

SLIDE SHAFT SPINDLE SHAFT

SLIDE SHAFT

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SPINDLE 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.

Hardened Layer
(cross section)



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)
- 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-10)

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-33)

TYPES

SN/SNS/SNT type (NB Shaft)



SNB/SNSB type (NB Center-lined Tapped Shaft)



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-14)

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	

Shaft Supporter and Shaft Support Rail

<p>SH-A type</p> <p>P.F-11</p>	<p>SH type</p> <p>P.F-12</p>	<p>SHF type SHF-FC type</p> <p>P.F-13</p>	<p>SA type</p> <p>P.F-14</p>
<p>WH-A type</p> <p>P.F-16</p>	<p>WA type</p> <p>P.F-18</p>	<p>LWA type</p> <p>P.F-19</p>	

Special Specifications



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		$\delta_{max} = \frac{Mo\ell^2}{216EI} = \frac{2}{9}Mo\ell^2C$	$i_1 = \frac{Mo\ell}{16EI} = 3Mo\ell C$ $i_2 = 0$

δ_1 : deflection at the concentrated load point (mm) δ_{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) ℓ : span (mm) I : moment of inertia of area (mm⁴)
 E : modulus of longitudinal elasticity (SUJ2) 2.06×10^5 (N/mm²) (SUS) 2.0×10^5 (N/mm²) C : $1/48EI$ (1/N·mm²)

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 (mm⁴)

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,
 $C = 2.54 \times 10^{-8}$ (N·mm²).

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,
 $C = 1.73 \times 10^{-13}$ (N·mm²)

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

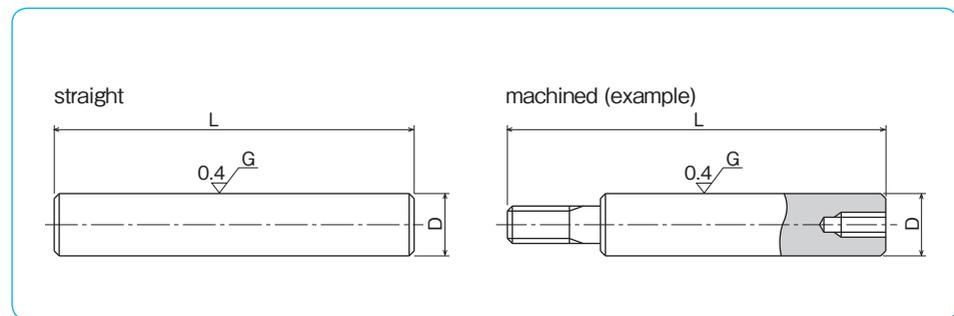
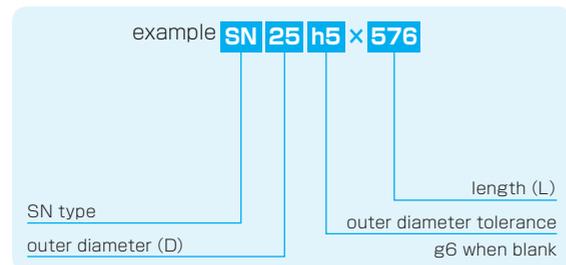
Table F-5 Hollow Shaft

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

SN TYPE

– NB Shaft –

part number structure



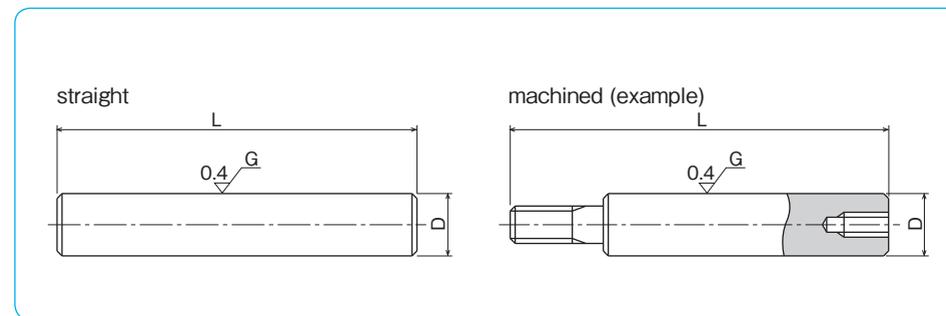
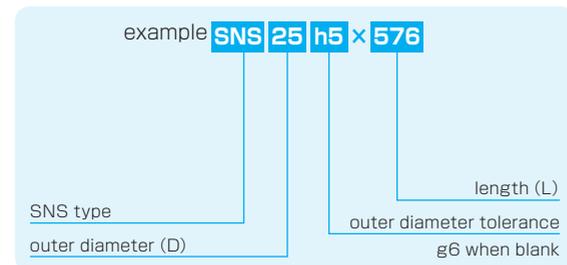
part number	outer diameter D mm	tolerance g6 μm	length L mm		mass Kg/m
			mm	mm	
SN 3	3	-2/-8	50	400	0.06
SN 4	4	-4	100	500	0.10
SN 5	5	-12	100	700	0.16
SN 6	6	-12	100	1000	0.23
SN 8	8	-5	200	1500	0.40
SN 10	10	-14	200	2000	0.62
SN 12	12	-6	200	3000	0.89
SN 13	13	-6	200	3000	1.04
SN 15	15	-17	300	4000	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 mm	tolerance g6 μm	length L mm		mass Kg/m
			mm	mm	
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

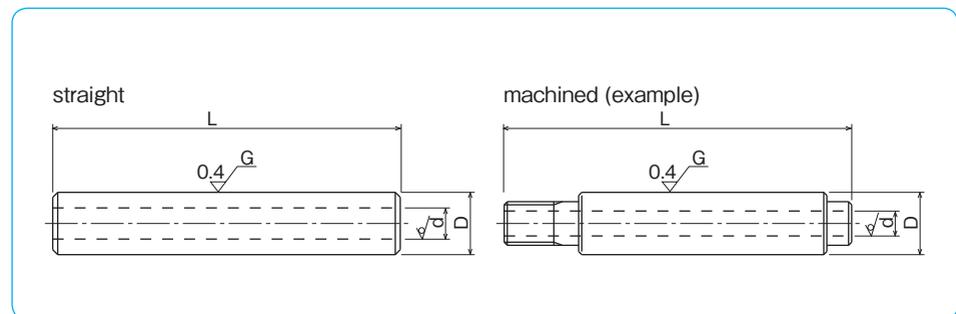
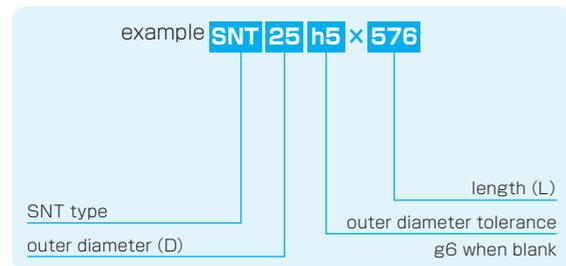
The maximum length of hardening is up to 4500mm for shafts with diameter over 80mm.

Tolerances other than g6 are available upon request.

SNT TYPE

— NB Hollow Shaft —

part number structure



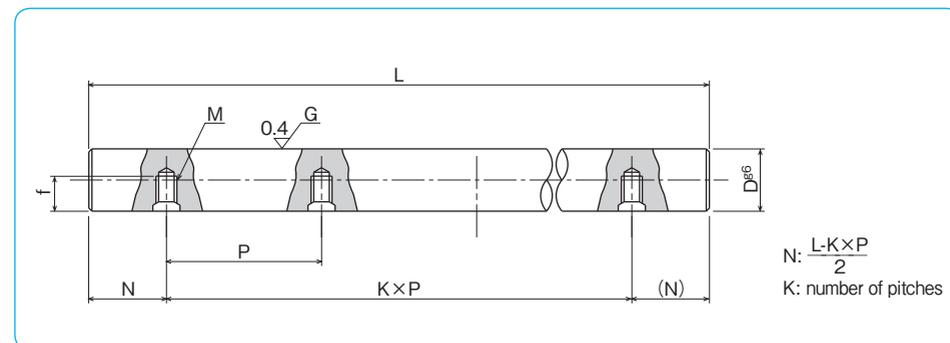
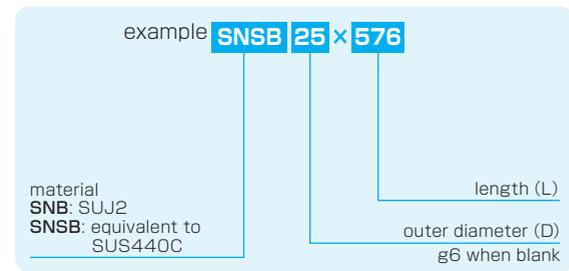
part number	outer diameter		inner diameter	length L		mass
	D	tolerance		L	L	
	mm	g6 μm	d mm	mm	mm	Kg/m
SNT 6	6	-4/-12	2	100 ←	→ 400	0.20
SNT 8	8	-5	3	200 ←	→ 600	0.34
SNT 10	10	-14	4	200 ←	→ 1000	0.52
SNT 12	12	-6	5	200 ←	→ 1500	0.73
SNT 13	13	-6	6	200 ←	→ 1500	0.82
SNT 16	16	-17	8	300 ←	→ 2500	1.18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

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 _{max}
					mm	mm
SNB10	10	-5/-14	100	M4	4.5	1,500
SNB12	12	-6	100	M4	5.5	1,800
SNB13	13	-17	100	M4	6	2,000
SNB16	16	-	150	M5	7	4,000
SNB20	20	-7	150	M6	9	4,000
SNB25	25	-20	200	M6	12	4,000
SNB30	30	-	200	M8	15	4,500
SNB35	35	-9	200	M8	15	5,000
SNB40	40	-25	300	M8	18	6,000
SNB50	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 _{max}
					mm	mm
SNSB16	16	-6/-17	150	M5	7	2,000
SNSB20	20	-7	150	M6	9	3,000
SNSB25	25	-20	200	M6	12	4,000
SNSB30	30	-	200	M8	15	4,500
SNSB35	35	-9	200	M8	15	5,000
SNSB40	40	-25	300	M8	18	6,000
SNSB50	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.

