passion
for precision

fraisa

High-performance milling cutter NVDS
For up to 15 times faster penetration

New
cutting data calculator
ToolExpert
HelixRamp

The 7 dimensions of NVDS technology opens a ground-breaking range of possibilities!

With the new high-performance penetration edge, the **NX-NVDS** and **NB-NVDS** achieve a level of performance that facilitates peak productivity and process reliability in **7 dimensions**!

This FRAISA innovation gives **NVDS** tools a ground-breaking performance range!

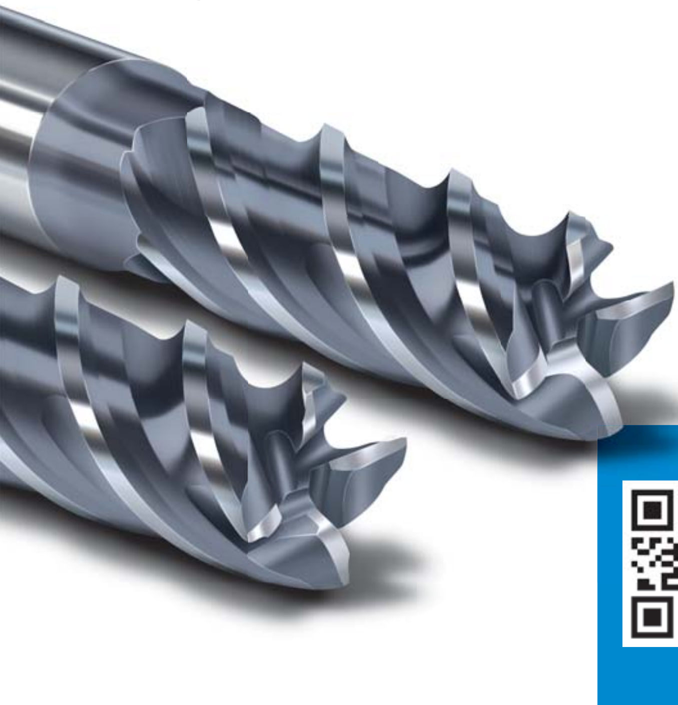
The patented double-groove geometry and the variable twist facilitate high radial and axial infeed positions, which are particularly suitable for **HPC and HDC milling**.

Thanks to exceptional chip clearing, the tools achieve the highest degree of **process reliability** and **reproducibility**. This allows the **automation capacity** to be increased further, even where productivity is already high.

The development of the new penetration edge allows FRAISA to introduce the term **high-performance penetration**. The new high-performance penetration edge **cuts easily and clears the chips without disrupting the process**.

With **NVDS** tools, **helical penetration angles of up to 20°** can thus be implemented. In components with inner contours, NVDS milling cutters can penetrate to the working depth up to **15 times (!) faster** than previous designs. This opens up **new areas of application**, which can also allow drilling operations to be eliminated.

The very broad range of applications for **NVDS** tools should be emphasized. **NX-NVDS** is excellently suited for annealed and hardened tool steel, as well as for cast iron and titanium. **NB-NVDS** is suitable for soft steel, annealed and stainless steel, and for titanium- and nickel-based alloys. **Between them, NVDS high-performance tools can machine over 2,000 types of steel, non-ferrous, heavy and light metals!**

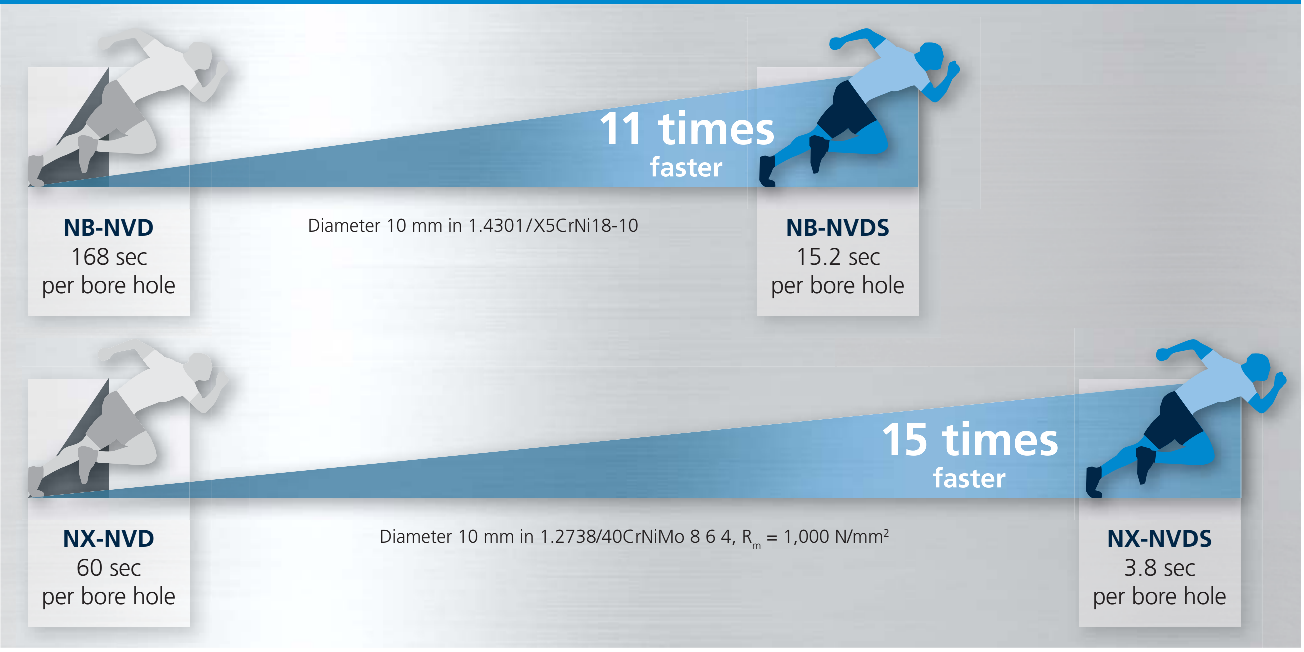


See for yourself the impressive performance of NVDS milling cutters in direct video comparison

