

# SLIDE SHAFT SPINDLE SHAFT

## SLIDE SHAFT

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# SHAFT

The NB shaft can be used in a wide range of applications as a mechanical component from straight shaft to spindle shaft. NB's expertise in machining and heat-treatment turns into manufacturing spindle shaft, roll shaft, and general machinery shaft for rotational motion. NB's high accuracy technology answers various shaft machining requirements.

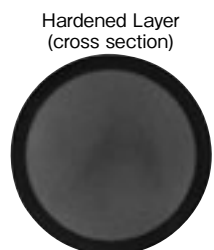
## ADVANTAGES

### Advanced Machining Technology

NB performs a wide variety of highly accurate machining processes to provide custom shafting from relatively simple machining, such as tapping and shaft stepping to the more demanding high-speed rotating shafts and spindles. NB can also answer the special grinding and bore machining requirements.

### Excellent Wear Resistance

Most commonly used materials are high-carbon chromium bearing steel (SUJ2) and martensite stainless steel (SUS440C or equivalent). NB's advanced heat-treatment technology gives these materials an excellent wear resistance by quenching and tempering to achieve a uniform hardened layer in the circumferential and axial directions. The cross-sectional picture below shows the hardened layer-depth of the NB shaft.



### Surface Roughness

Precision grinding results in a surface roughness of less than Ra0.4.

### Wide Selection of Shaft Types

- SN type, SNS type, SNT type,
- SNB, SNSB type (Center-lined tapped shaft)
- SNW, SNWS type (Inch shaft)
- SNW-PD, SNWS-PD type (Inch, pre-drilled shaft)
- Spindle shaft, roll shaft

### Special Requirements

Based on the customer drawings and specifications NB will answer the customer requirements in material (SCM, SKS etc.), heat-treatment, surface treatment, etc.

### Shaft Supporter and Shaft Support Rail

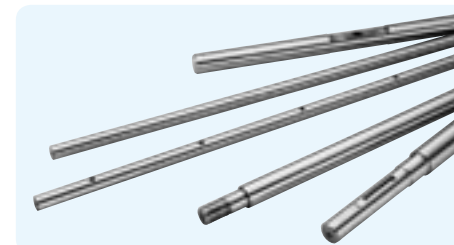
These components ease the shaft installation and help save the design/assembling time. (refer to page F-14)

### FIT Series

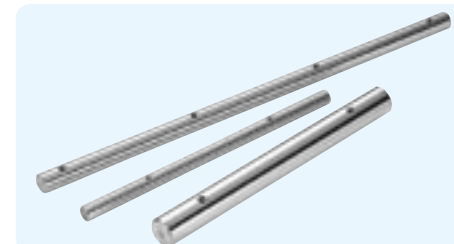
This series is a set of NB slide bush and NB shaft. By precise shaft-grinding, FIT series achieves the best-fit clearance adjustment for a smooth, high accuracy linear motion. (refer to page F-26)

## TYPES

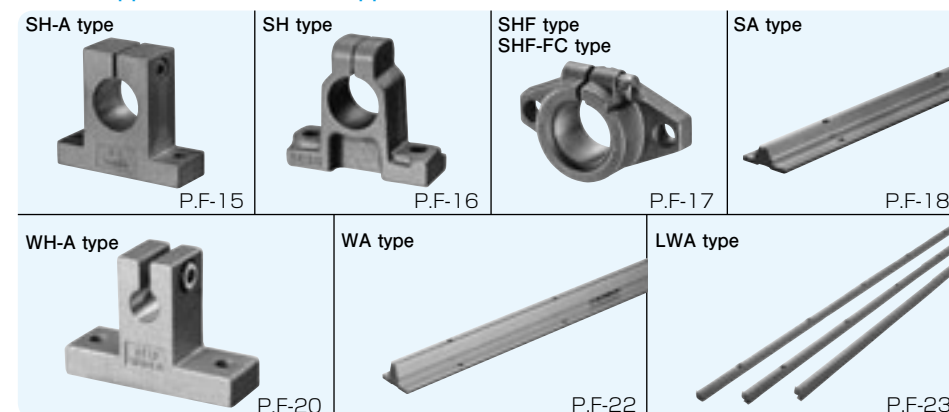
SN/SNS/SNT type (NB Shaft)  
SNW/SNWS type (Inch Shaft)



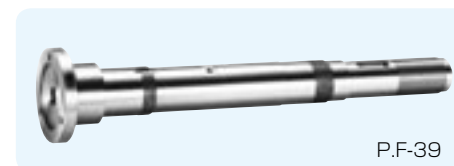
SNB/SNSB type (NB Center-lined Tapped Shaft)  
SNW-PD/SNWS-PD type (Inch Shaft, Pre-drilled Shaft)



### Shaft Supporter and Shaft Support Rail



### Special Specifications



NB shaft is a high-precision shaft that can be used with slide bush or any other bearings. A wide range of machining is provided for customer drawings and requirements.

Table F-1 Specifications

type	SN type	SNS type	SNT type
material	SUJ2	equivalent to SUS440C	SUJ2 (hollow shaft)
outer diameter tolerance	g6 or to be specified		
hardness	60HRC or more	56HRC or more	60HRC or more
surface roughness	Ra0.4 or less		
page	page F-6	page F-7	page F-8

Center-lined tapped shafts are standardized series for easy selection that can be used with the SA shaft support rails. (refer to page F-18)

Table F-2 Specifications

type	SNB type	SNSB type
material	SUJ2	equivalent to SUS440C
outer diameter tolerance	g6 or to be specified	
hardness	60HRC or more	56HRC or more
surface roughness	Ra0.4 or less	
page	page F-9	

The SNW and SNWS types are inch dimensional shafts with the same specifications as SN/SNS type (refer to page F-10,11). SNW-PD and SNWS-PD types are standardized series that can be used with the WA shaft support rails. (refer to page F-12,13,22)

Based on drawings and specifications, NB manufactures spindle shafts, and roll shafts for the rotary motion application. Material, heat-treatment (hardening/tempering), surface treatment, etc, NB meets customer requirements. Please contact NB for details.

**CALCULATION OF DEFLECTION AND DEFLECTION ANGLE**

The following formulas are used to obtain the deflection and its angle of the shaft. Typical conditions are listed in Table F-3.

Table F-3 Formulas for Calculating Deflection and Deflection Angle

support method	specification	formula for deflection	formula for deflection angle
1 support   support		$\delta_{max} = \frac{P\ell^3}{48EI} = P\ell^3C$	$i_1 = 0$ $i_2 = \frac{P\ell^2}{16EI} = 3P\ell^2C$
2 fixed   fixed		$\delta_{max} = \frac{P\ell^3}{192EI} = \frac{1}{4}P\ell^3C$	$i_1 = 0$ $i_2 = 0$
3 support   support		$\delta_{max} = \frac{5p\ell^4}{384EI} = \frac{5}{8}p\ell^4C$	$i_2 = \frac{p\ell^3}{24EI} = 2p\ell^3C$
4 fixed   fixed		$\delta_{max} = \frac{p\ell^4}{384EI} = \frac{1}{8}p\ell^4C$	$i_2 = 0$
5 support   support		$\delta_1 = \frac{Pa^2}{6EI} \left( 2 + \frac{3b}{a} \right) = 8Pa^3 \left( 2 + \frac{3b}{a} \right) C$ $\delta_{max} = \frac{Pa^3}{24EI} \left( \frac{3\ell^2}{a^2} - 4 \right) = 2Pa^3 \left( \frac{3\ell^2}{a^2} - 4 \right) C$	$i_1 = \frac{Pab}{2EI} = 24PabC$ $i_2 = \frac{Pa(a+b)}{2EI} = 24Pa(a+b)C$
6 fixed   fixed		$\delta_1 = \frac{Pa^2}{6EI} \left( 2 - \frac{3a}{\ell} \right) = 8Pa^3 \left( 2 - \frac{3a}{\ell} \right) C$ $\delta_{max} = \frac{Pa^3}{24EI} \left( 2 + \frac{3b}{a} \right) = 2Pa^3 \left( 2 + \frac{3b}{a} \right) C$	$i_1 = \frac{Pa^2b}{2EI\ell} = \frac{24Pa^2bC}{\ell}$ $i_2 = 0$
7 fixed   free		$\delta_{max} = \frac{P\ell^3}{3EI} = 16P\ell^3C$	$i_1 = \frac{P\ell^2}{2EI} = 24P\ell^2C$ $i_2 = 0$
8 fixed   free		$\delta_{max} = \frac{p\ell^4}{8EI} = 6p\ell^4C$	$i_1 = \frac{p\ell^3}{6EI} = 8p\ell^3C$ $i_2 = 0$
9 support   support		$\delta_{max} = \frac{\sqrt{3}Mo\ell^2}{216EI} = \frac{2\sqrt{3}}{9}Mo\ell^2C$	$i_1 = \frac{Mo\ell}{12EI} = 4Mo\ell C$ $i_2 = \frac{Mo\ell}{24EI} = 2Mo\ell C$
10 fixed   fixed		$\delta_{max} = \frac{Mo\ell^2}{216EI} = \frac{2}{9}Mo\ell^2C$	$i_1 = \frac{Mo\ell}{16EI} = 3Mo\ell C$ $i_2 = 0$

$\delta_1$ : deflection at the concentrated load point (mm)  $\delta_{max}$ : maximum deflection (mm)  $i_1$ : deflection angle at the concentrated load point (rad)  
 $i_2$ : deflection angle at the support point (rad) Mo: moment (N·mm) P: concentrated load (N)  
 p: uniformly distributed load (N/mm) a,b: concentrated load point distance (mm)  $\ell$ : span (mm) I: moment of inertia of area (mm<sup>4</sup>)  
 E: modulus of longitudinal elasticity (SUJ2)2.06×10<sup>5</sup> (N/mm<sup>2</sup>) (SUS)2.0×10<sup>5</sup> (N/mm<sup>2</sup>) C: 1/48EI (1/N·mm<sup>2</sup>)

The moment of inertia of area (I) is obtained using the following formulas:

● For solid shaft

● For hollow shaft

$$I = \frac{\pi D^4}{64}$$

$$I = \frac{\pi}{64} (D^4 - d^4)$$

I: moment of inertia of area (mm<sup>4</sup>)

D: outer diameter (mm) d: inner diameter (mm)

The values of the moment of inertia of area and C (=1/48 EI) for NB shafts are listed in Table F-4 and F-5.

**Calculation Examples**

1. Calculating the maximum deflection of a 30mm shaft with a 500mm span when a concentrated load of 980 N is applied at the mid-point of the shaft ... (neglecting the shaft weight)

① In case the support method is support-support:

From the given conditions, P = 980 N,  $\ell = 500$ mm  
 From Table F-4, C for an outer diameter of 30 mm,  
 C=2.54×10<sup>-8</sup> (N·mm<sup>2</sup>).

Substituting these values into the corresponding formula (No. 1) in Table F-3,  
 $\delta_{max} = P\ell^3C = 0.31$  (mm)

② In case the support method is fixed-fixed:

Substituting the values into the corresponding formula (No. 2) given in Table F-3,

$$\delta_{max} = \frac{1}{4}P\ell^3C = 0.08$$
 (mm)

2. Calculating the maximum deflection of a 60mm shaft with an inner diameter of 32 mm and a 2,000 mm span by its own weight ...

From Table F-5, C for an outer diameter of 60 mm,  
 C=1.73×10<sup>-13</sup> (N·mm<sup>2</sup>)

The mass per unit length of a shaft with an outer diameter of 60 mm and an inner diameter of 32 mm is 15.9kg/m. Therefore, a uniformly distributed load of 0.156 N/mm is applied. Substituting these values into the formula (No. 3) given in Table F-3.

$$\delta_{max} = \frac{5}{8}p\ell^4C = 0.27$$
 (mm)

Table F-4 Solid Shaft

outer diameter D (mm)	moment of inertia of area I (mm <sup>4</sup> )	C=1/48EI (1/N·mm <sup>2</sup> ) SUJ2	equivalent to SUS440C
3	3.98	2.54×10 <sup>-8</sup>	2.62×10 <sup>-8</sup>
4	1.26×10	8.05×10 <sup>-9</sup>	8.29×10 <sup>-9</sup>
5	3.07×10	3.30×10 <sup>-9</sup>	3.40×10 <sup>-9</sup>
6	6.36×10	1.59×10 <sup>-9</sup>	1.64×10 <sup>-9</sup>
8	2.01×10 <sup>2</sup>	5.03×10 <sup>-10</sup>	5.18×10 <sup>-10</sup>
10	4.91×10 <sup>2</sup>	2.06×10 <sup>-10</sup>	2.12×10 <sup>-10</sup>
12	1.02×10 <sup>3</sup>	9.94×10 <sup>-11</sup>	1.02×10 <sup>-10</sup>
13	1.40×10 <sup>3</sup>	7.21×10 <sup>-11</sup>	7.43×10 <sup>-11</sup>
15	2.49×10 <sup>3</sup>	4.07×10 <sup>-11</sup>	4.19×10 <sup>-11</sup>
16	3.22×10 <sup>3</sup>	3.14×10 <sup>-11</sup>	3.24×10 <sup>-11</sup>
20	7.85×10 <sup>3</sup>	1.29×10 <sup>-11</sup>	1.33×10 <sup>-11</sup>
25	1.92×10 <sup>4</sup>	5.27×10 <sup>-12</sup>	5.43×10 <sup>-12</sup>
30	3.98×10 <sup>4</sup>	2.54×10 <sup>-12</sup>	2.62×10 <sup>-12</sup>
35	7.37×10 <sup>4</sup>	1.37×10 <sup>-12</sup>	1.41×10 <sup>-12</sup>
40	1.26×10 <sup>5</sup>	8.05×10 <sup>-13</sup>	8.29×10 <sup>-13</sup>
50	3.07×10 <sup>5</sup>	3.30×10 <sup>-13</sup>	3.40×10 <sup>-13</sup>
60	6.36×10 <sup>5</sup>	1.59×10 <sup>-13</sup>	1.64×10 <sup>-13</sup>
80	2.01×10 <sup>6</sup>	5.03×10 <sup>-14</sup>	5.18×10 <sup>-14</sup>
100	4.91×10 <sup>6</sup>	2.06×10 <sup>-14</sup>	2.12×10 <sup>-14</sup>
120	1.02×10 <sup>7</sup>	9.94×10 <sup>-15</sup>	—
150	2.49×10 <sup>7</sup>	4.07×10 <sup>-15</sup>	—

