MillLine

T/EFE & DPD & EDPD

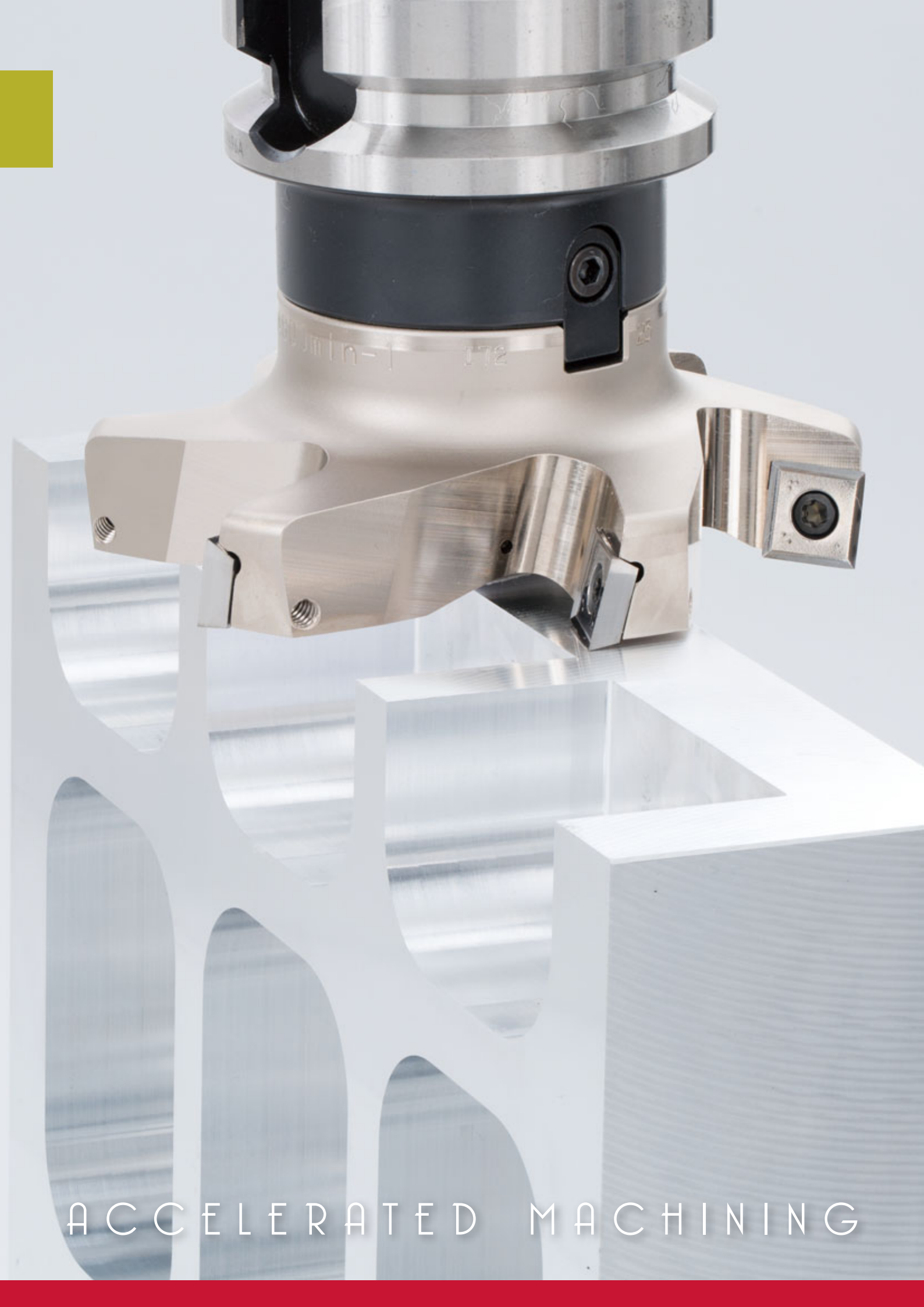
www.tungaloy.com

Tungaloy Report No. 348-G

High precision face milling series **with lightweight and adjustable pocket bodies**

INDUSTRY 4.0

FEED the SPEED!

