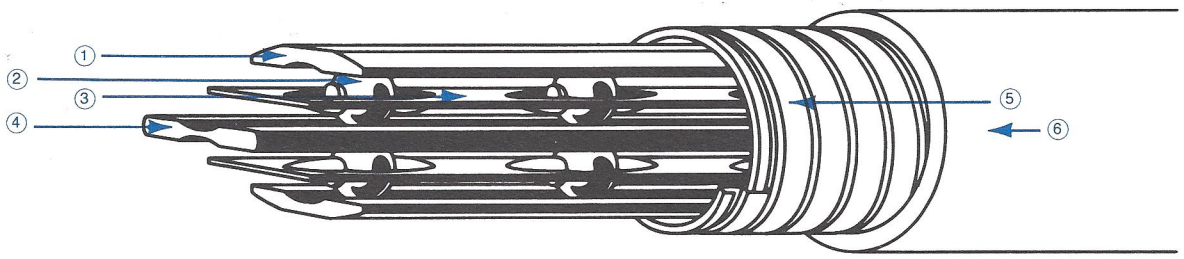
stainless steel ball bearing push-pull controls

VPS CONTROL SYSTEMS, INC.
19 Hill Road, PO Box 249
Hoosick, New York 12089
• Phone (518) 686-0019
• Fax (518) 686-1983

Flexball®

Flexball Control Cable



① Stainless steel outer rail (carries reactive loads)

② Free floating stainless steel balls

③ Stainless steel ball cage (positions balls for optimum performance)

④ Stainless steel center rail (active load transmitting element)

⑤ Flexible interlocking steel casing (provides radial support)

⑥ PVC cover (protects inner working elements from outside contamination)

Flexball is essentially a flexible linear ball bearing which transfers push-pull motion from one point to another. Its unique design allows for the efficient transmission of movement up to 8″ with maximum efficiency and minimal lost motion.

Flexball is available in lengths up to 65 feet and can easily be routed in three dimensional installations. Motion and load can be transmitted over even longer distances by coupling individual cables together.

Flexball can accommodate complex layouts with small bend radii and still achieve an efficiency rate of up to 97%. The stainless steel inner members of the cable assure an optimum cycle life under high bending stress.

Flexball offers a cost effective and mechanically reliable alternative to complicated rod linkages and hydraulic, pneumatic, electronic, or conventional cables.

Flexball provides these unique characteristics:

- Maximum flexibility in following complex multi-plane layouts
- High efficiency in the transmission of input forces
- Minimal loss of transmission motion regardless of cable length or layout
- Constant repeatability of transmission motion throughout the cyclic life of the cable
- Impervious to extreme ambient temperature fluctuations

Flexball is constructed of corrosion resistant materials:

- Rails and balls - 300 Series - stainless steel
- Ball cage - stainless steel or PTFE
- Conduit - stainless steel with plastic cover
- End rods - stainless steel
- Mounting sleeves - stainless steel or brass

Selecting Flexball

Flexball is available in five different sizes and with various end fitting options. The basic dimensional specifications and performance characteristics for each size are shown on the following pages.

In choosing the appropriate size of Flexball for your application, the following should be considered:

- Overall length of the cable
- Stroke length - input and output
- Compression load - maximum and working
- Tension load - maximum and working
- Temperature - minimum and maximum
- Life cycles required - per minute, hour and day
- Environmental conditions - water, dust, salt spray, etc.