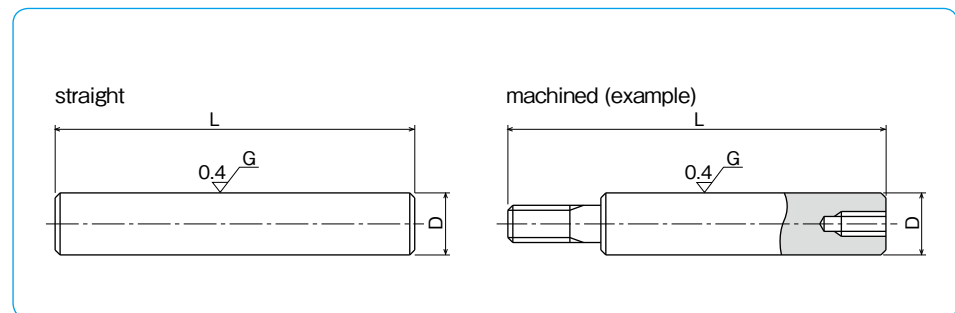
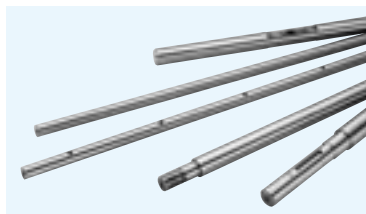
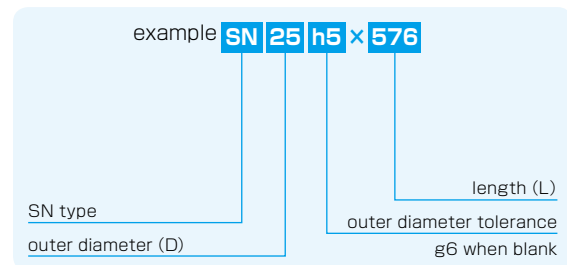
Table F-5 Hollow Shaft

outer diameter D (mm)	inner diameter d (mm)	moment of inertia of area I (mm <sup>4</sup> )	C=1/48EI (1/N·mm <sup>2</sup> )
6	2	6.28×10	1.61×10 <sup>-9</sup>
8	3	1.97×10 <sup>2</sup>	5.13×10 <sup>-10</sup>
10	4	4.78×10 <sup>2</sup>	2.11×10 <sup>-10</sup>
12	5	9.87×10 <sup>2</sup>	1.02×10 <sup>-10</sup>
13	6	1.34×10 <sup>3</sup>	7.55×10 <sup>-11</sup>
16	8	3.02×10 <sup>3</sup>	3.36×10 <sup>-11</sup>
20	10	7.36×10 <sup>3</sup>	1.37×10 <sup>-11</sup>
25	15	1.67×10 <sup>4</sup>	6.06×10 <sup>-12</sup>
30	16	3.65×10 <sup>4</sup>	2.77×10 <sup>-12</sup>
35	19	6.73×10 <sup>4</sup>	1.50×10 <sup>-12</sup>
40	20	1.18×10 <sup>5</sup>	8.57×10 <sup>-13</sup>
50	26	2.84×10 <sup>5</sup>	3.56×10 <sup>-13</sup>
60	32	5.85×10 <sup>5</sup>	1.73×10 <sup>-13</sup>
80	48	1.75×10 <sup>6</sup>	5.78×10 <sup>-14</sup>
100	60	4.27×10 <sup>6</sup>	2.37×10 <sup>-14</sup>

# SN TYPE

– NB Shaft –

## part number structure



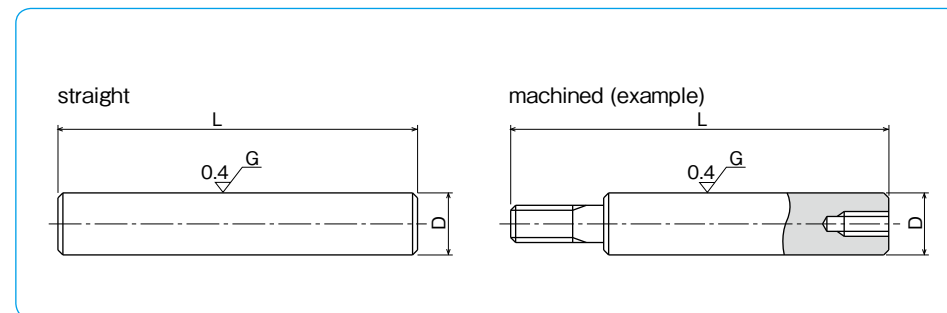
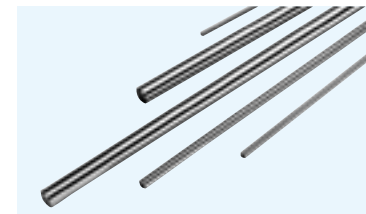
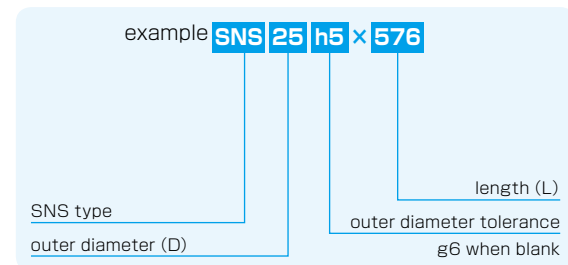
part number	outer diameter D		length L	mass
	mm	tolerance g6 μm		
SN 3	3	-2/-8	50 → 400	0.06
SN 4	4	-4	100 → 500	0.10
SN 5	5	-12	100 → 700	0.16
SN 6	6	-12	100 → 1000	0.23
SN 8	8	-5	200 → 1500	0.40
SN 10	10	-14	200 → 2000	0.62
SN 12	12	-6	200 → 3000	0.89
SN 13	13	-6	200 → 3000	1.04
SN 15	15	-17	300 → 4000	1.39
SN 16	16	-17	300 → 4000	1.58
SN 20	20	-7	300 → 5000	2.47
SN 25	25	-20	300 → 6000	3.85
SN 30	30	-20	300 → 6000	5.55
SN 35	35	-9	400 → 6000	7.55
SN 40	40	-9	400 → 6000	9.87
SN 50	50	-25	500 → 6000	15.4
SN 60	60	-10	600 → 6000	22.2
SN 80	80	-29	800 → 6000	39.5
SN100	100	-12	1000 → 6000	61.7
SN120	120	-34	1500 → 4500	88.8
SN150	150	-14/-39	1500 → 4500	139

material: high-carbon chromium bearing steel (SUJ2) hardness: 60HRC (HV697) or more  
Tolerances other than g6 are available upon request.

# SNS TYPE

– NB Stainless Steel Shaft –

## part number structure



part number	outer diameter D		length L	mass
	mm	tolerance g6 μm		
SNS 3	3	-2/-8	50 → 300	0.06
SNS 4	4	-4	100 → 400	0.10
SNS 5	5	-12	100 → 500	0.16
SNS 6	6	-12	100 → 600	0.22
SNS 8	8	-5	200 → 1000	0.39
SNS 10	10	-14	200 → 1500	0.61
SNS 12	12	-6	200 → 2500	0.88
SNS 13	13	-6	200 → 3000	1.03
SNS 16	16	-17	300 → 4000	1.56
SNS 20	20	-7	300 → 5000	2.43
SNS 25	25	-20	300 → 6000	3.80
SNS 30	30	-20	300 → 6000	5.48
SNS 35	35	-9	400 → 6000	7.46
SNS 40	40	-9	400 → 6000	9.75
SNS 50	50	-25	500 → 6000	15.2
SNS 60	60	-10	600 → 6000	21.9
SNS 80	80	-29	800 → 6000	39.0
SNS100	100	-12/-34	1000 → 6000	60.9

material: martensite stainless steel (equivalent to SUS440C)

hardness: 56HRC (HV613) or more

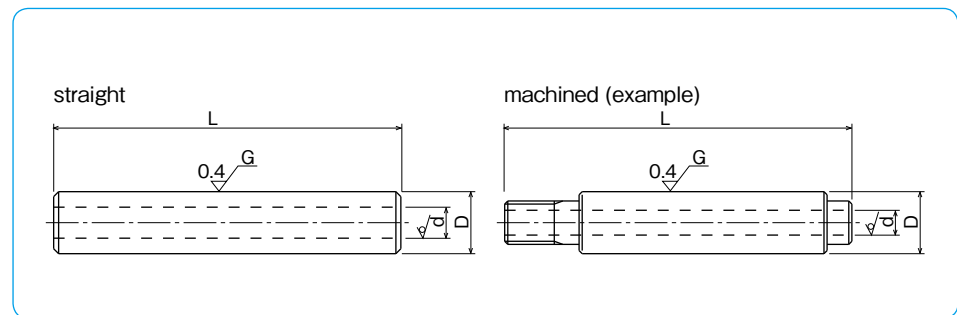
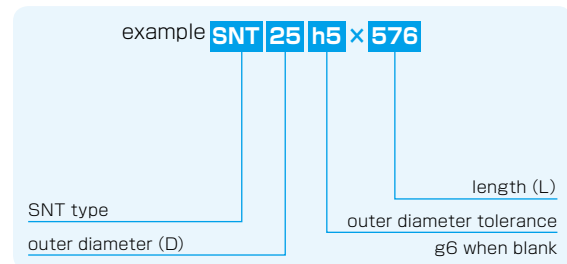
The maximum length of hardening is up to 4500mm for shafts with diameter over 80mm.

Tolerances other than g6 are available upon request.

# SNT TYPE

– NB Hollow Shaft –

## part number structure



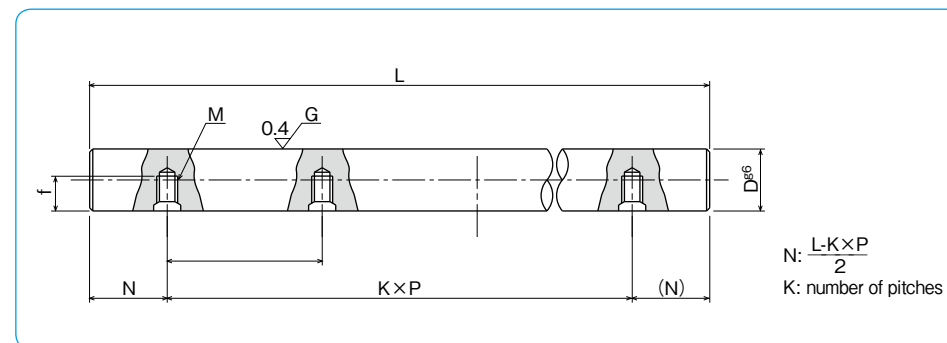
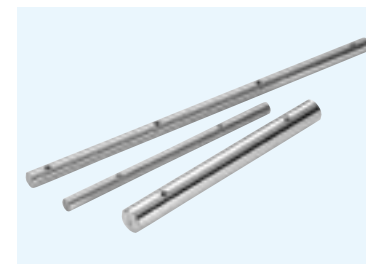
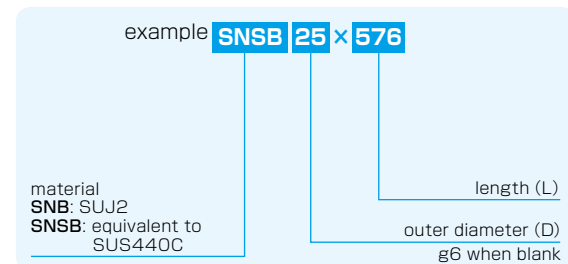
part number	outer diameter		inner diameter	length L		mass
	D	tolerance		L	L	
	mm	g6 μm	d mm	mm	mm	Kg/m
<b>SNT 6</b>	6	-4/-12	2	100 ←	→ 400	0.20
<b>SNT 8</b>	8	-5	3	200 ←	→ 600	0.34
<b>SNT 10</b>	10	-14	4	200 ←	→ 1000	0.52
<b>SNT 12</b>	12	-6	5	200 ←	→ 1500	0.73
<b>SNT 13</b>	13	-6	6	200 ←	→ 1500	0.82
<b>SNT 16</b>	16	-17	8	300 ←	→ 2500	1.18
<b>SNT 20</b>	20	-7	10	300 ←	→ 4000	1.85
<b>SNT 25</b>	25	-20	15	300 ←	→ 4000	2.46
<b>SNT 30</b>	30	-	16	300 ←	→ 4500	3.97
<b>SNT 35</b>	35	-	19	400 ←	→ 4500	5.32
<b>SNT 40</b>	40	-9	20	400 ←	→ 4500	7.39
<b>SNT 50</b>	50	-25	26	500 ←	→ 4500	11.3
<b>SNT 60</b>	60	-10	32	600 ←	→ 4500	15.9
<b>SNT 80</b>	80	-29	48	800 ←	→ 4500	25.3
<b>SNT100</b>	100	-12/-34	60	1000 ←	→ 4500	39.5

material: high-carbon chromium bearing steel (SUJ2)  
 hardness: 60HRC (HV697) or more  
 Tolerances other than g6 are available upon request.

# NB CENTER-LINED TAPPED SHAFT

A larger diameter shaft can overcome problems in maintaining precision functionality when a high or unbalanced load is applied. A combination of the center-lined tapped shaft together with the SA type support rail is ideal in such cases. (see pages F-18,19) The center-lined tapped shaft is standardized to simplify shaft selection.

## part number structure



## NB Center-Lined Tapped Shaft

part number	outer diameter	tolerance	pitch	screw	tap	maximum
	D	g6*	P	size	depth	length
	mm	μm	mm	M	f	L <sub>max</sub>
					mm	mm
<b>SNB10</b>	10	-5/-14	100	M4	4.5	1,500
<b>SNB12</b>	12	-6	100	M4	5.5	1,800
<b>SNB13</b>	13	-17	100	M4	6	2,000
<b>SNB16</b>	16	-	150	M5	7	4,000
<b>SNB20</b>	20	-7	150	M6	9	4,000
<b>SNB25</b>	25	-20	200	M6	12	4,000
<b>SNB30</b>	30	-	200	M8	15	4,500
<b>SNB35</b>	35	-9	200	M8	15	5,000
<b>SNB40</b>	40	-25	300	M8	18	6,000
<b>SNB50</b>	50	-	300	M10	22	6,000

material: high-carbon chromium bearing steel (SUJ2)  
 hardness: 60HRC (HV697) or more  
 \*g6 is a standard tolerance of the outer diameter.

## NB Center-Lined Tapped Stainless Steel Shaft

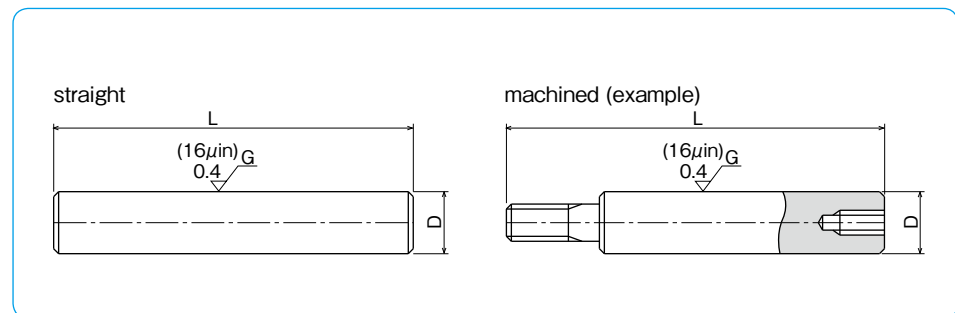
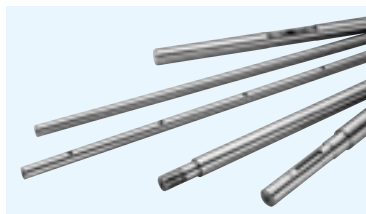
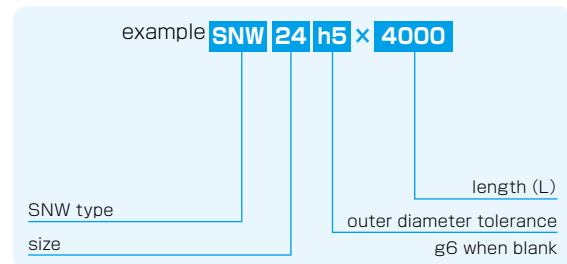
part number	outer diameter	tolerance	pitch	screw	tap	maximum
	D	g6*	P	size	depth	length
	mm	μm	mm	M	f	L <sub>max</sub>
					mm	mm
<b>SNSB16</b>	16	-6/-17	150	M5	7	2,000
<b>SNSB20</b>	20	-7	150	M6	9	3,000
<b>SNSB25</b>	25	-20	200	M6	12	4,000
<b>SNSB30</b>	30	-	200	M8	15	4,500
<b>SNSB35</b>	35	-9	200	M8	15	5,000
<b>SNSB40</b>	40	-25	300	M8	18	6,000
<b>SNSB50</b>	50	-	300	M10	22	6,000

material: martensite stainless steel (equivalent to SUS440C)  
 hardness: 56HRC (HV613) or more  
 \*g6 is a standard tolerance of the outer diameter.

