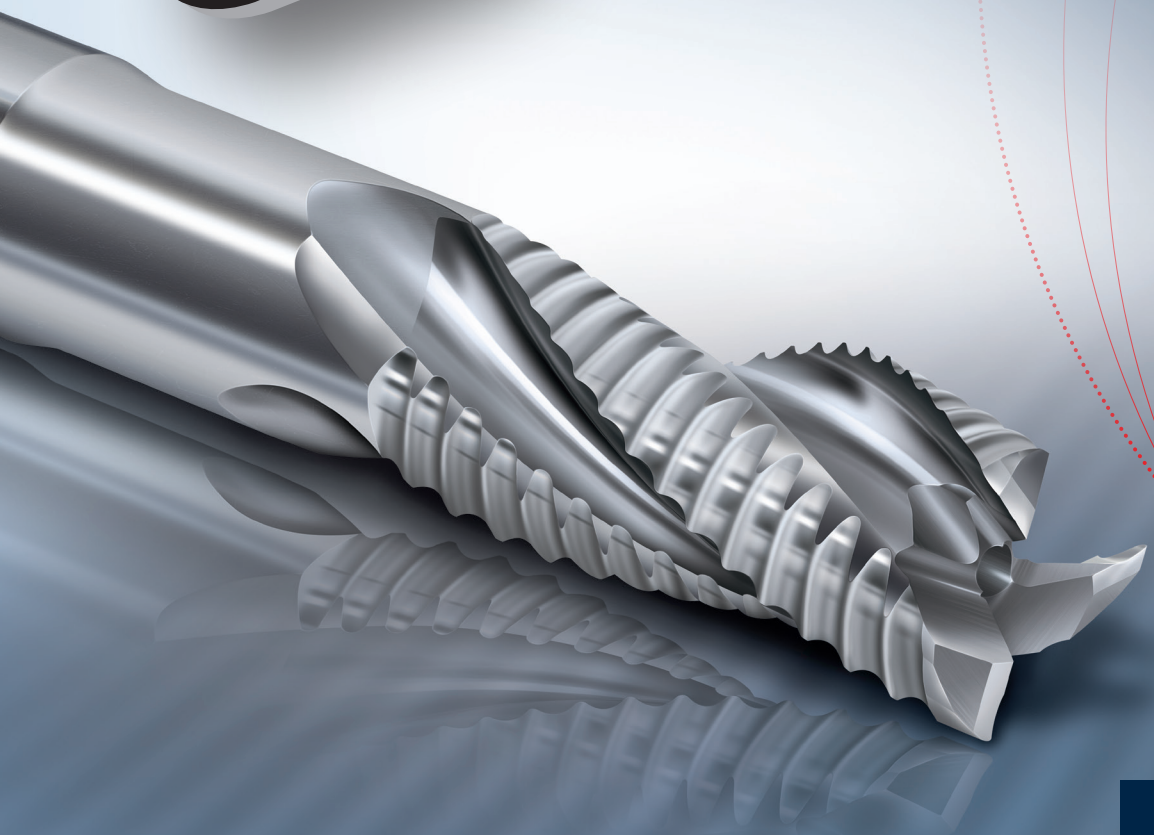
passion
for precision

fraisa

AX-FPS New performance horizons for high-performance milling of aluminum

Productivity gains thanks to perfect coordination of the tool and machine environment

NEW



Cutting data calculator
ToolExpert
AX-FPS

Maximum performance and minimal power consumption = extreme cost reduction!

With **AX-FPS**, FRAISA is presenting a **groundbreaking tool concept for aluminum machining.**

The all-new **AX-FPS** milling cutter opens up new performance horizons in the field of aluminum machining. The perfect coordination between damping and cutting ability ensures **reduced power consumption and torque input** by the spindle and **guarantees a long service life** and **maximum process reliability.**

In combination with the new **ToolExpert AX-FPS**, the cutting parameters can be ideally matched to the spindle characteristics. This makes it possible to achieve not only productivity gains but also massive cost reductions as the tool can work at the ideal operating point of the spindle and machine environment.