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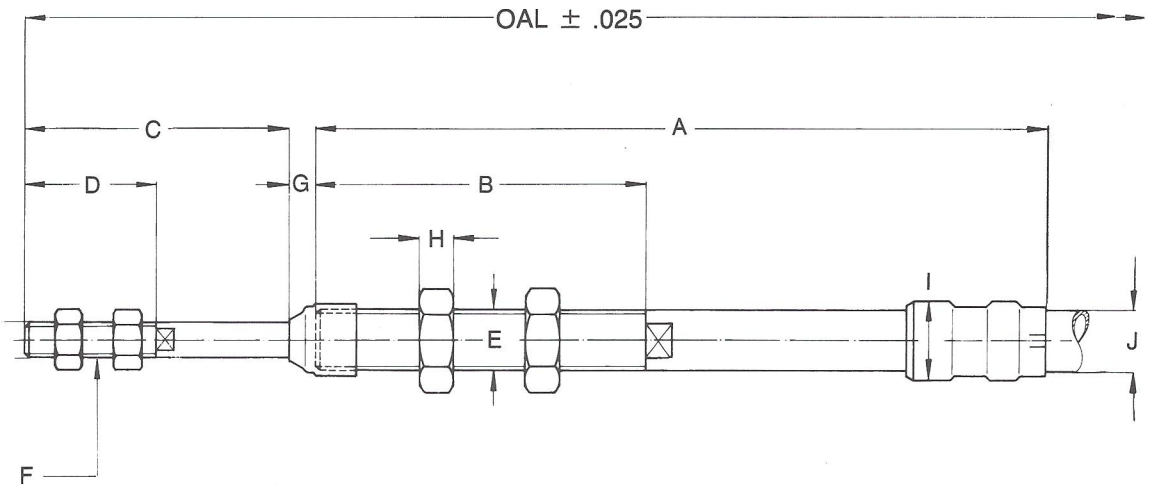
Standard Dimensions for Flexball Types 55, 70, 95, 125 & 160



TYPE	STROKE	A	B	C	D	E	F	G	H	I	J
55	1" & 2" 3" & 4"	5.13 7.06	2.16 4.13	1.00 + 1/2 Stroke	.75	3/8-24 UNF -2A	10-32 UNF -2A	.25	.16	.56 Dia	.44 Dia
70	1" & 2" 3" & 4" 5" & 6" 7" & 8"	5.56 7.50 9.50 11.50	2.16 4.13 6.10 8.07	1.38 + 1/2 Stroke	1.13	1/2-20 UNF -2A	1/4-28 UNF -2A	.25	.20	.63 Dia	.50 Dia
95	1" & 2" 3" & 4" 5" & 6" 7" & 8"	6.25 8.19 10.19 12.13	2.75 4.72 6.69 8.66	1.50 + 1/2 Stroke	1.13	5/8-18 UNF -2A	3/8-24 UNF -2A	.25	.32	.75 Dia	.62 Dia
125	1" & 2" 3" & 4" 5" & 6" 7" & 8"	7.00 9.00 11.00 12.75	2.88 4.88 6.85 8.81	1.63 + 1/2 Stroke	1.38	3/4-16 UNF -2A	1/2-20 UNF -2A	.25	.36	.95 Dia	.81 Dia
160	1" & 2" 3" & 4" 5" & 6" 7" & 8"	8.63 10.63 12.56 14.50	3.94 5.88 7.88 9.75	1.66 + 1/2 Stroke	1.38	M22x1.5	1/2-20 UNF -2A	.25	.40	1.12 Dia	.95 Dia

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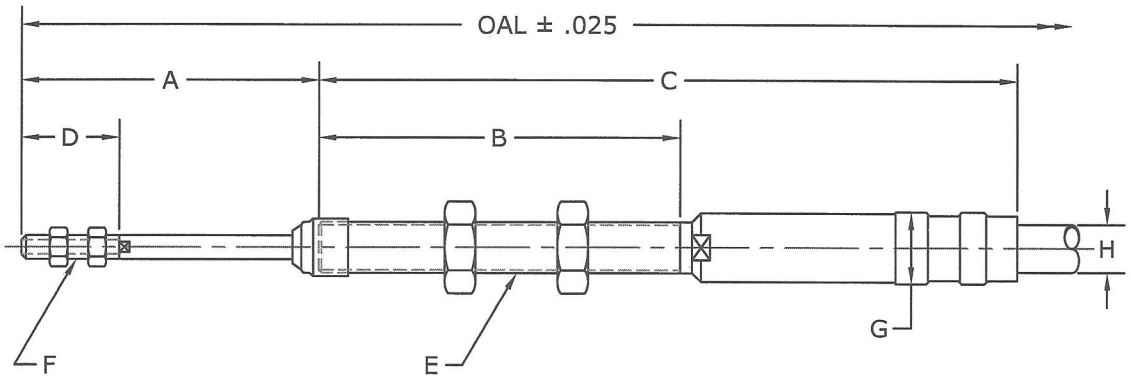
Standard Dimensions for Flexball Types 78, 98 & 128



