



USED IN MICROWAVE EQUIPMENT • SERVO SYSTEMS • SYNCHROS
 • INVERTERS • THERMOCOUPLE and STRAIN GAGE CIRCUITS
 • PULSE SYSTEMS • COMPUTER GROUNDING CONTACTS
 • TORQUE INDICATORS • MEDICAL EQUIPMENT • PACKING MACHINERY

GRAPHALLOY® BRUSHES

GRAPHALLOY Brushes are used in rotating equipment to conduct currents ranging from minute instrument or signal values to power ratings. Applications run the gamut of exacting equipment such as transducers (strain gages, thermocouples), synchros, guided missiles, fire control apparatus, servomechanisms, selsyns, azimuth measurement, dynamotors, radar, sonar and avionic equipment.

Graphalloy brush materials include Silver-Graphalloy and Copper Graphalloy as general types... with specialized high altitude grades available as required. Each grade is engineered for the particular application.

Silver-Graphalloy Brushes have been widely used because of **low and constant contact drop, extremely low electrical noise, and long life.**

Over 100 grades are now serving in a wide variety of applications. Silver-Graphalloy Brushes on 1/2-inch-diameter coin silver slip rings have operated successfully in highly critical electrical circuits at speeds up to 100,000 r.p.m.



Standard sizes from 1/8"-square to 3/4"-square. Many sizes in stock.

Our Engineering Department will assist you in determining the exact grade of GRAPHALLOY for your needs. Ask for our *Brush Inquiry Form 109*.



LEAF SPRINGS

CUP CONTACTS

We design special brush and slip-ring assemblies to meet special requirements.

STANDARD BRUSH HOLDERS

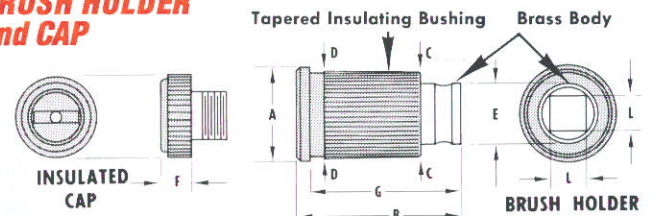
(1/8" x 1/8" and larger, using helical spring)

Standard Brush Holders (250 volts) are provided with a cylindrical insulating bushing. The brush holder is pressed into a mounting hole. The internal cross section is square or rectangular, a design feature that prevents the brush from shifting its contact area on the commutator or slip ring and thereby changing the brush contact resistance. Friction of the helical spring and of the brush within the brush holder tends to damp the natural frequency of the brush assembly in operation, hence avoids chattering and reduces noise.

Standard brush holders for instrument, thermocouple and strain gage circuits have a hole in the cap. When the brush shunt is threaded through the cap, the shunt completes an unbroken circuit from brush face to the external circuit, resulting in a very low noise level. The shunt is normally connected to a spring binding post. For such circuits, three brushes per slip ring, spaced 120° apart, are recommended, along with coin-sliver slip rings.

Dimensions of standard brush holders are shown here. *Other sizes are also manufactured!*

BRUSH HOLDER and CAP



BRUSH HOLDER & CAP NO.	BRUSH SIZE	SUGGESTED MIN. SLIP-RING WIDTH	**MOUNTING HOLE DIAMETER	BRUSH HOLDER TO SLIP RING - MIN.	Other Sizes Available							
					A	B	F	C	D	E	G	L
14326	1/8" sq.	3/16"	13/32"	1/16"	.437"	7/8"	3/16"	.404"	.418"	.281"	25/32"	.129"
11509	5/32" sq.	1/4"	13/32"	1/16"	.437"	7/8"	3/16"	.404"	.418"	.281"	25/32"	.160"
11570	3/16" sq.	1/4"	7/16"	1/16"	.484"	7/8"	3/16"	.441"	.451"	.313"	25/32"	.193"
19011	1/4" x 3/16"	5/16"	9/16"	1/8"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	256 x .193"
11527	1/4" sq.	5/16"	9/16"	1/8"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256"
14292	3/8" x 1/4"	7/16"	43/64"	1/8"	.718"	1 7/16"	1/4"	.672"	.682"	.533"	1 5/16"	382 x .256"
12166	3/8" sq.	7/16"	13/16"	1/8"	.921"	1 13/16"	1/4"	.813"	.828"	.628"	1 5/8"	.382"
31392	1/2" sq.	9/16"	1 1/8"	1/8"	1.237"	1 13/16"	1/4"	1.126"	1.141"	.878"	1 9/16"	.503"
35439	3/4" x 1/2"	7/8"	1 33/64"	1/8"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"
35440	3/4" sq.	7/8"	1 33/64"	1/8"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"