AX-FPS is a **contoured roughing tool** with a 20° cutting angle and a helix angle of 30°. The specially designed flutes are **ground to a mirror finish** and **precisely designed damping surfaces are attached** at the curved and end cutting edges.

These geometric features form a **very easy-cut tool concept** and guarantee a **low-vibration** and **safe milling process** with previously **unattained material removal rates** per unit of time.

AX-FPS tools are equipped with the FRAISA **high-performance penetration edge** and **central cooling channel bore.** The tools are **finely balanced** and have a **short shank** with smooth transitions.

All of these technologies **increase the reliability** and **productivity** of the **AX-FPS** tools to an unparalleled level of performance!

The **ToolExpert AX-FPS** specially developed for the **AX-FPS** tools enables you to determine the machine environment and to **optimize** the performance of the tools and the **system utilization** of the spindle and machine.

The benefits

- **Maximum performance with minimal spindle load**
  Maximum productivity – low costs
- **High process reliability**
  Guaranteed chip removal thanks to mirror-finish grinding, a central cooling channel and contoured cutting edge
- **Lower energy consumption per area of material milled**
  Extremely easy cutting
- **New ToolExpert AX-FPS**
  Cutting data that matches the machine spindle and machine environment
- **At least 2xd length of cutting edge**
  High infeed rates, reliable chip removal and low axial extraction force
- **Ideal life cycle**
  with ToolCare® tool management, ReTool® tool reconditioning and ReToolBlue recycling

Key factors: Machine spindle and machine environment

When milling aluminum, the machine tool is all too often the limiting factor. This is due to the

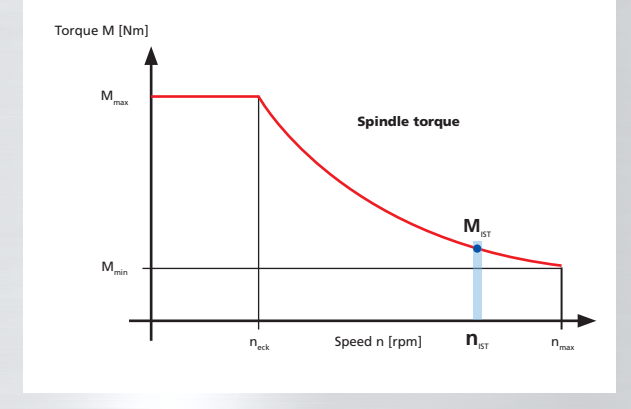
- reduced spindle torque at high speeds
- active axial spindle preload and the spindle interface (e.g. HSK-63)
- cooling lubrication and maximum coolant pressure
- tool throats and the stability of the chucking
- active spindle power
- reliable chip removal

Spindle torque and spindle power characteristics

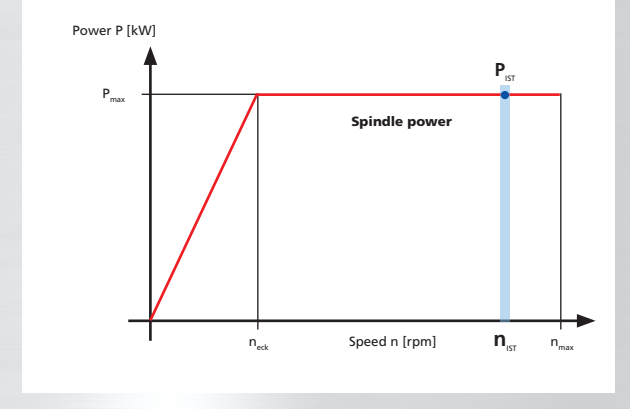
The torque of a machine spindle decreases significantly as the speed increases. As aluminum is machined in the very highest speed range (n_{IST}), the active torque in the operational area (M_{IST}) is usually crucial with respect to the spindle's performance.

