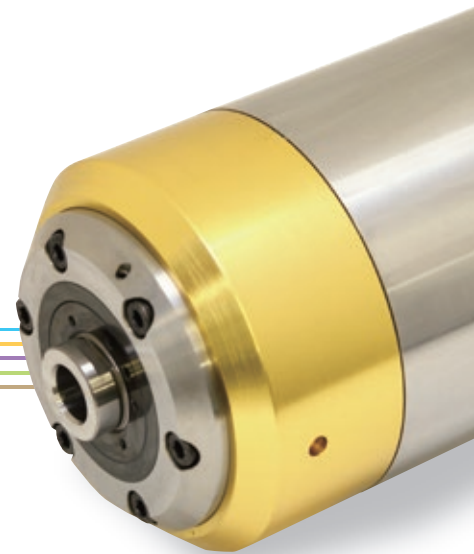


Supporting Precision Machining Technology



Seiko Instruments Inc.  
563 Takatsukashinden, Matsudo-shi,  
Chiba, 270-2222, Japan  
Telephone: (+81)47-392-2091 Fax: (+81)47-392-2476  
<http://www.sii.co.jp/mt/spindle/en/>



# Our Pursuit of Ultra-high-precision Began with Wristwatch Manufacturing

We cultivated our precision machining technology in the manufacture of wristwatches that requires advanced technology.

Above all, we have built up a track record and experience in the field of grinding.

The beginnings of the SII Spindle Series can be found in our ultra-high-speed and high-frequency spindles for our internal grinders.

This series has now earned a high level of trust from our customers for more than half a century.

We developed our new SSPG Series by incorporating new technologies into our wealth of experience to embark on a complete re-design as gold spindles and launch us onto a new stage.

In addition, we have assembled an abundant range of variations, such as high-speed and ultra-high-precision oil static pressure and air spindles in addition to the H Series that provides support up to 300,000min<sup>-1</sup>.

**High-efficiency machining**

**High-output and high-rigidity**

Built-in motors with high output  
Higher speeds and rigidity through larger diameters of the axis of rotation

**Ultra-precision machining**

**High-precision**

Uses high-precision bearings (UP and P2 grades)  
Few vibrations or noise

**High reliability**

**High-quality**

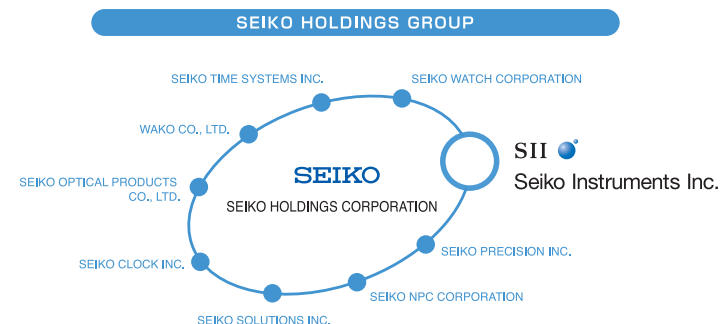
Quality management through the careful selection of all parts, our unique assembly technologies and careful assembly & tuning function inspection system



We have precision machining and assembly technologies that we have cultivated with our wristwatch production technologies.

We offer world-class ultra-precision grinding. This makes it possible to achieve ultimate form precision.

This is the central part of our ultra-precision grinders. We have ultra-high-speed, high-precision and high-rigidity spindles. We have built up trust and a track record over half a century since the old Seiko Seiki era.



- 1881 Kintaro Hattori established Hattori Watch Shop (presently: Seiko Holdings Corporation)
- 1937 Daini Seikosha (presently Seiko Instruments (SII)) established
- 1964 Seiko Seiki established
- 1966 Inner surface grinder developed and ultra-high-speed and high-frequency spindle M20 (200,000 min<sup>-1</sup>) developed
- 2001 Seiko Seiki merged with Seiko Instruments (presently SII)
- 2009 SII became a 100% owned subsidiary of Seiko Holdings
- 2013 Individual spindle product sales started and new series released

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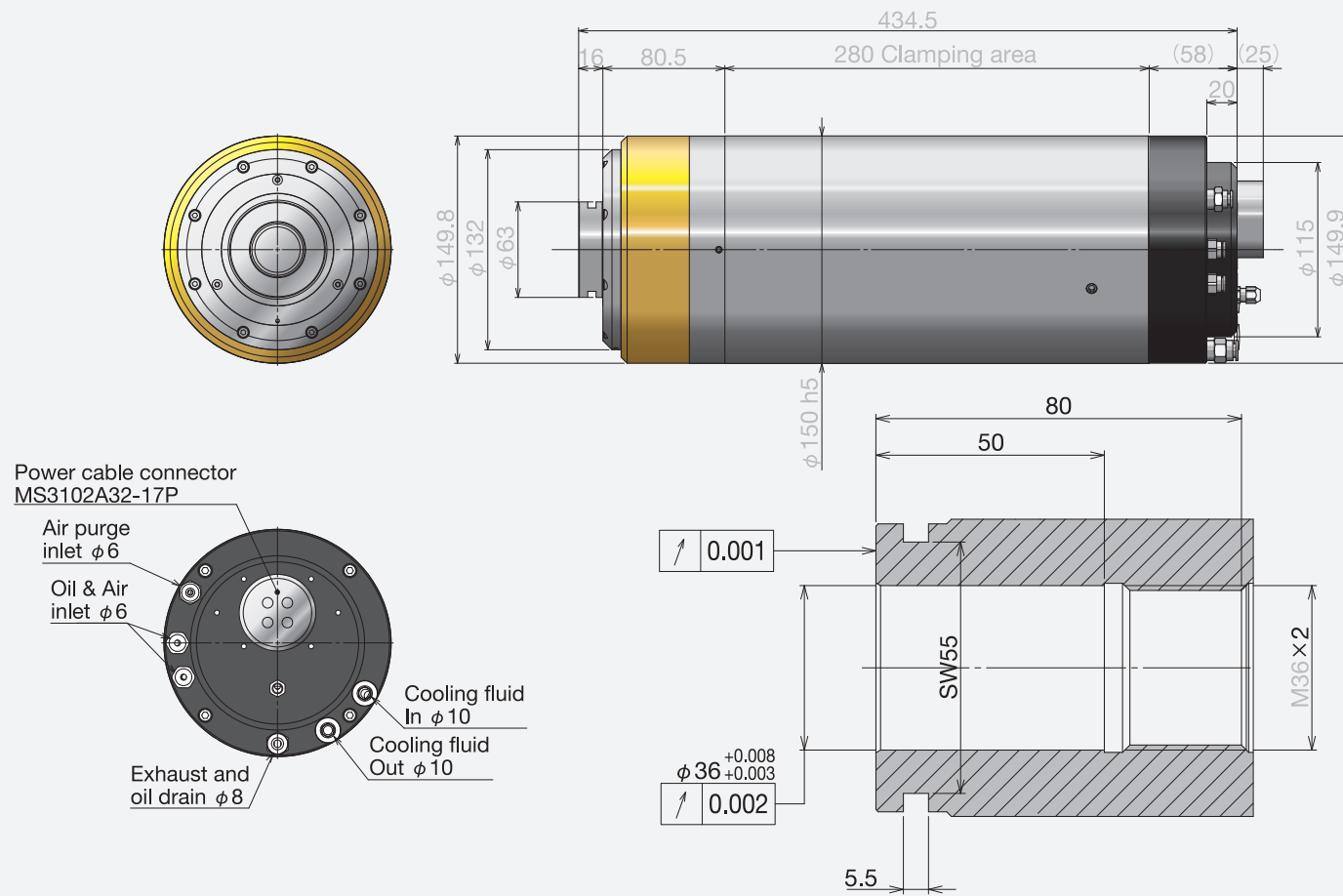




Maximum number of rotations:

*30,000 min<sup>-1</sup>*

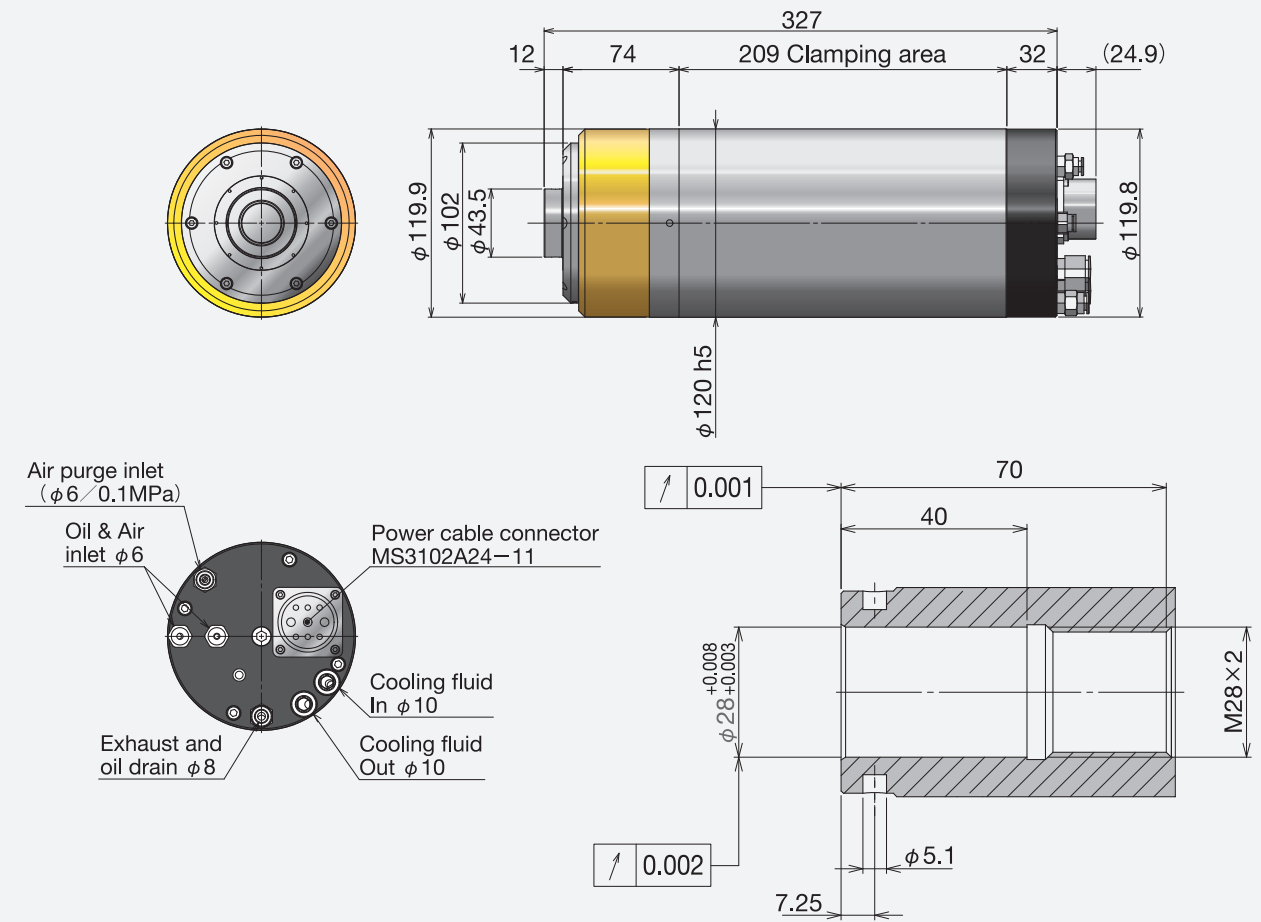
Cutting Grinding



Maximum number of rotations:

*45,000 min<sup>-1</sup>*

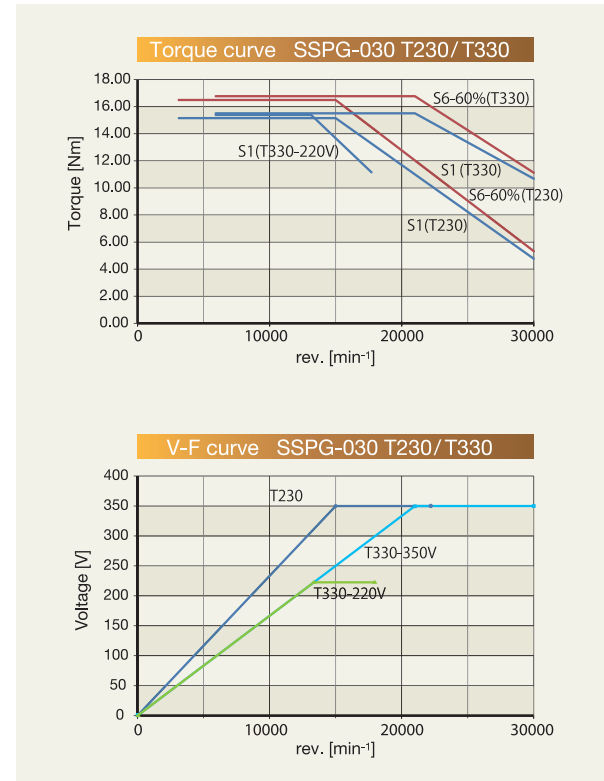
Cutting Grinding



## SSPG-030 T180 / T230 / T330 New Products

### Specifications

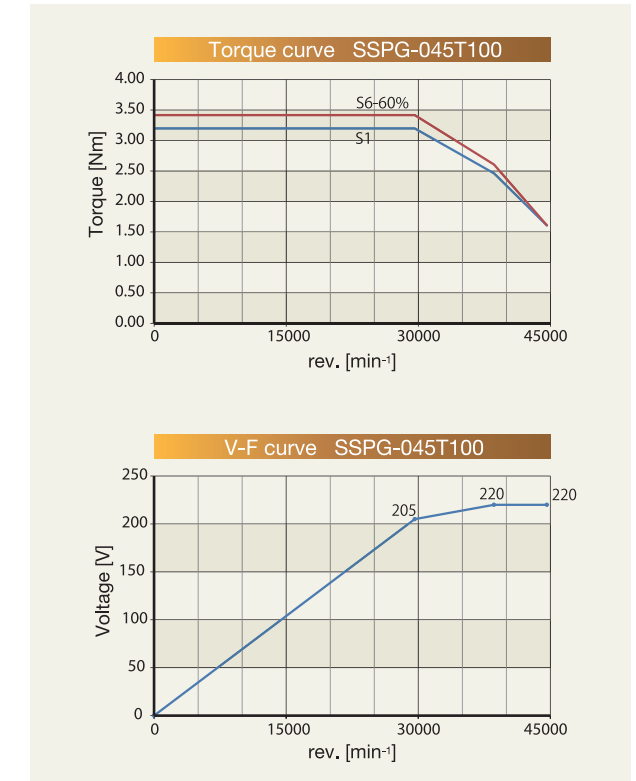
Item	Details			
	T230	T330		
Machining details	Quill type grinding *Please talk to us about machining applications			
Maximum number of rotations	30,000 min <sup>-1</sup>			
Rotation direction	Anticlockwise as viewed from the quill side			
Mounting direction	Horizontal / vertical (Quill pointing downward) *Separate specifications			
Spindle nose system	M36 (Illustration)			
Shaft diameter	65 mm			
Seal air	Required			
Cooling system	Oil cooling and water cooling (Containing rust inhibitor)			
Lubrication	System	Oil-air		
	Viscosity	ISO VG32		
	Setting	Calculated each time		
Motor specifications	Voltage	Three-phase: 350V	Three-phase: 220V	
	Frequency	1000 Hz		
	Number of poles	4		
	Rated output	26.0 kW (S6- 60%) 23.0 kW (S1-100%)	33.0 kW (S6- 60%) 37.0 kW (S1-100%)	25.0 kW (S6- 60%) 21.0 kW (S1-100%)
	Rated torque	16.5 Nm (S6-60%) 15.1 Nm (S1-100%)	17.0 Nm (S6-60%) 15.4 Nm (S1-100%)	17.0 Nm (S6-60%) 15.4 Nm (S1-100%)
	Rated current	53 A (S1-100%)	76 A (S1-100%)	
Rigidity (Reference)	Radial	200 N/μm		
	Thrust	125 N/μm		
Static runout accuracy	Radial	2 μm or less		
	Thrust	1 μm or less		
Sensor	Thermistor	PTC 130 °C		



## SSPG-045 T100

### Specifications

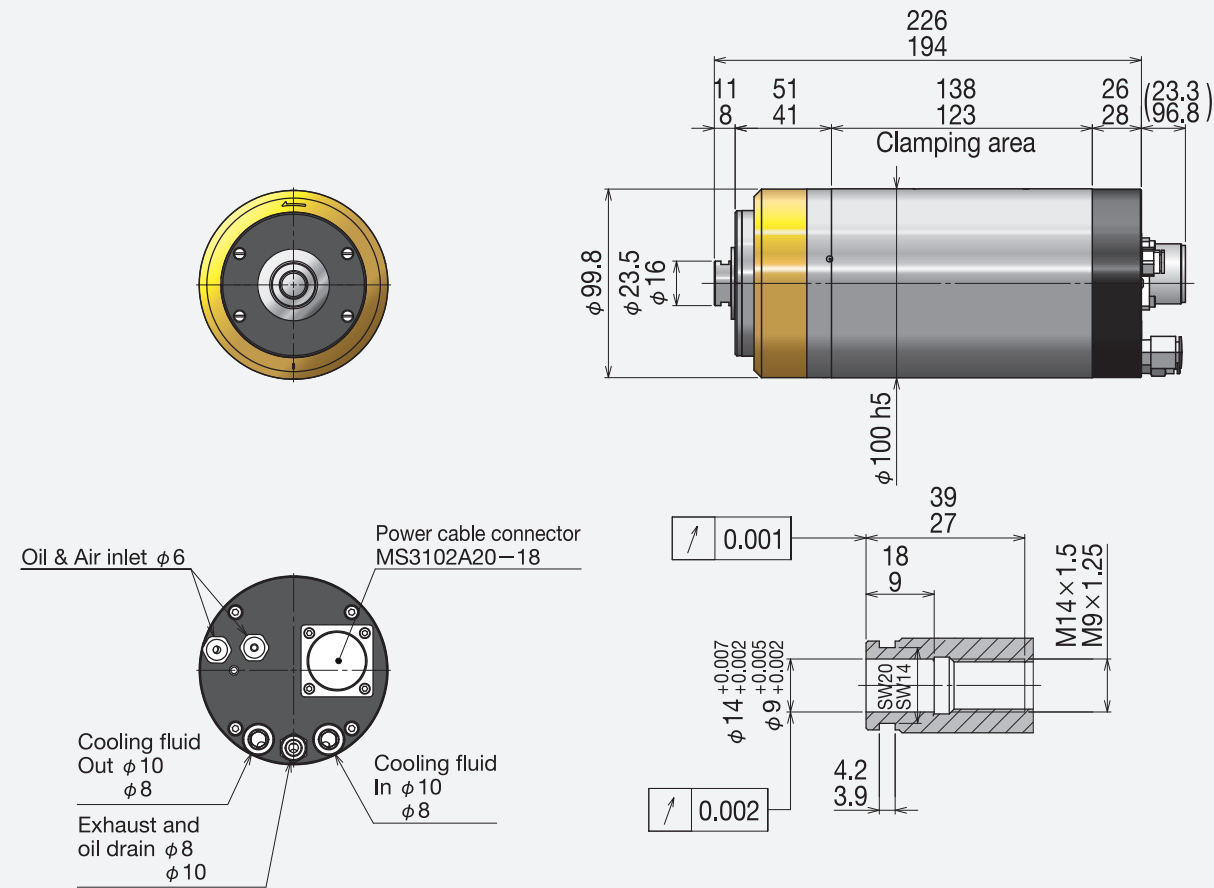
Item	Details			
	Machining details	Quill type grinding *Please talk to us about machining applications		
Maximum number of rotations	45,000 min <sup>-1</sup>			
Rotation	Anticlockwise as viewed from the quill side			
Mounting direction	Horizontal / vertical (Quill pointing downward) *Separate specifications			
Spindle nose system	M28 (Illustration)			
Shaft diameter	φ 45 mm			
Shaft diameter	Required			
Cooling system	Oil cooling and water cooling (Containing rust inhibitor) Tuning to a flow rate of around 6 l/min			
Lubrication	System	Oil-air		
	Viscosity	ISO VG32		
	Setting	Calculated each time		
Motor specifications	Voltage	Three-phase: 220V		
	Frequency	1500 Hz		
	Number of poles	4		
	Rated output	11.5 kW (S6- 60%) 10.0 kW (S1-100%)		
	Rated torque	3.4 Nm (S6-60%) 3.2 Nm (S1-100%)		
	Rated current	47 A (S6-60%) 42 A (S1-100%)		
Rigidity (Reference)	Radial	125 N/μm		
	Thrust	91 N/μm		
Static runout accuracy	Radial	2 μm 以下		
	Thrust	1 μm 以下		
Sensor	Thermistor	PTC 130 °C		