# SNW TYPE

– NB Inch Shaft –

## part number structure



part number	outer diameter		length L	mass
	D	tolerance		
	inch	g6	inch	lbs/inch
	mm	inch/µm	mm	Kg/m
SNW 4	1/4 6.350	-.0002 -.0006	3.94 100 ← → 39.37 1000	0.014 0.25
SNW 6	3/8 9.525	-5 -14	7.84 200 ← → 59.06 1500	0.031 0.56
SNW 8	1/2 12.700	-.0002 -.0007	7.84 200 ← → 118.11 3000	0.056 0.99
SNW10	5/8 15.875	-6 -17	7.84 200 ← → 157.48 4000	0.086 1.55
SNW12	3/4 19.050	-.0003 -.0008	11.81 300 ← → 157.48 4000	0.125 2.24
SNW16	1 25.400	-7 -20	11.81 300 ← → 157.48 4000	0.222 3.98
SNW20	1-1/4 31.750	-.0004 -.0010	11.81 300 ← → 157.48 4000	0.348 6.22
SNW24	1-1/2 38.100	-9 -25	15.75 400 ← → 157.48 4000	0.500 8.95
SNW32	2 50.800	-.0004 -.0011	19.69 500 ← → 157.48 4000	0.890 15.91
SNW40	2-1/2 63.500	-10 -29	23.62 600 ← → 157.48 4000	1.391 25.00
SNW48	3 76.200	-10 -29	23.62 600 ← → 157.48 4000	2.003 37.92
SNW64	4 101.600	-.0005/-0013 -12/-34	39.37 1000 ← → 157.48 4000	3.560 64.02

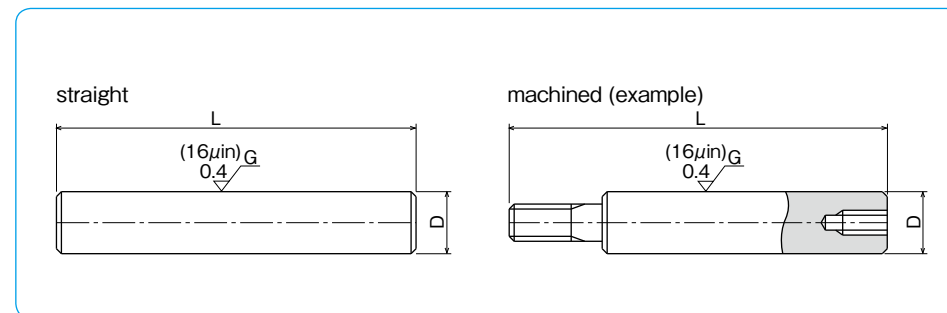
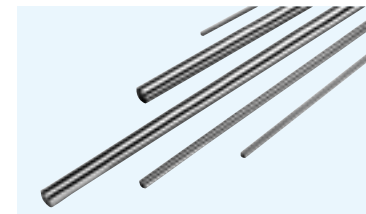
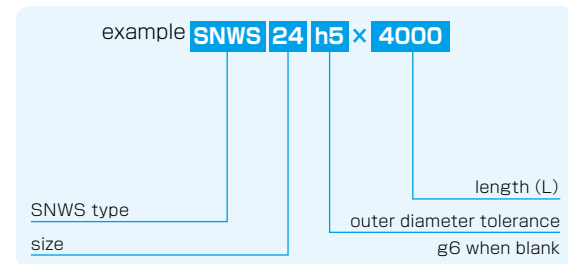
material: high-carbon chromium bearing steel (SUJ2)  
hardness: 60HRC (HV697) or more  
Tolerances other than g6 are available upon request.

1kg≒2.205lbs

# SNWS TYPE

– NB Inch Stainless Steel Shaft –

## part number structure



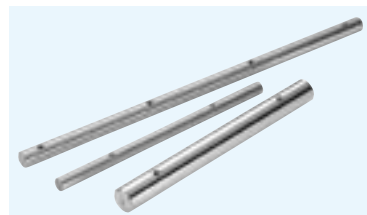
part number	outer diameter		length L	mass
	D	tolerance		
	inch	g6	inch	lbs/inch
	mm	inch/µm	mm	Kg/m
SNWS 4	1/4 6.350	-.0002 -.0006	3.94 100 ← → 23.62 600	0.014 0.25
SNWS 6	3/8 9.525	-5 -14	7.84 200 ← → 39.37 1000	0.031 0.55
SNWS 8	1/2 12.700	-.0002 -.0007	7.84 200 ← → 98.43 2500	0.056 0.98
SNWS10	5/8 15.875	-6 -17	7.84 200 ← → 118.11 3000	0.086 1.54
SNWS12	3/4 19.050	-.0003 -.0008	11.81 300 ← → 157.48 4000	0.125 2.22
SNWS16	1 25.400	-7 -20	11.81 300 ← → 157.48 4000	0.222 3.95
SNWS20	1-1/4 31.750	-.0004 -.0010	11.81 300 ← → 157.48 4000	0.420 6.16
SNWS24	1-1/2 38.100	-9 -25	15.75 400 ← → 157.48 4000	0.500 8.88
SNWS32	2 50.800	-.0004/-0011 -10/-29	19.69 500 ← → 157.48 4000	0.890 15.78

material: martensite stainless steel (equivalent to SUS440C)  
hardness: 56HRC (HV613) or more  
Tolerances other than g6 are available upon request.

1kg≒2.205lbs

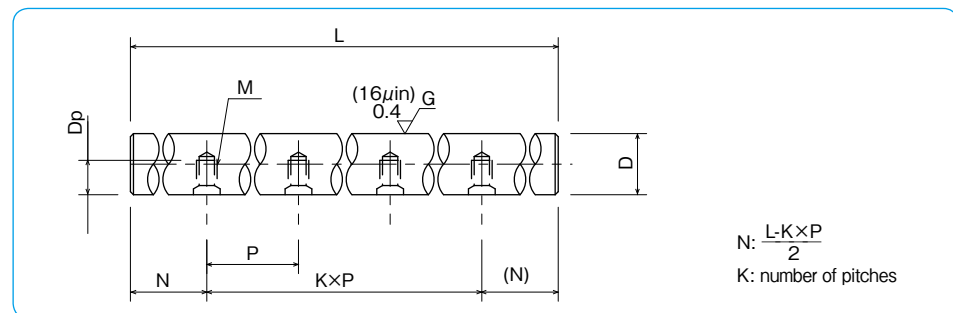
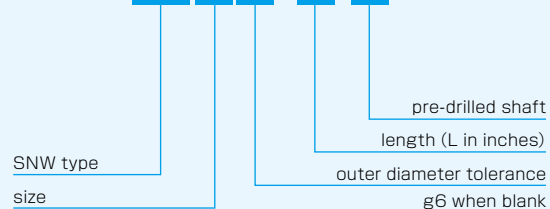
# SNW-PD

– NB Inch Pre-Drilled Shaft –



## part number structure

example **SNW 24 h5 x 72 - PD**



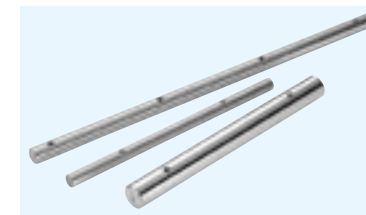
part number	outer diameter		pitch P inch/mm	bolt size M	tapped hole depth Dp inch/mm	maximum length L inch/mm
	D inch mm	tolerance g6* inch/µm				
<b>SNW 8-PD</b>	1/2 12.700	-.0002 -.0007	4 101.6	# 6-32	0.280 7.1	72 1,828.8
<b>SNW10-PD</b>	5/8 15.875	-6 -17			0.350 8.9	
<b>SNW12-PD</b>	3/4 19.050	-.0003 -.0008	6 152.4	# 10-32	0.400 10.2	
<b>SNW16-PD</b>	1 25.400	-7 -20			0.500 12.7	
<b>SNW20-PD</b>	1-1/4 31.750	-.0004 -.0010	8 203.2	5/16-18	0.650 16.5	
<b>SNW24-PD</b>	1-1/2 38.100	-9 -25			0.700 17.8	
<b>SNW32-PD</b>	2 50.800	-.0004/-0.0011 -10/-29		1/2-13	0.850 21.6	

material: high-carbon chromium bearing steel (SUJ2)  
hardness: 60HRC (HV697) or more  
Tolerances other than \*g6 are available upon request.  
Longer lengths are also available.

1kg≒2.205lbs

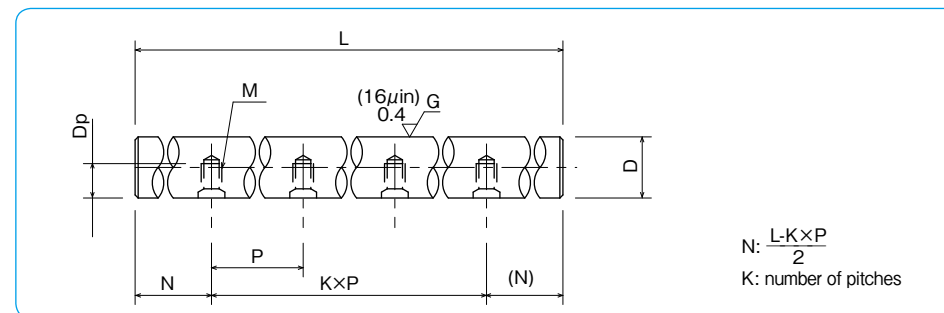
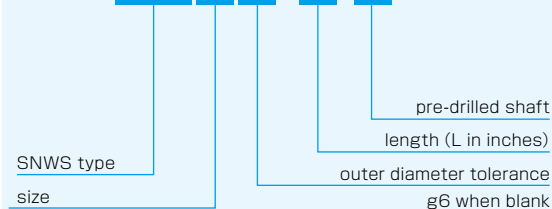
# SNWS-PD

– NB Inch Pre-Drilled Stainless Steel Shaft –



## part number structure

example **SNWS 24 h5 x 72 - PD**



part number	outer diameter		pitch P inch/mm	bolt size M	tapped hole depth Dp inch/mm	maximum length L inch/mm
	D inch mm	tolerance g6* inch/µm				
<b>SNWS 12-PD</b>	3/4 19.050	-.0003 -.0008	6 152.4	#10-32	0.400 10.2	72 1,828.8
<b>SNWS 16-PD</b>	1 25.400	-7 -20			0.500 12.7	
<b>SNWS20-PD</b>	1-1/4 31.750	-.0004 -.0010	8 203.2	5/16-18	0.650 16.5	
<b>SNWS24-PD</b>	1-1/2 38.100	-9 -25			0.700 17.8	
<b>SNWS32-PD</b>	2 50.800	-.0004/-0.0011 -10/-29		1/2-13	0.850 21.6	

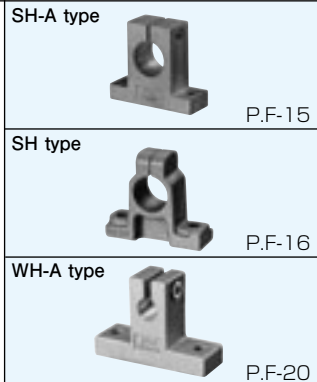
material: martensite stainless steel (equivalent to SUS440C)  
hardness: 56HRC (HV613) or more  
Tolerances other than \*g6 are available upon request.  
Longer lengths are also available.

SHAFT SUPPORTER AND SHAFT SUPPORT RAIL

These components save design/assembling time and ease shaft installation.

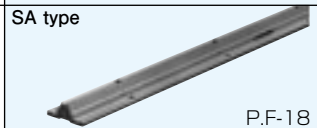
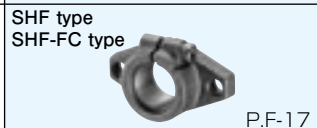
SH·SH-A·WH-A type

These are most commonly used compact shaft supporters. SH type is made of cast iron and SH-A/WH-A type is made of aluminum alloy.



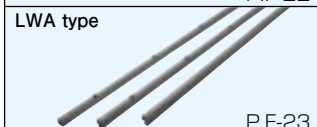
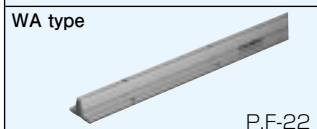
SHF·SHF-FC type

These are flanged type shaft supporters for a compact design. SHF is made of aluminum alloy and SHF-FC (shaft diameter 35 and over) is made of cast iron.



SA·WA·LWA type (shaft support rail)

These support rails support shafts from below to avoid shaft deflection for a long-stroke/high load application. This type is made of aluminum alloy.



ACCURACY OF SA TYPE SUPPORT RAIL

The accuracy of the SA support rails are measured as shown in Figure F-1.

Figure F-1 Measurement Method

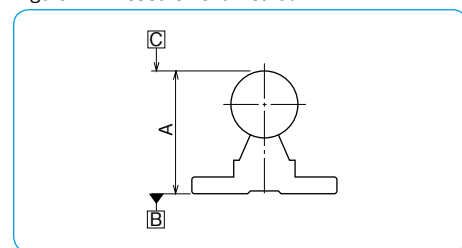
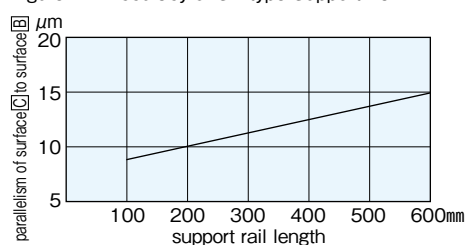


Figure F-2 Accuracy of SA type Support Rail

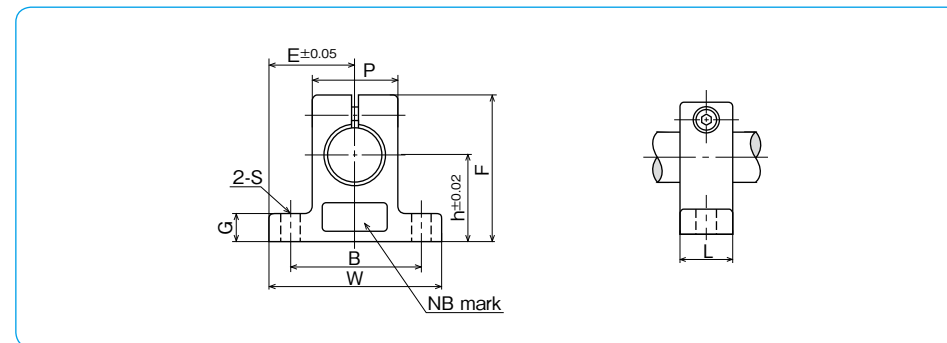
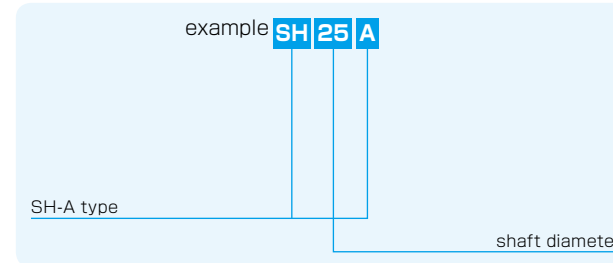


SH-A TYPE

– Shaft Supporter –



part number structure



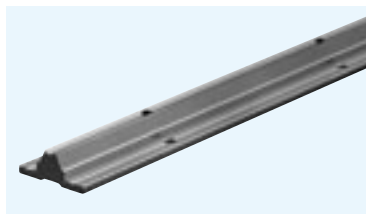
part number	shaft diameter mm	major dimensions									tightening screw size	recommended torque N·m	mass g
		h	E	W	L	F	G	P	B	S			
SH 8A	8	20	21	42	14	32.8	6	18	32	5.5 (M5)	M4	2	24
SH10A	10	20	21	42	14	32.8	6	18	32	5.5 (M5)	M4	2	24
SH12A	12	23	21	42	14	37.5	6	20	32	5.5 (M5)	M4	2	30
SH13A	13	23	21	42	14	37.5	6	20	32	5.5 (M5)	M4	2	30
SH16A	16	27	24	48	16	44	8	25	38	5.5 (M5)	M4	2	40
SH20A	20	31	30	60	20	51	10	30	45	6.6 (M6)	M5	3	70
SH25A	25	35	35	70	24	60	12	38	56	6.6 (M6)	M6	5.5	130
SH30A	30	42	42	84	28	70	12	44	64	9 (M8)	M6	5.5	180
SH35A	35	50	49	98	32	82	15	50	74	11 (M10)	M8	13.5	270
SH40A	40	60	57	114	36	96	15	60	90	11 (M10)	M8	13.5	420
SH50A	50	70	63	126	40	120	18	74	100	14 (M12)	M12	29	750
SH60A	60	80	74	148	45	136	18	90	120	14 (M12)	M12	29	1,100