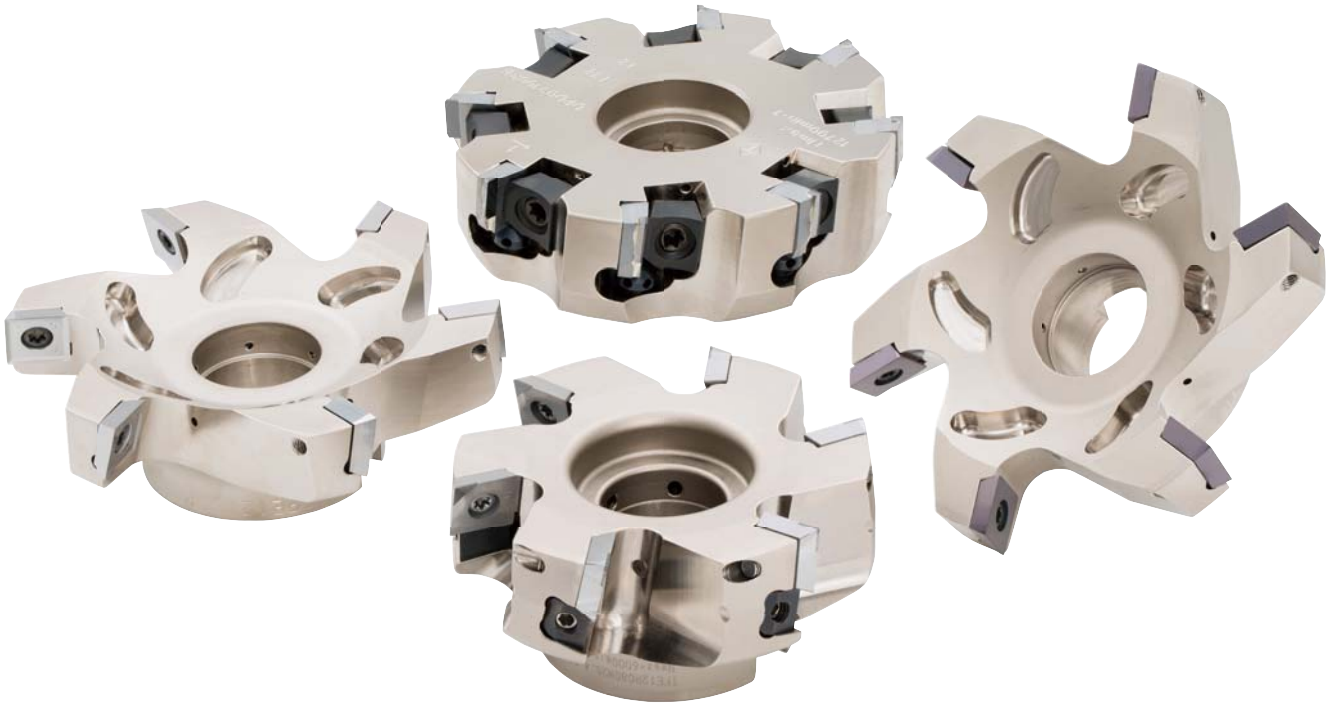


ACCELERATED MACHINING

MillLine

T/EFE & DPD & EDPD

TUNGALOY

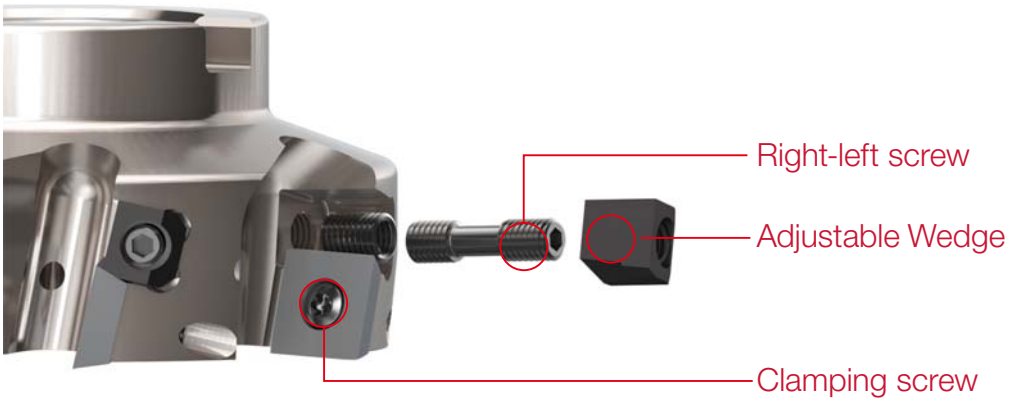


Extremely lightweight facemill series now integrates adjustable pockets for an extra precision on the surface finish

TFE series is now available **with adjustable pockets**

New TFE12...-...A

- Easy tool setting and insert adjustment
- Fine adjustment of axial runouts to 5 µm or less
- Adjustment range : ±0.065 mm (±.00256")
- Simple cutter structure allows fewer comprising parts

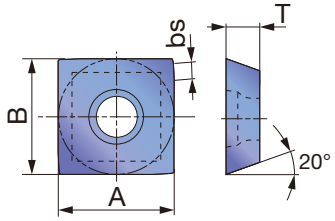


Precision facemilling is now possible with an insert adjustment system

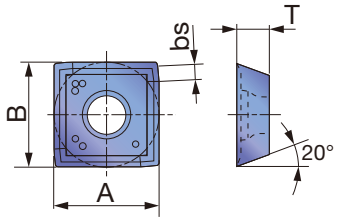
Common exsting TFE inserts

All existing TFE inserts can be used. No need to purchase additional inserts

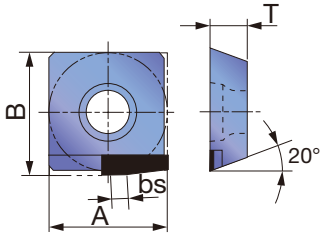
SEGW12X4ZEPR / ZEFR



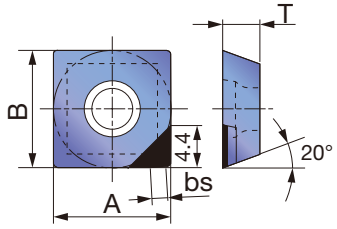
SEGT12X4-AJ



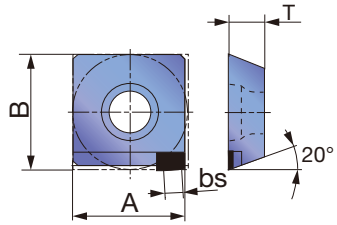
SEGW12X4ZEFR-BD



SEGW12X4ZEFR-D



SEGW12X4ZEFR-WD



TFE12 / EFE12 type

Most suited for roughing to super-finishing of non ferrous components.
Insert grades are also available for steel, stainless steel, and cast iron applications.

