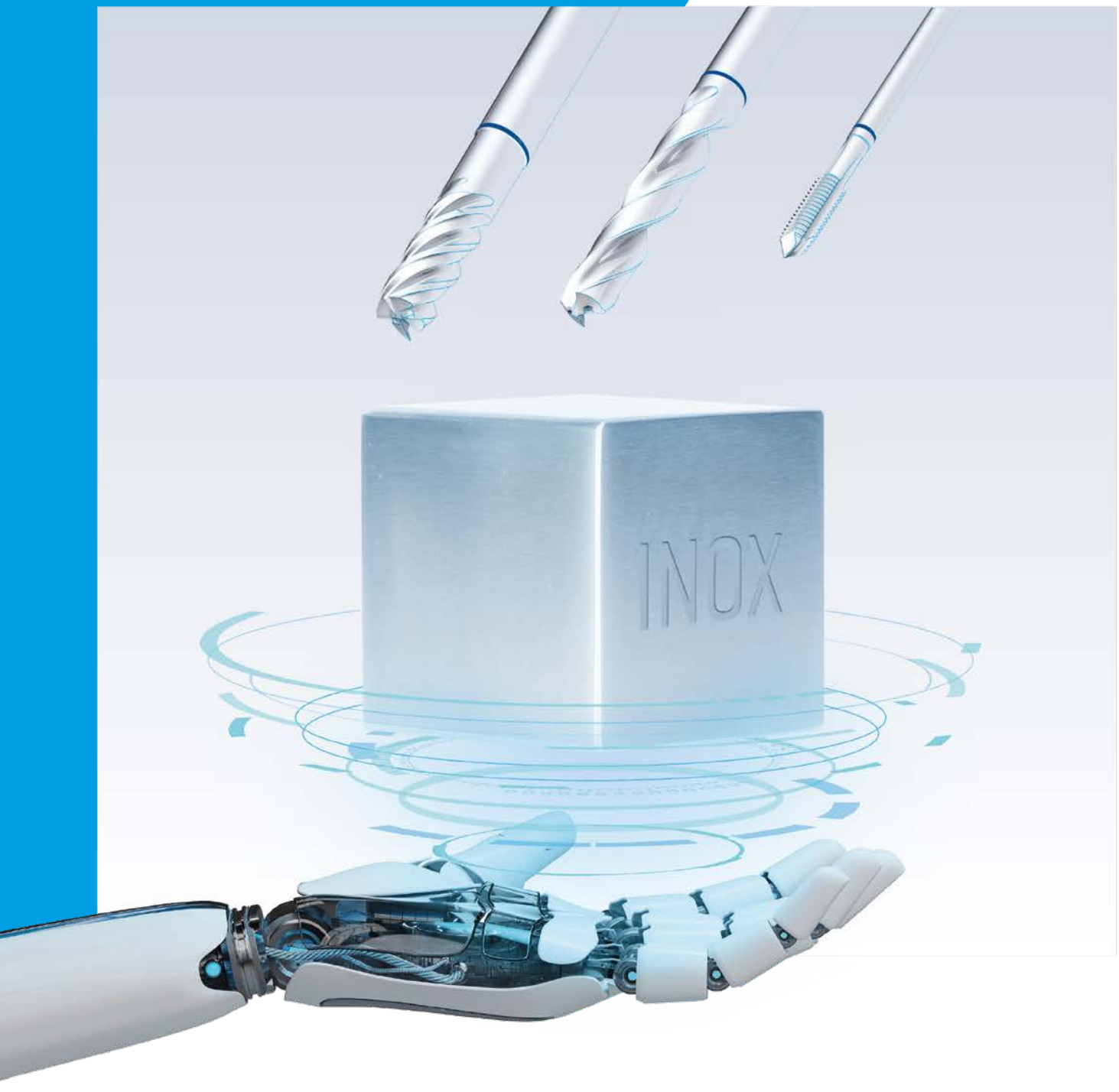
From the material to the perfect tool

maykestag

PERFORMANCE
IN PRECISION



The material INOX

WHAT IS STAINLESS STEEL?

Stainless steel is a material group consisting of rustproof and acid-resistant steels. They are characterised above all by their corrosion resistance and durability. This makes them very easy to maintain in their further use. Synonyms for stainless steel are: high-grade steel (Inox); V2A, V4A or non-rusting steel.

PROPERTIES

The chromium content of at least 10.5 % ensures that stainless steel is resistant to acids and rust. A protective layer of chromium oxide, also called a passive layer, is the reason for the material's corrosion resistance. By increasing the chromium content and other alloying elements, the corrosion resistance can be increased.

MACHINING STAINLESS STEEL MATERIALS ECONOMICALLY. WITH HIGH-PERFORMANCE TOOLS FROM MAYKESTAG!

For generations we have been involved in the development of mainly round shank tools for high-performance machining in steel, stainless steel, special alloys and non-ferrous metals, i.e. in addition to countersinking, reaming, various rotary burrs and a wide range of special tools, our focus is on shank cutting, drilling and threading. The above-average performance of our „speed tools" can be seen here as an absolute milestone in this development.

