

# STAINLESS STEELS



Threading up to  $3 \times D_1$

Works with Emulsion

h6 Tap shank



**THREADING**  
**TECHNOLOGY**

EN-ID-1016



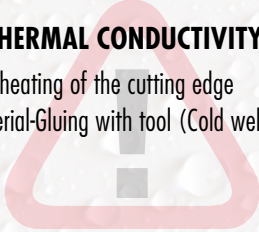
# THE CHALLENGE

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## WORKING WITH STAINLESS STEELS

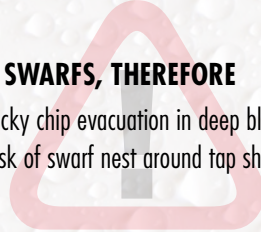
### POOR THERMAL CONDUCTIVITY, THEREFORE

- Overheating of the cutting edge
- Material-Gluing with tool (Cold welding)



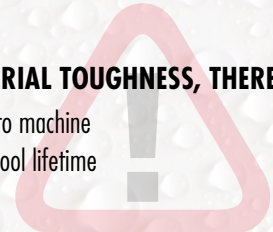
### LONG SWARFS, THEREFORE

- Tricky chip evacuation in deep blind holes
- Risk of swarf nest around tap shank



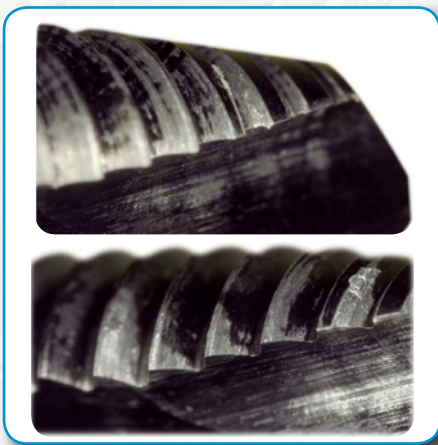
### HIGH MATERIAL TOUGHNESS, THEREFORE

- Difficult to machine
- Limited tool lifetime



# THE CONSEQUENCES

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**COLD WELDINGS**



**SWARF NESTS**

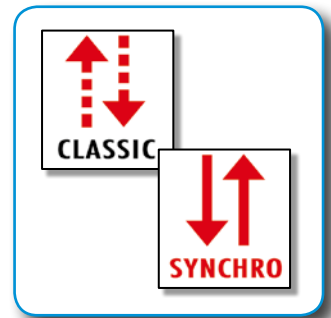
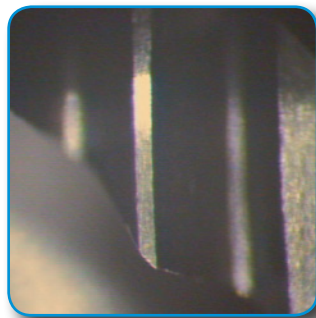


**DISSATISFIED CUSTOMER**

# THE SOLUTION

## DC SWISS Z-INOX THREAD CUTTING

# Z I I N O X



### PROPERTIES

The tap is made from HSSE-PM and is available with or without internal lubrication. The flutes are helical R 45, for tapping blind holes up to  $3 \times D_1$ , in Stainless and alloy steels with high elongation and tensile strength up to  $1'150 \text{ N/mm}^2$ .

### SUITABLE FOR SOLUBLE WATER

The VS surface coating provides protection against wear and cold welding. A high slip coefficient facilitates chip removal and reduces torque.

### PROCESS SAFETY UP TO $3 \times D_1$





The cutting geometry and shape of the R45 flutes generate compact, regular chips, ensuring process safety.

### IT'S YOUR CHOICE

The cutting geometry is suitable for classical tapping with a compensating spindle as well as for rigid tapping ( $h6$  shank for shrinking).
























# APPLICATION CHART

## Use

-  Optimal with cutting oil
-  Suitable with cutting oil
-  Optimal with emulsion
-  Suitable with emulsion




## Material classification


Material groups	Material designation	Hardness (HB)	Tensile strength Rm (N/mm <sup>2</sup> )	Elongation A (%)	Z. 70VS	Z. 73VS	Z. 20VS	Vc (m/min)
								