SHAFT SUPPORTER AND SHAFT SUPPORT RAIL

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

	<p>SH-A type</p>  <p>P.F-11</p>
<p>SH·SH-A·WH-A type</p> <p>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.</p>	<p>SH type</p>  <p>P.F-12</p>
	<p>WH-A type</p>  <p>P.F-16</p>
<p>SHF·SHF-FC type</p> <p>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.</p>	<p>SHF type SHF-FC type</p>  <p>P.F-13</p>
	<p>SA type</p>  <p>P.F-14</p>
<p>SA·WA·LWA type (shaft support rail)</p> <p>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.</p>	<p>WA type</p>  <p>P.F-18</p>
	<p>LWA type</p>  <p>P.F-19</p>

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

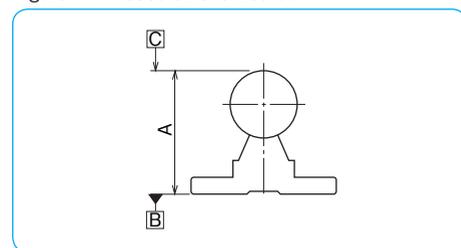
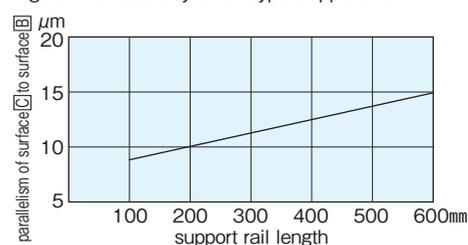
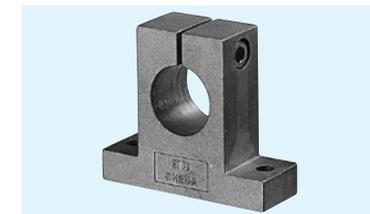


Figure F-2 Accuracy of SA type Support Rail

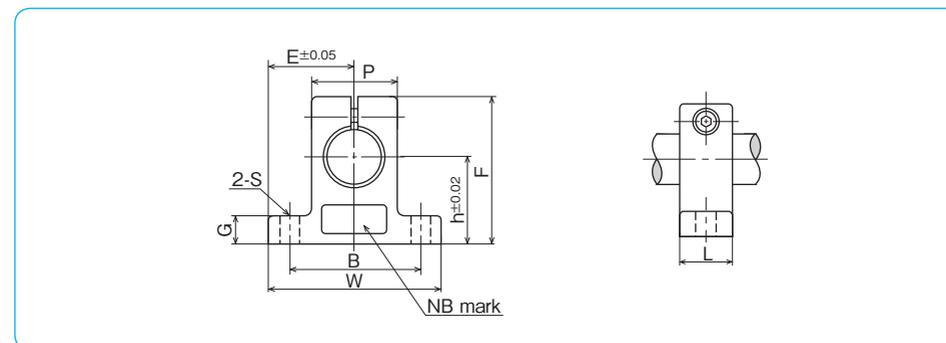
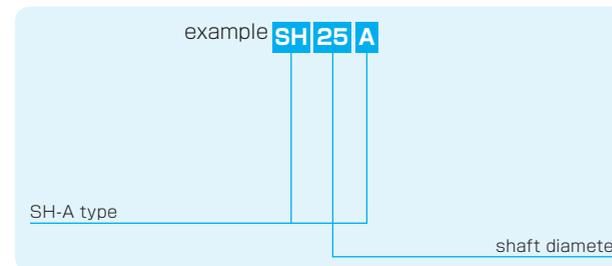


SH-A TYPE

– Shaft Supporter –



part number structure



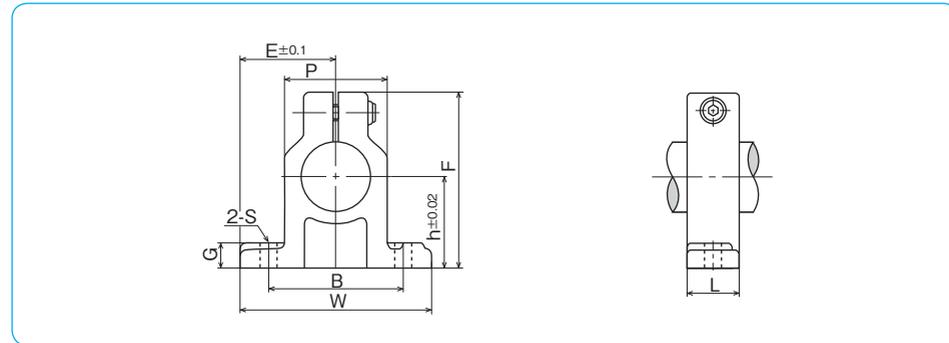
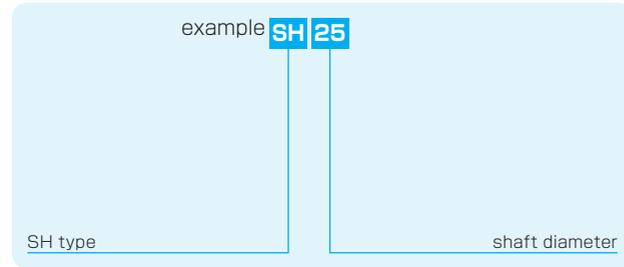
part number	shaft diameter mm	major dimensions									tightening screw size	recommended torque N·m	mass g
		h mm	E mm	W mm	L mm	F mm	G mm	P mm	B mm	S mm			
SH 8A	8	20	21	42	14	32.8	6	18	32	5.5 (M5)	M4	2	24
SH10A	10	20	21	42	14	32.8	6	18	32	5.5 (M5)	M4	2	24
SH12A	12	23	21	42	14	37.5	6	20	32	5.5 (M5)	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

SH TYPE

– Shaft Supporter –



part number structure



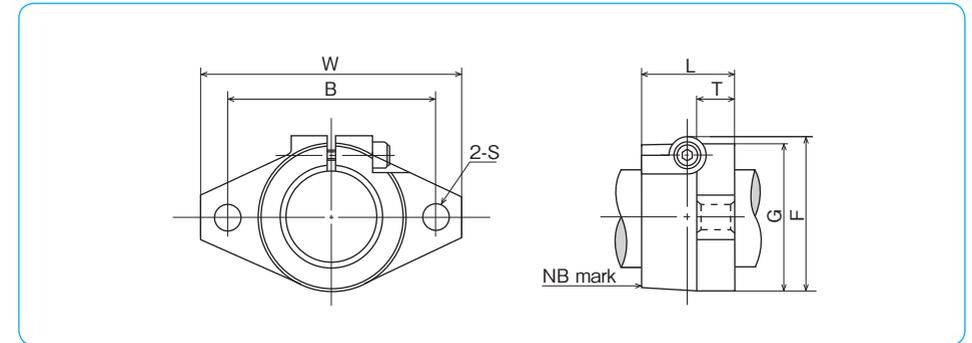
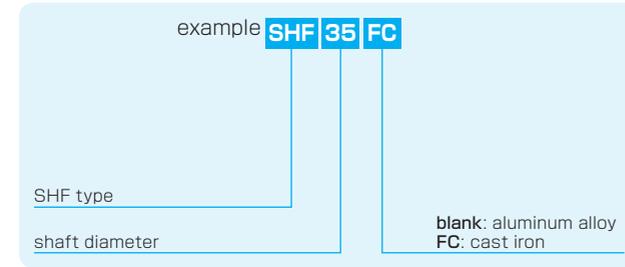
part number	shaft diameter mm	major dimensions										tightening screw		mass g
		h mm	E mm	W mm	L mm	F mm	G mm	P mm	B mm	S mm	size	recommended torque N · m		
SH10	10	20	22	44	15	35	7	19	32	4.5 (M4)	M4	2	80	
SH13	13	23	25	50	17	40	8	17	32	7 (M5)	M4	2	120	
SH16	16	27	27.5	55	17	45	10	25	38	7 (M5)	M4	2	120	
SH20	20	31	32.5	65	20	53	12	30	45	8 (M6)	M5	3	190	
SH25	25	35	38	76	24	61	12	35	56	8 (M6)	M6	5.5	300	
SH30	30	42	42.5	85	28	73	15	42	64	10 (M8)	M6	5.5	490	
SH35	35	50	50	100	32	87	15	50	74	12 (M10)	M8	13.5	690	
SH40	40	60	60	120	36	104	18	58	90	12 (M10)	M10	29	1,200	
SH50	50	70	70	140	40	122	20	68	100	14 (M12)	M12	29	1,700	
SH60	60	80	82.5	165	45	140	23	80	120	14 (M12)	M12	29	2,500	

SHF TYPE

– Shaft Supporter Flange Type –



part number structure



part number		shaft diameter mm	major dimensions							tightening screw		mass g	
aluminum alloy	cast iron		W mm	L mm	T mm	F mm	G mm	B mm	S mm	size	recommended torque N · m	aluminum alloy	cast iron
SHF10	—	10	43	10	5	24	20	32	5.5 (M5)	M4	2	13	—
SHF12	—	12	47	13	7	28	25	36	5.5 (M5)	M4	2	20	—
SHF13	—	13	47	13	7	28	25	36	5.5 (M5)	M4	2	20	—
SHF16	—	16	50	16	8	31	28	40	5.5 (M5)	M4	2	27	—
SHF20	—	20	60	20	8	37	34	48	7 (M6)	M5	3	40	—
SHF25	—	25	70	25	10	42	40	56	7 (M6)	M5	3	60	—
SHF30	—	30	80	30	12	50	46	64	9 (M8)	M6	5.5	110	—
SHF35	SHF35FC	35	92	35	14	58	50	72	12 (M10)	M8	13.5	140	380
SHF40	SHF40FC	40	102	40	16	67	56	80	12 (M10)	M10	29	205	510
SHF50	SHF50FC	50	122	50	19	83	70	96	14 (M12)	M12	29	360	890
SHF60	SHF60FC	60	140	60	23	95	82	112	14 (M12)	M12	29	530	1,500

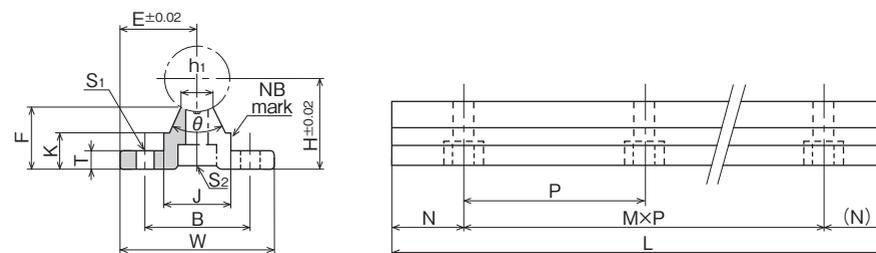
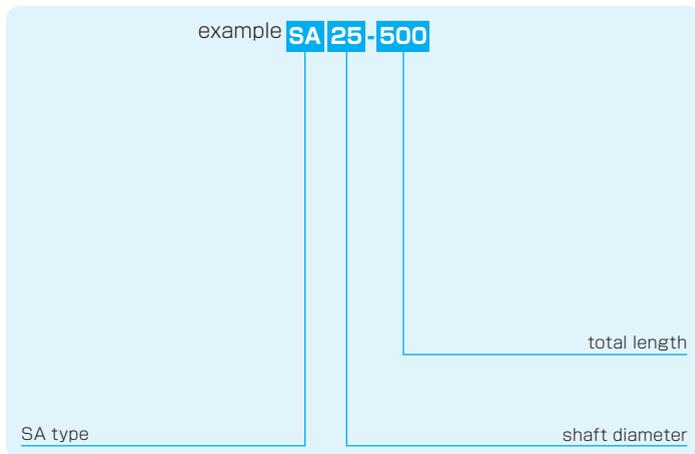
SA TYPE