One aspect that is often not taken into account but is very relevant is the bearing pretensioning of the spindle. This is why the axial tensile force must be kept as low as possible in order not to damage the spindle.

Spindle torque



Spindle power



Since FRAISA has measured the power and torque requirements of the **AX-FPS** tools, the application data in **ToolExpert AX-FPS** can be optimally positioned on the spindle characteristic so as to obtain maximum performance without overloading the spindle motor.

The technologies of the AX-FPS tools
A groundbreaking X-Generation tool concept

The new **AX-FPS** technology is systematically designed for **productivity** and **cost effectiveness.** Very positive, easy-cut geometries paired with mirror-finish flutes ensure excellent chip formation and good chip removal, supported by a central coolant supply. Small, radially mounted surfaces on the tool circumference act as vibration dampers and result in a very smooth and reliable cut. Of course, **AX-FPS** cutter also has a high-performance penetration edge that further enhances the tool's range of applications.

Description and benefits of the AX-FPS technologies

Milling tool with H5 shank

- High concentricity and accuracy of eccentricity
- Higher clamping force in nonpositive chucks (hot shrinking, hydraulic expansion chuck)
- **Important:** Degrease the tool and chucking device before assembly in order to increase the holding force and prevent tool slippage!

Milling tool with special mirror-finish-ground flute geometry

- Mirror-finish-ground flute geometry with special flute exit at the end of the cutting edge
- Improved chip flow and reduction of the process temperature
- Increase in the cutting edge length l2 with the same overall length l1 despite the small helix angle

Milling tool with parabolic support face

- Support of the tool in the radial and axial directions
- Reduced vibration levels and increased performance
- High effectiveness, especially in unstable conditions and with long throats

Finely balanced tools (with HA shaft)

- Finely balanced tools, at least G2.5 at n = 20,000 rpm or Uperm < 1 gmm
- Reduction or elimination of balancing for finely balanced chucking devices
- Improved surface quality thanks to smoother running and less vibration
- Longer service life for the machine spindle

High-performance penetration edge specially designed for aluminum tools

- Easy-cutting, high-performance penetration edge for high penetration angles
- Better performance, longer tool life and greater process reliability during penetration
- High functionality with cutting data from ToolExpert AX-FPS

Tools with a central cooling channel

- The tool has a central, continuous hole
- Perfect chip removal, especially at inner contours and when penetrating
- Better cooling of the cutting edge and less chip adhesion

Tools with a short shank and smooth transitions

- The transitions between the shaft, neck and cutting edge have smooth gradients and radii
- Improved tool rigidity and therefore less radial deflection
- Higher loads can be transmitted and be transformed into improved performance

Small corner radius

- The cylindrical tool has a small corner radius to strengthen the cutting edge
- Higher thermal and mechanical loads are possible and can be transformed into improved performance

Descriptions of all FRAISA technologies can be found in the main FRAISA catalog.

The aim of AX-FPS tool development was to reduce machining forces, power consumption and torque input:

- **Smaller loads**
  low torque, lower power consumption, minimal axial forces

- **Vibration-free operation**
  with maximum performance

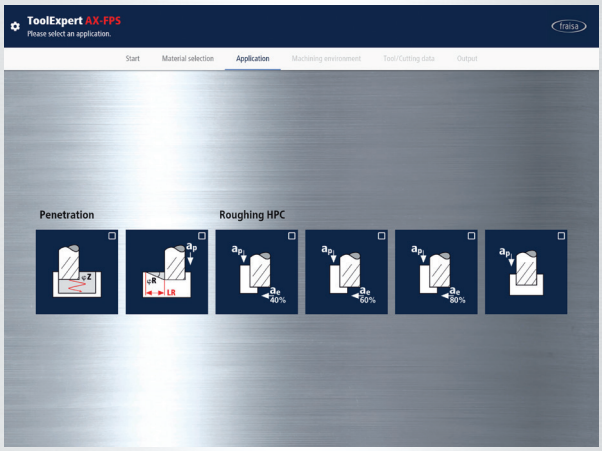
- **More technologies:** FRAISA high-performance penetration edge, central cooling channel – great chip removal, finely balanced tools with HA version, powerful corner radii with special tools

Use ToolExpert AX-FPS to determine the best possible cutting data for your machine environment!