Maximum number of rotations:

*75,000 min<sup>-1</sup>*     *90,000 min<sup>-1</sup>*

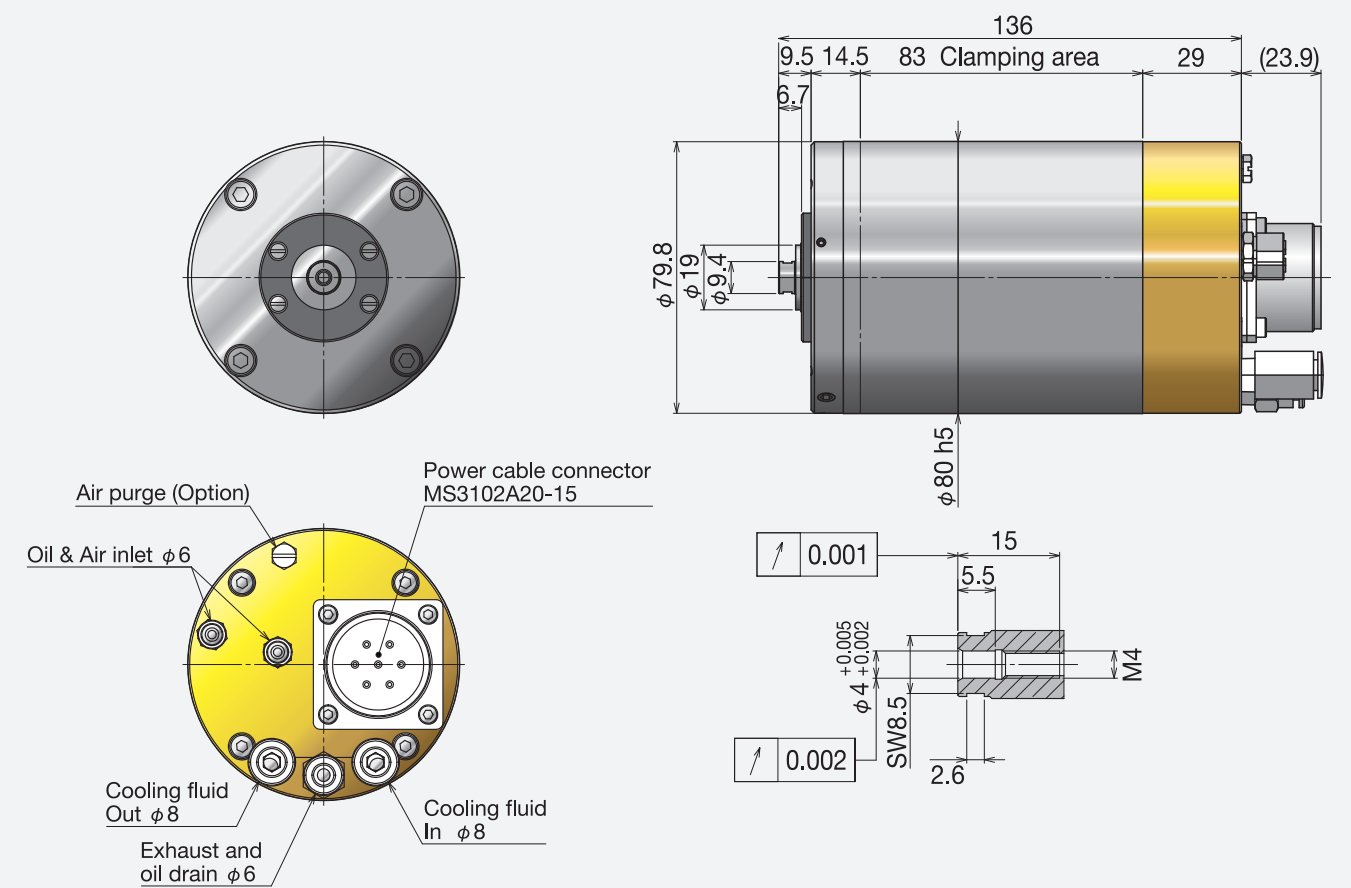
Grinding



Maximum number of rotations:

*150,000 min<sup>-1</sup>*

Grinding

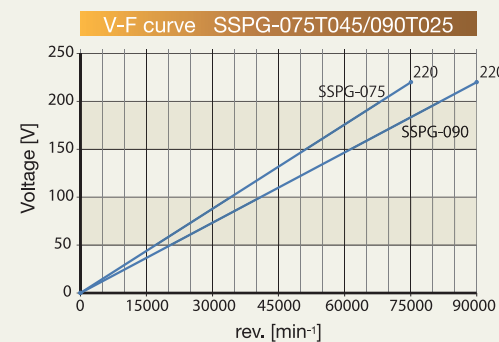
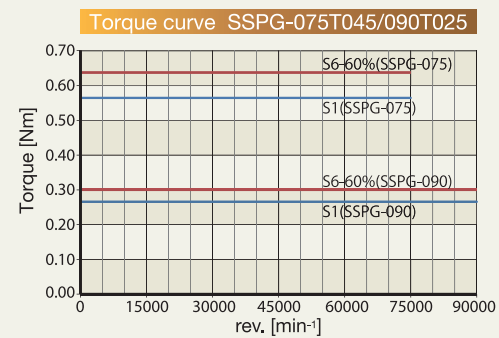


## SSPG-075 T045 / SSPG-090 T025S

New Products

### Specifications

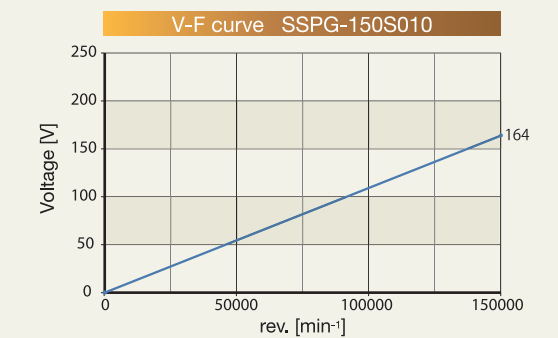
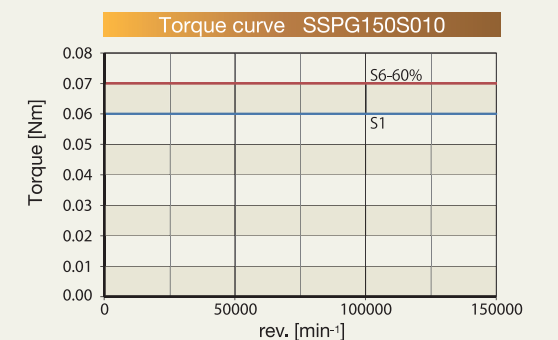
Item	Details	
	075	090
Machining details	Quill type grinding *Please talk to us about machining applications	
Maximum number of rotations	75,000 min <sup>-1</sup>	90,000 min <sup>-1</sup>
Rotation direction	Anticlockwise as viewed from the quill side	
Mounting direction	Horizontal / vertical (Quill pointing downward) *Separate specifications	
Spindle nose system	M14 + Spigot (Illustration)	M10 + Spigot (Illustration)
Shaft diameter	φ 25 mm	φ 17 mm
Seal air	Not required *Option available	
Cooling system	Oil cooling and water cooling (Containing rust inhibitor) Tuning to a flow rate of around 5.0 l/min	
Lubrication	System	Oil-air
	Viscosity	ISO VG32
	Setting	Calculated each time
Motor specifications	Voltage	Three-phase: 220V
	Frequency	1250 Hz     1500 Hz
	Number of poles	2
	Rated output	5.2 kW (S6-60%)     3.0 kW (S6-60%) 4.5 kW (S1-100%)     2.5 kW (S1-100%)
	Rated torque	0.66 Nm (S6-60%)     0.3 Nm (S6-60%) 0.57 Nm (S1-100%)     0.27 Nm (S1-100%)
Rigidity (Reference)	Radial	56 N/μm
	Thrust	53 N/μm
Static runout accuracy	Radial	2 μm or less
	Thrust	1 μm or less
Sensor	Thermistor	PTC 130 °C
Special specification	Coolant through	



