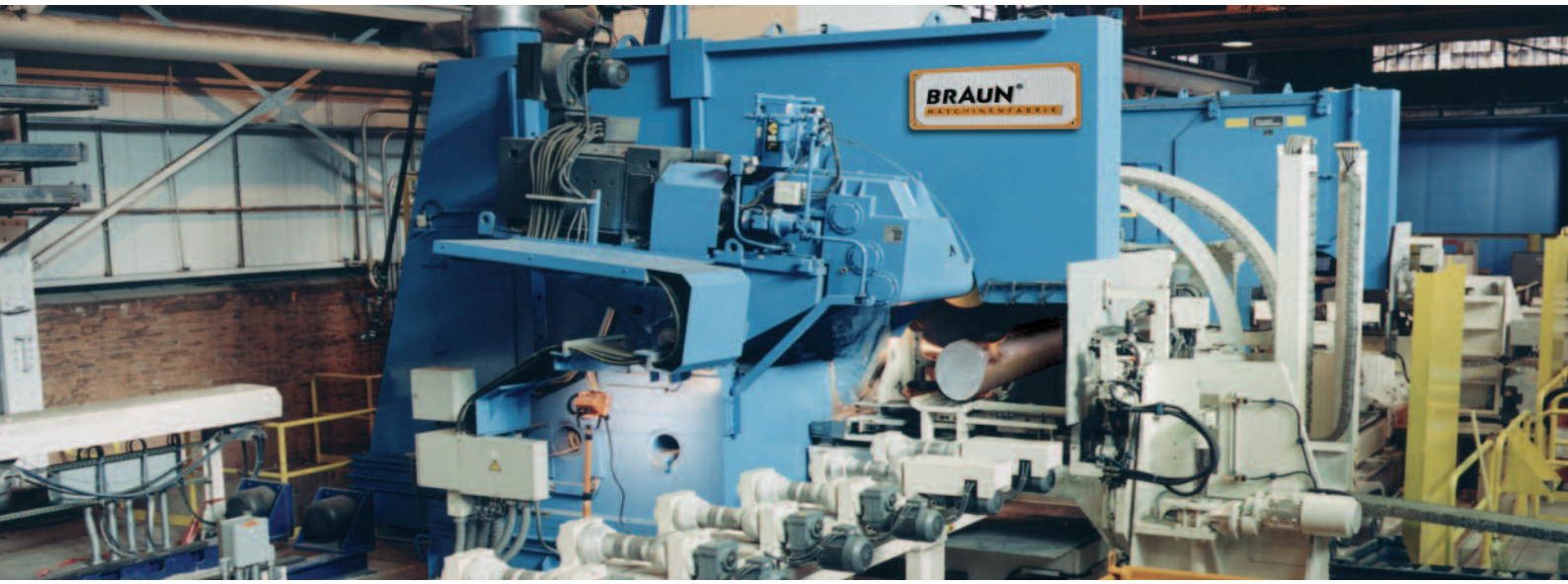
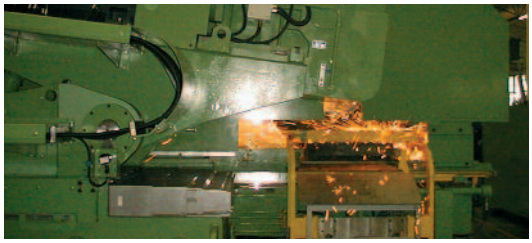
Innovation with tradition

High-performance abrasive cut-off machines





www.braun-steel.com

BRAUN®
MASCHINENFABRIK

Dipl. Ing. Martin Braun

There are not many industrial companies which manage to maintain their market position for over 160 years in the ownership of the same family. One reason is possessing the courage to launch new products and continue to develop existing products to meet the customer's requirements. Another reason is finding top-class people, investing in their qualifications, working with them for as many years as possible, and promoting team spirit.

We always have been, and continue to be, leaders in quality and technology in all the areas we cover. Listening to our customers, delivering in time, and providing customer service, are as much of a priority today as they were when our company was founded in 1848.

Becoming involved in abrasive cutting technology in 1965, BRAUN set new priorities right from the start. Innovative dry cutting technology was made possible on an industrial scale thanks to our involvement with leading manufacturers of cutting wheels and well-known companies in the steel industry. Since then we have continued to optimise abrasive cutting, helping the process to gain acceptance worldwide. As the technological leader, we offer our customers proven mechanical engineering concepts and extensive application expertise.

As a member of the sixth generation of the Braun family, I am proud to successfully lead our high technology company in the third millennium.