— Shaft Support Rail —



part number structure

example SA 25-500



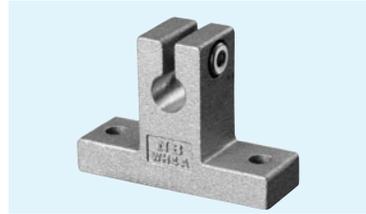
※ Mounting screws for the SN(S)B center-lined tapped shaft are included.

part number	shaft diameter mm	major dimensions											mass g					
		H	E	W	L	F	T	K	J	h ₁	θ	B		N	M×P	S ₁	S ₂	
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 ₁	θ	B		N	M×P	S ₁	S ₂	
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)



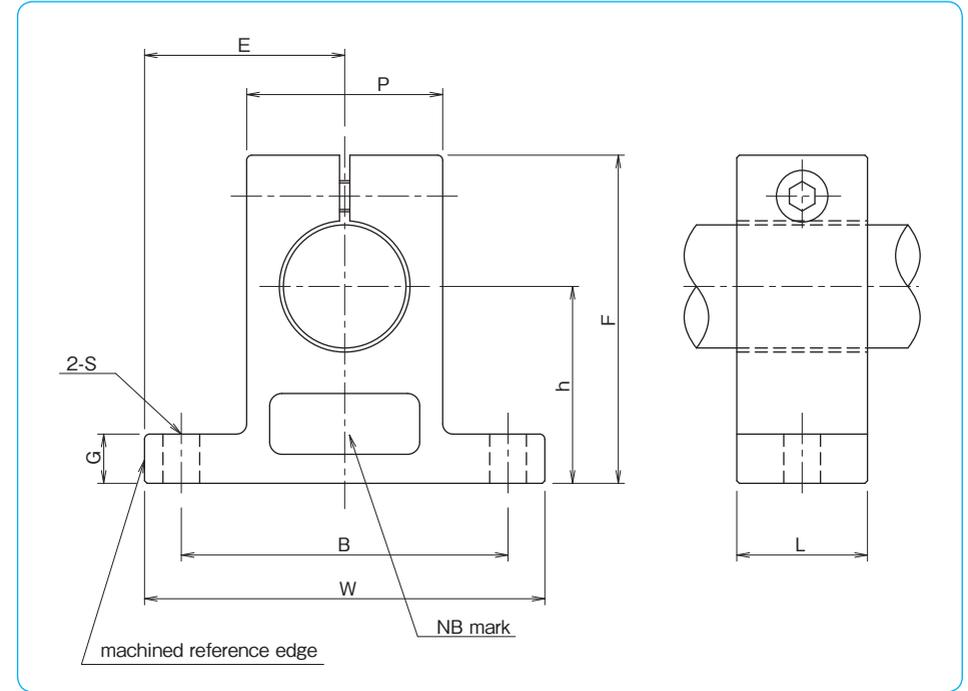
part number structure

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
WH 4A	.2500	.6875	.7500	1.500	.500	1.063
WH 6A	.3750	.7500	.8125	1.625	.563	1.187
WH 8A	.5000	1.0000	1.0000	2.000	.625	1.625
WH 10A	.6250	1.0000	1.2500	2.500	.688	1.750
WH 12A	.7500	1.2500	1.2500	2.500	.750	2.063
WH 16A	1.0000	1.5000	1.5315	3.063	1.000	2.500
WH 20A	1.2500	1.7500	1.8750	3.750	1.125	3.000
WH 24A	1.5000	2.0000	2.1875	4.375	1.250	3.437
WH 32A	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	WH 4A
.250	.688	1.250	.156	# 6	.044	WH 6A
.250	.875	1.500	.188	# 8	.075	WH 8A
.313	1.000	1.875	.218	# 10	.106	WH 10A
.313	1.250	2.000	.218	# 10	.156	WH 12A
.375	1.500	2.500	.281	1/4	.294	WH 16A
.438	2.000	3.000	.346	5/16	.531	WH 20A
.500	2.250	3.500	.346	5/16	.725	WH 24A
.625	3.000	4.500	.406	3/8	1.400	WH 32A

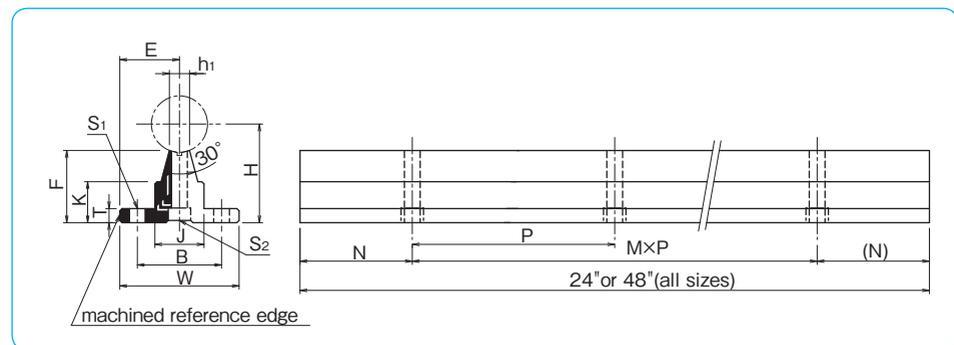
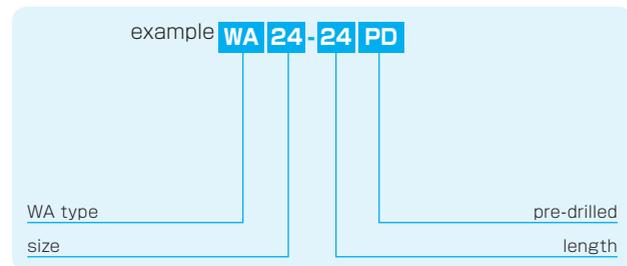
1kg≒2.205lbs
1lb≒0.454kg

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 ₁ inch	B ±.01 inch	N inch	M×P inch	S ₁ hole inch		S ₂ 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

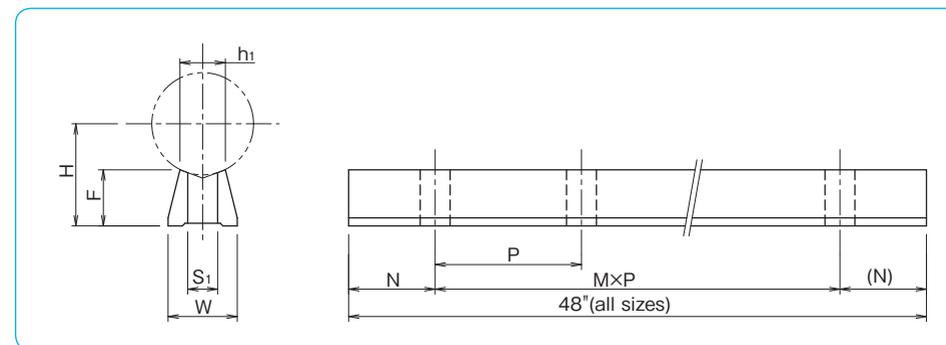
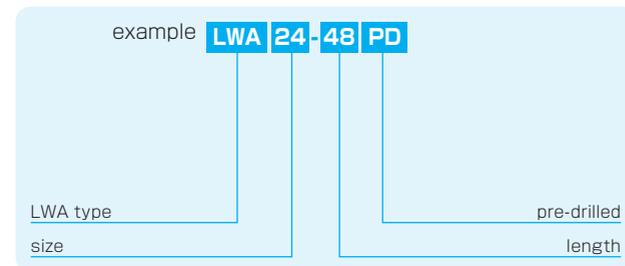
All sizes are also available without pre-drilled mounting holes.
Complete shaft-rail assemblies are also available as well as custom drilling and lengths.
Please send drawings with customer specifications.
Product of NB Corporation of America

LWA TYPE

– Low Shaft Support Rail –
(Inch Standard)



part number structure



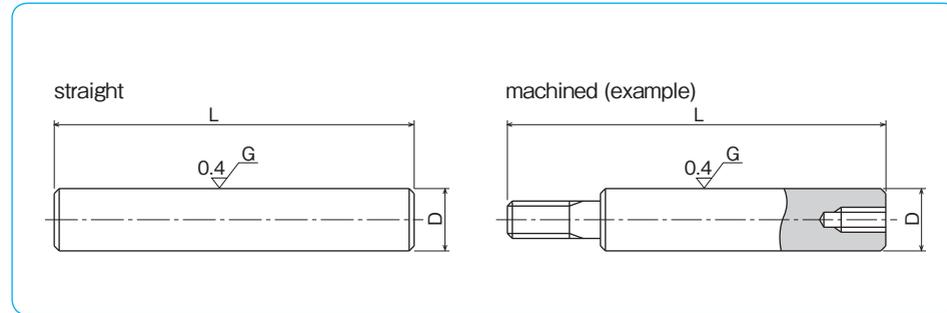
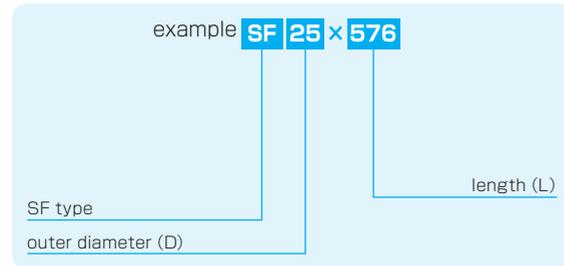
part number	shaft diameter inch	major dimensions			mounting dimensions				mass lb
		H ±.002 inch	W inch	F inch	N inch	M×P inch	h ₁ inch	S ₁ inch	
LWA 8-48 PD	.5000	.5625	.37	.342	2	11×4	0.25	.169	0.11
LWA 10-48 PD	.6250	.6875	.45	.405	2	11×4	0.276	.193	0.17
LWA 12-48 PD	.7500	.7500	.51	.409	3	7×6	0.317	.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