Lightweight body
The cutter body, although made of steel, is designed and built for an extreme lightness. Therefore, the cutter is also suited for use on BT30 spindle machines

Through-coolant system
Facilitates smooth chip evacuation and eliminates chip re-cutting

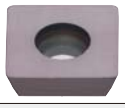
High insert reliability
TORX Plus® drive screw enhances insert reliability, allowing for extended tool life

Insert density variations
Insert pitch variations allow the best possible tool to be selected for maximum economy in the milling process

For aluminium and copper alloys N

Cemented carbide		PCD (Polycrystalline diamond)		
				
General purpose type	Low cutting force type (AJ)	Regular insert	Wiper insert	Deburring wiper insert

For steels,cast irons and stainless steel P K M S

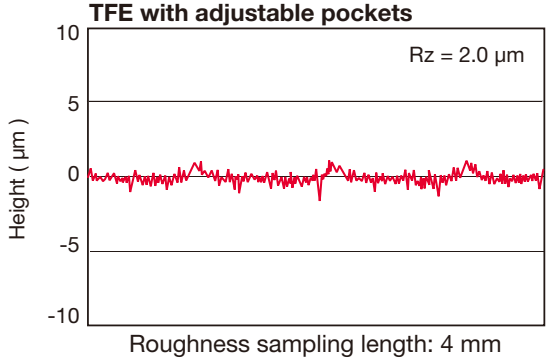

General purpose type

CUTTING PERFORMANCE

New TFE12R...-...A and TFE12...R

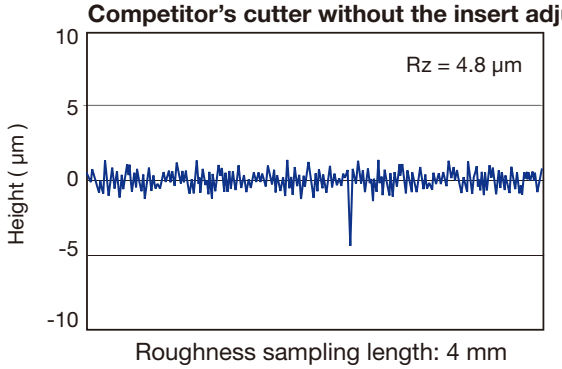
Surface roughness

TFE with adjustable pockets

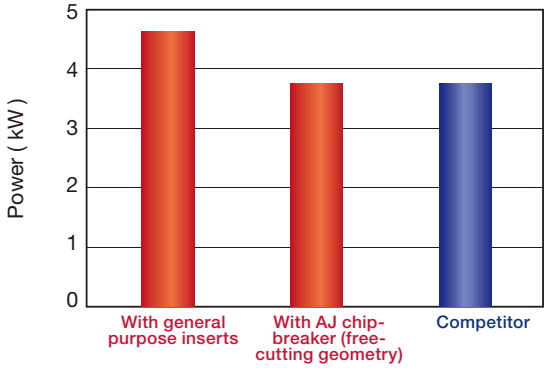


Cutter : TFE12R080M25.4-06A (ø80, z = 6)
Insert : SEGW12X4ZEFR-D DX140
Machine : Vertical 5-axis M/C
BT40 15/22 kW (Max. 12,000 min^{-1})
Parameters : *Vc* = 1,500 m/min, N = 5,968 min^{-1}
fz = 0.2 mm/z, *Vf* = 7,162 mm/min
ap = 2.0 mm, *ae* = 67 mm
Insert axial runout : < 2 µm
Wet / Dry : Wet
Material : AC4C-T6 (300x200)
Application : Face milling

Competitor's cutter without the insert adjustment

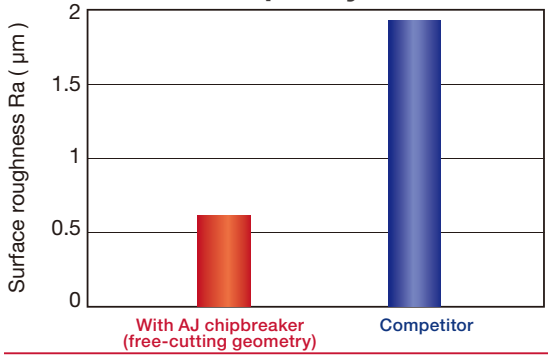


Power requirement



Cutter : TFE12125R (ø125, z = 6)
Insert : SEGW12X4ZEFR-D DX140
Machine : Vertical 5-axis M/C
BT40 15/22kW (Max. 12,000 min^{-1})
Parameters : *Vc* = 1,500 m/min, N = 5,968 min^{-1}
fz = 0.2 mm/t, *Vf* = 7,162 mm/min
ap = 2.0 mm, *ae* = 60 mm
Insert axial runout : < 2 µm
Wet / Dry Wet
Material : AC4C-T6 (300x200)
Application : Face milling

Surface finish quality

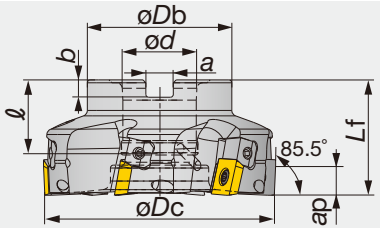


New

TFE12R...-...A

86° face mills for aluminum machining, with screw clamped inserts and adjustable pockets for axial runout

