

NAKANISHI online training

2021 NAKANISHI INC.

1. Ultrasonic Polisher Sheenus Zero 新款超声波研磨机

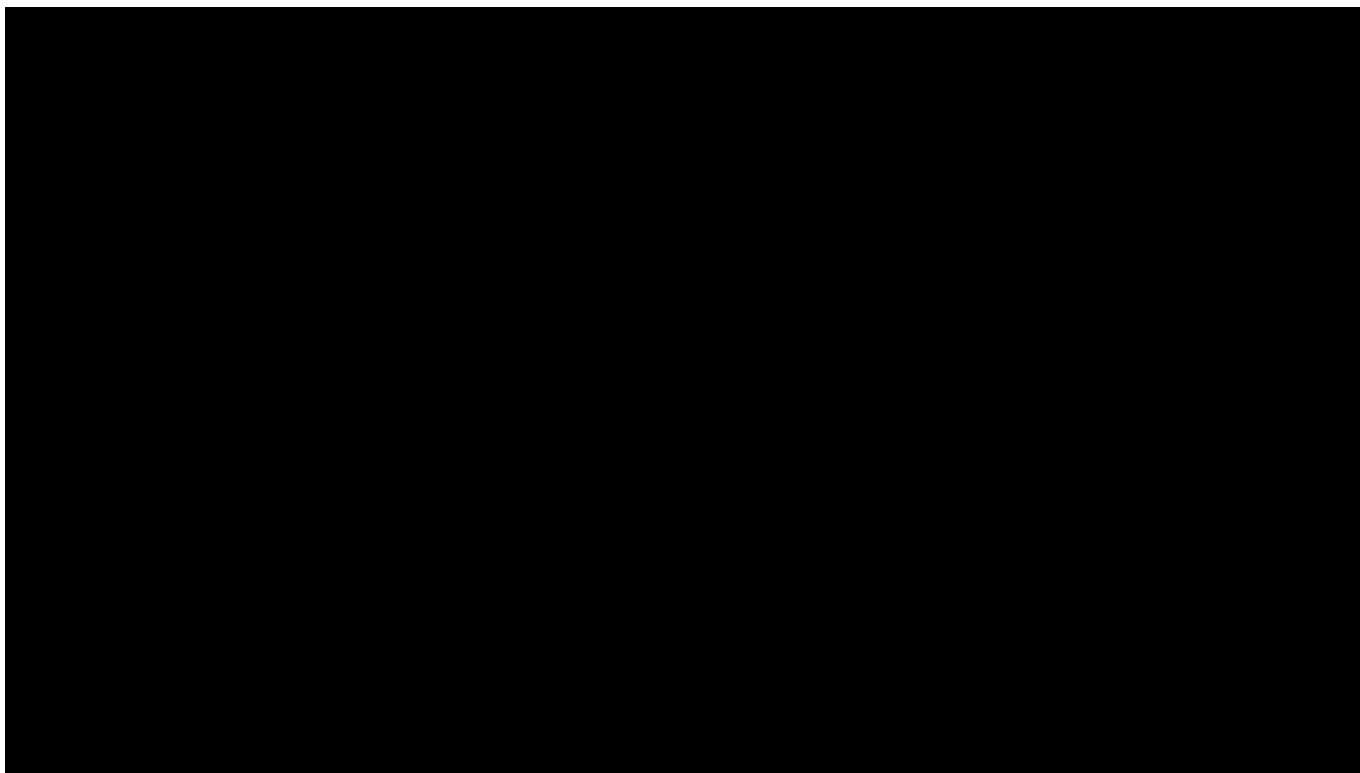
- Review for DMP exhibition 为DMP展会复习准备

2. New products 新产品

- Coolant Through Spindle (MQL and CTS) for Small-dia. deep hole 小、深孔加工用的中心出水主轴 (MQL和CTS)
- Electro-Static Discharge (ESD) for PCB depaneling
分板机用的防静电主轴 (ESD)

Ultrasonic Polisher
Sheenus Zero
新款超声波研磨机
Sheenus Zero

Why Selected by
Professionals of Mold Polishing?
为什么模具抛光的专业人士会选择它？



Design Comparison to Previous Model 与旧款设计上对比



Previous model 旧款
SHEENUS neo



New model 新款
Sheenus ZERO

Comparison to Previous Model

与旧款参数上对比

• Controller 控制器

	Previous model 旧款	Sheenus ZERO 新款	Strong point 要点
Model 型号	NE240	Sheenus ZERO Controller	
Max. output power 最大输出功率 UNCLAMP mode 非夹持模式 CLAMP mode 夹持模式	45 W 20 W	45 W 20 W	
Oscillating frequency 振荡频率	22.5 kHz	19 k – 29 kHz	
Frequency control 频率控制	Homing type 归位式	Homing type 归位式	
Vibrational amplitude 振幅	40 μm	40 μm	
Power conditioning 电源适配器	Continuous variable type 连续变量型	Variable 21 step type 21步变量型	
Power source 电源	AC 100, 120, 230 V	AC 100 – 240 V	Adapted the worldwide power supply 宽幅电压
Rated power consumption 额定功耗	31 W	27 W	13% reduction 减少13%

2021/11/16

Comparison to Previous Model

与旧款参数上对比

• Hand piece 手柄

	Previous model	Sheenus ZERO	Strong point 要点
Model 型号	US-25PB	US-50P	
Appearance 外观			Improved the visibility 改善了可视性
Oscillator 振荡器	Bolt-clamped Langevin type 螺栓夹紧式	Bolt-clamped Langevin type 螺栓夹紧式	
Length of cord 线长	2 m	3 m	Enhanced the working efficiency 提高了工作效率
Weight (excepting cord) 重量 (不含线)	140 g	140 g	

Why Selected by Professionals of Mold Polishing?

为什么模具抛光的专业人士会选择它？

Reason

1.

Overwhelming polishing power
压倒性的抛光性能优势



Reason

2.

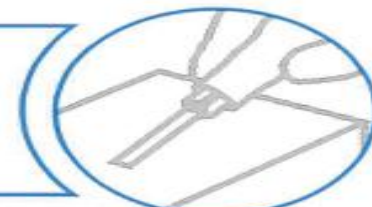
Visualization by digital display
数字显示实现可视化



Reason

3.

Frequency control to optimum level
频率控制到最理想状态



Reason

4.

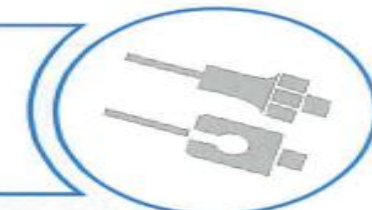
Light weight hand piece
手柄重量轻



Reason

5.