This range includes:

- The Speedcut HPC/MTC/HSC cutter series
- The Speedtwister STC Trochoidal cutter series
- The Turbo-Twister STC Allround series
- The Speeddrill drill bit series
- The Speedtap tap series

These tools are tested and used at their limits in our „speed centre" set up especially for trials.
In addition, our application engineers are ready to support you with your respective machining tasks.

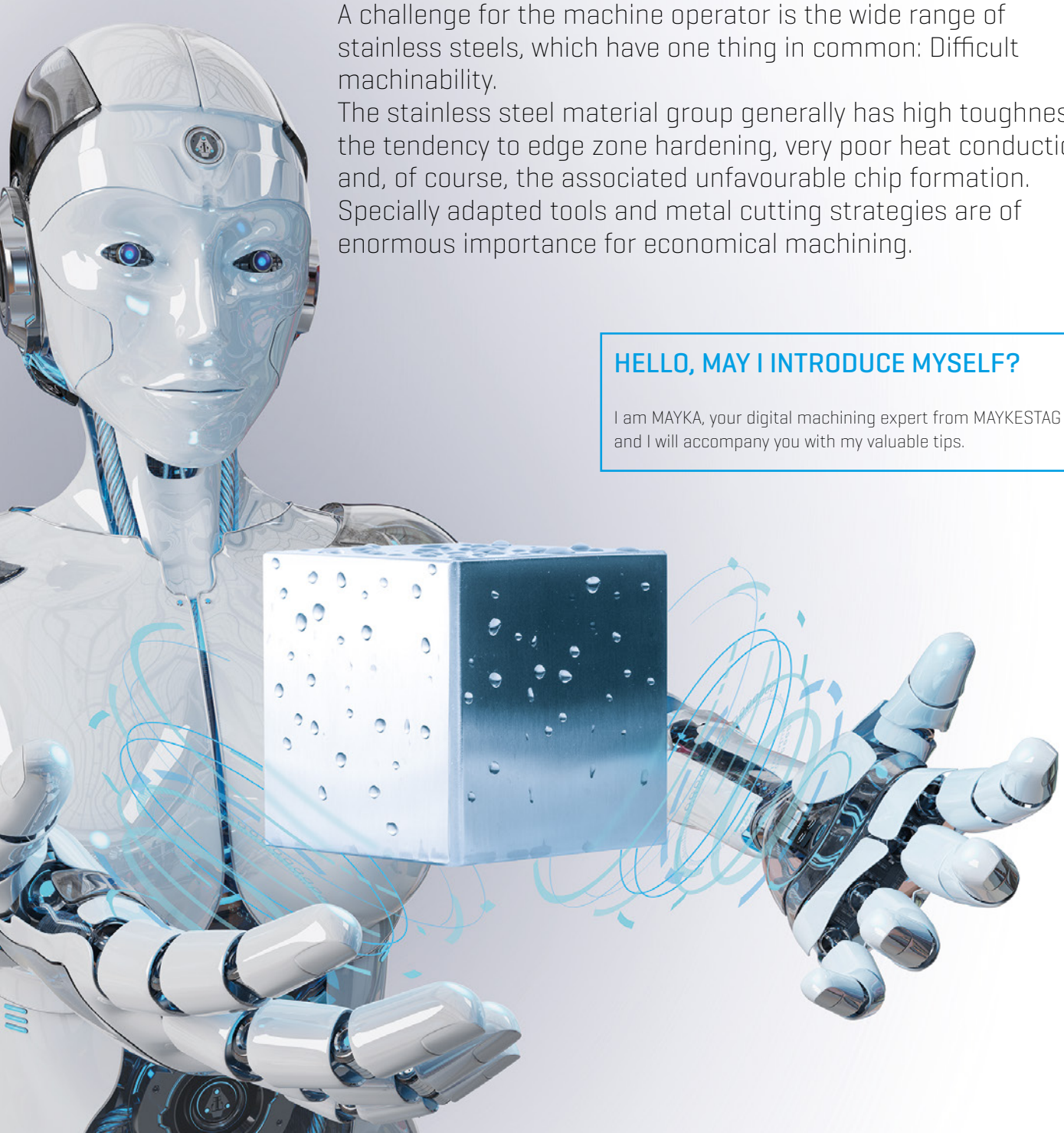
APPLICATIONS

Since stainless steels do not rust, they are very versatile: Examples of their uses are:

- Medical and pharmaceutical industry
- Aerospace
- Machinery and plant construction
- Food industry
- Shipbuilding
- Chemical industry
- Architecture
- And much more

MACHINABILITY

A challenge for the machine operator is the wide range of stainless steels, which have one thing in common: Difficult machinability.
The stainless steel material group generally has high toughness, the tendency to edge zone hardening, very poor heat conduction and, of course, the associated unfavourable chip formation. Specially adapted tools and metal cutting strategies are of enormous importance for economical machining.



HELLO, MAY I INTRODUCE MYSELF?

I am MAYKA, your digital machining expert from MAYKESTAG and I will accompany you with my valuable tips.