A.R. = +13°, R.R. = +7°



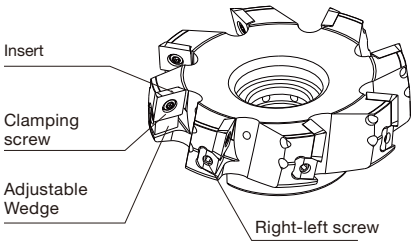
Air through type

Designation	Max. *ap*	ø*D*c	z	ø*D*b	*L*f	ø*d*	ℓ	*a*	*b*	Kg	Air hole	Insert
TFE12R080M25.4-06A	8	80	6	50	40	25.4	26	9.5	6	0.70	with	SEG*12X4...
TFE12R080M27.0E06A	8	80	6	55	40	27	22	12.4	7	0.69	with	SEG*12X4...
TFE12R100M25.4-08A	8	100	8	50	40	25.4	26	9.5	6	1.15	with	SEG*12X4...
TFE12R100M27.0E08A	8	100	8	55	40	27	22	12.4	7	1.11	with	SEG*12X4...
TFE12R125M31.7-10A	8	125	10	70	50	31.7	32	12.7	8	2.24	with	SEG*12X4...
TFE12R125M32.0E10A	8	125	10	70	50	32	28.5	14.4	8	2.14	with	SEG*12X4...

See page 10 for Insert setting procedure

SPARE PARTS

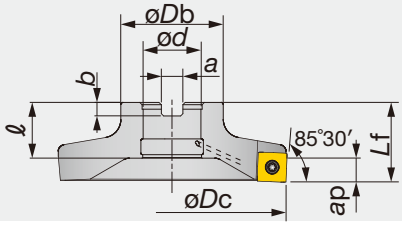
Designation	Clamping screw	Adjustable Wedge	Lubricant	Shell locking bolt	Right-left screw	Wrench	Wrench
TFE12R**A	CSTB-4	FW-701R	M-1000	TMBA-M12H	MCS520-2.5	P-2.5T	T-15LB



TFE12R

86° face mills with screw clamped inserts for aluminum machining

A.R. = +13°, R.R. = +7°

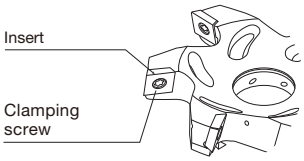


Air through type

Designation	Max. ap	øDc	z	øDb	Lf	ød	ℓ	a	b	Kg	Air hole	Insert
TFE12063R	8	63	3	45	35	22	19	10	6	0.34	with	SEG*12X4...
TFE12080R	8	80	4	50	35	25.4	24.5	9.5	6	0.45	with	SEG*12X4...
TFE12100R	8	100	6	50	35	25.4	24.5	9.5	6	0.59	with	SEG*12X4...
TFE12125R	8	125	6	50	35	25.4	24.5	9.5	6	0.9	with	SEG*12X4...

SPARE PARTS

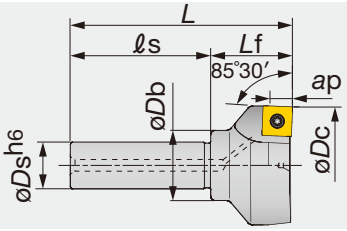
Designation	Clamping screw	Lubricant	Shell locking bolt	Shell locking bolt 1	Wrench
TFE12063R	CSPB-4S	M-1000	-	CM10X30H	IP-15D
TFE12080R	CSPB-4S	M-1000	TMBA-M12H	-	IP-15D
TFE12100R	CSPB-4S	M-1000	TMBA-M12H	-	IP-15D
TFE12125R	CSPB-4S	M-1000	TMBA-M12H	-	IP-15D



EFE12R

86° endmills with screw clamped inserts for aluminum machining

A.R. = +13°, R.R. = +7°

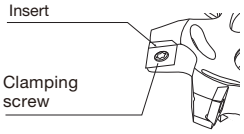


Air through type

Designation	Max. ap	øDc	z	øDs	øDb	ℓs	Lf	L	Kg	Air hole	Insert
EFE12050R	8	50	3	20	30	60	35	95	0.37	with	SEG*12X4...

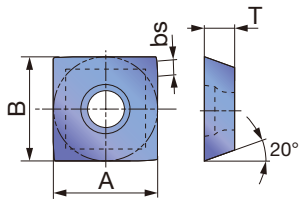
SPARE PARTS

Designation	Clamping screw	Lubricant	Wrench
EFE12000R	CSPB-4S	M-1000	IP-15D

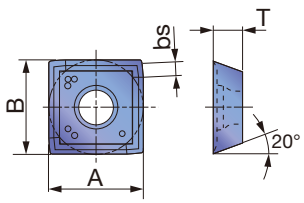


INSERTS

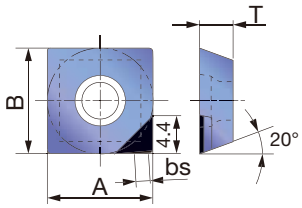
SEGW12X4ZEPR / ZEFR



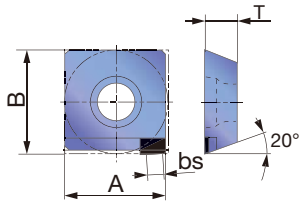
SEGT12X4-AJ



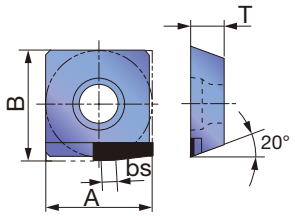
SEGW12X4ZEFR-D



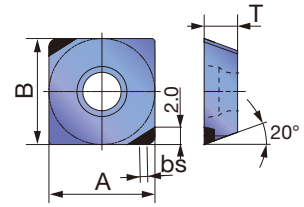
SEGW12X4ZEFR-WD



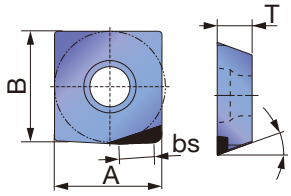
SEGW12X4ZEFR-BD



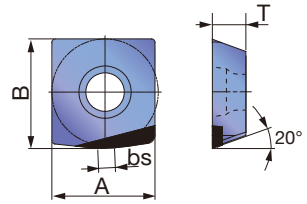
2QP-SECW12X412ZETR



1QP-SECW12X4ZETR-W



1QP-SECW12X4ZETR-B



		Coated			Cermet	Un-coated	PCD	CBN
P	Steel	★			★			
M	Stainless		★					
K	Cast iron	★						★
N	Non-ferrous			★		★	★	
S	Superalloys	★						
H	Hard materials							