## SSPG-150 S010

### Specifications

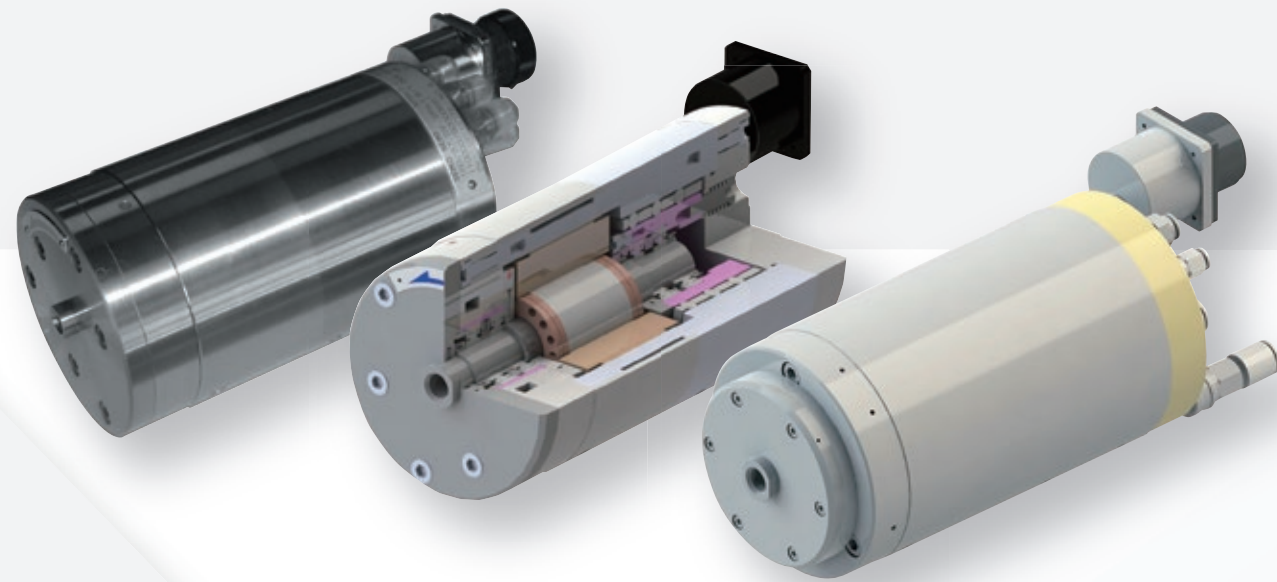
Item	Details	
Machining details	Quill type grinding *Please talk to us about machining applications	
Maximum number of rotations	150,000 min <sup>-1</sup>	
Rotation	Anticlockwise as viewed from the quill side	
Mounting direction	Horizontal / vertical (Quill pointing downward) *Separate specifications	
Spindle nose system	M4 + Spigot (Illustration)	
Shaft diameter	φ 10 mm	
Seal air	Not required	
Cooling system	Water cooling (Containing rust inhibitor) Tuning to a flow rate of around 3 l/min	
Lubrication	System	Oil-air
	Viscosity	ISO VG32
	Setting	Calculated each time
Motor specifications	Voltage	Three-phase: 164V
	Frequency	2500 Hz
	Number of poles	2
	Rated output	1.1 kW (S6-60%)     0.94 kW (S1-100%)
	Rated torque	0.07 Nm (S6-60%)     0.06 Nm (S1-100%)
Rigidity (Reference)	Radial	14.6 N/μm
	Thrust	12.5 N/μm
Static runout accuracy	Radial	2 μm or less
	Thrust	1 μm or less
Sensor	—	





# H Series / New H Series

Grinding  
(Internal and Face)



## Our Long-selling SII Spindles

This is our H Series of spindles that are equipped as standard in the internal grinders we make.

These high-speed and high-precision spindles backed

by a track record in grinding over half a century are still favored by our customers.

We have now changed all the models in our H Series and released the New H Series with the aim of further evolution.

We have improved the airflow and reduced the number of pipes in this new series to reduce the air flow rate and

support both VG10/32 lubricating oil. We have added the M8H-TM (80,000 min<sup>-1</sup>)

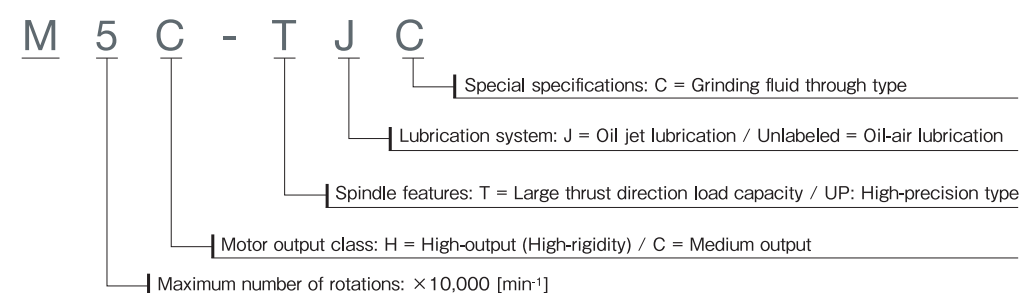
and M11H-TM (110,000 min<sup>-1</sup>) models to the lineup.

\*The basic specifications are equivalent to the conventional models.

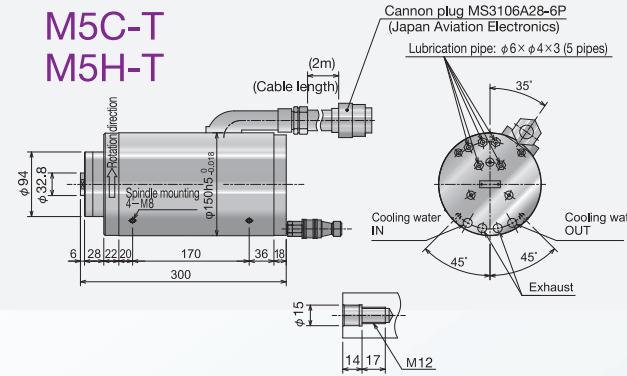
### Features

Number of rotations	We have an enhanced lineup from 50,000 to 200,000 min <sup>-1</sup>
High-precision	We have adopted P2 grade bearings
High-speed rotation	dmn: 2.2 to 2.9 million
Tool mounting	Screw + Spigot
Standard peripheral equipment	(Optional unit) We will provide you with a quotation

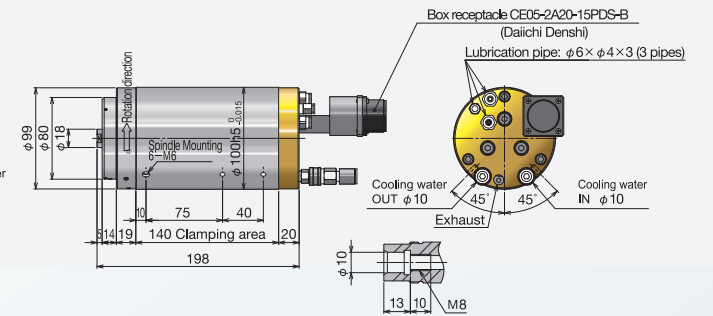
### Format Display



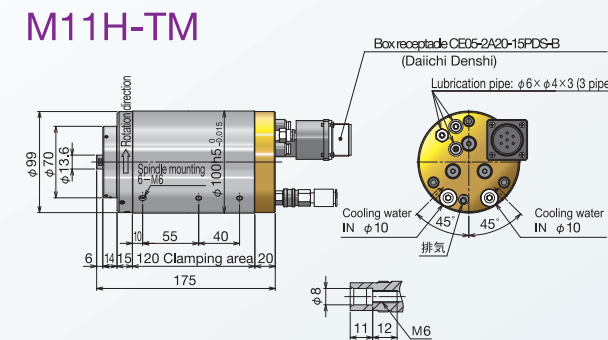
M5C-T  
M5H-T



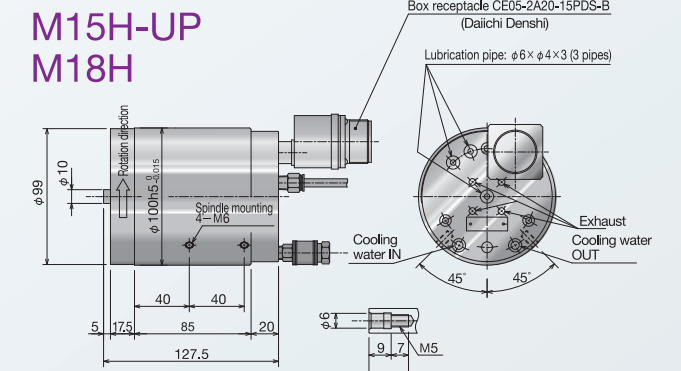
M8H-TM



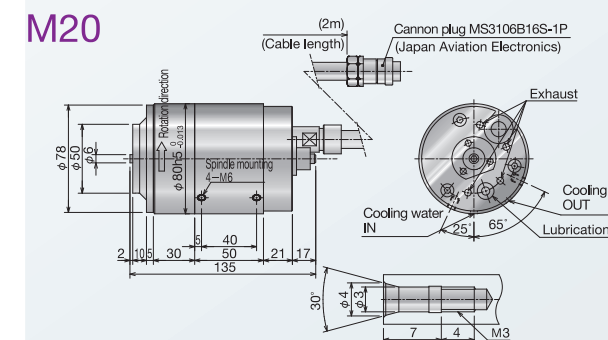
M11H-TM



M15H-UP  
M18H



M20



### Specifications

Specifications	Model	M5C-T	M5H-T	M8H-TM	M11H-TM	M15H-UP	M18H	M20
Maximum number of rotations	min <sup>-1</sup>	50,000	50,000	80,000	110,000	150,000	180,000	200,000
Rated output	kW	7.2	9.0	2.67	1.83	0.94	0.9	0.2
Rated torque	Nm	1.38	1.72	0.32	0.16	0.06	0.048	0.0096
Rated voltage	V	200	200	155.5	160.4	164.1	200	130
Frequency	Hz	833	833	1,333	1,833	2,500	3,000	3,333
Shell diameter	mm	φ 150	φ 150	φ 100	φ 100	φ 100	φ 100	φ 80
Shaft diameter	mm	φ 35	φ 35	φ 20	φ 15	φ 10	φ 10	φ 6
Rated current	A	29.5	38.7	15.1	10.4	7	6	2.94
Number of poles		2						
Lubrication system		Oil-air (Azbil TACO MICRON-LUB)						
Air flow rate	NL/min	250	250	150	150	150	150	225
Lubricating oil	Equivalent product	ISO VG10		ISO VG10/VG32		ISO VG10		
Amount of oil supply		6 shots/min		10 sec/shot (VG10) 40 sec/shot (VG32)		6 shots/min		
Coolant		Water (Including rust inhibitor)						
Coolant flow rate	L/min	6 ≤	6 ≤	3	3	3	3	3
Coolant temperature	°C	25	25	25	25	25	25	25
Total mass	kg	27	27	10.1	9	6.7	6.7	3.5
Warranty period	h	1,500	1,500	1,500	1,500	2,000	1,500	1,000

# Other Spindles

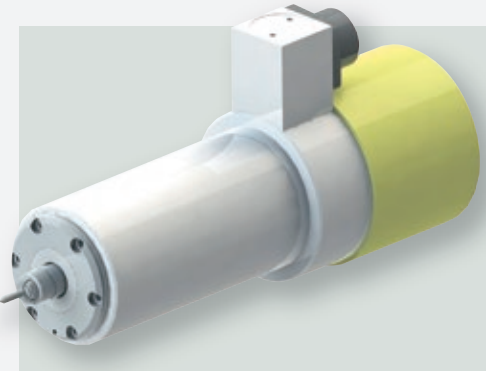
## Contributing to Work Environment Improvement and Energy Saving

- Grease lubrication improves the work environment without the dispersal of oil mist.
- The amount of air used is less than with oil-air lubrication. This contributes to energy saving and lower noise levels.