The advantages:

- **Extreme productivity increase during penetration** using helical interpolation or ramping, thanks to new high-performance penetration edge
- **Highest productivity during HPC milling** due to double-groove geometry and variable twist
- **Excellent suitability for highly dynamic HDC milling**
- **Process reliability, automation and reproducibility** thanks to controlled chip clearing and high wear resistance
- **Extremely high universality** in various materials and machining strategies
- Verified **FRAISA cutting and application data** in
  - ToolExpert
  - ToolExpert HDC
  - ToolExpert HelixRamp
- New options in **drilling and circular milling**
- Opening up further applications using **short shank tools**

The extreme increase in productivity when penetrating by means of helical drilling in direct comparison



The **ReTool®** tool reconditioning process completes the optimal service life of the **NVDS tools**. Overall economic efficiency is thus further improved, and valuable resources are saved.

Revolutionary ideas always need to be adequately reliable! FRAISA has therefore developed **ToolExpert HelixRamp** to provide verified cutting data for penetration or ramping. The present **FRAISA cutting data recommendations were continuously** tested and approved throughout the application development process.

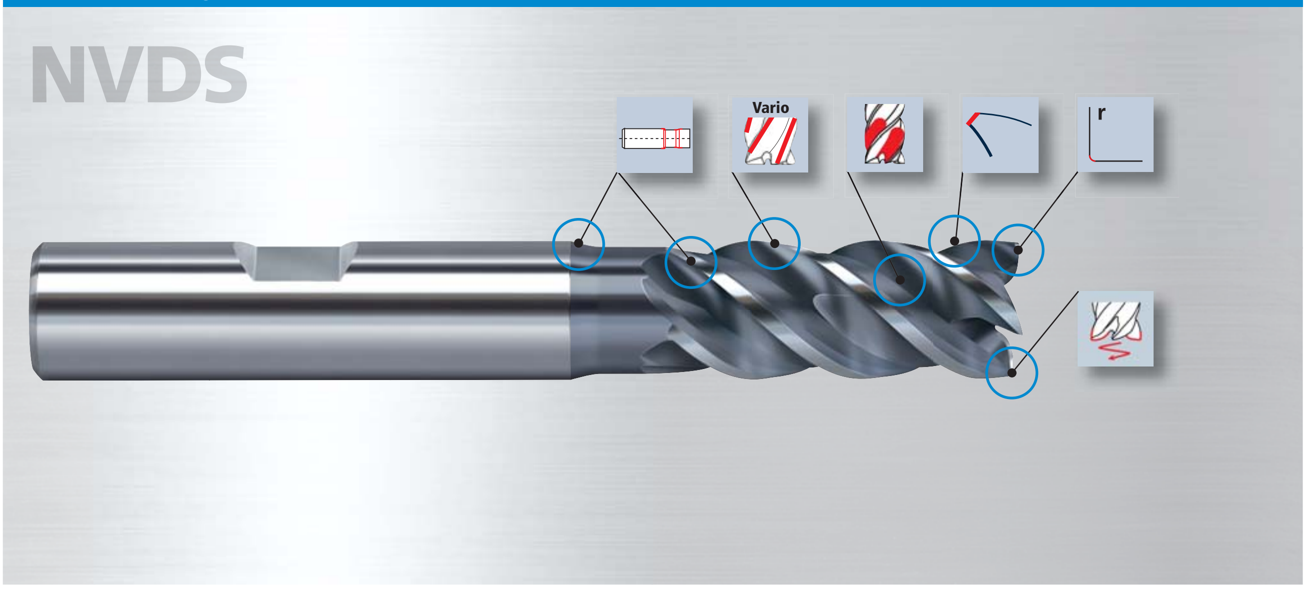
Test the new milling cutters from FRAISA, see for yourself the performance improvement potential with the **7 dimensions of the NVDS** technology, and improve productivity in your company.

The 7 dimensions of the NVDS technology:

- **high-performance HPC and HDC milling**
- **high-performance penetration**
- **process reliability and reproducibility**
- **automation**
- **universality**
- **ToolExpert cutting data**
- **ReTool® tool reconditioning**

Innovative top-end technology

The tool technologies of NVDS tools



Small corner radius

- The cylindrical tool has a small corner radius to strengthen the cutting edge
- Higher thermal and mechanical load, and therefore improved performance

Smooth transitions

- The shaft-neck-cutting edge transitions are made with smooth gradients and radii
- Improved tool rigidity and therefore less radial deflection
- Higher mechanical load and therefore improved performance

Milling tool with scaled slot

- Enlarging the chip space
- Optimized chip removal
- High axial and radial infeed rates possible

Milling tool with a special protective chamfer

- Reinforcement of the main cutting edge against chipping
- High tooth feed rates for smooth-edged tools

Milling tool with a variable helix angle

- Minimization of oscillations and vibrations
- Increase in material removal rates and tool life

High-performance penetration edge

- Easy-cutting high-performance penetration edge for high penetration angles
- Higher performance, tool life and process reliability for penetration
- High functionality with cutting data from ToolExpert HelixRamp

The new high-performance penetration edge from FRAISA

Small cutting corner radius and "wipers" with negative tooth point geometry

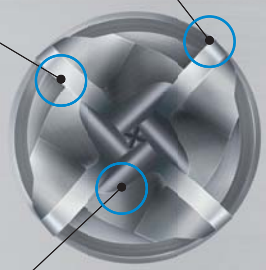
- Significant cutting corner reinforcement and improved chip removal
- Higher performance, tool life and process reliability

New cutting edge geometry with sharpened, open cutting edge

- Reduced cutting force loads during the penetration process
- High cutting edge stability, and hence higher wear resistance and performance
- Reliable penetration up to helical interpolation angles of 20°, and without special peripheral equipment

Flute connection between cutting edge and shaft area

- Controlled removal of chips from the cutting edge area – hence ensuring process reliability and reproducibility
- Reduced conversion energy thanks to radii on all sides in the spiral flute – hence lower thermal and mechanical loads



FRAISA has protected a variety of designs of **high-performance penetration edge** by means of **design and patent registration**.