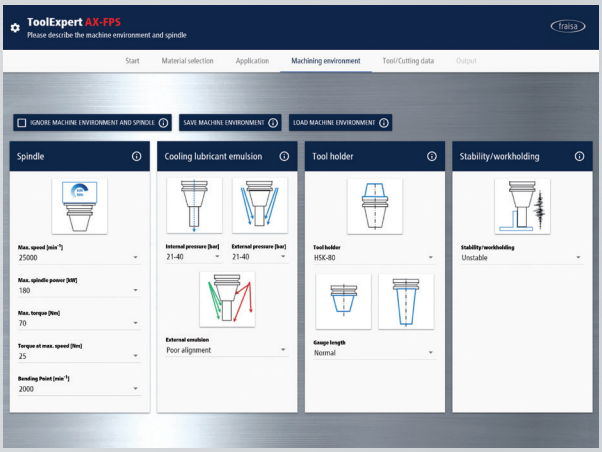
The new **ToolExpert AX-FPS** calculator is an innovative solution to determining **cutting data that match your machine environment.** Material removal rates of up to 18,000 cm³/min can be achieved with the new **AX-FPS** technology! High-performance roughing of wrought aluminum alloys is not limited by the tool, but by the machine spindle being used and the actual machine environment.

Consequently, **ToolExpert AX-FPS** lets you describe your **machine environment** clearly, so that you can determine the cutting data that is most efficient and reliable for your application. This option is unique and new and shows that FRAISA is **continuing to "digitalize" its application know-how.** The outcome is **genuine customer benefit** in respect to cutting production costs and reducing machining times.

ToolExpert AX-FPS



Select application



Specify machine environment

Optimize system utilization

Working together to hone ToolExpert!

ToolExpert AX-FPS includes a function that enables you to send us feedback regarding the cutting data recommended by FRAISA. In this way, we can work together to further perfect the knowledge we share and to enhance the benefits we gain from the cutting data recommendations.

FRAISA is looking forward to these discussions with its users!

How does ToolExpert AX-FPS work and what influencing factors are considered?

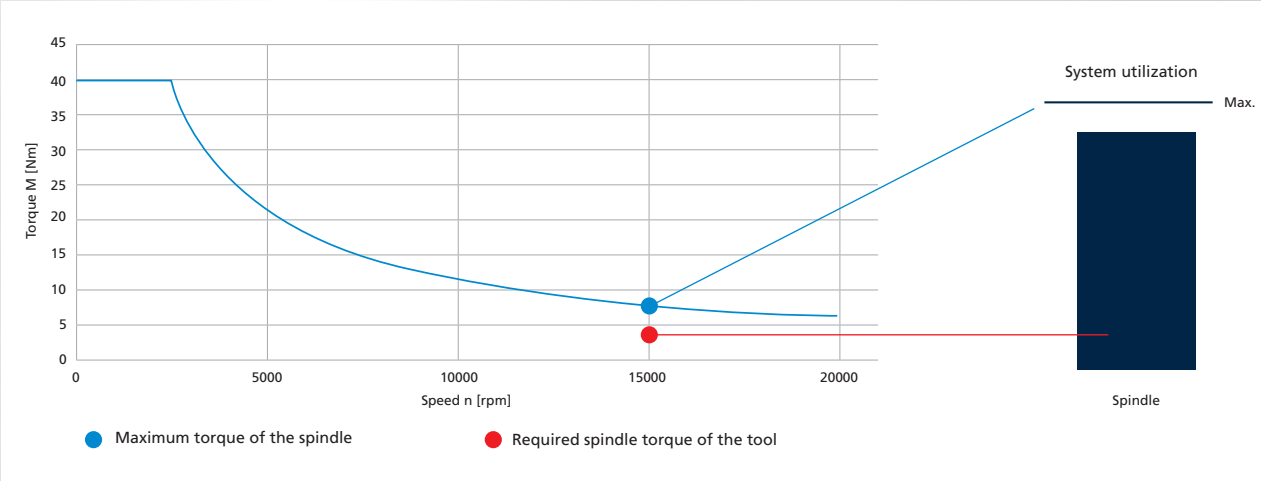
The functions built into ToolExpert were developed from more than a thousand recorded measuring points. Highly productive and reliable system utilization comes about when the degree of capacity utilization of the milling cutter, the machine spindle and the machine environment is as close as possible to maximum utilization.