TYPE	STROKE	A	B	C	D	E	F	G	H
78	1 2 3 4 5 6	1.75 2.25 2.75 3.25 3.75 4.25	.75+ Stroke	4.124+ Stroke	1	1/2-20 UNF -2A	1/4-28 UNF -2A	.57 Dia	.50 MAX Dia
98	1 2 3 4 5 6	2.5 3 3.5 4 4.5 5	0.75 Stroke	4.625+ Stroke	1.25	5/8-18 UNF -2A	3/8-24 UNF -2A	.63 Dia	.57 MAX Dia
128	1 2 3 4 5 6	2.5 3 3.5 4 4.5 5	1+ Stroke	5.875+ Stroke	1.5	3/4-16 UNF -2A	1/2-20 UNF -2A	1 Dia	.80 MAX Dia

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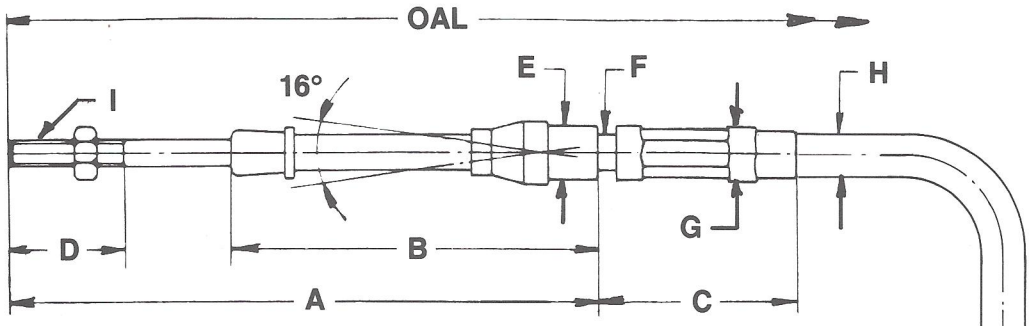
FLEXBALL "C" & "B" PUSH-PULL CONTROL CABLES

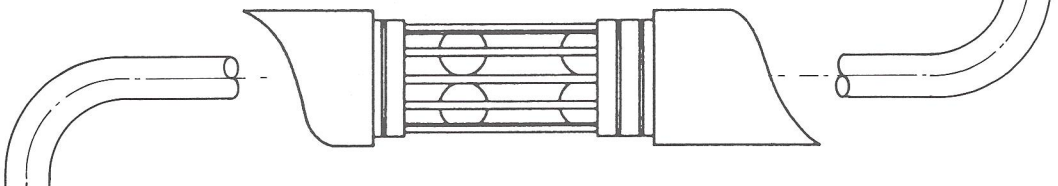
FLEXBALL TYPES 78 & 98 are now available with end fittings which utilize a built-in rod swivel and clamp (C) or bulkhead (B) mounting sleeves. Unlike other ball bearing cables there is no need to use ball joints and other awkward adaptor pieces when mounting FLEXBALL "C" or "B" cables to control heads and mounting brackets set up for conventional control cables.

This makes FLEXBALL an ideal upgrade from conventional sliding cable systems.

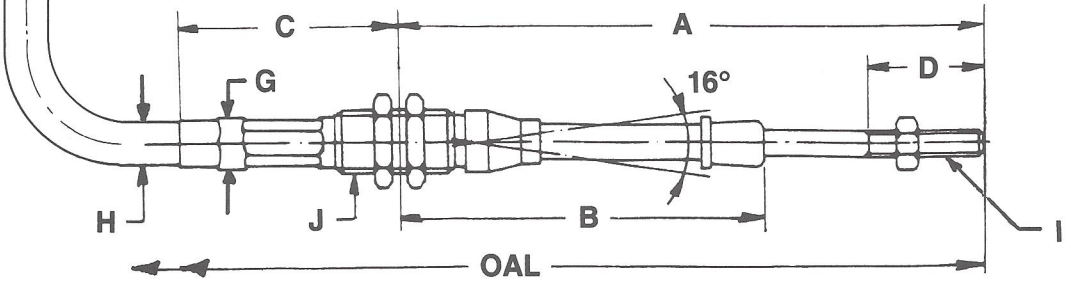
Type 78



TYPE	STROKE	A	B	C	D	E	F	G	H	I
78C	2 3 4	5.5 7.0 8.5	3.56 4.56 5.56	3.31	1.00	.50 DIA	.180 RADIUS .41 ROOT DIA	.63 DIA	.50 DIA	1/4-28 UNF-2A