10 Steels	11 Free-cutting steels	< 200	< 700	< 10				
	12 Structural / cementation steels	< 200	< 700	< 30				
	13 Carbon steels	< 300	< 1000	< 20				
	14 Alloy steels < 850 N/mm <sup>2</sup>	< 250	< 850	< 30				
	15 Alloy steels hard. / temp. > 850 - < 1150 N/mm <sup>2</sup>	> 250	> 850	< 30				6 - 12
	16 High tensile alloy steels	> 250	> 850	< 12				
20 Stainless Steels	21 Free machining stainless steels	< 250	< 850	< 25				20 - 30
	22 Austenitic stainless steels	< 250	< 850	> 20				6 - 12
	23 Ferritic and martensitic < 850 N/mm <sup>2</sup>	< 250	< 850	> 20				6 - 12
	24 Ferritic and martens. > 850 - < 1150 N/mm <sup>2</sup>	> 250	> 850	> 15				4 - 8
30 Cast iron	31 Cast iron	< 250	< 850	< 10				
	32 Spheroidal graphite + malleable cast iron	< 250	< 850	> 10				
40 Titan	41 Pure titanium	< 250	< 850	> 20				
	42 Titanium alloys	> 250	> 850	< 20				
50 Nickel	51 Nickel alloys 1 < 850 N/mm <sup>2</sup>	< 250	< 850	> 25				6 - 12
	52 Nickel alloys 2 > 850 - < 1150 N/mm <sup>2</sup>	> 250	> 850	< 25				4 - 8
	53 Nickel alloys 3 > 1150 - ≤ 1600 N/mm <sup>2</sup>	> 340	> 1150	< 20				
60 Copper	61 Pure copper (electrolytic copper)	< 120	< 400	> 12				12 - 16
	62 Short chip brass, phosphor bronze, gun metal	< 200	< 700	< 12				
	63 Long chip brass	< 200	< 700	> 12				
70 Aluminium Magnesium	71 Al unalloyed	< 100	< 350	> 15				
	72 Al alloyed Si < 1.5 %	< 150	< 500	> 15				
	73 Al alloyed Si > 1.5 % - < 10 %	< 120	< 400	< 15				
	74 Al alloyed Si > 10 %, Mg-Alloys	< 120	< 400	< 10				

## Pictographs

**PM** HSSE-PM

**VS**  wear-protective coating

 45° right hand spiral flutes

**C**  2 - 3 chamfered threads, form C




## Reference: DIN

<b>15</b> Alloy steels hard./temp. > 850 - < 1150 N/mm <sup>2</sup> 1.3553 X82WMoCrV6-5-4 1.6580 30CrNiMo8 1.7220 34CrMo4 1.7225 42CrMo4 1.8507 34CrAlMo5	<b>21</b> Free machining stainless steels 1.4005 X12CrS13 1.4104 X14CrMoS17 1.4305 X10CrNiS18-9	<b>22</b> Austenitic stainless steels 1.4301 X5CrNi18-10 1.4406 X2CrNiMoN17-12-2 1.4435 X2CrNiMo18-14-3 1.4541 X6CrNiTi18-10 1.4571 X6CrNiMoTi17-12-2	<b>23</b> Ferritic and martensitic < 850 N/mm <sup>2</sup> 1.4112 X90CrMoV18 1.4540 X4CrNiCuNb16-4 1.4582 X4CrNiMoNb25-7 1.4762 X10CrAl24 1.4922 X20CrMo11-1
<b>24</b> Ferritic and martensitic > 850 - < 1150 N/mm <sup>2</sup> 1.4057 X17CrNi17-2 1.4125 X105CrMo17 1.4542 X5CrNiCuNb16-4 1.4548 X5CrNiCuNb17-4-4 1.4748 X85CrMoV18-2	<b>51</b> Nickel alloys 1 < 850 N/mm <sup>2</sup> 1.3912 Ni36 (Invar) 2.4360 NiCu30Fe (Monel 400) 2.4816 NiCr15Fe (Inconel 600) 1.4876 X10NiCrAlTi32-20	<b>52</b> Nickel alloys 2 > 850 - < 1150 N/mm <sup>2</sup> 2.4375 NiCu30Al (MonelK500) 2.4631 NiCr20TiAl (Nimonic 80) 2.4668 NiCr19NbMo (Inconel718)	<b>61</b> Pure copper (electrolytic copper) 2.0060 E-Cu57 (E-Cu)