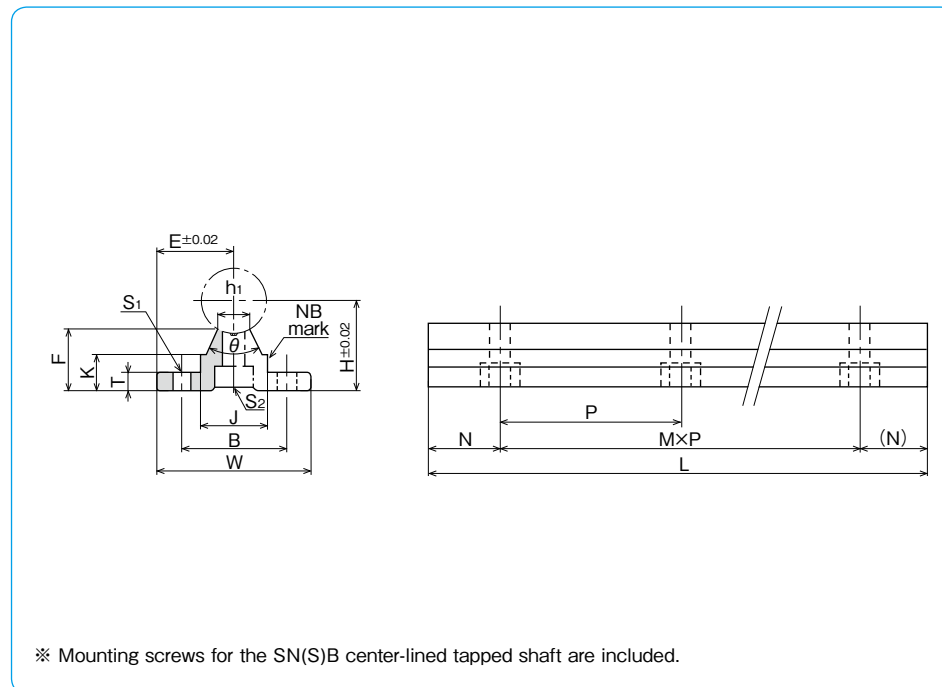
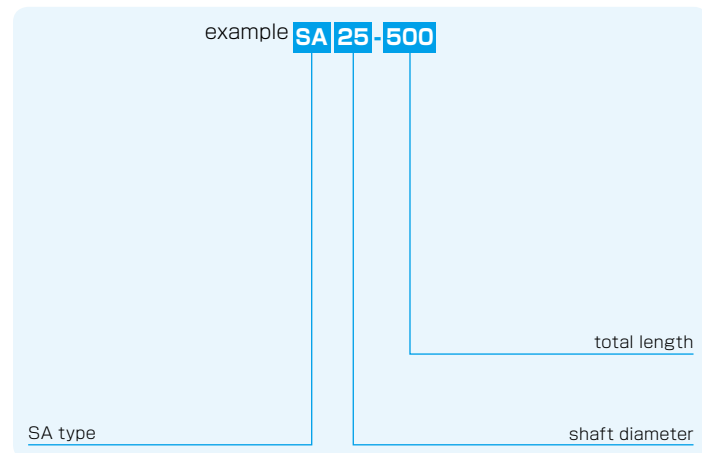
# SA TYPE

– Shaft Support Rail –



## part number structure

example SA 25-500



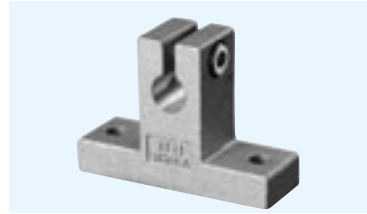
※ Mounting screws for the SN(S)B center-lined tapped shaft are included.

part number	shaft diameter mm	major dimensions													mass g			
		H	E	W	L	F	T	K	J	h <sub>1</sub>	θ	B	N	M×P		S <sub>1</sub>	S <sub>2</sub>	
SA10-200	10	18	16	32	200	13.5	4	8.9	12.4	4.7	80°	22	50	1×100	4.5	M4	110	
SA10-300					300								50	2×100				160
SA10-400					400								50	3×100				220
SA10-500					500								50	4×100				270
SA10-600					600								50	5×100				330
SA13-200	13	21	17	34	200	15	4.5	9.8	15	6	80°	25	50	1×100	4.5	M4	140	
SA13-300					300								50	2×100				210
SA13-400					400								50	3×100				280
SA13-500					500								50	4×100				350
SA13-600					600								50	5×100				420
SA16-200	16	25	20	40	200	17.8	5	11.7	18.5	8	80°	30	25	1×150	5.5	M5	200	
SA16-300					300								75	1×150				300
SA16-400					400								50	2×150				400
SA16-500					500								25	3×150				500
SA16-600					600								75	3×150				600
SA20-200	20	27	22.5	45	200	17.7	5	10	19	8	50°	30	25	1×150	5.5	M6	200	
SA20-300					300								75	1×150				300
SA20-400					400								50	2×150				400
SA20-500					500								25	3×150				510
SA20-600					600								75	3×150				610
SA25-200	25	33	27.5	55	200	21	6	12	21.5	8	50°	35	25	1×150	6.5	M6	290	
SA25-300					300								50	1×200				430
SA25-400					400								100	1×200				580
SA25-500					500								50	2×200				730
SA25-600					600								100	2×200				880

part number	shaft diameter mm	major dimensions													mass g			
		H	E	W	L	F	T	K	J	h <sub>1</sub>	θ	B	N	M×P		S <sub>1</sub>	S <sub>2</sub>	
SA30-200	30	37	30	60	200	22.8	7	13	26.5	10.3	50°	40	25	1×150	6.5	M8	360	
SA30-300					300								50	1×200				550
SA30-400					400								100	1×200				730
SA30-500					500								50	2×200				920
SA30-600					600								100	2×200				1,100
SA35-200	35	43	32.5	65	200	26.5	8	15.5	28	13	50°	45	25	1×150	9	M8	460	
SA35-300					300								50	1×200				700
SA35-400					400								100	1×200				950
SA35-500					500								50	2×200				1,190
SA35-600					600								100	2×200				1,420
SA40-200	40	48	37.5	75	200	29.4	9	17	38	16	50°	55	25	1×150	9	M8	630	
SA40-300					300								75	1×150				960
SA40-400					400								50	1×300				1,290
SA40-500					500								100	1×300				1,610
SA40-600					600								150	1×300				1,950
SA50-200	50	62	47.5	95	200	38.8	11	21	45	20	50°	70	25	1×150	11	M10	1,000	
SA50-300					300								75	1×150				1,500
SA50-400					400								50	1×300				2,000
SA50-500					500								100	1×300				2,500
SA50-600					600								150	1×300				3,000

# WH-A TYPE

– Shaft Supporter –  
(Inch Standard)



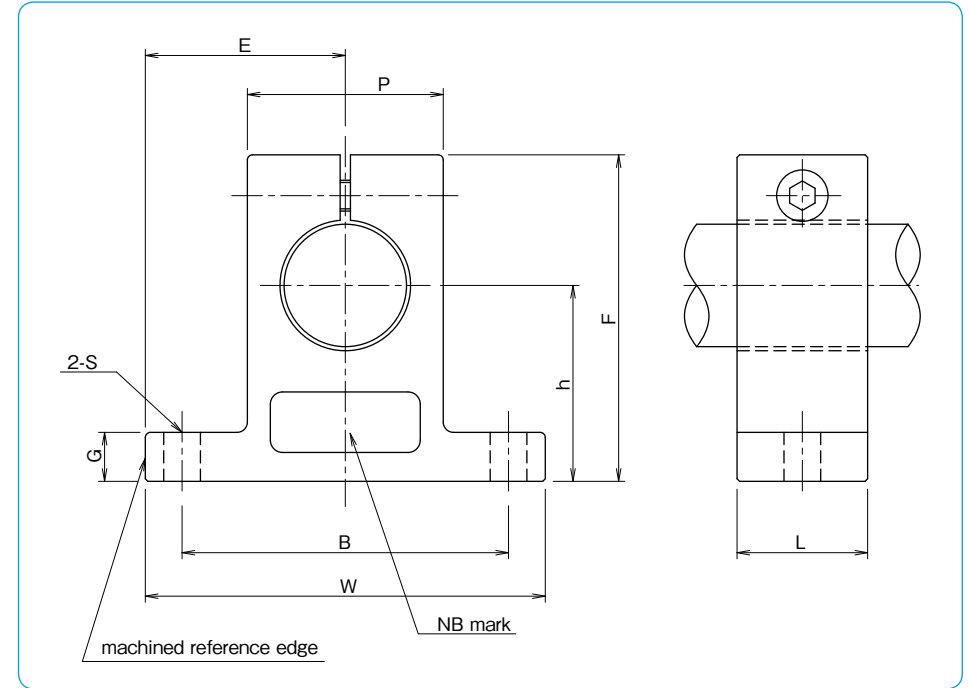
### part number structure

example **WH 24 A**

WH-A type

size

part number	shaft diameter inch	major dimensions				
		h ±.001 inch	E ±.005 inch	W inch	L inch	F inch
<b>WH 4A</b>	.2500	.6875	.7500	1.500	.500	1.063
<b>WH 6A</b>	.3750	.7500	.8125	1.625	.563	1.187
<b>WH 8A</b>	.5000	1.0000	1.0000	2.000	.625	1.625
<b>WH 10A</b>	.6250	1.0000	1.2500	2.500	.688	1.750
<b>WH 12A</b>	.7500	1.2500	1.2500	2.500	.750	2.063
<b>WH 16A</b>	1.0000	1.5000	1.5315	3.063	1.000	2.500
<b>WH 20A</b>	1.2500	1.7500	1.8750	3.750	1.125	3.000
<b>WH 24A</b>	1.5000	2.0000	2.1875	4.375	1.250	3.437
<b>WH 32A</b>	2.0000	2.5000	2.7500	5.500	1.500	4.375

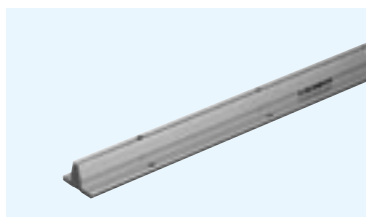


major dimensions					mass lbs	part number
G inch	P inch	B ±.01 inch	S inch	bolt#		
.250	.500	1.125	.156	# 6	.033	<b>WH 4A</b>
.250	.688	1.250	.156	# 6	.044	<b>WH 6A</b>
.250	.875	1.500	.188	# 8	.075	<b>WH 8A</b>
.313	1.000	1.875	.218	# 10	.106	<b>WH 10A</b>
.313	1.250	2.000	.218	# 10	.156	<b>WH 12A</b>
.375	1.500	2.500	.281	1/4	.294	<b>WH 16A</b>
.438	2.000	3.000	.346	5/16	.531	<b>WH 20A</b>
.500	2.250	3.500	.346	5/16	.725	<b>WH 24A</b>
.625	3.000	4.500	.406	3/8	1.400	<b>WH 32A</b>

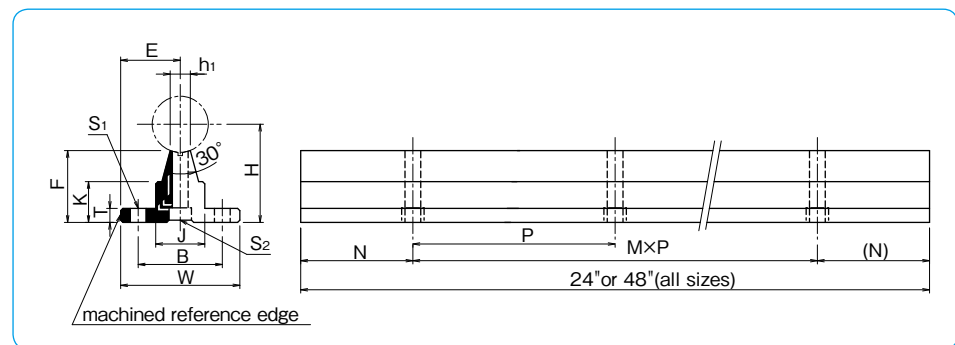
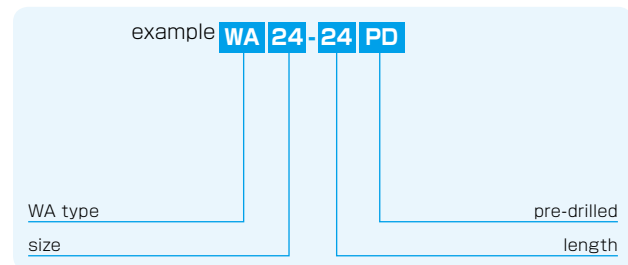
1kg≒2.205lbs  
1lb≒0.454kg

# WA TYPE

– Shaft Support Rail –  
(Inch Standard)



## part number structure



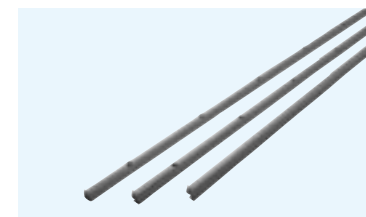
part number	shaft diameter inch	major dimensions								mounting dimensions				mass lbs				
		H ±.001 inch	E ±.005 inch	W inch	F inch	T inch	K inch	J inch	h <sub>1</sub> inch	B ±.01 inch	N inch	M×P inch	S <sub>1</sub> hole inch		S <sub>2</sub> hole inch			
WA 8-	24PD	.5000	1.125	.7500	1.500	.903	.188	.466	.500	.255	1.000	2	5×4	.169	#6	.169	#6	1.326
	48PD												11×4					2.652
WA10-	24PD	.6250	1.125	.8125	1.625	.841	.250	.423	.500	.276	1.125	2	5×4	.193	#8	.193	#8	1.488
	48PD												11×4					2.976
WA12-	24PD	.7500	1.500	.8750	1.750	1.158	.250	.592	.625	.322	1.250	3	3×6	.221	#10	.221	#10	2.100
	48PD												7×6					4.200
WA16-	24PD	1.0000	1.750	1.0625	2.125	1.280	.250	.727	.875	.359	1.500	3	3×6	.281	1/4	.281	1/4	2.776
	48PD												7×6					5.552
WA20-	24PD	1.2500	2.125	1.2500	2.500	1.537	.313	.799	1.100	.437	1.875	3	3×6	.343	5/16	.343	5/16	4.060
	48PD												7×6					8.120
WA24-	24PD	1.5000	2.500	1.5000	3.000	1.798	.375	.922	1.375	.558	2.250	4	2×8	.343	5/16	.406	3/8	5.840
	48PD												5×8					11.680
WA32-	24PD	2.0000	3.250	1.8750	3.750	2.322	.500	1.450	1.500	.800	2.750	4	2×8	.406	3/8	.531	1/2	9.500
	48PD												5×8					19.000

All sizes are also available without pre-drilled mounting holes.  
Complete shaft-rail assemblies are also available as well as custom drilling and lengths.  
Please send drawings with customer specifications.  
Product of NB Corporation of America

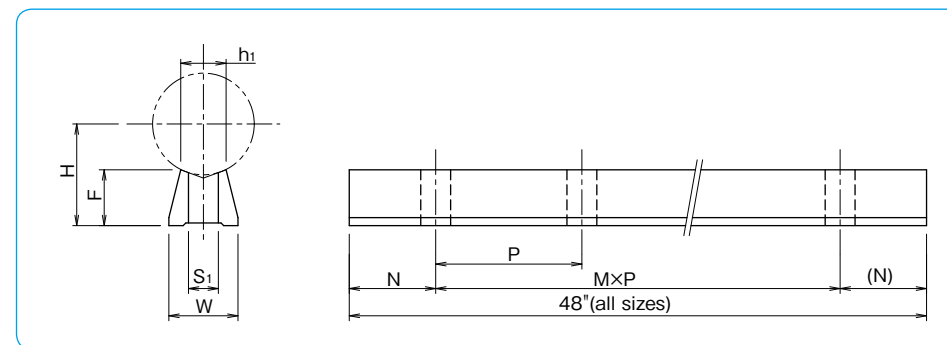
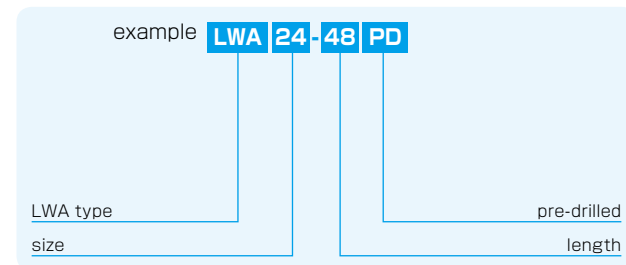
1kg≐2.205lbs  
1lb≐0.454kg

# LWA TYPE

– Low Shaft Support Rail –  
(Inch Standard)



## part number structure



part number	shaft diameter inch	major dimensions			major dimensions			S <sub>1</sub> inch	mass lb
		H ±.002 inch	W inch	F inch	N inch	M×P inch	h <sub>1</sub> inch		
LWA 8-48 PD	.5000	.5625	.37	.342	2	11×4	0.25	.169	0.11
LWA 10-48 PD	.6250	.6875	.45	.405	2	11×4	0.276	.193	0.17
LWA 12-48 PD	.7500	.7500	.51	.409	3	7×6	0.317	.220	0.20
LWA 16-48 PD	1.0000	1.0000	.69	.545	3	7×6	0.422	.283	0.35
LWA 20-48 PD	1.2500	1.1875	.78	.617	3	7×6	0.520	.343	0.44
LWA 24-48 PD	1.5000	1.3750	.93	.691	4	5×8	0.630	.406	0.58
LWA 32-48 PD	2.0000	1.7500	1.18	.836	4	5×8	0.824	.531	0.89

Product of NB Corporation of America

1kg≐2.205lbs  
1lb≐0.454kg

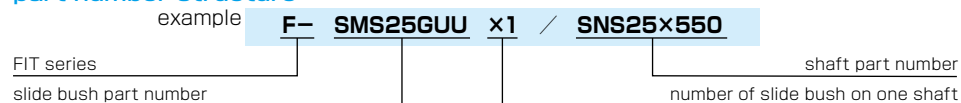


## FIT SERIES

Due to the combined tolerances of the bush's bore and the shaft's diameter, accuracy can be affected by clearance or increased dynamic friction caused by preloading.