**Mounting hole diameter for brush holder dimension D.

Request and fill in BRUSH INQUIRY SHEET, Form 109, so that we can supply the proper grade of brush material.

MINIATURE BRUSH HOLDERS (Smaller than 1/8" x 1/8", using helical spring). It has been impracticable to design a line of standard miniature brush holders because the space requirements for such special applications are extremely critical. Miniature brush holders are designed on an individual basis.

BRUSH-HOLDER CONNECTOR SPRINGS



A silver-plated connector spring (garter spring) makes a positive electrical connection to the brass body of the brush holder when the spring is snapped into the circumferential groove on the bare metal portion of the brush holder. The connecting lead may be pre-soldered to the connector spring.

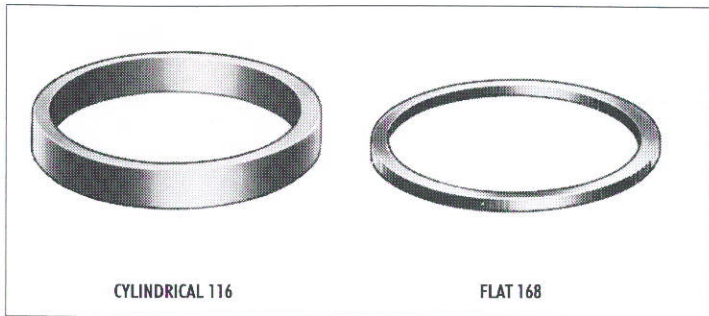
GARTER SPRING CONNECTORS	BRUSH SIZE	BRUSH HOLDER NO.
127-9	1/8" sq.	14326
127-9	5/32" sq.	11509
127-10	3/16" sq.	11570
127-14	1/4" x 3/16"	19011
127-14	1/4" sq.	11527
127-18	3/8" x 1/4"	14292
127-20	3/8" sq.	12166
127-24	1/2" sq.	31392
127-32	3/4" x 1/2"	35439
127-32	3/4" sq.	35440

SLIP RINGS

Solid Coin Silver or Bronze

Where strain gages, torque meters, or thermocouples are used on rotating equipment, the problem of measuring the changes in resistivity or emf is complicated by the fact that the information must be brought out of the rotating equipment by means of slip rings and brushes.

If data quality is to be maintained under these conditions, the extraneous circuit noise level must be kept below the signal level.



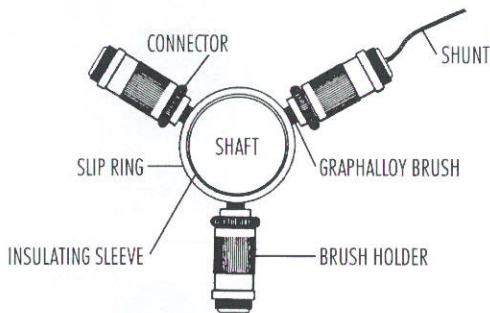
Coin silver slip rings, in combination with Silver GRAPHALLOY Brushes, reduce the extraneous noise level to extremely low values. These rings and brushes have been extensively used in rotating strain gage, torque meter, and thermocouple applications.

Noise levels as low as 20-50 microhms in a 100 ohm circuit have been obtained.

Bronze rings are used for power circuits where low noise is not a requirement.