## Reference: AISI/ASTM

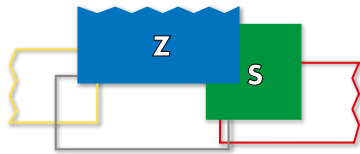
<b>15</b> Alloy steels hard./temp. > 850 - < 1150 N/mm <sup>2</sup> 1.3553 - 1.6580 4340 1.7220 4135 1.7225 4140 1.8507 A355CLD (K23510)	<b>21</b> Free machining stainless steels 1.4005 416 1.4104 430F 1.4305 303	<b>22</b> Austenitic stainless steels 1.4301 304 1.4406 316LN 1.4435 316L 1.4541 321 1.4571 316Ti	<b>23</b> Ferritic and martensitic < 850 N/mm <sup>2</sup> 1.4112 440B 1.4540 XM12 (15-5PH) 1.4582 - 1.4762 446 1.4821 4922
<b>24</b> Ferritic and martensitic > 850 - < 1150 N/mm <sup>2</sup> 1.4057 431 1.4125 440C 1.4542 630 (17-4PH) 1.4748 -	<b>51</b> Nickel alloys 1 < 850 N/mm <sup>2</sup> 1.3912 K93600 2.4360 N04400 1.4816 N08800	<b>52</b> Nickel alloys 2 > 850 - < 1150 N/mm <sup>2</sup> 2.4375 N05500 (B865) 2.4631 N07080 (B637) 2.4668 N07718 (B637)	<b>61</b> Pure copper (electrolytic copper) 2.0060 C11000

**6HX** Tolerance class 6HX

 Blind hole < 3 x D<sub>r</sub>, long chipping materials

 For Classic Tapping

 For Rigid Tapping



**Z362VS-3**

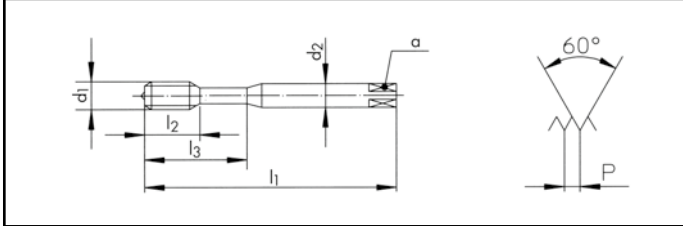
**Z370VS-3**

**Z373VS-3**

Z362VS-3	Z370VS-3	Z370VS-3	Z373VS-3
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< 2.5 x D	< 3 x D	< 3 x D	< 3 x D
	<b>PM</b>	<b>PM</b>	<b>PM</b>



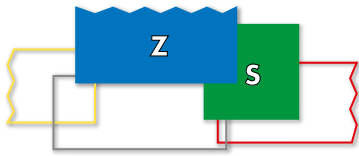
2.5 x P	2.5 x P	2.5 x P	2.5 x P
<b>6HX</b>	<b>6HX</b>	<b>4HX</b>	<b>6HX</b>

∅ d <sub>1</sub> M	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> mm	α mm			ID
*3	0.50	56	5.5	18	3.5	2.7	3	2.50	111504
4	0.70	63	7.5	21	4.5	3.4	3	3.30	111505
5	0.80	70	9.0	25	6.0	4.9	3	4.20	111506
6	1.00	80	11.0	30	6.0	4.9	3	5.00	111507
8	1.25	90	12.5	35	8.0	6.2	3	6.80	111508
10	1.50	100	14.0	39	10.0	8.0	3	8.50	111509

\* Z360VS-3

∅ d <sub>1</sub> M	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> h <sub>6</sub> mm	α mm			ID	ID	ID
3	0.50	56	5.5	18	3.5(h9)	2.7	3	2.50	162776	165324	165236
4	0.70	63	7.5	21	4.5(h9)	3.4	3	3.30	162777	165325	165237
5	0.80	70	9.0	25	6.0	4.9	3	4.20	162778	165326	165238
6	1.00	80	11.0	30	6.0	4.9	3	5.00	162779	165327	165239
8	1.25	90	12.5	35	8.0	6.2	3	6.80	162780	165328	165240
10	1.50	100	14.0	39	10.0	8.0	3	8.50	162781	165438	165241

**4HX** = = 6.70



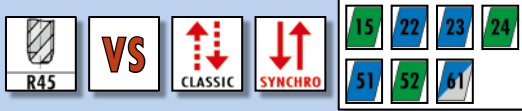
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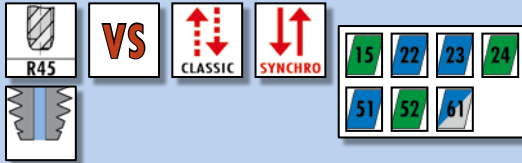
Z462VS-3