Wide variety of tools
可用于多种多样的工具



Why Selected by Professionals of Mold Polishing? 为什么模具抛光的专业人士会选择它？

Reason

1. Overwhelming polishing power

压倒性的抛光性能优势

- Max. vibrational amplitude: 40 μm 最大振幅40 μm
- 29,000 times frequency per second 频率29,000 次/秒
- No vibration to hand 使用中手感非常舒适，振动不会传导到手上
- Enable to polish at deep ribbing efficiently, which is difficult to polish by hand 能够有效地对难以手动抛光的深槽处进行抛光



Why Selected by Professionals of Mold Polishing?
为什么模具抛光的专业人士会选择它？

Reason

2. Visualization by digital display

数字显示实现可视化

- Digital display shows amplitude
(unique function) 数字显示振幅(独特的功能)
- Enable to standardize of work 可实现标准化作业



Why Selected by Professionals of Mold Polishing? 为什么模具抛光的专业人士会选择它？

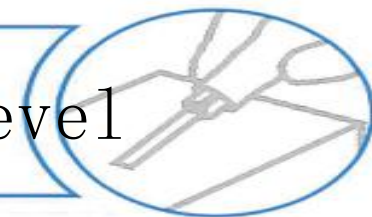
Reason

3. Frequency control to optimum level

频率控制到最理想状态

Enable to control the frequency to optimum level against the attached tool 能够把先端工具的频率控制到理想水平

- Enable to conduct the subtle feeling to finger-tips very well → Delicate Finishing!
- 能够很好的把先端工具微妙的触感引导到指尖 → 精抛!
- Enable to feel as if the tool was stuck to the workpiece → Efficient Polishing!
- 仿佛工具是被吸在工件上 → 2021/11/16 高效抛光!



Why Selected by Professionals of Mold Polishing?
为什么模具抛光的专业人士会选择它？

Reason

4. Light weight hand piece 手柄重量轻



- Easy to hold 手握轻便
- Light weight: 140 g 量轻: 140g
- Enable to polish for long time 长时间抛光不会累

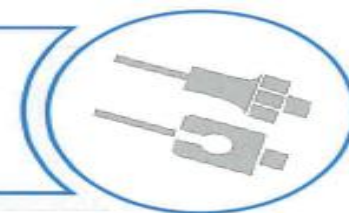
Why Selected by Professionals of Mold Polishing? 为什么模具抛光的专业人士会选择它？

Reason

5. Wide variety of tools

可用于多种多样的工具

- Enable to polish any workpiece by wide variety of tools 通过多样工具的搭配可以抛光任意工件

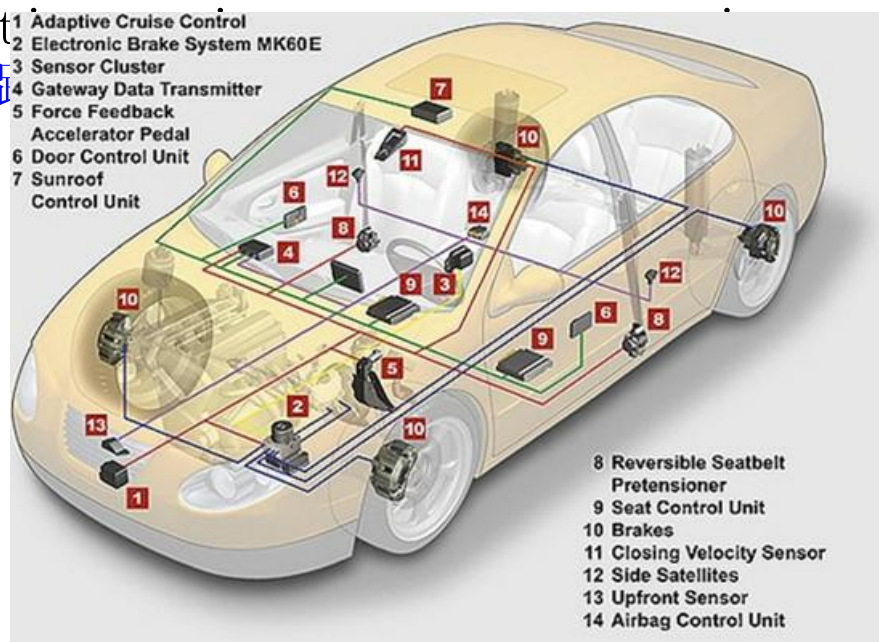


PCB Separator

What is ECU? 什么是ECU?

The ECU (Electric Control unit) is the device which electronically controls devices such as engines, motors, brakes, and sensors. Example: Engine ignition timing (electronic fuel injection unit ECU) ECU是发动机、马达、刹车系统、传感器等的电力控制装置。例如：汽车发动机的点火时间控制（电力燃油喷射ECU）

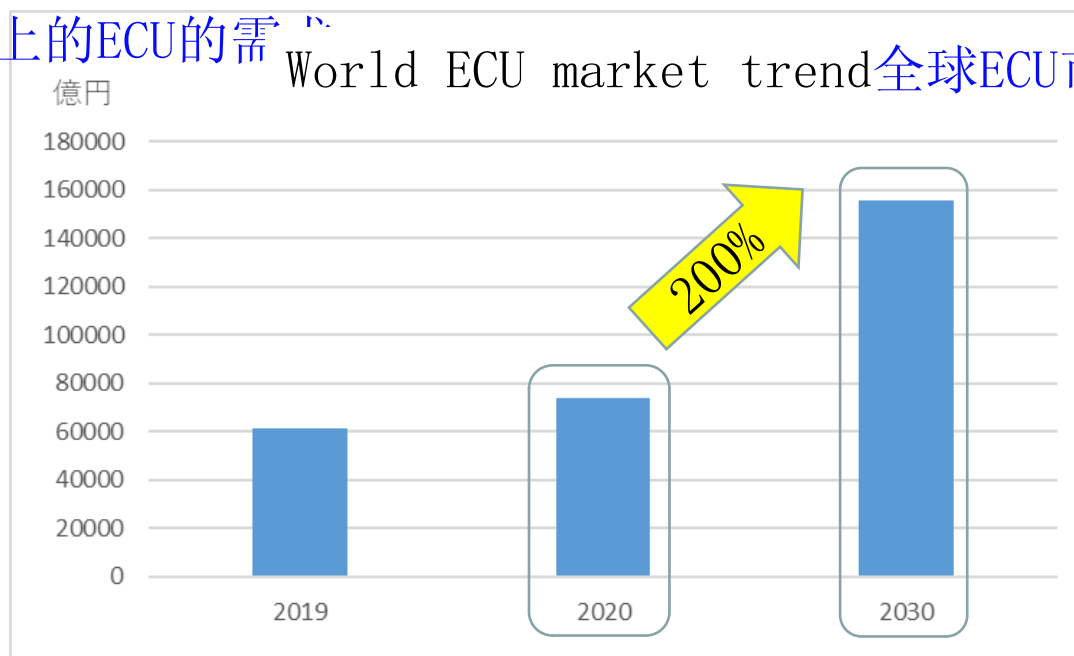
In order to improve fuel efficiency, the correct optimum conditions are created and controlled from information from various sensors from road surface condition, temperature, etc. 为了提高能效，从监测道路传感器获取信息，汽车各方面控制达到最优化。