NX-NVDS tools (rake angle -10°) are perfectly suited for annealed and hardened tool steel, cast iron and titanium.

	Rm 850–1100	Rm 1100–1300	Rm 1300–1500	HRC 48–56	HRC 56–60			Ti Titanium	GG(G) Tool Steel

NB-NVDS (rake angle 5°) are particularly suitable for soft steel, annealed and stainless steel, and for titanium- and nickel-based alloys.

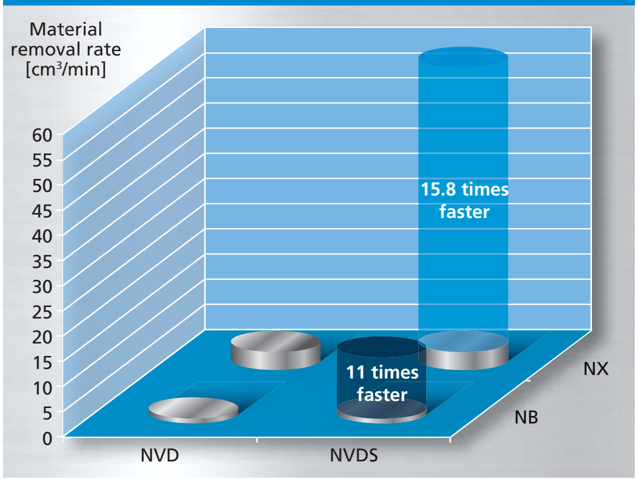
Rm < 850	Rm 850–1100	Rm 1100–1300	Rm 1300–1500				Inox Stainless	Ti Titanium	GG(G) Tool Steel Nickel Alloys

Very fast penetration means high savings potential

Extreme productivity increase through reduction in penetration time

The extreme performance of the new high-performance penetration edge results from a series of technological innovations. In comparison to the NVD concept, productivity in the penetration process is increased up to fifteen times.

Comparison of material removal rates during penetration



NX tools in annealed steel for plastic-moulding tools, 1.2738/40CrMnNiMo 8 6 4, R_m = 1,000 N/mm²

	d1	z	ap	vc	fz	n	vfZ	φZ	DA	Time per bore hole	Material removal rate Q	Productivity increase
	[mm]		[mm]	[m/min]	[mm]	[min⁻¹]	[mm/min]	[°]	[mm]	[s]	[cm³/min]	
NX-NVDS	10	4	20	140	0.065	4455	1160	20	15	3.8	55.80	15.8 times faster
NX-NVD	10	4	20	140	0.065	4455	1160	1	15	60.0	3.55	

NB tools in stainless austenitic steel, 1.4301/X5CrNi18-10

	d1	z	ap	vc	fz	n	vfZ	φZ	DA	Time per bore hole	Material removal rate Q	Productivity increase
	[mm]		[mm]	[m/min]	[mm]	[min⁻¹]	[mm/min]	[°]	[mm]	[s]	[cm³/min]	
NB-NVDS	10	4	20	90	0.045	2865	515	10	15	15.2	13.95	11 times faster
NB-NVD	10	4	20	90	0.036	2865	415	1	15	168.0	1.25	

Universality at the highest performance level

NVDS tools are particularly powerful, as they have a high level of universality in terms of their application and material spectrum – uncompromising at the highest performance. For reliable use, take advantage of FRAISA cutting data recommendations in the catalog or of the cutting data software:

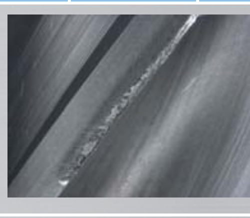
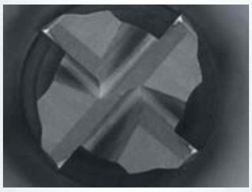
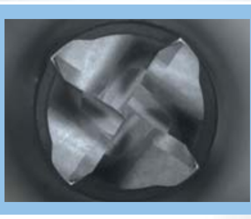
- **ToolExpert** for all basic applications with detailed material selection
- **ToolExpert HDC** for the highly dynamic HDC milling strategy with consistent cutting edge utilization
- **ToolExpert HelixRamp** for high-performance penetration and ramp milling