The material INOX

CLASSIFICATION OF STAINLESS STEELS

Depending on the chemical composition, stainless steels are divided into four groups, which relate to the mictrostructure:

Microstructure	Main alloying elements
Ferritic	Cr
Martensitic	Cr, C or Ni
Austenitic	Cr, Ni, Mo
Austenitic / Ferritic (Duplex)	Cr ↑, Ni ↓, Mo

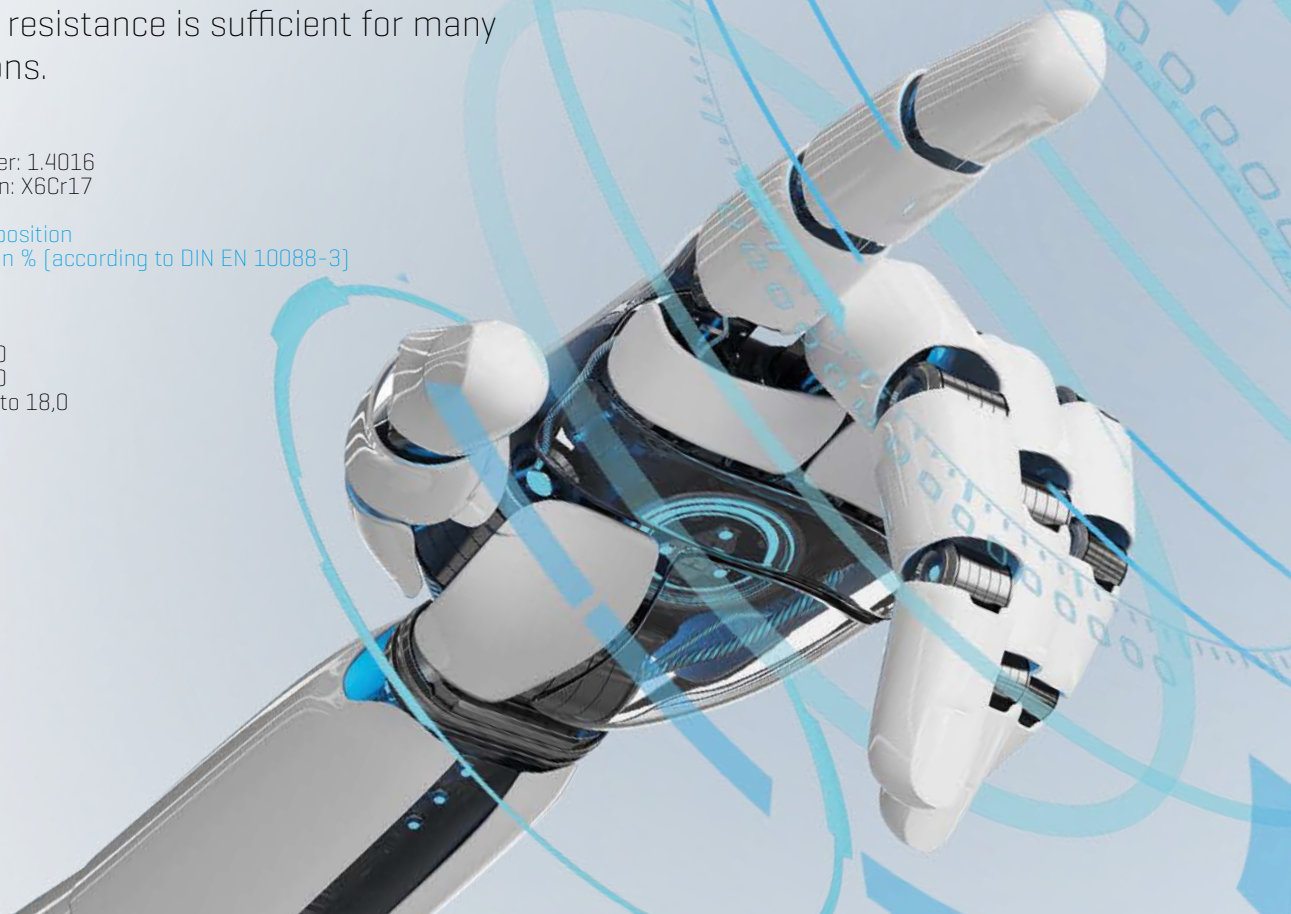
FERRITIC STEELS

Ferritic stainless steels consist essentially of iron and chromium. Ferritic stainless steels are mostly nickel-free and accordingly less corrosion resistant in reducing environments than grades that contain nickel. However, their corrosion resistance is sufficient for many applications.

Example:
Material number: 1.4016
DIN designation: X6Cr17

Chemical composition
in mass fraction % (according to DIN EN 10088-3)

C	0,08
Si	1,00
Mn	1,00
P	0,040
S	0,030
Cr	16,0 to 18,0



AUSTENITIC STEELS

The austenitic CrNi steels with ≥ 8 % Ni provide a particularly favourable combination of workability, mechanical properties and corrosion resistance. They are the universal materials for many applications and are therefore the most important group of stainless steels.

Example: Material number: 1.4301 DIN designation: X5CrNi 18-10

Chemical composition in mass fraction % (according to DIN EN 10088-3)

C	0,07
Si	1,00
Mn	2,00
P	0,045
S	0,030
Cr	17,5 to 19,5
Ni	8,0 to 10,5
N	0,10

MARTENSITIC STEELS

The biggest difference to the other groups is that, in addition to iron and chromium, they also contain carbon. This allows martensitic steels to be hardened by heat treatment. They are used wherever resistance to wear is required. However, the addition of carbon reduces the corrosion resistance.