### Grease Spindles

#### Features

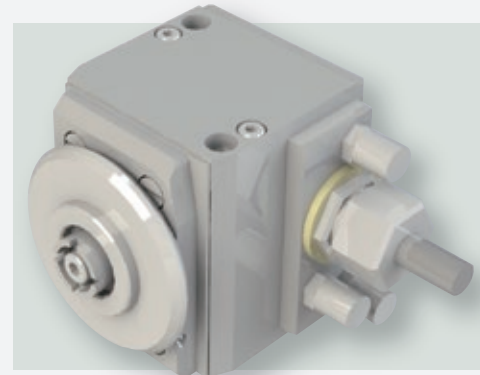
	Electronic component manufacturing spindle
	Coolant through
	Automatic tool changer (ATC) pull collet type
Size of the body (D)	φ62×(L)252 mm
Maximum number of rotations	60,000 min <sup>-1</sup>
Output	1.2 kW



### High frequency rotary dresser

#### Features

- A built-in high frequency motor in the rotary dresser, which is used in the dressing process, all minimization and high speed rotation.
- Best suited for a dressing unit such as a CBN wheel.
- A disk type dresser can be installed at the axial ends and be easy to adjust the run out of dresser.



#### Specifications

Model	Sync RPM [min]	Output [kw]	Voltage [V]	Rotational Dir.	Shaft Type	Lubrication	Over-all mass [kg]
U121—D1	10,000	0.05	55	Left	Straight	Micron-lub or Oil-mist	1.24
U121—D2	10,000	0.05	55	Left	Taper	Micron-lub or Oil-mist	1.24
U121—D3	10,000	0.05	55	Right	Straight	Micron-lub or Oil-mist	1.24

# Fluid Dynamic Bearing Spindles

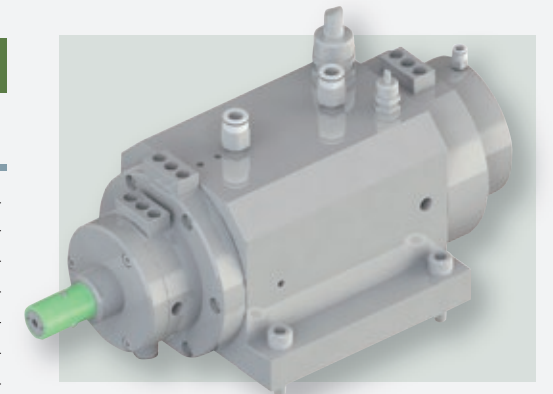
## Ultra-high-precision Machining Supported Products and Long-term Maintenance

- The spindle shaft does not come into contact with the outer peripheral. This enables higher precision and longer life.
- These spindles obtain extremely high rotational precision through an averaging effect.

### Hydrostatic Pressure Spindles Nano-machining (Ultra-high-precision Products)

#### Features

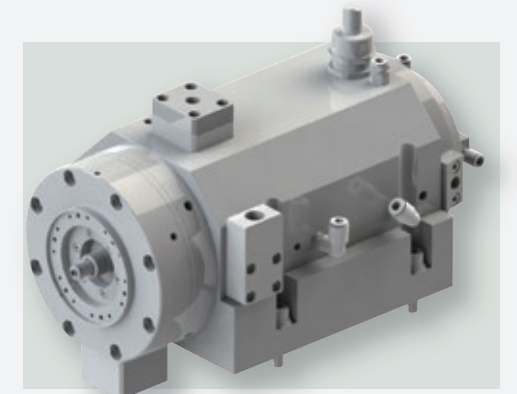
	Our automatic lathe equipped spindle
	Oil static pressure bearing adopted
Size of the body (D)	130×(H)125 mm
Rotational deflection	0.5 μm or less / NRRO 0.1 μm
	Powerful vibration damping
Maximum number of rotations	20,000 min <sup>-1</sup>
Output	2.9kW



### Hybrid Spindles Nano-machining Ultra-high-precision Products

#### Features

	Our inner surface grinder equipped spindle
	Combined model (dynamic/static pressure) bearing adopted (Hybrid of Hydrostatic and Hydrodynamic bearing)
Size of the body (D)	160×(H)130 mm
Maximum number of rotations	5,000 min <sup>-1</sup>
Output	1.5 kW



### Hydrostatic Spindles Ultra-high-precision Machining

#### Features

	For large rotating devices
Size of the body (D)	φ1100×(L)150 mm
Capacity	Large capacity: Radial direction load of 10,000 N (500 mm offset)
Maximum number of rotations	1,150 min <sup>-1</sup>





# Customization Support

Please talk to us if the spindle you desire is not among our standard products. We can make design changes based on the spindles listed in this catalog. The A, B and C you will find next to each item represents the degree of difficulty in customization in terms of design burden and cost. We have ranked each item A to C in order of the simplicity of customization.

## Shell Diameter [C]

It is possible to increase the output in order to be able to increase the motor size with a larger shell diameter.

## Motor Output (Length Change) [B]

We will change the bearing to match your application. The amount of preload will also vary by changing the model, so it is possible to adjust the rigidity and precision.

## Bearings [B]

We will change the bearing to match your application. The amount of preload will also vary by changing the model, so it is possible to adjust the rigidity and precision.

## Tool Fixation Method

We will supply you with spindles to suit your needs if you provide us with information on the shape and dimensions of the tools you will use. We can meet various demands for HSK or collet fixation methods and ATC.

- ATC [C]
- Manual HSK [B]
- Collet [B]

## Rotation Direction [A]

Our standard rotation direction is anticlockwise (CCW) as viewed from the quill side. However, we can make the rotation direction clockwise (CW), so please talk with us. \*This is [B] if the mounting part is the left screw in CCW.

## Mounting Shape [C]

We will also consider spindles to match your mounting method (e.g. clamp mounting and flange mounting).

## Spindle Vertical Mounting [A]

Horizontal mounting is the standard specification, but it is also possible to support vertical mounting.

## Coolant Through [C]

We can also meet your need for coolant through models (working fluid penetration).

## Connectors [A]

We equip MS connectors to MIL standards, but it is possible to change this within the dimensions.

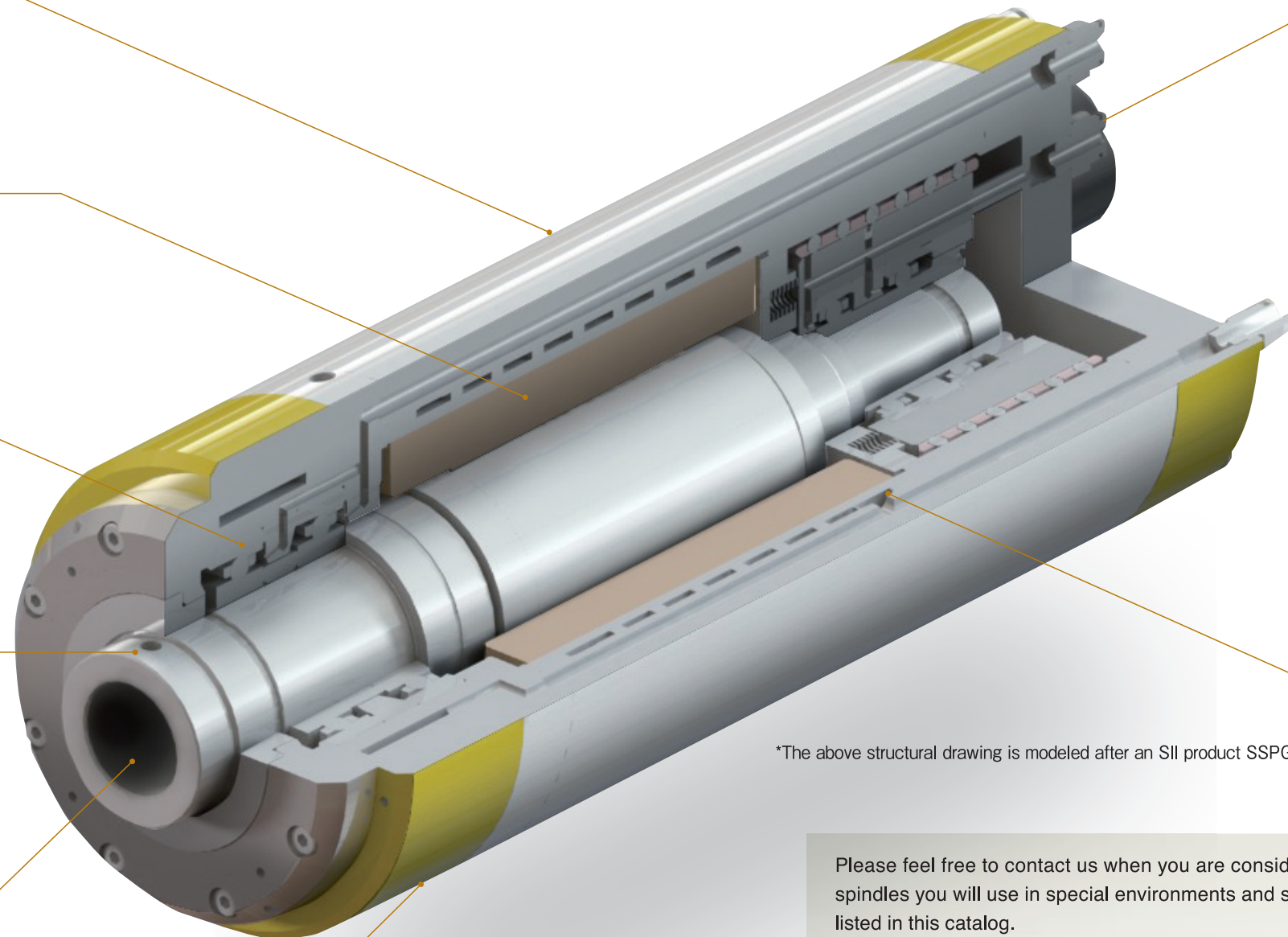
## Sensors

Please talk to us about mounting various types of sensor.