★ : First choice
☆ : Second choice

Designation	Max. ap	AH120	AH140	DS1100	NS740	KS05F	DX140	BX480	A	B	T	bs
SEGW12X4ZEFR	8					●			12.7	12.7	4	1.8
SEGW12X4ZEPR	8	●	●		●				12.7	12.7	4	1.4
SEGT12X4ZEFR-AJ	8			●		●			12.7	12.7	4	1.8
SEGW12X4ZEFR-D	3.5						●		12.7	12.7	4	1.8
SEGW12X4ZEFR-WD	-						●		12.4	12.8	4	2
SEGW12X4ZEFR-BD	-						●		12.4	13.1	4	1.8
2QP-SECW12X412ZETR	1.5							●	12.7	12.7	4	0.9
1QP-SECW12X4ZETR-W	-							●	12.3	12.9	4	4
1QP-SECW12X4ZETR-B	-							●	12.3	13.1	4	4

● : New product
● : To be released in 2018
DX140 : Package quantity = 1pc.

Insert setting procedure – adjustable-type TFE face milling cutter

1 Cleaning insert pockets

Remove all the inserts. Use air pressure to thoroughly clean the pockets of dust and chips.

2 Loosening wedges

Use the included key for wedge adjustment to loosen all the wedges so that they do not exceed the cutter's outer diameter.

3 Clamping inserts for adjustments

Place the insert in the pocket and lightly tighten the clamping screw with the included key. Suggested method: Tighten the screw first with the straight end of the key (Fig A) until finger tight, then use the angled end to further tighten the screw for insert steadiness (Fig B). Do NOT fully tighten the screw at this moment as this procedure is prior to insert adjustment. Repeat the procedure for all inserts.

4 Axial height adjustment of inserts

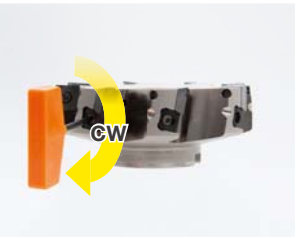
Mount the cutter in Step ③ on the setting fixture of the pre-setter. Determine the highest insert, and, while carefully monitoring each insert's axial position, rotate the wedge screw in the CW direction to raise the insert in the axial direction, as close as possible to that of the highest insert. Repeat this procedure for all inserts.

Note:
Since the insert is clamped, loosening the wedge screw will not bring down the insert. To lower insert height, both the insert and wedge screws need to be loosened. Start the adjusting procedure for this insert again from Step 1.

5 Tighten insert screws

Tighten the insert clamping screw at 3.5 Nm, using the key as shown to the left. Repeat the procedure for all inserts.

6 Final adjustments



After final tightening of all insert screws, measure to ensure all inserts are at the desired axial heights. If necessary, further tighten any wedge screws in the CW direction for the final few microns. For inserts exceeding the required runout, re-start the adjustment procedure from Step ① .

Note:
Do not re-tighten the insert screw after insert adjustment is completed. Additional tightening may weaken wedge clamping torque.

Cautions:

① Always clean all the insert pockets thoroughly of dust and chips. Any objects present in the pocket may shift the insert's position during machining and cause poor surface finishing quality.
② Always loosen the wedge screw before installing the insert as described in Step ② . If the wedge is left tightened in the cutter, the adjustment range of the wedge will be limited, and insert height may not be as freely adjustable as possible.
③ With a finger, firmly press and hold the insert into the wedge while tightening the insert screw. If the insert is not in contact, the wedge has to be driven until the gap in between is closed, with no actual insert movement.
④ Loosening the wedge will not lower the insert. When the insert height exceeds the desired setting during adjustment, loosen both the insert and wedge screws and re-start the adjustment procedure from Step ① . If the insert slides downward when the wedge screw is loosened, the clamping torque of the insert screw is too low. Tighten the insert screw with a slightly higher torque. Suggested clamping method: First use the straight end of the key to tighten the screw until finger tight, then switch the key to the angled side and turn an additional 45°.
⑤ Do not exceed the recommended clamping torque when fixing the insert. This may damage or fracture the insert screw.

DPD09 / EDPD09

Most suitable for roughing to super-finishing of non-ferrous components

Through-coolant
Through-coolant. Facilitates smooth chip evacuation and eliminates chip re-cutting

Insert geometry variations
Three standard types of insert geometries are available. Reconditioning service is available.