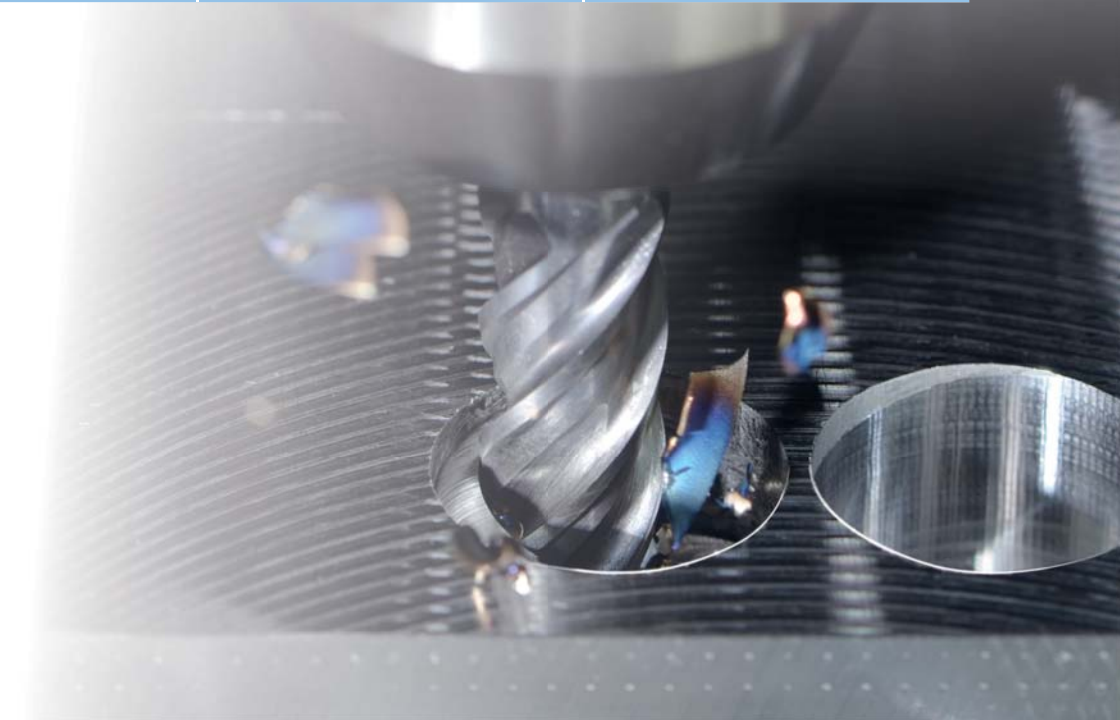
Lateral and groove machining using HPC and HDC strategies

The familiar **NX-NVD** and **NB-NVD** tools provide high performance in lateral milling (gear hobbing). The development objective of the high-performance penetration edge was to retain these positive milling characteristics of the tool at all costs.

This criteria was fulfilled, and could even be exceeded in some materials. The reason for this is a new cutting edge stabilization thanks to a small corner radius. This additionally strengthens the exposed cutting edge against thermal and mechanical loads.

Comparison between NB-NVD and NB-NVDS in St-37; 235JR after 60 minutes operating time

Milling	Ø d	z	ap	ae	Vc	n	fz	Vf	Q
	[mm]		[mm]	[mm]	[m/min]	[min^{-1}]	[mm]	[mm/min]	[cm^3/min]
	6	4	12	1.5	239	12679	0.081	4108	74.0
Standard Vario tool									
NB-NVD									
NB-NVDS									



Reliable penetration parameters
Information for users

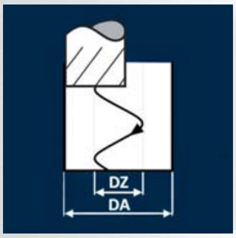
Tool life, process reliability, automation

High productivity is important, but so are process reliability and tool life. The development process therefore placed particular value on reliable tools. The recommended cutting data were calculated and checked in many tests. The number of penetration processes specified below is determined on the basis of the tool diameter, the material, and the material removal rate during lateral milling. These validate the broad application spectrum of the NVDS milling tools.

The cutting data displayed in the catalog and in the online tool ToolExpert HelixRamp can be utilized over a long tool life. And then the tools can always be resharpened, and can be reused..

NX-NVDS in annealed steel for plastic-moulding tools in 1.2738, R_m = 1000 N/mm²

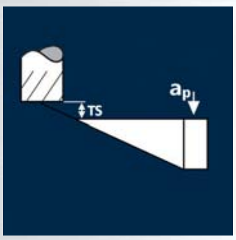
HELIX	**d1** [mm]	**z**	**vc** [m/min]	**fz** [mm]	**n** [min⁻¹]	**vfZ** [mm/min]	φ**Z** [°]
NX-NVDS	12	4	140	0.075	3715	1115	20



Wear pattern after
80 helical penetration
processes

NB-NVDS in stainless austenitic steel in 1.4301, R_m = 650 N/mm²

RAMPING	**d1**[mm]	**z**	**vc** [m/min]	**fz** [mm]	**n** [min⁻¹]	**vfZ** [mm/min]	φ**R** [°]
NB-NVDS	8	4	70	0.025	2785	280	16



Wear pattern after
50 ramping penetration
processes

Program the penetration angle φZ or φA correctly!

Penetration using **helical interpolation** is today used as standard to get into pockets, deeper levels or bores. The reason for this is the improved chip removal and the lower process temperatures during helical interpolation. This allows higher penetration depths to be achieved during helical machining. Depending on the machine control system or CAM system used, different input parameters may be required for the same procedure. Typically these are:

- The external diameter of the helical drilling DA
- The central penetration angle φZ
- The speed n and the feed rate vfZ at the center
- The penetration depth TB

FRAISA recommends entering the DA as 1.9xd1 if possible.
e.g.: milling cutter diameter d1 = 10 mm, DA = 19 mm

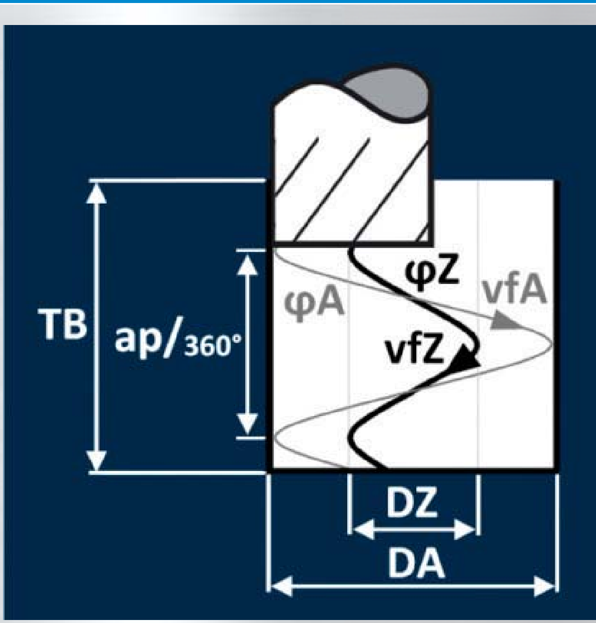
ATTENTION: For cycle programming, it may be necessary to enter other penetration parameters, depending on the machine control system. On some machine control systems (e.g. Heidenhain), it is not the central penetration angle φZ that is needed, but the penetration angle at the outer track φA!