Martin Braun, President & CEO

Fig. 1 Team @ work – BRAUN specialists deliver the ultimate solution

“Steel cutting and grinding machines” is just one of 3 divisions at BRAUN. Abrasive cut-off machines are one of our main products, which is why we give them such a high profile. This and the following factors make BRAUN the industry leader worldwide:

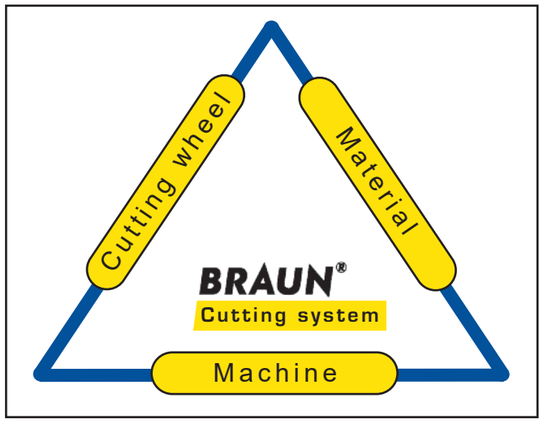


Fig. 2 The cutting system: machine, tool and material

Fig. 3 In-house abrasive cut-off machine type TS 8 V for testing and demonstrations

- **Decades of experience:**
  We have been supplying abrasive cut-off machines all over the world since 1965.
- **BRAUN single-source engineering:**
  We do our own mechanical engineering, electrical engineering and software programming.
- **In-house manufacturing of key components and in-house machine assembly:**
  Our machines are assembled and tested at our works.
- **Effective quality management:**
  The BRAUN quality assurance system complies with ISO 9001 guidelines.
- **Ongoing purpose-driven research and development:**
  We investigate new concepts while continuing to develop current designs and processes.
- **Experience-based knowledge of the complete cutting system (machine–tool–material):**
  The machine and cutting wheel are optimally tuned to the process material.
- **Intensive cooperation with leading cutting wheel manufacturers:**
  TYROLIT, RAPPOLD and NORTON use BRAUN machines for their own research and development.
- **BRAUN's own full-scale testing and demonstration abrasive cut-off machine:**
  We are always pleased to carry out tests and cutting demonstrations with your material.

Abrasive cutting is one of the most effective methods for cutting metal materials:

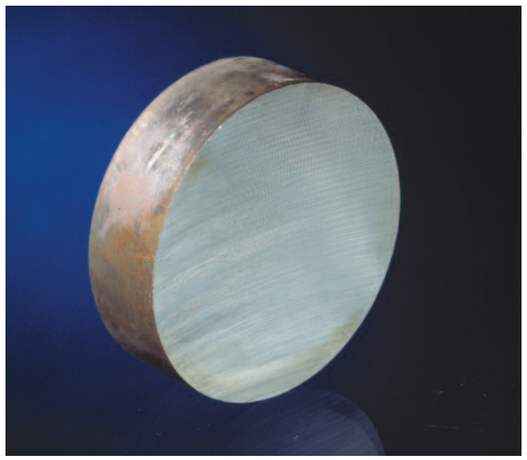


Fig. 4 Abrasive cutting quality

Cold-, Warm- or Hot cutting

- **Cold cutting:**
material temperature up to approx. 100 °C (212 °F)
- **Warm cutting:**
material temperature between approx. 100 °C (212 °C) and 700 °C (1292 °F)
- **Hot cutting:**
material temperature in excess of approx. 700 °C (1292 °C) to over 1000 °C (1832 °F)

- The universal cutting process for various steels and special alloys
- Precision cutting angles with smooth, low-burr surfaces without influencing microstructure - even during cold cutting
- Consistent high-quality cut thanks to continuous self sharpening cut-off wheel
- Rapid cutting times due to high abrasion rate
- Cutting wheels are quick and easy to change
- Low noise levels, even without a soundproof booth
- Material can be cut either hot or cold
- Low overall cutting costs (subsequent machining or deburring is normally not necessary)
- Flexible machine design – proven system, also available for flat foundations
- Fully automatic operation with visualisation system and data archiving available
- Scrap disposal system allows separation of scrap according to alloy