Utilization of the milling cutter:
The optimum is the maximum possible chip removal rate of the cutter at the speed selected. The blue bar represents the chip removal rate with the set or recommended cutting data.

Utilization of the spindle:
The maximum is the active spindle power and the spindle torque at the corresponding speed. The blue bar shows the power and torque required by the tool in relation to the active spindle power and spindle torque.

Utilization of the machine environment:
The maximum represents the cutting data recommended by FRAISA to ensure process reliability. This were derived from the entries made with respect to the machine environment. The blue bar shows the difference when the operator adjusts the cutting data.

Torque diagram of the spindle



System utilization of the milling cutter, spindle and machine environment

The aim is to utilize the system as efficiently as possible in order to achieve maximum productivity. **ToolExpert AX-FPS** reveals when too large a diameter has been selected; while utilization of the spindle can be optimally adjusted by setting reduced cutting data, the performance potential of the cutter is far from being fully utilized. Smaller diameters are therefore recommended for less powerful machines or spindle interfaces.

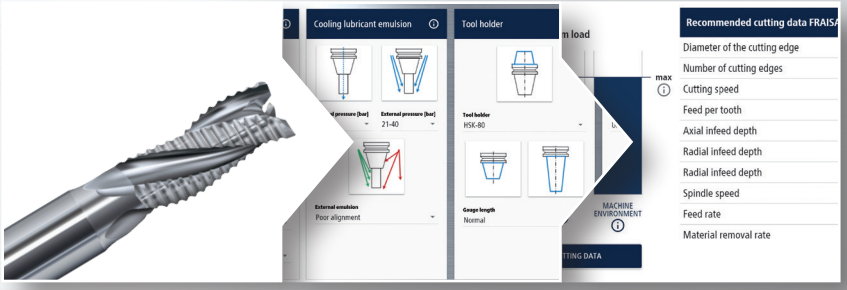
Maximum system utilization

	d_1 [mm]	d_2 [mm]	l_2 [mm]	l_3 [mm]	z
☐	6	6	13	20	3
☐	8	8	18	26	3
☑	10	10	22	31	3
☐	12	12	26	37	3
☐	16	16	32	46	3
☐	20	20	40	53	3
☐	25	25	50	70	3
☐	25	25	44	64	3

Maximum productivity
thanks to the AX-FPS tool concept

FRAISA's **AX-FPS** tool concept provides tools and cutting data that enable you to machine aluminum workpieces perfectly in your own particular machine environment. Thanks to the function built into the software that allows for interaction between FRAISA and our customers, we can share experiences and work together to continually improve the concept.