Example: Material number: 1.4021 DIN designation: X20Cr13

Chemical composition in mass fraction % (according to DIN EN 10088-3)

C	0,16 to 0,25
Si	1,00
Mn	1,50
P	0,040
S	0,030
Cr	12,0 to 14,0

DUPLEX STEELS

DUPLEX steels have a two-phase structure - austenitic and ferritic. The properties are determined depending on the quantity ratio of the microstructure components.

Example: Material number: 1.4462 DIN designation: X2CrNiMoN22-5-3

Chemical composition in mass fraction %

C	0,03
Si	1,00
Mn	2,00
P	0,035
S	0,015
Cr	21,0 to 23,0
Mo	2,5 to 3,5
Ni	4,5 to 6,5
N	0,10 to 0,22

Milling in stainless steel

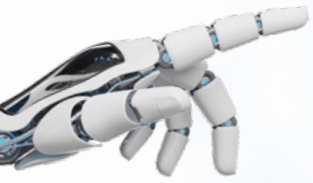
TOOL SELECTION CRITERIA

The choice of the right tool and the machining strategy depends mainly on the type and shape of the component to be machined, and subsequently also on the machine on which it is to be produced. The following criteria influence the machining strategy:

- Machine dynamics
- Spindle power
- Spindle speed range
- Possibility of internal cooling or MQL (Minimum quantity lubrication)
- Type of programming – CAM system

COOLING

The material properties such as poor heat conduction, high toughness and elongation at fracture as well as the tendency to hardening of the edge zones make sufficient and targeted cooling indispensable, and this also has a positive influence on chip removal.



MAYKAS TIP

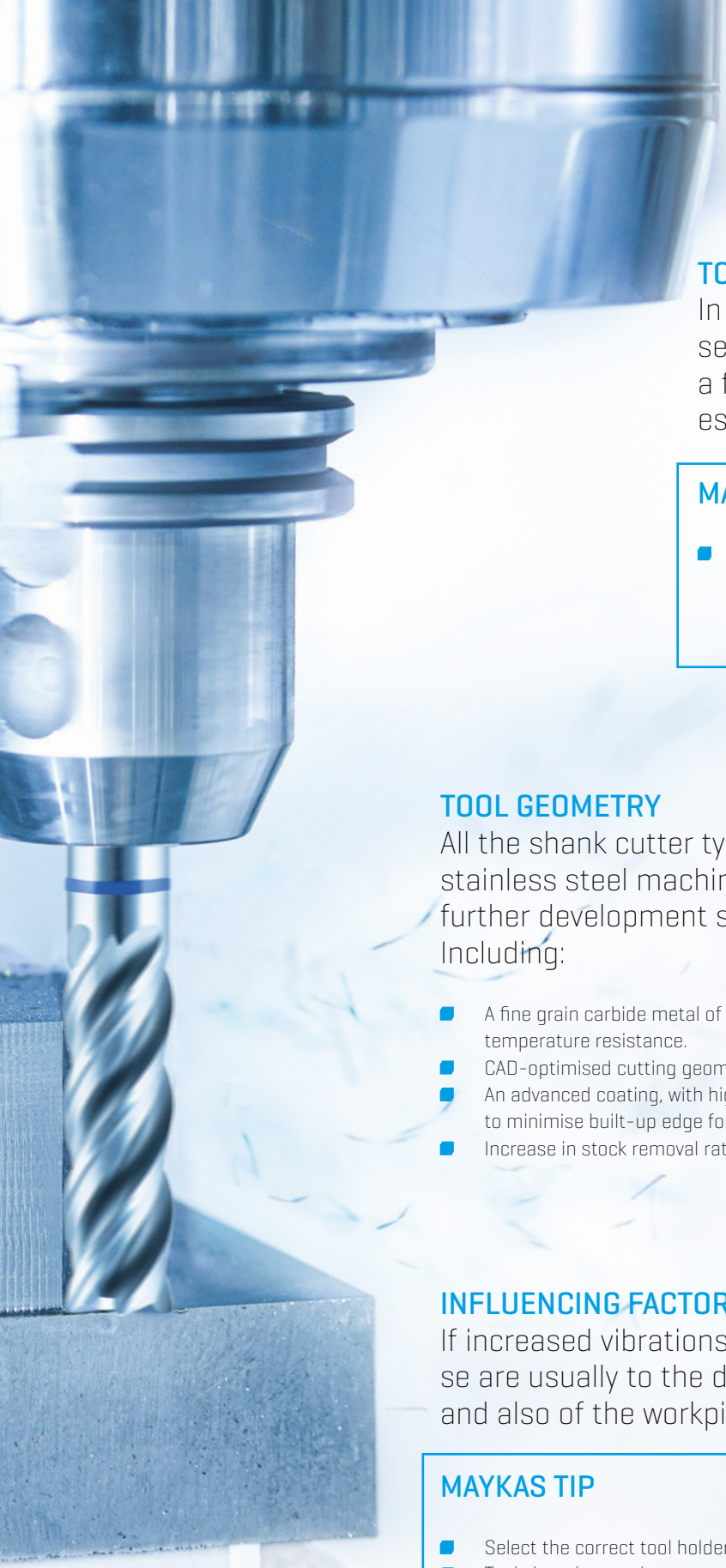
- When using tools with internal cooling, the coolant can be introduced directly into the cutting zone.
- As cooling lubricant we recommend high-performance cutting oils or emulsion with approx. 8 % oil content.

