

# SSEH Series

Radius Endmill for Exotic Alloys



# SSEH Series



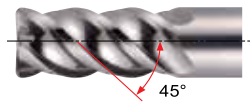
## General Features

- Radius endmill for exotic alloys
- Titanium alloy and heat resistant alloy can be machined easily
- Large helix angle (45 degrees)
- Adhesion is reduced by special coating with almost mirror like surface
- The hard substrate and improved coating hardness enable higher tool life
- New radius endmill SSEHVL anti-vibration type achieves more stable machining

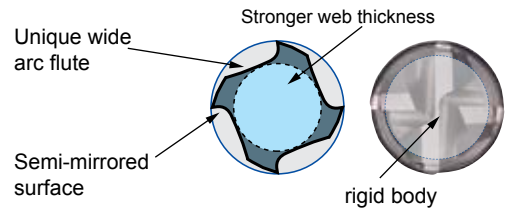
## Characteristics

- **Excellent Cutting Performance and Chip Evacuation**  
Large Helix angle (45 degrees) is used to improve cutting performance while providing smooth and steady chip evacuation.

Large helix angle



- **High Tool Rigidity**  
The optimized web thickness and the shape and size of the flute provide tool rigidity and excellent chip evacuation.



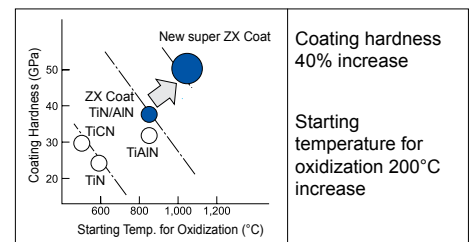
- **Improved Adhesion Resistance**  
The semi-mirrored surface and the advanced coating technology improve adhesion resistance and wear resistance.

- **Improved Fracture Resistance**  
Smooth radius shape mitigates cutting impact and improves fracture resistance.

Smooth radius shape



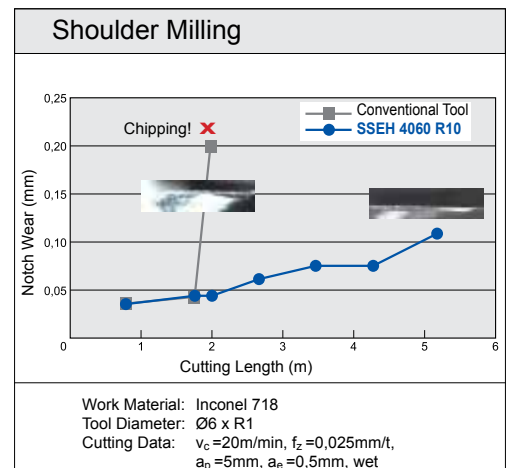
- **Adoption of New Coating**  
Ultra-smooth coating with significantly improved coating hardness and heat resistance improve tool life in heat resistant alloy machining.



## Series Selection Guide

Design	No. of Teeth	Diameter ØD <sub>c</sub> (Min~Max)	Cat. No.	Grade	Coating	Appearance
Standard	4	Ø4,5 ~ Ø16	SSEH 4000W R	Coated Carbide	ACW	
		Ø4,5 ~ Ø16	SSEH 4000 R	Carbide		
Anti-vibration	4	Ø4,5 ~ Ø16	SSEHVL 4000W R	Coated Carbide	ACW	
		Ø4,5 ~ Ø16	SSEHVL 4000 R	Carbide		

## Application Example



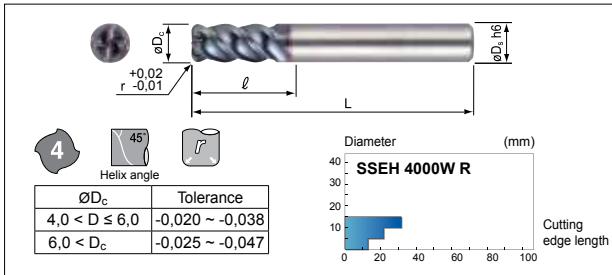
# SSEH Standard Type

## Endmill Identification

**SSEH**      **4**      **045**      **W**      **R05**  
 Series      No. of      Diameter      Coated      Corner  
 Code      Teeth                     Radius