NB's FIT Series takes advantages of the lower cost slide bush and the precision ground shaft to achieve a target clearance in order for the linear system to produce a smooth, high-accuracy performance.

### part number structure



- Please refer to corresponding catalog pages for details.
- Please specify on the drawing about the shaft machining, radial clearance, match-marking, etc.

### Recommended Radial Clearance

Depending on the type of application, the clearance range varies, please use the chart below as a guideline.

target	clearance (+)	← 0 →	clearance (-)
light motion	[Bar chart showing positive clearance range]		
high accuracy	[Bar chart showing narrow clearance range around 0]		
no play	[Bar chart showing negative clearance range]		

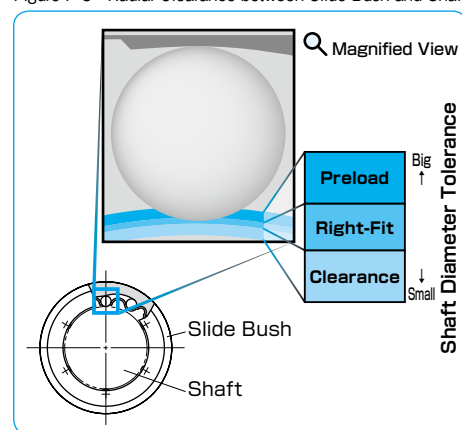
### Slide Bush, Radial Clearance (-), Negative Limit

Negative clearance is opted to reduce backlash. Please refer to the chart below for the negative clearance limits.

size	3~8	10~13	16~25	30~35	40	50~60
radial clearance limit	-3μm	-4μm	-6μm	-8μm	-10μm	-13μm

- The off-center of the housing causes uneven loading on the slide bush, please pay special attention to the centering of the housing especially when negative clearance is a requirement.
- Please contact NB for details on the extra preloading requirement or on other part numbers like SRE, SR, etc.

Figure F-3 Radial Clearance between Slide Bush and Shaft

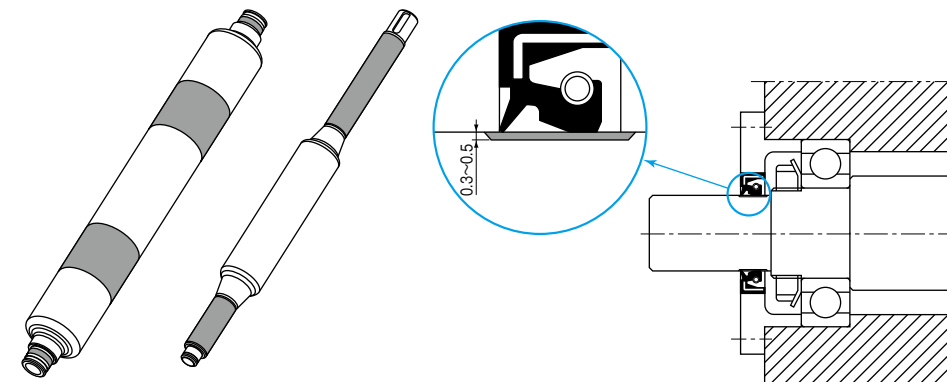


## THERMAL-SPRAYING CERAMIC-COATING SPECIFICATIONS

### ADVANTAGES

Parts that require wear and corrosion resistance can be thermal-sprayed with a ceramic material per NB's ceramic-coating specifications. Ceramic-coating can be applied to a wide variety of materials. The pores in the coated layer result in good lubrication characteristics and can be sealed to achieve high corrosion resistance.

### APPLICATION EXAMPLE



Application of a ceramic coating to oil-sealing parts, rollers, and roll shafts results in good lubrication and high wear/corrosion resistance characteristics.

Note: Ceramic coated surface cannot be used as the inner race for a slide bush.

### REFERENCE

Standard Coating Materials

High-carbon chromium bearing steel (SUJ2)	Martensite stainless steel (equivalent to SUS440C)
Chrome molybdenum steel (SCM415, 435)	Austenite stainless steel (SUS303, 304)
Carbon steel for machinery (S45C)	Tool steel (SKS3, SK4)

Proper heat treatment can be done on your request. Thermal-spraying ceramic-coating is applicable to other materials as well.

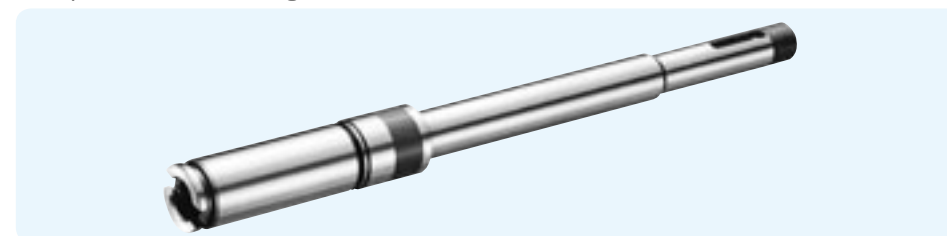
Standard Ceramic for Thermal-Spraying

main component	specific gravity	hardness	characteristics
TiO <sub>2</sub> titanium dioxide	4.7	58HRC	max. temp. 540°C color: black fine coating fine surface finish

thermal-spraying layer thickness: 0.3-0.5mm

Other types of ceramic materials can be thermal-sprayed. Contact NB for more information.

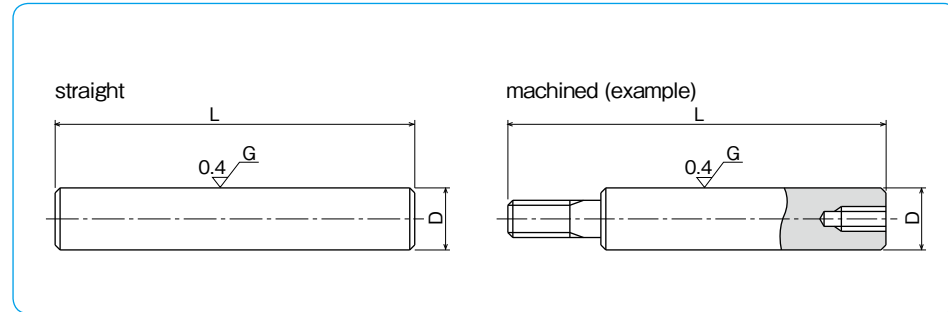
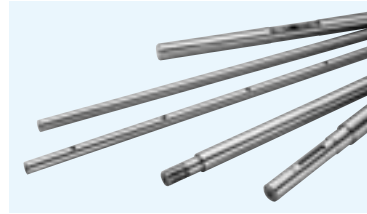
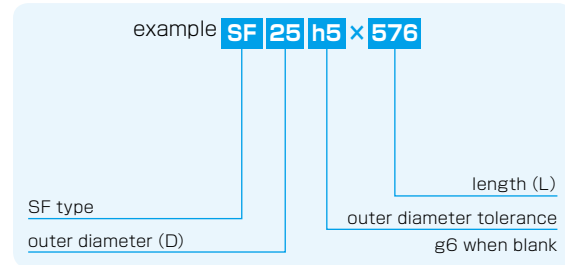
### Example of Ceramic Coating



# SF TYPE

– NBCA Shaft –

## part number structure



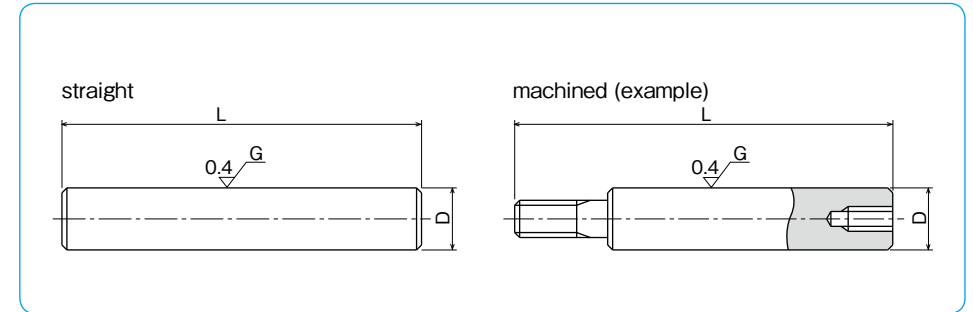
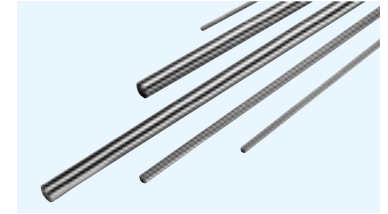
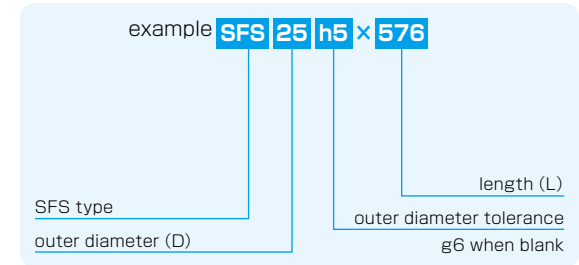
part number	outer diameter D mm	outer diameter tolerance g6 μm	length L mm	mass Kg/m
SF 6	6	-4/-12	100 → 3000	0.23
SF 8	8	- 5	100 → 3000	0.40
SF 10	10	-14	100 → 3000	0.62
SF 12	12		100 → 3000	0.89
SF 13	13	- 6	100 → 3000	1.04
SF 15	15	-17	100 → 3000	1.39
SF 16	16		100 → 3000	1.58
SF 20	20	- 7	100 → 3000	2.47
SF 25	25	-20	100 → 3000	3.85
SF 30	30		100 → 3000	5.55
SF 35	35	- 9	100 → 3000	7.55
SF 40	40	-25	100 → 3000	9.87
SF 50	50		100 → 3000	15.4

material: Equivalent to SUJ2 hardness: 60HRC (HV697) or more  
Tolerances other than g6 are available upon request.  
Product of NB Corporation of America

# SFS TYPE

– NBCA Stainless Steel Shaft –

## part number structure

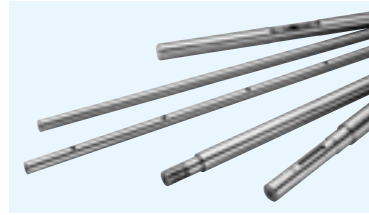


part number	outer diameter D mm	outer diameter tolerance g6 μm	length L mm	mass Kg/m
SFS 6	6	-4/-12	100 → 3000	0.22
SFS 8	8	- 5	100 → 3000	0.39
SFS 10	10	-14	100 → 3000	0.61
SFS 12	12		100 → 3000	0.88
SFS 13	13	- 6	100 → 3000	1.03
SFS 16	16	-17	100 → 3000	1.56
SFS 20	20	- 7	100 → 3000	2.43
SFS 25	25	-20	100 → 3000	3.80
SFS 30	30		100 → 3000	5.48
SFS 35	35	- 9	100 → 3000	7.46
SFS 40	40	-25	100 → 3000	9.75
SFS 50	50		100 → 3000	15.2

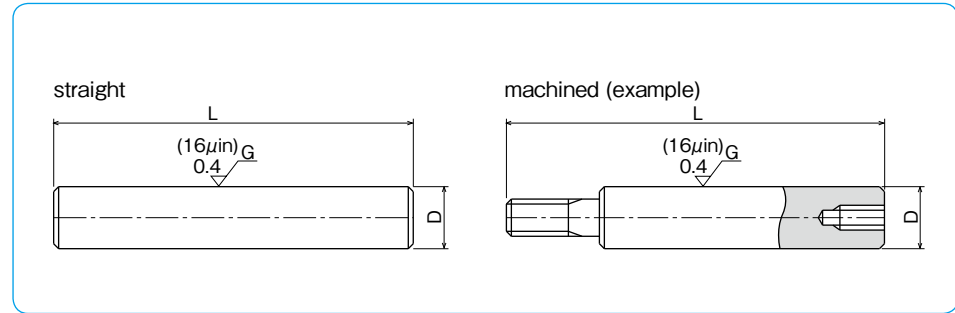
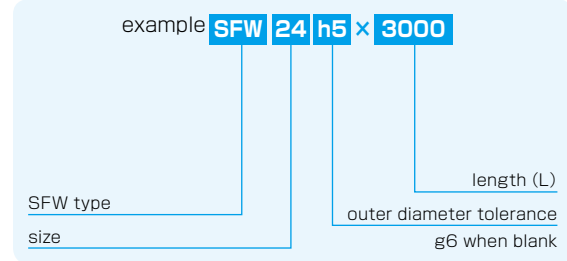
material: Equivalent to SUS440C  
hardness: 52HRC (HV544) or more  
Tolerances other than g6 are available upon request.  
Product of NB Corporation of America

# SFW TYPE

– NBCA Inch Shaft –



## part number structure



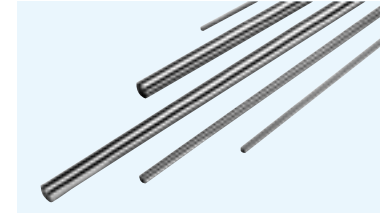
Part Number	Outer Diameter		Length L inch/mm	Mass lbs/inch kg/m
	D inch/mm	g6 inch/mm		
SFW 4	1/4	−.0002	2	0.014
	6.350	−.0006	50.8 ← → 3048	0.25
SFW 6	3/8	−5	2	0.031
	9.525	−14	50.8 ← → 3048	0.56
SFW 8	1/2	−.0002	2	0.056
	12.700	−.0007	50.8 ← → 3048	0.99
SFW 10	5/8	−6	2	0.086
	15.875	−17	50.8 ← → 3048	1.55
SFW 12	3/4	−.0003	2	0.125
	19.050	−.0008	50.8 ← → 3048	2.24
SFW 16	1	−7	2	0.222
	25.400	−20	50.8 ← → 3048	3.98
SFW 20	1-1/4	−.0004	2	0.348
	31.750	−.0011	50.8 ← → 3048	6.22
SFW 24	1-1/2	−10	2	0.500
	38.100	−29	50.8 ← → 3048	8.95
SFW 32	2	−.0005/−.0013	2	0.890
	50.800	−12/−34	50.8 ← → 3048	15.91

material: Equivalent to SUJ2  
 hardness: 60 HRC or more  
 Tolerances: g6 or to be specified  
 Product of NB Corporation of America