This is entered at the machine (tool table) under "Angle". The penetration angles at the center φZ and at the outer track φA vary significantly, depending on the DA for the milling cutter diameter. The outer angle φA is always smaller than the central angle φZ.

With other control systems again, the infeed per helical rotation (ap/360°), the radius of the tool tip path (e.g. Siemens) or the radius of the bore (e.g. Fanuc) is required.

In some cases the ramps have to be selected on the basis of the component, e.g. an elongated hole slot. The parameters for programming a **ramp** are identical on all control systems.

Helix Penetration Process



Use ToolExpert HelixRamp

For the cycle programming on the machine, note which entries are relevant for the corresponding control system. For the cutting data, you can find the basic data with φZ and vfZ. You can then use the conversion table below to find φA. It is even faster and simpler with the cutting data software **ToolExpert HelixRamp**, which allows all penetration parameters to be calculated and compared with just a few clicks!

Conversion table φZ to φA with corresponding bore diameter

Penetration angle φZ [°]	20°	18°	17.5°	15°	13°	12°	10°	8°
Bore diameter DA	**Penetration angle φA [°]**							
DA = d1 x 1.3 [mm]	4.8°	4.3°	4.2°	3.5°	3.0°	2.8°	2.3°	1.9°
DA = d1 x 1.5 [mm]	6.9°	6.2°	6.0°	5.1°	4.4°	4.1°	3.4°	2.7°
DA = d1 x 1.7 [mm]	8.5°	7.6°	7.4°	6.3°	5.4°	5.0°	4.2°	3.3°
DA = d1 x 1.9 [mm]	9.8°	8.7°	8.5°	7.2°	6.2°	5.7°	4.8°	3.8°

☐ FRAISA recommendation

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**.

Fast, simple, reliable:
ToolExpert HelixRamp

The cutting data software ToolExpert HelixRamp was developed for the new high-performance tools. The software can conveniently be started using the FRAISA website **www.fraisa.com/en/toolexpert-helixramp**

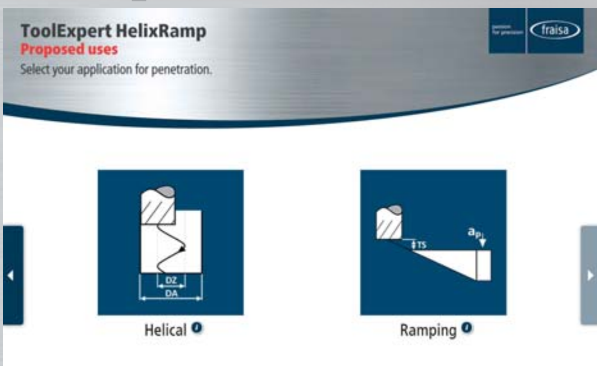
With just a few clicks, you can define the material, tool and penetration strategy, and receive the parameters to be programmed for your machine control or CAM system.

Using ToolExpert HelixRamp

Step 1.

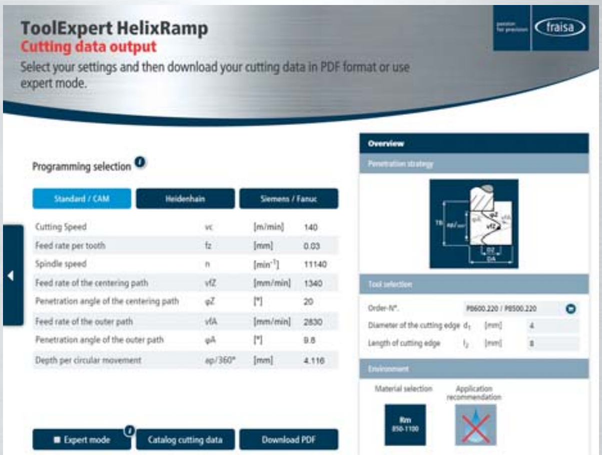
Tool and material selection (material)

Step 2.



Proposed uses

Step 3.



Cutting data output

Expert Mode

ToolExpert HelixRamp

Expert mode Helical

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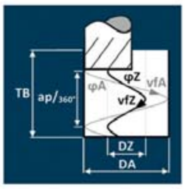
Change the parameters in the second table on your own responsibility and compare them with the recommended application values.

Application recommendation				Manual input
Diameter of the cutting edge	d_1	[mm]	4	4
Number of cutting edges	z	-	4	4
External diameter of the drilled hole	DA	[mm]	7.60	7.60
Diameter of the centering path	DZ	[mm]	3.60	3.60
Hole depth	TB	[mm]	6.00	6.00
Cutting Speed	vc	[m/min]	140	140
Feed rate per tooth	fz	[mm]	0.03	0.03
Spindle speed	n	[min^{-1}]	11140	11140
Axial safety distance	TS	[mm]	2	2
Feed rate of the centering path	vfZ	[mm/min]	1340	1340
Penetration angle of the centering path	φZ	[°]	20	20
Feed rate of the outer path	vfA	[mm/min]	2830	2830
Penetration angle of the outer path	φA	[°]	9.8	9.8
Depth per circular movement	ap/360°	[mm]	4.116	4.116
Penetration time per drilled hole (incl. TS)	-	[sec]	1.292	1.292
Material removal rate	Q	[cm^3/min]	12.640	12.640

Expert mode | Catalog cutting data | Download PDF

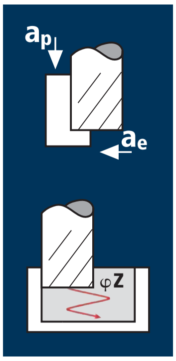
Overview

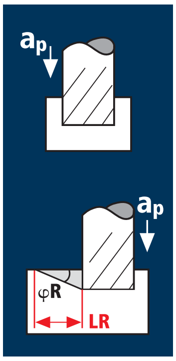
Penetration strategy



Expert Mode then allows you to calculate cutting data or your new productivity yourself, and finally to save all information in a PDF or printout.

