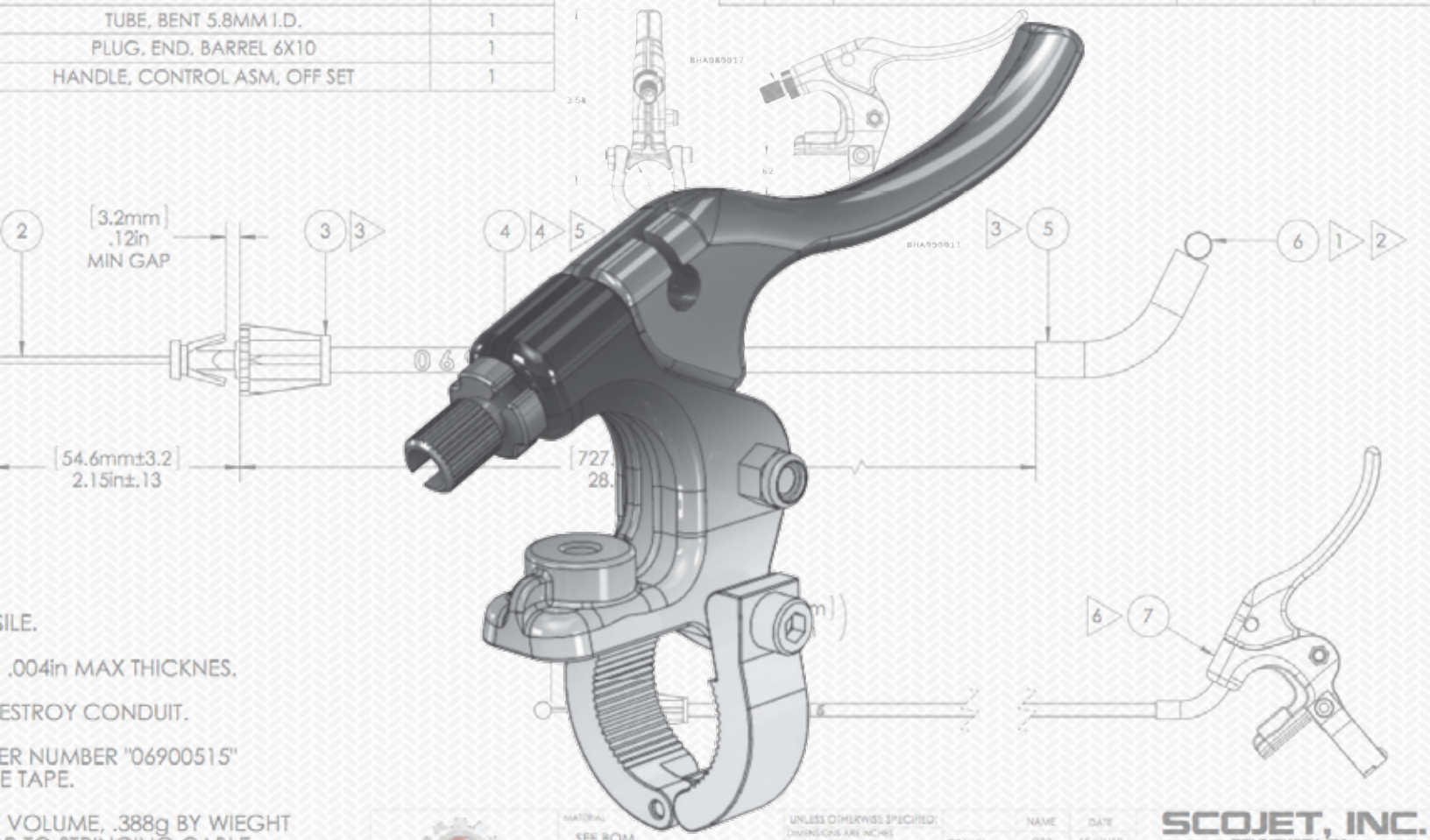
SCOJET
CONTROL CABLE

2024 CATALOG

DESCRIPTION	QTY.
PLUG END, BALL 7.5MM	1
CABLE, CONTROL, WIRE 1.5MM DIA 7x7 S.S.	1
CABLE, CONTROL, BOOT SNAP, 3.2MM WALL	1
ABLE, CONTROL, 5.65MM CASING OUTER LINED	1
TUBE, BENT 5.8MM I.D.	1
PLUG, END, BARREL 6X10	1
HANDLE, CONTROL ASM, OFF SET	1

REVISIONS

ZONE	REV.	DESCRIPTION	DATE	APPROVED
-	A	RELEASED FOR PRODUCTION	28APR11	GMT
8D	B	ITEM NUMBER 4 WAS BHP090039-0515	03OCT14	CBB
-	C	UPDATED NOTES / ADDED GAP DIMENSION	18DEC14	CBB



ILE.

.004in MAX THICKNES.

ESTROY CONDUIT.

ER NUMBER "06900515"
E TAPE.

VOLUME, .388g BY WIEGHT
R TO STRINGING CABLE.

T BE BOUND
SEPARATING
IPPING.
SILY REMOVED
ON UNIT.
BE A RUBBER BAND.

MATERIAL: SEE BOM

FINISH: SEE PARTS

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	CBB	15JUN10
CHECKED	GMT	12MAY11
ENG APPR.	GMT	12MAY11
MFG APPR.		
Q.A.		
COMMENTS:		

SCOJET, INC.
BRUNSWICK, GA

TITLE: CABLE, CONTROL , ICE MELT

SIZE B | DWG. NO. BHA110019 | REV C

SCALE: 1:5 WT: SHEET 1 OF

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Cable Construction

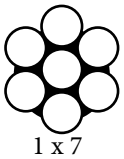
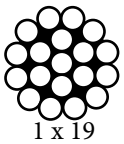
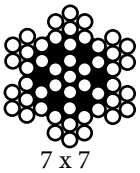
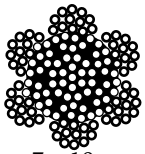
All wire rope and mechanical cables are fabricated from individual wires that are helically twisted into a strand. Most small commercial cables are made using a core as their central member, with a given number of strands helically wrapped around the core. All cable is made using two ore more strands as a basis of its construction. The number of wires is in a strand and the number of strands in a cable controlled by the construction that is specified.

Cable is specified by the number of strands it has by (x) the number of wires in each strand. Commercial quality “aircraft grade” type cables are most typically 1 x 7, 1 x 19, 7 x 7, and 7 x 19. The most popular strand is 1 x 7, which consists of 1 center core wire, which is straight, and 6 wires helically stranded around the core. This basic strand is used to make 1 x 19, 3 x 7, 7 x 7, and 7 x 19 cable. Flexibility of the same diameter cable is a function of the number of wires in the cross section; with 1 x 7 being the stiffest, and 7 x 19 being the most flexible standard construction. Each cable use must be analyzed to determine the most suitable construction for the application.

All cables consist of individual wires, a center core and outer strands as shown. Most “aircraft grade” type cables are made with performed wires (except for the center wire, a center wire of a strand) and performed strands. Performing allows the cable to lay straight and reduces the tendency of the wires to pop or fly apart when the cable is cut mechanically.

Cable can be stranded with either a right or left hand lay, which is the direction that the outer strands are “laid” around the core. All commercial quality “aircraft grade” cable is made and stocked in right regular lay configuration. Wires in the strand are laid to the left and each strand is laid to the right. The length of lay is dimension in inches for one strand, or one wire to make one helical revolution around the center core. The length of lay is determined by the specification for the particular strand or cable, or by the application.

Standard Cable Construction

SIZE RANGE	DESCRIPTION	TYPICAL USES	CONTRUCTION
3/64” thru 1/4” Dimameter	Basic strand for all concentric cable, relatively stiff in larger diamters, and offers the least stretch.	Basic strand, straight pull-pull assemblies, tension members.	 1 x 7
1/32” thru 3/8” Diameter	Smooth outside diameter, moderately flexible, compressive force resistant, strongest construction in sizes above 3/32” diameter.	Tension members, guy lines, push-pull controls, pull-pull controls.	 1 x 19
1/32” thru 3/8” Diameter	Durable, higher flexibility and abrasion resistance.	Used over pulleys in small diameters, pull-pull cable controls.	 7 x 7
1/16” thru 3/8” Diameter	The strongest and most flexible, with greatest strength.	Over pulleys, drive cables, reciprocating applications, and lanyards.	 7 x 19

Cable Assembly Design Factors

Some cable assemblies perform simple functions while others are essential to perform multiple, various tasks, making every application different.

There are many unique and diverse factors to cable and cable assembly design. These factors and specifications ought to be carefully, and thoughtfully, considered in the assembly and production techniques. For critical applications, fabrication of samples is highly recommended for testing in the actual, or simulated, use.

Cable Stretch

All cables stretch when under an applied load. There are 2 types of stretch: Constructional and Elastic. In most cases, where a cable of the correct diameter and construction has been specified, stretch is usually not a issue in the role of the assembly.

Constructional Stretch

All cables contain minute clearances between the individual wires and strands. When the initial load is applied, the clearances are minimized, allowing the cable to stretch in length. The type of construction, amount of load, and length of the assembly all affect the amount of Constructional Stretch. The more wires in a cross section, the more the cable will stretch during the application of a load.

Most cable assemblies are quantified with a safety factor larger than the working load. This may minimize Constructional Stretch as a design factor.

In areas where stretch will be a factor, Constructional Stretch of a cable assembly can be nearly removed by “proof loading” the assembly to 60% of the cable’s minimum breaking strength. Please note that cable stretch will occur, and should be planned for in design and installation.

Elastic Stretch

Elastic Stretch is the actual elongation of the individual wires in a strand or cable. This type of stretching occurs when the cable is subjected to a load that is less than the yield point of the metal. The elongation is roughly proportional to the load applied. When the load is removed from a “proof loaded” cable it will return to its original length, providing the load has not exceeded the yield point of the metal, which may result in permanent elongation or structural failure. The Elastic Stretch of a cable using this formula:

$$S = \frac{W \times L}{E \times A}$$

Where: S = Elastic Stretch in Inches
W = Pounds Load
L = Length in Inches (of Cable Assmeblies)
E =
A = Cross sectional wire area $\left(\frac{D^2 \times \pi}{} \right) / 4$

Cable and Assembly Breaking Strength

Minimum Breaking Strength of a cable is defined as the minimal ultimate tensile strength in lbs. or kg. The Minimum Breaking Strength of any cable on a specific assembly should be based on the maximum working load, any potential shock load, and a reasonable safety factor.

Recommended Minimum Saftey Factors Ratio	Minimum Cable Breaking Strength	:	Maximum Working Load
Normal Applications	5	:	1
Shock or Peak Load Applications	8	:	1
Critical or Safety Related	10	:	1

Assembly Strength

Most standard assembly fittings were designed to hold around 80% of the minimum breaking strength of the cable. Swaging fittings to the bare cable protects maximum holding strength. It is possible to vary the holding strength if a fitting is swaged to a smaller cable or when commercially acceptable variations occur in cable diameter and the fitting's material hardness. A minimum holding strength based on 80% of the cable breaking strength should be specified for most assemblies, except for ball fittings, which should be specified at 50%. Requirements higher than 80% can be acquired based on cable and fitting selection. More expensive rotary swaged fittings and aircraft terminals can generate holding strengths equal to the minimum breaking strength of the cable. Standard and custom fittings can be tested to determine the maximum allowable holding strength for any given application.

Holding Strength/Cable Protrusion

Cable protrusion on ball fittings, plug fittings, ball and shank fittings, as well as most eye fittings, contributes to the maximum holding strength of the fitting and cable selected. The protrusion can be ground flush on plug and ball fittings, if required, at an additional cost; however a lower holding strength must be specified.

Characteristic	Greatest → Least			
Flexibility	7 x 19	7 x 7	1 x 19	1 x 7
Tensile Strength	1 x 19	1 x 7	7 x 19	7 x 7
Stretch Resistance	1 x 7	1 x 19	7 x 7	7 x 19
Relative Cost	7 x 19	7 x 7	1 x 19	1 x 7
Corrosion Resistance	Coated Stainless Steel	Bare Stainless Steel	Coated Galvanized Steel	Galvanized Steel

Application	Recommended	Acceptable
Straight Tensile Load	1 x 19	1 x 7
Tensile Load with Flexing	7 x 19	7 x 7
Over Pulleys	7 x 19 Coated and Lubricated	7 x 7

Cable Lubrication

All commercial quality “Aircraft Grade” cable is available either dry or lubricated. Lubrication applied to the wires and strands during fabrication increases cycle life and is essential for cable applications using pulleys or sheaves. This allows the wires and strands to move easily against one another while flexing back and forth over pulleys. For most static applications, dry cable is acceptable and should be specified.

Pulley Materials/Types

Pulley materials and construction should be selected based on the application and system environment.

Commercially available pulleys are made from aluminum, steel, nylon, acetal, and other thermoplastic resisns. Most are available with sintered bronze bushings, open or closed ball, or roller bearings. Dynamic loads, RPMs, expected life cycles, corrosion resistance, and cost must all be considered as factors in pulley and bearing selection.

Pulley/Bearing Description	Features	Typical Uses
1. Plain metallic or thermoplastic pulleys	Lowest cost, light loads, low RPM, intermittent operation.	Low frequency drive cable and lift cable applications.
2. Metallic or plastic pulleys with sintered bronze bearings	Self-lubricated bearings, cost-effective, durable, higher load, shock resistant.	Higher RPM, medium load drive, index &lift systems.
3. With open free turning or precision closed & lubricated ball bearings	Minimum friction, precise tracking, medium load, high RPM.	High speed drive, and index cable systems.

For axial and radial load capacitites and maximum recommended RPMs, consult individual bearing and pulley manufacturers’ literature.

Pulley Diameter to Cable Diameter Ratio

Cable Construction	Preferred Minimum (D:d)	Absolute Minimum (D:d)	Absolute Minimum (D:d) for Aircraft Applications
3X7	50:1	40:1	
7X7	42:1	30:1	Not Recommended
7X19	24:1	18:1	40:1 35:1

D = Pulley Tread, or Root Diameter
d = Nominal Bare or Coated Cable Diameter

Groove Design

The recommended groove diameter should be calculated as follows:

1.5 x Diameter Tolerance (Plus tolerance of bare cable or coating) **+** **Maximum Cable Diameter (Bare or coated diameter for either)**

Proper groove diameter is also essential to cable life expectancy. A small groove will pinch the cable, while a large groove will flatten it. The pulley groove should be molded or machined so it is smooth and free of imperfections.

Installation

The environment, alignment, installation procedures, unecessary overloading and lubrication all affect pulley, bearing and cable life expectancy. Atention to these factors in the design and specification stages of your project will help to ensure a functional system.

Pulley, capstan, and cable systems should be designed so that their alignment is within acceptable fleet angles. For most drum or capstan installations, it is recommended that the system design acommodates a minimum fleet angle of 1/2 degree and a maximum of 1 and 1/2 degrees (2 degrees for a grooved capstan) from the outside edge (flange) to the centerline of the drum or capstan. Adherence to these limits should allow proper payoff, and re-winding of the cable, in a consistent basis. This minimizes the potential for crushing, abrasion, and stacking of the cable.

Assembly and Fitting Tolerances

The specification of realistic tolerances is essential to producing cost-effective cable assemblies. In most cases, standard block tolerances should not be used for cable fittings and assemblies. The swaged areas of most fittings should be specified as reference dimensions, unless that part is critical to the installation and assembly. Where fittings must nest or fit into a mating part, after swagedimensions can be specified within the tolerances indicated on the fitting charts. Extremely close tolerances on the fittings and assembly length can add unnecessary cost. The chart below indicates acceptable length tolerance conditions for commercial cable assemblies.

Cable Assembly Tolerances

Assembly Length in Feet	Tight Tol.+/- in./mm	Normal Tol.+/- in./mm	Relaxed Tol.+/- in./mm
0-2 ft.	.030/.76	.060/1.52	.125/3.18
2-5 ft.	.060/1.52	.125/3.18	.188/4.8
5-10 ft.	.188/4.8	.375/9.53	.500/12.7
10-20 ft.	.375/9.53	.500/12.7	.750/19.0
20-40 ft.	.500/12.7	.750/19.0	1.00/25.4
40-50 ft.	.750/19.0	1.00/25.4	2.00/50.8
>50 ft.	Dictated by Application		

A small load is applied to any cable assembly in order to keep it straight and true, permitting accurate measurement. Any special tolerance conditions and/or inspec tion procedures should be reviewed with Scojet Engineering and Quality Control personnel prior to drawing release and quotation.

Cable Installation and Assembly Procedures

Proper handling and installation of cable and cable assemblies is important to obtain maximum cable life and to avoid prematurefailure. Cable assemblies should never be twisted, or the fittings rotated, during installation. Twisting and rotation will either unwind or over wind the strands, which can result in cable failure. Care should also be taken to avoid nicking, kinking, or bending of the cable during installation.

Any cable used in high life cycle reciprocating pulley applications should be inspected on a regular basis to cinfirm its integrity condition.

Cable Assembly Design Criteria

A systemic approach to recording design criteria can help in reaching an appropriate design and proper specification for most cable assemblies.

DESIGN CRITERIA:

DEFINE APPLICATION:_____

ASSEMBLY WILL BE SUBJECT TO:
- TENSION LOAD_____
- COMPRESSION LOAD_____
- STATIC LOAD_____
- DYNAMIC LOAD_____

APPLICATION REQUIRES:
- CABLE ASSEMBLY: COMMERCIAL/OEM_____
- CYCLE FLEX MINIATURE_____

DEFINE:
- WORKING LOAD_____
- SHOCK LOAD (IF ANY)_____
- SAFETY FACTOR_____
- USE/LIFE CYCLE_____
- ENVIRONMENT_____

SELECT CABLE:
- CONSTRUCTION_____
- DIAMETER_____
- BARE/COATED_____

SELECT FITTINGS/TERMINALS:
- STANDARD_____
- CUSTOM_____
- TYPE_____

DEFINE TOLERANCE CONDITIONS: (See Assembly Tolerances Chart)
- TIGHT_____
- NORMAL_____
- RELAXED_____

NOTE: The completion of the Scojet Application Data Sheet on our website, or available from the Scojet Sales Department, will also assist you in defining your requirements for a cable assembly design.

Detailing and Specifying Cable Assemblies

An engineering drawing, or sketch which is complete in terms of specifications and required control dimensions, provides a clear picture of the proposed assembly. This results in a more accurate quotation and evaluation of the design. Scojet's Engineering, Sales Staff, and Field Representatives are ready and willing to assist you in the design and specification of your cable design.

Thermoplastic-Coated Cable

The pressure extruded thermoplastic coatings become an integral part of the cable and are highly recommended for use with lubricated cable in pulley applications. The coating seals out contaminants, retains cable lubrication, cushions the strands, resists abrasion and increases the life cycle capability of cable used in flexing applications. Scojet's extensive background incable coating technology and extrusion capability produces smooth, uniform and concentric coatings of high quality. Our standard resins, listed below, offer a selection of choices and colors suitable for pressure extrusion on cable. For specific recommendations based on your requirements or information on special and custom coatings, please contact Scojet Sales and Engineering departments.

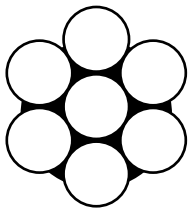
Material	Description	Uses
Nylon (Polyamide)	Very flexible and abrasion resistant for high life cycle applications	Thin wall & pulley applications
	General-purpose with adequate flexibility and abrasion resistance	Most applications for cable 1/16" and larger, lanyards, restraint cables
	General-purpose, weather-resistant	Most outdoor cable uses for larger dia. cables
	Very flexible and abrasion resistant for larger diamter cables and pulley applications	High life cycle pulley applications, physical fitness equipment
	Relatively stiff, higher heats, chemical and abrasion resistant	Cable controls, lanyards, etc.
Vinyl (Polyvinylchloride)	General purpose PVC resistant to fatigue, high flexibility	High flexibility, appearance applications
	Color – White/Opaque.	Same as
	Color – Black/Opaque.	Good mechanical properties with excellent flame resitance
	Color – Yellow/Opaque.	Same as
	Color – Green/Opaque.	Same as
	Color – Blue/Opaque.	Same as
	Color – Red/Opaque.	Same as
TPE (ThermoplasticElastomer)	Extrusion grade with rubber-like properties. Highly resistant to moisture and chemicals, good flexibility.	Good for outdoor applications, tailgate cables, parts requiring flexibility and weather esistance

How to Specify Thermoplastic-Coated Cable

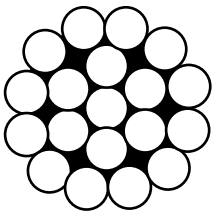
- Select the proper bare cable diamtere and part number from those listed on this page.
- Determine which "PC" resin will meet your requirments. Take into consideration cost, life expectancy, environment, etc.
- Select O.D. of coating and refer to the following for information pertaining to diameters, tolerances, and part numbers.

BARE CABLE DIAMETER [In.] / mm	OD AFTER COATING [In.] / mm	STANDARD TOLERANCE + Only [In.] / mm	APPROXIMATE WEIGHT OF PLASTIC PER M FEET Lb.	Kg.	COATING DIAMETER SUFFIX
3/64/ 1.2 (047)	1/16/ 1.6	.010/ 0.25	2	.9	063
	5/64/ 2.0	.010/ 0.25	3	1.4	078
	3/32/ 2.4	.012/ 0.30	5	2.3	094
	1/8/ 3.2	.014/ 0.36	7	3.2	125
1/16/ 1.6 (063)	5/64/ 2.0	.010/ 0.25	2	.9	078
	3/32/ 2.4	.012/ 0.30	3	1.4	094
	1/8/ 3.2	.014/ 0.36	6	2.7	125
3/32/ 2.4 (094)	1/8/ 3.2	.014/ 0.36	4	1.8	125
	5/32/ 4.0	.016/ 0.41	9	4.1	156
	3/16/ 4.8	.016/ 0.41	13	5.9	188
1/8/ 3.2 (125)	5/32/ 4.0	.018/ 0.46	6	2.7	156
	3/16/ 4.8	.018/ 0.46	11	5	188
	7/32/ 5.6	.018/ 0.46	16	7.3	219
	1/4/ 6.5	.018/ 0.46	22	10	250
5/32/ 4.0 (156)	3/16/ 4.8	.018/ 0.46	5	2.3	188
	7/32/ 5.6	.018/ 0.46	11	5	219
	1/4/ 6.5	.018/ 0.46	19	8.6	250
3/16/ 4.8 (188)	1/4/ 6.5	.018/ 0.46	14	6.4	250
	5/16/ 7.9	.022/ 0.56	28	12.7	312
	3/8/ 9.5	.022/ 0.56	51	23	375
7/32/ 5.6 (218)	5/16/ 7.9	.022/ 0.56	25	11.3	312
	3/8/ 9.5	.022/ 0.56	44	20	375
1/4/ 6.4 (250)	5/16/ 7.9	.022/ 0.56	17	7.7	312
	3/8/ 9.5	.022/ 0.56	39	17.7	375
9/32/ 7.1 (281)	3/8/ 9.5	.022/ 0.56	31	14.1	375
	7/16/ 11.1	.025/ 0.64	52	23.6	437
5/16/ 7.9 (312)	3/8/ 9.5	.025/ 0.64	25	11.3	375
	7/16/ 11.1	.025/ 0.64	47	21.3	437
3/8/ 9.5 (375)	7/16/ 11.1	.025/ 0.64	30	13.6	437
	1/2/ 12.7	.025/ 0.64	52	23.6	500