We strongly recommend three brushes per ring to minimize the noise level and maintain consistent contact, especially for higher speed applications.

Typical Brush and Ring Assembly



The accompanying table presents a series of standard flat and cylindrical slip rings designed for nesting. These rings are available in coin silver or bronze. Standard cylindrical slip rings (116) are easy to mount because they have been designed to be pressed over standard shafting. Electrical connections are made by soldering a lead to each ring.

Where cylindrical type slip rings cannot be used because of axial space limitations, standard flat (or disc type) slip rings (168) will solve the problem.

A series of these rings has been designed so that the rings will nest with a standard 1/8" spacing between successive rings. Each ring provides a radial contact surface 1/4" wide.

Our 3/16" square brush in brush holder #11570 may be used with these rings.

Standard Coin Silver Slip Rings

PART NO.	OD	ID	WIDTH
1165-4	1/4	.127/.123	3/16
1165-6	3/8	.252/.248	3/16
1165-8	1/2	.377/.373	3/16
1165-10	5/8	.502/.498	3/16
1165-12	3/4	.627/.623	3/16
1165-14	7/8	.752/.748	1/4
1165-16	1	.877/.873	1/4
1165-18	1 1/8	1.000/.996	1/4
1165-19	1 3/16	1.000/.996	1/4
1165-23	1 7/16	1.250/1.246	1/4
1165-27	1 11/16	1.500/1.496	1/4
1165-31	1 15/16	1.750/1.746	1/4
1165-35	2 3/16	2.000/1.996	1/4
1165-39	2 7/16	2.250/2.246	1/4
1165-43	2 11/16	2.500/2.496	1/4
1165-52	3 1/4	3.000/2.996	5/16
1165-60	3 3/4	3.500/3.496	5/16
1165-68	4 1/4	4.000/3.996	5/16
1165-76	4 3/4	4.500/4.496	5/16
1165-84	5 1/4	5.000/4.996	5/16
1165-92	5 3/4	5.500/5.496	5/16
1165-102	6 3/8	6.000/5.996	5/16
1165-118	7 3/8	7.000/6.996	5/16
1165-134	8 3/8	8.000/7.996	5/16
1165-150	9 3/8	9.000/8.996	5/16
1165-166	10 3/8	10.000/9.996	5/16

PART NO.	OD	ID	THICKNESS
1685-20	1 1/4	3/4	3/16
1685-32	2	1 1/2	3/16
1685-44	2 3/4	2 1/4	3/16
1685-56	3 1/2	3	3/16
1685-68	4 1/4	3 3/4	3/16
1685-80	5	4 1/2	3/16
1685-92	5 3/4	5 1/4	3/16
1685-104	6 1/2	6	3/16
1685-116	7 1/4	6 3/4	3/16
1685-128	8	7 1/2	3/16
1685-140	8 3/4	8 1/4	3/16
1685-152	9 1/2	9	3/16
1685-164	10 1/4	9 3/4	3/16
1685-176	11	10 1/2	1/4
1685-188	11 3/4	11 1/4	1/4
1685-200	12 1/2	12	1/4
1685-212	13 1/4	12 3/4	1/4
1685-224	14	13 1/2	1/4
1685-236	14 3/4	14 1/4	1/4
1685-248	15 1/2	15	1/4
1685-260	16 1/4	15 3/4	5/16
1685-272	17	16 1/2	5/16
1685-284	17 3/4	17 1/4	5/16
1685-296	18 1/2	18	5/16
1685-308	19 1/4	18 3/4	5/16
1685-320	20	19 1/2	5/16

BRONZE Slip Rings, cylindrical or flat, are available in the above sizes.

Part numbers are as above except substitute B for S.

Larger and smaller rings are also available.

CONTACTS and LEAF SPRING ASSEMBLIES

GRAPHALLOY contacts and leaf spring assemblies are used for grounding and signal applications.

The standard leaf spring assemblies (DS 1313) are designed for prototyping. Cup contacts are available in standard sizes (DS 105 / 128).

Discuss your application with our sales engineers.