CHIPS

The high toughness and elasticity of stainless steel materials often results in unfavourable chip formation, which makes them prone to sticking. Controlled chip breaking coupled with optimum coolant-lubricant control is crucial for chip removal.

MAYKAS TIP

- Reduced cutting speeds and increased feed rates often have a positive effect on chip formation.
- Use shank cutters with internal cooling.



TOOL HOLDER

In order to achieve optimum process security when machining stainless steel, a finely tuned clamping system is essential.

MAYKAS TIP

- For both HPC roughing and trochoidal machining, we recommend holders with perfect frictional locking, such as Weldon holders or power chucks with mechanical pull-out protection!

TOOL GEOMETRY

All the shank cutter types listed are perfectly matched to stainless steel machining. The 4.0 series already includes further development steps.
Including:

- A fine grain carbide metal of the latest generation with focus on wear and temperature resistance.
- CAD-optimised cutting geometry for excellent smooth running and ease of cutting.
- An advanced coating, with high abrasive resistance and a very smooth surface structure to minimise built-up edge formation.
- Increase in stock removal rate and cutter service life.

INFLUENCING FACTORS

If increased vibrations occur in the machining process, these are usually to the detriment of the service life of the tool and also of the workpiece surface quality.

MAYKAS TIP

- Select the correct tool holder.
- Tool clamping as short as possible.
- Optimise workpiece clamping.
- Optimise cutting values in MaySpeedGuide NexGen.
- Use tools with small corner radius or corner protection chamfer.
- For machining centres: swivel the milling table for better axis load distribution (frequency shift).
- Optimise milling strategy.
- Pay attention to cooling lubricant control.

Milling in stainless steel

Speedcut 4.0

Product overview

Product	Code	Ø mm	Cutting length	Icons	Coating	T
	8167	1-20	3-38 long series, neck	45° · DIN 6535-HA · HPC+ · MTC	ULTRADUR	2
	8107	1-20	2,5-38 long series, neck	45° · DIN 6535-HB · HPC+ · MTC	ULTRADUR	3
	8117	1-20	3-60 XL, neck	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	3
	8697	3-20	5-26 short series	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8397	3-16	5-22 short series, neck	45° · DIN 6535-HA · HPC+ ·	ULTRADUR	4
	8497	3-16	5-22 short series, neck	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8557	6-20	13-38 long series	45° · DIN 6535-HA · HPC+ ·	ULTRADUR	4
	8567	6-20	13-38 long series	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8247	2-20	5-38 long series	45° · DIN 6535-HA · HPC+ ·	ULTRADUR	3-4
	8747	3-20	8-38 long series	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8587	6-20	13-38 long series, neck	45° · DIN 6535-HA · HPC+ ·	ULTRADUR	4
	8597	6-20	13-38 long series, neck	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8347	3-20	8-38 long series, neck	45° · DIN 6535-HA · HPC+ ·	ULTRADUR	4
	8447	3-20	8-38 long series, neck	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8267	5-20	13-38 XL, neck	45° · DIN 6535-HA · HPC+ ·	ULTRADUR	4
	8767	5-20	13-38 XL, neck	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8777	5-20	18-60 XL, neck	45° · DIN 6535-HB · HPC+ ·	ULTRADUR	4
	8647	2-20	5-38 long series, neck	R · DIN 6535-HA · HPC+ ·	ULTRADUR	3-4
	8177	2-20	4-26 short series	DIN 6535-HA · HPC+	ULTRADUR	4
	8187	2-20	4-26 XXL	DIN 6535-HA · HPC+	ULTRADUR	4

Speedcut

Product overview

Product	Code	Ø mm	Cutting length	Icons	Coating	T
	7397	3-16	5-22 short series, neck	45° · DIN 6535-HA · HPC · MTC	ALUNIT-S	4
	7497	3-16	5-22 short series, neck	45° · DIN 6535-HB · HPC · MTC	ALUNIT-S	4
	7247	2-20	5-38 long series	45° · DIN 6535-HA · HPC · MTC	ALUNIT-S	3-4
	7747	3-20	5-38 long series	45° · DIN 6535-HB · HPC · MTC	ALUNIT-S	4
	7347	3-20	8-38 long series, neck	45° · DIN 6535-HA · HPC · MTC	ALUNIT-S	4
	7447	3-20	8-38 long series, neck	45° · DIN 6535-HB · HPC · MTC	ALUNIT-S	4
	7267	5-20	13-38 XL, neck	45° · DIN 6535-HA · HPC · MTC	ALUNIT-S	4
	7767	5-20	13-38 XL, neck	45° · DIN 6535-HB · HPC · MTC	ALUNIT-S	4
	6547	2-20	5-38 long series, neck	R · DIN 6535-HA · HPC · MTC	ALUNIT-S	3-4