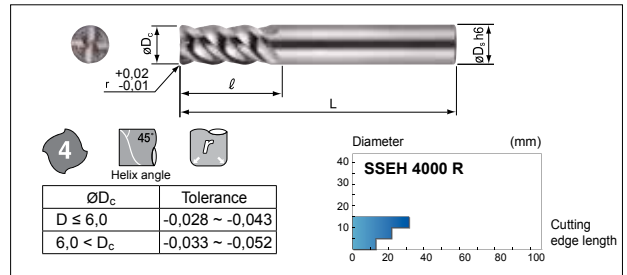
## SSEH 4000W R (Coated)

General Steel	Carbon Steel	Alloyed Steel	Prehardened Steel	Tempered St. Die Steel	Hardened Steel	Stainless Steel	Ti Alloy Heat Resist. Alloy	Cast Iron	Al Alloy	Copper Alloy	Graphite
○	○	○	○	○	45-55 HRC	55-60 HRC	60-65 HRC	●	○	○	○
					○ Good      ● Best						



## SSEH 4000 R (Uncoated)

General Steel	Carbon Steel	Alloyed Steel	Prehardened Steel	Tempered St. Die Steel	Hardened Steel	Stainless Steel	Ti Alloy Heat Resist. Alloy	Cast Iron	Al Alloy	Copper Alloy	Graphite
○	○	○	○	○	45-55 HRC	55-60 HRC	60-65 HRC	○	○	○	○
					○ Good      ● Best						



## Body

Cat. No.	Stock	$\phi D_c$	$r$	$\ell$	$L$	$\phi D_s$
SSEH 4045W R05	●	4,5	0,5	12	50	6
SSEH 4045W R10	●	4,5	1,0	12	50	6
SSEH 4050W R05	●	5,0	0,5	13	60	6
SSEH 4050W R10	●	5,0	1,0	13	60	6
SSEH 4060W R10	●	6,0	1,0	13	60	6
SSEH 4080W R10	●	8,0	1,0	19	80	8
SSEH 4100W R10	●	10,0	1,0	22	90	10
SSEH 4100W R30	●	10,0	3,0	22	90	10
SSEH 4120W R10	●	12,0	1,0	26	90	12
SSEH 4120W R30	●	12,0	3,0	26	90	12
SSEH 4160W R10	●	16,0	1,0	32	115	16
SSEH 4160W R30	●	16,0	3,0	32	115	16

● Euro stock      Grade: ACW52

## Body

Cat. No.	Stock	$\phi D_c$	$r$	$\ell$	$L$	$\phi D_s$
SSEH 4045 R05	●	4,5	0,5	12	50	6
SSEH 4045 R10	●	4,5	1,0	12	50	6
SSEH 4050 R05	●	5,0	0,5	13	60	6
SSEH 4050 R10	●	5,0	1,0	13	60	6
SSEH 4060 R10	●	6,0	1,0	13	60	6
SSEH 4080 R10	●	8,0	1,0	19	80	8
SSEH 4100 R10	●	10,0	1,0	22	90	10
SSEH 4100 R30	●	10,0	3,0	22	90	10
SSEH 4120 R10	●	12,0	1,0	26	90	12
SSEH 4120 R30	●	12,0	3,0	26	90	12
SSEH 4160 R10	●	16,0	1,0	32	115	16
SSEH 4160 R30	●	16,0	3,0	32	115	16

● Euro stock      Grade: EH520

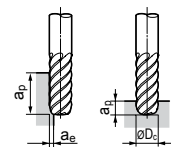
## Recommended Cutting Conditions

For stable machining, a high rigidity machine is recommended. Wet machining is recommended for stainless steel and heat resistant alloy applications. If cutting noise and vibration occur modify the cutting conditions accordingly.

## Possible Diameter and Corner Radius Combination

$D_c$	$r 0,5$	$r 1,0$	$r 3,0$
4,5	●	●	
5,0	●	●	
6,0		●	
8,0		●	
10,0		●	●
12,0		●	●
16,0		●	●

● Euro stock



## Shoulder Milling

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	3.500	350	3.500	280	2.100	170
5,0	3.200	380	3.200	320	1.900	190
6,0	2.700	430	2.700	320	1.600	190
8,0	2.000	400	2.000	280	1.200	170
10,0	1.600	380	1.600	260	1.000	160
12,0	1.300	360	1.300	230	800	140
16,0	1.000	320	1.000	200	600	120
Depth of cut $a_p$	$1,5D_c$		$1,5D_c$		$1,5D_c$	
$a_e$	$0,1D_c$		$0,05D_c$		$0,05D_c$	