World ECU market trend 全球ECU市场趋势

Demand for ECUs for electric vehicles such as hybrid vehicles (HV) and electric vehicles (EV) is expected to increase in the number of vehicles production, electrification and electrification of vehicles, and improvements in autonomous driving technology. 电动汽车和无人驾驶技术的发展，将会带动电动汽车（EV）

和混动汽车（HV）上的ECU的需求 World ECU market trend 全球ECU市场趋势



Reference source:

Create the graph based on Fuji Chimera Research Institute, Inc.

ECU and NAKANISHI

ECU = Aluminum die-cast case + PCB (Printed Circuit Board)

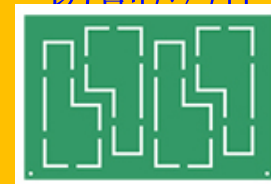
ECU = 压铸铝外壳 + PCB (印刷电路板)

And both material require NAKANISHI spindles 这两种材料都需要NAKANISHI 主轴



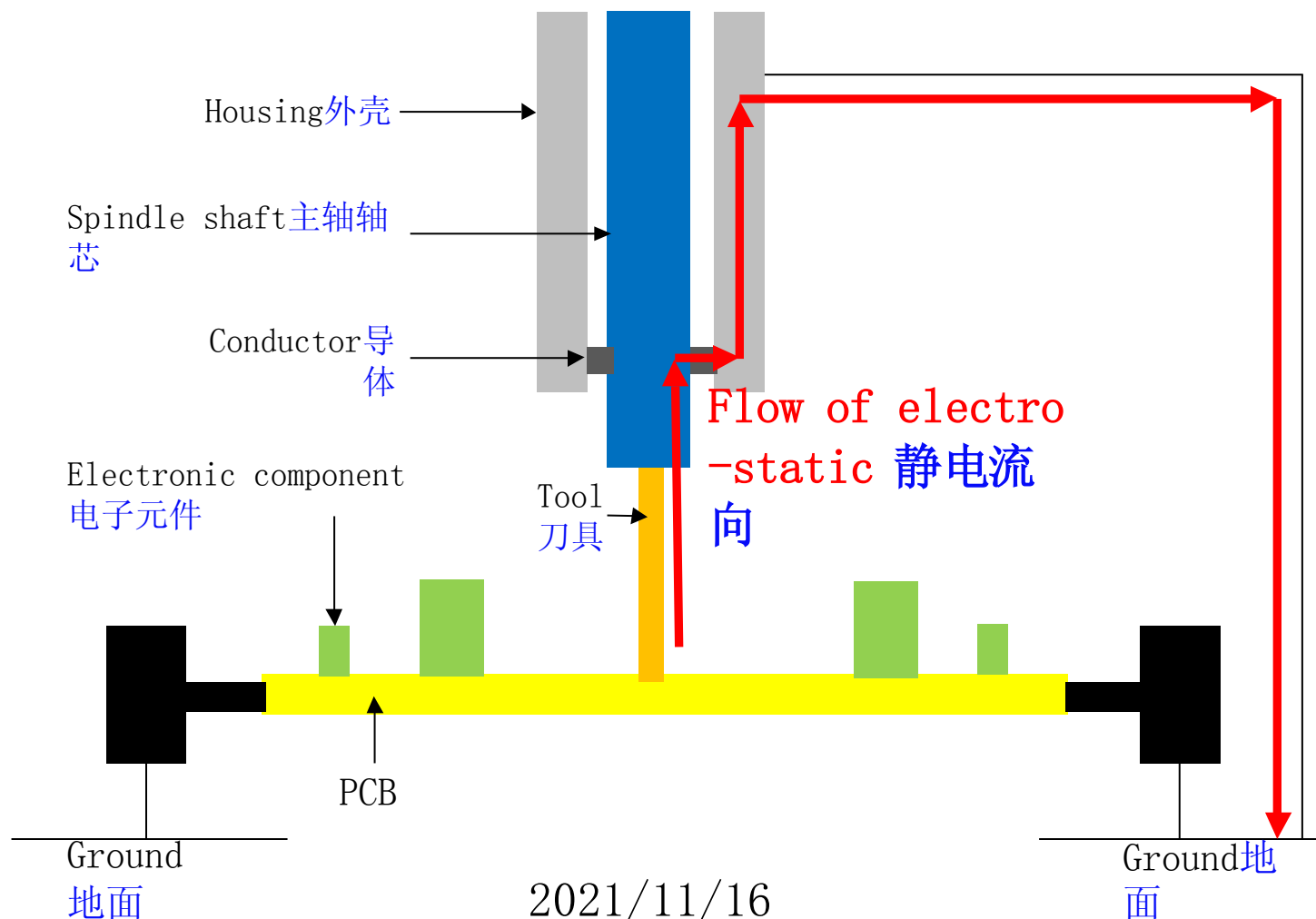
Deburring
required for
Aluminum die-
cast case
压铸铝外壳的去毛
刺需求

PCB depanelling
required the
cutting from PCB
big sheet 分板机
切割应用



System of Electrostatic Discharge

静电释放系统



PCB separator PCB分板机



Specifications Comparison 参数对比

Model 型号	NAKANISHI NR33-6000ATC-ESD +EM-3060J	SycoTec 4033AC-ESD-LN15	Difference 差异
Product composition 产品组成	Spindle + Motor 主轴+马达	Monolithic spindle 一体式主轴	Individual repair availability at our wider global network (9countries) 可对主 轴或马达任一单独维修，全球 网点更广
Outer diameter 外径	Φ 33 Φ 50 $\times$ 238.4	Φ 33 Φ 48 $\times$ 186	-
Motor system 马达系统	DC brushless motor (Closed loop) 无刷直 流马达（闭环）	3 phase AC motor (Open loop) 3相交 流马达（开环）	Better rotation speed and Torque characteristic 更好的转速和扭矩特征
Allowable motor speed 最大马达转速	60,000 min ⁻¹	80,000 min ⁻¹	Depends on actual processing condition 根据实际加工条件
Contact resistance ESD 接触电阻	$\leq$ 0.3 K Ω	$\leq$ 0.3 K Ω	-
Protection category 保护等级 (sealing air turned on)	IP57	IP55 (IP57 Option)	Better waterproof property 更好的防水性
Spindle accuracy 主轴 精度	within 1 μ m	within 3 μ m	-
Bur runout (Actual value) 跳动公差	1 μ m	4 μ m	Longer tool life time