Z470VS-3



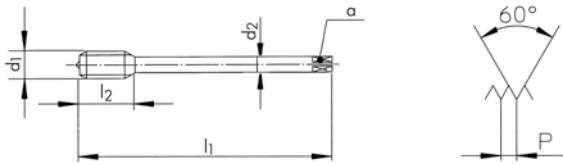
Z473VS-3





PM    PM





6HX    6HX    6HX



∅ d <sub>1</sub> M	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> mm	a mm		
12	1.75	110	14.0	9.0	7.0	4	10.20
16	2.00	110	18.0	12.0	9.0	4	14.00
20	2.50	140	24.0	16.0	12.0	4	17.50

ID

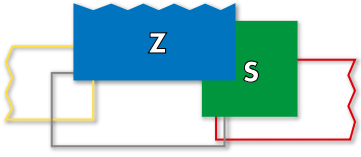








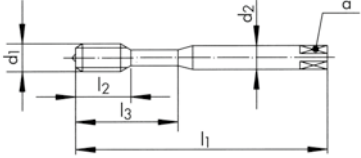





111510  
111511  
111512

∅ d <sub>1</sub> M	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> h6 mm	a mm		
12	1.75	110	14.0	*10.0	*8.0	4	10.20
14	2.00	110	14.0	*12.0	*9.0	4	12.00
16	2.00	110	18.0	12.0	9.0	4	14.00
18	2.50	125	21.0	14.0	11.0	4	15.50
20	2.50	140	24.0	16.0	12.0	4	17.50
22	2.50	140	24.0	16.0	12.0	4	19.50
24	3.00	160	27.0	16.0	12.0	4	21.00

ID    ID

162782    165242  
162783    165243  
162784    165244  
170643  
162785    165234  
175190  
162786    165235

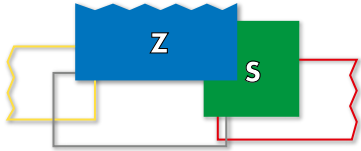
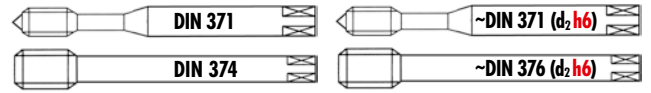
\* DC Norm

		Z320VS-4		Z420VS-4						
										
Z320VS-4			<b>VS</b>							
Z420VS-4			<b>VS</b>							
										
										
					<b>PM</b>	<b>PM</b>				
 										
					<b>ISO 2 6H</b>	<b>ISO 2 6H</b>				
$\varnothing d_1$	<b>P</b>	$l_1$	$l_2$	$l_3$	$d_2$	$a$			<b>ID</b>	<b>ID</b>
<b>M</b>	mm	mm	mm	mm	mm	mm				
2.5	0.45	50	10.0		2.8	2.1	3	2.05	<b>143683</b>	
3	0.50	56	12.0	18	3.5	2.7	3	2.50	<b>104830</b>	
4	0.70	63	14.0	21	4.5	3.4	3	3.30	<b>104831</b>	
5	0.80	70	15.0	25	6.0	4.9	3	4.20	<b>104832</b>	
6	1.00	80	17.0	30	6.0	4.9	3	5.00	<b>104833</b>	
8	1.25	90	20.0	35	8.0	6.2	3	6.80	<b>104834</b>	
10	1.50	100	22.0	39	10.0	8.0	3	8.50	<b>104835</b>	
12	1.75	110	24.0		9.0	7.0	3	10.20		<b>104836</b>
14	2.00	110	28.0		11.0	9.0	3	12.00		<b>143684</b>
16	2.00	110	30.0		12.0	9.0	3	14.00		<b>111569</b>
20	2.50	140	36.0		16.0	12.0	4	17.50		<b>111570</b>



# MF ISO DIN 13

PM

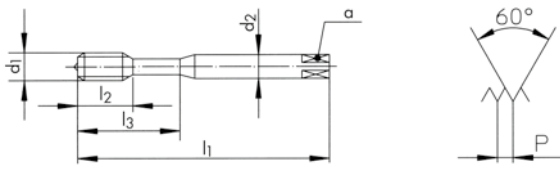


Z320VS-4	Z420VS-4	Z370VS-3	Z470VS-3
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Z320VS-4		
Z420VS-4		
Z370VS-3		
Z470VS-3		

<b>PM</b>	<b>PM</b>	<b>PM</b>	<b>PM</b>



<b>ISO 2 6H</b>	<b>ISO 2 6H</b>	<b>6HX</b>	<b>6HX</b>

∅ d <sub>1</sub> MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> mm	a mm		
8	1.00	90	20.0	35	8.0	6.2	3	7.00
10	1.00	100	22.0	39	10.0	8.0	3	9.00
12	1.50	100	24.0		9.0	7.0	3	10.50
14	1.50	100	24.0		11.0	9.0	3	12.50
16	1.50	100	26.0		12.0	9.0	3	14.50

