

Made by Electroforming

Nickel-Cobalt Alloy

Pin-point Gate Bushing Cavity



Sheru Industry Co., Ltd.

Headquarters/Factory

7048, Oaza-Komuro, Ina-machi, Kitaadachi-gun,
Saitama 362-0806, Japan
TEL: +81-48-722-7565 FAX: +81-48-722-7613
<http://www.sheru.co.jp> E-mail: info@sheru.co.jp

Tokyo Office

2-9-19, Horifune, Kita-ku, Tokyo 114-0004,
Japan
TEL: +81-3-3927-1351 FAX: +81-3-3927-
6361

Nickel-Cobalt Alloy

Cavity

Electroforming Type

■ **Feature** — Nickel-cobalt alloy electroforming with 100% of the master copying accuracy can make cavities of intricate shapes with surface roughness of nanoscale order. Super-fine sharp angles, long pieces with ultra-small diameters are made with mirror surface. Hardness is HRC40–45, HRC55–60.

■ **Typical applications** — Medical equipment, stationery, cosmetics, optical products, food related items



Electroforming Type

Nickel-Cobalt Alloy Pin-point Gate Bushings

Type	Name	Hardness HRC		
		Inner surface	Depth m/m	Outer surface
GF	Common hardness	55~60	0.5	40~45
HGF	High hardness	55~60	All	55~60
SHGF	Superhigh hardness	63~65	0.1	55~60

Feature

Abrasion resistance

The friction surface is made of nickel-cobalt alloy and the hardness is HRC40-45, HRC55-60, and HRC63-65. It also has superior toughness as well as superb abrasion resistance thanks to its mirror finished inner surface. The superhigh-hardness (SHGF) type is ideal for molding glass fiber mixed plastics which require abrasion resistance.

Corrosion resistance

Corrosion is not a concern when molding vinyl chloride or fluoroc plastic.

Cost performance

A higher molding cycle is possible compared with a steel gate bush because it has better heat conductivity, the mirror finished inner surface and smaller draft angle.

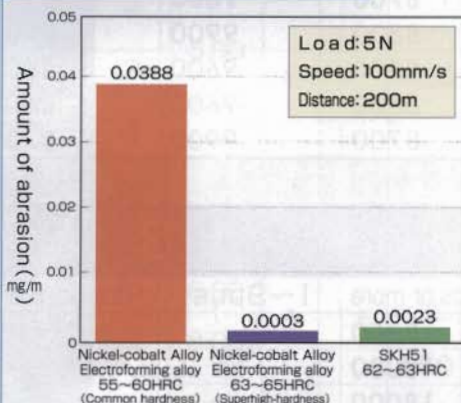
Quality

By developing an electroforming device which is completely different from the steel gate bush, we have succeeded in producing high-quality products having the characteristics described above.

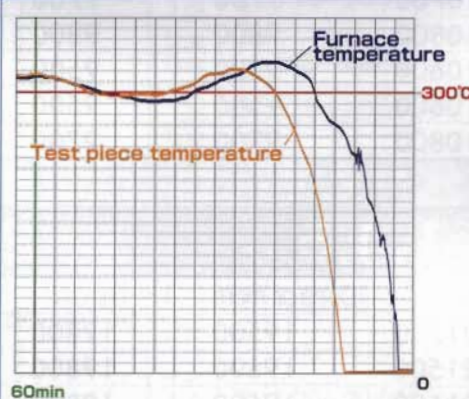
Delivery

To meet the needs of customers for various shapes and dimensions, standard products are kept ready in stock.

Glass ball abrasion test



Test of heat resistance temperature in actual use



Surface roughness of electroforming



Heat conductivity

Temperature (°C)	Heat conductivity (Wm ⁻¹ K ⁻¹)
20	49.8
100	49.1
200	49.0

Thermal expansion test

Average linear expansion factor	Temperature
12.7×10 ⁻⁶ /°C	40°C~100°C
13.2×10 ⁻⁶ /°C	40°C~200°C
13.5×10 ⁻⁶ /°C	40°C~400°C