Coolant Through Spindle 中心出水主轴

Japan small-dia end mill market trend

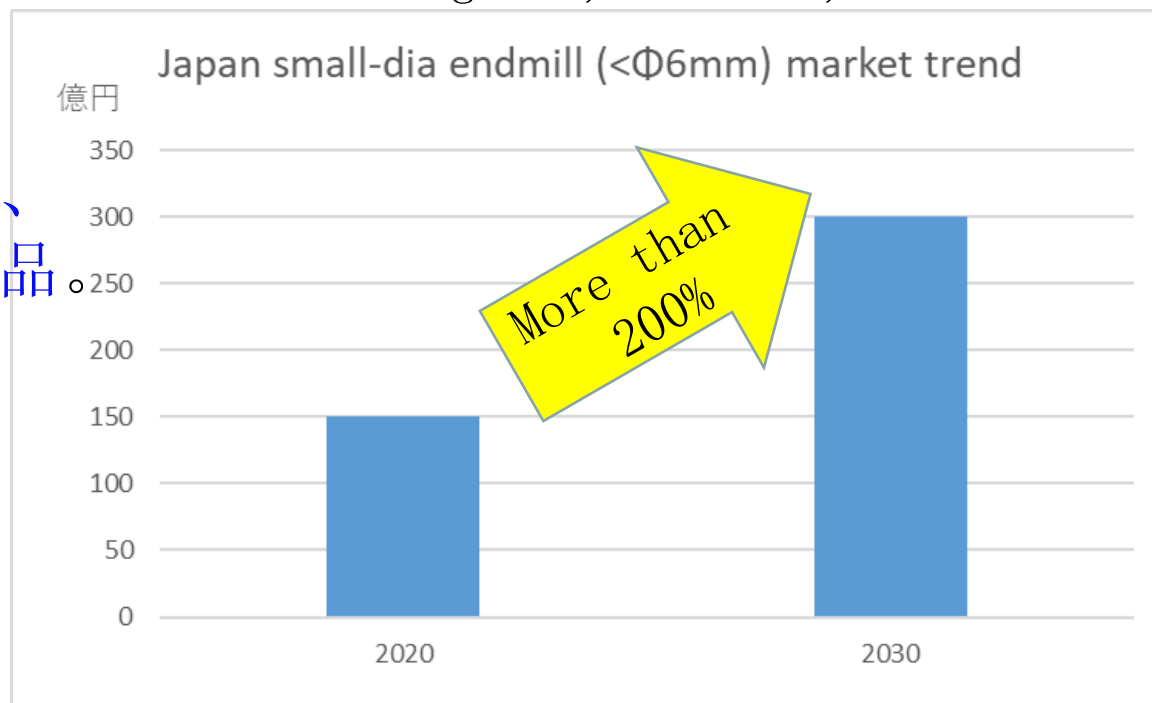
日本小直径铣刀市场趋势

Tool size down trend at NS Tool NS Tools 刀具尺寸缩小趋势

2010 $\Phi 2 \sim 3\text{mm}$ → 2015 $\Phi 1\text{mm}$ → 2020 $< \Phi 1\text{mm}$

It shows the market toward lighter, thinner, shorter and smaller products.

表明市场更
趋向轻、薄、
短、小的产品



Reference source:

Create the graph based on IR information at NS Tool Co., Ltd.

Product samples 工件样品

Automotive 汽车行业



Product: Plunger 产品: 活塞
Material: Pure iron, Electromagnetic SS
材质: 纯铁, 电磁不锈钢
OD: $\Phi 12 \sim 25$ 外径: $\Phi 12 \sim 25$
Length: 15~30mm 长度: 15~30mm
Hole size: $\Phi 2$ 孔径: $\Phi 2$



Product: Sleeve 产品: 套管
Material: Pure iron, SUM43
材质: 纯铁, SUM43合金钢
OD: $\Phi 14$ 外径: 14
Length: 50mm 长度: 50mm
Hole size: $\Phi 2 \sim \Phi 4.5$ 孔径: $2 \sim \Phi 4.5$

Medical 医疗行业



Product: Surgical suture needle
产品: 外科缝合针
Material: SUS 材质: SUS不锈钢
Hole size: $\Phi 0.33 \sim 1.6$ 孔径: $\Phi 0.33 \sim 1.6$



Product: CAD/CAM denture 义齿
Material: Aluminum, Brass 材质: 铝、铜
Hole size: $\Phi 2$ 孔径: $\Phi 2$

Precision component for Aerospace, Semiconductor 航空精密零件, 半导体



Coolant Through Spindle (CTS)

中心出水主轴 (CTS)

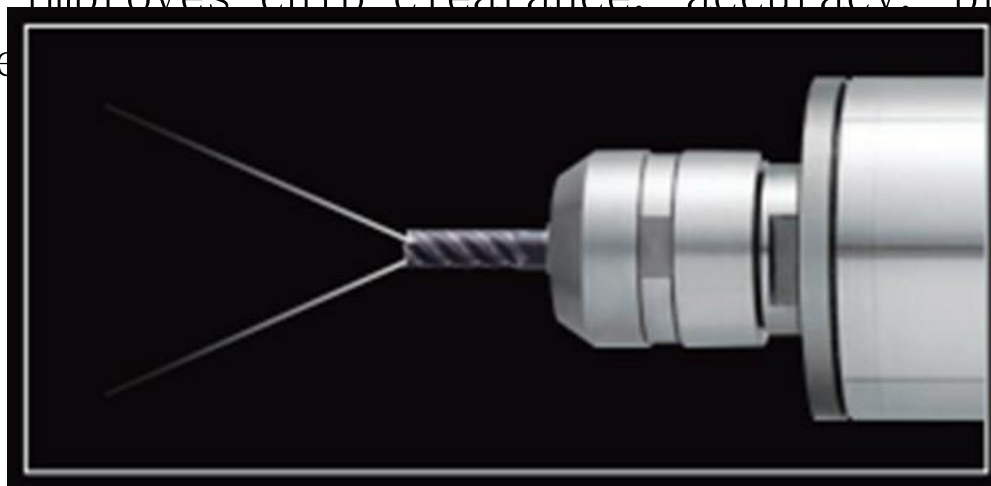
CTS is the solution for Small-dia. deep hole by stable chip evacuation