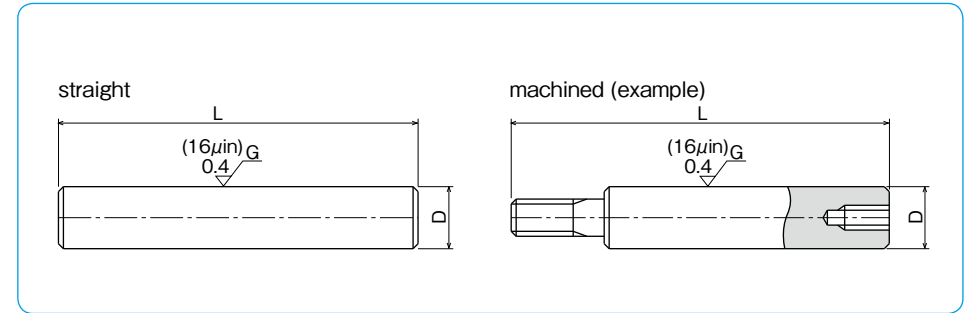
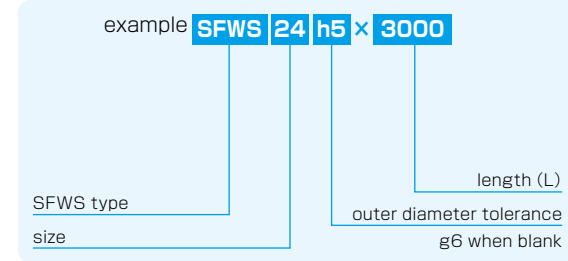
1kg≐2.205lbs

# SFWS TYPE

– NBCA Inch Stainless Steel Shaft –



## part number structure



Part Number	Outer Diameter		Length L inch/mm	Mass lbs/inch kg/m
	D inch/mm	g6 inch/mm		
SFWS 2	1/8	−.0002	2	0.004
	3.175	−.0005	50.8 ← → 16	0.10
SFWS 3	3/16	−5	2	0.008
	4.763	−12	50.8 ← → 16	0.20
SFWS 4	1/4	−.0002	2	0.014
	6.350	−.0006	50.8 ← → 3048	0.25
SFWS 6	3/8	−5	2	0.031
	9.525	−14	50.8 ← → 3048	0.56
SFWS 8	1/2	−.0002	2	0.056
	12.700	−.0007	50.8 ← → 3048	0.99
SFWS 10	5/8	−6	2	0.086
	15.875	−17	50.8 ← → 3048	1.55
SFWS 12	3/4	−.0003	2	0.125
	19.050	−.0008	50.8 ← → 3048	2.24
SFWS 16	1	−7	2	0.222
	25.400	−20	50.8 ← → 3048	3.98
SFWS 20	1-1/4	−.0004	2	0.348
	31.750	−.0011	50.8 ← → 3048	6.22
SFWS 24	1-1/2	−10	2	0.500
	38.100	−29	50.8 ← → 3048	8.95
SFWS 32	2	−.0005/−.0013	2	0.890
	50.800	−12/−34	50.8 ← → 3048	15.91

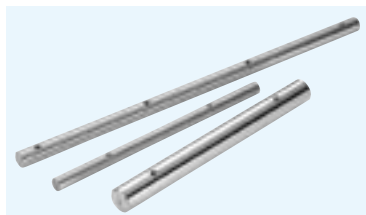
material: Equivalent to SUS440C  
 hardness: 52 HRC or more  
 Tolerances: g6 or to be specified  
 Product of NB Corporation of America

1kg≐2.205lbs



# SFW-PD

– NBCA Inch Pre-Drilled Shaft –



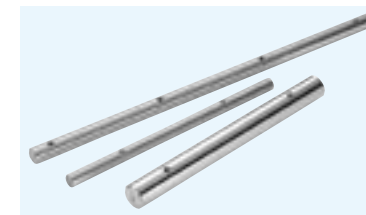
## part number structure

example **SFW 24 x 72 - PD**

SFW type size      pre-drilled shaft length (L in inches)

# SFWS-PD

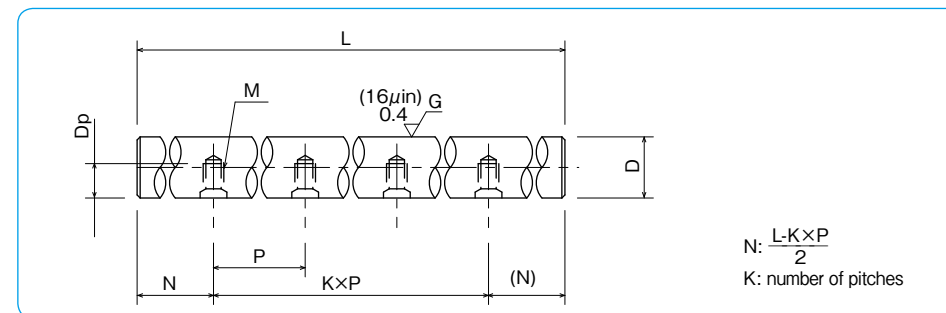
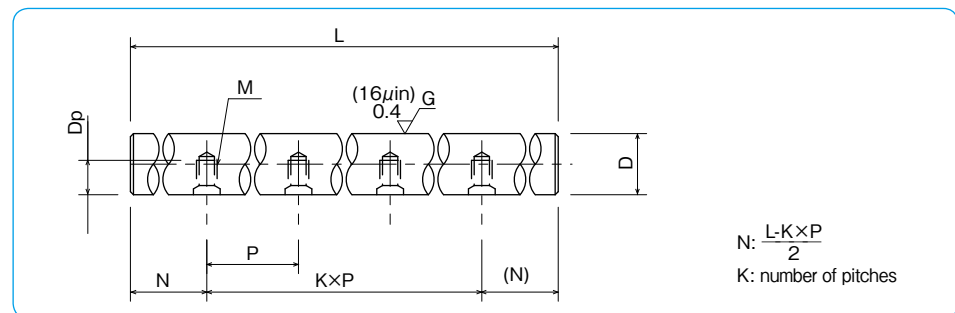
– NBCA Inch Pre-Drilled Stainless Steel Shaft –



## part number structure

example **SFWS 24 x 72 - PD**

SFWS type size      pre-drilled shaft length (L in inches)



Part Number	Outer Diameter		Pitch P inch/mm	Bolt Size M	Tapped Hole Depth Dp inch/mm	Maximum Length L inch/mm
	D inch/mm	inch/mm				
<b>SFW 8-PD</b>	1/2	-.0005	4	# 6-32	0.280	168
	12.700	-.0010				
<b>SFW 10-PD</b>	5/8	-13	101.6	# 8-32	0.350	180
	15.875	-25				
<b>SFW 12-PD</b>	3/4	-.0005	6	# 10-32	0.400	204
	19.050					
<b>SFW 16-PD</b>	1	-13	152.4	1/4-20	0.500	204
	25.400	-25				
<b>SFW 20-PD</b>	1-1/4	-.0005	8	5/16-18	0.650	204
	31.750					
<b>SFW 24-PD</b>	1-1/2	-13	203.2	3/8-16	0.700	204
	38.100	-25				
<b>SFW 32-PD</b>	2	-.0005	8	1/2-13	0.850	204
	50.800	-.0010				

material: Equivalent to SUJ2  
 hardness: 60 HRC or more  
 Product of NB Corporation of America  
 1kg≒2.205lbs

Part Number	Outer Diameter		Pitch P inch/mm	Bolt Size M	Tapped Hole Depth Dp inch/mm	Maximum Length L inch/mm
	D inch/mm	inch/mm				
<b>SFWS 8-PD</b>	1/2	-.0005	4	# 6-32	0.280	158
	12.700	-.0010				
<b>SFWS 10-PD</b>	5/8	-13	101.6	# 8-32	0.350	158
	15.875	-25				
<b>SFWS 12-PD</b>	3/4	-.0005	6	# 10-32	0.400	158
	19.050					
<b>SFWS 16-PD</b>	1	-13	152.4	1/4-20	0.500	158
	25.400	-25				
<b>SFWS 20-PD</b>	1-1/4	-.0005	8	5/16-18	0.650	158
	31.750					
<b>SFWS 24-PD</b>	1-1/2	-13	203.2	3/8-16	0.700	158
	38.100	-25				
<b>SFWS 32-PD</b>	2	-.0005	8	1/2-13	0.850	158
	50.800	-.0010				

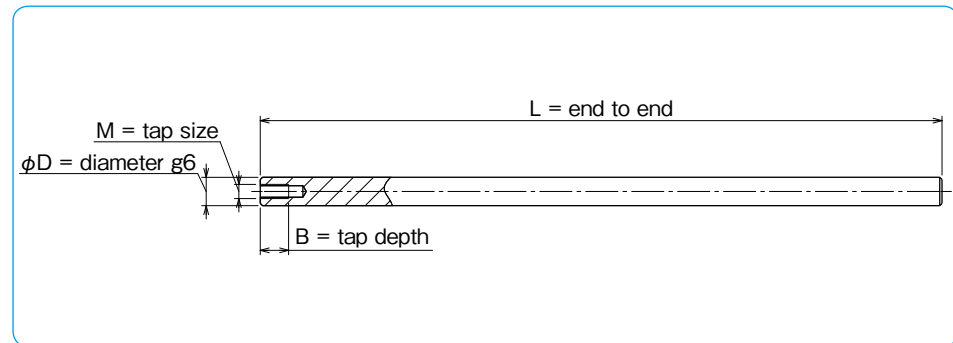
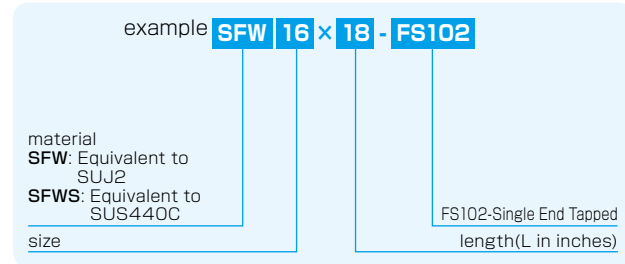
material: Equivalent to SUS440C  
 hardness: 52 HRC or more  
 Product of NB Corporation of America  
 1kg≒2.205lbs

### SFW-FS102/SFWS-FS102 TYPE

– Format Single End Tapped Inch Shaft –



#### part number structure



Part Number SFW	Part Number SFWS	Outer Diameter D		Tap Size M	Tap Depth B	Length in mm							
		inch/mm	inch/mm			6	8	9*	10*	12	18	24	36
<b>SFW 4-FS102</b>		1/4	-.0002	# 5-40	0.250"	6	8			12	18	24	36
		6.350	-.0006			152.4	203.2			304.8	457.2	609.6	
<b>SFW 6-FS102</b>	<b>SFWS 6-FS102</b>	3/8	-5	# 8-32	0.330"	6	8*	9*	10*	12	18	24	36
		9.525	-14			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 8-FS102</b>	<b>SFWS 8-FS102</b>	1/2	-.0002	1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		12.700	-.0007			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 10-FS102</b>	<b>SFWS10-FS102</b>	5/8	-6	1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		15.875	-17			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 12-FS102</b>	<b>SFWS12-FS102</b>	3/4	-.0003	5/16-18	0.625"	6	8*	9*	10*	12	18	24	36
		19.050	-.0008			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 16-FS102</b>	<b>SFWS16-FS102</b>	1	-7	3/8-16	0.750"	6	8*	9*	10*	12	18	24	36
		25.400	-20			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 20-FS102</b>	<b>SFWS20-FS102</b>	1-1/4	-.0004	1/2-13	1.000"	6	8*	9*	10*	12	18	24	36
		31.750	-.0011			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 24-FS102</b>	<b>SFWS24-FS102</b>	1-1/2	-10	5/8-11	1.250"	6				12	18	24	36
		38.100	-29			152.4				304.8	457.2	609.6	914.4

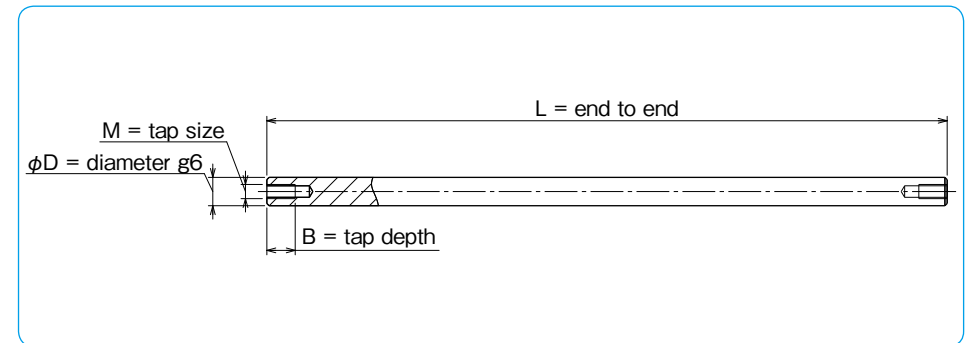
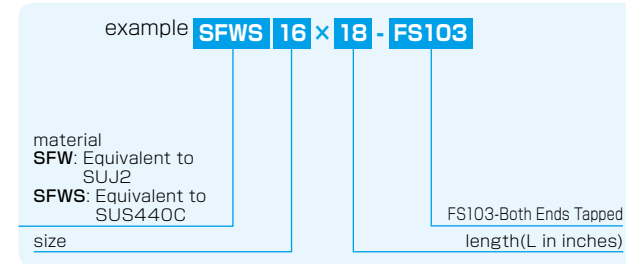
hardness of SFW: 60 HRC or more  
 hardness of SFWS: 52 HRC or more  
 Product of NB Corporation of America  
 \* SFWS is not available

### SFW-FS103/SFWS-FS103 TYPE

– Format Both Ends Tapped Inch Shaft –



#### part number structure

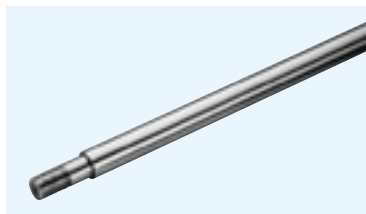


Part Number SFW	Part Number SFWS	Outer Diameter D		Tap Size M	Tap Depth B	Length in mm							
		inch/mm	inch/mm			6	8	9*	10*	12	18	24	36
<b>SFW 4-FS103</b>		1/4	-.0002	# 5-40	0.250"	6	8			12	18	24	36
		6.350	-.0006			152.4	203.2			304.8	457.2	609.6	
<b>SFW 6-FS103</b>	<b>SFWS 6-FS103</b>	3/8	-5	# 8-32	0.330"	6	8*	9*	10*	12	18	24	36
		9.525	-14			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 8-FS103</b>	<b>SFWS 8-FS103</b>	1/2	-.0002	1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		12.700	-.0007			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 10-FS103</b>	<b>SFWS10-FS103</b>	5/8	-6	1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		15.875	-17			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 12-FS103</b>	<b>SFWS12-FS103</b>	3/4	-.0003	5/16-18	0.625"	6	8*	9*	10*	12	18	24	36
		19.050	-.0008			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 16-FS103</b>	<b>SFWS16-FS103</b>	1	-7	3/8-16	0.750"	6	8*	9*	10*	12	18	24	36
		25.400	-20			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 20-FS103</b>	<b>SFWS20-FS103</b>	1-1/4	-.0004	1/2-13	1.000"	6	8*	9*	10*	12	18	24	36
		31.750	-.0011			152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
<b>SFW 24-FS103</b>	<b>SFWS24-FS103</b>	1-1/2	-10	5/8-11	1.250"	6				12	18	24	36
		38.100	-29			152.4				304.8	457.2	609.6	914.4