SF TYPE

– NBCA Shaft –

part number structure



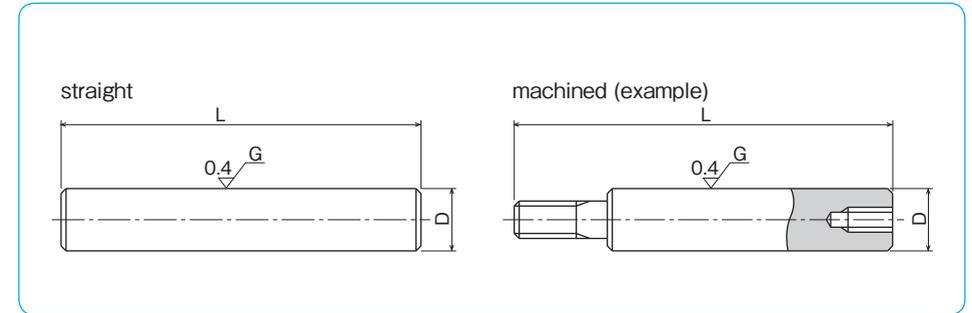
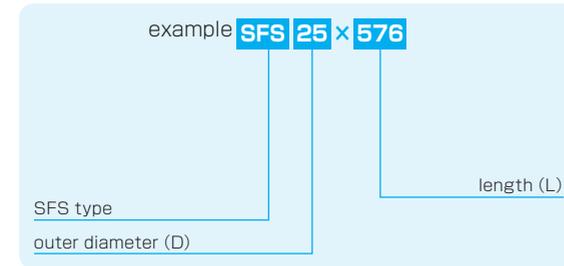
part number	outer diameter		length L	mass
	D	tolerance		
	mm	g6 μm	mm	Kg/m
SF 6	6	-4/-12	100 ← 3000	0.23
SF 8	8	- 5	100 ← 3000	0.40
SF 10	10	-14	100 ← 3000	0.62
SF 12	12		100 ← 3000	0.89
SF 13	13	- 6	100 ← 3000	1.04
SF 15	15	-17	100 ← 3000	1.39
SF 16	16		100 ← 3000	1.58
SF 20	20	- 7	100 ← 3000	2.47
SF 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: CF53 or Equivalent hardness: 60HRC (HV697) or more
Product of NB Corporation of America

SFS TYPE

– NBCA Stainless Steel Shaft –

part number structure



part number	outer diameter		length L	mass
	D	tolerance		
	mm	g6 μm	mm	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		100 ← 3000	2.43
SFS 25	25	- 7	100 ← 3000	3.80
SFS 30	30	-20	100 ← 3000	5.48
SFS 35	35		100 ← 3000	7.46
SFS 40	40	- 9	100 ← 3000	9.75
SFS 50	50	-25	100 ← 3000	15.2

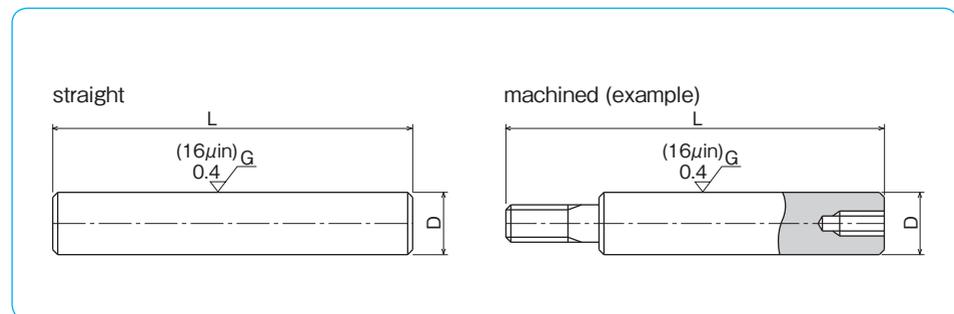
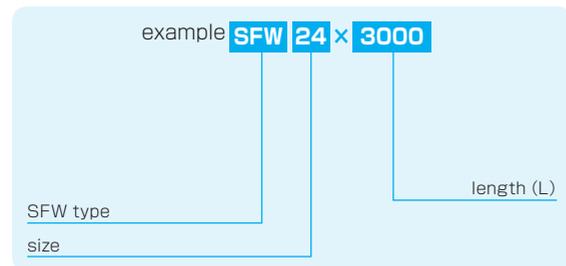
material: X46Cr13 or Equivalent
hardness: 52HRC (HV544) or more
Product of NB Corporation of America

SFW TYPE

– NBCA Inch Shaft –



part number structure



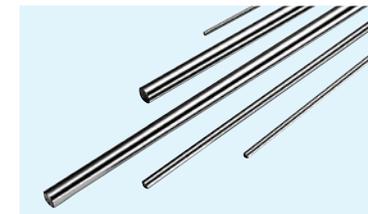
Part Number	Outer Diameter D		Length L	Mass
	inch/mm	inch/µm		
SFW 4	1/4	2	120	0.014
	6.350		3048	0.25
SFW 6	3/8	2	120	0.031
	9.525		3048	0.56
SFW 8	1/2	-0.0005	120	0.056
	12.700		3048	0.99
SFW 10	5/8	-0.0010	120	0.086
	15.875		3048	1.55
SFW 12	3/4	-0.0013	120	0.125
	19.050		3048	2.24
SFW 16	1	-0.0010	120	0.222
	25.400		3048	3.98
SFW 20	1-1/4	-0.0006~-0.0011	120	0.348
	31.750		3048	6.22
SFW 24	1-1/2	-0.0006~-0.0011	120	0.500
	38.100		3048	8.95
SFW 32	2	-0.0006~-0.0013	120	0.890
	50.800		3048	15.91

material: CF53 or Equivalent
hardness: 60 HRC or more
Product of NB Corporation of America

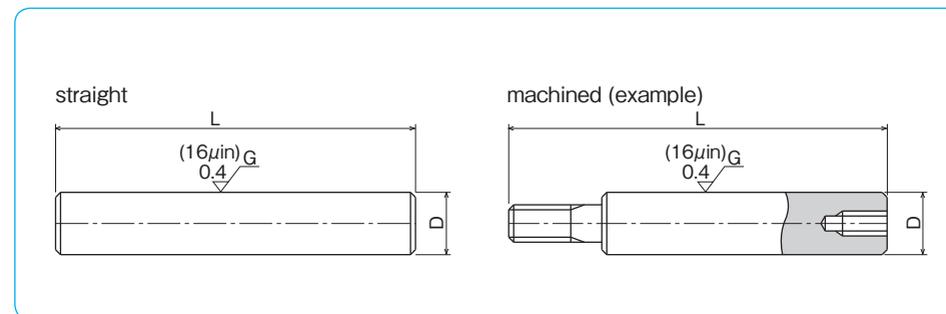
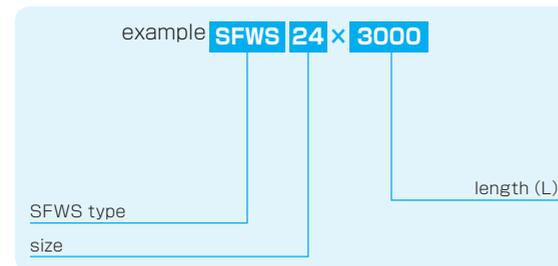
1kg≒2.205lbs

SFWS TYPE

– NBCA Inch Stainless Steel Shaft –



part number structure



Part Number	Outer Diameter D		Length L	Mass
	inch/mm	inch/µm		
SFWS 2	1/8	-0.0002~-0.0005	16	0.004
	3.175		406.4	0.10
SFWS 3	3/16	-0.0002~-0.0006	16	0.008
	4.763		406.4	0.20
SFWS 4	1/4	-0.0005	120	0.014
	6.350		3048	0.25
SFWS 6	3/8	-0.0010	120	0.031
	9.525		3048	0.56
SFWS 8	1/2	-0.0013	120	0.056
	12.700		3048	0.99
SFWS 10	5/8	-0.0010	120	0.086
	15.875		3048	1.55
SFWS 12	3/4	-0.0006~-0.0011	120	0.125
	19.050		3048	2.24
SFWS 16	1	-0.0006~-0.0011	120	0.222
	25.400		3048	3.98
SFWS 20	1-1/4	-0.0006~-0.0011	120	0.348
	31.750		3048	6.22
SFWS 24	1-1/2	-0.0006~-0.0011	120	0.500
	38.100		3048	8.95
SFWS 32	2	-0.0006~-0.0013	120	0.890
	50.800		3048	15.91

material: X46Cr13 or Equivalent
hardness: 52 HRC or more
Product of NB Corporation of America

1kg≒2.205lbs

SFW-PD

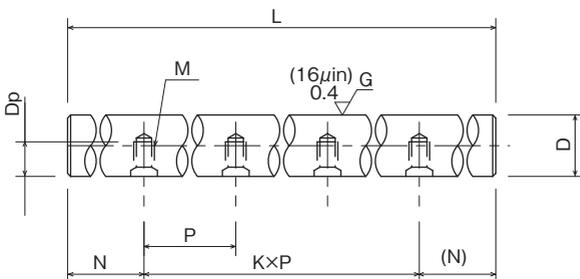
– NBCA Inch Pre-Drilled Shaft –



part number structure

example **SFW 24 x 72 - PD**

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



$$N: \frac{L-K \times P}{2}$$

K: number of pitches

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/µm				
SFW 8-PD	1/2	-.0005	4	# 6-32	0.280	168
	12.700	-.0010			7.1	4267.2
SFW 10-PD	5/8	-13	101.6	# 8-32	0.350	180
	15.875	-25			8.9	4572
SFW 12-PD	3/4	-.0005	6	# 10-32	0.400	204
	19.050				10.2	5181.6
SFW 16-PD	1	-.0010	152.4	1/4-20	0.500	204
	25.400	-13			12.7	5181.6
SFW 20-PD	1-1/4	-25	203.2	5/16-18	0.650	204
	31.750	-25			16.5	5181.6
SFW 24-PD	1-1/2	-.0006	8	3/8-16	0.700	204
	38.100	-.0011			17.8	5181.6
		-15				
SFW 32-PD	2	-.0006	203.2	1/2-13	0.850	204
	50.800	-.0013			21.6	5181.6
		-15				
		-33				

material: CF53 or Equivalent
hardness: 60 HRC or more
Product of NB Corporation of America