TYPE	STROKE	A	B	C	D	G	H	I	J
78B	2 3 4	6.13 7.63 9.13	4.19 5.19 6.19	2.88	1.00	.63 DIA	.50 DIA	1/4-28 UNF 2A	5/8-18 UNF-2A



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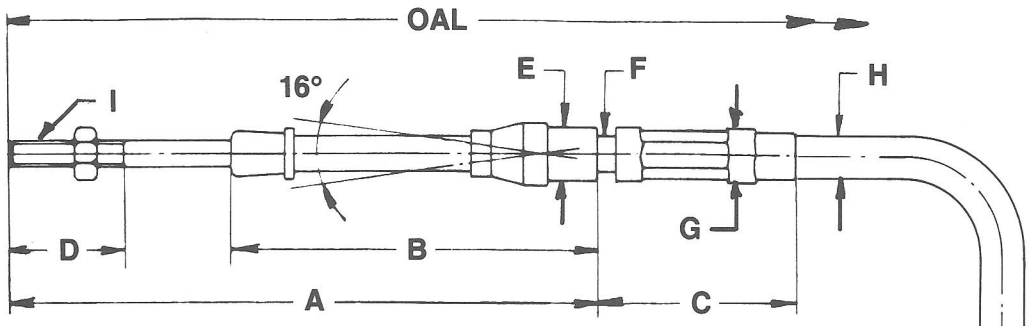
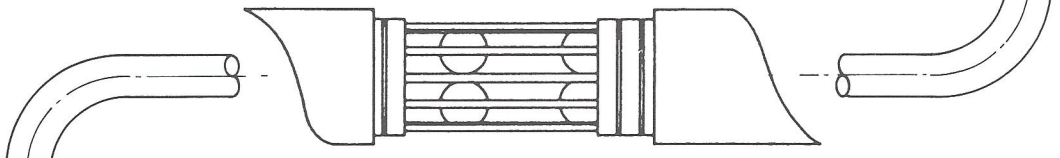
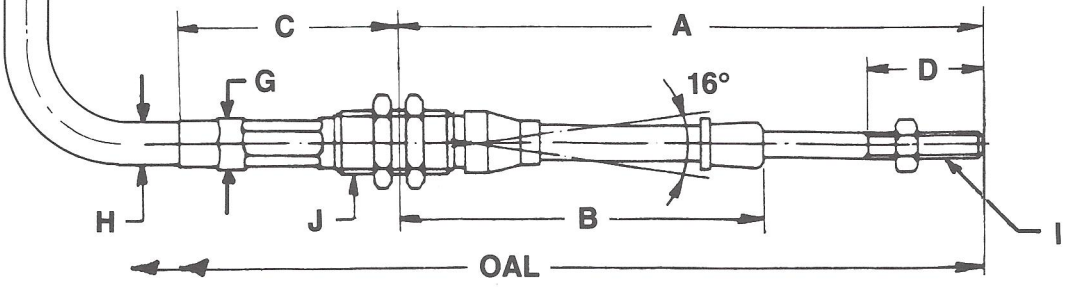
Type 98



TYPE	STROKE	A	B	C	D	E	F	G	H	I
98C	2 3 4	5.88 7.38 8.88	3.68 4.68 5.56	3.75	1.18	.57 DIA	.180 RADIUS .46 ROOT DIA	.75 DIA	.63 DIA	5/16-24 UNF-2A



TYPE	STROKE	A	B	C	D	G	H	I	J
98B	2 3 4	6.56 8.06 9.56	4.38 5.38 6.38	2.88	1.18	.75 DIA	.63 DIA	5/16-24 UNF 2A	11/16-16 UNF-2A