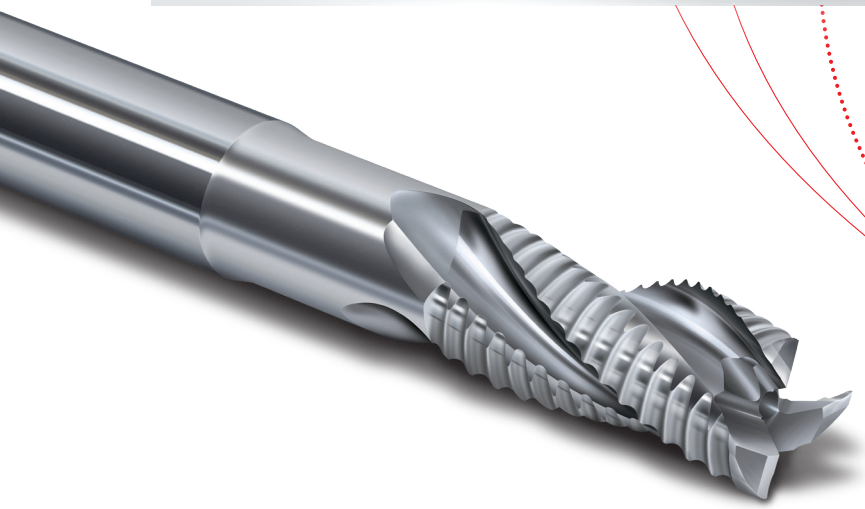
The AX-FPS tool concept



Tools	Machine environment	Cutting data

Aims:

- **Maximize productivity of your machine environment**
- **Massive cost reductions**
- **Perfecting by sharing experiences**



Cutting data calculator
ToolExpert
AX-FPS

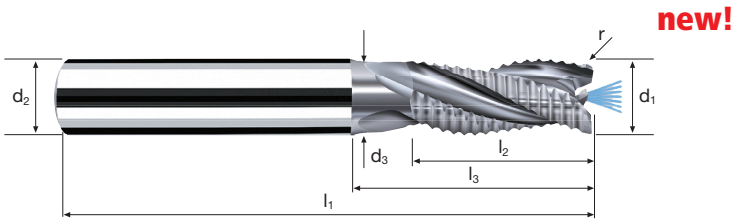
Cylindrical end mills AX-FPS

Profiled, normal version with short neck
High-performance penetration edge with central cooling channel

X-Generation X

HM MG10 | λ 30° γ 20°

r | G 2.5



Roughing

Finishing

			Al Aluminium > 99%	Al Aluminium Alloy	Al Aluminium Cast		Cu Copper	Plastic Thermoplast	

Example: **Order-N°.** Coating **15500** Article-N°. **300** ø-Code

ø Code	d1 e8	d2 h5	d3	l1	l2	l3	r	z	15600	15500
300	6	6	5.5	57	13	20	0.10	3	●	
391	8	8	7.4	63	18	26	0.15	3	●	
450	10	10	9.2	72	22	31	0.20	3	●	
501	12	12	11.0	83	26	37	0.20	3	●	
610	16	16	15.0	95	32	46	0.20	3	●	
682	20	20	19.0	104	40	53	0.20	3	●	
772*	25	25	24.0	121	50	70	0.25	3	●	
770**	25	25	24.0	121	44	64	0.25	3	●	

* Cylindrical shank HA, shank length = 50 mm

** Shank with side clamping according to DIN 6535 HB

Where is it possible to ask questions concerning the product?

If you have any question, please send an email to **mail.ch@fraisa.com**. You may also directly contact our local customer consultant.

The FRAISA application engineers will be happy to advise you.