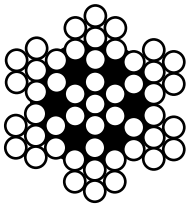
CABLE CONSTRUCTION
Control Cable Guide



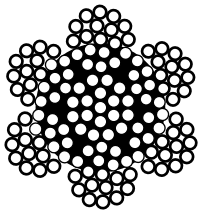
1 x 7



1 x 19



7 x 7



7 x 19

PART #	DIAMETER in./mm	TOLERANCE in./mm	GALVANIZED MIN. BREAKING STRENGTH Lb./Kg.	EA VALUE x10E4	STAINLESS STEEL MIN. BREAKING STRENGTH Lb./Kg.	EA VALUE x10E4	WEIGHT PER M FT. Lb./Kg.
BHP120003	1/32" / 0.8	005" / 0.13	Stainless Only	16	125 / 57	15	2 / 0.9
BHP120004	3/64" / 1.2	.005" / 0.13	375 / 170	35	375 / 170	33	5.2 / 2.4
BHP120005	1/16" / 1.6	.006" / 0.15	500 / 227	62	500 / 227	59	8.5 / 3.9
BHP120006	5/64" / 2.0	.008" / 0.20	800 / 363	97	800 / 363	92	14 / 6.3
BHP120007	3/32" / 2.4	.009" / 0.23	1,200 / 544	140	1,200 / 544	133	21 / 9.5
BHP120008	1/8" / 3.2	.013" / 0.33	1,830 / 830	249	1,830 / 830	237	32 / 15
BHP120009	5/32" / 4.0	.016" / 0.41	2,940 1,333	389	2,940 / 1,333	370	50 / 23
BHP120010	3/16" / 4.8	.013" / 0.33	3,990 / 1,810	560	3,990 / 1,810	532	72 / 33
BHP120011	7/32" / 5.6	.015" / 0.38	5,400 / 2,449	763	5,400 / 2,499	725	98 / 44
BHP120012	1/4" / 6.4	.018" / 0.46	6,650 / 3,016	996	6,650 / 3,016	946	120 / 54
BHP120013	1/32" / 0.8	.003" / 0.08	175 / 79	42	150 / 68	40	2 / 0.9
BHP120014	3/64" / 1.2	.003" / 0.08	350 / 159	95	300 / 136	90	4.3 / 1.95
BHP120015	3/64" / 1.2	.005" / 0.13	375 / 170	95	335 / 152	90	5.2 / 2.4
BHP120016	1/16" / 1.6	.006" / 0.15	500 / 227	169	500 / 227	161	8.5 / 3.9
BHP120017	5/64" / 2.0	.008" / 0.20	800 / 363	264	800 / 363	251	14.2 / 6.5
BHP120018	3/32" / 2.4	.009" / 0.23	1,200 / 544	380	1,200 / 544	361	20 / 9
BHP120019	1/8" / 3.2	.013" / 0.33	2,100 / 952	676	2,100 / 952	642	35 / 16
BHP120020	5/32" / 4.0	.016" / 0.41	3,300 / 1,497	1056	3,300 / 1,497	1003	57 / 26
BHP120021	3/16" / 4.8	.013" / 0.33	4,700 / 2,132	1521	4,700 / 2,132	1445	8 / 35
BHP120022	7/32" / 5.6	.015" / 0.38	6,300 / 2,857	2070	6,300 / 2,857	1967	101 / 46
BHP120023	1/4" / 6.4	.018" / 0.46	8,200 / 3,719	2704	8,200 / 3,719	2569	135 / 61
BHP120024	9/32" / 7.1	.020" / 0.51	9,900 / 4,490	3423	9,900 / 4,490	3251	172 / 78
BHP120025	5/16" / 7.9	.023" / 0.58	12,500 / 5,669	4225	12,500 / 5,669	4014	210 / 95
BHP120026	3/8" / 9.5	.026" / 0.55	18,000 / 8,163	6085	18,000 / 8,163	5780	305 / 138
BHP120027	1/32" / 0.8	.005" / 0.13	Stainless Only	109	115 / 52	104	1.5 / 0.6
BHP120028	1/32" / 0.8	.005" / 0.13	Stainless Only	109	150 / 56	104	1.5 / 0.6
BHP120029	3/64" / 1,2	.006" / 0.15	270 / 122	245	270 / 122	233	4.1 / 1.9
BHP120030	1/16" / 1.6	.010" / 0.25	480 / 218	436	480 / 218	414	7.5 / 3.4
BHP120031	5/64" / 2.0	.010" / 0.25	650 / 295	681	650 / 295	647	12 / 5.5
BHP120032	3/32" / 2.4	.012" / 0.30	920 / 417	981	920 / 417	932	16 / 7
BHP120033	1/8" / 3.2	.014" / 0.36	1,700 / 771	1744	1,700 / 771	1656	29 / 13
BHP120034	5/32" / 4.0	.016" / 0.41	2,600 / 1,179	2724	2,400 / 1,088	2588	45 / 20
BHP120035	3/16" / 4.8	.018" / 0.46	3,700 / 1,678	3923	3,700 / 1,678	3727	61 / 28
BHP120036	7/32" / 5.6	.018" / 0.46	4,800 / 2,177	5340	4,800 / 2,177	5072	82 / 37
BHP120037	1/4" / 6.4	.018" / 0.46	6,100 / 2,766	6974	6,100 / 2,766	6625	107 / 49
BHP120038	9/32" / 7.1	.020" / 0.51	7,400 / 3,356	8827	7,400 / 3,356	8385	135 / 61
BHP120039	5/16" / 7.9	.022" / 0.56	9,200 / 4,172	10897	9,100 / 4,127	10351	166 / 75
BHP120040	3/8" / 9.5	.026" / 0.66	13,300 / 6,032	15692	12,600 / 5,714	14906	238 / 108
BHP120041	1/16" / 1.6	.010" / 0.25	480 / 218	1183	480 / 218	1124	8.1 / 3.7
BHP120042	3/32" / 2.4	.012" / 0.30	1,000 / 454	2662	920 / 417	2529	16 / 7.3
BHP120043	1/8" / 3.2	.014" / 0.36	2,000 / 907	4732	1,760 / 417	4495	30 / 13.6
BHP120044	5/32"4.0	.016" / 0.41	2,800 / 1,270	7395	2,400 / 1,088	7024	44 / 20
BHP120045	3/16" / 4.8	.018" / 0.46	4,200 / 3,485	10648	3,700 / 1,678	10115	63 / 29
BHP120046	7/32" / 5.6	.018" / 0.46	5,600 / 2,540	14493	5,000 / 2,268	13767	85 / 39
BHP120047	1/4" / 6.4	.018" / 0.46	7,000 / 3,175	18930	6,100 / 2,766	17982	108 / 49
BHP120048	9/32" / 7.1	.020" / 0.51	8,000 / 3,628	23958	7,800 / 3,537	22758	140 / 263
BHP120049	5/16" / 7.9	.022" / 0.56	9,800 / 4,444	29578	9,000 / 4,082	28097	175 / 79
BHP120050	3/8" / 9.5	.026" / 0.66	14,400 / 6,531	42592	12,000 / 5,443	40459	245 / 111

Push-Pull and Pull-Pull Controls Design Guide

There are may common, everyday applications that use efficient and reliable Scojet controls. Some uses of controls are obvious and visible, while others are not. Simple and lightweight controls for dependable, remote activation of throttles, gas springs, mechanisms, or electromechanical devices, etc., can use either push-pull or pull-pull type products.

Push Pull Controls

Solid core controls are used in applications that require the transmission of forces in both the push and pull mode of operation. The vast majority of these products use various combinations of conduit styles and solid wire cores in their construction.

In some cases, stiffer, small diameter cables can be used for push-pull applications, providing the push load is very light and the combination of cable adn conduit is carefully considered. Solid wire cores can be formed in the ends to eliminate the need to apply separate fittings or terminations. Bend radii should be large and routing must be simple in order to avoid a permanent set in the core wire. All push-pull controls have a larger capacity in the pull (or tension) mode than in the push (or compression) mode.

Pull-Pull Controls

Flexible core controls are used in applications that require the transmission of forces in tension only. IN general, more flexible conduit and a cable core are used for greater freedom in routing and smaller bend radii restricted installations feature an integral return spring to keep a specified load on the cable and to return the cable or mechanism to its original position after activation. Controls with cable cores permit the use of most standard fittings allowing a very wide range of mounting and retaining options.

Push-Pull/Pull-Pull Control Design Factors

Applications - Analysis and review of the proposed control function will determine what type of product can be used for a given application. Consideration and definition of potential system variables, such as load, routing, friction, stretch, set, effects of bends on length, temperature, environment, and exposure to containments, will aid in the design of an acceptable control. In general, pull-pull controls are lighter in weight and more flexible than push-pull controls, however, this is a function of the application and load requirements.

Load Factors

Push-Pull - Working loads should be specified as the highest in the pull or tension mode, with the push or compression mode specified at 50% or less of the pull mode. Lower working loads in the push function minimize the tendency of the core to displace the conduit and, more importantly, reduces the potential for the unsupported core outside of the conduit to kink, bend, or distort.

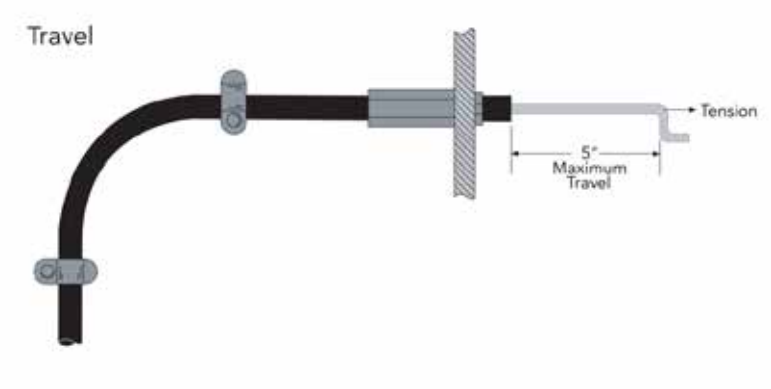
NOTE: The final specifications should be specified based on the travel core material column strength and the type of use. Consult Scojet's Engineering department for additional information.

Pull-Pull - Maximum working loads should be specified based on the minimum breaking strength of the cable with a safety factor, and the resistance of the type of conduit selected to resist deflection and compressive forces when a laid is applied to the core. Extremely high loads and high life cycles can cause the cable to stretch and wear through the liner of the conduit. The conduit and retained in its routed position for proper function.

Travel

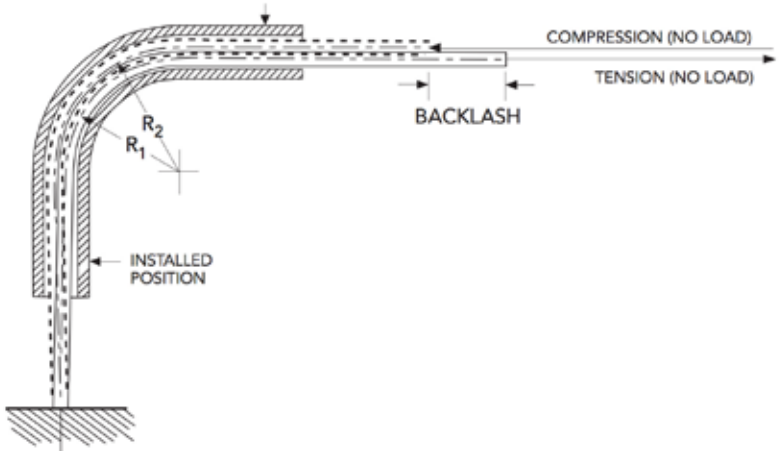
Push-Pull - It is recommended for most light-and-medium - duty applications that travel should be limited to 5" maximum. This minimizes possible loss of input versus output, and potential for the core to buckle. IN a very small diameter core situations, a smaller travel should be used to minimize the possibility of buckling. Each applications should be analyzed to compare travel and the applied load to determine if core buckling could occur.
Pull-Pull - Travel of cable cores can usually be specified to suit the application. If the control and core a subject to a hostile environment that could affect the core, a minimum stroke should be specified to limit the exposure of the cable outside the conduit.

NOTE: Travel and design length of the core is affected by the total number of degrees of bend in the actual routed installation. The type of conduit, core and clearance between the O.D. of the core and the I.D. of the conduit can increase or decrease the travel length of the core member. It is highly recommended that a prototype be installed in the system to confirm correct design length and travel.



Lost Motion

Push-Pull - Consideration must be given to the fact that all push-pull controls are subject to the loss of motion between in the input and the output ends when a load is applied to the system. Total lost motion of the control consists of backlash and deflection.
Backlash - is the lost motion caused by the clearance between the core diameter and the inside diameter of the conduit. It is present in both the push and pull modes of the operation. Backlash is directly proportional to the total degrees of bend in the installed routing and the clearance between the O.D. of the core and the I.D. of the conduit. It can be calculated as shown below:



General Formula for Backlash

$$BL = \frac{X\pi R_2}{180} - \frac{X\pi R_1}{180}$$

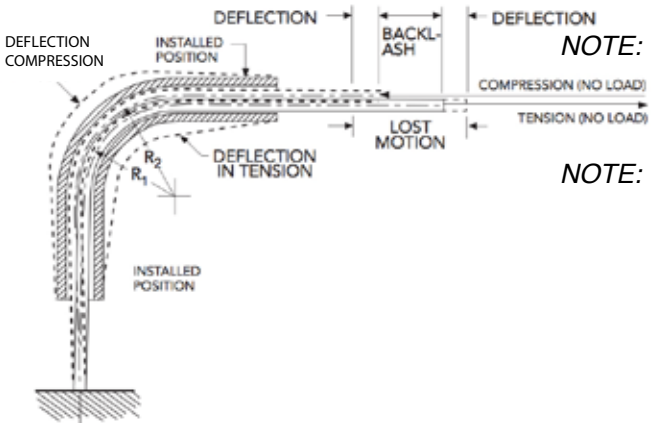
BL = Backlash

R_1 = Centerline of core in tension (no load)

R_2 = Centerline of core in compression (no load)

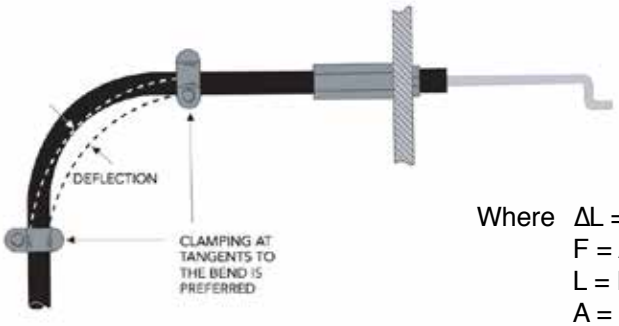
(R_1 + Clearance - Difference between nominal conduit I.D. and nominal core Dia.)

X = Degree of bend (total degrees)



NOTE: *R1 = Center line of core in tension (working load)*
R2 - Center line of core in compression (working load)
Lost Motions - Backlash + Deflection

NOTE: *Clearance between core O.D. and conduit I.D. is exaggerated for illustration purposes.*



Deflection - is the lost motions from elastic strain resulting from tension or compression loads applied to the control. It can be calculated as follows:

$$\Delta L = \frac{FL}{AE}$$

Where ΔL = Deflection
F = Average force or 1/2 output load + 1/2 input force
L = Length of active inner core
A = Cross sectional area of core
E = Modulus of elasticity of core

NOTE: Actual deflection of a control in compression may vary from the value calculated based on the potential for buckling and the column strength of the core and conduit.

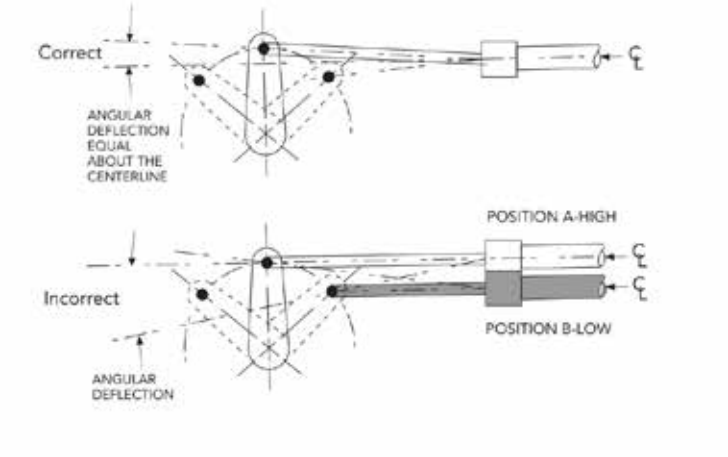
The total amount of lost motion increases with higher loads, more bends and increased length of the control. It can be overcome by designing over-travel into the system at either the input or output ends, or both.

All consideration of lost motion must include the assumption that the control will be securely mounted on wither end, and the conduit is firmly held on its routed position.

Pull-Pull - Lost motion is also present in pull-pull controls. Backlash is minimized since most pull-pull controls function under tension. The length of the travel in any cable control will be affected by routing. The required travel for actuation should be added or subtracted to the amount of travel lost or gained in the routed positions. IN some cases, this can be calculated; in others, samples installed in the system are more accurate in determining core length. However, these controls are subject to the same deflection factors as push-pull controls. Deflection should also be calculated and used as a design factor.

Alignment and Installation

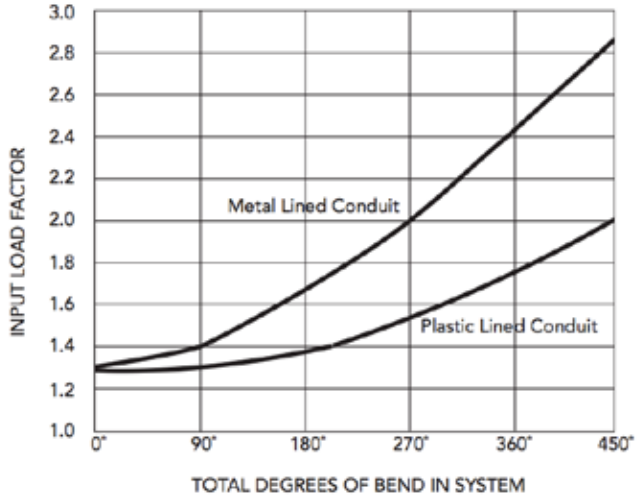
Correct mounting and careful alignment of the cable control and core can maximize efficiency, decreasing working loads and increase cycle life. All controls should be securely mounted and installed to keep cable or core travel in a straight line to the load or device being actuated. In some cases where a lever are is being moved, mount the control to minimize angular deflection of the core, as illustrated. Specify a fitting or assembly detail that will allow rotation at the mounting point.



Efficiency

Push-Pull - The conduit and core selection, as well as the number of bends in the system, combined with the relative friction between the core and the conduit, determine the efficiency of the control. Depending on the materials selected, bends should be kept within a 2” to 10” minimum radius. Recommended minimum bend radii can be estimated by multiplying the core diameter “D” x 100.
Efficiency is reduced by the friction created by bends in the system. This can be calculated using the graph and formula below.

Total Degress of Bend in System



I = P x F

I = Input Load (actual)
P = Output Load (working)
F = Input Load Factor (from graph)
P/! x 100 = %Efficiencey

NOTE: The information contained on the graph is for the general design guidelines only. All push-pull controls should be tested and evaluated in the actual use to determine suitability for a given application.

Pull-Pull

Cable cores can create greater friction in either a lined or underlined conduit, and therefore, cable construction should be considered. Most cable controls use 1x19 cable, since it has the smoothest outside diameter, and is more flexible than a solid core. For applications requiring more flexibility, 7x7 cable can be specified. However, if higher loads are involved, efficiency is reduced and the liner can be subjected to undue wear and damage.

Lubrication

Lubrication is not recommended for most applications. Lubricants can decrease the efficiency of lined conduit and only offer minimal improvements in unlined conduit. Most lubricants tend to collect dirt, dust, etc., that can build up on the core and decrease its efficiency. Special combinations of swaged cable and conduit with liners of very low coeffecient of friction are available. Consult Scojet Sales and Engineering for further details.

Shuttle Molded Cable Controls

All design considerations for push-pull controls also apply to molded cable controls. Additional design factors do affect the design of these products. They include the molded conduit fittings, conduit selection, assembly functions and dimensions.
Recognition of these factors, combined with a practical design for the application, will result in a successful, reliable and cost-effective assembly.

Shuttle Molded Conduit Fittings

Accepted industry standards for molded part design should be utilized in the design and development of a custom molded fitting. In general, the follwing should be considered.

1. Determine the type of assembly option desired; i.e., snap in place, push in place, retained with fastener, etc.

2. The wall thickness should be as consistant as possible to minimize potential warpage or excessive shrinkage

3. The design should permit a minimum of 1/2” length of conduit to be molded within the part. Using notched or serrated conduit with 1/2” minimum length results in a minimum of 35 lbs. pull-off.

4. The design should allow for a straight “open and close” of the mold. *NOTE: Our engineering personnel will evaluate your custom conduit fitting and make recommendations regarding its moldability.*

5. The fittings must be designed to allow the insertion of a support pin into the inside diameter of the conduit.

Materials

Material selection should be based on temperature, strength and flexibility requirements. Almost any commercially available thermoplastic resin can be shuttle molded. Typical production parts are molded from the following resins.

Material	Properties	Typical Uses
Poltpropylene	Low Cost, flexibility, low strength and lower temperature ranges	Handles and bushings
Acetal	Moderate cost, good strength, lower impact, moderate stiffness and temperature ranges	Standard fittings, ferrules, bushings and flags
Nylon 6	Some felxibility, good impact resistance and higher temperature ranges	conduit fittings, ferrules and bushings
Nylon 6/6 Glass reinforced	Higher stiffness, good strength and higher temperature ranges	Bushings, levers, brackets and handles

NOTE: Standard colors for these materials are black or natural. Custom colors are available at additional cost.

Select the material based on the application, with the following criteria considered:

1. Environment and operating temperature ranges and extremes
2. Axial and side loaded requirements
3. Exposure to chemicals or containments
4. Assembly method to mating part or mounting surface
5. Actual part function

Control Cable Guide

Conduit and Core Selection

The size and type of the core (cable or wire) and selection of the conduit is determine by the application.

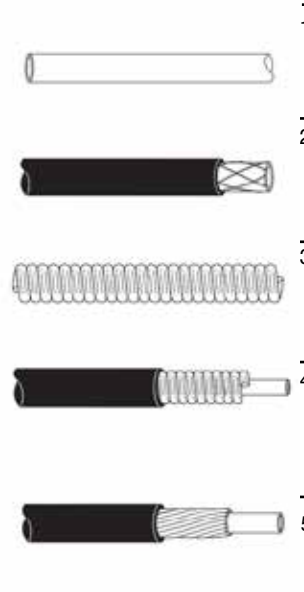
The majority of applications utilize braided, reinforced conduits. It is also possible to shuttle mold conduit fittings on a flat wire Bowden, as well as long lay conduit (consult Scojet Engineering for further information). Braided conduit is coated with either polypropylene (relatively stiff) or nylon (more flexible and heat resistant). Refer to the chart on conduit constructions to aid in selection of the appropriate material to meet your needs.

All conduit and core combinations should include a reasonable clearance between the inner I.D. and the core O.D. For most light and medium duty pull-pull applications, a clearance of.015 to .025 between the conduit I.D. and the cable O.D. is recommended.

NOTE: Decreasing the clearance to minimize the effects of lost motion can result in dramatically higher operational efforts.

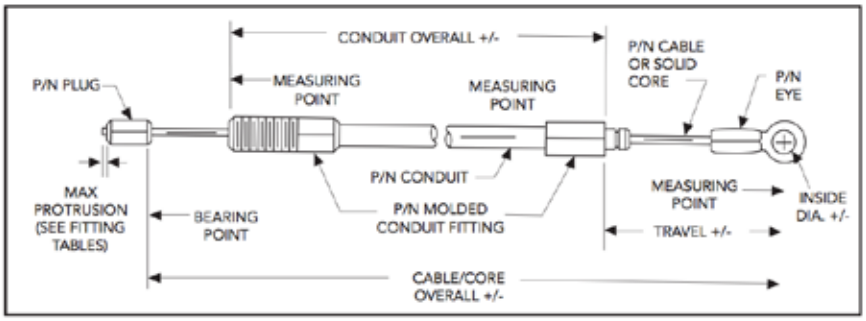
Characteristic	Material	Greatest			Least
Corrosion Resistance	Wire or Cable	Type 302/304 Stainless Steel, Cadmium Plated Music Wire		Copperized Steel Galvanized Steel	Bright Music Wire Oil Temp. Spring Steel
Flexibility	Wire Cable	Small Diameter 7 x 19	7 x 7	1 x 19	Large Diameter 1 x 7
Efficiency	Wire Cable	302/304 Stainless Steel 1 x 19	7 x 19	7 x 7	Hard Drawn Galvanized 1 x 7
Compression Loads	Wire Cable	Large Diameter 1 x 7	1 x 19	7 x 7	Small Diameter 7 x 19
Tensile Loads	Wire Cable	Large Diameter Wire 1 x19	1 x 7	7 x 19	Small Diameter 7 x 7

Conduit Selection and Description

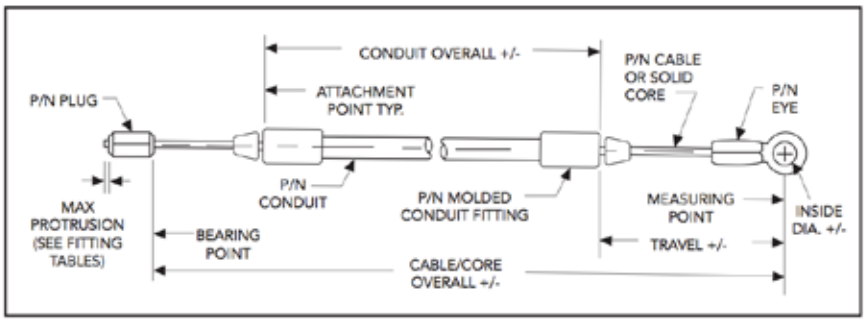


Cost Factor Rating	Conduit Type	Features	Typical Uses
1	Tubing	Lightweight, very flexible. assemblies, vent controls.	Light duty seat release
2	Braided Reinforced	Lightweight with liner braid for stiffness & minimal crush resistance	Seat latch, window mechanism, release assemblies, gas spring control
3	Bowden	Good flexibility, good compression strength, good crush resistance	Medium-duty lower efficiency throttle controls, PTO controls
4	Flat Wire Bowden w/liner	Fairly flexible, high efficiency, good compressive strength, good crush resistance	Remote latch, deck and push-pull controls.
5	Long Lay	Relatively stiff, high compressive strength, good crush resistance.	Clutch cables, brake cables, heavy-duty push-pull controls, marine throttles, shift control cables.

Push-Pull/Pull-Pull Controls



Shuttle Molded Controls



Cable Assembly Tolerances

Assembly Length in Feet	Tight Tol. +/- in./mm.	Normal Tol. +/- in./mm.	Relaxed Tol. +/- in./mm.
0-2 ft.	.030/.076	.060/1.52	.125/3.18
2-5 ft.	.060/1.52	.125/3.18	.188/4.8
5-10 ft.	.188/4.8	.375/9.53	.500/12.7
10-20 ft.	.375/9.53	.500/12.7	.750/19.0
20-40 ft.	.500/12.7	.750/79.0	1.00/25.4
40-50 ft.	.750/19.0	1.00/25.4	2.00/50.8
>50 ft.	DICTATED BY APPLICATION CONTACT SCOJET		

NOTE: Tolerances tighter than shown are sometimes attainable at additional cost.
Contact Scojet Engineering for additional information

NOTE: When dimensioning your finished drawing it is recommended that you specify the conduit overall with the cable/core overall OR the conduit overall and the travel.

Additional specifications, which should be added to your assembly drawing.

1. Holding strength of cable/core end fittings to be---lbs. (N)min.
2. Holding strength of conduit end fittings to be---lbs. (N)min.
3. Max working load in pull mode to be ---lbs.(N)min.
4. Max working load in push mode to be ---lbs. (N). (Solid Core Assemblies)

Shuttle Molding

The process permits the molding of almost any type of thermoplastic component directly to the surface of conduit cable or wire. Shuttle molding is done with a vertical injection molding press that utilizes a shuttle or table. With the press closed and in the molding cycle, one lower-half mold is positioned to either the right or left of the head. This permits the operator to remove completed parts and to reload cut lengths of serrated conduit in preparation for another molding cycle. The process offers the following advantages:

- More cost-effective than assembled steel or plastic components.

