NAKANISHI

E3000i SERIES

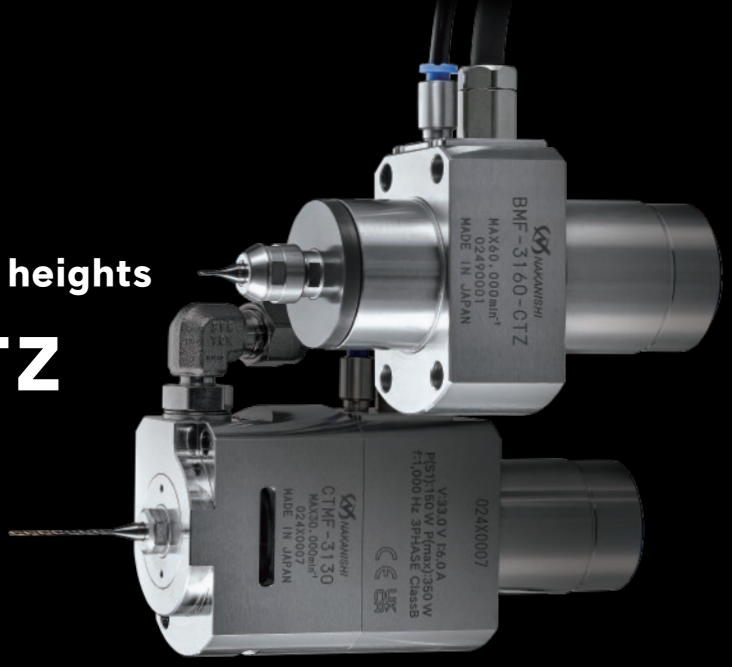
Taking CNC automatic lathes to its new heights

BMF-3160/3130-CTZ

Flange type motor spindle for CNC automatic lathe
Flange type torque motor spindle for CNC automatic lathe

CTMF-3130

Coolant through motor spindle for CNC automatic lathe



Case Study

[Drilling and cross-hole deburring on SUS303 shaft (ϕ1.0 mm)]

CNC Automatic Lathe × 60,000 min^{-1} Flange Type Spindle

- Spindle : BMF-3160-CTZ × 2
- Machine : CNC automatic lathe (STAR MICRONICS CO., LTD. / SB-16R type G)
- Tool : [Process 1] MITSUBISHI Solid carbide drill (Mitsubishi Materials Corporation / DWAE0100X04S030 ϕ1.0 drill)
- Tool : [Process 2] XEBEC Back Burr Cutter (XEBEC TECHNOLOGY CO., LTD. / XC-08-A)
- Workpiece material : SUS303

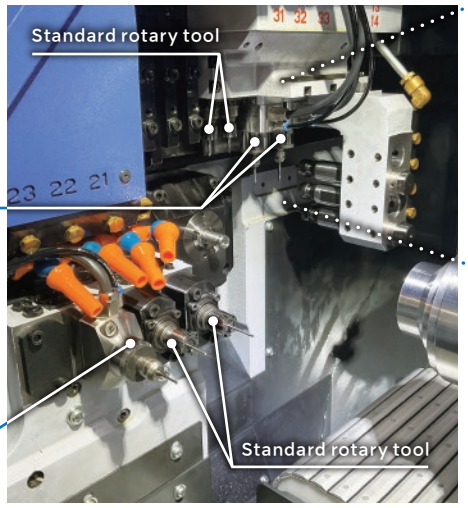
BMF-3160-CTZ

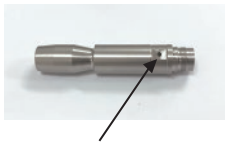
Nakanishi **60,000 min^{-1} high-speed spindle**
+ Sleeve (SL-31×34)
Mountable with Cross Drilling Units (T3400 / T3500)

BM-322FL

Nakanishi **60,000 min^{-1} high-speed spindle**
+ Spacer (SP-22×10L)
Mountable with 4-Axis Backworking Units (T2100–T2400)

*Mounted on STAR MICRONICS SB-16R type G





ϕ1.0 drill hole

XEBEC Back Burr Cutter Before implementation	XEBEC Back Burr Cutter After implementation	XEBEC Back Burr Cutter + Nakanishi spindle After implementation
Processing time **15** sec	Processing time **10** sec	Processing time **4** sec

Reduces machining time by **11 seconds per shaft**

Drilling and cross-hole deburring on SUS303 shaft (ϕ1.0 mm)