Tensile strength test

Gate bush GF...Diameterφ16×180ℓ
Broken at the load of 186 kN 5% elongation



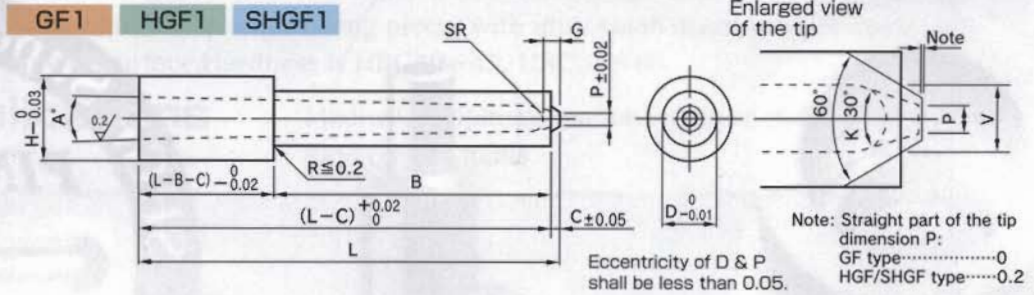
▲ Special pinpoint gate bushing

Electroforming Type

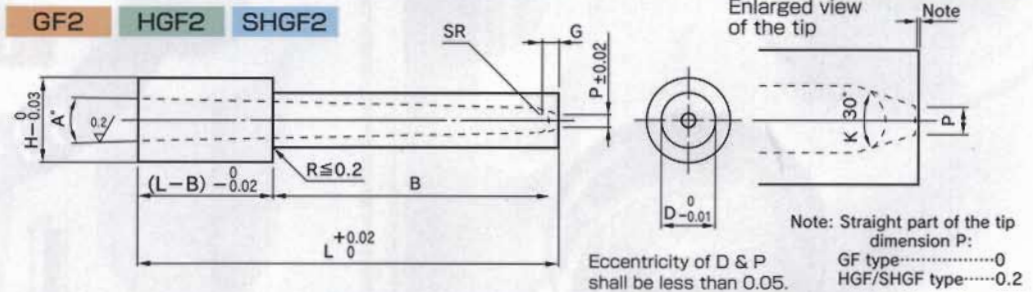
Nickel-Cobalt Alloy Pin-point Gate Bushings

Type	Name	Hardness HRC		
		Inner surface	Depth m/m	Outer surface
GF	Common hardness	55-60	0.5	40-45
HGF	High hardness	55-60	All	55-60
SHGF	Superhigh hardness	63-65	0.1	55-60

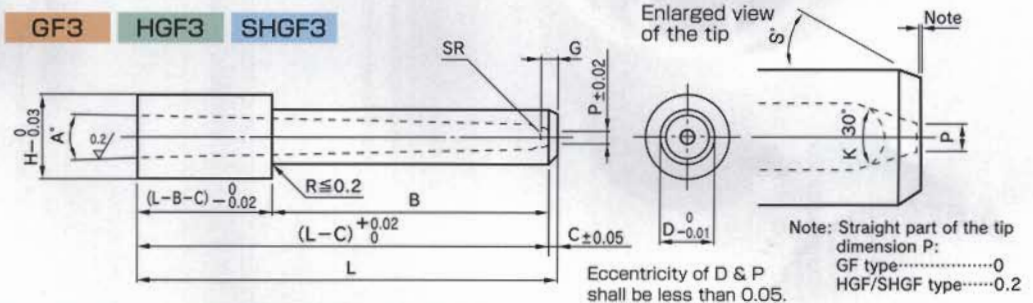
Tip Shape : 1



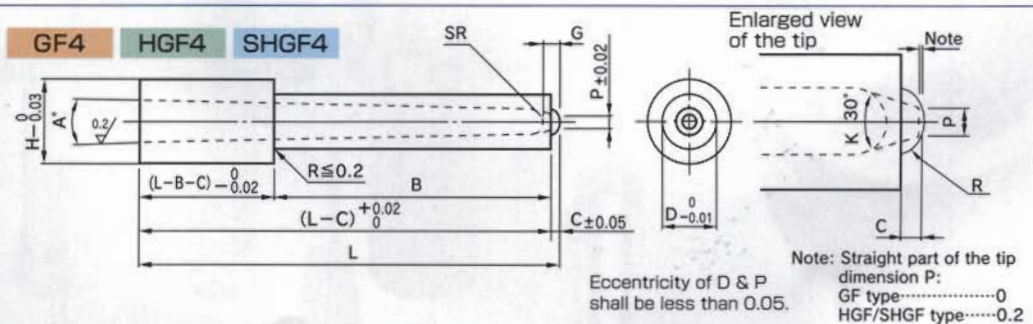
Tip Shape : 2



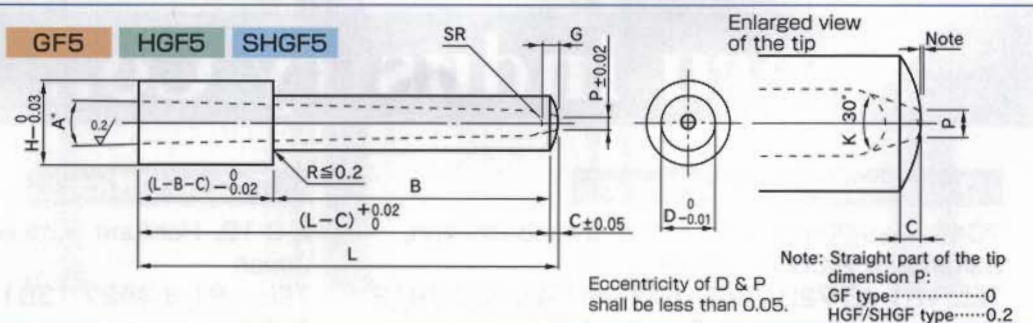
Tip Shape : 3



Tip Shape : 4



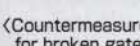
Tip Shape : 5



Specifications of Standard Dimension (Special dimensions available)