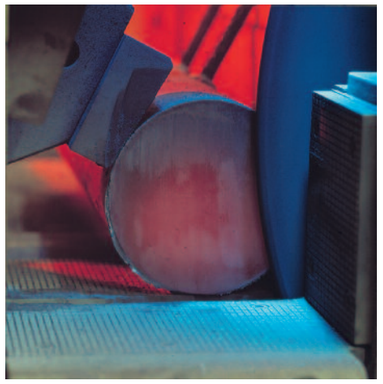


Fig. 5 Hot cutting

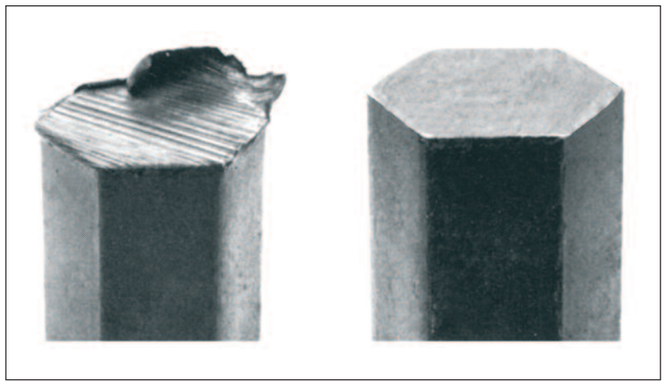


Fig. 6 Surface comparison: hot sawing and abrasive cutting

The basic design of the machines is the same for cold and hot cutting.

The following material grade and production-related parameters give an indication of cutting speed and cutting wheel wear:

Cutting rate Z:

$$Z\ (cm^2/s) = \frac{\text{cross-sectional area of cut } (cm^2)}{\text{cutting time } (s)}$$

G ratio G_A:

$$G_A\ (cm^2/cm^2) = \frac{\text{cross-sectional area of cut } (cm^2)}{\text{consumed wheel surface } (cm^2)}$$

Material group	Properties	Examples	Typical material grades
1	non-alloyed medium to high carbon content	carbon steels	Ck35
2	low-alloyed low carbon content	construction steels, railway steels, hardenable steels	16MnCr5
3	low-alloyed medium carbon content	heat-treated steels	34CrNiMo6
4	low-alloyed high carbon content	bearing steels	90MnV8
5	high-alloyed & medium carbon content	stainless steels	X2CrNi189
6	high-alloyed medium and high carbon content	tool steels	X210 Cr12
7	high temperature light metal alloys	titanium alloys	LT31
8	high temperature hard metal	nickel alloys	NiCr5Fe
9	other non-ferrous metal alloys	brass, bronze	CuZn20Al

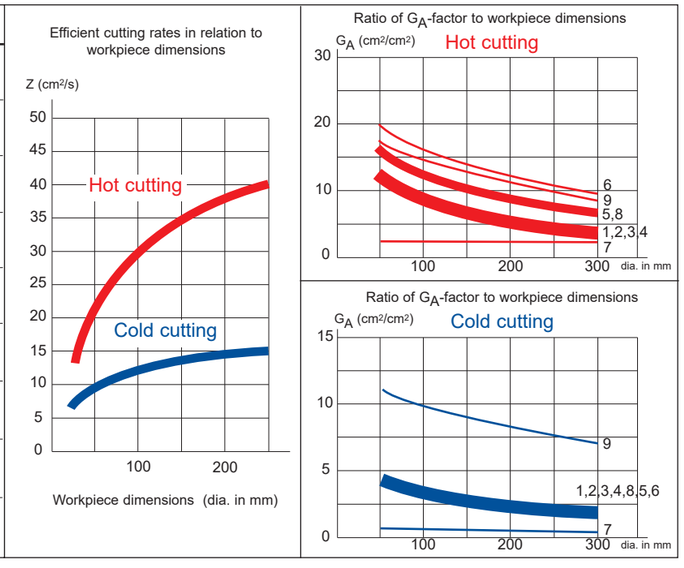


Fig. 7 Cutting rate and G-ratio as a function of material and workpiece diameter for cold and hot cutting

There are various cutting methods available depending on the movement of the cutting disc and the material to be cut. The choice is based on the type, shape and size of the material and on the specific application: standalone cutting facility or inline cutting machine as an integral part of a continuous production process - in a rolling mill for example.
The cutting method has a significant influence on the design of the cutting machine and its peripheral components. That is why BRAUN has developed five standard machine types:

- **Type V – the heavy duty power pack:** chop-stroke abrasive cut-off machine with vertical rocker.

Ideal for cutting single bars with a round, square or polygon cross section. Powerfully engineered machine, proven over decades.

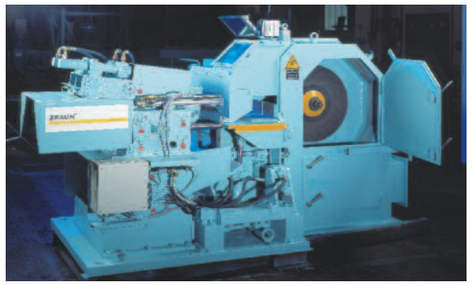


Fig. 8 Abrasive cut-off machine type TS 6 V for ERASTEEL Champagnole, France

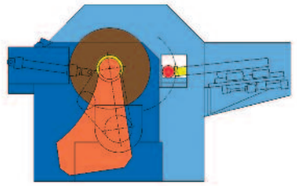


Fig. 9 Type V – chop-stroke cut-off machine with vertical rocker

- **Type L – the precise worker:** chop-stroke abrasive cut-off machine with linear-guided cutting head.