CTS主轴解决了加工小深孔稳定排屑的问题

- Pressurized coolant entered through the back of the spindle and through the cutting tool at a speed of 40,000 RPM. 受压的冷却液以40,000RPM的速度从主轴的后端穿过刀具。

- Through coolant improves chip clearance, accuracy, productivity and extends tool-life

清理了切削屑、提高了精度、产量，延长了刀具寿命。



Coolant Through Spindle spec

中心出水主轴参数

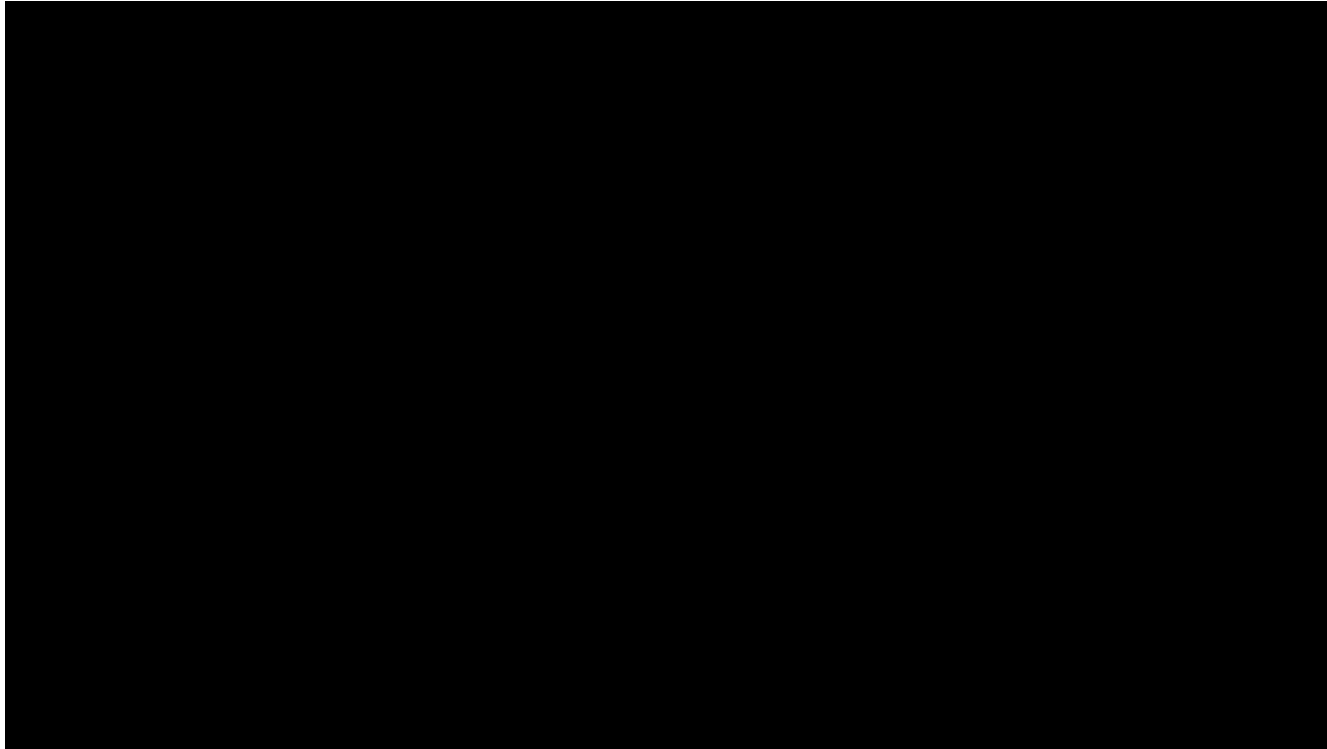
	CTS-3030	BMS-4020 -MQL	BMS-4040 -MQL	BMS-4020 -MQL-CHK	BMS-4040 -MQL-CHK
Max. rpm最大转速	30, 000	20, 000	40, 000	20, 000	40, 000
Spindle runout主轴精度	Within 1 μ m				
Electric motor马达	EM-3030T-J, EM-3030T-J-2M	- (One-piece type) 一体式			
Weight重量	810g	2, 300g			
Coolant冷却液	Oil 油性	Oil or Oil Mist 油或油雾性			
	(Can be used in both oil and water solubility, Low viscosity is commended) 油或水溶性皆可，推荐低粘度的冷却液				
Coolant pressure 冷却液压力	3. 0~20. 0MPa (Oil)	0. 2~3. 0MPa (Oil) 0. 2~1. 0MPa (Oil Mist)			
Filtration rating	过滤等级 Within 5 μ m				
Collet	CHA-3. 0, 3. 175, 4. 0	CH160H-3. 0~10. 0		CHK-OH-3. 0~6. 35	
Collet nut	CHN-CTA-3. 0, 3. 175, 4. 0	CHN16		K-265 25	
Hole size ref 参考的孔	1. 5	1. 5		2. 5	

BMS-4020/4040-MQL

BMS-4040-MQL

Φ2 x 19mm through hole on ELCH2

<https://youtu.be/CqDW4KqgRFA>



BMS-4040-MQL process data sample

BMS-4040-MQL加工数据案例
Design for high aspect ratio

	Current process condition	NAKANISHI
Material材质	ELCH2	
Hole spec孔尺寸	Φ2 x 19mm	
Tool刀具	MHS0200L025B (MITSUBISHI MATERIAL)	
Coolant pressure冷却液压力	—	3MPa
Cutting Speed (m/min) 切削速度 (米/分)	40	251
Spindle Speed (min-1) 主轴转速 (min-1)	6, 400	40, 000
Feed rate (mm/rev) 进给速率 (毫米/转)	0. 03	0. 06
Feed (mm/min) 进给量 (毫米/分)	192	2, 400
Step 切削步骤	正面Front side: 3.5mm x 2times 背面Back side: 4.0mm x 2times	12.5 times 12.5倍 Only front side仅正面 Non step 无 需停顿退刀再钻 28

BMS-4020/4040-MQL(-CHK) System chart

BMS-4020/4040-MQL(-CHK) 系统配置图

"High pressure coolant device" or "oil mist supply device" to be arranged by the customer. 高压冷却剂装置和油雾供给装置由客户自己配备



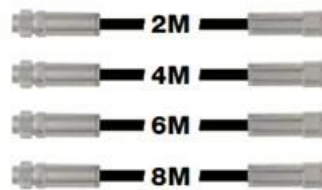
BMS-4020/4040-MQL



BMS-4020/4040-MQL-CHK



EMCD-4000-
2M/4M/6M/8M
Power cable with Air hose
p.23



EMCD-4000S-
2M/4M/6M/8M
Signal cable
p.23

※Power cable and Signal cable should be used as set.
※8M motor cord is only for BMS-4020 / BMS-4040 / BMS-4020-MQL / BMS-4040-MQL