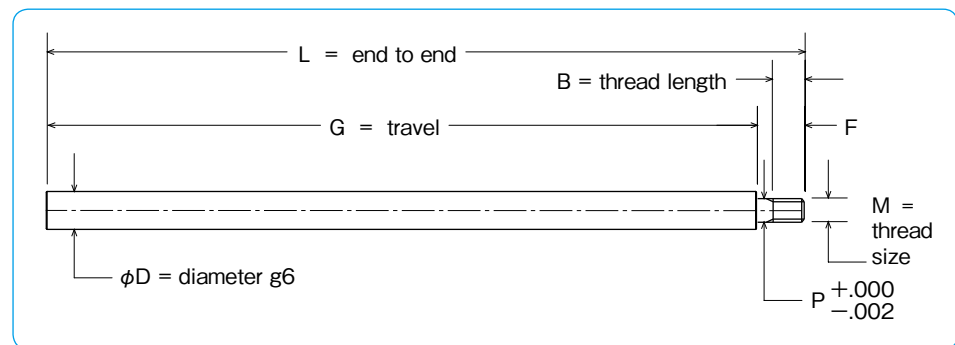
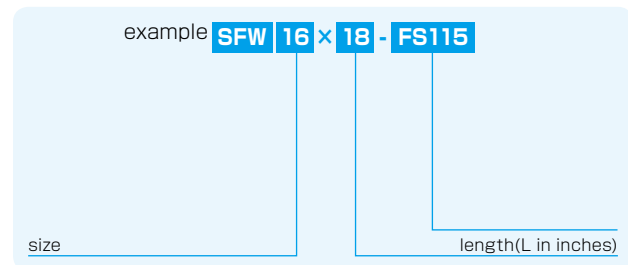
hardness of SFW: 60 HRC or more  
 hardness of SFWS: 52 HRC or more  
 Product of NB Corporation of America  
 \* SFWS is not available

# SFW-FS115 TYPE

– Format Single End Threaded Inch Shafts –



## part number structure

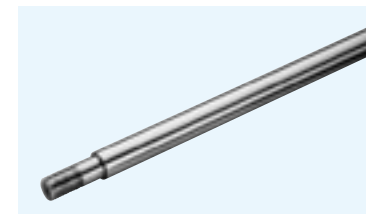


Part Number	Outer Diameter		Thread Size M	Thread Length B	Journal Length F	Journal DIA P	4" Travel G	6" Travel G	8" Travel G	12" Travel G	24" Travel G	36" Travel G	48" Travel G
	D	inch/mm					Length L	Length L	Length L	Length L	Length L	Length L	
SFW 6-FS115	3/8	—5	# 8-32	0.31	0.330	0.250	4.500	6.500	8.500	12.500	24.500		
	9.525	—14										114.3	215.9
SFW 8-FS115	1/2	—0.002	1/4-20	0.39	0.500	0.313	4.625	6.625	8.625	12.625	24.625		
	12.700	—0.007										117.5	168.3
SFW 10-FS115	5/8	—6	1/4-20	0.47	0.500	0.375	4.750	6.750	8.750	12.750	24.750		
	15.875	—17										120.7	171.5
SFW 12-FS115	3/4	—0.003	5/16-18	0.63	0.625	0.500	5.000	7.000	9.000	13.000	25.000		
	19.050	—0.008										127.0	177.8
SFW 16-FS115	1	—7	3/8-16	0.78	0.750	0.625		7.250	9.250	13.250	25.250	37.250	
	25.400	—20											184.2
SFW 20-FS115	1-1/4	—0.004	1/2-13	0.94	1.000	0.750		7.500	9.500	13.500	25.500	37.500	
	31.750	—0.011											190.5
SFW 24-FS115	1-1/2	—10	5/8-11	1.25	1.250	1.000		10.000	14.000	26.000	38.000	50.000	
	38.100	—29											31.75

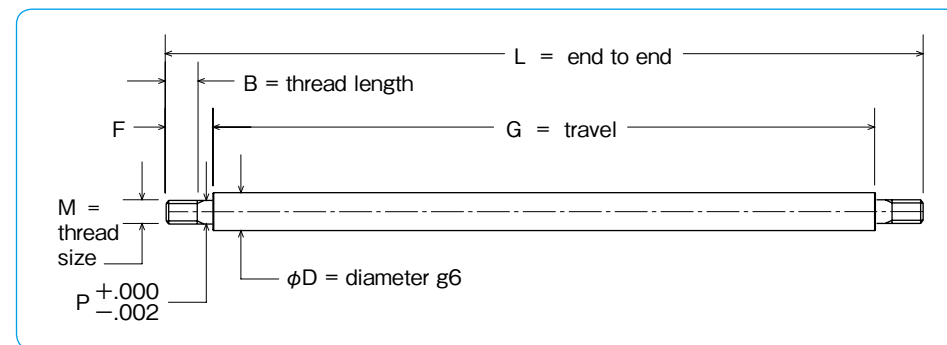
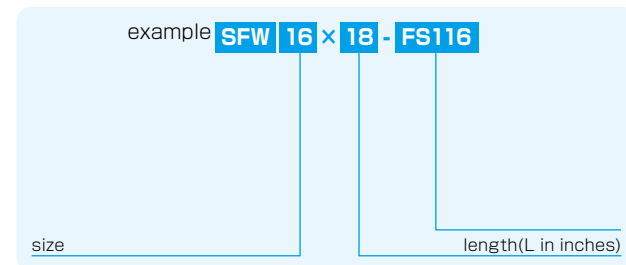
material: Equivalent to SUJ2  
hardness: 60 HRC or more  
tolerances: g6 or to be specified  
stainless steel sizes are available on this series by quote only  
Product of NB Corporation of America

# SFW-FS116 TYPE

– Format Both Ends Threaded Inch Shafts –



## part number structure

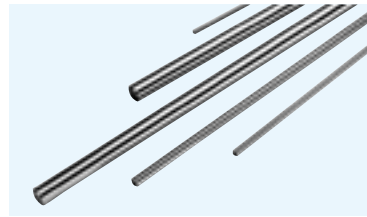


Part Number	Outer Diameter		Thread Size M	Thread Length B	Journal Length F	Journal DIA P	4" Travel G	6" Travel G	8" Travel G	12" Travel G	24" Travel G	36" Travel G	48" Travel G
	D	inch/mm					Length L	Length L	Length L	Length L	Length L	Length L	
SFW 6-FS116	3/8	—5	# 8-32	0.31	0.330	0.250	5.000	7.000	9.000	13.000	25.000		
	9.525	—14										127.0	177.8
SFW 8-FS116	1/2	—0.002	1/4-20	0.39	0.500	0.313	5.250	7.250	9.250	13.250	25.250		
	12.700	—0.007										133.4	184.2
SFW 10-FS116	5/8	—6	1/4-20	0.47	0.500	0.375	5.500	7.500	9.500	13.500	25.500		
	15.875	—17										139.7	190.5
SFW 12-FS116	3/4	—0.003	5/16-18	0.63	0.625	0.500	6.000	8.000	10.000	14.000	26.000		
	19.050	—0.008										152.4	203.2
SFW 16-FS116	1	—7	3/8-16	0.78	0.750	0.625		8.500	10.500	14.500	26.500	38.500	
	25.400	—20											215.9
SFW 20-FS116	1-1/4	—0.004	1/2-13	0.94	1.000	0.750		9.000	11.000	15.000	27.000	39.000	
	31.750	—0.011											228.6
SFW 24-FS116	1-1/2	—10	5/8-11	1.25	1.250	1.000		12.000	16.000	28.000	40.000	52.000	
	38.100	—29											31.75

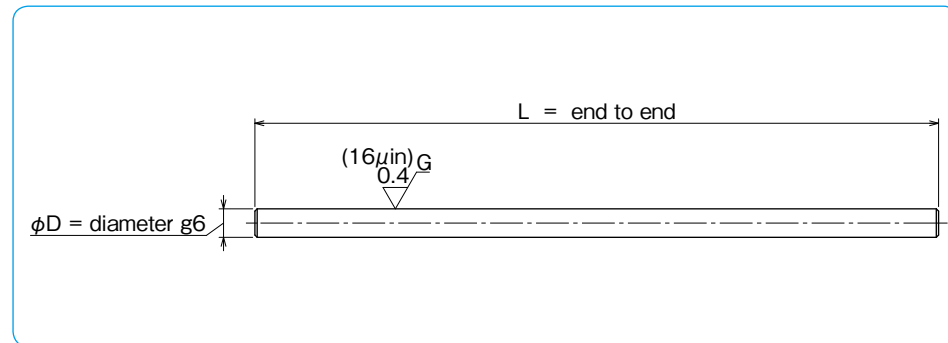
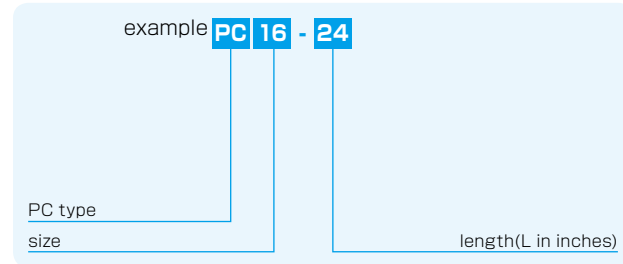
material: Equivalent to SUJ2  
hardness: 60 HRC or more  
tolerances: g6 or to be specified  
stainless steel sizes are available on this series by quote only  
Product of NB Corporation of America

# PC TYPE

– Pre-Cut Slide Shafts –



### part number structure



Part Number	Outer Diameter		Length L							Mass lbs/inch kg/m	
	D inch/mm	g6 inch/mm	inch mm								
PC 4	1/4	-.0002	6	12	18	24				0.014	
	6.350	-.0006	152.4	304.8	457.2	609.6				0.25	
PC 6	3/8	-5	6	12	18	24				0.031	
	9.525	-14	152.4	304.8	457.2	609.6				0.56	
PC 8	1/2	-.0002		12	18	24	30	36		0.056	
	12.700	-.0007		304.8	457.2	609.6	762	914.4		0.99	
PC 10	5/8	-6		12	18	24	30	36		0.086	
	15.875	-17		304.8	457.2	609.6	762	914.4		1.55	
PC 12	3/4	-.0003			18	24	30	36	42	48	0.125
	19.050	-.0008			457.2	609.6	762	914.4	1066.8	1219.2	2.24
PC 16	1	-7			18	24	30	36	42	48	0.222
	25.400	-20			457.2	609.6	762	914.4	1066.8	1219.2	3.98
PC 20	1-1/4	-.0004			18	24	30	36	42	48	0.348
	31.750	-.0011			457.2	609.6	762	914.4	1066.8	1219.2	6.22
PC 24	1-1/2	-10			18	24		36		48	0.500
	38.100	-29			457.2	609.6		914.4		1219.2	8.95

material: Equivalent to SUJ2  
 hardness: 60 HRC or more  
 tolerances: g6 or to be specified  
 Product of NB Corporation of America

# SPINDLE SHAFT & SPINDLE UNIT

NB Spindle Shaft is back by decades of precision manufacturing experience as well as up to date manufacturing facility to meet the demands. NB is capable of handling all your spindle needs such as manufacturing of bearing case and spindle base, design and manufacturing of spindle unit, and overhauling of spindles.

## ADVANTAGES

### Spindle Unit

NB provides overhauling, engineering services as well as manufacturing of spindle unit.

### Ultra Precision Machining

Spindle manufacturing facility is controlled to a constant temperature throughout the year for precision manufacturing of spindles.

### Various Machining Solution Available

BT, BBT, HSK inner tapers, gauge and bearing matching, thread grinding, and many other spindle related machining are available.

### Surface Treatments

Various surface treatments are available such as hard chrome and ceramic coating. Repairing a damaged spindle with replating and grinding is also available.

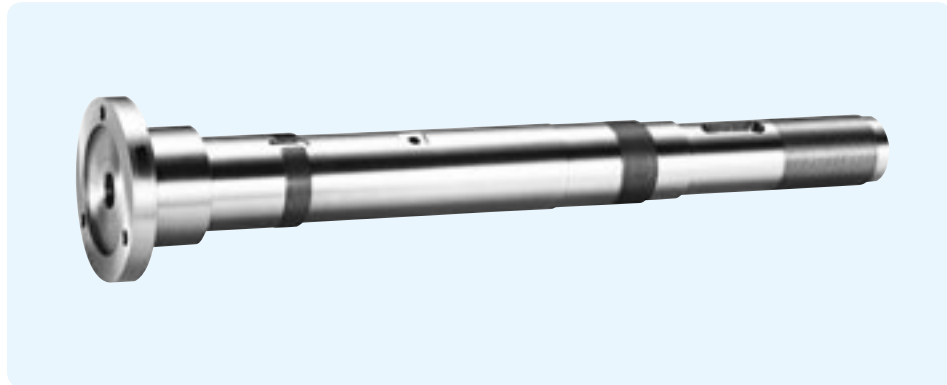
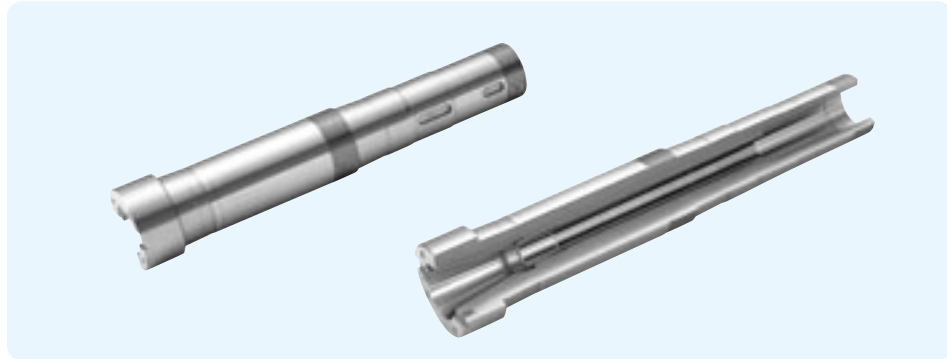
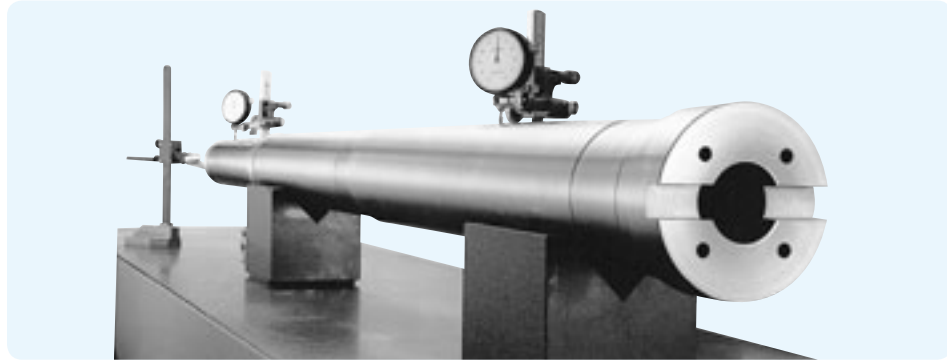
## EXAMPLE OF SPINDLE UNIT DESIGN AND MACHINING