1kg≒2.205lbs

SFWS-PD

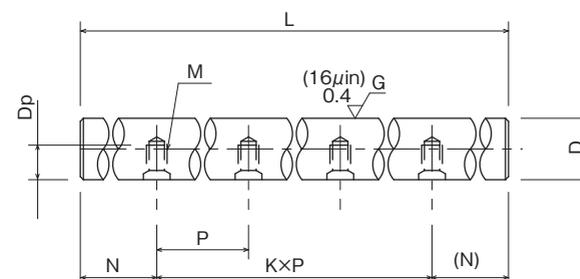
– NBCA Inch Pre-Drilled Stainless Steel Shaft –



part number structure

example **SFWS 24 x 72 - PD**

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



$$N: \frac{L-K \times P}{2}$$

K: number of pitches

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/µm				
SFWS 8-PD	1/2	-.0005	4	# 6-32	0.280	158
	12.700	-.0010			7.1	4013.2
SFWS 10-PD	5/8	-13	101.6	# 8-32	0.350	158
	15.875	-25			8.9	4013.2
SFWS 12-PD	3/4	-.0005	6	# 10-32	0.400	158
	19.050				10.2	4013.2
SFWS 16-PD	1	-.0010	152.4	1/4-20	0.500	158
	25.400	-13			12.7	4013.2
SFWS 20-PD	1-1/4	-25	203.2	5/16-18	0.650	158
	31.750	-25			16.5	4013.2
SFWS 24-PD	1-1/2	-.0006	8	3/8-16	0.700	158
	38.100	-.0011			17.8	4013.2
		-15				
SFWS 32-PD	2	-.0006	203.2	1/2-13	0.850	158
	50.800	-.0013			21.6	4013.2
		-15				
		-33				

material: X46Cr13 or Equivalent
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 —



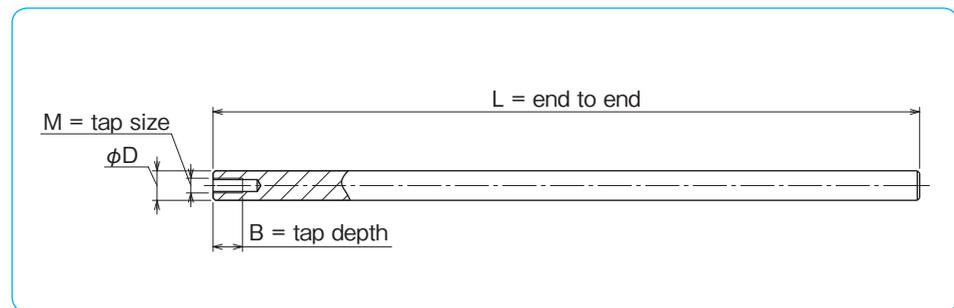
part number structure

example **SFW 16 × 18 - FS102**

material
SFW: CF53 or Equivalent
SFWS: X46Cr13 or Equivalent

size

FS102-Single End Tapped length(L in inches)



Part Number		Outer Diameter		Tap Size M	Tap Depth B	Length in mm							
SFW	SFWS	D inch/mm	inch/μm			6	8	9*	10*	12	18	24	36
SFW 4-FS102		1/4		# 5-40	0.250"	6	8		12	18	24	36	
		6.350				152.4	203.2		304.8	457.2	609.6		
SFW 6-FS102	SFWS 6-FS102	3/8		# 8-32	0.330"	6	8*	9*	10*	12	18	24	36
		9.525				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 8-FS102	SFWS 8-FS102	1/2		1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		12.700				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 10-FS102	SFWS 10-FS102	5/8		1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		15.875				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 12-FS102	SFWS 12-FS102	3/4		5/16-18	0.625"	6	8*	9*	10*	12	18	24	36
		19.050				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 16-FS102	SFWS 16-FS102	1		3/8-16	0.750"	6	8*	9*	10*	12	18	24	36
		25.400				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 20-FS102	SFWS 20-FS102	1-1/4		1/2-13	1.000"	6	8*	9*	10*	12	18	24	36
		31.750				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 24-FS102	SFWS 24-FS102	1-1/2		5/8-11	1.250"	6				12	18	24	36
						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 —



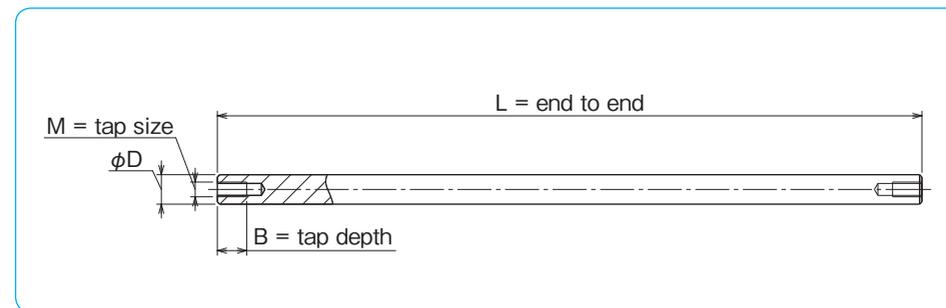
part number structure

example **SFWS 16 × 18 - FS103**

material
SFW: CF53 or Equivalent
SFWS: X46Cr13 or Equivalent

size

FS103-Both Ends Tapped length(L in inches)

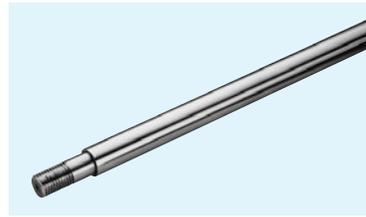


Part Number		Outer Diameter		Tap Size M	Tap Depth B	Length in mm							
SFW	SFWS	D inch/mm	inch/μm			6	8	9*	10*	12	18	24	36
SFW 4-FS103		1/4		# 5-40	0.250"	6	8		12	18	24	36	
		6.350				152.4	203.2		304.8	457.2	609.6		
SFW 6-FS103	SFWS 6-FS103	3/8		# 8-32	0.330"	6	8*	9*	10*	12	18	24	36
		9.525				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 8-FS103	SFWS 8-FS103	1/2		1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		12.700				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 10-FS103	SFWS 10-FS103	5/8		1/4-20	0.500"	6	8*	9*	10*	12	18	24	36
		15.875				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 12-FS103	SFWS 12-FS103	3/4		5/16-18	0.625"	6	8*	9*	10*	12	18	24	36
		19.050				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 16-FS103	SFWS 16-FS103	1		3/8-16	0.750"	6	8*	9*	10*	12	18	24	36
		25.400				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 20-FS103	SFWS 20-FS103	1-1/4		1/2-13	1.000"	6	8*	9*	10*	12	18	24	36
		31.750				152.4	203.2	228.6	254	304.8	457.2	609.6	914.4
SFW 24-FS103	SFWS 24-FS103	1-1/2		5/8-11	1.250"	6				12	18	24	36
						152.4				304.8	457.2	609.6	914.4

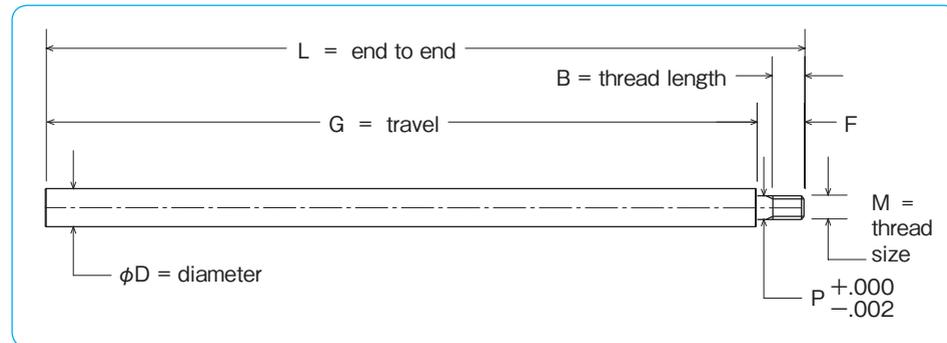
hardness of SFW: 60 HRC or more
 hardness of SFWS: 52 HRC or more
 Product of NB Corporation of America
 * SFWS is not available

SFW-FS115 TYPE

– Format Single End Threaded Inch Shafts –



part number structure

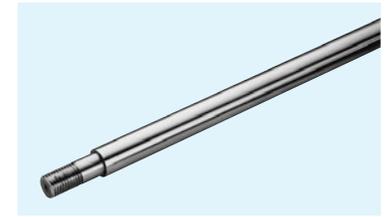


Part Number	Outer Diameter		Thread Size M	Thread Length B	Journal Length F	Journal DIA P	4" Travel	6" Travel	8" Travel	12" Travel	24" Travel	36" Travel	48" Travel	
	D	inch/μm					G Length L							
SFW 6-FS115	3/8	9.525	1/4-20	0.31	0.50	0.250	4.500	6.500	8.500	12.500	24.500			
				7.87	12.70	6.35	114.3	165.1	215.9	317.5	622.3			
SFW 8-FS115	1/2	12.700	5/16-18	0.39	0.63	0.313	4.625	6.625	8.625	12.625	24.625			
				9.91	15.88	7.95	117.5	168.3	219.1	320.7	625.5			
SFW 10-FS115	5/8	15.875	3/8-16	0.47	0.75	0.375	4.750	6.750	8.750	12.750	24.750			
				11.94	19.05	9.53	120.7	171.5	222.3	323.9	628.7			
SFW 12-FS115	3/4	19.050	1/2-13	0.63	1.00	0.500	5.000	7.000	9.000	13.000	25.000			
				16.00	25.40	12.70	127.0	177.8	228.6	330.2	635.0			
SFW 16-FS115	1	25.400	5/8-11	0.78	1.25	0.625		7.250	9.250	13.250	25.250	37.250		
				19.81	31.75	15.88		184.2	235.0	336.6	641.4	946.2		
SFW 20-FS115	1-1/4	31.750	3/4-10	0.94	1.50	0.750		7.500	9.500	13.500	25.500	37.500		
				23.88	38.10	19.05		190.5	241.3	342.9	647.7	952.5		
SFW 24-FS115	1-1/2	38.100	1-8	1.25	2.00	1.000				10.000	14.000	26.000	38.000	50.000
				31.75	50.80	25.40				254.0	355.6	660.4	965.2	1270.0