E4000
Controller
p.23



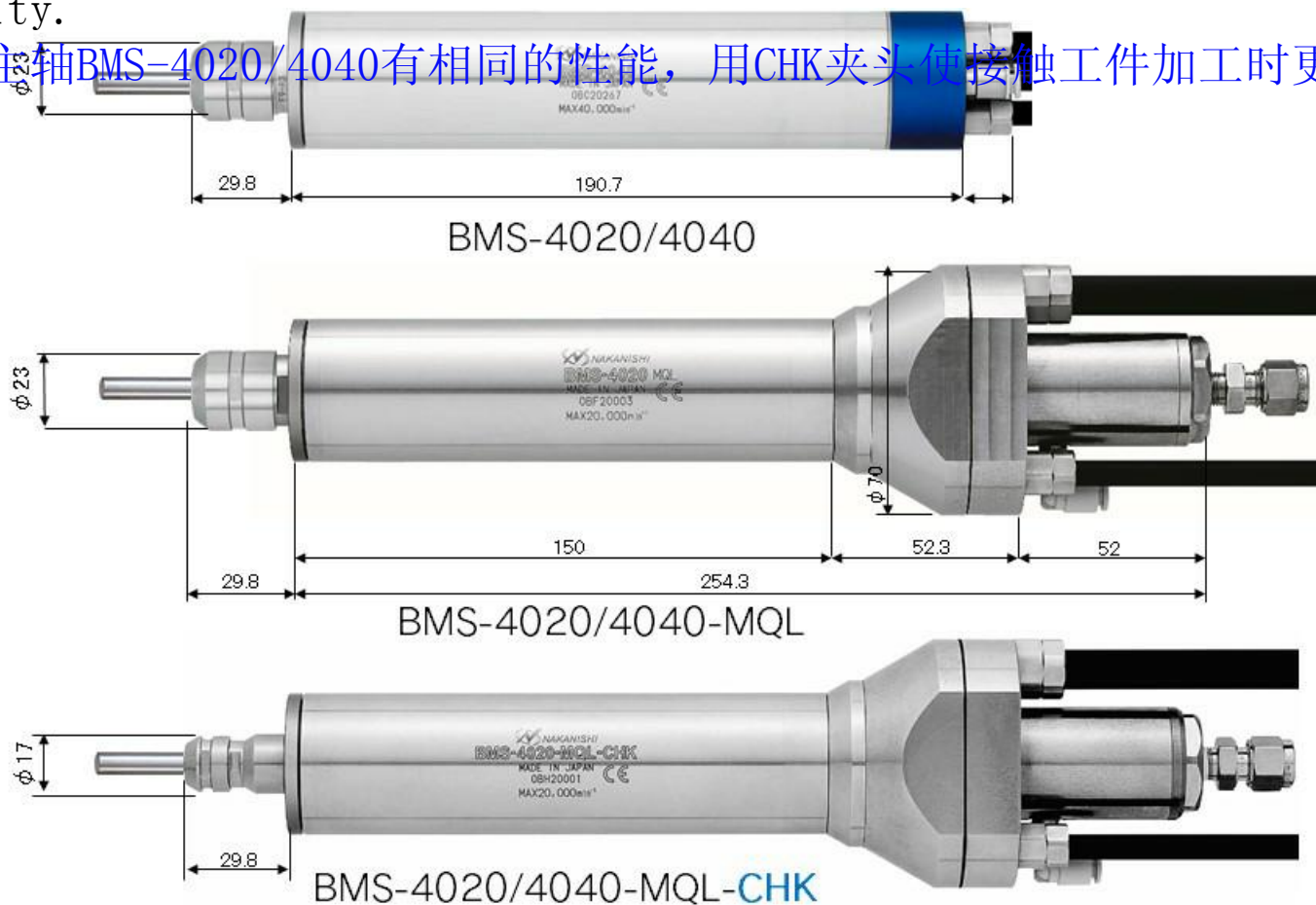
AL-C1204
Air line kit
To supply clean and dry cooling and purging air to Controller and Motor/Spindle.
p.24

Air compressor

BMS-4020/4040-MQL (-CHK)

Supports Center Through Coolant with the same performance of BMS-4020/4040. CHK type of collet using at BMS-4020/4040-MQL-CHK improve the work accessibility.

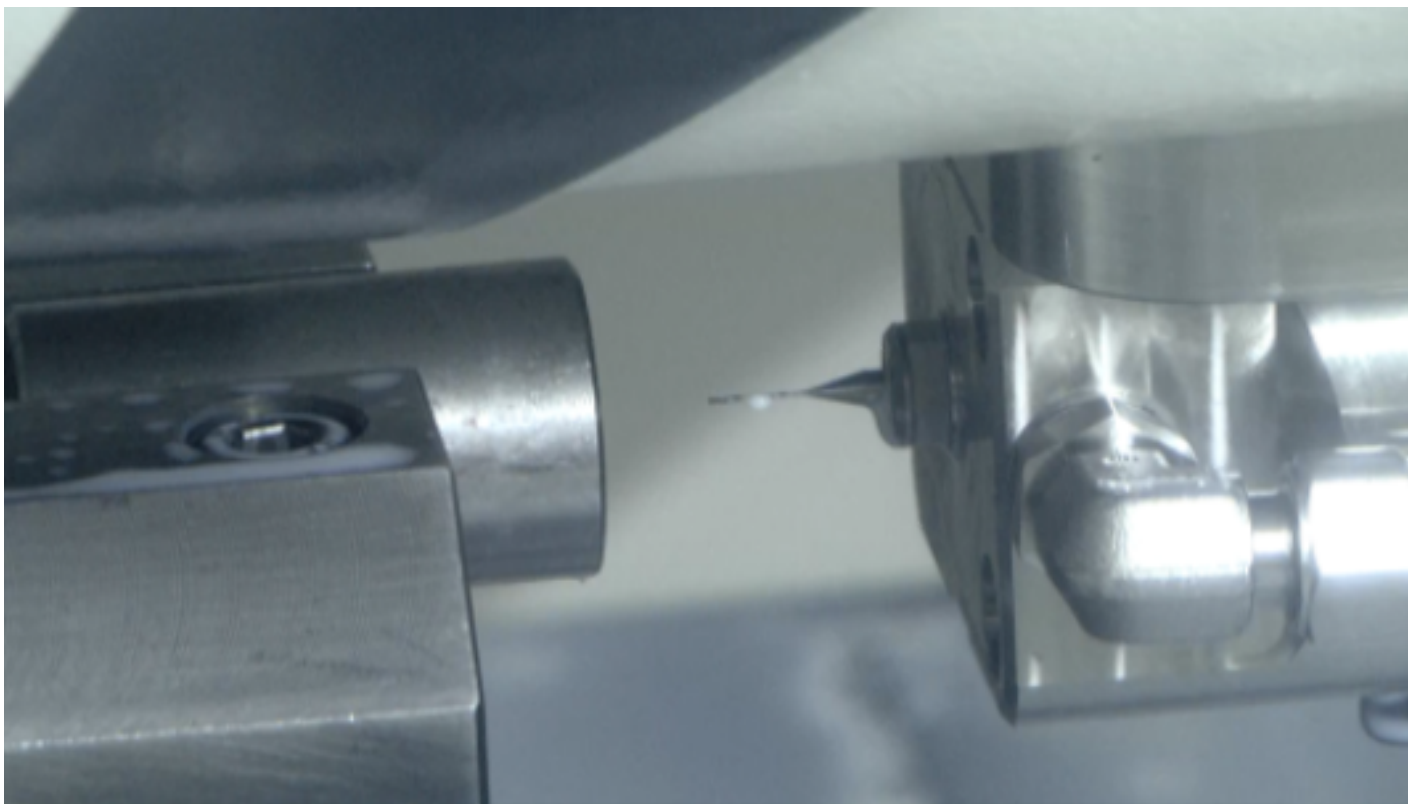
与中心出水主轴BMS-4020/4040有相同的性能，用CHK夹头使接触工件加工时更无障碍。