- Manufactured and assembled in one operation.

- Better pull-off strength than conventional assembly techniques.

- More design flexibility than metal conduit fittings and flags.

Tooling

All molds are made using standard injection mold tool steels. All cavity inserts and cores are hardened to specification, to reduce wear and ensure tool life. Most shuttle molds are made in 1, 2, 4 and 8-cavity configurations. The number of cavities is dictated by:

- Part size
- Monthly or annual production volume requirement
- Piece part vs. tooling cost analysis
- Complexity of the part design

Custom designed conduit fittings can be prototype using a “soft” single cavity and core pin inserts in out prototype mold base. Prototype tooling can prove the design concept and aid in final specifications for the cable control system. Made for low volume (500-1,000 pieces), these tools are the best way to test a design and get a program going.

Scojet’s extensive selection of tooling for conduit, cable, fittings, as well as standard molded conduit fittings, offer you many solutions for your cable control needs.

Our Engineering personnel can offer suggestions and design assistance early in your cable control project. Feel free to call us with your requirements.

Die Cast Ends:
Die Cast Ends are made out of ZAMAK 5, an alloy containing zinc, aluminum, magnesium and copper. This is the most common alloy for die casting and suits most applications. Its pull off strength is rated at 150 pounds minimum tensile.

Mechanical Properties of ZAMAK 5	
Ultimate Tensile Strength: psi x 10^3 (MPa)	47.5(328)
Yield Strength - 0.2% Offset: psi x 10^3 (MPa)	33(228)
Elongation: % in 2”	7
Shear Strength: psi x 10^3 (MPa)	38(262)
Hardness: Brinell	91
Impact Strength: ft-lb (J)	48(65)
Fatigue Strenght Rotary Bend - 5x10^8 cycles: psi x 10^3 (MPa)	8.2(56)
Compressive Yield Strength 0.1 % offset: psi x 10^3 (MPa)	87(600)
Modulus of Elasticity - psi x 10^6 (MPa x 10^3)	13(87)
Poisson’s Ratio	0.25

Physical Properties of ZAMAK 5	
Density: lb/cu in (g/ cm^3)	47.5(328)
Melting Range: ºF (ºC)	720-730(380-390)
Electrical Conductivity: %IACS	26
Thermal Conductivity: BTU/ft/hr/ºF (W/m/hr/ºC)	64(110)
Coefficient of Thermal Expansion: 68 - 212ºF pin/in/ºF (100-200 ºC pm/mm/ºC)	27
Specific Heat: BTU/lb/ºF (J/kg/ºC)	0.1(410)
Pattern of Die Shrinkage: in/in	1.2

Conduit Swage Fittings:
Fittings that are crimped onto a cable’s conduit include threaded cable ends, bulkheads, snaps, and end caps. These are typically rated for a 30 pound pull off tensile minimum, however certain items can have higher ratings.

Cable Swage Fittings:
Fittings that are crimped on the cable’s wire rope, such as threaded rod ends, and are rated for a minimum pull off strength of 150 pounds tensile.

Swivel Tube Ends:
Tubes are crimped on a die cast end in a manner that allows it to swivel 360 degrees while maintaining a minimum pull off rating of 125 pounds tensile.

Threaded Fittings:
The thread shear pull out strength varies by material and thread size, but this number is usually much higher than other failure points on the cable.

RoHS Compliant:
Clear Zinc Plate. Relieve for Hydrogen Embrittlment. Finish must pass ASTM117-03 Salt Spray test for 72 HOURS Before Oxide Formation appears.

Zinc Plating:
A common sacrificial coating used in finishing steel parts to provide protection from red rust. It is applied electrolytically to a typical thickness of 200-300 micro inches (.0002" - .0003"). The zinc plating protects the underlying steel by a formation of a "galvanic cell," which results in the zinc corroding preferentially to the steel. Red rust will not start forming until all zinc has been converted to white rust (zinc oxide). Normally zinc plating is used for indoor applications, but can also be used as a base for painting. By itself, a 200 - 300 micro inch plating will probably get no more than 12 hours of Salt Spray protection per ASTM-B117. With a clear chromate topcoat the protection time is increased to 72 hours, while a yellow chromate top coating can achieve protection up to approximately 96 hours. Even though it is mostly used as a functional coating, zinc plating does have some decorative appeal. Other properties of zinc plating includes: moderate appearance, excellent abrasion resistance and excellent adhesion.

Black Oxide:
This is a black conversion finish used over steel parts for aesthetic purposes. The coatings have a deep glossy appearance. Self Spray protection approaches 24 hours (ASTM-B117) depending on the sealant used.

Phosphate Conversion Coatings
There are 3 basic types of phosphate coatings: Iron (TT-C-490 type II or IV), zinc (TT-C-490 type 1) and Manganese phosphate (DOD-16232). Iron and Zinc phosphate are both used as a pretreatment on steel and other metal parts to enhance paint adhesion and corrosion resistance. Iron phosphate yields light coating weights of 30 to 80 mg/SF or more. Heavier phosphate coats coating weights require weight paint to achieve a smooth finish. Manganese phosphate is used over steel as a break-in lubricant with oil or where a very 3500 mg/SF. All phosphate coatings can serve as good "in process rust preventatives."

Spring Information:
Scojet can produce springs to your specifications. Things that we need are:

1. General Dimensions
2. Working Length
3. Working Load at the Working Length 4. Desired Finish

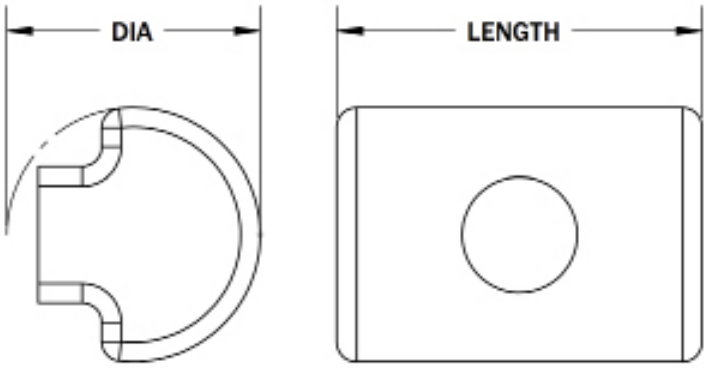
Additional information such as spring rate, coil diameter, wire diameter, and finish will help ensure your springs meet the intended performance needs.

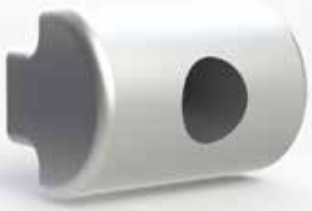
END FITTINGS

BARREL FITTINGS

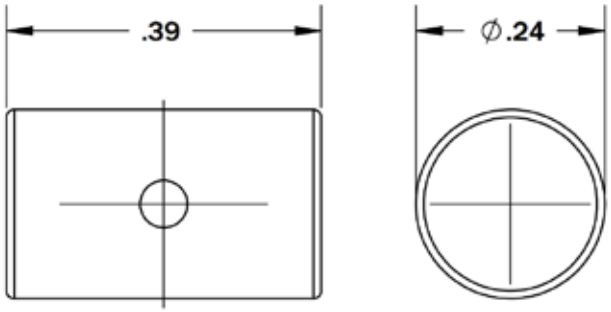
-XXX	DIA.	LENGTH	MAX. CABLE DIA.
001	.125	.187	3/64
002	.16	.18	1/16
003	.160	.285	3/64
004	.187	.105	1/16
005	.187	.200	1/16
006	.194	.275	1/16
007	.219	.250	5/64
008	.20	.30	1/16
009	.20	.40	5/64
010	.23	.25	3/64
011	.230	.375	3/64
012	.250	.160	3/64
013	.25	.25	3/64
014	.250	.312	.1/16
015	.250	.375	5/64
016	.276	.235	1/16
017	.281	.313	1/16
018	.313	.313	1/16
019	.313	.375	5/64
020	.375	.500	1/8
021	.375	.530	5/64
022	.313	.400	1/8

BARREL FITTING BHP100014-XXX
Material: ZAMAK 5

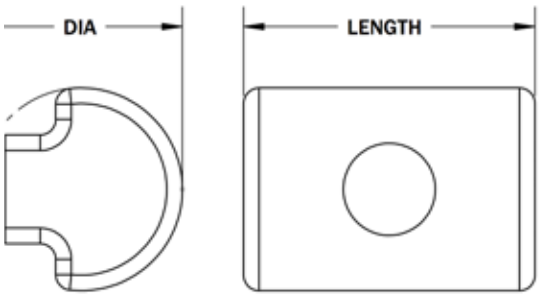




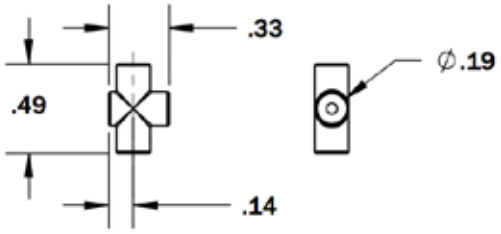
PLUG END BARREL BHP040015
Material: ZAMAK 5



BARREL FITTING BHP100015
Material: ZAMAK 5

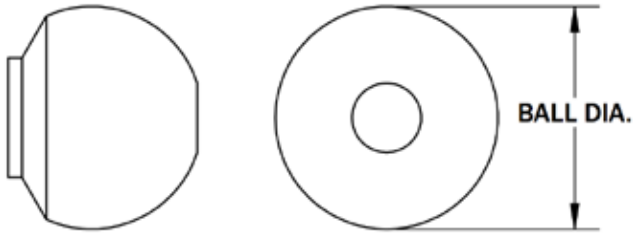


BARREL FITTING BHP100016
Material: ZAMAK 5



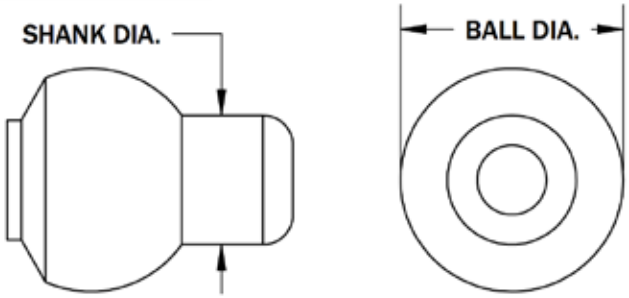
-XXX	BALL DIA.	MAX. CABLE DIA.
001	3/16	5/64
002	1/4	3/32
003	5/16	1/8
004	3/8	1/8
005	1/2	3/16

BALL FITTING BHP100017-XXX
Material: ZAMAK 5

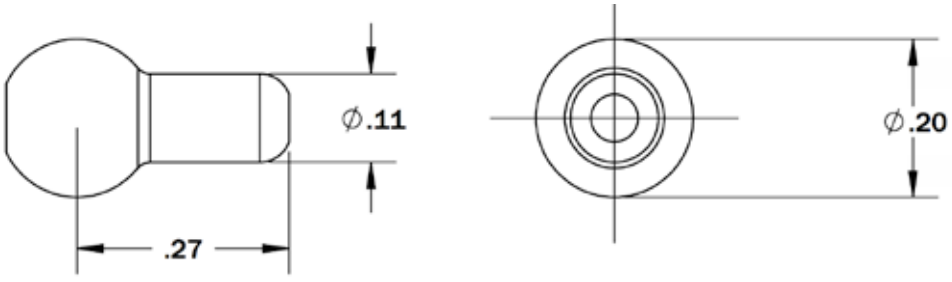


-XXX	BALL DIA.	SHANK DIA.	MAX. CABLE DIA.
001	3/16	.105	5/64
002	1/4	.025	5/64
003	5/16	.056	3/32
004	3/8	.188	1/8
005	1/2	.250	3/16

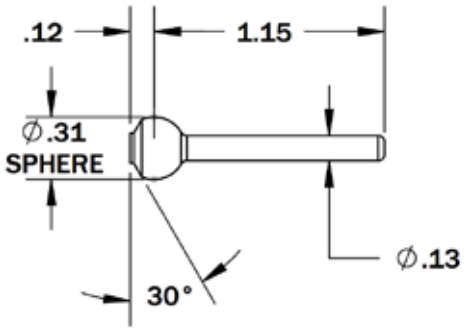
BALL FITTING BHP100018-XXX
Material: ZAMAK 5



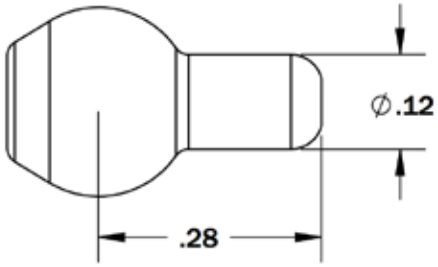
BALL SHANKBHP080003
Material: ZAMAK 5

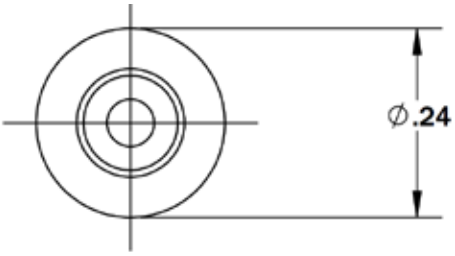


BALL SHANK BHP100044
Material: ZAMAK 5

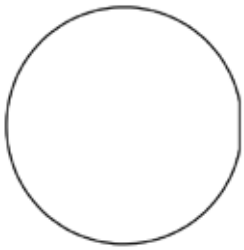


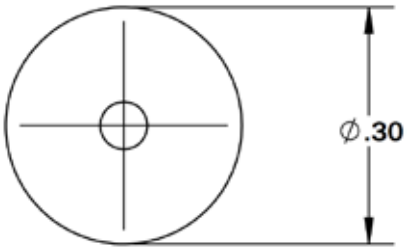
BALL SHANK BHP090006
Material: ZAMAK 5





BALL END BHP090025
Material: ZAMAK 5

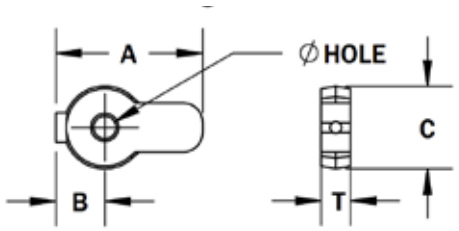




PADDLE FITTING BHP100019-XXX

Material: ZAMAK 5

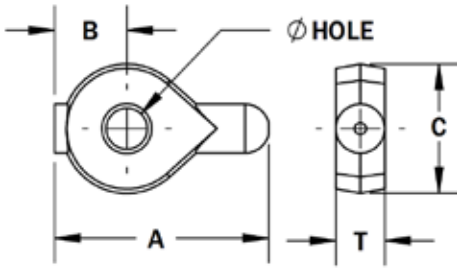
-XXX	MAX. CABLE DIA..	HOLE SIZE	FASTENER SIZE	A	B	C	T
001	1/16	.115	-	.75	.25	.42	.15
002	1/16	.171	#8	.75	.25	.42	.15
003	3/64	.188	11/64	.75	.25	.42	.15
004	1/16	.196	3/16	.75	.25	.42	.15
005	1/16	.205	#12	.75	.25	.42	.15
006	1/16	.234	#12	.90	.30	.54	.15
007	1/16	.265	1/4	.90	.30	.54	.15



PADDLE FITTING BHP100020-XXX

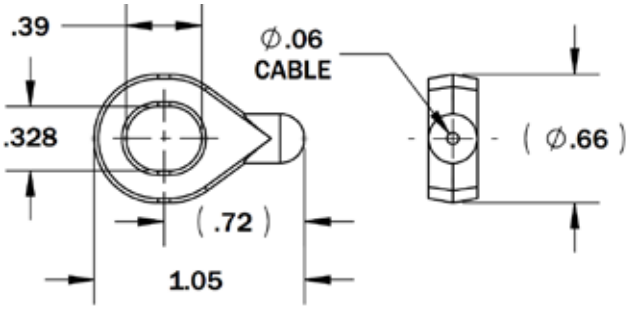
Material: ZAMAK 5

-XXX	MAX. CABLE DIA..	HOLE SIZE	FASTENER SIZE	A	B	C	T
001	3/32	.205	#12	1.10	.37	.66	.25
002	3/32	.265	1/4	1.10	.37	.66	.25
003	3/32	.238	5/16	1.10	.37	.66	.25
004	5/64	.340	11/32	1.10	.37	.66	.25
005	1/16	.367	23/64	1.10	.37	.66	.25
006	3/32	.386	3/8	1.10	.37	.66	.25
007	1/8	.265	1/4	1.10	.37	.74	.25
008	1/8	.328	5/16	1.10	.37	.74	.25
009	1/8	.386	3/8	1.10	.37	.74	.25



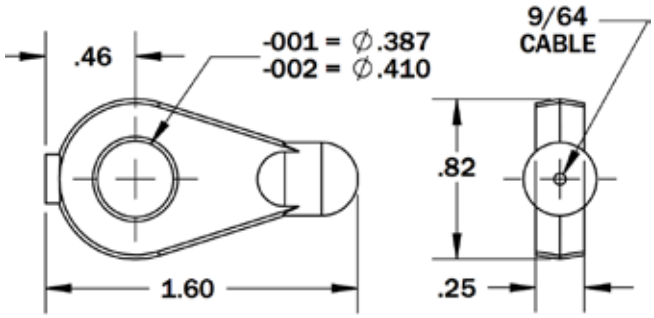
PADDLE FITTING BHP100021

Material: ZAMAK 5



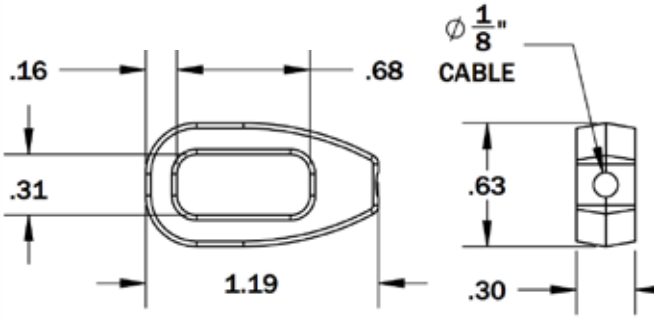
PADDLE FITTING BHP100022-XXX

Material: ZAMAK 5



PADDLE FITTING BHP100023

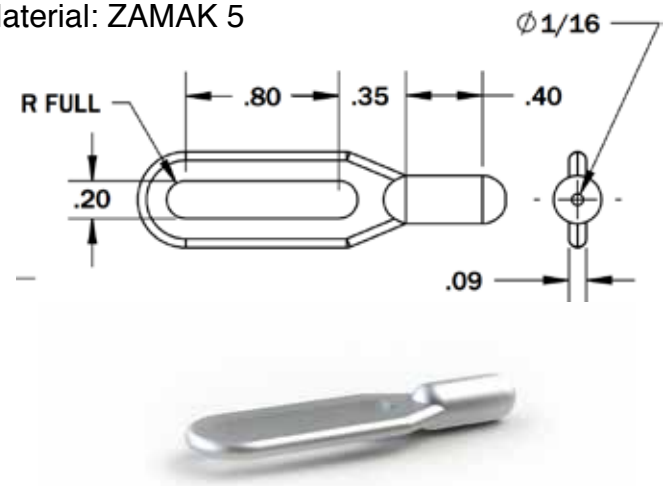
Material: ZAMAK 5



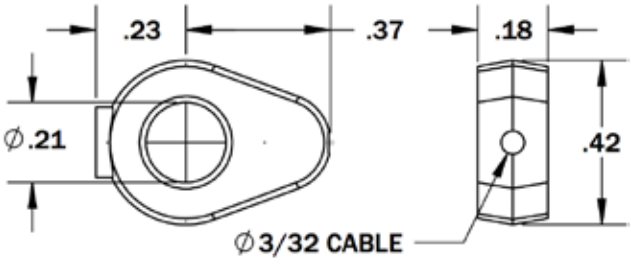
END FITTINGS

PADDLE FITTINGS

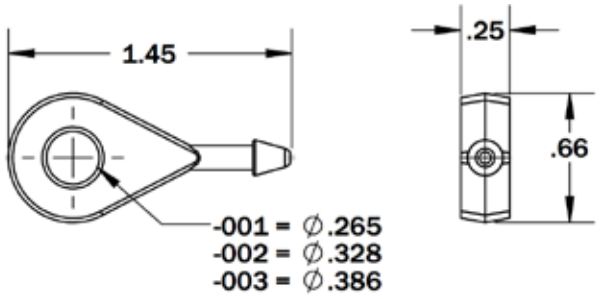
PADDLE FITTING BHP100024
Material: ZAMAK 5



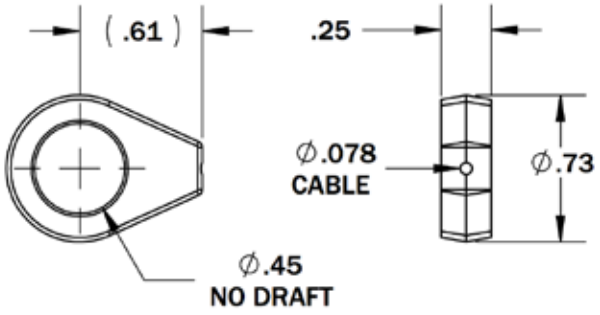
PADDLE FITTING BHP100025
Material: ZAMAK 5



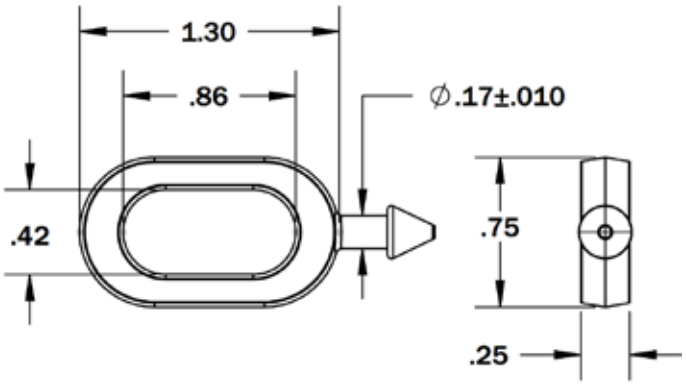
PADDLE FITTING BHP100026-XXX
Material: ZAMAK 5



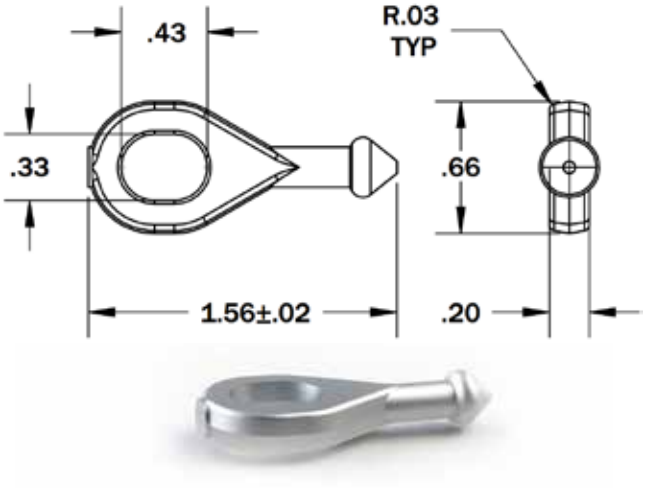
PADDLE FITTING BHP100039
Material: ZAMAK 5



PADDLE FITTING, BOOT ANCHOR BHP100048
Material: ZAMAK 5



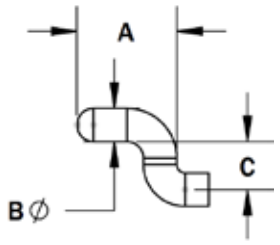
PADDLE FITTING, BOOT ANCHOR BHP100049
Material: ZAMAK 5



-XXX	A	B	C	R	13GA. (.090)	12GA, (.105)	11GA. (.120)	10GA. (.134)
001	.51	.165	.155	B/2	.199	.206	.214	.221
002	.51	.168	.162	-	.191	.198	.206	.216
003	.51	.160	.160	-	.184	.191	.199	.206
004	1.06	.197	.155	B/2	.219	.227	.234	.241
005	.61	.165	.155	B/2	.199	.210	.214	.223
006	1.05	.170	.245	B/2	.183	.183	.183	.190

RECOMMENDED HOLE DIA. VS. MATERIAL SIZE
Material: ZAMAK 5

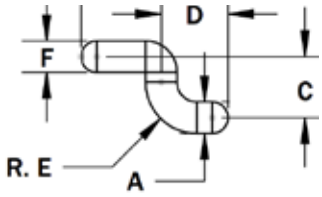
Z FITTING BHP100030-XXX



-XXX	A	B	C	D	E	F	13GA. (.090)	12GA, (.105)	11GA. (.120)	10GA. (.134)	9GA. (.134)
001	.156	.75	.305	.340	.255	.156	.183	.196	.217	N/A	N/A
002	.187	1.00	.358	.390	.315	.202	.215	.225	.241	.260	N/A
003	.210	1.00	.413	.450	.355	.225	.229	.236	.244	.255	.292