Also for cutting single bars with a round, square or polygon cross section. Extremely precise due to linear-guided cut.

Fig. 10 Abrasive cut-off machine type TS 6 L for SANDVIK STEEL, Sandviken, Sweden

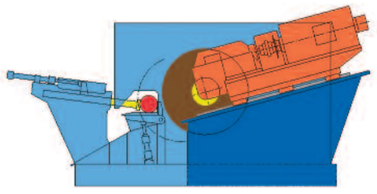


Fig. 11 Type L – chop-stroke cut-off machine with linear-guided cutting head

In addition to **chop-stroke cutting** and **traverse** cutting, there is also **rotary cutting** (where the workpiece is rotated during cutting) and **index cutting** (where the cutting process is made up of several partial cuts; the workpiece is rotated after each partial cut). For both rotary cutting and index cutting applications chop-stroke abrasive cut-off machines are used, the difference is the special material handling and clamping systems.

- **Type W – the versatile all-rounder:** chop-stroke abrasive cut-off machine with horizontal rocker.

Excellent cutting wheel utilisation achieved even when cutting flat material and narrow layers of bars.

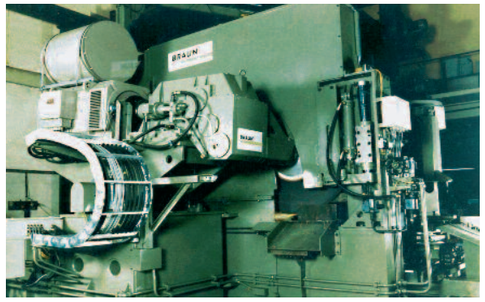


Fig. 12 Abrasive cut-off machine, type TS 15 W for ARCELOR-INDUSTEEL, Fabrique de Fer, Charleroi, Belgium

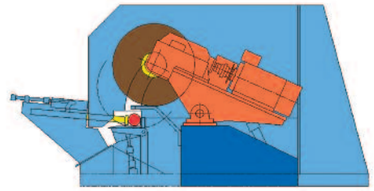


Fig. 13 Type W – chop-stroke cut-off machine with horizontal rocker

- **Type F – the high-capacity performer:** traverse abrasive cut-off machine.

Suitable for cutting layers of bars or flat material up to a width of approx. 1300 mm (4 ft – 3 in). Highest possible throughputs achievable.

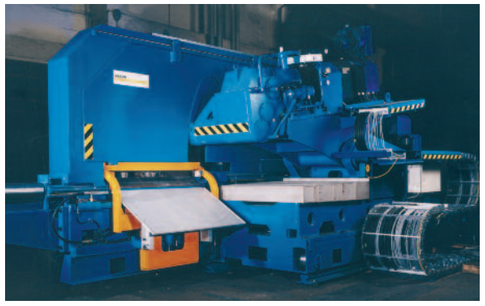


Fig. 14 Abrasive cut-off machine type TS 12 F for JIANGYIN XING CHENG, Jiangyin City, PR China

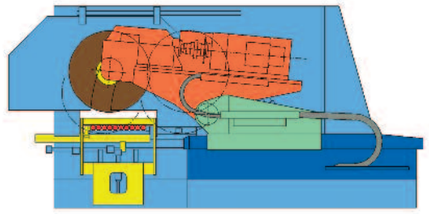


Fig. 15 Type F – Traverse cut-off machine

- **Type FP – the extra-wide specialist:** gantry-type traverse abrasive cut-off machine.

Designed to cut extremely wide cross sections (plates, slabs) up to and exceeding 2300 mm (7ft – 6 in).

Fig. 16 Abrasive cut-off machine type TS 12 FP at BÖHLER-Bleche, Mürzzuschlag-Hönigsberg, Austria

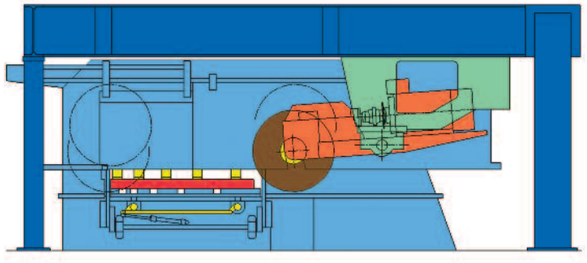


Fig. 17 Type FP – gantry-type traverse cut-off machine

BRAUN abrasive cut-off machines are optimised for specific applications and come with the following special features:

- Cutting shaft with special bearings for vibration-free operation
- Secure cutting wheel mounting using special clamping flanges on the cutting shaft
- Infinitely-variable main drive for consistent cutting wheel speed, regardless of wheel diameter
- Infinitely-variable hydraulic cutting wheel infeed for continuous cutting action and power
- Automatic cutting wheel wear compensation measures actual diameter of wheel after each cut
- Function-specific material clamping system to secure workpiece during cutting (special solutions for rotation cutting and index cutting – see industrial applications for cutting machines)
- Direct reading device for monitoring the cutting process (available on smaller machines)
- Customer-specific chip and scrap disposal systems
- Larger machines are available with cut-off wheel lifting devices and pneumatic wrench hammers (option)
- Soundproof booths are also available as an option if the machine is to be installed in a low noise environment
- Control centres and automation systems for semi-automatic or fully automatic operation

Machine size	TS 4	TS 5	TS 6	TS 8	TS 10	TS 12	TS 16	TS 18	TS 20
Maximum cutting wheel diameter	approx. 400 mm (16 in)	approx. 500 mm (20 in)	approx. 600 mm (24 in)	approx. 800 mm (31-1/2 in)	approx. 1000 mm (39-1/2 in)	approx. 1250 mm (50 in)	approx. 1600 mm (63 in)	approx. 1800 mm (71 in)	approx. 2000 mm (79 in)

Fig.18 Overview of machine sizes

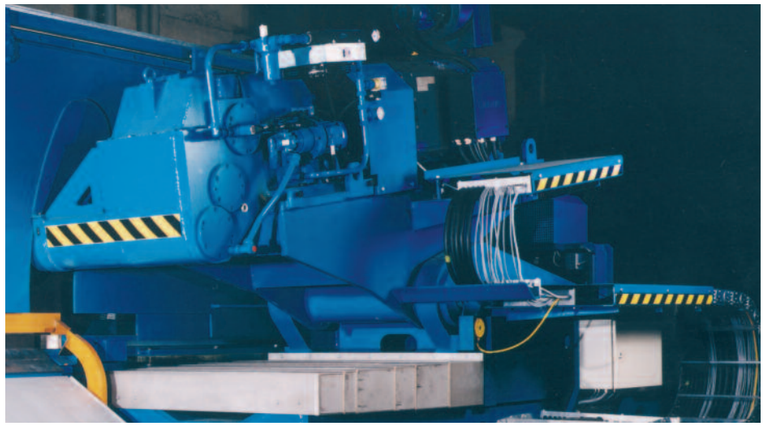


Fig.19 Cutting shaft driven by bevel gear unit (machine size TS 8 upwards)

Fig. 20 Cutting shaft driven by multiple V-belts (up to machine size TS 8)

Fig. 21 Pneumatic wrench hammer for changing cutting wheels (option)

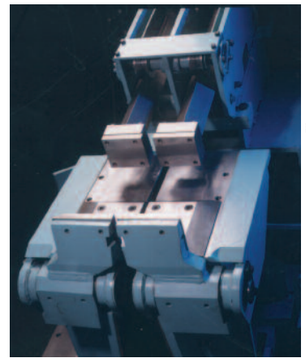


Fig. 22 Standard material clamping system for single bars

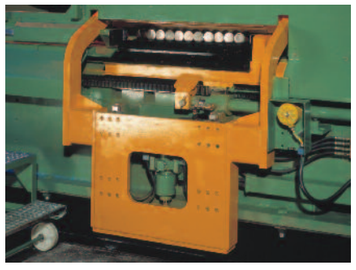


Fig. 23 Material clamping system with hold down bar for layers of bars

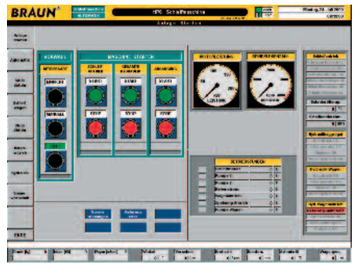


Fig. 24 Screen mask for process visualisation

Fig. 25 Soundproof booth (option)

BRAUN not only supplies cutting machines, but a complete range of process technology. From handling equipment and automation systems to complete turnkey installations, we deliver machinery custom-designed to meet your production requirements.

In addition to conventional handling components such as roller tables and cross conveyors etc., BRAUN designs manipulation systems for special applications.
You can also rely on BRAUN to locate and supply the best dedusting systems as well as stamping and marking systems.Everything supplied by BRAUN complies with CE conformity guidelines.