New product 新产品
CTS-3030

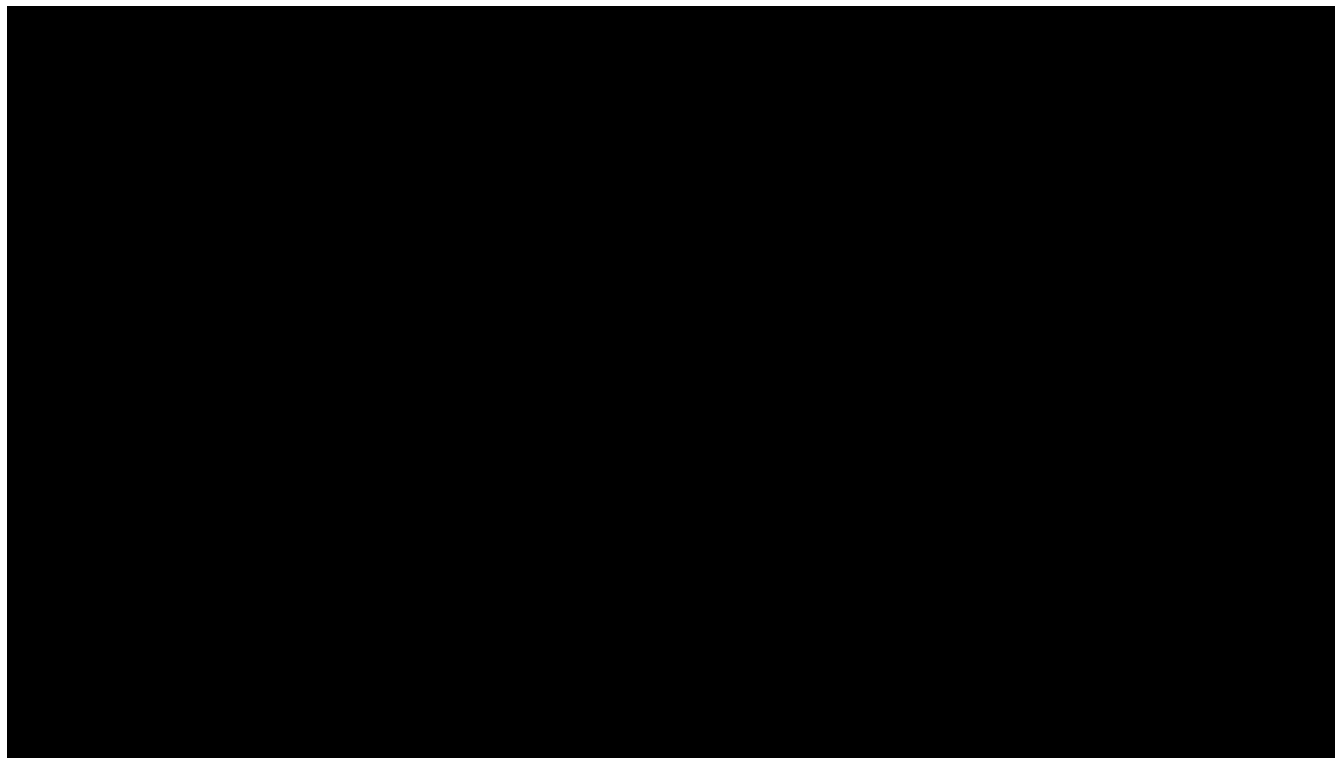
Coolant Thru Spindle 中心出水主轴

$\Phi 0.5 \times 2\text{mm}$ through hole on ELCH2 $\Phi 0.5 \times 2\text{mm}$ 通孔



Coolant Thru Spindle 中心出水主轴

Φ2.0 x 20mm through hole on SUS304 Φ2.0 x 20mm 通孔



CTS-3030 process data sample

CTS加工数据案例

Design for high aspect ratio

Material材质	ELCH2	SUS304
Hole spec孔尺寸	$\Phi 0.5 \times 2\text{mm}$	$\Phi 2 \times 20\text{mm}$
Tool刀具	MWS0050LB (MITSUBISHI MATERIAL)	DVAS0200X12S040 (MITSUBISHI MATERIAL)
Coolant pressure冷却液压力	10MPa	20MPa
Spindle Speed (min-1) 主轴转速	30,000	15,000
Feed rate (mm/rev) 进给速率	0.01	0.027
Step切削步骤	Non step无停顿	Non step无停顿

CTS-3030 process data sample CTS加工数据案例

Ref. How to integrate CTE-3030 into Eq.