RECOMMENDED HOLE DIA. VS. MATERIAL SIZE
Material: ZAMAK 5

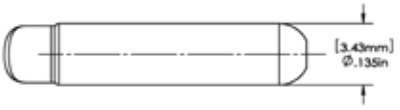
Z FITTING BHP100031-XXX

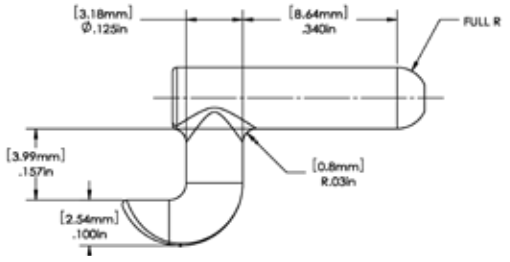


MATERIAL THICKNESS	13GA. (.090)	12GA, (.105)	11GA. (.120)	10GA. (.134)
MIN HOLE DIA. AFTER FINISH	.156	.166	.172	.180

Material: ZAMAK 5

Z FITTING BHP100038

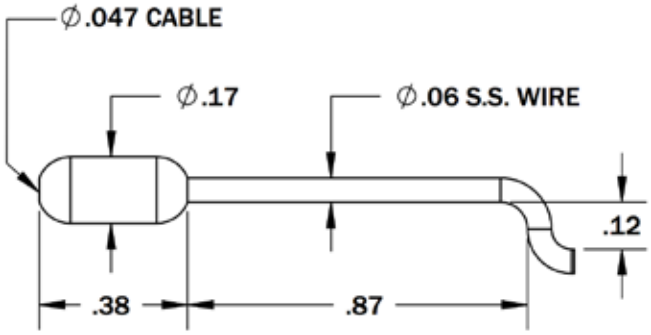




-XXX	LENGTH	DIA.
001	.38	.17

Material: ZAMAK 5 / S.S. Wire

BHP100042 WIRE Z FITTING

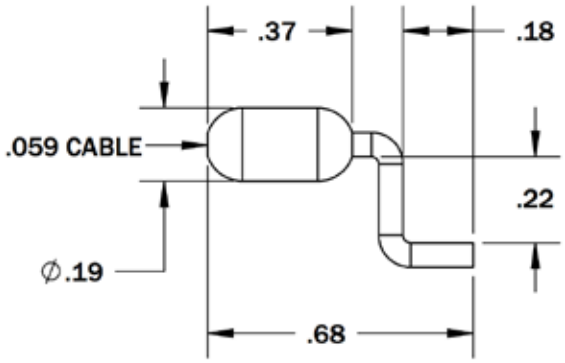


END FITTINGS

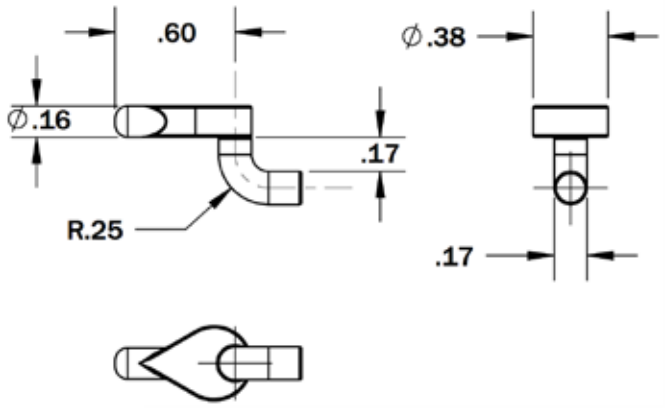
Z FITTINGS

-XXX	LENGTH	DIA.
001	.37	.19

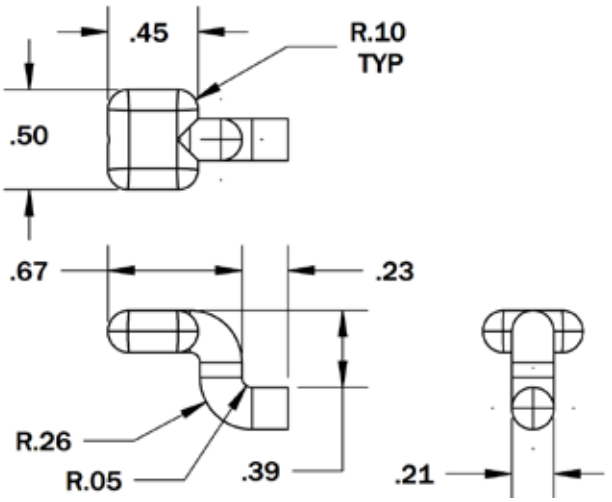
BHP100043 WIRE Z FITTING
Material: ZAMAK 5 / S.S. Wire



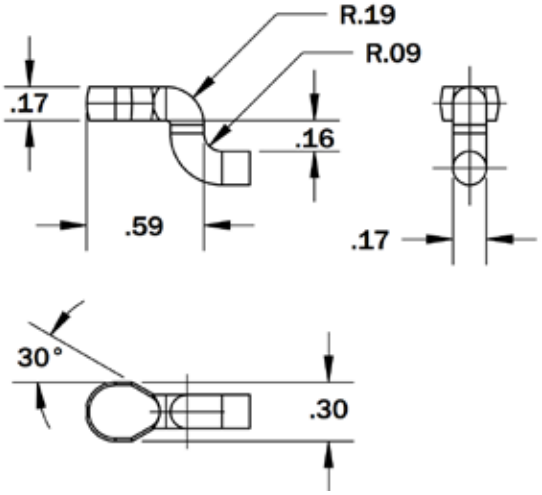
Z FITTING BHP100045
Material: ZAMAK 5



Z FITTING BHP100046
Material: ZAMAK 5



Z FITTING BHP100047
Material: ZAMAK 5

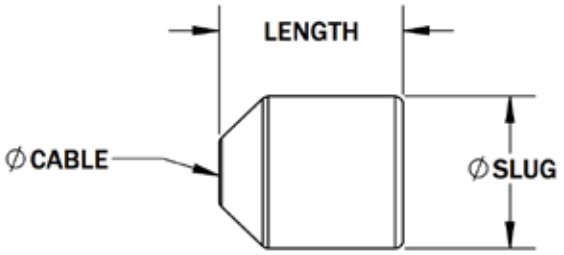


END FITTINGS

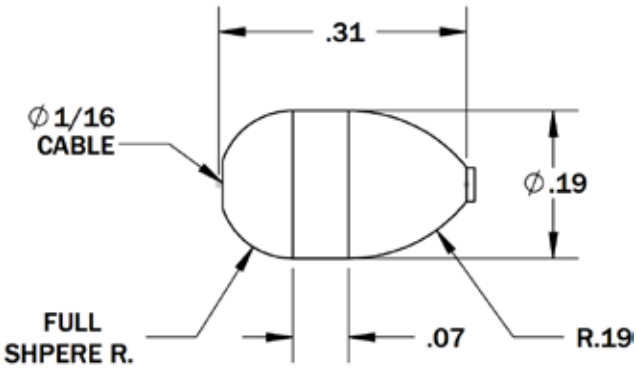
SLUG FITTINGS

-XXX	DIA.	LENGTH	MAX CABLE SIZE
001	.119	.123	3/64
002	.122	.185	1/16
003	.158	.130	1/16
004	.187	.500	1/16
005	.187	.225	1/16
006	.205	.220	3/32
007	.250	.400	1/8
008	.250	.500	3/32
009	.250	.525	1/8
010	.260	.375	1/16
011	.281	.43	1/8
012	.370	.750	1/8
013	.370	.450	1/8
014	.310	.560	3/32
015	.317	.500	1/16
016	.250	.298	3/32
017	.437	.650	1/16
018	.310	.400	1/16
019	.250	.250	3/32

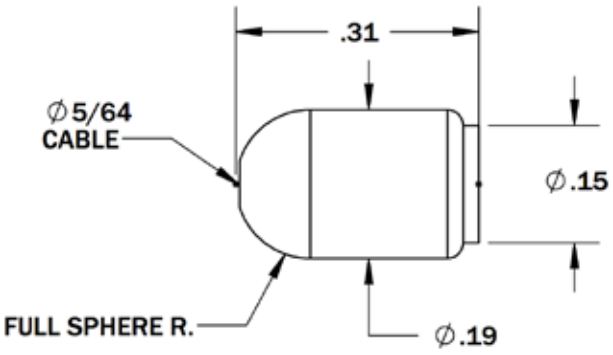
SLUG FITTING BHP100027-XXX
Material: ZAMAK 5



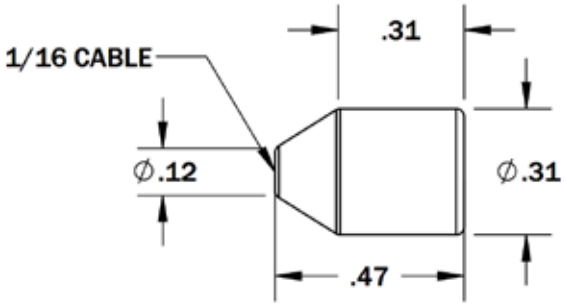
SLUG FITTING BHP100036
Material: ZAMAK 5



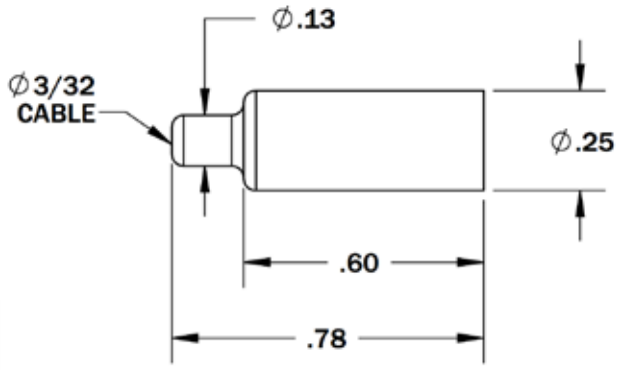
SLUG FITTING BHP100034
Material: ZAMAK 5



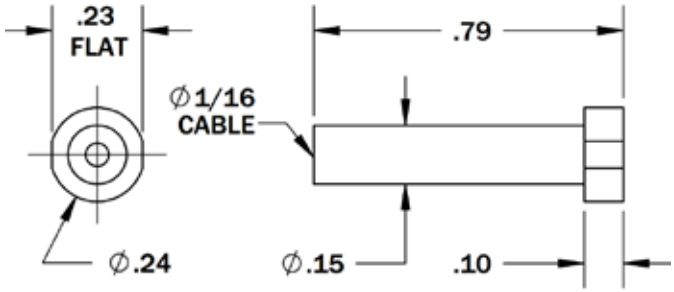
SLUG FITTING BHP070027
Material: ZAMAK 5



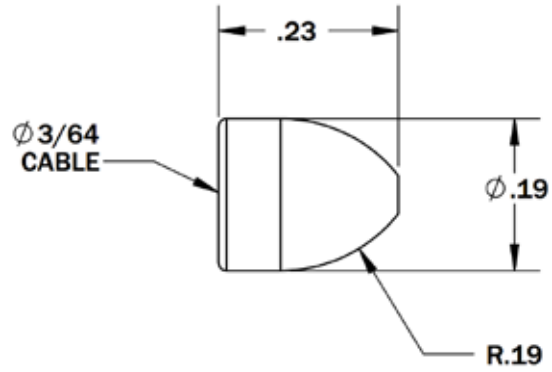
SHANK SLUG FITTING BHP100032
Material: ZAMAK 5



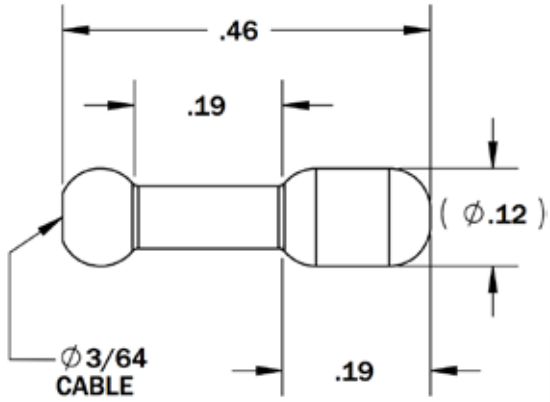
SHANK SLUG FITTING BHP100029
Material: ZAMAK 5



TEARDROP SLUG FITTING BHP100035
Material: ZAMAK 5



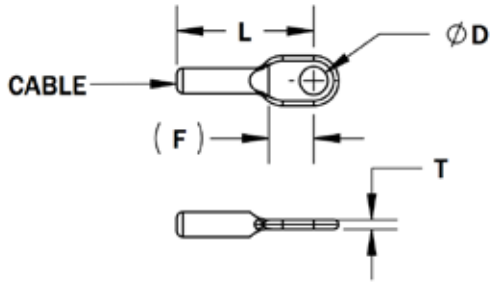
HOUR GLASS SLUG FITTING BHP100033
Material: ZAMAK 5



-XXX	L	D	F	T	CABLE
001	1.37	.281	.56	.093	1/16
002	1.37	.281	.56	.125	3/32
003	1.37	.386	.56	.125	3/32
004	1.37	.265	.56	.125	3/32
005	1.56	.203	.56	.125	1/8
006	1.37	.250	.37	.125	1/8

Material: Aluminum

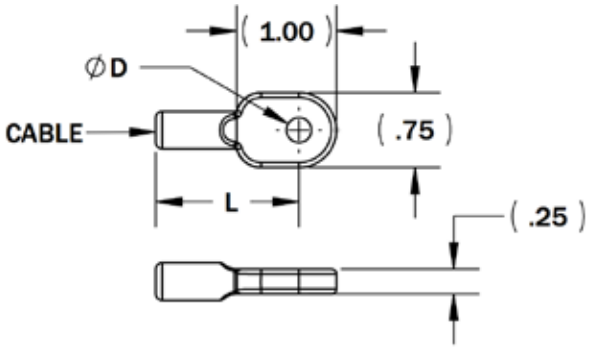
SWAGE CABLE EYE BHP100050-XXX



-XXX	L	D
001	1.83	.265
002	1.47	.375
003	1.47	.386
004	1.83	.329
005	1.83	.386
006	1.47	.329

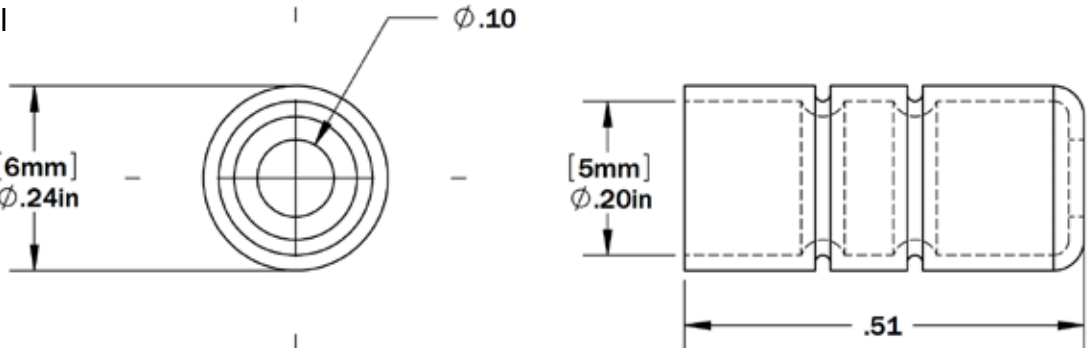
Material: Aluminum

SWAGE CABLE EYE BHP100051



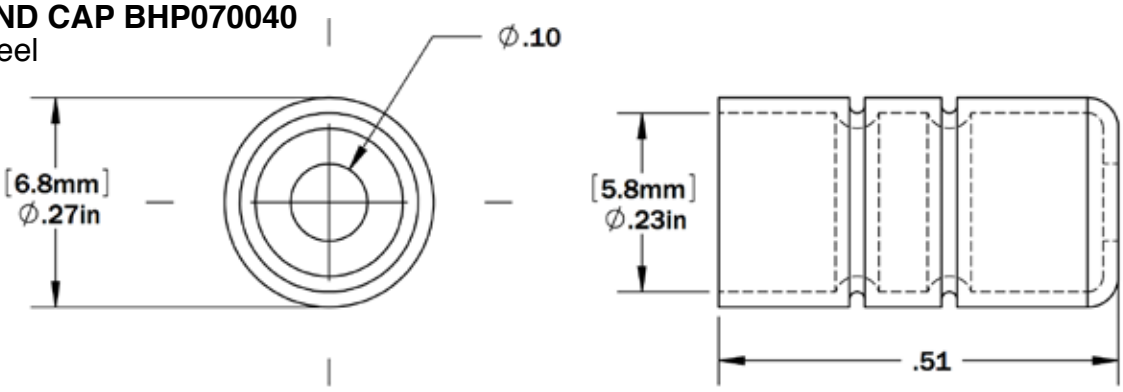
SWAGE ON END CAP BHP040017

Material: A3 Steel



SWAGE ON END CAP BHP070040

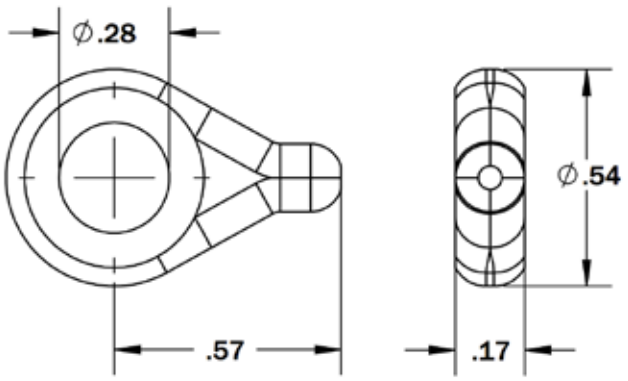
Material: A3 Steel



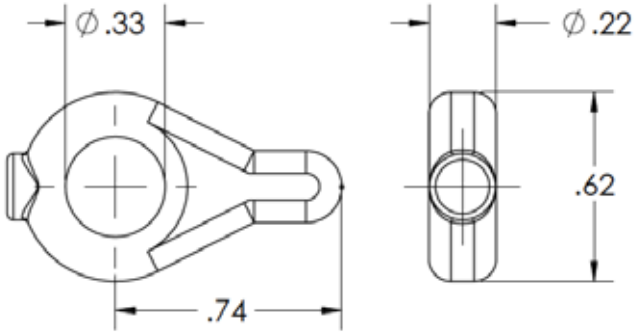
END FITTINGS

EYELETS

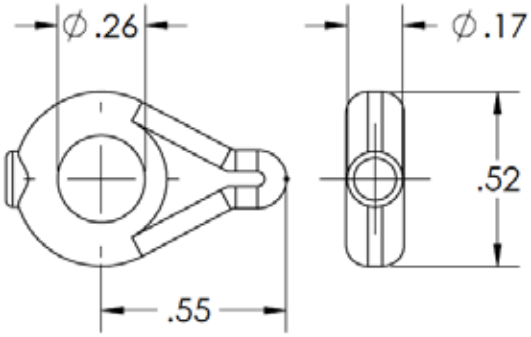
EYELET BHP070038
Material: ZAMAK 5



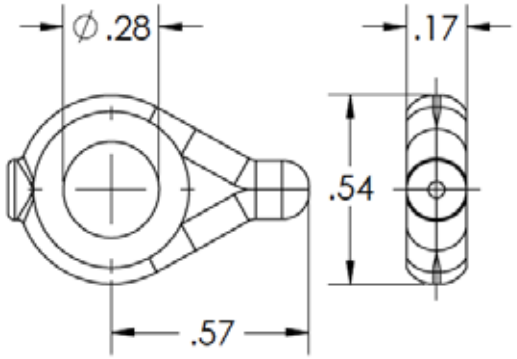
EYELET BHP090001
Material: ZAMAK 5



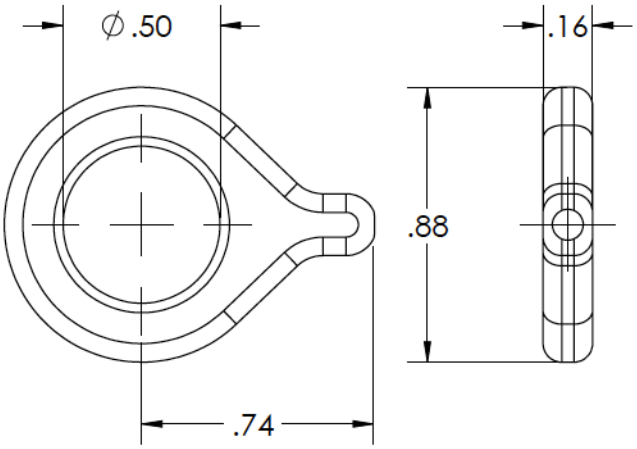
EYELET BHP090002
Material: ZAMAK 5



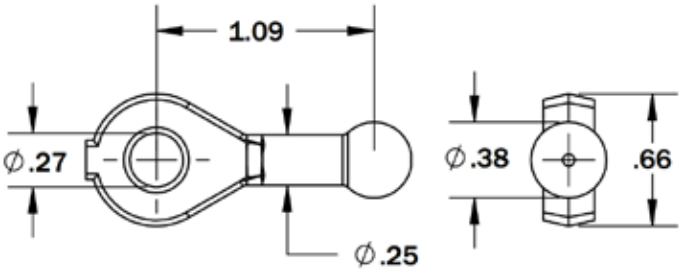
EYELET BHP090020
Material: ZAMAK 5



EYELET BHP090017
Material: ZAMAK 5

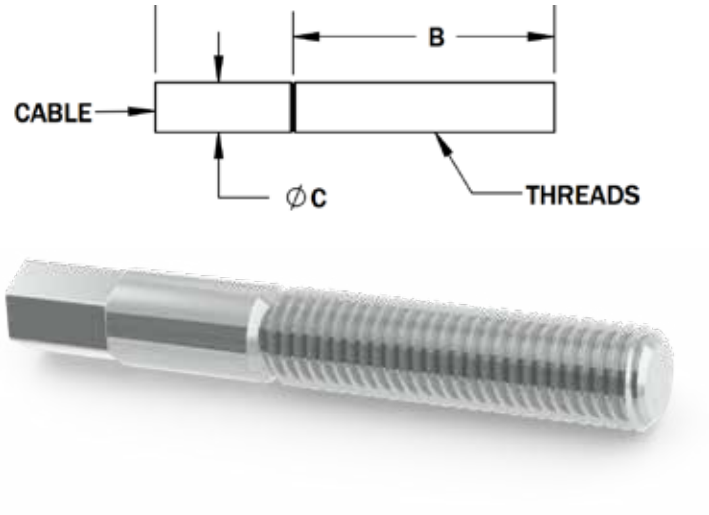


EYELET FOR BELLOW BHP090071
Material: ZAMAK 5



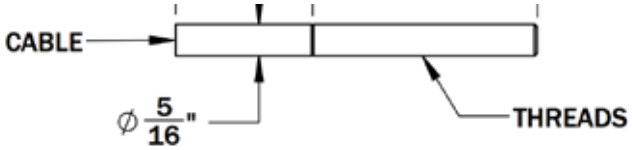
THREADED END ROD BHP100052-XXX
Material: Steel

-XXX	A	B	C	THREAD	CABLE
001	1.375	.75	3/16	#10-24	1/16
002	1.875	1.25	3/16	#10-24	1/16
003	2.750	2.00	3/16	#10-24	1/16
004	2.125	1.50	3/16	#10-32	1/16
005	2.125	1.50	3/16	#10-24	5/64
006	1.625	.87	1/4	1/4-20	3/32
007	2.250	1.50	1/4	1/4-20	3/32
008	2.00	1.31	1/4	1/4-28	3/32
009	3.687	2.94	5/16	5/16-24	3/32
010	2.750	1.75	5/16	5/16-18	1/8
011	2.750	1.75	5/16	5/16-24	1/8
012	3.375	2.25	3/8	3/8-16	3/16



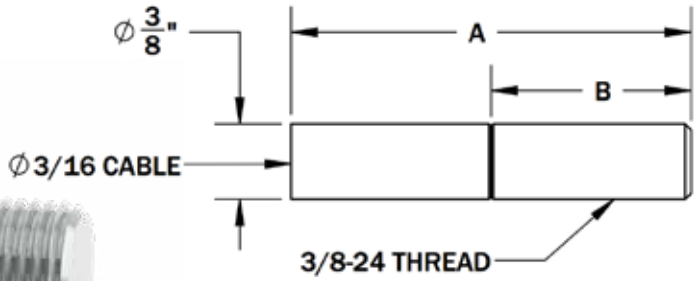
THREADED END ROD BHP100053-XXX
Material: Steel

-XXX	A	B	THREAD	CABLE
001	3.62	.75	5/16-24	.140
002	4.31	1.25	1/4-20	.140
003	2.25	2.00	1/4-20	.078



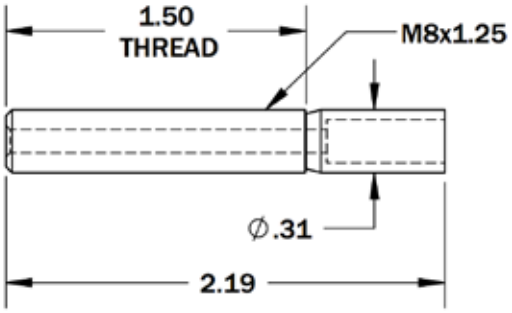
THREADED END ROD BHP100054-XXX
Material: Steel