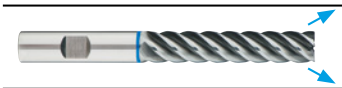
Turbo Twister

Product overview

Product	Code	Ø mm	Cutting length	Icons	Coating	T
	8002	3-20	7-42 short series	45° · DIN 6535-HB · STC+ · Q	SUPRADUR	5
	8003	3-20	10-62 long series	45° · DIN 6535-HB · STC+ · Q	SUPRADUR	5
	8004	6-20	26-82 XL	45° · DIN 6535-HB · STC+ · Q	SUPRADUR	5
	8005	6-20	32-102 XXL	45° · DIN 6535-HB · STC+ · Q	SUPRADUR	5

Speedtwister

Product overview

Product	Code	Ø mm	Cutting length	Icons	Coating	T
	6107	3-20	10-62 long series, neck	45° · DIN 6535-HB · STC · Q	ULTRADUR	5
	6197	6-16	32-82 XL	45° · DIN 6535-HB · STC · Q	ULTRADUR	5
	6198	6-16	32-82 XL	R · DIN 6535-HB · STC · Q	ULTRADUR	5

Drilling in stainless steel

TOOL SELECTION CRITERIA

The selection of the right tool is influenced by the following factors:

- Drilling depth
- Cooling (IC/MQL)
- Spindle power (machining centre / turning-milling machine)
- Coolant pressure or flow rate

COOLING

As with milling, the service life of the drilling tools is significantly reduced by the known material properties of stainless steel. Therefore, sufficient cooling directly at the cutting edge is also essential here.

MAYKAS TIP

- Use drilling tools with internal cooling.
- As cooling lubricant we recommend high-performance cutting oils or emulsion with approx. 8 % oil content.

CHIPS

The high toughness and elasticity of stainless steel materials means that unfavourable chip formation is also often encountered: these tend to stick and catch. Controlled chip breaking is often not possible or only possible with difficulty. Sufficient coolant pressure and cooling channel cross-section are crucial for heat and chip removal.

MAYKAS TIP

- Reduced cutting speeds and increased feed rates often have a positive effect on chip formation, as well as on heat dissipation via the chips.
- Use drill bits with stainless steel geometry and internal cooling.

TOOL HOLDER

Perfect concentricity (max. concentricity error <0.01mm) is important for process security when drilling in stainless steel materials

MAYKAS TIP

- Shrink fit toolholder / Hydraulic expansion holder / Power chuck

TOOL GEOMETRY

All „blue ring“ Speeddrill types are perfectly matched to stainless steel machining. The 4.0 series already includes further development steps.
Including:

- A fine grain carbide metal of the latest generation with focus on wear and temperature resistance.
- A CAD optimised primary cutting edge and flute geometry with excellent spot drilling properties.
- An advanced coating, with high abrasive resistance, a very smooth surface structure to minimise built-up edge formation.
- Significant increase in economic efficiency.

FACTORS INFLUENCING DRILLING OPERATIONS

MAYKAS TIP

- Select the correct tool holder with good concentricity <0.01mm.
- Optimise workpiece clamping and avoid vibrations.
- Optimise cutting values by using our MaySpeedGuide NexGen.
- Ensure sufficient coolant pressure.
- Only use sharp tools, blunt drill bits increase the hardening of the edge zones, which can lead to problems in any subsequent machining operations (reaming, threading, etc.).
- Avoid frequent chip removal, except for chip breaking.
- For drill bits >Ø12mm, clamping via the lateral driving surface (HB/HE) provides additional safety.

Speeddrill 4.0

Product overview

Product	Code	Ø mm	Cutting length	Icons	Coating	T
	6887	3-12	20-55 short series	3xd, DIN 6535-HA, HPC+, Q	NANODUR	2
	6897	3-12	28-71 long series	5xd, DIN 6535-HA, HPC+, Q	NANODUR	2

Speeddrill

Product overview

Product	Code	Ø mm	Cutting length	Icons	Coating	T
	6827	2-16	20-65 short series	3xd, DIN 6535-HA, HPC	ALUNIT-S	2
	6837	3-12,7	28-77 long series	5xd, DIN 6535-HA, HPC	ALUNIT-S	2

Threads in stainless steel

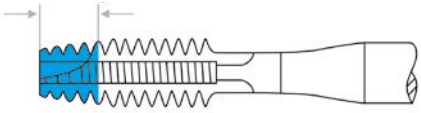
TOOL SELECTION CRITERIA

The selection of the right tool is influenced by the following factors:

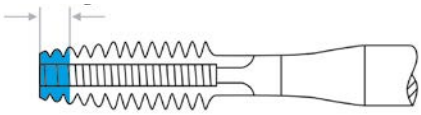
- Is the problem solved by tapping or thread forming?
- Thread type (blind thread / thread right through)
- Chamfer form (B / C / E)
- Thread depth

COMMON TAP CHAMFER FORMS FOR STAINLESS STEEL

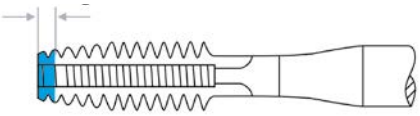
- B (3,5 – 5 Gg) for through hole taps with spiral point



- C (2 – 3 Gg) for blind taps (standard)



- E (1,5 – 2 Gg) for blind taps (short)



FACTORS INFLUENCING CHIP FORMATION

The main factors influencing the chip cross-section are the chamfer, length and the number of flutes or hob-blade inserts.
In relation to the shape of the chips, surface treatments, e.g. vaporising or coating, also play a significant role.