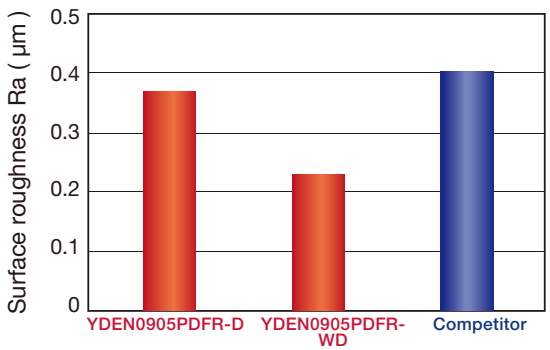
Enormously high balancing quality for high-speed milling
Balancing grade: G16. (ISO1940/1)
Maximum cutting speed:
Vc = 4000 m/min

Lightweight body
The cutter body, although made of steel, is designed and built for an extreme lightness. The cutter is also suited for use on BT30 spindle machines

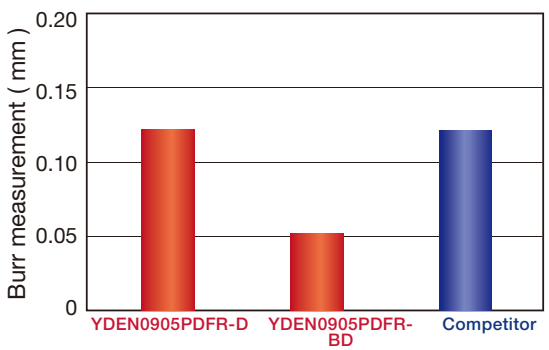
High-precision adjustment system
Precise axial adjustment of all inserts is possible to a range of ≤ 5 µm

CUTTING PERFORMANCE

Surface finish quality



Burr generation



STANDARD CUTTING CONDITIONS

ISO	Workpiece material	Grade	Designation	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steels and alloy steels < 300HB	AH120	SEGW12X4ZEPR	100 - 180	0.03 - 0.15
		NS740	SEGW12X4ZEPR	100 - 180	0.03 - 0.15
M	Stainless steels < 250HB	AH140	SEGW12X4ZEPR	80 - 180	0.03 - 0.15
K	Grey and ductile cast irons	AH120	SEGW12X4ZEPR	100 - 200	0.03 - 0.15
N	Cast aluminium alloy / Die-cast Si < 13%	KS05F	SEGT12X4ZEFR-AJ	200 - 1500	0.05 - 0.2
		DX140	SEGW12X4ZEFR-D	200 - 1500	0.05 - 0.2
	Cast aluminium alloy / Die-cast Si ≥ 13%	KS05F	SEGT12X4ZEFR-AJ	80 - 200	0.05 - 0.2
		DX140	SEGW12X4ZEFR-D	200 - 500	0.05 - 0.2
	Aluminium alloy Tensile strength < 350 N/mm^2	KS05F	SEGT12X4ZEFR-AJ	200 - 1500	0.05 - 0.2
		DX140	SEGW12X4ZEFR-D	200 - 1500	0.05 - 0.2
	Aluminium alloy Tensile strength > 350 N/mm^2	KS05F	SEGW12X4ZEFR	200 - 1500	0.05 - 0.2
		DX140	SEGW12X4ZEFR-D	200 - 1500	0.05 - 0.2
	Copper alloy	KS05F	SEGT12X4ZEFR-AJ	200 - 500	0.05 - 0.2
		DX140	SEGW12X4ZEFR-D	200 - 500	0.05 - 0.2

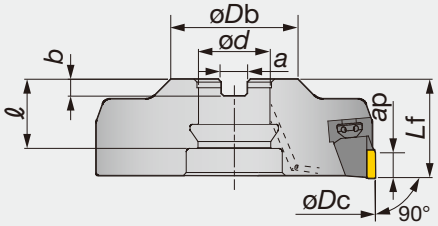
Notes:

- In milling aluminium and copper alloys:
  (1) For improved surface finish, use together with wiper insert SEGW12X4ZEFR-WD
  (2) For reducing burr occurrence, use together with deburring inserts SEGW12X4ZEFR-BD
- When milling aluminium and copper alloys, use of a water soluble cutting fluid is recommended. When milling steels, cast irons, and stainless steels, dry cutting is recommended.
- When the length-to-diameter overhang ratio of the tool (L/D) exceeds 3, reduce cutting speed and feed to 70 to 80% of the values given in the table.

DPD09

Light-weight square mills with PCD inserts in adjustable pockets, for alminum machining

A.R. = +8.5°, R.R. = +3° ~ +5°

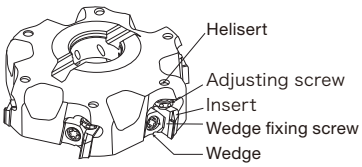


Air through type

Designation	Max. ap	øDc	z	øDb	Lf	ød	ℓ	a	b	Kg	Air hole	Insert
DPD09080R	7	80	4	50	41	25.4	23	9.5	6	0.8	with	YDEN0905...
DPD09080RB	7	80	6	50	41	25.4	28.5	9.5	6	0.82	with	YDEN0905...
DPD09100R	7	100	6	50	35	25.4	24.5	9.5	6	1.13	with	YDEN0905...
DPD09100RB	7	100	8	50	35	25.4	24.5	9.5	6	1.17	with	YDEN0905...
DPD09125R	7	125	6	50	35	25.4	24.5	9.5	6	1.7	with	YDEN0905...
DPD09125RB	7	125	10	50	35	25.4	24.5	9.5	6	1.77	with	YDEN0905...
DPD09160R	7	160	8	60	52	31.75	40	12.7	8	3.28	with	YDEN0905...
DPD09160RB	7	160	12	60	52	31.75	40	12.7	8	3.25	with	YDEN0905...