-XXX	A	B
001	2.00	1.00
002	2.50	1.50
003	3.00	2.00
004	3.25	2.25

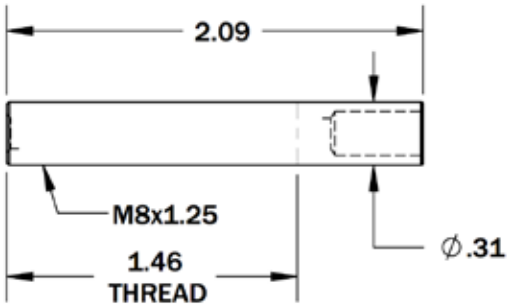


END FITTINGS
THREADED CABLE ENDS

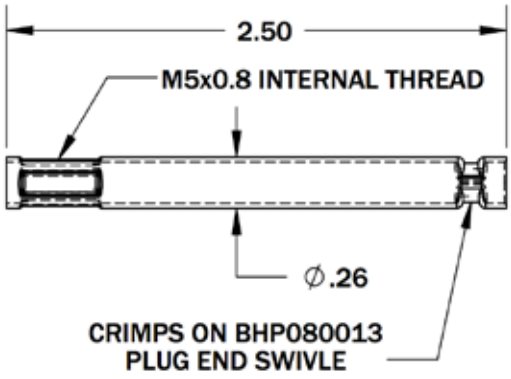
BHP070043 Material: A3 Steel



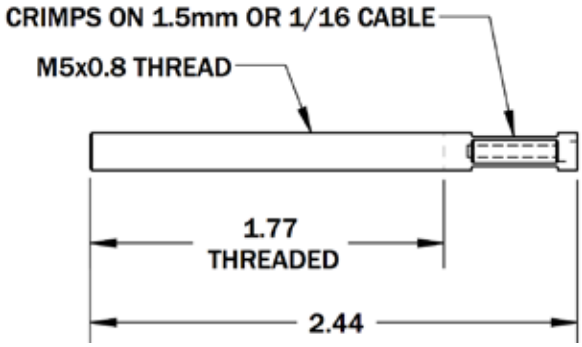
Material: A3 Steel **BHP080022**



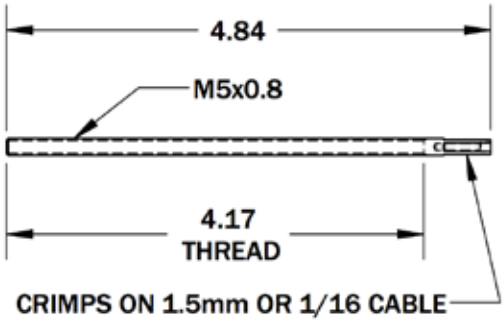
BHP080014 Material: A3 Steel



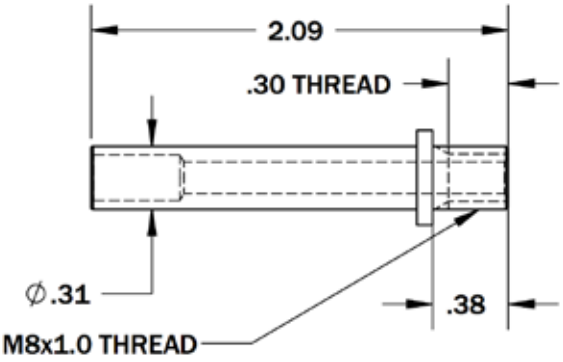
Material: A3 Steel **BHP080015**



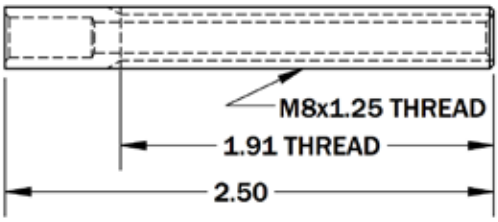
BHP090005 Material: A3 Steel



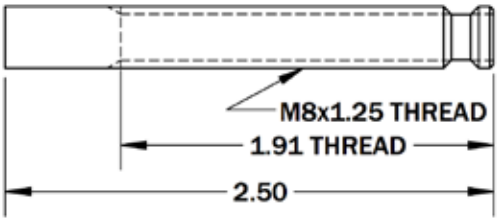
Material: A3 Steel **BHP090042**



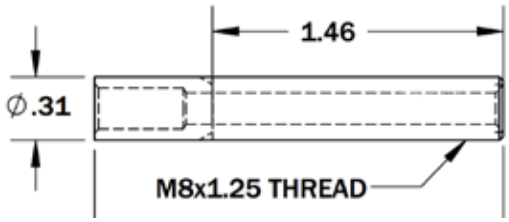
BHP090046 Material: A3 Steel



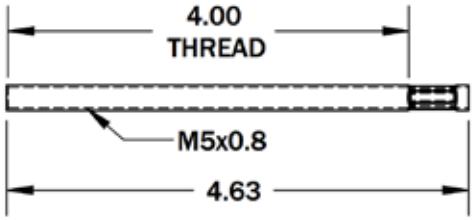
Material: A3 Steel **BHP100085**



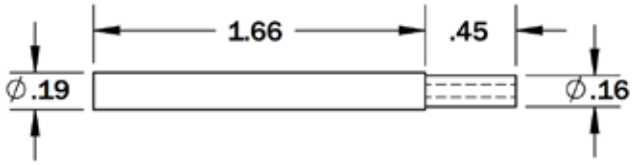
THREADED CABLE END BHP040013
Material: A3 Steel
Finish: Clear Zinc



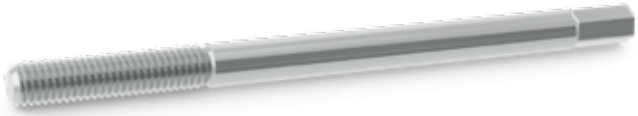
THREADED CABLE END TUBE BHP090004
Material: A3 Steel
Finish: Clear Zinc

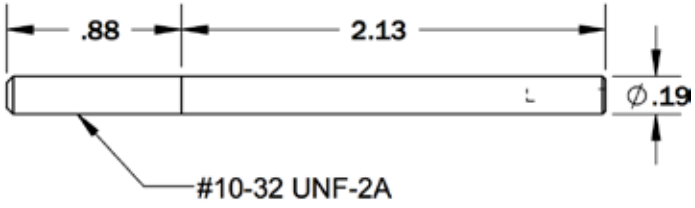


THREADED CABLE END BHP100102
Material: A3 Steel
Finish: Clear Zinc



THREADED CABLE END BHP100104
Material: A3 Steel
Finish: Clear Zinc



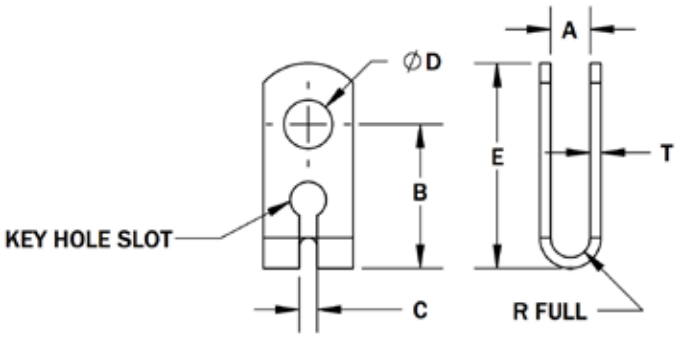


END FITTINGS
CLEVIS PARTS

CLEVIS - TYPE 1 BHP100073

PART NO.	A	B	C	D	E	F	T	KEY SLOT	BALL SIZE
001	.22	.80	.100	.270	1.14	.50	.078	NO	3/16
002	.22	.80	.09	.270	1.14	.50	.078	YES	3/16
003	.34	.88	.20	.265	1.19	.63	.090	YES	3/16
004	.41	1.25	.22	.328	1.56	.63	.120	NO	5/16
005	.32	.75	.16	.281	1.00	.62	.059	NO	5/16
006	.260	.89	.115	.265	1.20	.50	.075	YES	3/16
007	.510	1.35	.21	.39	1.78	.75	.105	YES	3/8

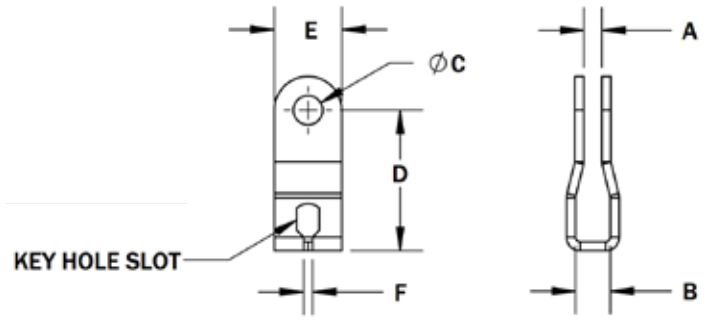
Material: Plain Sheet Steel



CLEVIS - TYPE 2 BHP100074

PART NO.	A	B	C	D	E	F	KEY SLOT
001	.21/.27	.41/.42	.32/.33	1.44	.65	.21	NO
002	.22/.28	.38/.39	.39/.41	.188	.75	.21	NO
003	.16/.22	.38/.39	.39/.41	1.56	.75	.21	NO
004	.22/.28	.51/.52	.32/.33	1.75	.75	.21	NO
005	.20/.28	.51/.52	.39/.41	2.38	.75	.21	NO
006	.26/.28	.51/.52	.32/.33	1.45	.75	.21	NO
007	.16/.22	.38/.39	.39/.41	1.56	.75	.21	YES
008	.21/.27	.41/.42	.32/.33	1.44	.65	.21	YES

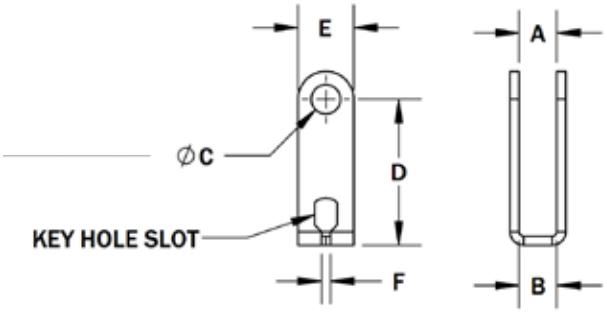
Material: Plain Sheet Steel



CLEVIS - TYPE 3 BHP100075

PART NO.	A	B	C	D	E	F	KEY SLOT
001	.38/.45	.30/.40	.32/.33	1.62	.62	.21	NO
002	.38/.45	.39/.40	.32/.33	2.00	.62	.21	NO
003	.38/.45	.39/.40	.39/.40	2.00	.75	.21	NO
004	.49/.56	.51/.52	.32/.33	1.62	.62	.21	NO
005	.49/.56	.51/.52	.39/.40	1.94	.75	.21	NO
006	.49/.56	.51/.52	.315/.320	1.94	.75	.21	NO
007	.38/.45	.39/.40	.32/.33	1.62	.62	.21	YES

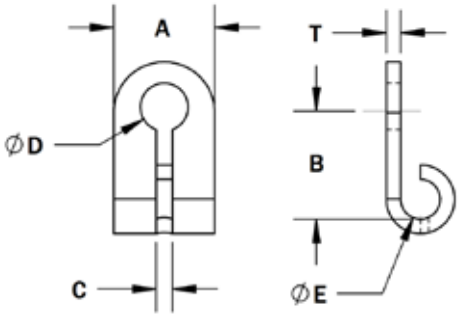
Material: Plain Sheet Steel



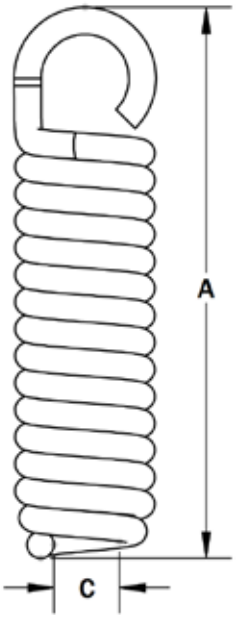
HALF CLEVIS BHP100076

PART NO.	A	B	C	D	E	T
001	.562	.62	.090	.265	.218	NO
002	.750	.91	.165	.325	.359	NO

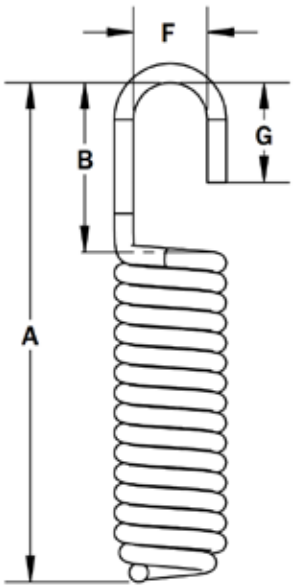
Material: Plain Sheet Steel



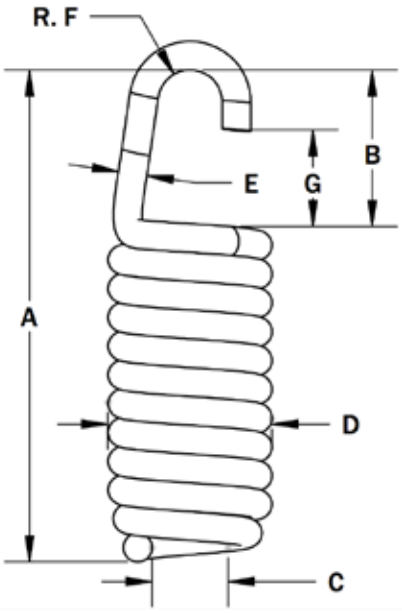
STYLE 1



STYLE 2

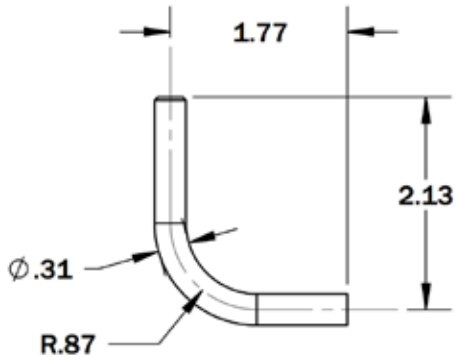


STYLE 3



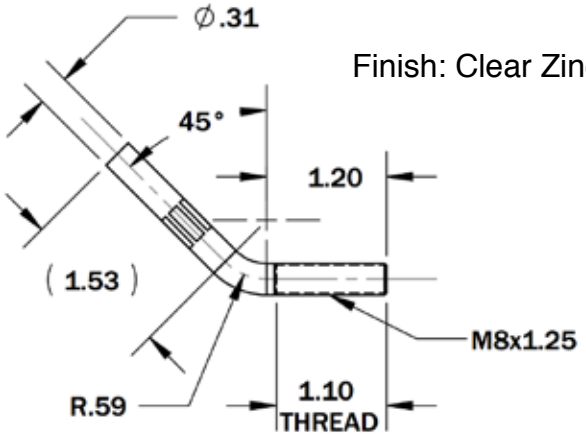
PART NO.	STYLE	FINISH	A	B	C	D	E	F	G	INITIAL LBS. TEN-SION	MAX LBS. LOAD	MAX EXT.	SPRING RATE
BHP100077	1	BLACK OXIDE	2.62	.44	.31	.700	.135	.44	.22	37.00	143.60	.55	189.00
BHP100078	1	ZINC PLATE	3.12	.75	.38	1.20	.177	.75	.55	38.90	160.00	1.00	126.00
BHP100079	2	ZINC PLATE	1.50	.36	.19	.400	.067	.26	.19	8.00	32.00	1.98	54.00
BHP100080	2	BLACK FINISH	2.50	.85	.22	.56	.095	.37	.50	15.50	83.00	.79	86.00
BHP100081	2	PHOS-PHATE & OIL	4.36	.15	.24	.57	.100	.37	.34	14.00	80.00	1.00	40.00
BHP100082	2	BLACK ZINC	5.15	2.07	.27	.600	.085	.43	.50	8.61	35.00	1.50	16.94
BHP100083	2	ZINC PLATE	2.00	1.00	.25	.545	.095	.35	.50	16.00	69.00	.36	145.00
BHP100087	2	ZINC PLATE	2.00	.92	.21	.625	.106	.41	.30	16.25	70.50	.303	179.00
BHP100088	2	ZINC PLATE	1.76	.36	.19	.470	.085	.30	.21	8.00	58.00	.46	109.00
BHP100114	2	ZINC PLATE	3.95	2.41	.22	.687	.119	.383	.59	10.00	85.00	.45	150.00
BHP100115	3	ZINC PLATE	1.23	.35	.19	.410	.072	.08	.15	10.00	55.40	.38	113.00

BULKHEAD BHP070028
Material: A3 Steel



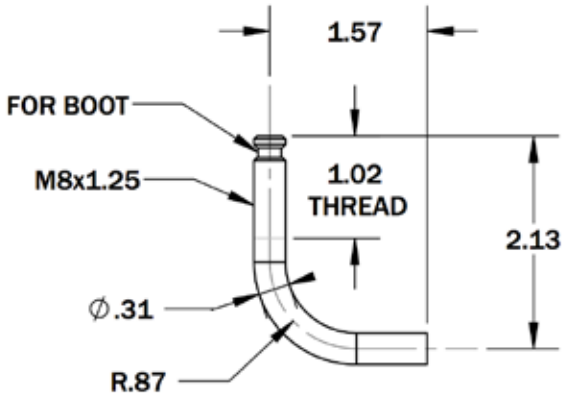
Finish: Clear Zinc

BULKHEAD BHP080005
Material: A3 Steel



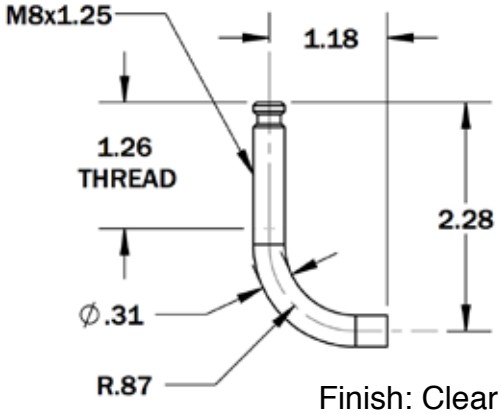
Finish: Clear Zinc

BULKHEAD BHP100006
Material: A3 Steel



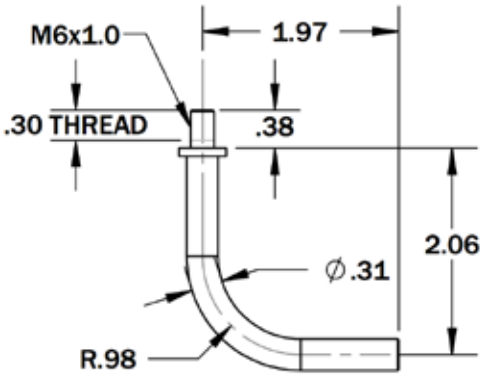
Finish: Clear Zinc

BULKHEAD BHP100007
Material: A3 Steel



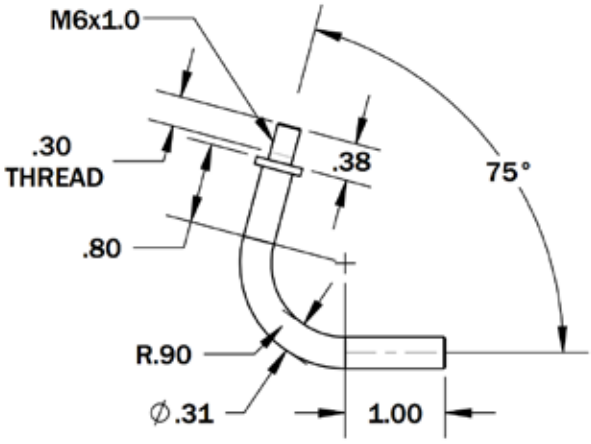
Finish: Clear Zinc

BULKHEAD BHP090044
Material: A3 Steel



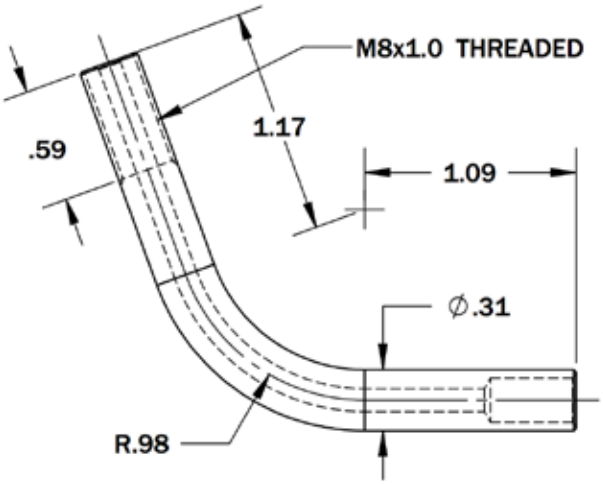
Finish: Clear Zinc

BULKHEAD BHP090047
Material: A3 Steel



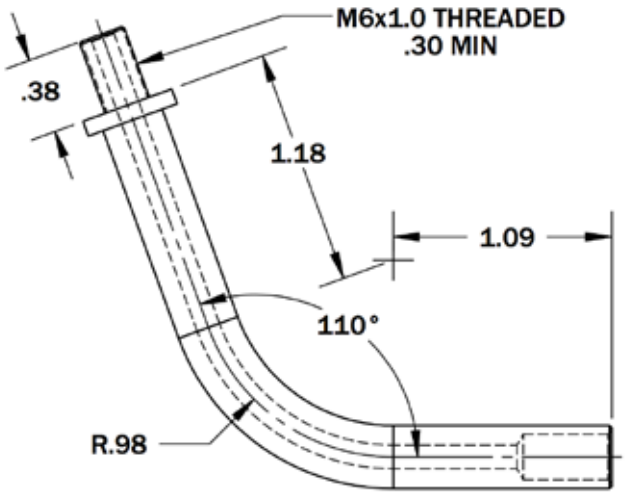
Finish: Clear Zinc

BULKHEAD BHP090003
Material: A3 Steel



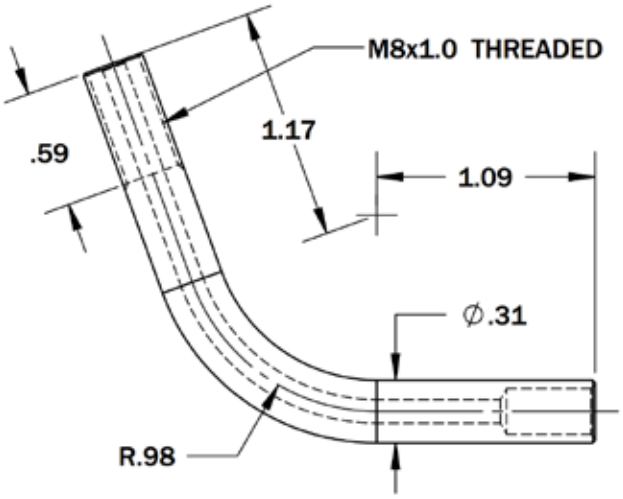
Finish: Clear Zinc

BULKHEAD BHP100001
Material: A3 Steel



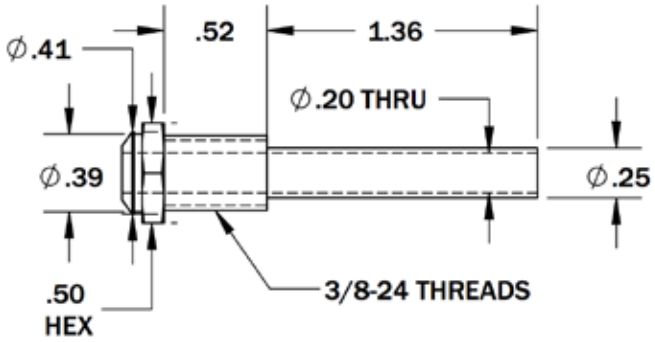
Finish: Clear Zinc

BULKHEAD BHP100005
Material: A3 Steel

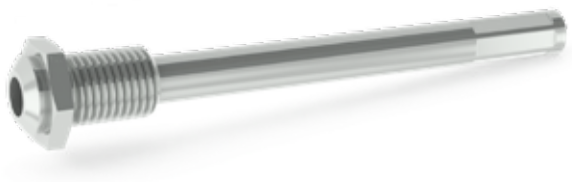


Finish: Clear Zinc

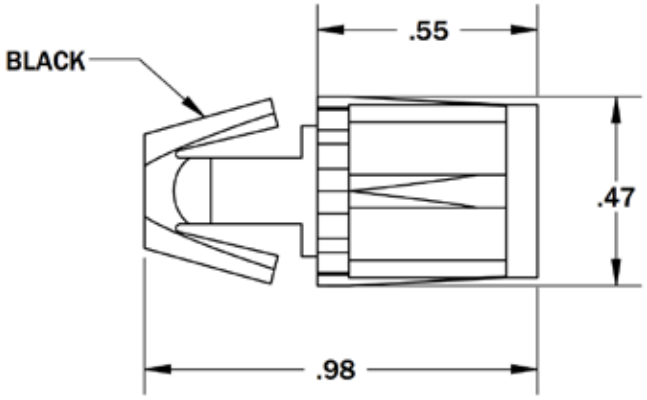
BULKHEAD BHP100101
Material: A3 Steel



Finish: Clear Zinc

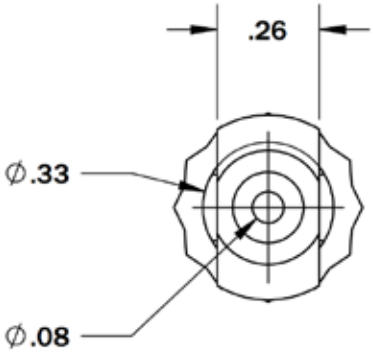


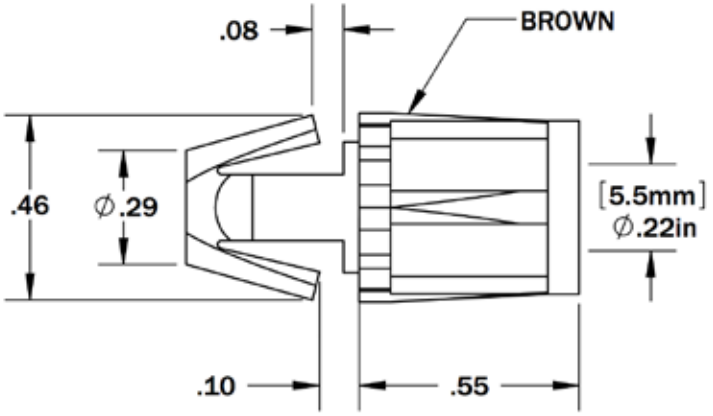
SNAP BHP070041
Material: Black PP Copolymer