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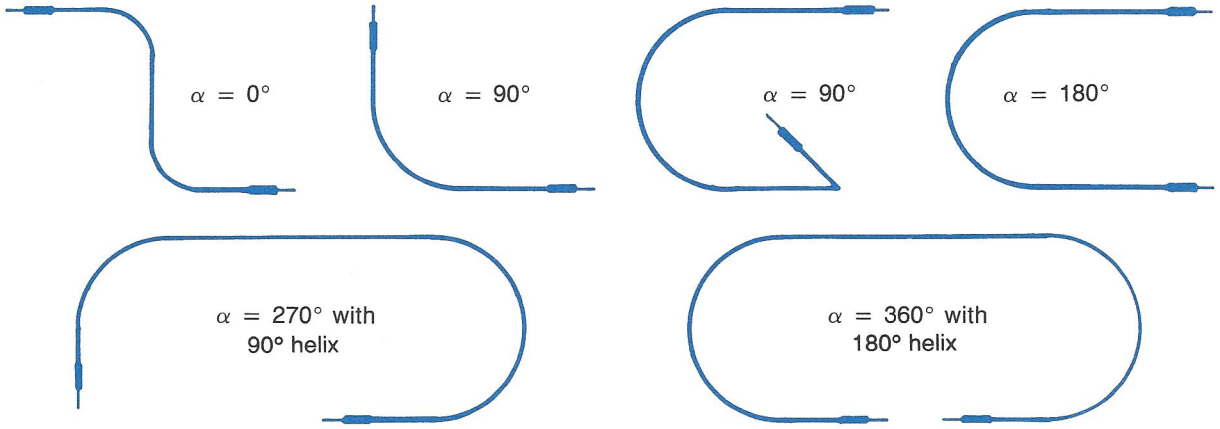
Flexball Installation Characteristics

Because of its unique inner construction, Flexball cannot be treated like a conventional wire core push-pull cable. When considering Flexball for an application, it should be remembered that whenever the cable is bent, the three internal rails will form concentric arcs. Therefore, either the outside outer rail must increase in length or the inside outer rail must shorten in length to compensate for the different radii of each rail's arc.

This requirement is met by an internal anchoring system. While Flexball can be bent a little over 180 degrees in either direction, any number of bends can be accommodated during installation so long as the difference between the total number of opposing bends does not exceed 180 degrees. Should a particular routing require a bend in excess of 180 degrees in one direction, it can be accomplished by helixing the rails. (See below.)



Flexball Specifications

	Type 55/58	Type 70/78	Type 95/98	Type 125/128	Type 160/168
Maximum Recommended Input Loads Compression:					
Stroke 1″—4″	50 lbs.	200 lbs.	400 lbs.	1000 lbs.	1200 lbs.
5″—6″		100 lbs.	250 lbs.	500 lbs.	600 lbs.
7″—8″		40 lbs.	100 lbs.	250 lbs.	300 lbs.
Tension:					
Stroke 1″—8″	100 lbs.	300 lbs.	500 lbs.	2000 lbs.	3000 lbs.
Minimum Recommended Bend Radius					
Occasional Cycling	3.50 in.	4.00 in.	5.00 in.	8.00 in.	10.00 in.
Continuous Cycling	7.00 in.	12.00 in.	15.00 in.	20.00 in.	24.00 in.
Elastic Stretch Push or Pull, Per foot by 20 lbs. of Input Load	.0035 in.	.0020 in.	.0012 in.	.0006 in.	.0006 in.
Temperature Range with Plastic Cover *	—40°F to +220°F				
Temperature Range without Plastic Cover	—40°F to +600°F				
Maximum Overall Length **	30 ft.	65 ft.	65 ft.	65 ft.	65 ft.