## Shoulder Milling

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	1.800	90	3.500	280	1.400	110
5,0	1.600	100	3.200	320	1.300	130
6,0	1.300	100	2.700	320	1.100	130
8,0	1.000	100	2.000	280	800	110
10,0	800	100	1.600	260	600	100
12,0	700	100	1.300	230	500	90
16,0	500	80	1.000	200	400	80
Depth of cut $a_p$	$1,5D_c$		$1,5D_c$		$1,5D_c$	
$a_e$	$0,1D_c$		$0,05D_c$		$0,05D_c$	

## Grooving

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	2.800	140	2.500	200	1.300	100
5,0	2.500	150	2.200	220	1.100	110
6,0	2.100	170	1.900	230	1.000	120
8,0	1.600	160	1.400	200	700	100
10,0	1.300	160	1.100	180	600	100
12,0	1.100	150	900	160	500	90
16,0	800	130	700	140	400	80
Depth of cut $a_p$	$0,3D_c$		$0,2D_c$		$0,15D_c$	

## Grooving

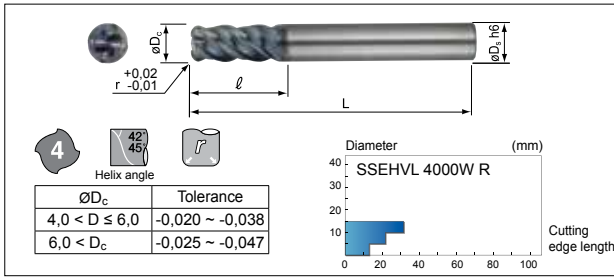
Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	1.400	40	2.500	200	1.100	90
5,0	1.300	40	2.200	220	1.000	100
6,0	1.100	40	1.900	230	800	100
8,0	800	40	1.400	200	600	80
10,0	600	40	1.100	180	500	80
12,0	500	40	900	160	400	70
16,0	400	30	700	140	300	60
Depth of cut $a_p$	$0,3D_c$		$0,2D_c$		$0,15D_c$	

## Endmill Identification

**SSEH**   **VL**   **4**   **045**   **W**   **R05**  
 Series Code   Vibration Less   No. of Teeth   Diameter   Coated   Corner Radius

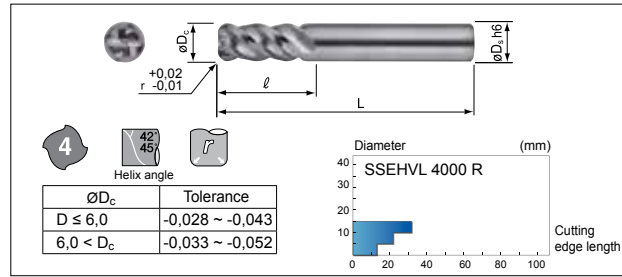
### SSEHVL 4000W R (Coated)

General Steel	Carbon Steel	Alloyed Steel	Prehardened Steel	Tempered St Die Steel	Hardened Steel	Stainless Steel	Ti Alloy Heat Resist. Alloy	Cast Iron	Al Alloy	Copper Alloy	Graphite
○	○	○	○	○	45-55 HRC	55-60 HRC	60-65 HRC	○	○	○	○
					○ Good   ● Preferred Choice						



### SSEHVL 4000 R (Uncoated)

General Steel	Carbon Steel	Alloyed Steel	Prehardened Steel	Tempered St Die Steel	Hardened Steel	Stainless Steel	Ti Alloy Heat Resist. Alloy	Cast Iron	Al Alloy	Copper Alloy	Graphite
○	○	○	○	○	45-55 HRC	55-60 HRC	60-65 HRC	○	○	○	○
					○ Good   ● Best						



## Body

Cat. No.	Stock	ØDc	r	ℓ	L	ØDs
SSEHVL 4045W R05	●	4,5	0,5	12	50	6
SSEHVL 4045W R10	●	4,5	1,0	12	50	6
SSEHVL 4050W R05	●	5,0	0,5	13	60	6
SSEHVL 4050W R10	●	5,0	1,0	13	60	6
SSEHVL 4060W R10	●	6,0	1,0	13	60	6
SSEHVL 4080W R10	●	8,0	1,0	19	80	8
SSEHVL 4100W R10	●	10,0	1,0	22	90	10
SSEHVL 4100W R30	●	10,0	3,0	22	90	10
SSEHVL 4120W R10	●	12,0	1,0	26	90	12
SSEHVL 4120W R30	●	12,0	3,0	26	90	12
SSEHVL 4160W R10	●	16,0	1,0	32	115	16
SSEHVL 4160W R30	●	16,0	3,0	32	115	16