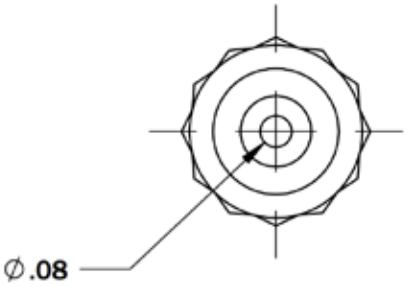
BHP070041 & BHP100086 ARE DIMENSIONALY IDENTICAL

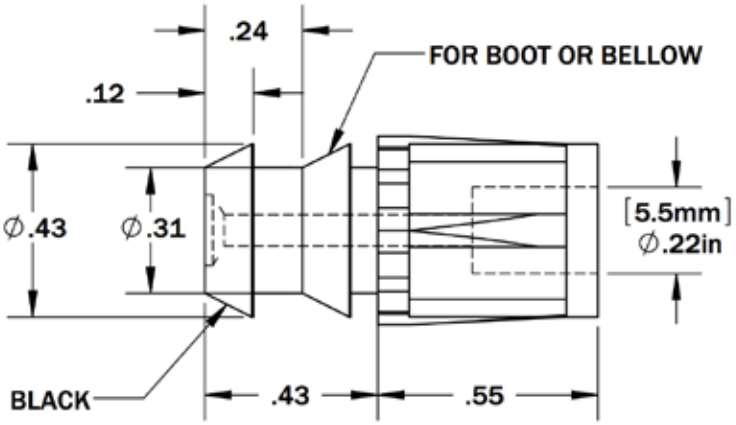
SNAP BHP100086
Material: Black PP Copolymer



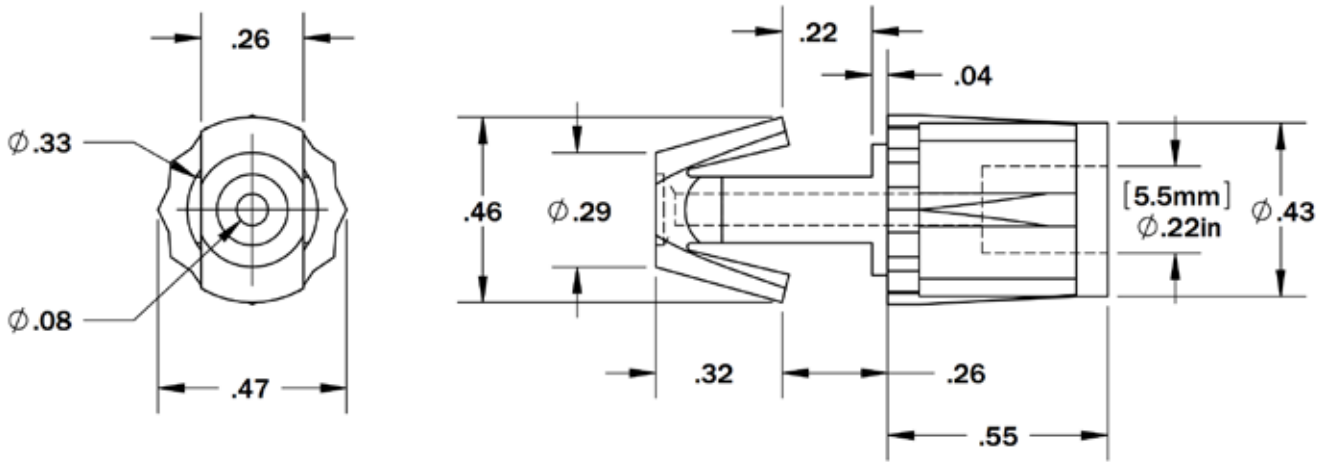


BOOT BARB BHP100109
Material: Black PP Copolymer

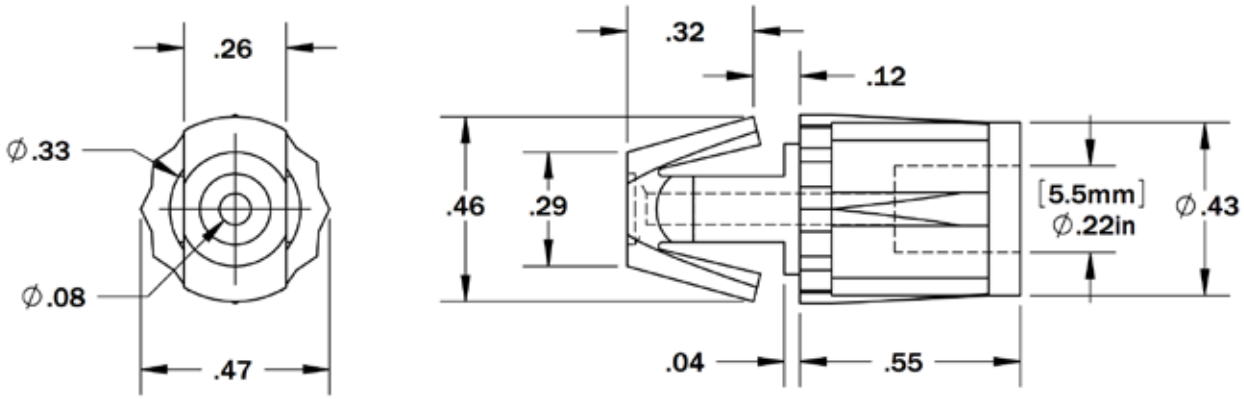




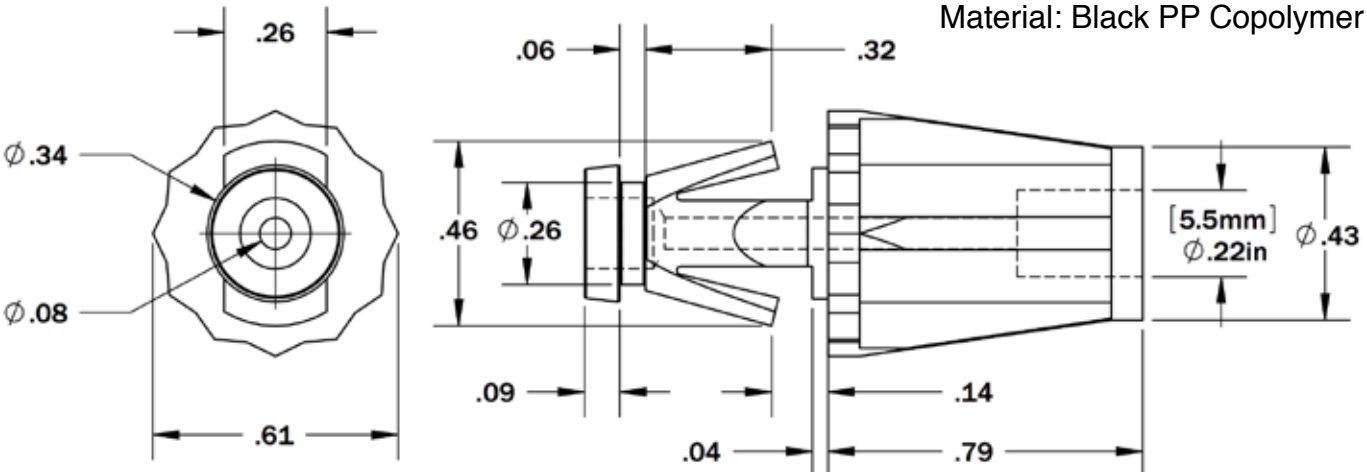
SNAP BHP090031
Material: Black PP Copolymer



SNAP BHP090043
Material: Black PP Copolymer

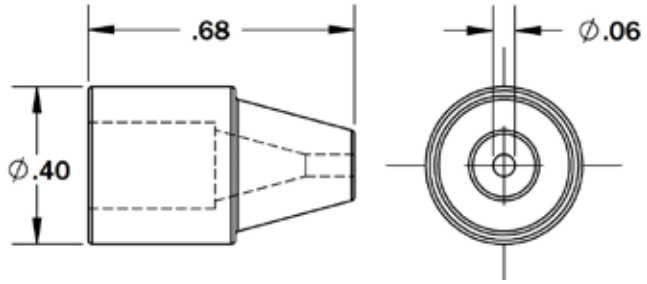


SNAP BHP090048
Material: Black PP Copolymer

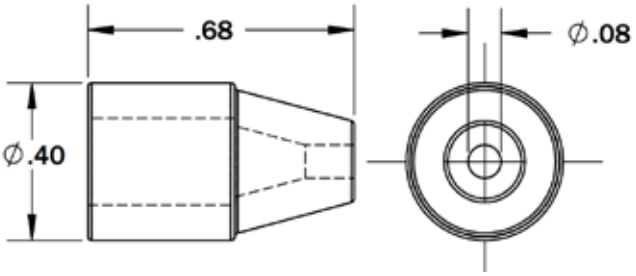


-XXX	FOR THREAD
001	1/4
002	5/16

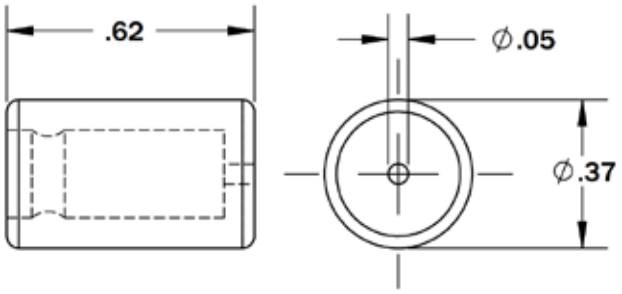
SEAL END WIPER BHP100056
Material: Black Rubber



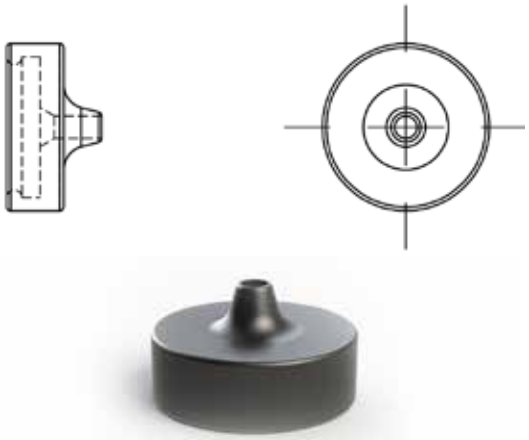
SEAL END WIPER BHP100057
Material: Black Rubber



SEAL END WIPER BHP100058
Material: Black Rubber

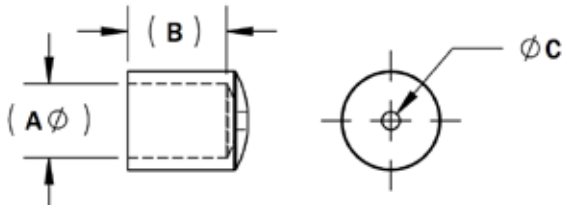


SEAL END WIPER BHP100059
Material: Black Rubber



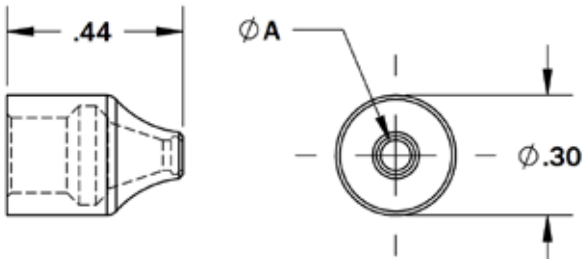
SEAL END WIPER BHP100060
Material: Black Rubber

-XXX	A	B	C	COLOR
001	.37	.62	.16	BLACK
002	.28	.50	.09	RED
003	.34	.50	.09	BLACK
004	.28	.50	.09	BLACK
005	.34	.50	.20	BLACK

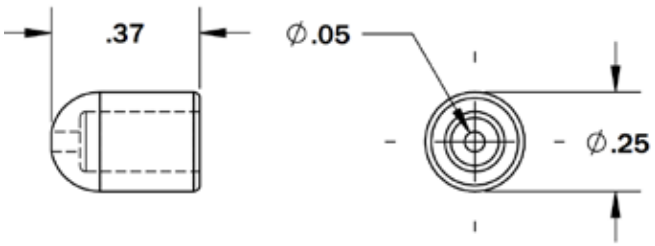


SEAL END WIPER BHP100061
Material: Black Rubber

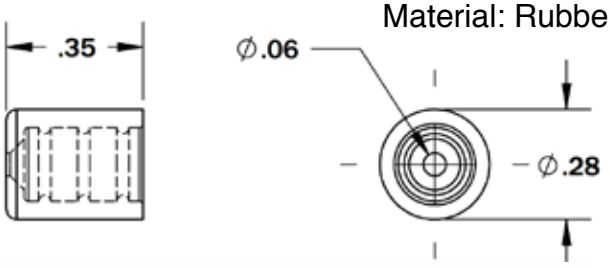
-XXX	A	COLOR
001	.076	GRAY
002	.056	BLACK
003	.096	BLACK



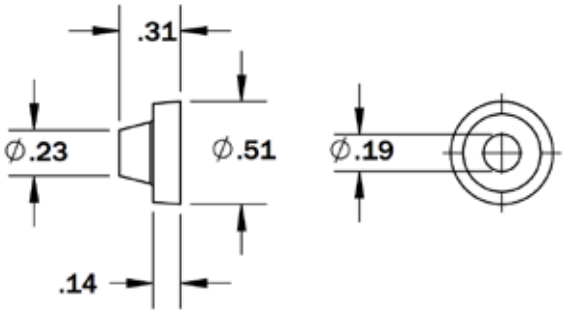
SEAL END WIPER BHP100062
Material: Rubber



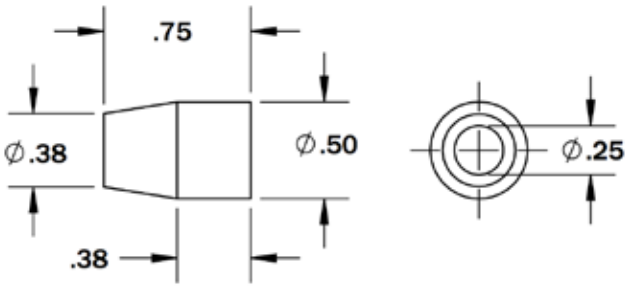
SEAL END WIPER BHP100063
Material: Rubber



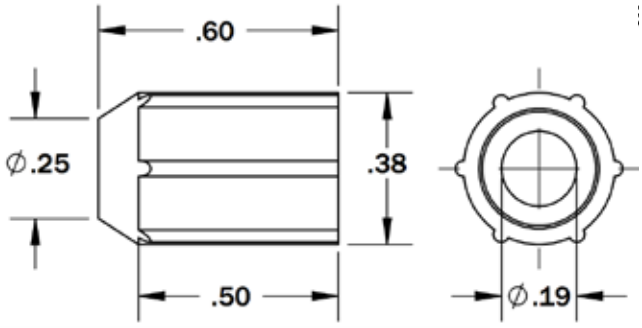
WIPER BHP100103
Material: Black Rubber



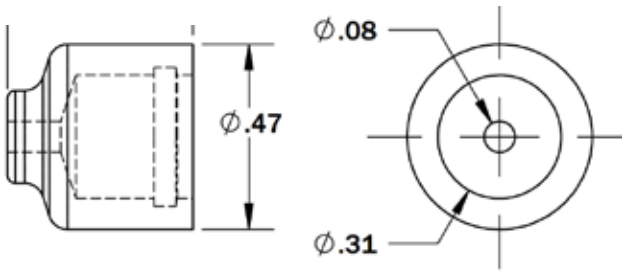
WIPER BHP100106
Material: Black Rubber



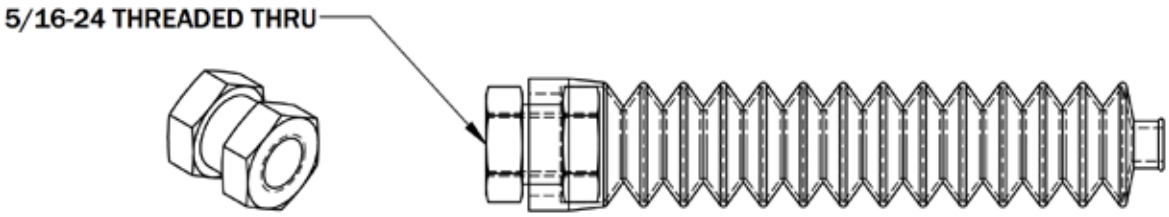
WIPER BHP100107
Material: Black Rubber



WIPER BHP080007
Material: Black Butal Rubber

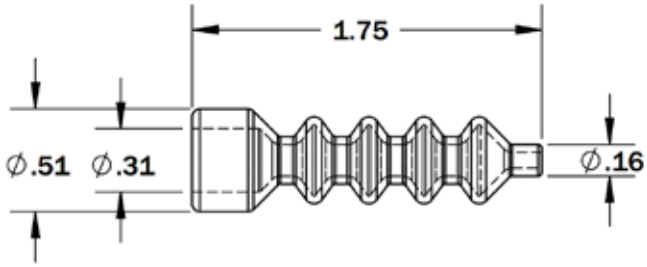


Material: Black Rubber



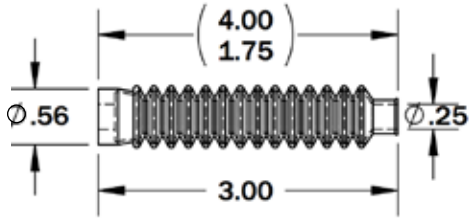
RUBBER BELLOW BHP090018

Material: Black Butal Rubber



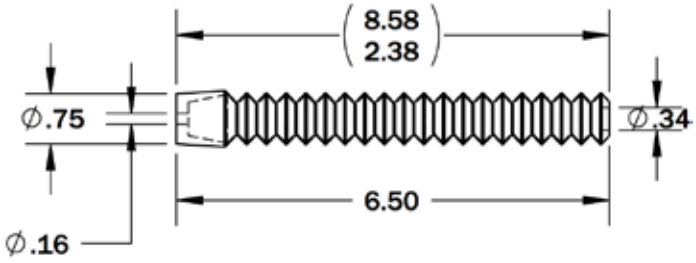
RUBBER BELLOW BHP100100

Material: Black Butal Rubber



RUBBER BELLOW BHP090070

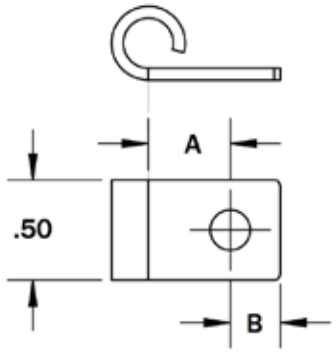
Material: Black Butal Rubber



CONDUIT CLIP BHP100067

-XXX	MOUNTING HOLE	A	B	FINISH
001	.200	,44	.25	BRIGHT
002	.263	.56	.25	BRIGHT
003	.227	.50	.25	BRIGHT
004	NO HOLE	.56	.25	BRIGHT
005	.27 X .39 SLOT	.37	.32	CLEAR
006	.20 X .25 SLOT	.44	.25	CLEAR
007	.263	.56	.25	BLACK
008	.27 X .39 SLOT	.37	.32	BLACK

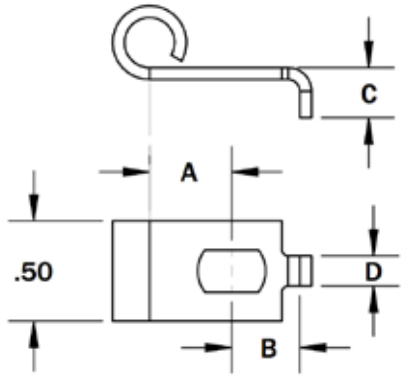
Material: Steel
Finish: Clear Zinc Plate



ANTI-ROTATIONAL CONDUIT CLIP BHP100068

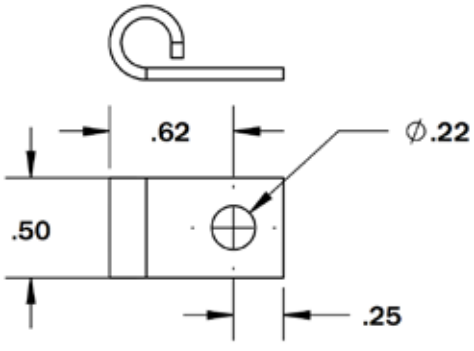
-XXX	CONDUIT	MOUNTING HOLE	A	B	C	D	FINSH
001	7/32	.21 X .34 SLOT	.41	.34	.25	.25	BRIGHT
002	1/4	.192 X .256 SLOT	.43	.357	.19	.19	CLEAR

Material: Steel
Finish: Clear Zinc Plate



LOOSE STRING-ON-CLIP BHP100069

Material: Steel
Finish: Clear Zinc Plate

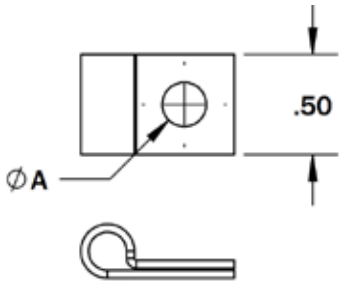


FOR Ø3/16 OR Ø7/32 CONDUIT SIZE

CONDUIT CLIP BHP100070

-XXX	CONDUIT SIZE	A	FINISH
001	3/16	.22	CLEAR
002	7/32	.28	CLEAR
003	1/4	.28	CLEAR
004	3/16	.28	CLEAR

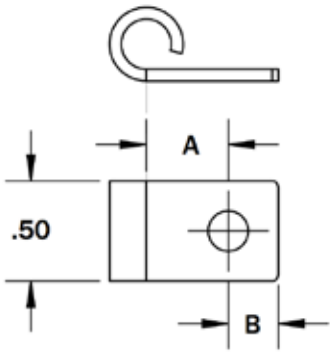
Material: Steel
Finish: Clear Zinc Plate



CONDUIT CLIP BHP100067

-XXX	MOUNTING HOLE	A	B	FINISH
001	.200	,44	.25	BRIGHT
002	.263	.56	.25	BRIGHT
003	.227	.50	.25	BRIGHT
004	NO HOLE	.56	.25	BRIGHT
005	.27 X .39 SLOT	.37	.32	CLEAR
006	.20 X .25 SLOT	.44	.25	CLEAR
007	.263	.56	.25	BLACK
008	.27 X .39 SLOT	.37	.32	BLACK

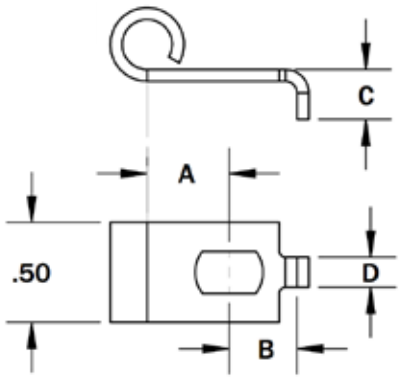
Material: Steel
Finish: Clear Zinc Plate



ANTI-ROTATIONAL CONDUIT CLIP BHP100068

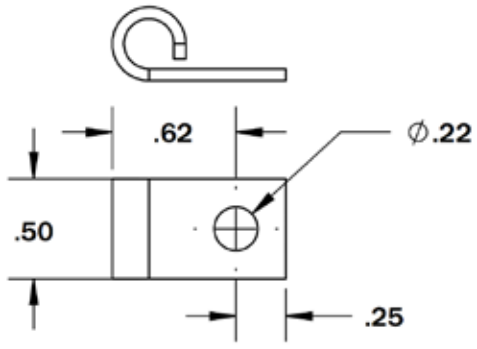
-XXX	CONDUIT	MOUNTING HOLE	A	B	C	D	FINSH
001	7/32	.21 X .34 SLOT	.41	.34	.25	.25	BRIGHT
002	1/4	.192 X .256 SLOT	.43	.357	.19	.19	CLEAR

Material: Steel
Finish: Clear Zinc Plate



LOOSE STRING-ON-CLIP BHP100069

Material: Steel
Finish: Clear Zinc Plate

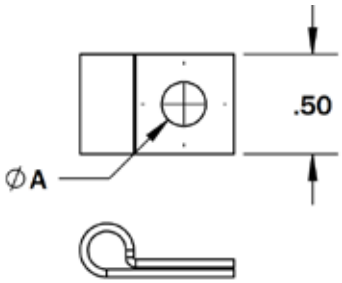


FOR Ø3/16 OR Ø7/32 CONDUIT SIZE

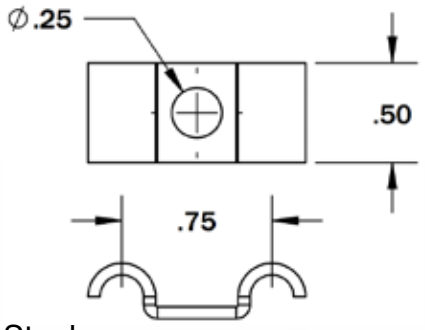
CONDUIT CLIP BHP100070

-XXX	CONDUIT SIZE	A	FINISH
001	3/16	.22	CLEAR
002	7/32	.28	CLEAR
003	1/4	.28	CLEAR
004	3/16	.28	CLEAR

Material: Steel
Finish: Clear Zinc Plate



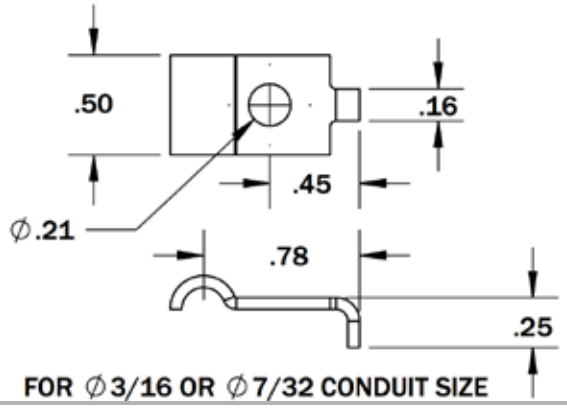
DUAL CONDUIT CLIP BHP100071



Material: Steel
Finish: Clear Zinc Plate

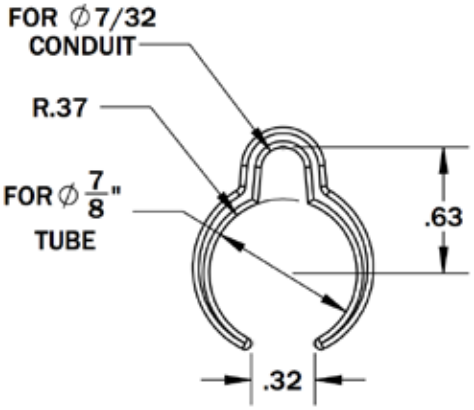
SINGLE CONDUIT CLAMP BHP100072

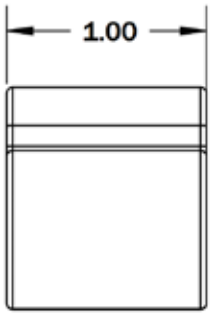
Material: Steel
Finish: Clear Zinc Plate