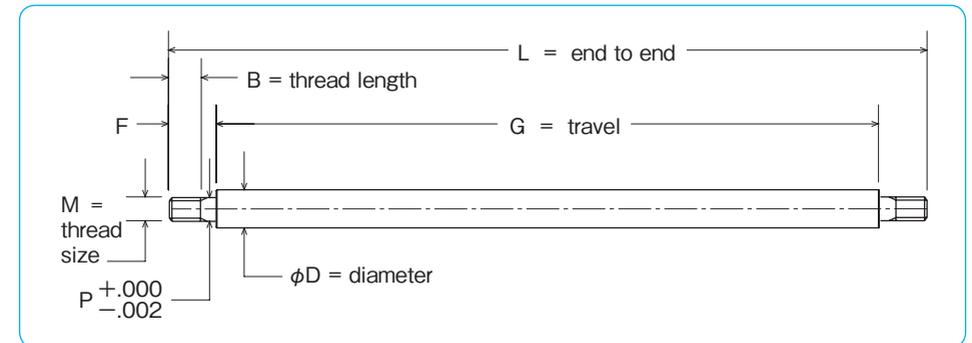
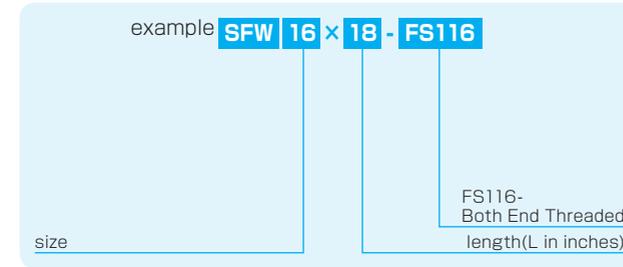
material: CF53 or Equivalent
 hardness: 60 HRC or more
 stainless steel sizes are available on this series by quote only
 Product of NB Corporation of America

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	6" Travel	8" Travel	12" Travel	24" Travel	36" Travel	48" Travel	
	D	inch/μm					G Length L							
SFW 6-FS116	3/8	9.525	1/4-20	0.31	0.50	0.250	5.000	7.000	9.000	13.000	25.000			
				7.87	12.70	6.35	127.0	177.8	228.6	330.2	635.0			
SFW 8-FS116	1/2	12.700	5/16-18	0.39	0.63	0.313	5.250	7.250	9.250	13.250	25.250			
				9.91	15.88	7.95	133.4	184.2	235.0	336.6	641.4			
SFW 10-FS116	5/8	15.875	3/8-16	0.47	0.75	0.375	5.500	7.500	9.500	13.500	25.500			
				11.94	19.05	9.53	139.7	190.5	241.3	342.9	647.7			
SFW 12-FS116	3/4	19.050	1/2-13	0.63	1.00	0.500	6.000	8.000	10.000	14.000	26.000			
				16.00	25.40	12.70	152.4	203.2	254.0	355.6	660.4			
SFW 16-FS116	1	25.400	5/8-11	0.78	1.25	0.625		8.500	10.500	14.500	26.500	38.500		
				19.81	31.75	15.88		215.9	266.7	368.3	673.1	977.9		
SFW 20-FS116	1-1/4	31.750	3/4-10	0.94	1.50	0.750		9.000	11.000	15.000	27.000	39.000		
				23.88	38.10	19.05		228.6	279.4	381.0	685.8	990.6		
SFW 24-FS116	1-1/2	38.100	1-8	1.25	2.00	1.000				12.000	16.000	28.000	40.000	52.000
				31.75	50.80	25.40				304.8	406.4	711.2	1016.0	1320.8

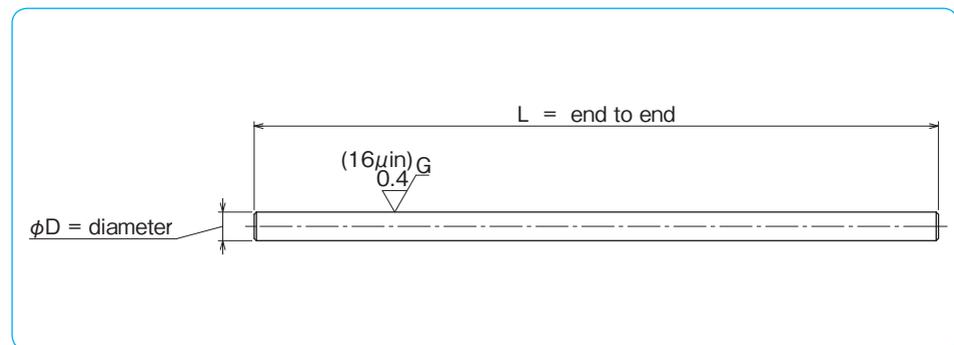
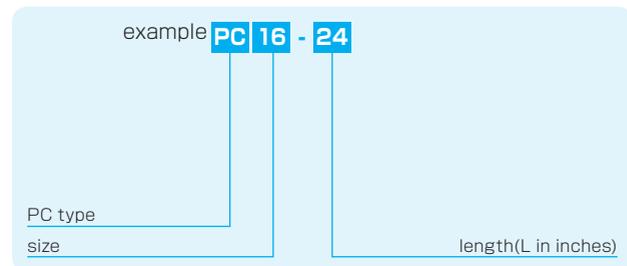
material: CF53 or Equivalent
 hardness: 60 HRC or more
 stainless steel sizes are available on this series by quote only
 Product of NB Corporation of America

PC TYPE

– Pre-Cut Slide Shafts –



part number structure



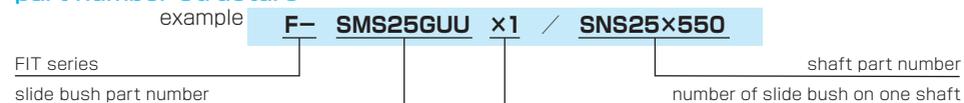
Part Number	Outer Diameter		Length L							Mass	
	D inch/mm	inch/μm	inch/mm								
PC 4	1/4	-0.0005	6	12	18	24				0.014 0.25	
	6.350		152.4	304.8	457.2	609.6					
PC 6	3/8	-0.0010	6	12	18	24				0.031 0.56	
	9.525		152.4	304.8	457.2	609.6					
PC 8	1/2	-0.0010		12	18	24	30	36		0.056 0.99	
	12.700			304.8	457.2	609.6	762	914.4			
PC 10	5/8	-0.0010		12	18	24	30	36		0.086 1.55	
	15.875			304.8	457.2	609.6	762	914.4			
PC 12	3/4	-0.0010			18	24	30	36	42	48	0.125 2.24
	19.050				457.2	609.6	762	914.4	1066.8	1219.2	
PC 16	1	-0.0010			18	24	30	36	42	48	0.222 3.98
	25.400				457.2	609.6	762	914.4	1066.8	1219.2	
PC 20	1-1/4	-0.0010			18	24	30	36	42	48	0.348 6.22
	31.750				457.2	609.6	762	914.4	1066.8	1219.2	
PC 24	1-1/2	-0.0010			18	24		36		48	0.500 8.95
	38.100				457.2	609.6		914.4		1219.2	

material: CF53 or Equivalent
hardness: 60 HRC or more
Product of NB Corporation of America

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 zero clearance range]		
no play	[Bar chart showing negative clearance range]		

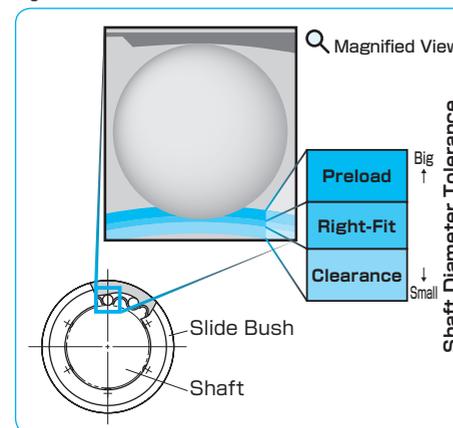
Slide Bush, Radial Clearance (-), Negative Limit

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



SPINDLE SHAFT

NB Spindle Shaft is backed by decades of precision manufacturing experience as well as up to date manufacturing facility to meet 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

Ultra Precision Machining

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

Various Machining Solution Available

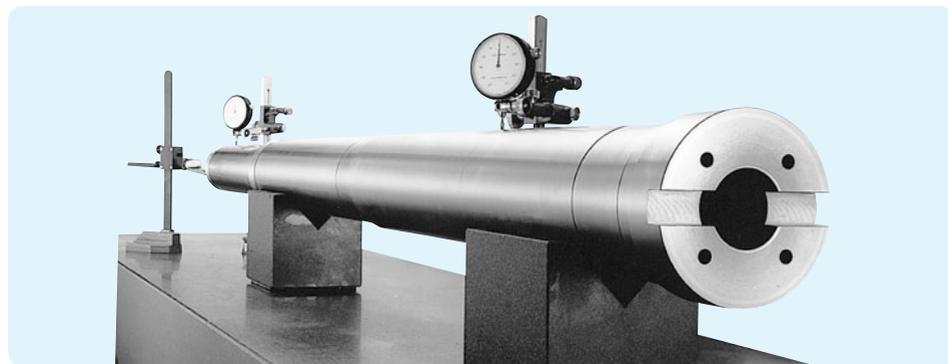
BT, BBT, HSK inner tapers, gauge and bearing matching, thread grinding, and many other spindle related machining are available.