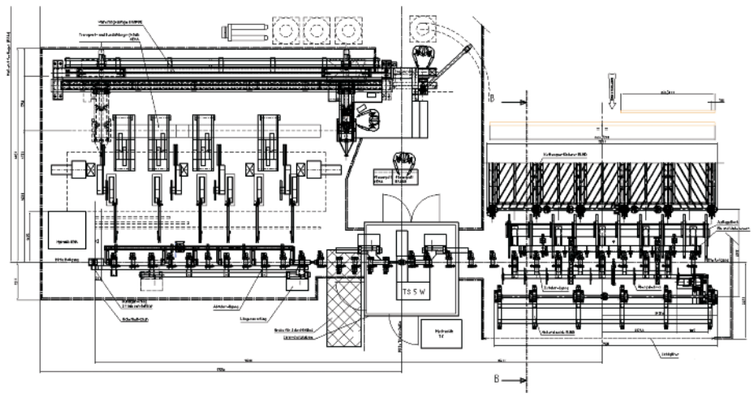


Fig. 26 Cutting line with chop-stroke abrasive cut-off machine type TS 5 W with material handling equipment inline between heat- treatment section and packaging facility for HENNIGSDORFER ELEKTROSTAHLWERKE (RIVA Group), Hennigsdorf, Germany

RIVA STAHL

CARPENTER
Engineered Materials for a Changing World

Fig. 28 Complete installation with 2 chop-stroke abrasive cut-off machines type TS 16 W, at CARPENTER Technologies, Reading, PA, USA; view of rotating chucks for inverting large ingots during index cutting

BÖHLER EDELSTAHL

Fig. 27 Complete installation with chop-stroke abrasive cut-off machine type TS 15 V, in forging/conditioning area at BÖHLER Edelstahl, Kapfenberg, Austria

SLOVENSKE ŽELEZARNE
METAL • RAVNE d.o.o

Fig. 29 Complete installation with chop-stroke abrasive cut-off machine type TS 8 W, at METAL RAVNE, Ravne na Koroškem, Slovenia

BRAUN high-performance abrasive cut-off machines are used in a wide range of industrial processes:

- **For rolling mills (long products):**

As they gain in length during rolling, bars and profiles need to be cut to length both during, and at the end of the process. Both hot or warm cutting can be used. Traverse cut-off machines are often implemented to cope with high throughputs.

XINGCHENG STEEL

Fig. 30 Traverse abrasive cut-off machine type TS 12 F at JIANGYIN XING CHENG, Jiangyin City, PR China;
cutting wheel diameter max. 1260 mm (49-1/2 in),
material: hot-rolled bar, diameter 20 to 100 mm (0-3/4 to 4 in);
batch width max. 1200 mm (47-1/4 in),
cutting temperature between 300 and 700° C (572 and 1292 °F).

- **For rolling mills (flat products):**

After hot rolling, the material is cut into finished plates or sheets. The cutting process is normally carried out while the material is still hot. Gantry-type traverse cut machines are usually preferred here due to the width of the material.

BÖHLER BLECHE

Fig. 31 Gantry-type traverse abrasive cut-off machine type TS 12 FP at BÖHLER Bleche, Mürzzuschlag-Hönigsberg, Austria;
cutting wheel diameter max. 1260 mm (49-1/2 in),
plate width up to 2300 mm (90-1/2 in),
material thickness max. 260 mm (10-1/4 in),
cutting temperature between 600 and 1000°C (1112 and 1832 °F);
slabs can also be cold-cut

- **For forges:**

The ends of the forgings need to be cropped during or at the end of the forging process. Sometimes forgings need to be divided into finished cut-to-length parts.

SCOT FORGE

Fig. 32 Chop-stroke cut abrasive cut-off machine type TS 15 V with entry and exit end material handling equipment at SCOT FORGE, Spring Grove, IL, USA;
cutting wheel diameter max. 1500 mm (59 in),
material: forged bar, diameter 150 to 420 mm (6 to 16-1/2 in),
cutting temperature max. 1000 °C (1832 °F).

- **For peeling lines:**

These bars, which are normally hardened, are warm or cold cut before or after peeling. Small diameter bars are often cut in layers.

DONETSKIJ METALURGICESKIJ

Fig. 33 Chop-stroke abrasive cut-off machine type TS 6 V with integral material handling system at DONETSKIJ METALURGICESKIJ ZAVOD, Donetsk, Ukraine;
cutting wheel diameter max. 600 mm (24 in),
material: bar, diameter 10 to 25 mm (0-3/8 to 1 in),
cutting temperature max. 100 °C (212 °F).

- **For conditioning and inspection lines:**

Cold material is conditioned and inspected prior to shipment or final working – defective material is then discarded.