New
cutting data calculator
ToolExpert
HelixRamp

Application	Material	d1 [mm]	z	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	n [min^{-1}]	v_f / v_{fZ} [mm/min]	Q [cm^3/min]	φZ [°]	φA [°]
	Steel 850 - 1100 N/mm²	4	4	140	0.030	6.0	1.6	11140	1335	13.0	20°	see ToolExpert HelixRamp (www.fraisa.com)
		5	4	140	0.035	7.5	2.0	8915	1250	19.0	20°	
		6	4	140	0.040	9.0	2.4	7425	1190	25.5	20°	
		8	4	140	0.050	12.0	3.2	5570	1115	43.0	20°	
		10	4	140	0.065	15.0	4.0	4455	1160	69.5	20°	
		12	4	140	0.075	18.0	4.8	3715	1115	96.5	20°	
		16	4	140	0.085	24.0	6.4	2785	945	145.0	20°	
		20	4	140	0.100	30.0	8.0	2230	890	213.5	20°	
	Steel 1100 - 1300 N/mm²	4	4	115	0.030	6.0	1.6	9150	1100	10.5	17.5°	see ToolExpert HelixRamp (www.fraisa.com)
		5	4	115	0.035	7.5	2.0	7320	1025	15.5	17.5°	
		6	4	115	0.040	9.0	2.4	6100	975	21.0	17.5°	
		8	4	115	0.050	12.0	3.2	4575	915	35.0	17.5°	
		10	4	115	0.065	15.0	4.0	3660	950	57.0	17.5°	
		12	4	115	0.075	18.0	4.8	3050	915	79.0	17.5°	
		16	4	115	0.085	24.0	6.4	2290	780	120.0	17.5°	
		20	4	115	0.100	30.0	8.0	1830	730	175.0	17.5°	
	Hardened tool steel 52 - 56 HRC	4	4	50	0.015	6.0	1.6	3980	240	2.5	15°	see ToolExpert HelixRamp (www.fraisa.com)
		5	4	50	0.020	7.5	2.0	3185	255	4.0	15°	
		6	4	50	0.025	9.0	2.4	2655	265	5.5	15°	
		8	4	50	0.030	12.0	3.2	1990	240	9.0	15°	
		10	4	50	0.035	15.0	4.0	1590	225	13.5	15°	
		12	4	50	0.045	18.0	4.8	1325	240	20.5	15°	
		16	4	50	0.055	24.0	6.4	995	220	34.0	15°	
		20	4	50	0.070	30.0	8.0	795	225	54.0	15°	
	Titanium alloys >300 HB [Ti6Al4V]	4	4	60	0.020	6.0	1.6	4775	380	3.5	12°	see ToolExpert HelixRamp (www.fraisa.com)
		5	4	60	0.025	7.5	2.0	3820	380	5.5	12°	
		6	4	60	0.030	9.0	2.4	3185	380	8.0	12°	
		8	4	60	0.040	12.0	3.2	2385	380	14.5	12°	
		10	4	60	0.045	15.0	4.0	1910	345	20.5	12°	
		12	4	60	0.055	18.0	4.8	1590	350	30.0	12°	
		16	4	60	0.065	24.0	6.4	1195	310	47.5	12°	
		20	4	60	0.080	30.0	8.0	955	305	73.0	12°	

Application	Material	d1 [mm]	z	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	n [min^{-1}]	v_f / v_{fR} [mm/min]	Q [cm^3/min]	φR [°]	LR [mm]
	Steel 850 - 1100 N/mm²	4	4	110	0.025	5.0	4	8755	875	17.5	32°	8.0
		5	4	110	0.025	6.3	5	7005	700	22.0	32°	10.4
		6	4	110	0.030	7.5	6	5835	700	31.5	32°	12.0
		8	4	110	0.040	10.0	8	4375	700	56.0	32°	16.0
		10	4	110	0.050	12.5	10	3500	700	87.5	32°	20.0
		12	4	110	0.055	15.0	12	2920	640	115.0	32°	24.0
		16	4	110	0.065	20.0	16	2190	570	182.5	32°	32.0
		20	4	110	0.075	25.0	20	1750	525	262.5	32°	40.0
	Steel 1100 - 1300 N/mm²	4	4	90	0.025	5.0	4	7160	715	14.5	28°	9.4
		5	4	90	0.025	6.3	5	5730	575	18.0	28°	12.2
		6	4	90	0.030	7.5	6	4775	575	26.0	28°	14.1
		8	4	90	0.040	10.0	8	3580	575	46.0	28°	18.8
		10	4	90	0.050	12.5	10	2865	575	72.0	28°	23.5
		12	4	90	0.055	15.0	12	2385	525	94.5	28°	28.2
		16	4	90	0.065	20.0	16	1790	465	149.0	28°	37.6
		20	4	90	0.075	25.0	20	1430	430	215.0	28°	47.0
	Hardened tool steel 52 - 56 HRC	4	4	40	0.010	5.0	4	3185	125	2.5	24°	11.2
		5	4	40	0.015	6.3	5	2545	155	5.0	24°	14.6
		6	4	40	0.020	7.5	6	2120	170	7.5	24°	16.8
		8	4	40	0.025	10.0	8	1590	160	13.0	24°	22.5
		10	4	40	0.025	12.5	10	1275	130	16.5	24°	28.1
		12	4	40	0.035	15.0	12	1060	150	27.0	24°	33.7
		16	4	40	0.040	20.0	16	795	125	40.0	24°	44.9
		20	4	40	0.055	25.0	20	635	140	70.0	24°	56.2
	Titanium alloys >300 HB [Ti6Al4V]	4	4	50	0.015	5.0	4	3980	240	5.0	19°	14.5
		5	4	50	0.020	6.3	5	3185	255	8.0	19°	18.9
		6	4	50	0.025	7.5	6	2655	265	12.0	19°	21.8
		8	4	50	0.030	10.0	8	1990	240	19.0	19°	29.0
		10	4	50	0.035	12.5	10	1590	225	28.0	19°	36.3
		12	4	50	0.040	15.0	12	1325	210	38.0	19°	43.6
		16	4	50	0.050	20.0	16	995	200	64.0	19°	58.1
		20	4	50	0.060	25.0	20	795	190	95.0	19°	72.6