● Euro stock   Grade: ACW52

## Body

Cat. No.	Stock	ØDc	r	ℓ	L	ØDs
SSEHVL 4045 R05	●	4,5	0,5	12	50	6
SSEHVL 4045 R10	●	4,5	1,0	12	50	6
SSEHVL 4050 R05	●	5,0	0,5	13	60	6
SSEHVL 4050 R10	●	5,0	1,0	13	60	6
SSEHVL 4060 R10	●	6,0	1,0	13	60	6
SSEHVL 4080 R10	●	8,0	1,0	19	80	8
SSEHVL 4100 R10	●	10,0	1,0	22	90	10
SSEHVL 4100 R30	●	10,0	3,0	22	90	10
SSEHVL 4120 R10	●	12,0	1,0	26	90	12
SSEHVL 4120 R30	●	12,0	3,0	26	90	12
SSEHVL 4160 R10	●	16,0	1,0	32	115	16
SSEHVL 4160 R30	●	16,0	3,0	32	115	16

● Euro stock   Grade: EH520

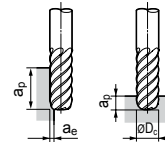
## Recommended Cutting Conditions

For stable machining, a high rigidity machine is recommended.  
 Wet machining is recommended for stainless steel and heat resistant alloy applications.  
 If cutting noise and vibration occur modify the cutting conditions accordingly.

## Possible Diameter and Corner Radius Combination

Dc	r 0,5	r 1,0	r 3,0
4,5	●	●	
5,0	●	●	
6,0	●	●	
8,0	●	●	
10,0	●	●	●
12,0	●	●	●
16,0	●	●	●

● Euro stock



## Shoulder Milling

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	5.100	480	5.300	600	2.500	200
5,0	4.600	520	4.800	700	2.200	220
6,0	3.800	560	4.000	800	1.800	210
8,0	2.900	520	3.000	780	1.400	200
10,0	2.300	500	2.400	640	1.100	180
12,0	1.900	470	2.000	600	930	160
16,0	1.400	430	1.500	500	700	140

Depth of cut: ap = 1,5Dc, ae = 0,1Dc

## Shoulder Milling

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	2.300	120	4.600	370	1.600	130
5,0	2.000	130	4.100	410	1.500	150
6,0	1.700	130	3.400	400	1.200	140
8,0	1.300	130	2.600	360	900	130
10,0	1.000	130	2.100	340	700	110
12,0	800	110	1.700	300	600	100
16,0	600	90	1.300	260	500	100

Depth of cut: ap = 1,5Dc, ae = 0,1Dc

## Grooving

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	4.200	200	3.900	270	1.400	100
5,0	3.800	240	3.500	300	1.300	120
6,0	3.200	260	2.900	300	1.100	140
8,0	2.400	260	2.200	270	800	120
10,0	1.900	240	1.700	250	650	110
12,0	1.600	220	1.400	230	550	100
16,0	1.200	200	1.100	200	400	80

Depth of cut: ap = 0,5Dc

## Grooving

Work Material	Stainless Steel		Titanium Alloy		Heat Resistant Steel	
	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)
4,5	1.800	50	3.200	250	1.300	110
5,0	1.600	50	2.900	290	1.200	120
6,0	1.400	50	2.400	290	1.000	120
8,0	1.000	50	1.800	250	700	90
10,0	800	50	1.400	230	600	100
12,0	600	50	1.200	210	500	90
16,0	500	40	900	180	400	80

Depth of cut: ap = 0,3Dc

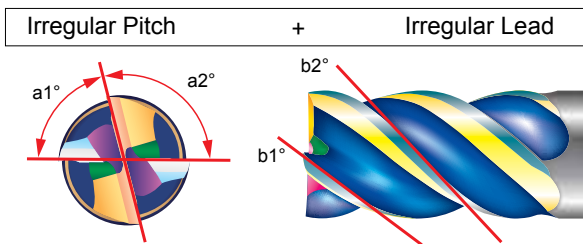
## Characteristic of Anti-Vibration Type

New anti-vibration type added to the endmill series SSEH for exotic materials.