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120060	
	120421
	120688
	120878

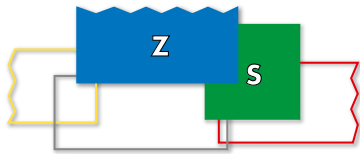
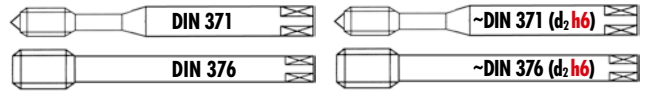
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6	0.75	80	11.0	30	6.0	4.9	3	5.25
8	1.00	90	12.5	35	8.0	6.2	3	7.00
10	1.00	100	14.0	39	10.0	8.0	3	9.00
12	1.50	110	14.0		*10.0	*8.0	4	10.50
14	1.50	110	14.0		*12.0	*9.0	4	12.50
16	1.50	110	18.0		12.0	9.0	4	14.50

ID	ID
	166117
	166118
	166119
	166120
	166121
	166122

\* DC Norm

# UNC ANSI B1.1

PM



Z320VS-4    Z420VS-4    Z370VS-3    Z470VS-3

Z320VS-4



VS



Z420VS-4



VS



Z370VS-3



VS



Z470VS-3



VS



PM



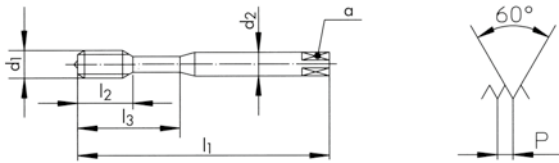
PM



PM



PM



2B



2B



2BX



2BX

Ø" d <sub>1</sub> UNC	P TPI	d <sub>1</sub> mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> mm	a mm		
6	32	3.50	56	13.0	20	4.0	3.0	3	2.75
8	32	4.16	63	14.0	21	4.5	3.4	3	3.40
10	24	4.82	70	15.0	25	6.0	4.9	3	3.80
1/4	20	6.35	80	17.0	30	7.0	5.5	3	5.10
5/16	18	7.93	90	20.0	35	8.0	6.2	3	6.50
3/8	16	9.52	100	22.0	39	10.0	8.0	3	8.00
1/2	13	12.70	110	24.0		9.0	7.0	3	10.80
5/8	11	15.87	110	30.0		12.0	9.0	3	13.60
3/4	10	19.05	125	33.0		14.0	11.0	4	16.60

ID	ID
111560	
111561	
111562	
111563	
111564	
111565	
	111566
	111567
	111568

Ø" d <sub>1</sub> UNC	P TPI	d <sub>1</sub> mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> h <sub>6</sub> mm	a mm		
6	32	3.50	56	6.5	20	4.0(h9)	3.0	3	2.75
8	32	4.16	63	7.5	21	4.5(h9)	3.4	3	3.40
10	24	4.82	70	9.0	25	6.0	4.9	3	3.80
1/4	20	6.35	80	11.0	30	*6.0	*4.9	3	5.10
5/16	18	7.93	90	12.5	35	8.0	6.2	3	6.50
3/8	16	9.52	100	14.0	39	10.0	8.0	3	8.00
7/16	14	11.11	100	14.0		8.0	6.2	3	9.30
1/2	13	12.70	110	14.0		*10.0	*8.0	4	10.80
5/8	11	15.87	110	18.0		12.0	9.0	4	13.60
3/4	10	19.05	125	21.0		14.0	11.0	4	16.60
1	8	25.40	160	27.0		16.0	12.0	4	22.30

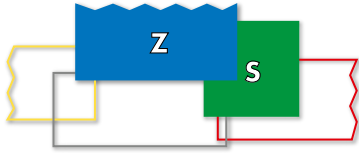
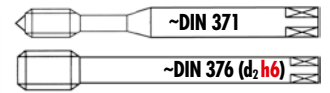
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	166128
	166129
	166130
	166131
	166132
	175703