- Temperature monitoring
  - Motor [A]
  - Bearing [C]
- Rotation and speed detection [B]
- Tool clamp detection [C]

## Coolants [A]

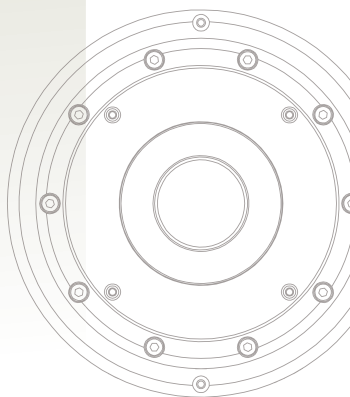
We recommend using water (water containing anti-rust inhibitor), but it is also possible to use oil. However, the cooling efficiency will drop. This means you must use oil under the premise that the real motor output will decrease.



\*The above structural drawing is modeled after an SII product SSPG Series.

Please feel free to contact us when you are considering changing the mounting method, spindles you will use in special environments and spindles with special specifications not listed in this catalog.

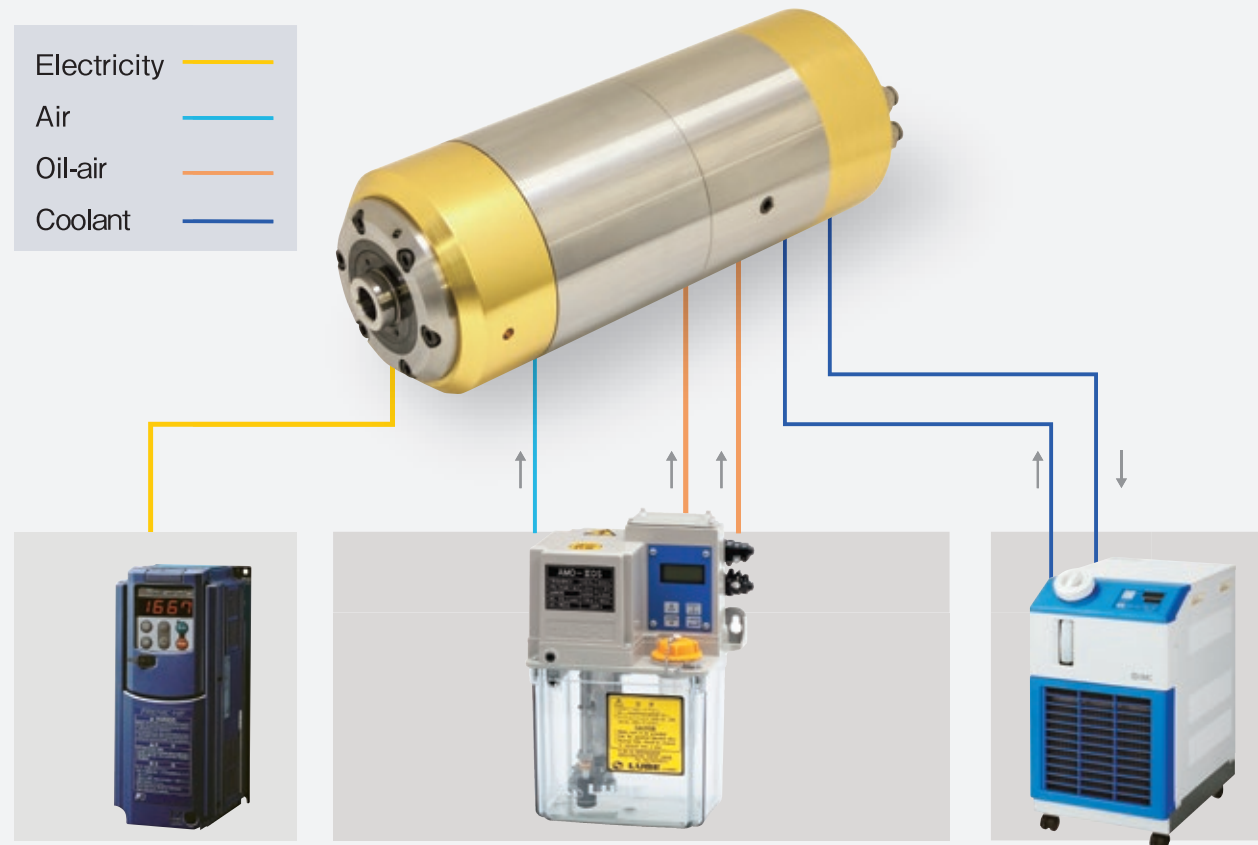
We produce spindles with specifications to order. Therefore, we would appreciate it if you could tell us the details of your specifications, the number of spindles you expect to use and when you would like the initial delivery. (We recommend you make a minimum order of at least two spindles.) Customization incurs separate development costs.





# Peripheral Equipment

The system construction of peripheral devices is very important for the safe and stable operation of spindles. The following figure is a standard system configuration example. (This is an oil-air lubrication example.)



## Peripheral Equipment Selection Precautions

### A.Driver

**Capacity :** This should have a higher rated current with a margin than the rated current in the specifications. (This should be a model with a small harmonic component. Alternatively, a filter such as a three-phase reactor should be mounted on the output side.)

**Cable:** This should be a shielded cable.

### B.Lubrication Device

**Lubrication system:** Oil-air  
**Lubrication capacity:** This should satisfy the lubrication settings described in the specifications.

### C.Air Purge

**Flow rate:** Please adjust the flow rate of the air purge with a speed controller or similar.

### D. Cooling Device

**Cooling capacity:** This should have a higher capacity than the required capacity in the specifications taking into account the rise in the ambient temperature.

### Common to B, C and D

**Pipe tube:** This should have excellent oil resistance with the inside visible.

Please determine the system configuration based on the specifications of the spindle and peripheral equipment.  
Please contact the equipment manufacturers for more details.  
We can also design peripheral equipment according to your requirements.  
Please talk to us about this.

# Lends and Repairs

Seiko Instruments offers a spindle Lends and Repairs service.

We can discuss your time requirements to suit your needs. First, please feel free to contact us.

## Spindle Lends

Lend fee: Free (You may have to pay repair costs if you are responsible for damaging the lent spindles.)  
Lend period: One month  
Lendable products: SSPG-045 T100 / SSPG-075 T045 / SSPG-090 T025SCT / SSPG-150 S010  
(We are currently considering expanding this lineup.)

## Lend product Request Flow

- ① Inquiry Please contact us using the Lend request sheet or by phone/fax.  
Construction Machinery Sales Section in Seiko Instruments  
TEL : (+81)47-392-2091 FAX : (+81)47-392-2476  
URL : <http://www.sii.co.jp/mt/spindle.html> (Use the Lend request sheet)  
Business hours: 08:15 to 17:15 from Monday to Friday  
(Excluding the days on which we are closed)
- ② Meeting After listening to your Lend requirements, we will meet with you about the Lend.
- ③ Reply We will tell you the Lend date.
- ④ Shipping We will send you the Lend products to arrive on your desired date.
- ⑤ Lend product test We will conduct a Lend spindle evaluation test.  
A member of our service personnel will provide you with assistance if you have any requirements.
- ⑥ Return Please return the spindles that have been evaluated.

## Repair Flow

- Repair request and acceptance Please contact your dealer of our products or our firm about repairs.  
Maintenance Service Section in Seiko Instruments  
TEL : (+81)47-392-7868 FAX : (+81)47-392-2476  
URL : <http://www.sii.co.jp/mt/spindle.html> (Use the contact form)  
Business hours: 08:15 to 17:15 from Monday to Friday  
(Excluding the days on which we are closed)
- Product destination Please pack the product and then send it to us.  
Address: Maintenance Service Section, Precision Machinery Division,  
Seiko Instruments, 563 Takatsukashinden, Matsudo-shi, Chiba, 270-2222  
\*Please pack the product so that the ends of the spindle shaft are not subjected to loads or shocks during transport.  
\*Please apply rust inhibitor (oil) and pack the product so that it does not become contaminated with water.  
\*Please send us the product making the name of your company clear.
- Repair cost and time We will contact you with an estimate for the repair cost and time after the product arrives in our firm.  
We will make a repair request (start repairs) once you approve our quotation.  
We will repair the product free of charge if it fails during the warranty period.  
The warranty period is determined for each model from the date on which the product was purchased, so please check the specifications list.  
Please note that we may charge a fee depending on the cause of the failure or the state the product was being used when it failed.