THREAD FORMING ADVANTAGES AND DISADVANTAGES

+ Chipless process therefore large thread depths possible.
+ Higher cutting speeds possible therefore shorter machining times.
+ Cold forming gives better surface quality.
+ Higher pull-out resistance.
+ Longer service lives in materials that are easy to form, such as stainless steel.
− Higher torque required.
− Incompletely formed thread core: due to the resulting indentation, cleaning is difficult, therefore not suitable for medical technology or food industry and automatic assembly systems.
− Tighter core hole tolerances required for optimal thread forming.

TOOL HOLDER

The collet chuck in combination with a suitable square collet, often with minimum length compensation, can be described as standard.

MAYKAS TIP

- When using highly twisted tools, we recommend rigid clamping without length compensation to avoid overlapping of the thread.

COOLING

Precise and efficient cooling is required especially for thread cutting in stainless steel. The oil content should be at least 5-6 % for tapping, whereas thread forming places significantly higher demands on the cooling lubricant. Oil content at least 8-10 %.

MAYKAS TIP

- When thread forming, make sure that the cutting oil is suitable for thread forming, in other words cold forming.
- Use taps and formers with internal cooling.

FACTORS INFLUENCING THREAD MACHINING

- **Core hole drilling:** This should be carried out precisely.
  Always use solid carbide drill bits with internal cooling (see Drilling).
- **Coating:** A coating with a low coefficient of friction helps towards optimum chip removal and at the same time counteracts built-up edge formation. In addition, the service life is significantly extended. Our TiN and TiCN coatings are particularly well suited for stainless steel materials.
- **Tolerances:** Due to the heat generated during thread production, sticking may occur.
  We therefore recommend „X" tolerances (HX, GX) for stainless steel materials.
- **Cutting speed:** a recommendation is good, but fine-tuning on the machine is best, as the cutting speed is very important for the chip pattern.
  This prevents chip wraps, which can obstruct the coolant and quickly lead to tool breakage.

MAYKAS TIP

- For deep threads (>2.5xD) it is advisable to cut the thread in two steps.
  Caution: only possible with synchronous spindle and rigid tension.

Threads in stainless steel

Speedtap 4.0

Product overview

Product	Code	Ø	Tapper lead form	Icons				Coating	T
	4618	M6-M20	B 3.5-5P	M	HSS E/PM	6HX		HARDDUR	3-4
	4608	M2-M30	B 3.5-5P	M	HSS E/PM	6HX		HARDDUR	3-4
	4628	M3-M20	B 3.5-5P	M	HSS E/PM	6GX		HARDDUR	3
	4648	M6-M20	C 2-3P	M	HSS E/PM	6HX		HARDDUR	3-4
	4638	M2-M30	C 2-3P	M	HSS E/PM	6HX		HARDDUR	3-4
	4668	M3-M20	E 1.5-2P	M	HSS E/PM	6HX		HARDDUR	3-4
	4658	M3-M20	C 2-3P	M	HSS E/PM	6GX		HARDDUR	3-4
	4609	MF8-MF20	B 3.5-5P	MF	HSS E/PM	6HX		HARDDUR	3-4
	4619	MF8-MF20	C 2-3P	MF	HSS E/PM	6HX		HARDDUR	3-5
	4772	G1/8-G1	B 3.5-5P	G	HSS E/PM			HARDDUR	3-4
	4782	G1/8-G1	C 2-3P	G	HSS E/PM			HARDDUR	3-5

Speedtap

Product overview

Product	Code	Ø	Tapper lead form	Icons				Coating	T
	4625/4635	M6-M20	B 3.5-5P	M	HSS E/PM 55	6HX		HARDDUR	3-4
	4605/4615	M2-M30	B 3.5-5P	M	HSS E/PM 55	6HX		HARDDUR	3-4
	4686/4696	M3-M20	B 3.5-5P	M	HSS E/PM 55	ISO 2 6H		TiCN	3
	4629/4639	M3-M20	B 3.5-5P	M	HSS E/PM 55	6GX		HARDDUR	3
	4685/4695	M6-M20	C 2-3P	M	HSS E/PM 55	6HX		HARDDUR	3-4
	4665/4675	M2-M30	C 2-3P	M	HSS E/PM 55	6HX		HARDDUR	3-4