\* DC Norm

**3B**  
UNC(J) See DC Main Catalogue

# UNF ANSI B1.1

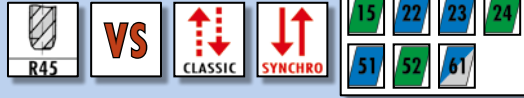
PM



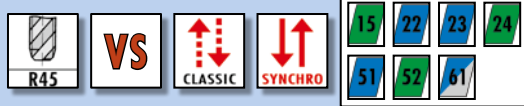
Z370VS-3

Z470VS-3

Z370VS-3



Z470VS-3



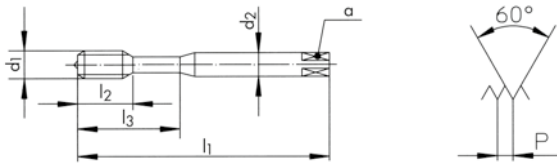
PM

PM



2BX

2BX



Ø" d <sub>1</sub> UNF	P TPI	d <sub>1</sub> mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> h <sub>6</sub> mm	α mm		
10	32	4.82	70	9.0	25	6.0	4.9	3	4.05
1/4	28	6.35	80	11.0	30	*6.0	*4.9	3	5.50
5/16	24	7.93	90	12.5	35	8.0	6.2	3	6.90
3/8	24	9.52	100	14.0	39	10.0	8.0	3	8.50
7/16	20	11.11	100	14.0		8.0	6.2	3	9.80
1/2	20	12.70	110	14.0		*10.0	*8.0	4	11.40

\* DC Norm

ID

ID

166136

166135

166134

166133

166138

166137

3B  
UNF(J)

Ø" d <sub>1</sub> UNF	P TPI	d <sub>1</sub> mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> h <sub>6</sub> mm	α mm		
10	32	4.82	70	9.0	25	6.0	4.9	3	4.15
1/4	28	6.35	80	11.0	30	*6.0	*4.9	3	5.55
5/16	24	7.93	90	12.5	35	8.0	6.2	3	7.00
3/8	24	9.52	100	14.0	39	10.0	8.0	3	8.60

\* DC Norm

ID

165121

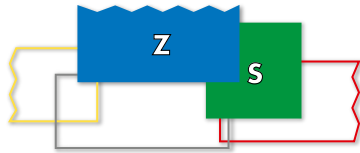
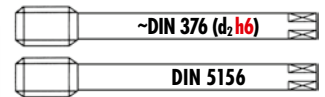
165122

165123

165124

# G DIN ISO 228 (BSP)

PM



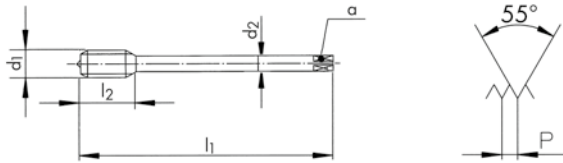
Z420VS-3

Z470VS-4

Z420VS-4



Z470VS-3



$\varnothing'' d_1$ G	P TPI	$d_1$ mm	$l_1$ mm	$l_2$ mm	$d_2$ mm	$\alpha$ mm			ID
1/8	28	9.72	90	22.0	7.0	5.5	3	8.75	142800
1/4	19	13.15	100	20.0	11.0	9.0	3	11.60	119303
3/8	19	16.66	100	20.0	12.0	9.0	3	15.20	142802
1/2	14	20.95	125	22.0	16.0	12.0	4	18.90	142803

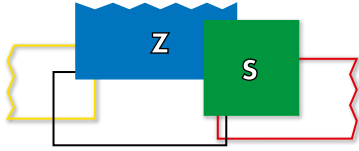
$\varnothing'' d_1$ G	P TPI	$d_1$ mm	$l_1$ mm	$l_2$ mm	$d_2 h6$ mm	$\alpha$ mm			ID
1/8	28	9.72	100	14.0	*8.0	*6.2	3	8.75	165198
1/4	19	13.15	110	14.0	*12.0	*9.0	4	11.60	165199
3/8	19	16.66	110	18.0	12.0	9.0	4	15.20	165200
1/2	14	20.95	125	20.0	16.0	12.0	4	18.90	165201

\* DC Norm



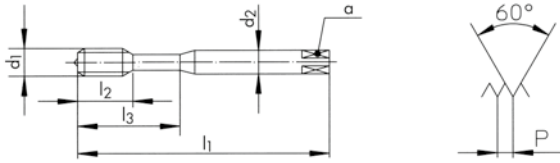
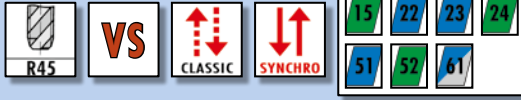
# EG UNC/UNF NASM33537