Surface Treatments

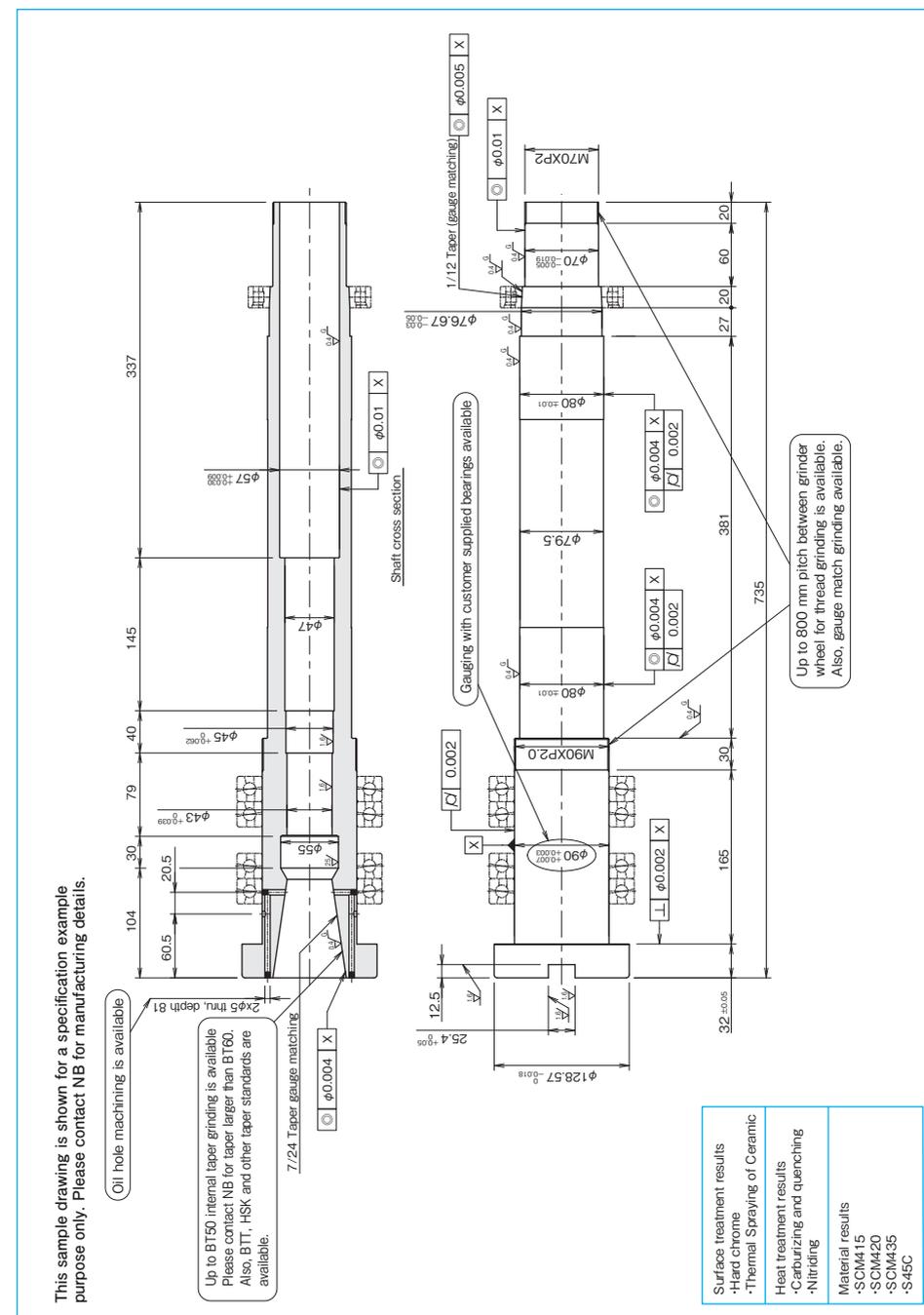
Various surface treatments are available such as hard chrome and ceramic coating. Repairing a damaged spindle with replating and grinding is also available.

EXAMPLES OF MACHINING

Spindle



EXAMPLE OF DRAWING ①

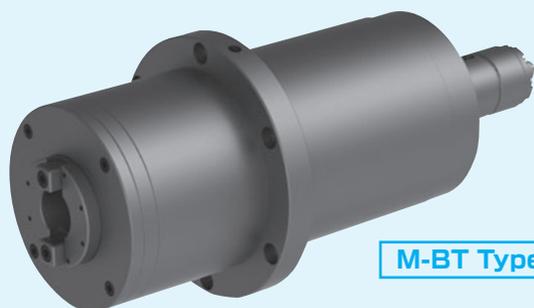


SPINDLE UNIT M-BT TYPE/G-MA TYPE

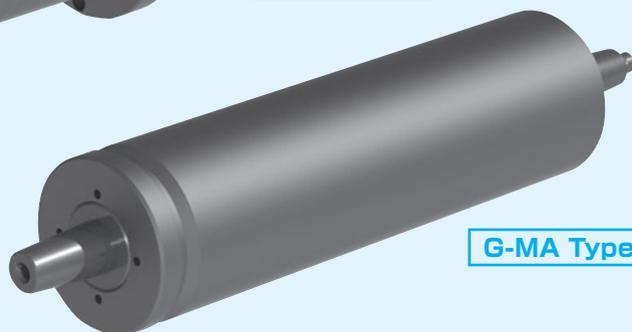
NB Spindle Shaft is backed by decades of precision manufacturing experience as well as up to date manufacturing facility to meet demands. NB is capable of handling all your spindle needs such as manufacturing of bearing case and spindle base, design and manufacturing of spindle unit, and overhauling of spindles, other than standard spindle unit M-BT and G-MA type.

ADVANTAGES

- M-BT type is used in various cut processing machines and machining centers. It can be successfully operated having high rigidity and stability by utilizing angular ball bearings (the four-line combined) and double row cylindrical roller bearing.
- G-MA type is used in external grinding and flat surface grinding machines. It can be successfully rotated having high speed and stability by utilizing preloaded high accuracy angular ball bearings.
- Customised spindle units are available based on M-BT and G-MA type.
- M-BT and G-MA type can be used for long time coped with NB's overhaul.



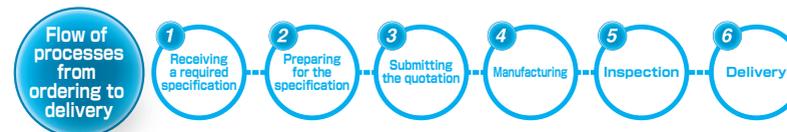
M-BT Type



G-MA Type

SPECIAL REQUIREMENTS

Other than spindle units for machine tool, designing spindle units for various industrial machineries is available. Please feel free to contact NB when you take orders of spindle units.



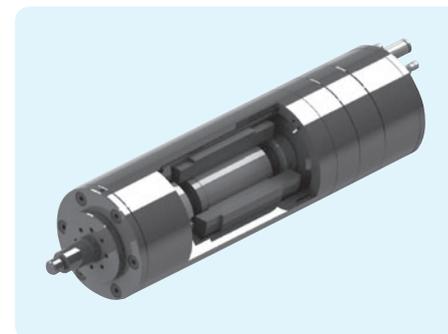
[Examples of special requirements]

- M-BT: Modifying outer dimensions / Adding a pulley / Adding an unclamping cylinder / etc.
- G-MA: Modifying shaft end machining / Adding a pulley / Adding a grindstone flange / etc.

EXAMPLES OF SPINDLE UNIT



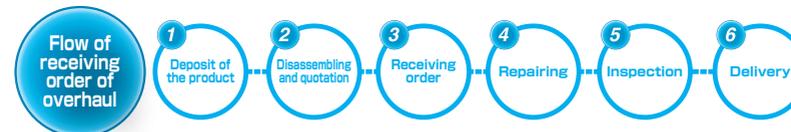
Example of spindle unit specification	
application	machining center
mounting	vertical
rpm	max 10,000 (without tool: max 700)
spindle shaft shape	#30
lubrication	grease
lubricant	ISOFLEX NBU 15 (NOK Klüber)
tool clamping power	400kgf (theoretical value)
estimated driving force	3.5kW
estimated weight	31kg



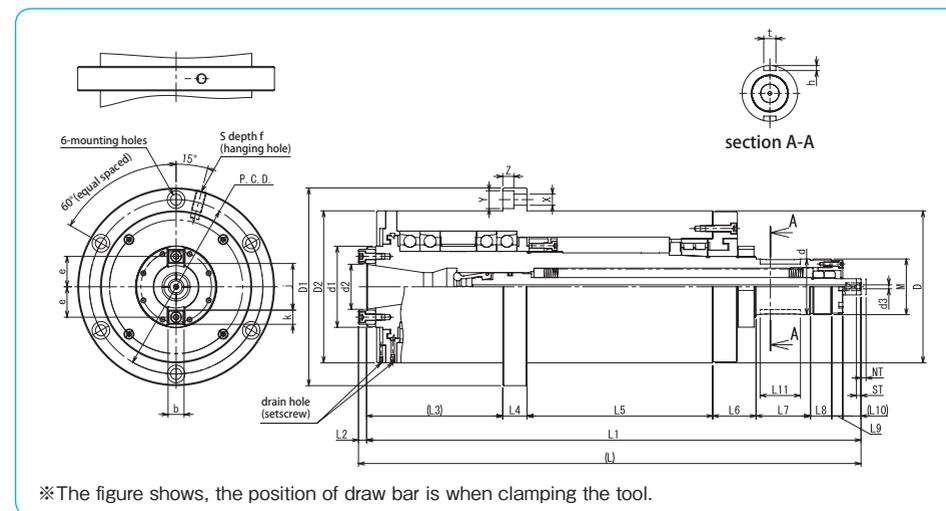
Example of spindle unit specification	
cooling method	oil cooling
mounting	horizontal
rpm	max 30,000
lubrication	grease
lubricant	ISOFLEX NBU 15 (NOK Klüber)
estimated weight	3.9kg
output characteristic	frequency: 500Hz
voltage: 200V	current value: 3.9A
rpm: 30,000	torque: 0.3Nm
repeated load continuous use (S6)	continuous rated output: 0.85kW

OVERHAUL

Also, other than NB's designed spindle unit can be overhauled. Please feel free to contact NB.



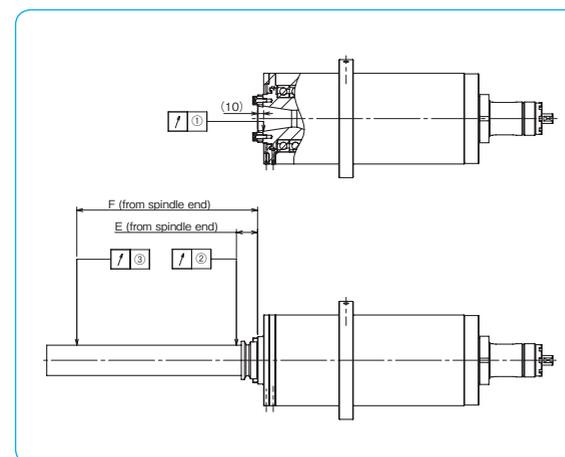
M-BT TYPE



part number	major dimensions																					
	D	D1	D2	d	d1	d2	d3	L	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11			
	tolerance			tolerance																tolerance		
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		
M-BT30-01	130	0	170	130	45	0	68	31.75	4	413	405	8	115	20	137	43	39	26	8	17	30	+0.2 0
M-BT40-01	150	-0.018	195	150	55	0	80	44.45	4	498	490	8	135	24	184	43	54	21	11	18	40	
M-BT50-01	230	0	290	230	85	0	130	69.85	4	717	704.5	12.5	197	35	270	59	79	30	11	23.5	60	

- When mounting this model or mounting mounted object, please handle with the utmost care and avoid shock.
- This model doesn't come with lubrication mechanism. Amount of pre-applied grease is enough for use.
- When using this model for the first time or not using for a long time, perform the running-in operation properly.
- The figure shows, the position of draw bar is when clamping the tool.
- Only when unclamping, air blow from d3 through hole is possible. Please use dried and clean air for air blow.
- Do not rotate at a high speed without clamping the tool.
- The drain hole is plugged when shipping. Please open the drain hole by unplugged the setscrew.
- This is horizontal mounting model. Please contact NB for vertical mounting model.