Type	Shape	D 0.01 unit	H	G	SR	L 0.01 unit	P	A°	B 0.01 unit	C 0.1 unit	V 0.1 unit	S° 1° unit	R 0.1 unit
GF (Common hardness)	1	1.00	2	0.4	0.25	6.00~15.00	0.25	$\frac{1}{2}$	1.00~2.50	0.2~0.3	0.7	Taper of the protrusion of tip shape 1 type is 30°.	
		1.50	2	0.6	0.4		0.3	$\frac{1}{2}$	1.00~3.00		1.0~1.2		
	2	1.80	3	0.6	0.5	6.00~20.00	$\frac{0.3}{0.4}{\over 0.5}$	$\frac{1}{2}$	1.00~3.00		1.1~1.3		
		2.00 } 2.40	3	0.7	0.6		$\frac{0.3}{0.4}$	$\frac{1}{2}{\over 3}$	1.00~5.00	0.2~0.5	1.3~1.9		~1.0
		2.50 } 3.40	4	1.0	0.75	8.00~25.00	$\frac{0.3}{0.4}{\over 0.5}$	$\frac{1}{2}{\over 3}$	1.00~6.00		1.5~2.4		~1.2
		3.00 } 4.40	5		1.00		$\frac{0.5}{0.6}{\over 0.7}$	$\frac{1}{2}{\over 3}$	1.00~9.00 1.00~8.00 1.00~7.00		2.0~2.9		
		4.00 } 5.00	6	1.2	1.00	10.00~40.00	$\frac{0.8}{0.9}{\over 1.0}{\over 1.2}$	$\frac{1}{2}{\over 3}$	1.00~30.00 1.00~20.00	0.2~0.8	2.5~3.9	1~45	0.8~1.5
					1.25		$\frac{0.8}{0.9}{\over 1.0}{\over 1.2}$	$\frac{1}{2}{\over 3}$	1.00~30.00 1.00~20.00				
	1				1.00		$\frac{0.8}{1.0}{\over 1.2}$	$\frac{1}{2}{\over 3}$	1.00~35.00 1.00~30.00				
							$\frac{0.8}{0.9}{\over 1.0}{\over 1.2}$	$\frac{1}{2}{\over 3}$	1.00~30.00				
	2	5.00 } 7.00	8		1.25		$\frac{0.8}{0.9}{\over 1.0}{\over 1.2}$	$\frac{1}{2}{\over 3}$	1.00~30.00 1.00~20.00		3.5~4.9		1.0~2.0
							$\frac{0.8}{1.0}{\over 1.2}{\over 1.4}$	$\frac{1}{2}{\over 3}$	1.00~20.00				
	3				1.50		$\frac{0.8}{1.0}{\over 1.2}{\over 1.4}$	$\frac{1}{2}{\over 3}$	1.00~30.00 1.00~20.00				
							$\frac{0.8}{0.9}{\over 1.0}{\over 1.2}$	$\frac{1}{2}{\over 3}$	1.00~50.00 1.00~40.00	0.2~1.5	4.0~5.9	1~50	1.5~3.0
	4	6.00 } 8.00	9	1.5	1.25	15.00~60.00	$\frac{0.8}{1.0}{\over 1.2}{\over 1.4}$	$\frac{1}{2}{\over 3}$	1.00~40.00 1.00~30.00				
					1.50		$\frac{0.9}{1.0}{\over 1.2}{\over 1.4}$	$\frac{1}{2}{\over 3}$					
	5				1.25		$\frac{1.0}{1.2}{\over 1.4}$	$\frac{1}{2}{\over 3}$					
					1.50		$\frac{1.0}{1.2}{\over 1.4}{\over 1.6}$	$\frac{1}{2}{\over 3}$	1.00~50.00		4.5~7.9	1~60	2.0~4.0
		8.00 } 10.00	11		2.00		$\frac{1.0}{1.2}{\over 1.4}{\over 1.6}$	$\frac{1}{2}{\over 3}$					

* Dimension C is for shapes 1, 3, 4, and 5. Dimension V is for shape 1 only. Angle S is for shape 3 only. Dimension R is for shape 4 only. Gate angle for dimension D 1:1.8 is 20° only. Others are 30°.