		Conventional conditions 1 (Standard rotary tool)		Conventional conditions 2 (Standard rotary tool)	Nakanishi's proposed conditions
		Zero-cut machining		XEBEC Back Burr Cutter	XEBEC Back Burr Cutter + Nakanishi spindle
Process 1	Tool	ϕ1.0 cross-hole drill		ϕ1.0 cross-hole drill	ϕ1.0 cross-hole drill
	Cutting speed [m/min]	16		16	60
	Motor speed [min^{-1}]	5,000		5,000	19,000
	Feed/rev. [mm/rev]	0.012		0.012	0.018
	Feed rate [mm/min]	60		60	350
	Step [mm]	0.5		0.5	-
Process 2	Tool	ϕ3.0 front drill	ϕ1.0 cross-hole drill	ϕ0.8 XEBEC Back Burr Cutter	ϕ0.8 XEBEC Back Burr Cutter
	Cutting speed [m/min]	5	16	18	50
	Motor speed [min^{-1}]	1,700	5,000	7,000	20,000
	Feed/rev. [mm/rev]	0.02	0.012	0.03	0.03
	Feed rate [mm/min]	34	60	210	600
Processing time [sec]		15		10	4

Image of backside deburring in cross-holes

Machining conditions : BMF-3160 / 3130-CTZ

Drilling : A5052 (aluminum alloy)

Motor spindle	Tool diameter [mm]	Hole depth [mm]	Cutting speed [m/min]	Motor speed [min^{-1}]	Feed/rev. [mm/rev]	Feed rate [mm/min]	Load meter
BMF-3160-CTZ	NACHI-FUJIKOSHI CORP. DLCDR2.5	7.5 No pecking	196	25,000	0.040	1,000	Yellow1
BMF-3130-CTZ	NACHI-FUJIKOSHI CORP. DLCDR3.0	9 No pecking	198	21,000	0.050	1,050	Yellow1

Drilling : S50C (carbon steel)

Motor spindle	Tool diameter [mm]	Hole depth [mm]	Cutting speed [m/min]	Motor speed [min^{-1}]	Feed/rev. [mm/rev]	Feed rate [mm/min]	Load meter
BMF-3160-CTZ	MISUMI Group Inc. TAC-ESDBA2.0	6 1mm/step	126	20,000	0.010	200	Red
BMF-3130-CTZ	MISUMI Group Inc. TAC-ESDBA2.5	7.5 2.5mm/step	126	16,000	0.020	320	Yellow1

End mill : A5052 (aluminum alloy)

Motor spindle	Tool diameter [mm]	Cutting speed [m/min]	Motor speed [min^{-1}]	Feed per blade [mm/tooth]	Feed rate [mm/min]	Cutting depth ap x ae [mm]	Load meter
BMF-3160-CTZ	Mitsubishi Materials Corporation MS2ES ϕ3	565	60,000	0.02	2,400	0.3×2.7	Blue 1
BMF-3130-CTZ	Mitsubishi Materials Corporation MS2ES ϕ3.5	330	30,000	0.05	3,000	0.35×3.15	Blue 1

End mill : S50C (carbon steel)

Motor spindle	Tool diameter [mm]	Cutting speed [m/min]	Motor speed [min^{-1}]	Feed per blade [mm/tooth]	Feed rate [mm/min]	Cutting depth ap x ae [mm]	Load meter
BMF-3160-CTZ	Mitsubishi Materials Corporation MS2ES ϕ2.5	149	19,000	0.02	570	0.25×2.25	Blue 1
BMF-3130-CTZ	Mitsubishi Materials Corporation MS2ES ϕ3.0	151	16,000	0.02	640	0.3×2.7	Blue 1

Machining conditions : CTMF-3130

ϕ2.0 drilling on electromagnetic soft iron Comparison between conventional drilling and coolant through drilling

92% reduced

Drilling method	Work material	Tool diameter [mm]	Hole depth [mm]	L/D	Cutting speed [m/min]	Motor speed [min^{-1}]	Feed/rev. [mm/rev]	Feed rate [mm/min]	Coolant	Peck drilling cycle	Processing time [sec]
Conventional drilling (Automatic lathe rotation tool)	ELCH2 (Electro-magnetic soft iron)	2.0	19	10	40	6,400	0.03	192	External	Front 3.5 mm×2 times Back 4.0 mm×3 times	13.0
Coolant through drilling (CTMF-3130)			20		188	30,000	0.04	1,200	Internal	**No pecking**	**1.0**

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