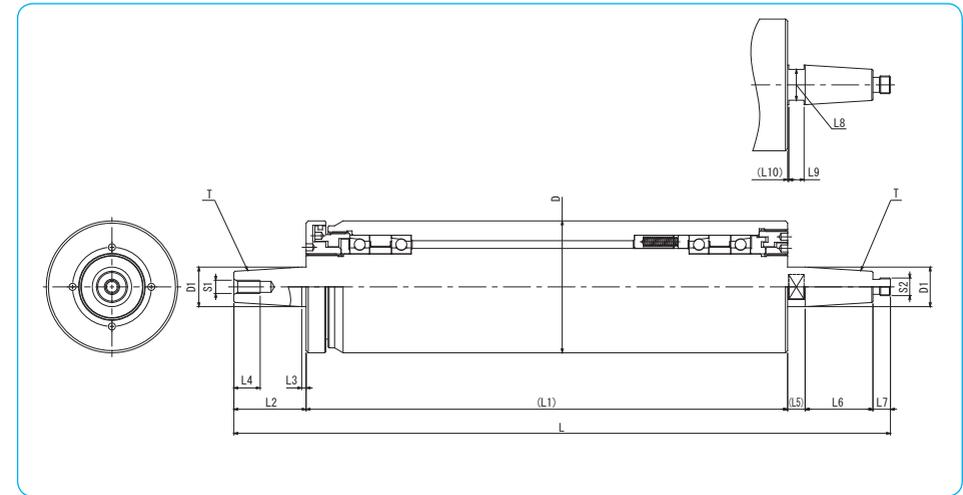
P.C.D.	X×Y×Z	S	f	e	major dimensions										unclamping stroke		without tool	tool clamping power (theoretical rate)	estimated weight	maximum revolutions	bearings	
					b	j	k	M	t	h	ST	NT	mm	N	kg	rpm	front	rear				
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
152	9×14×8.6	M10	20	24	15.9		34	14	M45×1.5	8	0	4			4.5		3 ~ 4.5	3920	29	8000	7012C	NN3010
172	11×17.5×11	M10	20	30	15.9	-0.02 -0.04	46	14	M55×2.0	12	0	5	+0.2 0	4.5	+0.5 0		2.5 ~ 5	7840	47	7000	7014C	NN3012
260	16×23×15.2	M16	30	49	25.4		72	26	M85×2.0	14	0	5.5		6.5			3 ~ 8	15680	161	4500	7022C	NN3019



■ Rotational accuracy (max.)

part number	runout of the taper part (μm)		runout of the test bar (μm)		distance from spindle end (mm)	
	①	②	③	④	E	F
M-BT30-01	2	3	8		30	230
M-BT40-01	2	3	8		35	300
M-BT50-01	2	3	8		45	300

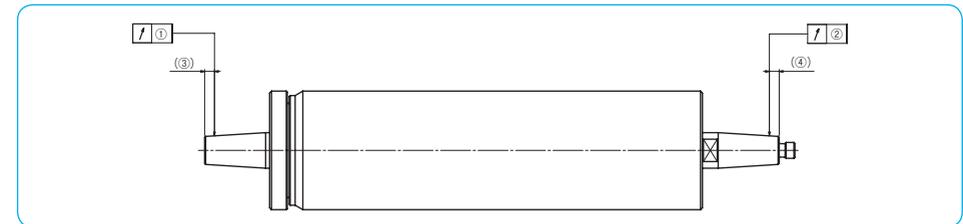
G-MA TYPE



part number	major dimensions								
	D mm	tolerance mm	D1 mm	L mm	L1 mm	L2 mm	L3 mm	L4 mm	L5 mm
G-MA060-01	60	0	18	300	220	33	2	12	8
G-MA080-01	80	-0.030	28	382	250	55	3	24	12
G-MA100-01	100	0 -0.035	38	460	300	65	8	32	16

- When mounting this model or mounting mounted object, please handle with the utmost care and avoid shock.
- This model doesn't come with lubrication mechanism. Amount of pre-applied grease is enough for use.
- When using this model for the first time or not using for a long time, perform the running-in operation properly.
- When holding the spindle unit, do not deform the outer cylinder.
- Maximum revolutions are based on the spindle unit single-body. Maximum revolutions are decreased by the external factors such as grindstone, belt tension, etc..
- Please contact NB for grindstone flange and puley.

major dimensions								estimated weight kg	maximum revolutions rpm	bearings
L6 mm	L7 mm	L8 mm	L9 mm	L10 mm	S1 mm	S2 mm	T taper			
31	8	14	7	0.5	M6	M8×0.75 (left-hand thread)	1/8	4.5	15000	7906C
52	13	24	11	0.5	M12	M12×1 (left-hand thread)	1/8	9	12000	7007C
57	22	32	15	0.5	M16	M20×1 (left-hand thread)	1/5	17.5	9500	7009C



■ Rotational accuracy (max.)

part number	runout of the taper part (μm)	runout of the taper part (μm)	measuring point dimension (mm)	
	①	②	③	④
G-MA060-01	2	2	4	3
G-MA080-01	2	2	6	7
G-MA100-01	3	3	8	3

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.

THERMAL-SPRAYING CERAMIC-COATING SPECIFICATIONS

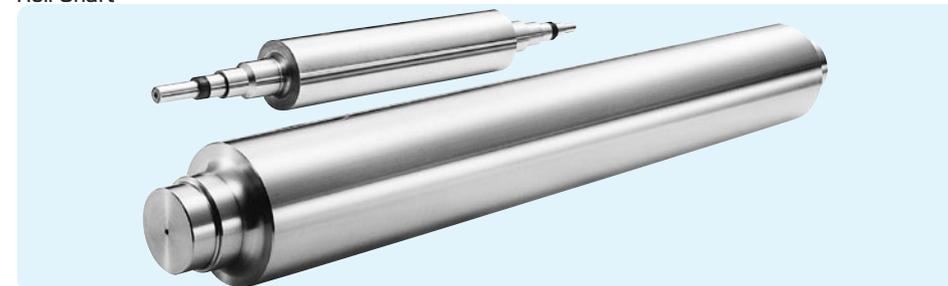
Parts that require wear and corrosion resistance can be thermal-sprayed with a ceramic material per NB's ceramic-coating specifications. Ceramic-coating can be applied to a wide variety of materials. The pores in the coated layer result in good lubrication characteristics and can be sealed to achieve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

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	Gauging with customer supplied nuts and bearings
	Tool Steel (JIS SK4)			Triangular and trapezoidal thread grinding available
	Tool Steel (JIS SKS3)			
Heat Treatment	Induction Hardening			
	Induction Hardening (deep)			
	Carburizing and quenching			

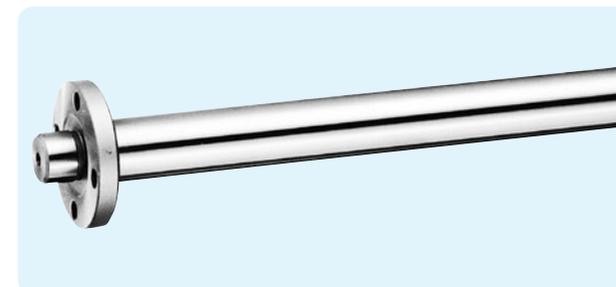
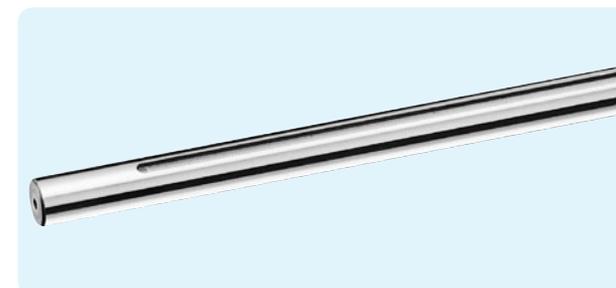
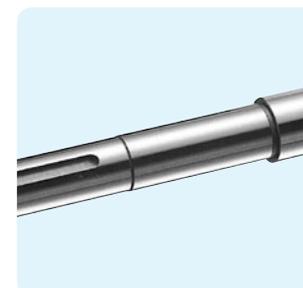
Machining Ability	Process Details / Manufacturing Contents	Maximum Machinable Diameter	Maximum Machinable Length	Remarks / Notes
	Centerless Grinding	φ60 mm outer diameter	4000mm	
	External Grinder	φ640 mm outer diameter	6000mm	
	Internal Grinder	φ200 mm inner diameter	300mm	Allowable work length: up to 1100 mm
	Vertical Grinder	φ350 mm inner diameter	300mm	
		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

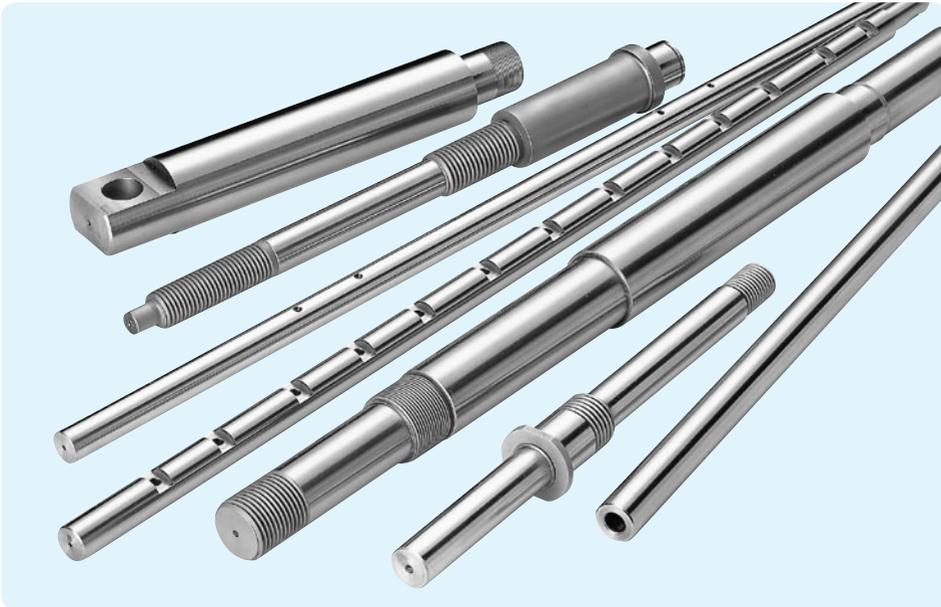
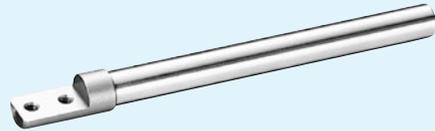
Roll Shaft



Quill Shaft



EXAMPLES OF MACHINING ②



Please visit at NB Website for more examples of machining.