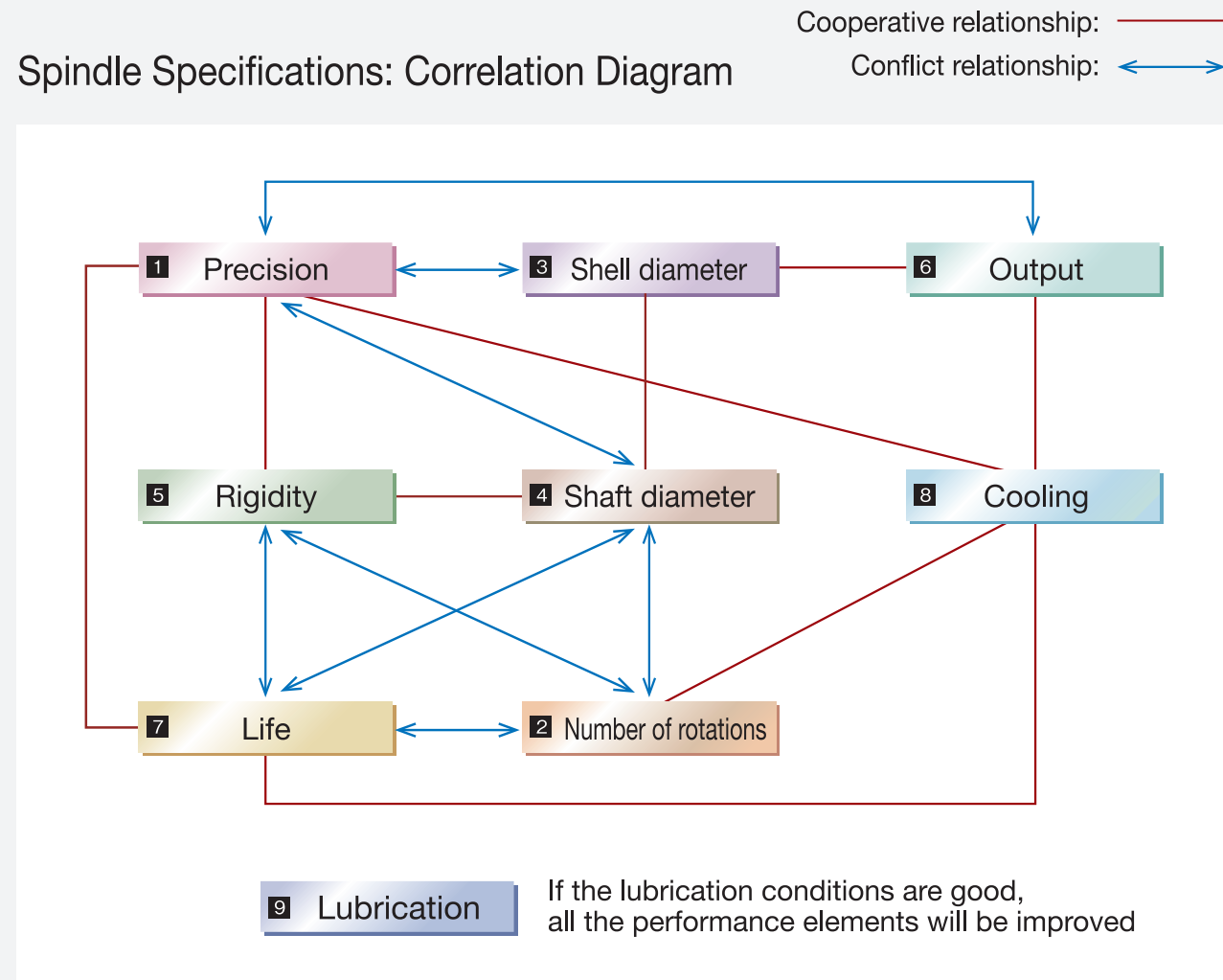
# Technical Data

The specifications of the spindles are configured according to the correlation below.

Cooperative relationship: This is a relationship in which an improvement in the capacity of one leads to an improvement in another.

Conflict relationship: This is a relationship in which an improvement in the capacity of one does not lead to an improvement in another.

\*We have explained this briefly for each given number. However, this is only a diagram to help you understand the relationship under general conditions.



It is very important to clarify the priority order of the required specifications because the mutual relationship of each specification intersects in a complex manner.

\*There may not be a mutual relationship as shown in the above relationship diagram. Please refer to this as an example of spindle selection and contact our firm for more details.

## 1 Precision

The precision of the spindle directly impacts the machining precision. This means that strict precision is required of spindles. In addition to the initial precision, it is necessary to continue maintaining precision in order to achieve stable productivity.

### ● Rotational deflection

The parts machining precision, the assembly precision, the bearing precision and the precision grade of the bearing used have an impact on this. We adjust the preload to the optimal value at the time of assembly.

### ● Position precision

Heat generated by the motor causes parts to expand and deform. This leads to the position precision becoming unstable. It is very important to equip a cooling device with good precision to prevent deformation. In addition, the amount of expansion is proportional to the rise in temperature and size.

## 2 Number of rotations

It is possible to achieve high-precision and high-efficiency machining by increasing the circumferential speed of the tool. On the other hand, this leads to an increase in the imbalance vibrations, a shorter life of the bearings and heat deformation due to increased heat generation. We minimize the aforementioned disadvantages in our spindles. Nevertheless, please select the minimum number of rotations necessary in consideration of the balance between the advantages and disadvantages.

### ● Bearings

We have adopted P2 or UP grade ceramic ball bearings. These have a weight less than half that of iron and excellent abrasion resistance to enable high-speed rotational operation by achieving low-noise, long-life and low-heat generation.

### ● dmn

This is used as the value to represent the orbital speed of bearings. The calculation formula for this is as follows.

$$dmn = dm \times n$$

dm : Pitch circle diameter (mm)  
n : Number of rotations (min<sup>-1</sup>)

### ● Frequency (Hz)

This is the notation method for which the unit of the number of rotations has been changed. The relationship between the number of motor poles and the number of rotations is as follows.

$$n = f \times 60 \times \frac{2}{P}$$

n : Number of rotations (min<sup>-1</sup>)  
f : Frequency (Hz)  
P : Number of poles

## 3 Shell diameter

It is possible to increase the diameter of the bearing and the outer diameter of the motor with a bigger shell diameter. It is possible to significantly increase the output by increasing the outer diameter of the motor. This makes it possible to dramatically increase output and rigidity.

## 4 Shaft diameter

The radial rigidity becomes higher the greater the shaft diameter is and it is possible to mount large diameter tools. Therefore, the rigidity becomes even higher at the machining point. However, increasing the shaft diameter causes an increase in thermal deformation due to the larger parts and a lengthening of the rotational orbit. Therefore, there is a tradeoff with an increased risk of vibrations. It is important to determine where to place the emphasis.

## 5 Rigidity

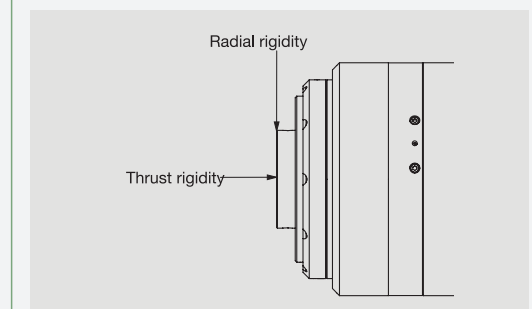
This is the degree of difficulty in changing the position of the spindle in regards to external force. The following describes the static rigidity that is the rigidity when not operating. In the case of spindles, the rigidity is divided into the radial direction and thrust direction.

### ▼ Radial rigidity

This is the rigidity of the outer circumference direction. There is a large impact on the distance from the bearing to the machining point. Therefore, the rigidity in long tool tips significantly reduces.

### ▼ Thrust rigidity

This is the rigidity in the shaft direction. This has an impact on the machining capability of tool edge machining.



It is possible to increase or decrease the rigidity with the bearing preload. However, excessive rigidity leads to an increased load on the bearing which leads to a shorter life. Therefore, we consider the optimal balance in the design stage.

\*Note: The rigidity is different to the load carrying capacity (withstand load).



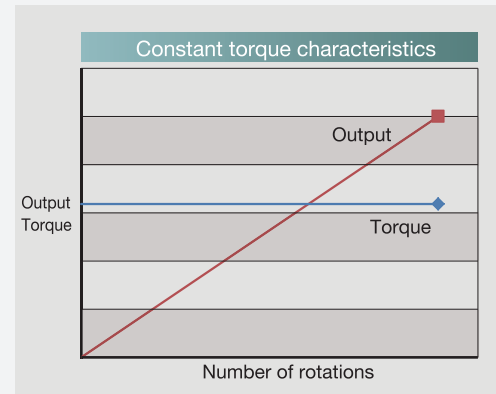
6 Output ▶ 1

● Output and torque

The motor characteristics of spindles are constant torque characteristics and reduced torque characteristics.

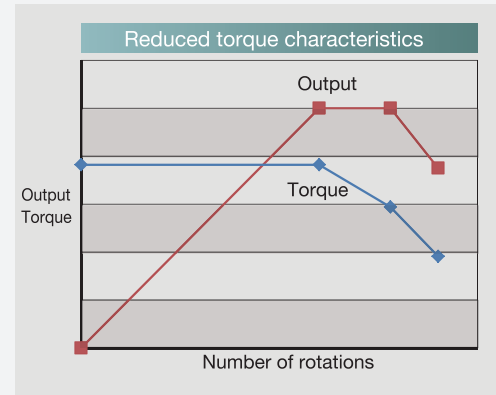
▼ Constant torque characteristics

This is the motor characteristic with a constant torque regardless of the number of rotations of the spindle.



▼ Reduced torque characteristics

This is the motor characteristic that places an emphasis on torque in the low-speed range. This means that the torque is reduced in the high-speed range. Normally, machining that requires high torque is done in the low-speed range while finishing that does not require torque is done in the high-speed range. Therefore, this kind of torque characteristic is widely used.



● Rated output

The output at which the motor can operate under the stipulated temperature is the rated output. Therefore, it is possible to increase the output in the case of intermittent operation.