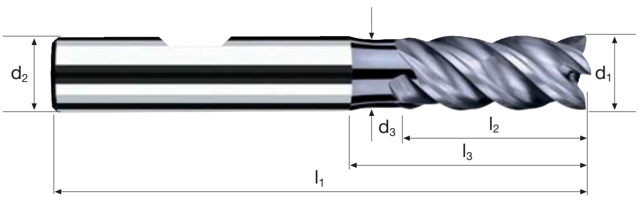
Cylindrical end mills NX-NVDS

Smooth-edged, normal version with short neck
High-performance penetration edge

HSS | Favora® | Base-X | X-Generation

HM MG10	λ 45° γ-10°

Vario



Roughing

Finishing

	Rm 850-1100	Rm 1100-1300	Rm 1300-1500	HRC 48-56	HRC 56-60			Ti Titanium	GG(G) Tool Steel

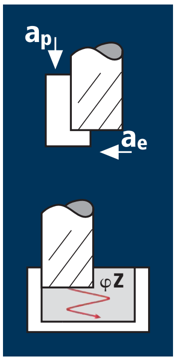
Example: Order-N°. P 8600 .220 (Coating: P, Article-N°: 8600, ø-Code: .220)

		POLYCHROM
		P8600
		P8500

ø Code	d1 e8	d2 h6	d3	l1	l2	l3	r 0/+0.05	α	z		
.220	4	6	3.7	57	8	16	0.10	3.0°	4		●
.260	5	6	4.6	57	10	18	0.10	1.5°	4		●
.300	6	6	5.5	57	12	20	0.10	0.0°	4		●
.391	8	8	7.4	63	19	26	0.15	0.0°	4		●
.450	10	10	9.2	72	23	31	0.20	0.0°	4		●
.501	12	12	11.0	83	27	37	0.20	0.0°	4		●
.610	16	16	15.0	92	32	43	0.20	0.0°	4		●
.682	20	20	19.0	104	39	53	0.20	0.0°	4		●

FRAISA marks all exceptional innovations with the signature KS. This is in memory of the legendary Head of Production and Development, Mr Konrad Schmid, who defined the FRAISA brand from 1969 until 2000.

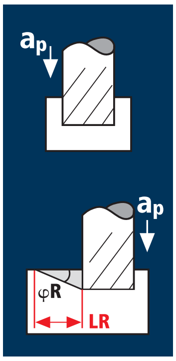
Application



Material

Material	d1 [mm]	z	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	n [min⁻¹]	v_f / v_fZ [mm/min]	Q [cm³/min]	φZ [°]	φA [°]
Steel < 850 N/mm²	4	4	180	0.035	6.0	1.6	14325	2005	19.0	20°	see ToolExpert HelixRamp (www.fraisa.com)
	5	4	180	0.040	7.5	2.0	11460	1835	27.5	20°	
	6	4	180	0.050	9.0	2.4	9550	1910	41.5	20°	
	8	4	180	0.060	12.0	3.2	7160	1720	66.0	20°	
	10	4	180	0.075	15.0	4.0	5730	1720	103.0	20°	
	12	4	180	0.085	18.0	4.8	4775	1625	140.5	20°	
	16	4	180	0.095	24.0	6.4	3580	1360	209.0	20°	
	20	4	180	0.110	30.0	8.0	2865	1260	302.5	20°	
Steel 850 - 1100 N/mm²	4	4	140	0.030	6.0	1.6	11140	1335	13.0	18°	see ToolExpert HelixRamp (www.fraisa.com)
	5	4	140	0.035	7.5	2.0	8915	1250	19.0	18°	
	6	4	140	0.040	9.0	2.4	7425	1190	25.5	18°	
	8	4	140	0.050	12.0	3.2	5570	1115	43.0	18°	
	10	4	140	0.065	15.0	4.0	4455	1160	69.5	18°	
	12	4	140	0.075	18.0	4.8	3715	1115	96.5	18°	
	16	4	140	0.085	24.0	6.4	2785	945	145.0	18°	
	20	4	140	0.100	30.0	8.0	2230	890	213.5	18°	
Cold work tool steel (12% Cr), high alloyed [1.2379]	4	4	70	0.030	6.0	1.6	5570	670	6.5	12°	see ToolExpert HelixRamp (www.fraisa.com)
	5	4	70	0.035	7.5	2.0	4455	625	9.5	12°	
	6	4	70	0.040	9.0	2.4	3715	595	13.0	12°	
	8	4	70	0.050	12.0	3.2	2785	555	21.5	12°	
	10	4	70	0.060	15.0	4.0	2230	535	32.0	12°	
	12	4	70	0.075	18.0	4.8	1855	555	48.0	12°	
	16	4	70	0.085	24.0	6.4	1395	475	73.0	12°	
	20	4	70	0.095	30.0	8.0	1115	425	102.0	12°	
Stainless steel [Cr-Ni/1.4301]	4	4	90	0.020	6.0	1.6	7160	575	5.5	12°	see ToolExpert HelixRamp (www.fraisa.com)
	5	4	90	0.025	7.5	2.0	5730	575	8.5	12°	
	6	4	90	0.030	9.0	2.4	4775	575	12.5	12°	
	8	4	90	0.035	12.0	3.2	3580	500	19.0	12°	
	10	4	90	0.045	15.0	4.0	2865	515	31.0	12°	
	12	4	90	0.055	18.0	4.8	2385	525	45.5	12°	
	16	4	90	0.065	24.0	6.4	1790	465	71.5	12°	
	20	4	90	0.080	30.0	8.0	1430	460	110.5	12°	