EG-STI



Z370VS-3

Z370VS-3



Ø" d <sub>1</sub> EG UNC	P TPI	d <sub>1</sub> mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> h6 mm	a mm			ID
4	40	3.67	56	6.5	20	4.0 (h9)	3.0	3	3.05	165126
6	32	4.53	70	9.0	25	6.0	4.9	3	3.75	165127
8	32	5.19	70	9.0	25	6.0	4.9	3	4.45	165128

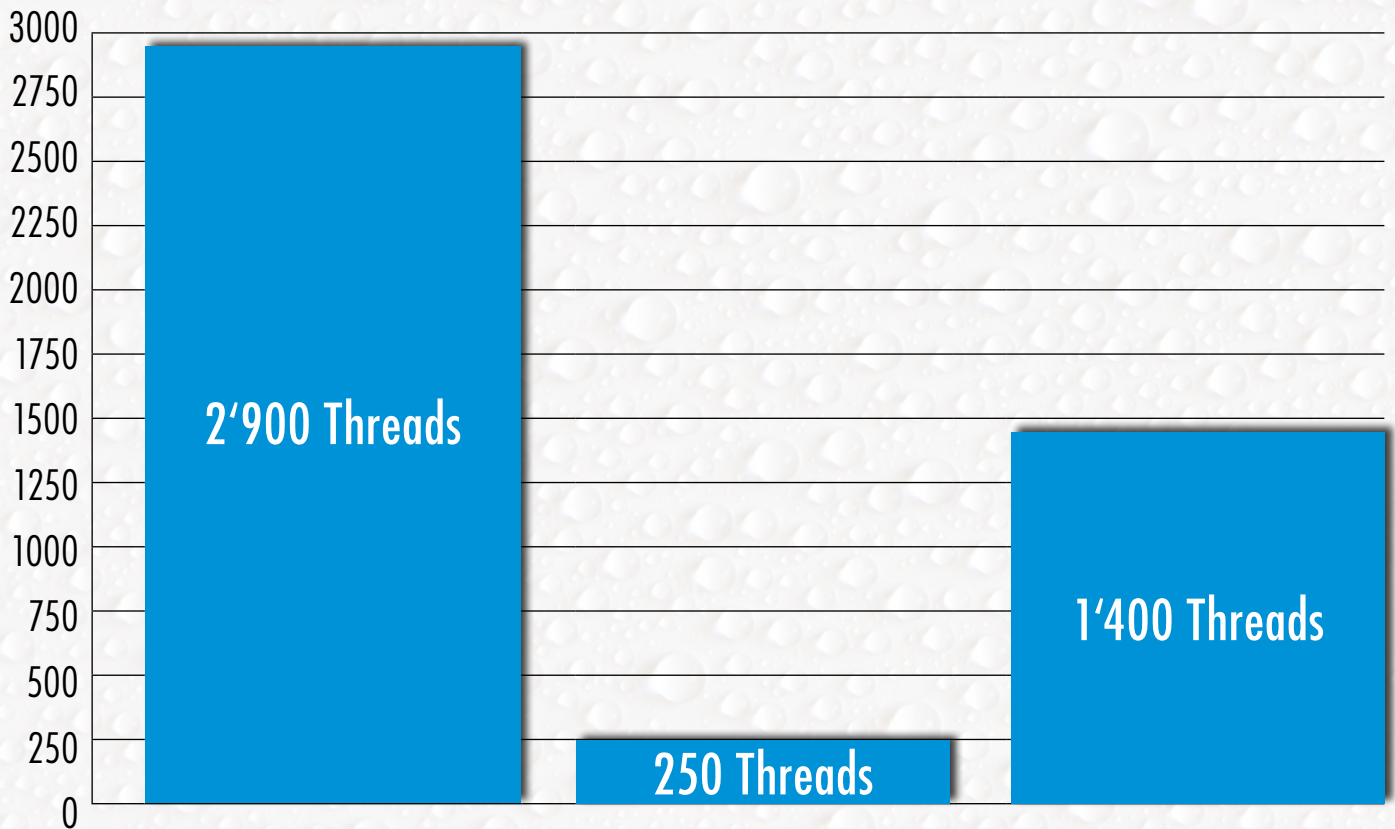
Ø" d <sub>1</sub> EG UNF	P TPI	d <sub>1</sub> mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> h6 mm	a mm			ID
10	32	5.85	80	11.0	30	6.0	4.9	3	5.10	165129
1/4	28	7.52	90	12.5	35	8.0	6.2	3	6.65	165130
5/16	24	9.31	90	12.5	35	*8.0	*6.2	3	8.20	165131