如何安装CTS-3030

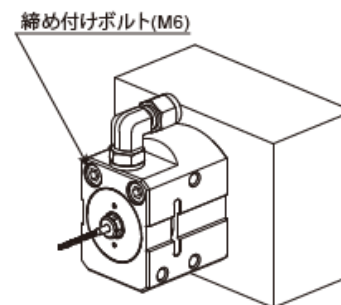


図 - 17

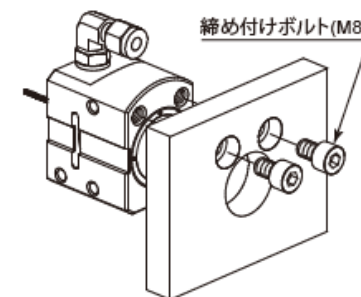
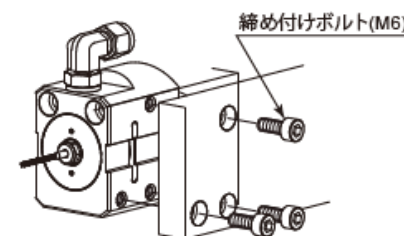
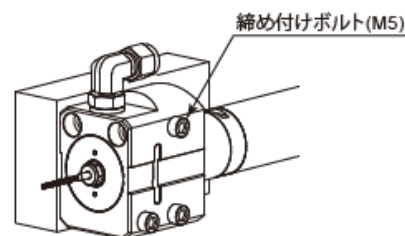


図 - 18



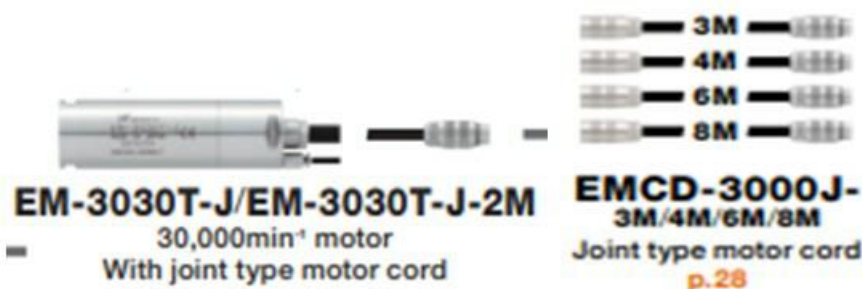
CTS3030 System chart CTS3030系统配置图

"High pressure coolant device" to be arranged by the customer.

高压冷却液装置由客户自己配备



CTS-3030

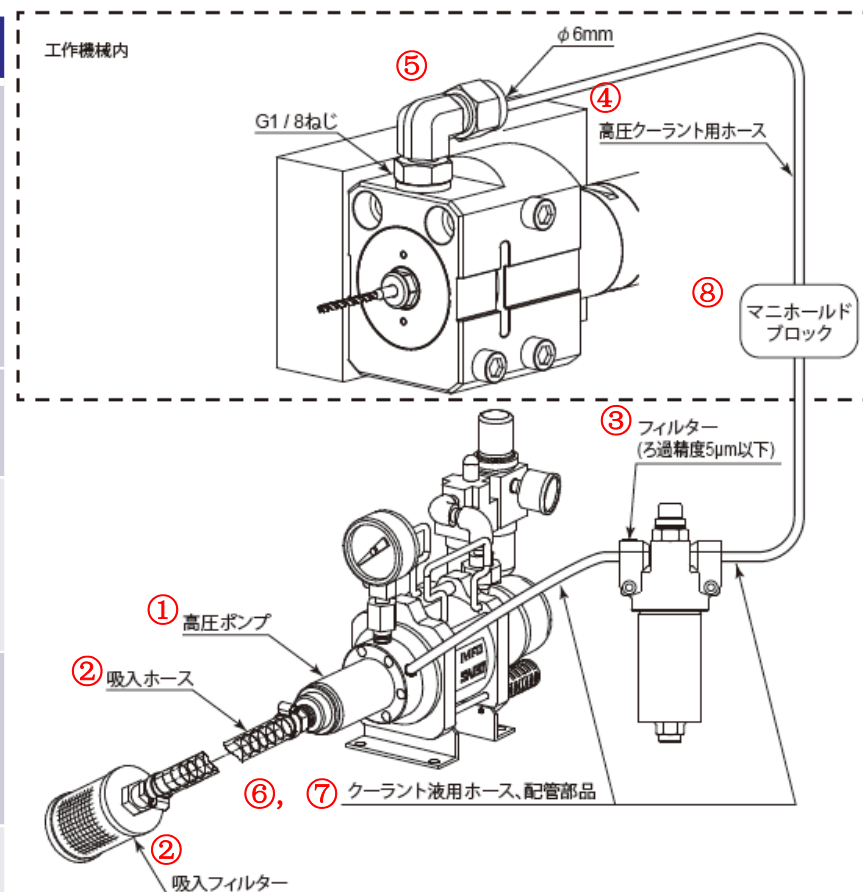


CTS-3030 pipe connection example

CTS-3030管道连接示例

Recommended products 推荐产品

	Product 产品	Model# 型号	Maker 厂商
①	High-pressure pump 高压泵	CHP150-1200	RIX (Available to purchase from RIX Thailand)
②	Inlet filter and hose 进气过滤器和软管	(CHP150-1200 Accessory)	
③	Filter 过滤器	TM-C-04-2-3CH	Taisei Kogyo
④	High pressure coolant hose 高压冷却液用软管	NH3-K6-□-K6	ASK
⑤	High pressure coolant joint 高压冷却液用接头	SS-6M0-2-2PR (CTS3030 Accessory)	Swagelok
⑥	Coolant hose 冷却液用软管	SS-FX4TM6TM6-□CM	Swagelok
⑦	Coolant pipe 冷却液用输送管	NWP3506	YOKOHAMA RUBBER



Coolant Through Spindle spec

中心出水主轴参数

	CTS-3030	BMS-4020 -MQL	BMS-4040 -MQL	BMS-4020 -MQL-CHK	BMS-4040 -MQL-CHK
Max. rpm最大转速	30, 000	20, 000	40, 000	20, 000	40, 000
Spindle runout主轴精度	Within 1 μ m				
Electric motor马达	EM-3030T-J, EM-3030T-J-2M	- (One-piece type) 一体式			
Weight重量	810g	2, 300g			
Coolant冷却液	Oil 油性	Oil or Oil Mist 油或油雾性			
	(Can be used in both oil and water solubility, Low viscosity is commended) 油或水溶性皆可，推荐低粘度的冷却液				
Coolant pressure 冷却液压力	3. 0~20. 0MPa (Oil)	0. 2~3. 0MPa (Oil) 0. 2~1. 0MPa (Oil Mist)			
Filtration rating	过滤等级 Within 5 μ m				
Collet	CHA-3. 0, 3. 175, 4. 0	CH160H-3. 0~10. 0		CHK-OH-3. 0~6. 35	
Collet nut	CHN-CTA-3. 0, 3. 175, 4. 0	CHN16		K-265	
Hole size ref 参考的孔	1. 5	1. 5		38	