BÖHLER EDELSTAHL

Fig. 34 Complete inspection line with chop-stroke abrasive cut-off machine type TS 8 W at BÖHLER Edelstahl, Kapfenberg, Austria;
cutting wheel diameter max. 800 mm (31-1/2 in),
material: billets with round, square and rectangular cross sections,
max. material cross section: 200 x 150 mm (7-7/8 x 6 in),
cutting temperature max. 100 °C (212 °F)

- **For finishing lines:**

There are a multitude of applications where abrasive cut-off machines are used in finishing lines to cut material to its final length.

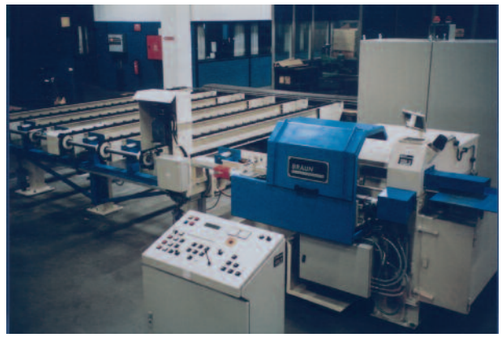
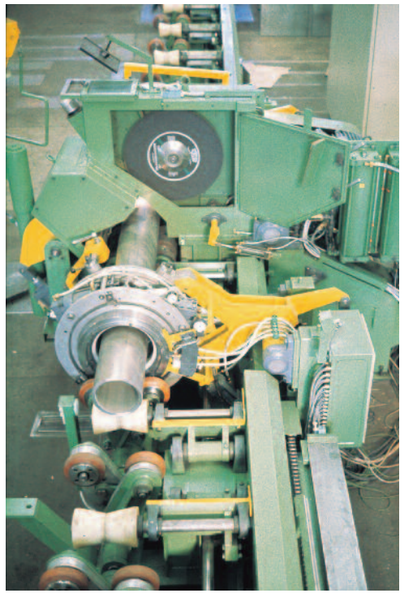


Fig. 35 Cutting line with chop-stroke abrasive cut-off machine type TS 5 V at IGGESUND TOOLS, Iggesund, Sweden; cutting wheel diameter max. 500 mm (20 in), material: special tool profiles, max. material cross section: 100 x 200 mm (4 x 7-7/8 in), cutting temperature max. 100°C (212 °F).



- **For tube mills:**

Rotary cutting is often implemented here to extend the service life of each cutting wheel. The tube is rotated in a special chuck during the cutting process with the advantage that the cutting wheel only has to penetrate the thickness of the tube wall, and not the whole diameter of the tube.

Fig. 36 Chop-stroke abrasive cut-off machine type TS 6 V with rotating chuck and specially-designed material feed and transfer system to rotary-cut tubes at SCHÖLLER-BLECKMANN, Ternitz, Austria; cutting wheel diameter max. 600 mm (24 in), material: stainless steel tube, diameter 60 to 280 mm (2-3/8 to 11 in), cutting temperature max. 100°C (212 °F).

- **For material testing and research laboratories:**

Laboratories testing materials and developing cutting wheels are typical users of compact abrasive cut-off machines.

Fig. 37 Chop-stroke abrasive cut-off machine, type TS 5 V in compact form for test laboratory at NORTON Abrasives, USA; cutting wheel diameter max. 500 mm (20 in), material: bar stock, diameter max. 60 mm (2-3/8 in), cutting temperature max. 100°C (212 °F).

- **For steelworks and foundries:**

Contaminated crops on electrodes and remelt ingots, as well as the “stubs” welded onto the electrodes for transportation need to be removed after smelting and casting. The index cutting process is used due to the sheer size of the ingots (2 to 3 partial cuts with the ingot being rotated through 180 or 120° after each partial cut using special rotating clamps).