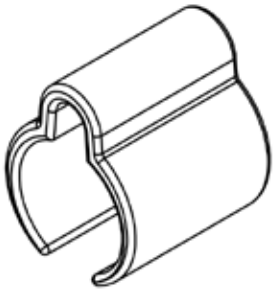


COMPOSITE SNAP CLIP-SINGLE CONDUIT BHP100064

Material: Black PP Copolymer



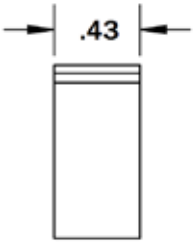




SNAP CLIP-SINGLE CONDUIT BHP100065

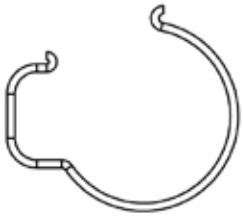
Material: Spring Steel
Finish: Clear Zinc Plate

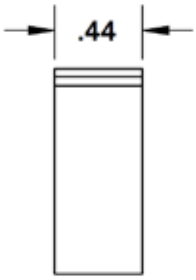
-XXX	TUBE DIA.
001	.75
002	.87
003	1.00



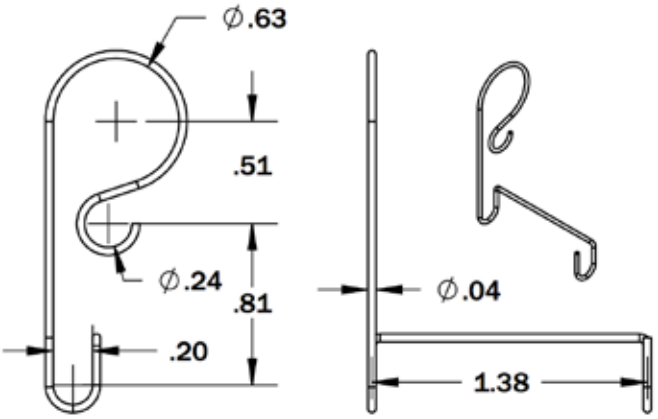
SNAP CLIP-DUAL CONDUIT BHP100066

Material: Spring Steel



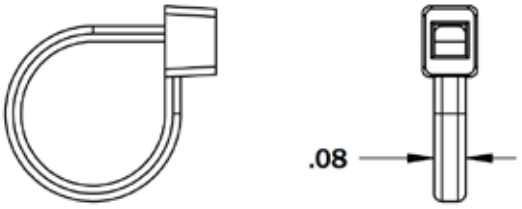


WIRE HANGER BHP080008
Material: .39” Music Wire

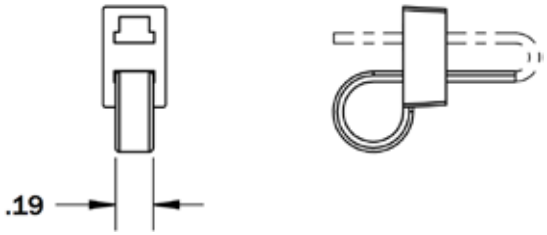


Finish: Phosphated Salt Spray
for no less than 48 hours

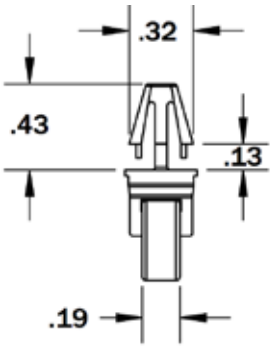
CABLE TIE BSP090015
Material: Black Nylon



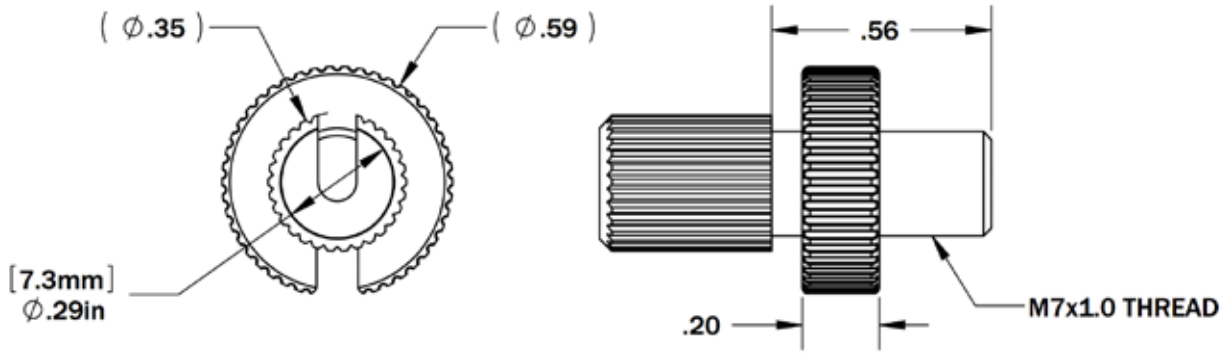
DOUBLE HEADED TIE BSP100002
Material: Black Nylon



SELF FASTENING TIE BSP100003
Material: Black Nylon

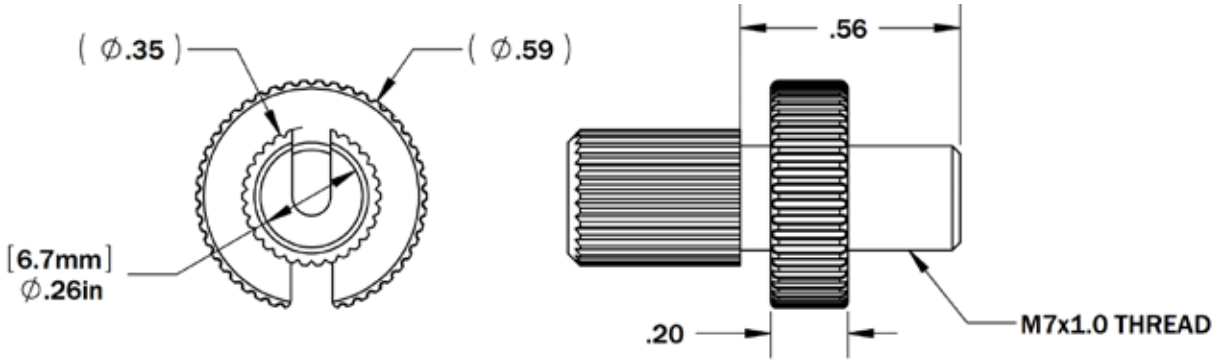


STEEL ADJUSTER BHA090043
FOR USE WITH BHP070040



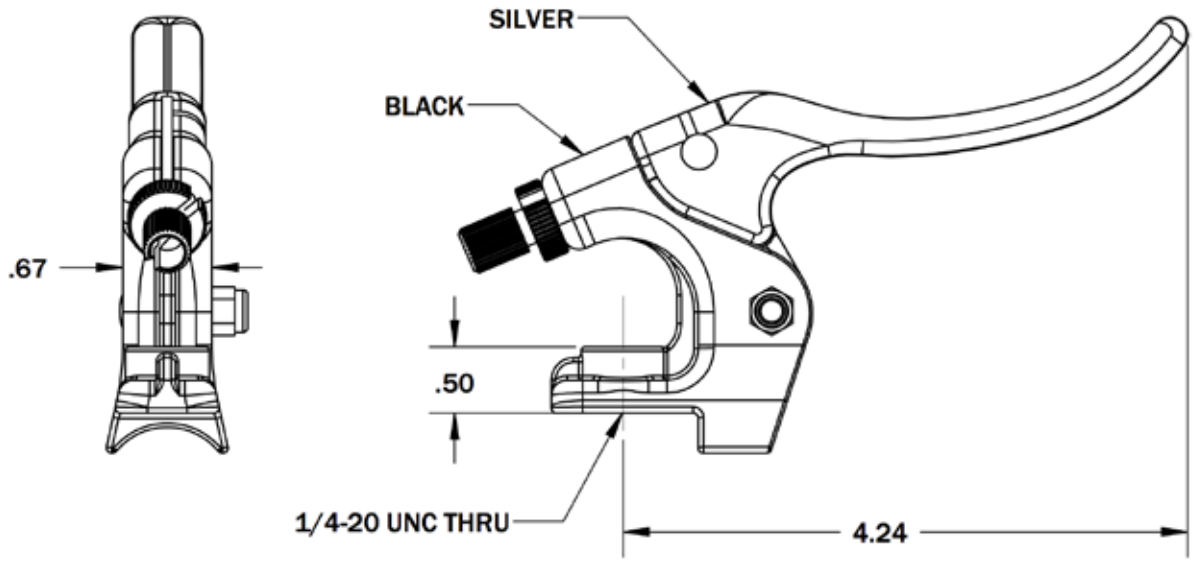
Finish: Clear Zinc Plate

STEEL ADJUSTER BHA080017
FOR USE WITH BHP040017



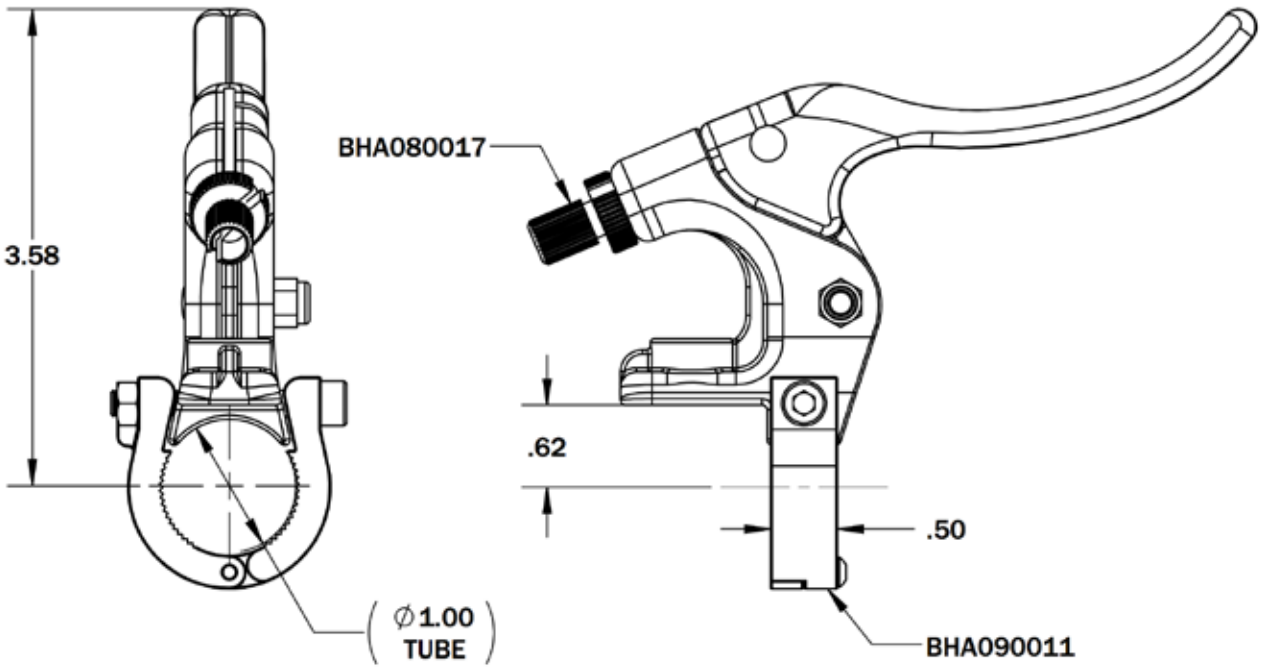
Finish: Clear Zinc Plate

AERO HANDLE BHA100025

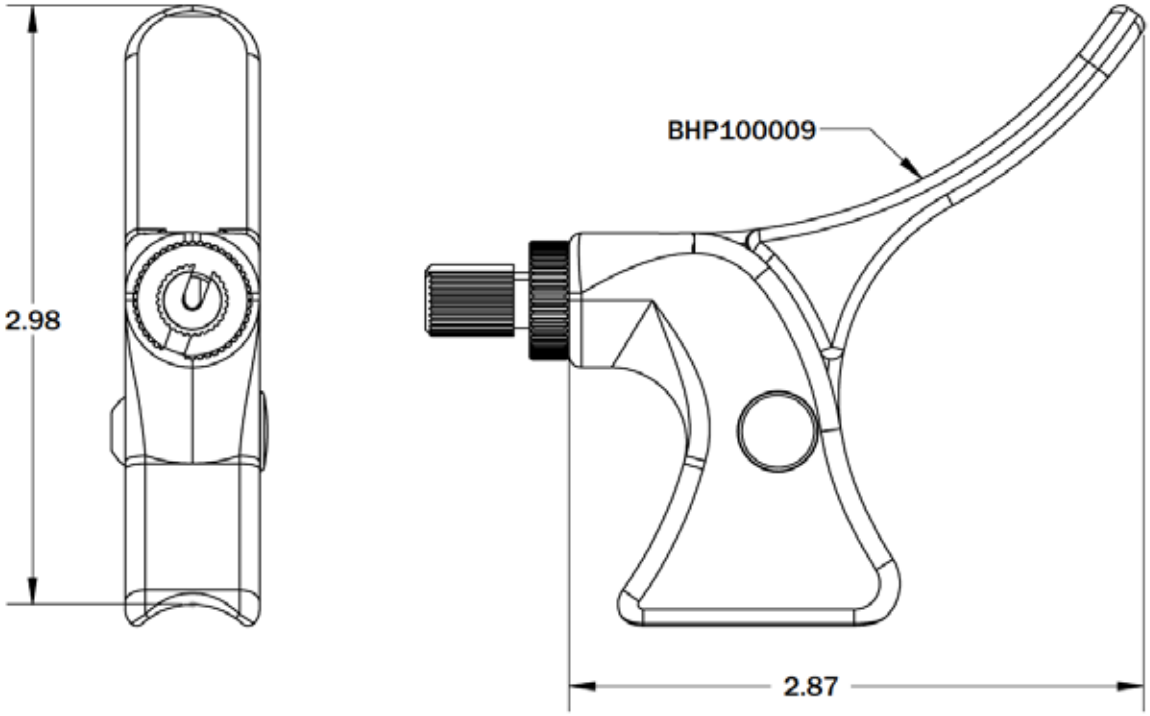


AERO HANDLES HAVE A 1.00 INCH STROKE ALUMINUM BODY WITH STEEL HARDWARE

AERO HANDLE BHA100026

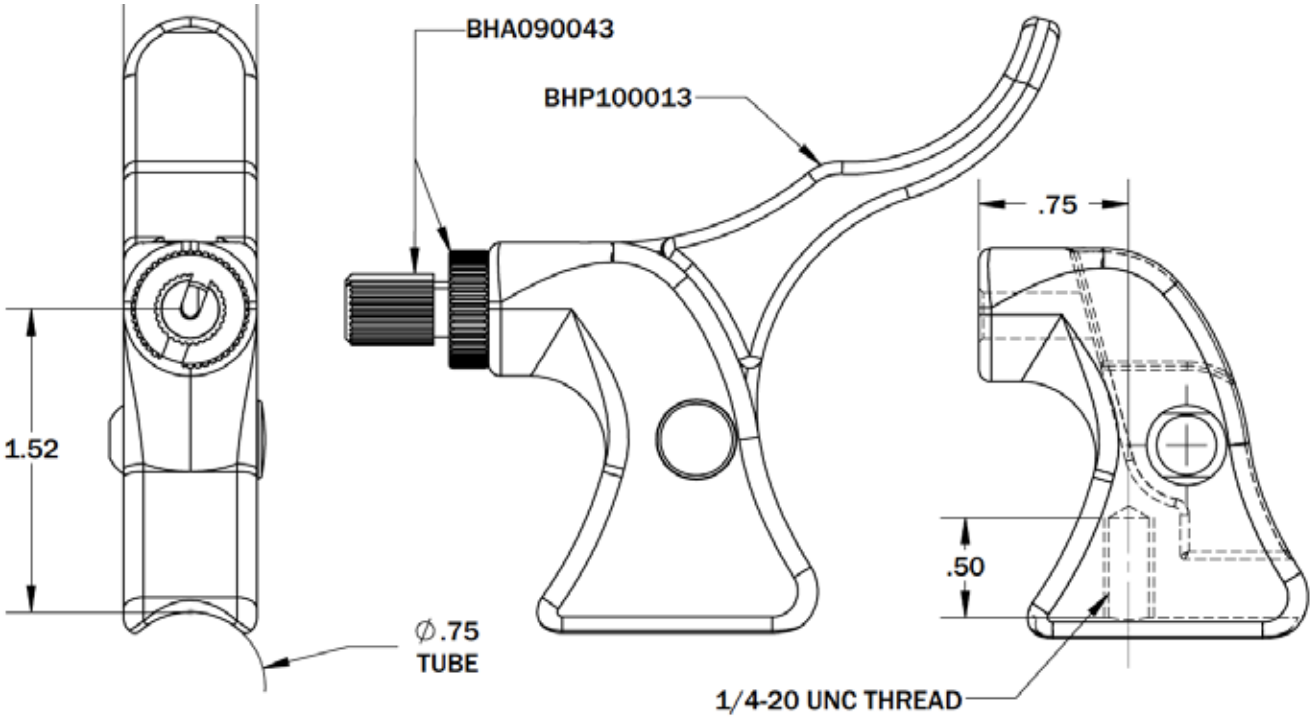


QUICKSHOT TRIGGER BHA100007

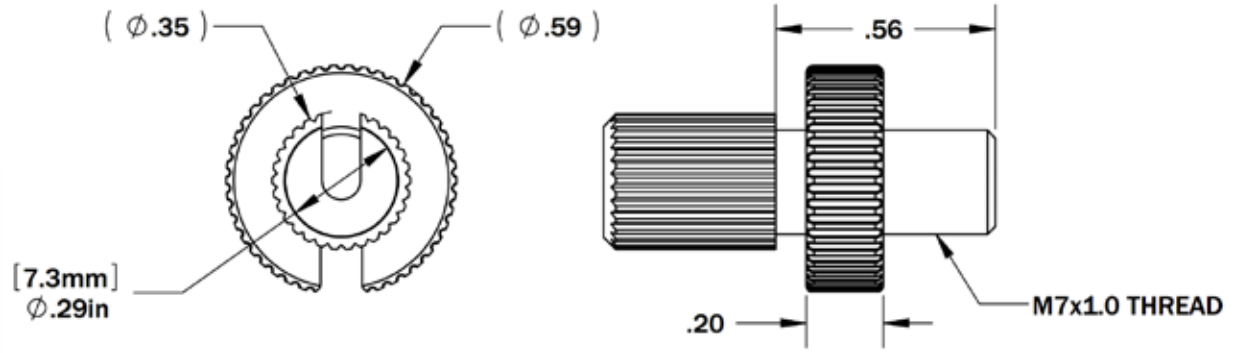


QUICKSHOT TRIGGERS HAVE A .75 IN. STROKE AND ARE MADE FROM GLOSS RED ABS PLASTIC

QUICKSHOT TRIGGER BHA100013

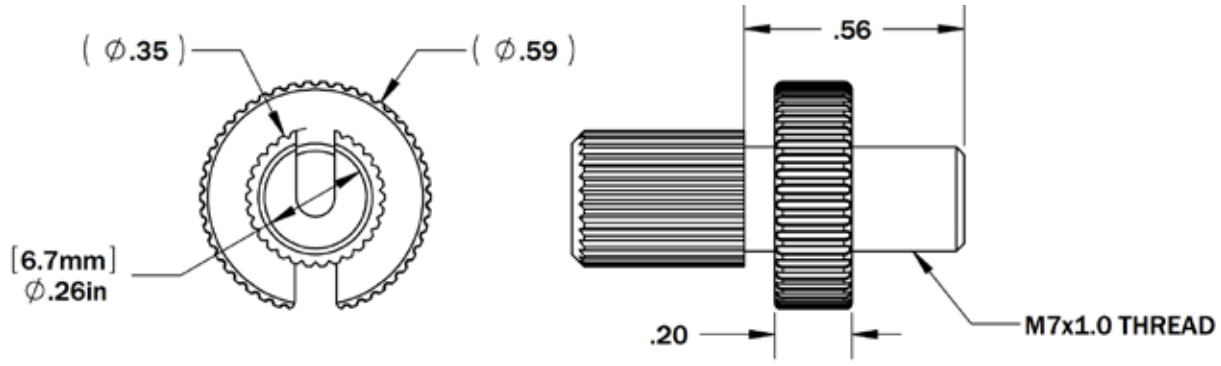


STEEL ADJUSTER BHA090043
FOR USE WITH BHP070040



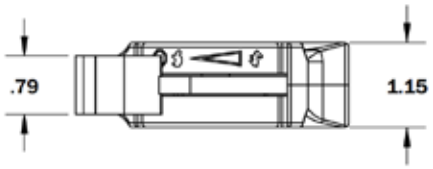
Finish: Clear Zinc Plate

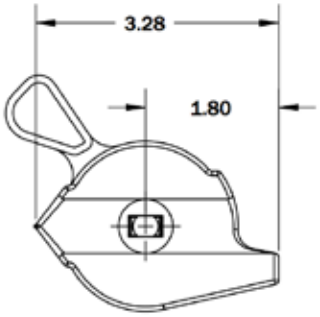
STEEL ADJUSTER BHA080017
FOR USE WITH BHP040017

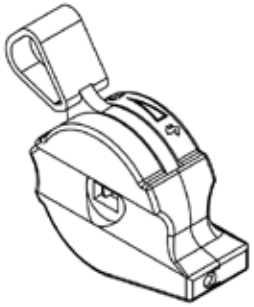


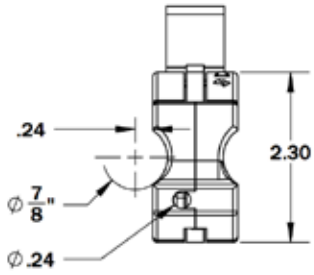
Finish: Clear Zinc Plate

1.25 IN. STROKE
Material: Black PP Copolymer

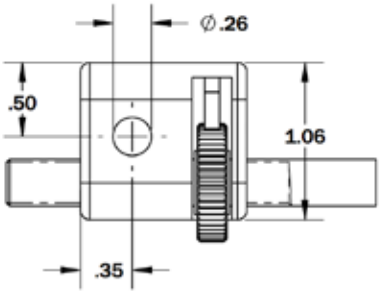


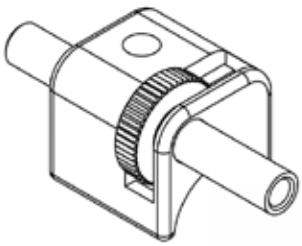


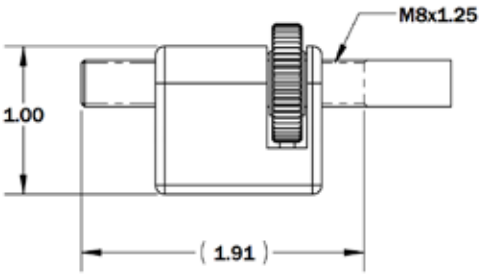


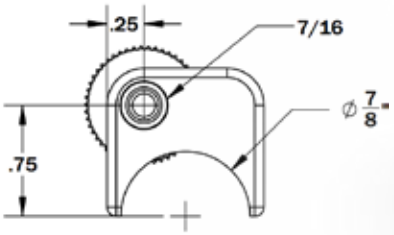


THUMB WHEEL ASSEMBLY BHA090036
Material: Steel
Finish: Clear Zinc Plate & Black PP Copolymer



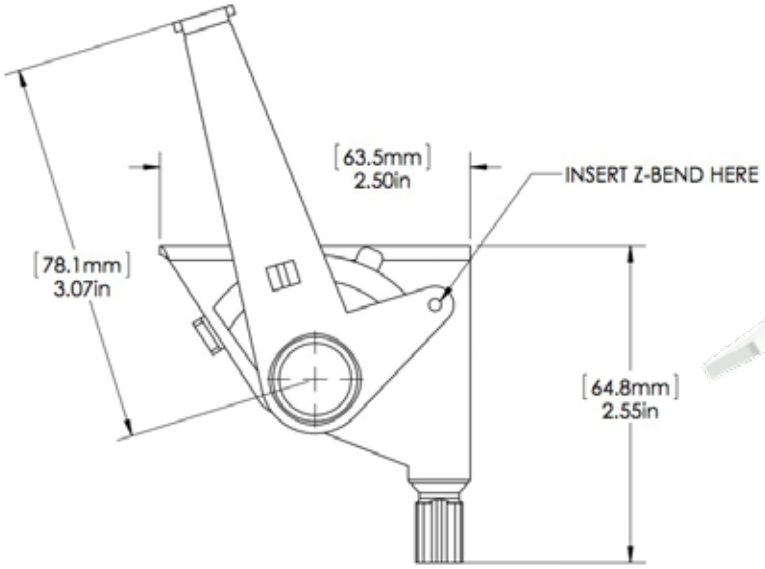


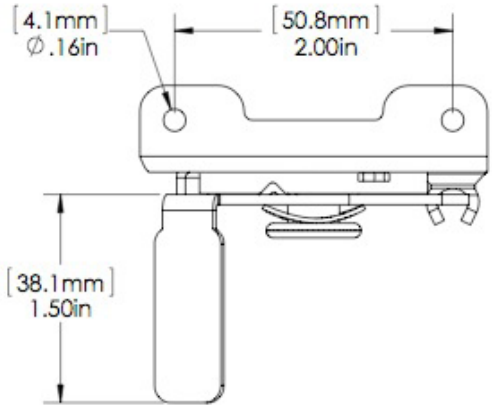




SHEET METAL CONTROL LEVER BHA100021 & BHA100022

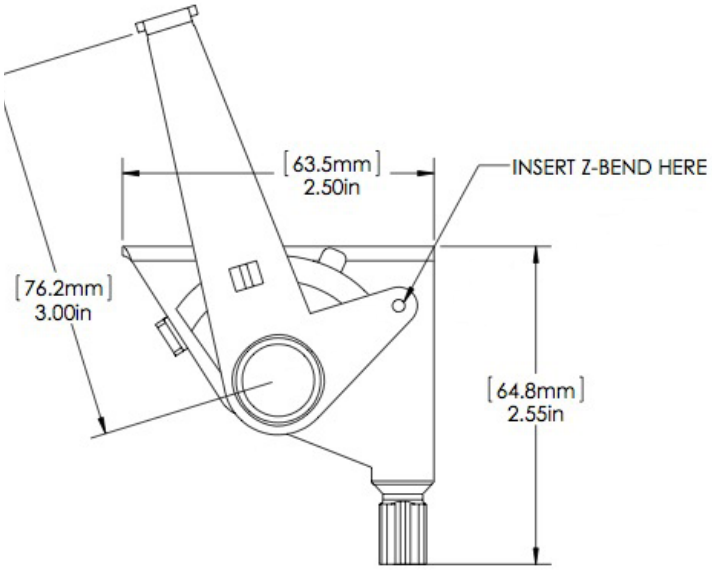
Shown in relaxed position
20 degree pull, .40” stroke
60 degree push, 1.19” stroke
Total Stroke: 80 degree 1.69”
Force to Move: 5 lbs.