** High temperature covers (+400°F) available upon request.*

*** When longer lengths are required, individual cables can be coupled together.*

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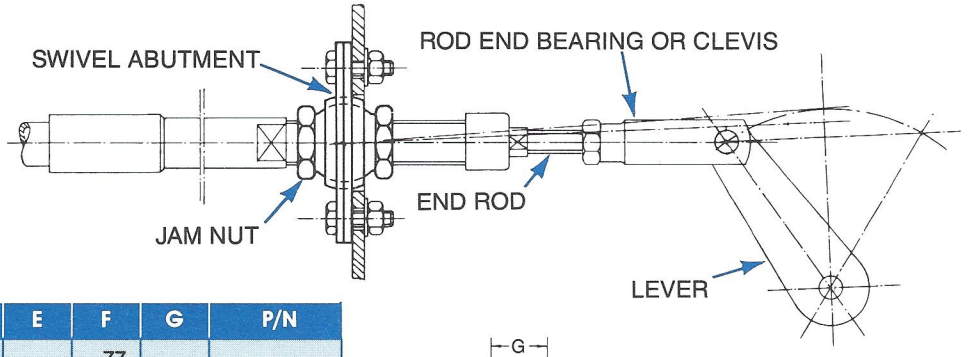
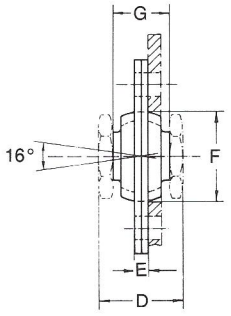
Mounting Information

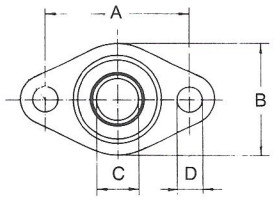
Flexball Installations will generally fall into either one of two categories: when inputs and/or outputs are straight linear push-pull operations or, when rotary (lever) motion must be converted to linear motion. The most practical method of converting rotary to linear motion is through the use of either a swivel abutment or our new swivel tube end fitting.

Rotary Motion
with Swivel Abutment

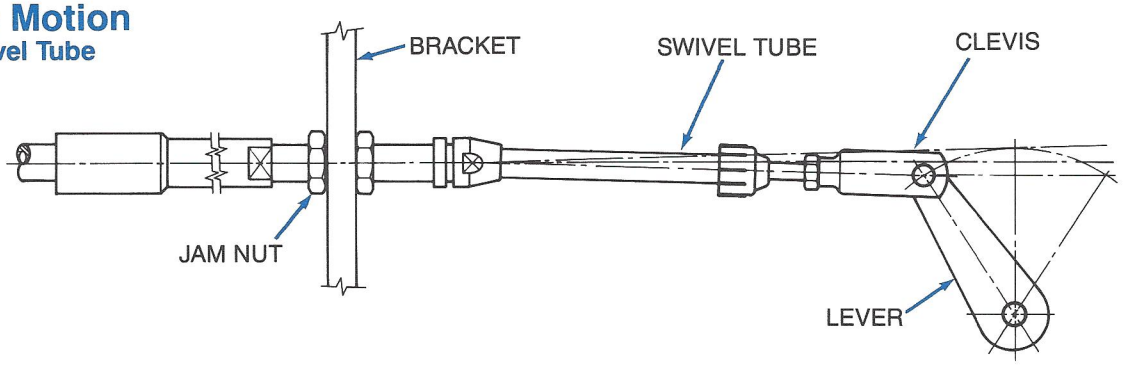


Type	A	B	C	D	E	F	G	P/N
55	1.18	1.02	.40	.20	.12	.77 DIA	.48	55-220-B
70	1.57	1.18	.48	.24	.16	.99 DIA	.63	70-220-B
95	2.05	1.65	.63	.32	.20	1.34 DIA	.87	95-220-B
125	2.20	1.77	.72	.32	.20	1.42 DIA	.99	125-220-B
160	2.36	2.32	.87	.40	.63	1.58 DIA	1.07	160-220-B





Rotary Motion
with Swivel Tube



Application Information

When considering FLEXBALL for a particular application the following data should be provided:

A sketch or drawing showing how FLEXBALL will be routed, how the ends will be mounted, what it will be activating and whether the input and output motion will be straight, angular or rotary.

What force (in pounds or inch/pounds) is required to induce motion at the output?

Is the input to be manual or power?

What is travel (stroke) required in inches or degrees?

What are the environmental conditions under which the system must operate?

What is the cycle rate (per minute, hour, day, week, etc.)?

What is the required length of the cable, number of bends and bend radii?

Does this represent a new or an existing application?