Application



Material

Material	d1 [mm]	z	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	n [min⁻¹]	v_f / v_fR [mm/min]	Q [cm³/min]	φR [°]	LR [mm]
Steel < 850 N/mm²	4	4	145	0.025	5.0	4	11540	1155	23.0	32°	8.0
	5	4	145	0.030	6.3	5	9230	1110	34.5	32°	10.4
	6	4	145	0.040	7.5	6	7695	1230	55.5	32°	12.0
	8	4	145	0.045	10.0	8	5770	1040	83.0	32°	16.0
	10	4	145	0.055	12.5	10	4615	1015	127.0	32°	20.0
	12	4	145	0.065	15.0	12	3845	1000	180.0	32°	24.0
	16	4	145	0.070	20.0	16	2885	810	259.0	32°	32.0
	20	4	145	0.085	25.0	20	2310	785	392.5	32°	40.0
Steel 850 - 1100 N/mm²	4	4	110	0.020	5.0	4	8755	700	14.0	29°	9.0
	5	4	110	0.025	6.3	5	7005	700	22.0	29°	11.7
	6	4	110	0.030	7.5	6	5835	700	31.5	29°	13.5
	8	4	110	0.040	10.0	8	4375	700	56.0	29°	18.0
	10	4	110	0.050	12.5	10	3500	700	87.5	29°	22.6
	12	4	110	0.055	15.0	12	2920	640	115.0	29°	27.1
	16	4	110	0.065	20.0	16	2190	570	182.5	29°	36.1
	20	4	110	0.075	25.0	20	1750	525	262.5	29°	45.1
Cold work tool steel (12% Cr), high alloyed [1.2379]	4	4	55	0.025	5.0	4	4375	440	9.0	19°	14.5
	5	4	55	0.025	6.3	5	3500	350	11.0	19°	18.9
	6	4	55	0.030	7.5	6	2920	350	16.0	19°	21.8
	8	4	55	0.040	10.0	8	2190	350	28.0	19°	29.0
	10	4	55	0.045	12.5	10	1750	315	39.5	19°	36.3
	12	4	55	0.055	15.0	12	1460	320	57.5	19°	43.6
	16	4	55	0.065	20.0	16	1095	285	91.0	19°	58.1
	20	4	55	0.070	25.0	20	875	245	122.5	19°	72.6
Stainless steel [Cr-Ni/1.4301]	4	4	70	0.015	5.0	4	5570	335	6.5	14°	20.1
	5	4	70	0.020	6.3	5	4455	355	11.0	14°	26.1
	6	4	70	0.025	7.5	6	3715	370	16.5	14°	30.1
	8	4	70	0.025	10.0	8	2785	280	22.5	14°	40.1
	10	4	70	0.035	12.5	10	2230	310	39.0	14°	50.1
	12	4	70	0.040	15.0	12	1855	295	53.0	14°	60.2
	16	4	70	0.050	20.0	16	1395	280	89.5	14°	80.2
	20	4	70	0.060	25.0	20	1115	270	135.0	14°	100.3

Cylindrical end mills NB-NVDS

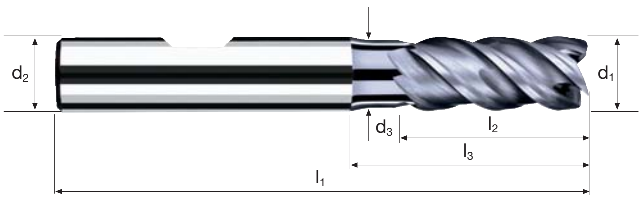
Smooth-edged, normal version with short neck
High-performance penetration edge

K·S | HSS | Favora® | Base-X | B | X-Generation

HM MG10	λ 45° γ 5°

r

Vario



Roughing

Finishing

Rm < 850	Rm 850-1100	Rm 1100-1300	Rm 1300-1500				Inox Stainless	Ti Titanium	GG(G) Tool Steel Nickel Alloys

Example: **Order-N°.** — Coating **P**, Article-N°. **8200**, ø-Code **.220**

ø Code	d1 e8	d2 h6	d3	l1	l2	l3	r 0/+0.05	α	z		POLYCHROM P8200 / P8100
.220	4	6	3.7	57	8	16	0.10	3.0°	4		●
.260	5	6	4.6	57	10	18	0.10	1.5°	4		●
.300	6	6	5.5	57	12	20	0.10	0.0°	4		●
.391	8	8	7.4	63	19	26	0.15	0.0°	4		●
.450	10	10	9.2	72	23	31	0.20	0.0°	4		●
.501	12	12	11.0	83	27	37	0.20	0.0°	4		●
.610	16	16	15.0	92	32	43	0.20	0.0°	4		●
.682	20	20	19.0	104	39	53	0.20	0.0°	4		●

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