Speedtap

Product overview

Product	Code	Ø	Tapper lead form		Icons			Coating	T
	4606/4616	M3-M20	E 1.5-2P	M	HSS E/PM 55	6HX		HARDDUR	3-4
	4627/4637	M6-M30	C 2-3P	M	HSS E/PM 55	ISO 2 6H		TiCN	3-4
	4649/4659	M3-M30	C 2-3P	M	HSS E/PM 55	ISO 2 6H		TiCN	3-4
	4626/4636	M3-M20	C 2-3P	M	HSS E/PM 55	6GX		HARDDUR	3-4
	4602	M2-M12	B 3.5-5P	M	HSS E/V3	ISO 2 6H		VAPO	2-3
	4622	M3-M10	B 3.5-5P	M	HSS E/V3	ISO 2 6H		TiN	3
	4642	M3-M10	B 3.5-5P	M	HSS E/V3	ISO 2 6H		TiCN	3
	4612	M3-M36	B 3.5-5P	M	HSS E/V3	ISO 2 6H		VAPO	3-4
	4632	M4-M30	B 3.5-5P	M	HSS E/V3	ISO 2 6H		TiN	3-4
	4652	M12-M36	B 3.5-5P	M	HSS E/V3	ISO 2 6H		TiCN	3-4
	4662/4672	M2-M20	B 3.5-5P	M	HSS E/V3	ISO 3 6G		VAPO	2-3
	4647	M2-M12	C 2-3P	M	HSS E/V3	ISO 2 6H		VAPO	2-4
	4604	M3-M10	C 2-3P	M	HSS E/V3	ISO 2 6H		TiN	3
	4624	M3-M10	C 2-3P	M	HSS E/V3	ISO 2 6H		TiCN	3
	4657	M3-M36	C 2-3P	M	HSS E/V3	ISO 2 6H		VAPO	3-5
	4614	M3-M20	C 2-3P	M	HSS E/V3	ISO 2 6H		TiN	3-4
	4634	M12-M36	C 2-3P	M	HSS E/V3	ISO 2 6H		TiCN	4-5
	4646/4656	M4-M20	C 2-3P	M	HSS E/V3	ISO 2 6H		VAPO	3-4
	4687/4697	M2-M30	C 2-3P	M	HSS E/V3	ISO 3 6G		VAPO	2-5
	4753	MF8-MF20	B 3.5-5P	MF	HSS E/PM 55	6HX		HARDDUR	3-4

Threads in stainless steel

Speedtap

Product overview

Product	Code	Ø	Tapper lead form	Icons				Coating	T
	4763	MF8-MF20	C 2-3 P	MF	HSS E/PM 55	6HX		HARDDUR	3-5
	4723	MF3-MF24	B 3.5-5 P	MF	HSS E/V3	ISO 2 6H		VAPO	3
	4733	MF3-MF30	C 2-3 P	MF	HSS E/V3	ISO 2 6H		VAPO	3-5
	4742	G1/8-G1	B 3.5-5 P	G	HSS E/PM 55			HARDDUR	3-4
	4752	G1/8-G1	C 2-3 P	G	HSS E/PM 55			HARDDUR	3-5
	4722	G1/8-G1	B 3.5-5 P	G	HSS E/V3			VAPO	3-4
	4732	G1/8-G1 1/2	C 2-3 P	G	HSS E/V3			VAPO	4-6

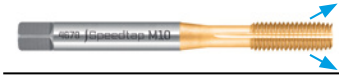
Machine taps

Product overview

Product	Code	Ø	Tapper lead form	Icons				Coating	T
	4801/4806	M3-M24	B 3.5-5 P	M	HSS Co5	ISO 2 6H		TiN	2
	4971/4976	M3-M30	C 2-3 P	M	HSS Co5	ISO 2 6H		TiN	2

Speedtap Rolling taps

Product overview

Product	Code	Ø	Tapper lead form	Icons				Coating	T
	4678/4688	M6-M16	C 2-3 P	M	HSS-E	6HX		TiN	5-7
	4644/4654	M2-M16	C 2-3 P	M	HSS-E	6HX		TiN	3-7
	4783	MF3-MF16	C 2-3 P	MF	HSS-E	6HX		TiN	3-6

Technical information

Coating	Layer	Colour	Preferably workable materials	Typical machining
ULTRADUR	Multiple-layer	Dark gray	Especially for stainless steels and high-strength materials	Milling
ALUNIT-S	Single-layer	Dark gray	Universal, for general steels, castings	Universal
SUPRADUR	Multiple-layer	Light gray	Universal, for tool steel, stainless steel, heat-resistant steels, titanium, cast iron, hard machining <52 HRC	Milling
NANODUR	Single-layer	Dark gray	Especially for stainless steels	Drilling
HARDDUR	Single-layer	Dark gray	Universal applications, difficult to machine materials	Tapping
TiCN	Single-layer	Blue gray	High and low-alloy steels, structural steels, high-strength materials, cast iron	Tapping
VAPO	-	Dark gray	Soft, ductile (tough) materials	Tapping
TiN	Single-layer	Golden yellow	Universal usable layer	Universal

Signs and symbols

Icon	Explanation
STC	Speed Trochoidal Cutting
STC+	STC with a longer tool life
HPC	High Performance Cutting
HPC+	HPC with a longer tool life
MTC	Multi Task Cutting
HSS-E	HSS with increased resistance to wear
HSS Co5	5% cobalt-alloyed high speed steel
HSS E/V3	Powder-metallurgical manufactured high speed steel with 3% vanadium
HSS E/PM 55	HSS PM steel with 5% vanadium and 5% cobalt

Icon	Explanation
Q	Very high cutting volume
45°	Corner version
3xd	Drilling depth
DIN 6535-HB	Shank form
M	Thread type
ISO 2 6H	Thread tolerance
B 3.5-5P	Taper lead form, taps
	Through hole
	Blind hole

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