SPARE PARTS

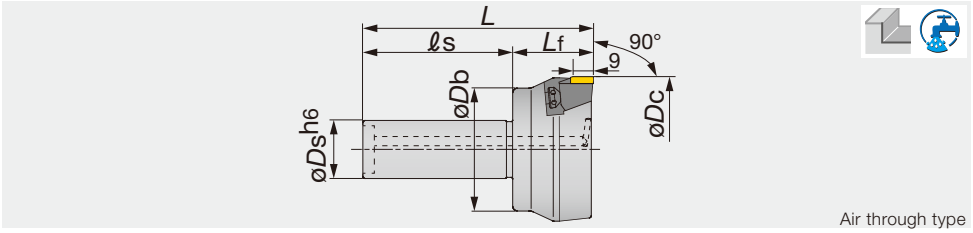
Designation	Wedge	Wedge fixing screw	Adjusting screw	Helisert	Shell locking bolt	Shell locking bolt 1	Wrench	Wrench 1
DPD09080R*	FW-304R-T	FDS-8ST-18	AJM5	LM5-0.8X1DNS	-	CM12X30H	T-27T	T-7F
DPD09100R*	FW-304R-T	FDS-8ST-18	AJM5	LM5-0.8X1DNS	TMBA-M12H	-	T-27T	T-7F
DPD09125R*	FW-304R-T	FDS-8ST-18	AJM5	LM5-0.8X1DNS	TMBA-M12H	-	T-27T	T-7F
DPD09160R*	FW-304R-T	FDS-8ST-18	AJM5	LM5-0.8X1DNS	TMBA-M16H	-	T-27T	T-7F



EDPD09

Light weight square endmills with PCD inserts in adjustable pockets, for alminum machining

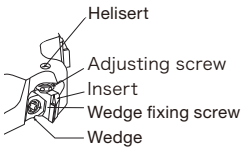
A.R. = +8.5°, R.R. = +3°



Designation	Max. *ap*	ø*D*c	z	ø*D*s	ø*D*b	ℓs	*L*f	*L*	Kg	Air hole	Insert
EDPD09063R	8	63	3	25	37	60	40	100	0.75	with	YDEN0905...

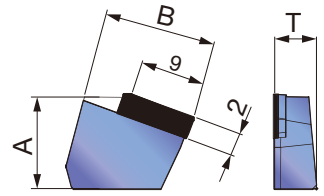
SPARE PARTS

Designation	Wedge	Wedgte fixing screw	Adjusting screw	Helisert	Wrench	Wrench 1
EDPD09063R	FW-304R-T	FDS-8SST	AJM5	LM5-0.8X1DNS	T-27T	T-7F

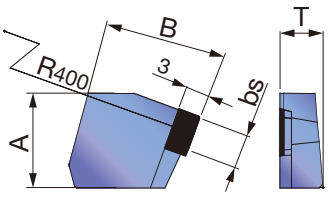


INSERTS

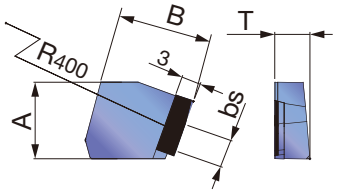
YDEN0905PDFR-D



YDEN0905PDFR-WD



YDEN0905PDFR-BD



P	Steel	
M	Stainless	
K	Cast iron	
N	Non-ferrous	★
S	Superalloys	
H	Hard materials	

★ : First choice
☆ : Second choice

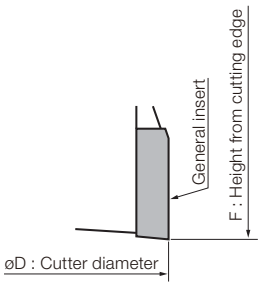
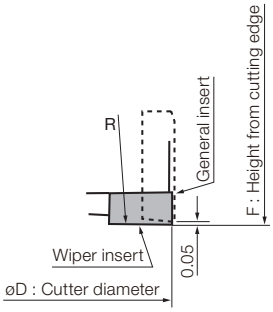
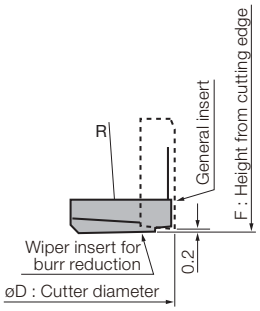
Designation	Max. ap	PCD	A	B	T	bs
		DX140				
YDEN0905PDFR-D	7	●	12.4	15.1	5.7	-
YDEN0905PDFR-WD	-	●	12.4	15.2	5.7	4.5
YDEN0905PDFR-BD	-	●	12.4	15.2	5.7	4.5

Note: As a principle, our company re-grinds these inserts.

●: Line up

Package quantity = 1pc.

HOW TO PUT EACH INSERT TOGETHER

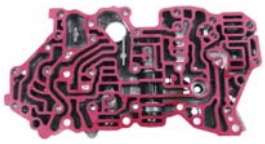
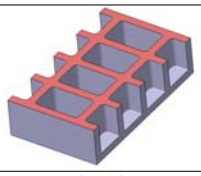
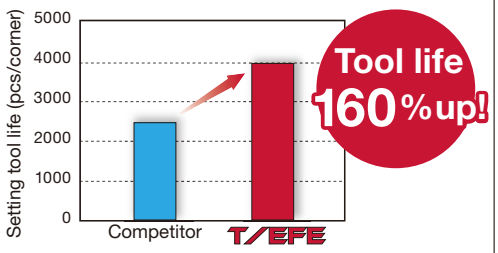
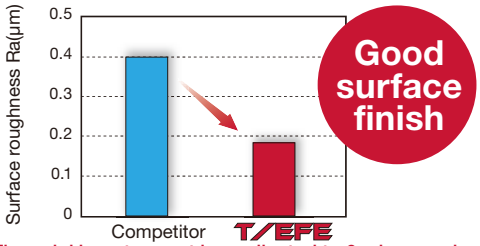
			For general	Accuracy of machining surface priority	Burr reduction priority
Applicable insert	General insert	YDEN0905PDFR-D	◎	◎	◎
	Wiper insert	YDEN0905PDFR-WD	–	◎	–
	Wiper insert for burr reduction	YDEN0905PDFR-BD	–	–	◎
	Number of Inserts by type		All general	1 or 2 wiper inserts in cutter body	General insert : Burr wiper insert = 1 : 1
Specification of insert setting					
Accuracy of machining surface (roughness and undulation)			△	◎	○
Burr of machining surface			△	○	◎