Specially made items	○Gate angle (Dimension K)---Available in units of 1°, from 1° to 100°	  
	○Gate diameter (Dimension P)---Available in units of φ 0.01, from φ 0.2.	
	○Taper angle (Dimension A°)---Available in units of 1°.	
	○Maximum diameter (Dimension H)-----φ30mm	
	○Maximum length (Dimension L)-----300 mm	
		
		Gate angle 60° 80° 100°

SHGF TYPE (Superhigh-hardness) Super-hard, Abrasion resistant

Patent

◇Test condition---Against glass, Load weight 5 N (Approx. 510 g), Friction speed 100 mm/s, Friction distance 200 m.

◆Test result Measured by : Tokyo Metropolitan Industrial Technology Research Institute (13 Industrial Engineering Appraisal Table No. 525, 14 Industrial Engineering Appraisal Table No. 212.)

Test sample	Abrasion (mg/m)	Vickers hardness	Rockwell conversion
Electroformed nickel alloy (SHGF Superhigh-hardness)	0.0003	Inner surface:866HV0.2 (851~883)	66-67HRC
		Outer surface:734HV0.2 (721~744)	61-62HRC
SKH-51 steel	0.0023	741HV0.2 (733~753)	62-63HRC

Price (Domestic Price in Japan)

Currency mark: Japanese yen

Type	Tip shape Dimension D Quantity	1,4,5		2		3	
		1~9pcs.	10pcs.or more	1~9pcs.	10pcs.or more	1~9pcs.	10pcs.or more
GF (Hard)	1	13500	12200	12300	11000	—	—
	1.5	12500	11200	11900	10700	—	—
	1.8	12500	11200	11900	10700	—	—
	2	10500	9500	9500	8500	9800	8800
	2.5	10500	9500	9500	8500	9800	8800
	3	7700	6900	6900	6200	7000	6300
	4	7800	7000	7000	6300	7100	6400
	5	7600	6800	6800	6100	6900	6200
	6	7600	6800	6800	6100	6900	6200
	8	7800	7000	6900	6200	7100	6400

Type	Tip shape Dimension D Quantity	1,4,5		2		3	
		1~9pcs.	10pcs.or more	1~9pcs.	10pcs.or more	1~9pcs.	10pcs.or more
HGF (Full-hard)	1	18500	16700	16700	15100	—	—
	1.5	17800	16000	16200	14600	—	—
	1.8	17800	16000	16200	14600	—	—
	2	13800	12400	12800	11500	13100	11700
	2.5	13800	12400	12800	11500	13100	11700
	3	10700	9700	9700	8700	9800	8800
	4	10800	9800	9800	8800	9900	8900
	5	10600	9500	9500	8500	9600	8600
	6	10600	9500	9500	8500	9600	8600
	8	10800	9700	9700	8700	9900	8700

Type	Tip shape Dimension D Quantity	1,4,5		2		3	
		1~9pcs.	10pcs.or more	1~9pcs.	10pcs.or more	1~9pcs.	10pcs.or more
SHGF (Super-hard)	1	21500	19500	19800	18000	—	—
	1.5	21500	19500	19800	18000	—	—
	1.8	21500	19500	19800	18000	—	—
	2	19100	17200	17900	16200	18000	16300
	2.5	19100	17200	17900	16200	18000	16300
	3	13800	12500	12300	11100	12500	11300
	4	14100	12800	12600	11400	12800	11600
	5	13500	12200	11900	10800	12100	11000
	6	13500	12200	11900	10800	12100	11000
	8	13700	12400	12100	11000	12300	11200

Note: Tip shape for $\phi 1$, $\phi 1.5$, and $\phi 1.8$ is 1.2 only.

● Please order by telephone or fax.

Order

Type	Shape	D	H	SR	L	P	A°	B	C-V-S-R
Example	GF	2	— 3.10 —	5	— 1.0 —	23.2	— 0.6 —	2	— 8
	GF	4	— 4.30 —	6	— 1.25 —	20.1	— 0.8 —	2	— 15 — CO.5 — R1
	HGF	2	— 3.10 —	5	— 1.0 —	23.2	— 0.6 —	2	— 8
	HGF	4	— 4.50 —	6	— 1.25 —	20.1	— 0.8 —	2	— 15 — CO.5 — R1
	SHGF	2	— 3.70 —	5	— 1.0 —	23.2	— 0.6 —	2	— 8
	SHGF	4	— 4.20 —	6	— 1.25 —	20.1	— 0.8 —	2	— 15 — CO.5 — R1

Delivery time (Domestic Delivery in Japan)

G F the 5th day after receipt of order

H G F Product after receipt of order
(Please consult us for delivery schedule.)

SHGF the 8th day after receipt of order

[Note] *Dimension K Angles of 20°, 40°, 50° and 60° are produced after receipt of order.

*Tip of dimension P There is a straight part of 0 for the GF type, 0.2 for HGF and SHGF. If the straight part is not required, please state this.