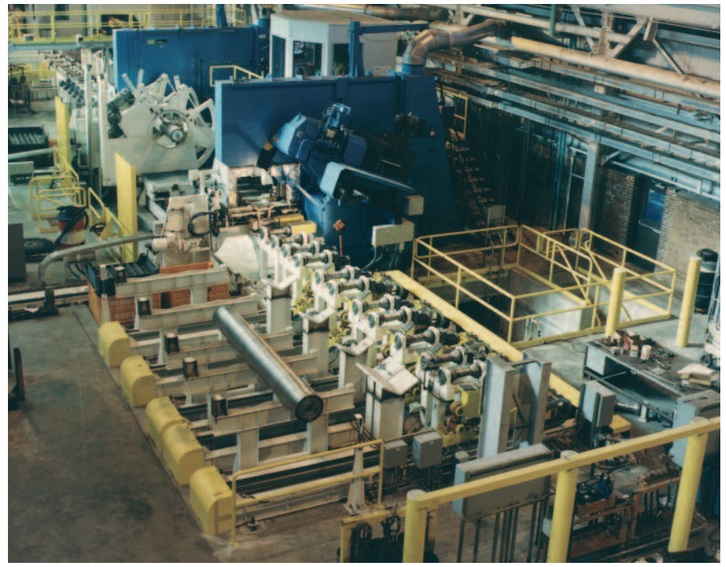


Fig. 38 Complete installation with 2 chop-stroke abrasive cut-off machines type TS 16 W incorporating special material handling equipment including 2 rotating chucks for index-cutting large cross sectional material at CARPENTER Technologies, Reading, PA, USA; cutting wheel diameter max. 1600 mm (63 in), material: electrodes and round cross section ingots, diameter: 102 to 914 mm (4 to 36 in), cutting temperature max. 260°C (500 °F).

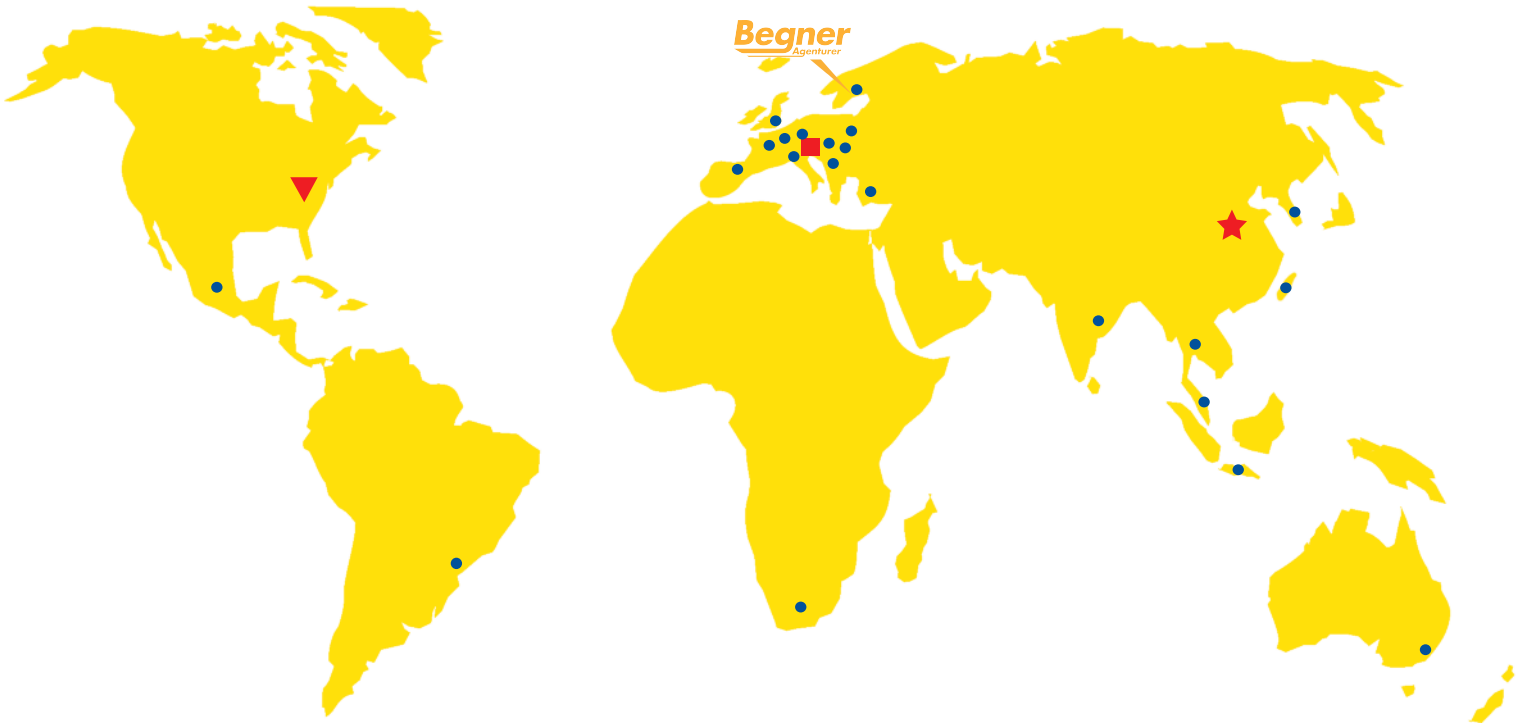
- **Special applications and unique services:**

As well as designing and supplying abrasive cut-off machines for the industrial applications listed above, BRAUN is also able to design, develop and build machines for special applications. BRAUN's cutting edge technology is based on decades of comprehensive product experience developed in-house.

TS-17 en

Innovation with tradition

Innovation - solutions - customer satisfaction



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