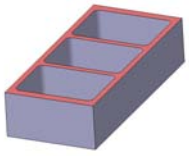
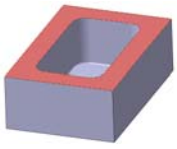
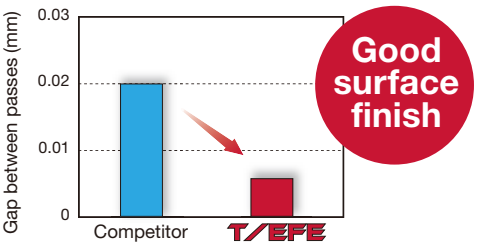
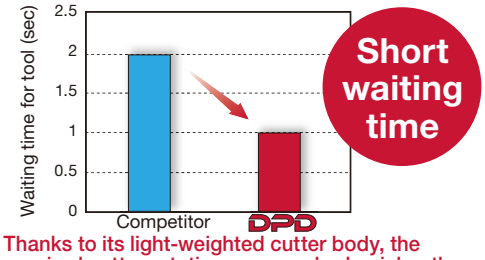
STANDARD CUTTING CONDITIONS

ISO	Workpiece material	Grade	Designation	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
N	Aluminium alloy castings & die castings Si < 13%	DX140	YDEN0905PDFR-D	500 - 4000	0.05 - 0.2
	Aluminium alloy castings & die castings Si ≥ 13%	DX140	YDEN0905PDFR-D	200 - 500	0.05 - 0.2
	Rolled aluminium alloys	DX140	YDEN0905PDFR-D	500 - 4000	0.05 - 0.2
	Copper alloys	DX140	YDEN0905PDFR-D	200 - 500	0.05 - 0.2

Notes:
(1) When requiring improved surface finish, use the wiper insert together with regular inserts YDEN0905PDFR-WD.
(2) When requiring reduced burr occurrence, use the deburring inserts together with regular inserts YDEN0905PDFR-BD.
(3) When using the cutter at speeds over 1500m/min, use an arbor or tool-holder balanced to within G16.
(4) Wet cutting, using a water soluble cutting fluid, is recommended.
(5) When the length-to-diameter overhang ratio of the tool (L/D) exceeds 3, reduce cutting speed and feed to 70 to 80% of the values given in the table.

PRACTICAL EXAMPLES

	Workpiece type	Valve sheet	Plate
	Cutter	TFE12R125M31.7-10A (ø125, z = 10)	TFE12R080M25.4-06A (ø80, z = 6)
	Insert	SEGW12X4ZEFR-D	SEGW12X4ZEFR-D
	Grade	DX140	DX140
	Workpiece material	ADC12  N	AC4C-T6  N
Cutting conditions	Cutting speed: *Vc* (m/min)	2,000	1,500
Cutting conditions	Feed per tooth: *fz* (mm/t)	0.06	0.2
Cutting conditions	Feed speed: *Vf* (m/min)	2,400	7,200
Cutting conditions	Depth of cut: *ap* (mm)	0.5	2.0
Cutting conditions	Width of cut: *ae*(mm)	100	60
Cutting conditions	Application	Face milling	Face milling
Cutting conditions	Coolant	Wet	External
Cutting conditions	Machine	Vertical M/C,BT40	Vertical M/C、BT40
	Results	 Inserts were replaced after 2,500 units for the competitor's cutter. Tool life of the TFE cutter has achieved 4,000 units.	 The axial insert runout has adjusted to 2 microns, dramatically improving the surface quality over the competitor's non-adjustable style. (Rz=4.8 μm vs Rz=2.0 μm)

	Workpiece type	Plate	Housing
	Cutter	TFE12125R (ø125, z = 4)	DPD09100R (ø100, z = 6)
	Insert	SEGT12X4ZEFR-AJ	YDEN0905PDFR-D
	Grade	KS05F	DX140
	Workpiece material	AC4B-T6  N	AC3A  N
Cutting conditions	Cutting speed: *Vc* (m/min)	1500	1,900
Cutting conditions	Feed per tooth: *fz* (mm/t)	0.2	0.04
Cutting conditions	Feed speed: *Vf* (m/min)	4,600	1,450
Cutting conditions	Depth of cut: *ap* (mm)	2.0	1.0
Cutting conditions	Width of cut: *ae*(mm)	80	40
Cutting conditions	Application	Face milling	Face milling
Cutting conditions	Coolant	Wet	Wet
Cutting conditions	Machine	Vertical M/C,BT30	Vertical M/C, BT30
	Results	 Steps were removed between the two passes, eventually improving the total surface finish quality.	 Thanks to its light-weighted cutter body, the required cutter rotation was reached quicker than the competitor, reducing the total cutting time. The surface roughness was also improved.

MEMO

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