\* DC Norm

# APPLICATION 1

**Material:** Austenitic stainless steel  
**DIN:** 1.4301/AISI 304  
**Tensile strength:** 500 - 700 N/mm<sup>2</sup>  
**Blind hole:** M10 6H  
**Threading depth:** 20 mm

**Working method:** Rigid Tapping  
**Lubricant:** Cutting oil



**FAS381VS-3**

Vc = 12 m/min  
Thread Forming  
VS-Coated

**Z362V-3**

Vc = 3 m/min  
Thread Cutting  
V-Surface treated

**Z370VS-3**

Vc = 10 m/min  
Thread Cutting  
VS-Coated

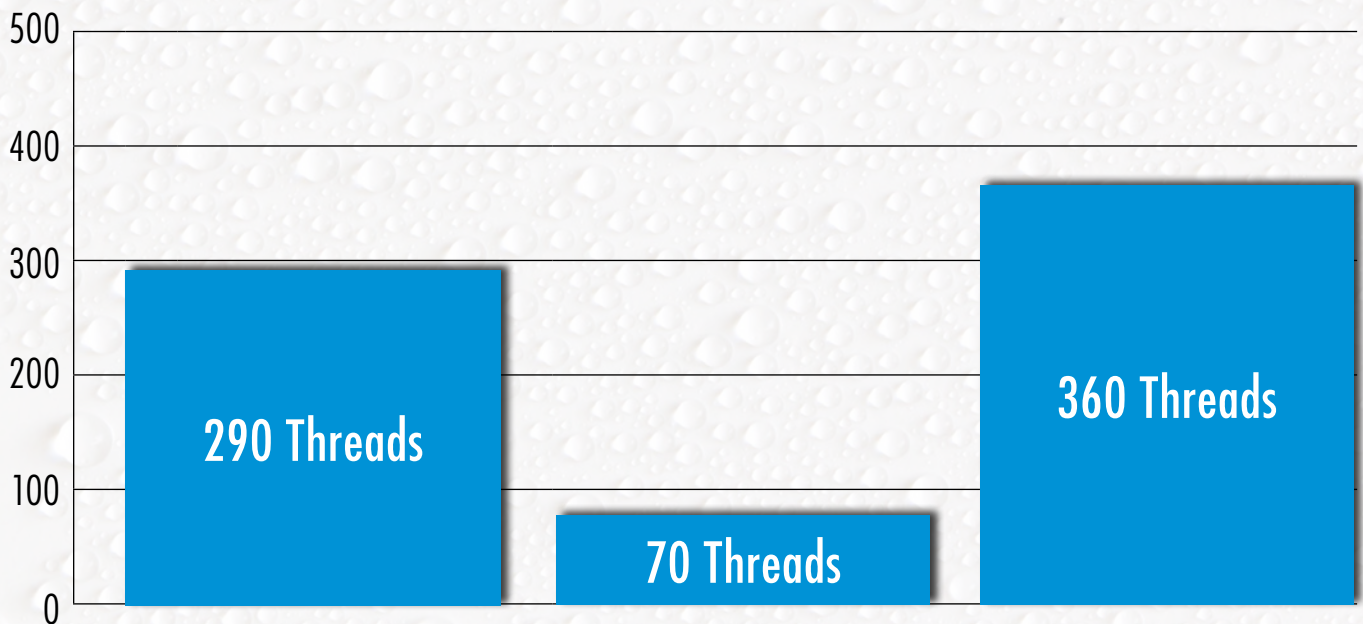




# APPLICATION 2

**Material:** Austenitic stainless steel  
**DIN:** 1.4301/AISI 304  
**Tensile strength:** 500 - 700 N/mm<sup>2</sup>  
**Blind hole:** M10 6H  
**Threading depth:** 20 mm

**Working method:** Rigid Tapping  
**Lubricant:** Emulsion 8 - 10%



### FAS381VS-3

Vc = 12 m/min  
Thread Forming  
VS-Coated

### Z362V-3

Vc = 3 m/min  
Thread Cutting  
V-Surface treated

### Z370VS-3

Vc = 8 m/min  
Thread Cutting  
VS-Coated





« **THREAD CUTTING IS OFTEN THE LAST OPERATION ON THE WORKPIECE. PROCESS SECURITY IS THEREFORE MANDATORY. DC SWISS CAN OFFER US THE REQUIRED RELIABILITY, EVEN IN TOUGH MATERIALS.** »

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**THREADING  
TECHNOLOGY**

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