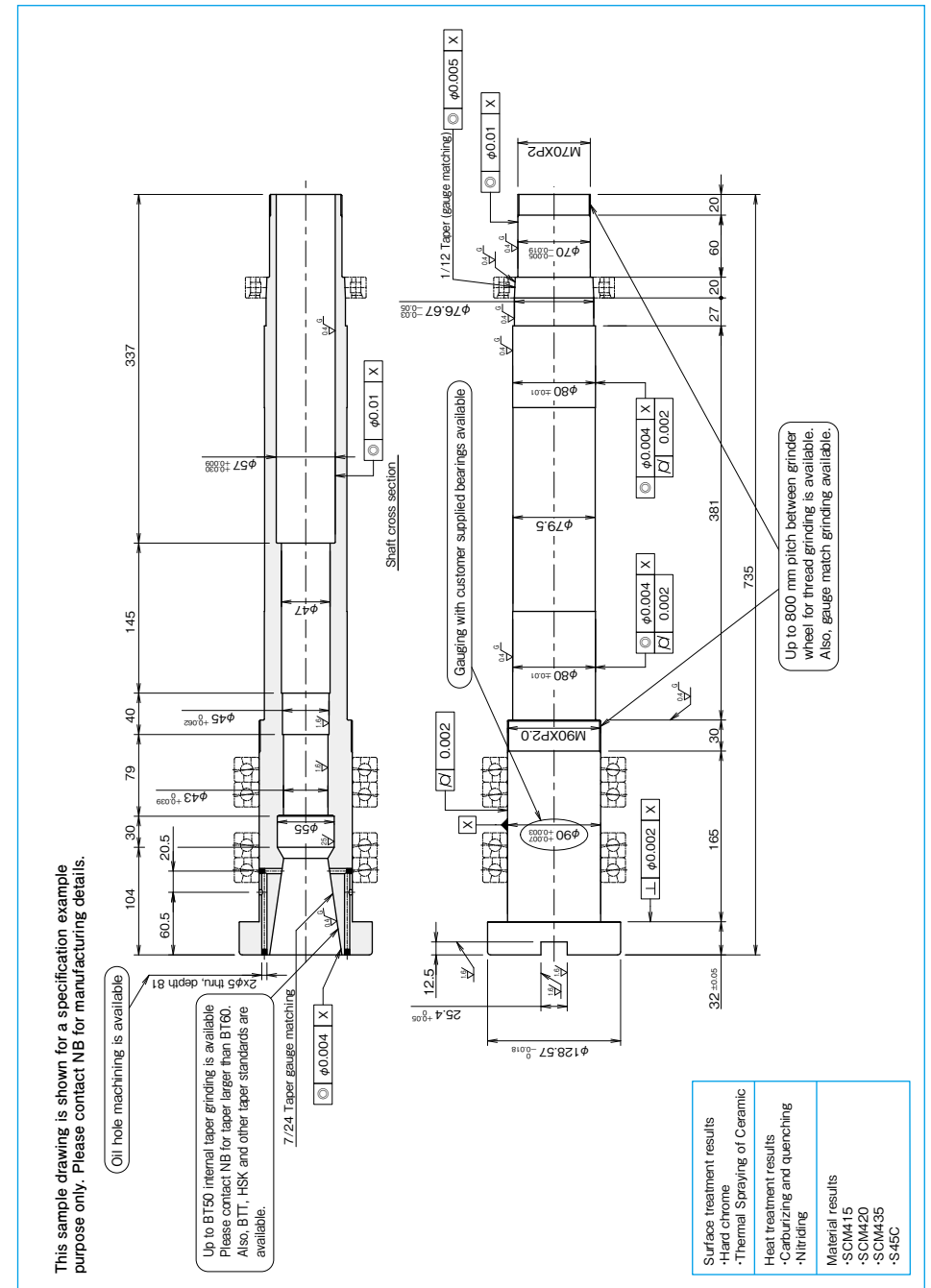
Example of spindle unit specification	
Machine used	Machining center
Mounting orientation	Vertical
Rotational Speed	Max. 10,000 rpm (Max. 700 rpm without tooling attached)
Spindle taper size	#30
Lubrication methods	Grease lubrication
Lubricant	ISOFLEX NBU15 (NOK Corporation)
Tool clamping power	400 kgf (theoretical)
Estimated drive power	3.5kW
Estimated weight	31kg

EXAMPLES OF MACHINING

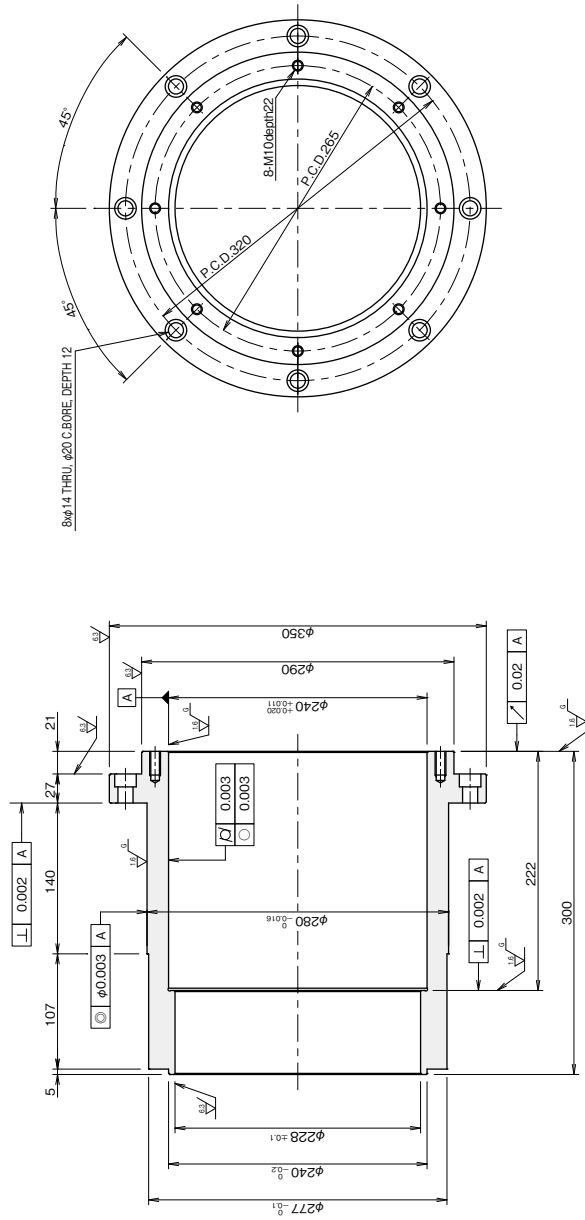
Spindle



EXAMPLE OF DRAWING ①



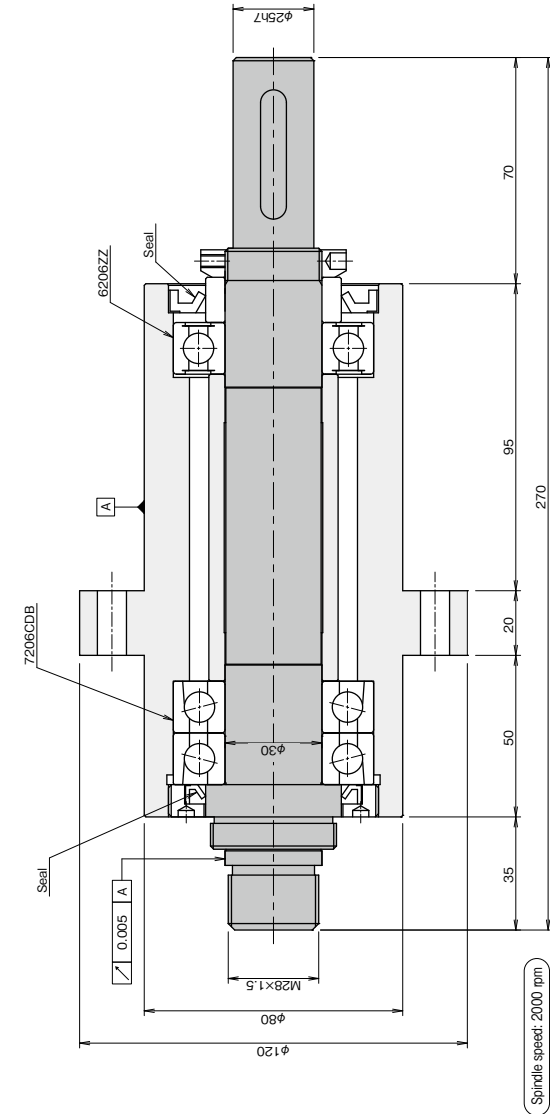
EXAMPLE OF DRAWING ②



Material results  
-S45C  
-SCM435

This sample drawing is shown for a specification example purpose only. Please contact NB for manufacturing details.

EXAMPLE OF DRAWING ③



Spindle speed: 2000 rpm

This sample drawing is shown for a specification example purpose only. Please contact NB for manufacturing details.

Custom design and manufacturing service for various spindle units is available. Please contact NB for details.

# GENERAL MACHINE SHAFTING

NB general machine shafts are made to customer drawings. Integrated production from material sourcing, machining, heat treatments, surface treatments and final inspection, NB does it all.

## ADVANTAGES

### Small Lot Production Accepted

One piece custom accepted.

### Variety of Machining Capabilities

From small to large, various shaft and spindle machining is available.

### Surface Treatment

Various surface treatments are available such as hard chrome, electroless nickel plating, and low temperature black chrome.

### Heat Treatment

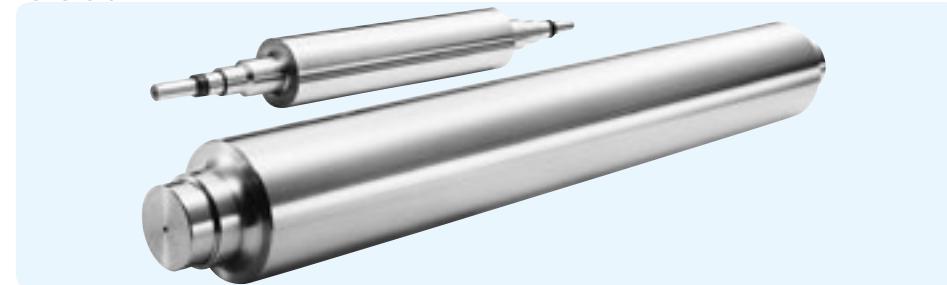
Various heat treatments are available such as carburizing and induction hardening.

Materials	High Carbon Chromium Bearing Steel (SUJ2)	Surface Treatment	Hard Chrome
	Chrome Molybdenum Steel (JIS SCM415, 420, 435)		Low Temperature Black Chrome
	Structural Carbon Steel (JIS S45C)		Electroless Nickel Plating
	Martensite Stainless Steel (SUS440)		Thermal Spray Ceramic Coating
	Austenite Stainless Steel (SUS303, 304)		Others
	Tool Steel (JIS SK4)	Triangular and trapezoidal thread grinding available	
	Tool Steel (JIS SKS3)		
Heat Treatment	Induction Hardening		
	Induction Hardening (deep)		
	Carburizing and quenching		

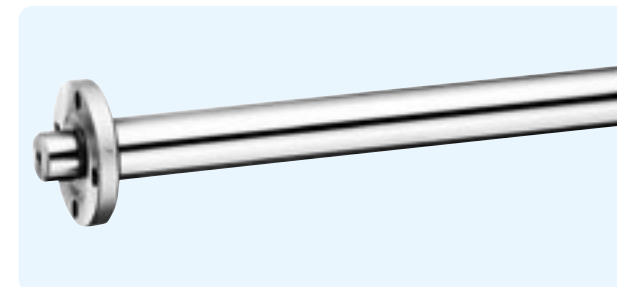
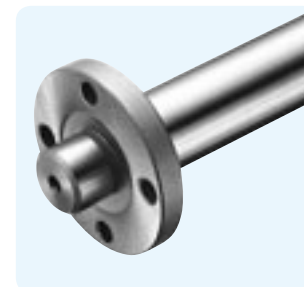
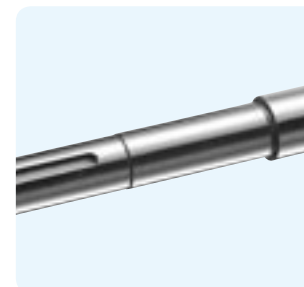
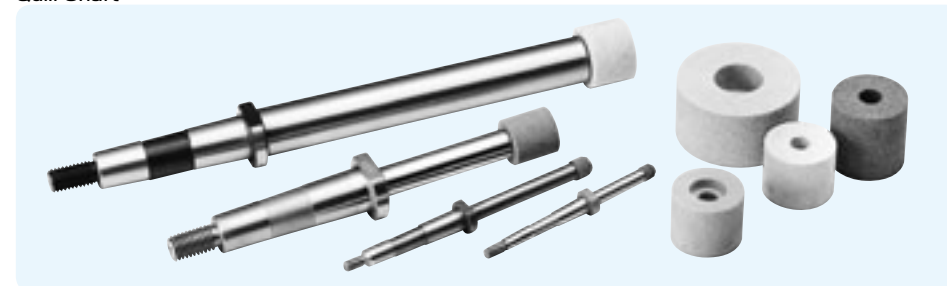
Machining Ability	Process Details / Manufacturing Contents	Maximum Machinable Diameter	Maximum Machinable Length	Remarks / Notes
	Centerless Grinding	φ60 mm outer diameter	4000mm	
	External Grinder	φ640 mm outer diameter	6000mm	
	Internal Grinder	φ200 mm inner diameter	300mm	Allowable work length: up to 1100 mm
		φ350 mm inner diameter	300mm	
	Vertical Grinder	φ630 mm outer diameter	300mm	
	Lathe	φ400	3800mm	
	Horizontal Machining Center	φ350	2000mm	Up to 3000 kg
Vertical Machining Center	φ300	3000mm	Up to 3000 kg	
BT / Gun Drilling	φ80	2000mm	Up to 4000 mm long with both end machining for less than φ120 Up to 2000 mm long for φ120 and over	

## EXAMPLES OF MACHINING ①

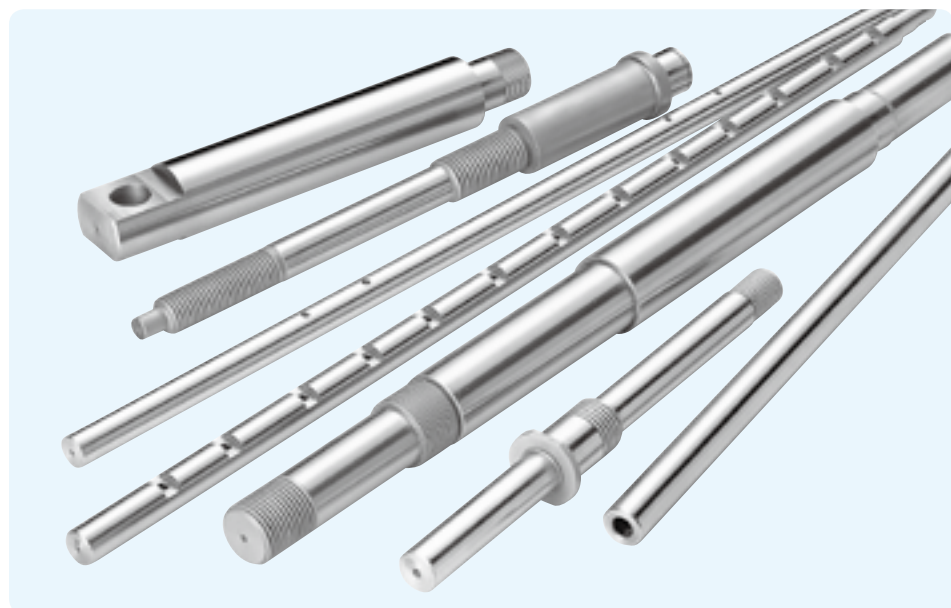
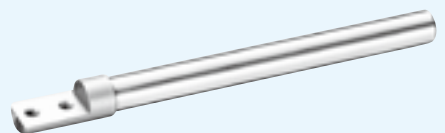
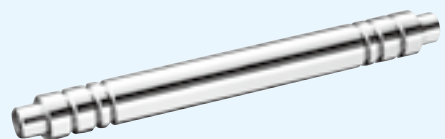
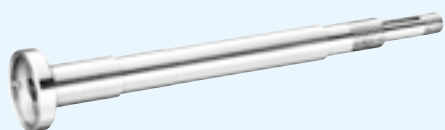
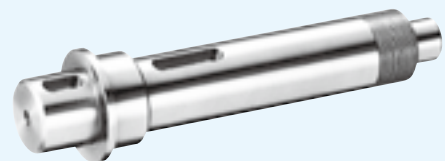
Roll Shaft



Quill Shaft



EXAMPLES OF MACHINING ②



Please visit at NB Website for more examples of machining.

# SLIDE WAY SLIDE TABLE MINIATURE SLIDE GONIO WAY

## SLIDE WAY

- STRUCTURE AND ADVANTAGES G-2
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