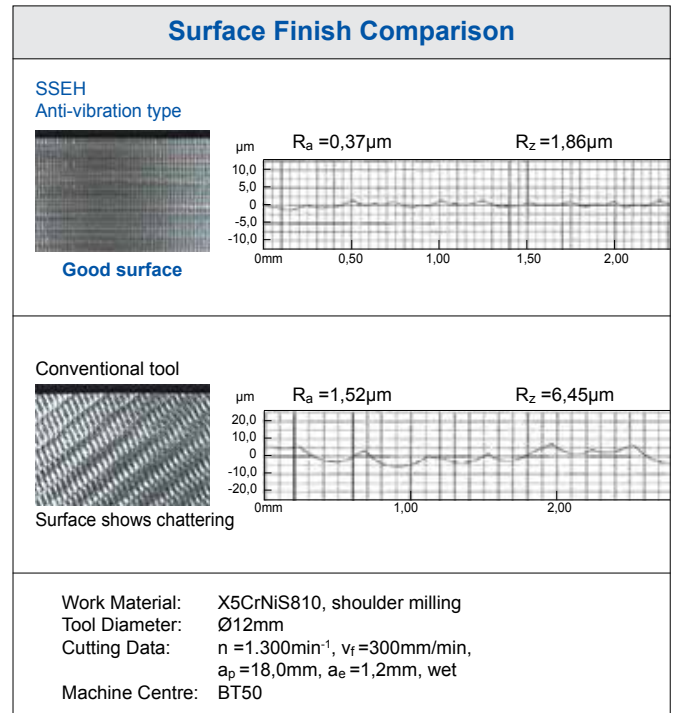
Builds on the same features of existing endmills by adding an irregular lead for exceptionally good anti-vibration performance.

Compatible with milling for wide range of exotic alloys including stainless steel, inconel and titanium.

Reduces chattering for high-speed, high-feed cutting.



## Application Examples



## Corner Finishing of Titanium Alloy

	SSEH Radius Anti-Vibration Type SSEHVL 4120W 30	Endmill without Anti-Vibration Mechanism $\varnothing 12 \times R3,0$
Machined Surface	 No vibration	 Vibration
Vibration Data	 Stable milling	 Vibration at entry point
Detail of Milling Edge	 No chipping	 Chipping due to vibration
Cutting Data	$v_c = 42,4\text{m/min}$ ( $n = 1.125\text{min}^{-1}$ ) $v_f = 200\text{mm/min}$ ( $f_z = 0,044\text{min/t}$ ) $a_p = 5,0\text{mm}$ , $a_e = 12\text{mm}$ , wet	

# Radius Endmill SSEH Series

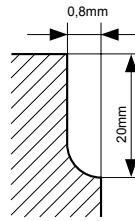
## Application Examples

Inconel 713

**SSEH 4100W R10**



Competitor's

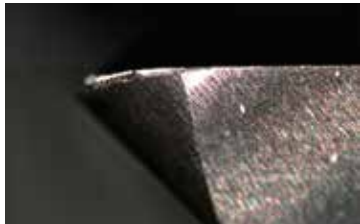


In Sumitomo tests the special coating with excellent adhesion resistance provided less cutting edge adhesion than the competitor's product and enabled fracture-free machining. The competitor's product suffered from edge adhesion leading to breakage.

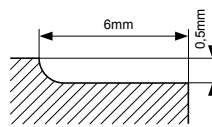
Cutting Data:  $v_c = 32\text{m/min}$ ,  $f_z = 0,018\text{mm/t}$ ,  $a_p = 20\text{mm}$ ,  $a_e = 0,8\text{mm}$ , dry  
 Diameter:  $\varnothing 10 \times R1$   
 Tool Life: 150 pcs

Inconel 713C

**SSEH 4080W R05**



Competitor's



The SSEH type was able to be operated continuously without chipping by combination of the special rigid substrate and the smooth radius shape. In contrast the competitor's product resulted in chipping.

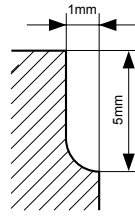
Cutting Data:  $v_c = 6\text{m/min}$ ,  $f_z = 0,025\text{mm/t}$ ,  $a_p = 0,5\text{mm}$ ,  $a_e = 6\text{mm}$ , wet  
 Diameter:  $\varnothing 8 \times R0,5$  (Special tool)  
 Cutting Length: 120mm

X5CrNi1810 (Stainless Steel)

**SSEH 4060W R10**



Conventional



In dry machining where good heat resistance is required, the sharp edge reduces heat generation. The conventional tools resulted in boundary chipping. The SSEH type was able to be operated continuously up to the cutting length of 70m.

Cutting Data:  $v_c = 50\text{m/min}$ ,  $f_z = 0,04\text{mm/t}$ ,  $a_p = 5\text{mm}$ ,  $a_e = 1\text{mm}$ , dry  
 Diameter:  $\varnothing 6 \times R1$   
 Cutting Length: 20m



(Germany)

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