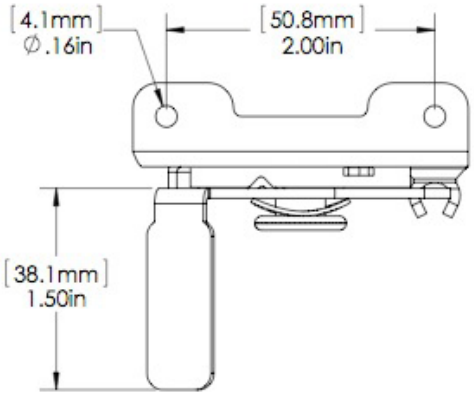




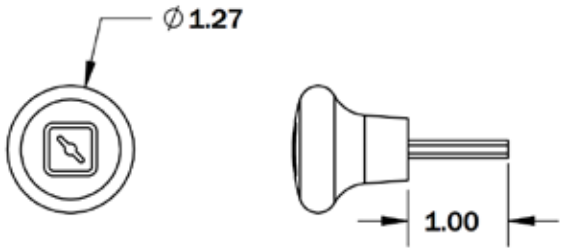
THROTTLE CONTROL BHA090035

Shown in relaxed position
20 degree pull, .40” stroke
60 degree push, 1.19” stroke
Total Stroke: 80 degree 1.69”
Force to Move: 5 lbs.



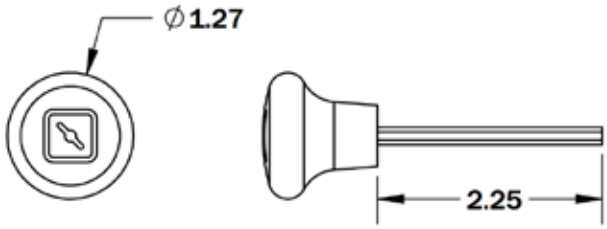


CHOKE KNOB BHP100117



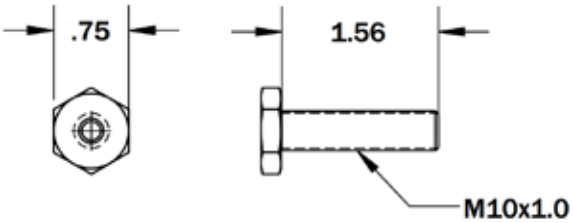
Material: Black Rubber and Steel
Finish: Clear Zinc Plate

CHOKE KNOB BHP100090



Material: Black Rubber and Steel
Finish: Clear Zinc Plate

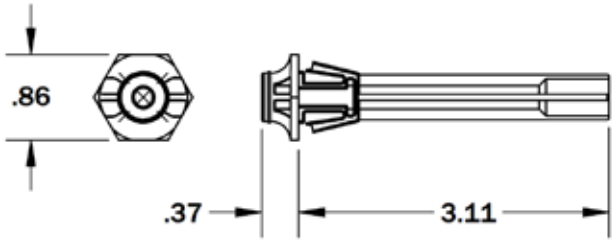
CHOKE FITTING BHP100118



Material: Steel
Finish: Clear Zinc Plate

CHOKE TUBE BHP100091

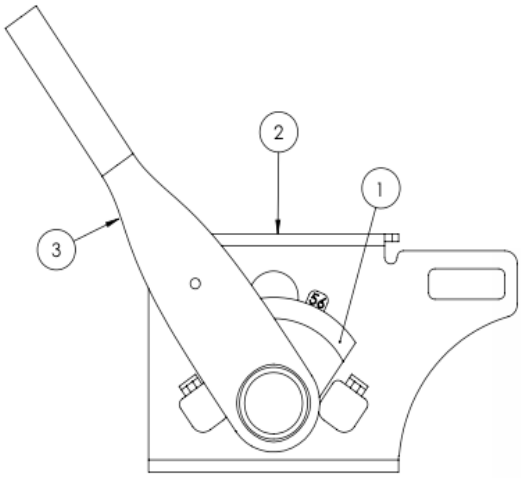
Material: Black PP Copolymer

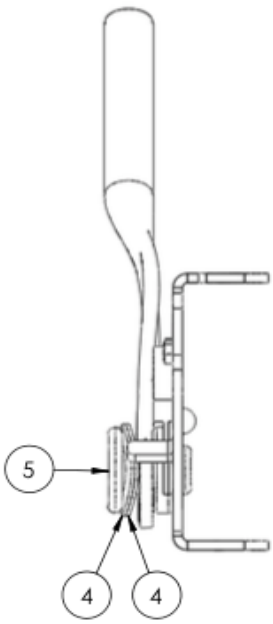


L/H POS ACTION LEVER BHA1100242

Throttle cable inner wire tralve: 1.60in±.10.
Force to Move the throttle range: 13 lb±3 lb.

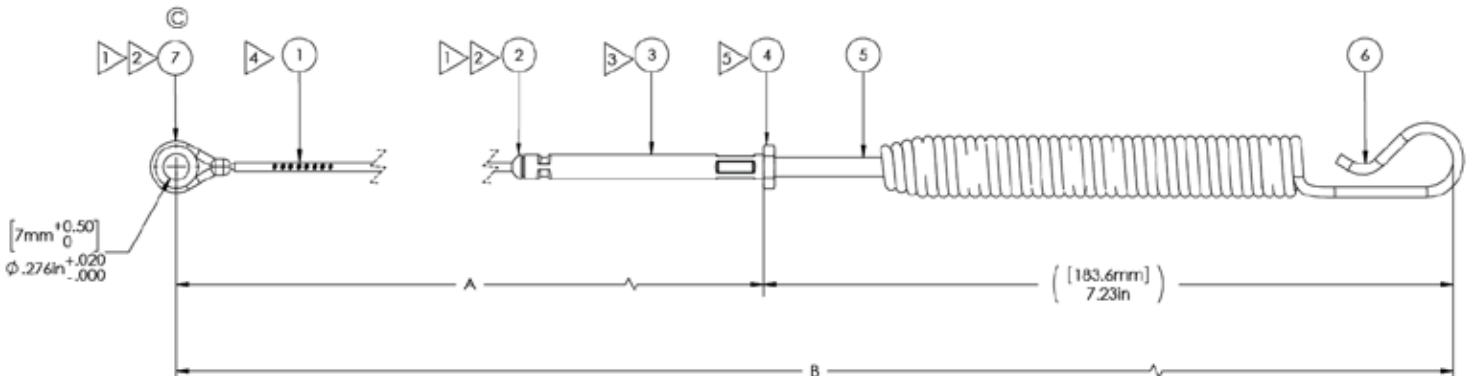
ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHP140002	HANDLE, GROMMET, PLASTIC 56	1
002	BHP140016	HANDLE, SHEET METAL BRK	1
003	BHP140017	HANDLE, SHEET METAL, ROD	1
004	BHP140019	HANDLE, SHEET METAL, WASHER	2
005	BHP140018	HANDLE, SHEET METAL, RIVOT	1





CABLE, CONTROL, AUGER UPPER TRACTION BHA110009

ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHP080009-502A	CABLE, CONTROL, 2.4MM COATED WIRE	1
002	BHP080013	PLUG, END, SWIVEL	1
003	BHP080014	TUBE, TURNBUCKLE M5x63.5	1
004	BSP090013	NUT, HEX JAM, M5x0.8 10mm HEX	1
005	BSP090009	HANDLE, SHEET METAL, RIVOT	1
006	BHP110004	SPRING, EXTENSION	1
007	BHP140018	PLUG, END, EYELET 7MM ID	1

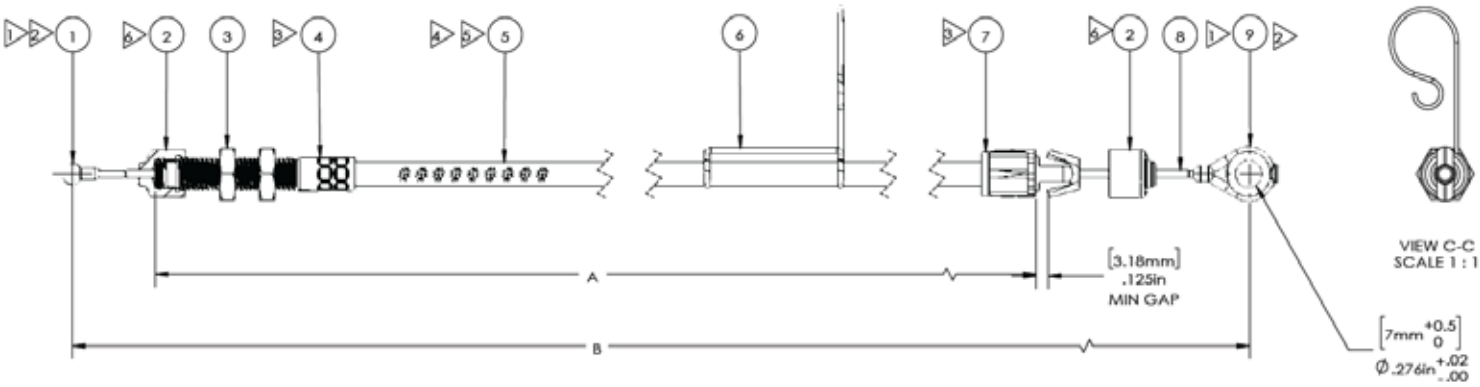


NOTES

1. **MINIMUM PULL OFF OR BREAK :** 150 lb. TENSILE.
2. **DIECAST FLASH PERMITTED** .004in MAX. THICKNESS.
3. **MINIMUM PULLOFF OF TUBE :** 125 lb.
4. **HOT STAMP CUSTOMER PART NUMBER** "########" **AND LOT NUMBER WITH WHITE TAPE.**
5. **NUT TO BE ONLY FINGER TIGHT.**

DELUXE CHUTE LOCK CABLE ASSEMBLY BHA140002

ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHP080003	PLUG, END, BALL 5MM	1
002	BHP080007	PSEAL CAP, CABLE CONTROL	2
003	BSP090001-003	3 BSP090001-003 NUT, HEX JAM, M8x1.25 2	2
004	BHP080022	CABLE, CONTROL, 5.65MM CASING OUTER LINED	1
005	BHP070039-1402	CABLE, CONTROL, 5.65MM CASING OUTER LINED	1
006	BHP080008	HANGER, CONTROL CABLE, WIREFORM	1
007	BHP130002	CABLE, CONTROL, BOOT SNAP	1
008	BHP090022-1402	CABLE, CONTROL, WIRE 1.65MM DIA COATED	1
009	BHP090020	PLUG, END, EYELET 7MM ID	1

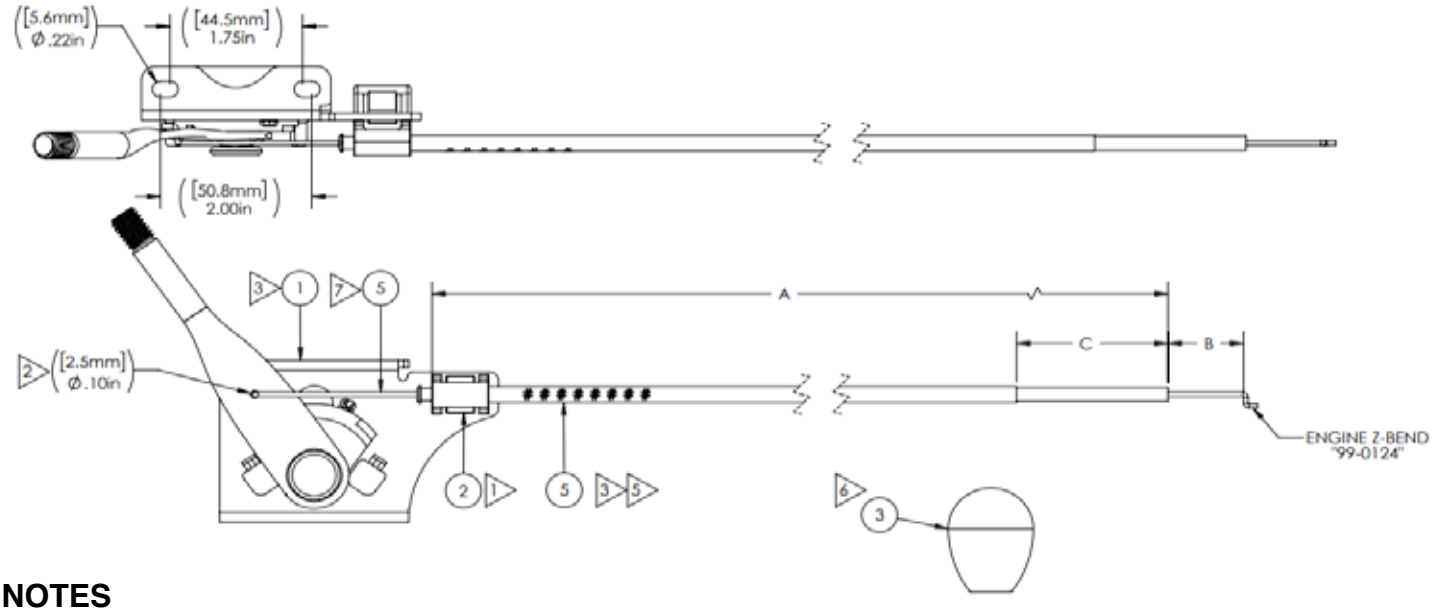


NOTES

1. **MINIMUM PULL OFF OR BREAK :** 150 lb. TENSILE.
2. **DIECAST FLASH PERMITTED** .004in MAX. THICKNESS.
3. **MIN. PULL OFF : 30 lb. TENSILE OR DESTROY CONDUIT.**
4. **HOTSTAMP PART NUMBER** "########" **& LOT NUMBER WITH WHITE TAPE.**
5. **INJECT A MINIMUM OF 0**.8cc **BY VOLUME,** 0.776g **BY WEIGHT, CABLE LUBRICANT INTO CONDUIT PRIOR TO STRINGING CABLE.**
6. **DO NOT SEAT BOOT ON END SNAP FOR SHIPPING.**

CABLE, CONTROL ASM, THROTTLE BHA140009

ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHA110024	L/H POS ACTION	1
002	BHP110029	FTG-SDSNAP, P-O	1
003	BHP110030	LEVER KNOB, PLASTIC	1
004	BHP090053-1409	CABLE, CONTROL, 1.5MM DIA WIRE ROD	1
005	BHP070039-1409	CABLE, CONTROL, 5.65MM CASING OUTER LINED	1

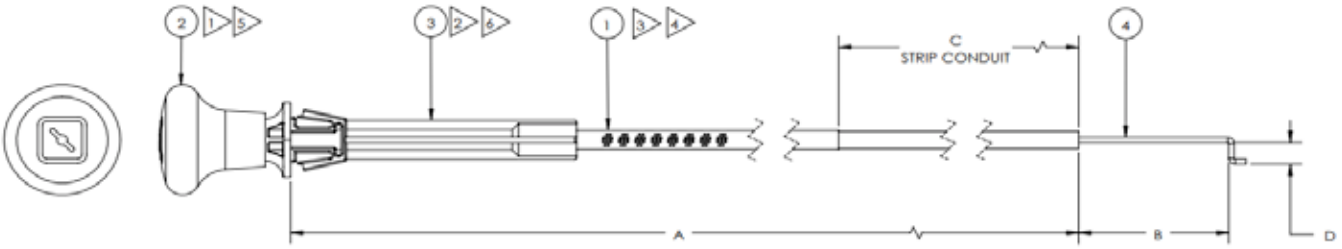


NOTES

1. **MINIMUM PULL OFF OR BREAK :** 150 lb. TENSILE.
2. **DIECAST FLASH PERMITTED** .004in MAX. THICKNESS.
3. **LEVER IN FULL FAST DETENT POSITION.**
4. **HOT STAMP CUSTOMER PART NUMBER "########" AND LOT CODE**
5. **INJECT A MINIMUM OF** 0.8g **BY WEIGHT OF CABLE LUBRICANT PRIOR TO STRINGING CABLE**
6. **KNOB SHIPPED IN BULK,** 1 **PER ASSEMBLY**
7. **CABLE INNER WIRE STROKE,** 1.60in .10in

CABLE, CHOKE, SNAP IN BHA150005

ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHP100090	CHOKE KNOB W/PLUNGER	1
002	BHP100091	CHOKE KNOB W/PLUNGER	1
003	BHP090053-1505	FTG, NON ORIENTED SNAP IN CHOKE SLEEVE, P-O 0.190	1
004	BHP110004	CABLE, CONTROL, WIRE 1.65MM DIA COATED	1

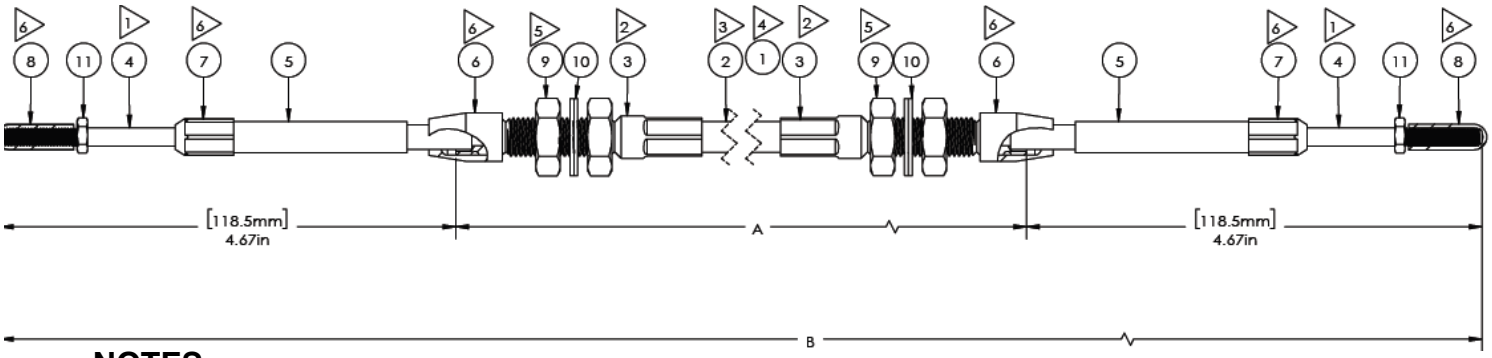


NOTES

1. **MINIMUM PULL OFF OR BREAK :** 150 lb. TENSILE.
2. **MIN. PULL OFF :** 30 lb. **TENSILE OR DESTROY CONDUIT.**
3. **HOT STAMP CUSTOMER PART NUMBER** "########"
   AND LOT NUMBER WITH WHITE TAPE.
4. **INJECT A MINIMUM OF** 0.8cc **BY VOLUME,** 0.776g **BY WEIGHT,**
   CABLE LUBRICANT INTO CONDUIT PRIOR TO STRINGING CABLE.
5. **CENTER THE SWAGE OPERATION OF THE STEM OVER THE INNERWIRE "DING**
6. **RECOMMENDED MOUNTING OPENING FOR CHOKE SLEEVE IS** 0.47 0.01 X
   0.542 0.005 **WITH A PANEL THICKNESS OF** .125 0.00

CABLE, CONTROL ASM, SHIFT BHA180025

ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHP090053-1032	CABLE, CONTROL, 1.5MM DIA WIRE ROD	1
002	BHP090068-1825	CABLE, CONTROL, 8MM CASING TWO WIRE	1
003	BHP090069	CABLE, CONTROL BULKHEAD STUD 4MM ID M1	2
004	BHP100104	THREADED END ROD	2
005	BHP100105	BARBED END TUBE	2
006	BHP100106	SEAL END WIPER	2
007	BHP100107	SEAL END WIPER	2
008	BHP100108	SEAL END CAP	2
009	BHP180048	7/16-20 UNF-2A NUT	4
010	Internal Tooth LW	7/16 INTERNAL TOOTHED WASHER	4
011	BHP180047	#10-32 UNF 2B JAM NUT	2

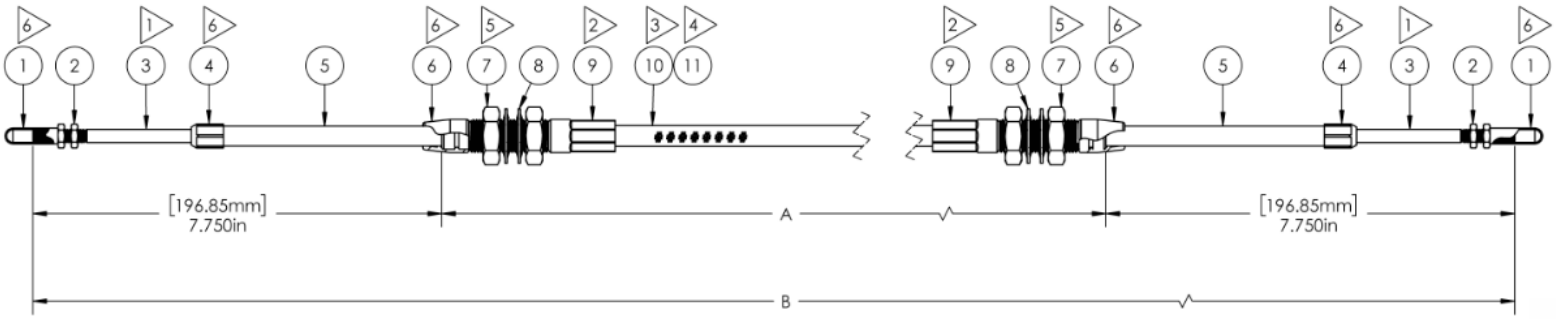


NOTES

1. **MINIMUM PULL OFF OR BREAK :** 150 lb. TENSILE.
2. **MIN. PULL OFF :** 30 lb. **TENSILE OR DESTROY CONDUIT.**
3. **INJECT A MINIMUM OF** 0.8cc **BY VOLUME,** 0.776g **BY WEIGHT, CABLE LUBRICANT INTO CONDUIT PRIOR TO STRINGING CABLE**
4. **HOTSTAMP PART NUMBER** "########" **& LOT NUMBER WITH WHITE TAPE.**
5. **NUTS TO BE LOOSE OR NO MORE THAN FINGER TIGHT..**
6. **SEAL CAPS TO BE FULLY SEATED.**
7. **STROKE LENGTH IS** [50.8mm] 2.00 in

PUSH / PULL CABLE

ITEM NO.	PART NUMBR	DESCRIPTION	QTY
001	BHP180010	SEAL END CAP	2
002	BSP090001-002	NUT, HEX JAM, M6x1	4
003	BHP180011	THREADED END ROD	2
004	BHP180012	SEAL END WIPER	2
005	BHP180013	BARBED END TUBE	2
006	BHP180023	SEAL END WIPER	2
007	BHP180025	M16X1.5 HEX NUT	2
008	BHP180024	M16 INTERNAL TOLLTHED WASHER	4
009	BHP180022	CABLE, CONTROL BULKHEAD STUD	4
010	BHP180026	10MM LINED BOWDEN CONDUIT	2
011	BHP180027	3MM 7X COATED CABLE	1



NOTES

1. **MINIMUM PULL OFF OR BREAK :** 150 lb. TENSILE.
2. **MIN. PULL OFF :** 30 lb. **TENSILE OR DESTROY CONDUIT.**
3. **INJECT A MINIMUM OF** 0.8cc **BY VOLUME,** 0.776g **BY WEIGHT, CABLE LUBRICANT INTO CONDUIT PRIOR TO STRINGING CABLE**
4. **HOTSTAMP PART NUMBER** "########" **& LOT NUMBER WITH WHITE TAPE.**
5. **NUTS TO BE LOOSE OR NO MORE THAN FINGER TIGHT..**
6. **SEAL CAPS TO BE FULLY SEATED.**
7. **STROKE LENGTH IS** [101.6mm] 4.00 in