▼ S1-100%: Continuous operation mode

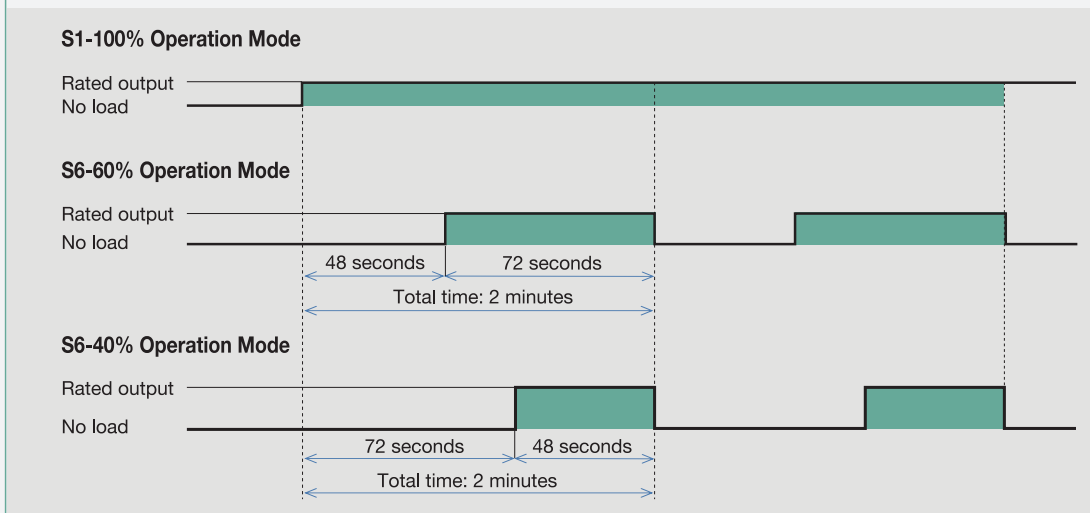
This is the operation mode in which there is continuous operation at a constant load.

▼ S6-60%: Repeat load continuous operation mode (Load-time factor: 60%)

This is the operation mode in which the constant load operation period and no-load operation period are repeated as one cycle. There is no stop or power off period. The rated output increases greater than when S1 is used from the sum total of the output per hour.

▼ S6-40%: Repeat load continuous operation mode (Load-time factor: 40%)

The rated output increases greater than when S6-60% is used from the sum total of the output per hour.

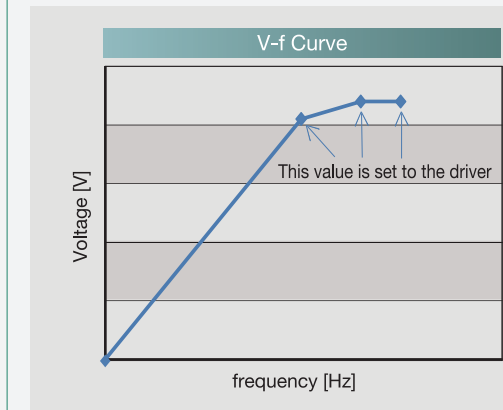


In the S11 high-frequency spindle specifications, the rated output in the S1 operation mode is described as the basic and in the S6 operation mode as reference.

6 Output ▶ 2

● Voltage [V]

The value of V (voltage) and f (frequency) at the point of the angle change on the V-f curve described in the specifications as in the figure below is set to each driver.



7 Life

The life of the spindle is the life of the bearing. Reducing the load applied to the bearing leads to a longer life for the spindle.

● Causes of short life

▼ Inappropriate machining conditions

- High-speed operation
- Large machining loads
- Mounting of tools with a large imbalance

▼ Insufficient environment maintenance

- Abnormal atmospheric temperature (high and low temperature)
- Insufficient cooling
- Poor oil-air exhaust and waste liquid
- Condensation

▼ Contamination of foreign substances in the bearing

- Excessive coolant
- Chips

It is necessary to pay sufficient attention in advance because this is often the cause of usage method and handling problems.

8 Cooling

This cools the motor and bearings. Insufficient cooling leads to rotational precision deterioration, position precision instability and shorter spindle life.

● Types of coolant

▼ Water cooling (Including rust inhibitor)

The cooling efficiency of water is the best among general fluids, so this is recommended. However, rusting may occur in long-term storage after being used. Therefore, it is important to pay attention to sufficiently dry the spindle.

▼ Oil cooling

Oil has the advantage of not generating rust and of the need to replace the coolant less frequently. On the other hand, the cooling efficiency is poor compared to water. This results in a smaller rated output being used.

9 Lubrication

It is necessary to lubricate the bearings for a variety of reasons. These include minimizing the sliding friction when the bearings are rotating, diffusing the heat generated and lengthening the life of the bearings.

● Lubrication method

▼ Oil-air (micro-fog) lubrication

Oil-air lubrication is a method in which a microscopic amount of oil is placed on compressed air and then delivered to the bearings. High-speed rotation is possible by controlling the amount that drips down. This method is overwhelmingly superior in terms of life than grease lubrication when compared under the same conditions.

▼ Grease lubrication

A grease lubrication system is one in which the bearings are lubricated by grease encapsulated with a seal inside the bearings. This makes it possible to keep down the consumption of air and to simplify the configuration in the area around the spindle. The life of the grease is the life of the spindle. In general, the number of rotations in this system is about a third to half of that when using oil-air lubrication and the same bearings. It is necessary to perform sufficient warming up operations after building such a system into the body of a machine.

# Handling Precautions

## Installation

- Do not hold cables or axes of rotation while transporting spindles.
- When mounting a spindle, make sure that there is no dust or burr on the mounting surface and that it has not been deformed by scratches.
- Install spindles in the established direction and with the established procedures. Not doing this may lead to a failure.

## Operation

- Check that the lubrication/cooling is functioning reliably and that there are no abnormalities (e.g.stiffness) when the spindle shaft is turned by hand prior to operation.
- Check that the rotation direction of the shaft is correct.
- Always conduct a warming up operation after mounting a spindle. The procedures for the warming up operation vary depending on the lubrication system. Refer to the user's manual.
- Put in oil-air lubrication greater than the fixed time prior to operation.

## Tool Selection

### ● Imbalance

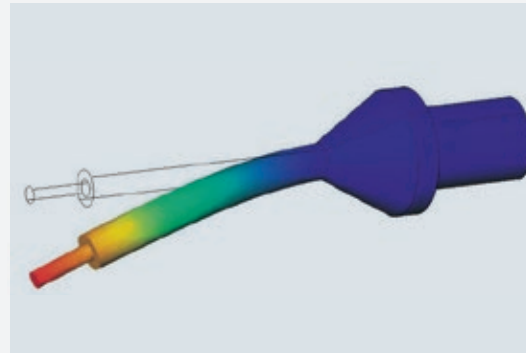
A large tool imbalance leads to poor precision and accidents. Correct imbalances in all tools.

### ● Critical Speed

Do not use inappropriate tools like those with critical speed in the vicinity of the number of rotations used. This is extremely dangerous.

### ● Centrifugal Force Exerted on the Tools

The grindstone has a weak tensile strength. This will cause damage if the centrifugal force from high-speed rotation is too great. Use a grindstone with a margin greater than the maximum circumferential speed specified by the grindstone manufacturer.



## Maintenance

- Make sure to thoroughly prevent rust with anti-rust/oil paper or rust inhibitor when performing maintenance.
- Store spindles in locations with low temperatures/humidity and with few temperature/humidity changes.
- Only replace spindles after fully wiping away any chips or machining oil stuck to the holder. In particular, make sure that dirt does not become stuck to the air pipes and power supply connectors.
- Take care over the positional relationship between the tools and other units and interference with work pieces when replacing spindles.

\*Refer to the user's manual of each product for details.

## Contact Fax Sheet

Date:

# SEIKO

### Your Information

Name of your company				Position	
Name					
Company address					
TEL		FAX		E-mail	

### Required Specifications

Number of rotations	min <sup>-1</sup>	Rotation direction (As viewed from the tool mounting side)	CCW (Standard) • CW
Output	W	Torque	Nm <input type="checkbox"/> Constant torque characteristics <input type="checkbox"/> Reduction torque characteristics
Inverter power supply voltage	V	Operating time rate (Duty)	%
Spindle cooling method	<input type="checkbox"/> Water cooling (Antirust agent required) <input type="checkbox"/> Oil cooling <input type="checkbox"/> Forced cooling <input type="checkbox"/> Natural cooling		
Bearing lubrication method	<input type="checkbox"/> Oil-air (ISO VG ) <input type="checkbox"/> Grease		
Mounting direction	<input type="checkbox"/> Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/> Pivot	Fixation method	<input type="checkbox"/> Outer liner <input type="checkbox"/> Flange
Splash amount around the tool	<input type="checkbox"/> Large <input type="checkbox"/> Small	Size	φ × L
Tool mounting	<input type="checkbox"/> Manual ( Quil / Collet ) <input type="checkbox"/> Automatic ( HSK / BT / BBT )		
Processing emphasis condition	<input type="checkbox"/> Finishing quality is emphasized <input type="checkbox"/> A rough processing speed is emphasized.		
Processing method	<input type="checkbox"/> Grinding <input type="checkbox"/> Cutting	Quill (Special orders)	<input type="checkbox"/> Oil-based <input type="checkbox"/> Water-based
Work piece Material/Hardness	/	Grinding Wheel / Wheels Material	/

### OPTION

Inverter	<input type="checkbox"/> Not required <input type="checkbox"/> Required AC200V (Three-phase) <input type="checkbox"/> Required AC400V (Three-phase)		
Cable (Sp. (←) Inv.)	<input type="checkbox"/> Not required <input type="checkbox"/> Required (2m typeのみ)	Power connector	<input type="checkbox"/> Not required <input type="checkbox"/> Required
Chiller	<input type="checkbox"/> Not required <input type="checkbox"/> Required AC200V (Single-phase)		
Lubricator	<input type="checkbox"/> Not required <input type="checkbox"/> Required AC200V (Single-phase)		
Spanner (For rotation shaft fixing)	<input type="checkbox"/> Not required <input type="checkbox"/> Required	Quill (Special order)	<input type="checkbox"/> Not required <input type="checkbox"/> Required
Coolant Through	<input type="checkbox"/> Not required <input type="checkbox"/> Required if possible <input type="checkbox"/> Required	Power frequency	Hz

### Request (Special Notes)

Transmission destination

## FAX: (+81)47-392-2476

You can also contact us from our website. <http://www.sii.co.jp/mt/spindle/en/>

### Seiko Instruments Inc.

Spindle Section, Construction Machinery II Department, Precision Machinery Division  
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