For further information, please refer to **fraisa.com**

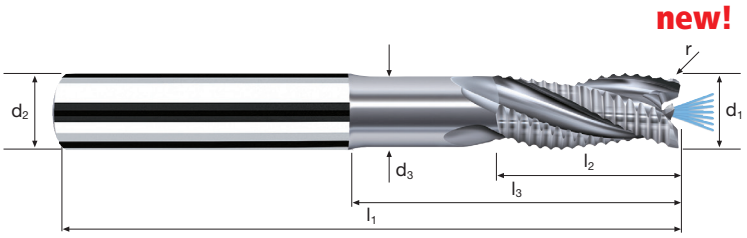
Cylindrical end mills AX-FPS

Profiled, medium length version with neck
High-performance penetration edge with central cooling channel

X-Generation

HM MG10 | λ 30° γ 20°

r | G 2.5



Roughing

Finishing

Al Aluminium > 99%	Al Aluminium Alloy	Al Aluminium Cast	Cu Copper	Plastic Thermoplast

Example:
Order-N°. Coating | Article-N°. **15505** | ø-Code **300**

ø Code	d1 e8	d2 h5	d3	l1	l2	l3	r	z	15605	15505
300	6	6	5.5	63	13	26	0.10	3	●	
391	8	8	7.4	72	18	35	0.15	3	●	
450	10	10	9.2	84	22	43	0.20	3	●	
501	12	12	11.0	97	26	51	0.20	3	●	
610	16	16	15.0	108	32	59	0.20	3	●	
682	20	20	19.0	122	40	71	0.20	3	●	
772*	25	25	24.0	144	50	92	0.25	3	●	
770**	25	25	24.0	144	50	87	0.25	3	●	

* Cylindrical shank HA, shank length = 50 mm
** Shank with side clamping according to DIN 6535 HB

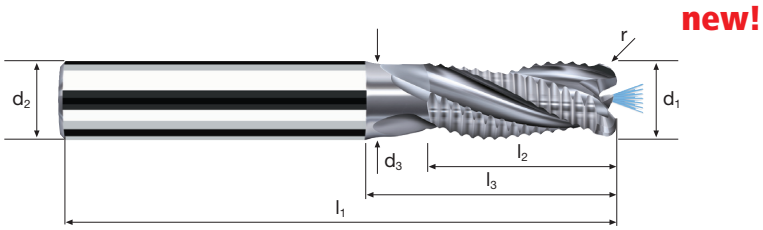
Corner radius end mills AX-RFPS

Profiled, normal version with short neck
High-performance penetration edge with central cooling channel

X-Generation

HM MG10 | λ 30° γ 20°

h5 | G 2.5



Roughing

Finishing

			Al Aluminium > 99%	Al Aluminium Alloy	Al Aluminium Cast		Cu Copper	Plastic Thermoplast	

Example: **Order-N°.** Coating **15502** ø-Code **498**

ø Code	d1 e8	d2 h5	d3	l1	l2	l3	r 0/+0.03	z	15502
498	12	12	11	83	26	37	0.5	3	●
501	12	12	11	83	26	37	1.0	3	●
505	12	12	11	83	26	37	2.0	3	●
506	12	12	11	83	26	37	2.5	3	●
606	16	16	15	95	32	46	0.5	3	●
608	16	16	15	95	32	46	1.0	3	●
611	16	16	15	95	32	46	2.0	3	●
612	16	16	15	95	32	46	2.5	3	●
613	16	16	15	95	32	46	3.0	3	●
680	20	20	19	104	40	53	1.0	3	●
683	20	20	19	104	40	53	2.0	3	●
684	20	20	19	104	40	53	2.5	3	●
685	20	20	19	104	40	53	3.0	3	●
686	20	20	19	104	40	53	4.0	3	●
770 *	25	25	24	121	50	70	1.0	3	●
772 *	25	25	24	121	50	70	2.0	3	●
774 *	25	25	24	121	50	70	2.5	3	●
775 *	25	25	24	121	50	70	3.0	3	●
776 *	25	25	24	121	50	70	4.0	3	●
777 *	25	25	24	121	50	70	5.0	3	●

* Cylindrical shank HA, shank length = 50 mm

Articles can only be ordered as special execution tools. Different radii available on request.

Scan this QR code to access more information about the FRAISA Group.

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